

**normet****Operator manual****Utimec 1500 Transmixer****1606 1930**

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**OPERATOR MANUAL**

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Code: . . . . . 16061930

Chassis No. . . 421

Equipment: . . . Drum

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This manual is a guide to the proper and safe operation of the vehicle. In respect of operation the equipment outfit over the vehicle causes changes and additions which must be considered separately. The information contained in this manual is current for this vehicle. Continued product improvement, and different versions of the equipment may result in changes to the vehicle which are not covered.

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**VEHICLE IDENTIFICATION**

In order to identify the vehicle and its components correctly when discussing technical points or ordering of spare parts, please check the models serial numbers as follows:

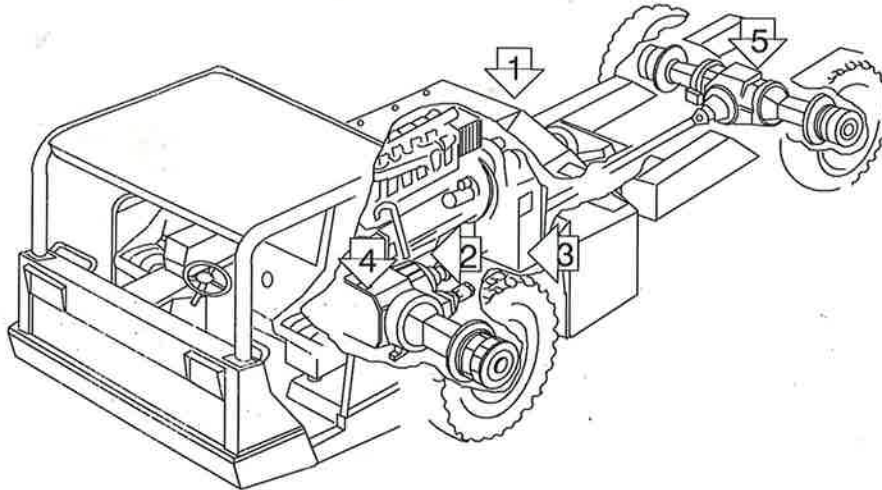


Fig. 1. Vehicle identification

- 1. Vehicle
  - Type .....
  - Serial No. ....
- 2. Engine
  - Type .....
  - Serial No. ....
- 3. Transmission
  - Type .....
  - Serial No. ....
- 4. Front axle
  - Type .....
  - Serial No. ....
- 5. Rear axle
  - Type .....
  - Serial No. ....

**1. VEHICLE DATA****1.1. TECHNICAL INFORMATION 4600767****FUNCTION**

The carrier is a diesel-engined vehicle provided with hydro-dynamic transmission, four-wheel drive and hydraulic centre pivot steering.

**ENGINE**

Deutz ..... BF4M 1013 C  
 Output ..... 112 kW / 2300 rpm / min  
 Exhaust gas purifier ..... Catalytic ECS

**TRANSMISSION**

*Hydrodynamic transmission*

Dana Spicer Powershift ..... Three speeds forward and reverse.  
 Type ..... 24000 series

**AXLES**

Dana ..... 176  
 Planetary type. Rear axle fixed  
 Front axle oscillation ..... +/- 10°

**TYRES** ..... 12.00 - 20 PR 18

**BRAKES**

*Drive brake:*

Hydraulic power assisted two-circuit oil immersed multidisc brakes in both axles.

*Safety brake / parking brake:*

Hydraulically released fail safe-type brake.

**STEERING AND CONTROLS**

Hydraulic frame steering

Steering valve ..... ORBITROL  
 Frame articulation ..... +/- 40°

**HYDRAULICS:**

Hydraulic pump ..... Gear pump

**Output:**

175 bar, 78 l / min / 2300 rpm for steering and brakes  
 200 bar, 105 l / min / 2300 rpm for remixer

**ELECTRIC SYSTEM**

Voltage .....	24 V, negative ground
Alternator .....	80 A
Battery .....	2 x 110 Ah
Driving lights .....	(2+2) x 70 W
Work lights .....	4 x 70 W

**PERFORMANCE**

Gear: .....	Speed:
I-gear .....	5,0 km/h
II-gear .....	10,0 km/h
III-gear .....	25,0 km/h
Max. tractive effort .....	132 kN

**MAIN DIMENSIONS**

Length .....	8910 mm
Width .....	2000 mm
Height .....	2330 mm
Wheel base .....	3650 mm
Track .....	1650 mm
Ground clearance .....	390 mm

**TURNING RADIUS**

Outer .....	6350 mm
Inner .....	3950 mm

**WEIGHT**

Operating .....	11800 kg
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**REMIXER**

Concrete capacity .....	5,5 m <sup>3</sup>
Hydraulically controlled mixing and unloading	
Adjustable rotation speed .....	0...13 rpm

**HIGH PRESSURE WASHER (OPTION)**

Washing effect .....	10 kW, 200 bar / 30 l/min
Max. input water temperature ..	+ 70 °C

**MIST SPRAY SYSTEM (OPTION)**

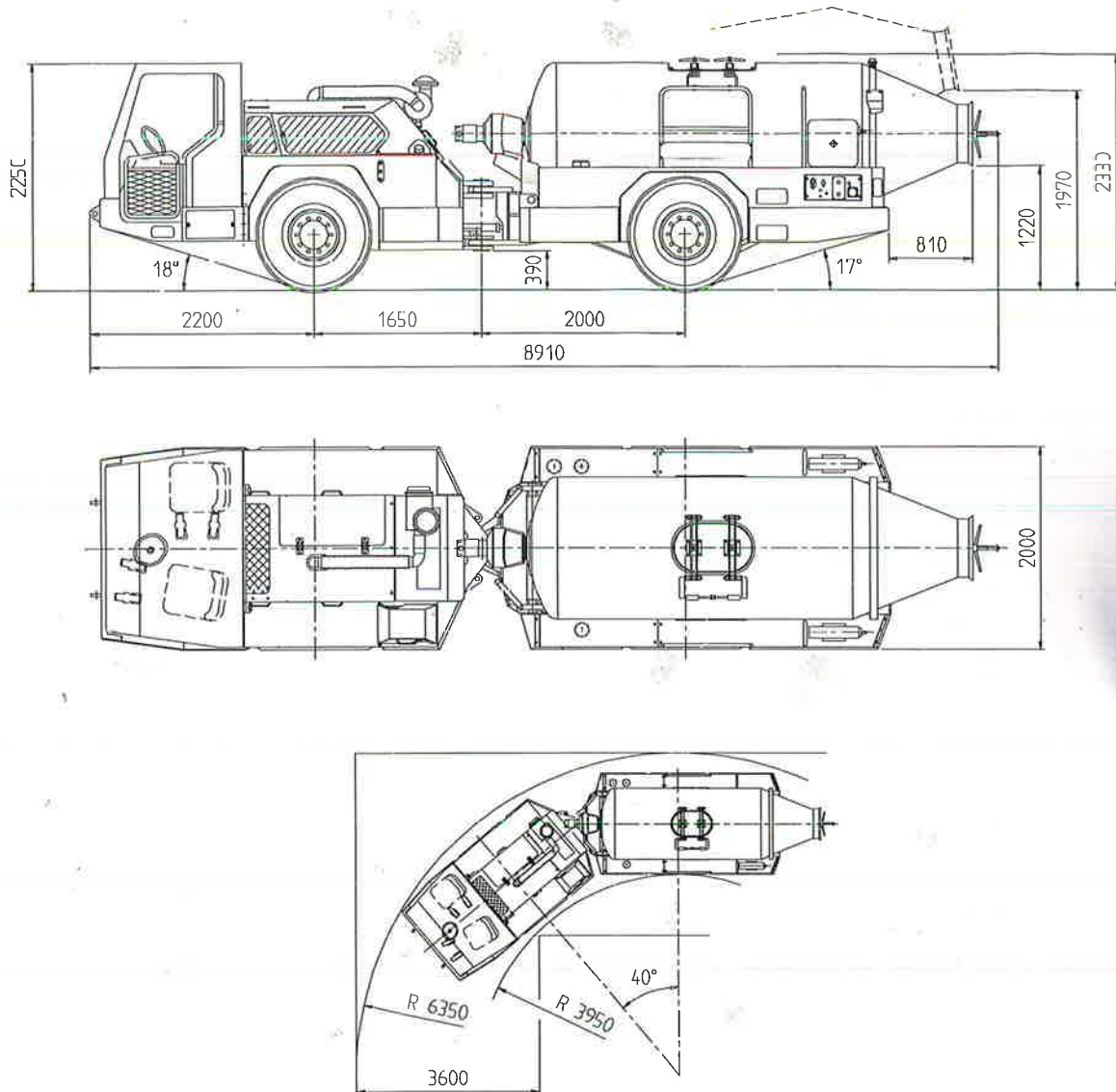


Fig. 2. Dimensioned drawing



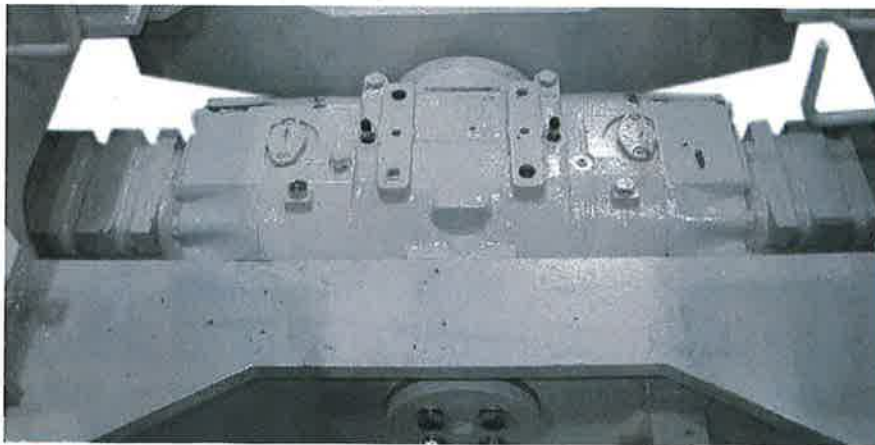
**1.2. FRAME STRUCTURE**

The carrier consists of two modular frames the front (engine end) and the rear (load end) frame. The frames are joined near the centre of the unit in the frame joint, which is movable about a vertical shaft through two hinge pins for steering.



*Fig. 3. Frame joint*

The front axle oscillation allows the front and rear frames of the carrier to be turned along the longitudinal axis. This arrangement makes it possible for the machine to maintain full tractive power on all four wheels on uneven surfaces.



*Fig. 4. Oscillation*

**1.2.1. FRONT FRAME**

The front frame of the carrier has been made by welding of steel plate and incorporates the power unit, power shift transmission, operator's area and front drive axle as main components.

**1.2.2. REAR FRAME**

Is also of welded steel plate construction and incorporates the rear drive axle and the accessories like basket booms, cassettes and lift frames.

**Utimec 1500 Transmixer****1606 1930****1.3. ENGINE DESCRIPTION**

The internal combustion engine will remain indispensable in years to come by virtue of its efficiency in providing independent motive power for a wide variety of applications. Diesel engines, in particular, satisfy market requirements where environmental considerations, durability, reliability and economy are of prime importance.

Deutz is committed to the diesel engine of the future. Out of this commitment has emerged a totally new generation of engines with outputs in the key power range between 27 kW and 190 kW – the FM 1012/1013.

These engines are designed to fulfill all the requirements of vehicle and plant manufacturers well into the next century.

**1.3.1. COOLING**

FM 1012/1013 power units are liquid-cooled engines. FM 1012/1013 engines with integrated cooling can accommodate both engine cooling system and additional torque converter or hydraulic oil coolers within the engine envelope. No extra space is required.

### 1.3.2. FUEL INJECTION

High-pressure, individual fuel injection pumps are recessed in the cylinder block. Three different governing systems are available: mechanical, electro-mechanical or fully electronic engine management allow perfect adaptation of engine to drive train requirements.

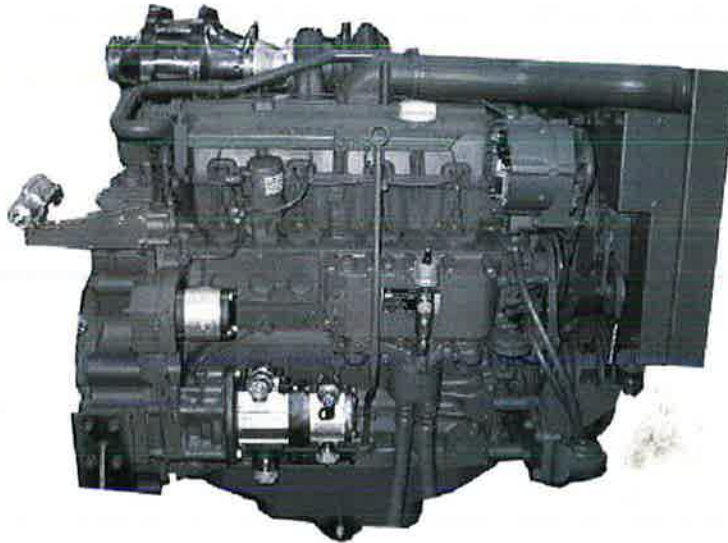


Fig. 5. Engine lay-out

### 1.3.3. CATALYTIC EXHAUST GAS PURIFIER

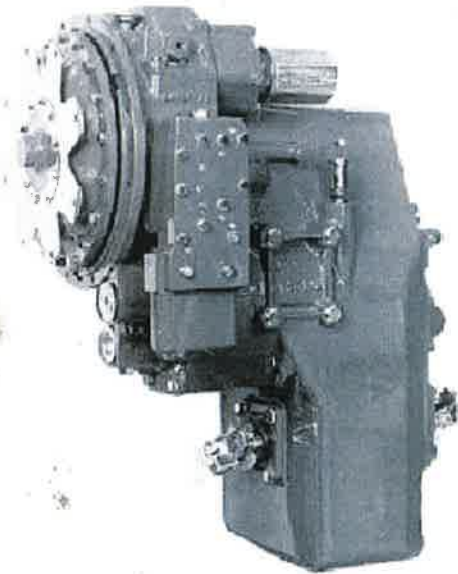
The ECS diesel purifier consists of a metallic honeycomb coated with a precious metal catalyst, packaged into a stainless steel housing. The catalyst serves to oxidize the hazardous carbon monoxide (CO) and hydrocarbons (HC) to form harmless carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O). The ECS diesel purifier is also capable of reducing the overall particulate emissions by 25 – 30 % by oxidizing the soluble organic fraction (SOF) of the particulate.

## 1.4. HYDRODYNAMIC TRANSMISSION

### 1.4.1. GENERAL

The power transmission is hydrodynamic. The diesel engine runs through a drive plate a torque-converter transmission, from which the power is further led by propeller shafts to both axles.

The transmission consists of the hydrodynamic torque converter followed by a multi-speed powershift transmission. The transmission and torque converter function together and operate through a common hydraulic system.



*Fig. 6. Basic design of transmission*

### 1.4.2. OPERATION PRINCIPLE OF THE CONVERTER

The hydraulic torque converter consists of three elements and their related parts to multiply engine torque.

The engine power is transmitted from the engine flywheel to the impeller element through the impeller cover. This element is the pump portion of the hydraulic torque converter and is the primary component which starts the oil flowing to the other components which results in torque multiplication. This element can be compared to a centrifugal pump in that it picks up fluid at its center and discharges at its outer diameter.

The torque converter turbine is mounted opposite the impeller and is connected to the output shaft of the torque converter. This element receives fluid at its outer diameter and discharges at its center. Fluid directed by the impeller out into the particular design of blading in the turbine and reaction member is the means by which the hydraulic torque converter multiplies torque.

The reaction member of the torque converter is located between and at the center or inner diameters of the impeller and turbine elements. Its function is to take the fluid which is exhausting from the inner portion of the turbine and change its direction to allow correct entry for recirculation into the impeller element.

The torque converter will multiply engine torque to its designed maximum multiplication ratio when the output shaft is at zero RPM. Therefore, we can say that as the output shaft is decreasing in speed the torque multiplication is increasing.

#### **1.4.3. POWER-SHIFT TRANSMISSION**

The power shift transmission has clutch discs which engage the gears. The multi-speed transmission can be engaged under load. A governor control senses the speed and load and directs the hydraulic oil to whichever clutch bands give the best gear ratio for the work being done. All gears are running in antifriction bearings, and are constantly meshed.

The speed and direction clutch assemblies are mounted inside the transmission case and are connected to the output shaft of the converter. The purpose of the speed or directional clutches is to direct the power flow through the gear train to provide the desired speed range and direction.

#### **1.4.4. TRANSMISSION CONTROLS**

The vehicle has three speed ranges for both directions. Drive direction and the gear changing is electro-hydraulic. The control lever (drive direction / speed range selector) is connected to the electric control unit, by which magnetic valves are operated. The magnetic valves are connected to the transmission shift control valve.

The shift control valve assembly is mounted directly on the side of the converter housing. The function of the control valve assembly is to direct oil under pressure to the desired directional and speed clutch.

## **1.5. MECHANICAL TRANSMISSION**

### **1.5.1. GENERAL**

The diesel engine runs a powershift transmission, from which the power is further led to the both axles.

### **1.5.2. DRIVE SHAFTS**

There are two driveshafts in the power train. The two output shafts connect the lower part of the powershift transmission case to the rear axle and to the front axle.

### **1.5.3. AXLE ASSEMBLIES**

Both axles are driving. The power is transmitted from the drive / differential gear to wheel hubs, which incorporate planetary gear units. The axles are of the double reduction type having primary reduction by spiral bevels and secondary reduction through planetary gears in the hub ends.

Power is transmitted from the drive shaft to the sun gear which is fitted to the end of the drive shaft. The sun gear rotates with the help of the planet pinions, the planetary carrier which is fastened to the wheel hub.

The brake assemblies are oil immersed multi-plate disc type mounted within the centre casing and are operated hydraulically. As they are enclosed and running in oil they are free from the ingress of dirt and foreign matter and are thus ideally suited to off-highway applications. The centre casing has been designed to give adequate oil capacity for heat dissipation.



*Fig. 7. Axle assemblies*

## 1.6. HYDRAULICS

### 1.6.1. HYDRAULIC SCHEMA, PUMPS

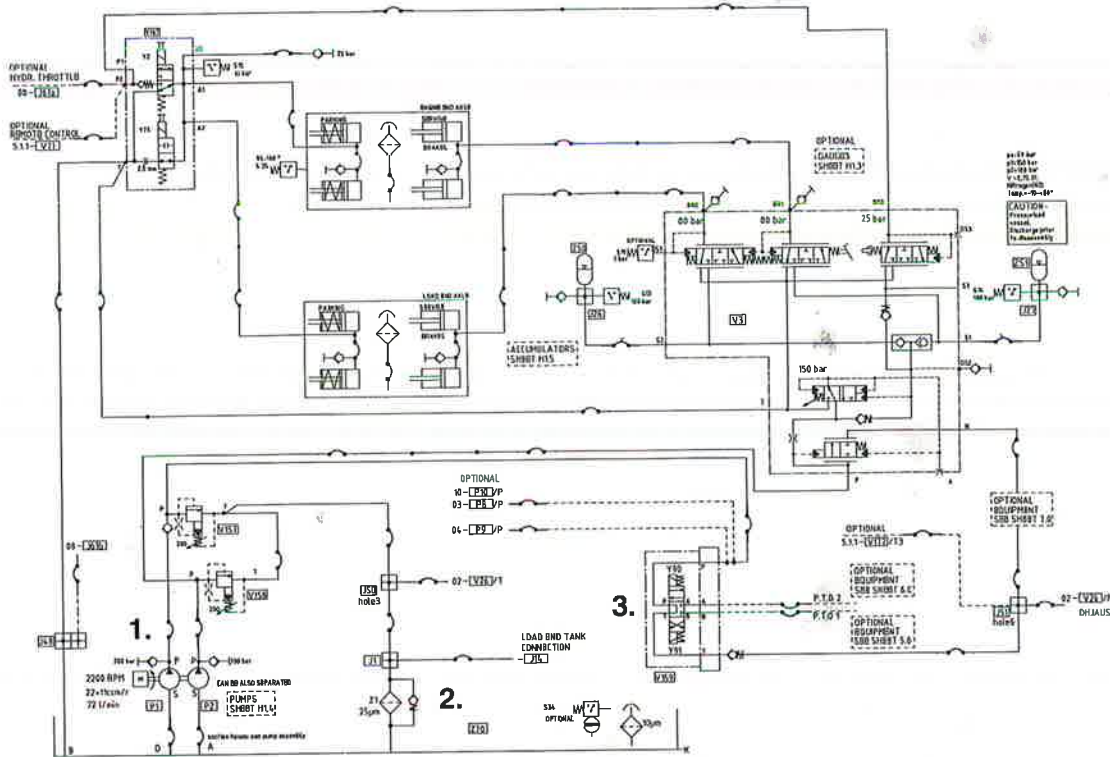


Fig. 8. Hydraulic schema 46040380

1. Hydraulic pump 23/11 ccm/r, 2200 rpm, 75 l/min, 200 bar Diesel-driven
2. Return oil filter
3. Selector valve



**Utimec 1500 Transmixer**

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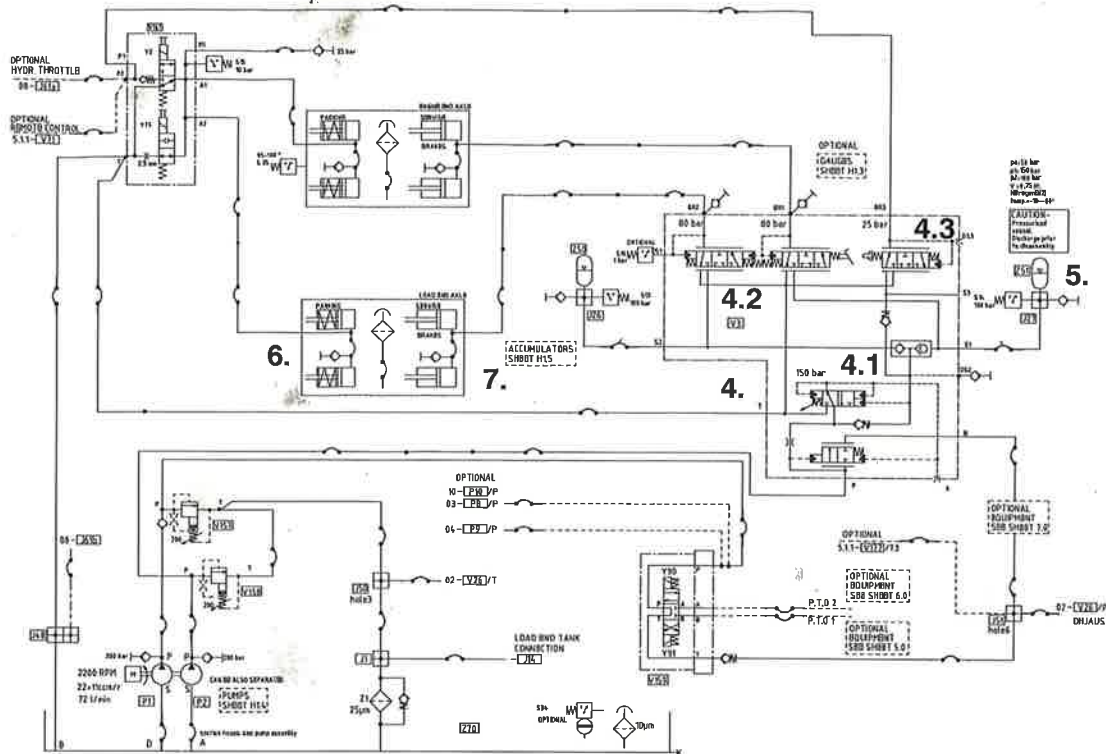
**1.6.2. HYDRAULIC SCHEMA, BRAKES**

Fig. 9. Hydraulic schema 46040380

4. Remotely powered braking system
- 4.1. Charging valve 150 bar
- 4.2. Service brake valve
- 4.3. Safety / parking brake valve
5. Pressure accumulator 0,7 l
6. Safety / parking brake cylinders 25 bar
7. Service brake cylinders 80 bar

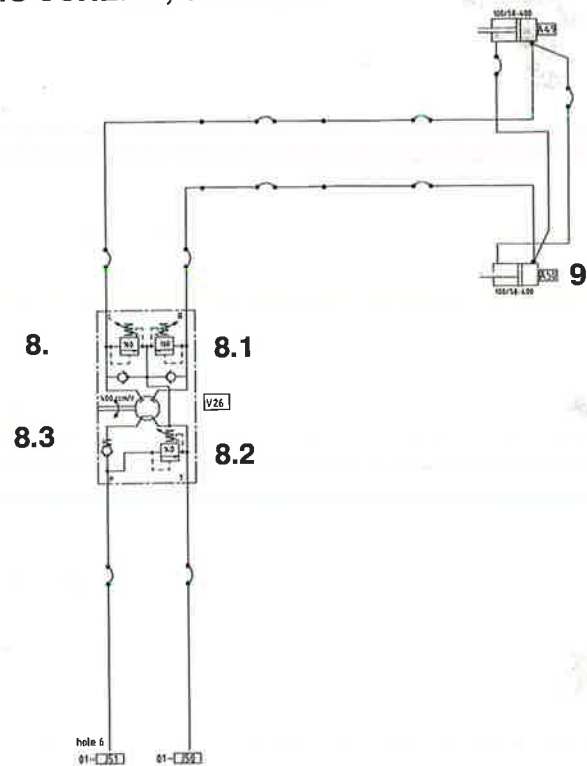
**1.6.3. HYDRAULIC SCHEMA, STEERING**

Fig. 10. Hydraulic schema 45887150

- 8. Steering valve
- 8.1 Dual shock valve with suction valve 210 bar
- 8.2 Pressure relief valve 140 bar
- 8.3 Check valve
- 9.. Steering cylinders

**1.6.4. STEERING HYDRAULICS**

The machine has a common hydraulic system for its steering and the operation of the accessories. The oil supplied by the diesel operated dual hydraulic pump (1) is led through selector valve (3). With this valve the flow is directed either to steering valve or to the accessories. Simultaneous operation of the steering and the accessories is not possible. Steering valve (8) is Orbitrol type. Pressure is limited with relief valve (8.2) and is 140 bar max.

**Function of the steering system**

The main components are:

- Hydraulic pump (1), which supplies the pressure oil required.
- Steering cylinders (9), which turn the vehicle by its centre hinge through the effect of the pressure oil.
- Steering device (8), to which the steering wheel has connected, controls the hydraulic pump—supplied oil flow to the cylinders (9) so that a turning direction and speed corresponding to the steering wheel movements is obtained for the vehicle. The function of the steering device is also to act as a stand-by steering pump in situations when for some reason or other it is not possible to get pressurized oil into the steering system. The required steering force is then produced manually.

In addition the system incorporates the following valve units that improve the steering characteristics and increase safety.

**Dual shock valve (8.1)**

This valve is built in where reasons of safety one of the requirements is the protection of steering system hoses against pressure surge.

**Suction valve (8.1)**

A suction valve is built into the dual shock valve. It ensures oil suction on the one side of the steering cylinder piston where, under unfavorable circumstances, vacuum could otherwise occur.

**Pressure relief valve (8.2)**

There is a pressure relief valve between the valve block inlet port and return port. This valve limits maximum pressure drop across the steering unit thereby protecting the steering system. In addition, the valve ensures bypass when the steering cylinder is in one of its extreme positions.

**Check valve (8.3)**

The check valve prevents oil from returning through the steering unit when the pressure on the cylinder side is greater than the pressure on the pump side. In this way steering wheel jerk is avoided.

### **1.6.5. SERVICE BRAKE HYDRAULICS**

Inside the axle assemblies, in the drive housing, oilbath type disc brake packs have been fitted for both drive shafts. The brakes are hydraulically operated.

#### **Functional description**

This compact brake control block (4) is installed in the circuit immediately downstream of the pump (1). The integral accumulator loading valve (4.1) first of all supplies oil to the accumulators (5) before permitting flow to pass to the other actuators. Only when the accumulator charge pressure has been achieved, will the accumulator loading valve (4.1) allow oil to flow to the rest of the circuit. The switching pressure difference is approximately 18% of the cut-out pressure. The braking circuits are isolated from each other by means of valves.

#### **Function of foot brake (4.2)**

When the foot brake is operated, the two circuit remotely powered brake valve adjusts the pressure in the braking cylinders (7) in proportion to the operating force in the brake pedal. When the braking pedal force is released, oil flows directly to the tank again from the braking cylinders.

Should one braking system fail, the second system remains operational as the two brake control spools within the dual brake control valve are in direct mechanical contact. The operating force remains unchanged.

### **1.6.6. SAFETY BRAKE HYDRAULICS**

Serving as a safety / parking brake in the vehicle there are two spring cylinders (6). When the safety / parking brake is operated, braking occurs by means of two spring loaded cylinders (6). When the safety / parking brake is released, oil flows from the remotely powered braking valve (4.3) into the spring loaded cylinders and releases the brake. Releasing pressure is 25 bar.

**1.7. DRUM HYDRAULICS****1.7.1. TRANSPORT OF WET CONCRETE**

Normet can offer a range of vehicle fitted with concrete mixer drums. The main uses of these vehicles being to supply concrete for shotcreting, projection and injection work. The user is offered several possibilities depending on the extent of the work to be carried out. In all cases the combinations proposed ensure delivery of high quality concrete which is easily placed thanks to the hydrostatic diesel drive of the mixer drum and its manually controlled unloading cover.

**1.7.2. OPERATION**

Transmixer offers a rational solution for transporting the concrete. The concrete is carried in a mixer for the wet process. Drum is made of anti-wearing steel and the door of the charging / discharging mouth is provided with cam closing device and seal gaskets. Drum revolutions by means of hydraulic motor with planetary gear. The drum revolution is hydrostatically controlled. The hydraulic pump provides the needed fluid flow to rotate the hydraulic motor and planetary gearbox. The fluid flow is controlled by means of the valves in the driver's cabin and at the end of the drum.

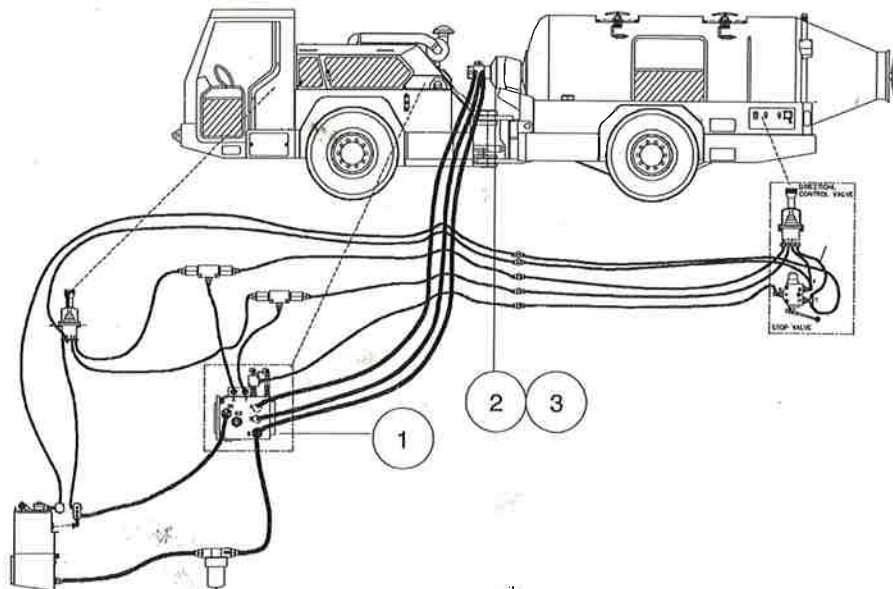


Fig. 11. Main components

1. Hydraulic pump
2. Hydraulic motor
3. Planetary gearbox

**1.7.3. MAIN COMPONENTS***(1) Hydraulic pump*

Axial piston variable displacement pump is of swashplate construction with variable flow capability suitable for hydrostatic transmission with closed loop circuit. The flow rate is proportional to the pump's driven speed and displacement, which, in turn, is determined by the swashplate angle. The latter is infinitely adjustable between zero and maximum displacement. Flow direction is reversed by tilting the swashplate of the opposite side of the neutral or zero displacement position.

*(2) Hydraulic motor*

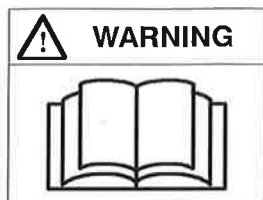
Axial piston fixed displacement motor is of swashplate construction with fixed displacement is intended for closed circuit. The output is proportional to the flow rate of the input fluid. The output torque is proportional to difference between high and low pressure sides of the fluid circuit. The direction of rotation of the motor shaft depends upon which port the fluid enters the motor.

*(3) Planetary gearbox*

This two-stage planetary gearbox is purpose designed to drive the mixer drum. It is attached to the mixer frame by means of base supports which also carries the torque forces of the drive.

**2. SAFETY RULES****2.1. GENERAL SAFETY RULES**

1. Learn to recognize potential hazard areas such as the hinge area, and avoid these.



2. Study the operating and maintenance manual for the vehicle.



3. Use recommended safety devices, i.e. gloves, safety boots, hard hats, goggles and ear protection, and wear protective clothing when and where required.

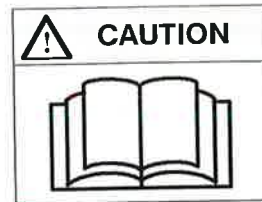
4. Get to know the capabilities and limitations of the vehicle and the correct operating techniques.
5. Operate the vehicle only when you feel physically fit and not under the influence of alcohol or drugs.
6. To operate the vehicle you must be trained and qualified.
7. Keep floors, steps and running boards clean and free of oil, ice, mud and loose objects.
8. Never remove any elements of the engine's exhaust system or any safety covers and devices from the operational vehicle.
9. Do not get on or off the vehicle when it is moving.
10. Do not stand anywhere near vehicle when the engine is running.
11. Keep a serviceable first aid kit in good order on the vehicle.
12. Always comply with the instructions in this manual and your company's regulations for the operation of the vehicle.

**2.2. OPERATING SAFETY RULES**

1. When the engine is running, no one should be allowed in the operating area.



2. When fueling, servicing or repairing, shut down the engine unless required for adjustment purposes.



3. Read this manual thoroughly before operating vehicle.

4. Check the area around the vehicle before entering the operator's compartment.
5. Do not allow anyone to ride with you, except in helper's seat.
6. Before starting the vehicle make sure that the transmission is in neutral and the safety / parking brake is applied.
7. Before starting to drive always make sure that all equipment controls and functions are in operating condition.
8. Maintain a safe operating distance between the vehicle and other personnel.
9. Repair or report any irregular operation or damage immediately.
10. Do not use the safety / parking brake for stopping the vehicle in any other than emergency cases.
11. Never use high speed when going downhill.
12. Follow all instructions of auxiliary equipment before operating.
13. Strictly apply all the regulations of the work site as to operation of this vehicle.
14. Park on level ground, if possible. Turn wheels into bank or rib, or block the wheels when parking on a downground.
15. Shift the transmission to neutral during idle periods.
16. Do not stop a hot engine directly off from high revolutions.
17. Do not open the master switch while the engine is running.



### 3. OPERATOR'S CONTROLS

#### 3.1. SWITCHES

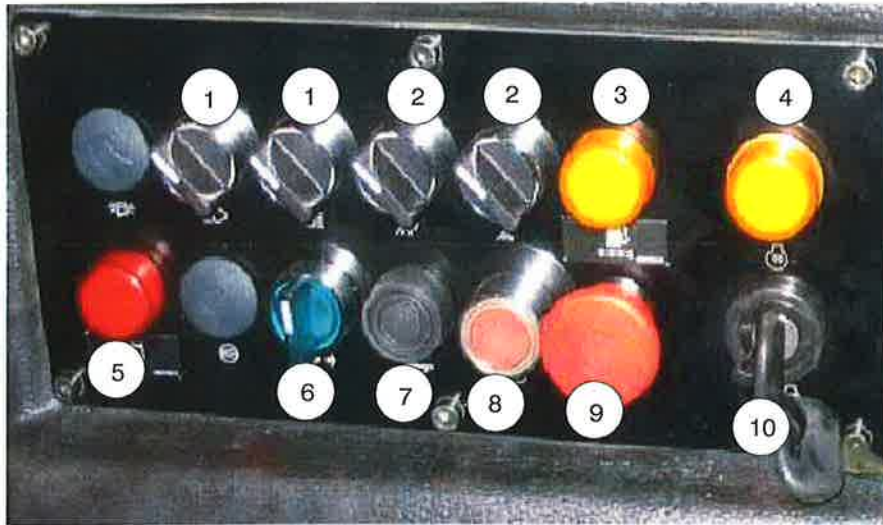






Fig. 12. Switches / lights


1. Head light
2. Work light
3. Water separator indicator
4. Engine preheat indicator
5. Hydraulic oil level
6. Turn lights
7. Horn button
8. Safety / parking brake releasing
9. Safety / parking brake
10. Starter


- 


1. Light switches for both ends of the vehicle.
- 


2. Working light switch.
- 


3. Indicator lamp lights up if there is water in the water separator. Unscrew drain plug and allow water to drain until the separation vessel is empty.
- 


4. Engine preheat indicator will glow to indicate that the engine is ready to start. When the engine is warm, it is not necessary to use pre-heater.
- 

5. Indicator lamp for the hydraulic oil level in the tank.
- 

6. Turning the blinker switch to the left position the left turn signal will flash. Turning the blinker switch to the right position the right turn signal will flash.
- 

7. Push button for horn signal.
- 

8. By pushing the button you can release the safety / parking brake. Check that the indicator light goes off. Pull and turn first the safety / parking brake knob.
- 

9. By pushing the knob you can apply the safety / parking brake.
- 

10. This key contact switch will prevent accidental starting of the engine by unauthorized persons when the operator is absent. Insert switch key. Turn the switch clockwise, whereupon the indicator lights light up. Turning the switch further gets the engine started. Once the engine fires, release the switch. Engine shut down is electrical. When the key contact switch is turned anti-clockwise, a solenoid stops the engine. When stopping the engine, speed should first be reduced to idling for a few minutes so as to permit the heat to equalize itself in the engine.

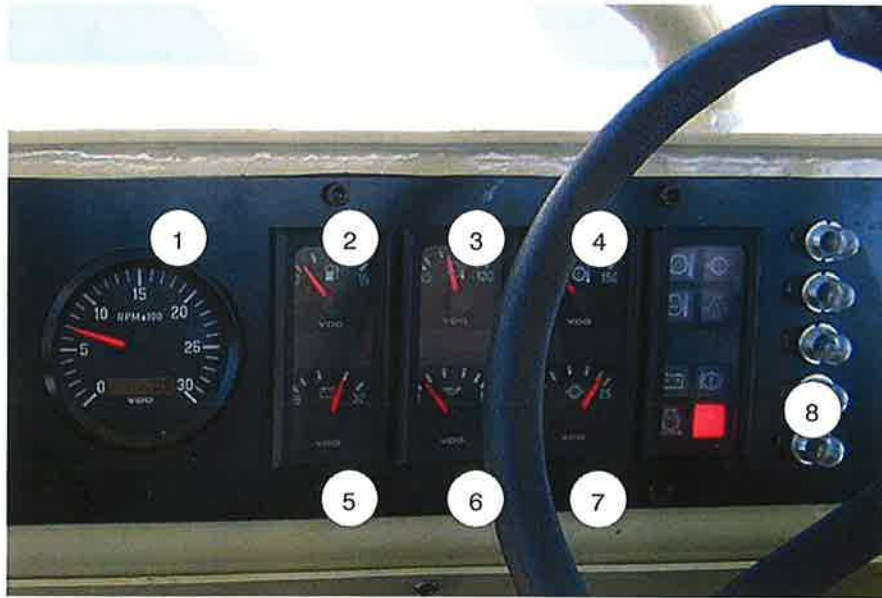
**3.2. INSTRUMENTS**

Fig. 13. Instruments

1. Tachometer / Hour Meter
2. Fuel gauge
3. Engine temperature
4. Converter oil temperature
5. Voltmeter
6. Engine oil pressure
7. Converter clutch pressure
8. Circuit breakers



1. Hour-meter indicates the hours of operation and vehicle's service hours. Tachometer indicates the engine revolutions. 2000 RPM is normal under full load.



2. Fuel gauge shows the amount of fuel in the tank.



3. Water temperature. The temperature of the coolant may vary according to load, but should never exceed the boiling temperature for the pressurized system being used.



4. Thermometer shows the temperature of the converter oil. Max. temperature is 120°C. Don't run the engine at too high a speed until the transmission oil is warmed up. This is especially important in cold weather, as the hydraulic functions do not work satisfactorily if the oil temperature is too low.



5. Voltmeter shows the charging state in the battery when the engine is not running. When the engine is running the voltmeter shows the alternator charging.



6. Oil pressure will be greatest after starting a cold engine. Oil pressure will decrease as the engine warms while idling. As the engine speed is increased to full load speed, oil pressure will increase into normal range and stabilize. The red light will light up if the pressure is below 1 bar.



7. Transmission feed pressure gauge shows the transmission feed pressure. Normal pressure is 16,518..20,684 bar. Check during driving that the pressure is normal.

8. Circuit breakers, in which the centre part bounces up as a result of a temperature rise when a short circuit occurs.

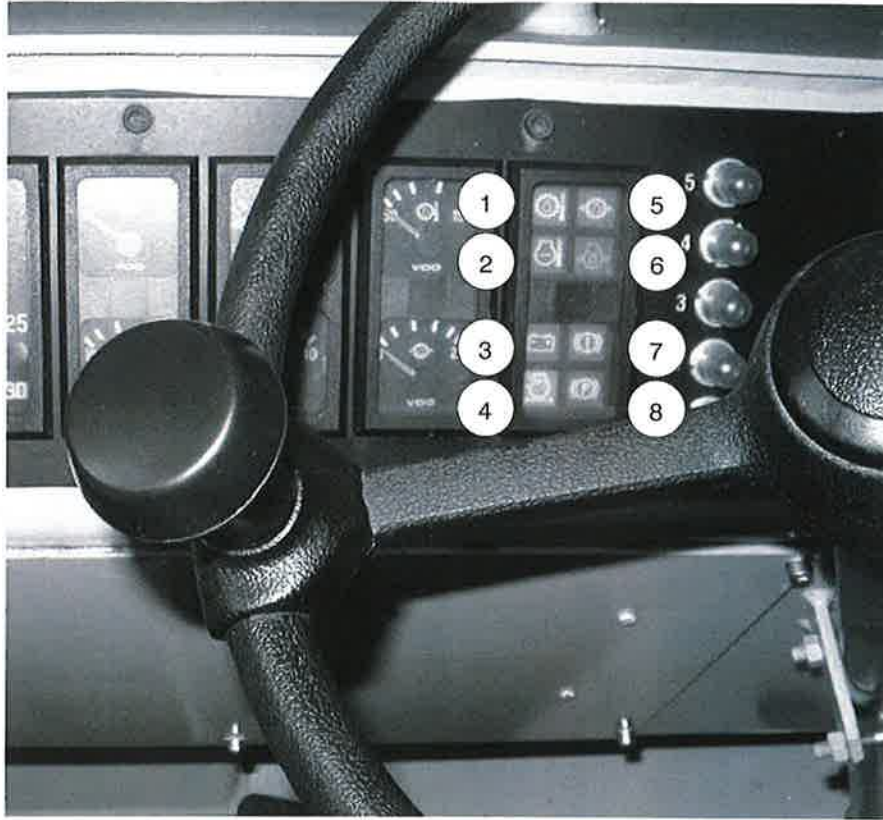
**3.3. INDICATOR LIGHTS**

Fig. 14. Indicator lights

1. *Transmission oil temperature*
2. *Engine coolant level*
3. *Battery charging*
4. *Air cleaner*
5. *Transmission feed pressure*
6. *Engine oil pressure*
7. *Service brake pressure*
8. *Safety / parking brake pressure*



1. Indicator lamp lights up if the transmission oil temperature rises over 120 °C. If temperature warning light goes on the converter can be cooled as follows:
  - Engage safety / parking brake.
  - Engage the shift lever to neutral.
  - Allow the engine run a few minutes.



2. Indicator lamp lights up if the engine's temperature rises alarmingly high or the coolant level falls below the minimum mark. The engine must be stopped immediately. Find the cause of this defect and correct it before restarting the engine.



3. Indicator lamp lights up if the battery is not being charged. If this occurs while you are driving stop and investigate the cause.



4. Indicator lamp lights up if the air cleaner has become choked.



5. Indicator lamp lights up if the transmission feed pressure drops below 10 bar. With cold oil to bring the oil temperature to normal; engage shift lever in forward and high speed and apply brakes. Accelerate engine half to three-quarter throttle.



6. Indicator lamp lights up if the pressure is lower than 1,0 bar. If the oil pressure drops be low normal, stop the engine and have the fault rectified.



7. Indicator lamp lights up if the brake pressure drops below 100 bar.



8. Indicator lamp lights up if the safety / parking brake is engaged.

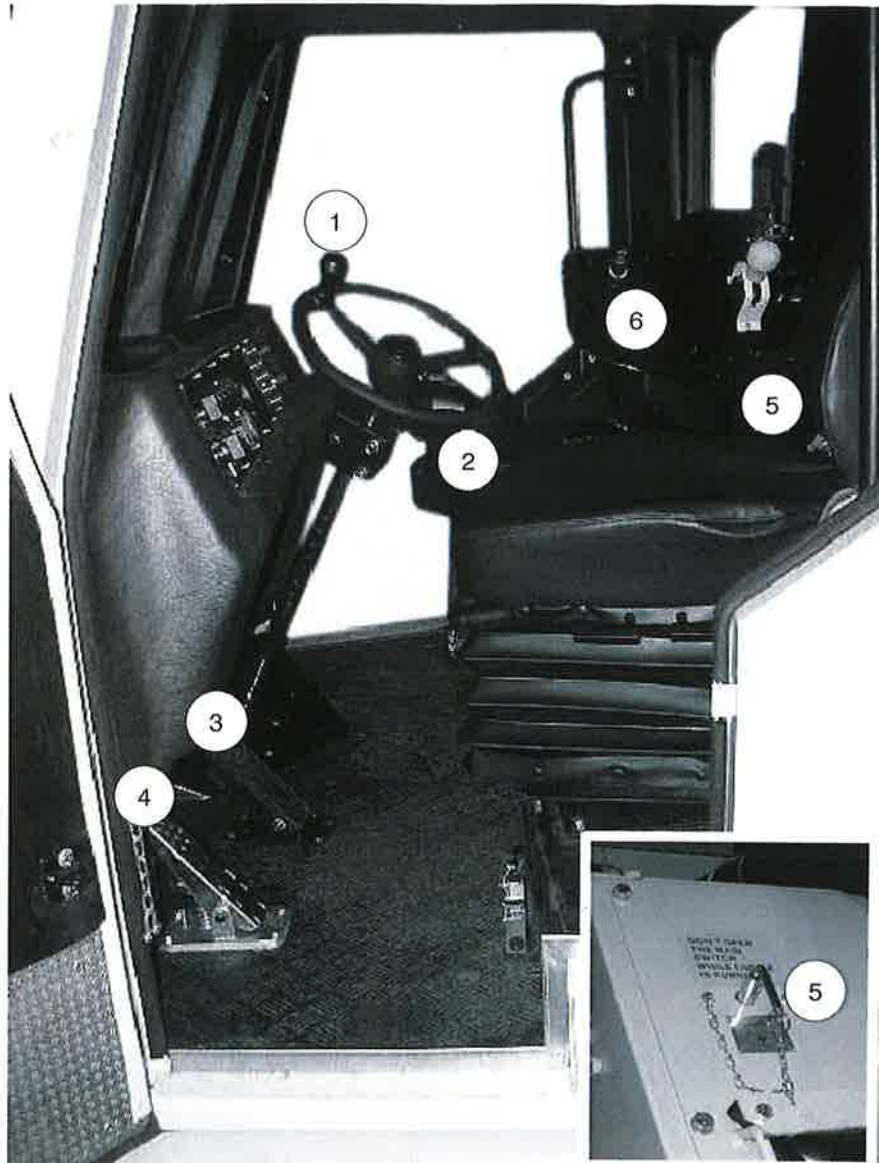
**3.4. OPERATING CONTROLS**

Fig. 15. Controls

1. *Steering wheel*
2. *Drive selector*
3. *Accelerator pedal*
4. *Service brake pedal*
5. *Master switch*
6. *Hand throttle*



- \* 1. Steering valve controls the direction and volume of the oil flow going to the steering cylinders.



2. Turn the knob to 'F' position for forward movement. Turn the knob to 'R' position for reverse movement. "N" position is neutral. Desired driving speed is selected with the lever in each situation. There are three gears and gear-shifting is possible also when the vehicle is moving.

- RPM** 3. Engine speed / power is controlled with the accelerator pedal.



4. Brake pedal acts on the brake valve through, which the pressured oil is directed to the brake cylinders.



5. This switch will isolate the battery from the rest of the circuit for protection from fire, when the engine is stopped and the vehicle left unattended. Don't open the switch while engine is running or the alternator will be damaged.

- RPM** 6. By the hand throttle you can set the engine revolutions to the desired level.



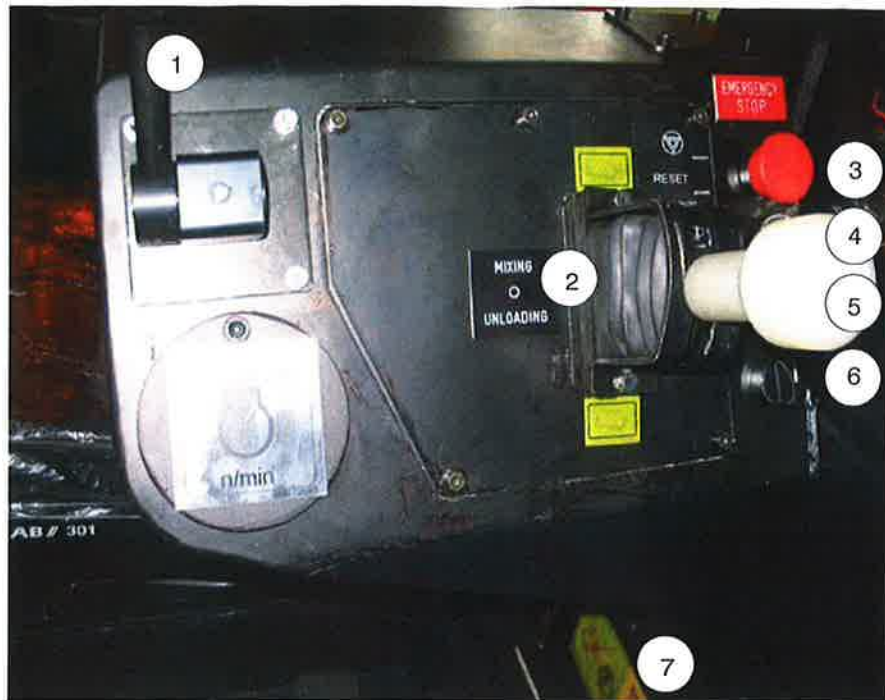


Fig. 16. Controls

1. Hand throttle
2. Drum rotation
3. Emergency stop
4. Emergency stop release
5. Drum lowering / lifting
6. Drum lock
7. Master switch

1. By the hand throttle you can set the engine revolutions to the desired level.
2. Transmixer rotation speed / rotation direction change over.
3. For rapid stopping of the drum rotation. After use the valve knob must be returned to its initial position and the emergency stop release knob pressed.
4. Emergency stop release. Push the button after:
  - Closing the carrier's master switch.
  - Turning the current key switch current on position in the instrument panel.
  - Bringing the emergency stop button to off position.
5. Drum end lowering and lifting.
6. Drum lock, open—0—close. Use the drum lock during transport to prevent drum movements. Open the lock before lifting the drum end.
7. This switch will isolate the battery from the rest of the circuit for protection from fire, when the engine is stopped and the vehicle left unattended. Don't open the switch while engine is running or the alternator will be damaged.

**3.5. WINDSHIELD WASHER, DOME LIGHT AND AIR CONDITIONING**

Fig. 17. Controls

1. Windshield wiper, front
2. Windshield washer
3. Windshield wiper, back
4. Fan
5. Dome light
6. Fan rotation speed
7. Recirculated air from inside / outside

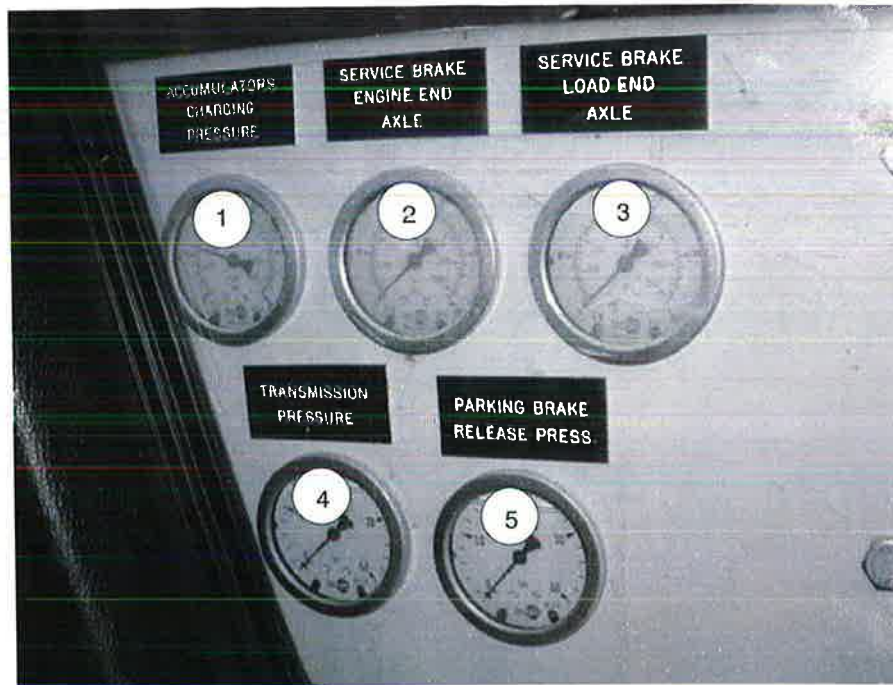





**3.6. PRESSURE GAUGES**

Fig. 18. Controls

- 
 1. Accumulators charging pressure 150 bar.
- 
 2. Service brake pressure, engine end axle 80 bar.
- 
 3. Service brake pressure, load end axle 80 bar.
- 
 4. Transmission charge pressure 16,9...19,6 bar.
- 
 5. Safety / parking brake release pressure 25 bar.

## 4. OPERATION AND USE

### 4.1. COMMISSIONING, STARTING AND STOPPING

#### 4.1.1. COMMISSIONING ON DELIVERY

Following inspections must be done during the delivery check-up.

- Make a "walk-around" inspection of the vehicle.
- Check the engine oil level.
- Check the transmission oil level.
- Check the axle oil level.
- Check the hydraulic oil level.
- Check battery electrolyte level.
- Check the fuel level.
- Clean the air filter / check air cleaner oil.
- Check tire pressure and condition.
- Check wheel nuts.
- Check gauges and warning lights.
- Check safety and service brake function.
- Check engine belts for tension and condition.
- Check steering function.
- Check engine revolutions.
- Check hydraulic circuit.
- Check safety symbols and warnings.
- Check fire extinguisher pressure.
- Check vehicle for leakages.

#### 4.1.2. STARTING THE ENGINE

Make sure that the frame joint safety bar is not connected.



**Check the area around the vehicle before entering the operator's compartment.**

Use the steps and hand rails provided to enter the operator's area safely.

Foot controls must be free of obstructions. Keep the operator's area clean.

**Seat adjustment**

*Weight adjustment:* It is important that you set the suspension of the seat to suit your individual weight. This ensures that you enjoy maximum comfort throughout the hours you are driving. Sit in the seat and look to see the position of the indicator (3). If the seat is correctly set, the tongue of the indicator should be level with the front edge of the side frame. If it is behind the frame edge, the adjuster lever (1) should be operated with the + sign uppermost. Place left thumb on indicator tongue and when it is felt to be level with the frame the seat will be correctly set. If the tongue is in front of the frame, set adjuster lever (1) with sign uppermost and operate until setting is correct. (It is important to note that the seat can only be correctly adjusted with the driver fully seated).

*Back-rest angle adjustment:* Press your back firmly against the back-rest. Press down either of the two levers (2), set back-rest to any of the three angles, and release lever.

*Fore-and-aft adjustment:* Move lever (4) inwards and slide seat forward or backwards to required position and release lever.

*Seat cushion adjustment:* The front and rear ends are separately variable. To raise front pull latch (5) upwards and lift seat cushion. Release latch at required level. There are four settings. The rear end of the cushion is raised or lowered by pushing the entire cushion backwards, then setting it into any of the three notches provided.



Fig. 19. Seat adjustment

1. Close the master switch.



2. **Check that the drive selector is in the middle position.**



3. **Check that the safety / parking brake is engaged.**

4. Switch the current on with the key switch in the instrument panel, whereupon the indicator lamps light up.
5. Check that all warning lamps, except the hydraulic oil level and the water separator lamps, are illuminated. Water separator lamp illuminates a few seconds, if there is not water in the water separator. If some light is not illuminated, open the lamp and change the bulb. The engine must not be started if some warning light is not functioning.
6. Depress the accelerator pedal to approximately to middle speed position.
7. Start up the engine by turning the key switch further.
8. Crank the engine for a maximum of 10 seconds only. If the engine has not fired within this time period, release the switch and wait about one minute before the next starting attempt. The one minute interval is required for the batteries, to restore their charge and also to prolong their life.
9. When the engine has started up, the indicator lights should go out immediately, except safety / parking brake indicator light. The service brake circuit light goes out only after sufficient pressure has built up in the system.
10. As soon as the engine runs smoothly reduce the speed to idle.



**When the engine is running, no unauthorized persons should be allowed in the operating area.**

**4.1.3. STOPPING**

Stop the vehicle by decreasing the engine revolutions and using the service brake. Avoid violent braking when driving a loaded vehicle.



**Never use the safety / parking brake for stopping the vehicle in any other than emergency situations.**

When the vehicle has stopped:



**1. Park on level ground, if possible. Turn wheels into bank, rib, or block the wheels when parking on a slope.**

2. Engage the safety / parking brake. See that the safety / parking brake warning light comes on.
3. Allow the engine to run at idling speed a few minutes.



**A hot engine MUST NOT BE STOPPED directly from high revolution speeds. It is better to let the engine idle for 5 minutes to allow for temperature balance.**

4. Stop the engine by pressing the engine stop button.
5. Check that all indicator lamps are lit up.
6. Switch the current off with the current switch.
7. Open the master switch.



**Master switch MUST NOT be opened while the engine is running because there is a danger of burning of the alternator, voltage regulator and the lamps.**

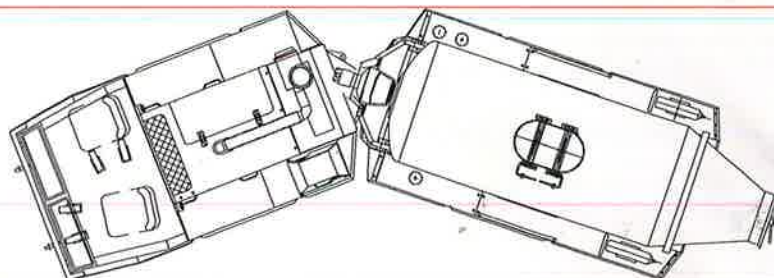


Fig. 20. Parking on a slope



**4.2. DAILY OPERATION****4.2.1. DAILY MAINTENANCE OPERATIONS**

Make a "walk-around" inspection of the vehicle. It only takes a few minutes to correct minor problems. This can prevent major repairs at a later date.

Before starting the engine at the beginning of each shift, perform the following checks.

- Check the engine oil level.
- Check the hydraulic oil level.
- Check the fuel level.
- Check the transmission oil level.
- Clean the air filter.
- Check fire extinguisher pressure.

**4.2.2. INSTRUMENTATION CHECKS**

After a few minutes operation with moderate load and varying speed, the engine will reach normal operating values.

- Engine oil pressure ..... min. 0,8 bar
- Engine temperature ..... below 110°C
- Transmission feed pressure ..... 16,548...20,684 bar.
- Transmission oil temperature ..... below 90°C
- Voltmeter ..... 24...27 V or the pointer of the voltmeter gauge must be in the green sector.

If any of the gauges do not read within the normal operating ranges, stop engine and investigate the problem.

**4.2.3. TESTING THE BRAKES**

The operation and holding capacity of the brakes must always be ensured before driving is started.



**Do not operate the vehicle with a faulty safety / parking brake. Damage to the vehicle or serious personal injury may result.**

**Service brakes (drive brakes)**

Start up the engine and let it run until the transmission oil temperature is normal.

The holding effect of the service brakes depends both on the condition of the equipment and on the pressure acting on the brake circuit.

To test the holding effect depress the brake pedal, select 2-gear with the gear selector, engage the forward driving direction and release the safety / parking brake. The brake circuits should be full, i.e. the indicator lamps in the instrument panel should be out.

Press the accelerator pedal and increase the engine revolutions to full RPM. The vehicle must not move.

**Safety / parking brake**

The brake holding effect depends on the condition of the equipment. The brake's holding effect is adequate when 2-gear is engaged and the engine is driven at full RPM safety / parking brake applied. The vehicle must not move.

**4.2.4. SETTING THE UNIT IN MOTION**

Check that all connections that possibly have been coupled to the vehicle from outside are disconnected.

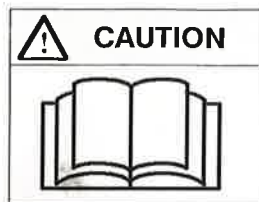
1. Turn the drive direction selector to the position of the desired driving direction.
2. Use the first gear to set the vehicle in motion.
3. Release the safety / parking brakes by pulling out the safety / parking brake knob and by pressing the brake release button.
4. Apply even pressure to the accelerator. The vehicle starts to move.
5. Check to make sure that all travel ways are clear of obstructions.
6. Check the function of the steering.

**4.2.5. DRIVING**

Before taking the vehicle into use to actual production work familiarize yourself thoroughly with its operation, behavior in different situations and the location of its controls. Driving this vehicle without regular inspection or maintenance schedules will greatly reduce its efficiency and life.

Check to make sure that all travel ways are clear of obstructions.

Make sure that proper side clearances are maintained.



**Read this manual thoroughly before driving the vehicle.**



- 1. Before starting to drive always make sure that all vehicle controls and functions are in operating condition.**



- 2. Follow all instructions of auxiliary equipment before operating.**

- 3. Keep the operator's compartment clean and free of any extra materials.**



- 4. Maintain a safe operating distance between the vehicle and other personnel.**



- 5. Repair or report any irregular operation or damage immediately.**



- 6. When fueling, servicing or repairing, shut down the engine.**



- 7. Strictly apply all the regulations of the work site as to operation of this vehicle.**

**4.2.6. CHANGING THE SPEED RANGE AND DRIVE DIRECTION**

To select the transmission gear ranges and the forward reserve direction of travel operate the shift lever as indicated below.

- Use first gear to set the vehicle in motion and where load and ground conditions prohibit driving in a higher gear.
- Shift to second gear when the vehicle speed approaches the limit of the first gear and the load and ground conditions allow a higher travelling speed.
- Shift to third gear when the vehicle speed approaches the limit of the second gear and the load and ground conditions allow travelling at maximum speed.
- When changing in the direction of a lower gear the vehicle speed must be observed. Changing must not be done when the vehicle speed is higher than the maximum speed which will be selected.
- When changing the driving direction, the vehicle must be brought to a complete stop before the forward / reverse lever is shifted.



**Shift the transmission to neutral during idle periods.**



Fig. 21. Gear shifting

**4.2.7. STEERING**

The vehicle has a hydrostatically controlled centre pivot steering. Notice that the steering reaction speed diminishes when the engine's rotation speed decreases. Take this into account particularly in turnings and when driving in higher gears. Ease back slightly when you have reached steering lock to prevent unnecessary oil heating. Use the handknob when steering.



Fig. 22. Use of the steering wheel

**4.2.8. DRIVING ON SLOPES**

**Driving downhill with the gear disengaged to neutral is FORBIDDEN.**

When driving downwards select such a gear as to enable you to take best possible use of the transmission / engine braking. Avoid continuous use of the service brakes, as it will cause unnecessary wear and heating.



**Never use high speed when going downhill.**

When driving upwards use a sufficiently low gear to avoid overheating of the transmission.

Note:

Select the speed range always by the prevailing driving conditions. Watch the transmission temperature. Suitable operation temperature is about 90 °C. If too high a range is used, transmission overheats rapidly and can cause damage.

### 4.3. MOVEMENT OF MACHINE BETWEEN WORK SITES

#### 4.3.1. DRIVING ON TRAVEL WAYS

Strictly apply all the traffic regulations of the work site as to driving of this vehicle.

Keep a careful lookout to both the front and rear. When driving in curves, remember that the equipment (boom) require a greater radius in the outer curve than the carrier.

#### 4.3.2. TOWING

Note:

Because of the design of the hydraulic system, the engine cannot be started by pushing or towing.

If the engine – pump combination is in operating condition, towing can be done without any special measures. Start the engine up and adjust its rotation speed so that the feed pressure is normal. Towing can then be performed at normal driving speed.

If the engine – pump combination is not in working condition thus the engine cannot be started, this means that the steering does not function either, and then towing requires the following measures:

1. Disconnect both front and rear driveline. Fasten the drivelines and support them properly to avoid damages during towing.



**Connect the tow bar between the vehicle and the towing carrier, before disengaging the brakes and dismantling the cardan shafts.**

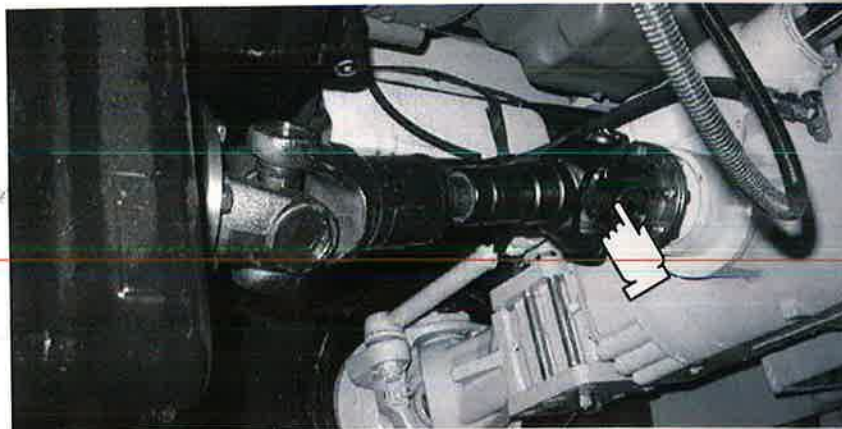


Fig. 23. Disconnecting the driveline

2. If the brake circuit has no pressure in it, or if no external oil pressure can be used, release the safety / parking brakes mechanically.
  - For releasing the safety / parking brake, undo lock nut (1).
  - Thread in screw (2) whereupon the brake is released. Lock the screw with the nut, to prevent it from unthreading.
  - Disengage the brakes on all four wheels.

**After towing:**

- Undo lock nut (1) and then unthread screw (2), until it sticks out 47 mm.
- The brakes must be tested.

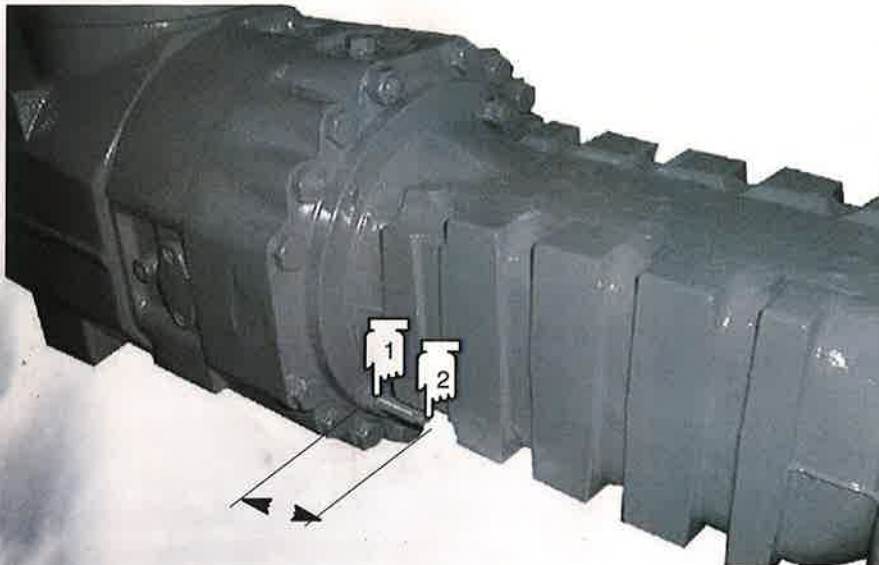


Fig. 24. Safety / parking brake mechanical releasing

	<b>WARNING</b>

**Remember to reset the brake release after towing.**

3. One end of the steering cylinders are detached, or the hydraulic hoses coming to the cylinders are disconnected. If the cylinder ends are not disconnected, stiffness of the steering limits the towing speed. As no hydraulic pressure is available, steering is very stiff and slow.

**4.4. SPECIAL CONDITION OF USE****4.4.1. WINTER OPERATION****Lube Oil Viscosity**

- Select the oil viscosity (SAE grade) according to the ambient temperature when the engine is started.
- Increase oil change frequency when operating below  $-10\text{ }^{\circ}\text{C}$ .

**Diesel Fuel**

- Use winter-grade diesel fuel for operation below  $0\text{ }^{\circ}\text{C}$ .

**Coolant**

- Set the water/antifreeze mix to suit the lowest likely temperature (max.  $-35\text{ }^{\circ}\text{C}$ ).

**Additional Maintenance Work**

- Drain the sludge from the fuel tank once a week by undoing the drain plug.
- Adjust the oil level in the oil bath air cleaner (if fitted) to suit the ambient temperature.
- At temperatures below  $-20\text{ }^{\circ}\text{C}$ , lubricate the flywheel ring gear from time to time with low-temperature grease, such as Bosch FT 1 V 31. To do so, remove the starter and introduce the grease through the pinion hole.

**Cold-Start Aids**

- At temperatures near or below freezing point, use glow plugs if necessary. This not only lowers the starting limit temperature, but provides easier starting at temperatures normally not requiring a starting aid.

**Battery**

- Efficient cold starting requires a healthy battery.
- The starting limit temperature can be lowered by  $4 - 5\text{ }^{\circ}\text{C}$  by heating the battery up to about  $+20\text{ }^{\circ}\text{C}$ . To do so, remove the battery and store in a warm place.

**Power shift transmission operation in winter**

- At temperatures  $0... -35\text{ }^{\circ}\text{C}$ , use oil sump preheater. At temperatures below  $-15\text{ }^{\circ}\text{C}... -55\text{ }^{\circ}\text{C}$ , use oil sump preheater and MIL-L-46167 and MIL-L-46167 A oils.



**4.4.2. HIGH AMBIENT TEMPERATURE, HIGH ALTITUDE**

- As the altitude and ambient temperature rise, the density of the air tends to decrease, which affects the maximum power output of the engine, the exhaust gas quality and, in extreme cases, the starting behavior. Under transient conditions, the engine can be used at altitudes up to 1000 meters /3400 feet and temperatures up to 30 °C.

If the engine is to operate under more severe conditions (at higher altitudes or temperatures), it will be necessary to reduce the injected fuel quantity and, thus, engine power.

- If you have any doubts about engine operation under these or similar conditions, ask your engine or equipment supplier whether the engine has been derated in the interests of reliability, service life and exhaust gas quality (smoke). Otherwise, contact the nearest service representative.

**Power shift transmission operation in high ambient temperature, dusty atmospheric conditions**

- Normal drain periods and filter change intervals are for average environmental and duty-cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination. For extreme conditions judgment must be used to determine the required intervals.

**Effect of environmental conditions on vehicle's electrical equipment**

- The rise of temperature reduces current-carrying capacity of cables and rated output of electric motors.
- The rated output of electric motors reduces if the work site is above 1000 m of sea level.
- The effect of humidity is condensation of water to housing of electrical equipment. Therefore it is important to make sure that the water removal holes at the bottom of housings are open.
- Sand and dust can change contact and creepresistance, impair movement of moving parts and reduce cooling of electrical equipment. Clean the electric equipment from sand and dust everytime it's needed.

**4.5. ENGINE PRESERVATION****Preservation**

If the engine is to remain idle for an extended period of time, it is necessary to take protective measures to prevent rust formation. The preservative measures described here will protect the engine for up to 6 months. The procedure will have to be reversed before the engine is recommissioned.

- Anti-corrosion oils to specification:
  - MIL-L-21260B
  - TL 9150-037/2
  - NATO code C 640/642
- Recommended cleansing agent to remove preservatives when recommissioning engine:
  - Petroleum benzine (hazardous materials class A3)

**Preserving Engine:**

- Clean engine (with cold cleansing agent if preferred).
- Run engine until warm, then turn off.
- Drain engine oil and fill with anticorrosion oil.
- Drain coolant.
- Fill with anti-corrosion agent.
- If necessary, clean oil bath air cleaner and fill with anti-corrosion oil.
- Drain fuel tank.
- Make up a mixture of 90% diesel fuel and 10% anti-corrosion oil, and refill fuel tank.
- Run engine for about 10 minutes.
- Turn engine off.
- Turn engine over manually several times.
- If using starter, set shutdown lever to stop position.
- Remove V-belts and store in wrapped condition.
- Spray grooves of V-belt pulleys 2 with anticorrosion agent.
- Close off intake ports and exhaust ports.
- Lightly grease and replace coolant filler.
- Drain anti-corrosion agent.

**Removing Engine Preservatives:**

- Remove anti-corrosion agent from grooves in V-belt pulleys.
- Install V-belts. Retension after brief operation is necessary.
- Remove covers from intake port 3 and exhaust port.
- Fill with coolant.
- Start engine.

