STIGA

TRE 586V - TRE586VA
TRE635V

WORKSHOP MANUAL

Rel. 0.0		PRODUCTION YEAR 2020 -->

The manufacturer reserves the right to make all the necessary technical or commercial improvements to its products, so there may be some differences between the series of engines and the contents of this manual. However the basic specifications and different operating procedures will remain the same.

IMPORTANT NOTICE : The information contained herein is intended for Service Operations and professionals only, able to competently perform the operations described herein, using the appropriate equipment in order to safeguard se-curity and performance of the machine. The manufacturer is not liable for damages or injuries arising from operations performed by individuals or inadequate facilities.

ALPINA Mountfield ATCO CASTELGARDEN

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INTRODUCTION

The purpose of this manual is to provide to Service Centres the information necessary for a correct maintenance, dismantling and repair procedure for **engines TRE 586V - TRE 586VA - TRE 635V**.
Interventions on the engine must be performed in accordance with instructions in the following pages and with safety regulations in force in the country in which the engine is operated, and only by authorised and appropriately trained personnel.

In every manual page the following informations are described:

A: Motor type for which the page is valid;

B: Reference to the chapter and the argument with the relative numbering;

C: Presence of previous or following chapters from the present chapter;

D: Issue date or possible audit;

E: Audit number;

F: Page progressive numbering.

Certain symbols are used in the manual, highlighting particularly important information, risks, warnings and prescriptions:

Warns of operations that should be carried out with utmost care to avoid impairing the functionality and safety of the lawnmower.

Warns of operations that should be carried out with utmost care to avoid impairing the functionality and safety of the lawnmower.

NOTE: Refers to specific advice by the manufacturer.

Reference to another procedure or part of the manual.

Recommends that washers and O-rings are checked and replaced if necessary.

Refers to use of special tools.

Shows all the operations requiring different intervention methods depending on the engine version.

NOTE: During the description of procedures, the indications "right", "left", "front", "rear", "upper" and "lower" refer to the engine mounted on the machine seen from the user's perspective.

Integrated abbreviations:

"RON": Ride On

"FM": Front Mover

Please read all the contents of this manual to become familiar with the basics of the engine, which is fundamental for operating in a logical manner without making errors or wasting time.

1. RULES AND PROCEDURES FOR SERVICE CENTRES

1.1. Guarantee validity

The warranty is supplied under the terms, procedures and limits stated in the contract.

1.2. Service repairs after guarantee period

The Service Centre must write a report for each intervention containing the serial number of the engine[[☞ 3.1], summary information about the problems complained of, the intervention made and possible spare parts used.
A copy of these reports must be kept and made available to the manufacturer together with the replaced parts, in case clients should make further complaints.

1.3. Fault notification

The manufacturer should be informed of all faults that recur frequently; this allows it to carefully examine the problem and make corrections on the production line.
Similarly, the manufacturer shall report any faults traced on its engines, indicating the best troubleshooting procedure.

1.4. Spare parts request

When asking for spare parts, you must quote their code by referring to the exploded views corresponding to the year of manufacture reported on the nameplate [[☞ 3.1].
Use only original spare parts; the use of non-original spare parts may compromise the efficiency and durability of the engine.

Gaskets, washers, O-rings and oil seals must be checked and, if necessary, replaced during every inspection and/or maintenance operation.

2. GENERAL AND SAFETY REGULATIONS

IMPORTANT: Before commencing with any intervention, carefully read the information provided in the present manual, in particular the following safety regulations.

2.1. Qualification of operators

All maintenance, disassembly and repairs must be carried out by expert mechanics who are familiar with all the accident prevention and safety regulations after reading through the procedures in this manual.

2.2. Safety measures

All the engines are built in conformity with the European safety regulations in force.
To maintain initial safety levels in the long term, the Service Centre should take proactive measures by making checks whenever possible.
Every time you are asked to service the engine (or the machine on which it is installed), you should:

- check:

- **that the safety devices function correctly;**
- **that the casings and protection covers have not been removed;**
- **that the nameplates or specification labels have not been removed or made illegible, (as they form an integral part of the safety devices).**

- Also:

- **restore to proper working order any safety devices which have been manipulated or removed;**
- **replace ineffective, damaged or missing guards and covers;**
- **replace illegible labels;**
- **do not carry out operations or modifications on the machine or on the engine that could affect their performance or lead to an improper or different use from the one for which it has been designed and approved;**
- **warn the customer that the failure to comply with the above points automatically voids the warranty and the responsibility of the manufacturer.**

2.3. Precautions during servicing

As well as following the usual accident prevention regulations that apply to most repair shops, we recommend you:

- **the site used for disassembly and assembly must be clean;**
- **checking and maintenance operations must be carried out with the engine switched off and cold; high temperature operation of the engine may cause injury and/or burns;**
- **clean the engine, removing dirt/dust, metal debris, carbon deposits, grease stains and other impurities with cleaning agents and compressed air;**
- **prepare suitable tools and devices for disassembly and assembly;**
- **when dismantling, highlight the most difficult parts with reference mark, this helps when reassembling the most complex parts;**
- **carry out assembly in the opposite order to disassembly, i.e. assemble in order from the inside to the outside and from the main part to the auxiliary part and its components, until the whole engine is assembled;**
- **disconnect the spark plug cap before servicing;**
- **protect hands with suitable working gloves, especially when working near the cutting unit;**
- **check that you do not cause accidental petrol leaks or other losses;**
- **do not smoke when working on the tank or when handling petrol;**
- **do not inhale oil or petrol fumes;**
- **test the engine in a well-ventilated environment or where there are adequate exhaust fume extraction systems;**
- **do not pollute the environment with oil, petrol or other waste and dispose of all waste in accordance with the laws in force;**

2. GENERAL AND SAFETY REGULATIONS

Exhaust gas contains carbon monoxide, which is highly toxic, odourless and colourless. Avoid inhaling.

- **Perform tests on the engine in a well-ventilated environment or in the presence of adequate exhaust gas extraction systems.**
- **Once the engine has been assembled, perform a test for correct operation and any adjustments before fitting it back onto the machine.**

2.4. Warning labels

On the cowl motor, in a immediately identification position, are some indication or prescription plates for the safety of the operator.
The plates are as follows:

1 - Fire hazard due to:
- Petrol or oil
Prevent by following the precautions below:
- Do not smoke or ignite a flame in the vicinity of the petrol or oil;
- Turn engine off before adding petrol;
- Do not spill petrol on overheated or electric parts of the engine;
- Handle or store petrol or oil in well-ventilated areas;
- Use non-flammable oil for cleaning engine parts.

- Accumulation of flammable material
Prevent by following the precautions below:
- Remove dry leaves, chips, pieces of paper, dust or other flammable material which has accumulated in or is attached to the engine.

- Electrical cabling
Short circuits can cause fires. Prevent by following the precautions below:
- Always keep the electrical connections of the machine clean and tightly sealed;
- Tighten any loose connectors or cabling clamps. Replace those that are damaged.

2 - Observe the instructions and warnings contained in the present manual and on the safety plates on the engine.
Inappropriate functioning and maintenance can result in serious injury or even death.

3 - Ventilation of closed areas:
In the event that it is necessary to start the engine in a closed environment or if petrol or cleaning oil is being used, open doors and windows to ensure adequate ventilation and, therefore, avoid gas poisoning.

4 - Motor label (see [[☞ 3.1]).

2.5. Necessary equipment

All the operations can be carried out with the tools normally used in a good garage.

The  symbol used for certain interventions indicates that special tools or equipment are recommended.

2.6. Symbols and terms used for safety purposes

Some paragraphs in this manual are preceded by symbols which indicate the following:

Operations that should be carried out with utmost care to avoid impairing the functionality and safety of the engine and/ or machine on which it is installed.

Operations that should be carried out with utmost care to avoid injury to operators.

"WARNING" stresses the risk of injury to oneself and others if instructions and regulations are not observed.

3. TECHNICAL DATA AND SPECIFICATIONS

3.1. Identification

Every motor is marked with a serial number on the base and applied on the cowl; this serial number can identify:

TREXXXX MM/YYYY XXXXX

- TREXXXX: Month of manufacture
- MM/YYYY: Year of manufacture
- XXXXX: Monthly progress reading

NOTE - The monthly progress reading is reset to zero every month.

The serial number must be reported on every operating sheet in the warranty application and is fundamental for identifying and ordering spare parts.

3.2. Technical data

	TRE 586VA	TRE 586V	TRE 635V
Displacement	586 cc	586 cc	635 cc
Bore	73 mm	73 mm	76 mm
Stroke	70 mm		
Minimum speed (SLOW)	1800 (±150) r.p.m.		
Ride On (RON)	2800 (±100) r.p.m.		
Front mover (FM)	3200 (±100) r.p.m.		
Oil sump capacity	1,70 litres		
Weight	36 kg		

3.3. Adjustments

Distance between spark plug electrodes	0,7 - 0,8 mm
Coil air gap	0,3 - 0,40 mm
Inlet valve clearance	0,10 - 0,15 mm
Exhaust valve clearance	0,10 - 0,15 mm
Generator charge	3,0 ÷ 4,0 Ω (Ohm)

3.4. Expendable materials

Petrol		Unleaded (green) minimum 90N.O.
Engine oil	- from 5 to 35 °C - from -15 to +35 °C	SAE 30 - 10W30
Spark plug		RN9YC (Champion) or equivalent

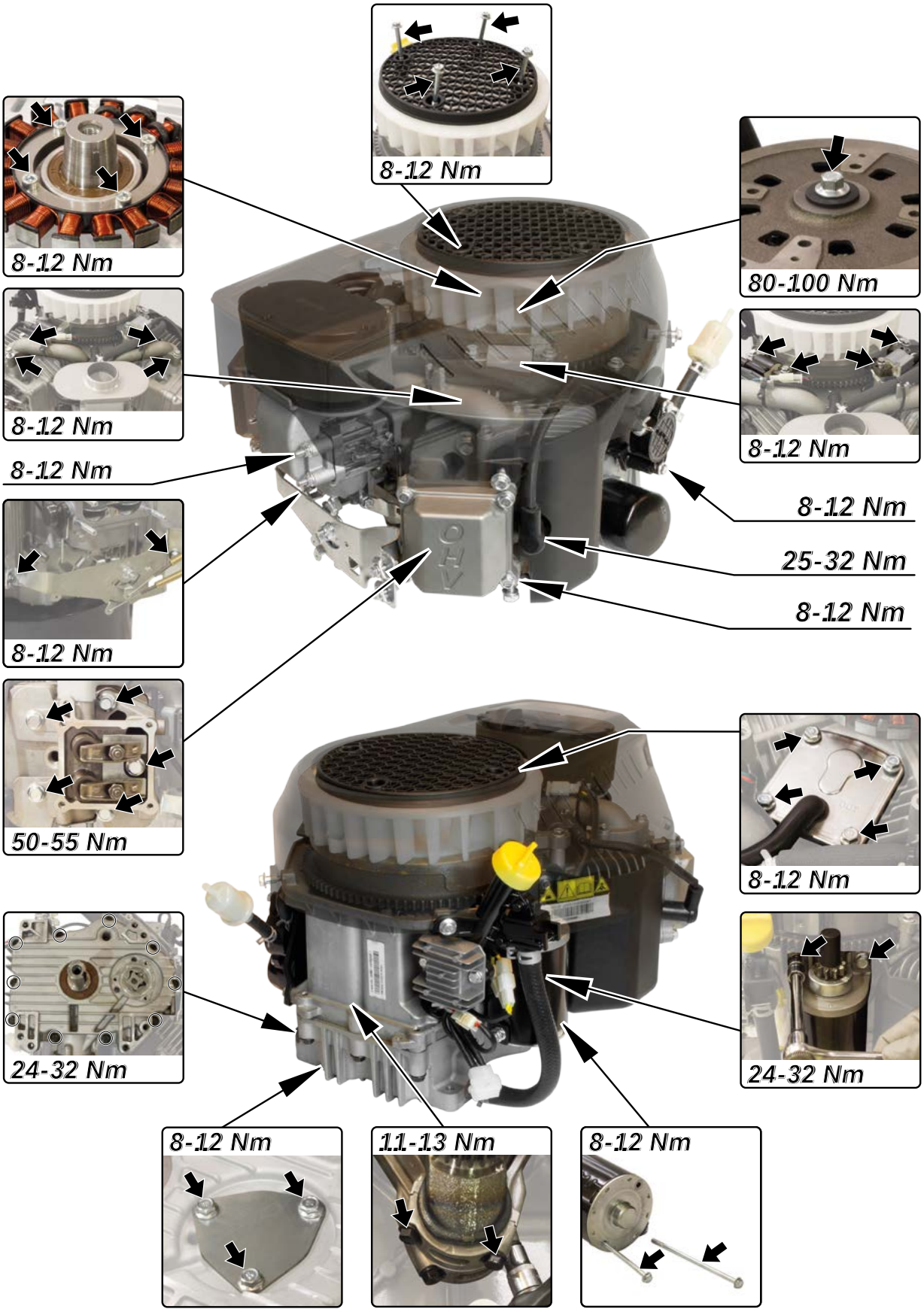
3.5. Use limits

The following table gives the use limits of certain components subject to wear, after which the component must be replaced.

		TRE 586VA - TRE 586V TRE 635V
Brushes lenght starter push botton		11,7 ÷ 8,0 mm
Compression		12,5 bar
Minimum inlet valve stem diameter		6,515 mm
Minimum exhaust valve stem diameter		6,495 mm
Minimum inlet valve head rim thickness		2,70 mm
Minimum exhaust valve head rim thickness		3,20 mm
Valve seat width		2,0 mm
Minimum valve spring length		39,0 mm
Maximum gap between ends of cylinder rings		1,0 mm
Max. axial gap for compression rings		0,11 mm
Minimum gudgeon pin diameter		16,90 mm
Max. gudgeon pin-piston seat diameter		17,07 mm
Max. connecting rod diameter	gudgeon pin side	17,07 mm
	crank side	38,075 mm
Diameter connecting rod's pin on engine shaft		37,93 mm
Verify the engine shaft extremes		0,10 mm
Diameter Pump seat on camshaft		15,916 mm
Diameter aspiration cam		29,75 mm
Diameter discharge cam		29,75 mm
Diameter oil pump seat		40,90 mm
Height pump cylinder		8,90 mm
Cylinder/seat clearance on the pump		0,34 mm

3. TECHNICAL DATA AND SPECIFICATIONS

3.6. Tightening torques



3. TECHNICAL DATA AND SPECIFICATIONS

3.7. Table of Tightening torques

Chapter Ref.	Description of screw	Tightening torques
6	Fixing screw starting motor	24 - 32 Nm
6	Starting motor screw	8 - 12 Nm
7	Fixing nuts carburettor and filter	8 - 12 Nm
8	Support screws petrol pump	8 - 12 Nm
8 -10	Screw support steering lever	8 - 12 Nm
9	Coil fixing screws	8 - 12 Nm
9 - 10	Spark plug tightening torque	25 - 32 Nm
10	Attachment bolt flywheel	80 - 100 Nm
10	Screws valve cover	8 - 12 Nm
10	Manifold fixing screws	8 - 12 Nm
10	Fixing head screws	50 - 55 Nm
10	Fan grille fixing screws	8 - 12 Nm
10	Screws small plate drop wire	8 - 12 Nm
10	Fixing screws generator	8 - 12 Nm
11	Screws cover oil pump	8 - 12 Nm
11	Union screws under carter and sump	24 - 32 Nm
11	Fixing screws lower connecting rod cap	11 - 13 Nm

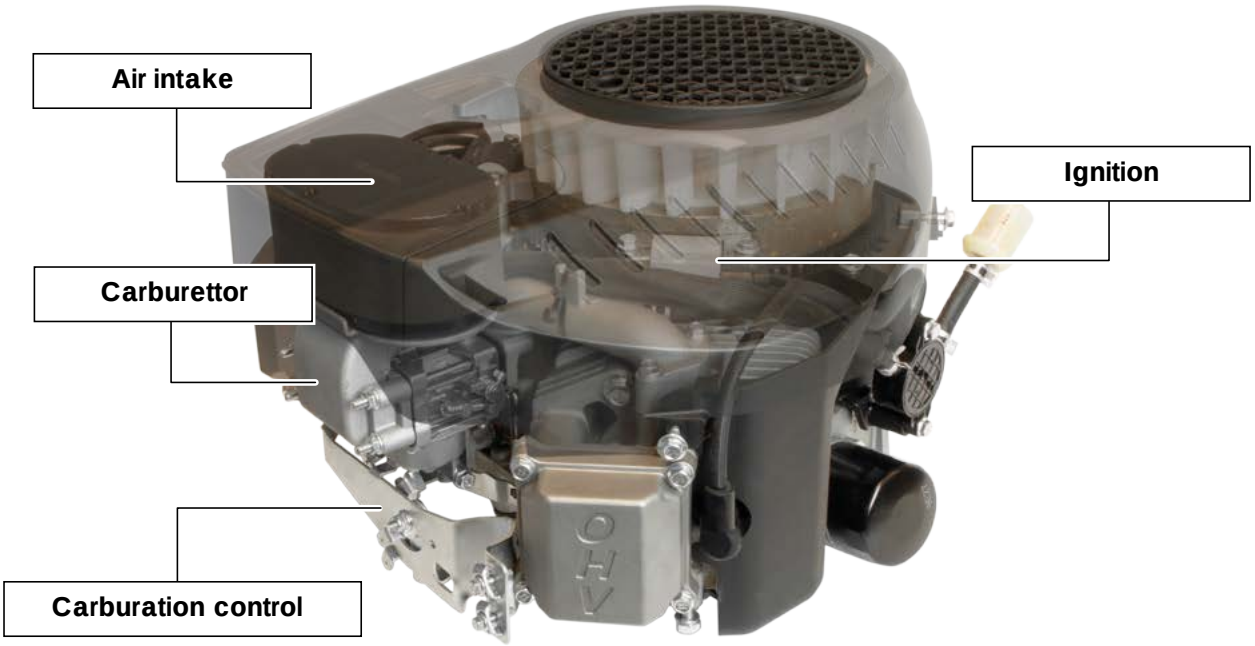
For the tightening torques of all other standard screws, refer to the unified table below:

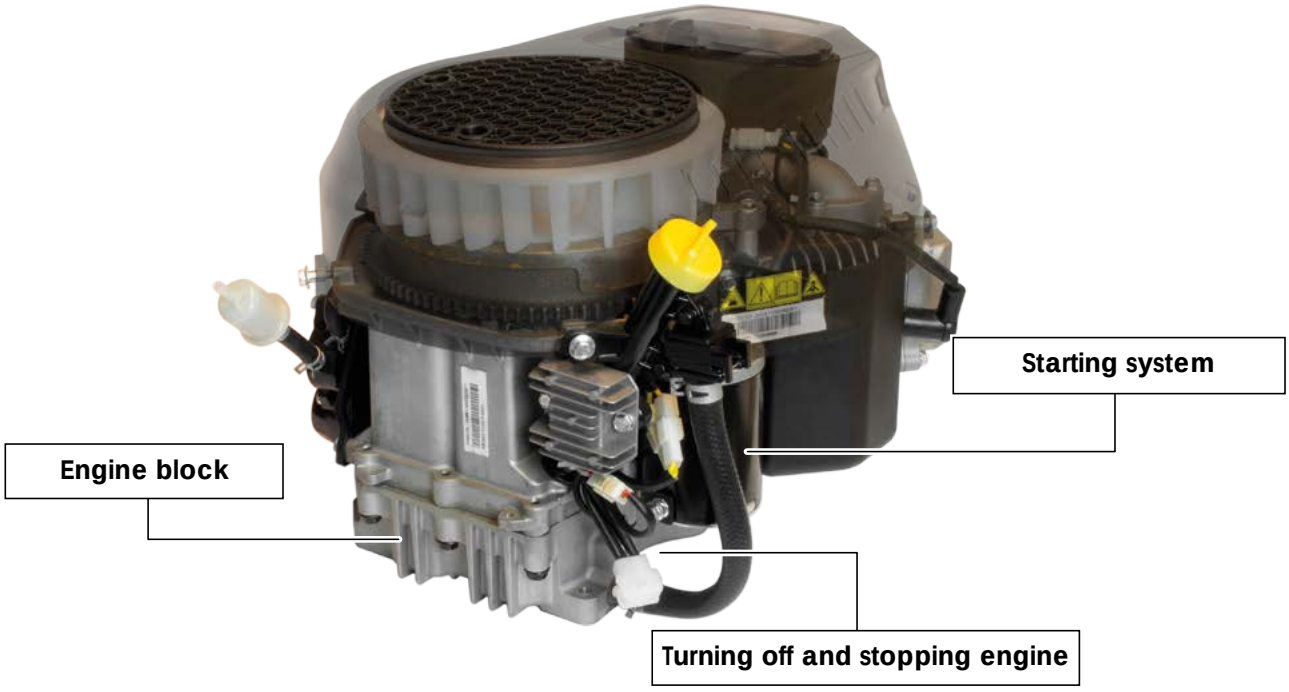
Fastening parts	Specific measures	Tightening torques
Bolts and nuts	5 mm	4 - 7 Nm
	6 mm	8 - 12 Nm
	8 mm	20 - 28 Nm
	10 mm	35 - 40 Nm
	12 mm	50 - 60 Nm

3. TECHNICAL DATA AND SPECIFICATIONS

3.8. Identification of engine units

For ease of reference, this manual has subdivided maintenance operations into different sections, each of which refers to an engine component unit as indicated in the diagrams below.





4. ENGINE TUNING AND TESTING

4.1. Operating guidelines

The engine requires a series of interventions (shown in the table below) in order to ensure minimum basic maintenance.

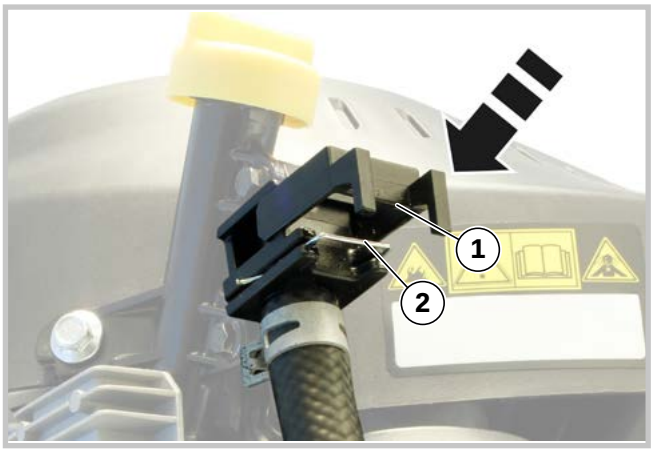
Operation	First 5 hours	Every 5 hours or daily	Every 25 hours or every season	Every 50 hours or every season	Every 100 hours	Every 200 hours	Every 300 hours
Check oil level	-	■	-	-	-	-	-
Change oil *(1)	■	-	-	-	■	-	-
Change oil filter	-	-	-	-	■	-	-
Check and oil pre-filter *(2)	-	■	-	-	-	-	-
Blow filter *(2)	-	-	■	-	-	-	-
Change air filter	-	-	-	■	-	-	-
Check spark plug	-	-	-	■	-	-	-
Replace spark plug	-	-	-	-	■	-	-
Checking and replacing the fuel filter	-	-	-	-	■	-	-
Petrol tube replacement	**Every 2 years (if necessary)**						
Checking valves clearance	-	-	-	-	-	■	-
Combustion chamber cleaning	-	-	-	-	-	-	■

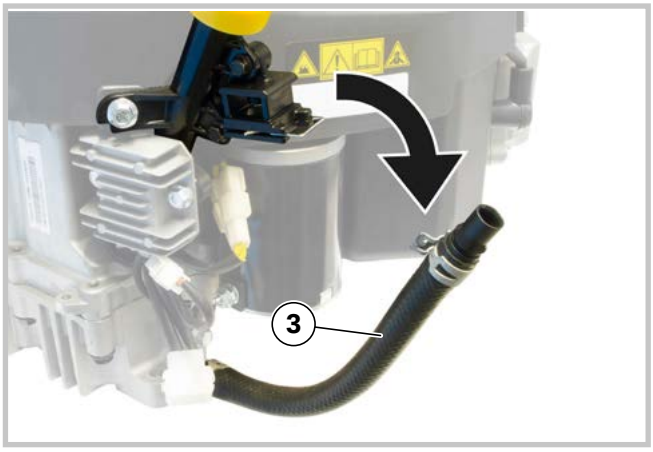
*(1) Replace the oil every 25 hours if the engine is working at full load or at high temperatures.
*(2) Clean the air filter more often if the machine is working in dusty areas.

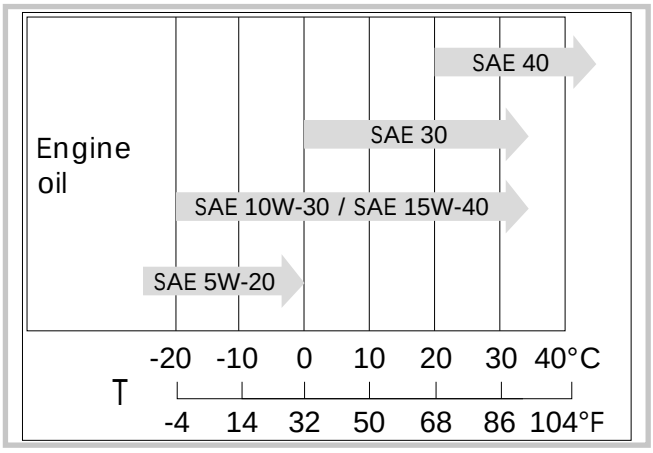
For the operations that are not difficult for the final user the assistance centre must maintain the motor in perfect efficiency, in accordance with two intervention lines:

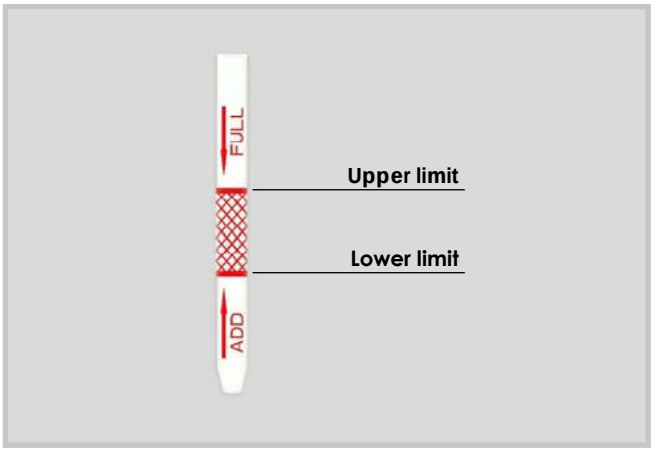
- Tuning the engine whenever possible.
- Recommending the client a routine maintenance program at set intervals (e.g. at the end of the season or before a long period of inactivity).

4. ENGINE TUNING AND TESTING









4.2. Changing the engine oil

NOTE - Drain the engine oil when the machine is stationary but not completely cold so as to ensure that the oil is drained quickly and completely.

The engine oil affects the performance and durability of the petrol. It is recommended that engine oil containing additives and two-stroke engine oil are not used because they lack lubrication. The different viscosity of the oil increases petrol consumption and also reduces engine performance.

- Clean the area around the filler cap with the dipstick.
- Remove the filler cap with dipstick and drain the engine oil by following the steps below.

1 - Remove the protection (**1**) and release the clip (**2**) from the seat;

2 - Pull the hose (**3**) downwards from the fitting and let the engine oil drain into a suitable container.

3 - Check that the hose is not damaged but is intact, otherwise replace it.

Engine oil capacity

Use a 4-stroke engine oil of high detergent quality. **SAE30 10W-30** is recommended for general use at all temperatures. Other viscosities shown in the table may be used when the average temperature in the area is within the indicated range

4 - When the machine is cold and on flat ground, unlock the filler cap fitted with dipstick and check the level indicated.
Top up and start the engine for a few minutes, check the level after a few minutes by repeating the step if necessary, until the oil level reaches the upper limit as shown in the figure.

4. ENGINE TUNING AND TESTING

4.3. Change oil filter

1 - Protect the underlying surface from oil leaks with a cloth.

2 - With the help of plier (**4**) unscrew the filter (**5**) in anti-clockwise to remove it.

3 - Before installing a new filter, lightly lubricate the new gasket with clean engine oil.

4 - Lock the filter into the housing by turning it clockwise until the gasket touches the filter adapter. Tighten 1/2 to 3/4 extra turns to ensure tightness.

5 - Start the engine to check for oil leaks.

WARNING: The used oil contains dangerous substances that can cause skin irritation; use of gloves is recommended.
If you come into contact with or have long-term exposure to used oil, it is recommended that you wash your hands thoroughly with soap and clean water as soon as possible.

WARNING: Dispose of the used oil in a suitable sealed container.
Used oil must be delivered to the appropriate collection centres in the country where the machine has been used where the specific regulations are in force. Do not dispose of in landfill or disperse into the environment.

4. ENGINE TUNING AND TESTING

4.4. Engine tuning program

As part of general engine tuning or any intervention on the machine, it is recommended that the Service Centre performs a series of operations aimed at maintaining the engine's efficiency.

Tuning should involve:

- external blowing and cleaning the cylinder head, cylinder and muffler by removing any remains of grass and mud;
- checking the oil level, topping up or replacing parts if necessary;
- cleaning the air filter [[☞ 5.1]];
- adjusting minimum and maximum speeds [[☞ 7.3]] and [[☞ 8.4]];
- inspecting the condition of the spark plug; checking the distance between the electrodes [[☞ 9.1]];
- tightening the screws [[☞ 11.2]];
- functional test [[☞ 4.5]].

Should the checks and adjustments fail to achieve a satisfactory result, refer to chapter [[☞ 14]] for troubleshooting.

4.5. Functional test

A functional test needs to be carried out at the end of each servicing operation, to check that the operations made are effective. The test must be performed in accordance with safety regulations provided for the use of the machine on which the engine is mounted.

The functional test is carried out as follows:

a. Refuelling and checking the supply system

When you have refuelled the tank with new petrol, check the seal of the tank, the cap and the carburettor pipe.

b. Cold starting test

With the "CHOKE" lever pulled upwards, perform a few starts to ensure there are no issues with this.

c. Check the engine rpm

When the engine is hot enough, check the engine speed with the throttle control set to "SLOW" and "FAST"; the readings should be equal to the specifications [[☞ 3.2]].

d. Hot start test

With the engine hot and the throttle control set to "SLOW", start the engine a few times to check it runs normally.

If all of these operations have a positive result, the engine can be considered fully serviceable and be returned to the client.

5. PETROL SUPPLY AND AIR INTAKE

IMPORTANT: Carefully read the information below before commencing any intervention.

General information

The **petrol supply** occurs via a tank mounted on the machine and connected to the carburettor by a pipe. A filter, positioned between the tank and the petrol pump, stops deposits and impurities from reaching the carburettor.

Supply to the float chamber of the carburettor occurs via the petrol pump and the volume of petrol taken from the tank during operation is compensated by a breather fitted in the cap.

See the relevant section [[☞ 14] for advice on resolving problems due to the malfunctioning of the petrol supply system.

WARNING! All interventions on the supply system must be performed in safe conditions, therefore:

- **do not smoke;**
- **work in a ventilated environment away from naked flames or unprotected sources of heat;**
- **collect any remaining petrol by positioning a suitable container under the engine, avoiding soiling the work bench;**
- **remove all traces of spilt petrol immediately.**

5. PETROL SUPPLY AND AIR INTAKE

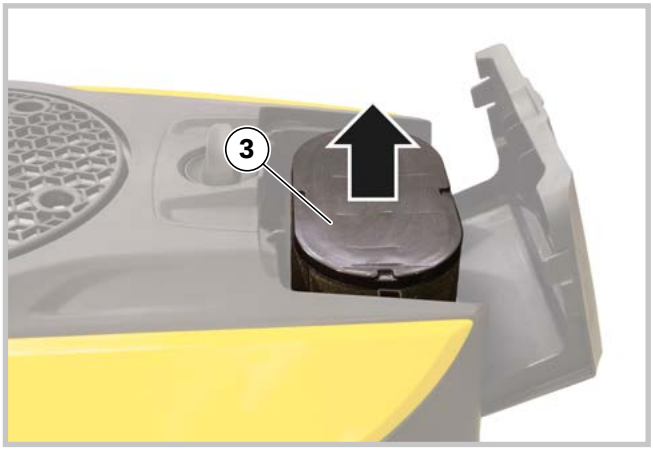
General information

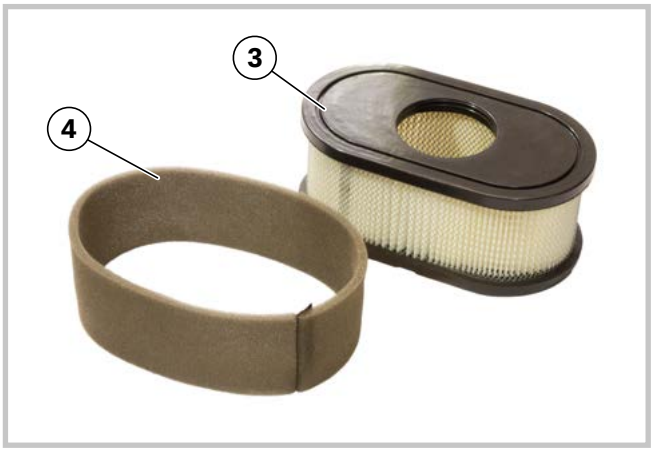
The **filtering system** consists of an air filter directly connected to the carburettor and an internal manifold, located between the carburettor and the cylinder head, which carries the air/petrol mix towards the intake valve.

See the relevant section [[☞ 14] or advice on resolving problems due to the malfunctioning of the air intake system.

An inefficient filter can let dust or debris enter the cylinder, causing premature wear to the piston rings and cylinder.

The air filter is located on the front side of the engine and can be inspected without removing other components.





5.1. Maintenance of filtering element

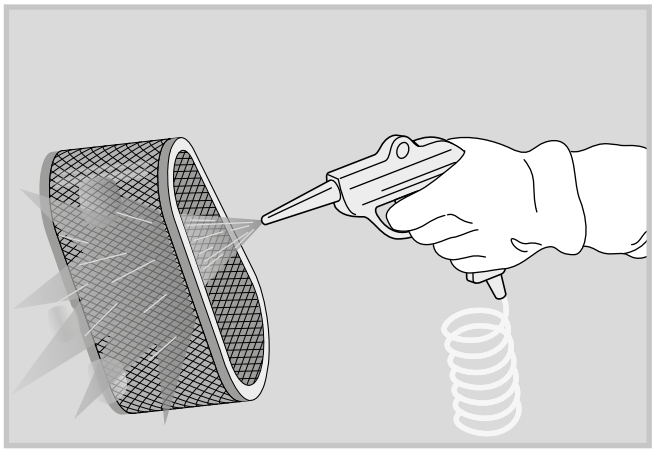
⚠ ***WARNING: Never run the engine without air filter. The engine would certainly be damaged.***

1 - Clean around the filter cover (**1**).

2 - Open the cover (**1**) by turning the knob (**2**) anti-clockwise (open padlock symbol).

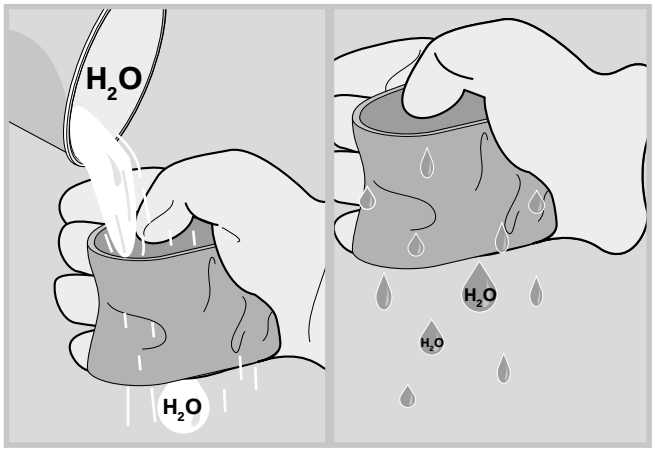
3 - Remove the filter element (**3**) and remove the prefilter (**4**) from the cartridge.

5. PETROL SUPPLY AND AIR INTAKE



4 - Touch the cartridge on a solid surface and blow with compressed air from the interior side to remove dust and product residues.

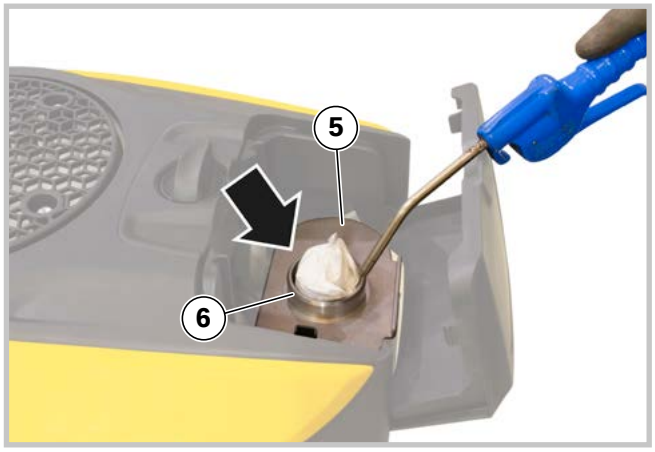
☑ ***IMPORTANT! For the cartridge cleaning don't use water, petrol, detergent.***



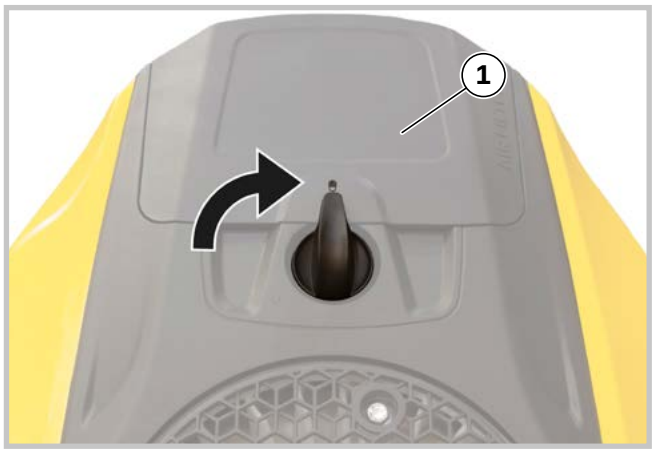
5 - Wash the prefilter with water and detergent and let it air dry.

☑ ***IMPORTANT! The prefileter MUST NOT be oiled.***

6 - Refit the prefilter (**4**) on the cartridge.



7 - With a jet of compressed air, clean inside the seat (**5**) of the filter by removing dust and remains of grass, making sure that the intake pipe hole (**6**) is closed so that nothing gets inside the pipe.



8 - Place the filter element in its housing, close the cover (**1**) and lock it by turning the knob clockwise (closed padlock symbol).

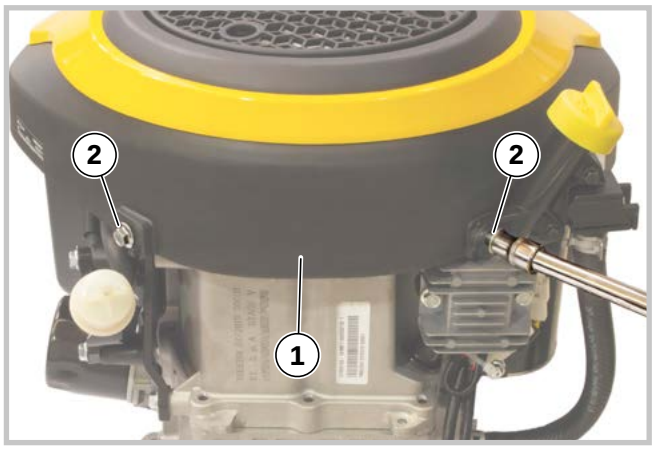
6. STARTING SYSTEM

General information

The **starting system** consists of the starting motor mounted on the engine casing which transmits movement to the flywheel and therefore, to the engine shaft.

See the relevant section [[☞ 14] for advice on resolving problems due to the malfunctioning of the starting system.

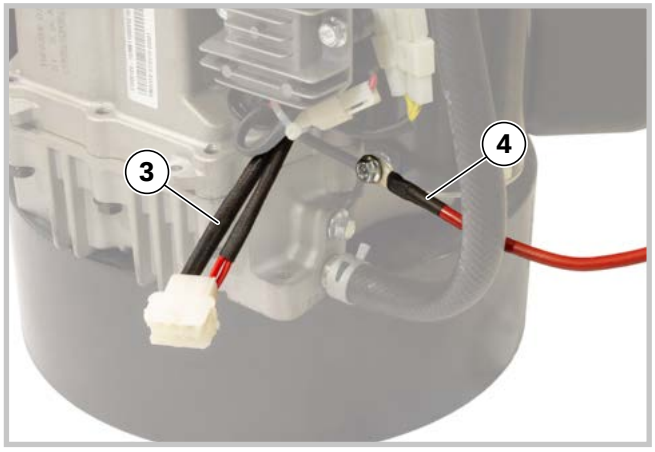
The starter motor is situated on the right side of the engine (in relation to the direction of travel) and for maintenance, it is necessary to dismantle it by following the steps below.



6.1. Replacement of brushes

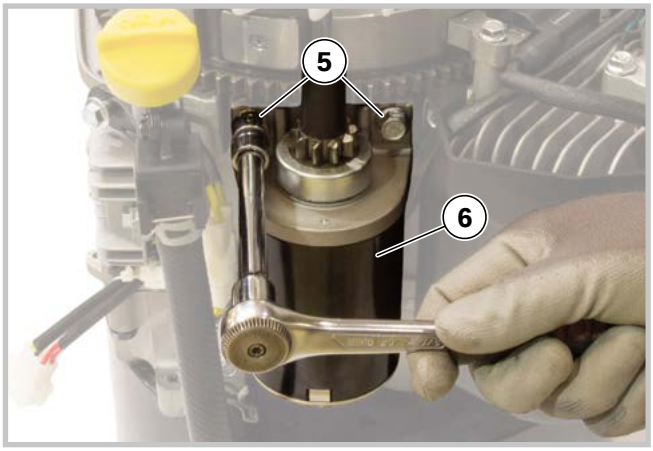
1 - Loosen the four screws (**2**) on the cowl.

2 - Remove the cowl (**1**) from the engine by lifting it up.

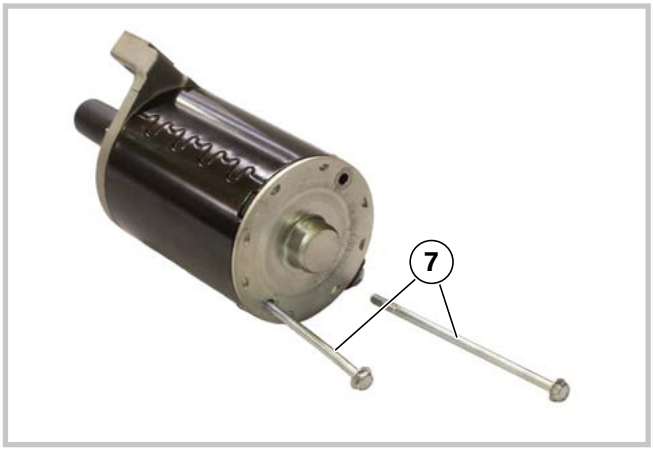


3 - Disconnect the two connectors (**3**) and (**4**) from the machine.

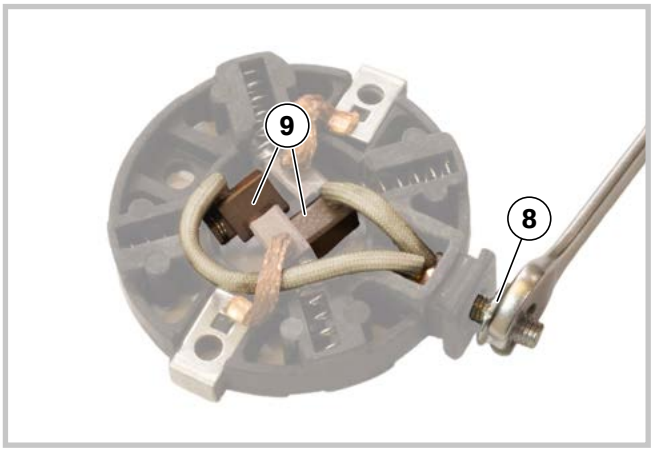
6. STARTING SYSTEM



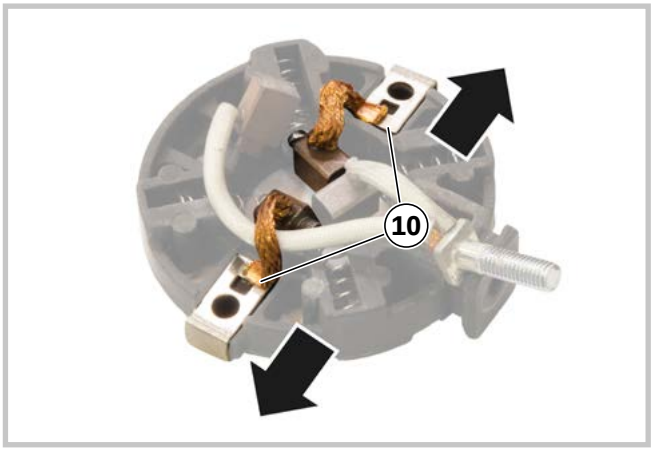
4 - Remove the two screws (**5**) and remove the starter motor (**6**).



5 - Unscrew the two screws (**7**) and remove the lower part of the starter motor.

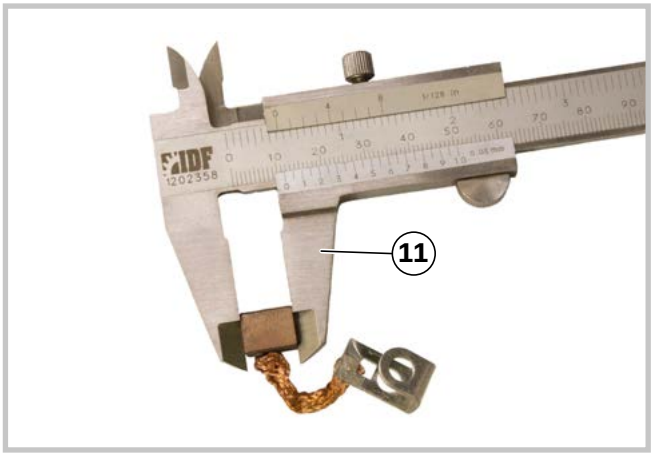


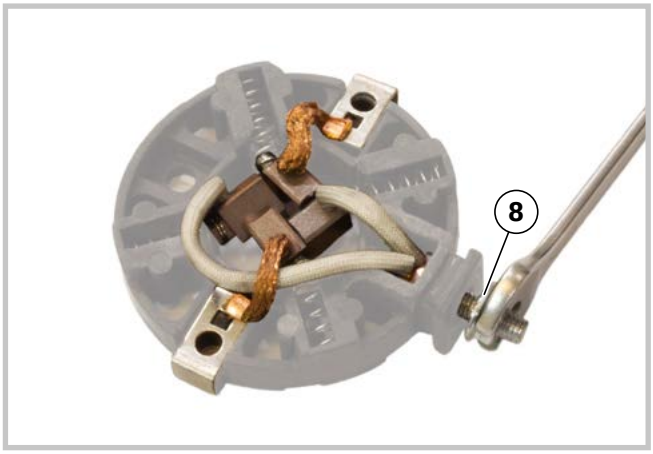
6 - Completely remove the nut (**8**) to remove the mass brushes (**9**) from the housing.



7 - Remove the positive brushes (**10**) from their housing.

6. STARTING SYSTEM





8 - Verify the condition of the brushes and, using a gauge (**11**), measure the length which should be between 11,7 and 8,0 mm. If the length is shorter, the brushes must be replaced as indicated below.

9 - Insert the new brushes in the appropriate places and fix the brushes by tightening the nut (**8**).
Pay particular attention to the correct positioning of the brushes and springs.

10 - Re-assemble the starter motor, securing the screws (**7**) to the indicated couple.

11 - Fix the starter motor to the engine with the screws (**5**) at the indicated torque, reconnect the connectors and refit the top cowl (**1**) con le quattro viti (**2**).

6.2. Replacement of starting motor

Perform operations indicated in **[[☞ 6.1].**

Tightening torques		
5	Fixing screw starting motor	24-32 Nm
7	Starting motor screw	8-12 Nm
Technical information		
Brushes length		11,7÷0,8 mm
Special equipment		
11	Gauge	

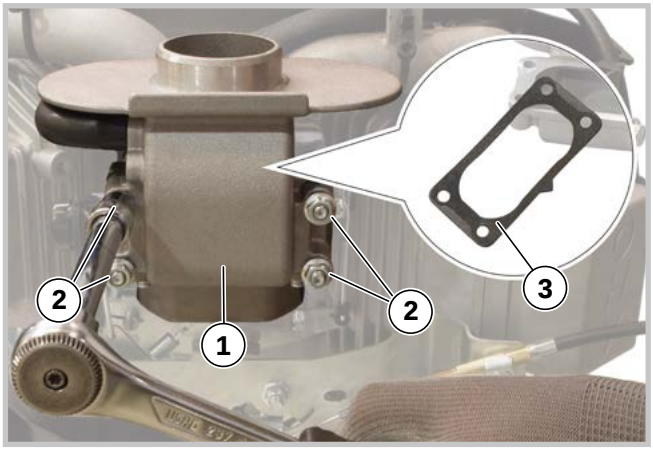
7. CARBURATION

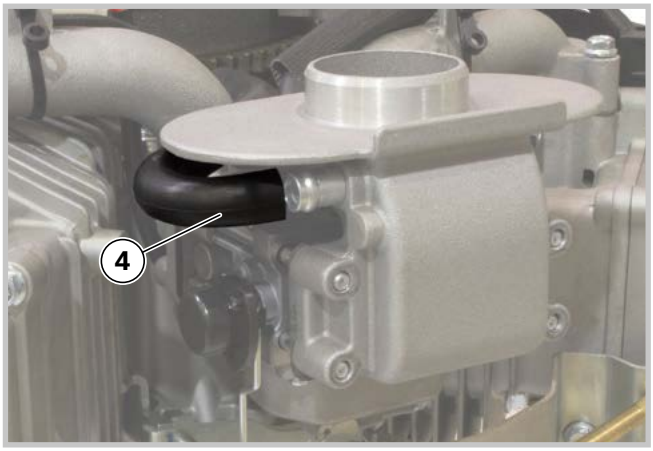
Informazioni generali

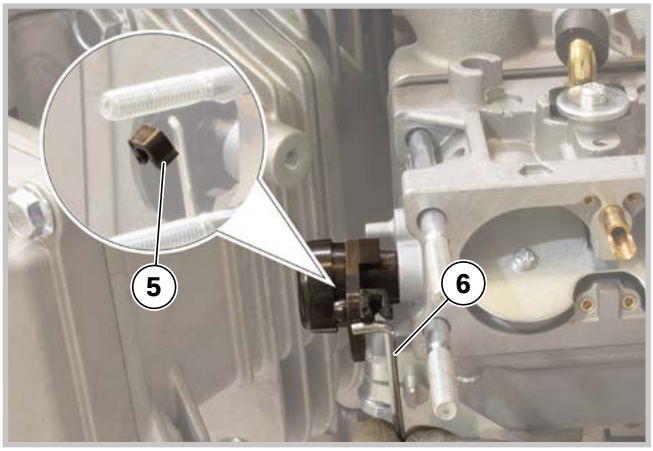
The **carburettor** has a float with a fixed jet and a "CHOKE" control.

See the relevant section [[☞ 14] for advice on resolving problems due to carburation.

The carburettor is placed on the front side of the engine and for its maintenance it is necessary to disassemble the top cowl **[[☞ 6.1]** and remove the air filter **[[☞ 5.1]**.
Dismantle the engine from the machine following the instructions in section **[[☞ 11.1]**.







WARNING! All operations on the tank and supply system must be carried out in safe conditions, so:

- **do not smoke;**
- **always empty the tank if petrol is not strictly necessary for the operation to be carried out;**
- **work in a ventilated environment away from naked flames or unprotected sources of heat;**
- **collect petrol in a suitable container with a cap using a funnel and avoid spilling it on the work bench;**
- **remove all traces of spilt petrol immediately;**
- **check you have connected the pipes before pouring petrol back into the tank.**

7.1. Removing and cleaning the carburettor

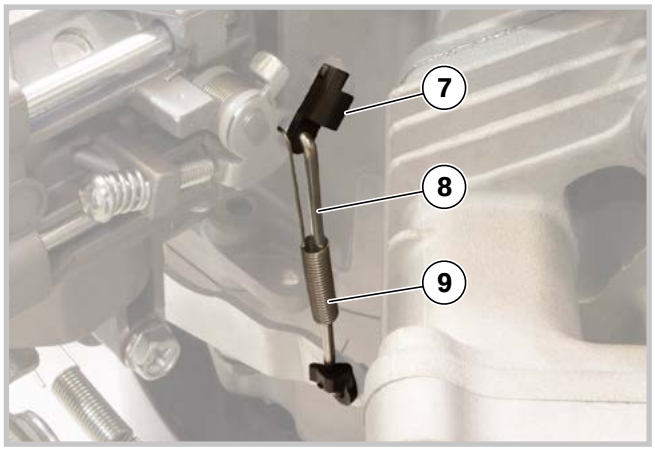
1 - Unscrew the four nuts (**2**) and remove the carburettor cover (**1**).

- It is always advisable to check and, if necessary, replace the gasket (**3**) on the cover.

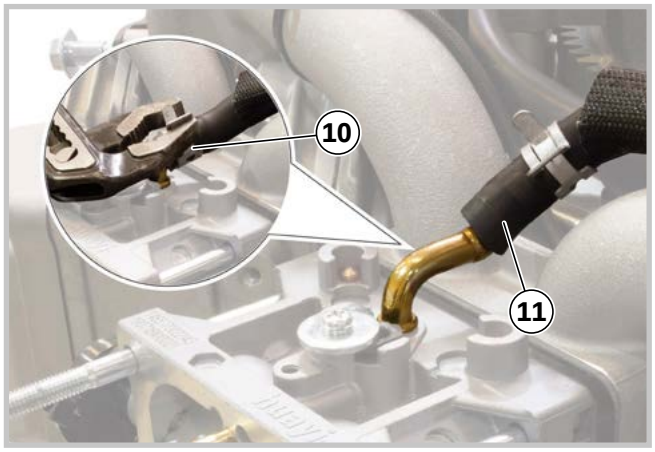
2 - Remove the Blow-by tube (**4**) on the left side of the carburettor.

3 - Release the locking clip (**5**) and remove the tie rod (**6**) of the accelerator lever.

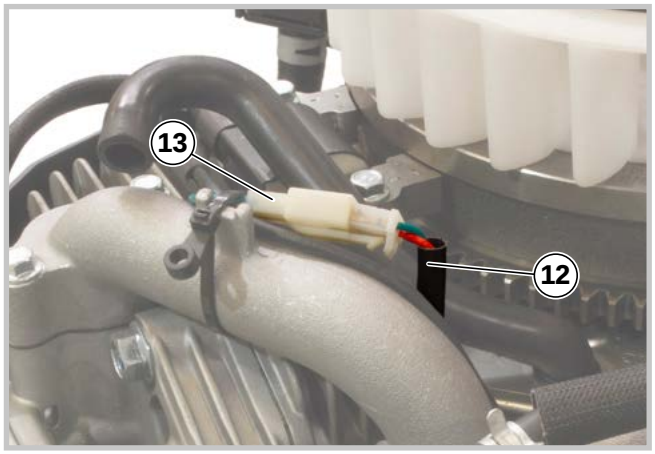
7. CARBURATION



4 - Release the locking clip (**7**), remove the tie rod (**8**) of the "CHOKE" lever from its housing and the spring (**9**).

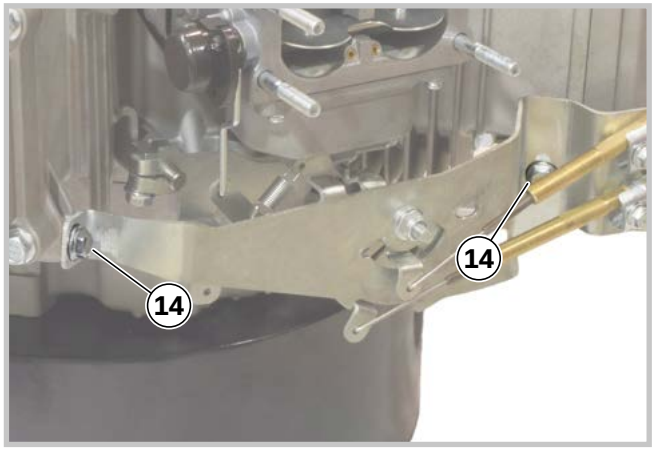


5 - Using plier, remove the clamp (**10**) and disconnect the petrol hose (**11**).
Collect all the fuel in the tank and hose in a suitable container.



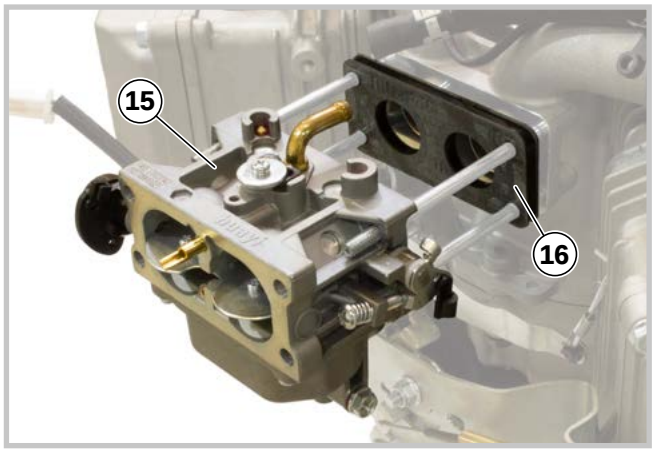
6 - Disconnect the connector (**12**) connected to the carburettor solenoid (**13**).

NOTE - Apply a suitable tester (ohmmeter) on the solenoid (13) of the carburettor. The reading must be between 36,5 and 39,5 Ω.



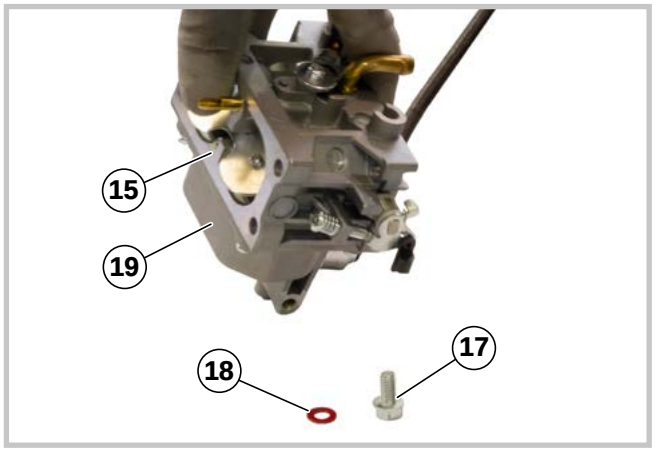
7 - Operate the steering lever, loosening the fixing nut on the right (**14**) and removing the one on the left (**14**).

7. CARBURATION

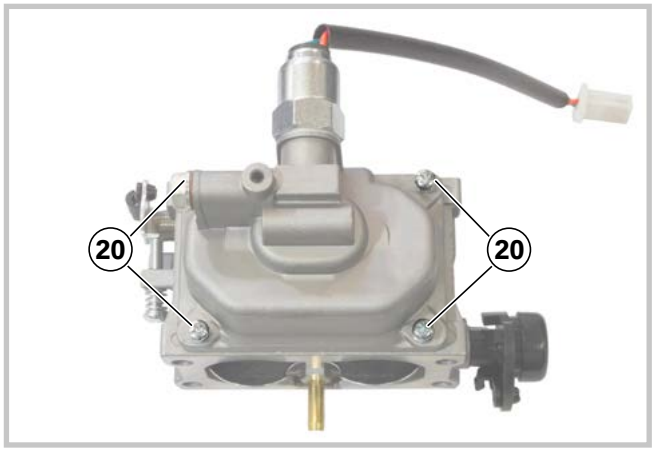


8 - Completely remove the carburettor (**15**) from its housing and the gauge (**16**) with the two gaskets.

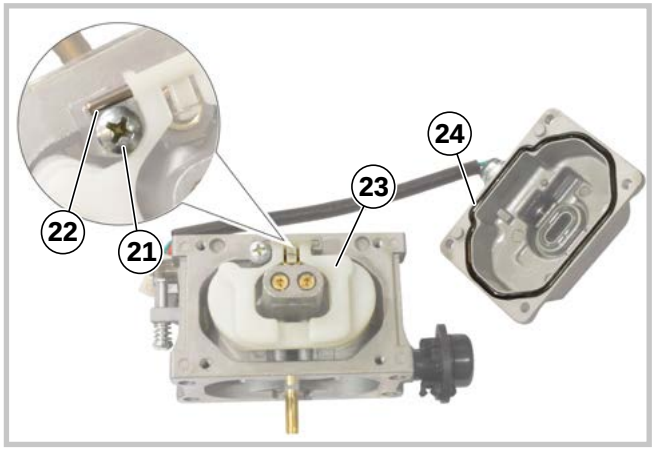
- It is always advisable to check and, if necessary, replace the gaskets on the gauge (**16**), when reassembling the carburettor (**15**).



9 - Remove the screw (**17**),the washer (**18**) and by turning the carburettor (**15**), completely empty the petrol present in the tank (**19**) into a suitable container.



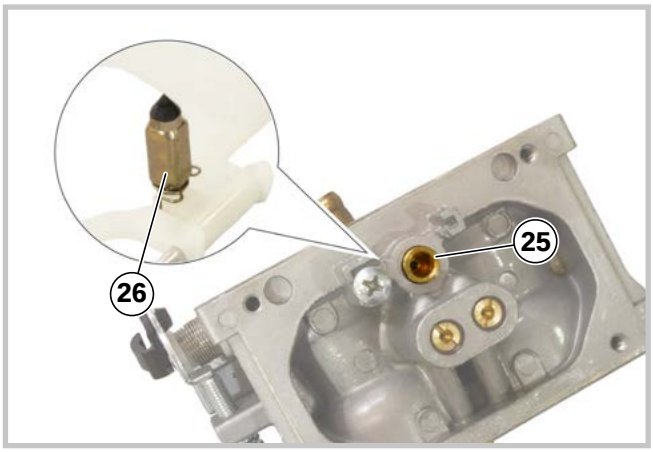
10 - Open the carburettor by unscrewing the four screws (**20**) on the tank (**19**).



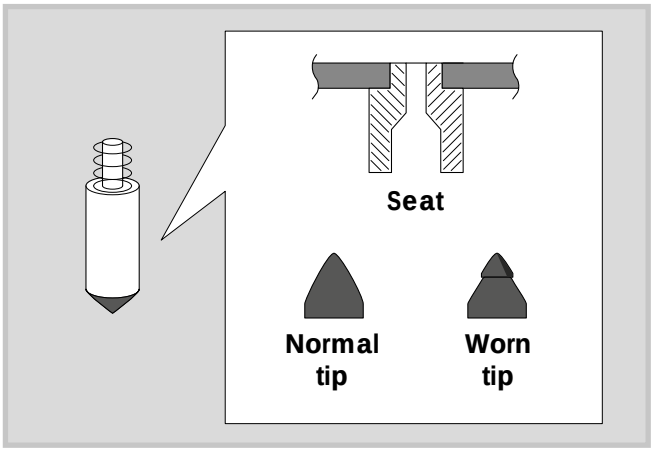
11 - Loosen the screw (**21**), remove the pin (**22**) from its housing and remove the float (**23**).

- It is always advisable to check and, if necessary, replace the gasket (**24**) in the tank.

7. CARBURATION

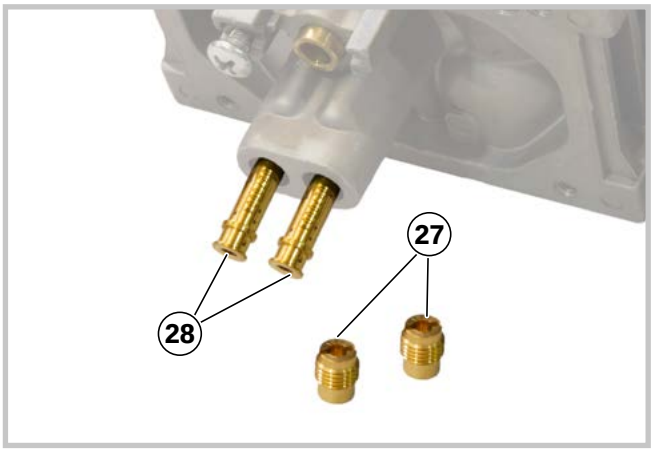


12 - Check that no impurities or dirt are deposited in the seat (**25**) of the needle (**26**).
Verify that the rubber tip of the needle is not marked or worn.



13 - Using a screwdriver, unscrew the two max jets (**27**) and extract the sprayers (**28**).
Check the sprayer seats for impurities or dirt.

14 - Clean the carburettor (**16**), the main jets (**27**) and the sprayers (**28**) thoroughly by immersing them in clean petrol (or a detergent) for 24 hours. Dry with compressed air, blowing well through the carburettor holes.

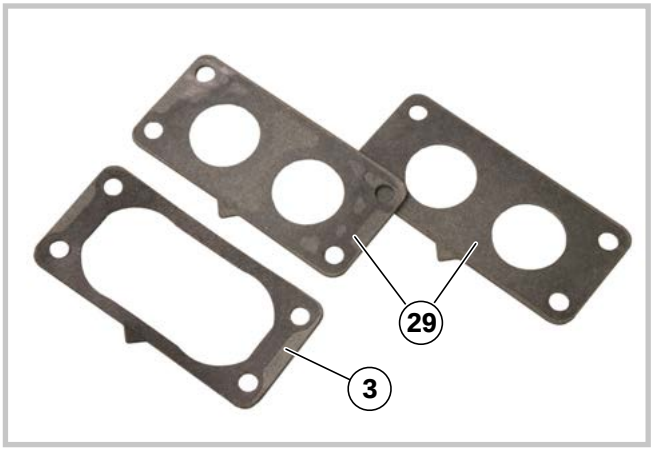


15 - Mount the carburettor following the previous points 13 - 11 - 10 - 9 in reverse order, remembering that:

- It is always advisable to check and, if necessary, replace the gasket (**3**) of the cover, the tank (**24**), and the gaskets (**29**) of the gauge.

- the float (**23**) must oscillate freely on the pin (**22**);

- the jets (**27**) should never be modified or replaced with others even if they seem to have the same specifications;



16 - Remount the tie rods (**6**) and (**8**) checking that the governor system moves smoothly without stopping.

7. CARBURATION

17 - Fit the carburettor cover (**1**) with its nuts (**2**) to the indicated torque.

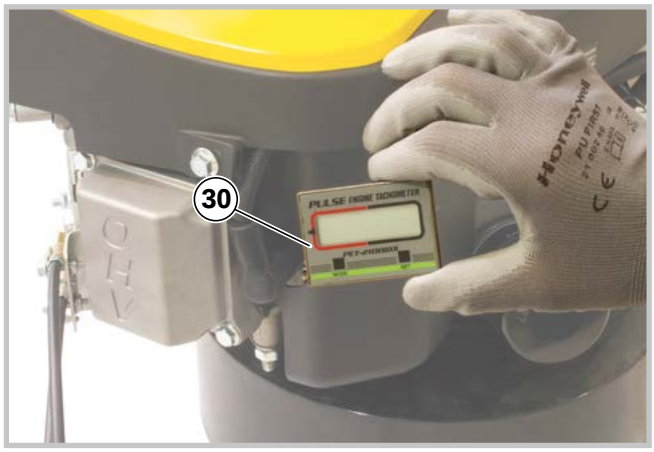
7.2. Replacing the carburettor

1 - Perform operations 1- 2 - 3 - 4 - 5 - 6 - 7 - 8 - 15 - 16 - 17 indicated in section [[☞ 7.1] above.

7.3. Adjusting minimum speed

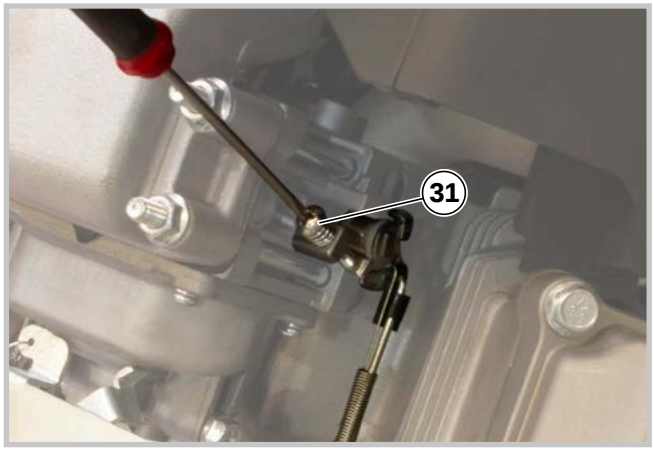
1 - Check that the throttle cable is adjusted correctly [[☞ 8.1].

2 - Let the engine heat up for a few minutes, then set the throttle control to "**SLOW**" 🐢.



Check the rotation speed on the speed indicator (**30**).

NOTE - The engine's minimum speed must be between 1800 (±150) rpm.



3 - Turn the screw (**31**) until you achieve a stable minimum speed within the above values.

7. CARBURATION

7.4. Adjusting maximum speed

NOTE - This operation is carried out by adjusting the governor system [8.4].

7.5. Adjusting the carburation

NOTE - The carburation is set in the factory and does not normally need changing. In the event of irregular functioning, clean the carburettor as indicated in section [7.1].

Tightening torques		
2	Carburettor nuts	8-12 Nm
14	Screw support steering lever	8-12 Nm
Technical information		
Minimum speed (SLOW)		1800 rpm
Special equipment		
30	Speed indicator	

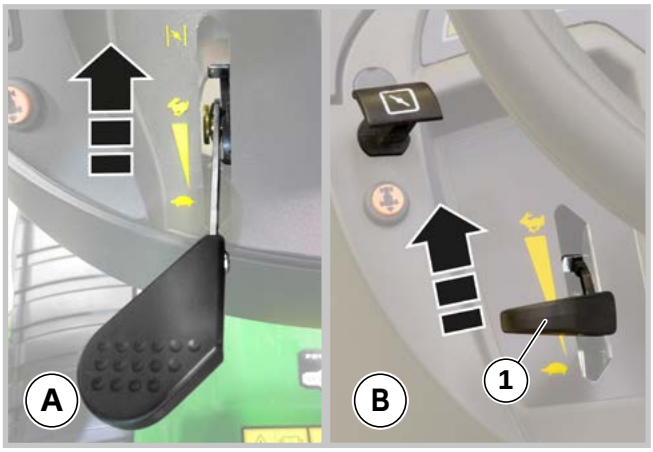
8. GOVERNOR SYSTEM OF THE CARBURETTOR

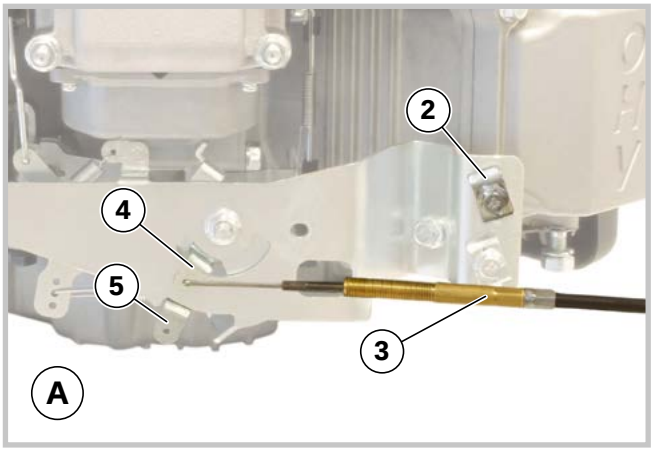
General information

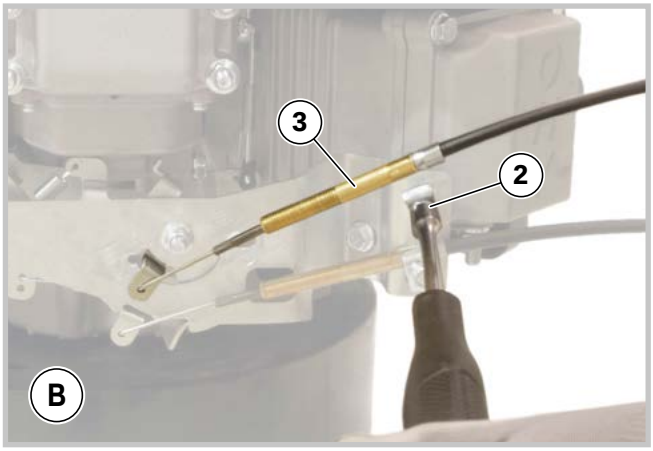
The **carburettor governor system** uses a engine shaft linkage fitted on a support fixed to the left-hand side of the engine, completed by a counterweight device, driven by the camshaft, and thus sensitive to changes in the engine's revolution pattern depending on load.

The force of the counterweights, transferred to the control lever, tends to shut the main carburettor butterfly, in opposition with the spring that would keep it open; the balance between the spring loading and the thrust of the counterweights on the control lever modifies the butterfly opening and adapts the flow of fuel to the engine so that the revolution speed is kept constant with engine load changes.

See the relevant section [14] for advice on resolving problems related to the governor system.







8.1. Adjusting of accelerator cable

CONFIGURATION A

When the "CHOKE" control is integrated in the throttle control (single cable engine model), proceed as follows:

1 - Loosen the sheath fixing screw (**2**) on the steering lever and release the cable (**3**) from the seat of the clamp.

2 - Set the throttle control lever (**1**) to "**FAST**" .

3 - Turn the speed regulator lever (**4**) until you notice the movement of the "CHOKE" lever (**5**).

4 - Stop the speed regulator lever (**4**) a little before entering "CHOKE" and, keeping it in this position, lock the cable sheath (**3**) by tightening the clamp screw (**2**).

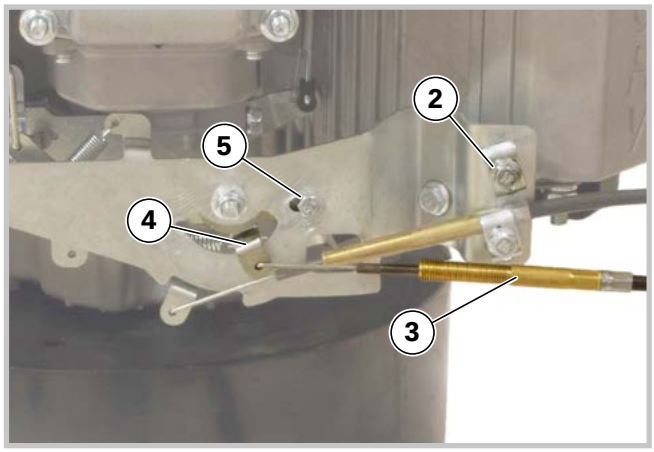
CONFIGURATION B

When the "CHOKE" control is separated from the throttle control (two cable engine model), proceed as follows:

1 - Set the throttle control lever (**1**) to"**FAST**" .

2 - Loosen the sheath fixing screw (**2**) on the steering lever and release the cable (**3**) from the seat of the clamp.

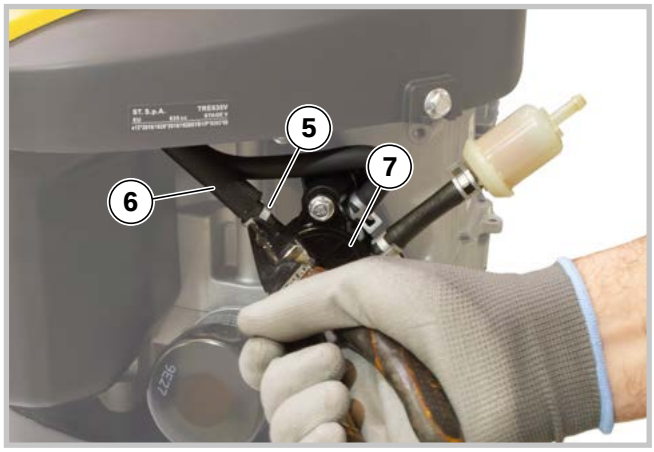
8. GOVERNOR SYSTEM OF THE CARBURETTOR



3 - Push the speed regulator lever (**4**) right until insert a plug (**5**) in the appropriate seat.

4 - Make sure that the throttle control lever is in "**FAST**" position; reposition the cable (**3**) in the clamp site and lock it with the sheath fixing screw (**2**). Remove the plug (**5**).

5 - Check the rotation speed on the speed indicator.



8.2. Verify petrol pump (if present)

By following the operations below, verify that the flow from the petrol pump is continuous and without interruptions:

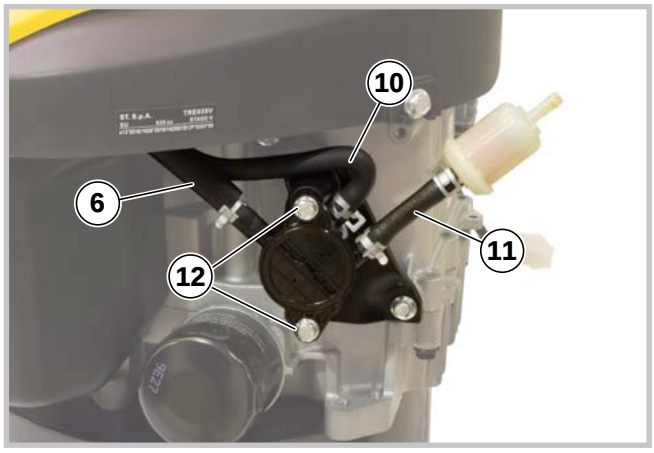
1 - Close the tap on the petrol tank of the machine (if present).

2 - Using plier, remove the clamp (**5**) and remove the outlet pipe (**6**) that connects to the carburettor from the pump (**7**).

3 - Insert a tube (**8**) connected to an additional tank (**9**) and start the engine.

4 - Set the throttle control lever to "**FAST**" .

5 - Test petrol outflow for approx ten seconds. If the flow is irregular, the pump must be replaced.

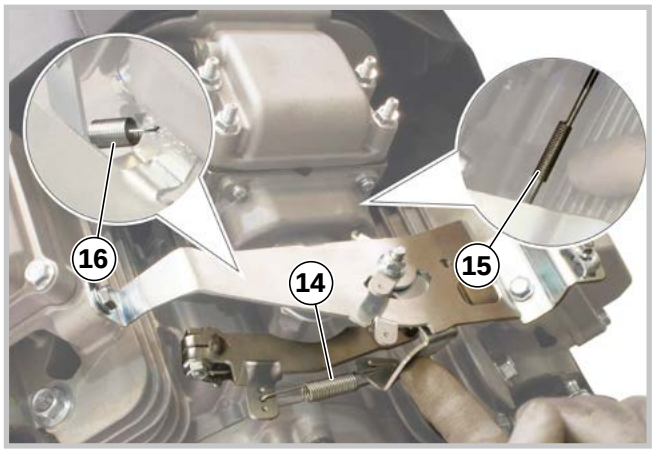


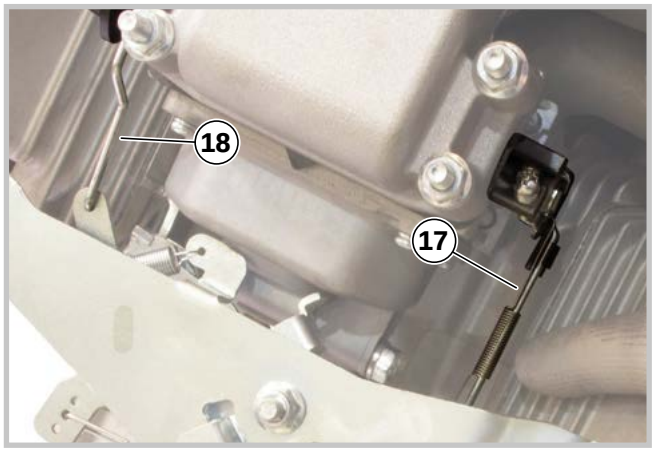
8.3. Pump replacement (if present)

1 - Disconnect the outlet tube (**6**), the inlet tube (**11**) and the pressure indicator tube (**10**).

2 - Remove the two screws (**12**) which secure the petrol pump and replace pump.

8. GOVERNOR SYSTEM OF THE CARBURETTOR





8.4. Adjusting maximum speed

1 - Check that the throttle cable is adjusted correctly [[☞ 8.1].

2 - Let the engine heat up for a few minutes then set the throttle control to "**FAST**" .

3 - Check the rotation speed on the speed indicator (**13**).

During the regulation, verify that the movement of the mobile levels don't damage the contact with level air support (position"CHOKE").

NOTE - The engine's maximum speed must be between RON: 2800 (±100)* rpm, *FM: 3200 (±100)* rpm*; if you do not read this value, proceed as follows.

5 - Check:

- that the springs (**14**),(**15**) and (**16**) are intact;

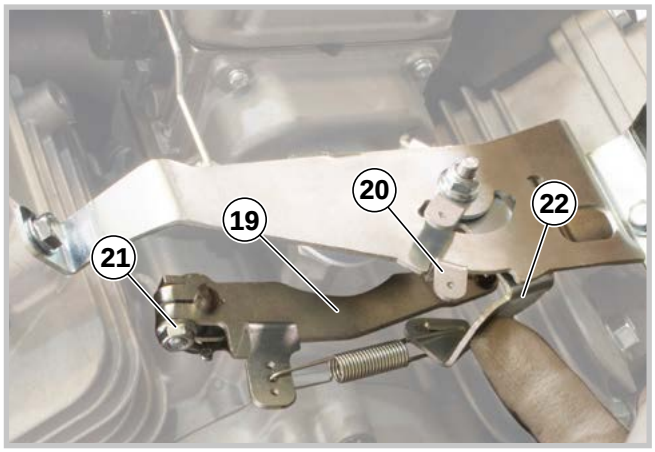
- that the tie rods (**17**) and (**18**) are intact and not deformed;

- that the moving levers (**19**) and (**20**) are not bent or deformed and replace if necessary.
If necessary, using plier, bend the lever.

6 - If the above checks do not reveal any anomalies, the timing of the control levers (**19**) and (**20**).
Operate the speed regulator:

- stop the engine and move the accelerator control to "**FAST**" ;

8. GOVERNOR SYSTEM OF THE CARBURETTOR



- loosen the nut (**21**) of the regulator arm grip but do not remove it.
- turn the regulator pin (**22**) anti-clockwise completely with plier.
- without changing the position of the lever (**19**), turn the regulator pin (**22**) fully clockwise with a plier, then lock the nut (**21**).

7 - Check that the regulator arm and the regulator pin (**22**) move freely.

8 - Three holes are present on the lever (**19**) for inserting the spring (**14**). The number of engine rotations is determined depending on the position of the spring:

- top hole (**A**): minimum rotations;

- central hole (**B**): suitable number of revolutions (RON);

- bottom hole (**C**): maximum rotations (FM).

Tightening torques		
12	Support screws petrol pump	8-12 Nm
Technical information		
RON (Ride On)		2800 rpm
FM (Front Mover)		3200 rpm
Special equipment		
13	Speed indicator	

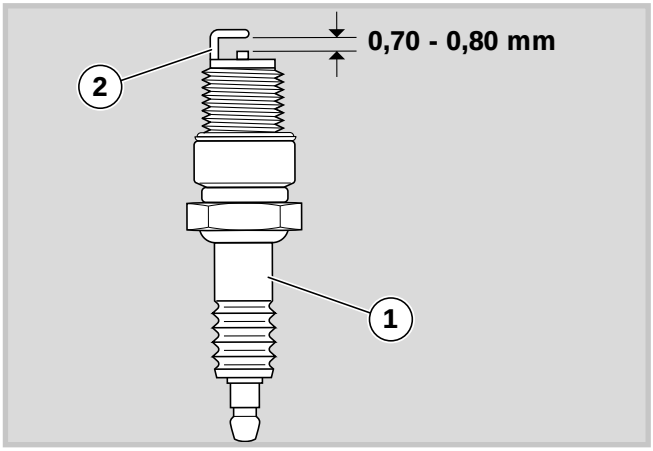
9. IGNITION

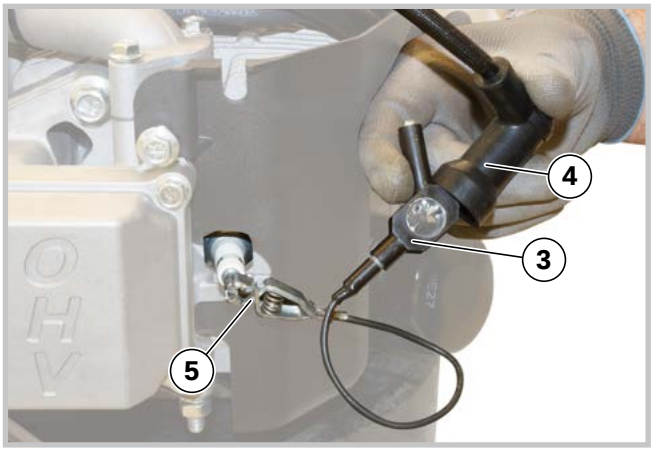
General information

The **ignition system** is of the magnet flywheel type, with electronic coils that supply high voltage to the spark plugs.

See the relevant section [[☞ 14] for advice on resolving problems related to the ignition.
The coil and magneto flywheel are accessible by removing the cowl [[☞ 6.1].
Dismount the engine from the machine by following the instructions in section [[☞ 11.1].

NOTE - Checking and replacing the spark plug guarantee continuous spark, reliability and better fuel. The use of a spark plug with indicated models and values different from those supplied by the manufacturer may reduce the engine performance or damage the engine itself.





9.1. Checking the efficiency of the ignition system

NOTE - The following operations must be performed on both spark plugs.

1 - Dismount the spark plug (**1**) and look at the colour on the end of the thread. This can give you a good idea of the carburation:
- **black:** mixture too greasy due to clogged air filter;
- **nut brown:** regular carburation.

Replace the spark plug (with one of the same or equivalent characteristics) **if the electrodes (2) are burnt or if the porcelain is broken or cracked.**

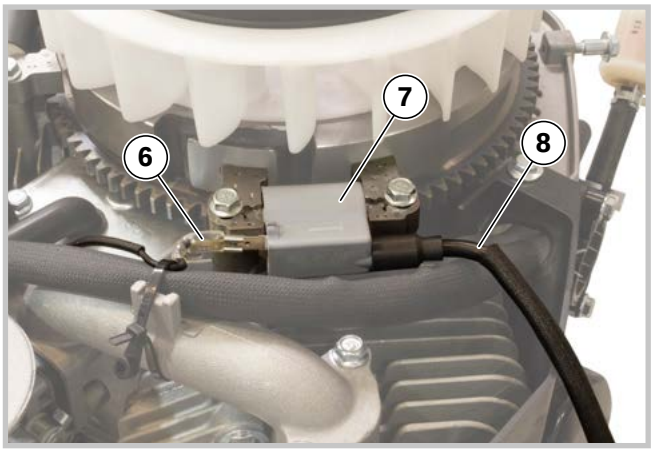
FIRE HAZARD:
- do not check the ignition system if the spark plug is not screwed in place;
- always use the specific tool for the spark test.

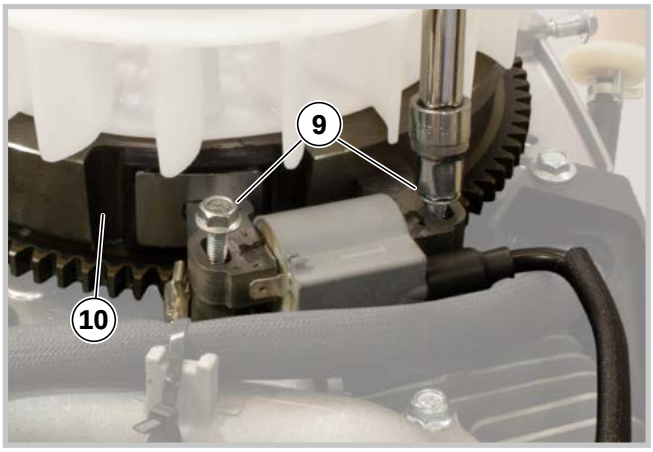
2 - Connect the tester (**3**) to the spark plug cap (**4**) and to earth on the engine (**5**). Activate the starter and see in the instrument if the spark jumps.

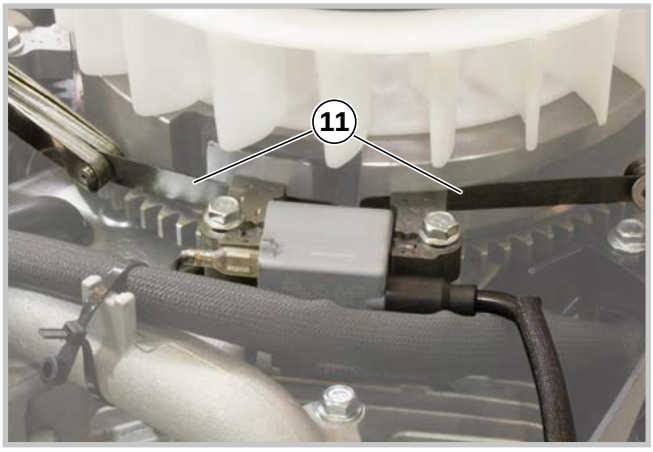
3 - If the test has a positive result, clean the electrodes (**2**) with compressed air and adjust the distance to 0,70-0,80 mm. Remount the spark plug and tighten it to the specified levels.

Unless otherwise required, proceed to verify system components as indicated in section [[☞ 9.2].

9. IGNITION







9.2. Adjusting the air gap and checking the coil

NOTE - The following operations must be performed on both coils.

1 - Remove the cowl [[☞ 6.1].

2 - Make sure that the earth cable faston (**6**) of the coil (**7**) is not oxidized; if it is, disconnect, clean and remount it, spraying it with a special antioxidant.

3 - Make sure that the earth cable (**6**) is intact. The black spark plug cable (**8**) should not have any cracks or signs of deterioration or burns which reduce its efficiency and insulation level.

4 - Loosen the screws (**9**) securing the coil (**7**), remove the spark plug and turn the flywheel (**10**) until the magnetic inserts correspond to the poles of the coil core.

NOTE - To facilitate these operations, both spark plugs must be removed.

5 - Insert a 0,35 mm thickness gauge (**11**) between the flywheel (**10**) and the coil poles (**7**). Push the coil until the poles come in contact with the thickness gauge and secure screws (**9**); tighten the screws remembering that the air gap must be between 0,3 and 0,4 mm.

NOTE - An accurate inspection of the efficiency of a coil can only be carried out in a laboratory equipped with a oscilloscope.

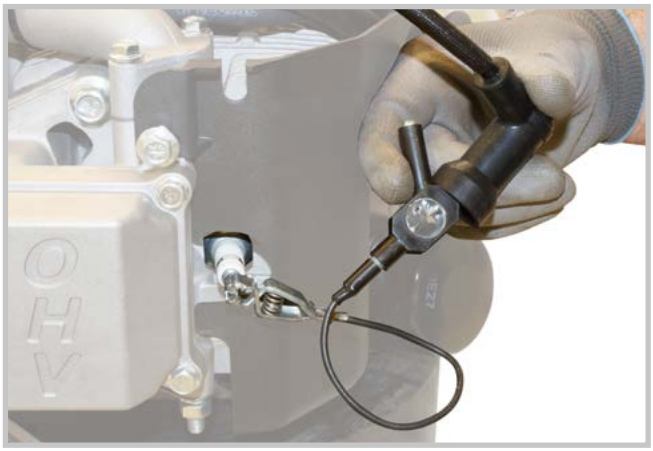
To make a brief check, proceed as follows:

6 - Disconnect the earth cable faston (**6**) of the coil (**7**), so that the starter can be activated.

7 - Place the tester terminal and lead terminal in contact with the iron core of the coil and measure the resistance of the primary coil.
If the resistance value is different from 0 Ω (continuity), it means that the coil is intact and working.

9. IGNITION

8 - Insert the tester terminal and remove the high voltage of the wire spark plug cap in contact with the iron wire and measure the resistance of the secondary coil. The resistance value must be between 18,2 and 21,2 Ω.



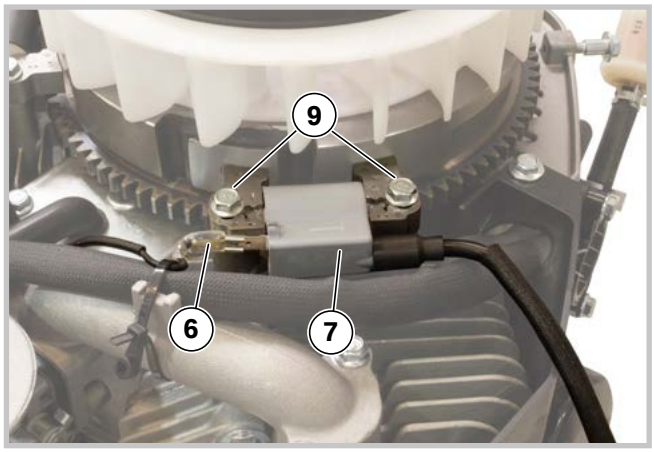
9 - Perform a spark test as indicated in [[☞ 9.1].

- **If the spark jumps:** the coil functions properly and in the event of malfunction, verify that the cut-off cable is not earthed.
- **if the spark does not jump:** the coil is faulty and must be replaced [[☞ 9.3].

10 - Reassemble the cowl [[☞ 6.1].

☑ ***NOTE - Adjustment is required when the ignition coil or flywheel has been removed.***

9. IGNITION



9.3. Replacing the coil

NOTE - The following operations must be performed on both coils.

1 - Remove the cowl [[☞ 6.1].

2 - Disconnect the faston of the earth cable (**6**).

3 - Unscrew the screws (**9**) and remove the coil (**7**).

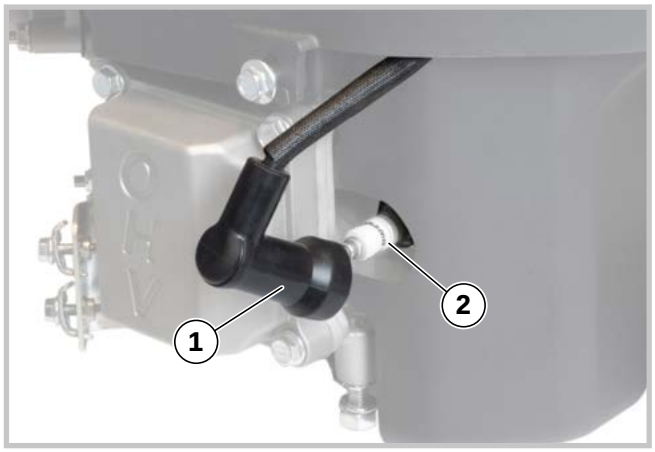
4 - Mount the new coil and regulate the air gap according to the procedure indicated in points 4 and 5 in section [[☞ 9.2].

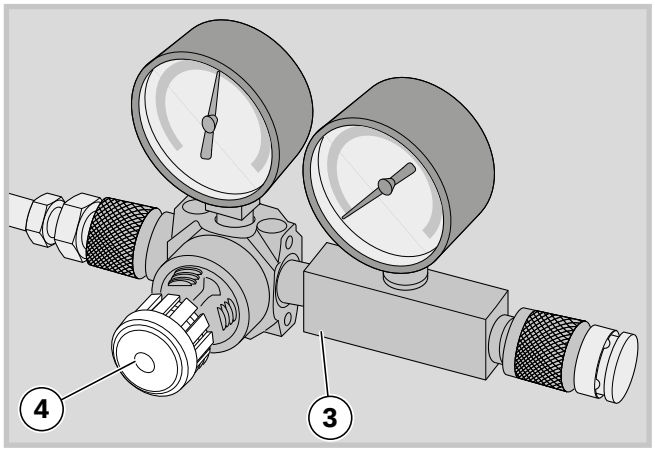
5 - Connect the faston of the earth cable (**6**).

6 - Refit the cowl [[☞ 6.1].

Tightening torques		
1	Spark plug tightening torque	25-32 Nm
9	Coil fixing screws	8-12 Nm
Technical information		
Type of spark plug		RN9YC (Champion) or equivalent
Distance between electrodes		0,70-0,80 mm
Air gap/flywheel		0,3-0,4 mm
Special equipment		
3	Tester for spark test	

10. ENGINE BLOCK - External repairs





10.1. Checking the compression

NOTE - The following operations must be performed on both spark plugs.

1 - Remove the cap (**1**) and take out the spark plug (**2**).

2 - Manually set the piston to the TDC (Top Dead Centre) of the compression stroke so that both valves are closed.

3 - Screw the terminal of the compression testing tool (**3**) into the spark plug hole and connect the supply pipe to a compressed air socket with a pressure of approximately 12,5 Bars (181 psi).

4 - On opening the air tap (**4**), the manometer gauge on the engine side should position itself in the green zone and remain there for about 30 seconds. If the gauge falls rapidly it means that the compression is poor.

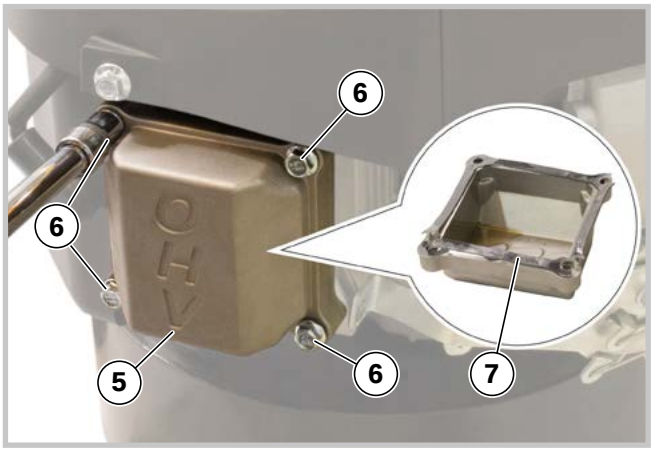
NOTE - Lack of compression could be due to:

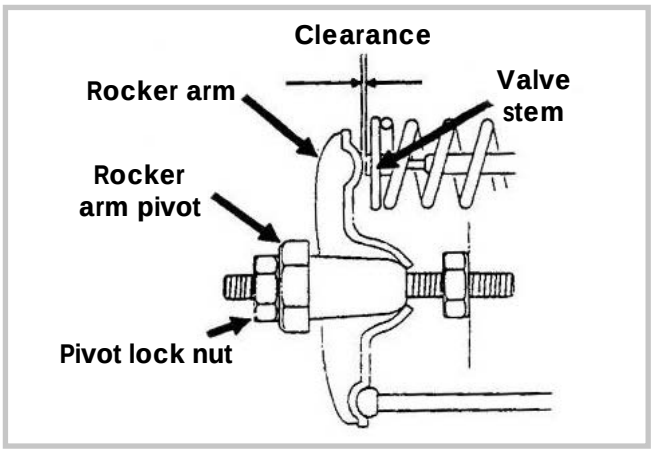
- incorrect valve clearance [[☞ 10.2]];
- cylinder head loose or cylinder head gasket worn [[☞ 10.3]].
- lack of seal in the valves [[☞ 10.4]];
- piston rings worn [[☞ 10.3]].

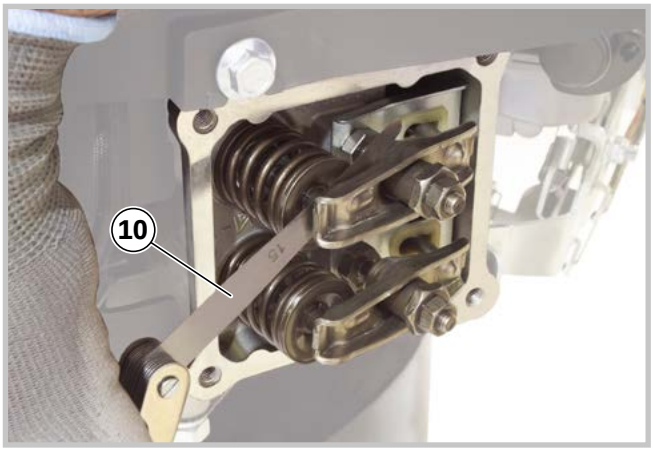
5 - Refit the spark plug (**2**) and close it to the indicated couple.

WARNING: A loose spark plug could overheat and damage the engine.
Too tight a fastening can ruin the spark plug threading or create problems inside the engine.

10. ENGINE BLOCK – External repairs







If necessary, remove the engine of the machine according to indications in paragraph [[☞ 11.1].

10.2. Adjusting the valve clearance

NOTE - The following operations must be performed on both pairs of valves

WARNING: The adjustment must be made with the engine is cold.

1 - Remove the cowl [[☞ 6.1].

2 - Remove the cover and demount the spark plug [[☞ 10.1].

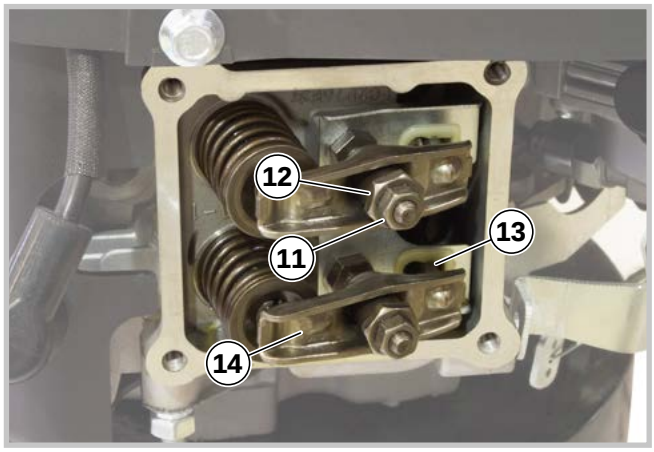
3 - Remove lid (**5**) which is secured with four screws (**6**) and remove the gasket (**7**).

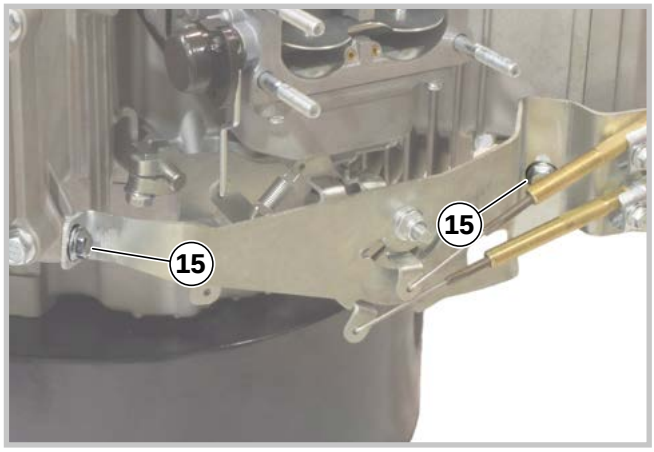
4 - Unscrew the three screws (**8**) and remove the side cover (**9**).

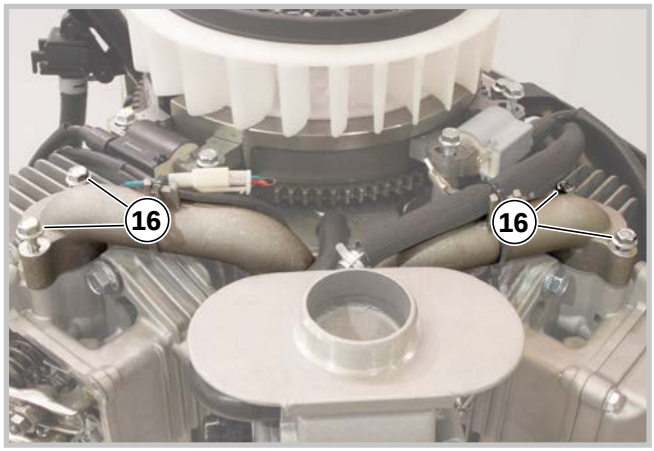
5 - Manually set the piston to the TDC (Top Dead Centre) of the compression stroke so that both valves are closed.

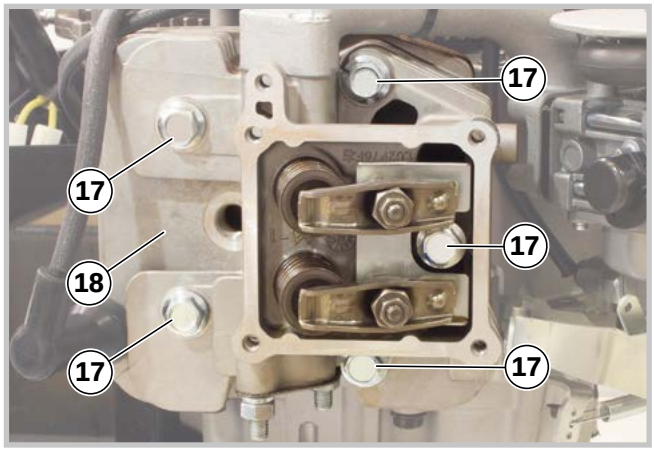
6 - Use from 0,10 mm to 0,15 mm (inlet) or from 0,10 mm to 0,15 mm (exhaust) feeler gauge (**10**) to check the gap between the rocker arm and the tip of the valve stem; the gauge should pass between without forcing and without a further gap.

10. ENGINE BLOCK – External repairs









7 - The gap is adjusted by slackening off the nut (**11**) and suitably adjusting the register nut (**12**) until the above condition is reached.

8 - Following adjustment, check that the pushrods (**13**) are properly inserted in the rocker arm housings (**14**) and always fully tighten the nut (**11**).

9 - When assembling, it is always advisable to check and, if necessary, replace the cover gasket (**7**) of the lid (**5**).

10 - Assemble the spark plug and the cover [[☞ 10.1].

10.3. Dismantling and cleaning the cylinder head

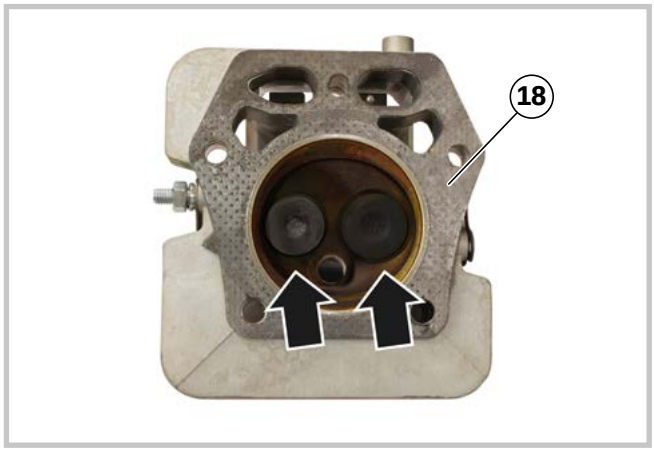
1 - Perform the operations indicated in points 1 - 2 - 3 - 4 in section [[☞ 10.2] above**.**

2 - Remove the left and right screws (**15**) of the steering lever support.

3 - Remove the four screws (**16**) present in torque in the two carburettor manifolds.

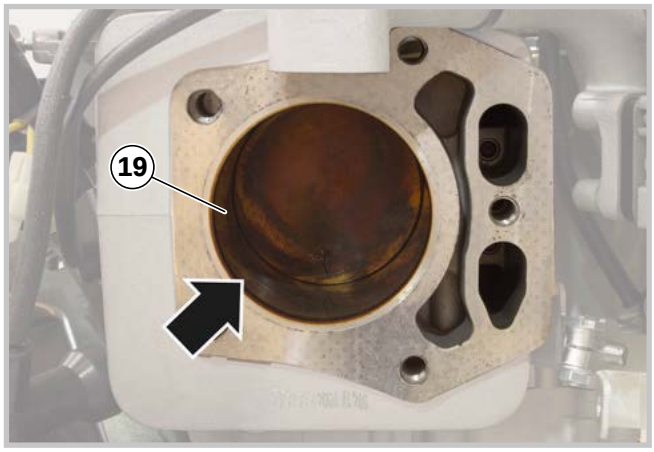
4 - Unscrew the five screws (**17**) and remove the cylinder head (**18**).

10. ENGINE BLOCK – External repairs

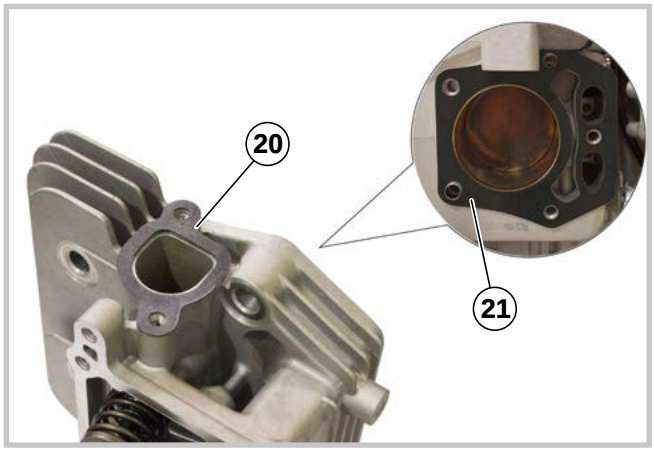


5 - Clean the cylinder head (**18**) and cylinder surfaces (**19**).

6 - Carefully clean the inside of the combustion chamber and remove possible deposits from the valve seats.



7 - Turn the flywheel manually to move the piston and clean inside the cylinder (**19**).



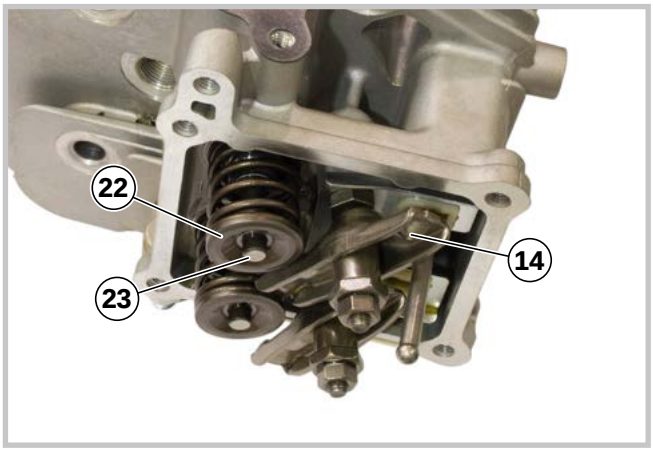
8 - When mounting:

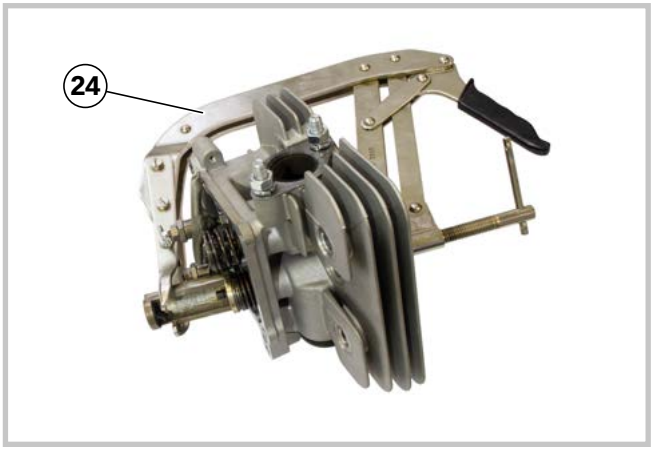
- It is always advisable to replace the gasket (**20**) of the manifolds (**21**) and of the cylinder head;

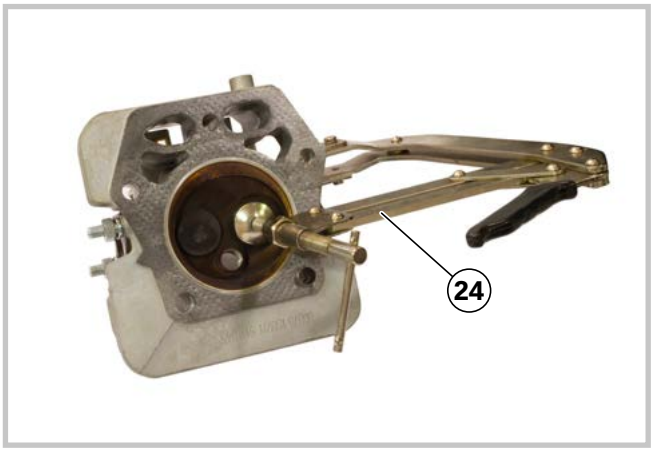
- remount the cylinder head (**18**), screwing the five screws (**17**) without fully tightening, then tighten them to the given torque values, using a cross-over sequence;
- pay attention to the rods (**13**) which must be correctly positioned.

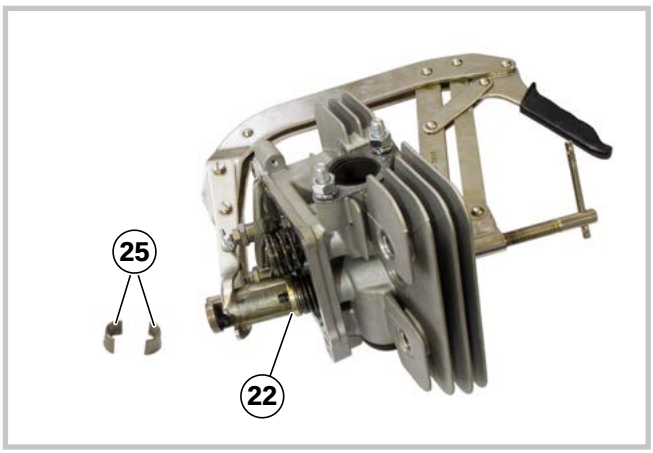
9 - Remount the items removed in the reverse order used in dismantling.

10. ENGINE BLOCK – External repairs









10.4. Overhauling the cylinder head and valves

NOTE - These paragraphs describe all the operations for checking and overhauling the cylinder head;

it is left to the operator to assess the advisability of performing all the operations described or only part of them, depending on the type of engine problems encountered.

1 - Dismount the cylinder head [[☞ 10.3].

2 - Move the rocker arms (**14**); press down the spring seal cap (**22**) and move it sideways to remove from the valve stem (**23**).

IMPORTANT - The inlet and exhaust valves are different from each other and can be identified by the marking «IN» (YI - inlet) and «EX» (YE - exhaust), on the valve head.

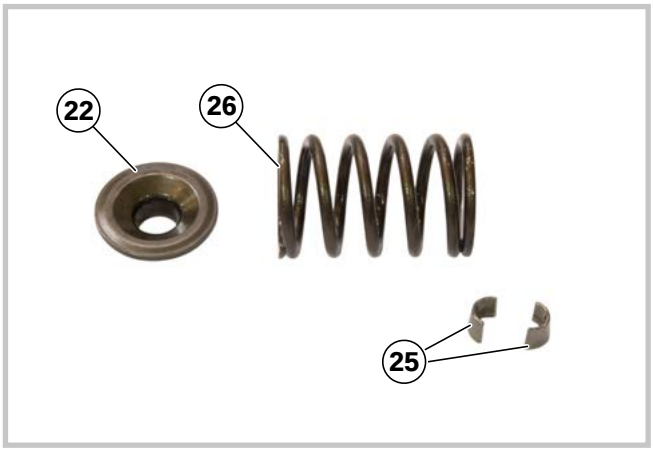
3 - Use an adequate tool to carry out the valve removal procedure.

4 - Position the tool (**24**) onto the upper and lower part of the valve as shown in the figure.

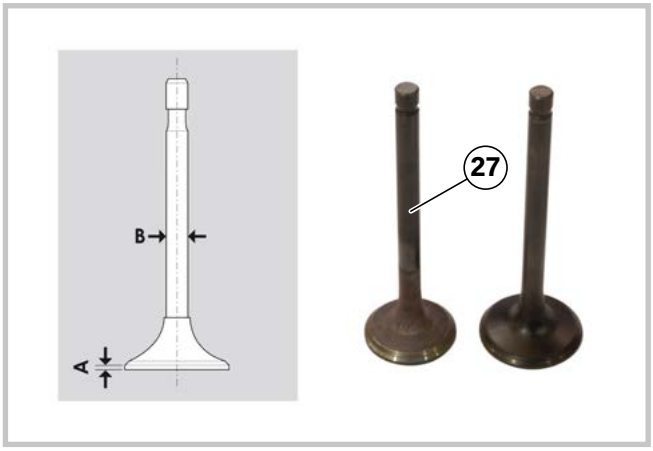
NOTE - Centre the tool with the cup and the bottom of the tool with the valve.

5 - Apply pressure with the tool into the valve cup-washer (**22**). The two half-cones (**25**) will push out of their seats.

10. ENGINE BLOCK – External repairs

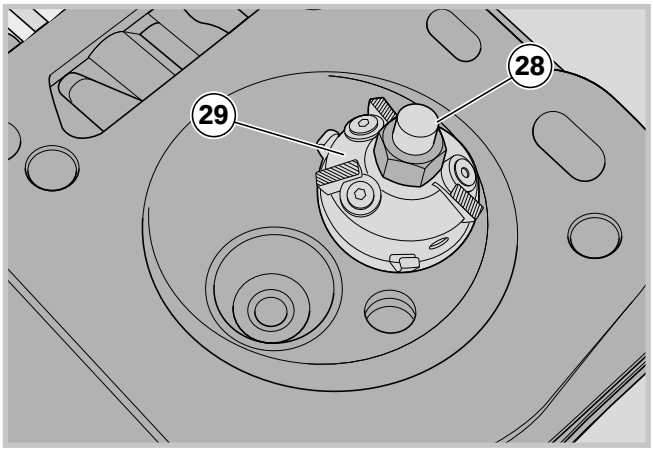


6 - Remove the cup-washer (**22**), the spring (**26**) and the two half-cones (**25**).



7 - Remove all incrustations from the valve head (**27**) with abrasive cloth and check the thickness of the margin (**A**); the valve must be replaced if the margin (**A**) is less than between 2,80 mm and 3,20 mm (**inlet - IN/YI**) or between 3,30 mm and 3,70 mm (**exhaust - EX/YE**) or if it shows signs of burning.

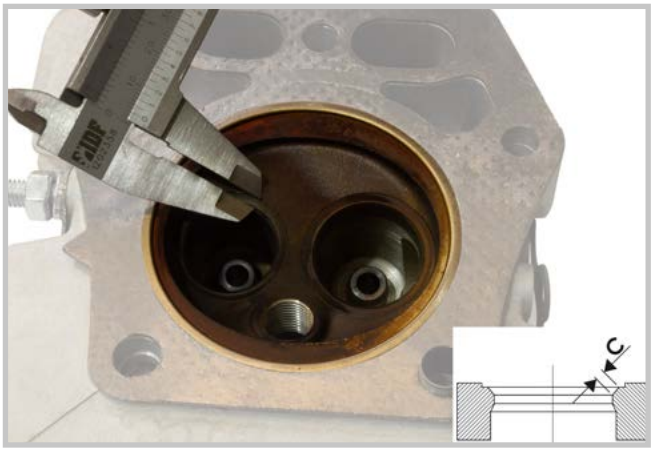
8 - Check the diameter of stem (**B**) in several points and replace the valve if it is less than the following, even if only in one point:
6,515 mm (inlet - IN/YI)
6,495 mm (exhaust - EX/YE)



☑ ***NOTE - The valve seats must be ground by hand, using a special grinding tool with an angle of 45°.***

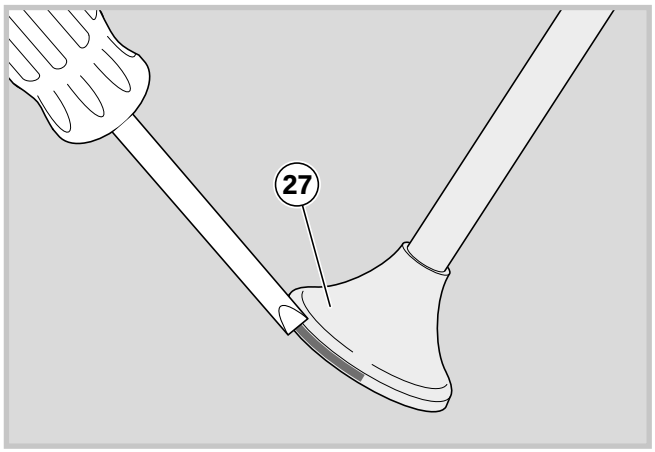
9 - Insert the pin (**28**) in the cylinder head valve guide and then the grinding tool (**29**).

☑ ***NOTE - Grinding must be done taking care to remove as little material as possible.***

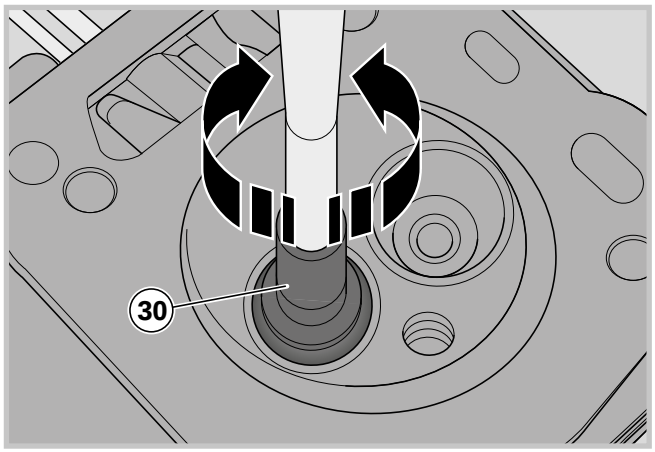


10 - Use a caliper gauge to check the width of the valve seat (**C**), which must be 2,0 mm; the cylinder head must be replaced if a greater value is measured.

10. ENGINE BLOCK – External repairs

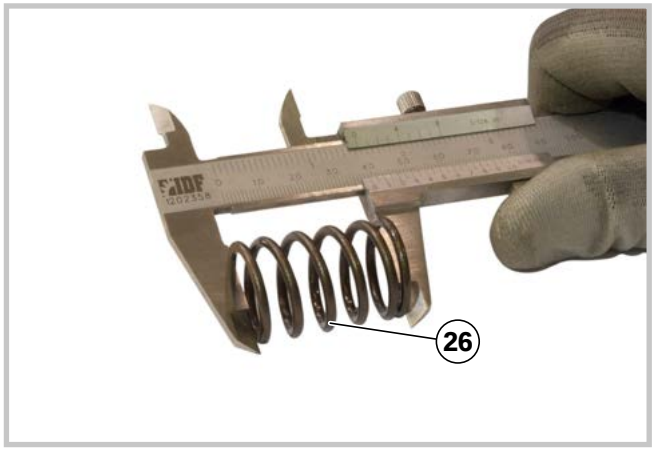


11 - Apply abrasive paste for grinding around the rim of the valve head (**27**) and then insert the valve into its seat.



12 - Use the special manually operated tool (**30**) to grind the seat and rim of the valve.

13 - Remove the valve and use clean petrol to carefully clean all traces of paste or metal residues from the valve seat and rim.



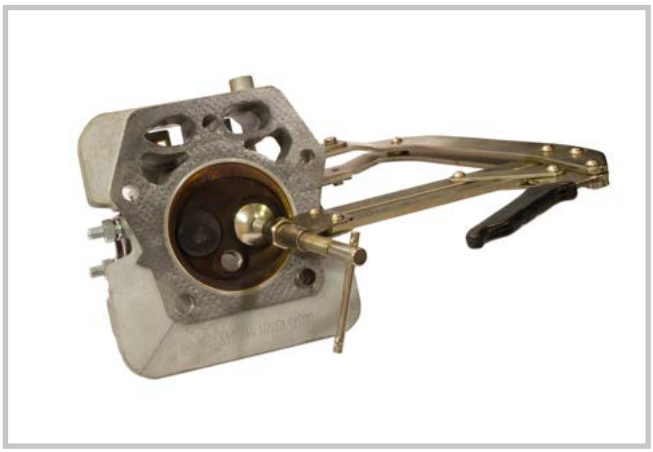
14 - Check the free length of the spring (**26**) and replace the spring of it is less than 39 mm.

15 - When mounting:

- carefully clean the valve guides and housings of any foreign body;

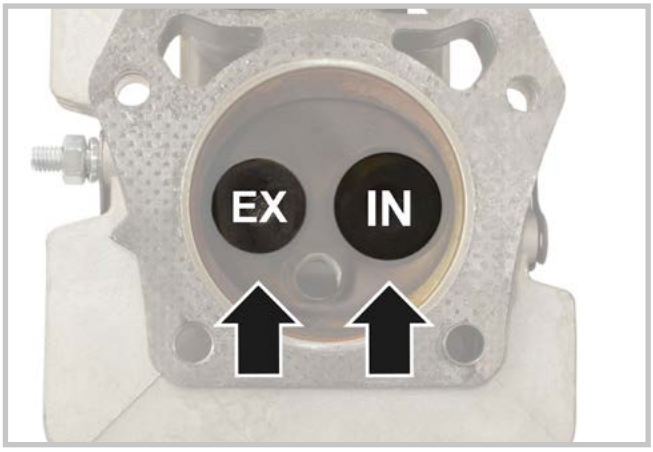
- apply a film of oil on the valve stems before inserting them in their respective housings;

10. ENGINE BLOCK – External repairs



- insert the valve and position the spring (**26**), the cup-washer (**22**) and the two half-cones (**25**) and follow the removal procedure in reverse using the tool (**24**), to lock the two half-cones into place.

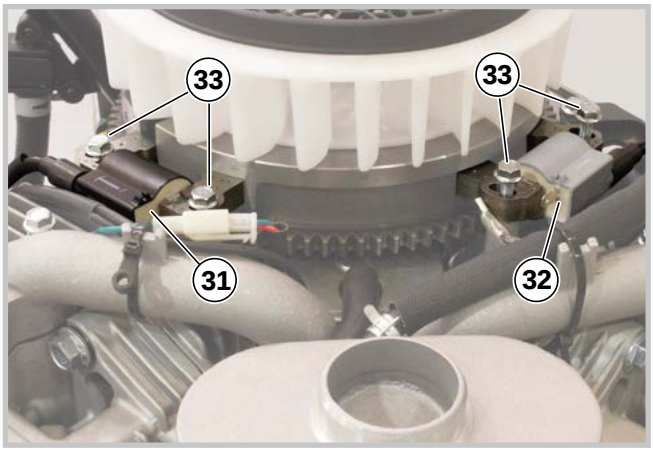
NOTA - Check that the two half-cones (25), are locked correctly in place.



- ensure the correct position of the inlet valve and the exhaust valve, marked, respectively, with «**IN**» and «**EX**» on the valve head.

16 - Remount the cylinder head [[☞ 10.3] and fix the screws to the indicated couple.

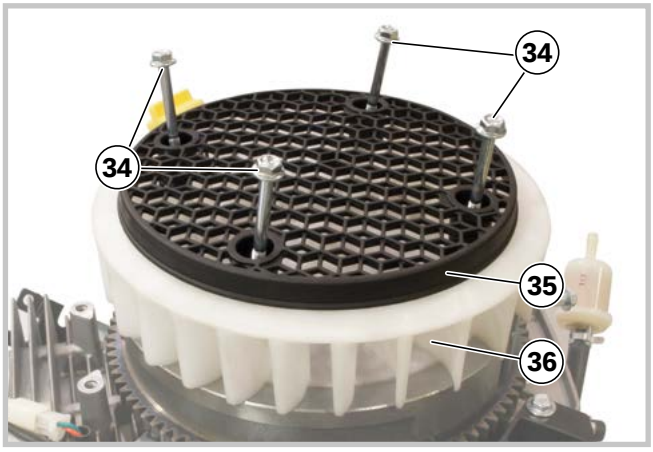
17 - The valve clearances must be checked whenever the cylinder head is removed and refitted [[☞ 10.2].



10.5. Dismantling and replacing the magneto flywheel

1 - Remove the cowl [[☞ 6.1].

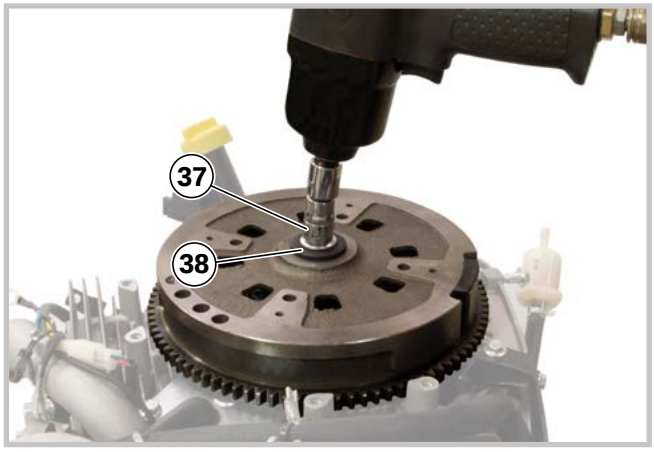
2 - Remove the electronic coils (**31**) and (**32**) by unscrewing the two pairs of screws (**33**).



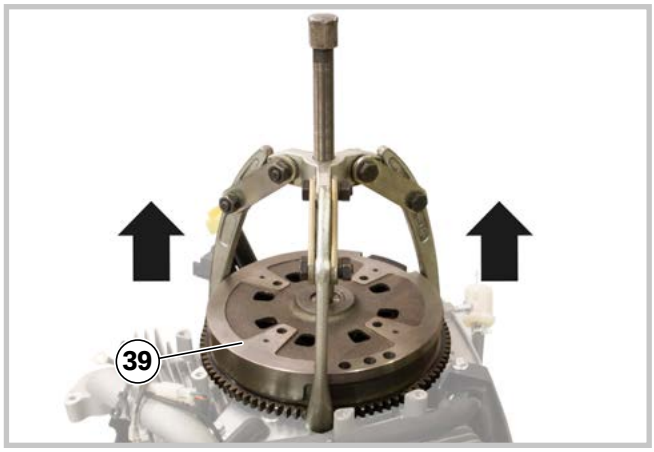
3 - Unscrew the four screws (**34**) and remove the grille (**35**) located above the fan (**36**).

4 - Remove the fan (**36**) from the seat.

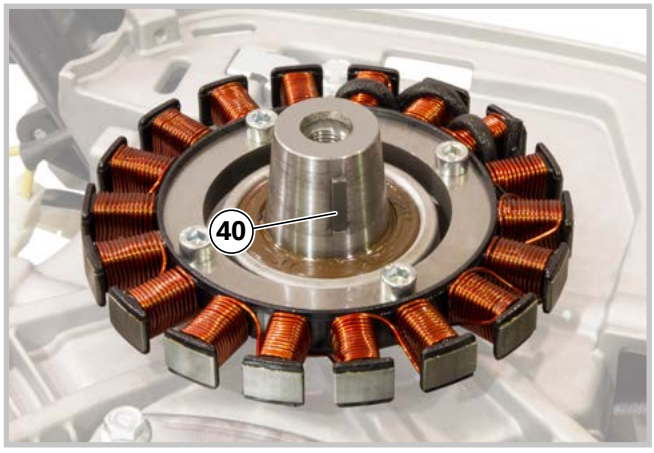
10. ENGINE BLOCK – External repairs



5 - Using a pneumatic gun, unscrew the nut (**37**) and recover the washer (**38**).



6 - Using a suitable extraction tool, remove the flywheel (**39**) as indicated in the diagram.
Ensure that the engine shaft key is retained.



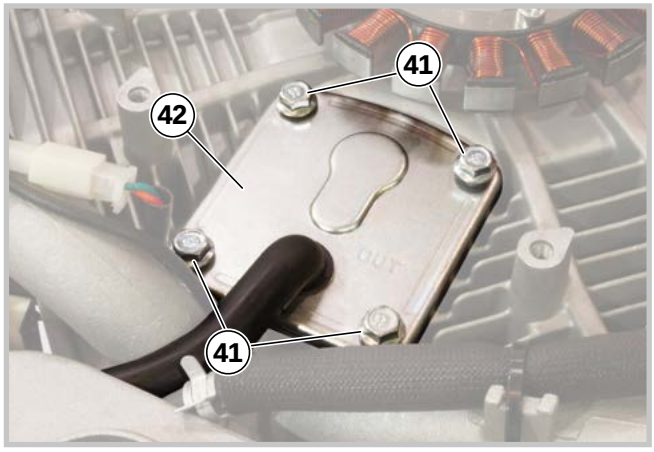
7 - Remount the coil (**31**) and (**32**) fixing the screws (**33**) to the indicated couple.

8 - When mounting the flywheel check the integrity of the key (**40**) and replace it if it is deformed: insert the washer (**38**) into its seat and tighten the nut (**37**) using a pneumatic gun.

9 - Position the fan (**36**) and the grille (**35**) by tightening the four screws (**34**).

10 - Remount the cowl [[☞ 6.1].

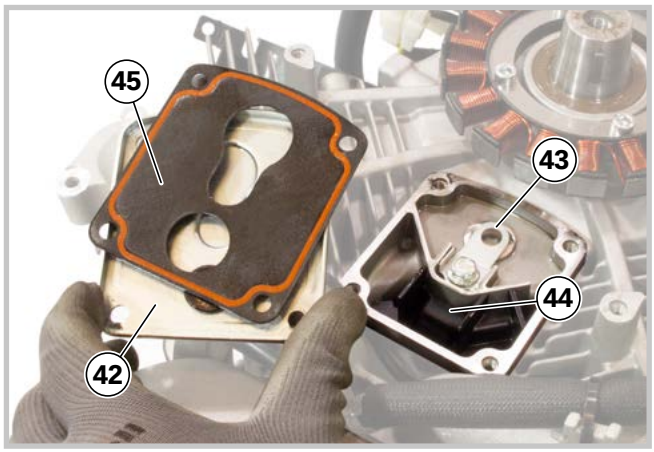
10. ENGINE BLOCK – External repairs



10.6. Checking the oil breather

1 - Remove the magneto flywheel [[☞ 10.5].

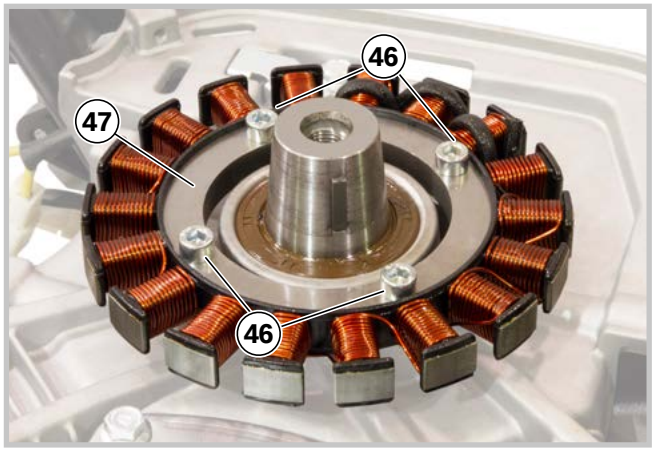
2 - Unscrew the four screws (**41**) that secure the closing plate (**42**) of the Blow-by tube.



3 - Check that the lamella (**43**) is not blocked or deformed and check the status of the filter (**44**). Replace them if necessary.

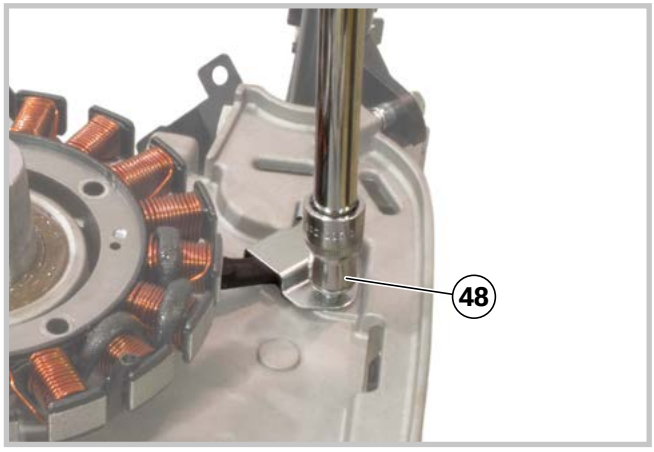
4 - Reassemble the plate (**42**) tightening the screws to the indicated torque.
The gasket (**45**) should be checked and replaced if necessary.

5 - Refit the magneto flywheel [[☞ 10.5].



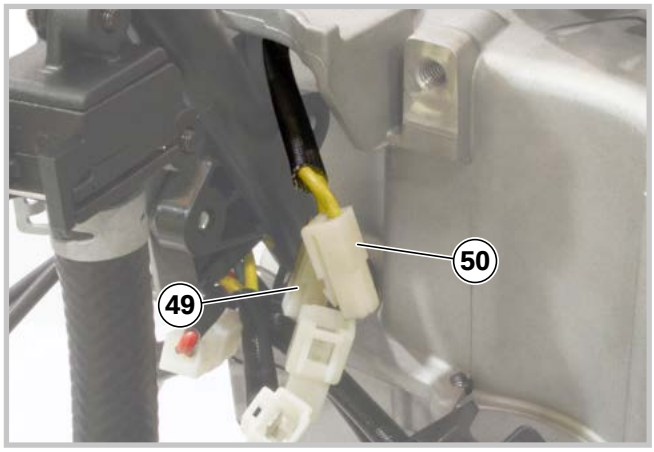
10.7. Replacing the upper compression ring of the engine shaft (flywheel side)

1 - Remove the magneto flywheel [[☞ 10.5].



2 - Unscrew the screws (**46**) of the alternator (**47**) and the screw (**48**) of the cable stop plate.

10. ENGINE BLOCK – External repairs



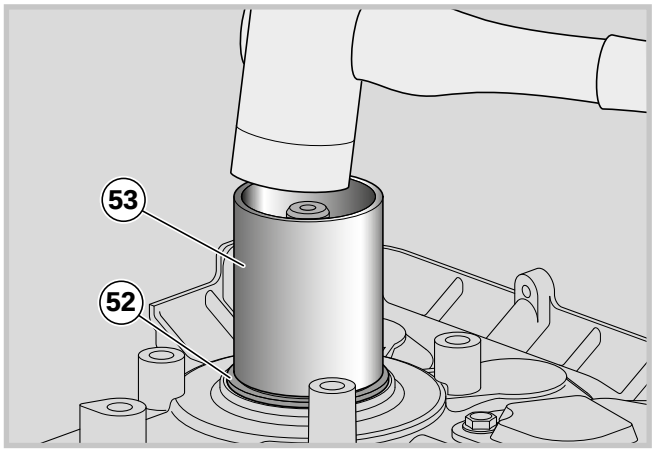
3 - Disconnect the two connectors (**49**) and (**50**) and remove the alternator (**47**) from the seat.

4 - Use a thin screwdriver inserted under the sealing lip to extract the oil seal ring (**51**).

5 - The new ring (**52**) must be inserted with the help of a pipe (**53**) with a diameter of approximately 50-55 mm, taking care not to damage the sealing lip.

6 - When mounting, check the integrity of the key (**40**) and replace it if it is deformed: reassemble the alternator (**47**), reconnect the alternator connectors (**49**) and (**50**), fasten the screw (**48**) of the cable retainer plate and the screws (**46**) to the indicated torques.

7 - Refit the magneto flywheel [[☞ 10.5].



10.8. Verify alternator charge

When there isn't a battery charger it's necessary to perform an alternator check:

1 - Remove the magneto flywheel [[☞ 10.5].

2 - Disconnect the connectors from the governor and remove the alternator [[☞ 10.7].

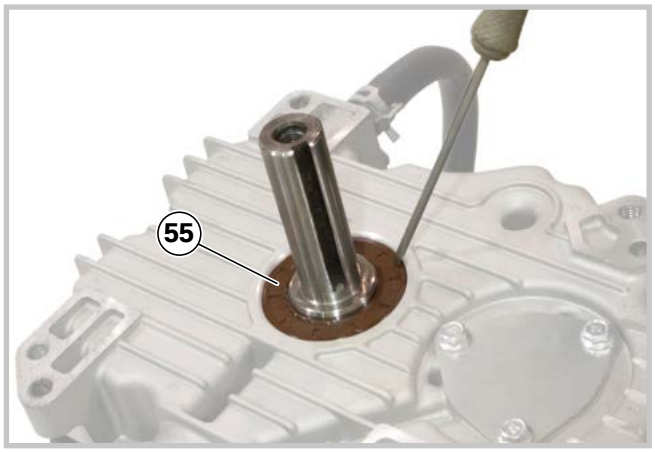
3 - Attach an appropriate tester (ohmmeter) (**54**) onto the alternator connectors (**47**). The value should be between 0,3 and 0,4 Ω.

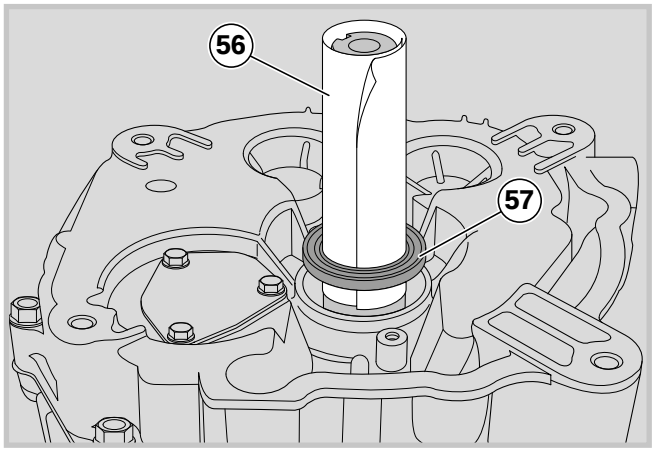
4 - Refit the alternator [[☞ 10.7].

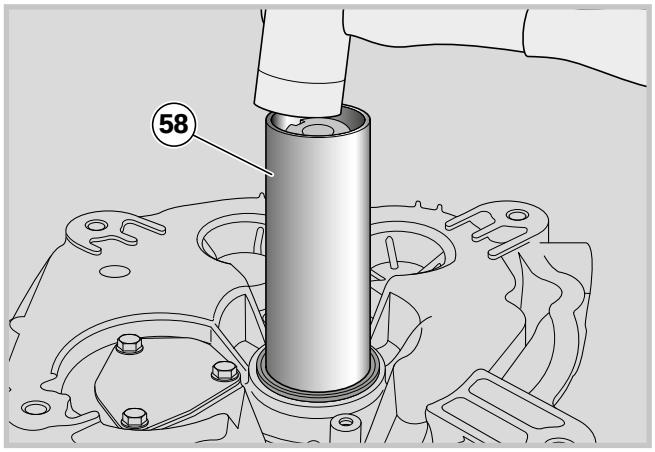
5 - Refit the magneto flywheel [[☞ 10.5].

6 - Refit the fan and grille by tightening the screws to the indicated torque [[☞ 6.1].

10. ENGINE BLOCK – External repairs







10.9. Replacing the lower compression ring of the engine shaft (sump side)

NOTE - Before executing this operation discharge all the oil from the sump and rotate 180° the motor.

1 - Use a thin screwdriver inserted under the sealing lip to extract the oil seal ring (**55**).

2 - Make a paper tube (**56**) around the shaft to protect the sealing lip and insert the new ring (**57**) so that it enters its housing.

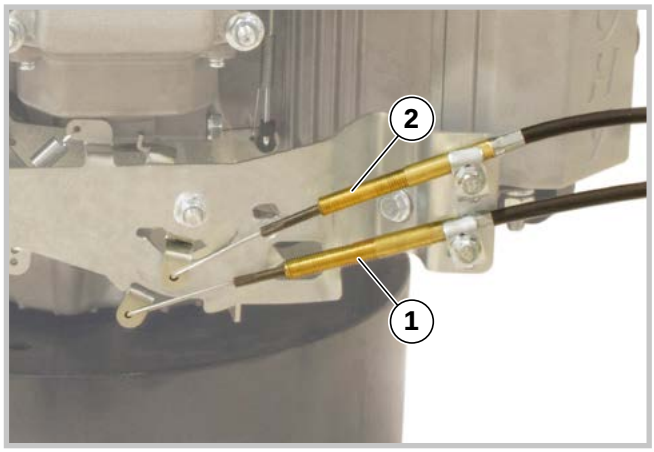
3 - Complete the insertion with the help of a pipe (**58**) of a diameter of approximately 30-35 mm.

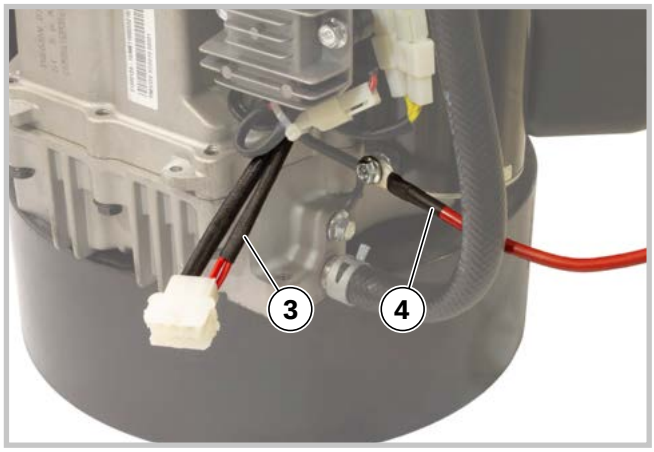
Tightening torques		
2	Spark plug tightening torque	25-32 Nm
6	Valve cover fixing screws	8-12 Nm
15	Screw support steering lever	8-12 Nm
16	Manifold fixing screws	8-12 Nm
17	Cylinder head screws	50-55 Nm
33	Coil fixing screws	8-12 Nm
34	Fan grille fixing screws	8-12 Nm
37	Flywheel fixing nut	80-100 Nm
41	Screws small plate louver	8-12 Nm
46	Screws alternator fixage	8-12 Nm

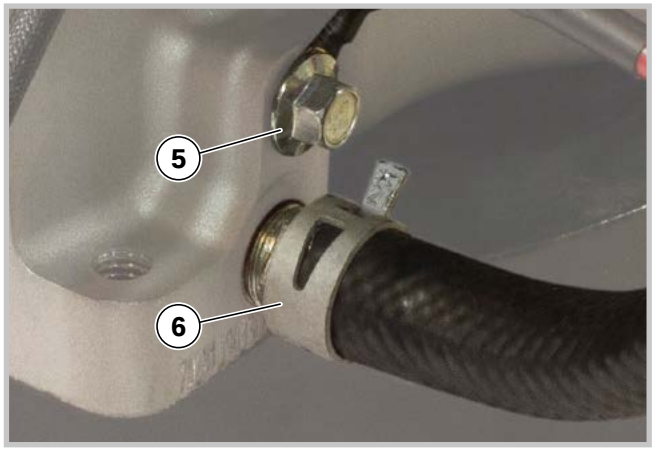
Technical information	
Compression	12,5 bar
Inlet valve clearance	0,10-0,15 mm
Exhaust valve clearance	0,10-0,15 mm
Minimum inlet valve stem diameter	6,515 mm
Minimum exhaust valve stem diameter	6,495 mm
Min. inlet valve head rim thickness	2,70 mm
Min. exhaust valve head rim thickness	3,20 mm
Valve seat depth	2,0 mm
Minimum valve spring length	39 mm
Alternator charge	0,3-0,4 Ω

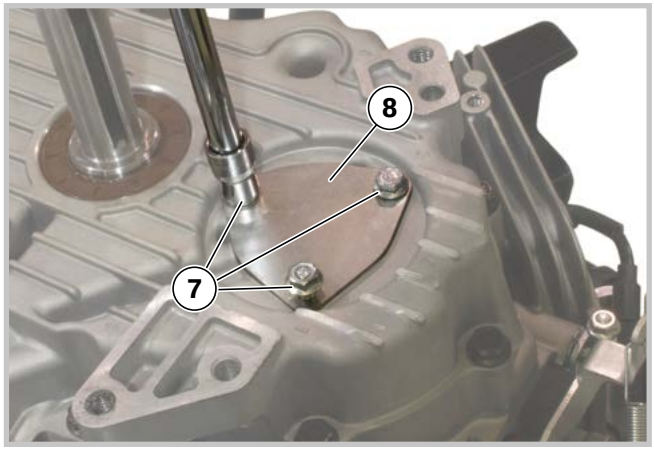
Special equipment	
3	Compression testing tool
29	Valve seat grinding tool
30	Valve grinder

11. ENGINE BLOCK - Overhauling internal parts









All the operations below require that the engine is removed from the machine.

11.1. Remove the engine from the machine

1 - **CONFIGURATION A:** Disconnect the throttle/ cable "CHOKE"(**2**) **[[☞ 8.1].**

1 - **CONFIGURATION B:** Disconnect the throttle cable (**1**) and "CHOKE" cable (**2**) **[[☞ 8.1]**.

2 - Disconnect the connector (**3**) of the electrical cabling, the power supply cable (**4**) of the starting motor and the petrol pipe.

3 - Remove the four screws anchoring the engine to the machine.

4 - ⚠ **Hold the engine in points with a firm grip, remembering that it weighs approx 36 kg.**

11.2. Carter opening

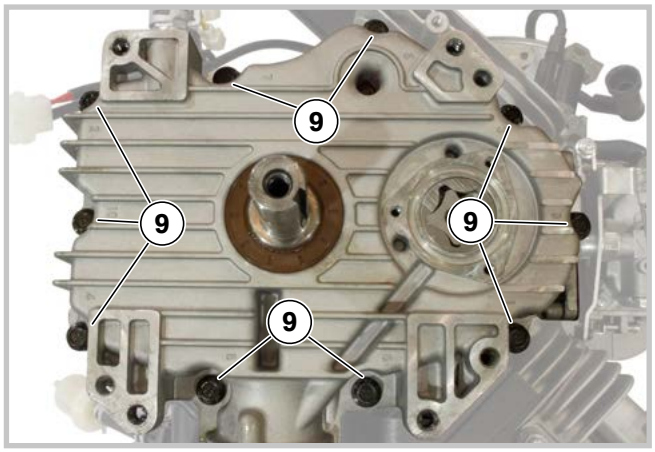
1 - Place the engine on a stable support, remove both spark plugs.

2 - Remove the motor ground screw (**5**), remove the clamp and remove the drain hose (**6**).
Collect all the oil in the sump properly through the hole in the pipe.

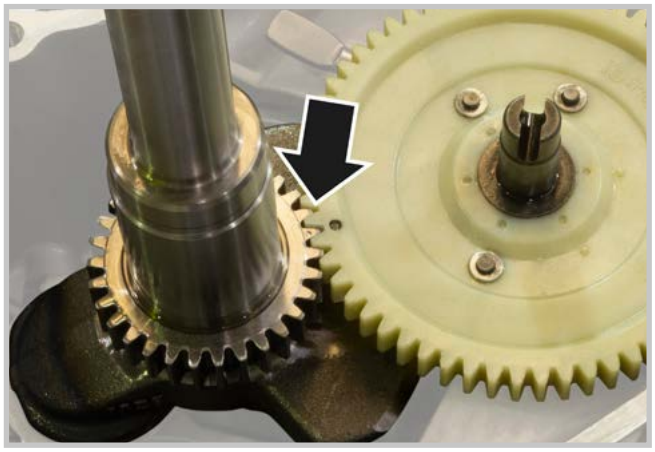
3 - Turn the engine up-side-down and position it so that the shaft projects upwards.

4 - Unscrew the three screws (**7**) and remove the oil pump cover (**8**).

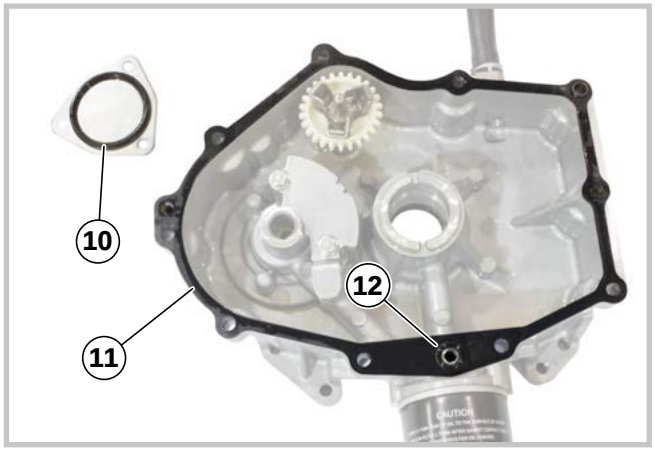
11. ENGINE BLOCK - Overhauling internal parts



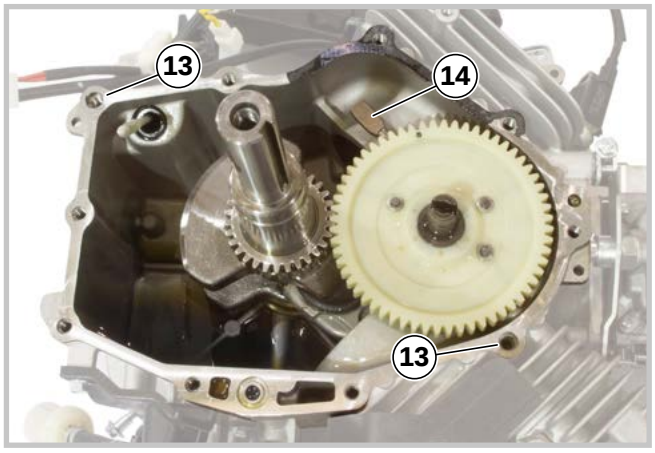
5 - Open the crankcase sump by unscrewing the ten screws (**9**).



6 - verify the phasing between:
- the engine shaft and the camshaft;
If necessary, re-set the phasing, referring to the indications provided.



7 - On assembly, follow the steps described in reverse and:
- check and if necessary replace the oil pump gasket (**10**) and tighten the screws (**7**) to the indicated torque;
- check and eventually replace the gasket (**11**) between the carter and sump, and the O-Ring (**12**) of the oil duct passage.
- ensure that the two centring pins (**13**) are correctly inserted;
- always replace the compression ring from the sump side [[☞ 10.9]].
- ensure that the regulator lever (**14**) is horizontal positioned;
- close the ten cup fixing screws (**9**) to the indicated torque, following the numbering stamped on the external surface of the carter;
- ensure that the oil plug is properly screwed in and fill the cover;

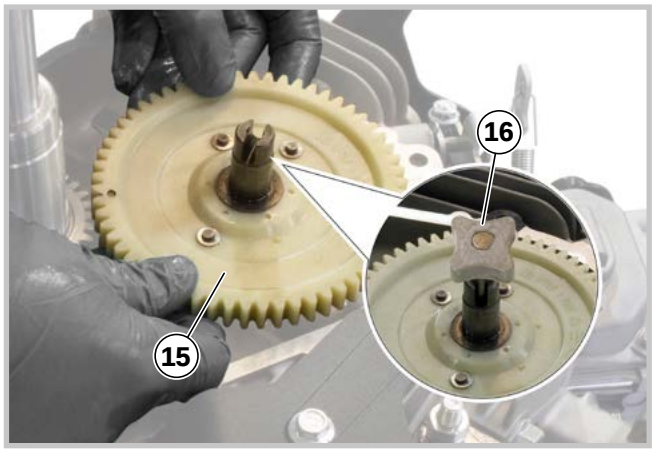


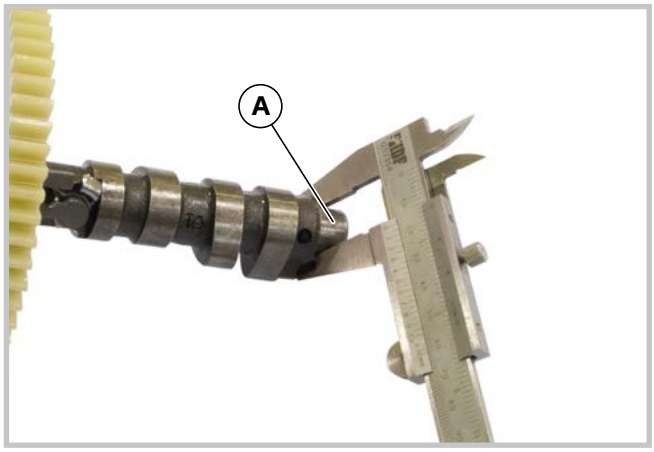
8 - After installing the engine on the machine:
- check the correct adjustment of the control cables [[☞ 7.3]], [[☞ 8.1]] and [[☞ 8.4]].

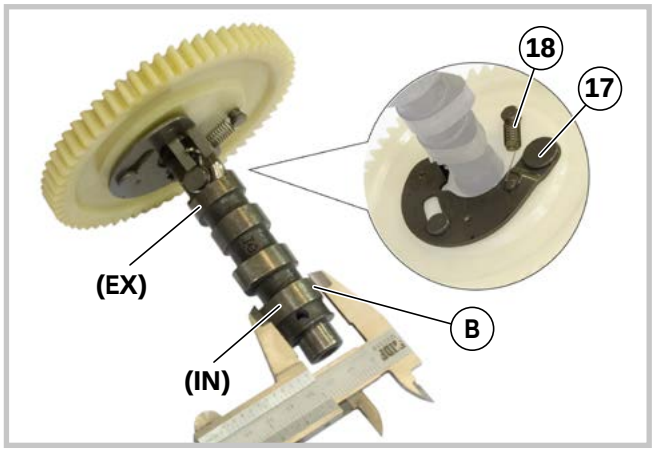
9 - Following reassembly it is advisable to check the engine's peak rpm [[☞ 8.4]].

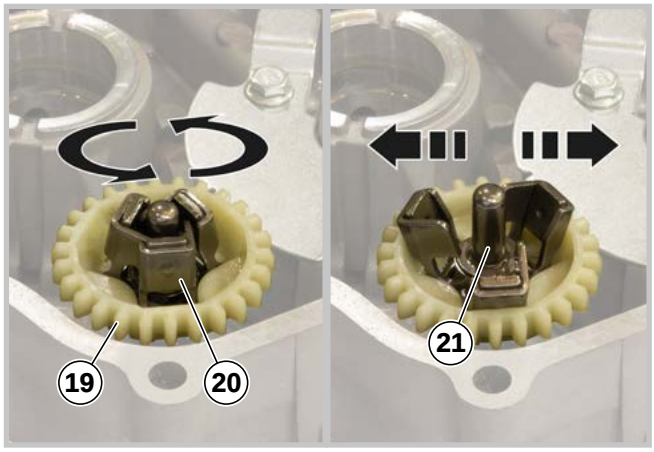
☑ ***NOTE - When mounting, make sure that the oil pump shaft is properly in place.***

11. ENGINE BLOCK - Overhauling internal parts









11.3. Dismantling and checking the camshaft and counterweight governor

1 - Remove oil pump cover and the housing [[☞ 11.2].

2 - Remove the camshaft (**15**).

3 - Check the movement of the oil pump spindle (**16**) in the slot of the camshaft. Verify that the two seats are not deformed and that there is not excessive play.

4 - Measure seat (**A**) of the camshaft, checking for wear and tear. The value must not be lower than 15,916mm.

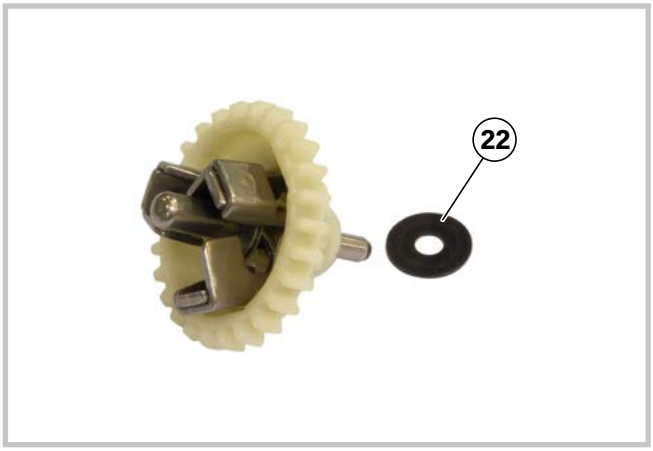
5 - Measure the cams (**B**), checking for wear and tear. The value must not be lower than 29,75 mm **IN (YI)** and 29,75 mm **EX (YE)**.

6 - Check the regular movement of the pressure reducer (**17**) and the efficiency of the spring (**18**); the whole group must always be replaced in the case of breakage or irregular operation of the pressure reducer.

7 - Check that the irregolar centrifugal (**19**) that are not present ruptures of the lubrification pallets.

8 - Turn the governor's gears quickly and check that the counterweights (**20**) expand correctly, causing the pin (**21**) to be moved axially.

11. ENGINE BLOCK - Overhauling internal parts

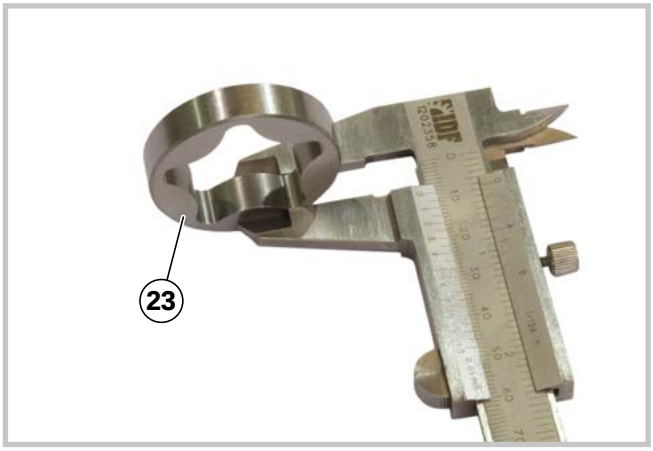


9 - In the case of breakage or irregular operation of the counterweights assembly; remove the centrifugal assembly, and retaining the shim washer (**22**).

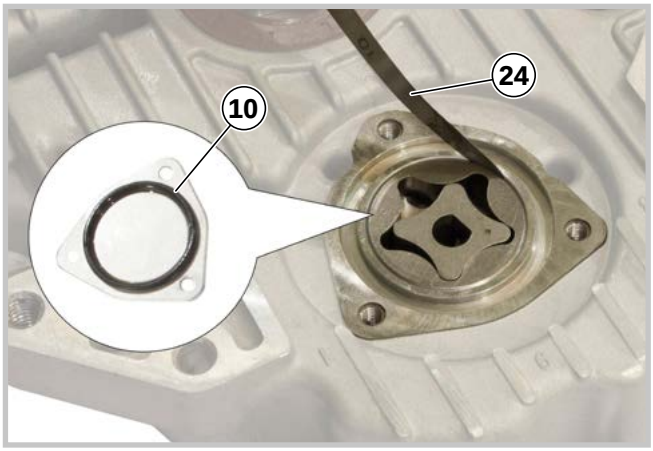
10 - After the check, reassemble the centrifugal regulator making sure that the washer (**22**) is correctly positioned at the base of the regulator and carry out the steps described above backwards.

11 - Before remounting the oil pump, perform the following measurements:

- using a gauge, measure the diameter of the pump seats. The value must not exceed 40,90 mm.



- Measure the height of the pump cylinder body (**23**), which must be lower than 8,90 mm.

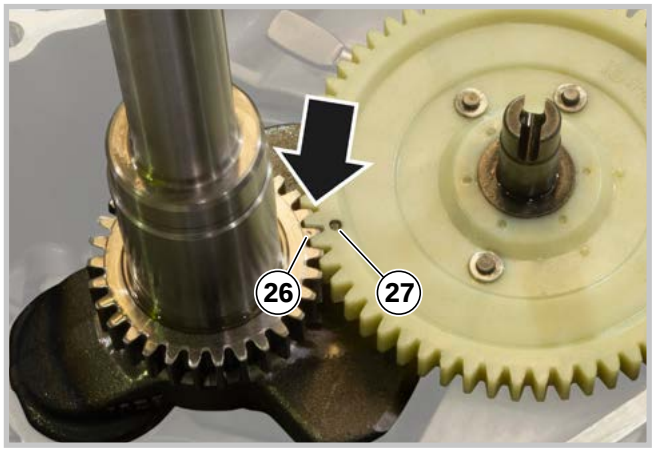


- using a thickness gauge (**24**), measure the play between the pump cylinder and its mounting seat on the sump. The value must not exceed 0,34 mm.

12 - When installing the oil pump, it is always advisable to replace the gasket (**10**) and fix the cover screws to the indicated torque.

11. ENGINE BLOCK - Overhauling internal parts

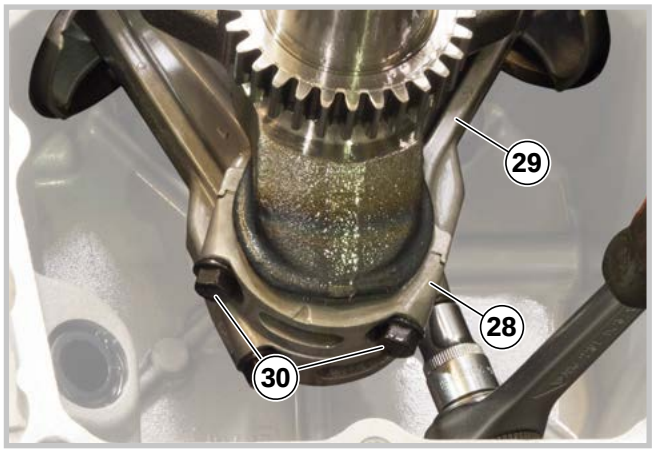
13 - Before fitting the camshaft ensure that the two tappets (**25**) are correctly housed in their seats.

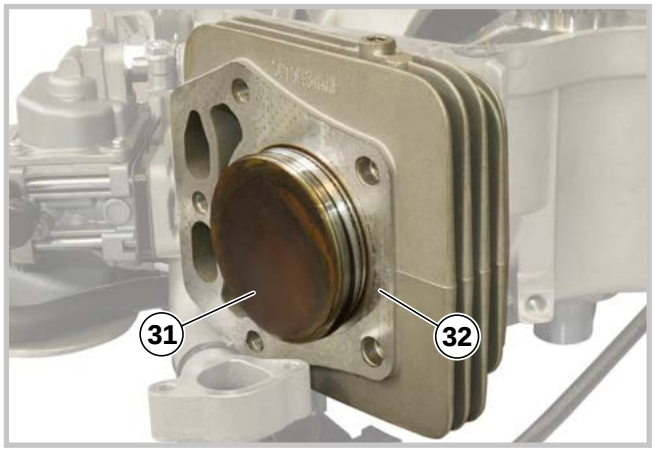


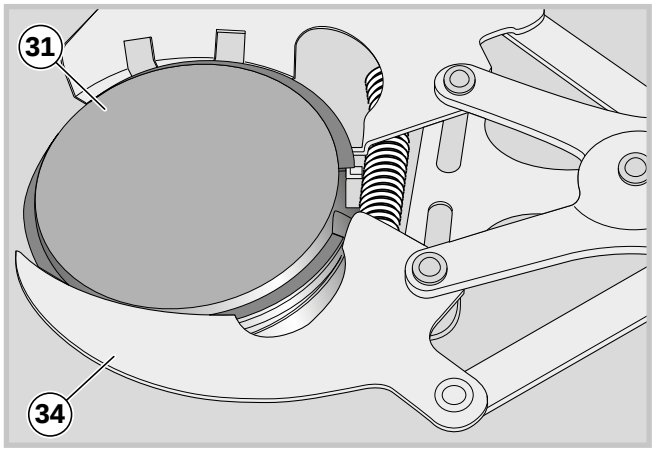
14 - When refitting the camshaft, maximum care must be taken to match up the two references (**26**) and (**27**) punched on the gears, so as to ensure correct distribution phasing.

15 - During assembly, refer to the operations in section [[☞ 11.2] remembering that it is always advisable to check and eventually replace the gasket (**11**) between sump and carter, and the O-Ring (**12**) of the oil duct passage.

11. ENGINE BLOCK - Overhauling internal parts







11.4. Dismantling and checking the piston, piston rings, connecting rod and engine shaft

NOTE - These paragraphs describe all the operations for checking and overhauling the thermal components of the engine; it is left to the operator to assess the advisability of performing all the operations described or only part of them, depending on the type of engine problems encountered.

NOTE - The following operations must be performed on both cylinders.

1 - Remove the engine from the machine [[☞ 11.1].

2 - Remove the cowl [[☞ 6.1].

3 - Remove the fan and the flywheel [[☞ 10.5].

4 - Dismount the cylinder head [[☞ 10.3].

5 - Open the cover [[☞ 11.2].

6 - Remove the camshaft [[☞ 11.3].

7- Remove the cap (**28**) of the connecting rod (**29**) by removing the two screws (**30**).

8 - Push the connecting rod (**29**) so as to cause the piston (**31**) to come out of the cylinder (**32**).

9 - Check and mark with a marker pen the correct position of the cap (**28**) and the connecting rod (**29**); on both connecting rods are stamped some reference arrows (**33**) (one on the upper part on the flywheel side and the other on the lower part on the drive shaft side).

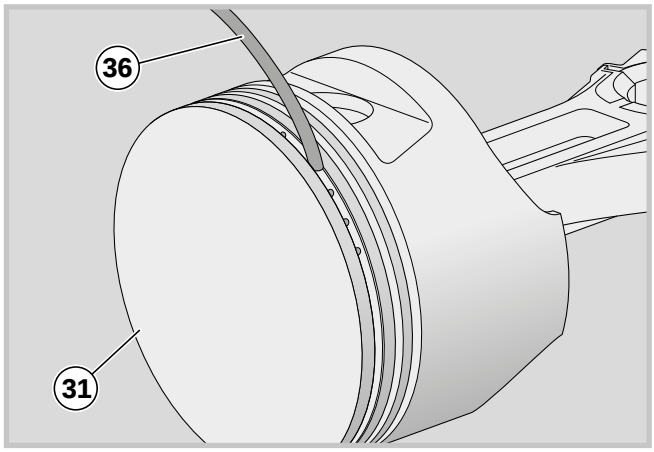
10 - Use the special expanding tool (**34**) to remove the two compression rings and the oil scraper ring from the piston (**31**).

11 - Carefully remove all carbon deposits from the compression rings, the inside of the cylinder and the piston head.

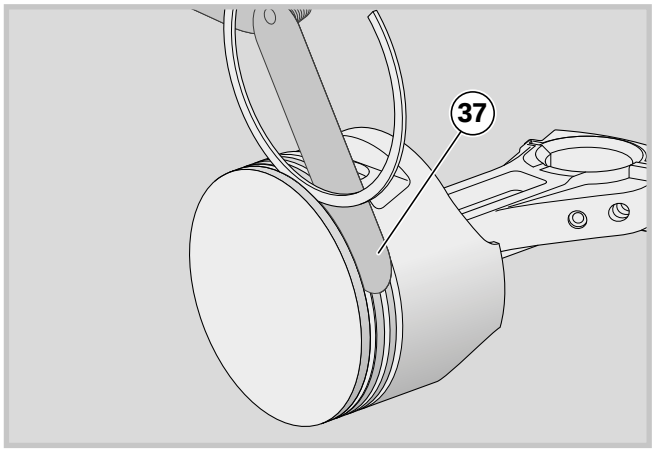
11. ENGINE BLOCK - Overhauling internal parts

12 - To check the wear in the compression rings, insert them one at a time into the cylinder (**32**) by about 10-15 mm and measure the gap between the two ends with a feeler gauge (**35**); the rings must be replaced if the gap is more than 1,0 mm.

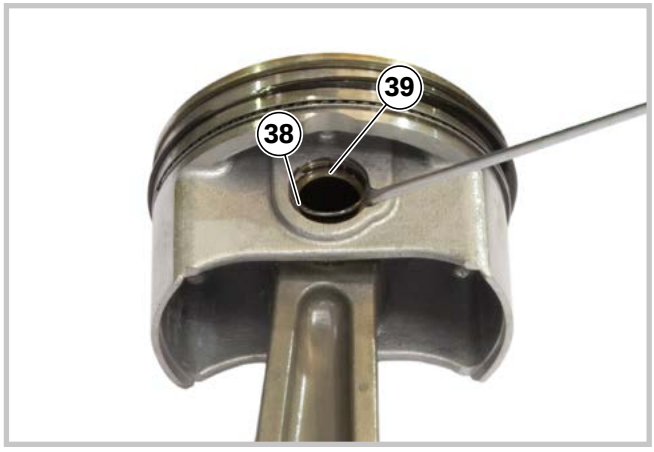
NOTE - If a gap of more than 0,6 mm is measured with new rings it means that the cylinder is worn beyond the acceptable limits and must be replaced. The cylinder must be replaced if it shows striping due to a seizure.



13 - Use a section of an old ring (**36**) to carefully clean the inside of the piston (**31**) ring housings, ensuring that the oil passage holes are not blocked.

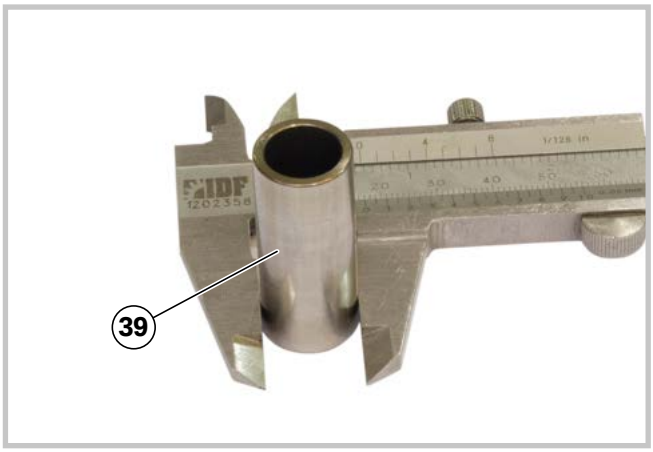


14 - To check the wear in the piston ring housings, fit a new ring and measure the residual space with a feeler gauge (**37**). The piston must be replaced if it is greater than 0,11 mm in the two compression ring housings.

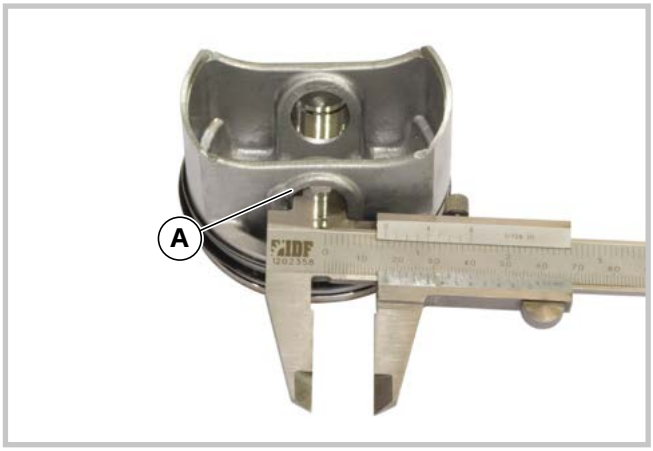


15 - Use a screwdriver to remove the clamping ring (**38**) and remove the gudgeon pin (**39**) from the piston (**31**).

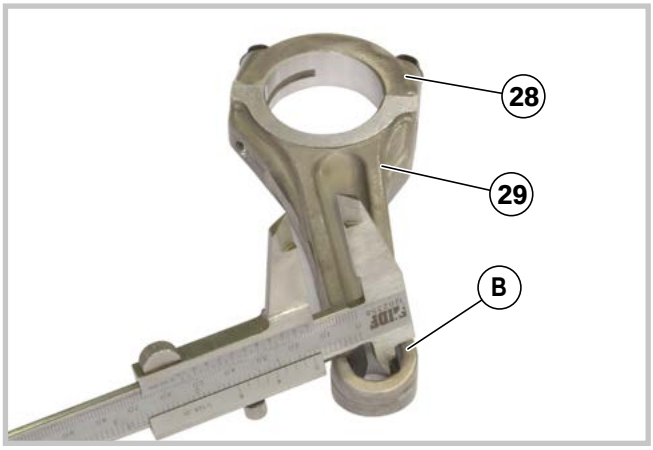
11. ENGINE BLOCK - Overhauling internal parts



16 - Check the diameter of the gudgeon pin (**39**) in several places and replace it if it is less than 16,90 mm, even at a single point.



17 - Check the diameters of the gudgeon pin housings (**A**) on the piston (**31**) and replace the piston if they are more than 17,07 mm, even at a single point.



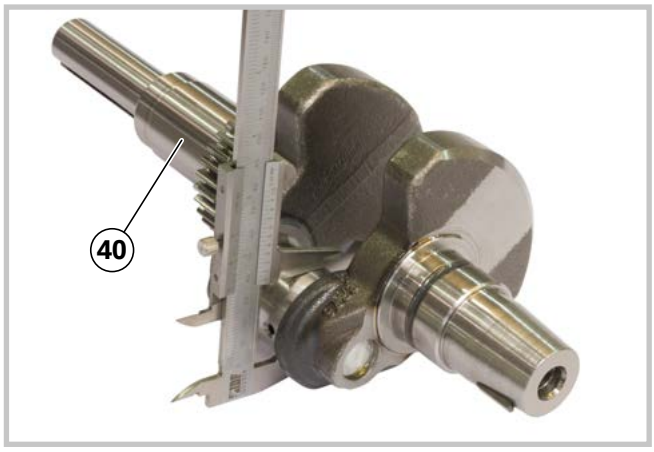
18 - Fit the cap (**28**) to the connecting rod (**29**) and check the diameter from the gudgeon pin side and the crank side; replace the connecting rod if the values are greater than:

B : 17,07 mm on the gudgeon pin side;

C : 38,075 mm on the crank side.

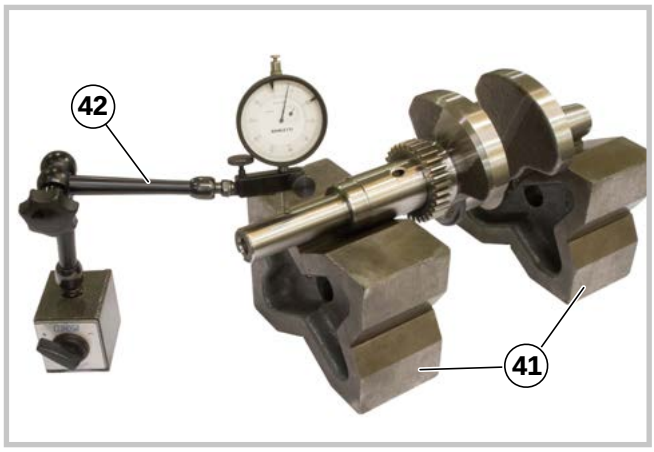
If the connecting rod is outside measurement tolerances or has small scratches or marks, it is necessary to replace it.

11. ENGINE BLOCK - Overhauling internal parts



19 - Remove the engine shaft (**40**), checking the diameter of the connecting rod pin with a digital gauge. The value must not be less than 37,93 mm or the engine shaft will have to be replaced.

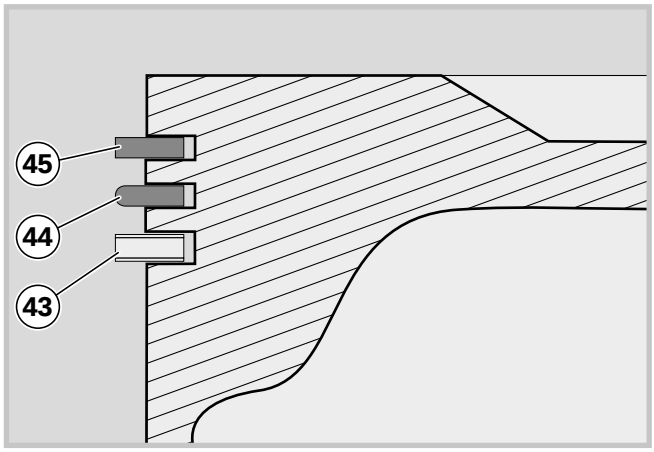
NOTE - In the case of seizing, the manifolds can be polished with fine emery cloth, only removing foreign matter and checking that the final size remains within the aforementioned limit.



20 - To check the alignment between the manifolds and the protruding part of the shaft, place the engine shaft on two prismatic guides (**41**) and, with the help of a comparator (**42**) placed at the end, check the displacement by rotating the shaft. The shaft must be replaced if the displacement exceeds 0,10 mm.

IMPORTANT: A bent shaft must never be repaired!

WARNING - DANGER: A bent shaft causes abnormal vibrations and could be dangerous when the machine is used!

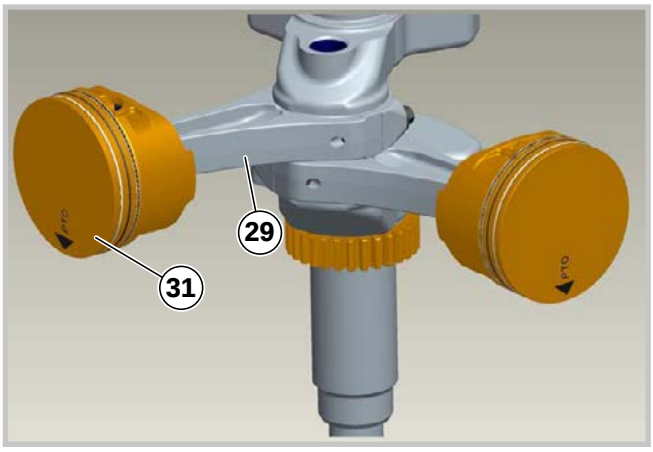


21 - To reassemble the segments on the piston perform sequentially:

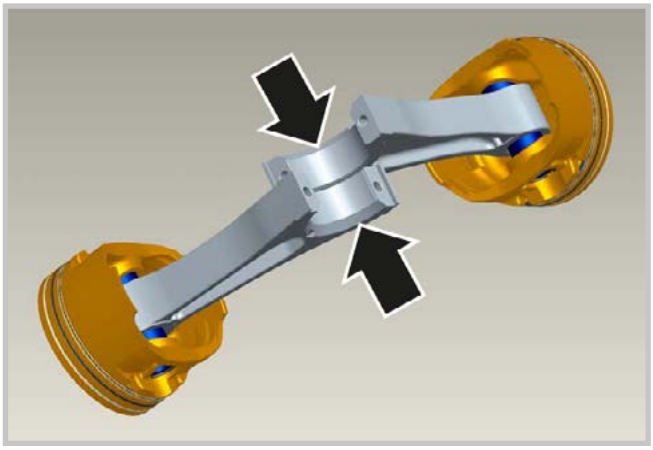
- mount the oil wiper (**43**), composed of three rings;
- assemble the rounded edge segment (**44**) with the rounded edge facing downwards;
- assemble the live edge segment (**45**).

NOTE - The two segments (44) and (45) must be oriented with the lights not aligned between them.

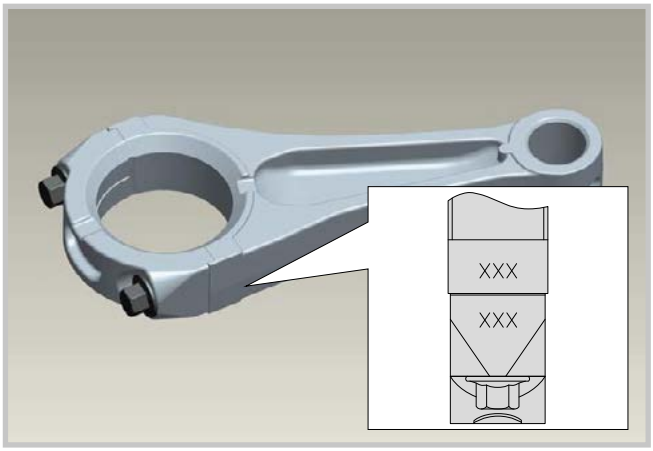
11. ENGINE BLOCK - Overhauling internal parts



22 - Fit the connecting rod (**29**), gudgeon pin and clamping rings to the piston (**31**).
Piston marking must point towards the exhaust.



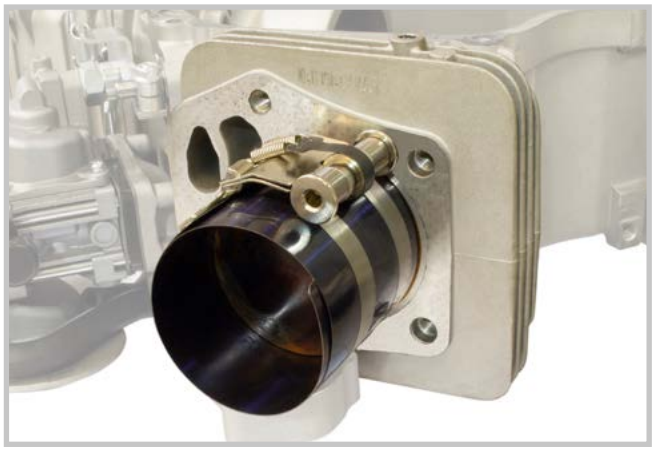
23 - When installing the connecting rods, check that the chamfers of the hole (motor shaft fixing) are opposite each other.



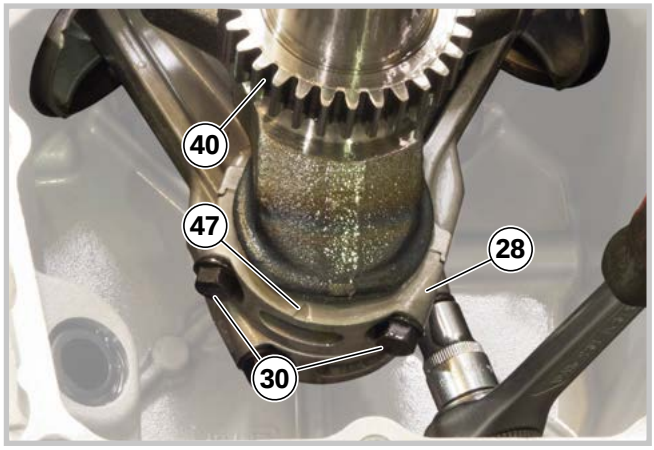
24 - The body of the connecting rod and the cap have the same order number, stamped on one side.

25 - Put the piston into the ring compression tool (**46**).

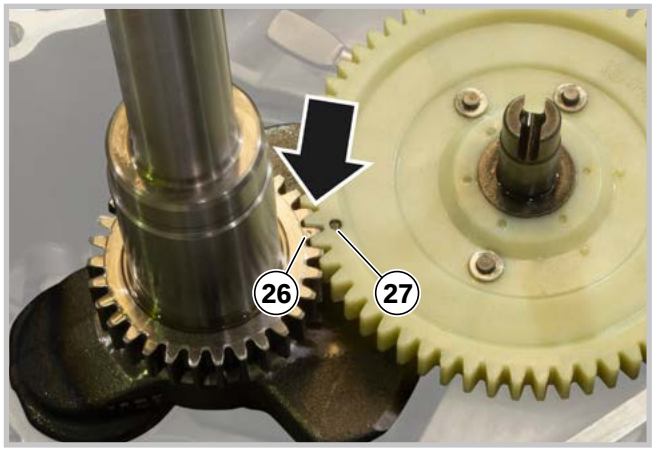
11. ENGINE BLOCK - Overhauling internal parts



26 - Oil the inside of the piston liberally and insert the piston, with the marking facing the exhaust.



27 - Mount the engine shaft (**40**) and the connecting rod cap (**28**) with the relative screws (**30**), taking care with the position references (**47**) so as to avoid inverting the mounting direction of the cap.
Close the screws (30) to the indicated couple.



28 - After having fixed the connecting rod cap, take the greatest care to ensure that the two position references (**26**) and (**27**) punched on the engine shaft and camshaft gears, coincide, ensuring the correct distribution phasing.

29 - Close the carter and fix the screws (**9**) to the indicated couple [[☞ 11.2].

30 - During assembly perform the operations indicated in section [[☞ 11.2] remembering that it is always advisable to check and eventually replace the gasket (**11**) between sump and carter, and the O-Ring (**12**) of the oil duct passage.

11. ENGINE BLOCK - Overhauling internal parts

Tightening torques		
7	Screws oil pump cover	8-12 Nm
9	Union screws under carter and sump	24-32 Nm
30	Fixing screws lower connecting rod cap	11-13 Nm
Technical information		
Oil sump capacity		1,70 litres
Diameter Pump seat on camshaft		15,916 mm
Diameter aspiration cam		29,75 mm
Diameter discharge cam		29,75 mm
Diameter oil pump seat		40,90 mm
Height pump cylinder		8,90 mm
Cylinder/seat clearance on the pump		0,34 mm
Maximum segments gap in the cylinder		1,0 mm
Max. compression ring axial gap		0,11 mm
Minimum gudgeon pin diameter		16,90 mm
Max. gudgeon pin housing diameter on piston		17,07 mm
Max. connecting rod diameter		
	gudgeon pin side	17,07 mm
	crank side	38,075 mm
Diam. connecting rod's pin on engine shaft		37,93 mm
Verify the engine shaft extremes		0,10 mm
Special equipment		
34	Piston ring removal expander	
42	Comparator	
46	Piston rings compressing tool	

12. TURNING OFF AND STOPPING ENGINE

For maintenance operations relating to this section, refer to the manual specific to the machine on which the engine is mounted.

13. EXHAUST SYSTEM

For maintenance operations relating to this section, refer to the manual specific to the machine on which the engine is mounted.

14. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
The engine does not start or starts badly	No power supply to battery	Check alternator charge [10.8]
	Starting motor short circuit (burnt rotor and stator)	Replace starting motor [6.2]
	No earth	Check electrical cabling of earth wire [9.1]
	Earth wire is flattened	Replace earth wire [9.2]
	The coils are faulty and do not supply current or the air gaps are too large	Check coils [9.2]
	Petrol tank obstructed	Check functioning of pump [8.2]; clean or replace pump [8.3]
	Petrol pump pressure indicator tube broken or disconnected	Check or replace tube [8.3]
	Internal petrol pump membrane broken	Replace pump [8.3]
	Carburettor dirty	Check and clean the carburettor [7.1]
	Poor seal of carburettor needle valve	Clean the carburettor housing and needle valve [7.1] or replace the carburettor [7.2]
	Choke blocked	Check and clean the carburettor and the choke [7.1]
	The spark plugs are badly connected or faulty	Check spark [9.1] or replace spark plugs
	Blocked air filter	Execute the filter cleaning [5.1]
	Fouling in the combustion chamber	Dismount the cylinder head and remove fouling [10.3]
	Insufficient pressure	Check tightness of cylinder head screws, replace washer if necessary. Check wear and tear of the piston rings [10.4]
The engine starts but does not run	Petrol tank obstructed	Check pump functioning [8.2]; Clean or replace pump [8.3]
	Petrol pump pressure indicator tube broken or disconnected	Check or replace tube [8.3]

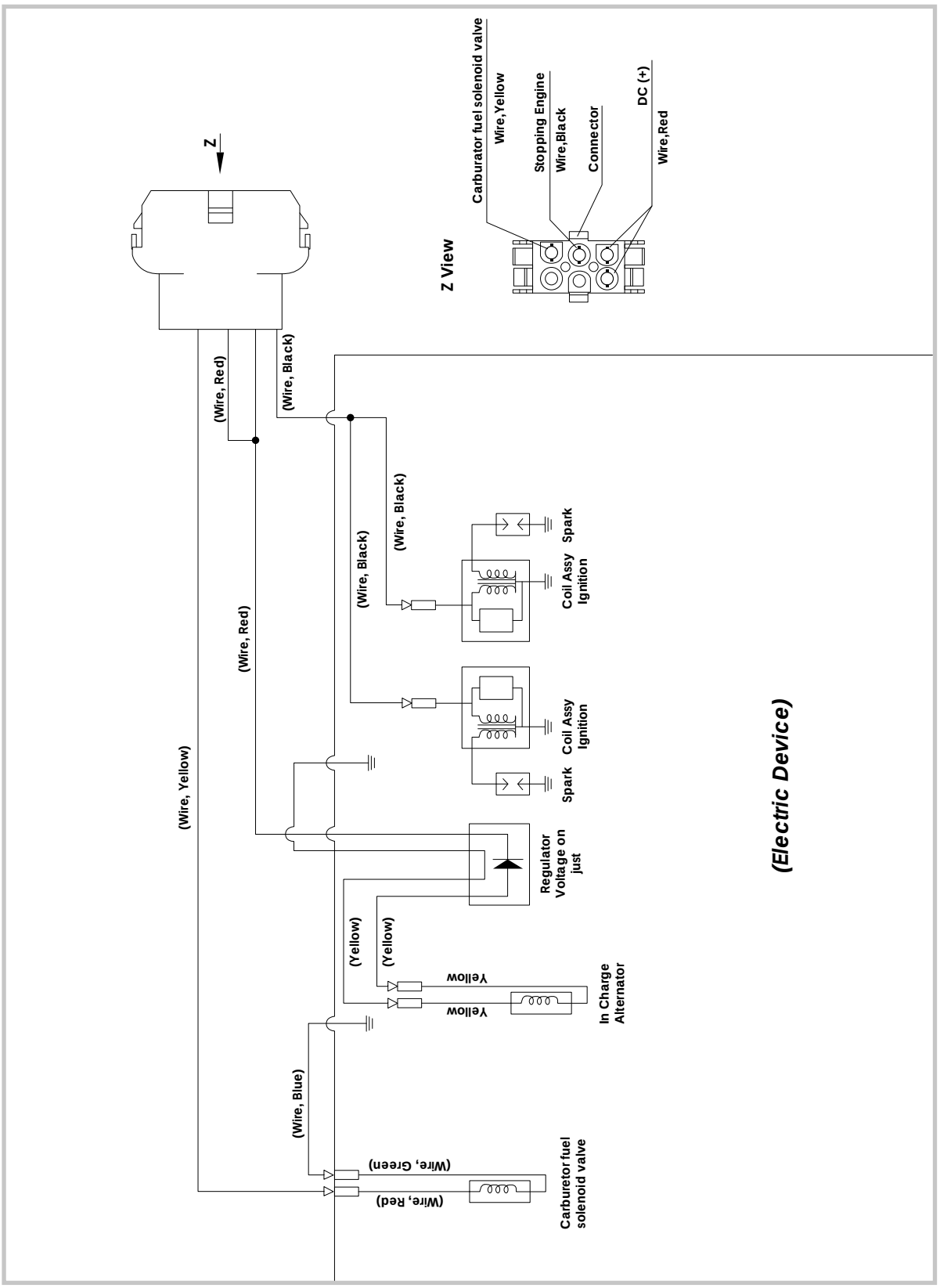
14. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
The engine starts but does not run	Internal petrol pump membrane broken	Replace pump [8.3]
	The tank cap has a clogged breather pipe	Clean and/or replace the cap
	Fouling in the combustion chamber	Dismount the cylinder head and remove fouling [10.3]
	Insufficient pressure	Check tightness of cylinder head screws, replace washer if necessary. Check wear and tear of the piston rings [10.4]
The engine is inefficient or the runs irregularly	The throttle cable is not well adjusted	Check and/or adjust the throttle cable [8.1]
	The governor malfunctions or there is a problem with the rods	Check the entire governor system [8]
	Insufficient pressure	Check tightness of the screws of the cylinder head and replace washer if necessary. Check wear and tear of piston rings [10.4]
	Carburettor dirty or air seeps into the carburettor	Check and clean the carburettor. Replace the carburettor gaskets [7.1]
	Inadequate adjustment of air gaps of the coils	Adjust the air gaps [9.2] and, if the problem persists, the coils must be replaced [9.3]
	Oxidation or loosening of spark plugs connections	Perform spark test [9.1] or replace spark plugs
The engine overreved	Governor blocked due to breakage of centrifugal assembly or breakage of external governor springs. It is possible that the governor is dirty.	Check the entire governor system [8].
The engine judders	Engine screws loose	Tighten the screws
	Engine timing faulty	Check wear and tear of the connecting rods of the engine shaft, replace shaft if necessary [11.4]
The engine does not turn off	The earth cable is disconnected or broken	Check earthing connection [9.1]
The engine uses a lot of oil	Defective breather valve operation	Check and/or replace the breather valve [10.6]
	Poor pistons rings seal	Replace the rings [11.3]

15. CHARGING SYSTEM

15.1 Electrical diagram

NOTE - The colors of the cables can change according to the type of motors.



15. CHARGING SYSTEM

15.2 Control of the charging system

1. Always check the condition of the battery before checking other parts of the charging system. The battery must be fully charged in order to conduct accurate system tests.

2. Heat the engine to bring the components to their normal operating temperatures.

3. Measure the regulated output voltage at various engine speeds. Connect a voltmeter through the battery terminals.

4. The readings should almost show the battery voltage when the motor speed is low and when the motor speed increases, the readings should also increase. But they must remain within the specified range **[[☞ 15.3].**

5. If the output voltage is much higher than the specifications, the regulator is defective or the regulator cables are pulled out or damaged.
If the output voltage does not increase as the motor speed increases, the regulator is defective or the alternator has insufficient output for the required voltage loads.

⚠ ***WARNING: There are some important precautions that must be taken when maintaining electrical systems:***

- do not reverse the battery cable connections. This will burn the diodes in the electrical parts;

- always check the condition of the battery before defining the inefficiency of other parts of an electrical system. When the battery is charged, perform accurate tests on the electrical system;

- electrical parts must never be hit hard, like with a hammer, or dropped on a hard surface. Such a shock can damage the parts;

- to avoid damage to electrical parts, do not disconnect the battery cables or any other electrical components or connections when the engine switch is turned on or while the engine is running;

- take care not to short circuit the cables to which the positive (+) terminal of the battery is directly connected to the chassis ground;

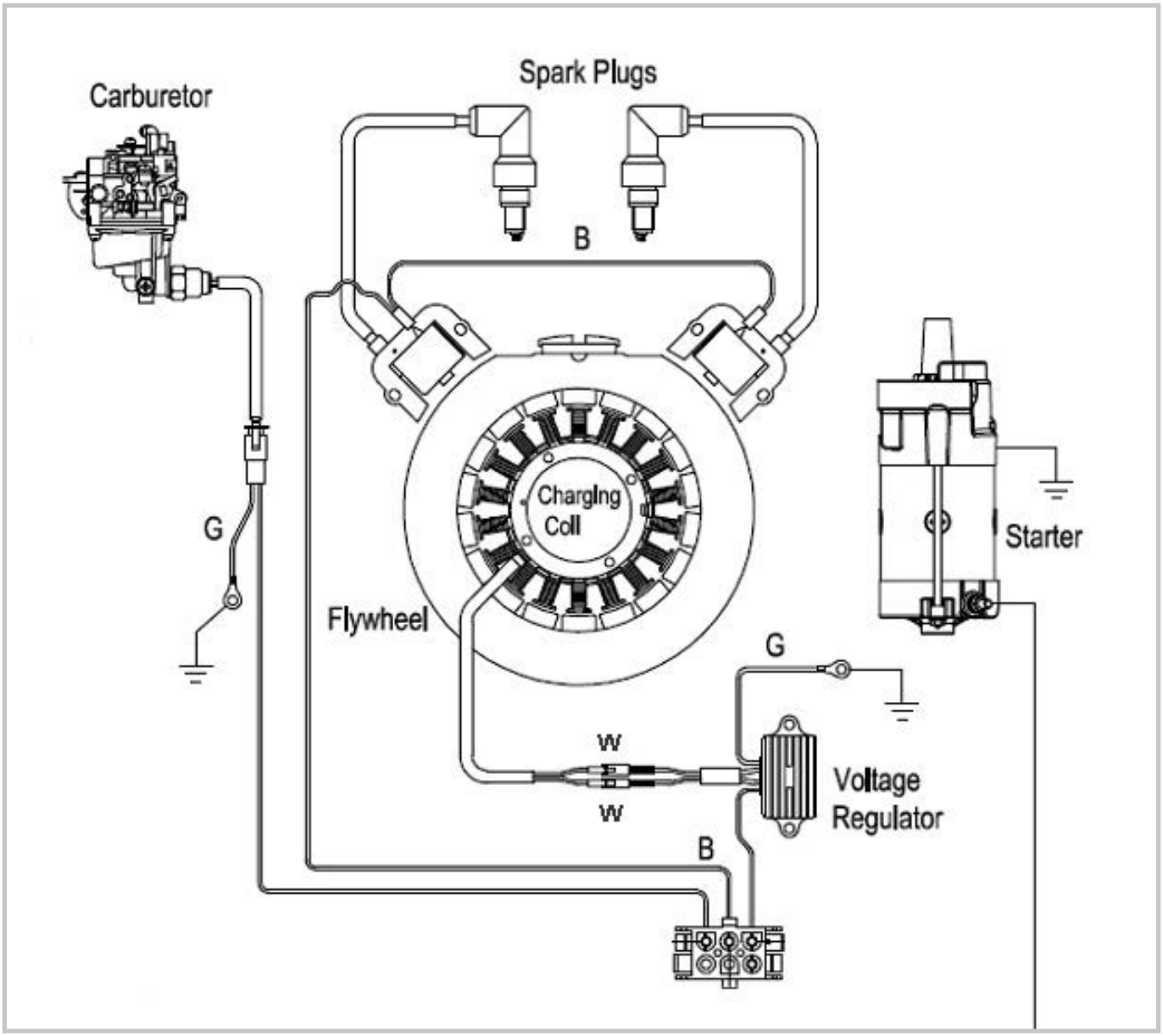
- problems may concern one or in some cases all elements. Never replace a defective part without determining which CAUSE caused the error. If the problem was caused by another item or items, they too must be repaired or replaced, otherwise the replaced parts will become defective again;

- make sure all connectors in the circuit are clean and tight and examine the cables for signs of burning, fraying, etc. Defective cables and faulty connections will affect the operation of the electrical system;

- measure the coil and winding resistance when the part is cold (at room temperature).

15. CHARGING SYSTEM

15.3 Recharge system diagram



Performance parameters

	Standard	Service limits
Regulated output voltage	14±1,0 V DC	15,5 V DC
Stator output not regulated	41,5±0,5 V AC/3200 rpm/1’	40 V AC/3200 rpm/1’