

A detailed white line drawing of a Mikasa MTX Series Tamping Rammer is shown in the background. The machine features a fuel tank at the top, a handle on the left, and a large cylindrical tamping head at the bottom. The tamping head has several horizontal rings and is mounted on a base plate with four mounting points.

Mikasa
TAMPING RAMMER

MTX *SERIES*

INSTRUCTION MANUAL

302-02804

1) DECLARATION OF CONFORMITY

2) Manufacturer's name and address.		Mikasa Sangyo Co., Ltd. 1-4-3 Sarugaku-cho, Chiyoda-ku, Tokyo, Japan				
3) Name and address of the person who keeps the technical documentation.		Takao Itoh, engineer R. & D. Division, Mikasa Sangyo Co., Ltd. Shiraoka-machi, Saitama, Japan				
4) Type: Vibratory Rammers						
5) model	MTX-60	MTX-70	MTX-80	MTX-90		
6) Equipment item number	51087 51089	51228 51229 51233	51265 51267	51275 51277		
7) power source	Honda GX100U 1.7kW	Honda GX100U 1.7kW	Robin EH12-2D 2.1kW	Robin EH12-2D 2.1kW		
8) Measured sound power level(dB)	103	104	105	105		
9) Guaranteed sound power level(dB)	107	107	107	107		
10) Max. Sound pressure level(dB)	92	94	95	97		
11) Conformity assessment according to Annex:		VIII (Full Quality Assurance procedure)				
12) Name and address of the Notified Body		Société Nationale de Certification et d'Homologation (SNCH) 11, route de Luxembourg L-5230 Sandweiler LUXEMBOURG				
13) Related Directive		Directive 2000/14/EC relating to the noise emission in the environment by equipment for use outdoors.				
14) Declaration		The equipment refer in this document, fulfills with all the requirements of the Directive 2000/14/EC				
15) Other related Community Directives		98/37/EC , 89/336/EEC, 2002/88/EC EN500-1, EN500-4				
16) EC Conformity Certificate No:		e13*2000/14*2000/14*0472*00				
17) Place and date of the declaration		Tokyo, Japan December, 2007 Signed by: Mikasa Sangyo Co., Ltd.  Keiichi YOSHIDA Director, General Manager R&D Division				

Rammer Specifications					
Model		MTX-60	MTX-70	MTX-80	MTX-90
Overall height	mm	985	1,000	1,000	1,000
Overall width	mm	350	350	365	365
Overall length	mm	713	788	788	788
Shoe Size W x L	mm	265 x 340	285 x 340		
Number of Blow	Hz (min ⁻¹)	10.7 ~ 11.6 (644 ~ 695)	10.7 ~ 11.6 (644 ~ 695)	10.7 ~ 11.3 (642 ~ 679)	11.0 ~ 11.6 (660 ~ 698)
Jumping stroke	mm	50 ~ 80			
Impact Force	kN (kgf)	13.6 (1,390)	14.9 (1,520)	15.6 (1,590)	16.5 (1,680)
Clutch	Automatic Centrifugal				
Fuel Tank Capacity	liters	2 liters	3 liters		
Lubricant for Body	Automobile Oil SAE 10W-30; Class SE or higher				
Capacity of Lubricant for Body	liters	0.65	0.82		
Operating weight	kg	64 kg	75 kg	83 kg	89 kg
Guaranteed Sound Power Level (in comply with 2000/14/EC)		107 dB	107 dB	107 dB	107 dB
Hand Arm Vibration (m/sec²) (in comply with 2002/44/EC) Ahv		5.2	5.6	5.6	5.5

Engine Specifications					
Model		Honda GX100U-KRBF		Robin EH12-2D46530	
Type		Air-Cooled 4 Stroke, OHC, single cylinder gasoline engine.		Air-Cooled 4 Stroke, OHV, single cylinder gasoline engine.	
Caburetor System		Diaphragm Type			
Piston Displacement	cc	98		121	
Max. Output	kw / rpm	2.1 / 3,600		2.6 / 3,600	
Setting speed	rpm	3,800 – 4,100		3,400 – 3,600	3,500 – 3,700
Starting System		Recoil Sterter			
Spark plug Only use the anti-EMI (electromagnetic interference) type		NGK : CR5HSB DENSO : U16FSR-UB		NGK : BR6ES	
Lubricant for Engine		Automobile Oil ; Class SE or higher			
Capacity of Lubricant for Engine	liters	0.28		0.4	
Fuel		Unleaded Gasoline			

Standard Equipment:

Triple Air Cleaner System
Hour & Tacho-meter
Throttle lever which united the engine switch and the fuel cock
Engine Protector
Roller on Handle
Lifting Handle

*** About Operetion weight**

- 1) Fuel tank is filled up with one half of the fuel of regulation tank capacity.
- 2) Oil measure of the body and engine is included the stated capacity

MTX TAMPING RAMMER INSTRUCTION MANUAL

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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 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 gasoline 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 gasoline, 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.

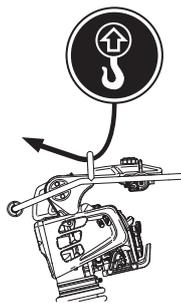


- If the machine falls over while working, the machine will move forward due to the kicking motion of the foot while it is lying on its side. If the ground is solid, it will move quickly and is very dangerous. To ensure that the operator and anyone nearby are safe, turn the throttle lever to the engine 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 and carburetor. Then close the fuel tank cap and oil fill plug securely. Next, position the machine so that the carburetor will be facing up.
- 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 carburetor will be facing up. 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.

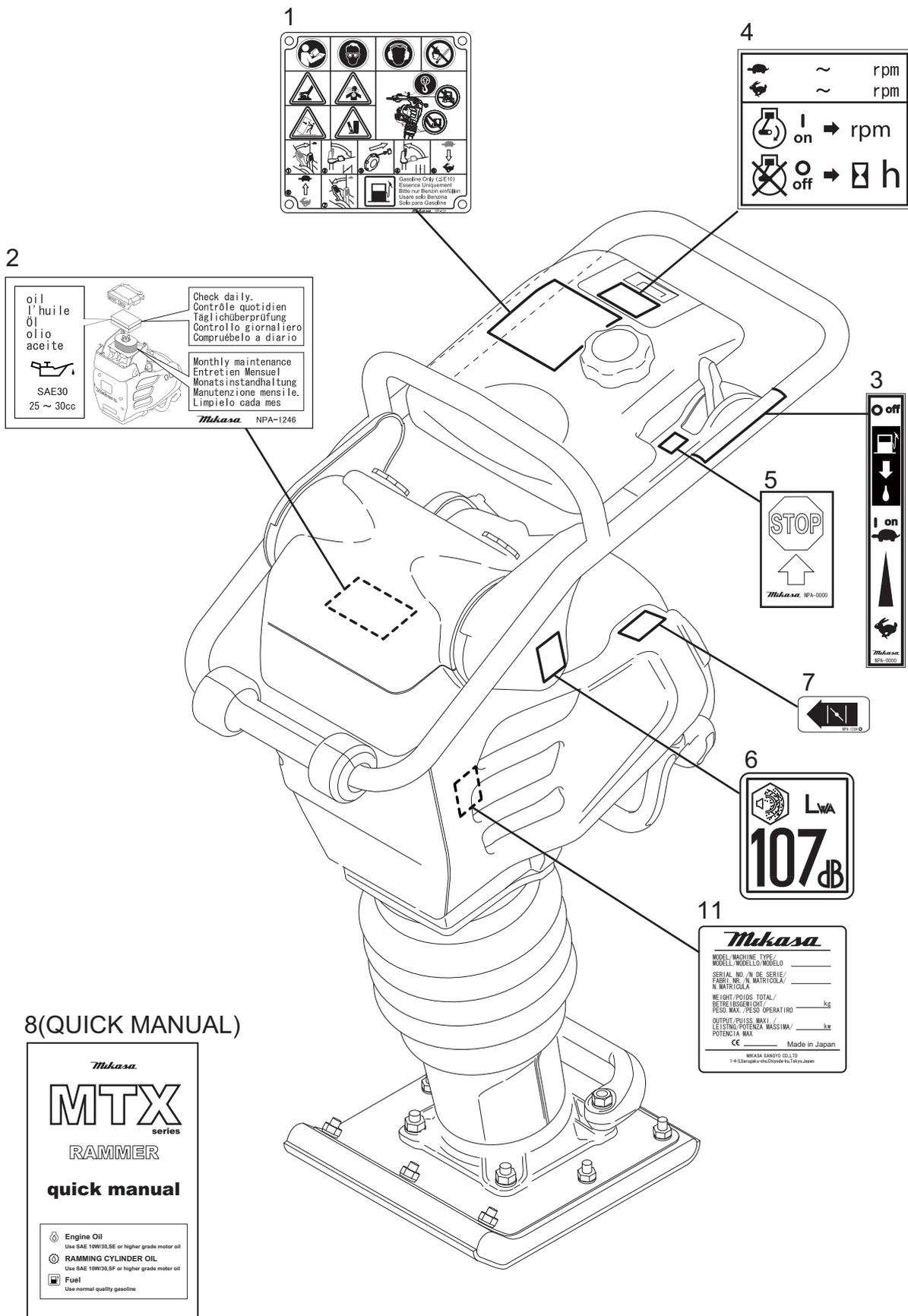
CAUTION

- 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.



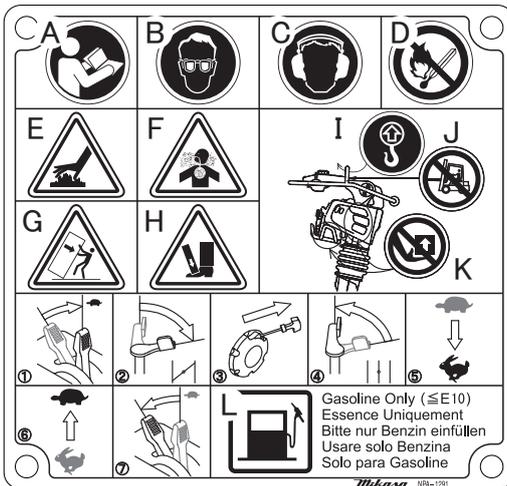
- After performing any maintenance, check the condition of the safety components and the general safety of the machine. In particular, check the nuts and bolts thoroughly.
- If you have to disassemble any components on the machine, be sure to refer the maintenance standard sheets and always work safely.

Places where decals are attached



No.	Part No.	Part Name	Remarks
1	9202-12910	DECAL,OPERATION	
2	9202-12460	DECAL,AIR CLERNER	
3	9202-12470	DECAL,LEVER OPERATION	
4	9202-12490	DECAL,MAX SPEED 4100	MTX-60,70
4	9202-12500	DECAL,MAX SPEED 3600	MTX-80
4	9202-12510	DECAL,MAX SPEED 3700	MTX-90
5	9202-12480	DECAL,MACHINE STOP	
6	9202-10310	DECAL,EC NOISE REQ.LWA107	
7	9202-12840	DECAL,CHOKE OPERATION	
8	9202-12540	QUICK MANUAL	
11	9202-13040	PLATE,SERIAL NO./MTX-60	MTX-60
11	9202-12370	PLATE,SERIAL NO./MTX-70	MTX-70
11	9202-12390	PLATE,SERIAL NO./MTX-80	MTX-80
11	9202-12410	PLATE,SERIAL NO./MTX-90	MTX-90

Descriptions of the symbols on the warning decals



- A. Read the instruction manual carefully
- B. Wear protective clothing, such as safety glasses.
- C. Wear protective clothing, such as ear protectors.
- D. Fire hazard
- E. Be careful not to get burned
- F. Danger: poisonous exhaust gas
- G. Lay the machine down carefully
- H. Don't let your foot slip under the machine foot.
- I. Lift point.
- J. Lifting with a forklift is prohibited
- K. Lifting the machine by the engine guard is prohibited
- L. Fuel specification (gasoline)

Starting, running and stopping

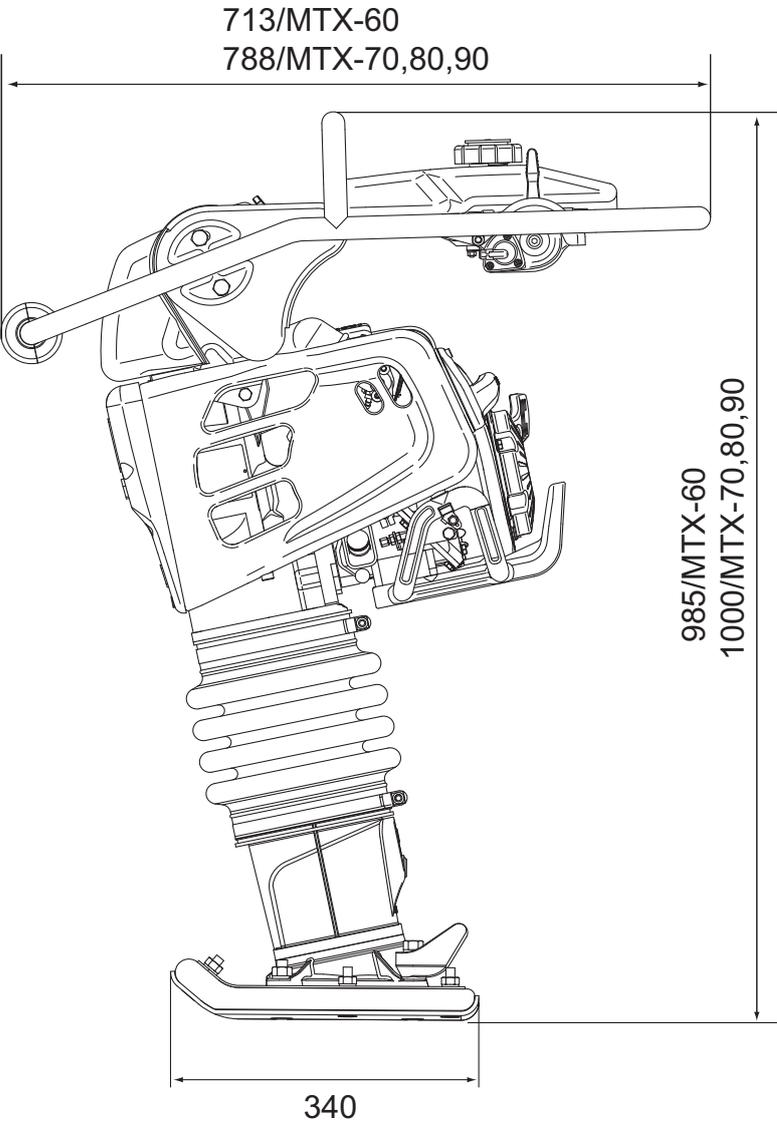
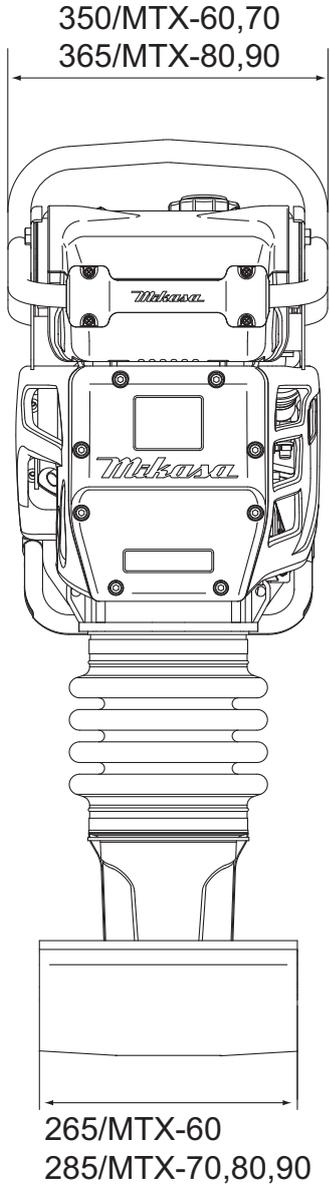
- 1) Slide the throttle lever to the idle position.
- 2) Turn the choke lever to the "Closed" position.
- 3) Pull the recoil starter handle.
- 4) Turn the choke lever to the "Open" position.
- 5) Slide the throttle lever to the operating position.
- 6) After work, slide the throttle lever to the idle position.
- 7) After the machine has cooled down a little, slide the throttle lever to the stop position.

Mikasa	
MODEL/MACHINE TYPE/ MODELL/MODELLO/MODELO	_____
SERIAL NO./N DE SERIE/ FABRI NR./N. MATRICOLA/ N. MATRICULA	_____
WEIGHT/POIDS TOTAL/ BETREIBSGEWICHT/ PESO. MAX./PESO OPERATIVO	_____ kg
OUTPUT/PUISS. MAXI./ LEISTUNG/POTENZA MASSIMA/ POTENCIA MAX	_____ kw
CE _____	Made in Japan
MIKASA SANGYO CO.,LTD 1-4-3,Sarugaku-cho,Chiyoda-ku,Tokyo,Japan	

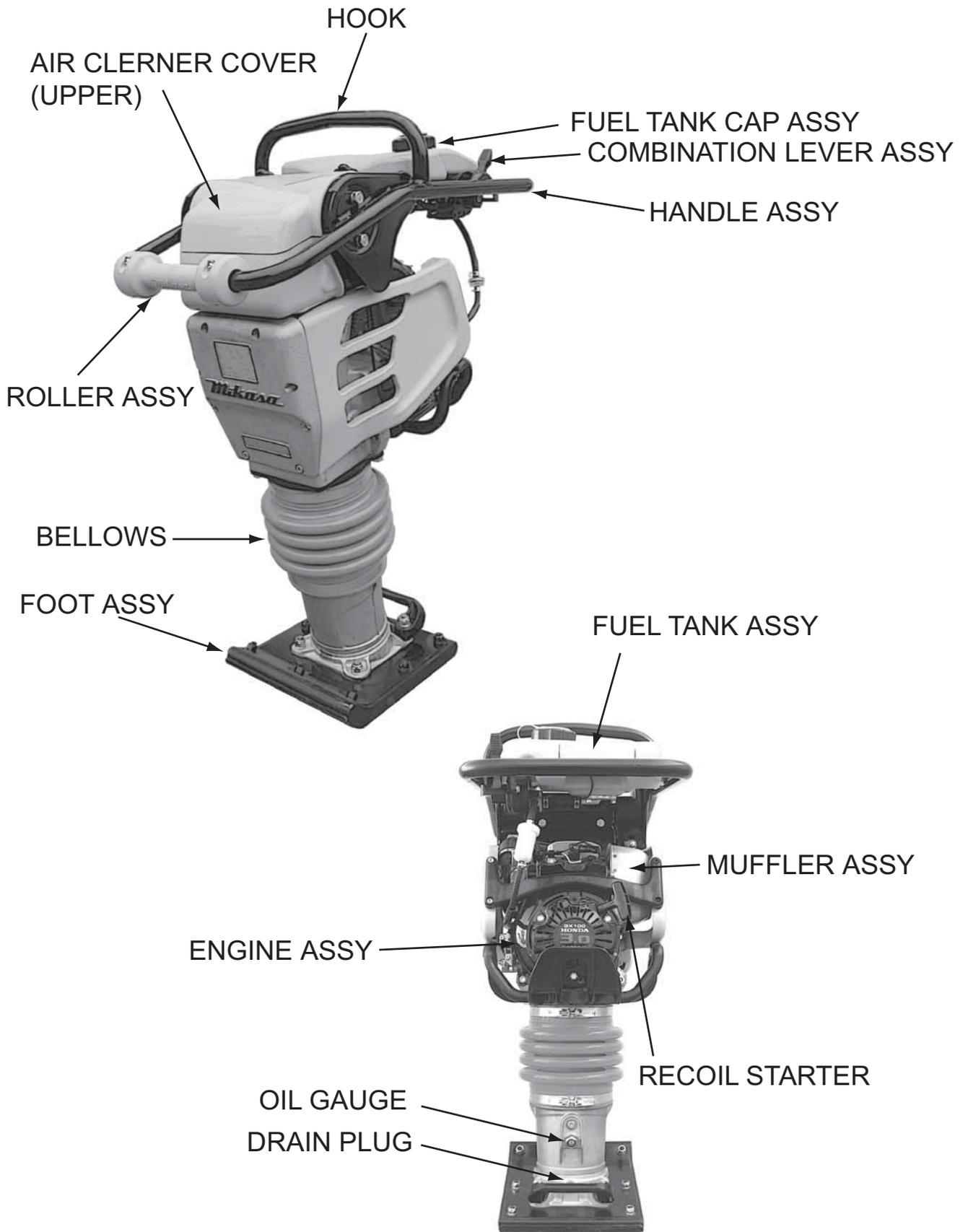
Product number name plate

Product name, machine serial number, weight, engine output, and CE mark

Dimensions



Components



Inspection before operation

WARNING

- Only check the machine while the engine is stopped. Otherwise, you may be caught by the rotating components and be seriously injured.
- Check the machine body only after it has cooled down. The muffler is very hot and you may be badly burned.



Inspection points

Appearance
Air cleaner
Bolts, nuts
Handle
Rubber damper
Engine oil
Main body lubrication oil
Fuel tank
Fuel system

Inspection items

Flaws, deformity, stains
Stains, flaws, deformation
Loose or missing parts
Flaws, deformity, cracks, breaks
Flaws, deformity, cracks, breaks
Color, oil level
Color, oil level
Leaks, fuel level, presence of dirt
Leaks, wear, loose parts

1 Clean each component thoroughly so that there is no mud or dirt on it.

In particular, remove any mud on the machine foot, and clean the area around the recoil starter and carburetor.

2 Make sure that all of the screws are tight. Loose screws may cause an accident due to the vibration.

3 To check the engine oil, place the machine body on a level surface and then tilt it forward. (Figure 1)

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

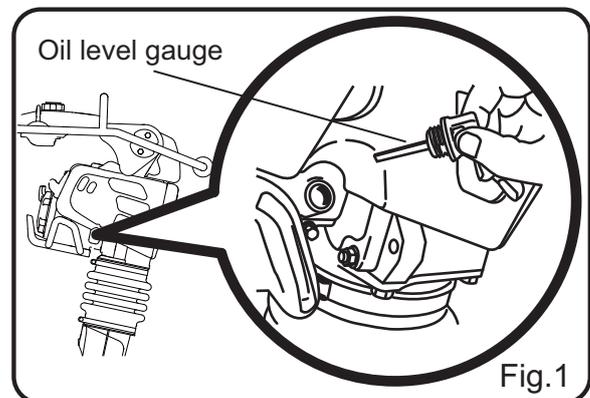


Fig.1

4 Place the machine body on a level surface and look at the oil gauge on the protective sleeve, from the right side. See if the oil is at the specified level. (Figure 2)

Use 10W-30 engine oil rated SE or SF or better for the engine.

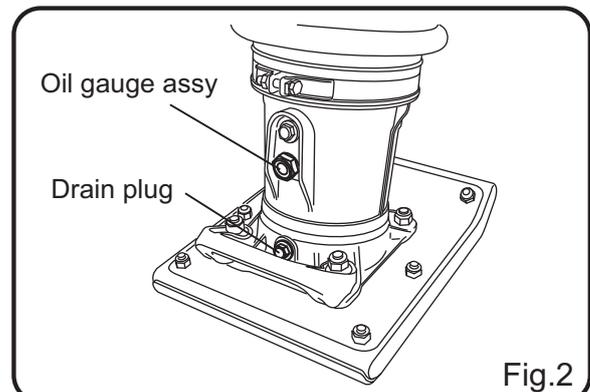
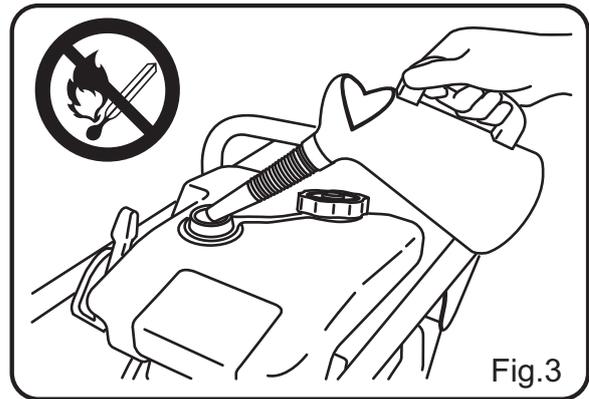


Fig.2

- 5 Add regular gasoline (Unleaded) to the fuel tank and check the engine oil. Add oil before it gets too low. Too little engine oil may cause the engine to wear prematurely. (Figure 3)
Use 10W-30 engine oil rated SE or SF or better for the engine.

⚠ DANGER: Fire hazard while refueling.

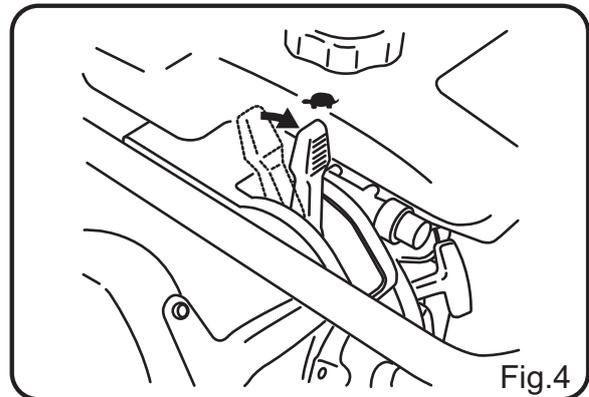
⚠ CAUTION: If any fuel spills, wipe it all up.



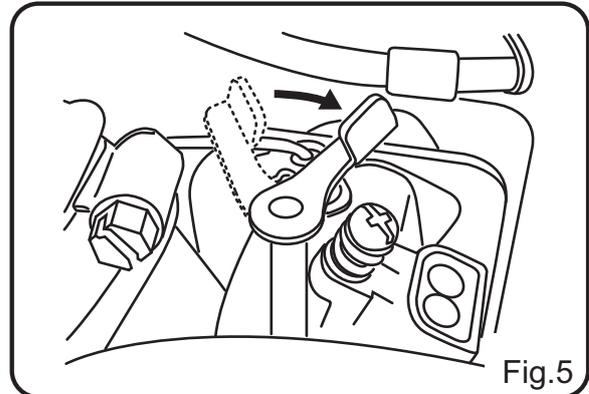
Operation

Starting

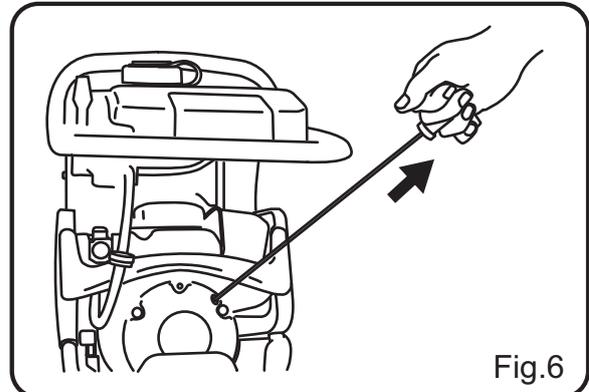
- 1 Slide the throttle lever from the stop to the idle position (☛). That opens the fuel cock and the engine electrical circuit is turned on automatically. (Figure 4)



- 2 Push the choke lever on the carburetor to the closed position. When it is cold, close the choke all the way. When it is hot, such as in the summer, or when the engine is already hot, open the choke a little or leave it fully open. If the engine cannot be started, open the choke a little so as not to flood the carburetor. (Figure 5)



- 3 Hold the recoil starter handle and pull it a little. You will feel resistance. Then, pull it hard to turn the engine. Allow the starter cord to return slowly into the case before letting go of the handle. (Figure 6)



- 4 After the engine has started, open the choke lever gradually until it is wide open. Pay attention to the sound of the engine to guide you in the amount to open the choke. After the engine has started, be sure to warm up the engine at low speed for 3 to 5 minutes. During this time, check the machine for leaking fuel, abnormal sounds, or abnormal exhaust color or odor.

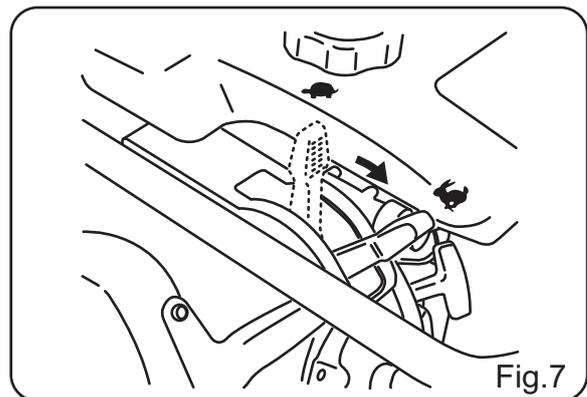
CAUTION: When warming up, if in the semi-clutch in order not to be, **pay attention to engine speed.**

- 5 If the engine cannot be started after pulling the starter handle several times, remove the spark plug and see if it has a spark. If the plug is wet from fuel (due to flooding from the carburetor), or if it is stained, replace the plug or clean it thoroughly. While the plug is removed, pull the starter handle 2 to 3 times to discharge any fuel from the cylinder.

Operation

- 1 Shift the throttle lever from idle (☛) to the operating position (☞) (Figure 7) and the tamping rammer will start vibrating. Shifting the lever slowly will cause irregular operation and damage the clutch, springs, and foot.

CAUTION: If you start it operating too quickly the engine may stop due to the operation of the carburetor.



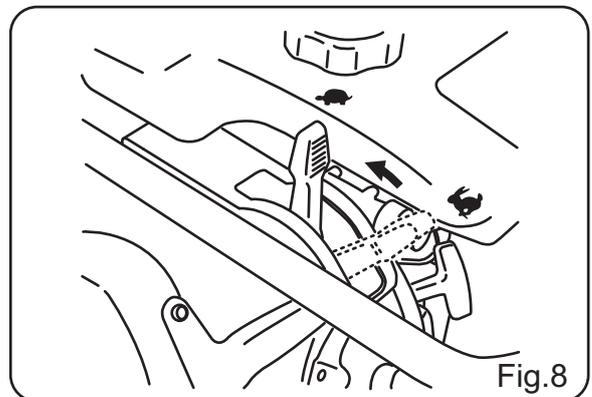
- 2 After operation is started, adjust the throttle lever a little until the rammer tamps the soil correctly. When the engine is running within the specified rpm range, the rammer will be the most effective. If the engine runs too fast, the tamping force will not be increased. Instead, the spring resonance will decrease the tamping force and damage the machine.



If you start it operating too quickly the engine may stop due to the operation of the carburetor.

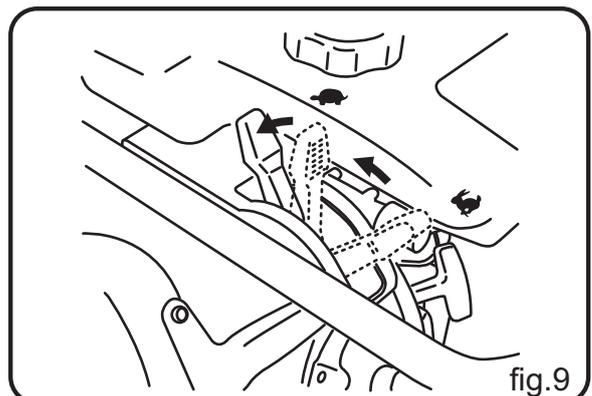
WARNING: If the rammer is used on sloping ground, check the safety of the surroundings and be careful not to allow the machine to fall over.

- 3 In the cold season, the oil in the machine will be thicker, and the resistance of the components will be much larger, which may cause irregular motion. Shift the throttle lever from the operation to the idle position several times and allow it to warm up sufficiently before starting actual work.
- 4 The surface of the foot in contact with the ground is a metal sheet that has excellent wear resistance. However if you need to tamp ground that contains large stones (about the size of a fist), first put some fill soil over them so that the foot will tamp the ground evenly.
- 5 The machine body will advance as it jumps. If you want to move forward faster, push the handle a little forward to make the machine body lean a little forward.
- 6 To halt work, quickly slide the throttle lever from the operation position (👉) to the idle position (👈). Do not slide the throttle lever slowly (Figure 8).



Stopping the machine

- 1 Slide the throttle lever from the operation position (👉) to the idle position (👈). Run the engine at low speed for 3 to 5 minutes to cool it down. Then slide the throttle lever from the idle position to the stop position. The engine will stop and the fuel cock is closed automatically. (Figure 9)
- 2 If the engine does not stop due to a problem with the switch or something similar, take the machine to a safe location and hold the throttle lever in the stop position. Let the machine run in idle and the engine will stop after a few minutes.



Maintenance and storage

- 1 Wash off any dirt or mud on each part of the machine using fresh water.
- 2 After the engine and main body have cooled down, store the rammer on a level location. Secure the machine body so that it can not fall down. If you have to lay the machine down, close the fuel tank cap securely and tighten engine oil drain plug. After the engine and machine body have cooled down, lay the machine so that the carburetor is facing up. Once the machine has been laid down, make sure that there are no fuel lubrication oil leaks. (If the fuel leaks, drain the fuel from the fuel tank.)
- 3 Put a cover on the machine body to prevent dirt landing on it. Store the machine in a location that is not exposed to direct sunlight and which has low humidity.
- 4 For prolonged storage
 - Slide the throttle lever to the stop position.
 - Drain any fuel and replace the lubrication oil. Apply grease to the lubrication points. Be sure to remove any fuel in the fuel hose, too.
 - Cover the air intake on the air cleaner and the exhaust outlet on the muffler.
 - Store the machine indoors. Do not leave it outside.

Periodic checks and adjustments

Table of scheduled checks

How often?	Place to check	Item to check	Oil etc.
Daily (before starting operation)	Appearance Air cleaner Bolts, nuts Handle Rubber damper Engine oil Lubrication oil in the main body Fuel tank Fuel system	Flaws, deformity, dirt Dirt, flaws, deformation Loose or missing parts Flaws, deformity, cracks, damage Wear, deformity, cracks, damage Dirt, oil level Dirt, oil level Leaks, fuel level, dirt Leaks, wear, looseness	Engine oil Engine oil Gasoline
After first 20 hours	Engine oil	Replace once, after the first 20 hours	Engine oil
Every 50 hours	Spark plug Engine oil	Clean, adjust gap Replace	Engine oil
Every 200 hours	Lubrication oil in the main body	Replace	Engine oil
Every 200 to 300 hours	Pre-air cleaner (primary element)	Cleaning	Lamp kerosene
Every 2 years	Fuel hose	Replace	

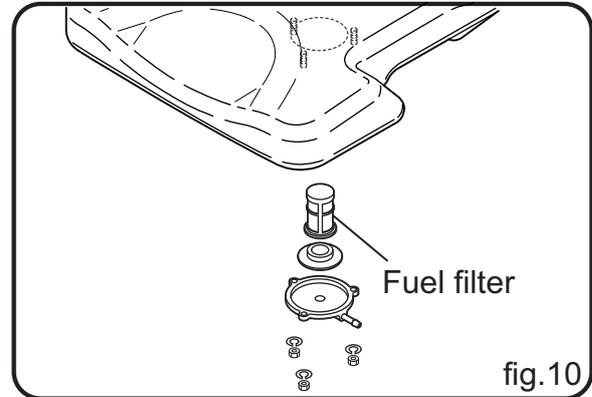
Periodic checks and adjustments(Continued)

1 Daily maintenance

Carefully wipe off any mud, dirt or oil from each component.
If oil leaks, retighten the joints and check again.

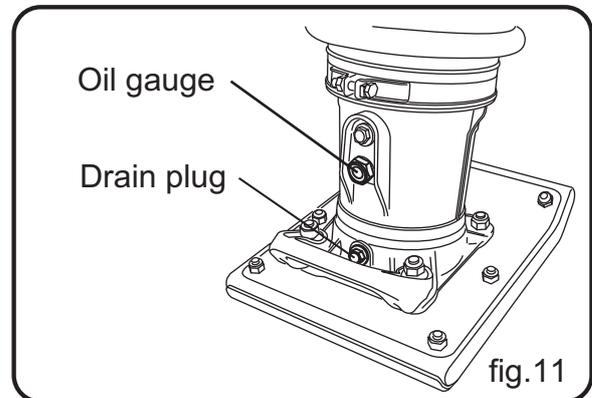
2 Maintenance after every 50 hours of operation

Remove the fuel filter cup and clean the inside thoroughly. (Figure 10) Remove the spark plug and clean it. Then adjust the gap to 0.6 to 0.7 mm.



3 Replacing the lubrication oil

Remove the drain plug on the lower part of the machine body and drain the oil inside. Then add the specified amount of new oil. (Figure 11)

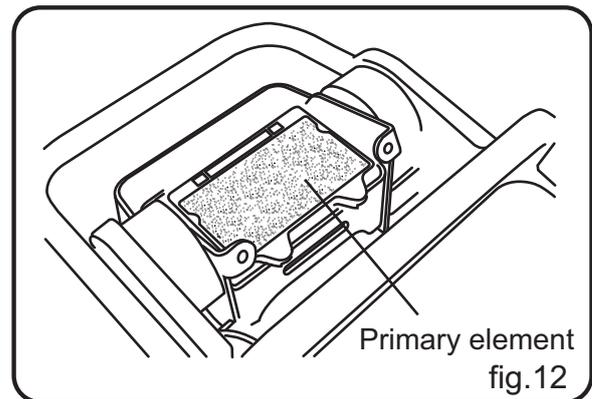


4 Cleaning the air cleaner

Remove the upper air cleaner cover on the main body. Loosen and remove the 2 Phillips screws that hold the cover on the air cleaner assembly.

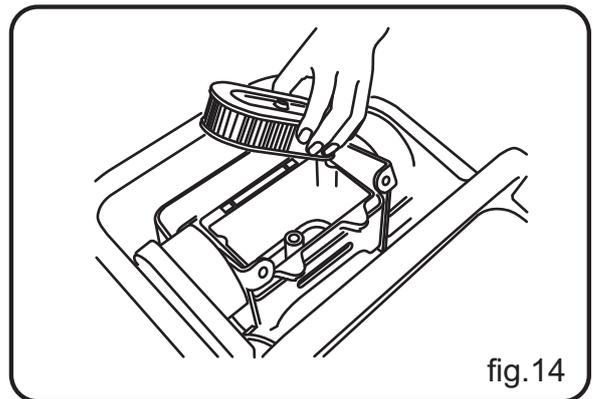
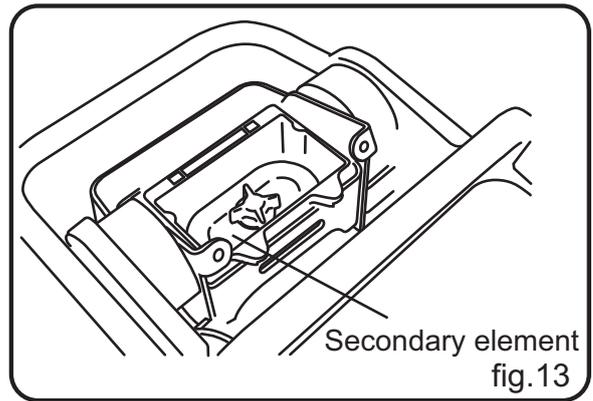
a. Primary element (clean every 80 to 100 hours)

If the primary element is dirty, wash it with gasoline or lamp kerosene. Then, dip it in engine oil SAE10W-30 and wring it out. (Wring the element so that 25 to 30 cc of engine oil remains in the element.) (Figure 12)



b. **Secondary element (clean every 100 to 150 hours)**

When the secondary element (under the primary element) becomes dirty, wash it with neutral detergent solution and dry it well. Then reuse it. (Figures 13, 14)



5 **Be sure to check the fuel line for damaged or looseness.**

Replace the fuel line every 2 years, even if it does not show any abnormality.

6 **Cleaning the machine body**

If you want to clean the machine body using high-pressure steam, do not spray water directly into the air cleaner, carburetor, muffler, or top of the fuel tank. Otherwise engine problems may occur.

Troubleshooting

Engine

1. Won't start

Fuel is present but the spark plug is not sparking.	Electricity is being supplied to the high voltage cable.	The gap in the spark plug tip is clogged. Carbon is stuck on the spark plug The spark plug has a short circuit due to faulty insulation. The gap in the spark plug is the wrong size.
	Electricity is not being supplied to the high voltage cable	The stop button switch has a short circuit. The ignition coil is broken.
Fuel and spark are both present.	Compression is good	The muffler is clogged with carbon. The wrong fuel was used. The air cleaner is clogged. The fuel is contaminated with water or dirt. The cylinder head gasket is blown or the head is not correctly tightened.
	Compression is low	The piston rings don't fit well. The cylinder is worn. The spark plug is not seated tightly. The valve seat is damaged.
Fuel is not being supplied to the carburetor.	No fuel in the fuel tank. Faulty fuel cock operation. The fuel filter is clogged. The air hole in the cap on the fuel tank is clogged. Air is trapped in the fuel line.	

2. Faulty operation

Too little power	Good compression and no misfiring		Dirt in the air cleaner. Air trapped in the fuel line. Carbon has accumulated in the cylinder.
	Low compression (See "Compression in low" above)		
	Good compression but misfires		Faulty ignition coil. Dirt on the spark plug. Ignition coil shorts sometimes.
Engine overheats	Excessive accumulation of carbon in the combustion chamber. Clog exhaust port or muffler. Faulty spark plug.		
Smoke comes from the muffler	Black smoke		Choke lever wasn't returned to the open position.
	Blue smoke	Good compression	Blended oil (for 2-cycle engines) was used. Too much oil. Engine oil leaked into the air cleaner when the machine was laid down on the wrong side.
		Compression is low	Worn piston rings. The piston rings don't fit well.
White smoke		Moisture in the gasoline. The air cleaner is wet.	

(In the winter, the machine may emit white smoke for a while when first started in the morning. This is not abnormal.)

Engine speed fluctuates	Faulty governor adjustment. Faulty governor spring. Faulty fuel flow. Air being sucked into the fuel line.
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Note

A series of horizontal dashed lines for writing notes.



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