Operation Manual

LIFAN Diesel Engine

92454

Illustration similar, may vary depending on model

Read and follow the operating instructions and safety information before using for the first time.

Technical changes reserved!
Due to further developments, illustrations, functioning steps and technical data can differ insignificantly.

Updating the documentation
If you have suggestions for improvement or have found any irregularities, please contact us.

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Introduction

Thank you for purchasing this quality product. **To minimize the risk of injury we urge that our clients take some basic safety precautions when using this device. Please read the operation instructions carefully and make sure you have understood its content.**
Keep these operation instructions safe.

Product properties and application range

This device offers

- direct injection combustion chamber,
- recoil-type manual starter and optional electric starter,
- force air cooling system,
- fan cover made of low noise composite steel plate.

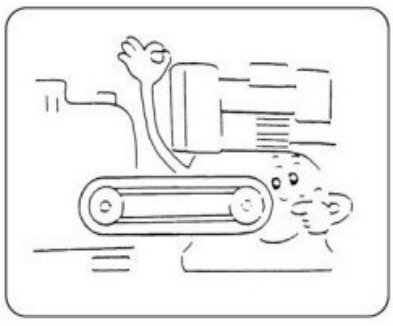
Series air cooling direct injection 4-stroke diesel engines are such a type engine of saving on material and energy. The series engines are small, light. They are easy to maintain, and convenient to move. They are used widely as a power for industrial, agricultural, machinery tool such as irrigation, spray, rice-transplanting, threshing, grass-cutting, soil-sampling, and also used in vibration rammers, shock rammers, as marine engines, in light-type transport vehicle, movable-type compressor, light-type generation set, car washing machine, tillage machinery, etc.

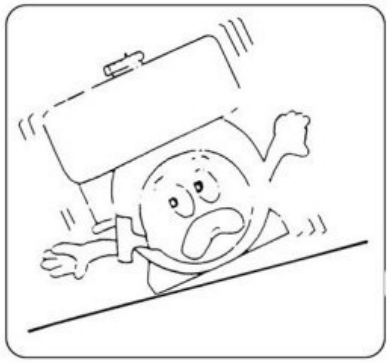
Purpose of this manual

This operating manual will tell you how to operate and maintain your series engines. Please read it before running the engine for correct operation. Follow the operating requirement in the manual to keep your engine in best working condition and make the make the engine run longer. If you have any questions or suggestions about this manual, please contact us or dealer. The user should pay attention to that, with the improvement of our products, the description in this manual may differ from practical products.

Please make sure to follow each precaution carefully.

Precautions

	*Exhaust precautions* • **Never** inhale exhaust gas. It contains carbon monoxide, a colourless, odourless, and extremely dangerous gas which can cause unconsciousness or death. • **Never** operate the engine indoors or in a poorly ventilated area, such as tunnels or caves, etc. Be **extremely careful** when operating the engine near people or animals. • Keep the exhaust pipe free of external objects.
	*Refuelling precautions* • Be sure to **stop** the engine prior to refuelling. • Do **not overfill** the fuel tank. • If fuel is spilt, wipe it away carefully and wait until the fuel has dried before starting the engine. • When changing oil, make sure that the fuel cap is secure to prevent spillage.
	*Fire prevention* • Do **not** operate the engine while smoking or near an open flame. • Do **not** use the engine near dry brushes, twigs, cloth-rags, or other flammable materials. • Keep the engine **at least 3 feet** (1 meter) away from buildings or other structures. • Keep the engine away from flammables and other hazardous materials (trash, rags, lubricants, explosives).
	*Protective cover* • Place the protective covers over the rotating parts. If rotating parts, such as the driving shaft, pulley, belt, etc. are left exposed, they are potentially hazardous. To prevent injury, equip them with protective covers or shrouds. • Be careful of hot parts. The muffler and other engine parts become very hot while the engine is running or just after it has stopped. Operate the engine in a safe area and keep children away from the running engine.

<table>
<tr>
<td>  </td>
<td>Surroundings
• Operate the engine on a table, level surface free of small rocks, loose gravel, etc.
• Operate the engine on a level surface. If the engine is tilted, fuel spillage may result.
NOTE: Operating the engine at a steep incline may cause seizure due to improper lubrication even with a maximum oil level.
• Be careful of fuel spillage when transporting the engine. Tighten the fuel tank cap securely and close the fuel strainer cock before transit.
• If the engine will be transported over a long distance or on rough roads, drain fuel off from fuel tank to prevent fuel leakage.</td>
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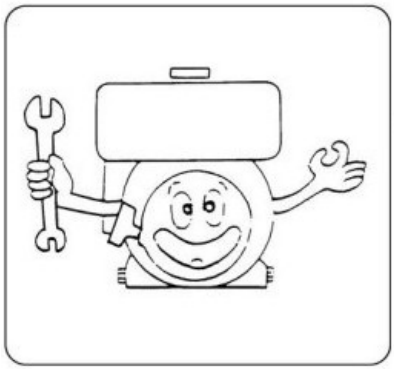
<tr>
<td>  </td>
<td>Pre-operation checks
• Carefully check fuel pipes and joints for looseness and fuel leakage. Leaked fuel creates a potentially dangerous situation.
• Check bolts and nuts for looseness. A loose bolt or nut may cause serious engine trouble.
• Check the engine oil and refill if necessary.
• Check the fuel level and refill if necessary. Take care not to overfill the tank.
• Wear snug fitting working clothes when operating the engine.
• Loose aprons, towels, belt, etc., may be caught in the engine or driving train causing a dangerous situation.</td>
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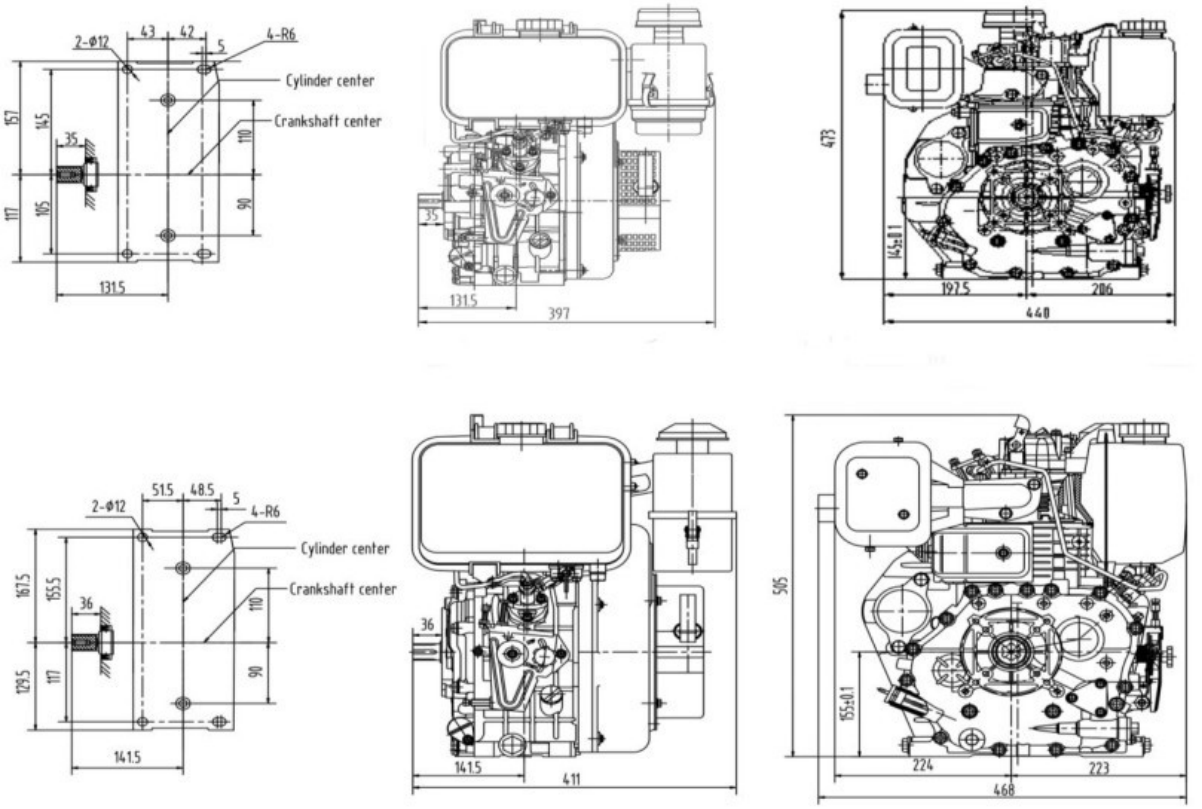
</table>

Technical data

Model			C178FD	
Engine type			Four stroke, OHV, single cylinder, forced air	
Displacement (cm³)			296	
Bore × stroke (mm)			78 × 62	
Power	max. theoretic	(kW)	4	4.4
		(PS)	5.4	6
		(rpm)	3000	3600
	recommended	(kW)	3.7	4
		(PS)	5.0	5.4
		(rpm)	3000	3600
Fuel consumption (g/kW • h)			≤ 280	
Capacity		Fuel tank (ℓ)	3.5	
		Oil tank (ℓ)	1.1	
Cooling system			Force air-cooled	
Ignition system			Compaction	
Power output mode			Vertical power shaft	
Start model			Electric/manual	
Power shaft output direction			Counter-clockwise	
Dimensions (mm)			397 × 440 × 473	
Dry weight (kg)			34	

Overall dimensions



Installation

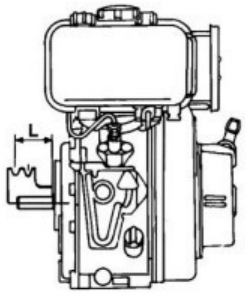
1. There must be a tight stationary foundation for diesel engine to avoid vibration or movement when the engine is running.
2. Be sure that the centre position of the output axle is correct.
3. Check whether calibration between axle hole of belt wheel and keyway shaft is correct and whether the tighten screw nut of belt wheel is tightened up.
4. When the engine is matched with other belt-driving machine, the diameter of driving wheel must be in harmony with the speed of diesel engine and the size of axle wheel of the equipped machine. Otherwise it will directly influence working condition of diesel engine, the life of the engine and the efficiency of working machine.
5. The diameter of the driving wheel (belt wheel) can be calculated as follow:

Ø engine driving wheel = (Ø working machine axle wheel × working machine speed) ÷ diesel speed

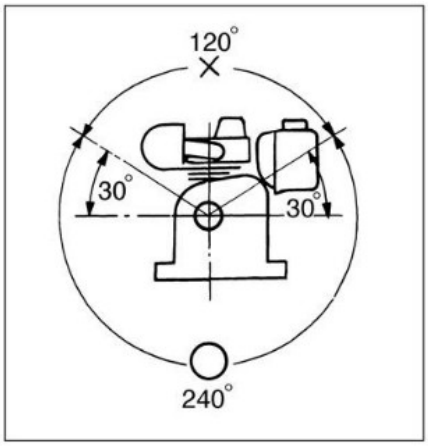
6. Be sure that belt is tightened properly. If the belt is fixed too tight, the engine will be over-loaded while starting, the belt will be drawn longer, and the engine may be damaged. If the belt is fixed too loose, the belt will slip at high speed and high load.

Allowed distance between belt wheel and engine

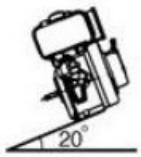
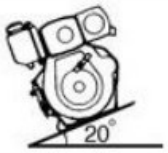
The V-axle wheel groove should be close to the engine as possible as it can be, the allowed value of L is listed in the table (options).
Note: The value of L is shown in figure below. Please contact us or dealer if you have any questions.

Model		C178FD	
Belt	Type	B	
	Quantity	2	
Minimum pulley diameter (mm)		97	
L (mm)		≤70	

Tilt

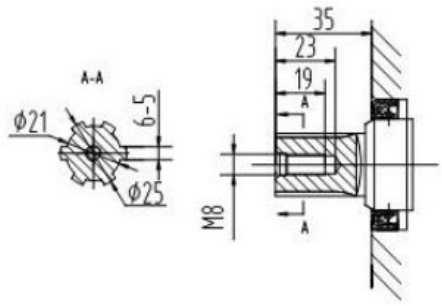
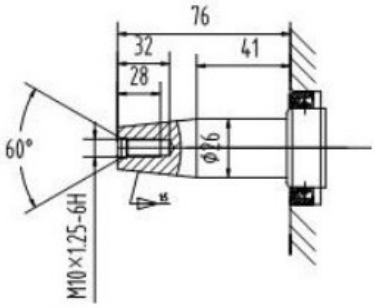


The tilt must be kept within the allowed value shown:

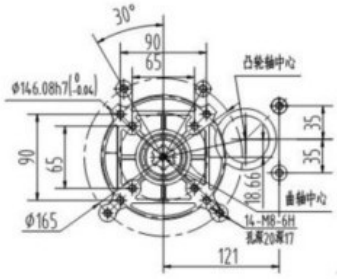
 	Output shaft tilt
≤20°	Allowed tilt (continuous running)
 	Engine tilt
≤20°	Allowed tilt (continuous running)

Connection dimensions

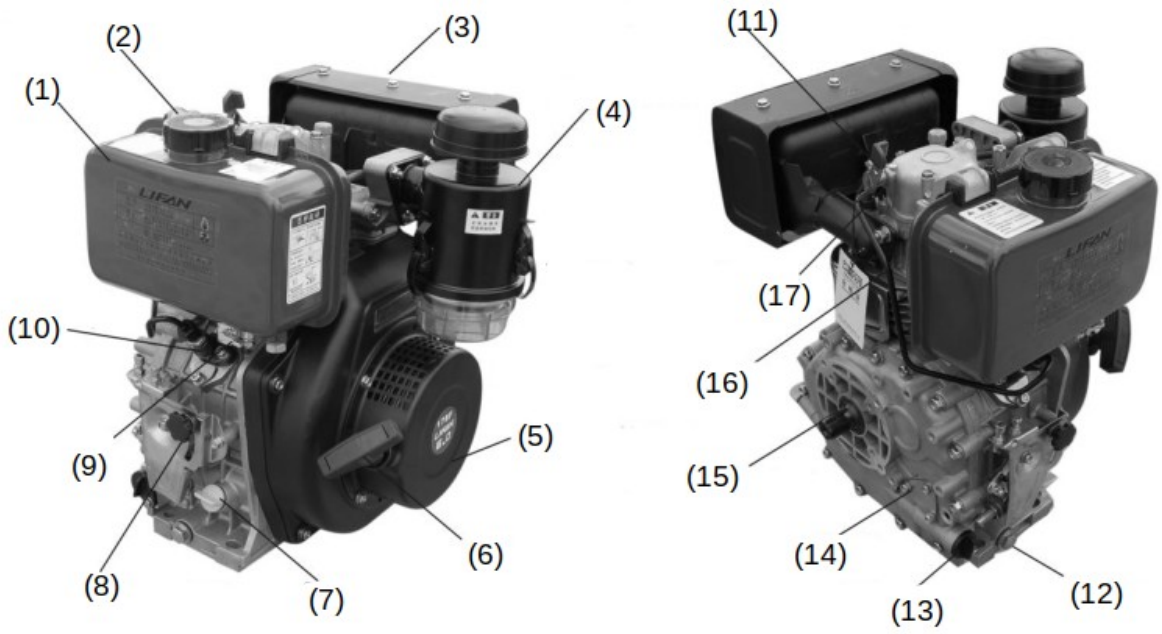
Sizes of output shaft

Model	Spline shaft	Taper shaft
C178FD		

Sizes of PTO flanges



Parts



№	Name	№	Name	№	Name
1	Fuel tank	**7**	Dipstick	**13**	Oil filter
2	Fuel filler cap	**8**	Speed governor system	**14**	Oil pump
3	Exhaust muffler	**9**	Fuel cock	**15**	Crankshaft output
4	Air-cleaner	**10**	Fuel pump	**16**	High pressure fuel pipe
5	Wind cover	**11**	Decompression lever	**17**	Fuel injection nozzle
6	Starter	**12**	Drain plug		

Optimal engine settings

Valve open and close phase (unit: ca)

Intake valve	open	BTDC 18°
	close	ATDC 46°
Exhaust valve	open	BBDC 52°
	close	ABDC 12°

Fuel supply advance angle (unit: ca)

17°±1°

Valve clearance (unit: mm)

Intake valve (cold state)	0.10 ~ 0.15
Exhaust valve (cold state)	0.10 ~ 0.15

Range of temperature, smoke, and pressure

Exhaust temperature (℃)	≤ 500
Machine oil temperature (℃)	≤ 110
Smoke (FSU)	≤ 4,5
Injection pressuer (MPa / kgf/cm²)	19.6±0.49 / 200±5

Torque for tightening up the main screw bolt nuts (unit: Nm)

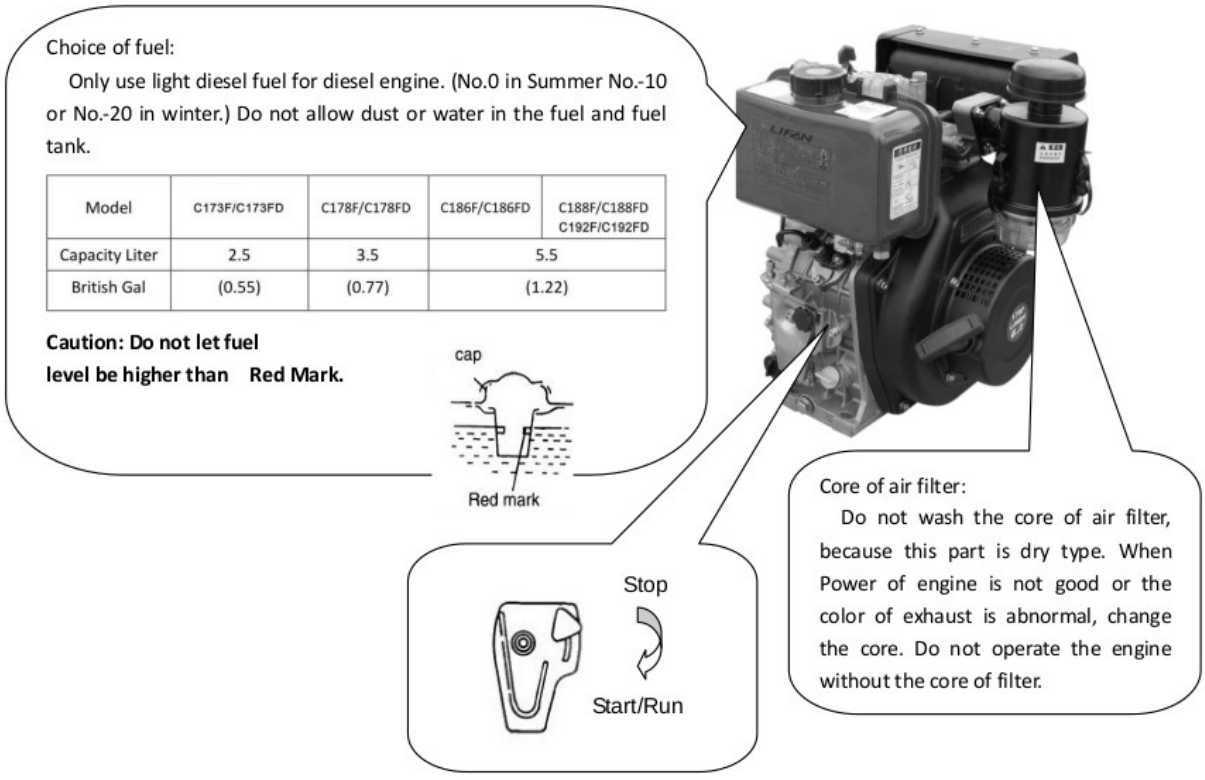
Connection rod nut	18~21
Cylinder head nut	42~46
Flywheel nut	100~120
Nozzle retainer nut	10~12
Rocker support tighten bolt	25~30
Standard M8 bolt	18~20
Standard M6 bolt	10~12

Diesel engine operation

Instructions for safe operation

- The fuel must be filtered through a silk fabric, or settled for 24 hours before used. Do not add oil into the fuel tank or the crank shaft case when the engine is running.
- There should not be burnable and explosive goods near the engine, and the place for installation should be plain and ventilated.
- Do not touch the muffler with your hand when the engine is running or just after it has stopped.
- The diesel engine must be run under a rated power and a rated speed. If you detect an abnormal phenomenon, stop the engine immediately to check and remedy.
- A new engine or a newly maintained one must be run at a low speed and a low load at the first 20 hours. Do not allow to run it at a high speed and a full load.

Fuel and lubricant choice, and preparation before start



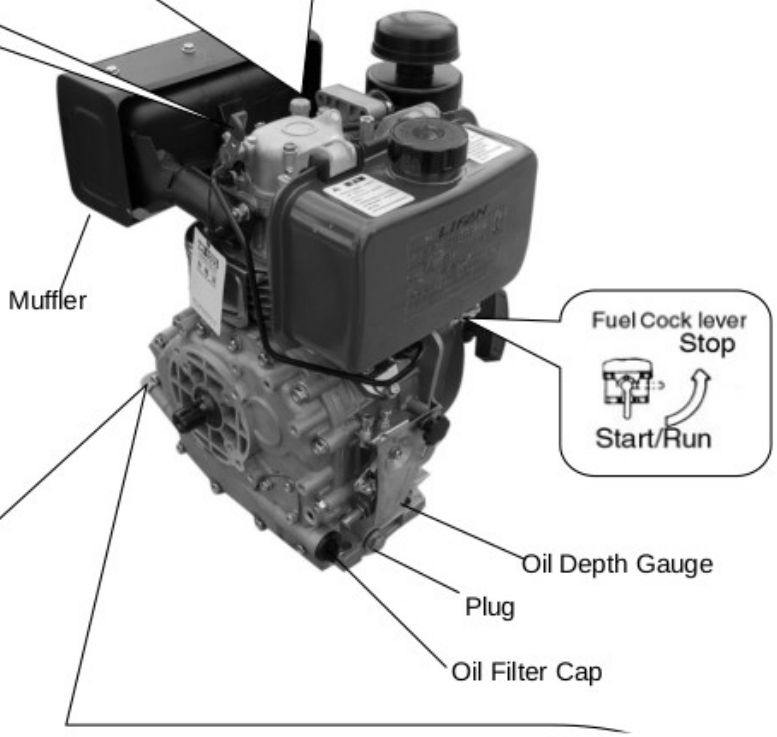
Oiling screw pulg:

In winter, if it is difficult to start the engine, pull out the plug and fill 2cc lube oil into the hole and then return the plug. Keep plug in tight condition. The engine can absorb dust and be damaged if the plug is taken away.

Decompression lever: Push the lever down to start the engine.

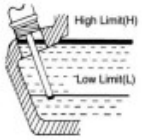
Loose it afterwards.

The fuel oil and machine oil in the engine were drained away before exfactory. Check fuel pipeline before refilling fuel oil and starting the engine. If there is air in the pipeline, drain it out. The detailed method is to loosen the nut of connection between injection pump and fuel pipe and drain out the air until there is no bubble in fuel.



Lubricant inlet:

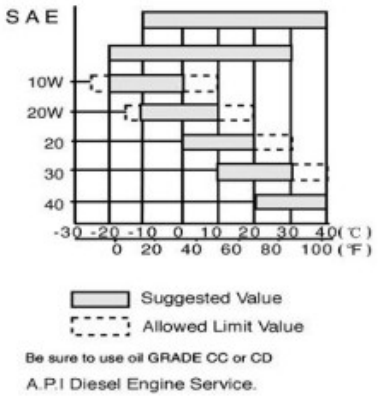
Set the engine on plane ground and then fill lubricant into the inlet. When checking oil level, put the oil scale into the inlet lightly.



Do not turn the oil scale.

Change	Operating period
First	First month or after 20 Hrs.
Second and later	Every 30 months or 1000 Hrs.

Model		C178F/C178FD
Capacity (Liter)		1.10
British Gal		(0.24)

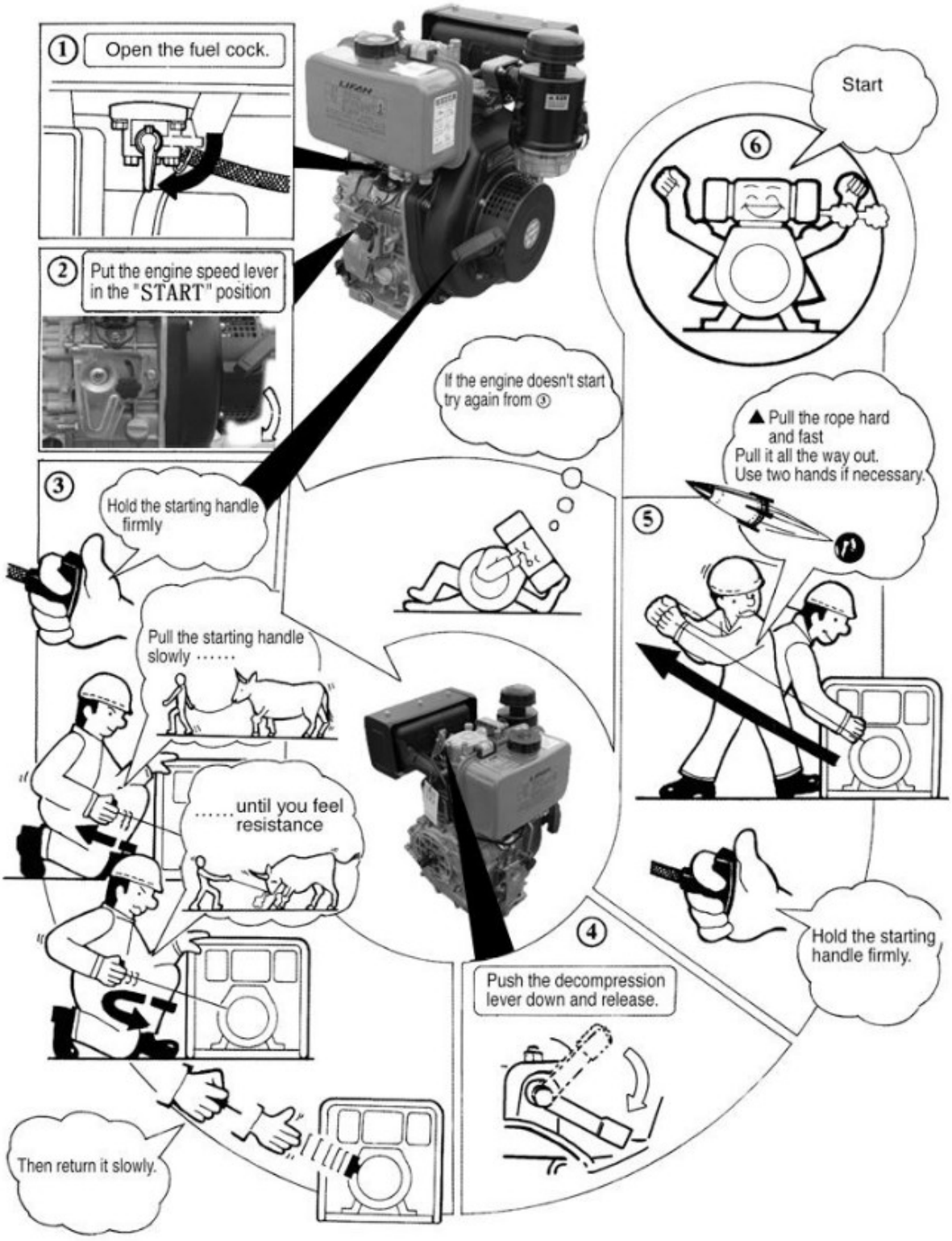


Be sure to use oil GRADE CC or CD
A.P.I Diesel Engine Service.

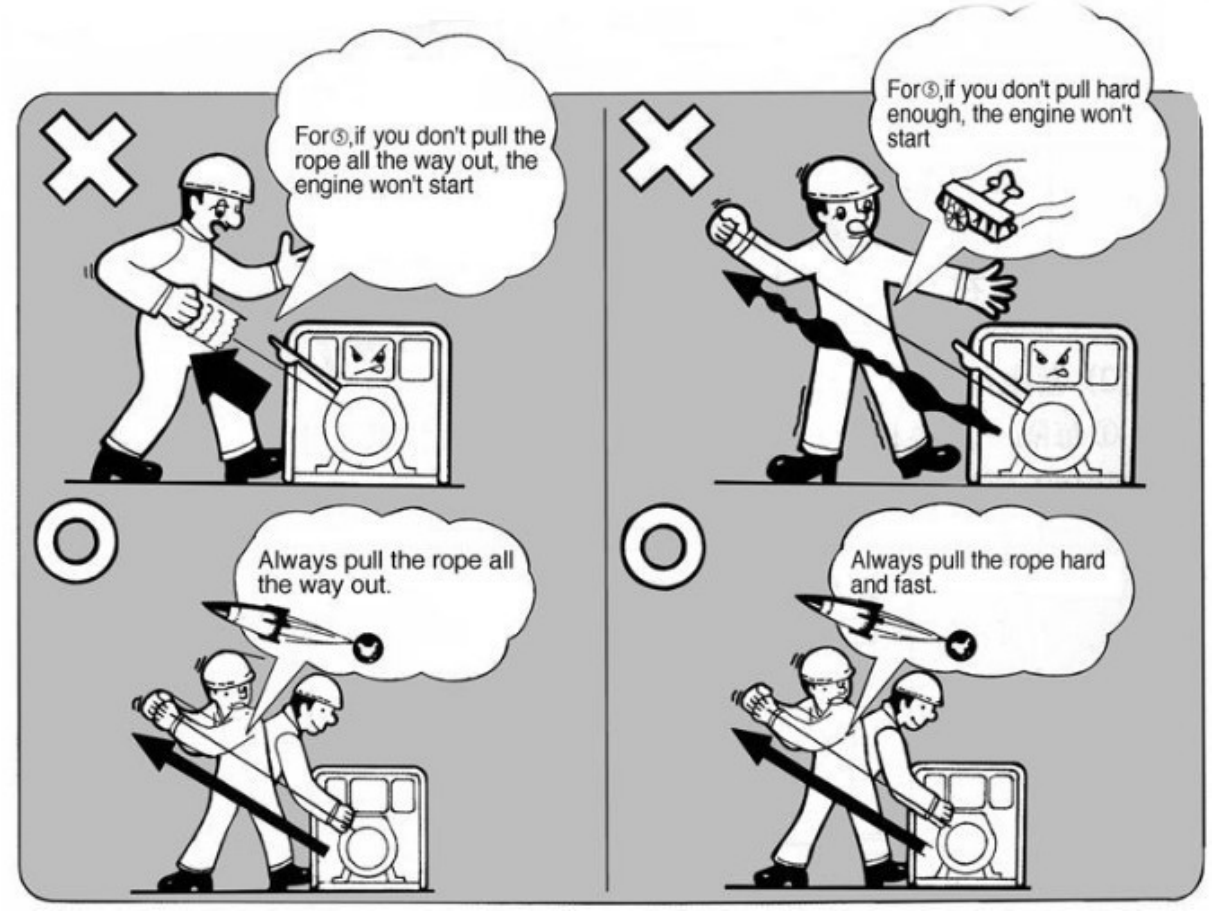
Avoid overload within the first 20 working hours. If it is overloaded, its life span will be shortened. Change the machine oil regularly. Please use SAE 15W40.

Starting the diesel engine

- Recoil start



NOTE: WHEN THE ENGINE IS RUNNING, DO NOT PULL THE RECOIL HANDLE OTHERWISE THE ENGINE MAY BE DAMAGED.

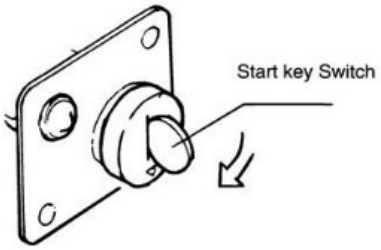


- Electronic starting

Start

The preparation of motor-driven start type is identical to the manual type (recoil type):

- Open the fuel cock.
- Set the speed governor lever at “start” position.
- Turn on the start switch toward clockwise to “start” position.
- If the engine is started, take your hand away from key switch immediately.

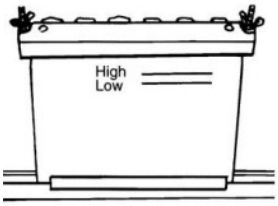


- If the engine does not start after 10 s, wait for a while (about 15 s) then start again.

**If the run time of motor is too long,
the voltage of accumulator will drop,
and the motor may be damaged.
Keep key switch at “ON” position
when the engine is running.**

Accumulator (options)

Check the liquid level in accumulator every month, if the level is lower than the low limit mark, refill distilled water up to the upper limit mark.



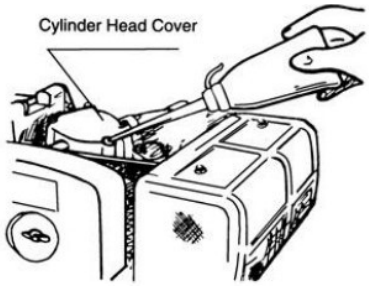
If the liquid in the accumulator is not enough, the electric motor will not run for too little electric current; so keep the liquid level between the upper and lower limit marks. The liquid will splash on near parts (which will be spoiled) if there is too much liquid in the accumulator.

Note:
With lead-gel batteries,
NO liquid needs to be added!

Aided start

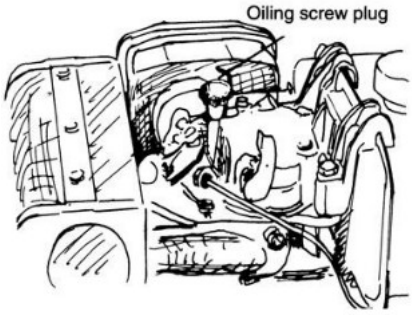
If the engine is difficult to start in winter, take off the rubber seal plug and then fill 2 cc machine oil into the hole.

CAUTION: Engine supplied to torrid zones will not have the rubber plug attached (a solid plug is present only).



WARNING:
Do not use volatile liquid as fuel, such as gasoline etc., and do not take away the air cleaner for easy start of the engine, if you do so, it may cause explosion.

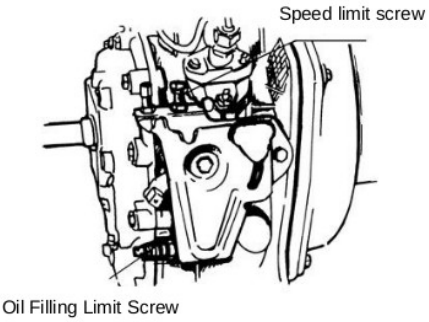
Do not pull out the plug unless filling oil. If plug is not at its correct position, rain, dust or other impurity may be sucked into the engine to cause serious failure or to damage engine parts.



Running and stopping the diesel engine

Running the engine

- Preheat the machine for three minutes at no load.
- Set the speed governor lever of the engine at required speed position. Use the speed governor lever to control the engine speed. Do not loosen or readjust the speed limit screw or the oil-filling limit screw, otherwise the performance of the machine may be changed.



Checks while running the machine

- Is there any abnormal sound or vibration?
- Is the engines combustion bad or is the engine over-speeding?
- What is the colour of the exhaust gas? Is it black as usual or too white?

If any of above phenomena is detected,
stop the engine immediately and
contact our local dealer.

Stopping the engine

1. At first set the speed governor lever at low speed position before stopping the engine, and the run the engine at no-load for three minutes.

2. Set the speed governor lever at the “stop” position. Decrease the load gradually when stopping the engine. Sudden stop of the engine will cause an abnormal temperature rise. Do not stop the engine with the decompression lever.
3. Set the fuel cock at “S” (stop position).
4. If the engine possesses a motor type starter, turn the start key switch to the “off” position.
5. Pull out the recoil handle slowly until the pressure is felt by your hand (that means at the point of compression stroke, where the intake and exhaust valves are closed), then let the handle back to its natural position so that it can prevent rust when the engine is not used.

NOTE: Only after stopping the engine you can pull the recoil handle, otherwise the engine may be damaged.

Technical maintenance

Daily

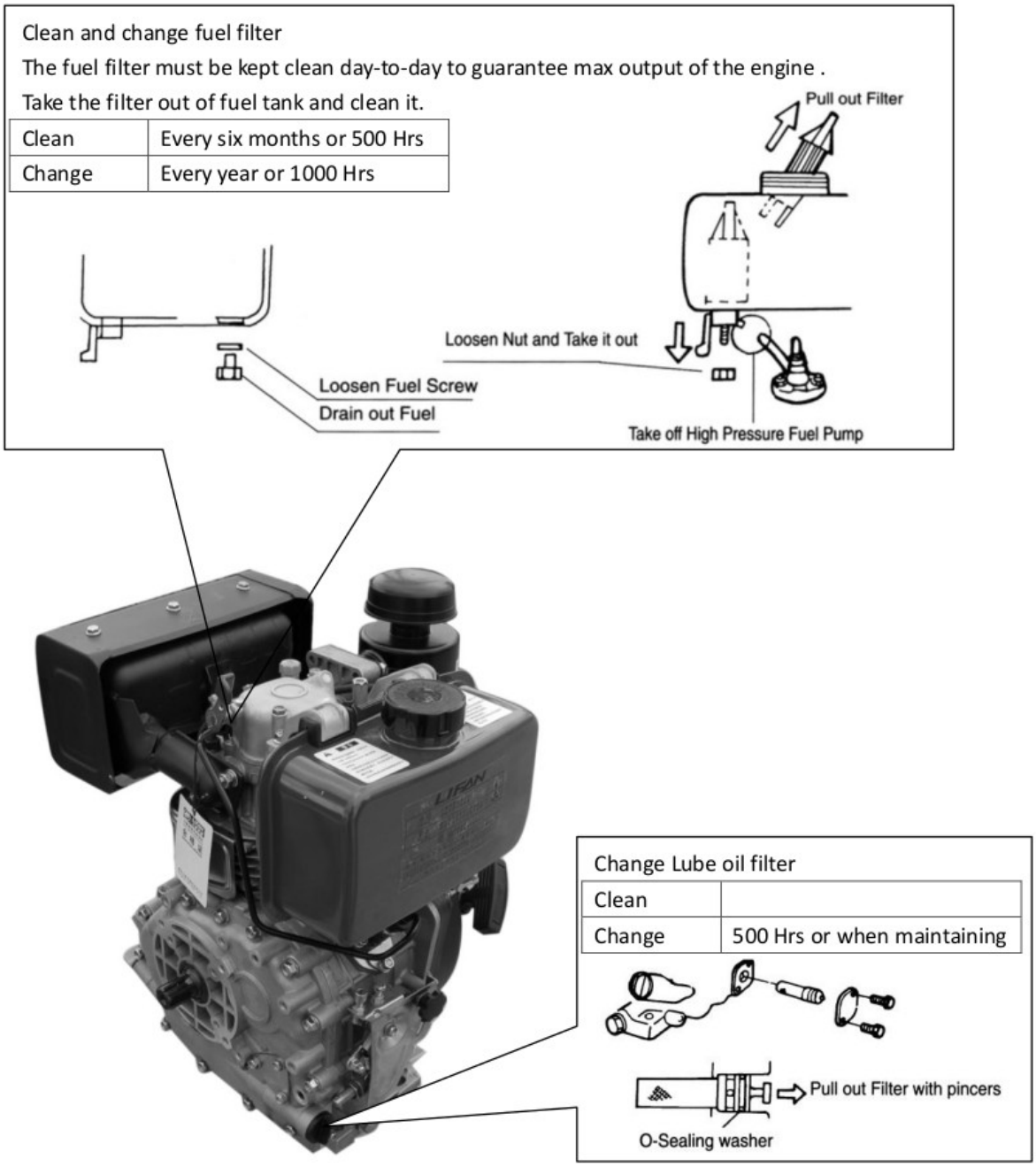
Check the machine oil level to know whether it is between the upper and lower limit. Check whether there is an oil leakage phenomenon. Clean up the dirt, the greasy dust on the diesel engine and its appendage, and keep the engine clean. Remove malfunction detected during this work.

Regularly

Regular check and maintenance are very important for normal operation and durability of engine. The following table indicates what is necessary and when to check the engine. Marks show special tool or technique is needed for maintenance. Please contact local dealer.

Time	Daily	Monthly or every 20 hours	Every 3 months or 100 hours	Every 6 months or 500 hours	Every year or 1000 hours
Check and tighten nut and screw	x				
Check and fill machine oil	x				
Change machine oil		x (1st time)	x (2nd time and later)		
Clean and change oil filter				x	x (change)
Check for oil-leakage	x				
Change the core of air filter		Cycle of check and maintenance will be shortened at a dusty place.		x	
Clean fuel tank	Every month				
Clean or change fuel filter				x (cleaning)	x (change)
Check nozzle				x	
Check injection pump				x	
Check pipeline of fuel				x (change if necessary)	
Adjust valve clearance of inlet and exhaust		x (1st time)		X	

Grind valve holder of inlet and exhaust					x
Change piston ring					x
Check accumulator liquid	Every month				
Clean the core of air filter		x (Clean every month or 50 hours)			



Change the core of the air filter: change it every 6 months or 500 hours (earlier if necessary).

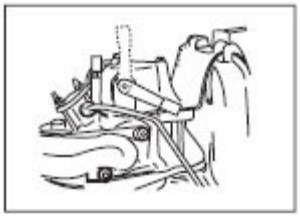
NOTE: Do not use detergent to clean the filter core.
Use a soft brush instead.

The core of filter obstruction means that the air in combustion chamber will decrease, and the output of engine decreases, and consumption of fuel and lubricant increases. It is also difficult to start the engine. Clean the core of filter regularly.

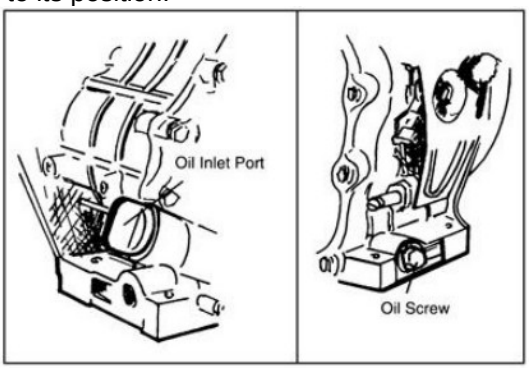
Storage for longer periods

Please follow these steps if you want to store the engine for a longer period:

1. Run the machine for three minutes and then stop the machine.
2. Drain away the lubricant before the engine becomes cool and refill new machine oil.



3. Disassemble the rubber plug on the cover of rocker shaft and then fill about 2 cc lubricant into it and return the plug to its position.



4. **RECOIL-START TYPE:** Push down and keep the decompression lever at the non-compression point and then pull the recoil starter two or three times.
   FOR MOTOR-DRIVEN START: Keep the decompression lever at non-compression point and let the engine rotate for two or three seconds with the start key switch on “start” position (do not run the engine).
5. Pull up the decompression lever and pull out recoil starter slowly until the resistance is felt by your hand (i. e. at the point of compression stroke, where the intake and exhaust valves are closed, which can prevent engine from rust).
6. Clean out machine oil and dirt from the engine, and to put the engine at a dry place.

Troubleshooting

Engine does not start

CAUSE	SOLUTION
Cold weather, machine oil becomes more adhesive	Fill machine oil into crankshaft case after preheated. Fill machine oil into inlet manifold. Disassemble the connection belt of matching machine and then start the diesel engine. Stop the engine when the engine becomes hot and reassemble the belt. Start the engine again.
Fuel system malfunction; fuel mixed with water	Clean fuel tank filter and fuel pipe, change fuel.
Fuel viscous or too thin	Use the specific fuel.
Air inside fuel system	Drain out the air and tighten each connector of fuel pipe.
Combustion not complete	The spray nozzle is not good, delivery angle is not correct, gasket of cylinder head is leaky and the pressure of compression is not enough. Fix the cause.
Diesel fuel delivery interrupted	Diesel fuel is too little in the fuel tank. Fill the fuel into the fuel tank. If the fuel pipe and fuel are obstructed or leaky, remedy them.
Not enough compression pressure in the cylinder; cylinder head nut not tighten, or gasket of cylinder damaged or leaky	Tighten the nut of cylinder head, according to diagonal line sequence and standard requirement, check gasket of cylinder, if changing the gasket, tighten the nut of cylinder head once again after pre-running the diesel engine.
Piston ring gap too big because of wear	Change the piston ring.
Each piston ring gap lines up, causing leakage	Set each piston gap at an angle of 120°.
Piston rings seriously stuck or even broken	Clean with diesel fuel or change rings.
Gas valve leakage	Grind the gas valves; if the vestige is too deep, please send it to the factory for remedy.
Valve stem clipped on guide pipe	Disassemble the gas valve and clean the stem and guide pipe.

Loss of power

CAUSE	SOLUTION
Malfunction of fuel system: Parts obstruction of fuel pipeline and fuel filter.	Check fuel switch, it must be opened fully. Clean fuel filter and fuel pipeline.
Fuel pumping not good	Maintain or change the damaged parts of the fuel pump.
Nozzle malfunction: incorrect injection pressure	Adjust the injection pressure.
Spray hole carbon deposit	Clean.
Needle valve adhered	Clean or change.
Too loose fitting between needle valve and needle valve body	Change.
Air filter obstructed	Disassemble to clean or change the core of filter.
Speed not high enough	Check the speed of diesel engine with tachometer. Adjust the adjust high speed limit screw.

Engine stops automatically

CAUSE	SOLUTION
Fuel system malfunction: no fuel.	Add fuel.
Fuel pipeline of filter obstructed	Maintain or clean.
Air in fuel system	Drain out the air.
Needle valve of nozzle adhered	Clean, grind the nozzle, or change it if necessary.
Air filter obstructed	Maintain or brush off.
Load increases suddenly	Decrease the load.

Exhaust of black smoke

CAUSE	SOLUTION
Overload	Decrease the load; if working machine is not properly matched, change it.
Fuel injection not good	Check the injection pressure and spray condition, and correct it, or change the nozzle if it is damaged.
Air not enough or leaky	Clean the air filter, check the cause of leakage and remedy.

Exhaust of blue smoke

CAUSE	SOLUTION
Machine oil in cylinder	Check the oil level, drain away the unnecessary machine oil.
Piston ring clipped or worn; insufficient springiness, or each gap of ring turns to same direction to make the machine oil go up	Check, change the piston ring, and cross each gap position.
Gap between piston and cylinder too big	Remedy or change.
Valve and guide worn	Change.

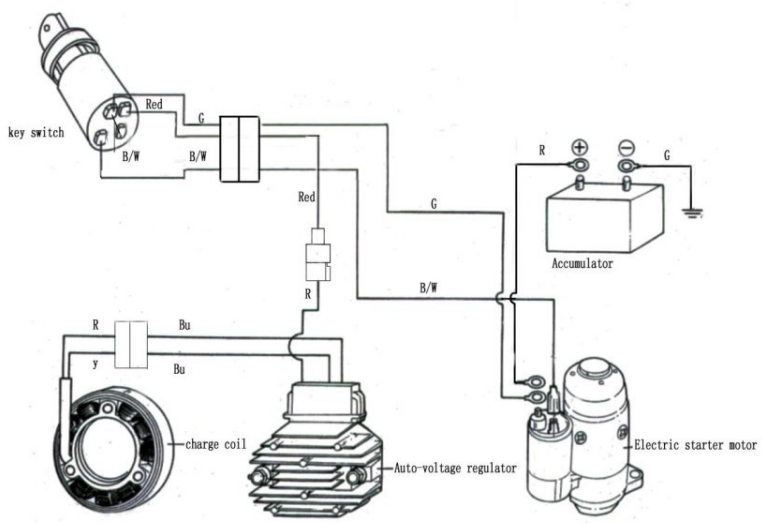
Exhaust of white smoke

CAUSE	SOLUTION
Water in diesel fuel	Clean the fuel tank and diesel filter, change diesel fuel.

Other possible problems

CAUSE	SOLUTION
Speed sometimes high, sometimes low	Check the speed governor system whether it is nimble, or whether there is air in the fuel pipeline.
Abnormal sound suddenly appearing	Check each motional part carefully.
Exhaust with black smoke suddenly	Check the fuel system, especially the nozzle.
Rhythmical metal knocking sound in the cylinder	The fuel delivery angle is too big; adjust it.

Wiring diagram



Disposal regulations

EU guidelines regarding the disposal of scrap electric appliances (WEEE, 2012/19/EU) were implemented in the law related to electrical and electronic equipment and appliances.

All WilTec electric devices that fall under the WEEE regulations are labelled with the crossed-out wheeled waste bin logo. This logo indicates that this electric equipment must not be disposed with the domestic waste.

The company WilTec Technik GmbH has been registrated in the German registry EAR under the WEEE-registration number DE45283704.

Disposal of used electrical and electronic appliances (intended for use in the countries of the European Union and other European countries with a separate collection system for these appliances).
The logo on the article or on its packaging points out that this article must not be treated as normal household waste but must be disposed to a recycling collection point for electronic and electrical waste equipment. By contributing to the correct disposal of this article you protect the environment and the health of your fellow men. Environment and health are threatened by inappropriate disposal.

Material recycling helps reduce the consumption of raw materials.

Additional information on recycling this article can be provided by your local community, municipal waste disposal facilities or the store where you purchased the article.

Address:
WilTec Wildanger Technik GmbH
Königsbenden 12 / 28
D-52249 Eschweiler

Important notice: