Moto Guzzi GRISO 8V

TECHNICAL DATA

LEARNING CENTRE

- Engine
- Transmission
- Chassis
- Electrical system
- Dimensions

TECHNICAL DATA

LEARNING CENTRE

ENGINE	
Type	**two-cylinder V of 90°, 4 strokes**
Cooling	**with air and oil and independent cooling pump**
Engine capacity	**1,151 cc**
Bore and stroke	**95 x 81.2 mm**
Compression ratio	**11:1**
Distribution diagram (with 1 mm control clearance)	**intake valve opening 36° BTDC**
	intake valve closing 62° ABDC
	exhaust valve opening 58° BBDC
	exhaust valve closing 30° ATDC
	measured with control clearance rocker arm/valve of 1.5 mm
Maximum power	**over 80.8 kW (110CV) at 7,500 rpm**
Maximum torque	**above 108 Nm at 6,400 rpm**
Fuel supply / Ignition	**multipoint electronic ignition, sequential, Magneti Marelli IAW5A timing, alfa-n system; 2 throttled bodies of Ø 50 mm, injectors Weber IWP 189, lambda probe.**
Start-up	**electric**
Spark plugs	**NGK PMR8B (Long Life)**
Exhaust system	**stainless steel, type 2 in 1 three-ways catalysed with lambda probe**
Type approval	**Euro 3**

TECHNICAL DATA

LEARNING CENTRE

TRANSMISSION	
Gearbox	**6 shift gears**
Gear ratio values	**1st 17/38 = 1 : 2.235**
	2nd 20/34 = 1 : 1.700
	3rd 23/31 = 1 : 1.348
	4th 26/29 = 1 : 1.115
	5th 31/30 = 1 : 0.968
	6th 29/25 = 1 : 0.862
Lubrication	**splash lubrication**
Primary transmission	**helical teeth, ratio 26/35 = 1 : 1.346**
Final transmission	**Compact reactive cardan joint CA.R.C.; double joint and floating bevel gear pair, ratio 12/44 = 1 : 3,666**
Clutch	**single-disc with integrated spring drive**

TECHNICAL DATA

LEARNING CENTRE

CHASSIS	
Chassis	**tubular with double steel cradle with high yield point limit**
Wheelbase	**1,554 mm**
Trail	**108 mm**
Headstock tube slant	**26° 30'**
Steering angle	**34°**
Front suspension	**Inverted rods fork Ø 43 mm completely adjustable (spring and hydraulic preload in extension and compression) with radial connection pad for brake calliper**
Front wheel excursion	**120 mm**
Rear suspension	**Single-arm with progressive leverage, single-absorber with separate gas holder completely adjustable (spring and hydraulic preload in extension and compression).**
Rear wheel excursion	**110 mm**
Front brake	**Stainless steel floating double-disc, wave type, Ø 320 mm, radial callipers with 4 opposite pistons.**
Rear brake	**Stainless steel fixed disc Ø 282 mm, floating calliper with two parallel pistons.**
Wheels	**Three hollow spokes of chill-casted aluminum alloy.**
Front rim	**3.50" x 17"**
Rear rim	**5.50" x 17"**
Front tyre	**120/70 ZR17"**
Rear tyre	**180/55 ZR17"**

TECHNICAL DATA

LEARNING CENTRE

ELECTRICAL SYSTEM	
System voltage	**12 V**
Battery	**12 V – 18 Ah**
Alternator	**12 V – 550 W**

DIMENSIONS	
Length	**2,260 mm**
Width	**830 mm**
Height	**1,070 mm**
Saddle height	**800 mm**
Minimum height from ground	**185 mm**
Dry weight	**222 kg**
Fuel tank capacity	**16.4 litres**
Reserve	**3.3 litres**

SUGGESTED PRODUCTS

Engine oil → AGIP RACING 4T 10W-60

Transmission oil → AGIP GEAR SAE 80 W 90

Gearbox oil → AGIP GEAR MG/S 85 W 90

Fork oil → AGIP FORK 7.5W

Brake fluid → AGIP BRAKE 4 / BRAKE 5.1

Clutch fluid → AGIP BRAKE 4 / BRAKE 5.1

SPARK PLUGS

LEARNING CENTRE

Compared to 2-valves engines there is only one plug per cylinder. This plug is the NGK PMR8B (long life), the same inside plug to be found on 2-valves engines

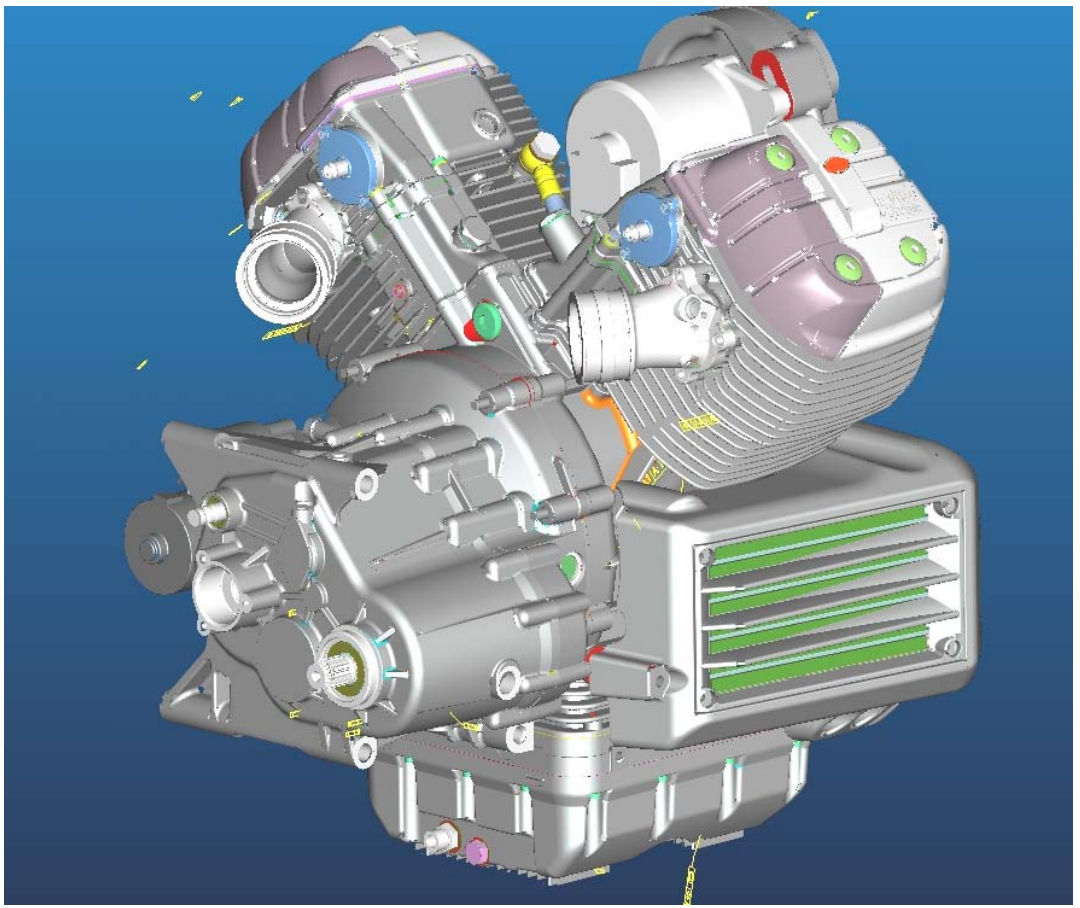
INSTRUMENT PANEL

LEARNING CENTRE

- ✓ **The instrument panel and its function are identical to the Griso 850/1100**

- ✓ **Instrument panel code 12425 (as Griso 850/1100)**

GRISO 8V



CONTENTS

LEARNING CENTRE

SPECIAL TOOLS

LEARNING CENTRE

Tool description	Code
Front cover insertion cone	GU05911730
Gearbox opening tool	GU05912530
Timing system cover oil seal punch	GU05927230
Sump and filter cover	GU01929100
Flange on crankshaft	GU12912000
Flywheel side flange seal	GU14927100
Flywheel/starting crown gear locking	GU12911801
Support for gearbox	GU05902530
Ignition timing disc	GU19929600
Ignition timing arrow	GU17947560
Flywheel side flange fitting/removal	GU12913600
Flywheel flange sealing ring	GU19927100

SPECIAL TOOLS

LEARNING CENTRE

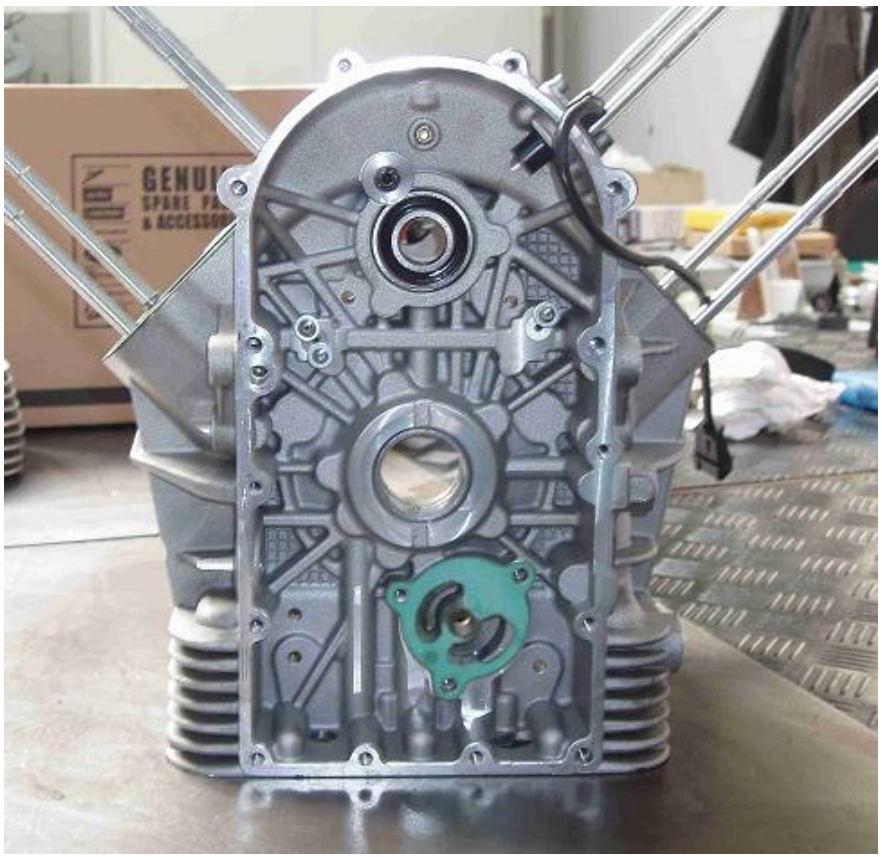
Tool description	Code
Valve fitting/removal support	AP8140179
Crankcase separation	AP8106698
Connecting rod locking	020716Y
Tool for pin ring	020470Y
Punch for fitting valve sealing rings	020306Y
Extractor for valve oil seal	020431Y

- ✓ ENGINE CRANKCASE
- ✓ ENGINE SUPPORT FLANGE
- ✓ CONNECTING RODS
- ✓ SPARE PARTS

ENGINE CRANKCASE

LEARNING CENTRE

TIMING SYSTEM SIDE



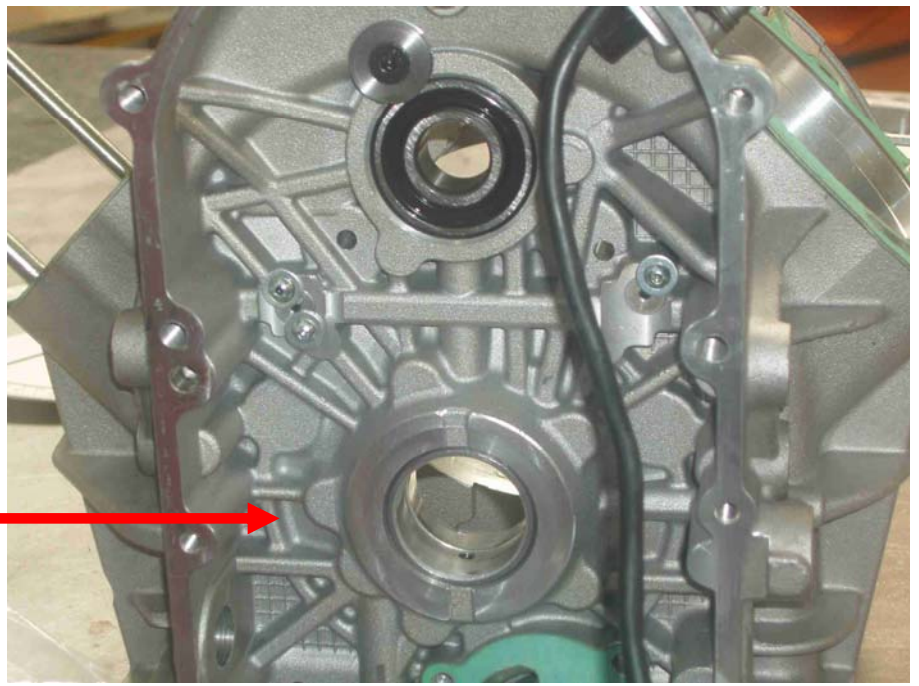
TRANSMISSION SIDE

ENGINE CRANKCASE

LEARNING CENTRE

CRANKSHAFT SUPPORT BEARING

No longer fitted on a flange but directly on the crankcase



CRANKSHAFT BEARING CIRCLIP

Support flange on timing system side crankshaft has been removed

Now there is only a bushing pivoted on the crankcase

ENGINE CRANKCASE

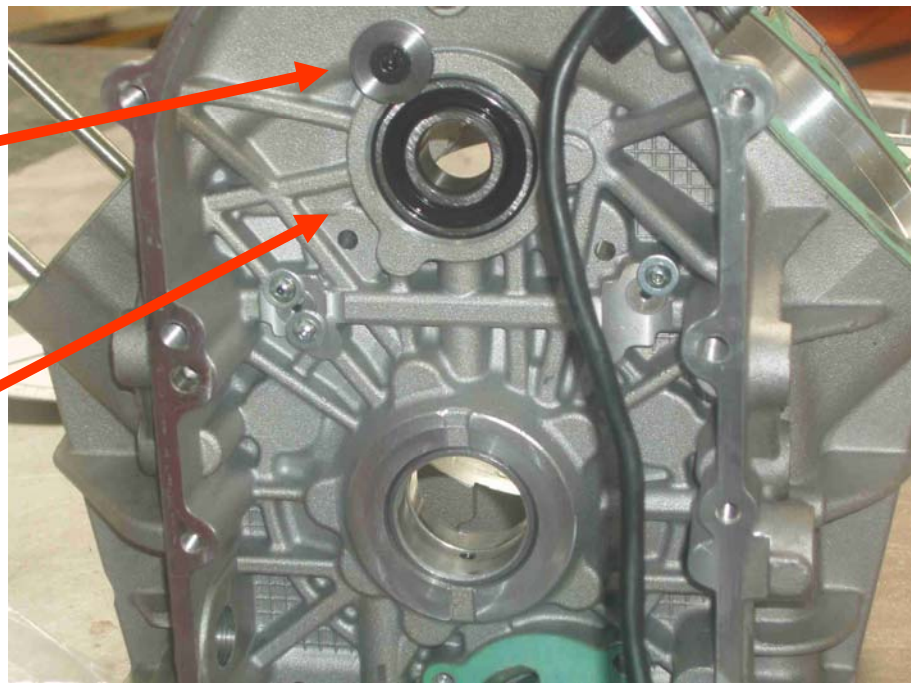
Once the crankshaft has been fitted, fasten it RIGHT AWAY with the pinion, so that the bearing check bushing does not come off its seat

Support flange on timing system side camshaft has been removed

The service shaft is fitted on the ball bearing checked in position by a lock washer and screw

Screw with washer with Loctite 243

Torque 10 Nm

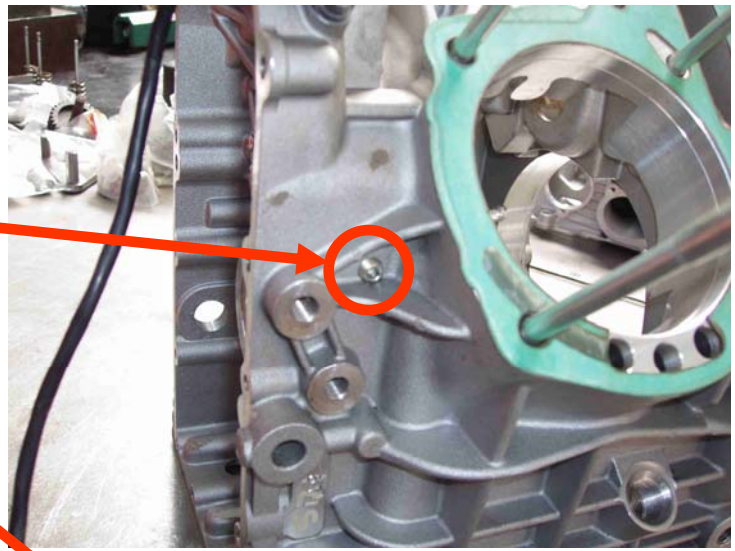


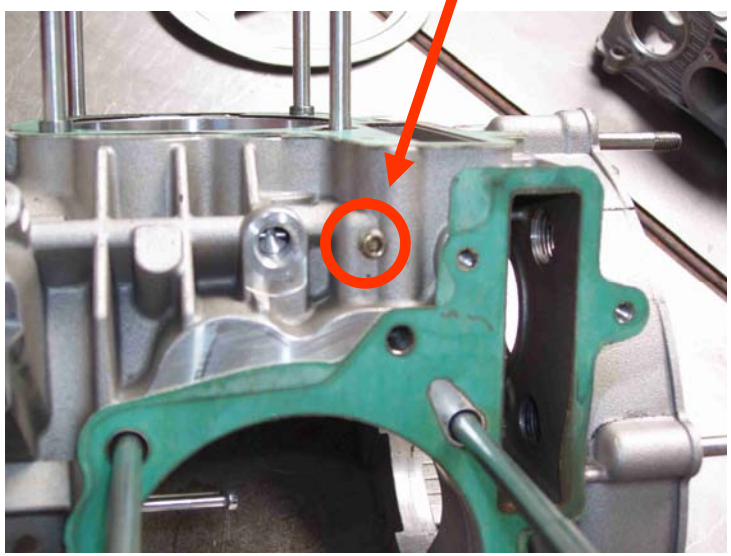
ENGINE CRANKCASE

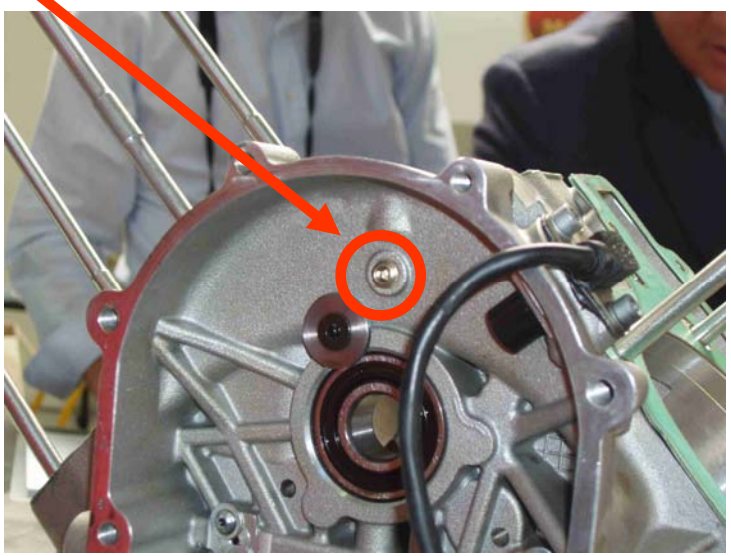
LEARNING CENTRE

WORK DOWELS

Tapered, with Loctite







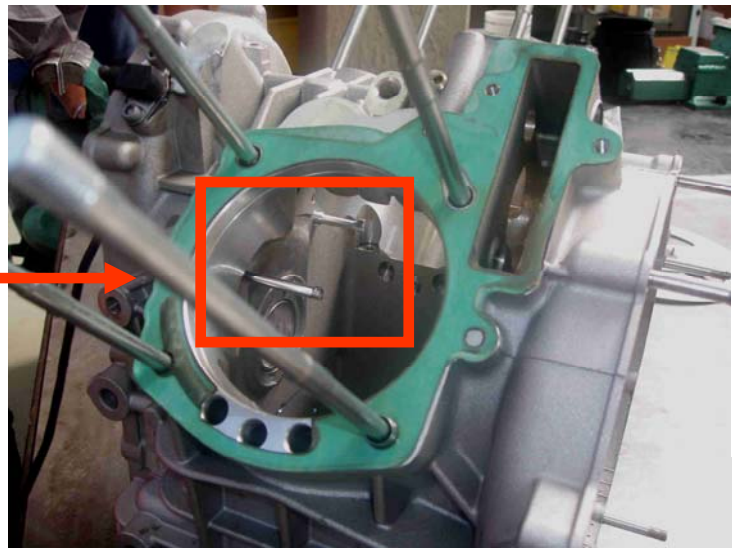
ENGINE CRANKCASE

LEARNING CENTRE

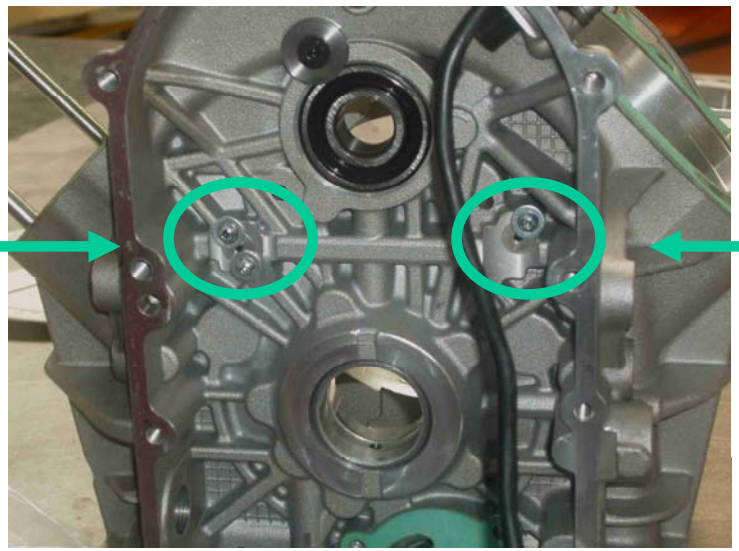
COOLING JETS

Right → shorter

Left → longer



Right jet: two countersinks for locking washers



Left jet: a countersink for a locking washer

Screws and washers with Loctite 243

CRANKCASE → ENGINE SUPPORT FLANGE

LEARNING CENTRE

Fitted with a seal with centring pins

Fixed to the base with 8 screws, there is an oil passage bushing with O-ring

8 screws with washer

Torque: →26 Nm

In addition to the 2-valve engines, there is an <u>OIL SCAVENGE DISC</u>, fixed to the flange with 3 screws

3 screws with Loctite 243

Torque: →5 – 6 Nm

For removal from the base, use the special tool (flywheel side flange fitting/removal, code GU12913600)

CRANKCASE → CONNECTING RODS

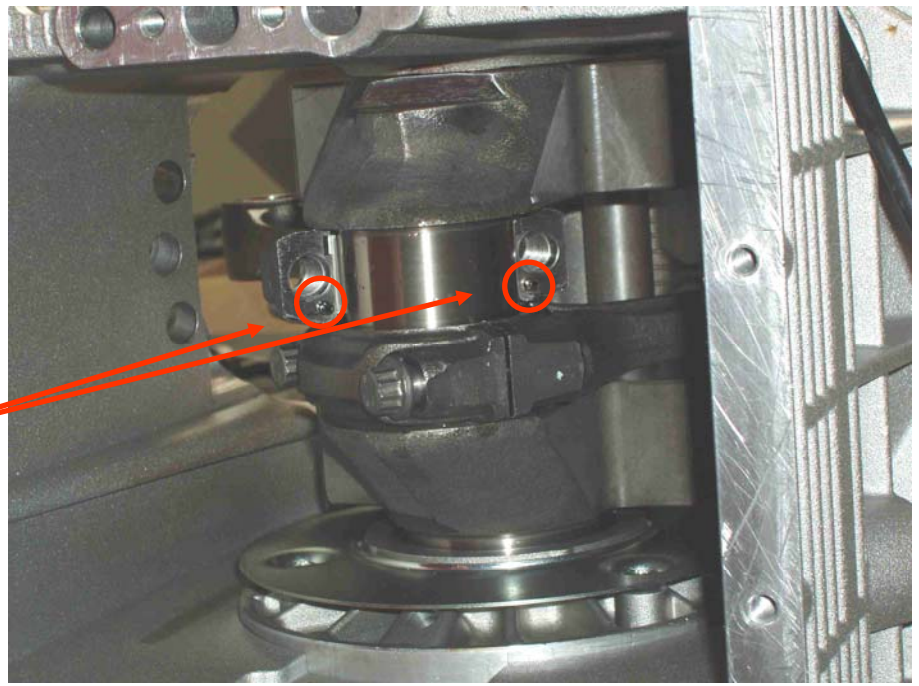
LEARNING CENTRE

- ✓ **Similar to the old engine**

- ✓ **Connecting rods identical one to each other (provided they are new) → Should they be removed, mark them to be refitted in the same position**

- ✓ **Centring dowels must be facing the base internal side**

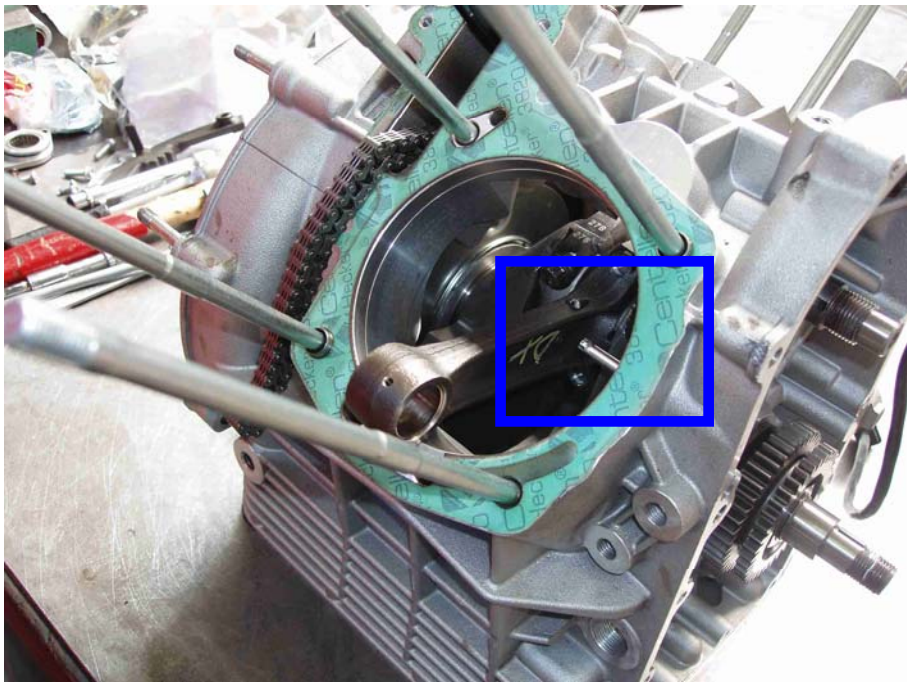
- ✓ **The lubrication holes are CLOSED**



Torque: → pre-torque: 40 Nm; afterwards, 80 Nm

CRANKCASE → CONNECTING RODS

From now on be careful with crankshaft rotation as the connecting rods may hit and damage the cooling jets



CRANKCASE → SPARE PARTS

LEARNING CENTRE

- ✓ **The crankcase spare part has a sole code (single category)**

- ✓ **The crankshaft bearing lock bushing has NO spare part available → The entire crankcase should be replaced in case the bushing gets damaged**

- ✓ **The work dowels have NO spare part available**

LEARNING CENTRE

1 Special tools

2 Basic structure

3 **Timing system**

4 Thermal unit

5 Timing

6 Oil system

7 Clutch

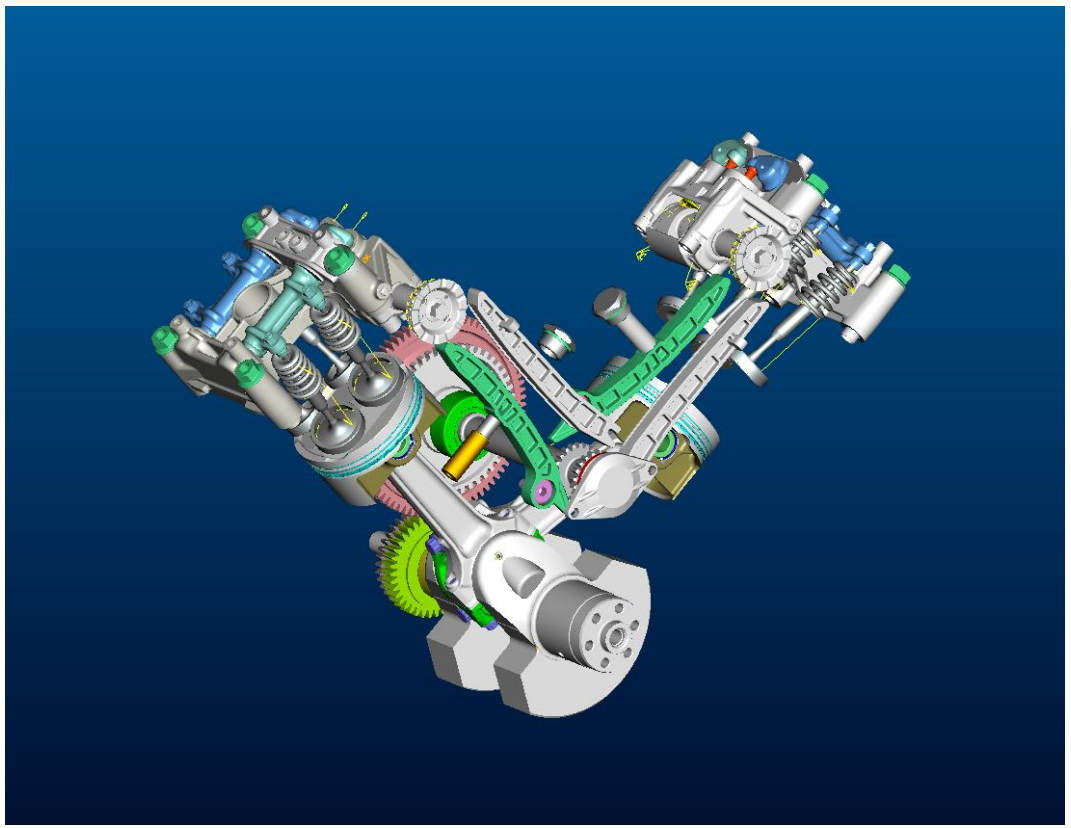
8 Temperature sensor and oil pressure sensor

- ✓ TIMING CHAINS
- ✓ SERVICE SHAFT
- ✓ CHAIN SLIDERS
- ✓ CHAIN TENSIONERS
- ✓ CAMSHAFT GEAR
- ✓ CAMSHAFT
- ✓ CAM CAP
- ✓ GEARS
- ✓ SPARE PARTS

TIMING SYSTEM → GENERAL DIAGRAM

LEARNING CENTRE

The timing system comprises mainly the following elements:



- ✓ SERVICE SHAFT
- ✓ DOUBLE TIMING CHAIN
- ✓ DOUBLE OVERHEAD CAMSHAFT
- ✓ RODS
- ✓ ROCKING LEVERS

LEARNING CENTRE

TIMING CHAINS

Once removed, mark them to be refitted in the same position

TIMING SYSTEM → SERVICE SHAFT

LEARNING CENTRE

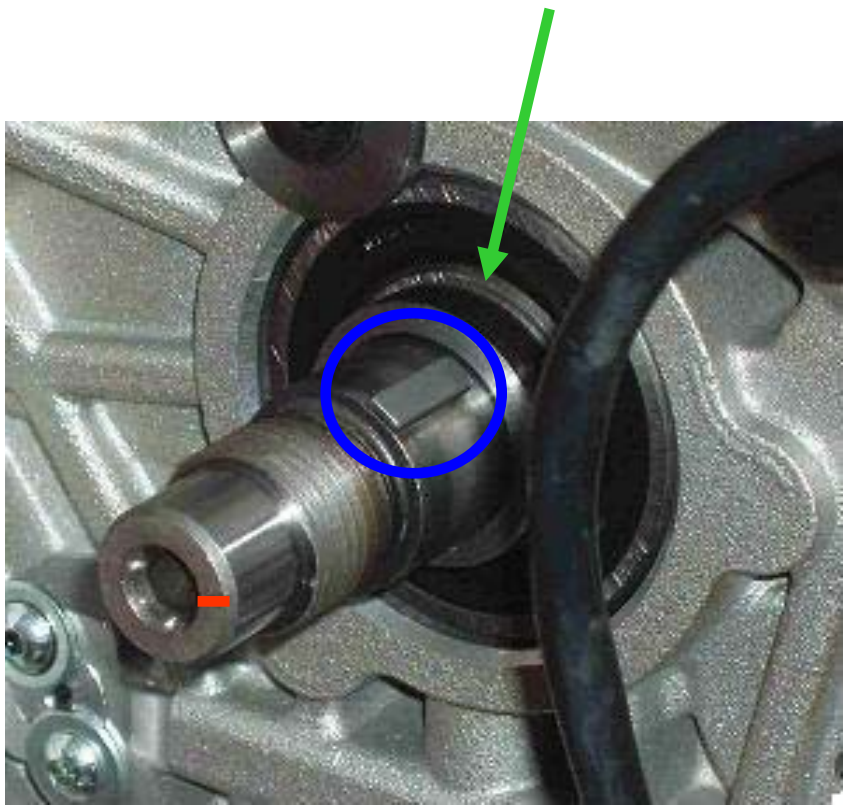
THE <u>SERVICE SHAFT</u> (which replaces the camshaft) is, in fact, the element which causes the timing chains to move. Fitting the shaft to the base is carried out from the side opposite to the 2-valve engine (transmission side). This operation should be done at the same time the chains are fitted; these chains will operate on two pinions on the shaft.

TIMING SYSTEM → SERVICE SHAFT

LEARNING CENTRE

The service shaft has:

- ✓ **a spacer for the tone wheel**
- ✓ **seat for the woodruff key**
- ✓ **a reference notch (important for timing)**



TIMING SYSTEM → SERVICE SHAFT → CLOSING CAP

LEARNING CENTRE

closing CAP for transmission side service shaft

Cap with roller bearing and O-ring

Each single part (cap, bearing and O-ring) has spare parts available

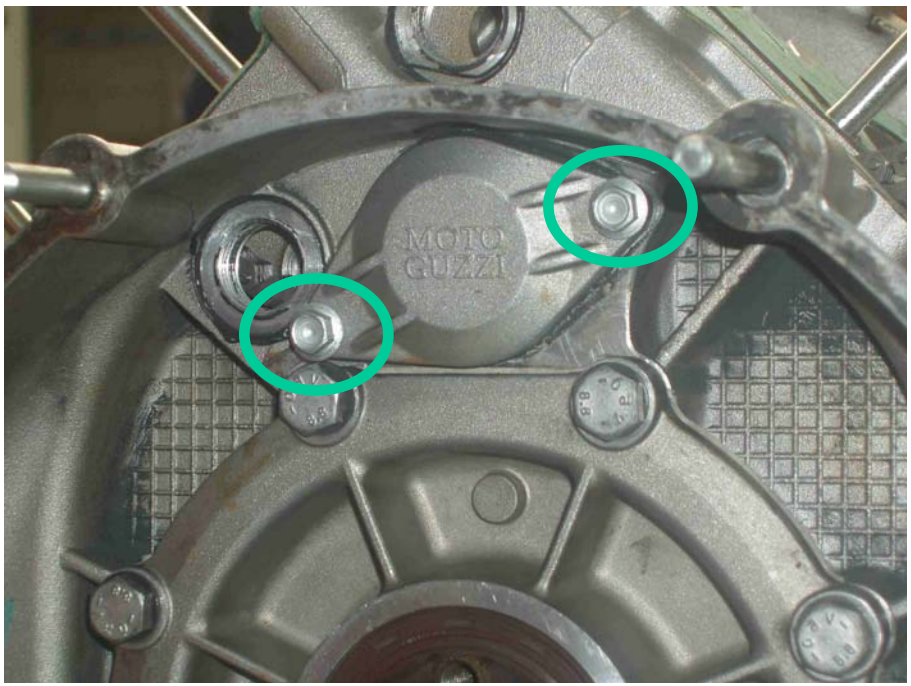
TIMING SYSTEM → SERVICE SHAFT → CLOSING CAP

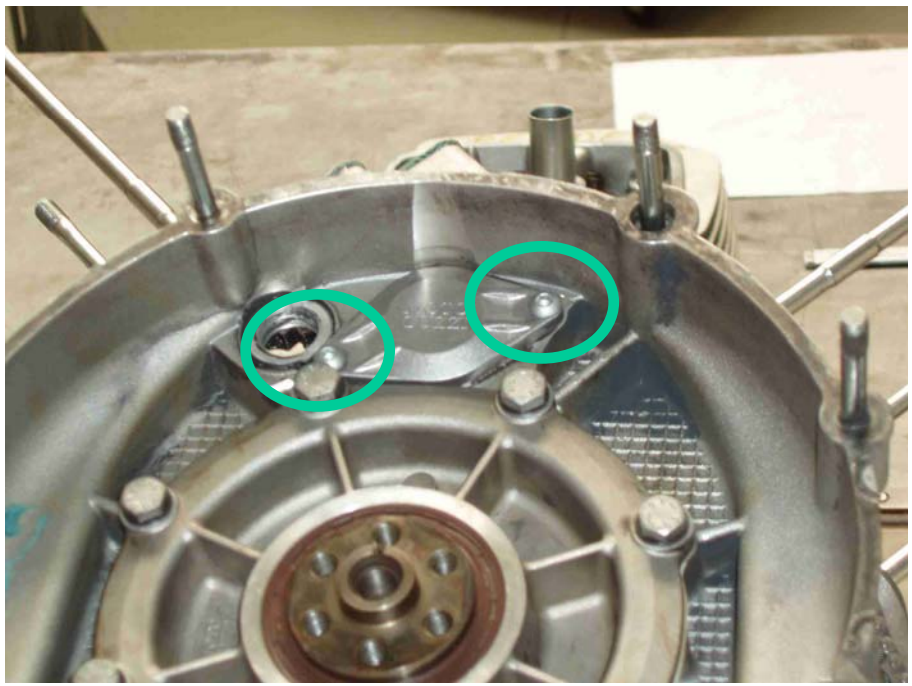
LEARNING CENTRE

Be very careful upon fitting: Make sure that the cap is in abutment against the crankcase, and avoid cutting the O-ring (use two flanged screws longer than the original screws, if required)

2 screws with Loctite 542

Torque: → 10 Nm





TIMING SYSTEM → CHAIN SLIDERS → MOVABLE

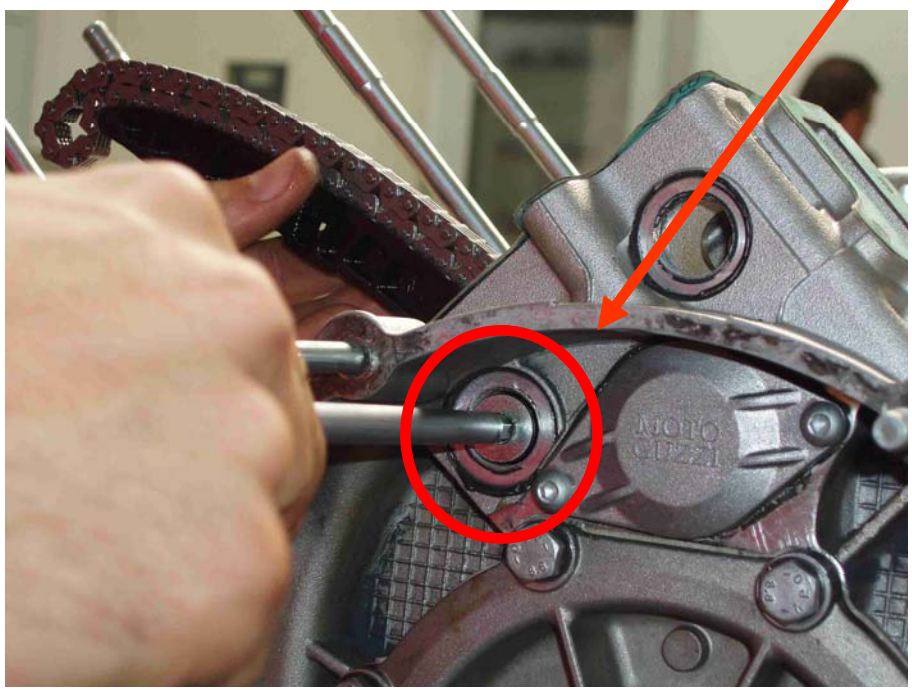
LEARNING CENTRE

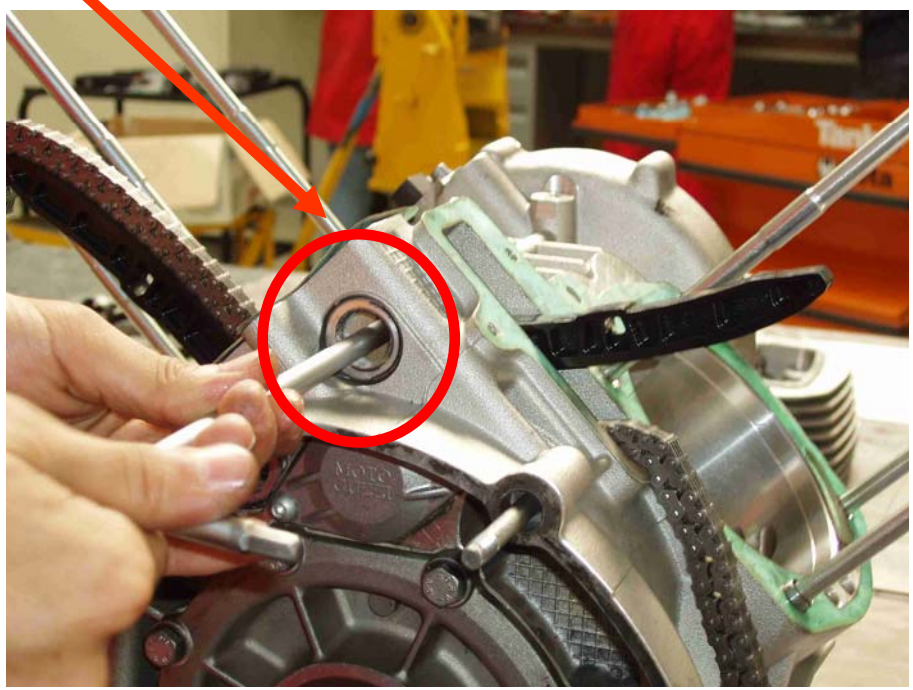
Screw with Loctite 243

Torque: → 25 Nm

Cap with O-ring

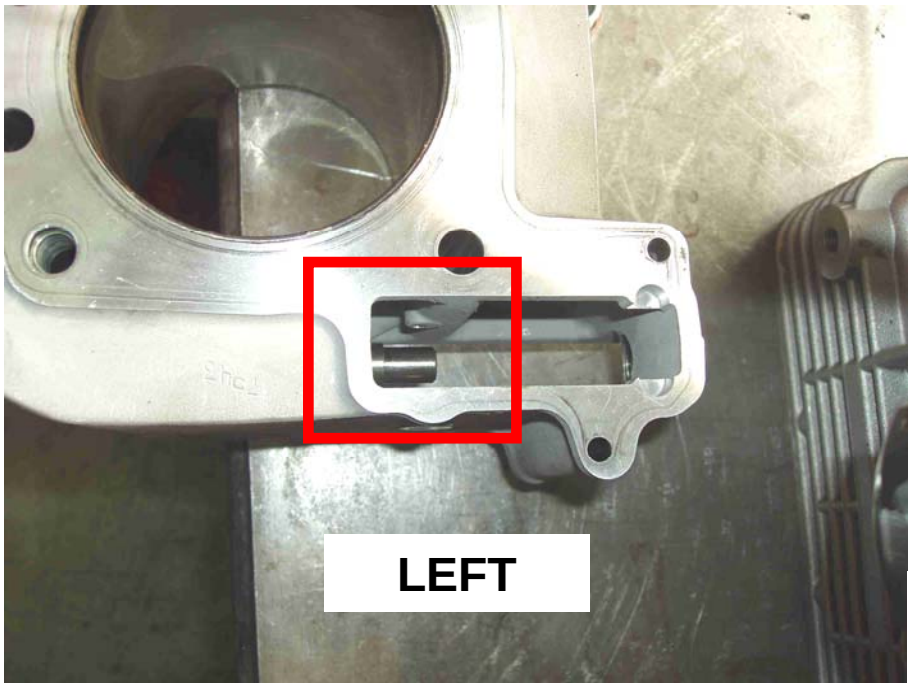
Cap torque: → 25 Nm





TIMING SYSTEM → CHAIN TENSIONER

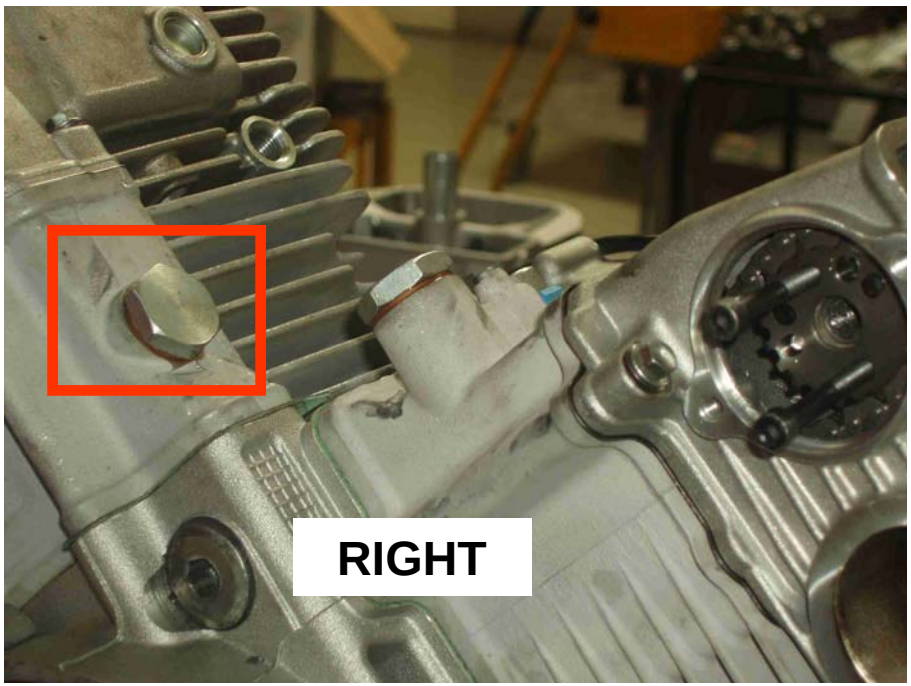
LEARNING CENTRE



Distribution chains are kept under tension by means of a CHAIN TENSIONER which works on the mobile shoe. The left tensioner is inside the cylinder, while the right one is outside of it

Plug + washer

Torque → 30 Nm

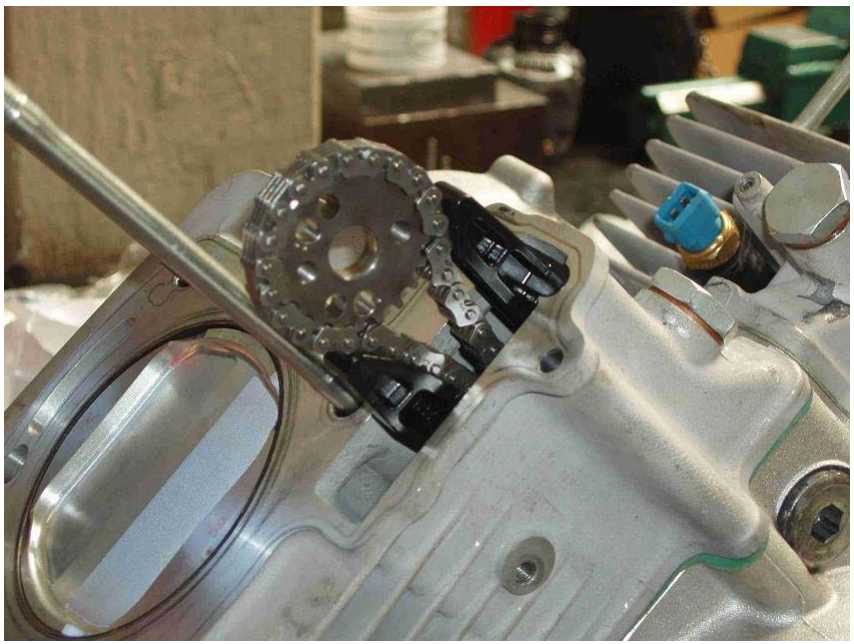


The right and left chain tensioners have, as spare parts, two different codes

TIMING SYSTEM → CAMSHAFT GEAR

LEARNING CENTRE

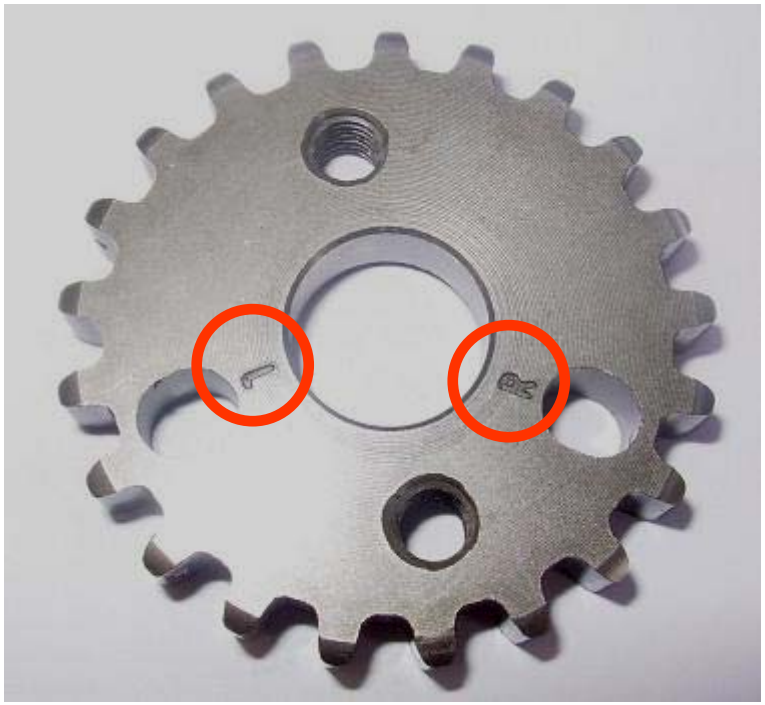
Once also the fixed pad has been positioned, fit the CAMSHAFT GEAR as shown in the figure



TIMING SYSTEM → CAMSHAFT GEAR

LEARNING CENTRE

The camshaft gear shows a letter L and a letter R. These letters will be used as reference for the next timing.

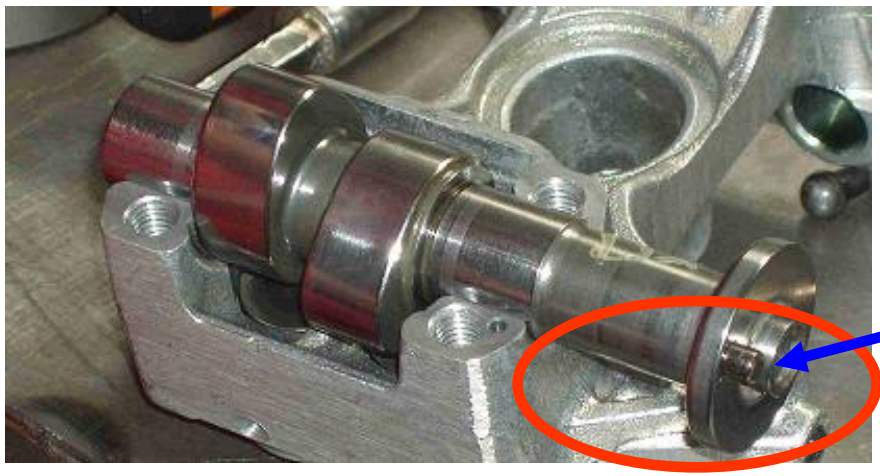


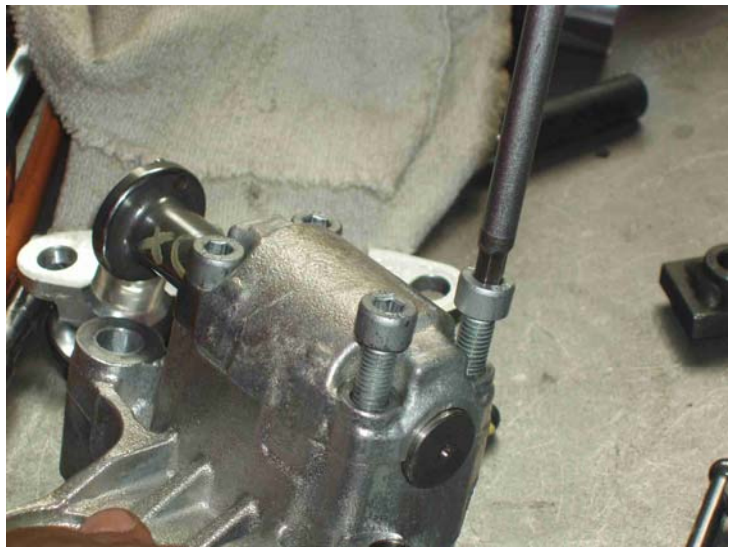
In a first series of engines, in place of L one may find two 2 WHITE DOTS and in place of R 1 WHITE DOT

DISTRIBUTION → CAMSHAFT

LEARNING CENTRE

The camshaft has to rest on the small frame with the pin toward the longer side of the cam cap





The recess is made to close with a lid fastened by means of 4 screws

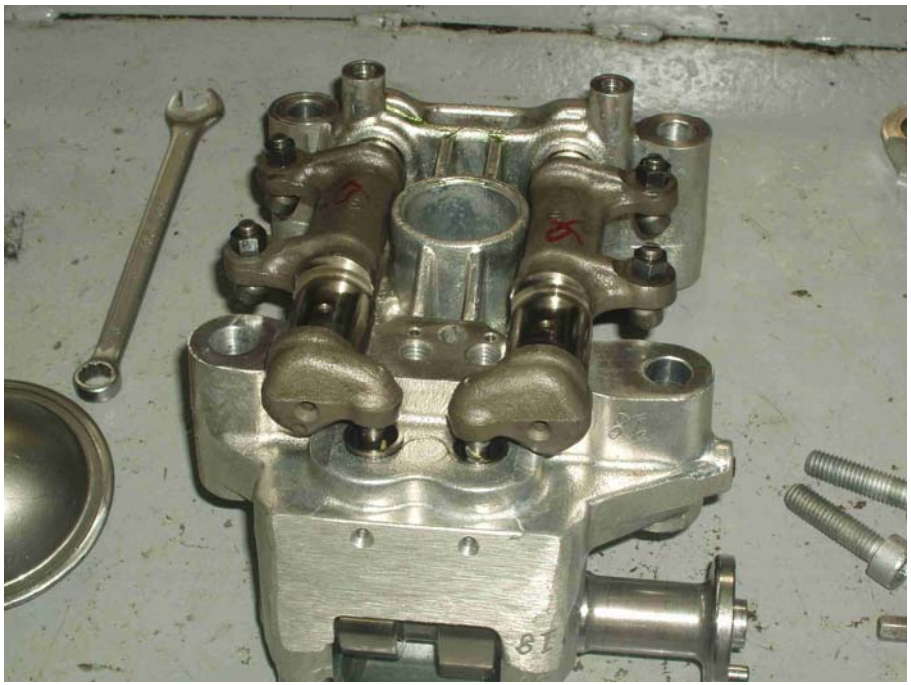
Torque → 25 Nm

Right and left camshafts are the same. Make a mark at the time they are removed and place them back as they were originally

TIMING SYSTEM → CAM CAP

The <u>CAPS</u> are equal, and so they can be interchanged both between the two cam caps and intake and exhaust if they are removed mark them so they may be replaced in the same position →

TIMING SYSTEM → CAM CAP

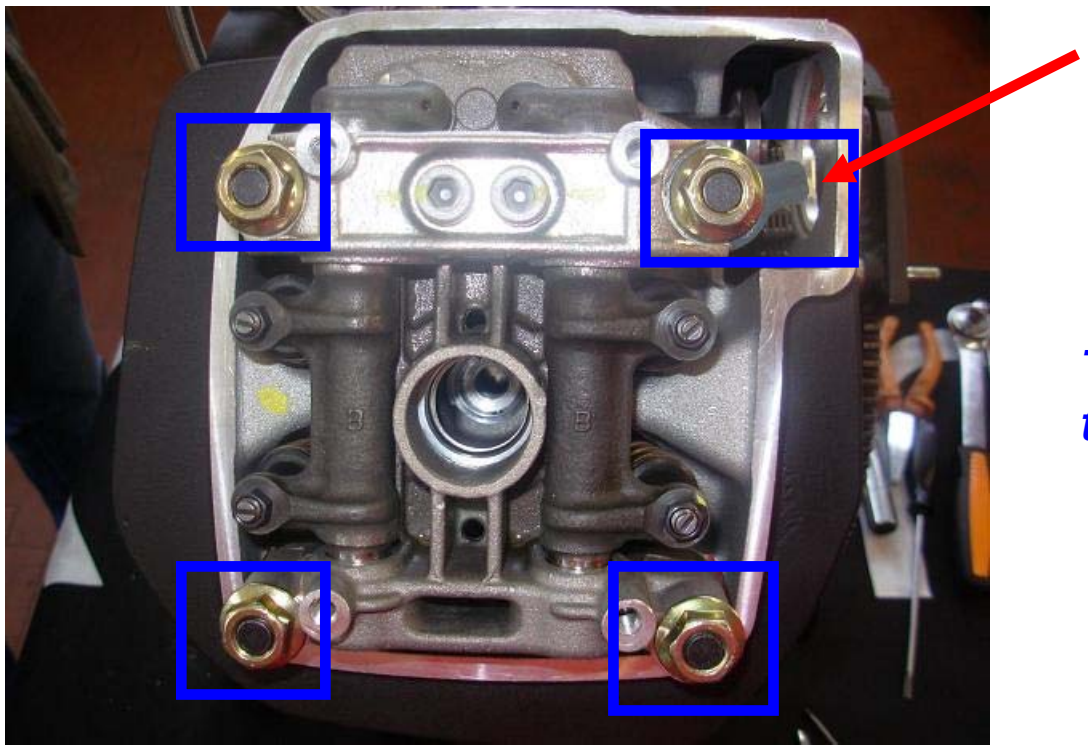


The rockers are interchangeable between a cylinder and the other → mark them so as to fit them back in the same position

TIMING SYSTEM → CAM CAP

LEARNING CENTRE

The cam cap is fastened to the head by means of 4 nuts, one with a tab to prevent shocks

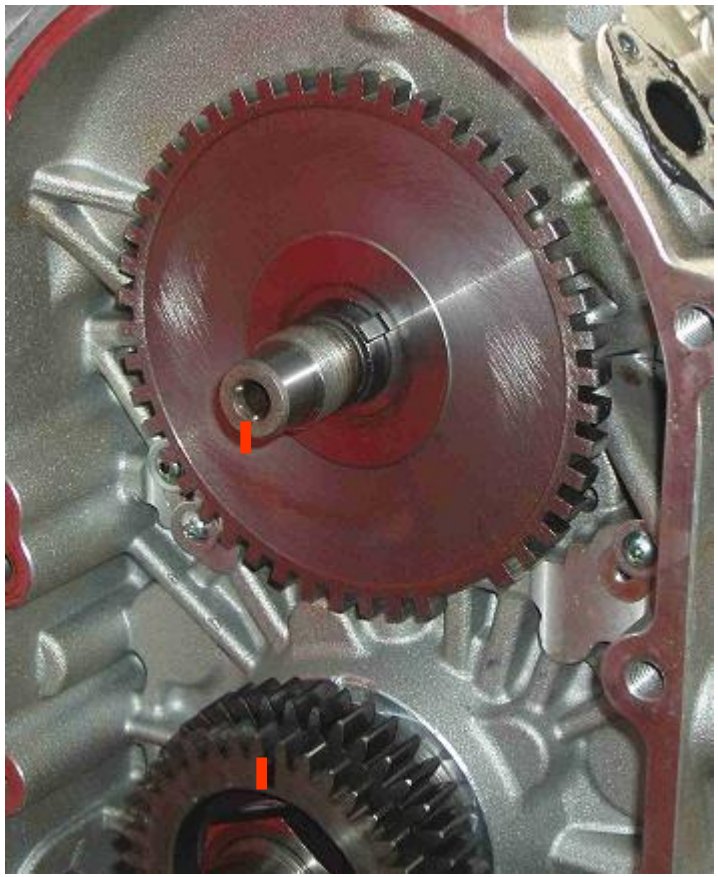


Tightening → pre-torque 15 Nm, then 90° + 90°

TIMING SYSTEM → GEARS → TONE WHEEL

LEARNING CENTRE

After the clutch unit has been assembled, make sure that the crankshaft is positioned in correspondence with TDC of the left piston (use the mark on the pinion) and lock it using the special tool (lock of flywheel/ ignition crown, cod. GU12911801)



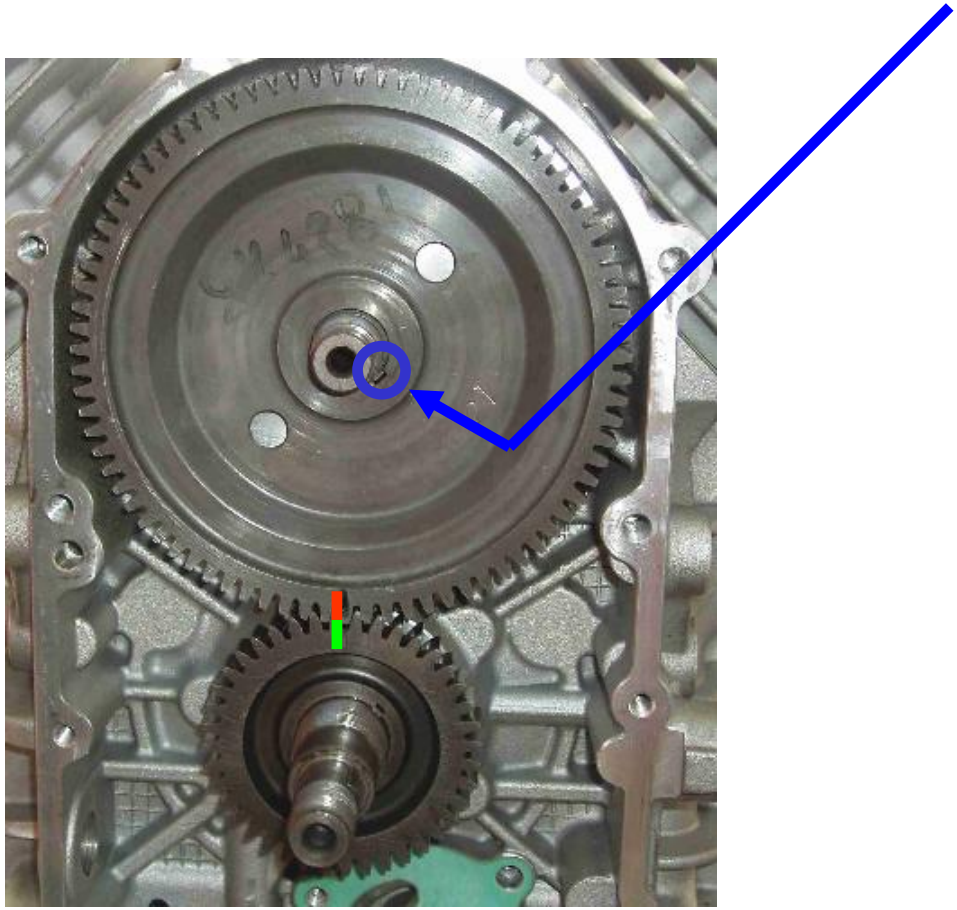
<u>TONE WHEEL</u>: after spacer and key have been fitted in their seats, on the service shaft, the assembly of the tone wheel is forced. The flared face has to be turned toward the crankcase.

Then rotate the service shaft so that the notch faces toward the bottom

TIMING SYSTEM → GEARS → TIMING GEAR

LEARNING CENTRE

The <u>TIMING GEAR</u> is also assembled in a forced position, given the seat for the key

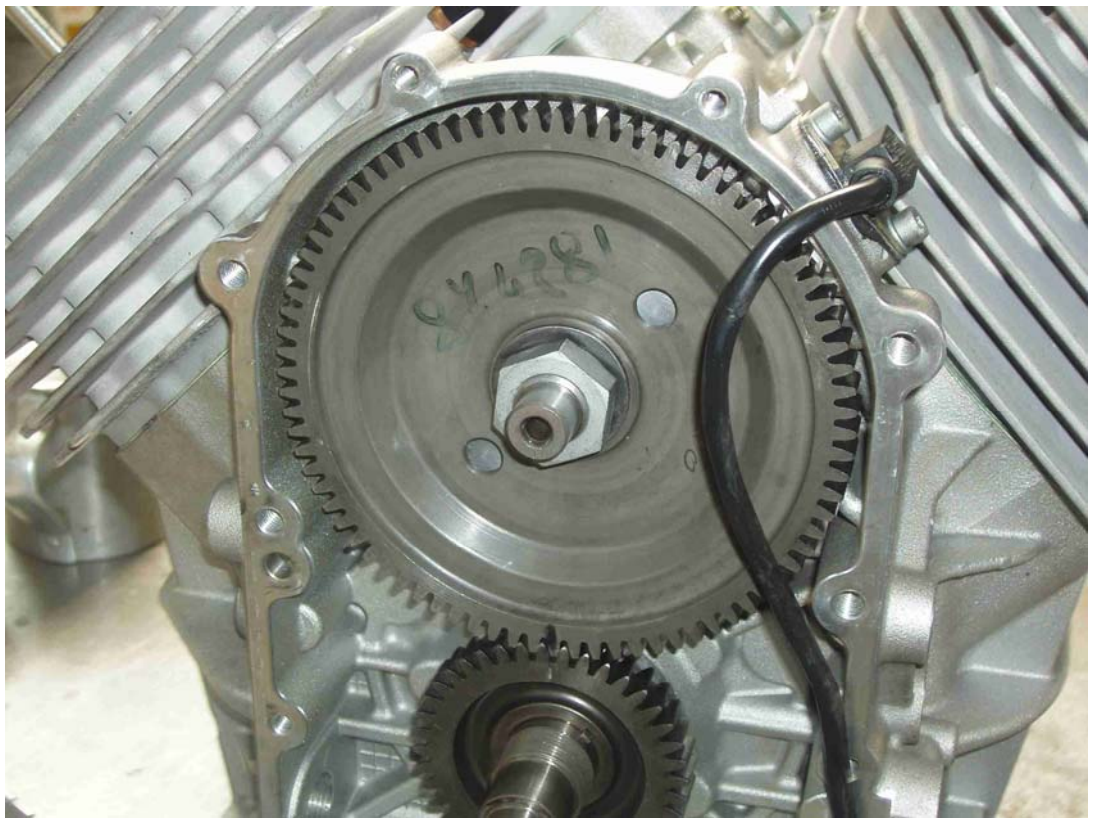


Make a reference notch on the gear for the next timing

Tightening the timing gear

Nut + corrugated washer

Torque → 150 Nm



Chapter 4

LEARNING CENTRE

1. Special tools
2. Basic structure
3. Timing system
4. **Thermal unit**
5. Timing
6. Oil system
7. Clutch
8. Temperature and oil pressure sensors

- ✓ PISTONS
- ✓ CYLINDERS
- ✓ DIRECTION
- ✓ SPARE PARTS

THERMAL UNIT → PISTONS

When fitting the piston make sure that the triangle marked on it is turned toward the exhaust/ timing system

As for the 2-valve model, the piston has 2 piston rings and one oil scraper

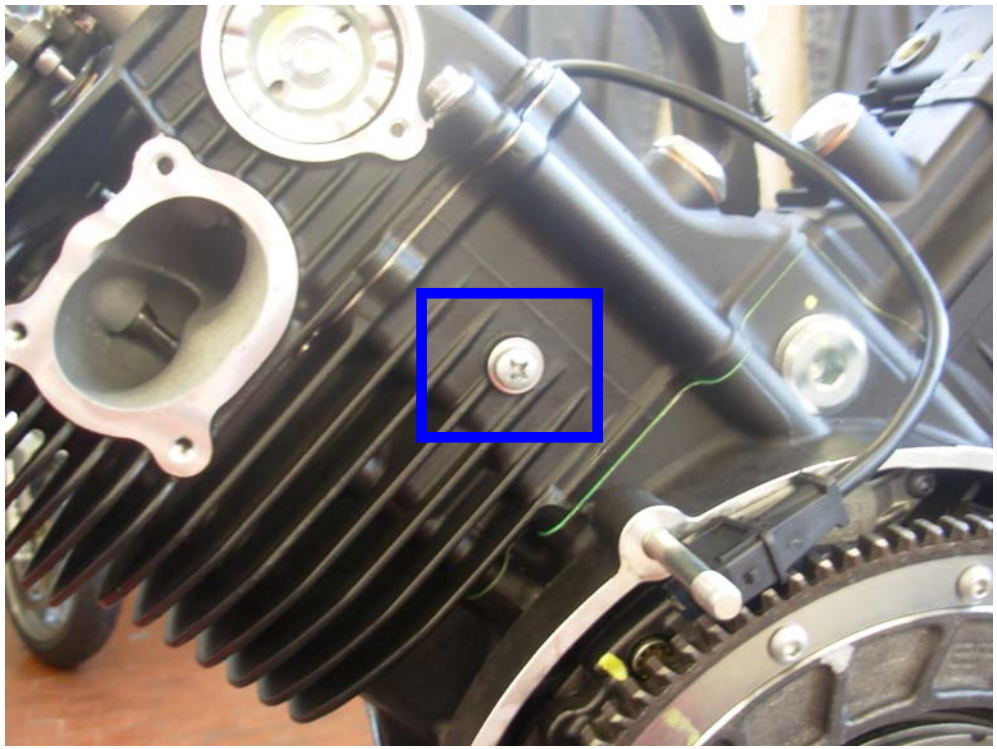
The letter N has to face upward

Displace the piston rings by 90° with respect to each other

As spare parts there is only one category available

The left cylinder has a hole (closed with a screw) to be used for the next timing so as to release the chain tensioner

Screw + washer + loctite 243



THERMAL UNIT → HEAD

LEARNING CENTRE

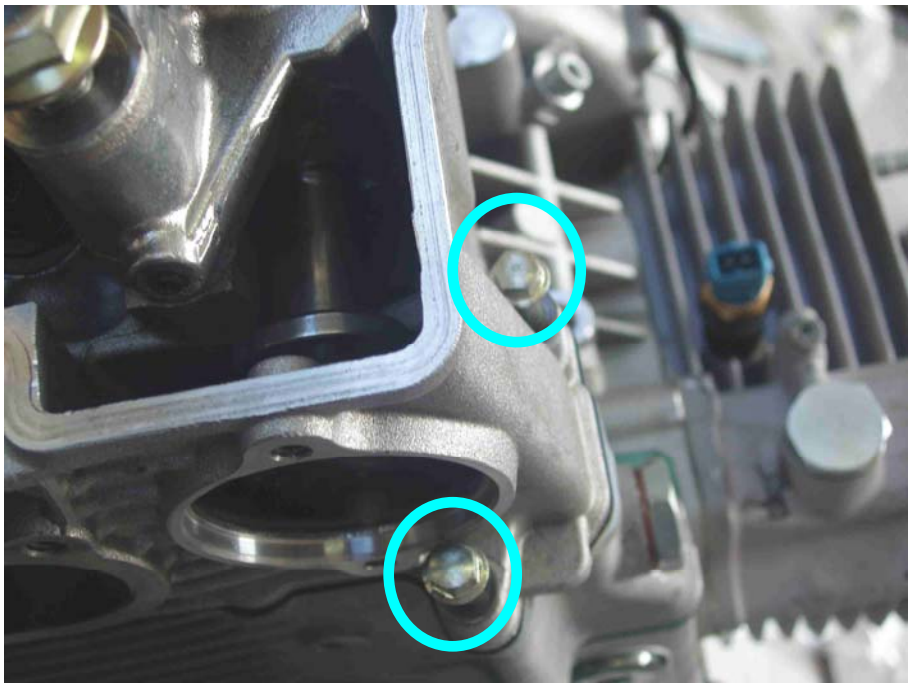
The head gasket comes in 3 different thicknesses. In order to find which is the lining to use, one has to figure out at the time it is needed and using the special tool, the difference between the bottom of the cylinder and the height of the piston at TDC

Difference [mm]	Gasket thickness [mm]	Code
0.37 – 0.56	0.65 ± 0.05	874621
0.19 – 0.37	0.85 ± 0.05	874622
0 – 0.19	1.05 ± 0.05	976311

THERMAL UNIT → HEAD

LEARNING CENTRE

It is fastened with 2 springs with washer (the screw of the left head closer to the timing system has two washers)



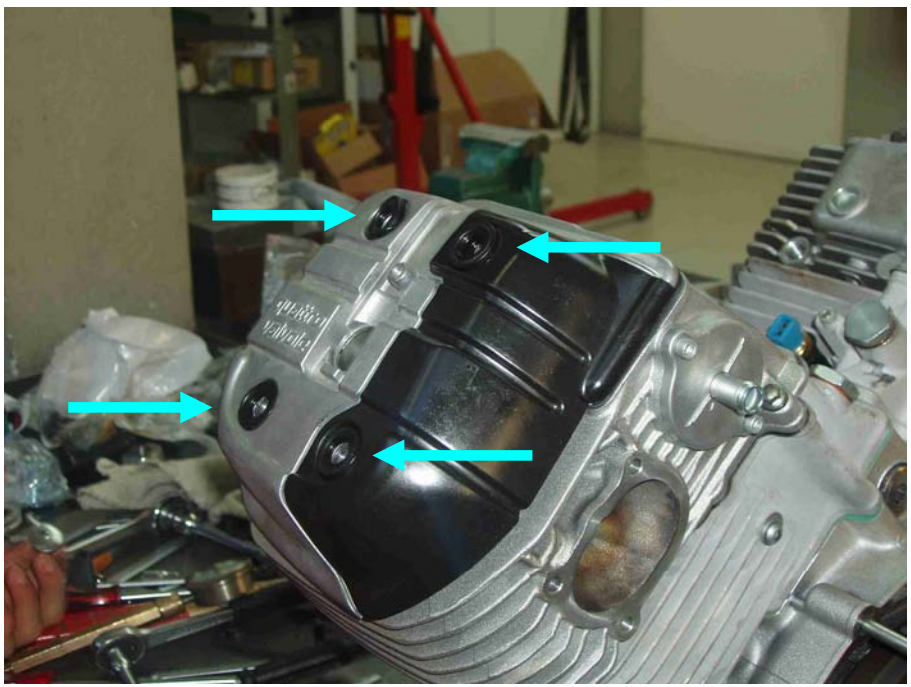
2 screws with washer

Torque → 10 Nm

THERMAL UNIT → HEAD COVER

LEARNING CENTRE

Valve covers, made of two pieces, are fastened with 4 screws and a rubber gasket to be replaced at the time of assembly



4 screws with damping buffers

Torque → 10 Nm

Chapter 5

LEARNING CENTRE

1 Special tools

2 Basic structure

3 Timing system

4 Thermal unit

5 **Timing**

6 Oil system

7 Clutch

8 Temperature and oil pressure sensors

- ✓ REFERENCE
- ✓ LEFT HEAD
- ✓ RIGHT HEAD
- ✓ VALVE ADJUSTMENT

TIMING → REFERENCE

By LEFT head we mean the head on the left when we are seated on the motorcycle (i.e. looking at the crankcase gearbox)

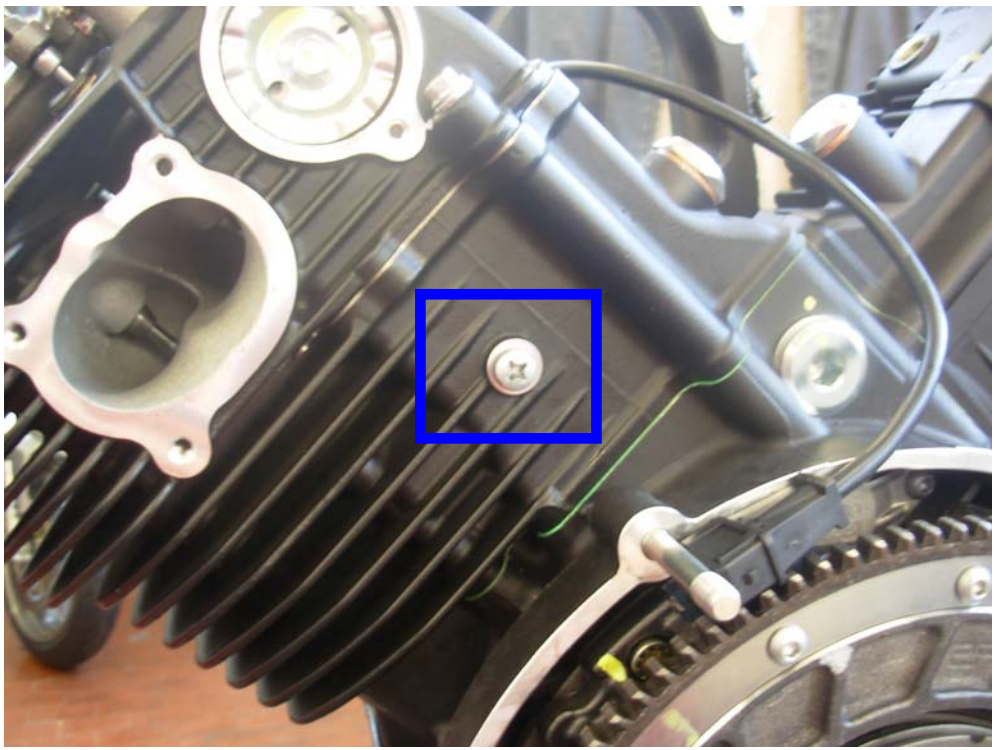
The LEFT piston is also the main piston (when the notches on the timing gears are lined up, at this point the left piston is at TDC)

TIMING →LEFT HEAD

LEARNING CENTRE

Move the left piston (main piston) to TDC

3 GEAR NOTCHES, TIMING SIDE – SERVICE SHAFT ALIGNED!!!

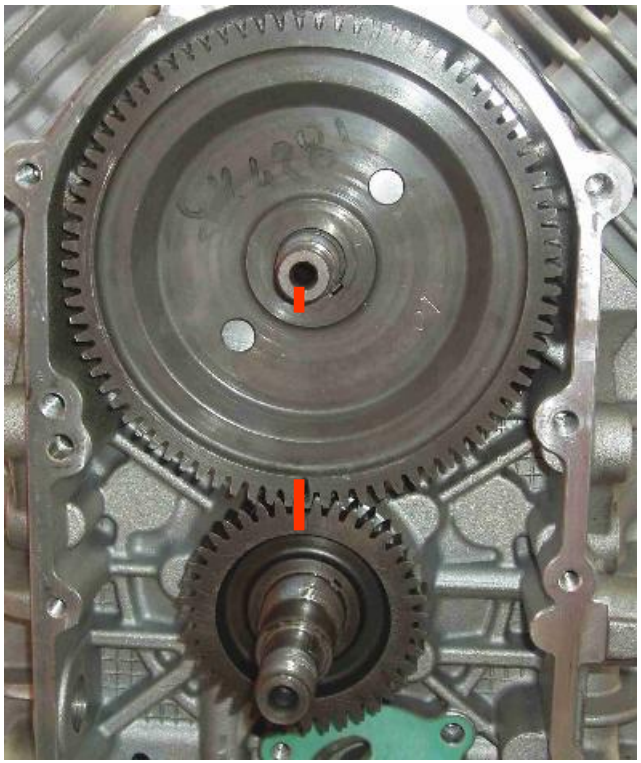


Remove the screw in the cylinder, as already seen, so that the chain tensioner may be released

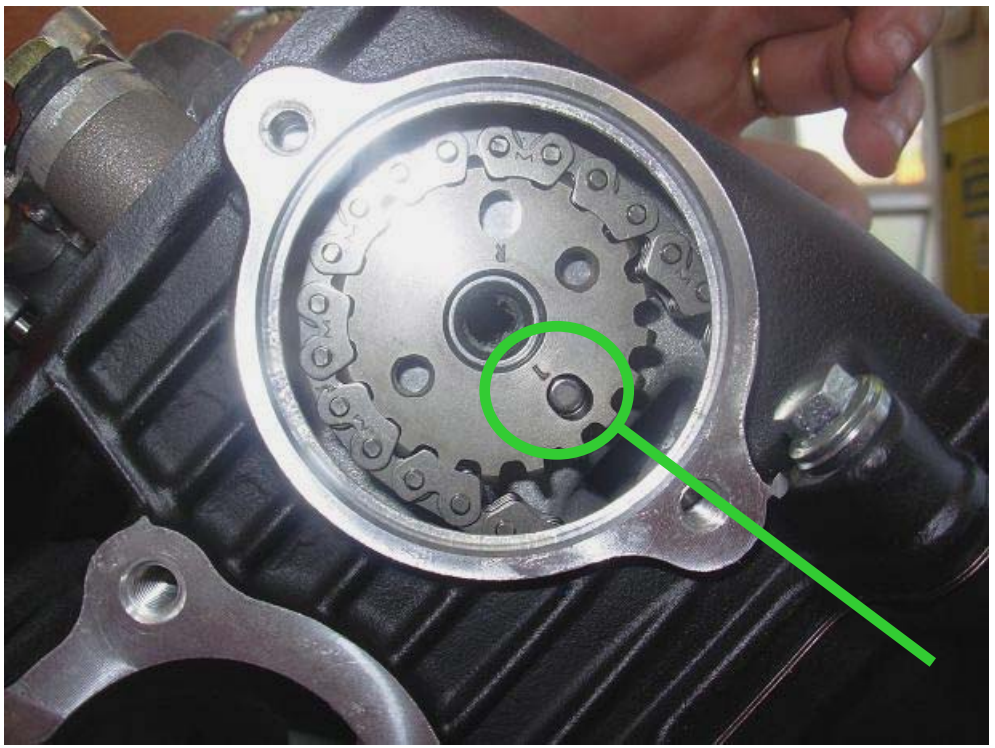
TIMING →LEFT HEAD

LEARNING CENTRE

The pin of the camshaft has to fit in the hole of the camshaft gear showing the letter L



This hole must face toward the base of the cylinder



In a previous series of engines one may find 2 white spots in place of the letter L

TIMING → RIGHT HEAD

LEARNING CENTRE

The right piston is positioned by rotating the crankshaft by 270° in the direction of rotation of the engine, (clockwise LOOKING AT THE TIMING SYSTEM). To do this, it is possible to use the following special tools:

Ignition timing phase disc

(cod. GU19929600)

Ignition timing phase arrow

(cod. GU17947560)

Use a dial gauge to check the position of the piston

TIMING → RIGHT HEAD

LEARNING CENTRE

The pin of the camshaft has to fit in the hole of the camshaft gear showing the letter L

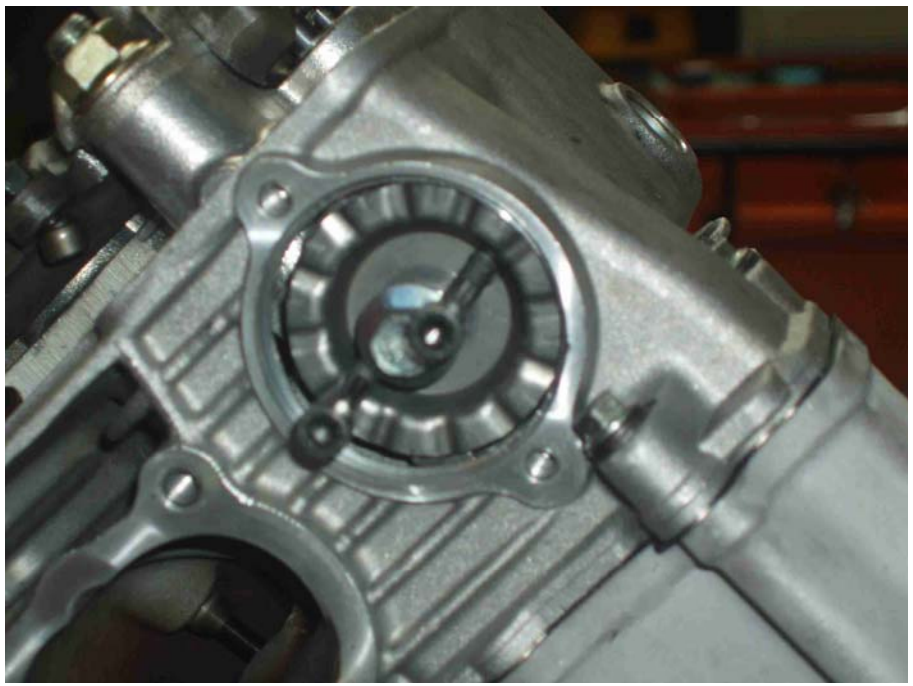
This hole must face toward the base of the cylinder

In a previous series of engines one may find 1 white point in place of the letter L

TIMING → THIN METAL PLATE AS AN OIL GUARD AND PLUG

LEARNING CENTRE

The camshaft gear is then covered with a thin metal plate to protect the oil and, later, with a plug



Screw with loctite 243

Torque → 30 Nm

Plug with OR

Torque → 6 - 8 Nm

TIMING → VALVE ADJUSTMENT

LEARNING CENTRE

The play of the valves is adjusted with the valves closed (power stroke)

INTAKE VALVES CLEARANCE → 0.10 mm

EXHAUST VALVES CLEARANCE → 0.15 mm

LEARNING CENTRE

1 Special tools

2 Basic structure

3 Timing system

4 Thermal unit

5 Timing

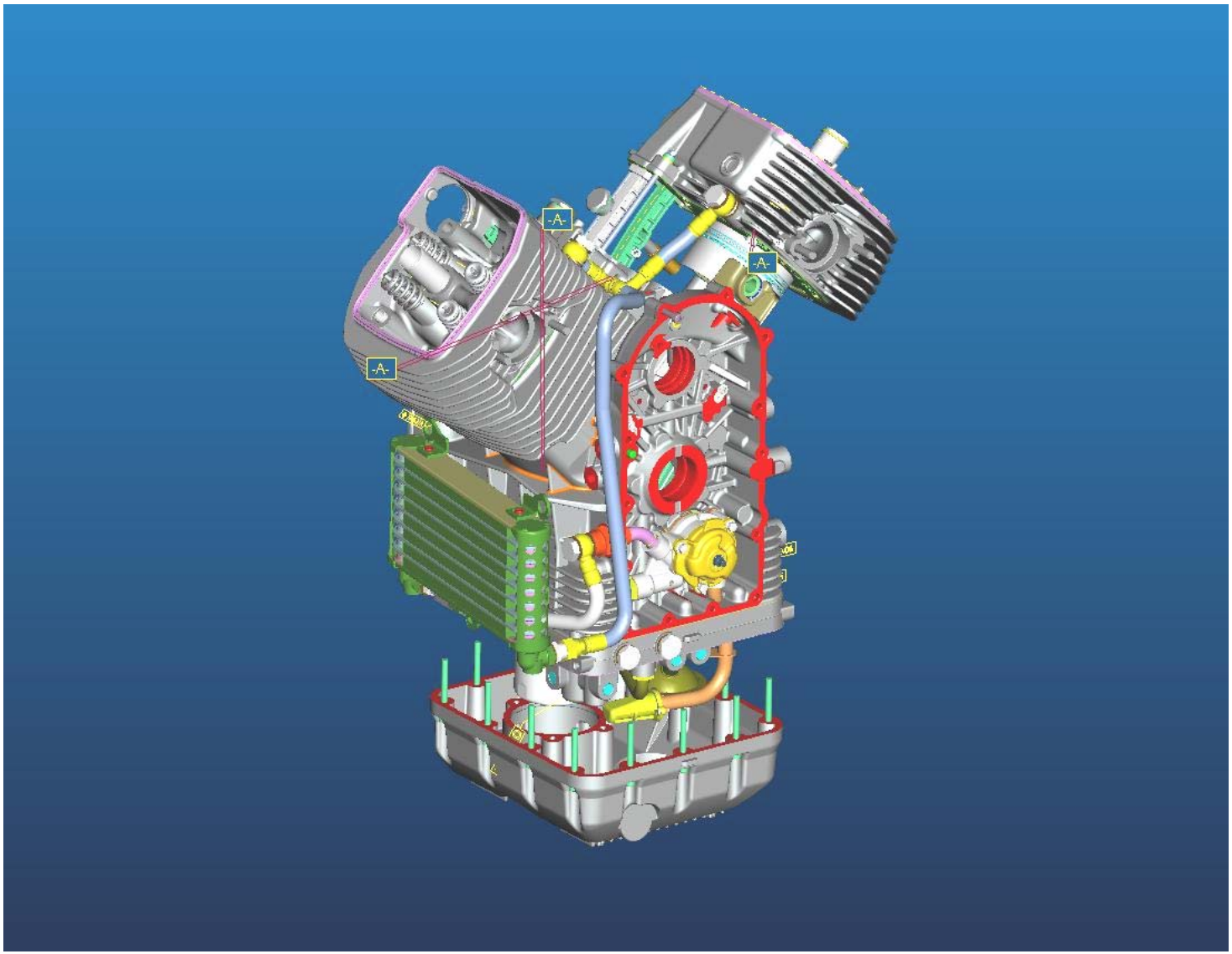
6 **Oil system**

7 Clutch

8 Temperature and oil pressure sensors

- ✓ OIL PUMP
- ✓ SUCTION FILTERS
- ✓ OIL FILTER
- ✓ OIL CIRCUIT

OIL SYSTEM → OVERALL VIEW



OIL SYSTEM → OIL PUMP

LEARNING CENTRE

The oil pump is made of a double pressure pumping element working on two different delivery lines

One pumping element works for lubricating the engine

The second works to cool the oil, sending the oil to the radiator and, then, to the heads

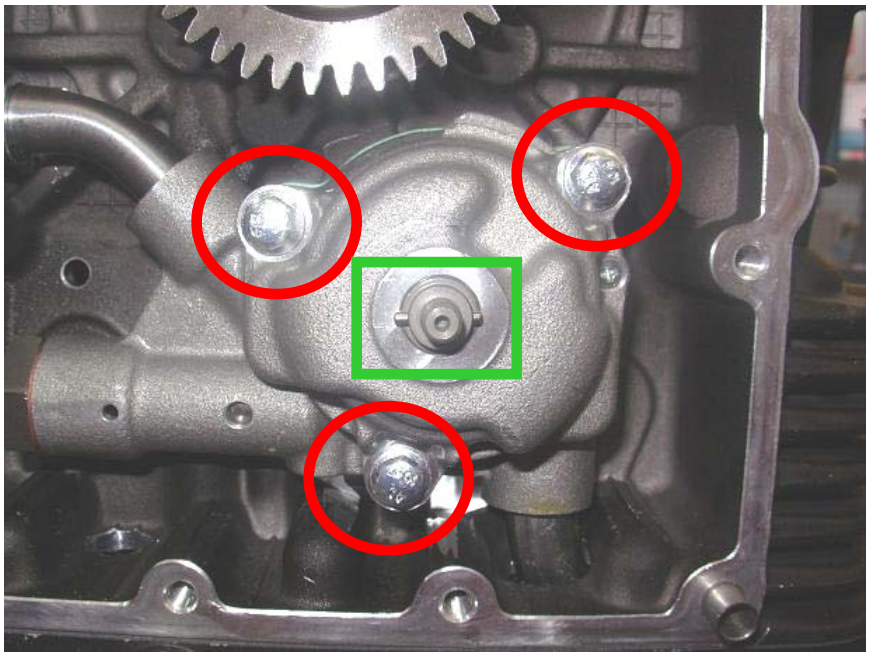
OIL SYSTEM → OIL PUMP

LEARNING CENTRE

The engine block is fastened with 3 screws

3 screws with loctite 243

Torque → 10 Nm



The pump is actuated by a gear which is made to rotate by a motoring over gear mounted on the crankshaft. The oil pump gear is fitted on a small shaft out the output of the pump and is made to rotate by a roller

OIL SYSTEM → OIL PUMP

LEARNING CENTRE

The oil pump gear is fastened by means of a washer, a corrugated washer and a thin nut assembled in sequence

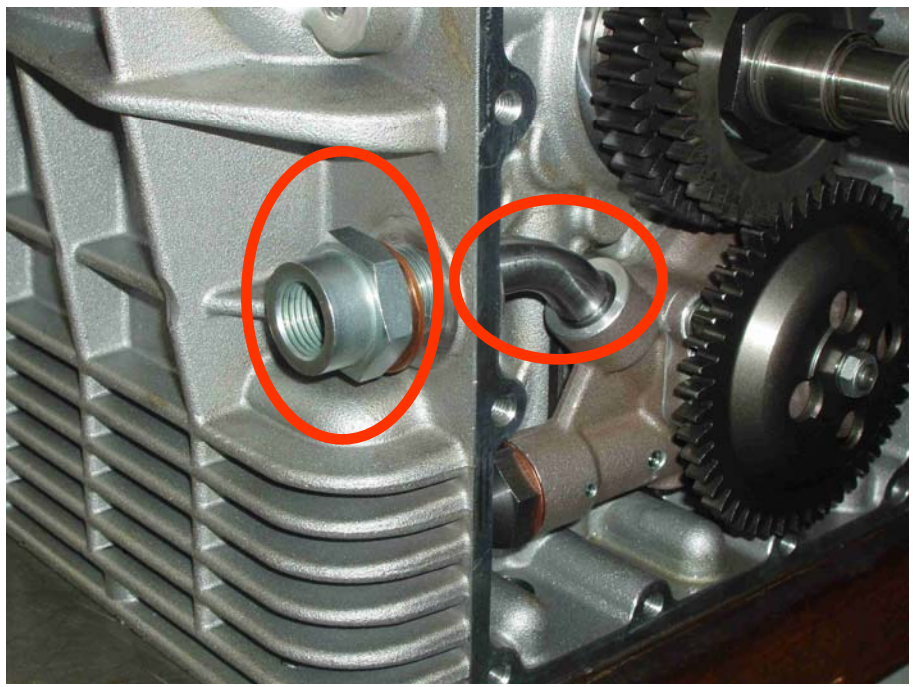
Torque → 8 Nm

During assembly be careful not to loose the roller and remember to fit it during assembly

OIL SYSTEM → OIL PUMP

LEARNING CENTRE

The pump is connected to the radiator by means of a connecting tube and a nipple screwed on the engine block



2 OR for the seat of the nipple

Gasket

OIL SYSTEM → INTAKE FILTERS

LEARNING CENTRE

Under the sumo, unlike the 2-valve engine, there are two intake filters: one for the oil to be used for lubrication, the other oil for the radiator

Cooling oil filter

Lubrication oil filter (filtering strainer)

OIL SYSTEM → OIL FILTER

LEARNING CENTRE

As a qualitative improvement, the seat of the oil filter gasket has been modified, to improve its support

Torque → 15 Nm

OIL SYSTEM → OIL CIRCUIT → INSIDE PUMPING ELEMENT

LEARNING CENTRE

The inside pumping element is the one dedicated to the lubrication of the engine. The oil circuit may be simplified as follows:

- ✓ **oil intake from the filter as seen before (filtering strainer)**
- ✓ **delivery to the oil filter**
- ✓ **recycle to the engine crankcase**
- ✓ **crankshaft lubrication**
- ✓ **from the lubrication holes timing system side:**
  - **pistons cooling jets**
  - **crankshaft support timing system side**
  - **through the holes on the cylinders it goes to lubricate the heads**
- ✓ **through the connecting pipe, to be seen in the picture, the oil lubricates the big end bearing clutch side**

OIL SYSTEM → OIL CIRCUIT → OUTSIDE PUMPING ELEMENT

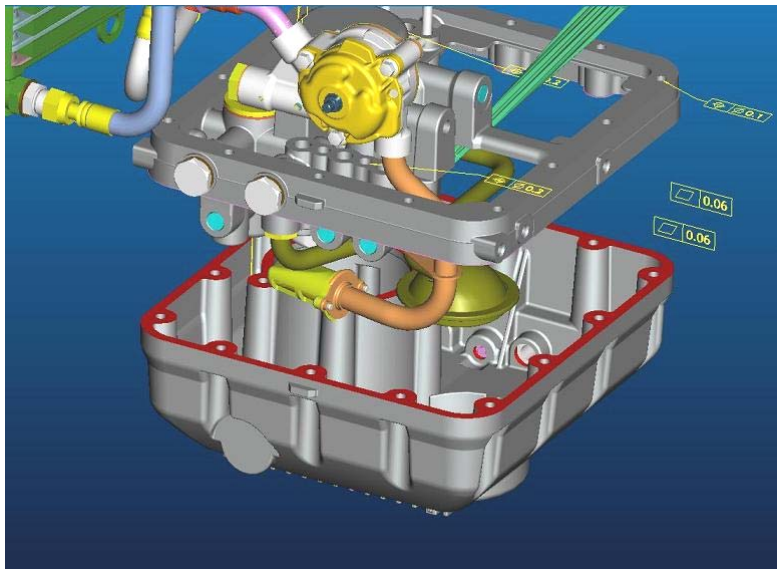
LEARNING CENTRE

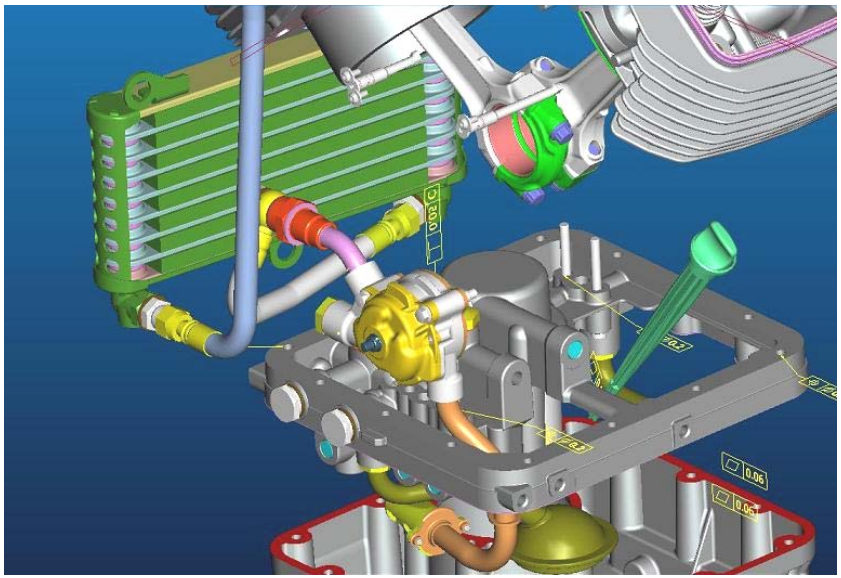
The outside pumping element is dedicated to cooling the oil. The oil circuit may be simplified as follows:

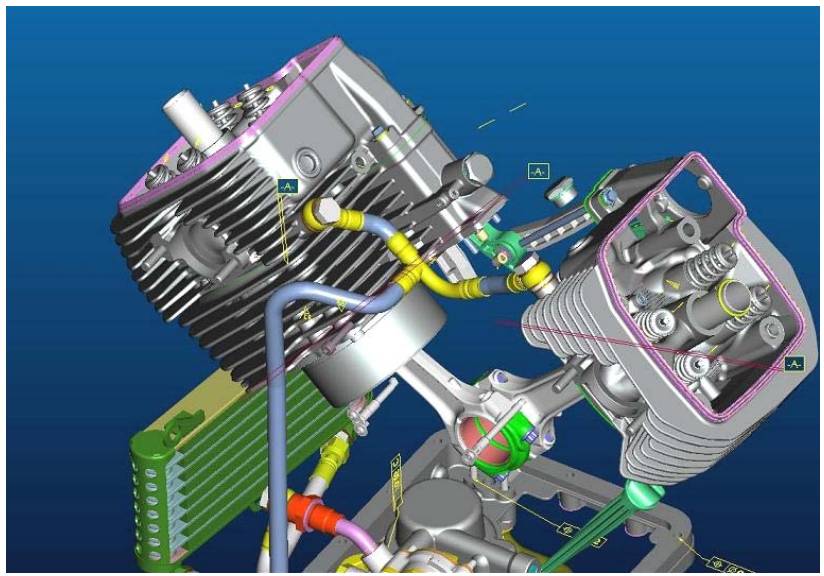
- ✓ **intake from the filter as seen before**
- ✓ **delivery to the radiator**
- ✓ **through the two outside pipes for the passage of oil in the two heads for cooling**

OIL SYSTEM → OIL CIRCUIT → OUTSIDE PUMPING ELEMENT

LEARNING CENTRE







Chapter 7

LEARNING CENTRE

1 Special tools

2 Basic structure

3 Timing system

4 Thermal unit

5 Timing

6 Oil system

7 **Clutch**

8 Temperature and oil pressure sensors

- ✓ COMPONENTS
- ✓ ASSEMBLY

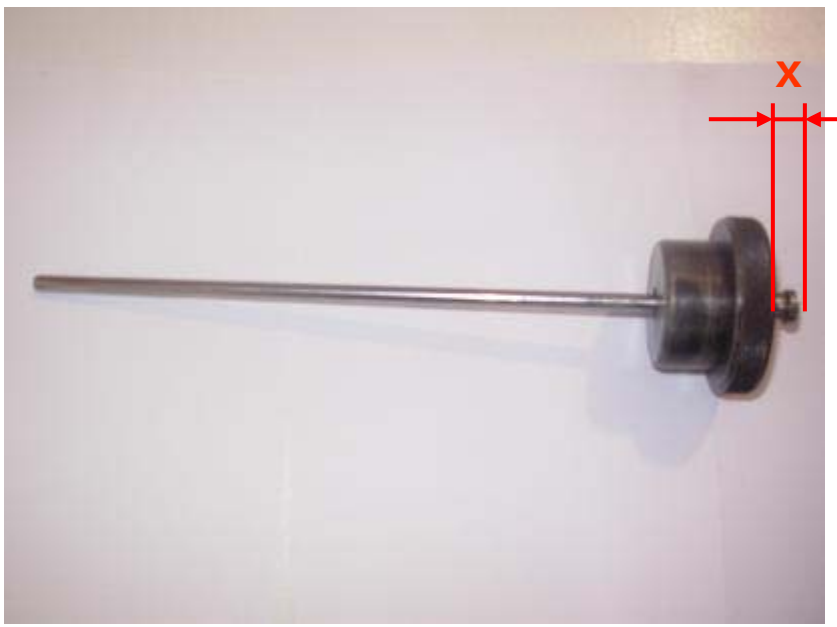
CLUTCH

LEARNING CENTRE

✓ In comparison with the old 2-valve engine, the clutch is SINGLE-DISC The spring drives are placed on the friction disc

✓ Should the clutch be replaced, do remember that the control rod is available in 4 classes. In order to figure out which is the right rod to be fitted, one has to measure the distance between the top of the rod and the base of the bumper (to be seen in the picture, during), and choose the rod according to the table below

Measurement X	Length of the rod to be fitted	Code
From 9.8 mm to 11.2 mm	183 mm	976593
From 8.3 mm to 9.7 mm	184.5 mm	976594
From 6.8 mm to 8.2 mm	186 mm	976595
From 5.3 mm to 6.7 mm	187.5 mm	976596



CLUTCH → COMPONENTS

LEARNING CENTRE

The clutch unit is made of the following elements

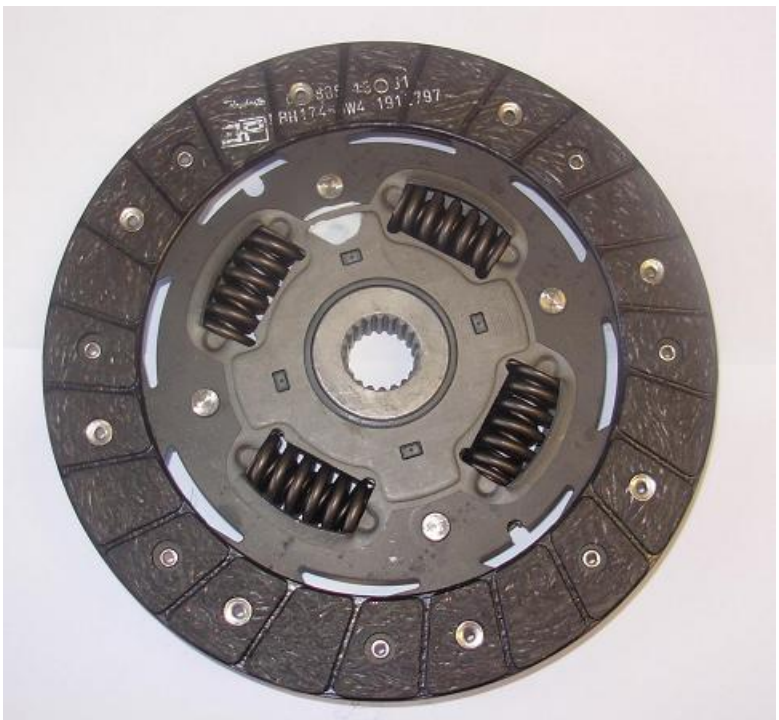
- ✓ **Clutch disc**

- ✓ **Clutch thrust plate**

CLUTCH → COMPONENTS

LEARNING CENTRE

- ✓ **Piston ring**



- ✓ **Friction disc**

CLUTCH → COMPONENTS

LEARNING CENTRE

- ✓ **Clutch bell**

- ✓ **Crown**

CLUTCH → FITTING

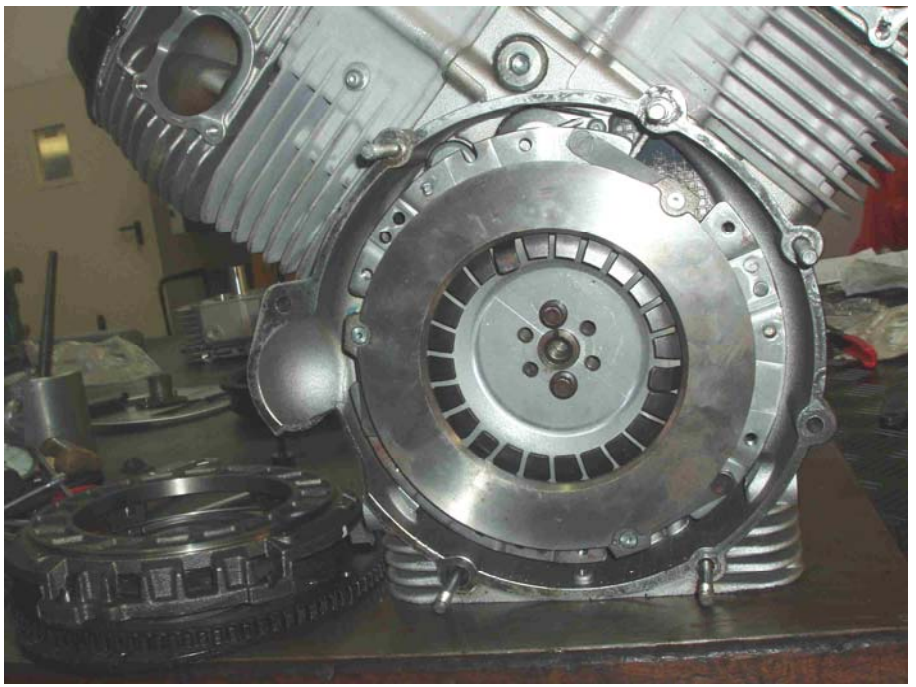
LEARNING CENTRE

Assemble in sequence:

- ✓ **Clutch disc**

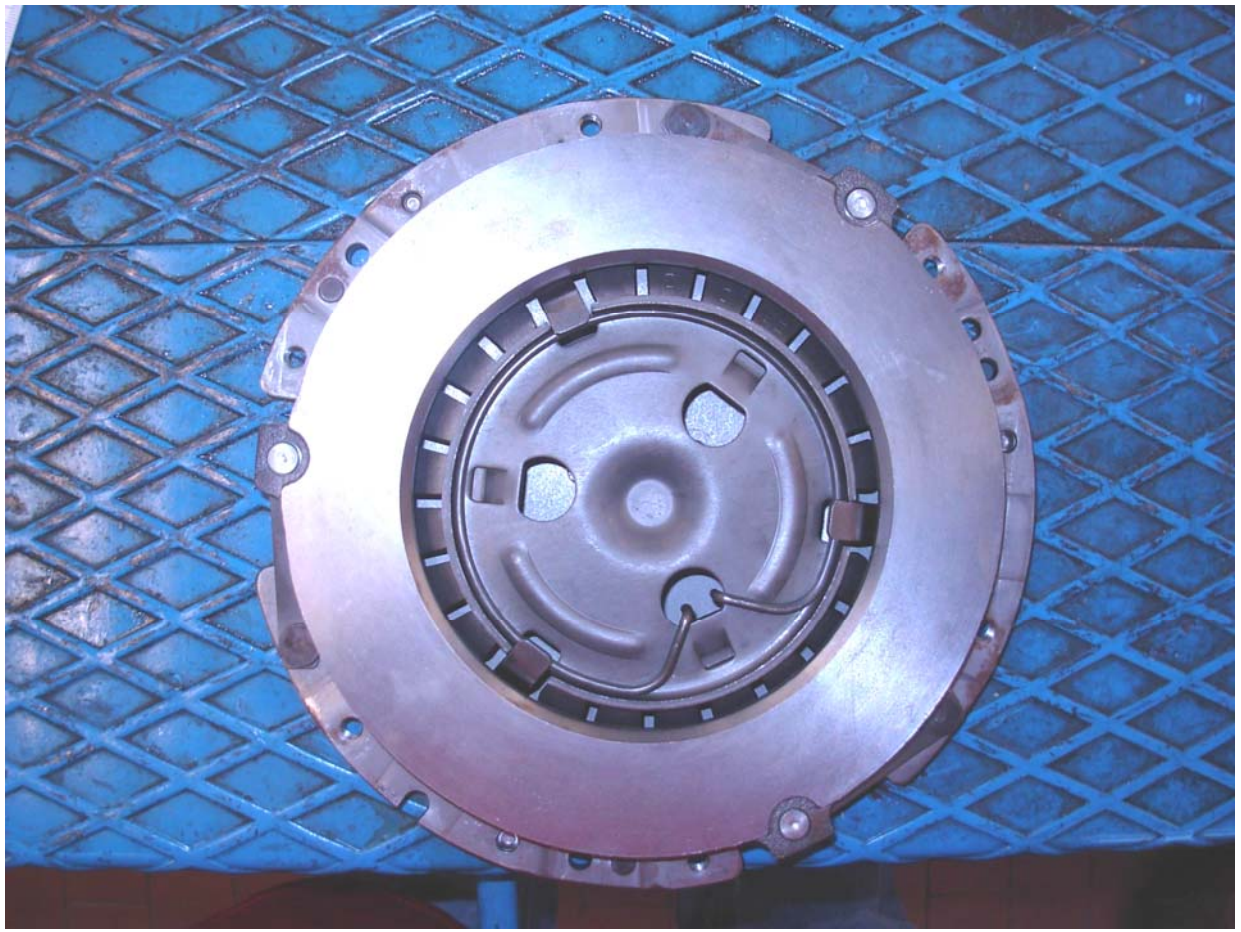
6 screws with elastic gaskets

Torque 42 Nm



With crankshaft in line with the TDC of the left piston, the clutch has to be assembled with the yellow sign facing the left ribs on the engine crankcase. The right rib corresponds to the TDC of the right piston

CLUTCH → FITTING



- ✓ **Thrust plate and piston ring**

Make sure that the ends of the ring fit in the grooves of the thrust plate

It is very important for the thrust plate to be properly centred, to avoid anomalous wear → a special tool is being prepared

CLUTCH → FITTING

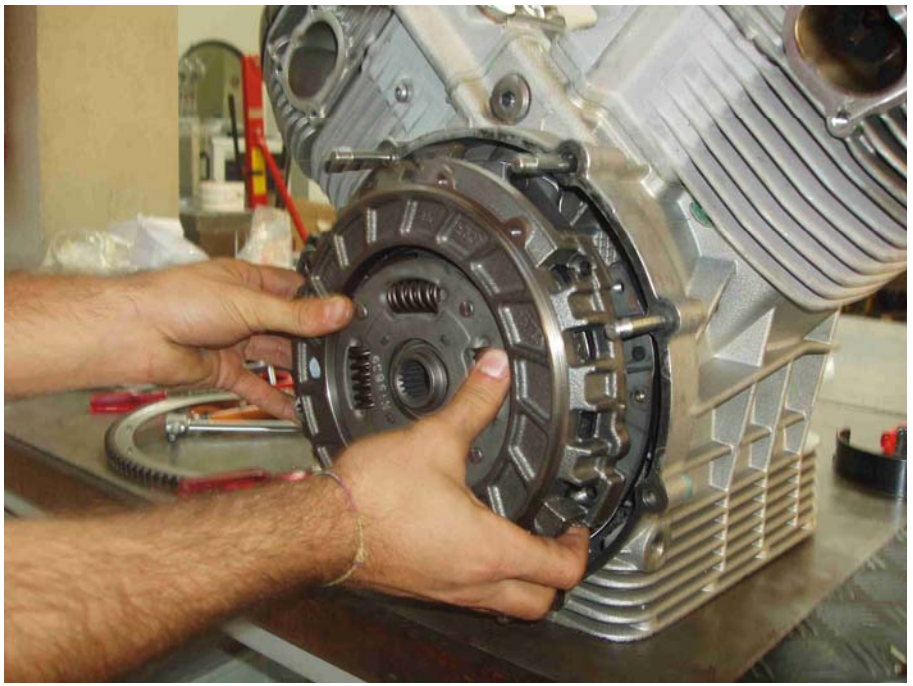
LEARNING CENTRE

- ✓ **Friction disc and clutch bell**

Line-up the yellow marks

6 screws with loctite 243

Torque → 20 Nm



- ✓ **Crown**

Line-up the yellow marks

6 screws with loctite 243

Torque → 10 Nm

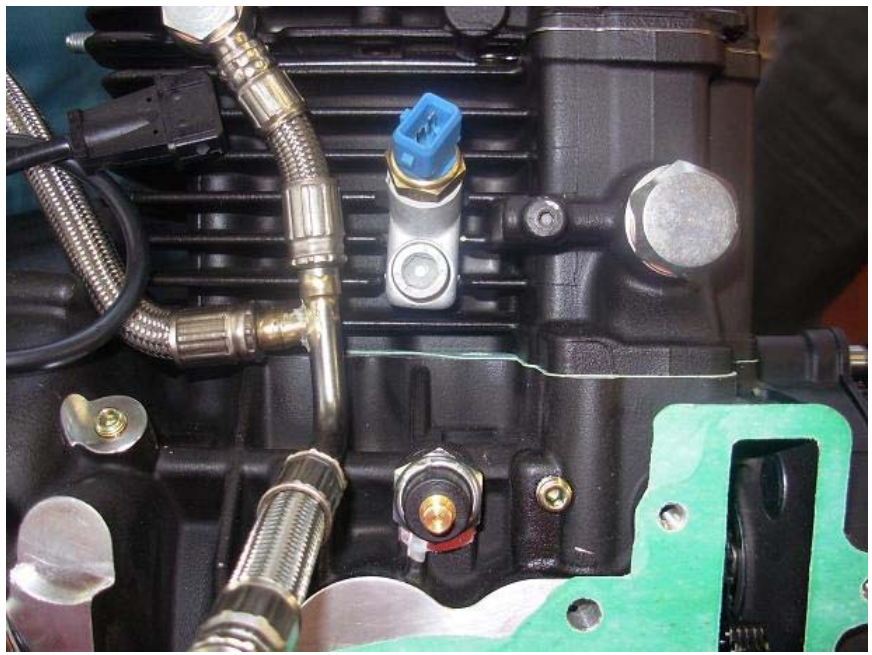
TEMPERATURE AND OIL PRESSURE SENSOR

LEARNING CENTRE

The <u>TEMPERATURE GAUGE</u> is positioned on the right cylinder and mounted on the support as can be seen in the picture

Screw with loctite 243

Torque → 10 – 12 Nm



The <u>OIL PRESSURE GAUGE</u>, instead, is positioned on the engine block, closer to the gearbox with respect to the position in the old 2-valves engine

THANK YOU FOR YOUR KIND ATTENTION

CONTENTS

LEARNING CENTRE

LEARNING CENTRE

1 **Electronic injection**

2 Components

3 Safety system

4 Axone

5 Throttle alignment

6 Diagrams

- ✓ FUEL CIRCUIT
- ✓ INTAKE AIR
- ✓ 5AM 2 ECU

The ECU is a digital electronic unit with microprocessor. For a perfect operation of the engine, through a series of sensors, it provides a continuous monitoring of the operating conditions of the engine

The main sensors are:

- ✓ **Engine rpm sensor → it measures the engine rpm and the position of each cylinder with respect to TDC**
- ✓ **Throttle position sensor → it measures the opening angle of the throttle**

The secondary, or correction sensors are:

- ✓ **Pressure sensor (in the instrument panel) → it measures the barometric pressure**
- ✓ **Air temperature sensor → it measures the temperature of intake air**
- ✓ **Engine temperature sensor → it measures the thermal condition of the engine**

The way the information received is managed determines the control of the actuators:

- ✓ **Quantity of fuel fed sequentially, not in parallel, to each cylinder, checking the instant closure of the injectors and, hence, the timing of the injection as referred to the instant when the intake of each cylinder is completed**

- ✓ **Ignition advance (coils)**

Keeping the minimum rpm is obtained by means of a stepper motor which lets the air enter the combustion chambers by-passing the throttles

Its position is modified to hold the minimum rpm fixed by the power unit based on the ambient conditions (engine temperature, air temperature, ...)

INJECTORS

The control action sent by the power unit is by pulsation.
It establishes the displacement of the moving core of the solenoid, uncovering the opening of the nozzles of the injector.

In the presence of a constant pressure for the petrol, provided by the regulator in the pump of 3 ± 0.2 bars, the injected quantity will depend exclusively on the time the injectors stay open.

Power input 12V

Resistive value 14 Ω ± 2 at 20°C

NTC air temperature sensor present in the filter housing

°C	kOhm
-40	100,950
0	9,750
+10	5,970
+20	3,750
+30	2,420
+40	1,600
+90	0.280

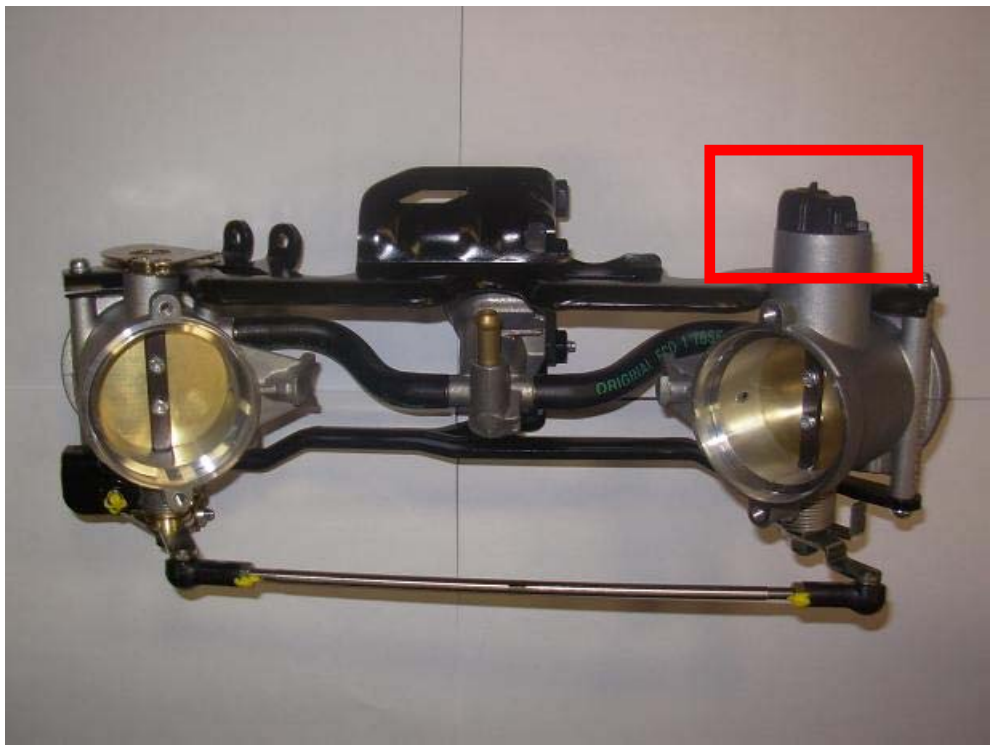
THROTTLE VALVE POTENTIOMETER

This sensor informs the power unit of the position of the throttle. The mechanical degrees are changed into electrical signals in the form of voltage

Based on this signal, the ECU will adjust the times of injection and thus optimise the stoichiometric ratio

Three-wire connector:

- ✓ **Power input 5V**
- ✓ **The mass from the power unit**
- ✓ **Signals the position of the throttle valve, scale from about 0.55 V (for a beat) to about 4.4 V (max. opening)**

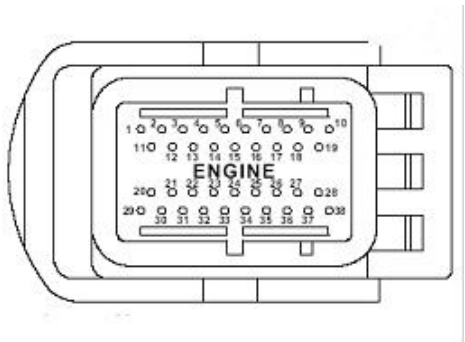


Positive and negative, with respect to the 2 valves, are inverted

LEARNING CENTRE

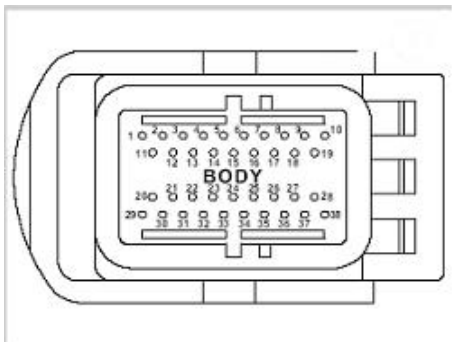
The ECU is housed in the front and under the tank and has two connectors

Connector A - from 1 to 38 pins



BROWN connector → engine

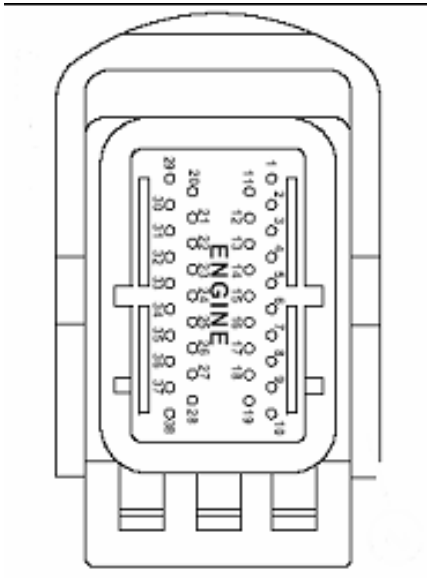
Connector B - from 1 to 38 pins



BLUE connector → vehicle

PIN CONFIGURATION ENGINE ECU

A Connector - Brown



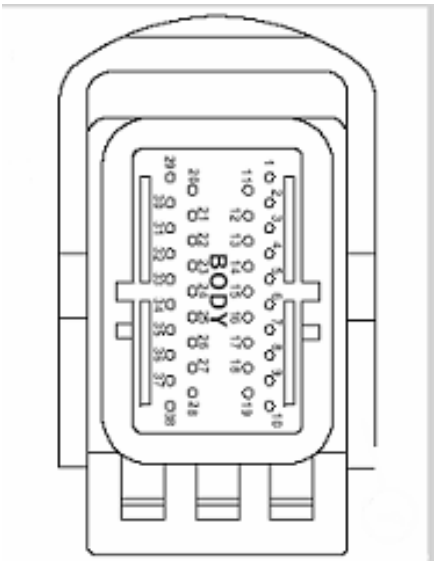
*****Not connected

1*
2*
3 throttle position signal
4*
5 engine temperature signal
6*
7*
8*
9 stepper motor +
10 RH cylinder coil control.
11*
12*
13*
14 air temperature signal
15*
16*
17 stepper motor +
18 stepper motor +
19 stepper motor +
20 power supply 5V (NTC sensors)
21*
22*
23 neutral sensor signal
24*
25 engine rpm sensor signal
26*
27*
28 LH cylinder injector control.
29 throttle sensor input
30*
31*
32 throttle negative sensor
33*
34 rpm sensor anti-jamming cable
35 engine rpm sensor signal
36*
37 RH cylinder injector control
38 RH cylinder coil control.

LEARNING CENTRE

PIN CONFIGURATION ENGINE ECU

B Connector - Blue



***** Not connected

1 pin 85 start-up relays control
2*
3*
Power supply 4V
5*
6 secondary relay pin 86 control
7 line K (Reprog. instrument panel)
8*
9*
10*
11 lambda probe negative control
12*
13*
14*
15*
16 line K (diagnosis)
17 Input from main relay
18*
19*
20 line CAN – H (ECU/instrument panel)
21*
22 lambda probe signal
23*
24 vehicle speed signal input
25*
26*
27 “run/stop” input switch
28 start-up signal input
29 line CAN – H (ECU/instrument panel)
30*
31*
32 lambda probe supply
33 clutch sensor signal
34*
35 fall sensor signal
36*
37*
38 side stand sensor signal.

1 Electronic injection

2 **Components**

3 Safety system

4 Axone

5 Throttle alignment

6 Diagrams

- ✓ IGNITION
- ✓ ELECTRICAL
- ✓ ELECTROMECHANICAL

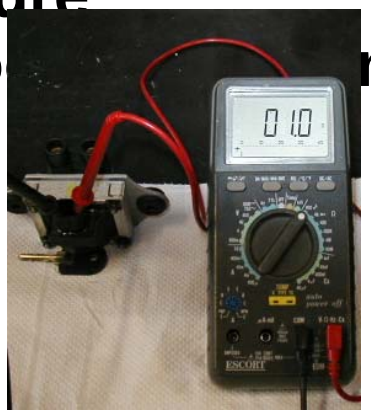
The system used is of the inductive discharge type

The ECU elaborates the following parameters:

- ✓ **engine load**
- ✓ **engine temperature**
- ✓ **injection time: lo… …nition advance control point**

Primary: to be measured between pin 1 and 15

Control valves:
from 0.9 to 1.1 Ω



Secondary: to be measured between the high voltage outputs

Control valves:
from 6.5 to 7.2 KΩ

SPEED SENSOR

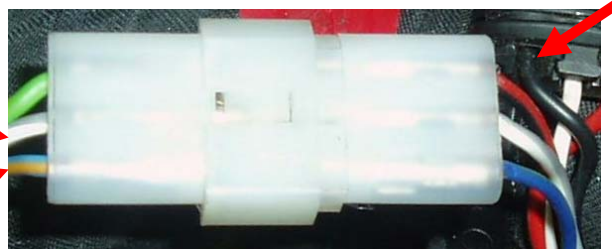
Housed on the Cardan joint, it is a Hall effect sensor

3 pin connector:

1 → Voltage of about 12V (present both if the connector is connected or not)

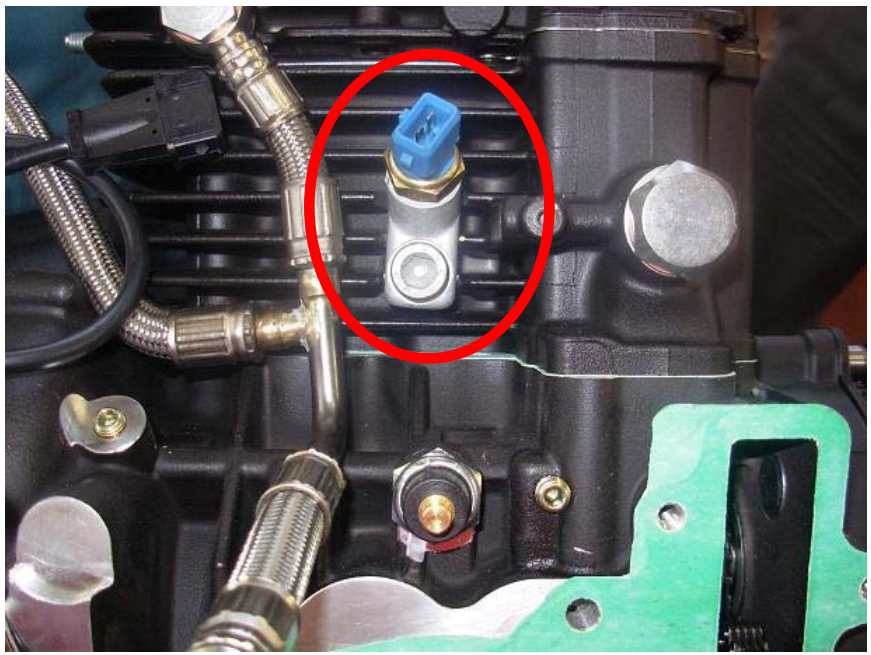
2 → Signal (voltage of about 12 V held by ECU) when the sensor feels a metallic object it drops the voltage down to about 0 (square wave)

3 → Ground



ENGINE TEMPERATURE SENSOR

This sensor fed with 5V, has NTC characteristics, and feeds to the ECU a signal that varies as a function of temperature for handling the stoichiometric ratio during the engine rpm setting.



°C	kOhm	°C	kOhm
-40	100.950	+50	1.080
-30	53.100	+60	0.750
-20	29.120	+70	0.530
-10	16.600	+80	0.380
0	9.700	+90	0.280
+10	5.970	+100	0.204
+20	3.750	+110	0.153
+30	2.420	+125	0.102
+40	1.600		

CRANKSHAFT POSITION SENSOR

Engine rpm and stroke → it measures the engine rpm and the position of each cylinder with respect to TDC

Inductive sensor with three-way connector:

- ✓ **positive voltage pin**
- ✓ **negative voltage pin (resistive value: from 650 to 720 Ω approx.)**
- ✓ **shielding pin**

Air gap → measure the length of the sensor with a depth gauge

OK from 0.6 mm to 0.7 mm

IDLE ACTUATOR

In order to increase the passage of air and, consequently of the engine idle, the ECU uses a stepper motor.

It operates by the shift of the inside shutter which, through its axial modulated movement, lets the intake air by-pass the accelerator throttle.

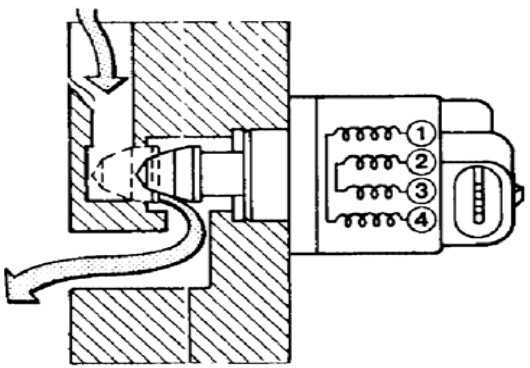
The variation parameters of the motor modulated steps, from their respective sensors, are:

- ✓ **engine revs**
- ✓ **coolant temperature**

If it is running idle, the operation is in CLOSED LOOP to keep the rpm as set by the ECU

Impulse control

Resistance values:
Between 1 and 4 = 50 Ω
Between 2 and 3 = 50 Ω

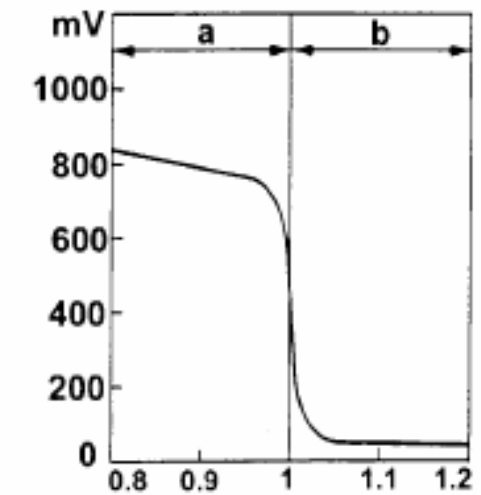


EXHAUST EMISSION CONTROL

For an optimum mixture, the quantity of intake air for the combustion in the engine must be equal to the quantity theoretically necessary for the complete combustion of the gasoline injected in the combustion chamber.

Hence the factor λ is the ratio between the intake and the theoretical air. And so, the theoretical value is equal to 1.

- ✓ **λ > 1 → lean mixture**
- ✓ **λ = 1 → optimum**
- ✓ **λ < 1 → rich mixture**



a. rich mixture (lack of air)

b. lean mixture (too much air)

Everything being handled by the lambda probe, which is the same component already known

The RELAYS located under the saddle are as follows**:**

- ✓ **Secondary injection relays**
- ✓ **Lights relays**
- ✓ **Start-up relays**
- ✓ **Main injection relays**

In addition, with respect to 2-valves engines there is the START-UP HOLDING RELAY. This relay is located under the tail and its function is to allow ignition even when the battery voltage is below 12 V

BATTERY (under the saddle)

18 Ah YTX 20 CH-BS maintenance free

ENGINE OIL PRESSURE SENSOR

This sensor is normally grounded. With the engine on, the pressure in the lubrication system will break this contact, transmitted by pin 17 of the grey connector of the dashboard

Shortly, an oil waterproof pressure sensor will be installed, that operates identically

NEUTRAL INDICATION SENSOR

Also this sensor is normally grounded. With the engine running the contact remains open and is signalled to the engine ECU through pin 23 of the brown connector (A)

STARTER MOTOR

This actuator is activated by means of a solenoid time-controlled by the engine ECU:

- ✓ **Key ON**
- ✓ **Line of safety switches in continuity**
- ✓ **Start button contact**

This control remains present in the ECU for 5-10; only when 400 rpm are exceeded the signal will be deactivated automatically.

Specifications:
12V

If the ECU has all safeties ok, but the battery is not sufficiently charged to start the engine, with the start button kept pressed the ECU direct control is bypassed taking maximum advantage of the remaining energy of the battery

ALTERNATOR

Specifications:

- → **Rated 12V**
- → **Max charge 40A (550W)**
- → **Charge start > 1000 rpm**
- → **Regulator from 14.2 to 14.8V**
- → **5000 rpm 40A -25°C**
- → **Temperature range from -30°C to 90°C**

Belt replacement every 50,000 km

SAFETY SYSTEM

The safety system has the following components:

- ✓ **FALL SENSOR**
- ✓ **CLUTCH SENSOR**
- ✓ **IDLE SENSOR**
- ✓ **STAND SENSOR**

All these sensors are directly connected to the injection ECU which, based on the signals from these components, will allow or not allow the engine to run and the engine start-up

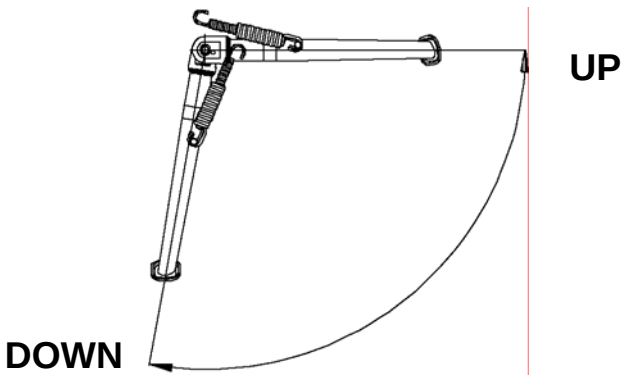
FALL SENSOR

This sensor in the right position with the engine running is in open contact. Should the vehicle fall the sensor will close the ground contact through pin 35 of connector B. The ECU, sensing this condition of danger, will stop the engine.
If the sensor is repositioned correctly, the consent to start-up is achieved turning the key to OFF and waiting 10 seconds during which the ECU carries out the power latch.

SIDE STAND LOGIC/GRISO 8V CLUTCH

GEARBOX	STAND	CLUTCH	IGNITION	START/UP	STAND WARNING LIGHT
NEUTRAL	UP	ACTUATED	FUNCTIONS	POSSIBLE	OFF
		NOT ACTUATED			
	DOWN	ACTUATED			ON
		NOT ACTUATED			
RUN	UP	ACTUATED			OFF
		NOT ACTUATED		NOT POSSIBLE	
	DOWN	ACTUATED	DOES NOT FUNCTION		ON
		NOT ACTUATED			

GEARBOX: NEUTRAL means closed contact, RUN means open contact
STAND: UP means contact open, DOWN means contact closed
CLUTCH: ACTIVATED means contact closed, DEACTIVATED means contact open



LEARNING CENTRE

1 Electronic injection

2 Components

3 Safety system

4 **Axone**

5 Throttle alignment

6 Diagrams

- ✓ AXONE
- ✓ ACTIVE DISPLAYS

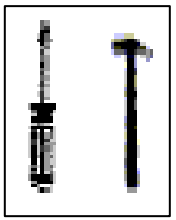
SOFTWARE AXONE

The software for connection to the ECU is available starting from the 5.1.6 of the Axone.

Selecting SELF-DIAGNOSIS, GRISO, GRISO 1,200 8V, and always confirming the successive selections and following the instructions for connecting to the diagnosis socket and to the vehicle battery one communicates with the ECU of the vehicle

Learning on the part of the ECU of the THROTTLE ZERO position is carried out in the following cases

- ✓ **throttle position sensor replacement**
- ✓ **ECU replacement or cylinders balancing**
- ✓ **replacement of the complete throttle body**
- ✓ **ECU re-mapping**



Such an operation is carried out entering the display of ADJUSTABLE PARAMETERS, selecting the *POSITION SENSOR PARAMETER OF THE ACTUATOR*

Checking the correct application of the procedure is carried out entering the ENGINE PARAMETERS READING display, where the throttle parameter must be equal to 4.6±0.1 °

RECOVERY FUNCTION

If the signal of the following sensors is interrupted, the ECU sets some values so that the engine may function

Air temperature → 25°C
Engine temperature → 30°C, with linear growth of the air temperature
Barometric pressure → 1,010 hPa
Throttle potentiometer → minimum 2.9°, otherwise variable
Idle motor → fixed value depending on vehicle

The instrument panel and the Axone, however signal the malfunction

LAMBDA PROBE

To verify if the ECU is using the lambda probe, it is also possible to observe, in the DEVICES STATUS, the *LAMBDA STATUS* parameter. This parameter must indicate CLOSED

This condition occurs in idle conditions only if all the following conditions have been met:

- ✓ **Air temperature > 20°C**
- ✓ **Engine temperature > 30°C**
- ✓ **Engine running for approx. 2 – 3 minutes**

ISO Display → 

✓ **MAPPING displays the mapping present in the ECU**

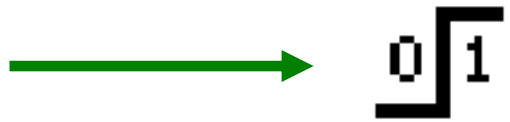
Display of ENGINE PARAMETERS READING → 

→ **It displays the classical engine parameters**

Stepper motor parameter:

✓ **STEPPER C.L. → indicates the steps set by the ECU for the starter**

Display of DEVICES STATE



It is possible to view the condition of the safety devices and of other systems such as the lambda probe and the rpm signal

- ✓ FALL SENSOR → for an overturned vehicle TIP OVER
- ✓ RUN/STOP SWITCH → contrary to other injection systems, it is possible to understand the condition of the safety switch button
- ✓ IGNITION → indicates whether the ECU, based on the condition of the safety components and of the immobilizer, lets the engine start

DEVICES ACTIVATION display

- ✓ This display makes it possible to activate a series of devices
- ✓ ERRORS CLEARING performs the operation only for the errors of the injection ECU

ERRORS DISPLAY

- ✓ In most cases when an error occurs, once the error has been selected, by pressing the ENTER button, a detailed description of the error is displayed.

CONTROL AND SETTING PROCEDURE OF THE THROTTLE BODY

Properly connect Axone to the diagnosis socket of the vehicle and with its battery, select the model and follow the indications provided by Axone

- ➔ **Connect the vacuum gauge to the two intake collectors**
- ➔ **Interface with Axone**
- ➔ **Turn the key to ON**
- ➔ **Make sure no errors are present in the ECU (if they are present intervene, solve and repeat the procedure)**

THROTTLE ALIGNMENT

LEARNING CENTRE

➔ **Make sure the throttle is perfectly closed**

An end of travel pin is present for both throttle bodies → they <u>must not</u> be moved to avoid having to replace the body

Left

Right

THROTTLE ALIGNMENT

LEARNING CENTRE

Select the parameter *SELF-LEARNING THROTTLE POSITION* from the ADJUSTABLE PARAMETERS display

➔ **Turn the key on OFF** for 30s

➔ **Turn back to key to ON** to restore the communication with Axone

➔ **Check that the value read "*Throttle*" is 4.7 ± 0.2°**. If this value is incorrect proceed to the replacement of the ECU, and repeat the procedure from the start.

➔ **Completely close the bypass screws**

➔ **Start the engine and regulate it to 60°**

THROTTLE ALIGNMENT

LEARNING CENTRE

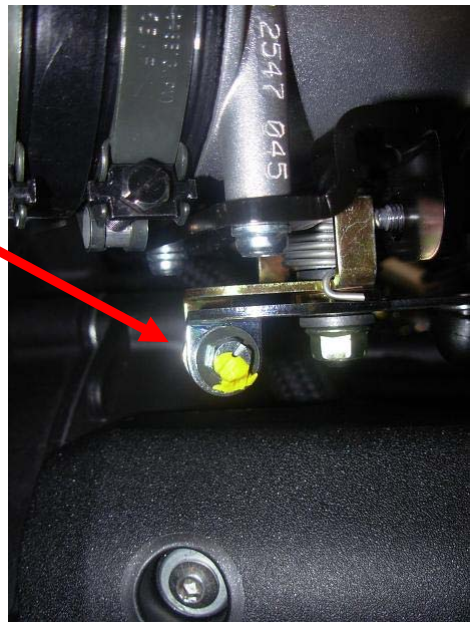
➔ **Bring the engine to 2,000/3,000 rpm** and using the vacuum gauge check that the difference between the two pressures is at the most 1 cm Hg (1.33 kPa)

➔ If this condition occurs go to **point 1**
If the difference is higher go to **point 2**

1. **Bring the engine back to idle and check the low pressure values so that the two cylinders are aligned.**
If this is not case, intervene with the bypass screws opening **only** the screw with a higher depression to achieve the correct balancing.

THROTTLE ALIGNMENT

2. **Intervene on the register of the rod connecting the throttle bodies** to reduce the pressure difference in the two conduits, only in case of extreme necessity



➔ Carry out again the ***THROTTLE SELF-LEARNING POSITION procedure as already explained***

➔ **Bring the engine back to idle and check the values of depression so that the two cylinders are aligned.** If they are not, intervene with the bypass screws, opening **only** the screw with higher depression so as to obtain the correct balance

1 Electronic injection

2 Components

3 Safety system

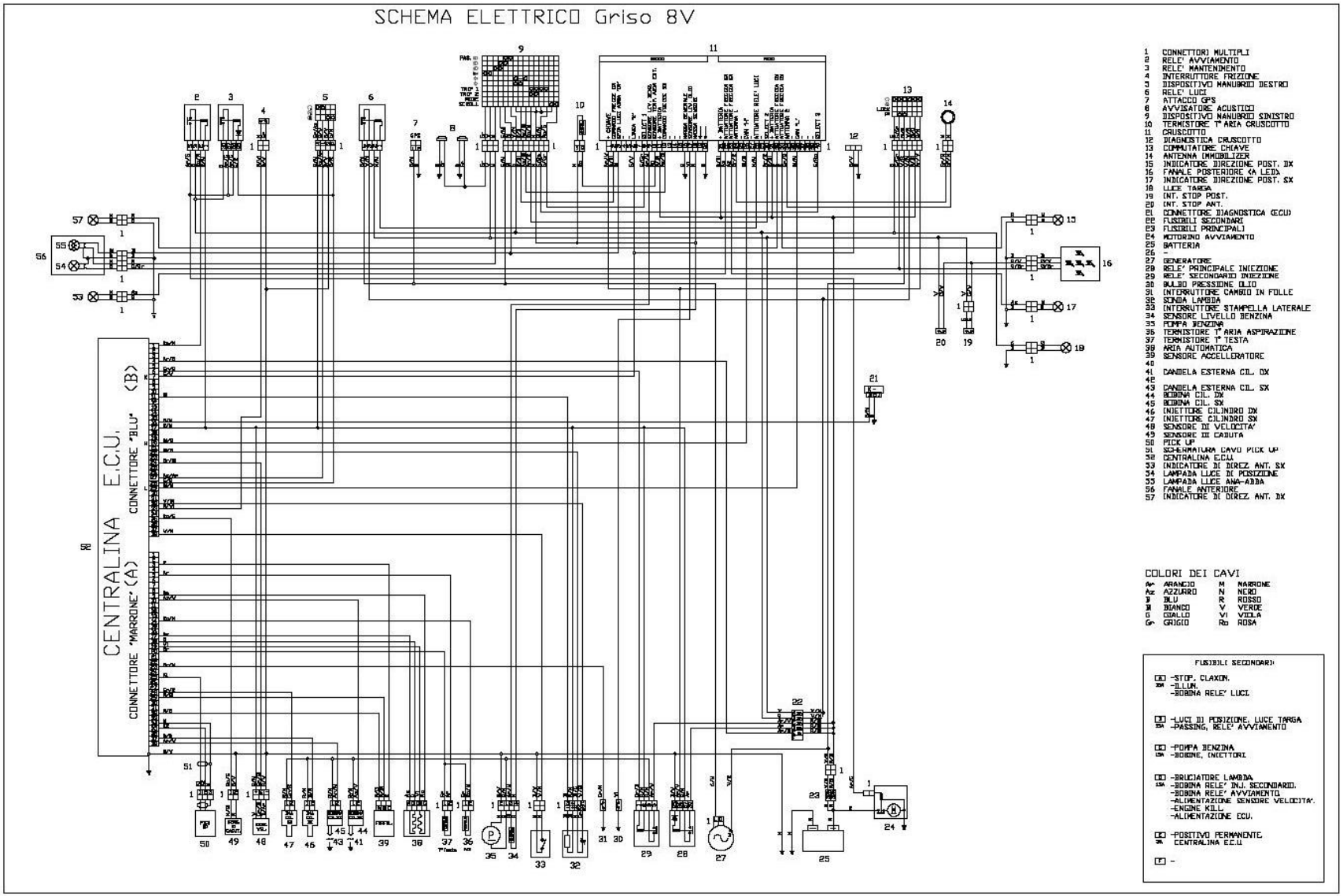
4 Axone

5 Throttle alignment

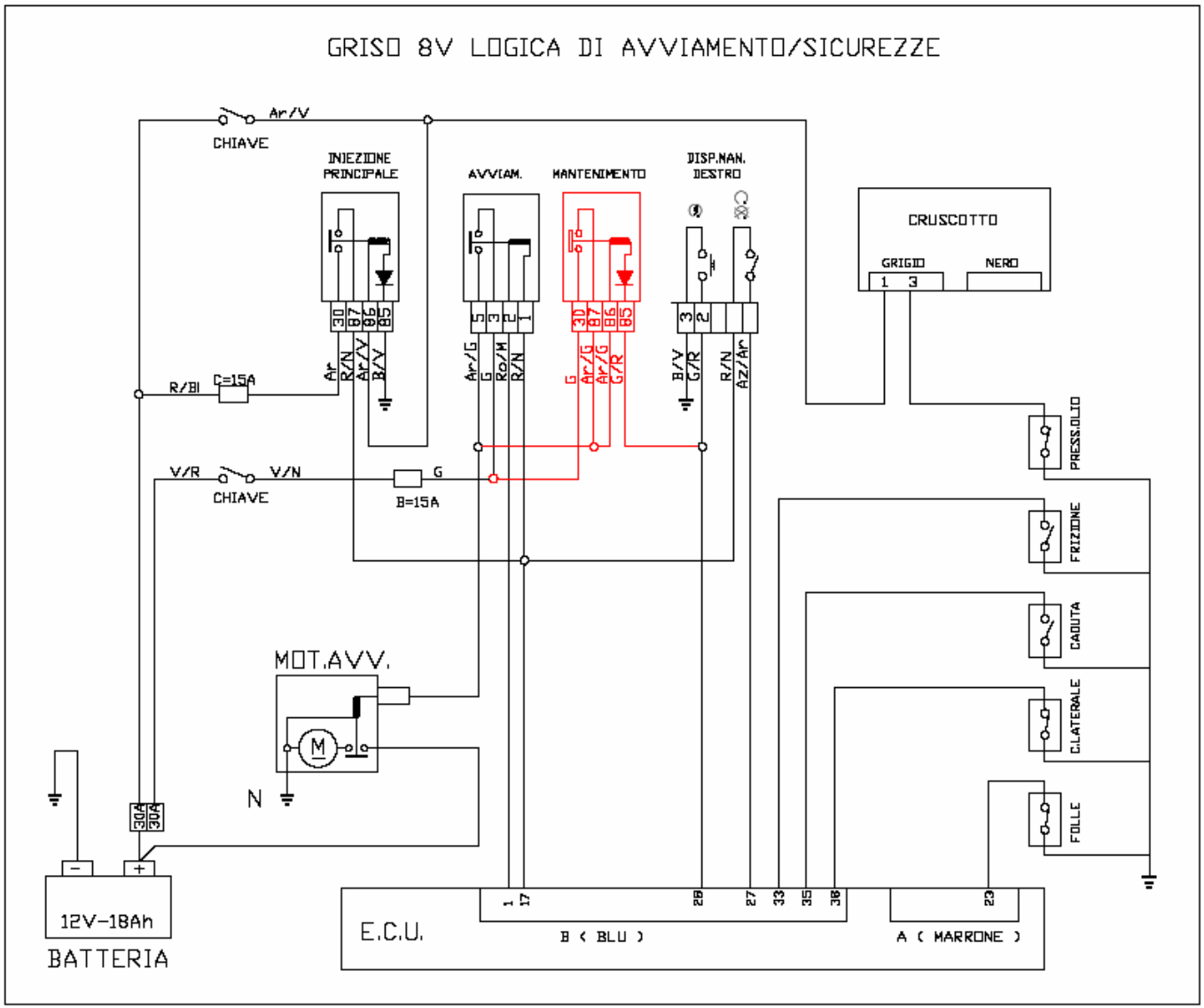
6 **Diagrams**

- ✓ WIRING DIAGRAM
- ✓ SAFETY/START-UP LOGIC

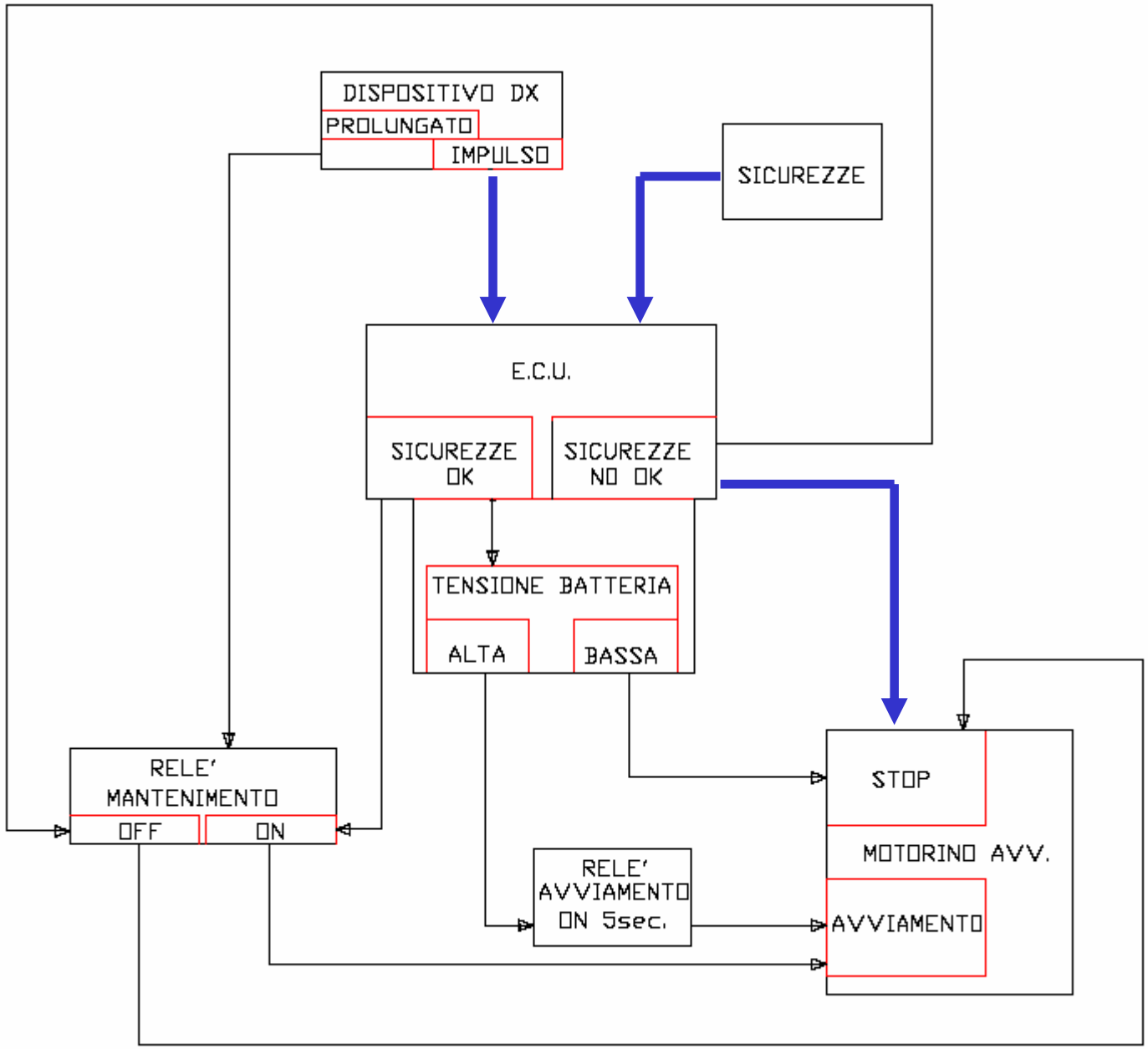
DIAGRAMS → ELECTRIC DIAGRAM



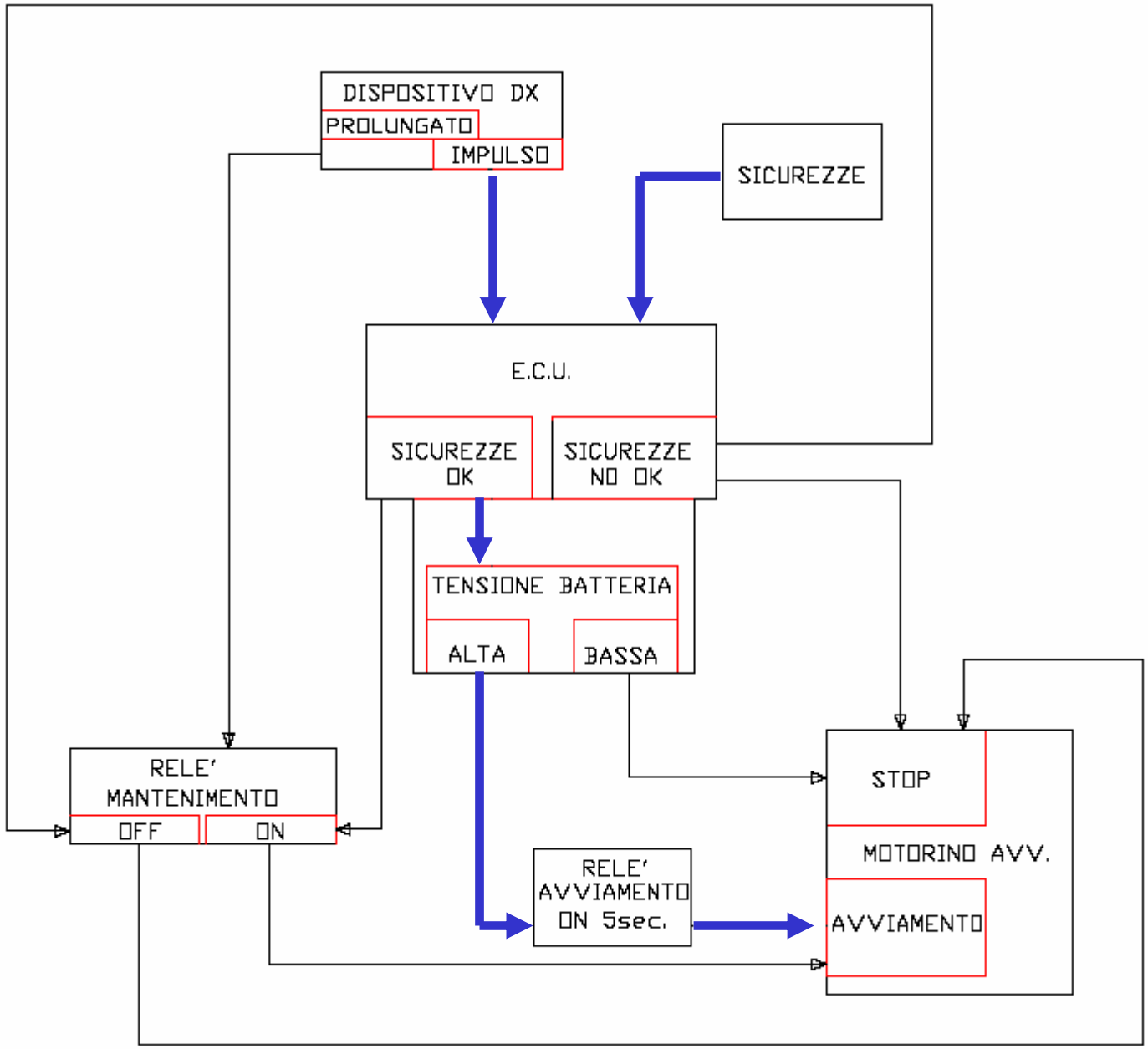
DIAGRAMS → SAFETY/START-UP LOGIC



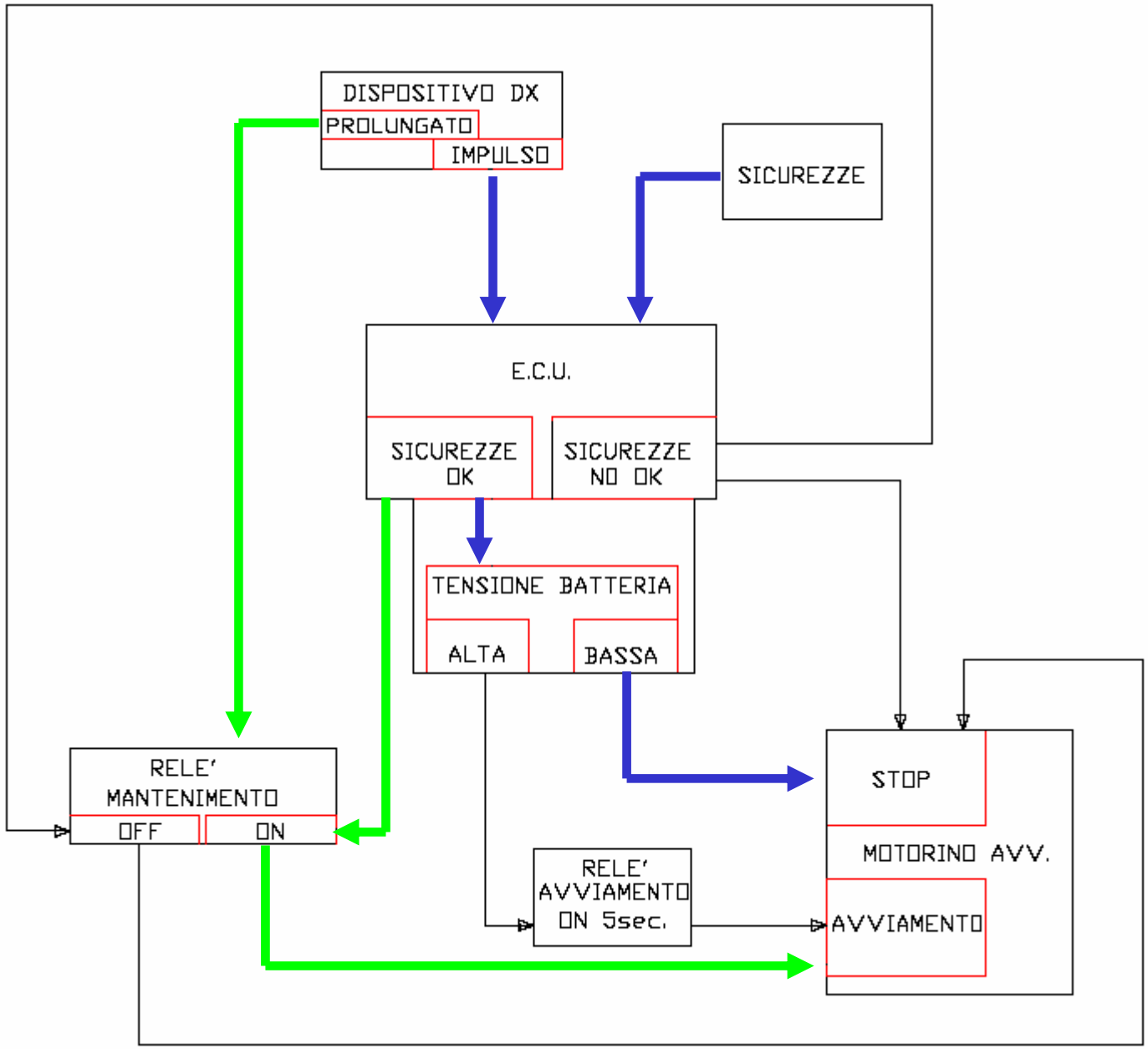
DIAGRAMS → SAFETY/START-UP LOGIC



DIAGRAMS → SAFETY START-UP LOGIC



DIAGRAMS → SAFETY START-UP LOGIC



The difference between 'PROLONGED' and 'IMPULSE' cannot be felt by the driver. By pressing the START button, the installation follows the classic procedure and, in case a low battery voltage is recorded, the route is automatically deviated by-passing the start-up relay, as per the scheme already considered. All of this happens during the duration of a normal ignition