REMKO WELLPOINT DEWATERING PISTON PUMP

OPERATION, MAINTENANCE & SPARE PARTS MANUAL

VACUUM PISTON PUMPS FOR DEWATERING

MODEL : RWPP-150

SUCTION / DISCHARGE SIZE : DN150 (6")

REMKO WELLPOINT DEWATERING PISTON PUMP

INDEX

1. GENERAL DESCRIPTION

The Remko RWPP Vacuum Piston Pumps are universal in operation for lowering the ground water level. Suitable For every type of soil, they are most suited for well points as well as sump dewatering.

Special features and Advantages.

1.1 Water & Air Flow is constant, independent of suction & Discharge head.
1.2 Does not require separate vacuum pump since this is a self – priming & high thrust discharge pump due to the duplex piston.
1.3 Due to pulsating vacuum (rhythmically developing vacuum), well points never get clogged.
1.4 Minimum fuel consumption & permanent high efficiency.
1.5 Very simple maintenance with very less wear of spares, making it very economical.
1.6 Very Low operating cost & service reducing the overall project coasts.
1.7 The piston rod & cylinder liner are made of stainless steel, making them resistant to corrosion.
1.8 Allow universal applications. A single pump can be connected with 40-80 well – points and 40-300 meters of header pipe depending on the soil conditions.

2. STARTING THE PUMP

2.1 The Gear Box Should Box should be filled with oil up to the oil measuring Stick (ID.No.8-06) through the oil filter plug (ID.NO.9-32)
2.2 Fill the fuel tank to its full capacity of 5 Gallons with diesel.
2.3 The pump must be installed as horizontally as possible.
2.4 In order to increase the life of the cylinder liners, valve and piston collars, clean the suction pipe thoroughly before installation.
2.5 If the pump has been non- operational for a long duration, the valves may not open. Due the pump always sucking in dry, fill the discharge chamber above the water fill plug (9-72) with water. If this is unsuccessful, then remove the discharge valve cover (058) and lift the discharge valves by hand so that the suction chamber can be completely filled

.

3. INSTRUCTIONS FOR MAINTENANCE

3.1 OIL CHANGE

For the first time after approx... 500 and subsequently after every 2000 running hours, it is necessary to draw off the used oil, to clean the gear case and to fill in fresh oil.

3.2 STUFFING BOX

A slight stuffing box leakage is permitted and even recommendable. In case of an excessive leakage, retighten the nuts (9-65) of the gland (8-17) uniformly and not too strongly so that the leakage is again, reduced to a minimum.

3.3 CHECKING REGULARY

It is must to check regularly the following;

** The Leakage of the stuffing boxes,

** If the rubber plate (8-40) is tightly clamped to the piston rod,

** The V – Belt tension,

** The oil level with the aid of the oil – measuring stick (8-06),

** The adjusting screws (8- 236) which must sufficiently press on the pressure plates (8-22),

3.4 PROTECTION

It is advised to suck in as little sand as possible to reduce unnecessary wear of the cylinder liner (8-38) and piston collars (8-22). Take measure to avoid installing defective strainers and through cleaning & tightening of the suction pipe.

4. HOW TO REPLACE WORN OUT PARTS?

4.1 VALVES [ref.fig(i)]

The discharge valves can be replaced after removing the discharge valve cover (058) and the valve – stem guide screw (8-57)

Similarly, the suction valves can be replaced after removing discharge valve seat (8-53) by unscrewing the 3 nuts (9-66) by means of press fit. The suction valve seat (8-5) is adjusted into the cylinder

4.2 PISTON COLLARS [ref . fig (ii)]

Firstly dismantle the cylinder cover (037) in the Following order:

a) Removal of the cap nut (9-69),

b) The setscrew (8-23) is loosened a little and,

c) Removal of the nuts (9-63)

Removal the cylinder cover and the pressure piece (8-22).put a fixed spanner on the recess of the piston rod and unscrew the piston nuts (082) by means of a four – way rim wrench.

Now the piston collars can be replaced. Reassembly is made in reverse order, But grease piston body and plate carefully.

4.3 PISTON RODS

With the aid of a screw driver, lift up the dust cover (059) .After unscrewing the crosshead nut (064), the piston rod (063) is turned out of the crosshead with the aid of a four –way rim wrench slipped on the piston nut (062). After the crosshead nut the dust cover and the rubber plate (8-40) have been removed one after the other. The piston rod can be drawn out backward via stuffing box and cylinder liner.

When the reassembly is made. It is advisable at first to mount the piston complete with the collars on the piston rod before this part is pushed in again via cylinder liner and stuffing box.

The above mentioned parts must be reassembled in reverse order. By screwing the piston rod more or less into the crosshead, the correct position of the piston in cylinder liner must be approx. 1cm. if that is the case, the crosshead nut (with its flat side), must firmly screwed up to the crosshead . Special tools for crosshead nut can be ordered separately.

4.4 STUFFING BOX PACKING [ref . fig (iii)]

With the aid of packing worm, the used up packing is removed. The New packing rings are laid (with joints mutually displaced by 90) are laid around the piston rod and pressed into the stuffing box one after the other with the help of the gland (8-17) and a screwdriver.

4.5 CYLINDER LINER [ref . fig (iv)]

The cylinder liner (8-38) made of stainless steel, are installed with a loose fit and 2'o-rings (8-39).thus replacement or tuning can be made by hand, very simple. After removing the cylinder cover (037)and the pressure piece (see 4.2) the cylinder liner is forced out by turning the V- belt pulley of the pump by hand. The wear mainly occurs at the lower side in the beginning of the liner.

So, by regularly turning the cylinder a little, its life increases before replacement is necessary.

On wearing out, the cylinder liner may jam tightly during the dismantling because some sand may settle between the cylinder wall the liner. In this case , the use of an auxiliary tool as shown in fit. 4 is necessary. First, remove the piston and piston rod. Then the pressing rod is shoved through the stuffing box and crosshead and pressed on the connecting rod (068).

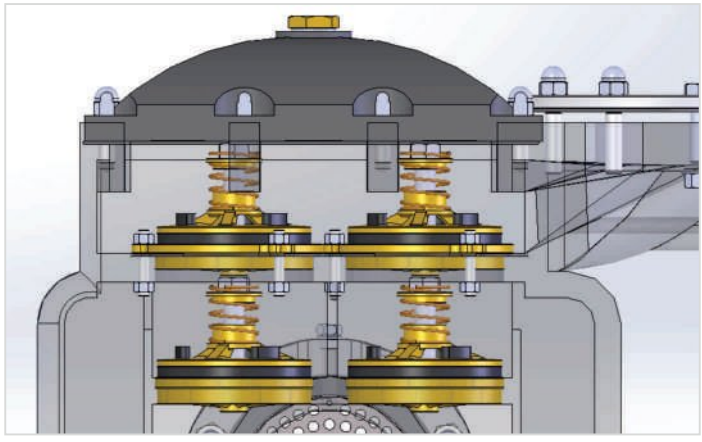
DISASSEMBLING AND AND ASSEMBLING OF THE VARIOUS PUMP PARTS

VALVES

After removing the discharge cover and untightening the valve guide (2), the parts of the discharge valve can be separately exchanged.

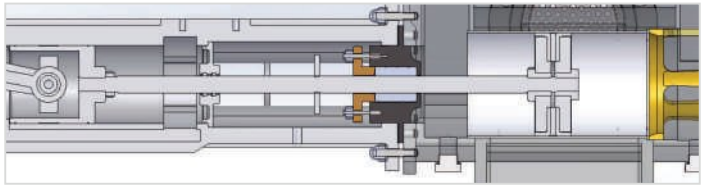
The same applies for the parts of the suction valve after the discharge valve

seat (3) and the packing (6) are removed. This is possible by releasing the three nuts (4).
The seat of the suction valve (5) is mounted in mounted in the cylinder with a press fitting and can be (dis) assembled with the help of the tools as instructed.



PISTON ROD

Disassemble dust cover (1) with the help of a screw driver, release the crosshead locknut (2) and turn with help of a Four-way rim wrench, placed on the piston lock nut (3), the piston rod (4) out of the crosshead (5) After crosshead locknut (2),dust cover (1) and rubber plate (6) have been removed, the piston rod (4) can be disassembled through the stuffing box and cylinder liner.
During assembly it is advisable to primarily mount the piston with piston collars (7) on the piston rod. Carefully install the piston rod through the cylinder liner and glandpacking (8 and assemble the different parts in reverse order.
The correct position of the piston with regard to cylinder liner has to be set during assembly by screwing the piston rod more or less into the crosshead. In the utmost front position of the piston the distance between the piston and end of the cylinder liner must be 1 cm.Finally screw the crosshead lock nut (with its flat side) against crosshead.



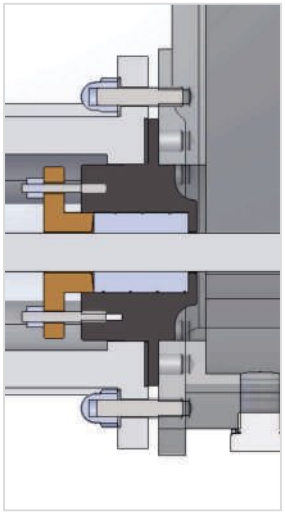
GLANDPACKING

If leakage of the gland packing unit can not be further stopped by tightening the gland nuts, the gland packing have to be exchanged.

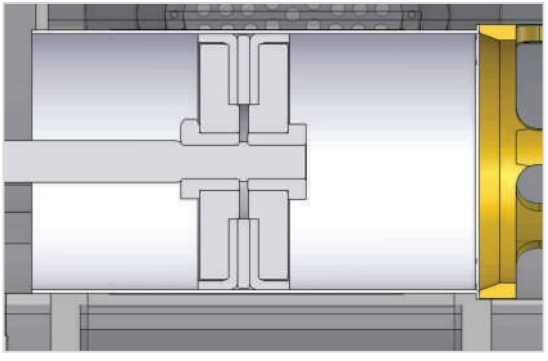
Parts:

(1) Stuffing box
(2) Gland
(3) Gland Packing
(4) Seal Ring
(5) Nut

Remove the old Gland packing with the help of packing worm. The new packing (with joints mutually displaced by 90º) are laid around the piston rod and pressed into intermediate piece with the help of the gland and a screw driver.



CYLINDER LINER



Afterwards, the pressure block (G.320) is placed behind the groove for the O- ring in the cylinder liner.On turning the V- Belt pulley of the pump by hand, the cylinder liner is forced out subsequently.

4.6 DRIVING GEARING

If the operating instructions are adhered to, the gearing is practically free from wear. Any Trained mechanic can replace the parts. If however, any problems do

occur, we are at your service at any Time.

4.7 SPARE PARTS

It is generally recommendable to keep stock of the following spare parts to perform quick repairs:

Qty	Spare Part	Id No.
4	Piston Collars	55 (1.6.1)
2	Cylinder Liners	65 (1.7.1)
2	O- Rings	? (1.7.1)
2	Sets of Stuffing Box Packing	81 (1.7.1)
8	Rubber Suction Valves	3 (1.2.1)
2	Rubber Deflector Plates	57 (1.6.1)
8	Valve Springs	6 (1.2.1)

4.8 FAULT ANALYSIS

SYMPTON	CAUSE	REMEDY
Little or no capacity	a) Pump body not Fitted With water	a) Fill pump with water thru'fill Plug from the top of 62 (1.7.1) suction inlet.
	b) Wear of Piston Collar	b) Replace piston collars (9-80) or Cylinder Lines.
	c) Rubber valves worn out or damaged	c) Replace rubber valves (8-55) & (8-56)
	d) Valves do not close because of presence of sand and gravel	d) Clean valves valve weights
	e) Suction hose collapsed or big leakage	e) Replace suction lines
heavy knocking Inside the pump	a) high vacuum in combination with Too less water out Of the system	a) To increase the number of header pipes connected to Pump. Place a Sniffle valve on The plug of Suction side.
	b) Due to water in gear casing, heavy wear of bearings, etc.	b) replace all defective parts and seal rings.

Suction Valve Assy.

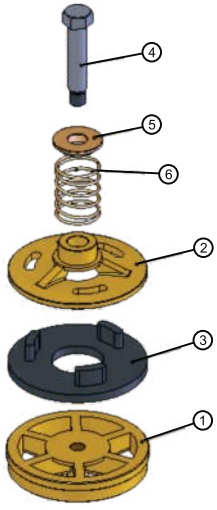


Fig. 1.1.1

Item No.	Part Name	Part No.	Qty.	Material
1	SUCTION VALVE SEAT	RP.03.06.01	1	BRASS
2	VALVE WEIGHT	RP.03.06.02	1	BRASS
3	VALVE	RP.03.06.03	8	RUBBER
4	VALVE STEM GUIDE SCREW	RP.03.06.04	1	S S
5	WASHER FOR GUIDE SCREW	RP.03.06.05	1	BRASS
6	VALVE SPRING	RP.03.06.06	1	

Discharge Valve Assy.

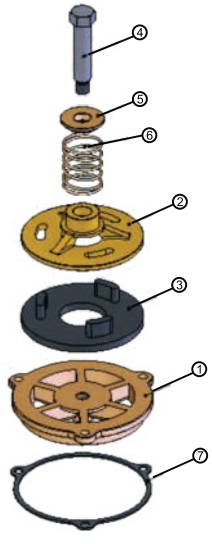


Fig. 1.2.1

Discharge Valve Assy.

Item No.	Part Name	Part No.	Qty.	Material
1	DISCHARGE VALVE SEAT	RP.03.06.07	1	BRASS
2	VALVE WEIGHT	RP.03.06.02	1	BRASS
3	VALVE	RP.03.06.03	1	RUBBER
4	VALVE STEM GUIDE SCREW	RP.03.06.04	1	S S
5	WASHER FOR GUIDE SCREW	RP.03.06.05	1	BRASS
6	VALVE SPRING	RP.03.06.06	1	
7	DISCHARGE VALVE SEAT RUBBER	RP.03.06.08	1	RUBBER

Gear Case Assy.

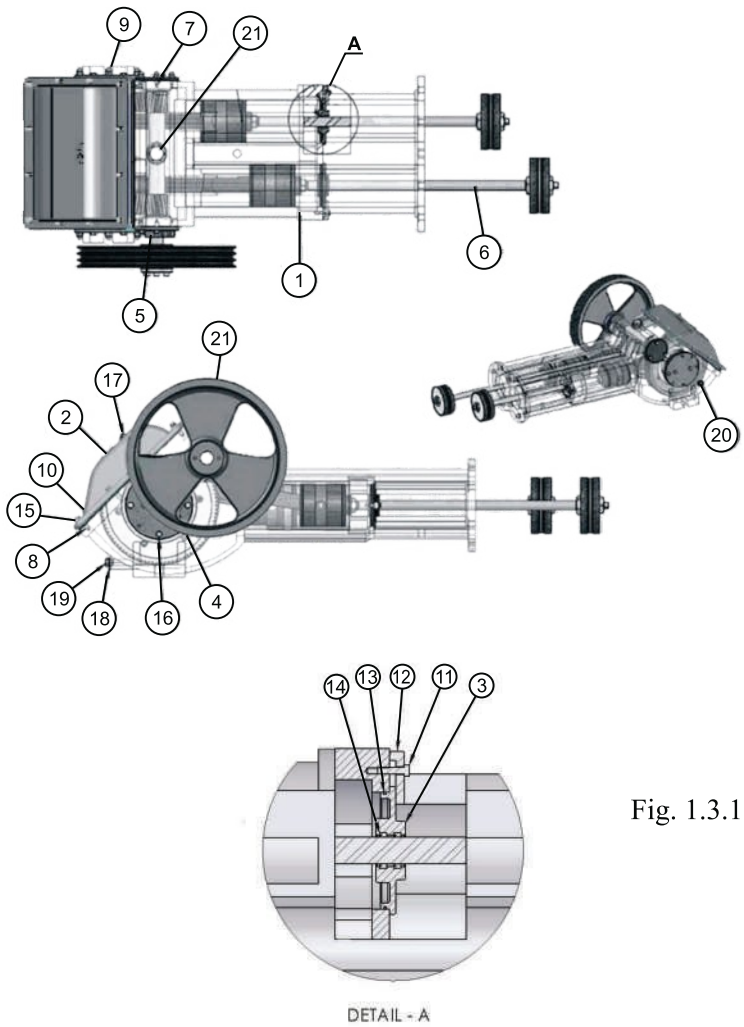


Fig. 1.3.1

Gear Case Assy.

Item No.	Part Name	Part No.	Qty.	Material
1	GEAR CASE	RP.03.06.09	1	CI
2	GEAR CASE COVER	RP.03.06.10	1	ALUMINIUM
3	DUST CAP	RP.03.06.11	2	S.G IRON
4	CRANK ASSEM (Fig. 5.5.1)	RP.03.06.	1	
5	PISTON SHAFT ASSEM (Fig. 5.4.1)	RP.03.06.	1	
6	PISTON ASSEM	RP.03.06.	2	
7	STUD M10 x 35	RP.03.06.12	6	S S
8	STUD M10 x 45	RP.03.06.13	12	S S
9	STUD M12 x 50	RP.03.06.14	8	S S
10	GEAR CASE COVER RUBBER GASKET	RP.03.06.15	1	RUBBER
11	HEX BOLT M8 x 30	RP.03.06.16	2	G R 8.8
12	DUST CAP RETAINER STRIP	RP.03.06.17	2	EN 8/M.S.
13	O RING 126 x 132	RP.03.06.18	2	RUBBER
14	OIL SEAL 30 x 40 x 8	RP.03.06.19	4	RUBBER
15	DOME NUT M10	RP.03.06.20	18	BRASS
16	DOME NUT M12	RP.03.06.21	8	BRASS
17	PLUG 3/8" BSP	RP.03.06.22	1	M.S
18	DOWTY WASHER 1-2 in BSP	RP.03.06.22.5	1	M.S
19	B.S.P. PLUG 1/2"	RP.03.06.23	1	M.S
20	OIL LEVEL INDICATOR	RP.03.06.24	1	ALUMINIUM
21	B.S.P. PLUG 1"	RP.03.06.25	1	M.S

Pinion Shaft Assy.

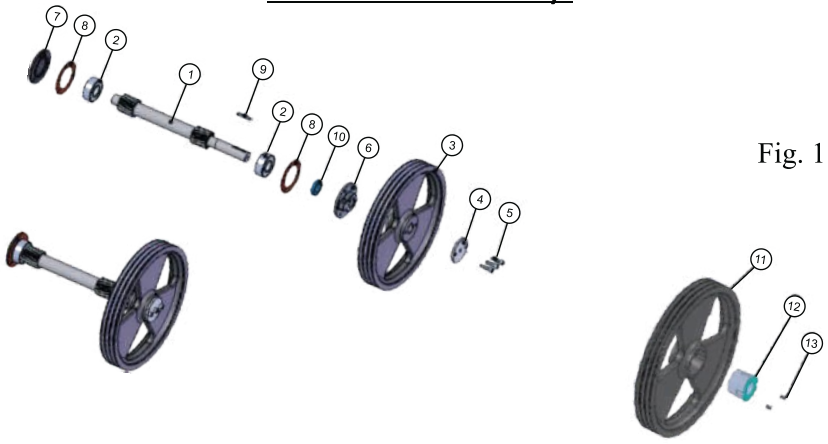


Fig. 1.4.1

Pinion Shaft Assy.

Item No.	Part Name	Part No.	Qty.	Material
1	PINION SHAFT	RP - WP - 26	1	EN-19
2	BEARING 2308	RP - WP - 27	2	
3	PULLEY	RP - WP - 28	1	CAST IRON
4	PULLEY LOCK DISC	RP - WP - 29	1	MILD STEEL
5	ALLEN BOLT M12x40	RP - WP - 30	3	
6	BEARING COVER LH PINION SHAFT	RP - WP - 31	1	S.G IRON
7	BEARING COVER RH PINION SHAFT	RP - WP - 32	1	S.G IRON
8	BEARING COVER PINION SHAFT GASKET	RP - WP - 33	2	PAPER GASKET
9	KEY PINION SHAFT	RP - WP - 34	1	EN-8/M.S
10	OIL SEAL 40 x 60 x 12	RP - WP - 35	1	RUBBER
11	TAPER PULLEY	RP - WP - 98	1	CAST IRON
12	TAPER LOCK BUSH	RP - WP - 99	1	CAST IRON
13	GRUBE SCREW 7/16”	RP - WP - 100	1	G.R 8.8

Crank Assy.

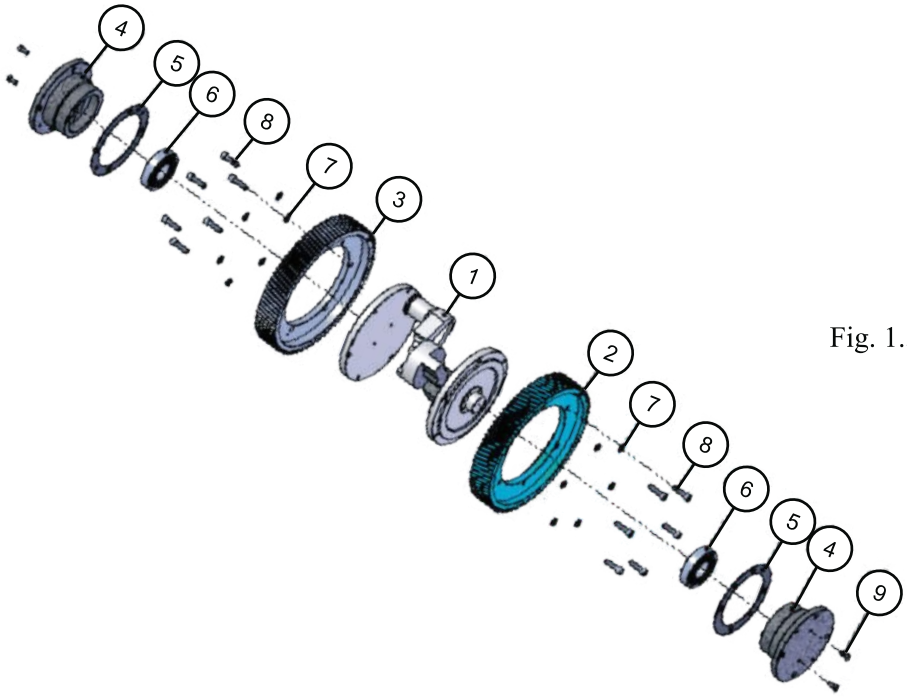


Fig. 1.5.1

Crank Assy.

Item No.	Part Name	Part No.	Qty.	Material
1	CRANK	RP - WP - 36	1	S.G IRON
2	BULL GEAR LH	RP - WP - 37	1	S.G IRON
3	BULL GEAR RH	RP - WP - 38	1	S.G IRON
4	BEARING COVER	RP - WP - 39	2	S.G IRON
5	BEARING COVER GEAR CASHING RUBBER	RP - WP - 40	2	RUBBER
6	ROLLER BEARING NU 310 / NJ 310	RP - WP - 41	2	
7	SPRING WASHER M12	RP - WP - 42	12	G r 8.8
8	ALLEN BOLT M12 x 40	RP - WP - 43	12	G r 8.8
9	HEX BOLT M10 x 20	RP - WP - 44	4	G r 8.8

Piston Assy.

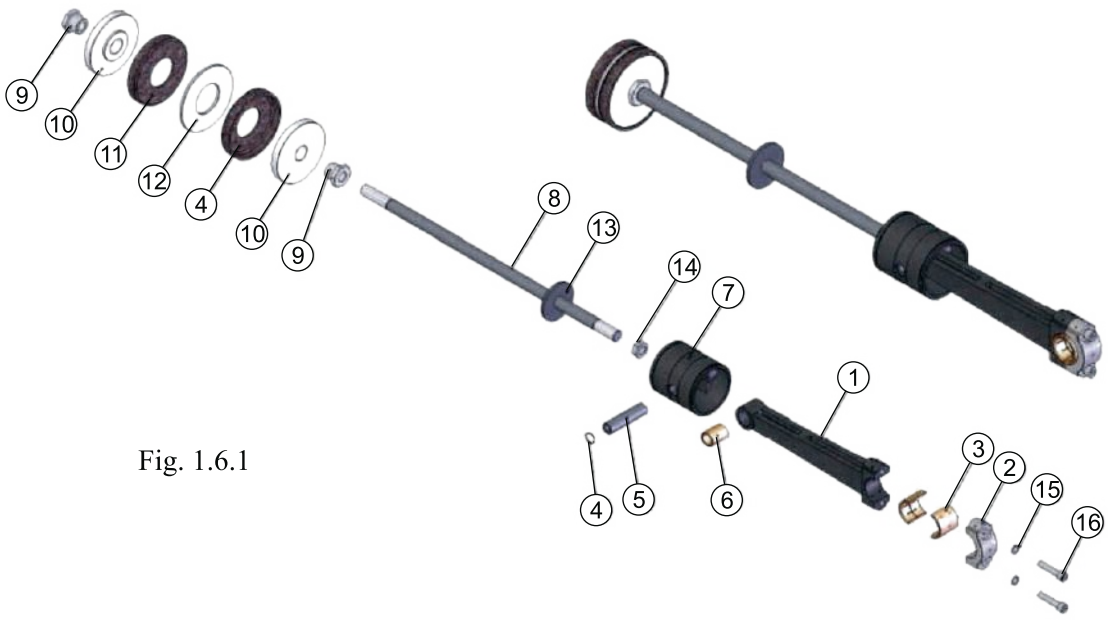


Fig. 1.6.1

Piston Assy.

Item No.	Part Name	Part No.	Qty.	Material
1	CONNECTING ROD	RP - WP - 45	1	S.G IRON
2	CONNECTING ROD UPPER HALF	RP - WP - 46	1	S.G IRON
3	CONNECTING ROD BUSH	RP - WP - 47	2	BRASS
4	INTERNAL CIRCLIP DIA.	RP - WP - 48	1	SS
5	GUDGEON PIN	RP - WP - 49	1	EN-8
6	CONNECTING ROD BUSH SMALL	RP - WP - 50	1	BRASS
7	PISTON	RP - WP - 51	1	S.G IRON
8	PISTON SHAFT	RP - WP - 52	2	S S 202
9	PISTON LOCK NUT	RP - WP - 53	2	BRASS
10	PISTON BODY	RP - WP - 54	2	NYLON
11	PISTON COLLAR	RP - WP - 55	1	LEATHER
12	INTERMEDIATE DISC	RP - WP - 56	1	NYLON
13	RUBBER DISC FOR SHAFT	RP - WP - 57	2	RUBBER
14	HEX LOCK NUT 1-1/8" x 7 TPI	RP - WP - 58	2	G r 8.8
15	SPRING WASHER M14	RP - WP - 59	4	MS
16	ALLEN BOLT M14 x 70	RP - WP - 60	4	G r 8.8

Pump Body Assy.

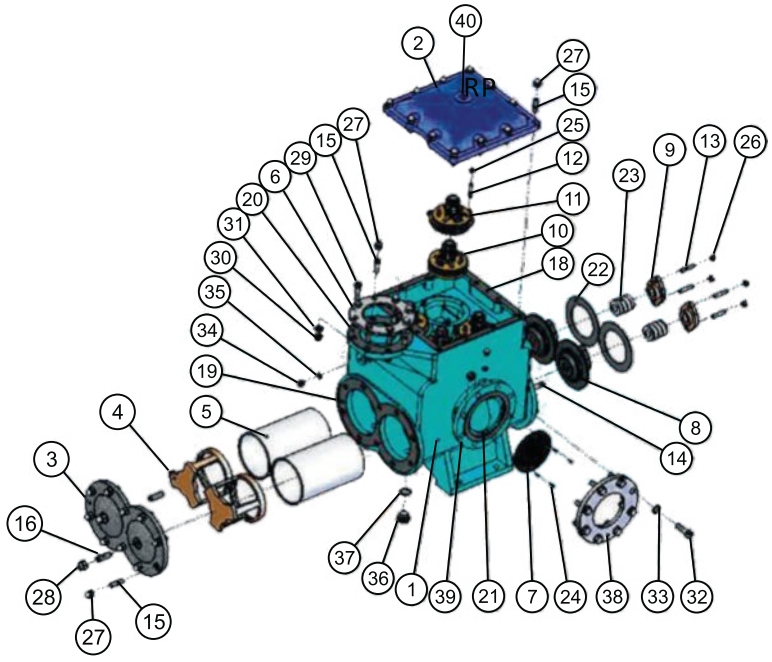


Fig. 1.7.1

Pump Body Assy.

Item No.	Part Name	Part No.	Qty.	Material
1	PUMP BODY	RP - WP - 61		C. I
2	DISCHARGE VALVE COVER	RP - WP - 62	1	ALUMINIUM
3	CYLINDER COVER	RP - WP - 63	1	C. I
4	BRASS CAGE	RP - WP - 64	2	BRASS
5	CYLINDER LINER	RP - WP - 65	2	S.S
6	DISCHARGE FLANGE	RP - WP - 66	1	,.S
7	FILTER PLATE	RP - WP - 67	1	
8	STUFFING BOX	RP - WP - 68	2	S.G. IRON
9	GLAND	RP - WP - 69	2	BRASS
10	SUCTION VALVE ASSEMBLY (Fig. 5.1.1)	RP - WP -		
11	DISCHARGE VALVE ASSEMBLY (Fig. 5.2.1)	RP - WP -		
12	STUD M10 x 62	RP - WP - 70	13	S.S
13	STUD M12 x 62	RP - WP - 71	4	S.S
14	STUD M16 x 64	RP - WP - 72	10	S.S
15	STUD M16 x 58	RP - WP - 73	26	S.S
16	STUD M20 x 2.5 x 68	RP - WP - 74	2	S.S
17	B.S.P. PLUG 1" x 3/8"	RP - WP - 75	1	
18	DISCHARGE VALVE COVER RUBBER	RP - WP - 76	1	RUBBER
19	CYLINDER COVER RUBBER	RP - WP - 77	1	RUBBER
20	DISCHARGE FLANGE RUBBER	RP - WP - 78	1	RUBBER
21	SUCTION FLANGE RUBBER	RP - WP - 79	1	RUBBER
22	RUBBER GASKET FOR STUFFING BOX	RP - WP - 80	2	RUBBER
23	GLAND ROPE	RP - WP - 81	3	
24	ALLEN BOLT M5 x 16	RP - WP - 82	4	G r 8.8
25	HEX NUT M10	RP - WP - 83	24	G r 8.8
26	HEX NUT M12	RP - WP - 84	4	G r 8.8
27	DOME NUT M16	RP - WP - 85	27	S S 304
28	DOME NUT M20	RP - WP - 86	2	S S 304
29	HEX BOLT 5/8" x 2.5"	RP - WP - 87	4	G r 8.8
30	HEX NUT 5/8"	RP - WP - 88	4	G r 8.8

Pump Body Assy.

Item No.	Part Name	Part No.	Qty.	Material
31	WASHER 5/8"	RP - WP - 89	4	M.S
32	HEX BOLT 3/4" x 2.5"	RP - WP - 90	8	G r 8.8
33	WASHER 3/4"	RP - WP - 91	8	M.S
34	PLUG 3/8" BSP	RP - WP - 92	2	M.S
35	DOWTY WASHER 3/8" BSP	RP - WP - 93	2	M.S
36	B.S.P. PLUG 1"	RP - WP - 94	4	M.S
37	DOWTY WASHER 1" BSP	RP - WP - 95	4	M.S
38	SUCTION FLANGE1	RP - WP - 96	1	M.S
39	HEX NUT 3/4"	RP - WP - 97	8	G r 8.8
40	PLUG (DISCHARGE COVER)		1	
41	TOPPER		2	SGI
42	VIRBRATION PAD OF PUMP FOR CANOPY BASE			

TECHNICAL DATA

Technical Specifications	
Bore Diameter	174mm
Stroke	215mm
No. of pistons	2
Displacement per stroke (In Lit.)	5.11Lit.
Piston Type	Double Acting
Electric Motor Power Required Power	10 H.P.
Electric Motor Rpm-Pump Pulley	360 rpm
Pulley Ratio	0.25
Gear Ratio	0.166
Pump (Crank Shaft) Rpm	60 rpm
Pump Efficiency	Up to 90%
Max. Discharge capacity	90 m^3/h
Suction and Discharge Size	150mm

TECHNICAL DATA

Technical Specifications	
Max. Suction	9.0 m (27ft.)
Max. Delivery Head	27 m
Max. Suction Pressure	0.9 bar
Suction Flange Mounting	8 Holes Φ23, P.C.D. 242 (See fig. 6.1.1)
Discharge Flange Mounting	8 Holes Φ19, P.C.D. 210 (See fig. 6.1.1)

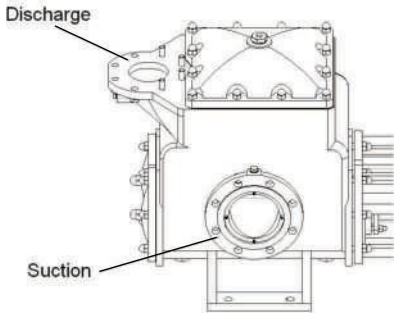


Fig. 2.1.1

Outline Sketch of Pump Assembly

Overall Dimensions of Pump

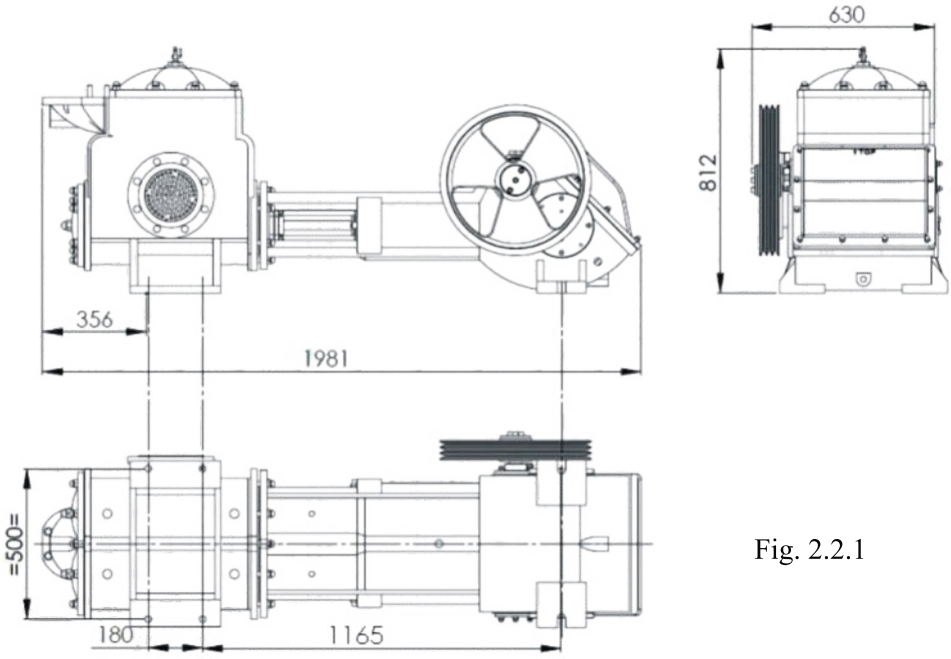
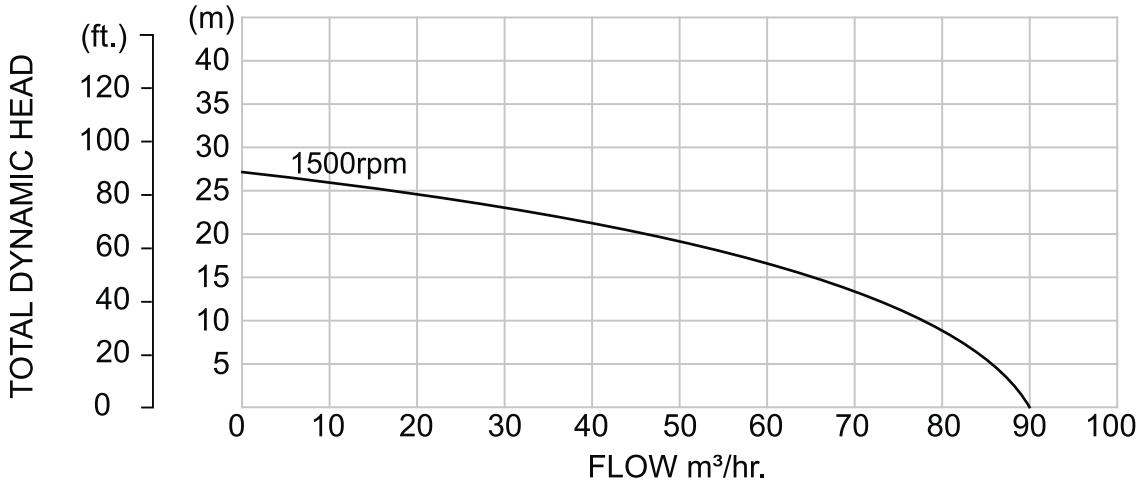


Fig. 2.2.1

PERFORMANCE CURVE



2.3.1

DIESEL ENGINE TECHNCIAL DATA

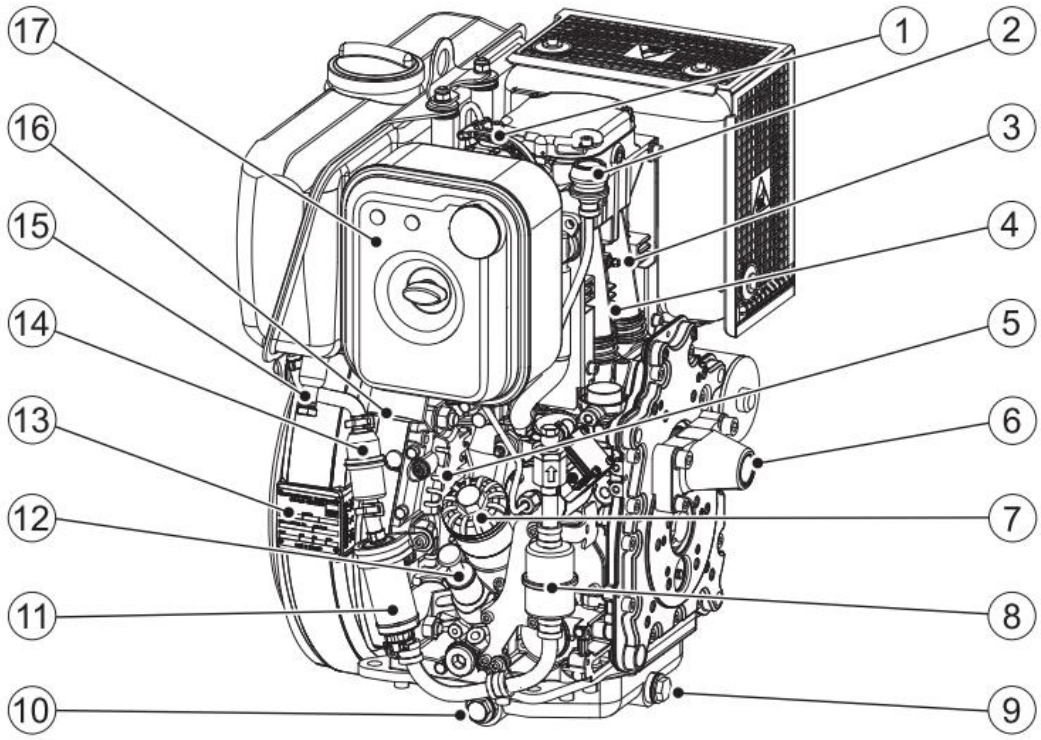
MAKE : HATZ
MODEL : 1D90E

Type		**1D90E**
Model		S, Z
Type		Air-cooled, four stroke diesel engine
Combustion system		Direct injection
Number of cylinders		1
Bore/Stroke	mm	104 / 85
Displacement	cm^3	722
Engine oil consumption (after running-in period)	Approx.	1 % of fuel consumption, pertaining to full load
Engine oil pressure at oil temperature of 80–120 °C	Min.	0.6 bar at 850 rpm
Sense of rotation		When viewing flywheel: left
Permissible inclination [1)]	Max.	25°
Tappet clearance at 10–30 °C inlet/outlet		0.30
Weight Model **S** Model **Z**	Approx. kg	 107 109
Battery capacity	Max.	12 V – 88 Ah / 640 A (EN) / 700 A (SAE)
Model **S**: normal counter balance Model **Z**: additional counter balance		

[1)] The values apply to continuous operation in any direction.

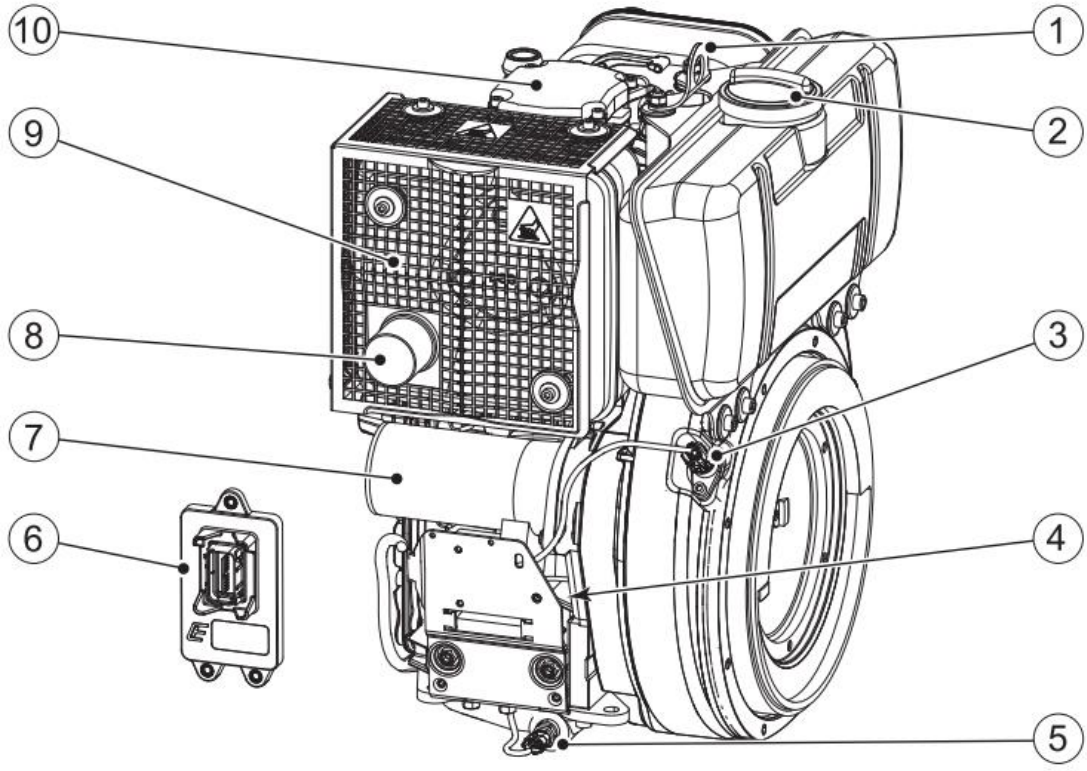
ENGINE OVERVIEW

Intake side components



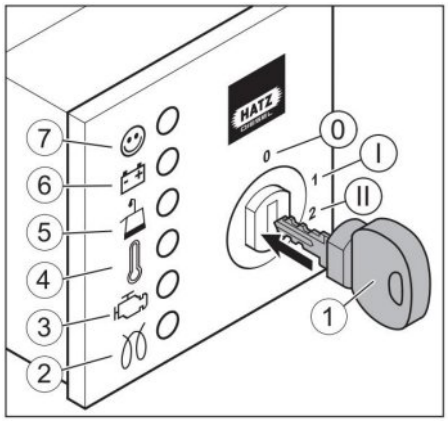
1 Decompression lever
2 Air filter maintenance indicator (option)
3 Temperature switch4 Coolant air outlet
5 Intake opening for cooling air
6 Guide sleeve for starting handle (in model with emergency hand start system)
7 Oil filter (option)
8 Main fuel filter
9 Oil drain screw (front)
10 Oil drain screw (side)
11 Electric fuel pump
12 Oil filling opening and dipstick
13 Engine type plate
14 Fuel pre-filter
15 Water separator
16 Intake opening for combustion air
17 Dry air filter

Exhaust side components (standard model)



1 Lifting eye
2 Fuel cap
3 Crankshaft speed sensor
4 Voltage controller
5 Oil temperature sensor
6 Engine control unit
7 Starter
8 Exhaust pipe (exhaust outlet)
9 Silencer with contact protection
10 Cylinder head cover

HATZ instruction box (Overview)



1 Starting key
2 Pre-glow indicator (option)
3 Engine fault
4 Engine temperature indicator
5 Oil pressure indicator
6 Charge control
7 Operating indicator

Ignition lock
0 Off
I Operation
II Start

Symbol	Meaning
	Operating indicator Lights up during operation when there is no engine fault.
	Charge control Fault in the alternator or alternator charging circuit. The battery is no longer charged. Eliminate the fault immediately.
	Oil pressure indicator Engine oil pressure too low. Danger of engine damage. Stop the engine immediately and check the oil level (see chapter *7.5 Check the oil level, page 43*). Contact the HATZ service if the oil level is correct.
	Engine temperature display Engine temperature is impermissibly high. Danger of engine damage. Switch off the engine immediately! For details of troubleshooting, see chapter *9.1 Troubleshooting, page 71*.
	Engine fault This indicator is lights up steadily or flashes if there are engine faults. For details on troubleshooting measures, see *9.2 Flash code table for engine faults, page 75*. Depending on the engine specification, the engine controller reacts as follows in case of a malfunction: ▪ **Emergency operation** The engine switches to emergency operation. In this situation, the engine power is reduced or the maximum speed is limited. The engine malfunction indicator lights up. ▪ **Engine stop** The engine switches off automatically. The engine malfunction indicator flashes. ▪ **Warning lamp** Only the engine malfunction indicator calls attention to a malfunction.
	Pre-glow indicator Lights at temperatures below 0 °C. Start the engine after the indicator has gone out.

GENERAL MAINTENANCE INSTRUCTIONS

- Maintenance tasks may only be performed by trained personnel.
- Accident prevention measures must be in accordance with the local accident prevention regulations.
- Perform setting and maintenance work at the specified intervals.
- Replace defective machine parts as soon as possible.
- Always wear personal protection equipment.
- Only use fully functional tools.
- Installation of unsuitable spare parts can lead to problems. We cannot accept liability for direct damage or secondary damage that results from this. We therefore recommend the use of Hatz original spare parts.
- Closely adhere to the maintenance conditions prescribed in this manual.
- Only make changes to the machine in agreement with the manufacturer.
- Only perform maintenance work when the engine is switched off.
- Protect the starting key from unauthorized access.
- Disconnect the negative battery terminal before carrying out maintenance work.
- Adhere to legal regulations when handling and disposing of used oil, filters, and cleaning agents.
- After completing maintenance work, check that all tools, screws, aids, and other objects are removed from the machine, and that all safety equipment has been replaced.
- Before starting, ensure that no persons are located in the danger zone of the engine or machine.

Performance of maintenance work

The entire machine is designed to be maintenance friendly. Parts that require maintenance are easily accessible.

- Perform maintenance work faithfully at the specified intervals to prevent premature wear of the machine.
- Follow the notice and warning labels on the machine.
- Always retighten screw connections loosened during maintenance work.
- After the necessary maintenance and repair work is completed, perform a function test (test run).
- For maintenance work that is not listed and described in the maintenance documentation, please contact your nearest HATZ service station.

	⚠ CAUTION
	**Danger of injury from ignoring the maintenance instructions.** ▪ Only perform maintenance work when the engine is switched off. ▪ Protect the starting key from unauthorized access. ▪ Disconnect the negative battery terminal. ▪ When the maintenance work has been completed, ensure that all tools are removed from the machine.

MAINTENANCE PLAN

Daily Checks

Symbol	Interval	Activity/check
8-15h	Every 8–15 operating hours or every day before starting	Check the oil level
		Check the air filter maintenance indicator
		Check the intake area of the combustion air
		Checking the cooling air area

Routine Maintenance

Symbol	Maintenance interval	Maintenance step/check
	Weekly	Check the water separator
250h	Every 250 operating hours or every 12 months	Diagnosis of engine management[1) 2)] (to be performed by trained technicians)
		Update of the engine control unit[2) 3)] (to be performed by trained personnel)
		Change the engine oil[2)]
		Check and adjust the tappet clearance[2)]
		Clean the cooling air area[2)]
		Check the screw connections[2)]
		Change the fuel prefilter and main fuel filter[2) 4)]
		Maintain the dry air filter[2)]
500h	Every 500 operating hours	Clean the diesel particulate filter (DPF)[5)] (to be performed by trained technicians)
	Every 1500 operating hours	Change the diesel particulate filter (DPF)

1) engine control module continuously evaluates the engine relevant data during operation. If an engine fault or deviations from the set points occur, these data are written to the error memory. Stored data can be read out and evaluated for fault diagnostics by a Hatz service partner using the Hatz Diagnostic Software HDS². In this way, faults can be detected and eliminated early on or preventative maintenance can be performed.
2) Maintenance according to the maintenance interval or after 12 months whichever comes first.
3) The engine control unit can only be updated using the Hatz diagnostic software HDS . The update installs extensions and improvements of the control software.
4) The interval at which maintenance work should be performed on the fuel filter depends on the cleanliness of the fuel in use and may need to be shortened to 150 operating hours.
5) Only for model with diesel particulate filter Hatz offers the EasyClean cleaning program for overhauling the diesel particulate filter.
For more information, see https://parts.hatz.com/service/easyclean/

TROUBLESHOOTING

General troubleshooting notes
If the cases listed below have been worked through but the fault continues to persist, please contact your nearest Hatz service station.

The engine fault indicator on the HATZ instrument box lights up during op- eration.

Possible causes	Remedy
Various errors in different assemblies.	Use the flash code table to identify and eliminate errors.

The engine does not start or is difficult to start, but can be turned easily as usual

Possible causes	Remedy
The tank ran out of fuel during operation.	Add fuel.
Fuel filter is clogged.	Change the fuel filter.
Electrical fuel pump is not working.	Check the cabling.
Injection nozzle is not functional.	Contact HATZ service.
Insufficient compression:	
▪ Wrong tappet clearance.	Check the tappet clearance and adjust if necessary.
▪ Cylinder and/or piston ring wear.	Contact HATZ service.
Model with diesel particulate filter:	
Diesel particulate filter is clogged.	Contact HATZ service.

At low temperatures (engine does not start)

Possible causes	Remedy
Pre glow system (option) defective.	Contact HATZ service.
Fuel gelled due to insufficient cold resistance.	Check whether the fuel that emerges from the fuel feed line is clear and not cloudy. If the fuel has gelled, either thaw the engine or drain the entire fuel supply system, and change the fuel filter. Fill with a temperature-resistant fuel mixture.
Oil is too viscous and causes a too low starter speed.	Change the engine oil. Add engine oil with a suitable viscosity class.
Insufficiently charged battery.	Check the battery and contact the service center if necessary.
Machine is not uncoupled.	If possible, separate the engine from the machine by uncoupling it.

The starter does not switch on and the engine does not turn.

Possible causes	Remedy
Irregularities in the electrical equipment:	
Battery and/or other cable connections are incorrectly connected.	Check the electrical equipment and its components or contact Hatz service.
Cable connections are loose and/or oxidized.	
Battery is defective and/or not loaded.	
Defective starter.	
Defective relay, monitoring elements etc.	

Engine switches off spontaneously during operation

Possible causes	Remedy
Engine malfunction (indicator for engine malfunction flashes).	Use the flash code table to identify and eliminate errors.
The tank ran out of fuel during operation.	Fill with fuel.
Fuel filter is clogged.	Change the fuel filter.
Electrical defects.	Check the wiring or contact HATZ service.
Mechanical faults.	Contact HATZ service.

The engine loses power and speed

Possible causes	Remedy
▪ The engine is running in emergency mode due to a malfunction (engine malfunction indicator is lit)	Switch off the engine and use the flash code table to identify and eliminate errors.
▪ The tank ran out of fuel during operation.	Add fuel.
▪ Fuel filter is clogged.	Change the fuel filter.
▪ Inadequate tank venting.	Ensure that the tank is sufficiently vented.
Model with diesel particulate filter:	
Diesel particulate filter is clogged.	Contact HATZ service.

The engine loses power and speed, and black smoke emerges from the exhaust

Possible causes	Remedy
Dirty air filter unit.	Check the degree of dirt contamination of the air filter, and clean or renew if necessary.

Possible causes	Remedy
Tappet clearance not OK.	Adjust the tappet clearance.
Injection nozzle not OK.	Contact HATZ Service.
Model with diesel particulate filter:	
In engines with a diesel particulate filter, black smoke only comes out of the exhaust pipe if the diesel particulate filter is faulty.	Contact HATZ Service.

The engine is unexpectedly running at a low speed. It is not possible to increase the engine speed.

Possible causes	Remedy
Engine malfunction (indicator for engine malfunction is lit).	Use the flash code table to identify and eliminate errors.

Engine becomes very hot. Indicator lamp for engine temperature (option) lights up

Possible causes	Remedy
Too much engine oil in the engine.	Drain the engine oil to the upper mark of the dipstick.
Inadequate cooling:	
▪ Contamination in the entire area of the cooling air guides.	Clean the cooling air area.
▪ Incompletely closed air guide parts.	Check the air guide parts and shafts for completeness and good sealing properties.

Unusual noises in the exhaust area

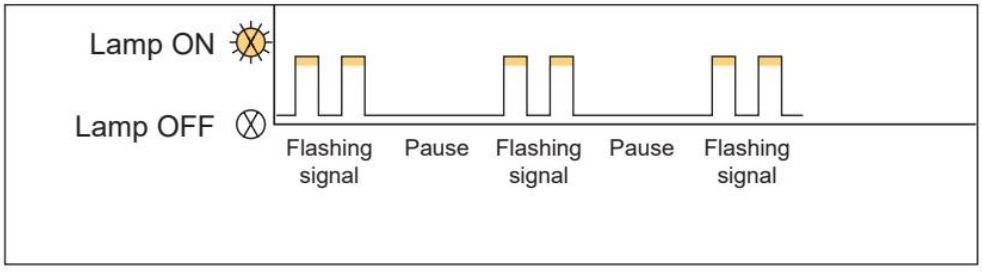
Possible causes	Remedy
Model with diesel particulate filter:	
Diesel particulate filter is faulty.	Contact HATZ service.

Flash Code table for engine faults

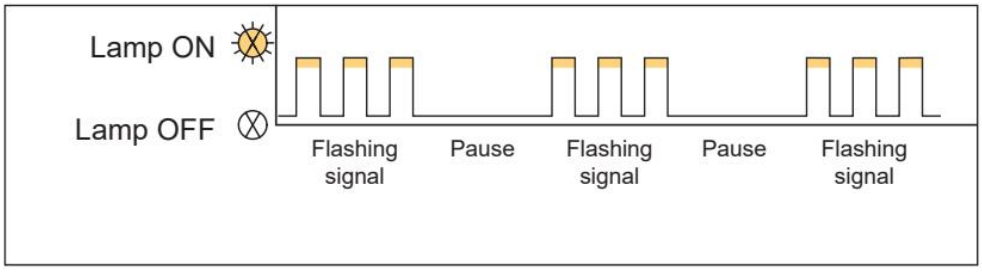
If an engine malfunction occurs, the indicator for "Engine malfunction" lights up (see Explanation of symbols, chapter 5.2 HATZ instrument box). If the engine is switched off and the starting key is set to "I", a flashing signal is output on the engine control indicator . The table below shows possible flashing signals, their meaning, as well as measures for remedies. If the listed fault cases have been worked through but the fault continues to persist, please contact your nearest HATZ Service.

The diagrams show the structure of a flash code using flash codes 2 and 3 as examples:

Flash code 2



Flash code 3



The light flashes three times in a row for each error. If two or more errors are active, these are flashed immediately afterwards. To repeat, turn the starting key to position "0" and then back to position "I". The flash code is deleted au- tomatically if the error does not reoccur within two operating cycles (= start/ operation/stop).

Flash code table

Flashing signal	Possible causes	Remedy
1 *Area affected:* **Engine oil pres-sure**	Engine oil pressure too low.	Check the oil level.

Flashing signal	Possible causes	Remedy
2 *Area affected:* **Overtemperature**	Engine temperature is too high.	Clean the cooling air area.
	Oil temperature too high.	Reduce the engine load.
3 *Area affected:* **Charge control**	Faulty voltage controller.	Contact HATZ service.
	Battery voltage too high.	Contact HATZ service.
	Battery voltage too low.	Check the electrical equipment and its components or contact Hatz service.
	Speed control is faulty.	Contact HATZ service.
	Supply voltage for sensors is faulty.	Check the cabling.
4 *Area affected:* **Analog setpoint or CAN communication**	Cabling is faulty.	Check the cabling.
	Speed control is faulty.	Contact HATZ service.
5 *Area affected:* **Ambient pressure sensor**	Sensor is faulty.	Contact HATZ service.
6 *Area affected:* **Maintenance interval indicator**	The 250-hour service is due.	Perform all maintenance work as per the mainteance plan.After the maintenance work is completed, reset the maintenance interval indicator using the Hatz Diagnostics Software HDS² or HDS² light. If necessary, contact Hatz service.
7 *Area affected:* **Fuel pump, glow plug, injection pump**	Cabling is faulty.	Check the cabling.
	Fuel pump, glow plug or injection pump is faulty.	Contact HATZ service.
8 *Area affected:* **Speed sensor system**	Cabling to the crankshaft speed sensor is faulty.	Check the cabling.
	Crankshaft speed sensor is faulty.	Contact HATZ service.
	Engine speed is impermissibly high.	Contact HATZ service.
9 *Area affected:* **Control unit**	Cabling to the control unit is faulty.	Check the cabling.
	Faulty control unit.	Contact HATZ service.

⚠ CAUTION

Danger of injury from ignoring the maintenance instructions.

- Only perform maintenance work when the engine is switched off.
- Protect start-up devices (crank handle, recoil start or starting key) from unauthorized access.
- For engines with a starter: Disconnect the negative battery terminal.
- When the maintenance work has been completed, ensure that all tools are removed from the machine.

⚠ CAUTION

Danger of burns.

There is a danger of burns when working on a hot engine.

- Let the engine cool before maintenance.

NOTES

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