Operation Manual

Tier 4 Hydraulic Power Unit

Four Cylinder Diesel

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SAFETY

READ THIS MANUAL BEFORE USING EQUIPMENT

Equipment supplied by Texas International Oilfield Tools is intended for installation and use in controlled environments involving hazardous operations and situations.

Only authorized and trained personnel shall install, maintain, operate and/or repair equipment supplied by Texas International Oilfield Tools, LTD. Equipment shall be used only for the purpose for which it is intended.

The User is responsible for ensuring the equipment is in safe working order prior to use. Texas International Oilfield Tools, LTD is not responsible for injuries or equipment damage that arises from equipment neglect or misuse.

The User is responsible for ensuring the safety of all personnel within the vicinity of the equipment. Texas International Oilfield Tools recommends a hazard assessment be performed by qualified safety representatives prior to using equipment. All personnel shall possess and use Personal Protective Equipment (PPE) and must be trained at minimum on rig safety, rig procedures, and equipment operation.

Hazard Labels Used in this Manual

DANGER is represented by this hazard symbol and signifies the highest level of risk. Failure to observe and heed this information may result in serious bodily injury or death.

WARNING is represented by this hazard symbol and signifies potential hazards of medium risk. Failure to observe and heed this information may result in significant bodily injury, catastrophic equipment failure, and/or environmental contamination.

CAUTION is represented by this hazard symbol and signifies potential hazards of low risk. Failure to observe and heed this information may result in bodily injury and/or equipment damage.

NOTICE symbol denotes items of importance unrelated to personal injury which highlight additional information provided to aid the user during installation, commissioning, operating, and/or maintaining equipment.

Notes, cautions, warnings, explanations, and information are provided herein to advise readers to take deliberate action to protect personnel from potential injury or lethal conditions.
Please pay close attention to these advisories.

DANGER **Extreme forces are involved in using the Hydraulic Power Unit. Exercise the utmost caution, safety, and awareness when working on or around the equipment!**

WARNING

Always wear impact resistant eye protection while operating or working near this equipment.

WARNING

Personal hearing protection is recommended when operating or working near this equipment.

CAUTION

Operation, Maintenance, and/or Adjustments to any part of the Hydraulic Power Unit must be accomplished by trained and knowledgeable personnel only!
Contact TIOT for assistance if malfunctions or other issues with the equipment occur.

All safety requirements listed below are those generally applicable to hydraulically powered machinery but are not intended to be an all-inclusive list. They are intended as guidelines only and will assist in avoiding risk of injury when followed by qualified, experienced personnel.
These precautions should be included in the comprehensive safety program for the particular machinery, equipment, plant, or process and overseen by personnel capable of analyzing any hazards associated with operating and maintaining the equipment.

- Return all movable parts of the machinery being operated to their normal startup condition, if possible, before starting unit.
- Be sure all personnel, product, etc. are clear of machinery before starting hydraulic unit.
- Check to make sure any hydraulic connections which may have been removed, replaced or disconnected during shut down have been reconnected securely before starting hydraulic unit.
- If there are tools or machinery being operated by the HPU that may move when hydraulic flow or pressure are turned off or turned on, block or lock these parts in position before shutting down or starting the hydraulic unit.
- Shut down the hydraulic unit and relieve pressure from all pressurized accumulators, actuators, and lines before removing, tearing down or performing maintenance on any remotely located actuators, hoses, filters, valves, piping, etc.
- Do not inspect hoses and fittings for leaks using your bare hands. A pin-hole leak can inject hydraulic fluid through the skin, with the potential for serious injury.

- Avoid locating equipment in any environment for which it was not designed, and which may create a dangerous operating condition such as an explosive atmosphere (e.g., gas, dust), high heat (e.g., molten metal, furnace), chemicals, extreme moisture, etc.

- Avoid bodily contact with hydraulic fluids. Hydraulic fluids may irritate or injure the eyes and skin. Check with your fluid suppliers to obtain this information.

- Use only Texas International Oilfield Tools parts and materials when servicing the equipment. Substitute parts or materials could produce a hazardous operating condition.

- When piping your equipment, use only materials of adequate size and strength to suit the flows and pressures of the system. Consider all safety factors when selecting the strength of materials to allow for shock and over-pressure conditions which could occur.

INTRODUCTION

Figure 1
Tier 4 Hydraulic Power Unit

Texas International Oilfield Tools (TIOT) offers Tier 4 Hydraulic Power Units which are used to provide hydraulic power to numerous types of equipment requiring hydraulic pressure for operation. Each power unit is contained within a skid made for easy transport.

Tier 4 Hydraulic Power Unit Features

- Skid with leak proof belly pan for oil containment, drain plug, and thru skid forklift tubes
- Removeable Hose Storage Basket
- Removable 140 (125) gallon hydraulic tank with filter and sight glass
- Removable 30 (28) gallon diesel tank with sight glass
- Deutz 74hp Tier 4 Diesel Engine
- Murphy TEC-10 PowerCore Control Console
- Hydraulic Pump
- Hydraulically Driven Cooling Fan
- Bypass & Pressure Comp Flow Control Valves

SPECIFICATIONS

HPU COMPLETE		
	Weight (lbs) (Tanks Empty)	Full Weight (lbs) (Hydraulic & Diesel Tanks Full)
Weight	3,007	4,231

Dimensions

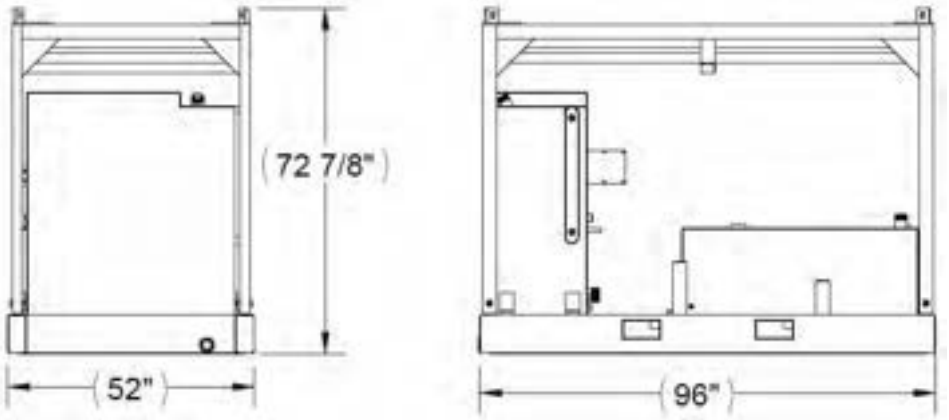


Figure 2

PUMP
For detailed information on the pump, please refer to the pump datasheet.
ENGINE
For detailed information on the diesel engine, see the Deutz engine manual.
COOLER
For detailed information on the cooler, see the cooler datasheet.

INSTALLATION

The diesel hydraulic power unit requires a location where adequate air flow and exhaust removal are available.

DANGER Ensure that adequate ventilation is available to carry away the exhaust fumes – diesel exhaust can be lethal

The Hydraulic Power Unit should be positioned on stable, level ground in a well-ventilated area.

CAUTION Ensure the unit will not shift or move from its intended location.

WARNING Transport the power unit using ***only*** the forklift tubes provided

Do not lift the entire unit using the basket lifting eyes. The basket lifting eyes are designed only for lifting the basket from the skid.

Figure 3

Avoid placing the unit in areas where hazardous vapors from other sources may exist.

Ensure that the unit is easily accessed for operation without hazards that will cause slips, trips, or falls.

Leave at least three (3) feet between the oil cooler fan and any wall or obstruction. Positioning with the fan facing open air will provide optimum cooling.

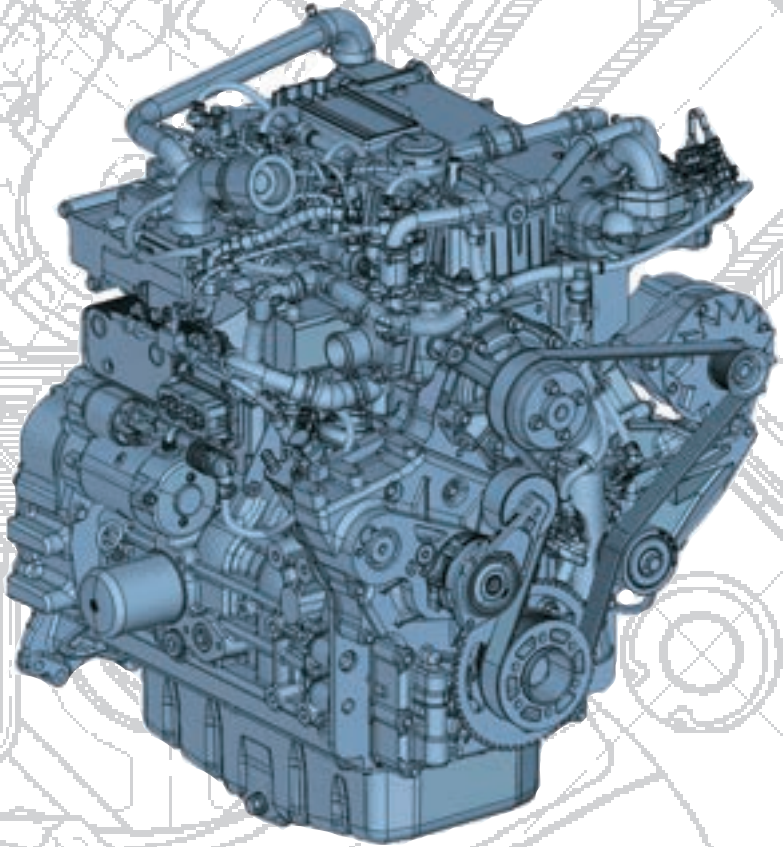
Ensure power cables and hoses are placed where they won't be cut, nicked, or crushed.

Every Company has to have a Toolbox.

At Texas International Oilfield Tools,

We provide the tools to fuel the World!

APPENDIX



Operation Manual

TD 3.6 L4
TCD 3.6 L4

DEUTZ®

Notes

Notes

- This engine is defined exclusively for purpose according to the scope of delivery and built by the equipment manufacturer (use for the intended purpose). Any other use above and beyond this will be considered as misuse. The manufacturer will not accept any liability for damages resulting from this. The user bears the sole risk.
- Use for the intended purpose also includes observance of the operating, maintenance and repair conditions specified by the manufacturer. The engine should only be operated, serviced and repaired by personnel trained in its use and the hazards involved.

  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 and hot components
  - on motors with external ignition (high electrical voltage). Contact must be avoided!
- Unauthorised engine modifications will invalidate any liability claims against the manufacturer for resultant damage.
- Equally, manipulations to the injection and control system can affect the engine's performance and the exhaust characteristics. Adherence to legislation on pollution can no longer be guaranteed under such conditions.
- Do not change the cooling air feed area to the blower of fan. An unobstructed cooling air supply must be guaranteed.

  The manufacturer will accept no liability for damage resulting from this.
- When carrying out maintenance work 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/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 contact 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 for the pressure to be relieved once the engine has shut down (for engines with common rail, approx. 5 minutes, otherwise 1 minute) as the system is under high pressure **- Danger to life!**

  During the first trial run do not stand in the danger area of the engine.

  Danger due to high pressure in case of leaks - **Danger to life!**
  - In case of leaks immediately contact workshop.
  - When working on the fuel system, make sure that the engine is not started inadvertently during repairs - **Danger to life!**

Dear customer,

Congratulations on the purchase of your DEUTZ engine.

DEUTZ air/liquid-cooled engines are developed for a broad spectrum of applications. Consequently, a wide range of variants is offered to meet the requirements of specific cases.

The engine is equipped accordingly for the particular installation situation, i.e. not all the components described in the operating manual are installed in your engine.

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

Please make sure that this operating manual is available to everyone involved in the operation, maintenance and repair of the engine and that they have understood the contents.

If you have any queries, please contact us, we'll be happy to advise you.

Sincerely,

DEUTZ AG

Engine serial number

Please enter the engine serial number here. This will simplify the handling of customer service, repair and spare parts queries.

Components of the exhaust aftertreatment system

Please enter the serial numbers of the exhaust aftertreatment components.

Diesel oxidation catalytic converter

Diesel particle filter

Notes

We reserve the right to make technical changes to the descriptions and data in this operating manual in the interest of further development of the engines.

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DEUTZ diesel engines

DEUTZ diesel engines and the appropriate exhaust aftertreatment components are the result of years of research and development. The detailed know-how gained by this in connection with the high quality demands are the guarantee for production of engines with a long life, high reliability and low fuel consumption. Naturally the high demands for protection of the environment are also met.

Safety precautions when the engine is running

Maintenance work or repairs may only be performed on the shut-down engine. Make sure that the engine cannot be started inadvertently - **Danger of accident!**

After repair work: Check that all guards have been replaced and that all tools have been removed from the engine.

Observe industrial safety regulations when running the engine in an enclosed space or underground.

When working on the running engine, work clothing must be close fitting.

Never fill the fuel tank while the engine is running.

Service and Maintenance

Service and maintenance are also decisive for whether the engine satisfactorily meets the set demands. Recommended service intervals must therefore be observed and service and maintenance work must be carried out conscientiously.

Special care should be taken under abnormally demanding operating conditions.

Original DEUTZ parts

Original DEUTZ parts are subject to the same strict quality demands as the DEUTZ engines. Further developments for improving the engines are also introduced in the original DEUTZ parts of course. Only the use of original DEUTZ parts manufactured according to the state-of-the-art can guarantee perfect functioning and high reliability.

DEUTZ Xchange components

DEUTZ replacement parts are a low-cost alternative. Of course, the quality standards here are just as high as for new parts. DEUTZ replacement parts are equal to the original DEUTZ parts in function and reliability.

Asbestos

The gaskets used in this engine contain no asbestos. Please use the appropriate original DEUTZ parts for maintenance and repair work.

Service

We want to preserve the high performance of our engines, and with it the confidence and satisfaction of our customers. We are therefore represented worldwide by a network of service branches.

The DEUTZ name does not merely stand for engines that are the products of extensive development work, DEUTZ also stands for complete service packages that ensure optimum operation of our engines, and for customer services operations that you can count on.

Please contact your DEUTZ-partner in case of malfunctions and sare parts inquiries. Our specially trained personnel will ensure fast, professional repairs using original DEUTZ spare parts in case of damage.

The DEUTZ home page gives you a continuously up-to-date overview of the service partners in your vicinity with notes on product responsibilities and services. Or you can use another fast, convenient way via the Internet under www.deutzshop.de. The DEUTZ P@rts Online parts catalogue gives you a direct contact to your nearest local service partner.

California
Proposition 65 Warning

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

Masthead

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Danger

This symbol is used for all safety instructions which, if not observed, present a direct danger to life and limb for the person involved. Observe these carefully. The attention of operating personnel should be drawn to these safety instructions. Furthermore, the legislation for "general regulations for safety and the prevention of accidents" must be observed.

Caution

This symbol indicates a danger to the part and engine. The relevant instructions must be observed, failure to do so can lead to destruction of the part and the engine.

Notes

This symbol accompanies notes of a general kind.

Engine type designation

This manual covers the following engine types

TD 3.6 L4

TCD 3.6 L4

TCD	
T	Exhaust gas turbocharger
C	Charge air cooler
D	Diesel

3.6	
3.6	Displacement in litres

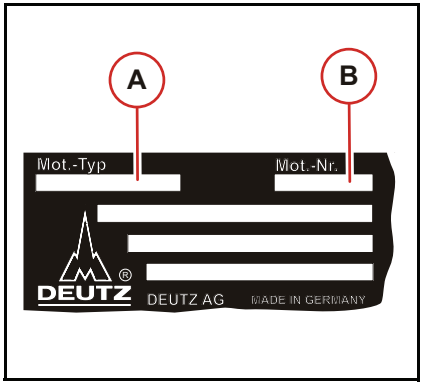
L4	
L	in series
4	No. of cylinders

Emissions legislation

The engine and the corresponding EAT system (**E**xhaust **A**fter **T**reatment) are adapted to each other and linked by an appropriate electronic controller.
They are only certified by the responsible authorities and comply with the permissible exhaust limits in this combination.
Operation of the engine with other EAT systems is not allowed.

The engines of these operating instructions fulfill the following exhaust emissions regulations	
TCD 3.6 >56 kW With exhaust aftertreatment system	
USA	EPA Tier 4i
EU	Stage IIIB
TD 3.6 <56 kW With exhaust aftertreatment system	
USA	EPA Tier 4 final
EU	Stage IV
TCD 3.6 >56 kW Without exhaust aftertreatment system	
USA	EPA Tier III
EU	Stage IIIA
TD 3.6 <56 kW Without exhaust aftertreatment system	
USA	EPA Tier 4i
EU	Stage IIIB

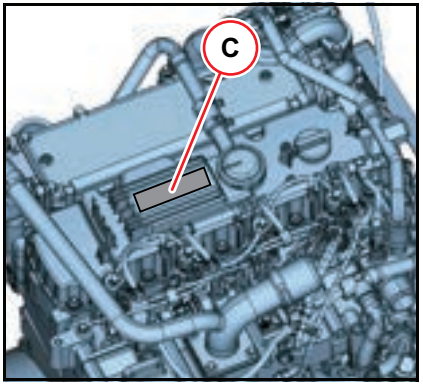
The engines of this operating manual may only be used with a functioning exhaust aftertreatment system.
(if included in the DEUTZ scope of supply)



Rating plate

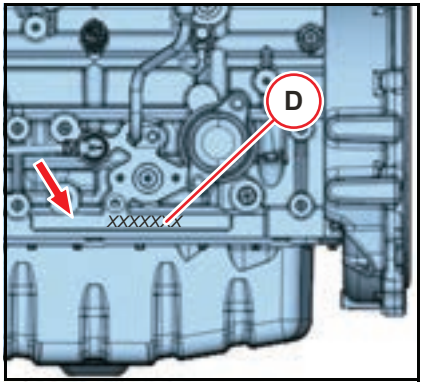
The type (A), engine number (B) and performance data are stamped on the rating plate.

The engine type and number must be stated when purchasing spare parts.



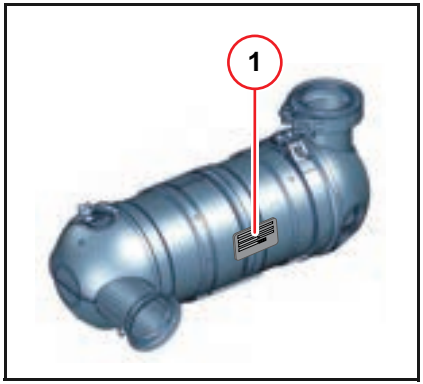
Location of the rating plate

The rating plate (C) is fixed to the cylinder head cover or the crankcase.



Engine serial number

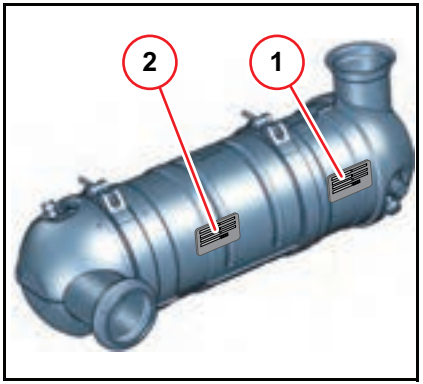
The engine number (D) is stamped onto the crankcase (arrow) and onto the rating plate.



Serial numbers of the exhaust aftertreatment components

1 Rating plate of the diesel oxidation catalytic converter

The serial numbers of the exhaust aftertreatment components are stamped on the rating plates.

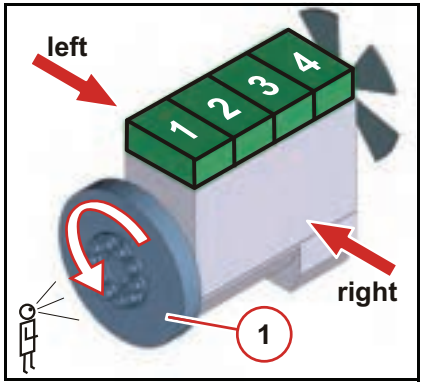


Serial numbers of the exhaust aftertreatment components

1 Rating plate of the diesel oxidation catalytic converter

2 Rating plate of the diesel particle filter

The serial numbers of the exhaust aftertreatment components are stamped on the rating plates.



Cylinder numbering

Cylinder arrangement

The cylinders are counted consecutively starting from flywheel (1).

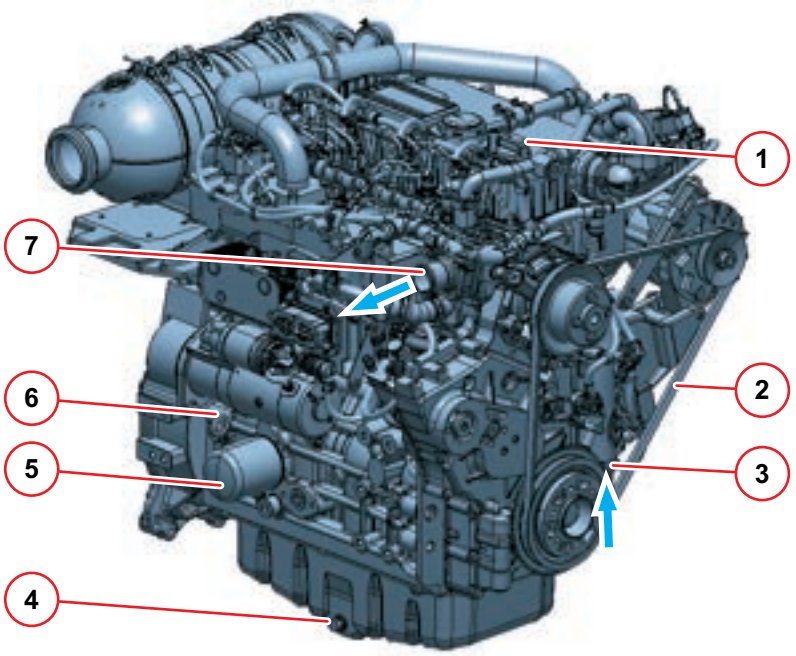
Direction of rotation

Looking onto the flywheel.

rotating to the left: counter-clockwise.

Engine sides

Looking onto the flywheel.

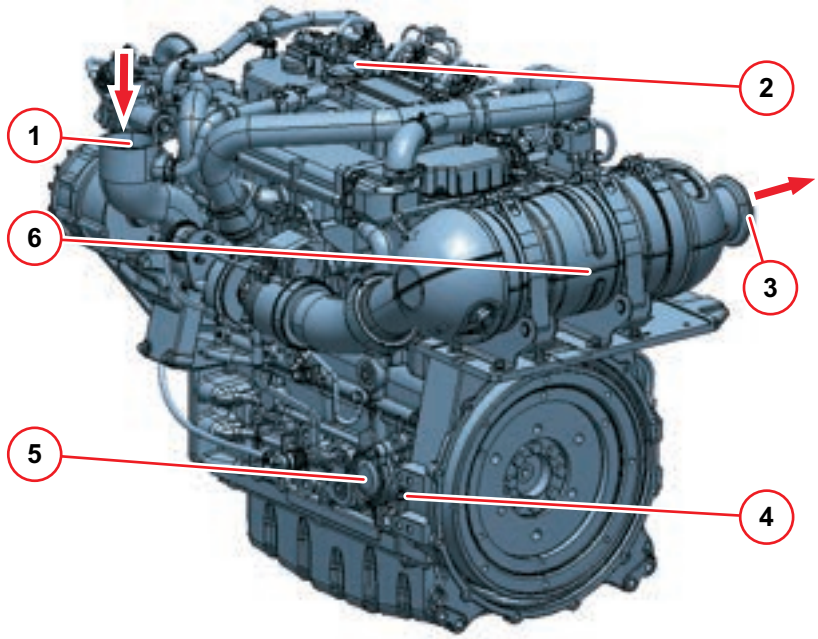


TD 3.6 L4

Industrial engine

View from right (example)

1 Lubricating oil filling
2 V-belts
3 Coolant inlet
4 Lubricating oil drain plug
5 Lube oil replacement filter
6 Lubricating oil dipstick
7 Coolant outlet

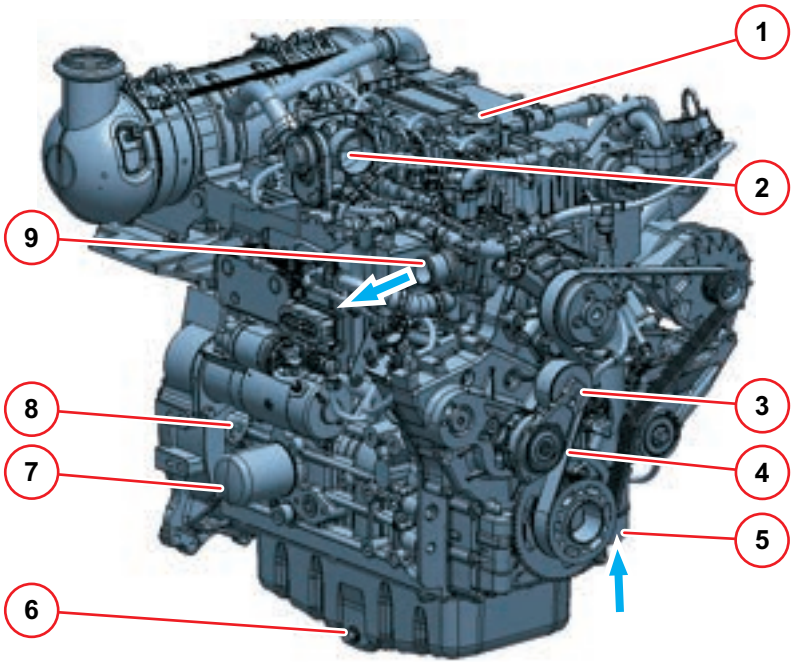


TD 3.6 L4

Industrial engine

View from left (example)

1 Combustion air inlet
2 Crankcase breather
3 Exhaust outlet
4 Lubricating oil dipstick
Optional
5 Lube oil replacement filter
Optional
6 Diesel oxidation catalytic converter

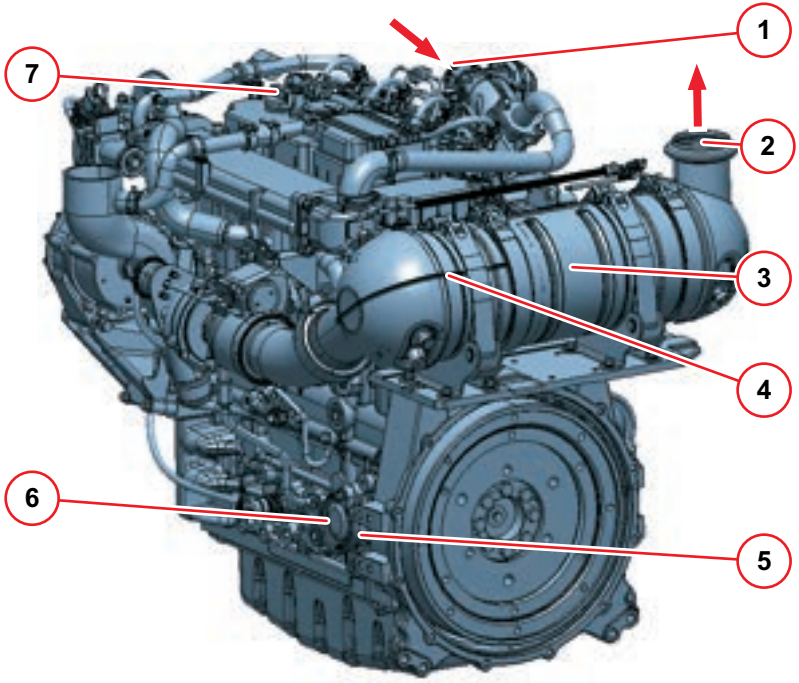


TCD 3.6 L4

Industrial engine

View from right (example)

1 Crankcase breather
2 Throttle valve
3 Tension pulley
4 V-rib belt
5 Coolant inlet
6 Lubricating oil drain plug
7 Lube oil replacement filter
8 Lubricating oil dipstick
9 Coolant outlet

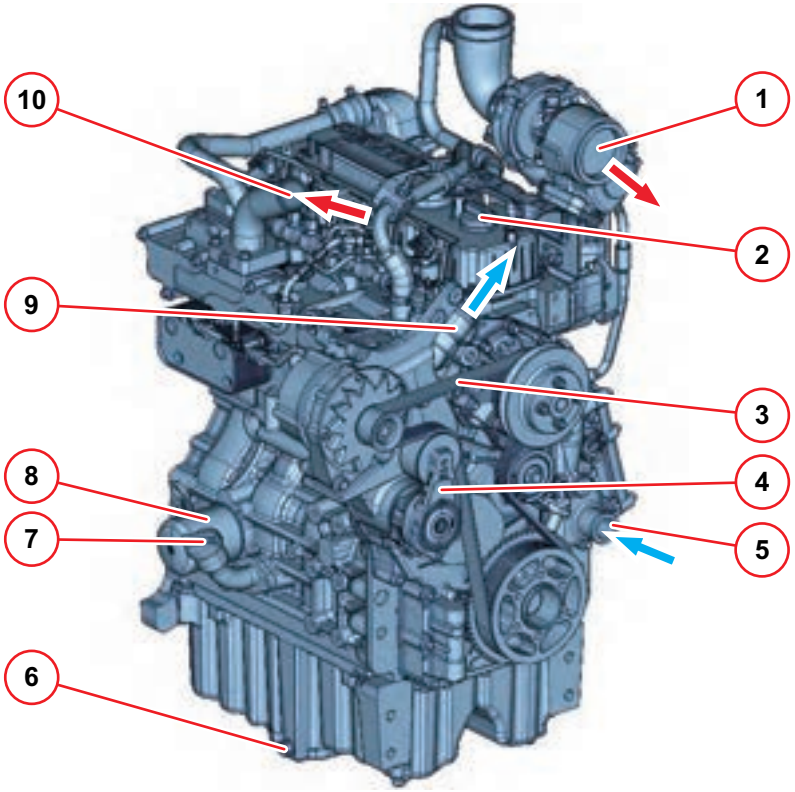


TCD 3.6 L4

Industrial engine

View from left (example)

1 Combustion air inlet
2 Exhaust outlet
3 Diesel particle filter
4 Diesel oxidation catalytic converter
5 Lubricating oil dipstick
Optional
6 Lube oil replacement filter
Optional
7 Lubricating oil filling

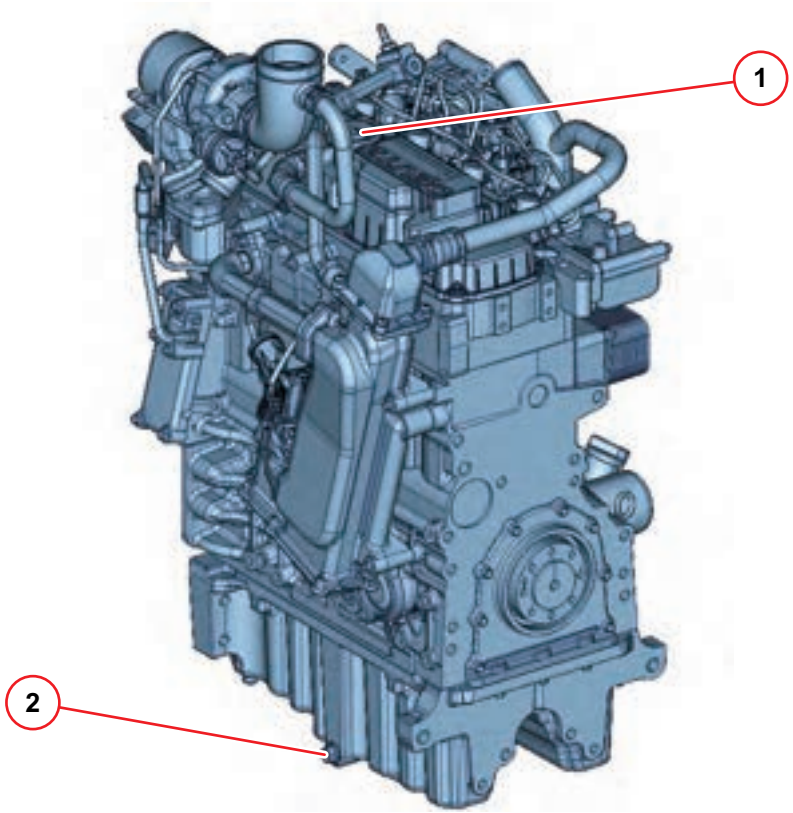


TCD 3.6 L4

Agricultural technology

View from right (example)

1 Exhaust outlet
2 Lubricating oil filling
3 V-rib belt
4 Tension pulley
5 Coolant inlet
6 Lubricating oil drain plug
7 Lubricating oil filling
8 Lube oil replacement filter
9 Coolant outlet
10 Combustion air inlet

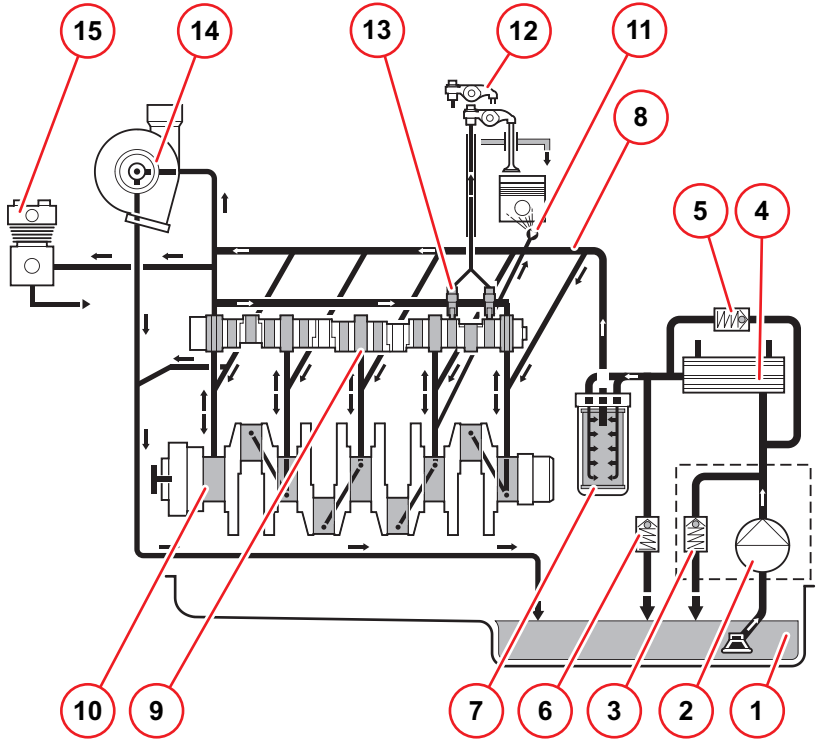


TCD 3.6 L4

Agricultural technology

View from right (example)

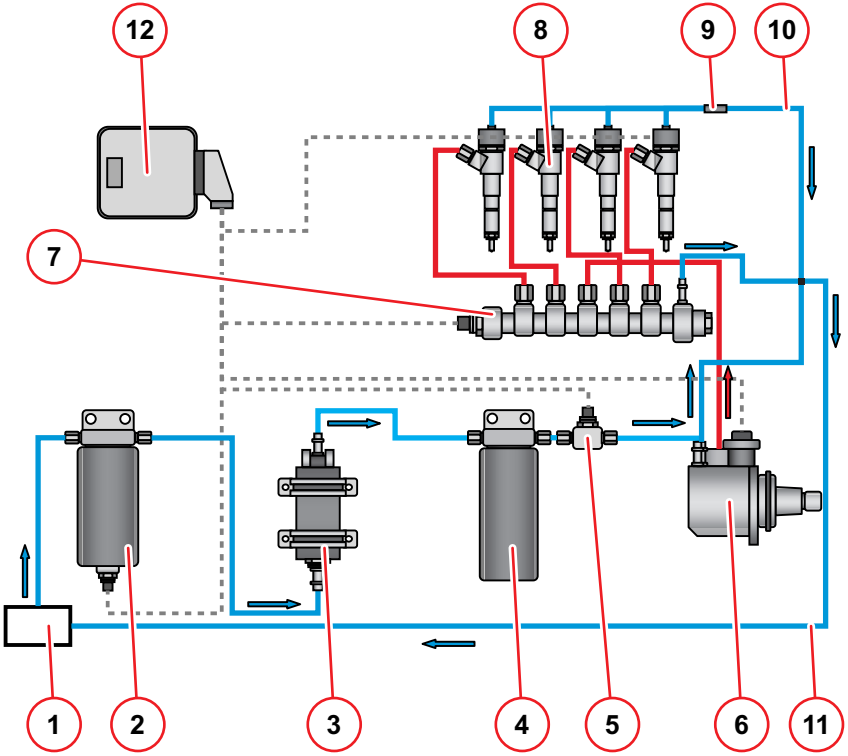
1 Crankcase breather
2 Lubricating oil drain plug



Lubricating oil system

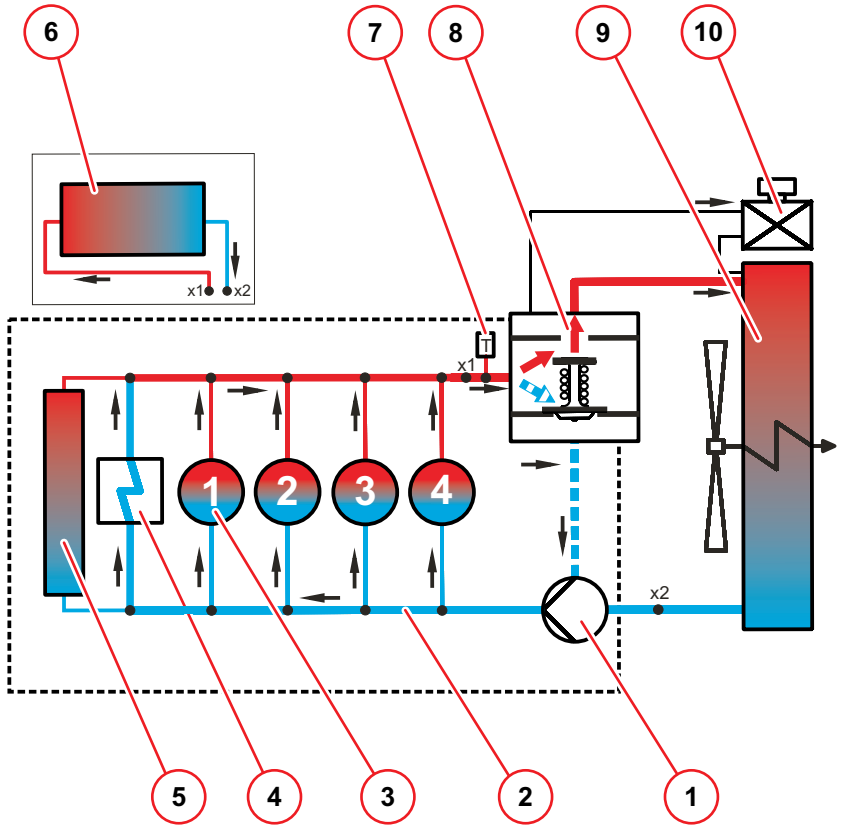
(example)

1 Lubricating oil sump
2 Lubricating oil pump
3 Overpressure valve
4 Lube oil cooler
5 Bypass valve
6 Pressure control valve
7 Lubricating oil filter
8 Main lube oil channel
9 Camshaft bearing
10 Crankshaft bearing
11 Piston cooling nozzle
12 Rocker arm
13 Hydraulic tappets
14 Turbocharger
15 Air compressor
Optional



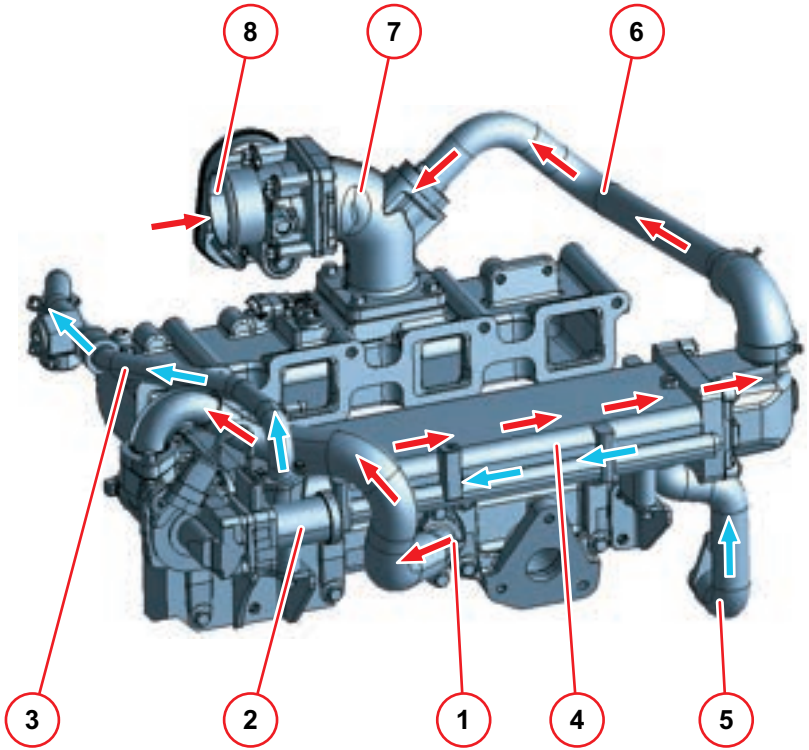
Fuel schematic (example)

1 Fuel tank
2 Fuel pre-filter
3 Fuel pump (electrically powered)
4 Exchangeable fuel filter
5 Fuel transducer
6 High-pressure pump with
– Control block FCU (Fuel Control Unit)
7 Rail
8 Injector
9 Check valve
10 Return line
11 Fuel return to fuel tank
12 Engine control unit



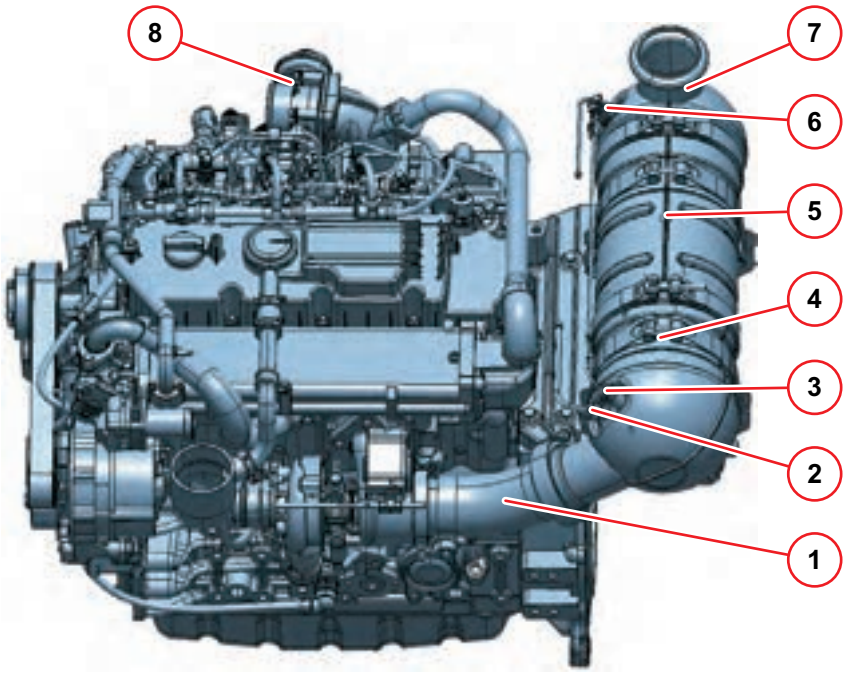
Coolant schematic (example)

1 Coolant pump
2 Coolant supply for engine cooling
3 Cylinder pipe/head cooling
4 Lube oil cooler
5 Exhaust return cooler
6 Connection possibility for cab heating
7 Temperature transmitter
8 Thermostat
9 Cooler
10 Compensation tank



External exhaust gas recirculation

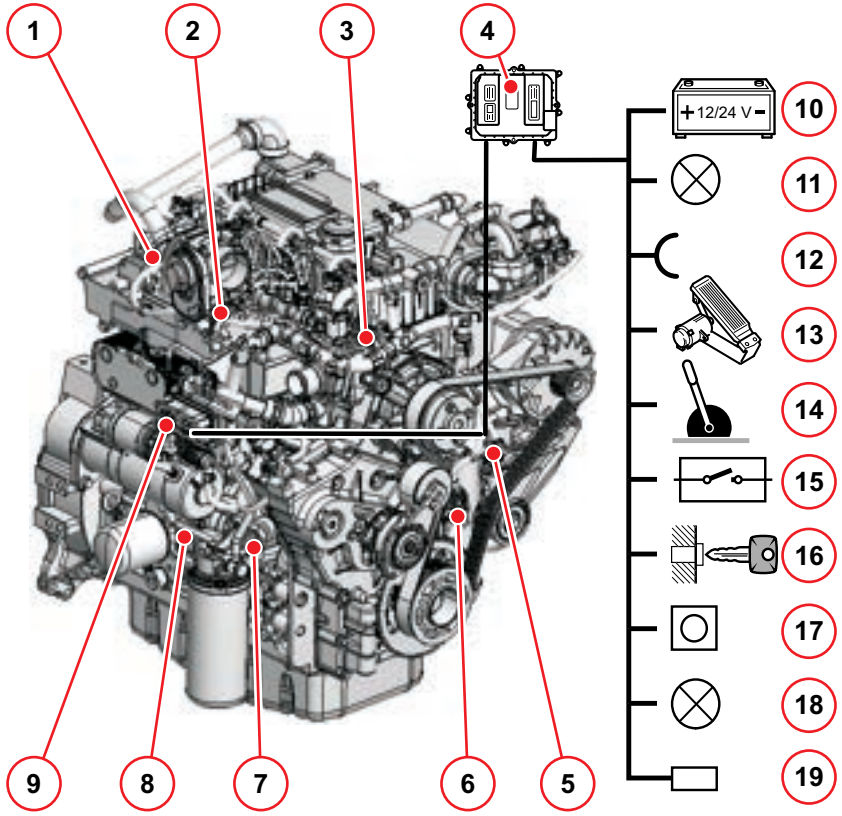
1 Exhaust gas partial flow (uncooled)
2 Actuator (electrically actuated)
3 Coolant return
4 Exhaust return cooler
5 Coolant line to the EGR cooler
6 Exhaust gas partial flow (cooled)
7 Mixing pipe
8 Throttle valve



Exhaust aftertreatment system

Example:

1 Decoupling line
2 Differential pressure sensor
3 Exhaust temperature sensor
4 Diesel oxidation catalytic converter
5 Diesel particle filter
Optional
6 Differential pressure sensor
7 Exhaust outlet
8 Throttle valve



Electronic engine control

Engine side

1 Rail pressure sensor
2 Charge air pressure transmitter, charge air temperature transmitter
3 Coolant temperature transmitter
4 Engine control unit
5 Speed transmitter via camshaft
6 Speed transmitter via crankshaft
7 Fuel transducer
8 Lubricating oil pressure transmitter (on the opposite side)
9 Central plug (for engine control)

Equipment side

10 Power supply (battery)
11 Signal outputs, e.g. for lamps, speed, engine operation, etc.
12 Inputs (e.g. override button)
13 Accelerator
14 Hand throttle
15 Optional function selector switch, e.g. for P degree, type of controls, maximum curve, fixed speeds, etc.
16 Detachable key switch Start/Stop
17 Diagnosis button
18 Error lamp
19 Diagnostic interface/CAN bus

Information about the engine electronics

This engine is equipped with an electric control unit.

The equipping of the respective system depends on the desired scope of function and the planned type of engine application.

The resultant wiring with pin assignment can be seen in the appropriate wiring diagram.

The installation regulations of the DEUTZ AG must also be taken into account.

Precautions

The connections of the control units are only dust and water proof when the mating plugs are plugged (protection class IP69K)!
The control units must be protected against spray water and moisture until plugging in the mating plugs!
Reverse polarity can lead to failure of the control unit.
To avoid damaging the control units, all the connections on the control unit must be disconnected before electric welding work.
Interventions in the electrical system contrary to the DEUTZ regulations or by unqualified personnel can permamently damage the engine electronics and have serious consequences which are not covered by the manufacturer's guarantee.

It is strictly prohibited:
a) to make changes or connections to the wiring of the electrical control devices and the data transmission cable (CAN lines).
b) to switch control units.
Otherwise guarantee rights will be lost!
Diagnostic and maintenance work may only be carried out by authorised personnel using equipment approved by DEUTZ.

Installation instructions

The control units are calibrated to the respective engine and identified by the engine number. Every engine may only be operated with the appropriate control unit.

Setpoint transmitters (pedal value transmitters) necessary for vehicle operation must be connected to the vehicle side cable harness and calibrated with the DEUTZ diagnostic program SERDIA (SERvice DIAgnosis). Wiring and cable assignment of the vehicle side cable harness must be taken from the connection diagram of the DEUTZ installation consulting.

Supply voltage

12 Volt

24 Volt

It should be ensured that the battery is sufficiently charged. If the supply voltage is interrupted while the engine is running, this can lead to damage to the electrics/electronics. If the supply voltage fails, the engine shuts down.

Voltages above 32 Volt will destroy the control unit.

Diagnostics

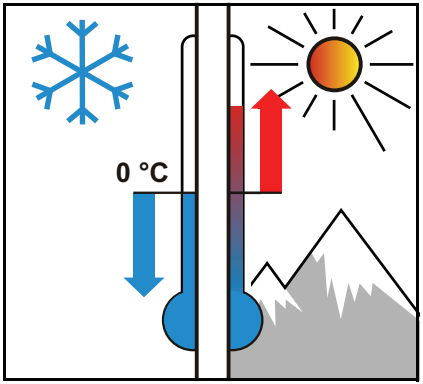
DEUTZ control units are equipped with self-diagnostics. Active and passive error entries are saved in the error memory. Active errors are displayed on error lamps/diagnostics lamps (62).

A diagnosis can be made with:

- Error lamp (flash code)
- CAN bus
- DEUTZ electronics display
- Diagnostic socket (SERIDA)

Equipment-side wiring

The DEUTZ AG installation regulations should be adhered to. In particular, the plug contact must be crimped with the appropriate standard tools. If it is necessary to do so, plugged-in contacts may only be removed from the plug housing with the proper tools.



Low ambient temperatures

Lubricating oil

- Select the lubricating oil viscosity according to the ambient temperature.
- If cold starting occurs frequently cut the lube oil changing interval by half.

Fuel

- Use winter fuel below 0 °C (39).

Battery

- A good charging condition of the battery (56) is the prerequisite for starting the engine.
- Heating up the battery to approx. 20°C improves the starting behaviour of the engine. (Remove and store the battery in a warm room).

Cold start aid

- The engines in these operating instructions are equipped with glow plugs.(26)

Coolant

- Observe the mixing ratio anti-freeze/cooling water. (40)

High ambient temperatures, high altitude

This engine is equipped with an electric control unit.
Under the operating conditions listed below, the amount of fuel is reduced automatically, controlled by the electronic control unit.

- Application at high altitude
- Application at high ambient temperatures

Reason: Air density decreases as altitude or ambient temperature increase. This reduces the amount of oxygen in the engine intake air and the fuel-air mixture would be too rich if the injected amount of fuel were not reduced.

- The results would be:
  - black smoke in the exhaust
  - high engine temperature
  - reduction in engine performance
  - possible impairment of starting behaviour

Consult your equipment supplier or DEUTZ partner if you have any other questions.

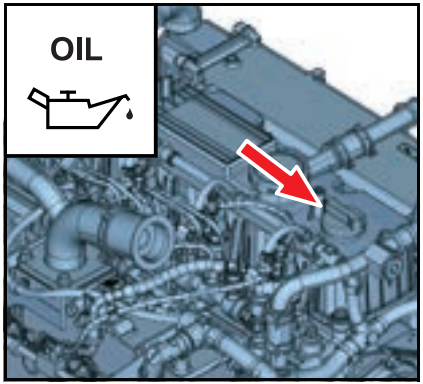
Preparations for initial commissioning

(Maintenance schedule E 10)

- Remove engine corrosion protection
- Remove any transport devices.
- Check the battery and cable connections and mount if necessary.
- Check belt tension (54).
- Have the engine monitor or warning system checked by authorised personnel.
- Check the engine mounting.
- Check that all hose unions and clips fit properly.

The following additional work must be carried out on generally overhauled engines:

- Check the fuel pre-filter and main filter and change if necessary.
- Check the intake air cleaner (if available, maintain according to maintenance indicator).
- Drain lubricating oil and condensation water from the charge air cooler.
- Fill with engine lube oil.
- Fill the coolant system (67).

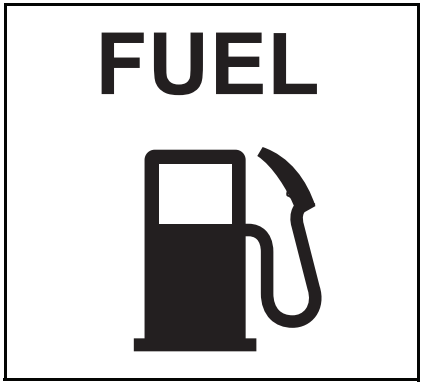


Fill with engine lube oil

Low lubricating oil level and overfilling lead to engine damage.

The engines are generally supplied without lubricating oil filling.
Select lubricating oil quality and viscosity before filling.
Order DEUTZ lubricating oils from your DEUTZ partner

- Fill the engine with lubricating oil via the lubricating oil filler neck.
- Observe the lubricating oil filling level (67).



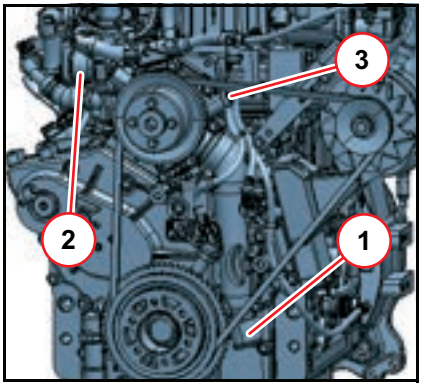
Pour in fuel

Never fill the fuel tank while the engine is running.
Ensure cleanliness.
Do not spill fuel.
Additional venting of the fuel system by a 5 minute trial run at idle speed or on low load is absolutely essential.

- Fuel low-pressure system must be vented before initial start-up after filling with the electric fuel supply pump. 48

Only use clean commercially available brand diesel fuel. Observe fuel quality (39).

Use summer or winter-grade fuel, depending on the ambient temperature.



Filling the coolant system

The coolant must have a prescribed concentration of cooling system corrosion protection agent!
Never operate the engine without coolant, even for a short time!

Order coolant corrosion protection agent from your DEUTZ partner.

- Connect coolant outlet (2) and coolant inlet (1) to the cooling system. Connect the feed line of the compensation tank to the coolant pump or to the coolant inlet line (3).
- Connect ventilation line from the engine and, if necessary, from the cooler to the compensation tank.
- Fill cooling system via the compensation tank.
- Close compensation tank with valve.
- Start the engine and run up until the thermostat opens (line (2) heats up).
- Engine operation with open thermostat 2 - 3 minutes.
- Check the coolant level and top up coolant if necessary.

Danger of scalding from hot coolant!
Cooling system under pressure! Only open the cap when cool!
Observe safety regulations and national specifications when handling cooling media.

- If required, repeat procedure with engine start.
- Fill up coolant to the MAX mark on the compensation tank and close the cooling system cap.
- Switch on any available heating and set to the highest level so that the heating circuit is filled and vented.
- Observe the filling volume of the cooling system (67).

Trial run

Additional venting of the fuel system by a 5 minute trial run at idle speed or on low load is absolutely essential.

Carry out a brief trial run up to operating temperature (approx. 90 °C) after preparations.

Do not load the engine if possible.

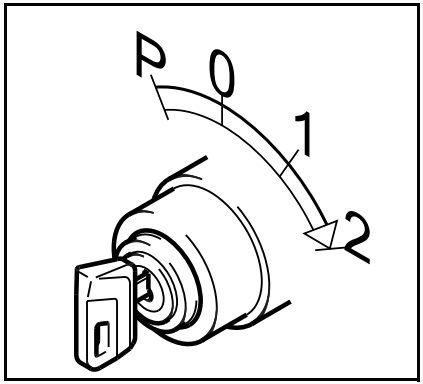
- Work with the engine not running:
  - Check engine for tightness.
  - Check lubricating oil level, if necessary top up.
  - Check the coolant level and top up coolant if necessary.
- Work during the trial run:
  - Check engine for tightness.

Starting

Before starting, make sure that nobody is standing in the immediate vicinity of the engine or work machine.
After repair work: Check that all guards have been replaced and that all tools have been removed from the engine.
When starting with the flame glow plug/ glow plug/heating flange system do not use any other starting aid (e.g. injection with start pilot). Risk of accident!

If the engine fails to fire and the error lamp lights, the electronic engine control 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.
Do not actuate the starter for more than 20 seconds. 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 attempts, determine the cause as per fault table (58).
Do not run up the engine immediately to high idling speed / full load operation from cold.

Disconnect the engine by uncoupling devices to be driven where possible.



with cold starting device

- Insert key.
  - Position 0 = no operating voltage.
- Turn key to the right.
  - Position 1 = operating voltage.
  - Engine is ready for operation.
- Below the temperature specified in the electronic engine control, the pre-heating phase begins with turning on the ignition.
- The electronic engine control controls and activates the current feed to the glow plugs via the engine coolant temperatures.
- Push the key in and turn further clockwise against spring pressure.
  - Level 2 = start.
- release the key as soon as the engine starts up.
  - The pilot lamps will go out.

If the starter is controlled by the electronic engine control via a relay:

- the maximum start duration is limited.
- the pause between two start attempts is specified.
  - the start is then continued automatically
- starting while the engine is running is prevented.

If the touch start function is programmed, a short start command with the ignition key in position 2 or a start button, if available, suffices.

Electronic engine control

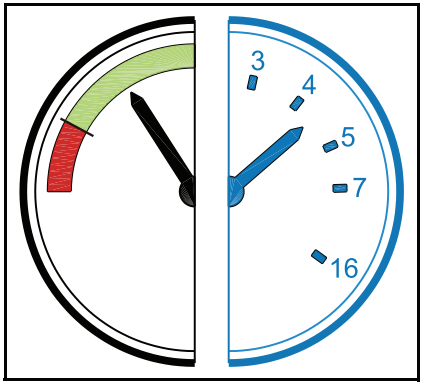
The statuses are displayed by the error lamp.

The system monitors the condition of the engine and itself.

- Function test
  - Ignition on, error lamp lights up for approx. 2 seconds and then goes out.
  - Check the error lamp if there is no reaction after switching on the ignition.
- The lamp does not light
  - After the lamp test an extinguished lamp indicates an error-free and trouble-free operating state within the scope of the control possibility.
- Continuous light
  - Error in the system.
  - Operation continued with restrictions.
  - The engine must be checked by a DEUTZ partner.
  - If a lamp lights steadily a monitored measuring variable (e.g. coolant temperature, lubricating oil pressure) has left the permissible value range.

  Depending on the fault, the engine power may be reduced by the electronic engine control to protect the engine.
- Flashing
  - Serious error in the system.
  - Switch off prompt for the operator. Attention: Failure to do so will lead to loss of guarantee!
  - The engine has reached switch-off condition.
  - Engine forced to run with power reduction to cool the engine, with automatic shutdown if necessary.
  - The switch-off process has been accomplished.
  - There may be a start lock after engine stop.
  - The start lock is deactivated by turning off the system with the ignition key for approx. 30s.
  - Additional control lamps, e.g. for lubricating oil pressure or lubricating oil temperature, are switched on if necessary.
  - optionally the power reduction can be bypassed, the automatic switch-off delayed or a start lock bypassed with the override key on the instrument panel to avoid critical situations. This brief deactivation of the engine protection functions is logged in the control unit.

The engine protection functions are released in co-operation with the equipment manufacturer and the DEUTZ installation consulting and may be designed individually. It is therefore absolutely essential to observe the operating instructions of the equipment manufacturer.



Display instrument

Possible displays:

- Colour scale
  - Display of operating state by coloured areas:
  - green = normal operating state
  - red = critical operatng state
    Take suitable action.
- Measured value scale
  - Actual value can be read off directly. The nominal value should be taken from the Technical Data (67).

Instruments and symbols

Instruments/symbols	Designation	Possible display:	Measure
	Lubricating oil pressure display	Lubricating oil pressure in the red area	Switch off engine
	Coolant temperature	Coolant temperature too high	Switch off engine
	Lubricating oil temperature	Lubricating oil temperature too high	Switch off engine
	Lubricating oil pressure pilot lamp	Lubricating oil pressure below minimum	Switch off engine
	Lube oil level	Lubricating oil level too low	Fill up lube oil
	Coolant level	Coolant level too low	Shut down the engine, allow to cool and top up coolant
	Operating hours counter	Indicates the previous operating time of the engine	Observe the maintenance intervals
	Horn	With acoustic signal	See fault table (58).

Instruments/symbols	Designation	Possible display:	Measure
	Ash lamp	Continuous light	The ash lamp indicates that the loading of the diesel particle filter with ash has reached a critical level and the device can no longer regenerate. 32
	DPF function lamp	Continuous light flashes (0.5 Hz) flashes (2 Hz)	Initiate standstill regeneration 32
	Engine warning lamp	Continuous light Flashing	Initiate standstill regeneration 32

DEUTZ Electronic Display

In order to show measured values and error messages of the EMR control unit, a CAN display is optionally available, which can be integrated into the dashboard of the driver´s position of working machines.

The following data may be displayed if they are sent by the control unit.

- Engine speed
- Engine torque (current)
- Coolant temperature
- Suction intake air temperature
- Exhaust gas temperature
- Lubricating oil pressure
- Coolant pressure
- Charge air pressure
- Fuel pressure
- Status of the regeneration of the diesel particle filter
- Operation monitoring of the diesel particle filter
- Faults in the exhaust aftertreatment system
- Battery voltage
- Accelerator position
- Fuel consumption
- Operating hours

Error messages are displayed in clear text and acoustically; the error memory of the control unit can be read out.

For a detailed description, refer to the operating instructions enclosed with the DEUTZ Electronic Display.

Diesel oxidation catalytic converter

The diesel oxidation catalytic converter has a catalytic surface which is used to convert the pollutants in the exhaust gas into harmless substances. Here, carbon monoxides and unburned hydrocarbons are made to react with oxygen and converted into carbon dioxide and water. In addition, the nitrogen monoxides are converted to nitrogen dioxides.

Temperatures > 250 °C are necessary for a high degree of efficiency.

Diesel particle filter

The combustion of diesel fuel results in soot, which is separated in the diesel particle filter. This must be regenerated as the contamination with soot increases. That means that the soot in the diesel particle filter is burned.

The regeneration is based on a continuous regeneration process, which is activated as soon as the exhaust temperature of 250 °C is exceeded at the inlet of the exhaust gas aftertreatment system. The filter contamination with soot is monitored continuously by the engine control unit.

Regeneration

The passive particle filter system burns the soot in the filter with the nitrogen oxides in the exhaust which are oxidised in the DOC beforehand. This process runs continuously once the exhaust temperature has exceeded 250°C. The passive particle filter system does not contain a burner. A prerequisite for the passive continuous regeneration is having a sufficient ratio of nitrogen oxides to soot in the raw exhaust gas of the engine.

Normal operation

Under normal operating conditions (exhaust temperature > 250 °C), the filter contamination with soot remains in a permissible range and no actions are necessary.

The regeneration lamp is off.

Support mode

If the operating conditions of the engine do not permit any passive regeneration, the contamination of the diesel particle filter with soot will increase.

A throttle valve controlled via the engine control unit is located in the combustion air inlet. This is used to increase the exhaust gas temperature for regeneration of the diesel particle filter, if this is not reached during normal operation.

This can be the case if:

- The engine only has short operating times.
- The engine workload is not high.

This process is automatically activated by the engine control unit, the operator does not need to perform any actions.

The regeneration lamp is off.

During this operating state, an acoustic change occurs to the running of the engine.

Standstill regeneration

Temperatures of approx. 600 °C occur on the exhaust pipe during regeneration.
A special engine operating state becomes active during standstill regeneration and the machine is not allowed to be used during the active standstill regeneration.
Danger of burns!

If the support mode does not attain an adequate reduction of the soot contamination, the filter will continue to become contaminated with soot and a standstill regeneration will be necessary.

This is displayed by a flashing regeneration lamp.

The standstill regeneration must be initiated manually by the operator.

We recommend carrying out a necessary standstill regeneration as quickly as possible, as otherwise the diesel particle filter will continue to become contaminated with soot.

If the standstill regeneration is not carried out, the engine control unit will activate the specified engine protection functions, depending on the contamination of the diesel particle filter.

Every standstill regeneration slightly dilutes the engine oil with fuel. The oil quality is therefore monitored. The request to change the oil must therefore be obeyed.

Implementation of the standstill regeneration

The engine must be brought into a "safe state" for the regeneration:

- Shut down the engine on an open terrain at a safe distance to flammable objects.
- Warm up the engine; the coolant temperature must reach at least 75°C.
- Operate the engine in idling.
- The engine control unit now requires a signal indicating that the unit is safely parked (stationary signal).
  This occurs,depending on the application, for example by:
  – Activating the parking brake.
  – Engaging a specified gear position in the gearbox.
- Operating the release button.
  Position depends on application, see device manual.

The regeneration lamp lights up continuously.

Once the standstill regeneration has been released, the engine automatically increases the speed level.

Using the device during standstill regeneration is prohibited.

The regeneration lasts 30 minutes on average.

The standstill regeneration can be interrupted at any time by pressing the regeneration button again or by removing the regeneration release.

Using the device during standstill regeneration also leads to it being interrupted.

The request for standstill regeneration remains until it is completed without interruption.

Certain engine faults lead to excessive carbon emission which cannot be seen due to the diesel particle filter.

In such cases, the diesel particle filter can be loaded very quickly, among other things, to a level which no longer allows a standstill regeneration by the opera-

tor.

Very short intervals between two standstill regenerations (<10h) can be an indication of such a defect.

Please contact the DEUTZ service.

The regeneration lamp goes out when regeneration has been successfully completed.

If the standstill regeneration request is not observed and the DPF is overloaded to an impermissible level, then the filter can only be regenerated via the DEUTZ service.

Replacing the diesel particle filter

It may be necessary to replace the diesel particle filter after a high filter running time as non-combustible residues accumulate in the filter - so-called ash.

If the ash loading goes beyond a certain level, this will be indicated by the ash lamp.

The diesel particle filter needs to be replaced.

The machine can operate normally until the replacement is carried out by the service.

The time interval between two regeneration requests is shortened in proportion to the run time.

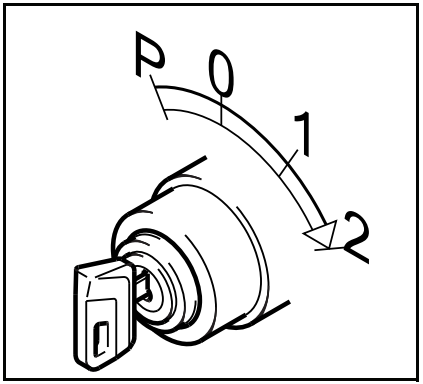
Please contact your DEUTZ partner

The contaminated diesel particle filter can be returned and replaced with a clean one in the DEUTZ exchange programme.

Display of the regeneration control

The display and monitoring of the exhaust aftertreatment system can be executed either with pilot lights or with a CAN interface and a corresponding display, depending on the engine version.

Instruments/symbols			Power reduction	Regeneration
 Regeneration lamp	 Engine warning lamp	 Ash lamp		
off	off	off		Normal operation
off	off	off		Support mode
flashes (0.5 Hz)	off	off		Standstill regeneration Release by the operator
flashes (2 Hz)	Continuous light	off	-30 %	Standstill regeneration Release by the operator
flashes (2 Hz)	Flashing	off	-30 % + Engine speed limitation to 1200 rpm	Standstill regeneration Release only by the DEUTZ partner
flashes (2 Hz)	Flashing	Continuous light Ash load 100 %	-30 % + Engine speed limitation to 1200 rpm	No regeneration possible



Shutting off

Avoid switching off from full load (coking/ blockage of the remaining lubricating oil in the turbocharger bearing housing). The lubricating oil supply of the turbocharger is then no longer guaranteed! This shortens the life of the turbocharger.
Run the engine in low idling speed for approximately one minute after relieving the load.

- Move the key to position 0.
  P = gear position: park
  0 = gear position: switch off engine
  1 = gear position: Ignition on
  2 = gear position: start engine

Lag time

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

General

Modern diesel engines place very high demands on the lubricating 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 lubricating oil. The lubricating oil is also more exposed to contamination due to reduced oil consumption and longer oil change intervals. For this reason it is necessary to observe the requirements and recommendations described in this operating manual in order not to shorten the life of the engine.

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

In principle, all engine oils of the same specification can be mixed. However, mixing of engine oils should be avoided because the worst properties of the mixture are always dominant.

The lubricating oils approved by DEUTZ have been thoroughly tested for all engine applications. The active ingredients they contain are compatible with each other. Therefore, the use of additives for lubricating oils is not permitted in DEUTZ engines.

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

The **lubricating oil viscosity** describes the way the lubricating oil flows, depending on the temperature. The lubricating oil viscosity only has a small influence and effect on the quality of the oil.

Synthetic lubricating oils are used increasingly and offer advantages. These lubricating oils have better temperature and oxidation stability as well as relatively low cold vicosity. Since some processes which are relevant for determining the lubricating oil change times are largely dependent on the oil quality (e.g. the infiltration of soot and other contamination), the oil change time for synthetic lubricating oils may not be increased in relation to the specifications on lubricating oil change intervals.

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

Quality

Lubricating oils are classified by DEUTZ according to their performance and quality class (DQC: DEUTZ Quality Class). Essentially, the following applies: the higher the quality class (DQC I, II, III, IV), the more effective/the better quality the lubricating oil is.

The DQC quality classes are still to be extended by the DQC-LA quality classes which include the modern, low-ash lubricating oils (LA = Low Ash).

Lubricating oils according to other comparable specifications can be used as long as they meet DEUTZ requirements. In regions in which none of these qualities are available, please contact your responsible DEUTZ partner.

or see www.deutz.com

http://www.deutz.com	
de	\SERVICE \Betriebsstoffe und Additive**D**eutz **Q**uality **C**lass**DQC-Freigabeliste**
en	\SERVICE \Operating Liquids and Additives**D**eutz **Q**uality **C**lass**DQC Release List**

The choice of luricating oil essentially depends on the exhaust aftertreatment system.

The following lubricating oils are permissible for the engines in this operating manual:

Permissible quality class	
DEUTZ	**Others**
Engines with exhaust aftertreatment system	
DQC III **LA**	Please contact your DEUTZ partner
DQC IV **LA**	
Engines without exhaust aftertreatment system	
DQC II	Please contact your DEUTZ partner
DQC III	
DQC III **LA**	
DQC IV	
DQC IV **LA**	

For low-ash engine oils released according to the DQC system an appropriate reference is made in the oil release list.

DEUTZ lubricating oils DQC II TLS - 15W40 D	
Not for engines with exhaust gas aftertreatment	
Container	Order number:
5 litre container	0101 6331
20 litre canister	0101 6332
209 litre barrel	0101 6333

DEUTZ lubricating oils DQC III TLX - 10W40 FE	
Not for DPF	
Container	Order number:
5 litre container	0101 6335
20 litre canister	0101 6336
209 litre barrel	0101 6337

DEUTZ lubricating oils DQC III LA low-ash DEUTZ Oil Rodon 10W40 Low SAPS	
Container	Order number:
20 litre canister	0101 7976
209 litre barrel	0101 7977

DEUTZ lubricating oils DQC IV synthetic DQC IV - 5W30-UHP	
Not for DPF	
Container	Order number:
20 litre canister	0101 7849
209 litre barrel	0101 7850

Lubricating oil change intervals

- The intervals depend on:
  - lubricating oil quality
  - sulphur content in the fuel
  - type of application of engine
  - Number of standstill regenerations
- The lubricating oil change interval must be halved if at least one of the following conditions applies:
  - Constant ambient temperature below -10 °C (14 °F) or lube oil temperature below 60 °C (84 °F).
  - Sulphur content in diesel fuel of >0.5 weight % .
- If the lubricating oil change intervals are not reached within a year, the oil should be changed at least once a year.

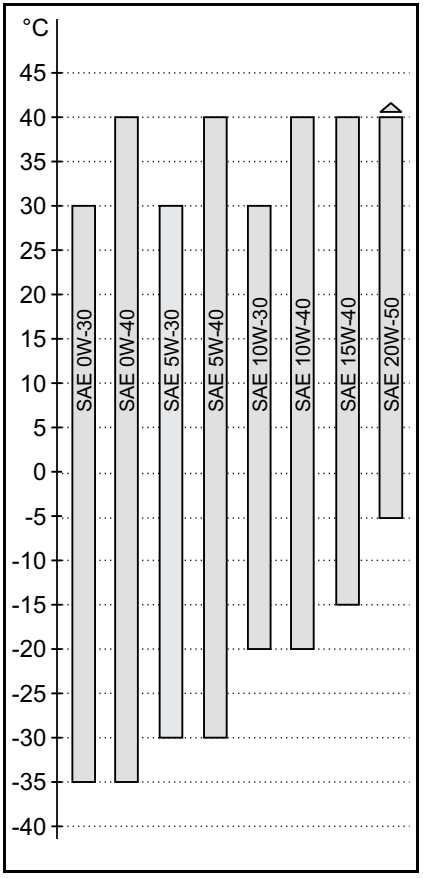
Viscosity

The ambient temperature at the installation site or in the application area of the engine is decisive for choosing the right viscosity class. Too high a viscosity can lead to starting difficulties, too low a viscosity can endanger the lubrication effect and cause a high lubricating oil consumption. At ambient temperatures below -40 °C, the lubricating oil must be pre-heated (e.g. by storing the vehicle or the machine in a hall).

The viscosity is classified according to SAE. Multi-purpose lubricating oils should be used basically. Single-purpose lubricating oils can also be used in enclosed, heated spaces at temperatures >5 ° C.

The prescribed lubricating oil quality must be observed when selecting the viscosity class!

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


°C
45
40
35
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
SAE 0W-30
SAE 0W-40
SAE 5W-30
SAE 5W-40
SAE 10W-30
SAE 10W-40
SAE 15W-40
SAE 20W-50

Permissible fuels

In order to satisfy the exhaust gas legislation, diesel engines that are equipped with an exhaust aftertreatment system may only be operated with a sulphur-free diesel fuel.

The operational reliability and durability of the individual exhaust aftertreatment technologies cannot be assured upon failure to comply.

Exhaust aftertreatment systems	
DPF	Diesel particle filter
DOC	Diesel oxidation catalytic converter

The following fuel specifications / standards are approved:

- Diesel fuels
  - EN 590

Sulphur <10 mg/kg

  - ASTM D 975 Grade 1-D S15
  - ASTM D 975 Grade 2-D S15

Sulphur <15 mg/kg

- Light heating oils
  - in EN 590 quality

Sulphur <10 mg/kg

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

The certification measurements for compliance with the legal emission values are made with the test fuels specified in the laws. These correspond to the diesel fuels in accordance with EN 590 and ASTM D 975 described in the operation manual. No emission values are guaranteed with the other fuels described in this operation manual.

The respective fuels prescribed by law must be used to comply with the national emission regulations (e.g. sulphur content).

Please contact your DEUTZ partner

http://www.deutz.com	
de	\SERVICE\Betriebsstoffe und Additive**Kraftstoffe**
en	\SERVICE\Operating Liquids and Additives**Fuels**

Winter operation with diesel fuel

Special demands are placed on the cold behaviour (temperature limit value of the filtrability) for winter operation. Suitable fuels are available at filling stations in winter.

For engines with DCR® DEUTZ common rail injection, the mixing of petroleum and adding of extra low additives is not permissible.

At low ambient temperatures paraffin discharges can lead to blockages in the fuel system and cause operating faults. Below 0 °C ambient temperature use winter diesel (down to -20 °C) (filling stations provide this in good time before the cold season starts).

- Special diesel fuels can be used for arctic climates to -44 °C.

4

General

Never operate the engine without coolant, even for a short time!

In liquid-cooled engines, the coolant must be conditioned and monitored, otherwise the engine could be damaged by:

- corrosion
- cavitation
- freezing
- overheating

Water quality

The right water quality is important for conditioning the coolant. Clear, clean water within the following analysis values should always be used:

Analysis values		min	max	ASTM
ph value		6,5	8,5	D 1293
Chlorine (Cl)	[mg/l]	-	100	D 512 D 4327
Sulphate (SO_4)	[mg/l]	-	100	D 516
Total hardness ($CaCO_3$)	[mmol/l] [mg/l]		3,56 356	D 1126
	[°dGH]		20,0	-
	[°e]		25,0	
	[°fH]		35,6	

Specifications of the water quality are made by the local water board.

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

- **pH value too low:**
  Addition of diluted sodium or potassium lye. Small trial mixtures are advisable.
- **Total hardness too high:**
  Mixing with softened water (pH neutralized condensate or water softened by ion exchanger).
- **Chlorides and/or sulphates too high:**
  Mixing with softened water (pH neutralized condensate or water softened by ion exchanger).

Cooling system corrosion protection agent

Health damaging nitrous amines form when nitrite-based cooling system corrosion protection agents are mixed with amine-based agents!

Cooling system corrosion protection agents must be disposed of in an environmentally friendly way.
Observe the notes on the safety data sheet.

The conditioning of the coolant for liquid-cooled DEUTZ compact engines is performed by mixing an anti-freeze with corrosion protection inhibitors based on ethylene glycol into the water.

DEUTZ cooling system corrosion protection agent	
Container	Order number:
5 litre container	0101 1490
20 litre canister	0101 6416
210 litre barrel	1221 1500

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

Please contact your DEUTZ partner if the DEUTZ cooling system corrosion protection agent is not available.

http://www.deutz.com	
de	\SERVICE\Betriebsstoffe und Additive**Kühlsystemschutz**
en	\SERVICE\Operating Liquids and Additives**Cooling System Conditioner**

The cooling system must be monitored regularly. This also includes checking the coolant system corrosion protection agent concentration in addition to checking the coolant level.

The cooling system corrosion protection agent concentration can be checked with conventional test instruments (e.g. refractometer).

Cooling system corrosion protection agent percentage	Water percentage	Cold protection up to
min. 35 %	65 %	-22 °C
40 %	60 %	-28 °C
45 %	55 %	-35 °C
max. 50 %	50 %	-41 °C

At temperatures below -41 °C, please contact your responsible DEUTZ partner.

It is possible to use other cooling system corrosion protection agents (e.g. chemical corrosion protection agents) in exceptional cases. Consult your DEUTZ partner.

Assignment of the DEUTZ maintenance and service schedules to maintenance intervals

Standard maintenance schedule TD / TCD 3.6 L4			
Stage	**Activity**	**To be carried out by**	**Maintenance interval every ..... operating hours (oh)**
E10	Initial commissioning	Authorised specialists	When commissioning new or overhauled engines
E20	Daily inspection	Operator	1x daily or every 10 operating hours in continuous operation
E30	Maintenance	Qualified personnel	500 [1) 2) 3)]
E40	Extended maintenance I		1.000 [3)]
E50	Extended maintenance II	Authorised specialists	3.000 [3)]
E70	General overhaul		6.000 [3) 4)]

Observations	
1)	The lubricating oil load may be high depending on the application. The lubricating oil change interval must be halved here (36).
2)	Data for lubricating oil change interval, in relation to lubricating oil quality DQC III.
3)	The display of the operating hours should be ensured by the device manufacturer. The engine operating hours are recorded by the control unit. Enquiry via the CAN bus and display in a display or creation/display via electromechanical counter.

General overhaul	
4)	The best time for a general overhaul depends to a great extent on the load, application and ambient conditions and the care and maintenance of the engine during the operating time. Your DEUTZ partner will advise you on determining the best time for a general overhaul.

Maintenance measures

Stage	Activity	Measure	Page
E10		The measures are listed in chapter 3.	24
E20	Check	Lubricating oil level (if necessary top up)	44
		Coolant level (top up if necessary)	25
		Engine tightness (visual inspection for leaks)	
		Exhaust system including exhaust aftertreatment components for leaks	20
		Suction air filter/dry air filter (maintain in accordance with maintenance indicator)	53
		Emptying of the water tank in the fuel pre-filter	48
E30	Check	V-belts	55
		Coolant (additive concentration)	49
		Intake air pipes for damage	
	Replace	Lubricating oil filter/insert (every time the lubricating oil is changed)	45
		Lubricating oil An lubricating oil application/change strategy adapted optimally to the individual engine application type can be created, for example, with the DEUTZ oil diagnosis. Ask your DEUTZ partner.	36/44
E40	Check	Charge air cooler entry area (drain lube oil/condensate)	
		Battery and cable connectors	56
		Cold starting device	
		Engine mounting (tighten, replace if damaged when necessary)	
		Fastenings, hose unions / clips (renew if damaged)	
		V-rib belt and tensioning pulley	54
	Replace	Fuel filter cartridge	47
		Filter insert for the fuel pre-filter. If the warning system responds (lamp/horn), the water trap bowl must be emptied immediately.	48
		Dry air filter	53
		V-belts	55
E50	Replace	V-rib belt and tensioning pulley	54

Stage	Activity	Measure	Page
annually	Check	Engine monitor, warning system Maintenance only to be carried out by authorised service personnel	
	Replace	Fuel pre-filter	48
Every 2 years	Replace	Dry air filter	53
		Coolant	40 49
Status dependent	Change	Diesel particle filter, the required exchange is displayed by the ash lamp or via an electronic display, depending on the engine version (see DEUTZ exchange programme 32).	

Maintenance work outside the DEUTZ maintenance and service schedules

*If the water level warning system (lamp/siren) responds, the fuel pre-filter must be emptied immediately.

Maintenance profile

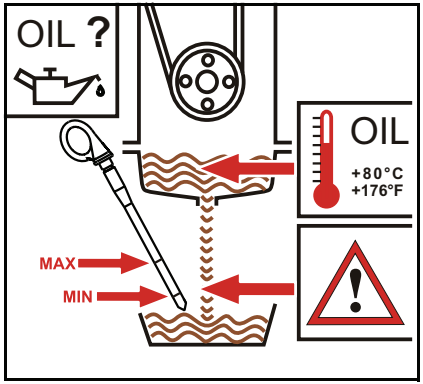
A self-adhesive maintenance diagram is delivered with every engine. It should be stuck in a well visible location on the engine or equipment.

Order number: 0312 3911 (TD/TCD 3.6 L4)

Regulations for working on the lubricating oil system

Do not work when the engine is running!
Smoking and naked lights prohibited!
Be careful of hot lubricating oil. Danger of scalding!

Pay attention to utmost cleanliness when working on the lubricating oil system. Clean the area around the components concerned carefully. Blow damp parts dry with compressed air.
Observe the safety regulations and national specifications for handling lube oils.
Dispose of leaking lubricating oil and filter elements properly. Do not allow used oil to seep away into the ground.
Perform a trial run after all work. Pay attention to tightness and lubricating oil pressure and then check the engine oil level.



Checking the lubricating oil level

Low lubricating oil level and overfilling lead to engine damage.
The lubricating oil level may only be checked with the engine in a horizontal position and switched off.
Only check lubricating oil level whilst warm, 5 minutes after shutting down.

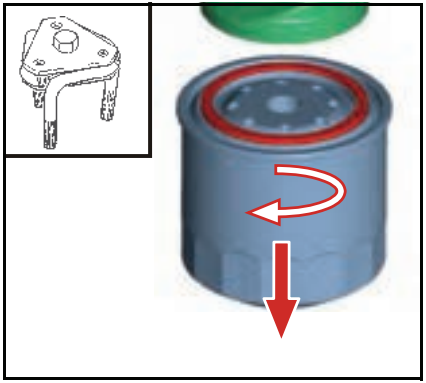
Be careful of hot lubricating oil. Danger of scalding!
Do not pull out the dipstick while the engine is running. Danger of injury!

- Pull out the lubricating oil dipstick and wipe off with a lint-free, clean cloth.
- Insert the lubricating oil dipstick as far as it will go.
- Extract the lubricating oil dipstick and read off the oil level.
- The oil level must always be between the MIN and MAX marks! Top up to the MAX mark if necessary.

Changing the lubricating oil

- Warm up the engine (lubricating oil temperature > 80 °C).
- Ensure that the engine or vehicle is in a level position.
- Switch off the engine.
- Place a collecting receptacle underneath the lube oil drain screw.
- Unscrew the lube oil drain screw, drain oil.
  - In the case of agricultural technology engines with a separate oil pan, both oil drain plugs must be unscrewed.
- Turn in and tighten lubricating oil drain plug fitted with new sealing ring.

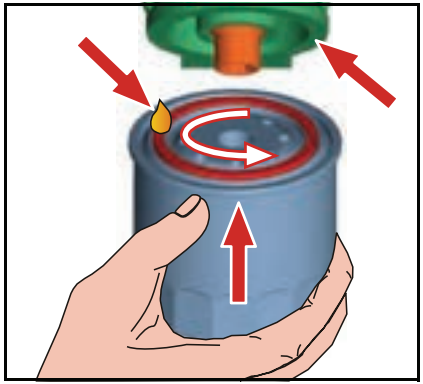
  Tightening torque 55 Nm
- Pour in lube oil.
  - Quality/viscosity data (36).
  - Filling volume (67).
- Warm up the engine (lubricating oil temperature > 80 °C).
- Ensure that the engine or vehicle is in a level position.
- Check lubricating oil level, if necessary top up.



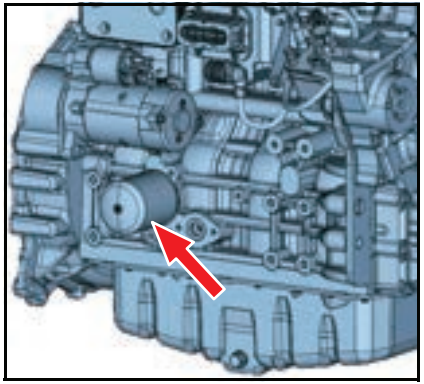
Change lubricating oil filter

The filter cartridge should never be pre-filled. There is a danger of dirt contamination!

- Remove clamps when twist protection mounted (optional).
- Loosen and unscrew filter with tool **(order no.: 0189 9142)**
- Collect draining lubricating oil
- Clean the sealing surface of the filter support with a lint-free, clean cloth.



- Oil the gasket of the new DEUTZ original filter cartridge lightly.
- Screw on new filter by hand until the gasket is touching and tighten with a torque of:
  15-17 Nm
- Fasten clamps of the twist protection (optional).

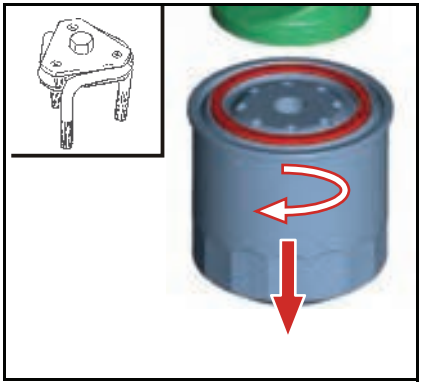


Specifications when working on the fuel system

Engine must be switched off!
Smoking and naked lights prohibited!
No injection/high pressure pipes may be disconnected while the engine is running.
Caution when handling hot fuel!
Pay attention to utmost cleanliness when refuelling and working on the fuel system.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Dispose of leaking fuel and filter elements properly. Do not allow fuel to seep away into the ground.
After all work on the fuel system, the system should be vented, a trial run performed and the tightness checked.
It will be necessary to vent the fuel system when commissioning for the first time, after maintenance work or if the tank has been run dry.

Additional venting of the fuel system by a 5 minute trial run at idle speed or on low load is absolutely essential.
Pay attention to utmost cleanliness due to the high production accuracy of the system!
The fuel system must be tight and closed.
Make a visual inspection for leaks/damage in the system.

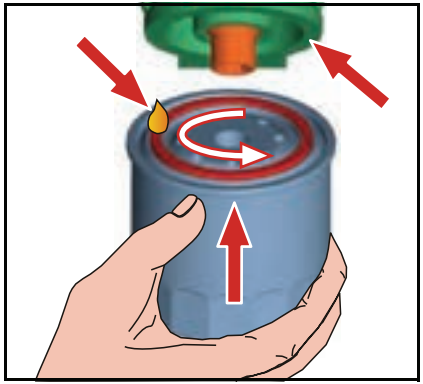
Clean and dry the engine and engine compartment thoroughly before beginning work.
Areas of the engine compartment from which dirt could be loosened must be covered with a fresh, clean foil.
Work on the fuel system may only be carried out in an absolutely clean environment.
Contamination of the air such as dirt, dust, moisture etc. must be avoided.



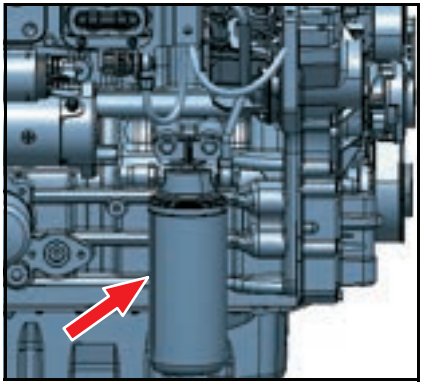
Change the fuel filter cartridge

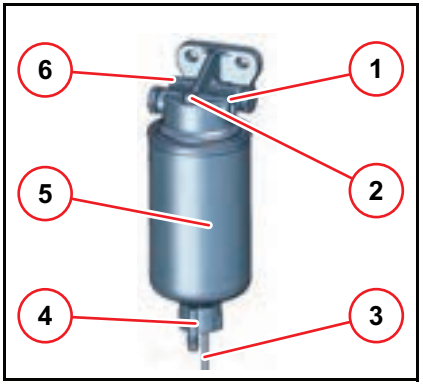
The filter cartridge should never be pre-filled. There is a danger of dirt contamination!

- Remove clamps when twist protection mounted (optional).
- Loosen and unscrew filter with tool **(order no.: 0189 9142)**
- Catch any escaping fuel.
- Clean the sealing surface of the filter support with a lint-free, clean cloth.



- Oil the gasket of the new DEUTZ original filter cartridge lightly.
- Screw on new filter by hand until the gasket is touching and tighten with a torque of:
  10-12 Nm
- Fasten clamps of the twist protection (optional).
- Vent the fuel system.





Change/vent fuel pre-filter

1 Fuel supply flow to the pump
2 Venting screw
3 Electrical connection for water level sensor
4 Drain plug
5 Filter insert
6 Fuel inlet from the fuel tank

Empty water tank

- Switch off the engine.
- Place suitable collecting containers underneath.
- Electrical connection
  - Disconnect cable connections.
- Loosen drain plug.
- Drain fluid until pure diesel fuel runs out.
- Mount drain plug.

Tightening torque 1.6 ±0.3 Nm

- Electrical connection
  - Connect cable connections.

Change the fuel pre-filter insert

- Switch off the engine.
- Shut off the fuel supply to the engine (with high-level tank).
- Place suitable collecting containers underneath.
- Electrical connection
  - Disconnect cable connections.
- Loosen drain plug and drain liquid.
- Disassemble filter insert.
- Clean any dirt off the sealing surfaces of the new filter cartridge and opposite side of filter head.
- Wet the sealing surfaces of the filter cartridge slightly with fuel and screw back on to the filter head, clockwise (17-18 Nm).
- Mount drain plug.

Tightening torque 1.6 ±0.3 Nm

- Electrical connection
  - Connect cable connections.
- Open the fuel shutoff tap and vent the system, see venting the fuel system.

Vent the fuel system

The fuel system is vented via the electric fuel supply pump.

In order to ensure that no error messages are generated, no attempt should be made to start the system up whilst venting.

This process is carried out as follows:

- Ignition "ON"

The electronic fuel supply pump switches on for 20 seconds in order to vent the fuel system and build up the required fuel pressure.

Wait until the electric fuel supply pump is disconnected from the control unit.

- Ignition "OFF"

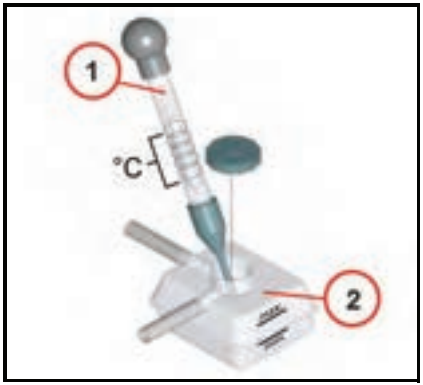
Repeat the process at least 2 times until the fuel system is vented.

Specifications when working on the cooling system

Danger of scalding from hot coolant!
Cooling system under pressure! Only open the cap when cool!
The coolant must have a prescribed concentration of cooling system corrosion protection agent!
Observe safety regulations and national specifications when handling cooling media.
Observe the manufacturer's specifications for an external cooler.
Dispose of leaking liquids properly and do not allow them to seep into the ground.
Order coolant corrosion protection agent from your DEUTZ partner.
Never operate the engine without coolant, even for a short time!

Checking the coolant level with an external cooler

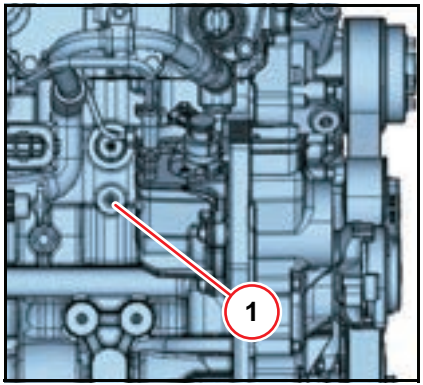
- Fill in new coolant and vent the system according to the specifications of the cooling system manufacturer.
- Open the cooling system cap (1) carefully.
- The coolant level must always be between the MIN and MAX marks of the compensation tank! Fill up to the MAX mark if necessary.



Check coolant additive concentration

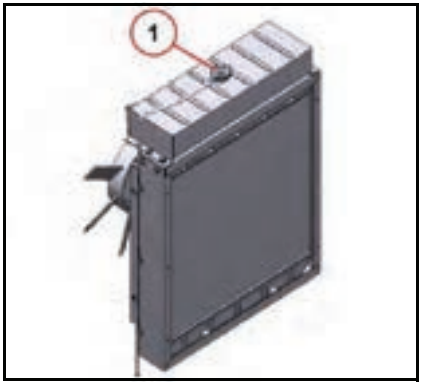
- Open the cooling system cap (1) carefully.
- Check the coolant aditive concentration in the cooler/compensation tank (2) with a conventional antifreeze measuring device (1) (e.g. hydrometer, refractormeter).
- Necessary coolant additive concentration Coolant mixing ratio (40).

The corresponding test device can be ordered from your DEUTZ partner under the order no.: 0293 7499.



Emptying the cooling system

- Open cooler locking cap carefully.
- Place suitable collecting containers underneath.
- Remove the locking screw (1) in the crankcase.
- Drain coolant.
- If the locking screw is not accessible, the drainage can be carried out at the engine oil cooler (coolant duct).
- Insert screw again with sealant.
- Close cooler locking cap.



Fill and ventilate cooling system

Danger of scalding from hot coolant! Cooling system under pressure! Only open the cap when cool!

- Open the cooling system cap (1) carefully.
- Loosen the cooler venting screw if necessary.
- Fill coolant up to the max. mark or filling limit.
- Switch on any available heating and set to the highest level so that the heating circuit is filled and vented.
- Close cooler locking cap.
- Run engine up to operating temperature (opening temperature of the thermostat).
- Switch off the engine.
- Check coolant level in cooled engine and top up to the MAX mark or filling level on the compensation tank if necessary.

Cleaning work

For all cleaning work, make sure that no parts are damaged (e.g. bent cooler mesh). Cover electrical/electronic parts and connections to clean the engine (e.g. control units, generator, solenoid valves etc.). Do not aim the water/steam jet directly at them. Allow engine to warm up.

Only carry out cleaning work on the engine when it is not running!
Remove the engine cover and cooling air cover if available and remount after cleaning.

General

The following causes of soiling make it necessary to clean the engine:

- High dust content in the air.
- Chaff and chopped straw in the area of the engine.
- Coolant leaks
- Lubricating oil leakage
- Fuel leaks

Because of the different application conditions, cleaning depends on the degree of dirt contamination.

Cleaning with compressed air

- Blow dirt off or out. Always blow out the cooler and cooling fins from the exhaust air side to the fresh air side.

Cleaning with cold cleaner

- Spray the engine with cold cleaner and leave it for about 10 minutes to take effect.
- Spray the engine clean with a high pressure water jet.
- Warm up the engine so that the water residues evaporate.

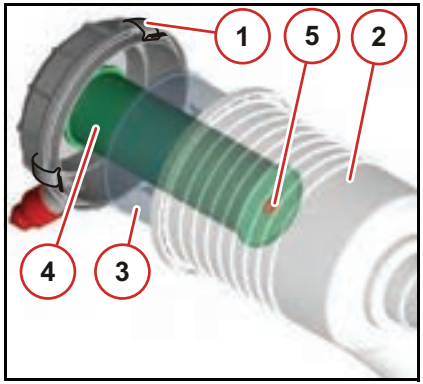
Cleaning with a high pressure cleaner

- Clean the engine with a steam jet (maximum spray pressure 60 bar, maximum steam temperature 90 °C, distance at least 1m).
- Warm up the engine so that the water residues evaporate.
- Always clean the cooler and cooling fins from the exhaust air side to the fresh air side.

Regulations for working on the intake system

Do not work when the engine is running!

Pay attention to utmost cleanliness when working on the intake system, close intake openings if necessary.
Dispose of old filter elements properly.



Maintaining the dry air filter

Do not clean the filter element (3) with petrol or hot liquids!
Renew damaged filter elements.

- Maintain the filter element (3) according to the interval in the maintenance schedule
- Lift up the clamping yoke (1).
- Remove the filter hood (2) and pull out the filter element (3).
- Filter element (3):
  - blow out with dry compressed air (max. 5 bar) from the inside to the outside if soiling is only slight,
  - renew if heavily soiled.

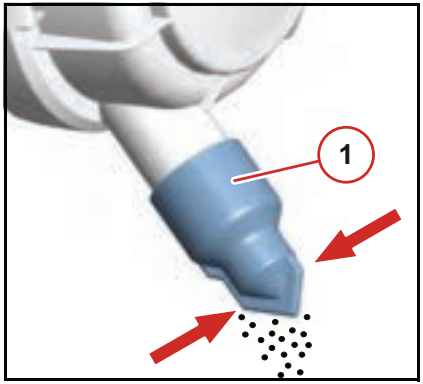
Renewing the safety cartridge of the dry air filter

Never clean the safety cartridge (4).

- Renew safety cartridge (4) according to the interval in the maintenance schedule
- To do this:
  - Unscrew hexagon nut (5), pull out safety cartridge (4).
  - Insert new safety cartridge, screw on hexagonal nut.
- Insert filter element (3), mount hood (2) and fix with clamping yoke (1).

Maintenance indicators for dry air filter

- The dry air filter is maintained according to a maintenance switch or maintenance indicator.
- Maintenance is necessary when:
  - the yellow warning light of the **maintenance switch** lights up when the engine is running.
  - the red field (1) of the **maintenance indicator** is fully visible.
- After carrying out maintenance work, reset the signal by pressing the button on the maintenance indicator. The maintenance indicator is now ready for operation again.



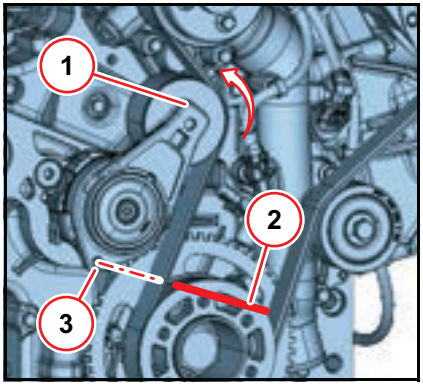
Clean the dust discharge valve of the dry air filter

- Empty the dust discharge valve (1) by pressing together the discharge slit.
- Remove any caked dust by pressing together the upper section of the valve.
- Clean the discharge slit.

Checking the belt drive

Only carry out work on the belt drive with the engine at a standstill!
After repair work: Check that all guards have been replaced and that all tools have been removed from the engine.

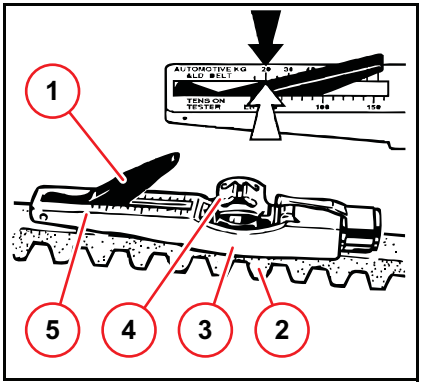
- Check the whole belt drive visually for damage.
- Renew damaged parts.
- Remount protective devices if necessary.
- Pay attention to correct fit of new belts, check the tension after running for 15 minutes.



Replace V-rib belt

1 Tension pulley
2 Retaining pin
3 Assembly bore

- Press tensioning roller with socket wrench in the direction of the arrow until a retaining pin can be fixed in the assembly bore. The V-ribbed belt is now tension free.
- First pull the V-ribbed belt off the smallest roller or off the tensioning roller.
- Mount new V-ribbed belt.
- Retain tensioning pulley using the pin wrench and remove the holding pin.
- Tension V-ribbed belt using the tensioning roller and socket wrench. Check whether the V-ribbed belt is correctly in its guide.

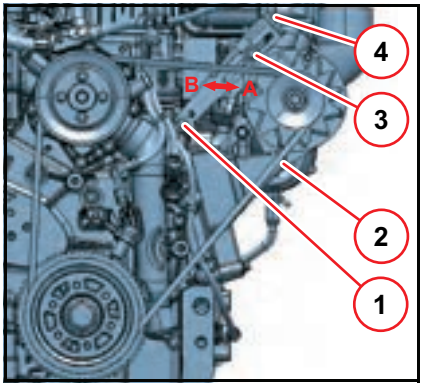


Checking the belt tension

- Lower indicator arm (1) into the measuring device.
- Place guide (3) between two belt pulleys on the V-belt (2). The stop have to be at the side.
- Press the button (4) at right angles to the V-belt (2) evenly until you hear or feel the spring snap in.
- Lift the measuring device carefully without altering the position of the indicator arm (1).
- Read the measured value at the point of intersection (arrow), scale (5) and indicator arm (1).
- If necessary, re-tension belt and measure again.

Tools

The belt tension measurement device **(order no.: 0189 9062)** can be ordered from your DEUTZ partner.



Change the belt

1 Screw
2 Screw
3 Screw
4 Setting screw

- Remove screw and lock nut.
- Move the generator over the setting screw in direction (B) until the V-belt is slack.
- Remove belt and fit new one.
- Move the generator over the setting screw in direction (A) until the V-belt has attained the correct tension.
- Checking the belt tension (67).
- Tighten screw and lock nut again.

Tightening torque	Screw	1	30 Nm
	Screw	2	42 Nm
	Screw	3	30 Nm

Regulations for working on the electrical system

Do not touch the voltage conducting parts, faulty warning lamps should be immediately replaced.

Pay attention to correct polarity of the connections.
Cover electrical/electronic parts and connections to clean the engine (e.g. control units, generator, solenoid valves etc.). Do not aim the water/steam jet directly at them. Allow engine to warm up.
Touching a lead against the frame to check whether it is live must not, under any circumstances, be carried out.
For electrical welding work, the ground terminal of the welding gear must be clamped directly to the part being welded.
Three-phase current generator: Never disconnect the cables between battery, generator and regulator while the engine is running.

Battery

Electronically stored data could be lost if the battery is disconnected.
Keep battery clean and dry.
Make sure the battery is fitted correctly and securely.
Dispose of old batteries in an environmentally friendly way.

Danger of explosion! The gases emitted by the battery are explosive!
Fire, sparks, smoking and naked lights are prohibited!
Danger of acid burns! Wear protective gloves and glasses! Avoid contact with skin and clothing!
Danger of short circuit! Do not rest tools on the battery!

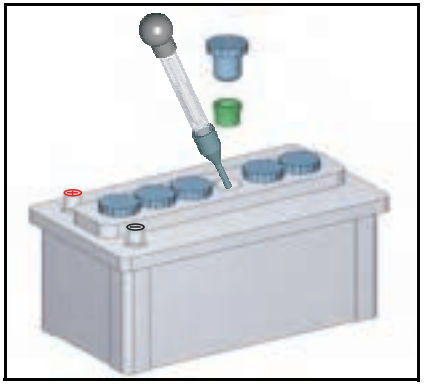
Checking the voltage

- Check the battery voltage with a standard voltmeter. The voltage gives information about the charge status.

Battery	Charge status (Volt)
12 Volt	12-14,4
24 Volt	24-28,4

Check acid level

- Unscrew caps.
- Note the manufacturer's specifications concerning the liquid level.
  The liquid should normally be 10-15 mm above the top edge of the plate or reach up to any available control device.
- Only use distilled water to top up the battery.
- Screw in caps.



Check acid density

- Unscrew caps.
- Measure the electrolyte density of individual cells with a commercial hydrometer. Hydrometer reading indicates battery's state of charge. The acid temperature when measuring should be 20 °C if possible.
- Check the acid level before recharging.
- Screw in caps.

Acid density [kg/ l]		Charge status	Measure
Normal	Tropical		
1,28	1,23	good	none
1,20	1,12	half	charge
1,12	1,08	empty	charge

Removing the battery

- Always disconnect the minus pole first when removing the battery. Otherwise there is a danger of short-circuit!
- Remove the fastenings and take out the battery.

Charging the battery

- Unscrew caps.
- Charge the battery with a conventional battery charger. Observe the manufacturer specifications!
- Screw in caps.

Installing the battery

- Insert new or charged battery and attach the fastenings.
- Clean the terminals and battery poles with fine emery paper.
- Connect the plus pole first and then the minus pole. Otherwise there is a danger of short-circuit!
  Make sure the terminals have good contact. Tighten clamp bolts hand-tight.
- Grease the assembled terminals with an acid-free, acid-resistant grease.

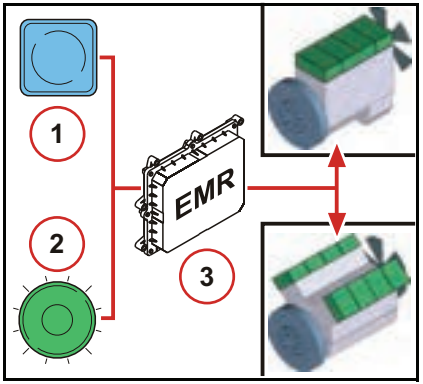
Faults and remedies

Faults	Causes	Measures
Engine does not start or is difficult to start	Not disconnected (if possible)	Check coupling
	Fuel tank empty	Tanks
	Electric fuel supply pump defective	Check
	Fuel suction pipe blocked	Check
	Below starting limit temperature	Check
	Cold starting device	Check/replace
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Fuel quality does not comply with operating manual	Change the fuel
	Battery defective or discharged	Check battery
	Cable connection to starter loose or oxidized	Check cable connections
	Starter defective or pinion does not engage	Check starter
	Air filter clogged / turbocharger defective	Check/replace
	Air in fuel system	Vent fuel system
	Compression pressure too low	Check compression pressure
	Exhaust gas backpressure too high	Check
	Injection line leaks	Check injection line
Engine does not start and diagnostic lamp flashes	Engine electronics prevents starting	Check error according to error code and eliminate error if necessary
Engine starts, but runs irregularly or fails	Exhaust gas backpressure too high	Check
	Compression pressure too low	Check compression pressure
	Cold starting device	Check/replace
	Air in fuel system	Vent
	Fuel filter contaminated	Clean
	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
	Injection line leaks	Check injection line

Faults	Causes	Measures
Speed changes are possible and diagnostic lamp lights up	Engine electronics has detected a system error and activates an equivalent speed	Check error according to error code and eliminate error if necessary
Engine becomes excessively hot. Temperature warning system activates	Vent line blocked	Clean
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
	Lube oil cooler defective	Check/replace
	Lube oil filter contaminated on the air or lube oil side	Change
	Lube oil level too high	Check lube oil level, if necessary drain off.
	Lubricating oil level too low	Fill up lube oil
	Injector defective	Change
	Coolant heat exchanger soiled	Clean
	Defective cooling water pump (torn or loose V-belt)	Check whether torn or loose
	Low coolant	Fill up
	Resistance in cooling system is too high / flow volume too low	Check the cooling system
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Check/clean
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Exhaust gas backpressure too high	Check

Faults	Causes	Measures
Engine output is deficient	Lube oil level too high	Check lube oil level, if necessary drain off.
	Fuel suction temperature too high	Check the system
	Fuel quality does not comply with operating manual	Change the fuel
	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Fan defective/V-rib belt torn or loose	Check fan/V-belt, change if necessary
	Charge air line leaking	Check charge air line
	Charge air cooler soiled	Clean
	Resistance in cooling system is too high / flow volume too low	Check the cooling system
	Injection line leaks	Check injection line
	Injector defective	Change
Engine performs poorly and diagnostic lamp lights	Engine electronics reduce performance	Please contact your DEUTZ partner
Engine does not run on all cylinders	Injection line leaks	Check injection line
	Injector defective	Change
	Charge air line leaking	Check charge air line
	Lube oil level too high	Check lube oil level, if necessary drain off.
Engine lubricating oil pressure is non-existant or excessively low	Lubricating oil level too low	Fill up lube oil
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Wrong SAE viscosity class of the engine lubricating oil	Change the lubricating oil
Engine lubricating oil consumption excessive	Lube oil level too high	Check lube oil level, if necessary drain off.
	Excessive inclination of engine	Check engine mounting / reduce inclination
	Crankcase breather	Check/replace
Lubricating oil in the exhaust system	Engine operated continuously with too low a load (< 20-30%)	Check load factor
Engine producing blue smoke	Lube oil level too high	Check lube oil level, if necessary drain off.
	Excessive inclination of engine	Check engine mounting / reduce inclination

Faults	Causes	Measures
Engine producing white smoke	Below starting limit temperature	Check
	Cold starting device	Check/replace
	Fuel quality does not comply with operating manual	Change the fuel
	Injector defective	Change
Engine producing black smoke	Air filter clogged / turbocharger defective	Check/replace
	Air filter maintenance switch / maintenance indicator defective	Check/replace
	Charge air line leaking	Check charge air line
	Injector defective	Change
Regeneration lamp flashing	Diesel particle filter is contaminated with soot and must be regenerated	Initiate standstill regeneration 32
Regeneration lamp flashing quickly Engine warning lamp lit	Diesel particle filter is contaminated with soot and must be regenerated Standstill regeneration has not been released	Initiate standstill regeneration 32
Regeneration lamp flashing quickly Engine warning lamp flashing Power reduction	Diesel particle filter is contaminated with soot and must be regenerated Standstill regeneration has not been released	Release of the standstill regeneration by the DEUTZ partner
Regeneration lamp flashing quickly Engine warning lamp flashing Ash lamp lit	Diesel particle filter is overloaded	Replace diesel particle filter



Engine protection function of the electronic engine control

1 Diagnosis button
2 Error lamp
3 Electronic engine control (EMR)

The error lamp goes out when all the errors have been eliminated. For some errors, it is necessary to switch off the ignition, wait 30 s and only then switch back on the ignition. The appropriate monitoring functions are switched off when a sensor fails. Only the sensor failure is documented in the error memory.

Depending on the design of the monitoring functions, the electronic engine control can protect the engine in certain problematical situations by monitoring important limit values during operation and checking the correct function of the system components.

Depending on the seriousness of a recognised fault, the engine can continue to operate with limitations, during which the error lamp lights up continuously or indicates a serious system error by flashing. In this case, the engine should be switched off as soon as safely possible.

Error lamp

The error lamp is located in the vehicle drive stand.

The error lamp can release the following signals:

- Function test
  - Ignition on, error lamp lights up for approx. 2 seconds and then goes out.
  - Check the error lamp if there is no reaction after switching on the ignition.
- The lamp does not light
  - After the lamp test an extinguished lamp indicates an error-free and trouble-free operating state within the scope of the control possibility.
- Continuous light
  Error in system.
  - Operation continued with restrictions.
  - The engine must be checked by a DEUTZ partner.
  - If a lamp lights steadily a monitored measuring variable (e.g. coolant temperature, lubricating oil pressure) has left the permissible value range.
    Depending on the fault, the engine power may be reduced by the electronic engine control to protect the engine.
- Flashing
  Serious error in system.
  - Switch off prompt for the operator. Attention: Failure to do so will lead to loss of guarantee!
  - The engine has reached switch-off condition.
  - Engine forced to run with power reduction to cool the engine, with automatic shutdown if necessary.
  - The switch-off process has been accomplished.
  - There may be a start lock after engine stop.
  - The start lock is deactivated by turning off the system with the ignition key for approx. 30s.
  - optionally the power reduction can be bypassed, the automatic switch-off delayed or a start lock bypassed with the override key on the instrument panel to avoid critical situations. This brief deactivation of the engine protection functions is logged in the control unit.

Please contact your DEUTZ-partner in case of malfunctions and sare parts inquiries. Our specially trained personnel will ensure fast, professional repairs using original DEUTZ spare parts in case of damage.

Diagnosis button

The diagnosis button allows the errors currently saved in the error memory of the electronic engine control to be visualised in the form of a flash code. The flash codes permit:

- Errors that may occur can be classified.
- Clear display of the error as visual signal.
  - The blink codes can only be interpreted by a DEUTZ partner.

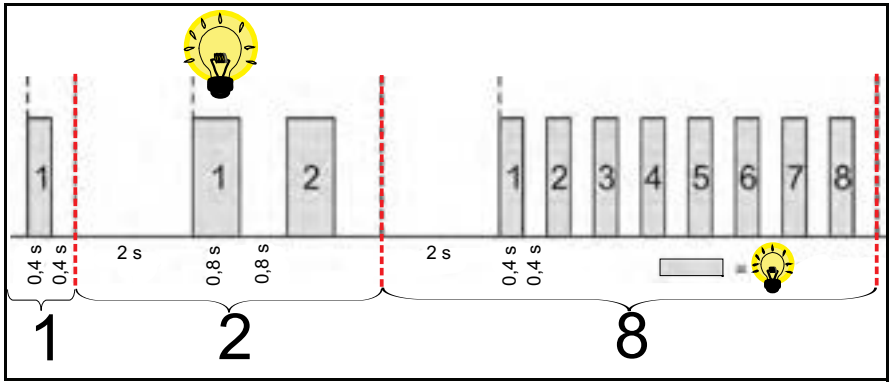
Use of the diagnostic key

The flash code displays all errors in the error memory, this means active as well as passive ones.

The control unit must be switched off to start the enquiry (ignition off). Then the diagnosis button should be pressed for approx. 1s during the start (ignition on).

Then the next error (i.e. the following one in the error memory) can be displayed by pressing the diagnostic key again. If the last error was displayed, the first error is displayed again on pressing the diagnostic key again.

After the display of the error flash code, the error lamp goes out for five seconds.



Display system error by flash code

Example:

Flash code 1-2-8

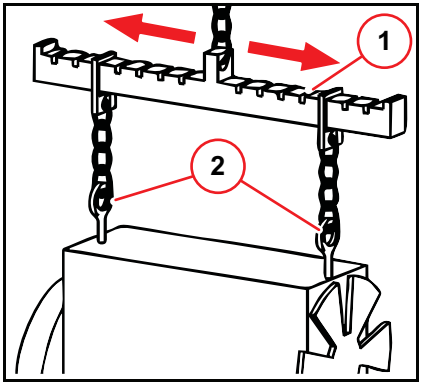
1 x short flash

2 x long flash

8 x short flash

This flash code indicates a break or short circuit in the wiring of the charge air temperature sensor. The temporal sequence of the flash signals is shown in the illustration.

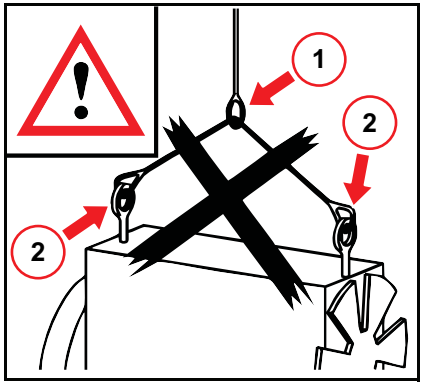
- The blink codes can only be interpreted by a DEUTZ partner.



Suspension equipment

The transport devices mounted on this engine are adapted to the engine weight. If the engine is transported with add-on components, the transport devices must be designed accordingly.

- Always use proper suspension equipment when transporting the engine.
- The suspension device (1) must be adjustable for the engine's centre of gravity.
- After transportation and before commissioning of engine: remove attachment eyes (2).



Danger to life!
The engine may tip over or fall down if suspended incorrectly!

- The fastening attachment cannot be fixed securely above the centre of gravity (1).
- The fastening attachment can slip, the engine swings backwards and forwards (1).
- Too short a fastening attachment causes bending torques in the transport device (2) and can damage it.

General

Engines contain the following types of corrosion protection:

- Interior corrosion protection
- Exterior corrosion protection

Your DEUTZ partner has the right corrosion protection agent for your needs.

The following measures for corrosion protection **after taking the engine out of operation** meet the requirements for 12 months corrosion protection.

The following corrosion protection work may only be carried out by persons familiar with it and instructed in the potential dangers.

If these measures are deviated from by exposing the corrosion-protected engines or parts to unfavourable conditions (installation outdoors or storage in damp, badly aired places) or damage to the corrosion protection layer, a shorter corrosion protection duration is to be expected.

The engine corrosion protection should be checked about every 3 months by opening the covers. If corrosion is detected, the corrosion protection should be renewed.

At the end of the corrosion protection work the crank drive may no longer be turned so that the corrosion protection agent in the bearings, bearing liners and cylinder liners is not scraped off.

Before operating a corrosion protected engine, the corrosion protection must be removed.

Interior corrosion protection

- Interior corrosion protection is always provided by wetting of the walls with the implemented corrosion protection agent in a corrosion protection run of the engine.
- The corrosion protection run can be performed once to protect the different systems:

Fuel system

Close the fuel/tank/supply line to the engine so that the system is protected against dirt and dust. Protect the electronics against moisture and corrosion.

- Fill the fuel tank with a mixture of:
  - 90 % distilled fuel
  - 10 % corrosion protection oil.
- Perform a corrosion protection run with no load for at least 5 minutes.

Lubricating oil system

- Drain lubricating oil from warm engine.
- Thoroughly clean lube oil tray, cylinder head with rocker arms, valves, valve springs with diesel fuel or cleaning agent.
- Fill engine with TITAN EM 2020 DEUTZ (SAE 20W-20) preservation oil and carry out corrosion protection run (together with corrosion protection run for fuel system), warm up the engine to approx. 60 °C, duration at least 5 minutes so that all components of the lubricating oil system are wet,

  or

  all accessible components are wet with preservation oil and pump approx. 60 °C warm preservation oil through the engine with a separate pump until all bearings and bearing liners are wet.

Cooling system

- Depending on the series the engines are equipped with cooling air, cooling oil or cooling fluid system (cooling water with cooling system protection agent).
- Cooling air system, see the Exterior corrosion protection section.
- In engines of the oil-cooled series the circulating lubricating oil serves simultaneously for cooling. The cooling chambers are protected automatically against corrosion with the lube oil system.
- If a coolant with corrosion protection properties is poured into liquid-cooled engines, no further action is necessary after draining.
- If not, the coolant must be drained and, to ensure the formation of a covering layer on the inside surfaces of the cooling system, a corrosion protection run performed with a mixture of:
  - 95 % treated water
  - 5 % corrosion protection agent
- The duration of the corrosion protection run and the concentration of the corrosion protection agent are specified by the manufacturer of the corrosion protection agent.
- Then drain the coolant.

Air intake pipes

- Spray ANTICORIT VCI UNI O 40 corrosion protection oil or TITAN EM 2020 DEUTZ (SAE 20W-20) preservation oil into the intake air pipe.

Exterior corrosion protection

- The engine must be cleaned thoroughly with a cleaning agent before exterior corrosion protection. Any signs of corrosion and damage to the paintwork must be removed.

Bare exterior surfaces and parts

- Coat or spray all bare exterior parts and surfaces (e.g. flywheel, flange faces) with corrosion protection agent.

Rubber parts

- Rubber parts (e.g. muffs) which are not painted over must be rubbed down with talcum powder.

Belt drive

- Remove V-belts and V-rib belts and store packed.
- Spray V-belt pulleys and tension rollers with corrosion protection agent.

Engine openings

- All engine openings must be fitted with air-tight, water-tight covers to delay the vapourisation process of the corrosion protection agents.
- With installed air compressor, the suction and pressure connection must be sealed by a cap.
- Air should be excluded to avoid ventilation of the engine (chimney effect) for the suction from an air supply pipe.

Storage and packaging

- After being protected against corrosion, the engine must be stored in a dry, ventilated hall and suitably covered.
- The cover must be placed loosely over the engine so that the air can circulate around it to prevent condensation from forming. Use a desiccant if necessary.

Removal of corrosion protection

- The corrosion protection must be removed from the corrosion protected engine before starting.
- The packaging and all covers over the closed openings must be removed.
- Any corrosion deposits and paint damage should be remedied.

Fuel system

If there is a mixture of diesel fuel/corrosion protection oil in the fuel tank, drain it.

- Connect fuel/tank/supply line to the engine. Pay attention to cleanliness.
- Fill the fuel tank and fuel system with the proper fuel.

Lubricating oil system

- Unscrew the lube oil drain screw, drain oil.
- Fill the engine with lubricating oil via the lubricating oil filler neck.

Coolant system

- If the implemented corrosion protection agent is compatible with the intended cooling system protection agent, this can be filled directly into the coolant system as specified.
- If it is uncertain whether the implemented corrosion protection agent is compatible with the cooling system protection agent, the cooling system should be purged with fresh water for about 15 minutes before filling.

Removal of exterior corrosion protection

- All areas and components coated with corrosion protection agent must be washed off with distilled fuel or a suitable cleaning agent.
- Wash out grooves of V-belt pulleys if necessary.
- Mount V-belts or V-rib belts as specified.
- Fill with coolant.

Corrosion protection agent / cleaning agent

Please ask your DEUTZ partner for reference products for the corrosion protection agents/cleaning agents to be used which meet DEUTZ requirements.

or see www.deutz.com

http://www.deutz.com	
de	\SERVICE \Betriebsstoffe und Additive**Motorkonservierung**
en	\SERVICE\Operating Liquids and Additives**Engine Corrosion Protection**

General technical data

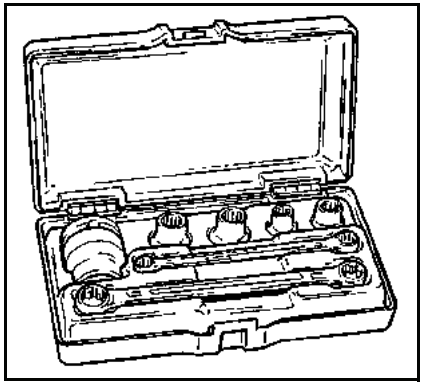
Engine type	Dimension	TD 3.6 L4	TCD 3.6 L4
Working principle		Four-stroke diesel engine	
Charging		Exhaust gas turbocharger	Turbocharger with charge air cooling
Type of cooling		water-cooled	
Cylinder arrangement		in series	
No. of cylinders		4	
Bore/stroke	[mm]	98/120	
Total displacement	[cm^3]	3621	
Combustion process		Direct injection	
Injection system		Common Rail	
Exhaust gas recirculation		externally cooled	
Exhaust gas aftertreatment		Diesel oxidation catalytic converter DOC and/or Diesel particle filter DPF or without	
Valves per cylinder		2	
Firing order of the engine		1-3-4-2	
Direction of rotation looking onto the flywheel		left	
Engine power rating according to ISO 3046	[kW]	see engine rating plate	
Speed (nominal revolutions)	[min^{-1}]	see engine rating plate	
Coolant volume (only engine content without cooler / hoses and pipes)			
Industrial engines/Agricultural technology	≈ [l]	4,6/4,6	
Permissible continuous coolant temperature	[°C]	max. 110	
Temperature difference between coolant inlet/outlet	[°C]	8	
Start of thermostat opening	[°C]	88	
Thermostat fully open	[°C]	95	

Engine type	Dimension	TD 3.6 L4	TCD 3.6 L4
Lubricating oil change volume (with filter)	≈ [l]	8*	
Lube oil temperature in the lube oil tray, maximum	[°C]	125	
Lubricating oil pressure minimum (low idle, engine warm)	[kPa/bar]	80/0,8	
Permissible maximum combustion air temperature after charge air cooler	[°C]	50	
V-belt tension V-belts AVX (width: 13 mm)	[N]	Pre-tensioning/Re-tensioning 650±50/400±50	
V-rib belt tensioning		Automatic tensioning spring-loaded clamping roller	
Weight without cooling system according to DIN 70020-A	≈ [kg]	350	
*specified lubricating oil filling volumes apply for standard versions. In engines which deviate from the standard, for example different lubricating oil pans/dipstick variants and/or special inclined versions, the lubricating oil volume may vary. **The lubricating oil dipstick mark is always decisive.**			

Tool ordering

The special tools described in this chapter can be ordered from:

Please contact your DEUTZ partner



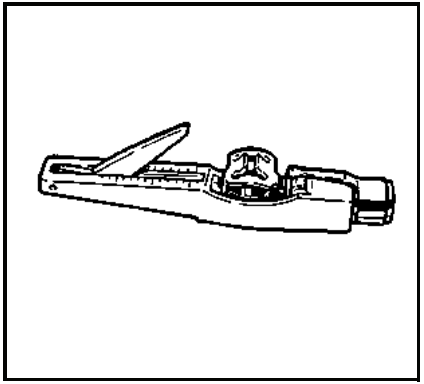
Torx tool

Order number:

0189 9092

The Torx screw system is used in engines in this series among other things. This system was introduced for a number of reasons:

- Excellent accessibility
- High force transmission when loosening and tightening
- Slipping or breaking of the key and risk of injury are practically excluded.

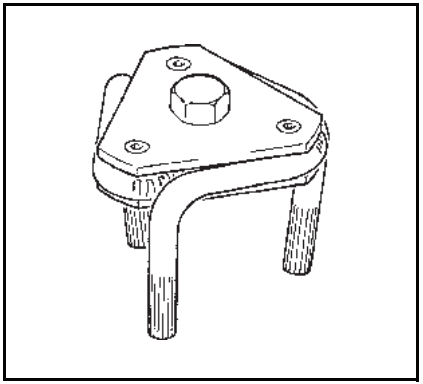


V-belt tension measuring instrument

Order number:

0189 9062

Measuring instrument for checking the specified V-belt tensions.

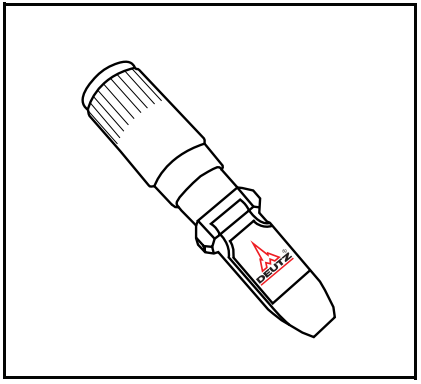


Special wrench for loosening exchangeable filters

Order number:

0189 9142

For loosening changeable filters.



Refractometer

Order number:

0293 7499

The following operating media can be evaluated with this test device:

- Coolant
- Battery acid
- AdBlue®

DEUTZ Operating Fluids

DEUTZ Oil Rodon 10W40 low SAPS (DQC III-10 LA)	
5 L	-
20 L	0101 7976
209 L	0101 7977

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

DEUTZ Cooling System Conditioner	
5 L	0101 1490
20 L	0101 6416
210 L	1221 1500

DEUTZ Oel DQC4-5W30-UHP (DQC IV-10)	
5 L	-
20 L	0101 7849
209 L	0101 7850

The engine company.

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Information Systems Sales & Service
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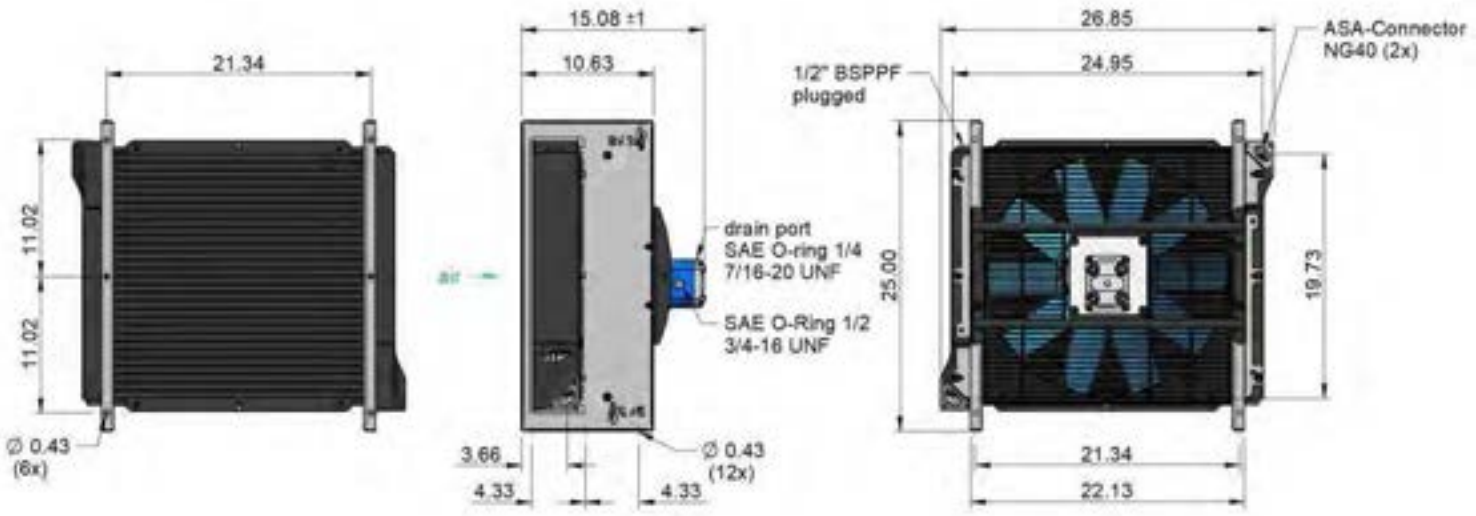
Fax: +49 (0) 221-822-3525
E-Mail: info@deutz.com
www.deutz.com

Printed in Germany

Order number:

0312 4633 en

Original operating instructions

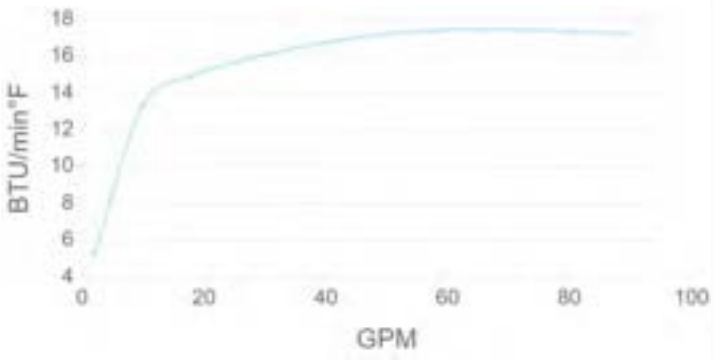


Technical data

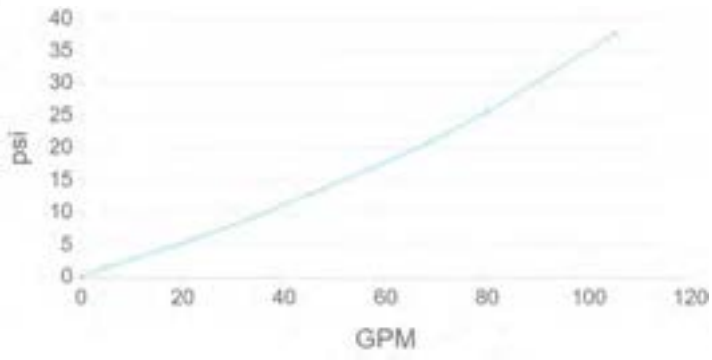
order number	ASA0257AH12U00	
description	ASA 0257 Hyd. Motor 0.73in³ 1000rpm	
motor power	0.14	hp
motor size		
current		A
protection level		
air flow	1713	scfm
noise level	70	dB(A)
weight	98.1	lbs
oil pressure	80	psi
oil flow	3.3	gpm
rotation	1000	rpm

ASA 0257 Hyd. Motor 0.73in³ 1000rpm

specific cooling performance



pressure drop at150SSU



Radiator Style C

material	aluminum
working temperature range	-4°F to +176°F (oil temperature)
air fin shape	wavy
working pressure	370 PSI (static)

This data sheet and the corresponding scale drawings are to be used as a general guideline and technical overview of our products. Please contact us if more exact information is needed. As we are constantly improving our products, their characteristics, dimensions and weights may also change, although we do our best to incorporate these changes continually. asa assumes no liability for any information therein, any errors, omissions, misprints, nor any direct or indirect damages, losses or costs resulting therefrom. Any cooling performances and general technical values indicated in this catalogue are measured at a test bench according to asa testing procedures or calculated, based on such tests. They represent a basis for your product selection. Due to different conditions in testing and application environments the performance may also vary by +/- 15%. All sound values are determined in accordance with ISO 9614-2, DIN EN ISO 11203 accuracy class 3 or Machinery Directive 2006/42/EG and are A-rated. At some of the performance data, possible differences to competition data are possible. The reason to that are no existing standardized testing procedures on individual subjects, e.g. for cooling performance measurements. Therefore, we recommend all products to be checked under the system operating conditions. This is also true of vibrations and mechanical stress as well as for pressure peaks and thermal stress and any other relevant factors. General tolerances according to DIN ISO 2768-vL, General tolerances for casted parts according EN ISO 8062-3 (DCTG 10). Tolerances for rubber parts are according to ISO 3302-1 (class M4-F+C). The tolerances of welding seams are defined by quality group D according to EN ISO 10042, if it is not specified on the actual scale drawing or data sheet. Any form of liability is excluded for the information included in this datasheet. All details and calculation values are checked to the best of our ability, but these do not ensure any intrinsic product properties: due to the wide-ranging possible applications, it is advised that all technical data herewith included be confirmed through testing carried out by the end-user. asa technology Produktions- und Vertriebs GmbH reserves the right to modify the product without any separate notification. This refers to both technical data and the product itself. Furthermore, it is herewith specified that the datasheet does not substitute the corresponding scale drawings, assembly and installation guidelines, nor the operating instructions.

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Made in the Heartland of America
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Engineering & Manufacturing Solutions

FC

PFC51-12SAE

Full Range Pressure Compensating Variable Flow Control

PFCR51-3/4

PFCB51-12SAE

Specifications:

- See flow chart for capacity.
- Rated for 3000 psi (207 bar).
- Weighs 7- ¾ lbs. (3.52 kg).
- 30-Micron Filtration Recommended.
- Torque to turn side lever spool.
  - 35 in*lbs with 3000 psi (207 bar) on EX Port.

ISO 9001:2008 WITH DESIGN
Certificate #02.002.1

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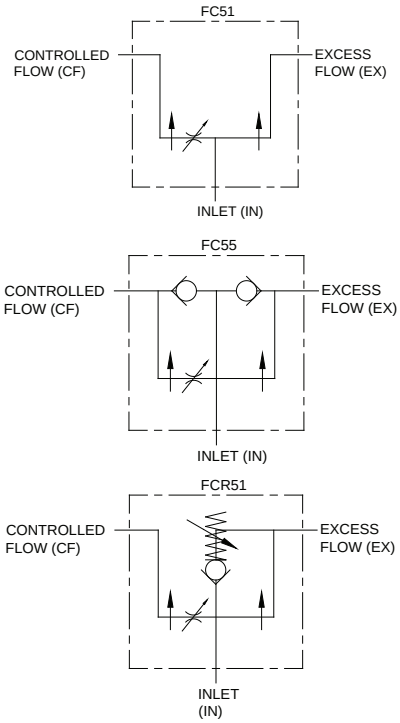
FC Full Range Pressure Compensating Variable Flow Control



PFC51-12SAE

PFCR51-3/4

PFCB51-12SAE

MATERIALS:

- Cast Iron Body.
- Heat Treated Compensator Spool.
- Stainless Steel Rotary Spool.
- Buna N O'Rings (Standard)
- Heat Treated Free Reverse Check Seat.

FEATURES:

- DIAMOND HONED SPOOL BORE provides consistent spool fit with low leakage.
- EVERY FC IS TESTED for shutoff, max. flow, and pressure compensation.
- STANDARD 3-PORT allows for pressure compensated flow out of two ports.
- STANDARD 416 STAINLESS STEEL rotary lever spool to prevent the spool from locking up.
- STANDARD SAE ORB COMPENSATOR PLUGS to eliminate external leakage from the compensator bore.
- EXTERNAL SEALS ON ROTARY SPOOL prevents contamination from locking up spool.
- OPTIONAL TOP PORT allows the customer to plumb their pipe directly in line with the inlet.
- OPTIONAL 2-PORT allows for pressure compensated flow out of one port.
- OPTIONAL 316 STAINLESS STEEL rotary spool provides highest corrosion resistance.
- OPTIONAL FREE REVERSE FLOW allows fluid to move from the CF (control flow) and EX (excess flow) port to the inlet. (Single reverse flow is also available)
- OPTIONAL ADJUSTABLE BALL SPRING RELIEF AND HIGH LIFT BALL SPRING RELIEF CF (control flow) port.

FC – GENERAL INFORMATION

The Brand, full range pressure compensating variable flow control is designed so that the orifice area varies as the lever is rotated. Fluid travels past the variable orifice, through the compensator spool and then out the controlled flow port. Therefore the flow out of the CF port is proportional to the orifice area which can vary from closed to open. The sum of the controlled flow and the excess flow equals the inlet flow and as the controlled flow increases the excess flow decreases. Both outlet flows are pressure compensated with a spool that maintains a constant flow by adjusting for pressure. Hunting between the compensated pump and our valve is dampened with a dashpot on the compensator spool. Thus, the outlet flow is smooth and constant regardless of the pressure on the CF and EX port. External seals on the rotary spool prevent contamination from getting between the spool and the casting, thus preventing the spool from locking in one position. All FC's are built with stainless steel (416) rotary spools to help prevent the rotary spools from locking up when they are in a corrosive environment. We also offer the FC with outlet ports coming from the top of the casting.

ADJUSTABLE BALL SPRING RELIEFS – The adjustable ball spring relief (R) and the adjustable high lift ball spring relief (B) allow the customer pressure compensated flow up to the pressure setting on the relief. Once the pressure on the CF port increases above the relief setting the relief valve opens and diverts flow to the EX port while maintaining the pressure on the CF port. The EX port must be plumbed back to tank for both of these reliefs. Both relief options are preset to 1500 psi (103 bar), standard, and field adjustable from 750 to 3000 psi. (52 to 207 bar). Pressure settings between 250 and 750 psi (17 and 52 bar) can be achieved by using a different spring. The B option's advantage over the R option is that the cracking pressure at low and high flow is virtually the same. The B option is also more stable when flow is traveling past the ball and spring. (See relief flow charts on next page)

FREE REVERSE FLOW – The free reverse flow (55) option is designed primarily where cylinders and motors are needed to go in reverse. Flow can go in reverse from either the EX or the CF port to the inlet. Flow is not metered when it goes in reverse. The non-metered flow travels past the poppet, down the center of the valve, past the compensator spool and through the inlet. The steel poppet seat inside the free reverse flow check is heat treated to assure a long life.

FC Full Range Pressure Compensating Variable Flow Control

FC – EXAMPLES OF COMMON MODEL CODES:

FC51-3/4.....3/4" ports and a max flow of 30 gpm (114 lpm).

FCR51-3/8.....Ball spring relief (1500 psi (103 bar) setting), adjustable from 750 to 3000 psi (52 to 207 bar), 3/8" ports, and a max flow of 8 gpm (30 lpm).

FC55-1/2.....Free reverse flow, 1/2" ports, and a max flow of 16 gpm (61 lpm).

FC – CREATING A MODEL CODE FOR FC'S:

F C - ____ ____ ____ ____ ____

PAINT:
Blank – No paint
P – Painted black (other colors available, consult factory)
MP – Epoxy coating

RELIEF TYPE:
Omit – No relief
R – Adj. ball spring relief (Standard 1500psi (103bar) setting)
B – Adj. high-lift ball spring relief (Standard 1500psi (103bar) setting)

FLOW PATH:
51 – Standard flow control
55 – Free reverse flow (Cannot be used in conjunction with ball spring relief).

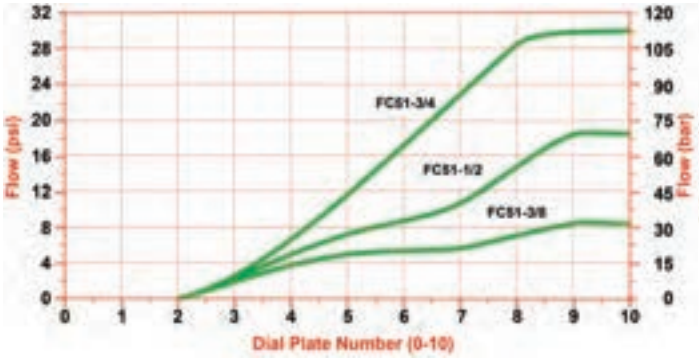
PORT SIZE:
3/8 – 3/8" NPT (0-8 gpm (0-30 lpm), standard)
1/2 – 1/2" NPT (0-16 gpm (0-61 lpm), standard)
3/4 – 3/4" NPT (0-30 gpm (0-114 lpm), standard)
6 - #6SAE (9/16 – 18) (0-8 gpm (0-30 lpm), standard)
8 - #8SAE (3/4 – 16) (0-8 gpm (0-61 lpm), standard)
10 - #10SAE (7/8 – 14) (0-16 gpm (0-61 lpm), standard)
12 - #12SAE (1-1/16 – 12) (0-30 gpm (0-114 lpm), standard)

2 OR 3 PORT:
2P – 2 port
Omit – 3 port (Standard)
TP – Top ported

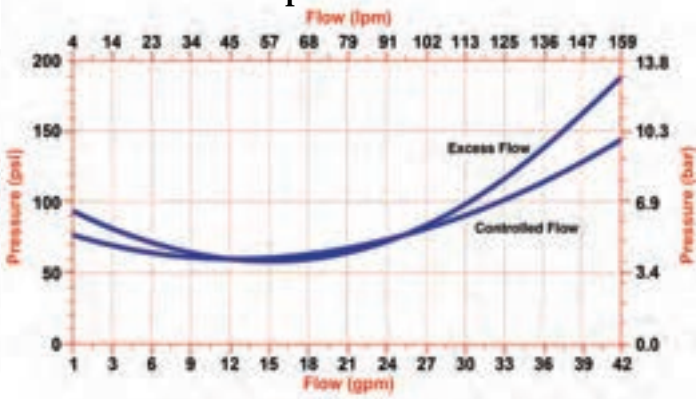
FLOW SETTING & SPOOL TYPE:
SS - 316 Stainless Steel (416 S.S. is standard)
X – Increased Compensation Stability
***37** – 0-8 gpm (0-30.3 lpm)
***50** – 0-16 gpm (0-60.6 lpm)
***75** – 0-30 gpm (0-113.6 lpm)
** - Consult factory for others
** - Need not specify for standard flow settings noted under " PORT SIZE"

FC - FLOW AND PRESSURE INFO:

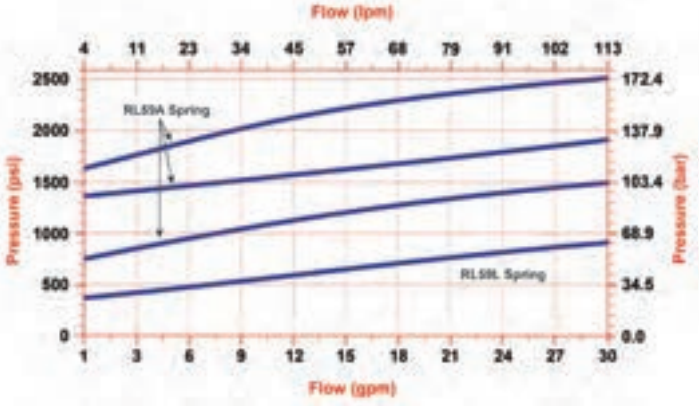
Controlled Flow vs. Dial Plate for FC Series



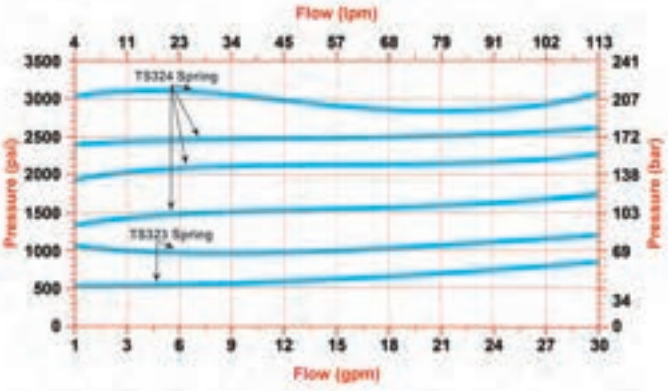
Pressure Drop vs. Flow for FC Series



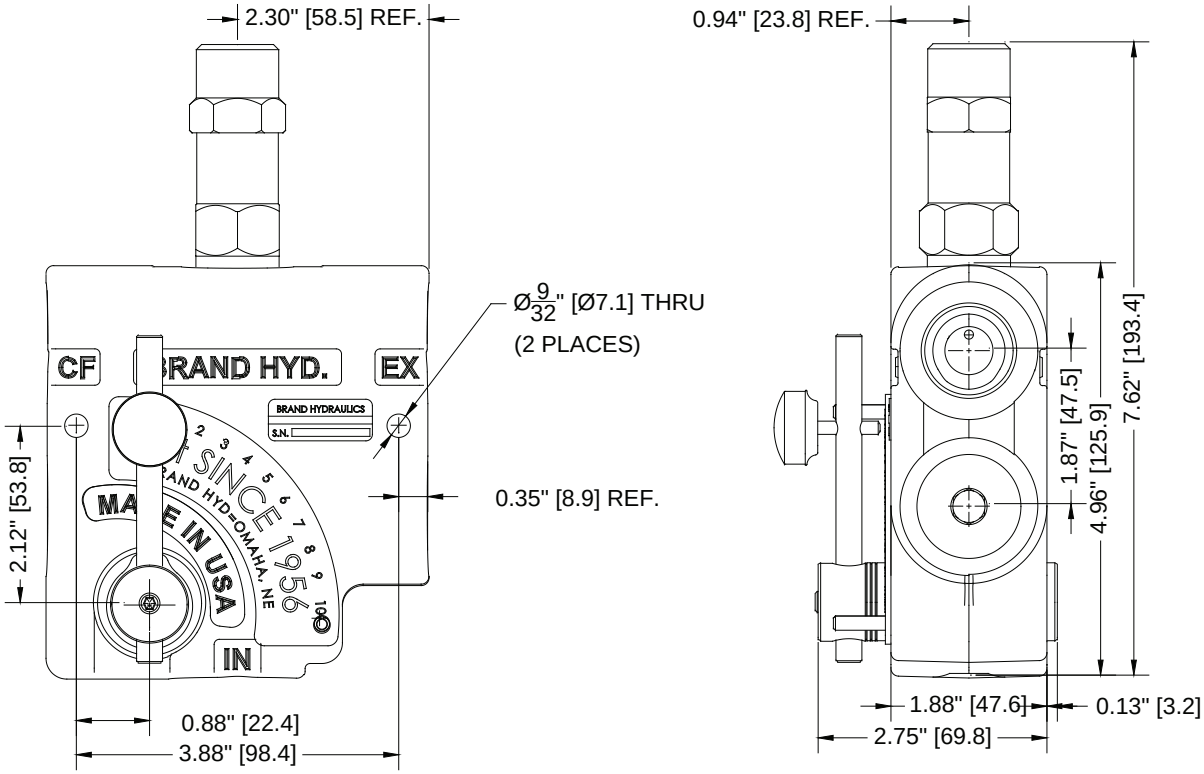
Pressure vs. Flow for FCR51

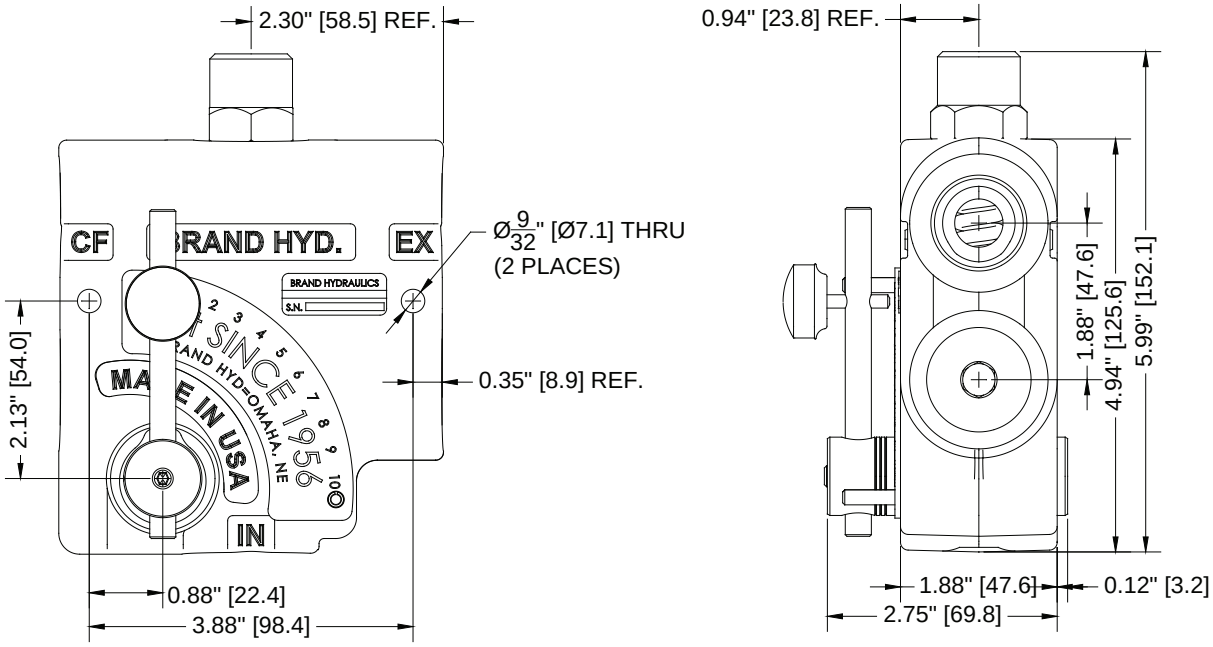


Pressure VS. Flow for FCB51



DIMENSIONAL DATA:
FCB51 AND FC51 DIMENSIONAL DATA (inches & [millimeters]):
(FCB51 SHOWN):





GEARTEK®

HYDRAULIC GEAR PUMPS AND MOTORS

'DB' Series

PIGGY-BACK

Performance Data

MODEL SIZE	DISPLACEMENT/REVOLUTION (THEORETICAL)			PRESSURE RATINGS				MAXIMUM SPEED (RPM)
				NORMAL DUTY		SEVERE DUTY		
	U.S. GALLONS	CUBIC INCHES	CUBIC CENT.	PSI	BAR	PSI	BAR	
DB15	.0129	2.98	48.8	4000	276	3800	262	2500
DB20	.0172	3.97	65.1	3800	262	3000	207	2500
DB25	.0215	4.97	81.4	3000	207	2300	159	2500
DB30	.0258	5.96	97.6	2500	172	2000	138	2500
DB35	.0301	6.95	113.9	2500*	172	2000*	138	2500
DB40	.0344	7.95	130.2	2500*	172	2000*	138	2500
DB45	.0387	8.94	146.5	2500*	172	2000*	138	2500

* CONSULT FACTORY WITH TYPE APPLICATION
PRESSURES MAY BE LIMITED TO SHAFT TYPE

- CAST IRON THROUGHOUT
- PRESSURES TO 4000 PSI
- FLOWS TO 97 GPM
- HEAVY DUTY SLEEVE TYPE BEARINGS
- DOUBLE VITON® SHAFT SEALS STANDARD
- PRESSURE COMPENSATED THRUST PLATES
- DESIGNED FOR HEAVY DUTY APPLICATIONS
- SINGLE AND MULTI-STAGE CONFIGURATIONS
- VARIOUS SHAFT, FLANGE AND PORT OPTIONS
- PRECISION GEARS MACHINED FROM SOLID BAR STOCK
- COMPATIBLE WITH MOST FIRE RESISTANT FLUIDS
- CONTAMINANT RESISTANT
- COMPUTER DESIGNED AND MANUFACTURED
- QUALITY CERTIFIED
- FLEXIBLE DESIGN FOR NEW OR OEM REPLACEMENTS
- SERVICE SUPPORTED BY DEDICATION AND INVENTORY

P. O. BOX 2160, 1506 FULTON DR.
CORINTH, MISSISSIPPI 38835

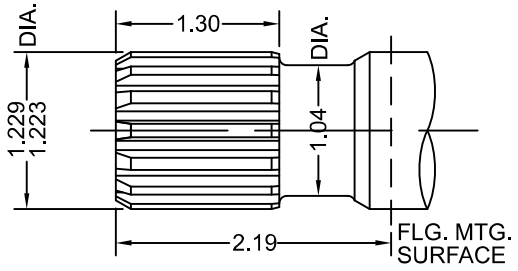
Phone: 662/286-2252 Fax: 662/287-6580 E-mail: haisales@geartek.com Http: www.geartek.com

SHAFTS AVAILABLE

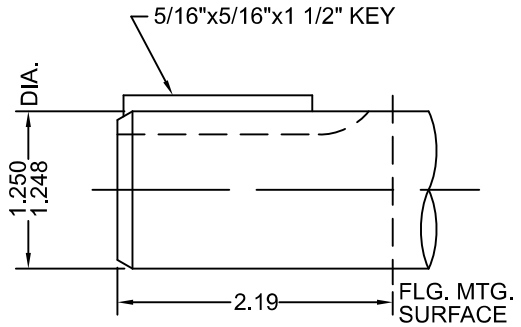
1
1 1/4"-14 TOOTH SPLINE
TORQUE LIMIT 650 FT/LBS

SPLINE DATA

DIAMETRAL PITCH	12/24
PRESSURE ANGLE	30°
NO. OF TEETH	14
MINOR DIA.	1.062-1.050

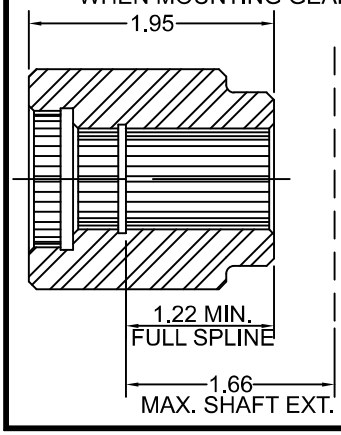


3
1 1/4" STRAIGHT
TORQUE LIMIT 650 FT/LBS



REAR COUPLINGS AVAILABLE

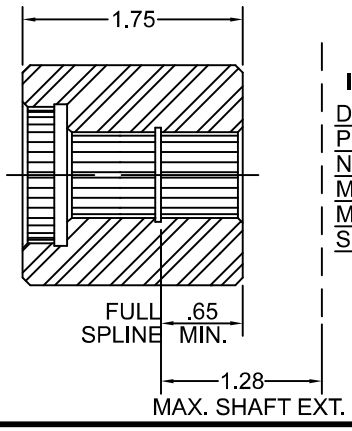
78
7/8"-13 TOOTH INTERNAL SPLINE
SEE INSTRUCTION SHEET 110102
WHEN MOUNTING GEARTEK 'D/HD' ON REAR



INTERNAL SPLINE DATE

DIAMETRAL PITCH	16/32
PRESSURE ANGLE	30°
NO. OF TEETH	13
MAJOR DIA.	.901-.906
MINOR DIA.	.754-.759
SPACE WIDTH	.1008-.1035

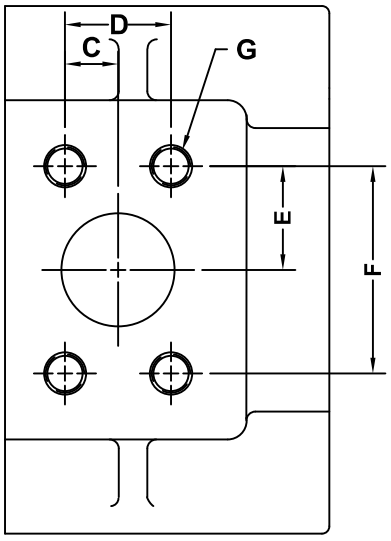
58
5/8"-9 TOOTH INTERNAL SPLINE



INTERNAL SPLINE DATE

DIAMETRAL PITCH	16/32
PRESSURE ANGLE	30°
NO. OF TEETH	9
MAJOR DIA.	.680-.690
MINOR DIA.	.500-.510
SPACE WIDTH	.1008-.1035

STANDARD SAE 4-BOLT CONNECTOR PORTS



SAE 4-BOLT CONN. PORTS

SIZE	INLET SIZE	OUTLET SIZE
DB15	1 1/4"	1"
DB20	1 1/4"	1"
DB25	1 1/2"	1 1/4"
DB30	1 1/2"	1 1/4"
DB35	1 1/2"	1 1/4"
DB40	2"	1 1/4"
DB45	2"	1 1/4"

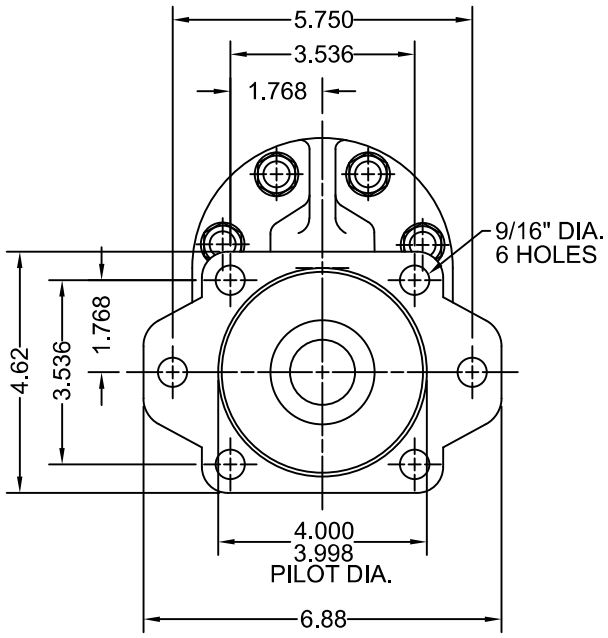
4-BOLT CONNECTOR CHART

SIZE	C	D	E	F	G
1"	.51	1.031	1.03	2.062	3/8-16NC
1 1/4"	.59	1.188	1.15	2.313	7/16-14NC
1 1/2"	.70	1.406	1.37	2.750	1/2-13NC
2"	.84	1.688	1.53	3.062	1/2-13NC

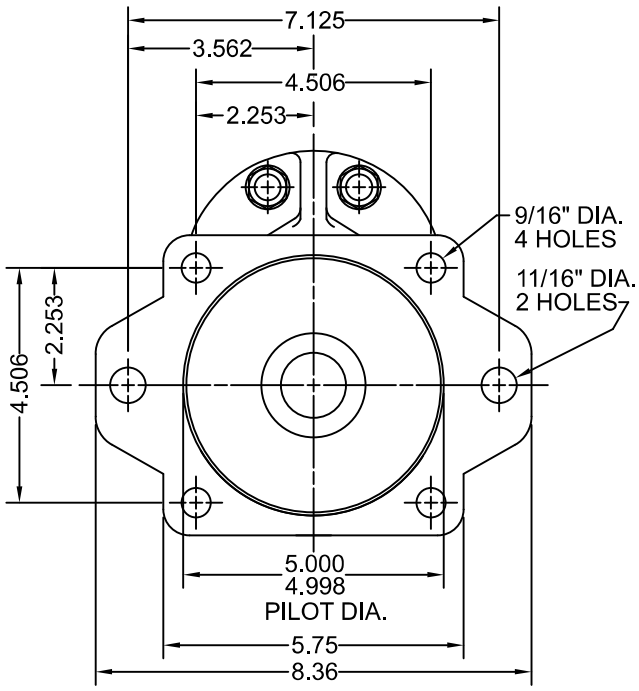
UNLESS OTHERWISE SPECIFIED, ALL LINEAR DIMENSIONS ARE IN INCHES.

FLANGES AVAILABLE

B SAE 2X4 BOLT 'B' FLANGE

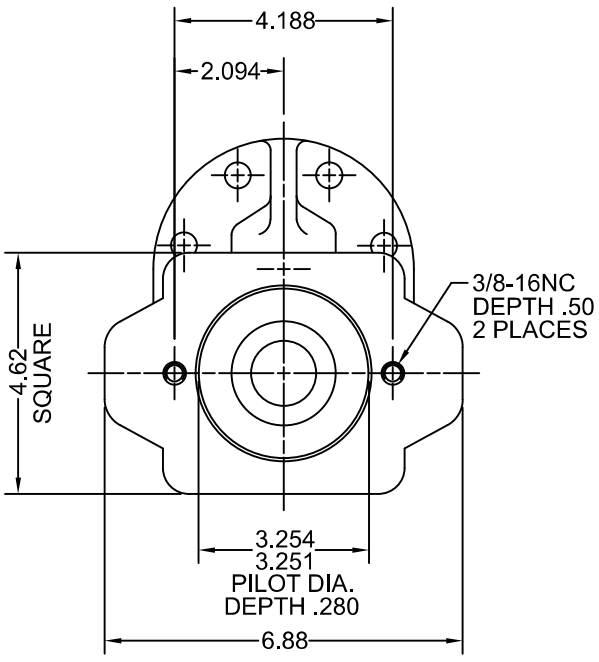


C SAE 2X4 BOLT 'C' FLANGE

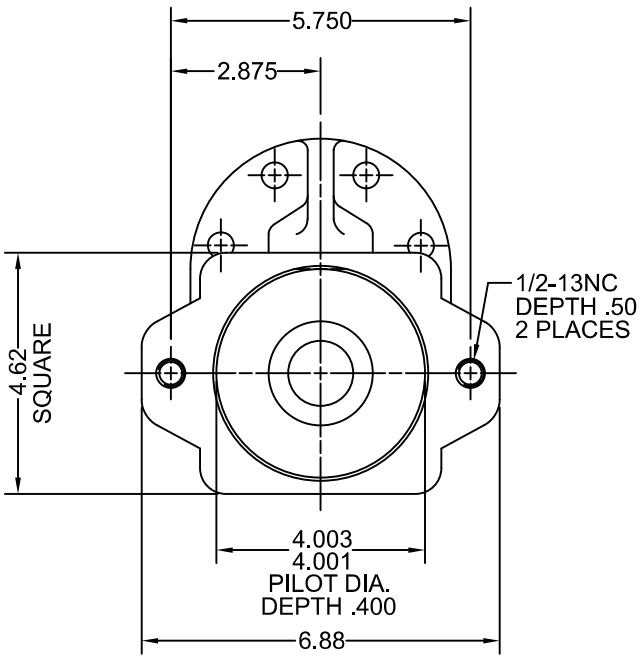


REAR ADAPTERS AVAILABLE

A SAE 'A' REAR ADAPTER PLATE



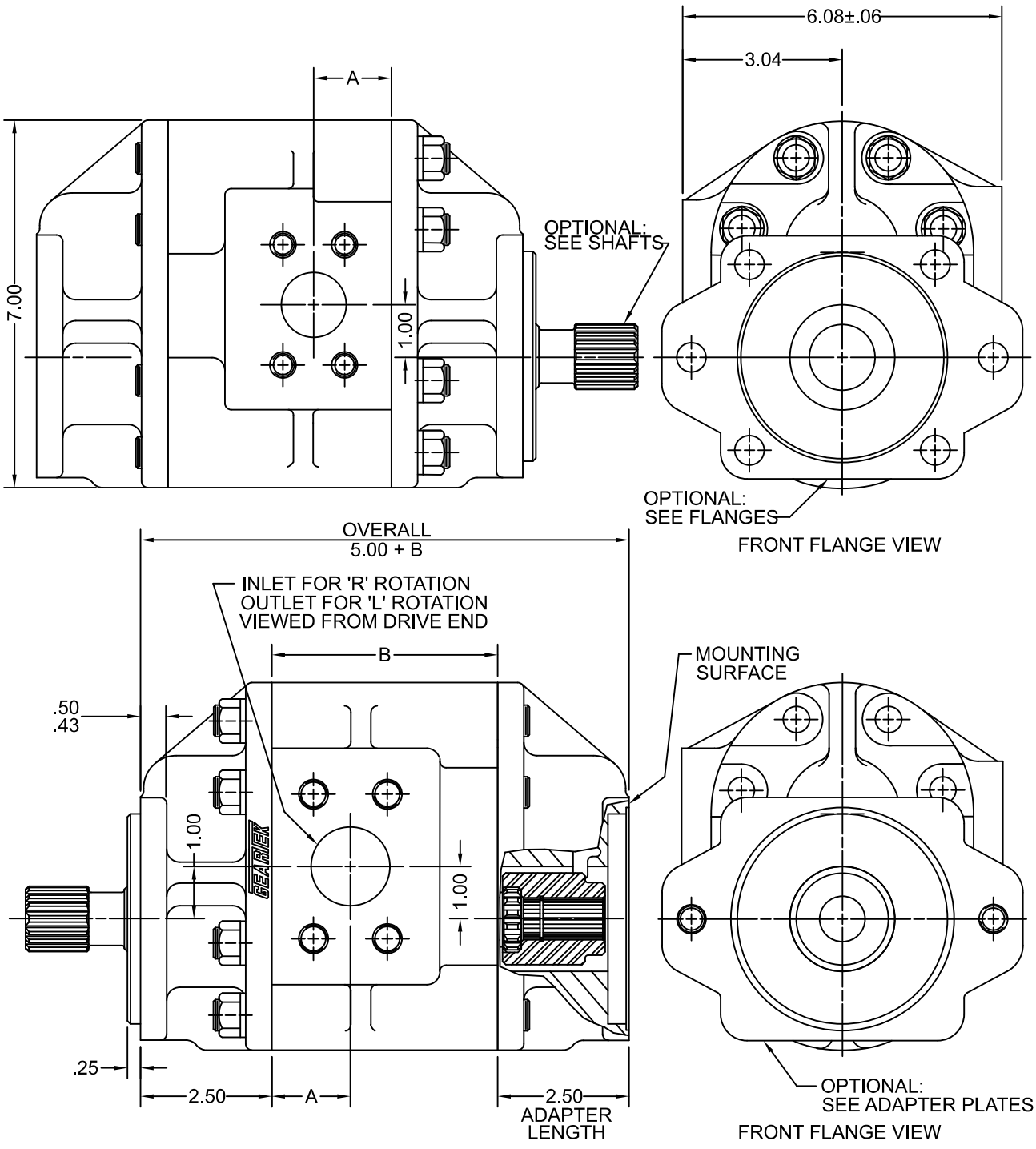
B SAE 'B' REAR ADAPTER PLATE



Revised: January 23, 2009

UNLESS OTHERWISE SPEC F ED, ALL L NEAR DIMENSIONS ARE IN NCHES.

DIMENSIONAL DATA



MOUNTING DIMENSIONS

SIZE	A	B
DB15	1.25	3.02
DB20	1.36	3.31
DB25	1.50	3.59
DB30	1.64	3.87
DB35	1.85	4.16
DB40	1.85	4.44
DB45	2.16	4.73

FOR METRIC DIMENSIONS
MULTIPLY 25.4 X IN. = mm

OTHER PORT TYPES AVAILABLE
CONSULT FACTORY

MODEL EXAMPLE

DB 25 R - 1 C - B - 78

- DB — SERIES
- 25 — SIZE
- R — ROTATION (R=CLOCKWISE, L=COUNTERCLOCKWISE)
- 1 — SHAFT
- C — FLANGE
- B — REAR ADAPTER
- 78 — COUPLING

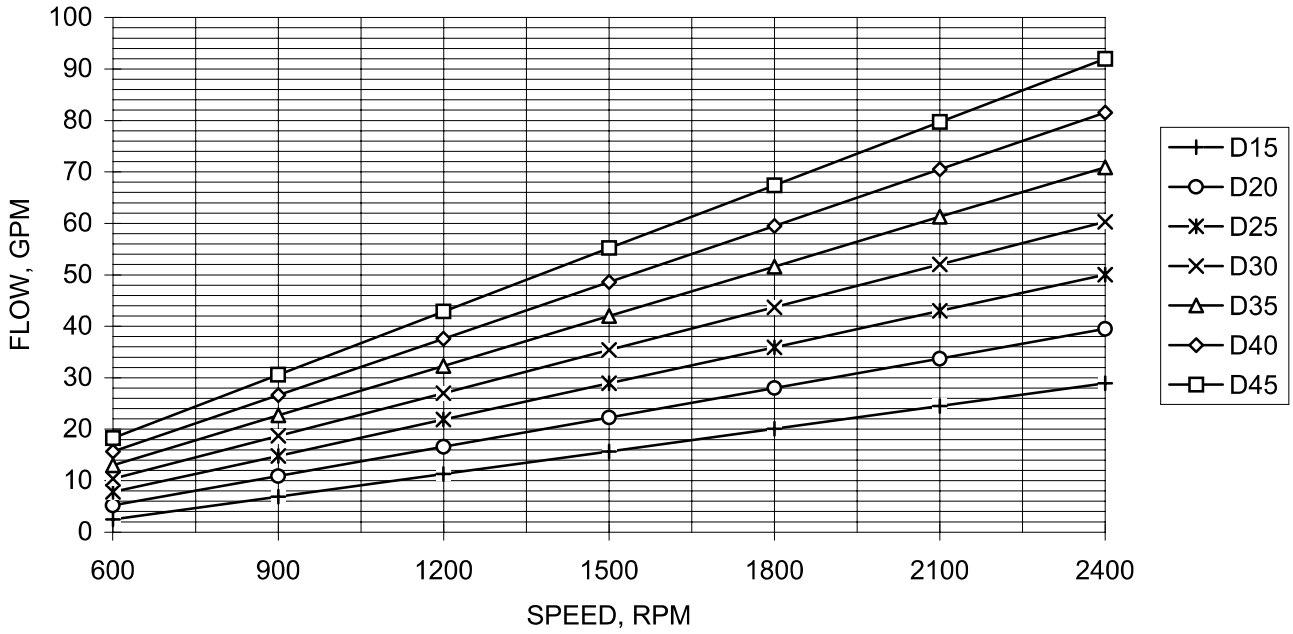
Revised 06/06/2012

UNLESS OTHERWISE SPEC F ED, ALL L NEAR DIMENSIONS ARE IN INCHES.

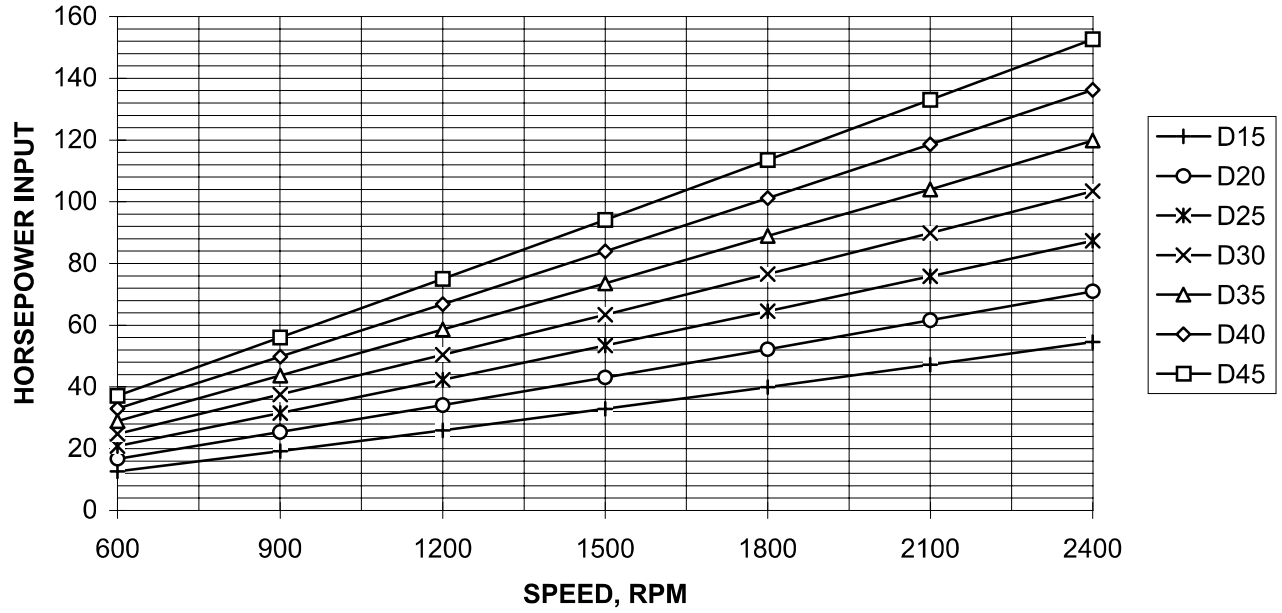
TYPICAL PERFORMANCE DATA

SAE 10W oil @ 150 DEGREES FAHRENHEIT
(150 SSU)

'D' SERIES PUMP FLOW OUTPUT @ 2500 PSI - SAE 10W OIL @ 150 DEGREES FAHRENHEIT



'D' SERIES PUMP HORSEPOWER IN @ 2500 PSI



GEARTEK® FLUID POWER PUMPS AND MOTORS

DIVISION OF HYDRAULIC ANALYSIS, INC.

PowerCore® TEC-10
Turnkey Electronic Controller

A superior turnkey electronic controller, the PowerCore® TEC-10 panel provides full control of your engine including auto start/stop, auto throttling and display of engine parameters along with critical faults from the engine/application. The TEC-10 supports SAE J1939 CAN protocols for electronically governed engines as well as analog sensors on mechanical engines for fault and safety warnings/shutdowns.

The TEC-10 follows a standard operating sequence of 22 machine states that happen in a predetermined order. These machine states may be set to zero if not needed or adjusted to fit the application. The incredibly versatile menu structure allows parameters and settings to be changed from the face without the need of a PC tool, if desired. This flexibility allows for the same controller panel to be used across many applications and provides the operator familiarity with the controller panel in a variety of uses.

The controller panel features molded connectors that utilize industry-standard Deutsch connectors and are compatible for use on the simplest mechanical engine to the most advanced, fully electronic Tier 4 engines.*

Designed as a plug-and-play solution, the TEC-10 can also utilize a free PC configuration tool that allows customers to change default settings as well as provide three levels of passcode protection, if needed.

The rugged TEC-10 panel can be mounted directly to the engine or engine/application cover. Built to endure industrial environments from full sun to wide temperature ranges, the panel features a high degree of sealing for dust and water as well as the ability to withstand higher vibration with exposure.

*Murphy Industrial Harness or John Deere OEM engine harnessing required.

Specifications

TEC-10 Panel

Operating Voltage: 8-32 VDC, reverse battery polarity and load dump protected

Operating Temperature: -40° to +85° C (-40° to 185° F)

Storage Temperature: -40° to +85° C (-40° to 185° F)

Cranking Power Holdup: 0 VDC up to 50 mS (also good for brownout/blackout instances)

IP Rating: IP67

Total Current Consumption:
Power on in stopped state; 117 mA at 12 VDC. Power on in standby mode; 52 mA at 12 VDC.

Mating Connectors:
21 Position, Deutsch HDP26-24-21SE,
31 Position, Deutsch HDP26-24-31SE

Communications:
(1) CAN: J1939
(1) RS485: Modbus RTU

Outputs (8):
(3) Relays:
(2) +DC (10A)
(1) Form C (10A)
(2) Low-side FET: -DC (1A)
(2) High-side FET: +DC (1A)
(1) Dedicated Alternator Excitation +DC (1A)

Inputs (9):
(5) Digital, configurable (active on High, Low, Open)
(3) Analog, configurable (4-20 mA, 0-5V, resistive or digital ground)
(1) Frequency, supporting:
Magnetic pickup (30 Hz - 10 kHz, 2.0 VAC-120 VAC) and
Engine Alternator (30 Hz - 10 kHz, 4.5 VRMS - 90 VRMS)

Languages: English, Spanish, German, French, Italian

Dimensions: 9.59 x 7.34 x 5.20 in. (243.48 x 186.5 x 132.23mm) (WxHxD)

Enclosure: Polycarbonate

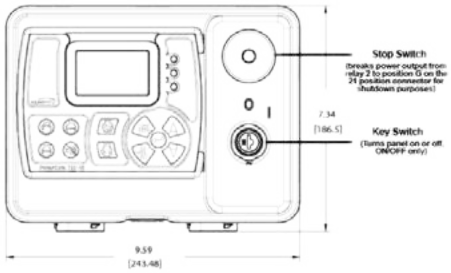
How to Order

Part Number	Model and Description	Notes
40700495	PowerCore TEC-10 Panel	
40000602	Engine Harness, 21 Position Connector 10’ Whip Harness (3m approx.)	
40000603	I/O Harness, 31 Position Connector 10’ Whip Harness (3m approx.)	
40000479	Deutsch Connector Kit, 21-pin & 31-pin, Panel Connector Kit	
40000531	Deutsch Connector kit, 21-pin, Panel Connector Kit, Engine Only	
78700046	Deutsch Connector kit, 31-pin, Panel Connector Kit, I/O Only	

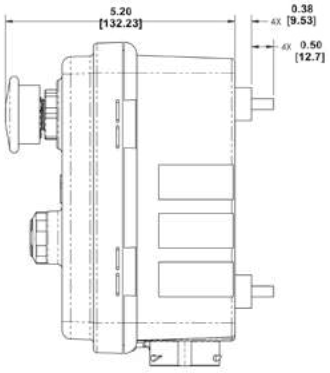
Product and Mounting Dimensions

PowerCore TEC-10

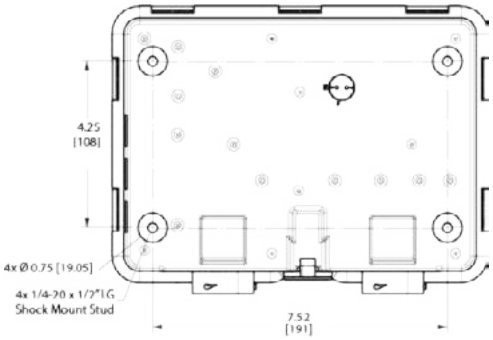
Front View



Side View



Back View



Connectors

Deutsch 21 pin Connector Engine	
PIN	**Function**
A	Unavailable
B	Battery (positive)
C	Unavailable
D	Relay 1, +DC (10A), Default Setting: Crank
E	Battery (negative)
F	J1939 CAN Shield
G	Relay 2, +DC (10A), Default Setting: ECU Enable
H	Unavailable
J	Alternator Excite Output, +DC (1A)
K	Unavailable
L	Unavailable
M	Unavailable
N	Unavailable
P	Unavailable
R	Digital Output 3, -DC, (1A), Default Setting: Throttle Decrease
S	Digital Ouput 4, -DC, (1A), Default Setting: Throttle Increase
T	Frequency Input
U	J1939 CAN Low (includes terminating resistor, Default to ON)
V	J1939 CAN High (includes terminating resistor, Default to ON)
W	Analog Input 2, Default Setting: Not Used
X	Analog Input 1, Default Setting: Not Used

Deutsch 31 pin Connector I/O	
PIN	**Function**
1	Unavailable
2	Unavailable
3	Unavailable
4	Unavailable
5	Unavailable
6	Unavailable
7	Unavailable
8	Unavailable
9	Analog Input 3, Default Setting: Not Used
10	Unavailable
11	Unavailable
12	Unavailable
13	Digital Output 1, +DC, (1A), Default Setting: Not In Auto
14	Digital Input 3, Default Setting: Dual Contact Stop, B-
15	Unavailable
16	Unavailable
17	Relay 3 Common (RLY 3 Defaulted to Not Used) 10A Max
18	Relay 3 NC (RLY 3 Defaulted to Not Used) 10A Max
19	Relay 3 NO (RLY 3 Defaulted to Not Used) 10A Max
20	Digital Input 5, Default Setting: Low Lube Oil Level B-
21	Digital Input 1, Default Setting: Not Used
22	Unavailable
23	Digital Input 2, Default Setting: Dual Contact Start, B-
24	Digital Output 2, +DC, (1A) Default Setting: Engine Running)
25	Unavailable
26	Unavailable
27	Unavailable
28	Unavailable
29	Digital Input 4, Default Setting: Low Coolant Level, B-
30	RS485 (positive)
31	RS485 (negative)