Service Manual

Track excavator

2404

Machine model	**2404**
Edition	**1.0**
Language	**EN**
Article number	**1000256964**

WACKER NEUSON

1.2 Identification of warnings and dangers

Important information regarding the safety of the service staff and the machine are identified in this service manual with the following terms and symbols:

Danger!

Failure to observe the instructions identified by this symbol can result in personal injury or death for the service staff and/or other persons.

☞ *Measures for avoiding danger*

Caution!

Failure to observe the instructions identified by this symbol can result in damage to the machine.

☞ *Measures for avoiding danger for the machine*

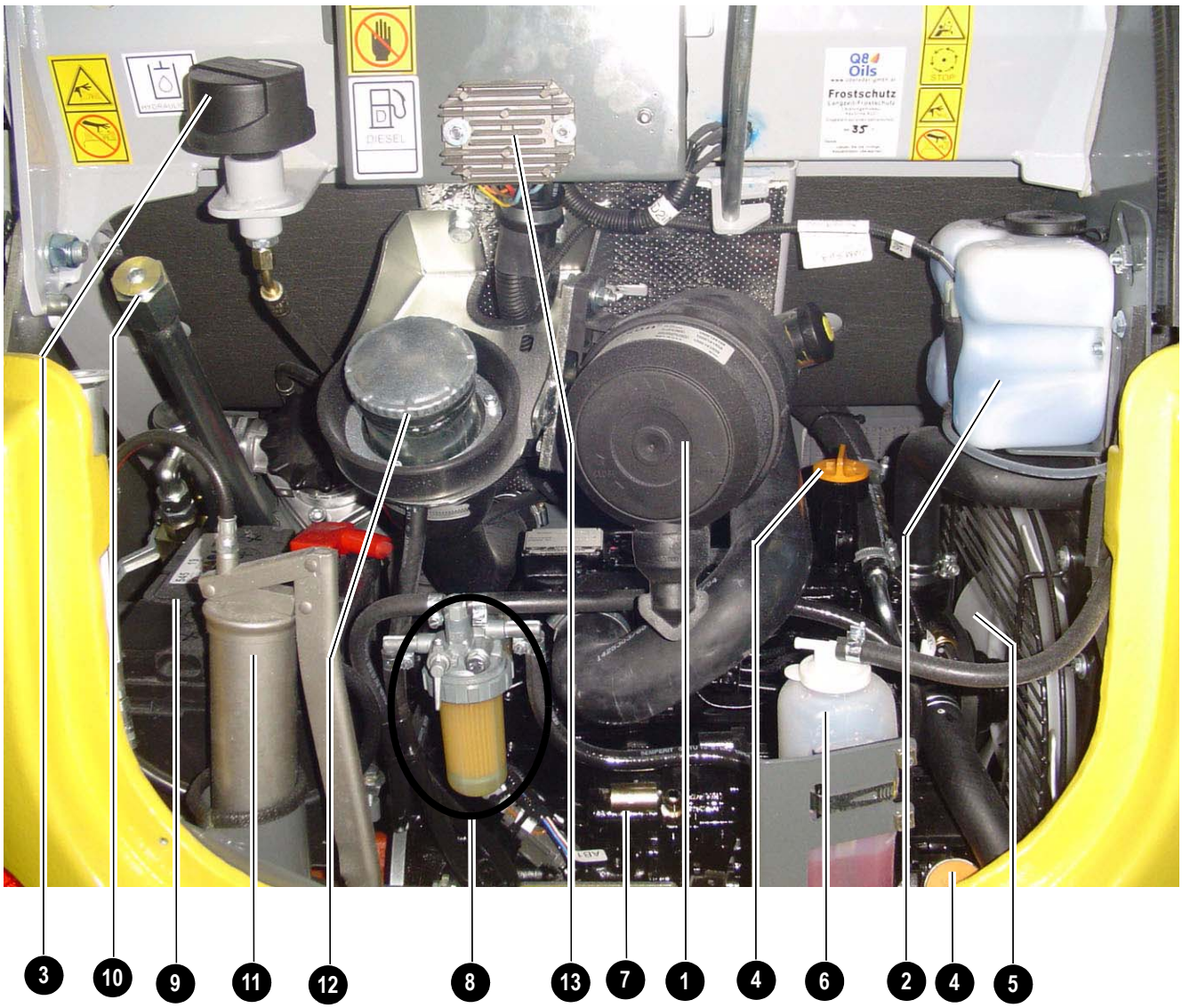
Notice!

This symbol identifies instructions for a more efficient and economical use of the machine.

Environment!

Failure to observe the instructions identified by this symbol can result in damage to the environment. The environment is in danger if environmentally hazardous material (e.g. waste oil) is not subject to proper use or disposal.

1.10 Engine compartment overview



Pos.	Description	For more information see page
1	Air filter	3-19
2	Washer fluid tank	
3	Breather filter	5-34
4	Engine oil filler inlet	3-13
5	Fan wheel	
6	Expansion tank	3-17
7	Fuel injection pump	4-10
8	Fuel filter	3-12
9	Battery	3-51
10	Hydraulic oil filler inlet	3-26
11	Grease gun	
12	Fuel filler inlet	3-9
13	Regulator	6-8

2.9 Towing and raising

Details and safety instructions on towing and raising the machine are contained in the Operator's Manual.

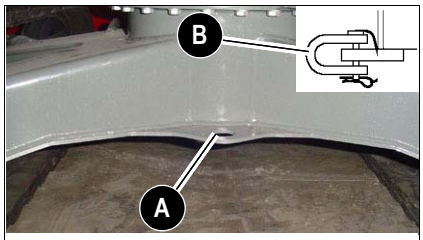


Fig. 17: Towing bore

Towing

☞ *Use towing bracket **A** on the undercarriage for towing the machine*

➥ Use towing bracket **A** only for towing

➥ Never use towing bracket **A** for towing another machine

☞ *Use only shackle **B** with the shackle pin and a lock pin*

The machine cannot be towed away if it is at a standstill or broken down,

➥ otherwise the machine's travelling drives can be damaged

Caution!

Maximum admissible load on towing bracket **A**:

1.5 x excavator dead weight

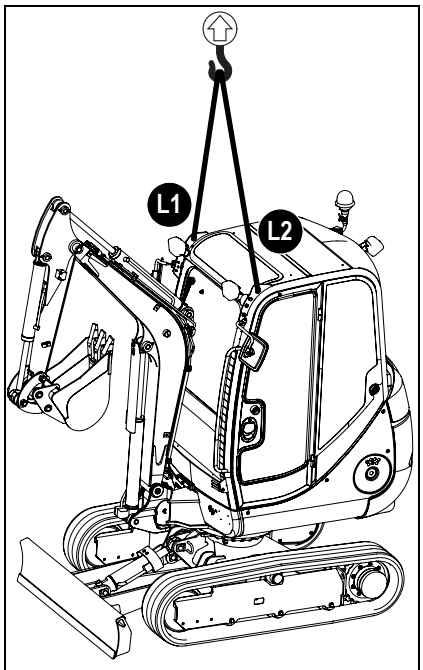


Fig. 18: Craning operation

Raising and loading

- Before raising the machine always check the fastening screws of the cab and the seat console with a torque wrench – *see Model-specific tightening torques* on page 2-8
- The crane and the lifting gear must have suitable dimensions

☞ *Lock the upper carriage*

☞ *Mount suitable lifting gear at the points on the cab provided for lifting the machine*

☞ *Ensure that the lifting gear has the required lengths under all circumstances*

➥ Specified length of lifting gear **L1** and **L2**: 1300 mm (51.2”)

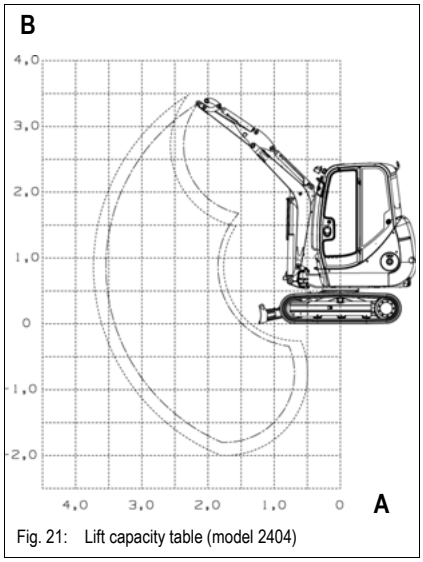
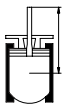
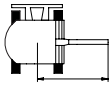


Fig. 21: Lift capacity table (model 2404)

max	Admissible load on extended stick
A	Reach from live ring centre
B	Load hook height
*	Lift capacity limited by hydraulics

	With the stabiliser blade in driving direction
	Without the stabiliser blade, 90° to driving direction

If equipped with a bucket or other attachments, lift capacity or tilt load is reduced by bucket or attachment dead weight.

Calculation basis: according to ISO 10567

The compact excavator's lift capacity is restricted by the settings of the pressure limiting valves and the hydraulic system's stabilising features.

Neither 75 % of the static tilt load nor 87 % of the hydraulic lift capacity is exceeded.

3.2 Maintenance plan (overview)

Work description

For service and maintenance work on the attachment, please refer to the operation and maintenance manual of the attachment manufacturer as well.

	Maintenance plan/service hours (s/h)							
	Maintenance work (once a day)	Every 50 s/h	Every 250 s/h	Every 500 s/h	Every 1000 s/h once a year	Every 2000 s/h	Customer	Authorised workshop
Fluid and filter changes ( ):								
Carry out the following oil and filter changes (check oil levels after test run):								
• Engine oil[1]		●	●					●
• Engine oil filter[2]		●	●					●
• Fuel filter[3]		●		●				●
• Air filter element according to fouling indicator [4]					●		●	
• Coolant					●			●
• Hydraulic oil filter insert [5]		●		●				●
• Hydraulic oil[6]		●			●			●
• Hydraulic oil tank breather					●			●
• Drain condensation water from hydraulic oil tank				●				●
• Gearbox oil[7]		●			●			●
• Filter insert of fuel prefilter (water separator)				●				●
Inspection work ( ):								
Check the following material. Refill if necessary:								
• Engine oil	●						●	
• Engine coolant	●						●	
• Fuel	●						●	
• Hydraulic oil	●						●	
• Gearbox oil		●						●
Clean water ducts [8]					●			●
Check radiator for engine and hydraulic oil for dirt. Clean if necessary	●						●	
Check cooling systems, heating and hoses for leaks and pressure (visual check)	●						●	

Replacing the engine oil filter cartridge

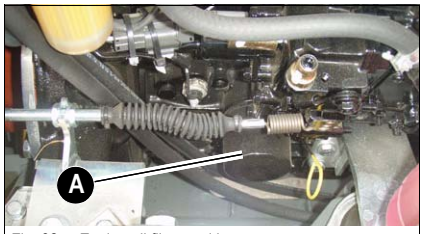


Fig. 32: Engine oil filter position

Danger!

Caution when draining hot engine oil –

Danger of burns!

☞ *Wear protective gloves*

Environment!

Collect the drained engine oil in a suitable container. Dispose of used oil and filters in an environmentally friendly manner!

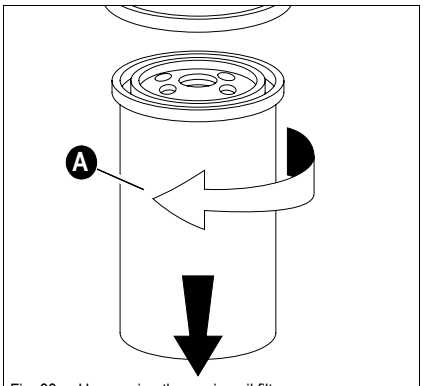


Fig. 33: Unscrewing the engine oil filter

☞ *Change the filter as follows:*

- Stop the engine
- Place a suitable container underneath the oil filter to collect the oil as it drains
- Slowly open oil filter cartridge **A** counterclockwise with an oil filter wrench
- Let the oil drain into the container
- Remove the filter cartridge once the oil is completely drained

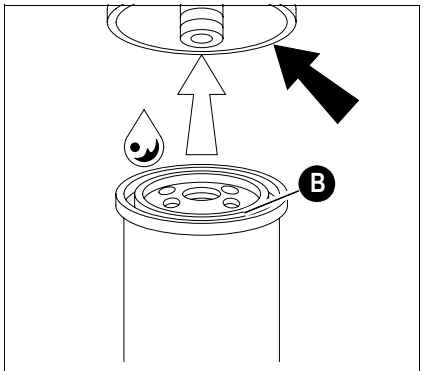


Fig. 34: Cleaning the filter head and oiling the gasket

- Clean the inside of the filter head
- Apply a thin coat of fresh engine oil to the sealing ring **B** of the new oil filter cartridge
- Tighten the new filter cartridge clockwise by hand until the seal makes contact.

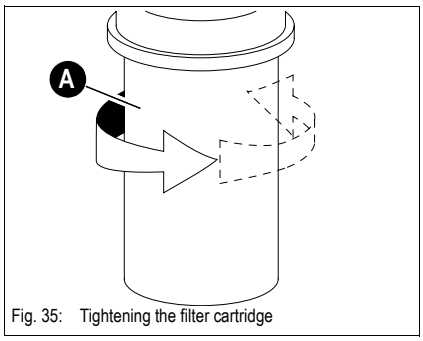


Fig. 35: Tightening the filter cartridge

- Tighten oil filter cartridge **A** by hand or with an oil filter wrench

➥ Tighten about one additional turn or to a tightening torque of 19.6 – 23.5 Nm (14 – 17 lb/ft)

- Ensure that the oil level is correct!
- Completely remove all oil spills from the engine
- Allow the engine to warm up for about 5 minutes
- Stop the engine
- Check the seal of oil filter cartridge **A** and retighten by hand
- Check the oil level and fill in engine oil if necessary
- Completely remove all oil spills from the engine
- Dispose of the used oil filter in an environmentally friendly manner

Checking the hydraulic oil level

Caution!

Do not fill up oil if the oil level is above the **FULL** mark, otherwise the hydraulic system can be damaged and escaping oil can cause serious injuries.

☞ *Check the hydraulic oil level each time the machine is put into operation or once a day*

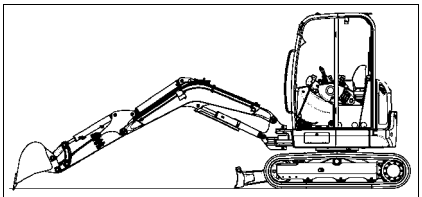


Fig. 50: Positioning the excavator

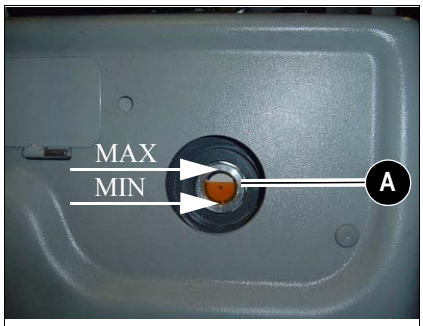


Fig. 51: Oil level gauge

☞ *Park the machine on level ground*

➥ Position the work equipment as shown (see *Fig. 50*)

☞ *Retract the bucket and boom rams and lower the boom and the bucket with the bucket teeth to the ground*

☞ *Lower the stabiliser blade to the ground*

☞ *Set the boom straight (slewing ram)*

☞ *Stop the engine*

☞ *Fold the control lever base up*

☞ *Open the engine cover*

☞ *Sight glass* **A** *is located in the cab under the seat*

☞ *Check the oil level on sight glass* **A**

☞ *The oil level should be visible at about 1 cm (0.4 ") above the centre of the sight glass between the positions* ***Min*** *and* ***Max*** *as shown in Fig. 51*

➥ The MIN level is marked by the lower joint

➥ The MAX level is marked by the upper joint

☞ *Fill up hydraulic oil if the oil level is lower*

A yellowish colour of the entire sight glass is a sign that too much oil has been filled in!

The oil level varies according to the machine's operating temperature:

Machine condition	Temperature	Oil level
• Before putting into operation	Between 10 and 30 °C (50 and 86 °F)	In the lower part of the sight glass
• Normal operation	Between 50 and 90 °C (122 and 194 °F)	In the upper part of the sight glass

Notice!

Measure the oil level of the hydraulic system only after the machine reaches its operating temperature.

Pressure check of gear pump P3

Functions: “Stabiliser blade”, “Auxiliary hydraulics/boom swivelling”, “Upper carriage rotation”, “VDS”, “Hydraulic quickhitch”, “3rd control circuit/PowerTilt”

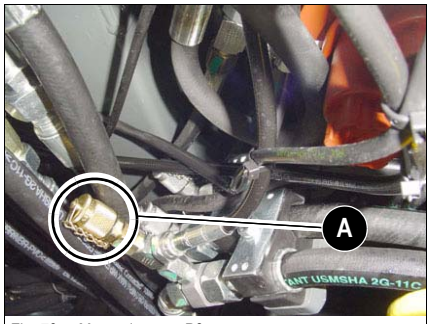


Fig. 70: Measuring port P3

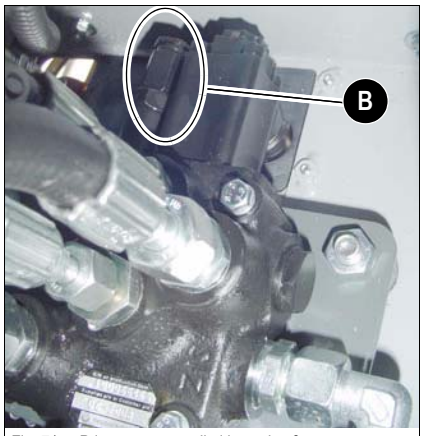


Fig. 71: Primary pressure limiting valve 3

Checking primary pressure limiting valve 3 (PPLV 3)

☞ *Connect a pressure gauge to measuring port **A** (MP 3)*

☞ *Extend the stabiliser blade ram as far as it will go at maximum engine speed*

☞ *Check and make a note of the pressure value.*

Checking pressure drop

☞ *Extend the stabiliser blade ram as far as it will go at maximum engine speed*

☞ *Swiftly reduce engine speed from maximum to minimum*

☞ *Check and make a note of the pressure drop and pressure value.*

➥ Pressure drop should not exceed the specified value by more than 10 %

➥ Approximate value applies to primary pressure limiting valves only

➥ An excessively high pressure drop can indicate a leak

Adjusting primary pressure limiting valve 3 (PPLV 3)

☞ *Adjust the pressure at the primary pressure limiting valve **B** (PPLV 3) on the blade valve*

➥ Accessible through the right-hand side flap

☞ *Slacken the locknut of the pressure limiting valve*

☞ *Unscrew the pressure limiting valve until you can read off a pressure drop on the pressure gauge*

➥ The valve seat may be stuck and must be slackened first

☞ *Adjust the pressure limiting valve and tighten the locknut*

☞ *Check the primary pressure limiting valve **B** and the pressure drop again once adjustment is over*

Check pressure limitation and pressure drop again for the functions “Stabiliser blade (rod side)”, “Auxiliary hydraulics”, “Boom swivel” and “Upper carriage rotation”! Also check any option included (VDS, quickhitch, 3rd control circuit/PowerTilt connection).

Swivel unit pressure check

The operating pressure is limited by the secondary pressure limiting valves on the swivel unit – *see* *Secondary pressure limiting valve for swivel unit* on page 3-36. Checking the pressure drop is only permissible for primary pressure limiting valves.

Checking the auxiliary hydraulics pressure

➥ Auxiliary hydraulics supply by P2 and P3

Notice!

At the measuring ports MP 2 and MP 3, the auxiliary hydraulics function shows the specified value for the primary pressure limiting valves PPLV 2 or PPLV 3

- With an open ball-type cock, measure the banking-up pressure of the system – non-pressurised circulation
- If secondary valves are fitted on the attachment, the specified value of these secondary valves is displayed

3.16 Lubrication work

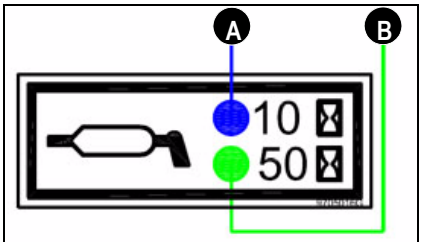


Fig. 82: Lubrication recommendation

A grease type listed in the specifications must be applied to all lubrication points listed – *see chapter 3.1 Fluids and lubricants* on page 3-2.

- Lubrication points **A** with blue caps
  ☞ Apply grease daily
- Lubrication points **B** with green caps
  ☞ Apply grease once a week

Lubricate all mechanical pivots on the machine (such as door hinges, joints) and fittings (such as door arresters) at regular intervals even if they are not listed in the lubrication plan.

Stabiliser blade

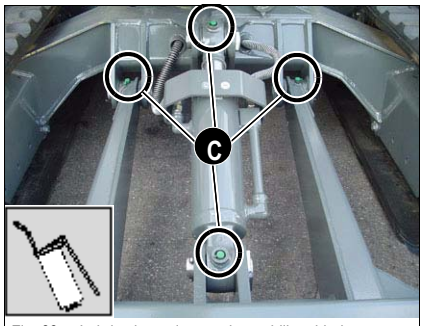


Fig. 83: Lubrication points on the stabiliser blade

☞ *Apply grease to lubrication points **C** on the stabiliser blade ram*

☞ *Apply grease to lubrication points **C** on the stabiliser blade*

Swivelling console

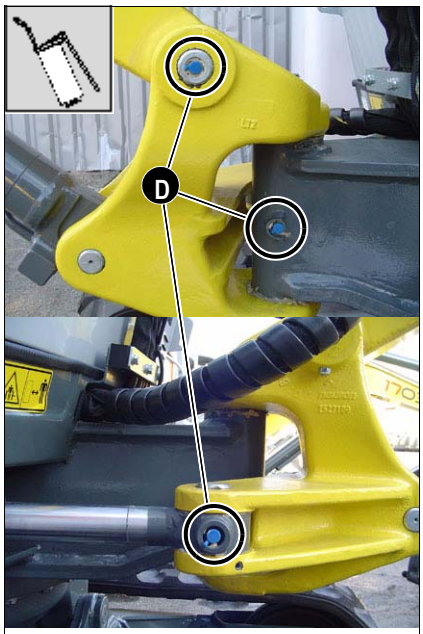


Fig. 84: Lubrication points on the swivelling console

☞ *Apply grease to lubrication points **D** of the swivelling console*

Exterior of the machine

The following articles are generally suitable:

- High-pressure cleaner
- Steam jet

Engine compartment

Danger!

Clean the engine at engine standstill only –

Danger of personal injury!

☞ *Stop the engine before cleaning*

Caution!

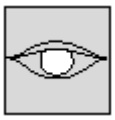
When cleaning the engine with a water or steam jet

☞ *The engine must be cold*

☞ *and do not point the jet directly at electric sensors such as the oil pressure switch.*

The humidity penetrating any such sensors causes them to fail and leads to engine damage!

Screw connections and attachments



All screw connections must be checked regularly for tightness, even if they are not listed in the maintenance schedules. See the tightening torques on page 2-8.

Retighten loose connections immediately. Contact an authorised workshop if necessary.

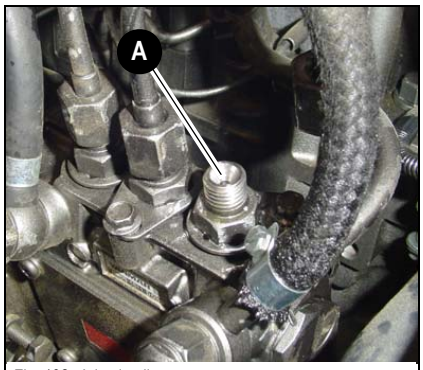


Fig. 102: Injection line

Measurement:

☞ *Slacken the high-pressure fuel injection lines of cylinder 1 and push to one side*

➥ The opening of injection pump **A** must be visible

☞ *Turn all fuel cocks to flow*

Notice!

Fuel is pumped to the cylinder only every second turn of the crankshaft; for this reason it may be necessary to turn the crankshaft twice.

☞ *An auxiliary means (fuel injection line with a transparent pipe) can be mounted on the fuel injection line for precise observation*

➥ This auxiliary means is not essential

☞ *Position a spanner on the screw of the pulley (on the crankshaft)*

➥ Or turn the ring gear on the flywheel with a screwdriver

☞ *Slowly turn clockwise until fuel is discharged from the opening of injection pump **A***

☞ *Then slowly turn approximately two more rotations until about 30° before top dead centre*

☞ *Remove any bubbles at the opening of the injection pump with your finger so that the opening of the injection pump is about half full with fuel*

☞ *Slowly keep turning the crankshaft clockwise until the fuel level rises to the opening of injection pump **A***

☞ *Stop the rotary motion immediately*

☞ *Read the degrees before top dead centre by means of the indentations on the flywheel*

➥ Rated value: 16° ± 1° before top dead centre – *see Flywheel marks* on page 4-8

☞ *Check the injection time again two to three times*

➥ If the specified value is reached, the injection time is correct

☞ *Refit the fuel injection line, cutoff solenoid and plug*

☞ *Check the fuel system for leaks*

➥ If the value varies from the specified value, the injection time must be adjusted

Setting injection time

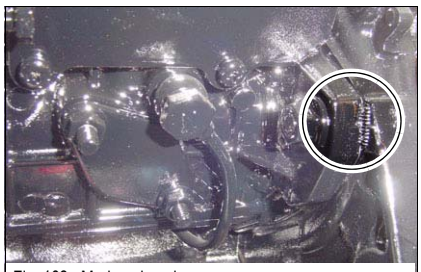


Fig. 103: Mark on housing

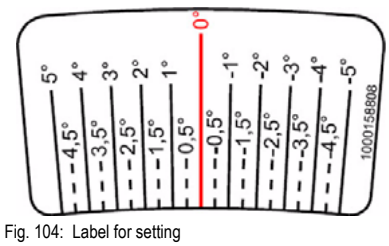


Fig. 104: Label for setting

Variations of the injection time outside the tolerance range can be corrected by turning the fuel injection pump.

➥ The injection time must be measured to determine whether it is premature or too late – *see Flywheel marks* on page 4-8

☞ *Mark the original position of the injection pump on the pump and gear casing – see Fig. 103*

☞ *Remove all injection lines on the fuel injection pump and slacken the 4 flange screws by about ½ a revolution (do not unscrew completely)*

☞ *Swivel the pump in the required direction and retighten the screws*

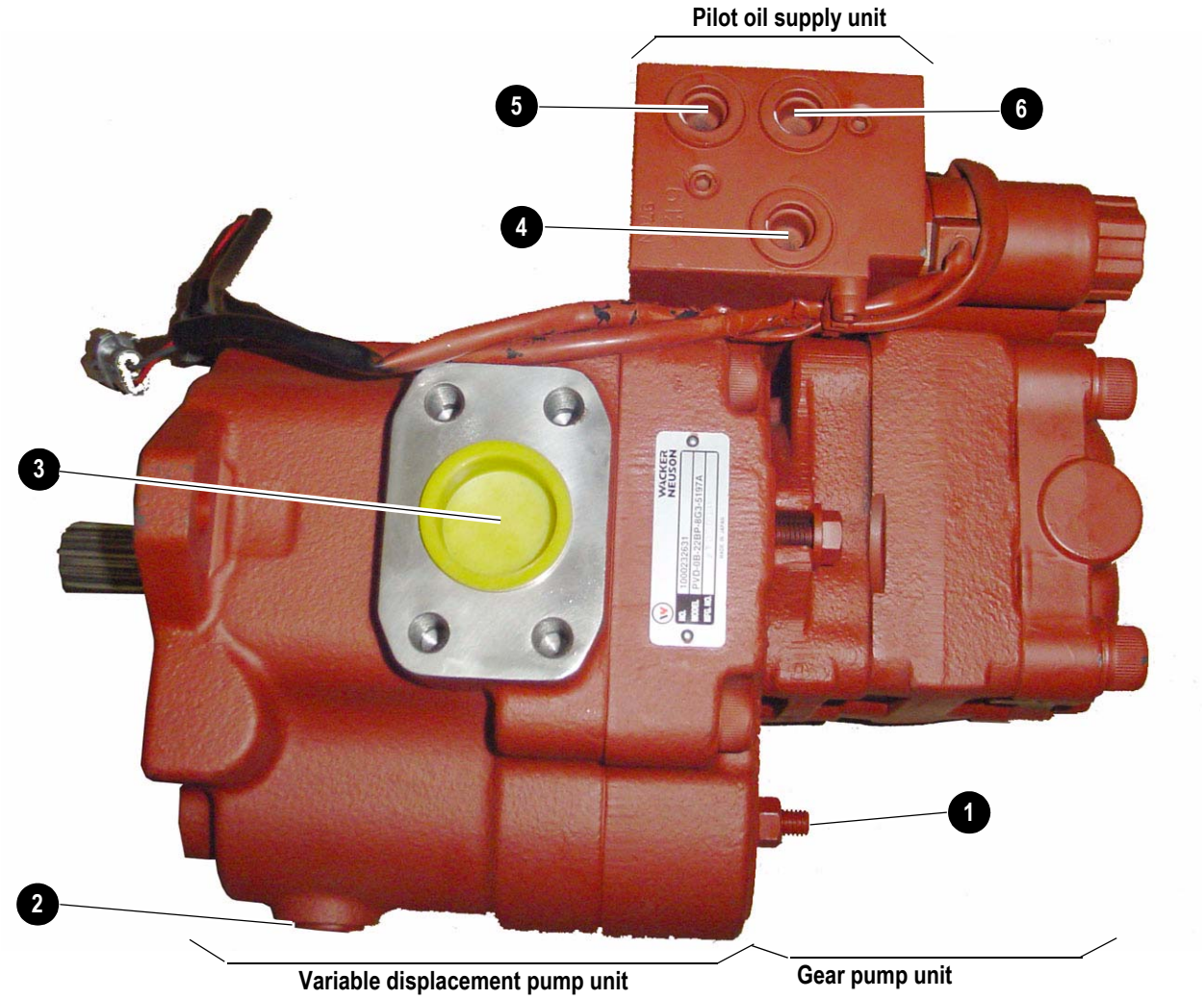
➥ Rotated away from the engine: earlier injection time

➥ Rotated towards the engine: later injection time

➥ *An adhesive label (article no.: 1000158808) can be attached as an aid*

☞ *Bend each of the injection lines before you mount them so they are not subject to tension once they are mounted*

☞ *Check the injection time again – see Checking injection time on page 4-8*



Pos.	Description
1	Control initiation set screw
2	Bleed screw (not active)
3	Suction line Port
4	Port PB1 (drive valve supply)
5	Port PR (2nd speed range)
6	Port PB2 (left/right pilot valves)

5.2 Main valve block

Sections and ports

Rotating the upper carriage

Counterbalancing/input P3

Auxiliary hydraulics/swivel boom

Stick

Right-hand side drive

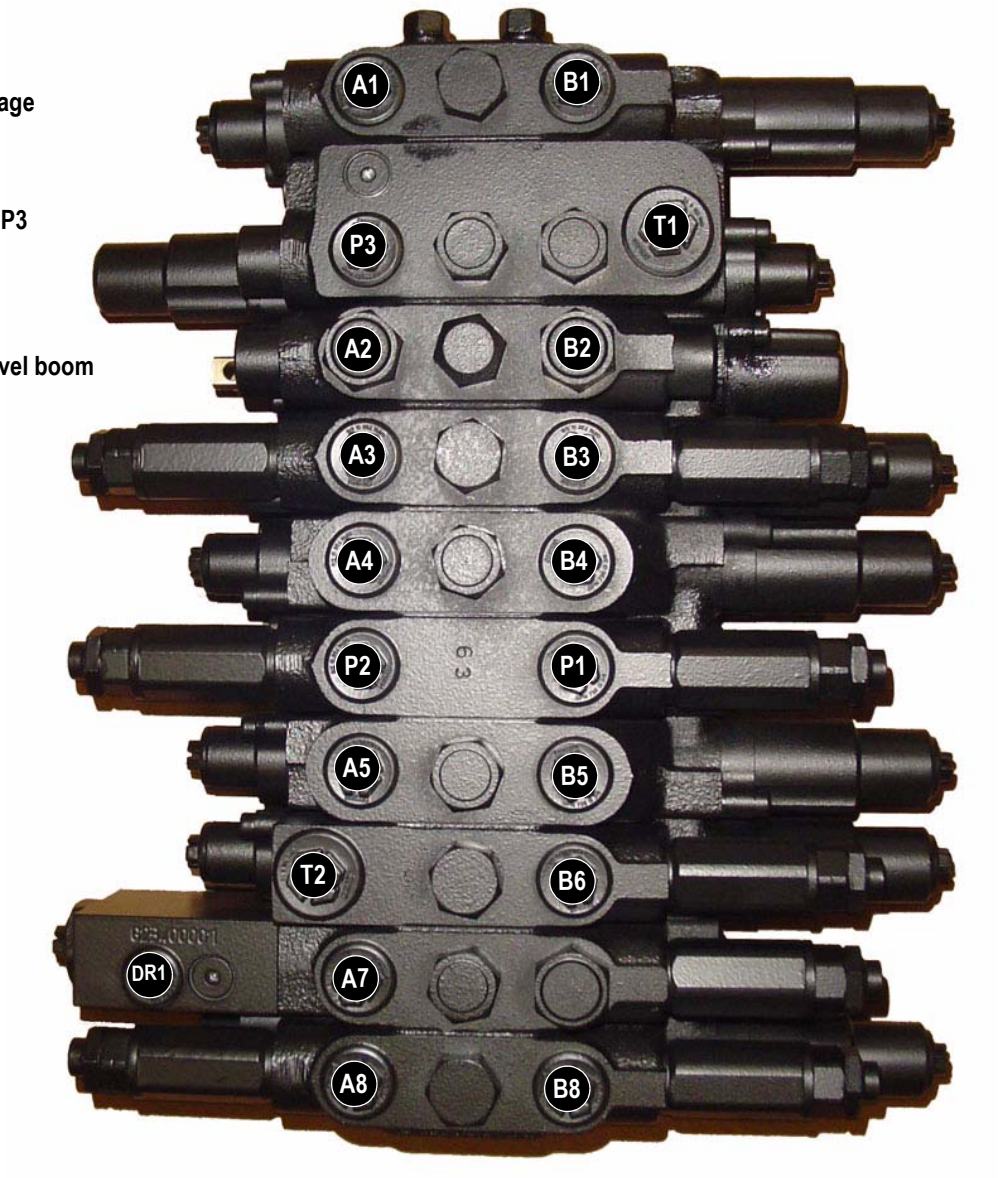
Input P1/P2

Left-hand side drive

Boom 1

Boom 2

Bucket



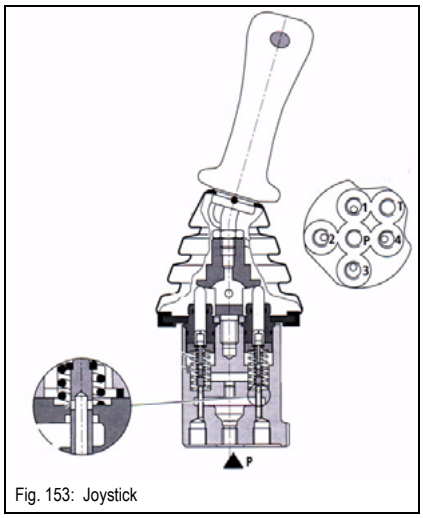


Fig. 153: Joystick

Joystick function

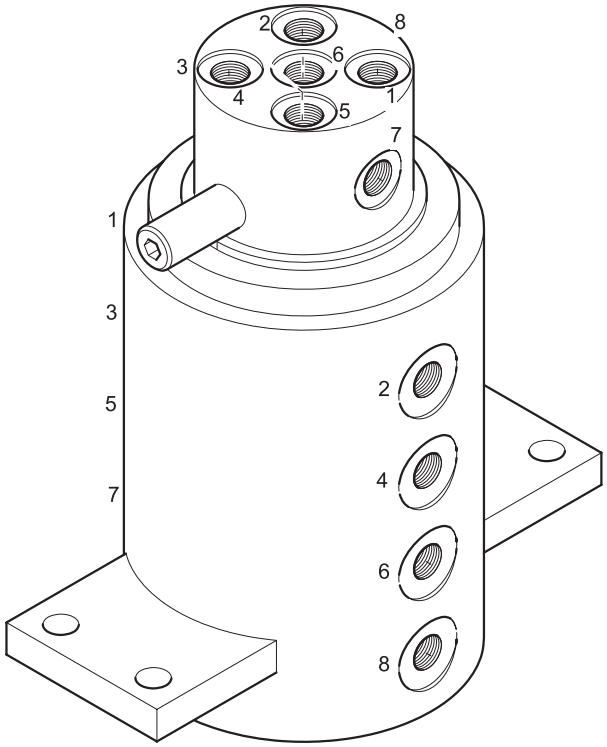
The pilot control unit serves to control the path and direction of motion of a spool in the main valve block.

When not in operation, the control lever is kept in the neutral position by the return springs.

If the control lever is moved, the tappet pushes the control piston downwards and opens the connection to P.

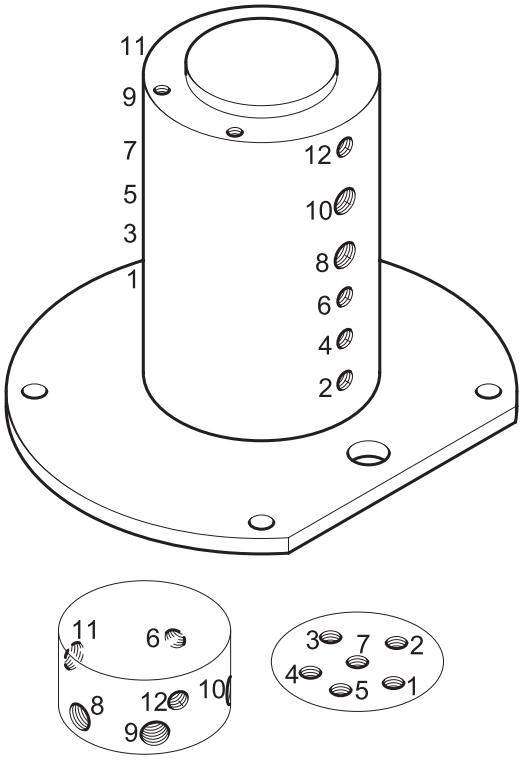
5.14 Swivel joint

8-channel swivel joint (standard)



Pos.	Description	Pos.	Description
1	High speed	5	Left-hand side drive
2	Right-hand side drive	6	Extend stabiliser blade ram
3	Left-hand side drive	7	Retract stabiliser blade ram
4	Right-hand side drive	8	Leak oil

12-channel swivel joint (VDS option)

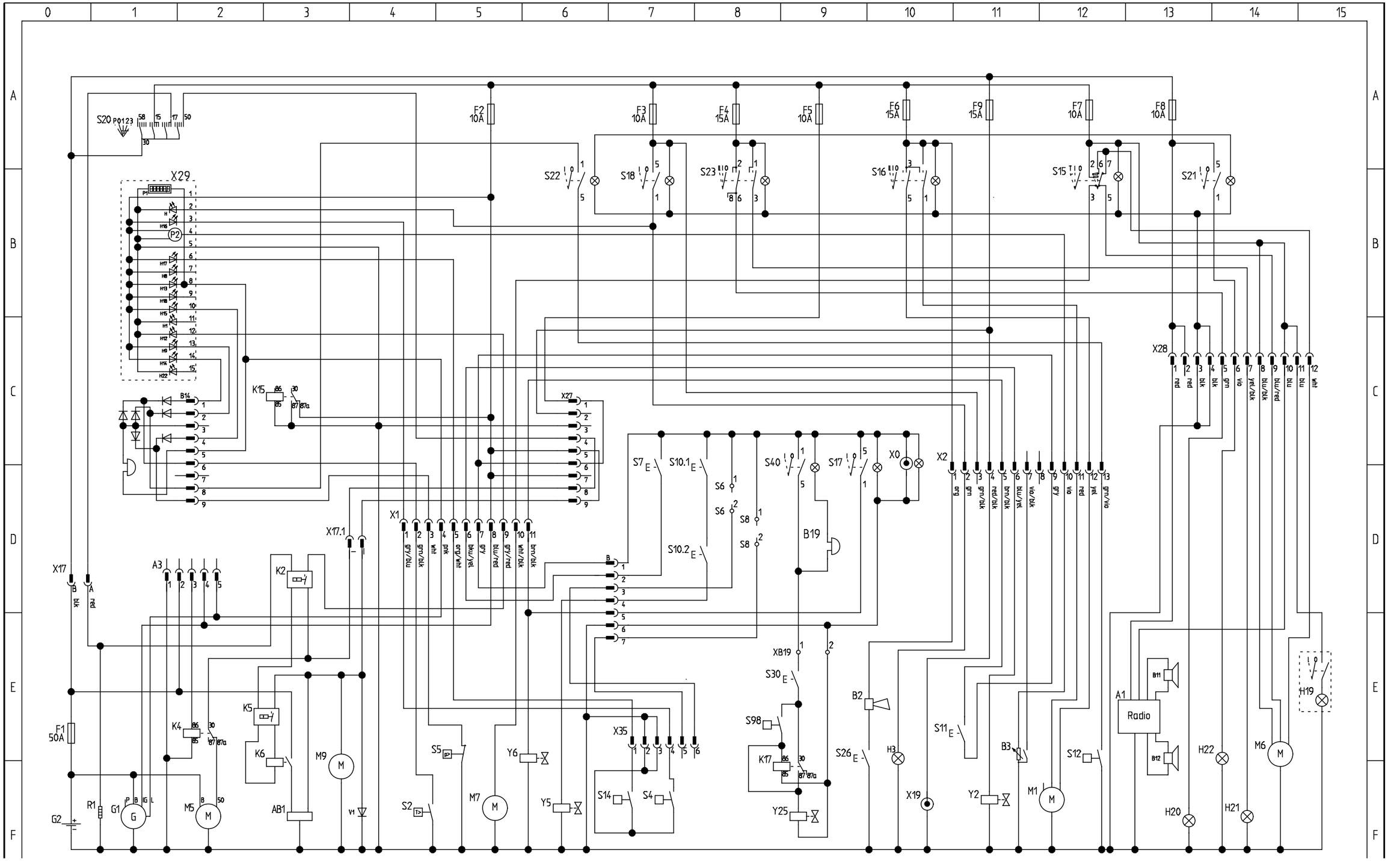


Pos.	Description	Pos.	Description
1	Leak oil	7	VDS down
2	Extend stabiliser blade ram	8	Right-hand side drive
3	Retract stabiliser blade ram	9	Left-hand side drive
4	VDS up	10	Right-hand side drive
5	High speed	11	Left-hand side drive
6	-	12	-

Electrical system

Wiring diagrams and wiring harnesses include all options.

6.20 Wiring diagram with 40 A alternator A3 (option)



Function

The valve is mounted directly on the base-side port of the boom ram.

“Extend ram” function

- Ram can be extended as usual (always “free flow” towards the ram)

In the event of a hose rupture, the load is safely held in base position by means of the non-return valve.

“Retract ram” function

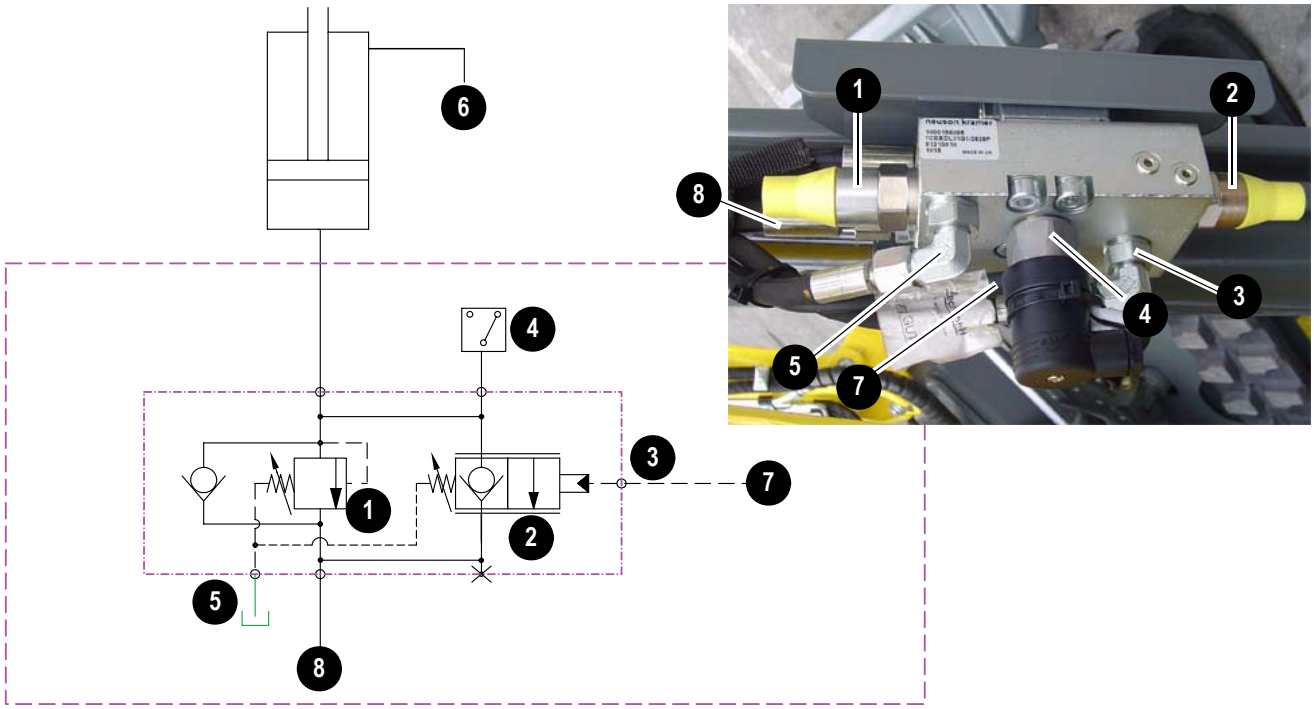
- Pilot control pressure moves valve (**2**) to work position (free oil return from the base side)
- The valve moves back to home position if the pilot control pressure drops.

In addition, safety valve (**1**) protects the hydraulic ram from overload. Overload actuates pressure switch (4), the warning device comes on and the buzzer sounds.

Notice!

The valve settings are sealed, no modifications for legal reasons!

Wiring diagram



Pos.	Description	Connection	Pos.	Description	Connection
1	Safety valve	CT1	5	Tank line	DR
2	Directional valve	CT2	6	Lower boom	B6
3	Pilot control port	PILOT	7	Lower boom pilot control line	Pb6
4	Pressure switch	GP	8	Raise boom	Valve

Pos.	Description
1	Safe load indicator cable
2	Boom segment pilot control port
3	Stick segment pilot control connection
4	Pressure switch
5	Boom hose burst valve
6	Stick hose burst valve
7	Switch
8	Leak oil line connection
9	Non-return valve
10	Hose burst valve

Function

A hose burst valve is mounted directly on the base-side port of the boom ram, the other valve is mounted on the rod-side port of the stick ram.

Extending the boom ram

- Ram can be extended as usual (always “free flow” towards the ram)

In the event of a hose rupture, the load is safely held in base position by means of the non-return valve.

Retracting the boom ram

- Pilot control pressure moves valve (**2**) to work position (free oil return from the base side).
- The valve moves back to home position if the pilot control pressure drops.

Retracting the stick ram

- Ram can be retracted as usual (always “free flow” towards the ram)

The built-in non-return valve safely holds the load in rest position.

Extending the stick ram

- Pilot control pressure moves valve (**2**) to work position (free oil flow to the base side)
- The valve moves back to home position if the pilot control pressure drops.

In addition, safety valve (**1**) protects the hydraulic rams from overload. Overload actuates the pressure switch (4), the warning device comes on and the buzzer sounds.

Notice!

The valve settings are sealed, no modifications for legal reasons!

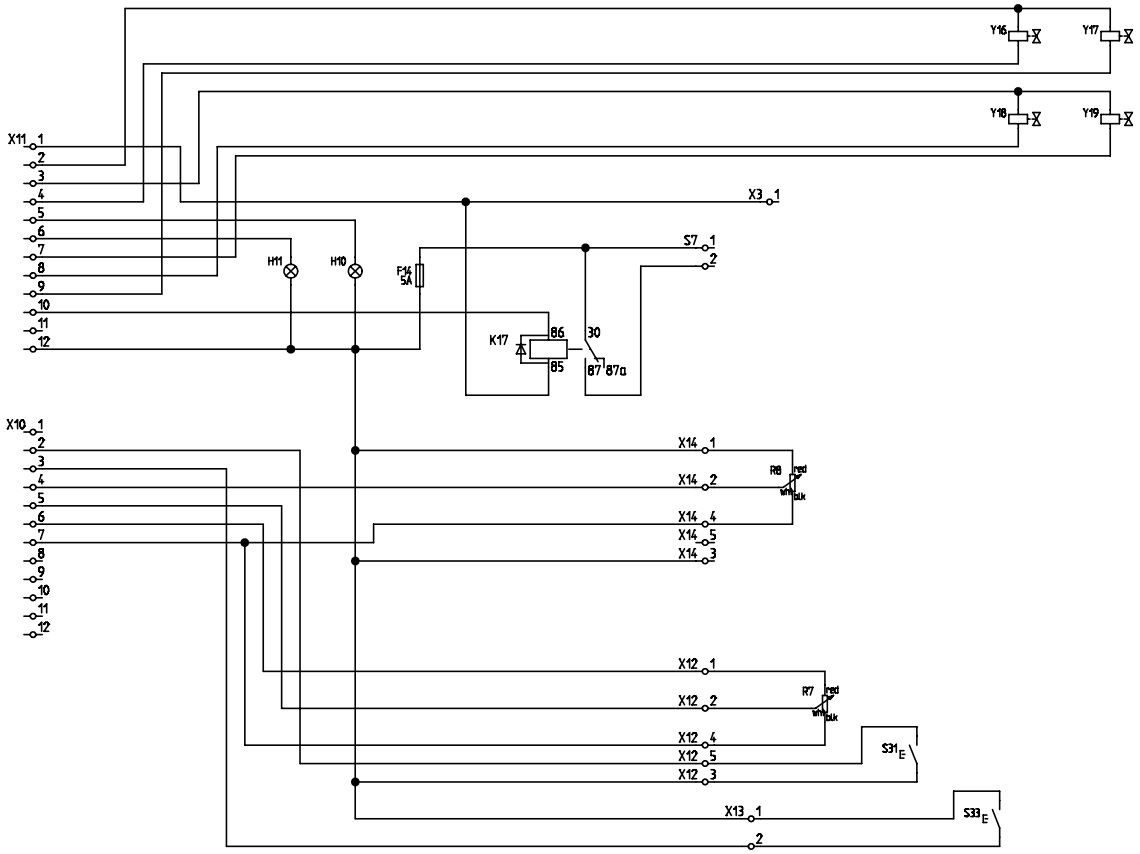
Extending the stabiliser blade ram

Ram can be extended as usual (always “free flow” from the ram)

Retracting the stabiliser blade ram

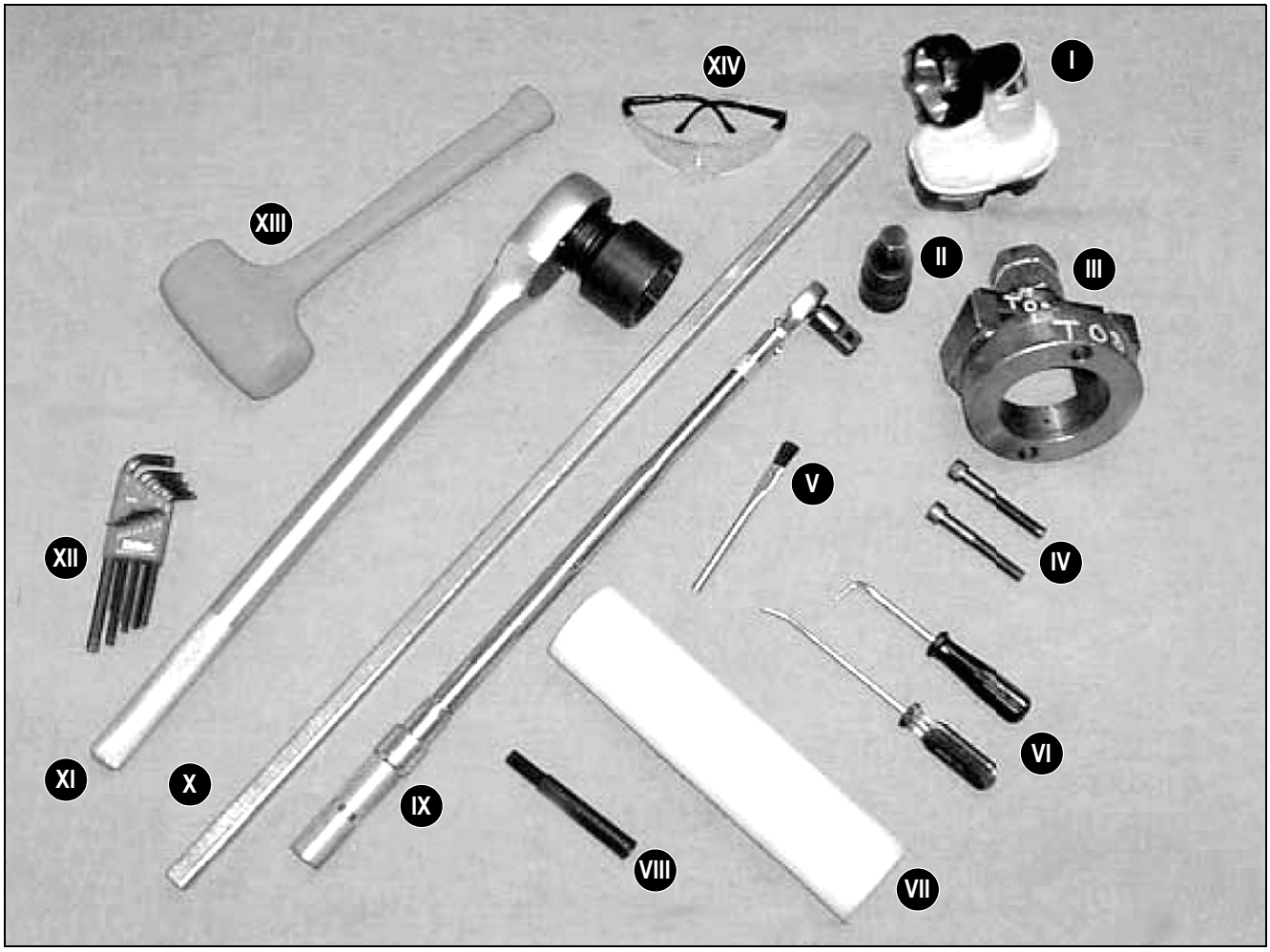
Check valve (**8**) is controlled in parallel by the operating pressure (free oil flow to the base side).

Wiring harness for auxiliary hydraulics and 3rd control circuit/PowerTilt connection



Connections	Hose designation
X10	Connector 1 control unit inputs (black)
X11	Connector 2 control unit outputs (grey)
X12	Joystick (left)
X13	Connector for changeover valve push button
X14	Joystick (right)
F14	Fuse
K17	Changeover valve relay
H10	Auxiliary hydraulics telltale
H11	Telltale for 3rd control circuit/PowerTilt connection
Y16	Connector 1 for auxiliary hydraulics
Y17	Connector 2 for auxiliary hydraulics
Y18	Connector 1 for 3rd control circuit/PowerTilt connection
Y19	Connector 2 for 3rd control circuit/PowerTilt connection
R7	Joystick rocker switch for auxiliary hydraulics
R8	Joystick rocker switch for 3rd control circuit/PowerTilt connection
S7	Connector on left-hand side armrest
S31	Push button for hammer operation
S33	Changeover valve tip switch
X3	Earth

8.2 Tools



List of tools		
No.	**Description**	**Qty**
I	Torch (may be required)	1
II	Spanner socket	1
III	PTS4.5 special tool for end cap (article no. 1000255602)	1
IV	Threaded bolts	0
V	Brush	1
VI	Tools for removing seals – *see chapter Making a tool VI for removing the seals* on page 8-6	1 – 2
VII	Plastic pusher	1
VIII	Permanent marker pen	1
IX	Torque wrench	1
X	Mounting lever or similar	1
XI	Large socket spanner	1
XII	Allen keys	1 set
XIII	Rubber or plastic hammer	1
XIV	Protective goggles	1