Perforadora hidráulica

Hydraulic drilling rig

MYM-C5

MECANIZACIÓN Y MINERÍA, S.A.

Perforadora hidráulica
Drilling Rig

MYM-C5

Versión Top Hammer.

Versión Rotary.

Versión Rotary.

Aplicaciones
Applications

MYM-C5

KRUPP HB 30 A
KRUPP HB 35 A

La MYM-C5 es una máquina versátil capaz de obtener elevados rendimientos en los siguientes campos de aplicación:

- Micropilotes
- Perforación de anclajes
- Perforación de pozos de agua
- Investigación de terrenos
- Perforación para geotermia

Está clasificada como una perforadora con power pack separado para utilización en espacios reducidos con altura limitada.

La MYM-C5 ha sido proyectada y fabricada teniendo en cuenta la seguridad del operador por lo que está dotada de todos los dispositivos necesarios de acuerdo con la norma ISO 9001 respetando los requisitos esenciales de seguridad en el trabajo.

La perforadora cumple con la normativa CE aplicable a este tipo de equipos.

CR 300
CR 600

The MYM-C5 it is a versatile machine able to obtain high performances in the following applications:

- Micropiling
- Anchoring
- Water well drilling
- Soil investigation
- Geothermal drilling

It is clasified as a separate power pack drilling rig to be used at low room job sites.

The MYM-C5 has being designed and manufactured taking in mind operator safety and it is equiped with all necessary systems according to ISO 9001 and esencial safety rules at job site.

Drilling rig it is according CE regulation.

CE Cámara Madrid CC Servicio de Certificación EMPRESA CERTIFICADA ISO 9001 EC - 1.208.0304

Detalles
Details

MYM-C5

Sistema hidráulico de desplazamiento lateral.

Hydraulic system for lateral movement.

Selector de seguridad para las operaciones de perforación y desplazamiento.

Safety lever for drilling and tramming operations.

Soporte del mástil tipo "heavy duty".

"Heavy duty" mast support.

Cabrestante hidráulico.

Hydraulic winch.

Detalles
Details

MYM-C5

Equipada con 4 cilindros estabilizadores para ser utilizados durante las operaciones de perforación.

Equiped with 4 hydraulic jacks to be used during drilling operation.

Engrasador para DTH y línea de barrido aire/agua integrada.

DTH oiler and air/water flushing line integrated.

Extensiones de mástil útiles y soporte de poleas giratorio.

Useful mast extensions and rotative jib.

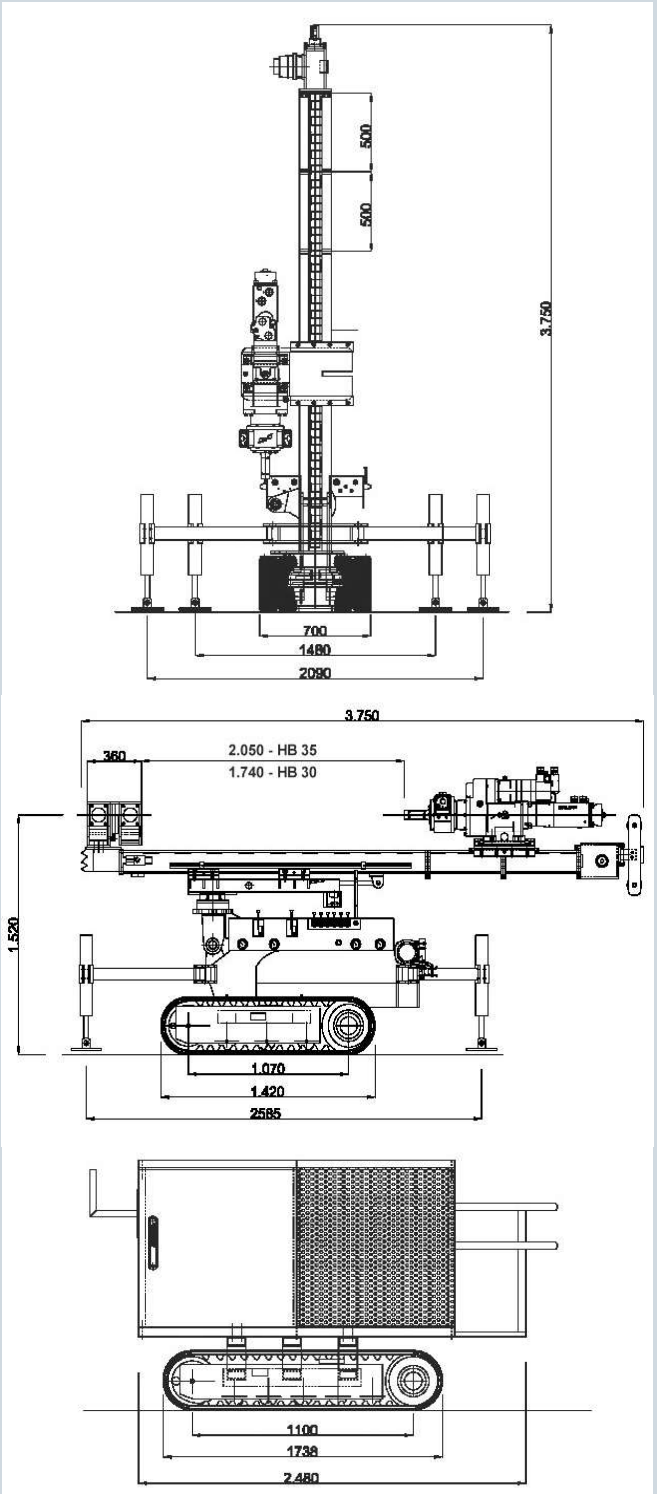
Mordaza hidráulica doble con giro.

Double Hidraulic clamp with breaking device. MD 200

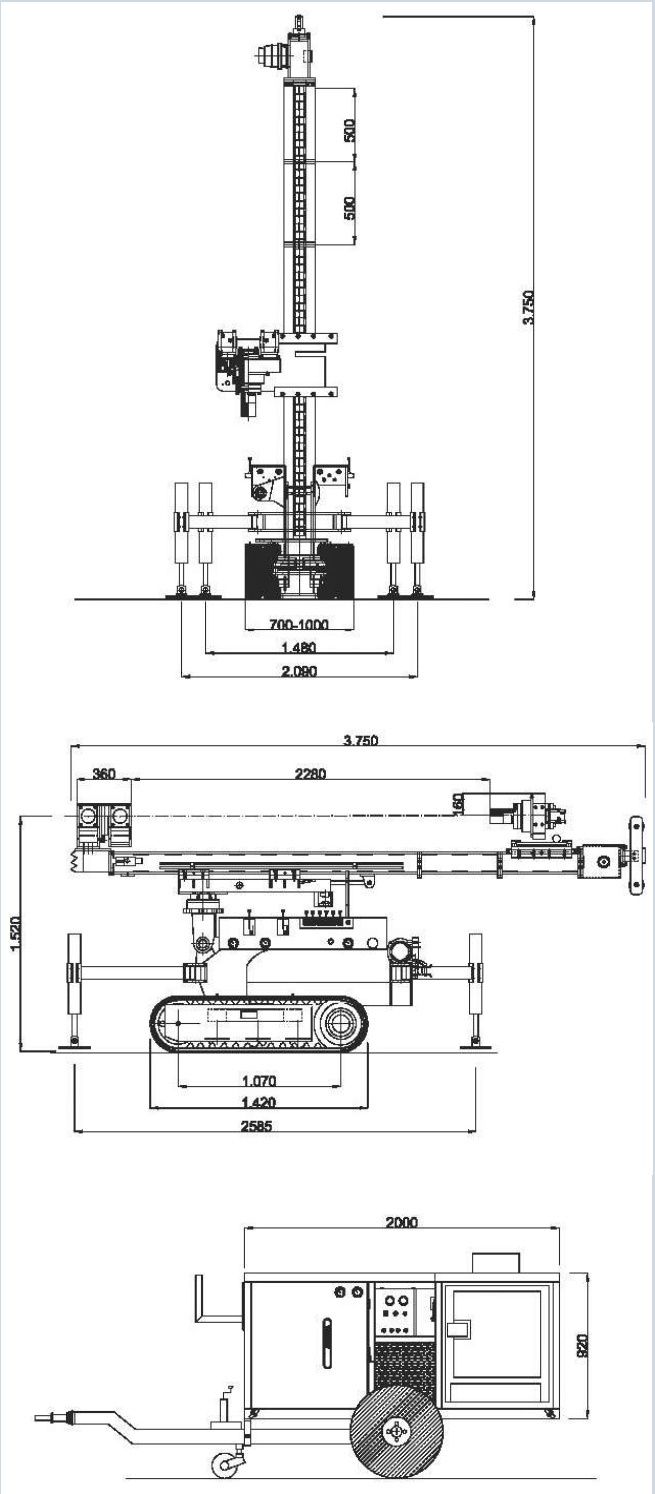
Dimensiones-Transporte
Dimmensions-Transport

MYM-C5

VERSIÓN TOP HAMMER



VERSIÓN ROTARY



Versión Top Hammer		Versión Rotary
1.700 kg.	Peso total de la máquina	1.500 kg.
2.120 Kg.	Peso total del Power Pack	1.050 Kg.

Las especificaciones técnicas de los equipos están sujetas a cambios sin previo aviso. Las máquinas mostradas pueden tener opciones no reflejadas.

Technical specifications may change without prior notice. Drilling rigs could be equiped with other options.

Especificaciones Técnicas
Technical Specifications

MYM-C5

VERSIÓN ROTARY

Power Pack	
Motor diesel	DEUTZ F3L2011
Refrigeración	Aire / Air
Potencia a 2.300rpm	34 kW (46 HP)
Capacidad depósito combustible	55 Litros
Sistema hidráulico	
Bombas hidráulicas	2 Bombas
Principal	70 l/min
Secundaria	25 l/min
Presión de trabajo 180 bar	180 bar
Capacidad del depósito hidráulico	189 l
Insonorización	75 dB
Carro base de la máquina	
Tipo de orugas	Extensible
Fuerza de arrastre de orugas	2.500 kg
Velocidad de desplazamiento	2.5 km/h
Presión sobre el suelo	0,449 kg/cm^2
Anchura total del carro base	700 a 1.000 mm
Ancho de tejas	230 mm
Longitud de orugas	1.420 mm
Altura sobre el suelo	350 mm
Mástil de perforación	**CR 600**
Tipo	Reforzado
Par máximo	580 kg/m
Velocidad rotación máxima	140 r.p.m.
Longitud total del mástil	2.640 mm
Longitud de avance	1.295 mm
Fuerza de avance	3.000 kg
Fuerza de retracción	3.000 kg
Velocidad de avance/retracción	10 cm/s
Velocidad rápida avance/retracción	12 cm/s
Mordaza	
Tipo	Doble 70 – 200
Peso	
Peso de la máquina	1.500 Kg
Peso del power pack	1.050 Kg

VERSIÓN TOP HAMMER

	Power Pack
DEUTZ BF4M 2012	Diesel engine
Agua / Water	Cooling system
74.9 kW (100 HP)	Power rated at 2.000 r.p.m.
100 Litros	Fuel tank capacity
	Hydraulic system
3 Bombas	Hydraulic pumps
90+90 l/min	Main
25 l/min	Secundary
180 bar	Operating pressure
189 l	Hydraulic tamo capacity
75 dB	Sound proofing cover
	Machine crawler base
Extensible	Crawler type
2.500 kg	Towing force (crawlers)
2.5 km/h	Travel speed
0,508 kg/cm^2	Ground pressure
700 a 1.000 mm	Overall Width
230 mm	Track Width
1.420 mm	Tracks length
350 mm	Ground clearance
HB 35 A	**Drilling mast**
Reforzado	Type
415 kg/m	Max. Torque
115 r.p.m.	Max. Speed
2.640 mm	Total length (mast)
1.295 mm	Feed length
3.000 kg	Feed force
3.000 kg	Retracction force
10 cm/s	Feed / retraction (speed)
12 cm/s	Feed / retraction (fast speed)
	Clamps
Doble 70 – 200	Type
	Weight
1.700 Kg	Machine weight
2.120 Kg	Power pack weight

Perforadora hidráulica

Hydraulic drilling rig

MYM-C5

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USER MANUAL

TABLE OF CONTENTS

1.- GENERAL INFORMATION

This instructions manual refers to the MYM-C5 drilling rig and users must keep it in a safe, protected place for easy consultation.

The MYM-C5 drilling equipment has been designed and manufactured in compliance with all safety requirements in order to guarantee its reliability and correct operation throughout time if used for its intended purpose.

All structural, connection and control elements have been designed with such a level of safety that they are capable of resisting stress and, in any case, higher than the safety levels indicated in this manual. Materials of the highest quality have been used and their arrival at the factory, storage and use in the workshop is constantly controlled in order to guarantee that they are not damaged, deteriorated or incorrectly handled.

Never use the machine or perform any task on it without first having read and understood all the sections of this manual.

All precautions and safety measures indicated in the safety regulations section must be fulfilled.

We may not accept any liability for damages or consequences that may arise from the undue use or deficient handling of the **MYM-C5 drilling equipment**.

IMPORTANT

DO NOT HANDLE, ALTER OR MODIFY, EVEN PARTIALLY, ANY ELEMENTS OR THE EQUIPMENT OBJECT OF THIS MANUAL, ESPECIALLY ANY SAFETY GUARDS.

DO NOT USE DIFFERENTLY TO WHAT IS INDICATED HEREIN OR NEGLECT NECESSARY SAFETY OPERATIONS.

If you should require further information, our technical service department will be happy to provide advice and instructions.

MECANIZACIÓN Y MINERÍA, S.A.

C/ Pelaya, 33

28110 ALGETE (Madrid), Spain

2.- GENERAL SAFETY INSTRUCTIONS

Important instructions that refer to the technical safety and to the protection of operators.

1. Read all service and maintenance instructions carefully before starting-up the machine.
   Make sure you have read and understood these instructions and that you have any additional instructions on any special equipment installed on your machine.

2. Only expressly authorised people may operate the machine, perform maintenance tasks or repair it.
   Take into account any minimum legal age.

3. Only work with well-trained personnel; clearly define operation, equipment, maintenance and conservation responsibilities.

4. Establish the responsibilities of the machine operator (also concerning legal traffic regulations) and allow him to reject instructions from third parties that may lead to any type of risk.

5. Only allow informed, trained personnel or staff included in the general instructions framework to work with the machine under the supervision of experienced personnel.

6. Control, at least occasionally, the work performed by the operators concerning safety and risks based on service instructions.

7. Always wear appropriate working garments when working with or on the machine.

   - Avoid the use of rings, wrist-watches, ties, scarves, open jackets, loose clothing….
   - Certain jobs require the use of safety goggles, safety footwear, work gloves, waistcoats with reflective bands, ear protections…..

8. Unless otherwise instructed, perform maintenance and repair work as follows:

   - Park the machine on firm, level ground and place the working equipment on the ground.
   - Place all control levers in neutral position.
   - Switch off the engine, remove the ignition key and the main battery key.

9. Secure all loose parts of the machine.

10. Never use a machine that has not gone through a detailed inspection process and verify that no warning plaques are missing and that they are legible.

11. It is obligatory to observe all plaques that include risk or safety indications.

12. For special uses, the machine must be equipped with specific safety elements. Only operate the machine in these cases when the said elements have been installed and are ready to be used.

13. Do not alter or modify the machine without the supplier's authorisation. The same applies to the assembly and adjustment of the installations, safety valves and the welding on structural elements.

14. Do not work underneath the equipment unless it is firmly on the ground or supported.

15. Under service conditions, the motor oil and hydraulic fluid are hot. Avoid contact of the skin with hot oil or with parts through which oil flows.

16. Use protection goggles and work gloves when handling the battery. Avoid sparks or bare flames.

17. After every operation performed in the engine compartment, place, fix and secure the relevant engine covers.

18. Before starting-up the machine, close and secure the engine and battery covers.

19. When refuelling, the engine must be switched off.

20. Do not smoke and avoid bare flames when refuelling or when recharging the batteries.

21. Follow service instructions when starting-up the engine.

22. Check the electrical installation. Immediately repair any defects, such as loose connections, damaged wires, lamps or burnt fuses.

23. Do not transport any flammable liquid, except the relevant fuel tanks, with the equipment.

24. Regularly check all tubes, sleeves and couplings for leaks or damage. Immediately repair leaks or change damaged elements. Oil leaks may easily cause burns.

25. Make sure all supports and shields used to prevent vibrations, friction and the concentration of heat have been installed in accordance with regulations.

26. Carefully read the handling and location instructions of fire extinguishers and obtain local information on how to inform on and fight fires.

3.- TECHNICAL SPECIFICATIONS

3.1.- MYM-C5 Rotary Technical Specifications

Figure 3.1: MYM-C5 ROTARY drilling rig

Figure 3.2: MYM-C5 ROTARY rig Power Pack

- Main equipment components

Power Pack

1. Diesel engine
2. Heat exchanger
3. Diesel engine accelerator
4. Start-up electric panel
5. Pipe support
6. Hydraulic fluid level indicator
7. Elevation rings
8. Tow wheel
9. Tow ring

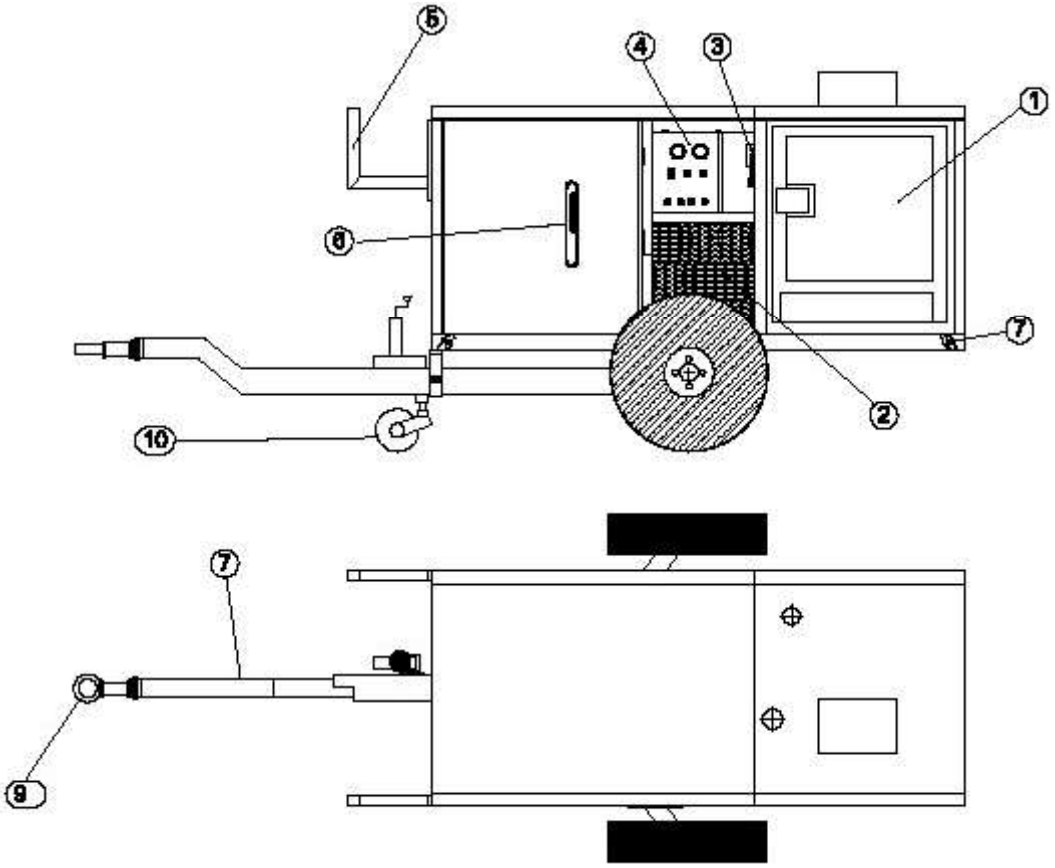


Figure 3.3. Rotary Power Pack Components

Drilling Rig

1. Rubber caterpillar truck
2. Bridge structure
3. Rotating structure
4. Drilling mast
5. Reduction gear
6. Rotating head
7. Clamp assembly
8. Winch
9. Regulating valve
10. Pulley assembly
11. Transmission
12. Stabilising jacks
13. Pressure gauges
14. Cylinder distributor
15. Rotary distributor
16. Advance distributor
17. Selection valve
18. Caterpillar distributor
19. Lubricator
20. Advance chain
21. Mast approximation structure
22. Tow hook
23. Side movement
24. Front clamp
25. Approximation cylinder
26. Front pulley shackles
27. Side movement cylinder

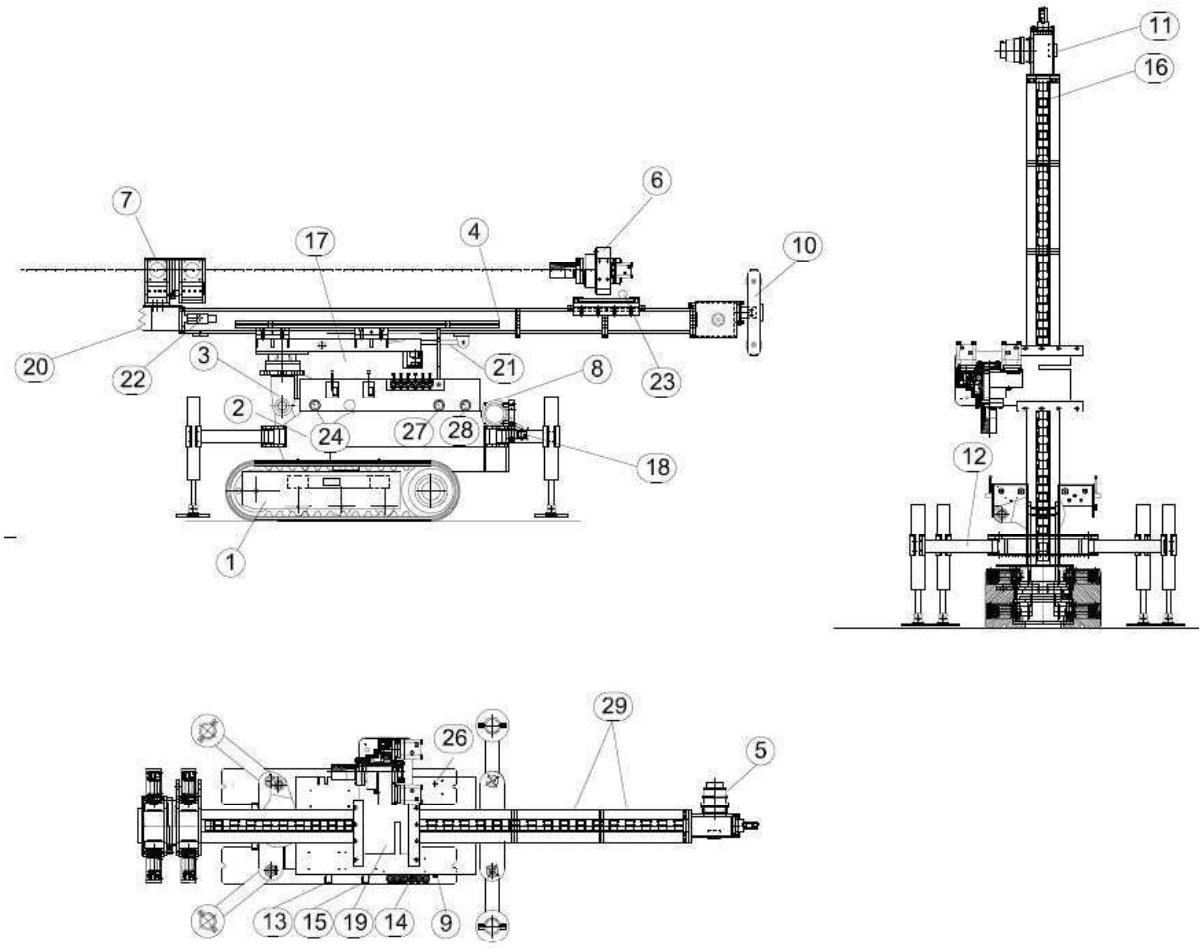


Figure 3.4: Rotary Drilling Rig Components

- **Dimensions**

Drilling Rig dimensions have been indicated in figures 3.3 and 3.4.

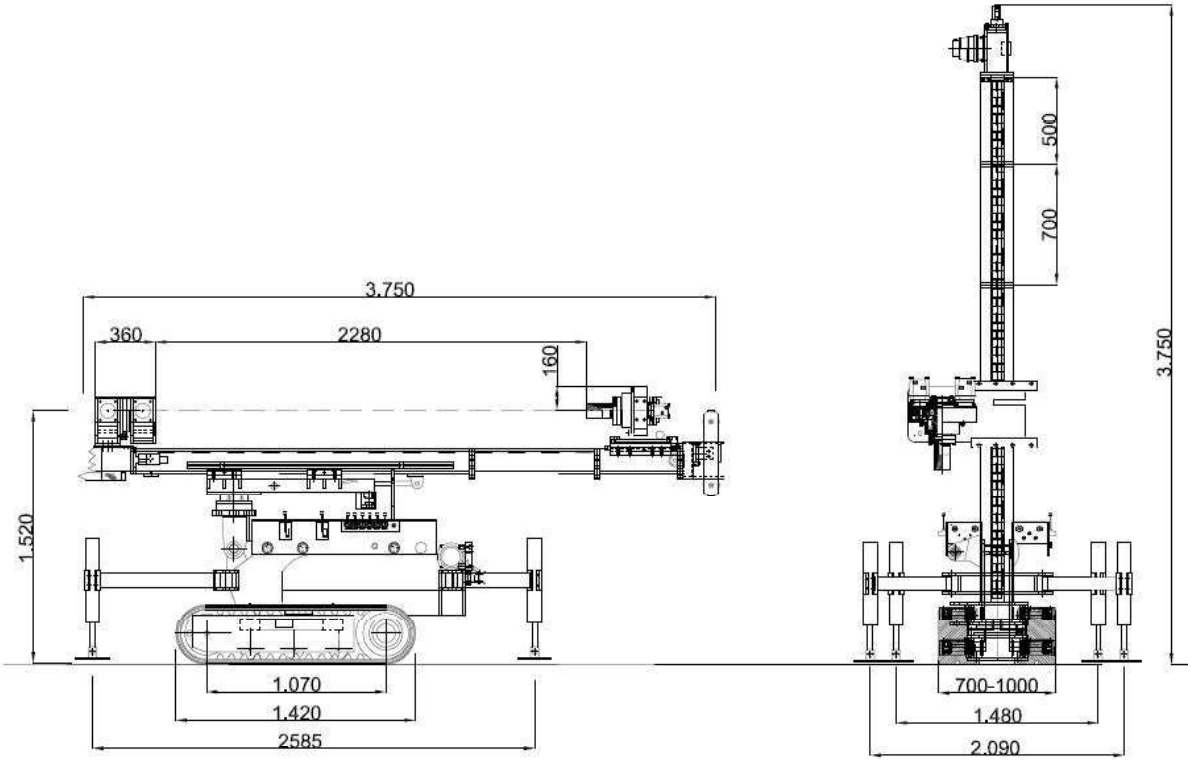


Figure 3.5: Rotary Drilling Rig Dimensions (in mm.)

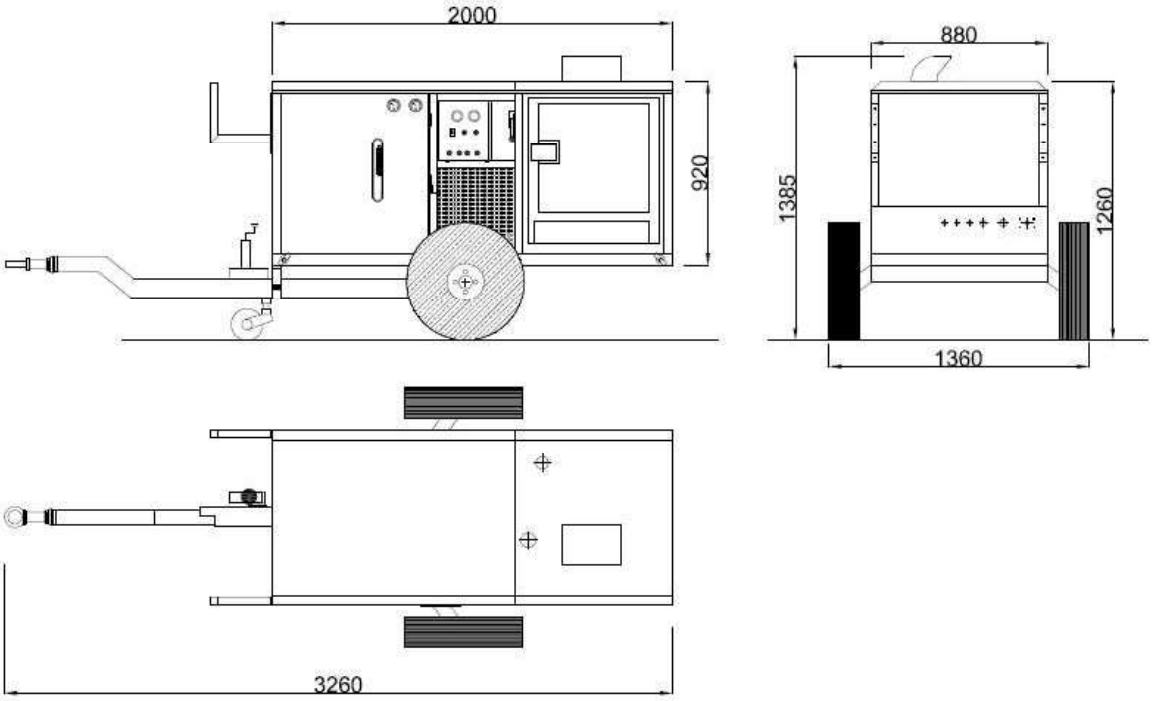


Figure 3.6: Rotary Power Pack Dimensions (in mm.)

3.2.- MYM-C5 Top Hammer Technical Specifications

Figure 3.7: MYM-C5 Top Hammer Drilling Rig

- **Main equipment components**

  - **Power Pack**

1. Diesel engine
2. Heat exchanger
3. Pipe support
4. Hydraulic fluid level indicator
5. Travel cockpit
6. Caterpillar controls
7. Accelerator
8. Bushing
9. Metal caterpillar tracks

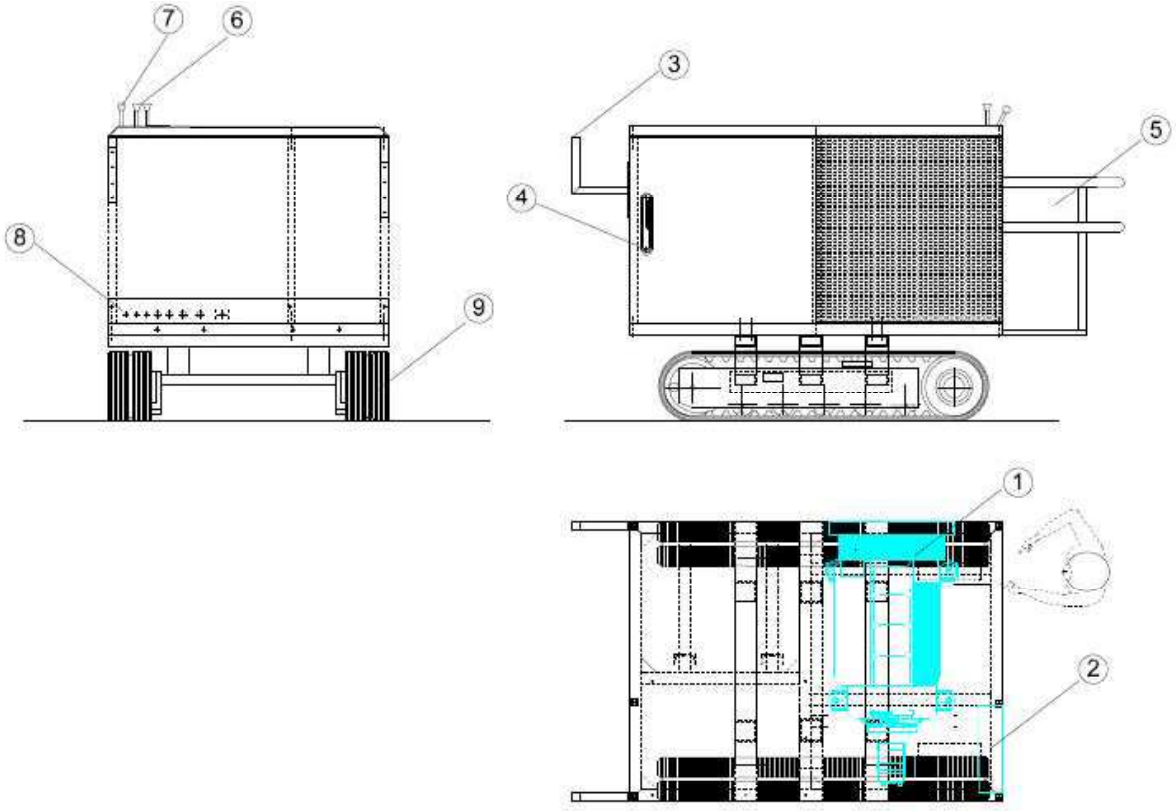


Figure 3.8: Top Hammer Drilling Rig Components

Drilling Rig

1. Rubber caterpillar truck
2. Bridge structure
3. Rotating structure
4. Drilling mast
5. Reduction gear
6. Hydraulic hammer
7. Clamp assembly
8. Winch
9. Regulating valve
10. Pulley assembly
11. Transmission
12. Stabilising jacks
13. Hammer distributor
14. Cylinder distributor
15. Rotary distributor
16. Advance chain
17. Approximation structure
18. Tow hook
19. Side movement
20. Front clamp
21. Approximation cylinder
22. Front pulley shackles
23. Side movement cylinder
24. Hammer gauge
25. Rotation gauge
26. Emergency shut-down
27. Advance pressure meter
28. Sweep meter
29. Extensions

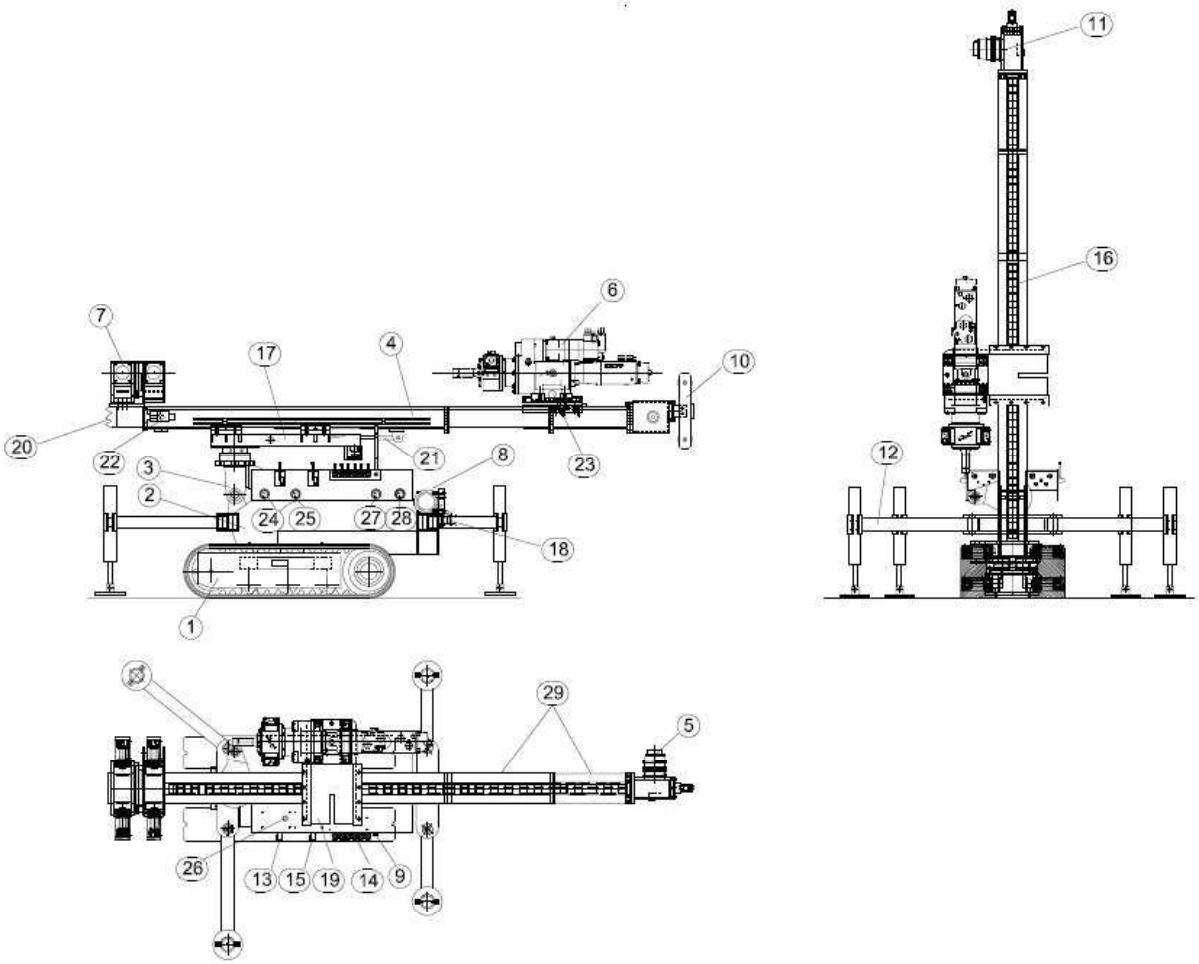


Figure 3.: Top Hammer Drilling Rig Components

- **Dimensions**

Drilling Rig dimensions have been indicated in *figures 3.10 and 3.11.*

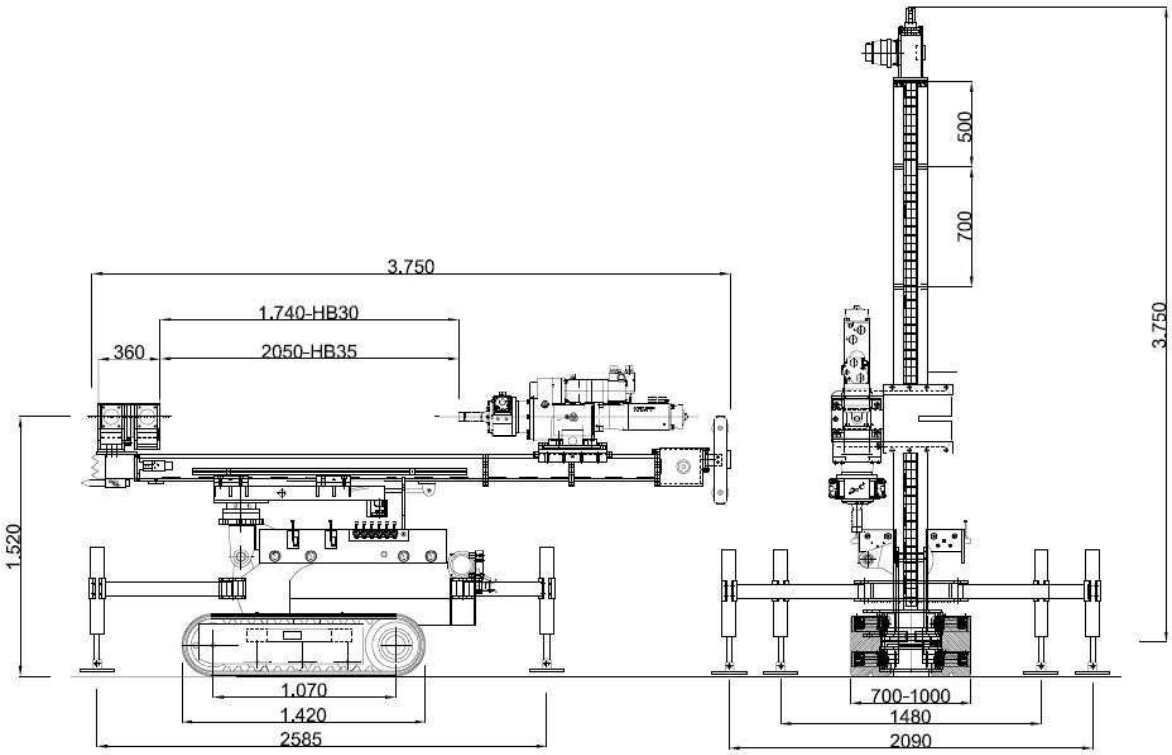


Figure 3.10: Top Hammer Drilling Rig Dimensions (in mm.)

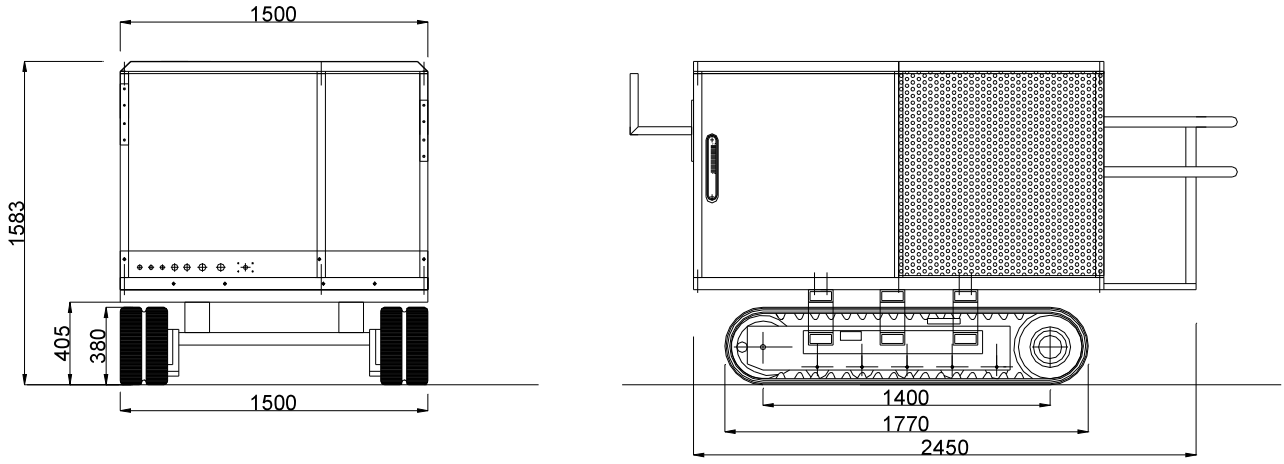


Figure 3.11: Top Hammer Power Pack Dimensions (in mm.)

3.3.- Machine Technical Specifications

Technical Specifications		
	Rotary	**Top Hammer**
Width of Caterpillar truck (mm)	700 – 1000	700 – 1000
Width of Caterpillar tracks (mm)	230	230
Length of Caterpillar tracks (mm)	1420	1420
Width of Power Pack Caterpillar Truck (mm)		1500
Width of Power Pack Caterpillar Tracks (mm)		230
Length of Power Pack Caterpillar tracks (mm)		1770
Speed (km)	0 – 2.5	0 – 2.5
Pressure on ground (kg/cm^2)	0.451	0.451
Pressure on ground – Power Pack (kg/cm^2)		0.638
Noise level (dB(A))	89	89
Motor (kW)	DeutzF3L2011(34)	DeutzF3L2011(34)
Mast length (mm)		3750
Length of mast extensions (mm)		500
Travel (mm)	2280 approx.	2050 – HB 35 1740 – HB 30
Extraction power (kg)	2500	2500
Double clamp (mm)	Ø70 – Ø200	Ø70 – Ø200
Drilling tool	CR 600	HB 35A
Maximum torque (kg/m)	580	415
Maximum rotation speed (rpm)	140	115
Weight of drilling rig (kg)	1550 kg	1700 kg
Weight of power pack (kg)	1050 kg	2120 kg

- **Power Pack Specifications**

The Power Pack comprises a fully covered truck that houses the diesel engine, the hydraulic pump, the fuel tank, the hydraulic fluid tank and the hydraulic radiator apart from the Power Pack structural elements.

The Power Pack complies with safety regulations and includes a 3 kg fire extinguisher.

- **Diesel Engine**

	Rotary	Top Hammer
Model	DEUTZ F3L2011	DEUTZ BFM4M2012
Maximum power	34 kW (46 HP) at 2500 rpm.	74.9 kW (102 HP) at 2500 rpm.
Type of refrigeration	Oil	Water
Specific fuel consumption	218 g/kWh	208 g/kWh (at 1500 rpm).
Weight – DIN 70020	216 kg.	391 kg.

- **Rotary Hydraulic Pumps**

70 LITRE PUMP	
Cubic capacity	34.39 cc/rev
Minimum speed	400 rpm
Maximum speed	3000 rpm
Operational pressure	270 bar
Weight	16.80 kg

25 LITRE PUMP	
Cubic capacity	14.40 cc/rev
Minimum speed	500 rpm
Maximum speed	3500 rpm
Operational pressure	260 bar
Weight	4.15 kg

- **Top Hammer Hydraulic Pumps**

90 + 90 Litre Double Pump	
Cubic capacity	40 cc/rev
Minimum speed	900 rpm
Maximum speed	2500 rpm
Operational pressure	270 bar
Weight	41 kg

25 LITRE PUMP	
Cubic capacity	14.40 cc/rev
Minimum speed	500 rpm
Maximum speed	3500 rpm
Operational pressure	260 bar
Weight	4.15 kg

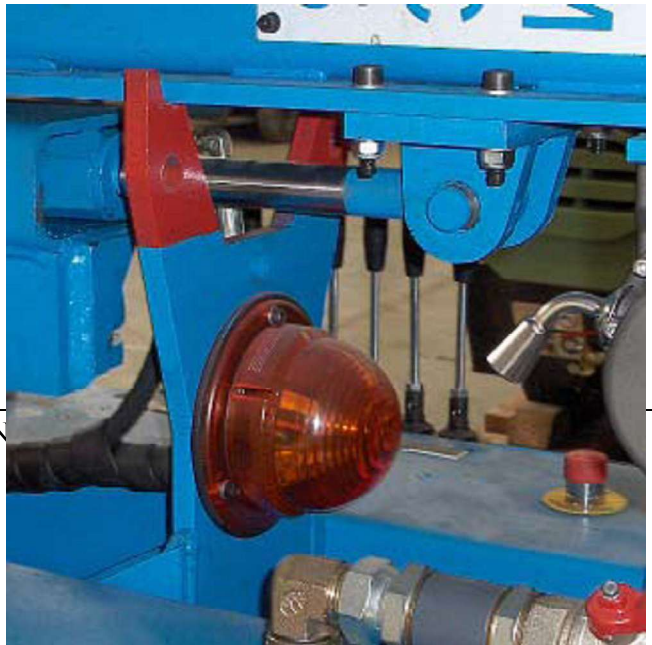
- **Drilling equipement specifications**

  - **Caterpillar truck**

This is a truck that uses non-oscillating rubber caterpillar tracks, i.e., they are joined by a fixed axle. The width of the tracks varies from 700 to 1000 mm.

This truck is joined to the Power Pack by means of a tow bar and travels at a top speed of 4.6 km/h. The truck features four hydraulic stabilising jacks: two at the front and two at the back.

For safety reasons, the truck also includes a warning light that flashes when the engine is running, as well as an acoustic signal that sounds whenever the equipment is moving.



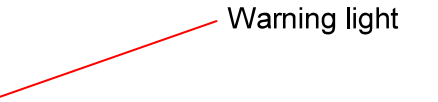


Figure 3.12: Mast support

- **Drilling mast**

The machine's mast can be adjusted to two levels and, together with the rotating mechanism and the mast arm-transporter, can be aligned vertically or horizontally,

which is extremely useful when placed in areas with limited access, such as corners or gateways.

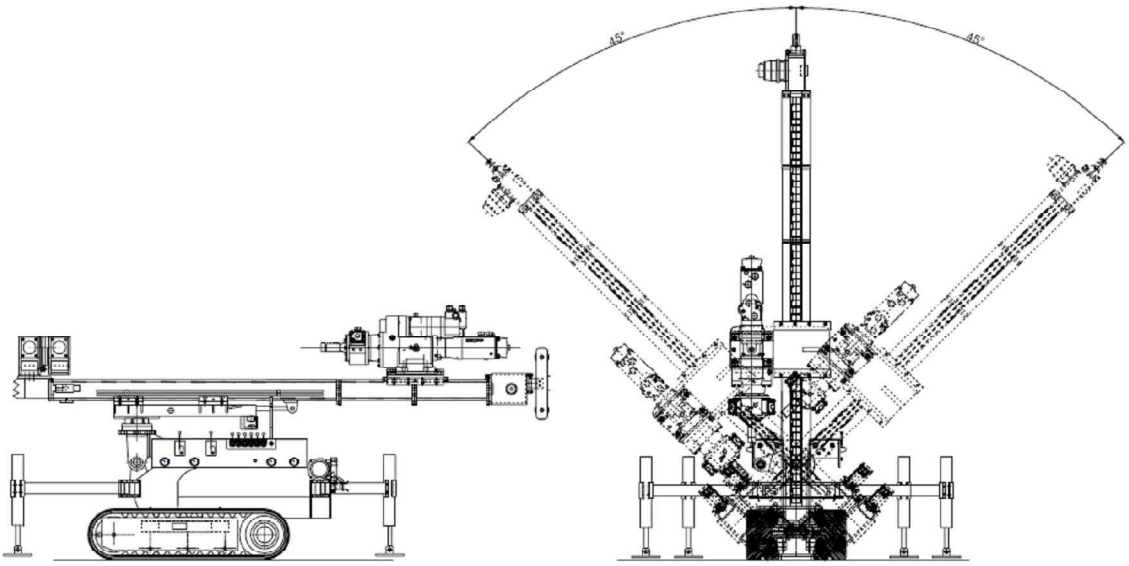
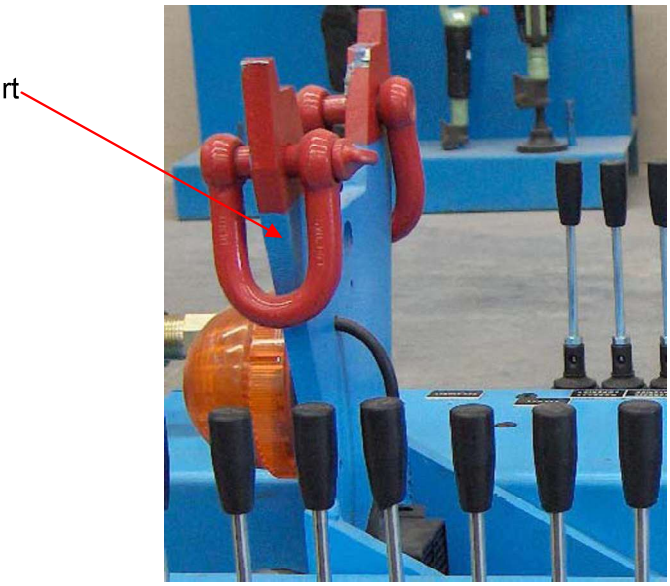


Figure 3.13: Positioning the drilling mast

When the mast is in it travel position, it must rest on the support located on the truck platform as indicated in Figure 3.9.



The back part of the mast houses the advance motor with the differential and hydraulic brakes.

The rotating section or top hammer (rotation motor, axle, adaptor…) are mounted on a chariot guide moved by a chain. The drilling tool includes a hydraulic cylinder for side movements in order to be able to work with the winch.

IMPORTANT

When moving, the mast must be placed horizontally and fixed to its support.

Mast	A
Length	3500 mm approx.
Rotation head travel	2280 mm approx.
Hammer travel	HB – 35 2050 mm approx. HB – 30 1740 mm approx.

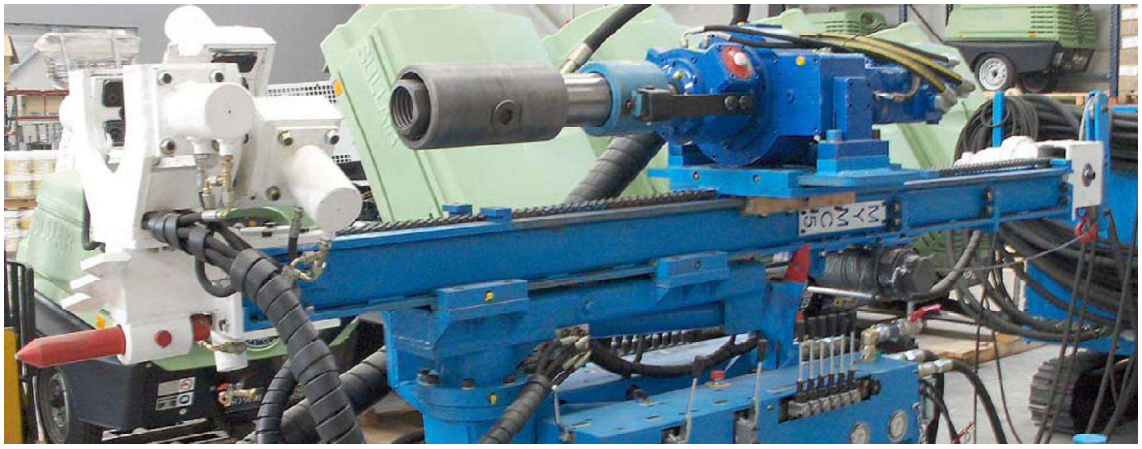


Figura 3.15: Drilling Mast

The gear housing is joined to the drilling mast by means of a bolted plate; the mast can be lengthened by adding a pad between the gear housing and the mast.

- **CR600 Rotation Head Specifications**

Cubic capacity	335 cc
Maximum torque	300 kg.m
Top speed	200 rpm
Lubricating oil	S 220
Weight	120 kg.

Figura 3.16: Rotaty Head

- **Hydraulic Hammer Specifications**

  The hammer is installed on the chariot, which features a hydraulic cylinder and guides so that it can be moved to one side when the winch is used.

HB 30 A	
Blows per minute	1800 min^{-1}
Maximum torque	484.6 kg.m
Top speed	214 rpm
Weight	300 kg.

HB 35	
Blows per minute	1800 min^{-1}
Maximum torque	415 kg.m
Top speed	115 rpm
Weight	335 kg.

* See manufacture manual

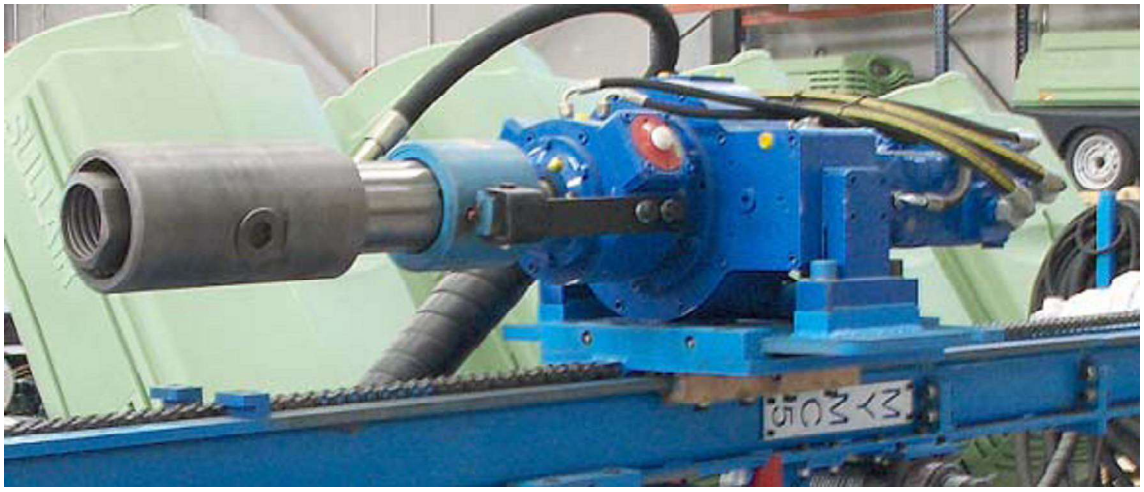


Figure 3.18: Hydraulic Hammer

- **Advance Gears**

The advance gears include a reducer (1), a hydraulic motor (2) and hydraulic brakes (3).

Cubic capacity	162.2 cc
Flow	25 l/min
Outflow speed	23 rpm
Brake torque	430 Nm
Max. extraction speed	12 cm/s
Maximum torque	2880 Nm
Reducer fluid	S 150

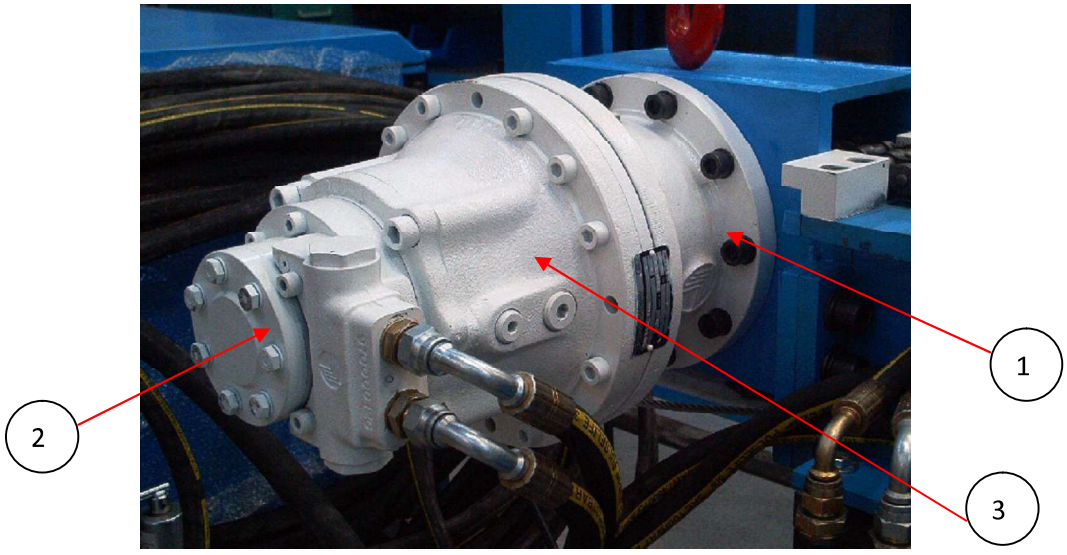


Figure 3.19: Advance reducer

- **Winch**

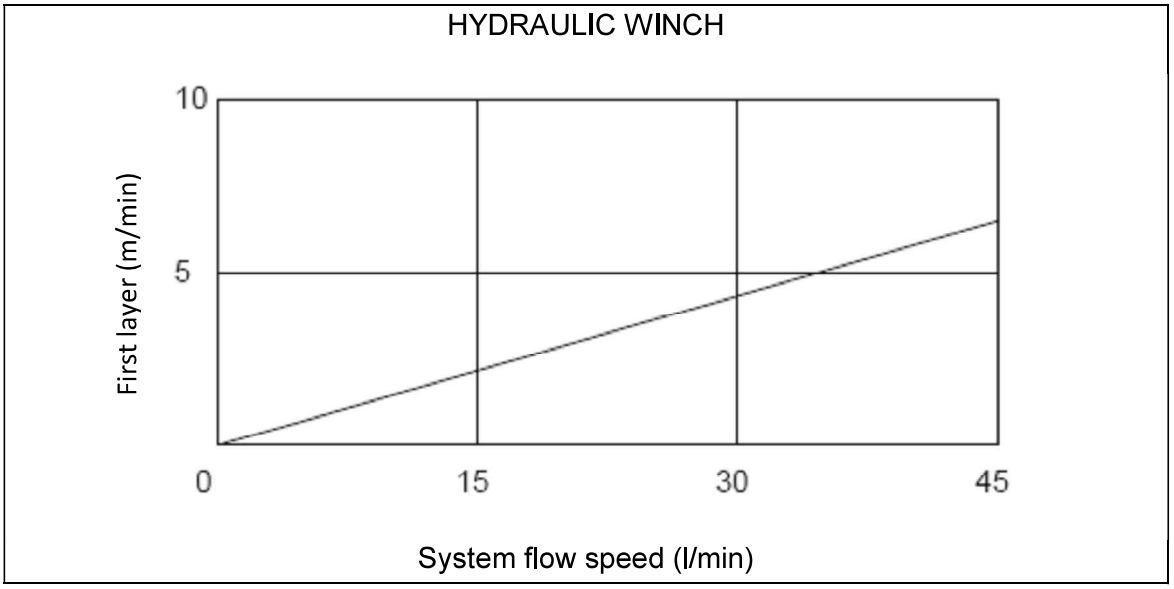
The drilling rig features a hydraulic winch located at the lower rear of the mast as well as a set of pulleys located on the back of the mast.

Figure 3.20: Hydraulic Winch

Operating the winch without observing the following safety measures may lead to injuries or to damage to property. Read and understand all operational instructions and safety measures before using the winch.

- Do not exceed the capacity of the extraction line displayed on the identification label.
- Do not exceed the maximum capacity of the metal cable being used.
- This winch has **not** been designed or intended to lift equipment or to transport people.
- The free clutch is only intended for use when the winch cable is being retrieved manually. If the winch is in free clutch mode, the use of the clutch may damage the winch or lead to serious personal injuries.
- These winches are designed for intermittent use.
- The overheating of the mechanical brake may lead to permanent damage or failures of the system. Replace any damaged brake component before using the winch.

Max work load, first layer	2700 kg
Brake strength of lift, first layer	5400+kg
Max. recommended diameter of metal cable	8 mm
Approximate weight of clutch	18 kg



- **Double clamps**

This assembly if formed by a fixed retaining body on the front of the mast attached by means of bolts.

The said retaining body includes 2 hydraulic cylinders, 2 holders and 4 clamps.

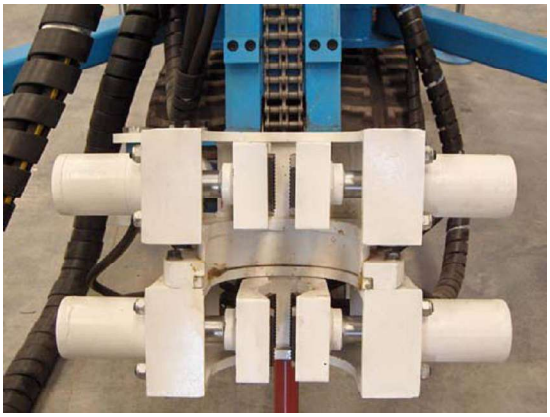
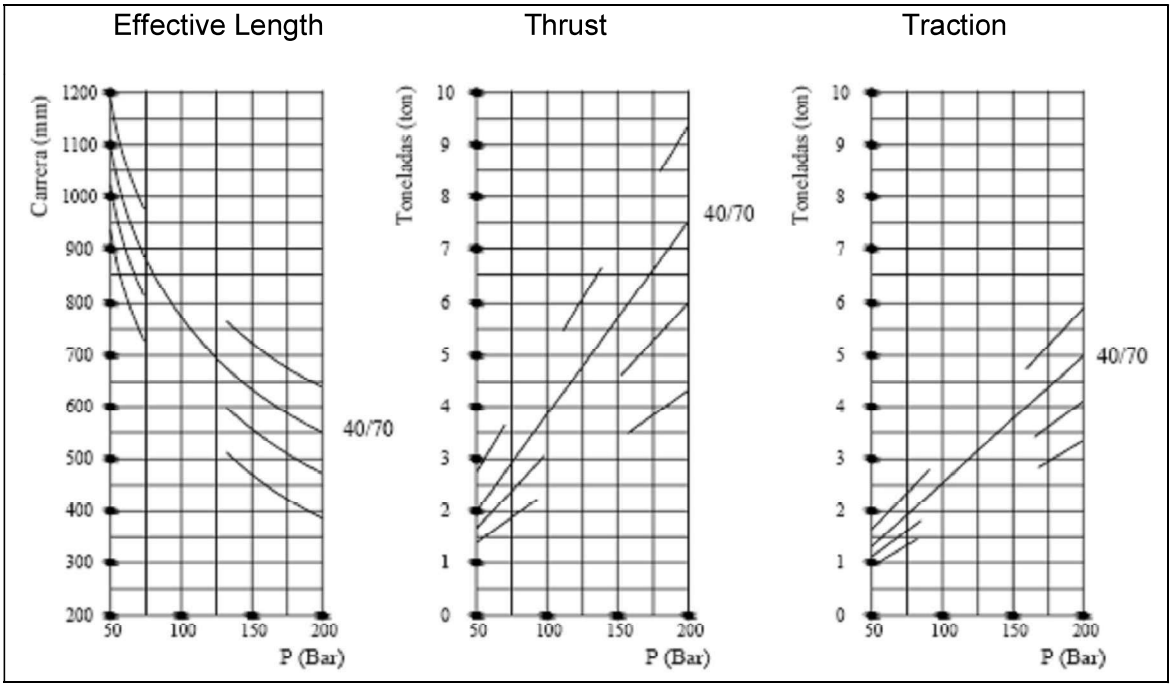


Figure 3.21: Double clamp assembly

Diameter	Ø 70 mm – Ø 180 mm
Work pressure	120 bar
Effective length	600 mm travel
Thrust power	480 kN
Traction power	400 kN



3.4.- Specifications of Fluids Used

The following tables refer to the basic machine and to the rotation head and provide the type and brand of the fluids (fuel, oil, grease…) used by MECANIZACIÓN Y MINERÍA, S.A. on the machine originally and that have been designed for a temperature range between -10º and +40º C.

BASIC MACHINE

COMPARTMENT OR SYSTEM	TYPE OF FLUID
Hydraulic installation	CEPSA HV 46
Greasing nipples in general Cable lubrication	GR MU EP2 FIN 332 F
Lubrication of uncovered cogs	FIN 332 F
Diesel engine	CEPSA TURBODIESEL 15W40
Fuel tank	-
Hydraulic fluid tank	CEPSA HV 46

DRILLING TOOL

COMPARTMENT OR SYSTEM	TYPE OF FLUID
Greasing of bar guides	GR MU EP2
Greasing of drilling tool and assembly	GR MU EP2

ADVANCE REDUCER

COMPARTMENT OR SYSTEM	TYPE OF FLUID
Reducer	S 150

Fluid data tables

The tables indicate the features of the type of lubricant used and that must be used on the machine. Other types of lubricants with different specifications can be considered for specific situations / conditions after having consulted MECANIZACIÓN Y MINERÍA, S.A.

A	**HV 46**	**OIL**
Specifications		
Viscosity at 40ºC	mm^2/s	45
Viscosity at 100ºC	mm^2/s	8.3
Viscosity index		164
Flash point V.A.	ºC	215
Flow point	ºC	-36
Density at 15ºC	kg/l	0.870

B	**15W-40**	**OIL**
Specifications		
Viscosity at 40ºC	mm^2/s	13.7
Viscosity at 100ºC	mm^2/s	100
Viscosity index		3300
Flash point V.A.	ºC	138
Flow point	ºC	-27
Density at 15ºC	kg/l	0.885

C	**GR MU EP 2**	**GREASE**
Specifications		
NLGI Consistency		2
Penetration	dmm	280
Melting point – ASTM	ºC	185
Oil viscosity 40ºC	mm^2/s	165

D	SAE-90	OIL
Specifications		
SAE Grade		80W-90
Viscosity at 40ºC	mm^2/s	130
Viscosity at 100ºC	mm^2/s	14
Viscosity at -12ºC	mPa.s	
Viscosity at -26ºC	mPa.s	130000
Viscosity index		100
Flash point V.A.	ºC	240
Flow point	ºC	-27
Density at 15ºC	kg/l	0.895

3.5.- Location, Use and Maintenance of Extinguishers

The drilling rig includes a 3 kg. fire extinguisher.

*Figure 3.22:*Fire Extinguisher

Using fire extinguishers

1. Remove the safety pin by pulling the ring.
2. Aim the nozzle at the base of the fire and press the trigger/handle.

ATTENTION: Do not use on elements where electrical voltage exceeds 35,000 V.

Maintenance:

1. Recharge after every total or partial use.
2. Periodically check the pressure gauge.
3. Use original and approved spare parts when performing maintenance operations.

3.6.- Noise Level

- Soundproof machine.
    - Average noise level – **A**(Lwa) = 89 dB(A)
- Measurements performed in accordance with:
    - UNE-EN 791:1996
    - EN 74-102-90

4.- USING THE DRILLING EQUIPMENT

4.1.- Definition of the Machine

- The drilling equipment includes two independent units: the drilling rig and the power pack.
- The Power Pack, totally covered, features a diesel engine, a double hydraulic pump (a single pump in the case of the Top Hammer model), the fuel and hydraulic fluid tanks, electric radiator to cool the hydraulic system, electric panel apart from a number of hydraulic elements such as valves, pipes….
- The drilling rig features a fixed axle caterpillar truck with rubber or steel tracks. This truck includes a sliding plate that houses the advance reducer, the drilling tool, hydraulic winch and clamps. A supplement can be added to the sliding plate to extend its length. The drilling truck includes 4 hydraulic stabilising jacks, 2 at the front and 2 at the rear.
- When travelling, the machine can handle 20º (approximately 36%) slopes. When moving the stabilisation jacks must be retrieved.
- When the machine is in a drilling position, make sure the ground is stable – if it is not, position the jacks appropriately by hand.
- When working in the presence of flammable gas, take all necessary measures to comply with local regulations and legislation.
- In order to avoid injuring people who can not be seen from the control position; before using the machine, the operator must perform a visual inspection around the machine and, if necessary, shout a warning to make sure nobody is in the danger area around the machine.

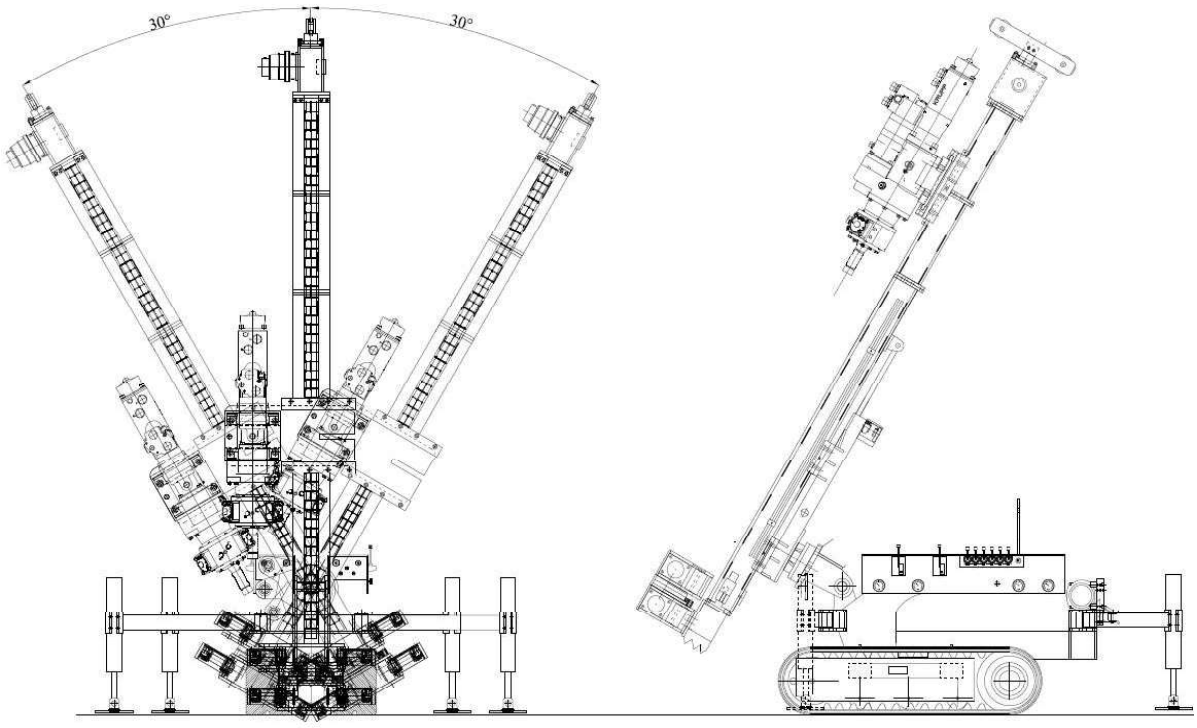


Figure 4.1: Work position

4.2.- Scope of Application

- The **MYM-C5** drilling equipment has been designed to drill using both a rotating-hammer system and a simple rotation system depending on the geological features of the land.

IMPORTANT

When using the hammer, it is essential to place, after the rotating head, an impact dampener depending on the hammer being used.

NEVER USE THE HAMMER WITHOUT A DAMPENER – THIS WOULD CAUSE IRREPARABLE DAMAGE TO THE ROTATION HEAD

Consequently, the drilling rig presents all the requirements to perform small scale engineering jobs, such as draining, small piles, anchoring elements….

IMPORTANT

The basic version does not include a built-in lighting system and, therefore, should not be used in conditions of poor visibility.

IMPORTANT

The machine can work at temperatures between -10ºC and +40ºC.

4.3.- Moving the Machine

- When moving the machine to a work site, always place the mast in a horizontal position resting on the support installed on the chassis and with the four stabilising jacks in transport position.
- Do not transport people on the machine.

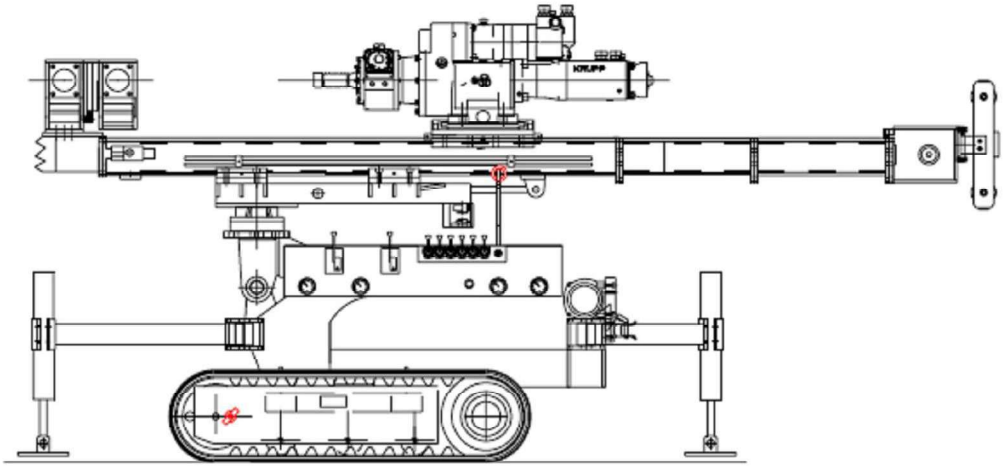


Figure 4.2: Transport position

IMPORTANT

This equipment has not been designed to transport people.

4.4.- Work Conditions

- Work conditions, in the drilling phase, should be on compact ground. For greater stability deploy the hydraulic stabilisers in such a way as to make the drilling rig as stable as possible. (Fig. 4.1).
- The machine, in its basic configuration, is ideal for working on flat surfaces and slopes up to a limit of 20º.
- The parking configuration is displayed in Fig. 4.2.: the machine must be horizontal and the mast placed on its relevant support. We advise deploying the hydraulic jacks for greater stability.
- If the machine has to be moved from one place to another within the work site, the following instructions, at least, must be observed:
  - The mast must be in a horizontal position resting on the axis of the machine on the mast support at the back.
  - The rotation head must be placed in the centre of the sliding plate for greater stability (due to the small size of the drilling truck).
  - For greater safety, it is obligatory to position the 4 stabilising jacks in the transport position.

IMPORTANT

The 45º position must be reached with the drilling tool located half way through the mast travel distance.

IMPORTANT

The term STABILITY is used in accordance with the definition given by the UNE-EN 791:1996 Standard.

4.5.- Operator Positions

The operator will stand at one side or the other of the machine depending on the operations to be performed, i.e., located at the fixed control panel on the left-hand side of the machine when performing drilling operations and at the control panel on the right-hand side of the truck when moving the machine.

For safety reasons, there is a selection valve near the truck's travelling distributor that is used to channel the flow of the pump depending on the function required, travel or drilling and other functions, but never two at the same time.

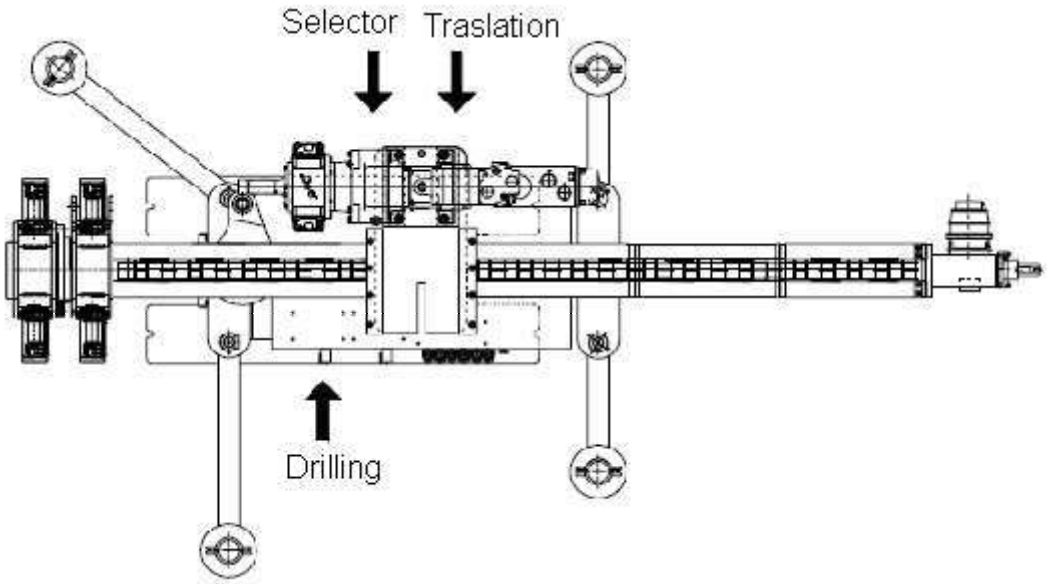


Figure 4.3: Operator Position (Top View)

5.- INSTRUMENTS AND CONTROLS

5.1.- Drilling Rig Control Position

The control position (drilling, winch, hydraulic cylinders, sweeps) is on the left-hand side of the machine.

The control panel for moving the machine is on the right-hand side, as is the “travel-drill” selection valve.

4 way valve CR 600

The rotary head CR600 can to work with 2 speeds, it deepens if you work one or two Charlyn. To changer the speed have to move the lateral key in the rotary

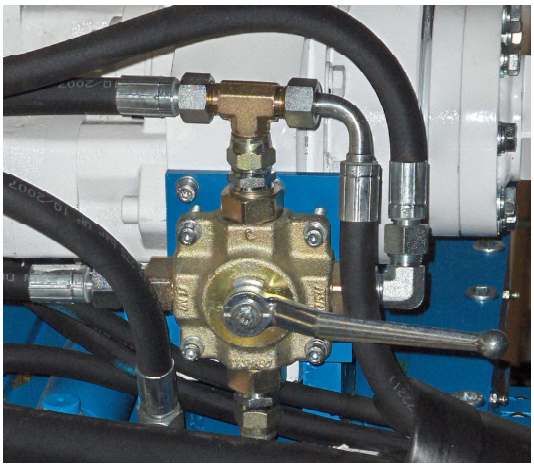


Figure 5.1. Llave de 4 vías CR600

Travel and position distributors

Layout of controls for travel, stabilisation and positioning.

1. Cylinder Nº 1
2. Cylinder Nº. 2
3. Cylinder Nº. 3
4. Caterpillar trucks
5. Stabilising jacks
6. Reverse
7. Track movement

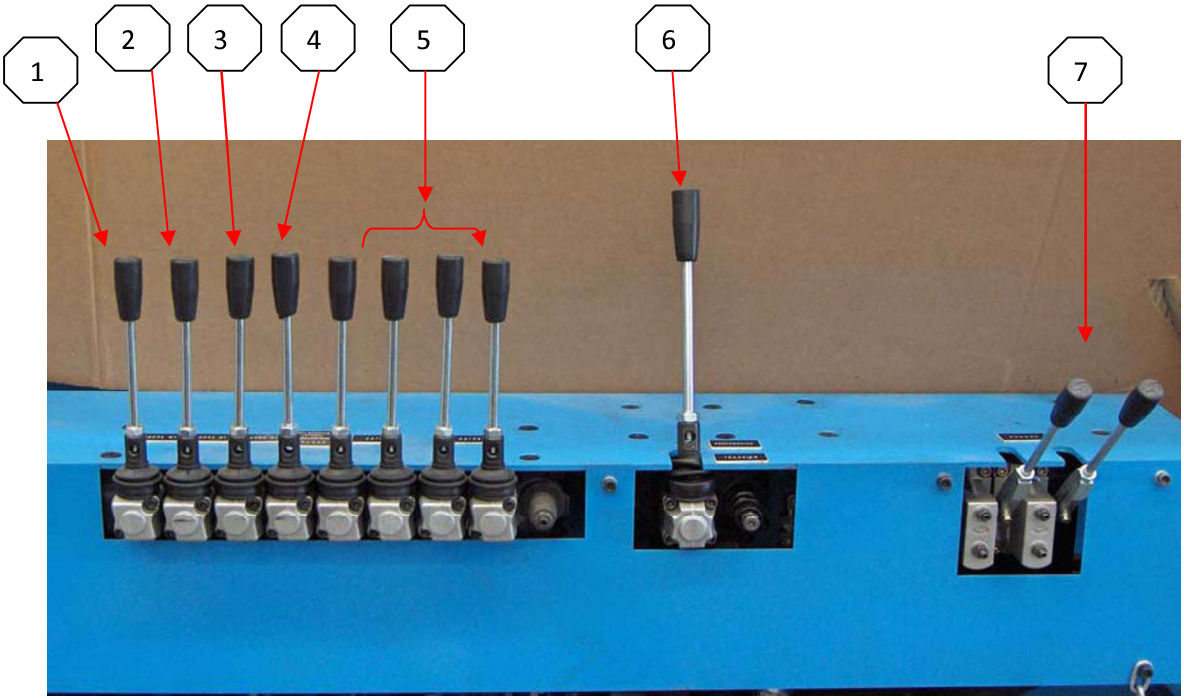


Figura 5.2: Caterpillar Tracks and Travel Controls

Drilling distributor and pressure gauges

8. Rotation
9. Hammer (Top Hammer)
10. Clamps
11. Side movement
12. Winch
13. Advance
14. Regulation valve
15. Rotation gauge
16. Hammer gauge (Top Hammer)
17. Cylinder Pressure Gauge
18. Sweep pressure gauge

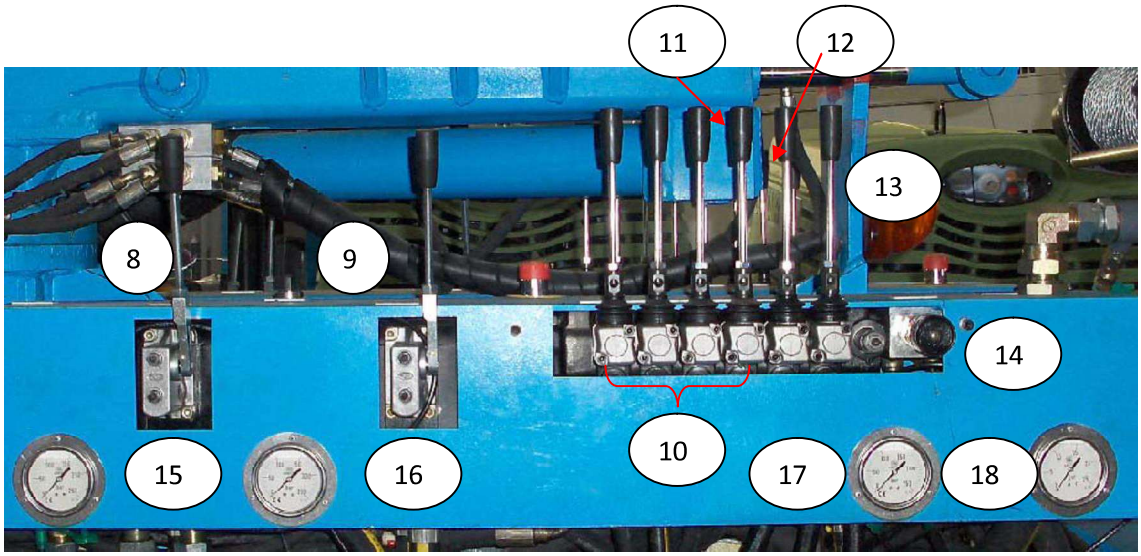


Figure 5.3. Drilling distributor and pressure gauges

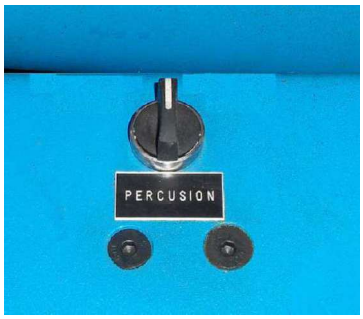


Figure 5.4: Hydraulic hammer speed control

5.2.- Power Pack Control Panel

- Control Cabinet

The electric control panel is located on the Power Pack. It includes control indicators, ignition key, engine use timer and water level indicator.

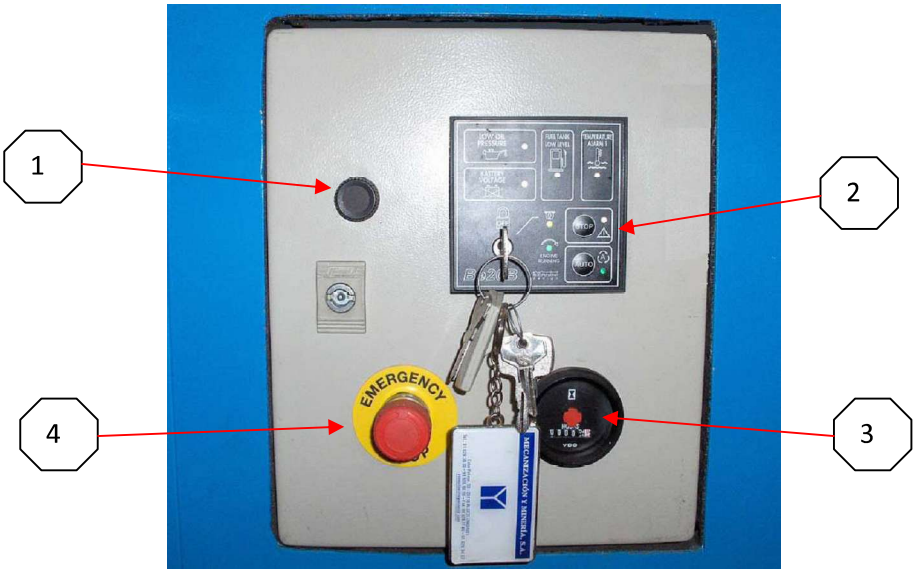


Figure 5.6: Photograph of control cabinet

1. Water level indicator
2. Control and ignition unit
3. Horometer
4. Emergency shut-down button

- Top Hammer Power Pack Caterpillar Track Distributor

In order to move the Top Hammer Power Pack, the operator must go to the position where the caterpillar track controls are located.

6.- OPERATING THE MACHINE

6.1.- Controls Prior to Starting Up.

IMPORTANT

Before starting-up the machine, read and understand all safety instructions.

Only the operator may start-up the machine when he is sure that the equipment is in good service conditions. If not, he is obliged to perform the following tasks:

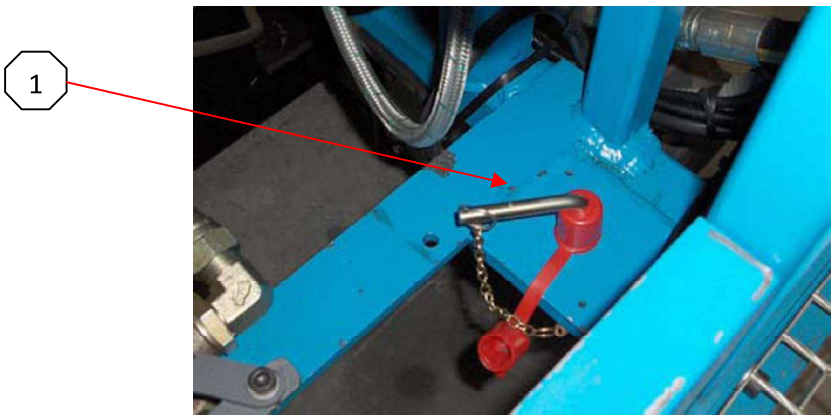
1. Engine oil level (check the oil dipstick)
2. Level of hydraulic fluid in the tank (window)
3. Fuel level
4. Visual control of all hanging elements and oil spills
5. Check control lights

IMPORTANT

All control levers described above must be moved gradually from position 0 (neutral) to their work position and vice-versa. Failure to observe this instruction may lead to the incorrect operation of the machine or to break-downs.

6.2.- Starting-up

1. Turn the power switch (1) to activate the power supply
2. Move the engine RPM lever, accelerator (2), to the start-up position.
3. Place the key in the ignition and turn to the right to the first position.
4. The alternator and oil pressure lights will turn on.
5. Turn the key to the second position to start-up the engine.
6. The hydraulic system will be ready for use.
7. Adjust engine rpm to work requirements.



Power Switch

Accelerator

- Carefully inspect the equipment and check for any fluid leaks, missing or damaged parts, or whether there is any problem with the protection or safety devices.

IMPORTANT

If the event of any anomaly when performing the above-mentioned procedures, the operator must request the presence of a maintenance expert.

IMPORTANT

Before stopping the equipment, make sure all levers that do not automatically return to a neutral position are in position 0.

6.3.- Stopping

- Before stopping the engine, the operator must make sure that the machine is in a perfectly stable position. In order to prevent risks connected with suspended loads or caused by the wind, place the front part on the ground.
- Do not use, except in the event of engine failure, the emergency shut-down to switch off the engine.

In order to switch off the engine:

1. Place control levers in their neutral position.
2. Move the RPM lever to the “Stop” position and turn the key to the “0” position.
3. Remove the ignition key.

6.4.- Moving

The equipment's safety acoustic warning signal is activated when the selection valve is placed in the travel position. The safety light switches on when the engine is switched on, i.e., whenever the equipment is in operation.

In order to move the equipment, once the engine has been switched on:

1. Move the selection valve to the Travel position.
2. Activate the relevant direction control levers.
3. The drilling truck is steered by activating the control levers in opposite directions.
4. The parking brakes are applied automatically when the control levers are moved to their central position (negative brakes).

IMPORTANT

Make sure there is enough free space before starting-up and before each travel, adjustment or drilling operation.

Do not move the levers to their full range at the beginning; move them gradually.

The position of the levers controls the opening of the control valves and, consequently, the amount of fluid injected.

IMPORTANT

Never use one single track; use the other in reverse when turning or changing direction.

Both safety switches must be activated to move one or both tracks eliminating the possibility of moving the machine by accident.

While the machine is moving, make sure to place the drilling mast in a horizontal position, resting on its support.

Never try to turn the truck on its axis on muddy or wet ground. Try to free the tracks by moving and turning them slowly at the same time.

In order to ensure maximum manoeuvrability and control of the tracks, it is important to keep them as clean and free from dirt accumulation. The accumulation of dirt and mud

on the tracks will make them stiffen and hinder their movement around the cogged drive wheel.

This will have a negative effect on steering and will cause the tracks to break.

6.5.- Transporting the Equipment

- The drilling rig and the power pack will be secured separately.
- When transporting the drilling equipment and the power pack, use four straps and pass them through the rings located on the base of the power pack (Fig. 6.1) and on the drilling rig (Fig. 6.2).
- Do not transport people on the machines.
- The machine can be loaded onto a trailer by means of a crane or the operator may drive it up a ramp.

IMPORTANT

Use a crane with sufficient load capacity for the weight of the machine.

- Fix the stabilizing cylinders to the platform of the trailer without taking the weight of the machine (i.e., without lifting the tracks from the platform).
- Secure the machine to the platform of the trailer with cables or chains to avoid it from moving during transport.

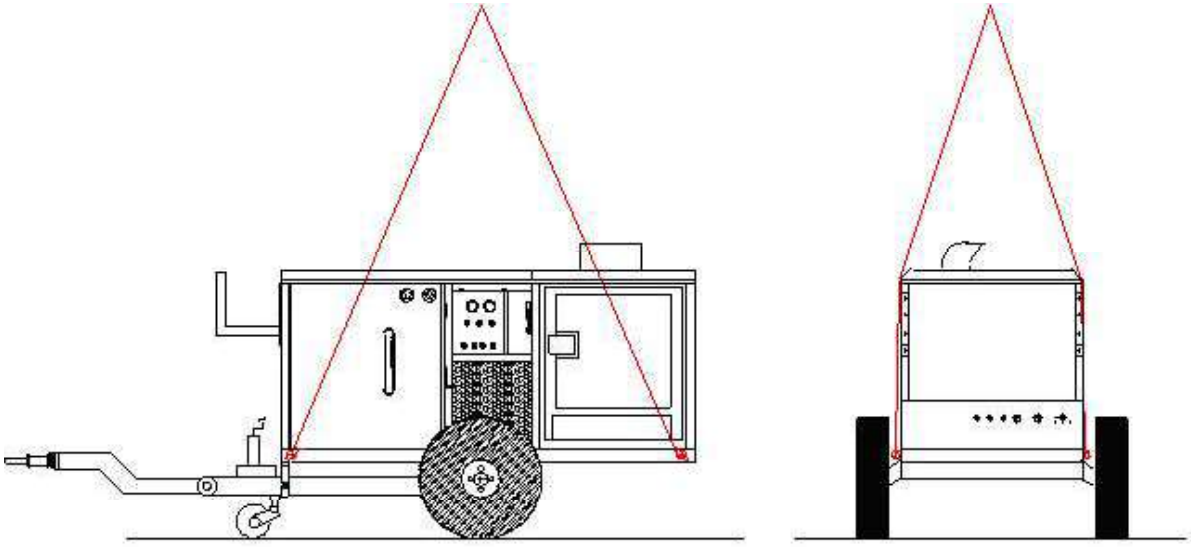
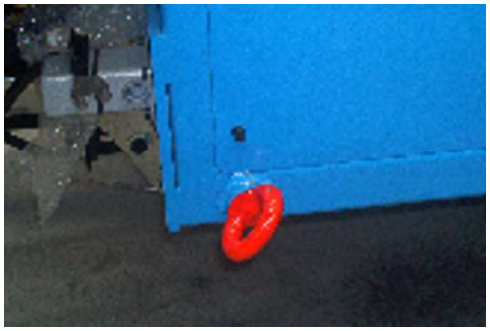


Figure 6.1: Transporting the Power Pack (*)

(*) In the case of the Top Hammer, the hoisting rings are located in the same position in the Power Pack base structure.



Hoisting Rings

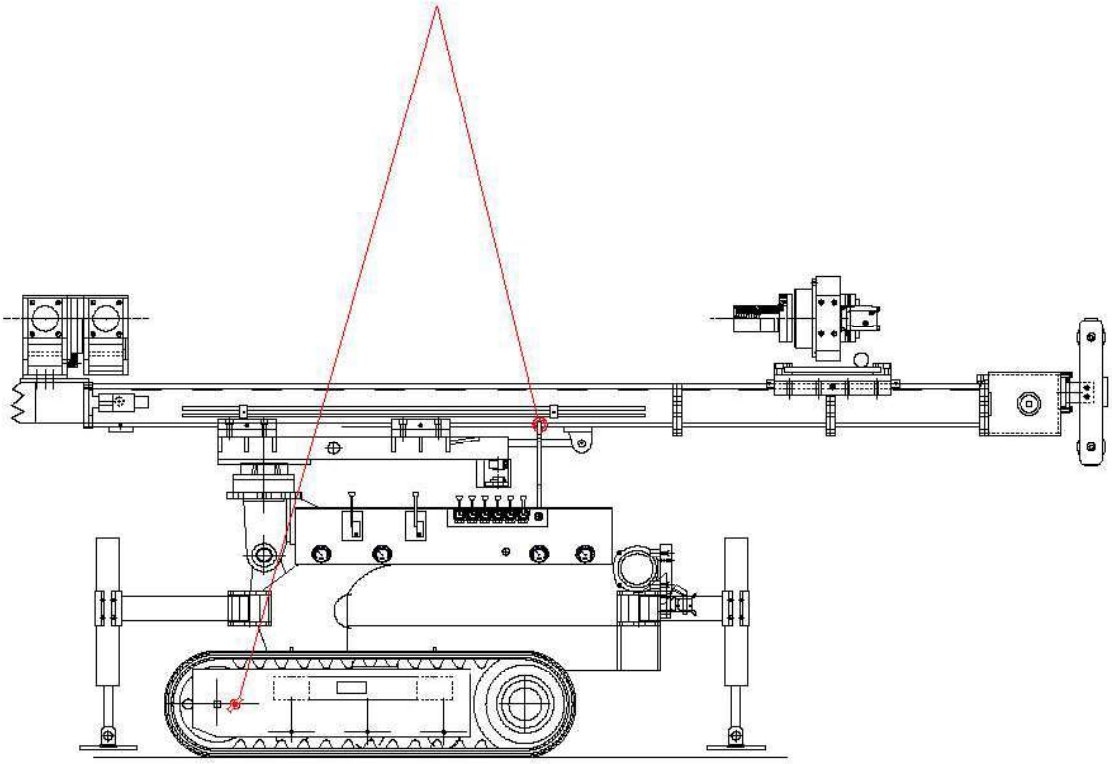


Figure 6.2: Transporting the Drilling Rig

Hoisting Rings on Drilling Rig

- During transport, the drilling tool must be located in the half-way position of the mast.

IMPORTANT

It is obligatory to keep the drilling tool placed in the half-way position of the mast to ensure stability when securing the drilling rig.

6.6.- Moving over Rough Ground

When moving or working with the drilling rig on slopes, the 4 stabilisation cylinders must be in position and the machine must be equipped and secured with a winch cable and a braking device to avoid it from sliding or rolling downhill. The connection point for the cable must be built to support the dynamic forces involved.

7.- MAINTENANCE AND CONSERVATION

7.1.- Introduction

The purpose of this chapter is to provide all the necessary information to execute the maintenance operations that can be performed by users. In the case of any situation not mentioned in this manual, users must contact MECANIZACIÓN Y MINERÍA, S.A. to obtain the necessary assistance.

Maintenance tasks may only be performed by suitably trained staff. The maintenance periods indicated in this manual must be observed as far a possible.

Pay special attention to the lubricants established and their instructions of use. Any work performed on the diesel engine must take into consideration the manual of the engine manufacturer.

Before performing any maintenance tasks, operators must:

- Switch off the engine.
- Remove the key.
- Place a notice on the control panel: **"EQUIPMENT UNDER MAINTENANCE – DO NOT START-UP"**

7.2.- Cleaning

- In order to clean the machine, use a mild cleaning product and then wash with a water jet.
- After washing, the drilling rig must be lubricated.
- When washing, never direct the water jet directly on to electric components.

7.3.- Troubleshooting

INCIDENT	POSSIBLE CAUSES	SOLUTION
Alternator and oil pressure lights do not switch on	Defective fuse(s)	Check battery, batter or alternator wiring. Then change fuse.
	Emergency Button on control panel has been pressed.	Pull Emergency Button up.
Control lights do not switch on	Emergency Button on control panel has been pressed.	Pull Emergency Button up.
	Defective lamps	Change lamps
Engine does not start or starts with problems	Very low temperature	Pre-heat (only engines without automatic shut-off)
	Empty fuel tank	Load fuel and bleed system
	Dirty fuel pipe or filter	Clean fuel filter or change fuel filter
	Fuel pump (defective membrane)	Repair or change
	Defective injection valve	Change
	Emergency Button on control panel has been pressed.	Pull Emergency Button up.
	Defective main fuse	Replace
	Start-up circuit wiring loose or rusted	Check connections and clean
	Defective starter-motor, sprocket does not work	Repair
	Defective valves	Adjust valves
	Low compression	Repair
	Worn cylinders or piston rings	Repair
Engine has no oil pressure or very low oil pressure	Very low oil level	Re-fill engine oil
	Extremely tilted position of engine.	Place machine horizontally

"Oil Pressure" control light switches on	Defective oil pressure lamp	Replace lamp
	Defective oil circuit	Repair
"Load" control light switches on	Defective alternator	Change alternator
No electric functions on drilling command panel	Emergency Button on control panel has been pressed.	Pull Emergency Button up.
	Defective fuse	Change fuse
	Defective pipe	Check pipe, repair
	Rusted contacts	Clean contacts

7.4.- Maintenance

7.4.1. General instructions

Maintenance intervals must be observed as exactly as possible. Only use lubricating products and oil recommended by MECANIZACIÓN Y MINERÍA, S.A.

7.4.2. Maintenance work and frequency

Notes on columns:

"Maintenance & Control tasks" column. Controls and tasks that must be performed (e.g.: check, change, replace, adjust…).

"*Daily*" column. Tasks that must be performed on a daily basis or before starting-up the machine.

"*Weekly*" column. Tasks that must be performed on a weekly basis, in addition to daily tasks.

"*20*" to "*3000*" Column. Tasks that must be performed based on the number of hours the machine has been used.

"*Yearly*" and "*Every 2 years*" column. These are "minimum maintenance periods". The jobs indicated in these columns must also be performed when the relevant hours of use have been reached.

NOTE: If several periods are assigned to any maintenance task, such as "*change engine oil*" (20, 250, yearly), this means that the oil must be changed for the first time after 20 hours of use, the second time after 250 hours of use and, then after each 250 hour-of-use period or, at least, one year after the last time the oil was changed.

A) Diesel engine (See DEUTZ engine manual)

B) Hydraulic installation

Maintenance & Control Tasks	Frequency										Yearly	Every 2 years
	Daily	Weekly	20	125	250	500	1000	1500	2000	3000		
Check oil level	*											
Change hydraulic fluid						*			*		*	
Return filter												
- Check dirt indicator	*											
- Change							*				*	
Greaser												
- Check oil level	*											
Change advance motor oil									*			*

C) Caterpillar track chassis

Maintenance & Control Tasks	Frequency										Yearly	Every 2 years
	Daily	Weekly	20	125	250	500	1000	1500	2000	3000		
Wheel reducer												
- Check oil level		*			*							
- Change oil										*	*	
Rubber tracks												
- Check state		*										

D) Electric installation

Maintenance & Control Tasks	Frequency										Yearly	Every 2 years
	Daily	Weekly	20	125	250	500	1000	1500	2000	3000		
Check battery acid state		*		*								
Check state of wiring		*										
Check emergency stop system	*											

E) Mechanical elements

Maintenance & Control Tasks	Frequency										Yearly	Every 2 years
	Daily	Weekly	20	125	250	500	1000	1500	2000	3000		
Lubricate		*										
Check tightness of bolts and screws			*			*					*	

7.5.- Conservation

7.5.1.- General instructions

The scheduled conservation of the drilling rig by users must be performed based on a time plan (service hours) and must include:

Pre-start-up tasks: The operator must check that the machine is safe to use before each start-up.

Maintenance tasks: Maintenance intervals depend on the duration and type of work performed and include cleaning the device, control tasks and maintenance tasks.

7.5.2 Tasks prior to each start-up

CHECK	THEORETICAL STATE – THEORETICAL VALUE
Check under the machine	- No sign of spills - No loose or hanging parts
Hydraulic fluid level (window)	- Maximum level
Lubricating oil level (window)	- Maximum level
Fuel tank	- Maximum level
Diesel engine oil level	- Maximum level
Engine belt tension	- Tense, not damaged
Engine air filter	- Clean
Return filter - hydraulics	- No signs of dirt

7.5.3 Maintenance tasks

Hydraulics

Assembly / Name	Task
Hydraulic fluid level	- Check - Change - Verify (safety signals)
Return filter	- Change
Advance motor	- Change oil
Pressure dampener	- Adjust
Hoses / cylinders	- Check

Lubrication points

The MYM-C5 uses M10 x 100 greasing nozzles. The lubrication periods specified in the above-mentioned tables must be observed for the correct operation of all mechanical parts of the equipment.

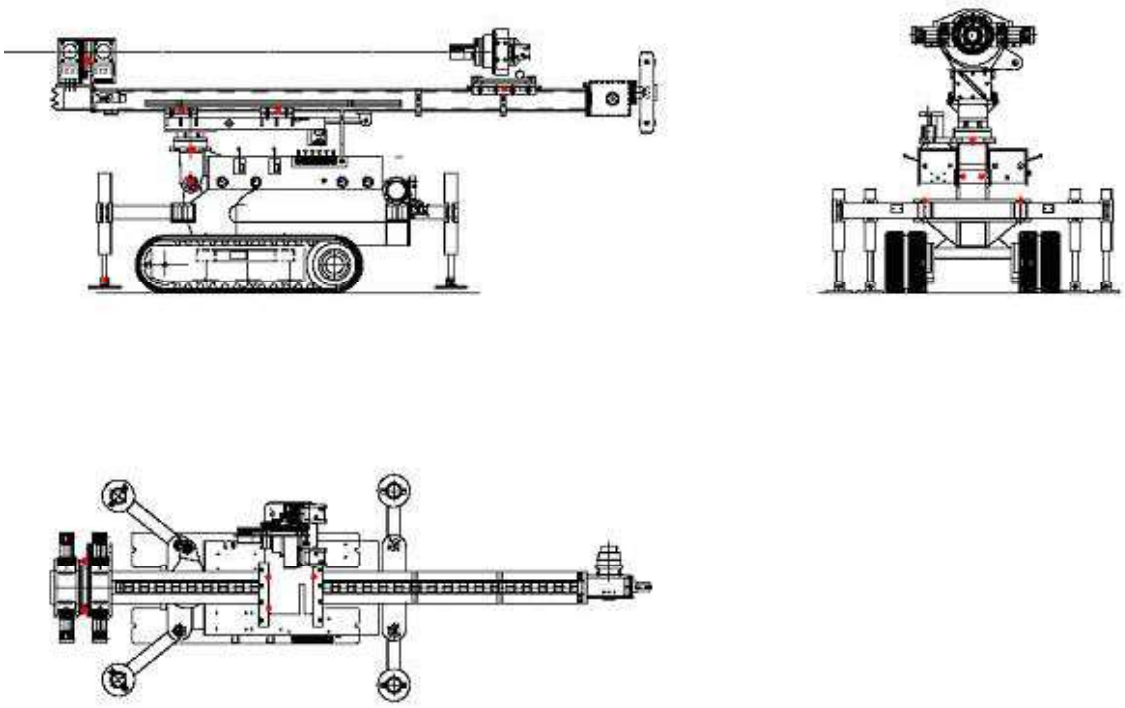


Figure 7.1: Lubrication points (*)

(*) See the lubrication points for the hydraulic hammer in the manufacturer's manual.

Check the engine oil level

- The engine must be switched off and in a horizontal position.
- Remove the oil dipstick, clean with a cloth and dip again.
- Remove the dipstick again to see the oil level.

Engine oil dipstick

The oil level reading should be between the max. and min. marks. If the oil level is below the min. mark, add oil immediately to avoid damaging the engine.

NOTE: Checking the engine oil level when the engine is cold (before starting-up) ensures that there is sufficient oil in the engine for the start-up process. It is better to measure the oil level when the engine is at operational temperatures.

NOTE: Change engine oil when the engine is hot, as hot oil flows better.

- Switch off the engine.
- Unscrew the engine oil tank cover.
- Pour in new oil up to the top mark on the dipstick.
- Check the oil level after a brief test start-up. If necessary, add more oil.

IMPORTANT

Risk of burns when discharging hot oil.

It is essential to collect used oil and prevent it from filtering into the ground.

Changing the engine oil filter

- Unscrew the oil filter cartridge
- Clean the coupling joint.
- Slightly lubricate the rubber seal on the new filter; screw on by hand as far as the seal and then tighten with half a turn.

Checking the air filter maintenance switch.

Let the **engine run freely at maximum revolutions**

If the maintenance switch does not trigger any reaction, cover the air input **hermetically for a short space of time**.

If no reaction is caused, proceed as follows:

- Stop the engine and remove the engine cover.
- Place the key in **position 1.**
- Remove the hose from the air intake and generate a vacuum effect at one end of the hose.

Checking the fluid level in the hydraulic fluid tank.

Check the hydraulic oil level on a daily basis before starting-up the engine.

The indicator is on the side of the Power Pack and features two marks – a max. and a min. mark. In order to establish the maximum level, the hydraulic cylinders must be drawn in as far as possible.

Changing hydraulic fluid

The first fluid change should be performed after the first 500 hours of use. Following changes will be every 2000 hours of use or, at least, once a year.

1. Draw in the hydraulic cylinders as much as possible.
2. Place a sufficiently large collection pan under the tank.
3. Open the filling intake.
4. Unscrew the 1" cover from the tank drainage system and place a hose.
5. Hold the drainage hose over the pan and screw on the cover.
6. After emptying the fluid, remove the drainage hose and place the drainage cover.
7. Reload with hydraulic fluid through the filling intake.
8. Check the fluid level after a brief test start-up. If necessary, add more hydraulic fluid.

NOTE: Change the fluid when the machine is at service temperature.

Checking the return filter and changing it.

The filter must be immediately replaced when the dirt indicator is pushed up when the machine is in use after it has been pushed down by hand.

1. Stop the machine.
2. Remove the cover by unscrewing the 4 hexagonal head bolts.
3. Replace the filter and screw the cover on again.

Checking control lights

Control lights should be checked every day before starting-up the machine. Proceed as follows:

- Turn the ignition key to position "**ON**"
- The alternator and oil pressure light switch on.

Checking the battery

1. Remove covers
2. With existing control accessories, the level of the liquid should reach the bottom.
3. Without control accessories, place a clean wooden dipstick on the top edge of the plates and remove again. The liquid level should be 10-15 mm over the top edge of the plates.
4. If necessary, replenish with distilled water.
5. Screw the covers on again.
6. Clean the battery terminals and lubricate using suitable grease.

IMPORTANT

When working with batteries, do not smoke or handle bare flames. No not spill any acid on your skin or clothes. Use protection goggles. Do not place tools on the battery.

Checking mechanical parts

Occasionally check the firmness of screws, bolts, nuts….

Align damaged covers and paint. Safety devices must be repaired or replaced immediately.

Lubricate all pins and joints once a week.

Changing fuses

IMPORTANT

Before changing, disconnect the battery.

1. Open the electric panel.
2. Change the defective fuses for new ones.

8.- STORING THE EQUIPMENT

Position of the machine during storage.

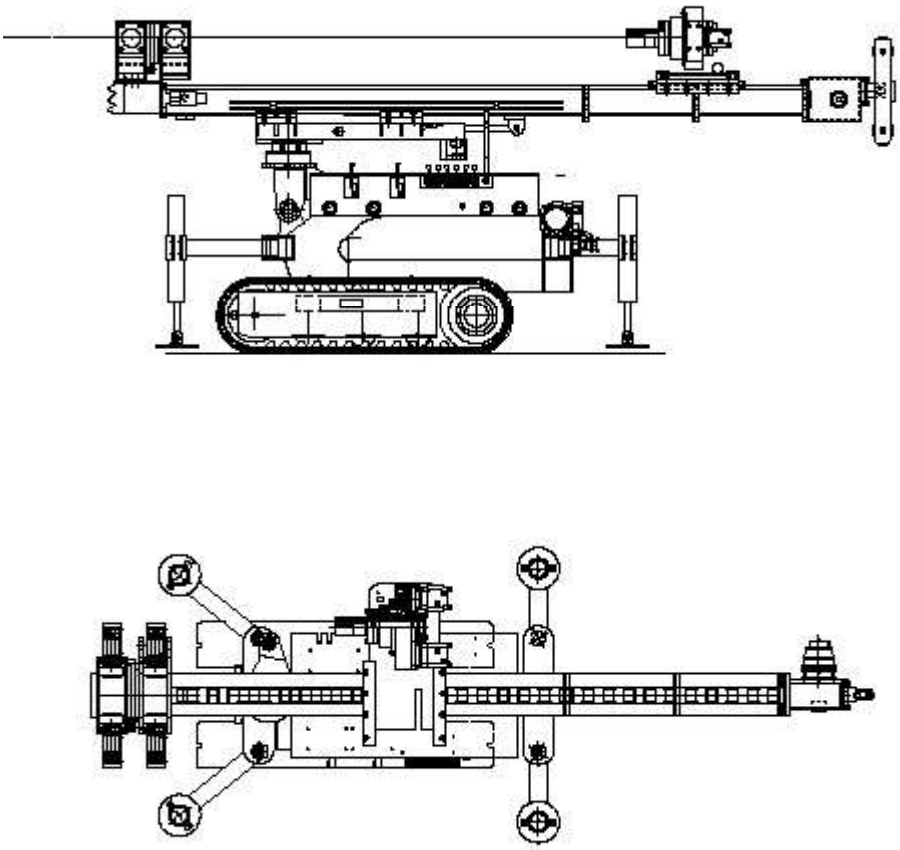


Figure 8.1: Store position

- When the machine is not going to be used for more than 1 month, a number of measures should be taken to avoid the deterioration of the materials, the gripping of mechanical parts…..

  - Place the machine in its storage position and make sure it is parked on level and solid ground.
  - Wash the machine to remove all dirt.
  - Inject grease through all greasing nipples on the machine.
  - Slightly loosen the tension of the advance chain on the rotation head.
  - Repaint any areas where the paint has chipped or where there are signs of rust.

- Check whether there are any hydraulic fluid or lubricating oil leaks and, if so, repair them.
- Make sure that the hydraulic fluid tank and fuel tank are full. Fill, if necessary.
- Disconnect the battery and keep it in a dry place at a moderate temperature.
- If unable to park the machine in a covered area, protect with covers.

- Consult the diesel engine manual on procedures concerning storing the engine.

9.- ASSEMBLY AND DISASSEMBLY

9.1.- Replacing Flexible Hoses

IMPORTANT

Before removing any flexible hoses from the machine:

- **Stop the engine.**
- **Depressurise the hydraulic system.**

Collect the fluid appropriately where the hoses are removed.

When changing a flexible hose because it is broken or damaged, replace it for another of the same features as the original (type-diameter-length-accessories) or observe the following conditions:

- Flexible hydraulic hoses need not be exactly the same length as the distance between the two points of connection and should not be subject to traction forces.
- Do not bend, twist or crush hydraulic hoses; the radii of elbow joints must be increased in the case of greater fluid pressures.
- Do not stretch hoses when installing.
- Install each hose using the most appropriate connection accessories (curved or straight); avoid excessive curves or elbow joints with small radii.
- If flexible hoses have to be held in place with clamps, check the tightness of the screws to avoid crushing.

9.2.- Cables

Under normal circumstances, cables should be replaced for cables of the same type. If different cables are installed, the operator should check that their specifications are, at least, equivalent to those of the original cables.

9.2.1.- Adjusting the winch cable

- The first round of the cable around a smooth surface winch drum must be totally regular to prevent following rounds from getting tangled.
- When rolling the cable on, keep a tension that is 1-2% that of the breakage tension and tap the cable after each round.
- Before placing a new cable, check the conditions of the pulleys and whether they are working correctly. If necessary, change any worn parts or repair the pulley to re-establish the correct profile.

NOTE

When using the winch for the first time, perform a number of operations with a load that is approximately 10% of the nominal load in order to adjust the cable.

9.2.2.- Attaching the cable

- The fixed end of the cable must be fixed by means of a wedge in the correct location on the winch drum.
- When unrolling the winch cable under operational conditions, make sure that at least three rounds remain on the winch so that any traction can be absorbed completely by the friction between the drum and the cable.
- The free end of the cable must be protected carefully. It must be inspected regularly as this part of the equipment is prone to damage.

10.- MYM-C5 MAINTENANCE SHEET

HOURS	MAINTENANCE	PERSON	DATE	SIGNATURE

SPARE PARTS

MYM-C5

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6. TRANSPORTING THE TRUCK

INTRODUCTION

The purpose of the present manual is to provide customers and distributors simple indications in connection with spare parts. Each part has been numbered on the diagram and linked to a definition and reference number.

INSTRUCTIONS FOR PLACING ORDERS

In order to ensure that accurate information is included on orders, **MECANIZACIÓN Y MINERÍA, S.A.** requires customers to include the following data accurately and completely:

- **Name of equipment**
- **Equipment serial number**
- **Diagram number linked to the part**
- **Name and reference number of the part required**
- **Number of parts.**

NOTE: Take into account the following indications based on the type of machine:

RT → Rotary: Machine with rotation head.

TH → Top Hammer: Machine with Top Hammer

EQUIPMENT DIMENSIONS			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Drilling rig dimensions - RT		5220000246CNJ00
2	1	Drilling rig dimensions - TH		5220000247CNJ00
3	1	Power Pack dimensions - RT		5220000248CNJ00
4	1	Power Pack dimensions - TH		5220000249CNJ00

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5220000243CNJ00
5220000244CNJ00

VIEW OF DRILLING RIG			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1RT	1	Rubber tracks		522000016170900
1TH	1	Steel tracks		5220500PT15A452
2RT	1	Bridge structure		----------
2TH	1	Bridge structure		----------
3	1	Rotation structure		----------
4	1	Drilling sliding element		5220000396CNJ00
5	1	Advance reducer		5220000303L1HC
6RT	1	Rotary head		522000000CR-245
6TH	1	Top hammer		522000036002571
7	1	Clamp assembly		5220000225MTJ00
8	1	Winch		522000009141635
9	1	Advance regulating valve		522000000011743
10	1	Pulley assembly		----------
11	1	Advance reducer housing		5220000406CNJ00
12	1	Stabilising jacks		5220500C7040300
13TP	1	Hammer distributor		522050013010061
14	1	Cylinder distributor		522000002308000
15	1	Rotation distributor		5220001003.1044
16	1	Advance chain		5220000000016B2
17	1	Adjustment structure		----------
18	1	Tow hook		522000090505058

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5220000243CNJ00
5220000244CNJ00

VIEW OF DRILLING RIG			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
19RT	1	Side movement		----------
19TP	1	Side movement		52200000329FAB01
20	1	Front pointer		5220000429FAB00
21	1	Adjustment cylinder		5220500C5030500
22	1	Front tension devices		----------
23	1	Side movement cylinder		522000005030500
24	1	Rotation pressure gauge		522000000122500
25TH	1	Hammer pressure gauge		522000000122500
26	1	Emergency stop		4990000SETAPARO
27	1	Advance pressure gauge		522000000122500
28	1	Sweep pressure gauge		522000000120250
29	2	Sliding extensions		5220000398CNJ00

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DRILLING RIG CATERPILLAR TRACKS			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1RT	2	Rubber tracks		----------
1TP	2	Steel tracks		----------
2	2	Guide wheel		----------
3	2	Guide wheel support		----------
4	2	Spring		----------
5	2	Guide wheel cylinder		----------
6	2	Valve		----------
7	2	Chassis		----------
8	2	Reducer protection cover		----------
9	2	Cover		----------
10	2	Reducer housing		----------
11	2	Crown wheel driver		----------
12	6	Guide rollers		----------
13	2	Guide chain		----------

TRACTION REDUCER (Truck Caterpillar Tracks)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Traction reducer		----------
1	1	Side support ring		----------
2	2	Cover		----------
3	1	Set of covers		----------
4	1	Sliding element		----------
5	1	O-ring		----------
6	1	Central gear		----------
7	1	1st Reduction assembly		----------
8	4	Elastic ring		----------
9	4	Planet gear assembly		----------
10	1	Reducer housing		----------
11	1	Elastic ring		----------
12	1	Bearings		----------
13	1	Elastic ring		----------
14	1	Front joint		----------

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5220000287CNJ00

TRACTION REDUCER: Rim Tension Cylinder			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Rim Tension Cylinder		----------
1	1	Pipe		----------
2	1	Joint		----------
3	1	Joint		----------
4	1	Rod		----------
5	1	Sleeve		----------
6	1	Valve		----------

EQUIPMENT CHASSIS STRUCTURE			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Structure delivery plate		----------
2	1	Rotation flange		----------
3	1	Axle joint		----------
4	1	Washer		499000000000107
5	1	Sleeve		52200P120100P10
6	1	Rotation sleeve		----------
7	1	Rotation structure		----------
8	1	Rotation-Bridge joint		----------
9	1	Pin		----------
10	4	Sleeve		----------
11	8	Screw		499000000000107
12	8	Washer		499000000000107
13	2	Washer		499000000000107
14	2	Washer		499000000000107
15	1	Washer		499000000000107
16	1	Washer		499000000000107
17	1	Pin		----------
18	1	Pin		----------
19	2	Sleeve		52200PAP5060P1
20	2	Washer		499000000000107

EQUIPMENT CHASSIS STRUCTURE			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
21	2	Washer		499000000000107
22	4	Stabilising cylinders		522000007040300
23	1	Bridge structure		----------
24	4	Jack pins		----------
25	4	Washer		499000000000107
26	12	Rod		----------
27	1	Tow hook		522000090505058
28	1	Winch		522000009141635
29	1	Washer		----------
30	1	Washer		499000000000107
31	4	Sleeve		52200PAP3030P1
32	2	Sleeve		----------
33	1	Pin		----------
34	8	Washer		499000000000107
35	4	Pin		----------
36	24	Screw		499000000000107
37	24	Washer		499000000000107
38	24	Screw		499000000000107

SLIDING ASSEMBLY			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Clamp assembly		5220500225MTJ00
2	2	Chain tension device		5220000418FAB00 5220000419FAB00
3	6	Screw		499000000000107
4	6	Washer		499000000000107
5	6	Nut		499000000000107
6	2	Nut		499000000000107
7	2	Screw		499000000000107
8	5	Screw		499000000000107
9	5	Washer		499000000000107
10	5	Washer		499000000000107
11	2	Washer		499000000000107
12	2	Hydraulic hose		522000000THD-12
13	2	Double flange		522000000BSD-12
14	8	Screw		499000000000107
15	4	Slide guide		5220000254FAB00
16	8	Screw		499000000000107
17	8	Washer		499000000000107
18	2	Chariot tension elements		----------
19	8	Screw		499000000000107
20RT	1	Rotation head		522050000CR-245
20TH	1	Top hammer		522050036002571

SLIDING ASSEMBLY			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
21	1	Hydraulic cylinder		5220500C5030300
22	4	Screw		499000000000107
23	4	Screw		499000000000107
24	4	Washer		499000000000107
25	4	Screw		499000000000107
26	1	Hydraulic cylinder		522000005030300
27	1	Pin		----------
28	2	Washer		499000000000107
29	2	Washer		499000000000107
30	4	Washer		499000000000107
31	4	Washer		499000000000107
32	4	Screw		499000000000107
33	4	Washer		499000000000107
34	1	Hydraulic winch		522000009141635
35	4	Washer		499000000000107
36	1	Traction chain		5220000000016B2
37	2	Traction pulley		5220000POLD-100
38	2	Washer		499000000000107
39	2	Washer		499000000000107
40	1	Pin		----------
41	1	Hydraulic motor		----------

SLIDING ASSEMBLY			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
42	1	Hydraulic reducer		5220000303L1HC
43	10	Screw		499000000000107
44	10	Washer		499000000000107
45	1	Winch plate		5220000423FAB00
46	4	Screw		499000000000107
47	4	Washer		499000000000107
48	4	Screw		499000000000107
49	4	Washer		499000000000107
50	1	Traction gear		5220000016B2Z14
51	1	Gear stop		5220000412FAB00
52	1	Washer		499000000000107
53	1	Screw		499000000000107
54	2	Bearings		52200000NJ2306E
55	1	Advance pulley		5220000417FAB00
56	1	Washer		499000000000107
57	1	Pin		5220000429FAB00
58	1	Front clamp		5220000288FAB00
59	2	Chariot guides		5220000251FAB00
60RT	2	Side movement guides		5220000252FAB00
60TH	2	Side movement guides		5220500253FAB00

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5220000225MTJ00

DOUBLE CLAMP ASSEMBLY CMD 30505			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	4	Hydraulic cylinders		5220000352CNJ00
2	4	Holder		5220000340CNJ00
3	4	Screw		499000000000107
4	8	Clamp holders		5220000002-0970
5	16	Screw		499000000000107
6	16	Washer		499000000000107
7	6	Screw		499000000000107
8	6	Washer		499000000000107
9	6	Screw		499000000000107
10	1	Pin		5220000373FAB00
11	2	Sleeve		5220000P3030P10
12	1	Washer		499000000000107
13	1	Washer		499000000000107

ROTATION HEAD ASSEMBLY (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1		Joint		5220000300FAB00
2	1	Bearings		52200000032.022
3	1	Rotation head body		5220000297FAB00
4	2	Pinion		5220000303FAB00
5		O-ring		----------
6		Screw		----------
7		Joint		----------
8		Washer		----------
9		Hydraulic motor		----------
10		Screw		499000000000107
11		O-ring		----------
12		Joint		----------
13		Screw		499000000000107
14		Rear cover		----------
15		Joint		----------
16		Spacing ring		----------
17		Bearings		52200000032.020
18	1	Crown		5220000298FAB00
19		Screw		499000000000107
20		Bearings support		----------

ROTATION HEAD ASSEMBLY (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
21	1	Flange		5220000302FAB00
22	1	Flange		5220000301FAB00
23	8	Screw		499000000000107
24	1	O-ring		----------
25	10	Screw		499000000000107
26	1	O-ring		----------

ROTATION HEAD ASSEMBLY (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
	1	Full advance reducer		5220000303L1HC
1	1	Hydraulic motor		----------
2	1	Hydraulic brake		----------
3	1	Hydraulic reducer		----------
4	10	Screw		499000000000107
5	10	Washer		499000000000107
6	10	Washer		499000000000107
7	1	Pin		----------
8	1	Driving pinion		5220000016B2Z14
9	1	Limit		5220000412fAB00
10	1	Washer		499000000000107
11		Screw		499000000000107
12	1	Spacing ring		5220500162FAB00

ENGINE-ADVANCE REDUCER ADAPTOR			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	4	Screw		----------
2	1	Elastic ring		----------
3	2	Bearings		----------
4	1	Gasket		----------
5	1	Joint		----------
6	1	Support disc		----------
7	1	Elastic ring		----------
8	1	Ring		----------
9	1	Flange		
10	8	Screws		

ENGINE-ADVANCE REDUCER ADAPTOR			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Elastic ring		----------
2	1	Rear cover		----------
3	1	O-ring		----------
4	1	Ring		----------
5	3	Screw		----------
6	1	Rear cover		----------
7	1	Z axle - channelled		----------
8	1	Pin		----------
9	1	C cylindrical axle		----------
10	1	Bearings		----------
11	1	Reducer body		----------
12	1	Spacing pin		----------
13	1	Spacing ring		----------
14	1	Spacing ring		----------
15	1	Spacing ring		----------
16	1	Bearings		----------
17	1	Bearing ring		----------
18	1	Screw end		----------

REDUCER STAGES			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	2	Joint		----------
2	1	Reducer assembly		----------
3	1	Cog wheel		----------
4	1	Central cog		----------
5	1	Reducer stage		----------

ADVANCE REDUCER BRAKE			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	2	Elastic ring		----------
2	2	Gasket		----------
3	1	Brake axle		----------
4	8	Steel ring		----------
5	9	Sintered disc		----------
6	1	Brake housing		----------
7	1	Cover		----------
8	1	Oil level cover		----------
9	2	Gasket		
10	2	Ring		
11	1	Spacer		
12	1	Gasket		
13	1	Ring		
14	1	Piston		
15	19	Spring		
16	1	Ring		
17	12	Screws		
	13			
	8			
	12			

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5220000153MTJ00

SLIDING LIFT CYLINDER			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Hydraulic cylinder		522000008040500
2	4	Flat washer		499000000000107
3	4	Joint		522050000000RAC
4	1	Anti-return valve		522000000409022
-	1	Sealing kit		----------

SLIDING ROTATION CYLINDER			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Complete hydraulic cylinder		522000001021226
2	4	Flat washer		5220000000AP3/8
3	2	Joint		522000000000RAC
4	1	Hydraulic hose		----------
5	1	Anti-return valve		522000000409022
6	1	Ball-and-socket joint		----------
7	1	Ball-and-socket joint		----------
8	2	Joint		522050000000RAC
9	1	Hydraulic hose		----------
-	1	Sealing kit		----------

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5220000155MTJ00

SLIDING ADJUSTMENT CYLINDER			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Hydraulic cylinder		522000005030500
2	4	Flat washer		5220000000AP3/8
3	4	Joint		522000000000RAC
4	1	Anti-return valve		522000000409022
-	1	Sealing kit		----------

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5220000156MTJ00

SIDE MOVEMENT CYLINDER			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Hydraulic cylinder		522000005030300
2	4	Flat washer		5220000000AP3/8
3	4	Joint		522000000000RAC
4	1	Anti-return valve		522000000409022
-	1	Sealing kit		----------

STABILISING CYLINDER (Jacks)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Hydraulic cylinder		522000007040300
2	4	Flat washer		5220000000AP3/8
3	4	Joint		522000000000RAC
4	1	Anti-return valve		522000000409022
-	1	Sealing kit		----------

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5220000158MTJ00

CLAMP CYLINDER			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	O-ring		----------
2	2	O-ring		----------
3	1	Scraper		----------
4	2	O-ring		----------
5	1	Collar		----------
6	2	Collar		----------
7	1	O-ring		----------
8	1	Complete clamp cylinder		5220000352CNJ00
-	1	Complete joint kit		5220500KITMORD

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5220000159MTJ00
5220000159FAB00

ROTATION DISTRIBUTOR			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Complete distributor		5220001003.1044
1	1	Outlet cover		----------
2	1	Inlet cover		----------
3	1	Regulating valve		----------
4	1	Control kit (friction)		----------
5	-	----------		----------
6	4	Allen screw		499000000000107
7	1	Nut		499000000000107
8	1	Nut		499000000000107
9	2	Washer		5220000000AP1/2
10	2	Joint		522000000000RAC
11	2	Washer		5220000000AP3/4
12	2	Joint		522000000000RAC

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2/511
5220000160FAB00
5220000160MTJ00

HAMMER DISTRIBUTOR (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Complete distributor		522050013010061
1	1	Outlet cover		----------
2	1	Inlet cover		----------
3	1	Regulating valve		----------
4	1	Control kit		----------
5	1	Load sensing		----------
6	4	Allen screw		499000000000107
7	1	Nut		499000000000107
8	1	Nut		499000000000107
9	2	Washer		499000000000107
10	2	Joint		522000000000RAC
11	2	Washer		499000000000107
12	2	Joint		522000000000RAC

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5220000161FAB00
5220000161MTJ00

MACHINE CATERPILLAR TRACK DISTRIBUTOR			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Complete distributor		5220002002.1045
1	1	Outlet cover		----------
2	1	Inlet cover		----------
3	1	Regulating valve		----------
4	1	Control kit (spring)		----------
5	-	----------		----------
6	4	Allen screw		499000000000107
7	1	Nut		499000000000107
8	1	Nut		499000000000107
9	2	Washer		499000000000107
10	2	Joint		522000000000RAC
11	2	Washer		499000000000107
12	2	Joint		522000000000RAC

CYLINDER DISTRIBUTOR			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Complete distributor		522000002308000
1	1	Outlet cover		----------
2	1	Inlet cover		----------
3	4	Screw		499000000000107
4	8	Control kit (spring)		----------
5	17	Flat washer		499000000000107
6	1	Joint		522000000000RAC
7	16	Joint		522000000000RAC
8	1	Flat washer		499000000000107
9	1	Joint		522000000000RAC

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5220000319FAB00

SELECTOR DISTRIBUTOR			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
	1	Complete distributor		522000001501040

ADVANCE DISTRIBUTOR			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
	1	Complete distributor		522000023060851
1	1	Outlet cover		----------
2	1	Inlet cover		----------
3	4	Screw		499000000000107
4	6	Control kit		
5	13	Flat washer		499000000000107
6	9	Joint		522000000000RAC
7	4	Joint		522000000000RAC
8	1	Flat washer		499000000000107
9	1	Joint		522000000000RAC
10	1	Joint		522000000000RAC

HYDRAULIC WINCH			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Pin		----------
2	2	Flange		----------
3	1	Drum		----------
4	1	Rotation axle		----------
5	1	Sleeve		----------
6	1	Circlyp		----------
7	1	Pin		----------
8	1	Sleeve		----------
9	2	Separators		----------
10	1	Rear cover		----------
11	2	Screw		----------
12	1	Hydraulic motor		----------
13	2	Washer		----------
14	2	Screw		----------
15	1	Front cover		----------
16	2	Screw		----------
17	2	Flange joint		----------
18	1	Crown		----------
19	2	Reducer assembly		----------
20	2	Pinion adapter		----------

HYDRAULIC WINCH			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
21	1	Pinion		----------
22	1	Sleeve		----------
23	1	Front cover		----------
24	1	Stay bolt		----------
25	1	Brake lever		----------
26	1	Washer		----------
27	1	O-ring		----------
28	10	Screw		----------

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1/201_FE
5220000283CNJ00

POWER PACK VIEWS (RT)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel engine		52200000F3L2011
2	1	Air-oil exchanger		522000025202024
3	1	Engine accelerator		522000560CT2000
4	1	Electric panel		----------
5	2	Hose support		5220000013CNJ00
6	1	Oil level indicator		52200000000ZLG3
7	1	Tow axle		----------
8	2	Wheel		----------
9	1	Tow ring		----------
10	1	Jockey wheel		----------
-	--	1 axle trailer		5220000000PG1SF

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1/201_TH
5220000284CNJ00

POWER PACK VIEWS (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel engine		522PP05TH090311
2	1	Metal plate		5220000020FAB00
3	2	Hose support		5220000013CNJ00
4	1	Oil level indicator		52200000000ZLG3
5	1	Operator's platform		5220000227CNJ00
6	1	Steel caterpillar truck		5220000000PT1500

COVER-MOTOR COUPLING (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel engine		52200000F3L2011
2	1	Coupling wheel		522000991035112
3	1	Coupling cover		522000993242083
4	1	Double hydraulic pump		522000004014002
5	2	Engine bedplate		----------
6	1	Silent Block		----------
7	1	Silent Block		----------
8	1	Coupling		522000992060066

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1/114_TH
5220000226MTJ00

COVER-MOTOR COUPLING (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel engine		522000000090311
2	1	Coupling wheel		522000991035112
3	1	Coupling cover		522000993242083
4	1	Double hydraulic pump		522000000403492
5	1	Silent Block assembly		----------
6	1	Coupling		522000992060066
7	1	Hydraulic pump		522000000214043

POWER PACK CATERPILLAR TRACKS (TH)	MYM-C5	

Pos.	Qty.	Definition	Manufacturer Ref.	MYM Reference
1	2	Steel chain		----------
2	2	Complete rim tension device		----------
3	2	Rim tension device		----------
4	4	Bearing		----------
5	2	Tension wheel axle		----------
6	4	Sealing oil		----------
7	4	Wheel fixing plate		----------
8	2	Full rim tension support		----------
9	2	Rim tension support		----------
10	2	Spring		----------
11	2	Rim tension cylinder		----------
12	2	Track guide		----------
13	2	Cover		----------
14	2	Traction wheel		----------
15	2	Traction reducer		----------
16	2	Cover		----------
17	10	Complete roller		----------
18	10	Roller		----------
19	20	Bearing		----------
20	10	Traction wheel axle		----------
21	20	Oil seal		----------

POWER PACK TRACTION TRACKS (TH)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Hydraulic motor		----------
2	6	Screw		----------
3	1	----------		----------
4	1	----------		----------
5	1	----------		----------
6	1	----------		----------
7	1	----------		----------
8	1	----------		----------
9	1	----------		----------
10	1	----------		----------
11	1	----------		----------
12	1	Sealing ring		----------
13	1	Bearings kit		----------
14	1	----------		----------
15	1	Motor sealing kit		----------

320 L. HYDRAULIC FLUID TANK (TH)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Fluid tank		050CFP300GC320L
2	2	Return filter		52200OMTF300-BN
3	1	Filling cover		522000000000TR2
4	2	Hose		522000000000RAC
5	1	Hose		522000000000RAC
6	1	Valve		522000000000RAC
7	4	Screw		499000000000107
8	4	Flat washer		499000000000107
9	4	Nut		499000000000107
10	2	Valve		522000000000RAC
11	8	Screw		499000000000107
12	4	Nut		499000000000107
13	4	Flat washer		499000000000107
14	4	Screw		499000000000107
15	1	Level indicator		52200000000ZLG3

240 L. HYDRAULIC FLUID TANK (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Fluid tank		5220000ZCF180G
2	1	Return filter		52200OMTF300-BN
3	1	Filling cover		0500000TR291081
4	2	Hose		522000000000RAC
5	1	Hose		522000000000RAC
6	1	Valve		522000000000RAC
7	4	Screw		499000000000107
8	4	Flat washer		499000000000107
9	4	Nut		499000000000107
10	2	Valve		522000000000RAC
11	8	Screw		499000000000107
12	4	Nut		499000000000107
13	4	Flat washer		499000000000107
14	4	Screw		499000000000107
15	1	Level indicator		52200000000ZLG3

100 L. DIESEL TANK (TH)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel tank		522000000131835
2	1	Emptying cover		----------
3	1	Filling cover		----------
4	1	Test cover		----------
5	1	Diesel escape cover		----------
6	1	Level		5220000000LG2-T

55 L. DIESEL TANK (TH)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel tank		522000068561941
2	1	Fuel top		----------
3	1	O-ring		----------
4	1	Emptying cover		----------
5	1	Hose		----------
6	1	Hose		----------
7	4	Screw		499000000000107
8	4	Flat washer		499000000000107
9	4	Nut		499000000000107
10	2	O-ring		----------
	1	Complete tank		5220000293CNJ00

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5220000537FAB00
5220000537MTJ00

POWER PACK TRACK DISTRIBUTOR (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
-	1	Complete distributor		522000013020025
1	1	Outlet cover		----------
2	1	Inlet cover		----------
3	1	Regulating valve		----------
4	1	Control kit		----------
5	1	Load sensing		----------
6	4	Allen screw		499000000000107
7	1	Nut		499000000000107
8	1	Nut		499000000000107
9	2	Washer		499000000000107
10	2	Joint		522000000000RAC
11	2	Washer		499000000000107
12	2	Joint		522000000000RAC

TRUCK HYDRAULIC DIAGRAM (RT)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	2	Pressure gauges		522000000122500
2	1	Traction-rotation distributor		522000001501040
3	1	Anti-return valves		522000300409022
4	1	Caterpillar tracks distributor		5220002002.1045
5	1	Rotation distributor		522000013010039
6	1	Rubber track extensions		522000016170900
7	1	Rotation head		522000000CR-245
8	8	Anti-return valve		522000000409022
9	4	Stabilising cylinders		522000007040300
10	2	Caterpillar extension cylinder		----------
11	1	Adjustment cylinder		522000005030500
12	1	Rotation cylinder		52200001021226
13	1	Lifting cylinder		522000008040500
14	1	Cylinder distributor		522000002308000
15	1	Winch		522000009141635
16	1	Side movement cylinders		522000005030300
17	1	Clamp rotation cylinder		522000010171640
18	2	Distribution valve		522000000081323
19	4	Clamp cylinder		5220000352CNJ00
20	1	Advance reducer		5220000303L1HC
21	1	Advance regulating valve		522000000011743
22	1	Advance distributor		522000023060851

TRUCK HYDRAULIC DIAGRAM (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
23	1	Fast plug		52200000ERAP3/8
24	1	Fast plug		5220000000ERAP1
25	1	Fast plug		5220000000ERAP1
26	1	4-way valve		522000001051038
27	1	Fast plug		52200000ERAP3/8
29	1	Fast plug		52200000ERAP3/4

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2/215 FE
5220000240HDR00

POWER PACK HYDRAULIC DIAGRAM (RT)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	Diesel engine		5220000F3L20110
2	1	Double hydraulic pump		522000000403492
3	1	Safety valve		522000000011743
4	1	Safety valve		522000000011743
19	1	Air-fluid exchanger		522000025202012
20	1	Return filter		52200OMTF300-BN
23	1	Fast plug		52200000ERAP3/8
24	1	Fast plug		5220000000ERAP1
25	1	Fast plug		5220000000ERAP1
27	1	Fast plug		52200000ERAP3/8
29	1	Fast plug		52200000ERAP3/4

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1/215 TH
5220000241HDR01

TRUCK HYDRAULIC DIAGRAM (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	3	Pressure gauges		52200000120250 522000000122500
2	1	Traction-rotation distributor		522000001501040
3	1	Hammer distributor		522000013010061
4	1	Caterpillar tracks distributor		5220002002.1045
5	1	Rotation distributor		5220001003.10044
6	1	Rubber tracks Steel tracks		522000016170900 5220500PT15A452
7	1	HB-35 Hydraulic Hammer		522000036002571
8	9	Anti-return valve Anti-return valve		522000000409022
9	4	Stabilising cylinders		522000007040300
10	2	Caterpillar extension cylinder		----------
11	1	Adjustment cylinder		522000005030500
12	1	Rotation cylinder		52200TH01021226
13	1	Lifting cylinder		522000008040500
14	1	Cylinder distributor		522000023060851
15	1	Winch		522000009141635
16	1	Side movement cylinders		522000005030300
17	1	Clamp rotation cylinder		5220008207.0150
18	2	Distribution valve		522000000081323
19	4	Clamp cylinder		5220000352CNJ00

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1/215 TH
5220000241HDR01

TRUCK HYDRAULIC DIAGRAM (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
20	1	Advance reducer		5220000303L1HC4
21	1	Advance regulating valve		522000000011743
22	1	Advance distributor		522000023060851
23	1	Fast plug		52200000ERAP3/8
24	1	Fast plug		5220000000ERAP1
25	1	Fast plug		5220000000ERAP1
26	1	Fast plug		52200000ERAP1/2
27	1	Fast plug		52200000ERAP3/8
28	1	Fast plug		52200000ERAP3/4
29	1	Fast plug		52200000ERAP3/4
30	1	Fast plug		52200000ERAP1/4
31	1	¼" 3 way coupling		522000000VLV1/4

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2/215 TH
5220000242HDR01

POWER PACK HYDRAULIC DIAGRAM (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	1	DEUTZ BF4M2012 Engine		522000000090311
2	1	Double hydraulic pump		522000000403492
3	1	Hydraulic pump		522000000214043
4	1	½" maximum valve		522000000011132
5	2	¾" maximum valve		522000000011134
6	1	1/2" diverter		522000000300020
7	2	¾" Diverter		522000000300030
9	1	Distributor		522000000020029
10	1	Steel tracks		522000000PT15.A
11	2	Ball valve		5220000000VBL16
12	1	Ball valve		----------
13	1	Pump 1 return filter		52200OMTF300
14	1	Pump 2 return filter		52200OMTF300
15	1	Air-fluid exchanger		52200025202012
23	1	Hammer bleed fast plug		52200000ERAP3/8
24	1	Pump 1 tank fast plug		5220000000ERAP1
25	1	Pump 2 tank fast plug		5220000000ERAP1
26	1	Pump 3 pressure fast plug		52200000ERAP1/2
27	1	Pump 3 pressure fast plug		52200000ERAP3/8
28	1	Fast plug		52200000ERAP3/4
29	1	Pump 1 pressure fast plug		52200000ERAP1/8
30	1	Fast plug		52200000ERAP1/4

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2/215 TH
5220000242HDR01

POWER PACK HYDRAULIC DIAGRAM (TH)			**MYM-C5**	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
31	1	Ball valve		522000000VLV1/4
32	1	Pressure switch		492000000F4T1M2

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ELECTRIC DIAGRAM (RT)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
	1	Protection switchboard		5220000136ELC00
-	--	12V connection to electric panel		5220000078ELC01
-	--	Electricity distribution		5220000515ELC00
-	--	External connection		5220000320ELC00
-	--	Machine-Power Pack connection		5220000335ELC00

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ELECTRIC DIAGRAM (TH)			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
	1	Protection switchboard		5220000136ELC00
-	--	12V connection to electric panel		5220000519ELC00
-	--	Electricity distribution		5220000515ELC00
-	--	External connection		5220000320ELC00
-	--	Machine-Power Pack connection		5220000335ELC00

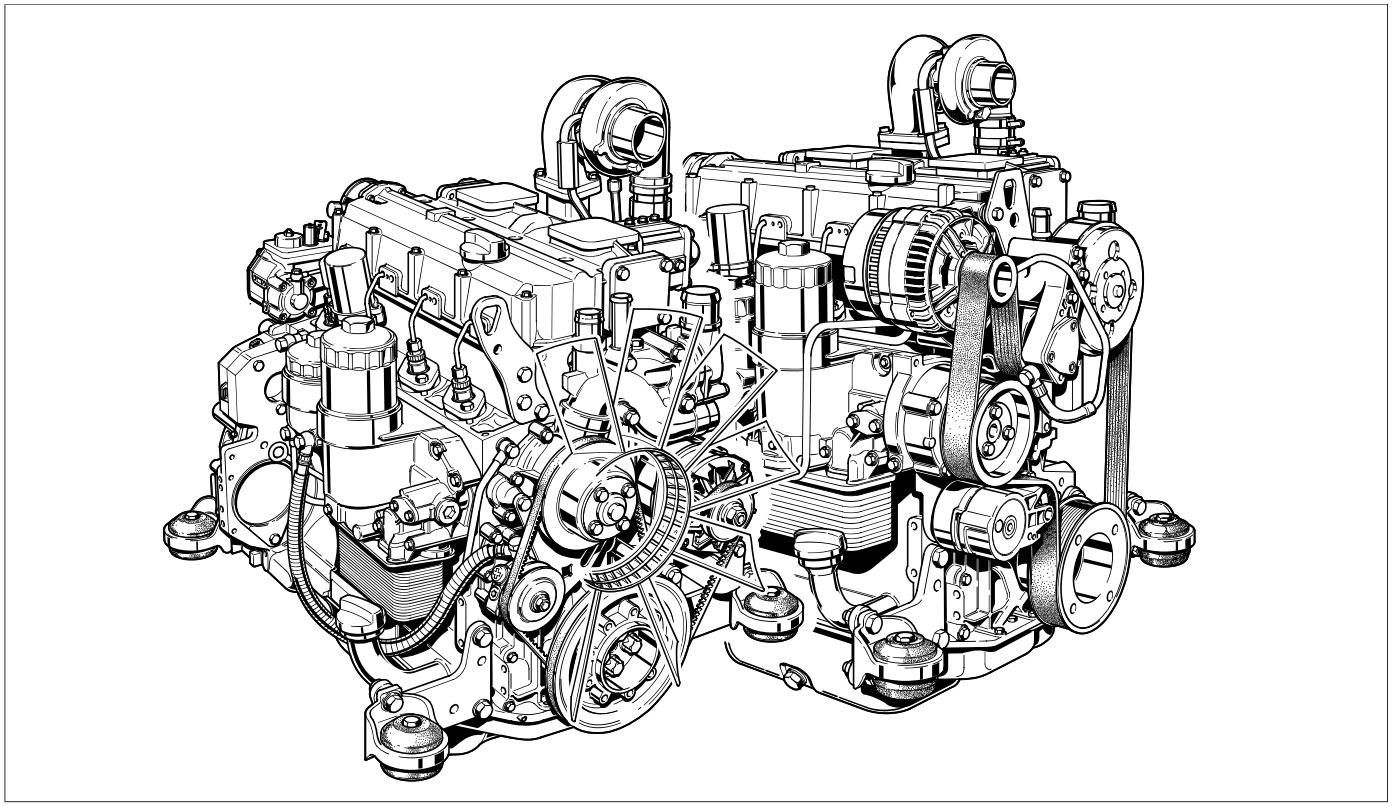
DRILLING RIG TRANSPORT			MYM-C5	
Pos.	**Qty.**	**Definition**	**Manufacturer Ref.**	**MYM Reference**
1	2	Rings		----------
2	2	Straps		----------
3	2	Straps		----------

Información que aparece en todos los dibujos:

Diseñado por	=	Designed by
Dibujado por	=	Drawn by
Revisado por	=	Revised by
Aprobado por	=	Approved by
Código	=	Code
Fecha	=	Date
Escala	=	Scale

Definiciones que aparecen en el dibujo de la pagina 86

1. Fluid tank
2. Return filter
3. Filling cover
4. HOSE: WELDED JOINT FEMALE 1”
5. HOSE: WELDED JOINT FEMALE ¾”
6. Butterfly valve – ¾”
7. Hexagonal bolt - M12
8. Flat washer – M12
9. Self-locking nut – M12
10. Butterfly valve – 1”
11. Allen screw – M6
12. Self-locking nut – M10
13. Flat washer – M10
14. Hexagonal bolt – M10
15. Level indicator



Operation Manual
2012

DEUTZ®

Safety guidelines / Accident prevention

- Please read and observe the information given in this Operation Manual. This will enable you to avoid accidents, preserve the manufacturer's warranty and maintain the engine in peak operating condition.

- This engine has been built exclusively for the application specified in the scope of supply, as described by the equipment manufacturer and is to be used only for the intended purpose. Any use exceeding that scope is considered to be contrary to the intended purpose. The manufacturer will not assume responsibility for any damage resulting therefrom. The risks involved are to be borne solely by the user.

- Use in accordance with the intended purpose also implies compliance with the conditions laid down by the manufacturer for operation, maintenance and servicing. The engine should only be operated by personnel trained in its use and the hazards involved.

- The relevant accident prevention guidelines and other generally accepted safety and industrial hygiene regulations must be observed.

- When the engine is running, there is a risk of injury through:
  - turning/hot components
  - engines with positive ignition
  - ignition systems (high electrical voltage)
  You must avoid contact at all times!

- Unauthorized engine modifications will invalidate any liability claims against the manufacturer for resultant damage.
  Manipulations of the injection and regulating system may also influence the performance of the engine, and its emissions. Adherence to legislation on pollution cannot be guaranteed under such conditions.

- Do not change, convert or adjust the cooling air intake area to the blower.
  The manufacturer shall not be held responsible for any damage which results from such work.

- When carrying out maintenance/repair operations on the engine, the use of DEUTZ original parts is prescribed. These are specially designed for your engine and guarantee perfect operation.
  Non-compliance results in the expiry of the warranty!

- Maintenance and cleaning of the engine should only be carried out when the engine is switched off and has cooled down.
  You must ensure that the electrical systems have been switched off and the ignition key has been removed.
  Accident prevention guidelines concerning electrical systems (e.g. VDE-0100/-0101/-0104/-0105 Electrical protective measures against dangerous touch voltage) are to be observed.
  When cleaning with fluids, all electrical components are to be covered impermeably.

Operation Manual
2012

0297 9912 en

Engine Serial Number: | | | | | | | |

Please enter the engine serial number here. This number should be quoted when inquiring about Customer Service, Repairs or Spare Parts (see Section 2.1).

Technical modifications required to improve our engines are reserved with regard to specification data and other technical information contained in this Operation Manual. No parts of this Manual may be reproduced in any form or by any means without our written approval.

DEUTZ®

Foreword

Dear Customer,

Liquid-cooled DEUTZ engines are designed for a large number of applications. Consequently, a wide range of variants are offered to meet the requirements of specific cases.

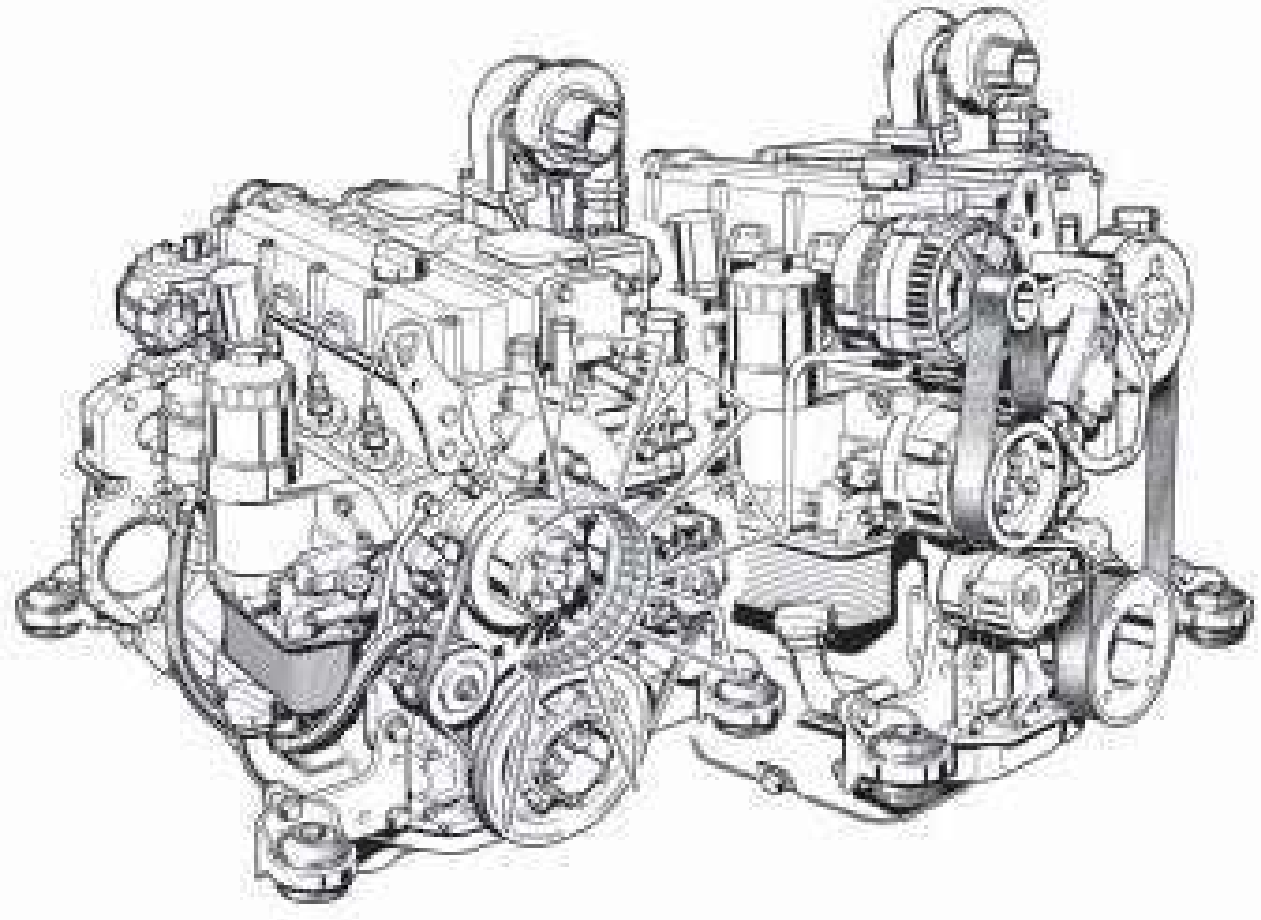
Your engine is appropriately equipped for the installation concerned, which means that not all of the components described in this Operation Manual are necessarily mounted to your engine.

We have endeavored to highlight any differences so that you will be able to locate the operating and maintenance instructions relevant to your engine quickly and easily.

Please read this Manual before starting your engine, and always observe the operating and maintenance instructions.
We are available to help with any additional inquiries

Sincerely,

DEUTZ AG



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DEUTZ Diesel Engines

are the product of many years of research and development. The resulting know-how, coupled with stringent quality standards, guarantee their long service life, high reliability and low fuel consumption.
It goes without saying that DEUTZ Diesel Engines meet the highest standards for environmental protection.

Beware of Running Engine

Shut the engine down before carrying out maintenance or repair work. Ensure that the engine cannot be accidentally started. Risk of accidents.
When the work is complete, be sure to refit any panels and guards that may have been removed.
Never fill the fuel tank while the engine is running.
Observe industrial safety regulations when running the engine in an enclosed space or underground.

Care and Maintenance

Sound care and maintenance practices will ensure that the engine continues to meet the requirements placed on it. Recommended service intervals must be observed and service and maintenance work carried out conscientiously.
Special care should be taken under abnormally demanding operating conditions.

Safety

This symbol is used for all safety warnings. Please follow them carefully. The attention of operating personnel should be drawn to these safety instructions. General safety and accident prevention regulations laid down by law must also be observed.

Asbestos

DEUTZ original parts are asbestos-free.

Service

Please contact one of our authorized service representatives in the event of breakdowns or for spare parts inquiries. Our trained specialists will carry out repairs quickly and professionally, using only genuine spare parts.
Original parts from DEUTZ AG are always produced in accordance with state-of-the-art technology.
Please turn to the end of this manual for further service information.

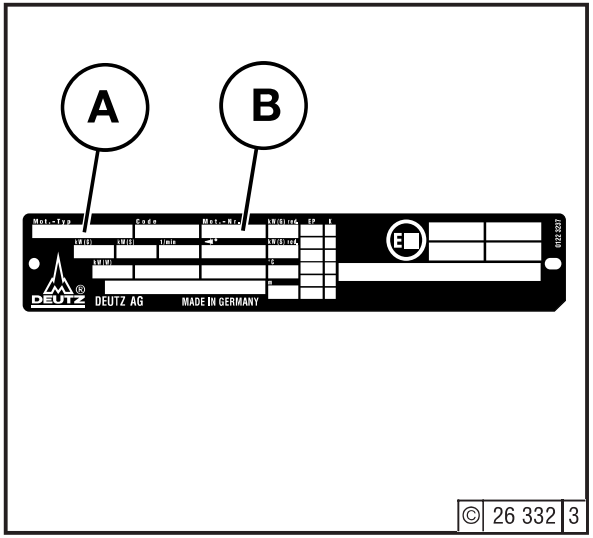
California

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

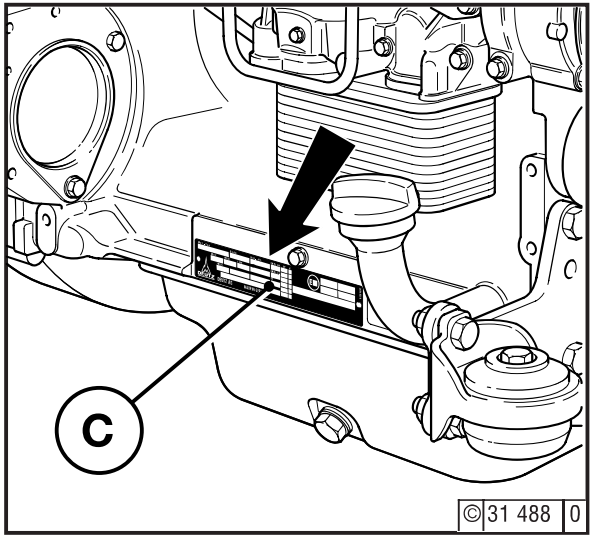
1

2.1.1 Rating Plate



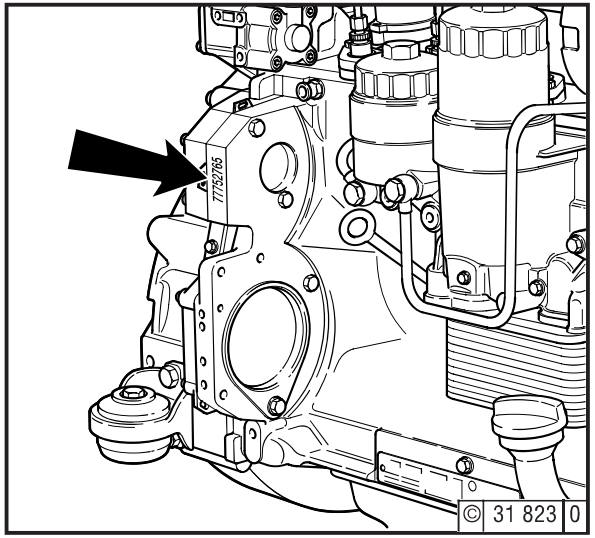
The model **A**, the engine serial number **B** and the performance data are stamped on the rating plate.The model and engine serial number must be given when ordering parts.

2.1.2 Position of the Rating Plate



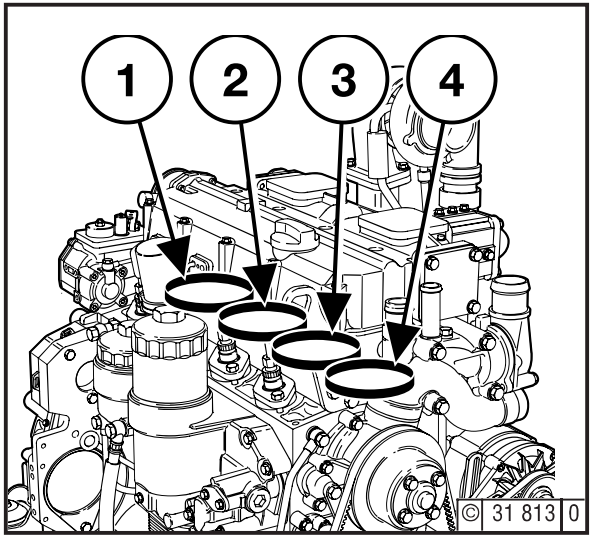
The rating plate **C** is attached to the crankcase.

2.1.3 Engine Serial Number



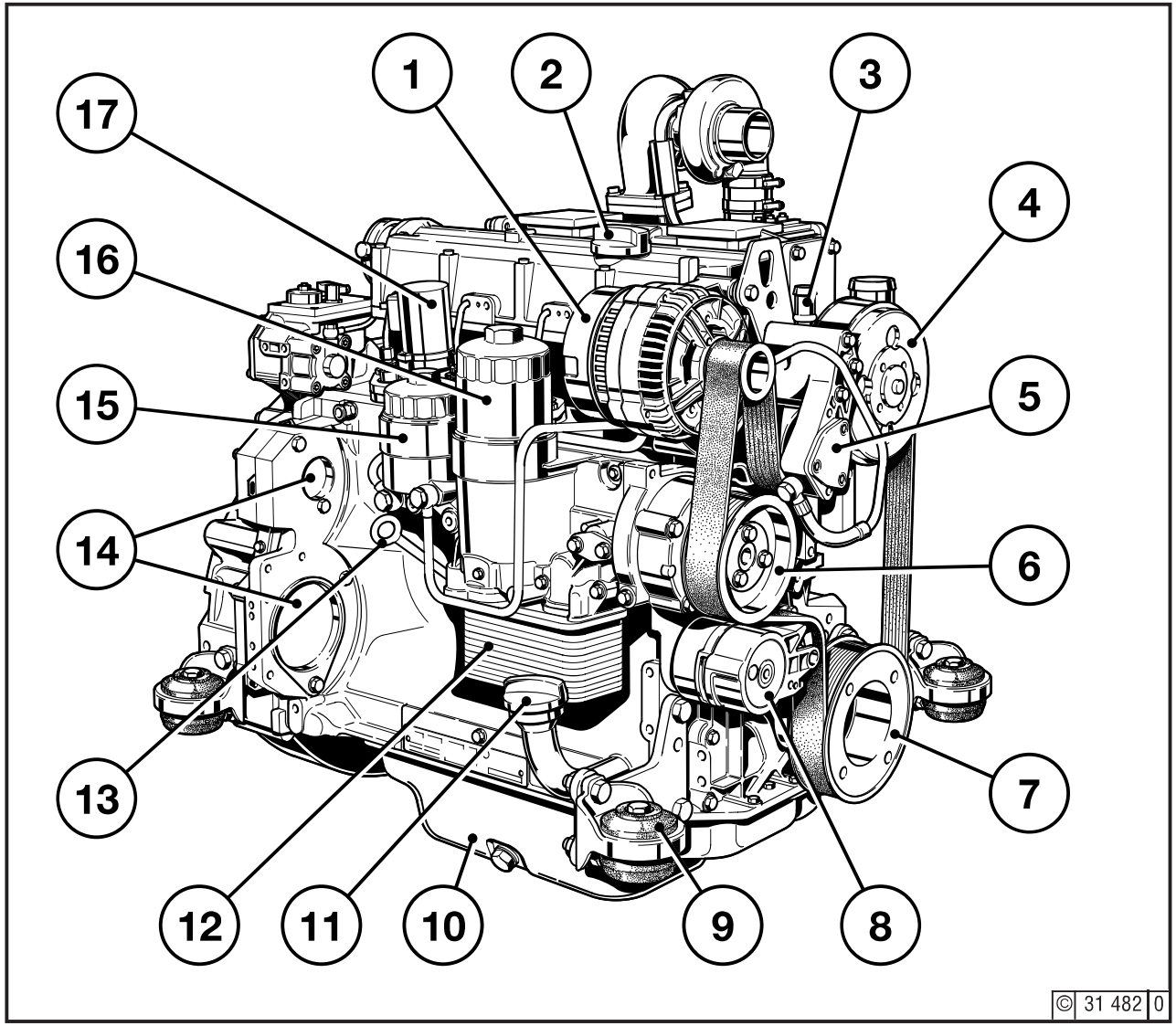
The engine serial number is stamped on the crankcase (**arrow**) as well as the rating plate.

2.1.4 Cylinder Enumeration



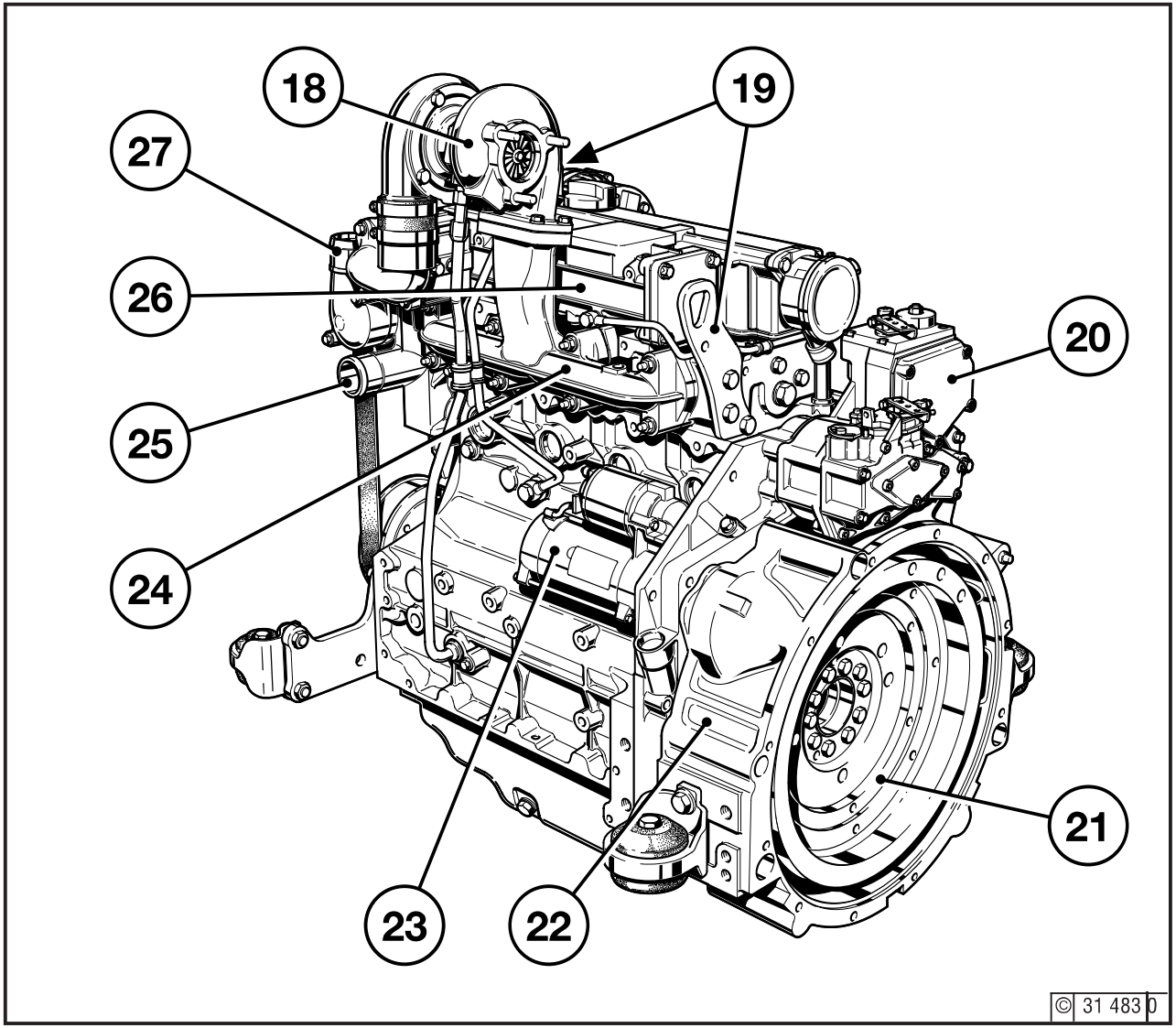
Cylinders are numbered consecutively, beginning at the flywheel.

2.2.1 Operating Side 2012
Ribbed V-belt drive



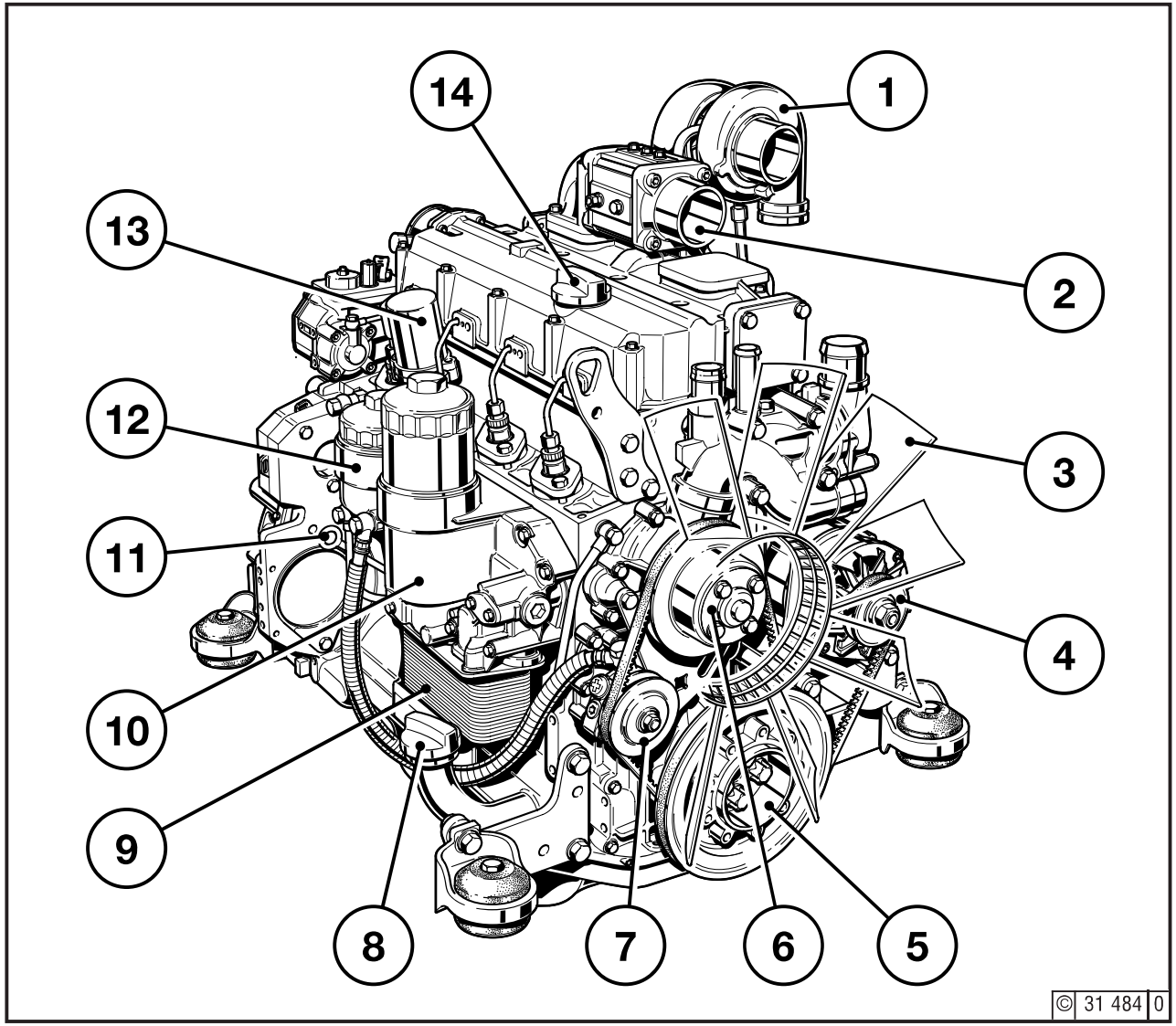
1 Alternator
2 Oil filler
3 Coolant connection compensation line
4 Fan pulley
5 Fuel pump
6 Coolant pump
7 Ribbed V-belt pulley on crankshaft
8 Tension roller
9 Feet
10 Oil pan
11 Oil filler neck
12 Oil filter housing with engine oil cooler
13 Oil dipstick
14 Optional attachment of:
Compressor or hydraulic pump
15 Fuel filter cartridge
16 Oil filter cartridge
17 Tractive electromagnet

2.2.2 Starter Side 2012
Ribbed V-belt drive



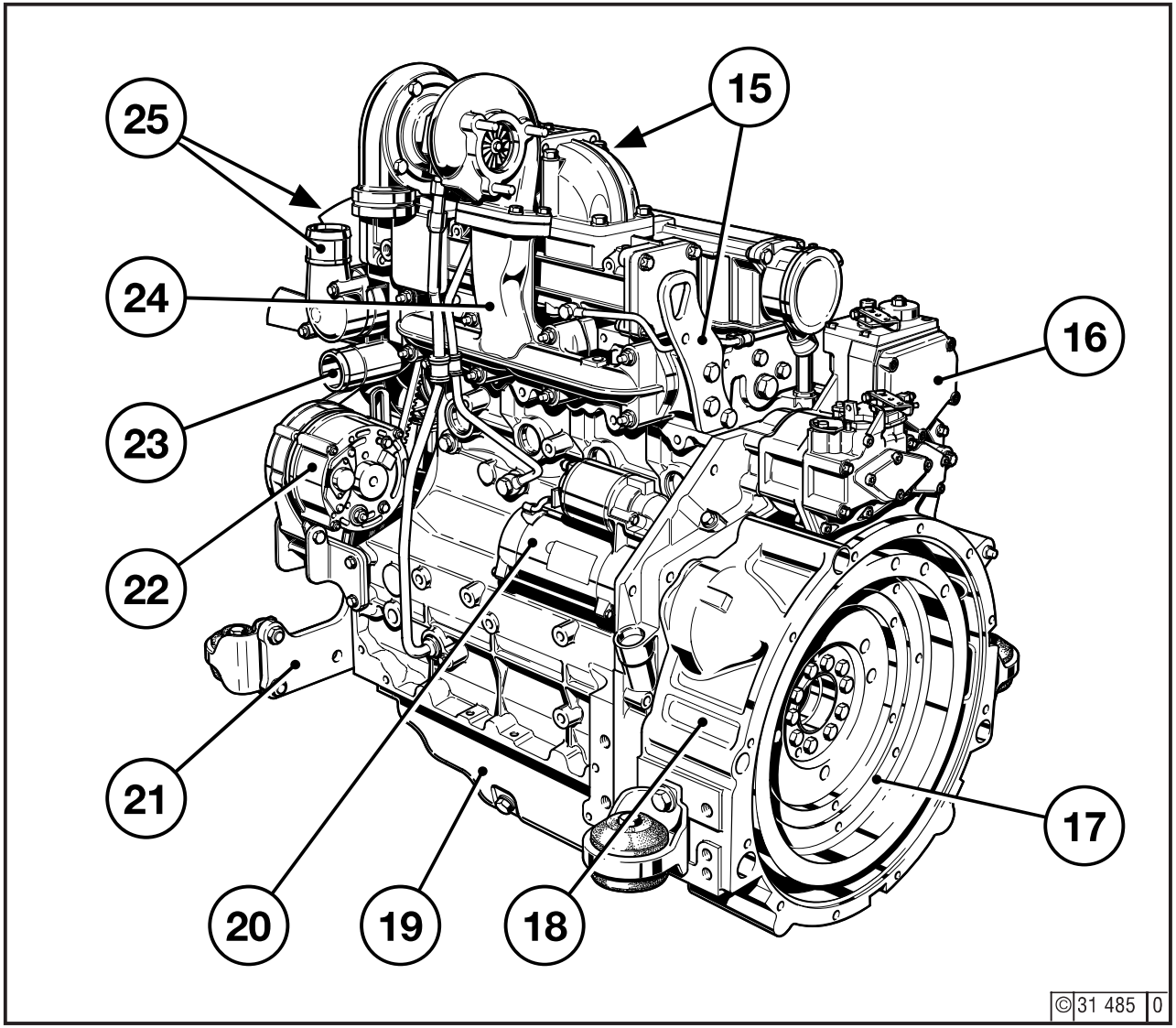
18 Turbocharger
19 Engine suspension
20 Speed regulator
21 Flywheel
22 SAE housing
23 Starter
24 Exhaust manifold
25 Coolant inlet
26 Heater flange not shown
27 Thermostat housing coolant outlet

2.2.3 Operating Side 2012



1 Turbocharger
2 Heater flange
3 Fan
4 Alternator
5 V-belt pulley on crankshaft
6 Coolant pump
7 Fuel pump
8 Oil filler
9 Oil filter housing with engine oil cooler
10 Oil filter housing with oil filter cartridge
11 Oil dipstick
12 Fuel filter
13 Tractive electromagnet
14 Oil filler neck

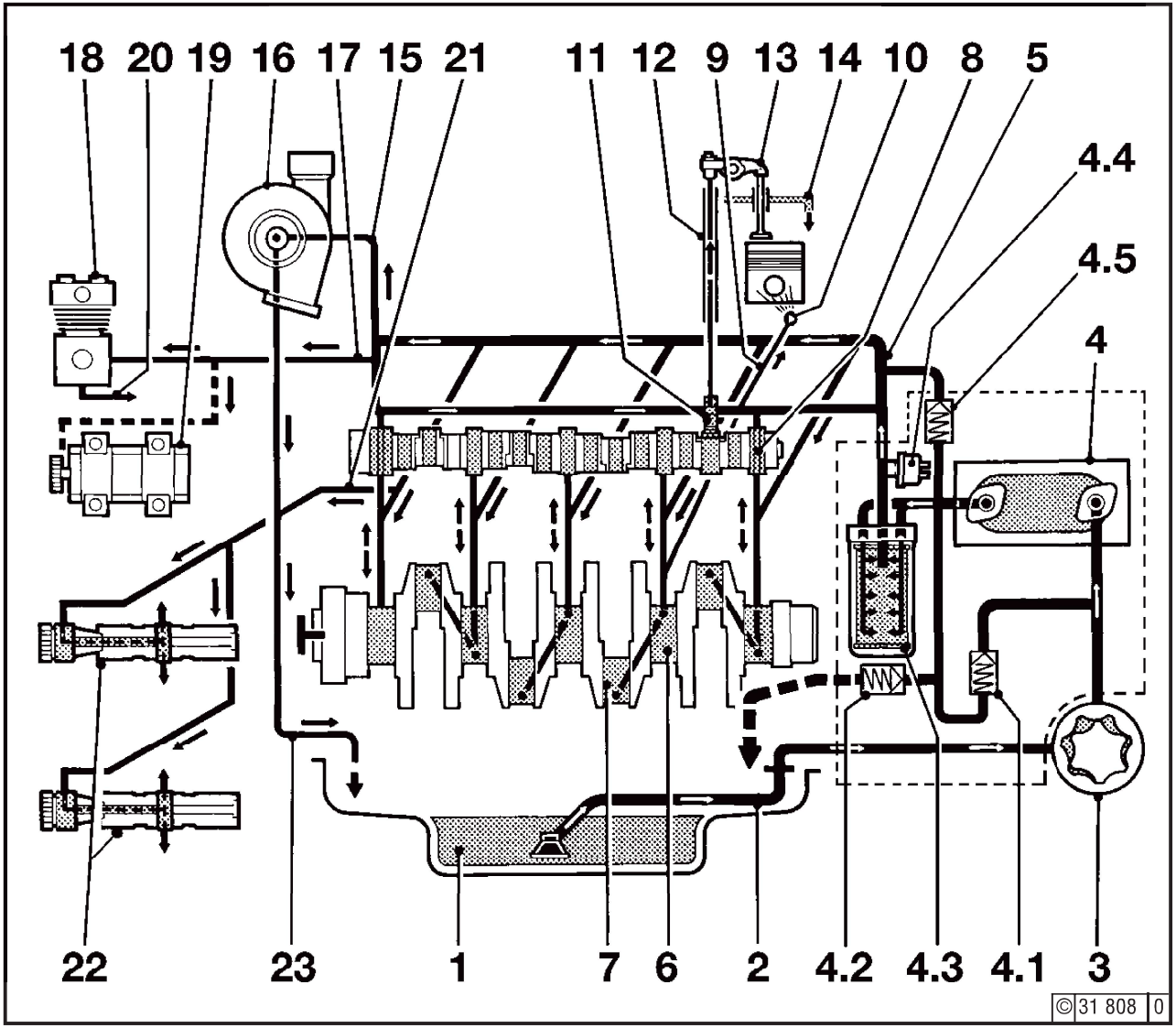
2.2.4 Starter Side 2012



15 Engine suspension
16 Speed regulator
17 Flywheel
18 SAE housing
19 Oil pan
20 Starter
21 Feet
22 Alternator
23 Coolant inlet
24 Exhaust manifold
25 Coolant outlet

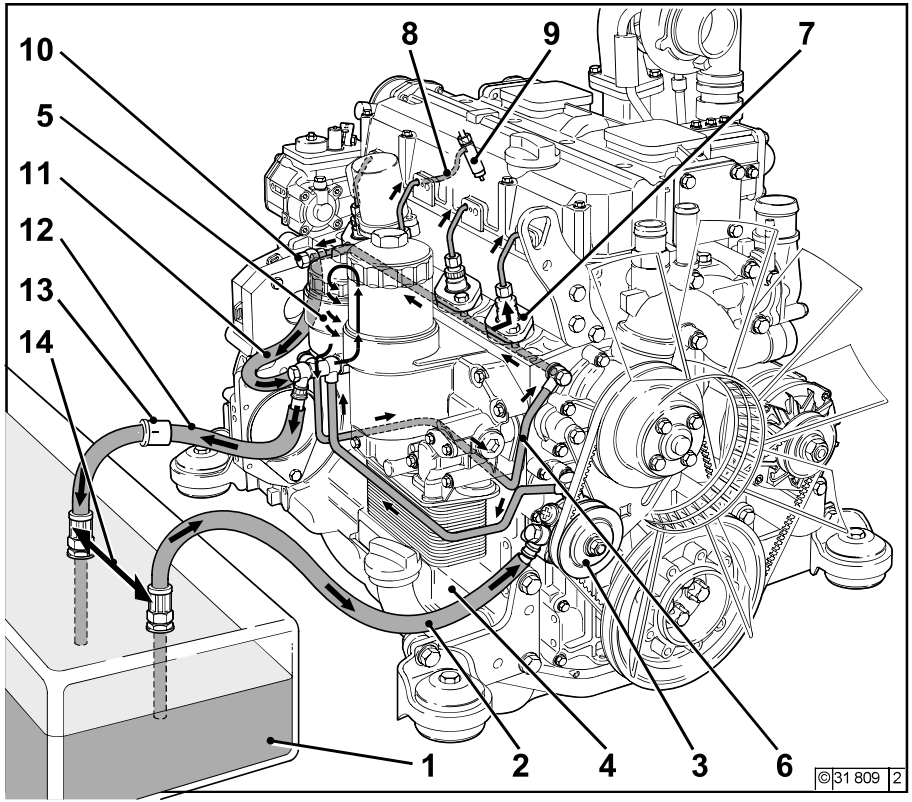
2

2.3.1 Lube Oil Plan



1 Oil pan
2 Intake line
3 Lube oil pump
4 Lube oil cooler
4.1 Heat exchanger bypass valve
4.2 Shut-off valve
4.3 Lube oil replacement filter
4.4 Oil pressure sensor
5 Main oil pipe
6 Crankshaft bearing
7 Con-rod bearing
8 Camshaft bearing
9 Line to spray nozzle
10 Spray nozzle for piston cooling
11 Valve lifter with rocker arm impulse lubrication
12 Stop rod, oil supply for rocker arm lubrication
13 Rocker arm
14 Return line to oil pan
15 Oil line to turbocharger
16 Turbocharger
17 Oil line to compressor or hydraulic pump
18 Compressor
19 Hydraulic pump
20 Return line from compressor or hydraulic pump
21 Line to the differential (2x)
22 Balancer shafts
23 Turbocharger return to crankcase

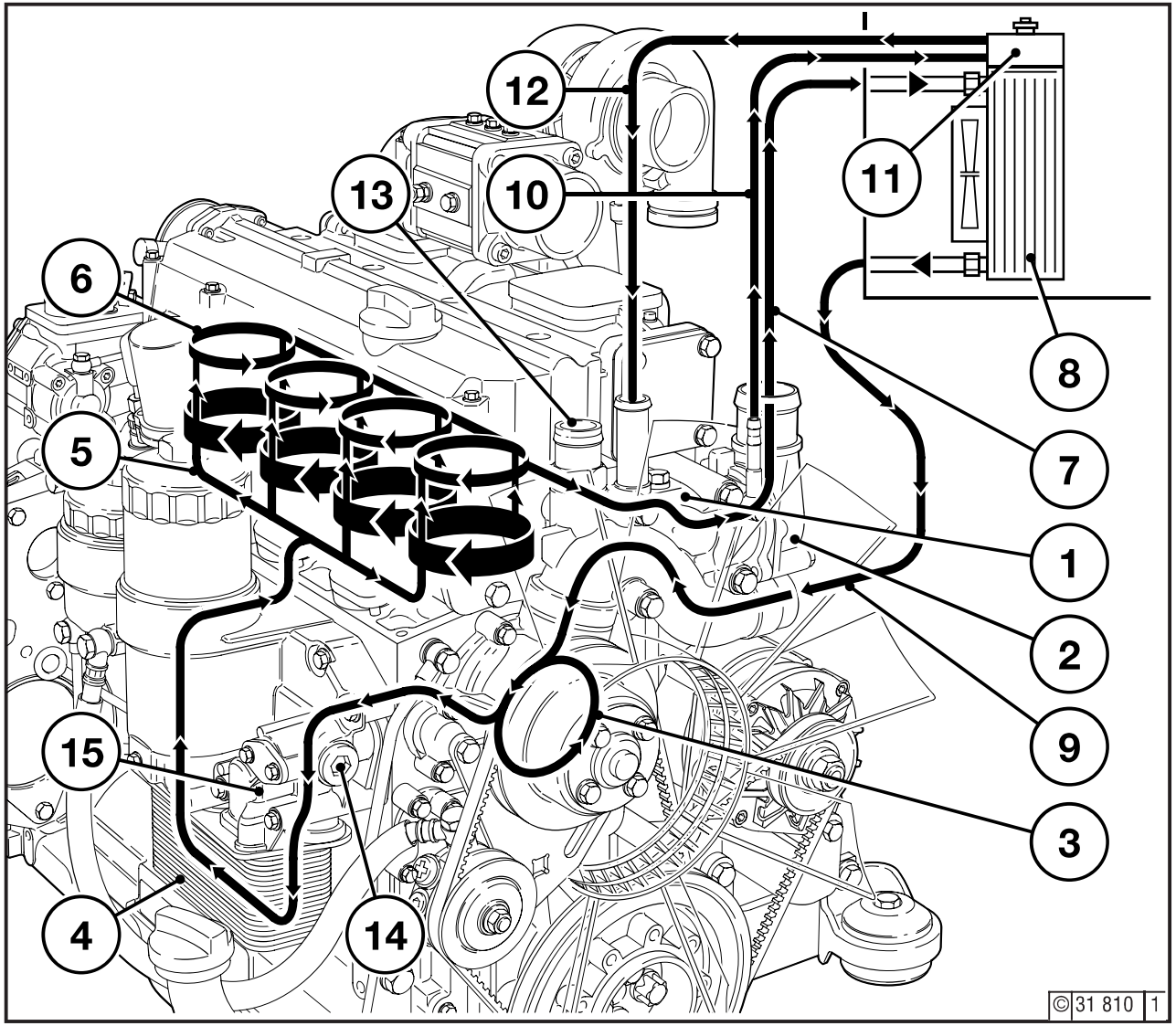
2.4.1 Fuel System Plan



1 Fuel tank
2 Line to fuel pump
3 Fuel pump
4 Line to fuel filter
5 Fuel filter
6 Line to the injection pumps
7 Injection pump
8 Line to injection valve
9 Injection valve
10 Banjo bolt with pressure maintenance valve
11 Return line to fuel filter housing from pressure maintenance valve (with cup filter installation only)
12 Return line to fuel tank
13 Fuel check valve
14 Maintain maximum possible distance

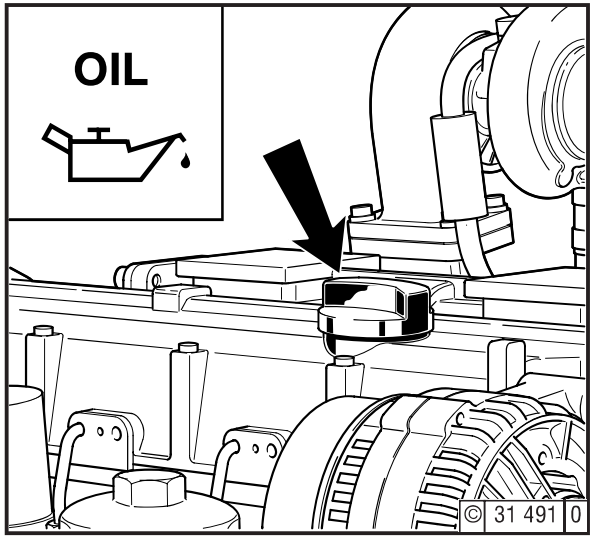
For the protection of the engines, by dirt in the fuel, an installation is compellingly prescribed by fuel prescreeners hand pump, between fuel tank and engine.

2.5.1 Coolant block diagram 2012
Example: With cup filter



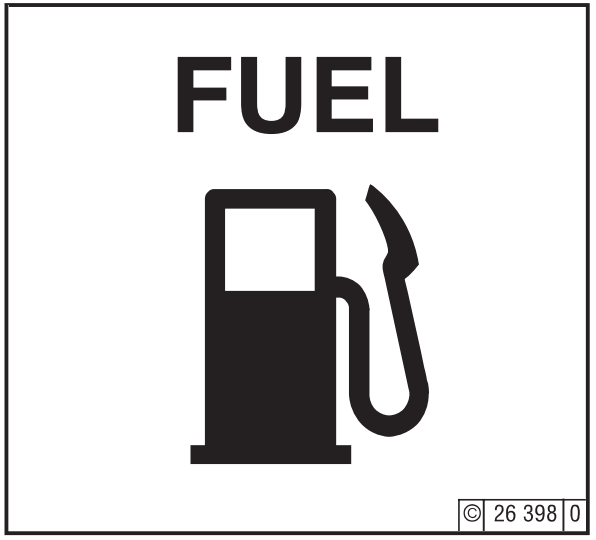
1. Thermostat housing
2. Outlet neck cover
3. Coolant pump
4. Lube oil cooler
5. Cylinder cooling
6. Cylinder head cooling
7. Line from engine to heat exchanger
8. Heat exchanger
9. Line from heat exchanger to thermostat
10. Ventilation line to the compensation tank
11. Compensation tank
12. Coolant compensation line
13. Coolant return from heater
14. Coolant supply to heating at V-belts
15. Coolant supply to heating at ribbed V-belts

3.1.1 Pour in Engine Oil



As a rule, engines are delivered without oil.
Pour lube oil into the oil filler neck (arrow).
Oil capacity, see 9.1.
For oil grade and viscosity, see 4.1.

3.1.2 Oil Bath Air Filter with Engine Oil



Fill oil cup 1 of the oil bath air cleaner (if installed) with oil up to the arrow.
For oil grade and viscosity, see 4.1.

Never fill the fuel tank while the engine is running. Ensure cleanliness! Do not spill fuel!

3.1.3 Fill / Bleed Cooling System

- 2012: In accordance with the radiator supplier's specifications
- Unit engine: In accordance with the radiator supplier's specifications

3.1.4 Other Preparations

- Check battery and cable connections, see 6.7.1.

- **Trial run**
  - After the engine has been prepared, carry out a brief trial run for approx. 10 minutes, without load if possible.

  During and after the trial run
  - Check the engine for leaks.

  After the engine has been turned off
  - Check oil level and top up if necessary, see 6.1.2.
  - Retension V-belts, see 6.5.

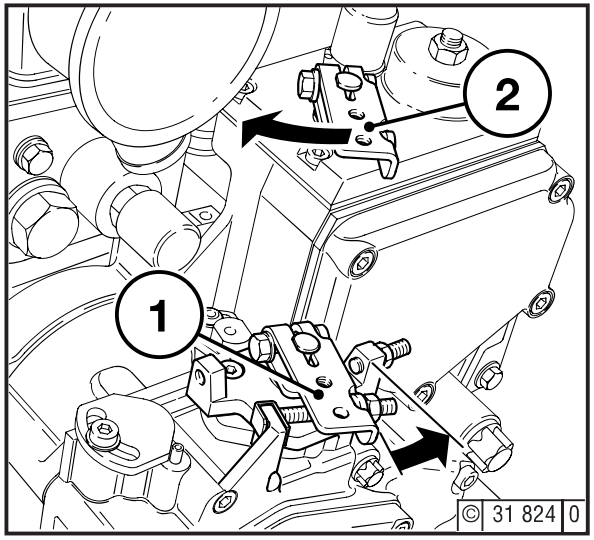
- **Breaking in**
  During the break-in phase - about 200 operating hours - check the oil level twice a day.
  After the engine is broken in, checking once a day will be sufficient.

- **In the event of commissioning engines which have been preserved**
  Carry out removal of preservation in accordance with Chapter 8.1.

3

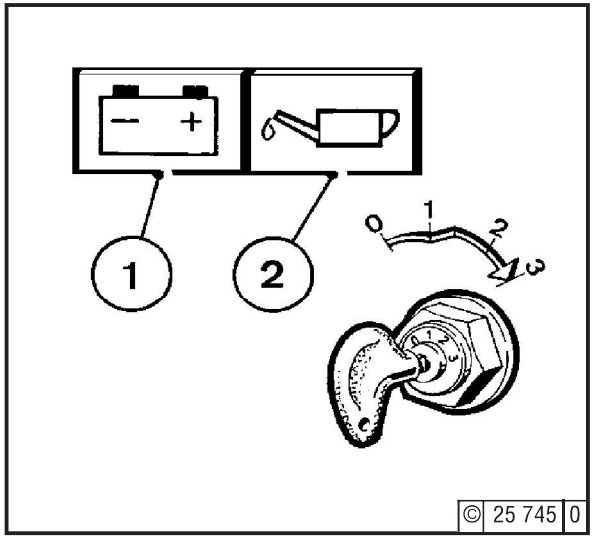
3.2.1 Electric Starting

Before starting, make sure that nobody is standing in the immediate vicinity of the engine or driven machine.
After repair work:
Check that all guards have been replaced and that all tools have been removed from the engine.
When starting with glow plugs, do not use any other starter substance (e.g. injection with start pilot). Risk of accident!
Caution: If the speed regulator has been removed, the engine must not be started under any circumstances.
Disconnect the battery!



- Disengage the clutch to separate the engine from any driven parts.
- Bring speed adjustment lever 1 into at least the middle speed position in the direction of the arrow.
- Move cut-out handle 2 into operating position counter to the direction of the arrow.

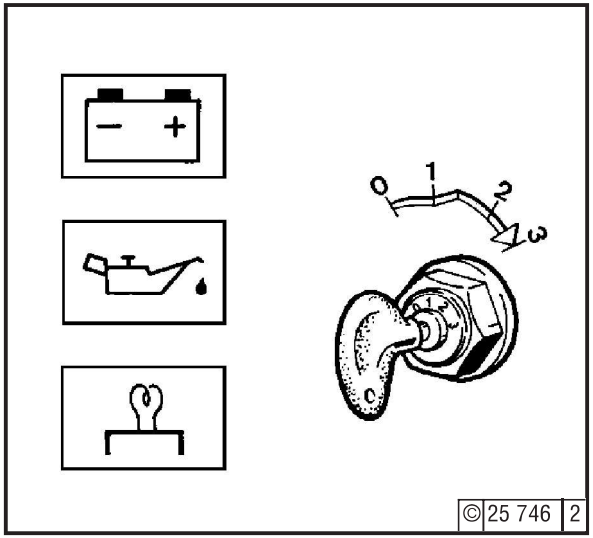
without cold start assistance



- Insert key
  - Position 0 = no operating voltage.
- Turn key clockwise
  - Position 1 = operating voltage
  - Pilot lights 1 and 2 illuminate.
- Push key in and turn further clockwise against spring pressure.
  - Position 2 = no function
  - Position 3 = start
- Release key as soon as engine fires
  - The pilot lights will go out.

Do not actuate the starter for more than 20 seconds. If the engine does not catch, wait for one minute then try again.
If the engine does not catch after two attempts, refer to the Fault Table (see 7.1).

with cold start assistance
Heater flange



- Insert key
  - Position 0 = no operating voltage.

- Turn key clockwise
  - Position 1 = operating voltage.
  - Pilot lights illuminate, pre-glowing until glow indicator is extinguished.

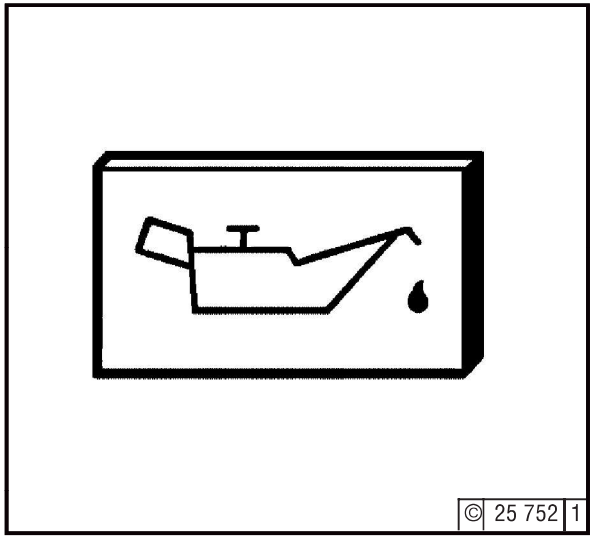
- Push key in and turn further clockwise against spring pressure.
  - Position 2 = no function
  - Position 3 = start

- Release key as soon as engine fires.
  - The pilot lights will go out.

3

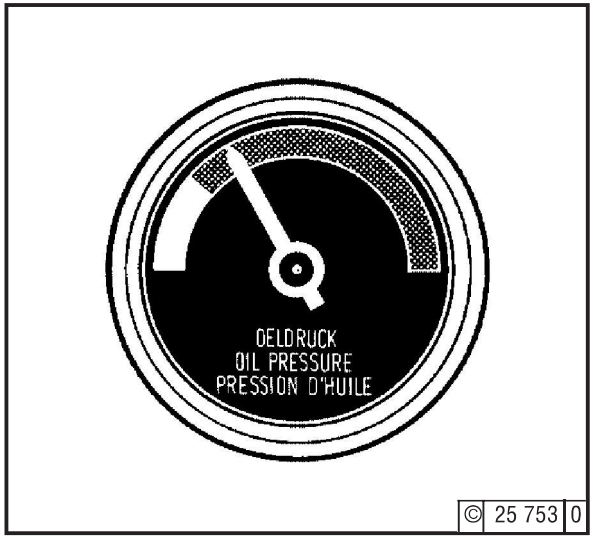
3.3.1 Engine Oil Pressure

Oil pressure lamp



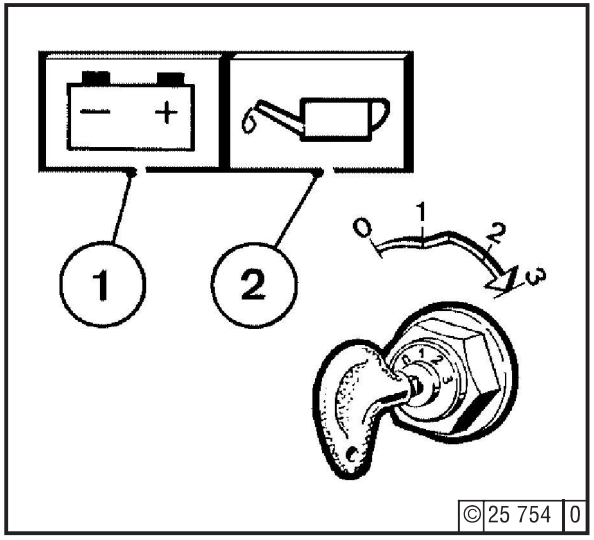
- The oil pressure pilot light comes on with operating voltage on and engine off.
- The oil pressure pilot light must be extinguished when the engine is running.

Oil Pressure Indicator



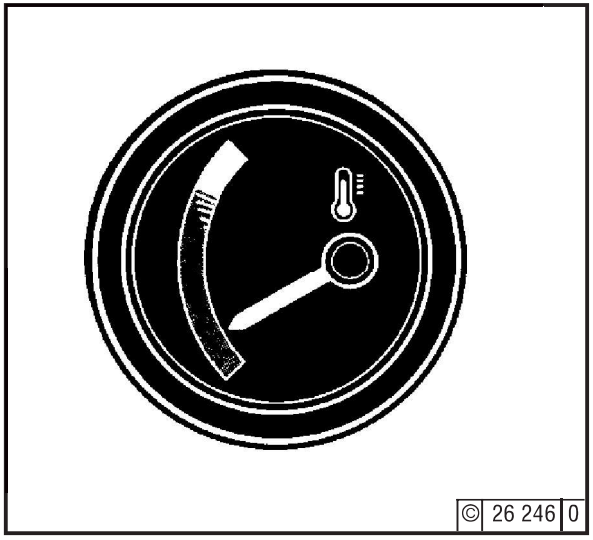
- The pointer must remain in the green sector over the entire operating range.

Oil Pressure Gauge



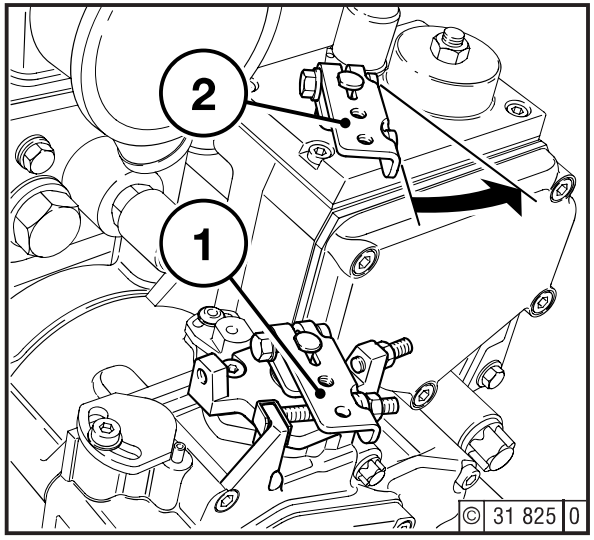
- The pointer of the oil pressure gauge must display the minimum oil pressure (see 9.1)

3.3.2 Coolant temperature



- The engine temperature gauge pointer should always remain in the green sector. It should rarely enter the yellow-green sector. If the pointer enters the orange sector, the engine is overheating.
  Turn off and establish the cause from the Fault Table (see 7.1).

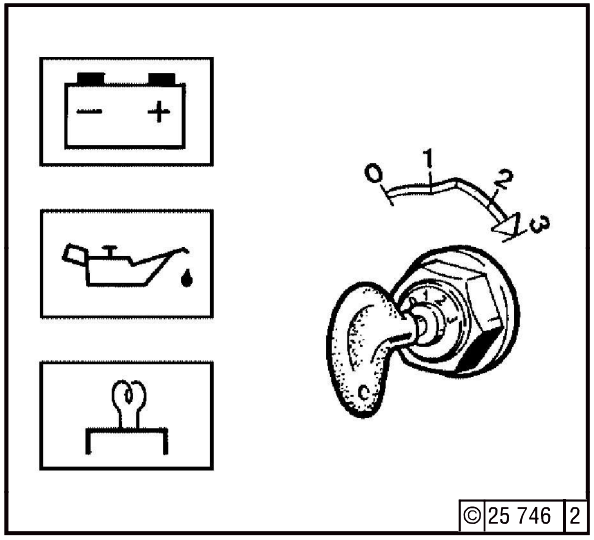
3.4.1 Mechanical Stopping



- Move speed adjustment lever 1 to low idle.
- Move shut-off lever 2 until the engine comes to a stop. The charge pilot light and the oil pressure pilot light illuminate when the engine stops.
- Turn key counterclockwise (to position 0) and remove. The pilot lights will go out.

If possible, do not switch off the engine when under full load. Subsequently allow the engine to idle for approx. 2 mins.

3.4.2 Electrical Stopping



- Turn key counterclockwise (to position 0) and remove. The pilot lights will go out.

3.5.1 Winter Operation

● Lube Oil Viscosity
- Select the oil viscosity (SAE grade) according to the ambient temperature before starting the engine, see 4.1.2.
- Increase oil change frequency when operating below -10 °C, see 6.1.1.

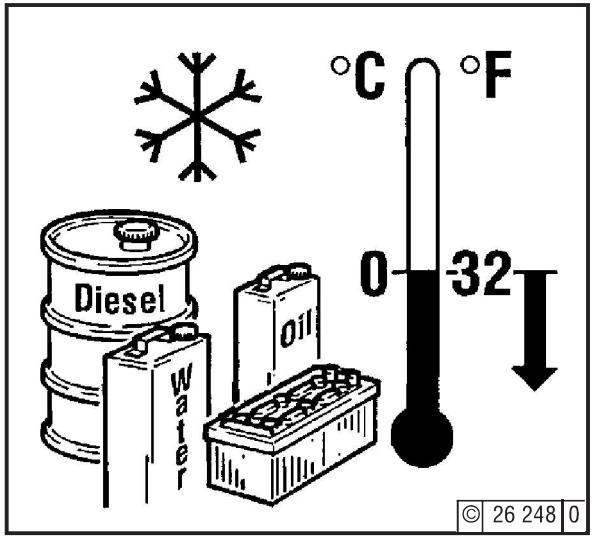
● Diesel Fuel
- Use winter-grade diesel fuel for operation below 0 °C, see 4.2.2.

● Coolant
- Mixture ratio of anti-freeze / water for minimum temperature (max. -35 °C), see 4.3.1.

● Additional Maintenance Work
- Drain the sludge from the fuel tank once a week (undo the sludge drain screw).
- If necessary, adjust oilbath filter oil level, like the engine oil, to the ambient temperture.
- Below -20 °C, after removing the starter if necessary, smear the ring gear on the flywheel via the pinion bore from time to time with cold-resistant grease. (e.g. Bosch grease FT 1 V 31).

● Cold Start Assistance
- The heater flange is automatically initialised at temperatures < -25 °C.

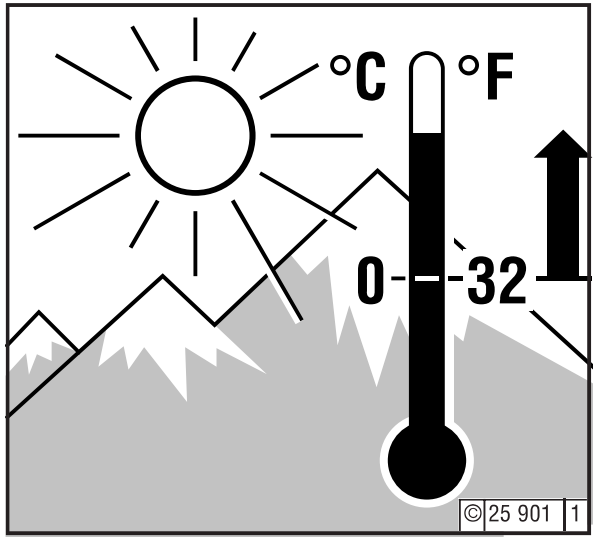
● Battery
- Efficient cold starting necessitates that the battery is well-charged, see 6.7.1.
- The starting limit temperatures can be lowered by 4-5 °C by heating the battery up to about 20 °C. (To do so, remove the battery and store in a warm place).



3.5.2 High Ambient Temperature High Altitude

- Air density decreases as altitude or ambient temperature increase.
  As a result of this, the engine's maximum output, the quality of the exhaust gas, the temperature level and, in extreme cases, starting behaviour, are impeded.
  In the event of non-stationary operation, use up to altitudes of 1000 m and temperatures of 30 °C is permissible.
  If the engine is to operate under unfavourable 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 your service representative.



4.1.1 Quality Grade

Lube oils are differentiated by **Deutz** according to their performance and quality class. Oils of other, comparable specifications can be used.

Approved oils:			
Deutz	DQC I	DQC II	DQC III
ACEA	E2-96	E3/96/E5-02	E4-99
API	CF/CF-4	CH-4/CG-4	-
DHD	-	DHD-1	-

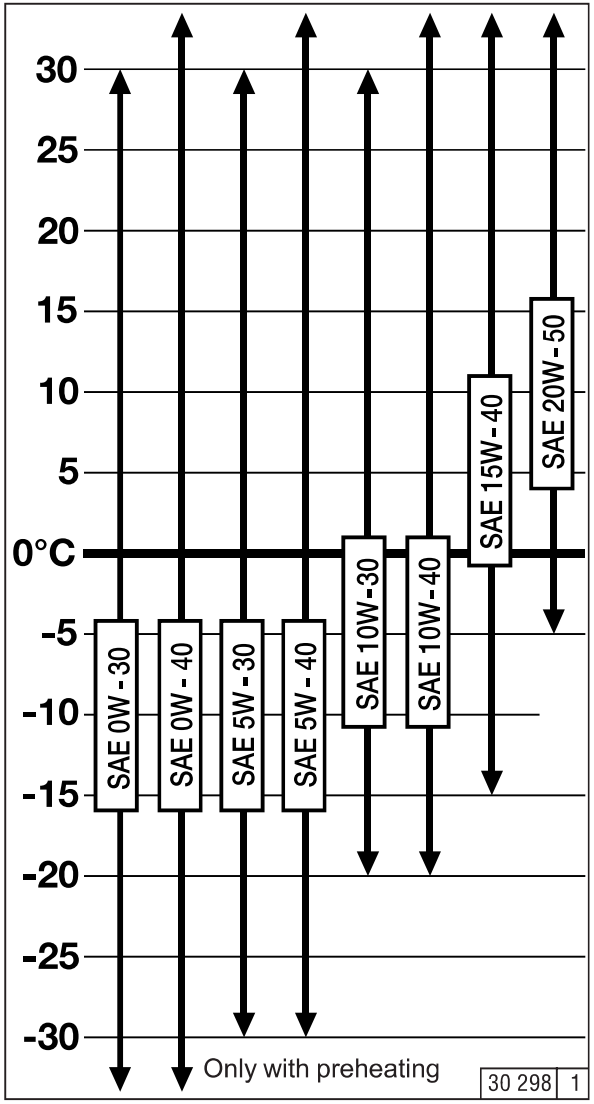
The precise assignment of the admissible oil qualities to the engines is indicated in chapter 6.1.1.
If in doubt, contact your service representative.

4.1.2 Viscosity

Generally, multi-grade oils shall be used. In closed heated rooms at temperatures >5°C, also single-grade oils can be used.

As the viscosity of lube oil is dependent on temperature, the choice of SAE grade should be governed by the ambient temperature prevailing at the engine operating site.
Optimum operating behaviour will be attained if you take the accompanying oil viscosity diagram as a guide.
Should the temperature fall temporarily below the limits of the SAE grade selected, cold starting may be affected but the engine will not be damaged.
In order to keep wear to a minimum, do not exceed application limits for extended periods of time.

Synthetic lube oils feature an improved temperature and oxidation stability.



4.1.2.1 Specific lube oil definitions

Turbocharged engines with uprated power and engines with high loading
The oils listed in enclosure 1 are to be used for the following engines and applications:
COM/EPA II version and increased output
BF4M 2012/C > 95 kW
BF6M 2012/C > 143 kW (bore 101 + 98-MVS)
BF6M 2012/C > 135 kW (bore 98 mech. FIE)

- all engines in CHP plants
- all engines in gensets operating in parallel with the mains/with each other
- engines in combines with:

These are high-grade oils according to ACEA or API. In addition most of these oils are partly synthetic, some even fully synthetic (5W-40) and thus achieve the thermal stability required for the relevant application and are distinguished by a low tendency to cause deposits in the turbocharger and in the charge air pipes with closed-circuit crankcase breather

Lube oils for engines with uprated power and engines with high loading

Producer	Type of lube oil	SAE class	Availability
DEUTZ	**TXL-10W40 FE**	**10W-40**	
AGIP	Agip Sigma Ultra TFE	10W-40	worldwide
AGIP	Autol Valve Ultra FE	10W-40	Germany
ARAL GmbH	Aral MegaTurboral	10W-40	worldwide
ARAL GmbH	Aral SuperTurboral	5W-30	worldwide
BAYWA	BayWa Super Truck 1040 MC	10W-40	South Gemany
BAYWA	BayWa Turbo 4000	10W-40	South Gemany
Castrol GmbH	Castrol SYNTRUCK	5W-40	Europe, North America, Brazil Argentina, Australia, South Africa
Castrol GmbH	Castrol DYNAMAX	7,5W-40	Europe, North America, Brazil Argentina, Australia, South Africa
CHEVRON	Chevron Delo 400 Synthtic	5W-40	North America
ESSO	Essolube XTS 501	10W-40	Europe
FINA	FINA KAPPA FIRST	5W-30	Europe
FINA	FINA KAPPA ULTRA	10W-40	Europe
FUCHS DEA	DEA Cronos Synth	5W-40	Germany, Europe
FUCHS DEA	DEA Cronos Premium LD	10W-40	Germany, Europe
FUCHS DEA	Fuchs Titan Cargo MC	10W-40	worldwide
FUCHS DEA	Deutz Oel TLL 10W-40 MB	10W-40	Germany
FUCHS DEA	DEA Cronos Premium FX	10W-40	Europe
FUCHS DEA	Fuchs Titan Unic Plus MC	10W-40	worldwide
MOBIL OIL	Mobil Delvac 1 SHC	5W-40	Europe, SE Asia, Africa
MOBIL OIL	Mobil Delvac 1	5W-40	worldwide
MOBIL OIL	Mobil Delvac XHP Extra	10W-40	Europe, SE Asia
BP OIL International	BP Vanellus HT Extra	10W-40	Europe
Shell International	Shell Myrina TX /	5W-30	Europe, different
	Shell Rimula Ultra		description in some countries
Shell International	Shell Myrina TX /	10W-40	Europe, different
	Shell Rimula Ultra		description in some countries
TOTAL	TOTAL RUBIA TIR 86000	10W-40	worldwide
Schmierölraffinerie Salzbergen GmbH	Wintershall TFG	10W-40	Europe

The table will be extended as and when required.

4

4.2.1 Quality

Use commercially available diesel fuel with less than 0.5 % sulphur content. If the sulphur content is higher, oil change intervals should be reduced (see 6.1.1).

The following fuel specifications / standards are approved:

- DIN EN 590
- BS 2869: A1 and A2
  (with A2, take note of the sulphur content!)
- ASTM D 975-88; 1-D and 2-D
- NATO Code F-54 and F-75

Exhaust emission values which may be determined in the case of type approval tests always refer to the reference fuel prescribed by the authorities for the type approval test.

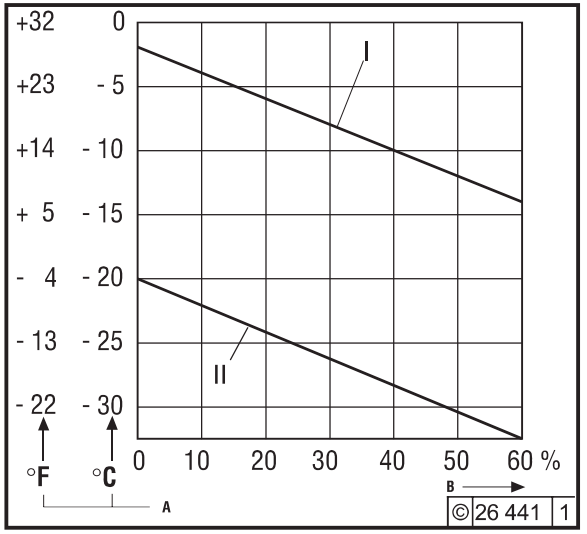
4.2.2 Winter Fuel

Waxing may occur at low temperatures, clogging the fuel system and reducing engine efficiency. Use winter-grade diesel fuel (up to -20 °C) for operation below 0 °C. This is made available within good time by filling stations prior to the start of the winter season.

- Kerosene must be added at temperatures below -20 °C. The relevant percentages are given in the adjacent diagram.
- Special diesel fuels may be used in arctic climatic zones up to -44 °C.

If summer-grade diesel fuel must be used at temperatures below 0 °C, up to 60% kerosene can be added (see diagram).

In most cases, adequate resistance to cold can be obtained by adding a flow improver (additive). Please ask your DEUTZ partner.



Legend:	
I	Summer-grade diesel fuel
II	Winter-grade diesel fuel
A	Ambient temperature
B	Percentage of kerosen added

Diesel fuels must never be mixed with gasoline (Normal and Super grades)!

Mix in tank only! Fill with the appropriate amount of kerosene first, then add the diesel fuel.

4.3.1 Quality of Water for Coolant

The values listed below must not be exceeded. In order to examine the quality of your water, a test case can be ordered from DEUTZ under Order No. 12130382.

Water quality	min.	max.
pH value at 20 °C	6.5	8.5
Chloride ion content [mg / dm^3]	-	100
Sulphate ion content [mg / dm^3]	-	100
Total hardness [°dGH]	3	20

4.3.2 Coolant Treatment

In the case of liquid-cooled engines, special attention must be paid to the treatment and control of the coolant, as the engine may otherwise become damaged as a result of corrosion, cavitation and freezing.
The treatment of the coolant is carried out by adding a cooling system protectant to the cooling water.
The cooling system must be continuously monitored, see 5.1. In addition to checking the coolant level, this also involves checking the concentration of the cooling system protectant.
The cooling system protectant concentration can be checked with commercially available testers (example: gefo glycomat ®).

If nitrite-based cooling system protectants are mixed with amine-based agents, dangerous nitrosamines are formed.

4.3.3 Cooling System Protectants

DEUTZ cooling system protectant must be purchased in drums under Order No. 01011490 (5 litres) or 1221 1500 (210 litres). These are nitrite, amine and phosphate-free, and provide effective protection against corrosion, cavitation and freezing.
If the above mentioned cooling system protectant is unavailable, the following products may be used in exceptional cases.

Manufacturer	Product designation
AVIA	AVIA Antifreeze Extra
ARAL	Antifreeze Extra
BASF	Glysantin G 48
DEA	DEA Radiator Antifreeze
SHELL	SHELLGlycoShell

The cooling system protectant in the coolant should not fall below or exceed the following concentration:

Cooling system protectant	Water
max. 45 Vol.%	55%
min. 35 Vol.%	65%

Filling volume, see chart over page in combination with specifications in Chapter 9.1.
The use of other cooling system protectants, e.g. chemical anti-corrosion agents, is possible in exceptional cases. Consult DEUTZ Service.

Cooling system protectants must be disposed of in an environmentally-friendly manner.

Cooling system protection									
Cooling system protection in	Frost protection in [°C]	content of coolant system *) [Litres]							
		18	20	22	25	27	30	32	35
		Cooling system protectant							
35	–22	6,3	7,0	7,7	8,75	9,5	10,5	11,2	12,3
40	–28	7,2	8,0	8,8	10	10,8	12	12,8	14
45	–35	8,1	9,0	9,9	11,3	12,2	13,5	14,4	15,8
50	–45	9,0	10	11	12,5	13,5	15	16	17,5

*) For coolant content of your engine, see Operation Manual Chapter 9.1.
Note: Grey sector only after consulting head office

5.1 Maintenance Schedule
5.2 Maintenance Chart
5.3 Maintenance Work Completed

check= ● adjust= ❍ clean= ▲ replace= ■

∅ prior to or during 1st trial run, check 2x daily during the breaking in phase or when commissioning new and overhauled engines

∅ every 10 hours of operation or daily

Industrial engines

The specified engine maintenance values are permissible recommended maximums. Depending on usage, reduced maintenance intervals may be necessary, comply with the unit manufacturer's operating instructions.
Maintenance must only be carried out by authorised service personnel

Operating hours (OP) every						Years		Operation	Section
250	500	1000	1500	12000	1	2			
●	●							Top lube oil up if necessary	6.1.2/3.3.4
		■						Lube oil (oil change intervals depending on engine use), see TR 0199-99-3002	6.1.1/ 6.1.2
		■						Oil filter cartridge (at each lube oil change)	6.1.3
			■					Fuel filter cartridge	6.2.1
		●					■	Flexible fuel leak oil lines (replace completely)	
				■				Injection valve	#
		▲			■			Fuel pre-cleaner/ filter element (cleaning or replace if necessary)	4.2/ 5.2
	●						■	Coolant (additive concentration)	4.3.1/ 2/ 3
				■				Coolant pump	#
●	●							Coolant level	–
●	●	■						Intake air cleaner (If available, maintain according to maintenance indicator)	6.4.3 /6.4.4
●		●			▲			Intercooler (drain lube oil/condensation)	
		●						Battery and cable connectors	6.7.1
●		●						Engine monitoring system, warning system	3.3 #
			❍					Valve clearance	6.6.1#
●		●					■	V-belts (retension or replace if necessary)	6.5.1

* When the warning system responds (lamp/horn), the fuel pre-filter must be emptied immediately

check= ● adjust= ❍ clean= ▲ replace= ■

prior to or during 1st trial run, check 2x daily during the breaking in phase or when commissioning new and overhauled engines

every 10 hours of operation or daily

In hours of operation (HO) every					Years		Operation	Section
250	500	1000	1500	12000	1	2		
●	●						Check engine for leaks (visual inspection)	–
●				●					Engine suspension (replace if damaged)	9.2
●				●					Fastenings, hose connections / clamps	–
					■				Basic overhaul	#

Industrial engines

The specified engine maintenance values are permissible recommended maximums. Depending on usage, reduced maintenance intervals may be necessary, comply with the unit manufacturer's operating instructions.
Maintenance must only be carried out by authorised service personnel

check= ● adjust= ❍ clean= ▲ replace= ■

Max. permissible reference times in operating hours (HO) every

prior to or during 1st trial run, check 2x daily during the breaking in phase or when commissioning new and overhauled engines

every 10 hours of operation or daily

In hours of operation (HO) every						Years		Operation	Section
250	500	1000	3000	6000	12000	1	2		
			■					Injection valve	#

Additions and modifications for engines with EPA approval

The specified engine maintenance values arepermissible recommended maximums. Depending on usage, reduced maintenance intervals may be necessary, comply with the unit manufacturer's operating instructions.
Maintenance must only be carried out by authorised service personnel

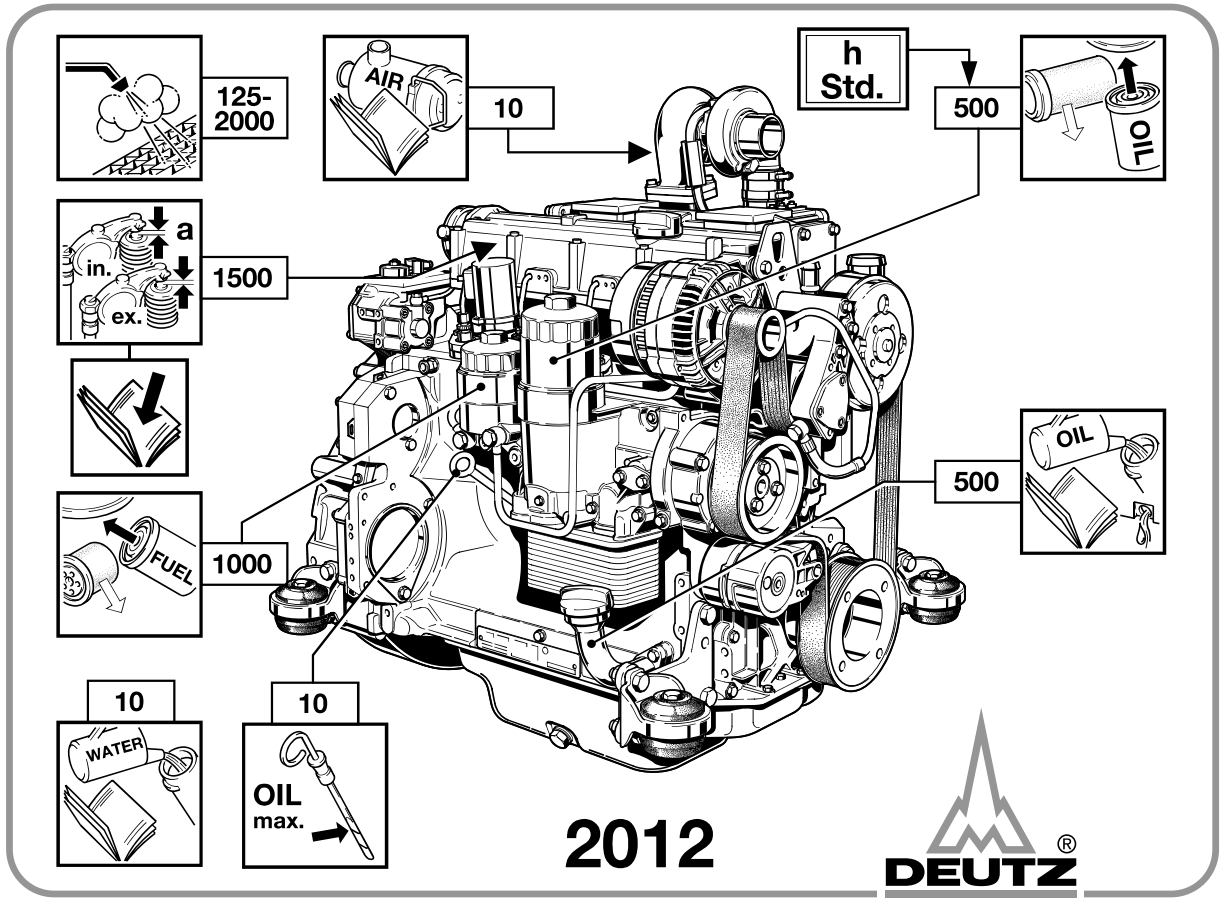
5

The maintenance chart shown on this page is supplied as a self-adhesive label with each engine. It should be affixed where it can be seen clearly on the engine or driven equipment.

Check that this is the case.

If necessary, ask your engine or equipment supplier for a fresh supply of labels.

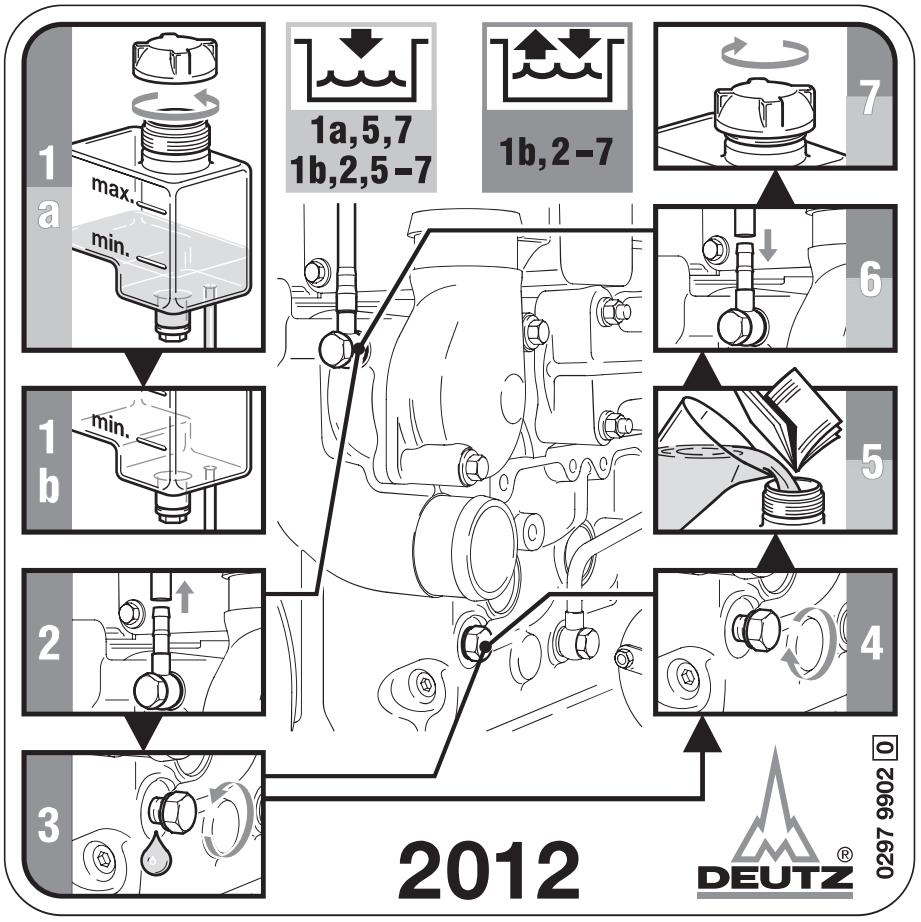
Routine work should be carried out according to the schedule in 5.1.



0297 9901 1

Stop the engine before carrying out any maintenance work.

The maintenance chart shown on this page is supplied as a self-adhesive label with each engine. It should be affixed where it can be seen clearly on the engine or driven equipment.
Check that this is the case.
If necessary, ask your engine or equipment supplier for a fresh supply of labels.
Routine work should be carried out according to the schedule in 5.1.



Op. hours	Date	Signature/stamp	Op. hours	Date	Signature/stamp
50-150*			-		
125			250		
375			500		
625			750		
875			1000		
1125			1250		
1375			1500		
1625			1750		
1875			2000		
2115			2250		
2375			2500		
2625			2750		

* following commissioning of new and overhauled engines.
Duly completed maintenance jobs can be recorded and signed off in the above chart.

Op. hours	Date	Signature/stamp	Op. hours	Date	Signature/stamp
2875			3000		
3125			3250		
3375			3500		
3625			3750		
3875			4000		
4125			4250		
4375			4500		
4625			4750		
4875			5000		
5125			5250		
5375			5500		
5625			5750		

Duly completed maintenance jobs can be recorded and signed off in the above chart.

5.3 Maintenance Work Completed

Op. hours	Date	Signature/stamp	Op. hours	Date	Signature/stamp
5875			6000		
6125			6250		
6375			6500		
6625			6750		
6875			7000		
7125			7250		
7375			7500		
7625			7750		
7825			8000		
8125			8250		
8375			8500		
8625			8750		

Duly completed maintenance jobs can be recorded and signed off in the above chart.

Op. hours	Date	Signature/stamp	Op. hours	Date	Signature/stamp
8875			9000		
9125			9250		
9375			9500		
9625			9750		
9875			10000		
10125			10250		
10375			10500		
10625			10750		
10825			11000		
11125			11250		
11375			11500		
11625			11750		

Duly completed maintenance jobs can be recorded and signed off in the above chart.

5.3 Maintenance Work Completed

Op. hours	Date	Signature/stamp	Op. hours	Date	Signature/stamp

6.1.1 Oil Change Intervals

- The lube oil is changed for the first time 50-150 hours of operation following commissioning or recommissioning or following repairs

- The lube oil change intervals are dependent on:
  - Lube oil quality
  - Fuel sulphur content
  - The engine application

- If the oil change times are not achieved within a year, the oil must be changed at least once a year.

- The table refers to the following conditions:
  - For diesel fuel: Sulphur content max. 0.5% by weight.
  - Continuous ambient temperature down to -10 °C (+14 °F).

- In the case of fuels
  – with > 0.5 to 1 % sulphur content
  or
  – Continuous ambient temperatures down to -10 °C (+14 °F)
  or
  – with biological diesel fuels to DIN 51606-FAME, the oil change intervals must be halved.
- In the case of fuels with a sulphur content higher than 1%, ask the relevant **Service** representative.

Change the oil with the engine off but still warm (lube oil temperature approx. 80 °C).

6.1.1.1 Lube oil change intervals for industrial and marine engines

		Lube oil grade		
	Deutz lube oil quality class	**DQC I**	**DQC II**	**DQC III**
	ACEA-specfication	E2-96	E3-96/E5-02	E4-99
	API-specification	CF/CF-4	CG-4/CH-4	-
	Worldwide specification	-	DHD-1	-
	special DEUTZ release list	-	-	Enclosure 1
	Standard lube oil code for building equipment and nonraod vehicles	EO... EO...A, EO...B	EO...C	-
Engine series	**Engine version**	**Lube oil change intervals in op. hours**		
		Oil use normal high	**Oil use normal high**	**Oil use normal high**
2012	All engines except for:	250	500	500
	BF4M2012C P > 95 kW	-	-	500
	BF6M2012C P > 143 kW, from nonroad stage II at cylinder bore 101 mm or 98 mm with MV system	-	-	500
	BF6M2012C P > 135 kW, from nonroad stage II at cylinder bore 98 mm with mech. injection system	-	-	500
	Other engines from nonroad stage II	-	500	500
	eng. in harv. machines, block-typethermal power stat., gensets*	-	-	500

*Gensets as referred to here are units operating in parallel with the mains / with each other.
Emergency power units are dealt with in TR 0199-99-1126.

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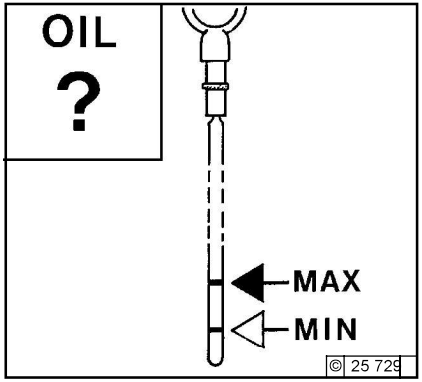
6.1.1.2 Oil change intervals for vehicle engines

				Schmieröl-Qualität		
			Deutz lube oil quality class	**DQC I**	**DQC II**	**DQC III**
			ACEA specification	E2-96	E3-96/E5-02	E4-99
			API specification	CF/CF-4	CG-4/CH-4	-
			worldwide specification	-	DHD-1	-
			special DEUTZ release	-	-	Enclosure 1
Application			**Engine version**	**Lube oil change intervals in km**		
Site vehicles/ busses	Average speed in km/h approx.]	25	**2012** Euro I	10 000	15 000	20 000
			Euro II and Euro III, except for:	-	15 000	20 000
			BF4M2012C > 95 kW from Euro II	-	-	20 000
			BF6M2012C > 143 kW from Euro II at cylinder bore 101 mm with or 98 mm with MV system	-	-	20 000
			> 135 kW from Euro II at cylinder bore 98 mm with mechanical injection system	-	-	20 000
Local traffic		40	**2012** Euro I	15 000	20 000	30 000
			Euro II and Euro III,except for:	-	20 000	30 000
			BF4M2012C > 95 kW from Euro II	-	-	30 000
			BF6M2012C > 143 kW from Euro II at cylinder bore 101 mm with or 98 mm with MV system	-	-	30 000
			> 135 kW from Euro II at cylinder bore 98 mm with mechanical injection system	-	-	30 000
Long distance traffic		60	**2012** Euro I	20 000	30 000	40 000
			Euro II and Euro III, except for:	-	30 000	40 000
			BF6M2012C > 143 kW from Euro II at cylinder bore 101 mm with or 98 mm with MV system	-	-	40 000
			> 135 kW from Euro II at cylinder bore 98 mm with mechanical injection system	-	-	40 000

If, for vehicle engines, lube oil change intervals are determined by operating hours, the lube oil change intervals indicated in table 4.1. for “Oil use under normal duty” will apply.

6.1.2 Check Oil Level / Change Engine Oil

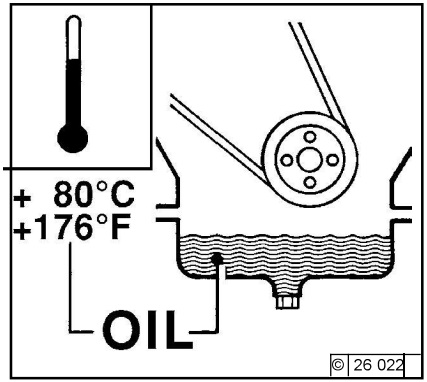
6.1.2.1 Check Oil Level



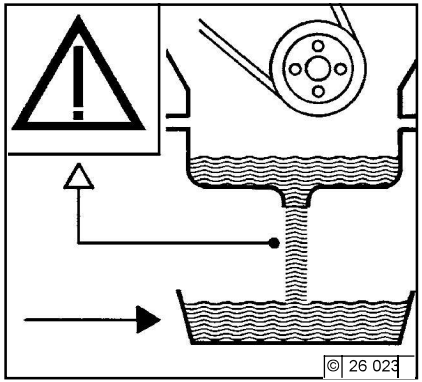
- Ensure that the engine or vehicle is in a level position.
- Engine warm:
  Shut engine off, wait for 5 minutes and check oil level.
- Engine cold:
  Check oil level.
- Remove the oil dipstick.
- Wipe the dipstick with a non-fibrous, clean cloth.
- Insert it to the stop and remove again.
- Check the oil level, and if necessary, top up to the “MAX” mark.
  - If the oil level is only just above the “MIN” mark, more oil must be added.

The level must not fall below the “MIN” mark.

6.1.2.2 Engine Oil Change



- Run engine until warm.
- Ensure that the engine or vehicle is in a level position.
  - Lube oil temperature approx. 80 °C.
- Switch off the engine.

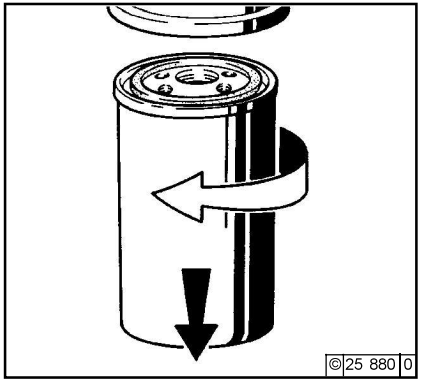


- Place oil tray under the engine.
- Unscrew oil drain screw.
- Drain oil.
- Screw oil drain screw in with new seal ring and tighten. (Tightening torque see 9.2).
- Pour in lube oil.
  - For grade / viscosity, see 4.1
  - For quantity, see 9.1.
- Check oil level, see 6.1.2.1.

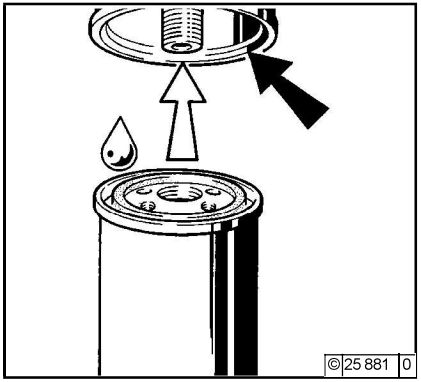
Caution when draining hot oil: Risk of scalding!
Do not let used oil run into the soil but collect it in a container!
Dispose of this in accordance with environmental regulations!

6

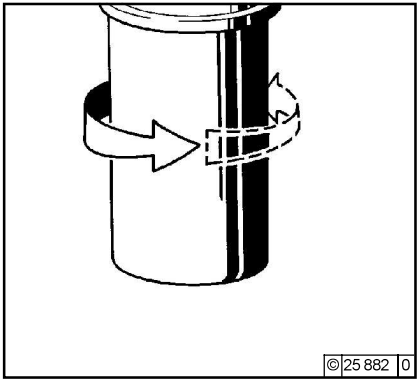
6.1.3 Replace Oil Filter



- With attached locking piston:
  Undo tensioning screws and remove tensioning clamps downwards.
- Undo the lube oil filter cartridge using a commercial tool and spin off.
- Catch any escaping oil.



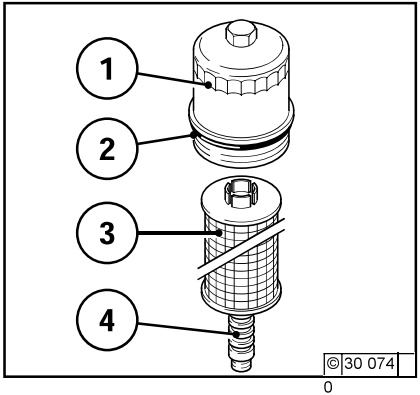
- Clean any dirt from the filter carrier sealing surface.
- Lightly oil the rubber gasket of the new lube oil filter cartridge.
- Manually screw in the new cartridge until the gasket is flush.



- Tighten the lube oil filter cartridge with another half-turn.
- If locking piston is available:
  Position tensioning clamps and tighten with tensioning screws.
- Check oil level, see 6.1.2.
- Check oil pressure, see 3.3.1.
- Check lube oil filter cartridge seal for leaks.

Caution is required in the case of hot oil: Risk of scalding!

6.1.4 Clean / Replace Oil Filter (Cup)



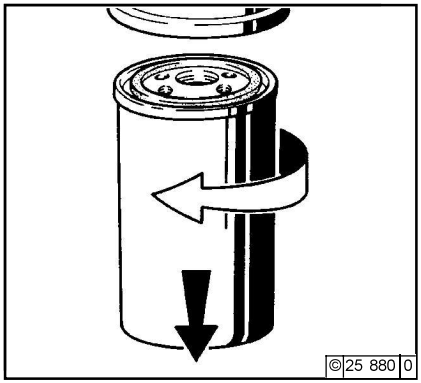
- Switch off the engine.
- Loosen lube oil filter cover 1 and unscrew in an anticlockwise direction, emties itself the system automatically (drain valve).
- Carefully loosen paper filter cartridge 3 upwards from the guide 4.
- Catch any escaping oil.
- Replace paper filter cartridge 3.
- Clean any dirt from the sealing surface of the filter carrier and lube oil filter cover 1 and fromb the guide 4.

Caution is required in the case of hot oil:
Risk of scalding!

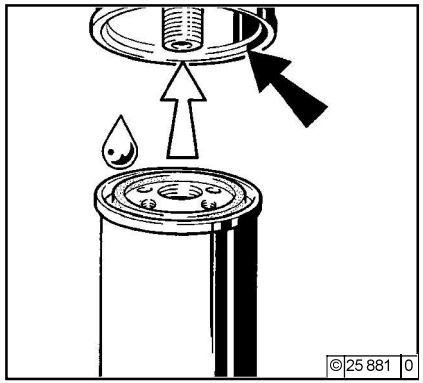
- Replace and lightly oil the rubber gasket 2.
- Carefully insert new paper filter cartridge 3 into guide 4.
- Tighten lube oil filter cover 1 in a clockwise direction (25 Nm).
- Start engine.
- Check oil level, see 6.1.2.
- Check oil pressure, see 3.3.1.
- Check lube oil filter attachment for leaks.

6

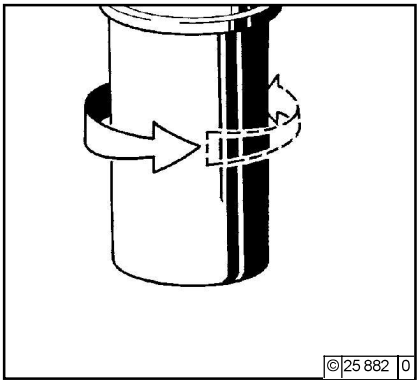
6.2.1 Replace Fuel Filter



- Close the fuel shut-off valve.
- Undo fuel filter cartridge with commercial tool and spin off.
- Catch any escaping fuel.
- Clean any dirt from the filter carrier sealing surface.



- Apply light film of oil or diesel fuel to the rubber gasket of the new fuel filter cartridge.
- Manually screw in the new cartridge until the gasket is flush.
- Tighten the fuel filter cartridge with a final half-turn.

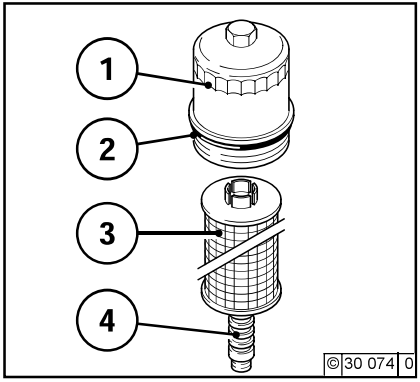


- Open fuel shutoff valve.
- Check for leaks.

The fuel system does not need to be bled.

Keep naked flames away when working on the fuel system. Do not smoke!

6.2.2 Clean / Replace Fuel Oil Filter (Cup)

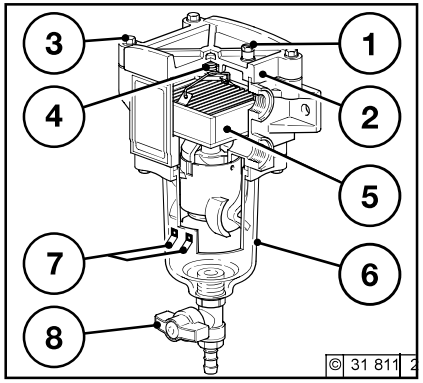


- Switch off the engine.
- Loosen fuel oil filter cover 1 and unscrew in an anticlockwise direction, emties itself the system automatically (drain valve).
- Carefully loosen paper filter cartridge 3 upwards from the guide 4.
- Catch any escaping oil.
- Replace paper filter cartridge 3.
- Clean any dirt from the sealing surface of the filter carrier and fuel oil filter cover 1 and fromb the guide 4.

Keep naked flames away when working on the fuel system. Do not smoke!

- Replace and lightly oil the rubber gasket 2.
- Carefully insert new paper filter cartridge 3 into guide 4.
- Tighten fuel oil filter cover 1 in a clockwise direction (25 Nm).
- Start engine.
- Check fuel oil filter attachment for leaks.

6.2.3 Clean / purge or change fuel pre-filter



Clean (purge) - remove water:
- Turn off engine or, in the case of a change-over filter, switch over to the other filter.
- Close the fuel stopcock or supply. (if available)
- Open the bleed screw 1 on the cover 2
- Place the fuel collector underneath the fuel pre-filter.
- Empty water and dirt from the bowl 6 by opening (press in and turn slightly without using force) the drain cock 8 and close the drain cock 8 again
- Close the bleed screw 1 on the cover 2 again
- Bleed the fuel pipe according to instructions, see 6.2.5 opposite

Changing the filter element 5:
Change at least once a year or as required (drop in performance also after purging)
- Turn off the engine or switch to other filter in case of changeover filter
- Close the fuel stopcock or supply (if available)
- Loosen the cover screws 3 diagonally
- Remove the cover 2
- Remove the spring cassette 4
- Remove the filter element 5 from the bracket
- Insert new filter element 5
- Place spring cassette 4 on the element
- Check that the cover seal is fit properly in the cover 2 and check for damage (change if necessary)
- Tighten the cover 2 with the screws 3 diagonally (torque 6 Nm)
- Check the cover 2 for proper fit and leaks
- Bleed the fuel system, see 6.2.4.

The connection of a warning system (lamp/horn) via contacts 7 is specified. Immediate maintenance is necessary when the warning system is triggered.

Naked flames are prohibited when working on the fuel system! Do not smoke!
Dispose of old fuel in an environmentally friendly way!

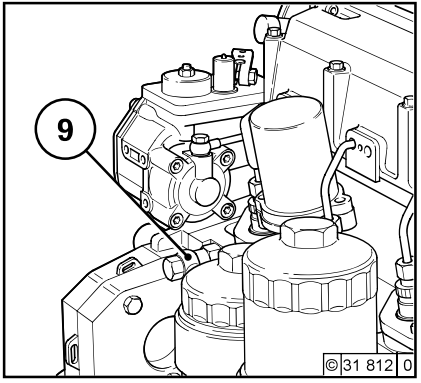
6.2.4 Bleed Fuel System with Fuel Pre-filter

- Place fuel collection container beneath the fuel pre-filter.

Bleed:
- In the event of re-commissioning, following maintenance work or if the tank has been run empty, the fuel system must be bled.
- Bring engine regulator into stop position.
- Position fuel collection container beneath filter housing 8 / pressure maintenance valve 9.
- Open fuel shut-off valve, pressure maintenance valve 9, bleeder screw 1.
- Turn engine over with starter (max. 20 sec.) until bubble-free fuel escapes from bleeder screw 1 and pressure maintenance valve 9.
- Firmly tighten bleeder screw 1 and pressure maintenance valve 9, see 6.2.5..
- Bring engine regulator into start position and start.
- Check for leaks after starting the engine.

Keep naked flames away when working on the fuel system. Do not smoke!
Dispose of used fuel in an environmentally-friendly manner!

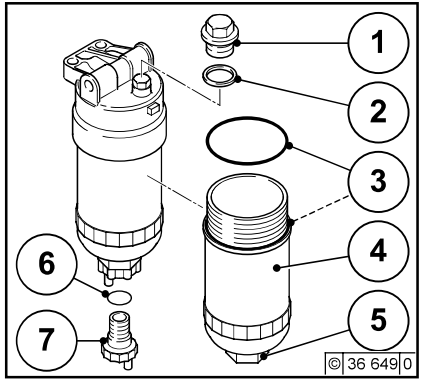
6.2.5 Bleed Fuel System without Fuel Pre-filter



- Bring engine regulator into stop position.
- Open fuel shut-off valve.
- Loosen pressure maintenance valve 9. Collect any escaping fuel and dispose of this in an environmentally-friendly manner.
- Turn engine over with starter (max. 20 sec.) until bubble-free fuel escapes from pressure maintenance valve 9.
- Tighten pressure maintenance valve 9.
- Bring engine regulator into start position and start.
- Check for leaks after starting the engine.

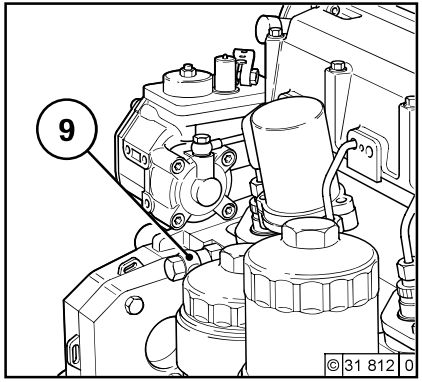
Keep naked flames away when working on the fuel system. Do not smoke!
Dispose of used fuel in an environmentally-friendly manner!

6.2.6 Clean/Replace Fuel Pre-Filter, Filter Element



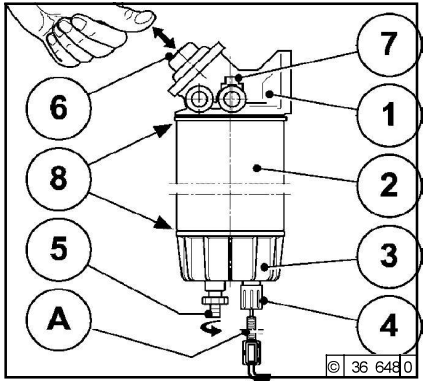
Clean/Replace:

- Close the fuel shut-off valve.
- Place fuel collection container beneath the fuel pre-filter.
- Loosen the drain screw 7+9 and drain fuel.
- Turn the filter element housing 4 with gasket 3 and filter element 3 anti-clockwise and remove.
- Clean any dirt from the sealing face of the filter carrier and filter element housing 4 and sludge chamber 5 and filter element (replace if necessary).
- Insert new round sealing rings 2+3+6.
- Screw in filter element housing 4 and filter element (max. torque 25^{-5} Nm).
- Tighten the drain screw 7+9



- Open fuel shut-off valve.
- Bleed system
- Check for leaks after starting the engine.

6.2.7 Clean/Replace/Vent Fuel Pre-Filter, Filter Element



Clean:

- Close the fuel shut-off valve.
- Place fuel collection container beneath the fuel pre-filter.
- Loosen the drain screw 5 and drain fuel/ water.
- Turn filter cartridge 2 and dirt trap 3 anticlockwise and remove.
- Turn dirt trap 3 anticlockwise and remove. Empty emulsion into the fuel collection container and clean the dirt trap 3.
- Screw the filter cartridge 2 and dirt trap 3 together. Wet the filter cartridge with fuel, wet the sealing surfaces 8 slightly with oil.
- Mount clockwise.
- Open the fuel shut-off valve and bleed the system.
- Check for leaks after starting the engine.

Replace:

- Replace defective filter cartridge 2.
- Clean any dirt from the filter carrier 1 sealing surface 8.
- Wet the filter cartridge 2 with fuel, wet the sealing surfaces 8 slightly with oil.
- Mount the filter cartridge 2 and dirt trap 3 clockwise.
- Open fuel shut-off valve.
- Check for leaks and vent the system after starting the engine.

Work may only be performed on the fuel system with the engine switched off.
No naked flames! Do not smoke!
Dispose of waste fuel in an environmentally-friendly manner.

6

6.3.1 Cleaning Intervals

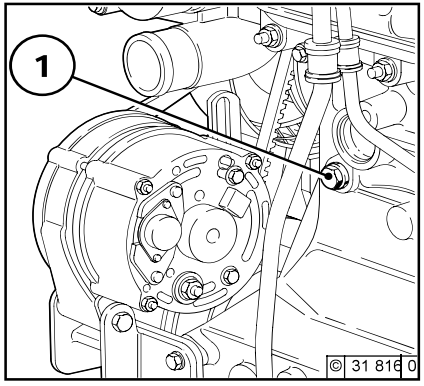
- The amount of contamination in the cooling system depends on the engine application.
- Oil and fuel residues on the engine increase the risk of contamination. Therefore pay special attention to leaks if the engine is used in dusty environments.
- Serious contamination occurs, for example:
  - on construction sites where there is a high level of air-borne dust.
  - in harvesting applications where there are high concentrations of chaff and chopped straw in the vicinity of the machine.
- Because applications vary, cleaning intervals have to be determined from case to case. The cleaning intervals given in the table below can be used as a guide.

Checking or cleaning intervals	
Guideline values OH	Engine application
2000	Ships, electrical modules in enclosed areas, pumps.
1000	Vehicles on paved roads
500	Tractors, fork-lift trucks, drivable electric units.
250	Vehicles on construction sites and unpaved roads, construction machines, compressors, underground mining units.
125	Agricultural machines, tractors in harvesting applications.

6.3.2 Clean Cooling System

- External cooling system: Clean according to cooling system manufacturer's specifications.

6.3.3 Drain Cooling System



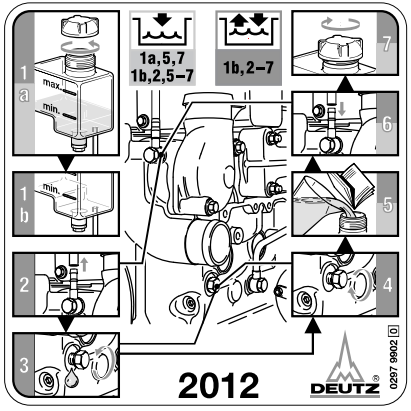
- Position a collecting pan beneath screw plug 1.
- Remove screw plug 1 at crankcase.
- Drain coolant.
- Tighten screw plug 1 again.
- If screw plug 1 is not accessible, drainage can be carried out at the engine radiator (coolant channel).
  Fill / bleed cooling system see Chapter 6.3.4

Caution when draining hot coolant: Risk of scalding! Collect coolant on draining.
Dispose of this in accordance with environmental regulations!

Engine never without coolant operate (also not briefly)

6.3.4 Fill / Bleed Cooling System 2012

Standard Engine



- Open radiator cap item 1.
- Loosen vent hose item 2.
- Fill coolant item 1b in up to the “MAX” mark or filling limit (if fitted, system heater valve must be open).
- Connect vent hose, item 6, + tighten screw plug item 4.
- Close radiator cap item 7.
- Start engine and warm up until thermostat opens.
- Switch off the engine.
- Check coolant level when engine is cold, and top up if necessary.
- Close radiator cap item 1.

Bleed

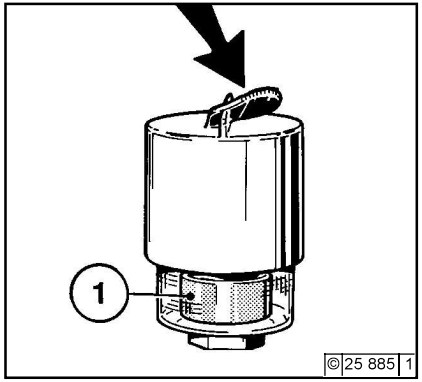
- External cooling system: According to cooling system manufacturer’s specifications.

Engine never without coolant operate (also not briefly)

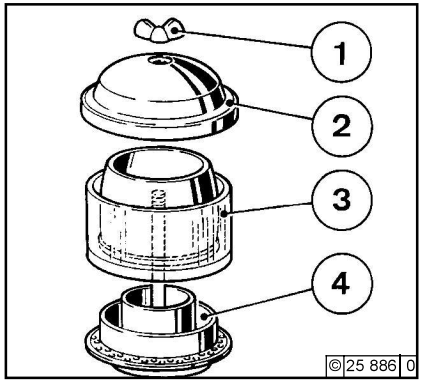
6

6.4.1 Cleaning Intervals

- The amount of dirt in the combustion air filter depends on the amount of dust in the air and the size of the air filter used. If a high level of dust is anticipated, a cyclone-type pre-cleaner can be fitted in front of the combustion air filter.
- Cleaning intervals must therefore be determined from case to case.
- If dry type air filters are used, cleaning should only be carried out according to the service indicator or service switch.
- Filter servicing is needed when:
  - Service indicator
    the red signal 1 is fully visible when the engine is off.
  - Service switch
    the yellow pilot light comes on when the engine is running.
- After carrying out service work, press the reset button on the service indicator. The service indicator is now ready for operation again.



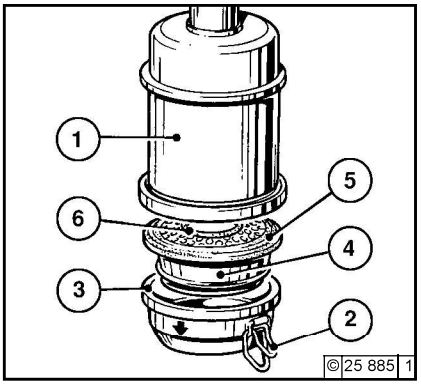
6.4.2 Emtying Cyclone Type Precleaner



- Undo wing nut 1 and remove cover 2.
- Remove collector bowl 3 from lower section 4 and empty. Clean leaves, straw and other foreign matter from lower section of precleaner.
- Reposition collector bowl 3 onto lower section 4, fasten cover 2 in place by tightening wing nut 1.

Never fill collector bowl with oil. Replace collector bowl if damaged.

6.4.3 Clean Oil Bath Air Filter



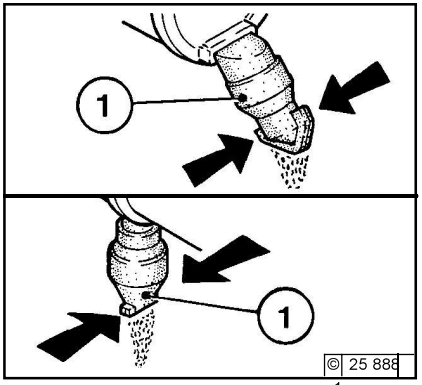
- Turn engine off and wait about 10 minutes for the oil to drain from filter housing 1.
- Loosen snap clips 2 and remove oil cup 3 with filter element 4; if necessary, loosen filter element with the aid of a screwdriver at the separating point. Do not damage rubber gasket 5!
- Remove dirty oil and sludge. Clean oil cup.
- Clean filter element 4 in diesel fuel and allow to drip-dry thoroughly.
- Clean filter housing 1 if very dirty.
- Inspect and replace rubber gasket 5 and 6 if necessary.
- Fill oil cup with engine oil up to the mark (arrow) (for viscosity, see 4.1.2).
- Refit oil cup and element to filter housing and secure with snap clips.

Never clean filter with gasoline. Dispose of old oil in accordance with environmental regulations!

6

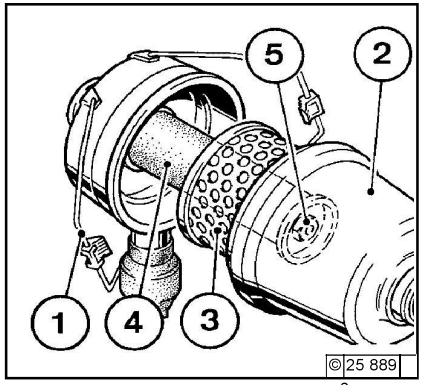
6.4.4 Dry Type Air Filter

Dust Discharge Valve



- Empty dust discharge valve 1 by pressing apart lips of discharge slot as indicated by arrows.
- Clean discharge slot from time to time.
- Remove any caked dirt by pressing together the upper section of the valve.

Filter Cartridge



- Undo clip fasteners 1.
- Take off hood 2 and remove cartridge 3.
- Clean cartridge (replace at least once a year)
- Clean cartridge 3.
  - Using dry compressed air (max. 5 bar), blow out from inside outwards,

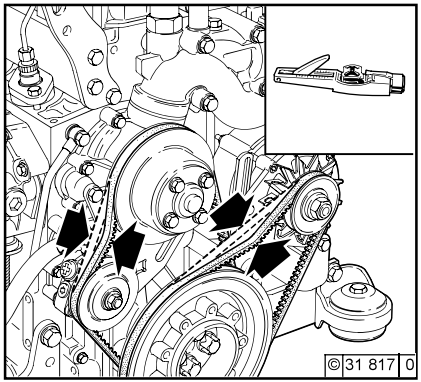
or

  - Tap out (in emergencies only). Do not damage the cartridge, or
  - Wash out according to manufacturer's specifications.
- Check paper filter (light showing through) and gaskets for damage. Replace if necessary.
- After five filter services or after two years at the latest, replace safety cartridge 4 (never clean!).
  To do so:
  - Undo hex nut 5 and remove cartridge 4.
  - Insert new cartridge, re-install hex nut and tighten.
- Install cartridge 3, replace hood 2 and do up clip fasteners 1.

Never clean filter cartridge with gasoline or hot fluids!

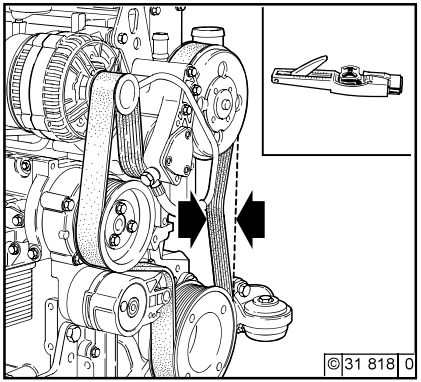
6.5.1 Check V-belts

2012 Standard

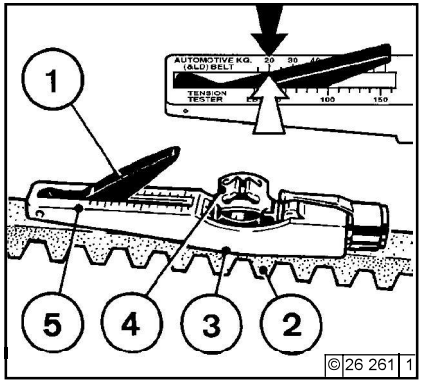


- Visually inspect entire V-belt for damage.
- Replace damaged V-belts.
- After installing new belts, run engine for 15 minutes, then check belt tension.
- To check the tension of the V-belt, use a tension gauge (see 9.3).
  - Place indicator arm 1 into gauge.
  - Position guide 3 on V-belt 2, midway between the pulleys, with flange 3 on bottom of gauge against the edge of belt.
  - Push slowly on the black pad 4 at right angles to V-belt 2 until the spring is heard or felt to trigger.

2012 with Ribbed V-belt

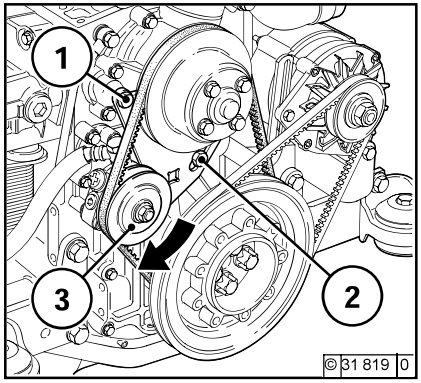


- Carefully raise the gauge without changing the position of indicator arm 1.
- Read off the value where the indicator arm 1 intersects scale 5 (arrow) and read indicator arm 1 off. For settings, see 9.1.
- If necessary, retension belt and measure again.



Check, tension and change V-belts only with the engine off. If necessary, reinstall V-belt

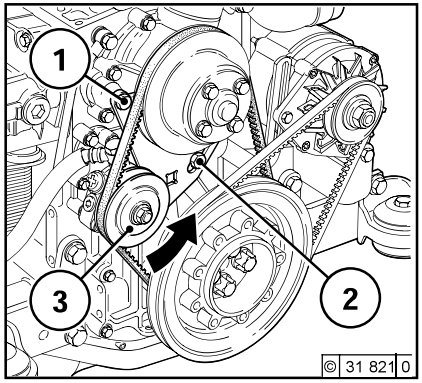
6.5.2 Tension V-belts Coolant / Fuel Pump



- Loosen screws 1 and 2.
- Press fuel pump 3 in direction of arrow until the correct V-belt tension has been achieved.
- Tighten screws 1 and 2 again.

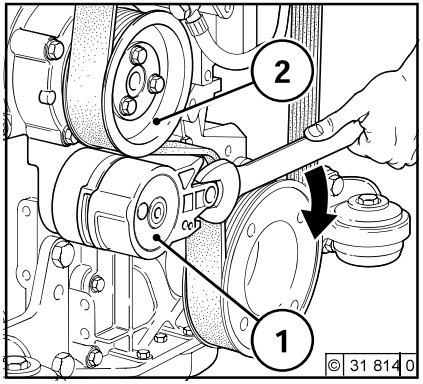
Check, tension and change V-belts only with the engine off. If necessary, reinstall V-belt guard.

6.5.3 Replace V-belts Coolant / Fuel Pump



- Loosen screws 1 and 2.
- Press fuel pump 3 in direction of arrow.
- Remove V-belt and position new belt.
- Press fuel pump counter to direction of arrow until the correct V-belt tension has been achieved.
- Tighten screws 1 and 2 again.

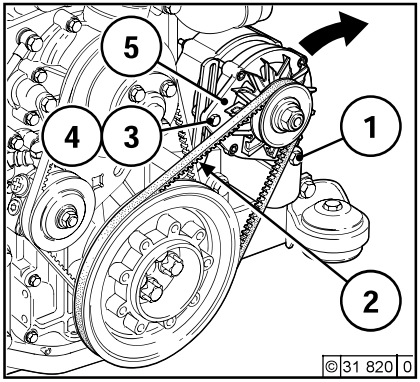
6.5.4 Replace V-belts



- Press tension roller in direction of arrow until the ribbed V-belt is free.
- First remove ribbed V-belt from the smallest roller.
- Position new ribbed V-belt.
- Press tension roller counter to direction of arrow until the ribbed V-belt is tensioned.

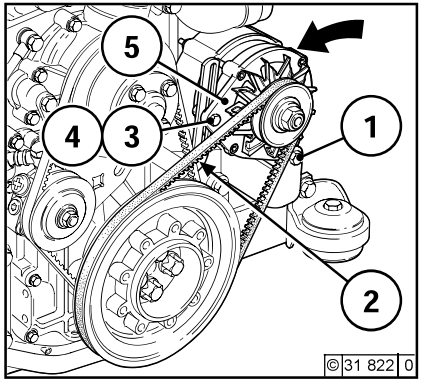
Check whether ribbed V-belt is positioned correctly in its guide.

6.5.5 Tension V-belts Alternator



- Loosen screws 1, 2 and 4.
- Adjust alternator 5 in direction of arrow by turning screw 3 until correct V-belt tension is achieved.
- Retighten screws 1, 2 and 4.

6.5.6 Replace V-belts Alternator

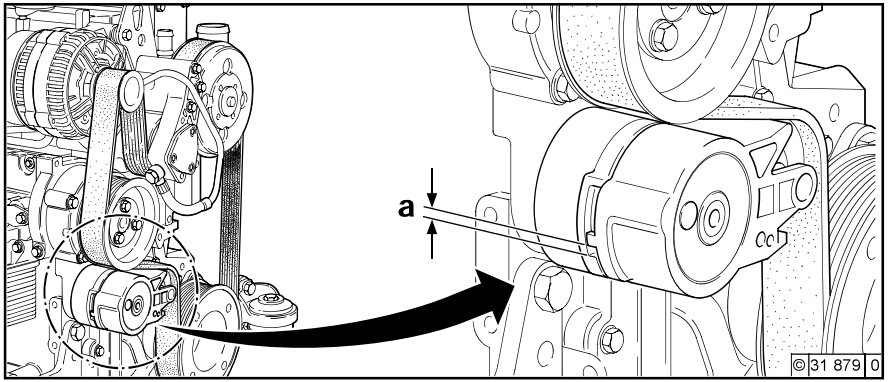


- Loosen fuel pump V-belt, see 6.5.3
- Loosen screws 1, 2 and 4.
- Adjust screw 3 until V-belt can be removed.
- Position new belt.
- Adjust screw 3 until the correct V-belt tension has been achieved.
- Retighten screws 1, 2 and 4.
- Tension fuel pump V-belt, see 6.5.4.

Check, tension and change V-belts only with the engine off. If necessary, reinstall V-belt guard.

6

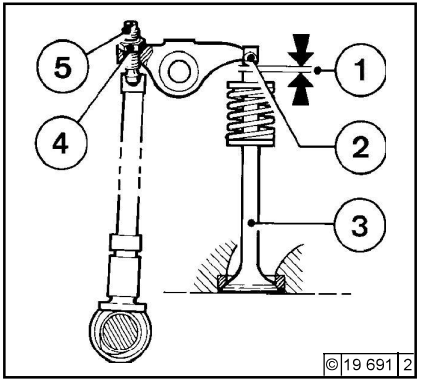
6.5.7 Wedge rib V-belts wear limit examine.

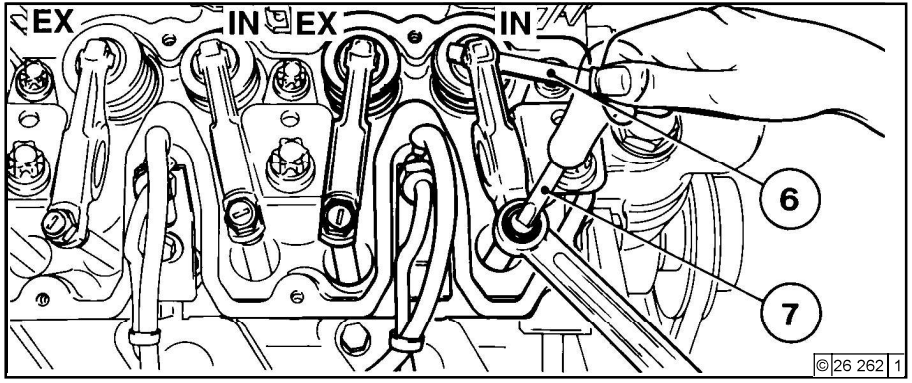


- Wear limit of the wedge rib V- belt as follows examine:
- Distance between the nose of the flexibiliti clamping arm and the notice of the firm tension adjuster housing examine.
- If „a“ is smaller than 3 mm, then the wedge rib V- belt is to be exchanged

6

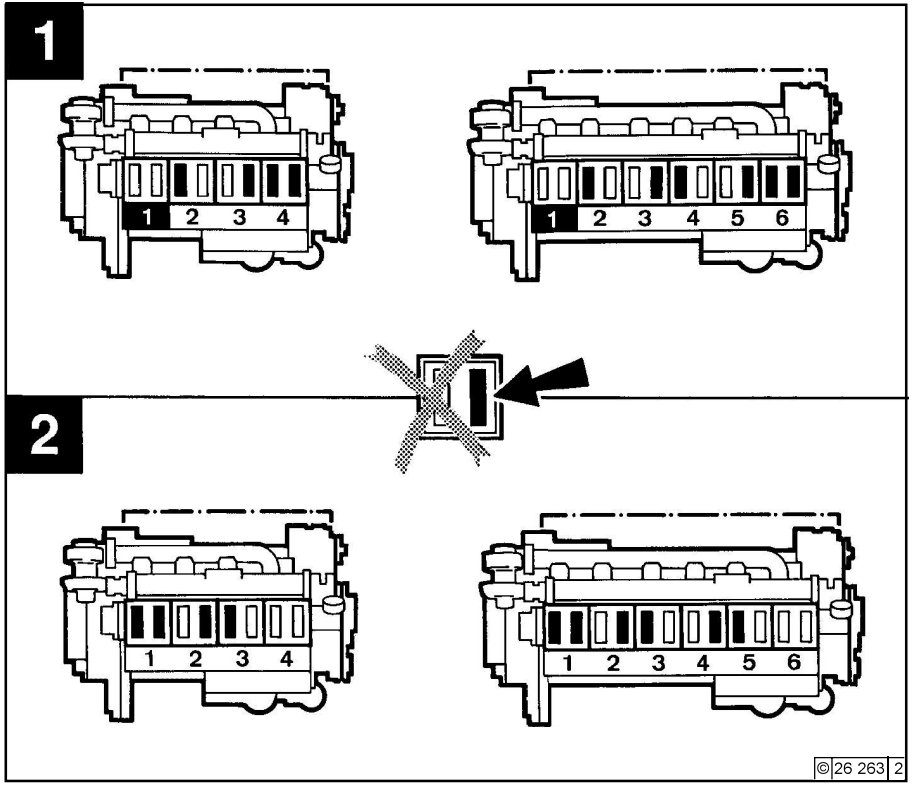
6.6.1 Check Valve Clearance, Adjust if Necessary





- Loosen ventilation valve and swing to the side.
- Remove the cylinder head cover.
- Position crankshaft as per schematic, see 6.6.1.1.
- Before adjusting valve clearance, allow engine to cool down for at least 30 minutes. The oil temperature should be below 80 °C.
- Check valve clearance 1 between rocker arm / tappet contact face 2 and valve 3 with feeler gauge 6 (there should be only slight resistance when feeler blade is inserted). For permissible valve clearance, see 9.1.
- Adjust valve clearance if necessary:
  - Release locknut 4.
  - Use screwdriver 7 to turn setscrew 5 so that the correct valve clearance 1 is attained after locknut 4 has been tightened.
- Check and adjust valve clearance on all cylinders.
- Reinstall cylinder head cover (with new gasket if necessary).
- Swing ventilation valve into position and fasten.

6.6.1.1 Valve Clearance Adjustment Schematic

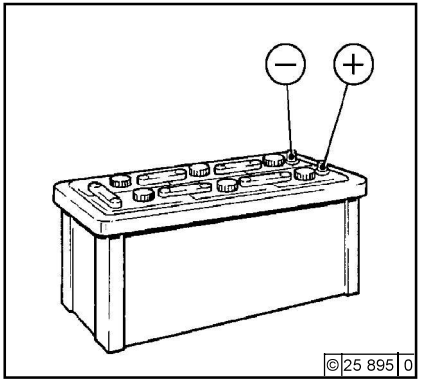


- **Crankshaft Position 1:**
  Turn crankshaft until both valves in cylinder 1 overlap (exhaust valve about to close, inlet valve about to open). Adjust valve clearance according to schematic **(marked in black).** Mark respective rocker arm with chalk to show that adjustment has been carried out.

- **Crankshaft Position 2:**
  Turn crankshaft one full revolution (360°). Adjust valve clearance according to schematic **(marked in black).**

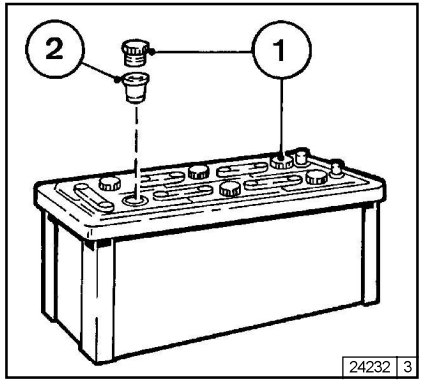
6.7.1 Battery

6.7.1.1 Check Battery and Cable Connections



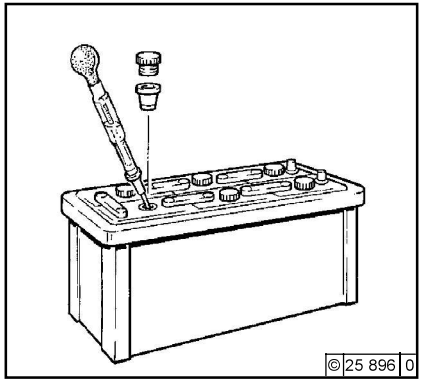
- Keep battery clean and dry.
- Undo dirty clamps.
- Clean terminal posts (+ and -) and clamps of the battery, and grease with acid-free and acid-resistant grease.
- When reassembling, ensure that clamps make good contact. Tighten clamp bolts hand-tight.

6.7.1.2 Check Electrolyte Level



- Remove sealing caps 1.
- If testers 2 are present:
  Electrolyte level should reach the base of these.
- Without testers:
  The electrolyte level should be 10-15 mm above the top of the plates.
- If necessary, top up with distilled water.
- Screw sealing caps back in.

6.7.1.3 Check Electrolyte Density



- Measure the electrolyte density of individual cells with a commercial hydrometer.
  The hydrometer reading (see table on following page) indicates the battery's state of charge. During measurement, the temperature of the electrolyte should preferably be 20 °C.

Electrolyte density				
in [kg/ l]		in [°Bé (Baumé scale)*]		Charge status
Normal	Tropical	Normal	Tropical	
1.28	1.23	32	27	well charged
1.20	1.12	24	16	semi-charged, re-charge
1.12	1.08	16	11	discharged, immediately charge

* Measurement of electrolyte density in ° Bé (Baumé scale) is out of date and rarely used today.

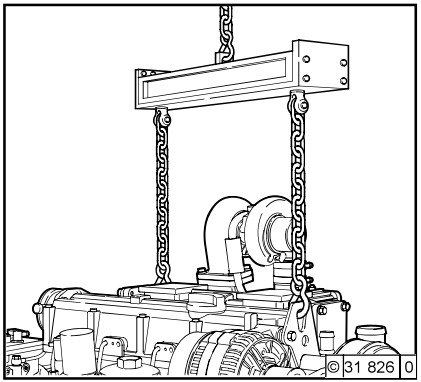
The gases emitted by the battery are explosive! Keep sparks and naked flames away from the battery!
Do not allow battery acid to come into contact with skin or clothing!
Wear protective goggles!
Do not rest tools on the battery!

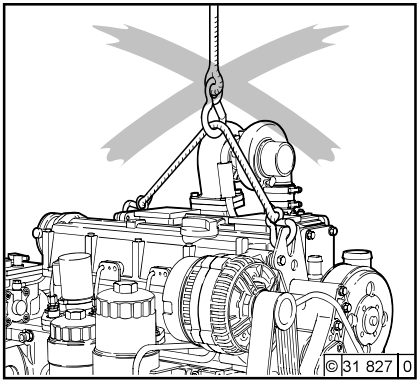
6.7.2 Rotary Current Alternator

Notes on the three-phase system:

- Never disconnect the cables between battery, alternator and regulator while the engine is running.
- If, however, it is necessary to start and operate the engine without the battery, disconnect the regulator from the alternator before starting.
- Be sure not to confuse the battery terminals.
- Replace defective charge pilot lamp bulb immediately.
- When cleaning the engine: Do not spray the alternator with a direct jet of water/ steam!
  Allow the engine to run warm so that the remaining water evaporates.
- The habit of touching a lead against the frame to check whether it is live must under no circumstances be used with three-phase electrical systems.
- In case of electric welding, connect the ground terminal on the welder directly to the piece being welded.

6.7.3 Transportation Shackles





- Only use proper lifting gear when transporting the engine.

Use only the correct lifting gear !

7.1 Fault Table

Faults, Causes and Remedies

7

- Faults can frequently be attributed to the fact that the engine has been incorrectly operated or not serviced.
- Each time a fault occurs, check whether all operating and servicing regulations have been complied with.
- A corresponding fault table can be found on the opposite page.
- If the cause of a fault cannot be determined, or you are unable to remedy a fault yourself, then please contact your DEUTZ Service representative.

Before starting, make sure that nobody is standing in the immediate vicinity of the engine or driven machine.
In the event of repair work:

Caution: If the speed regulator has been removed, the engine must not be started under any circumstances.
Disconnect the battery!

Faults Engine does not start or is difficult to start (Starting speed is not achieved on starting) Engine starts, but runs irregularly or fails Engine becomes excessively hot. Temperature warning system responds Engine output is deficient Engine does not run on all cylinders Engine oil pressure is non-existant or excessively low Engine oil consumption excessive Engine smokes - blue - white - black										Measures Check P Adjust E Replace W Clean R Top up A Bleed L	
										Cause	**Section**
●										Not declutched (where possible)	Engine Operation P
●								●		Below starting limit temperature	P
●			●							Engine shut-off lever still in stop position (shutoff magnet defective)	P
		●			●					Oil level too low	A
		●	●			●	●			Oil level too high	S
					●	●	●			Excessive inclination of engine	P / E
●										Adjust throttle to half actuation travel	P / E
		●	●						●	Air cleaner clogged / turbocharger defective	Combustion air P / W
		●	●						●	Air cleaner service switch / indicator defective	P
			●						●	CPD* defective (connection line leaks)	P
		●	●						●	Charge air line leaking	P / W
		●								Coolant pump defective	Cooling system P / R
			●						●	Intercooler soiled	P / R
		●								Coolant heat exchanger soiled	P / R
●	●	●	●	●						Cooling fan defective, torn or loose V-belt (fuel pump in belt drive)	P / W
		●	●							Cooling air temperature rise / heating short circuits	P
●										Battery defective or discharged	Electrics P

*CPD = Charge pressure-dependent full-load stop

Table 1 of 2

Faults, Causes and Remedies

7.1 Fault Table

Faults										Cause	Section	
Engine does not start or is difficult to start (Starting speed is not achieved on starting)												
Engine starts, but runs irregularly or fails												
Engine becomes excessively hot. Temperature warning system responds												
Engine output is deficient												
Engine does not run on all cylinders												
Engine oil pressure is non-existant or excessively low												
Engine oil consumption excessive												
Engine smokes - blue												
- white												
- black												
●										Cable connections, starter, electrical circuit loose or oxidised	Electrics	P
●										Starter defective or pinion does not engage		P
●	●		●					●	●	Incorrect valve clearance	Engine	E
●	●		●	●						Injection line leaks		P
		●								Ventilation line blocked (coolant heat exchanger)		P / R
●								●		Sheathed glow plugs defective		P
●	●	●	●	●				●	●	Injection valve defective		P / W
●	●		●	●						Air in the fuel system		P / W
●	●		●	●						Fuel filter / fuel pre-cleaner soiled		P / R / W
		●								Oil filter defective		W
●					●	●				Incorrect engine lube oil SAE class or quality	Operating media	W
●	●		●					●		Fuel quality not as per operation manual		P / W
		●								Coolant deficiency		P / A

Measures	
Check	P
Adjust	E
Replace	W
Clean	R
Top up	A
Reduce	S

Table 2 of 2

8.1 Preservation

8

8.1 Preservation

If the engine is to remain idle for an extended period of time, it is necessary to take protective measures to prevent the formation of corrosion. The preservative measures described here will protect the engine for up to approx. 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 cleaning agent to remove pre servatives:
  - Petroleum benzine (hazardous materials class A3)

Preserve engine:

- Clean engine (poss. with cold cleaner). Radiator cleaning, see 6.3.2.
- Run engine until warm, then turn off.
- Drain engine oil, see 6.1.2, and fill with anti-corrosion oil.
- Drain coolant, see 6.3.3.
- Top up anti-corrosion agent, see specifications.
- Clean oil bath air filter if necessary, see 6.4.3, and top up anti-corrosion oil.
- Drain fuel tank.
- Make up a mixture of 90 % diesel fuel and 10 % anti-corrosion oil, and refill fuel tank.
- Allow the engine to run for approx. 10 mins.
- Switch off the engine.
- Manually turn the engine over several times. When turning over with starter, set shutoff lever to stop position.

- Remove V-belts and store in wrapped condition.

- Spray grooves on V-belt pulleys 2 with anti-corrosion spray.

- Drain anti-corrosion agent, see 6.3.3.

- Lightly preserve coolant filler neck and seal with cap.

- Seal intake ports and exhaust ports.

Remove engine preservation:

- Remove anti-corrosion agent from grooves in V-belt pulleys 2.

- Install V-belts. Retension after brief operation if necessary, see 6.5.

- Remove covers from intake port 3 and exhaust port 4.

- Disconnect coolant inlet and outlet neck covers, remove protection and connect to cooling system.

- Top up coolant, see 6.3.4. System must be bled.

- Commission engine

9

Model		BF4M 2012	BF4M 2012 C	BF6M 2012 C
Number of cylinders		4	4	6
Cylinder arrangement		vertical in line		
Bore	[mm]	ø 101		
Stroke	[mm]	126		
Total displacement	[cm³]	4.04	4.04	6.06
Compression ratio	[◊].	19		
Working cycle		Four-stroke diesel		
Combustion system		with turbocharging and direct fuel injection		
Charge air cooling		without	with	with
Direction of rotation		counter-clockwise		
Weight 2012/ C including cooling system to DIN 70020-A [approx.kg]		Refer to head-office		
Engine output	[kW]	75	103	155
Max. speed	[1/rpm]	2500		
Valve clearance with cold engine (PTs)	[mm]	Inlet $0.3^{+0.1}$ / exhaust $0.5^{+0.1}$.		
Valve clearance with cold engine standard	[mm]	Adjustment with special tool, see 6.6.1		
Injector opening pressure	[bar]	250		
Start of feed	[□CS BTOC]	[1)].		
Firing order of the engine		1-3-4-2	1-3-4-2	1-5-3-6-2-4
V-belt tension:		Pre-tension / re-tension 2)		
Alternator / fan	[N]	450 / 300 □ 50.		
Fuel pump - coolant pump	[N]	450 / 300 □ 50.		
Compressor	[N]	550 / 450 □ 50.		
Ribbed V-belt tension spring-loaded tension roller	[N]	900 / 600 □ 50.		

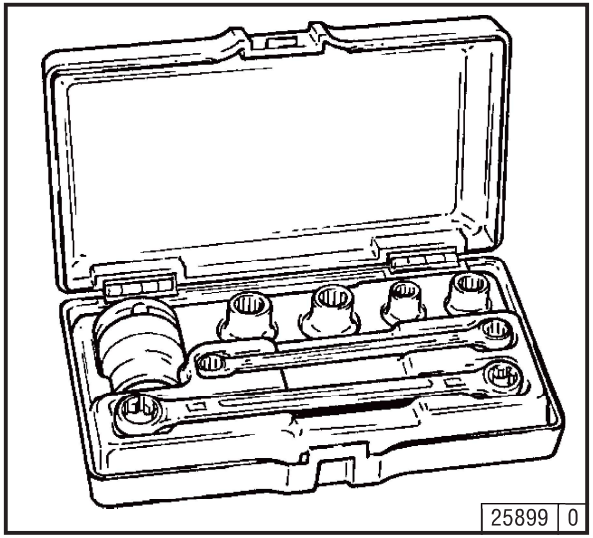
[1)] Engine output, speed, start of delivery are stamped on engine rating plate, etc., see also 2.1.
[2)] Re-tension 15 minutes after the engine has been operated under load.

Model		BF4M 2012	BF4M 2012 C	BF6M 2012 C
ling		Liquid-cooled / cooling system protection		
Coolant volume				
2012/ C	[ca.ltr.]	5,6	5,6	7,3
Perm. constant coolant temperature				
Engine exhaust, output group I	[□C]	max.110 [6]		
Engine exhaust, output group II-IV	[□C]	max. 105 [6]		
Thermostat opening commencement at	[□C]	[7]		
Thermostat fully open from	[□C]	83 [8]		
Coolant pre-heating		[4]		
Coolant pump				
Feed pressure in	[bar]	[9]		
Feed quantity in	[m^3 /h]	[9]		
Power consumption in	[kW]	[9]		
Lubrication		Pressure lubrication		
Oil temperature in oil pan	[□C]	125		
Min. oil pressure when warm (120 □C and SAE oil 15 W 40) and low idle	[bar]	0,8		
Oil plate filling quantity without filter	[approx.ltr.]	8.5 [3]	8.5 [3]	13.0 [3]
Oil plate filling quantity with filter	[approx.ltr.]	10 [3]	10 [3]	14.5 [3]

[3] Approx. values may vary depending on version. The upper oil dipstick mark is always authoritative.
[4] Only necessary in winter operation, see 3.5.1.
[5] Engine content without radiator only. Content of external cooling system depending on cooling system version.
[6] Other output groups have different values, consultation with head office is required.
[7] In the case of external cooling systems with outlet regulation, the thermostat begins to open at 87 □C
[8] In the case of external cooling systems with outlet regulation, the thermostat is fully open at 102 □C
[9] Consultation with head office is required (differ depending on engine version)

Installation location	Pre-tension [Nm]			Re-tension [Nm]				Total [Nm]	Comments
	1. Stage	2. Stage	3. Stage	1. Stage	2. Stage	3. Stage	4. Stage		
Cylinder head cover								8.5	
Rocker arm adjustment screw								21	
Foot on flywheel side								187	M16x40 8. 8.8 A 4 C
Foot on fan side		30			45			187	M16x40 8. 8.8 A 4 C
Intake manifold								8.5	
Exhaust manifold								21	
Oil drain screw								50	
Injection valve attachment								16	Torx
Injection line attachment								30	M14x1.5
Oil pan (cast)									29
Oil pan (sheet metal)								21	

TORX



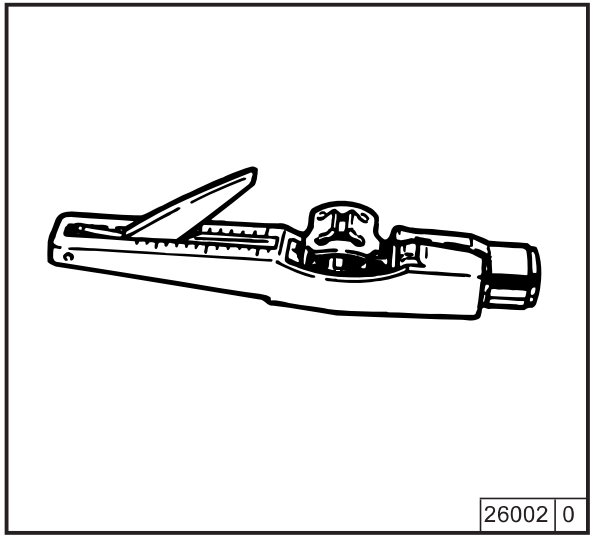
A TORX wrench set is used with engines in the 2012 series.
This system was chosen because of the many advantages it offers:

- Outstanding accessibility to bolts.
- High load transfer when loosening and tightening.
- Almost impossible for socket to slide off or break, thereby practically ruling out the risk of injury.

TORX tools can be ordered from:

Please contact your DEUTZ partner

V-belt tension gauge



The V-belt tension gauge can be obtained under order number **8115 + 8120** from:

Please contact your DEUTZ partner

Notes

Warnings to Place on Equipment

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Warning in the Manual

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

or

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

California Proposition 65 Information

To California customers and to customers selling diesel engine equipment into or for use in California.

Proposition 65, a California law, requires warnings on products which expose individuals in California to chemicals listed under that law, including certain chemicals in diesel engine exhaust.

Obligations of Manufactures of Diesel-Powered Off-Road Equipment. The California Superior Court has approved either of the following two methods of compliance with Proposition 65 requirements by manufactures of off-road equipment containing diesel engines. (The court order containing these provisions is attached.)

1. **On-Equipment Warning.** Place the warning pictured in attachment 1 on all equipment shipped by you into or for sale in California after January 1, 1996. The warning must be in a location where it is easily visible to the operator of the equipment when (s)he is operating the equipment. The warning must be secured to the equipment. If warnings or operating instructions are provided through a digital display, you may usee that method of providing warning.
2. **Operator Manual Warning.** When the operator manual is next revised or by December 31, 1995 whichever is earlier, place the warning in attachment 2 in the operator manual. The warning may be either printed in the manual or on a sticker.

The warning must appear in one of the following locations:

- Inside The front cover
- Inside the back cover
- Outside the front cover
- Outside the back cover
- As the first page of text

Under either alternative, the warning must appear in the same size, print and format as the attachment selected or be of an equally conspicuous size and format. If the warning is provided in an on-screen display, the warning must contain the language in the attachment and must be provided at the time of or in connection with ignition in the same manner as other safety warnings electronically communicated on screen.

Obligation of Resellers of Diesel Engines. This letter must accompany any loose diesel engine sold in California.
Should you have any questions, please call Deutz Corporation Product Support Department.

DEUTZ Oil

DEUTZ Oil DQC II-05
ACEA E5-02 / E3-96 / B3-04
API CG-4

TLS-15W40D (DQC II-05)	
5 L	0101 6331
20 L	0101 6332
209 L	0101 6333

DEUTZ Oil DQC III-05
ACEA E7-04 / E5-02 / E3-96 / B4-04 / A3-04
API CI-4 / SL GLOBAL DHD-1

TLX-10W40FE (DQC III-05)	
5 L	0101 6335
20 L	0101 6336
209 L	0101 6337

DEUTZ Oil DQC IV-05 (Synthetic)
ACEA E7-04 / E5-02 / E4-99

DEUTZ Oel DQC IV-5W30 (DQC IV-05)	
5 L	-
20 L	0101 7849
209 L	0101 7850

We move your world

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Service-Technik
Instandhaltungstechnik Motoren
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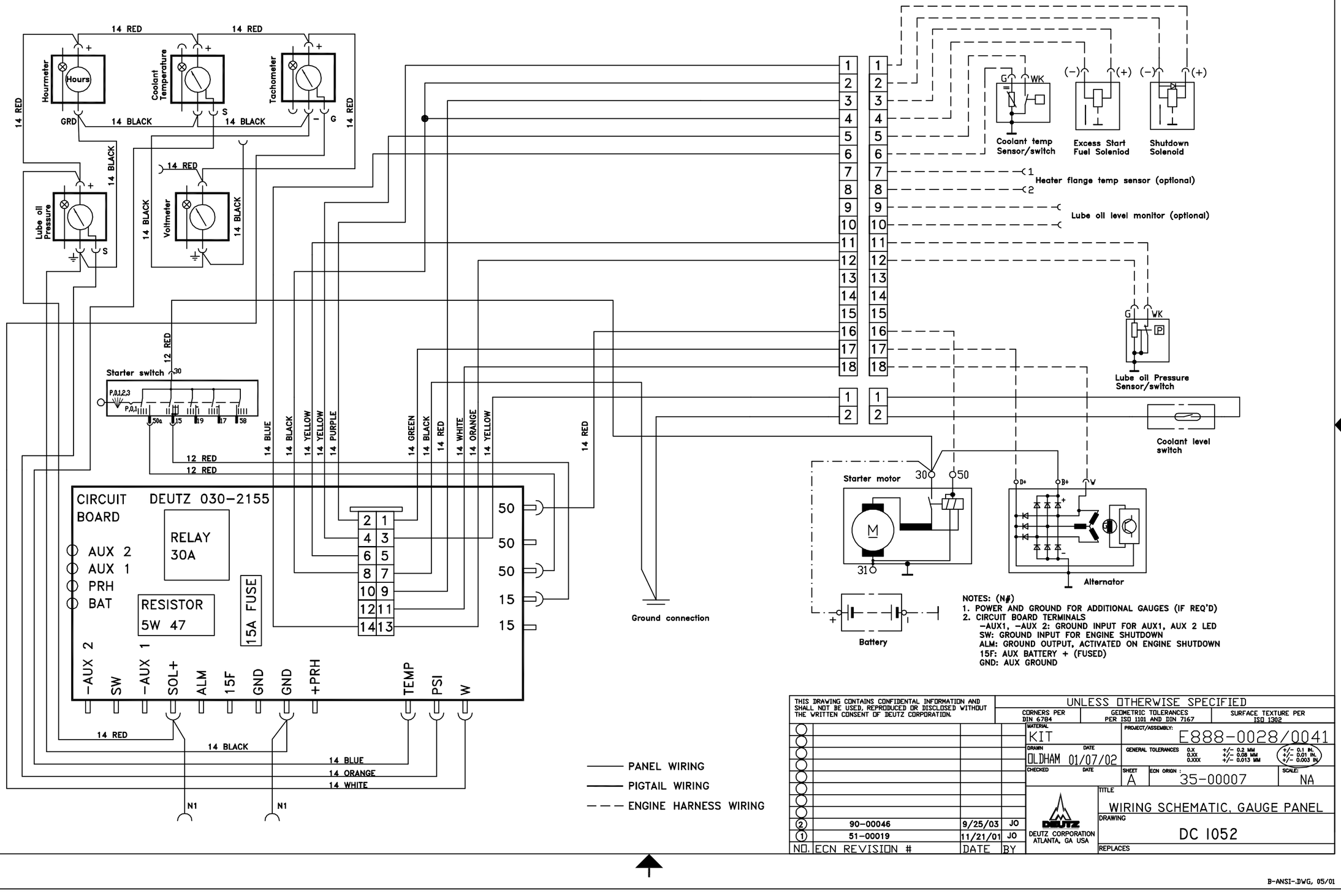


UNLESS OTHERWISE SPECIFIED

CORNERS PER DIN 6784 | GEOMETRIC TOLERANCES PER ISO 1101 AND DIN 7167 | SURFACE TEXTURE PER ISO 1302

NO.	ECN REVISION #	DATE	BY
2	90-00046	9/25/03	JO
1	51-00019	11/21/01	JO

MATERIAL: KIT
PROJECT/ASSEMBLY: E888-0028/0041
DRAWN: OLDHAM DATE: 01/07/02
CHECKED
GENERAL TOLERANCES: .X +/- 0.2 MM (+/- 0.1 IN.), .XX +/- 0.08 MM (+/- 0.01 IN.), .XXX +/- 0.013 MM (+/- 0.003 IN.)
SHEET: A
ECN ORIGN: 35-00007
SCALE: NA

DEUTZ CORPORATION ATLANTA, GA USA

TITLE: WIRING SCHEMATIC, GAUGE PANEL
DRAWING: DC 1052
REPLACES

B-ANSI-.DWG, 05/01

CUSTOMER WIRING

TB1

W	1	2	3	4	5	6	7	8	9	10	11	12
	SOLENOID +	OVERSPEED SWITCH NO	OVERSPEED SWITCH NO	LOW PRESSURE SWITCH	HI TEMP SWITCH	BATTERY 1 +		BATTERY 2 +	STARTER 1 SIGNAL	STARTER 2 SIGNAL	GROUND	SHUTDOWN

TO FIRE PUMP CONTROLLER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LOW PRESSURE SWITCH	STOP SOLENOID	ALTENATOR D+	WATER SOLENOID VALVE +	WATER SOLENOID VALVE –	HI TEMP SWITCH	MAG PICKUP –		MAG PICKUP SHIELD	GROUND	TEMP SENDER	BATTERY 1 +	OIL PRESSURE SENDER	STARTER 1 SIGNAL		BATTERY 2 +		STARTER 2 SIGNAL	MAG PICKUP +

19 PIN MATING CONNECTOR
DEUTSCH HDP26–24–19SN
MURPHY P/N: 00–00–2503

LOW PRESSURE SWITCH

STOP SOLENOID

ALTERNATOR
D+
B+

WATER SOLENOID VALVE

OIL PRES. SENDER

TEMP SENDER

MAG PICKUP
+
–

HI TEMP SWITCH

STARTER CONTACTOR 1

STARTER CONTACTOR 2

BATTERY 1
+ –

BATTERY 2
+ –

STARTER
SOL
+ 50

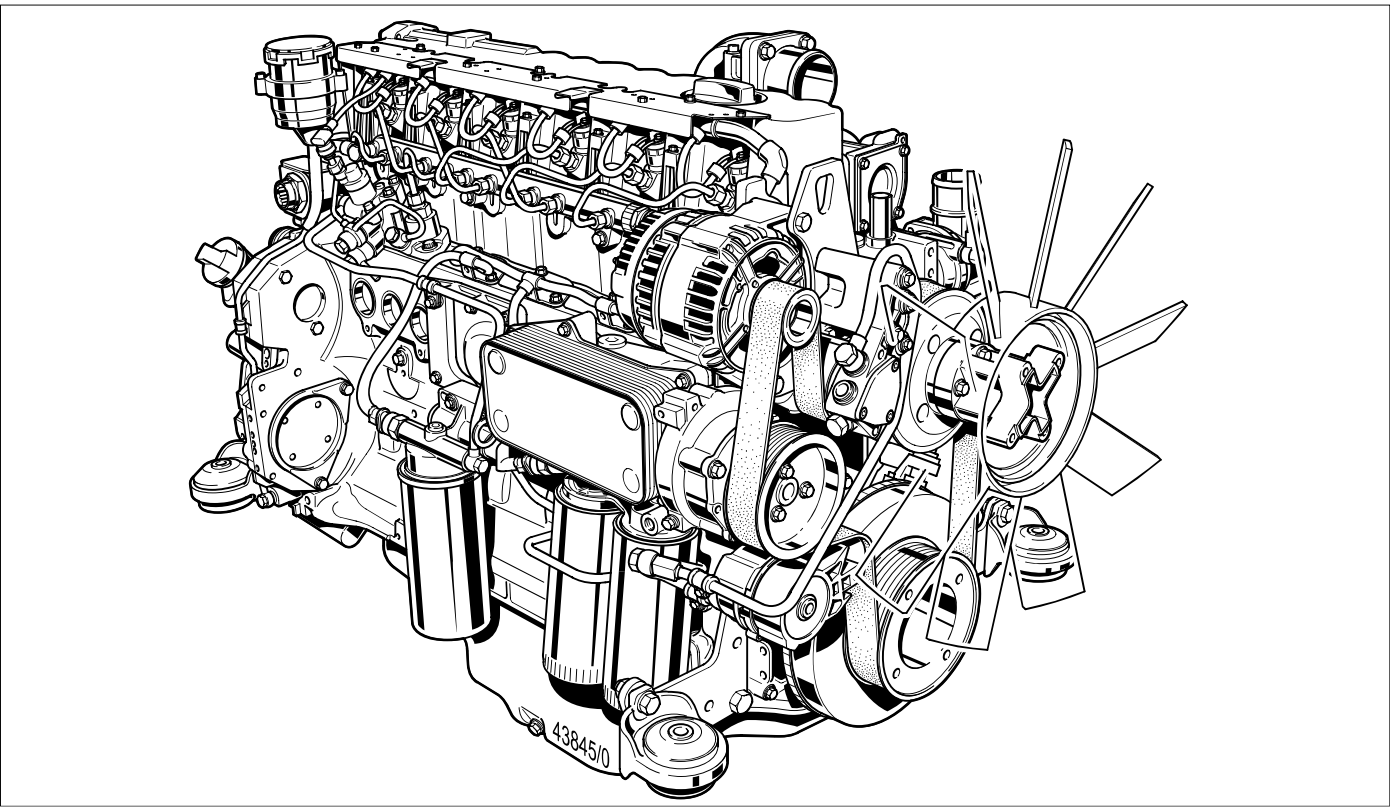
1. *"SEE ALSO 0300513"*

DEVELOPMENT
Release
06/18/07
ECN# 90–00123

UNLESS OTHERWISE SPECIFIED

NO.	ECN	REVISION	DATE	BY

VENDOR
FP–" ALL 12V "
PAS 06/18/07
A 90–00123
CONNECTION MAP
DC1191



Operation Manual

TCD 2012 L04/06 V2

TCD 2013 L04/06 V2

DEUTZ®

- Read and observe the information in this instruction manual. You will avoid accidents, retain the manufacturer's warranty and have a fully functional, ready to use engine at your disposal.

- This engine is exclusively for the purpose according to the scope of delivery - defined and built by the equipment manufacturer (use for the intended purpose). Any use above and beyond this is considered improper use. The manufacturer will not be liable for damages resulting from this. The user will bear the sole risk in this case.

- Use for the intended purpose also includes observance of the operating, maintenance and repair instructions specified by the manufacturer. The engine may only be used, maintained and repaired by persons who are familiar with it and instructed in the dangers.

- The pertinent rules for the prevention of accidents and other generally recognised safety and industrial medicine rules must be observed.

- When the engine is running there is a danger of injury caused by:
  - rotating / hot components
  - engines with extraneous ignition
  - ignition systems (high electrical voltage)
    Contact must be avoided!

- The manufacturer will not be liable for damages resulting from unauthorised modification to the engine.
  Equally, manipulations to the injection and control system can affect the engine's performance and the exhaust characteristics. Compliance with environmental regulations will no longer be guaranteed in this case.

- Do not alter, obstruct or block the area of the cool air supply to the fan.
  The manufacturer will accept no liability for damages resulting from this.

- Only DEUTZ original parts may be used when carrying out maintenance/repair work on the engine. These have been designed especially for your engine and ensure a trouble-free operation.
  Failure to observe this will lead to voiding of the warranty!

- Maintenance/cleaning work on the engine may only be carried out when the engine is not running and has cooled down.
  When doing this, make sure that the electrical system is switched off (remove ignition key).
  The specifications for accident prevention with electrical systems (e.g. VDE-0100/-0101/-0104/-0105 Electrical protective measures against dangerous touch voltages) must be observed.
  Cover all electrical components tightly when cleaning with liquids.

- Do not work on the fuel system while the engine is running **- Danger to life.**
  Wait (1 minute) for the engine to come to a standstill (pressure release), as system is under high pressure: there is a **- Danger to life.**
  During the first trial run do not stand in the danger area of the engine (danger due to high pressure of leaks) **- Danger to life.**
  - In case of leaks immediately contact the workshop.
  - When working on the fuel system ensure that the engine is not unintentionally started during repairs **- Danger to life.**

Operation Manual

TCD 2012 L04/06 V2

TCD 2013 L04/06 V2

312 1890 en

Engine number: | | | | | | | | |

Please enter the engine number here. This will simplify the handling of customer service, repair and spare parts queries (see Section 2.1).

DEUTZ®

Foreword

Dear customer,

The liquid-cooled engines made by DEUTZ are developed for a wide variety of applications. An extensive range of variants ensures that the respective special requirements are met.

Your engine is equipped according to the installation, i.e. not all the parts and components described in this instruction manual are installed on your engine.

We have done our best to clearly identify the differences, so that you can easily find the operating, maintenance and repair instructions relevant to your engine.

Please read these instructions before you start your engine and observe the operating and maintenance instructions.

We are at your service for any questions you may have in this matter.

Your

DEUTZ AG

Contents

Contents

General

DEUTZ Diesel Engines

are the product of many years of research and development. The resulting know-how, coupled with stringent quality standards, guarantee their long service life, high reliability and low fuel consumption.
It goes without saying that DEUTZ Diesel Engines meet the highest standards for environmental protection.

Care and Maintenance

Sound care and maintenance practices will ensure that the engine continues to meet the requirements placed on it. Recommended service intervals must be observed and service and maintenance work carried out conscientiously. Special care should be taken under abnormally demanding operating conditions.

Service

Please contact one of our authorized service representatives in the event of breakdowns or for spare parts inquiries. Our trained specialists will carry out repairs quickly and professionally, using only genuine spare parts. Original parts from DEUTZ AG are always produced in accordance with state-of-the-art technology.
The Technical Circulars listed in the instruction manual are obtainable from your DEUTZ partner.
Please turn to the end of this manual for further service information.

Beware of Running Engine

Shut the engine down before carrying out maintenance or repair work. Ensure that the engine cannot be accidentally started. Risk of accidents!
When working on the running engine, work clothing must be close fitting.
Observe industrial safety regulations when running the engine in an enclosed space or underground.
When the work is complete, be sure to refit any panels and guards that may have been removed.Never fill the fuel tank while the engine is running.

Safety

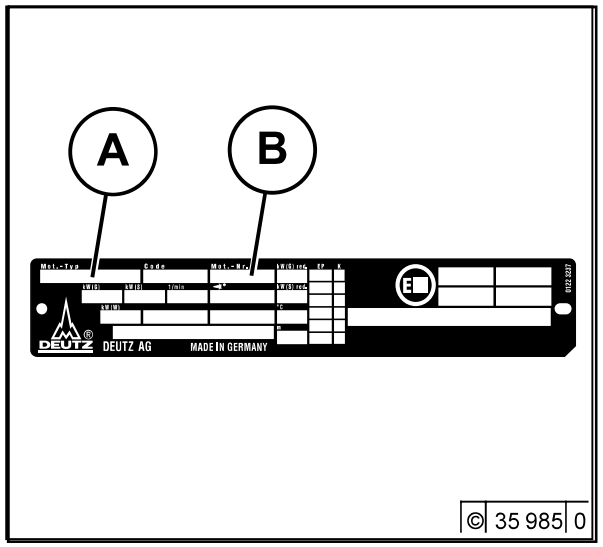
This symbol is used for all safety warnings which, if not observed, present a direct danger to life and limb for the person involved. Please follow them carefully. The attention of operating personnel should be drawn to these safety instructions. General safety and accident prevention regulations laid down by law must also be observed.

Asbestos

DEUTZ original parts are asbestos-free.

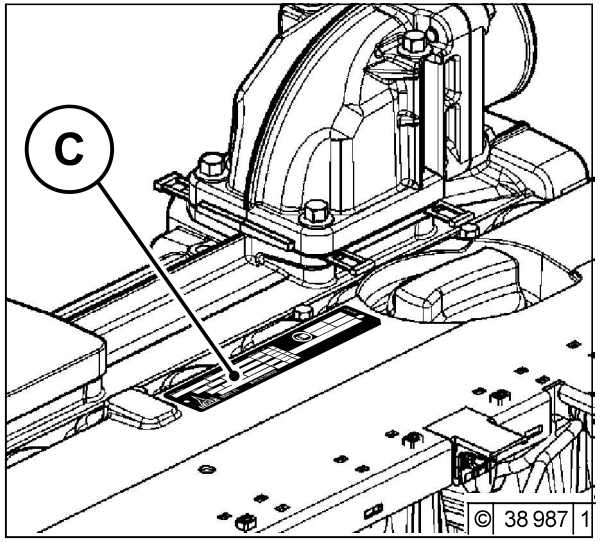
2

2.1.1 Company plate

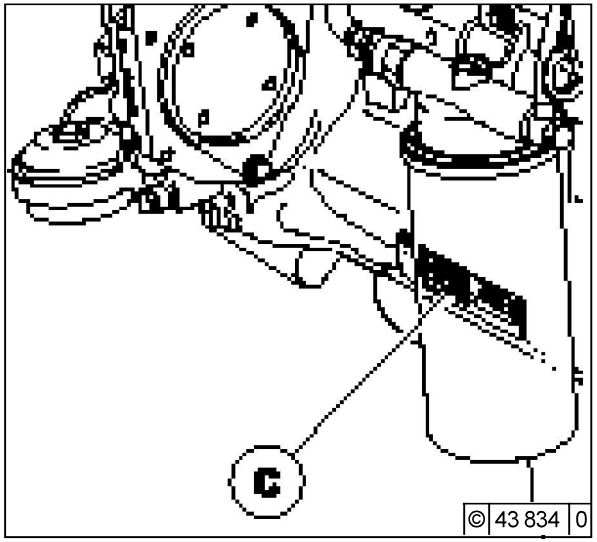


The engine type **A,** engine number **B** and the power data are stamped on the company plate. The engine type and number must be stated when purchasing spare parts.

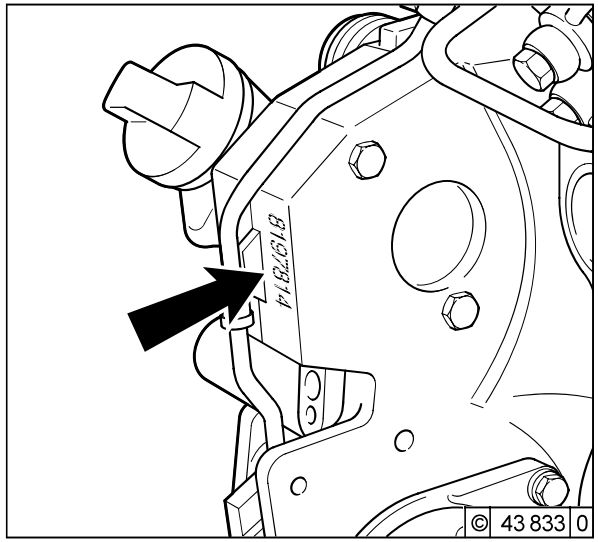
2.1.2 Location of company plate



The company plate **C** is fixed to the cylinder head cover or the crankcase.

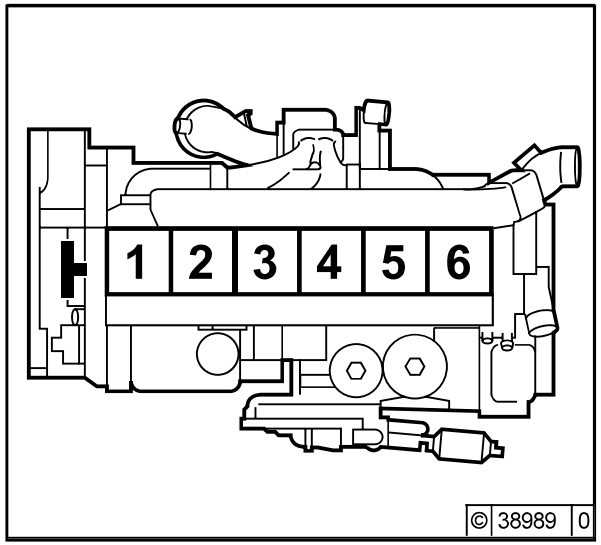


2.1.3 Engine number



The engine number is stamped on the crankcase (arrow) and on the company plate.

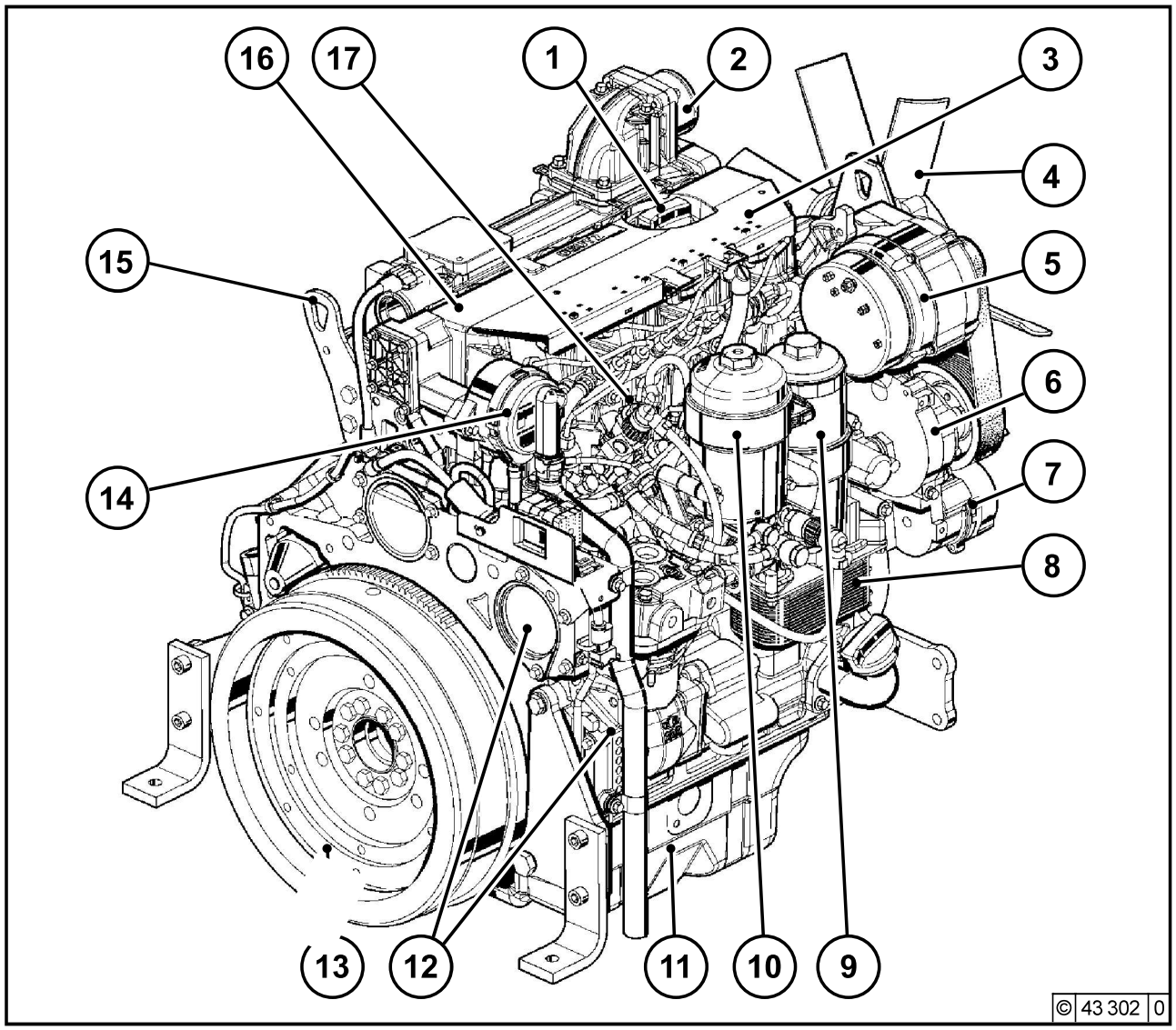
2.1.4 Cylinder numbering



The cylinders are counted consecutively, starting from the flywheel.

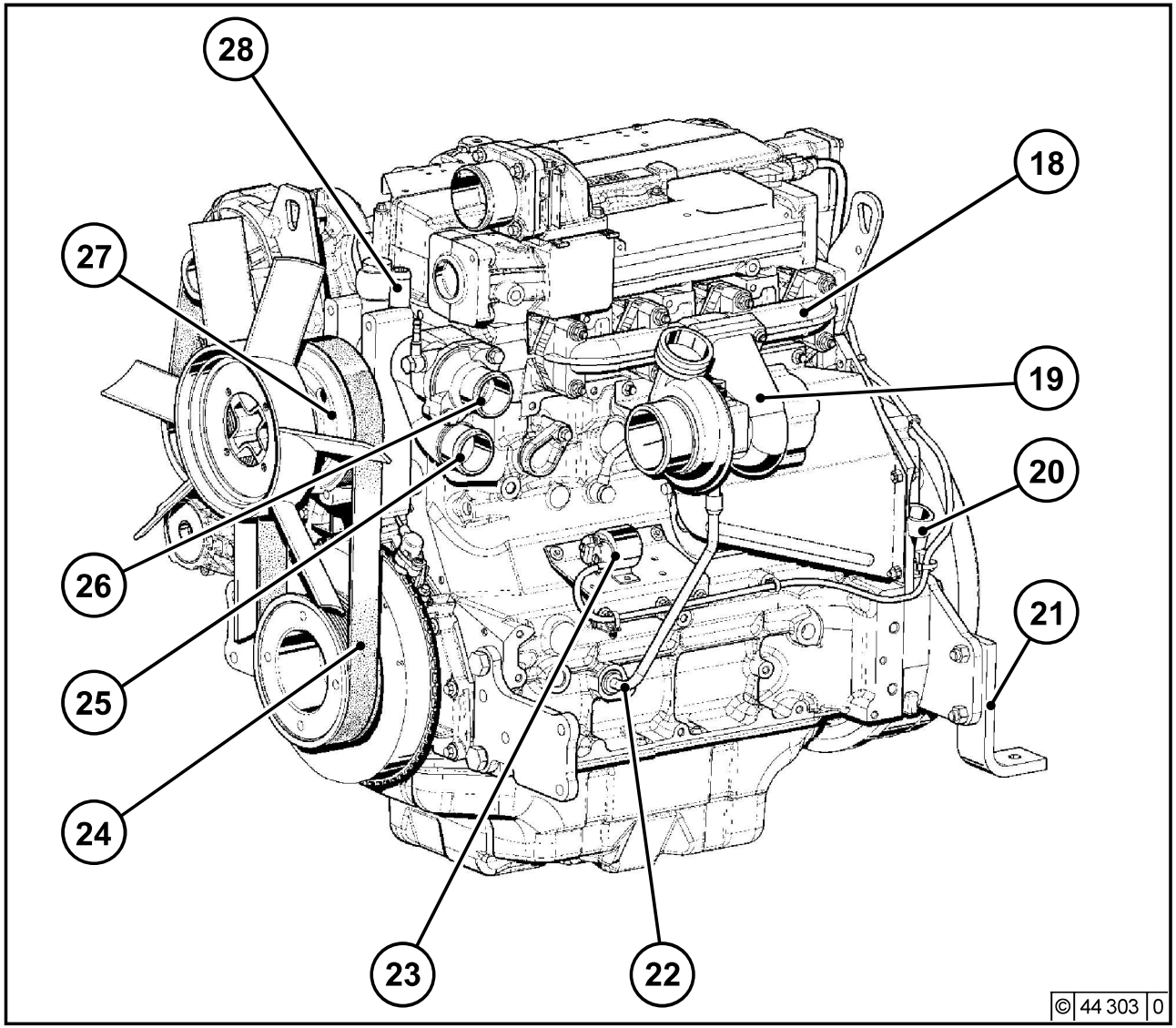
2

2.2.1 Operation side
TCD 2012 L04 2V



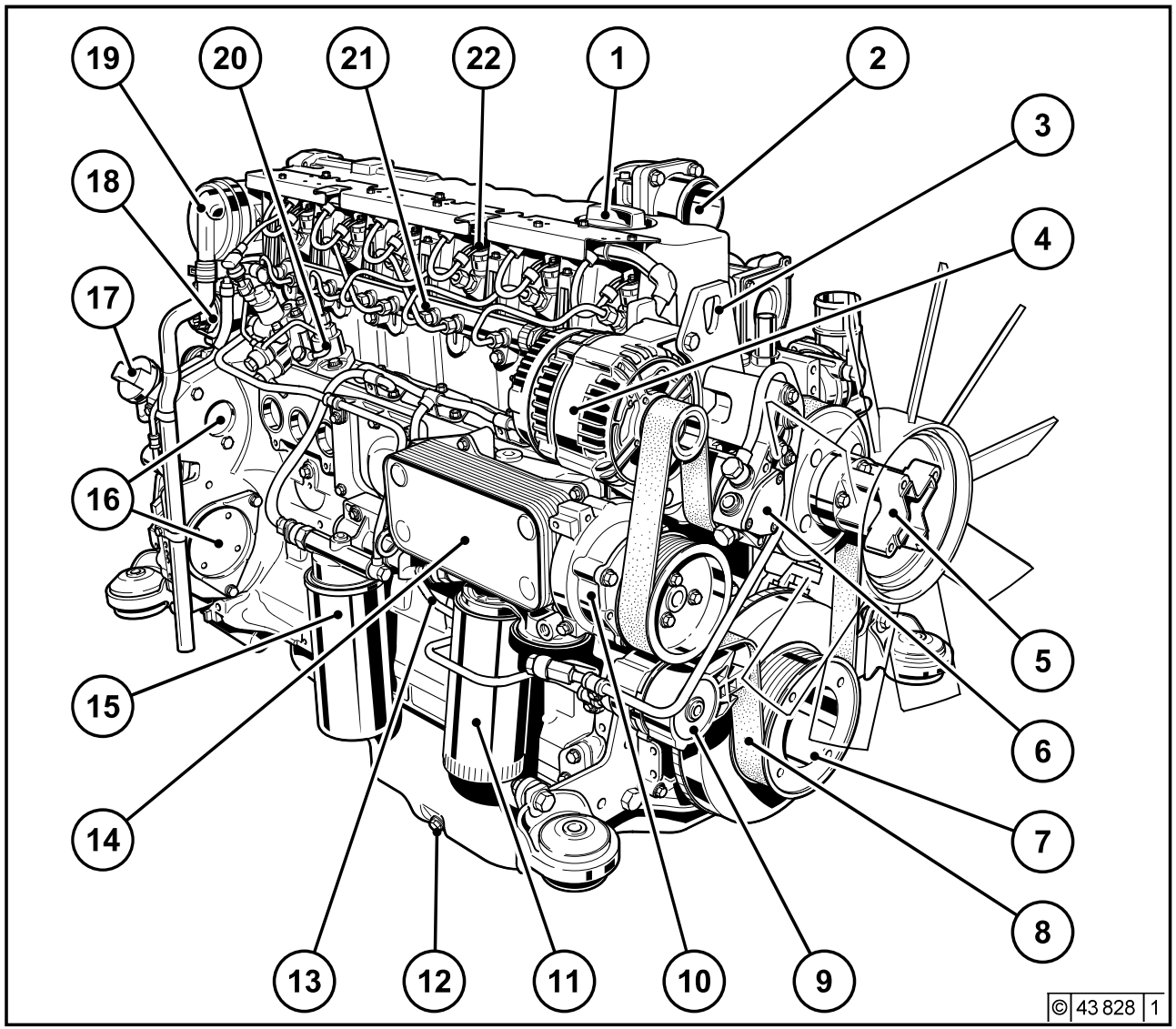
1 Oil filler
2 Combustion air inlet
3 Cover
4 Fan
5 Generator
6 Fuel pump
7 Tension pulley with torsion spring
8 Oil cooler
9 Exchangeable fuel filter
10 Exchangeable lube oil filter
11 Oil tray
12 Hydraulic pump or compressor mounting possibility
13 Flywheel
14 Crankcase bleeding valve
15 Transport eyes
16 Charge air pipe
17 Fuel control unit

2.2.2 Starter side
TCD 2012 L04 2V



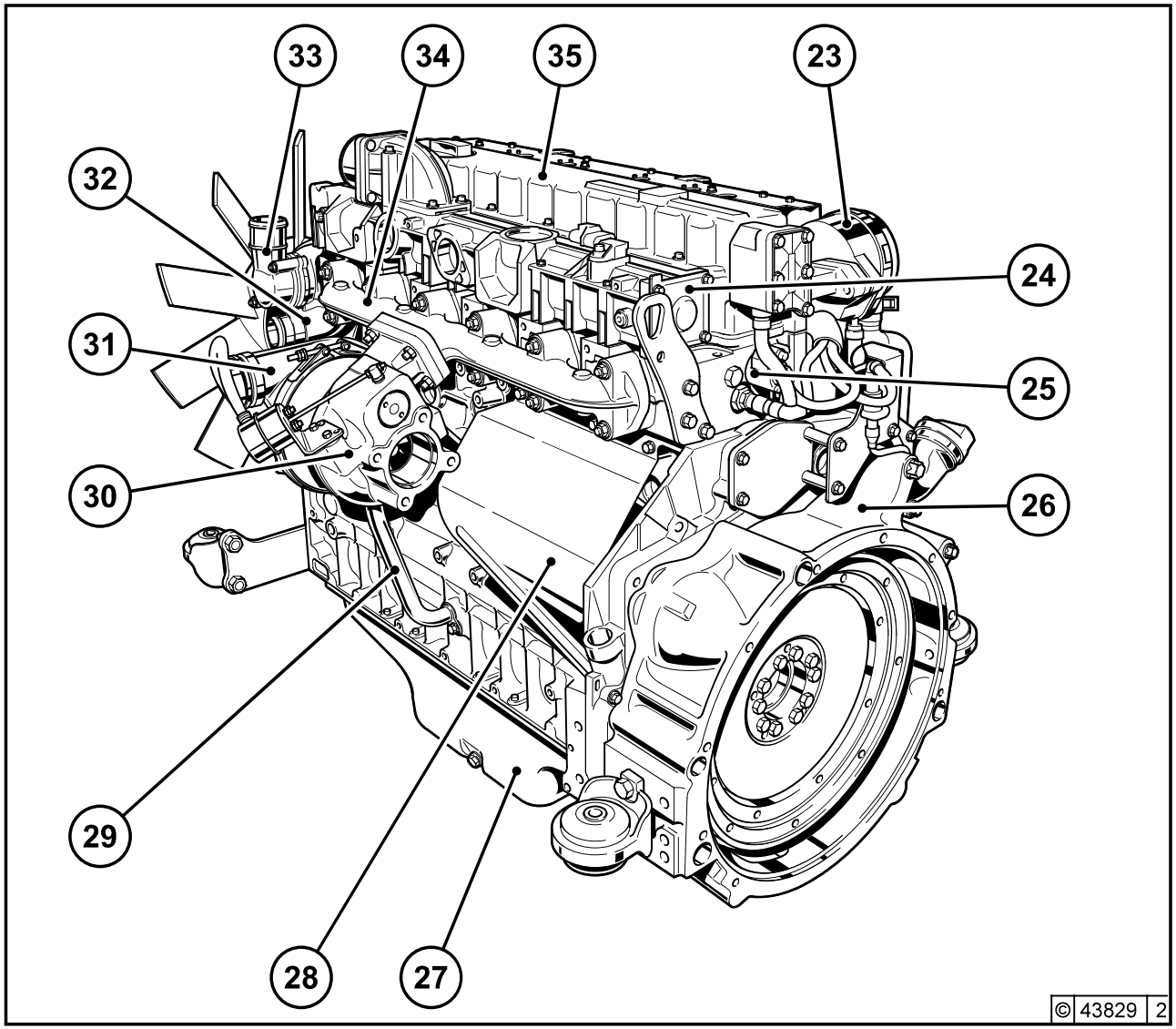
18 Exhaust manifold
19 Turbocharger
20 Oil filler (optional)
21 Engine mounting
22 Oil return line from turbocharger
23 Relay (starter)
24 V-rib belt
25 Coolant inlet
26 Coolant outlet
27 Coolant pump
28 Connection cabin heater or compensation line

2.2.3 Operation side
TCD 2012 L06 2V



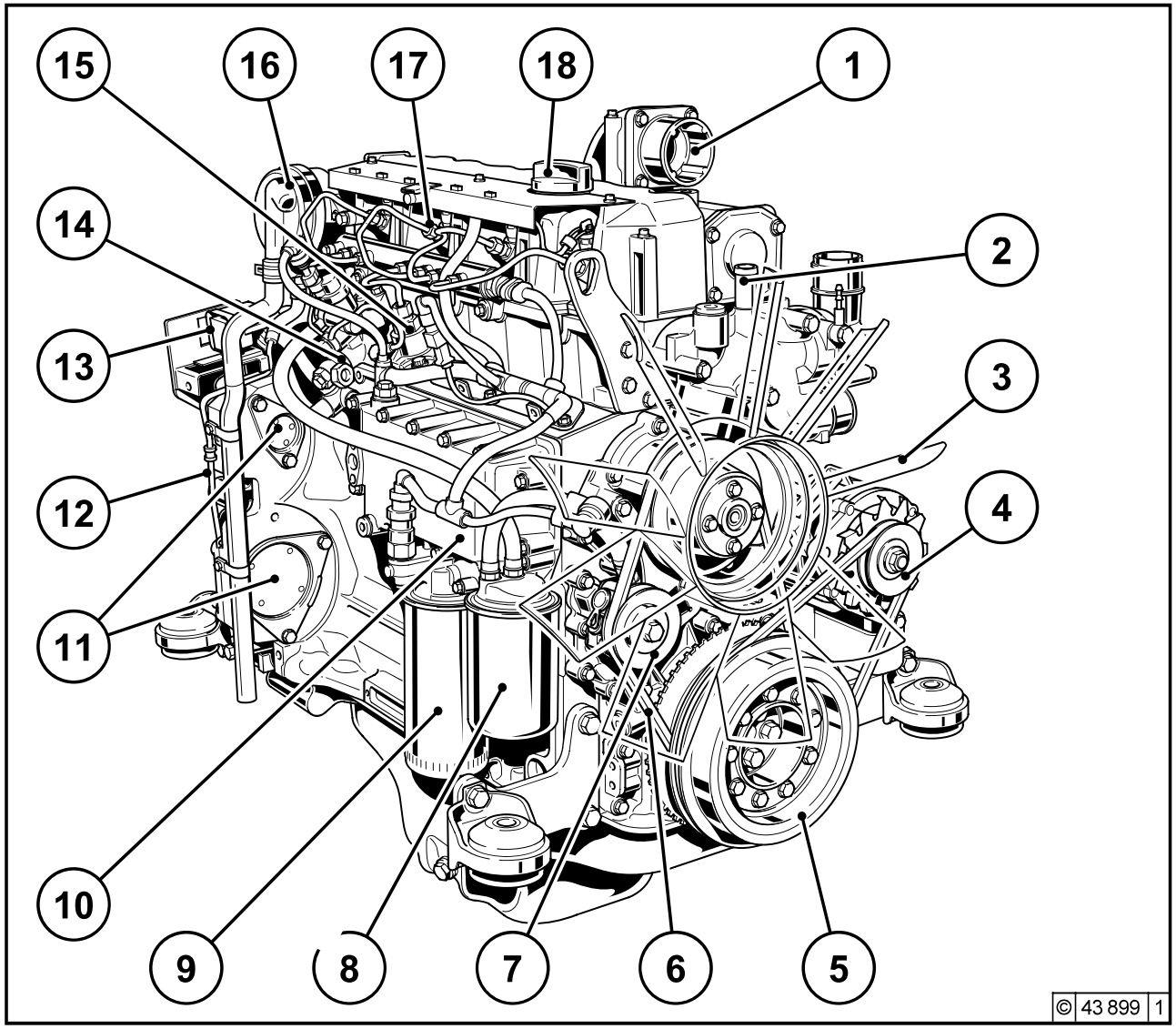
1 Oil filler
2 Combustion air inlet
3 Transport eyes
4 Generator
5 Fan hub
6 Fuel pump
7 V-rib belt drive on crankshaft
8 V-rib belt
9 Tension pulley with torsion spring
10 Coolant pump
11 Exchangeable lube oil filter (1x optional)
12 Oil drain screw
13 Oil dipstick
14 Lube oil cooler
15 Exchangeable fuel filter
16 Hydraulic pump or compressor installation (optional)
17 Oil filler (optional)
18 Plug to control unit
19 Crankcase bleeding valve
20 High-pressure pump (2)
21 Rail
22 Injector

2.2.4 Starter side
TCD 2012 L06 2V



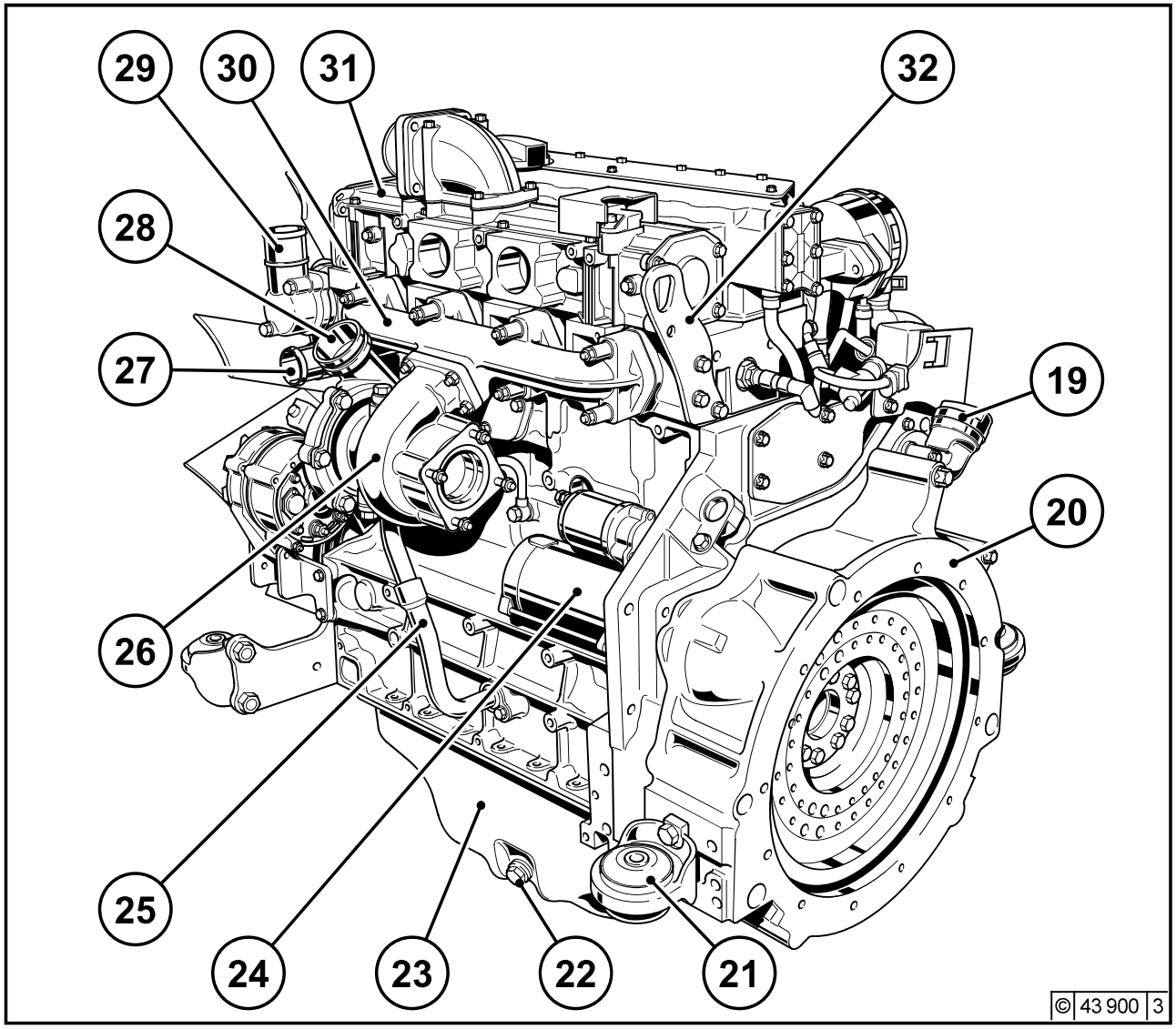
23 Crankcase bleeding valve
24 Charge air pipe
25 Solenoid valve for exhaust gas recirculation
26 SAE housing
27 Oil tray
28 Starter cover
29 Oil return line from turbocharger
30 Exhaust turbocharger
31 Charge air connection to charge air cooler
32 Coolant inlet
33 Coolant outlet
34 Exhaust manifold
35 Cylinder head cover

2.2.5 Operation side
TCD 2013 L04 2V



1 Combustion air inlet (heating flange installation facility, optional)
2 Connection cabin heater or compensation line
3 Fan (drive coolant pump)
4 Generator
5 Belt pulley on crankshaft
6 V-belt
7 Fuel pump drive
8 Exchangeable fuel filter
9 Exchangeable lube oil filter
10 Oil cooler
11 Drive facility (e.g. hydraulic pump, optional)
12 Oil return line crankcase bleeding
13 Plug to control unit
14 Fuel control unit (**E**lectronic **C**ontrol **U**nit)
15 High-pressure pump
16 Crankcase bleeding valve
17 **I**njector
18 Oil filler

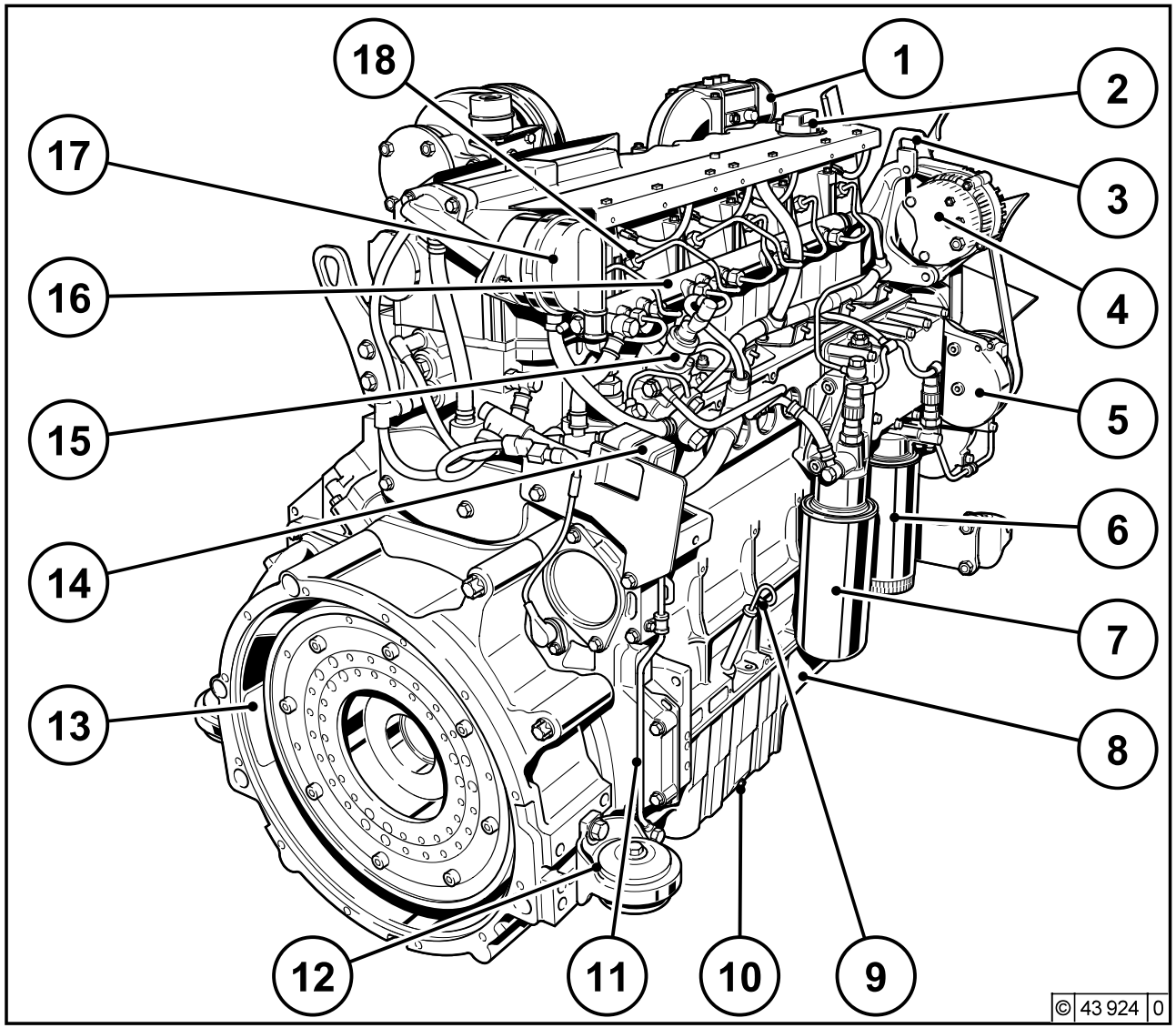
2.2.6 Starter side
TCD 2013 L04 2V



19 Oil filler (optional)
20 SAE housing
21 Engine mounting
22 Oil drain screw
23 Oil tray
24 Starter
25 Lube oil return from turbocharger
26 Turbocharger
27 Coolant inlet
28 Charge air connection to cooler
29 Coolant outlet
30 Exhaust manifold
31 Charge air pipe
32 Transport eyes

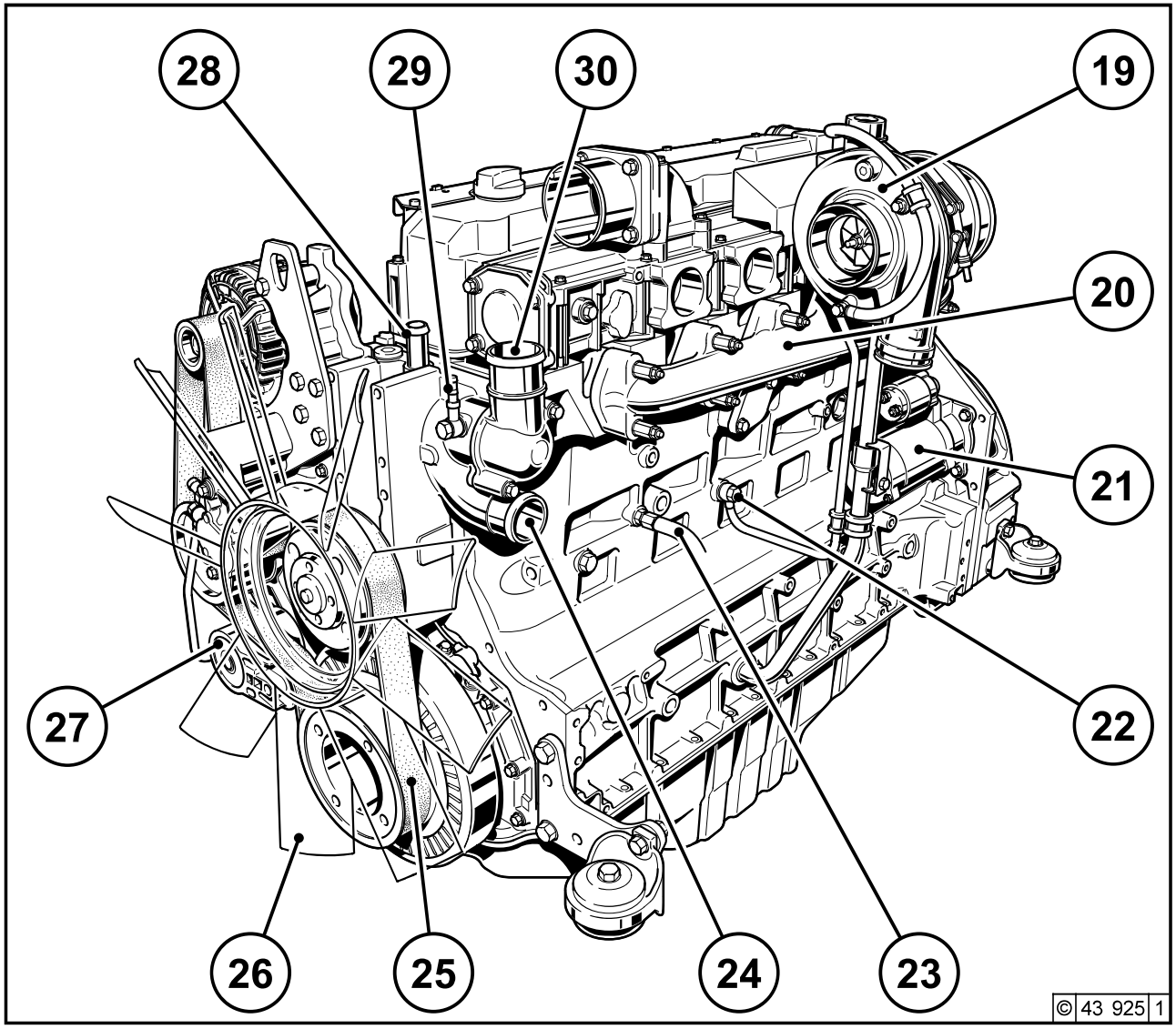
2

2.2.7 Operation side TCD 2013 L06 2V



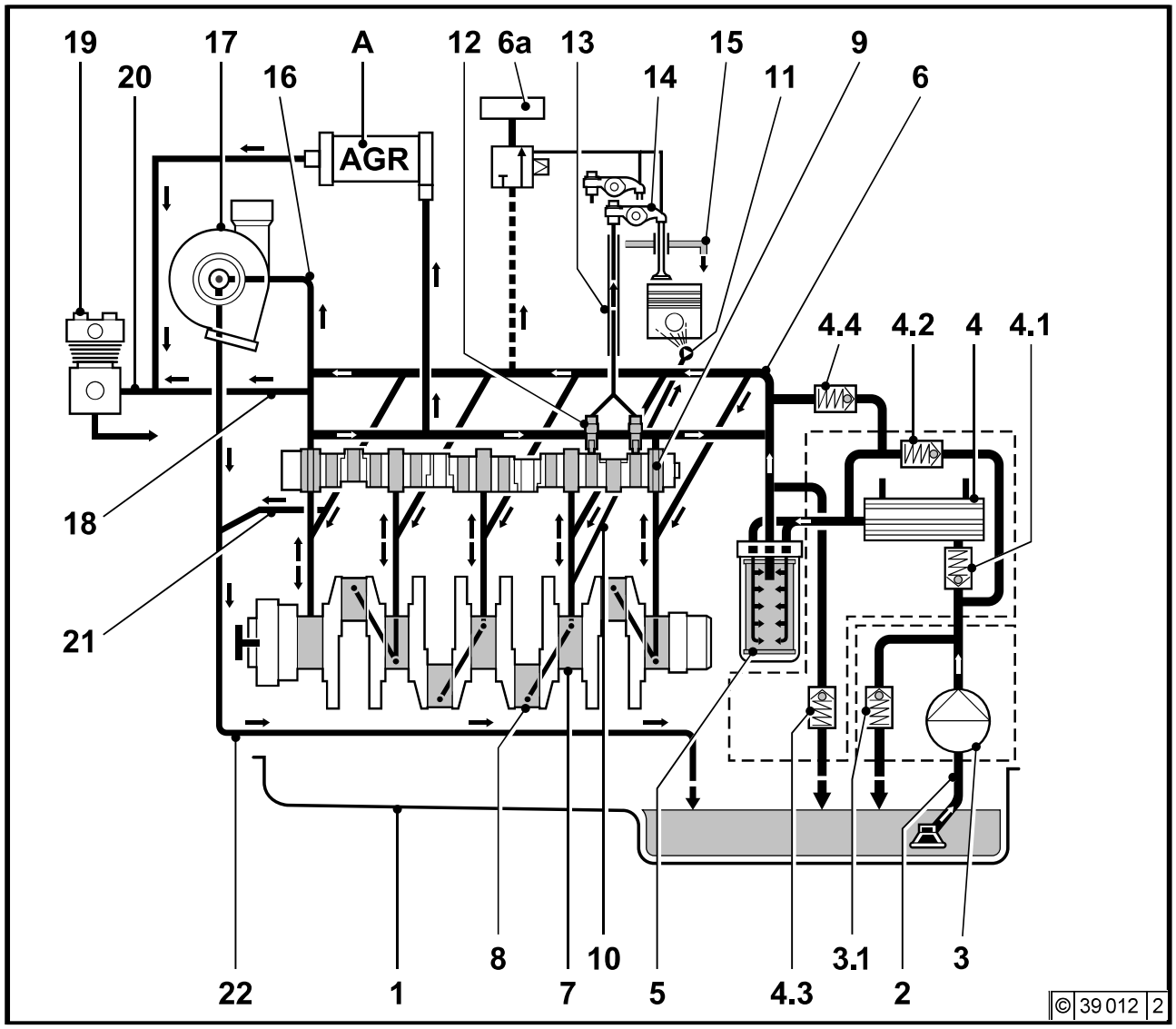
1 Combustion air inlet
2 Oil filler
3 Transport eyes
4 Generator
5 Coolant pump
6 Exchangeable lube oil filter
7 Exchangeable fuel filter
8 Oil tray
9 Oil dipstick
10 Oil drain screw
11 Oil return line crankcase bleeding
12 Engine mounting
13 SAE housing
14 Plug to control unit
15 High-pressure pump
16 Rail
17 Crankcase bleeding valve
18 Injector

2.2.8 Starter side
TCD 2013 L06 2V



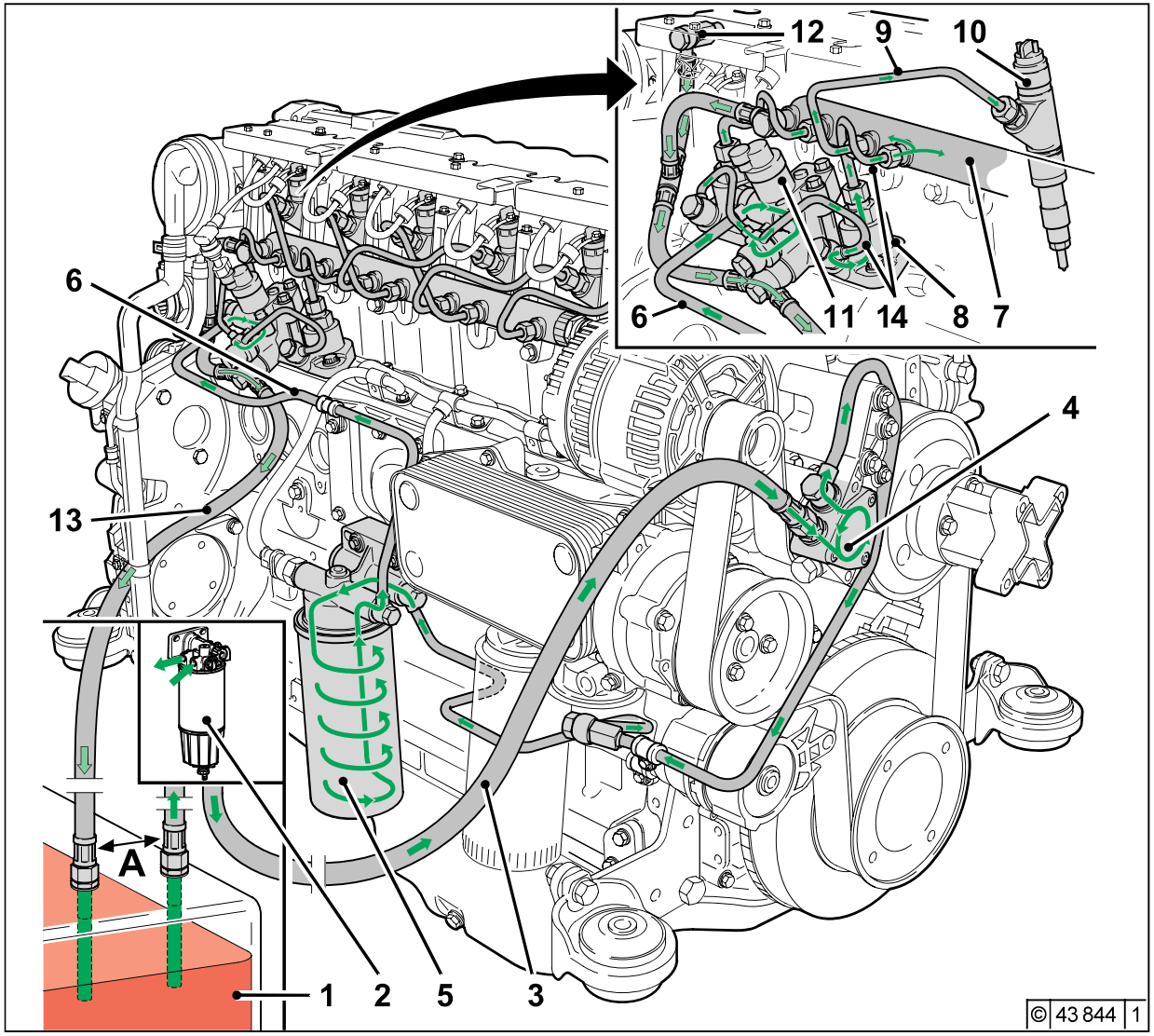
19 Turbocharger
20 Exhaust manifold
21 Starter
22 Lube oil line to turbocharger
23 Coolant drain screw
24 Coolantinlet
25 V-rib belt
26 Fan
27 Tension pulley with torsion spring
28 Connection compensation line
29 Ventilation line to compensation tank
30 Coolant outlet from engine to cooler

2.3.1 Lube oil diagram (example)



1 Oil tray
2 Intake pipe
3 Lube oil pump
3.1 Safety valve
4 Lube oil cooler
4.1 Return shutoff valve (only in 2012)
4.2 By-pass valve
4.3 By-pass valve oil filter
4.4 Pressure control valve
5 Exchangeable lube oil filter
6 Main oil pipe
6a Internal exhaust gas recirculation
7 Crankshaft bearing
8 Con rod bearing
9 Camshaft bearing
10 Line to injection nozzle
11 Injection nozzle for piston cooling
12 Tappet with rocker arm pulse lubrication
13 Stop rod, oil supply for rocker arm lubrication
14 Rocker arm
15 Return line to oil tray
16 Lube oil line toexhaust turbocharger
17 Exhaust turbocharger
18 Return line from compressor 2x
19 Compressor or hydraulic pump
20 Oil line to compressor or hydraulic pump
21 Return line from exhaust turbocharger

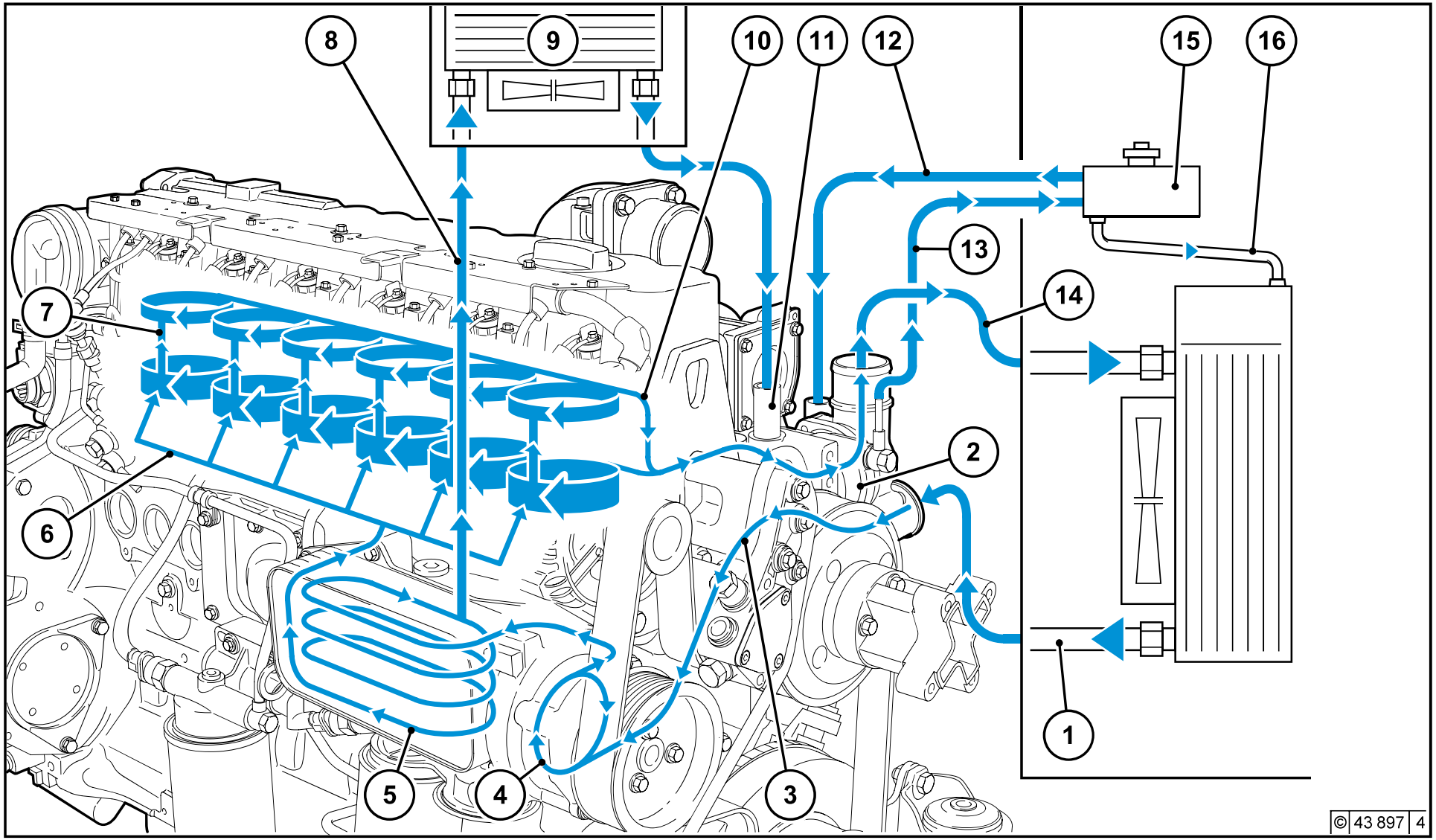
2.4.1 Fuel diagram



1 Fuel container
2 Fuel pre-filter with pre-pressure pump possibility for filling the low pressure area (to be provided by the customer)
3 Line to fuel pump
4 Fuel pump
5 Fuel filter
6 Fuel supply line to fuel control unit
7 Rail
8 High-pressure pump
9 Fuel line to injector
10 Injectors
11 Control block FCU (**F**uel **C**ontrol **U**nit)
12 Fuel return at the cylinder head
13 Fuel return line to the tank
14 Fuel lines from the control block to the high - pressure pumps and to the rail

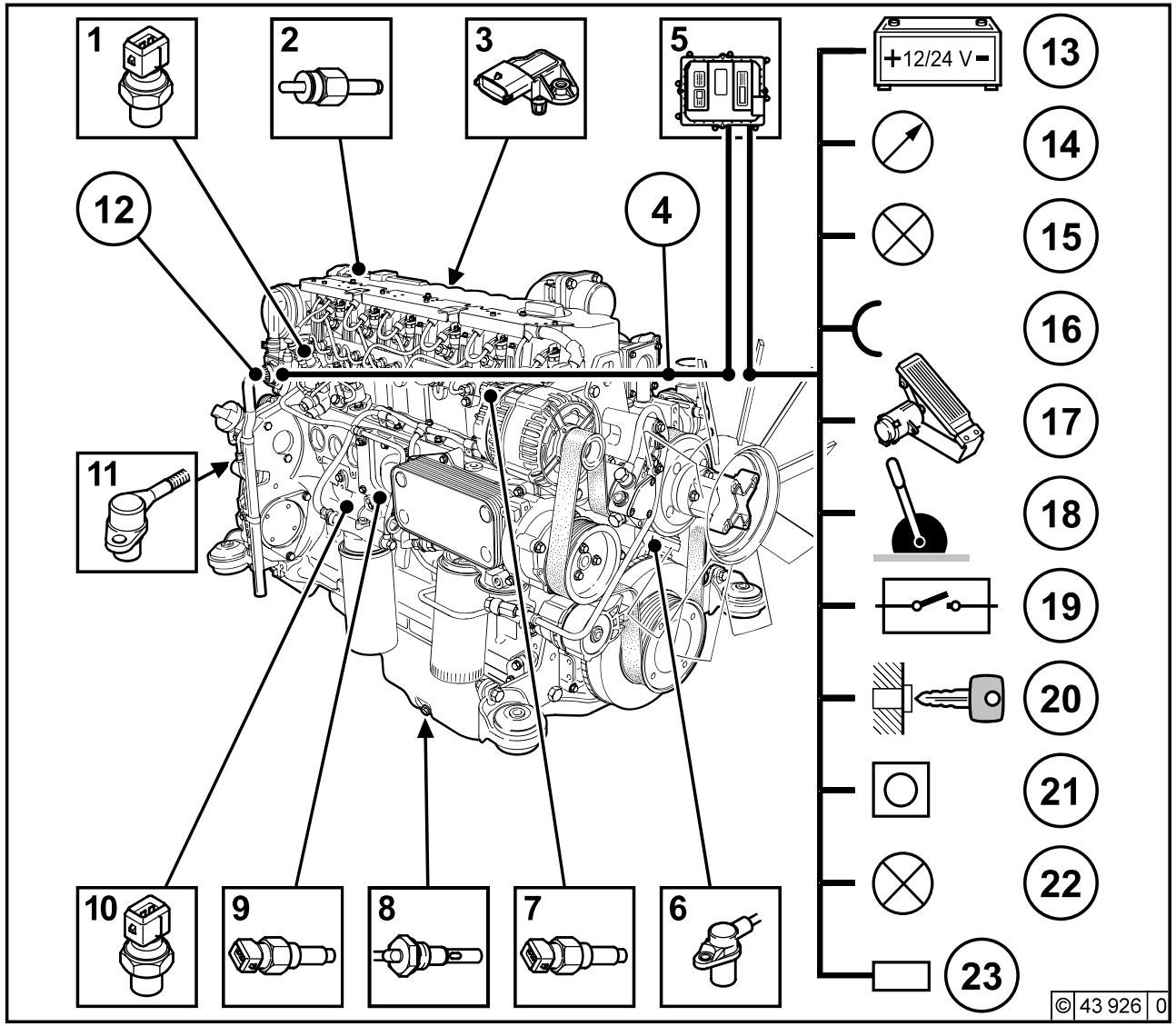
A min. distance 500 mm

2.5.1 Coolant diagram (example)



1 Coolant outlet at the cooler
2 Thermostat
3 Coolant feed line to pump
4 Coolant pump
5 Lube oil cooler
6 Cylinder cooling
7 Cylinder head cooling
8 Coolant inlet to heating
9 Heating
10 Coolant to thermostat
11 Heating connection
12 Compensation line
13 Ventilation line to compensation tank
14 Coolant outlet to cooler
15 Compensation tank
16 Compensation line to heat exchanger

2.6.1 Electrical cable connections for monitoring

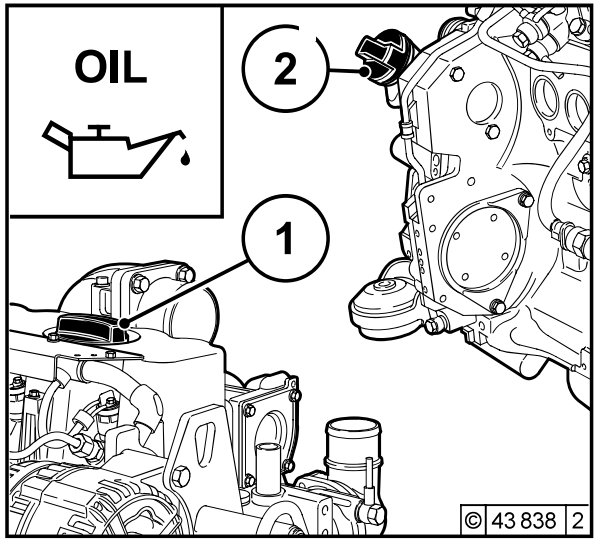


1 Solenoid valve EGR (optional)
2 Coolant temperature
3 Charge air pressure/temperature transmitter
4 Connection facility example: Control unit not mounted on the engine
5 Engine control unit
6 Speed governor via crankshaft
7 Rail pressure, on side of rail
8 Oil level transmitter (optional)
9 Oil pressure transmitter
10 Fuel pressure
11 Speed governor via camshaft
12 Central plug (for engine control)
13 Power supply (battery)
14 Multifunction displays
15 Outputs (configurable, e.g. for lamps, torque (PWM), speed, engine running signal, etc.)
16 Inputs (configurable) (PWM/digital/analogue)
17 Accelerator pedal
18 Hand throttle (optional)
19 Switch functions (optional, e.g. for P factor, controller type, roof curves, fixed speeds, (etc. also multistage switches))
20 Key switch Start/stop
21 Diagnosis button
22 Fault light with blink code
23 Diagnosis interface / CAN-Bus

Other application-side components (depending on the application)

- Water trap fuel filter, see chap. 6.2.3
- Override key, see chap. 3.3.1 (for temporary bypassing of the engine protection functions)
- Coolant level transmitter
- Separate engine stop switch
- Fan control
- Switch for brake contact, engine brake, clutch
- Drive speed sensor, drive speed control unit
  (+ - keys, for speed increase reduction)
- Cold start aid control lamp, see chap. 3.2.1
  If there is a serious fault, e.g. the heating flange draws current although the control unit does not control it, this lamp flashes. The power supply to the heating flange **must** then be disconnected separately (overheating protection heating flange).

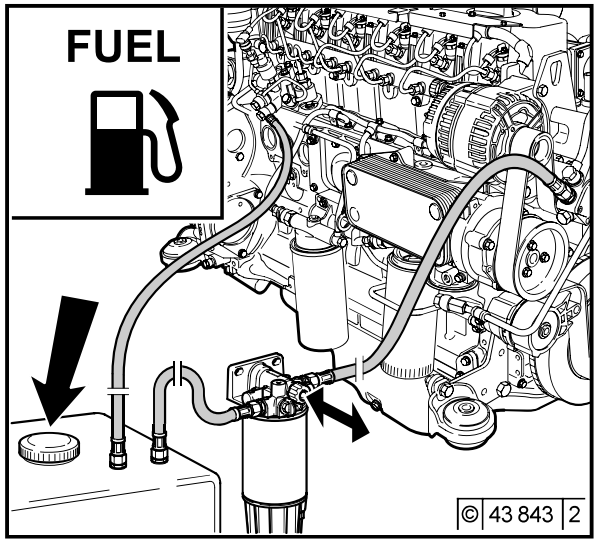
3.1.1 Filling engine oil



The engines are generally supplied without oil filling.
Fill engine with lube oil through the oil filler (1) on the cylinder head cover. Alternatively, you can fill on the wheel box (2) or on the side of the crankcase.
For oil filling amount see 9.1.
For quality and viscosity of oil see 4.1.

Oil may not be filled into the dust collecting tank of the pre-separator, if this is present.

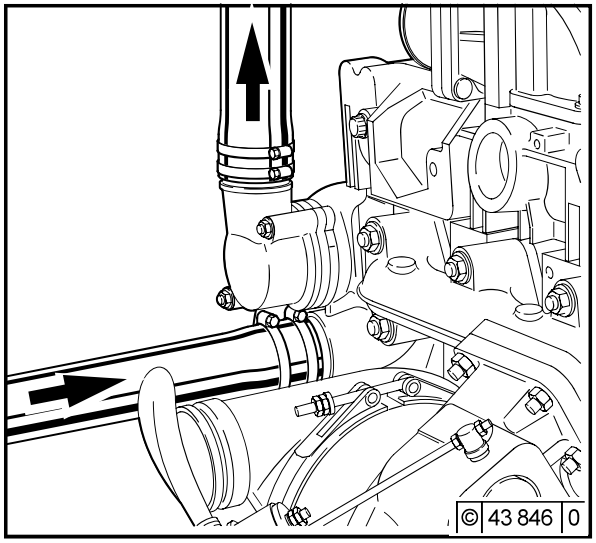
3.1.2 Filling fuel



Only use clean, standard, branded diesel fuel. For fuel quality see 4.2.
Depending on the outdoor temperature, use either summer or winter diesel fuel.
Bled the fuel low pressure system after filling, see 6.2.3.
Additional venting of the fuel system by a 5 minute trial run in idle or low load is absolutely essential.

Only re-fuel when the engine is not running!
Pay attention to cleanliness!
Do not spill any fuel!

3.1.3 Filling / bleeding cooling system



- Connect connection coolant outlet 1 and coolant inlet 2 to the cooling system. Connect the lead line from the compensation tank to the water pump or to the coolant inlet pipe 2.
- Connect the bleed lines from the engine and poss. from the cooler to the compensation tank.
- Fill the cooling system through the compensation tank.
- Close the compensation tank with the valve.
- Start the engine and run warm until the thermostat opens (line 1 heats up).
- Engine run with open thermostat 2 - 3 minutes.
- Check the coolant level in the compensation tank and top up the coolant if necessary.
- Repeat the process with engine start if necessary.

Never operate the engine without coolant (not even briefly).

3.1.4 Other preparations

- Check battery and cable connections, see 6.7.1.

- **Trial run**
  - After preparations carry out a short trial run of approx. 10 min.
    Do not fully load the engine.

  During and after the trial run
  - Check engine for tightness.

  With engine not running
  - Check oil level, re-fill oil if necessary, see 6.1.2
  - Check V-belt, re-tighten if necessary, see 6.5.

- **Running-in**
  Check the oil level twice a day during the running-in phase.
  After the running-in phase, checking once a day is sufficient.

3.2.1 Electrical starting

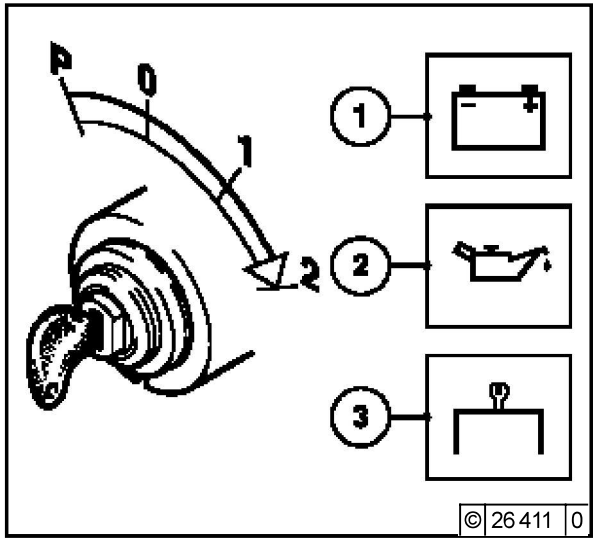
without cold start aid

Before starting make sure that there is nobody in the engine/ work machine danger area. After repairs: Check that all protective equipment is mounted and all tools have been removed from the engine.
When starting with heating plugs/heating flange, do not use additional start aids (e.g. injection with start pilot)! Danger of accidents!

- Engine is electronically controlled by
  Example: EMR3 (electronic engine control)
  - engine is programmed and supplied with the necessary function configurations.
- As far as possible separate engine from driven devices by disconnecting.
- Engine connector plug must be connected by the customer (e.g in driver's cab/ device) to at least:
  - Supply voltage
  - Torque output
  - Speed output.
- Warm up the engine for approx. 30 seconds at a low idling speed.
- Do not run up the engine immediately to high idling speed / full load operation from cold.

If the starter is connected by a relay on the EMR3,

- the maximum starting time is limited by the EMR3.
- the pause between two start attempts is given by the EMR3.



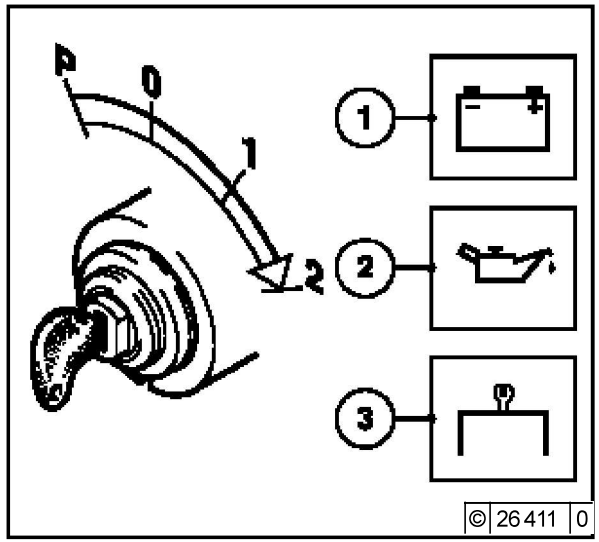
- If the touch start function is programmed, a short start command with the ignition key suffices in position 2 or, if available, by a start button.
  The start is then continued automatically by the EMR3.
- For special applications, the EMR3 can be programmed by data record so that the control unit performs other automatic start attempts if the engine fails to start.

- Insert key
  - Step 0 = no operating voltage.
- Turn key to the right
  - Step 1 = operating voltage,
  - Warning lights light up.
- Turn the key further to the right against the spring load.
  - Step 2 = start
- Release key as soon as the engine starts up.
  - Warning lights go out.

Start the engine for a maximum of 20 seconds uninterrupted. If the engine does not start up, wait for one minute and then repeat the starting process. If the engine does not start up after two starting processes, determine the cause as per fault table (see 7.1).
If the engine does not start and the diagnostic lamp flashes, the EMR3 system has activated the start lock to protect the engine.
The start lock is released by switching off the system with the ignition key for about 30 seconds.

with cold start aid

Heating plug/heating flange



- Insert key.
  - Step 0 = no operating voltage.
- Turn key to the right.
  - Step 1 = operating voltage,
  - Warning lights 1+2+3 light up.
  - Pre-heat until heating indicator goes out. If the pre-heating indicator flashes, there is an error, e.g. pre-heating relay sticking which can fully discharge the battery at standstill.
  - Engine is ready for operation.
- Turn the key further to the right against the spring load to
  - Step 2 = start
- Release key as soon as the engine starts up.
  - Warning lights go out.

Caution: Engine must start within 30 seconds, if not, repeat the starting process.

The EMR3 system monitors the engine condition and itself.
The states are indicated by the diagnostic lamp.
Lamp test:

- The diagnostic lamp lights for about 2s after ignition (ignition lock stage 1).

Steady light:

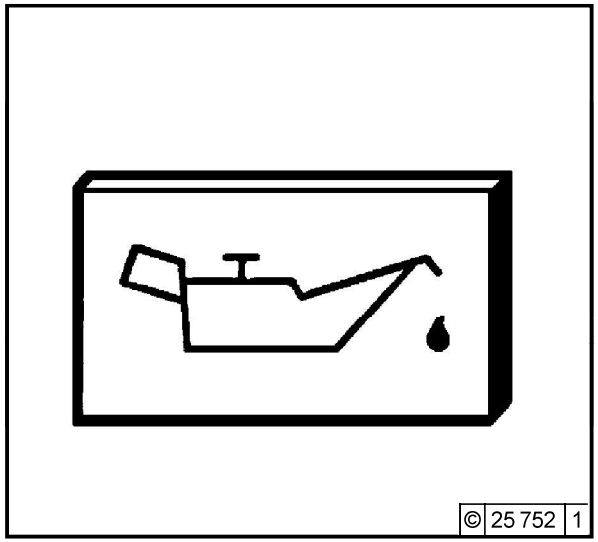
- There is an error in the system or a variable of the engine (temperature, pressure, etc.) is in the warning area. Depending on the error, the performance of the engine may be reduced by the EMR3 to protect the engine so that it is not in danger.

Fast flashing:

- **Attention, the engine is in danger and must be switched off**.
- **Depending on the application, the control unit switches the engine off automatically**.
- The control unit may also specify an idle speed to cool the engine before shutting down.
- There may be a start lock after stopping the engine.
- Additional control lamps e.g. for oil pressure or oil temperature may be on.
- The override key can bypass the reduction in performance to avoid critical situations, as well as delay the automatic shutdown or bypass a start lock. This overwriting of the engine protection functions is logged in the control unit.
- The start lock is released by switching off the system with the ignition key for about 30 seconds.

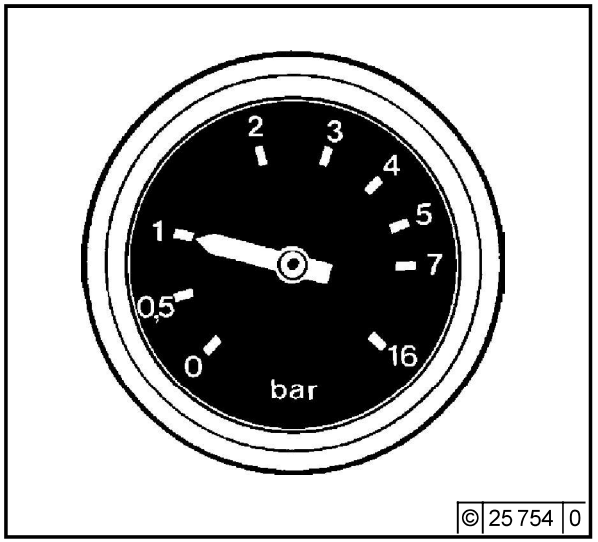
3.3.1 Engine oil pressure

Oil pressure light



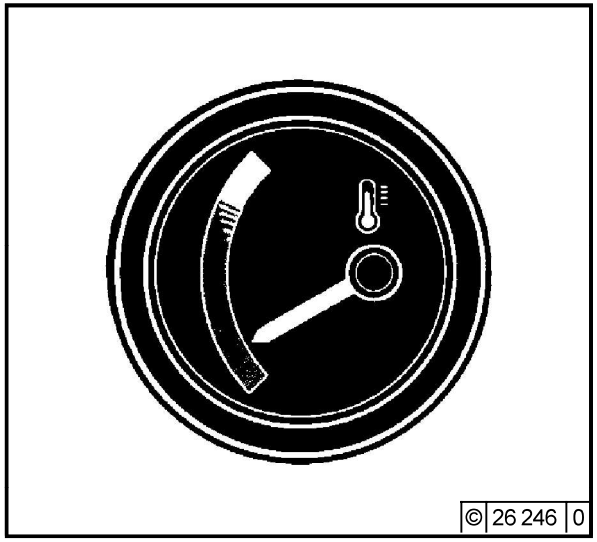
- The oil pressure light comes on for about 2s after switching on the system.
- The oil pressure light must be off when the engine is running.

Oil pressure gauge



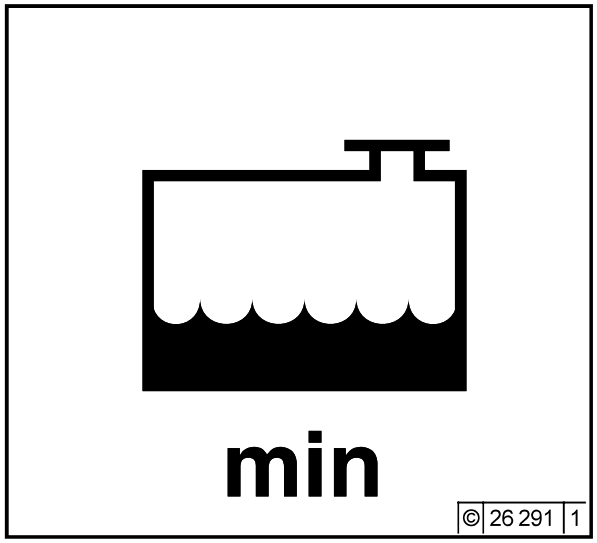
- Oil pressure gauge shows the lube oil pressure (minimum lube oil pressure, see chap. 9.1).

3.3.2 Coolant temperature



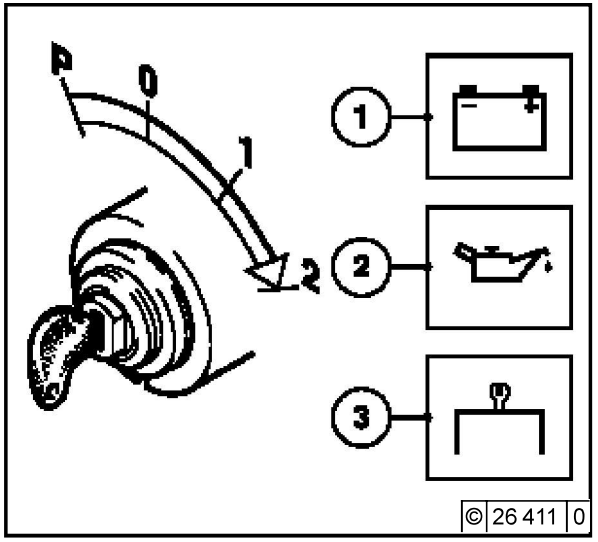
- The needle of the temperature display should always be in the green area, and only as an exception in the yellow/green area. If the needle rises into the orange area the engine is getting too hot. Switch off the engine and determine the cause as per fault table (see 7.1).

3.3.3 Coolant level



- Light on coolant level display comes on (contact is via float switch/ level probe if coolant level is below minimum):
  Switch off the engine and determine the cause as per fault table (see 7.1).
- Function check of coolant level:
  - Coolant level OK: Light goes out

3.4.1 Electrical shutdown



- Turn the key to the left (to step 0) and remove. Warning lights go out.

Note:
The control unit remains active for about another 40 seconds to save the system data (lag) and then switches itself off.

Avoid shutting down from full load operation if possible (coking/ blockage of the remaining oil in the turbocharger bearing housing).
Lube oil is no longer supplied to the turbocharger! Run the engine after relieving the load for about one minute at low idling speed.

3.5.1 Winter operation

- Lube oil viscosity
  - Select the viscosity (SAE class) according to the ambient temperature before starting the engine, see 4.1.2.
  - Observe shorter oil change times when operating below -10 °C, see 6.1.1.

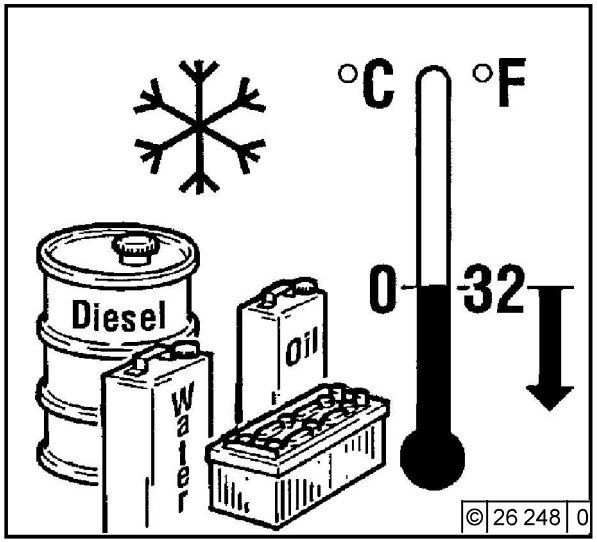
- Diesel fuel
  - Below 0 °C use winter fuel, see 4.2.2.

- Coolant
  - Mixing ratio anti-freeze / water for lowest temperature (max. - 35 °C), see 4.3.1.

- Additional maintenance work
  - Check the fuel container weekly for contaminations, clean if necessary.
  - If necessary, adjust the oil filling of the oil bath air filter (as engine oil) according to the outside temperature.

- Cold start aids
  - When there is a frost, start with heating plugs if necessary (see 3.2.1). This does not only lower the starting limit temperature, but also simplifies starting at temperatures which do not actually require a starting aid.

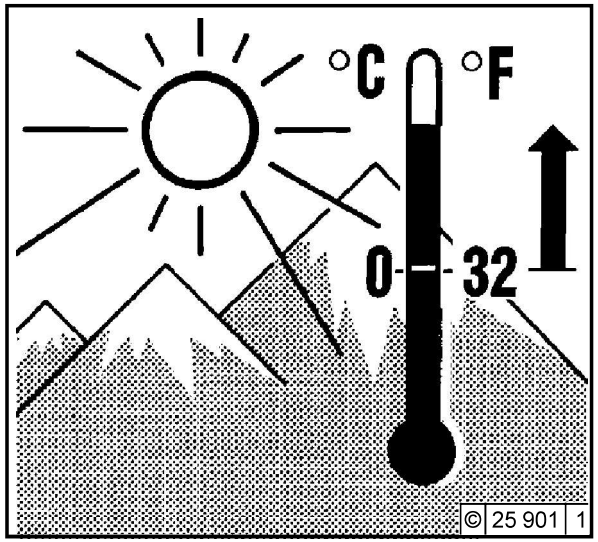
- Battery
  - A well-charged battery is a prerequisite for a good cold start, see 6.7.1.
  - Heating the battery to approx. 20 °C (dismantle and store in a warm room) lowers the starting limit temperature by 4-5 °C.



3.5.2 High ambient temperature, high altitude

- When the altitude or ambient temperature increases, the air density decreases. This impairs the maximum engine performance, exhaust quality, temperature level and, in extreme cases, the starting performance.
  For transient operation, usage up to 1500 m altitude and a temperature of 30 °C is permissible, for stationary operation 1000 m altitude and a temperature of 40 °C is permissible.
  When using the engine under adverse conditions (high altitude or high temperature) the amount of fuel power injected is reduced and the amount of fuel injected and with it the engine power.

- In case of doubt regarding engine usage, please ask your engine or device supplier whether necessary fuel stop reduction has been carried out in the interest of operational safety, service life and exhaust quality (smoke!), or contact your service representative.



General

Modern diesel engines place very high demands on the lube oil to be used. The specific engine performances which have increased constantly over the last few years lead to an increased thermal load on the oil and also the oil is more exposed to contamination due to reduced oil comsumption and longer oil change intervals. For this reason it is necessary to observe the requirements and recommendations described in this instruction manual in order not to shorten the life of the engine.

Lube oils always consist of a basic oil and an additive package. The most important tasks of a lube oil (e.g. wear protection, corrosion protection, neutralization of acids from combustion products, prevention of coke and soot deposits on engine parts) are assumed by the additives. The properties of the basic oil are also decisive for the quality of the product, e.g. with regard to thermal load.

Mixing of engine oils should be avoided because the worst properties of the mixture are always dominant. Basically all engine oils are mixable so that a complete lube oil change from one oil type to another is unproblematical under the aspect of mixability.

The **lube oil quality** has a considerable influence on the life, performance and thus also on the cost-effectiveness of the engine.
It basically applies that: the better the lube oil quality, the better these properties.

The **lube oil viscosity** describes the flow behavior of the lube oil dependent on the temperature. The lube oil viscosity has no influence and effect on the lube oil quality.

Synthetic lube oils are used increasingly and have advantages. These oils have a better temperature and oxidation stability as well as a relatively low cold viscosity. Since some processes relevant to the definition of the lube oil change intervals are not essentially dependent on the lube oil quality (such as the entry of soot and other contaminations), the lube oil change interval when using synthetic lube oils may not be increased in relation to the specifications of the lube oil change intervals section 6.1.1.

Biodegradable lube oils may be used in DEUTZ engines if they meet the requirements of this operating manual.

4.1.1 Quality

Lube oils are classified by DEUTZ according to their performance and quality class (**DQC** : **D**eutz **Q**uality **C**lass). It basically applies that the lube oils are more efficient or higher quality with ascending quality class (DQC **I**, II, III, IV).
The annex (- 02, - 05) specifies in what year the classification was created.
Lube oils according to other, comparable specifications can be used as long as they meet the DEUTZ requirements. In regions in which none of these qualities is available, please contact the DEUTZ Service responsible.

DEUTZ lube oil quality classes	**DQC I - 02**	**DQC II - 05**	**DQC III - 05**	**DQC IV - 05**
ACEA classification (**A**ssociation des **C**onstructeurs **E**uropéen d'**A**utomobiles)	E2 - 96	E3 -96 / E5 - 02 E7 - 04	E4 - 99 / E6 - 04 or according to table T 4-1-3	Table T 4-1-4
or API classification (**A**merican **P**etroleum **I**nstitute)	CF / CF - 4	CG - 4 / CH-4 / CI-4	-	-
or worldwide classification	-	DHD - 1	-	-

The following lube oils are prescribed for the engines of this operating manual:

TCD 2012 / 2013 2V
with open crankcase bleeding:
DQC II - 05
DQC III - 05
DQC IV - 05

The best results are achieved with DEUTZ lube oils. These can be ordered from DEUTZ Service with the order number.

DEUTZ lube oil quality classes	**DQC II - 05**		**DQC III - 05**	
Lube oil type	DEUTZ ÖI TLS - 15W-40 D		DEUTZ ÖI TLX - 10W-40 FE	
	Container	Order no.	Container	Order no.
	5 liter	0101 6331	5 liter	0101 6335
	20 liter	0101 6332	20 liter	0101 6336
	209 liter	0101 6333	209 liter	0101 6337
	Tank store	0101 6334	Tank store	0101 6338

4

DEUTZ lube oil quality level			DQC III-05
Manufacturer	**Lube oil type**	**SAE class**	**Availability**
DEUTZ	**DEUTZ oil TLX-10W40FE**	**10W-40**	**Europe**
ADDINOL	ADDINOL Super Truck MD 1048	10W-40	Europe, Asia
	ADDINOL Ultra Truck MD 0538	5W-30	Europe, Asia
AGIP	Agip Sigma Ultra TFE	10W-40	worldwide
	Autol Valve Ultra FE	10W-40	Germany
ARAL	Aral MegaTurboral	10W-40	worldwide
	Aral SuperTurboral	5W-30	worldwide
AVIA	TURBOSYNTH HT-E	10W-40	Germany
BAYWA	BayWa Super Truck 1040 MC	10W-40	Southern Germany
	BayWa Turbo 4000	10W-40	Southern Germany
BP OIL International	BP Vanellus E7 Plus	10W-40	Europe
	BP Vanellus E7 Supreme	10W-40	Europe
	BP Vanellus C8 Ultima	5W-30	Europe
Bucher AG	MOTOREX FARMER	10W-40	Europe
Castrol	Castrol Enduron Plus	5W-40	Europe, America, Australia, South Africa
	Castrol Enduron	10W-40	Europe, America, Australia, South Africa
	Castrol Elexion	5W-30	USA
CEPSA	EUROTRANS SHPD	10W-40	Spain, Portugal
CHEVRON	Chevron Delo 400 Synthetic	5W-40	North Amerika
ESSO	Essolube XTS 501	10W-40	Europe
FUCHS EUROPE	Fuchs Titan Cargo MC	10W-40	worldwide
	Fuchs Titan Unic Plus MC	10W-40	worldwide
MOBIL OIL	Mobil Delvac 1 SHC	5W-40	Europe, SE Asia, Africa
	Mobil Delvac 1	5W-40	worldwide
	Mobil Delvac XHP Extra	10W-40	Europe, SE Asia
OMV AG	OMV super Truck	5W-30	Europe
	OMC truck FE plus	10W-40	Europe
Ravensberger Lube oil refinery	Ravenol Performance Truck	10W-40	Germany
Salzbergen	Wintershall TFG	10W-40	Europe varies
Texaco	Ursa Super TDX	10W-40	Europe
	Ursa Premium FE	5W-30	Europe
TOTAL	TOTAL RUBIA TIR 8600	10W-40	worldwide
	EXPERTY	10W-40	worldwide

T 4-1-3 Release list for DEUTZ lube oil quality class DQC III - 05

DEUTZ lube oil quality level DQC IV-05			
Manufacturer	**Lube oil type**	**SAE class**	**Availability**
FUCHS EUROPE	Fuchs Titan Cargo SL	5W-30	worldwide
SHELL International	Shell Rimula Ultra Shell Rimula Ultra	5W-30 10W-40	Europe, code country-specific, varies Europe, code country-specific, varies

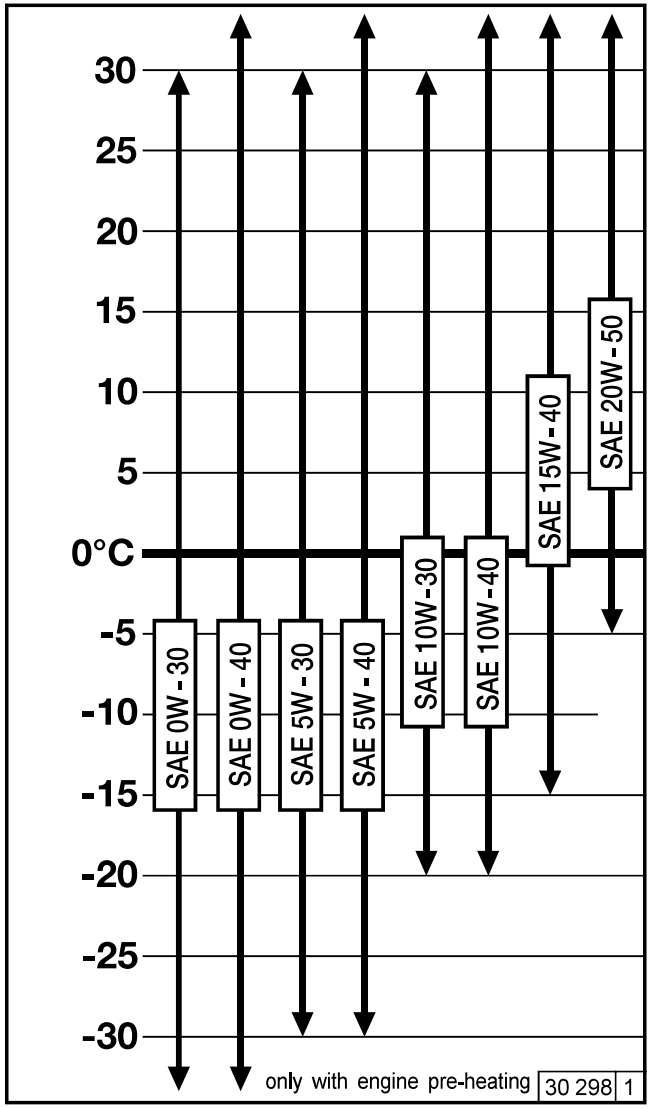
T 4-1-4 Release list for DEUTZ lube oil quality class DQC IV - 05

4

4.1.2 Quality

The ambient temperature at the installation site or area of application of the engine is decisive for the choice of the right viscosity class. Too high a viscosity can lead to starting difficulties, too low a viscosity can endanger the lubrication effect and cause high lube oil consumption. At ambient temperatures below 40°C the lube oil must be pre-heated (e.g. by storing the vehicle or machine in a shed). The viscosity is classified according to SAE. Multipurpose oils should be used basically. Single purpose oils can also be used in closed, heated rooms at temperatures >5 °C. The specified lube oil qualities must also be single purpose oils of course.

Depending on the ambient temperature we recommend the following common viscosity classes:



4.2.1 Quality

The following fuel specifications are permitted:

- **Diesel fuels according to DIN EN 590**
- **US diesel fuel according to ASTM D 975 Grade-No 1-D and 2-D**
- **Japanese diesel fuel JIS K 2204 Grade 1 Fuel and Grade 2 Fuel with lubricating properties according to diesel fuel EN 590 (HFFR max. 460 micrometer according to EN ISO 12156)**

Use commercially available diesel fuels with a sulfur content below 0.5%. If the sulfur content is higher, the lube oil change intervals must be reduced (see 6.1.1).

If other fuels are used which do not meet the requirements of this instruction manual, the warranty will be voided.

The certification measurements to satisfy the legal emission limits are performed with the test fuels defined by law. These correspond to the diesel fuels according to EN 590 and ASTM D 975 described in this operating manual. No emission values are guaranteed with the other fuels described in this instruction manual.

4.2.2 Winter fuel

For the engines TCD 2012/2013 2V and TCD 2012/2013 4V which are operated with fuel according to ASTM D 975 1-D/ 2-D, adding paraffin is not permissible.

At low ambient temperatures paraffin discharges can lead to blockages in the fuel system and cause operating faults. Use winter fuel at outside temperatures below 0 °C (to -20 °C) (generally offered by petrol stations in good time before the cold season begins).

- Paraffin should be added at temperatures below -20 °C. The mixing ratios required are as per the diagram on the right.
- Special diesel fuels can be used for arctic climates to -44 °C.

If it is necessary to use summer diesel fuel under 0 °C, paraffin can also be added up to 30 % as per the diagram on the right.

Generally, sufficient resistance to cold can also be achieved by adding a flow ameliorant. For questions regarding this please contact your **DEUTZ partner.**

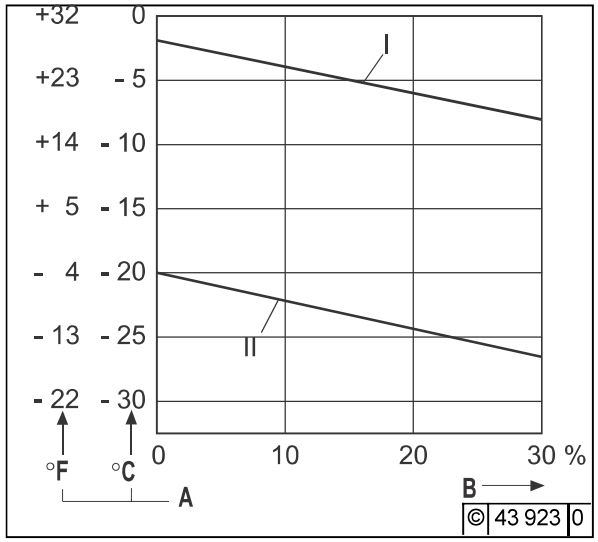


	Diagram key:
I	Summer diesel fuel
II	Winter diesel fuel
A	Outside temperature
B	Paraffin mixing proportion

Only carry out mixing in the tank! First pour in the necessary amount of paraffin, then the diesel fuel. Addition of normal and super petrol is not permitted.

4

4.3.1 General

In liquid-cooled engines, the coolant must be conditioned and monitored otherwise the engine may incur damage due to:

- corrosion,
- cavitation,
- freezing.

The correct water quality is important for conditioning the coolant. Basically, clear, clean water within the following analysis values must be used:

Analysis values	min.	max.
ph value at 20 °C	6.5	8.5
Chloride ion content[mg/dm3]	-	100
Sulfate ion content[mg/dm3]	-	100
Total hardness *1 [°dGH]	3	12

*1 carbonate hardness proportion of total hardness min 3 dGH.

Water quality data are obtainable from the local waterworks.

A test case can be requested from DEUTZ Service (order no. 1213 0382) for checking your water quality.

The water must be treated if it deviates from the analysis values.

- pH value too low:

  Addition of diluted caustic soda or caustic potash solution. Small sample mixtures are advisable.

- Total hardness too high:

  Mix with softened water *2

- Total hardness or carbon hardness too low:

  Mix with harder water *3

- Chloride and / or sulfate too high:

  Mix with softened water *2

*2 Softened water is a distilled water, pH neutral condensate or water treated with ion exchangers.

*3 Harder water is available in most cases in the form of drinking water (city water).

4.3.2 Coolant preparation

The coolant for liquid-cooled DEUTZ compact engines is conditioned by mixing an antifreeze with ethylene-glycol-based corrosion protection inhibitors into the water.

The best results are achieved with DEUTZ cooling system preservatives:

Container	Order no.
5 liter container	0101 1490
20 liter container	0101 6416
210 liter container	1221 1500

This cooling system is free from nitrite, amine, phosphate and adapted to the materials in our engines. Order from your DEUTZ Service

f the DEUTZ cooling system preservative is not available, a coolant according to T 4-1-5 can be used.
Coolants of product group A or B respectively can be mixed.
Coolants of product group A may not be mixed with coolants of product group B.

The cooling system must be monitored regularly, see 5.1. This includes checking the concentration of the cooling system preservative, as well as inspecting the coolant level.
The inspection of the concentration of cooling system preservative can be carried out with standard testing devices (e.g. refractometer).

Cooling system preservative percentage	Water percentage	Cold protection up to
min. 35 %	65%	-22 °C
40 %	60%	-28 °C
max. 45 %	55%	-35 °C

At temperatures below -35°C, please consult your responsible DEUTZ Service.

It is possible to use other cooling system preservatives (e.g. chemical corrosion preservatives) in exceptional cases. Consult DEUTZ Service.

The mixing of nitrite based cooling system preservatives with amine-based agents forms nitrosamines which are hazardous to the health!

Cooling system preservatives must be disposed of in an environmentally friendly manner.

check= ● set=❍ clean=▲ renew= ■

⇓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines

⇓ every 10 oh or daily

in operating hours (oh)							every year(s)			
E10	E20	E30	E40	E45	E50	E60	E70			Activity	Section
		500	1,000	1,500	3,000	6,000	12,000	1	2		
●	●									Lube oil level, if necessary re-fill	6.1.2
		■								Lube oil (oil change intervals depending on engine application and oil quality), see TR 0199-99-3002	6.1.1/ 6.1.2
		■								Oil filter cartridge	6.1.3
			■[1)]							Fuel filter cartridge	6.2.1
						■				Electronic injector check via EMR3	#
●			■[1)]							Fuel filter insert[1)] (fuel pre-filter)	4.2
●		●							■	Coolant (additive concentration)	4.3.1/2/3
●	●	●								Coolant level	–
●	●		■							Intake air filter (if available, maintenance as per maintenance display)	6.4.3 /6.4.4
●			●					▲		Charge air cooler (drain lube oil/condensation)	
			●							Check function of heating plug / heating flange	
			●							Battery and cable connections	6.7.1
●			●							Engine monitoring, warning system [2)]	3.3 #
				❍						Valve clearance / contol piston clearance (exhaust gas return)	6.6.1
●		●			■				■	V-belt (re-tighten if necessary)	6.5.1
●			●		●	■				V-rib belt/tension pulley (renew when wear limit reached)	6.5.1
			●		■					Crankcase pressure bleed valve	#
●	●									Engine tightness (visual inspection for leaks)	–
●			●							Engine mounting (renew in case of damage)	9.2
●			●							Fastenings, hose connections / clamps	–
							■			General overhaul	#, 5.1.1

Industrial engines

The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer.

Maintenance only to be carried out by authorised service personnel

[1)] The maintenance interval must be halved for contaminated fuel or poor quality fuel.

[2)] If the warning system (light/siren) is activated, the fuel pre-filter must be emptied immediately.

check= ● set= ❍ clean= ▲ renew= ■								
max. permissible job times **in operating hours (oh) every**								
⇓ check 2x daily before or during the 1st trial run, during the running-in phase or when commissioning new and overhauled engines								
	⇓ every 10 oh or daily							
		in operating hours (oh)			every year(s)			
E10		E30	E40	E70			**Activity**	**Section**
		500	5,000	12,000	1	2		
●		■					Lube oil (oil change intervals depending on engine application and oil quality), see TR 0199-99-3002	6.1.1/ 6.1.2
			■				Injector	#
		●	▲				Charge air cooler (drain lube oil/condensation)	#
		●	▲				Charge air cooler inlet surface (clean if necessary)	#
						■	Crankcase bleeding valve	#
			■				Exhaust turbocharger compressor outlet	-

Enhancements or modifications

for engines with EPA acceptance

The engine maintenance times given are maximum permissible job times. Depending on the usage circumstances, shorter maintenance times may be necessary. Observe the instruction manual of the equipment manufacturer.

 # Maintenance only to be carried out by authorised service personnel

5.1.1 Standard maintenance schedule

Intervals at/ after	Deutz maintenance and service schedules	Activity	Execution by:
50 oh	E 10	after commissioning and E 50-E 70	authorised specialists
10 oh or daily	E 20	daily inspection round	the user / authorised specialists
500 oh	E 30	inspection	authorised specialists
1000 oh	E 40	intermediate overhaul	authorised specialists
1500 oh	E 45	extended intermediate overhaul	authorised specialists
3 000 oh	E 50	partial overhaul	authorised specialists
5 000 oh (EPA)	E 60	extended partial overhaul	authorised specialists
6 000 oh	E 60	extended partial overhaul	authorised specialists
12 000 oh *)	E 70	general overhaul	authorised specialists

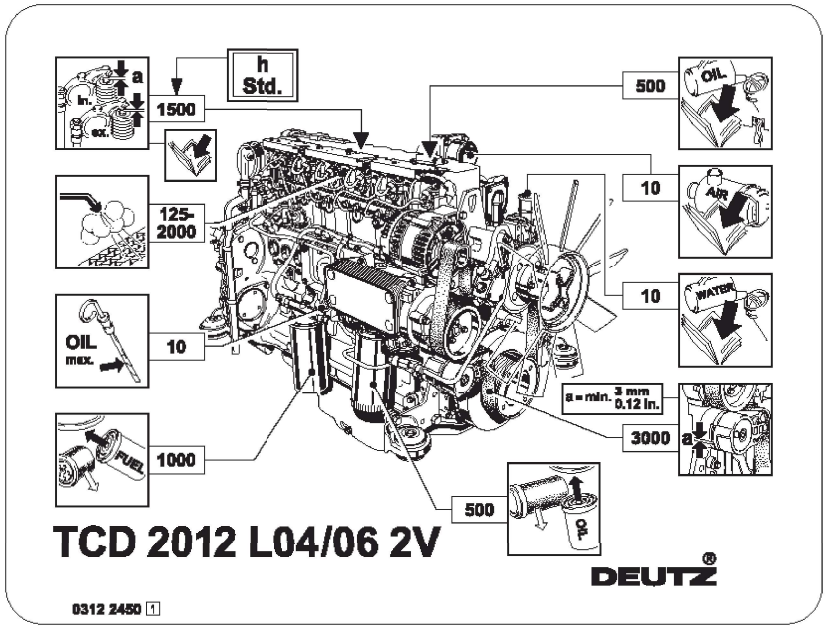
***) approximate value, depends on the type of engine application and/or regular engine maintenance. Please contact your responsible DEUTZ Service partner.**

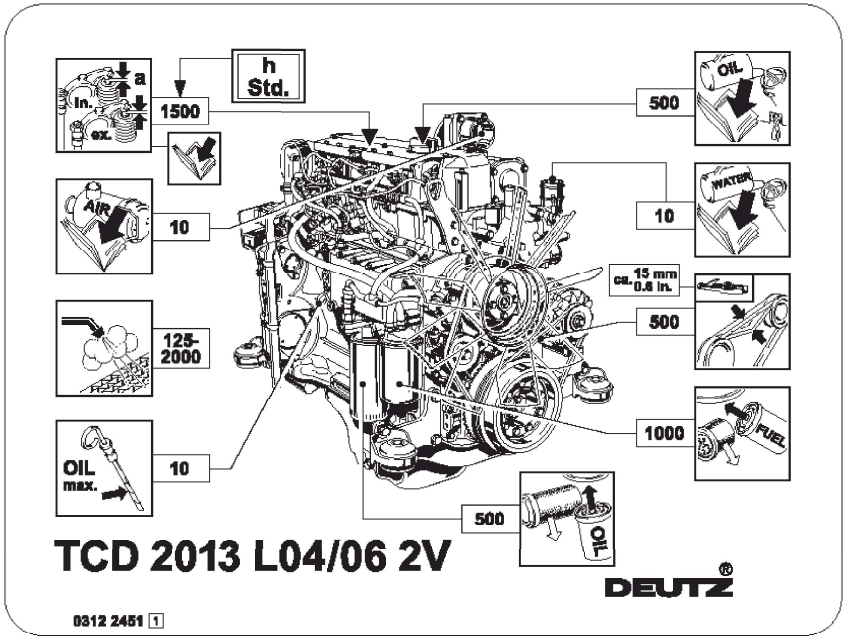
The maintenance diagram shown on this page is supplied with every engine in self-adhesive form. It should be stuck onto a well visible location on the engine or equipment.

Check that this is the case!

If not, request a replacement from your engine or equipment supplier!

The maintenance schedule is decisive for standard maintenance, see 5.1.





All maintenance work should only be carried out when the engine is not running.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
50-150*			-		
125			250		
375			500		
625			750		
875			1000		
1125			1250		
1375			1500		
1625			1750		
1875			2000		
2115			2250		
2375			2500		
			2750		

* after commissioning new and overhauled engines
The maintenance work carried out methodically can be recorded in the table and confirmed.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
2875			3000		
3125			3250		
3375			3500		
3625			3750		
3875			4000		
4125			4250		
4375			4500		
4625			4750		
4875			5000		
5125			5250		
5375			5500		
5625			5750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
5875			6000		
6125			6250		
6375			6500		
6625			6750		
6875			7000		
7125			7250		
7375			7500		
7625			7750		
7825			8000		
8125			8250		
8375			8500		
8625			8750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

Op. hrs.	Date	Signature / stamp	Op. hrs.	Date	Signature / stamp
8875			9000		
9125			9250		
9375			9500		
9625			9750		
9875			10000		
10125			10250		
10375			10500		
10625			10750		
10875			11000		
11125			11250		
11375			11500		
11625			11750		

The maintenance work carried out methodically can be recorded in the table and confirmed.

6

6.1.1 Oil change intervals

- The oil change times depend on the engine application and the quality of the lube oil.
- If the oil change times are not reached within a year, the oil change should be carried out at least **1x yearly.**
- The following conditions apply for the table
  – Sulphur content max. 0.5 % of weight for diesel fuel.
  – Constant ambient temperature -10 °C (+14 °F)
- For fuels
  – with sulphur content > 0.5 to 1%

or

  – Constant ambient temperatures **<** -10 °C (+14 °F)

- For fuels with a sulphur content higher than 1% ask your responsible **service representative**.
- If the lube oil change intervals are planned in terms of operating hours, the lube oil change intervals for installed engines 6.1.1.1 apply.

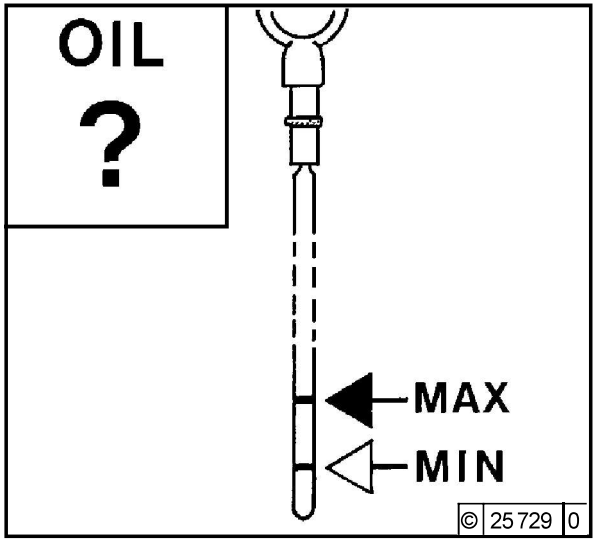
Carry out oil changes on warm engine when the engine is not running (lube oil temperature < 80 °C).

6.1.1.1 Lube oil change intervals for installed engines

		Lube oil quality			
Deutz lube oil quality class		**DQC I-02**	**DQC II-05**	**DQC III-05**	**DQC iV-05**
ACEA specification		E2-96	E3-96/E5-02/E07-04	E4-99/E6-04 see chap 6.1.1.3	E4-99/E6-04 only fully synthetic
API specification		CF/CF-4	CG-4/CH-4/ CI-4	-	-
worldwide specification		-	DHD-1	-	-
special DEUTZ release list		-	-	see chap 4.1.2.1	-
Standard lubricant code designation for building machines and building vehicles		EO... EO...A, EO...B	EO...C	-	-
Engine series	**Engine version**		**Lube oil change intervals in oh**		
TCD 2012 L04/06 2V	**Crankcase ventilation:** open	-	500	500	500
TCD 2013 L04/06 2V	**Crankcase ventilation**: open	-	500	500	500

6.1.2 Checking oil level, changing engine oil

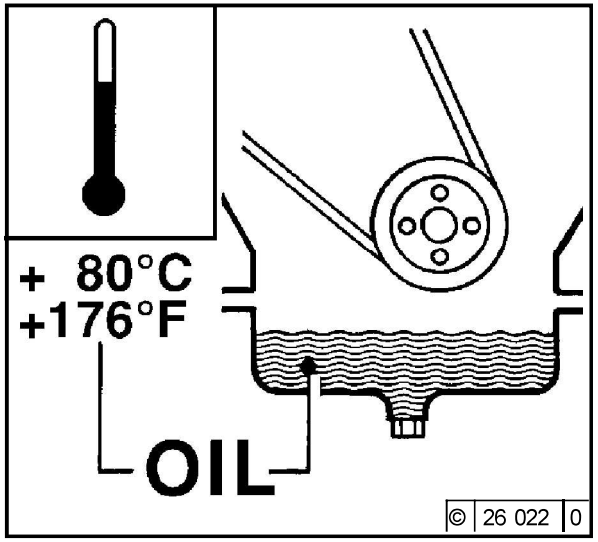
6.1.2.1 Checking oil level



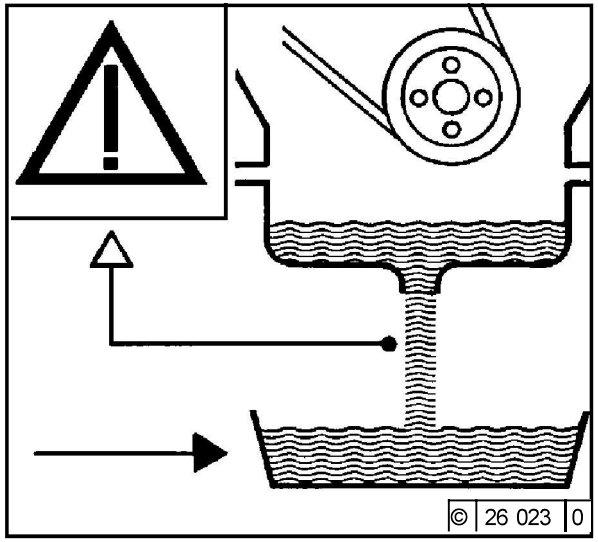
- Position the engine or vehicle so as to be level.
  - **Engine warm:**
    Switch off the engine, wait for 5 minutes and check the oil level.
  - **Engine cold:**
    Check oil level.
- Extract oil dipstick.
- Wipe with a fibre-free, clean cloth.
- Insert until it stops and extract again.
- Check oil level and re-fill to "MAX" if necessary.
  - If the oil level lies just above the "MIN" line marking, re-filling is necessary.

The oil level may not fall short of the "MIN" line marking.

6.1.2.2 Changing engine oil



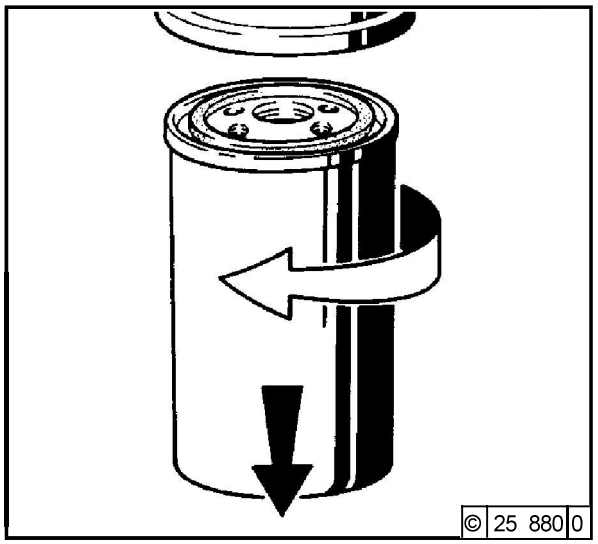
- Warm up the engine.
- Position the engine or vehicle so as to be level.
  - Lube oil temperature approx. 80 °C.
- Switch off engine.
- Position oil drip cup under the engine.
- Unscrew oil drain screw.



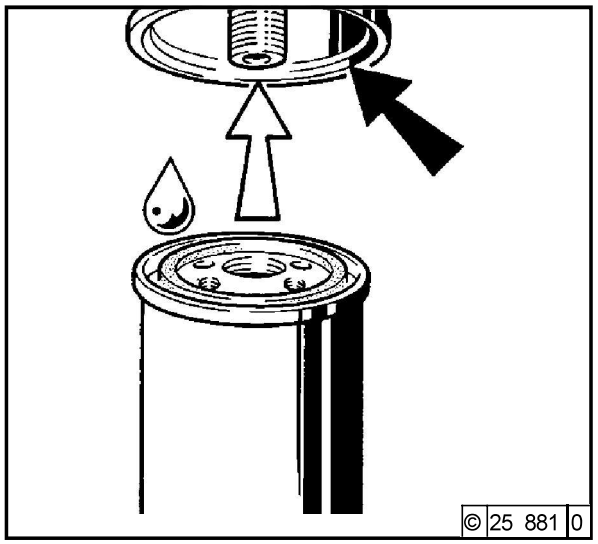
- Drain off oil.
- Screw in oil drain screw with new sealing ring and tighten. (For tightening torque see 9.2).
- Fill lube oil
  - For quality / viscosity data see 4.1.
  - For filling quantities, see 9.1
- Check oil level, see 6.1.2.1

Caution when draining hot oil: danger of scalding!
Collect the used oil, do not allow to seep into floor! Dispose of according to instructions!

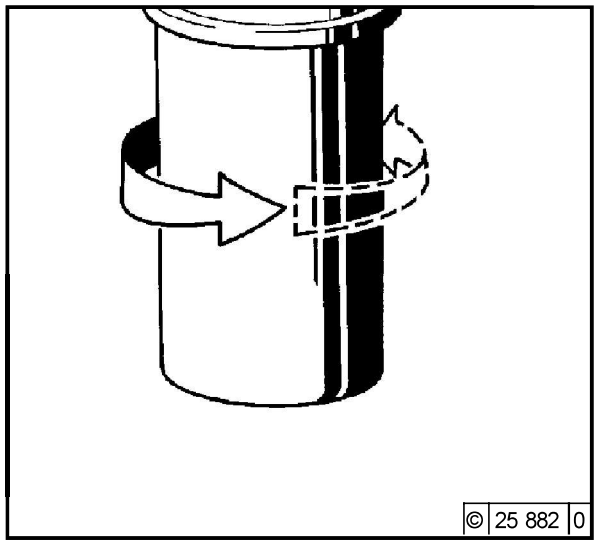
6.1.3 Changing oil filter



- When anti-rotation lock is installed:
  Loosen clamping screws and remove tightening clamps from below.
- Loosen lube oil filter cartridge with standard tool and unscrew.
- Collect any oil which may run out.



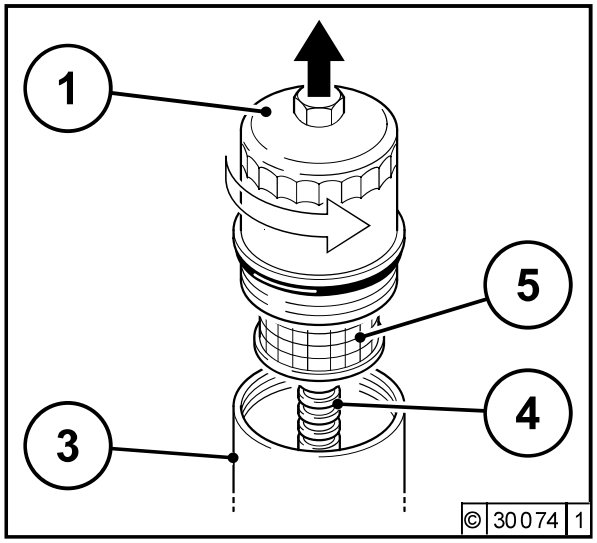
- Clean the sealing surface of the filter support for any dirt there may be.
- Lightly oil the rubber seal of the new lube oil cartridge.
- Screw on the cartridge by hand until the seal makes contact.



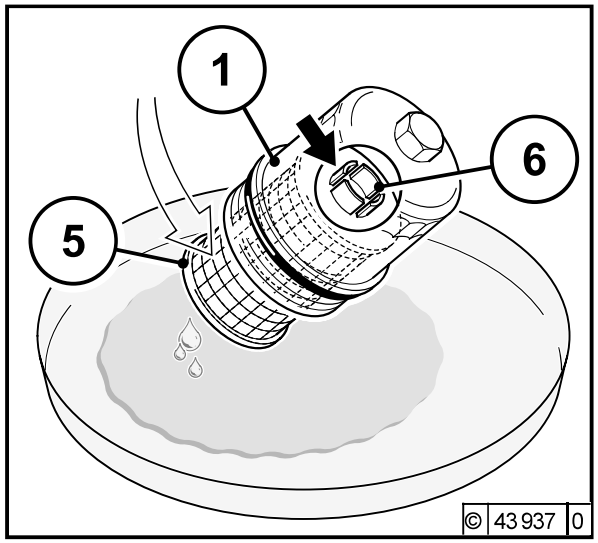
- Tighten the lube oil filter cartridge with a three-quarter turn (about 10 Nm).
- Check the seal of the lube oil cartridge for tightness.
- Check oil level, see 6.1.2.

Careful with hot oil:
danger of scalding!

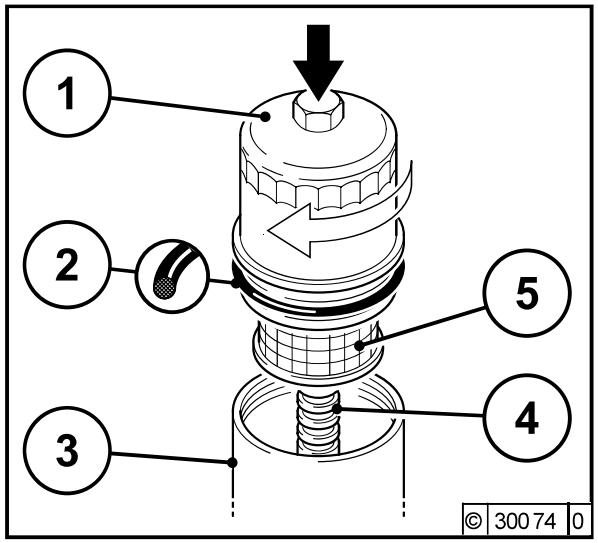
6.1.4 Cleaning / changing oil filter (cup)



- Switch off engine.
- Loosen lube oil filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew lube oil filter cover 1 with paper filter cartridge 5 in anti-clockwise direction.
- Carefully loosen paper filter cartridge 5 from the guide 4, which is inserted in the housing 3, from above.



- Collect any lube oil which may run out.
- Crease the paper filter cartridge 5 in the collection vessel slightly at the side until the cartridge is released from the clip 6.
- Clean the sealing surface of the filter support and the lube oil filter cover 1 as well as the guide 4 of any dirt there may be



- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Screw the lube oil filter cover 1 tight in clockwise direction (25 Nm).
- Start the engine.
- Check lube oil filter assembly for leaks.
- Check engine oil level and top up if necessary.

Careful with hot oil:
Danger of scalding
Dispose of used oil in an environmentally friendly way.

Regulations for working on the fuel system

Engine must be switched off! Smoking and naked lights prohibited!
No injection/high pressure pipes may ever be disconnected when the engine is running.
Caution when handling hot fuel!

Pay attention to absolute cleanliness when refueling and working on the fuel system!
Clean the vicinity of the components concerned carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national regulations for handling fuels.
Dispose of leaked fuel and filter elements according to regulations. Do not allow fuel to seep into the ground.
After working on the fuel system, bleed it, conduct a test run and check for leaks.
Additional venting of the fuel system by a 5 minute trial run in idle or low load is absolutely essential.

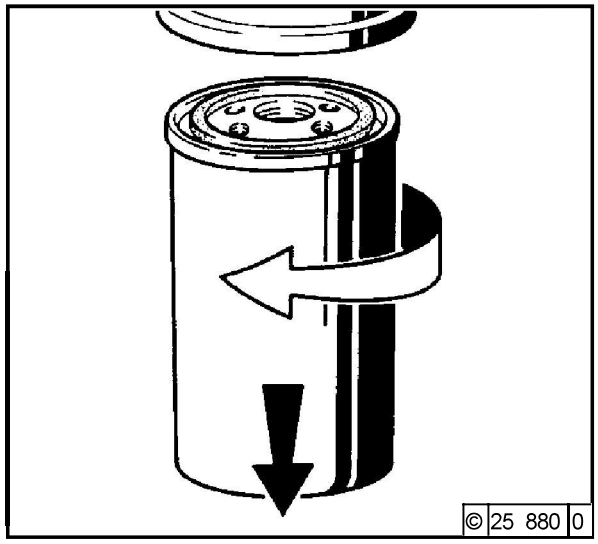
Additional regulations for DEUTZ Common Rail Systems

Danger to life! Never work on the fuel system with the engine running. The system is under high pressure!
Do not stand near to a leak in the high pressure system because fuel jet can cause severe injury! After switching off the engine, wait 30 seconds before working on the fuel system. In the event of leaks in the fuel system contact your DEUTZ Service immediately!

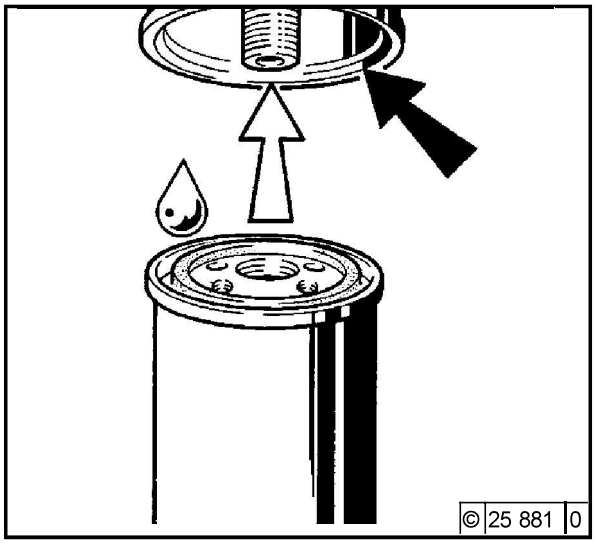
Cleanliness hints and measures for handling DEUTZ Common Rail Systems

Pay attention to extreme cleanliness due to the high-precision technology!
The fuel system must be tight and closed. Inspect visually for leaks/damage in the system.
Clean the engine and engine compartment thoroughly and dry before starting work. Cover engine compartment areas from which dirt could be loosened with fresh, clean foil.
Work on the fuel system may only be carried out in an absolutely clean environment. Air contamination such as dirt, dust, moisture etc. must be avoided.

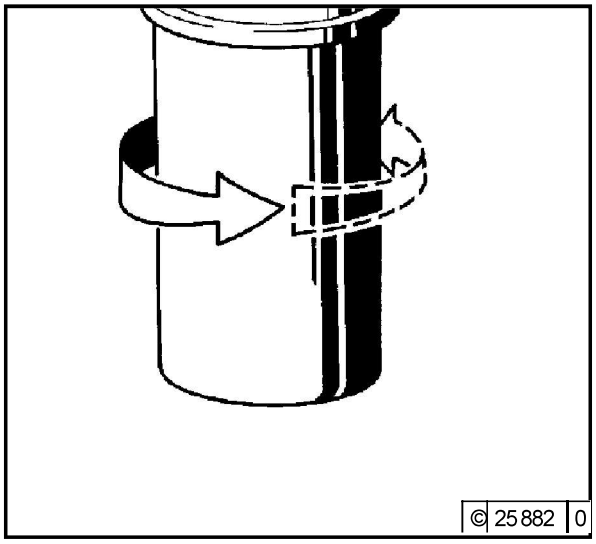
6.2.1 Changing fuel filter



- Close fuel stopcock.
- Loosen fuel filter cartridge with standard tool and unscrew.
- Collect any fuel which may run out.
- Clean the sealing surface of the filter support for any dirt there may be.
- Lightly oil the rubber seal of the filter support.



- Lightly oil the fuel filter cartridge or wet with diesel fuel.
- Screw on the cartridge by hand until the seal makes contact.



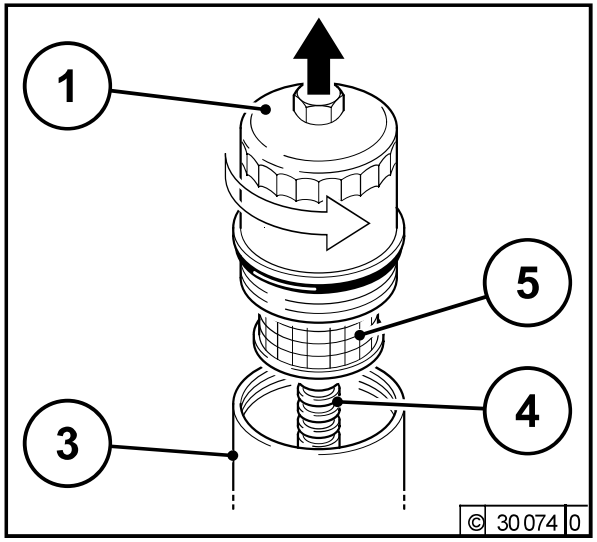
- Tighten the fuel filter cartridge with a three-quarter turn (10 Nm).
- Open fuel stopcock.
- Check for tightness.

No open fire when working on the fuel system! Do not smoke! Pay attention to cleanliness as the fuel system (rail) is very sensitive!!!

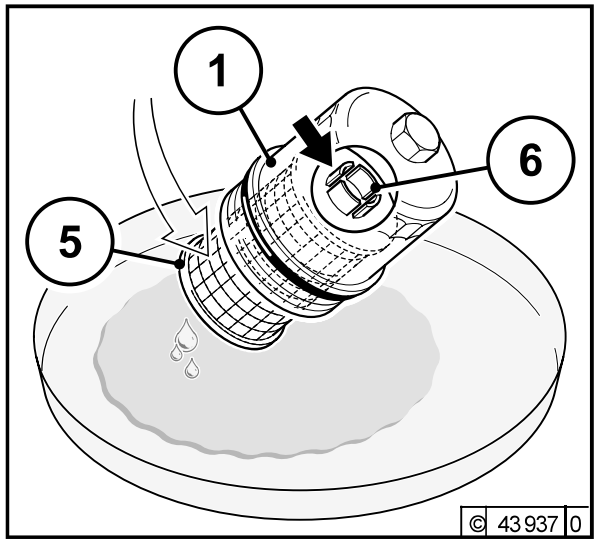
Venting of the fuel system is necessary, see chapter 6.2.3.

6

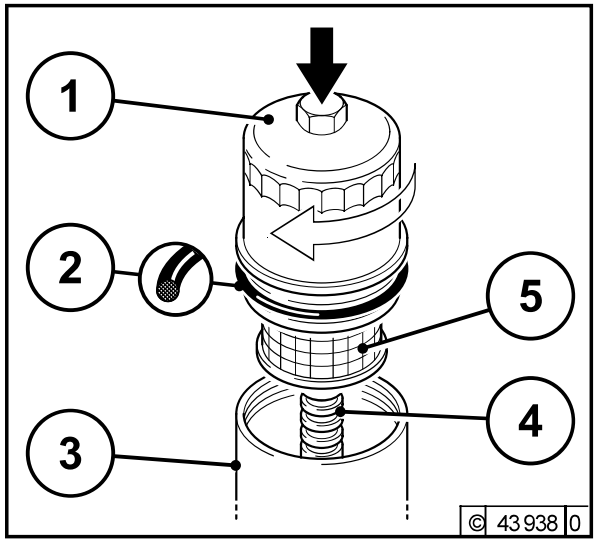
6.2.2 Cleaning / changing fuel filter (cup)



- Switch off engine.
- Loosen fuel filter cover 1 with two or three turns and wait for 30 seconds.
- Unscrew fuel filter cover 1 with paper filter cartridge 5 in anti-clockwise direction.
- Carefully loosen paper filter cartridge 5 from the guide 4, which is inserted in the housing 3, from above.



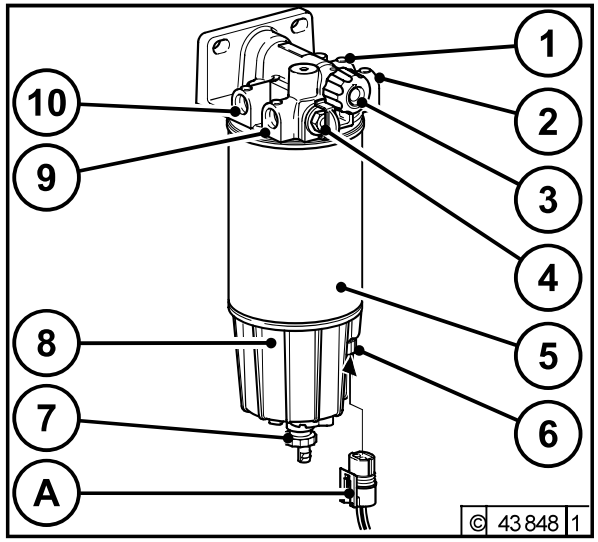
- Collect any fuel which may run out.
- Slightly bend paper filter cartridge 5 sideways in the collecting vessel until the cartridge is loosened from clamp 6.
- Clean the sealing surface of the filter support and the fuel filter cover 1 as well as the guide 4 of any dirt there may be.



- Change the round sealing ring 2 and lightly oil.
- Press new paper filter cartridge 5 into the clip 6 and insert carefully in the guide 4 together.
- Tighten the fuel filter cover 1 in clockwise direction (25 Nm).
- Start the engine.
- Check fuel filter attachment for tightness.

Only work on the fuel system when the engine is switched off.
Wait at least 30 seconds.
No open fire! Do not smoke!
Dispose of used fuel in an environmentally friendly manner.
Venting of the fuel system is necessary, see chapter 6.2.3.

6.2.3 Fuel pre-filter, changing / bleeding filter insert



Filter change:

- Close fuel stopcock (for high tanks).
- Position fuel collecting vessel beneath fuel pre-filter.
- Loosen drain cock (7) and drain water + fuel completely.
- Unscrew filter cartridge (5) together with water collecting vessel (8) in anti-clockwise direction and remove.
- Loosen water collecting vessel (8) from old filter cartridge (5) in anti-clockwise direction and remove.
- Empty remaining fuel into the fuel collecting vessel and clean water collecting vessel (8).
- Screw water collecting vessel (8) onto the new filter cartridge (5) in clockwise direction.
- Clean any dirt from the sealing surface of the new filter cartridge (5) and the reverse side of the filter head
- Wet the sealing surfaces of the filter cartridge (5) slightly with fuel and screw back onto the filter head in clockwise direction (17-18 Nm).
- Open the fuel stopcock and bleed the system (see "Bleeding fuel system").
- Dispose of collected fuel and old filter cartridge (5) properly.

Bleeding fuel system:

- Unlock the bayonet plug of the fuel hand pump (3) by pressing and turning anti-clockwise at the same time. The pump plunger is now pushed out through the spring.

☞ **Turn the shutdown lever of the thermostat valve (4) by approx. 45° in clockwise direction until it is felt to engage**.

- Pump until a very strong resistance is felt and pumping becomes very slow.
- Now carry on pumping a few more times (the return pipe must be filled).
- Start the engine and run for about 5 minutes in idle or low load. Check the pre-filter for leaks.
- Perform some more pumping movements. (The return line must be filled).
- Turn the shutdown lever of the thermostat valve (4) by approx. 45° in anti-clockwise direction until it is felt to engage.
- Lock the bayonet plug of the fuel hand pump (3) by pressing and turning clockwise at the same time.

1 Fuel supply to pump
2 Fuel return from control block FCU (Fuel Control Unit)
3 Fuel hand pump with bayonet plug for locking and unlocking
4 Thermostat valve with shutdown lever
5 Filter cartridge
6 Connection facility for electrical water level sensor
7 Drain cock
8 Water collecting vessel (bowl)
9 Fuel inlet from fuel tank
10 Fuel return to fuel tank

A Connection for electr. warning lamp / siren

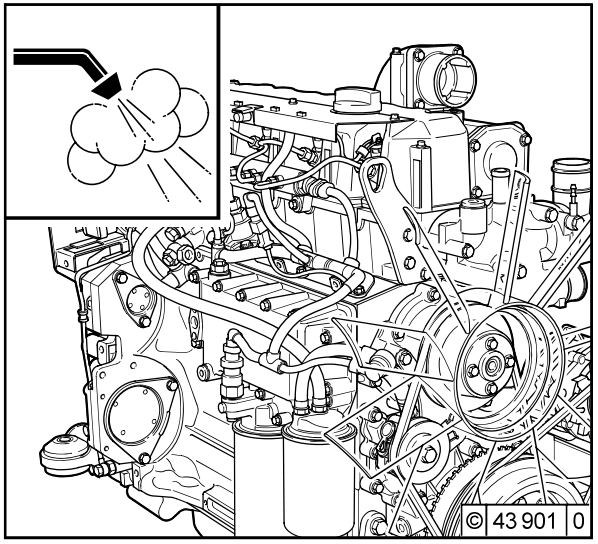
Only work on the fuel system when the engine is switched off. No open fire! Do not smoke! Dispose of used fuel in an environmentally friendly manner.

6.3.1 Cleaning intervals

- The cooling system soiling depends on the type of engine application.
- The risk of soiling is increased by oil and fuel residues on the engine. Therefore pay particular attention to tightness when operating under high dust exposure.
- Increased soiling occurs, for example, during:
  - Building site application from high dust content of air.
  - Harvesting application from high proportion of chaff and chopped straw, for example, in the area of the work machine.
- Due to the various application conditions, the cleaning intervals must be defined according to each case. Therefore, the cleaning intervals given in the table below can be used as guidelines.

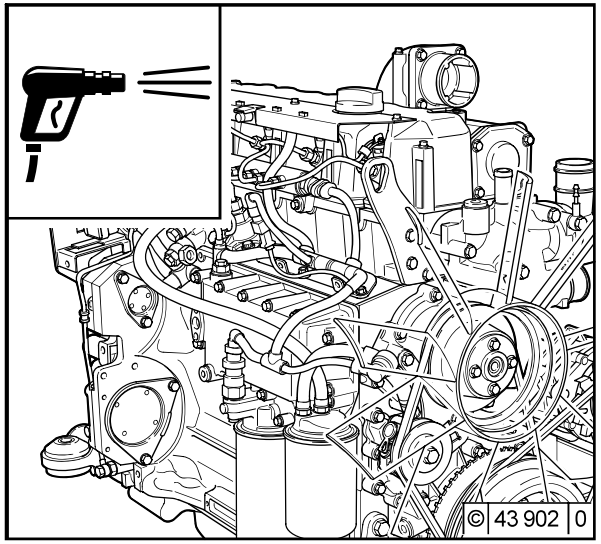
Checking or cleaning intervals Guideline oh	Engine application
2000	Ships, electronic units in enclosed spaces, pumps
1000	Vehicles on paved roads
500	Tractors, fork lift trucks, drivable electronic units
250	Vehicles on building sites and unpaved roads, building machines, compressors, mining equipment.
125	Agricultural machinery, tractors with harvesting application.

6.3.2 Cleaning cooling system



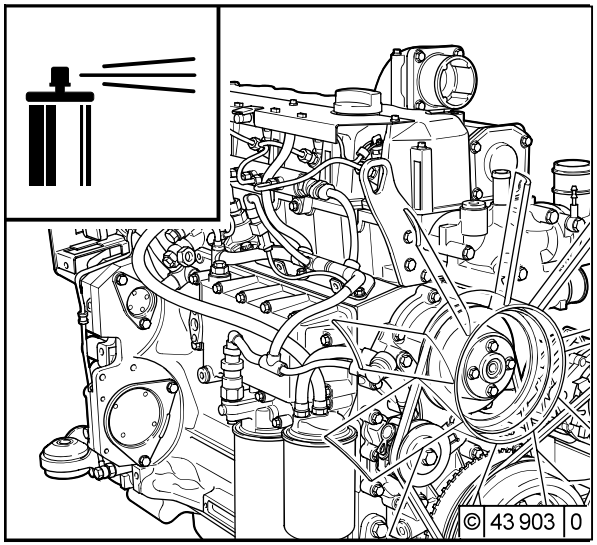
Cleaning with compressed air

- Blast out the engine with compressed air. Do not damage any components.
- Rinse out the loosened dirt with a water jet.



Cleaning with cold cleaner

- Spray the engine with standard cold cleaner and leave to work for approx. 10 minutes.
- Spray the engine clean with an acute water jet (do not spray the water jet directly at sensitive engine parts, e.g. generator, cabling, electronic components, fan drive).



Cleaning with steam or hot water

- Remove oil and greasy residues with a gentle jet setting (do not spray directly on sensitive engine parts, e.g. generator, wiring, electrical-components, fan drive).

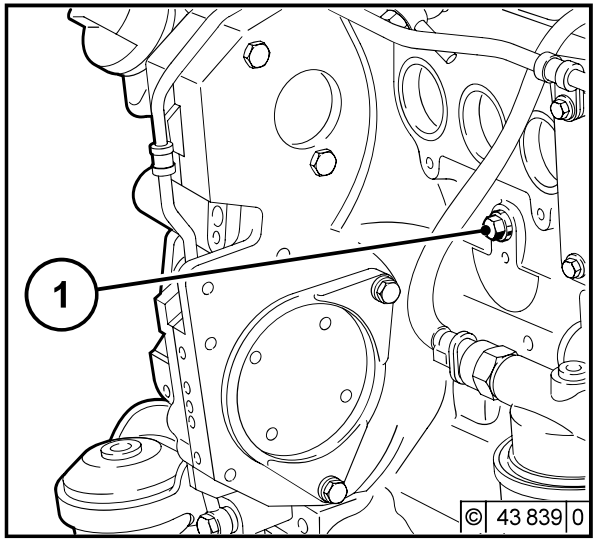
- Warm up the engine so that the water residues evaporate.

External cooling

- For external coolers: Cleaning as per specifications of the cooling system manufacturer.

Injection pressure: maximum 100 bar and at a distance of 1 meter!

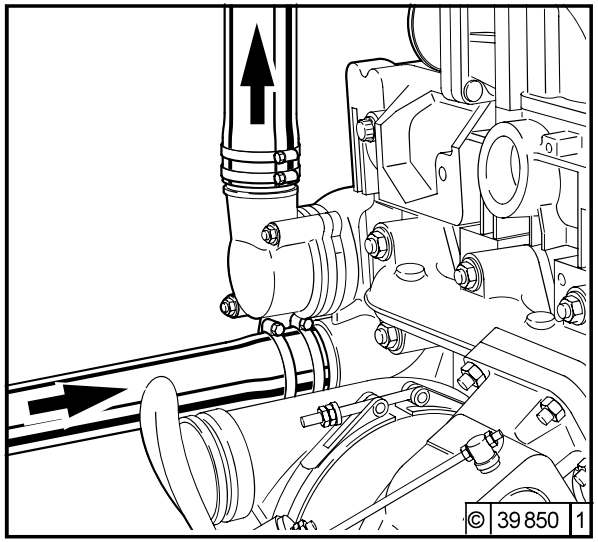
6.3.3 Emptying cooling system



- Open cooler cover.
- Position collecting dish underneath locking screw 1.
- Remove locking screw 1 on the crankcase.
- Drain off coolant.
- Re-tighten locking screw 1.
- If locking screw 1 is not accessible, the cooling system can be emptied on the engine oil cooler (coolant channel).

Caution when draining hot coolant: danger of scalding! Collect coolant when draining off. Dispose of according to instructions!

6.3.4 Filling / bleeding cooling system



- Open cooler cover.
- Loosen locking screw item 1 (chap.6.3.3).
- Pour in coolant until the maximum mark or the filling limit (system heating valve must be open, if present).
- Tighten locking screw item 1(chap.6.3.3).
- Close cooler cover.
- Start engine and warm up until the thermostat opens.
- Switch off engine.
- Check the coolant level with the engine cold and re-fill if necessary.
- Close cooler cover.

- The cooling system (if constructed under consideration of our installation guidelines) is bled automatically after filling.

Never operate the engine without coolant (not even briefly).

6.4.1 Cleaning intervals

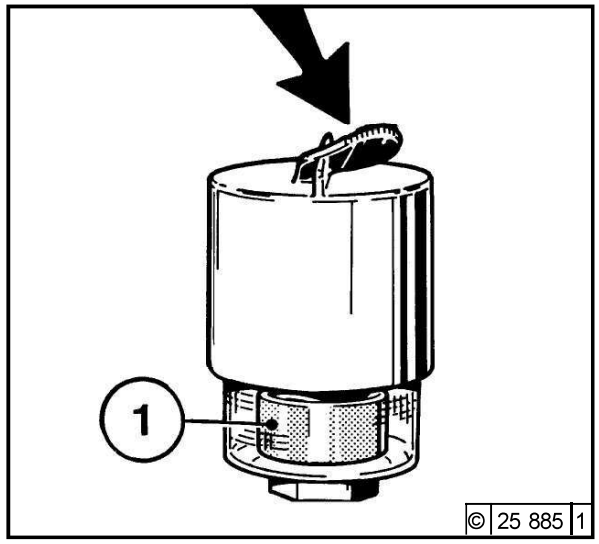
- The soiling of the combustion air filter depends on the dust content of the air and the selected filter size. If a high dust exposure is to be expected, a cyclone separator can be connected to the combustion air filter.

- The cleaning intervals cannot be generally defined. They must be defined depending on each case.

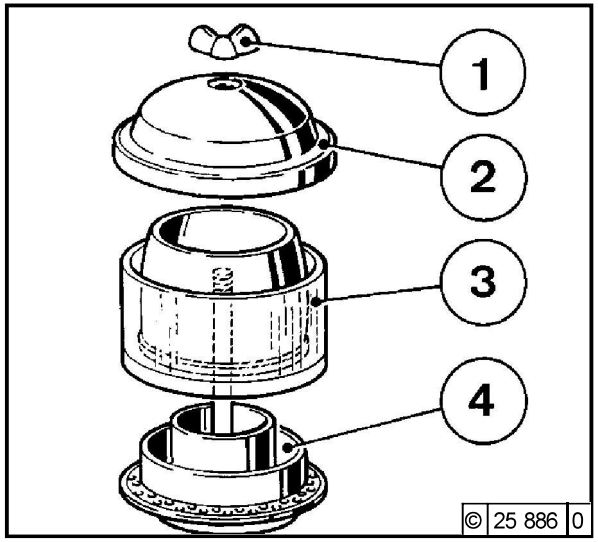
- If dry air filters are used, cleaning should only be carried out according to the maintenance display or maintenance switch.

- Filter maintenance is required when on the:
  - **Maintenance display**
    the red service field 1 is fully visible when the engine is not running.
  - **Maintenance switch**
    the yellow warning light lights up when the engine is running.

- After completion of the maintenance work push the reset button on the maintenance display. The maintenance display is ready for operation again.



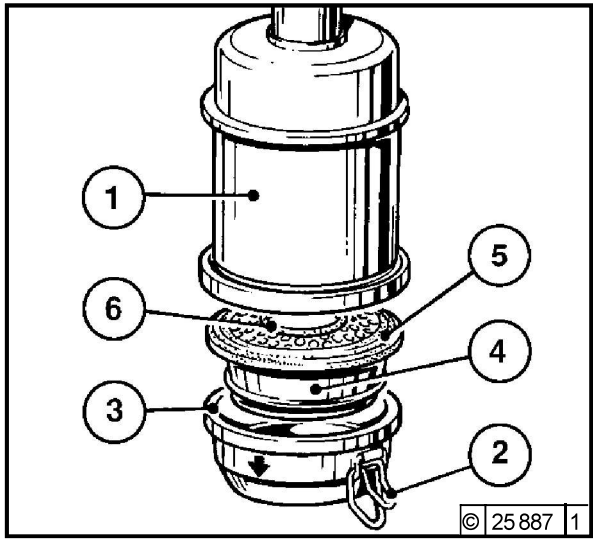
6.4.2 Emptying cyclone pre-separator



- Loosen wing nut 1 and lift housing cover 2.
- Remove the dust container 3 from the base of the cyclone 4 and empty. Clean foliage, straw and the like from the cylone base.
- Place the dust container 3 on the base 4 and tighten the housing cover 2 with wing nut 1.

Never fill the dust container with oil, replace damaged containers!

6.4.3 Cleaning oil bath air filter

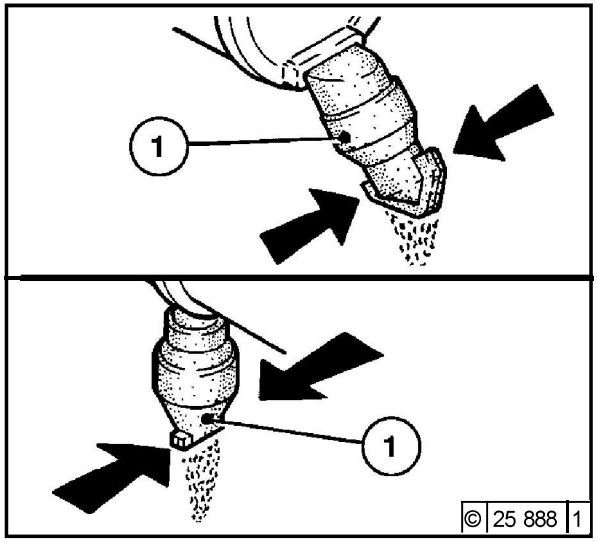


- Turn off the engine and wait approx. 10 min until the oil has run out of the filter housing 1.
- Loosen quick fasteners 2 and remove oil pan 3 with filter insert 4, if possible loosen filter insert on the dividing point with the aid of a screwdriver. Do not damage rubber seal 5!
- Remove soiled oil and sludge, clean oil pan.
- Clean filter insert 4 in diesel fuel and allow to drip dry thoroughly.
- In the event of heavy soiling, clean filter housing 1.
- Visually inspect rubber seals 5 and 6 and renew if necessary.
- Fill up the oil pan with engine oil up to the oil level mark (arrow) (for viscosity see 4.1.2).
- Place the oil pan with the filter insert on the filter housing and close the plugs.

Never clean the filter in petrol!
Dispose of used oil according to instructions!

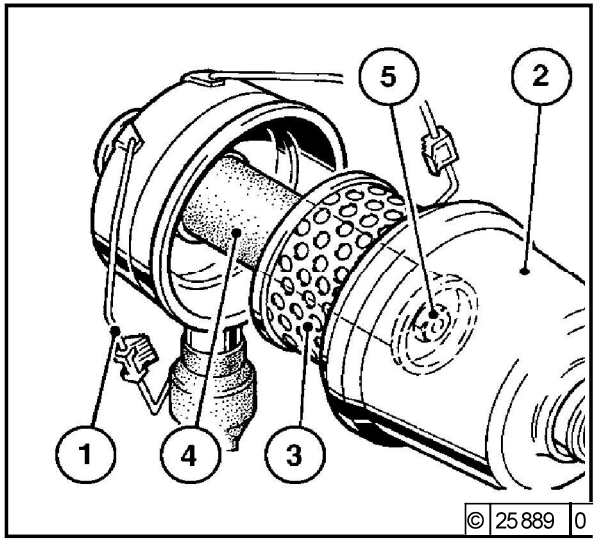
6.4.4 Dry air filter

Dust discharge valve



- Empty the dust discharge valve 1 by squeezing the discharge slot in the direction of the arrow.
- Clean the discharge slot occasionally.
- Remove any stuck on dust residues by squeezing the upper area of the valve.

Filter cartridge

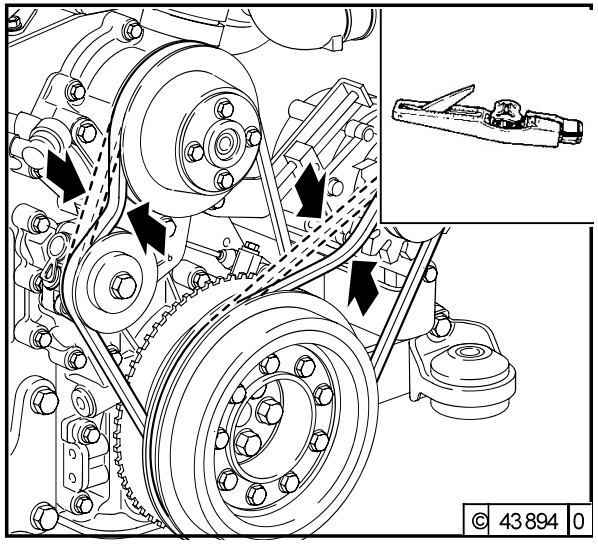


- Open clamping bracket 1.
- Remove filter hood 2 and pull out filter cartridge 3.
- Clean filter cartridge, renew after a year at the latest.
- Clean filter cartridge 3.
  - Blast out from the inside out with dry compressed air (max. 5 bar), or
  - beat out (only in extreme cases). Do not damage the cartridge, or
  - wash according to manufacturer's specifications.
- Check filter cartridge for damage to the filter paper (shine light through) and damage to the seal. Exchange if necessary.
- Renew the safety cartridge 4 after 5 filter maintenances, after 2 years at the latest (never clean!).
  To do this:
  - Loosen the hexagonal nut 5 and pull out the cartridge 4.
  - Insert new cartridge, re-mount hexagonal nut and tighten.
- Insert filter cartridge 3, close hood 2 and secure clamping bracket 1.

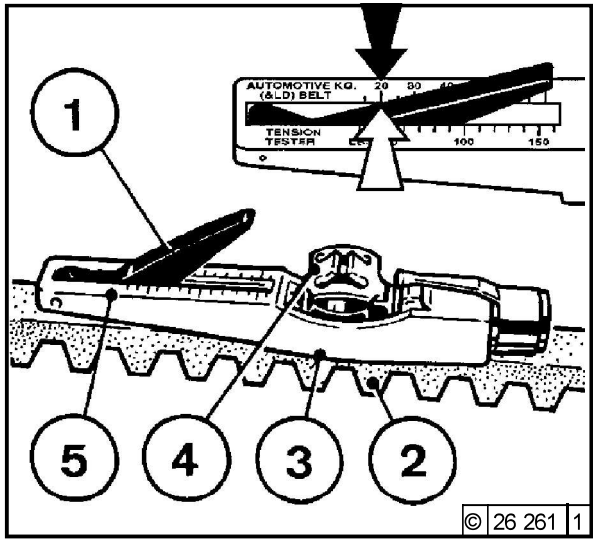
Never clean filter cartridge with petrol or hot liquids!

6

6.5.1 Checking V-belt
2013 example



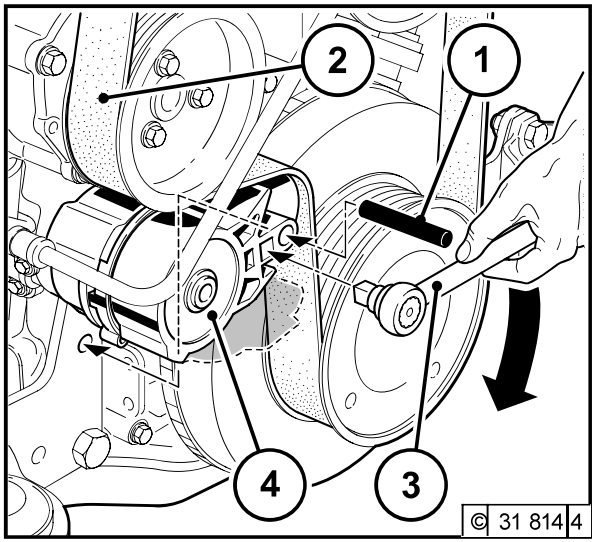
- Visual inspection of entire length of V-belt for damages.
- Renew damaged V-belts.
- Check the belt tension of new V-belts after 15 minutes running time.



- To check the V-belt tension
  - Use a tension measuring device (see 9.3).
  - Lower indicator arm 1 into the measuring device.
  - Lay the guide 3 between two belt pulleys on the V-belt 2. The stop should lie sideways.
  - Press the button 4 at right angles to the V-belt 2 steadily, until the spring is heard or felt to unlock.
  - Carefully lift the measuring device, without altering the position of the indicator arm 1.
  - Read off the measured values on the in tersection (arrow), scale 5 and the indicator arm 1. For setting values see 9.1.
  - If necessary, re-tighten and repeat measurement.

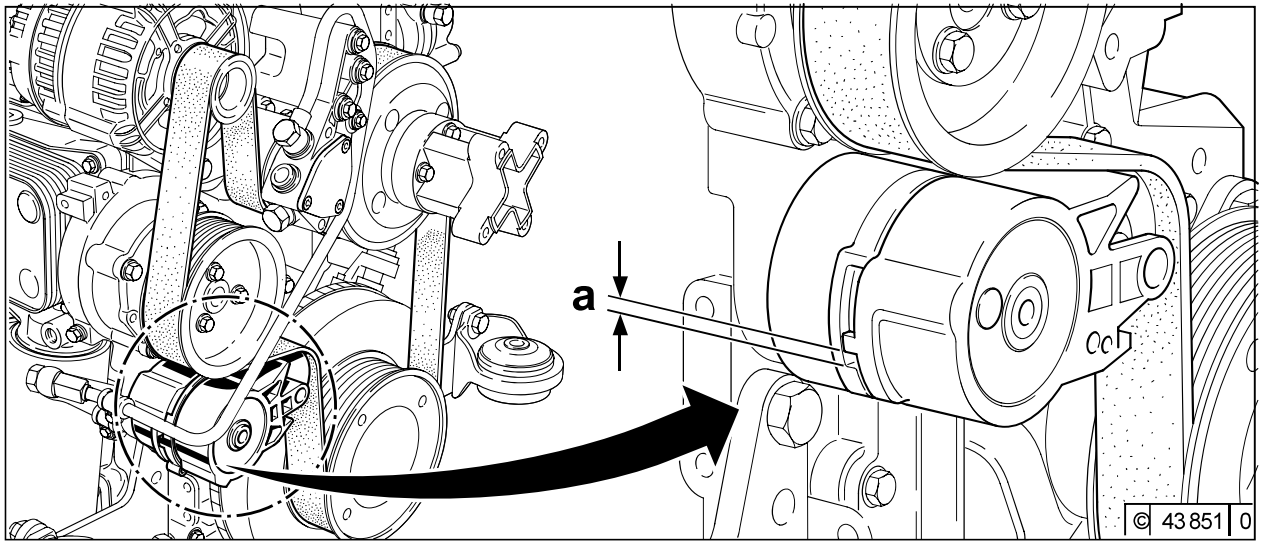
Only test / tighten / change V-belts when the engine is not running. If necessary, re-mount V-rib belt guard.

6.5.2 Changing V-rib belt



- Push tension roller 1 with ratchet 3 in direction of arrow until locking pin 4 can be fixed in the mounting hole. V-rib belt 2 is now tension-free.
- First pull the V-rib belt 2 from the smallest roller or from the tension roller.
- Fit new V-rib belt 2.
- Hold ratchet 3 in the opposite direction to the arrow and remove pin 4.
- Loosen the tension pulley in the opposite direction to the arrow until the V-rib belt is tight, at the same time checking that the V-rib belt is positioned correctly in its guides.

6.5.3 Checking wear limit of V-rib belt

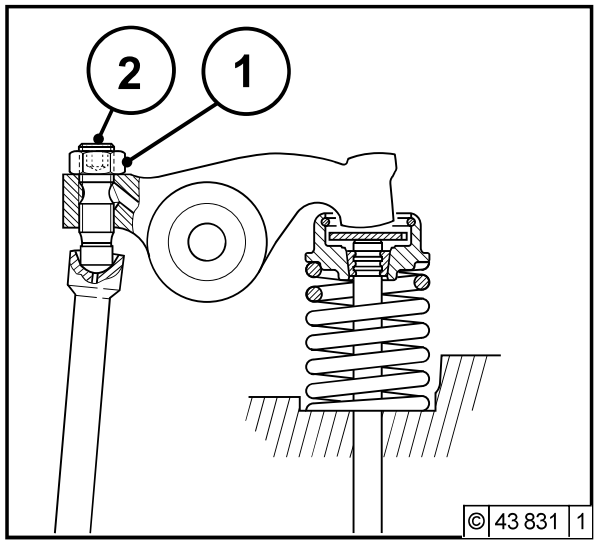


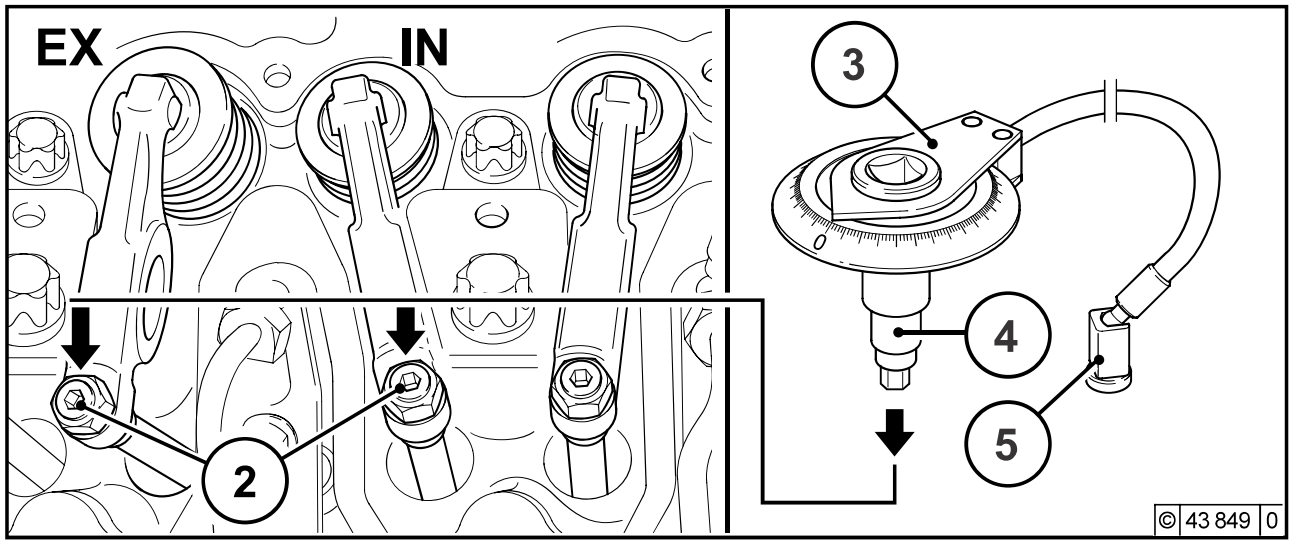
- The wear limit of the V-rib belt is checked as follows:
- Check the distance between the projection of the moving tension arm and the contact with the fixed tensioner housing.
- If the distance "a" is less than **3 mm,** the V-rib belt should be changed.

Only test / tighten / change when the engine is not running. If necessary, re-mount V-belt guard.

6

6.6.1 Checking valve clearance, setting if necessary





- Before setting the valve clearance allow the engine to cool down for at least 30 minutes: Oil temperature below 80 °C.
- Place the turning gear (see chap. 9.3) over the fastening screws of the belt pulleys.
- Turn over engine until the valve overlap is achieved, cylinder no. 1.
  The cylinders to be set are specified in the setting schematic, see chap. 6.6.3.

Special tools for valve setting see chap. 9.3

- Loosen lock nut 1
- Place rotation angle disc and socket wrench insert 4 on the valve clearance setting screw 2.
- Fix magnet 5 to the rotation angle disc 3.
- Turn the rotation angle disc 3 clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn the rotation angle disc anti-clockwise until you reach the specified rotation angle size:

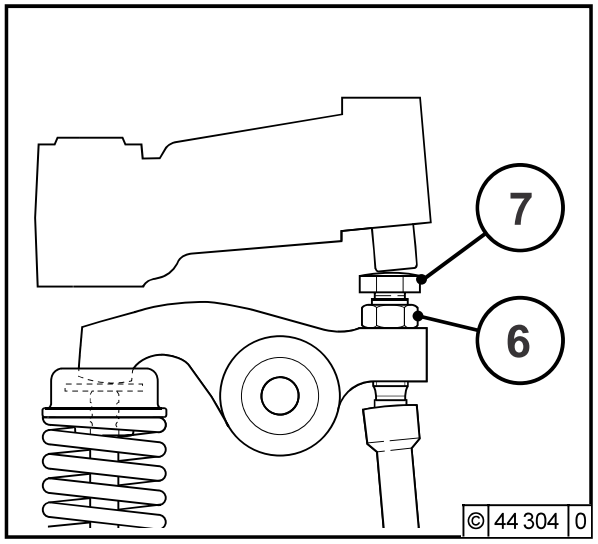
Engine 2012

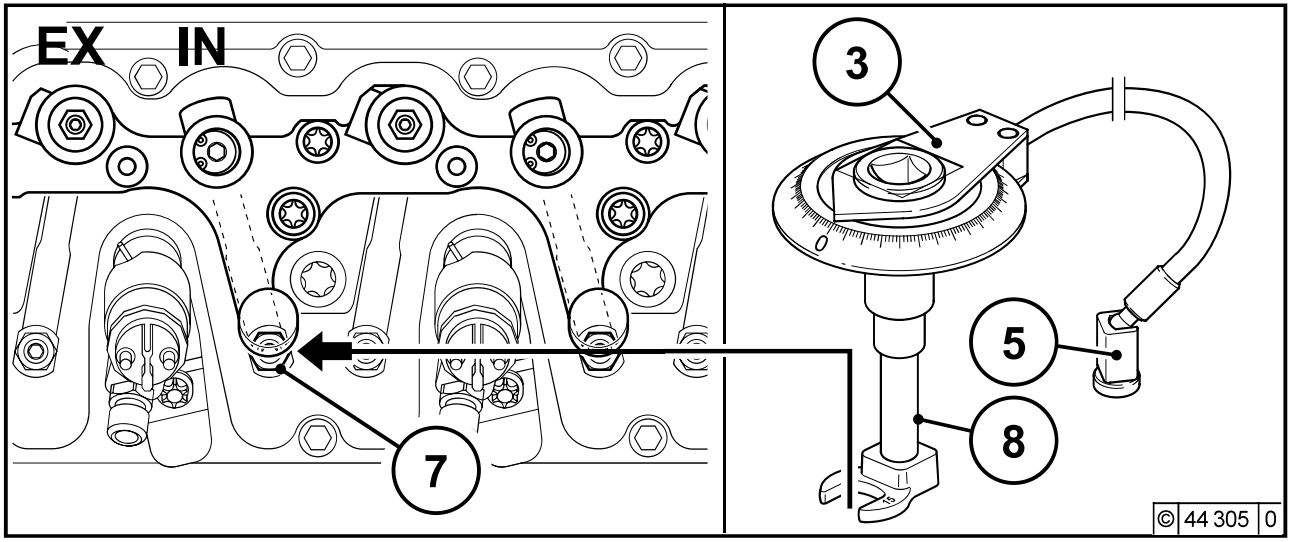
IN = inlet valve	75°
EX = outlet valve	120°

Engine 2013

IN = inlet valve	90°
EX = outlet valve	150°

- Hold rotation angle disc 3 tight against twisting.
- Tighten the lock nut 1.
- Perform the setting on every cylinder (see chap. 6.6.3).





Valve clearance setting inlet valve in exhaust gas return line (EGR):

- Loosen lock nut 6.
- Place rotation angle disc 3 with crow's foot wrench 8 on valve clearance setting screw 7 on the inlet valve.
- Fix magnet 5 to the rotation angle disc 3.
- Turn the rotation angle disc 3 clockwise to the stop (rocker arm without clearance) and set scale to zero.
- Turn the rotation angle disc anti-clockwise until you reach the specified rotation angle size.

Engine 2012

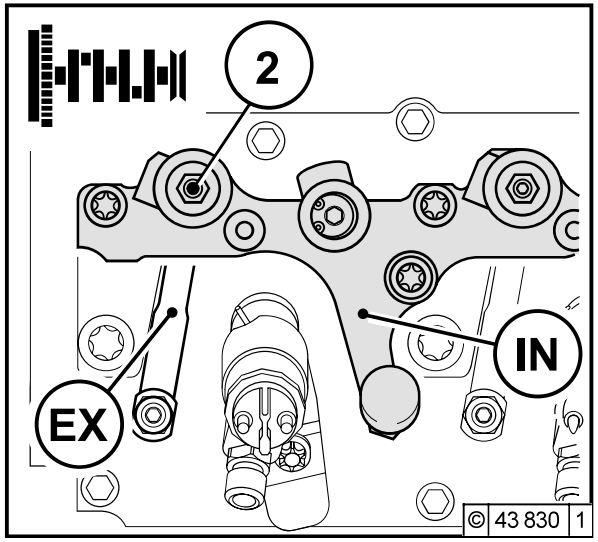
IN = inlet valve 75°

Engine 2013

IN = inlet valve 90°

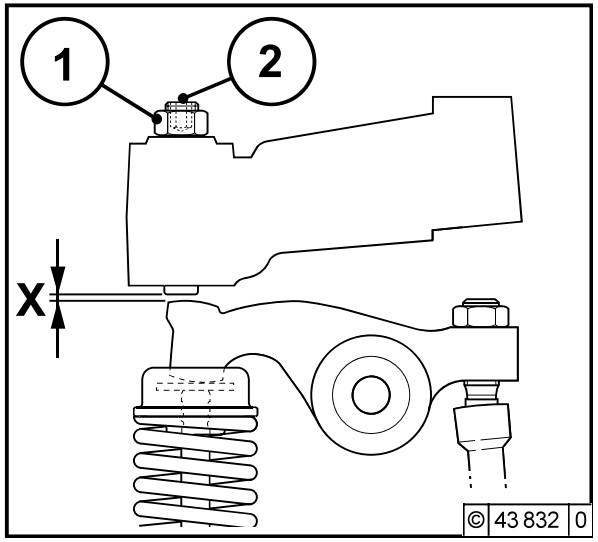
- Hold rotation angle disc 3 tight against twisting.
- Tighten the lock nut 6.
- Perform the setting on every inlet valve (see chap. 6.6.3)

6.6.2 Setting control piston clearance in exhaust gas recirculation (EGR)



- After setting the valve clearance, the control piston clearance should be set as follows:
- Place the turning device over the fastening screws of the belt pulley.
- Turn engine until reaching the valve overlap, cylinder no. 1 The cylinders to be set are specified in the setting diagram, see chap. 6.6.3

Special tools for valve setting see chap. 9.3



- Loosen lock nut 1.
- Place the rotation angle disc and socket wrench insert on the setting screw 2
- Fix the magnet of the rotation angle disc.
- Turn the rotation angle disc clockwise to the stop (control piston without clearance) and set scale to zero.
- Turn the rotation angle disc counter-clockwise until you reach the specified rotation angle.
  Control piston x : 144°
- Tighten the lock nut 1.
- Perform the setting on every control piston (see chap. 6.6.3)

6.6.3 Diagram for setting valve / control piston clearance

Engine TCD 2012/2013 L04 2V

Ignition sequence: 1–3–4–2

Valves	Cylinder			
overlap	1	3	4	2
set to	4	2	1	3

Valve operlap: Outlet valve not yet closed, inlet valve starts opening.

At fully open outlet valve, the inlet valve opens briefly by about 2 mm. This is not the valve overlap.

Engine TCD 2012/2013 L06 2V

Ignition sequence: 1–5–3–6–2–4

Valves	Cylinder					
overlap	1	5	3	6	2	4
set to	6	2	4	1	5	3

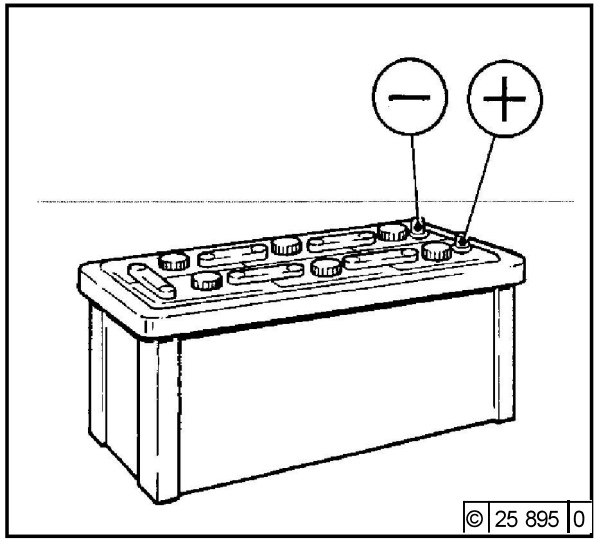
Valve operlap: Outlet valve not yet closed, inlet valve starts opening.

At fully open outlet valve, the inlet valve opens briefly by about 2 mm. This is not the valve overlap.

6

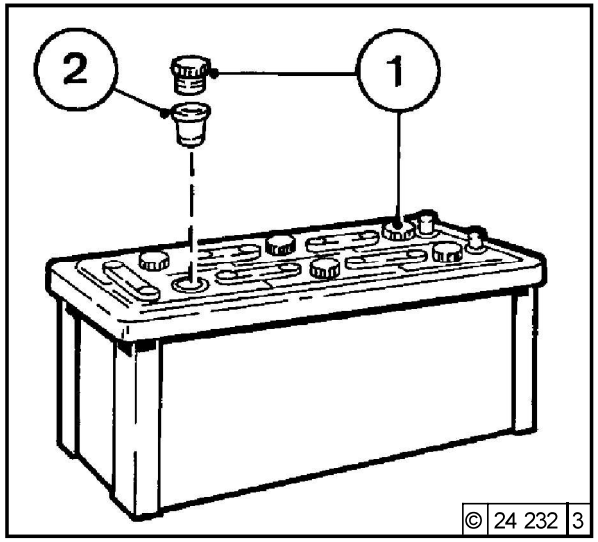
6.7.1 Battery

6.7.1.1 Checking battery and cable connections



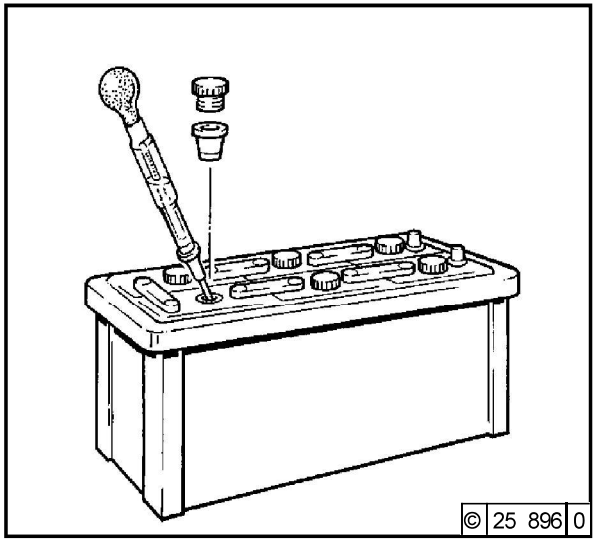
- Keep the battery clean and dry.
- Loosen soiled connection terminals.
- Clean the battery poles (+ and -) and terminals, and grease with an acid-free and acid-resistant grease.
- Ensure that the terminal connections contact well when assembling. Tighten the clamping screws by hand.

6.7.1.2 Checking the acid level



- Remove sealing caps 1.
- If checking inserts 2 are available:
  The liquid level should reach to their bottom.
- Without checking inserts:
  The liquid level should reach 10-15 mm above the upper edge of the plate.
- If necessary, re-fill with distilled water.
- Screw sealing caps back on.

6.7.1.3 Checking acid density



- Measure the acid density of individual cells with a standard acid testing device.

The measured values (see table overleaf) indicate the charge status of the battery. The acid temperature when measuring should be 20 °C if possible.

Acid density in [kg/ l]		Charge level
Normal	Tropics	
1.28	1.23	well charged
1.20	1.12	half charged, re-charge
1.12	1.08	discharged, charge immediately

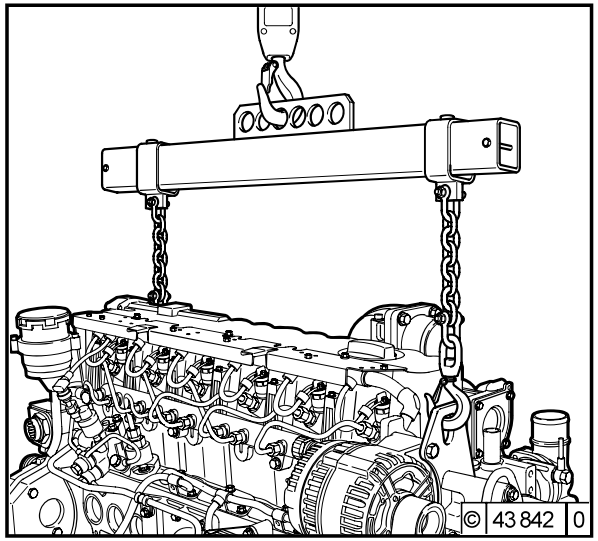
The gases released by the battery are explosive! Avoid sparks and open fire in the vicinity of the battery! Do not allow acid to get on skin or clothes!
Wear protective glasses!
Do not place any tools on the battery!

6.7.2 Three-phase current generator

Notes on three-phase current system:

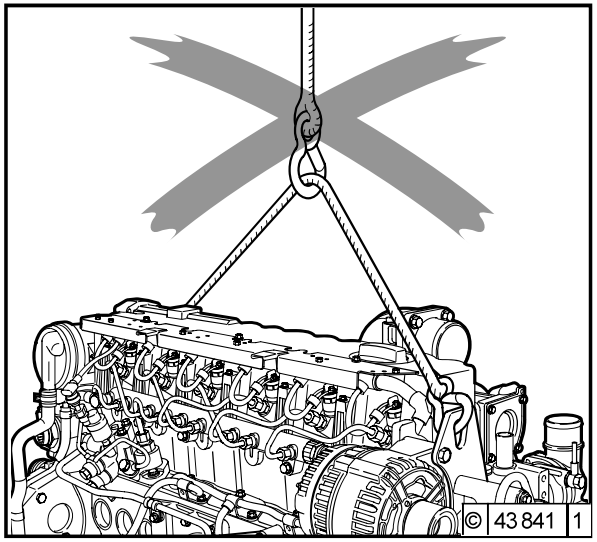
- Do not interrupt the connections between the battery, generator and governor when the engine is **running**.
- If, however, an engine must be started and operated without battery, the connection governor / generator is to be separated before starting.
- Do not swap battery connections.
- Replace defective charging warning light immediately.
- When cleaning engine: Do not spray water/ steam jet directly at generator!
  Warm up the engine so that the water residues evaporate.
- Under no circumstances may the voltage of a three-phase current system be tested by tapping against the earth cable.
- When carrying out electrical welding work, clamp the earth terminal of the welding device directly to the part to be clamped.
- Disconnect battery and three-phase current generator.
- Remove the control unit.

6.7.3 Transportation suspension



- Only use the correct suspension equipment for engine transportation. Suspension equipment must be adjustable for the engine centre of gravity.

Only use correct suspension equipment!



- Fastening devices cannot be fixed safely over the centre of gravity.
- Fastening devices can slip, engine capsizes.
- Short fastening devices cause bending moments in the suspension. This can damage the suspension.

Engine can fall.
Danger to life!

Faults, causes and remedies

7

- Faults are often caused by incorrect operation or maintenance of the engine.
- For every fault, check whether or not all operating and maintenance specifications have been observed.
- A corresponding fault table can be found overleaf.
- If you cannot recognise the cause of a fault or cannot remedy a fault yourself, please contact your **DEUTZ Service.**

Before starting make sure that there is nobody in the engine/ work machine danger area.
For repairs:
Caution: Separate battery connection!

Faults												Cause	Action	
Engine doesn't start up, or starts up with difficulty														
	Engine doesn't start up and diagnosis light is blinking												Check	C
		Engines starts up, but runs irregularly or misfires											Set	S
			Engine gets too hot. Temperature warning system is activated										Change	Ch
				Engine lacks power										
					Engine lacks power and diagnosis light is lit up								Clean	Cl
						Engine doesn't work on all cylinders							Fill up	F
							Engine has no, or too little, oil pressure						Lower	L
								Engine has too high oil consumption					Engine electronics	E*
									Engine smoulders	- blue			* Identify fault by monitoring the blink code or fault memory	
										- white				
										- black				
												Cause	**Section**	
●												Not disconnected (if possible)	**Operation**	**C**
●										●		Starting limit temperature not reached		**C**
●				●								Engine shutdown lever is still in stop position (shutdown magnet defective)		**C**
			●				●					Oil level too low		**F**
			●	●				●	●			Oil level too high		**L**
							●	●	●			Engine is tilted too far		**C / S**
●												Set throttle to halfway (only with mech. regulators)		**C / S**
			●	●							●	Air filter soiled / exhaust turbocharger defective	Combustion air	**C / Ch**
			●	●							●	Air filter maintenance switch / display defective		**C**
			●	●							●	Charge air line leaking		**C / Ch**
			●									Cool water pump defective (V-rib belt torn or loose)		**C**
				●							●	Charge air cooler soiled	Cooling system	**C / Cl**
			●									Coolant heat exchanger soiled		**C / Cl**
●		●	●	●		●						V-belt/V-rib belt torn or loose		**C / W**
												(fuel pump in belt drive)		
			●	●								Cool air heating / heat short circuit		**C**
●												Battery defective or not charged	Electrics	**C**

Faults, causes and remedies

7.1 Fault table

Faults

- Engine doesn't start up, or starts up with difficulty
- Engine doesn't start up and diagnosis light is blinking
- Engines starts up, but runs irregularly or misfires
- Engine gets too hot. Temperature warning system is activated
- Engine lacks power
- Engine lacks power and diagnosis light is lit up
- Speed changes are possible + diagnostic light is lit up
- Engine has no, or too little, oil pressure
- Engine has too high oil consumption
- Engine has too high oil consumption
- Engine smoulders - blue
- Engine smoulders - white
- Engine smoulders - black

Action

Check	**C**
Set	**S**
Change	**Ch**
Clean	**Cl**
Fill up	**F**
Lower	**L**
Engine electronics	**E***

* Identify fault by monitoring the blink code or fault memory

Cause	Section	
Starter, circuit cable connections loose or oxidised	Electrics	**C**
Starter defective or pinion doesn't mesh		**C**
Valve clearance incorrect	Engine	**S**
Injection line leaking		**C**
Ventilation line blocked (coolant heat exchanger)		**C / Cl**
Heating plug defective		**C**
Injector defective		**C / Ch**
Air in fuel system		**C / Ch**
Fuel filter / fuel pre-cleaner soiled		**C/ Cl/ Ch**
Oil filter defective		
Incorrect SAE class or quality of engine lube oil	Operating substance	**Ch**
Fuel quality does not comply with instruction manual		**Ch**
Lack of cooling water		**C / Ch**
Engine electronics prevent start	Electronics	**C / Cl**
Engine electronics reduce power		**C / E**
Engine electronics has detected a system error and activates an equivalent speed		**C / E**

7.2.1 Engine protection function of the electronic engine controller EMR3

Depending on the design of the monitoring functions, the EMR3 can protect the engine against damage in certain fault situations by monitoring compliance with the important limit values during operation and checking the correct functioning of the system components. Depending on the severity of a detected fault, the engine may continue running with restrictions, whereby the fault lamp lights steadily or the fault lamp indicates a serious system fault by flashing. **In this case, the engine must be switched off as soon as it is safe to do so.**
Depending on the engine configuration, the flashing fault lamp can have the following meaning:

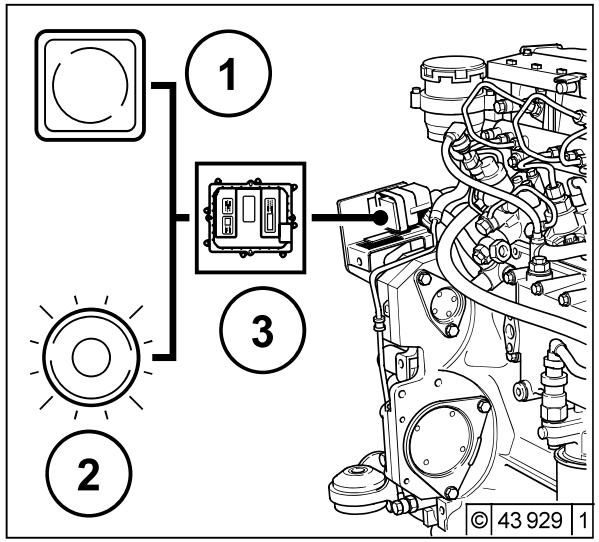
- Request to the operator to shut down
  Caution: Failure to heed this will lead to loss of warranty!
- Autom. shutdown of the engine after a brief warning time, poss. connected with a start prevention.
- To cool the engine, forced operation at low idling speed, poss. with automatic shutdown.
- Start prevention. (see also chap. 3.3)

When the fault is corrected the light goes out. For some faults it is necessary to switch off the ignition, wait for 30 s and then switch the ignition back on.

7.2.2 Using the diagnosis button

With the diagnosis button (1) the fault at hand can be read out as a blink code. The diagnosis button (1) and the fault light (2) can be found on the vehicle driving stand.
Faults are indicated by a blinking or continuous illumination of the fault light (2). More precise information regarding all existing faults can be read out in the form of a blink code, only when the engine is not running, in the following manner: After actuating the diagnosis button (1) for at least one second, the fault light (2) goes out and the first fault is, after releasing the key displayed as a blink code. Analyse the blink code as per the table on the following page. After the fault blink code has been displayed the fault light (2) goes out for five seconds.
Then the next existing fault (i.e. the following one in the fault memory) can be shown by actuating the diagnosis button (1) again. If the last existing fault has been shown, by actuating the diagnosis button (1) once more the first fault will be shown again.

7.2.3 Table of fault blink codes



The possible blink codes, their meaning and measures for correcting faults can be found in the table on the following page. The blink code values in the first column indicate the number of preliminary short blink signals (illuminated duration approx. 0.4 s), the number of subsequent long blink signals (illuminated duration approx. 0.8 s) as well as the number of concluding short blink signals. The code 2-1-4 for the fault "overspeed" is made up of two short, one long and four short blink signals, for example. If a fault cannot be corrected by the measures given in the table please contact your service representative responsible.

Blinkcode			Function / Component	Error
Short 0.4s	Long 0.8s	Short 0.4s		
1	2	3	Output to coolant temperature light	Signal faulty, Overtemperature control unit
1	2	6	Hand accelerator	Signal faulty / implausible
1	2	8	Suction air temperature sensor	Signal faulty
1	3	3	Gear oil temperature sensor	Signal faulty
1	3	4	Monitoring rail pressure	Signal implausible, pressure / pressure deviation outside the permissible range
1	3	5	Output to oil pressure warning lamp	Signal faulty, overtemperature control unit
			Output to valve of the fuel measuring unit	Signal faulty, overtemperature control unit
1	3	6	Monitoring air filter	Air pressure behind filter too low
1	3	7	Output to actuators	Short circuit to battery
1	3	8	Output to actuators	Short circuit to ground
1	4	2	Output to engine operating lamp	Signal faulty, overtemperature control unit
1	4	3	Multi-step switch 1 / 2 / 3	Signal faulty / implausible
1	4	4	Oil temperature sensor	Signal faulty / implausible
			Monitoring the oil temperature	Temperature outside the nominal range
1	4	5	Monitoring override switch	Signal implausible
1	4	6	Rail pressure limiting valve	Valve open / pressure surge necessary / do not open after pressure surge
1	4	7	Rail pressure sensor	Signal faulty, pressure deviation outside the permissible range

Blinkcode			Function / Component	Error
Short 0.4s	Long 0.8s	Short 0.4s		
2	1	2	Monitoring camshaft/crankshaft	No camshaft signal, no crankshaft signal
2	1	3	Monitoring camshaft/crankshaft	Deviation between the camshaft and crankshaft signal
2	1	4	Engine protection:	Overspeed/override status implausible
2	1	6	Fuel low pressure sensor	Signal faulty
			Monitoring fuel low pressure	Fuel low pressure outside the nominal range
2	1	9	Output to adjuster exhaust valve engine brake	Signal faulty, overtemperature control unit
2	2	2	Input accelerator 1 (PWM)	PWM signal faulty
2	2	3	Charge air pressure sensor	Signal faulty
			Monitoring charge air pressure	Charge air pressure outside the nominal range
2	2	4	Oil pressure sensor	Signal faulty / implausible
2	2	5	Coolant temperature sensor	Signal faulty / implausible in comparison with the oil temperature, CAN signal invalid
2	2	6	Input accelerator 1 (analog)	Signal faulty / implausible
2	2	7	Fuel temperature sensor	Signal faulty
2	2	8	Water level sensor in the fuel filter	Signal faulty
			Monitoring fuel filter water level	Max. water level exceeded

Blinkcode Short 0.4s	Long 0.8s	Short 0.4s	Function / Component	Error
2	3	1	Monitoring oil pressure	Pressure outside the nominal range
2	3	2	Monitoring coolant temperature	Temperature above the nominal range
2	3	3	Monitoring suction intake air temperature	Temperature above the nominal range
2	3	5	Monitoring coolant state	Level below the nominal range
2	3	7	Monitoring fuel temperature	Temperature outside the nominal range
2	3	8	Output to the fan adjuster 1 / 2	Signal faulty, overtemperature control unit
			Monitoring fan speed	Speed outside the nominal range
2	4	1	Monitoring combustion	Misfiring detected in one or more cylinders
2	6	1	Monitoring output to actuators	Relay does not open or opens too late, short-circuit to ground
2	6	3	Output to cold start aid	Signal faulty, relay defective, jammed or connected incorrectly, short-circuit
2	7	1	CAN-Bus	Timeout of one or more send messages, bus inactive
2	8	2	Sensor supply voltage 1 / 2 / 3	Voltage outside the nominal range
2	9	2	Atmospheric pressure sensor	Signal faulty / implausible

Blinkcode			Function / Component	Error
Short 0.4s	Long 0.8s	Short 0.4s		
3	1	4	Hydraulic oil temperature sensor	Signal faulty
			Monitoring hydraulic oil temperature	Temperature outside the nominal range
3	1	8	Monitoring battery	Voltage outside the nominal range
3	2	8	Output to cold start aid indicator lamp	Signal faulty, overtemperature control unit
4	1	4	Output to external EGR actuator	Signal faulty
4	1	5	Output to external EGR actuator	Signal faulty, overtemperature control unit
4	1	6	Output to external EGR actuator	Signal faulty
4	1	7	Oil wear meter	Critical time reached

Blink code			Function / Component	Error
Short	Long	Short		
0,4s	0,8s	0,4s		
5	1	2	Output to start relay	Signal faulty, overtemperature control unit
5	1	3	Output to error lamp	Signal faulty, overtemperature control unit
5	1	4	Monitoring terminal 15	No signal detected
5	1	5	Monitoring terminal 50	Permanent signal detected
5	2	1	Speed measurement	Implausible drive speed
5	2	8	Output to internal engine brake	Signal faulty

All other blink codes: Please contact your service partner

Behavior in case of error signal faulty / implausible: Perform function test on the parts concerned; check wiring and plugs for short-circuits, breaks, corrosion.

8.1 Corrosion protection

8

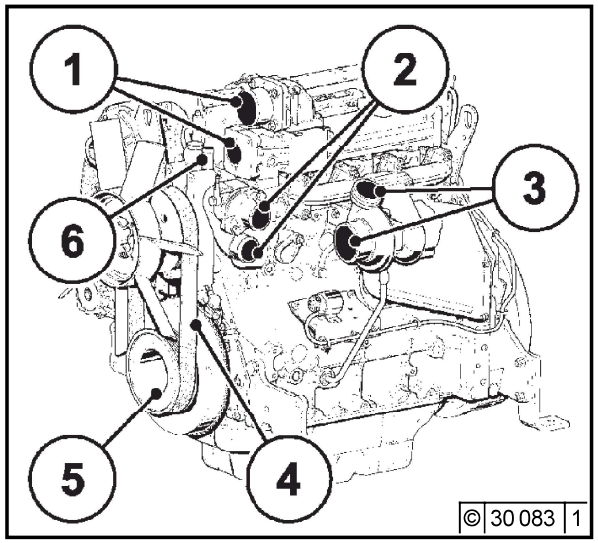
8.1 Corrosion protection

If the engine should be shut down for a long period of time, corrosion protection will be necessary in order to prevent rust formation. The measures described here apply for a shutdown period of up to approx. 6 months. Before the engine is commissioned again the corrosion protection should be removed.

- Corrosion protection oils according to specification:
  - MIL-L 21260B
  - TL 9150-037/2
  - Nato Code C 640/642
- Recommended cleaning agent for removal of corrosion protection:
  - Petroleum benzine (hazard class A3)

Protecting engine from corrosion:

- Clean engine (possibly with cold cleaner).
- Warm up the engine and switch off.
- Drain off engine oil, see chapter 6.1.2 and pour in corrosion protection oil.
- Drain off coolant, see 6.3.3.
- Pour in corrosion protection agent, see above.
- Drain fuel from container (tank).
- Make fuel mixture from 90 % diesel fuel and 10 % corrosion protection oil and fill up tank.
- Leave the engine running for approx. 10 minutes.
- Switch off engine
- Turn over the engine manually several times. When turning over with a starter position the shutdown lever in the Stop position.
- Remove V-belt 4, pack up and store.



- Spray the V-belt pulley 5 with corrosion protection agent.
- Seal intake openings 1 and exhaust openings 3.
- Lightly apply corrosion protection agent to the coolant nozzle 2 and seal.
- Drain off corrosion protection agent.

Note:

Fuel tank/supply line to the engine should also be sealed, so that the sensitive rail system is protected against dirt and dust. Protect the electronics from moisture/ corrosion.

Removing engine corrosion protection:

- Remove corrosion protection agent from grooves of V-belt pulley 5.
- Assemble V-rib belt 4 or V-belt, see 6.5.2.
- Remove plugs from intake opening 1, exhaust opening 3 and coolant inlet/outlet 2.
- Pour in coolant see 6.3.3
- Connect fuel tank / supply line to the engine. Pay attention to cleanliness here.
- Start up the engine.

Engine type		TDC 2012 L04 2V	TDC 2012 L06 2V
Number of cylinders		4	6
Cyl. arrangement		In-line	
Bore	[mm]	101	
Stroke	[mm]	126	
Total displacement	[cm^3]	4038	6067
Compression ratio	[ε]	18	
Working principle / combustion procedure		Four stroke diesel with charging and direct injection	
Charge air cooler		without/with	with
Charge air cooler temperature outlet at rated power	[°C]	50	
Direction of rotation		rotation to left	
Injection system **D**eutz **C**ommon **R**ail **(DCR)** **P**ump **L**ine **N**ozzle **(PLD)**		**DCR + PLD**	**DCR**
Weight TDC 2012 without cooling system according to DIN 70020-A	[approx.kg]	410	530
Engine performance according to ISO 3046	[kW]	[1]).	
Max. nominal speed	[1/min]	2400	
Valve clearance inlet/ exhaust, see 6.6.1	[mm]	0.3/0.5$^{+0.1/}$	angle degree 75/120
Setting with special tool			
Ignition pressure	[bar]	160	
Start of pumping	[°KW before TDC]	[1]).	
Engine ignition sequence		1-3-4-2	1-5-3-6-2-4
V-belt tension		pre-tighten/re-tighten	
Generator	[N]	650 / 400 $^{\pm 50}$.	
Fuel pump - coolant pump	[N]	650 / 400 $^{\pm 50}$.	
V-rib belt tension:		Spring-loaded tension pulley	

[1)] Engine power, speed and start of pumping, among other things, are stamped on the engine company plate, see also 2.1.

[2)] The V-rib belt has a spring-loaded tension pulley which tightens automatically and is not re-tightened: see ch. 6.5.2

Engine type		TDC 2012 L04 2V	TDC 2012 L06 2V
Cooling		Liquid-cooled / cooling system protection	
Coolant quantity (only engine content without cooler)	[approx.ltr.]	5.6	7.3
Permissible continuous coolant temperature engine outlet	[°C]	max.110	
Temperature difference between Coolant inlet/outlet	[°C]	4 to 8	
Start of thermostat opening at	[°C]	86	
Thermostat fully open at	[°C]	102	
Coolant pre-heating		[4].	
Lubrication		Forced feed lubrication	
Oil SAE		see chap. 4	
Maximum oil temperature in oil tray	[°C]	125	
Minimum oil pressure in warm state (114 °C) and low idling	[bar]	0,8	
Initial oil filling quantity without filter max.	[approx.ltr.]	15 [3].	26 [3].
min.	[approx.ltr.]	12.5 [3].	23.5 [3].
Initial oil filling quantity with filter max.	[approx.ltr.]	15.5 [3].	26.5 [3].
min.	[approx.ltr.]	13 [3].	24 [3].

[3] Approximate values can vary depending on version. The upper oil measurement marking is always decisive.
[4] Only necessary for winter operation, see 3.5.1.

Engine type		TDC 2013 L04 2V	TDC 2013 L06 2V
Number of cylinders		4	6
Cyl. arrangement		In-line	
Bore	[mm]	108	
Stroke	[mm]	130	
Total displacement	[cm^3]	4761	7142
Compression ratio	[ε]	18	
Working principle / combustion procedure		Four stroke diesel with charging and direct injection	
Charge air cooler		without/with	without/with
Charge air cooler temperature outlet at rated power	[°C]	50	
Direction of rotation		rotation to left	
Injection system **D**eutz **C**ommon **R**ail **(DCR)** **P**ump **L**ine **N**ozzle **(PLD)**	[bar]	**DCR+PLD**	**DCR**
Weight TDC 2013 without cooling system according to DIN 70020-A	[approx.kg]	450	590
Engine performance according to ISO 3046	[kW]	[1]).	
Max. nominal speed	[1/min]	2300	
Valve clearance inlet / exhaust, see 6.6.1	[mm]	$0.4/0.6^{+0.1/}$ / angle degree 90/150	
Setting with special tool			
Ignition pressure	[bar]	160	
Start of pumping	[°KW before TDC]	[1]).	
Engine ignition sequence		1-3-4-2	1-5-3-6-2-4
V-belt tension:			
Generator	[N]	550 / 300 $^{\pm 50}$.	
Fuel pump - coolant pump	[N]	550 / 300 $^{\pm 50}$.	
Compressor	[N]	650 / 400 $^{\pm 50}$.	
V-rib belt tension:		Spring-loaded tension pulley	

[1] Engine power, speed and start of pumping, among other things, are stamped on the engine company plate, see also 2.1.

[2] The V-rib belt has a spring-loaded tension pulley which tightens automatically and is not re-tightened: see ch. 6.5.2

Engine type		TDC 2013 L04 2V	TDC 2013 L06 2V
Cooling		Liquid-cooled / cooling system protection	
Coolant quantity (only engine content without cooler)	[approx.ltr.]	7.2	9.8
Permissible continuous coolant temperature engine outlet	[°C]	max.105	
Temperature difference between Coolant inlet/outlet	[°C]	4 to 8	
Start of thermostat opening at	[°C]	86	
Thermostat fully open at	[°C]	102	
Coolant pre-heating		[4].	
Lubrication		Forced feed lubrication	
Oil SAE		see chap. 4	
Maximum oil temperature in oil tray	[°C]	125	
Minimum oil pressure in warm state (114 °C) and low idling	[bar]	0.8	
Initial oil filling quantity without filter max.	[approx.ltr.]	15 [3].	26 [3].
min.	[approx.ltr.]	12.5 [3].	23.5 [3].
Initial oil filling quantity with filter max.	[approx.ltr.]	15.5 [3].	26.5 [3].
min.	[approx.ltr.]	13 [3].	24 [3].

[3] Approximate values can vary depending on version. The upper oil measurement marking is always decisive.
[4] Only necessary for winter operation, see 3.5.1.

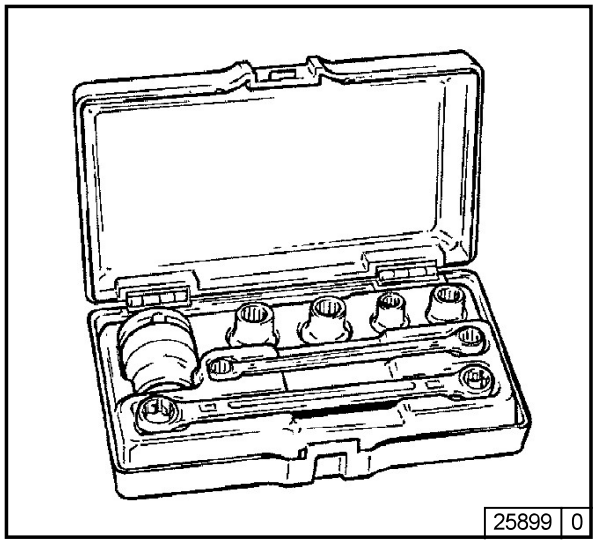
Installation	Pre-tightening [Nm]	Re-tightening				Total	Comments
		1st step	2nd step	3rd step	4th step		
Cylinder head cover	–	–	–	–	–	9 ± 1 Nm	M6
Lock nut Valves	–	–	–	–	–	20 ± 2 Nm	Nut with inner square
Front face mounting foot	–	–	–	–	–	280 Nm	M16 x 85 –10.9
	–	–	–	–	–	280 Nm	M16 x 40 –10.9
Oil drain screw aluminium tray	–	–	–	–	–	55 Nm	M 18x 1.5 with Cu ring
Oil drain screw sheet metal oil tray	–	–	–	–	–	55 Nm	M 18x 1.5 with Cu ring

Ordering tools

The special tools listed in this chapter must be ordered from:

FA.WILBÄR
Postfach 14 05 80
D-42826 Remscheid
http://www.deutz-tools.com

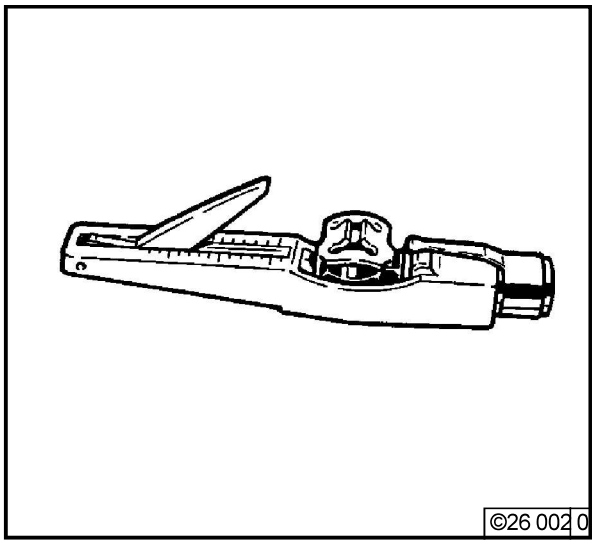
TORX



Order No. 8189
For engines of series 2012/2013, the TORX screw system BN. 8189, amongst others, is used.
This system was introduced due to its many advantages:

- Excellent screw accessibility.
- High transfer of force when loosening and tightening.
- Slipping or broken wrenches and the risk of injury associated with this is practically impossible.

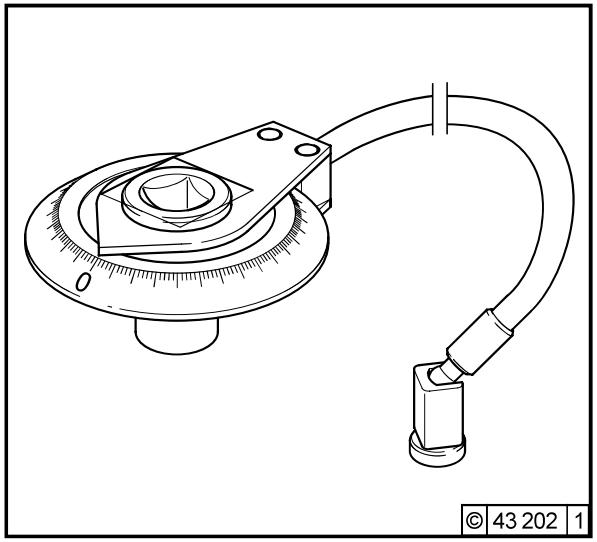
V-belt tension measuring device



Order No. 8115
Measuring device for checking the prescribed V-belt tensions

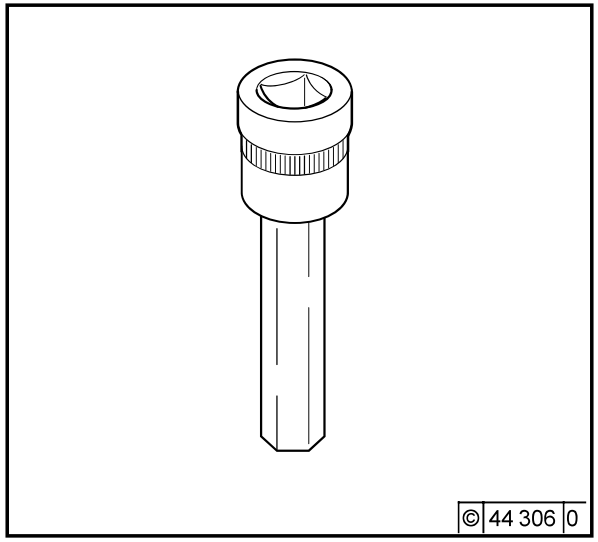
9

Rotation angle disc



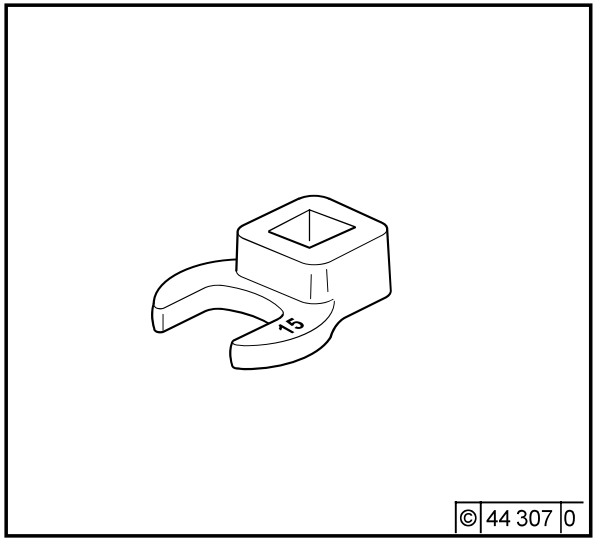
Order No. 8190
Rotation angle disc for setting the valve/ control piston clearance.

Socket wrench insert



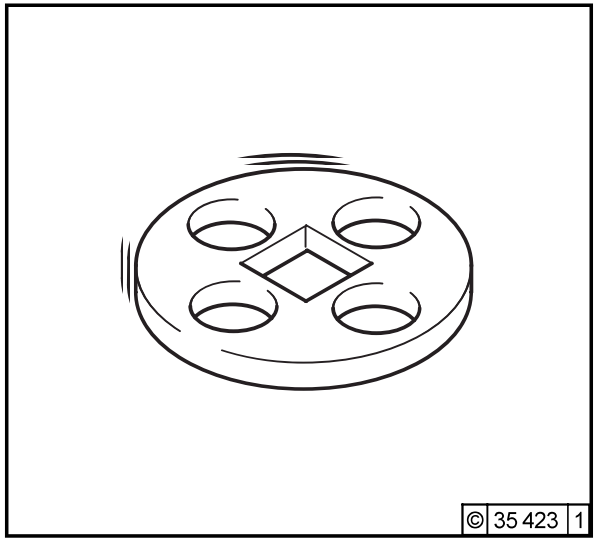
Order No. 8193 (5 mm) valve clearance
Order No. 8194 (4 mm) control piston clearance. Wrench inserts for rotation angle disc.

Crow's foot wrench



Order No. 8199
Crow's foot wrench for rotation angle disc 8190 in connection with commercially available square bar extension.

Turning gear



Order No. 100 330
For turning over the engine (as add-on on the torsional vibration damper).

Service

For many years DEUTZ has stood for pioneering development in engine construction. As an independent manufacturer we offer a complete palette of diesel and gas engines worldwide. Our products are perfectly tailored to meet the requirements of our customers.

More than 1.4 million DEUTZ engines reliably perform their service all over the world. We want to preserve the operational readiness of our engines and with it the satisfaction of our customers. Therefore we are represented worldwide by a network of competent partners, the concentration of whom corresponds to the regional distribution of our engines.

Thus, DEUTZ is not just a name for innovative engines. But also for a complete service package for every aspect of engines, and a service that you can rely on.

You can find an overview of DEUTZ partners in your area, their product competencies and their services on the DEUTZ website (see following address).
Also if there is no direct product competency specified, your DEUTZ partner will be able to help you further with professional advice.
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Fax: 0049-221-822-3523
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the engine company

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Service-Information Systems

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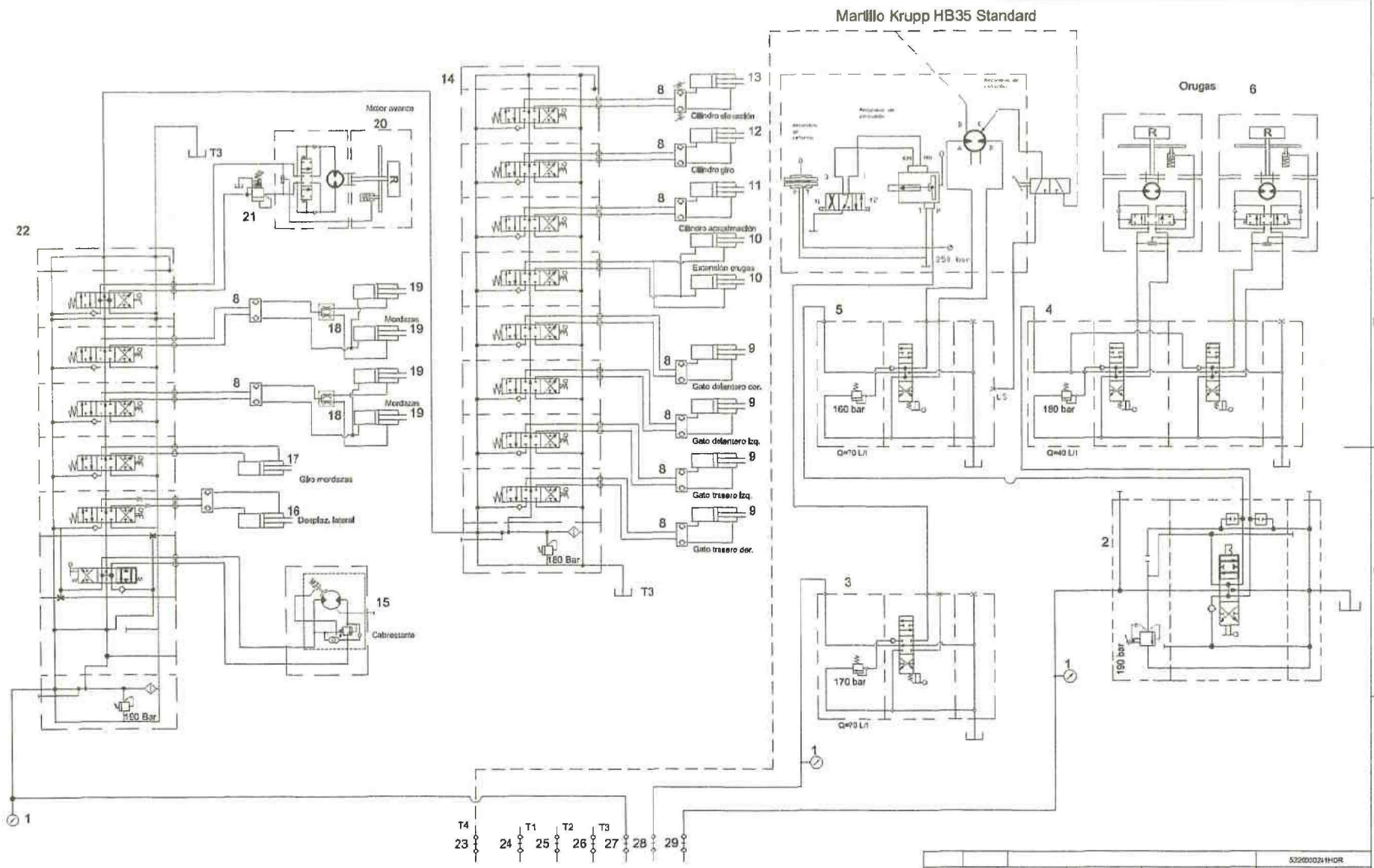

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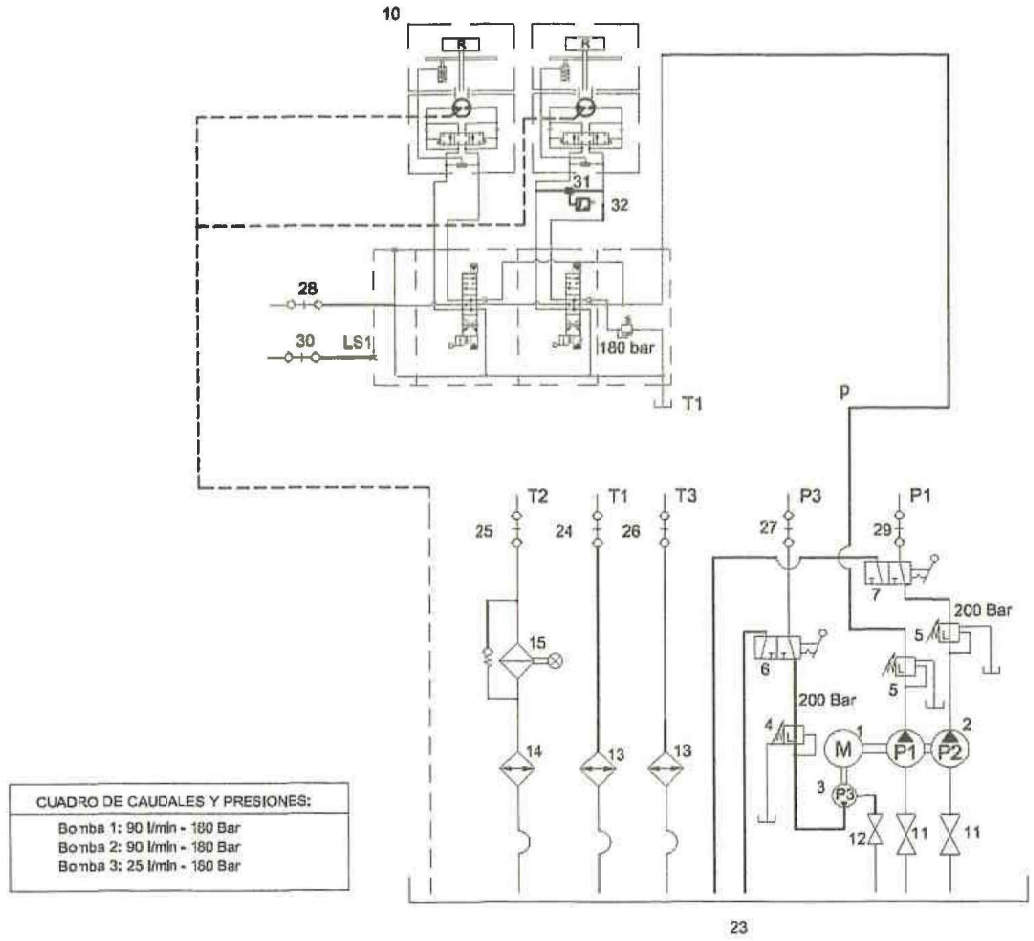
Diseñado por: P. Jordán	Dibujado por: JULIAND.	Aprobado por: PAULINOJ.		CODIGO: 5-0024	Fecha: 17/05/2010	Escala: SE
MECANIZACIÓN Y MINERÍA, S.A.	PLANO HIDRÁULICO CARRO DE PERFORACIÓN TH					
	1/215 TH				Rev_0	Lámina



CUADRO DE CAUDALES Y PRESIONES:
Bomba 1: 90 l/min - 180 Bar
Bomba 2: 90 l/min - 180 Bar
Bomba 3: 25 l/min - 180 Bar

MYM-C5					5220000242HDR01	
		Dibujado por: M.Andrés	Aprobado por: M.Andrés		Fecha 28/02/2007	Escala S/E
MECANIZACIÓN Y MINERÍA, S.A.		PLANO HIDRÁULICO POWER-PACK TH				
		2/215_TH		Rev_1	Lámina	

Perforadora hidráulica

Hydraulic drilling rig

MYM-C5

MECANIZACIÓN Y MINERÍA, S.A.

Perforadora hidráulica
Drilling Rig

MYM-C5

Versión Top Hammer.

Versión Rotary.

Versión Rotary.

Aplicaciones
Applications

MYM-C5

KRUPP HB 30 A
KRUPP HB 35 A

La MYM-C5 es una máquina versátil capaz de obtener elevados rendimientos en los siguientes campos de aplicación:

- Micropilotes
- Perforación de anclajes
- Perforación de pozos de agua
- Investigación de terrenos
- Perforación para geotermia

Está clasificada como una perforadora con power pack separado para utilización en espacios reducidos con altura limitada.

La MYM-C5 ha sido proyectada y fabricada teniendo en cuenta la seguridad del operador por lo que está dotada de todos los dispositivos necesarios de acuerdo con la norma ISO 9001 respetando los requisitos esenciales de seguridad en el trabajo.

La perforadora cumple con la normativa CE aplicable a este tipo de equipos.

CR 300
CR 600

The MYM-C5 it is a versatile machine able to obtain high performances in the following applications:

- Micropiling
- Anchoring
- Water well drilling
- Soil investigation
- Geothermal drilling

It is clasified as a separate power pack drilling rig to be used at low room job sites.

The MYM-C5 has being designed and manufactured taking in mind operator safety and it is equiped with all necessary systems according to ISO 9001 and esencial safety rules at job site.

Drilling rig it is according CE regulation.

CE Cámara Madrid CC Servicio de Certificación EMPRESA CERTIFICADA ISO 9001 EC - 1.208.0304

Detalles
Details

MYM-C5

Sistema hidráulico de desplazamiento lateral.

Hydraulic system for lateral movement.

Selector de seguridad para las operaciones de perforación y desplazamiento.

Safety lever for drilling and tramming operations.

Soporte del mástil tipo "heavy duty".

"Heavy duty" mast support.

Cabrestante hidráulico.

Hydraulic winch.

Detalles
Details

MYM-C5

Equipada con 4 cilindros estabilizadores para ser utilizados durante las operaciones de perforación.

Equiped with 4 hydraulic jacks to be used during drilling operation.

Engrasador para DTH y línea de barrido aire/agua integrada.

DTH oiler and air/water flushing line integrated.

Extensiones de mástil útiles y soporte de poleas giratorio.

Useful mast extensions and rotative jib.

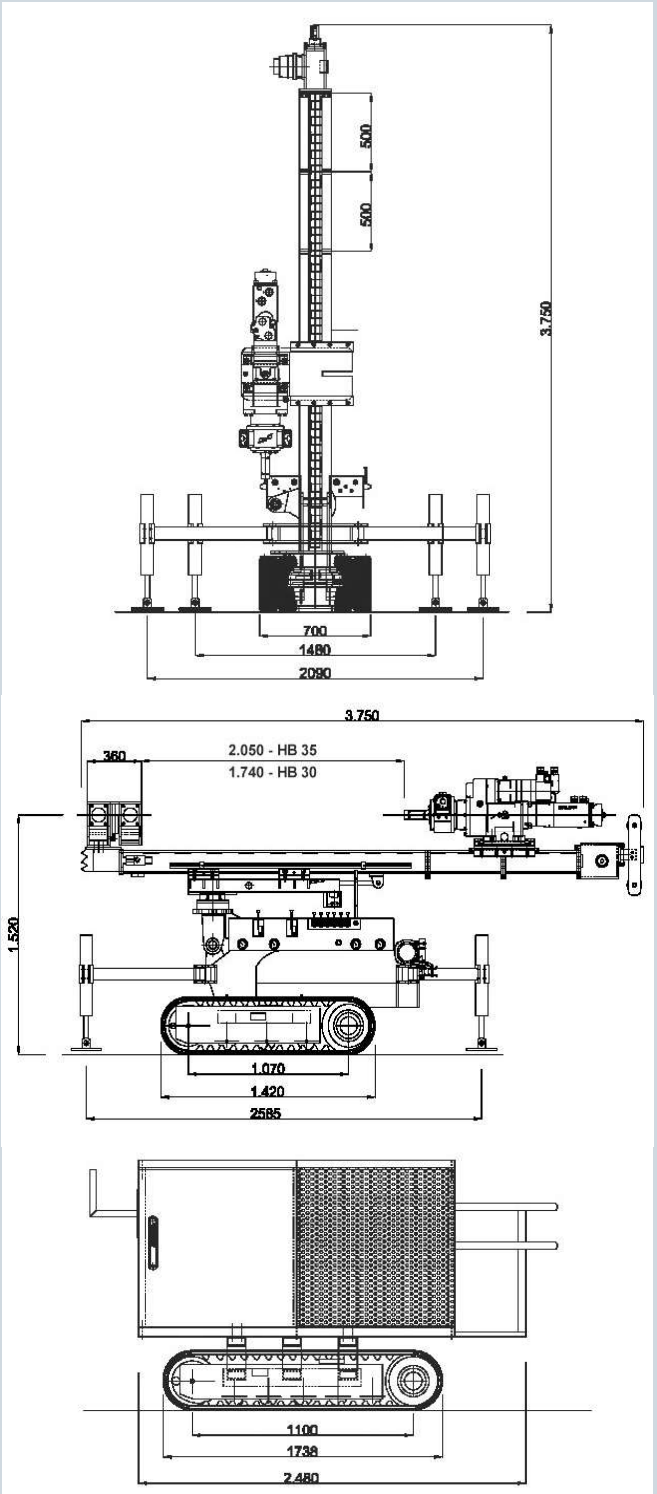
Mordaza hidráulica doble con giro.

Double Hidraulic clamp with breaking device. MD 200

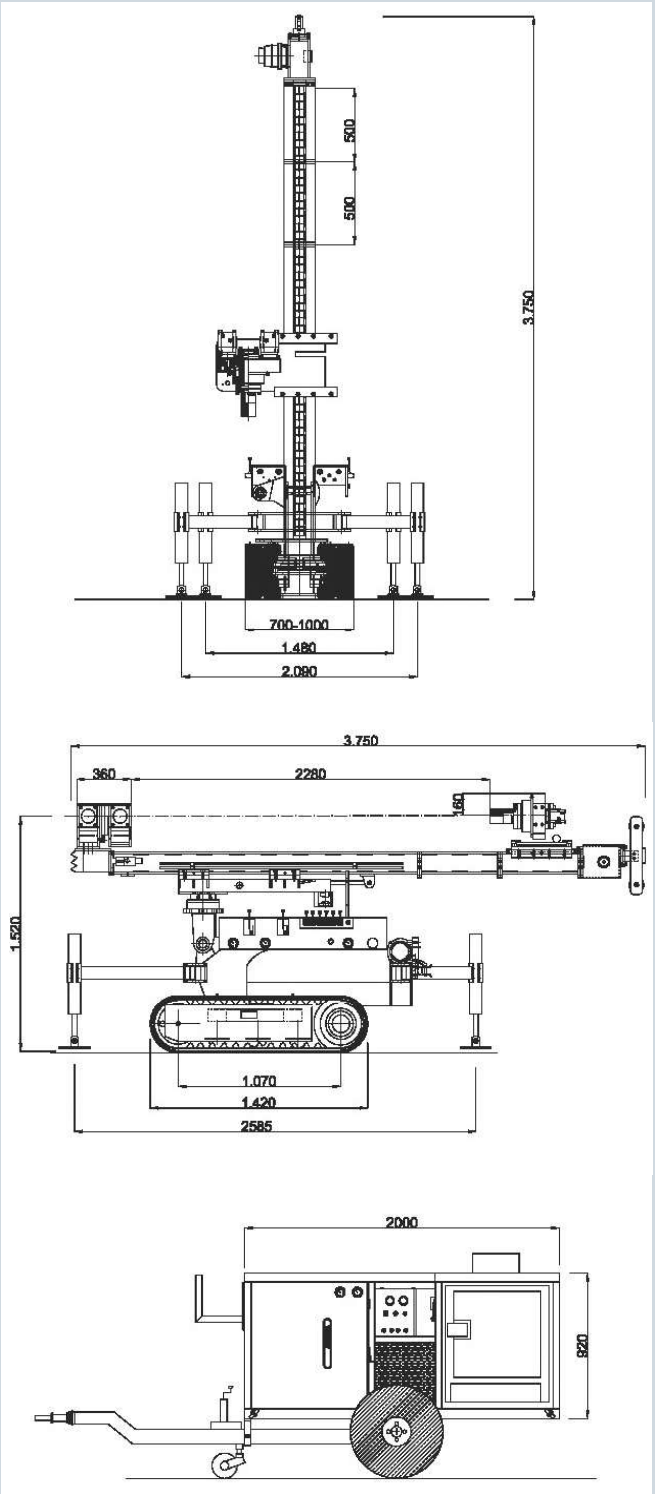
Dimensiones-Transporte
Dimmensions-Transport

MYM-C5

VERSIÓN TOP HAMMER



VERSIÓN ROTARY



Versión Top Hammer		Versión Rotary
1.700 kg.	Peso total de la máquina	1.500 kg.
2.120 Kg.	Peso total del Power Pack	1.050 Kg.

Las especificaciones técnicas de los equipos están sujetas a cambios sin previo aviso. Las máquinas mostradas pueden tener opciones no reflejadas.

Technical specifications may change without prior notice. Drilling rigs could be equiped with other options.

Especificaciones Técnicas
Technical Specifications

MYM-C5

VERSIÓN ROTARY

Power Pack	
Motor diesel	DEUTZ F3L2011
Refrigeración	Aire / Air
Potencia a 2.300rpm	34 kW (46 HP)
Capacidad depósito combustible	55 Litros
Sistema hidráulico	
Bombas hidráulicas	2 Bombas
Principal	70 l/min
Secundaria	25 l/min
Presión de trabajo 180 bar	180 bar
Capacidad del depósito hidráulico	189 l
Insonorización	75 dB
Carro base de la máquina	
Tipo de orugas	Extensible
Fuerza de arrastre de orugas	2.500 kg
Velocidad de desplazamiento	2.5 km/h
Presión sobre el suelo	0,449 kg/cm^2
Anchura total del carro base	700 a 1.000 mm
Ancho de tejas	230 mm
Longitud de orugas	1.420 mm
Altura sobre el suelo	350 mm
Mástil de perforación	**CR 600**
Tipo	Reforzado
Par máximo	580 kg/m
Velocidad rotación máxima	140 r.p.m.
Longitud total del mástil	2.640 mm
Longitud de avance	1.295 mm
Fuerza de avance	3.000 kg
Fuerza de retracción	3.000 kg
Velocidad de avance/retracción	10 cm/s
Velocidad rápida avance/retracción	12 cm/s
Mordaza	
Tipo	Doble 70 – 200
Peso	
Peso de la máquina	1.500 Kg
Peso del power pack	1.050 Kg

VERSIÓN TOP HAMMER

	Power Pack
DEUTZ BF4M 2012	Diesel engine
Agua / Water	Cooling system
74.9 kW (100 HP)	Power rated at 2.000 r.p.m.
100 Litros	Fuel tank capacity
	Hydraulic system
3 Bombas	Hydraulic pumps
90+90 l/min	Main
25 l/min	Secundary
180 bar	Operating pressure
189 l	Hydraulic tamo capacity
75 dB	Sound proofing cover
	Machine crawler base
Extensible	Crawler type
2.500 kg	Towing force (crawlers)
2.5 km/h	Travel speed
0,508 kg/cm^2	Ground pressure
700 a 1.000 mm	Overall Width
230 mm	Track Width
1.420 mm	Tracks length
350 mm	Ground clearance
HB 35 A	**Drilling mast**
Reforzado	Type
415 kg/m	Max. Torque
115 r.p.m.	Max. Speed
2.640 mm	Total length (mast)
1.295 mm	Feed length
3.000 kg	Feed force
3.000 kg	Retracction force
10 cm/s	Feed / retraction (speed)
12 cm/s	Feed / retraction (fast speed)
	Clamps
Doble 70 – 200	Type
	Weight
1.700 Kg	Machine weight
2.120 Kg	Power pack weight

Perforadora hidráulica

Hydraulic drilling rig

MYM-C5

MECANIZACIÓN Y MINERÍA, S.A.

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Edición: Enero de 2007

Emergency Kill Switch

Emergency Kill Switch

Warning Lamp

Junction Box

X3 Connector

X3 Connector

Audible Alarm

Pressure Switch

Percusion Control Switch

* Optional Electric Percusion Control

Percusion Control Valve

Remote Drill Unit

X3 Connector

X3 Connector

Pre-glow setting

BE20B (rear view)

#1 #2 (*1) #3 #4 #5 #6 #7 #8 #9 #10 #11 #12 #13

Output

5 Amp

-V Batt

50

30

(*1) Total Current=3A Max

(*2) Total Current=200mA Max

10 A - Fuse

87a 87 30 86 85

R-1 Relay

R-2 Relay

Emergency Kill Switch

Main Terminal Strip

Alarm Over ride Switch

30 A - Fuse

X17 Connector

X17 Connector

Control Panel Junction Box

Engine Harness Terminal Strip (unused wires)

Temp Switch

Engine Cooling Fan

Battery

Power Pack

Engine Electrical Harness & Components

G WK P

Lube oil Pressure Sensor/switch

G WK

Coolant temp Sensor/switch

(-) (+)

Excess Start Fuel Soleniod

(-) (+)

Shutdown Solenoid

D+ B+ W

Alternator

Starter motor 30 50

M

31

Description: Electrical Schematic for MYM-C5 Drill

No.	Revision	Date	Model No.	Serial No.

Note: This schematic incorporates 5 or more drawings. The original drawings were in Spanish and very incomplete. Be aware that there may be errors or mistakes in this drawing. These can be remedied by contacting the draftsman. Thank you.

Draftsman: Paul Rave Date: 11/15/2015 File No. TBH MYM-5C Drill~002.SKF

MECANIZACIÓN Y MINERÍA, S.A.

SERIAL Nº: 1005/07
YEAR OF MANUFACTURING:2007

HYDRAULIC DRILLING RIG
MYM-C5 ROTARY II - KRUPP HR40

optional

Shop
661-829-5931

DISTRIBUTOR: HENNESSY INTERNATIONAL INC.

CUSTOMER:

EC Declaration of Conformity

We, MECANIZACIÓN Y MINERÍA S.A.
C / Pelaya 33.
28110 Algete (Madrid)- España

Hereby declare under our own responsability that the equipment

Type	**HYDRAULIC DRILLING RIG**
Model	**MYM-C5 ROTARY II. KRUPP HR40**
Serial Nº	**1005/07**
Year of manufacturing	**2.007**
Engine Type	**DEUTZ BF4M 2012**
Power /RPM	**74,9 kW / 2.300 rpm**

Has bein manufactured in conformance with the provisions of the law which trasnpose the following ECC standards and their subsequent amendments: 98/37 CE, UNE-EN 292-1:1993 y UNE-EN 292-2 :1993. Safety for machinesand NORMA UNE-EN 791:1996 refered to drilling rigs.

Average Sound L_{WA}= 79 dB(A)

Name	**Ángel**
Surname	**Moreno González**
Cargo	**Director General**

Place and data:
Madrid, 29/11/2007

Signature