



Enriching Lives

Installation, Operation and Maintenance Manual FOR FIRE PUMP DRIVE ENGINES

KFP SERIES



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Foreword

Dear Customer,

We are glad to welcome you to the family of KIRLOSKAR KFP series engine owners. The KFP water cooled engines are specifically developed for Fire fighting pump set application. These engines are certified by FM approved and are UL Listed. Kirloskar products are well known for their reliability, simplicity in the maintenance and low running cost. Prompt after sales service through countrywide network of Service Dealers and Distributors is one of the plus point in buying Kirloskar products.

We assure you that all necessary safety precautions and regulations have been observed in design, selection of materials and manufactures of KFP series engines. All the units undergo rigorous tests before being delivered to customer.

This manual deals with engine Operations and Maintenance. The performance of the engine largely depends on its proper maintenance and upkeep. So be sure to maintain your KFP series engines properly as per the instructions and schedule given in this manual. We recommend that only trained staff should be permitted to perform the operating and maintenance tasks. Always use genuine **KIRLOSKAR SPARE PARTS**, if at all required. In addition to the publication of this manual, we maintain facilities for training operators and owners in the maintenance of KIRLOSKAR DIESELS. You can avail yourself of these facilities by contacting our authorized Service Dealer/Distributor nearest to you.

Continuous improvements and advancement of product design may cause changes in engine, which may not include in the publication. Each publication is reviewed and revised as and when required to update and include changes in later editions without notice.

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1. General

1.1 Your engine needs

- Clean High Speed Diesel oil.
- Lubricating oil of specified quality and viscosity grade.
- Fresh air for combustion of fuel, for cooling of engine.
- Proper ventilation of engine compartment to avoid re-circulation of hot air.
- Genuine spare parts for its maintenance.

1.2 Service and Maintenance

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

1.3 Maintenance and Repairs

- Shut down the engine before carrying out maintenance or repair work.
- When the work is complete, be sure to install safety devices that may have been removed.
- If you have to work on a running engine, ensure that all clothing is tight fitting and cannot catch the moving parts.
- Never fill the fuel tank while the engine is running.
- Observe all industrial safety regulations when engines are operating in enclosed spaces or underground.
- Please contact your Distributor for Spare parts enquiry. Use only genuine spare parts.

1.4 Safety

- All Safety instructions (for both engine and operator) in this manual are designed by the accompanying symbol. Please follow them carefully.
- The attention of operating personnel should be drawn to these instructions.
- General safety and accident prevention regulations laid down by law must also be observed.



IMPORTANT: After the engine service or repair, make sure that all the guards and shields have been replaced and all tools have been removed from the engine.

2. Introductions

2.1 Scope

The following paragraphs states the Scope of the Engine:

- The Kirloskar Engine supplied has been designed for the sole purpose of driving a stationary 'Fire Pump' only and these engines should not be used for any other applications other than above said purpose.
- These engines should not be subjected to the Horsepower requirements greater than the certified nameplate rating (For FM/UL only).
- 'Engine power Deration' for Altitude and temperature need to be considered for maximum pump power.
- Engine Fuel delivery settings are factory set with-in the injection pump and must not be tampered with or adjusted.
- The engine should be installed and maintained in accordance with the guidelines stated in this manual.
- Periodic engine running checks to ensure functionality should be kept to a maximum of 30 minutes per week.

2.2 Engine Name Plate

- Throughout this manual, the terms "Engine" and "Machine" are used.
- The term "Engine" refers solely to the diesel engine driver which is supplied by KIRLOSKAR
- The term "Machine" refers to any piece of equipment with which the engine interfaces.

This operation and maintenance manual provides all the information necessary to operate your newly equipped engine safely, efficiently and perform periodic servicing correctly.

Please read this manual carefully before installation and operation to avoid accidents.

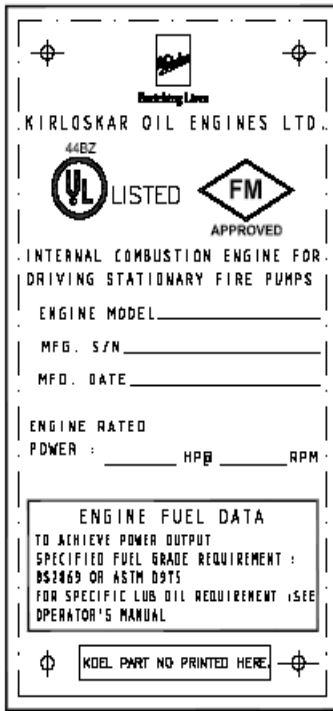
Name plate is provided on every engine. The nameplate will shows the Engine Model, Serial Number, Date of Manufacture and the Power Rating along with the specifications of diesel to be used. The engine nameplate is mounted at starter side on all KFP series engine. The engine nameplate is shown below.

Identification of Nameplate

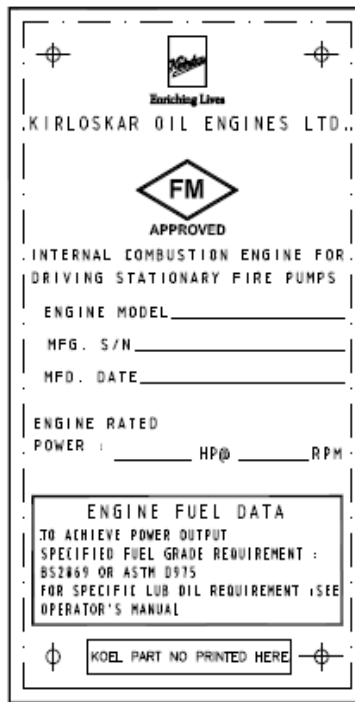
FM/UL Approved Nameplate

FM Approved Nameplate

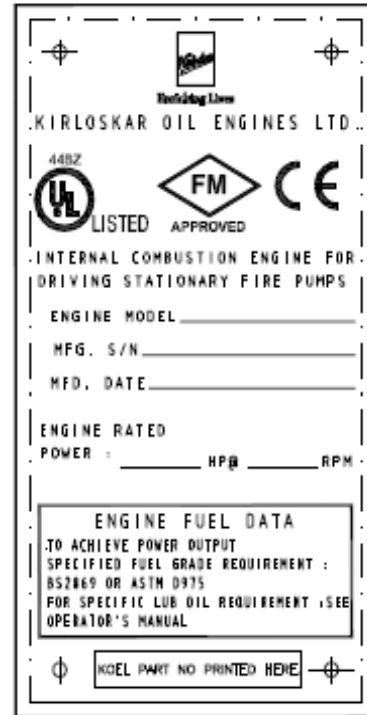
FM/UL with CE Nameplate



Enriching Lives
KIRLOSKAR OIL ENGINES LTD.
44BZ
UL LISTED FM APPROVED
INTERNAL COMBUSTION ENGINE FOR DRIVING STATIONARY FIRE PUMPS
ENGINE MODEL _____
MFG. S/N _____
MFD. DATE _____
ENGINE RATED POWER : _____ HP@ _____ RPM
ENGINE FUEL DATA
TO ACHIEVE POWER OUTPUT SPECIFIED FUEL GRADE REQUIREMENT : BS2869 OR ASTM D975 FOR SPECIFIC LUB OIL REQUIREMENT ,SEE OPERATOR'S MANUAL
KOEL PART NO PRINTED HERE



Enriching Lives
KIRLOSKAR OIL ENGINES LTD.
FM APPROVED
INTERNAL COMBUSTION ENGINE FOR DRIVING STATIONARY FIRE PUMPS
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KOEL PART NO PRINTED HERE

KIRLOSKAR engine model specifies the Base engine type, Number of cylinders, Approval listing and Power rating code.

Example: KFP4R-UF15

- KFP = Kirloskar Fire Power
- 4 = Number of cylinders
- R = Engine series
- UF = Underwriters Laboratories Listed/ Factory Mutual Approved
- 15 = Power rating code

2.3 Safety/Caution/Warnings

NOTICE: As these Kirloskar engine is having components and fluids that reach very high operating temperatures and is also provided with moving pulleys and belts. So it is necessary to approach with caution to avoid any type of accidents. It is the responsibility of the builder of the machine using a KIRLOSKAR engine to optimize the application in terms of maximum end user safety.

Personal Protective Equipment (PPE)

Operator should understand the effective and right type of PPE use and must be worn in the right way. Every PPE should be tested or checked for fitness before use. The following categories of PPE based on the body part to protect against hazards.

Eye and Face Protection:

- Operator should wear safety glasses or face shields when work areas which create flying particles or objects or splash hazards that may injure the eyes, face or any other parts of the body and also wear protections when exposed to electrical hazards.
- Face and eyes protectors should be selected on the type of hazards. For examples: chemical splash goggles for chemicals hazard, for other liquids use safety glasses with side shields for flying particles and for objects use safety glasses with appropriate protective shield for welding.



Foot Protection:

- Operator should wear safety shoes or boots with crack or puncture resistant soles.
- The protective footwear which have steel cup should be worn to prevent crushing injuries when working with heavy equipment which may fall on body.



Hand Protection:

- Operator should wear the appropriate gloves while working on Engine. Examples: Insulated gloves and sleeves when exposed to electrical hazards.
- Gloves should fit properly while working.



Head Protection:

- Wear hard type of hat when there is a possibility of objects falling from above, head collision to fixed objects, or head contact accidentally with electrical hazards.
- Every hat must be routinely inspected for cracks, dents, or damaged and should replace immediately.



Hearing Protection:

- Operator should use the ear plugs or ear protectors due to high noise while engine running and clean or replace damaged ear plugs regularly.
- Operator should wear the hearing protection properly to minimize the hearing sound.



Personal Protective Equipment with Possible Hazard

Sr. No.	PPE	Body Part	Hazard
1	Welding goggles	Eyes	Eyes exposed to welding sparks or particle
2	Safety goggles	Eyes	Risk of impact by flying particles like during chipping or grinding Risk of contact with corrosive material which may harm the eyes.
3	Safety side shield for goggles	Eyes	Exposed to minor Grinding pieces or splash etc.
4	Face shield and Welding helmet	Face & Eyes	Exposed to welding particle or sparks
5	Face Shield	Face & Eyes	Risk of contact with hot material or corrosive metal or liquid which may harm the face and eyes e.g. any type of acid / alkali or metal.
6	Leather shoe without steel toe	Feet	Industrial work with less risk of heavy material falling on feet or hitting toes etc
7	Leather safety shoe with steel toe & anti-skid soles.	Feet	Risk of heavy material falling on the feet e.g. Heavy material handling, maintenance work, lifting of heavy material like Engines & spare parts etc.
8	Electrician shoe with insulated sole	Feet	Exposure to live electrical wires, working on High tension lines and Electric panels
9	PVC shoe	Feet	Industrial work where there is exposure to liquid chemicals.
10	Heavy duty Hand gloves	Hand	Any type of welding or hot material handling etc.
11	Canvas cotton gloves	Hand	Exposure to grease, operating engine valves, lifting weights. Risk of exposure to hazardous or toxic material.
12	Nitrile Gloves	Hand	Risk of contact with corrosive or toxic material e.g. acids or Alkali.
13	Electric shock proof Hand gloves	Hand	Exposure to live electrical wires, working on High tension lines and Electric panels
14	Safety Helmet	Head	Risk of being head struck between machine moving parts or hitting head from something during working or Object falling on head from working floor.
15	Ear muffs	Hearing protection	Exposure to high noise levels for long time e.g. DG set running area or engine operation without canopy.
16	Ear plugs	Hearing protection	Exposure to high noise levels for short period e.g. visit to DG set room

Basic Recommendations

The following recommendations are specified to reduce the risk to human and property when an engine is in service or out of service.

These KFP series engines should not be used for applications other than those specified under “Scope”.

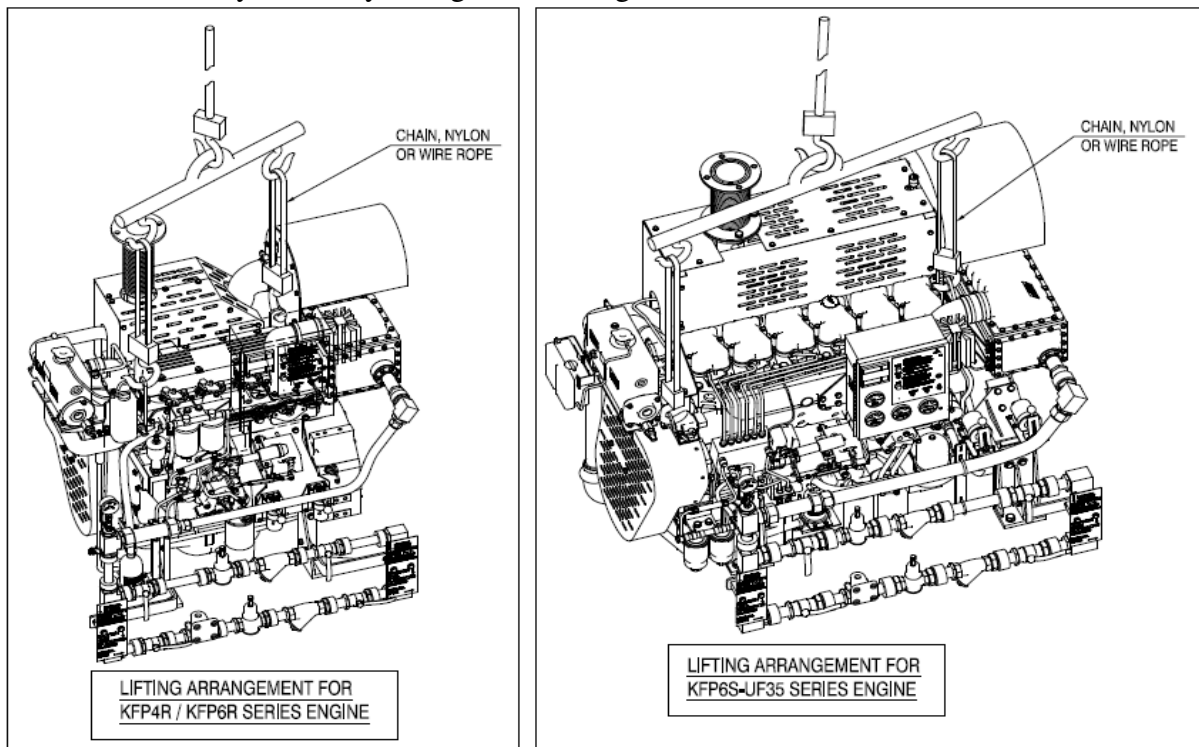
Any improper handling of engine and use of non-original parts may affect safety. While lifting the engine, one should take care to use suitable equipment or means to be applied to the lifting locations specially provided on every engine. These lifting locations are shown on the engine Installation Drawing.

KFP series engine weights are shown in table below,

Engine Model	Engine Weight lb(kg)
KFP4R-UF07	1278(580)
KFP4R-UF15	1931(631)
KFP6R-UF25	2365(883)
KFP6S-UF35	2557(1160)

2.4 Engine lifting (For Bare Engine)


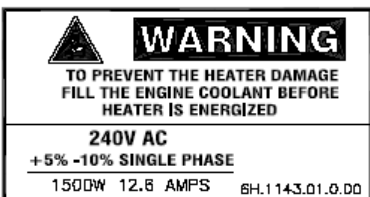
As shown in photograph below, before lifting a typical engine, fix the lifting hooks. The lifting hooks on the engine are meant for lifting the bare engine only. The use of both the hooks is mandatory for safely lifting the bare engine









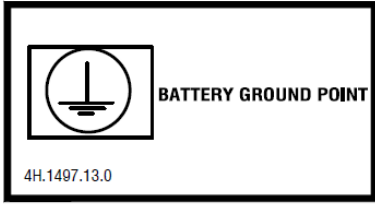



Note: - It is recommended that operator should use hearing protection like ear guard while doing the weekly functional test as the engine produces a noise more than 75 dB (A)

2.5 Warning Labels

Warning labels, in picture form, are applied to the engine. Their meanings are given below.

 <p>WARNING THIS EQUIPMENT STARTS AUTOMATICALLY USE EAR PROTECTION</p> <p>4H.1497.04.0.00</p> <p>AUTOMATIC START</p>	 <p>WARNING LIFTING HOOK TO LIFT ENGINE ONLY</p> <p>4H.1497.05.0.00</p> <p>LIFTING POINT</p>
 <p>WARNING HIGH CURRENT 45 AMPS USE ONLY ENGINE CONTROLLER OF PROPER RATING</p> <p>4H.1497.08.0.00</p> <p>ALTERNATOR SAFETY</p>	 <p>WARNING USE GUARDS TO PROTECT ROTATING PARTS</p> <p>4H.1497.03.0.00</p> <p>ROTATING PARTS</p>
 <p>CAUTION DO NOT START ENGINE WITHOUT AIR FILTER INSTALLED TO PREVENT ENGINE DAMAGE OR PERSONAL INJURY.</p> <p>4H.1497.01.0.00</p> <p>AIR FILTER INSTALLATION</p>	 <p>WARNING TO PREVENT THE HEATER DAMAGE FILL THE ENGINE COOLANT BEFORE HEATER IS ENERGIZED</p> <p>240V AC +5% -10% SINGLE PHASE 1500W 12.8 AMPS 6H.1143.01.0.00</p>
 <p>WARNING 60 P.S.I. (MAX)</p> <p>4H.1497.06.0.00</p> <p>HEAT EXCHANGER MAX. WORKING PRESSURE</p>	 <p>WARNING TO PREVENT THE HEATER DAMAGE FILL THE ENGINE COOLANT BEFORE HEATER IS ENERGIZED</p> <p>240V AC +5% -10% SINGLE PHASE 2000W, 8.3 AMPS 6H.1143.02.0.00</p> <p>JACKET WATER HEATER</p>
 <p>WARNING PRIOR TO FILLING PREMIX 50% TREATED WATER AND 50% ANTI-FREEZE COOLANT</p> <p>4H.1497.07.0.00</p> <p>USE OF ANTI FREEZE COOLANT</p>	 <p>FUEL SUPPLY FUEL RETURN 4H.1497.09.0.00</p> <p>FUEL SUPPLY AND RETURN</p>

 <p>WARNING</p>  <p>EMERGENCY STOP LEVER</p> <p>4H.1497.17.0</p>	 <p>WARNING</p>  <p>DANGER : ELECTRICITY</p> <p>4H.1497.14.0</p>
 <p>WARNING</p>  <p>NO SMOKING</p> <p>4H.1497.15.0</p>	 <p>WARNING</p>  <p>DO NOT TOUCH</p> <p>4H.1497.16.0</p>
  <p>BATTERY GROUND POINT</p> <p>4H.1497.13.0</p>	

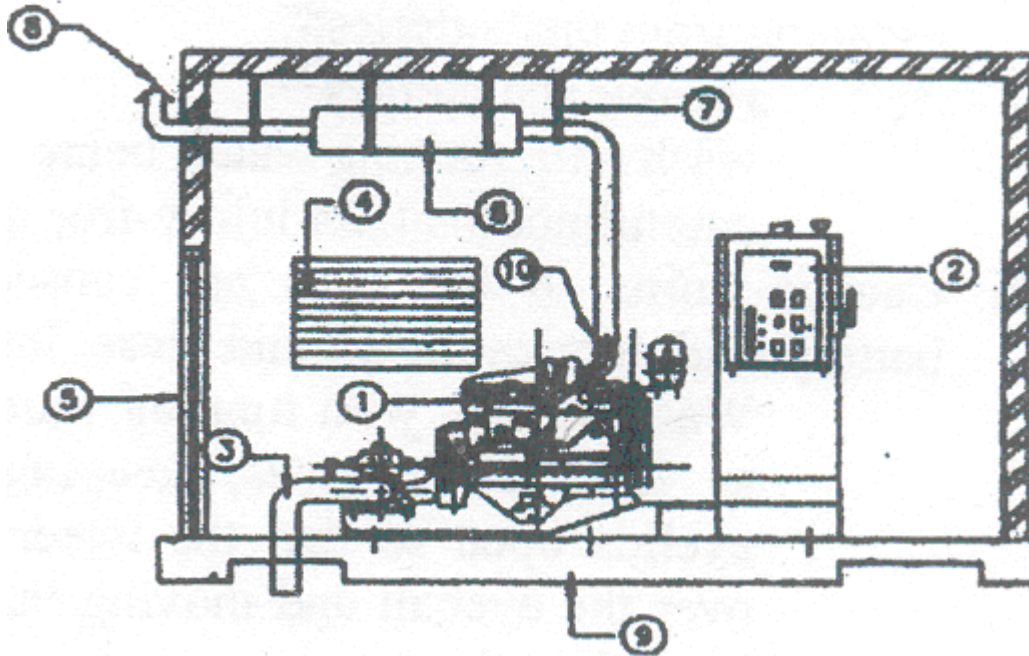


IMPORTANT: This exclamation symbol indicate that there is a possibility of danger. Please follow them carefully and also follow all federal regulations associated with the use of this product

3. Installation

3.1 Typical Installation

A typical Fire Pump installation is shown in the illustration below



1. Pump/Engine set
2. Main Pump Controller
3. Pump discharge
4. Air louver
5. Entrance door with air louver
6. Exhaust silencer
7. Exhaust system supports
8. Exhaust outlet pipe
9. Concrete base
10. Exhaust expansion bellow

3.2 Installation Instructions

The correct installation of the engine is very important to achieving optimum performance and extended engine life. In this respect, the engine has certain installation requirements, which are critical to how it performs. These requirements are generally associated with the cooling, exhaust, induction air, and fuel systems.

All installations should be clean, free of any debris and dry. Care should be taken to ensure that there is easy access to the engine for maintenance and repair. The safety of personnel who may be in the area of the engine when it is running is of paramount importance when designing the installation layout.

- ❖ Secure pump set to foundation and complete installation in accordance with pump Manufacturer's instructions.
- ❖ Engine with Heat Exchanger Cooling: Install the heat exchanger discharge pipe. The discharge pipe should be installed in accordance with applicable codes. All plumbing connecting to the heat exchanger must be secured to minimize movement by the engine. Cooling loop water pressure to the heat exchanger must not exceed the limit that is stated on the heat exchanger supplied with the engine.
- ❖ Install all engine cooling system drain cocks and plugs.
- ❖ Fill engine cooling system with 'K COOL Super plus coolant.
- ❖ Engine is shipped with oil **installed**. For make-up oil specification refer to Lubrication System.
- ❖ Connect fuel supply and return line to fuel supply tank
- ❖ Remove protective covering on air cleaner element.
- ❖ Connect jacket water heater to AC power source. The electrical supply requirements are indicated on the heater body. Connect the supplied heater connection wire directly to a customer supplied electrical junction box ***Supply wiring should never be routed through the engine instrumental panel***. Severe damage to critical engine control components could result. Energize heater only after engine coolant is filled in the cooling system.
- ❖ Connect exhaust system to flexible connection on the engine. The exhaust system plumbing must be supported by the building structure and not the engine. The exhaust flexible connection is provided only for the purpose of thermal expansion and vibration isolation, not for misalignment or directional change.
- ❖ Make electrical DC connections between the engine instrumental panel terminal strips and the controller as per the controller manufacturer's instructions.
- ❖ Connect cables between engine and batteries only after electrolyte is installed. Refer to the wiring diagram inside the engine instrumental panel, Refer wiring diagram No. 4H.1364.22.0.00 for KFP4R/KFP6R engines and F6.465.22.0.00 for KFP6S engine in this Manual for correct positive and negative connections. Connect negative cables directly to the engine block/starter negative terminal.. Note: For all KFP series engines, connect battery1 and battery2 positive cable separately to manual starter contactor 1 and 2.



IMPORTANT: DO NOT energize the AC coolant heater without coolant in engine which may damage the engine.

IMOPRTANT : General installation drawing for all KFP Series engines are given at the end of this manual. Refer these drawings for connections, mounting sizes and location dimensions.

Note: Kirloskar KFP series engines Installation, Operation and Maintenance instruction manual and Illustration spare parts list are supplied with the engine.

3.3 Weekly Test

An experienced operator should be present during the weekly test.

NOTE: - This engine is designed to operate at rated load conditions. For testing purposes the engine can be run at lower load (lower flow) conditions. Running times in any one period should not exceed 30 minutes maximum.

Before starting the engine make sure of the following:

- The operator has free access to stop the engine in an emergency.
- The plant room ventilation ducts are open and the engine has good access for air.
- All the guards are in position and, if not, for whatever reason, any rotating parts will be free and clear without restriction.
- Battery covers are in place and there is nothing on top of or touching the engine, which is not part of the original supply specification.
- Heat Exchanger Cooling: The water supply for coolant is available again without restriction.

When engine is running make sure that the coolant temperature and oil pressure, raw cooling water flow are within the limits specified on the relevant Engine Data Sheet.

If the coolant temperature is excessive, check:

- a) Cooling loop strainers
- b) Proper functioning of thermostat
- c) Condition of heat exchanger tube bundle

4. Starting/Stopping the engine

4.1 To Start Engine

Use main pump controller for starting. Follow instructions provided by controller manufacturer.

On FM/UL approved engines, use main pump controller for starting and stopping the engine. If the main pump controller become inoperable, the engine can be manually started and stopped from the engine instrumental panel. For manual starting and stopping of an engine with instrumental panel: Position **MODE SELECTOR** to **MANUAL RUN**. (Refer to Figure below). Lift and hold **MANUAL CRANK #1**, until engine starts, or release after 15 seconds. If unit fails to start, wait for 15 seconds, use **MANUAL CRANK #2** and repeat step. If **COOLING WATER** is not flowing or engine **TEMPERATURE** is too **HIGH**, open cooling system manual by-pass valves.

Note: KFP series engines can also start with manual starting contactors.



IMPORTANT: During manual starting the engine, make sure the cooling line water valve is open to flow to the engine exchanger.



IMPORTANT: Make sure that nobody is standing near by the engine as Engine is in **AUTOMATIC** start mode.



Engine Instrument panel



IMPORTANT: Main pump controller selector should be in the **OFF** position when starting from engine instrumental panel. Be sure to return selector on main pump controller and engine instrumental panel to **AUTOMATIC mode** after completing manual run.

4.2 To Stop Engine

If engine is started from main pump controller use main pump controller to stop the engine.

If engine is started from engine instrumental panel: Operate the **STOP** toggle switch to stop the engine. Remember to close cooling system manual by-pass valve if opened.

KFP series engines are also having manual shutdown lever on the engine for engine fuel shutdown.



IMPORTANT: DO NOT leave the **MODE SELECTOR** switch in the **MANUAL RUN** position during **AUTOMATIC** operation. (The controller will be unable to stop the engine and **DAMAGE MAY RESULT**).



IMPORTANT: The engine should not run with the engine fault lamp ON unless there is emergency.

5. Engine Systems

5.1 Fuel System

Circuit

A lift pump (feed pump) incorporated in the fuel injection pump is used to pick up the diesel from the tank. Two stages of filters (a pre-filter and a micro paper filter) ensures the cleanliness of fuel before it is supplied to the fuel injection pump. The schematic diagram shows the fuel circuit of the engine.

The flexible hose used for all fuel lines is complying as per ISO 15540 standard.

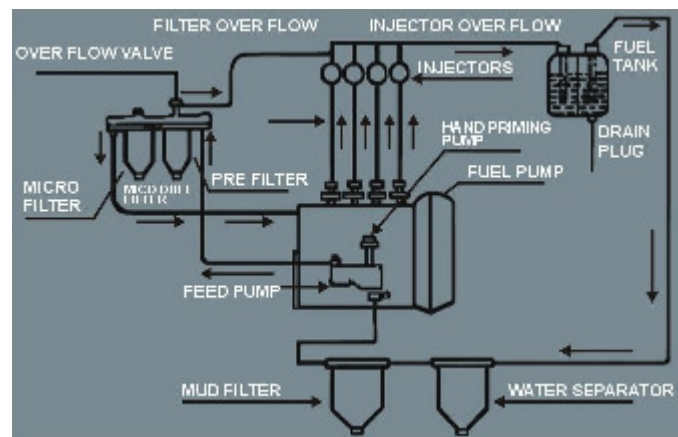
NOTE: - If the fuel tank is to be installed below the fuel pump level, then the bottom level of the fuel tank should be less than 1 meter below the feed pump inlet.

Fuel Specifications

The performance of the engine depends upon supply of clean and correct grade of fuel. The fuel injection equipment is manufactured to very close tolerances and slightest amount of dirt in fuel can cause wear on the injection equipment.

The following specification are approved

- ASTM D975 – 2003: 1D, 2D & 4D



Fill up the fuel tank after making sure that it is properly cleaned. Use only High Speed Diesel Fuel. Never fill the fuel tank while the engine is running. Observe strict cleanliness. Do not spill any fuel while filling.

5.1.1 Bleeding the Fuel System

- Loosen the vent screw on primary fuel filter as shown below.



Primary element

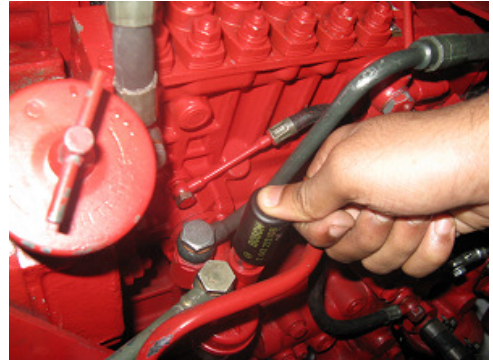


Micro element

- Operate the fuel lift pump (feed pump) until oil flows without air bubbles as shown below.



For KFP4R-UF07 Series

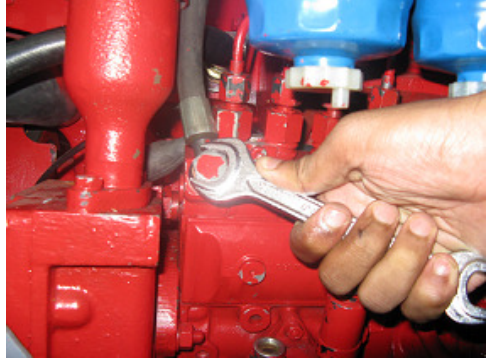


For KFP4R-UF15/KFP6R/KFP6S Series

- Tighten the vent screw on primary fuel filter while the diesel flowing without air bubbles.
- Similarly bleed the micro filter element by loosening the vent screw on it as shown above and tighten the vent screw after the removing the air lock.
- Loosen the banjo bolt on fuel pump gallery as shown below. Operate the fuel lift pump till the fuel flows free of air bubbles.



The fuel system should be tight and leak proof and always closed. Always do visual inspection to ensure leak proof in the fuel line. The venting/bleeding of fuel at either Idle speed or at low load is very much essential to run engine smoothly.



For KFP4R-UF07 Series



For KFP4R-UF15/KFP6R/KFP6S Series

- Tighten the vent screw on primary fuel filter while the diesel flowing without air bubbles.

Whenever the fuel system has been opened up for service like fuel filters change etc., it will be necessary to bleed air from the system.

5.1.2 Changing the Fuel Filter Cartridges

- Close fuel stopcock.
- Change pre-filter cartridge only. Do not change Pre-filter cartridge and Micro filter cartridge at a time. * (see Notes below)



For All KFP Series engines

- Complete the filter assembly and bleed the fuel system before starting the engine.
- Change over period for pre-filter insert and micro filter insert is given in note below.
- For changing micro-filter insert follow the same procedure explained above.

NOTE:

- Always replace the cartridge/element with new one, at recommended intervals.
- Since a filter attains the maximum efficiency only after a film of dirt is deposited on the surface of the filter insert, avoid replacing pre-filter

cartridge/element and micro-filter cartridge/element at the same time.
First change pre-filter cartridge/element and then after 250 running hours change micro-filter cartridge/element.



IMPORTANT: when working on the fuel system, keep naked lights away.



IMPORTANT: Never mix diesel with petrol or other fuels.



IMPORTANT: Do not smoke near the vicinity of engine. Keep the open flames away from the engine running area.



IMPORTANT: DO NOT spill the fuel. Never fill fuel tank while the engine is running. DO NOT use BIO- DIESEL which can harm the fuel injection system if the engine is not run for long period.

5.1.3 Cleaning Fuel Strainer



For KFP4R-UF07 Series engines



For KFP4R-UF15/KFP6R/KFP6S Series engines

- Close fuel stop cock.
- Remove the fuel strainer bowl at the bottom at the Inlet of feed pump.
- Takeout t he plastic/metallic strainer inside banjo bolt.
- Clean the strainer with clean diesel.
- Refit the strainer inside the banjo bolt and screw in the banjo bolt using new copper washers
- Bleed the fuel system and check for leaks.

5.1.4 Fuel Tanks

Keep the fuel tank filled to reduce condensation to a minimum. Open drain at the bottom of the fuel tank once a week to drain off any possible water and/or sediment. Fill tank after each test run.

1. Use fuel tank adequate capacity to run the engine for 4 to 8 hours. (Depends upon application and daily running of engine) Fuel tank should have correct ventilation, connections from return lines from fuel filter overflow, Nozzle overflow and fuel inlet to filter. The fuel tank can be mounted either on base frame or separately. Fuel tank must be placed where it will not be heated by radiated heat or direct surface to surface contact with hot engine surface.
2. Cap of fuel tank must have adequate vent.
3. The fuel tank can be kept at a lower level than that of engine. The maximum permissible suction lift from tank to feed pump is 1 meter. The fuel tank can be kept above the fuel tank at the height of 5 meter at the maximum. Fuel inlet line from tank to pump inlet should at least be 25 mm above the bottom of fuel tank to minimize the possibility of sucking sludge and or water settled at the bottom.
4. When the fuel tank is below the engine level, the fuel return line must not end in top of fuel tank. It must be carried down as deep as suction line. This is important because excess fuel from the fuel pump and the leak off from the injectors is carried back to the fuel tank.

NOTE : The fuel return line should never be connected to fuel suction line, it must be taken back to the fuel tank.

5. Fuel line from tank to engine should be leak proof with minimum possible length to avoid excessive restriction in the fuel line. The inside diameter for the suction line of 3 meter length should be 7.5 mm minimum.

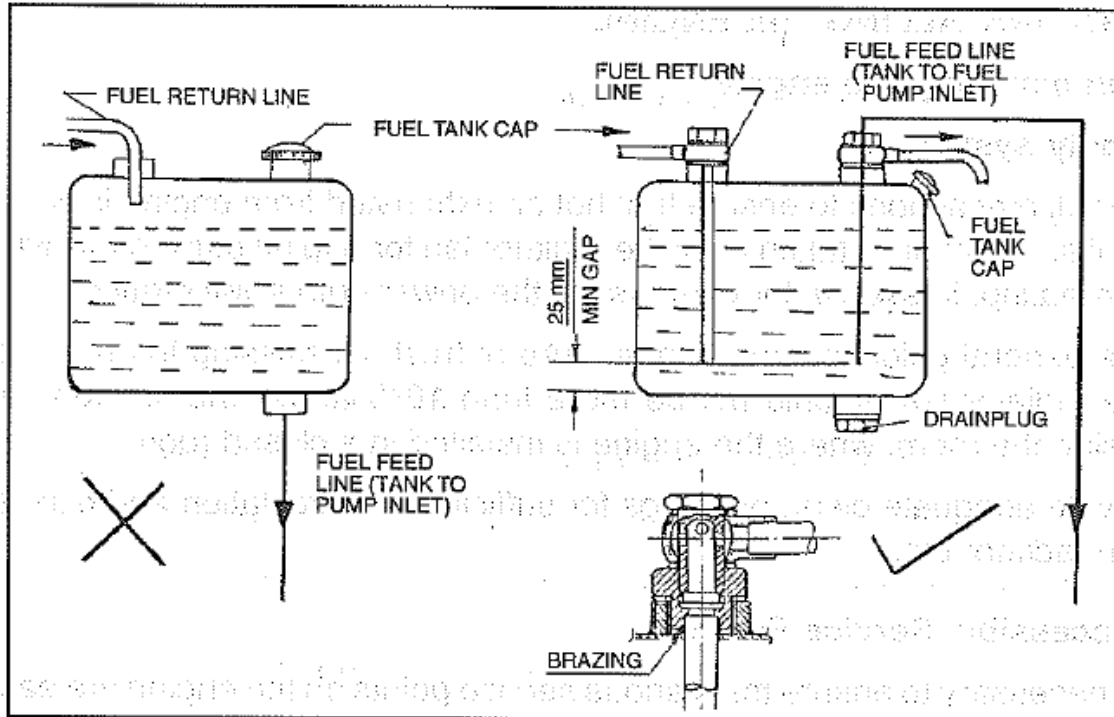


Figure 7.1-1 The incorrect and correct fuel connections on the tank.

! **IMPORTANT:** Fuel suction hose and its fittings should have at least 7.5 mm inner diameter upto 3 meter length and Return hose and its fittings should have at least 6.0 mm inner diameter for proper engine operation.

! **IMPORTANT:** Never mix diesel with petrol or other fuels.

! **IMPORTANT:** Make sure to drain the diesel fuel in container. Do not allow the drained fuel to run into the soil, dispose of the used fuel in accordance with the environmental regulations.

5.2 Air Intake System

Ambient Conditions

ALL KFP Series Engines are tested in accordance with SAE J1349.

High ambient temperature and/or High altitude

With increasing altitude or ambient temperature, the air density decreases, which affects

- Maximum power output of the engine.
- The exhaust gas temperature.

- In extreme cases the starting behavior.

Note: - The declared power ratings of the engine are obtained at standard reference conditions as per SAE J1349.

Where engines are operated at greater altitudes and or higher ambient temperatures, they must be derated in accordance with respective standards. Failure to do so can seriously impede the performance of the engine and could lead to premature failure.

5.2.1 Ventilation

The engine must be provided with adequate ventilation to satisfy the requirements of the Combustion system and allow adequate dissipation of radiated heat and crankcase emissions. For all this data refer to engine data sheet attached separately in this manual. This data can be used for proper sizing of inlet and outlet louvers.

5.2.2 Air Cleaner

The standard air cleaner is a reusable type. Should a situation occur where the air cleaner becomes plugged with dirt (starving the engine of air), loss of power and heavy black smoke will result; the air cleaner should be serviced immediately.

CAUTION: Do not attempt to remove the air cleaner while an engine is running nor run the engine while the air cleaner is off. Exposed components could cause severe injury to personnel and major internal engine damage could occur should any foreign matter be drawn into the engine.

5.2.3 Air Cleaner element servicing procedure



IMPORTANT: Keep the engine OFF condition while air cleaner cleaning.

Pre cleaning: - Tap the element gently to dislodge the large embedded dirt on air cleaner element outside surface. Then gently brush the element outside surface with a soft bristle brush.

Rinse off: - Rinse off the element with low pressure water. (Tap water is OK for rinsing). Always flush from inside of the element to remove the dirt.

Drying: - After rinsing , shake off all excess water and let the element dry naturally.

CAUTION: - Do not use compressed air.
- Do not use open flame.
- Do not use heat dryers.



IMPORTANT: NEVER try to open or remove the air cleaner while engine running.

5.3 Exhaust System

Excessive back pressures to the engine exhaust can considerably reduce both engine performance and life. It is therefore important that exhaust systems should be the proper diameter and be as short as possible within the minimum amount of bends.

5.3.1 Exhaust pipe diameter bends and pipe length recommendations

Engine Model	Minimum pipe inside diameter	Maximum no off bends allowed	Maximum exhaust pipe length allowed*
KFP4R-UF07	100	4 Nos.	15 meters
KFP4R-UF15	100		
KFP6R-UF25	125		
KFP6S-UF35	150		

*If the exhaust pipe line length exceeds 7 meters it is recommended to use an expansion bellow after 7 meter length.

The installation of the exhaust system should consist of the following:

- Personnel protection from hot surfaces.
- Adequate supports to prevent strain on the engine exhaust outlet and minimize vibration.
- Protection against entry of water and other foreign matter.

While the engine is running inspect exhaust pipe outlet outside of the pump room itself for environmental hazards such as excessive smoke conditions. The following could be used as a guide for general engine operating conditions.

- 1) Blue Smoke – Possible engine oil consumption.
- 2) White Smoke – Possibility of water in cylinders, water in fuel or internal engine problem.

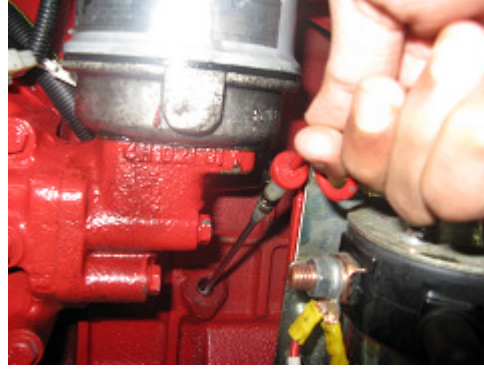
5.4 Lubrication system

5.4.1 Checking oil level

- Stop the engine and wait for a while till oil level in the sump is settled.
- Pull out dipstick, wipe it with a non-fraying rag and push it in as far as it will go and then withdraw again. See photographs below.



For KFP4R Series engines



For KFP6R Series engine



For KFP6S Series engine

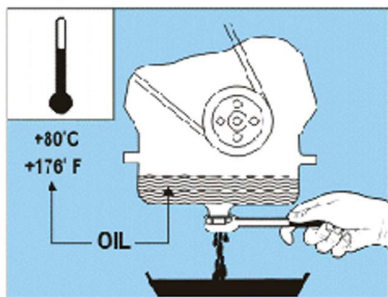
- The film of oil left on the dipstick should extend to the upper (max) mark. If the level only reaches to the lower mark, the oil should be topped-up without delay.



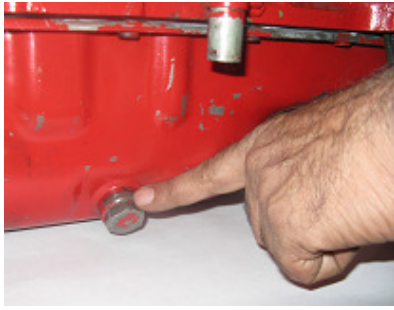
IMPORTANT: Failure to attend to this may result in serious damage to the engine (piston & bearing seizure)

5.4.2 Changing Engine Oil

- Change engine oil at recommended intervals.
- Run engine until warm.(lube oil temp. approx. 80°C)
- Stop the engine



- Place oil tray under oil drain plug.
- Unscrew oil drain plug on the end of drain pipe and drain oil completely
See photograph below.



For KFP4R Series engines



For KFP6R Series engine



For KFP6S Series engine

- Collect used oil in suitable receptacle ready for proper disposal to prevent environmental pollution.
- Refit oil drain plug with new joint washer and tighten firmly.
- Fill in fresh lube oil.



IMPORTANT: Take care when draining off hot oil: Danger of scalding!



IMPORTANT: Make sure to drain the oil in container. Do not allow the drained oil to run into the soil, dispose of the oil in accordance with the environmental regulations

5.4.3 Lube oil specifications

The Kirloskar make **K-Oil super** should be used for your engine. This oil meets the specification of MILC plus and SAE 15W40.

Please note that no guarantee claims would be entertained for engine damages due to use of unsuitable engine lube oil.

5.4.4 Lube oil sump capacity

Engine Model	Lube oil sump capacity in liters	
	First fill	Re fill
KFP4R-UF07	11.5	9.5
KFP4R-UF15	11.5	9.5
KFP6R-UF25	17	15
KFP6S-UF35	26	24

Note:

1. First fill = Sump Capacity + Gallery Capacity + Lube oil Filter Capacity.
2. Do not forget to fill the lube oil filter whenever you replace the filter.

While filling for the first time, add an additional quantity of lube oil equal to capacity of the oil filters to the sump to maintain the correct level.

“OBSERVE THE OIL LEVEL MARKS ON DIPSTICK”



IMPORTANT: Never add lubrication oil while engine is running

5.4.5 Lube oil filter cartridge change

Replace ‘Spin-on’ lube oil filter cartridge for every oil change.

- Release lube oil filter cartridge with special tool and spin off as shown in photographs below.



For engine models KFP4R-07/ KFP4R-UF15



For engine models KFP6R-25/ KFP6S-UF35

- Clean sealing surface of filter carrier See the photograph below.



- Fill the new cartridge with Lube oil before assembly
- Apply light film of oil to rubber seal of new cartridge.



- Screw cartridge into place by hand until seal is evenly seated.
- Tighten lube oil filter cartridge firmly by giving a final half turn, as shown in photograph below.



For engine models KFP4R-07/ KFP4R-UF15



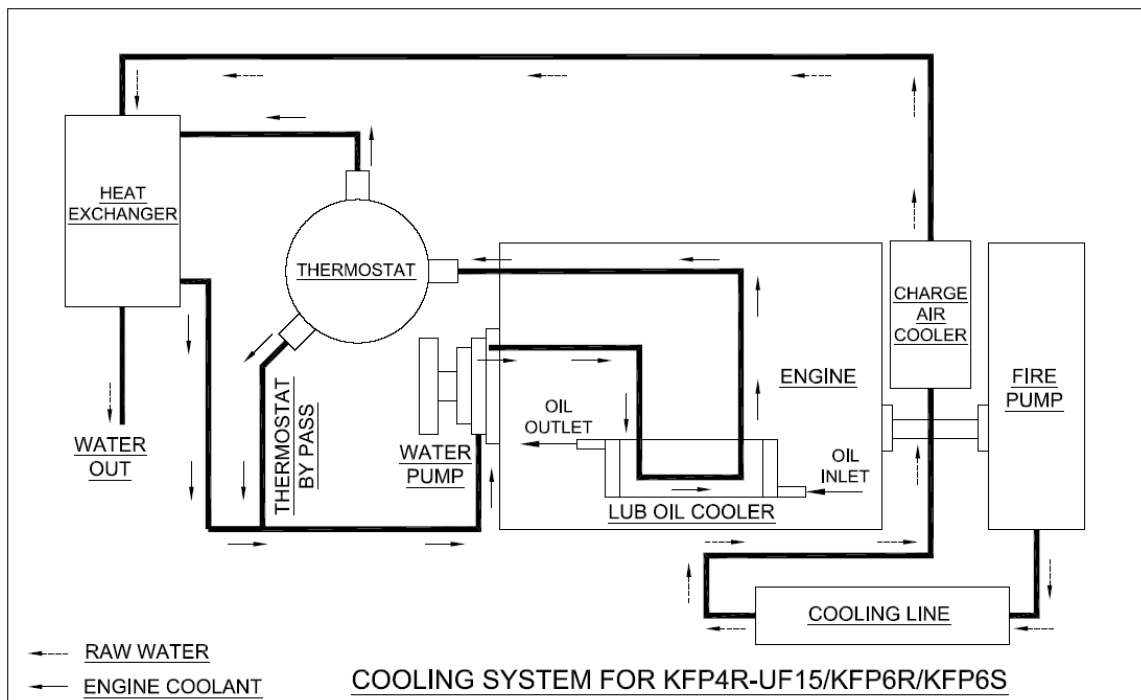
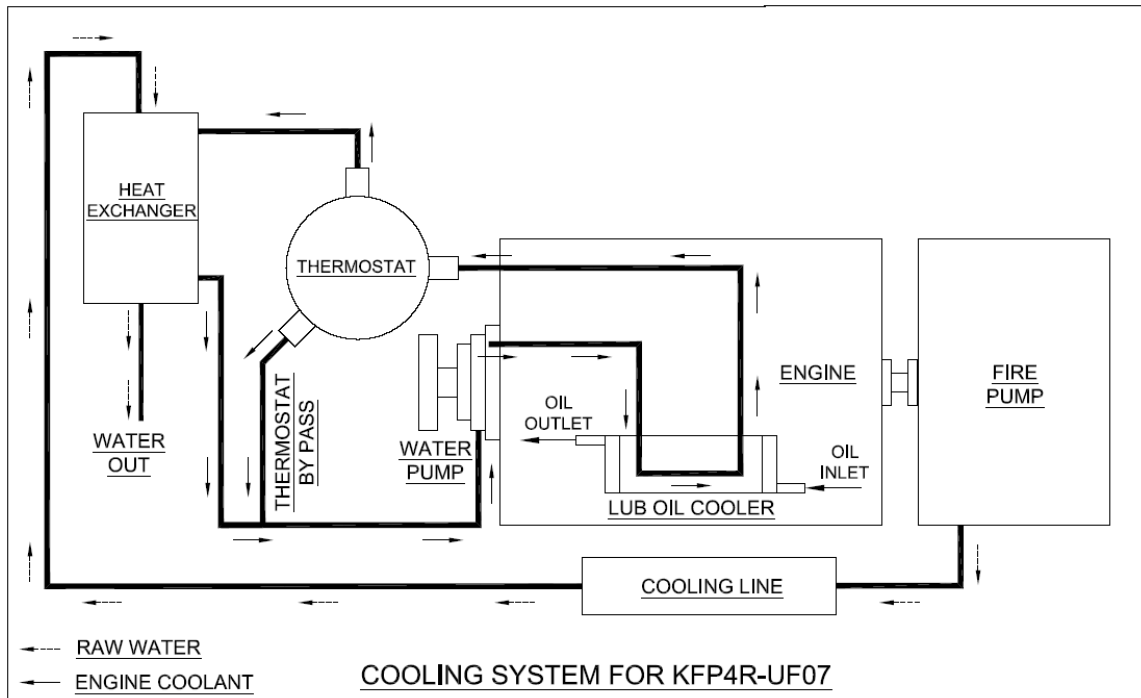
For engine models KFP6R-25/ KFP6S-UF35

- Check oil level and lube oil pressure.
- Check seal of lube oil filter cartridge for leaks

5.5 Cooling System

Heat exchanger type cooling system

The Schematic diagram, of the typical water circuit with Heat exchanger type cooling system, is shown below.



5.5.1 Cooling Line

The function of cooling line is to supply the raw water with required flow from the fire pump discharge to the Aftercooler and Heat Exchanger to maintain the engine cooling performance satisfactorily. KOEL engines are having 1 inch sized cooling line for KFP4R-UF07 and KFP4R-UF15 models whereas 1 ¼ inch sized cooling line for KFP6R-UF25 and KFP6S-UF35 models. The cooling line is connected between Pump discharge and the Engine as shown above cooling system.

There will be two separate water line i.e. NORMAL line and EMERGENCY line which can operate independently. NORMAL line is always open by default because fire pump always kept in Automatic mode. The NORMAL line is having water electrical flow solenoid which open and allow water only when engine is started otherwise solenoid is always in closed condition. In case of failure of electrical flow solenoid, the EMERGENCY line need to open manually before starting the engine.

Both the lines are having Pressure Reducing valve to reduce the pressure if required, pressure can be reduced by opening the screw upward provided on top of the pressure reducing valve.

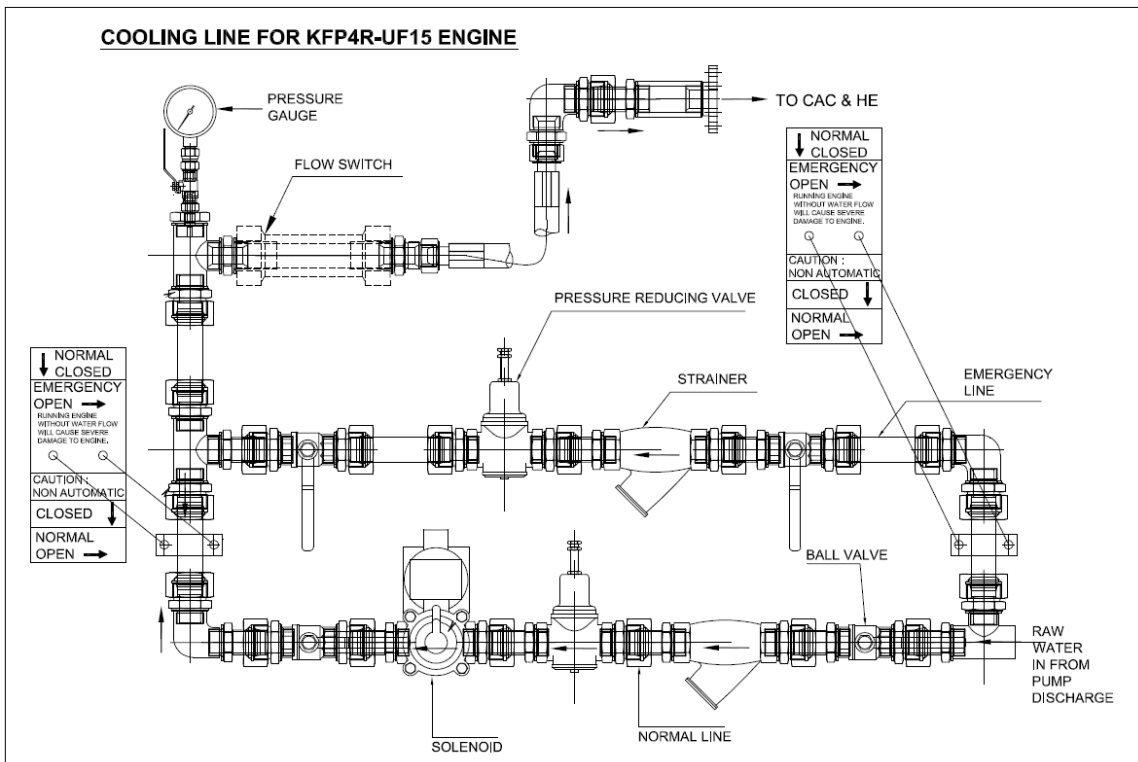
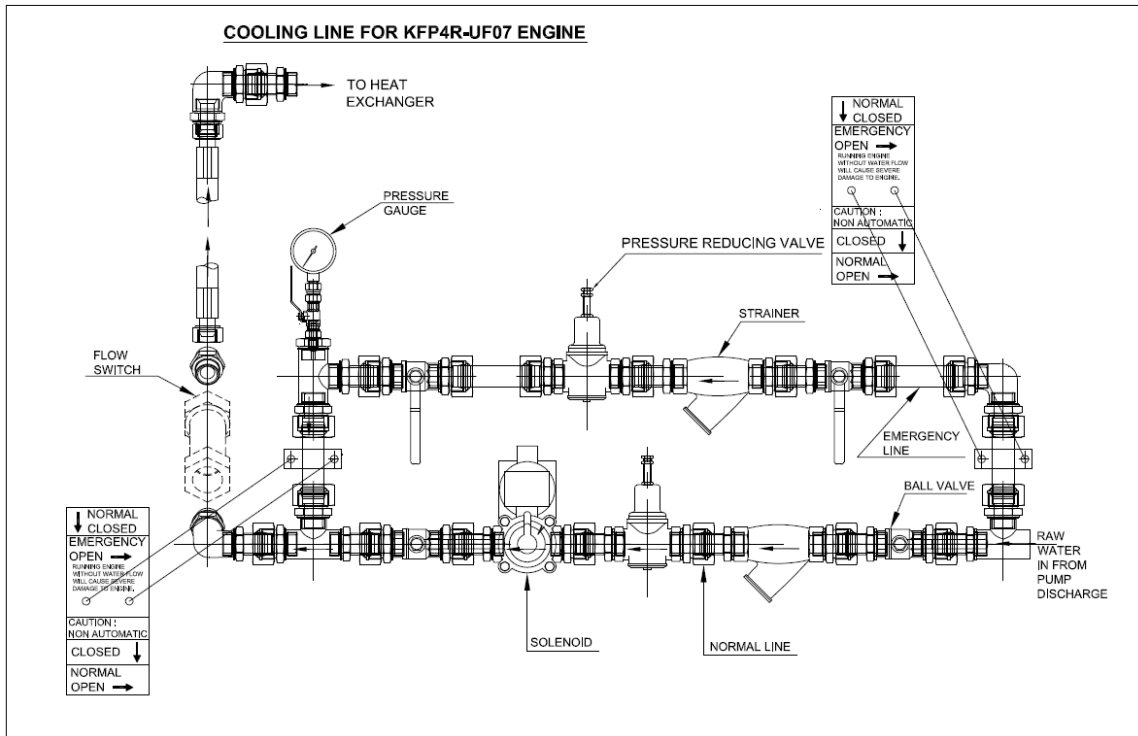
Both the lines are having Y type strainer with wire mesh filter inside to filter the incoming water from fire pump discharge end. The wire mesh filter need to remove and clean periodically for smooth running of the engine, this will also avoid engine over heating problem.

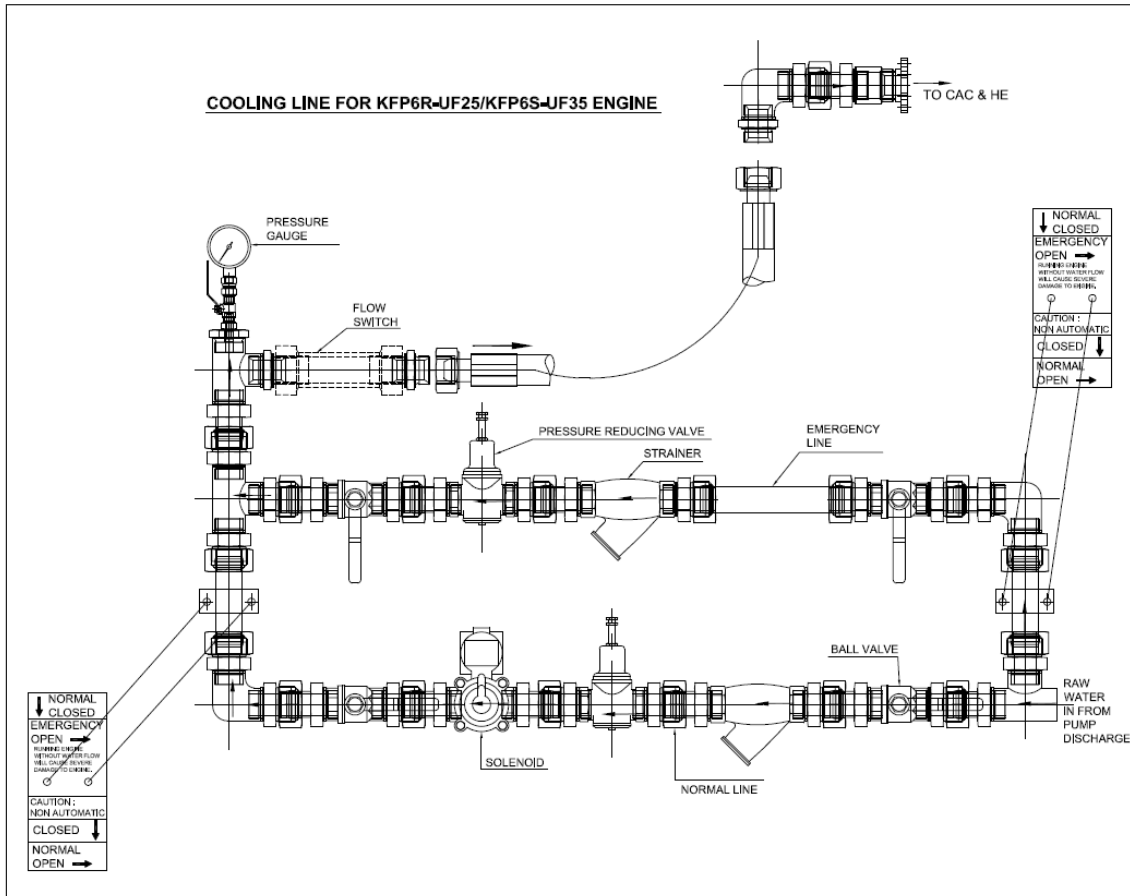
The flexible hose used for all cooling lines is complying as per ISO 15540 standard.

All cooling lines are having flow switch to monitor the flow through the line and this switch will activate and give the alarm signal to fire pump controller when the flow come down below the minimum required flow (75% of Normal flow). The Minimum and Maximum flow required for each engine model is mentioned below.

Raw water flow requirement for KOEL engines									
Sr. No.	KOEL Engine model	Minimum flow rate required (LPM) at 38° C	Normal Flow rate (LPM) at 38° C	Max. Flow rate (LPM) at 38° C	Line Pressure (Bar)	Inlet Pressure, Minimum (Bar)	Pipe line size (inch)	Flow switch type	Switching Contact type
1	KFP4R-UF07	45	60	70	0.5 - 1.5	2.0	1.0	12Vdc	Normally open
2	KFP4R-UF15	60	80	120	0.5 - 1.5	2.0	1.0	12Vdc	Normally open
3	KFP6R-UF25	90	120	160	0.5 - 2	3.0	1.25	12Vdc	Normally open
4	KFP6S-UF35	120	160	250	0.5 - 2	3.0	1.25	24Vdc	Normally open

The following cooling lines are used for KOEL FM/UL approved engines.





5.5.2 Coolant

Use K-COOL-SUPER PLUS coolant

The coolant is suitable to give a life of 6000 hours or 3 years without any addition of supplemental coolant additive.

- Extended life coolant to eliminate frequent coolant top ups, and
- A premixed coolant to eliminate any possibilities of using wrong water quality.

Usage recommendations:

On new engines – use undiluted pre-mix as supplied in sufficient quantities.

- K-Cool Super plus is available at our authorized parts & service dealers in 5, 10 and 25 Liters.
- Storage of engine should be only with K Cool Super Plus coolant in cooling system. Ensure pressure cap on balance water tank is secured tight.
- **Do not use water in cooling system**

- **If the coolant is lost from the system due to any problem always top it up with K Cool Super Plus only. Addition of any other coolant or dilution with water will reduce the life of coolant and equipment.**

On engines in field – Do not top up new coolant in old system.

- Drain the old coolant.
- Flush the cleaning system with clean water.
- Fill up engine with cleaning fluid (K_Clean). Clean water with 375 ml of cleaning fluid for less than 16 litre capacity. (For lager systems add 1 litre cleaning fluid)
- Run the engine at normal operating temperatures for 30 minutes.
- Completely drain the system.
- Flush with clean water

5.5.3 Coolant Capacities

Engine Model	Coolant Capacity in Liters
KFP4R-UF07	9.5
KFP4R-UF15	9.5
KFP6R-UF25	18
KFP6S-UF35	21

5.5.4 Procedure for Filling Engine coolant

- Fill the cooling water system with recommended coolant blend. Fill the coolant through neck of pressure cap on top of the Heat exchanger till it flows through the over flow pipe.



For all KFP Series engines.

- Do not open the pressure cap while engine is running or hot. The cooling system is under pressure hence danger of burning body skin.

Note: - Add coolant when the coolant system is cold. The temperature difference between the coolant in the engine and the coolant being added must not exceed 50°C.



IMPORTANT: Make sure to drain the engine coolant in container. Do not allow the drained coolant to run into the soil, dispose the coolant in accordance with the environmental regulations.

5.5.5 Thermostat

A thermostat having single element is used in the water circuit. Thermostat is provided to attain working temperature quickly during warm-up period and maintains desired temperature of coolant during running of the engine.

Normally thermostat does not require regular maintenance. Its operation shall be checked if sudden deviations from the specified coolant temperature occurs. Visual inspection will reveal whether or not the element rests in its seat i.e. whether or not close tightly. For thermostat element removal and installation, Refer section 6.1.

5.6 Electrical System

12V electrical system is used for KFP4R-UF07, KFP4R-UF15 & KFP6R-UF25 series engines. 24V system is used for KFP6S-UF35 engines.

5.6.1 Wiring Diagrams :

Electrical diagrams for 12V and 24V systems are attached at the end of engine data sheet.

Alternator

Engine Model	Make	Specification
KFP4R & KFP6R	Bosch	12V, 35 Amps
KFP6S	Bosch	24V, 40 Amps

Starter

Engine Model	Make	Specification
KFP4R	Bosch	12V, 2.7 kW
KFP6R	Bosch	12V, 3.0 kW
KFP6S	LUCAS-TVS	24V, 7.5 kW

5.7 Belts

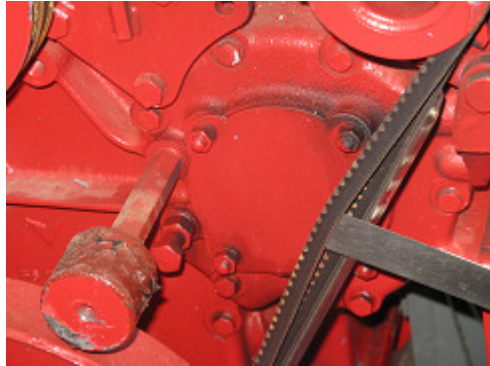
Check that belts are in position and the belt tension is proper. If the belt tension is not proper adjust the same as described below.

5.7.1 Checking the belt tension

The twin V belts of XPA section are used to drive engine water pump and battery

charging alternator for KFP4R & KFP6R engine series and the twin V belts of AVX section are used to drive engine water pump and battery charging alternator for KFP6S engines.

- Inspect V-belts over whole length for damage or cracks. Renew damaged or cracked v-belts.
- Check by pressing with the thumb midway between the pulleys to see whether the belt deflects inwards by not more than 10 to 15 mm.
- If necessary re-tension V-belt by loosening and re-tightening the battery charging alternator.



For all KFP series engines.



IMPORTANT: Keep the engine OFF condition while Checking, Tightening or replacing belts.

5.7.2 Re-tensioning V-belt

- Loosen the outer lock nut on the tensioning stud mounted on lifting hook as shown in below.



- Adjust the desirable tension on belt by tightening the inside nut as shown below.



- After completion of belt tension, Re-tighten the outer lock nut as shown below.



5.8 Speed Switch

In the event of an engine overspeed, the speed switch signals the main pump controller and also affects an engine shutdown. The OVERSPEED RESET switch is included on the instrument panel in the RPM/HR(HR01) meter. When an over speed condition occur, investigate the cause and make necessary corrections before placing engine back in service. The OVERSPEED RESET must be manually pressed PROG/RESET push button on RPM/HR (HR01) meter to reset.



IMPORTANT: If the engine got overspeed, Identify the cause and press the RESET button provided on the engine control panel before starting the engine again. Engine will not start thru the main pump controller or manually

5.9 Over speed Verification

On Engine instrument panel, Press the O/S TEST provided on the RPM/HR (HR01) meter for 5 to 10 sec. This will give the over speed signal to main pump controller and engine shutdown at over speed RPM set value.

Start the engine via the main pump controller, the speed switch will generate an over speed signal and shutdown the fire pump system to protect both the engine and pump.

Example: -Rated Speed: 2100 RPM

Over speeds Shutdown: 2520 RPM (Approx. 120% of Rated Speed)

Verification Shutdown: 1785 RPM (85% of Rated Speed)

CAUTION: After verification of over speed, Press the PROG/ RESET switch on (HR01) Hour Meter and reset the main pump controller to re-instate normal operation of the engine and speed switch.

5.10 Magnetic Pick-Up

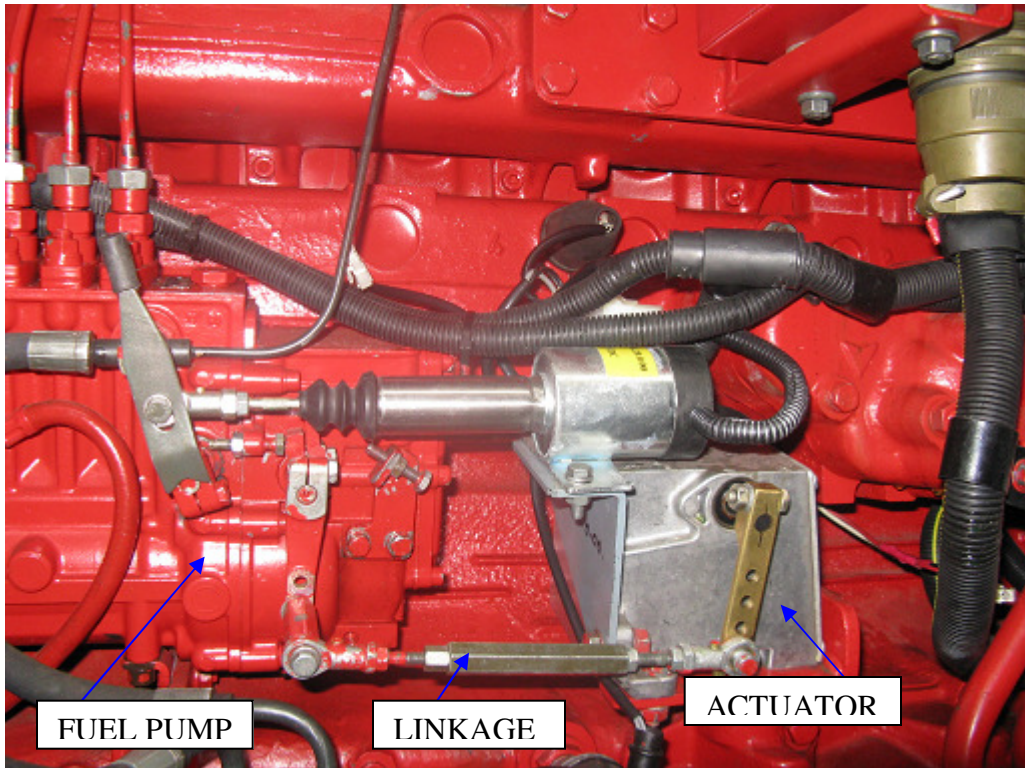
A magnetic pick-up, mounted on the flywheel housing, provides the input signal for the tachometer overspread switch, and/or the main pump controller. There should be a 0.7 mm air gap between the top of the ring gear and the center of the magnetic pick-up. With one tooth centered in the magnetic pick-up hole, thread the pickup in until it touches the gear tooth and then back it out 1/2 turn. Tighten jam nut while holding the pickup in position. Reconnect to wiring harness.

5.11 Instruction Manual for Electronic Speed Governor

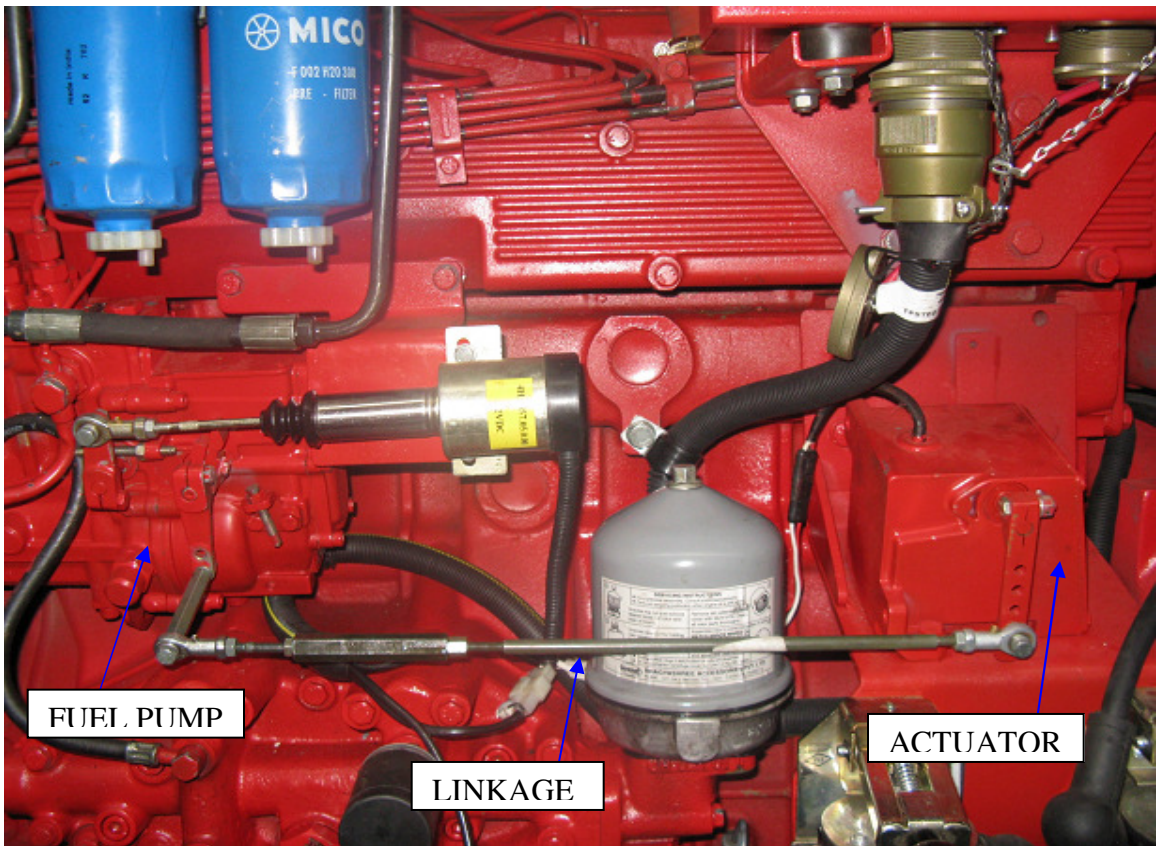
External Electronic speed governor with 12V system is used for KFP4R-UF15 and KFP6R-UF25, where as 24V system is used for KFP6S-UF35 series engines. The external electronic speed governor is mainly consists of three components namely Actuator cum solenoid, Speed governor card and Magnetic pick up for speed sensing. The actual construction is shown below.



IMPORTANT: Engine will run on mechanical governor in case of electronic governor failed.



For KFP4R-UF15 and KFP6S-UF35 Series engines



KFP6R-UF25 Series engines

Electronic speed governor consists of three components, which are as follows;

Electric Actuator: - Connected to engine fuel pump through the linkage for speed adjustment & controls the fuel quantity delivered to the engine as well as the speed set in speed control unit.

Electronic Speed Control Unit:- Compares the existing engine speed with desired speed and sends corrective signals to the electric actuator.

Magnetic Speed Sensor:- Measures the engine speed by sending a proportional frequency signal to the speed control unit.

The system maintains the desired speed very accurately and independent of engine load. The system offered is highly reliable with consisting accuracy & simplicity of speed adjustment.

NOTE: In case of electrical supply failure, this actuator will go to the full load and run the engine in that speed i.e. Engine will run even if electrical supply disconnected. The speed control unit is factory set. It is recommended that not to disturb the settings

System Troubleshooting

System is inoperative if the engine governing system does not function, the fault may be determined by performing the voltage tests described in steps 1 through 6. Positive (+) and negative (-) refer to meter polarity. Should normal values be indicated during troubleshooting steps, then the fault may be with the actuator or the wiring to the actuator. Tests are performed with the battery power on, engine off except where noted. See actuator publication for testing details.

Step	Terminals	Normal Reading	Probable Cause of Abnormal Reading
1	E (+) & F (-)	Battery Supply Voltage 12 or 24 VDC)	1. DC battery power not connected. Check for blown fuse 2. Low battery voltage 3. Wiring error.
2	A(+) & B (-)	0-3.9 with speed trim 7.1-7.9 without speed trim	1. Speed trim shorted or miswired 2. Defective unit.
3	C(+) & D(-)	1.0 VAC RMS min., while cranking	1. Gap between speed sensor and gear teeth too great. Check gap. 2. Improper or defective wiring to the speed sensor. Resistance between C and D should be 300 to 1200 ohms. 3. Defective speed sensor.
4	E(+) & H(-)	0.8-1.5 V while cranking	1. Wiring error to actuator. 2. Defective speed control unit. 3. Defective actuator.

6.0 Repair/Replacement

6.1 Coolant Thermostat Removal/Installation

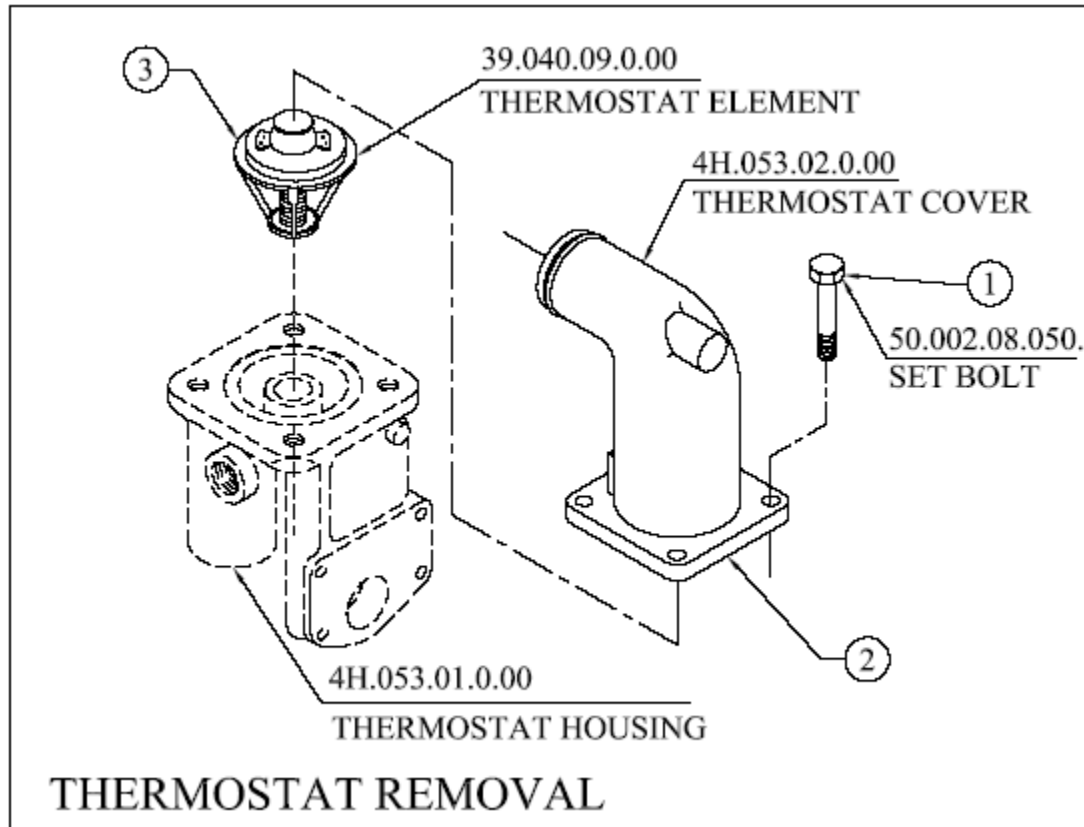
KFP series engines are having different thermostat housings for different engine models. The Thermostat removal and installation for all KFP series engines are shown in this section.

Thermostat Removal :

Disconnect all the hoses and clamps before removal of thermostat. The thermostat removal steps for all KFP series engine are shown below;

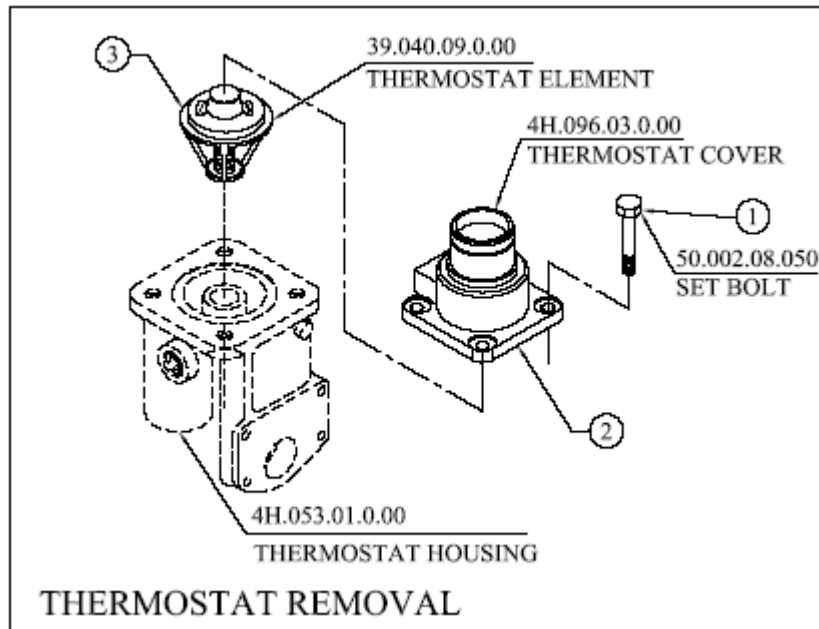
Thermostat removal sequence for KFP4R Series engine is shown as below;

1. SET BOLTS (FOUR)
2. THERMOSTAT COVER
3. THERMOSTAT ELEMENT



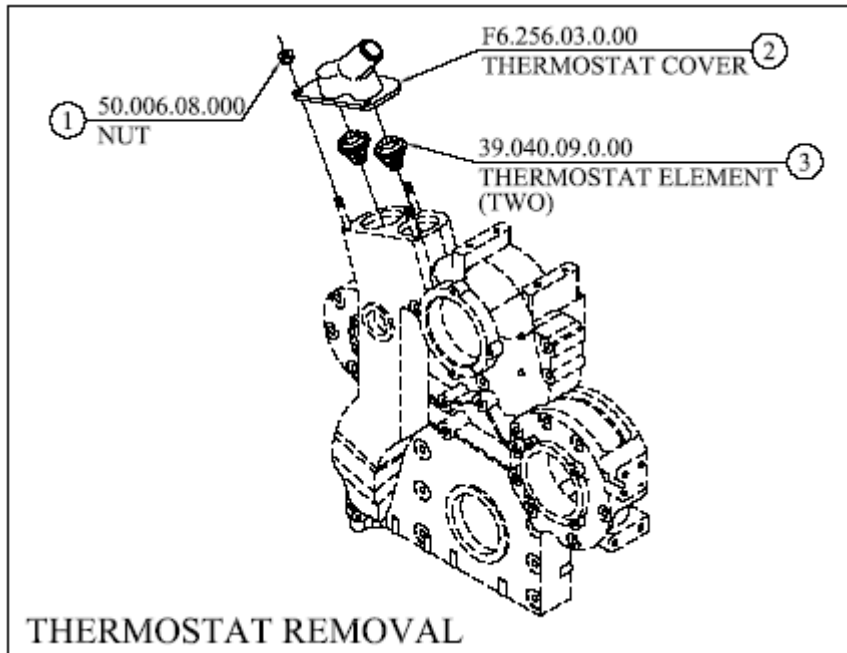
Thermostat removal sequences for KFP6R Series engine is shown as below;

1. SET BOLTS (FOUR)
2. THERMOSTAT COVER
3. THERMOSTAT ELEMENT



Thermostat removal sequences for KFP6R Series engine is shown as below;

1. NUT (THREE)
2. THERMOSTAT COVER
3. THERMOSTAT ELEMENT (TWO)



Thermostat Checking Before Replacement:

Before replacing the thermostat element for any reason, please ensure following checks;

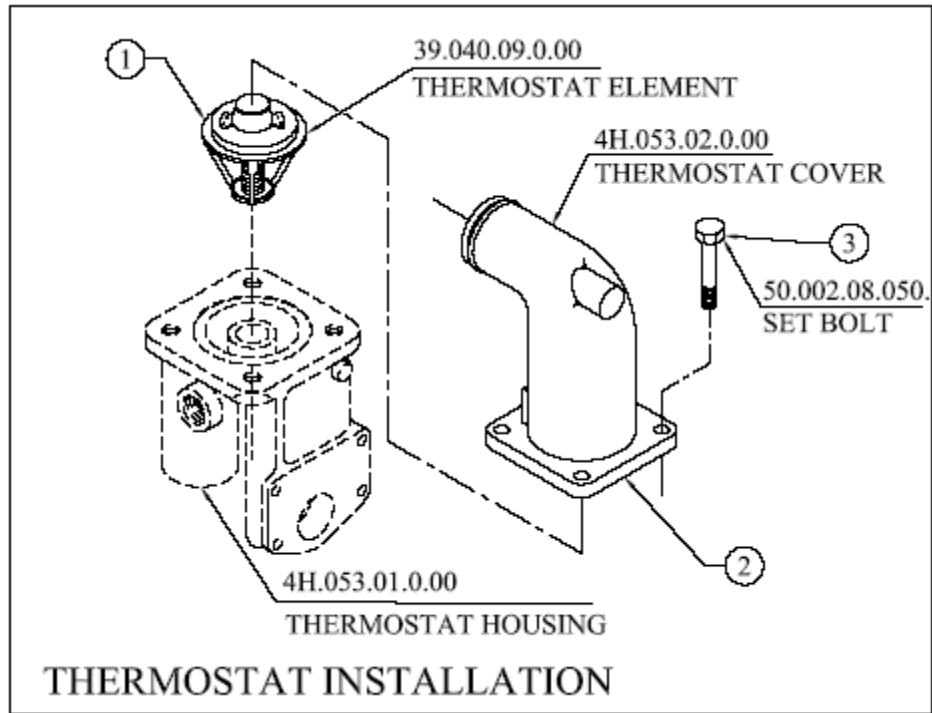
1. Check for any dirt, dust accumulations on thermostat element if so clean it properly.
2. Before carrying temperature test, check thermostat opening by hand pressure.
3. With the help of a string, immerse the thermostat element in the container such that opening and closing of the element can be clearly seen.
4. Thermostat position and thermometer position in container should be at same level while checking the temperature.
5. With the help of thermometer, record the temperature readings at both the conditions i.e. when thermostat element starts opening and when fully opened.
6. Replace new thermostat if the recorded temperature readings deviate from specified temperatures. Follow the 'Thermostat Installation' step for replacement.
- 7.

NOTE : The thermostat element start opening at 72 to 74 °C and opens fully at 88 °C

Thermostat Installation:

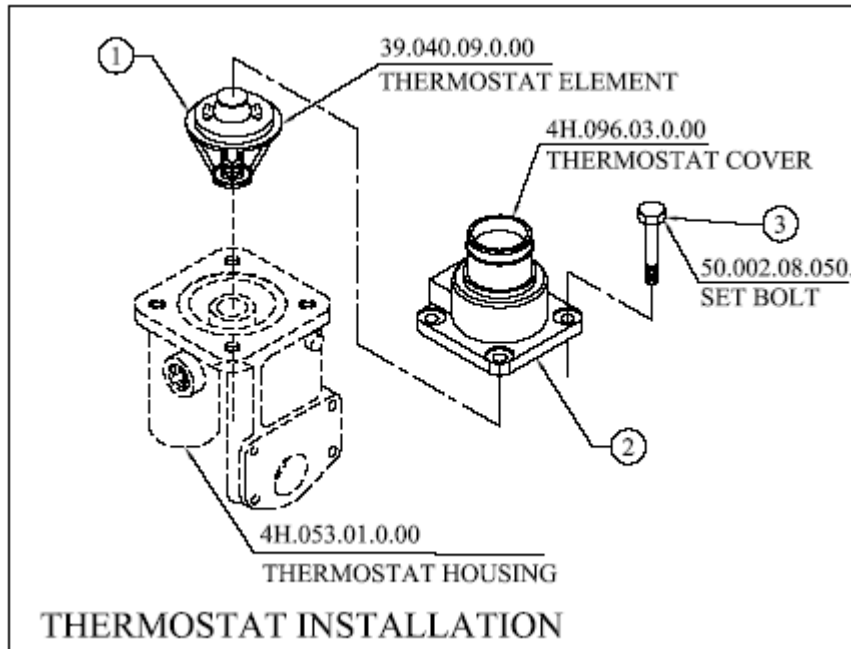
Thermostat installation sequence for KFP4R Series engine is shown as below;

1. THERMOSTAT ELEMENT
2. THERMOSTAT COVER
3. SET BOLTS (FOUR)



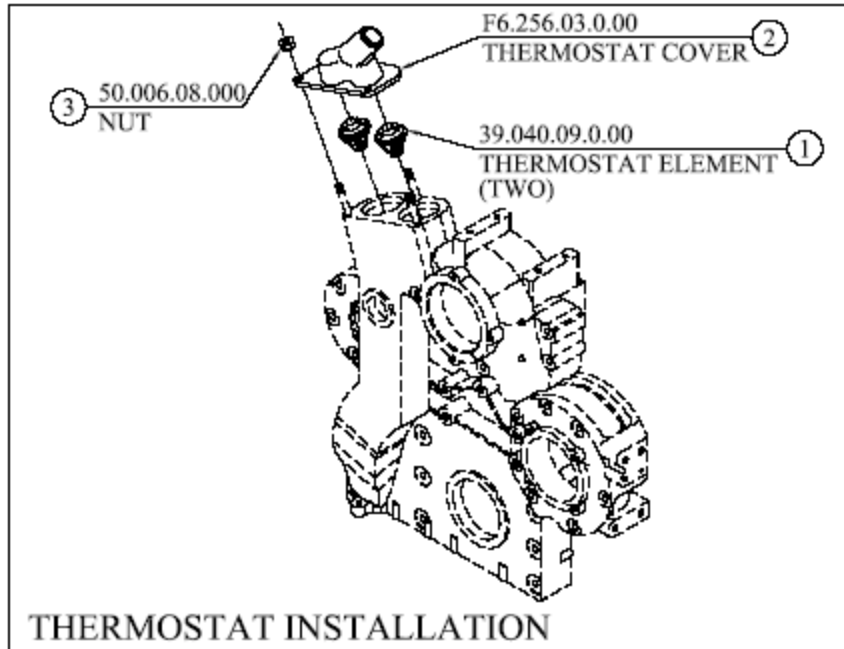
Thermostat installation sequence for KFP6R Series engine is shown as below;

1. THERMOSTAT ELEMENT
2. THERMOSTAT COVER
3. SET BLOLTS (FOUR)



Thermostat installation sequences for KFP6S Series engine is shown as below;

1. THERMOSTAT ELEMENT (TWO)
2. THERMOSTAT COVER
3. NUT(THREE)



7. Maintenance Schedule

Routine Maintenance :

The following 'Routine Maintenance schedule' is based on an engine usage of 2 hours per month maximum.

	Weekly	Every 6 months	Every 1 year	Every 2 years
Air Cleaner	Check	-	Clean	-
Fuel Tank	Check	-	Clean	Clean
Exhaust System	Check	-	-	-
Coolant Levels	Check	-	-	-
Cooling Water Solenoid Valve	Check	-	-	-
Coolant Hoses	Check	-	-	-
Thermostat		Check		
Battery	Check	-	-	-
General Inspection	Check	-	-	-
Governor Run-Stop Control	Check	-	-	-
Jacket Water Heater	Check	-	-	-
Lubrication Oil Level	Check	-	-	-
Operating Gauges	Check	-	-	-
Run Engine	Yes	-	-	-
Warning Light	Check	-	-	-
Battery Charging Alternator	-	Check	-	-
Belts	-	Check	-	Replace
Cooling Water Strainers/	-	Clean	-	-
Fuel Lines	-	Check	-	-
Crankcase Vent System	-	-	Check	-
Fuel & Oil Filters	-	-	Change	-
Lubricating Oil	-	-	Change	-
Mounting Isolators	-	-	Check	-
Wiring System	-	-	Check	-



IMPORTANT: Make sure that the engine is in stop condition before carry out any maintenance work.



IMPORTANT: Disconnect the battery before doing any kind of service or repair on engine.



IMPORTANT: The battery emitted gases are explosive so keep the sparks and open flames away from battery.

8. Engine Preservation

Preservatives and Preservation procedure is recommended for engine when it is to be kept idle (out of use) for prolonged period (more than 12 months).

8.1 Recommended Preservatives

Manufacturer	Engine Lube oil and fuel system	Engine cooling system	Unpainted ferrous metal parts
Castrol India	-	-	Rustilo DW 904 or DW 901
Veedol tied water oil co.	Veedol 30/40	Veedol Amulkut 4 Emulsion with water ratio 1:15	Veedol Rustop IT

8.2 Preservation Procedure

- Using H.S.D. fuel, run the engine at approximately 70% of maximum rated speed with 'No' load for 5 minutes to warm up the engine (in case of fixed speed engines like engine for Fire Pump set, it can be run at rated speed).
- After stopping the engine, drain lube oil from sump and refill with suitable preservative oil as mentioned above.
- Run the engine on 'No' load for 3 minutes. During this time the preservative will be circulated throughout the lube oil system of engine. Stop the engine and disconnect diesel fuel supply to fuel pump inlet. For engine speed refer point (a).
- Prepare a solution Diesel + Preservative Oil (5:1 ratio) in a separate tank and connect fuel line from this tank, directly to fuel pump inlet ensuring gravity feed (by-pass fuel filter).
- Electrically crank the engine till it fires and let it run for 30 seconds. During this time the diesel in fuel pump gallery and high pressure pipes will be displaced by Diesel + Preservative Oil mixture. Stop the engine.

Engine speed during above running -

- In case of fixed speed engine - Rated speed at 'No' load.
- Close the air inlet manifold (for the air cleaner inlet) and crank the engine by starter for 5 to 10 seconds. This will ensure coating of Diesel + Preservative oil on the combustion chamber surfaces.
- Drain preservative oil from oil sump, reinstall drain plugs and reconnect fuel filter into the fuel pipe line.
- Treat all unpainted external ferrous metal parts with two coats of suitable rust preventer as recommended in 8.1, allowing sufficient time for the first coat to thoroughly dry before applying second coat.
- All vents i.e. engine inlet pipe, exhaust pipe, air cleaner inlet, crankcase breather etc. to be carefully sealed with water proof paper and water proof adhesive tape.
- Dipstick on engine to be sealed in place, with water proof adhesive tape.

NOTE: - DO NOT ROTATE CRANKSHAFT AFTER ABOVE MENTIONED OPERATIONS.

- Loosen 'V belts tension.
- Battery for engine starting, if provided, should be disconnected and stored in a cool, dry place after ensuring the electrolyte level, refill with distilled water, if necessary.

It is recommended to recharge the battery every 30 days.

- Tag engine to indicate that it has been treated with preservatives, and should not be turned over until ready to run, due to possible reduction of protective film. The tag should show the date of treatment and validity date.
- It is preferable to wrap the engine in polyethylene bag and store in dry shade. Periodically inspect the engine for rust or corrosion and take corrective action if any.
- If the engine is to be stored unused for more than 12 months, repeat the above procedure completely, after every 12 months.

8.3 Commissioning of Preserved Engine

- ❖ Remove all the sealing tapes / papers from various openings.
- ❖ Remove the Rust Preventive coating from those unpainted machined surfaces, which are interfacing surfaces for the driven equipment. This can be done using NC Thinner.
- ❖ Fill recommended grade of lube oil in the oil sump upto the top mark of the dipstick for oil filling quantity.
- ❖ Readjust the V-belt tension after checking the condition of V-belt (s), replace, if necessary
- ❖ Reconnect a fully charged battery to recommended voltage and Amp-hr capacity ensuring correct polarity connection (where applicable).
- ❖ The engine is now ready for reuse. Follow the instructions given in section 3 before starting the engine.

9. Trouble Shooting

Trouble	Cause	Redress
Engine does not start.	No fuel in tank	Fill in fuel, vent fuel system.
	Air in fuel system.	Vent fuel system
	In sufficient speed of starter	Charge batteries.
Engine does not start at temperatures below 0°C.	See above or check water heater functioning or not.	Of above or check AC supply to water heater or change heater.
	Paraffin precipitation of fuel	Heat up fuel piping. Change filter.
Engine starts but stop after brief time.	Fuel tank cock closed	Open cock
	Dirt in primary fuel strainer or in fuel filter	Clean the strainer or change the filter cartridge.
	No fuel in tank, no conveyance of fuel	Fill in fuel, vent fuel system, inspect correct operation of fuel pump, repair if necessary and check safe venting of tank.
	Water or dirt in fuel system	Clean fuel tank, fill in clean fuel, replace filter and vent fuel system
No power and misfiring of engine	Interruption of air supply or heavy jamming of air cleaner	Inspect, clean or replace air filter element
	Air in fuel	Vent fuel system
	Fuel filter cartridge jammed	Replace fuel filter cartridge
	Starts of fuel supply missed	Reset start of fuel supply
	Defect of exhaust brake	Inspect and repair
Engine emits white or bluish fumes	Retorted and start of fuel supply	Set correct start of fuel supply
	Engine is still cold	Permit engine to heat up in operation
	Miss setting of fuel injection system	Check start of fuel supply. Inspect injectors.
Engine emits black fumes	Engine is overloaded	Reset fuel injection system, contact your Distributor
	Air filter jammed	Clean or change filter element
	Fuel injection piping loose or broken	Tighten fuel injection piping or replace it respectively
Heavy knocking of engine	Starts of fuel supply too early	Set correct start of fuel supply
	Mis setting of valve air gaps	Adjust correct valve air gaps
	Mechanical defects of engine	Consult your Distributor

Engine grows excessively hot	Slipping of V-belts	Tighten or replace V-belts
	V-belts broken	Replace V-belts
	Defect of temperature governor	Emergency operation; forced opening of valve plate
	Defect of temperature Controller	Perform electrical check of temperature controller
	Lack of coolant	Fill in coolant
	Clogged heat exchanger tubes	Clean Heat exchanger tubes
	Mis setting of fuel supply	Set correct engine in fuel supply
	Intake or exhaust system jammed	Redress cause of trouble
	Heavy dirt accumulation on cylinder elements	Consult your Distributor
Irregular speed of engine	Defect of speed governor	Inspect fuel pump and governor
Excessively high fuel consumption	Mis-setting of fuel injection system	Check fuel injection system
	Lealage in fuel system	Check and repair
	Injection of excessively high fuel quantity, engine emits black fumes	Have fuel injection pump adjusted by specialized workshop
	Jammed air filter	Clean or change filter element
	Engine is worn	Consult your Distributor
	Defective exhaust brake	Consult your Distributor
Very low oil pressure	Jammed paper filter cartridge	Replace paper filter cartridge
	Deficient oil level	Check and add oil
	Pressure gauge or pressure gauge tube loose or defective	Inspect and replace or tighten
	Leakage in oil system	Check and repair
	Improper lube oil (viscosity)	Check oil brand
	Defect in control valve for cooling pistons	Replace valve
	Heavy wears of bearings	Consult your Distributor
Increase in lube oil consumption	Leakage in lube oil system	Inspect pipes, filter and ducts for tightness
	Excessively high oil level	Adjust oil level
	Defect of air filter system and cooling of pistons	Consult your Distributor

10 Spare part Information

To ensure best operation and efficiency of all engine components, always use genuine Kirloskar Spare Parts.

10.1 Engine Maintenance Spare Parts List

Engine Model	Lube Oil Filter Cartridge	Fuel Filter Cartridge Primary	Fuel Filter Cartridge Secondary	Air Cleaner Element
KFP4R-UF07	06.436.01.0.00	3H.132.01.0.00	3H.132.02.0.00	4H.1345.01.0.00
KFP4R-UF15	06.436.01.0.00	3H.132.01.0.00	3H.132.02.0.00	4H.1346.01.0.00
KFP6R-UF25	06.436.01.0.00	3H.132.01.0.00	3H.132.02.0.00	6H.1128.01.0.00
KFP6S-UF35	06.436.01.0.00	3H.132.01.0.00	3H.132.02.0.00	F6.983.01.0.00

Other spare parts numbers are given separately in Illustrated Spare Parts List (ISPL). The ISPL Publication numbers for KFP series engines are given below for reference.

Engine Model

ISPL Publication No.

- | | |
|---------------|-----------------|
| 1. KFP4R-UF07 | 4H.1900.41.0.00 |
| 2. KFP4R-UF15 | 4H.1900.42.0.00 |
| 3. KFP6R-UF25 | 6H.561.72.0.00 |
| 4. KFP6S-UF35 | F6.489.62.0.00 |

11. Do's & Don'ts for FM Approved & UL Listed Engines

DO'S	DON'TS
<u>Engine Control Panel</u>	
✓ All the Battery and control terminals are tight on terminal & on Panel Connectors	✗ Don't disturb the any settings of the control panel and the electronic units unless you are trained
✓ Connections from Engine control panel to Fire pump control Panel should be as per circuit diagram	✗ Don't operate the Fuel stop solenoid more than 30 sec
✓ All the control and Battery cables are properly routed through cable tray	✗ Don't operate fire pump set with Discharged batteries & single Battery
✓ Keep the Engine in 'AUTOMATIC' mode always which is provided on Engine control panel	✗ Don't handle OR Service any part of Control panel & Wiring Harness without proper Training of FM/UL Package
✓ Keep the Engine in 'MANUAL' mode if you want to start the engine from Engine control panel	✗ Don't disturb any wires unless you aware of Circuit.
✓ Read all the Instructions on Engine Control Panel	✗ Don't operate the set with Open end connections & without Guards on Rotating Parts.
<u>Charging Alternator</u>	
✓ Observe correct Polarity while connecting Alternator.	✗ Don't run the alternator without Battery in the system.
✓ Isolate Alternator while carrying out Electric Welding.	✗ Don't flash Alternator output leads to check alternator working.
✓ Check Belt tension at the time of routine maintenance	✗ Don't disconnect Battery cable or Charging system in running
✓ Use Excitation Lamp for Initial excitation.	✗ Don't Use High Voltage Instruments on Alternator for Insulation check.
✓ Use Multimeter for testing Alternator	✗ Don't connect External Battery charging system while Engine is running.
<u>Air Cleaner</u>	
✓ Keep the air cleaner element cleaned for better performance	✗ Don't run the engine without air cleaner fitted
✓ Refer the O & M Manual to clean the air cleaner element	✗ Don't run the engine with bare element without air cleaner guard fitted
✓ Use restriction indicator always to indicate the air restriction level	✗ Don't remove the restriction indicator when engine is running

DO'S	DON'TS
<u>Engine Coolant Heater</u>	
✓ Use junction box provided on engine only to connect "AC" supply to heater	✗ Don't open any heater parts when "AC" supply is "ON"
✓ Ensure correct "AC" 230 / 240V supply to engine coolant heater	✗ Don't make heater 'ON' without engine coolant in engine.
✓ Keep the coolant heater always in 'ON' condition below Zero deg. C Temp.	✗ Don't keep heater 'ON' while engine is running.
✓ While draining the coolant the AC supply to heater should be disconnected	✗ Don't open any of heater part's when AC Supply is "ON"
✓ Disconnect AC supply before starting the Engine.	✗ Don't open any water pipes when Heater is "ON"
<u>Raw water Cooling Line</u>	
✓ Keep the cooling line always in 'NORMAL OPEN' position	✗ Don't remove the battery supply when engine is running
✓ Use 'EMERGENCY OPEN' line when raw water solenoid is not functioning or coolant temperature is too high	✗ Don't use reducer pipe at heat exchanger outlet and cooling line inlet which will restrict raw water flow and increase in back pressure
✓ Check the raw water circulation through CAC and Heat Exchanger when engine is running to ensure solenoid operation.	✗ Don't keep cooling line pressure gauge open always
✓ Clean the strainer element when it is choked or rise in coolant temperature	✗ Don't provide external DC supply while engine is running.
✓ Use the pressure reducing valve to increase the raw water flow if there is rise in coolant temperature	✗ Don't assemble water solenoid in wrong direction.
✓ Check the direction arrow mark before fitting solenoid in the line.	✗ Don't open solenoid when engine is running
<u>Electronic Governor</u>	
✓ Use fully charged battery for proper operation	✗ Don't remove the battery supply when engine is running
✓ Refer the circuit diagram for wiring connections	✗ Don't adjust the linkage as it is factory set
✓ Use only the dual output magnetic pick designed for KOEL FM/UL Engines	✗ Don't adjust the Governor card as it is factory set
✓ Check correct polarity before connecting governor card connection.	✗ Don't disturb any wiring of governor card without proper training.

DO'S	DON'TS
<u>Starter & Starter Contactor</u>	
✓ Use fully charged battery for proper operation	✘ Don't remove the battery supply when engine is running
✓ Use the stand-by contactor if unable to start engine within 15 seconds	✘ Don't crank the engine more than 15 seconds with each starter contactor
✓ Keep the Engine in 'MANUAL' mode for emergency starting	✘ Don't re-crank the engine through mechanical emergency handle when engine is running
✓ Use mechanical handle on starter contactor for emergency engine starting	✘ Don't re-crank the engine without 30 seconds rest period
✓ Check Starter & Starter contactor terminal connections tightness at every routine maintenance.	✘ Don't over crank the starter
<u>Maintenance Tip for Battery</u>	
✓ Secure the battery firmly on the cradle	✘ Don't hammer down terminals post
✓ Ensure the cable terminals tightly fitted on battery terminal post	✘ Don't tap any battery supply for external use other than Engine starting.
✓ Keep the battery top clean & dry-clean the terminals regularly to avoid corrosion	✘ Don't apply grease on terminal post
✓ Apply Petroleum jelly/ Vaseline in the battery terminal post	✘ Don't add acid in the battery for levelling
✓ Check Battery Sp. Gravity(above 1.2) on weekly basis & top up with distilled water to maintain the level corresponding to the maximum level	
<u>Others</u>	
✓ Regular change of engine oil/oil filters	✘ Don't run the engine with damaged oil supply & drain pipes for turbocharger, gas leakage in exhaust pipes
✓ Regular change/cleaning of air filter element	✘ Don't open any part of engine yourself, please contact KOEL representative at Area office
✓ Periodic cleaning of crankcase breather is necessary to allow free flow of oil from turbocharger outlet	✘ Don't put reducer at Exhaust silencer inlet/outlet which will increase the back pressure
✓ Use the same engine coolant and Lub. Oil as specified in O & M manual for KOEL FM/UL certified engines	


12. Warranty

Warranty is within a period of 12 calendar months from the start of engine with fire pump. After the engine has been taken delivery, we expressly warranty, in lieu of any warranty implied by law, to make good any defective parts in machinery of our own manufacture, which defect develops under proper use and arises solely from faulty material or workmanship, provide always that such defective parts are promptly returned carriage paid to our works. And provided that fuel and lubricants approved by us, have been continuously used. The repaired parts will be delivered free of cost, Ex-works. At the termination of such period of 12 calendar months, all liability on our part ceases. In the case of parts not of our manufacture, you are entitled to the benefits of our warranty given to us. In respect there of and our liability in respect of such parts is limited to the warranty given by the manufacturer. In no case shall we be liable for the fitting charges of replacement parts.

This warranty shall not apply to fair wear and tear or to damage due to negligence or improper handling by the purchaser, or his employees or agents or in the case of repairs or alterations carried out by purchaser without our knowledge, or approval or due to damage by any cause beyond our control.

The engines will be deemed to have been taken over by the customer upon dispatch from our works, in the case of direct deliveries Ex-Factory and from the godowns of our authorized Dealer viz, Distributors and Dealers, in the case of supplies from their stocks and this warranty will come into effect from that time. We will not be responsible for loss or damage to goods beyond the delivery stated in our tender and we will repair or replace goods damaged in transit up to the point of delivery by us, as specified above.

13. Engine Data Sheet

 Enriching Lives	Engine Data Sheet Kirloskar Oil Engines Limited Laxmanrao Kirloskar Road Khadki, Pune - 411003 (India)		Basic Engine Model: KFP4R-UF07				
			Reference Number : EDS - UF07 - 00				
			Revision Date : 13.02.2014 Rev. Number : 01				
General Engine Data							
Engine Manufacturer.....	KOEL						
Ignition Type.....	Compression (Diesel)						
Number of Cylinders.....	4						
Bore and Stroke - in.(mm).....	4.13 x 4.72 (105 x 120)						
Displacement - in. ³ (L).....	254 (4.16)						
Compression Ratio.....	18.0 : 1						
Valve per cylinder - Intake.....	1						
Exhaust.....	1						
Combustion System.....	Direct Injection						
Engine Type.....	In-Line, 4 Stroke Cycle						
Aspiration.....	Naturally Aspirated						
Firing Order.....	1-3-4-2						
Charge Air Cooling Type.....	Not Applicable						
Rotation(Viewed from Flywheel end) - Clockwise..	Not Available						
Counter-Clockwise.....	Standard						
Engine Crankcase Vent System.....	Open						
Installation Drawing.....	4H.2209.00.00						
Cooling system							
Engine Coolant Heat - Btu/sec.(kW).....	1760	2100	2200	2350	2600		
Engine Radiated Heat - Btu/sec.(kW).....	36.7(38.7)	41.2(43.5)	45.2(47.6)	44.6(47)	47.6(50.2)		
Heat Exchanger minimum Flow							
59°F (15°C) Raw Water - gal/min. (LPM)....	4.8 (18)	5.3(20)	5.8(22)	6.3(24)	7.4(28)		
95°F (35°C) Raw Water - gal/min. (LPM)....	5.8(22)	6.6(25)	7.1(27)	7.9(30)	9.2(35)		
Heat Exchanger Maximum Cooling Water							
Inlet Pressure - bar (lb./in. ²) (kPa).....	4 (60)(400)						
Flow - gal/min. (LPM).....	18.5(70)						
Thermostat, Start to Open - °F (°C).....	165.2(74)						
Fully Opened - °F (°C).....	183.2(84)						
Engine Coolant capacity - L.....	9.5						
Engine Coolant Temperature (Maximum) - °F (°C)..	203(95)						
Engine Coolant Temperature (Minimum) - °F (°C)..	165.2(74)						
Engine Coolant Low Temperature Switch - °F (°C)..	89.6(32) - 100.4(38)						
Raw water High Temperature Switch - °F (°C).....	143.6(62) - 154.4(68)						
Continued.....							

Electric System - DC

System Voltage (Nominal).....	12 V
Battery Capacity for Ambients above 32°F (0°C)	
Voltage (Nominal).....	12 V
Qty. per Battery Bank.....	1
SAE size per J537.....	4D - 640
CCA at 0°F (-18°C).....	640
Reserve Capacity - Min.....	280
Battery Cable Circuit*, Max. Resistance - ohm.....	0.0012
Battery Cable Minimum Size	
0 - 120 in. Circuit* Length.....	0
121 - 160 in. Circuit* Length.....	0
161 - 200 in. Circuit* Length.....	0
Charging Alternator Output - Amp.....	55
Starter Cranking Amps - at 60°F (15°C).....	400
*Positive and Negative Cables Combined Length	

Exhaust System

	1760	2100	2200	2350	2600
Exhaust Flow - ft ³ /min (m ³ /min).....	329(9.3)	369(10.5)	404(11.4)	399(11.3)	426(12)
Exhaust Temperature - °F (°C).....	1220(660)	1202(650)	1184(640)	1166(630)	1112(600)
Max. Allowable Back Pressure - in. of H ₂ O(kPa)...	16(4) for all speed range				
Exhaust pipe Dia. In. (mm)** for further exhaust piping(Min.).....	4 (100)				

Fuel System

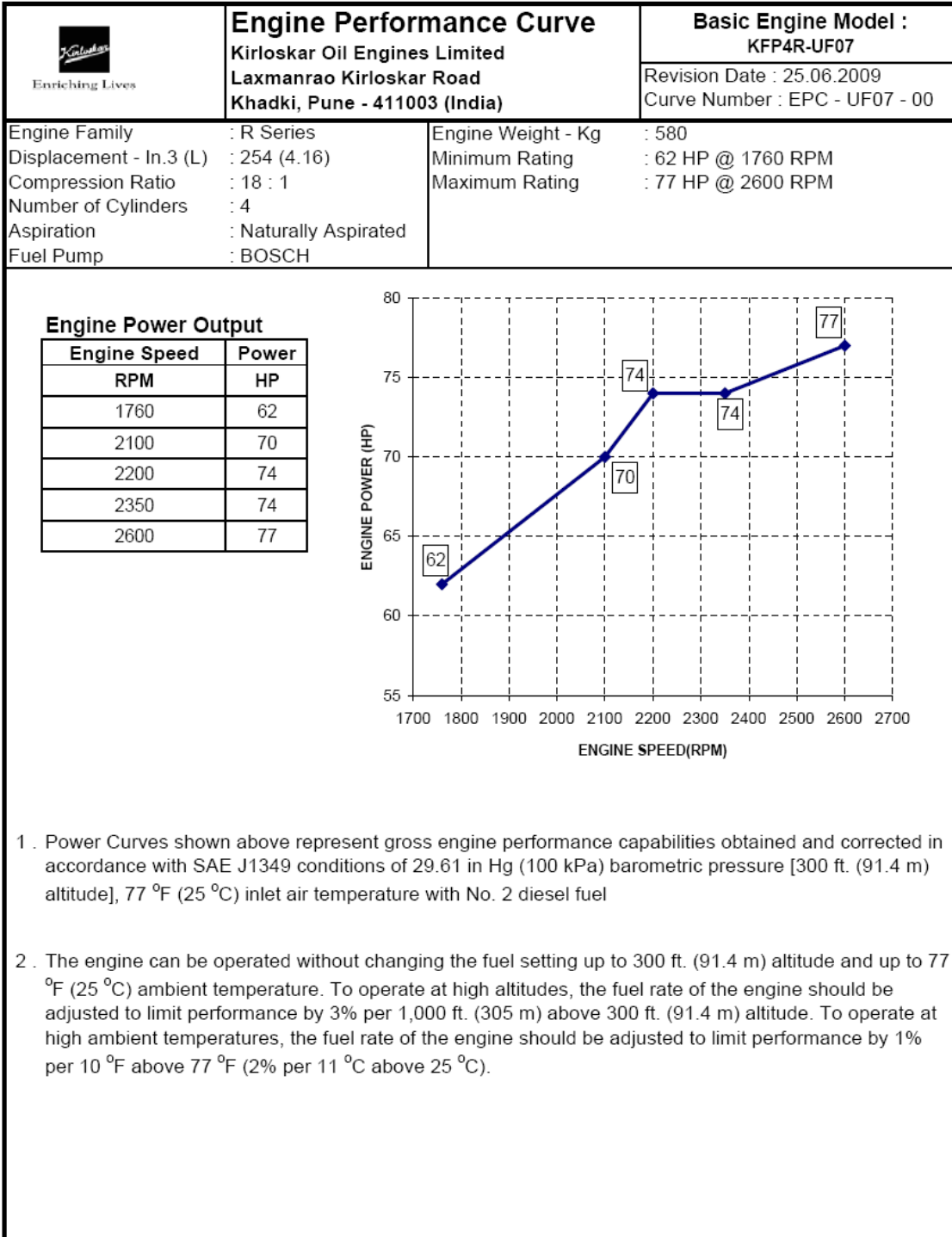
	1760	2100	2200	2350	2600
Fuel Consumption - gal./hr. (L/hr.).....	2.9(13)	3.2(14.7)	3.5(16)	3.5(16)	3.7(17)
Fuel Return - gal./hr. (L/hr.).....	13(52)	14.7(59)	16(64)	16(64)	17(68)
Total Supply Fuel Flow - gal./hr. (L/hr.).....	15.9(63.6)	17.9(71.7)	19.5(78)	19.5(78)	20.7(83)
Fuel Pressure - lb./in. ² (kPa).....	36.25(250)				
Fuel Supply Line Size(Min.) - in.(mm)	0.5(12.7)				
Fuel Return Line Size(Min.) - in.(mm).....	0.375(9.5)				
Max. Allowable Fuel Pump Suction With Clean Filter - in. H ₂ O (m H ₂ O).....	31(0.8)				
Max. Allowable Fuel Head Above Fuel Pump Supply or Return - m (ft.).....	2.7(9)				
Fuel Filter Size - Micron.....	10				


Heater System

Jacket Water Heater.....	Standard
Wattage (Nominal).....	1500
Voltage - AC, 1P.....	240

Continued.....

Induction Air System					
	1760	2100	2200	2350	2600
Air Cleaner Type.....	Dry				
Air Intake Restriction Maximum Limit					
Dirty Air Cleaner - in. of Water (kPa).....	8(2) at 1760 rpm and 17(4.25) at 2600 rpm				
Clean Air Cleaner - in. of Water (kPa)...	6(1.5)				
Engine Air Flow - ft.3/min. (m3/min).....	120(3.4)	135(3.8)	138(3.9)	146(4.1)	155(4.4)
Air Temperature(At Engine Inlet) - °F (°C)***.....	113(45) Max. Allowable				
Lubrication System					
Oil Pressure(Normal) - lb./in. ² (kPa).....	36.26 to 72.52 (250 to 500)				
Oil Temperature(In Pan) - °F (°C) (max.).....	230 - 248 (110 - 120)				
Oil Pan Capacity, High - L.....	9.5				
Low - L.....	8.5				
Total Oil Capacity with filter - L.....	11.5				
Performance					
	1760	2100	2200	2350	2600
BMEP - lb./in. ² (kPa).....	109(749)	103(708)	104(715)	97(669)	91(629)
Piston Speed - ft./min (m/min).....	1385(422)	1653(504)	1732(528)	1850(564)	2047(624)
Mechanical Noise - dB(A) at 1m.....	102 approx				
Power Curve.....	Performance curve No. : EPC - UF07 - 00				



 Enriching Lives	Engine Data Sheet Kirloskar Oil Engines Limited Laxmanrao Kirloskar Road Khadki, Pune - 411003 (India)	Basic Engine Model : KFP4R-UF15				
		Reference Number : EDS - UF15 - 00				
		Revision Date : 13.02.2014 Rev. Number : 01				
General Engine Data						
Engine Manufacturer.....	KOEL					
Ignition Type.....	Compression (Diesel)					
Number of Cylinders.....	4					
Bore and Stroke - in.(mm).....	4.13 x 4.72 (105 x 120)					
Displacement - in. ³ (L).....	254 (4.16)					
Compression Ratio.....	18.0 : 1					
Valve per cylinder - Intake.....	1					
Exhaust.....	1					
Combustion System.....	Direct Injection					
Engine Type.....	In-Line, 4 Stroke Cycle					
Aspiration.....	Turbocharged, Aftercooled					
Firing Order.....	1-3-4-2					
Charge Air Cooling Type.....	Raw Watercooled					
Rotation(Viewed from Flywheel end) - Clockwise..	Not Available					
Counter-Clockwise.....	Standard					
Engine Crankcase Vent System.....	Open					
Installation Drawing.....	4H.2588.00.00					
Cooling system						
Engine Coolant Heat - Btu/sec.(kW).....	1760	2100	2200	2350	2600	
Engine Radiated Heat - Btu/sec.(kW).....	55 (58)	57.4(60.5)	61.1(64.5)	75.8(80)	85.4(90.1)	
Heat Exchanger minimum Flow						
59 ⁰ F (15 ⁰ C) Raw Water - gal/min. (LPM)....	7(27)	9(35)	10(38)	11(41)	12(45)	
95 ⁰ F (35 ⁰ C) Raw Water - gal/min. (LPM)....	9(34)	11(41)	12(45)	13(49)	14(54)	
Heat Exchanger Maximum Cooling Water						
Inlet Pressure - bar (lb./in. ²) (kPa).....	4 (60)(400)					
Flow - gal/min. (LPM).....	31.5(120)					
Thermostat, Start to Open - ⁰ F (⁰ C).....	165.2(74)					
Fully Opened - ⁰ F (⁰ C).....	183.2(84)					
Engine Cooling capacity - L.....	9.5					
Engine Coolant Temperature (Maximum) - ⁰ F (⁰ C)..	203(95)					
Engine Coolant Temperature (Minimum) - ⁰ F (⁰ C)..	165.2(74)					
Engine Coolant Low Temperature Switch - ⁰ F (⁰ C)..	89.6(32) - 100.4(38)					
Raw water High Temperature Switch - ⁰ F (⁰ C).....	143.6(62) - 154.4(68)					
Continued.....						

Electric System - DC

System Voltage (Nominal).....	12 V
Battery Capacity for Ambients above 32°F (0°C)	
Voltage (Nominal).....	12 V
Qty. per Battery Bank.....	1
SAE size per J537.....	4D - 640
CCA at 0°F (-18°C).....	640
Reserve Capacity - Min.....	280
Battery Cable Circuit*, Max. Resistance - ohm.....	0.0012
Battery Cable Minimum Size	
0 - 120 in. Circuit* Length.....	0
121 - 160 in. Circuit* Length.....	0
161 - 200 in. Circuit* Length.....	0
Charging Alternator Output - Amp.....	55
Starter Cranking Amps - at 60°F (15°C).....	400
*Positive and Negative Cables Combined Length	

Exhaust System

	1760	2100	2200	2350	2600
Exhaust Flow - ft ³ /min (m ³ /min).....	494(14)	604(17)	643(18.2)	797(22.6)	898(25.4)
Exhaust Temperature - °F (°C).....	1022(550)	1022(550)	1022(550)	1022(550)	1022(550)
Max. Allowable Back Pressure - in. of H ₂ O(kPa)...	16 (4) at 1760 rpm and 24.4 (6.1) at 2600 rpm				
Exhaust pipe Dia. In. (mm)** for further exhaust piping(Min.).....	4 (100)				

Fuel System


	1760	2100	2200	2350	2600
Fuel Consumption - gal./hr. (L/hr.).....	4.3(19.6)	4.5(20.5)	4.8(21.8)	5.9(27)	6.7(30.5)
Fuel Return - gal./hr. (L/hr.).....	17.2(78.4)	18(82)	19.2(87.2)	23.6(108)	26.8(122)
Total Supply Fuel Flow - gal./hr. (L/hr.).....	21.5(98)	22.5(102.5)	24(109)	29.5(135)	33.5(152.5)
Fuel Pressure - lb./in. ² (kPa).....	36.25(250)				
Fuel Supply Line Size(Min.) - in.(mm)	0.5(12.7)				
Fuel Return Line Size(Min.) - in.(mm).....	0.375(9.5)				
Max. Allowable Fuel Pump Suction With Clean Filter - in. H ₂ O (m H ₂ O).....	31(0.8)				
Max. Allowable Fuel Head Above Fuel Pump Supply or Return - m (ft.).....	2.7(9)				
Fuel Filter Size - Micron.....	10				

Heater System

Jacket Water Heater.....	Standard
Wattage (Nominal).....	1500
Voltage - AC, 1P.....	240

Continued.....

Induction Air System					
	1760	2100	2200	2350	2600
Air Cleaner Type.....	Dry				
Air Intake Restriction Maximum Limit					
Dirty Air Cleaner - in. of Water (kPa).....	9.6 (2.4) at 1760 rpm and 16 (4) at 2600 rpm				
Clean Air Cleaner - in. of Water (kPa)...	6 (1.5)				
Engine Air Flow - ft.3/min. (m3/min).....	180(5.1)	221.7(6.3)	236(6.7)	292.7(8.3)	329.9(9.3)
Air Temperature(At Engine Inlet) - °F (°C)***.....	113(45) Max. Allowable				
Lubrication System					
Oil Pressure(Normal) - lb./in. ² (kPa).....	36.26 to 79.77 (250 to 550)				
Oil Temperature(In Pan) - °F (°C) (max.).....	230 - 248 (110 - 120)				
Oil Pan Capacity, High - L.....	9.5				
Low - L.....	8.5				
Total Oil Capacity with filter - L.....	11.5				
Performance					
	1760	2100	2200	2350	2600
BMEP - lb./in. ² (kPa).....	189(1304)	163(1123)	164(1130)	187(1293)	179(1234)
Piston Speed - ft./min (m/min).....	1385(422)	1653(504)	1732(528)	1850(564)	2047(624)
Mechanical Noise - dB(A) at 1m.....	102 Approx.				
Power Curve.....	Performance curve No. : EPC - UF15 - 00				

 Enriching Lives	Engine Data Sheet Kirloskar Oil Engines Limited Laxmanrao Kirloskar Road Khadki, Pune - 411003 (India)		Basic Engine Model: KFP6R-UF25				
	Reference Number : EDS - UF25 - 00						
	Revision Date : 13.02.2014 Rev. Number : 01						
General Engine Data							
Engine Manufacturer.....	KOEL						
Ignition Type.....	Compression (Diesel)						
Number of Cylinders.....	6						
Bore and Stroke - in.(mm).....	4.13 x 4.92 (105 x 125)						
Displacement - in. ³ (L).....	395.4 (6.48)						
Compression Ratio.....	17.6 : 1						
Valve per cylinder - Intake.....	1						
Exhaust.....	1						
Combustion System.....	Direct Injection						
Engine Type.....	In-Line, 4 Stroke Cycle						
Aspiration.....	Turbocharged, Aftercooled						
Firing Order.....	1-5-3-6-2-4						
Charge Air Cooling Type.....	Raw Watercooled						
Rotation(Viewed from Flywheel end) - Clockwise..	Not Available						
Counter-Clockwise.....	Standard						
Engine Crankcase Vent System.....	Open						
Installation Drawing.....	6H.2583.00.00						
Cooling system							
Engine Coolant Heat - Btu/sec.(kW).....	1760	2100	2200	2350	2600		
Engine Radiated Heat - Btu/sec.(kW).....	87.4(92)	100.8(106)	106.7(112)	113.8(120)	135.3(143)		
Heat Exchanger minimum Flow							
59°F (15°C) Raw Water - gal/min. (LPM)....	13.2(50)	14(53)	15.3(58)	16.6(63)	18.2(69)		
95°F (35°C) Raw Water - gal/min. (LPM)....	15.8(60)	17(65)	18.5(70)	20(76)	22(83)		
Heat Exchanger Maximum Cooling Water							
Inlet Pressure - bar (lb./in. ²) (kPa).....	4 (60)(400)						
Flow - gal/min. (LPM).....	42(160)						
Thermostat, Start to Open - °F (°C).....	165.2(74)						
Fully Opened - °F (°C).....	183.2(84)						
Engine Cooling capacity - L.....	18						
Engine Coolant Temperature (Maximum) - °F (°C)..	203(95)						
Engine Coolant Temperature (Minimum) - °F (°C)..	165.2(74)						
Engine Coolant Low Temperature Switch - °F (°C)..	89.6(32) - 100.4(38)						
Raw water High Temperature Switch - °F (°C).....	143.6(62) - 154.4(68)						
Continued.....							

Electric System - DC					
System Voltage (Nominal).....	12 V				
Battery Capacity for Ambients above 32°F (0°C)					
Voltage (Nominal).....	12 V				
Qty. per Battery Bank.....	1				
SAE size per J537.....	4D - 640				
CCA at 0°F (-18°C).....	640				
Reserve Capacity - Min.....	280				
Battery Cable Circuit*, Max. Resistance - ohm.....	0.0012				
Battery Cable Minimum Size					
0 - 120 in. Circuit* Length.....	0				
121 - 160 in. Circuit* Length.....	0				
161 - 200 in. Circuit* Length.....	0				
Charging Alternator Output - Amp.....	55				
Starter Cranking Amps - at 60°F (15°C).....	440				
*Positive and Negative Cables Combined Length					
Exhaust System					
	1760	2100	2200	2350	2600
Exhaust Flow - ft ³ /min (m ³ /min).....	817(23.1)	1060(30)	1163(32.9)	1241(35.1)	1476(41.8)
Exhaust Temperature - °F (°C).....	932(500)	932(500)	932(500)	932(500)	932(500)
Max. Allowable Back Pressure - in. of H ₂ O(kPa)...	18.7 (4.6) at 1760 rpm and 27 (6.6) at 2600 rpm				
Exhaust pipe Dia. In. (mm)** for further exhaust piping(Min.).....	5 (125)				
Fuel System					
	1760	2100	2200	2350	2600
Fuel Consumption - gal./hr. (L/hr.).....	6.9(31.2)	7.9(35.9)	8.4(38.1)	8.9(40.6)	10.6(48.3)
Fuel Return - gal./hr. (L/hr.).....	20.7(93.8)	23.7(107.7)	25(114)	26(128.4)	32(145.7)
Total Supply Fuel Flow - gal./hr. (L/hr.).....	27.6(125)	31.6(143.6)	33.4(152)	34.9(169)	42(194)
Fuel Pressure - lb./in. ² (kPa).....	36.25(250)				
Fuel Supply Line Size(Min.) - in.(mm)	0.5(12.7)				
Fuel Return Line Size(Min.) - in.(mm).....	0.375(9.5)				
Max. Allowable Fuel Pump Suction With Clean Filter - in. H ₂ O (m H ₂ O).....	31(0.8)				
Max. Allowable Fuel Head Above Fuel Pump Supply or Return - m (ft.).....	2.7(9)				
Fuel Filter Size - Micron.....	10				
Heater System					
Jacket Water Heater.....	Standard				
Wattage (Nominal).....	2000				
Voltage - AC, 1P.....	240				

Continued.....

Induction Air System					
	1760	2100	2200	2350	2600
Air Cleaner Type.....	Dry				
Air Intake Restriction Maximum Limit					
Dirty Air Cleaner - in. of Water (kPa).....	9.2 (2.3) at 1760 rpm and 20 (5) at 2600 rpm				
Clean Air Cleaner - in. of Water (kPa)...	6 (1.5)				
Engine Air Flow - ft. ³ /min. (m ³ /min).....	298.6(8.5)	389.4(11)	428(12.1)	456(12.9)	542.7(15.4)
Air Temperature(At Engine Inlet) - °F (°C)***.....	113(45) Max. Allowable				
Lubrication System					
Oil Pressure(Normal) - lb./in. ² (kPa).....	36.26 to 72.52 (250 to 500)				
Oil Temperature(In Pan) - °F (°C) (max.).....	230 - 248 (110 - 120)				
Oil Pan Capacity, High - L.....	15				
Low - L.....	13.5				
Total Oil Capacity with filter - L.....	17				
Performance					
	1760	2100	2200	2350	2600
BMEP - lb./in. ² (kPa).....	168(1162)	159(1100)	156(1078)	151(1045)	152(1047)
Piston Speed - ft./min (m/min).....	1444(40)	1723(525)	1805(550)	1928(587.5)	2133(650)
Mechanical Noise - dB(A) at 1m.....	102 approx				
Power Curve.....	Performance curve No. EPC - UF25 - 00				



Enriching Lives

Engine Performance Curve

Kirloskar Oil Engines Limited
Laxmanrao Kirloskar Road
Khadki, Pune - 411003 (India)

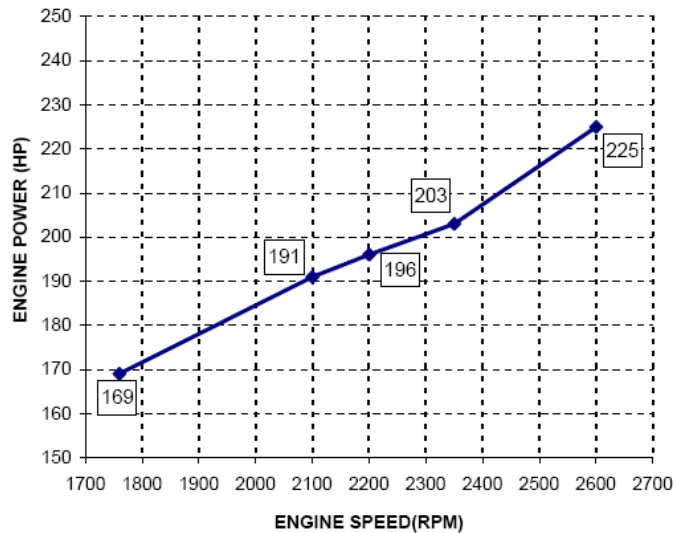
Basic Engine Model :
KFP6R-UF25

Revision Date : 25.06.2009
Curve Number : EPC - UF25 - 00

Engine Family	: R Series	Engine Weight - Kg	: 883
Displacement - In.3 (L)	: 395.4 (6.48)	Minimum Rating	: 169 HP @ 1760 RPM
Compression Ratio	: 17.6 : 1	Maximum Rating	: 225 HP @ 2600 RPM
Number of Cylinders	: 6		
Aspiration	: Turbocharged, Aftercooled		
Fuel Pump	: MOTORPAL		

Engine Power Output

Engine Speed	Power
RPM	HP
1760	169
2100	191
2200	196
2350	203
2600	225



1. Power Curves shown above represent gross engine performance capabilities obtained and corrected in accordance with SAE J1349 conditions of 29.61 in Hg (100 kPa) barometric pressure [300 ft. (91.4 m) altitude], 77 °F (25 °C) inlet air temperature with No. 2 diesel fuel
2. The engine can be operated without changing the fuel setting up to 300 ft. (91.4 m) altitude and up to 77 °F (25 °C) ambient temperature. To operate at high altitudes, the fuel rate of the engine should be adjusted to limit performance by 3% per 1,000 ft. (305 m) above 300 ft. (91.4 m) altitude. To operate at high ambient temperatures, the fuel rate of the engine should be adjusted to limit performance by 1% per 10 °F above 77 °F (2% per 11 °C above 25 °C).

Electric System - DC				
System Voltage (Nominal).....	24 V			
Battery Capacity for Ambients above 32°F (0°C)				
Voltage (Nominal).....	24 V			
Qty. per Battery Bank.....	2 (12 V Each)			
SAE size per J537.....	8D - 900			
CCA at 0°F (-18°C).....	900			
Reserve Capacity - Min.....	430			
Battery Cable Circuit*, Max. Resistance - ohm.....	0.002			
Battery Cable Minimum Size				
0 - 120 in. Circuit* Length.....	0			
121 - 160 in. Circuit* Length.....	0			
161 - 200 in. Circuit* Length.....	0			
Charging Alternator Output - Amp.....	55			
Starter Cranking Amps - at 60°F (15°C).....	500			
*Positive and Negative Cables Combined Length				
Exhaust System				
	1760	2100	2200	2350
Exhaust Flow - ft ³ /min (m ³ /min).....	1721(48.7)	2170(61.5)	2181(61.8)	2303(65.2)
Exhaust Temperature - °F (°C).....	1022 (550)	1022 (550)	1022 (550)	1022 (550)
Max. Allowable Back Pressure - in. of H ₂ O(kPa)...	20(5.0) at 1760 rpm and 30(7.5) at 2350 rpm			
Exhaust pipe Dia. In. (mm)** for further exhaust piping(Min.).....	6 (152.4)			
Fuel System				
	1760	2100	2200	2350
Fuel Consumption - gal./hr. (L/hr.).....	12.8(58.3)	15.6(70.9)	15.7(71.3)	16(72.7)
Fuel Returnn - gal./hr. (L/hr.).....	38.4(175)	46.8(212.7)	47.1(214)	48(216)
Total Supply Fuel Flow - gal./hr. (L/hr.).....	51.2(233.3)	62.4(283.6)	62.8(285.3)	64(288.7)
Fuel Pressure - lb./in. ² (kPa).....	36.25(250)			
Fuel Supply Line Size(Min.) - in.(mm)	0.5(12.7)			
Fuel Return Line Size(Min.) - in.(mm).....	0.375(9.5)			
Max. Allowable Fuel Pump Suction With Clean Filter - in. H ₂ O (m H ₂ O).....	31(0.8)			
Max. Allowable Fuel Head Above Fuel Pump Supply or Return - m (ft.).....	2.7(9)			
Fuel Filter Size - Micron.....	10			
Heater System				
Jacket Water Heater.....	Standard			
Wattage (Nominal).....	2000			
Voltage - AC, 1P.....	240			

Continued.....

Induction Air System	1760	2100	2200	2350
Air Cleaner Type.....	Dry			
Air Intake Restriction Maximum Limit				
Dirty Air Cleaner - in. of Water (kPa).....	8.8 (2.2) at 1760 rpm and 18.4 (4.6) at 2350 rpm			
Clean Air Cleaner - in. of Water (kPa)...	6 (1.5)			
Engine Air Flow - ft.3/min. (m3/min).....	632(17.9)	798(22.6)	802(22.7)	848(24)
Air Temperature(At Engine Inlet) - °F (°C)***.....	113(45) Max. Allowable			
Lubrication System				
Oil Pressure(Normal) - lb./in. ² (kPa).....	36.26 to 72.5 (250 to 500)			
Oil Temperature(In Pan) - °F (°C) (max.).....	230 - 248(110 -120)			
Oil Pan Capacity, High - L.....	24			
Low - L.....	22			
Total Oil Capacity with filter - L.....	26			
Performance				
BMEP - lb./in. ² (kPa).....	236(1632)	231(1595)	218(1505)	203(1400)
Piston Speed - ft./min (m/min).....	1559(475)	1860(567)	1949(594)	2083(635)
Mechanical Noise - dB(A) at 1m.....	103 Approx			
Power Curve.....	Performance curve No. EPC - UF35 - 00			

15. Engine General Assembly

