

MERCEDES-BENZ



Instruction Manual

UNIMOG 416

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Instruction Manual

UNIMOG 416

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Technical details of UNIMOG in relation to data and illustrations of the present manual subject to change.

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1 General Hints

Explanation of Contents

In addition to general explanations, this section **1 General Hints** also contains important details with regard to pertinent numbers, keys and equipment of the UNIMOG.

A careful study of section **2 Operating Instructions** in particular prior to initial operation, is one of the prerequisites for troublefree operation of the UNIMOG.

In addition, relevant instructions in section **3 Maintenance Instructions** are intended to guarantee that the UNIMOG remains efficient and constantly available for use.

Use only the types of fuels, lubricants, coolants, etc. described in section **4 Operative Materials** in the quantities specified.

In the following section **5 Trouble Shooting** we are providing remedies and references as to their possible cause, as well as recommendations for their repair.

For fast information, all the significant dimensional data concerning the engine, the chassis and the body are listed in section **6 Technical Data**.

Type Plate and Numbers

In all inquiries concerning the UNIMOG, and when ordering spare parts and special equipment, be sure to name the type and model designation, chassis and engine number, as well as any other unit number.

The type plate is located above the right-hand foot compartment underneath the outside hood.

The chassis number is on the type plate and on the frame at the right front in front of the spring bracket.

The engine number plate is located on the right rear next to the oil filter and on the cylinder head cover.

The designations „right-hand“ and „left-hand“ apply as seen in driving direction. The statements 1st, 2nd cylinder, etc. are always as seen from the direction of the radiator.

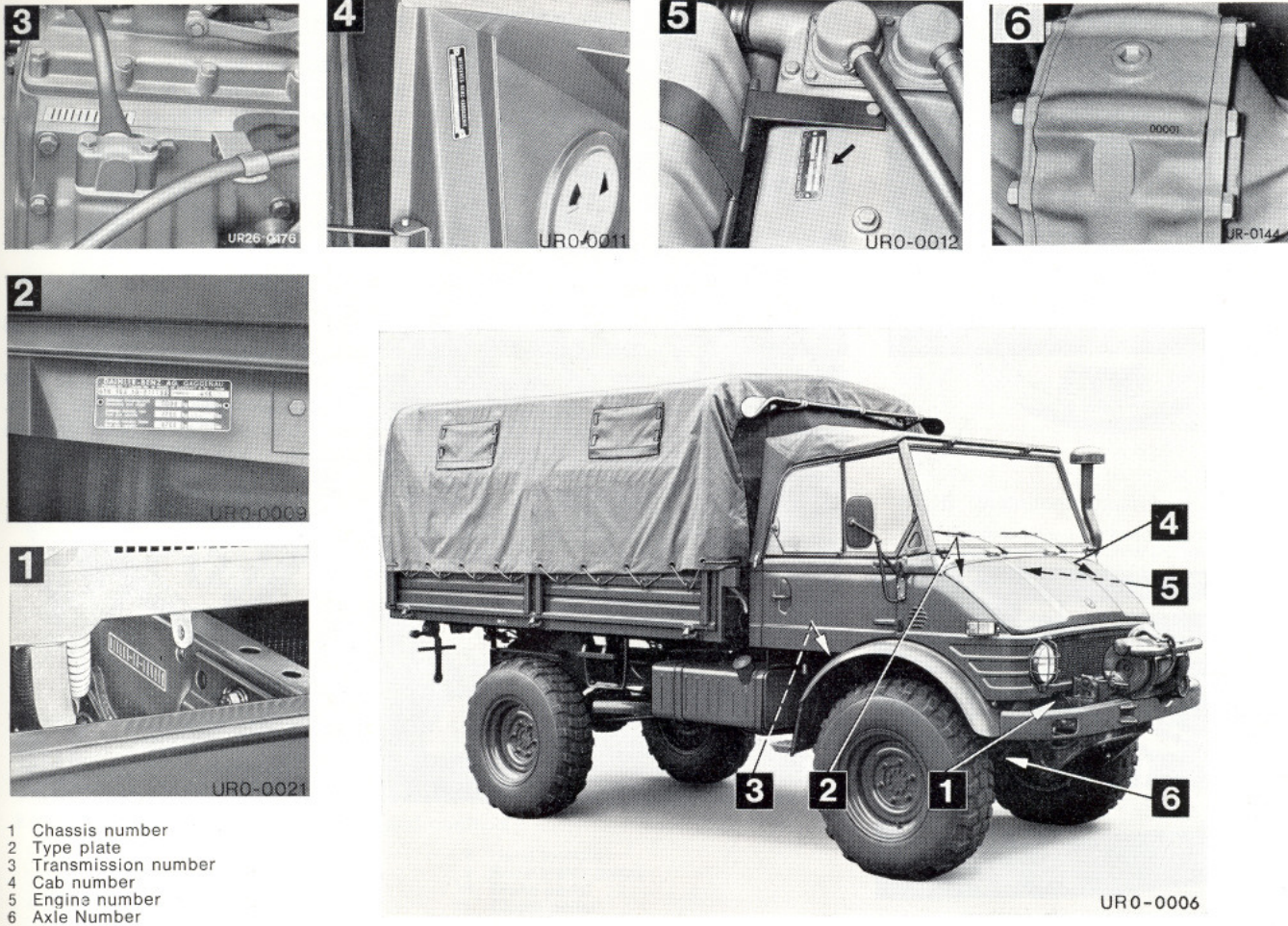


Fig. 1 Arrangement of type plate and numbers

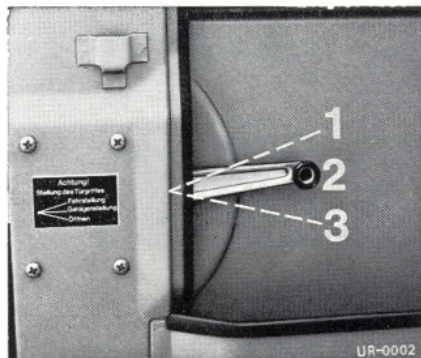


Fig. 2 Door locks

- 1 Driving position (latched)
- 2 Garage position
- 3 Open

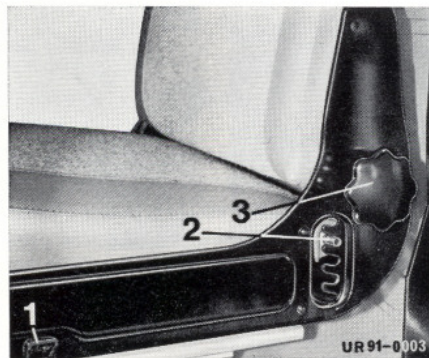


Fig. 4 Seat adjustment

- 1 Longitudinal adjustment
- 2 Tilt of seat cushion
- 3 Tilt of backrest

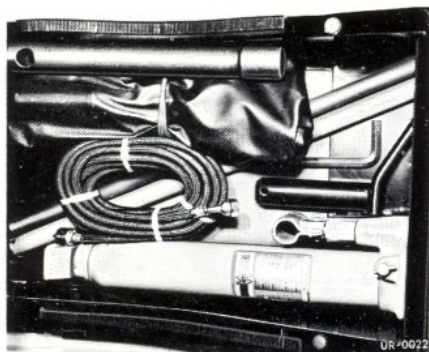


Fig. 3 Vehicle tool box under co-driver's seat

Keys

The **switch box key** serves for switching the switch box in the instrument panel. The **square drive bonnet key** is in the left-hand door box. It is used for opening the bonnet.

Doors, Seats and Tools

The door locks of the folding top cab must be latched from inside while driving. In latched condition the inside door latch is positioned at an upward angle. The door can be locked only when in this position.

For seat adjustment refer to Fig. 4.

For tools refer to Fig. 3.

2 Operating Instructions

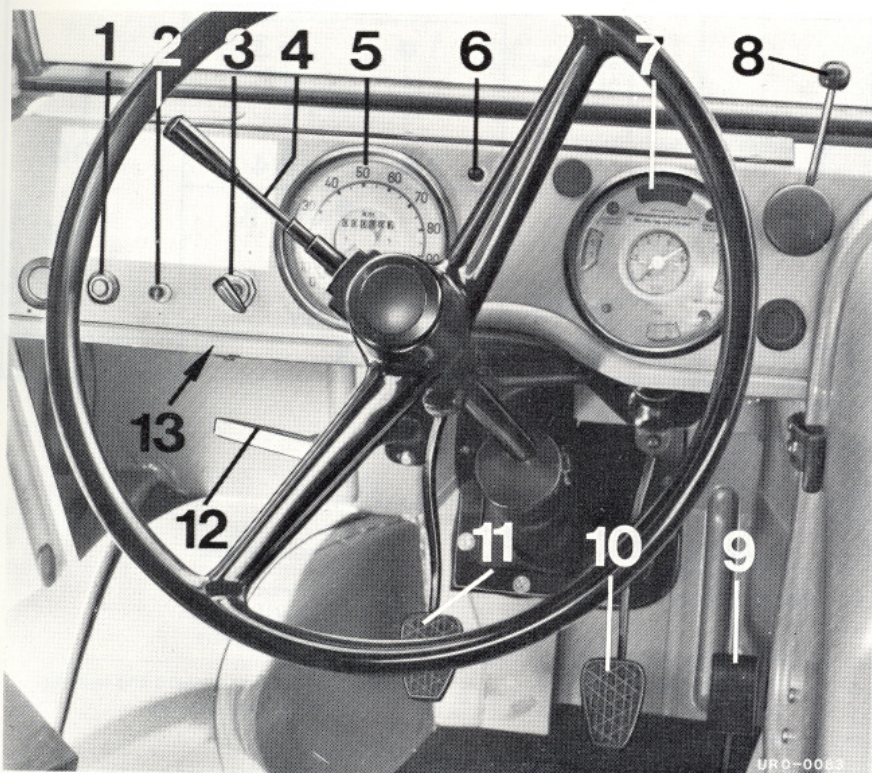


Fig. 5 Arrangement of instruments and controls

- | | |
|--|-------------------------------|
| 1 Starter switch | 8 Hand throttle |
| 2 Windshield wiper switch | 9 Accelerator pedal |
| 3 Switch box | 10 Brake pedal |
| 4 Blinker — Horn — Dimmer switch lever | 11 Clutch pedal |
| 5 Speedometer | 12 Parking brake lever |
| 6 Cut-out switch for blinker | 13 Socket for emergency light |
| 7 Instrument cluster | |

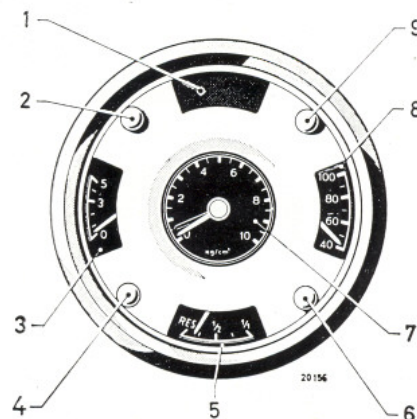


Fig. 6 Instrument cluster

- | |
|---|
| 1 Brake overpressure warning light (red) |
| 2 Blinker control light UNIMOG (green) |
| 3 Oil overpressure indicator |
| 4 High beam control light (blue) |
| 5 Fuel gauge |
| 6 Charging current control light (red) |
| 7 Dual brake overpressure gauge |
| White needle = tank overpressure |
| Red needle = brake overpressure |
| 8 Coolant temperature gauge |
| 9 Blinker control light for 2nd trailer (green) |

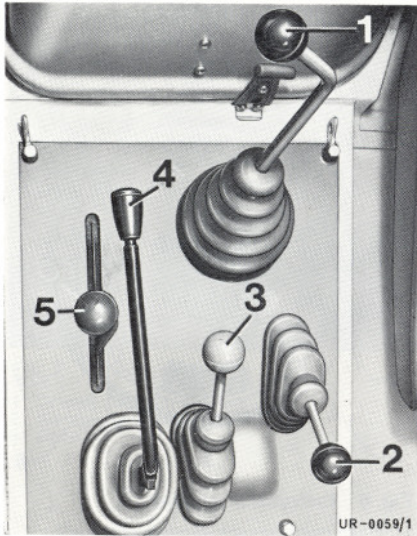
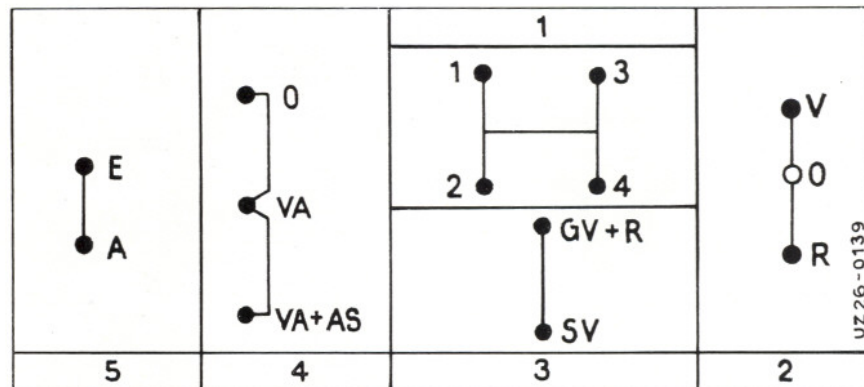


Fig. 7 Shifting levers

- 1 Main shift lever
- 2 Forward-reverse lever
- 3 High-low range lever
- 4 Four wheel drive/differential lock lever
- 5 Pto-shift lever

Transmission with 2 x 4 gear shifting



Shifting position 2 x 4

Shifting lever	Shifting position		
1	Main shifting lever	1—4	1st to 4th gear
2	Forward-reverse shifting lever	V O R	Forward gears Neutral position Reverse gears
3	High-low range shifting lever	GV+R SV	Low range forward and reverse High range forward
4	Four-wheel drive-diff. lock shifting lever	O VA VA+AS	Rear axle drive Four-wheel drive Four-wheel drive and diff. lock
5	Pto shifting lever	E A	Engaged Disengaged

Switch, Explanation

Switch Positions	Consumer
O *	Off Socket, interior light
P	Parking position Parking, Clearance light Instrument cluster light Socket
1	Drive position Charging current control light Starter switch Horn, socket, interior light Blinker-tail-stop light Windshield wiper Instrument indicator
2	to 1, additional Parking, Clearance light Instrument cluster light
3	to 1 and 2, additional Headlight low beam Headlight high beam High beam control light

* To switching from "O" to "P" and from "3" to "2" push ignition key down.

Switches

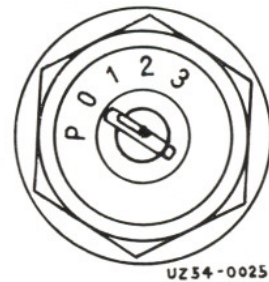


Fig. 8 Switch box

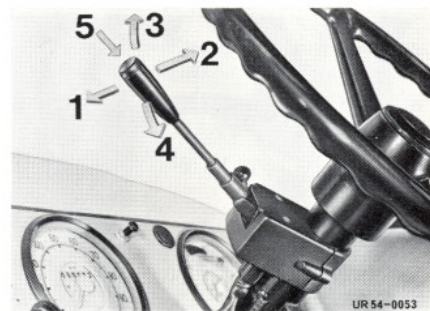


Fig. 9 Blinker-Horn-dimmer switch

- 1 High beam
- 2 Low beam
- 3 Blinker light right
- 4 Blinker light left
- 5 Horn

Putting UNIMOG into Operation

Preparations before Starting

Check coolant level in compensation tank. Actuate push button of safety valve prior to opening closing cap to relieve any excess pressure.

The coolant of the cold engine should be up to 30 mm below the upper edge of the filler hole of the compensation tank. Add coolant, if required.

Be sure to add 10 cc of anti-corrosive agent for each liter of coolant.

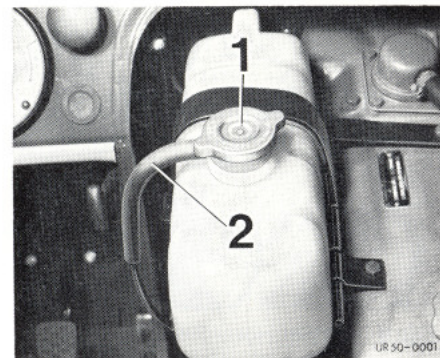


Fig. 10 Coolant compensation tank

- 1 Closing cover with safety valve
- 2 Overflow line

Run engine for 5 minutes at increased idling speed. If required, add coolant with the engine running, until cooling liquid level is reached.

Check **oil level in oil pan** with wiped-off oil dipstick with the UNIMOG on level ground. The oil level should be on the maximum level mark. When checking the oil level of the engine be sure to consider that the oil cooler and various oil passages can be completely drained when the engine has been inoperative for some time. To determine the exact oil level in the oil pan it is necessary **that the check is conducted immediately after shutting off the warm engine or after a short running period** of the previously cold engine.

Do not fill up beyond the maximum level mark!

Check contents of **fuel tank**.

Check **tyre pressure**.

Check **lights**.

Test brakes after moving off.

Important

Move vehicle only after red light on instrument cluster is gone off.

Starting the Engine

Move main shift lever and hand throttle into center position (idling speed).

Insert switch box key into switch box and turn to position 1:

Red charging current control lamp lights up and fuel gauge responds.

Declutch and step on accelerator pedal. Push starter switch and hold for some seconds. Engine will fire. Release starter switch immediately after engine fires since this can otherwise cause damage to the starter.

If the engine does not fire immediately, repeat starting attempt only when the engine and the starter have come to a stop. During repeated starting attempts short recovery periods for cooling the starter and conserving the battery should be imposed.

Watch oil pressure gauge after engine fires.

If no oil pressure is indicated with the engine running, stop engine immediately and look for the cause.

Adjust idling position with hand throttle until the engine runs „smoothly“ at slightly increased idling speed.

Running-in

It is of decisive importance for the life and the operational safety that the engine and drive train of a new UNIMOG, an exchange engine or reconditioned engine are not fully exploited during the first 1500 km.

Complete the specified service jobs according to schedule once during the running-in time up to 500 km. The regular service jobs according to schedules will then begin. Page 17.

Stationary Operation

For stationary operation of the pto shaft and low-speed operation the desired engine speed can be fixed by means of the hand throttle control. Tighten round locking disc in clockwise direction.

While operating the pto drive stationary make sure that the low range/high range lever is in „high range“ to guarantee the oil supply to all rotating parts inside the transmission.

Stopping the Engine

Pull hand throttle control toward the rear and turn completely to the right. Engine will stop. Immediately turn hand throttle control back to idle position. At a coolant temperature of 90 to 95°C do

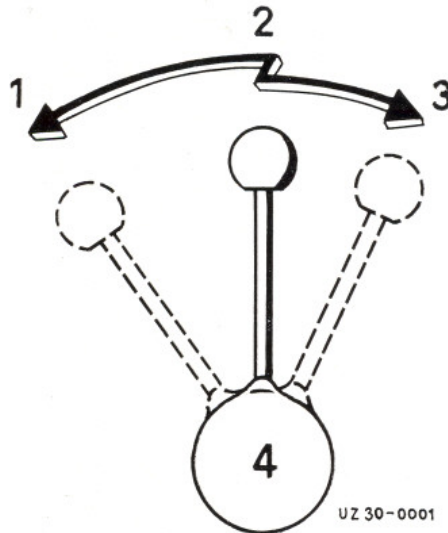


Fig. 11 Hand throttle control

- 1 Full throttle position
- 2 Idle position
- 3 Stop position
- 4 Locking plate

not stop the engine immediately but keep it running at increased idling speed for 1 or 2 minutes, so that the coolant remains in circulation and is not thrown out by the reheating effect of the engine.

Transmission Shifting 2 x 4 Shifting

The manual synchromesh transmission has 4 forward low range gears, 4 forward high range gears and 4 reverse gears.

The 4 forward low range gears have been provided for increased traction. They are shifted with the low range/high range lever (3) after disengaging the clutch. Page 12.

For road operation, the 4 forward high range gears are sufficient, i. e. start the vehicle, depending on trailer weight, with the 1st high range gear engaged.

For reverse operation, declutch and move the short forward/reverse lever to the „reverse“ position, the UNIMOG being stationary.

For repeated forward and reverse operation, keep main shift lever in its position and shift to forward and reverse only with the short forward/reverse lever. See page 12.

Special Drive for Pto Shaft

A special drive for pto shaft of 1/min, 540 can be installed.

The rotation of pto shaft will stop during declutching.

Four-Wheel Drive, Differential Locks

If under difficult ground conditions or with a high total train weight the ground adhesion of the rear wheels is inadequate, engage the four-wheel drive or the four-wheel drive **with** differential locks. This will provide high tractive power for the UNIMOG in spite of its low dead weight. Putting an additional load on the platform may improve ground adhesion still further.

The four-wheel drive and the differential locks can be engaged while driving without declutching, but only when the wheels are not spinning, that is, as long as the wheels are rotating in contact with the ground.

If a wheel slips when the four-wheel drive or the differential locks are engaged, declutching is required so that all the wheels are turning at uniform speed or that the UNIMOG comes to a stop.

The differential locks and the four-wheel drive can also be disengaged while driving without declutching. Briefly release accelerator pedal when disengaging the four-wheel drive.

Try not to engage the differential locks when driving around a road bend to eliminate additional stresses.

With the differential locks engaged the turning circle increases as a result of the automatically resulting wheel slip.

Instruments, Warning Lights

Check instruments,, warning and control lights occasionally while driving. The most favorable operating temperature of the coolant is at approximately 80° C and is indicated on the coolant temperature gauge. At this temperature the engine wear and the fuel consumption are the lowest. If possible, the operating temperature should not exceed 95° C.

Brake System

Test brakes immediately after moving off. Establish braking action on a dry road affording good grip.

The hand brake system serves as an auxiliary and a parking brake system acting on the rear wheels only.

3 Maintenance Instructions

Maintenance

General

The maintenance jobs specified for the UNIMOG are specified in the Service Booklet.

When driven on roads the maintenance intervals are subdivided according to km.

If, for organizational reasons, the maintenance jobs have to be accomplished by your own personnel we urgently recommend adherence to the required maintenance procedures.

Thoroughly clean grease nipples, oil filler and drain plugs prior to lubrication jobs.

Maintenance Schedule

Maintenance interval		Job schedule	Job accomplishment	
at	km			
Normal operating conditions	500	* Only once during running-in period of vehicle		
	1000	}	Refer to Maintenance Lubrication Points Survey	
	2000			
	3000			
	4000	2nd T.M.		
	5000	}		
	6000			1st T.M.
	7000			
	8000	2nd T.M.		
etc.	etc.			

* Lubrication jobs:

Change engine oil
 Replace bypass oil filter element
 Change transmission oil
 Change oil in differential (2)
 Change oil in wheel hub drive (4)
 Check oil level in steering
 Check brake fluid level
 Lubricate thrust ball (2)
 Lubricate steering knuckle bearings (4)
 Lubricate clutch release shaft
 Lubricate pto shaft universals (2)
 Lubricate trailer coupling (2)
 Lubricate intermediate hand brake lever

* Inspection and cleaning jobs:

Clean dry air filter element
 Retighten cylinder head nuts
 Check valve clearance, adjust
 Retighten air intake-manifold and oil pan mounting screws
 Check V-belt
 Check clutch play
 Retighten stabilizer bar/drive units mounting- and connecting screws
 Check pitman arm for tight seat, steering for correct functioning
 Check wheel nuts
 Check brake system

Maintenance Job Survey

Inspection and cleaning jobs	Pos. Nr.	daily	1st TM	2nd TM
Engine				
Check engine oil	1	—		
Clean air filter element	14	—	—	—
Check valve clearance, adjust			—	—
Clean fuel pre-filter	15	—	—	—
Retighten suction-/exhaust- and oilpan mounting screws			—	—
Cooling water		—	—	—
Check V-belt, retighten		—	—	—
Clean fuel filter felt element, paper filter element must be changed, bleed	12		—	
Chassis				
Check clutch adjustment	8	—	—	
Check differential locks for functioning			—	
Retighten stabilizer, drive train fastening and connecting bolts			—	
Check shock absorbers for leaks			—	
Check brake- and clutch fluid	2	—	—	
Check pitman arm for tight seat steering for free travel, correct	5	—	—	
Check toe-in			—	
Interchange wheels			—	
Retighten wheel nuts			—	
Check brakes, adjust			—	
Check compressed air system for functioning and leaks, drain condensation from compressed air tank and differential lock			—	
Electrical system				
Check all current consumers, fuses and line connections			—	—
Check battery			—	—
Check head light alignment, correct			—	—
Check all electrical instruments			—	—
Body				
Check bolts of cab and body attachment for tight seat, retighten			—	—

Lubrication jobs	Pos. No.	Lub. Points	Oil Grease Qty.	daily	1st TM	2nd TM
Engine oil: SAE 20 or SAE 30						
Change oil in engine, change oil filter	1+3	1	10.0	x	v	v
Change oil in air filter	14	1	1.0	x	v	v
Lubricate starter pinion	11	1	5 gr			xx
Transmission oil: SAE 90						
Transmission	9	1	6.0		x	v
Front axle differential	6	1	2.5		x	v
Rear axle differential	6	1	2.5		x	v
Wheel hub drive front	7	2	0.3		x	v
Wheel hub drive rear	7	2	0.3		x	v
Grease: Calcium No. 3						
Thrust ball front and rear axle	4	2	10 gr		xx	xx
Grease clutch shaft	8	1	5 gr		xx	xx
Grease trailer coupling	16	2	10 gr		xx	xx
Grease front winch		1	10 gr		xx	xx
Grease pto shaft universal	13	2	10 gr		xx	xx
Grease joints and nipples on manual and pedal lever assy. door hinges			5 gr		xx	xx
Grease hand brake — intermediate lever	10	1	10 gr		xx	xx
Grease steering knuckles	7	4	10 gr		xx	xx
Hydraulic oil						
Steering *	5	1	2.0	x	x	x
Brake fluid						
Check brake- and clutch fluid level	2	1	1.0	x	x	x

* Change oil and replace paper oil filter element after the first 52 000 km or once a year.

x = Check
xx = Lubricate
v = Change oil

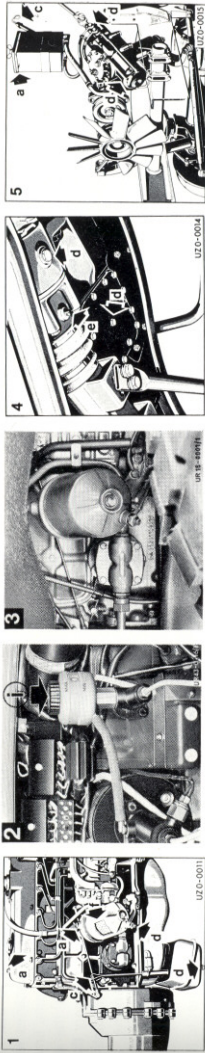
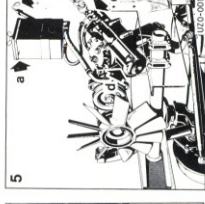
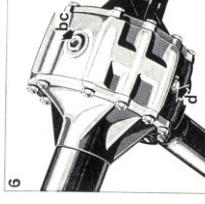
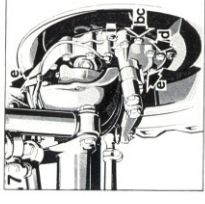
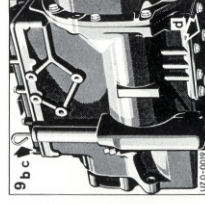
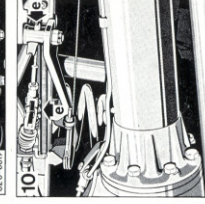
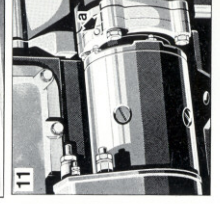
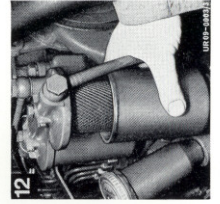
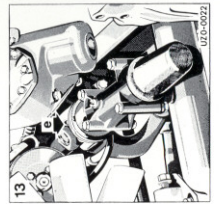
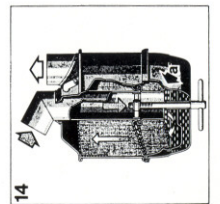
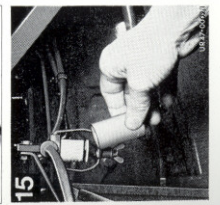
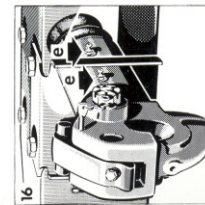
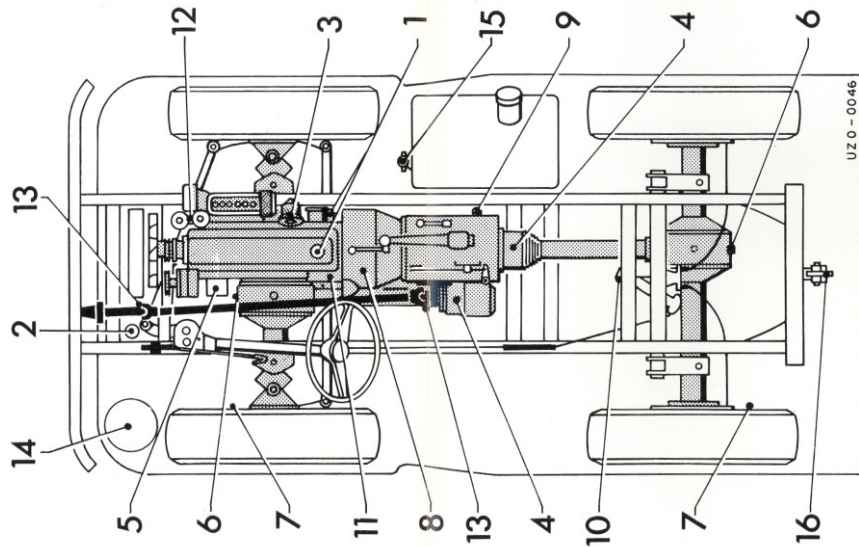


Fig. 12

- a Fill-in engine oil
- b Fill-in transmission oil
- c Check oil level
- d Drain oil
- e Lubricate with grease
- f Replace oil filter element
- i Fill-in and check brake fluid



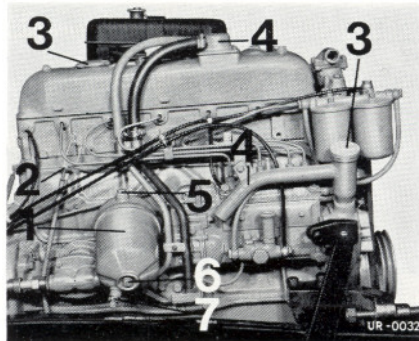


Fig. 13 Engine lubrication

- 1 Oil filter
- 2 Oil dipstick
- 3 Oil filler neck
- 4 Crankcase breather
- 5 Oil filter filler plug
- 6 Mounting bolt
- 7 Oil filter drain plug

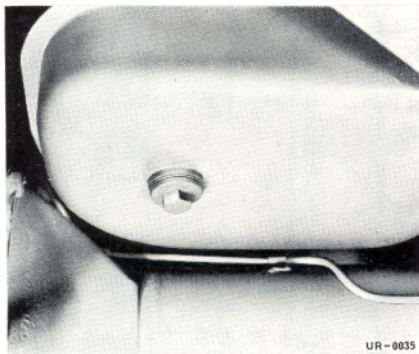


Fig. 14 Oil drain plug

Engine

Filling-up Engine Oil

The oil filler neck is located at the rear in the cylinder head cover, accessible from the cab after removal of the inside engine hood. Filling-up may also be accomplished at the breather neck on the timing gear case.

Engines of the new UNIMOG, exchange engines and fully reconditioned engines are filled with running-in oil for the first 500 km.

After this, only HD (heavy-duty) engine oil grades of the specified viscosity class are permitted. Refer to page 56.

Change HD engine oil brand if at all possible only during an oil change.

Oil Level and Oil Change

Check oil level regularly depending on the UNIMOG operating conditions and make adjustments, if required.

Check oil level in oil pan with the UNIMOG on level ground and with the oil dipstick wiped off.

The oil level should be between the minimum and maximum mark.

When checking the oil level of the engine, it must be considered that the **oil cooler** and various oil passages will drain after not being run for some time. In order to exactly determine the oil level in the oil pan, it is necessary **that the check be made either immediately after turning off the warm engine, or after briefly running the previously cold engine.**

If oil must be added already prior to the first oil change and if no running-in oil is available, an HD engine oil of the same viscosity class may be used as an exception.

Do not add oil beyond the max. level mark!

Complete oil change according to the maintenance schedule.

Complete oil change only following extended operation of the engine, as long as the engine oil is still **warm and thin**. Change the bypass oil filter element during every oil change. HD engine oil will become dark sooner than unblended engine oil, because the combustion residue entering the oil will not settle in the crankcase and on crank assembly components, but will be kept suspended in the oil. Do not change the HD engine oil too early because of its dark color.

Cleaning Oil Filter

Clean the combination oil filter with main flow and bypass oil filter element according to maintenance schedule.

Attach approximately 0.6 m of hose to the drain connection of oil filter. Place a collecting vessel underneath, loosen drain plug, unscrew filler plug and drain engine oil.

Loosen mounting bolt of oil filter bowl. Remove filter bowl with filter elements. Close center hole of main flow oil filter element on both sides, rinse with gasoline and then clean with a soft and not too large a brush, so that the filter fabric is not damaged.

Change bypass oil filter element. When assembling, place the main flow oil filter element, the bypass oil filter element and the resilient sealing washer on the oil filter housing.

Replace sealing rings.

To get oil pressure at once during starting procedure, **fill-up oil filter bowl half way.**

Watch out for correct position of drain plug screw on oil filter bowl.

Oil Overpressure

Under normal operating conditions and when using engine oil of viscosity class SAE 30 at nominal speed the oil overpressure is at least **2.5 bar (kp/cm²)**. At idling speed it may drop to **0.6 bar (kp/cm²)** without in any way endangering the operational safety of the engine.

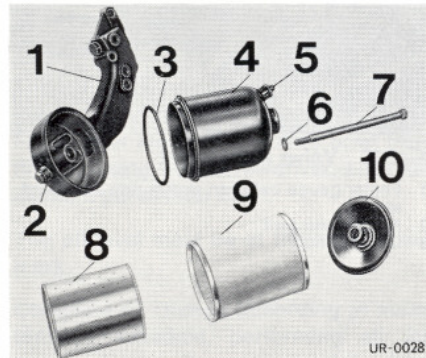


Fig. 15 Oil filter of engine, disassembled

- 1 Oil filter bracket
- 2 Oil filler plug
- 3 Seal ring
- 4 Oil filter housing
- 5 Drain plug
- 6 Seal ring
- 7 Mounting bolt
- 8 Bypass oil filter element
- 9 Main flow oil filter element
- 10 Spring plate

Retightening Cylinder Head Nuts

This maintenance job is done only once. Clean area around cylinder head cover thoroughly. Remove cylinder head cover and rocker arm shafts. Should it occasionally happen that the cylinder head cover removal is impeded by the lower edge of the instrument panel, loosen the front portion of the cab mounting and lift the cab approximately 20 mm.

First loosen each individual nut slightly prior to retightening.

Injection pump side

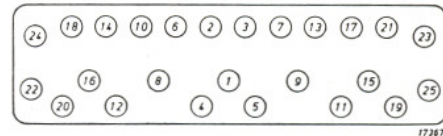


Fig. 16 Tightening pattern of cylinder head nuts

Uniformly retighten cylinder head nuts with the engine cold according to tightening pattern with torque wrench to specified torque of **110 NM (11 kpm)**. Adjust valve clearance Refer to page 67.

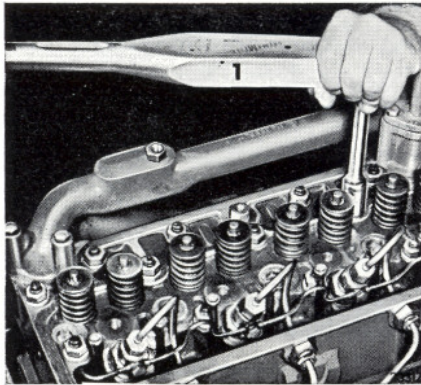


Fig. 17 Retightening cylinder head nuts
1 Torque wrench

Replacing Cylinder Head Gasket

If a cylinder head gasket leaks combustion gases, replace immediately with a new original gasket.

Indications for a damaged gasket may be among others:

Missing of one or several cylinders, traces of water on oil dipstick, traces of oil in coolant or coolant in compression chamber. Boiling coolant.

To check the cylinder head gasket for leaks, run engine warm and watch in the coolant filler neck whether gas bubbles are rising in the coolant.

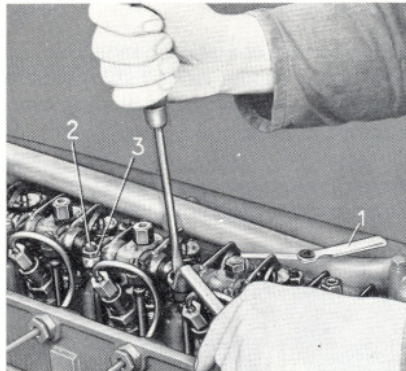


Fig. 18 Valve adjustment
1 Feeler gauge between rocker arm and valve stem
2 Adjustment bolt
3 Counter nut

Drain coolant if cylinder head gasket is damaged. Remove cylinder head cover and gasket. Unscrew rocker arm bearing brackets. Loosen cylinder head nuts with the **engine cold** in reverse to tightening sequence. Unscrew stud bolts and remove cylinder head. Clean contact surfaces of cylinder head gasket. Position new cylinder head gasket and cylinder head. Screw in stud bolts with screwdriver; apply graphite oil to threads of nuts and bolts. Uniformly tighten cylinder head nuts with engine cold according to tightening pattern (Fig. 16) with torque wrench in three steps from **60 Nm (6 kpm)** via **90 Nm (9 kpm)** to the specified torque of **110 (11 kpm)**. Adjust valve clearance. Complete all other jobs in reverse sequence.

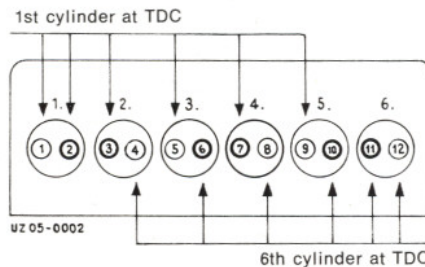


Fig. 19 Valve arrangement
○ Exhaust valves
● Intake valves

Adjusting Valve Clearances

Check valve clearance according to maintenance schedule each time upon removal of cylinder head or when retightening the cylinder head nuts. Measure valve clearance at pressure point between rocker arm and valve stem of intake and exhaust valves with **engine cooled down to below 25°C**.

Rotate crankshaft until the piston of the 1st cylinder is at TDC. Adjust the intake valves 2, 3, 7 and the exhaust valves 1, 5, 9 in the sequence mentioned.

Thereafter position the piston of the 6th cylinder at the TDC and adjust the **intake valves 6, 10, 11** and the **exhaust valves 4, 8, 12** in the sequence mentioned. Fig. 19.

Adjust valve clearance by turning adjustment bolts after loosening their counter nuts with a feeler gauge. Fig. 18. After adjustment tighten the counter nuts again. Check valve clearance again. When the valve clearance is properly adjusted the feeler gauge should pass tightly.

Renew cylinder head cover gasket.

Checking Compression Overpressures

When the engine output drops, measure compression pressure in each cylinder by means of compression pressure gauge. Measure at starter speed of approximately 150 to 200/min and warmed up engine. Crank engine with starter for at least eight rotations.

If the minimum value is not attained, check valve clearance. If required, remove cylinder head and check valve for leaks, condition of cylinder head gasket, cylinder wear and piston ring contact pattern in cylinder.

Refinish valve seats, if required. Engine must be reconditioned in the event of cylinder or piston ring damage.

Air Filter

A carefully cleaned air filter is absolutely necessary to protect the pistons and cylinder contact surfaces and in order to avoid damage.

Oil bath air filter

Change oil according to UNIMOG conditions of operation.

Loosen quick-release lock for removing filter bowl on front folding part of fender. Force filter element and filter bowl from filter housing with screwdriver. Lift filter element out of filter bowl.

The oil level must be at the appropriate mark.

Complete oil change according to maintenance schedule, performing all the specified jobs. Remove oil, clean filter element and filter bowl with benzene and fill up with fresh engine oil.

Dust deposits on the clean air end and in the intake manifold are a sure sign that the oil bath air filter must be cleaned more often than stated in the maintenance schedule.

Cyclone prefilter

Under extremely dusty operating conditions, we recommend using a cyclone prefilter in **addition** to the oil bath air filter in order to triple the service life of the oil bath air filter.

The cyclone normally requires no maintenance. Remove the cyclone and thoroughly clean according to type of dust accumulation.



Fig. 20 Oil bath air filter, disassembled

- 1 Filter bowl
- 2 Gasket
- 3 Filter element
- 4 Filter housing w. oil level mark (arrow)

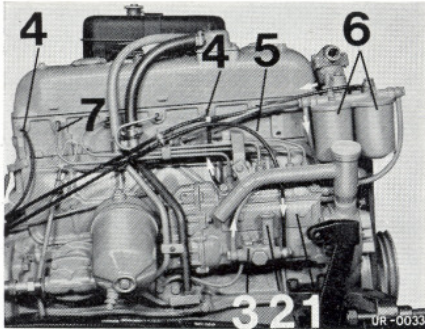


Fig. 21 Fuel system of engine

To Fig. 21

- 1 Injection pump
- 2 Fuel priming pump
- 3 Fuel feed pump
- 4 Fuel return line
- 5 Fuel suction line
- 6 Fuel filter
- 7 Fuel injection line

Cleaning Fuel Tank

Clean the fuel strainer in the fuel tank regularly.

If installed, remove filler strainer after unscrewing the cap and wash with brush in diesel fuel.

Drain fuel tank completely to clean the fuel tank and intake strainer. Have collecting vessel ready for use, unscrew drain plug and drain remainder of fuel. Pull intake strainer from intake pipe and clean. Fig. 23 and 24.

Fuel System

Filling-up Fuel

When filling fuel into the fuel tank make sure to avoid impurities, that the cap gasket is not damaged and seals tightly. Clean cap regularly.

Dirty fuel will result in early wear of the high-grade and very expensive injection pump elements.

When filling up from barrels or cans the following points should be observed:

Always suck fuel from closely under the fuel level of the barrel, that is, do not simply set suction pump into barrel. Maintain minimum distance between bottom of barrel and end of intake pipe, so that deposits such as dirt, sludge and water will not be sucked in.

Cleaning Fuel Prefilter

Clean prefilter according to maintenance schedule. Loosen wing nut, push clip aside and remove bowl. Unscrew strainer body. Carefully wash bowl and strainer in clean gasoline or diesel fuel.

During reinstallation replace worn or hardened gaskets since otherwise air will enter the fuel system. Fig. 25.

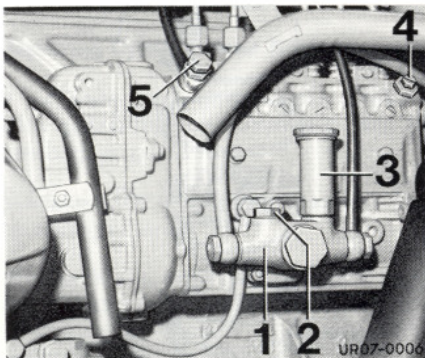


Fig. 22 Injection pump

- 1 Fuel feed pump
- 2 Suction- and pressure valve
- 3 Fuel primer pump
- 4 Bleeding screw
- 5 Pressure valve

Cleaning Fuel Filter

Clean fuel filter according to maintenance schedule:

Loosen fastening bolts of both filter bowls. Fig. 26. Remove filter bowls and take off felt tube elements. Clean out filter bowls. In no case disassemble felt tube elements for cleaning. Carefully close off both openings of a felt tube element so that no dirt can enter. Shake out felt tube elements in clean diesel fuel.

Immerse heavily dirtied felt tube element in diesel fuel until drawn full of oil and blow out with compressed air or with an air pump through one of the holes from inside. Repeat procedure until the blown out fuel remains clean. During reinsertion pay particular attention to upper and lower felt gasket.

Paper filter elements cannot be washed but should be changed during each 1st TM.

Trouble-free engine operation requires a carefully cleaned fuel filter.

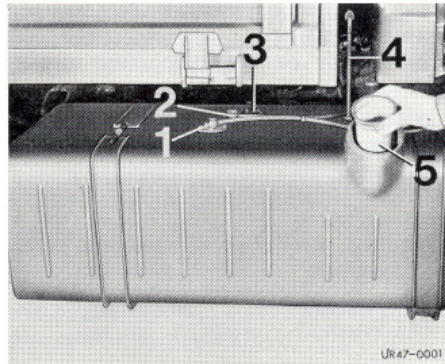


Fig. 23 Fuel tank

- 1 Intake line
- 2 Return line
- 3 Fuel gauge sending unit
- 4 Vent
- 5 Filter strainer

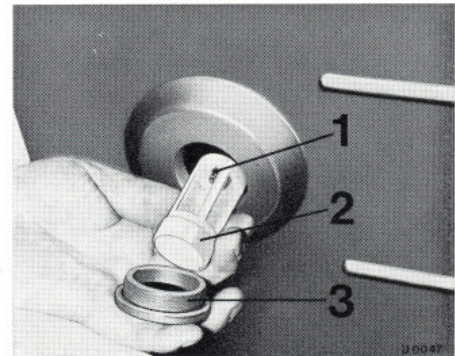


Fig. 24 Intake strainer

- 1 Intake pipe
- 2 Intake strainer
- 3 Drain plug

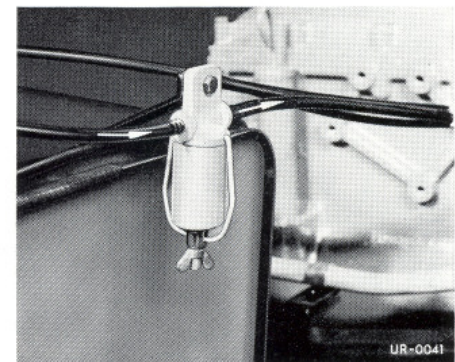


Fig. 25 Fuel prefilter

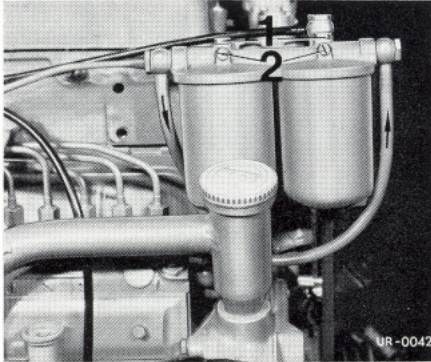


Fig. 26 Fuel filter

- 1 Fastening bolts of filter bowls
- 2 Bleed screws



Fig. 27 Cleaning of fuel filter element

Priming and Feed Pump

To operate priming pump first turn its handle counter-clockwise. After using primer pump screw handle down again by turning clockwise.

The fuel feed pump is a double acting piston pump. Normally, no service is required. If required, remove feed pump, disassemble, clean, assemble and reinstall. Fig. 21.

Bleeding Fuel Filter

Unscrew both bleeding screws of fuel filter one after the other for 1–2 complete turns and actuate fuel primer pump. Pump until fuel free of bubbles flows out of bore in bleeder screw.

Bleeding Fuel System

Complete bleeding of the injection pump or the entire fuel system is one of the basic conditions for perfect running of the engine.

If air bubbles collect in any part of the fuel system they are compressed without fuel being ejected out of the injector nozzle. To prevent such trouble in the fuel system never run the fuel tank completely empty.

Bleed entire fuel system prior to initial operation, as well as after each major repair:

When the fuel system has not been run empty completely bleeding of the fuel filter may be sufficient. If thereafter the engine does not fire immediately bleed the injection pump.

Bleed fuel filter.

Loosen bleeder screw on injection pump by a few turns and add fuel with the primer pump until fuel emerges absolutely free of bubbles. Primer pump requires fast actuation.

Checking and Cleaning Injectors

Trouble on injector nozzles may occur when the fuel system has dirt accumulations whereby the engine will emit black smoke, will knock badly or run erratically.

A stuck nozzle needle may be made operable when the engine is running by actuating the accelerator pedal several times. To find the damaged nozzle, loosen the pressure lines to the nozzle holders of the injector nozzles one after the other, that is, loosen only one pressure line at a time and watch operation, speed and exhaust of engine. If the speed changes not at all or only slightly and the abnormal noise or the black

smoking of the exhaust stop, the damaged injection nozzle has been located.

Replace a damaged injection nozzle or clean on an absolutely clean work bench:

Remove cylinder head cover. Immediately cover the thus unprotected intake ports so that no foreign matter can fall into them. Loosen glands in cylinder head which retain the injection lines. Unscrew pressure and leak fuel lines.

Unscrew union nut. Remove nozzle and watch out for washers under the spring. If damaged, only replace nozzle body and nozzle needle together.

Clean nozzle body and nozzle needle externally. Clean ejection bore and the upper annular surface with a pointed piece of **hardwood** or a soft brush.

Carefully clamp cylindrical pin of nozzle needle between lead jaws and pull nozzle needle out of nozzle body. If required, first soften both parts in diesel fuel.

Clean nozzle body inside with **wooden stick**, gasoline or diesel fuel. Clean nozzle needle with clean rag; hold nozzle needle by pin only to prevent any corrosion of the lapped surface.

Remove carbon deposits on nozzle body and nozzle needle only with hardwood stick.

Prior to reassembly immerse nozzle needle and nozzle body in clean diesel fuel. Drop test: Nozzle needle pulled out by half its length should drop back to its seat under its own weight.

Assemble nozzle needle, nozzle body and nozzle holder. Check ejection pressure. Refer to page 67.

Insert new copper gasket.

Screw in nozzle holder with specified tightening torque since otherwise the nozzles might be subject to distortion. Refer to page 74.

Connect pressure line and leak fuel line tightly.

Cooling System

Filling-up Coolant

Regularly check coolant level in expansion tank. Actuate push button of safety valve prior to opening cap to relieve any excess pressure. Fig. 10.

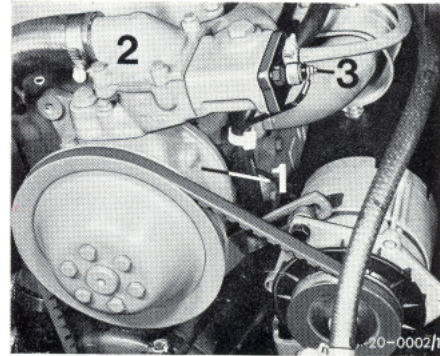


Fig. 28 Engine cooling system

- 1 Coolant pump
- 2 Thermostat
- 3 Sending unit (Temperature)

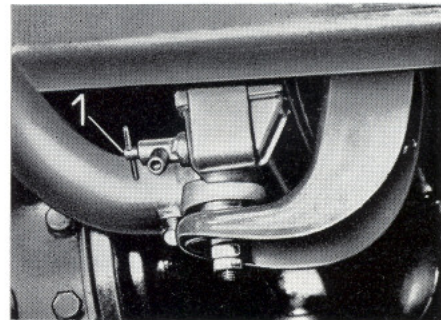


Fig. 29 Radiator drain cock

- 1 Drain cock

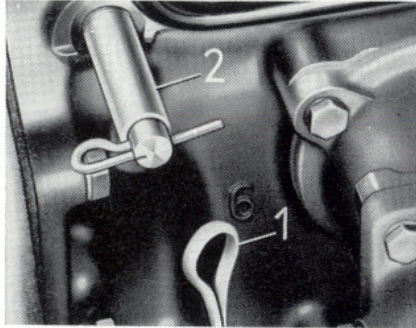


Fig. 30 Engine Drain Cock

- 1 Oil dip stick
- 2 Engine drain cock

The coolant level of the cold engine should be not more than 30 mm below the upper edge of the filler hole of the expansion tank. Add coolant, if required.

When filling up or changing the coolant **be sure** to add 10 cc of anticorrosive agent per liter of coolant.

Run engine at increased idle speed for 5 minutes. Add coolant with engine running, if required.

Draining Coolant

Prior to opening the expansion tank cover actuate push button of safety valve in order to relieve any excess pressure. Fig. 10.

Be sure to open all drain cocks and drain plugs since coolant would otherwise remain in cylinder crankcase.

They are located:
On the radiator at the bottom right. Fig. 29.

At right engine side. Fig. 30.

Coolant Pump

When coolant leaks out of the drain opening the gasket of the pump housing is damaged. Have new gasket installed. Do not in any case attempt to plug up a leaking drain opening for a longer period of time since the ball bearings in the housing will be damaged by penetration of the coolant.

Thermostat

The thermostat operates without any maintenance. During normal operation it will open the coolant circuit via the radiator at approximately 80° C. Have damaged thermostat replaced immediately since the engine can otherwise overheat.

Cleaning Cooling System

Clean cooling system regularly. If the coolant temperature increases gradually above the specified value a fault in the cooling system is indicated. For example, not enough coolant, dirty radiator, incorrectly tensioned V-belts or improperly operating thermostat.

If cooling system is dirty, clean, degrease or remove scale.

Cleaning: Blow out radiator from engine side with compressed air or spray out with water so that the radiator fins are thoroughly cleaned from foreign bodies.

Degreasing: Unscrew cover of expansion tank. Fill in two hands full of soda or a special agent. Drive for one day with this mixture and then drain all the coolant. Thoroughly rinse cooling system with running fresh water.

Coolant Hoses

Check hoses of cooling and heating system regularly for leaks, cracks and breakage. Replace damaged hoses immediately otherwise approximately every 2 years.

Coolant Pump V-Belt

Check V-belt according to maintenance schedule. Tension V-belt by swinging out generator that it will give only approximately 10 mm under thumb pressure from the straight line. A too tight or loose V-belt becomes worn out quickly.

Check new V-belt several times during first hour of operation for proper tension and retension if necessary since it will stretch somewhat while running in.

Clutch, Transmission, Axles

Clutch

Check adjustment of hydraulically operated clutch according to maintenance schedule and make readjustments if necessary. However, the maintenance intervals mainly depend on the application conditions of the UNIMOG.

The free travel of the clutch pedal — measured at upper edge of pedal plate — should be at least 25 mm before the declutching begins.

But it is absolutely necessary to maintain the clutch play on the clutch housing by adjusting the free travel on the slave cylinder. Adjust free travel with adjusting screw of slave cylinder. It is 4,0 mm for the single clutch.

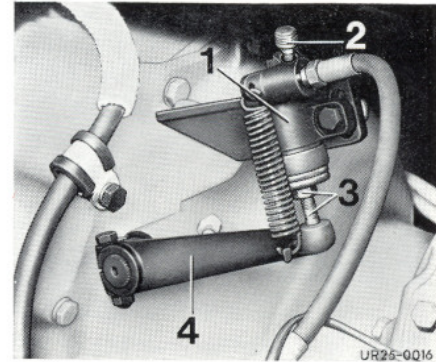


Fig. 31 Actuation of single clutch with basic transmission version

- 1 Slave cylinder
- 2 Bleeding screw
- 3 Adjusting screw with nut
- 4 Clutch lever

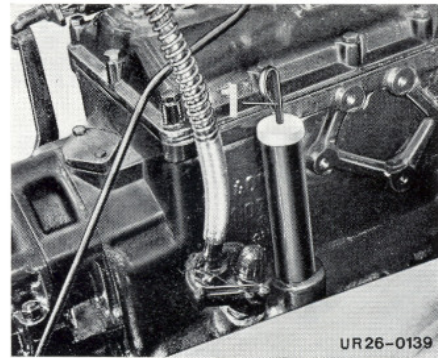


Fig. 32 Oil dipstick of transmission

- 1 Oil dipstick

Lubricate clutch throwout shaft according to maintenance schedule.

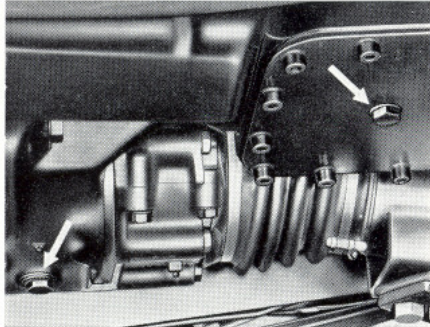


Fig. 33 Transmission drain plugs

Bleeding hydraulic clutch system

The hydraulic clutch system is **bled** by means of bleeding screw of the slave cylinder.

Add brake fluid to a level approximately 10 mm below upper edge of brake fluid tank filler hole.

Note: always refill brake fluid container between bleeding procedures.

Never pump container empty

Fit bleeding hose on bleeding plug and insert other end of hose in a glass vessel half filled with brake fluid.

Unscrew bleeding plug one to two turns. Depress clutch pedal in **one continuous motion**, tighten bleeding plug and slowly release clutch pedal. Any trapped air will escape through bleeding hose.

Repeat bleeding until no more air bubbles escape.

When stepping on clutch pedal for the last time retain it in its lowest position until the bleeding plug has been screwed down tight.

Remove bleeding hose and replace dust cap.

If required add brake fluid up to the level mark.

Transmission

Check oil level according to maintenance schedule. After shutting off the engine wait:

At least 5 minutes if transmission fluid is still warm.

At least 10 minutes if transmission fluid is still cold.

Normally, the oil level should be between the two marks. Do not add oil beyond the max. mark.

Change oil according to maintenance schedule.

Unscrew drain plugs and drain transmission oil as long as it is still **warm and thin**.

The opening of the oil dipstick tube serves for filling in the transmission oil.

For filling capacity and transmission oil viscosity refer to page 55.

Axle

Thrust Ball

Lubricate thrust balls according to maintenance schedule.

Axle Drive

Check oil level and change oil according to maintenance schedule. Fig. 12.

Prior to removing oil filler (oil level control) plug thoroughly clean axle drive housing at this point.

With the unloaded UNIMOG on level ground the oil level should be at bottom edge of filler hole.

For filling capacity and transmission oil viscosity refer to page 55.

Hub Reduction

Check oil level and change oil according to maintenance schedule. Fig. 12.

Prior to removing the lower oil filler (oil level control) plug thoroughly clean hub reduction housing at this point.

Remove oil filler plug (2) and oil level control plug (1), fill-up with transmission oil.

With the unloaded UNIMOG on level ground the oil level should be at the bottom edge of the lower filler hole.

For filling capacity and transmission oil viscosity refer to page 55.

Steering Knuckle Bearings

Lubricate steering knuckle bearings according to maintenance schedule.

To lubricate steering knuckles, lift front axle with floor lift.

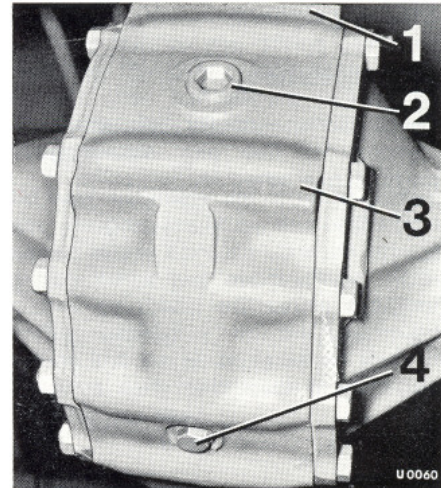


Fig. 34 Axle drive housing

- 1 Axle drive ratio stamped in
- 2 Oil filler plug
- 3 Axle end number stamped in
- 4 Oil drain plug

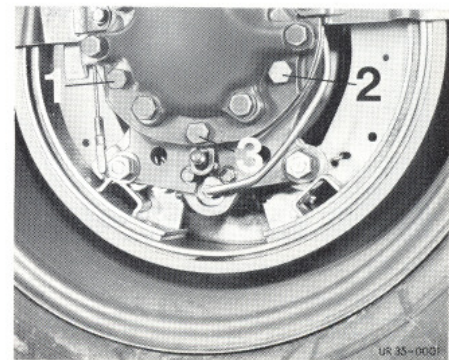


Fig. 35 Hub reduction housing

- 1 Oil level control plug
- 2 Oil filler plug
- 3 Oil drain plug

Steering System

Checking Steering

Check pitman arm for tight seat and steering for free play according to maintenance schedule.

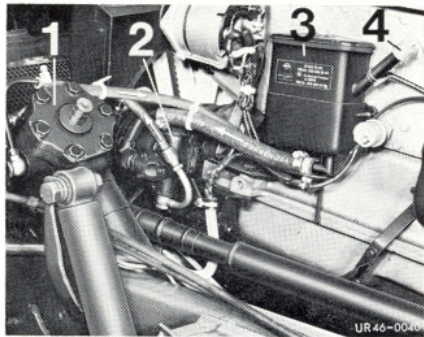


Fig. 36 Power steering

- 1 Power steering
- 2 Oil pump
- 3 Oil reservoir
- 4 Oil dipstick

32

Oil Level, Oil Change, Oil Filter

Check oil level in power steering oil reservoir according to maintenance schedule. The oil reservoir is located on the left side of the engine.

With the engine running the oil level **must** be at the upper mark of the oil dipstick and **may** be approximately 5 mm above it with the engine shut off.

For oil change in power steering tilt cab. Page 48.

For an oil change according to maintenance schedule loosen return line on the steering gear housing and drain oil. Crank engine for a short moment with starter and turn steering wheel from stop to stop.

Loosen power steering oil reservoir from its mounting, remove cover, pull out basket insert with oil filter element and clean tank. Install new filter.

Upon installation fill power steering oil reservoir with new hydraulic oil. Clean plug with bleeding slot and screw. Bleed power steering.

Bleeding Power Steering

Crank engine several times with starter and then run it at such a low engine speed that no pressure will be built up since otherwise air will dissolve in the oil.

In the meantime keep turning steering wheel slowly from stop to stop with front axle relieved or drag link disconnected until the oil level is at the upper mark of the oil dipstick. Add oil, if required.

Power Steering Pump V-Belt

Check V-belt according to maintenance schedule. Tension V-belt with tensioning screw in such a manner that it will give only approximately 10 mm under thumb pressure from the straight line. A too tight or loose V-belt becomes worn out quickly.

Check new V-belt several times during the first hour of operation for proper tension and retension if necessary since it will stretch somewhat while running. Fig. 55.

In case of sudden brake down of hydraulic system, the steering can still be operated. However more hand force is necessary to turn the steering wheel.

Wheels and Tyres

Wheels

Avoid unevenly worn tyres.

Interchange wheels, including the spare wheel, according to maintenance schedule to spread the wear as evenly as possible. Interchange only between right front and left rear or left front and right rear.

Retighten wheel nuts after driving approximately 50 km and then according to the maintenance schedule. The tightening torque is **290 Nm (29 kpm)**.

Toe-in (Toe-out)

Measure toe-in of front wheels according to maintenance schedule on front rim edge at level of wheel center. Repeat measurement after turning the respective front wheel by 180°. Adjust track rod accordingly, if required. Page 69.

Tyres

Normally single tyres 12.5–20 are provided.

When changing from one tyre size to another with differently effective dynamic radius be sure to replace the adaptor gear of the speedometer drive shaft since otherwise the speedometer or the tachograph will provide wrong figures.

Tyre treads

When **driving** predominantly **on roads** mount tyres in such a manner that the arrow tread points **forward** on the ground on the front wheels and to the **rear** on the ground on the rear wheels as seen in driving direction. Thus the UNIMOG will run more quietly at high speeds and tyre wear will be reduced.

Checking Tyre Overpressure

Prior to starting for a long drive check tyre overpressure with an accurately indicating tyre overpressure gauge. Do not forget the spare wheel. For tyre pressures refer to. Page 70.

For a long service life of the tyres be sure to remain within the permissible loading capacity and the specified tyre overpressure.

On soil with low loadability and on sand increase traction and driving power by reducing the tyre overpressure. Additionally, the selfcleaning action on sticky, wet soil improves with low tyre overpressure.

Be sure to inflate the tyres to normal tyre overpressure at the end of the jobs named above because constant driving at too low a tyre overpressure, particularly on roads, will cause a higher rolling resistance by the increased flexing and the resulting earlier wear of the tyres, early destruction of the fabric and the tyre bead.

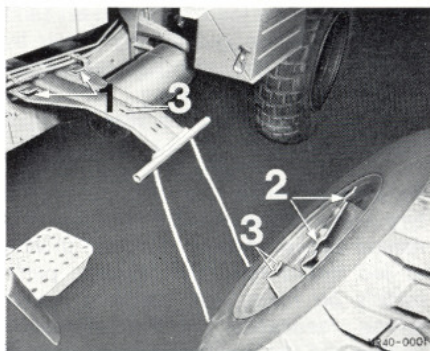


Fig. 37 Install spare tire

- 1 Flaps
- 2 Spare tire bracket with cut-outs
- 3 Mounting holes

Grip and Traction

In addition to reducing the tyre over-pressure the rear wheels or all four wheels may be provided with **anti-skid chains** to improve grip and to increase traction when operating off-the-road.

Care of Wheels and Tyres

Even when there is no wheel or tyre damage remove wheels and tyres once a year and check them. Clean rims from dirt and rust with a steel brush. Have dented rims straightened and repaired. Paint rims only with special rim paint. Other types of paint will attack tyres and tubes.

Install spare tire

Mount bracket to spare tire with 3 wheel nuts.

Hock-up rope, position spare tire to be pushed-in. The 2 cut-outs (2) must slide under the flaps on spare tire bracket (1) mounted on chassis frame.

The position of spare tire is correct when the mounting holes (3) of both brackets are lined-up.



34 Fig. 38 Install spare tire

Brake System

General

The **service brake system** is a hydraulic four-wheel single circuit Simplex expanding brake system which is actuated by the brake pedal.

The hand brake system serves as a **parking brake system** when the UNIMOG is stopped. In emergencies it can be used as an **auxiliary brake system**.

The service brake system is additionally provided with a **brake assistance system** to relieve the driver and take over part of the pedal force.

Filling-up Brake Fluid

Check hydraulic brake system for leaks and contents of brake fluid reservoir according to maintenance schedule.

Prior to unscrewing cap of brake fluid reservoir thoroughly clean it and surrounding area. The fluid level should be at MAX mark. Add brake fluid if required.

Do not permit brake fluid to touch paintwork. Screw cap of brake fluid reservoir down tightly.

If the brake fluid requires repeated replenishment the hydraulic brake system or the hydraulic clutch system are leaking and must be checked.

Change brake fluid at least once a year (spring inspection).

Bleeding Hydraulic Brake System

When no firm resistance is felt when fully stepping on the brake pedal the hydraulic brake system is either leaking, the brake shoe clearance is too great or there is air in the hydraulic brake system which must be removed immediately.

Always refill brake fluid reservoir to $\frac{3}{4}$ of its capacity during the next bleeding procedure.

Unscrew bottom brake cover panels.

When bleeding by „pumping“ with the brake pedal bleed the wheel brake cylinders in the sequence right rear, left rear, right front, left front.

Remove respective dust cap. Connect bleeding hose and insert end of hose into a transparent plastic vessel filled half way with brake fluid. Unscrew bleeding screw by 1 to 2 turns. Depress brake pedal in **one continuous motion**,

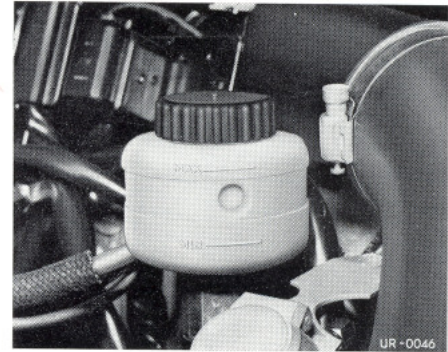


Fig. 39 Brake fluid reservoir

screw bleeding screw down tight and **slowly** release brake pedal. Repeat this pumping action until no more air bubbles rise. When stepping on the brake pedal for the last time retain it in its lowest position until the bleeding screw has been screwed down tight. Remove bleeding hose. Replace dust cap. Screw on brake cover panels.

Bleed hydraulic clutch system in the same manner.

Be particularly careful when bleeding the hydraulic brake and hydraulic clutch system.

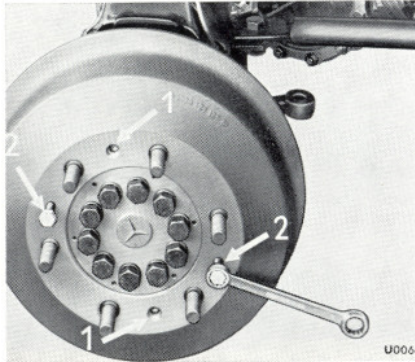


Fig. 40 Removing brake drum

- 1 Locking screws
- 2 Pulling screws

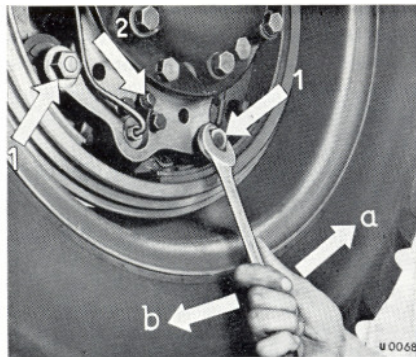


Fig. 41 Adjusting brake shoes

- 1 Adjusting cam
- 2 Bleeder screw of wheel brake cylinder
- a Direction of rotation for adjusting
- b Direction of rotation for loosening

Checking and Cleaning Brakes

Clean brake shoes and check thickness of brake linings according to maintenance schedule or in between depending on degree of soiling.

For this purpose remove brake drum or bottom brake cover panel:

When using the vehicle jack make sure that it is **applied** as far out as possible against the axle tubes and **never under the axle drive housing**.

Raise wheel by means of vehicle jack and remove.

Unscrew the two exposed countersunk screws and carefully loosen and remove the brake drum by means of puller screws applying light hammer taps if required. Replace brake linings before rivet heads start grinding on drum.

Clean all surfaces carefully prior to reassembly. The O-ring on inner diameter must not be damaged. Grease countersunk screws prior to inserting.

Tighten wheel nuts to a tightening torque of **290 Nm (29 kpm)**. Retighten wheel nuts after driving 50 km and thereafter according to maintenance schedule.

The brake linings must always be free from oil and water since the braking efficiency will otherwise be considerably impaired. After driving through water or mud remove brake cover pa-

nels and thoroughly clean brake shoes and linings if required.

If only clean water has entered up to the brake shoes, apply brakes slightly until the required braking effect returns after the water has evaporated.

Readjusting Brake Shoes

With increasing wear of the brake linings the dead travel of the brake pedal will become excessive. This requires readjustment of the brake shoes with the **brake drums cold**. Remove bottom cover panel and turn adjusting cam in the specified direction until the brake shoes rest against the brake drum.

Then turn back until the wheel can just be turned without offering any resistance. When the direction of rotation is wrong the brake shoes are also forced outward, but only with the cam tip. However, such an adjustment will be neutralized again after a short period.

The adjustments were properly made if after prolonged driving without using the brake, the brake drums will not run warm. When an adjustment travel (Fig. 41 a) is no longer available, the brake linings are worn down. Replace brake linings.

Adjusting Brake Pedal

The dead travel of the master cylinder piston rod respectively the brake booster control piston must be approximately **1 mm** in the brake pedal rest position.

The piston of the master brake cylinder is then in its initial position and leaves the compensating port open through which the brake fluid returns from the wheel brake cylinders to the brake fluid reservoir in the pedal rest position. When this compensating port is not cleared the brake cannot be completely released.

Readjusting Parking Brake System

With the brake released the parking brake lever must rest against the stop of the releasing position, that is, the parking brake lever should begin to pull only at the second notch.

Adjust parking brake system when the dead travel of the hand brake lever becomes too great.

First adjust brake shoes.

If the cams, are adjusted to the extent that the wheels can just be turned without offering any resistance tighten parking brake lever to second notch. Unscrew thrust rod with toothed wheel by means of screwdriver until the brake shoes rest well against the brake drum.

Then screw back until the wheel can just be turned without offering any resistance. The thrust rod has RH threads.

Levers and Pedals

Clean and lubricate all joints of the hand lever and pedal system according to the maintenance schedule.

Brake Hoses, Brake Lines

Immediately replace leaking or externally damaged brake lines. External damage comprises: corrosion, chafings, deformation etc.

Brake hoses must not be twisted when mounting and should not bind or chafe when the wheels are turned. In addition, brake hoses must **not be painted or preserved with underfloor protection etc.**, because the rubber will then become brittle and lose its elasticity.

Do not clean brake hoses with gasoline, benzol, kerosene, glycerin or mineral oils; remove dirt with water only.

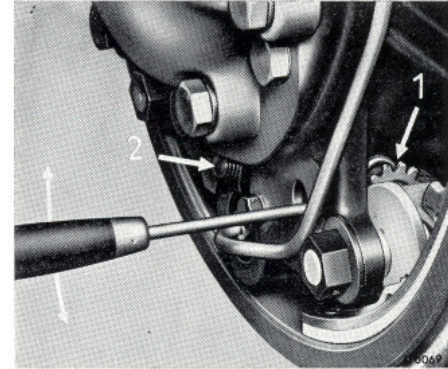


Fig. 42 Adjusting the parking brake system

- 1 Screw driver
- 2 Push rod with serrated wheel

Compressed Air System

General

The compressed air system is provided for the brake assistance system for actuating the differential locks and for inflating the tyres.

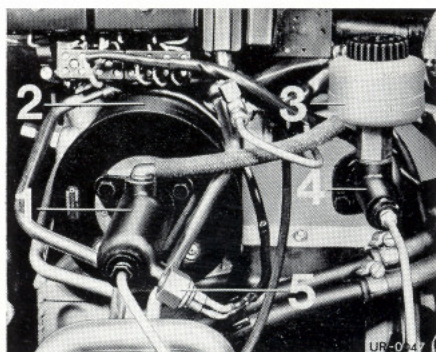


Fig. 43 Master brake cylinder with single chamber compressed air brake booster

- 1 Master brake cylinder
- 2 Single chamber compressed air brake booster
- 3 Brake fluid reservoir
- 4 Clutch master cylinder
- 5 Shop light switch

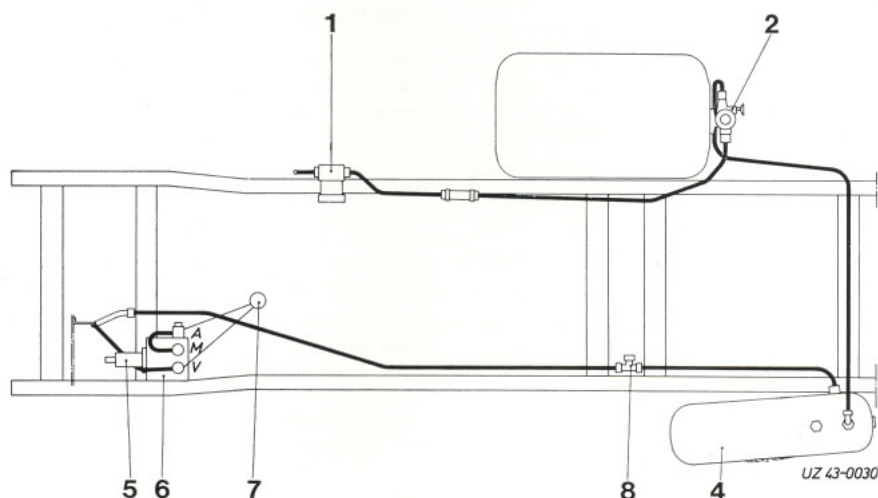


Fig. 44 Diagram of the compressed air brake assistance system

- | | |
|--|---|
| 1 Air compressor | 6 Compressed air brake booster |
| 2 Pressure regulator with filter and tire inflation connection | 7 Brake dual pressure gauge |
| 4 Compressed air reservoir | 8 Connection for actuating the differential locks |
| 5 Master brake cylinder | |

Air Compressor

The compressed air supply is produced by the air compressor rigidly mounted to the engine.

Pressure Regulator, Inflating Tyres

The pressure regulator with air filter and tyre inflation connection is set to **7.35 bar (kp/cm²)**. When the pressure drops below **5 bar (kp/cm²)** a red warning light will light up. Fig. 6.

Remove filter bowl of pressure regulator approximately every 3 months. Carefully clean filter element in Nitro N7 and dry.

Screw filter element together in dry condition only since the sealing elements are sensitive to all strong cleaning agents. When the pressure regulator cuts out at too low or too high a pressure have adjustment to proper pressure made.

For inflating tyres first actuate brake pedal so that **pressure regulator will change over** since the overpressure will otherwise be insufficient.

Loosen screw plug with tommy handle. Screw tyre inflating hose onto thus exposed hose connection. Fig. 47.

After inflating tyre unscrew hose and tightly screw down screw plug.

Compressed Air Reservoir

Release pressure by braking with the vehicle stopped to avoid any sudden discharge of air when unscrewing the drain plug.

Regularly drain condensate from compressed air reservoir. Fig. 47.

Compressed Air Brake Assistance

Check function and for leaks according to maintenance schedule.

Keep engine running until the reservoir pressure is at **7.35 bar (kp/cm²)**. Stop engine and watch brake dual pressure gauge. The system is leakproof when the pressure loss at **7.35 bar (kp/cm²)** reservoir pressure does not exceed **0.1 bar (kp/cm²)** within 10 minutes. Check all equipment, valves and lines for leaks. Step on brake pedal with the engine stopped for partial braking. Watch both needles. Under uniform pressure against the brake pedal they must not measurably drop within approximately 3 minutes.

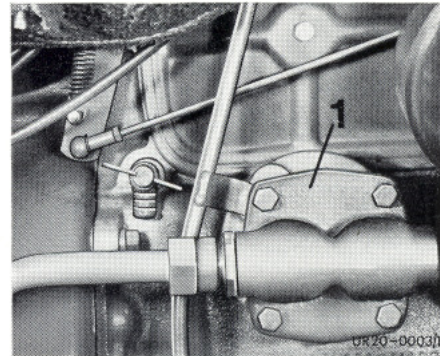


Fig. 45 Air compressor on engine

1 Air compressor

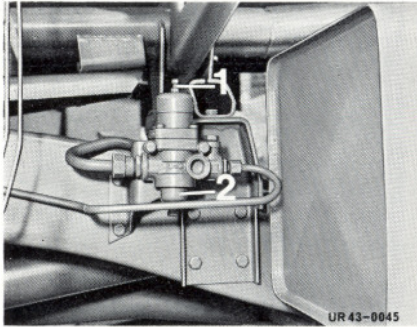


Fig. 46 Pressure regulator

- 1 Adjusting screw
- 2 Filter bowl

Compressed Air Operated Differential Locks

With the compressed air system installed the differential locks are actuated by means of compressed air.

The four-wheel drive/differential locks lever engages the control valve of the transmission cover for the compressed air control of the differential locks when it is in the second notch.

As a protection against pressure loss in the compressed air control for the brake-compressed air assistance, the supply line is provided with an overflow valve.

Check **function** of differential locks according to maintenance schedule.

Once a year spray approximately 1 cc of engine anti-corrosive oil each into the pipe connection on the axle drive housing of the front and rear axle on vehicles with compressed air actuated differential lock, to protect actuating pistons against rust caused by condensate. Fig. 49.

Make **adjustments** on control valve on the transmission cover. Set adjusting angle in such a manner that the shift lever of the four-wheel drive differential locks engages the differential locks in the second notch.

Clean and lubricate all joints and nipples of hand lever system, according to maintenance schedule.

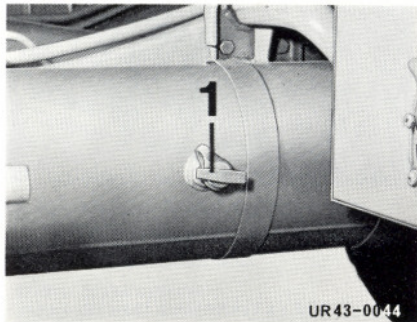


Fig. 47 Compressed air reservoir

- 1 Tyre inflation connection

The **functioning** of four wheel drive and differential lock must be checked as per lubrication schedule.

To do so, a wheel on front axle and the opposite one on rear axle must be jacked-up.

Four wheel drive

Engage four wheel drive shifting lever in its first notch. Now turn one wheel, the one of the opposite side must turn too.

Differential lock

Disengage shifting lever, engage operating valve on transmission cover by hand, a second person has to check both wheels.

Both wheels should not turn because differential is cut-off. Shift shifting lever in second notch, in this position the angle should operate the operating valve, otherwise the angle must be adjusted.

Drain **condens water** of the differential locks as per lubrication schedule.

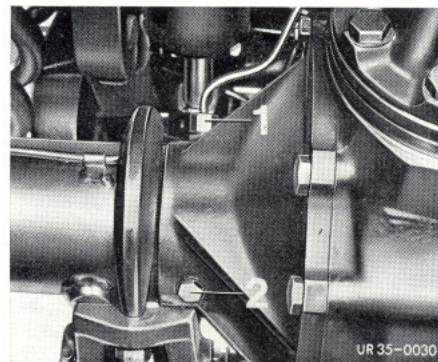


Fig. 48 Differential lock

- 1 Compressed air connection
- 2 Drain plug screw for condensed water

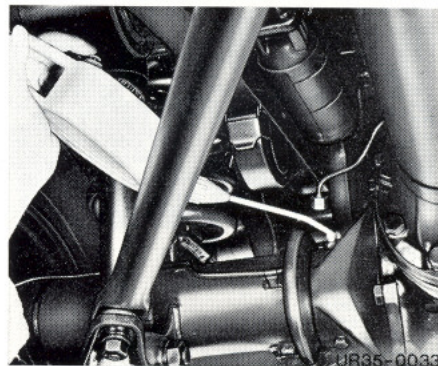


Fig. 49 Inject corrosion protection oil

Electrical System

General

The alternator and the battery supply the consuming units with current via the **switchbox**. Check all consuming units, fuses and line connections according to maintenance schedule.

The connections must have a good contact. Do not mend or bridge fuses, but replace them.

The fuse boxes are located in the engine compartment under the hood.

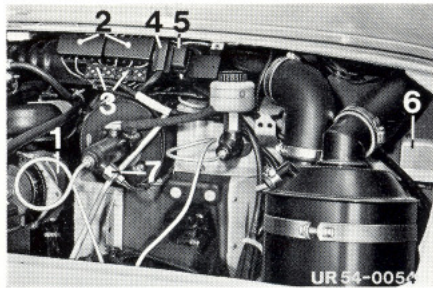


Fig. 50 Electrical system

- 1 Alternator
- 2 Fuse boxes
- 3 Line connectors
- 4 Plug connection, main harness
- 5 Plug connection, head light
- 6 Governor
- 7 Stop light switch

Three-Phase Alternator

Observe the following important instructions concerning the alternator:

As long as the engine is running do not remove line terminals of battery, alternator connections or plug of regulator since this would involve the risk that inductive voltage peaks will destroy the diodes in the alternator.

For the same reason it is not permitted to tow-start the engine of the UNIMOG as long as the battery is not connected.

Preexcitation is assured when the 2 W charging current control lamp on the instrument panel lights up.

Be careful when using rapid charging equipment! When charging the battery with a rapid charger remove battery terminals of UNIMOG. **When, as an exception, the rapid charger is simultaneously used as a starting aid with the battery terminals not removed be sure to switch off the rapid charger prior to removing terminals.**

On rapid chargers with separate main switch first reduce charging current and then switch off.

A bad contact between battery connecting piece and battery terminal, as well as the wrong connection of a rapid charger or an additional battery may also result in destruction of the diodes when using charger as a starting aid.

The bearings of the alternator require no special lubrication since they are permanently greased. Therefore never apply grease dissolving cleaning agents.

Regulator

Exchange damaged regulators at once. During changing or installing an alternator with higher output or installing an exchange engine, the respective regulator should be installed too.

Lubricating Starter Motor

The pinion of the starter motor requires special lubrication as mentioned in Lubrication Points Survey (Fig. 12). Remove threaded pin on starter flange with an angle screw driver.

Wiring Diagram UNIMOG 416

Explanation for wiring diagram

Lamps

Fuses	Consumer	Current Amp.
1	Parking/clearance light, right	8
2	Parking/clearance light, left	8
3	Headlight low beam right	8
4	Headlight low beam left	8
5	Headlight high beam right	8
6	Headlight high beam left	8
7	Stop light	16
8	Horn/windshield wiper/instrument panel lighting	8
9	Blinker light	8
11	Tail light right, speedometer light	8
10	Tail light left, instrument cluster light	8
12	Socket/interior light	8

Fuses

Wiring Diagram Location	Standard Version	Output at 12 V Watts
1+3	{ Main headlight Parking light }	45/50
11+12	{ Clearance light Blinker light front }	4
32+33	{ Blinker light rear Tail light Stop light }	21 10 18
25/26/27	{ Instrument cluster light Speedometer light Control lights }	2
10	Interior light	10

**Position of lamps, switches, instruments
etc.**

- | | |
|--|--|
| 1 Main headlight left | 21 Starter motor |
| 2 Windshield wiper | 22 Battery (12 V, 110 Ah) |
| 3 Main headlight right | 23 Brake light switch |
| 4 Plug connection for switch on steering wheel | 24 Switchbox |
| 5 Blinker-horn-dimmer switch | 25 Tachometer |
| 6 Horn | 26 Blinker control light for first trailer |
| 7 Windshield wiper switch | 27 Instrument cluster |
| 8 Plug connection for headlight system | 28 Blinker unit |
| 9 Female socket, 1 pole | 29 Plug connection |
| 10 Dashboard light | 30 Fuel gauge |
| 11 Blinker-clearance lamp right | 31 Line connector |
| 12 Blinker-clearance lamp left | 32 Blinker-tail-stop light right |
| 13 Fuse box (fuse no. 7 to 12) | 33 Blinker-tail-stop light left |
| 14 Fuse box (fuse no. 1 to 6) | 34 Trailer socket, 7 poles |
| 15 Shut-off switch for blinker system | A Blinker light |
| 16 Starter switch | B Tail light |
| 17 Line connector | C Stop light |
| 18 Regulator | |
| 19 Alternator | |
| 20 Engine | |
- ⏏ Ground

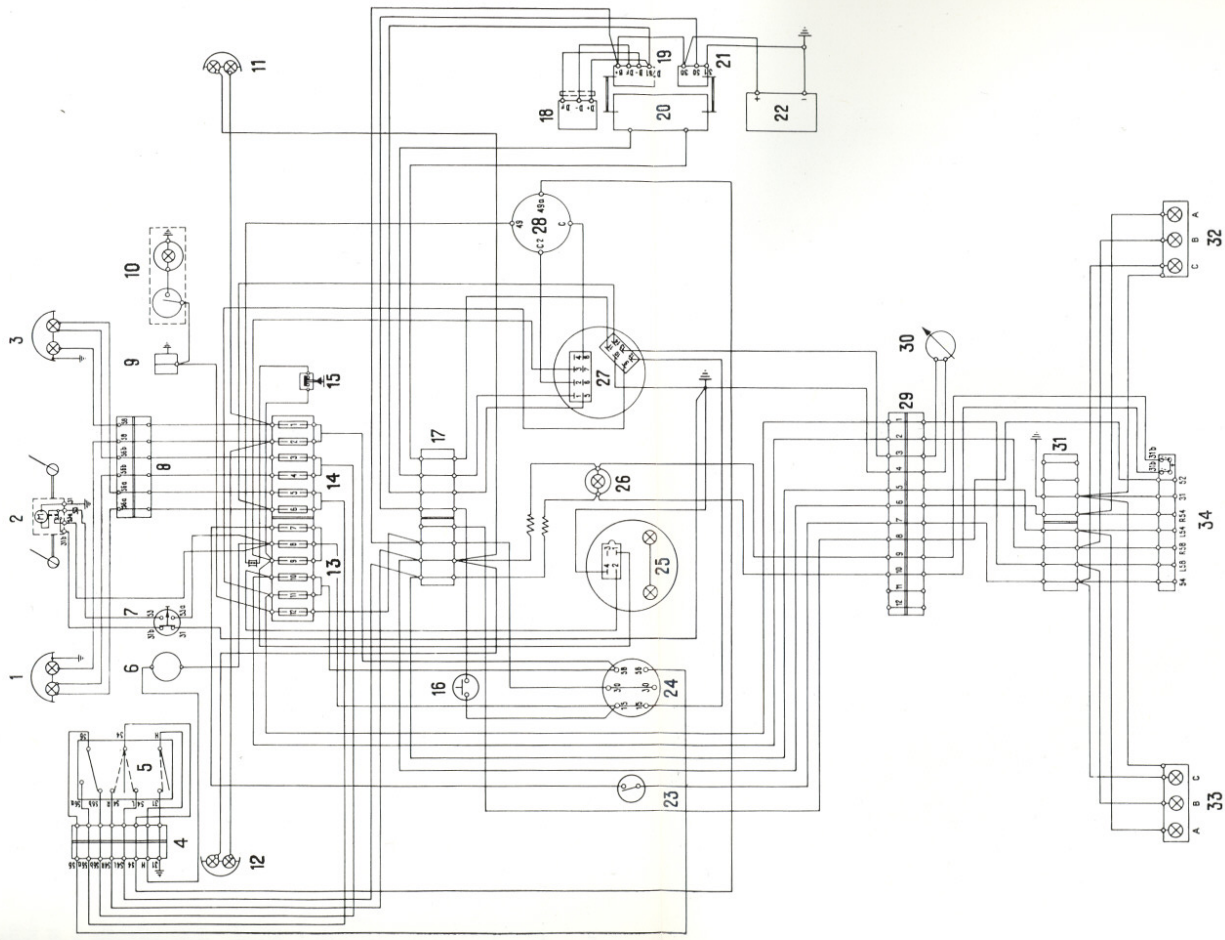


Fig. 51 Wiring Diagram

Checking Battery

Keep battery clean and dry. Check level and specific gravity of electrolyte and the cells according to maintenance schedule. Clean battery only with screw plugs screwed on so that no dirt can enter battery.

The electrolyte level in each cell should be approximately 10 to 12 mm above top of plate. **Add distilled water only.** We warn against the use of special electrolytes. They may shorten the life of the battery.

The charging condition of the battery is shown approximately by the electrolyte density measured with an hydrometer.

Density of battery electrolyte kg/liter	Charging condition of battery
1.23	Well charged
1.16	Partially charged
1.08	Empty, charge immediately

Connecting Battery

Prior to connecting the battery always clean battery terminals well with spirit.

First connect (+) pol and then (-) pol. The (+) pol has a bigger dia.

Tighten battery terminals well. Grease battery terminals after tightening with acidproof grease to prevent oxidation.

When installing and removing the battery avoid sparking as a protection against oxyhydrogen gas explosions.

Prior to working or welding on the electrical system loosen negative line connection (-) on battery. Do not place any conductive objects (tools) on battery to avoid the danger of short circuits.

Headlight Alignment

Aim headlights according to maintenance schedule and make corrections if required.

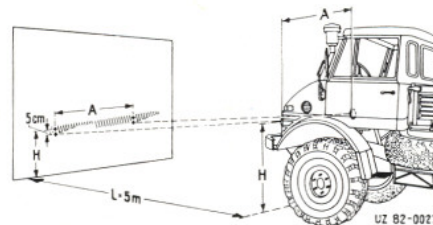


Fig. 52 Headlight alignment
Low beam on

The following test or adjustment according to Fig. 52 is a temporary expedient. Have an exact adjustment made with optical equipment.

Place unloaded UNIMOG for checkup or adjustment on level ground approximately 5 m from a wall which is vertical in relation to the longitudinal axis of the UNIMOG.

Place two central markings on the wall at height "H" to indicate the center of the light beams. The distance A+H between the two central markings should be the same as the distance A+H of the headlight centers.

Switch on high beam and adjust headlights in such a manner that both light spots are in alignment with the two central marks.

Check each headlight individually while covering the respective other headlight and the remaining lights. Adjust headlights if required.

Switch on low beam and check whether the light/dark boundary on the separating line is at height "h" (5 cm below central marks) and the break is on the vertical line of the central marks. Adjust headlights if required.

The vertical alignment has to be adjusted on the upper screw.

The horizontal alignment has to be adjusted on lateral screw.

Replacing Headlight Bulb

Remove screw on headlight, tilt headlight insert slightly and disconnect. Take bulb socket out of headlight reflector and then take bulb out of bayonet socket by turning to the left. Fig. 54.

Insert new bulb in a similar manner by turning right to the stop. When replacing a bulb do not handle bulb with dirty or oily fingers since the oil will evaporate under the heat of the bulb and will then settle on the headlight reflector thus considerably reducing the lighting power of the headlamps.

Do not clean the internal reflector of the headlights since any such contact will mar the highly polished surface.

Open headlights only when replacing a damaged bulb.

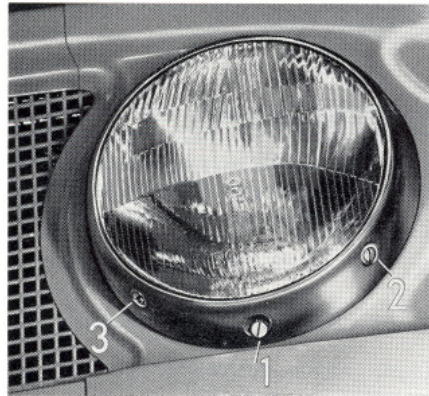


Fig. 53 Headlight adjust

- 1 Fastening screw
- 2 Lateral adjustment
- 3 Height adjustment

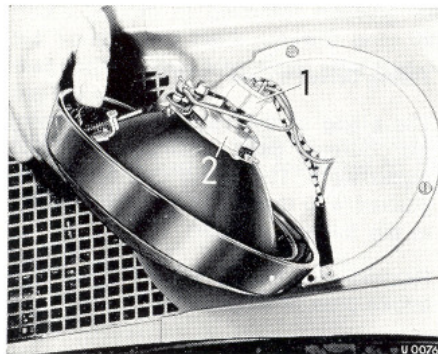


Fig. 54 Changing headlights

- 1 Bulb socket
- 2 Bayonet socket

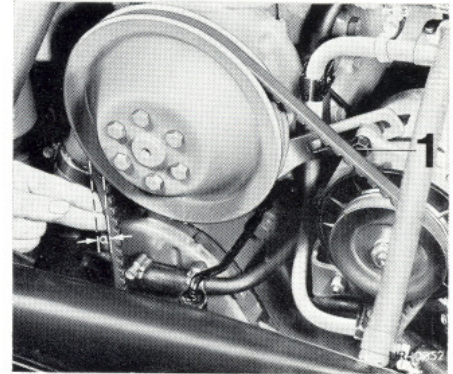


Fig. 55 V-belt of coolant pump and alternator

- a 10 mm proper tension
- 1 Tensioning screw of alternator

Alternator V-Belt

Check V-belt according to maintenance schedule. Tension V-belt by swivelling alternator outwards in such a manner that it will give only approximately 10 mm under thumb pressure from the straight line. A too tight or loose V-belt becomes worn out quickly.

Check new V-belt several times during the first hour of operation for proper tension and retension if necessary since it will stretch somewhat while running in.

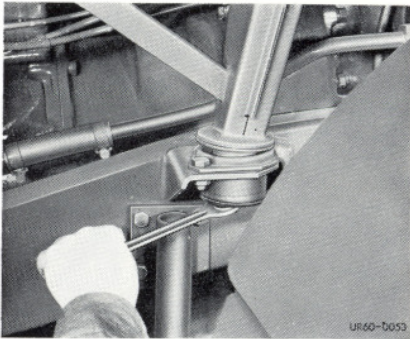


Fig. 56 Loosening cab attachment at rear

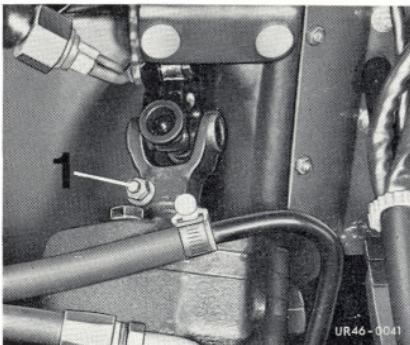


Fig. 57 Loosening universal joint

1 Fitted screw

Chassis, Body

Bolted Connections

Tighten fastening and connecting bolts of control arms and drive line according to maintenance schedule. Page 18.

Shock Absorber, Trailer Coupling

Check **shock absorbers** according to maintenance schedule for leaks and retighten fastening bolts.

Change faulty shock absorbers.

Grease **trailer coupling** according to maintenance schedule.

Tilting Driver's Cab

The tilting of the cab is a time saving aid during care, maintenance and repair work. The tilting can be accomplished with the aid of the tilting device in the following order:

Remove air intake rubber tube from intake pipe of engine.

Place steering in center position that the front wheels are pointing straight ahead.

Remove fitted screw on the steering gear side of the universal joint. Pull off universal joint with steering column and steering wheel in an upward motion.

Unlock the four locks on the transmission cover in the cab.

Loosen two hex. nuts on the front cab mounting left and right only so far that the slotted retaining fork becomes exposed

Unscrew the left and right rear cab mounting.

Attach the left and right hinges of the tilting device. For this lift the cab with the support of the tilting device in front.

Do not damage the radiator fins.

Remove loose parts from the cab and close the doors. Place door handle in "driving position" (locked).

Attach block and tackle and safety rope in the eyelets located on the rear wall of the cab. Loop the other end of the safety rope around the frame support behind the cab mounting and engage.

Carefully lift cab with block and tackle. If required, tilt cab with 4 persons by hand.

Assemble the three part support for safety reasons and locate between the lower supporting point on the frame and the upper supporting point on the cab and fasten with the available screws.

Remove the block and tackle.

The lowering of the cab takes place in reverse order.

Replace the fitted screws on the universal joint of the steering with new self-locking Cleveloc nuts.

Hint:

Press bottom of deflector housing for the hand brake cable upward until the leaf spring snaps into place after lowering the cab.

Reattache upper radiator mounting bracket if it had to be loosened to be able to tilt the cabin.

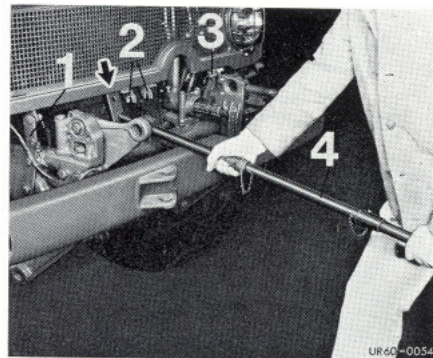


Fig. 58 Lifting front-end of cab

- 1 Mounting bracket 406 580 0351
- 2 Front-end mounting of cab
- 3 Mounting bracket 406 580 0351
- 4 Three-part cab support nos.: 406 580 0146, 406 580 0246, 406 580 0346

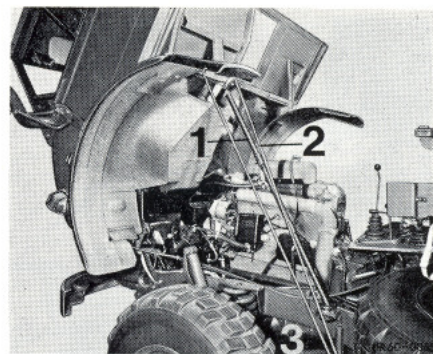


Fig. 59 Cab raised

- 1 Three-part cab support
- 2 Steel safety cable 406 580 0451
- 3 Boarding step bracket left

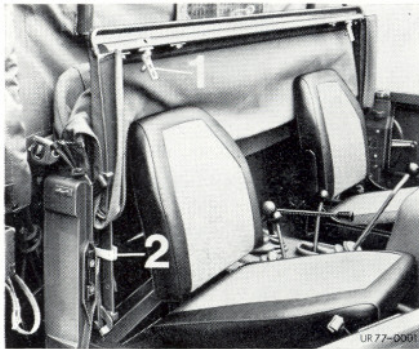


Fig. 60 Folding top folded back

- 1 Tension lock
- 2 Tightening belt

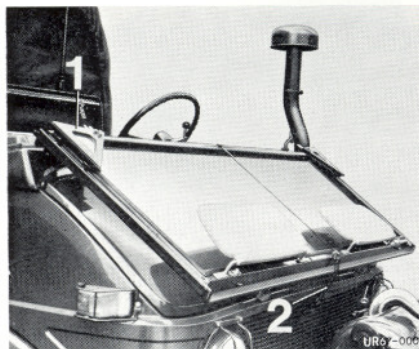


Fig. 61 Windscreen tilted down

- 1 Angel bracket tilted down
- 2 Rubber clamp

Folding Top

The folding top provides adequate weather protection with good allaround visibility even after removing the detachable side windows and the rear wall.

The folding top is attached to the front of the windscreen frame with snap locks and is not screwed down. After loosening the snap locks it can be folded toward the rear or completely removed after loosening the rear, lateral fastening screws.

For folding the top, pay attention to the following:

Loosen all rear tightening belts of canvas.

Open tension lock on windscreen and remove canvas in upwards direction.

Push right and left hand canvas bow universal to the outside of its stop. Fold canvas to the rear and at the same time on the second universal downwards behind the seats.

Secure with the side ways located tightening belts.

Windscreen

The windscreen of the folding top cab is arranged in such a manner that it can be tilted forward or completely removed.

Prior to tilting take both windscreen wiper arms out of their springloaded position and place them with the upper edge of the U-section into the recess of the swivel arm.

Loosen retaining screws on right and left outside.

Tilt windscreen. Attach to radiator grille with rubber clamping handle at upper edge to increase safety.

If the windscreen is to be removed loosen nut from hinge pin and pull windscreen out in lateral direction.

Platform canvas and tow-bar

The platform canvas consists of canvas bow, upper side panel and top bow. The parts are interchangeable, they can be used any way around.

The mounting strap on the canvas bow makes it easier to mount or remove the top bow.

Pay attention to the opening slot in the top bow, this slot should always be pointing downwards. When the bow is in stalled.

Tow bar

Tow bar mounting location is in the rear underneath the loading platform.

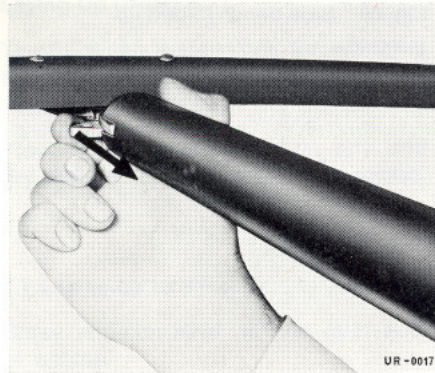


Fig. 62 Open the lock of top bow

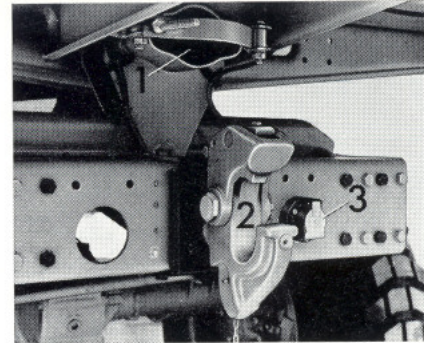


Fig. 64

- 1 = Mounting bracket for tow-bar
- 2 = Trailer coupling
- 3 = Socket for trailer light

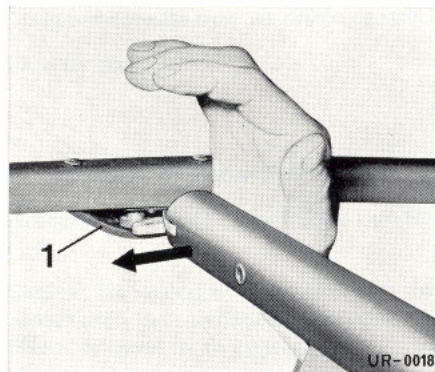


Fig. 63 Locking the lock of top bow

- 1 Mounting strap

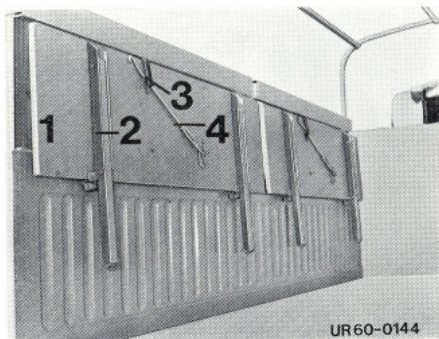


Fig. 65 Side bench folded up

- 1 Bench
- 2 Seat support
- 3 Rubber strip
- 4 Turn buckle

Side benches

The side benches are mounted and tightened to the side walls of the loading platform.

In folded-up position, the benches are tightened to the upper side panel — which at the same time serve as a back rest for the men sitting on the benches — with a rubber strip fastened to the bench lower side. The mounting rod with the turn buckle is also held in its place, while the UNIMOG is in motion, by the rubber strip.

In folded down position, the benches are held in its position by the mounting rod with turn buckle screwed-on the lower side of the bench and hooked into an eye on a mounting plate of the platform floor.

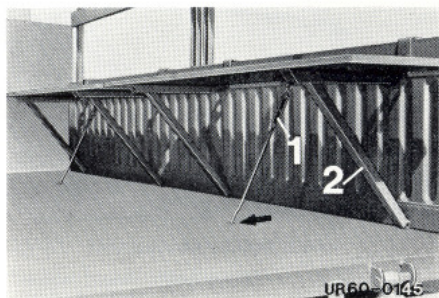


Fig. 66 Side bench folded down

- 1 Turn buckle
- 2 Seat support

Cleaning Canvas

In most cases the canvas tops are just full of dust. Clean canvas with a vacuum cleaner or carefully with a brush.

Remove coarse dirt with cold or luke-warm water using a brush. In obstinate cases clean with curd soap solution.

Do not use acid-containing or grease-dissolving compounds since this will deactivate the impregnating agents in the fabric so that they no longer are waterproof and durable.

Rinse folding top well and dry after wet cleaning. Then treat canvas with an impregnating agent.

Cleaning UNIMOG

In addition to cleaning the windscreen and canvas also clean the UNIMOG at regular intervals for continuous care.

Do not run the engine while washing the vehicle so that it will not suck up any water.

Check the chassis at least twice a year for paintwork damage.

To conserve thoroughly dried paint layers we recommend treating the entire chassis even at hard to reach spots with protective wax approximately every 100 hours of operation or every 2000 km.

Laying-Up UNIMOG

The following instructions for laying-up the UNIMOG for weeks must be observed:

Place washed vehicle in an airy and dry room to do the preserving process.

1.) Laying-up to 3 month:

Spray anti-corrosive oil into inlet duct of engine.

The coolant should contain 1% of an anti-corrosive agent. Remove battery, store in a dry room.

Check battery regularly (6–8 weeks) if necessary, recharge.

Drain condensate from air pressure tank.

Care for paint.

2.) Laying-up between 3–6 month:

Execute all work mentioned under point 1.

Engine: Do execute the engine run for preservation as mentioned in point 3. Check oil level in all aggregates.

Grease **lubrication points** as per lubrication schedule.

3.) Laying-up for more then 6 month:

Change the engine oil against anti-corrosive oil.

Oil filter: change filter cartridge, clean housing and fill with anti-corrosive oil.

Oil bath air filter: clean and fill with anti-corrosive oil.

Oil change: in all the rest of the aggregates and fill-up anti-corrosive oil.

Mark with stickers.

Fuel system:

Add 10 % of anti-corrosive oil to the diesel fuel, empty both fuel filters and fill up with fuel-corrosive oil mixture.

Do execute all work mentioned under points 1 and 2.

Raise front-and rear axle, loosen emergency brake lever, check tyre pressure for approx. **1 bar (kp/cm²).**

Putting into Operation after Laying-Up Period

After a long period of inoperation the piston surface of the fuel feed pump may dry out completely. Fill fuel into feed pump.

Drain anti-corrosive oil from engine, air filter, transmission and axle. Refill aggregates with the recommended kind of oil.

Inflate tires up to the recommended tyre pressure.

Remove blocks from underneath the front — and rear axles.

The battery must be fully charged. If required use external battery.

Set hand throttle lever to "Stop". De-clutch, **to not accelerate**.

Actuate starter. Crank engine until oil overpressure is indicated. Protect battery by allowing recovery periods.

Start as described under page 14.

Check all hoses and lines for leaks and cracks.

Check brakes.

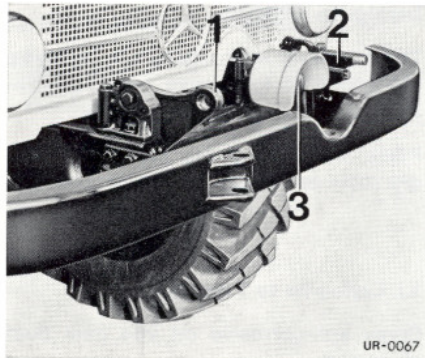


Fig. 67 Rope winch mounting bracket

- 1 Rope winch holder, right
- 2 Rope winch holder, left
- 3 Pto

Front Winch

The front winch is mounted at the front frame end and to the bumper by means of quick-release connections. Reposition bumper for installing winch.

For installing a front mounted rope winch to the front mounting brackets screw on the holding brackets. To do this reposition bumper further forward.

When using front-mounted implements attach corresponding counterweights (payload) at the UNIMOG.

Pto shaft

The joints of the entire pto drive line require service.

Lubricate front and rear pto shaft universals with calcium No. 3 grease according to maintenance schedule.

Clean and grease front pto shaft after use and cover with the cap provided as a protection against damage and corrosion.

4 Operative Materials

Filling capacities

Operative Materials		Quantities ltr.
Aggregates		
Engine		max. 10.0
Engine oil filter	SAE 20 for winter	min. 7.0
Oil bath air filter	SAE 30 for sommer	1.0
		1.8
Main transmission		6.0
Front- and rear axle differential	Transmission oil SAE 90	each 2.5
Front- and rear axle wheel hub drive		each 0.3
Front- and rear axle differential lock	Anti-corrosive oil	each 1 cm ³
Power steering	Hydraulic oil SAE 10	3.0
Hydraulic brake system	Brake fluid	approx. 0.8
Hydraulic clutch system		approx. 0.2
Cooling system, engine — radiator	Water and	24.0
	anti-corrosive agent	0.24 (1 %)
Lubrication nipples	Grease Calcium No. 3	as required
Battery terminals	Anti-acid grease	as required
Laying-up UNIMOG		
Fuel tank	Anti-corrosive oil	approx. 10 % of filling quantity
Chassis	Protective wax	as required
Consumption values		
Fuel consumption on level highway		approx. 20 l/100 km
Oil consumption (as per operating conditions)		approx. 1 % of the actual fuel consumption

4 Operative Materials

Filling capacities

Aggregates	Operative Materials	Quantities ltr.
Engine	SAE 20 for winter SAE 30 for sommer	max. 10.0
Engine oil filter		min. 7.0
Oil bath air filter		1.0
		1.8
Main transmission	Transmission oil SAE 90	6.0
Front- and rear axle differential		each 2.5
Front- and rear axle wheel hub drive		each 0.3
Front- and rear axle differential lock	Anti-corrosive oil	each 1 cm ³
Power steering	Hydraulic oil SAE 10	3.0
Hydraulic brake system	Brake fluid	approx. 0.8
Hydraulic clutch system		approx. 0.2
Cooling system, engine — radiator	Water and anti-corrosive agent	24.0 0.24 (1 %)
Lubrication nipples	Grease Calcium No. 3	as required
Battery terminals	Anti-acid grease	as required

Laying-up UNIMOG

Fuel tank	Anti-corrosive oil	approx. 10 % of filling quantity
Chassis	Protective wax	as required

Consumption values

Fuel consumption on level highway	approx. 20 l/100 km
Oil consumption (as per operating conditions)	approx. 1 % of the actual fuel consumption

Coolant

Coolant for Operation

Coolant consists of water and an anti-corrosion agent.

Only use clean tap water
(no distilled water)

To prevent the water from causing undesired corrosion special anti-corrosive agents are added.

Adequate anti-corrosive protection is only assured by adding **10 cc** of anti-corrosive agent to **each liter** of coolant.

Engine Oil

Running-In Oil
(anti-corrosive)

New, exchanged or completely reconditioned engines are filled with initial operation oil (engine anti-corrosive oil) for the first 500 km.

Initial operation oils have a favorable influence on the running-in process, they protect against corrosion and prevent undesirable wear, oil carbon deposits, the formation of sludge etc. To meet all these demands, the initial operation oil types approved by us also contain some HD additives in addition to the anti-corrosive additives.

When no initial operation oil for replenishment is available a HD engine oil of the same viscosity class may be used as an exception.

Initial operation oils are subject to the same viscosity rules as the HD engine oils.

Due to their good anti-corrosion characteristics initial operation oils are also used for preserving the engines of UNIMOGs which are to be laid up.

Heavy-Duty Oil

Use only HD engine oils of the specified viscosity classes.

HD engine oil will become dark faster than unblended engine oil because the combustion residues entering the oil will not settle in the crankcase and drive train components but will be kept suspended in the oil. Do not change HD engine oil ahead of time because it is getting dark.

Brake Fluid

Use **brake fluid** for the hydraulic brake system and the hydraulic clutch system.

Transmission Oil

For transmissions, axles, and pto shaft bearing use transmission oil SAE 90 throughout the year.

Hydraulic Oil

For the power steering system having its own oil reservoir use hydraulic oil only.

Grease

For thrust balls, steering knuckle bearings, clutch release shaft, joints and lube nipples, joints and hinges on body use lube grease calcium no. 3.

Anti-corrosive Oil

For preservation we recommend the following products:

For the engine: running-in oil (anti-corrosive oil).

For the fuel system: anti-corrosive agent, 10 % of the filling capacity.

For chassis and body: protective wax, commercially available.

5 Trouble Shooting

General

In the event of trouble the following instructions are intended to assist you in placing the UNIMOG in a condition which permits driving to a work shop.

These instructions do not claim completeness and are not meant to take the place of a thorough search for the cause of the failure, as well as expert repair in a UNIMOG repair shop.

Remedial measures described in terms such as "have ... checked", "have ... adjusted", "have ... replaced" etc. should be carried out in UNIMOG repair shop.

Towing

If towing of the UNIMOG cannot be avoided observe the following instructions to prevent gear damage as a result of oil shortage at bearing points.

Put main shift lever in 4th gear and low range/high range lever into low range. Shift forward/reverse lever to neutral position.

Maintain these shift positions during towing.
The towing speed must not exceed 20 km/h.

Complaints

Possible causes

Remedies

Engine Group

Engine Fails to Start

although starter is turning

Fuel tank is almost or completely empty

Add fuel
Bleed fuel system

Fuel lines, venting and intake strainer of fuel tank, fuel prefilter, fuel filter dirty

Clean

Bleed fuel system

Hand throttle control lever in stop position

Adjust control lever to "idle" or "full" load

Complaints	Possible causes	Remedies
Engine Difficult to Start	Fuel tank is almost or completely empty, which shows up particularly when driving around bends	Fill in fuel Bleed fuel system
	Fuel lines, venting and intake strainer of fuel tank, fuel prefilter, fuel filter dirty	Clean Bleed fuel system
	Fuel system leaks	Seal leaks Bleed fuel system
	Overflow valve in injection pump does not retain pressure	Have it cleaned and replaced if required
Engine Begins to Knock Heavily	Nozzle needle stuck	Declutch, depress accelerator pedal several times. If knocking continues clean fuel filter, have injection nozzles checked and cleaned
Engine Emits Black Smoke	Oil bath air filter or cyclone prefilter soiled	Clean, change oil

Complaints	Possible causes	Remedies
	Nozzle needle stuck	Declutch, completely depress accelerator pedal several times. If the black smoke continues clean fuel filter
	Injection pump start of delivery maladjusted, quantity of fuel injected too great	Check injection nozzles, have them cleaned Have injection pump checked and adjusted
Poor Engine Performance	Unsuitable fuel	Drain fuel, replenish with specified fuel
	Lack of fuel	Clean fuel filter
	Fuel prefilter dirty	Clean
	Air enters fuel system	Renew gasket
	Air filter dirty	Clean, renew
	Bad compression	Check compression
	Failure in injection system	Check, adjust
Excessive Coolant Temperature	Coolant level too low	Check coolant level, add coolant if required
	Cooling system leaks (loss of coolant)	Check radiator, hose connections, cover of expansion tank for leaks, seal if required, fill up with coolant
	V-belt tension of coolant pump too low	Retention
	Thermostat not in order	Have it exchanged

Complaints

Possible causes

Remedies

Oil Overpressure Drops Suddenly

Coolant pump not in order
Cylinder head gasket leaks
Cooling system soiled

Have it exchanged
Have cylinder head checked and replaced if required
Have it cleaned

Oil level too low
Oil filter leaks
Oil overpressure valve soiled or leaking
Oil pressure transmitter or oil pressure gauge damaged, electrical line loose

Check oil drain plug and oil level, add HD engine oil if required
Check oil filter for leaks, have it sealed and cleaned if required
Have it removed, checked and cleaned
Check, have unit exchanged if required, connect line tightly

Clutch

Clutch Disengages Insufficiently

Too much clutch play

Adjust free travel on clutch slave cylinder

Clutch Slips

None or insufficient clutch clearance
Release shaft hard to move or stuck
Lining greasy
Lining worn, clutch damaged

Adjust free travel on clutch slave cylinder
Make release shaft operateable, lubricate, but not to excess
Have clutch relined
Have clutch relined, reconditioned or exchanged

Complaints

Possible causes

Remedies

Steering System

Intermittent Stiffness of Power Steering

Power steering pump delivers insufficient oil because V-belt of power steering pump slips

Retension V-belt

Oil level too low

Check system for leaks, add oil, bleed

Power Steering Stiff

V-belt of power steering pump torn

Replace V-belt and tension correctly

Power steering pump damaged

Have pump replaced

Directional Stability of UNIMOG in Straight-Ahead Position Unsatisfactory

Steering has too much play

Have play adjusted

Tyre overpressure too low

Correct

Toe-in adjusted wrongly

Have toe-in adjusted

Oil level too low, air in oil circuit

Check system for leaks, add oil, bleed

Control arm loose

Tighten fastening bolts, replace rubber mounts if required

Steering knuckle hard to move

Lubricate, have play adjusted if required

Vehicle overloaded, unequal axle load

Maind max. load and speed

Ball heads on steering arm and tie-rod worn out

Renew

Wheels out of balance

Have wheels ballanced

Complaints

Possible causes

Remedies

Brake System

Wheel Brakes

None or insufficient braking effect

Release brake pedal briefly and depress twice in quick succession whereby the resistance must be felt. However, if the brakes do not grip stop UNIMOG with hand brake.

Brakes wet or soiled

Run dry while braking slightly or clean

Brake linings worn or greasy

Check, readjust
Seal wheel hubs or steering knuckles.
Have brakes relined

Hand brake cable damaged or corroded, brake shoes hard to move

Make operable, replace

Non-uniform braking effect

Bad tyres

Replace worn tyres

Non-uniform tyre overpressure

Correct tyre overpressure

Brakes adjusted wrongly

Adjust brakes

Brakes wet or dirty on one side after driving through water

Run dry while braking slightly or clean

Brake linings greasy on one side or unevenly worn

Seal wheel hubs or steering knuckles, have brakes relined

Too much braking effect

Brakes adjusted wrongly

Have brakes adjusted

Hydraulic Brake System

None or insufficient braking effect

Air in the system

Bleed, add brake fluid

System leaks

Seal system, replace gaskets

Master brake cylinder damaged

Check, have cylinder reconditioned or replaced if required

Complaints

Brake pulls or heats up while driving

Possible causes

Compensating port of master cylinder clogged

Unsuitable brake fluid

Remedies

Clean compensating port with 0.5 mm thick wire

Drain brake fluid, flush system thoroughly with spirit of alcohol, replace gaskets and have new bottom valve installed in master brake cylinder, fill in brake fluid, bleed

Compressed Air Brake Assistance System

None or insufficient braking effect

Condensation in compressed air tank

No reservoir overpressure

Compressed air system leaks

Drain condensation

Watch brake dual overpressure gauge until required reservoir overpressure is attained

Check compressed air system for leaks, seal

Compressed Air System

Warning Lamp Lights Up While Driving

Caution: Stop immediately!

None or insufficient reservoir overpressure

Watch brake dual overpressure gauge until required reservoir overpressure is attained

Check compressed air system for leaks, seal

Insufficient or a Too Slow Overpressure Build-Up

Air compressor does not deliver enough air

Pressure regulator continuously blowing off

Compressed air system leaks

Check air compressor, have compressor reconditioned or replaced if required

Clean pressure regulator, have replaced if required

Check compressed air system for leaks, seal

Complaints	Possible causes	Remedies
Dual Overpressure Gauge Indicates Incorrectly	Dual overpressure gauge damaged	During full brake application with the vehicle stopped both needles must be in alignment, if not replace indicator
Air Compressor not delivering air pressure	Suction or pressure valves leak, clearance between piston and cylinder too great	Have air compressor reconditioned or replaced
Pressure Regulator is not cutting out or to early	Pressure regulator does not shut off or shuts off too early	Adjust overpressure, clean pressure regulator if required, replace seal, have pressure regulator replaced if required

Electrical System

Charging Current Warning Light does not Light Up with switch box key in position 1	Charging current control lamp damaged	Replace control lamp
	Lines loose or damaged	Tighten or replace
	Regulator damaged	Have regulator renewed
	Battery discharged	Check electrolyte level, charge
Charging Current Warning Light Lights up while Driving	V-belt of alternator loose	Check V-belt tension and tighten if required
	Regulator damaged	Check, have replaced
	Line between charging current warning light and alternator is grounded	Look for chafed spot, replace line
	Alternator or diodes damaged by loose contacts or wrong contact of electrical lines to line connections	Check, have reconditioned or replaced

Complaints	Possibles causes	Remedies
Starter Motor does not Operate	Ignition key not in position 1	Move ignition key into position 1
	Check battery if starter does not rotate. For this switch on high beam, if	
	a the lamps slowly extinguish, the battery is insufficiently charged	Charge or have battery replaced
	b the brightness of the lamps remain unchanged, a cable, is loose or the starter itself is damaged	Tighten down cable, check starter and have replaced if required
	Electrical cable on starter switch loose, broken	Tighten electrical cable
	Starter defective	Check, repair
Current Consumer Inoperative	Fuse has poor contact	Brighten contact, rebend contact spring
	Fuse damaged	Replace, look for defect in electrical system
	Line and plug connections or connecting points have poor contact	Brighten contact, ensure good contact
	Grounded line	Look for chafed spot, replace line, replace fuse if required
	Current consumer damaged	Replace

Complaints	Possible causes	Remedies
Ineffective Head Lights		
High-low beam not working	Bulb damaged	Change
Parking light, marker lights tail light not burning	Fuses no contact, damaged	Clean exchange
	Electric cable broken	Renew
Direction Indicator System		
Direction indicator control lamp does not light up	Direction indicator control bulb failure	Replace
	Wrong direction indicator control bulb in trailer	Install 21 W indicator control bulb
Direction indicator control lamp lights up continuously (constant light)	Direction indicator transmitter damaged	Have transmitter replaced
Direction indicator light system not working	Defect in system	Check system, have defect repaired
Stop light not working	Stop light switch damaged	Renew

6 Technical Data

Type and Model

Type UNIMOG 416
Sales designation U 110/416
Model 416/114
Platform model 416/614
Cab model 416/810
Wheel base mm 2900
Chassis length mm 4687

Engine

M.B. type OM 352
Sales designation OM 352.XIII
Model 353.940

Engine

Mercedes-Benz type		OM 352
Model		353.940
Operating principle		Diesel four-stroke direct injection principle
Number of cylinders, cylinder arrangement		6 vertical, in-line
Bore	mm	97
Stroke	mm	128
Total displacement	cc	5675
Compression ratio		17 : 1
Compression overpressure at 150 to 200/min	bar (kp/cm ²)	normal 22–24, at least 20
Continuous output (bhp acc. to DIN) at rated speed	kW (HP) 1/min	81 (110) 2850
Max. torque	Nm (kpm) 1/min	314 (32) 1600
at speed	1/min	1600
Idling speed	1/min	700
Start of delivery BTDC	°	23
Injection order		1 – 5 – 3 – 6 – 2 – 4
Ejection overpressure of injection nozzles, new	bar (kp/cm ²)	205 ± 5
injection nozzles, used	bar (kp/cm ²)	min. 180
Valve clearance for intake, cold	mm	0.20
Valve clearance for exhaust, cold	mm	0.30
Coolant temperature	° C	80–90
Oil overpressure, normal	bar (kp/cm ²)	2–5
Oil overpressure, in idling speed	bar (kp/cm ²)	min. 0.6
Weight, dry	kg	415

Clutch, Transmission, Axles

Clutch

Manufacturer		Fichtel & Sachs
Design		Single plate, dry clutch
Pressure plate designation		GFX 310 KR
Pressure force	Nm (kpm)	7400 $\pm$ 500 (740 $\pm$ 50)
Clutch plate designation		310 GS
Lining		Raybestos 1488/05
Clutch operation		Mechanically/hydraulically
Clutch ply on slave cylinder	mm	4,0
Ply of piston rod clutch pedal/master cylinder	mm	0.5–1.0

Transmission

Transmission	Type	4-speed synchromesh transmission with rear axle drive, front axle drive engageable and disengageable while driving and transmission driven pto drive
2x4 shifting	Forward gears	1 / 2 / 3 / 4
	Ratios i =	14.531 / 8.027 / 5.314 / 3.227
	Reverse gears	1 / 2 / 3 / 4
	Ratios i =	11.625 / 6.421 / 4.251 / 2.589
	Special drive (for pto shaft)	540

Front Axle

Design	Portal axle with thrust tube, differential lock, hub reductions and drum brake
Ratios	Refer to Rear Axle
Toe-in (toe-out)	mm — 1 to — 3 (toe-out)
Camber	° 1° 45'
King pin inclination	° 10
Max. wheel stop, inside	° 40

Rear Axle

Design	Portal axle with thrust tube, differential lock, hub reductions and drum brake
Axle drive ratio	22: 7
Hub reduction ratio	27:13
Total axle ratio	6.527

Steering System

Power Steering

Design	Ball-nut power steering
Manufacturer, type	ZF Schwäbisch Gmünd, ZF-8038
Ratio in center	20.9
Steering wheel turns from stop to stop	5.2

Power steering pump	Design	ZF-Eaton pump	
	Manufacturer, type	ZF Schwäbisch Gmünd, ZF-7633	
	Delivery capacity at	lit/min	12
	Engine speed	1/min	1500
	Pump speed	1/min	2000
	Pump pressure	bar (kp/cm ²)	130 ± 5
	Oil temperature	°C	50

Wheels and Tyres

Tyre Treads

Type of tread	All purpose tread	Michelin XL
Tyres	size	12.5–20 Radial
Rim	size	11 x 20

Tyre Overpressures

Highway up to max. speed	front	bar (kp/cm ²)	3.5
	rear		4.0
Off-highway (up to 20 km/h)	front		1.6
	rear		2.0

Wheel track

	Tyre	Rim size	Press-in depth	Track	Turning circle
70	12.5–20	11 x 20	25 mm	1616 mm	40°

Brake System

Hydraulic Brake System	Design	Hydraulic four-wheel single-circuit Simplex internal expanding brake system	
Parking Brake System	Design	Manual hand brake system acting on rear wheels	
Brake Assistance System	Design	Compressed air brake assistance system	
	Cutout pressure	bar (kp/cm ²)	7.35
	Brake pressure warning light	bar (kp/cm ²)	5

Electrical System

Alternator	Design	Three phase alternator	
	Output	W	490
	Rated voltage and current intensity	VxA	14 x 35
Starter motor	Design	Screw-push starter	
	Output	kW (HP)	2.9 (4)
	Rated voltage	V	12
Battery	Capacity	Ah	110
	Rated voltage	V	12

PTO-shaft

Rpm front	1/min 540
Connection front	1 ³ / ₈ "
Direction of rotation	clockwise in driving direction
Perm. output of pto shaft in stationary operation:	
Engin	1/min 2800
Perm. output	Kw 33 HP 50

Weights

Payload	2.200 kg
Perm. GVW	6.000 kg
Perm. front axle load	3.700 kg
Perm. rear axle load	3.700 kg
Max. trailer load	4.000 kg
Dead weight ¹⁾	3.300 kg

¹⁾ The dead weight includes the following equipment or accessories:
Special pto, compressed air system, all tyres, spare wheel, trailer coupling, long auxiliary platform, front pto shaft, intake duct and 80 kg for other equipment.

Dimensions

Max. length	approx. mm	5120
Wheel base	mm	2900
Track width	mm	1616
Diameter of turning circle	m	12.90
Max. width of cab with fenders	mm	2140
Max. height of cab, unloaded	to approx. mm	2340
Max. height of canvas frame	to approx. mm	2680
Ground clearance under axle housing	approx. mm	440
Vehicle overhang, front	°	45
Vehicle overhang, rear	°	70
Bulk clearance	approx. mm	410
Fording depth	approx. mm	800
Length of auxiliary loading platform (inside dimension)	mm	3000
Width of auxiliary loading platform (inside dimension)	mm	2000
Available auxiliary loading platform space	sq. meter	6.0
Height of side and tail gates	mm	500
Loading height, unloaded	approx. mm	1230
Height of trailer coupling	approx. mm	815
Number of seats in cab		2

Maximum Speeds

Transmission 2 x 4 Shift

Gears	Total axle ratio	Engine speed 1/min	Tyres 12.5—20 Maximum speed in km/h
Forward low range (VG)	6.527	2800	5.33
			9.65
			14.58
			24.00
Forward high range (Vs)	6.527	2800	17.20
			31.13
			47.03
			77.46
Reverse gears (R)	6.527	2800	6.66
			12.06
			18.22
			30.01

Tightening Torques

Designation	Nm	(kpm)	Designation	Nm	(kpm)	Designation	Nm	(kpm)
Engine			Clutch, Transmission			Wheels		
Cylinder head cover	25	(2.5)	Clutch housing to engine	47	(4.7)	Wheel nuts	290	(29)
Timing house cover	5.0	0.5	Clutch housing to transmission housing	47	(4.7)	Steering		
Cover, push rod chamber	6.0	(0.6)	Special pto to transmission housing	47	(4.7)	Steering gear to steering gear bracket	290	(29)
Rocker arm brackets	100 to 110	(10 to 11)	Transmission mounting to transmission housing 4 bolts M 16 x 1.5	260	(26)	Steering gear bracket to frame		
Cylinder head nuts	100 to 110	(10 to 11)	Axles			Bolts M 12 x 1.5-10.9	135	(13.5)
Intake manifold	50	(5)	Thrust ball housing to transmission housing	65	(6.5)	Bolts M 12 x 1.5-12.9	160	(16.0)
Exhaust manifold	50	(5)	Control arm	190	(19)	Pictman arm	350 to 400	(35 to 40)
Injection nozzle in nozzle holder	80	(8)	Axle struts	290	(29)	Fastening of pitman arm to drag link	230	(23)
Nozzle holder in cylinder head	60 to 70	(6 to 7)	Axle drive housing to axle tubes	135	(13.5)	Chassis		
Protective sleeve for nozzle holder in cylinder head	60	(6)	Steering knuckle to hub reduction	90 to 100	(9 to 10)	Shock absorber mounting	350	(35)
Leak fuel line	6.0	(0.6)	Wheel hub, outside M 16 x 1.5	290	(29)	Front and rear spring to spring seat on frame	135	(13.5)
Union nut of over-pressure line	60	(6)	Clamping bolt to hub reduction M 20 x 1.5	220	(22)	Front and rear spring to spring seat on axle	135	(13.5)
Oil pan			Steering arm and steering knuckle arm	450	(45)	Trailer coupling to frame cross member		
Bolt M 6	5.0	(0.5)				Type/designation 28 G / 110	135	(13.5)
Bolt M 8	7.5	(0.75)						
Support to front engine mount	140	(14)						
Support to crankcase	140	(14)						

V-belts

Drive	Dimension	Note
Crankshaft / water pump / alternator	12.5 x 1450	Toothed
Crankshaft / power steering pump	12.5 x 900	