# Service manual

## Track excavator

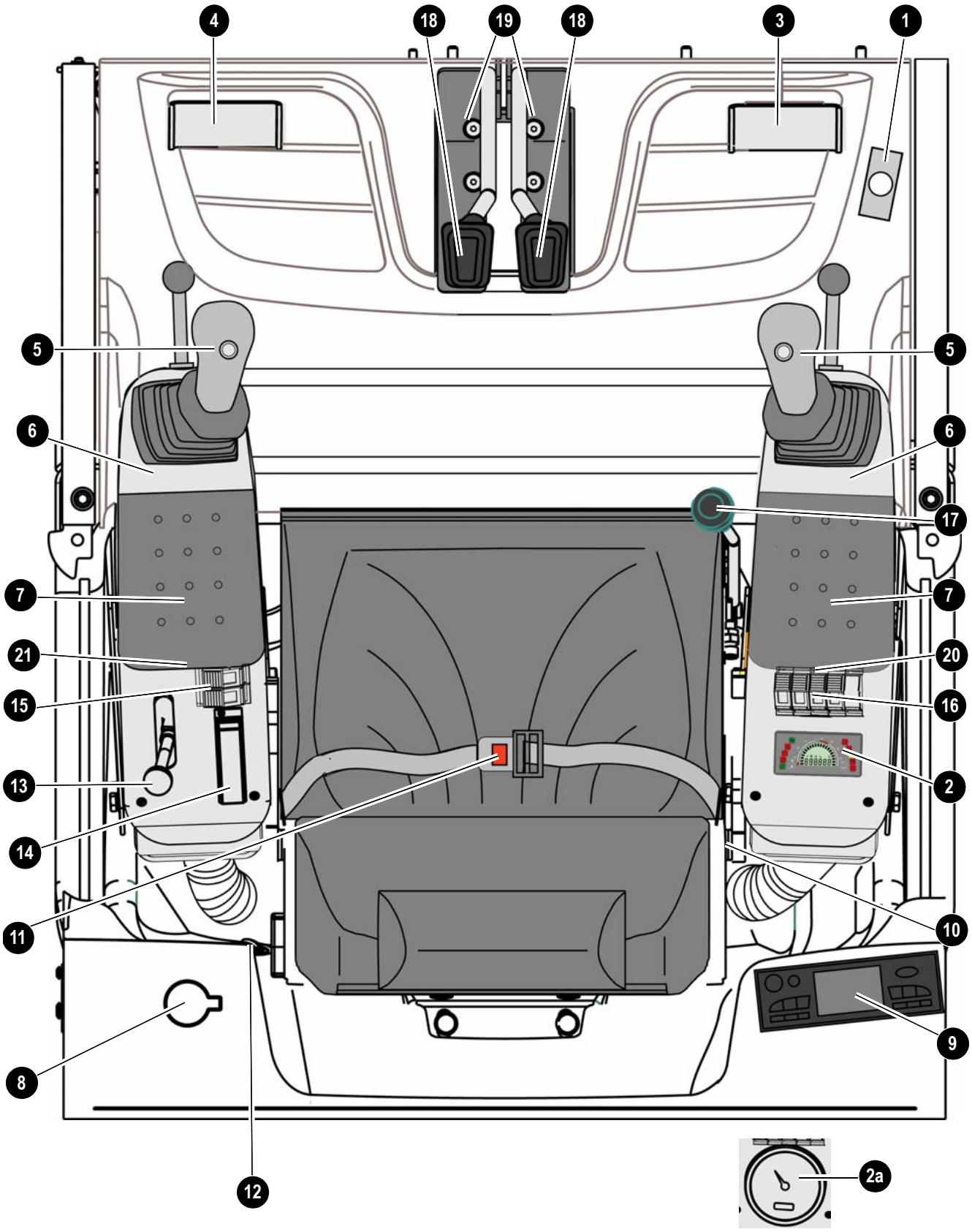
1404
ET16

| | |
|---|---|
| Vehicle model | 1404 E09-01<br>ET16 (E09-02) |
| Edition | 2.5 |
| Order no. | 1000166693 |
| Language | en |

WACKER NEUSON

# Operation

## 1.7 Cabin overview



## 1.15 Functional check of control lever base

Perform a functional check of the control lever base every time before you start the machine.

- Start the machine.
- Perform machine travel on open terrain.
- Secure the danger zone.
- Stop the machine.
- Raise the control lever base on the left.
- Move all control levers and pedals in all directions.
  ➥ The selected elements must not move.
  ➥ The machine may be put into operation.
- The selected elements move:
  ➥ Stop operation immediately.
  ➥ Rectify the malfunction.

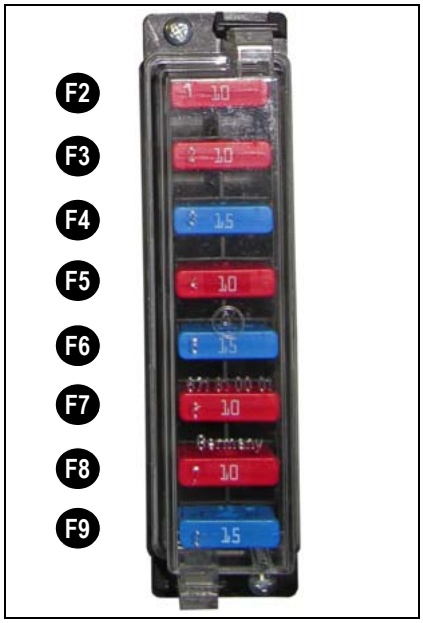
If the machine is equipped with a canopy (standard), control lever bases are installed on either side.

If the machine is equipped with a cabin, a control lever base is installed on the left. If the machine is equipped with an optional second door, a control lever base is also installed on the right.

## 2.6 Electrical system

| Electrical system | 1404 / ET16 |
|---|---|
| Dynamo (optional alternator up to serial no. WNCE0901CPAL00410) | 12 V 20 A |
| Alternator (standard from WNCE0901CPAL00411) | 12 V 40 A |
| Starter | 12 V 1.1 kW (1.5 hp) |
| Battery (up to serial no. AF05342) | 12 V 45 Ah |
| Battery (from serial no. AF05343) | 12 V 44 Ah |

**Fuses on control lever base on the left**




| Fuse no. | Rated current (A) | Protected circuit |
|---|---|---|
| F2 | 10 A | Fuse: relay, indicator, cutoff solenoid |
| F3 | 10 A | Boom working light fuse |
| F4 | 15 A | Cabin working light fuse |
| F5 | 10 A | Fuse valves, horn, driving signal speed 2 |
| F6 | 15 A | Heating fuse |
| F7 | 10 A | Wiper and interior light fuse |
| F8 | 10 A | Fuse for rotating beacon, radio, immobilizer |
| F9 | 15 A | Socket and 12 V power outlet fuse |

**Main fuse box with relays**

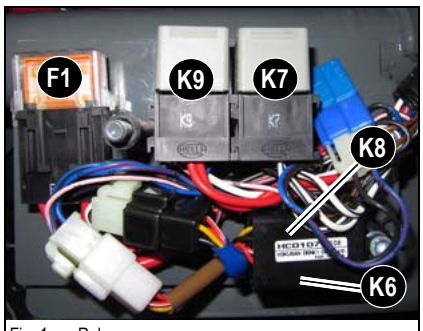


Fig. 1: Relays

The main fuse box is located at the rear left in the engine compartment.

| Fuse no. | Rated current (A) | Protected circuit |
|---|---|---|
| F1 | 40 A | Main fuse,<br>air-pressure sensor/output adaptation (Yanmar 3TNV80F-SSNS2) |

| Relay no. | Protected circuit |
|---|---|
| K 6 | Preheating time lag relay |
| K 7 | Start switching relay |
| K 8 | Time lag relay 1s cut-off solenoid |
| K 9 | Cut-off solenoid switching relay |

# Maintenance

## 3.5 Information on maintenance

**Responsibilities and prerequisites**

The working order and the service life of machines are heavily dependent on maintenance.

Servicing and maintenance must be performed by authorized personnel.

Have the maintenance, delivery inspection and the entries in the service booklet completed, otherwise warranty claims will not be acknowledged.

This ensures optimal machine operation. Immediately repair or replace parts that are already damaged or not working properly before they are due for replacement.

Use only original spare parts for repairs.

The manufacturer shall not be liable for damage to the machine or personal injury caused by failure to observe the specific information and descriptions.

**Important safety instructions on maintenance**

- Follow all safety instructions given in the Operator's Manual.
- Follow the maintenance and safety instructions given in the Operator's Manuals of the attachments.
- Wear protective equipment (for example hard hat, safety glasses, protective gloves, safety boots).
- Observe the danger indications and safety instructions during maintenance.
- In order to avoid injury hazard, do not perform work on a hot and running engine.
- Use a suitable container to collect fluids and lubricants as they flow out and dispose of them in an environmentally friendly manner.
- Attach a warning label to the control elements (for example **"Machine being serviced, do not start"**).
- In order to avoid damage to electronic components, do not perform welding work on the machine, add-on parts or tools, take suitable precautions:
  - Actuate the battery master switch
  - Disconnect both battery pole cables
- High engine load or a manual regeneration of the diesel particulate filter can lead to shorter engine oil maintenance intervals. The machine output is reduced if the maintenance interval is not complied with.
- If the machine is operated less than 500 hours per year the engine oil must be changed once a year

## Checking the coolant level/adding coolant

### Danger!

Never open the coolant reservoir and never drain coolant if the engine is warm since the cooling system is under high pressure –

**Burn hazard!**

☞ *Wait at least 15 minutes after stopping the engine!*

☞ *Wear protective gloves and clothing*

☞ *Open filler cap B to the first notch and release the pressure*

☞ *Ensure that the coolant temperature is sufficiently low so you can touch the radiator plug with your hands*

### Danger!

Antifreeze is flammable and toxic.

**Accident hazard!**

☞ *Keep away from flames!*

☞ *Avoid eye contact with antifreeze*

- If antifreeze comes into contact with the eyes

➥ Immediately rinse with clean water and seek medical assistance

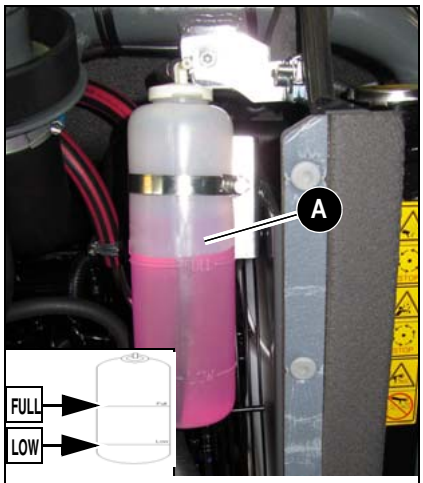



Fig. 14: Coolant reservoir

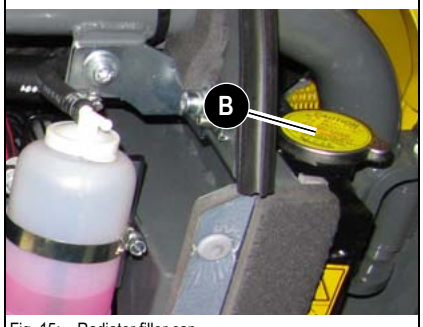



Fig. 15: Radiator filler cap

### Checking the coolant level

☞ *Proceed as follows:*

- Park the machine on level ground
- Stop the engine!
- Raise the control lever base
- Remove the key and carry it with you
- Let the engine and the coolant cool down
- Opening the engine cover
- Check the coolant level on the transparent coolant reservoir **A** and on the radiator **B**

☞ If the coolant level is below the **LOW** seam or if there is no coolant at the radiator's filler inlet:

➥ Adding coolant

☞ *Check the coolant grade (antifreeze) with suitable test equipment (antifreeze tester)*

➥ *– see Coolant compound table* on page 2-8

### Notice!

Check the coolant level ***once a day***.
We recommend checking it before starting the engine.

## (Re)tensioning the V-belt of the alternator

### Caution!

Overtensioning the V-belt can damage the V-belt, the V-belt guide and the water pump bearing.
Avoid contact of oil, grease, or similar substances with the V-belt.

☞ *Check the V-belt tension*
*– see Checking V-belt tension on page 3-30*

☞ *Replace V-belts with damage, cracks, cuts, etc.*

☞ *Avoid contact of oil, grease or similar substances with the V-belt*

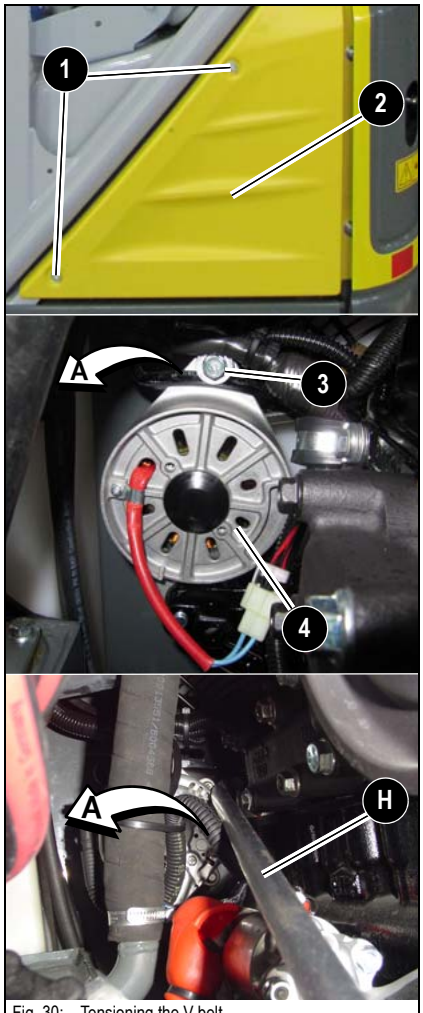


Fig. 30: Tensioning the V-belt

- (Re)tighten as follows:

☞ Stop the engine

☞ Raise the control lever base

☞ Remove the starting key and carry it with you

☞ Disconnect the battery or the battery master switch

☞ Opening the engine cover

☞ Let the engine cool down

☞ Loosen fastening screws **1** of cover **2**

➥ Remove cover **2**

☞ Loosen fastening screw **3** of alternator **4**

☞ Use a suitable tool to push the alternator in the direction of arrow **A** until reaching the correct V-belt tension *– see Checking V-belt tension* on page 3-30

☞ Keep the alternator in this position, and at the same time retighten fastening screw **3**

☞ Check V-belt tension again and adjust it if necessary

☞ Tighten fastening screws **1** of cover **2**

☞ Connect the battery or the battery master switch

☞ Close and lock the engine cover

### Pressure reducing valve (PRV)

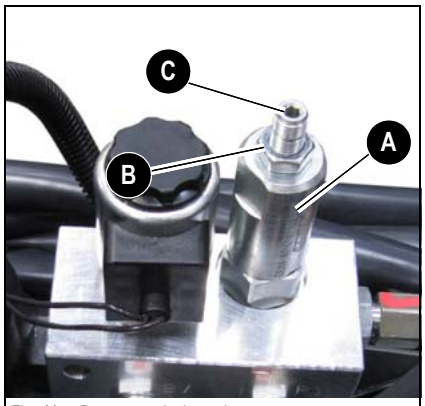


Fig. 41: Pressure reducing valve

☞ *Prepare the machine – see Prerequisites for pressure check on page 3-40*
☞ *Checking pilot control pressure – see Checking pilot control pressure on page 3-40*
☞ *Set the pressure on the pressure reducing valve **A** on the pilot oil supply unit*
  ☞ Increase to maximum engine speed
  ☞ Loosen locknut **B** on the pressure reducing valve.
  ☞ Turning adjusting screw **C** clockwise increases pressure
  ☞ Turning adjusting screw **C** anticlockwise reduces pressure
  ☞ Adjust the pressure limiting valve and tighten the locknut
☞ *Check the pilot control pressure again once adjustment is over*

### Gear pump P1

Hydraulic supply for boom, bucket, stick, driving, stabilizer blade, auxiliary hydraulics, slewing and rotation, telescopic travel gear (all)

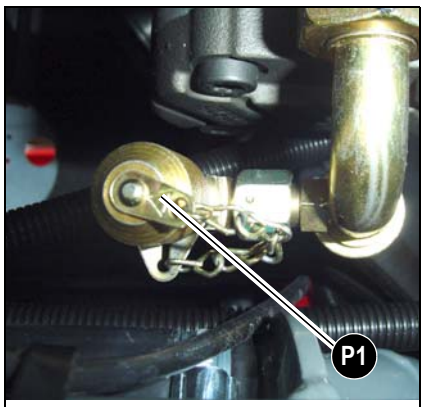


Fig. 42: Measurement connection P1

#### Checking the LS pressure limiting valve

☞ *Prepare the machine – see Prerequisites for pressure check on page 3-40*
☞ *Connect a pressure gage to measurement connection P**1***
☞ *Move the control lever base (safety switch) to work position*
☞ *For example, block the bucket cylinder in final position at max. engine speed*

☞ *Check and make a note of the pressure value – see Test report on page 3-43*

#### Checking pressure drop

☞ *For example, block the bucket cylinder in final position at max. engine speed*
☞ *Swiftly reduce engine speed from maximum to minimum -> pressure drop*
☞ *Check the pressure value according to the test report and make a note of it – see Test report on page 3-43*

Fig. 43: LS pressure limiting valve

#### Setting the LS pressure limiting valve

☞ *Prepare the machine – see Prerequisites for pressure check on page 3-40*
☞ *Pressure setting on LS pressure relief valve **A** on the main valve block*
  ☞ Remove the yellow protective cap
  ☞ Loosen the locknut on the LS pressure limiting valve
  ☞ Turning the adjusting screw clockwise increases pressure
  ☞ Turning the adjusting screw anticlockwise reduces pressure
  ☞ Check the pressure drop on the pressure gage
    ➥ The valve seat may be stuck and must be loosened first
  ☞ Adjust the pressure limiting valve and tighten the locknut
  ☞ Fit a new protective cap
☞ *Check the pressure limiting valve and the pressure drop once adjustment is over*

## 3.21 Lubrication work

### Lubrication points on the stabilizer blade

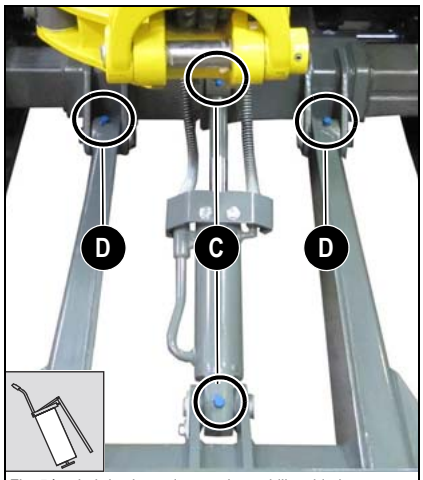



Fig. 54: Lubrication points on the stabilizer blade

☞ *Apply grease to lubrication points **C** on the stabilizer blade cylinder*

☞ *Apply grease to lubrication points **D** on the stabilizer blade*

### Lubrication points on the swiveling console

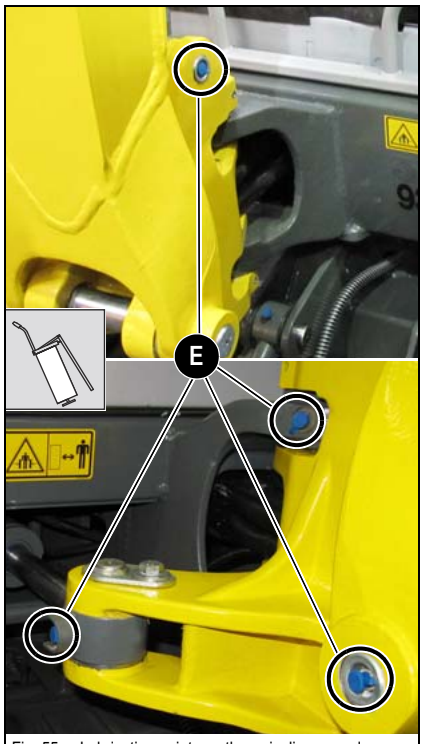



Fig. 55: Lubrication points on the swiveling console

☞ *Apply grease to lubrication points **E** of the swiveling console*

## 3.25 Maintenance when out of service for a longer period of time

The following measures must be taken if the machine is out of service for more than 30 days.

**Putting into operation again**

- Remove anti-corrosion agent from the piston rods.
- Charge, install, and connect the battery.
- Remove the seals from the exhaust pipe and the air filter intake.
- Check the condition of the air filter element and replace the element if necessary.
- Check the dust valve.
- Refuel.
- Switch on the fuel filter and prefilter on the engine (turn to ON).
- Turn the starter to position 1 for 2 minutes (to supply the engine with fuel).
- If the machine was out of service for over 6 months, change the oil in the gearbox, engine, etc. and the hydraulic oil reservoir.
- Check the engine oil.
- Also replace hydraulic oil filters (return and breather filters) if the machine has been out of service for over 6 months.
- Lubricate the machine according to the lubrication schedule.
- Check the levels.
- Check the coolant, change as required.
- Remove the starting key, remove fuse F2 on the control lever base on the left.
- Let the engine run 15 seconds.
- Wait 15 seconds.
- Let the engine run 1 minute again.
- Remove the starting key, put fuse F2 back in.
- Start the diesel engine.
- Let the engine run at idling speed at least 15 minutes without load.
- Check the oil levels in all units and add oil if necessary.

## 4.8 Injection time

### Checking injection time

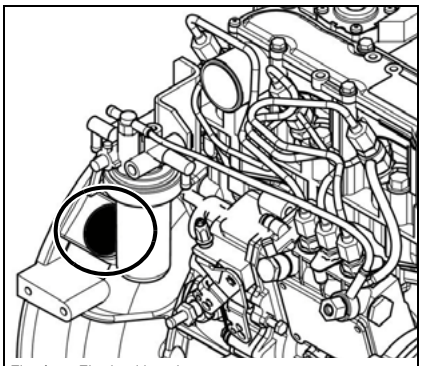


Fig. 4: Flywheel housing cap

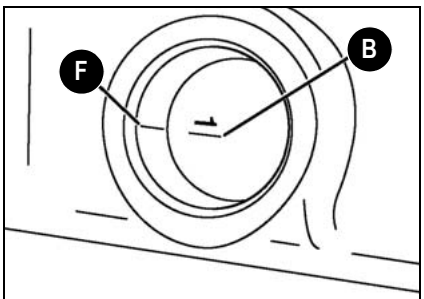



Fig. 5: Top dead center mark

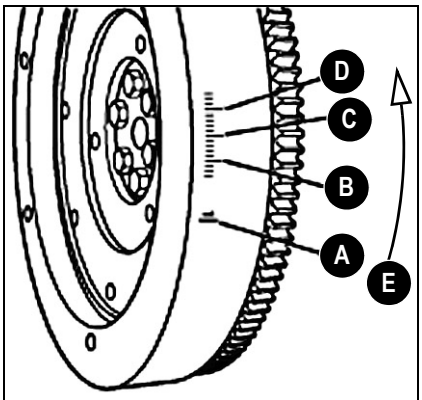



Fig. 6: Marks on flywheel

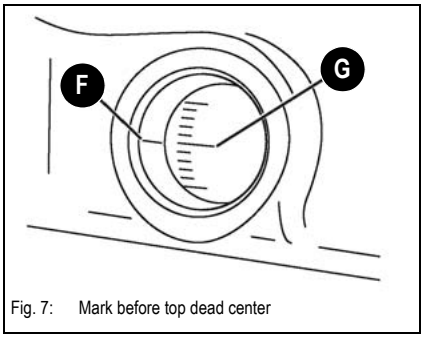



Fig. 7: Mark before top dead center

**Preparations:**

- The fuel system must be filled and bled
- Clean the injection pump and keep it clean

☞ *Checking cylinder 1 is basically sufficient and serves the purpose, but all other cylinders can also be checked*

☞ *Apply current to the cutoff solenoid, or remove the cutoff solenoid and the O-ring from the injection pump*

➥ Fuel supply is enabled

☞ *Set the throttle to the maximum speed*

☞ *Remove the cap on the flywheel housing, see Fig. 4*

➥ The view to the ring gear is opened

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

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

☞ *Turn until top dead center marks **B** on the ring gear for cylinder 1 are visible and at the same level as mark **5/F** on the flywheel housing*

➥ There are several marks on the ring gear depending on the number of cylinders of the diesel engine; each individual mark can be used with the corresponding cylinder for testing purposes

➥ Top dead center can be assigned to the correct cylinder with the number **B** stamped next to it

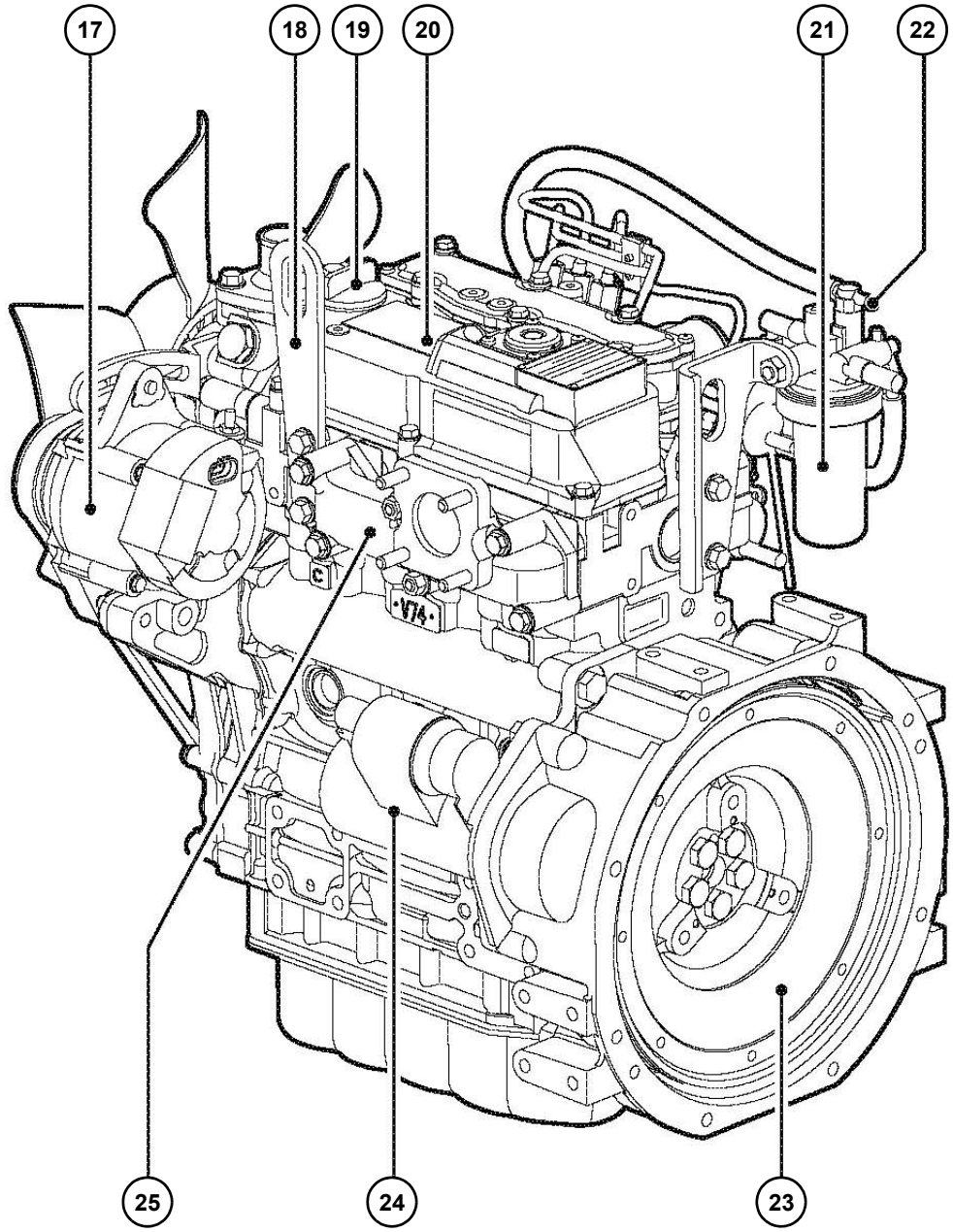
Marks (standard specification) on the flywheel:

- **6/A** top dead center with corresponding cylinder number
- **6/B** 15° before top dead center
- **6/C** 20° before top dead center
- **6/D** 25° before top dead center
- **6/E** direction of rotation

☞ *Turn until mark **7/G** on the ring gear for cylinder 1 is visible and at the same level as mark **7/F** on the flywheel housing*

➥ Rated injection point 16° before top dead center (+/− 1°)

☞ *Mark the (rated) injection point on the flywheel housing and ring gear*




Symbolic representation

| Pos. | Designation | Pos. | Designation |
|---|---|---|---|
| 17 | Alternator | 18 | Lifting eye |
| 19 | Oil filler neck | 20 | cylinder-head cover |
| 21 | Water separator | 22 | Fuel return line |
| 23 | Flywheel | 24 | Starter |
| 25 | Exhaust manifold | | |

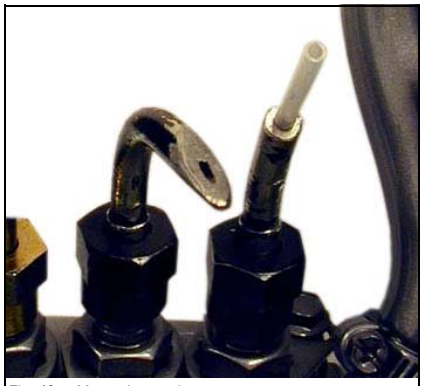


Fig. 40: Measuring equipment

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

☞ *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 center by means of the indentation on the flywheel.*

➥ Rated value: 16° +/− 1° before top dead center – *see Marks on flywheel* on page 4-28.

☞ *Measure the injection time two to three times.*

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

☞ *Install the fuel injection lines, cutoff solenoid and cap back on again.*

☞ *Check the fuel system for leaks.*

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

**Notice!**

Bend the injection lines as you install them so they are not subject to tension once they are installed. Bleed the injection lines once they are installed.

### Setting injection time

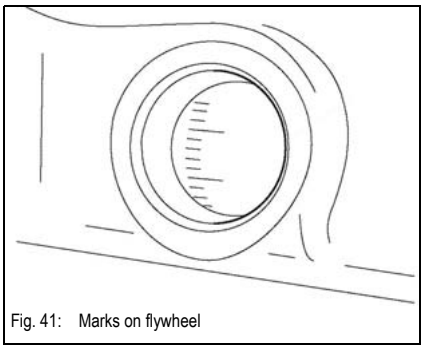


Fig. 41: Marks on flywheel

- 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 *Fig. 41*

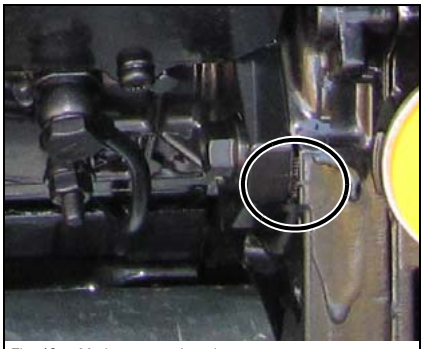


Fig. 42: Mark on pump housing

☞ *Mark the original position of the injection pump on the pump and gear casing. – see Fig. 42*

☞ *Remove all injection lines on the fuel injection pump and loosen the 4 flange screws by about half 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 toward the engine: later injection time.

☞ *Bend each of the injection lines before you install them so they are not subject to tension once they are installed.*

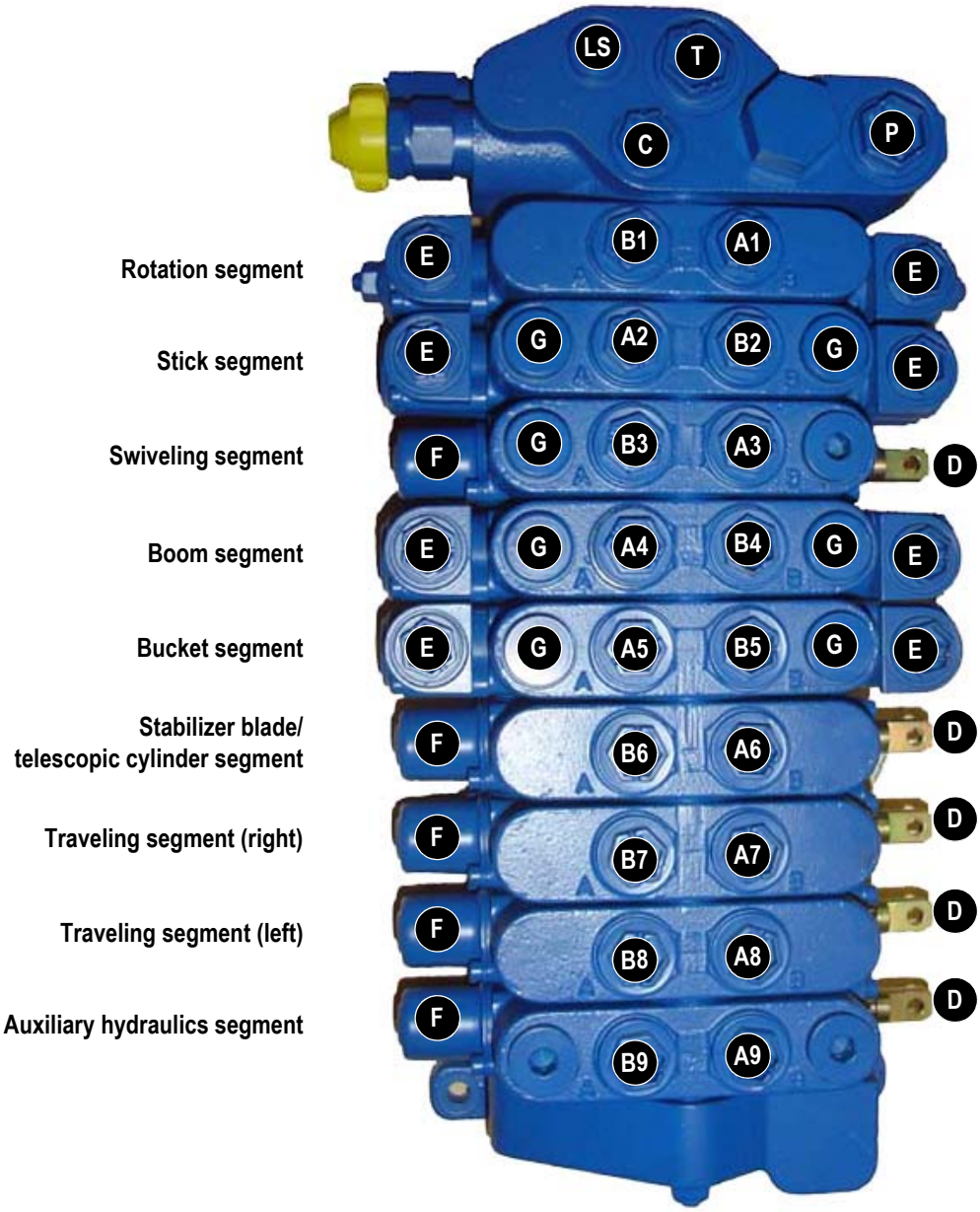
☞ *Check the injection time again – see Checking injection time on page 4-27.*

**Notice!**

Bend the injection lines as you install them so they are not subject to tension once they are installed. Bleed the injection lines once they are installed.

| Problem | | Possible causes |
|---|---|---|
| Engine smoke | White | Malfunctioning piston ring |
| | | Malfunctioning piston/cylinder |
| | | Fuel grade does not comply with specifications |
| | | Malfunctioning fuel injector |
| | | Wrong injection time (too late!) |
| | | Malfunctioning thermostat |
| | | Too much cooling |
| | | Water in fuel system |
| | | Engine burns oil |
| | | Incorrect setting of injection pump (injection too early) |
| | | Dirty injection nozzle |
| | Black | Dirty air filter |
| | | Clogged exhaust pipe |
| | | Malfunctioning fuel injector (drips) |
| | | Incorrect setting of injection pump (injection too early) |
| | | Wrong valve clearance |
| | | Dirty injection nozzle |
| | | Wrong fuel |
| | | Injection quantity too high |
| | | Overloaded engine |

**Connections**




**Legend**

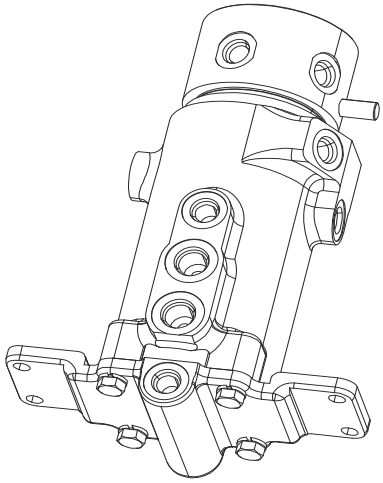
| Connection | Main control lines |
|---|---|
| A1, B1 | Rotate |
| A2, B2 | Shovel arm |
| A3, B3 | Swivel |
| A4, B4 | Boom |
| A5, B5 | Bucket |
| A6, B6 | Stabilizer blade/telescopic cylinder |
| A7, B7 | Traveling drive (right) |
| A8, B8 | Traveling drive (left) |
| A9, B9 | Auxiliary hydraulics |

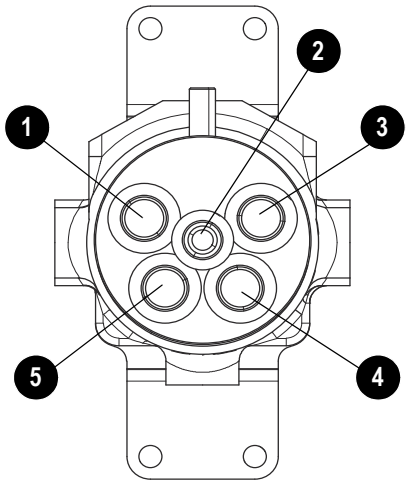
| | |
|---|---|
| D | Mechanical actuation with latch |
| E | Hydr. Control with control lever |
| F | Stick reset |
| G | Secondary pressure limiting valve |

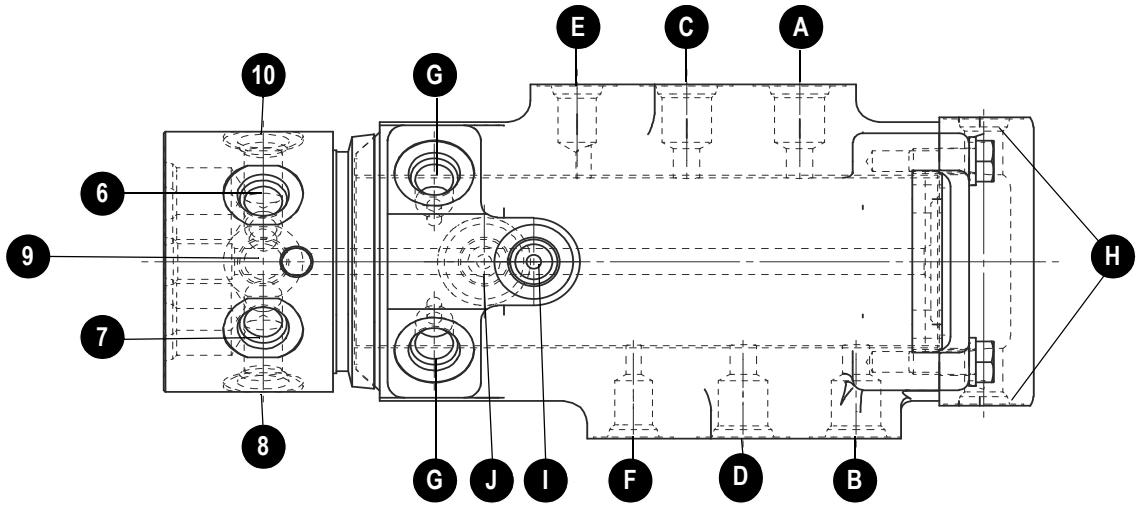
| Connection | Pump/reservoir lines |
|---|---|
| P | Pump connection |
| T | Reservoir line |
| LS | Load Sensing |
| C | Connection for pilot-control pressure lines |

## 5.8 Swivel implementation (from serial number WNCE0901KPAL02194)

The swivel joint ensures the oil flow between the upper carriage and the undercarriage.






| Pos. | Connection |
|---|---|
| 1 and 3<br>A and C | Traveling drive (left) |
| 2 and H | Leak oil |
| 4 and 5<br>B and D | Traveling drive (right) |
| 6 and J | connection on leakage oil / overflow |
| 7 and I | Telescopic cylinder (base side) |
| 8 and F | Dozer blade bottom side |
| 9 and G | 1st and 2nd gear |
| 10 and E | Telescopic cylinder / dozer blade rod side |

### Inclination of auxiliary hydraulics pedal

☞ *Loosen locknut **C** on steering rod **B** until you can counter the pedal in horizontal position.*

- The pedal must have no contact with the insulating mat!
- The slewing and accelerator pedals are set in the same manner as the auxiliary hydraulics pedal.

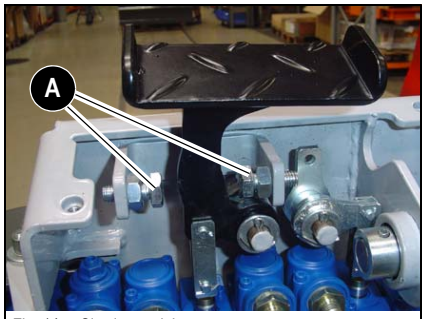



Fig. 14: Slewing pedal

### Correct setting of slewing and auxiliary hydraulics pedal

☞ *Actuate the pedal with your hand and in doing so, actuate the piston in the main valve block as far as it will go. If the pedal stop is limited by adjusting screws **A**, screw in or unscrew the adjusting screws.*

**Caution!**

Actuate the pedal only with your hand!

☞ *Screw in adjusting screw **A** as far as it will go with the pedal pressed.*

☞ *Then unscrew adjusting screw **A** again by half a revolution (stop tolerance).*

☞ *Fasten adjusting screw **A** with a locknut.*

☞ *Check the controls respond correctly.*

☞ *Perform this setting for both adjusting screws **A**.*

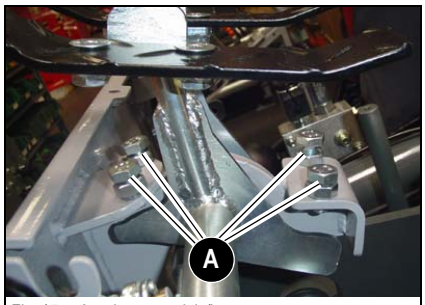



Fig. 15: Accelerator pedals/levers

**Notice!**

The angle of the swiveling pedal and of both accelerator pedals cannot be adjusted in inclination.

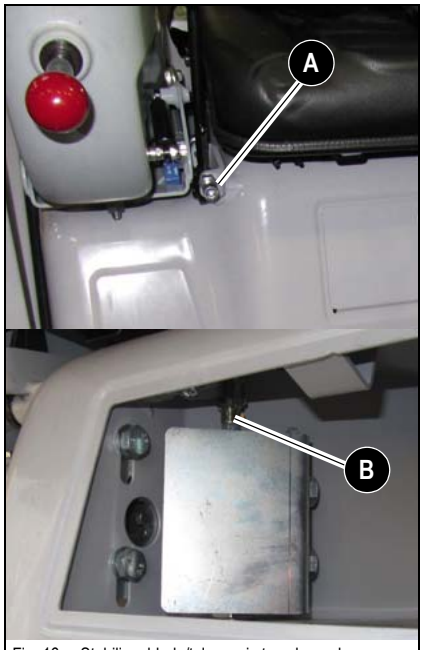



Fig. 16: Stabilizer blade/telescopic travel gear lever

### Adjusting the stabilizer blade/telescopic travel gear lever

☞ *Push or pull the lever as far as it will go in order to actuate the piston in the main valve block to the limit. Unscrew adjusting screw **A** if it limits the lever stop.*

☞ *Screw in adjusting screw **A** as far as it will go with the lever pushed.*

☞ *Then unscrew screw **A** again by half a revolution (stop tolerance).*

☞ *Fasten adjusting screw **A** with a locknut*

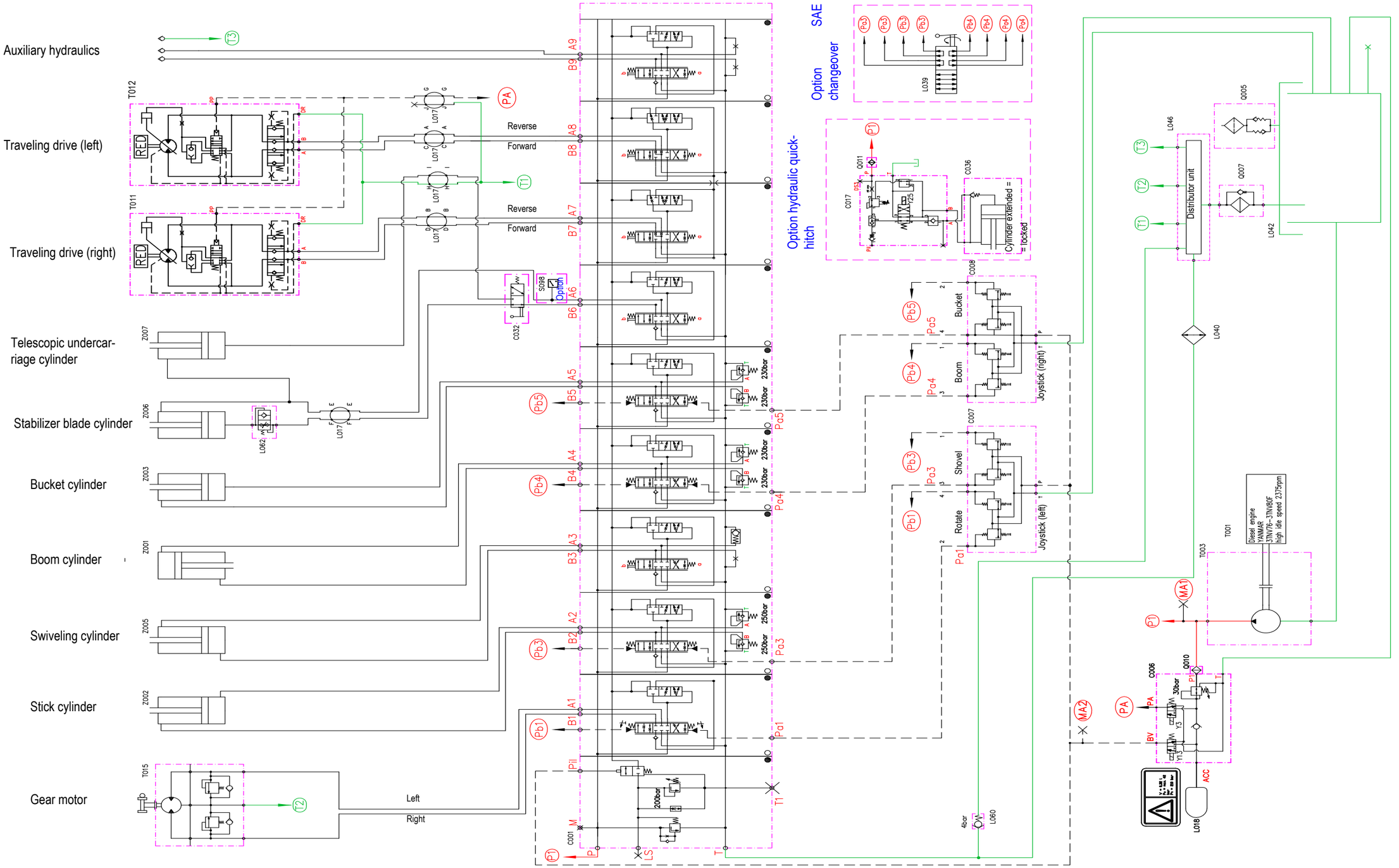
☞ *Check the controls respond correctly*

**Caution!**

Ensure that under all circumstances that the fork head of Bowden cable **B** in the tool case does not touch the seat console.

☞ *The angle of the stabilizer blade/telescopic travel gear lever can be set by means of the adjusting screw on the Bowden cable.*

## 5.22 Hydraulic diagram 1404 with second driving speed / ET 16



## 6.14 Regulator

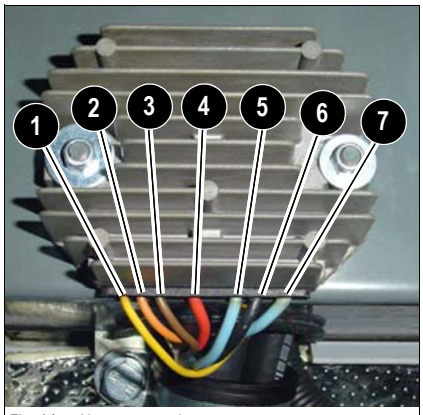



Fig. 14: Alternator regulator

| Pos. | Designation |
|---|---|
| 1 | Generator |
| 2 | Generator |
| 3 | Ground |
| 4 | Battery +12 V |
| 5 | Start voltage |
| 6 | Preheating start switch |
| 7 | Charge indicator light |

**Charge indicator light test**

☞ *DV voltage measurement to earth*

☞ *Engine running, charge indicator light does not illuminate*

➥ Battery is charging – measured value = 0 V

☞ *Charge indicator light illuminates*

➥ Measured value = + 12 V

**Preheating start switch +12V**

➥ If +12 V is connected to this contact, the regulator is activated

**+12 V battery test**

☞ *DV voltage measurement to earth*

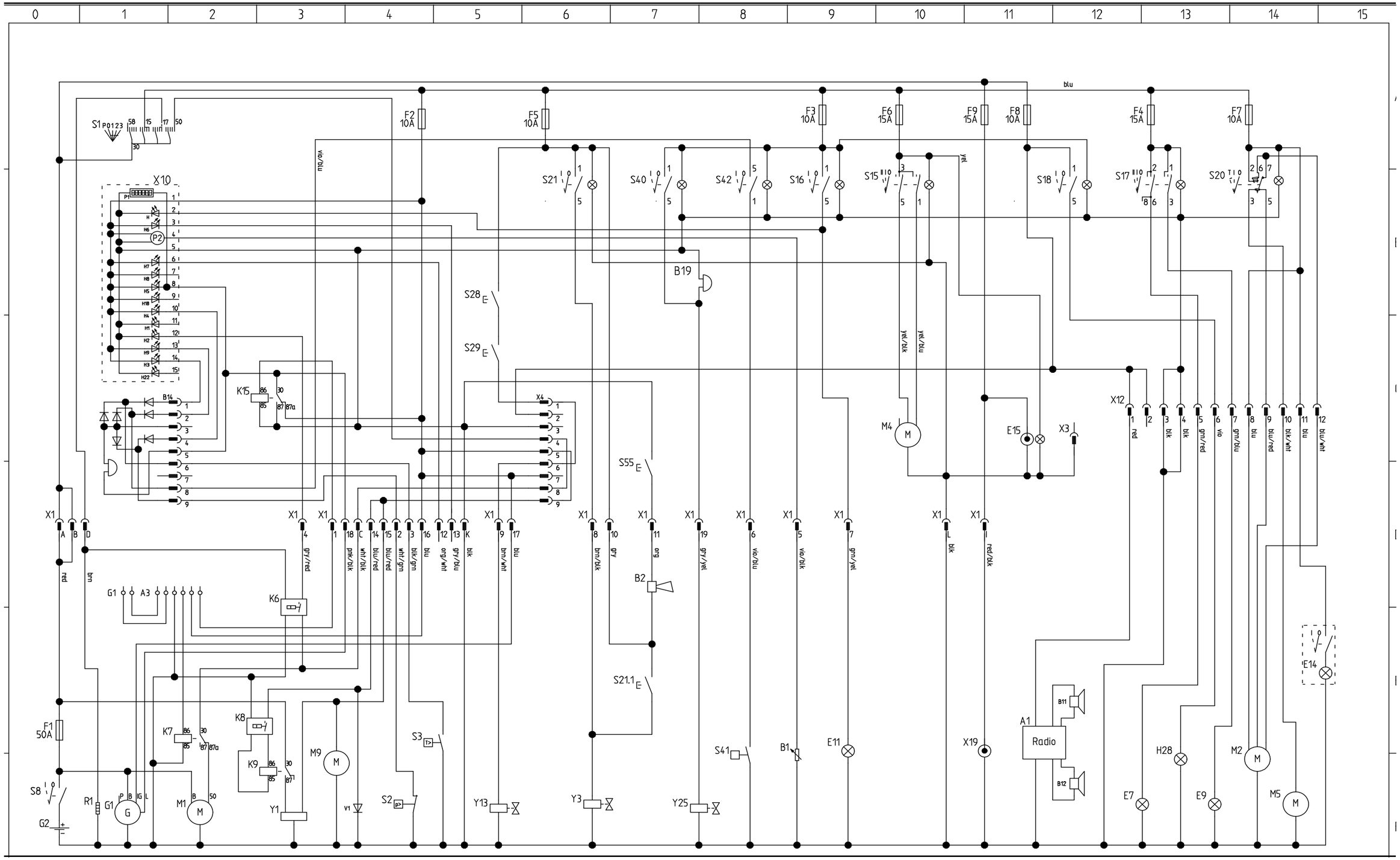
☞ *Engine running, charge indicator light does not illuminate*

➥ Battery is being charged – measured value = 13.5 – 14.5 V

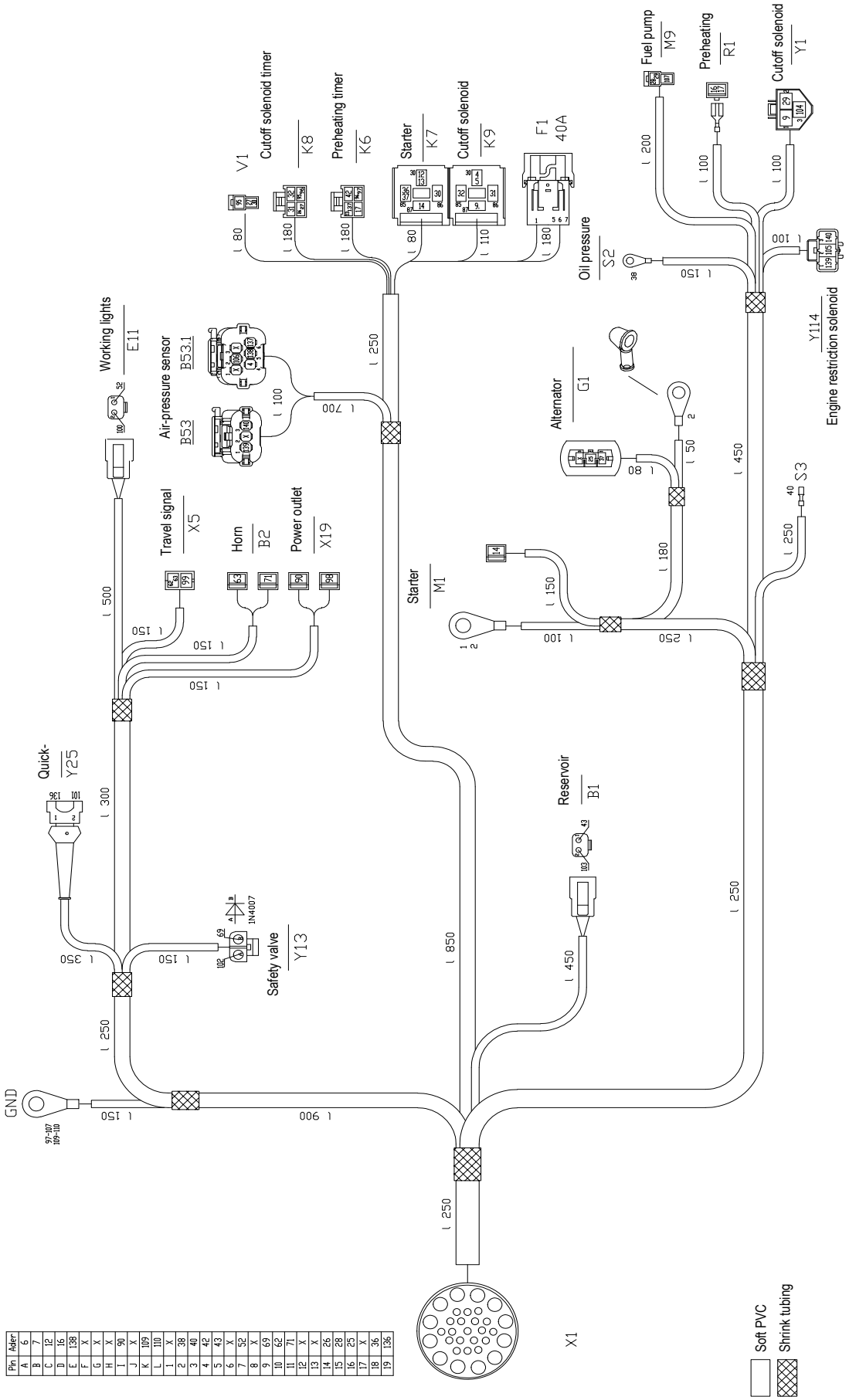
☞ *Engine is not running or battery is not charged*

➥ Measured value = about 12 V (battery voltage)

## 6.25 Wiring diagram with alternator (option)



## 6.34 Engine wiring harness 1404 / ET16 (TIER IV final from serial number WNCE0901KPAL02194)




| Pin | Ader |
|---|---|
| A | 6 |
| B | 7 |
| C | 12 |
| D | 16 |
| E | 138 |
| F | X |
| G | X |
| H | X |
| I | 90 |
| J | X |
| K | 109 |
| L | 110 |
| 1 | X |
| 2 | 38 |
| 3 | 40 |
| 4 | 42 |
| 5 | 43 |
| 6 | X |
| 7 | 32 |
| 8 | X |
| 9 | 69 |
| 10 | 62 |
| 11 | 71 |
| 12 | X |
| 13 | X |
| 14 | 26 |
| 15 | 28 |
| 16 | 25 |
| 17 | X |
| 18 | 36 |
| 19 | 136 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 113 | X10.1 / 4 | GND1 | 80 | 1 | blk | Ground |
| 114 | X10.2 / 6 | GND1 | 250 | 1 | blk | Ground |
| 115 | K17 / 85 | GND2 | 200 | 1 | blk | Ground |
| 116 | K17 / 85 | S20 / 9 | 200 | 1 | blk | Ground |
| 117 | S16 / 9 | S20 / 9 | 230 | 1 | blk | Ground |
| 118 | S18 / 9 | S15 / 9 | 260 | 1 | blk | Ground |
| 119 | S40 / 9 | S15 / 9 | 260 | 1 | blk | Ground |
| 120 | S55 / 2 | GND1 | 400 | 1 | blk | Ground |
| 121 | X12/3 | GND1 | 450 | 1 | blk | Ground |
| 122 | X12/4 | GND1 | 450 | 1 | blk | Ground |
| 123 | M4 / 3 | GND1 | 1050 | 1 | blk | Ground |
| 125 | X3/2 | GND2 | 450 | 1 | blk | Ground |
| 127 | S98 / 3 | GND1 | | 1 | blk | Ground |
| 130 | S30 / 1 | S40 / 5 | | 1 | gry/vel | Quickhitch |
| 131 | X10.1 / 7 | S40 / 5 | | 1 | gry/vel | Quickhitch |
| 132 | S30 / 2 | S98 / 1 | | 1 | gry/blu | Quickhitch pedal |
| 133 | S30 / 2 | K17 / 30 | | 1 | gry/blu | Quickhitch pedal |
| 134 | K17 / 86 | S98 / 2 | | 1 | gry/vel | Quickhitch valve |
| 135 | K17 / 86 | K17 / 87 | | 1 | gry/vel | Quickhitch valve |
| 136 | X1/19 | K17 / 87 | | 1 | gry/vel | Quickhitch valve |
| 138 | X1/E | F2 / A | | 1.5 | blu | 12 V/15 |

## 6.51 Immobilizer cable (option)