

**TRE 0701 - TRE 0702**  
**TRE 0801**

# **WORKSHOP MANUAL**

**Rel. 0.2**

**YEAR OF MANUFACTURE 2010→2017**

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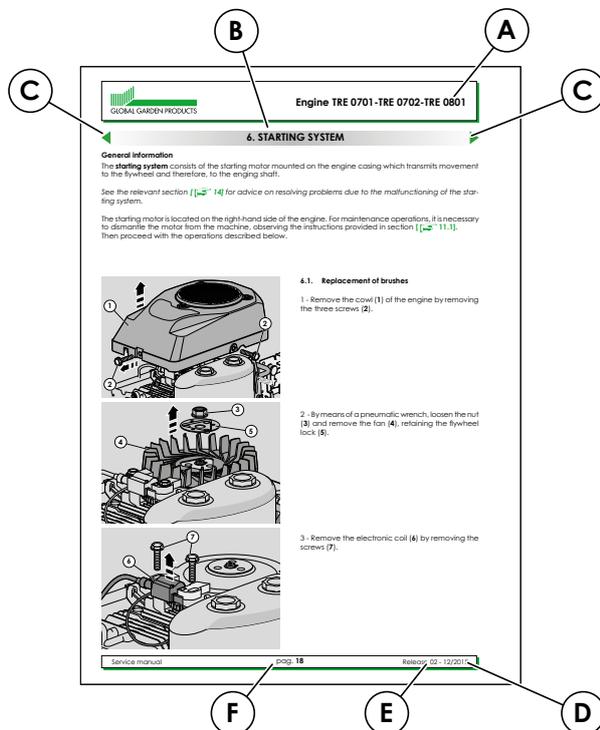
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## INTRODUZIONE AL MANUALE

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 0701, TRE 0702 and TRE 0801**.

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 typ 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 injury to the operator**



**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.**

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], and 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].

## 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 lawnmower 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 lawnmower 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:

- 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;
- clean up all traces of spilt petrol immediately;
- 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;



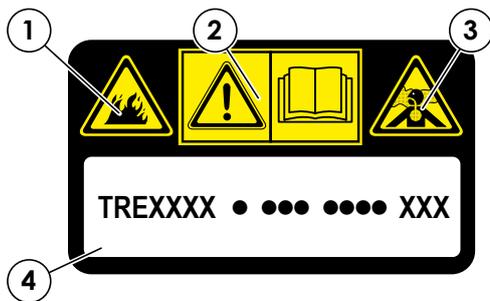
**Exhaust gas contains carbon monoxide, which is highly toxic, odourless and colourless. Avoid inhaling.**

- Perform tests on the engine in a well-ventilated environment or in the presence of adequate exhaust gas extraction systems.

## 2. GENERAL AND SAFETY REGULATIONS

### 2.4. Etichette di sicurezza

On the canopy motor, in a immediately identification position, are some indication or prescription plates for the safety 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 ensu-

readequate 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:



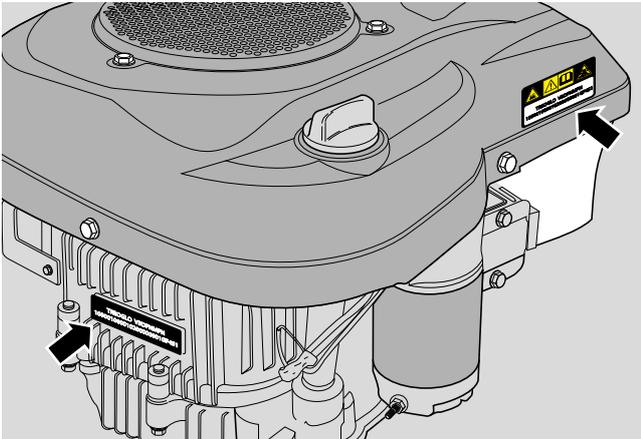
**Operations that should be carried out with utmost care to avoid impairing the functionality and safety of the engine and/or lawnmower on which it is installed.**



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

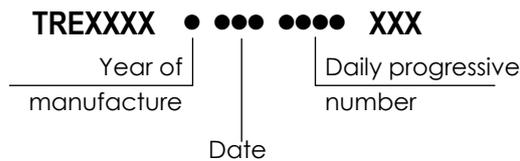
**“WARNING” stresses the risk of injury to oneself and others if instructions and regulations are not observed.**

### 3. TECHNICAL DATA AND SPECIFICATIONS



#### 3.1. Identification

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



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 0701	TRE 0702	TRE 0801
Displacement	432 cc	414 cc	452 cc
Bore	90 mm	88 mm	92 mm
Stroke	68 mm		
Minimum speed (SLOW)	1850 (±150) r.p.m.		
Maximum speed (FAST)	2950 (±250) r.p.m.		
Oil sump capacity	1.20 litres		
Weight	32 kg		

#### 3.3. Adjustments

Distance between spark plug electrodes	0,6 - 0,8 mm
Coil air gap	0,25 - 0,40 mm
Inlet valve clearance	0,10 - 0,15 mm
Exhaust valve clearance	0,15 - 0,20 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	RN12YC (Champion) or equivalent	

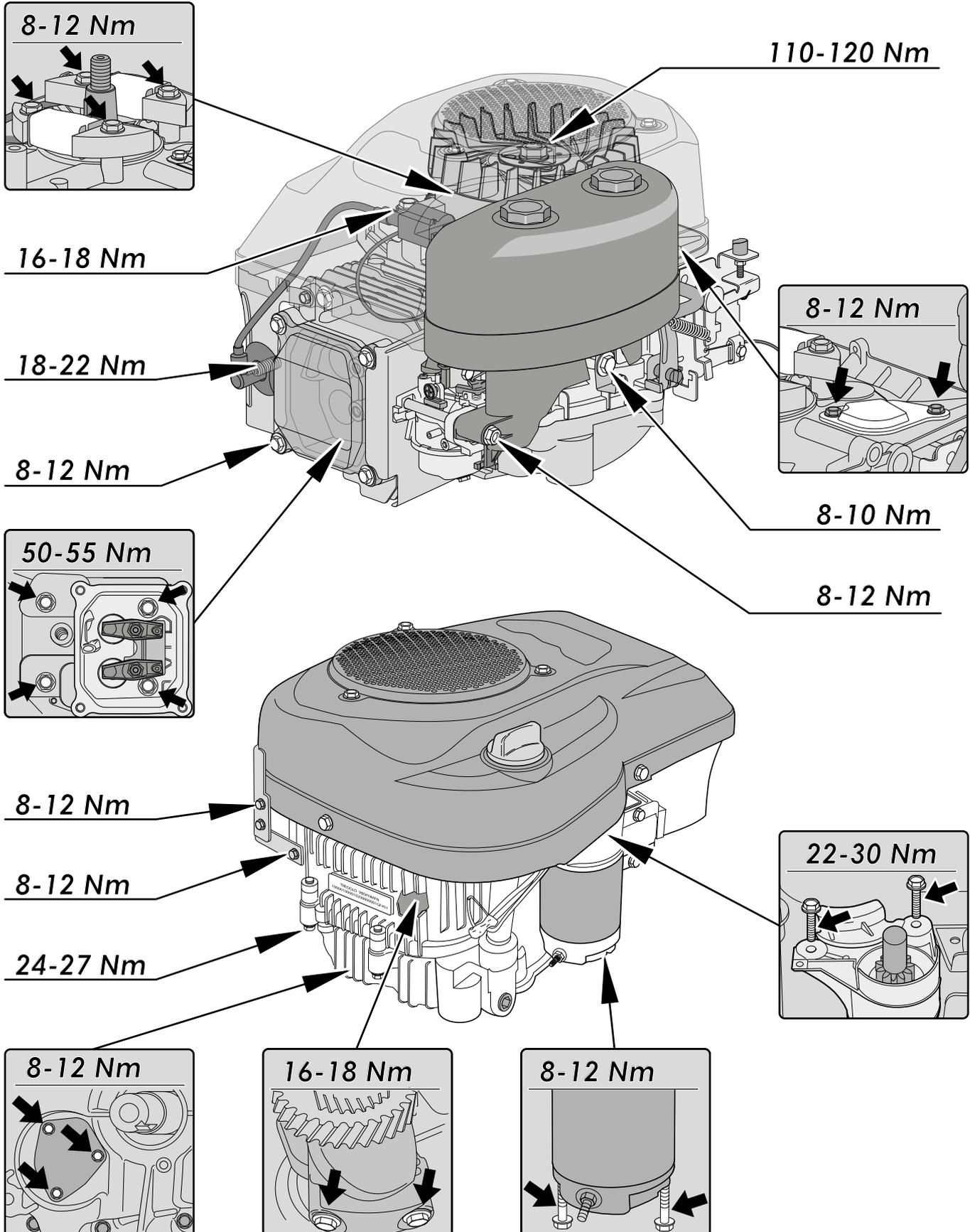
#### 3.5. Use limits

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

	TRE 0701 TRE 0702	TRE 0801
Brushes lenght starter push botton	8.5 ÷ 12 mm	
Compression	4.2 bar	
Minimum inlet valve stem diameter	6.425 mm	
Minimum exhaust valve stem diameter	6.375 mm	
Minimum inlet valve head rim thickness	0.5 mm	0.8 mm
Minimum exhaust valve head rim thickness	1.0 mm	
Valve seat width	1.5 mm	
Minimum valve spring length	37.5 mm	
Maximum gap between ends of cylinder rings	0.8 mm	
Max. axial gap for compression rings	0.15 mm	
Minimum gudgeon pin diameter	19.95 mm	
Max. gudgeon pin-piston seat diameter	20.04 mm	
Max. connecting rod diameter	gudgeon pin side	20.07 mm
	crank side	36.07 mm
Diameter connecting rod's pin on engine shaft	35.93 mm	
Verify the engine shaft extremes	0.10 mm	
Diameter Pump seat on camshaft	15.916 mm	
Diameter aspiration cam	32.15 mm	
Diameter discharge cam	32.35 mm	
Diameter oil pump seat	29.21 mm	
Height pump cylinder	9.95 mm	
Cylinder/seat clearance on the pump	0.26 mm	

3. TECHNICAL DATA AND SPECIFICATIONS

3.6. Tightening torques



### 3. TECHNICAL DATA AND SPECIFICATIONS

#### 3.7. Table of Tightening torques

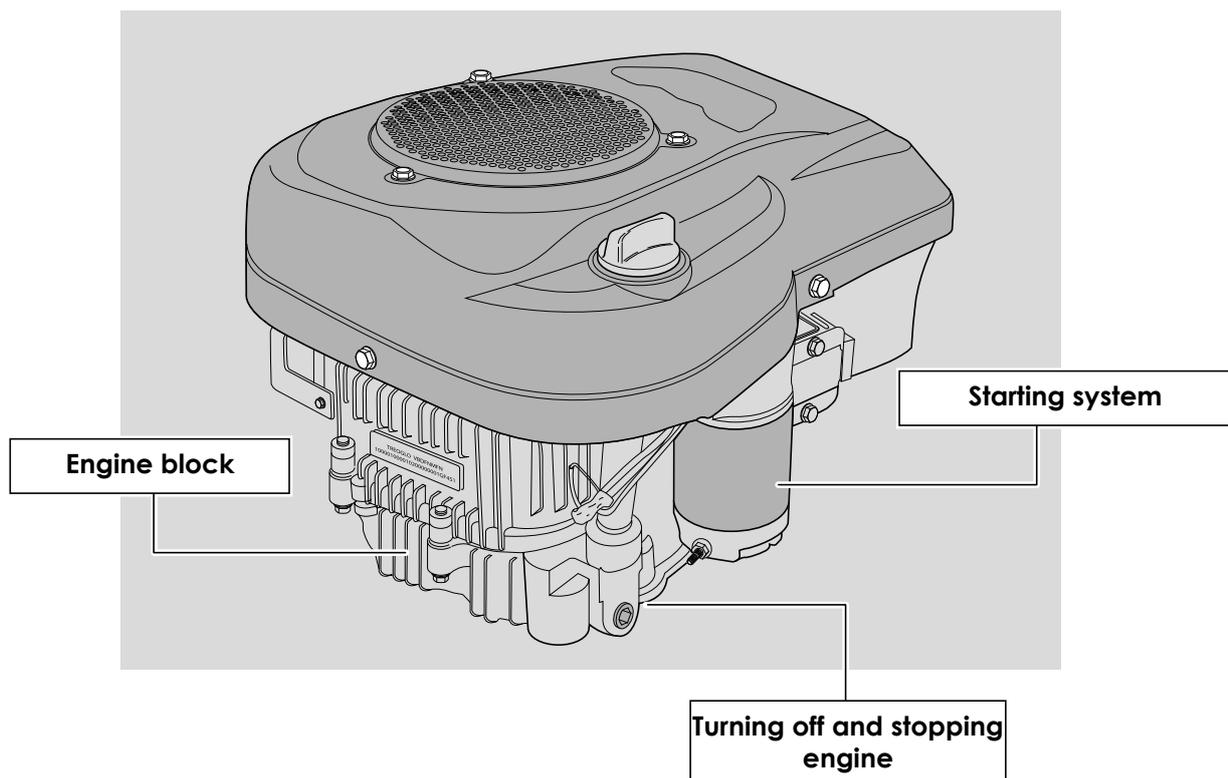
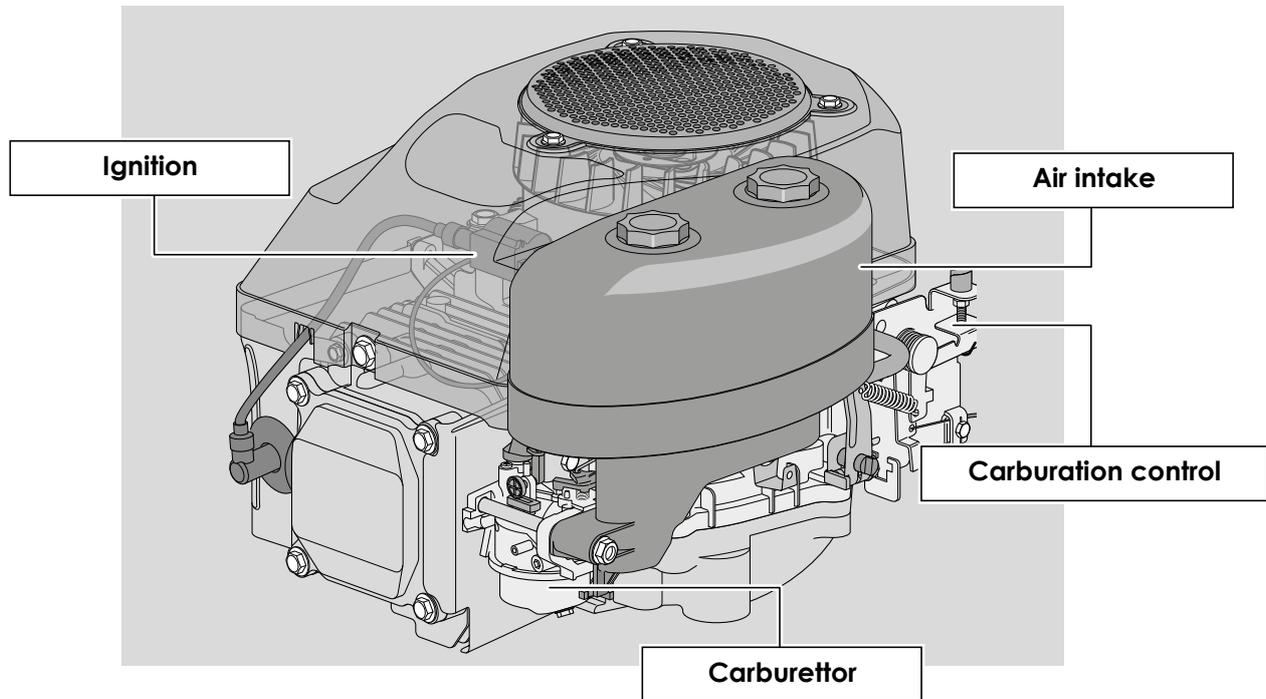
Chapter Ref.	Description of screw	Tightening torques
6 - 10	Attachment bolt flywheel	110 - 120 Nm
6 - 9	Fixing screw reel	8 - 12 Nm
6	Fixing screw starting motor	22 - 30 Nm
6	Starting motor screw	8 - 12 Nm
7	Fixing nuts carburettor and filter	8 - 12 Nm
8	Support screws petrol pump	8 - 12 Nm
8	Support return air screw	8 - 12 Nm
8	Support screws	8 - 12 Nm
9 - 10	Spark plug tightening torque	18 - 22 Nm
10	Screws valve cover	8 - 12 Nm
10	Fixing head screws	50 - 55 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 - 27 Nm
11	Fixing screws lower connecting rod cap	16 - 18 Nm

**P.S. For the coupling torque of all standard screws refer to the single table.**

### 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
Check oil level	-	■	-	-	-
Change oil <sup>*(1)</sup>	■	-	-	-	■
Check and oil pre-filter <sup>*(2)</sup>	-	■	-	-	-
Blow filter <sup>*(2)</sup>	-	-	■	-	-
Check spark plug	-	-	-	■	-
Replace spark plug	-	-	-	-	■

<sup>\*(1)</sup> Replace the oil every 25 hours if the engine is working at full load or at high temperatures.  
<sup>\*(2)</sup> 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).

- tightening the screws  11.2);
- functional test  4.3).

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

### 4.2. 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 and oiling the air filter  5.1);
- adjusting minimum and maximum speeds  8.1 and 8.3));
- inspecting the condition of the spark plug; checking the distance between the electrodes  9.1);

## 4. ENGINE TUNING AND TESTING

### 4.3. 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 throttle control in "CHOKE", start the engine a few times to check it runs normally.

#### c. Check the engine rpm

When the engine is hot enough, check the engine speed with the throttle control set to "SLO" 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

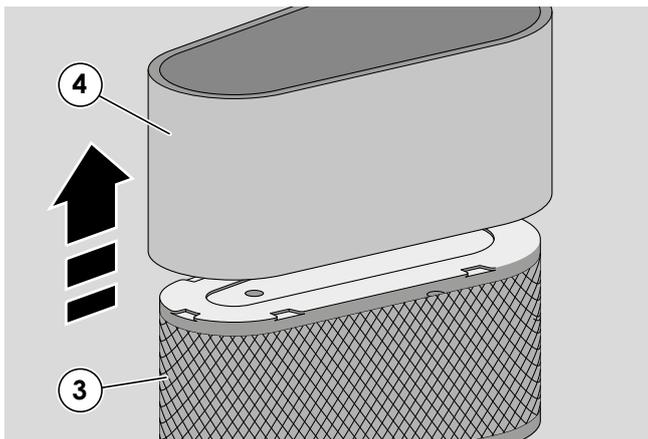
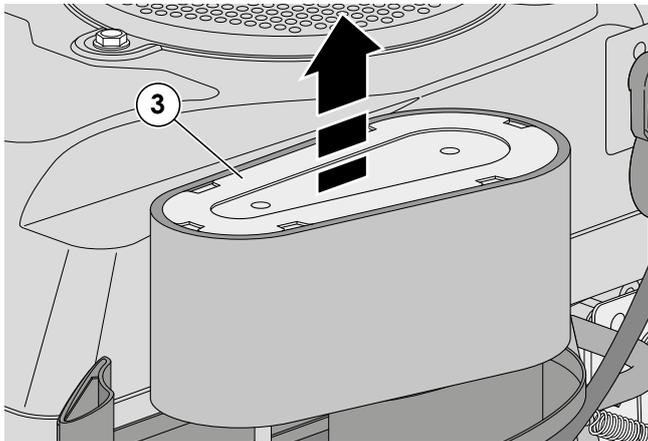
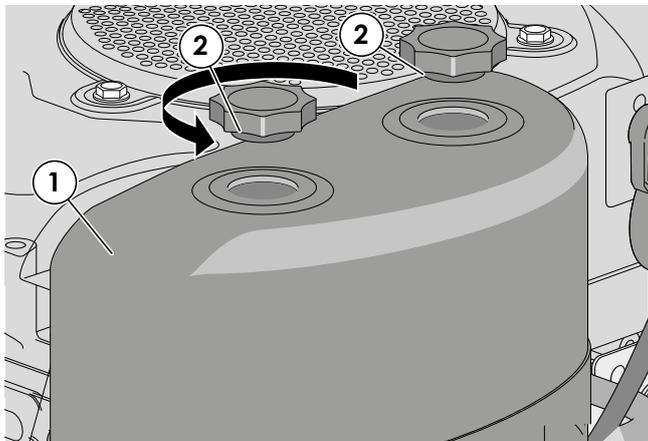
### General information

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 ] for 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 found on the left hand side of the engine and can be inspected without having to remove other parts.



### 5.1. Maintenance of filtering element



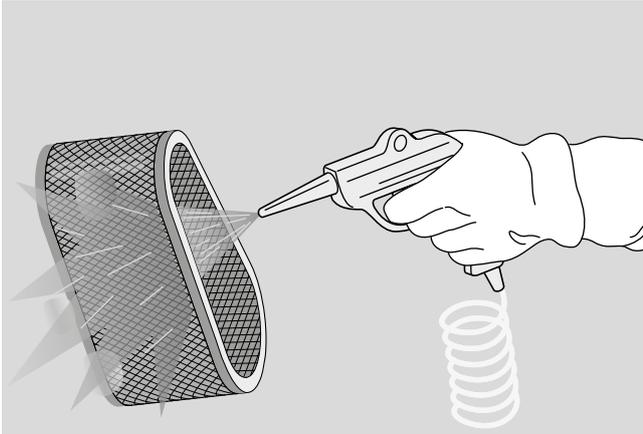
**WARNING: Never run the engine without air filter. The engine would certainly be damaged.**

1 - Clean around the filter cover (1).

2 - Unscrew the two screws (1) and remove the knobs (2).

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

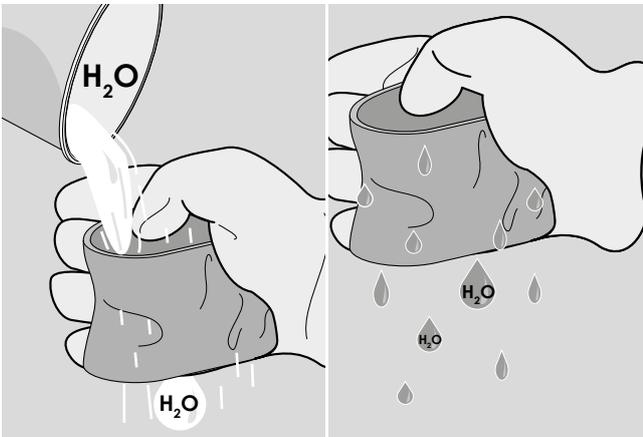
## 5. PETROL SUPPLY AND AIR INTAKE



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.**

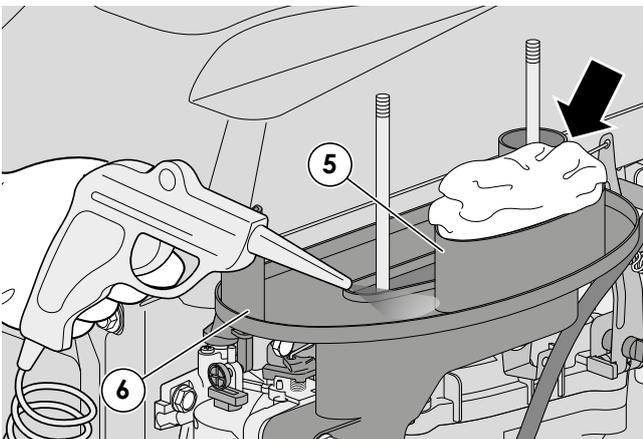


5 - Wash the prefilter with water and detergent and let it air dry..

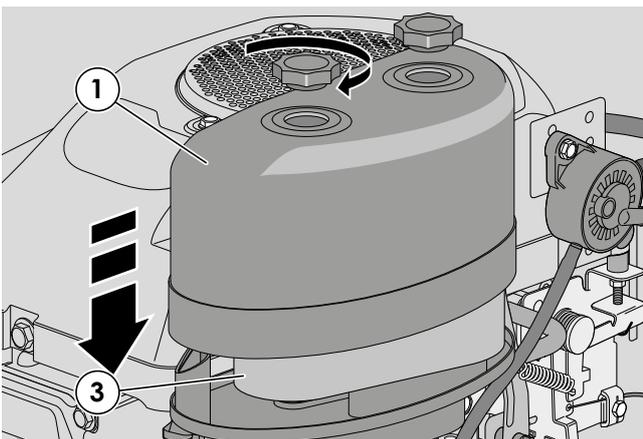


**IMPORTANT : the prefilterer MUST NOT be oiled.**

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 - Install the foam element (3) in its housing and refit the cover (1), tightening the knobs.

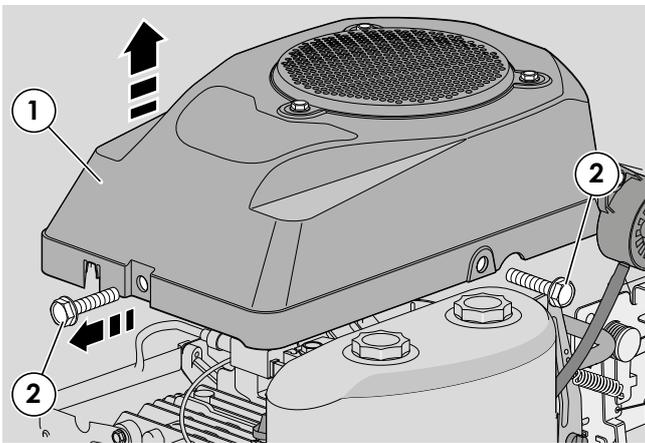
## 6. STARTING SYSTEM

### 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.

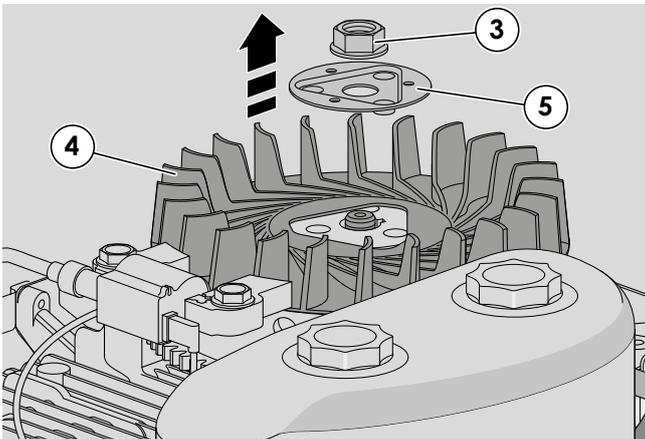
See the relevant section [\[🔧 14\]](#) for advice on resolving problems due to the malfunctioning of the starting system.

The starting motor is located on the right-hand side of the engine. For maintenance operations, it is necessary to dismantle the motor from the machine, observing the instructions provided in section [\[🔧 11.1\]](#). Then proceed with the operations described below.

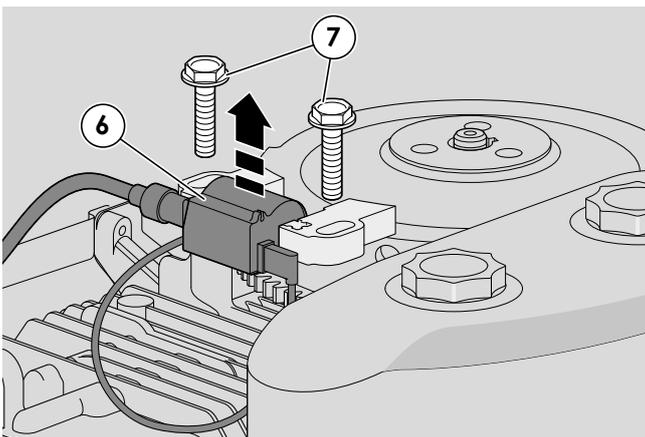


### 6.1. Replacement of brushes

1 - Remove the cowl (1) of the engine by removing the three screws (2).

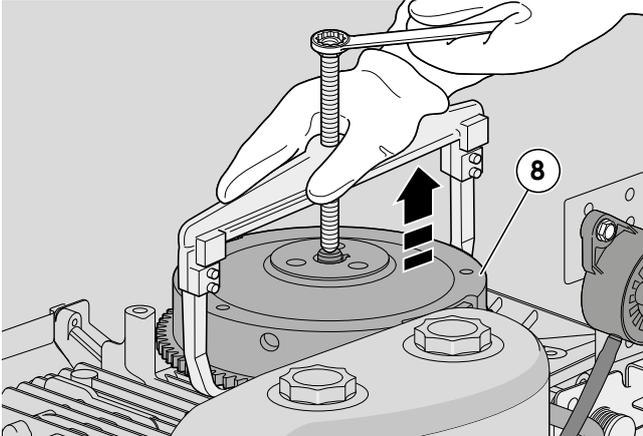


2 - By means of a pneumatic wrench, loosen the nut (3) and remove the fan (4), retaining the flywheel lock (5).

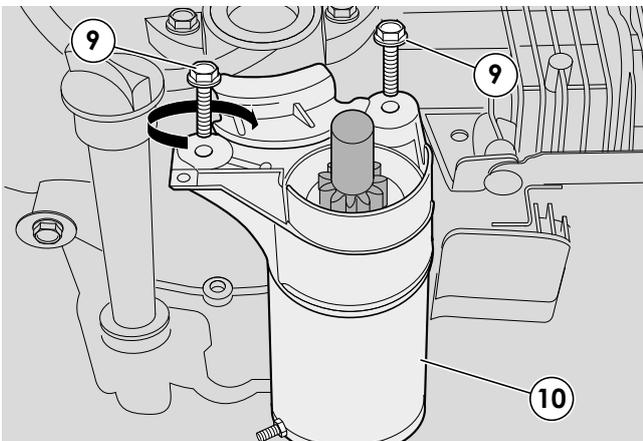


3 - Remove the electronic coil (6) by removing the screws (7).

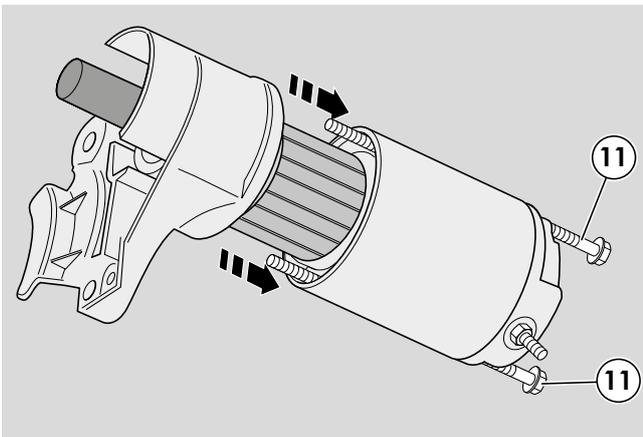
## 6. STARTING SYSTEM



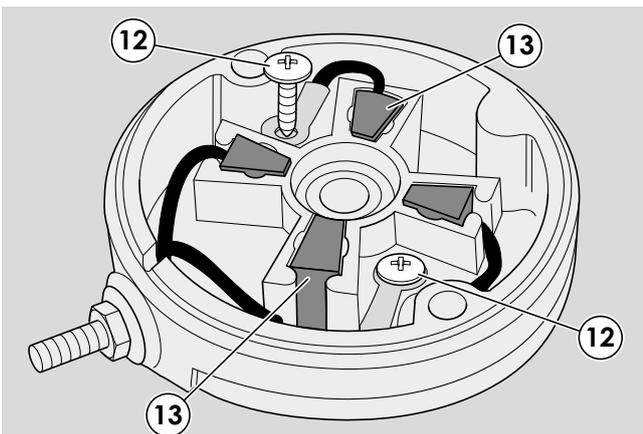
4 -  Using a suitable extracting tool, remove the flywheel (8) as indicated in the diagram.  
**Ensure that the engine shaft key is retained.**



5 - Remove the screws (9) and lift out the starting motor (10).

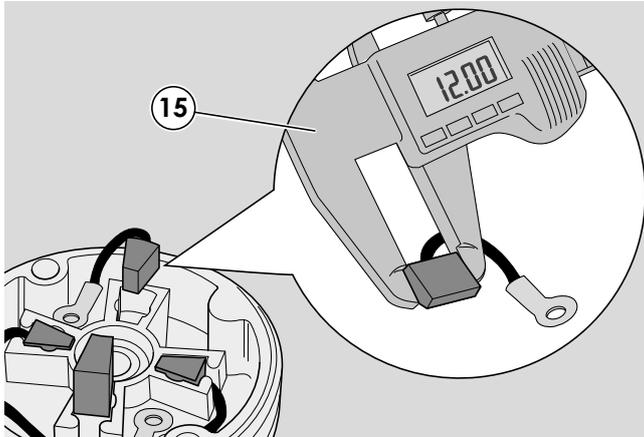


6 - Loosen the screws (11) and remove the lower part of the starting motor.



7 - Unscrew the two screws (12) which secure the brushes (13) inside the lower cover of the starting motor. Remove the springs (14).

## 6. STARTING SYSTEM



8 -  Verify the condition of the brushes and, using a gauge, measure (15) the length which should be between 8.5 and 12 mm. If the length is shorter, the brushes must be replaced as indicated below.

9 - Insert new brushes in the appropriate seats and secure with the screws (12).

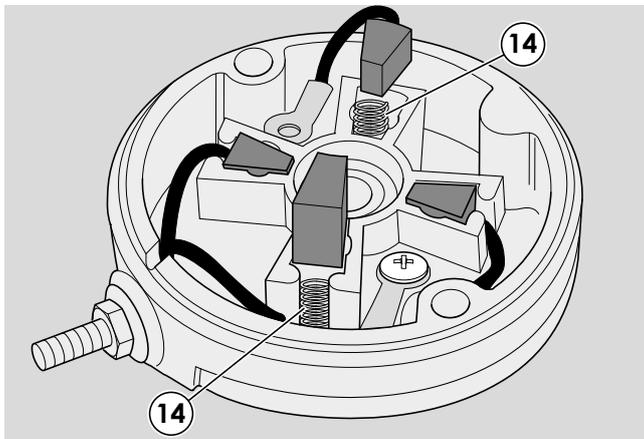
**Pay particular attention to the correct positioning of the brushes and springs.**

10 - Re-assemble the starter motor, securing the screws (11) to the indicated couple.

11 - Fix the starter button with the screws (9) to the indicated couple and refit the flywheel (8).

11 - Refit the tape reel and fix the screws to the indicated couple [  9.3] execute the regulation in accordance with the regulation air gap [  9.2].

12 - Refit the pivot and fix the nut (3) to the indicated couple, and the superior cover.



### 6.2. Replacement of starting motor

Perform operations indicated in [  6.1].

#### Tightening torques

3	Flywheel fixing nut	110-120 Nm
7	Coil fixing screw	8-12 Nm
9	Fixing screw starting motor	22-30 Nm
11	Starting motor screw	8-12 Nm

#### Technical information

Brushes length	8,5÷12 mm
Air gap tape reel/flywheel	0,25-0,40 mm

#### Special equipment

15 Gauge

## 7. CARBURATION

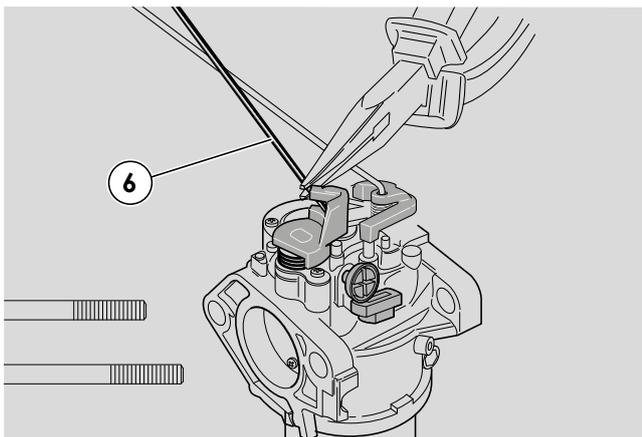
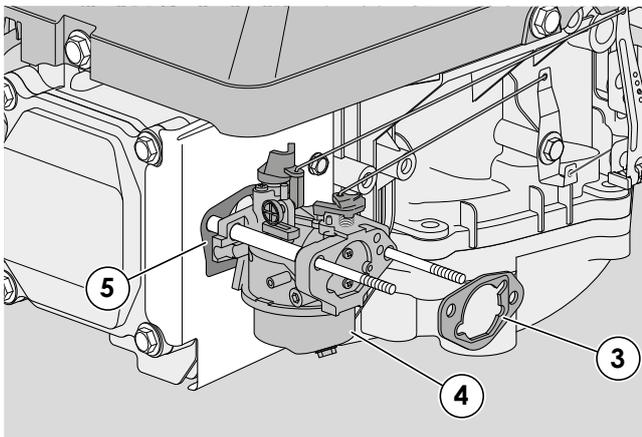
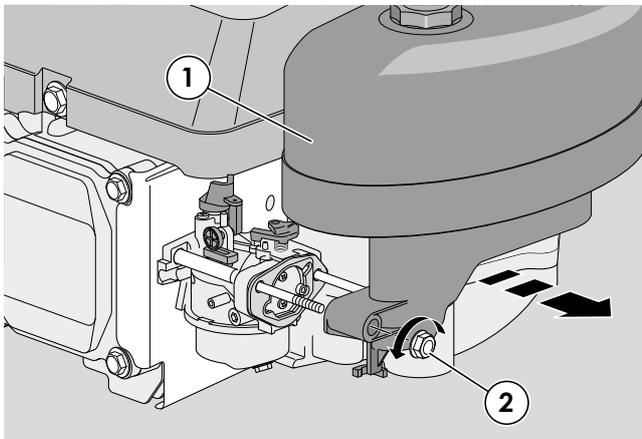
### General information

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 located on the left-hand side of the engine. For maintenance operations it is necessary to dismantle the air intake filter in the sequence shown below.

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

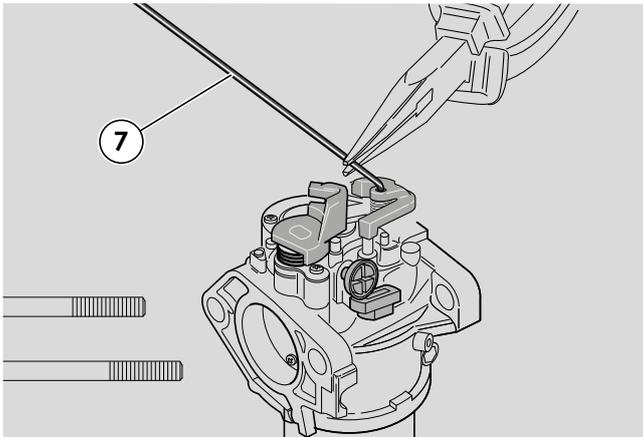
1 - Remove the complete filter (1) by unscrewing the nuts (2).

Remove the clamp for the petrol pipe from the side of the carburettor and use a suitable container to collect all the petrol in the tank and the pipe.

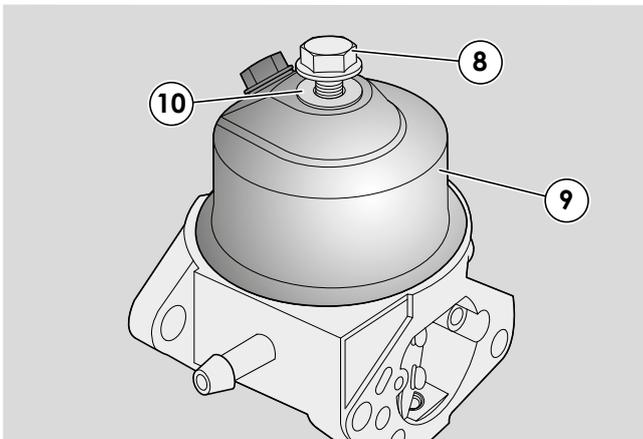
2 - Remove the washer (3) and lift the carburettor off (4). Retain washer (5).

3 - Using pliers, remove the tie engine shaft (6) of the accelerator throttle lever.

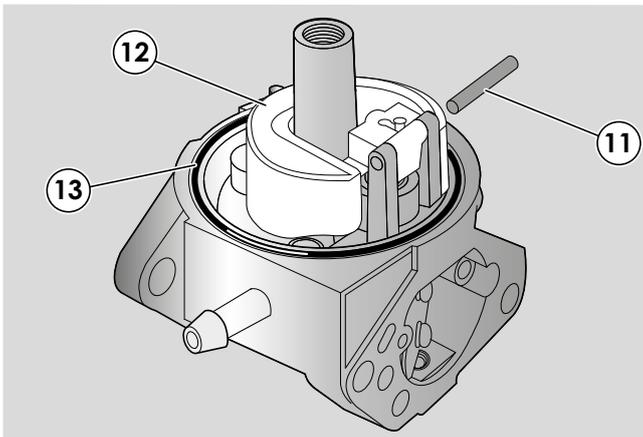
## 7. CARBURAZIONE



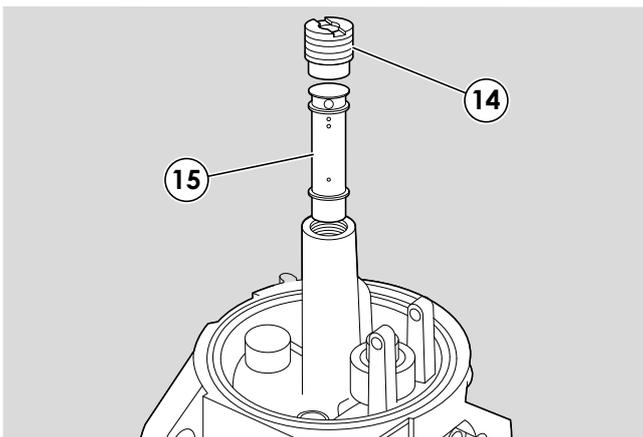
4 - Remove tie engine shaft (7) of the starter throttle lever.



5 - Loosen the central screw (8) fastening the float chamber (9), remove the relative gasket (10) and carefully collect all the petrol left in the float chamber.

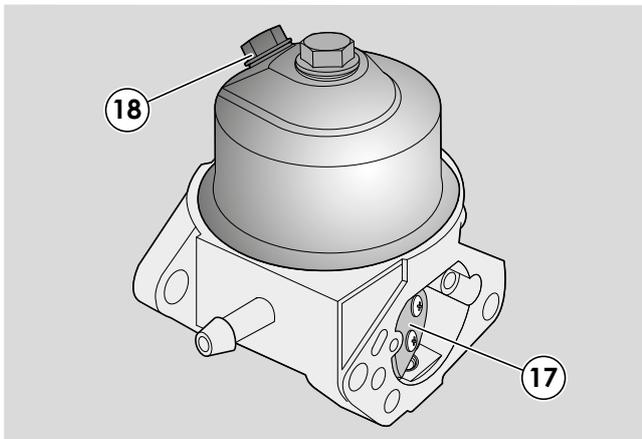
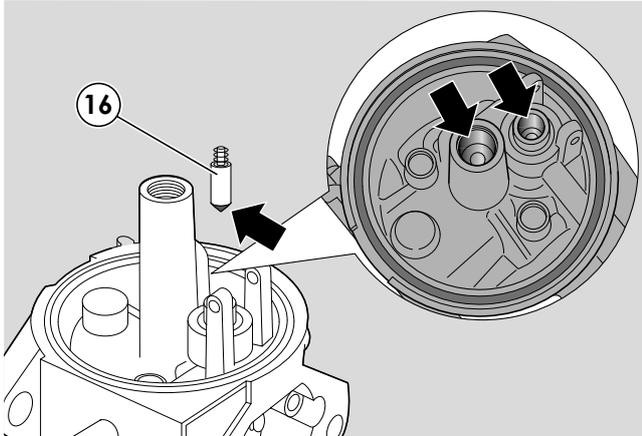


6 - Pull out the pin (11), dismount the float (12) and remove the gasket (13).



7 - Undo the main jet (14) and pull out the pilot jet (15).

## 7. CARBURATION



8 - Check that no impurities or dirt are deposited in the seat of the needle (16) and of the pilot jet (17).

Verify that the rubber tip of the needle is not marked or worn.

9 - Clean the carburettor (4), the main jet (14) and the pilot jet (16) thoroughly by immersing them in clean petrol (or a detergent) for 24 hours. Dry with compressed air, blowing well through the carburettor holes.

10 - Mount the carburettor following the previous points 7, -6 and 5 in reverse order, remembering that:

-  It is always advisable to replace the washer (13) and the gasket (10) of the float chamber.

- the float (12) must oscillate freely on the pin (11);

- the jet (14) should never be modified or replaced with others even if they seem to have the same specifications;

- the choke (17) must open and close regularly;

- the float chamber drain screw (18) must be facing forwards.

10 - Remount the tie rods (6) and (7) checking that the governor system moves smoothly without stopping.

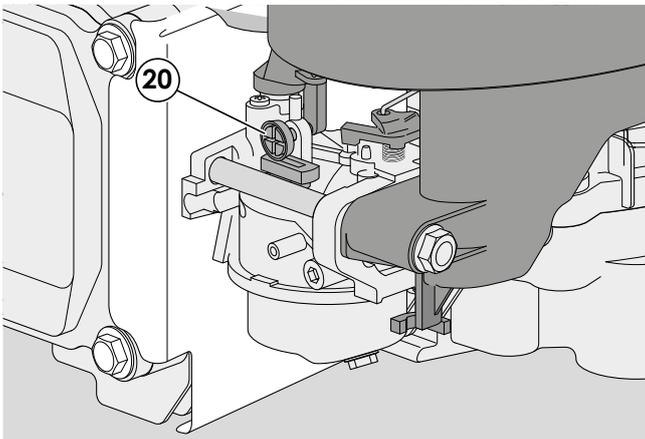
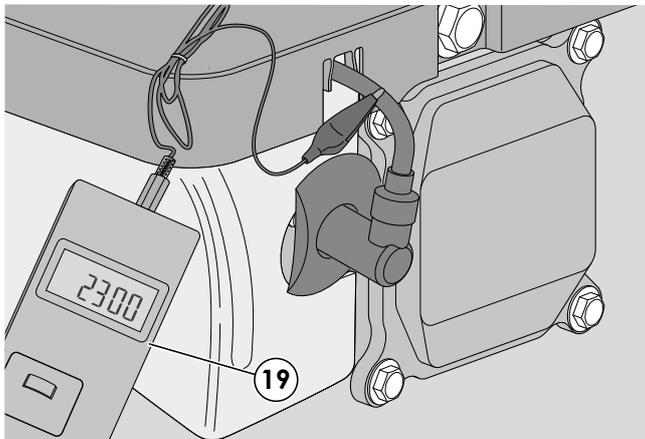
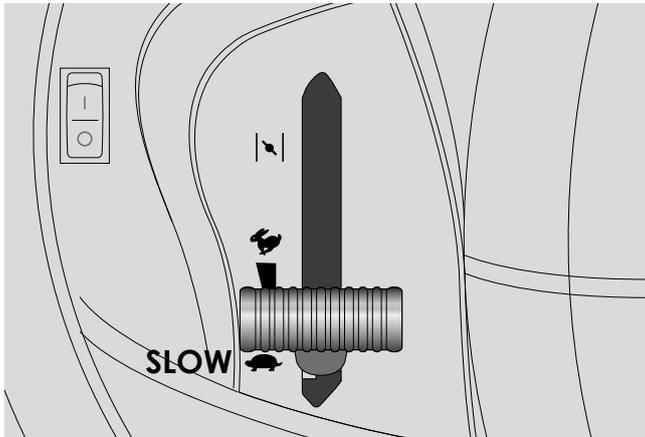
11 -  Always replace washers (3) and (5) when re-mounting the carburettor onto the engine.

12 - Fit the air filter with relative nuts (2) to the indicated couple.

### 7.2. Replacing the carburettor

1 - Perform operations 1 – 2 – 3 – 4 – 9 – 10 – 11 – 12 indicated in section [\[ 7.1 \]](#) above.

## 7. CARBURATION



### 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 (19).



**NOTE:** The engine's minimum speed must be between 1850 ( $\pm 150$ ) rpm.

3 - Turn the screw (20) until you achieve a stable minimum speed within the above values.

### 7.4. Adjusting maximum speed



**NOTE:** This operation is carried out by adjusting the governor system [ 8.3].

### 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/filter 8-12 Nm

#### Technical information

Minimum speed (SLOW) 1850 g/1'

#### Special equipment

20 Speed indicator

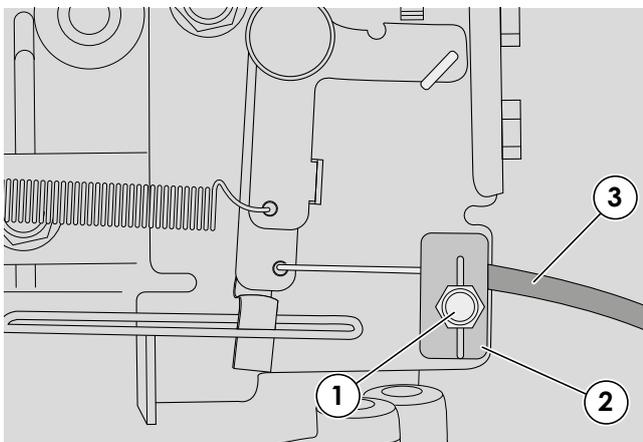
## 8. GOVERNOR SYSTEM OF THE CARBURETTOR

### 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.

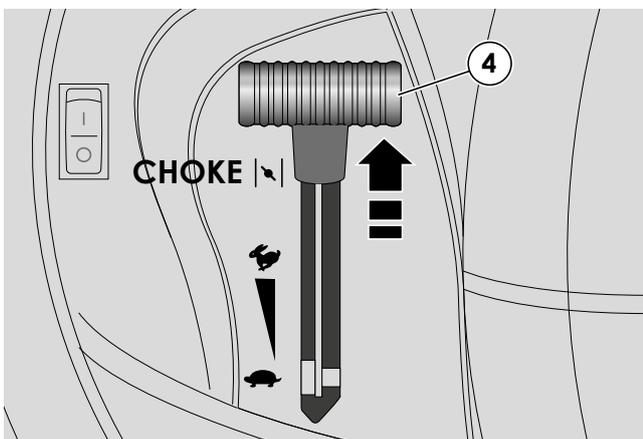
The force of the counterweights, transferred to the control lever, tends to shut the main carburettor butterfly, in opposition with the spring that would keep it open; the balance between the spring loading and the thrust of the counterweights on the control lever modifies the butterfly opening and adapts 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.

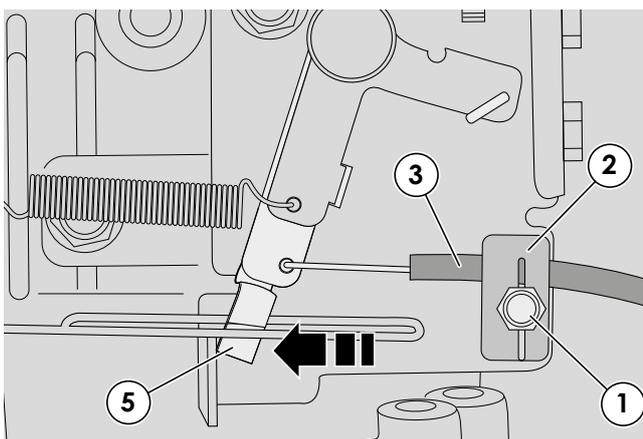


### 8.1. Adjusting of accelerator cable

1 - Loosen the screw (1) of the clamp (2) so that the cable casing (3) is free to move.



2 - Set the throttle control lever (4) to "CHOKE".



3 - Move governor control lever (5) forward as far as possible and, by keeping it in this position, lock the casing (3) full tightening the screw (1) of the clamp (2).

## 8. GOVERNOR SYSTEM OF THE CARBURETTOR

### 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 - Disconnect the outlet tube (6) which is connected from the pump (7) to the carburettor.

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

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

### 8.3. Pump replacement (if present)

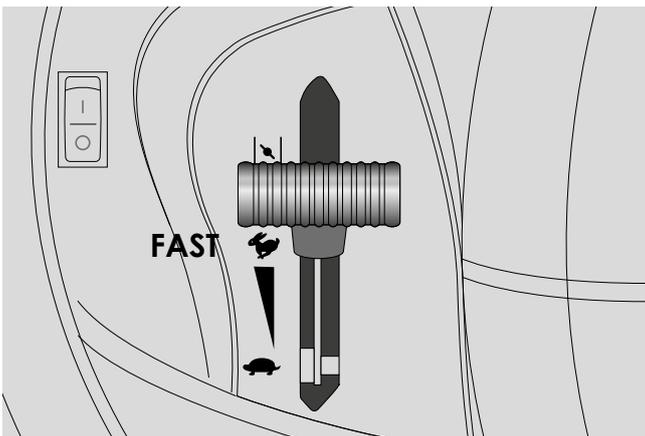
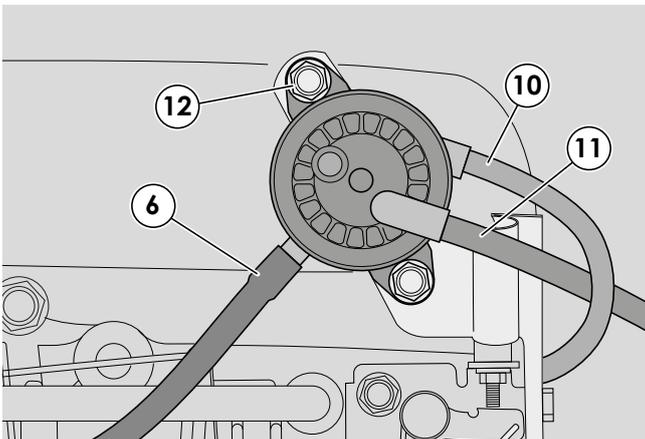
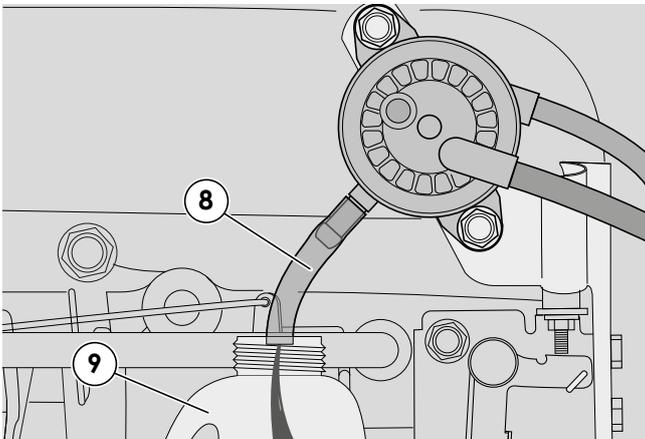
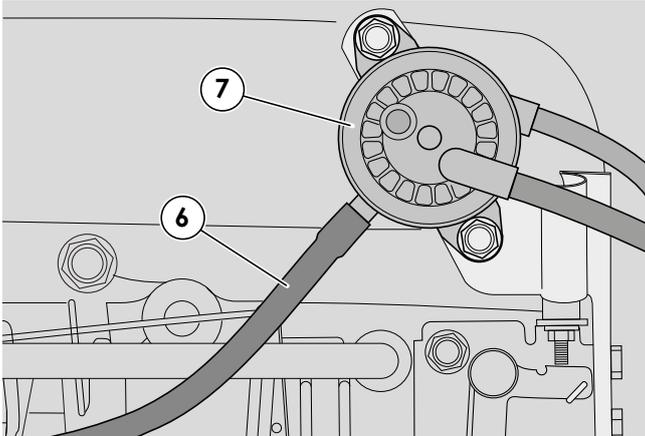
1 - Disconnect the outlet tube (6), the inlet tube (10) and the pressure indicator tube (11).

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

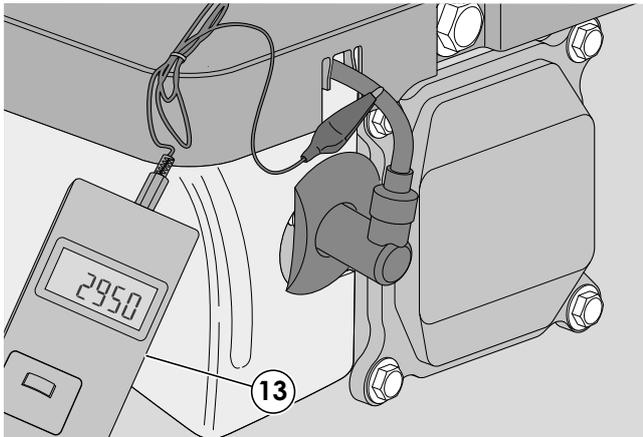
### 8.4. Adjusting maximum speed

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

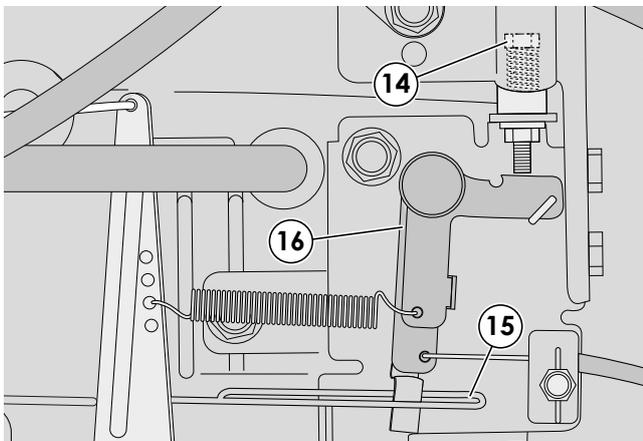
2 - Let the engine heat up for a few minutes then set the throttle control to "FAST".



## 8. GOVERNOR SYSTEM OF THE CARBURETTOR



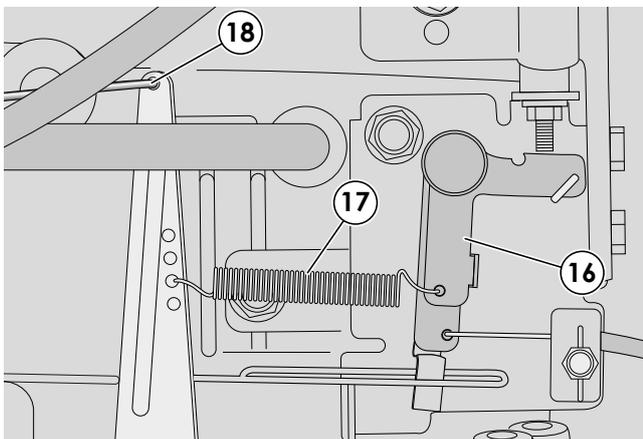
3 -  Check the rotation speed on the speed indicator (13).



4 - Act on the regulation screw (14) to establish the correct value of the maximum turn system.

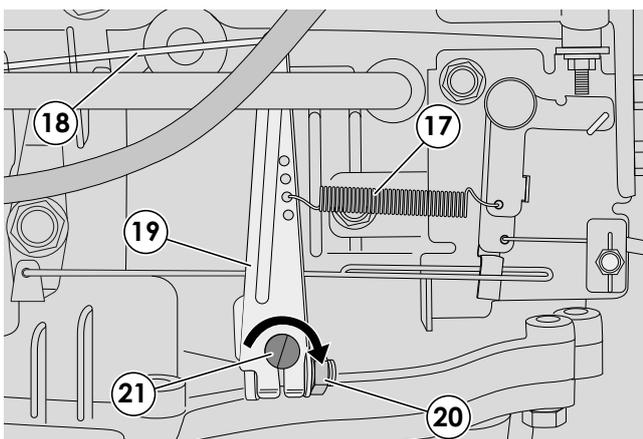
 **During the regulation, verify that the movement of the mobile levels (16) don't damage the contact with level air support (15) (position "CHOKE").**

 **NOTE: The engine's maximum speed must be between 2950 ( $\pm 250$ ) rpm; if you do not read this value, proceed as follows**



5 - Check:

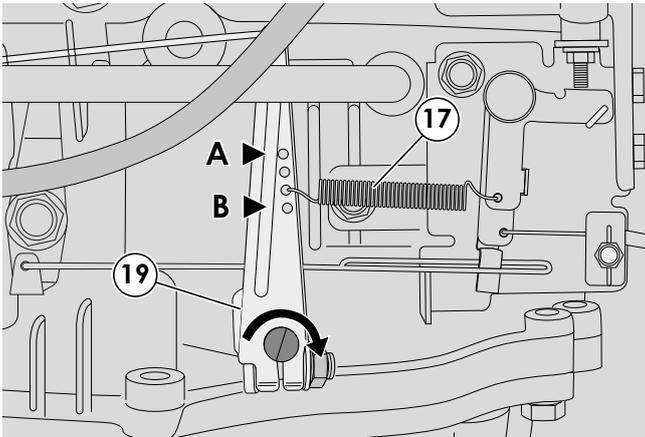
- that the spring (17) is intact;
- that the tie-engine shaft (18) is intact and undamaged;
- that the moving levers (16) are not bent or deformed and replace the entire support if necessary [  8.5].



6 - If the above checks do not show any faults, the phasing of the governor's control lever (19) with respect to the counterweight device must be checked:

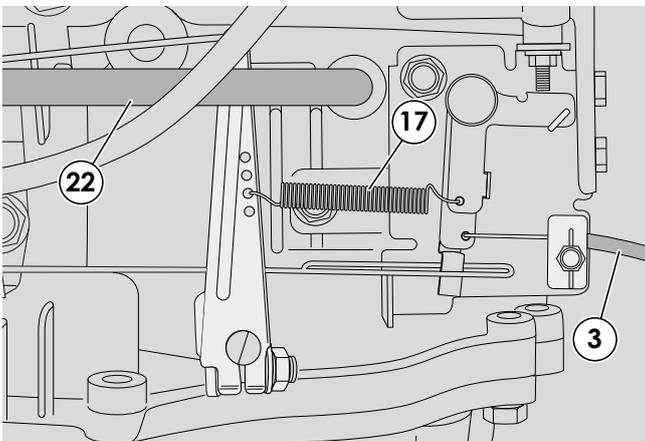
- stop the engine and move the accelerator control to "FAST";
- slacken off the control lever (20) locknut (19);
- without changing the lever (19) position determined by the spring (17) and tie-engine shaft (18), use a screwdriver to turn pin (21) clockwise to the end of its stroke and then lock the nut (20).

## 8. GOVERNOR SYSTEM OF THE CARBURETTOR



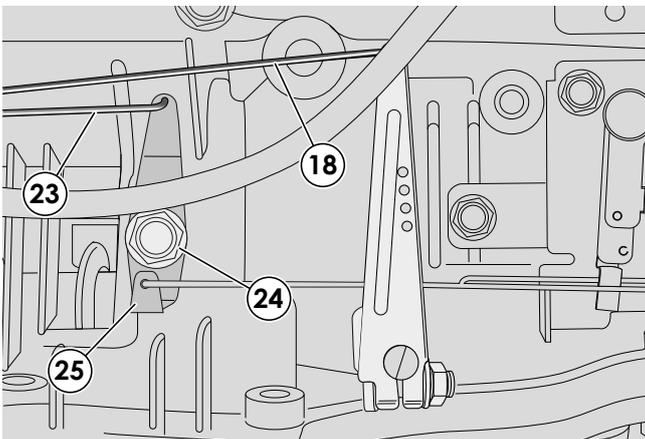
7 - Four holes are present on the lever (19) for inserting the spring (17). The number of engine rotations is determined depending on the position of the spring:

- top hole (A): maximum rotations;
- bottom hole (B): minimum rotations.



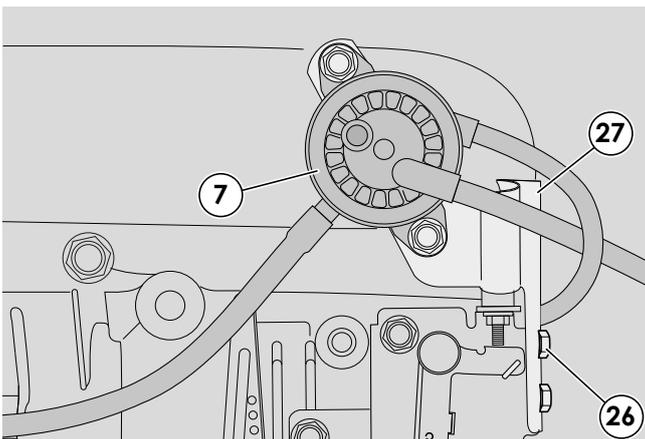
### 8.5. Replacing the lever support

1 - Disconnect the accelerator cable (3) and remove the breather pipe (22) and the spring (17).



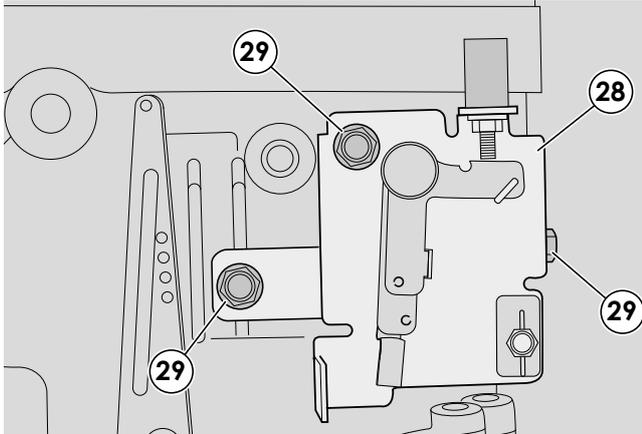
2 - Disconnect the tie engine shaft (18) from the air throttle and the tie engine shaft (23) from the starter throttle.

3 - Remove screw (24) and remove air lever support (25).



4 - Unscrew the two screws (26) which fasten the petrol pump support (if present) (27) to the lever support (28) and remove the support.

## 8. GOVERNOR SYSTEM OF THE CARBURETTOR



5 - Remove the three screws (29) which fasten the levers support (28) of the engine.

6 - Perform the above operations in reverse order when assembling.

7 - Adjust the maximum speed [ 8.4].

### Tightening torques

<b>24</b>	Support air level screw	8-12 Nm
<b>26</b>	Support screws petrol pump	8-12 Nm
<b>29</b>	Support level screws	8-12 Nm

### Technical information

Maximum speed (FAST)	2950 r.p.m.
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### Attrezzi speciali

<b>13</b>	Speed indicator
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## 9. IGNITION

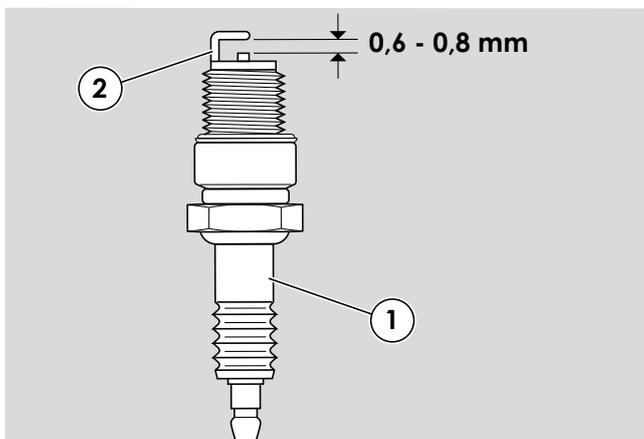
### General information

The **ignition system** has a flywheel with an electronic coil which supplies high voltage to the spark plug.

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.

Dismount the engine from the machine by following the instructions in section [  11.1 ].



### 9.1. Checking the efficiency of the ignition system

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.

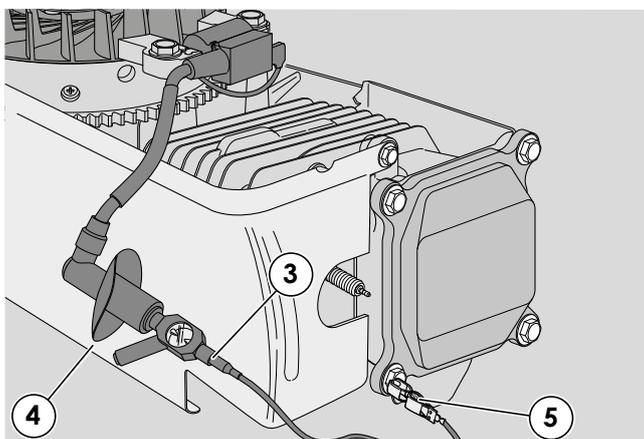
**Replace the spark plug** (with one of the same or equivalent characteristics) **if the electrodes (2) are burnt or if the porcelain is broken or cracked.**



#### **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.**

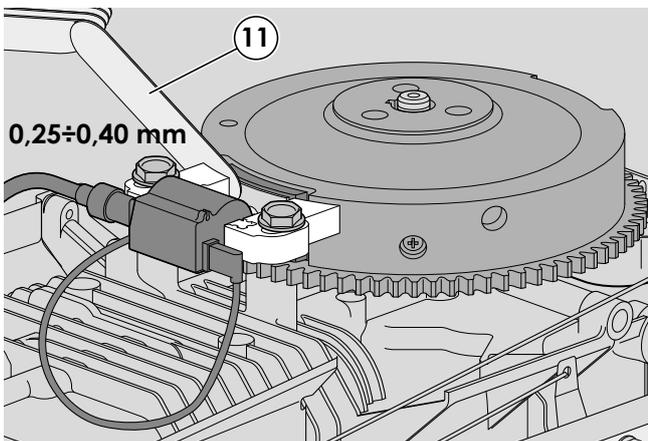
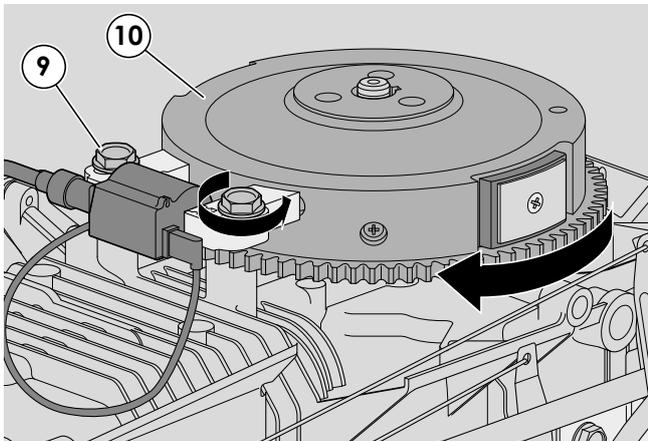
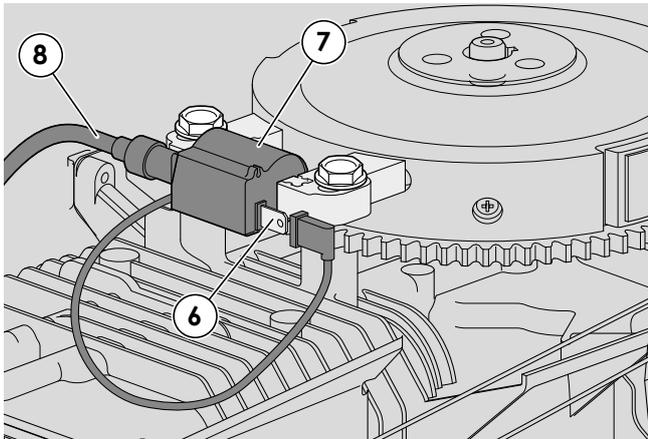


2 -  Connect the tester (3) to the spark plug cap (4) and to earth on the engine (5). Activate the starter and see in the instrument if the spark jumps.

3 - If the test has a positive result, clean the electrodes (2) with compressed air and adjust the distance to 0.6-0.8 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

1 - Remove the cowl and the fan [ [img alt="hand icon" data-bbox="830 168 865 183"/> 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), release the brake manually and rotate the flywheel (10) until the magnetic inserts are lined up with the poles of the coil core.

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 0.25 and 0.40 mm.

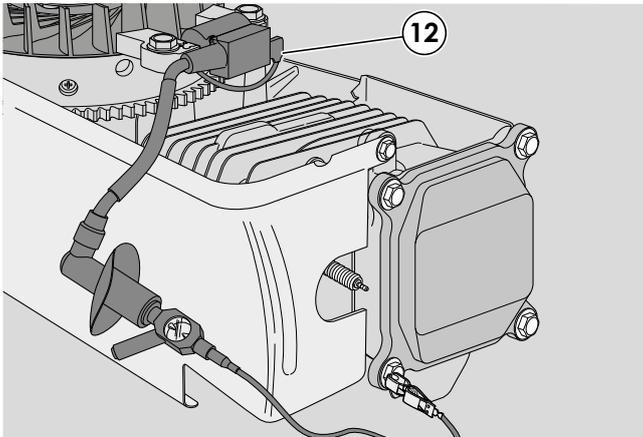


**NOTE:** An accurate inspection of the efficiency of a coil can only be carried out in a laboratory equipped with a oscilloscope.

To make a brief check, proceed as follows:

6 - Disconnect the earth cable faston (6) of the coil (7) and reposition the fan with the relative nut [ [img alt="hand icon" data-bbox="915 760 950 775"/> 6.1], so that the starter can be activated.

## 9. IGNITION



7 - 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 (12) is **not earthed**.

- **if the spark does not jump:** the coil is faulty and must be replaced [\[ \[🔧\] 9.3 \]](#).

8 - Close the nut to the indicated couple and refit the shutter [\[ \[🔧\] 6.1 \]](#).

### 9.3. Replacing the coil

1 - Remove the cowl and the fan [\[ \[🔧\] 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 shutter and close the nut to the indicated couple and the canopy [\[ \[🔧\] 6.1 \]](#).

#### Tightening torques

1	Spark plug tightening torque	18-22 Nm
9	Coil fixing screw	8-12 Nm

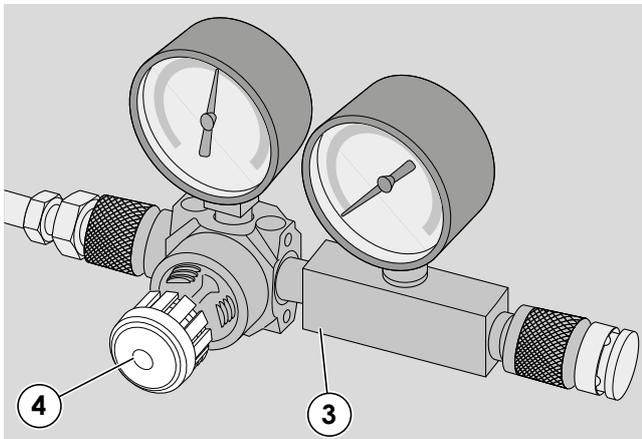
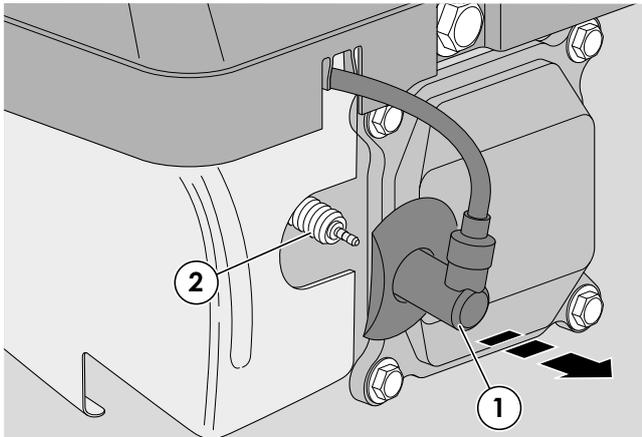
#### Technical information

Type of spark plug	RN12YC (Champion) or equivalent
Distance between electrodes	0,6-0,8 mm
Air gap/flywheel	0,25-0,40 mm

#### Special equipment

3	Tester for spark test
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## 10. ENGINE BLOCK - External repairs



### 10.1. Checking the compression

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 4.2 Bars (60 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.

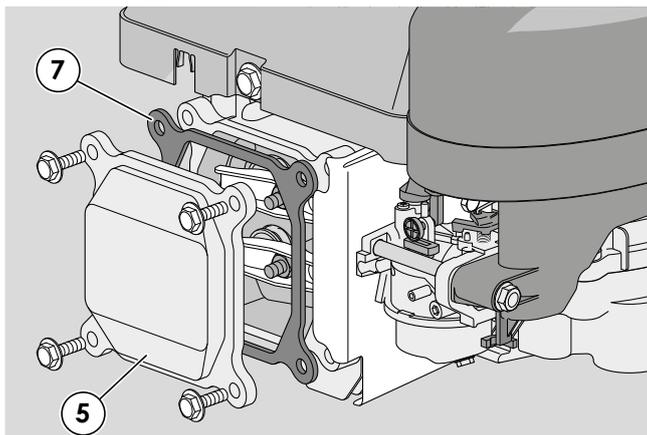
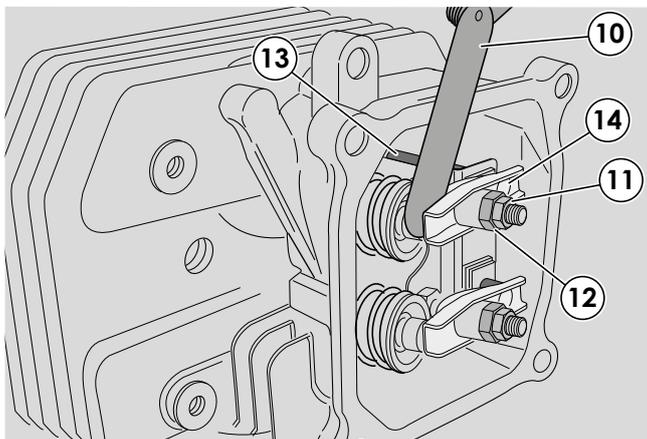
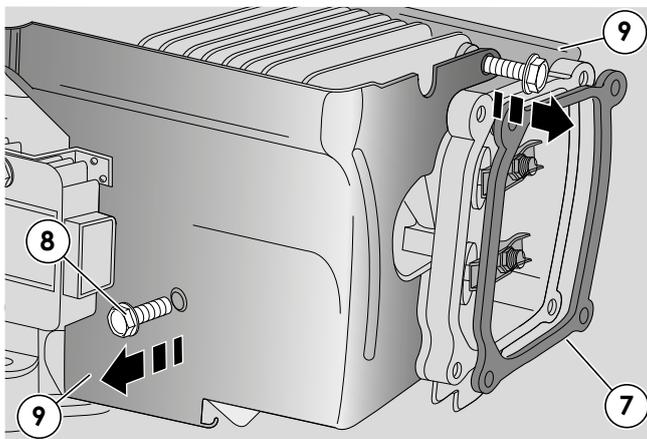
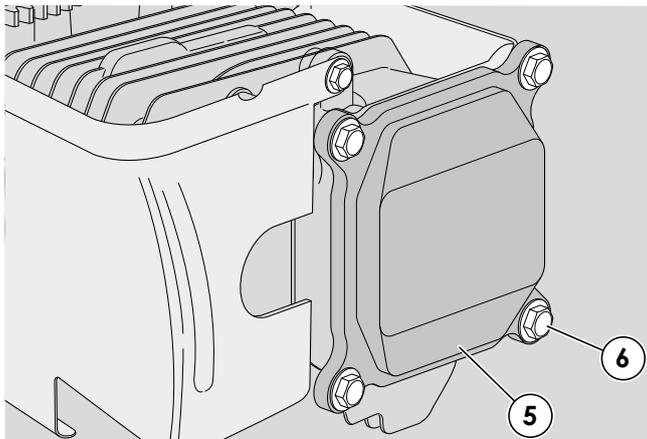
If the gauge falls rapidly it means that the compression is poor.

 **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.

## 10. ENGINE BLOCK – External repairs



If necessary, remove the engine of the machine according to indications in paragraph [\[ \[img alt="hand icon" data-bbox="825 150 855 165"/> 11.1\].](#)

### 10.2. Adjusting the valve clearance



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

1 - Dismount the cowl, filter and carburettor [\[ \[img alt="hand icon" data-bbox="875 250 905 265"/> 7.1\].](#)

2 - Remove the cover and demount the spark plug [\[ \[img alt="hand icon" data-bbox="505 320 535 335"/> 10.1\].](#)

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

4 - Unscrew the screws (8) and remove the right and left side panels (9).

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

6 - Use a 0.10 mm (inlet) or a 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.

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

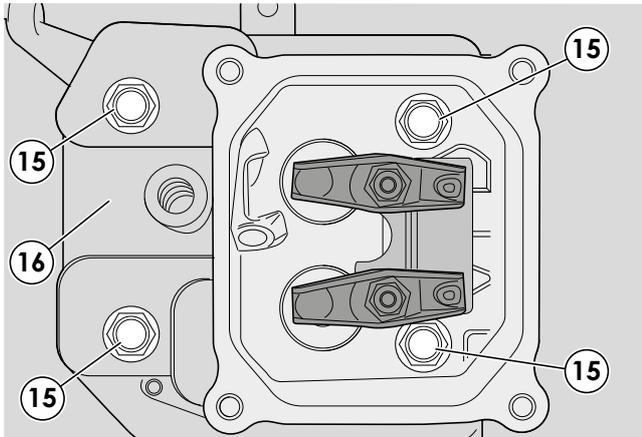
8 - Following adjustment, check that the pushrods (13) are properly inserted in the rocker arm housings (14) and always fully tighten the nut (11).

9 -  When reassembling check the condition of the gasket (7) of the cover (5) and replace it if it is damaged.

10 - Assemble the spark plug [\[ \[img alt="hand icon" data-bbox="745 845 775 860"/> 10.1\].](#)

11 - Refit the canopy, the filter and the carburettor and close the screws to the indicated couple [\[ \[img alt="hand icon" data-bbox="505 915 535 930"/> 7.1\].](#)

## 10. ENGINE BLOCK – External repairs

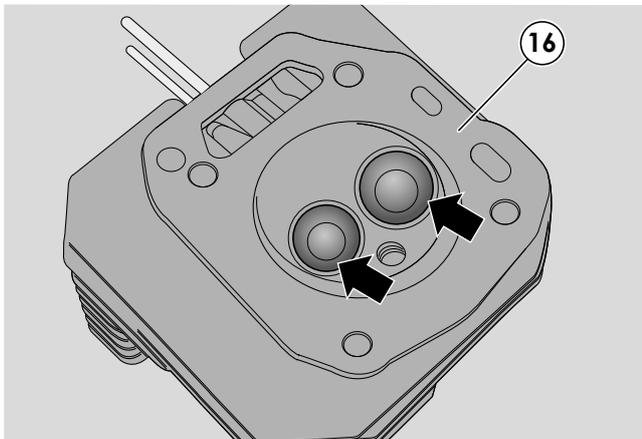


### 10.3. Dismantling and cleaning the cylinder head

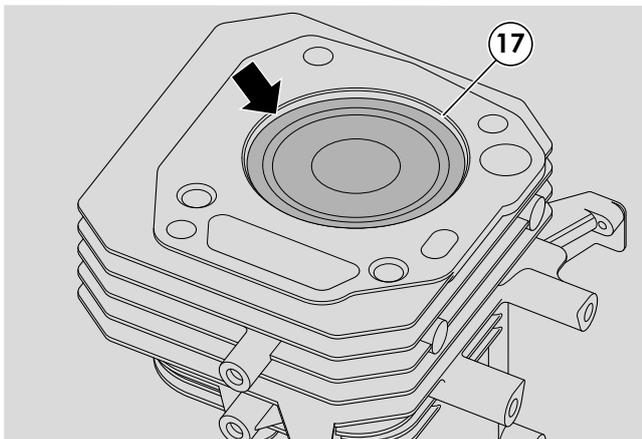
1 - Perform the operations indicated in points 1 - 2 - 3 - 4 in section [  10.2] above.

2 - Unscrew the screws (15) and remove the cylinder head (16).

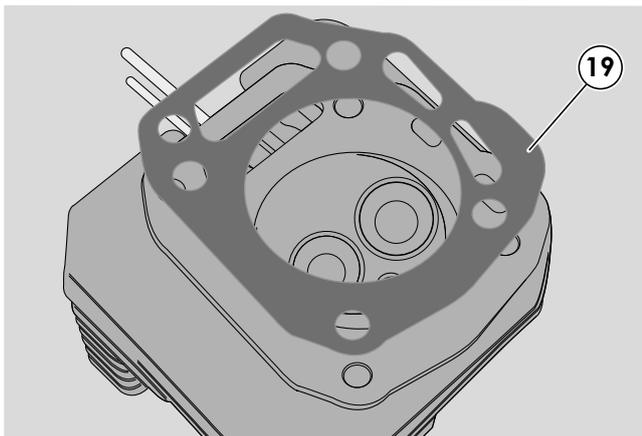
3 - Clean the cylinder head (16) and cylinder surfaces (17).



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



5 - Turn the flywheel manually to move the piston and clean inside the cylinder (17).

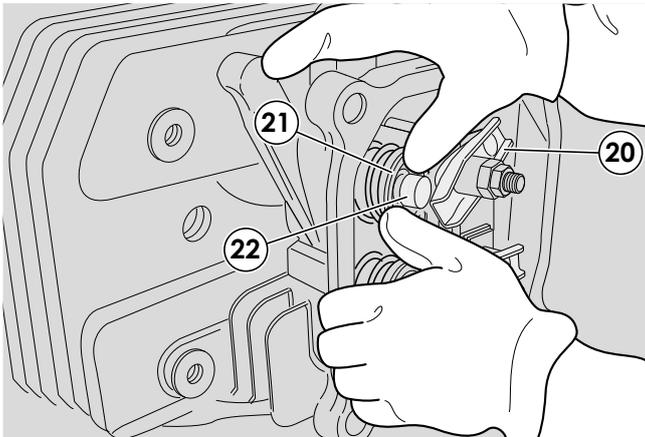


6 - When mounting:

- the gasket (19) must always be replaced;
- Remount the cylinder head (16), screwing the four screws (15) without fully tightening, then tighten them to the given torque values, using a cross-over sequence.

7 - 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 (20); press down the spring seal cap (21) and move it sideways to remove from the valve stem (22).

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



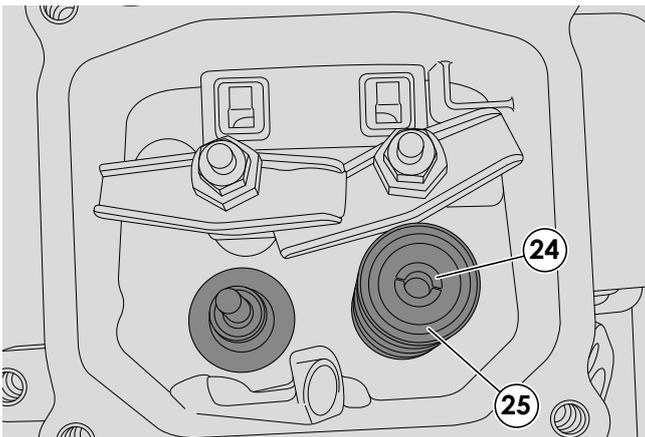
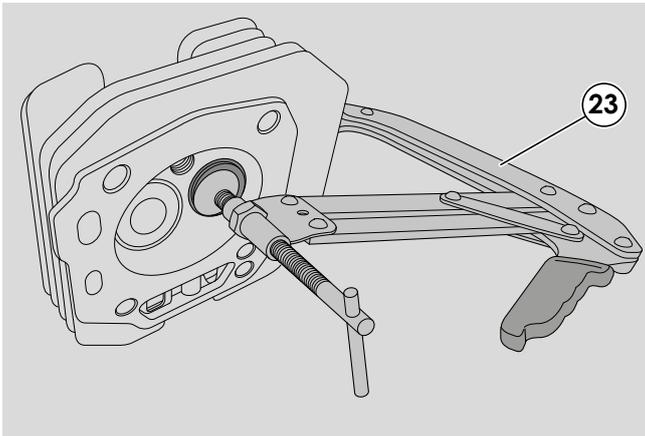
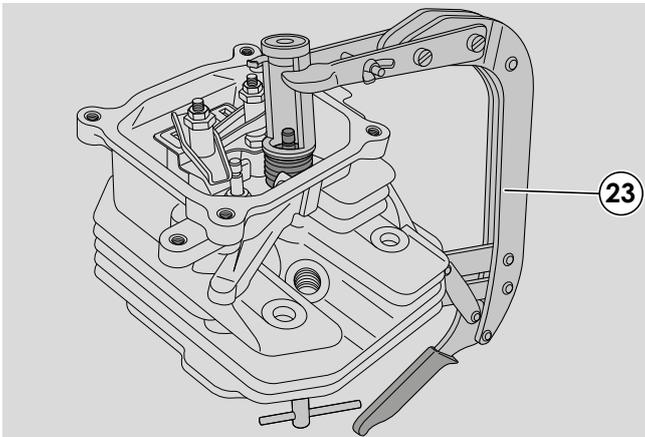
3 - Use an adequate tool to carry out the valve removal procedure.

4 - Position the tool (23) onto the upper and lower part of the valve as shown in the figure.

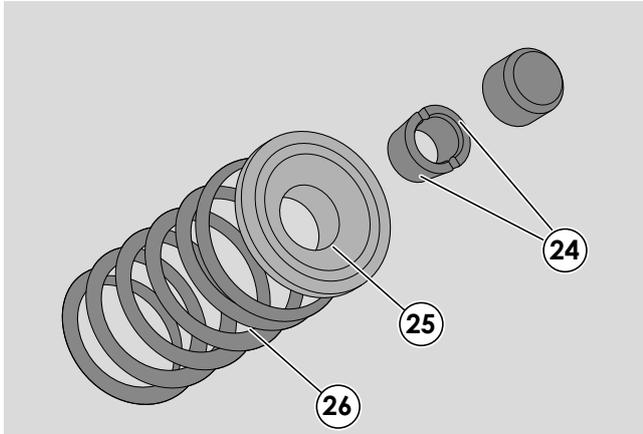


**NOTE** - The tool must be centered onto the valve cup and stem part of the valve itself.

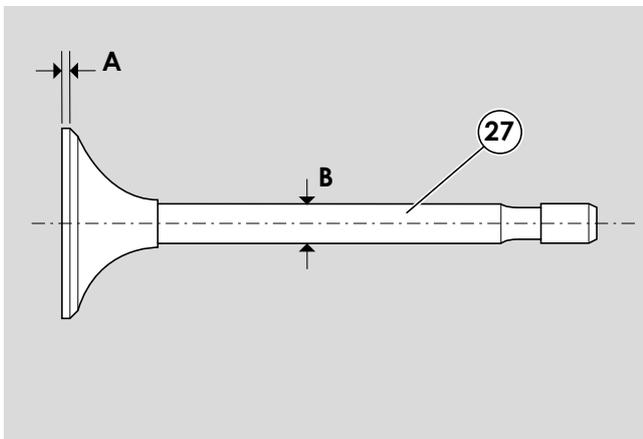
5 - Apply pressure with the tool onto the valve cup-washer (25). The two half-cones (24) will be pushed out of their seat.



## 10. ENGINE BLOCK – External repairs



6 - Remove the cup-washer (25), the spring (26) and the two half-cones (24).

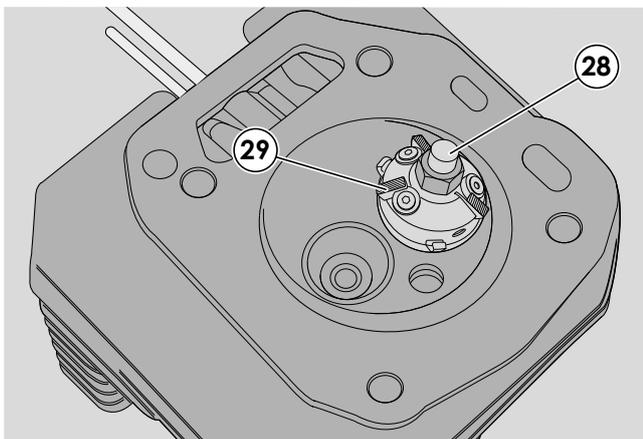


7 - Use an emery cloth to remove all incrustations from the valve head (27) and check the thickness of the rim (A). The valve must be replaced if the rim (A) is less than 0.5 mm (TRE0701 - TRE0702) or 0.8 mm (TRE0801) (**intake - IN**) or 1.0 mm (**exhaust - EX**) or if it shows signs of burning.

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:

**6,425 mm (inlet - IN)**

**6,375 mm (exhaust - EX)**



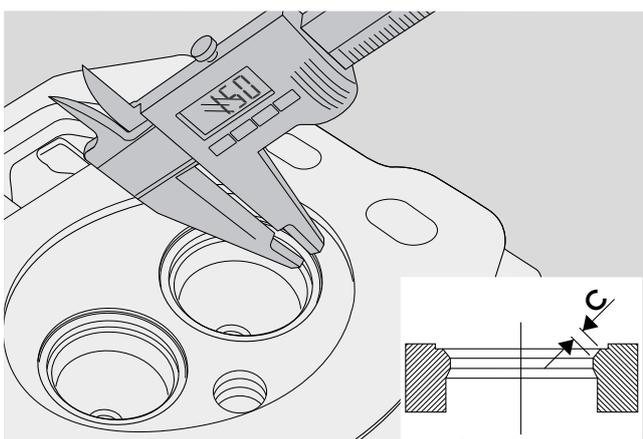
**NOTE - The valve seats must be ground by hand, using a special grinding tool with an angle of 45°.**



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

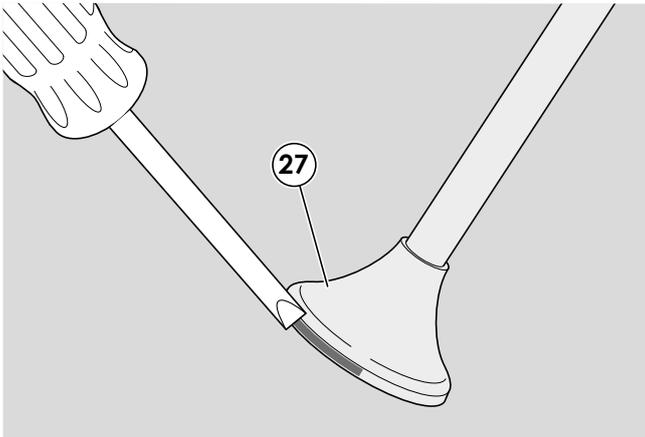


**NOTE - Grinding must be done taking care to remove as little material as possible.**

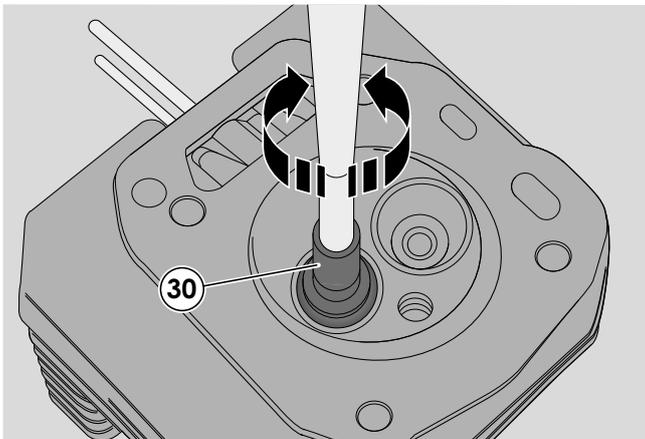


10 - Use a caliper gauge to check the width of the valve seat (C), which must be 1.5 mm; the cylinder head must be replaced if a greater value is measured.

## 10. ENGINE BLOCK – External repairs

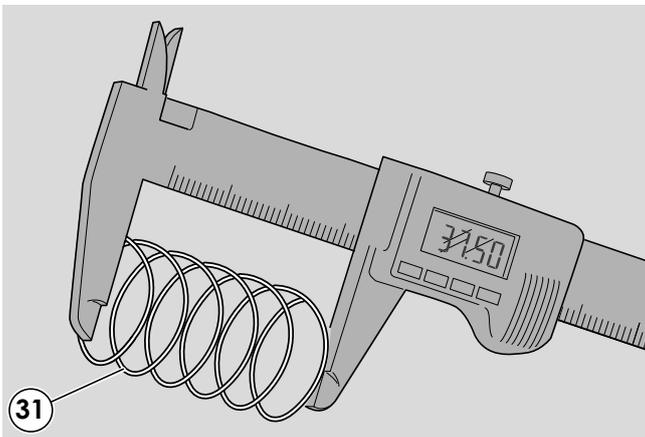


11 - Apply abrasive paste for grinding around the rim of the valve head (27) and then insert the valve into its seat.

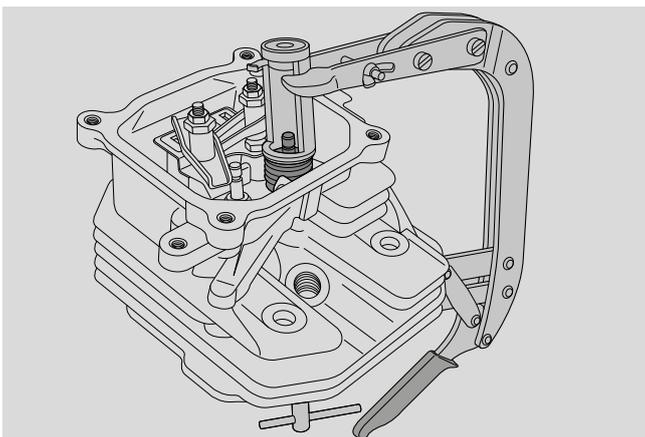


12 -  Use the special manually operated tool (30) to grind the seat and rim of the valve.

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



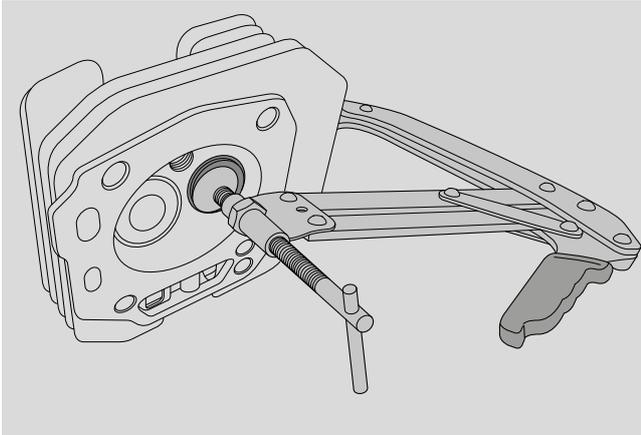
14 - Check the free length of the spring (31) and replace the spring if it is less than 37,5 mm.



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;

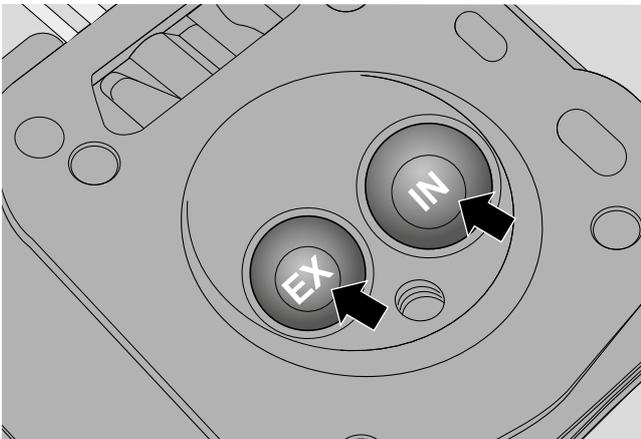
## 10. ENGINE BLOCK – External repairs



- Insert the valve and position the spring (26), the cup-washer (25) and the two half-cones (24) and follow the removal procedure in reverse using the tool (23), to lock the two half-cones into place.



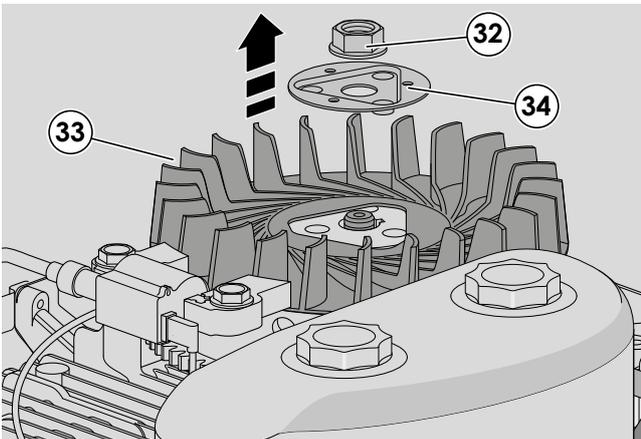
**NOTE** – check that the two half-cones (24), are locked correctly in place.



- 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.

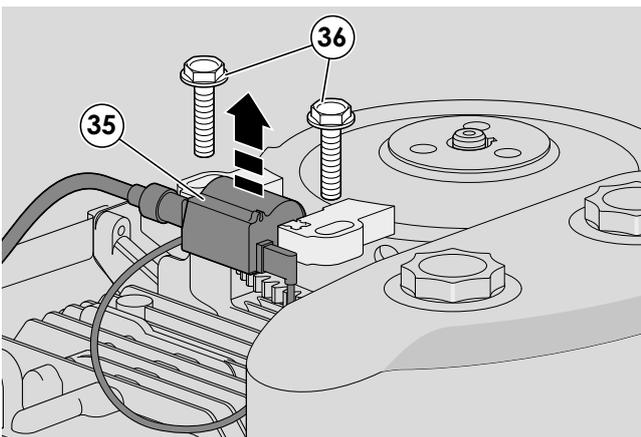
17 - The valve clearances must be checked whenever the cylinder head is removed and refitted [  10.2 ].



### 10.5. Dismantling and replacing the magneto flywheel

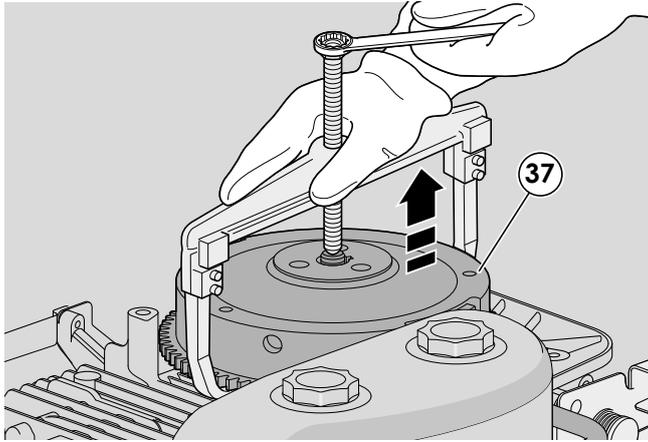
1 - Remove the cowl [  6.1 ].

2 - Using a pneumatic wrench, unscrew the nut (32) and remove the fan (33), retaining the flywheel lock (34).



3 - Undo the screws (36) and remove the electronic coil (35).

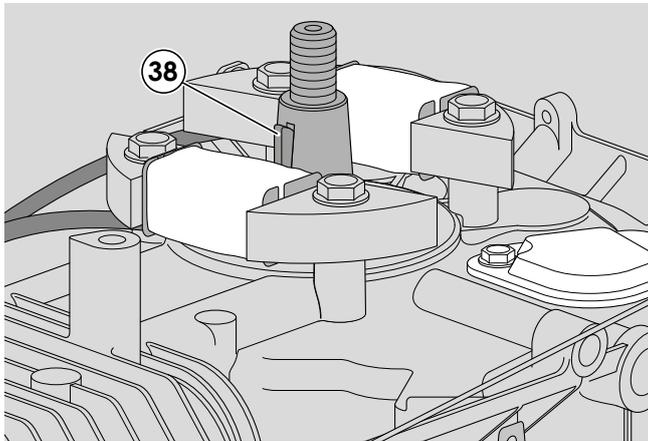
## 10. ENGINE BLOCK – External repairs



4 -  Using a suitable extraction tool, remove the flywheel (37) as indicated in the diagram. **Ensure that the engine shaft key is retained.**

5 - Remount the coil (29) and fix the screws (30) to the indicated couple.

6 - Assembling the flywheel and verify the integrity of the key (38) and remove it if it's damaged; assemble the Air gap/flywheel (28) and the fan. Close the nut to the indicated couple (26) and utilize a gun.

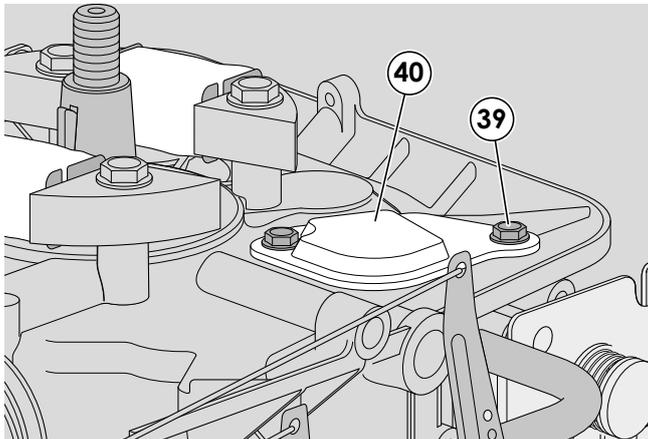


7 - Remount the cowl  6.1].

### 10.6. Checking the oil breather

1 - Remove the magneto flywheel  10.5].

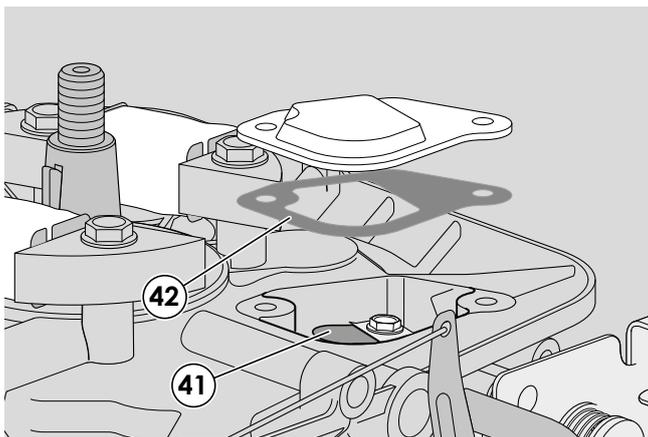
2 - Unscrew the three screws (39) fixing the closing plate (40).



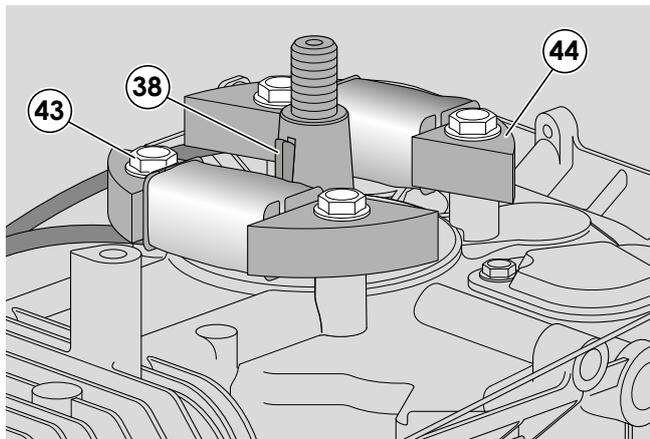
3 - Check that the reed (41) is not blocked or deformed. Replace if this is the case.

4 -  Remount the plate (40) and replace the washer (42).

5 - Refit the magneto flywheel  10.5].



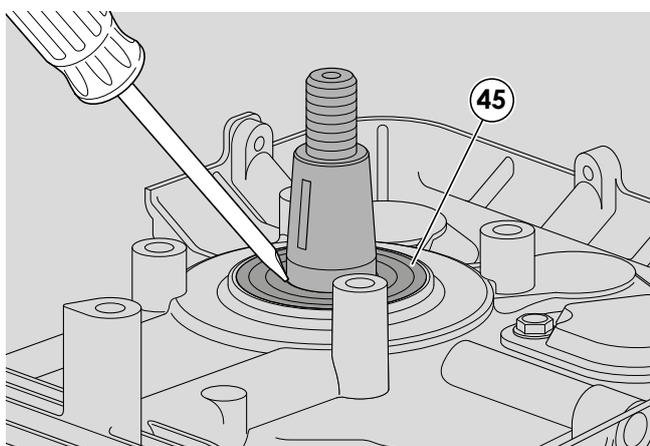
## 10. ENGINE BLOCK – External repairs



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

1 - Remove the magneto flywheel [[10.5](#)].

2 - Unscrew the screws (43) and remove the alternator (44). Take out the spline key (38).

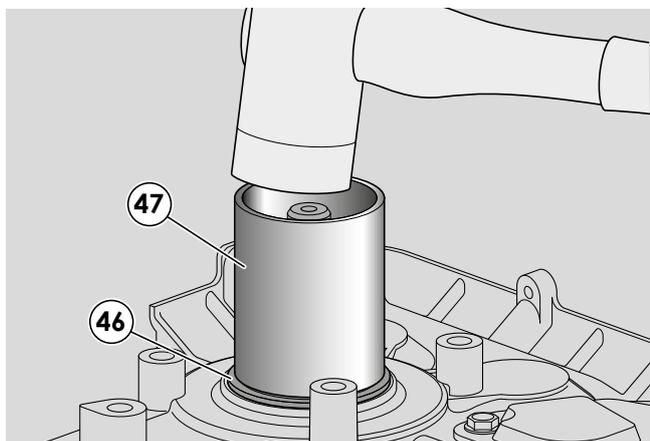


3 - Use a thin screwdriver inserted under the sealing lip to extract the oil seal ring (45).

4 - The new ring (46) must be inserted with the help of a pipe (47) with a diameter of approximately 50-55 mm, taking care not to damage the sealing lip.

5 - Refit the key (38) [[10.5](#)] and fix the screws (43) to the indicated couple.

6 - Refit the magneto flywheel [[10.5](#)].



### 10.8. Verify alternator charge

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

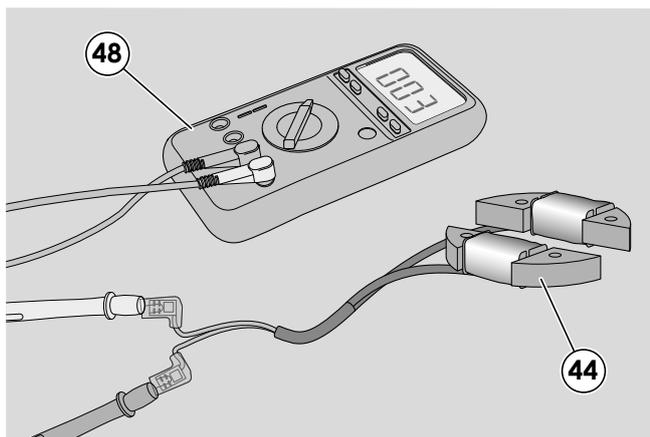
1 - Remove the magneto flywheel [[10.5](#)].

2 - Disconnect the connectors from the governor and remove the alternator [[10.7](#)].

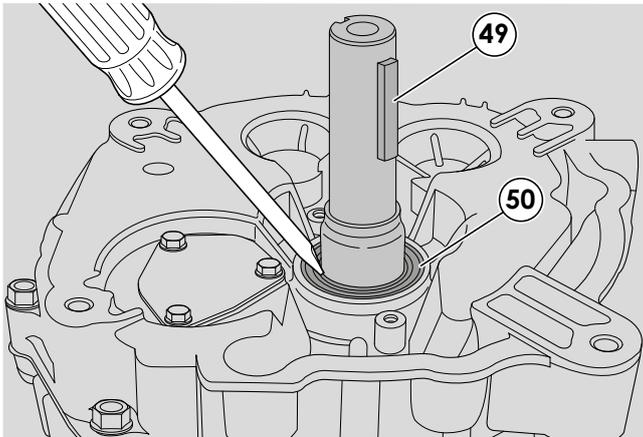
3 - Attach an appropriate tester (ohmmeter) (48) onto the alternator connectors (44). The value should be between 3.0 and 4.0 Ω.

4 - Refit the magneto flywheel [[10.5](#)].

5 - Refit the flywheel and close the nut to the indicated couple [[6.1](#)].



## 10. ENGINE BLOCK – External repairs



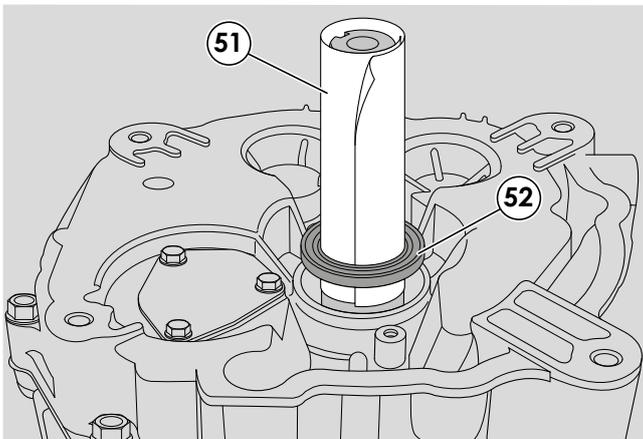
### 10.9. Replacing the lower compression ring of the engine shaft (sump side)



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

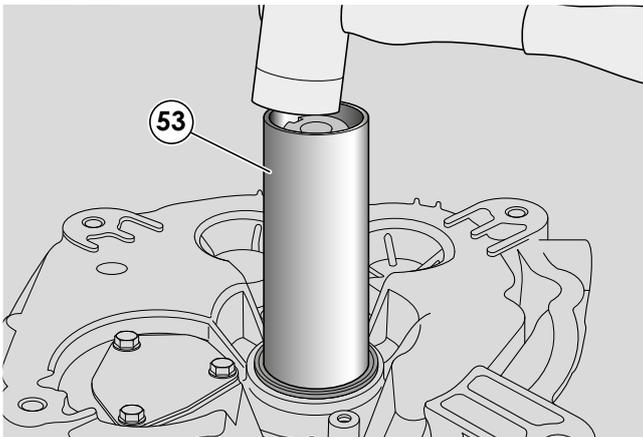
1 - Take out the spline key (49).

2 - Use a thin screwdriver inserted under the sealing lip to extract the oil seal ring (50).



3 - Make a paper tube (51) around the shaft to protect the sealing lip and insert the new ring (52) so that it enters its housing.

4 - Complete the insertion with the help of a pipe (53) of a diameter of approximately 30-35 mm.



#### Tightening torques

2	Spark plug tightening torque	18-22 Nm
6	Valve cover fixing screws	8-12 Nm
15	Cylinder head screws	50-55 Nm
26	Flywheel fixing nut	110-120 Nm
33	Screws small plate louver	8-12 Nm
37	Screws alternator fixage	8-12 Nm

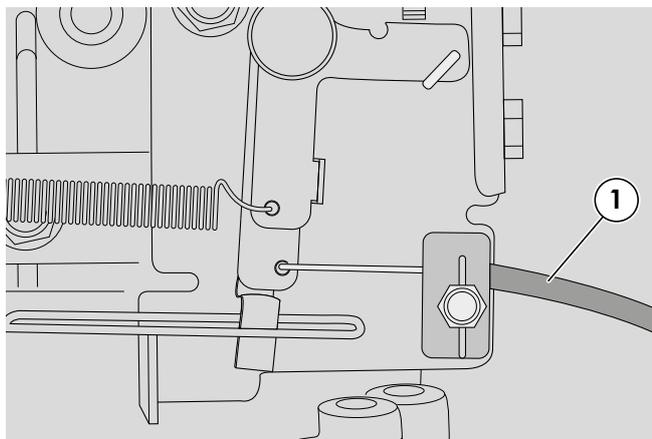
#### Technical information

Compression	4.2 bar
Inlet valve clearance	0.10-0.15 mm
Exhaust valve clearance	0.15-0.20 mm
Minimum inlet valve stem diameter	6.425 mm
Minimum exhaust valve stem diameter	6.375 mm
Min. inlet valve head rim thickness	
	(TRE 0701- TRE 0702) 0.5 mm
	(TRE 0801) 0.8 mm
Min. exhaust valve head rim thickness	1.0 mm
Valve seat depth	1.5 mm
Minimum valve spring length	37.5 mm
Alternator charge	3.0-4.0 Ω

#### Special equipment

3	Compression testing tool
23	Valve seat grinding tool
25	Valve grinder

## 11. ENGINE BLOCK - Overhauling internal parts



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

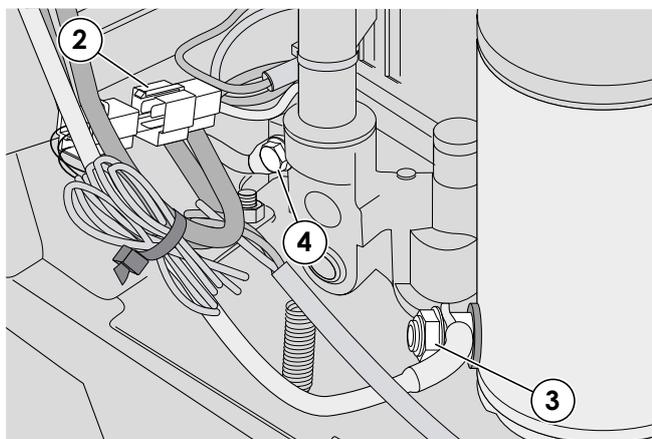
### 11.1. Remove the engine from the machine

1 - Unthread the accelerator cable (1).

2 - Disconnect the connector (2) of the electrical cabling, the power supply cable (3) of the starting motor and the engine earth wires (4).

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. 32 kg.**



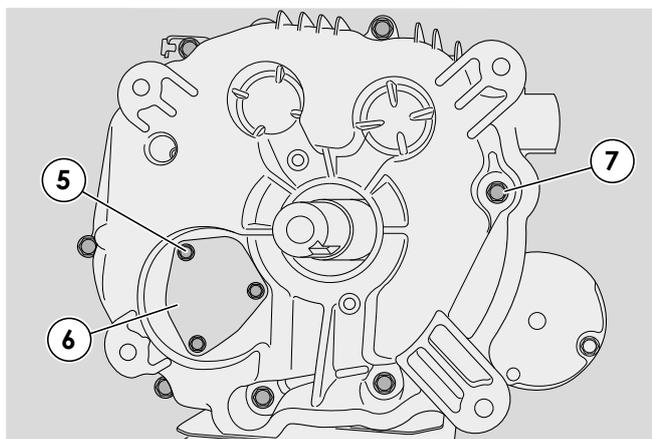
### 11.2. Carter opening

1 - Position the engine onto a stable support, remove the spark plug and collect all the oil present in the sump.

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

3 - Unscrew the three screws (5) and remove the oil pump cover (6).

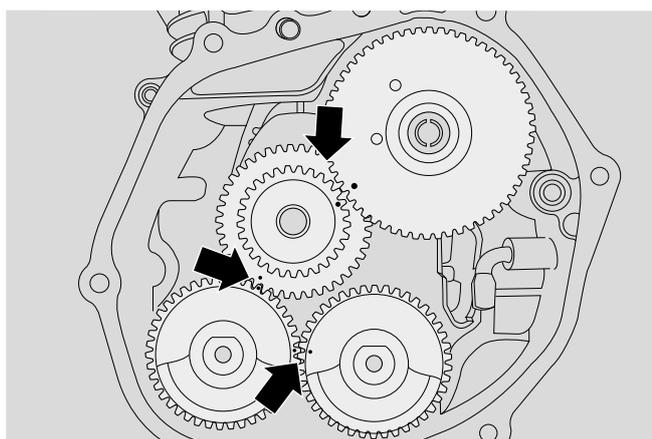
4 - Open the crankcase sump by unscrewing the seven screws (7).



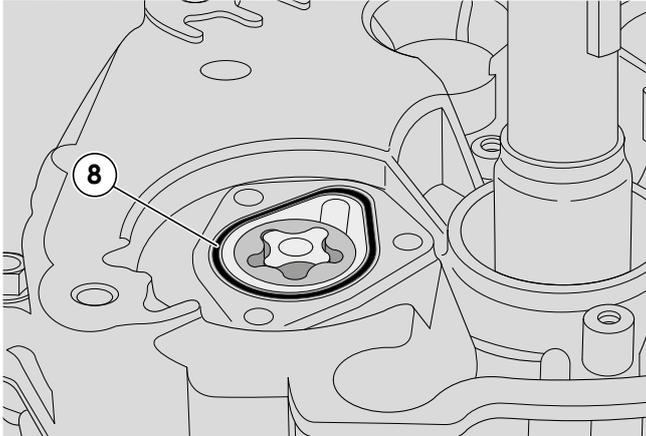
5 - verify the phasing between:

- the engine shaft and the camshaft;
- the left counterweight and the engine shaft;
- the right counterweight and the left counterweight.

If necessary, re-set the phasing, referring to the indications provided.

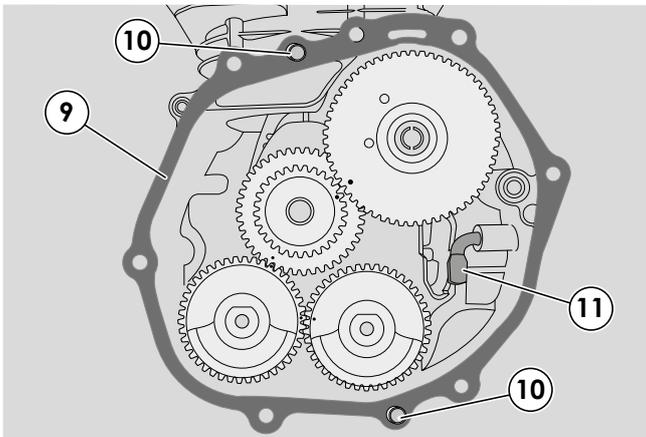


## 11. ENGINE BLOCK - Overhauling internal parts



6 - On assembly, follow the steps described in reverse and:

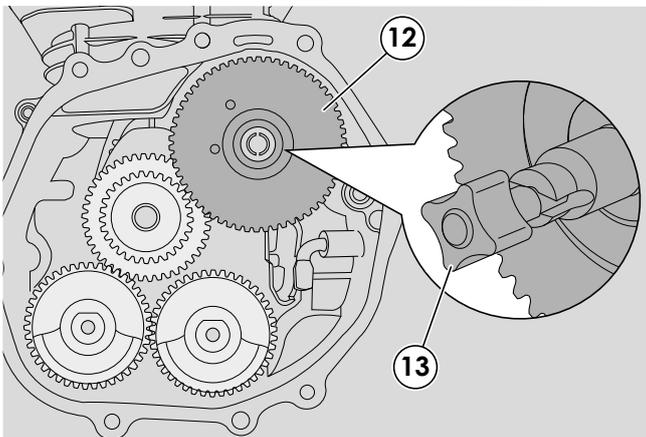
- Replace always the pump trimming (8) oil and close the screws (5) to the indicated couple;
- always replace the gasket (9) between cover and sump;
- ensure that the two centring pins (10) are correctly inserted;
- always replace the compression ring from the sump side [ 10.9].
- ensure that the regulator lever (11) is horizontal positioned;
- close the screws (7) intersection lock bowl to the indicated couple;
- ensure that the oil plug is properly screwed in and fill the cover;



7 - After installing the engine on the machine:

- check that the throttle cable is correctly adjusted [ 8.1].

8 - Following reassembly it is advisable to check the engine's peak rpm [ 8.3].

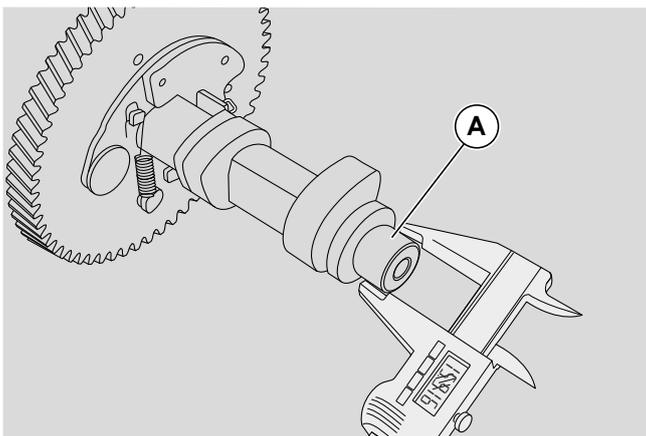


### 11.3. Dismantling and checking the camshaft and counterweight governor

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

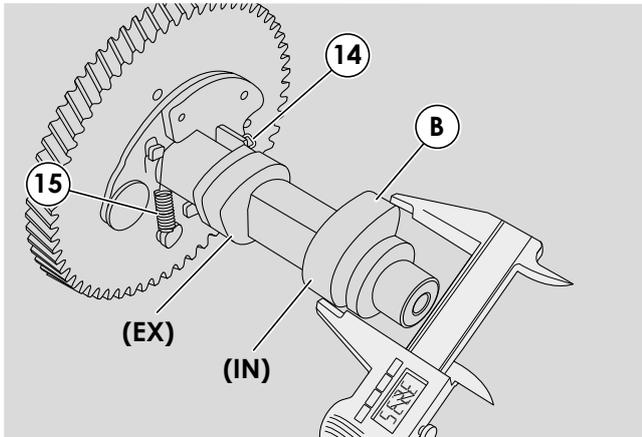
2 - Remove the camshaft (12).

3 - Check the movement of the oil pump spindle (13) 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.

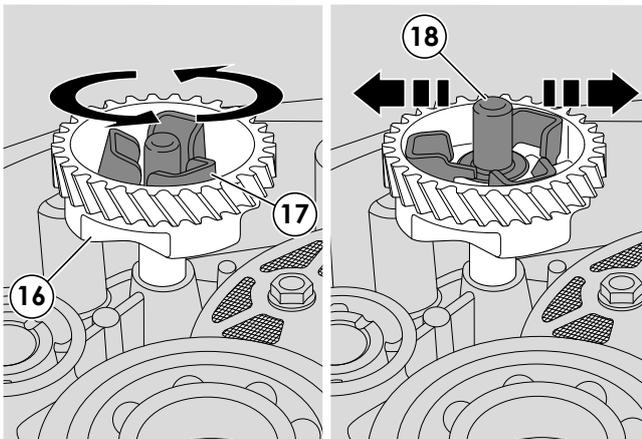
## 11. ENGINE BLOCK - Overhauling internal parts



5 -  Measure the cams (**B**), checking for wear and tear. The value must not be lower than 32.15mm (IN) and 32.35mm (EX).

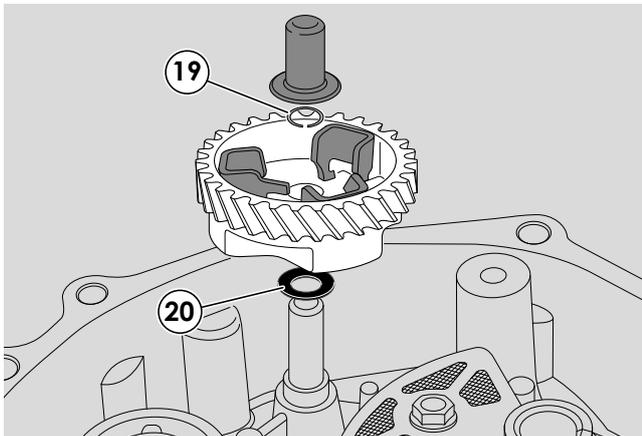
6 - Check the regular movement of the pressure reducer (**14**) and the efficiency of the spring (**15**); the whole group must always be replaced in the case of breakage or irregular operation of the pressure reducer.

7 - Check that the irregular centrifugal (**16**) that are not present ruptures of the lubrication pallets.



8 - Turn the governor's gears quickly and check that the counterweights (**17**) expand correctly, causing the pin (**18**) to be moved axially.

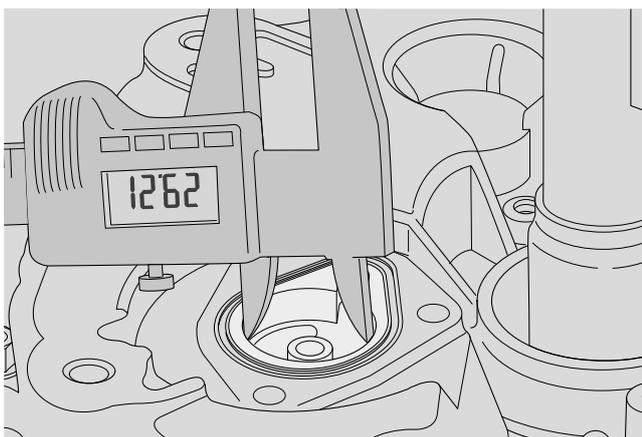
9 - In the case of breakage or irregular operation of the counterweights assembly; remove the centrifugal assembly, taking care of the grommet (**19**) and retaining the shim washer (**20**).



10 - After this verification, remount the centrifugal governor, ensuring that the washer (**20**) is positioned correctly at the base of the governor.

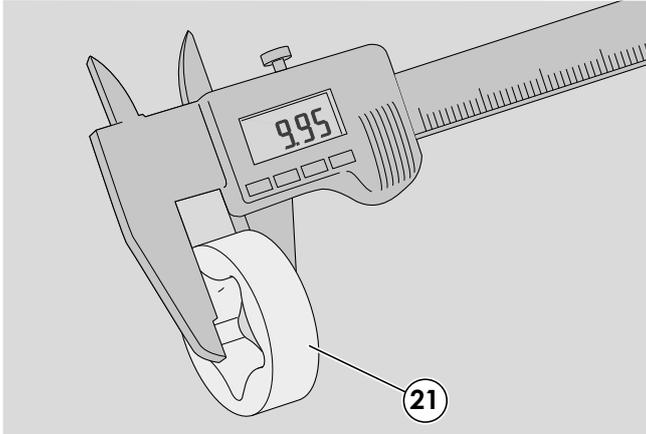
11 - Position the governor, fit the grommet (**19**) inside and insert the pin (**18**) between the tabs of the centrifugal assembly, pressing with force so as to block the governor system.

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

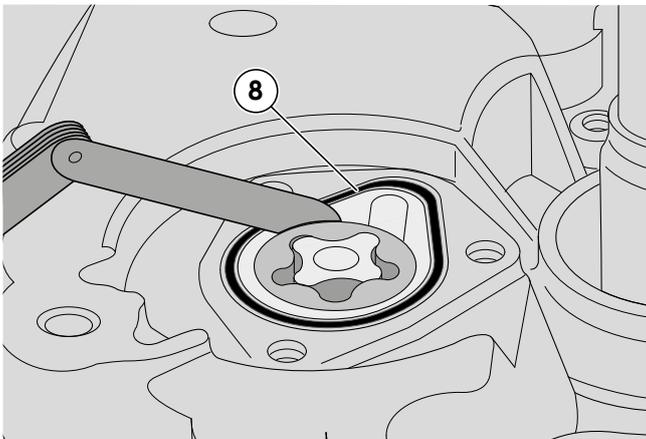


-  Using a gauge, measure the diameter of the pump seats. The value must not exceed 29.21mm.

## 11. ENGINE BLOCK - Overhauling internal parts

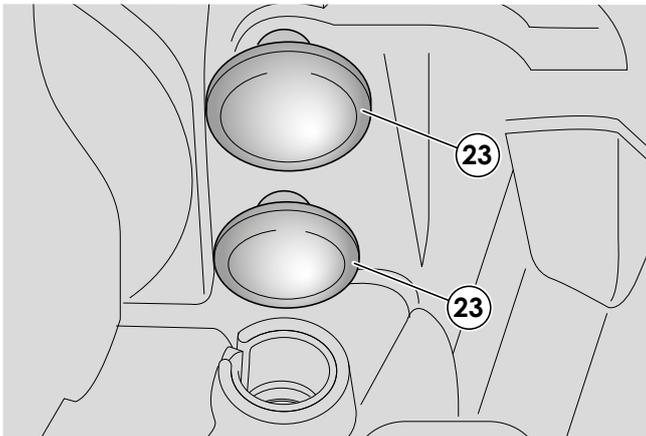


-  Measure the height of the pump cylinder body (21), which must be lower than 9.95mm.

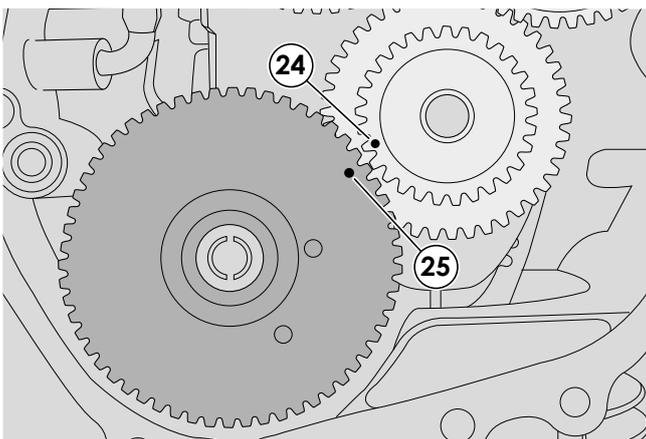


-  Using a thickness gauge (22), measure the play between the pump cylinder and its mounting seat on the sump. The value must not exceed 0.26mm.

- 13 -  Assembling the oil pump, remember to replace always the seal (8) and fix the screws of the cover to the indicated couple.



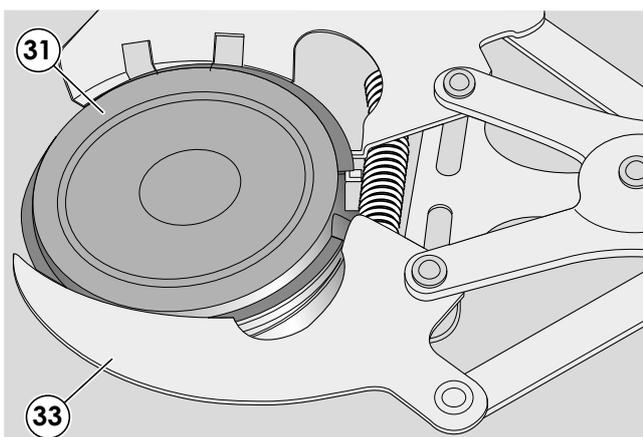
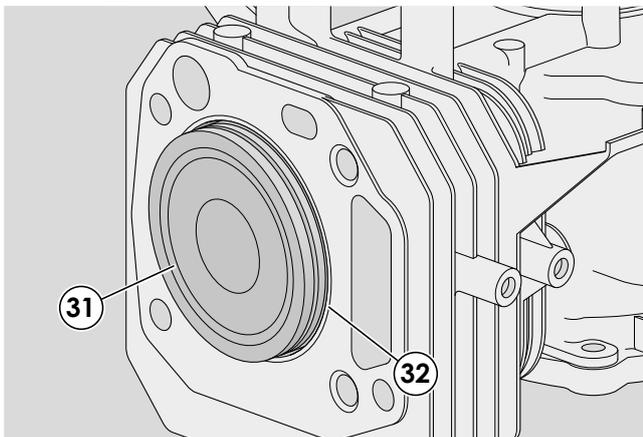
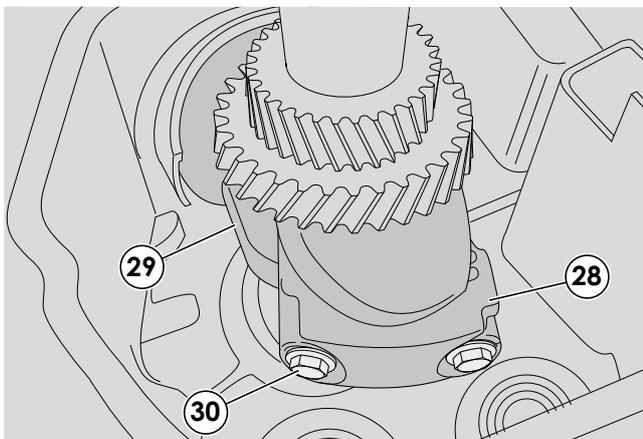
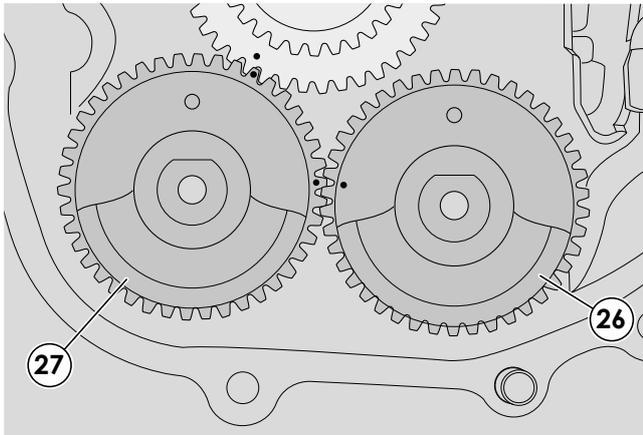
- 14 - Before fitting the camshaft ensure that the two tappets (23) are correctly housed in their seats.



- 15 - When refitting the camshaft, maximum care must be taken to match up the two references (24) and (25) punched on the gears, so as to ensure correct distribution phasing.

- 16 -  During assembly, refer to the operations in section [\[ 11.2 \]](#) always remembering to replace the washer between the sump and the housing (9).

## 11. ENGINE BLOCK - Overhauling internal parts



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



**NOTA** - 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.

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 right counterweight (26) and the left counterweight (27).

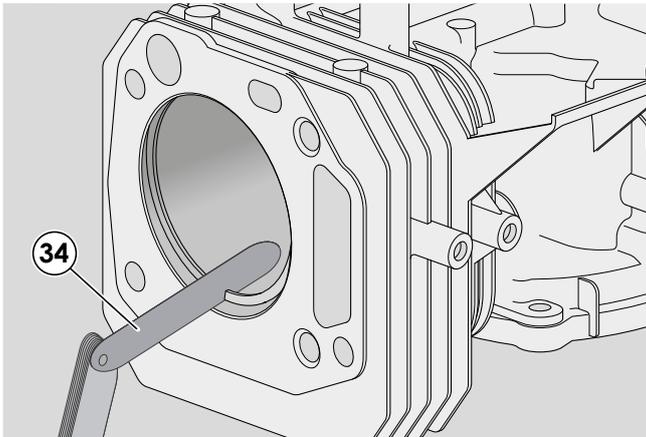
8 - Dismantle the connecting rod (28) cap (29), fixed with two screws (30).

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

10 -  Use the special expanding tool (33) 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.

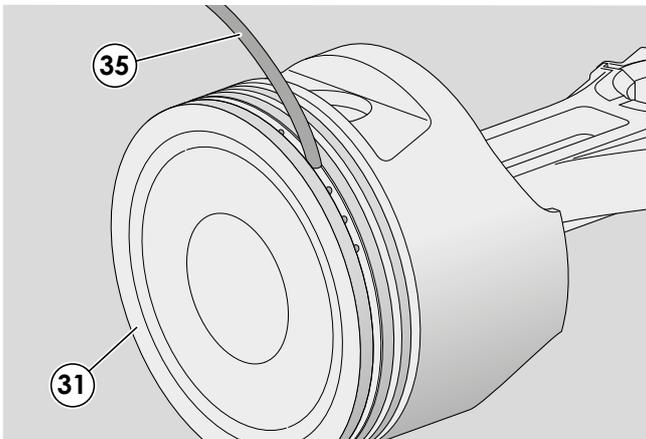
## 11. ENGINE BLOCK - Overhauling internal parts



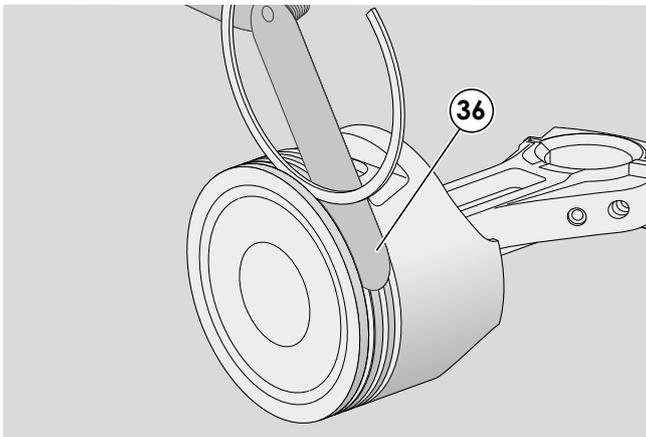
12 - To check the wear in the compression rings, insert them one at a time into the cylinder (32) by about 10-15 mm and measure the gap between the two ends with a feeler gauge (34); the rings must be replaced if the gap is more than 0.8 mm.



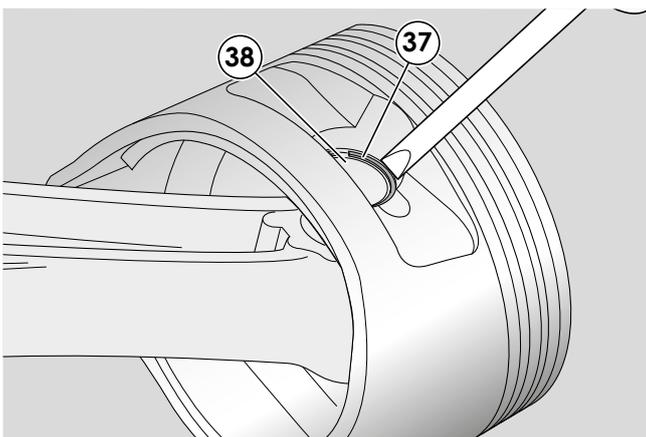
**NOTE - If a gap of more than 0.6 mm is measured with new rings it means that the cylinder is worn beyond the acceptable limits and must be replaced. The cylinder must be replaced if it shows striping due to a seizure.**



13 - Use a section of an old ring (35) to carefully clean the inside of the piston (31) ring housings, ensuring that the oil passage holes are not blocked.

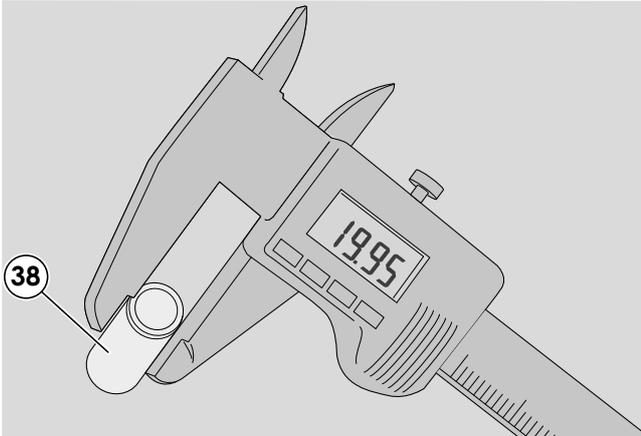


14 - To check the wear in the piston ring housings, fit a new ring and measure the residual space with a feeler gauge (36). The piston must be replaced if it is greater than 0.15 mm in the two compression ring housings.

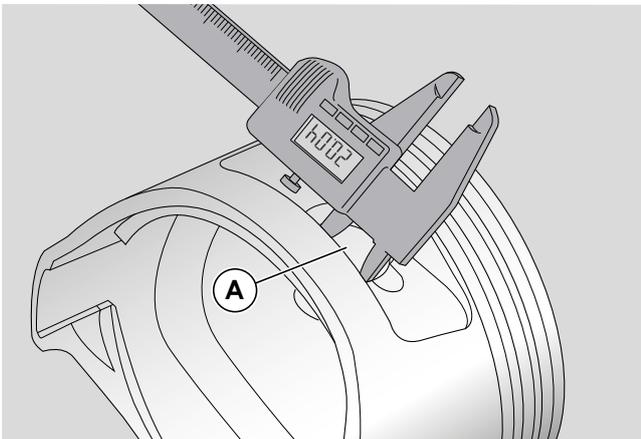


15 - Use a screwdriver to remove the clamping ring (37) and remove the gudgeon pin (38) from the piston (31).

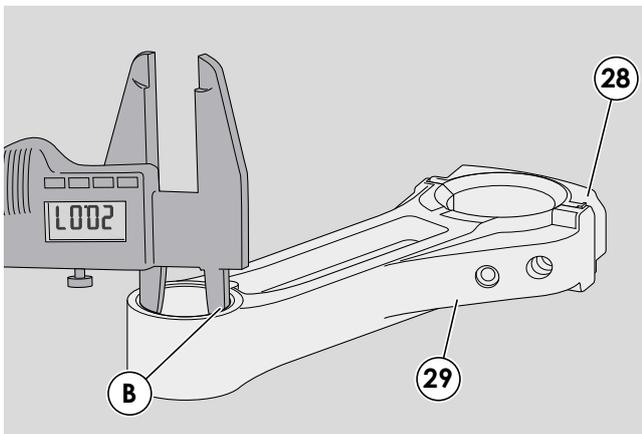
## 11. ENGINE BLOCK - Overhauling internal parts



16 - Check the diameter of the gudgeon pin (**38**) in several places and replace it if it is less than 19.95 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 20.04 mm, even at a single point.

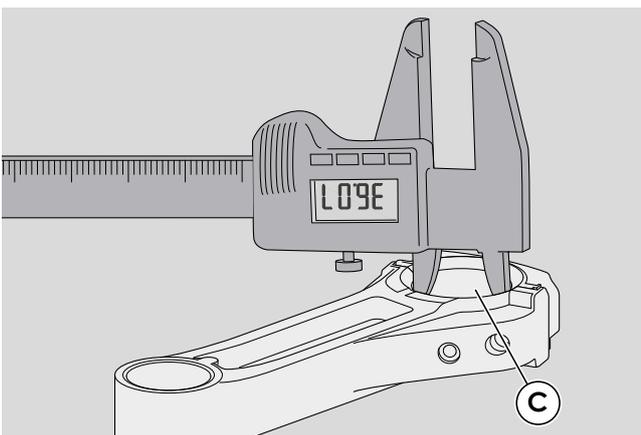


18 - Fit the cap (**28**) to the connecting rod (**29**) and check the diameter from the gudgeon pin side and the crank side; replace the connecting rod if the values are greater than:

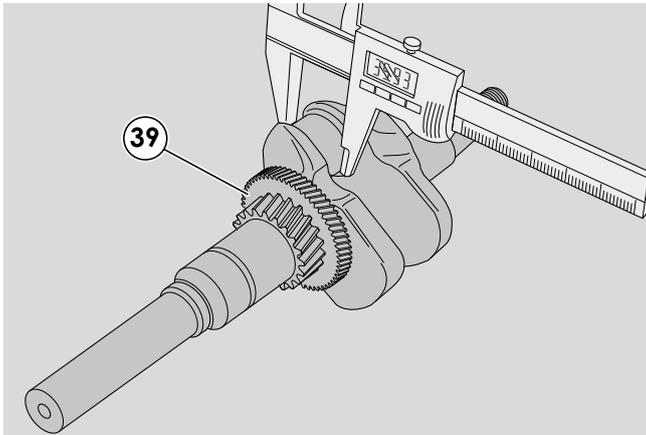
**B** : 20.07 mm on the gudgeon pin side;

**C** : 36.07 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.



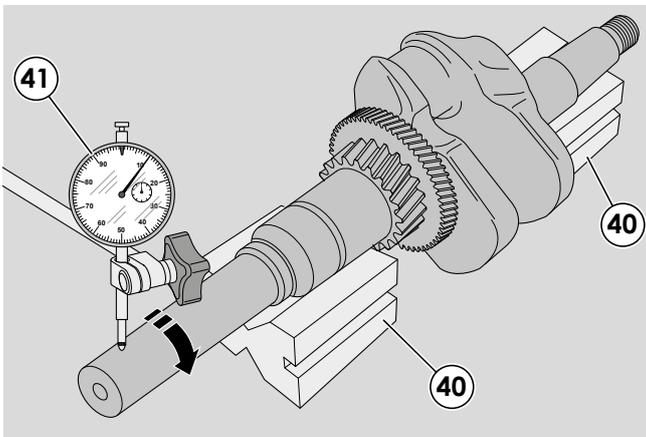
## 11. ENGINE BLOCK - Overhauling internal parts



19 - Remove the engine shaft (39), checking the diameter of the connecting rod pin with a digital gauge. The value must not be less than 35.93 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.**



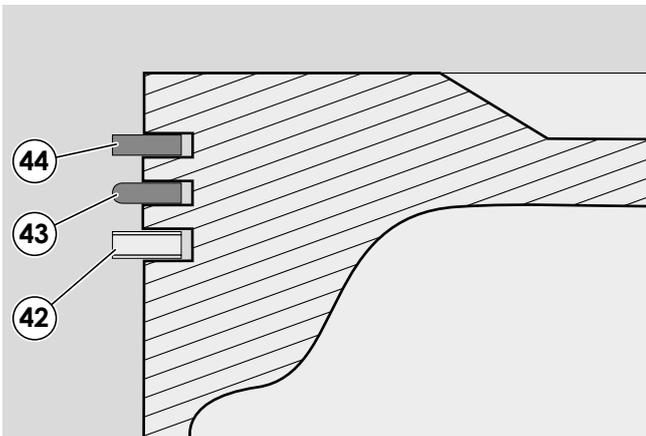
20 - To check the alignment between the manifolds and the protruding part of the shaft, place the engine shaft on two prismatic guides (40) and, with the help of a comparator (41) placed at the end, check the displacement by rotating the shaft. The shaft must be replaced if the displacement exceeds 0.10 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!**

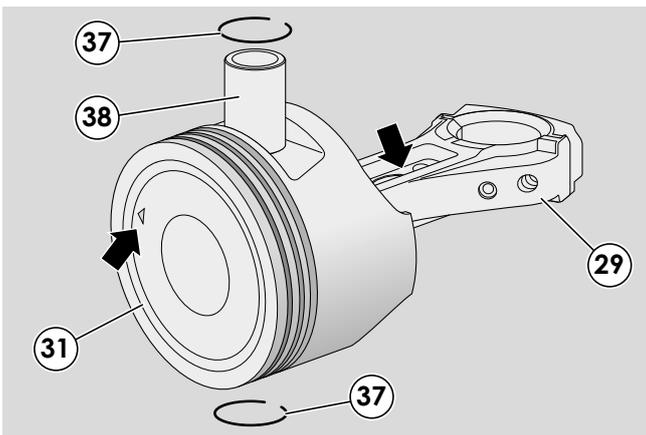


21 - To reassemble the segments on the piston perform sequentially:

- Mount the oil wiper (42), composed of three rings;
- Assemble the rounded edge segment (43) with the rounded edge facing downwards;
- Assemble the live edge segment (44).

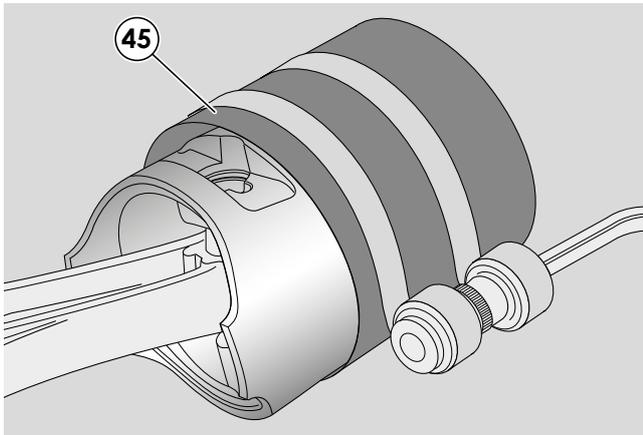


**NOTE: The two segments (43) and (44) must be oriented with the lights not aligned between them.**

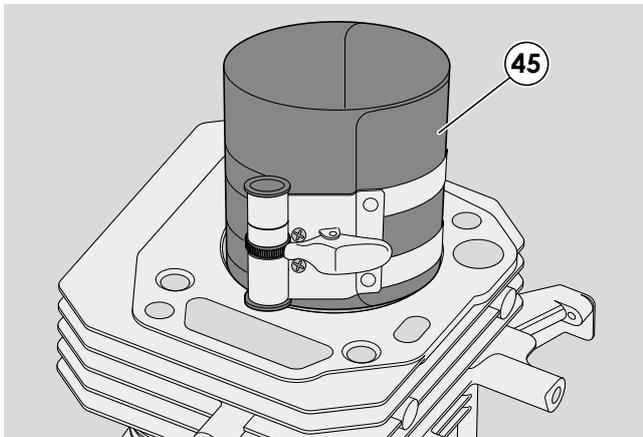


22 - Fit the connecting rod (29), gudgeon pin (38) and clamping rings (37) to the piston (31), taking care over the connecting rod marking, which must be pointing towards the engine shaft exit. Piston marking must point towards the exhaust.

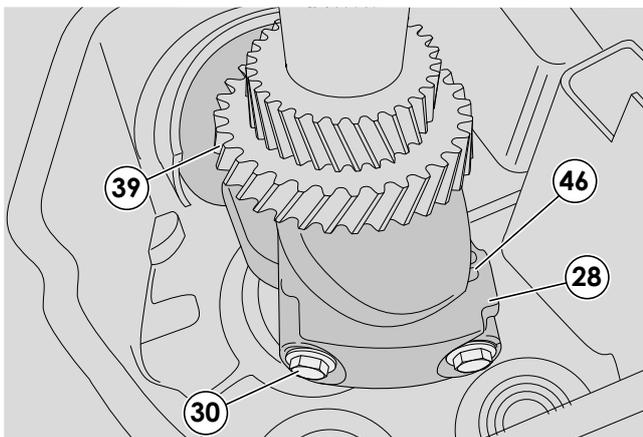
## 11. ENGINE BLOCK - Overhauling internal parts



23 - Put the piston into the ring compression tool (45).

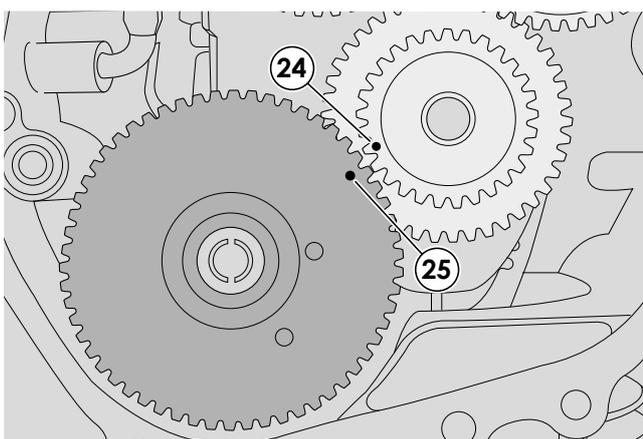


24 - Oil the inside of the piston liberally and insert the piston, with the marking facing the exhaust.



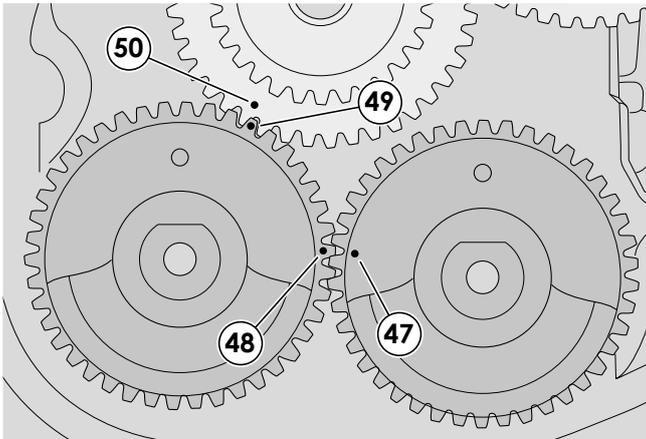
25 - Mount the engine shaft (39) and the connecting rod cap (28) with the relative screws (30), taking care with the position references (46) so as to avoid inverting the mounting direction of the cap.

**Close the screws (30) to the indicated couple.**



26 - After having fixed the connecting rod cap, take the greatest care to ensure that the two position references (24) and (25) punched on the engine shaft and camshaft gears, coincide, ensuring the correct distribution phasing.

## 11. ENGINE BLOCK - Overhauling internal parts



27 - Remount the two counterweights, ensuring that the position references (47) and (48) punched on the gears, coincide.

Check also that the position references (49) of the left counterweight and the position reference (50) of the engine shaft coincide, so as to ensure correct distribution phasing.

28 - Close the carter and fix the screws (7) to the indicated couple [  11.2].

29 -  During assembly perform the operations indicated in section [  11.2] always remembering to replace the washer between the sump and the housing (9).

### Tightening torques

<b>5</b>	Screws oil pump cover	8-12 Nm
<b>7</b>	Union screws under carter and sump	24-27 Nm
<b>30</b>	Fixing screws lower connecting rod cap	16-18 Nm

### Technical information

Oil sump capacity	0,65 litri
Diameter Pump seat on camshaft	15,916 mm
Diameter aspiration cam	32,15 mm
Diameter discharge cam	32,35 mm
Diameter oil pump seat	29,21 mm
Height pump cylinder	9,95 mm
Cylinder/seat clearance on the pump	0,26 mm
Maximum segments gap in the cylinder	0,8 mm
Max. compression ring axial gap	0,15 mm
Minimum gudgeon pin diameter	19,95 mm
Max. gudgeon pin housing diameter on piston	20,04 mm
Max. connecting rod diameter	
gudgeon pin side	20,07 mm
crank side	36,07 mm
Diam. connecting rod's pin on engine shaft	35,93 mm
Verify the engine shaft extremes	0,10 mm

### Special equipment

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

## 14. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
<b>The engine starts but does not run</b>	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 ]
<b>The engine is inefficient or the runs irregularly</b>	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 ]
	The coil air gap has been poorly adjusted	Adjust the air gap [  9.2 ] and if the problem persists, replace the coil [  9.3 ]
	Oxidation or loosening of spark plug connections	Perform spark test [  9.1 ] or replace spark plug
<b>The engine overrevved</b>	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. and 11. ]
<b>The engine judders</b>	Engine screws loose	Tighten the screws
	Engine timing faulty	Check wear and tear of the connecting rod of the engine shaft, replace shaft if necessary [  11.4 ]
<b>The engine does not turn off</b>	The earth cable is disconnected or broken	Check earthing connection [  9.1 ]
<b>The engine uses a lot of oil</b>	Defective breather valve operation	Check and/or replace the breather valve [  10.6 ]
	Poor piston ring seal	Replace the rings [  11.3 ]



