



REVERSIBLE COMPACTOR

MVH-308

MVH-408

MVH-508

SERIES

SERVICE MANUAL


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
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1. INTRODUCTION

- For correct operation, maintenance and service of Reversible Compactor, please read the separate operation manual before your work for your safe work.
- For the handling of engine, please read the separate engine operation manual and maintenance/service manual.
- This service manual explains the maintenance standard and how to disassemble and assemble for Reversible Compactor. Please read this service manual for a better understanding of the maintenance standard, the structure and function of each part.
- To improve the performance and quality of this machine, the change might be made in this machine without notice. If you have any questions, please contact with our distributor. For parts list, Mikasa WEB parts list is available at our homepage (<http://www.mikasas.com/>).

2. WARNING SIGNS

The triangle shaped  marks used in this manual and on the decals stuck on the main body indicate common hazards. Be sure to read and observe the cautions described.

 Warning labels indicating hazards to humans and to equipment.	
 DANGER	Denotes an extreme hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, is likely to result in serious injury or death.
 WARNING	Denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in serious injury or death.
 CAUTION	Denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury to people and may damage or destroy the product.
CAUTION (without at )	Failure to follow the instructions may result in damage to property.

3. CAUTIONS FOR MAINTENANCE TO SECURE SAFETY

3.1 Work Site

DANGER

- Do not work indoor or inside a tunnel where ventilation is poor. The emission from the engine contains toxic gas such as carbon monoxide, and it is very dangerous if this toxic gas and dust are inhaled. Also, to improve ventilation, please keep a proper distance between this machine and a building when operating the machine.



CAUTION

- Maintenance should be done in a place with a flat and hard surface to keep the machine stable. Also, do maintenance at sufficient work space.
- Before maintenance work, clean the floor. Oil on the floor, in particular, becomes the cause of falling accident.
- For maintenance work, have sufficient lighting in the work site. A portable lamp used to illuminate the work area has to be protected by wire. In case if the lamp is broken, fuel and oil might ignite.
- To prepare for an accident, please have emergency medical supplies and fire extinguisher ready at an easily accessible area.



3.2 Clothes And Protective

⚠ CAUTION

- To work safely, wear work clothes of appropriate size, and use suitable protective gear such as helmet and safety shoes. The work clothes that do not fit the body size might result in unpredicted injury because the clothes easily get caught by rotating part of the machine.



3.3 Cautions During Refueling

⚠ CAUTION

- When adding fuel
 - Always refuel in the well ventilated area.
 - Always refuel after the engine stopped and cooled sufficiently.
 - Select a flat surface location away from flammable material and Do not overfill the tank. If spilled fuel, wipe it off well.
 - Never put fire near the refueling area. (Never refuel while smoking.)
- If fuel is filled to the top, it might overflow, and is dangerous.
- After refueling, securely tighten the tank cap.

3.4 Prevention Of Burn And The Accident Of Getting Caught

⚠ WARNING

- Start your work after the machine temperature drops. Especially, the muffler gets very hot, and it will pose a danger of burn accident. Also, engine and engine oil as well as vibrator become hot. Be careful not to get a burn.
- If maintenance work is started with the engine running, injury might occur because you might get caught by the rotating part such as pulley and V-belt. Always stop the engine before maintenance.
- Before maintenance work, remove the starter key of the engine.
- Before starting maintenance, always remove the minus (-) terminal of the battery.



3.5 Tools And Equipment

⚠ WARNING

- When lifting the machine body and the engine, always use a crane. When lifting the machine and the engine, follow the cautions listed below. If the machine or the engine is dropped, a serious accident might occur.
- To operate a crane, a crane handling qualification is required. Have someone qualified to handle and operate a crane do this work.
- Before lifting, check the parts (especially, hook and anti-vibration rubber) of this machine for damage and loosening/lack of bolts to secure safety.
- Before lifting, stop the engine and shut the fuel cock.
- Use sufficiently strong wire rope.
- For lifting, use only the lifting hook. Do not use other part for lifting.
- Never allow anyone or any animal come under the lifted machine.
- For safety, do not lift to the height more than necessary.
- Use an appropriate tool. If the tool that is not suitable for the part is used, not only the damage on the part, but also unpredicted accident might occur.



3.6 Handling Of Battery

⚠ WARNING

- Before starting maintenance, always remove the minus terminal of the battery. If short circuit occurs, ignition might occur.
- The battery gas might become a cause of explosion. Do not put fire nearby.
- Especially, during charging, flammable gas is released. Do not put fire nearby.
- The battery fluid is very toxic. Be careful when handling. If the battery fluid gets on your skin, eye or on your clothes, wash it off with plenty of water, then see a doctor.



3.7 Use Of Genuine Parts And Appropriate Oil And V-belt

CAUTION

- Always use genuine parts.
If inappropriate parts are used, not only it will shorten the machine life, but it might lead to unpredicted accident.

3.8 Tightening Torque Of Bolts And Nuts

WARNING

- Tighten bolts and nuts with the tightening torque specified in this maintenance manual.
Over tightening torque and lack of tightening torque not only affect the machine life, but also might occur unexpected accident.

3.9 Disposal Of Waste Material

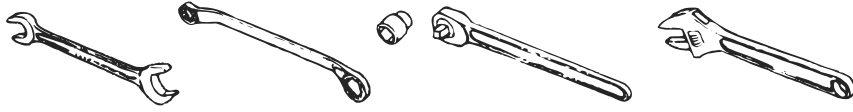
CAUTION

- Unnecessary engine oil, hydraulic oil and fuel should be kept in a container. Never dump it on the ground or pour into the sewage system such as side ditch.
- For disposal of unnecessary engine oil, hydraulic oil and fuel, follow the law and other regulations.

4. TOOLS

1. Wrench 10mm 12mm 13mm 14mm 17mm 19mm 22mm 24mm 27mm

Offset wrench/Socket wrench/Adjustable wrench



2. Hexagonal wrench 3/16inch

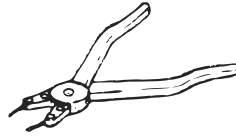
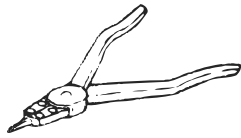
5mm 8mm 10mm 14mm



3. Plier



4. External snap ring plier/Internal snap ring plier(bent type can be also used)



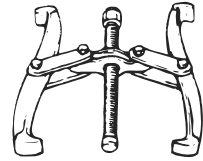
5. Screwdriver, flat and cross



6. Metal and plastic hammers



7. Pulley puller



8. Screw lock agent
(Locktite 242, 271 and 638)



9. Torch burner



10. Liquid gasket



11. Pressing machine

12. Special jig for hand pump disassembly and assembly

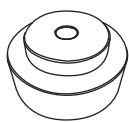


9840-10060
Spring compression tool

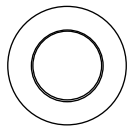


9840-10040
Disassembling tool

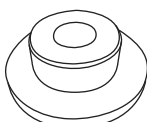
13. Special jig for vibrator disassembly and assembly



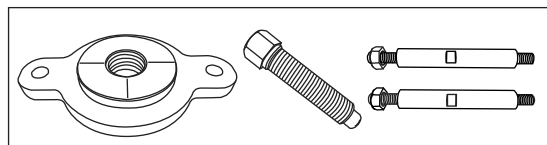
Bearing
insertion
cup



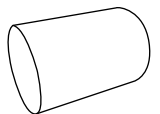
Bearing
insertion
ring



Bearing
insertion
holder



Bearing insertion puller



9840-10070
Bearing
remover

9849-10011
Bearing insertion jig (driven shaft and drive one) set

5. INSPECTION PROCEDURE

5.1 Appearance Check

- (1) Assembly condition of each component (bolt loosening, defective parts, etc.)
- (2) Damage on machine body
- (3) Oil check (oil level, dirtiness)
 - a. Engine oil (when shipped, SAE10W30) (For oil level, please see the table below.)
 - b. Vibrator oil
 - c. Hydraulic oil (forward/backward travel)
- (4) V-belt check (tension, scratch, crack, deterioration, etc.)
- (5) Anti-vibration rubber check (scratch, crack, setting, deterioration, etc.)

5.2 Operation Check

- (1) Engine
- (2) Engine speed check (Operating speed, idling speed)
 - Travel
 - a. Forward/backward travel switch check
 - b. Forward/backward travel speed check
- (3) Check for abnormal noise during operation

Standard torque table

Table 1

Screw diameter		The collar screws materials	
		Aluminum Aluminum type+Helisert	SS,FCD
M6	N·m	11.8 - 14.7	14.7 - 17.7
	Kgf·cm	120 - 150	150 - 180
	ft·lbf	8.7 - 10.8	10.8 - 13.0
M8	N·m	24.5 - 29.4	32.4 - 35.3
	Kgf·cm	250 - 300	330 - 360
	ft·lbf	18.1 - 21.7	23.9 - 26.0
M10	N·m	58.8 - 68.6	73.5 - 78.5
	Kgf·cm	600 - 700	750 - 800
	ft·lbf	43.4 - 50.6	54.2 - 57.9
M12	N·m	98.1 - 107.9	112.8 - 122.6
	Kgf·cm	1000 - 1100	1150 - 1250
	ft·lbf	72.3 - 79.6	83.2 - 90.4
M14	N·m	117.7 - 127.5	166.7 - 176.5
	Kgf·cm	1200 - 1300	1700 - 1800
	ft·lbf	86.8 - 94.4	123.0 - 130.2

Engine oil level table

Table 2

Model	MVH-308DSC MVH-308DSC-PAS	MVH-408DSC MVH-408DSC-PAS	MVH-308DSZ MVH-308DSZ-PAS	MVH-408DSZ MVH-408DSZ-PAS
Engine type	YANMAR L70V L70N	YANMAR L100V L100N	HATZ 1B30	HATZ 1B50
Capacity of Lubricant for Engine	1,050cc	1,600cc	1,100cc	1,500cc
Model	MVH-508DSC MVH-508DSC-PAS	MVH-308GE	MVH-308GH	MVH-408GH
Engine type	HATZ 1D81	ROBIN EX27	HONDA GX270	HONDA GX390
Capacity of Lubricant for Engine	2,000cc	1,050cc	1,050cc	1,100cc

6. SPECIFICATION

MODEL		MVH-308DSZ MVH-308DSZ-PAS	MVH-308DSY MVH-308DSY-PAS	MVH-408DSZ MVH-408DSZ-PAS
Main Dimensions				
Overall Length	mm	1540	1540	1570
Overall Height (Handle)	mm	1030	1030	1030
Overall Width	mm	445(595,745)	445(595,745)	500(650,800)
Compacting Board				
Width	mm	445(595,745)	445(595,745)	500(650,800)
Length	mm	860	860	900
Weight				
Operating Weight	kg	345(360,375)	341(356,371)	408(423,438)
Engine				
Manufacturer/Type		HATZ,1B30	YANMAR,L70N6	HATZ,1B50
Type Of Engine		Air-cooled 4-cycle diesel engine	Air-cooled 4-cycle diesel engine	Air-cooled 4-cycle diesel engine
Maximum Power	kw/min ⁻¹ PS/min ⁻¹	4.9/3300 6.7/3300	4.9/3600 6.7/3600	6.7/2500 9.1/2500
Set Engine Revolution	r.p.m	3350	3600	2350
Electric Start				
Performance				
Vibrating Frequency	Hz/VPM	73/4400	73/4400	73/4400
Centrifugal Force	kN/kgf	45/4600	45/4600	55/5600
Max. Traveling Speed	m/min	0~27	0~27	0~28
Hand Arm Vibration (Ahv)	m/sec ²	6.1	—	4.7

MODEL		MVH-408DSY MVH-408DSY-PAS	MVH-508DSZ MVH-508DSZ-PAS
Main Dimensions			
Overall Length	mm	1570	1600
Overall Height (Handle)	mm	1030	1070
Overall Width	mm	500(650,800)	650(800)
Compacting Board			
Width	mm	500(650,800)	650(800)
Length	mm	900	900
Weight			
Operating Weight	kg	407(422,437)	525(540)
Engine			
Manufacturer/Type		YANMAR,L100N2	HATZ,1D81
Type Of Engine		Air-cooled 4-cycle diesel engine	Air-cooled 4-cycle diesel engine
Maximum Power	kw/min ⁻¹ PS/min ⁻¹	7.0/3200 9.5/3200	8.9/2500 12.1/2500
Set Engine Revolution	r.p.m	3200	2350
Electric Start			
Performance			
Vibrating Frequency	Hz/VPM	73/4400	69/4150
Centrifugal Force	kN/kgf	50/5100	65/6600
Max. Traveling Speed	m/min	0~27	0~29
Hand Arm Vibration (Ahv)	m/sec ²	—	5.5

The number in parentheses is the dimension of the „extension plate(option)“ with „()“: MVH-308,408: (standard type, wide type)
MVH-508: (wide type)

MODEL		MVH-308GH	MVH-308GE	MVH-408GH
Main Dimensions				
Overall Length	mm	1540	1540	1570
Overall Height (Handle)	mm	1030	1030	1030
Overall Width	mm	445(595,745)	445(595,745)	500(650,800)
Compacting Board				
Width	mm	445(595,745)	445(595,745)	500(650,800)
Length	mm	860	860	900
Weight				
Operating Weight	kg	310(325,340)	307(322,337)	364(379,394)
Engine				
Manufacturer/Type		HONDA,GX270	ROBIN,EX27	HONDA,GX390
Type Of Engine		Air-cooled 4-cycle petrol engine	Air-cooled 4-cycle petrol engine	Air-cooled 4-cycle petrol engine
Maximum Power	kw/min ⁻¹ PS/min ⁻¹	6.3/3600 8.6/3600	6.6/4000 9.0/4000	8.7/3600 11.9/3600
Set Engine Revolution	r.p.m	3600	3600	3200
Electric Start		×	×	×
Performance				
Vibrating Frequency	Hz/VPM	73/4400	73/4400	73/4400
Centrifugal Force	kN/kgf	45/4600	45/4600	55/5600
Max. Traveling Speed	m/min	0~27	0~27	0~28
Hand Arm Vibration (Ahv)	m/sec ²	2.8	3.8	3.7

Remarks:

Vibration Level is in comply with EU Directive 2002/44/EC and the value is shown as 3 axis min vibration level.

Test course (Crushed gravel) is in comply with EN500-4.

The above values are subject to change in case that the machine is modified or/and the required regulations change.

*The number in parentheses is the dimension of the „extension plate(option)“ with.
 „()“: MVH-308,408: (standard type, wide type)
 MVH-508: (wide type)*

7. CAUTIONS BEFORE MAINTENANCE WORK

1. Disassembly and assembly of this machine, with inspection and change of vibrator oil included, should be done on a horizontal surface area. Before disassembly and assembly, understand well the normal assembly condition so that you will not make assembly error.
2. If oil seal, gasket, packing, O-ring or lock washer is disassembled, replace it with a new one each time.
3. The contact surface between vibrator case and vibrator top cover should be sealed with O-ring. (Clean the contact surface and be careful about O-ring position when assembling.)
4. When tightening bolts and nuts, tighten them according to the specified standard torque and applying the screw lock agent (Loctite, etc.). For bolts and nuts with no specification, refer to the "Tightening torque list". (When applying screw lock agent, degrease and clean the screw part with the brake cleaner, etc.)
Note) The bolts used on this machine are all of the right hand thread.
5. When disassembling and assembling, work in the maintenance shop without dirt and dust.

Tightening torque list (unit: kgf-cm, 1kgf-cm=9.80665N-cm)

		Thread diameter							
		6mm	8mm	10mm	12mm	14mm	16mm	18mm	20mm
Material	4T(SS41)	70	150	300	500	750	1,100	1,400	2,000
	6-8T(S45C)	100	250	500	800	1,300	2,000	2,700	3,800
	11T(SCM3)	150	400	800	1,200	2,000	2,900	4,200	5,600
	When the mating material is aluminum.	100	300~350	650~700	(Bolts used on the machine are all right-hand thread.)				

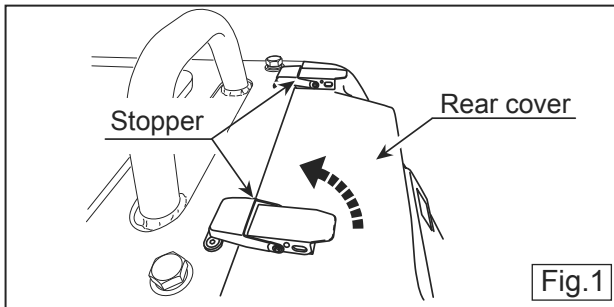
To change the unit to kgf-cm, convert with $1 \text{ N} \cdot \text{m} = 10.197 \text{ kgf} \cdot \text{cm}$.

6. When the bolts applied the screw lock agent (Loctite, etc.) are difficult to loosen, they loosen easily by heating them with a torch burner. Then, replace the heated bolt with a new one. It should be a specified high tension bolt (genuine parts).
7. Use correct tools correctly.
8. First of all, the machine with battery remove the minus terminal before starting disassembly. After assembly is done completely, install the minus terminal.

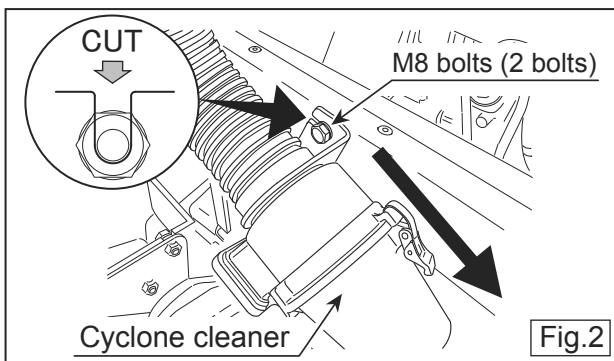
8. DISASSEMBLY AND ASSEMBLY

8.1 How To Remove The Battery

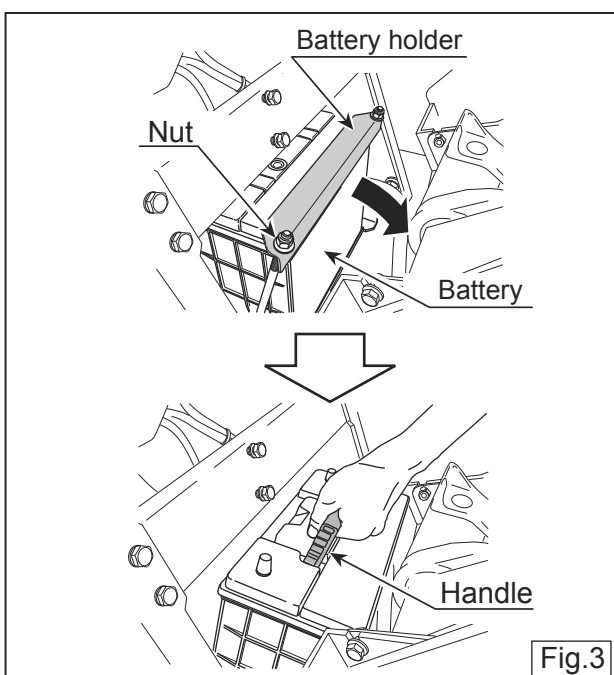
1. Remove the stopper at the two locations on the top portion of the rear cover to open the rear cover.(Fig.1)



2. Loosen, but not remove, the M8 bolts (2 bolts) used for cyclone cleaner attachment. Take out the cyclone cleaner downward.(Fig.2)



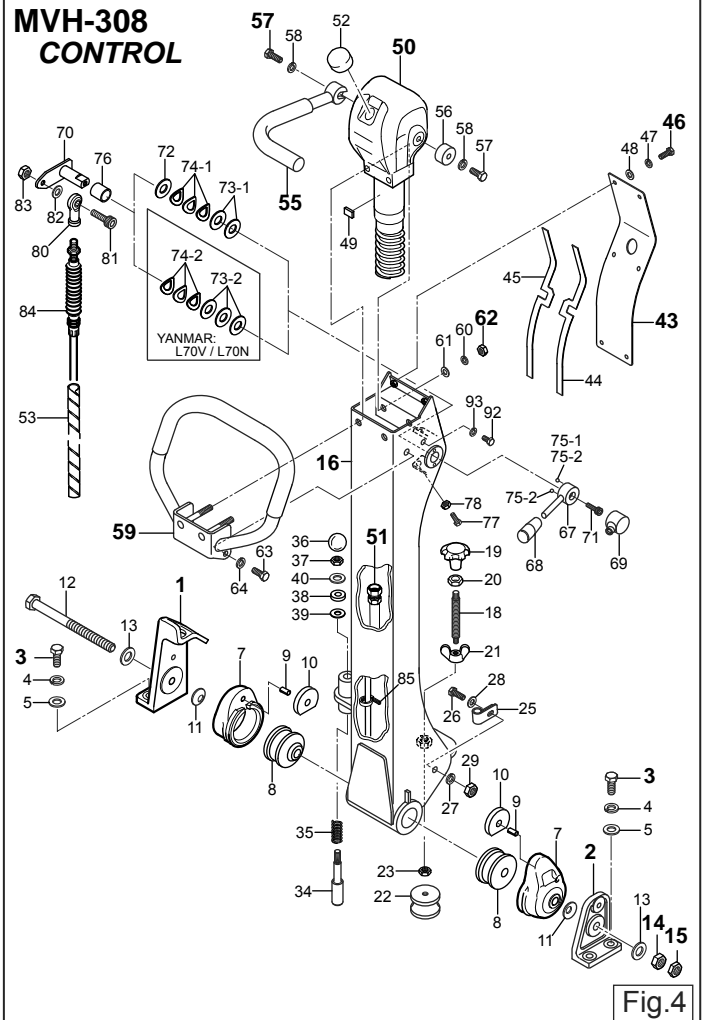
3. Take off the nuts and remove the battery holder. After tilting the battery backward, disconnect the battery terminal. When doing so, always disconnect the black terminal on the minus side first.
4. By holding the top surface handle, pull upward to remove the battery from the machine.(Fig.3)



CAUTION

Pay sufficient attention so that the battery terminal will not touch the frame.

8.2 Control Part



(1) Disassembly

CAUTION

Start your work after the temperature of hydraulic oil gets sufficiently lowered.

- a. Remove 6 bolts (46), then remove the handle cover (43).
- b. Remove a bolt (57), then remove the travel lever (55).
- c. Remove 2 bolts (63) and 2 nuts (62), then remove the handle grip (59).
- d. Remove the hydraulic hose (51) from hand pump (50), then remove the hand pump (50) from the handle (16). (Fig. 4)

CAUTION

After the hydraulic hose is removed, tighten the caps on both ends to prevent entry of dust.

e. Remove the wire terminal on engine side.

CAUTION

- Be very careful not to have your fingers get caught by the hand pump spring.
- Be very careful not to damage the wiring, when pulling out the hand pump.

f. Remove the hose clamp (33), then remove the hydraulic hose (51) from the cylinder on vibrator side. (Fig. 5)

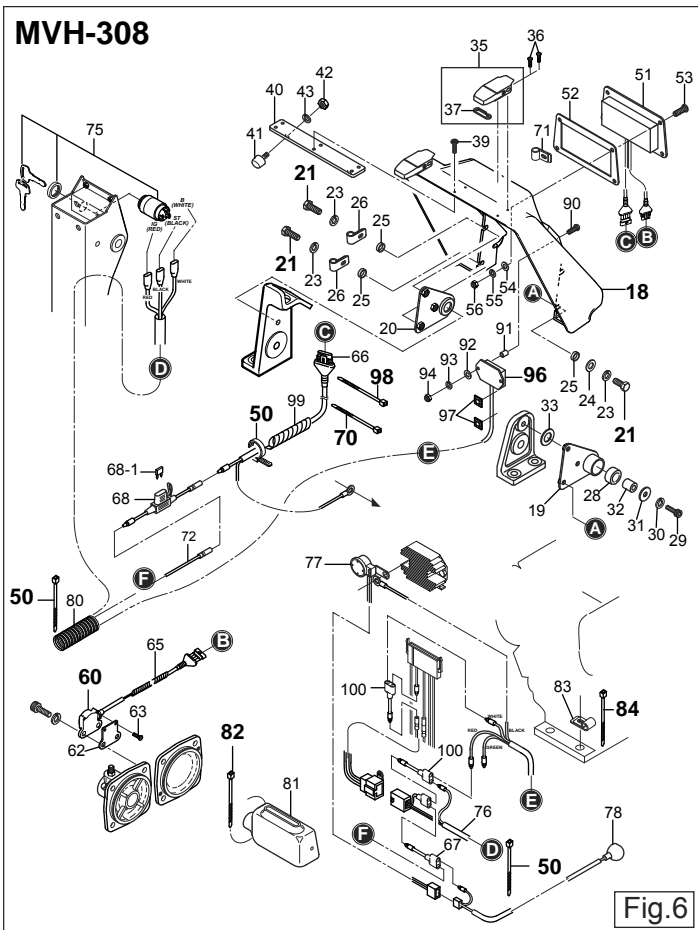
CAUTION

Before removing the hydraulic hose, clean up dirt and soil on its connection part.

Hose clamp (33) Hydraulic hose (51) Cylinder

Fig.5

- g. Remove the throttle wire on the engine.
- h. Remove the hour and tachometer (96) on the rear cover. (Fig. 6)
- i. Remove 6 bolts (21), then remove the rear cover (18). (Fig. 6)
- j. Remove 4 bolts (3), then remove the handle (16). (Fig. 4)



(2) Assembly

Assemble with the reversed procedure of disassembly, but be careful about the following points.

- Fix the wire (coupler) inside rear cover (18) with cable tie certainly. (Fig. 6)
- When installing the handle assembly to the engine base, tighten 4 bolts (3) for the handle brackets of right(1) and left(2) temporarily. Then after adjusting the handle operation with double nuts (14, 15), tighten 4 bolts (3) completely. (Fig. 4)
- Apply the grease to the shaft and washer.

CAUTION

Be very careful not to have your finger get caught by the hinge part.

For Inspection and Charge of the hydraulic oil, See the "9-8. Inspection & Change of Hydraulic Oil".

8.3 Main Body Part (Separation Of Engine Base And Vibrating Plate Assembly)

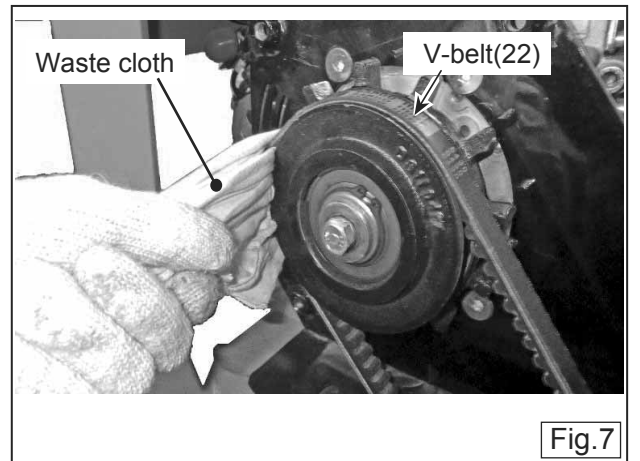
(1) Disassembly

- a. Remove 4 bolts (35), then remove the belt cover OUT (33). (Fig. 9)
- b. Remove the V-belt (22).

WARNING

When removing V-belt, after hanging the waste cloth on the V-belt, then remove the V-belt by rotating while pulling the waste cloth. Be very careful not to have your finger get caught.

In case of the V-belt have damage, it might be broken by the pulling force. Your body might damage due to this broken, so be very careful about level of pulling force.



For the machine with COMPAS II, acceleration sensor and clip (38) have to be removed.

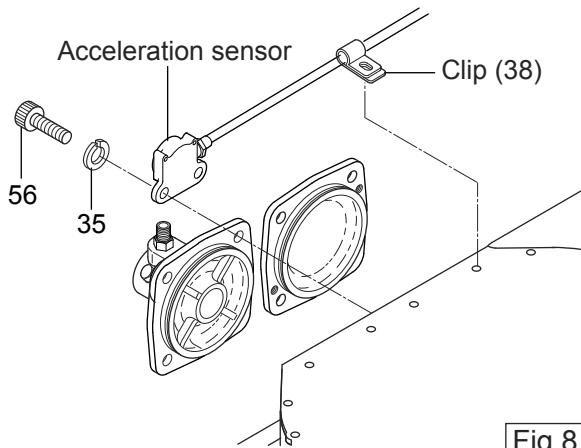


Fig.8

c. Remove 4 bolts of anti-vibration rubber that are fixing the engine base(1). then engine base and vibrating plate AY are separated by lifting the lifting hook on main body. (Fig. 9)

WARNING

To secure safety, check the no crack and no breakage on the guard hook, and check to tighten the bolts completely, before lifting the engine base.

Also, use the lifting wire which have sufficient strong. And use the lifting machine which have sufficient lifting capability.

**MVH-308
BASE AND ENGINE
(YANMAR: L70N, L70V)**

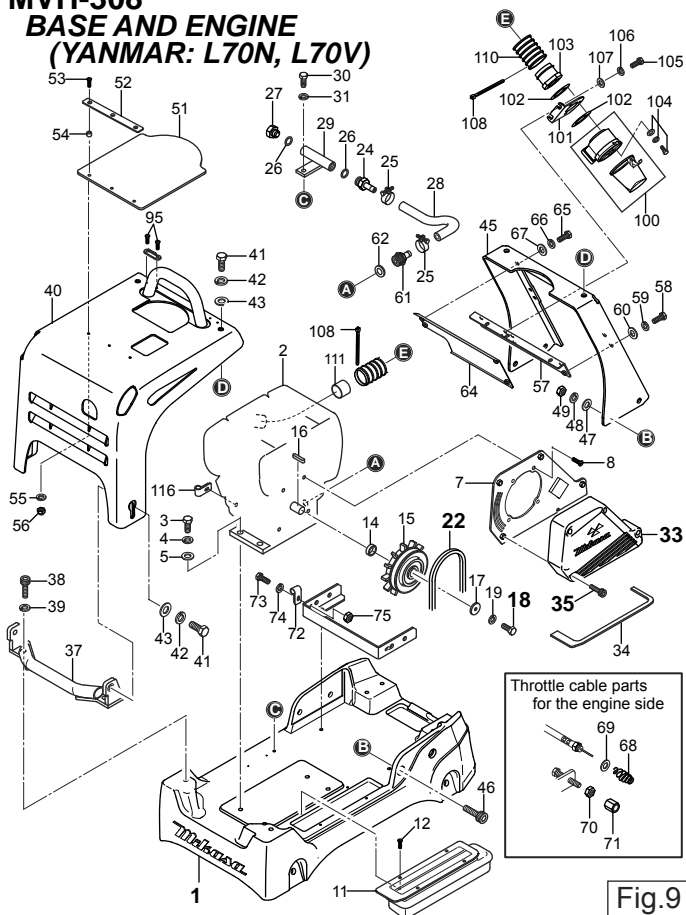


Fig.9

(2) Assembly

Assemble with the reversed procedure of disassembly, but be careful about the following points.

- Apply Loctite #243 to bolts and nuts for assembling anti-vibration rubber.
- Apply Loctite #243 to the all bolts for assembling the BASE AND ENGINE.
- When installing the clutch, put the shoe side of it to engine side.
- Use HDPF type V-belt for Mikasa genuine parts.

8.4 Vibrator Partcontrol

- During disassembly and assembly, be careful not to damage each part.
- Replace O-ring, oil seal, and packing with new one.

CAUTION

During disassembly and assembly of vibrator, be very careful not to have your fingers get caught by gear, eccentric rotator, and vibrator case.

(1) Disassembly (Fig.10)

- Remove 5 bolts (52), then remove the belt cover, lower (51).
- Remove a bolt (43), then remove the vibrator pulley (40).
- Remove 18 bolts that are fixing vibrator top cover, then remove the vibrator top cover from vibrating plate.

**MVH-308
VIBRATOR (With compaction sensor)**

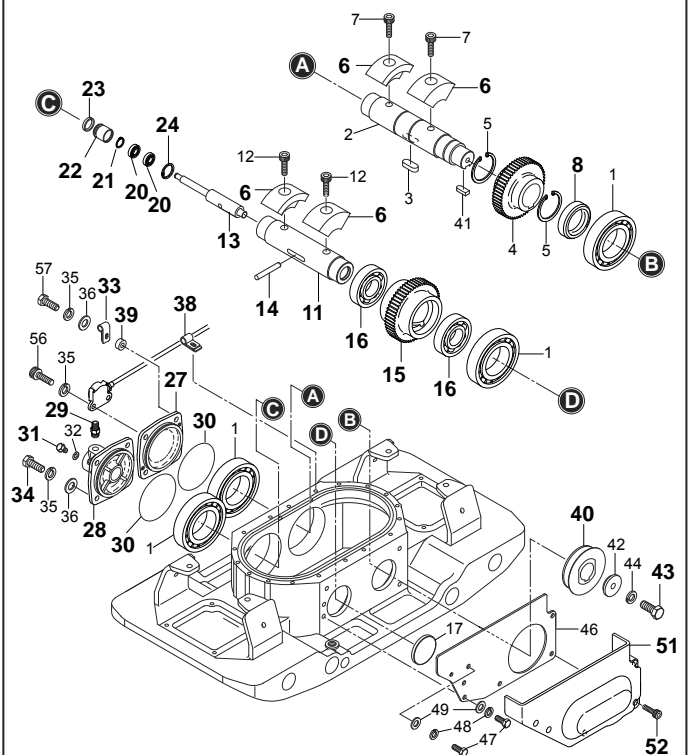
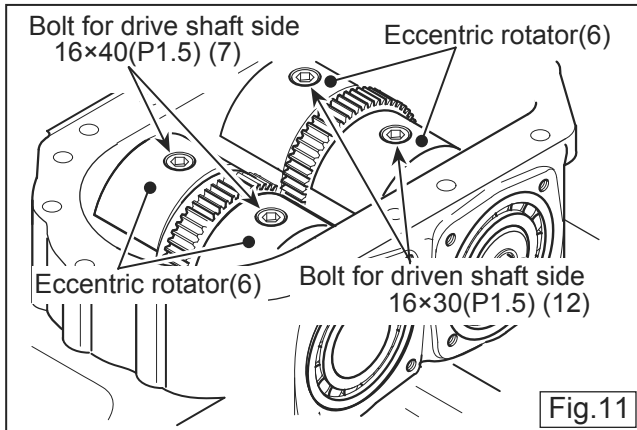


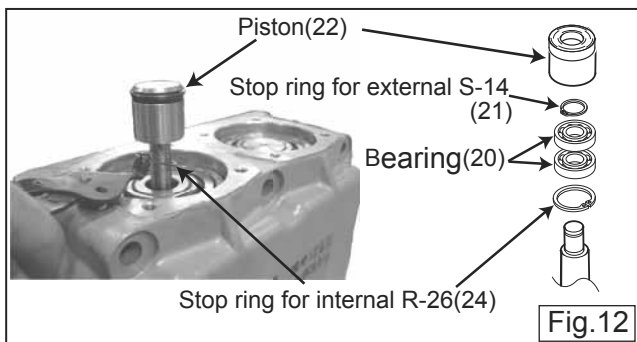
Fig.10

- d. Remove each 2 bolts (7 & 12), then remove 4 eccentric rotator (6). (Fig.11)



e. Disassembly of piston(Fig.12)

- ① Remove 4 bolts (34), then remove the cylinder (28).
When removing the cylinder, use the screw hole for cylinder removal.
- ② By rotating the driven gear (15), the piston (22) AY come out of the vibrator case.
- ③ Remove the stop ring for internal, R-26 (24), from the inside of piston. (Use internal snap ring plier with bent nose.)
- ④ Pull out the piston.
- ⑤ Remove the stop ring for external, S-10 (21), then remove 2 bearings (20) and the stop ring for internal (24) that was already removed.

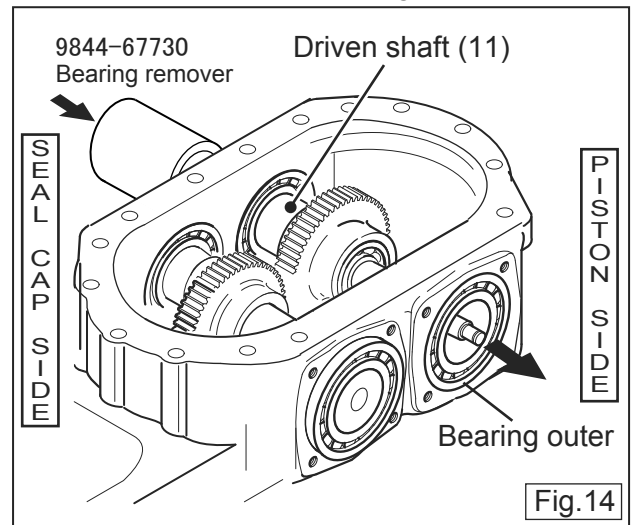


f. Disassembly of driven shaft (11) AY

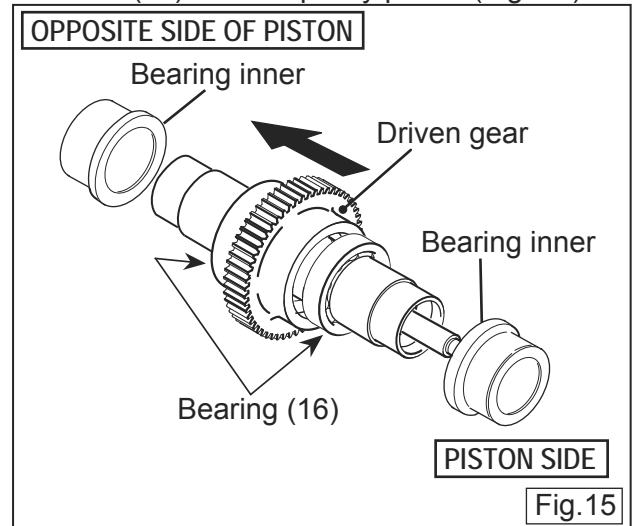
- ① Remove the seal cap (17).
The seal cap can remove easily by hitting its bottom side.
- ② By Inserting the bearing remover (9844-67730) from seal cap side, the driven shaft (11) AY come out to piston side, then remove the bearing outer for piston side. (Fig.13)



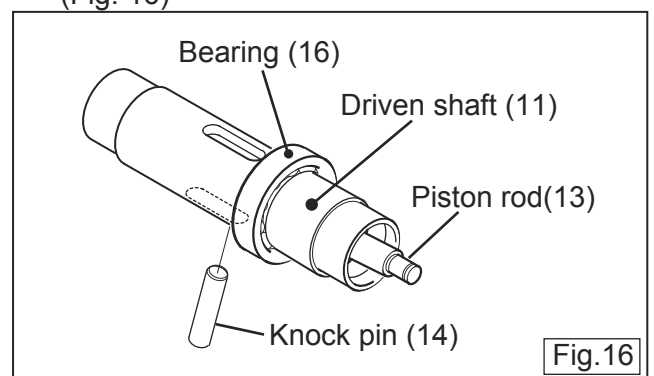
- ③ Remove the bearing outer for seal cap side with the bearing remover, then remove the driven shaft (11) AY from the inside of vibrator case. (Fig.14)



- ④ Remove the bearing inner from driven shaft (11) AY with pulley puller. (Fig. 15)



- ⑤ By pushing out the driven gear to opposite side of piston, Remove the bearing (16) of opposite side of piston.
In case of it is difficult to push out driven gear, push out it with pressing machine do not hit it with a hammer. (Fig. 15)
- ⑥ Remove the knock pin (14), then remove the piston rod (13). (Fig. 16)
- ⑦ Remove the bearing (16) on piston side. (Fig. 16)

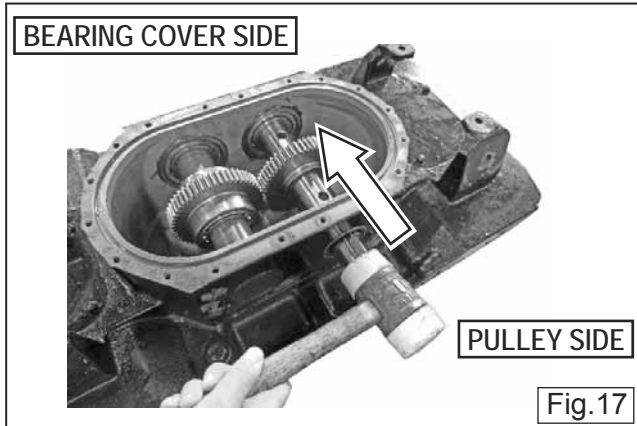


g. Disassembly of drive shaft (2) AY

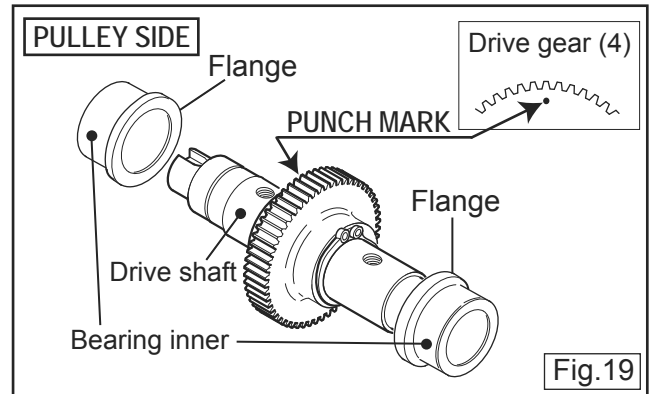
- ① Remove 4 bolts (34), then remove bearing cover (27).

When removing the bearing cover, use screw hole for bearing cover removal.

- ② By hitting the end of pulley side on the drive shaft (2) with plastic hammer, the drive shaft AY come out to bearing cover side, then remove the bearing outer for bearing cover side. (Fig.17)

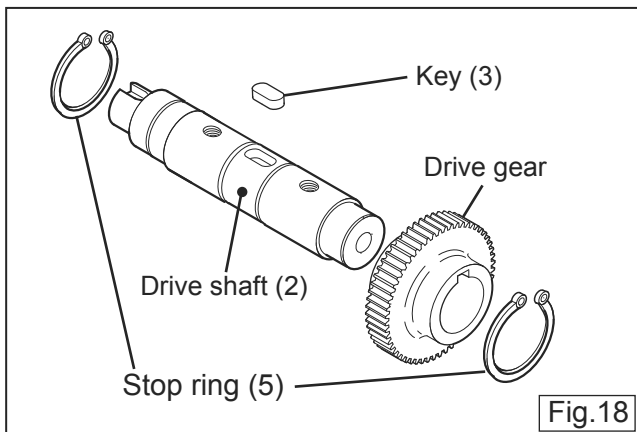


- Apply the grease to the drive gear (4) before press fitting.
 - The punch mark of drive gear (4) should put the pulley side. (Fig.19)
 - Be careful about the direction of the stop ring. (The edge side should put outside.)
- ② Press fit the bearing inner to drive shaft (2).
 - The flange of bearing inner should put to the eccentric rotator side. (Fig.19)

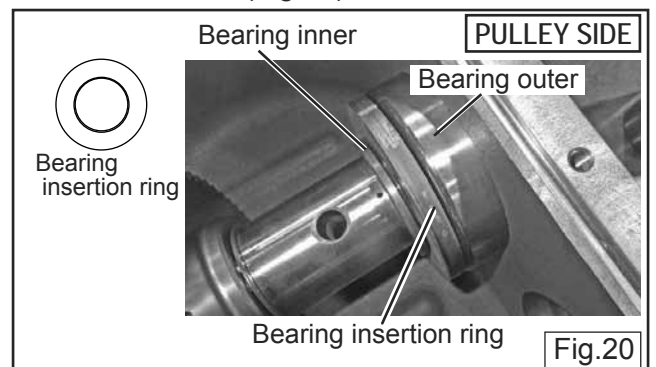


- ③ Remove the oil seal (8), then remove the bearing outer of pulley side by inserting the bearing remover (9844-67730) from pulley side.
- ④ Remove the drive shaft (2) AY from the inside of vibrator case.
- ⑤ Remove the bearing inner from drive shaft (2) AY with pulley puller.
- ⑥ Remove the stop ring (5) for external, then remove the drive gear. (Fig. 18)

In case of it is difficult to push out the drive gear, push out it with pressing machine do not hit it with a hammer.



- ③ After Assembling the bearing insert ring to the bearing inner on the pulley side of drive shaft (2), assemble the bearing outer there. Then insert this drive shaft into the vibrator case. (Fig.20)



- ⑦ Remove the key (3).

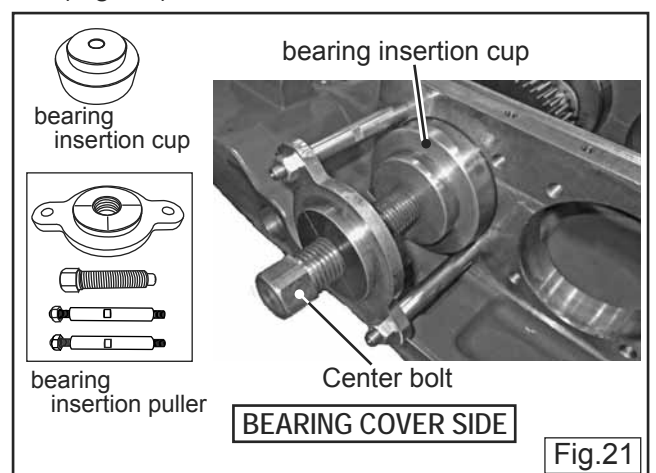
(2) Assembly

Degrease and clean the contact surface between the vibrator case and vibrator top cover, and other parts.

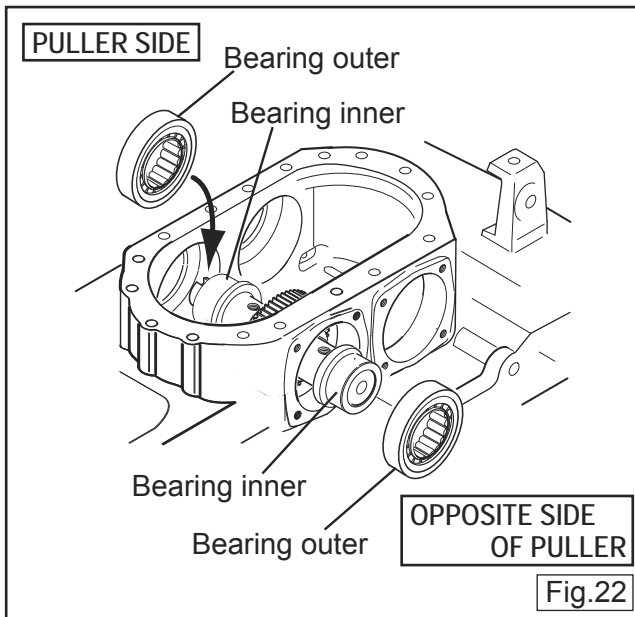
a. Assembly of drive shaft

- ① Assemble the key to drive shaft (2), then press fit drive gear (4). Fix both sides with stop ring (5) for external.(Fig.18)

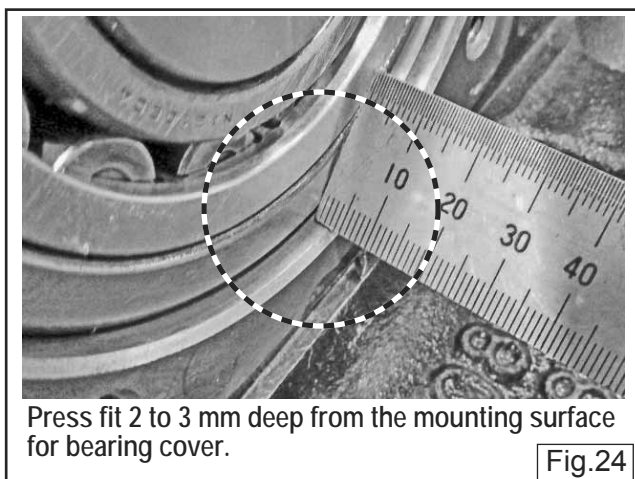
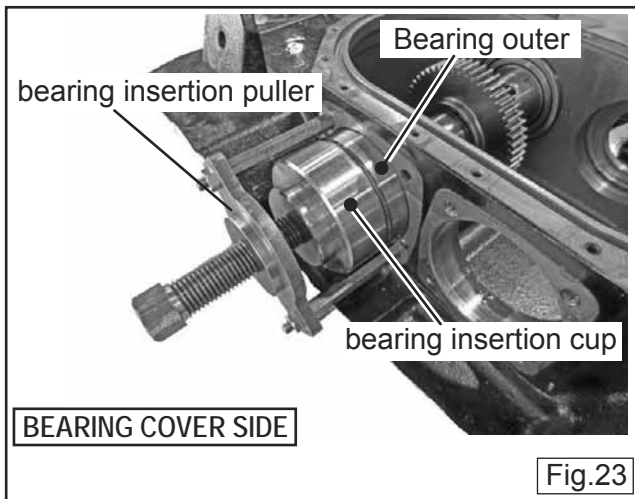
- ④ Assemble the bearing insertion puller to threaded hole of bearing cover, then assemble the bearing insertion cup between the center bolt and the bearing housing. (Fig. 21)



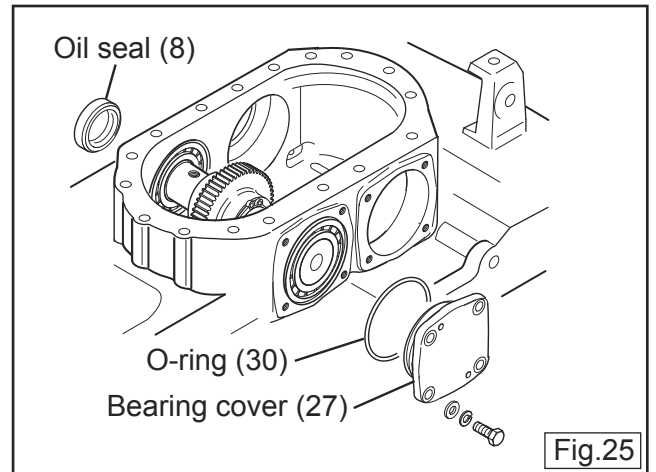
- ⑤ Press fit the bearing outer of pulley side by tightening the center bolt of bearing insertion puller. (Fig. 22)



- ⑥ Remove the bearing insertion ring of ③ from the drive shaft (2).
 ⑦ Press fit the bearing outer of bearing cover side with the bearing insertion puller and bearing insertion cup. At this time, press fit the bearing outer 2 to 3 mm deep from the mounting surface for bearing cover. (Fig. 23, 24)



- ⑧ Assemble the O-ring (30) to the bearing cover (27), then assemble it to the vibrator case for the bearing cover side. After assembled the bearing cover, check the thrust gap of drive shaft. (Standard value: 0.5mm to 1.0mm).
 ⑨ Insert oil seal (8) into vibrator case of pulley side of drive shaft. (Fig.25)

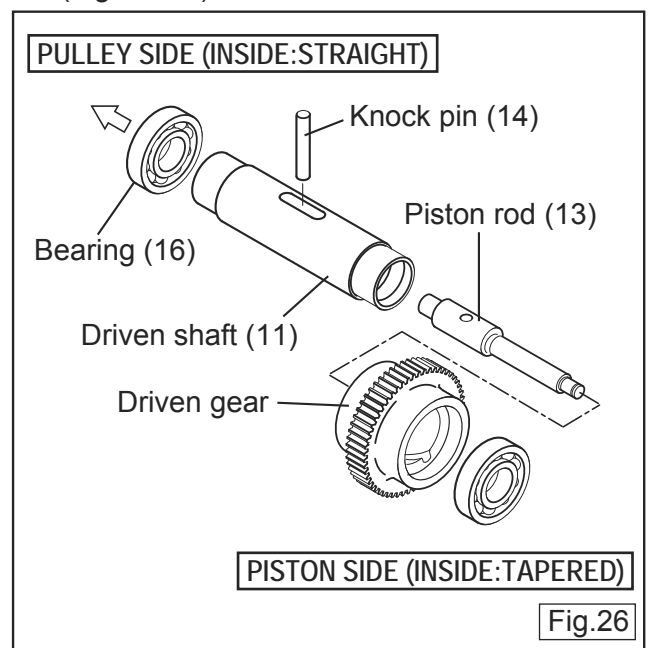


CAUTION

- Assemble the bearing after applying grease.
- Assemble the O-ring after applying grease.
- When inserting oil seal, make sure that there is no bend on oil seal and no damage on the lip.
- Apply Loctite #243 to the bolts for assembling the bearing cover. Tightening torque 35 N·m

b. Assembly of driven shaft

- ① Assemble an eccentric rotator (6) to the pulley side (inside: straight) on the driven shaft (11) by tightening a bolt (12). Then, press fit bearing (16) to driven shaft. (Fig.26, 27)



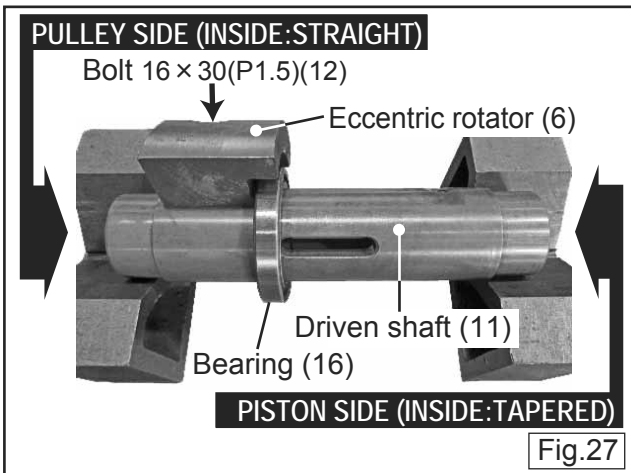


Fig.27

- ② Insert the piston rod (13) from the piston side (inside: tapered) of driven shaft, then insert knock pin (14) into the hole of piston rod through the groove of driven shaft. (Fig. 28)

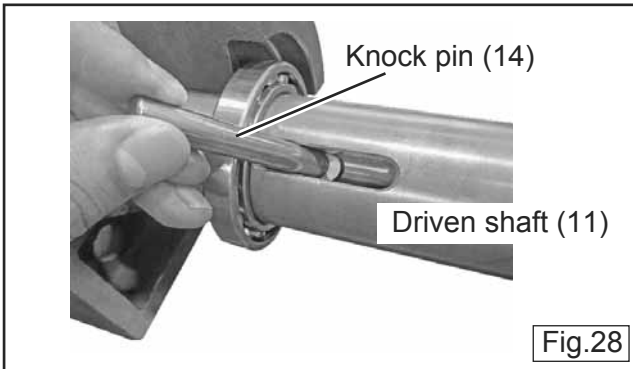


Fig.28

- ③ Put the eccentric rotator of driven shaft to the upper side, then push the piston rod into the driven shaft.
 ④ Put the punch mark of driven gear to the pulley side, then insert it to the driven shaft. At this time, set the driven gear by turning its punch mark to the right side when seeing from the pulley side. (Fig. 29)

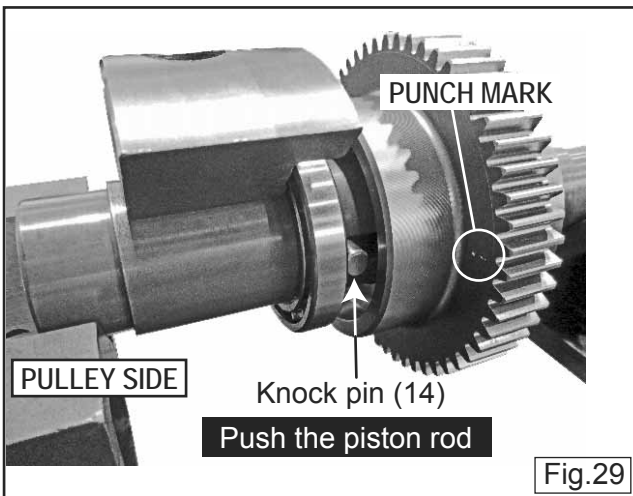


Fig.29

- ⑤ By seeing from the pulley side, while rotating driven gear to the right, insert the knock pin into the spiral groove of driven gear.

In case of the driven gear is assembled correctly, when pulling out the piston rod, the punch mark of driven gear and the threaded holes for eccentric rotator of driven shaft should be set in the same straight line. (Fig. 30)

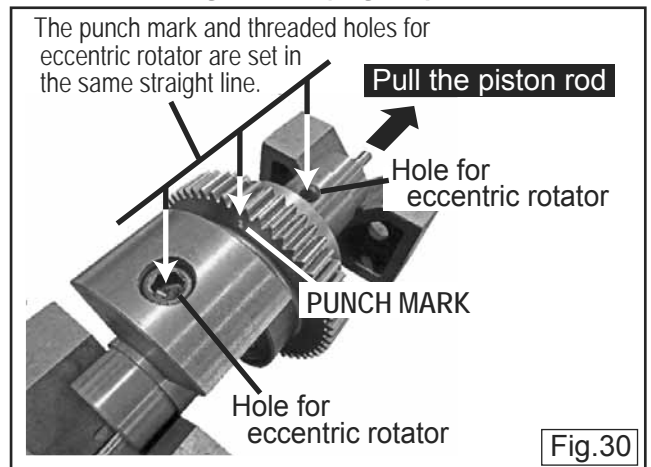


Fig.30

- ⑥ Press fit the bearing (16), then fix the drive gear (15). (Fig. 31)

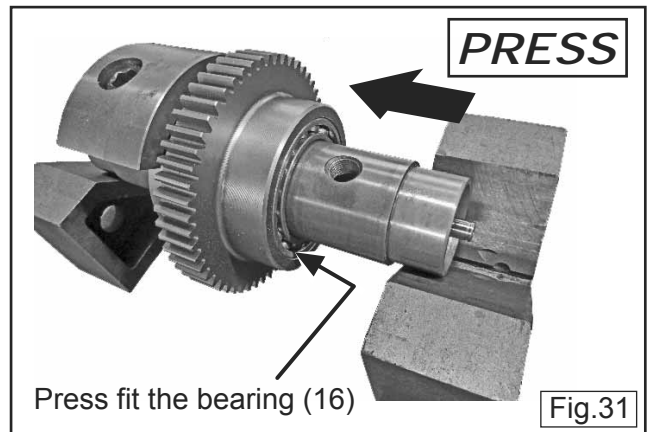


Fig.31

- ⑦ Press fit the bearing inner to the driven shaft (11).
The flange of bearing inner should put to the eccentric rotator side.
 ⑧ Press fit the bearing outer of pulley side from the inside of vibrator case with the bearing insertion puller and bearing insertion holder. (Fig. 32)

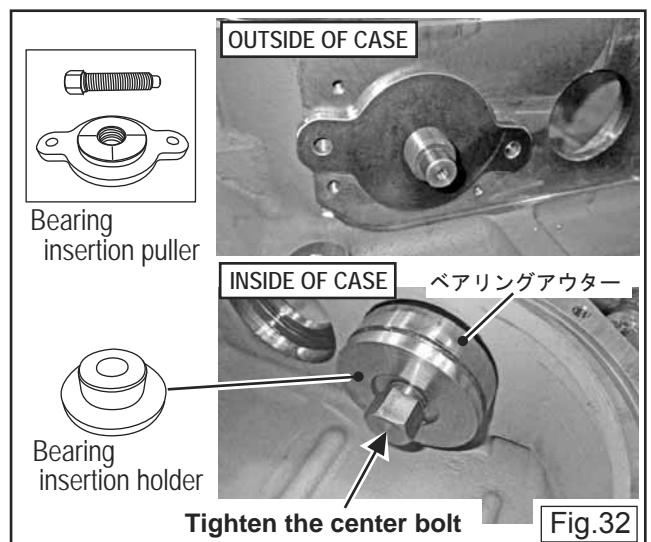
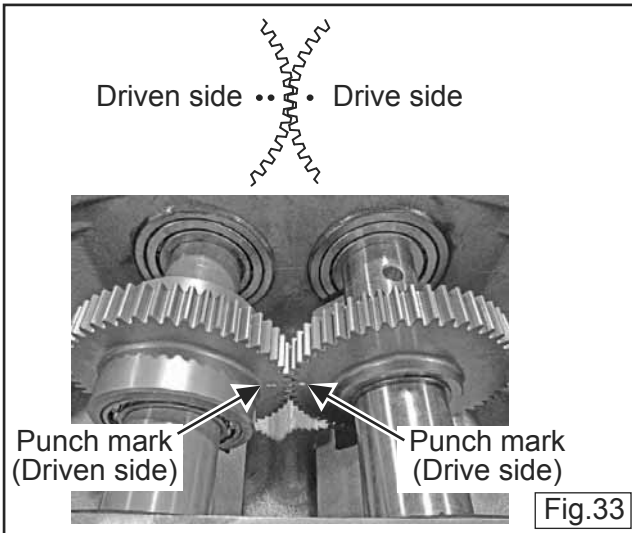


Fig.32

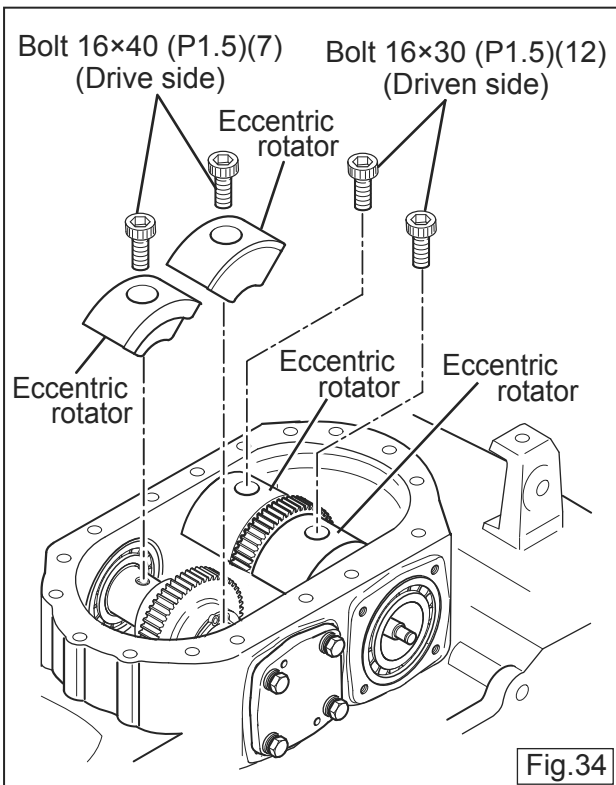
- ⑨ Insert from the piston side of driven shaft (11) AY into the vibrator case, then align the punch mark between the drive gear and driven gear. (Fig. 33)



- ⑩ Press fit the bearing outer of piston side with the bearing insertion puller and bearing insertion cup. At this time, press fit the bearing outer 2 to 3 mm deep from the mounting surface for cylinder cover. **See the "a. Assembly of drive shaft ⑦" on P14.**

CAUTION
When press fitting the bearing outer of piston side, push the piston rod until the end of groove of driven shaft.

c. Assemble the eccentric rotators to the drive shaft and driven shaft. (Fig.34)



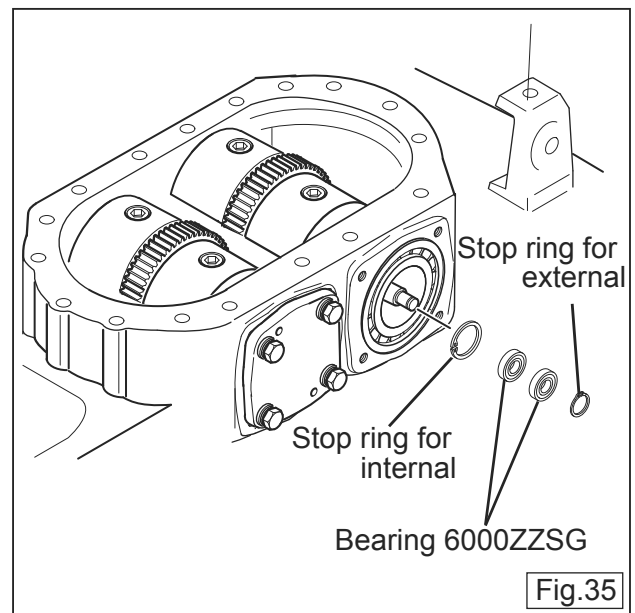
CAUTION

- Check the bolts size.
- Apply Loctite #263 to the each bolts (7 & 12).
- Do not turn the drive shaft and driven shaft, when tightening the bolts for eccentric rotator with torque wrench. Tightening torque 275 N·m

WARNING
Be very careful not to have your fingers get caught by gear, eccentric rotator, and vibrator case.

d. Assembly of piston

- ① First, insert the stop ring for internal (24) to piston rod. (Fig. 35)



- ② Insert 2 bearings (20) to piston rod, then fix them with stop ring for external (21). (Fig. 35)

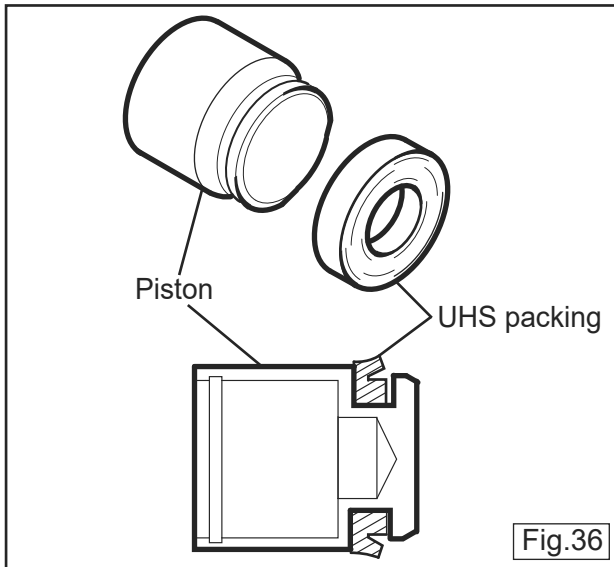
CAUTION

- Apply the grease to the bearing insertion part of piston rod.
- Use the genuine parts for bearing (20).

- ③ Assemble the UHS packing (23) to piston (22). (After applying hydraulic oil to UHS packing, assemble it with your finger.) (Fig. 36)

CAUTION

- Make sure that there is no scratch and no damage on the piston.
- Make sure that there is no damage on the UHS packing.
- Be careful about the direction of the UHS packing.



Assemble the piston (22) to bearings (20), then fix it by assembling the stop ring for internal (24) that was already inserted.

CAUTION

When assembling the piston, push it with your hand or hit it with a plastic hammer lightly.
 When assembling the stop ring for internal, use internal snap ring plier with bent nose. Make sure that it assembles into the groove certainly.
 After assembled the piston, make sure that it rotates smoothly.
 The edge side of the stop ring should put outside.

e. Assemble the O-ring (30) to the cylinder (28), then assemble it to the vibrating for the piston side. After assembled the cylinder, check the thrust gap of driven shaft.
(Standard value: 0.5 ~ 1.0mm)

CAUTION

Apply Loctite #243 to the bolts (34) for assembling cylinder.
Tightening torque 73.6N·m
 When inserting the piston to the cylinder, be careful not to damage UHS packing.
 Assemble the O-ring after applying grease.

f. Assemble the connector (29), air release bolt (31), and packing (32) to the cylinder.

CAUTION

Apply the seal tape around the connector (29).

g. Assemble the seal cap (17) to the vibrator case at the opposite side of the cylinder.

h. By the above steps, the assembly of the vibrator is completed. As a final step, turn the drive shaft with your hand to make sure that it rotates smoothly.
 If it does not rotate smoothly, adjust it by hitting the side of gear with a plastic hammer lightly.

WARNING

Be very careful not to have your fingers get caught between gear and eccentric rotator.

CAUTION

Never hit the gear teeth.

Add the new vibrator oil (10W-30 of SAE grade or higher) to vibrator case as specified level.

Degrease the contact surface between the vibrator case and vibrator top cover, then after assembling O-ring to the vibrator case, assemble them by tightening bolts. (Fig. 37)

Use the engine oil (SAE10W-30) as vibrator oil.
The oil quantity is 600cc (0.6L) / Oil level height is 9mm.

Measure the vibrator oil quantity correctly. (If it is more than the specified value, it might cause over-load. If it is less than the specified value, noise and shortening of bearing life might occur.)

Apply Loctite #243 to the bolts.
 Tightening torque (35 N·m)
 Tighten the bolts in a crisscross pattern.

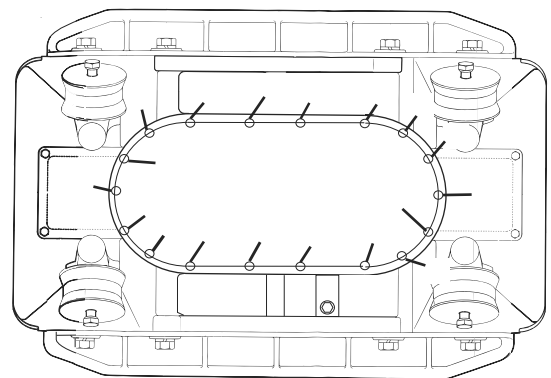


Fig.37

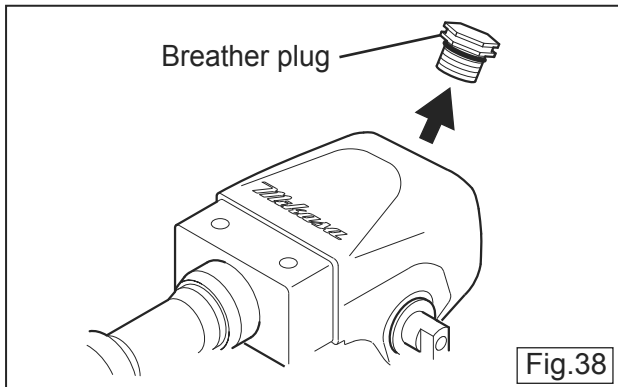
8.5 Hand pump & Accumulator CP

CAUTION

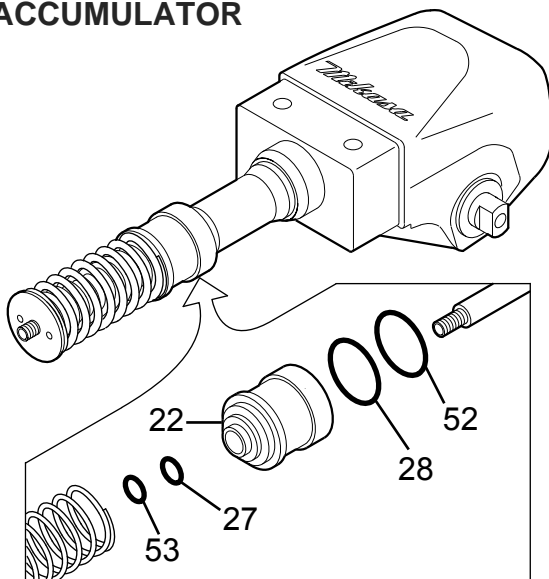
- During disassembly and assembly, be careful not to damage each part.
- Replace the O-ring, oil seal, and packing with a new one.
- Work in a clean workplace to prevent entry of dust and foreign material.

(1) Disassembly

a. Remove the breather plug, then remove the hydraulic oil from the inside of hand pump. (Fig. 38)

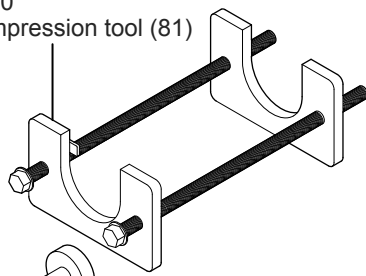


ACCUMULATOR



TOOLS FOR DISASSEMBLY (OPTIONAL)

9840-10060
Spring compression tool (81)

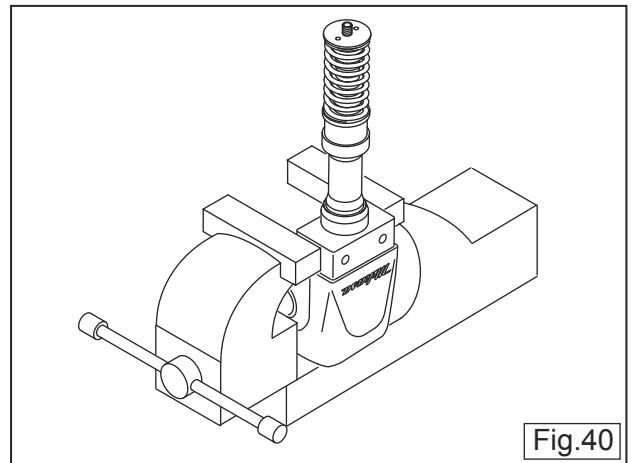


9840-10040
Disassembling tool (82)

Fig.39

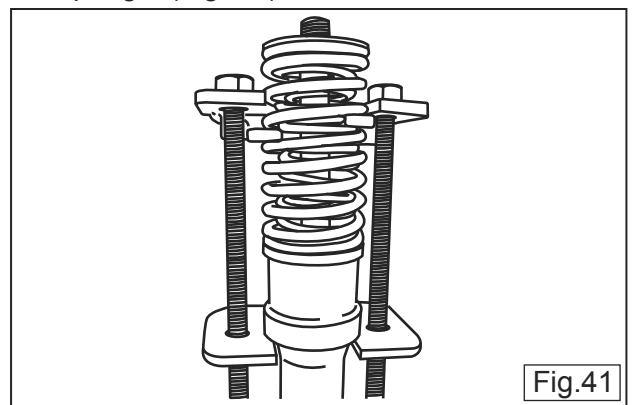
b. Fix the pump head with the vise. (Fig. 40)

Fix the handle insertion part of the pump head.



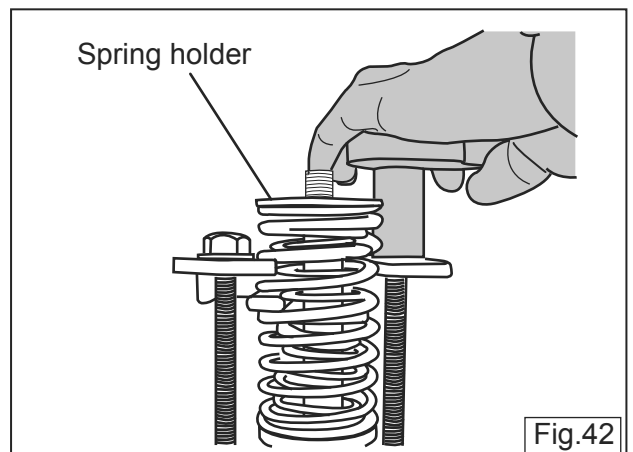
c. Compress the springs of accumulator by using the spring compression tool (81). (Fig. 39)

① Securely assemble the spring compression jig to accumulator case and its springs. (Fig. 41)



② Compress the spring by tightening the two bolts of spring compression tool evenly.

③ Compress the springs until there is no spring pressure to the spring holder. (Fig. 42)



d. Heat the spring holder with torch burner so that the spring holder can be removed easily. (Fig. 43)

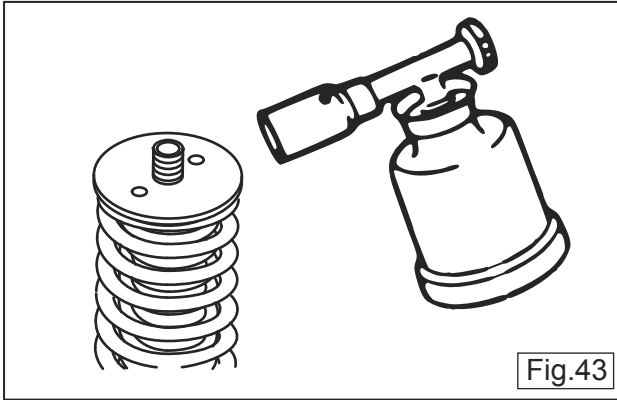


Fig.43

e. Remove the spring holder with the spring holder disassembling tool. (Fig. 44)

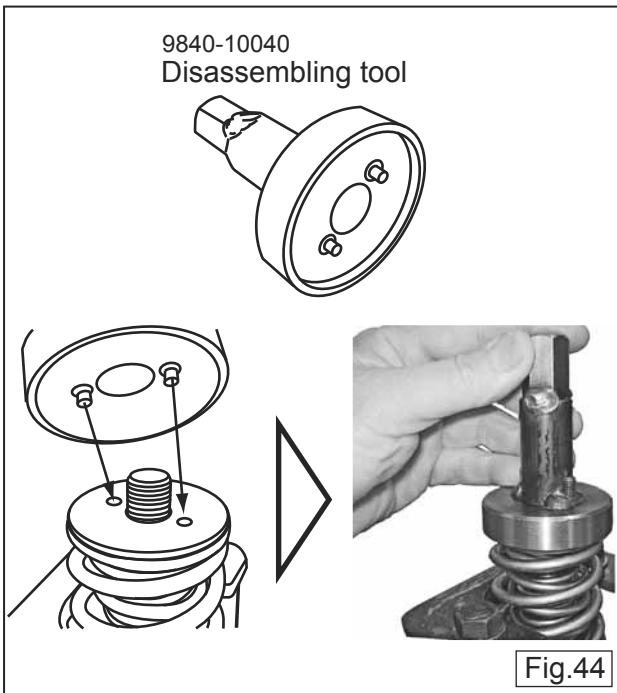


Fig.44

f. Loosen the two bolts of spring compression tool evenly. After making sure there is no spring pressure, remove the spring compression tool.

g. Remove the springs.

h. Degrease and clean the shaft of accumulator, then remove the accumulator case. (Fig. 45)

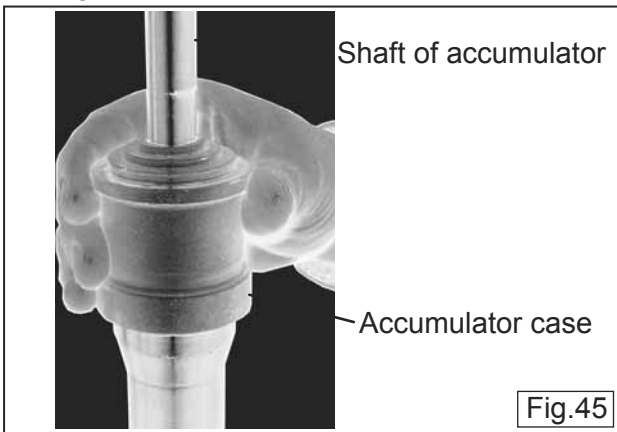


Fig.45

i. Remove the dust seal and O-ring from the inside of accumulator case.

(2) Assembly

Assemble with the reversed procedure of disassembly, but be careful about the following points.

- ① Degrease and clean the each parts.
- ② Be careful not to damage each parts, during assembly.
- ③ Replace the O-ring and dust seal with a new one.
- ④ Apply the molybdenum grease to the O-ring, dust seal and sliding area.
- ⑤ Be careful to prevent entry of dust and foreign matter.

a. Assemble the dust seal and O-ring into the accumulator case.

Put the lip of dust seal to the outside. (Fig. 46)

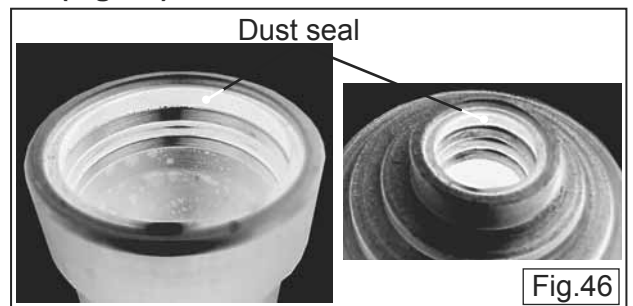


Fig.46

b. Insert the accumulator case to the accumulator shaft.

To prevent damage of the dust seal and O-ring, apply the tape to the thread on the end of accumulator shaft for protection. (Fig. 47)

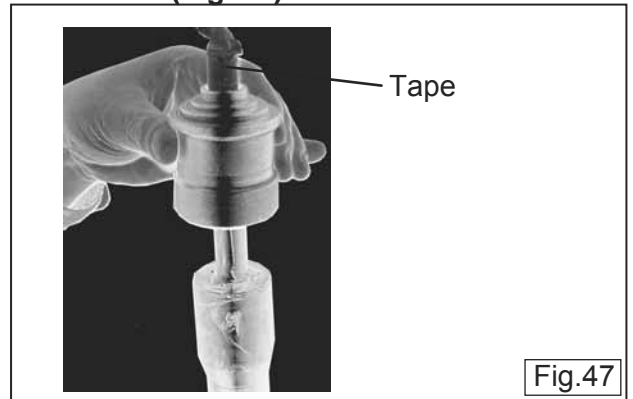


Fig.47

c. Degrease and clean the thread on the end of accumulator shaft, then apply 2 to 3 drops of Loctite #638. (Fig. 48)

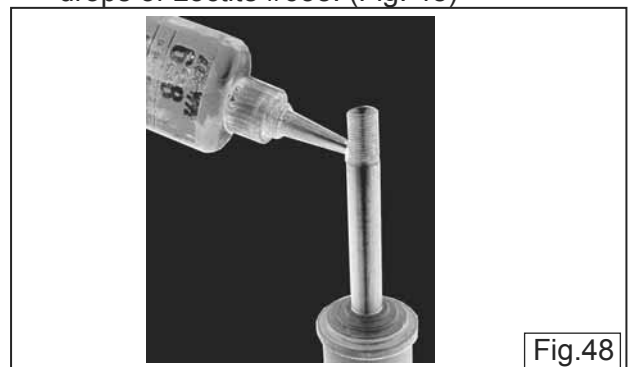
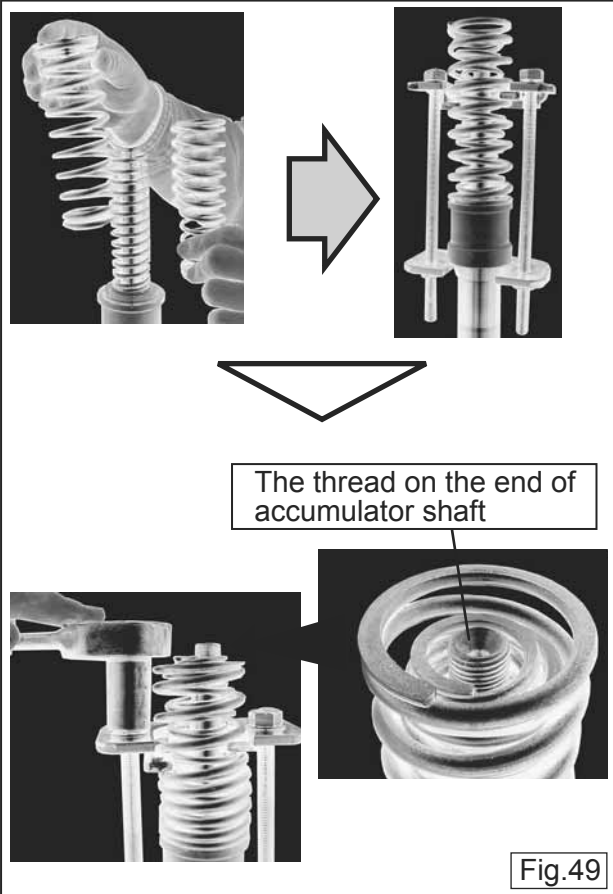


Fig.48

d. Assemble the springs to the accumulator. Then, compress the springs with the spring compression tool until the thread on the end of accumulator shaft is out completely. (Fig.49)

CAUTION

Be very careful not to have your fingers get caught between the springs and spring compression tool.



e. Assemble the spring holder with the spring holder disassembling tool. (Fig. 50)

**The spring holder tightening torque:
20N·m**

CAUTION

When assembling the spring holder, be very careful for the spring pressure.



f. Remove the spring compression tool.

By the above steps, the assembly of hand pump and accumulator is completed.

9. REGULAR CHECK AND ADJUSTMENT

CAUTION Do inspection and maintenance work in a place with a flat and hard surface to keep the machine stable, after stopped the engine certainly.

9.1 Inspection and Maintenance Chart

To use the machine in good condition all the time, always do the inspection and maintenance according to the following inspection sheet.

Check frequency	Check parts	Check items	Oils
Daily (before starting)	Appearance	Flaw, deformation	
	Fuel tank	Leakage, oil level, dirt	Light oil, gasoline
	Fuel system	Leakage, oil level, dirt	
	Engine oil	Leakage, oil level, dirt	Engine oil
	Shock absorber	Crack, damage, wear	
	Hand pump	Leakage	Hydraulic oil
	Vibrator oil	Leakage	Engine oil
	Hydraulic pipe system	Leakage, looseness,flaw, wear Dust on sponge	Hydraulic oil
	Air cleaner	Breakage, flaw, loosenedor missing bolts and nuts	
	Guard frame	Missing, breakage, flaw,looseness or missingbolts and nuts	
	Back and forth motion lever, linking parts	flaw,looseness or missingbolts and nuts	
	Back and forth motion lever operation	Operation check, play	
	Bolts and nuts	Looseness, missing	
	Duct hose	Crack, damage	
Every 20 hours	Engine oil	Replace only afterthe first 20 hours	
	Engine oil filter	Replace only afterthe first 20 hours	
Every 100 hours	Engine oil	Change	
	Engine oil filter	Washing	Engine oil
	Vibrator oil	Leakage, oil level, dirt	
	Hydraulic oil	Leakage, oil level, dirt	Engine oil
	Battery terminal	Cleaning	Hydraulic oil
Every 200 hours	V-belt for vibrator	Flaw, tension	
	Clutch	Dirt, flaw, wear	
Every 300 hours	Vibrator oil	Change	
	Hydraulic oil	Change	Engine oil
	Fuel filter	Change	Hydraulic oil
	Engine oil filter	Change	
Every 2 years	Fuel pipes	Change	
Irregular	Air cleaner element	Change	
	Hydraulic hose	Change	
	Cyclone cleaner	Cleaning	
	Duct hose(Cyclone cleaner)	Change	

For details about the check and maintenance of the engine, please refer to the attached engine operation manual.

Caution: The above table shows the check frequency for standard condition.

The check frequency may vary depending on the condition in which the machine is used.

9.2 Oil Application Table

Oil type	Quality	Temperature (°C)													
		-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35
Engine oil	For diesel	SAE 5W-20 / 5W-30													
	CE/CF class	SAE 10W-30													
	SAE 10W-40 or SAE 15W-40	SAE 20W-40													
		SAE 15W-40													
		SAE 10W-40													
Vibrator oil	Engine oil SAE 10W-30	SAE 10W-30													
Hydraulic oil	Hydraulic oil	ISO VG32													
	ISO VG46	ISO VG45													

CAUTION Fuel pipes should be changed every two year.

Check for fuel and oil leakage.

Check the hand pump and pipe hose for oil leakage.

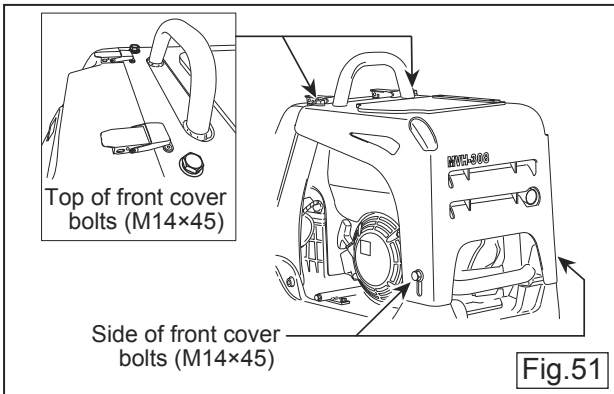
Check whether the hose joint is loose or not with the wrench, because the fuel and oil leakage might be occurred due to the loose of hose joint.

9.3 Opening The Front Cover

CAUTION

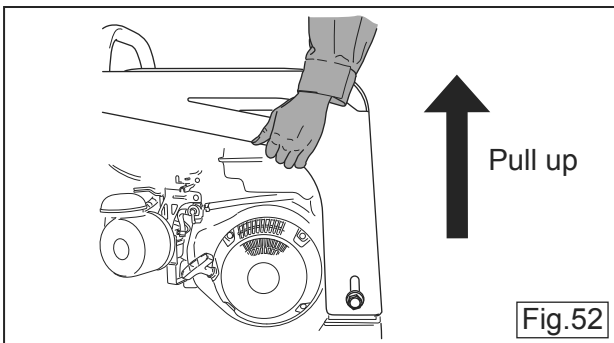
- During disassembly a maintenance work in a place with a flat and hard surface to keep the machine stable.
- Start your work after the machine and engine cool down completely.
- Be careful to catch the finger when opening and closing the front cover.

1. Remove the bolts (M14x35) on the front cover. Loosen the bolts (M14x35) on the side of front cover. (Do not remove.) (Fig.51)

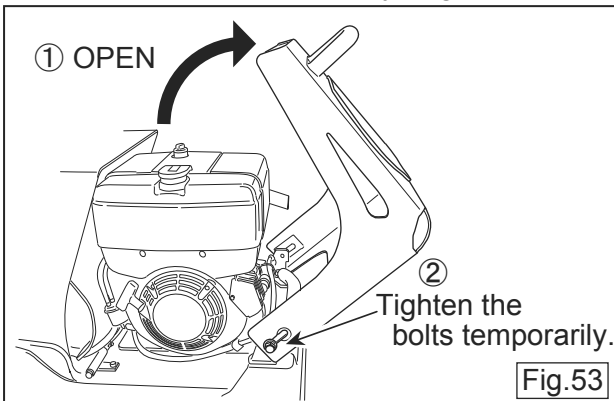


Gasoline Engine

2. Hold the side of front cover, and pull up to open position.(Fig.52)



3. Open the front cover slowly.(Fig.53)

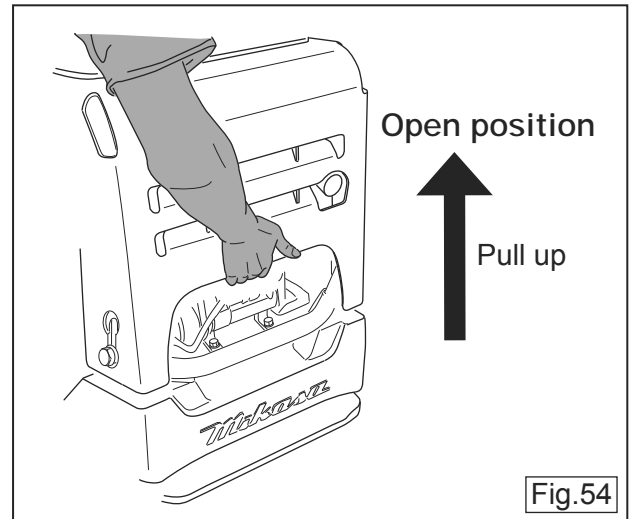


CAUTION

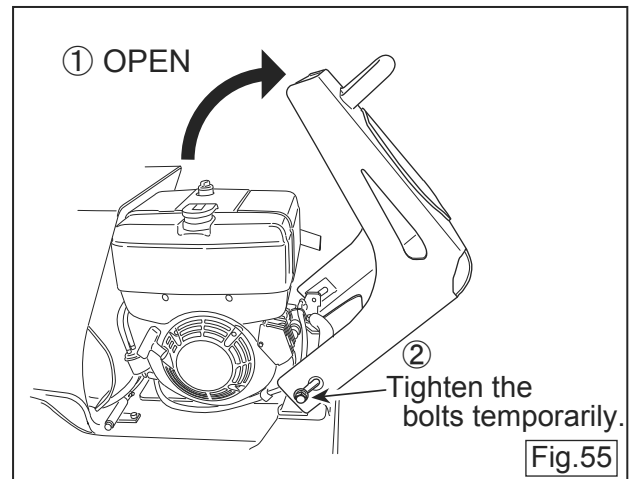
When doing maintenance by opening the front cover, tighten the bolt on the front cover side temporarily for safety.

Diesel Engine

2. Hold the hook and the front side of front cover, and pull up to open position. (Fig.54)



3. Open the front cover slowly.(Fig.55)



CAUTION

When doing maintenance by opening the front cover, tighten the bolt on the front cover side temporarily for safety.

4. Return the front cover to original position slowly.Tighten the bolts in the specified torque. (Fig.51)

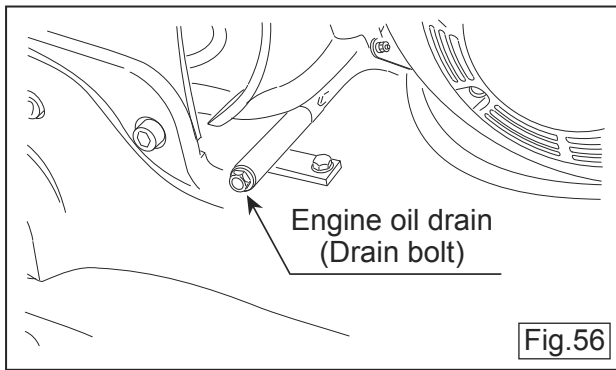
Size	Tightening torque	Remarks
Bolt M14X45	176.6N·m (130.2ft·lbf)	Apply Loctite #243

CAUTION

- Do not start the engine when opening the front cover.
- Tighten the bolts firmly.

9.4 Changing The Engine Oil

Perform the first engine oil change after 20 hours of operation, then change at every 100 hours.(Fig.56)



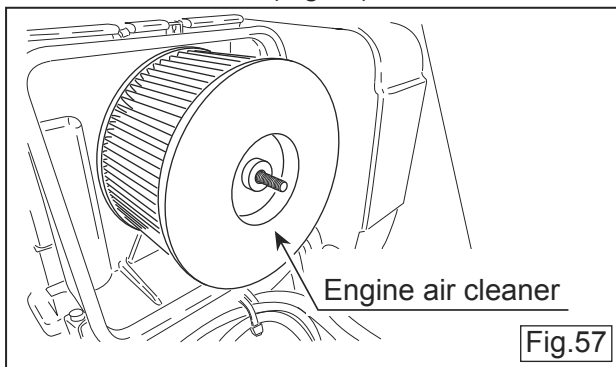
9.5 Cleaning The Air Cleaner

● The Engine Air Cleaner

When the air cleaner element becomes dirty, the engine does not start smoothly, and sufficient output cannot be obtained. Machine operation will be affected and the engine life will be shortened greatly. Do not forget to clean the element.

(For details, please see the separate engine operation manual.)

If the element cannot be cleaned, replace it with a new one.(Fig.57)

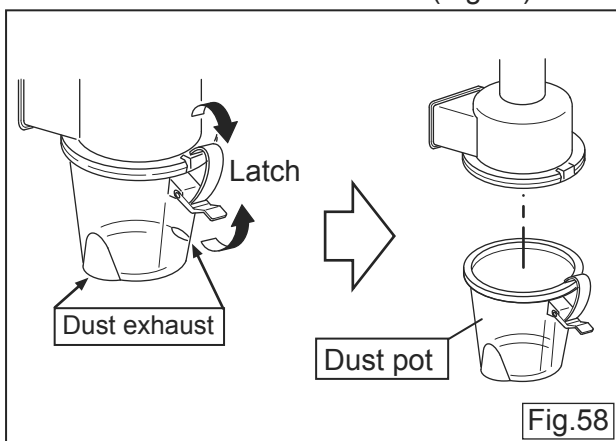


● Cyclone Cleaner

Always clean Dust Pot. Clogged Dust Pot leads to reduce cyclone effect with easy wear of Cleaner Element.

● How to clean Dust Pot

a. Latch off to remove Dust Pot. (Fig.58)



⚠ CAUTION

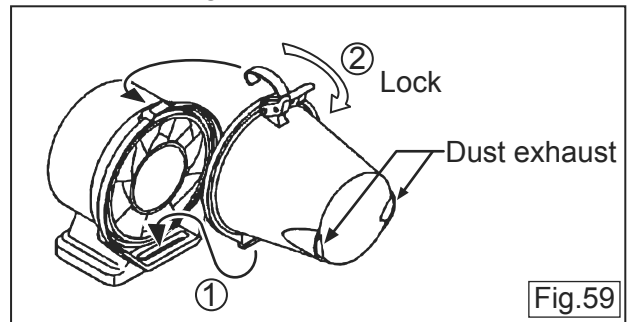
Be careful to avoid pinched fingers.

b. Clean Dust Pot inside with water and neutral detergent.

⚠ CAUTION

Do not use organic solvent like paint thinner, which may cause damage or deformation of Dust Pot.

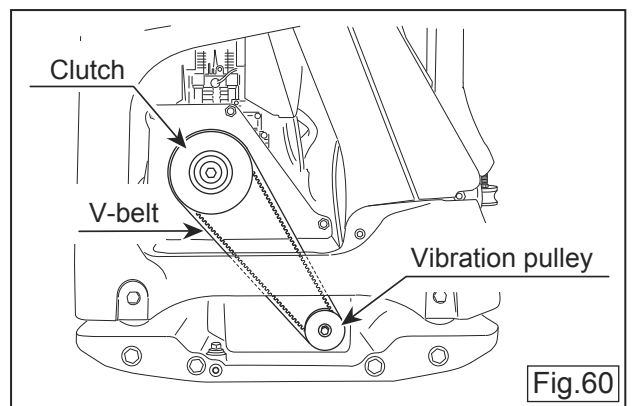
c. Latch up securely to return Dust Pot to Air Cleaner.(Fig. 59)



9.6 Checking/Changing The V-belt And Clutch

● Check of V-belt (Fig. 60)

At every 200 hours, remove the belt cover (top) to check the tension of the V-belt. The flexibility of the belt should be about 10 mm when pushed strongly with your finger at the mid-point between the axes. When the V-belt is loose, the engine power is not transmitted well, resulting in poor compacting force and shortening the life of the V-belt.



● Changing the V-belt

a. Removing the V-belt

Remove the top and bottom belt covers. Put a wrench (19mm) on the tightening bolt of the vibrator pulley (lower side). Put a piece of cloth at the center of the left side of the V-belt, and pull the belt strongly towards you. While pulling, turn the wrench clockwise, then remove the V-belt.

b. Installing the V-belt

Set the V-belt on the lower side of the vibrator pulley. Push the V-belt to the left side of the upper clutch. Similar to removing the V-belt, turn the wrench clockwise to install.

CAUTION

Stop the engine when inspecting or changing the V belt. Be careful not to have your hand or clothes get caught between the V belt and the clutch. Always wear work gloves.

Inspection of clutch

The clutch should be inspected at the time of V-belt inspection. Remove the belt cover and visually check the clutch for burning, wearing, and damaging on the clutch drum and its V groove.

Also, if its V groove is dirty, degrease and clean it.

The clutch lining shoe wear should be checked by operation inspection.

In case of wearing of the clutch lining shoe, the engine power is not fully transmitted to the vibrator by the clutch slipping.

When stopping this inspection, move the throttle lever to the low speed position at once.

CAUTION

Be very careful not to have your fingers get caught between the belt and clutch pulley. There is a danger of injury. Also, wear gloves when working.

Change of clutch

move the V-belt.

(See belt removal of the previous section.) Remove the bolt for assembling the clutch with impact wrench or by hitting the wrench with the hammer. (Counter-clockwise)

Remove the clutch with the pulley puller.

Assemble with the reversed procedure of disassembly.

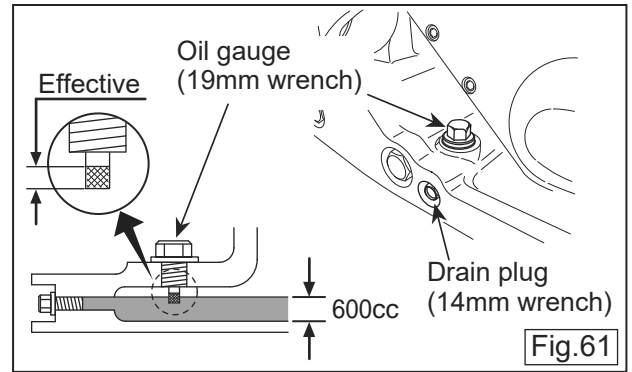
When tightening the bolt for assembling the clutch, tighten it with impact wrench or by hitting the wrench with the hammer certainly.

9.7 Checking/Changing The Vibrator Oil

At every 100 hours of operation, set the machine on a level surface and remove the oil gauge of the vibrator. Check the oil level to see if it is within the allowable range. (Fig.61)

Change the vibrator oil at every 300 hour operation. Drain the oil from the drain plug. For draining, put a beam under the compacting board at the other side of the drain plug to tilt the machine.

Use engine oil SAE 10W-30 as lubrication oil. The quantity used is 600cc.



CAUTION

Appropriate maintenance is required to ensure safe and efficient operation of the machine. Pay special attention to the parts used for lifting, if they are not maintained properly, it might result in a serious accident. When checking the vibrator oil, clean the oil port beforehand to prevent dust and other foreign materials from falling into the oil. Whenever there is an oil leakage from the vibrator, check the oil level.

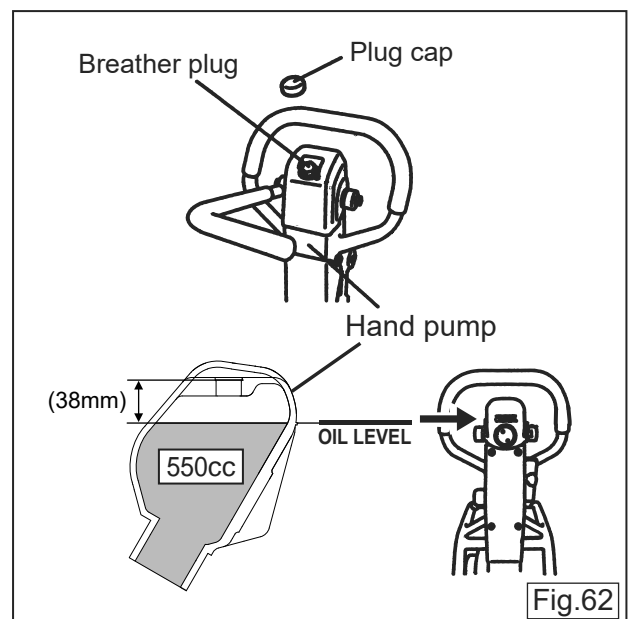
In case that oil is drained from Drain Plug, some oil still remains in Oil Pan. So be sure to check oil level correctly by Oil Gauge after filling oil.

Do not fill oil with excessive volume (600cc). It may cause the terrible fuel consumption and lower machine performance as the result of engine overload.

9.8 Checking/Changing The Hydraulic Oil

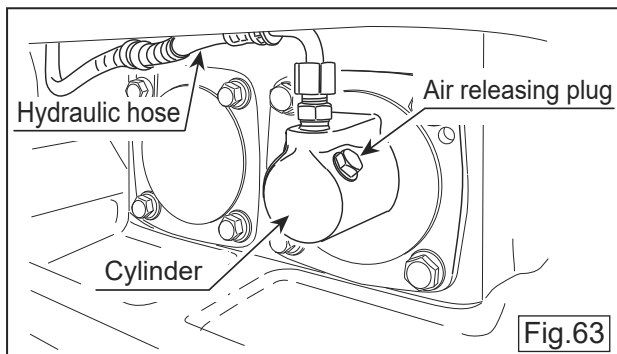
Check the hydraulic oil

Check the hydraulic oil at every 100 hours' operation. Keeping the handle at the operating position, remove the breather plug at the top of the hydraulic hand pump to see if the hydraulic oil is at the specified level (OIL LEVEL). (Fig.62)

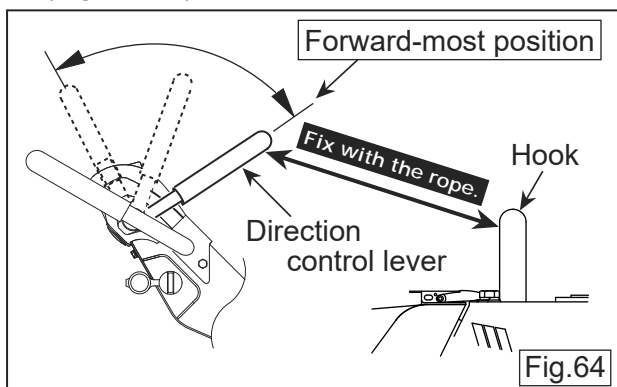


Changing the hydraulic oil

Remove the plug cap of the hand pump. Then remove the breather plug (with 24mm wrench) before removing the hydraulic hose connected to the cylinder on the vibrator side. Set the run lever to reverse, then drain the hydraulic oil from the pump.(Fig.62, 63)



After the oil is drained, attach the hydraulic hose again to the cylinder on the vibrator side. With the direction control lever at the forward-most position, fix to the hook with a rope to immobilize. (Fig.63, 64)

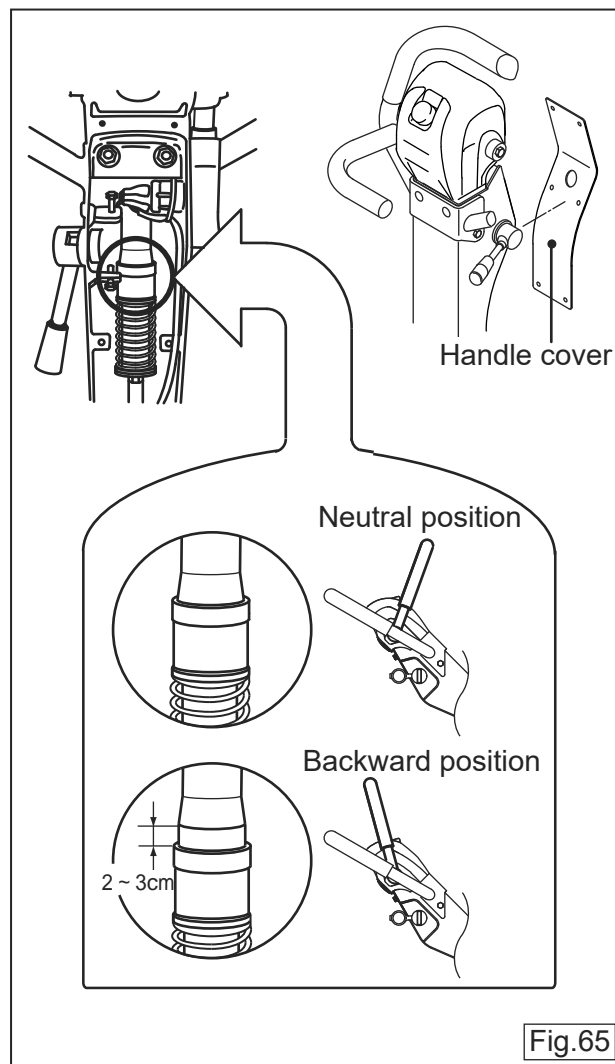


Pour hydraulic oil(550cc) from the hand pump breather plug attachment hole. (Fig.62)

Remove the air releasing plug of vibrator cylinder. Then oil will come out from the air releasing plug. After air bubbles stop coming out, attach the plug. Tighten securely. (Fig.61)

Remove the rope that is fixing the travel lever, then while stopping the travel lever for about 10 sec. at the forward position, move the travel lever to maximum position for forward and backward a few dozen times. At this time, the check valve opens at the maximum position for forward, and the air in hydraulic oil will be bled from the oil tank at the top of hand pump. (Fig.64)

Remove the handle cover, and if the accumulator move about 2 to 3 cm when moved the travel lever to backward position as shown in Fig. 67, air bleeding is completed. If there is the lack of air bleeding, do the procedure "1" again. (Fig.64,



Attach the hand pump breather plug, put on the plug cap. After making sure the hydraulic oil in the pump is at OIL LEVEL, attach the breather plug.

CAUTION

The level of the hydraulic oil in the hand pump should always be at OIL LEVEL. If the level is higher, the oil bursts out from the breather plug.

Hydraulic oil:
Shell Terrace Oil #32 or equivalent

9.9 Battery

Checking the battery

The standard battery installed is a maintenance free battery. It is not necessary to supply battery fluid. In case of a sudden voltage drop, the battery cannot be charged quickly, so it has to be replaced with a new one.

Check of battery capacity by battery checker

When the battery charging level gets low, the battery checker of the hour tachometer lights up in red.(Fig.66)

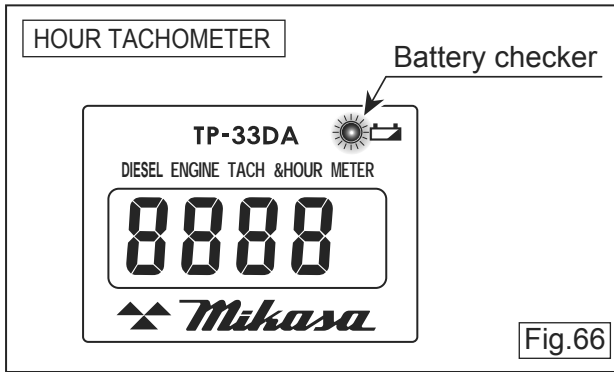


Fig. 66

CAUTION

If an old battery is used, even when the battery checker is not lighted (indicating charging level low), the cell starter might not operate because of low charging level. If that happens, change the battery with the new one.

(1) Inspection and cleaning of battery

- Check the battery for damage such as scratch and deterioration.
- Check the terminal for corrosion. If corroded, grind with wire brush or sanding paper, and apply grease at the terminal
- Also clean outside of the battery.
- Do inspection and cleaning also at the battery storage area of main machine side. Check also the anti-vibration mat. If it is necessary to replace with a new one due to deterioration or breakage, replace it.
- After the battery inspection is completed, securely fix it with the battery holder.

(2) When battery is dead

"Battery is dead" when the starter does not rotate. Also, even when the starter rotates, if the rotation is weak and the engine does not start, then the battery is dead.

Method taken for emergency

- Start the engine manually (use recoil starter or crank handle)
- If impossible to start the engine manually due to breakage or breakdown, jump-start the engine using another vehicle.

● Starting method using booster cable (Jump-starting)(Fig. 67)

- Connect the booster cable by the following order.
 - + (red) terminal of the battery of machine side
 - + (red) terminal of the battery of another vehicle side
 - (black) terminal of the battery of another vehicle side
 - Unpainted and protruded part of the crank case of the engine shown by "Fig. 67" (Connect the ground wire.)

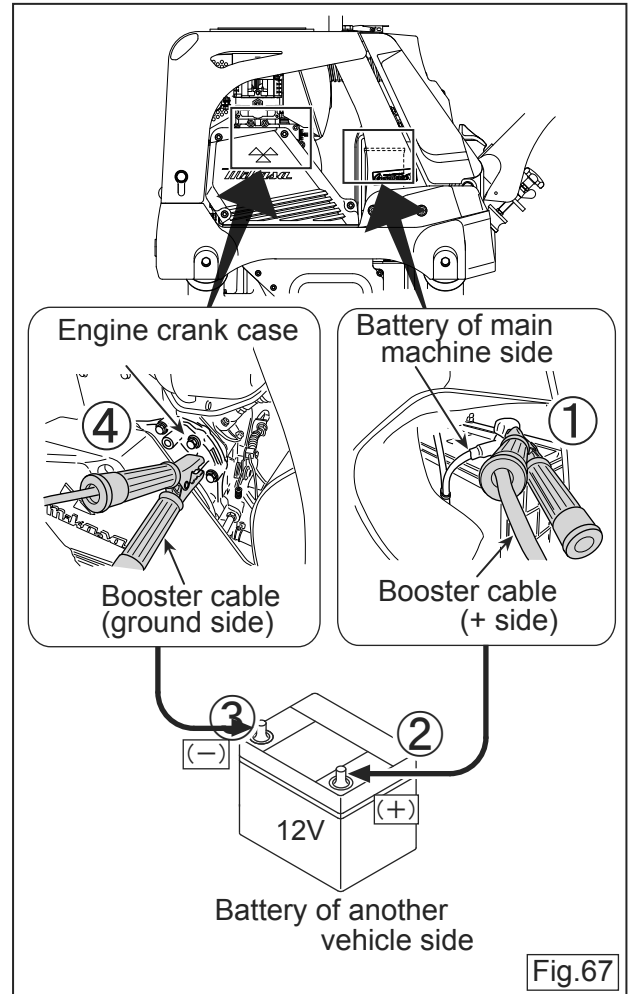


Fig. 67

- Disconnect the booster cable with the reversed procedure of connecting it.

WARNING

- For the above connection at ④, never connect the minus (black) terminal of battery directly. Spark occurs, and then explosion of the battery might occur due to ignite to the flammable gas from the battery by sparking.
- When connecting the booster cable, never contact the plus (+) terminal and the minus (-) terminal. Spark occurs, and then explosion of the battery might occur due to ignite to the flammable gas from the battery by sparking.
- Do not put fire near the battery. There is a danger of explosion.
- During charging the battery, do not go near the battery. Battery fluid that contains dilute sulfuric acid might be ejected. Eye and skin that contacted with such fluid might lead to serious injury. In case of contacting with battery fluid wash with plenty of water, then see a doctor.

CAUTION

Do not keep using the deteriorated battery. Do not operate with the battery removed. Engine regulator might be damaged.

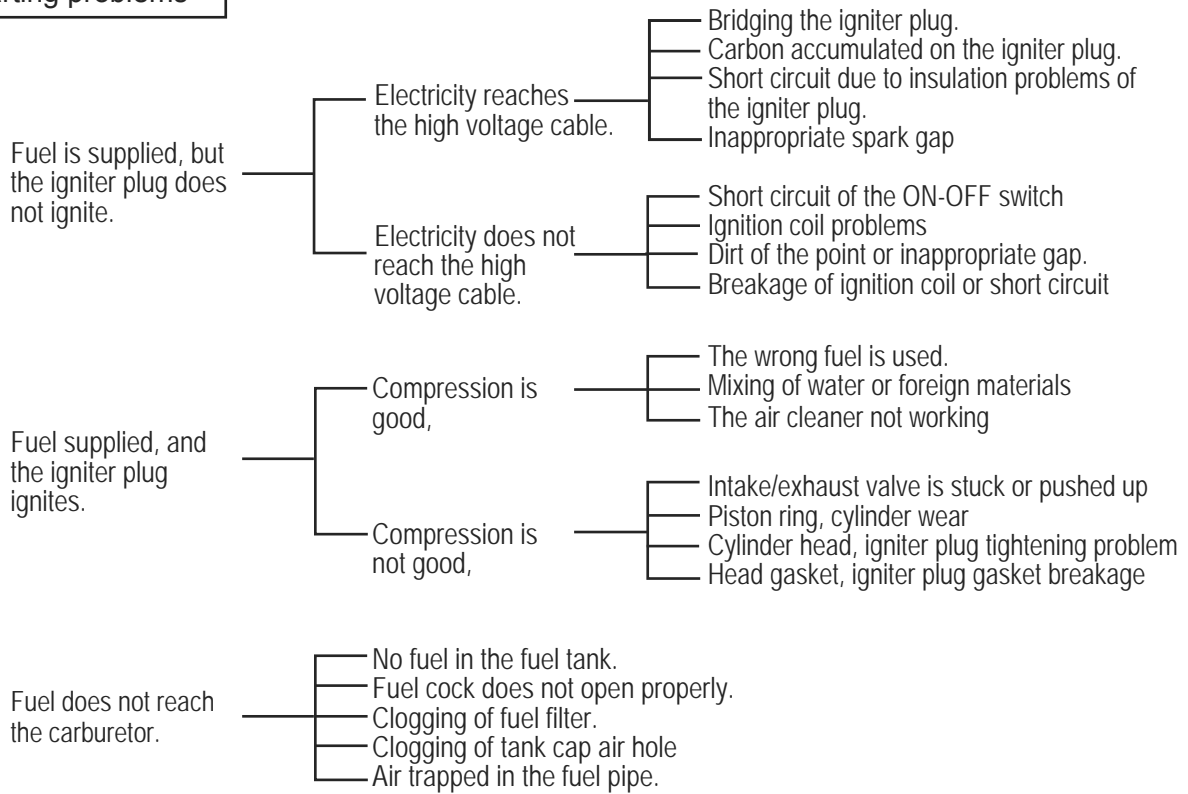
● Mountable battery size table

	L	W	H	SIZE	
MVH-308	238	129	203	55B24L(JIS) No.51R(BCI)	STD
	245	175	175	DIN 55Ah or equivalent	Replacement
	245	175	190		
	245	129	203	JIS/BCI TYPE Maximum capacity	
	245	175	190	DIN TYPE Maximum capacity	
MVH-408	238	129	203	55B24L (JIS) No.51R(BCI)	STD
	232	175	203	□ 75D23L(JIS) No.35(BCI)	Replacement
	245	175	175	DIN 55Ah or equivalent	
	245	175	190		
	245	175	203	Maximum capacity	
MVH-508	232	175	203	75D23L(JIS) No.35(BCI)	STD
	245	175	175	DIN 75Ah or equivalent	Replacement
	245	175	190		
	245	175	203	Maximum capacity	

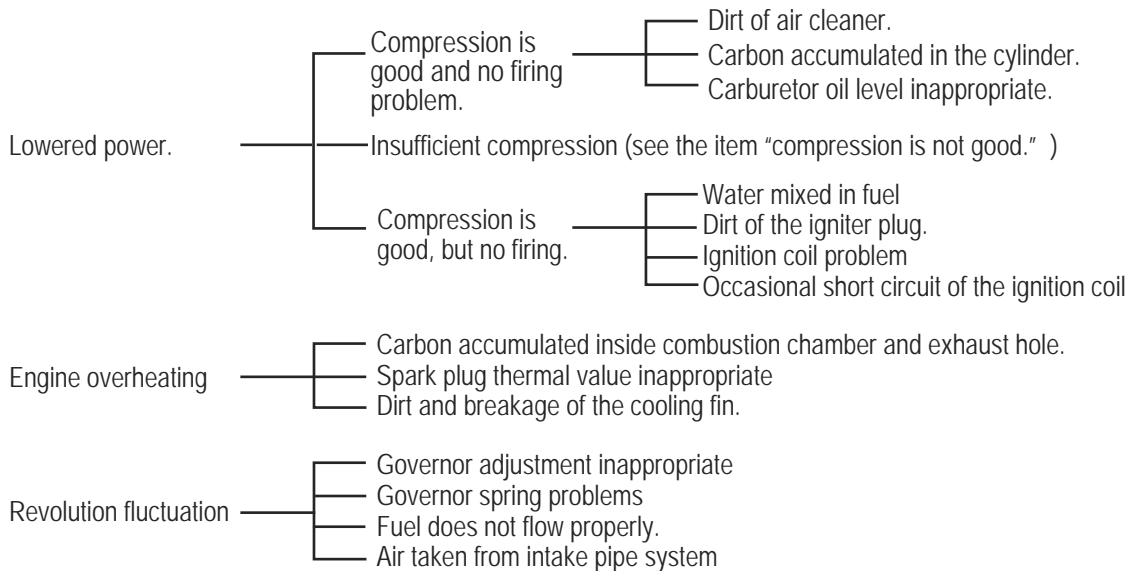
10. TROUBLESHOOTING

10.1 Gasoline Engine

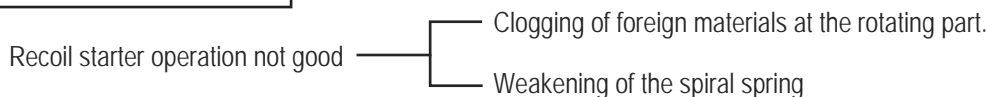
(1) Starting problems



(2) Operation problems



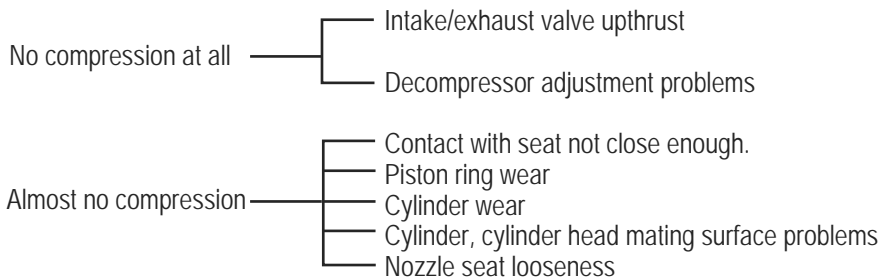
(3) Recoil starter problems



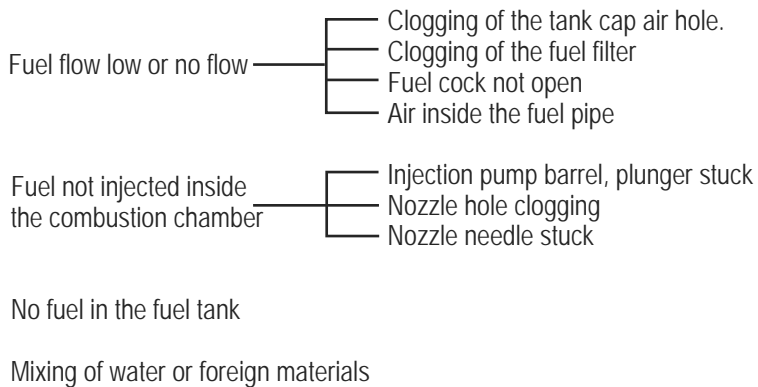
10.2 Diesel Engine

(1) Starting problems

(A) In case of compression problems



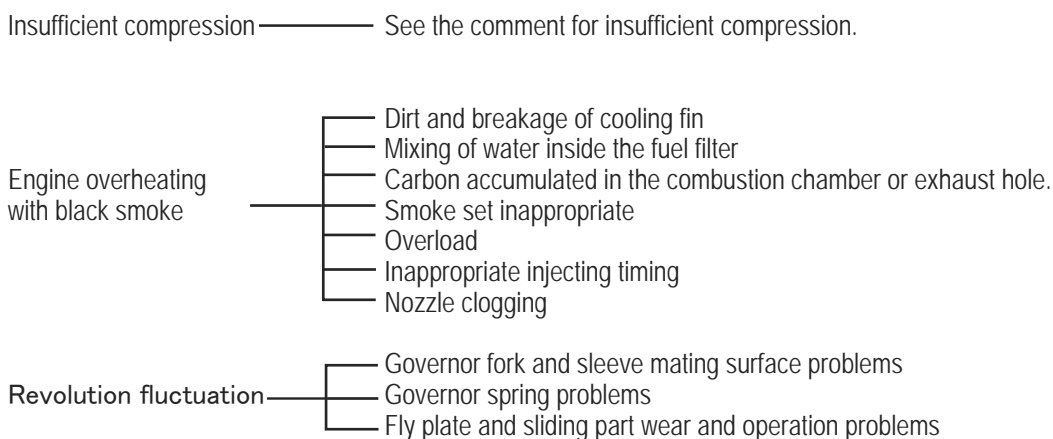
(B) In case of inappropriate fuel injection inside the combustion chamber

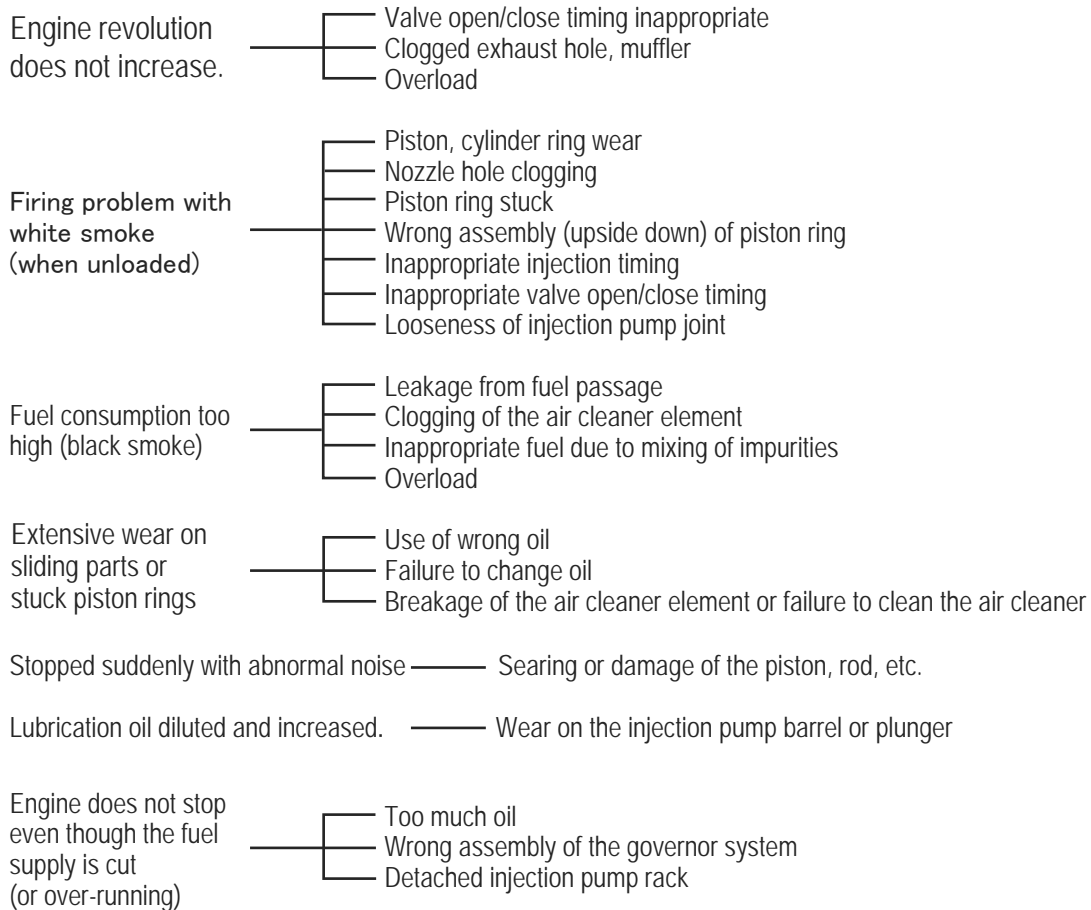


(C) Fuel and compression pressure appropriate, but the engine does not start.

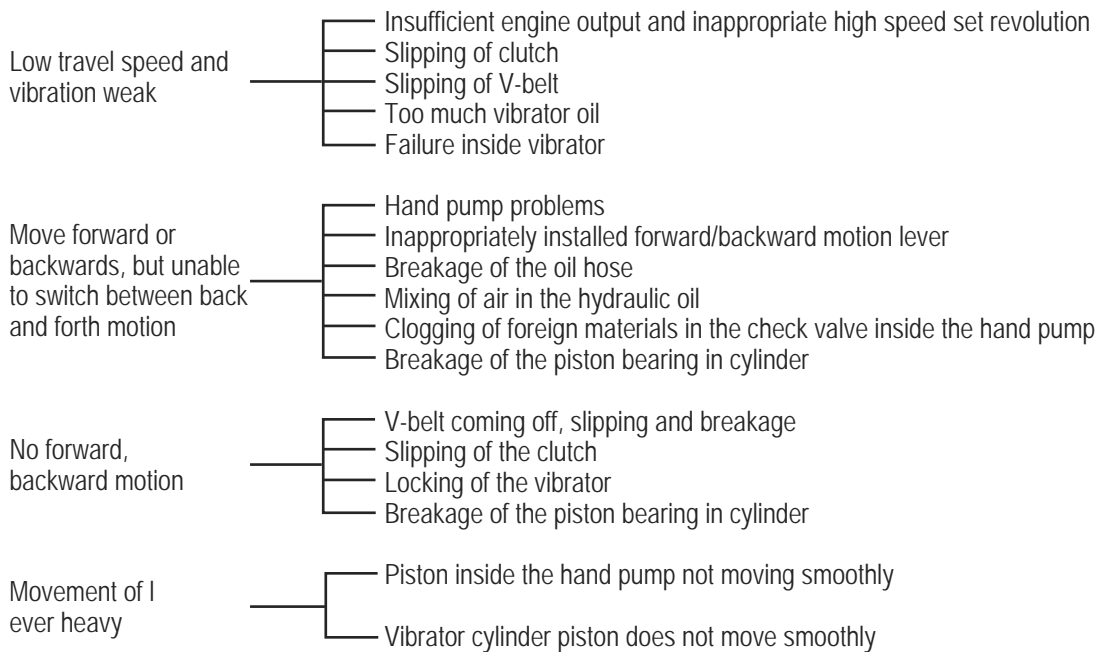


(2) Insufficient output and operation problems



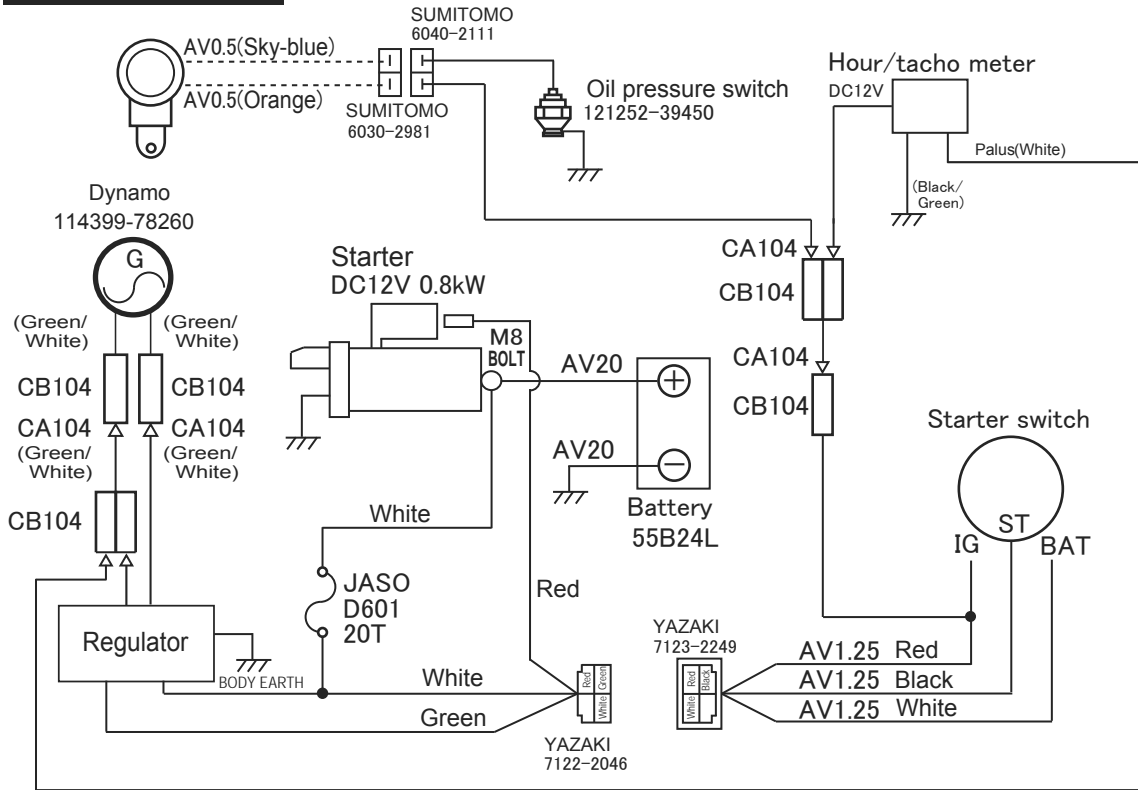


10.3 Main Body

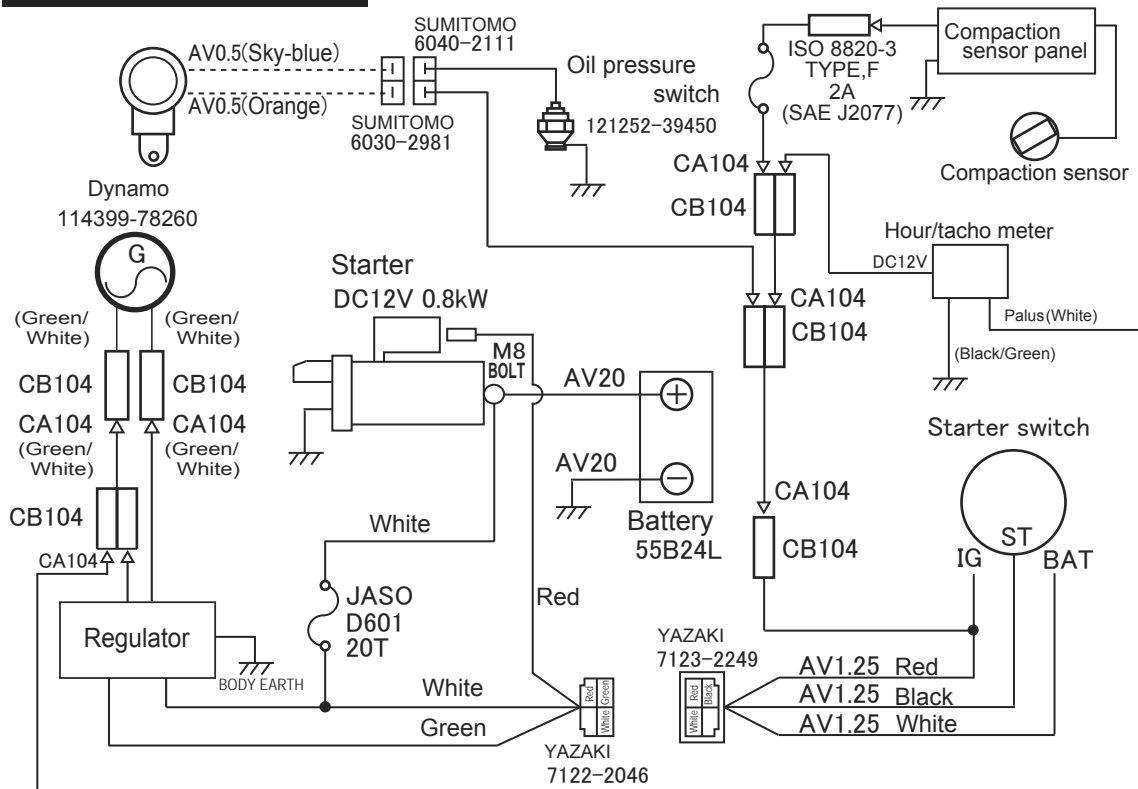


11. WIRING DIAGRAM

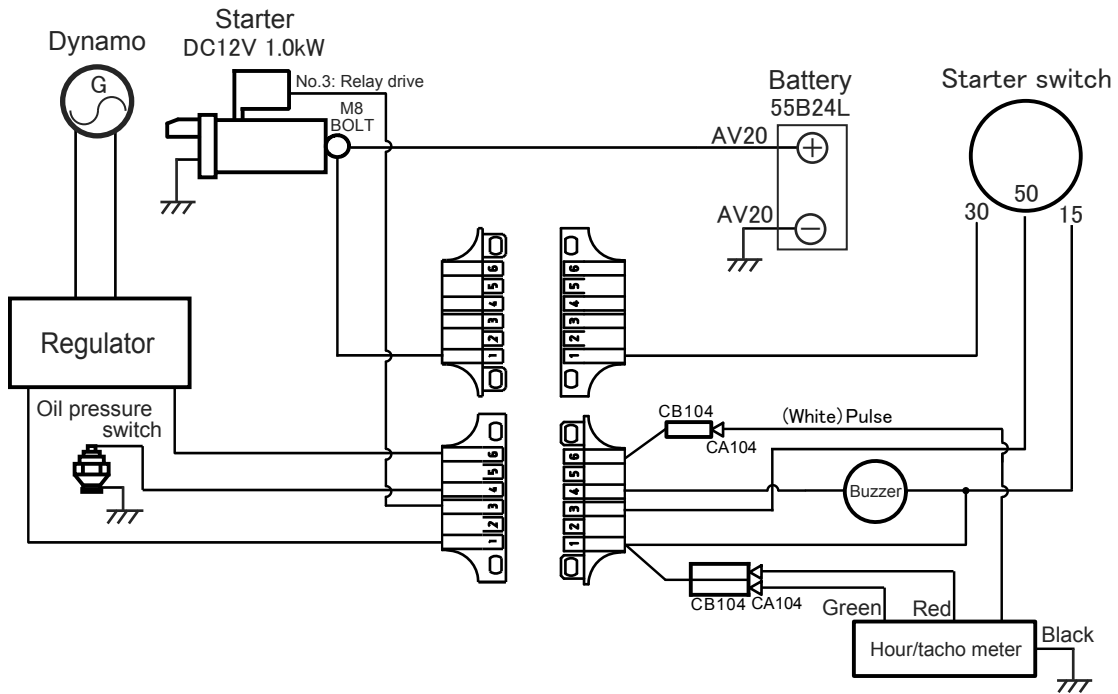
MVH-308DSY MVH-408DSY



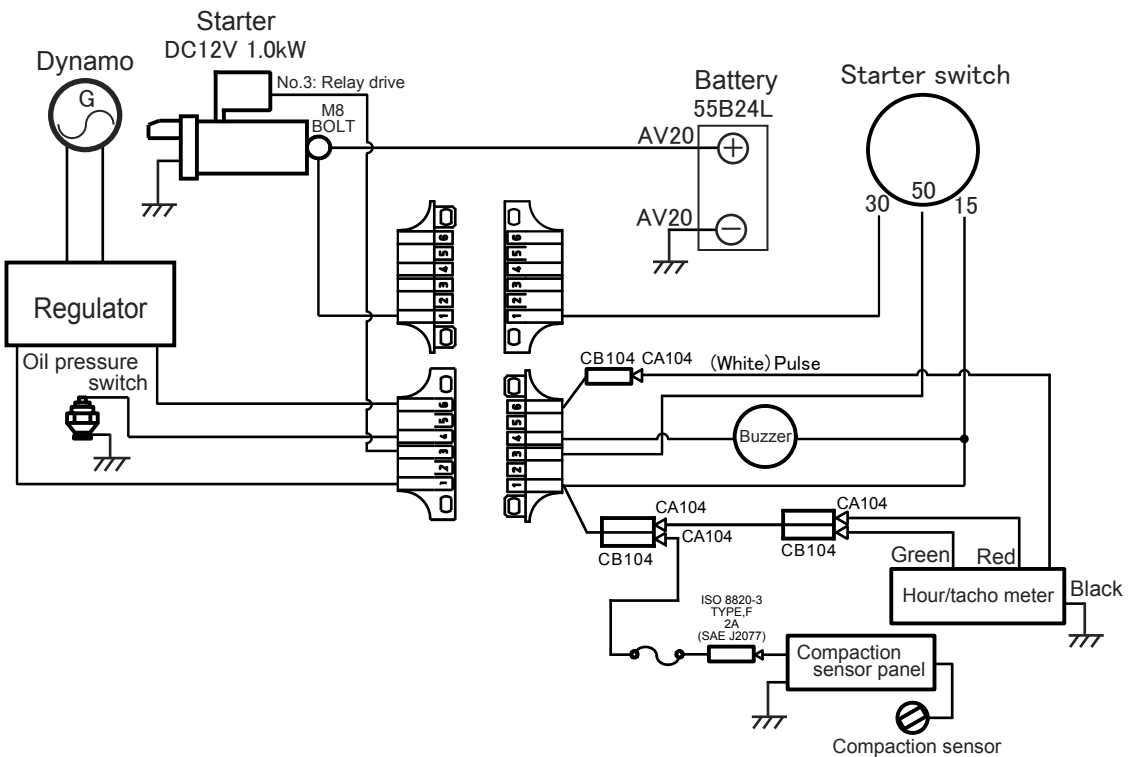
MVH-308DSY-PAS MVH-408DSY-PAS



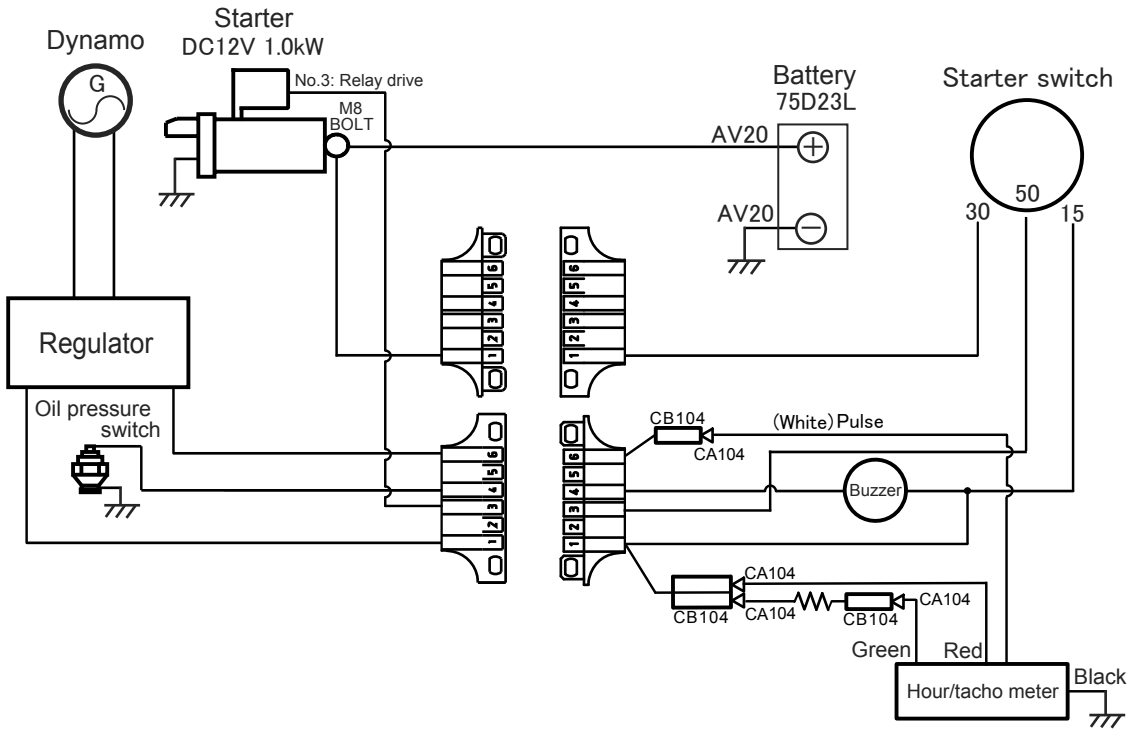
**MVH-308DSZ
MVH-408DSZ**



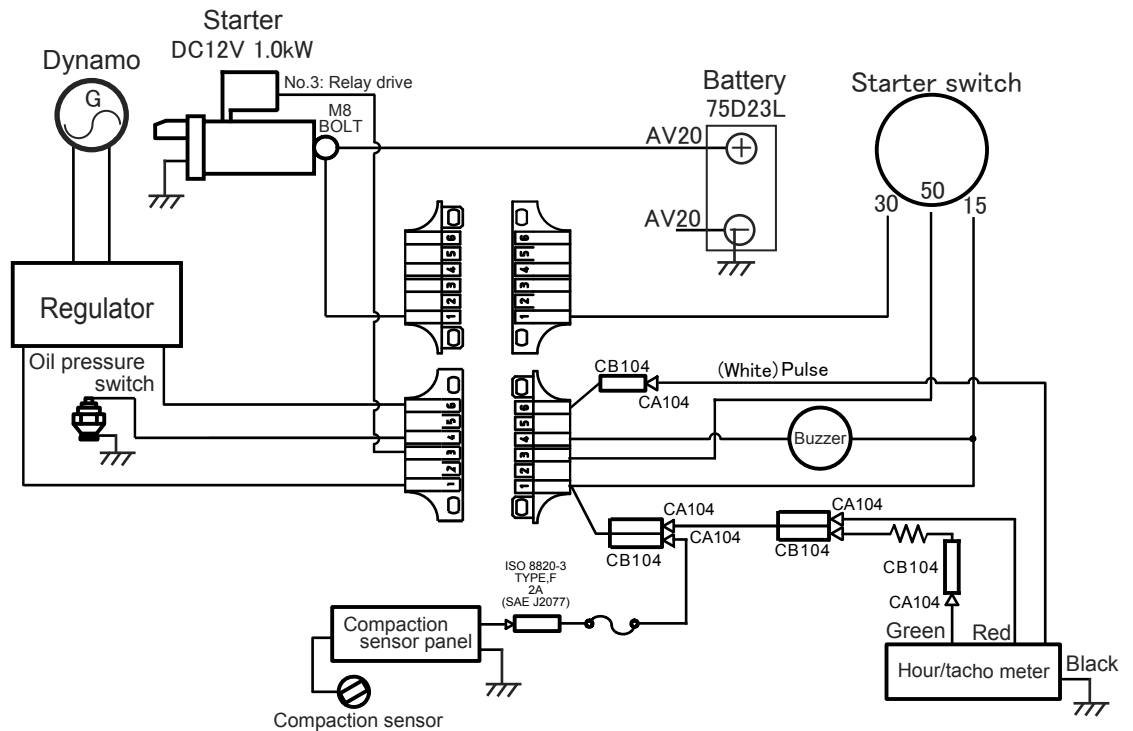
**MVH-308DSZ-PAS
MVH-408DSZ-PAS**



MVH-508DSZ



MVH-508DSZ-PAS





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