

# 单缸柴油发动机 尺寸: 142x210mm

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**KOOP**<sup>®</sup>

**DIESEL ENGINE**  
YOUR BEST POWER SOLUTION

## OPERATION INSTRUCTION AND PARTS LIST MANUAL

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This manual contains:  
IMPORTANT WARNINGS and INSTRUCTIONS  
READ AND RETAIN FOR REFERENCE.



**WARNING:**  
To reduce the risk of injury, the user must read and  
understand the operators manual before using this product.



SAVE THIS MANUAL FOR FUTURE REFERENCE

## INTRODUCTION

Thank you for purchasing products from our company.

- ★ Direct injection combustion chamber.
- ★ Recoil-type manual starter and optional electric starter.
- ★ Force air cooling system.
- ★ The 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're 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 rammer,shock rammer,marine engine,light-type transport vehicle,movable-type compressor,light-type generation set, car washing machine,tillage machinery etc.

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 engine run longer.

If you have any questions or suggestions about this manual, please contact us or dealer. User should pay attention to that with the improvement of our products the description in this manual may the differ from practical products.

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Please make sure to follow each precaution carefully.

## EXHAUST PRECAUTIONS



- Never inhale exhaust gas, it contains carbon monoxide, a colorless, odorless and extremely dangerous gas which can cause unconsciousness or death.
- Never operate the engine indoors or in a poorly ventilated area, such as a tunnel or cave, etc.
- Exercise extreme care when operating the engine near people or animals. Keep the exhaust pipe free of external objects.



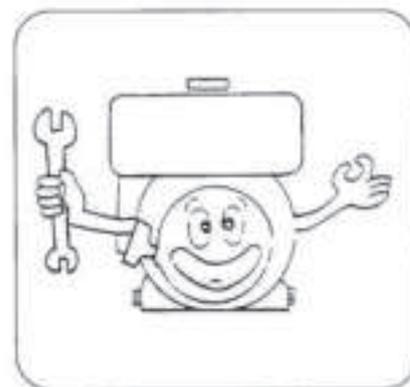
## REFUELING PRECAUTIONS

- Be sure to stop the engine prior to refueling.
- Do not overfill the fuel tank.
- If fuel is spilled, 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 around dry brush, twigs, cloths, 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.

## 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.
- Do not move the engine while it is in operation.
- If the engine will be transported over a long distance or on rough roads, drain fuel off from fuel tank to prevent fuel leakage.

## 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.

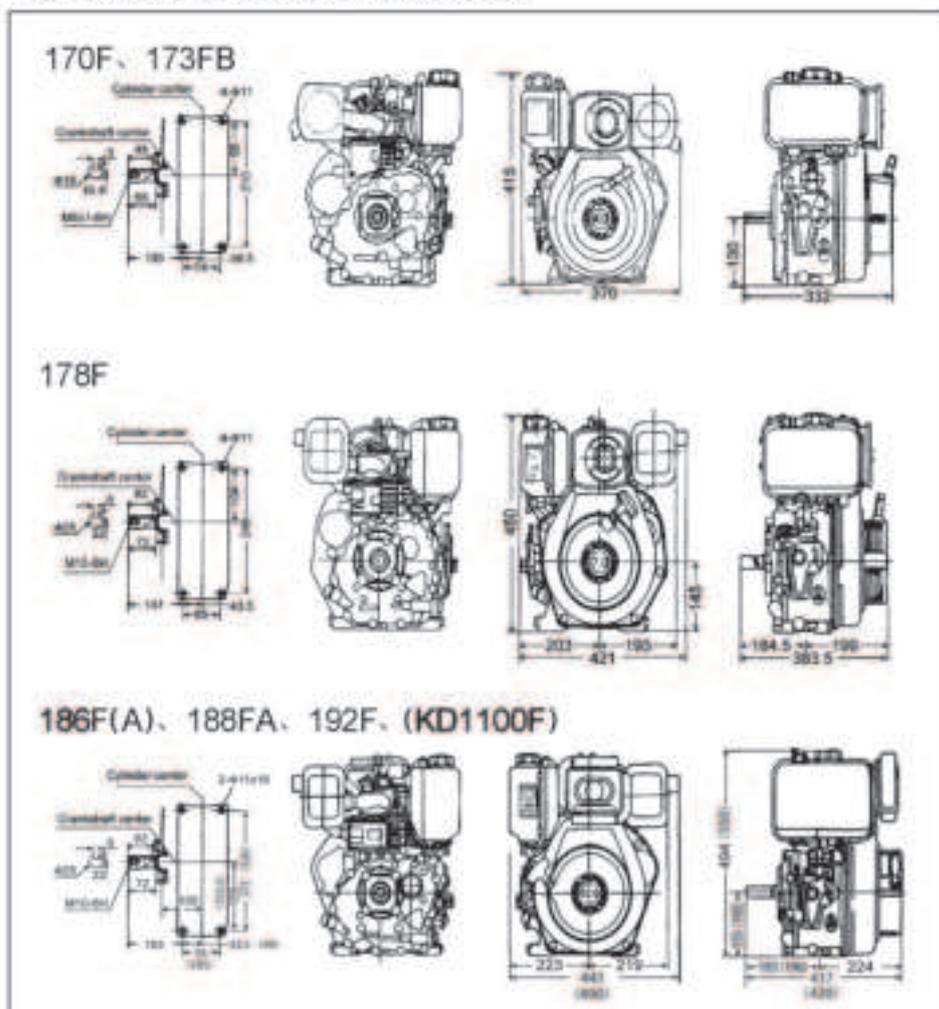
CHAPTER1 MAIN TECHNICAL SPECIFICATION AND DATA

1-1 Main Technical Specification

Item	Technical specification														
Model	170F	170FB		170F	160F	180FA		180FA		192F		1100F		1100F	
Type	Single-cylinder,vertical,4-stroke,air-cooled,direct injection														
Bore×stroke(mm)	70×55		75×59		78×62		84×78		86×72		88×75		92×75		100×85
Displacement(L)	0.211		0.247		0.296		0.406		0.418		0.456		0.499		0.607
Normal speed(r/min)	3000	3600	3000	3600	3000	3600	3000	3600	3000	3600	3000	3600	3000	3600	1500 (3000)
Normal power(kw/PS)	2.5/3.4	2.8/3.8	3.2/4.3	3.6/4.9	3.6/5	4/5.5	5.7/7.7	6.6/9	5.8/7.9	6.6/9	6.6/9	7.5/10.2	7.6/10.3	8.6/11.7	10.2
Mean speed of piston(m/s)	5.5	6.6	5.9	7.08	6.2	7.44	7.6	8.4	7.2	8.64	7.5	8.0	7.5	8.0	8.5
Mean effective pressure (KPa/kgf/cm <sup>2</sup> )	413.2 (4.32)	433.9 (4.4)	418 (4.26)	486 (4.96)	540.5 (5.52)	496.4 (5.07)	561.4 (5.73)	513.5 (5.25)	555 (5.66)	503 (5.13)	579 (5.91)	538 (5.49)	448 (4.57)	575 (5.87)	620
Consumption rate of fuel(g/kwh/gal/hp-h)	≤270 (21)	≤261 (20)	≤270 (21)	≤281 (22)	≤281 (22)	≤281 (22)	≤291 (23)	≤287 (23)	≤270 (21)	≤280 (22)	≤270 (21)	≤280 (22)	≤285 (23)	≤270 (21)	≤280 (22)
Consumption rate of engine oil(g/kwh/gal/hp-h)	≤4.08(3)						≤2.92(2.07)								
Fuel tank capacity(L)	2.5			3.5			5.5								
Lub Oil capacity	Filled(L)	0.75			1.1			1.65						2	
	Efficient(L)	0.25			0.4			0.6						0.72	
Rotary direction of crankshaft	Clockwise from flywheel end														
Cooling type	Forced air-cooled system														
Lub Type	Pressure, splash														
Starting type	Kick-start manual start and optional electric start														
Net weight(kg)	20			23			40						50		

## 1-2 Overall Dimension and Installation

### 1-2.1 Overall and installation dimensions



### 1-2.2 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 center position of 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.

The diameter of driving wheel(belt wheel)can be calculated asw follow:

$$\text{Diameter of engine driving wheel} = \frac{\text{Diameter of axle of wheel of working machine} \times \text{speed of working machine}}{\text{Diesel speed}}$$

(5) Be sure that belt is tightened properly.

If the belt is fixed too tight,the engine will be overloaded 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.

### 1-2.3 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 table 1-1

Note:The meaning of L is shown in figure above.Please contact us or dealer if you have any questions.

Model		170F	178F	186F(A) 188FA 192F 1100F
		173FB		
Belt	Type	A	B	B
	Qty.	2	2	2
Min.diameter of pulley		68	97	135
L		< 80mm	< 70mm	

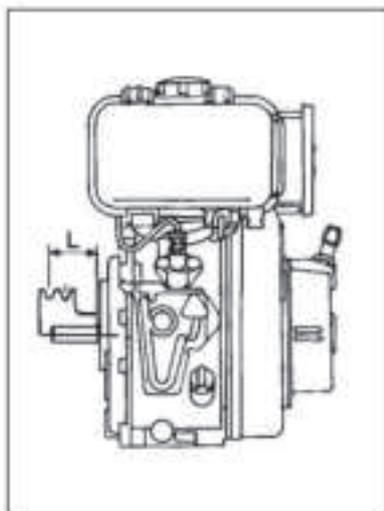


Table 1-1

1-2.4 Crank shaft(Original type) driving angle must be less than  $120^{\circ}$ ,see Fig.1-1

1-2.5 Tilt

The tilt must be kept within the allowed value shown in Fig.1-2

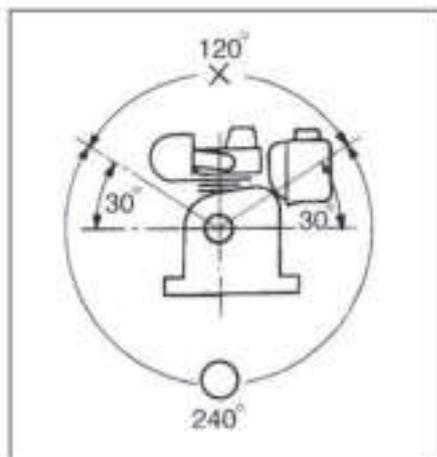


Fig 1-1

Output Shaft Tilt		
Allowed Tilt (Continuous running)	$\leq 20^{\circ}$	
Engine Tilt		
Allowed Tilt (Continuous running)	$\leq 20^{\circ}$	

Fig 1-2

1-2.6 Please contact out dealer about electric circuit

We recommend to use accumulators(Rated 20 hours)shown in table 1-2.

Table 1-2	unit:AH
170F- 173FB	18 ~ 24
178F	24 ~ 36
186F(A).188FA. 192F. 1100F	36 ~ 45

1-3 Connecting Sizes.

1-3.1 Sizes of output shaft

MODEL	Keyway shaft	Thread shaft	Taper shaft
170F, 173FB	<p>170FA-3/16" -20X7-6H 170FB-M8 x 1-24X7-6H</p>		
178F	<p>178FA-7/16" -20X7-6H 178FB-M10 x 1.25-20X7-6H</p>		
186F(A), 188FA, 192F, 1100F	<p>186FA-7/16" -20X7-6H 186FB-M10 x 1.25-20X7-6H</p>		

1-3.2 Sizes of PTO flanges

PTO Flanges		
170F, 173FB	178F	186F(A), 188FA, 192F, 1100F

1-4 Names of Diesel Engine Parts



## 1-5 Valve Open and Close Phase, Initial Angle of Fuel Delivery and Valve Clearance.

## 1-5.1 Valve open and close phase(see table 1-3)

Table 1-3

unit:CA

ITEM \ MODEL	PHASE		
	170F. 173FB	178F	186F(A).188FA.192F.1100F
Intake valve open	BTDC18° 30'	BTDC18°	BTDC13°
Intake valve close	ATDC45° 30'	ATDC46°	ATDC52°
Exhaust valve open	BBDC55° 30'	BBDC52°	BBDC57°
Exhaust valve close	ABDC8° 30'	ABDC12°	ABDC8.5°

## 1-5.2 Initial angle of fuel delivery

Table 1-4

unit:CA

170F. 173FB	178F	186F(A).188FA.192F.1100F
19° ± 1°		22° ± 1°

## 1-5.3 Valve clearance

Table 1-5

unit:mm

Description \ Model	170F. 173FB	178F	186F(A).188FA.192F.1100F
Intake valve	0.10~0.15(Cold state)		
Exhaust valve	0.10~0.15(Cold state)		

## 1-6 Range of temperature, smoke and pressure

Table 1-6

Description \ Model	170F. 173FB	178F	186F(A).188FA.192F.1100F
Exhaust temperature(°C)	≤ 550		
Machine oil temperature(°C)	≤ 120		
Smoke(Bosch)	≤ 4		
Pressure of injection Mpa(kg/cm <sup>2</sup> )	20.5 ± 0.49(200 ± 5)		

## 1-7 Torque for Tighten Up Main Screw Bolt and Nut

Table 1-7

unit:N · m

Description	Model	170F, 173FB	178F	188F(A), 189F(A), 192F	Note	1100F
Connecting rod nut		25 ~ 30		40 ~ 45	Retighten up after test period	53~56
Cylinder head nut		35 ~ 40	42 ~ 43	55 ~ 60		90~92
Flywheel nut		130 ~ 140		160 ~ 170		200~210
Nozzle retainer nut		10 ~ 12				10 ~ 12
Tighten bolt of rocker support		25 ~ 30				25 ~ 30
Standard M8 bolt		20 ~ 30				20 ~ 30
Standard M6 bolt		15 ~ 20				15 ~ 20

## CHAPTER2 OPERATION OF DIESEL ENGINE

## 2-1 Attention for Safe Operation.

2-1.1 The fuel must be filtered by silk fabric or setted for 24 hours before used.

Do not add oil into fuel tank or crank shaft case when the engine is running.

2-1.2 Burnable and explosive goods should not exist around the engine, and the place for installation should be plain and ventilative.

2-1.3 Do not touch muffler with your hand when the engine is running or just after it has stopped.

2-1.4 The diesel engine must be run under rated power and rated speed. If you detect abnormal phenomenon, stop the engine immediately to check and remedy.

2-1.5 New engine or newly maintained one must be run at low speed and low load at first 20 hours. Do not allow to run it at high speed and full load.

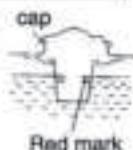
## 2-2 Choice of Fuel, Lubricant and Preparation Before Start.

## Choice of fuel:

Only use light diesel fuel for diesel engine. (No.0 in Summer No.-10 or No.-20 in winter.) Do not allow dust or water in the fuel and fuel tank.

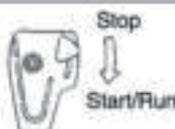
Model	170F 173FB	178F	180F(A) 180F(B)
Capacity Liter	2.5	3.5	5.5
British Gal	(0.55)	(0.77)	(1.21)

Caution: Do not let fuel level be higher than Red Mark



## Core of air filter:

Do not wash the core of air filter, because this part is dry type. When power of engine is not good or the color of exhaust is abnormal, change the core. Do not operate the engine without the core of filter.



**Oiling screw plug:**

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 decompression lever down to start the machine

The fuel oil and machine oil in the engine were drained away before ex-factory. 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

Filter



Oil Filter Cap

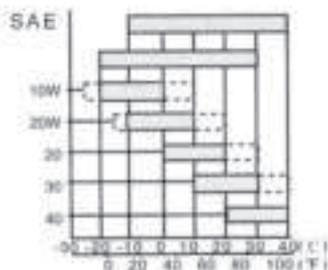
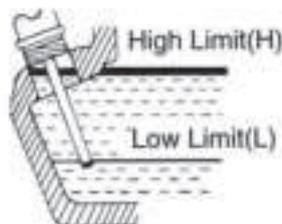
Fuel/Cock lever  
Stop



Start/Run

**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



— Suggested Value  
- - - Allowed Limit Value

Be sure to use SAE 10W30, API grade CD or higher.

Model	170F	178F	186F(A) 188FA 192F	1100F
Capacity	0.75	1.1	1.65	2
Litre (British Gal)	(0.16)	(0.24)	(0.36)	(0.43)

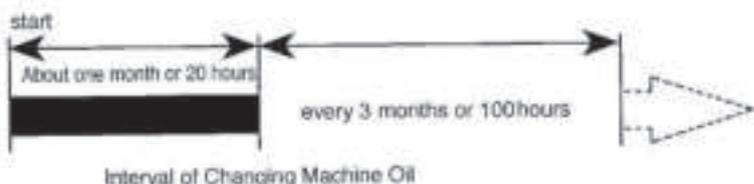
If your engine is still a newer one, its life would be shortened for over-load. At first 20 hours the engine must be started and stopped according to test run method.

**Avoid over-load:**

Avoid over load during test run.

**Change machine oil regularly:**

Change machine oil once every twentyhours or at the end of first month at primary running time and then once every three months or 100hours.

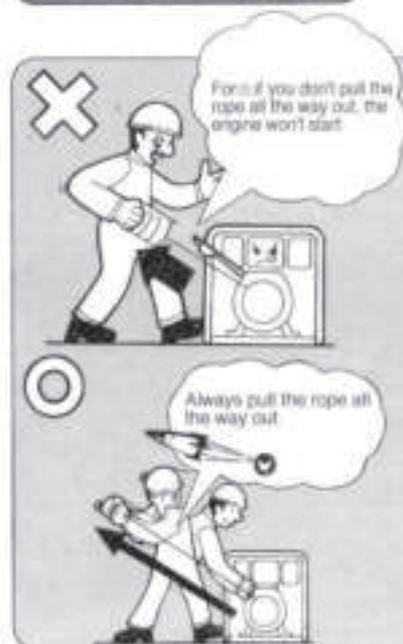


## 2-3 Start of the Diesel Engine

### 2-3.1 Recoil start

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



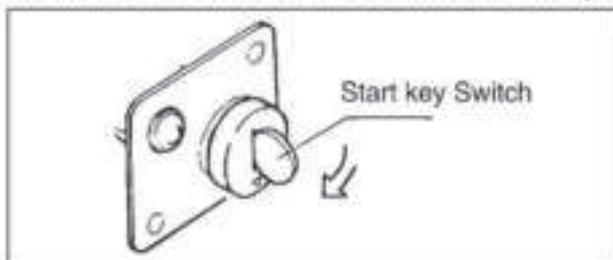


### 2-3.2 Motor-driven type start

#### (1)start

The preparation of motor-driven start type is same as manual type(Recoil type).

- ① Open the fuel cock.
- ② Set the speed governor lever at "start"position.
- ③ Turn on the start switch toward clockwise to "start"position.



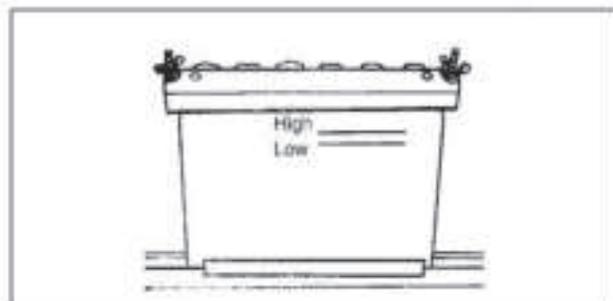
- ④ If the engine is started,take your hand away from key switch immediately.
- ⑤ If the engine do not start after 10 seconds,wait for a while(about 15 seconds) then start again.

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

#### (2)Accumulator

- ① 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 upper and low limit marks.

The liquid will splash on near parts (which will be spoiled) if it is too much in the accumulator.

### **2-3.3 Aided start**

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

**Notice:**

Engine supplied to the torrid zone will not attach the rubber plug. (a solid plug is presented only)

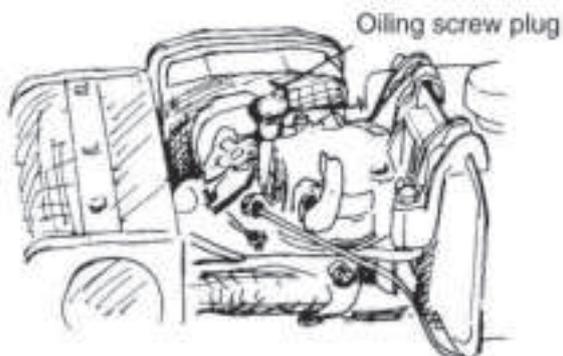
Cylinder Head Cover



**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.



## 2-4 Run and Stop of the Diesel Engine

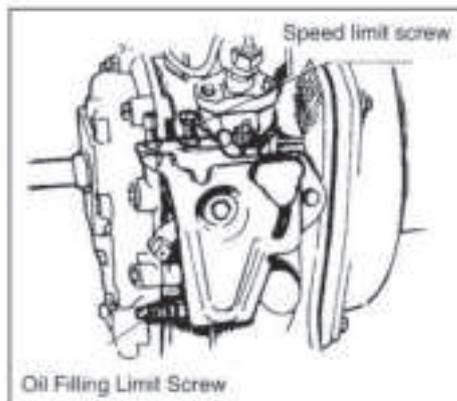
### 2-4.1 Run of the engine

(1)Preheat the machine for three minutes at no load.

(2)Set the Speed governor lever of the engine at required speed position.

Use the speed governor lever to control the speed of engine.

Do not loosen or readjust the limit screw of speed or oil-filling limit screw, otherwise the performance of the machine may be changed



### 2-4.2 Check,when ther machine is running

(1)Whether there is abnormal sound and vibration?

(2)Whether combustion is not good or overspeed?

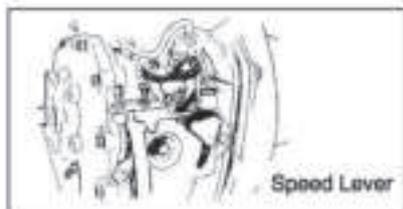
(3)Whether the color of exhaust gas is normal(black or too white)?

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

### 2-4.3 stop of the engine

(1)At first set the speed governor lever at low speed position before stopping the

engine,and then run the engine at no-load for three minutes.

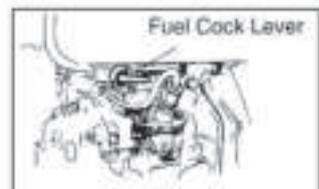


(2)Set the speed governor lever at"stop"position

Decrease the load gradually when stopping the engine.Sudden stop of engine will cause abnormal increasement of temperature.

Do not stop engine with decompression lever

(3)Set the fuel cock at"S"(stop position)



(4)If the engine possesses motor type starter,turn the start key switch to "OFF"position.

(5)Pull out the recoil handle slowly until pressure is felt by your hand(that means at the point of compression stroke,where the intake and exhaust valves are closed)and then let the handle back to its natural position so that it can prevent rust when the engine is not used.

**Note:Only when stopping the engine can you poull the recoil handle,otherwise the engine may be damaged.**

## CHAPTER3 TECHNICAL MAINTENANCE OF DIESEL ENGINE

## 3-1 Daily Check and Maintenance

Check oil level of machine oil whether it is between upper and low limit.

Check whether there is oil leakage phenomenon.

Clean up the dirt, greasy dust on the diesel engine and its appendage and keep the engine clean.

Remove malfunction detected during operation.

## 3-2 Regular Check and Maintenance

Regular check and maintenance are very important for normal operation and durability of the 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.

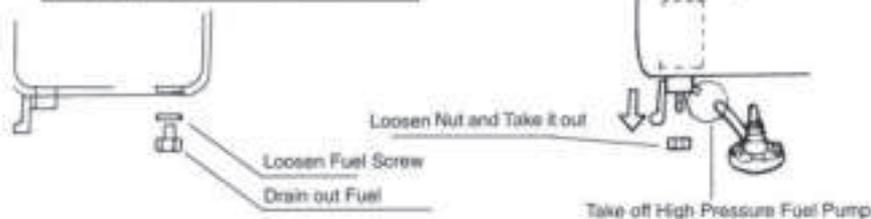
Item \ Time	Daily	After 20 hours or 1 month	100 Hours or Every 3 month	500 Hours or Every 6 month	1000 Hours or Every year
Check and tighten the nut and screw	○				
Check and fill machine oil	○				
Change machine oil		○ (First time)	○ (Second time and later)		
Clean and change oil filter				○	● (Change)
Check oil-leakage	○				
Change the core of air filter		Cycle of check and maintenance will be shortened at dusty place		○	
Clean fuel tank	Every month				
Clean or change fuel filter				○ (Clean)	○ (Change)
Check nozzle				●	
Check injection pump				●	
Check pipeline of fuel				○ (Change if necessary)	
Adjust valve clearance of inlet and exhaust		● (First time)		●	
Grind valve holder of inlet and exhaust					●
Change piston ring					●
Check accumulator liquid	each month				
Clean the core of air filter		○ (Clean) every month or 20 hours			

### Clean and change fuel filter

The fuel filter must be kept clean day-to-day to guarantee max output of the engine

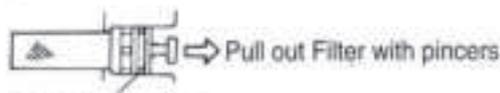
Take the filter out of fuel tank and clean it

Clean	Every six months or 500-hours
Change	Every year or 1000 hours



### Change Lube oil filter

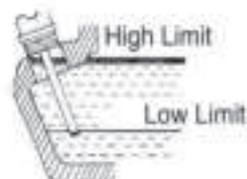
Clean	250 Hours
Change	500 Hours or when maintaining



O-Sealing washer

	170F L73F8	178F	180FA 182FA, 182F	KD1100F
Capacity(Liter)	0.75	1.10	1.65	2

Change	Operating period
First	First month or after 20 hours
Second and Later	Every 3 months or 100 hours



### Change the core of air filter



Change

Every 6 months or 500 hours  
(earlier if necessary)

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

The core of filter obstruction means that the air in combustion chamber will decrease, and then 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.

### 3-3 Storage for a Long Period

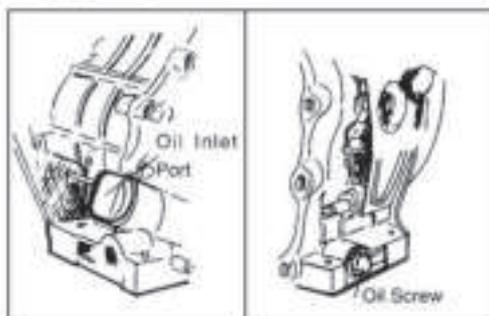
Please do as follow if store the engine for a long period.

(1) Run the machine for three minutes and then stop the machine.

(2) Drain away the lubricant before the engine becomes cool and then refill new machine oil



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



### (4) Recoil type start

Push down and keep the decompression lever at the non-compression point and then pull the recoil starter two or three times.

### Motor-driven type 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 (that is 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.

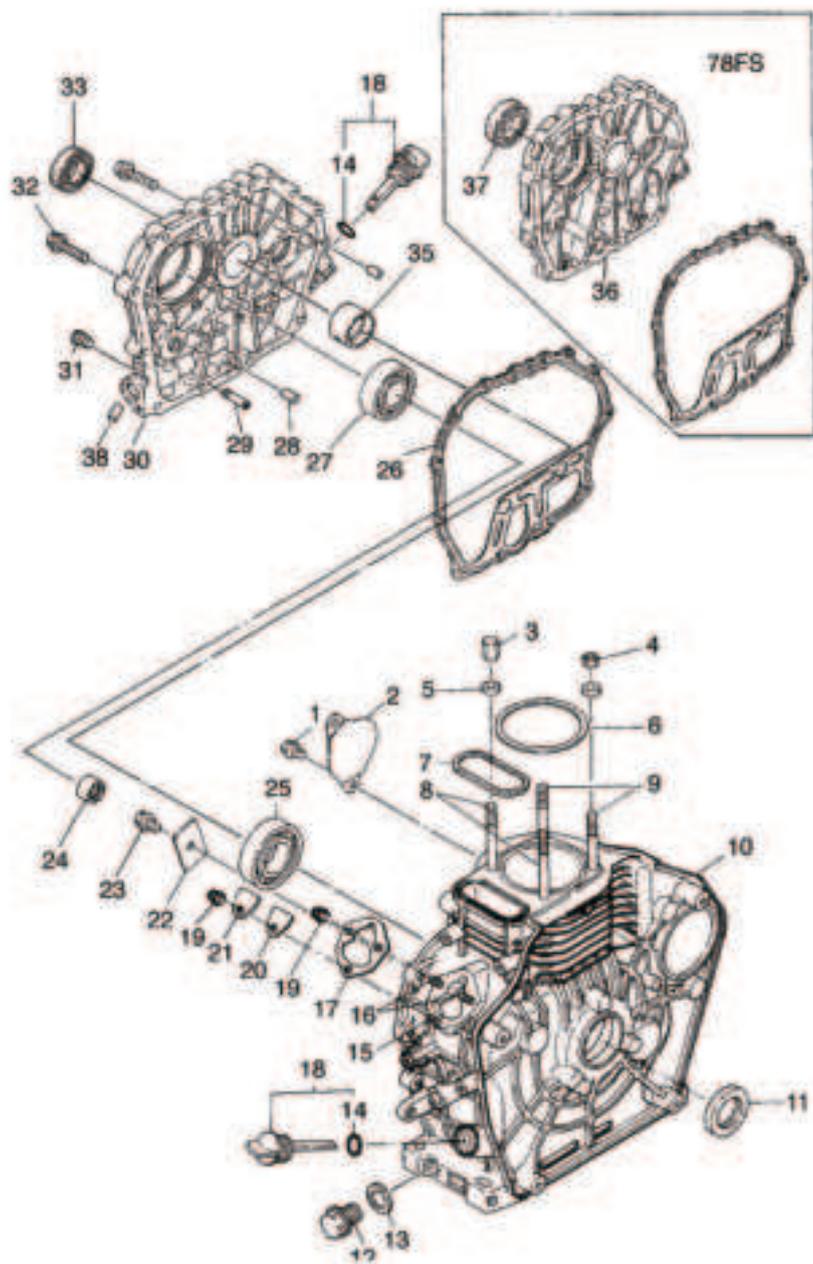
## CHAPTER4 PARTS LIST OF DIESEL ENGINE

No.	Code	Name of part	Unit	Qty each set
1	1710626	Bolt M10*20(GB5787-86)	Piece	2
2	17138	Cover of starting notor hole	Piece	2
3	70-1704901	Nut of cylinder head(long)	Piece	2
	78-1704902		Piece	2
	86-1704903		Piece	2
	KD192F-01004		Piece	2
4	70-1705001	Nut of cylinder head(short)	Piece	2
	78-1705002		Piece	2
	86-1705003		Piece	2
	KD192F-01003		Piece	2
5	70-1704801	Gasket of nut of cylinder head	Piece	4
	78-1704802		Piece	4
	86-1704803		Piece	4
	KD192F-01005		Piece	4
6	70-1719504	Gasket of cylinder head(0.4)	Piece	1
	78-1719704		Piece	1
	86-1706314		Piece	1
	KD192F-01007		Piece	1
	KD1100F-01002		Piece	1
7	70/78-17182	rectangle ring 5.1*2.5	Piece	1
	86-1720106	rectangle ring 5.1*2.5	Piece	1
8	70-1700201	Bolt of cylinder head(long)	Piece	2
	78-1700202		Piece	2
	86-1700203		Piece	2
	KD192F-01002		Piece	2
	KD1100F-01005		Piece	2
9	70-1700301	Bolt of cylinder head(short)	Piece	2
	78-1700302		Piece	2
	86-1700303		Piece	2
	KD192F-01001		Piece	2
	KD1100F-01006		Piece	2
10	70-1700107	Cylinder block	Piece	1
	78-1700103		Piece	1
	86-1700110		Piece	1
	KD192F-01100		Piece	1
	KD1100F-01100		Piece	1
11	70-1711702	Rad oil sealing30 × 45 × 8	Piece	1
	78-1711702	Rad oil sealing30 × 45 × 8	Piece	1
	86-1711704	Rad oil sealing35 × 50 × 8	Piece	1
12	17121	Cock of oil drining	Piece	1
13	17120	Gasket of cock of oil draining	Piece	1
14	1711324	"O" type ring24 × 2.4	Piece	2
15	17123	Fastening bolt of fuel injection pump(short)	Piece	1
16	17122	Fastening bolt of fuel injection pump(long)	Piece	2
	KD192F-01009		Piece	2
17	1719605	Adjusting gasket of fuel injector(0.5)	Piece	1
	KD1100F-01004		Piece	1
18	70-1702001	Dipstick of lubricating oil	Piece	2
	78/86-1702002		Piece	2

## CHAPTER4 PARTS LIST OF DIESEL ENGINE

No.	Code	Name of part	Unit	Qty each set
19	1710103	Nut M6	Piece	3
20	17159	Gasket of sealing plate	Piece	1
21	17158	Sealing plate	Piece	1
22	17195	Thrust piece	Piece	1
23	1710636	Bolt with flange face M8 × 14(GB5789-86)	Piece	1
24	1710010	Needle bearing 7941/15	Piece	1
25	70-1710006	Ball bearing 306(GB/T276-94)	Piece	1
	78-1710007	Ball bearing 307(GB/T276-94)	Piece	1
	86-1710008	Ball bearing 308(GB/T276-94)	Piece	1
26	70-1704601	Gasket of crankcase cover	Piece	1
	78-1704602		Piece	1
	86-1704603		Piece	1
	KD1100F-01003		Piece	1
27	70-1710002	Bearing 205(GB/T276-94)	Piece	1
	78-1710003	Bearing 206(GB/T276-94)	Piece	1
	86-1710004	Bearing 207(GB/T276-94)	Piece	1
28	1711111	retaining pin 8 × 12(GB119-86)	Piece	2
29	78/86-17080	Fuel pipe	Piece	1
30	70-1701901	Crankcase cover	Piece	1
	78-1701902		Piece	1
	86-1701904		Piece	1
	KD192F-01011		Piece	1
	KD1100F-01001		Piece	1
31	17133	Inner hexagon plug G1/8"	Piece	1
32	70-1710083	Anti-loosing bolt M6 × 33.5	Piece	14
	70-1711062	Anti-loosing bolt M6 × 25	Piece	15
	78-1710083	Anti-loosing bolt M8 × 33.5	Piece	16
	86-1710083	Anti-loosing bolt M8 × 33.5	Piece	1
33	70-1711701	Front oil sealing 25 × 42 × 10	Piece	1
	77-1711703	Front oil sealing 30 × 45 × 10	Piece	1
	86-1711705	Front oil sealing 35 × 50 × 10	Piece	1
35	70-1701801	Main bush	Piece	1
	78-1701802		Piece	1
	86-1701803		Piece	1
36	78-1701903	FS crankcase cover	Piece	1
37	78-1711703	FS front oil sealing	Piece	8
38	70-1711602	Al plug $\phi 8 \times 8$	Piece	2
	78/86-711602		Piece	3

Note:the part of cylinder block include 1,2,8,9,10,12,13,14,15,16,18 and 24.  
The parts of crankcase cover include 14,18,27,28,29,30,31,35and38.



## Cylinder head cover and cylinder head assembly

No.	Code	Name of part	Unit	Qty each set
1	70/78-1710755	Bolt with flange face M6 × 55(GB5789-86)	Piece	2
	86-1710730	Bolt with flange face M6 × 70(GB5789-86)	Piece	2
2	17142	Oiling screw plug	Piece	1
3	17139	Part of decompression shaft	Piece	1
4	1711310	"O" ring 10 × 1.9(GB1235-76)	Piece	1
5	17140	Decompression spring	Piece	1
6	1711103	Retaining pin 3 × 16(GB119-86)	Piece	1
7	70/78-17066	Cylinder head cover	Piece	1
	86-1706603		Piece	1
	KD192F-03000		Piece	1
	KD1100F-03000		Piece	1
8	70/78-17170	Gasket of cylinder head cover	Piece	1
	86-1717001		Piece	1
	KD192F-02012		Piece	1
	KD1100F-02012		Piece	1
9	70/78-17168	Rocker arm	Piece	1
	86-1716801		Piece	1
	KD1100F-02100		Piece	1
9A	17165	Adjusting screw of valve gap	Piece	2
10	70/78-1710745	Fastened bolt of rocker arm shaft	Piece	1
	86-1716901		Piece	1
11	70-1705201	Valve adjusting packing	Piece	2
	78-1705202		Piece	2
	86-1705203		Piece	2
12	70-1702701	Valve clip	Piece	2
	78-1702702		Piece	4
	86-1702703		Piece	4
	KD1100F-02004		Piece	4
13	70-1702801	Valve spring seat	Piece	4
	78-1702802		Piece	2
	86-1702803		Piece	2
	KD1100F-02005		Piece	2
14	70-1702901	Valve spring	Piece	2
	78-1702902		Piece	2
	86-1702903		Piece	2
15	70-1702003	Oil seal of valve guide	Piece	2
	78-1702004		Piece	2
	86-1702100		Piece	2
16	70/78-17136	Spring washer of valve	Piece	2
	86-1713601		Piece	2
	KD1100F-02006		Piece	2
17	1711104	Pin4 × 8(GB119-86)	Piece	1
18	1710920	Double ends stud AM8 × 20(GB899-86)	Piece	2
	+KD192F-02006	Muffler blot	Piece	2

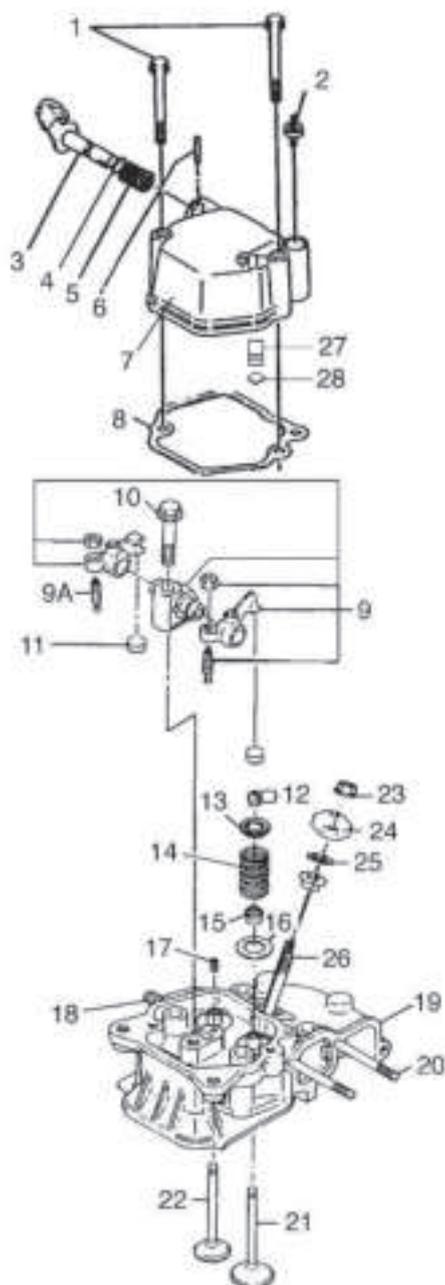
CHAPTER4 PARTS LIST OF DIESEL ENGINE

No.	Code	Name of part	Unit	Qty each set
19	70-1702403	<b>KD192F-02100</b>	Piece	1
	78-1702402	Mechanical process parts of cylinder head	Piece	1
	86-1702404		<b>KD1100F-02100</b>	Piece
20	70/78-1710955	Double ends bolt AM6 × 55(GB900-88)	Piece	2
	86-1710956	Double ends bolt AM6 × 75(GB900-88)	Piece	2
21	70-1702501	<b>KD192F-02101</b>	Piece	1
	78-1702601	Intake valve	Piece	1
	86-1702503	<b>KD1100F-02101</b>	Piece	1
22	70-1702502	Exhaust valve	Piece	1
	78-1702602		Piece	1
	86-1702605		Piece	1
23	1710103	Nut M6(GB6177-86)	Piece	2
24	1717302	Preaa plate of fuel injector	Piece	1
25	1724502	Adjusting gasket of fuel injector	Piece	1
26	70-1712201	Fastened bolt of fuel injectorAM6 × 42	Piece	2
	78-1712201	Fastened bolt of fuel injectorAM6 × 42	Piece	2
	86-17122	Fastened bolt of fuel injector(long)	Piece	2
27	17141	Breather assembly	Piece	1
28	1711312	"O" type ring 12 × 1.9	Piece	1

Note:the part of cylinder head cover include 2,3,4,5,6,7,27,28,and29.

The parts of rocker arm include 9 and 9A.

The parts of cylinder head include 12,13,14,15,16,17,18,19,20,22 and 26.



## CHAPTER4 PARTS LIST OF DIESEL ENGINE

### Piston connecting rod and crankshaft balancing mechanism

No.	Code	Name of part	Unit	Qty each set
1	70-1701403	Piston ring group	Piece	1
	78-1701402		Piece	1
	86-1701404		Piece	1
	KD192F-04300		Piece	1
	KD1100F-04300		Piece	1
2	70-1701601	Retainer of piston pine19	Piece	2
	78-1701602	Retainer of piston pine21	Piece	2
	86-1701603	Retainer of piston pine23	Piece	2
3	70-1701200	Piston	Piece	1
	78-170202		Piece	1
	86-170204		Piece	1
	78FS-1701203		Piece	1
	KD192F-04001		Piece	1
KD1100F-04001	Piece	1		
4	70-1701701	Piston pin	Piece	1
	78-1701702		Piece	1
	86-1701703		Piece	1
	KD192F-04004		Piece	1
	KD1100F-04005		Piece	1
5	70-1701301	Connecting rod body	Piece	1
	78-1701302		Piece	1
	86-1701303		Piece	1
	KD192F-04200		Piece	1
	KD1100F-04100		Piece	1
6	70-170501	Connecting rod bush	Piece	1
	78-1701502		Piece	1
	86-1701503		Piece	1
	KD192F-04005		Piece	1
	KD1100F-04002		Piece	1
7	70-1710001	Bearing 202(GB/T276-94)	Piece	2
	78-1710001	Bearing 203(GB/T276-94)	Piece	2
	86-1710000	Bearing 203(GB/T276-94)	Piece	2
8	70-1706501	Balancing shaft	Piece	1
	78-1706502		Piece	1
	86-1706503		Piece	1
	KD192F-05002		Piece	1
	KD1100F-05004		Piece	1
9	1710507	Key5 × 7(GB1096-79)	Piece	2
10	70-1707701	Balancing shaft timing gear	Piece	1
	78-1707702		Piece	1
	86-1707703		Piece	1
	KD1100F-05003		Piece	1
11		Bolt(for F shaft accompany with the diesel engine)	Piece	1
12	70-1700801	Crankshaft timing gear	Piece	1
	78-1700802		Piece	1
	86-1700803		Piece	1
	KD192F-05003		Piece	1
	KD1100F-05002		Piece	1
13	7078-1710512	Key5 × 12(GB1096-79)	Piece	2
	86-1710512	Key5 × 12(GB1096-79)	Piece	1

**CHAPTER4 PARTS LIST OF DIESEL ENGINE**

No.	Code	Name of part	Unit	Qty each set
13A	86-1710514	Key5 × 14(GB1096-79)	Piece	1
14	70-1710530	Key5 × 30(GB1096-79)	Piece	1
	78/86-1710563	Key6 × 63(GB1096-79)	Piece	1
15	70-1700601	Crankshaft	Piece	1
	78-1700701		Piece	1
	86-1700708		Piece	1
	KD192F-05001		Piece	1
	KD1110F-05001		Piece	1
16	1711601	Plug6 × 8	Piece	1
17	70-1707801	Driving gear of balancing shaft	Piece	1
	78-1707802		Piece	1
	86-1707803		Piece	1
	KD1110F-05005		Piece	1
18	70-1704400	Flywheel	Piece	1
	78-1704404		Piece	1
	86-1704409		Piece	1
	KD1110F-05006		Piece	1
19	70/78-17156	Gasket for nut of flywheel	Piece	1
	86-1715601		Piece	1
20	70/78-17155	Nut flywheel	Piece	1
	86-1715501		Piece	1
21	70-1704501	Gear ring of flywheel(for starting motor)	Piece	1
	78-1704502		Piece	1
	86-1704504		Piece	1
22	1704705	Sleeve of fuel pump tappet	Piece	1
23	70-1705101	Push rod	Piece	1
	78-1705102		Piece	2
	86-1705103		Piece	2
	KD192F-06100		Piece	2
	KD1110F-06004		Piece	2
24	70-17157	Tappet	Piece	2
	78-17157		Piece	2
	86-171501		Piece	2
	KD1110F-06003		Piece	2
25	70/86-1710514	Key5 × 14(GB1096-79)	Piece	2
	78-1710504	Key4 × 12(GB1096-79)	Piece	1
26	70-1701001	Camshaft	Piece	1
	78-1701002		Piece	1
	86-1701000		Piece	1
	KD192F-06001		Piece	1
	KD1110F-06001		Piece	1
26a	78-1701003	FS camshaft	Piece	1
27	70-1701101	Camshaft timing gear	Piece	1
	78-1701102		Piece	1
	86-1701103		Piece	1
	KD1110F-06002		Piece	1

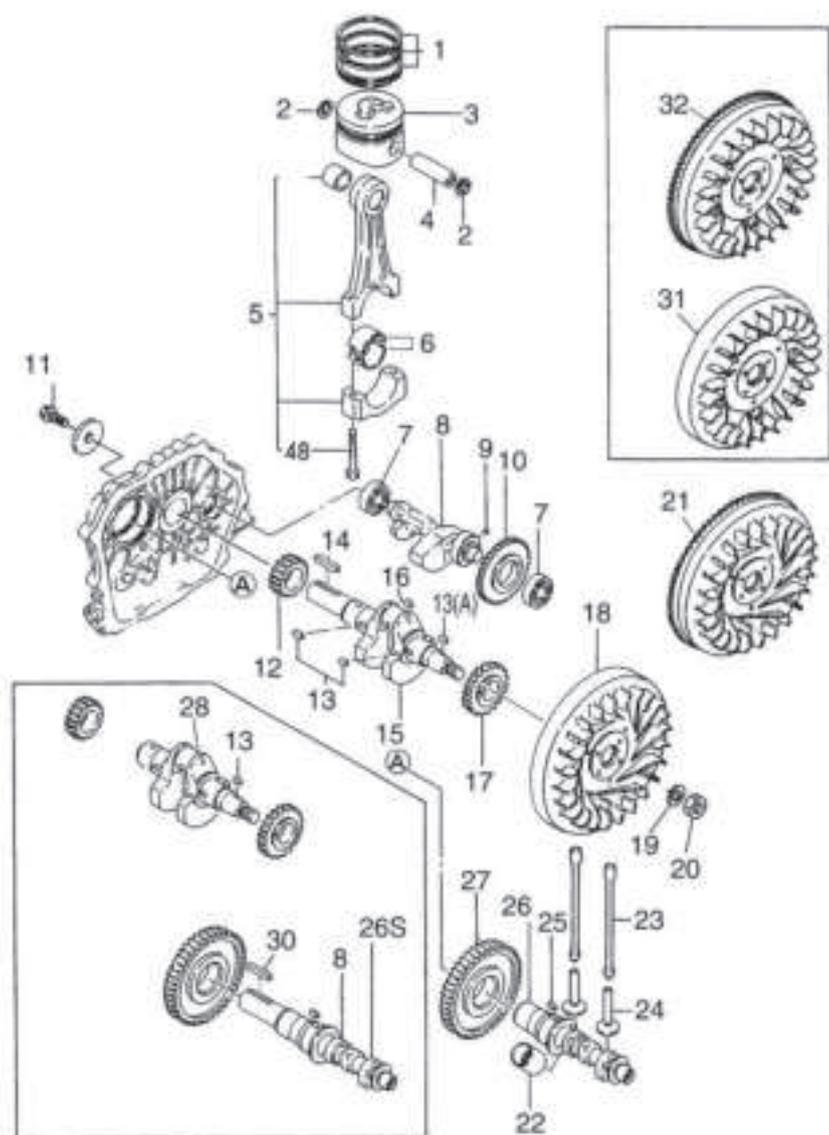
## CHAPTER4 PARTS LIST OF DIESEL ENGINE

No.	Code	Name of part	Unit	Qty each set
28	78-1700702	FS crankshaft	Piece	1
30	78-1710545	Key 6 x 45(GB1096-79)output of camshaft	Piece	1
31	78-1704403	FS flywheel	Piece	1
32	78-1704503	FS gear ring of flywheel	Piece	1

Note: The parts of piston connecting rod include 1, 2, 3, 4, 5 and 6.

The parts of balancing shaft include 8, 9 and 10.

The parts of crankshaft include 9, 12, 13, 15 and 17.



## CHAPTER4 PARTS LIST OF DIESEL ENGINE

## Fuel system

No.	Code	Name of part	Unit	Qty each set
1	1710745	Bolt M8*45(GB5787-86)	Piece	1
2	17185	Fastened bolt for upper bracket of fuel tank	Piece	1
3	1710208	Flat washer 8(GB97.1-85)	Piece	1
4	70-1705801	Upper bracket of fuel tank	Piece	1
	78-1705802		Piece	1
	86-1705803		Piece	1
5	1705301	Injector	Piece	1
	KD192F-10200		Piece	1
	KD1100F-13000		Piece	1
6	17212	Fuel leak-off pipe connecting	Piece	2
7	17192	Fuel leak-off pipe	Piece	1
8	17184	Shock absorbing pad of fuel tank	Piece	4
9	70-1704201	Fuel tank	Piece	1
	78-1704202		Piece	1
	86-1704203		Piece	1
10	17212	Fuel pipe connecting	Piece	2
11	17147	Fuel pipe	Piece	1
12	17151	Gasket of fuel draining M6(GB6177-86)	Piece	1
13	17152	Cock offuel fraining(fuel pipe)	Piece	1
14	17183	Lower bracket of fuel tank	Piece	1
15	1710714	BoltM6*14(GB5787-86)	Piece	2
16	1710106	NutM6(GB6177-86)	Piece	2
17	1710206	Flat washer6(GB97.1-85)	Piece	1
18	17150	Fuel tank cock Assem	Piece	1
19	17154	Flat washer	Piece	1
20	1719403	Clamp of fuel oil pipe	Piece	2
21	17189	Fuel oil pipe	Piece	1
22	17148	Gasket of fuel oil filter	Piece	1
23	70-1704301	Fitter element Assem	Piece	1
	78-1044302		Piece	1
	86-1704303		Piece	1
24	70-1704702	Fuel injection pump	Piece	1
	78-1704702		Piece	1
	86-1704700		Piece	1
	KD1100F-12000		Piece	1
25	70-1705601	High pressure fuel pipe	Piece	1
	78-1705602		Piece	1
	86-1705603		Piece	1

## CHAPTER4 PARTS LIST OF DIESEL ENGINE

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No.	Code	Name of part	Unit	Qty each set
26	17146	Fuel oil filter	Piece	1
27	17153	Fuel take cap Assem	Piece	1
28	1705302	Cap of fuel injector	Piece	1

Note:the fuel tank assembly:9,10,11,12,13,16,17,18,19,22,23,26,27.



## Lubricating and speed-control system

No.	Code	Name of part	Unit	Qty each set
1	70-1710712	Bolt M6*12(GB5787-86)	Piece	2
2	70-17187	Oil filter cover	Piece	1
3	70-17188	Oil filter Cover gasket	Piece	1
4	70-1711314	Seal ring 20*2.5	Piece	1
	78/86-1711316	Seal ring 20*2.65	Piece	1
5	70-1702101	Oil filter Aaaembly	Piece	1
	KD1100F-09001		Piece	1
6	1710712	Bolt M6*12(GB5787-86)	Piece	3
7	17022	Oil pump cover	Piece	1
8	1711334	O ring 34.5*18(GB3452.1-82)	Piece	1
9	70-17135	Oil pump	Piece	1
	78-17135		Piece	1
	86-1713501		Piece	1
	KD1100F-09100		Piece	1
10	1711103	Pin 3*16(GB119-82)	Piece	1
11	78/86-1710714	Bolt M6*14(GB5789-86)	Piece	1
12	78/86-1702103	Oil filter element	Piece	1
13	70-1711314	Seal ring 20*2.5	Piece	1
	78/86-1711316	Seal ring 20*2.65	Piece	1
14	78/85-17080	Oil guide	Piece	1
15	70-1702301	Driving gear of oil pump	Piece	1
	78-1702302		Piece	1
	86-1702302		Piece	1
16	17132	Pin of fly block	Piece	1
17	17131	Fly block	Piece	2
18	17234	Tappet of governor fork	Piece	2
	KD1100F-11001		Piece	2
19	17125	Gasket of lever shaft	Piece	1
20	1710009	Bearing 7941/8(GB290-64)	Piece	1
21	70-1700501	Fork lever assembly	Piece	2
	78-1700502		Piece	1
	86-1700503		Piece	1
	GS450-11100		Piece	1
22	17214	Wasker	Piece	1
23	70-17216	Parts of fuel controller	Piece	1
	78-17126		Piece	1
	86-1712601		Piece	1
	KD1100F-11100		Piece	1
24	17164	Handle bracket	Piece	1
25	17167	Speed-control lever	Piece	1

## Lubricating and speed-control system

No.	Code	Name of part	Unit	Qty each set
26	1710714	Bolt M6*14(GB5787-86)	Piece	2
27	1710714	Bolt M6*18(GB5787-86)	Piece	1
28		Lead seal	Piece	1
29	17612	Return spring II	Piece	1
30	17161	Return spring I	Piece	1
31	70-17160	Speed-control spring	Piece	1
	78-17160		Piece	3
	86-1716001		Piece	1
	KD1100F-11002		Piece	1
32	1710645	Bolt M6*45(GB6172-86)	Piece	1
33	1710111	Nut M10*1.25	Piece	1
34	1706701	FG partsof lever	Piece	1
35	1706901	FG gorenor spring	Piece	1
36	1710714	Bolt M6*14(GB5789-86)	Piece	1
37	1710106	Nut M6(GB39-88)	Piece	1
38	1716801	Washer	Piece	2
39	1730720	Handle shaft	Piece	1



**CHAPTER4 PARTS LIST OF DIESEL ENGINE**

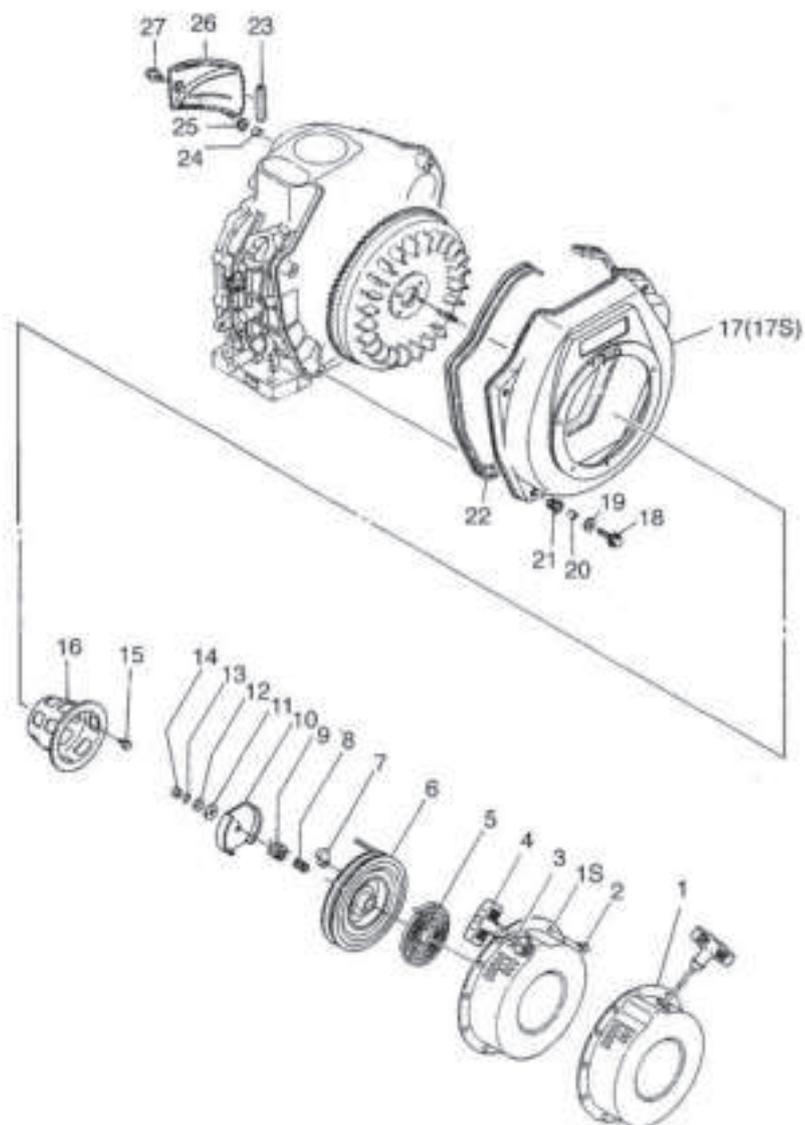
**Cooling and recoil starter**

No.	Code	Name of part	Unit	Qty each set
1	70-1703401	Case Assem	Piece	1
	78-1703402		Piece	1
	86-1703404		Piece	1
	KD1100F-14001		Piece	1
1S	78-1703404	178FS case Assem	Piece	1
2	1710708	bolt M6*8(GB5787-86)	Piece	4
3	70-1703501	Starting rope	Piece	1
	78-1703502		Piece	1
	86-1703503		Piece	1
4	70-1703801	Starting handle	Piece	1
	78-1703802		Piece	1
	86-1703802		Piece	1
5	70/78-1703301	Flat spriac spring	Piece	1
	86-1703303		Piece	1
6	70-1703201	Reel	Piece	1
	78-1703202		Piece	1
	86-1703203		Piece	1
7	70-1704003	Starting claw	Piece	2
	78/86-1704005		Piece	2
8	70-17218	Compressed spring	Piece	1
	78/86-1721801		Piece	1
9	70-17219	Torque spring	Piece	1
	78/86-1721901		Piece	1
10	70-1704004	Plate of starting claw	Piece	1
	78/86-1704006		Piece	1
11	70-17039	Friction plate	Piece	1
	78/86-1703902		Piece	1
12	70+1703903	Gasket of friction plate	Piece	1
	78/86-1703803		Piece	1
13	1710306	Spring wasger	Piece	1
14	1710106	Nut M6(GB6170-86)	Piece	1
15	1710712	Bolt M6*12(GB5789-86)	Piece	3or4
16	70-1705701	Starter	Piece	1
	78-1705702		Piece	1
	86-1705703		Piece	1

CHAPTER4 PARTS LIST OF DIESEL ENGINE

No.	Code	Name of part	Unit	Qty each set
17	70-1704101	Wind leading case welded	Piece	1
	78-1704102		Piece	1
	86-1704105		Piece	1
	<b>KD1100F-14100</b>		Piece	1
17S	78-1704106	78Fwind leading case welded Asssem	Piece	1
18	78-170622	bolt M6*22(GB5787-86)	Piece	5
	70/86-1710622		Piece	4
19	78-1710207	Washer6(GB90-85)	Piece	5
	70/86-1710207		Piece	4
20	78-17145	Collar	Piece	5
	70/86-17145		Piece	4
21	78-17143	shock absorber	Piece	5
	70/86-17143		Piece	4
22	17144	pieces of shock pads	Piece	1
23	78/86-17127	shock isolation piece of wind leading plate	Piece	1
24	78/86-17129	collar	Piece	1
25	78/86-17128	Pad	Piece	1
26	70-1700401	Wind leading plate	Piece	1
	78-1700402		Piece	1
	86-1700403		Piece	1
	<b>KD192F-01008</b>		Piece	1
	<b>KD1100F-01008</b>		Piece	1
27	70-1710712	bolt M6*12(shaped piece)	Piece	1
	78-1710718	bolt M6*18(shaped piece)	Piece	1
	86-1710614	bolt M6 22shaped piece)	Piece	1

Note:the parts of recoil starter Asssem.



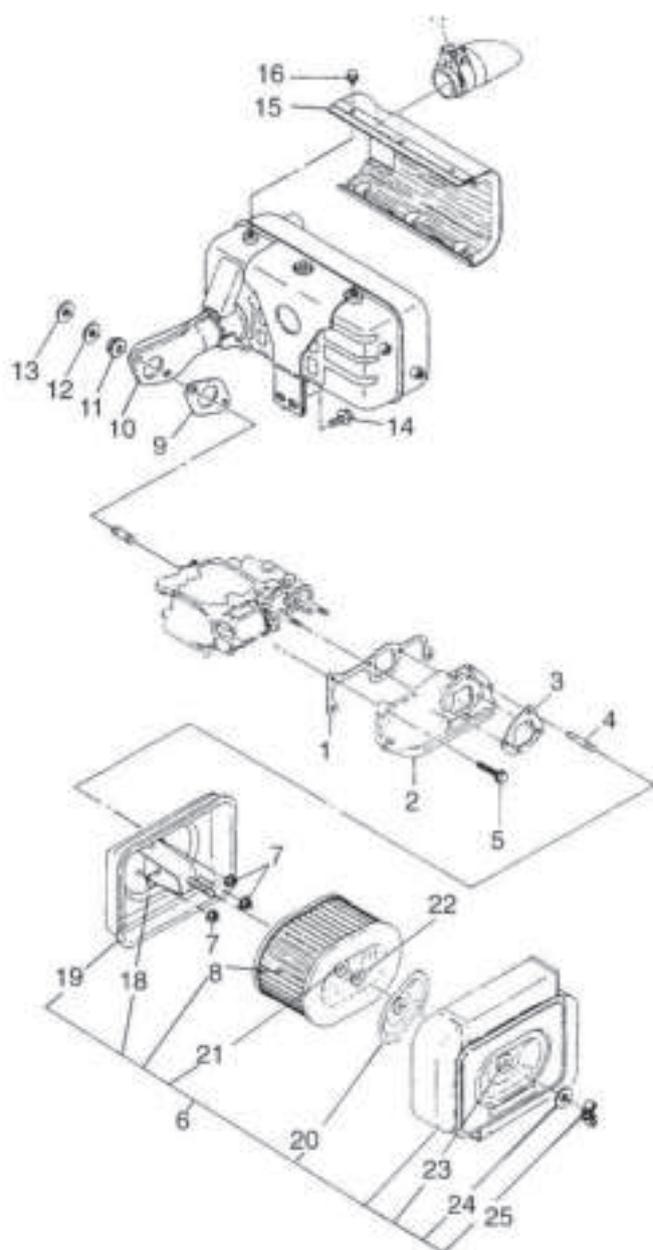
## CHAPTER4 PARTS LIST OF DIESEL ENGINE

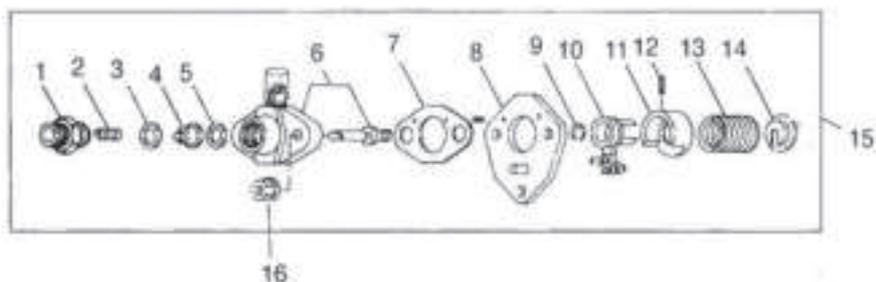
### Air cleaner and silencer system

No.	Code	Name of part	Unit	Qty each set
1	70-1703101	Gasket of intake pipe	Piece	2
	78-1703102		Piece	1
	86-1703103		Piece	1
	KD192F-02003		Piece	1
	KD1100F-02003		Piece	1
2	70-1703001	Intake pipe	Piece	1
	78-1703002		Piece	1
	86-1703003		Piece	1
	KD192F-07002		Piece	1
	KD1100F-07002		Piece	1
3	70/78-17175	Gasket of air cleaner	Piece	3
	86-1717501		Piece	1
	KD192F-07001		Piece	3
	KD1100F-07003		Piece	1
4	17137	Bolt	Piece	1
5	1710722	Shaped bolt M6*22(GB5789-86)	Piece	1
			Piece	1
			Piece	1
6	70/78-17174	Air filter assembly	Piece	1
	86-1717401		Piece	1
	KD1100F-07100		Piece	1
7	1710103	Nut M6(GB6177-86)	Piece	1
8	70/78-1717602	Air filter element	Piece	1
	86-1717601		Piece	1
	KD192F-07100		Piece	1
	KD1100F-07001		Piece	1
9	70/78-17186	Gasket of muffler	Piece	1
	86-1718601		Piece	1
10	70-1705401	Muffler assembly	Piece	1
	78-1705402		Piece	1
	86-1705403		Piece	1
	KD192F-08000		Piece	1
11	1710208	Flat washer Ø8	Piece	2
12	1710308	Spring washer Ø8	Piece	2
13	1710108	Nut M8(GB6170-86)	Piece	1
14	70-1710714	Bolt M6*14(GB5789-86)	Piece	1
	78/86-*	Bolt M8*14(GB5789-86)	Piece	2
15	70-1705501	Screen cover of muffler	Piece	1
	78-1705502		Piece	1
	86-1705503		Piece	1
16	1710708	Bolt M6*14(GB5789-86)	Piece	1
17	70/78-1705404	Comeator	Piece	1
	86-1705406		Piece	1
18	70/78-17179	Sealing ring II of shock proof	Piece	1
	86-1718002		Piece	1

CHAPTER4 PARTS LIST OF DIESEL ENGINE

No.	Code	Name of part	Unit	Qty each seat
19	70/78-17180	Air cleaner Bottom Case Assem	Piece	1
	86-1718003		Piece	1
	<b>KD192F-07200</b>		Piece	1
20	70/78-17178	Sealing ring I of shock proof	Piece	1
	86-1718001		Piece	1
21	70/78-17181	Shock absorbor of air filter	Piece	1
	86-1718101		Piece	1
22	70/78-1710103	Collar(GB6177-86)	Piece	1
	86-1710114	Collar(GB6177-86)	Piece	1
23	70/78-17182	Shock absorber of air filter(aquare)	Piece	1
	86-1720106		Piece	1
24	17177	Washer	Piece	1
25	70/78-1710107	Butterfly nut M6	Piece	1
	85-1710109	Butterfly nut M8	Piece	1





- |                                  |                                |
|----------------------------------|--------------------------------|
| 1. Delivery holder               | 9. Circlip                     |
| 2. Delivery spring               | 10. Control lever Assem        |
| 3. Delivery gasket               | 11. Spring seat I              |
| 4. Delivery valve                | 12. Pin of sleeve              |
| 6. Plunger                       | 13. Fuel injecting pump        |
| 7. Adjusting gasket              | 14. Fuel injection pump spring |
| 8. Connecting plate of pump body | 15. Fuel pump assembly         |
|                                  | 16. Nut M6                     |

## CHAPTER5 MALFUNCTION AND REMEDY OF DIESEL ENGINE

## 5-1 Cause and Remedy for the Engine Not Being Started

CAUSE	REMEDY
The weather is cold, machine oil become 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.
Malfunction of fuel system. The fuel is mixed with water	Clean fuel tank filter and fuel pipe, change fuel.
The fuel become thickening and not easy to flow	Use the specific fuel
There is air in the fuel system	Drain out the air and tighten each connector of fuel pipe.
Injection fuel is little or no, the spray is not good	Check the position of speed governor handle, clean spray nozzle, fuel pump, maintain or change the pump or nozzle if necessary.
Combustion is 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. Remedy with its cause.
Diesel fuel delivery is interrupted	Diesel fuel is too little in the fuel tank. Fill the fuel into the fuel tank. If the fuel pipe and fuel filter are obstructed or leaky, remedy them.
Compression pressure is not enough in the cylinder, the nut of cylinder head is not tighten or gasket of cylinder is damaged or leaky.	Tighten the nut of cylinder head, according to diagonal line sequence and standard requirement, check gasket of cylinder head once again after prerunning the diesel engine.
The gap of piston ring is too big because of water	Change the piston ring
Each gap of piston rings line up and cause leakage	Set each gap of piston at angle of 120°

CAUSE	REMEDY
The piston rings are stucked seriously or broken	Clean with diesel fuel or change rings.
Gas valves leakage	Grind the gas valves,if the vestige is too deep,please send it to factory for remedy.
The valve clearance is not correct	Adjust the clearance as specified.
The valve stem is clipped on guide pipe	Disassemble the gas valve and clean the stem and guide pipe.

### 5-2 Cause and Remedy for Not Enough Power of Diesel Engine

CAUSE	REMEDY
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.
The pumping of fuel is not good	Maintain or change the damaged parts of fuel pump
Malfunction of nozzle:injection pressure is not correct	Adjust the injection pressure.
Spray hole carbon deposit	Clean
Needle valve adhered	Clean or change.
Fitting is too loose between needle valve and needle valve body	Change.
Air filter is obstructed	Disassemble to clean or change the core of filter.
Speed is not high enough	Check the speed of diesel engine with tachometer. Adjust the adjust high speed limit screw.

## 5-3 Cause and Remedy for the Engine Stopping Automatically

CAUSE	REMEDY
Malfunction of fuel system:No fuel	Add fuel.
Fuel pipeline of filter is obstructed	Maintain or clean.
There is air in fuel system	Drain out the air.
Needle valve of nozzle adhered	Clean,grind the nozzle or change it if necessary.
Air filter is obstructed	Maintain or brush off.
The load increase suddenly	Decrease the load.

## 5-4 Cause and Remedy for Exhaust with Black Smoke

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

5-5 Cause and Remedy for Exhaust with Blue Smoke

CAUSE	REMEDY
There is machine oil,in cylinder	Check oil level,drain away the unnecessary machine oil
Piston ring is clipped or worn,and its sprigness is not enough 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.
The gap is too big between piston and cylinder	Remedy or change.
Valve and guide are worn	Change.

5-6Cause and Remedy for Exhaust with White Smoke

CAUSE	REMEDY
There is water in diesel fuel	Clean the fuel tank and diesel filter, change diesel fuel

5-7 Methods and Positions of Stopping to Check When the Engine's Maifunctioning

CAUSE	REMEDY
Speed is sometimes high,some-times low	Check the speed governor system whether it is nimble.Whether there is air in fuel pipeline.
Abnormal sound suddenly appear	Check each motional part carefully.
Enhaust with black smoke sud-denly	Check fuel system,especially nozzle.
There is metal knocking sound rythmically in the cylinder	The fuel delivery angle is too big.Adjust it.