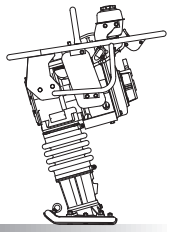
Mikasa

TAMPING RAMMER

MT-76D
MT-76DL



INSTRUCTION MANUAL

en

We thank you for selecting Mikasa Tamping Rammer.
For your safe and proper operation,please read this manual and be always sure to keep it ready for reference.

Contents of "Declaration of Conformity"
Please refer the EC DECLARATION OF CONFORMITY in this manual as well.

http://www.mikasas.com

302-00912

1) DECLARATION OF CONFORMITY

2) Manufacturer's name and address.			Mikasa Sangyo Co., Ltd. 4-3, Sarugaku-cho 1 chome, Chiyoda-ku, Tokyo101-0064, Japan			
3) Name and address of the person who keeps the technical documentation.			Takahiro Kishino, engineer R. & D. Division, Mikasa Sangyo Co., Ltd. Shiraoka-city, Saitama, Japan			
4) Type: Vibratory Rammers						
5) model	MT-76D	MT-76DL CE				
6) Equipment item number	251555, 251556, 251557, 251558, 251559, 251560	251561				
7) Serial number	For serial number, please refer it on front page.					
8) power source cont. output <max.output>	Yanmer L48N 3.1kW <3.5kW>	Yanmer L48N 3.1kW <3.5kW>				
9) Measured sound power level(dB)	107	105				
10) Guaranteed sound power level(dB)	108	107				
11) Operator's sound pressure level(dB)	96	97				
12) Conformity assessment according to Annex:			VIII (Full Quality Assurance procedure)			
13) Name and address of the Notified Body			Société Nationale de Certification et d'Homologation (SNCH) 11, route de Luxembourg L-5230 Sandweiler LUXEMBOURG			
14) Related Directive			Directive **2000/14/EC** and, to be followed by Directive **2005/88/EC**, relating to the noise emission in the environment by equipment for use outdoors.			
15) Declaration			The equipment referred in this document, fulfills with all the requirements of Directive 2000/14/EC			
16) Other related Community Directives			**2006/42/EC, 2005/88/EC, 2004/108/EC, 2002/88/EC(2004/26/EC)** EN500-1, EN500-4			
17) EC Conformity Certificate No:			e13*2000/14*2005/14*0472*01			
18) Place and date of the declaration			Tokyo, Japan May, 2016 Signed by:  Keiichi YOSHIDA Director, Product Control Division Mikasa Sangyo Co., Ltd.			

Italian

1. DICHIARAZIONE “CE” DI CONFORMITÁ
2. Nome e indirizzo Fabbricante
3. Nome e indirizzo della persona che conserva la documentazione tecnica
4. Tipo: **Piastre vibranti**
5. Modello
6. Codice macchina
7. Numeridi matricola
8. Potenza installata netta <resa massima>
9. Livello di potenza sonora misurato (dB)
10. Livello di potenza sonora garantito
11. Livello massimo di pressione sonora
12. Valutazione di conformità in accordo all'annesso VIII (procedura Garanzia di Qualità totale
13. Nome dell'organismo notificato
14. Rappresentante Autorizzato in Europa
15. Direttiva di riferimento
    Direttiva 2000/14/CE su l'emissione acustica ambientale delle macchine ed attrezzature destinate a funzionare all'aperto
16. Dichiarazione
    Le attrezzature riportate nel documento soddisfano i requisiti della Direttiva 2000/14/CE
17. Altre Direttive Comunitarie di riferimento
18. Certificato di Conformità CE No:
19. Luogo e data della dichiarazione

French

1. DECLARATION « CE » DE CONFORMITE
2. Non et adresse du Fabricant
3. Nom et adresse de la personne qui défient les documents techniques
4. Type du materiel: **Plaques vibrantes**
5. Modello
6. Numero equipement
7. Numéro de série
8. Puissance reseau <rendement maximal>
9. Niveau sonore mesure(dB)
10. Niveau sonore garanti(dB)
11. Niveau sonore maximum
12. Certification de conformite selon l'annexe VIII (procedura Garanzia di Qualità totale)
13. Nom et adresse de l'organisme notifié
14. Mandataire dans la Communaute Europeenne
15. Directive concernee
    Est egalement conforme aux dispositions de la directive <<emission sonores des equipements utilises a l'exterieur des batiments>> 2000/14/CE et aux legislations nationales la transposant.
16. Declaration
    L'équipement de référence satisfait aux exigences de la Directive 2000/14/EC
17. Autres directives communautaires concernees
18. Certificate deConformite CE numero:
19. Lieu et date de la declaratio

Spanish

1. DECLARACIÓN “CE” DE CONFORMIDAD
2. Nombre y dirección del fabricante
3. Nombre y dirección de la persona que guarda la documentación técnica.
4. Tipo: **Bandejas vibrantes**
5. Modelo
6. Número de referencia del equipo
7. Numeros de serie
8. Potencia neta instlada <rendimineto maximo>
9. Nivel sonoro medido del motor (dB)
10. Nivel sonoro garantizado del motor (dB)
11. Máximo nivel sonoro de presión (dB)
12. Evaluación de la Conformidad de acuerdo al Anexo VIII (Prcedimiento de total garantía asegurada)
13. Nombre y dirección de la Entidad Notificada
14. Representante autorizado
15. Directiva relacionada
    Directiva 2000/14/CE en relación a la emisión sonora en el ambiente por equipos que trabajan en espacios abiertos
16. Declaración
    El equipo referido en este documento , cumple con todos los requerimientos de la Directiva 2000/14/EC
17. Otras Directivas Comunitarias relacionadas
18. Certificado de Conformidad CE Nº
19. Lugar y fecha de la declaración

Preface

This instruction manual describes the proper methods for using the tamping rammer, as well as simple checks and maintenance. **Be sure to read this instruction manual before using the rammer**, in order to get full use of the excellent performance of this machine, to improve your operation and to perform engineering work effectively.

After reading this manual, **store it in a handy location** for easy reference.

For details about the engine in this machine, see the separate instruction manual for the engine.

For inquiries about repair parts, parts lists, service manuals, and repair of the machine, please contact the shop where you purchased it, our sales office, or the Mikasa Parts Service Center. In addition, parts lists are available on the MIKASA website at:
http://www.mikasas.com/english/

The illustrations and Figures in this manual may be different from the machine you actually purchased due to design changes and other reasons for improvement.

Application

Though compact and lightweight, this rammer creates a strong impact and you may expect a large tamping effect on the ground.
It will compact nearly all types of soil, except soft soil that contains too much moisture.
Use this rammer to tamp the ground for creating roads, embankments, and to prepare the surface to support buildings. It can also be used when burying gas or water lines, and electric cables.

Warning about incorrect applications and techniques

Do not use this machine on ground that is harder than the machine can handle, or for driving pilings or tamping rock beds. Furthermore, use of the machine on sloping ground such as the side of an embankment, may be make the machine unstable and can cause an accident. It can also result in premature machine wear due to uneven loads on the machine.
Use the machine with confidence for tamping earth and sand, soil, sand, gravel, and asphalt. Do not use the machine for other type of jobs.

Structure

The upper section of the machine functions as a weight and consists of an engine section guide, a gear reducer section, and reciprocating section. It also accommodates the handle and the fuel tank sections, which are connected by rubber dampers.
The lower section of the machine which hits the ground, consists of a spring case to engage sliding motion, a sloping section to allow the machine to tilt toward the front, bellows to cover the foot, a sliding section, and a protective sleeve.

Power transmission

Power is provided by an air-cooled, 4-cycle, single-cylinder diesel engine. The output end of the engine crankshaft is equipped with a centrifugal clutch.
As the engine speed increases, the centrifugal clutch expands and a pinion gear that is a part of the clutch drum engages a gear in the crank shaft on the main frame. The engine speed is decreased in order to produce the required force for tamping.
The rotating motion of the main frame crankshaft is converted to a reciprocating motion through a connecting rod. This reciprocating motion causes the foot to go up and down through a strong coil spring. The weight of the main body and the strong force from the engine compress the spring and the foot moves up and down, striking the ground forcefully.

Warning labels

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.

Precautions (without a triangular mark): Failure to follow the instructions may result in damage to property.

Precautions for safety

General precautions

⚠ WARNING

- **DO NOT** work in the following conditions.
  - If you do not feel well due to overwork or illness.
  - If you are taking any medicine.
  - If you are under the influence of alcohol.

⚠ CAUTION

- Read this instruction manual carefully and handle the machine as described so that you can work safely.

- For details about the engine, refer the separate instruction manual for the engine. Make sure you thoroughly understand the construction and operation of the machine.

- To work safely, always wear protective clothing (helmet, safety glasses, safety shoes, ear plugs etc.) and appropriate work clothes. Always check the machine to make sure that it is normal before starting operation.

- The decals on the machine body (operating methods, warning decals, etc.) are very important to ensure safety. Keep the machine body clean so that they can be read at all times. If any decal cannot be read, replace it with a new one.

- It is very dangerous if children come into contact with the machine. Take the utmost care about how and where the machine is stored.

- Before performing any maintenance, be sure to turn the engine off.

- Mikasa does not accept any liability for accidents or problems caused as a result of not using genuine Mikasa parts (foot assembly, etc.), or if the machine has been modified.

Precautions when adding fuel

⚠ DANGER

- When adding fuel.
  - Be sure to work in a well ventilated location.
  - Be sure to turn the engine off and wait until it has cooled down.
  - Take the machine to a clear flat location without any combustibles nearby. Be careful not any fuel. If you do spill some fuel of diesel, wipe it all up.
  - Do not allow any open flames nearby while adding fuel. (In particular, smoking while adding fuel is strictly prohibited.)

- Adding fuel until it comes too close to the top of the inlet may cause the fuel to overflow. That is dangerous. Follow the instructions in the engine manual about the specified fuel level.
- When through adding fuel, tighten the tank cap securely.

Precautions about where to use the machine

⚠ DANGER

- **DO NOT** run the engine in an unventilated location, such as indoors or in a tunnel. The exhaust gas from the engine is carbon monoxide and is deadly.

- **DO NOT** operate the machine near open fires.

Precautions before starting work

⚠ CAUTION

- If you use the machine for a long time, be careful to watch for signs of vibration syndrome. Since this machine vibrates, operation for a long time may have a negative effect on your body. Take sufficient breaks while working.
- Before starting to operate the machine, check for other people or obstacles that are too close for safe operation.
- When starting the engine, the rammer may jump suddenly. Hold the handle firmly with one hand and pull the recoil starter with the other hand.
- Always be careful around scaffolding. Operate the rammer in a stable manner so that it will not become unbalanced.
- During operation, don't let the foot of the machine come too close to your foot. The plate may smash your foot.
- The main parts of the engine, the muffler, and muffler cover will be very hot during operation. Be careful not to touch them during operation or soon after operation.

- If you encounter any problems or abnormality with the machine during operation, while moving it, or stopping operation, stop work immediately.
- Before leaving the machine, be sure to turn the engine off. Also, make sure to turn the engine off if you want to move the machine. When the throttle lever is in the stop position, the fuel cock is closed. Do not move the lever away from the stop position.
- When lifting the machine by the handle, be careful not to pinch your fingers between the handle and main body.

Precautions before starting work(Continued)

⚠ DANGER

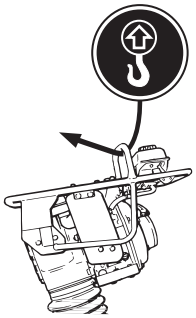
- Take the utmost care not to allow the machine to fall during work, or when stopped or stored. Secure the machine with a rope or similar tie when stored or left idle so that it cannot fall. If the rammer falls over when children are around, a serious accident may occur. If the machine foot is worn, the machine will be especially unstable. If the machine foot is worn badly, replace it with a new one.

- If the machine falls over while working, the machine will move forward due to the kicking motion of the foot while it is lying on its side. If the ground is solid, it will move quickly and is very dangerous. To ensure that the operator and anyone nearby are safe, turn the throttle lever to the engine stop position and make sure the machine stops. You must be extremely careful when working on a road because a serious accident can easily occur.

Precautions while lifting

⚠ DANGER

- Before lifting the machine, make sure that there is no damage to any of the components on the machine (look especially for damage to the rubber dampers and the hook). There must not be any loose or missing screws and the machine must generally be in a safe condition.
- Turn the engine off before lifting the machine.
- Use wire cables with enough strength to support the machine.
- **DO NOT** lift it higher than necessary, for safety.
- **DO NOT**use a damaged wire cable.
- Only use the single hook to lift the machine. **DO NOT** support it from any other points (such as the handle).



- Never lift or lower the machine rapidly when using a hydraulic shovel or a crane.
- When lifting the machine, do not allow any people or animals to pass under or near the machine.
- When using any type of equipment to lift the machine, be careful that the lifting equipment does not cause an accident. Make sure you check the lifting equipment carefully, to ensure that there are no problems or damage.

Transportation and storage precautions

⚠ DANGER

When transporting

- Before transporting the machine, stop the engine.
- **DO NOT** try to move it before the engine and machine body have cooled down enough.
- Drain any fuel before transporting the machine.
- Transport the rammer in a manner that keeps it level. If you must lay the machine down to transport it, drain any fuel from the fuel tank. Then close the fuel tank cap and oil fill plug securely. Next, position the machine so that the muffler will be facing down.
- Secure the machine body so that the machine cannot move or fall during transportation.
- When you want to lift the machine by gripping the handle, be careful not to pinch your fingers or hands between the handle and the main body.
- Since this machine is quite heavy, use a truck specifically designed to transport heavy objects.

When storing the machine

- After the engine and machine body have cooled down enough, store the rammer so that it is level. Fasten the machine as needed so that the machine cannot fall down. If it you must lay the machine down, close the fuel tank cap and oil fill plug securely. Arrange the machine position so that the muffler will be facing down. After it is lying down, make sure there are no oil or fuel leaks. (If fuel is leaking, drain it all from the fuel tank.)

Maintenance precautions

⚠ WARNING

- Appropriate maintenance of the machine is required to ensure safety and keep the machine performing well. Always be aware of the machine's condition and keep it in good condition.

⚠ CAUTION

- Be sure to turn the engine off before checking or adjusting the machine.
- The muffler and muffler guard become very hot. Do not touch them until they will have cooled down.
- The lubrication oil and engine oil are very hot and can burn you. Do not start any maintenance on the machine while the oil remains hot.

- After performing any maintenance, check the condition of the safety components and the general safety of the machine. In particular, check the nuts and bolts thoroughly.
- If you have to disassemble any components on the machine, be sure to refer the maintenance standard sheets and always work safely.

Specifications

Model	MT-76D/76DL
Overall height Overall width Overall length	1,010 mm 410 mm 740 mm
Impact shoe width Jumping stroke Impact number	285 mm 50～80 mm 10.8～11.7Hz (650～700blows/min.)
Impact force (max.)	15.7kN (1,600kgf)
Clutch	Automatic centrifugal clutch
Total weight	82 kg

Specifications for engine

Model	Yanmar L48N6-SMK
Type	Air-cooled 4-stroke diesel engine
Piston displacement	219cc
Max.Output	3.5 kw (4.7 PS) / 3600 rpm
Cooling system	Air-cooled by fan
Lubricant	Diesel engine lubricating oil API classification "CC" or "CD" grade
Fuel	Automotive Diesel Fuel
Starting system	Recoil starter with Auto-return decompression device

Hand-Arm Vibration Level

Model	Ahv (m/sec^2)
MT-76D	**18.5**
MT-76DL	**16.8**

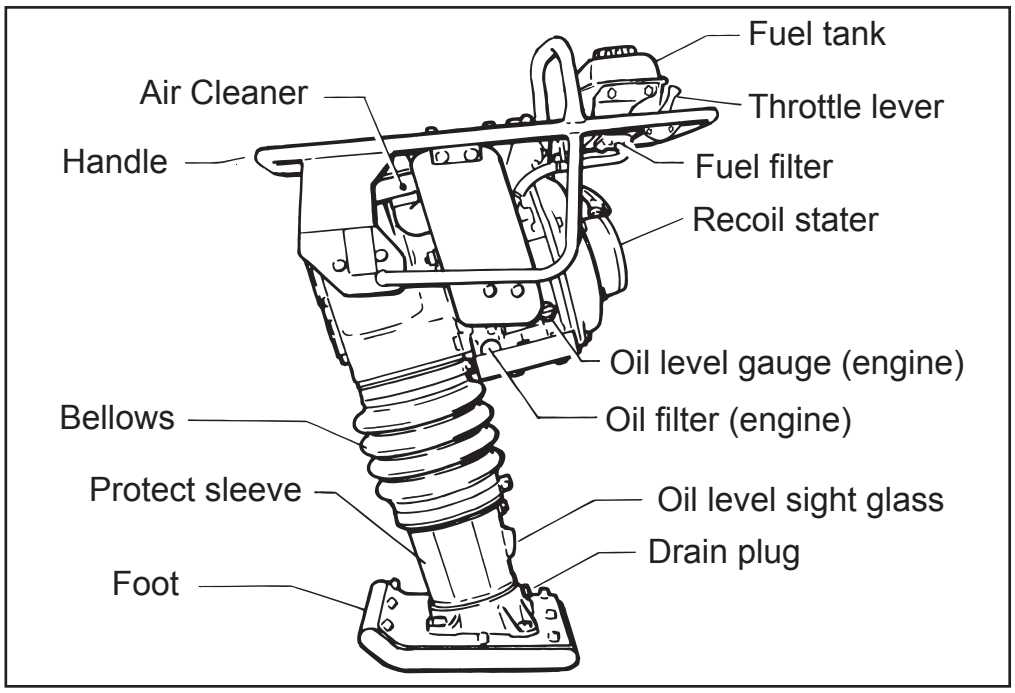
Vibration Level is in comply with EU Directive2002/44/EC and the value is shown as 3 axix min. vibration level.
Test course (Crushed gravel) is in comply with EN500-4.

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

※ Specifications are general and subject to change without notice.
If exact measurements are required, equipment should be weighed and measured.

⚠ WARNING: ⚠

The engine exhaust from this product contains chemicals known to the State of California to cause cancer,birth defects or other reproductive harm.



1.Definition of Tamping Rammer

The Mikasa MT-76D diesel rammer is a powerful compacting tool capable of applying tremendous force in consecutive impacts to a soil surface.

The impact force of the MT-76D levels and uniformly compacts voids between soil particles to increase dry density. Its applications include soil compacting for road, embankment and reservoirs as well as backfilling for gas pipelines, water pipelines and cable installation work.

2. Construction of Tamping Rammer

The rammer is equipped with an air-cooled, four-stroke diesel engine. Transmission of the power takes place by increasing engine speed to engage a centrifugal clutch.

Circular motion is converted into vertical motion to create impact force.

3. Prior to Operation

3-1 Identification of Controls:

1. Throttle
2. Engine Lubrication Oil
3. Oil Fill Plug
4. Oil Level Sight Glass
5. Recoil Starter Handle

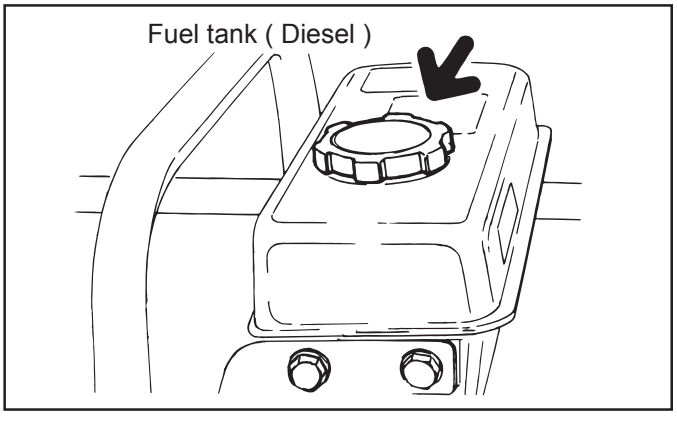


Fig. 1

3-2 Preoperation Inspection:
Rammer Gearbox and Spring Cylinder This unit uses an oil bath lubrication system. Check oil level through oil level sight glass at rear of tamper foot. If oil is not visible, add #10W-30 motor oil. Oil bath contains approx. 1.7 pt. (800 cc) for MT-76D.

3-3 Engine :
Use only automobile diesel fuel. Check the engine oil before starting operation and fill the oil regularly. For check the oil level, move the engine at vertical position and check that the oil is filled with at the oil inlet level.(about 700 cc)

3-4 Check all nuts, bolts and fasteners for tightness. Retighten as necessary.

3-5 Clean dirt from the recoil starter and foot. Wipe entire unit clean before operating

3-6 Replace any missing or damaged Safety/Operation decals.

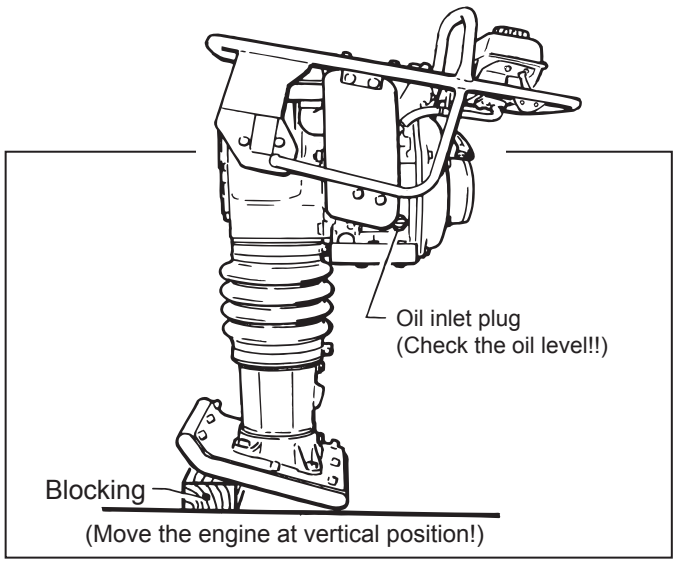


Fig.2

4.Starting

4-1 Move the throttle lever to IDLE position. (Fig.3-1,3-2)

⚠ Throttle lever is used only at three (STOP, IDLE & OPERATION) positions.

⚠ In cold weather, the engine should be started at operating position or between the idle and operation position of the throttle lever.
Use caution as higher engine RPM. may engage clutch, when engine starts.
Return throttle lever from starting position to idle position when engine starts.

4-2 Grip the recoil starter handle and pull it until you feel a slight resistance. (Fig.4)

4-3 Press the decompression lever to release decompression.
The decompression lever will return automatically when the recoil starter is pulled. (Fig.5)

4-4 Return the recoil starter, and pull the handle sharply and quickly.
Warm up the engine by running at low speed for three to five minutes, while checking for fuel leakage or abnormal sounds.

⚠ Do no pull the starter rope all the way to the end and do not let the starter rope snap back as damage may result.

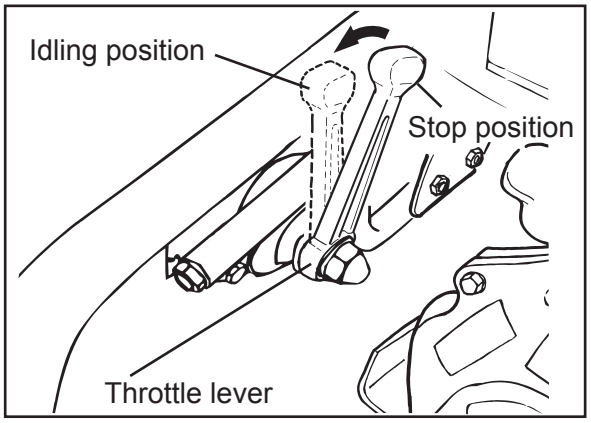


Fig. 3–1

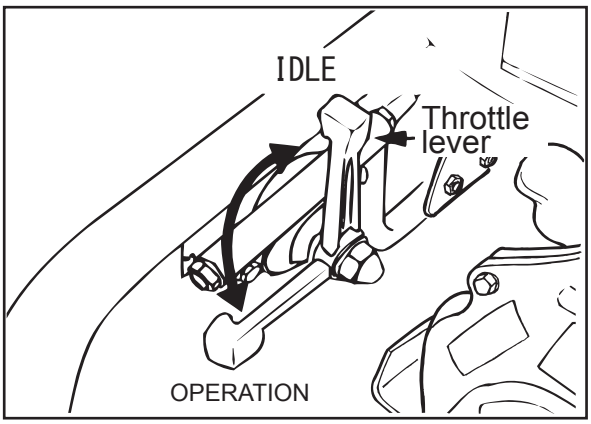


Fig. 3–2

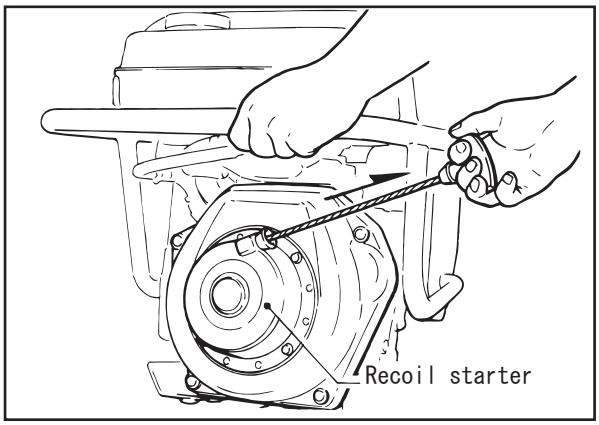


Fig. 4

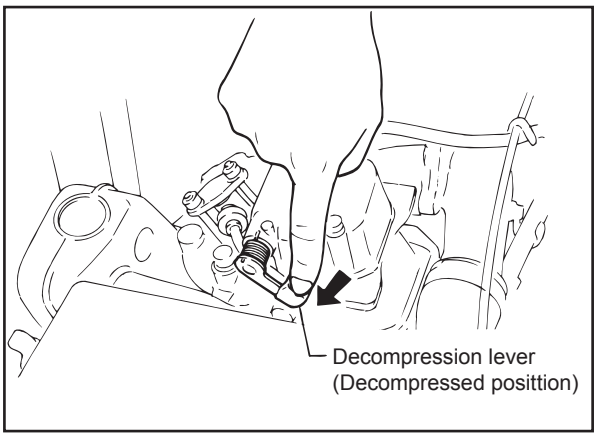


Fig. 5

5 Operation

5-1 Move the throttle lever quickly from the IDLE to OPERATION position to start tamping action. DO NOT move the throttle lever slowly as this may cause damage to the clutch or spring.

5-2 The tamping rammer is designed to tamp the ground 650 to 700 times per minute for MT-76D at an engine speed of 3,100 rpm.
Increasing the engine speed above the recommended rpm will not increase the rammer effectiveness.
Impact will actually decrease because a resonance is created rather than a tamping effect, and damage to the unit can result.

5-3 The rammer can be warmed by quickly moving the throttle lever from the OPERATION to the IDLE position several times until the rammer operates smoothly.

5 -4 The tamping rammer is designed to travel forward while tamping.
To increase travel speed, pull back slightly to the handle so that the rear of the foot contacts soil first.

5-5 To stop tamping, quickly move the throttle lever from the OPERATION to IDLE position.
Do not move the lever slowly as irregular action and damage may result.

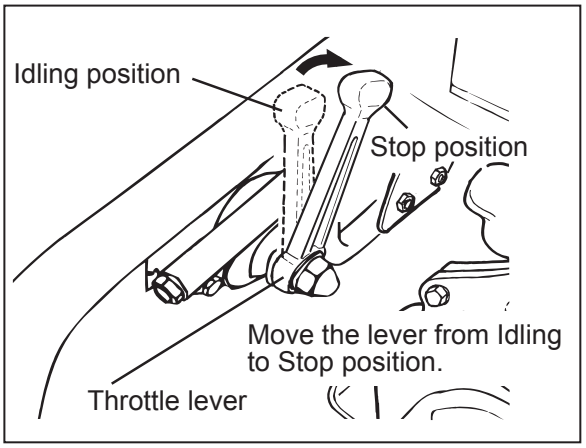


Fig. 6

6. Stopping the Engine

6-1 Move throttle lever quickly from idle to STOP while pressing the throttle lever button.
Run the engine for three minutes at idle speed to allow for proper cool down.
Following above procedure will prevent improper cylinder lubrication caused by overheated engine.(Fig.6)

7.Service

CAUTION:

⚠ Flammable Liquid. When refueling, stop engine and allow it to cool. Do not smoke or allow work to be performed in the immediate area. Fire or explosion could result from flames or sparks, or if fuel is spilled on a hot engine.

⚠ Moving Parts. Shut down the engine before performing service or maintenance functions.
Contact with moving parts can cause serious injury.

⚠ High Temperatures. Allow machine and engine to cool before performing service or maintenance functions. Contact with hot components can cause serious burns.

7-1 DAILY

* Thoroughly remove dirt and oil from the engine and control area.
* Clean or replace air cleaner as necessary.
* Check and retighten all fasteners as necessary.
* Check spring box and bellows for oil leaks. Repair as needed.
* Remove element from pre-cleaner at the top of crankcase(body side) and clean it by air.

7-2 WEEKLY(every 50 hours)

* Remove the fuel filter cap and inspect clean fuel tank.(Fig.7)

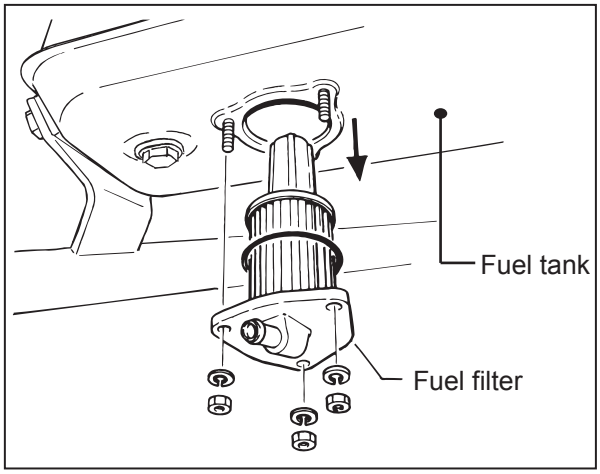


Fig. 7

7-3 Replacement of Lubricant(BODY)

* Remove the drain plug at the rear of tamper foot and drain dirty oil. Refill with clean oil to the middle of the sight glass. Oil bath contains approx. 1.7 pt. (800 cc) for MT-76D.

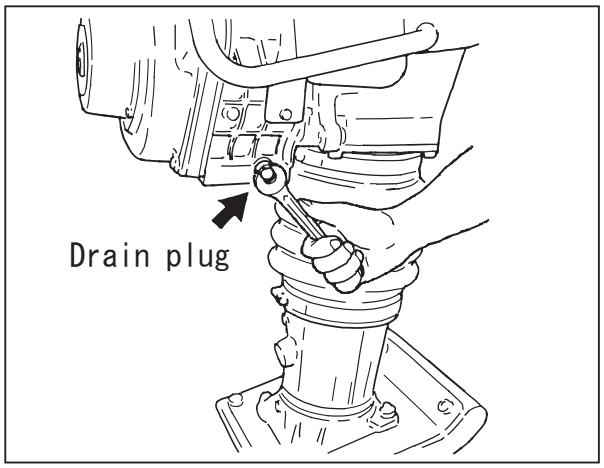


Fig. 8

INITIAL OIL CHANGE:
After 50 hours of operation
SECOND OIL CHANGE AND/OR LATER:
Every 200 hours of operation

7-4 Replacement of Lubricant(ENGINE)

7-4-1 While the engine is still warm, remove the drain plug. For quick discharging, it is advisable to take off the oil gauge.
Replace drain plug and refill engine crankcase.(Fig.8)

7-4-2 Refer the following chart, for oil types.

TEMPERATURE	CLASSIFICATION OF OIL	
20° C(+68° F)or over	CC class or higher grade	SAE 30
10° C(+14° F)-20° C(+68° F)		SAE 20
Below10° C(+14° F)		SAE 10W-30

7-4-3 The interval of oil replacement

INITIAL OIL CHANGE:
After 20 hours of operation
SECOND OIL CHANGE ANDIOR LATER:
Every 100 hours of operation

7-5 Cleaning the Air Cleaner

Cleaning the Air Cleaner (every 200－300 hours) (Fig. 9)

* Remove element from pre-cleaner at the top of crankcase(body side).
* Wash the element (outside) in detergent solution.
* Shake out excess moisture and dry the element.
* Clean inside element with air from the inside of element.

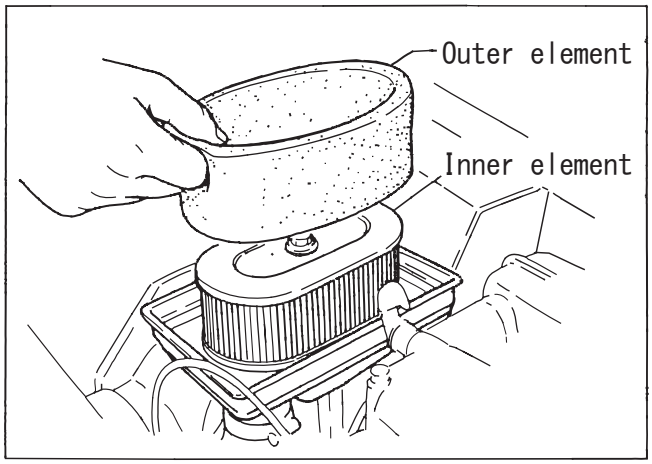


Fig. 9

7-6 Cleaning the Oil Filter

Drain oil filter every 100 hours of operation.
Replace the oil filter every 1,000 hours of operation. (Fig.10)

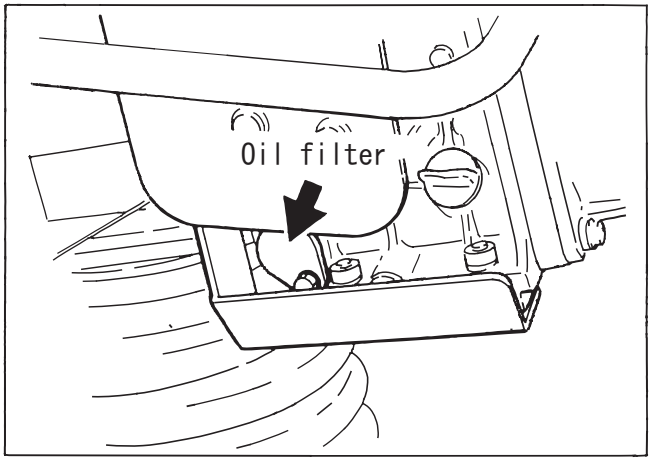


Fig. 10

7-7 Fuel Pipe & Oil Pipe

* Check fuel line regularly for damage, paying attention to clamps to assure a tight fit.
* Replace fuel line every two years to maintain original performance.

7-8 Transportation

Maintain upright position of rammer at all times.
Transport rammer in upright position.
If machine must be laid down for transportation, drain the diesel fuel first and lay machine with muffler side down. (Fig.11)

The fuel filter is installed at the bottom of fuel tank, should rammer be laid down dirt from fuel filter may invade into injection nozzle and fuel pump causing damage.

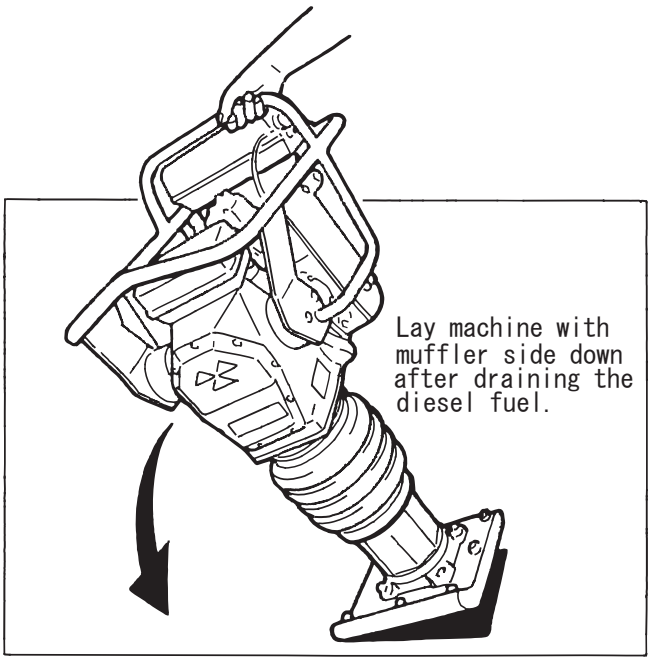


Fig. 11

7-9 Storage

* When storing the rammer for long periods of time, thoroughly drain all fuel from fuel line.
* Clean exterior of rammer with an oil-moistened cloth. Cover and store in a clean, dry place.

8. TROUBLE SHOOTING

1. Diesel Engine

(1) Starting Problem

(A) In case of compression problems

- No compression at all
  - Intake/exhaust valve upthrust
  - Decompressor adjustment problems
- Almost no compression
  - Contact with seat not close enough.
  - Piston ring wear
  - Cylinder wear
  - Cylinder, cylinder head mating surface problems
  - Nozzle seat looseness

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

- Fuel flow low or no flow
  - Clogging of the tank cap air hole.
  - Clogging of the fuel filter
  - Fuel cock not open
  - Air inside the fuel pipe
- Fuel not injected inside the combustion chamber
  - Injection pump barrel, plunger stuck
  - Nozzle hole clogging
  - Nozzle needle stuck
- No fuel in the fuel tank
- Mixing of water or foreign materials

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

- Does not reach the starting revolution.
  - Inappropriate starting operations
  - Engine oil viscosity high, engine oil is very dirty.
  - Air trapped inside the fuel pipe.

(2) Insufficient Output and Operation Problems

- Insufficient compression
  - See the comment for insufficient compression.
- Engine overheating with black smoke
  - Dirt and breakage of cooling fin
  - Mixing of water inside the fuel filter
  - Carbon accumulated in the combustion chamber or exhaust hole.
  - Smoke set inappropriate
  - Overload
  - Inappropriate injecting timing
  - Nozzle clogging
- Revolution fluctuation
  - Governor fork and sleeve mating surface problems
  - Governor spring problems
  - Fly plate and sliding part wear and operation problems
- Engine revolution does not increase.
  - Valve open/close timing inappropriate
  - Clogged exhaust hole, muffler
  - Overload

■ Firing problem with white smoke (when unloaded)
- Piston, cylinder ring wear
- Nozzle hole clogging
- Piston ring stuck
- Wrong assembly (upside down) of piston ring
- Inappropriate injection timing
- Inappropriate valve open/close timing
- Looseness of injection pump joint

■ Fuel consumption too high (black smoke)
- Leakage from fuel passage
- Clogging of the air cleaner element
- Inappropriate fuel due to mixing of impurities
- Overload

■ Extensive wear on sliding parts or stuck piston rings
- Use of wrong oil
- Failure to change oil
- Breakage of the air cleaner element or failure to clean the air cleaner

■ Stopped suddenly with abnormal noise
- Searing or damage of the piston, rod, etc.

■ Lubrication oil diluted and increased.
- Wear on the injection pump barrel or plunger

■ Engine does not stop even though the fuel supply is cut (or over-running)
- Too much oil
- Wrong assembly of the governor system
- Detached injection pump rack

2. Rammer itself

■ Engine rotates but amplitude not uniform, or does not strike.
- Operating speed of throttle lever too slow.
- Oil in excess.
- Clutch slips.
- Spring failure.
- Set speed of engine improper.

Note

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PRINTED IN JAPAN