Operating Instruction

Original Operating Instructions

DFP12D

Forward plate

S/N 101 924 26 1001>
DL8 203 75 EN ©
06/2018

DYNAPAC
FAYAT GROUP

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1 Introduction

1.1 Foreword

These operating and maintenance instructions are part of your machine.

They provide necessary information to operate your machine safely and properly.

They also contain information on required operating, maintenance and repair measures.

Carefully read the operating and maintenance instructions before taking your machine into operation.

Please observe the safety regulations strictly and follow all instructions to ensure safe operation.

If you are not yet acquainted with the indicators and control elements on this machine, you should thoroughly read the corresponding chapter ↳ *Chapter 4 „Indicators and control elements“ on page 37*.

The description of the individual operating steps including the notes on safety to be followed can be found in chapter “Operation” ↳ *Chapter 6 „Operation“ on page 51*.

Before every start up, carry out all required visual inspections and function tests ↳ *Chapter 5 „Checks prior to start up“ on page 43*.

Ensure the compliance with the specified operating, maintenance and repair measures to maintain the functional safety of your machine.

A description of all necessary maintenance work, maintenance intervals as well as information on fuels and lubricants can be found in the chapter “Maintenance” ↳ *Chapter 8 „Maintenance“ on page 65*.

Do not service or repair your machine by yourself to avoid harming persons or damaging material or environment.

The machine must only be serviced and repaired by qualified and authorised personnel.

Contact our customer service to carry out the required maintenance work or necessary repairs.

In case of operating errors, inadequate maintenance or the use of unapproved fuels and lubricants all warranty claims will become null and void.

For your own personal safety you should only use original parts from Dynapac.

For your machine we offer service kits to make maintenance easier.

In the course of technical development we reserve the right for technical modifications without prior notification.

These operating and maintenance instructions are also available in other languages.

Apart from that, you can also order the spare parts catalogue against the serial number of your machine.

The above notes do not constitute an extension of the warranty and liability conditions specified in the general sales and delivery conditions of Dynapac GmbH.

We wish you successful work with your Dynapac machine.

1.2 Machine type plate and engine type plate

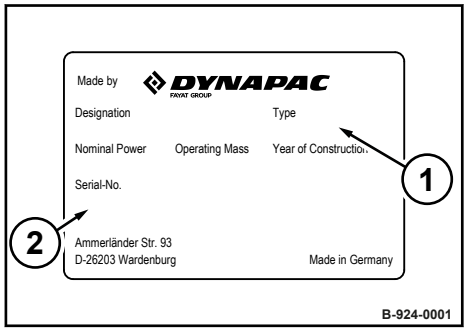


Fig. 1: Machine type plate (example)

Please enter here:	
Machine type (1):	
Serial number (2):	

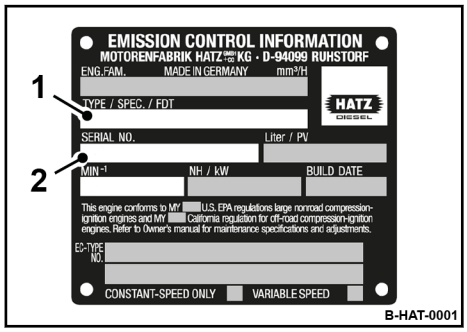


Fig. 2: Engine type plate (example)

Please enter here:	
Engine type (1):	
Engine number (2):	

2 Technical data

Technical data

Dimensions

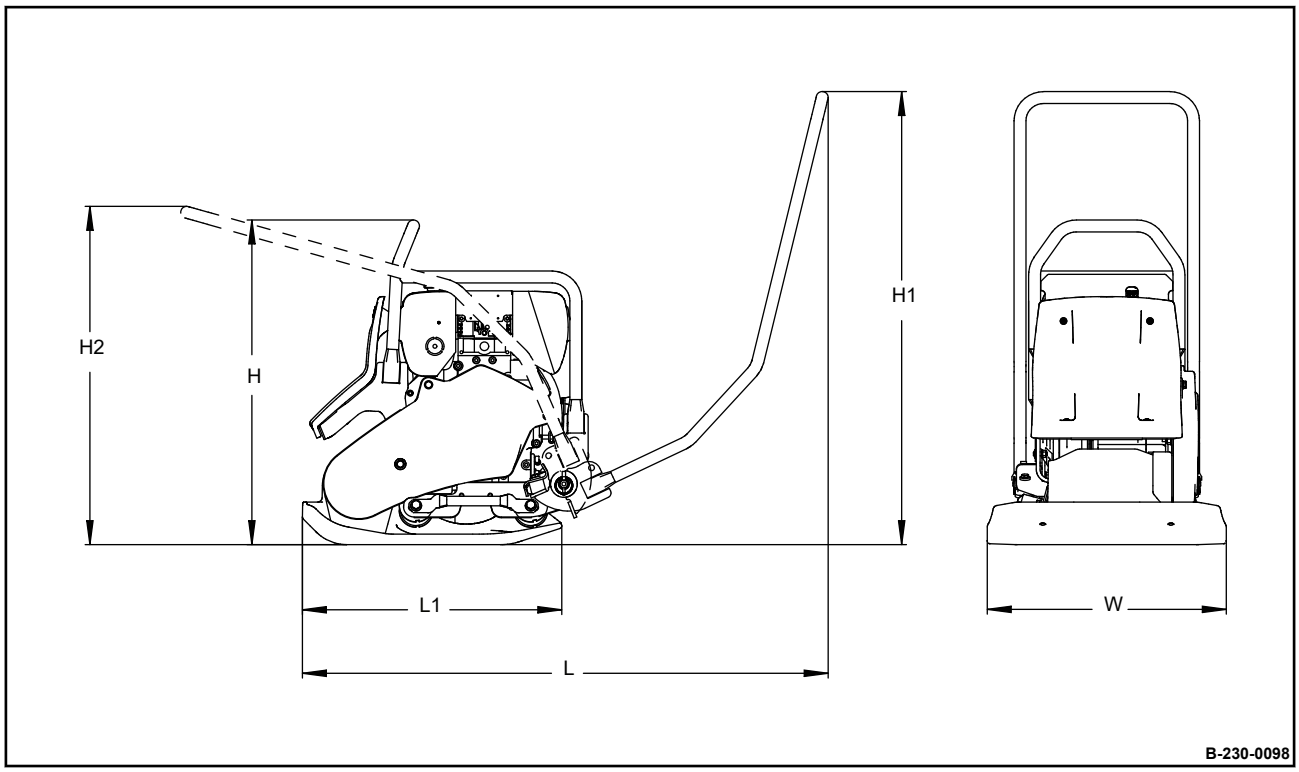


Fig. 3

H	H_1	H_2	L	L_1	W
708 (27.9)	962 (37.9)	700 (27.6)	1084 (42.7)	542 (21.3)	500 (19.7)
Dimensions in millimetres (Dimensions in inch)					

Weights		
Operating weight (CECE)	122 (269)	kg (lbs)
Basic weight	123 (271)	kg (lbs)
Water spraying system *(optional equipment)*	+ 10 (+ 22)	kg (lbs)
Transport wheels *(optional equipment)*	+ 4 (+ 9)	kg (lbs)

Travel characteristics		
Max. working speed	30 (98)	m/min (ft/min)
Max. gradability (depending on soil)	30	%

Drive		
Engine manufacturer	Hatz	
Type	1B20	
Cooling	Air	
Number of cylinders	1	
Rated power ISO 3046	3.1 (4.2)	kW (hp)
Rated speed	3000	min^{-1}
Drive system	mechanical	

Exciter system		
Frequency	92 (5520)	Hz (vpm)
Centrifugal force	25 (5620)	kN (lbf)
Amplitude	1.75 (0,069)	mm (in)

Water sprinkling system *(optional equipment)*		
Type of sprinkling	Gravity feed	

Filling capacities		
Fuel (diesel)	3.0 (0.8 each)	l (gal us)
Water sprinkling system	13.5 (3.6 each)	l (gal us)

2.1 Noise and vibration data

The following noise and vibration data were determined in accordance with the following guidelines under equipment specific conditions and by using harmonized standards:

- EU Machine Directive edition 2006/42/EU
- Noise Emission Directive 2000/14/EU, Noise Protection Directive 2003/10/EU
- Vibration Protection Directive 2002/44/EU

During operation these values may vary because of the prevailing operating conditions.

2.1.1 Noise data

Sound pressure level at the operator's stand

L_{pA} = 93 dB(A), determined acc. to ISO 11201 and EN 500.

WARNING!

Loss of hearing caused by too high noise burdens!

– Wear your personal protective equipment (ear protection).

Guaranteed sound power level

L_{WA} = 108 dB(A), determined acc. to ISO 3744 and EN 500.

2.1.2 Vibration data

Hand-arm vibration

Vector total of the weighted effective acceleration in three orthogonal directions:

Total vibration value a_{hv} = 4.3 m/s^2 on crushed rock determined acc. to ISO 5349 and EN 500.

Associated uncertainty K = 0.4 m/s^2, determined acc. to EN 12096.

Observe the daily vibration load (work safety acc. to 2002/44/EC).

Hand-arm vibration with comfort guide handle *(optional equipment)*

Vector total of the weighted effective acceleration in three orthogonal directions:

Total vibration value a_{hv} $\leq$ 2.5 m/s^2 on crushed rock determined acc. to ISO 5349 and EN 500.

Associated uncertainty K = 0.1 m/s^2, determined acc. to EN 12096.

Observe the daily vibration load (work safety acc. to 2002/44/EC).

3 Concerning your safety

3.1 Basic prerequisites

3.1.1 General

This machine has been built in compliance with the latest technical standard and complies with the applicable regulations and technical rules.

However, dangers for persons and property may arise from this machine, if:

- it is used for purposes other than the ones it is intended for,
- it is operated by untrained personnel,
- it is changed or converted in an unprofessional way,
- the safety instructions are not observed.

Each person involved in the operation, maintenance and repair of the machine must therefore read and comply with these safety regulations. If necessary, the operating company must obtain the relevant signatures as confirmation.

Furthermore, the following obviously also applies:

- applicable accident prevention instructions,
- generally accepted safety and road traffic regulations,
- country/state specific safety regulations.

It is the duty of the operator to be acquainted with the safety regulations and to apply these accordingly. This also applies for local regulations and regulations concerning different types of handling activities. Should the recommendations in these instructions be different from the regulations valid in your country, you must comply with the safety regulations valid in your country.

3.1.2 Explanation of signal words used:

DANGER!

Danger to life if failing to comply!

Sections marked accordingly indicate an extremely dangerous situation that could lead to fatal or severe injuries, if this warning is disregarded.

WARNING!

Danger to life or danger of severe injuries if failing to comply!

Sections marked accordingly indicate a dangerous situation that could lead to fatal or severe injuries, if this warning is disregarded.

CAUTION!

Danger of injury if failing to comply!

Sections marked accordingly indicate a dangerous situation that could lead to fatal or severe injuries, if this warning is disregarded.

NOTICE!

Danger of material damage if failing to comply!

Sections marked accordingly indicate possible dangers for machines or components.

Sections marked accordingly indicate technical information or notes on using the machine or its components.

ENVIRONMENT!

Environmental damage if failing to comply!

Paragraphs marked accordingly indicate practices for safe and environment-friendly disposal of fuels and lubricants as well as replacement parts.

3.1.3 Personal protective equipment

Depending on the work to be carried out, personal protective equipment is required (to be provided by the operating company):

	Working clothes	Tight fitting working clothes with low tear resistance, tight sleeves and without any projecting parts protect against being caught by moving components.
	Safety shoes	To protect against heavy falling parts and slipping on slippery ground.
	Protective gloves	To protect the hands against excoriation, punctures or deep injuries, against irritating and caustic substances as well as against burns.

	Safety goggles	To protect the eyes against airborne particles and squirting fluids.
	Face protection	To protect the face against airborne particles and squirting fluids.
	Hard hat	To protect the head against falling parts and to protect against injuries.
	Hearing protection	To protect hearing against excessive noise.
	Respiratory protection	To protect respiratory tracts against substances or particles.

3.1.4 Intended use

This machine must only be used for:

- Compaction of all types of soils
- Repair work on all types of soil
- Paving of walkways
- Work in trenches
- Underfilling and compaction of hard shoulders

Intended use also includes compliance with the specified operating, maintenance and repair measures.

3.1.5 Improper use

Dangers may arise from the machine when it is used for purposes other than the one it is intended for.

Any danger caused by improper use is the sole responsibility of the operating company or driver/operator, the manufacturer cannot be made liable.

Examples for improper use are:

- dragging the machine along as a measure of transportation
- throwing the machine off the transport vehicle
- attaching an additional weight to the machine

It is not permitted to stand on the machine while working.

Lifting tackle must be removed before starting work.

Starting and operating the machine in explosive environments and in underground mining is prohibited.

The lifting and lashing points specified in these instructions must be used. It is prohibited to use other lifting and lashing points (e.g. guide handle, steering rod).

3.2 Definition of responsible persons

3.2.1 Operating company

The operating company is the natural or juridical person who uses the machine or in who's name the machine is used.

The operating company must make sure that the machine is only used for the purpose it is intended for and in strict compliance with the safety regulations mentioned in these operating and maintenance instructions.

The operating company must determine and assess the danger in its company. It must then take appropriate action to ensure health and safety at work for its employees and point out any remaining dangers.

The operating company must determine whether there are special operational hazards such as a toxic atmosphere or limiting soil conditions. Such conditions require special, additional measures to remove or reduce the hazard.

The operating company must make sure that all users read and understand the information concerning safety.

The operating company is responsible for the planning and professional execution of regular safety inspections.

3.2.2 Expert / qualified person

An expert / qualified person is a person who, based on his/her professional education and experience, has profound knowledge in the field of construction equipment and the machine in question in particular.

This person is acquainted with the applicable governmental industrial safety regulations, accident prevention instructions, guidelines and generally acknowledged technical rules and regulations (standards, directives, technical rules of other member states of the European Union or other contractual states concerning the agreement about the European Economic Area) in as far as is necessary to be able to judge the safe condition of this machine.

3.2.3 Driver / operator

This machine must only be operated by trained, instructed persons entrusted by the operating company aged 18 or more.

Observe your local laws and regulations.

Rights, obligations and rules of conduct for driver or operator:

The driver or operator must:

- be instructed about his rights and obligations,
- wear protective equipment as appropriate for the application,
- have read and understood the operating instructions,

- have made himself familiar with the operation of the machine,
- be physically and psychologically able to drive and operate the machine.

Persons under the influence of alcohol, medication or drugs are not allowed to operate, service or repair the machine.

Maintenance and repair work requires specific knowledge and must therefore only be performed by trained specialists.

3.3 Basic safety regulations for safe operation

3.3.1 Remaining dangers, remaining risks

Despite careful work and compliance with standards and regulations it cannot be ruled out that further dangers may arise when working with and handling the machine.

Both the machine as well as all other system components comply with the currently valid safety regulations. Nevertheless, remaining risks cannot be ruled out completely, even when using the machine for the purpose it is intended for and following all information given in the operating instructions.

A remaining risk can also not be excluded beyond the actual danger zone of the machine. Persons remaining in this area must pay particular attention to the machine, so that they can react immediately in case of a possible malfunction, an incident or failure etc.

All persons remaining in the area of the machine must be informed about the dangers that arise from the operation of the machine.

3.3.2 Regular safety inspections

Have the machine inspected by an expert / qualified person as required for the conditions the machine is working under, but at least once every year.

3.3.3 Modifications and alterations to the machine

Unauthorized changes to the machine are prohibited for safety reasons.

Original parts and accessories have been specially designed for this machine.

We wish to make explicitly clear that we have not tested or approved any parts or accessories not supplied by us.

The installation and/or use of such products may have an adverse effect on the active and/or passive safety.

3.3.4 Damage, defects, misuse of safety devices

Machines which are not safe to operate or in traffic must be immediately taken out of service and shall not be used, until these deficiencies have been properly rectified.

Safety installations and switches must neither be removed nor must they be made ineffective.

3.4 Handling fuels and lubricants

3.4.1 Preliminary remarks

The operating company must ensure that all professional users have read and follow the corresponding safety data sheets for the individual fuels and lubricants.

Safety data sheets provide valuable information about the following characteristics:

- name of substance
- possible dangers
- composition / information on constituents
- first-aid measures
- fire fighting measures
- measures in case of accidental release
- handling and storage
- limitation and monitoring of exposure / personal protective equipment
- physical and chemical properties
- stability and reactivity
- toxicological data
- environmental data
- notes on waste disposal
- information on transport
- legislation
- other data

3.4.2 Safety regulations and environmental protection regulations for handling diesel fuel

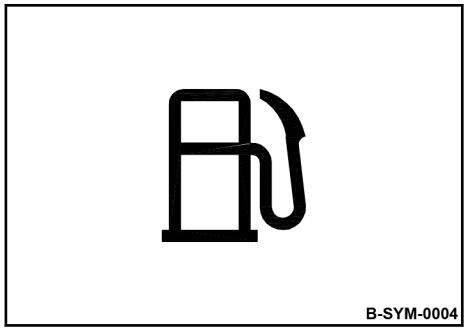


Fig. 4

WARNING!

Danger of burning by ignited diesel fuel!

– Do not allow diesel fuel to come into contact with hot components.
– Smoking and open fire is prohibited!
– Wear your personal protective equipment (protective gloves, protective clothing).

CAUTION!

Health hazard caused by contact with diesel fuel!

– Wear your personal protective equipment (protective gloves, protective clothing).
– Do not inhale any fuel fumes.
– Avoid contact.

CAUTION!

Danger of slipping on spilled diesel fuel!

– Immediately bind spilled diesel fuel with an oil-binding agent.

ENVIRONMENT!

Diesel fuel is an environmentally hazardous substance!

– Always keep diesel fuel in proper containers.
– Immediately bind spilled diesel fuel with an oil-binding agent and dispose of properly.
– Dispose of diesel fuel and fuel filters according to regulations.

3.4.3 Safety regulations and environmental protection regulations for handling oil

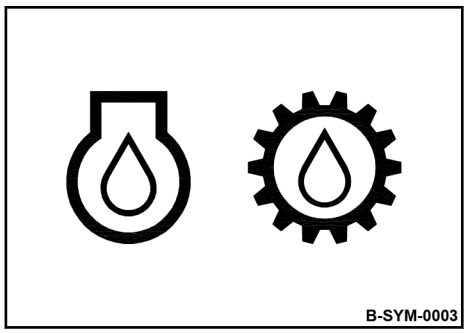


Fig. 5

WARNING!

Danger of burning by ignited oil!

– Do not allow oil to come into contact with hot components.
– Smoking and open fire is prohibited!
– Wear your personal protective equipment (protective gloves, protective clothing).

CAUTION!

Health hazard caused by contact with oil!

– Wear your personal protective equipment (protective gloves, protective clothing).
– Do not inhale any oil vapours.
– Avoid contact.

CAUTION!

Danger of slipping on spilled oil!

– Immediately bind spilled oil with an oil-binding agent.

ENVIRONMENT!

Oil is an environmentally hazardous substance!

– Always keep oil in proper containers.
– Immediately bind spilled oil with an oil-binding agent.
– Dispose of oil and oil filter according to regulations.

3.5 Loading/transporting the machine

Make sure that persons are not endangered by the machine tipping or sliding off.

Do not use damaged or in any other way impaired lashing points.

Always use appropriate lifting and lashing means on the lifting and lashing points.

Use lifting and lashing gear only in the prescribed direction of load application.

Lifting tackle must not be damaged by machine components.

Secure the machine on the transport vehicle against rolling, slipping and turning over.

Loads must only be attached and hoisted by an expert / capable person.

Use only lifting gear and lifting tackle with sufficient load bearing capacity for the weight to be loaded.

Fasten the lifting gear only at the specified lifting points.

Danger to the life of persons if they step or stand under a suspended load.

When lifting the machine avoid uncontrolled movements of the load. If necessary hold the load with guide ropes.

3.6 Start-up procedure

3.6.1 Prior to starting up

Use only machines which are serviced at regular intervals.

Become acquainted with the equipment, the indicators and control elements, the working principle of the machine and the working area.

Use your personal protective equipment (hard hat, safety boots, if necessary also goggles and ear protection).

Do not take any loose objects with you or fasten them to the machine.

Before start up, check whether:

- persons or obstructions are beside or in front of the machine,
- the machine is free of oily and combustible materials,
- all safety elements are in place,
- all grips are free of grease, oils, fuel, dirt, snow and ice.

Before start up, carry out all required visual inspections and function tests.

If the following tests reveal damages or other faults, the machine must not be operated, until these deficiencies have been corrected.

Do not operate the machine with defective indicators and control elements.

3.6.2 Starting the engine

Do not use any starting aids like start pilot or ether.

The machine must not be operated with damaged, missing or non-functional safety installations.

Before starting and moving the machine, make sure that there is nobody in the danger zone.

Always keep an eye on the machine when the engine is running and hold it by the steering bow.

Do not inhale exhaust fumes, because they contain toxic substances, which could cause damage to health, unconsciousness or even death.

Avoid operation in closed or partly closed rooms, or ensure adequate ventilation when working in trenches.

3.7 Operation

3.7.1 Persons in the danger area

Before taking up work, also after breaks, you should always convince yourself that the danger zone is free of persons or obstructions.

Give warning signals, if necessary. Stop work immediately if persons remain in the danger zone, despite the warning.

3.7.2 Operation

Guide the machine only by the guide handle.

Guide the machine so that your hands do not hit against solid objects.

Watch out for unusual noises and development of smoke. Perform trouble shooting and have the fault corrected.

Always keep a safe distance to excavation pit borders, embankments and edges.

Refrain from any work that could adversely affect the stability of the machine.

Observe the daily vibration load (work safety acc. to 2002/44/EC).

3.7.3 Parking the machine

Park the machine on horizontal, level, firm ground.

Before leaving the machine:

- Shut down the engine,
- Secure the machine against accidental tipping over,
- Secure the machine against unauthorized use.

Mark machines, which could be in the way, with a clearly visible sign.

3.8 Refuelling

Do not inhale any fuel fumes.

Refuel only with the engine shut down.

Do not refuel in closed rooms.

No open fire, do not smoke.

Ultra-low sulphur diesel fuel poses a higher risk of combustion caused by the static charging than diesel fuel with a higher sulphur content.

Apply measures against electrostatic charging.

Do not spill any fuel. Catch running out fuel, do not let it seep into the ground.

Wipe off spilled fuel. Keep dirt and water away from the fuel.

A leaking fuel tank can cause an explosion. Ensure tight fit of the fuel tank cover, if necessary replace immediately.

3.9 Maintenance work

3.9.1 Preliminary remarks

Adhere to the specified operating, maintenance and repair measures.

The machine must only be serviced by qualified personnel authorised by the operating company.

Keep unauthorised persons away from the machine.

Perform maintenance work only with the engine shut down.

Make sure that the engine cannot be accidentally started during maintenance work.

3.9.2 Working on the engine

Drain the engine oil at operating temperature – danger of scalding!

Wipe off spilled oil, catch running out oil and dispose of environmentally.

When working on the air filter no dirt should fall into the air duct.

Do not work on the hot exhaust - danger of burning!

Store used filters and other oil contaminated materials in a separate, specially marked container and dispose of environmentally.

3.9.3 Cleaning work

Do not perform cleaning work while the motor is running.

Allow the engine to cool down before starting cleaning work.

Do not use gasoline or other easily inflammable substances for cleaning.

3.9.4 After maintenance work

Reassemble all guards and protections.

3.10 Repair

Identify a defect machine with a warning sign.

Only operate the machine after it has been repaired.

When replacing safety relevant components, only original spare parts must be used.

Repairs must only be performed by an expert/qualified person.

When performing welding work on the machine you should cover the fuel tank with insulating material.

3.11 Signage

Keep stickers and signage in good and legible condition and comply with their meaning.

Replace damaged and illegible stickers or signage immediately.

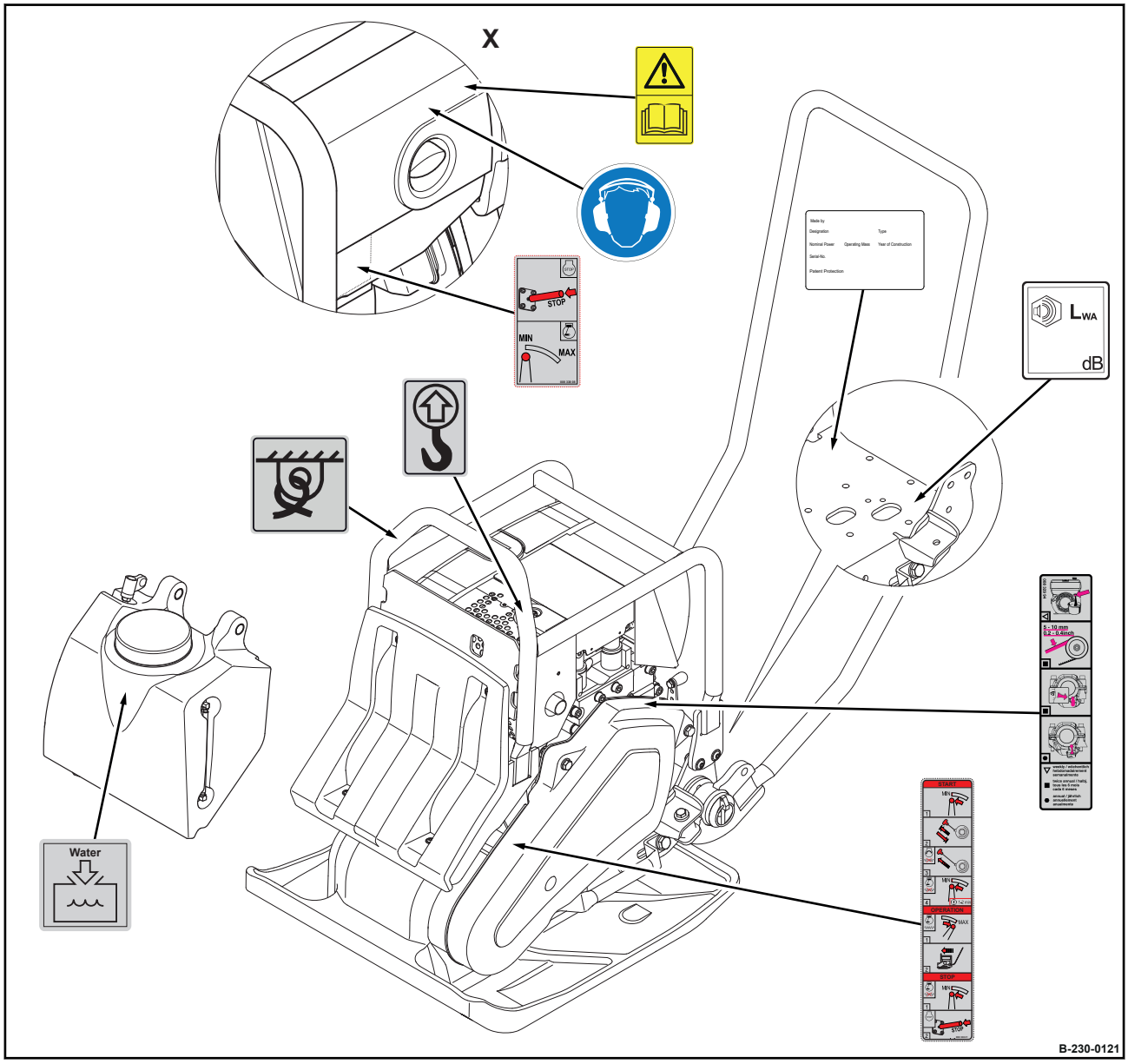
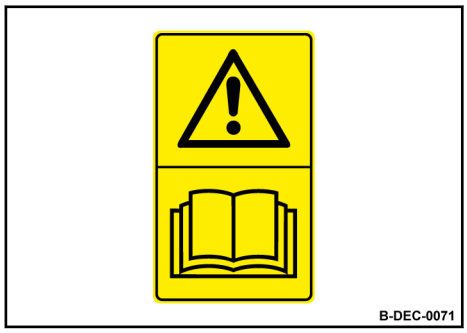
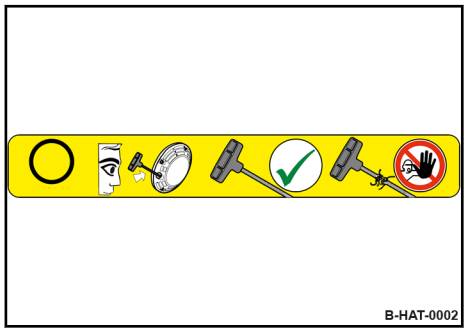


Fig. 6



Warning sticker - Follow operating instructions

Fig. 7

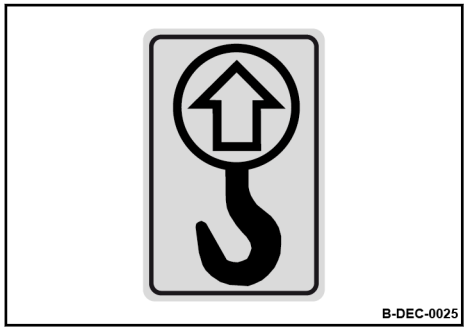


Warning sticker - Starter rope

Fig. 8

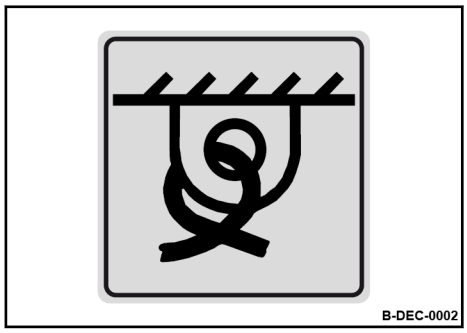
Instruction sticker - Wear ear defenders

Fig. 9



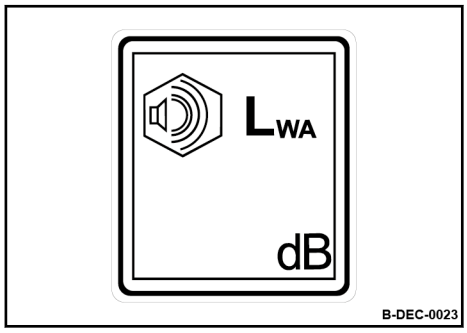
Information sticker - Lifting point

Fig. 10



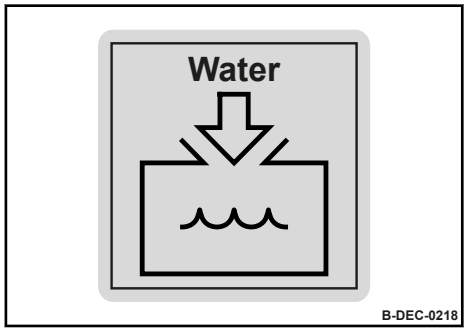
Information sticker - Lashing point

Fig. 11



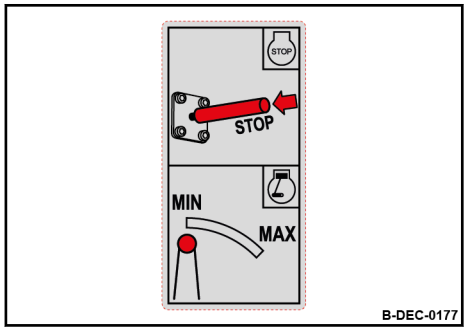
Information sticker - Guaranteed sound capacity level

Fig. 12



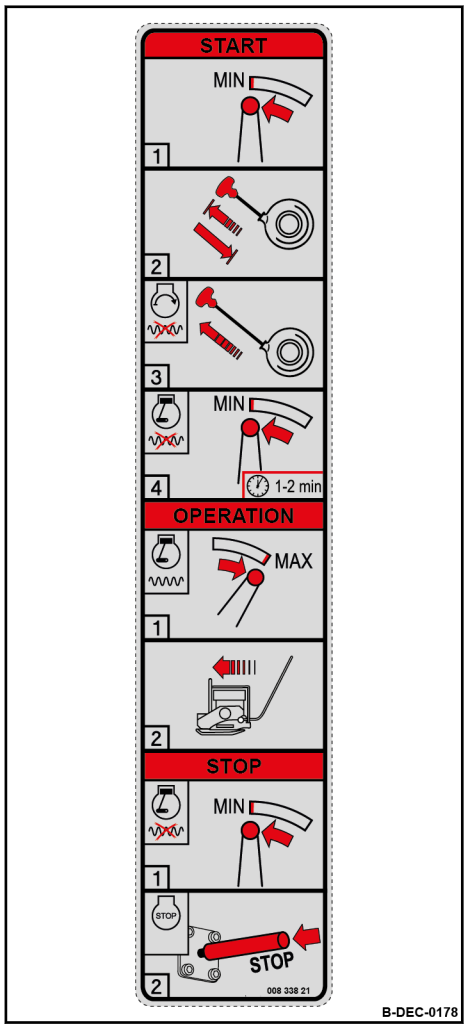
Information sticker - Filler opening for water

Fig. 13



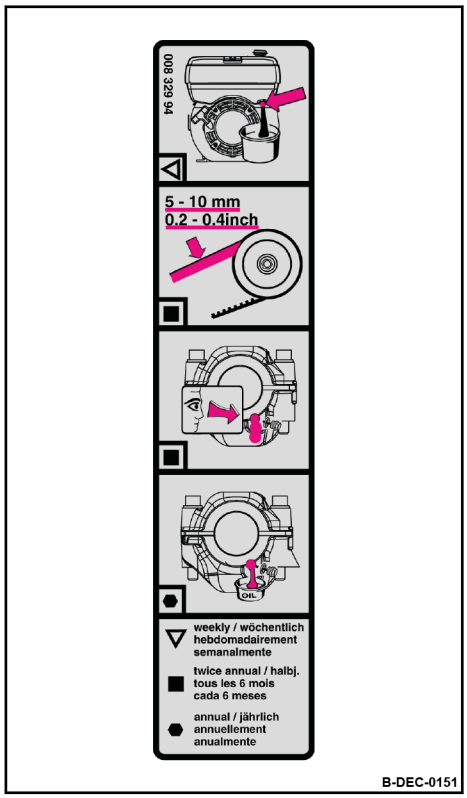
Information sticker Shut-down pin / throttle lever

Fig. 14



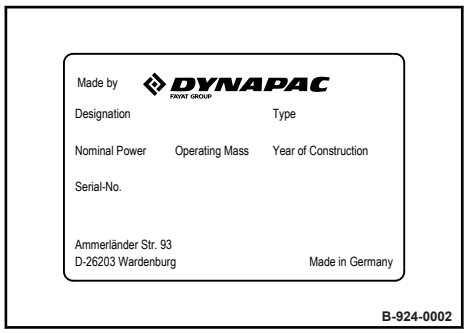
Brief operating instructions

Fig. 15



Maintenance sticker

Fig. 16



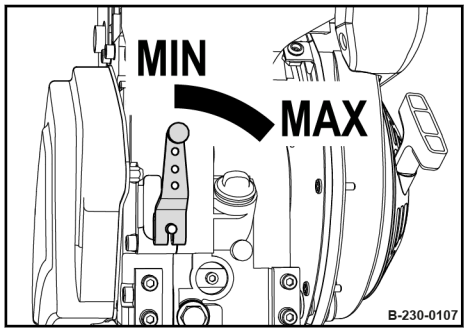
Machine type plate (example)

Fig. 17

4 Indicators and control elements

4.1 Engine

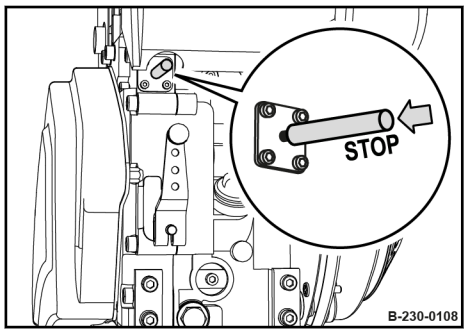
4.1.1 Throttle lever



Position “MIN”	Idle speed position
Position “MAX”	Full load position

Fig. 18

4.1.2 Shut-down pin



press	Shut down the engine

Fig. 19

4.1.3 Recoil starter

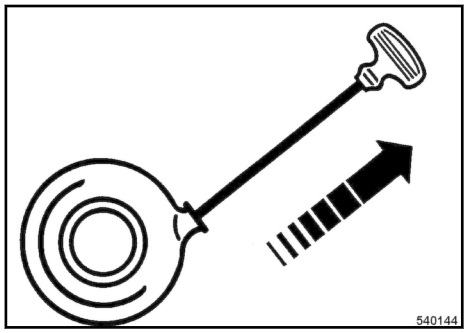
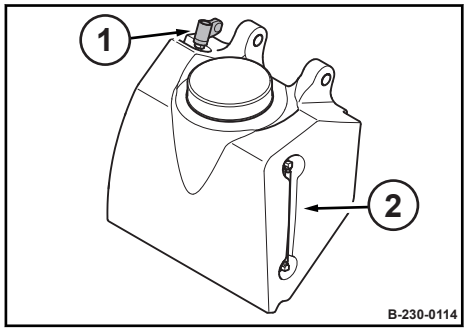


Fig. 20

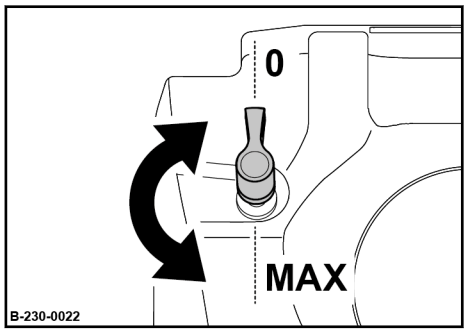
4.2 Water spraying system



1 Rotary button for water spraying system
2 Water level gauge

Fig. 21

4.2.1 Rotary button for water sprinkling system



Position "0"	Water sprinkling system off
turn anticlockwise	Water sprinkling system on infinite adjustment of the sprinkling quantity up to position “MAX”

Fig. 22

4.3 Transport wheels

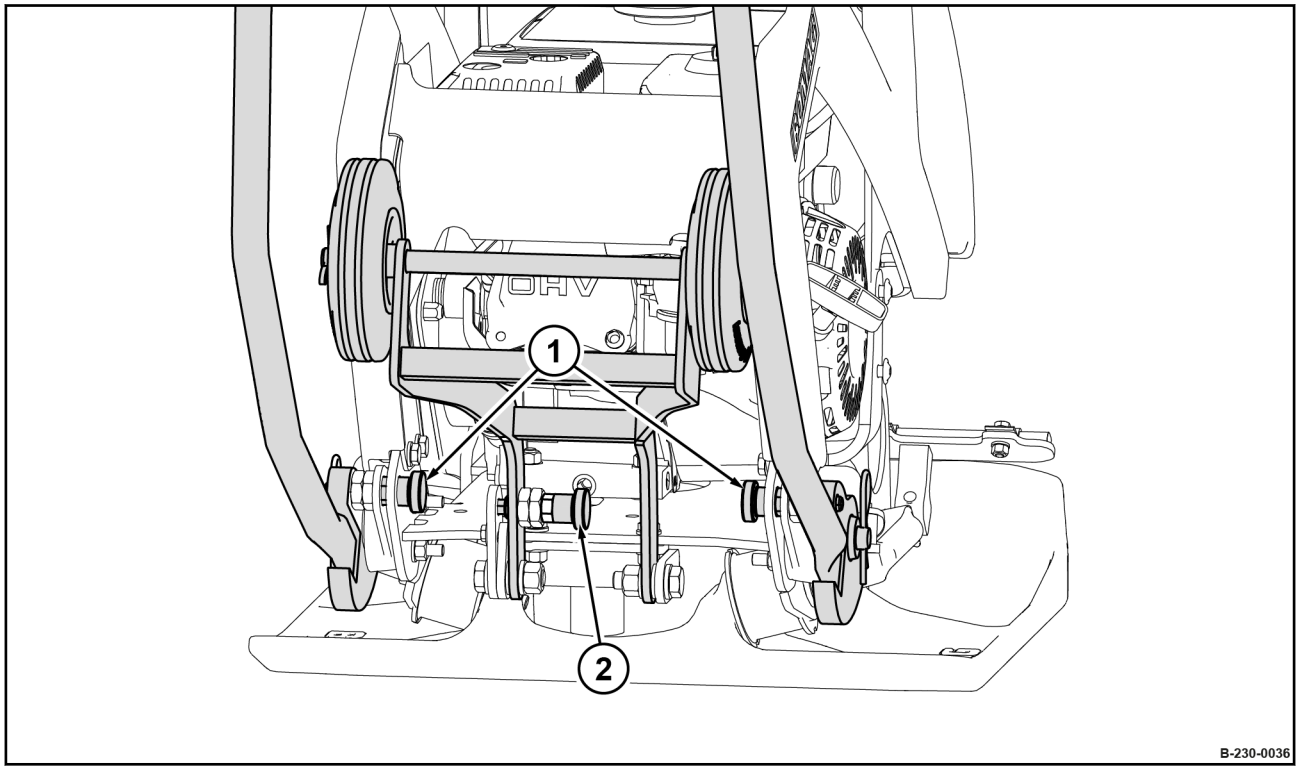


Fig. 23

1 Locking of guide handle
2 Locking of transport wheels

Optional equipment

4.3.1 Transport wheels with steering bow in middle position

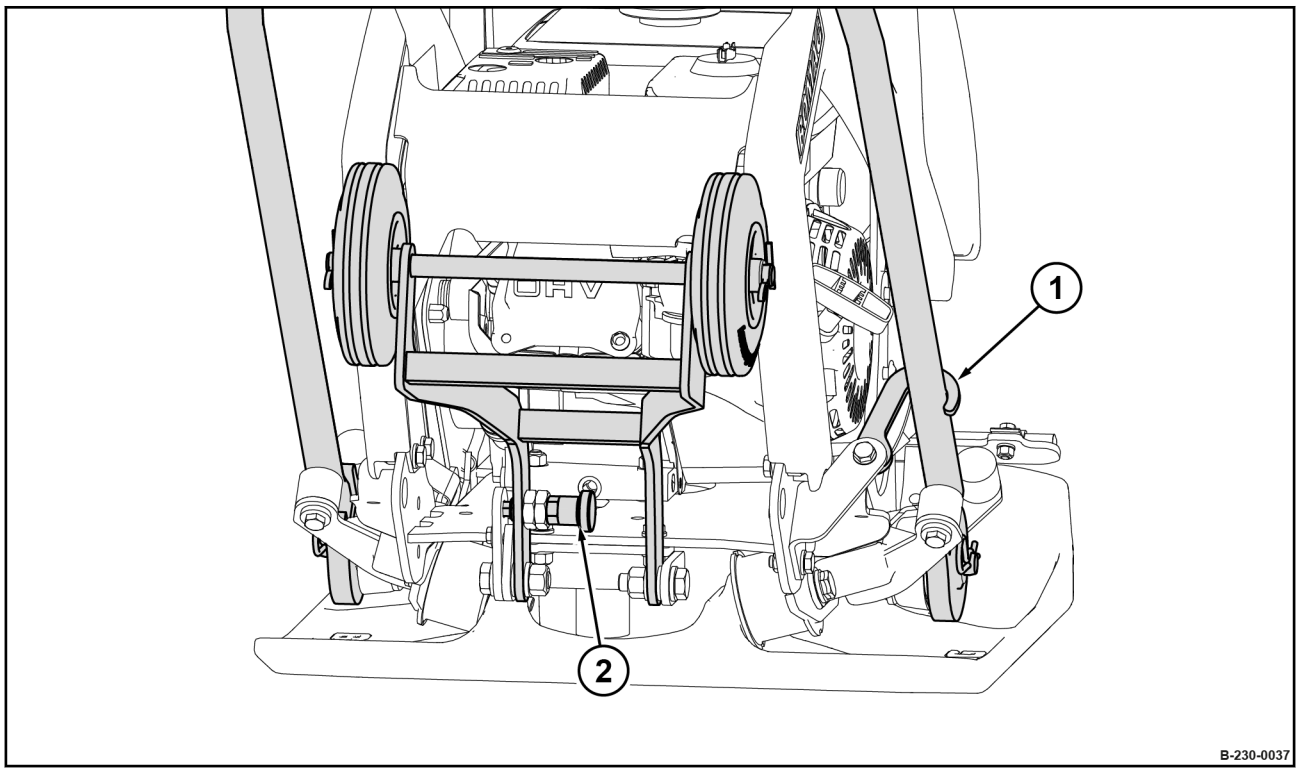


Fig. 24

1 Locking of guide handle
2 Locking of transport wheels

Indicators and control elements – Transport wheels

5 Checks prior to start up

5.1 Notes on safety

If the following tests reveal damages or other defects, the machine must not be operated, until these deficiencies have been corrected.

Do not operate the machine with defective indicators and control elements.

Safety installations must not be removed or made ineffective.

Do not change any fixed settings.

WARNING!

Health hazard caused by fuels and lubricants!

– Safety regulations and environmental protection regulations must be followed when handling fuels and lubricants ↳ *Chapter 3.4 „Handling fuels and lubricants“ on page 23*.

WARNING!

Danger of injury caused by rotating parts!

– Before starting work on the machine make sure that the engine can not be started.

1. Park the machine safely ↳ *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.

5.2 Visual inspections and function tests

1. Check fuel tank and lines for condition and leaks.
2. Check bolted connections for tight fit.
3. Check machine for contamination and damage.
4. Check the hydraulic oil cooler for dirt.
5. Check starter rope for chafing.

5.3 Checking the engine oil level

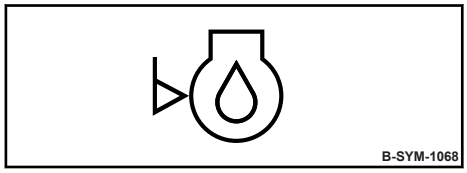


Fig. 25

NOTICE!

Danger of engine damage!

– +Use only oil of the permitted specification
↳ *Chapter 8.2.1 „Engine oil“ on page 67*.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

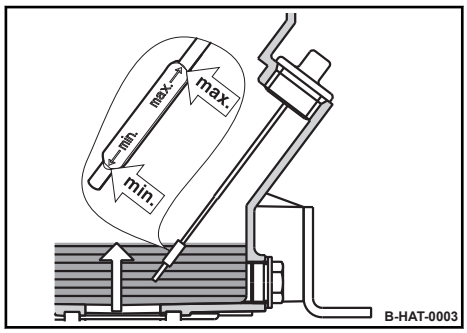


Fig. 26

1. Clean the area around the oil dipstick.

2. Unscrew the dipstick and wipe it clean with a lint-free, clean cloth.

3. Screw the dipstick back in and pull it out again to check the oil level.

⇨ The oil level must be between the “MIN” and “MAX” marks.

4.

NOTICE!

Danger of engine damage!

– Do not fill in too much engine oil.

If the oil level is too low, top up oil to the “MAX” mark.

5. Screw the oil dipstick in.

5.4 Checking the fuel level; topping up fuel

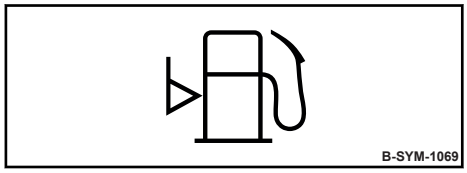


Fig. 27

NOTICE!

Danger of engine damage!

– Monitor the entire refuelling process.
– Contaminated fuel can cause malfunction or even damage of the engine. If necessary, fill in fuel through a screen filter.
– Use only fuel of the permitted specification
↳ *Chapter 8.2.2 „Fuel“ on page 67*.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

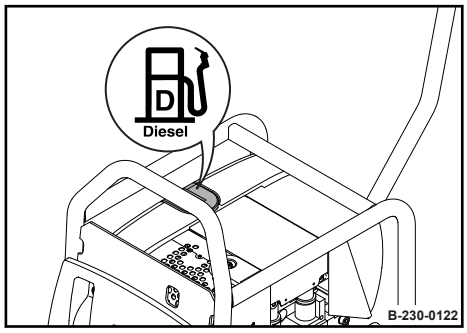


Fig. 28

1. Clean the area around the filling port.
2. Remove the cap and check the filling level visually.
3. Fill in fuel through a funnel with screen filter.
4. Close the cap.

5.5 Checking the rubber buffers

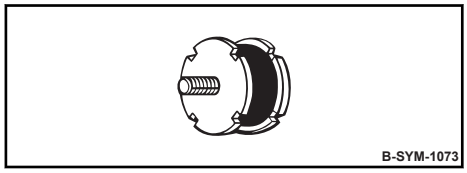


Fig. 29

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

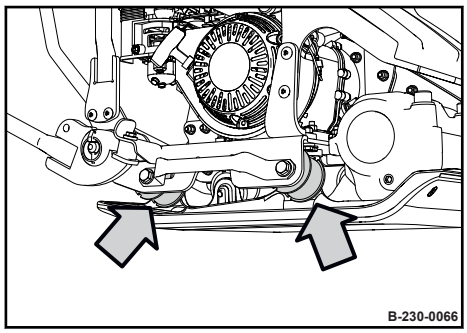


Fig. 30

1. Check the rubber buffer pairs, left and right, for tight fit, cracks and tear-offs.

⇨ Have damaged rubber buffers replaced by authorised service personnel immediately.

5.6 Checking the water level, topping up

NOTICE!
Components may get damaged by frost!
– Drain all water off if there is a risk of frost.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

1. Clean the area around the filling port.
2. Remove the cap and check the water supply in the water tank.

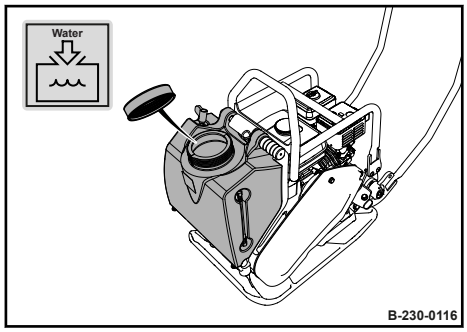


Fig. 31

NOTICE!
Dirty or contaminated water can block the bore-holes!
– Fill only with clean water.

3. If necessary, fill in clean water.
4. Close the cap.

Alternatively, the water tank can also be removed and transported for filling.

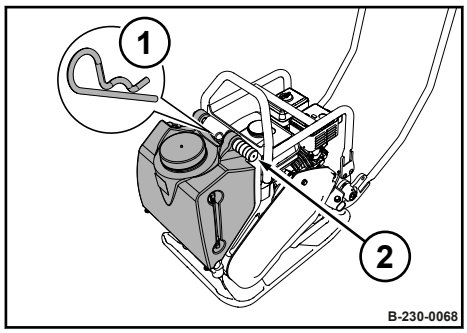


Fig. 32

1. Pull out the split pin (1).
2. Pull out the bolt (2) and take off the water tank.
3. Insert the bolt through the guides on the water tank and insert the split pin to lock.
   ⇨ The water tank can now be carried by the bolt.

Checks prior to start up – Checking the water level, topping up

6 Operation

6.1 Mounting the guide handle

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

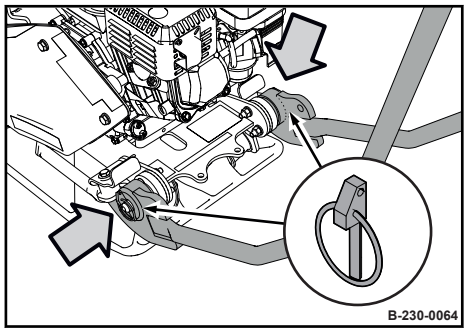


Fig. 33

1. Force the guide handle apart and plug it onto the brackets.
2. Lock and secure the guide handle on both sides with clip pins.

6.2 Starting the engine

Exhaust fumes contain toxic substances and can damage your health, cause unconsciousness or even death.

WARNING!

Danger of poisoning by exhaust gases!

– Do not inhale exhaust gases.
– Avoid operation in closed or partly closed rooms, or ensure adequate ventilation when working in trenches.

Components can be very hot during or immediately after operation.

WARNING!

Danger of burning on hot components!

– Wear your personal protective equipment (protective gloves, protective clothing).
– Avoid touching hot components.

WARNING!

Loss of hearing caused by too high noise burdens!

– Wear your personal protective equipment (ear protection).

Operate the machine only with the guide handle mounted and lowered.

Protective equipment:
- Hearing protection
- Working clothes
- Protective gloves
- Safety shoes

1. Mounting the guide handle ↳ *Chapter 6.1 „Mounting the guide handle“ on page 52*.
2. Fold down the guide handle into working position.
3. Set the throttle lever to position “MIN”.

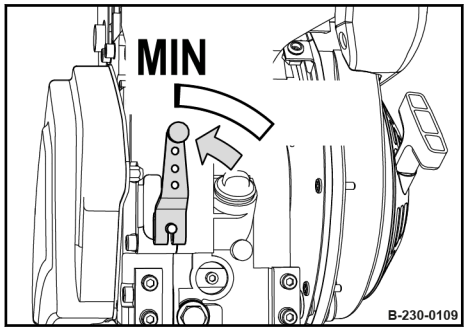


Fig. 34

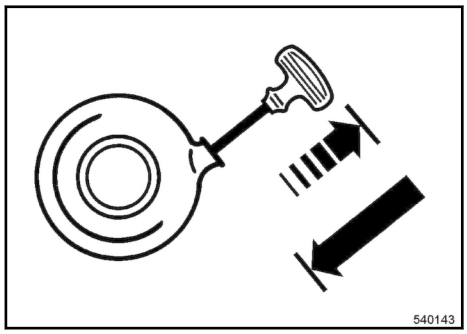


Fig. 35

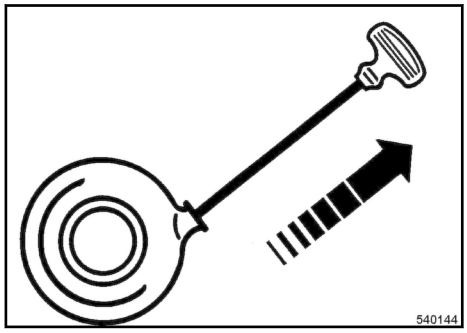


Fig. 36

4. Pull the rope by the starter handle, until resistance can be felt.
5. Guide the starter handle back to initial position.
6.

CAUTION!

Danger of injury caused by uncontrolled machine movement!

– Always hold on to a running machine.
– Always keep an eye on a running machine.

NOTICE!

The starter rope may tear off!

– Do not pull the starter rope all the way against the end stop.

Pull the starter handle quickly and with power.

7. Manually guide the starter handle back to initial position.
8. If the engine does not start during the first attempt, repeat the starting process.

NOTICE!

Danger of engine damage!

– Warm up engine for a short while before starting work. Do not operate the engine immediately under full load.

9. Run the engine warm for approx. 1 to 2 minutes in idle speed.

   ⇨ At idle speed vibration is switched off.

10. If white smoke comes out of the exhaust after a few unsuccessful starting attempts:

- Set the throttle lever to position “MIN”.
- Pull the starter handle 5-times completely out.
- Repeat the starting procedure.

6.3 Operation

Guide the machine only by the guide handle.

Guide the machine so that your hands do not hit against solid objects.

Keep feet clear of the vibrating base plate.

CAUTION!

Danger of injury caused by uncontrolled machine movement!

– Always hold on to a running machine.
– Always keep an eye on a running machine.

Components can be very hot during or immediately after operation.

WARNING!

Danger of burning on hot components!

– Wear your personal protective equipment (protective gloves, protective clothing).
– Avoid touching hot components.

Protective equipment:
- Hearing protection
- Working clothes
- Protective gloves
- Safety shoes

1. Make sure that no persons are in the danger zone.

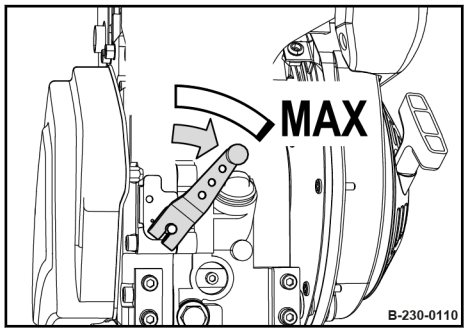


Fig. 37

2.

NOTICE!

The centrifugal clutch may be damaged!

– Operate the machine only with the throttle lever in position “MAX”.

Set the throttle lever to position “MAX”.

⇨ Machine vibrates forwards.

3. Guide the machine by means of the guide handle.

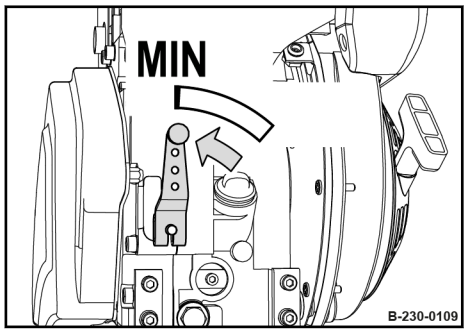


Fig. 38

4. Always shift the throttle lever to position “MIN” (idle speed) for short work breaks.

⇨ Vibration is switched off.

5. For short work interruptions you should always park the machine in secured condition ↬ *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.

6.4 Switching the water sprinkling system on/off

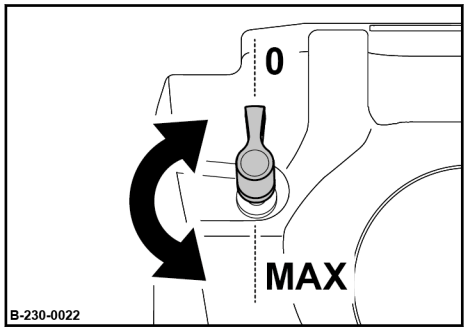


Fig. 39

1. Switch the water sprinkling system on or off with the rotary button:

Position "0"	Water sprinkling system off
turn anticlockwise	Water sprinkling system on infinite adjustment of the sprinkling quantity up to position “MAX”

6.5 Parking the machine in secured condition

Components can be very hot during or immediately after operation.

WARNING!

Danger of burning on hot components!

– Wear your personal protective equipment (protective gloves, protective clothing).
– Avoid touching hot components.

Protective equipment:
- Hearing protection
- Working clothes
- Protective gloves
- Safety shoes

1. Park the machine on level and firm ground.

2. Set the throttle lever to position “MIN” (idle speed).

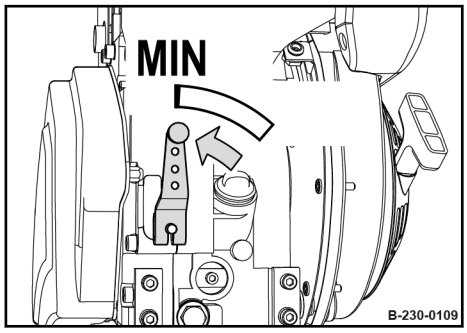


Fig. 40

NOTICE!

Danger of engine damage!

– Do not shut down the engine all of a sudden from full load speed, but let it idle for about two minutes.

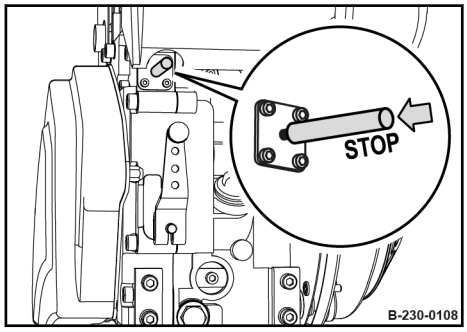


Fig. 41

3. Press and hold the shut-down pin until the engine switches off.

4. Release the shut-down pin and make sure that it returns to its initial position.

If necessary, pull the shut-down pin gently to return it to its initial position.

5. Secure the machine against unauthorized use.

7 Loading/transporting the machine

7.1 Loading the machine

Loads may only be attached and hoisted by an expert/qualified person.

Do not use lifting points that are damaged or impaired in any other way.

Only use lifting tackle with sufficient load bearing capacity for the weight to be loaded. Minimum load bearing capacity of lifting tackle: see operating weight *Chapter 2 „Technical data“ on page 11*.

Always use appropriate lifting tackle at the lifting points.

Use lifting tackle only in the specified loading direction.

Lifting tackle must not be damaged by machine parts.

When lifting the machine, make sure the load does not move in an uncontrolled way. If necessary, hold the load steady with guide ropes.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

1. Park the machine safely *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Allow the engine to cool down.
3. Fold the guide handle forwards.
4. Attach the lifting tackle to the dedicated lifting eye.
5. **DANGER!**
   Danger to life caused by suspended loads!
   – Do not step or stand under suspended loads.

   Lift the machine carefully and set down again at the intended location.

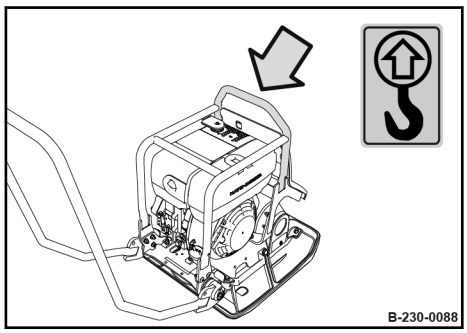


Fig. 42

6. If necessary, pull the machine by the handles (1) on an even surface.

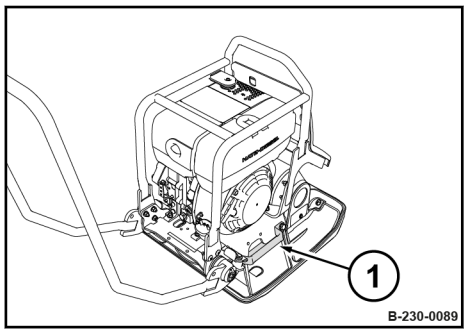


Fig. 43

7.2 Lashing the machine to the transport vehicle

Do not use lashing points that are damaged or impaired in any way.

Always use appropriate lashing tackle at the lashing points.

Use lashing tackle only in the specified loading direction.

Lashing tackle must not be damaged by machine parts.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

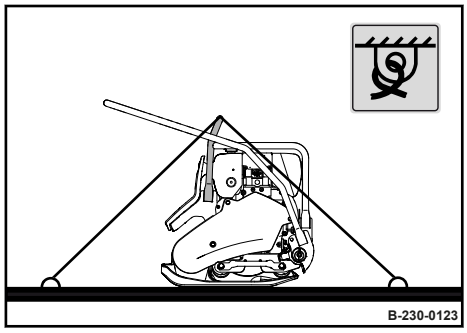


Fig. 44

1. Fasten the lashing tackle to the marked lashing point.

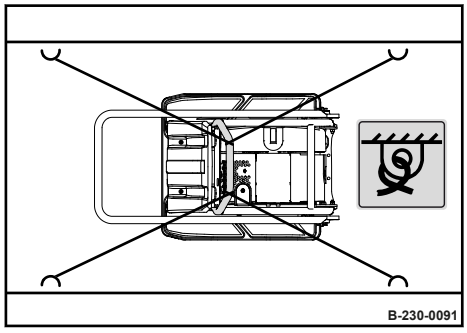


Fig. 45

2. Lash the machine securely to the transport vehicle as shown.

3. Use suitable gear to prevent the guide handle from swinging over unintentionally.

7.3 Transport wheels

1. Park the machine safely *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Lock the guide handle with the locking bolts (1).

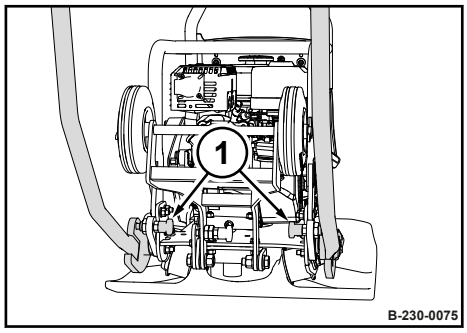


Fig. 46

3. Unlock the locking bolts (2) and fold down the transport wheels.

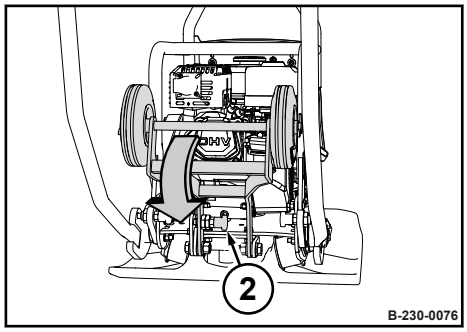


Fig. 47

4. Push the machine up by the guide handle and fold the transport wheels under the base plate.
   ⇨ The machine can now be moved.

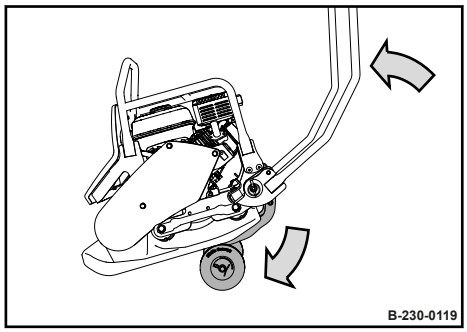


Fig. 48

7.3.1 Transport wheels with guide handle in middle position

1. Park the machine safely ↳ *Chapter 6.5 „Parking the machine in secured condition“ on page 58.*

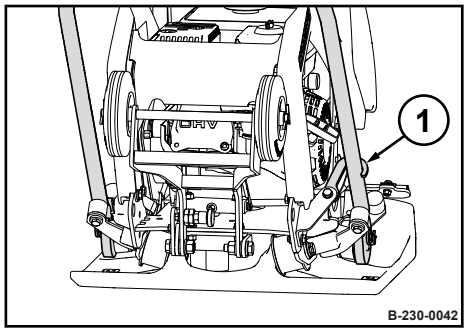


Fig. 49

2. Lock the guide handle with the hook (1).

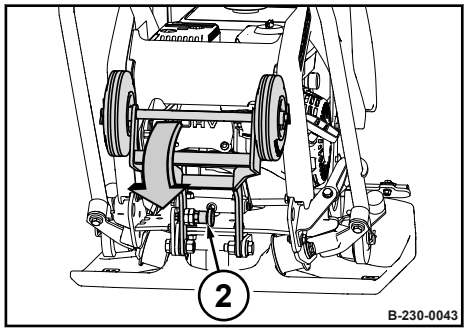


Fig. 50

3. Unlock the locking bolts (2) and fold down the transport wheels.

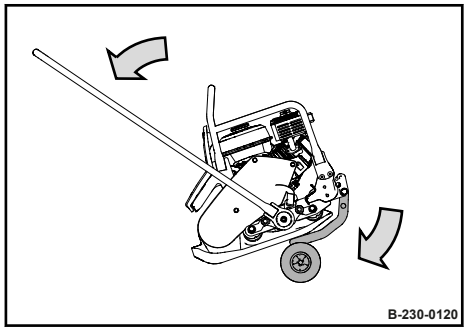


Fig. 51

4. Push the machine up by the guide handle and fold the transport wheels under the base plate.

   ⇨ The machine can now be moved.

Loading/transporting the machine – Transport wheels

8 Maintenance

8.1 Preliminary remarks and safety notes

DANGER!

Danger to life caused by an operationally unsafe machine!

– The machine must only be serviced by qualified and authorized personnel.
– Follow the safety regulations for maintenance work *Chapter 3.9 „Maintenance work“ on page 30*.

WARNING!

Health hazard caused by fuels and lubricants!

– Safety regulations and environmental protection regulations must be followed when handling fuels and lubricants *Chapter 3.4 „Handling fuels and lubricants“ on page 23*.

Wear your personal protective equipment.

Do not touch hot components.

Park the machine on horizontal, level, firm ground.

Perform maintenance work only with the engine shut down.

Make sure that the engine cannot be accidentally started during maintenance work.

Thoroughly clean machine and engine before starting maintenance work.

Do not leave any tools or other objects, that could cause damage, in or on the machine.

After maintenance work has been completed, dispose of fuels and lubricants, filters, sealing elements and cleaning cloths in an environmentally friendly way.

After all maintenance work is completed reinstall all guards and safety installations.

8.2 Fuels and lubricants

8.2.1 Engine oil

8.2.1.1 Oil quality

The following engine oil specifications are permitted:

- API CF/CH-4 or higher quality
- ACEA B3/E4 or higher quality

Avoid mixing engine oils.

8.2.1.2 Oil viscosity

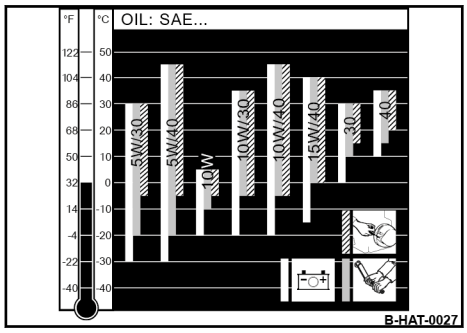


Fig. 52: Oil viscosity diagram

Since engine oil changes its viscosity with the temperature, the ambient temperature at the operating location of the engine is of utmost importance when choosing the viscosity class (SAE-class).

The temperature data of the SAE-class always refer to fresh oils. The engine oil ages during travel operation because of soot and fuel residues. This adversely affects the properties of the engine oil, especially at low ambient temperatures.

Optimal operating conditions can be achieved by using the oil viscosity chart as reference.

8.2.1.3 Oil change intervals

Annually or every 250 operating hours.

When changing to a higher alloyed oil quality after a longer period of operation, it is recommended to perform the first oil change of the higher quality oil already after 25 operating hours.

8.2.2 Fuel

8.2.2.1 Fuel quality

The following fuel specifications are permitted:

- EN 590
- ASTM D975 Grade-No. 1-D and 2-D
- BS 2869 A1/A2

In order to fulfil national emission regulations one must strictly use the legally required fuels (e.g. sulphur content).

8.2.2.2 Winter fuel

For winter operation use only winter diesel fuel, to avoid clogging because of paraffin separation.

At very low temperatures disturbing paraffin separation can also be expected when using winter diesel fuel.

Diesel fuels suitable for temperatures down to -44 °C (-47 °F) are available for Arctic climates.

NOTICE!

Danger of engine damage!

– The admixture of petroleum and the addition of “flow enhancing additives” (fuel additives) is not permitted.

8.2.2.3 Storage

Even traces of zinc, lead and copper can cause deposits in the injection nozzles, especially in modern Common-Rail injection systems.

Zinc and lead coatings in refuelling systems and fuel lines are not permitted.

Copper containing materials (copper lines, brass items) should be avoided, because they can cause catalytic reactions in the fuel with subsequent depositing in the injection system.

8.2.3 Oil for exciter shaft housing

Use only engine oils according to the following specifications:

- API CI-4 or higher quality

Avoid mixing engine oils.

NOTICE!

Components may get damaged!

– Do not use low-ash engine oils for the exciter shaft housing.

8.3 List of fuels and lubricants

Assembly group	Fuel or lubricant		Filling quantity
	Summer	Winter	Observe the level mark!
Engine oil	SAE 10W-40 Specification: *Chapter 8.2.1 „Engine oil“ on page 67*		0.9 l (0.24 gal us)
	SAE 15W-40		
	SAE 10W-30		
	SAE 30	SAE 10W	
Fuel	Diesel	Winter diesel fuel	3.0 l (0.8 gal us)
	Specification: *Chapter 8.2.2 „Fuel“ on page 67*		
Exciter shaft housing	SAE 10W-40 Specification: *Chapter 8.2.3 „Oil for exciter shaft housing“ on page 68* Components may get damaged! Do not use low-ash engine oils for the exciter shaft housing.		0.3 l (0.08 gal us)
	SAE 15W-40		
	SAE 10W-30		
Water tank	Water		13.5 l (3.6 gal us)

8.4 Running-in instructions

8.4.1 General

The following maintenance work must be performed when running in new machines or overhauled engines.

8.4.2 After 25 operating hours

1. Change the engine oil.
2. Check the valve clearance, adjust if necessary ↳ *Chapter 8.7.2 „Checking, adjusting the valve clearance“ on page 77*.
3. Check engine and machine for leaks.
4. Retighten the fastening screws on air filter, exhaust and other attachments.
5. Retighten the bolted connections on the machine.
6. Check the V-belt.
7. Check the oil level in the exciter shaft housing.

8.5 Maintenance Table

8.6 Weekly

8.6.1 Checking, cleaning the air filter

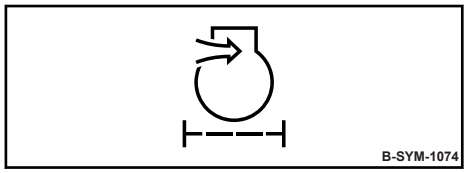


Fig. 53

NOTICE!

Danger of engine damage!

- Do not start the engine after having removed the air filter.
- If necessary, the air filter may be cleaned up to six times.
- Cleaning does not make sense if the air filter element is covered with a sooty deposit.
- Do not use gasoline or hot fluids to clean the filter element.
- After cleaning, the air filter must be inspected for damage using a torch.
- Do not continue to use a damaged air filter element. If in doubt use a new air filter.

Protective equipment:

- Working clothes
- Safety shoes
- Protective gloves
- Safety goggles

1. Park the machine safely *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.

2. Allow the engine to cool down.

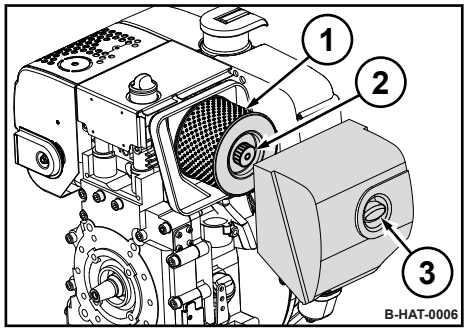


Fig. 54

3. Remove the cap (3).

4. Unscrew the knurled nut (2) and pull out the air filter (1).

5. Clean the cover.

6.

NOTICE!

Danger of engine damage!

- Prevent dirt from getting into the air intake opening.
- Do not clean the air filter housing with compressed air.

Clean the filter housing with a clean, lint-free cloth.

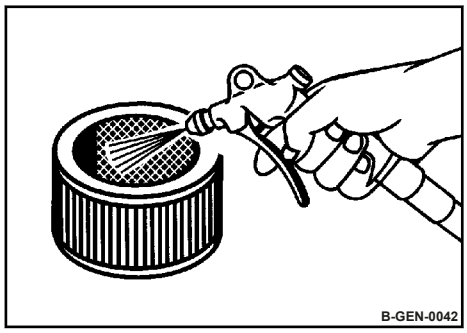


Fig. 55

7.

CAUTION!

Danger of eye injuries caused by particles flying around!

– Wear your personal protective equipment (safety gloves, protective working clothes, goggles).

Blow the air filter out with dry compressed air (max. 5 bar (73 psi)) from inside to outside by moving the gun up and down inside the element, until it is free of dust.

8. Examine the air filter with a torch for cracks and holes.

9. Replace the air filter if it is damaged.

10. Insert the air filter (1) carefully into the filter housing and fasten it with the knurled nut (2).

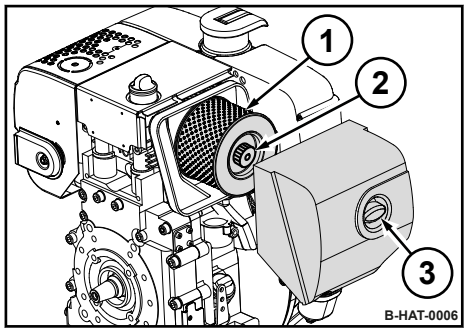


Fig. 56

11.

NOTICE!

Danger of engine damage!

– Ensure correct fit of air filter cover and seal.

Close the cap (3).

8.6.2 Checking and cleaning the water separator

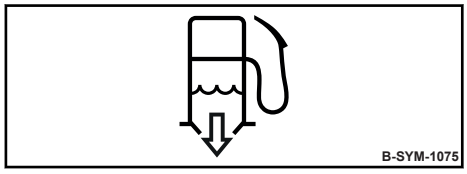


Fig. 57

The service intervals for the water separator depend on the water content in the fuel and can therefore not be determined precisely.

After taking the engine into operation you should check for signs of water and dirt initially every day.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

1. Park the machine safely *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Place the transparent container under the drain plug.
3. Loosen the drain plug and collect escaping fluid.
4. Drain the fuel off until there is no water left.
5. Screw the drain plug tightly back in. Ensure leak tightness.
6. Dispose of collected fluid in line with environmental regulations.

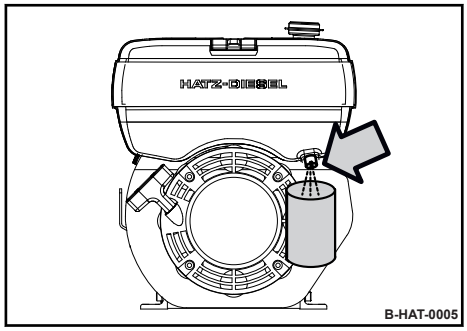


Fig. 58

8.7 Annually

8.7.1 Changing the engine oil and cleaning the oil filter

Change the engine oil at the latest after 250 operating hours.

NOTICE!

Danger of engine damage!

- Change the oil only with the engine at operating temperature.
- Use only oil of the permitted specification ↬ *Chapter 8.2.1 „Engine oil“ on page 67*.
- Filling quantity: ↬ *Chapter 8.3 „List of fuels and lubricants“ on page 69*

Protective equipment:
- Working clothes
- Protective gloves
- Safety goggles

1. Park the machine in secured condition ↬ *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.

Draining off engine oil

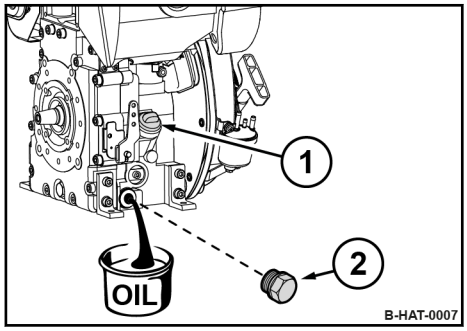


Fig. 59

2. Clean the area around oil dipstick (1) and drain plug (2).
3. Unscrew the oil dipstick.
4.

WARNING!

Danger of burning on hot components!

- Wear your personal protective equipment (protective gloves, protective clothing).
- Avoid touching hot components.

Unscrew the drain plug and collect any oil running out.

5. Clean the drain plug and screw it back in with a new seal ring, tightening torque: 50 Nm (37 ft·lbf).

Cleaning the oil filter

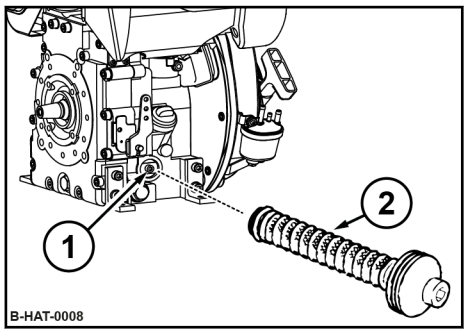


Fig. 60

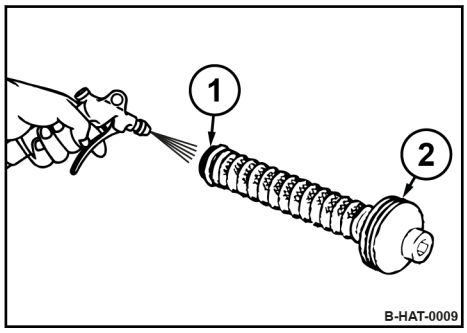


Fig. 61

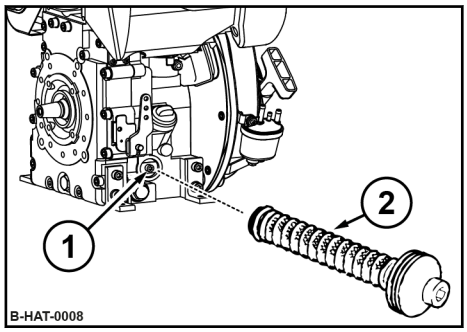


Fig. 62

6. Loosen the screw (1) for approx. five turns and pull the oil filter (2) out of the housing.

7.

CAUTION!

Danger of eye injuries caused by particles flying around!

– Wear your personal protective equipment (safety gloves, protective working clothes, goggles).

Use compressed air to blow the oil filter out from the inside to the outside.

8. Check the seal ring (2) for damage, change if necessary.

9. Slightly oil the seal rings (1) and (2).

10. Insert the oil filter (2) into the housing and press it against the end stop.

11. Before tightening the screw (1) make sure that the tensioning springs touch the oil filter with both ends.

12. Tighten the screw.

Filling in engine oil

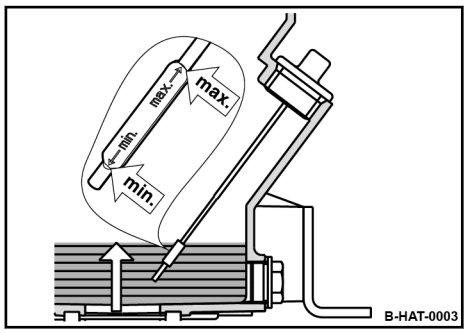


Fig. 63

13. Fill in new engine oil.
14. Screw the oil dipstick in.
15. After a short test run check the oil level on the dipstick; if necessary, top up to the top dipstick mark.

Final work

16. Check oil filter and drain plug for leaks.
17. Dispose of oil in an environmentally friendly way.

8.7.2 Checking, adjusting the valve clearance

NOTICE!

Danger of engine damage!

We recommend to have this work carried out by trained personnel or our after sales service.

– Before checking the valve clearance let the engine cool down.

Preparations

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine in secured condition *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Let the engine to cool down to ambient temperature.
3. Remove the air filter cover (2).
4. Disassemble the covering (1).

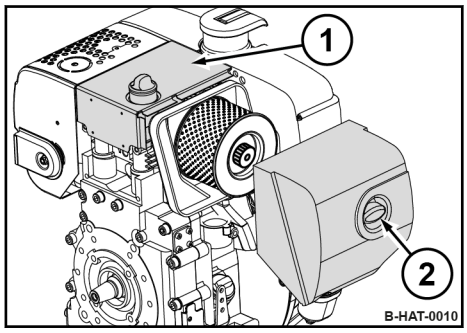


Fig. 64

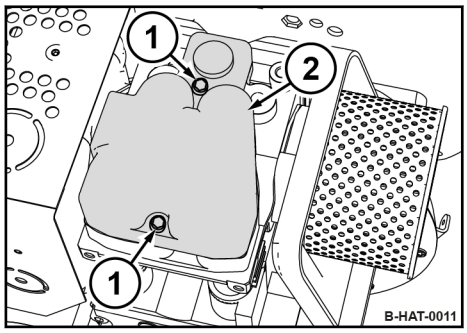


Fig. 65

5. Unscrew the fastening screws (1).
6. Remove the valve cover (2) with gasket.

Checking the valve clearance

Valve clearance:	
Intake valve (IN)	0.20 mm (0.008 in)
Exhaust valve (EX)	0.20 mm (0.008 in)

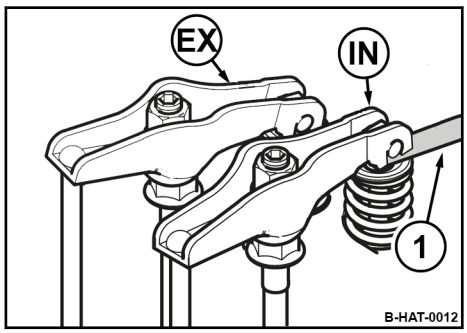


Fig. 66

1. Crank the engine, until the exhaust valve (EX) is fully open.
2. Check the valve clearance on the intake valve (IN) with a feeler gauge (1), adjust if necessary.
3. Crank the engine further, until the intake valve is fully open.
4. Check the valve clearance on the exhaust valve, adjust if necessary.

Adjusting the valve clearance

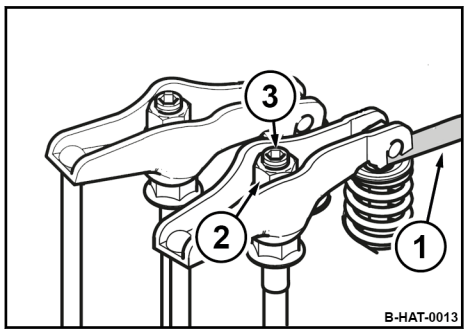


Fig. 67

1. Loosen screw (3) on the rocker arm.
2. Adjust the hexagon nut (2), until the feeler gauge (1) can be inserted and pulled out with noticeable resistance after the screw (3) has been tightened.

Final work

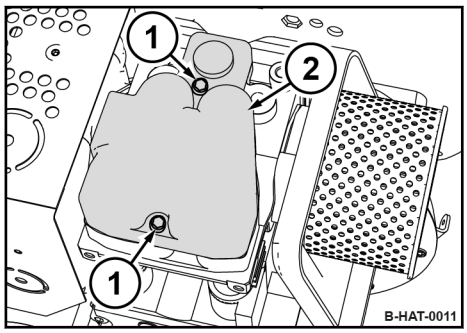


Fig. 68

1. Install the valve cover (2) with a new gasket.
2. Tighten the fastening screws (1) evenly.

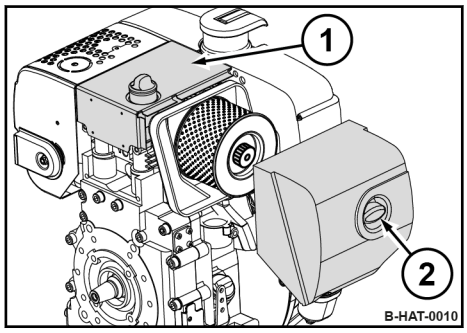


Fig. 69

3. Assemble covering (1) and air filter cover (2).
4. After a short test run check the valve cover for leaks.

8.7.3 Replacing the air filter

NOTICE!

Danger of engine damage!

– Do not start the engine after having removed the air filter.

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine in secured condition *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Allow the engine to cool down.

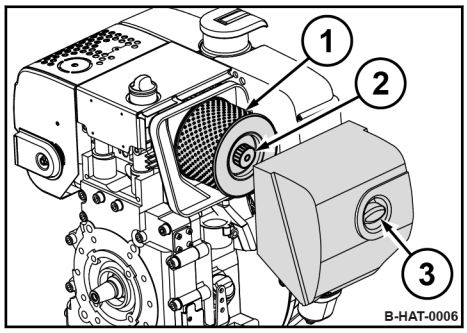


Fig. 70

3. Remove the cap (3).
4. Unscrew the knurled nut (2) and pull out the air filter (1).
5. Clean the cover.
6.

NOTICE!

Danger of engine damage!

– Prevent dirt from getting into the air intake opening.
– Do not clean the air filter housing with compressed air.

Clean the filter housing with a clean, lint-free cloth.

7. Replace the air filter.
8. Insert the air filter (1) carefully into the filter housing and fasten it with the knurled nut (2).
9.

NOTICE!

Danger of engine damage!

– Ensure correct fit of air filter cover and seal.

Close the cap (3).

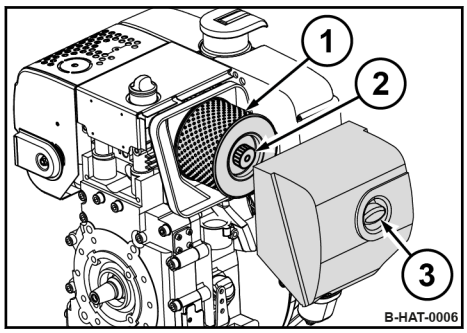


Fig. 71

8.7.4 Replacing the V-belt

Preparations

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

1. Park the machine safely *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Allow the engine to cool down.
3. Loosen the fastening screws (2) and remove the V-belt guard (1).

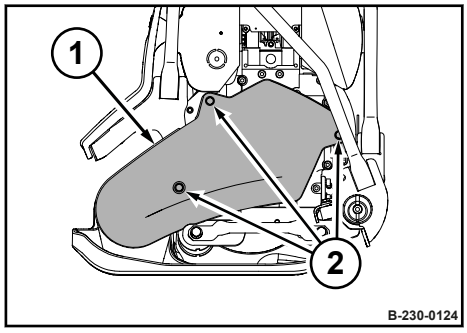


Fig. 72

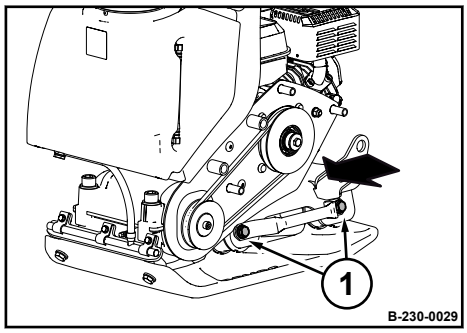


Fig. 73

4. Slightly loosen the fastening screws (1) on both sides.
5. Pull the engine carrier forward, remove and replace the V-belt.

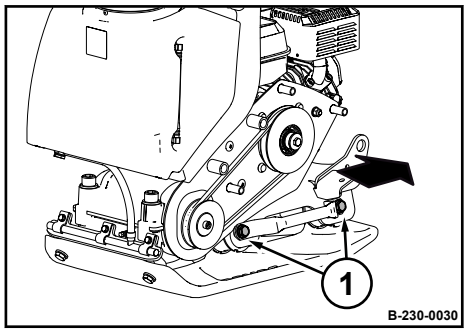


Fig. 74

6. Install the new V-belt and pull the engine carrier back.
7. Tighten the fastening screws (1) on both sides.

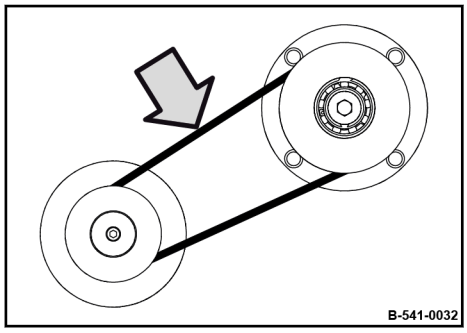


Fig. 75

8. Check tension of V-belt, tighten if necessary.
   ⇨ **Compression measurement:** 5 - 10 mm (0.2 - 0.4 in).

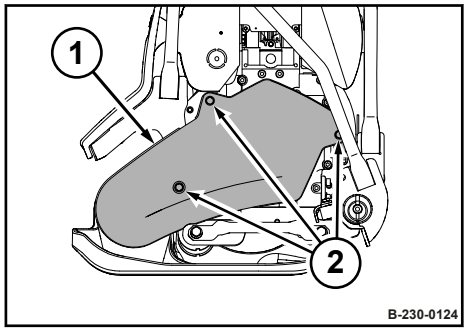


Fig. 76

9. Assemble the V-belt guard (1) with fastening screws (2).
10. Check the V-belt tension again after 25 operating hours, tighten if necessary.

8.7.4.1 Checking the frequency of the base plate

Keep feet and hands clear of the vibrating base plate.

CAUTION!

Danger of injury caused by uncontrolled machine movement!

– Always hold on to a running machine.
– Always keep an eye on a running machine.

Protective equipment:
- Working clothes
- Hearing protection
- Safety shoes

Special tool:
- Sirometer

1. Park the machine on a rubber mat.
2. Start the engine *Chapter 6.2 „Starting the engine“ on page 53*.
3. Run the machine at maximum speed for one minute.
4. Check the base plate’s frequency with a suitable measuring instrument (e.g. Sirometer).

   ⇨ **Nominal value:** *Chapter 2 „Technical data“ on page 11*
5. Park the machine safely *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
6. If frequency incorrect:
   - Check the engine speed.
   - Check the V-belt.
   - If necessary, contact our customer service.

8.7.5 Replacing the fuel filter

NOTICE!

Danger of engine damage!

– Ensure strict cleanliness! Thoroughly clean the area around the fuel tank beforehand.
– Never operate the engine after having removed the fuel filter.

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine in secured condition *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Clean the area around the tank filler cap.
3. Remove the tank filler cap.

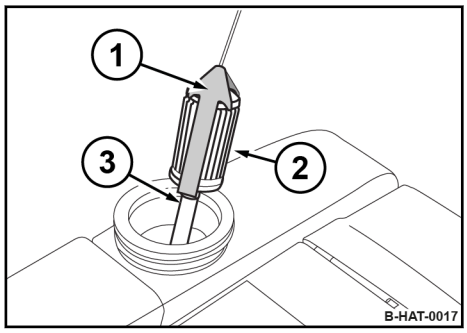


Fig. 77

4. Pull the fuel filter out of the tank by the string.
5. Pull the fuel hose (3) off the fuel filter (2).
6. Take the fuel filter out of the bracket (1) and replace it with a new one.
7. Plug on the fuel line.
8. Insert the fuel filter into the tank.
9. Close the fuel tank tightly.

The fuel system is self-bleeding.

10. Dispose of fuel and filter in an environmentally friendly way.

8.7.6 Replacing the starter rope

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine in secured condition *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Allow the engine to cool down.
3. Unscrew the fastening screws (1) and disassemble the recoil starter (2).

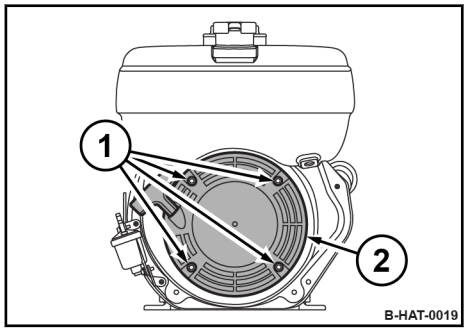


Fig. 78

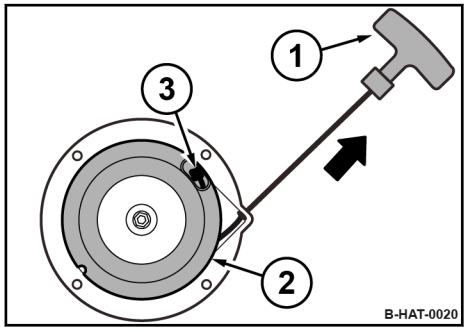


Fig. 79

4. Pull the starter rope with the starter handle (1) out completely.
5. Secure the coil (2) against winding up.
6. Loosen the knot (3) in the starter rope and remove the old starter rope.
7. Carefully turn the coil back, until the recoil spring is relieved.

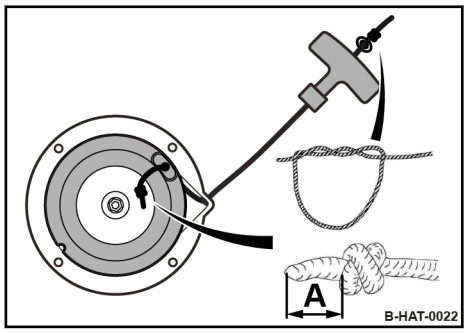


Fig. 80

8. Thread in the new starter rope and fix it with knots on both ends .

A = 15 mm (0.6 in)

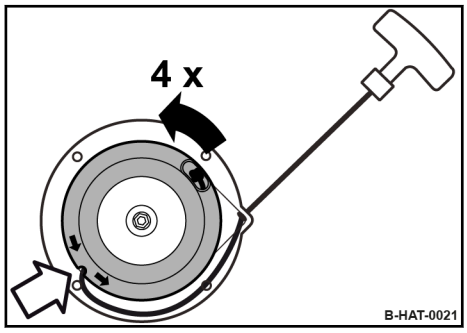


Fig. 81

9. Pre-tension the coil by approx. 4 rotations in direction of arrow.

Thereby place the starter rope into the recess in the coil .

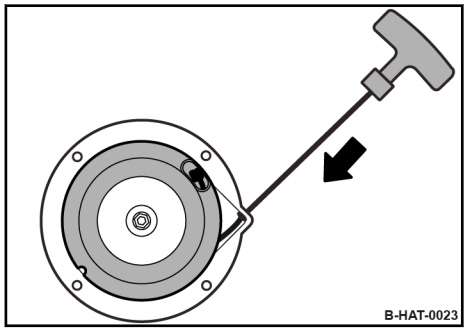


Fig. 82

10.

CAUTION!

Danger of injury caused by the starter handle hitting against your body!

– Do not let the starter handle hit back.

Slowly guide the starter handle back to initial position .

11. Pull the starter handle to check the function and light movement of the recoil starter.

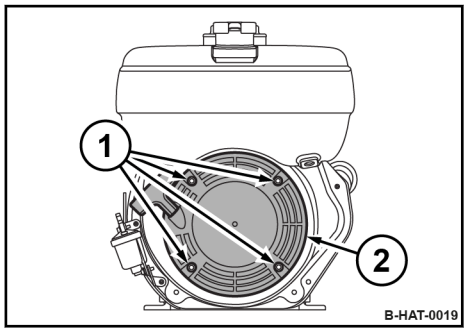


Fig. 83

12. Assemble the recoil starter (2) with fastening screws (1).

8.7.7 Changing the oil in the exciter housing

NOTICE!

Components may get damaged!

– Use only oil of the permitted specification ↬ *Chapter 8.3 „List of fuels and lubricants“ on page 69*.

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine on level ground.
2. Park the machine in secured condition ↬ *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
3. Tilt the machine slightly towards the oil drain side and support it safely.
4. Unscrew the oil drain plug (1) and collect running out oil.

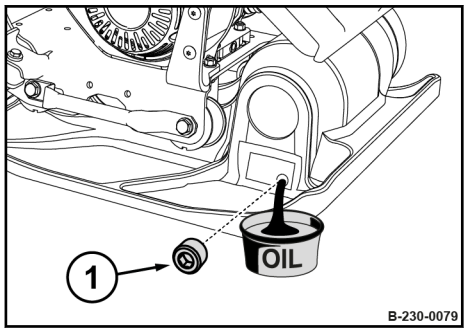


Fig. 84

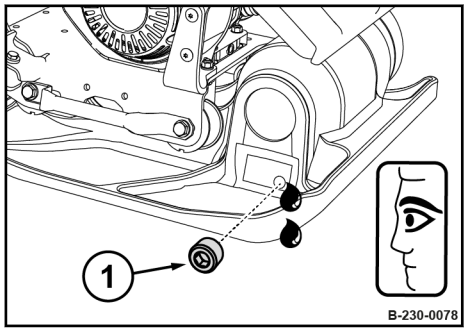


Fig. 85

5. Stand the machine upright.

NOTICE!

Components may get damaged!

Do not use low-ash engine oils for the exciter shaft housing.

6. Fill in fresh oil up to the bottom edge of the opening.
7. Screw in the oil drain plug (1).
8. Dispose of oil in an environmentally friendly way.

8.7.8 Cleaning the exhaust screen

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine in secured condition ↬ *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Allow the engine to cool down.

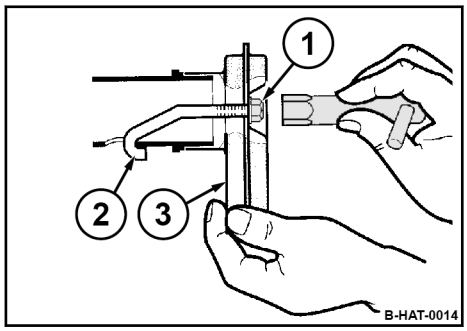


Fig. 86

3. Loosen the fastening nut (1).
4. Remove the exhaust manifold (3) with the fastening bracket (2).

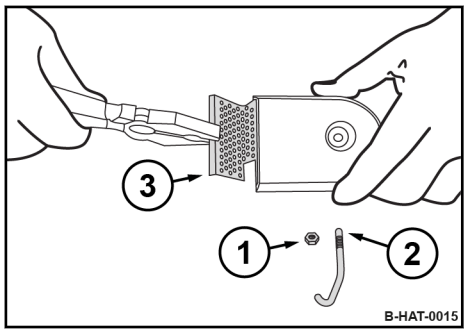


Fig. 87

5. Disassemble the fastening nut (1) and the fastening strap (2).
6. Pull out the screen insert (3).

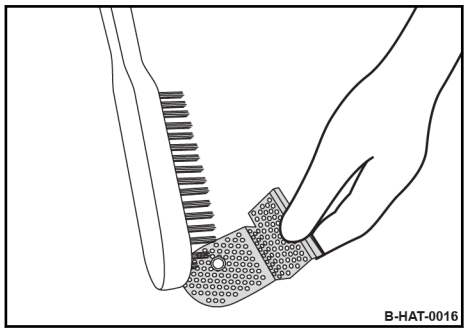


Fig. 88

7. Remove deposits from the screen insert with an appropriate wire brush.
8. Check the screen insert for damage, replace if necessary.

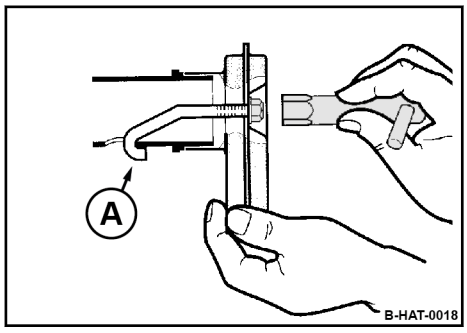


Fig. 89

9. Reassemble the screen insert and the fastening strap.
10. Tighten the fastening nut for approx.one turn.
11. Slide on the exhaust manifold with fastening strap.
12. Hook the fastening strap into the bore (A).
13. Tighten the fastening nut.

8.8 As required

8.8.1 Cleaning the cooling fins and the cooling air intake openings

How dirty the cooling fins and cooling air intake openings are depends very much on the daily operating conditions; clean daily if necessary.

Protective equipment:
- Working clothes
- Protective gloves
- Safety goggles

1. Park the machine in secured condition *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Allow the engine to cool down.
3. Remove dried dirt with a suitable brush from all cooling fins and cooling air intake openings.
4. **CAUTION!**
   Danger of eye injuries caused by particles flying around!
   – Wear your personal protective equipment (safety gloves, protective working clothes, goggles).

   Blow out the cooling fins and cooling air intake openings with compressed air.
5. In case of damp or oily contamination you should consult our customer service department.

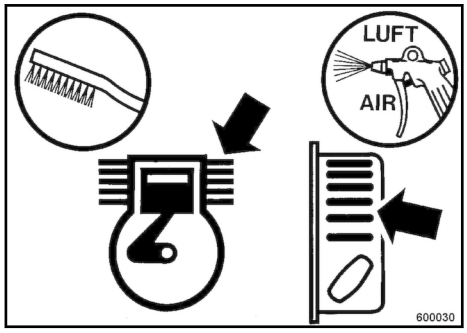


Fig. 90

8.8.2 Cleaning the machine

Protective equipment:
- Working clothes
- Protective gloves

1. Park the machine in secured condition *Chapter 6.5 „Parking the machine in secured condition“ on page 58*.
2. Let the machine cool down to ambient temperature.

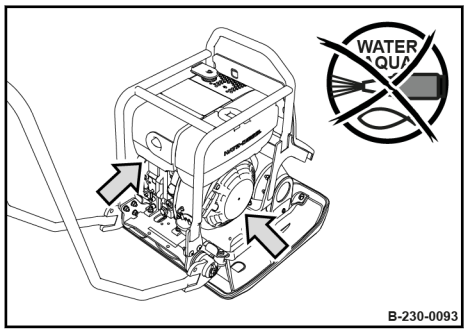


Fig. 91

3. Clean the machine with a water jet.

NOTICE!

Electric components can be damaged by water entering into the system!

– Do not guide the water jet directly into the cooling air openings of the recoil starter, into the dry air filter or onto electrical equipment.

4. Warm up the engine for a while to avoid corrosion.

8.8.3 Cleaning the water spraying system

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves

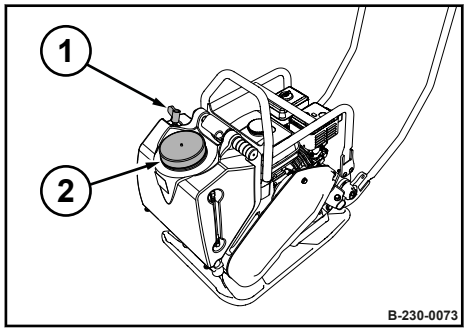


Fig. 92

1. Remove the cap (2).

2. Open the rotary button (1) completely and let all water run out.

Alternatively you may also remove the water tank for cleaning.

3. Flush the water tank with a strong water jet, until all dirt has run out.

4. Fill the water tank with clean water and close the cap.

8.8.4 Measures prior to extended shut-down period

8.8.4.1 Measures before shutting down

If the machine is shut down for a longer period of time, e.g. winter season, the following work must be carried out:

1. Clean the machine thoroughly.

2. Clean the water separator.

3. Fill the fuel tank with diesel fuel, to prevent the formation of condensation water in the tank.

4. Change the engine oil and clean the oil filter.

5. Change the fuel filter.

6. After shutting down store the machine under cover in a dry and well ventilated room.

7. Protect the cooled down engine against dust and moisture.

8.8.4.2 Measures before restarting

1. Replace the fuel filter.
2. Replace the air filter.
3. Change the engine oil and clean the oil filter.
4. Check cables, hoses and lines for cracks and leaks.
5. Start the engine and run it for 15 to 30 minutes with idle speed.
6. Check the oil levels.
7. Clean the machine thoroughly.

Maintenance – As required

9 Troubleshooting

9.1 Preliminary remarks

Malfunctions are frequently caused by incorrect operation of the machine or insufficient maintenance. Whenever a fault occurs you should therefore thoroughly read these instructions on correct operation and maintenance.

If you cannot locate the cause of a fault or rectify it yourself by following the trouble shooting chart, you should contact our customer service department.

9.2 Engine malfunctions

Fault	Possible cause	Remedy
The engine is hard to start or does not start at all	Shut-down pin in STOP position	Pull the shut-down pin gently to move it to operating position
	No fuel at the injection pump	Check the fuel level, top up if necessary
		Check the fuel lines
		Check the fuel filter, replace if necessary
	Injection nozzle out of order	Have it checked by qualified expert personnel
	Incorrect valve clearance	Check the valve clearance, adjust if necessary
	Cylinder or piston rings worn	Have it checked by qualified expert personnel
Engine does not start or starts poorly at low temperatures	Paraffin sweats in the fuel due to insufficient low temperature resistance	Use winter-grade fuel
	Engine oil with wrong SAE viscosity class	Changing the engine oil
Engine does not crank when operating the recoil starter	Recoil starter defective	Replace the recoil starter
	Spring broken	Replace the recoil starter
The starter rope does not return to the initial position	Recoil starter dirty	Clean the recoil starter
	Insufficient pretension of the spring	Check the pretension of the spring, adjust if necessary
	Spring broken	Replace the recoil starter
Engine ignites, but does not run	Fuel filter clogged	Check the fuel filter, replace if necessary
Engine stops	Fuel tank empty	Check the fuel level, top up if necessary
	Fuel filter clogged	Check the fuel filter, replace if necessary
	Tank ventilation blocked	Ensure sufficient ventilation of the tank
	Air in the fuel system	Check the fuel system for air entry. Check the ventilation valve.
	Mechanical defect	Have it checked by qualified expert personnel
Engine looses power and speed	Fuel tank empty	Check the fuel level, top up if necessary
	Tank ventilation blocked	Ensure sufficient ventilation of the tank
	Air in the fuel system	Check the fuel system for air entry. Check the ventilation valve.
Engine looses power and speed, black exhaust smoke	Air filter dirty	Clean, replace if necessary
	Incorrect valve clearance	Check the valve clearance, adjust if necessary

Troubleshooting – Engine malfunctions

Fault	Possible cause	Remedy
	Injection nozzle does not work correctly	Have it checked by qualified expert personnel
Engine overheats	Engine oil level too high	Check, drain off if necessary
	Lack of cooling air	Clean the cooling fins and the cooling air intake openings. Check air guide plates and ducts for completeness and good sealing.
Engine runs with high speed, but no vibration	Centrifugal clutch defective	Have it checked by qualified expert personnel
	V-belt torn	Replacing the V-belt

10 Disposal

10.1 Final shut-down of machine

If the machine can no longer be used and needs to be finally shut down you must carry out the following work and have the machine disassembled by an officially recognized specialist workshop.

WARNING!

Health hazard caused by fuels and lubricants!

– Safety regulations and environmental protection regulations must be followed when handling fuels and lubricants ↳ *Chapter 3.4 „Handling fuels and lubricants“ on page 23*.

Protective equipment:
- Working clothes
- Safety shoes
- Protective gloves
- Safety goggles

1. Empty the fuel tank.
2. Drain engine oil from engine and exciter housing.

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