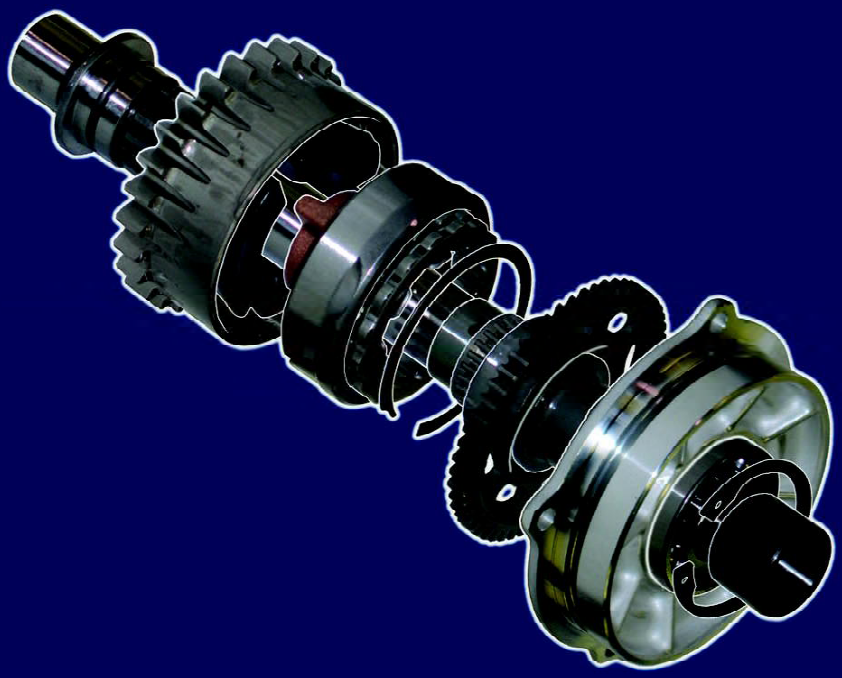
Motorcycle Art

F4



MV AGUSTA F4 1000 S - FT - R - RR

Engine workshop manual

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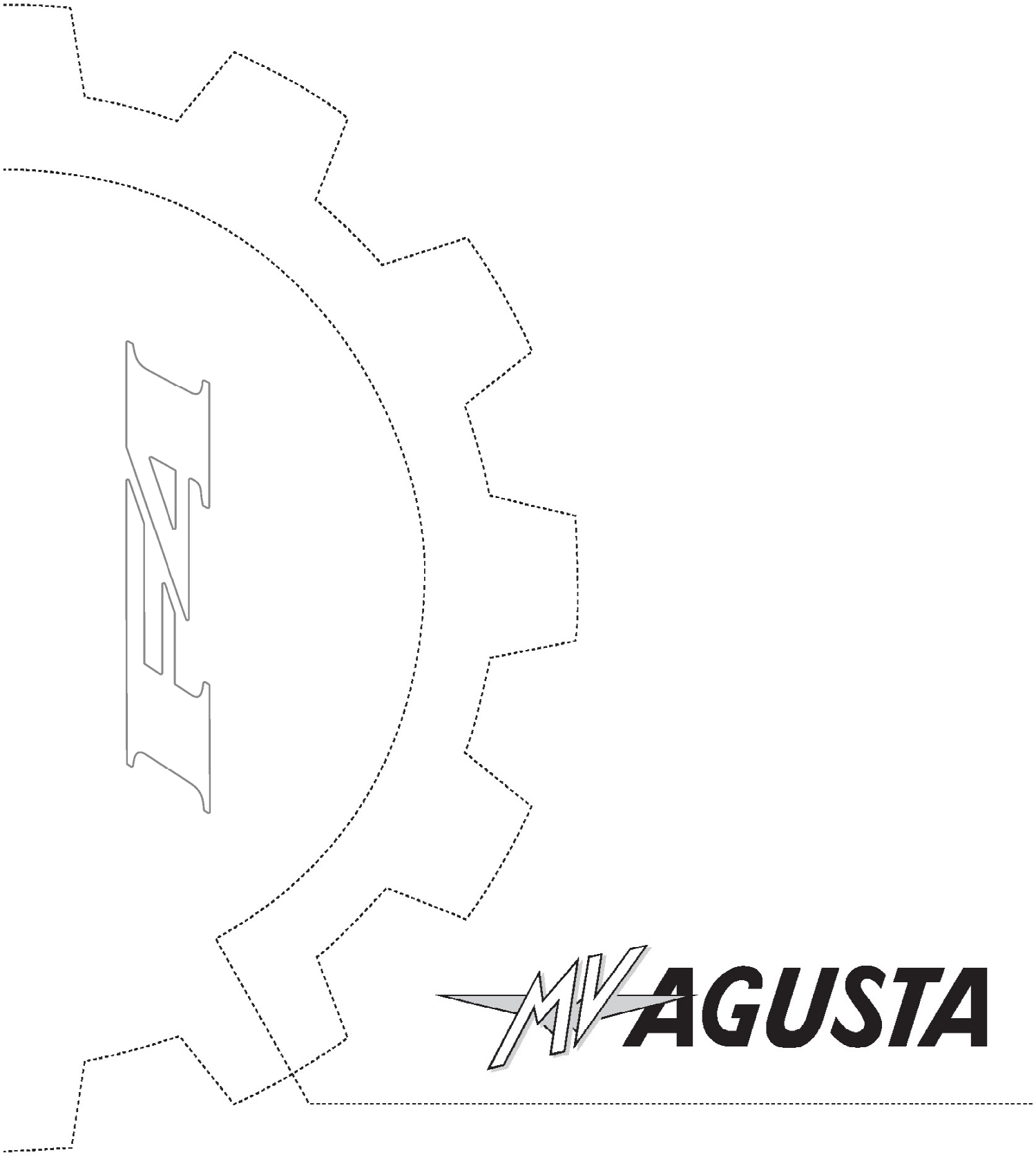
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Teil N° 8C00B4302 - Zweite Ausgabe
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Engine workshop manual

MV AGUSTA F4 1000 S - FT - R - RR



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Statement

This manual, to be used by the MV Agusta authorised workshops has been realised with the purpose of assisting authorised personnel in maintenance and repairs operations of the motorcycle. The knowledge of technical data herein noted, determines the complete professional training of the technician. With purpose of making the reading of this manual immediately comprehensible, the paragraphs have been aligned with detailed illustrations that highlight the argument dealt with.

Useful advice

To prevent any problems and to reach an excellent final result, MV Agusta recommend skeeping to the following guidelines:

- **In the case of an eventual repair, evaluate the client's impressions who states that there is an abnormal functioning of the motorcycle and to formulate the right questions to clarify the symptoms of the problem.**

- **Clearly diagnose the cause of the abnormality. The basic fundamental theories can be absorbed by reading this manual that must necessarily be integrated to the personal experience and the participation of training courses that are periodically organised by MV Agusta.**

- **Rationally plan the repair to avoid slack periods, e.g. the collection of spare parts, the preparation of tools and equipment, etc.**

- **To reach the part to be repaired limiting the work to the essential operations. With regards to this, a valid help would be to consult this manual with regards to the sequences of removal demonstrated in this manual.**

Informative note

MV Agusta S.p.A. is committed to a policy of continuous improvement of their products. For this reason, there could be slight differences between that which is written here and the motorcycle on which repairs and/or maintenance are about to be carried out. MV Agusta models are exported to many countries where different norms in relation to the highway code and homologation procedures are valid. Hoping that you will comprehend these problems, MV Agusta S.p.A. reserves the right to make modifications to its products and technical documentation at any moment and without prior announcement.

Respect and defend the environment

Everything that we do has repercussions on the entire planet and its resources. MV Agusta, wanting to protect the interest of the people, would like to make the client and the technicians of the technical assistance centres aware and to adopt modalities of use of the motorcycle and the disposure of its parts in full respect of the norms in force in terms of environmental pollution, disposal and the recycling of waste.

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GENERAL DESCRIPTION ..... A Rev. 0

MAINTENANCE ..... B Rev. 1

CYLINDER KIT ..... C Rev. 1

CYLINDER BLOCK ..... D Rev. 1

LUBRICATION ..... E Rev. 1

ELECTRICAL COMPONENTS ..... F Rev. 0

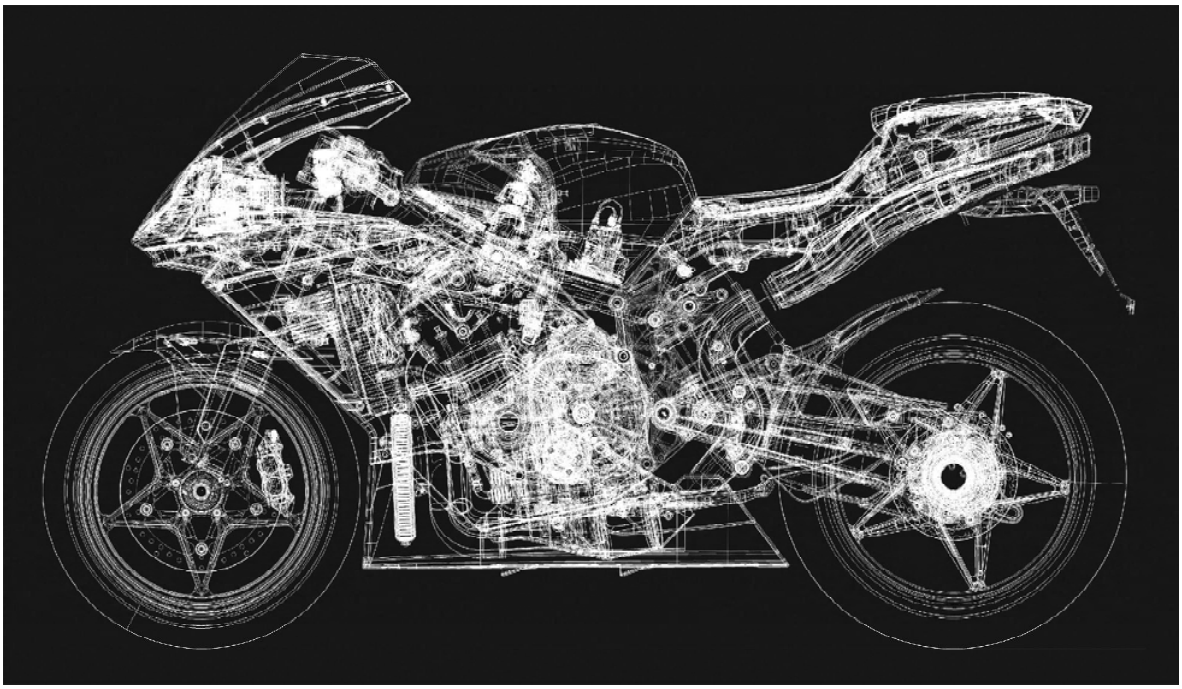
TIGHTENING TORQUES ..... G Rev. 0

SPECIAL TOOLS ..... H Rev. 0

ANALYTICAL INDEX ..... I Rev. 0

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SECTION A

REVISION 0

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A

SUMMARY

HOW TO CONSULT THIS MANUAL ..... Page 3
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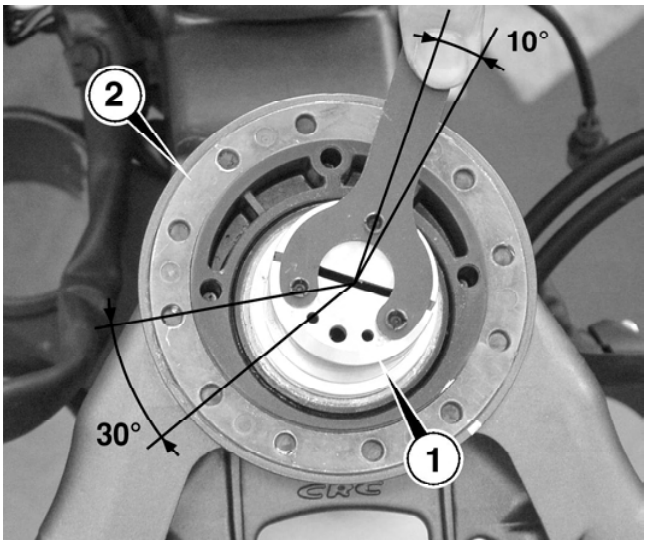
HOW TO CONSULT THIS MANUAL

Order of the subjects
This manual is divided into chapters that deal with the sub-groups of the motorcycle. To quickly find the chapter required, the pages of each chapter are marked with a reference mark aligned to the relative item in the general index.



Display of the operations
The operations of disassembly, assembly, removal and control are presented with the help of illustrations (designs and photographs).The illustrations contain symbols that indicate the procedure, special tools and other information. See the symbols lists for their significance. The procedures are described step after step.

EXAMPLE
Steering pin tightening
Screw in the steering pin flange ring, without tightening.
This operation must be done manually.
Check that the steering base is at the end of its travel, to the right. Using the special tool **N. 800091645**, tighten the ring (1) by rotating it 10°calculated approximately as one third of the movement between the two holes of the ring (2) of the steering head (see the figure).



PURPOSE OF THE MANUAL

Principally, this manual has been written for MV Agusta dealers and qualified mechanics. It is not possible to document all the knowledge necessary for a mechanic in a manual. Those who utilise it must have a basic knowledge of mechanical concepts and the inherent procedures in the techniques of repairing motorcycles. Without this knowledge, the maintenance and repair operations can render the motorcycle unsafe for use.

Updates
MV Agusta S.p.A. is committed to a policy of continuous updating of the models produced. The modifications and significant changes to the specifications and the procedures will be communicated to the official dealers and will appear in future editions of this manual. All information, instructions and technical data included in this manual are based upon information on the product updated at the moment of going to print. MV Agusta S.p.A. reserves the right to carry out changes at any moment without prior notice and without incurring any obligation.

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A GLOSSARY AND SYMBOLS



ATTENTION

▶ This signifies that the lack or the incomplete observance of this advice can be gravely dangerous for your safety and for the safety of other persons.

▶ During this kind of procedure inflammable vapours might develop and metallic parts might be expelled at high velocity. Thus, it is necessary to:

- work far from exposed flames and sparks;

- wear protective clothing;

- wear protective eye-glasses.



WARNING

▶ This signifies that the lack of observance of these instructions can bring the risk of damage to the motorcycle and the equipment.

▶ In case it should be necessary, due to wear, to substitute a particular, relative to a cylinder, we strongly suggest that you check and if necessary, substitute the same particular in all of the cylinders for more satisfying results.In particular, we recommend that at the same time you substitute:
- pistons with relative elastic bands and piston pins;
- valves with relative springs, semi-cones,disks and grazings;
- Valve guides with relative valves, springs, semi-cones and grazings;
- bed bearing;
- whatever else under goes uniform wear, a side from the position of the relative cylinder.

In order to allow the motorto function under the best conditions, it is necessary that all of the couplings are within the accepted tolerances established. A tight coupling, is in fact,

▶ cause for seizure as soon as the organs in motion begin to heat, while a loose coupling is cause for vibrations which accelerates wear on the particulars in motion.

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NOTE ▶ Supplies key information for the best fulfilment of the operation.

▶ All of the countersigns indicting right, left, superior, inferior, front and back, refer to the motor-bike in the normal direction of march.

▶ The motor supports numbering of the cylinders and of the attached components, increases moving from left towards right in regards to the direction of march.



▶ This symbol indicates "the procedures to be carried out with an empty cooling circuit".



▶ Utilise a specific tool or equipment for the correct carrying out of the operation described.



▶ Tighten to the specified torque.



▶ Tolerance or limit of use.



▶ Utilise the tester.



▶ Use the recommended oil.



▶ Use the recommended grease.



▶ Use the recommended brake fluid.



▶ Use the recommended suspension fluid.



▶ Use the recommended coolant.



▶ Use the recommended thread-locking fluid.



▶ Use the recommended sealant.



▶ Use the recommended adhesive.



▶ Carry out accurate cleaning.



▶ Use new components.



▶ Substitute the component.

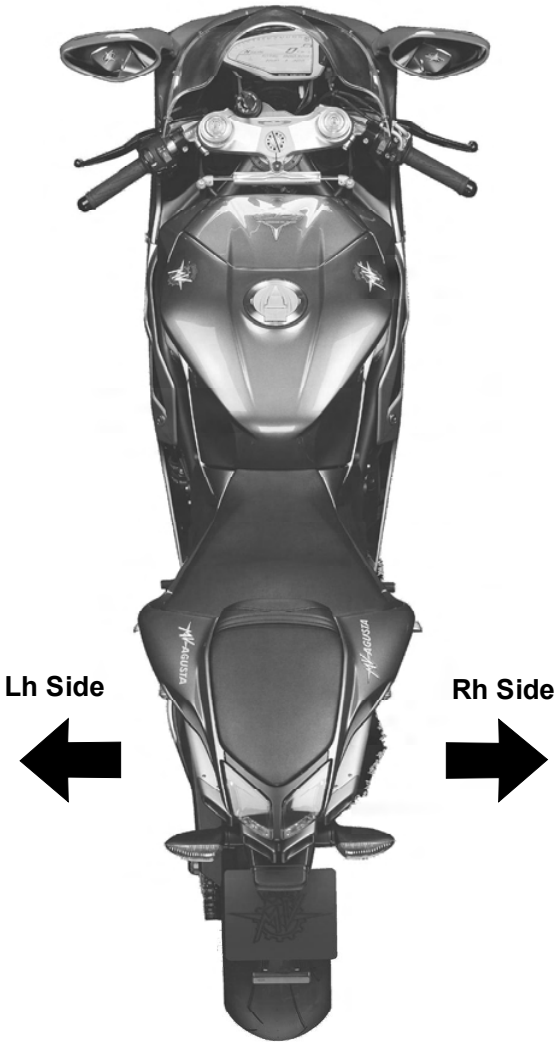


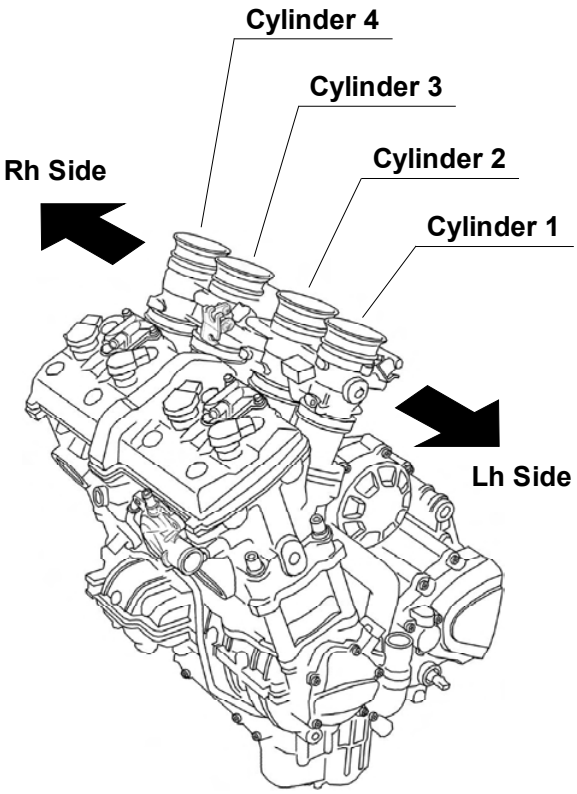
▶ Do not leave litter about.

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A RIGHT HAND AND LEFT HAND STANDARD

To clarify the right hand and left hand standard that is used in this manual, herewith below is a diagram of the motorcycle and the engine against which are indicated the right and left sides.





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SAFETY

ATTENTION

The information contained in this paragraph is fundamental so that the operations carriedout on the motorcycle can be conducted with minimum risk to the mechanic.

Carbon Monoxide

- Exhaust gases contain carbon monoxide (CO) that is poisonous. Carbon monoxide can cause the loss of consciousness and death.
- If it is necessary to switch on the engine, check that the environment is well ventilated. Never switch on the engine in an enclosed environment.
- Switching on the engine can only be carried out in an enclosed environment when there are the appropriate devices for the evacuation of exhaust gases.

Petrol

- Petrol is extremely inflammable and under certain conditions can be explosive.
- Keep sources of heat, sparks and flames away from the work area.
- Always work in a well-ventilated area.
- Never use petrol as a cleaning solvent. Generally, avoid handling it unless it is absolutely necessary.
- Do not use petrol for cleaning components by using compressed air.
- Keep petrol out of reach of children.

Engine oil

- Engine oil can cause skin illnesses if in constant and long contact with the skin.
- If the skin comes into contact with engine oil, wash the parts affected as soon as possible with soap and water.
- If engine oil comes into contact with the eyes, rinse abundantly with water and seek medical attention.
- If engine oil is swallowed, do not provocate vomiting to avoid the aspiration of the product into the lungs. Transport the injured person immediately to hospital.
- Used oil contains dangerous substances and poisonous for the environment. To substitute oil, it is necessary to be equipped to deal with the collection of used oil in respect of the norms in force.
- Do not dispose of used oil in the environment.
- Keep used oil out of the reach of children.

Engine coolant

- Under certain situations, the ethylene glycol contained in the engine coolant is inflammable and its flame is invisible. Ethylene glycol would cause serious burns if ignited because it is invisible.
- Avoid bringing the engine coolant into contact with hot parts. Such parts could be sufficiently hot to ignite the coolant.
- The engine coolant (ethylene glycol) can cause irritation of the skin and is poisonous if swallowed.
- If the engine coolant comes into contact with the skin, immediately remove any contaminated clothing and wash with soap and water. If it comes into contact with the eyes, abundantly rinse with clean water and immediately consult a doctor. If swallowed, do not provocate vomiting to avoid the aspiration of the product into the lungs. Administer clean water and transport the injured person immediately to hospital and show the product to a doctor.
- If exposed to high concentrations of vapour, transport the injured person to a non-poisonous atmosphere and if necessary call a doctor.
- Do not remove the radiator cap when the engine is still hot. Being under pressure, the engine coolant can be violently ejected and therefore provocate burns.
- The engine coolant contains dangerous and poisonous substances and is therefore dangerous for the environment. To substitute used engine coolant, it is necessary to be equipped to deal with the collection of used oil/of used engine coolant in respect of the norms in force.
- Do not dispose of engine coolant in the environment.
- Keep engine coolant out of reach of children.

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A

Brake fluid
- Brake fluid is extremely corrosive.
- Avoid any contacts with the eyes, skin and the mucous membrane.
- If brake liquid comes into contact with the skin, remove all contaminated clothing and wash immediately with soap and water.
- If brake fluid comes into contact with the eyes, abundantly rinse with water and call a doctor.
- If swallowed, do not provocate vomiting to avoid aspiration of the product into the lungs. Immediately call a doctor.
- Take the injured person immediately to hospital, if he has breathed brake fluid into the lungs.
- In the case of exposure to high concentrations of vapour, move the injured person to a non-poisonous atmosphereand if necessary call a doctor.
- In the case of accidental contact, rinse abundantly with water and call a doctor.
- Keep brake fluid out of reach of children.

Thread-locking fluid
- As it is not classified as dangerous, the prolonged contact with the skin, particularly with regards to abrasions can provocate sensitiveness and dermatitis. In the case of contact with the skin, rinse abundantly with running water.
- Move the injured person into the open air and call a doctor if the injured person feels ill after having breathed in the product.
- In the case of contact with the eyes, rinse abundantly with water for at least 15 minutes.
- If the thread-locking fluid has been swallowed, drink an abundant quantity of water or milk. Do not provocate vomiting to avoid the aspiration of the product into the lungs. Immediately call a doctor.
- Keep out of reach of children.

Nitrogen - rear shock absorber
- The rear shock absorber contains nitrogen under pressure.
- Before disposing of used shock absorbers, discharge the nitrogen via the depressurising valve.
- Utilise only nitrogen to pressurise the shock absorber. The use of unstable gases can cause explosions that could cause burns.
- Do not place the shock absorber near to flames or sources of heat as this could cause explosions with consequent burns.
- Keep out of reach of children.

Battery
- The battery produces explosive gases. Keep it away from sparks, flames or cigarettes. During recharging, adequately ventilate the environment.
- The battery contains a solution of sulphuric acid (electrolyte).
- Sulphuric acid is corrosive and it destroys many materials and clothing. On contact with small quantities of water it generates a violent reaction that manifests itself by creating large quantity of heat and spurts of hot acid. Sulphuric acid attacks many metals thereby liberating hydrogen: an inflammable gas that forms an explosive mixture when mixed with air.
- Contact with sulphuric acid can cause burns. In the case of contact, remove immediately all contaminated clothing and wash the skin with abundant quantities of water. Take the injured person to hospital if necessary.
- In the case of contact with the eyes, rinse immediately with abundant water. Call a doctor and continue with the treatment until the doctor arrives.
- If the electrolyte is swallowed, rinse the mouth with water without swallowing. Take the injured person immediately to hospital and explain to the doctor there what the injured person has swallowed.
- The battery contains dangerous substances that are poisonous for the environment. It is necessary to be equipped to dispose of this product in respect of the norms in force.
- Do not dispose of used batteries in the environment.
- Keep out of reach of children.

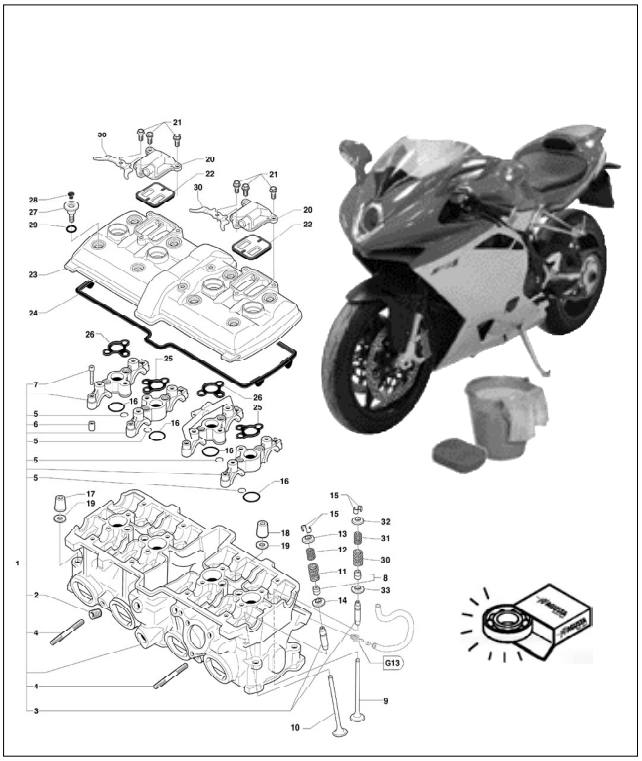
Hot parts
- The engine and the exhaust system become very hot and maintain this temperature for some time after the engine has been switched off. Wait for these parts to cool down before handling them or working on the motorcycle near to them. Use protective gloves.

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WARNING

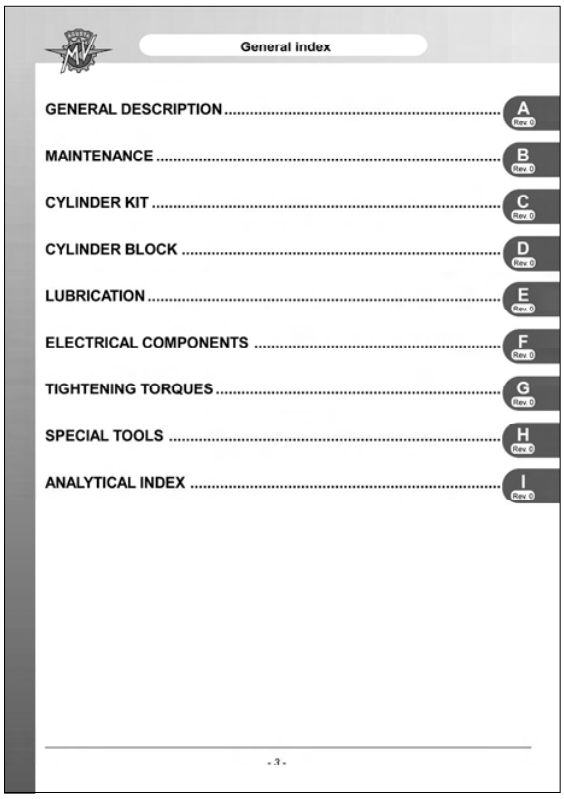
The information contained in thisparagraph is important so that the operations carried out on the motorcycle can be conducted without damaging the motorcycle.

- Thoroughly clean the motorcycle before disassembling it.
- During disassembly, clean all parts and place them in containers respecting exactly the order of disassembly.
- Always use the special utensils where necessary andeach time where prescribed.
- Always use adhesives, sealants and lubricants where prescribed. Respect the instructions about their technicalcharacteristics.
- Always substitute parts such as gaskets, O-rings, securitywashers with new parts.
- Slackening or tightening nuts or screws, always start withthose of a greater dimension or from the centre. Alwaysrespect the torque values indicated.
- Utilise only MV Agusta spare parts.

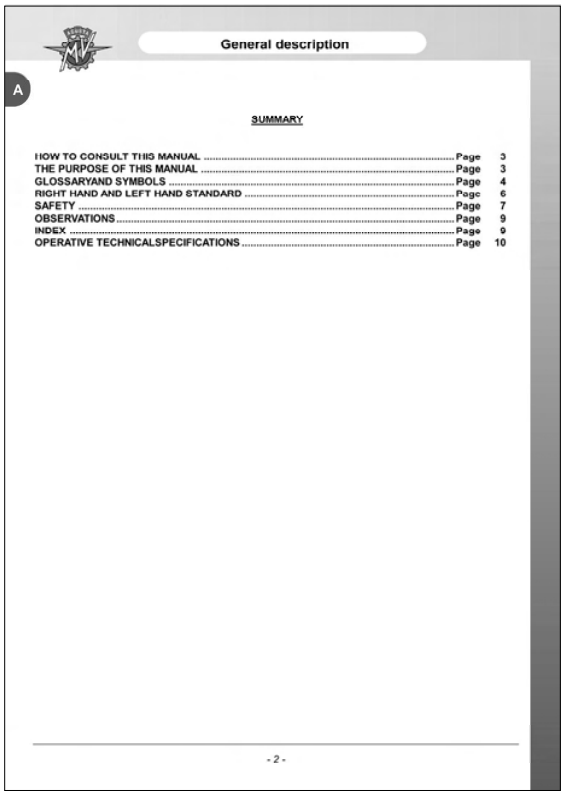


INDEX

GENERAL INDEX



SUMMARY OF EACH CHAPTER



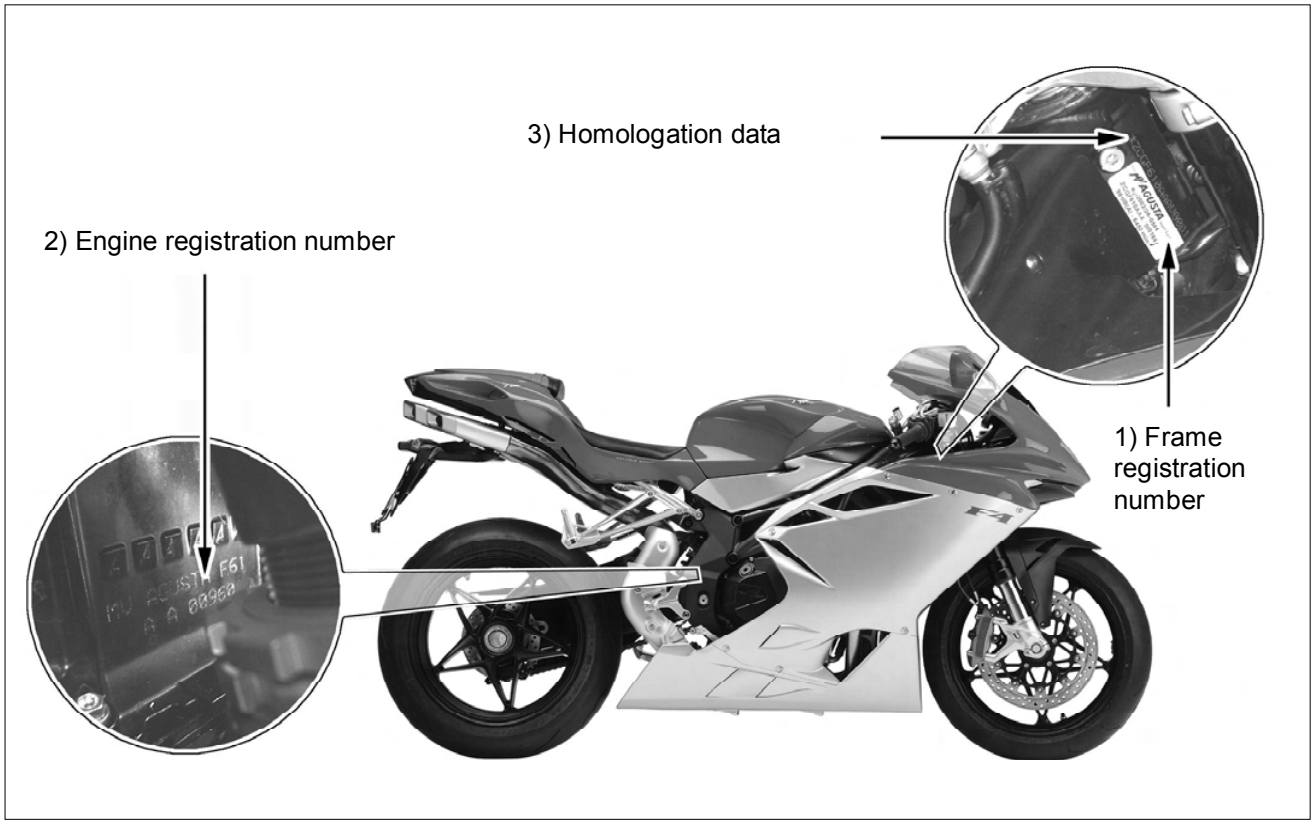
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A

OPERATIVE TECHNICAL SPECIFICATIONS

MOTORCYCLE IDENTIFICATION

The registration number of the motorcycle is stamped on the right side of the steering head.The engine registration number is stamped on the upper engine casing, near the forks.



Below is an example of the designation of the frame registration number:

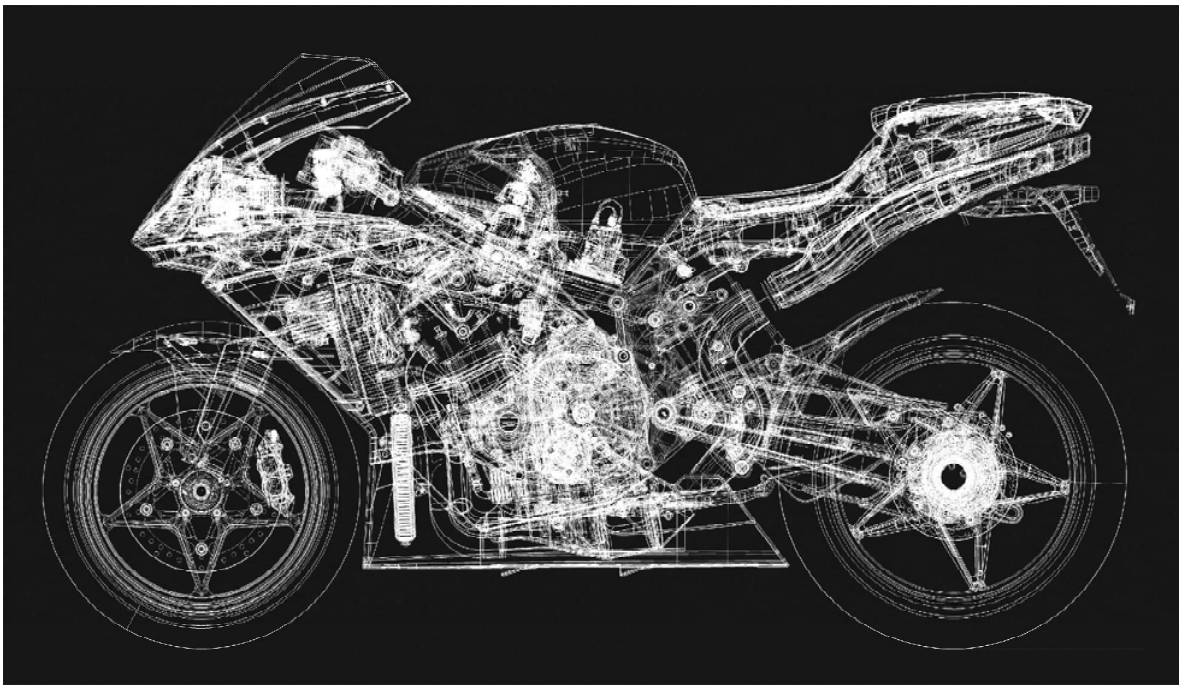
ZCG F6 10 AA Y V 000001

Manufacturer identification

Vehicle model

Progressive frame number

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SECTION B

REVISION 1

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B

SUMMARY

PLANNED MAINTENANCE SCHEDULE ..... Page 3
THROTTLE BODY ADJUSTMENT AND TUNING ..... Page 11

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PLANNED MAINTENANCE SCHEDULE

The following diagram shows the recommended planned maintenance intervals. Periodic maintenance is essen-tial to keep the vehicle in perfect running order and to ensure optimum cost efficiency.

WARNING

Use shorter maintenance intervals if the vehicle is used in particularly harsh conditions.

Let us help protect the environment

Everything we do affects the entire planet and its resources. To protect the common interest, MV Agustaurges its customers and service operators to use the vehicles and dispose of their components in com-pliance with applicable regulations on environmental pollution control, waste disposal and recycling.

Programmed maintenance schedule

Km (ml) covered		0	1000 (600)	6000 (3800)	12000 (7500)	18000 (11200)	24000 (14900)	30000 (18600)	36000 (22400)
Service		pre-delivery	A	B	C	D	E	F	G
Description	Operation								
Engine oil	Substitution		■	■	■	■	■	■	■
		At least once a year							
Engine oil filter	Substitution (utilize only MV Agusta original oil filter)		■	■	■	■	■	■	■
		At every substitution of engine oil							
Engine coolant	Check level / Top up	■	■	■	■	■	■	■	■
	Substitution	every 2 years							
Cooling	Check for leakages	■	■	■	■	■	■	■	■
Electric fan	Check functioning	■	■	■	■	■	■	■	■
Valves	Check / adjustment				■		■		■
Timing chain	Check				■		■		
	Substitution								■
Timing movable pad	Check / Substitution				■		■		
	Substitution								■
		At least every substitution of the timing chain							
Timing chain tensioner	Check / Substitution				■		■		■
Spark plugs	Check / Substitution			■		■		■	
	Substitution				■		■		■
Fuel filter	Check / Substitution				■		■		■
Throttle body	Check and adjustment		■	■	■	■	■	■	■
Air filter	Check / Substitution			■	■	■	■	■	■
Brake and clutch fluid	Check level	■	■	■	■	■		■	■
	Substitution						■		
		every 2 years							
Brake / Clutch	Check Functioning and Circuit	■	■	■	■	■	■	■	■
	Cleaning of contact lever and pump piston area	■	■	■	■	■	■	■	■
Brake pads (front and rear)	Check / Substitution		■	■	■	■	■	■	■
Fuel tubes	Check for defects and leakages			■		■		■	
	Substitution	every 3 years							
Accelerator control	Check functioning	■	■	■	■	■	■	■	■
	Verify / adjust play	■	■	■	■	■	■	■	■
Starter control	Check functioning	■	■	■	■	■	■	■	■
Transmission / flexible controls	Check / Adjustment	■	■	■	■	■	■	■	■
Transmission chain	Check / Adjustment	■	■	■	■	■	■	■	■
	Lubricate		■	■		■		■	
	Substitution				■		■		■

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B

Programmed maintenance schedule

Km (ml) covered		0	1000 (600)	6000 (3800)	12000 (7500)	18000 (11200)	24000 (14900)	30000 (18600)	36000 (22400)
Service		pre-delivery	A	B	C	D	E	F	G
Pinion wheel / Stop washer	Check		■	■		■		■	
	Substitution				■		■		■
		At least at each substitution of the transmission chain							
Crown wheel	Check		■	■		■		■	
	Substitution				■		■		■
		At least at each substitution of the transmission chain							
Crown wheel tension regulator	Check / Substitution				■		■		■
Steering head flange ring	Check / Adjustment		■		■		■		■
Steering bearings	Check / Adjustment		■		■		■		■
	Lubrication						■		
Tyres	Check for pressure	■	■	■	■	■	■	■	■
	Check for wear		■	■	■	■	■	■	■
Wheel rims	Visual check	■	■	■	■	■	■	■	■
		Every tyre substitution							
Front wheel bearings	Check			■	■	■	■	■	
		Every tyre substitution							
	Substitution								■
Side stand	Check functioning	■	■	■	■	■	■	■	■
Side stand switch	Check functioning	■	■	■	■	■	■	■	■
	Substitution	■	■	■	■	■	■	■	■
Rear wheel hub	Check / Lubricate roller bearings and guide				■		■		
	Substitution / Lubricate roller bearings and guide								■
Rear fork bearings	Check / Lubrication								■
Chain guide frame plate	Check / Adjustment		■	■	■	■	■	■	■
Rear shock absorber	Check / Adjustment		■		■		■		■
Front fork oil	Substitution						■		
Battery connections	Check and clean		■	■	■	■	■	■	■
Electrical system	Check functioning	■	■	■	■	■	■	■	■
instruments	Check functioning	■	■	■	■	■	■	■	■
Lights / Visual signals	Check functioning bulb replacement	■	■	■	■	■	■	■	■
Horn	Check functioning	■	■	■	■	■	■	■	■
Front headlight	Check functioning bulb replacement	■	■	■	■	■	■	■	■
	Adjust	at every variation of riding set-up of the motorcycles							
Ignition switch	Check functioning	■	■	■	■	■	■	■	■
Locks	Check functioning	■	■	■	■	■	■	■	■
Torque settings - nuts and bolt	Check / Tightness	■	■	■	■	■	■	■	■
Tube band fasteners	Check / Tightness	■	■	■	■	■	■	■	■
General lubrication		■	■	■	■	■	■	■	■
General check		■	■	■	■	■	■	■	■

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Table of lubricants and fluids

Description	Recommended product	Specification
Engine lubrication oil	AGIP RACING 4T 10W/60 (*)	API SJ SAE 10W/60
Engine coolant	AGIP ECO PERMANENT	Ethylene - Glycol Diluited with 40 % of Distilled Water
Clutch and brake fluid	AGIP BRAKE FLUID DOT 4	DOT 4
Chain lubrication oil	MOTUL CHAIN LUBE ROAD	-

* To find the recommended product, MV Agusta suggests going directly to the authorised MV Agusta dealers. AGIP Racing 4T10W/60 has been manufactured for the F4 engine. If the described oil is not available, MV Agusta suggests using completely synthetic oils with characteristics that conform or exceed the following norms:

– Conforming to API SJ
– Conforming to ACEA A3
– Conforming to JASO MA
– Grade SAE 20 W-50 or 10 W-60



NOTE **The above specifications indicated are marked either on their own or together with others on the container of the lubricating oil.**

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B

ITEM	STANDARD	WEAR LIMIT
VALVES		
Ø Sealing external diameter		
Exhaust (F4 M.Y. 2010).....	24,6 $^{+0,3}_{0}$ mm	
(F4 M.Y. 2011).....	25,6 $^{+0,3}_{0}$ mm	
Inlet (F4 M.Y. 2010).....	29,8 $^{+0,3}_{0}$ mm	
(F4 M.Y. 2011).....	31,6 $^{+0,3}_{0}$ mm	
Sealing face thickness		
Exhaust.....	0,9 $^{+0,3}_{0}$ mm	
Inlet.....	0,7 $^{+0,3}_{0}$ mm	
Stem - Guide clearance		
Exhaust.....	0,02 ÷ 0,04 mm.....	Coupling: 0,10 mm
Inlet.....	0,01 ÷ 0.03 mm.....	Coupling: 0,08 mm
Ø interno guida.....	4,5 $^{+0}_{+0,012}$ mm.....	4,55 mm
Valve stem		
Exhaust.....	4,4725 ± 0,0075 mm.....	4,4425 mm
Inlet.....	4,4825 ± 0,0075 mm.....	4,4525 mm
Exhaust Valve Spring :		
Internal (F4 M.Y. 2010).....	33,8 mm.....	33,3 mm
(F4 M.Y. 2011).....	38,7 mm.....	38,2 mm
External (F4 M.Y. 2010).....	37,9 mm.....	37,4 mm
(F4 M.Y. 2011).....	40,3 mm.....	39,8 mm

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ITEM	STANDARD	WEAR LIMIT
VALVES		
Inlet Valve Spring:		
Internal	40,2 mm	39,7 mm
External	41,7 mm	41,2 mm
Valve - Cam clearance		
Exhaust	0,20 ÷ 0,29 mm	
Inlet	0,15 ÷ 0,24 mm	
CYLINDER AND PISTONS		
Piston ovalization		0,015 mm
Piston-Cylinder play	0,038 ÷ 0,067 mm	0,10 mm
Piston-Pin play	0,004 ÷ 0,012 mm	0,03 mm
Wrist pin-Connecting rod clearance	0,015 ÷ 0,032 mm	0,06 mm
Piston ring width		
1° segment	$0,8\ ^{-0,01}_{-0,03}$ mm	0,75 mm
2° segment	$0,8\ ^{0}_{-0,02}$ mm	0,75 mm
Oil scraper	$1,5\ ^{-0,03}_{-0,08}$ mm	1,38 mm
Maximum piston ring-cylinder clearance		
1° segment	0,2 ÷ 0,4 mm	0,6 mm
2° segment	0,2 ÷ 0,4 mm	0,6 mm
Oil scraper	0,2 ÷ 0,7 mm	1 mm
CLUTCH		
Friction drive plate thickness	3 mm	2,8 mm
Springs (free lenght)	41 mm	39 mm

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B

ITEM	STANDARD	WEAR LIMIT
GEAR SHIFT		
Gear fork - Groove pivot play.....	0,35 ÷ 0,15 mm.....	0,65 mm
Shift drum groove width.....	7,05 ÷ 7,15 mm.....	7,35 mm
Ø Fork pivot.....	6,8 ÷ 6,9 mm.....	6,7 mm
Minimun idle gear axial play.....	0,10 mm	
Maximum gear fork play.....	.....	0,70 mm
Primary gear limit.....	.....	5,60 mm
Secondary gear limit.....	.....	4,60 mm
Fork selection gear limit		
Primary (5a - 6a).....	.....	4,65 mm
Secondary (1a - 2a, 3a - 4a).....	.....	3,65 mm
Fork - Pit play.....	0,2 ÷ 0,3 mm.....	0,7 mm
CRANKCASE - DRIVE SHAFT		
Crankshaft - crankcase plain bearing clearance.....	0,014 ÷ 0,044 mm.....	0,06 mm
Connecting rod - crankshaft plain bearing clearance.....	0,030 ÷ 0,050 mm.....	0,08 mm
Crankshaft axial clearance.....	0,2 mm	

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Cleaning the parts
All of the parts must be cleaned with special biodegradable solvents and dried with compressed air. Proceed with the cleaning process of all the parts before disassembling them as well as after the particular parts have been disassembled. Clean each part even before reassembling.

Connections
In order to allow the motor to function in the best conditions it is absolutely necessary that all of the connections meet the standards established by the manufacturer. A connection with reduced standards could cause seizing, while a connection with excessive toleration causes vibrations which accelerate the wear of the components.

General norms for assembling the parts
For reassembling invert the disassembling procedure, paying careful attention to the specified procedures. Gaskets, oil spill protector, metallic locks. Tightening rings in deformable material and self blocking nuts must always be substituted. The bearings are dimensioned for a determined number of working hours. Substitution is therefore recommended in consideration of the difficulty in checking wear. The above mentioned is in addition suggested for dimensional controls of the single components mentioned in the relative paragraphs. It is absolutely necessary to carefully clean all of the components; the bearings and all of the other parts subject to wear must be lubricated with motor oil before reassembling. Nuts and screws must be locked to the pre established torques.

Following are the descriptions of the disassembling, revision and reassembling procedures of the various parts and sub parts constituting the motor, in the finalized sequence of a completely disassembled motor.

Disassemble the motor from its frame as described in the relative paragraph; Drain the oil from the oil cup; Remove the spark plugs covering the openings with clean rags to avoid small objects (rings, etc.) from falling into the motor.

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B

Measuring compression in the cylinder
The following tools are necessary in order to carry out this procedure:
Spark plug key: n°800089013
Compression measurer
Adapter for the compression measurer.
A) Heat the motor to the usual functioning temperature (of regime);
B) Switch off the engine, remove the tank, air box and spark plugs;
C) Measure cylinder compression.

Drag the motor into rotation by means of the starting motor with the butterfly valve completely open until the compression measurer indicator (compression meter) no longer rises; the compression measurement obtained is the maximum.

NOTE **Be sure the battery is completely charged.**

Cylinder compression control (280 rpm-min.)		
Engine Type	Min Press. (bars)	Max Press. (bars)
F4	7,5	14

- Repeat the procedure for the other cylinders.

N.B.:If the compression in the cylinder is lower than the minimum value of the reported range, check the following points:
A) carbon deposits on the walls of the combustion chamber and on the piston ceiling;
B) the head gasket is not of the correct measurements;

N.B.:If the compression in the cylinder is lower than the minimum value of the reported range, check the following points:
A) The seat of one or more valves is damaged and the valves do not maintain the compression pressure;
B) One or more valves have null functioning play;
C) The piston, cylinder play is excessive;
D) The cylinder head is twisted and/or the head gasket is damaged;
E) Excessive play between ring and cable.

NOTE **Before carrying out the compression trial, accurately check the battery tension since the compression value which appears is quite influenced by the rotation velocity of the motor, and consequently by the battery tension.**

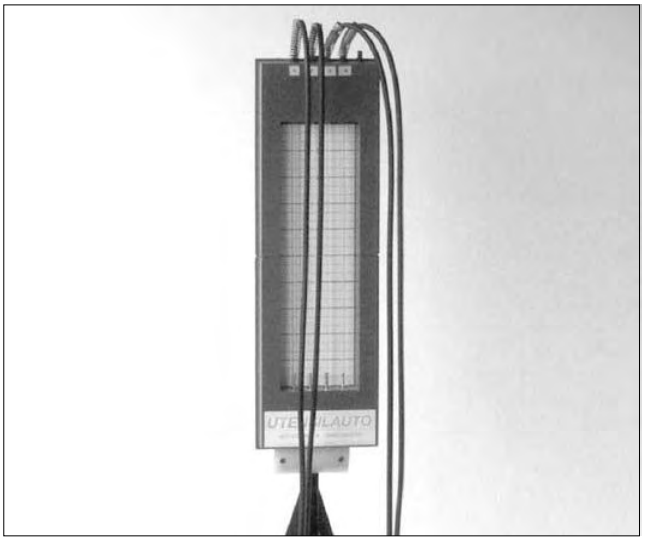


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THROTTLE BODY ADJUSTMENT AND TUNING (Tickover check, CO synchronisation and check)

Check and adjust — First 1000 kilometres and then every 6000 kilometres

The throttle body adjusting should be performed starting the engine of the motorcycle, therefore you should use a flue gas exhauster in order to not saturate the environment with burnt gas. The following described operations are fundamental for the correct functioning and the maximum performance of the engine.



When carrying out operations on throttle bodies, it is advisable to remove certain parts of the body work such as:

- Seat
- Tank side panels
- Fuel tank

Attention: before adjusting the throttle body verify accurately:

- the absence of any cracks or damages on the pipes to check the depression;
- the absence of gas leakages from drain pipes joint;
- that the fuel pipe unions are not buckled and crushed.

The motorcycle should be fitted with an auxiliary support for the tank.



Specific tool: Code 8000B4414



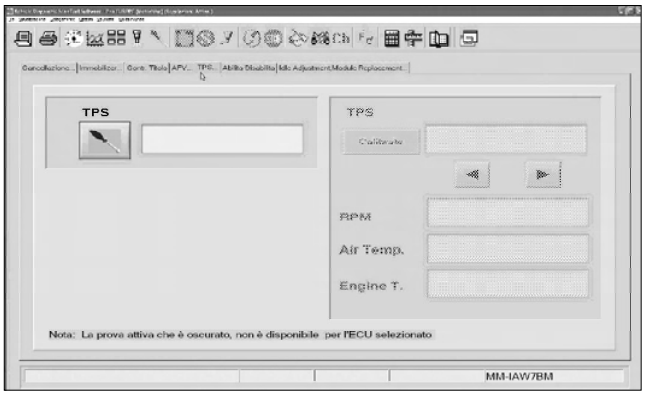


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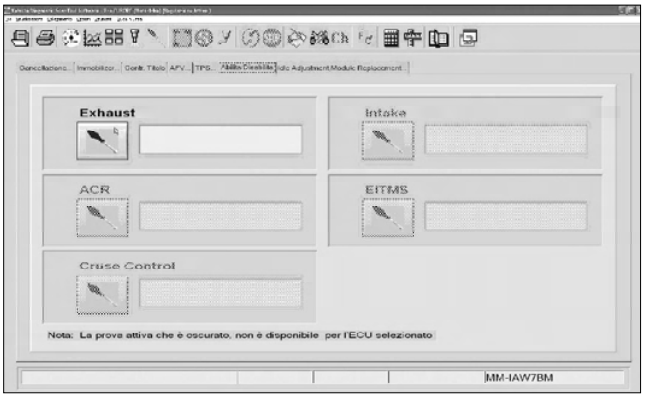
B

Adjustment and calibration of throttle body

After connecting the diagnostic software to the central unit, before starting the engine check the position of the throttle valve: 2.3 degrees (min. 1.7, max 2.9).
If it does not fall within the range, use the TPS feature to reset it, WITHOUT TOUCHING THE MECHANIC ADJUSTING SCREW OF THE THROTTLE.
From the icon “screwdriver” or from the menù View/ Adjust/Reset errors it is possible to select in the window TPS the function to reset the throttle position sensor.

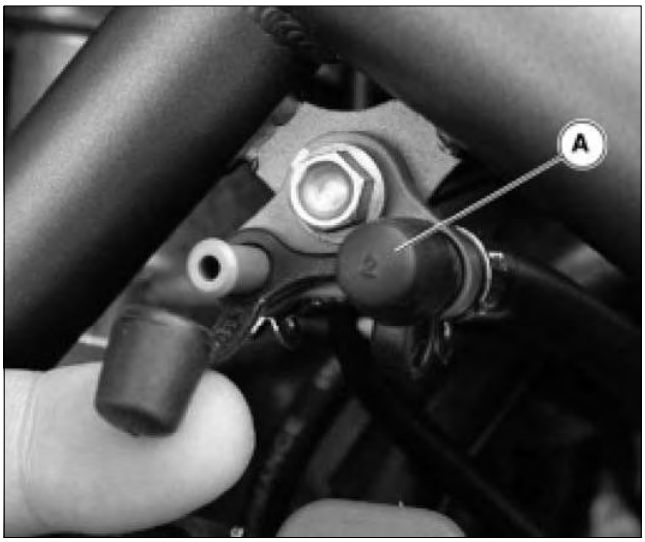


Before starting the engine it is necessary to also verify the position of the exhaust valve: from the window “Enable/Disable” it is possible to select the command EXHAUST for the zero resetting of the exhaust valve.
Once you reset the throttle sensor (TPS) and the exhaust valve (EXHAUST) it is necessary to memorize the new regulation on the unit positioning the key on “OFF” for around 20 seconds.
To this point he passes to the levelling of the present depression in the intake conducts.



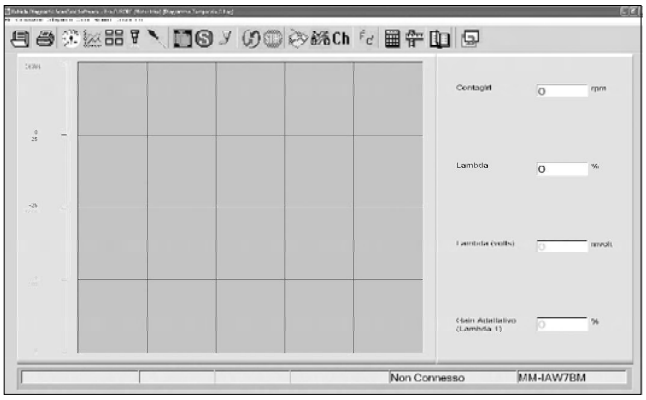
Levelling of induction manifold settings

To check this, use a mercury vacuum gauge of the type shown in the figure. Twist off the plugs that close the vacuum tubes. The number of the cylinder to which the rubber plug is connected is written on the same (A).
The vacuum tubes are located on the right and left side of the vehicle.
Left side: Cylinders 1 and 2
Right side: Cylinders 3 and 4
Connect the measuring device with the rubber pipes. Each pipe must match the cylinder to which it is connected.
Then, level the vacuum inside the induction manifolds, starting the engine to warm it up.
You will see that after starting the engine the Lambda



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channel (mvolt), which was next to zero, will start to rise. After starting the Lambda control (Lambda % range), the Lambda (mvolt) will range between a high of 1000 mvolt and a low of 0 mvolt (minus the diagnostic software lag). To see the range more clearly, adjust the two graphic settings. The above behaviour means the Lambda probe is in working order. Otherwise, if the Lambda (mvolt) shows a fixed value of about 0 mvolt or 1000 mvolt, after about thirty seconds, with the Lambda % controller fixed at -25% or +25%, the system will send out a 'Lambda probe voltage' alarm. In this case, check the electric connection between the Lambda probe and the system or replace the Lambda probe.



To align the throttle body, use the diagnostic software. For the engine to work properly, adjust the throttle body so that the idling regime control works at "mid-range".

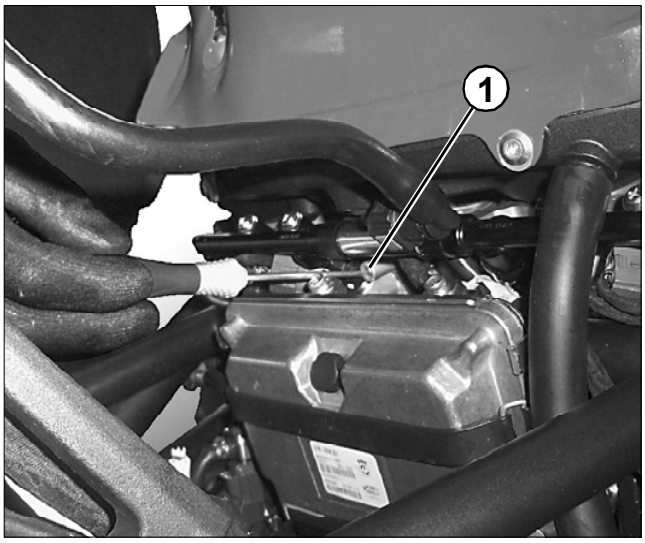
All bypass adjusting screws (1) must first be opened by turning them 1.5 turns off the 'all closed' position.

We recommend starting from the cylinder with the highest mercury level.

When this cylinder is taken as a reference, the by-pass screws of the other cylinders should then be tightened until the mercury levels have been aligned.

The following positions for the by-pass screws are admitted: min. 0,5 turns - max. 3,5 turns.

If the lower limit is exceeded, we recommend accepting a minimum position of 0.5 turns and undoing the screw of the cylinder which had been taken as an initial reference, without exceeding the upper limit.



When idling, the revs of the engine must range between 1100 revs/min and 1200 revs/min.

It is necessary regulate the course air without modify the correct alignment just obtained.

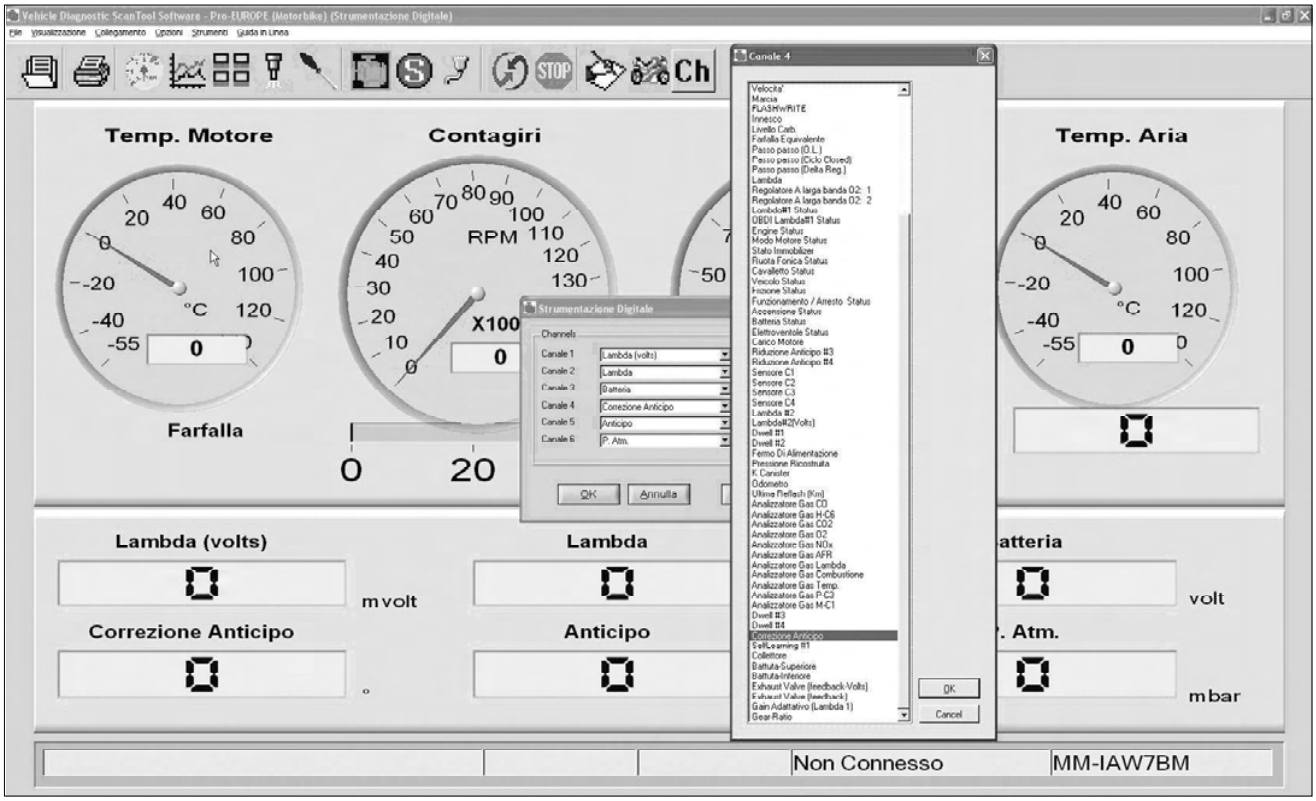


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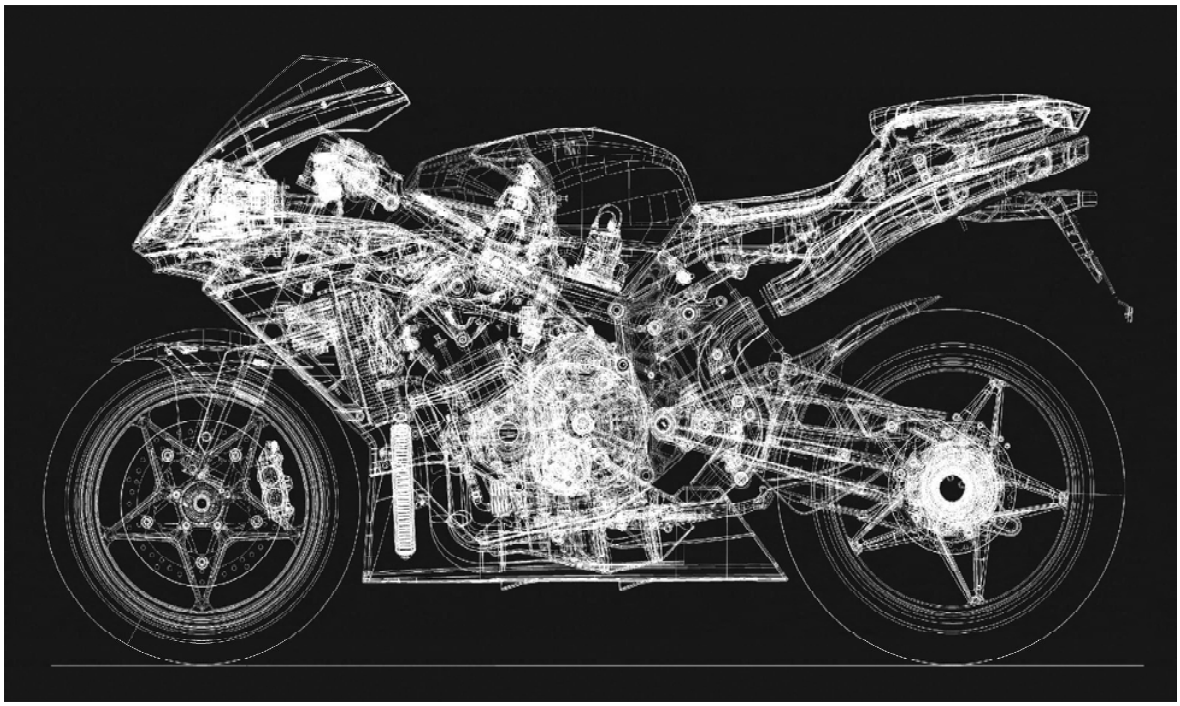
To do this proceed in the following way:
If the “lead correction” channel is NEGATIVE, close the by-pass valves to take air out, keeping it aligned until the “Lead correction” setting goes to work within a range of -4°to +4°. If the “Lead correction” channel is POSITIVE, open the by-pass valves to add air, keeping it aligned until the “Lead correction” setting goes to work within a range of -4° to +4°. When the adjustment is over, turn off the vehicle, remove the connection pipe and replace the four protective plugs.





Adjustment of carbon monoxide (CO)
CO ADJUSTMENT IS NOT REQUIRED. The system can correct its (stoichiometric) carburetion through the Lambda probe control. This does not happen straight away but depends on the Lambda probe switching speed for a water temperature of 85 to 105 °C.
You will notice that, when the Lambda probe % controller work slightly ABOVE ZERO, ADAPTIVE GAIN setting WILL INCREASE and will bring the Lambda % channel back to about 0 ±3%. You will notice that, when the Lambda probe % controller work slightly BELOW ZERO, ADAPTIVE GAIN setting WILL DECREASE and will bring the Lambda % channel back to about 0 ±3%.

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SECTION C

REVISION 1

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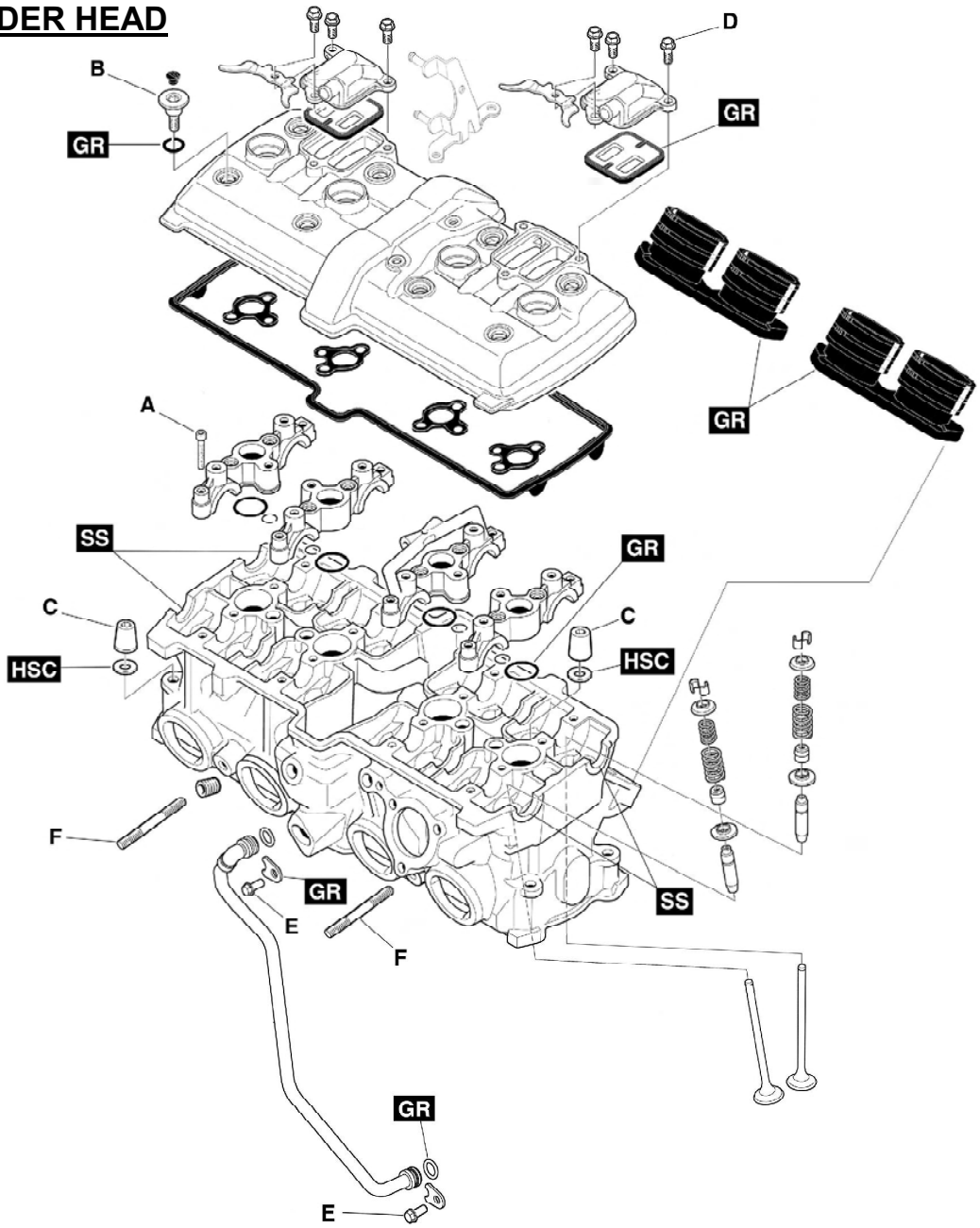
C

SUMMARY

CYLINDER HEAD ..... PAG. 3
DISTRIBUTION CONTROL UNIT ..... PAG. 6
CYLINDER AND PISTON GROUP ..... PAG. 26

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CYLINDER HEAD



Tghtening torque		A	B	C	D	E	F	G	H	I	L
	Nm	12	10	50*	10	8	36				
Thread blockers						medium	sealant				

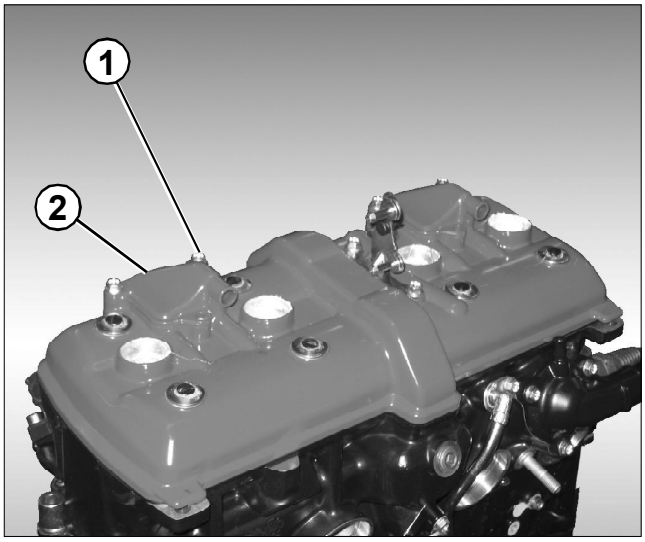
OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

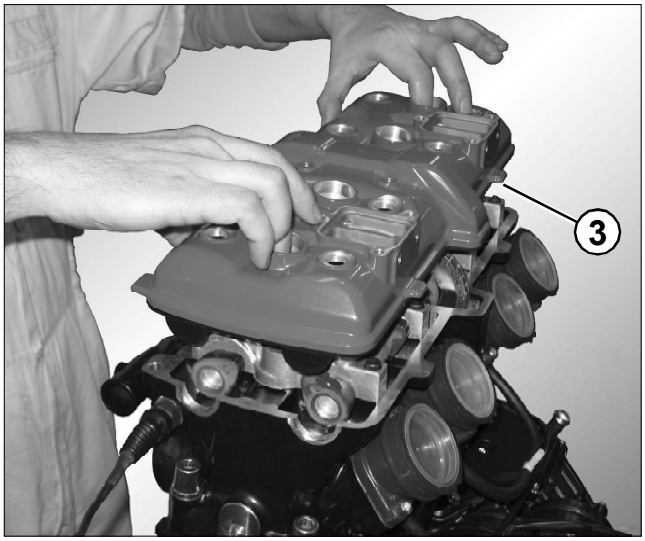
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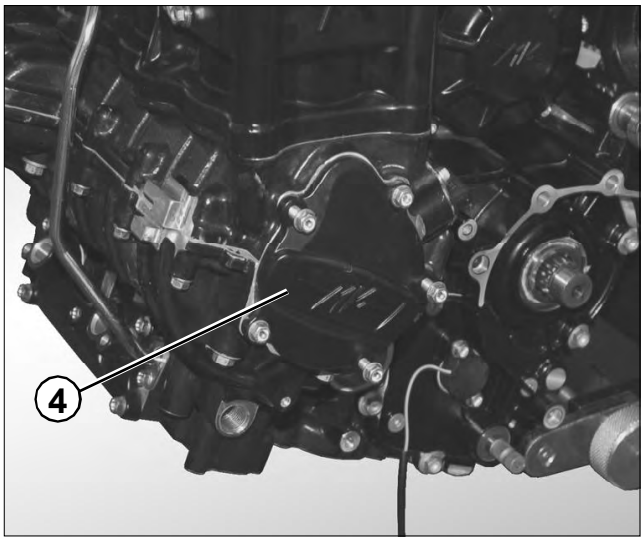
Removal of Head group
Remove the eight tightening nuts (1) and remove the valve cover (2) proceed carefully so as not to damage the gasket (3).

When refitting, it is essential to apply silicon sealant as shown in the figure at the beginning of the chapter.



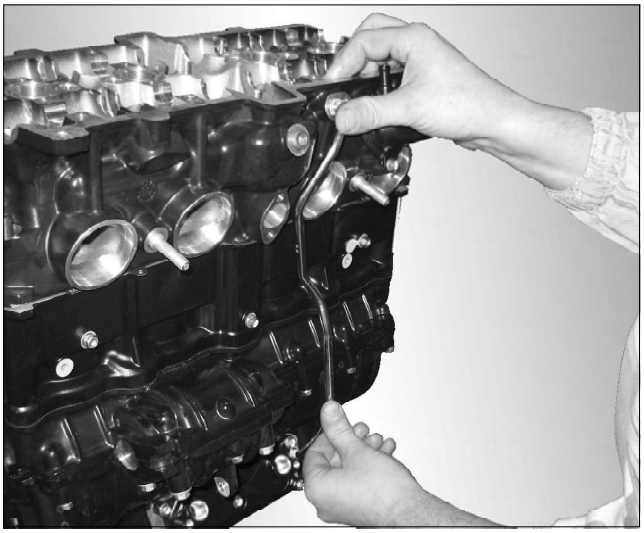


On the left side of the motor remove, together with the gasket, the phonic wheel cover (4) by means of the five screws.

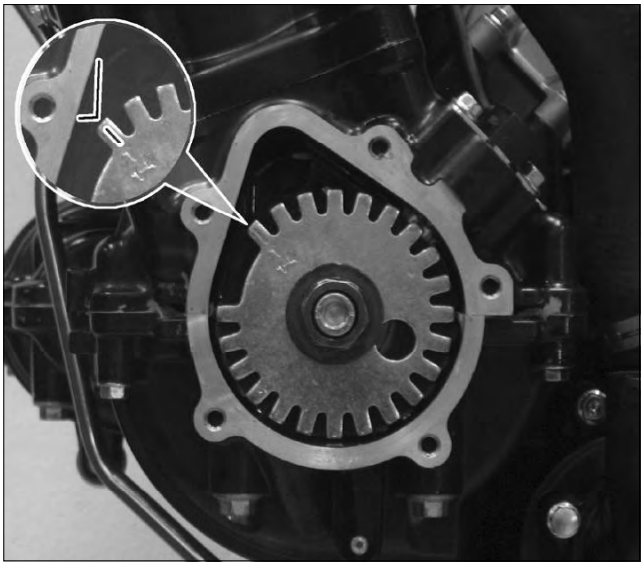


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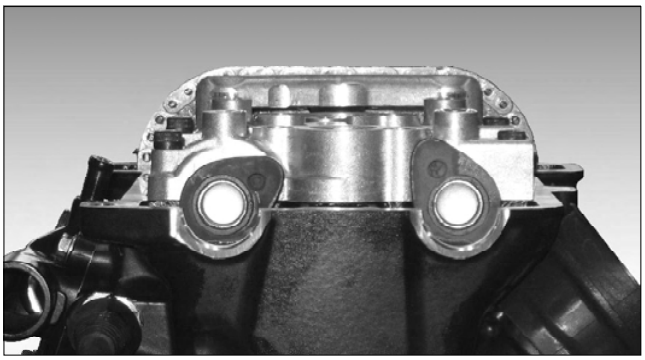
Remove the oil tube from the front of the engine by removing the (2) 8mm hex head bolts. Rotate the crankshaft by turning the 19mm bolt on the phonic wheel in the counter-clockwise direction until the n°1 piston is at TDC on the compression stroke.

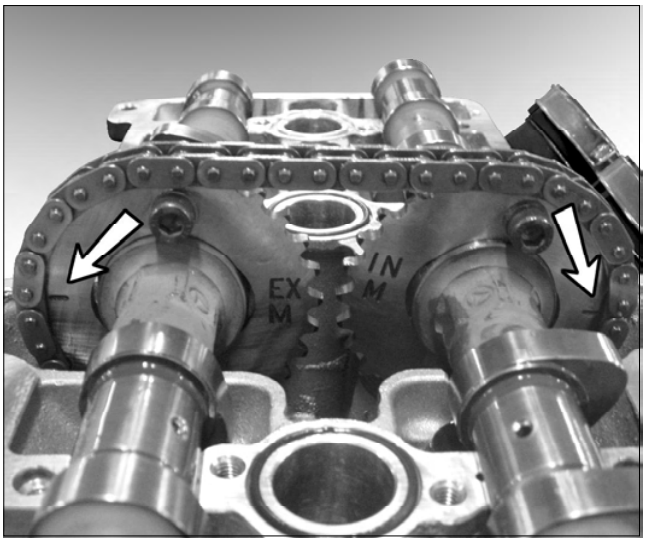


In this position the T notch on the phonic wheel is lined up with the reference notch on the crankcase.



The cams relative to cylinder n°1 converge upwards in the symmetrical position as indicated in the figure. Beside, the reference notches on the control wheels of the cam shafts are in horizontal position and positioned externally.

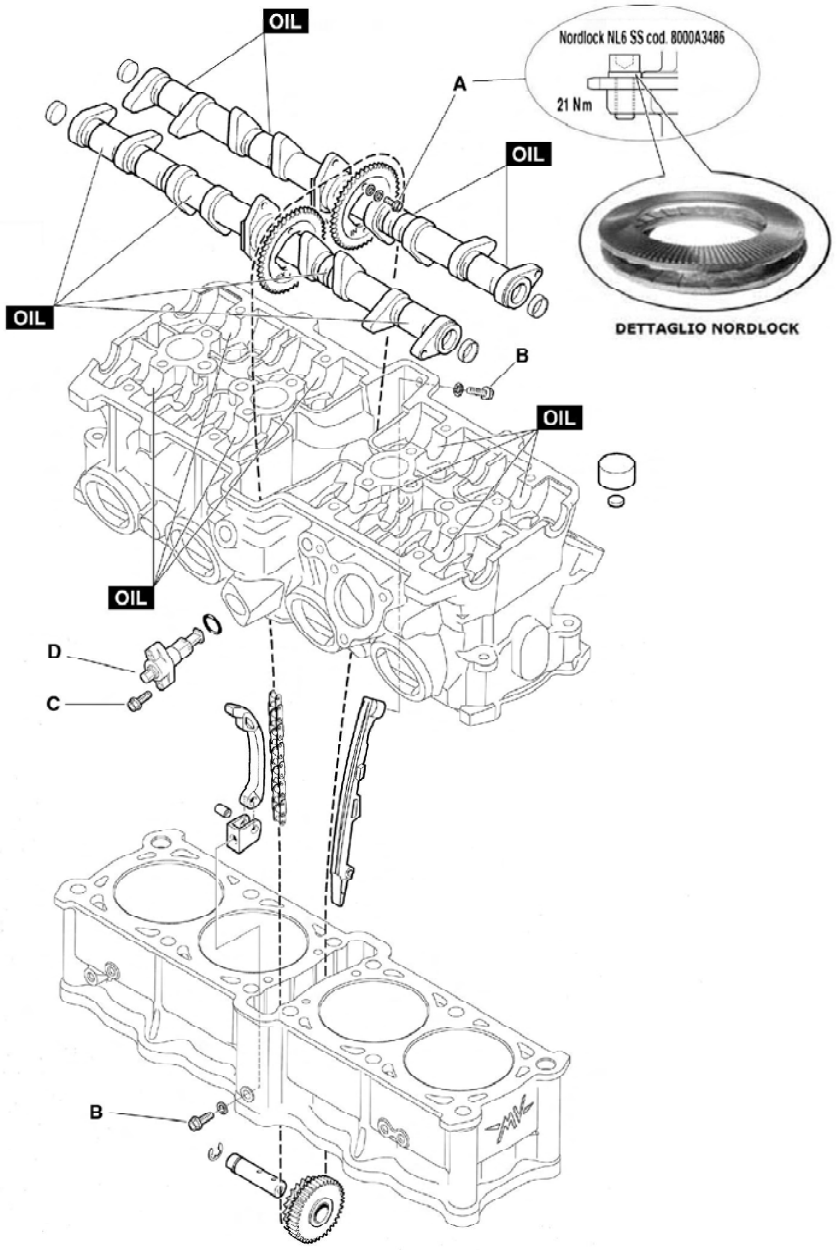




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DISTRIBUTION CONTROL UNIT



Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	21	8	8	12						
Thread blockers		strong	medium								

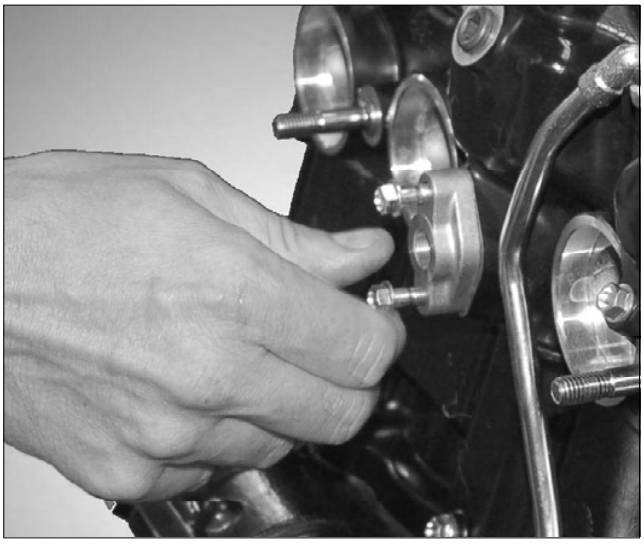
OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

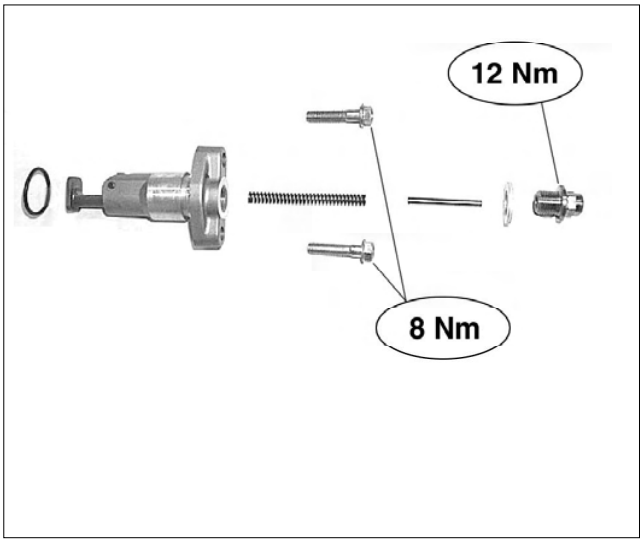
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Chain tensioner
Remove the central screw-cap and withdraw the spring and the pin.



Remove the screws fixing the chain tensioner to the head. Remove the chain tensioner. Disassembly the chain tensioner and check the correct working of each part. The internal pin must run clearly and the inner spring must give a quick response. Replace the assembly in case of malfunction. If everything works properly lubricate the parts and install the assembly with the chain tensioner in the minimum extension position (all in the main body) Install the chain tensioner body locking the 2 socket head screws using a T wrench with a 8 Nm torque.
Install in this order: the pin in the spring, the spacer and the screw cap. Lock the screw cap by hand till you feel the tensioner extend, then lock it with a 8 Nm torque.
Acting this way the chain tensioner is adjusted.





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C

Removing the valve gear components

First remove the 2 external stands (4and 5) of the camshafts by means of the four screws each internally hexagonal. At the same time remove the 2 internal stands (6 and 7) placing attention on the thrust caused by valvesprings.

In order to facilitate the detachment of the stands use a rubber hammer or delicately the end part of a flat screwdriver.

Slightly rotate without force the unloaded end of the gear shaft shifting it from its slot; by doing so, the tension on the distribution chain will loosen.

Release the distribution chain.

First remove the unloaded end of the gear shaft.

Fasten the distribution chain with copper thread in order to retrieve it during the following procedure.

Remove the inlet end of the camshaft.

Remove the first link block for the distribution chain by using the tightening screws.

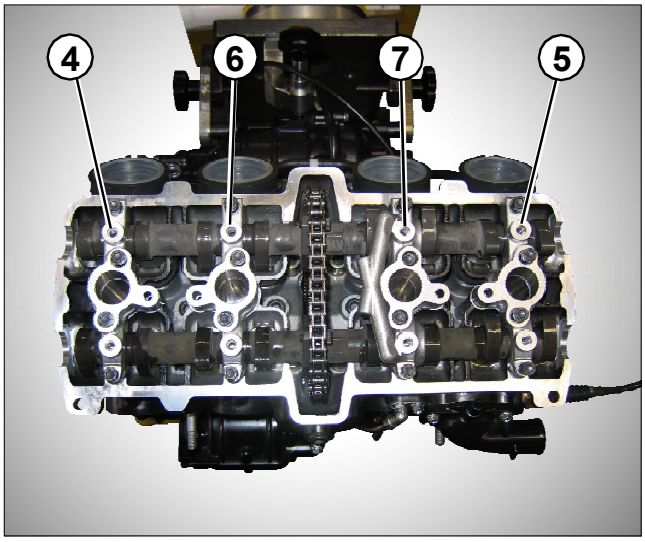
In case it should be necessary to substitute the distribution chain at the expected mileage (see the programmed maintenance chart), it is advisable also to substitute the gears on the camshaft (INLET n°8000A3032 - EXHAUST n°8000A3033).

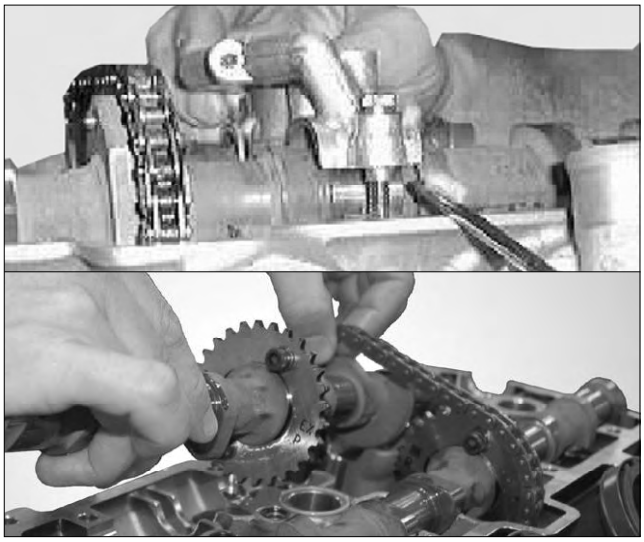
When refitting, thoroughly clean all surfaces.

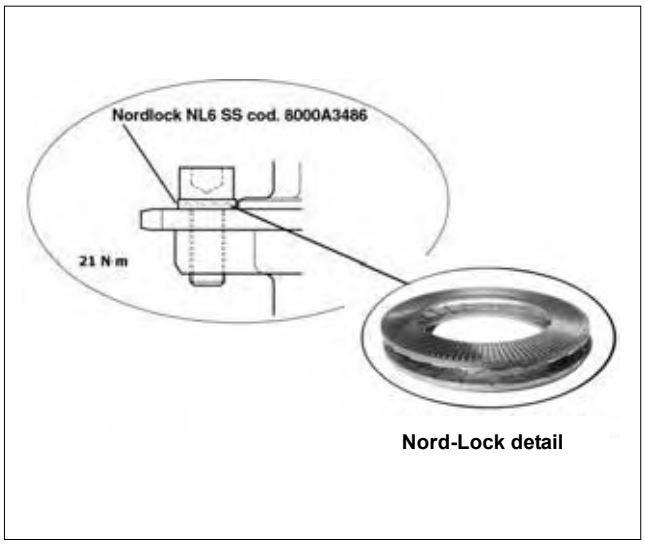
Position the timing gear so that the side that has received no thermal treatment (the one with no timing marks) is in contact with the NL655-TYPE NORD-LOCK washers Part No. 8000A3486.

When refitting, always replace the washers and fitthem as shown in the figure.

Apply the thread locking product STRONG THREAD BLOCKER on new screws Part No. 8C0085071 and tighten at 21 Nm.





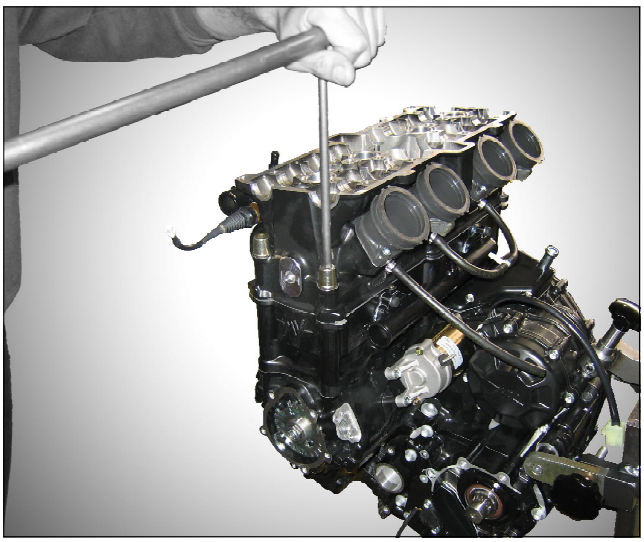


Nord-Lock detail

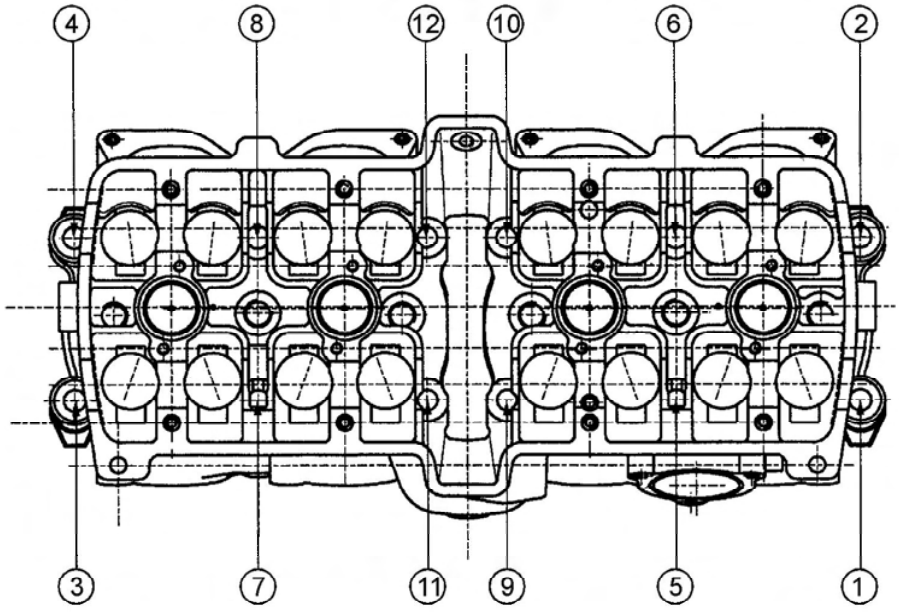


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Remove the 12 tightening nuts from the head beginning from the external ones proceeding towards the internal ones, following the sequence indicated in the figure.



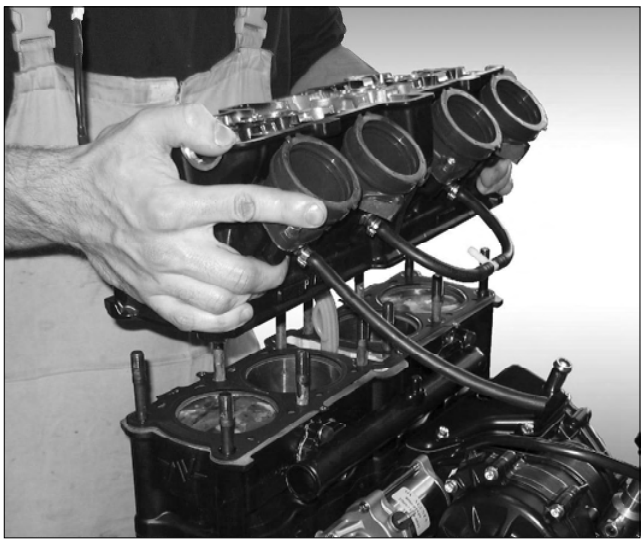
On each cylinder head stud there is a washer under the nut, be careful no to let this washer fall into the engine, block all passages with clean rags before removing the nuts and washer.



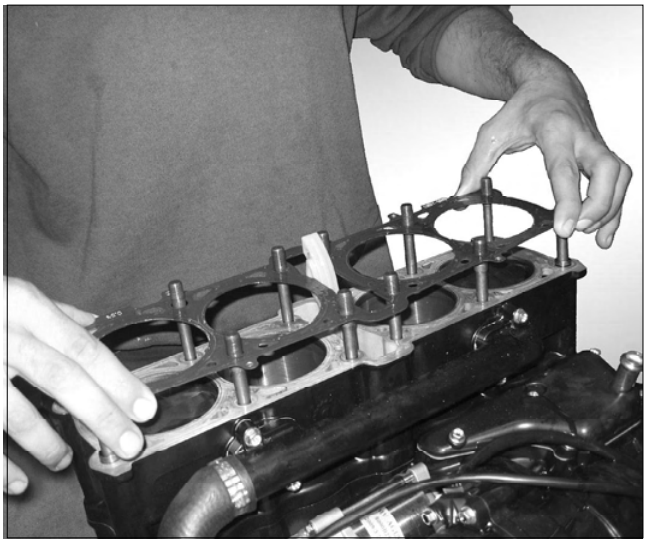
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Remove the head and place it onto a clear place.



Remove the gasket which will be substituted during reassembly.
Avoid placing the head upside down.

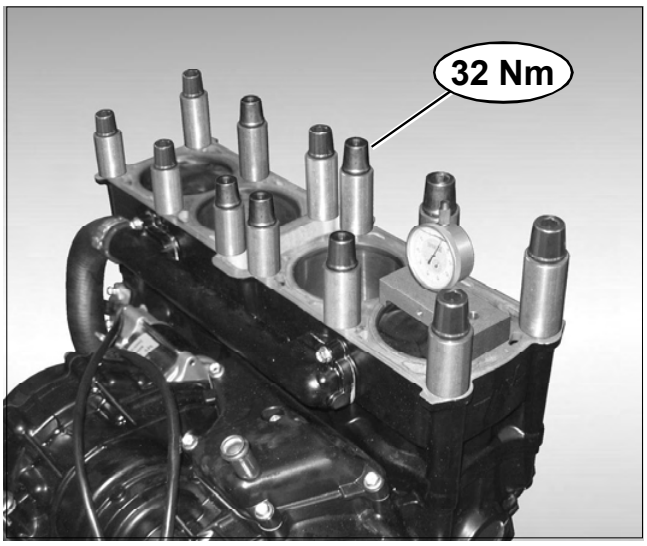


Inspection of the head group
Remove carbon deposits from the combustion chambers.
Clean away eventual encrustments from the canalizations of the cooling liquid.
Check to be sure that are no crack and that the holding surfaces are free of crevices, runs or any other kind of damage.
Verify the planarity of the stroke surfaces.
Verify the perfect state of the spark plug threads.

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Head assy assembly
To execute this operation you need the following special tool:
A) n° 8000A3406 piston / cylinder plane distance measuring tool

Place the new gasket on the cylinder plane.
The gasket is of the same thickness of the one installed before if no parts replacement occurred.



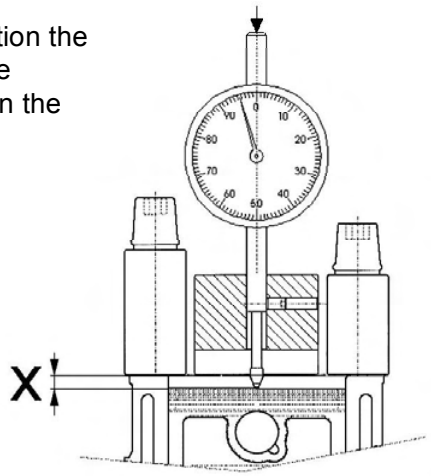
If replacement is necessary you'll need to measure the piston / cylinder plane distance with the n°8000A3406 tool, tightening the head nuts at 32 Nm.
The choice is made following table below:

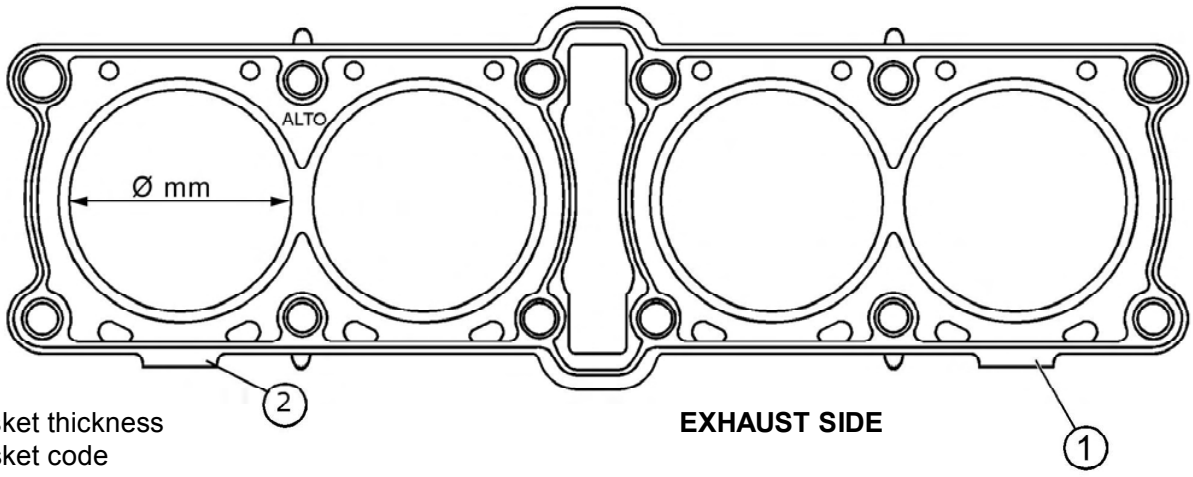
Distance between piston and cylinder surface (**X** mm)	Thick-ness (mm)	Head gasket Code	
		Ø 76 mm	Ø 79 mm
-0,070 ÷ -0,220	0,70	8B00A5200	8B00A9370
-0,230 ÷ -0,380	0,55	8A00A5200	8A00A9370
-0,390 ÷ -0,540	0,40	8000A5200	8000A9370

The cylinder base gaskets always have the same thickness (see table).

Thickness	N° ITEM
0,35 mm	8000A9371

Do not position the feeler on the projection on the piston top



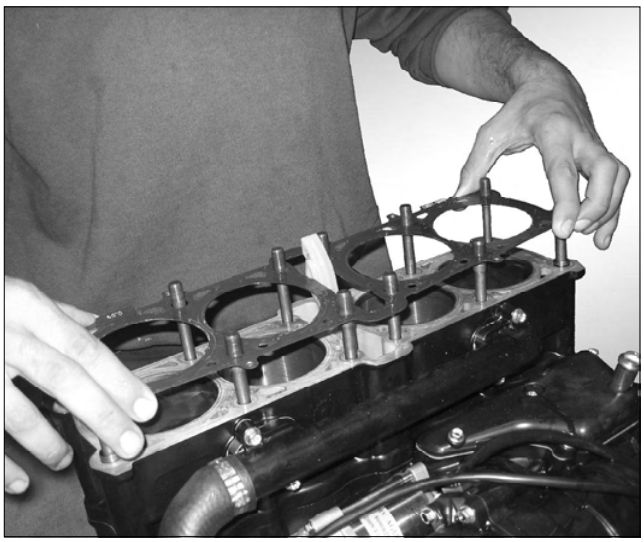


1-Gasket thickness
2-Gasket code
Note: Fit the gasket with the inscriptions facing up

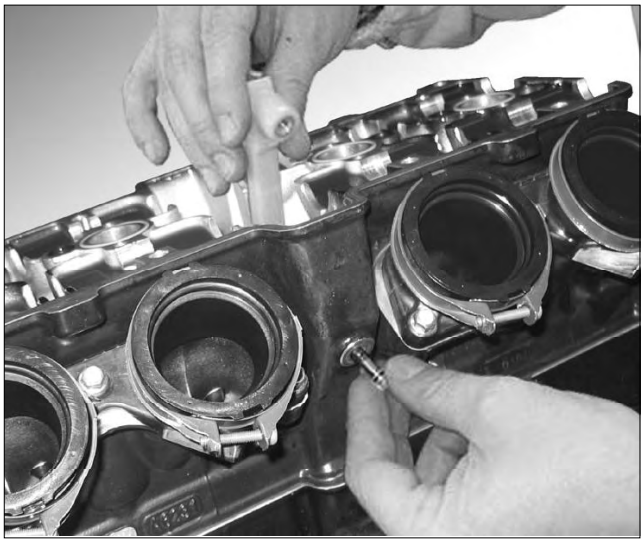
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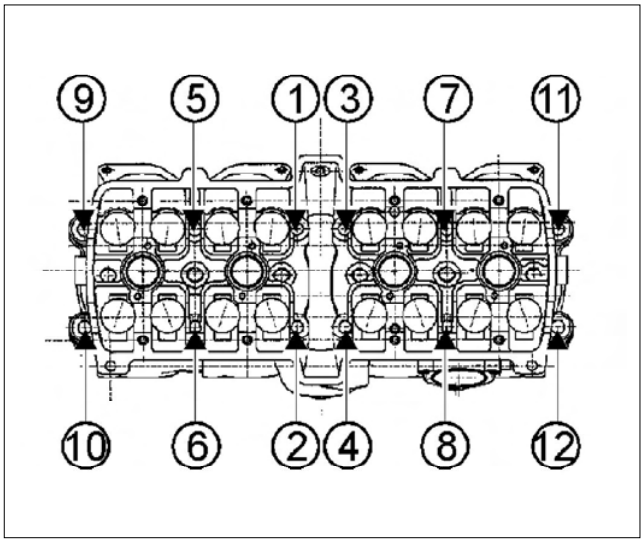
Insert the centering bushes between the head and the cylinder.
Fit the gasket with the inscriptions facing up and the protrusion towards the march gear.
Positioning the head.



Retrieve the distribution chain. Insert the fixed sliding block with its screws and, after having carefully degreased it, tighten it at a torque of 8 Nm with MEDIUM THREAD BLOCKER.



Insert the washers on the stud bolts if necessary with the help of a screw driver to guide them onto the internal stud bolts.
Lubricate with antibinding grease of the HSC MOLIKOTE type only on the nut threads.
Do not apply grease on the stud bolts thread, which must be well cleaned and degreased.
Screw the bolts with a brugle key and press them at 35 Nm.
Tighten the bolts beginning with the internal ones towards the external ones following the outline indicated in the figure at 50 Nm.



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DISTRIBUTION GEAR AND DRIVING SHAFT TIMING

Check and placement of distribution chain

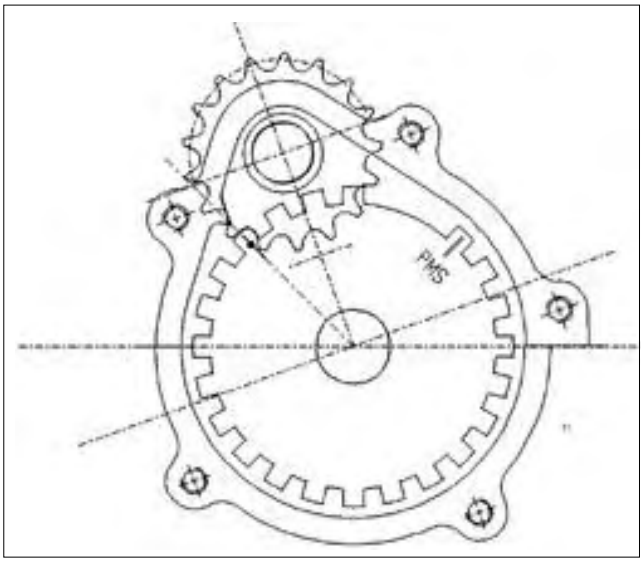
At each motor revision verify the wear state of each transmission distribution component.
If the gear teeth appear to be very worn substitute each piece.
Substitute the chain at the foreseen mileage.



In case wear should result beyond the permitted allowance even of just one of the distribution components, check them all and if necessary substitute them.

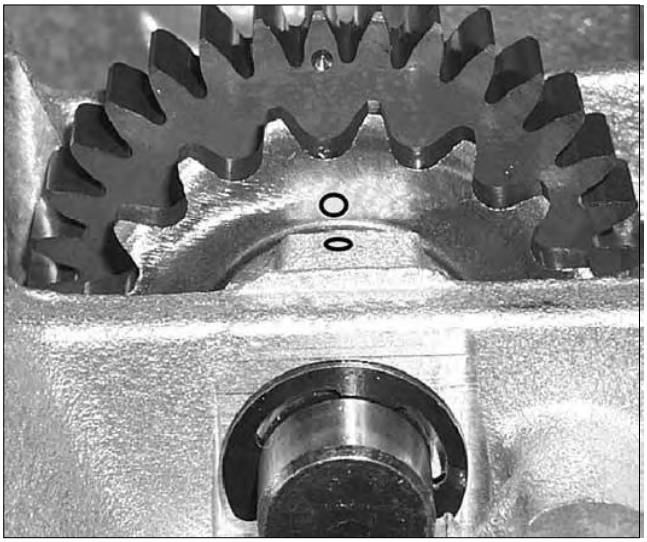
Rotate the drive shaft until the pellet on the phonic wheel tooth coincides with the notch on the crankcase, as shown in the following picture.

NOTE **Attention: the crankshaft is NOT in the TDC (cylinder n°1) position.**



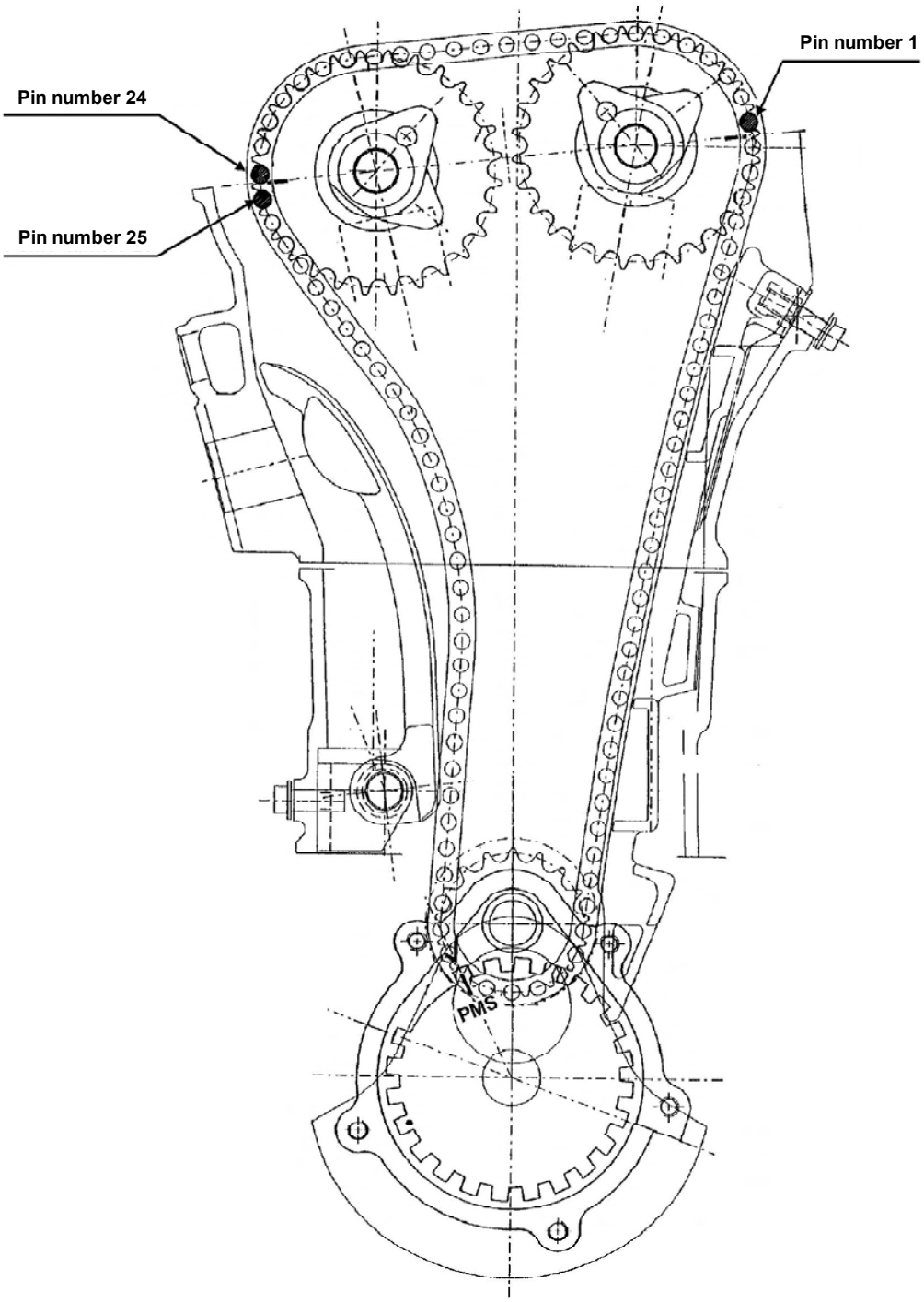
Fit the distribution chain on the intermediate gear.
Position the intermediate gear being careful that the pellet on the gear corresponds with the pellet on the crankcase, being careful that the drive shaft has not moved from the position priorly described.
Insert the intermediate gear rotation pin and tighten it with the relative seeger.

Without rotating the drive shaft check again to be sure that the pellet on the phonic wheel corresponds to the notch on the crankcase.
At this point, rotate the drive shaft and verify the correct teeth gripping.
Attention: the position relating to the balls will only be repeated after a few dozen turns of the engine shaft. However, this position does not need to be found for the correct assembling if the alignment was executed before hand.



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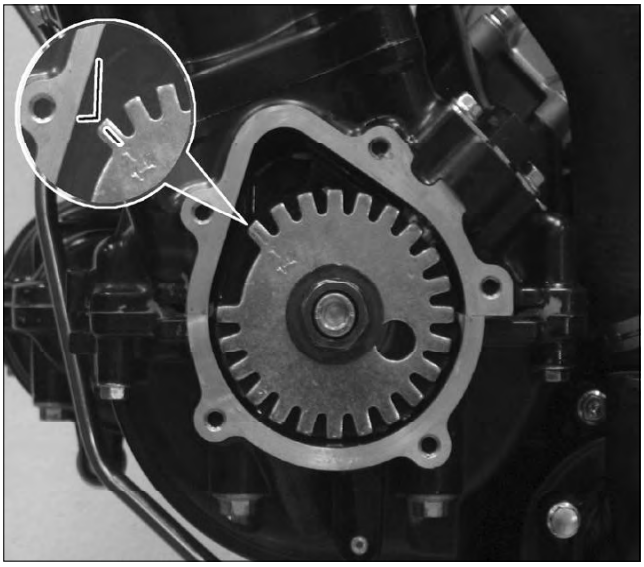
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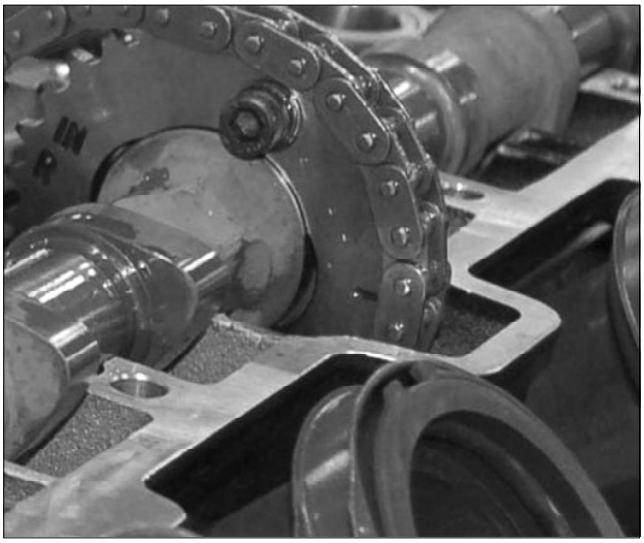
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CAMSHAFT AND DRIVING SHAFT TIMING
Continue with the setting as follows:
be sure that piston n°1 is the MSP in burst phase; in this position “T” notch on the phonic wheel is in line with the reference notch on the bedplate. Remove the copper thread from distribution chain, keep the chain tightened.

If the middle gears or motor shaft need replacing, time the engine. Refer to the instructions on the following page.

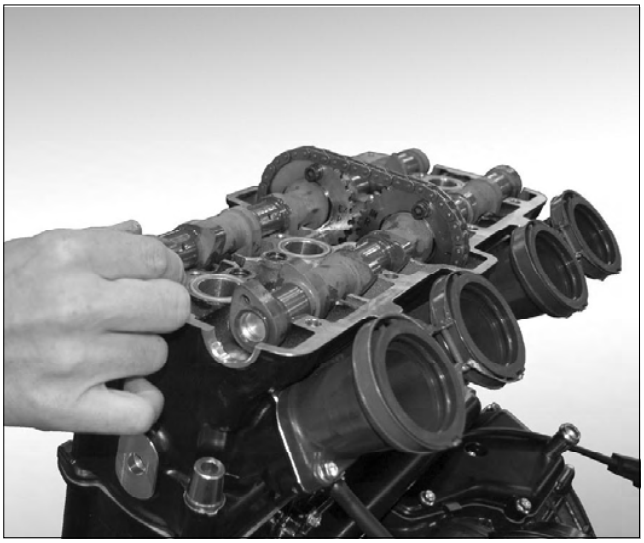


Insert the inlet camshaft so that the phase notch on the conveyer wheel is parallel to the head plane and facing the outside.



Insert the exhaust camshaft with the notch placed between the 24th and 25th chain distribution gudgeon, beginning to count from gudgeon after the inlet camshaft notch.
Check the correct position of all the O Rings under the head stands.

NOTA **If the operation is performed with the engine installed on the vehicle, lift the front wheel until the axis of the cylinders is in a vertical position.**



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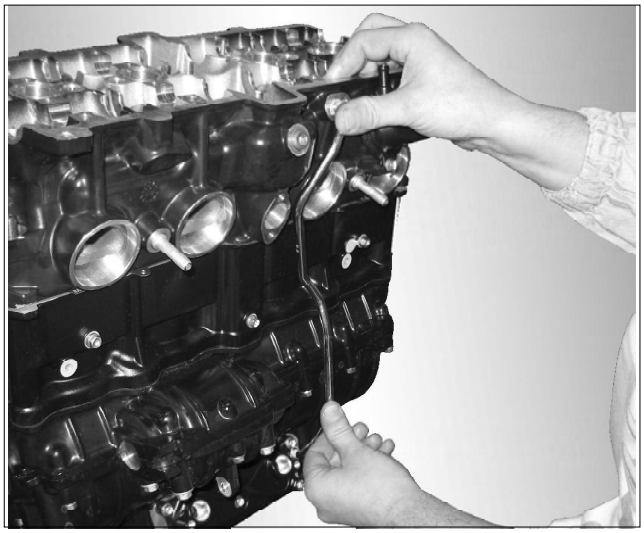
C

Position the n° 2 and n° 3 stands, referring to the numbers towards the inlet end;
Position the n° 1 and n°4 stands,
Progressively move the internal hexagonal screws close. Tighten the screws at a torque of 12 Nm, always beginning from n° 2 and n° 3 stands.
Lubricate the parts of the chain tensioner and install the assembly with the chain tensioner in the minimum extension position (all in the main body).
Install in this order: the pin in the spring, the spacer and the screw cap. Lock the screw cap by hand till you feel the tensioner extend, then lock it with to 12 Nm torque.
Acting this way the chain tensioner is adjusted.
Tighten the two screws at a torque of 8 Nm.



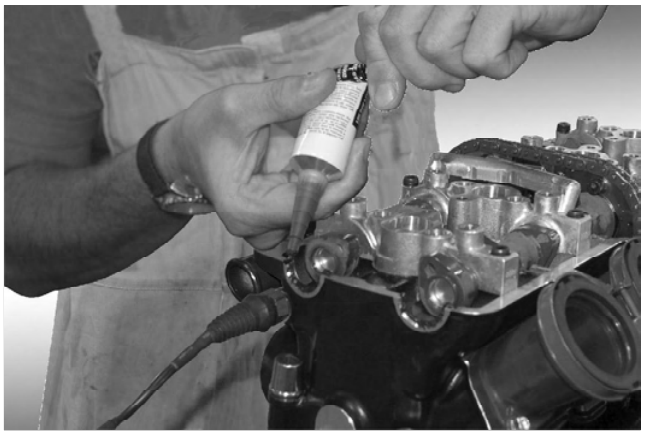
After having tightened the stands and mounted the chain tensioner,make some turns with the unloaded drive shaft to verify that the timing is correct.

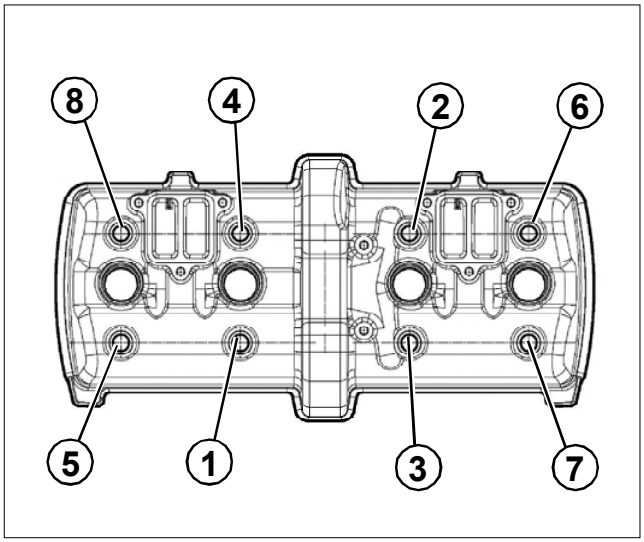
Place the adduction oil tube at the head greasing the O-Rings.



Check to be sure that the valve cap gaskets are in good condition.
Apply a layer of gasket silicone on the semi moons on the head in correspondence with the camshaft.

Position the valve cap. Manually position the screws, thus tighten at 8 Nm.





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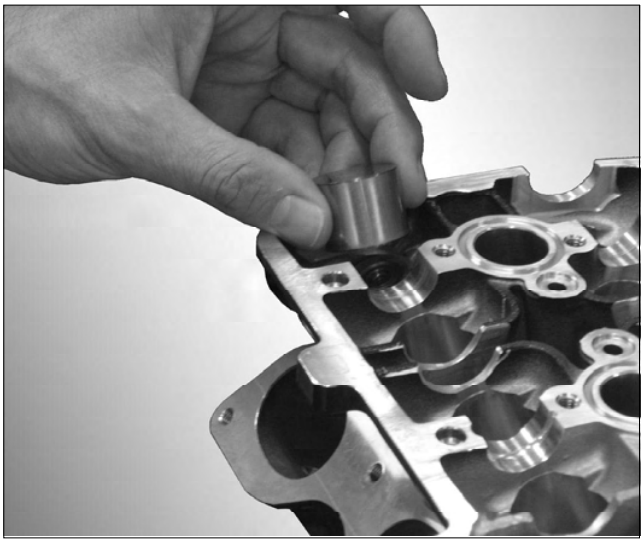
Dismounting cylinder head pieces
In order to carry out this procedure the following tools are necessary:
tool n°800094796 to disassemble valves
tool n°800095179 to remove semi cones
tool n°800094798 to take out rubber holdings

Each piece relative to the same valve (cup, spring, semi-cone, etc.) must be reassembled onto the same valve from which it came off.

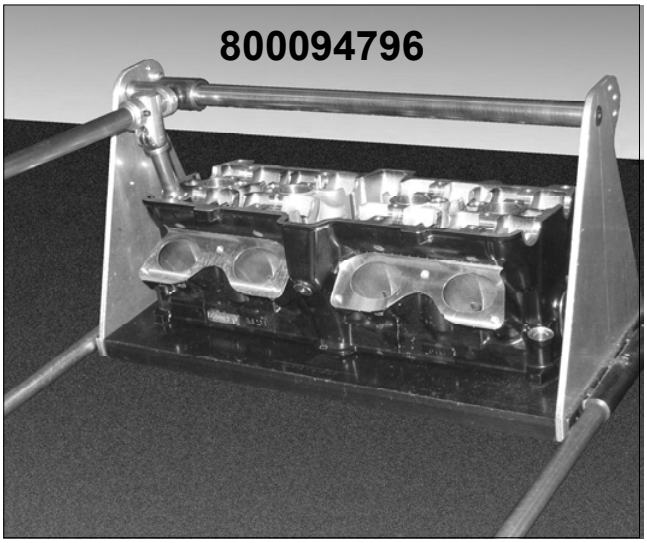
Remove the cylinder head as indicated the paragraph "Removal of head group".



Valve removal
A) Take out the cups (1) with the help of a magnet and number them with a marker so as to reassemble them in the same position.
B) Remove the tablets (2) of play adjustment with a magnet and place them inside the relative cup so as to reassemble them in the same position.
To remove the semi cones (3) exclusively use tool n°95179 so as to avoid bending the valves:
C) Assemble the head on tool n°800094796
D) Hammer on the superior disk with a rubber hammer to unblock the semi cones
E) Press the springs on the superior disk
F) Take out the semi cones with a magnet
G) Slowly release the disk pusher.



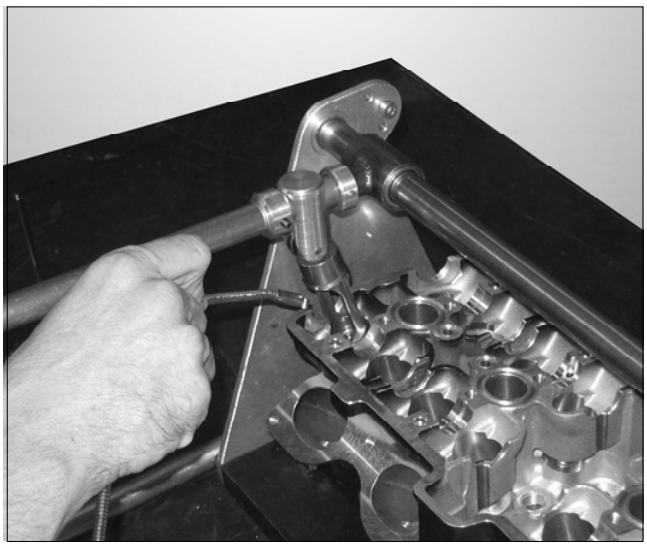




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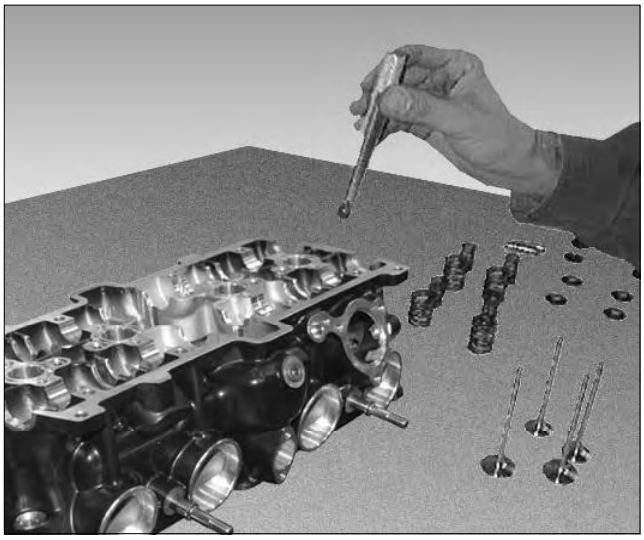
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Then remove in the following order:
A) Semicones
B) The 2 coaxial springs (4 and 5);
C) If necessary remove the rubber holdings using tool n°800094798
D) Remove the lower valve spring washers (6)

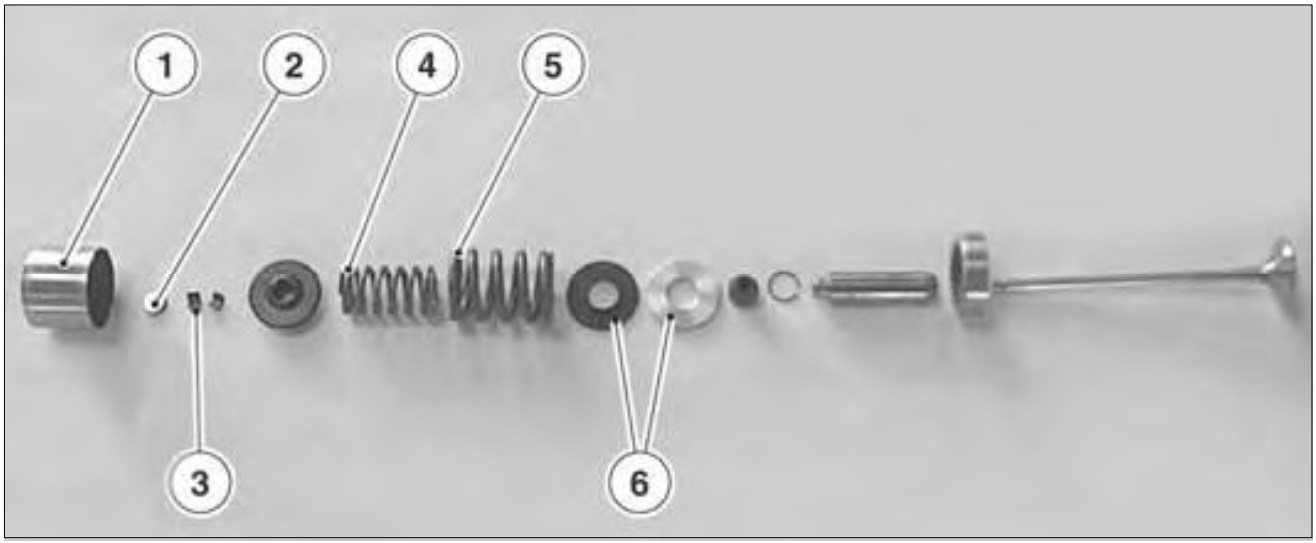


Before of slide out the titanium valves, in order to avoid the damaging of the valve guides, remove the burrs caused by by half-cones carefully using an oil stone.

E) Slide the valve out of the combustion chamber.







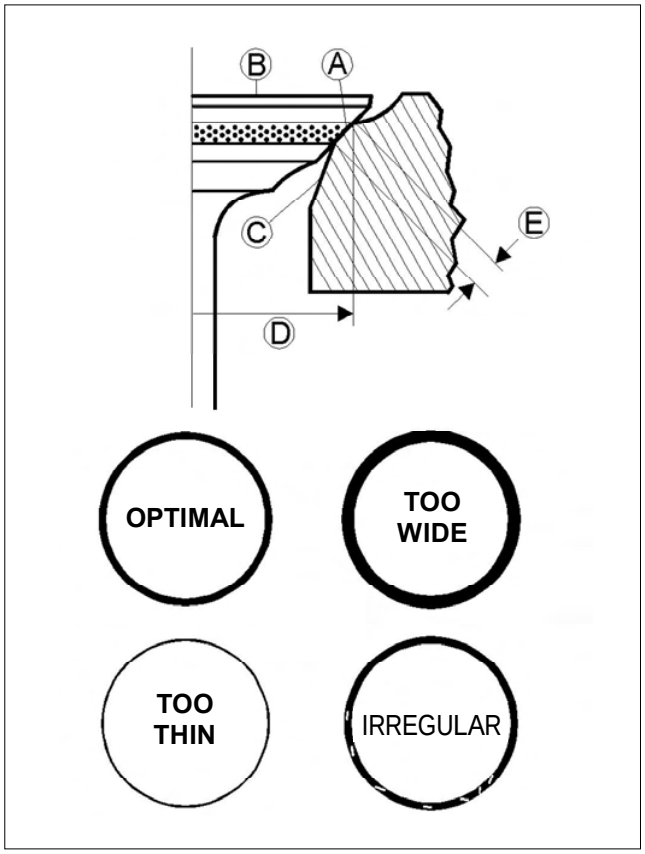
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Maintenance of the valve slot
Check the stroke surface [A] between the valve [B] and the slot [C] : no traces of pitting or cracks must appear.
Measure the external diameter [D] of the stroke surface on the valve slot. If this should appear to be too elevated it is possible to repair the slot.

External diameter of the stroke surface of the valve slot

standard :	exhaust	(**M.Y. 2010**)	24,6 $^{+0,3}_{0}$	mm
	exhaust	(**M.Y. 2011**)	25,6 $^{+0,3}_{0}$	mm
standard :	inlet	(**M.Y. 2010**)	29,8 $^{+0,3}_{0}$	mm
	inlet	(**M.Y. 2011**)	31,6 $^{+0,3}_{0}$	mm

Measure the width of the stroke [E] with a varnished gauge or with Prussian blue.
If it should turn out to be too wide, too thin or irregular it will be necessary to repair it.

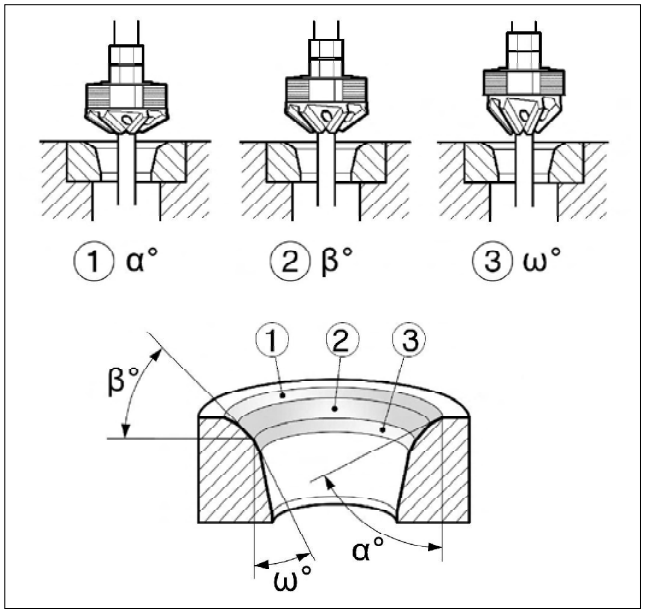


Thickness of the stroke surface of the slot

standard :	exhaust	0,9 $^{+0,3}_{0}$	mm [E]
standard :	inlet	0,7 $^{+0,3}_{0}$	mm [E]

Cylinder	Valve	monocutting milling		
		α	β	ω
Ø 76mm	Inlet./Exhaust	78°	45°	25°
Ø 79mm	Inlet	76°	45°	18°
	Exhaust	78°	45°	22°

The repair must be carried out by milling the slots using the appropriate monocutting milling machines at α°(1), β°(2) and ω°(3).Ten proceed with the grinding of the valves and verification of the holding.



Remove the minimum quantity of material from the slot.

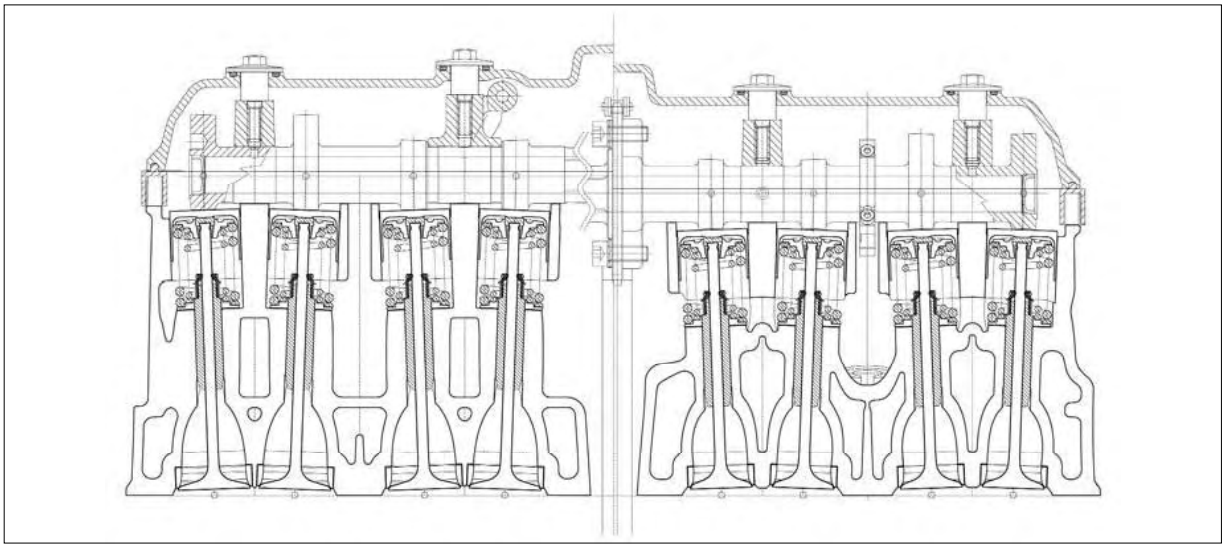
max 0,3 mm (vertical)

Verify that there is no leakage filling the inlet and exhaust of the gas canalization. If so, check the quality of repair with Prussianblue.

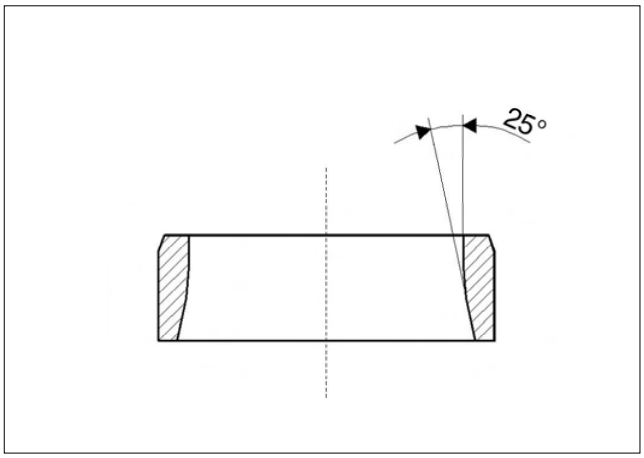
When reassembling never use calibrated tablets of a thickness inferior to1,6 mm.

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Substitution of the valve slot
The following tools are necessary for this procedure:
prick-puncher n°800095319 for inlet slot
prick-puncher n°800095318 for exhaust slot



Proceed as follows:
A) Remove the worn slots carefully milling them so as not to damage the head lodging
B) Check the lodging diameter on the head and choose the oversized valve slot considering that the assembling interference should be 0,10÷0,15 mm.
C) Valve slots are furnished with an increased replacement part of 0,03 mm on the external diameter.
D) Slowly and evenly heat the head at a max temperature of 180°C and cool the new slots with dry ice.
E) Place the slots perfectly in frame into its lodging, using the special n°800095319 prick-puncher (INLET) and n°800095318 (EXHAUST)
F) Let cool and proceed with the milling of the slots and grinding the valves referring to the following quotients:

Valve	M.Y. 2010	M.Y. 2011
Ø Inlet	29,8 $^{+0,3}_{0}$ mm	31,6 $^{+0,3}_{0}$ mm
Ø Exhaust	24,6 $^{+0,3}_{0}$ mm	25,6 $^{+0,3}_{0}$ mm
[E] Inlet	0,7 $^{+0,3}_{0}$ mm	0,7 $^{+0,3}_{0}$ mm
[E] Exhaust	0,9 $^{+0,3}$ mm	0,9 $^{+0,3}$ mm

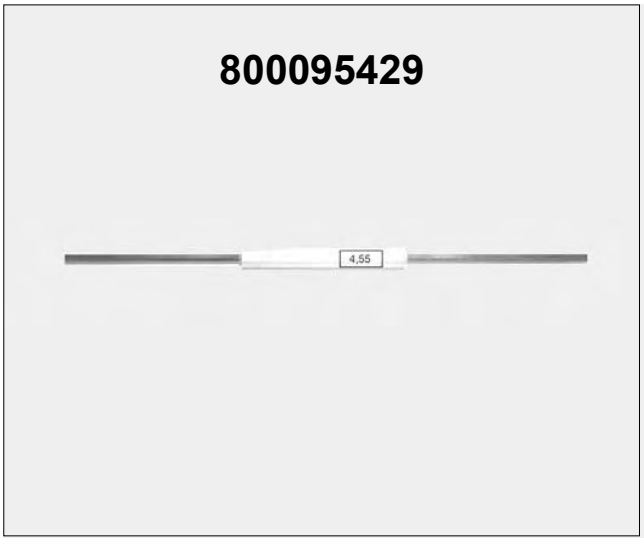


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Valve guide check and maintenance
In order to carry out this procedure the following tools are necessary:
Control tampon n°800095429
Punch n°8000A2385

valve stem-valve guide play: **0,01÷0,03 mm inlet**
0,02÷0,04 mm exhaust
coupling limit : **0,08 mm inlet**
0,1 mm exhaust
internal guide Ø limit: **4,55 mm**



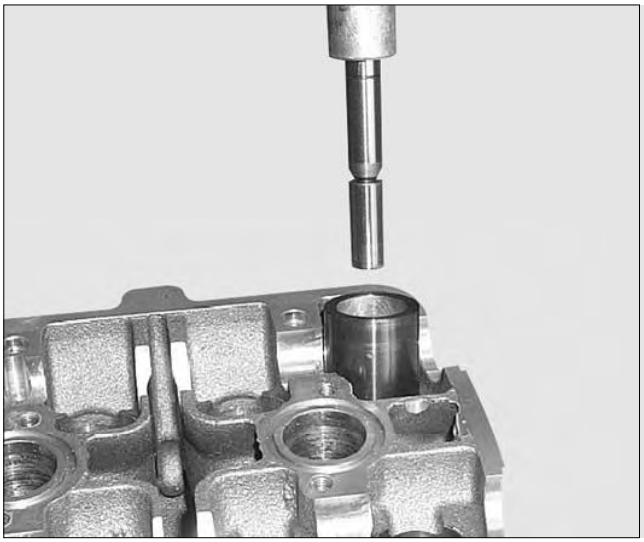
Proceed with an accurate visual check of the valve guide.
In order to determine the coupling wear between guide and valve stem it is necessary to measure the play using a control tampon and micrometer.

NOTA **The control tampon 800095429 (Ø 4,55) must not pass.**

NOTA **In the case of substituting the guide valve it is necessary to check and if necessary also substitute the valve.**



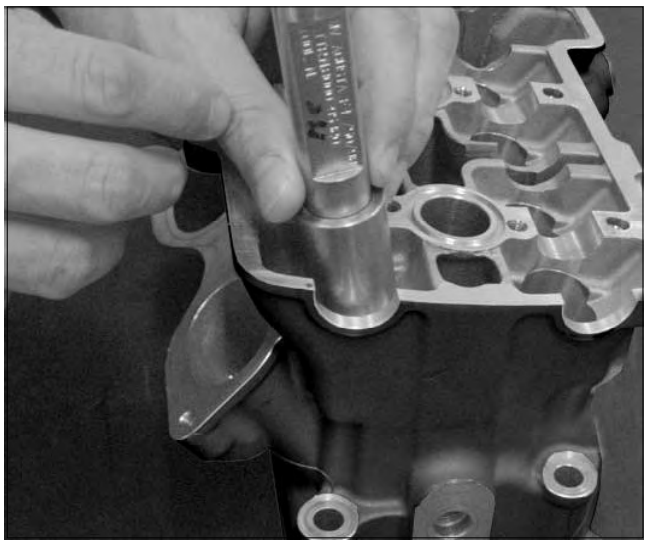
Removal of the valve guide
After having removed the valves and rubber holdings as described in the relative paragraph, continue as follows:
Slowly and evenly heat the cylinder head up to 100°.
Using the punch n°8000A2385 remove the valve guide.
Continue with a visual check of the slot to verify its State.



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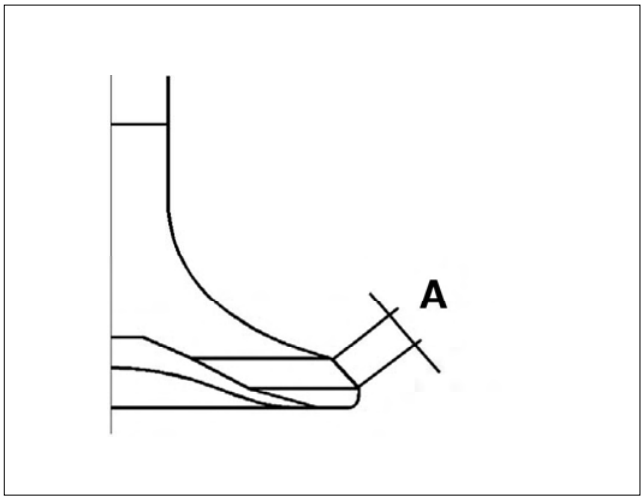
Guide valve installation
Assemble an oversized valve guide as follows:
Oil the external valve guide surface.
Slowly and evenly heat the cylinder head up to 150°.
If necessary cool the valve guides with (N2) nitrogen liquid; or dry ice.
Insert the valve guide using the special n°8000A2385 tampon up to the stroke and let rest until the temperature has stabilized.
Check to be sure the valve slides freely in the valve guide otherwise coat it with a 4,5 H7 reamer or broach N°8000A2625.

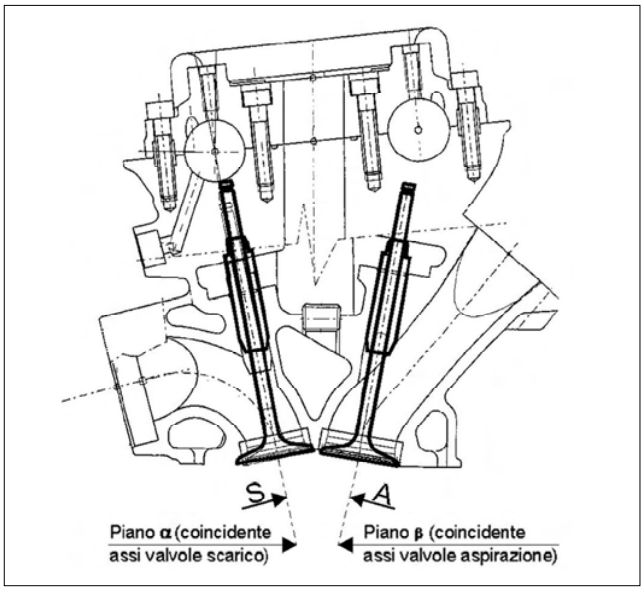


Valve
The stem diameters must not fall below:
$4{,}4825^{-0{,}03}$ mm inlet
$4{,}4725^{-0{,}03}$ mm exhaust

The width "**A**" of the sealing surfaces should fall in the range :
0,9 ÷ 1,3 mm inlet
1,7 ÷ 2,2 mm exhaust

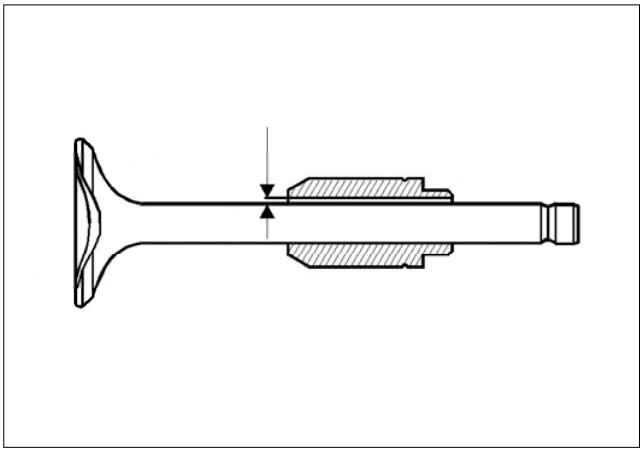
Check to be sure that the stem and the surface in contact with the valve slots are in good condition.
No traces of pitting, cracking, deformations or traces of wear should appear. Verify that the stem is perfectly rectilinear.





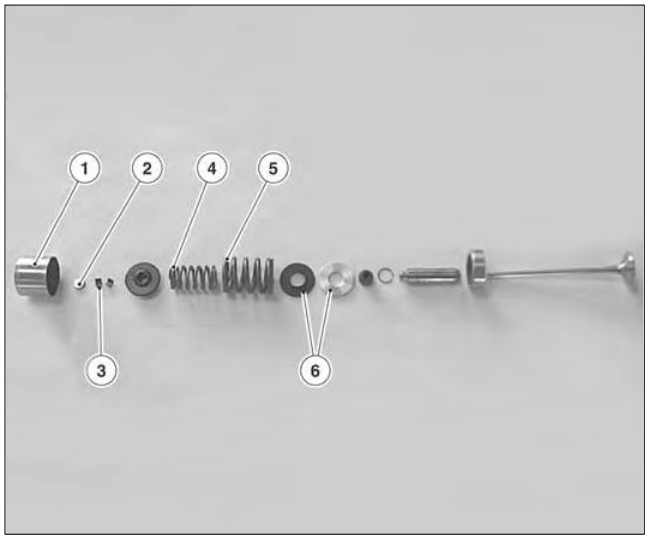
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Valve-guide valve coupling
Coupling play at assembly must be:
0,01 ÷0,03 mm inlet
0,02 ÷0,04 mm exhaust
The maximum coupling limit permitted is even to
0,08 mm inlet
0,10 mm exhaust
If a major play should result, substitute valve and valveguide.



Springs
Check to be sure that the free value of length is not inferior to the suggested limit and in such case substitute the springs:

Inlet:	Internal spring	**L= 40,2 mm**
	Service limit:	**39,7 mm**
	External spring	**L= 41,7 mm**
	Service limit:	**41,2 mm**
Exhaust (**M.Y. 2010**):	Internal spring	**L= 33,8 mm**
	Service limit:	**33,3 mm**
	External spring	**L= 37,9 mm**
	Service limit:	**37,4 mm**
Exhaust (**M.Y. 2011**):	Internal spring	**L= 38,7 mm**
	Service limit:	**38,2 mm**
	External spring	**L= 40,3 mm**
	Service limit:	**39,8 mm**



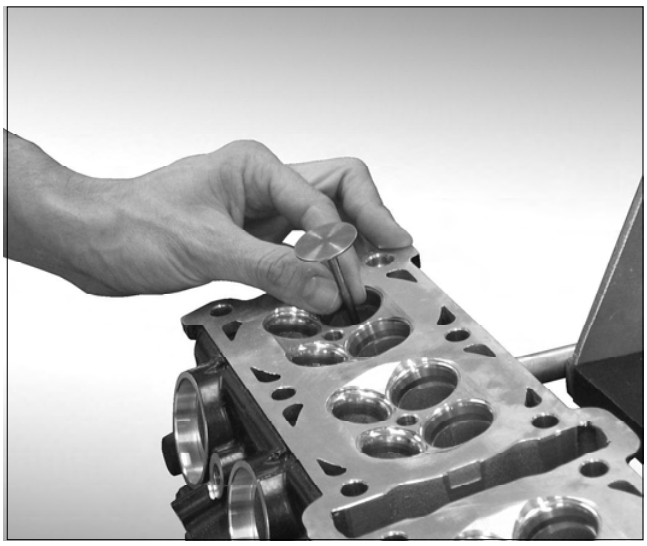
Valve reassembly
A) Carefully degrease the guide
B) Insert the lower washer (6) and make sure that they are properly seated.
C) Assembly new rubber valve seals onto the guide using tool n°800095581;
D) Apply oil to the valve stem before inserting into the guide.



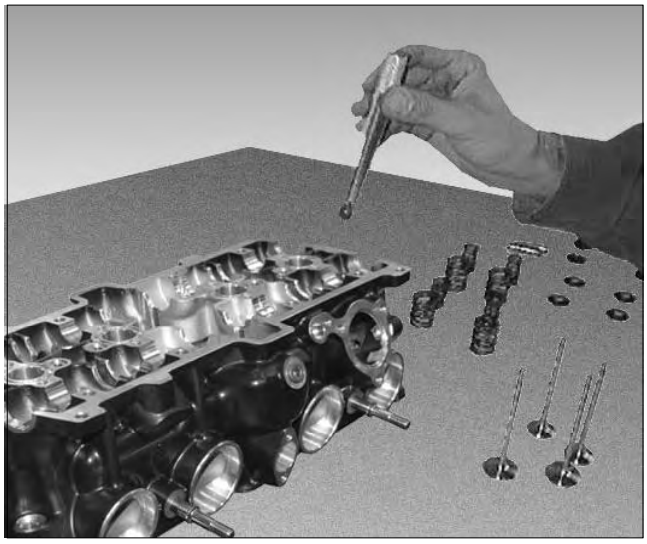
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Assembling the valve.

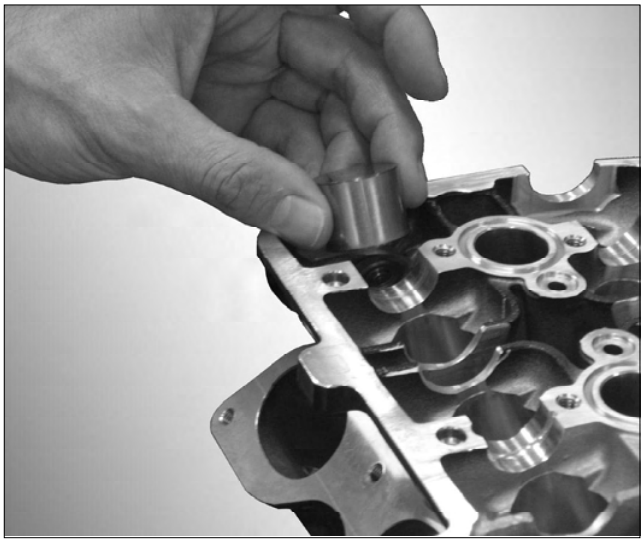


Insert in the order of:
A) Insert the two coaxial springs
B) Slide the semi cones into the superior disk slot and thus place the disk on the springs
C) Assemble the head on the disassembling valve tool n° 800094796 and compress the spring with the tool n° 800095180 until the semi cones are inserted.
D) Using a rubber hammer strike a slight blow on the valve so as to place the semi cones.



NOTA **Before placing the valve retainers be sure that the head is not resting on a plane in order to avoid distorting the valve. Place it onto two bases which allow the valve to move.**

E) Insert the tablet of the correct thickness and lubricate its surface
F) Make sure it easily turns in its slot
G) Insert the cup after lubricating the slot



Insert the cylinder head as described in the paragraph“Head assay assembly”.

800095180

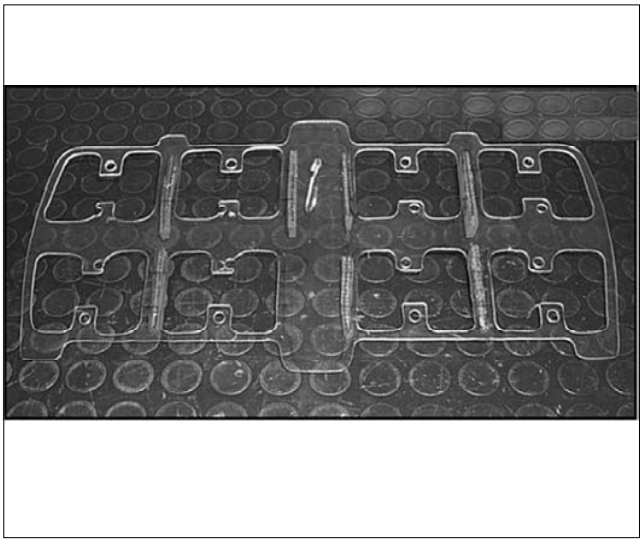


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Regulating valve play
Verify that the spark plugs have been disassembled.

Should this procedure be carried out with the head assembled on the motor, block the spark plug holes with clean rags and assemble plate n° 800094797 to avoid the pieces accidentally falling into the chain distribution opening.

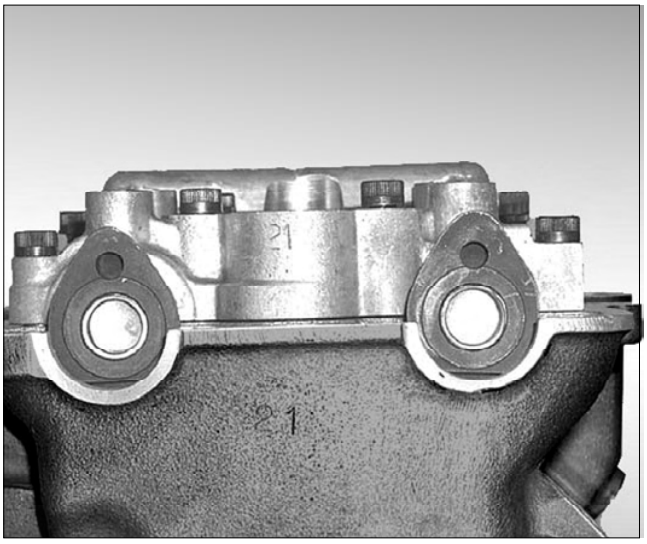
A) Rotate the drive shaft until completely unwinding the springs relative to the valves on which intervening (TDC in burst phase).
B) Measure valve play with a thickometer.



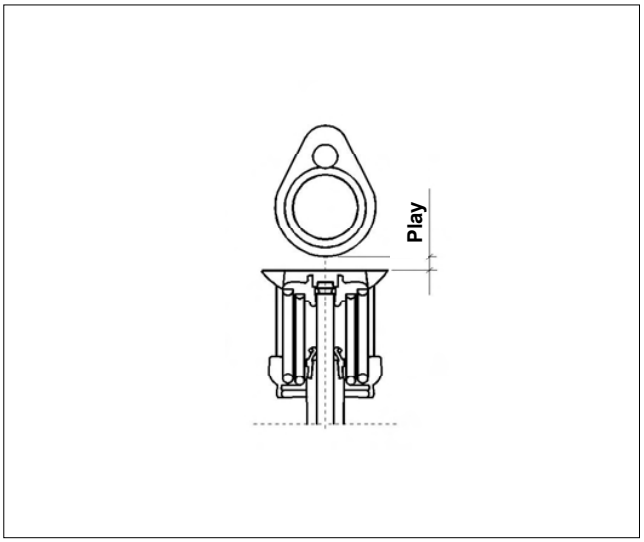
inlet valve play	exhaust valve play
0,15 ÷0,24 mm	0,20 ÷0,29 mm

C) Calculate the D difference between the compared play and optimal play shown on the chart
D) Read the value of S thickness on the tablet;
E) Choose a new tablet with an S+D thickness.

During reassembly never use a valve shim with a thickness less than 1,6 mm.



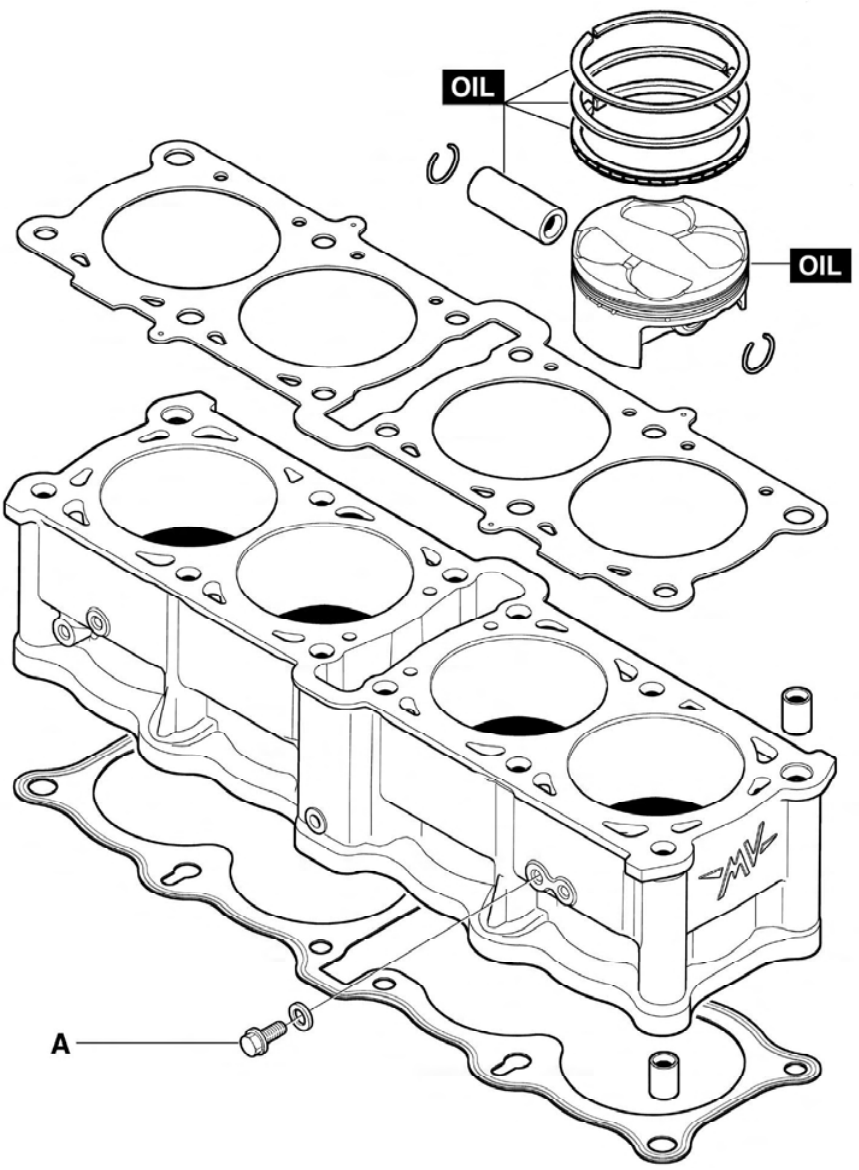




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C

CYLINDER AND PISTON GROUP

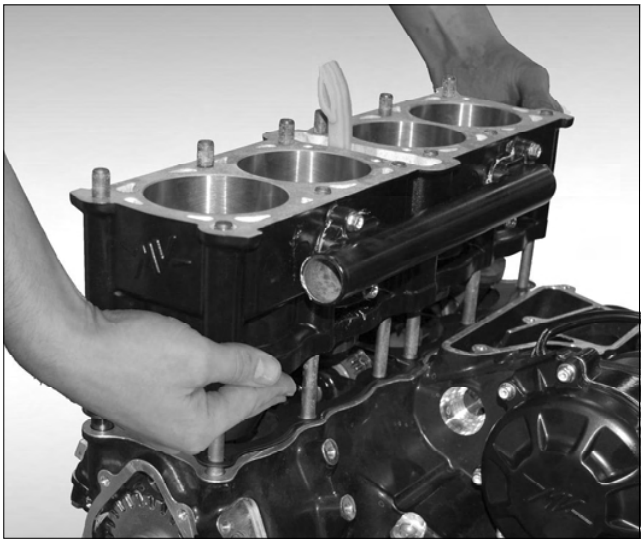


Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	8									
Thread		medium									

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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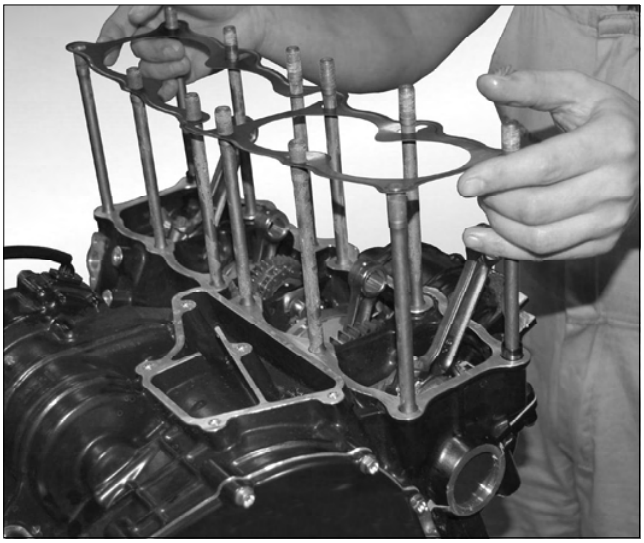
Removing cylinder and pistons
Remove the cylinder head and rubber tube between the cylinder and water pump as described in the relative paragraphs. Carefully slide out the cylinder group being careful not to damage the piston rings. Work on one piston at a time to continue the removal. First remove the 2 pistons which are at the TDC and rotate the drive shaft at 180° and disassemble the 2 remaining pistons.



Remove the circlips which blocks the pin to the piston. Slide the pin off. Slide the piston off only after having marked the ceiling with a marker to reassemble it properly.



Slide the gasket off between the cylinder and crankcase.



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C

Cylinder revision

Check to be sure that enclosures show no sign of seizures with the pistons.

Check piston ovalization in the following way:

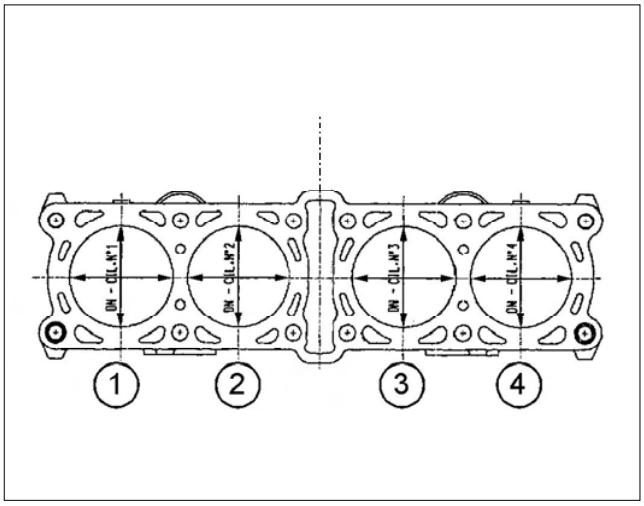
A) Measure the **nominal diameter of each cylinder at a distance of 20 mm from the superior edge** as indicated in the figure.

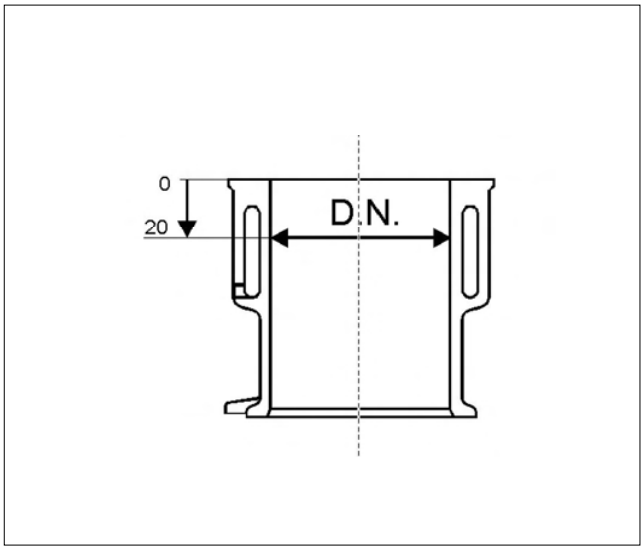
B) Perpendicularly repeat the measurements to the preceding ones.

C) Verify that the **ovalization is inferior to 0,015 mm** (wear limits).

In the case that not even one cylinder should pass this verification, substitute the entire block, If the block should be substituted and if necessary also substitute the pistons and elastic strips.

The cylinder is marked with a letter which indicates the class it belongs to: A and B cylinders and A and B pistons exist which must be coupled with the same letter; the cylinder-piston coupling must be carried out between classes of the same origin (A cylinder-A piston; B cylinder-B piston).





Piston revision

Carefully clean the piston ceiling from carbon residues.

Continue with a careful visual check of the piston; no signs of lines or other damage must appear.

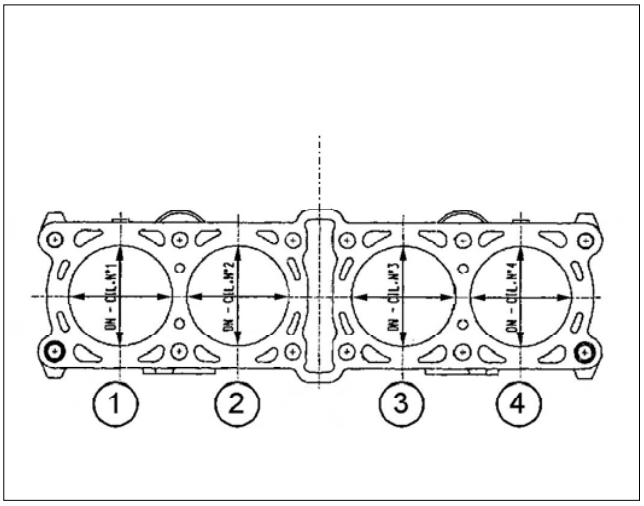
Measure the diameter of the piston at the portion indicated in the direction perpendicular to the piston pin axle.

In the case of excessive wear of one of the pistons, substitute it.

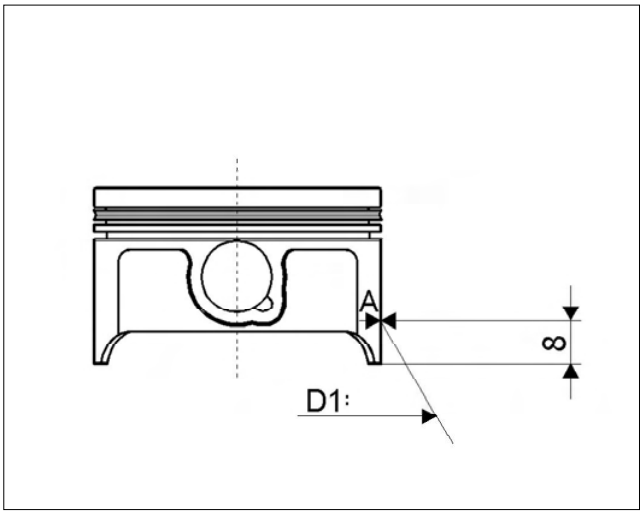
The piston should belong to the same class of the cylinder selection.

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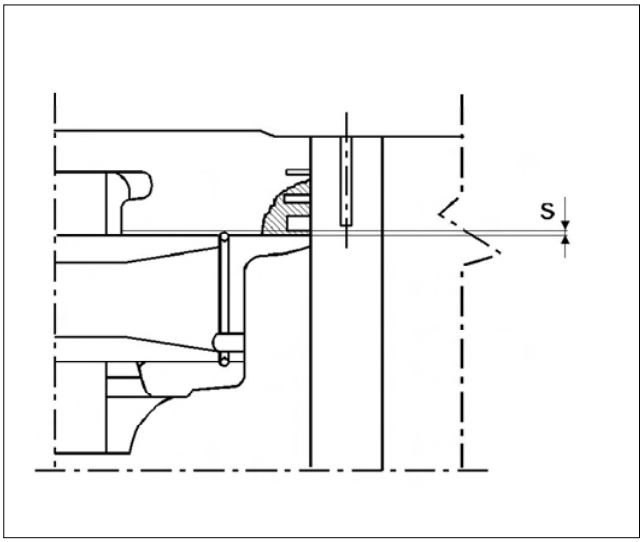
Piston-cylinder coupling
The cylinder-piston groups are furnished already coupled; if there should be an exchange of cylinders and pistons between them it would be necessary to proceed surveying coupling plays.
Measure the diameter of the (ND) pipe at 20 mmfrom the superior plane, as indicated on the sketch.
The piston diameter must be measured at 8 mm from the shell base, in a perpendicular position to the piston pin axle.
These measurements must be carried out at a stabilized temperature of 20°.
The play between piston and cylinder must fall between **0,038 e 0,067 mm**.
Maximum wear limit permitted **0,10 mm**.



Piston pin revision
Verify that the piston pins show no lines or bluish colours which indicate over heating.



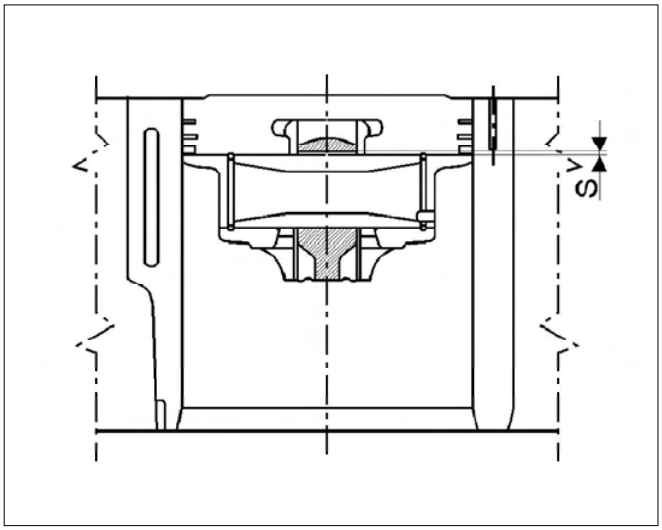
Piston-pin coupling
The (S) play between piston pins and piston must be of **0,004÷0,012 mm** in case the limit is exceeded it is necessary to substitute the piston pin and piston.
The **limited wear** permitted is **0,03 mm**.



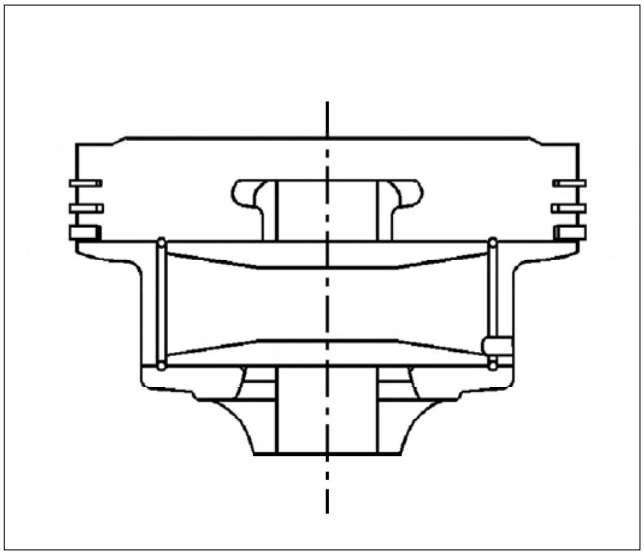
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C

Piston pin - connecting rod coupling
Play between piston pin and connecting rod must be of **0,015÷0,032 mm**.
Maximum **wear limit** allowed **0,06 mm**.



Piston rings
Verify the absence of lines and traces of shrinkage on each piston ring. Verify that the edge of the segment is well defined and free in the piston rings. The spare pistons are furnished complete with rings and piston pins. Whenever segment wear is noticeable it is recommended to change the pistons as well.



PISTON RING	Standard	Wear limit
1°	SP 0,8 $^{-0,01}_{-0,03}$	0,75
2°	SP 0,8 $^{0}_{-0,02}$	0,75
Oil scraper	SP 1,5 $^{-0,03}_{-0,08}$	1,38

Piston ring-cylinder coupling
Introduce the 5 mm segment under the head plane being careful to position it well in “square” and to measure the distance between the two ends of the piston ring.
The maximum play allowed between the ends of thering is the following for each segment:

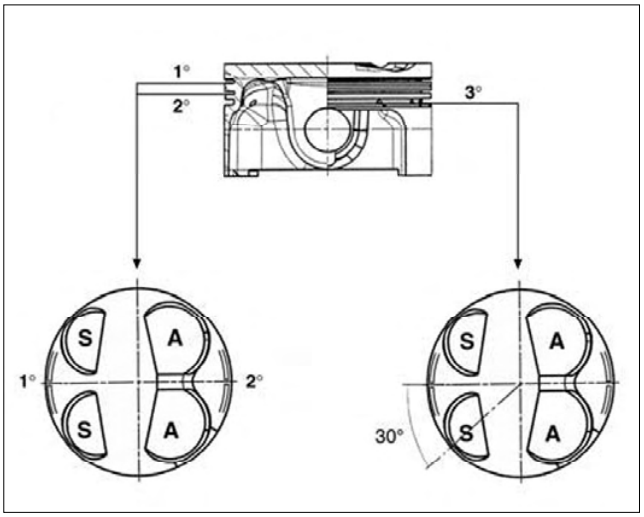
PISTON RING N°1: **0,2 ÷0,4 mm**;
Maximum wear limit allowed: **0,6 mm**

INTERMEDIATE PISTON RING: **0,2 ÷0,4 mm**
Maximum wear limit allowed: **0,6 mm**

OIL SCRAPER: **0,2 ÷0,7 mm**
Maximum wear limit allowed: **1,0 mm**

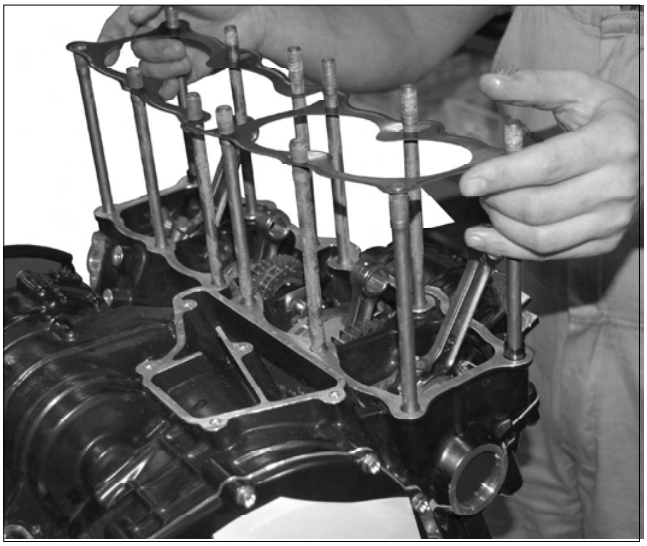
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Cylinder and piston assembly
The ringss must be assembled on the piston with the writing “R” “RN” turned upwards and by following the outline in the figure.
Assemble the internal ring on the piston
Insert the pistons complete with segments on the connecting rods with the arrow facing the exhaust
Insert the piston pins into the piston until beat.
Assemble the external rings.



Before securing the piston pins with the blocking rings, cover the bed plate opening with a clean rag to avoid any pieces from falling into the oil cup. Always use new blocking rings.

Assemble a new gasket between the cylinder and crankcase.



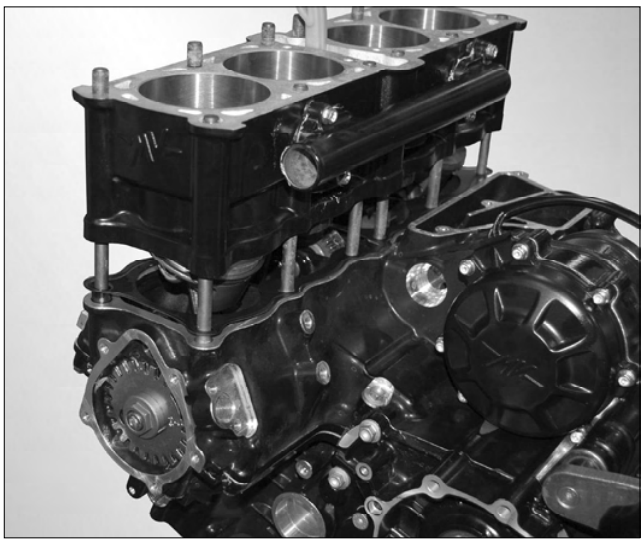
Position the clamps onto the pistons in the direction shown in the sketch.
Oil cylinders and clamps.



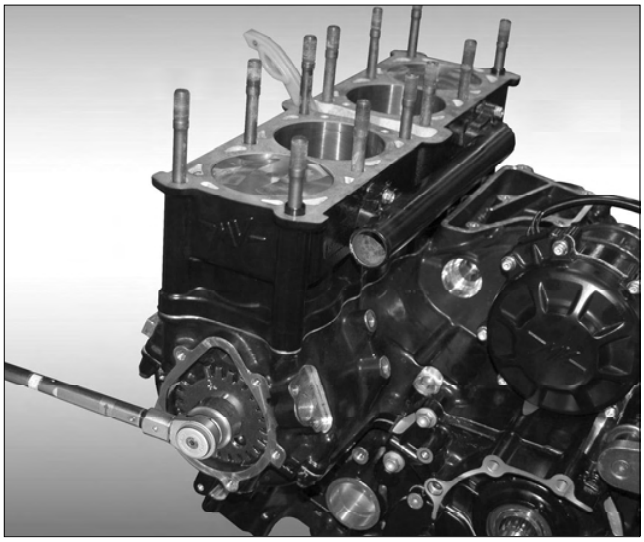
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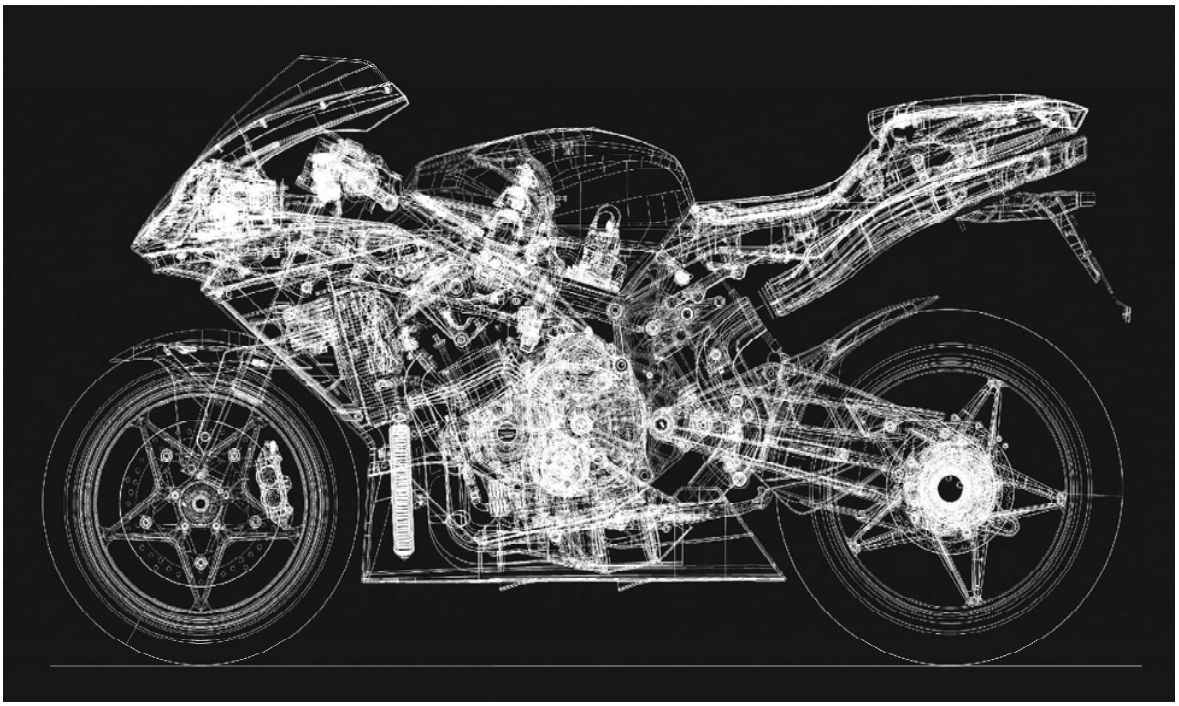
Position the two pistons 1 and 4 at the MSP turning the drive shaft.
First insert the two pistons at the MSP, thus rotate the drive shaft at 180°to invert the piston positions and to insert the two remaining ones.
Insert the pistons by manually pushing down on the piston rings.
Proceed with maximum care since it concerns a very delicate procedure due to the fragility of the piston rings.



Make some turns with the unloaded drive shaft and check to be sure that the pistons move freely with out force.



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SECTION D

REVISION 1

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D

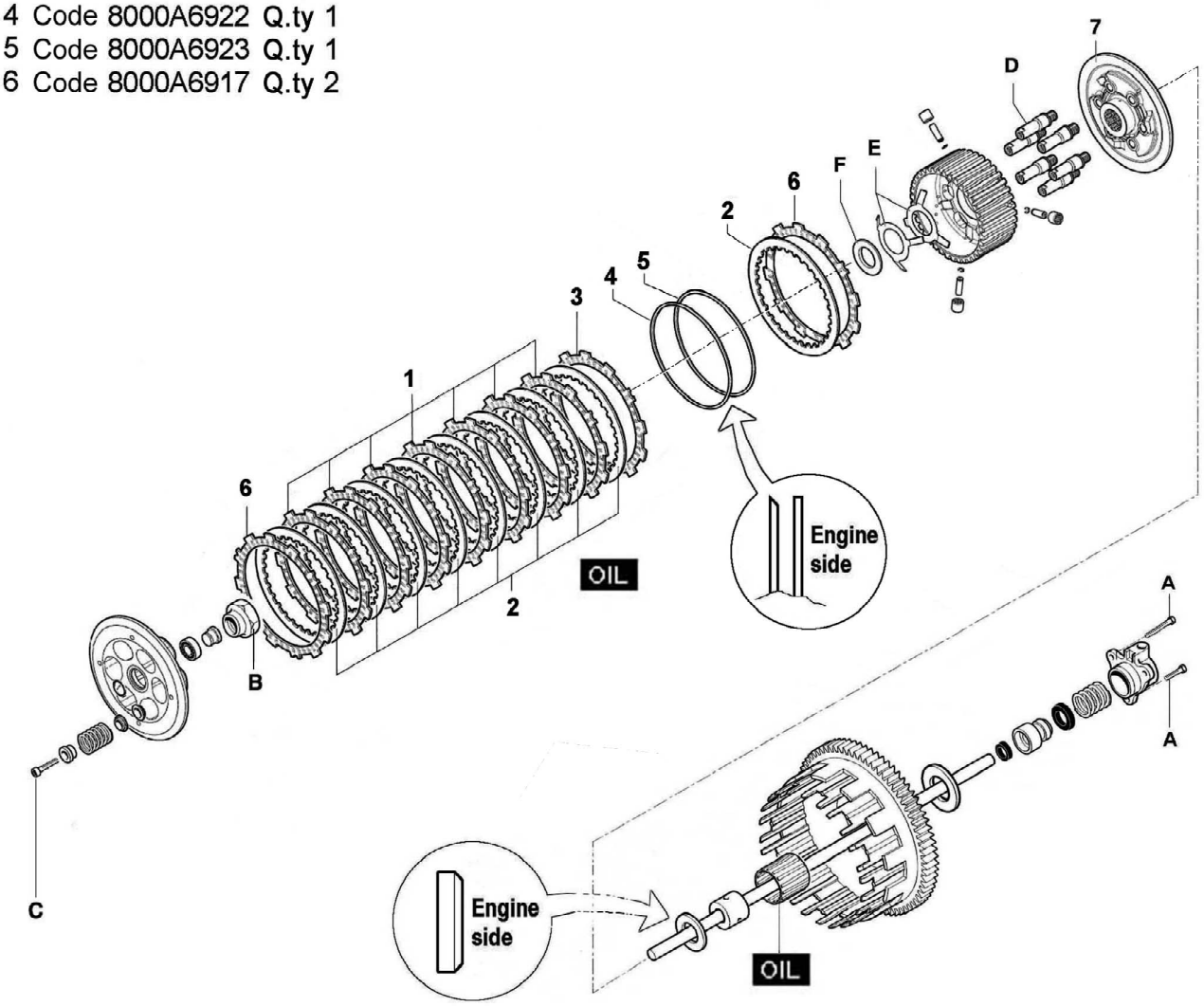
SUMMARY

CLUTCH ..... PAG. 3
GEAR AND GEAR CONTROL ..... PAG. 14
WATER PUMP ..... PAG. 22
STARTING ..... PAG. 25
CRANKCASE ..... PAG. 30
CAPS ..... PAG. 31
CRANKSHAFT ..... PAG. 44

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CLUTCH

1 Code 8000A6916 Q.ty 7
2 Code 8000A6918 Q.ty 9
3 Code 8000A6915 Q.ty 1
4 Code 8000A6922 Q.ty 1
5 Code 8000A6923 Q.ty 1
6 Code 8000A6917 Q.ty 2



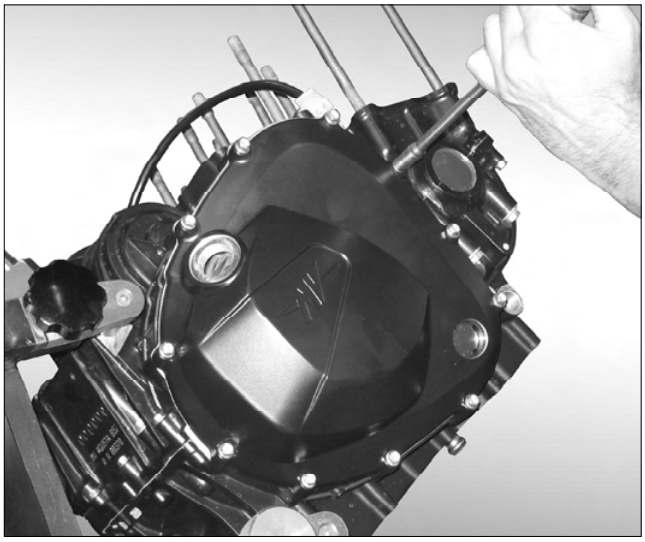
Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	8	140	10	4,5						
Threadblockers			medium								

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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D

The clutch release occurs using a post poning return group composed of a small thrust piston placed on the left side of the motor and operated by a hydraulic system. This small piston pushes a command rod which makes the disk pusher plate function.

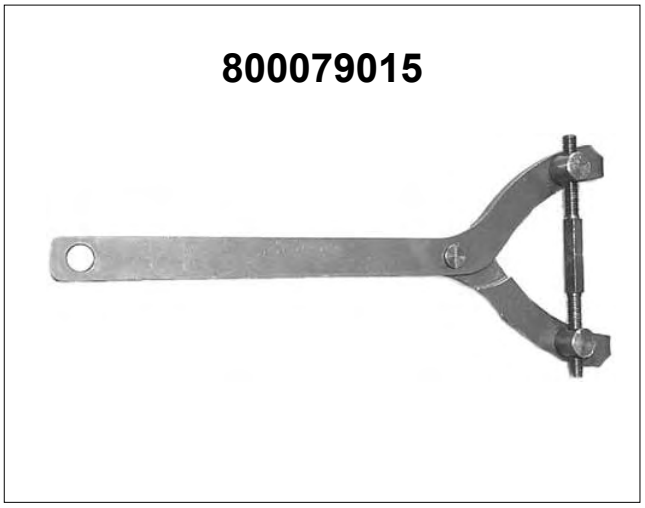


Clutch disassembly

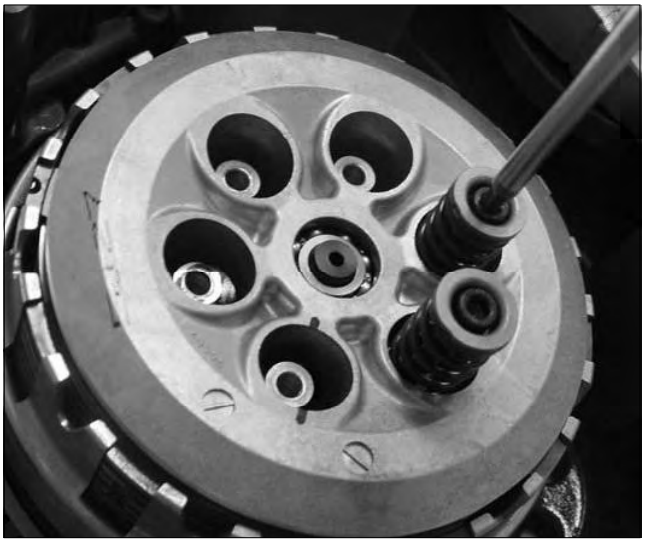
Remove the 11 screws which fasten the clutch cap to the Crankcase.
Remove the clutch cap together with the gasket which will be substituted during reassembly.

In order to carry out this function the following special tool is necessary:

Utensil n°**800079015**



Remove the 6 disk pusher plate tightening screws together with the springs and the relative holders.
Remove the disk pusher plate.



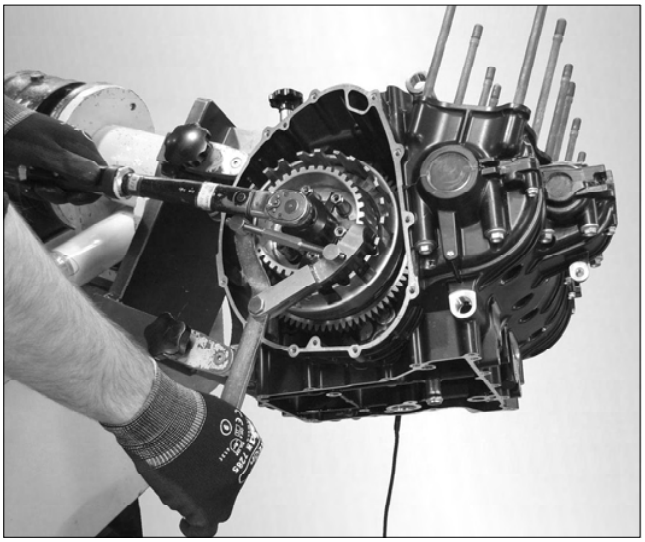
If the friction rod must be slipped off, it is important to replace it from the cylindrical side of the friction control (left side of the engine) in order to prevent the oil seal (1) from damaging. See the illustration on the following page with the slot for the lubrication facing towards the friction side.

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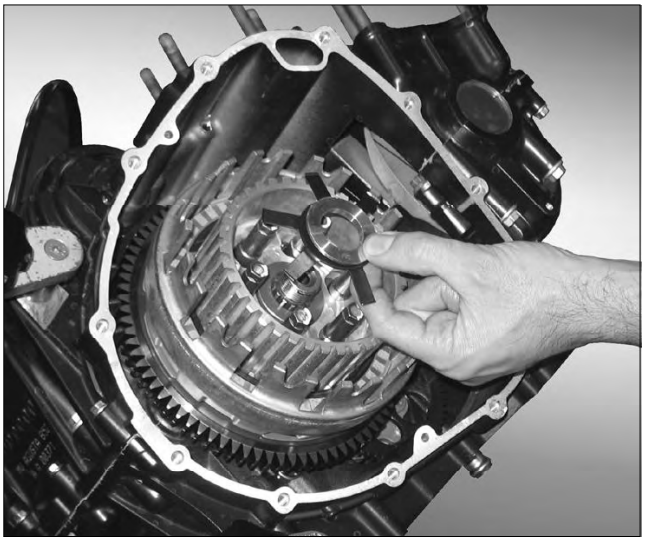
Manually remove all of the attrition disks (3) that you can.



Unscrew the nut using tool n°800079015 to hold the clutch hub still and remove it.

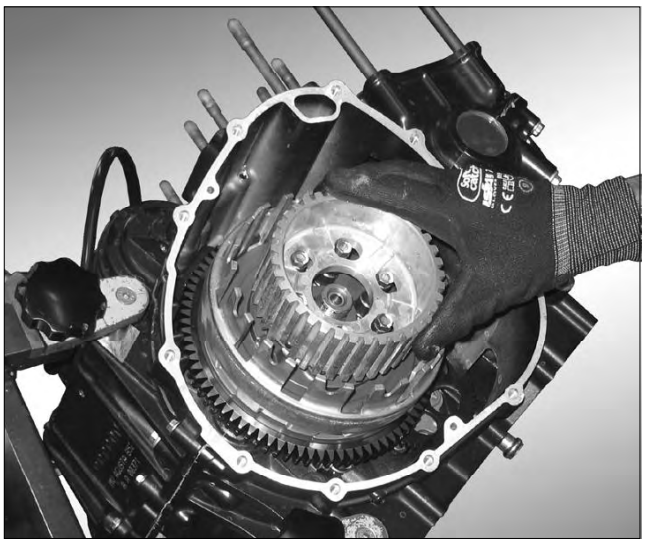


Remove the spacer and the springs.

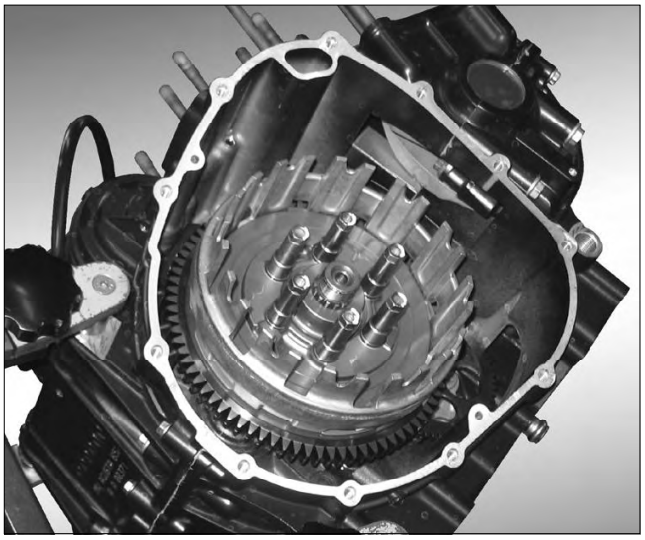


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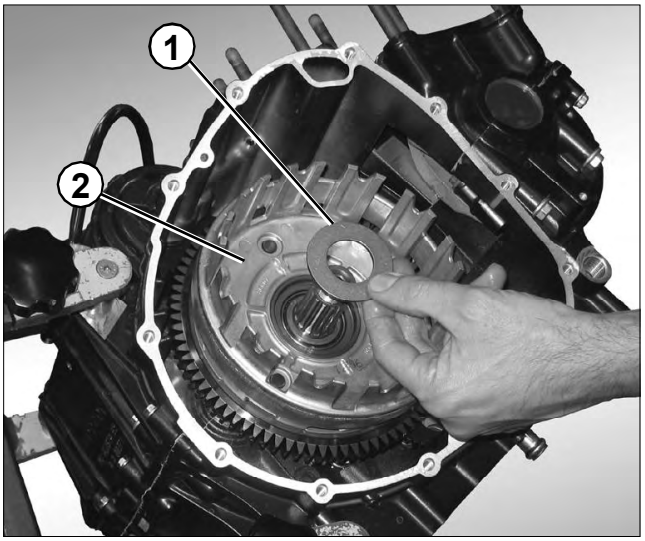
Extract the clutch hub.



Remove the flange.

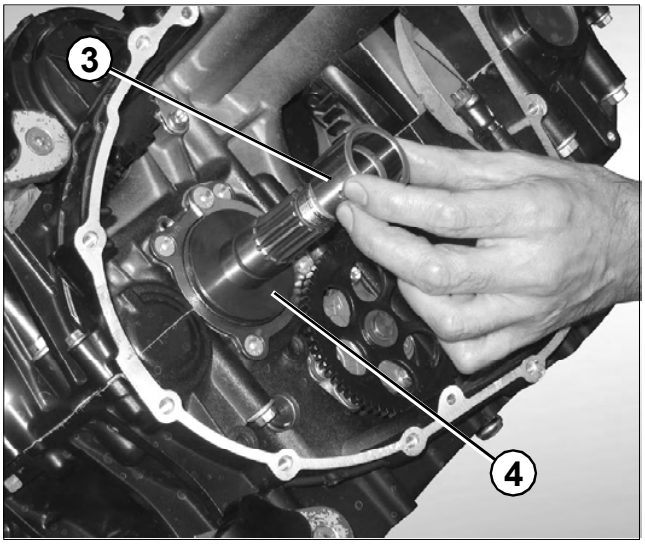


Remove the washer (1) and the (2) clutch housing.

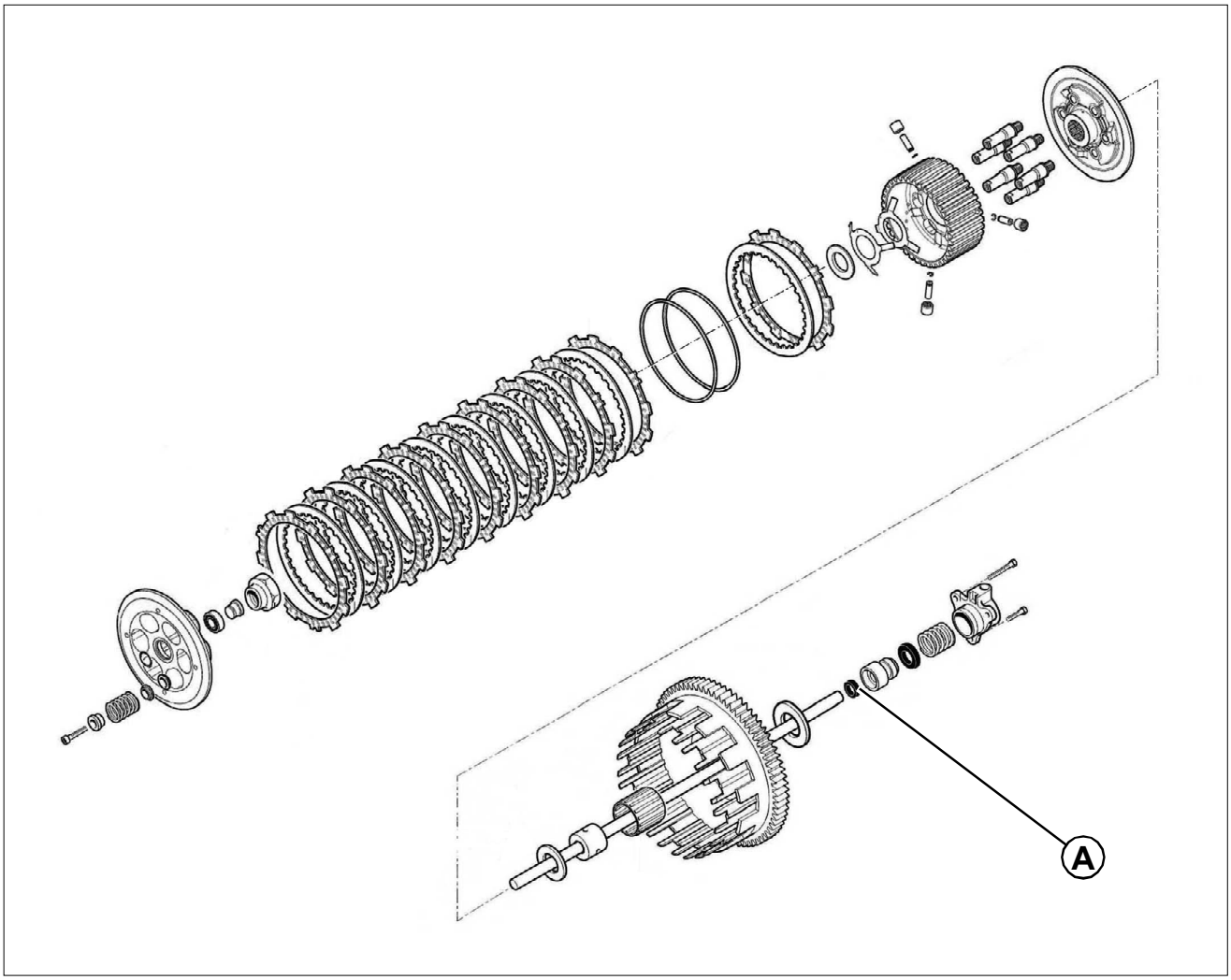


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Remove the spacer (3) and the shim washer (4).



Disassemble the clutch group following the sequence in the figure.

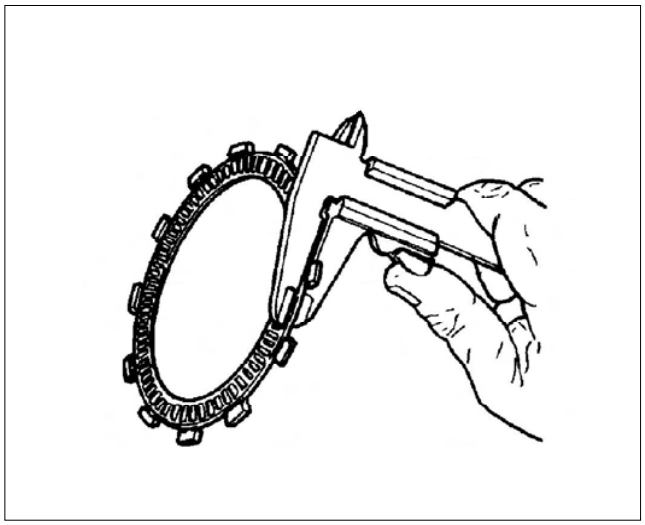


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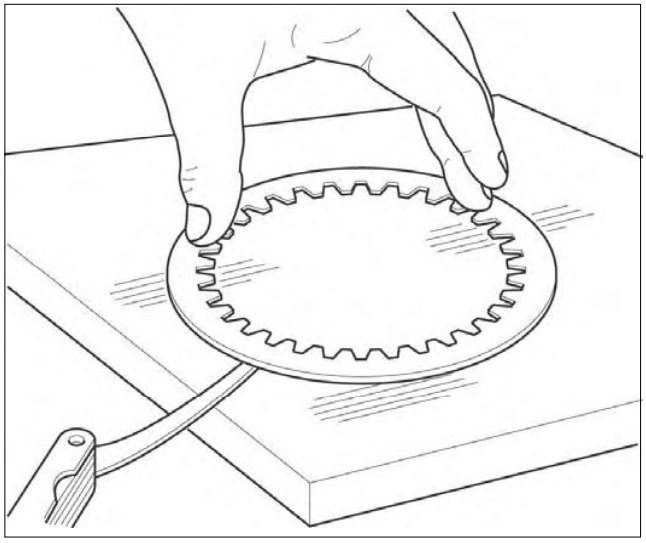
D

Clutch overhauling
Check the rod for straightness and wear.

Check the friction plates for wear.
The **standard thickness** is **3 mm**
Maximum allowed wear limit : **2,8 mm**.
No signs of burning, grooves or other damages are allowed.
Replace the whole plates group even if only one is damaged.

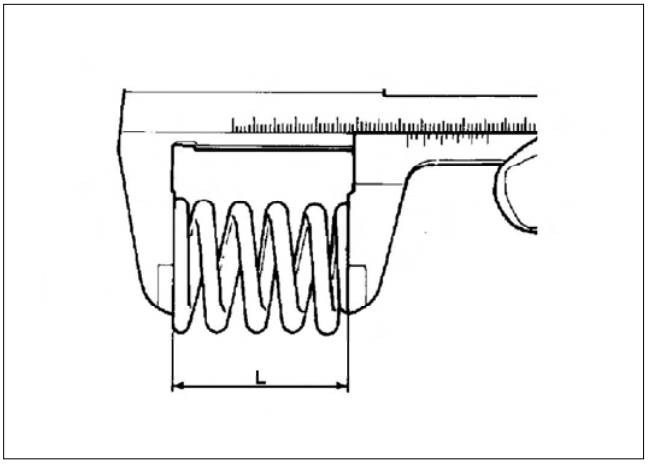


Put the plate on a table and check the deformation.
The maximum limit of deformation is **0,1 mm**.



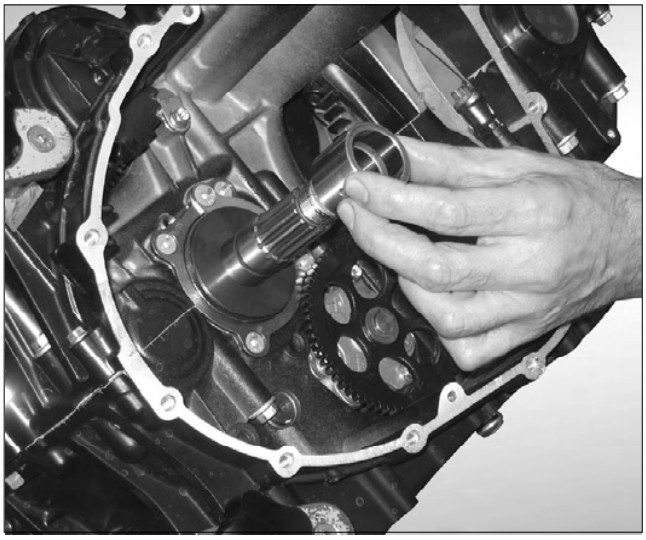
Measure the length “L” of the springs with a gauge.
Service limit: **39,0 mm**

Replace the springs exceeding the service limit.

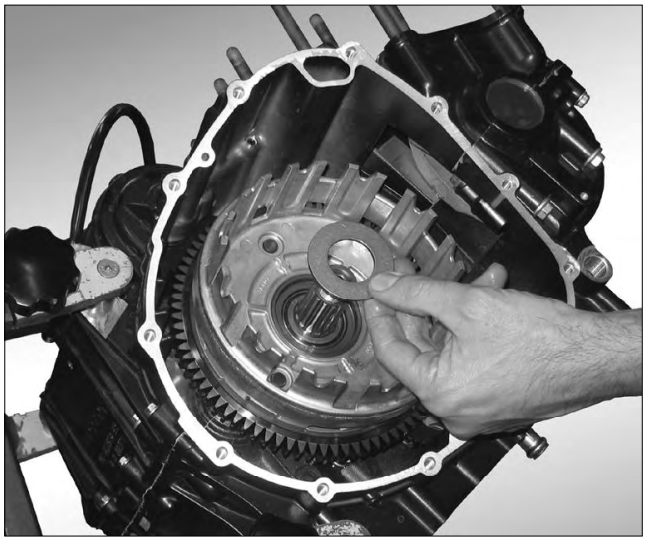


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Clutch reassembly
Reposition the shaving washer with the smallest diameter facing towards the engine.
Position the spacer,

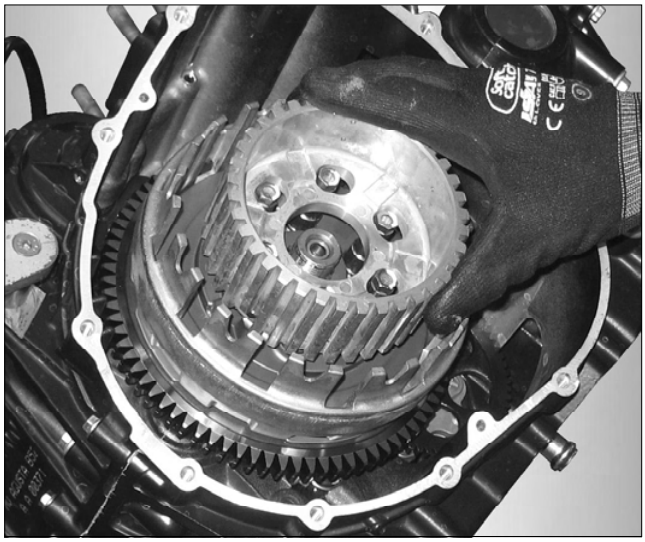


the roller cage, the clutch housing and the washer. Make sure the washer is positioned in front of the friction drum, since it was sheared and therefore has a sharp corner and a rounded corner. Position the rounded corner on the engine side.



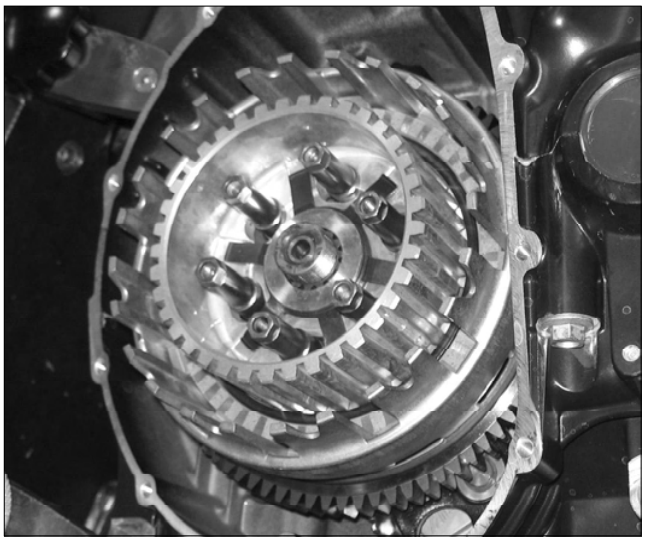
Install the flange with the six columns, already assembled (torque 4.5 Nm).

Fit in the disk-holder and angle it so the bearings fit into their housing on the flange.

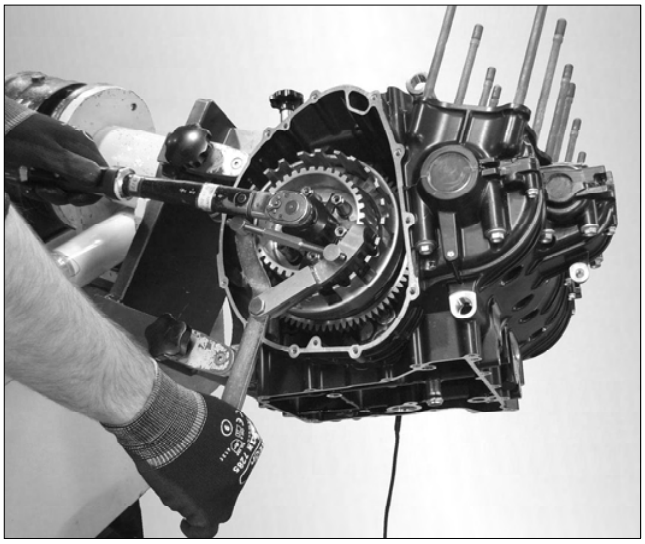


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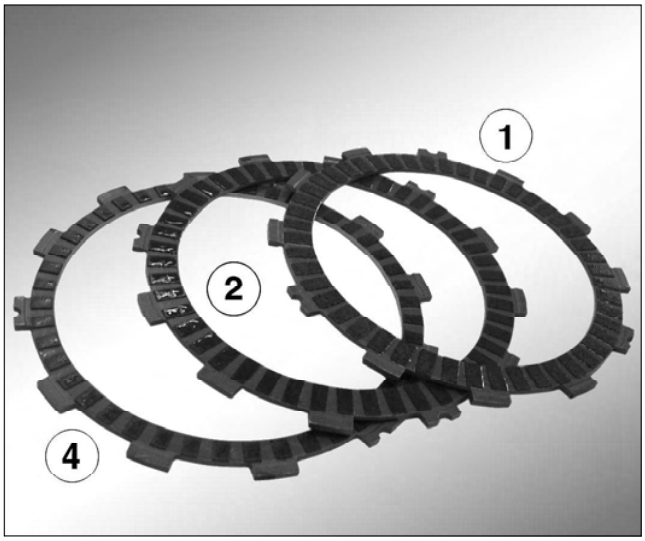
Install the two springs (as shown in the Figure), the washer and the nut.



Use the tool no. 800079015 to lock the clutch housing, thentighten the nut to 140 Nm.



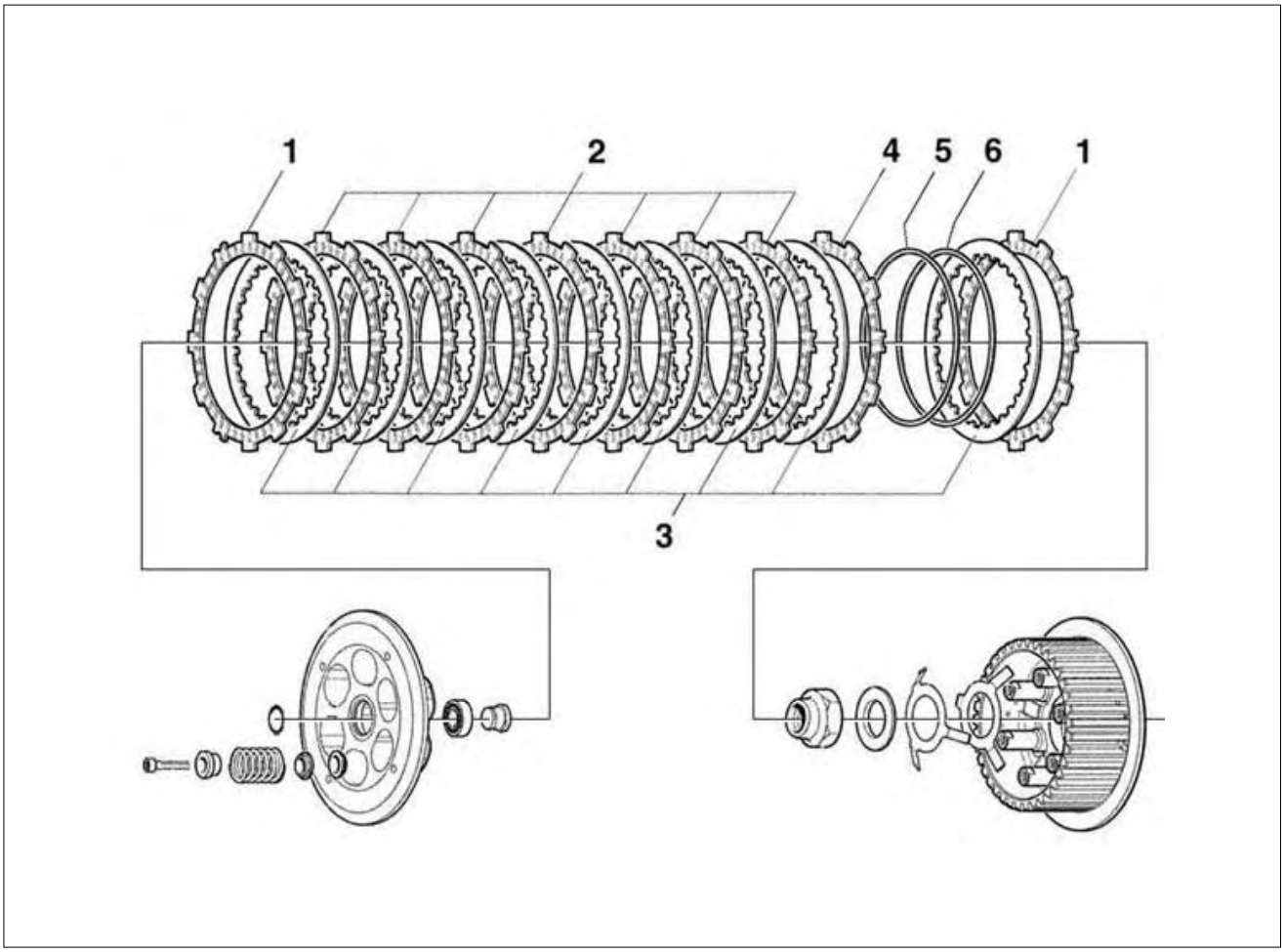
Notice: three types of packed disks are used; to assemble them, see the diagram.



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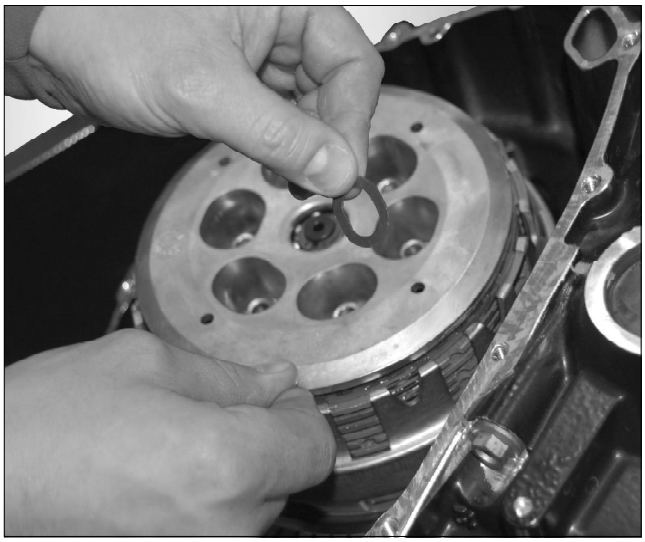
First fit in one of the two disks (1) with the larger friction cells and a plain disk (3). Fit in the spring holder (5), the spring (6) with the narrower diameter facing the engine and the packed disk with the larger inner diameter (4); then, fit in the other seven packed disks (2), alternating them with the plain disks (3), and lastly fit in the last outer disk (1).



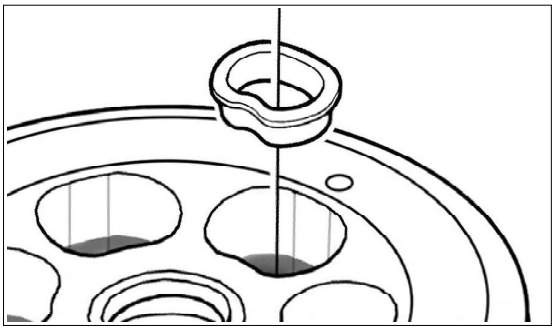


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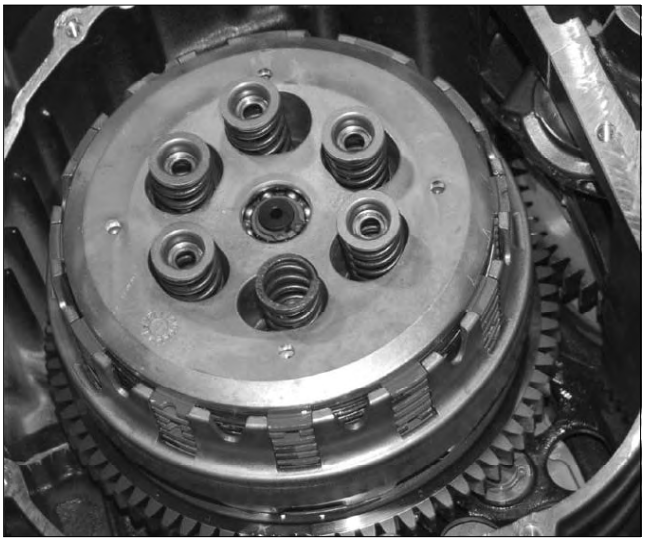
Fit in the clutch dish pusher, the six spring holders,



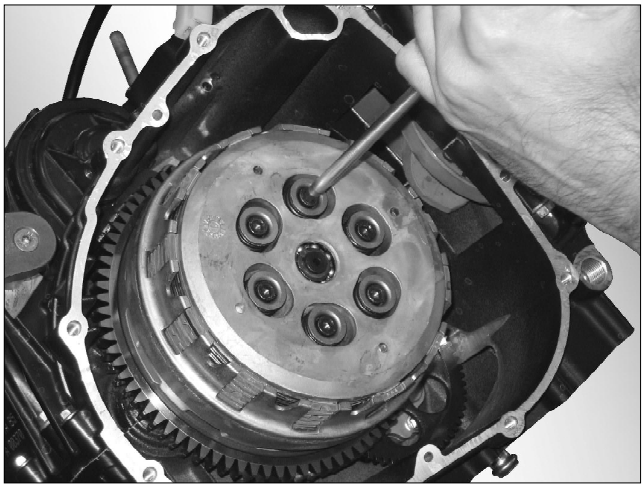
NOTE **The spring supports have an edge with a concave segment which must be oriented towards the center of the clutch plate pusher; for correct assembly refer to the scheme below.**



the plates, the springs, the self-centring washers

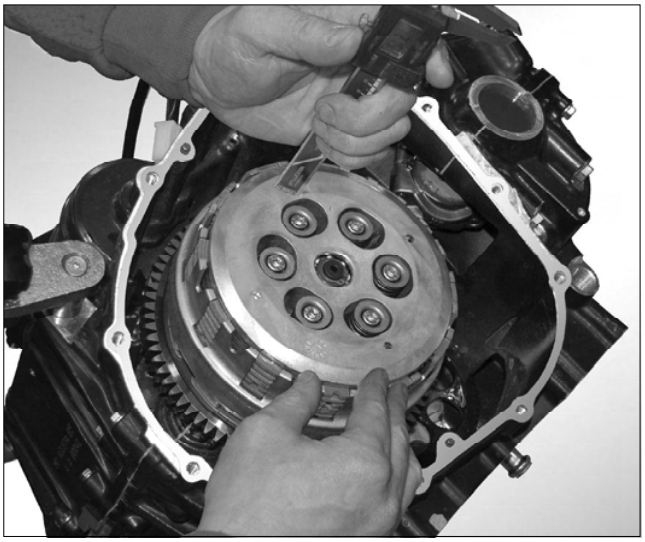


and the screws; tighten the screws to the prescribed torquein following a crossed run.

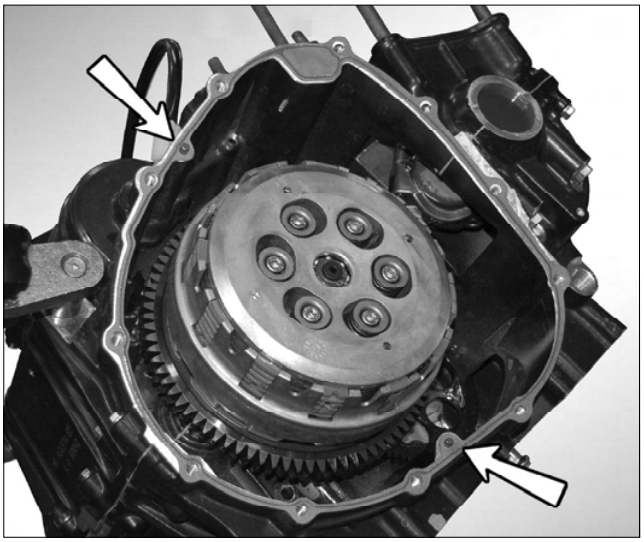


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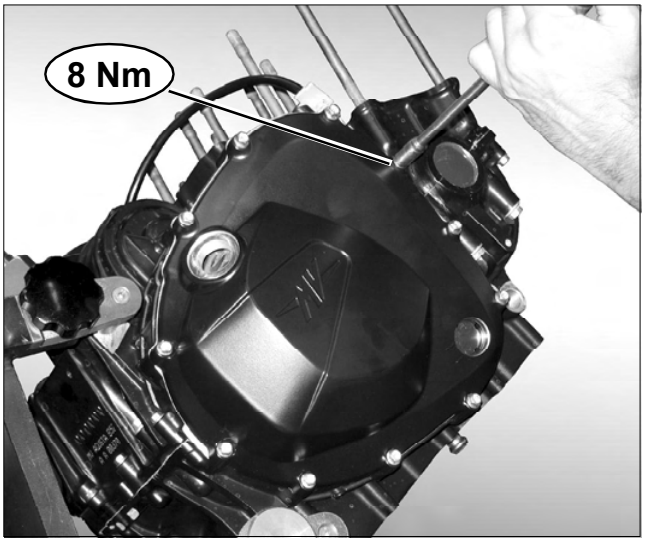
Finally, take a gauge and check if the measured distance between the outer surface of the disk pusher and the packed disk is consistently 5 ±0.2 mm in the four holes.



Replace the cover seal lining up with the centering pins.



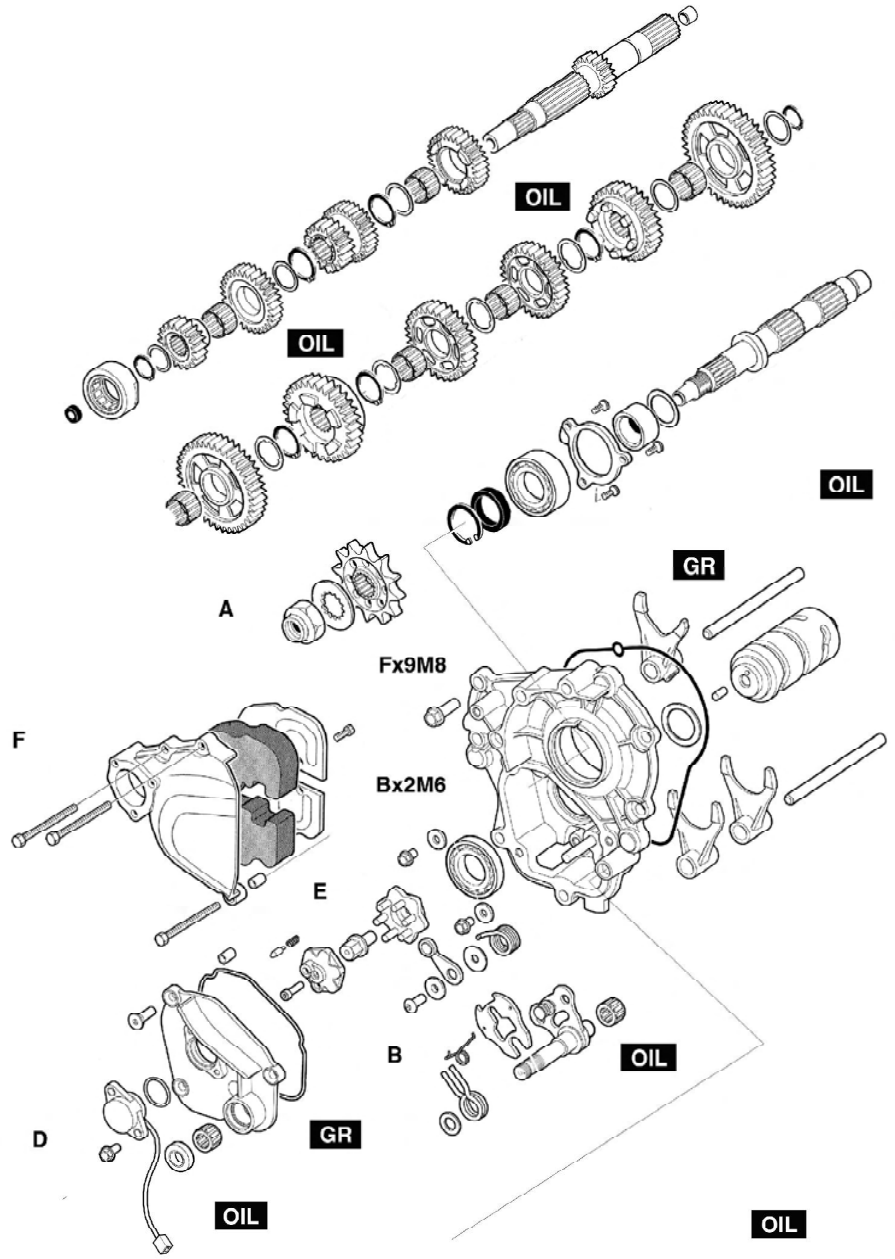
Put the cover in place and manually take the screws.
Tighten the screws to 8 Nm.



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GEAR AND GEAR CONTROL

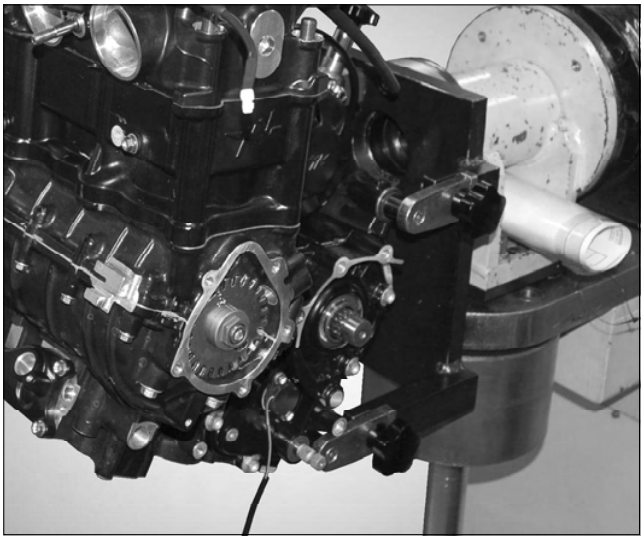


Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	140	8	8	6	25 (M8)	25				
Thread blockers		medium				medium					

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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Gear group disassembling
Remove the clutch following the instructions in the relative paragraph.
Remove the clutch rod from the clutch end.
Remove the 6 tightening screws from the gear cap.



Using a rubber hammer, delicately beat on the primary shaft from the clutch end holding a hand on the gear cap until it moves from the crankcase.



Slide the gear group out.

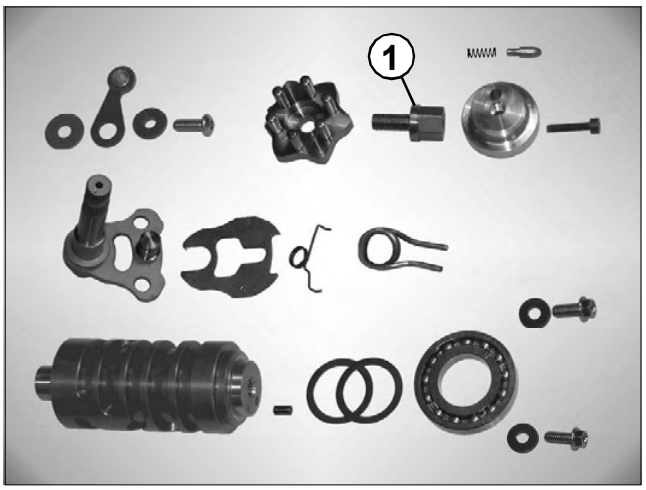


Do not invert the position of the forks on the secondary shaft. If this occurs, it will be necessary to restore the correct condition using tool n° 8A0094792.

It is important to reassemble the clutch rod from the cylindrical side of the clutch control (left side of engine) in order to prevent the oil seal from damaging (1). See the illustration on page 53 with the slot for the lubrication facing towards the clutch side.

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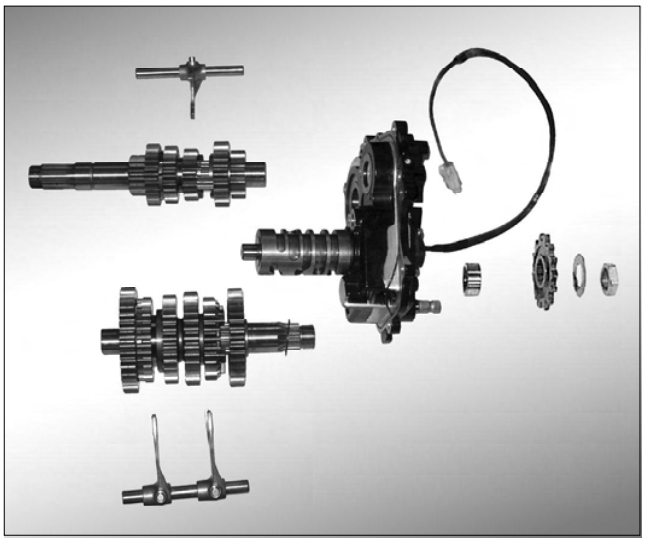
Gear control
If necessary, disassemble the gear command group following the order shown in the figure.
Place the various components in an orderly way so as to facilitate reassembling.
Check each component for wear of irregular traces on its surface.
Carefully check the following components.



D

Gear interlock plunger
Make sure that the wheel rotates freely and does not have excessive clearance

Shift drum
Check the shift drum: no signs of wear on the grooves are allowed.
Fork pin-groove clearance for new parts: **0,15÷0,35 mm**
Wear limit: **0,65 mm**.
Groove width of a new drum: **7,05÷7,15 mm**
Wear limit: **7,35 mm**.
The new fork pin diameter is equal to **6,8÷6,9 mm**
Wear limit: **6,7 mm**.
Verify the working clearance between the fork pin and the shift drum groove, measuring the dimensions with a gauge.
If the value exceeds the service limits, compare the standard value to choose the parts to be replaced.
Verify the gear locker pawl free movement.
Reassemble the various parts by acting in the opposite way.

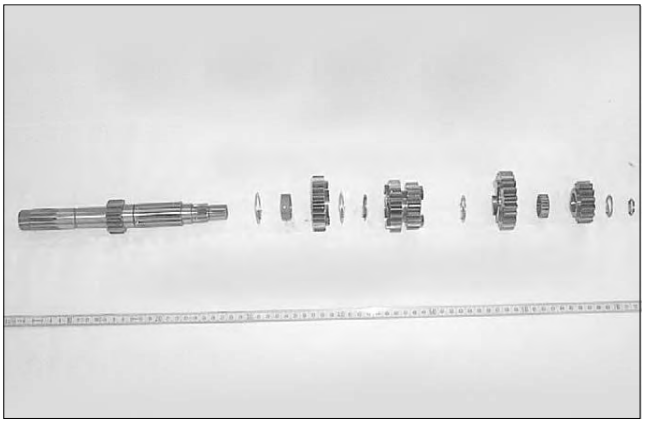


Degrease accurately and apply MEDIUM THREAD BLOCKER to all the screws, before reassembly. Lock all the screws at a 8 Nm torque but the screw 1, needing a 25 Nm torque.

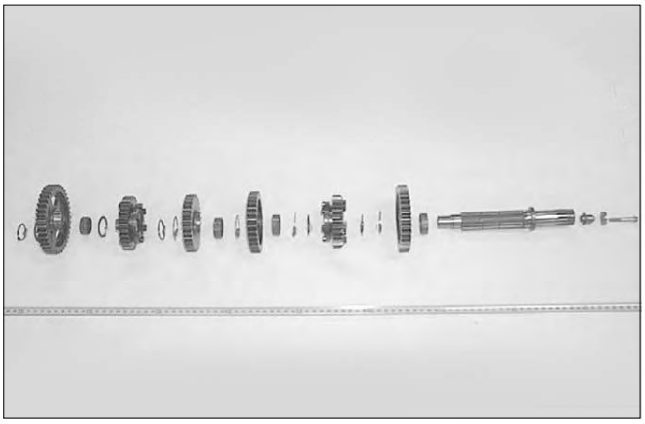
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Primary and secondary shaft

Check the two shafts separately so as to avoid confusion of similar components.



Place the components in such a way as to facilitate the correct positioning during reassembly.



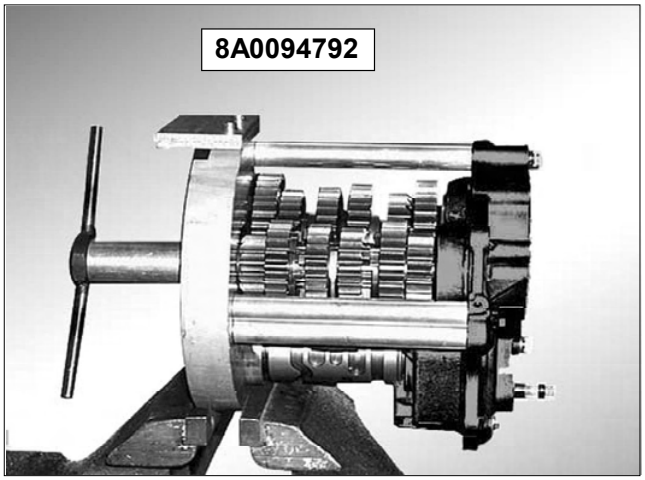
Check that the gear teeth are intact and the threads and grooves of the shafts are in perfect condition

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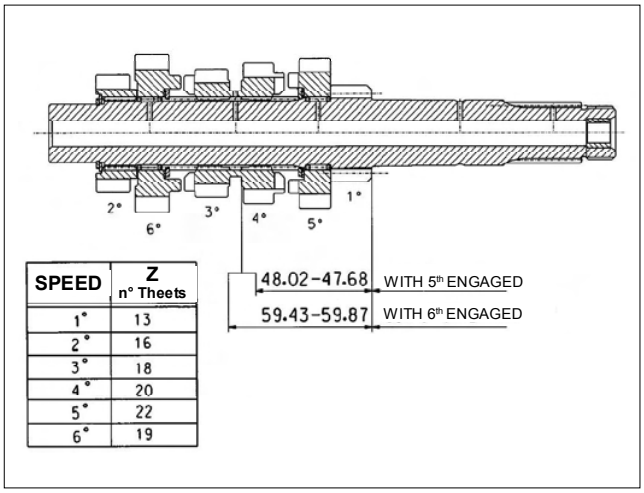
Gear group revision

In order to carry out the following procedure the following special tool is necessary:
Motor simulation utensil n°8A0094792
Disassemble the gear group from the motor and reassemble it on the special utensil n°8A0094792 motor simulator being careful to tighten the pinion fixing nuts with the separator that simulates the clutch hub and the 3 fixing screws on the plate.
Check the condition of the front clutching teeth of the gears which must be in perfect shape and sharp edged. The neutral gears must rotate freely on their shafts.
All of the neutral gears must present a minimum axial play of 0,10 mm.
Verify the wear on the bearings present on the inside of the gear box.
Verify the control quotas indicated onthe sketch in the figure.



Gear selection forks

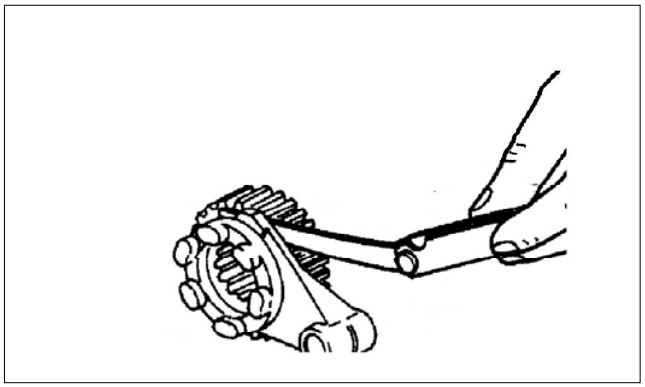
Visually inspect the gear selection forks to look for folds or other damage.
Every fork that appears damaged must be substituted because it can cause difficulty when inserting a gear and causes sudden uncoupling under load.
Check the play of each fork using a thick meter in the groove of its gear.
If play is above 0,7 mm substitute the gear or fork in relation to service limit of each part.

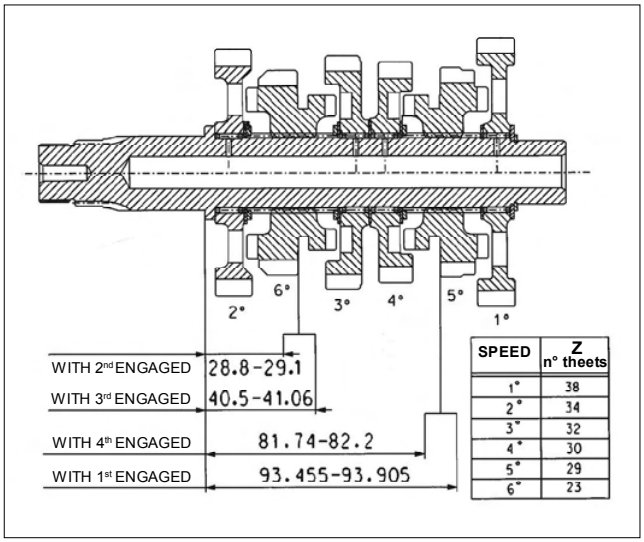


SPEED	Z n° Theets
1°	13
2°	16
3°	18
4°	20
5°	22
6°	19

Gear groove limit **5,6 mm** Primary
4,6 mm Secondary
Fork limit **4,65 mm** Primary 5-6 gear
3,65 mm Secondary 1-2, 3-4 gear

The fork must be able to move without force. Grippage of the gears must flow without impediments and without excessive attritions.





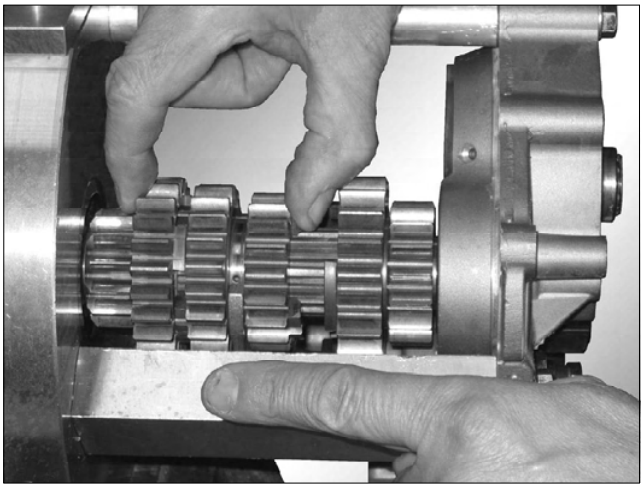
SPEED	Z n° theets
1°	38
2°	34
3°	32
4°	30
5°	29
6°	23

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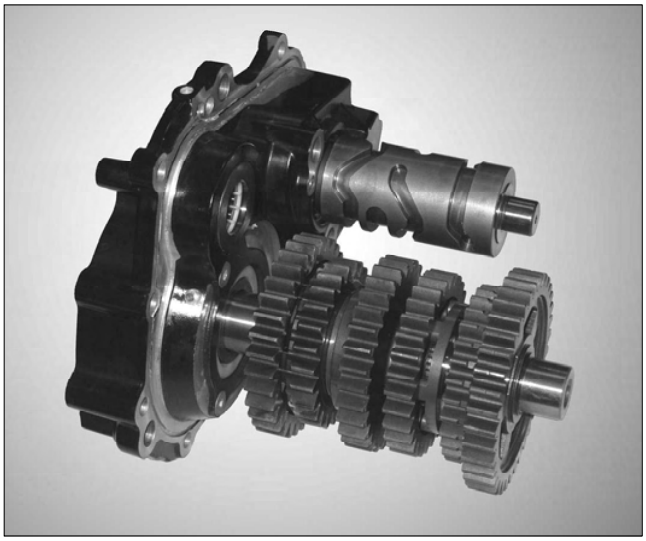
Replacement of gear shafts
If it becomes necessary to replace one or both of the gear shafts, either wholly or in part, proceed as follows:
A) firstly insert the main shaft with spindle and the relative fork in the gear plate;
B) assemble the gear plate on the engine simulation tool by tightening the 3 screws, assemble the spacer which simulates the clutch assembly and tighten the nut to 140 Nm;
C) insert the 5th gear;
D) keeping the gear of the 5th gear and the relative coupling united, position together on both sides, making sure that the fork has a clearance of 0.2÷0.3 mm;
D) repeat the operation for the 6th gear;



If the clearance is not evenly distributed, check the shim adjustment between the bearing and the desmo.

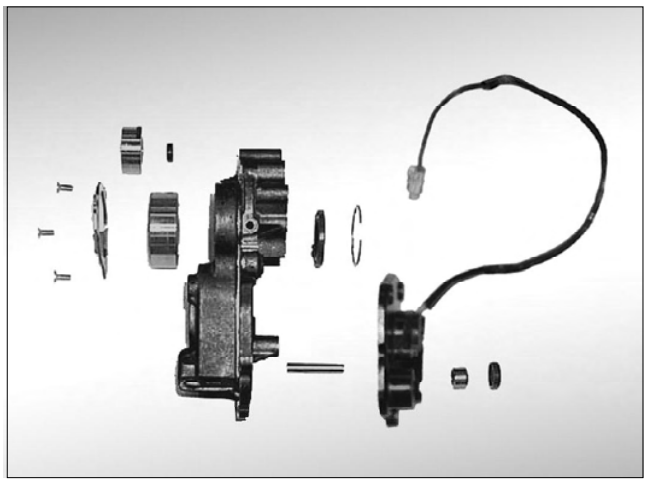


F) disassemble the plate and insert the secondary shaft with its shim, the spindle and the forks.
G) assemble the main shaft with spindle and fork;
H) assemble the plate on the engine simulation tool by tightening the 3 screws, assemble the spacer which simulates the clutch assembly and tighten the nut to 140 Nm;
I) repeat the operation described for the main shaft, making sure that the clearance of the forks is correct, if necessary by checking the shim adjustment of the secondary shaft.



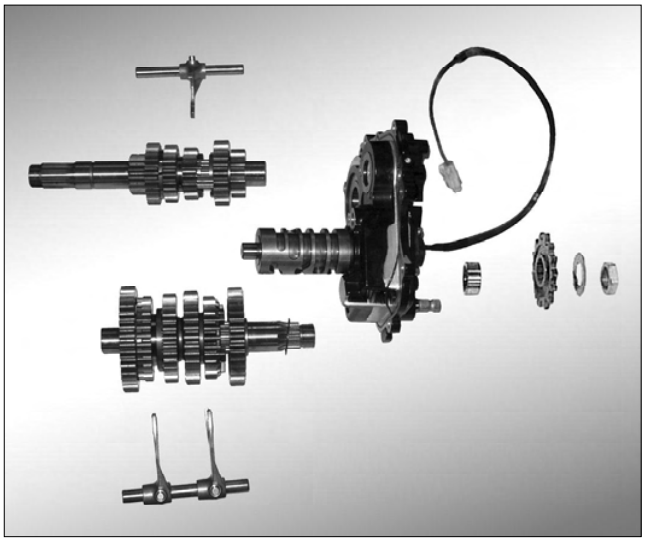
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Reassembly
Reassemble the components on the plate in the reverse order compared to disassembly.

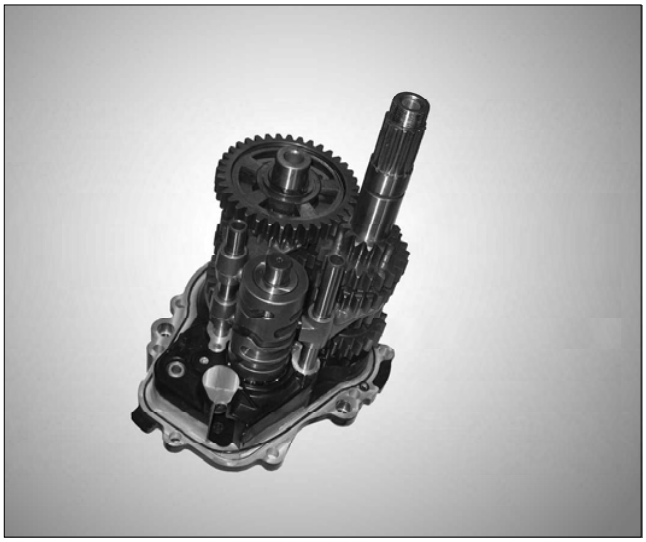


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Reassemble the components on the shaft in the reverse order compared to disassembly.

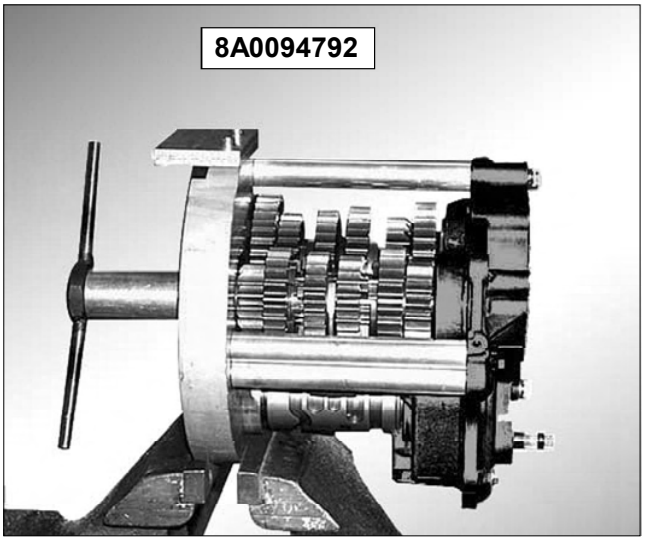


Assemble the shafts and the desmo on the plate,



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assemble the gear group on the n°8A0094792 engine simulation tool.
Install a shift pedal and check the gearbox is correctly working.

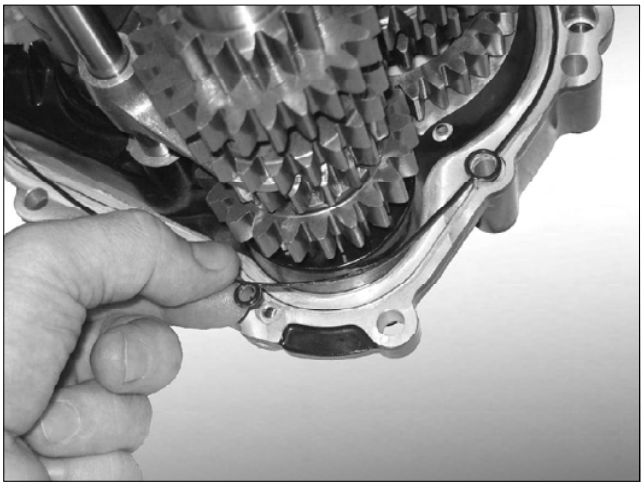


All the gears must be inserted and uninserted without stumbling.
In case of stumbling, verify that the axial play has been correctly restored.
With a thick meter verify that each gearing, once inserted presents a forkpit play equal to 0,2 ÷0,3 mm placing it on both ends of the coupling.

The fork must be free.
Assemble the gasket on the internal end.
Always install a new washer under the pinion at reassembly.
Carefully degrease the threads before reassembly.

Tighten the pinion nut at 140 Nm using a strong thread blocker.
Turn the security washer again so as to avoid the accidental unscrewing of the pinion nut.

Grease the gasket evenly and assemble in its housing on the inside of the gear plate.



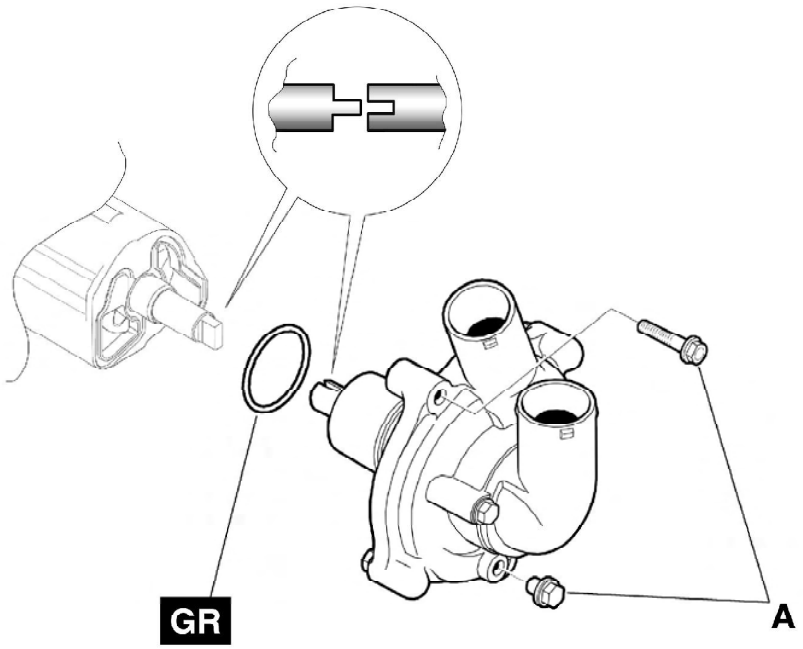
Assemble the gear assembly in the engine block, taking care not to damage the gasket.
Insert the clutch rod.



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D

WATER PUMP



Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	10									
Thread blockers		medium									

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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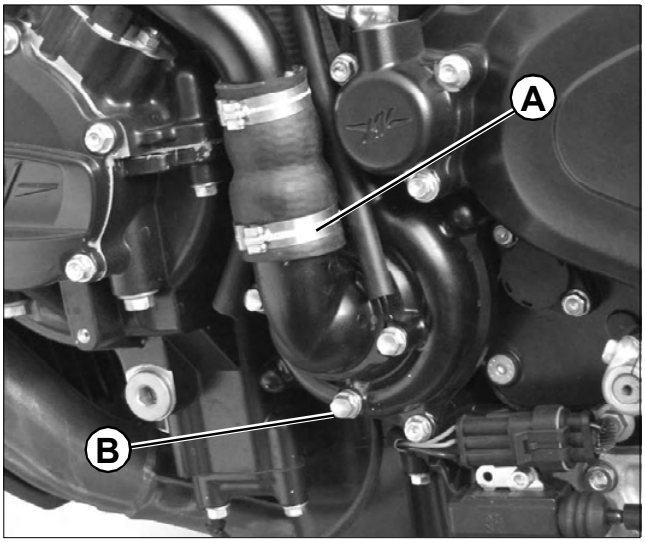
Water pump removing

NOTA **The engine does not need to be removed from the frame to perform this operation**

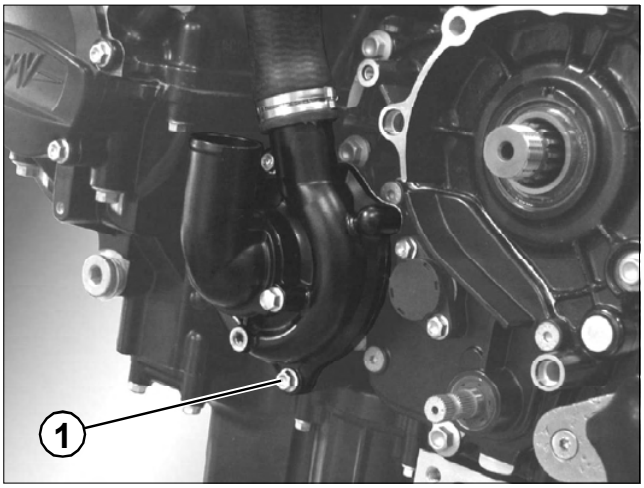
Work with cold motor.

Drain liquid.

A) Loosen the clamp and remove the coupling from the cylinder group, being careful not to damage it and drain the cooling liquid by removing the screw (B)

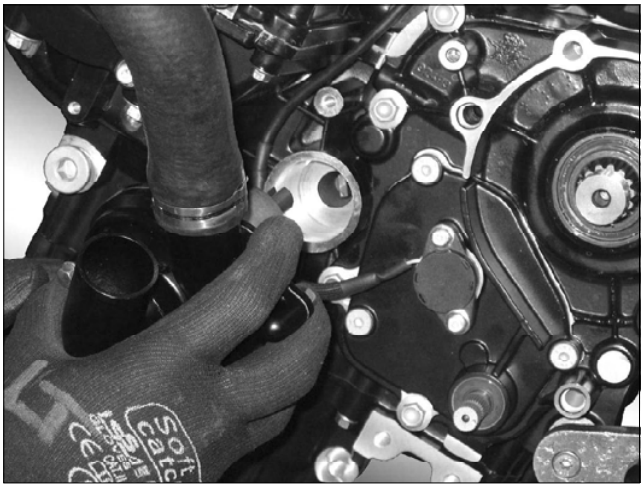


B) Remove the screws (1) which fasten the pump body to the crankcase.



C) Slide the pump out of the crankcase.

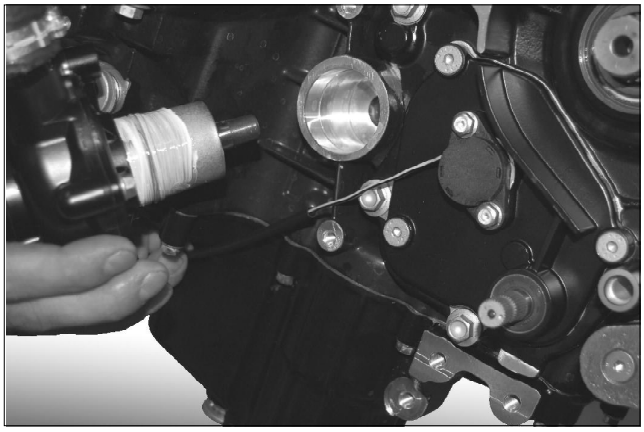
The water pump does not require maintenance. Do not take the water pump apart. Any attempts to take the components of the water pump apart will invalidate the guarantee.



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Water pump reassembly

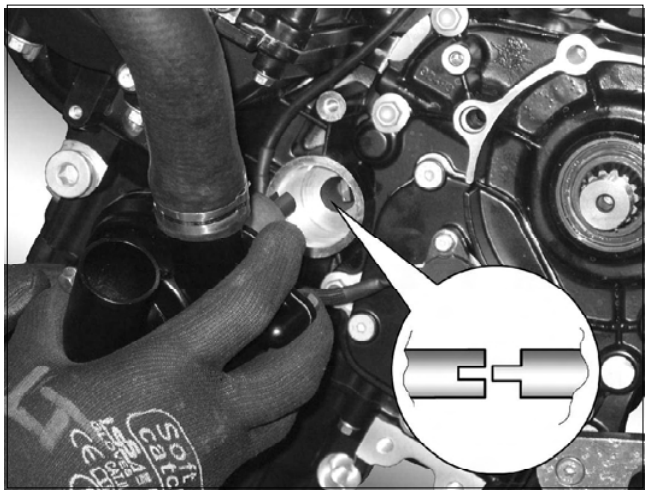
Grease the O-Ring and its housing on the pump evenly.



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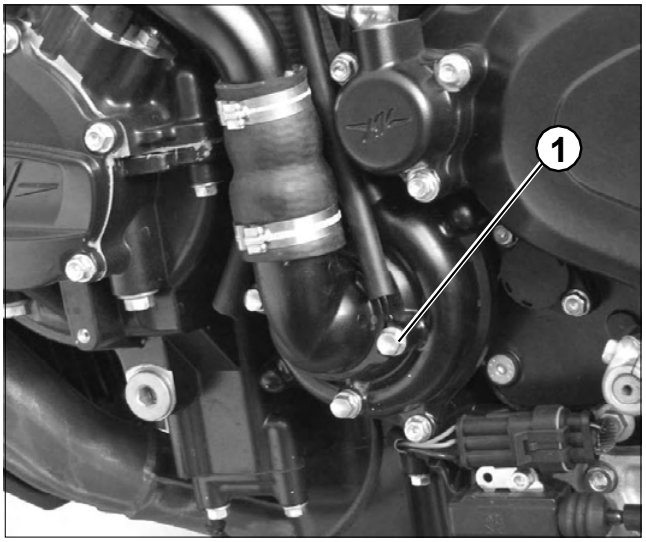
Make sure the grooves on the spindles of the water pump and the oil pump run in the right direction.

A) Insert the pump on the crankcase being very careful not to damage the O-Ring on the pump body and maintaining the cable of the gear sensor around the pump body as shown.



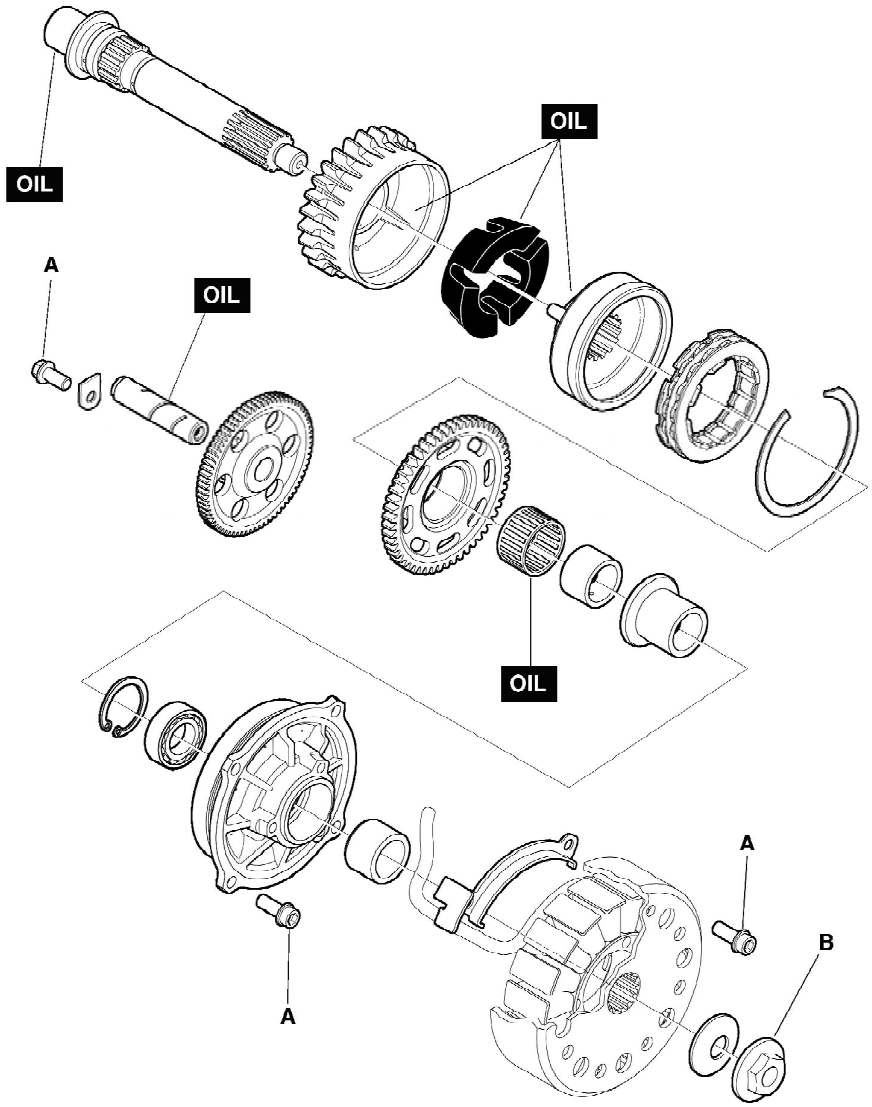
B) Insert the screws (1) which fix the pump body onto the crankcase

C) Install the coupling with its clamp onto the cylinder group, being careful not to damage it.



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STARTING



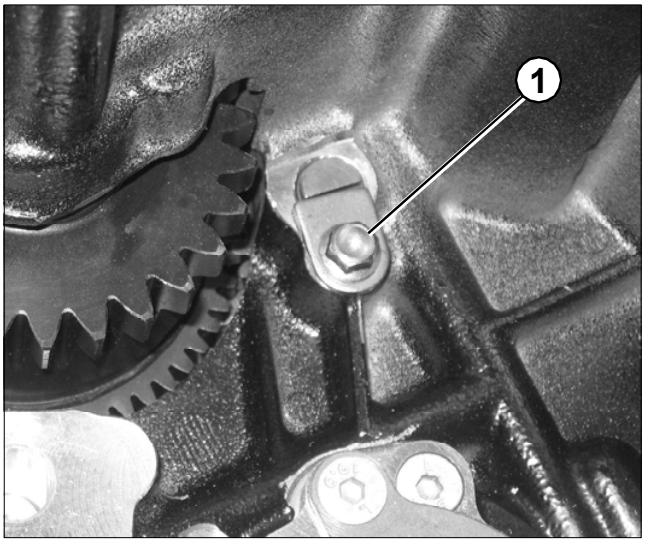
Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	10	65								
Thread blockers		medium	strong								

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

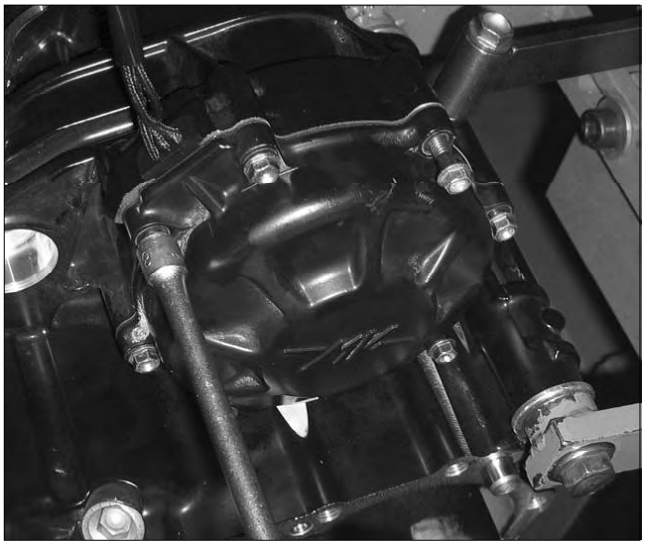
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Freewheel starting
Remove the clutch and gear indicated in the relative paragraphs. Remove the screw (1) and the plate which fixing the intermediate gear-pin.
Slide out the intermediate starting gear-pin and the intermediate gear.



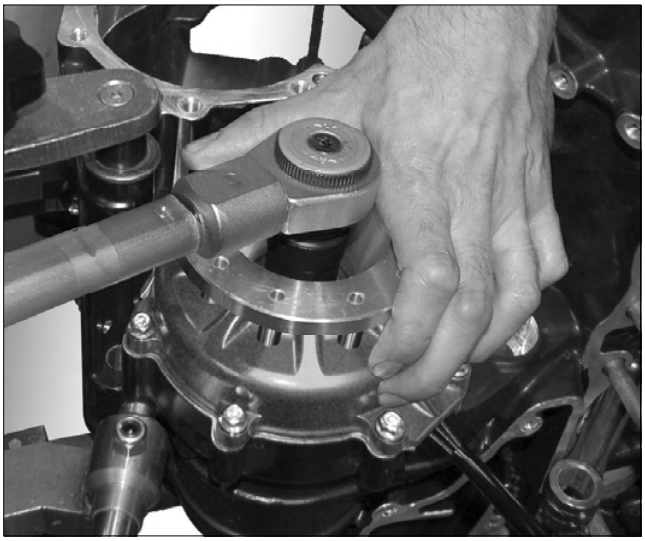
Undo the 7 fixing screws and remove the cover of the alternator and the relative gasket.



The following tools are required to perform this operation:

Flywheel locking tool : cod.8000B4304
Flywheel extractor : cod.8000B4305

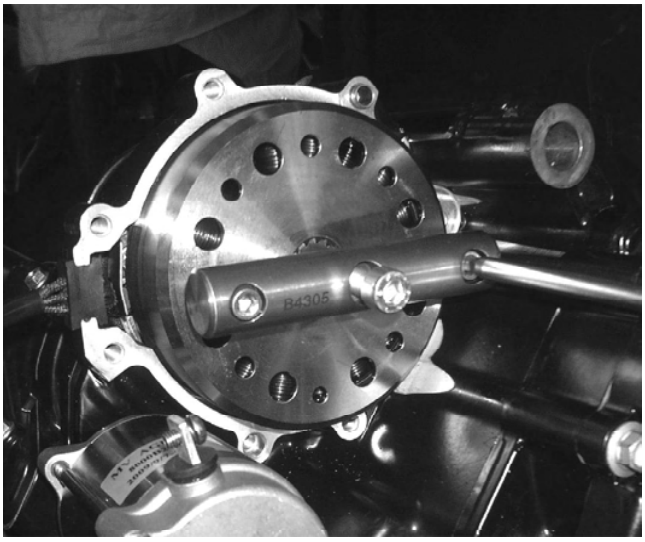
Place the flywheel stop tool cod.8000B4304 and undo the nut using a 19 mm spanner in an anti-clockwise direction (left-handed thread); remove the nut and the Belleville washer.



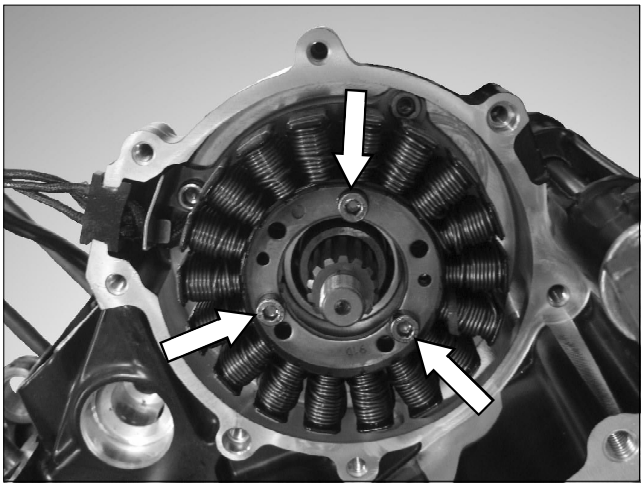
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Extract the flywheel using tool cod.8000B4305.

Insert the puller's screws into flywheel no more than 2 turns in order to avoid the damage of the stator

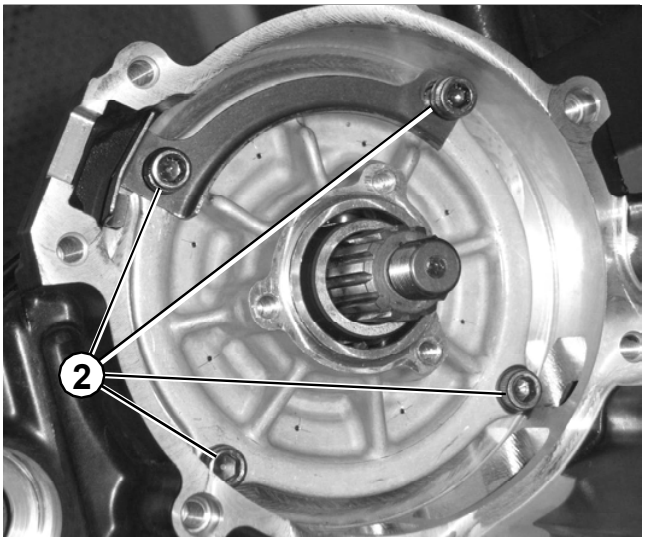


Remove the 3 fixing screws and remove the stator by pulling the cable tray rubber away from the engine block.



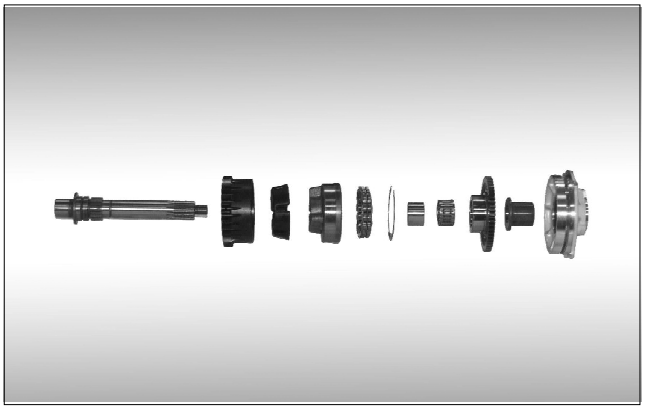
Remove the 4 fastening screws (2) on the starter flange and the cable guide plate.
Manually extract the starter assembly.





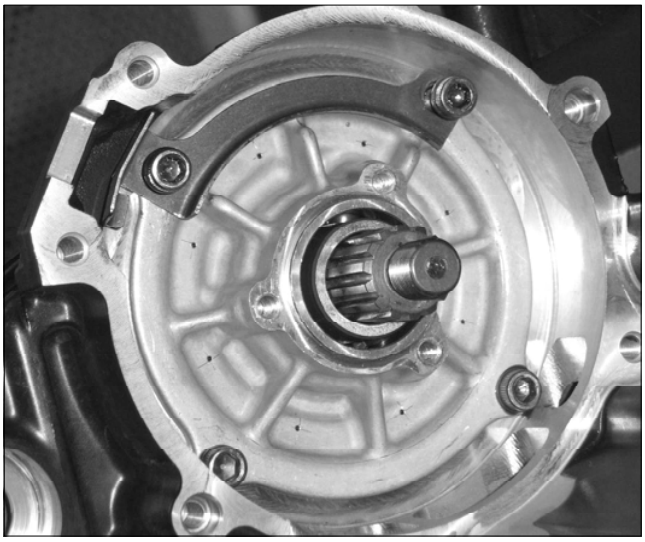
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Take the assembly apart and check that its components are intact.
Check that the surface of the spring drive rubber is even and does not have any cracks; otherwise replace.
Check the condition of the free wheel.

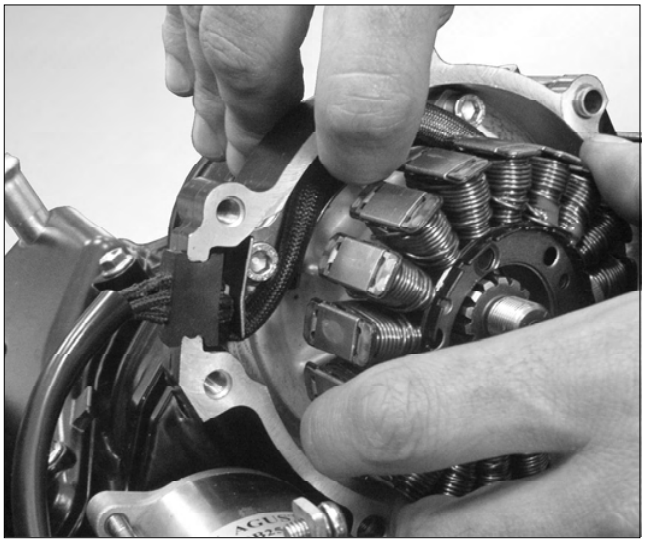


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Reassembly
Evenly grease the rubber and its gear housing and the outer ring of the free wheel.
Reassemble the free wheel with the flaps facing towards the inside and the snap ring; in order to facilitate this operation, insert the part on which the snap ring is open last of all.
Reassemble the other components of the unit in the reverse order compared to disassembly.
Check that the free wheel rotates **only** in a clockwise direction.
Lubricate the starter shaft and its bearing in the engine block.
Assemble the unit in the engine block, also positioning the cable guide plate; tighten the 4 screws to 10Nm with a medium strength thread-locking compound

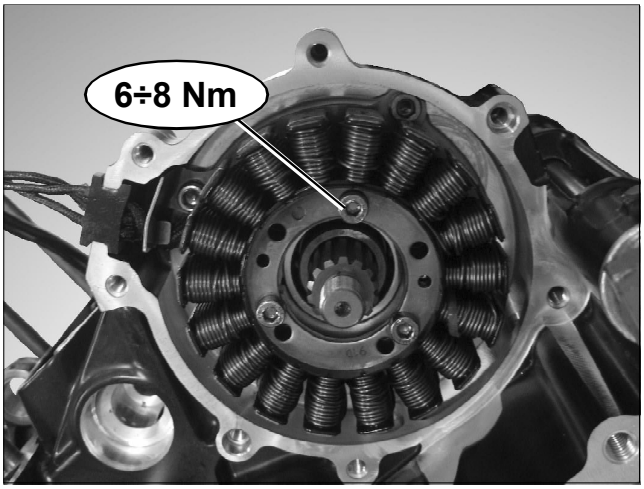


Reassembly the stator inserting first the cable-guide rubber and, maintaining the cable upper side on the cable guide plate, ultimate the starter reassembling.

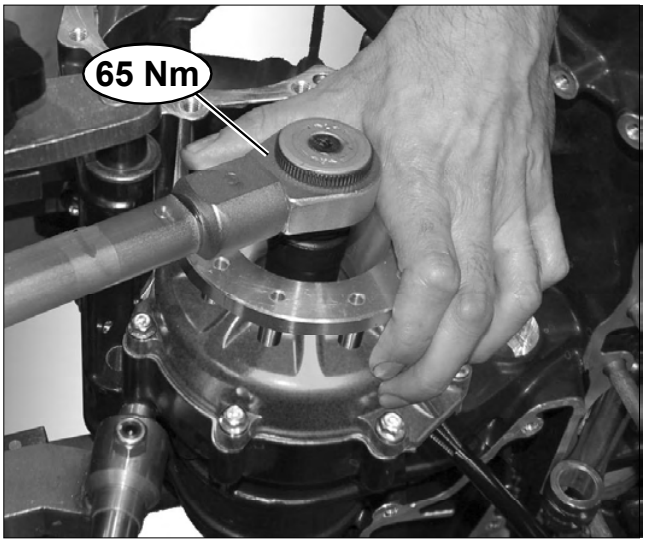


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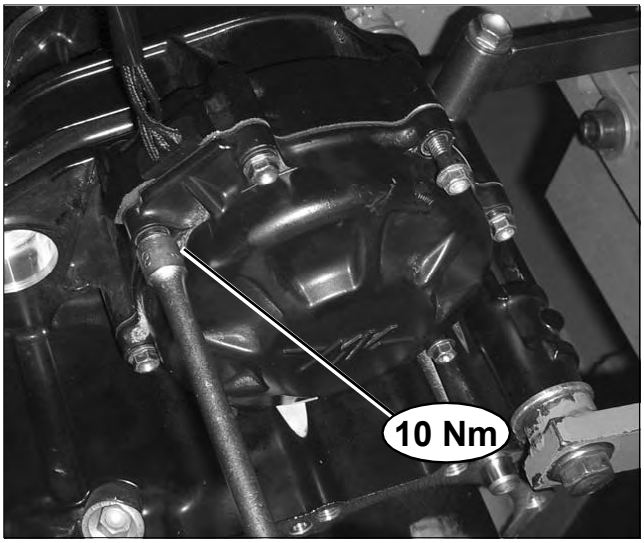
Insert the 3 fastening screwsand tight to 6÷8 Nm with a medium strength thread-locking compound.



Insert the rotor and the locking tool cod.8000B4304, assemble the washer and the nut and tighten to a torque of 65 Nm with strong thread-locking compound.



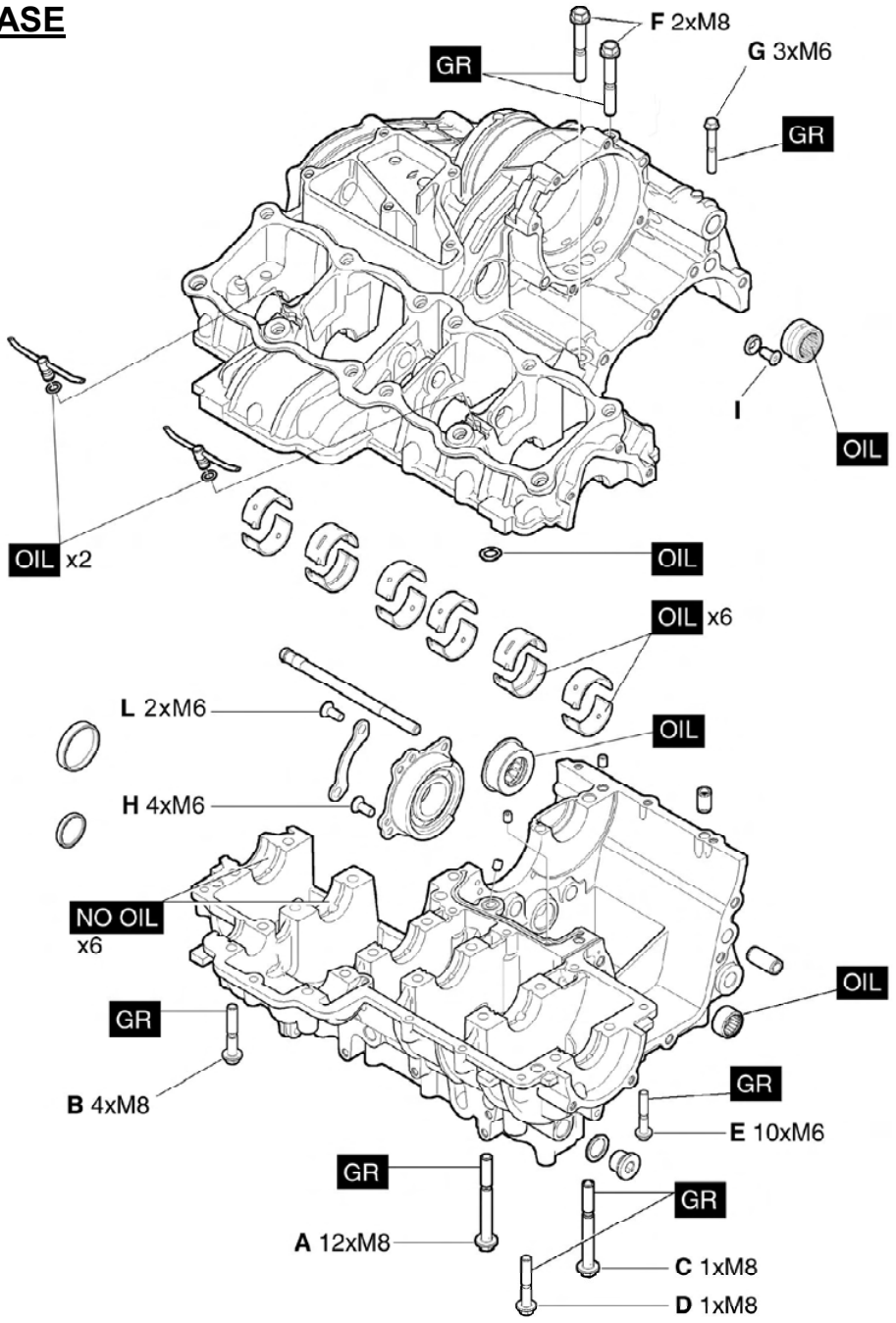
Disassemble the tool and reassemble the gasket and the cover, tightening the screws to 10 Nm.



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CRANKCASE

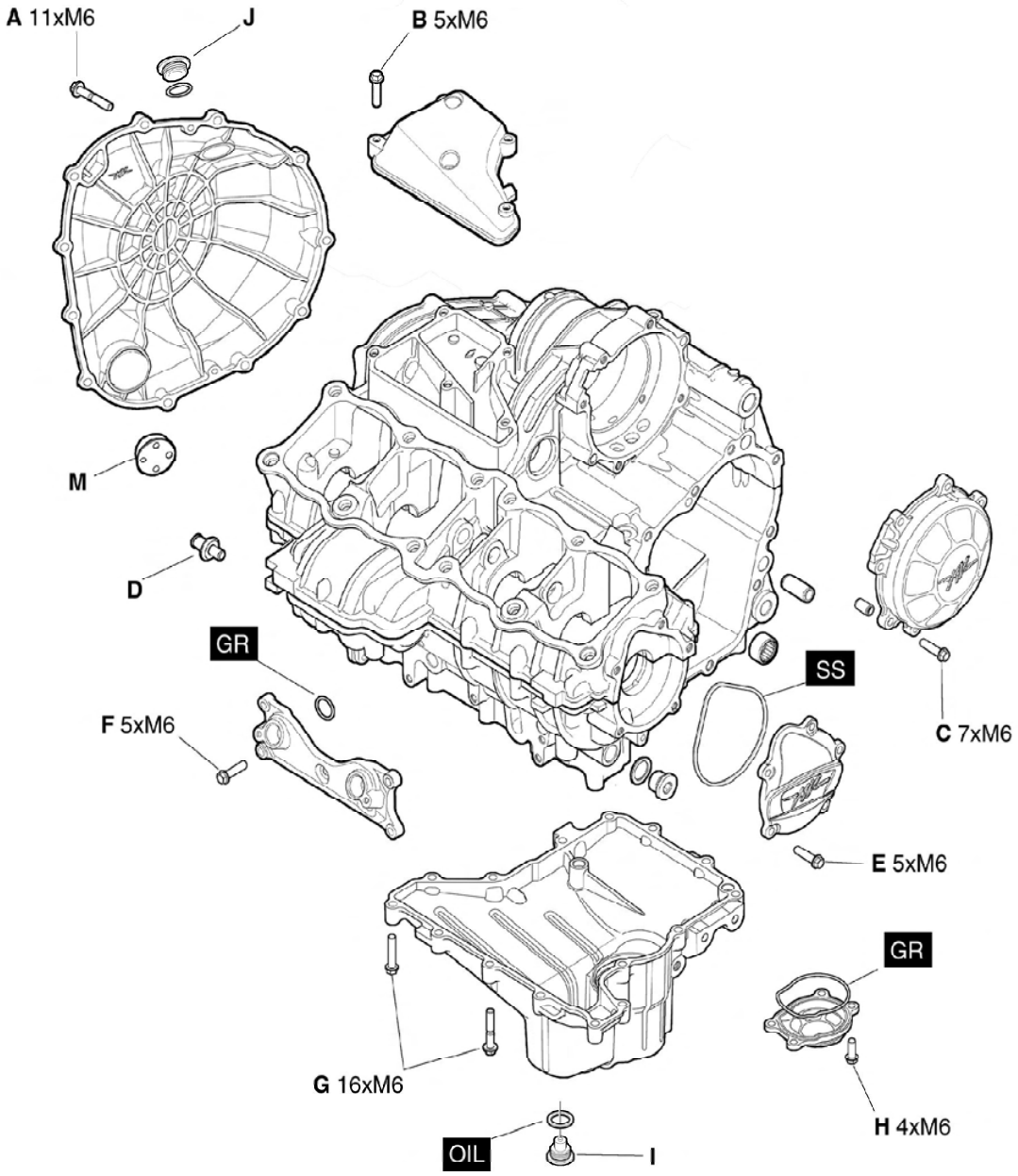


Tightening torque		A	B	C	D	E	F	G	H	I	L
	Nm	10+45°	10+40°	25	25	10	25	10	10	12	10
Thread blockers									strong	medium	strong

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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COVERS



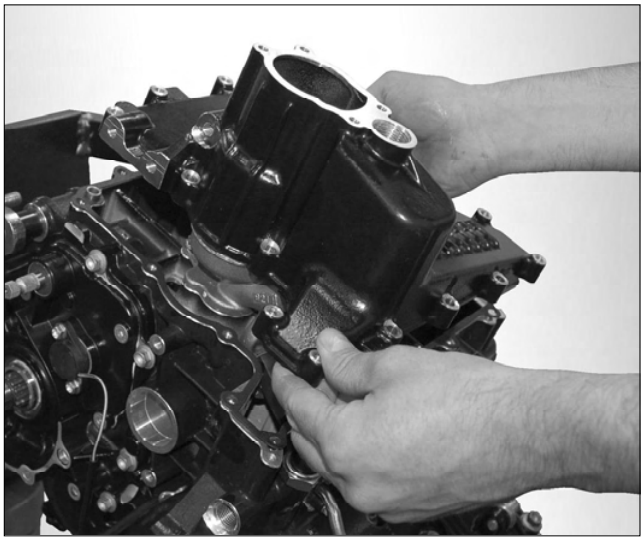
Tightening torque		A	B	C	D	E	F	G	H	I	J
	Nm	8	10	10	12	10	10	10	10	40÷45	35
Thread blockers											

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

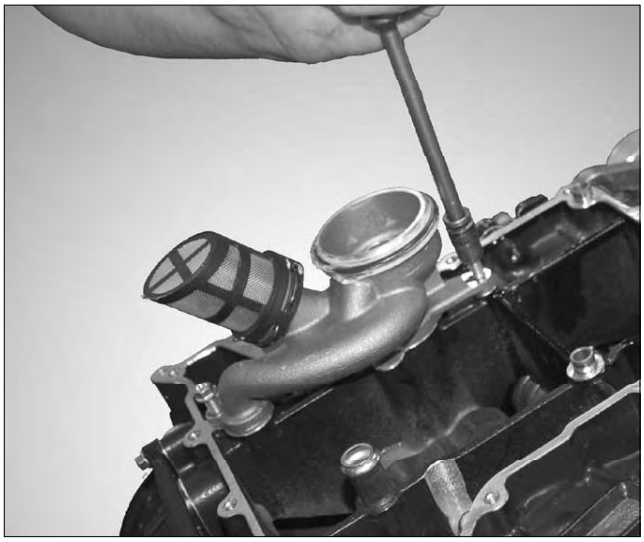
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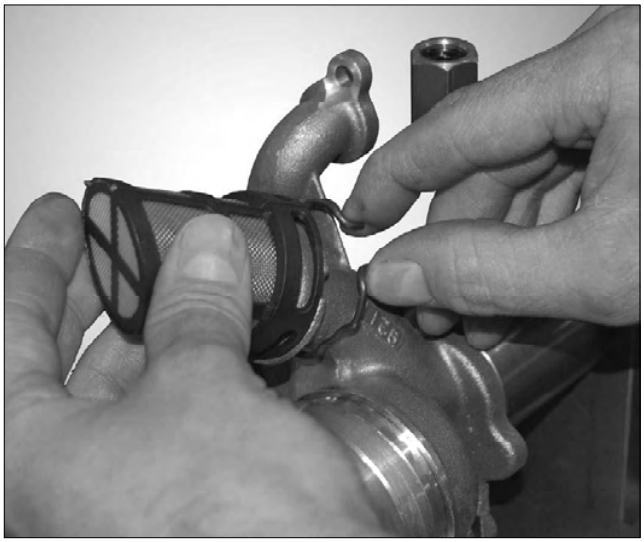
Oil sump
After having removed the oil filter (see Section E), remove the oil sump by unscrewing the 6 mm fixing screws.
Replace the gasket if necessary.



Remove the two fixing screws and extract the oil filter support from the engine block.



Remove the retaining spring and take out the oil suction filter.
Check the condition of the oil intake filter and make sure that it is free of cracks or clefts; clean it by using compressed air at a low pressure, blown from inside to outside.

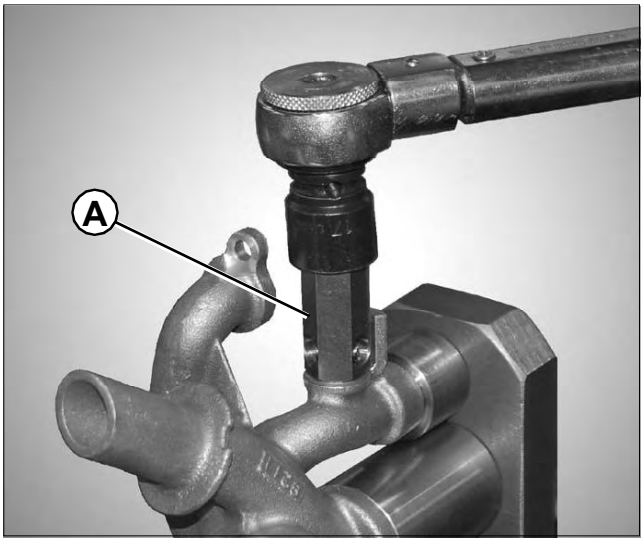


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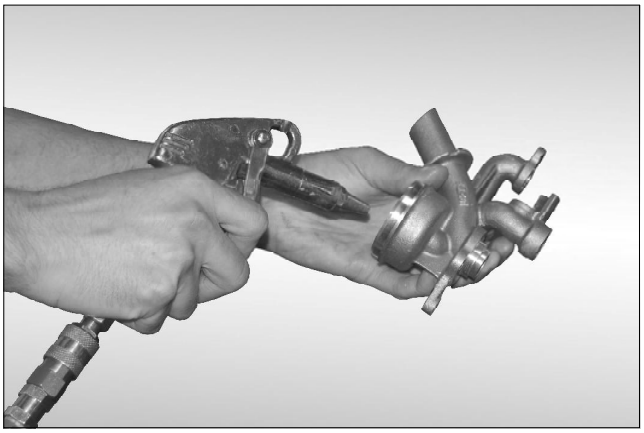
Remove the oil pressure adjustment valve (A) Disassemble the valve by removing the snap ring and check its components, accurately cleaning the mobile parts and the pipe.

If the perfect working order of the valve is uncertain, replace with a new valve.

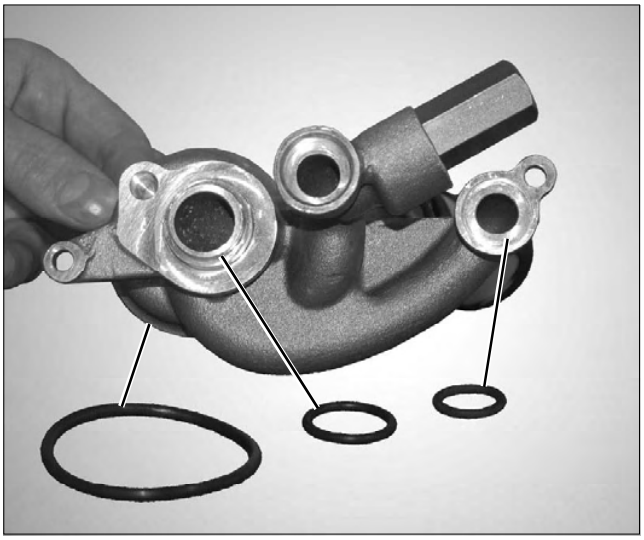
Check that the oil filter support is intact.
Once all controls have been performed, reassemble the valve on the support, tightening to a torque of 25 Nm (loctite 243).



Accurately clean the contact surfaces and the housings of the seal rings before reassembly.



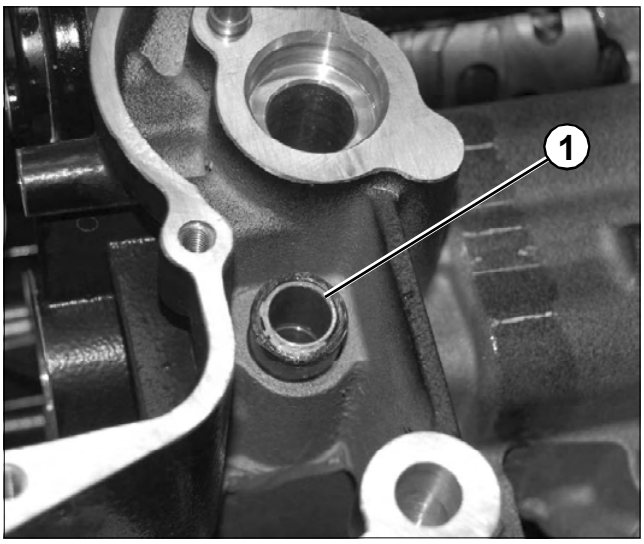
Assemble the seal rings on the support, taking care to grease evenly.



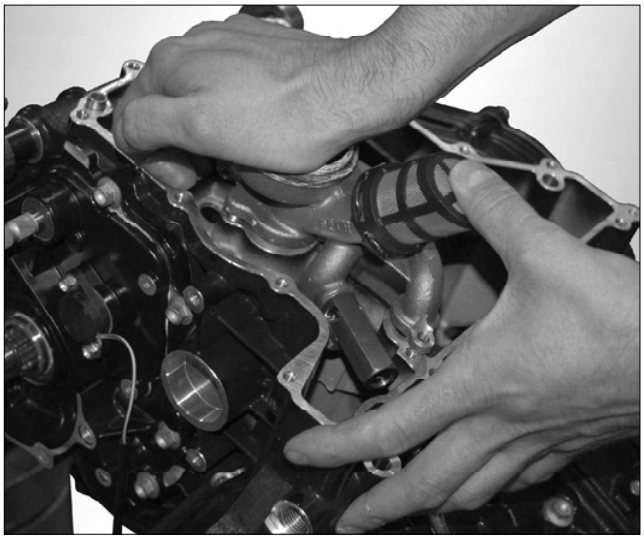
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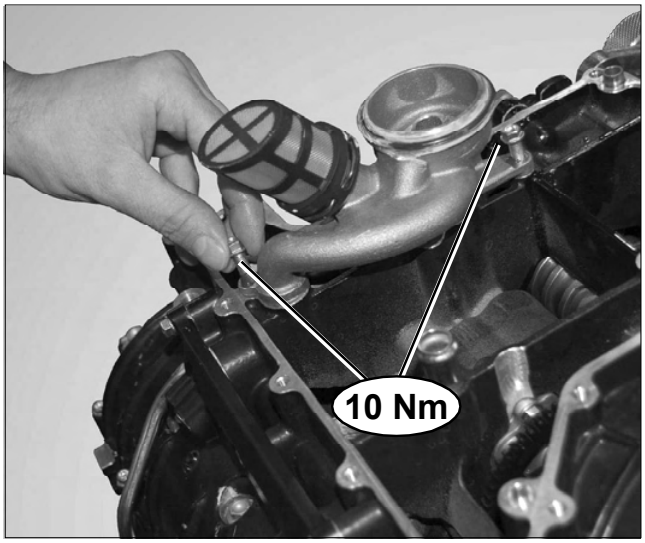
If the oil tube (1) was previously removed, reassemble with the evenly greased seal rings, push into place with a rubber spacer.



Assemble the filter support on the engine block, taking care not to spoil the seal rings.



Accurately degrease the thread of the two screws and apply loctite 243, tightening to 10 Nm.



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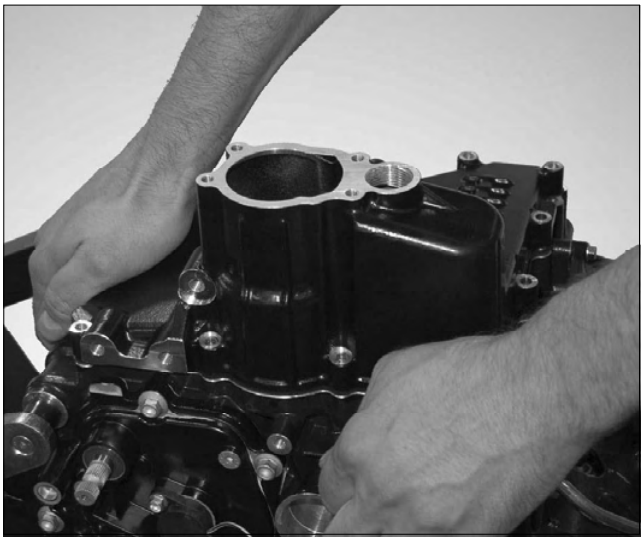
Grease the holes and insert centering pins in the oil sump.



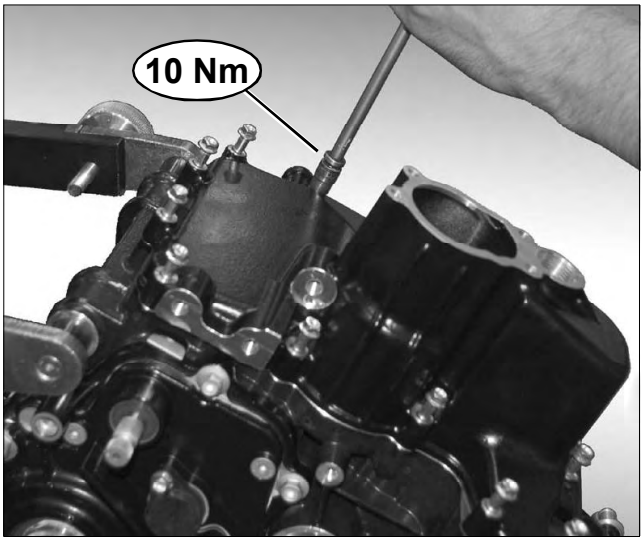
NOTA **When assembled in the sump, the bushes protrude more than in the engine block making it easier to centre before the sump comes into contact with the o-ring of the filter support, thus preventing the risk of damage.**

Position the gasket and,

once centred, push the sump to insert the o-ring into its housing,



Insert the screws by hand. Tighten the screws of the sump to 10 Nm.
Reassemble the oil filter following the instructions given in section E on page 12.



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Crankcase disassembly

Remove the oil filter, the sump and the oil filter support.

Remove as follows as indicated in the relative paragraphs:

A)The head

B) The cylinder group

C) The pistons

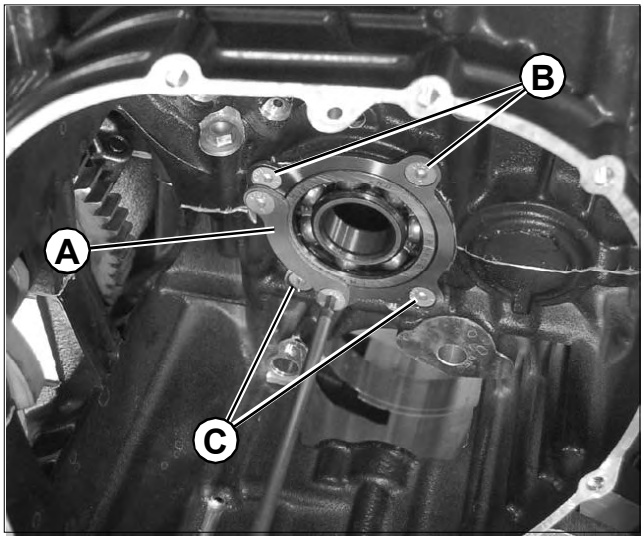
D) The clutch

E) The gear.

D

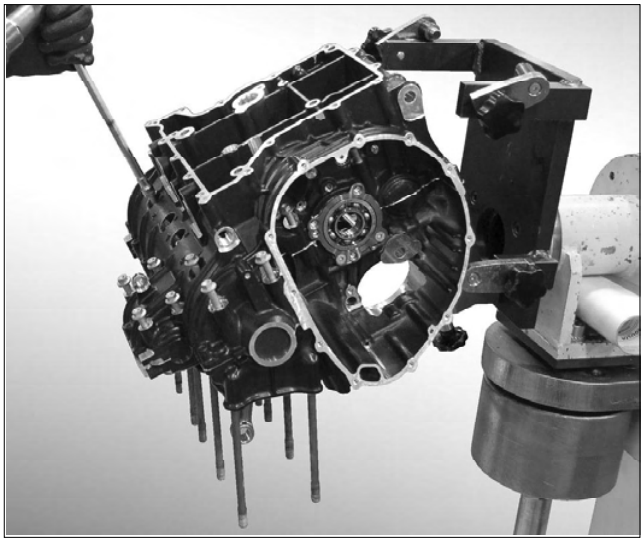
Remove:

F) The retaining plate (A), the relative screws and the two retaining screws (B) on the primary flange of the bearing on the lower block.

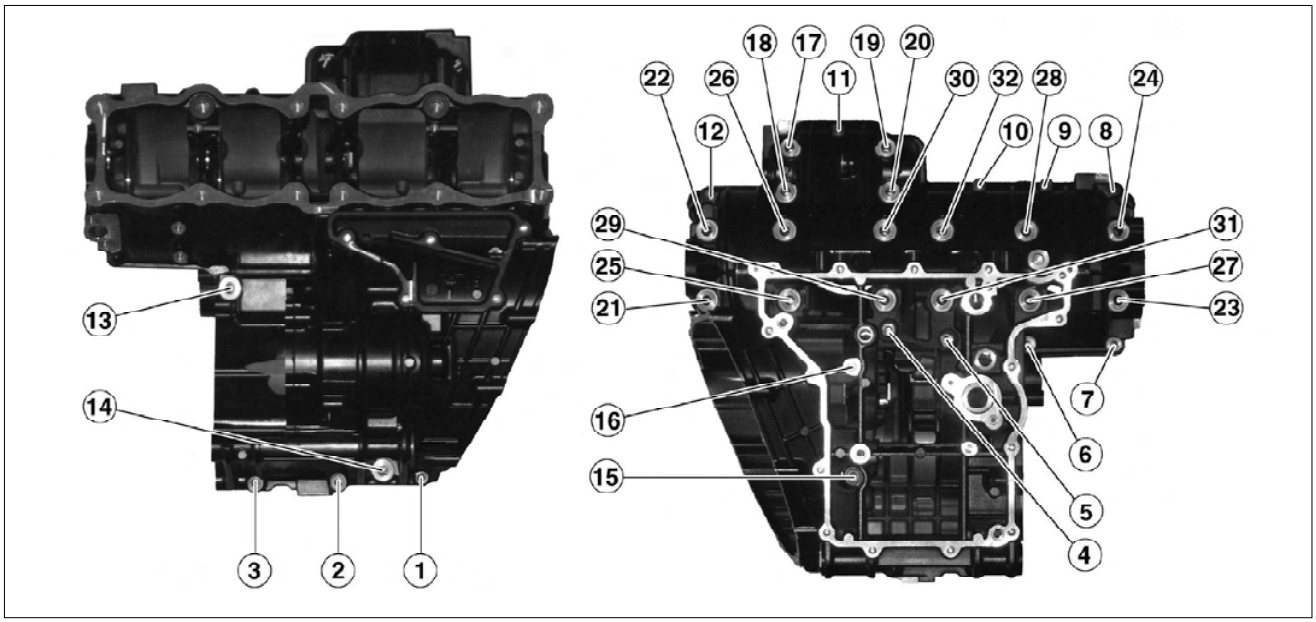


NOTE **Do not forget to loosen the two retaining screws (C) on the primary flange of the bearing on the lower block.**

G) 6 mm and 8 mm screws following the order of disassembly illustrated.

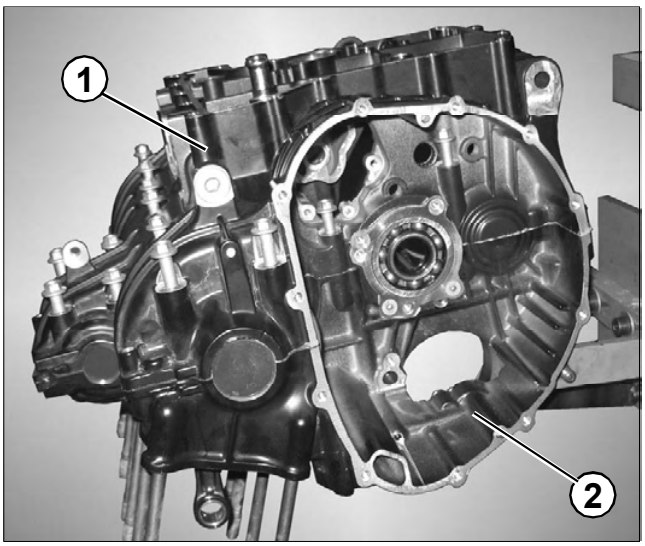


The sequence indicated for the disassembly of the screws on the engine block should be followed scrupulously.

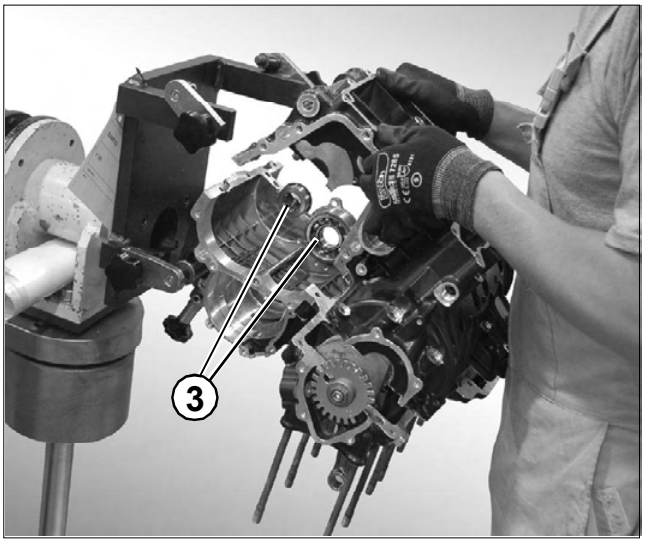


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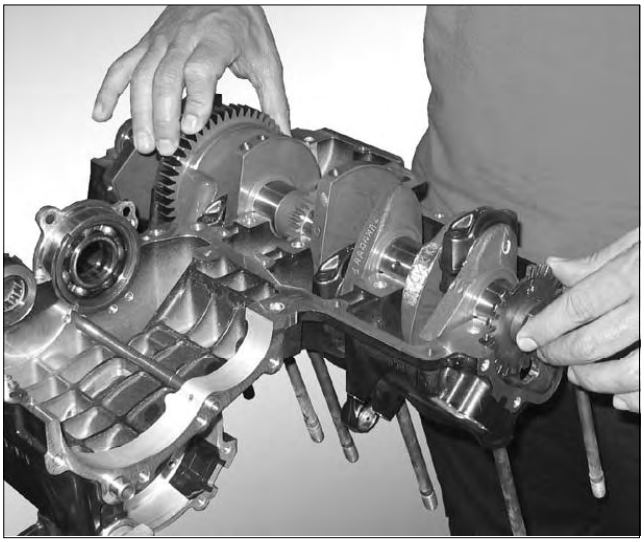
H) Separate the two carters (1 and 2) by manipulating the protrusions



.I) If necessary remove the bearings (3).



L) Slide the main shaft out.

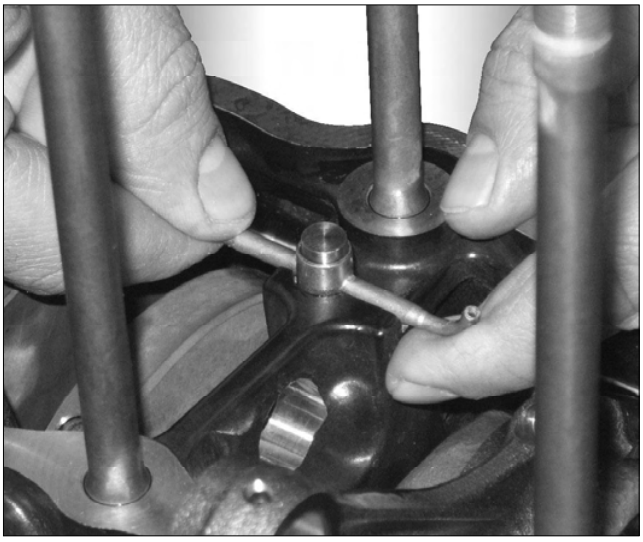


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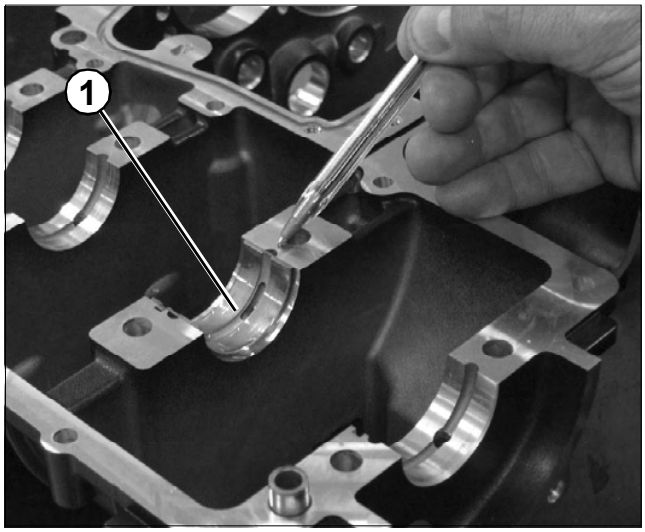
D

In the eventuality that the piston's oil nozzles should be removed it is recommended to manually extract them in order to avoid the damage of the ducts

NOTE **When reassembling it is necessary to clean the seats and the relative oil ducts of the carter from possible traces of dirty**



In the event that the bushings should be temporarily removed (1) it is a good idea to identify the bearing number and its carter with a number using a marker. For example the bushing removed from the n°1 bearing of the superior carter (starting from the left) will be identified by the mark S1.



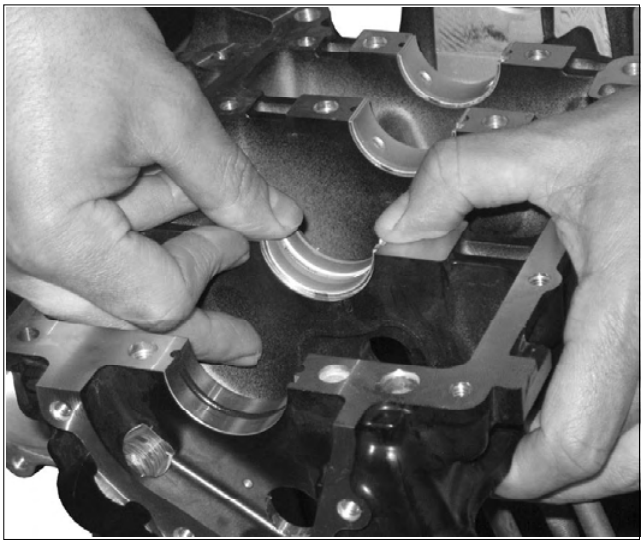
For the couplings refer to the groups they belong to shown on the chart.

Revision
Once you have disassembled the crankshaft and in case there should be any doubt substitute the bench bushings as well as the connecting rod.
Verify the motor shaft wear tolerance.
The function play of the bench bearings must be between **0,014÷0,044 mm**.
Service limit is **0,06 mm**.

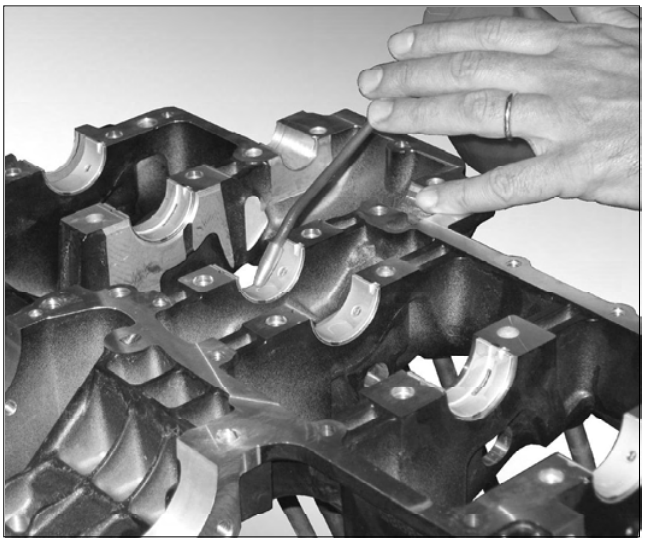
SELECTION TABLE FOR F4 BEARINGS				
			CARTER SLOT DIAMETER	
			A 38,103 38,111	B 38,112 38,119
BENCH PIN DIAMETER	A	34,996 35,001	1.546/1,550 BLUE	1,551/1,555 YELLOW
	B	35,002 35,007	1,541/1,545 RED	1,546/1,550 BLUE
FUNCTIONING PLAY 0,014/0,044				

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Reassembly
Carefully degrease and clean from any paste residues.
Position the bushings into the carter without lubricating.



After having positioned them put oil on each bush.



Laterally lubricate the n°5 support (both sides) as it carries out the function of the motor shaft centering.

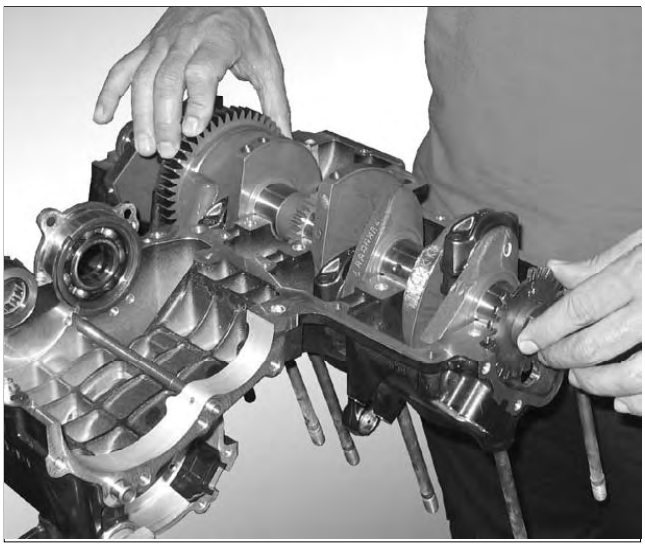
Put the new caps on the right side.



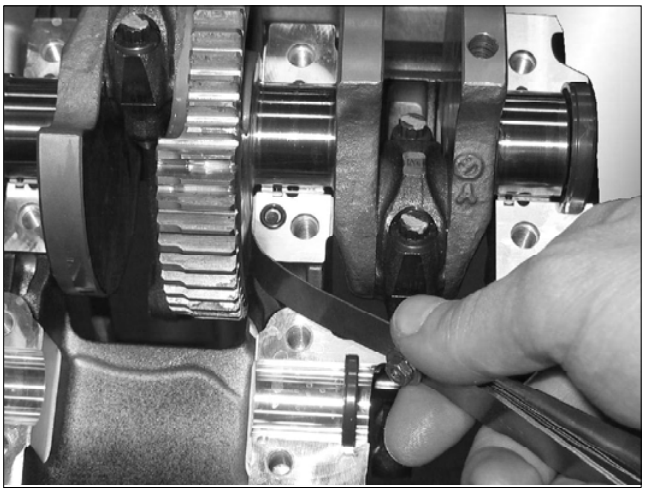
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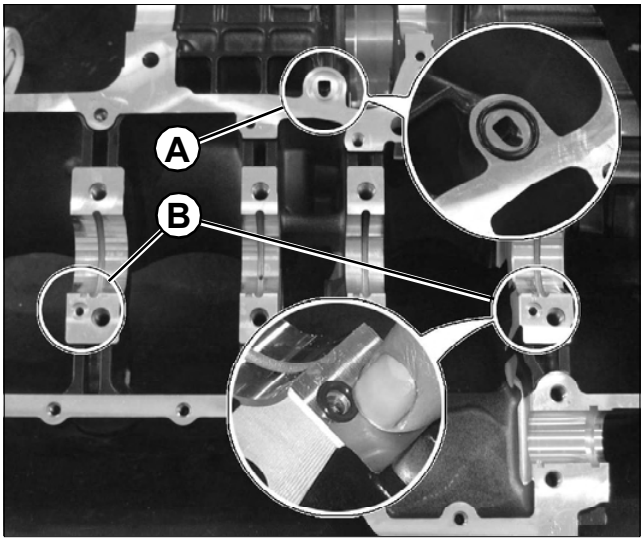
Assemble the mainshaft



Verify with a thick meter that the motor shaft has an axial play of 0,2 mm as regards the bench bearings.
In case there should be different values contact the manufacturer.



Lubricate the seal rings and insert them in the respective seats, preventively cleaned, of the oil ducts to starting (Á.) and to pistons (B).

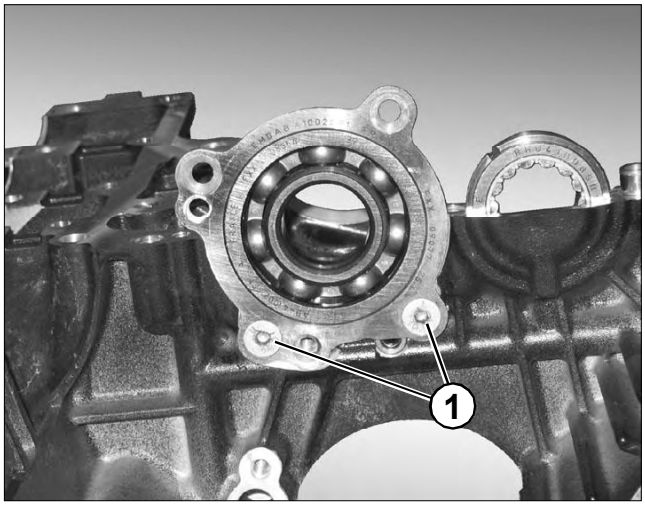


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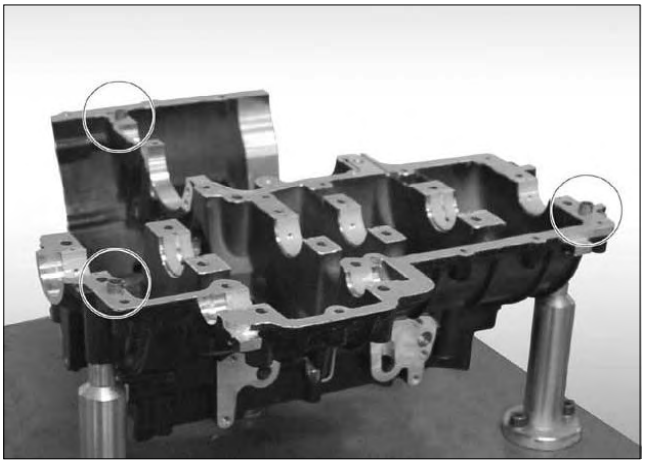
If it becomes necessary to disassemble the gear lubrication tube, reassemble, keeping the groove facing upwards.



reposition the bearings and insert the two screws (1) of the flange by hand, without tightening.



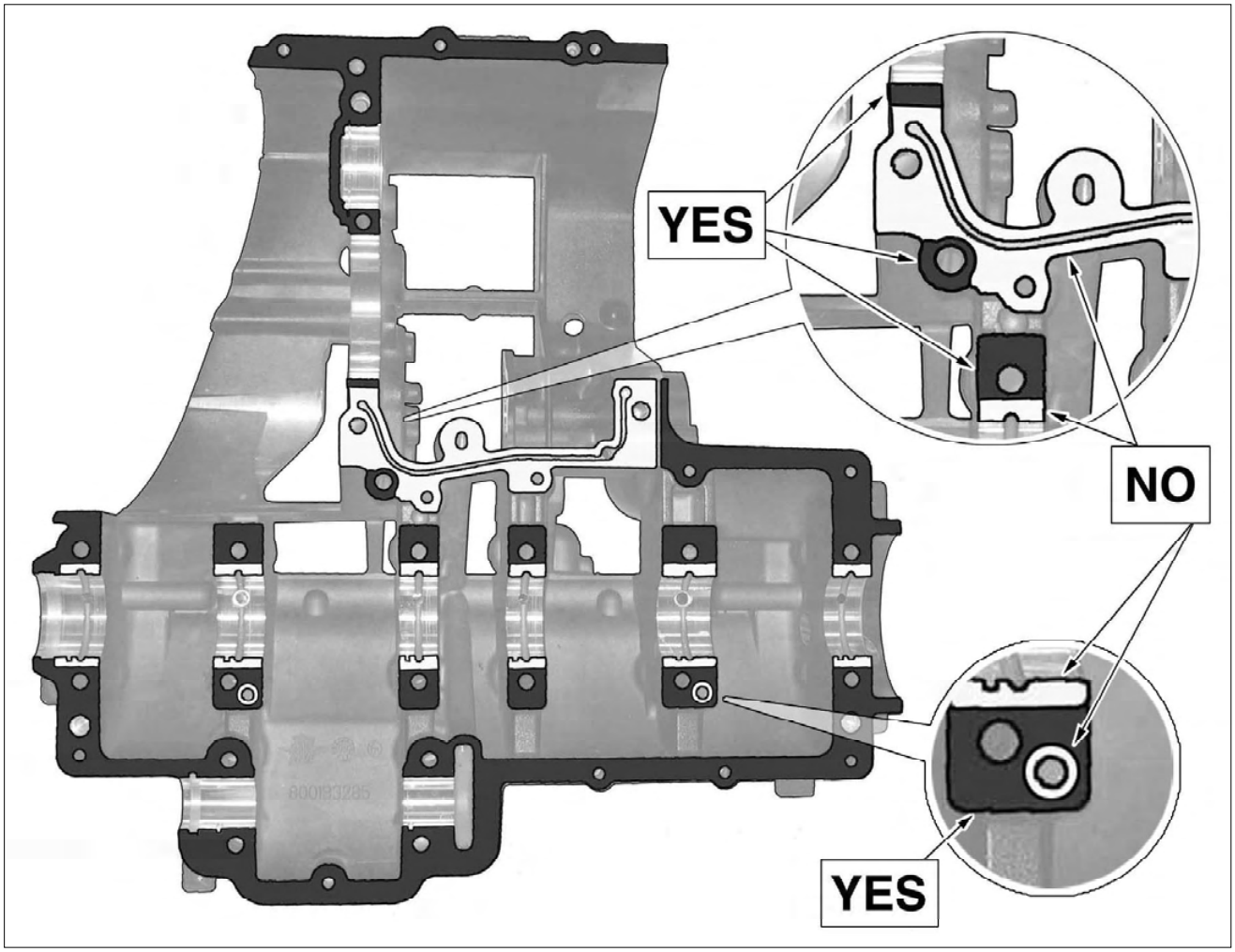
Be sure that the centering bushes are installed on the inferior semi-carter.



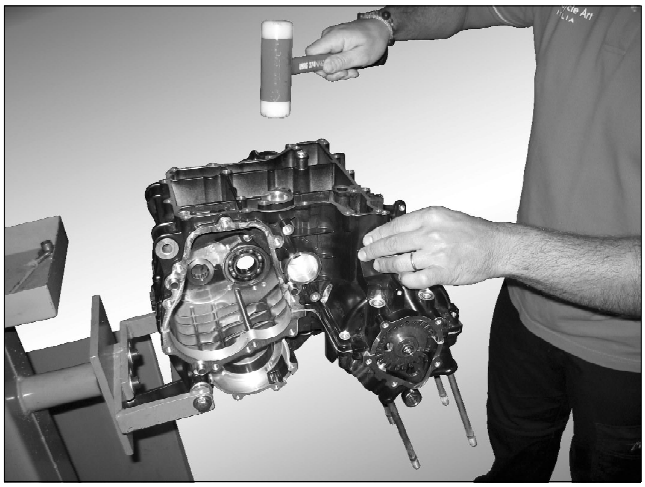
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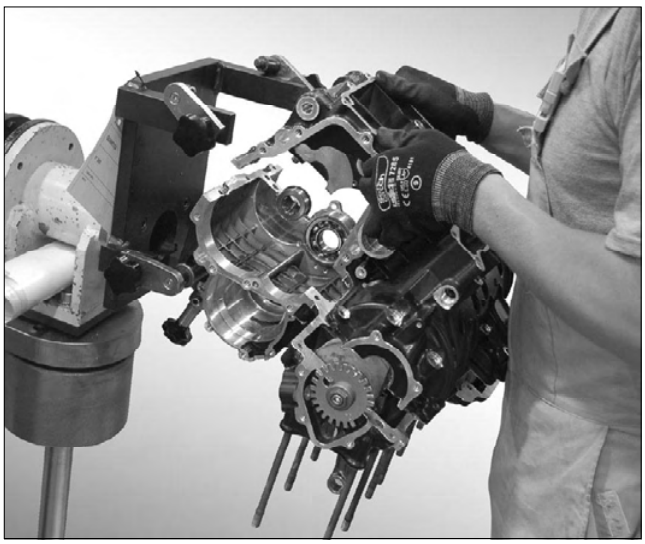
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Spread a layer of the 1215 THREEBOND type garnish on the stroke points of the two half crankcases having attention to prevent the paste from coming into contact with the bushings and the central area of the oil passage.



Couple the two half crankcases carefully beating them with a plastic hammer until completely closed.

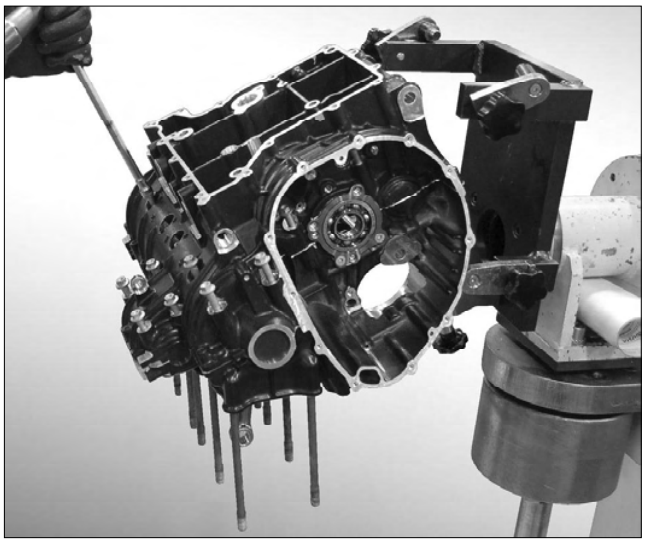




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Manually drive the M8 and M6 screw without tightening.

NOTE **All screws have either an equal or visibly different length; it is therefore impossible to mix them up during reassembly.**

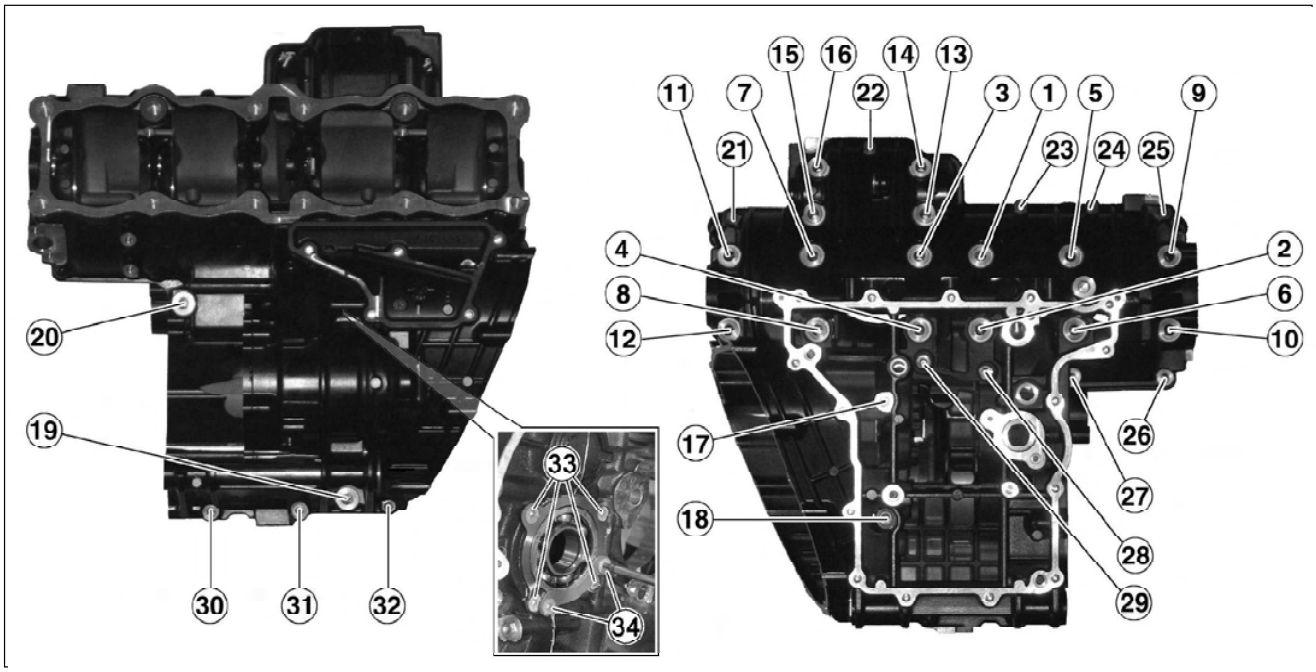


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Tighten the screws of the engine block, following the sequence indicated in the chart.

Pre-tighten the screws 1 to 12 to a torque of 10 Nm, then tighten fully, turning them a further 45°.
Carry out the same operation with screws 13 to 16 to a torque of 10 Nm + 40°.
Tighten screws 17 to 20 to a torque of 25 Nm.
Tighten the remaining screws 21 to 32 to a torque of 10 Nm.
Tighten the four screws 33 of primary bearing flange and the two screws 34 of flange retainig plate to a torque of 10 Nm with Loc-tite 270

Screw Nr.	Operation	Value
1-12 1-12	Pre-tightening Tightening	10 Nm 45°
13-16 13-16	Pre-tightening Tightening	10 Nm 40°
17-20	Tightening	25 Nm
21-32	Tightening	10 Nm

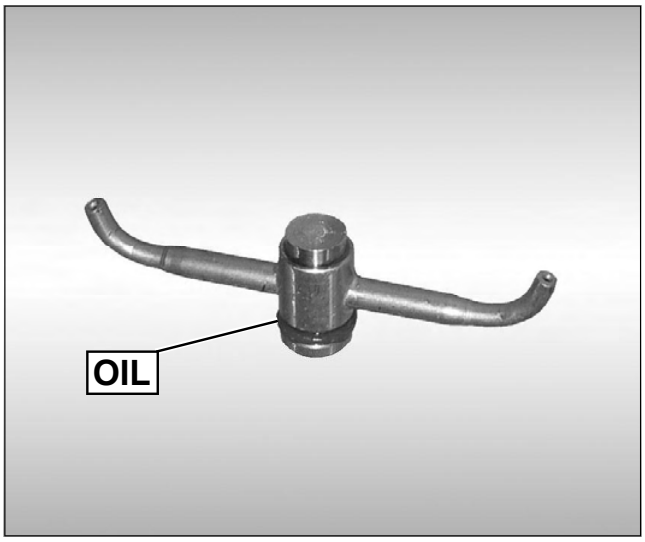


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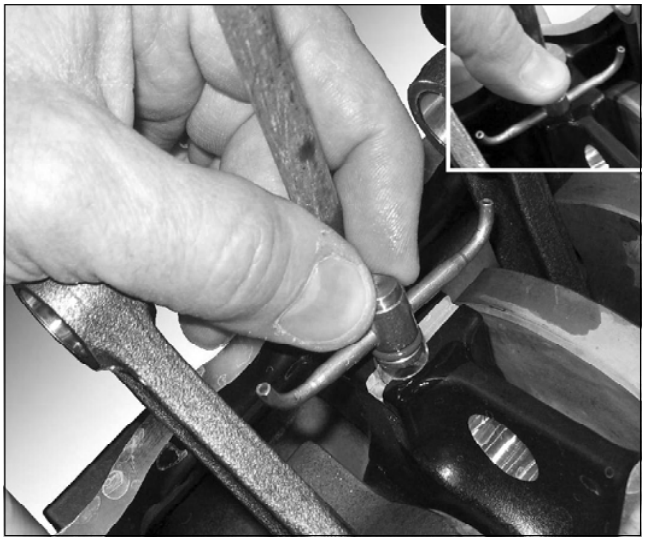
Oil nozzles to pistons
Clean the seats of the seal rings on the nozzles from possible traces of dirt.

Always replace the seal rings before reassembly

lubricate the seal rings with oil and insert on the nozzles.



Manually insert the oil nozzles in the respective seats on the superior carter pushing them in beat

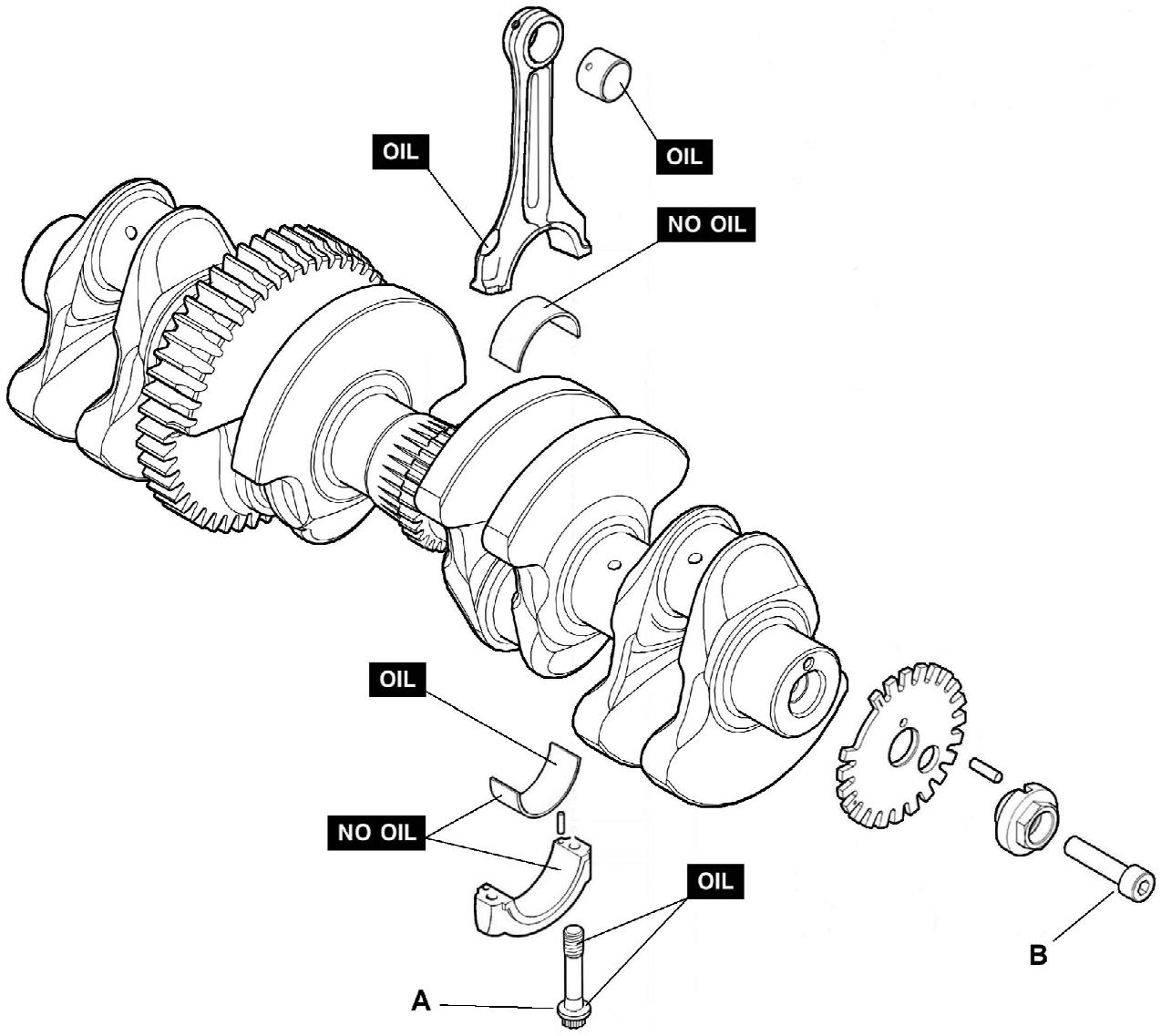




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MAINSHAFT



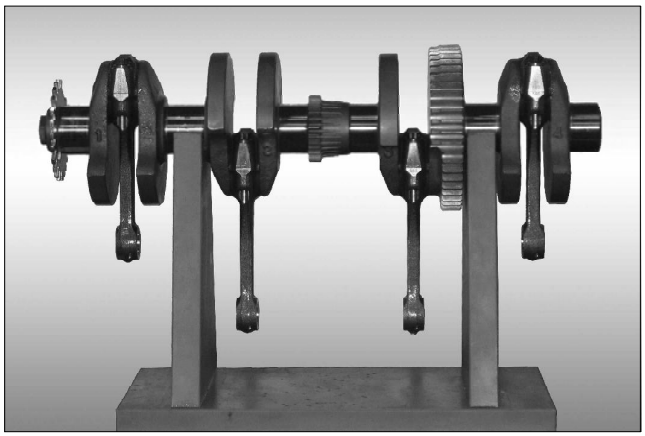
Tightening torque		A	B	C	D	E	F	G	H
	Nm	20 (5 + 15) + 90°	25						
Thread blockers			medium						

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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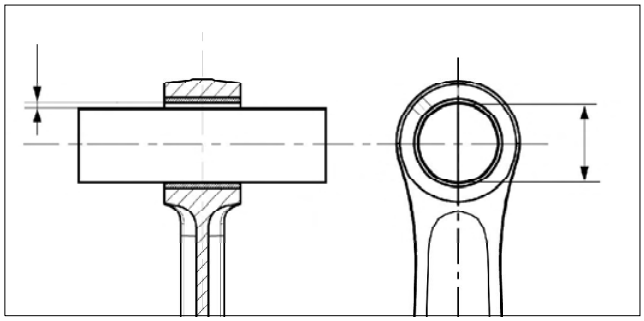
D

Connecting rod disassembly
Remove the crankshaft following the prescribed procedure. Position the main shaft with the connecting rods oriented downwards.
Loosen the bolts that tighten the head of connecting rod.
Remove the two bolts sustaining the connecting rod stem.
Separate the two components from the crankshaft.



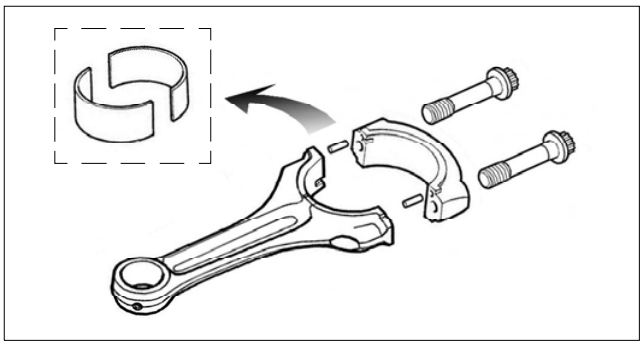
NOTE **Reassembly each connecting rod before working on the following one.**

Coupling of piston pin-small end bush
Check that the bearing is under good condition and that there are not wear marks.
Verify that the internal diameter of the small end bush is between 16,015÷16,025 mm.
The play between the small end bush and the piston pin must be between 0,015 and 0,032 mm.



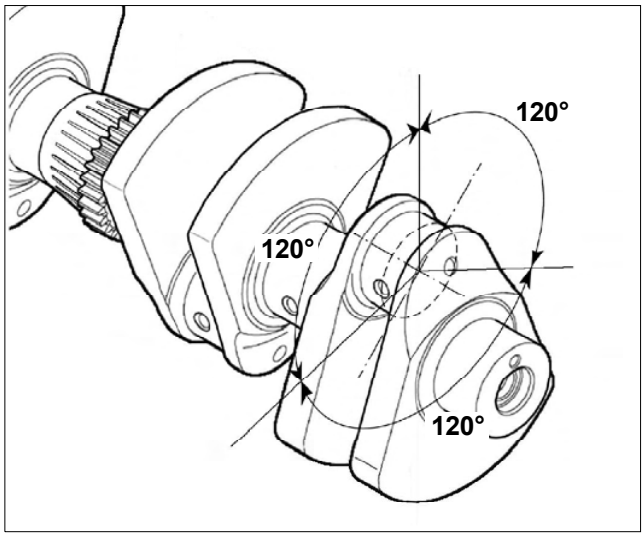
If the connecting rod does not conform to these parameters it will be necessary to replace it

Half-bearings removal
Disassembe the connecting rod in accordance with the prescribed procedure. Unscrew the bolts and remove the half-bearings from the connecting rod.



Coupling half-bearings - crank pin
Verify the measure of the connecting rod and pin diameters.

- **Connecting rod pin**
  The measure of the roundness of the crank pin must be performed along the center surface of the crank pin with three measurements at 120° intervals.
  The maximum nominal value of roundness is 0,005 mm.
  The obtained average value must be comprised in the values foreseen by the 2 classes of selection of the crankshaft.



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- **Connecting rod**
  The measure of the connecting rod must be effected after having tightened the connecting rod without half-bearings to the prescribed torque.

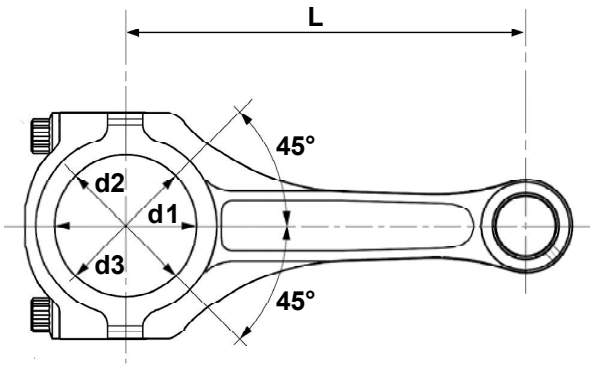
Its recommended to execute the measurement re-using the original used bolts

Degrease bolts and connecting rod.
Lubricate with oil the internal thread, thread and under head
Pre-load the bolts to the torque of 5 Nm
Intermediate tightening to the torque of 20 Nm
Final tightening by turning clockwise of 90° (1/4 of turn).

Once performed the tightening,effect a measurement on the principal axle of the stem and two to 45° from it as suitable in figure. The internal diameter of the connecting rod is given by the average of the three values.

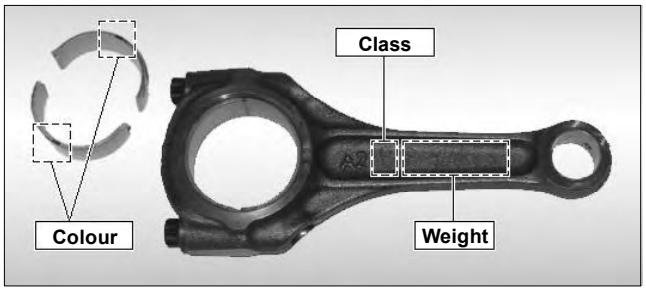
D.i. = (d1 + d2 + d3)/3

CONNECTING ROD SCREW TIGHTENING TORQUE	
Operation	Value
Pre-load	5 Nm
Intermediate tightening	20 Nm
Final tightening	90°



If it is necessary to replace one or more parts, refer to the class and the weight of the connecting rod and to the color of the bearing, printed on the same.

The replacement connecting rods must pertain to the same weight class. Do not use connecting rods with different weight classes.



To identify the weight class of the connecting rod, refer to the table herewith.

CONNECTING ROD WEIGHT CLASS SELECTION TABLE		
Class Letter	WEIGHT (g)	
	(L=107,3 mm)	(L=111,25 mm)
E		289,5 ÷ 291,5
P	281,1 ÷ 284,0	291,6 ÷ 293,5
T	284,1 ÷ 287,0	293,6 ÷ 295,5
S	287,1 ÷ 290,0	

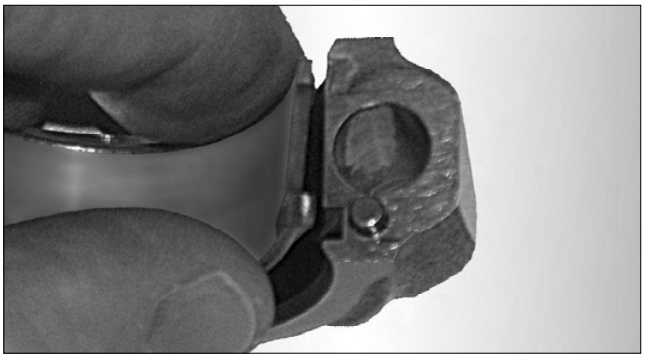
Select the half-bearings in base to the color according to the attached chart.

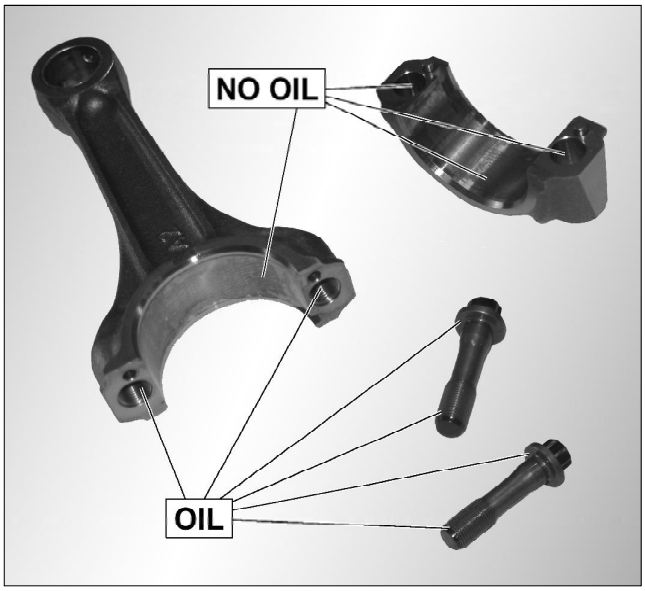
SELECTION TABLE FOR F4 CONNECTING ROD				
			CONNECTING ROD HEAD DIAMETER	
			A 38,079 38,087	B 38,088 38,095
CONNECTING ROD PIN DIAMETER	A	34,972 34,977	1.541/1,544 BLUE	1,545/1,548 YELLOW
	B	34,978 34,983	1,536/1,540 RED	1,541/1,544 BLUE
	FUNCTIONING PLAY 0,40 $^{+0,010}_{-0,010}$			

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Half-bearing reassembly
degrease bolts and connecting rod.
• Insert the half-bearing on the head of connecting rod
• Lubricate with oil the internal thread, thread and under head

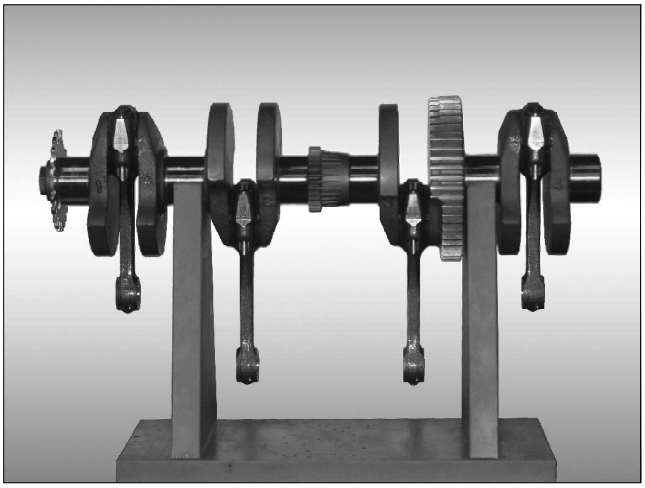
Always use new bolts, even with used connecting rods.



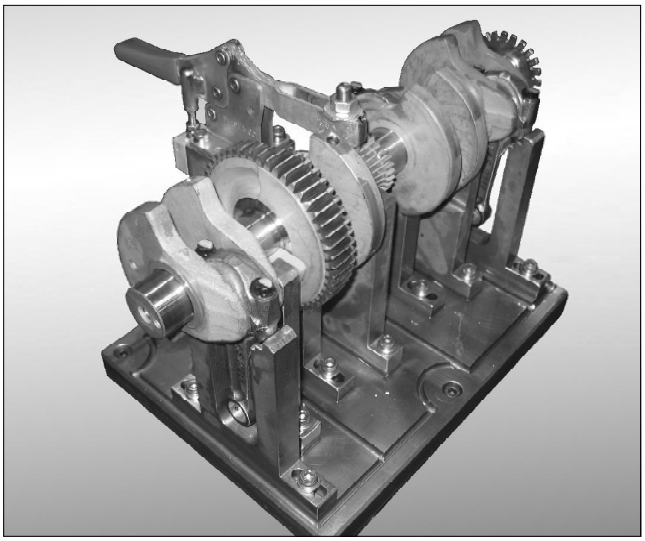


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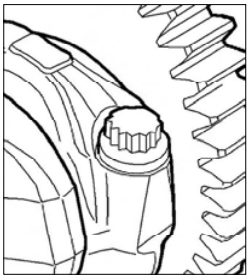
• Reassemble the connecting rods on the crankshaft, by hand tightening the bolts.



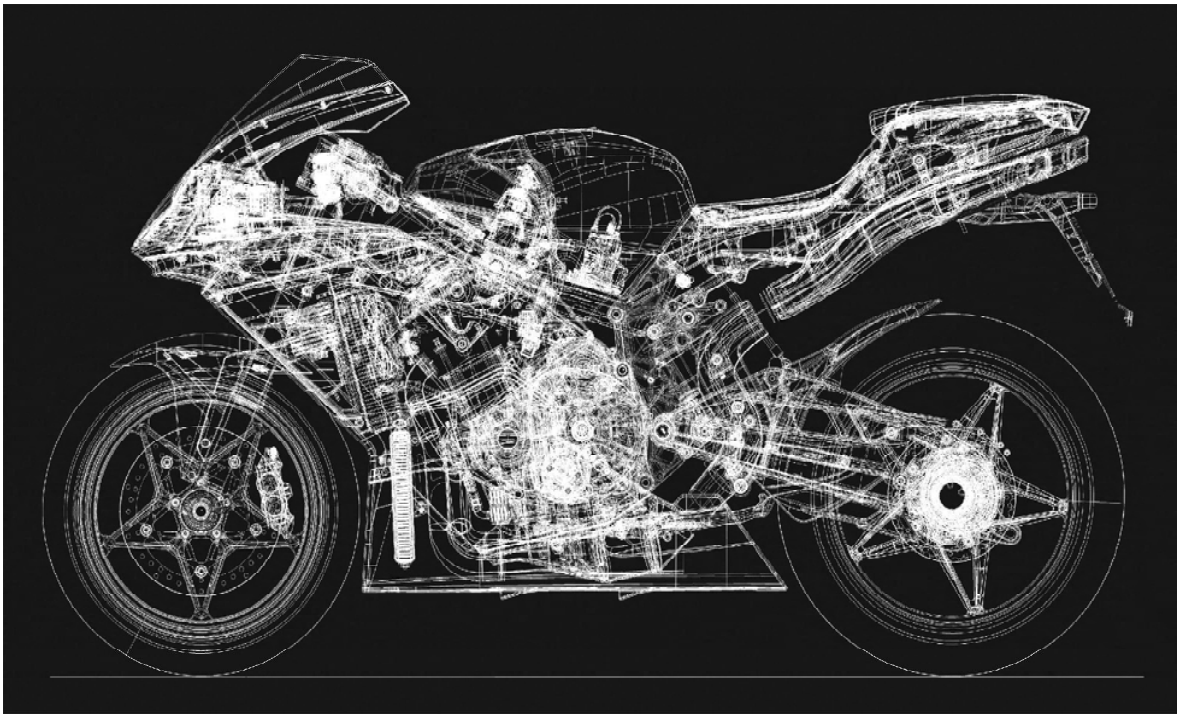
• Pre-load the bolts to the torque of 5 Nm
• Intermediate tightening to the torque of 20 Nm
• Final tightening by turning clockwise of 90° (1/4 of turn).



CONNECTING ROD SCREW TIGHTENING TORQUE	
Operation	Value
Pre-load	5 Nm
Intermediate tightening	20 Nm
Final tightening	90°



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E

SECTION E

REVISION 1

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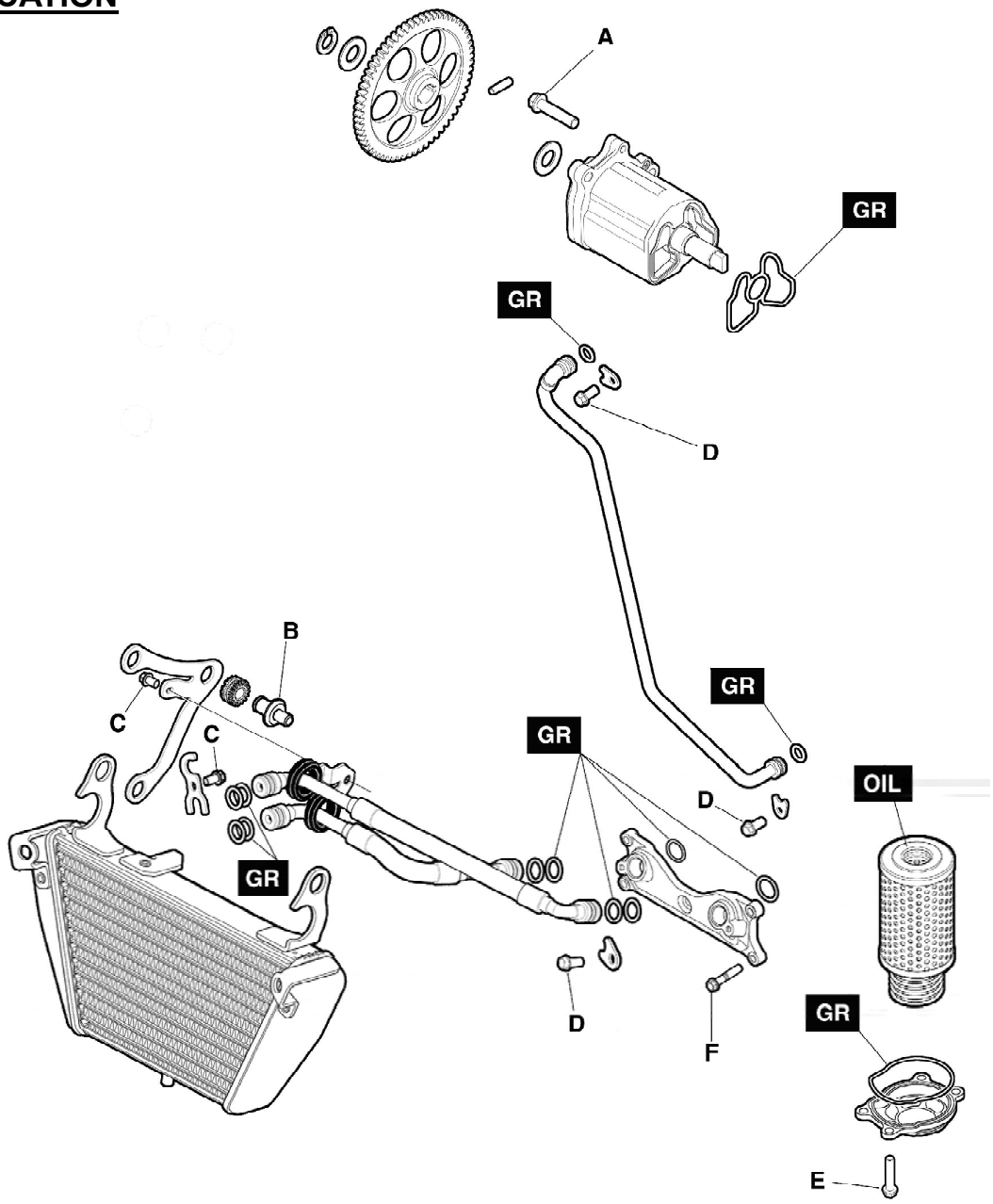
SUMMARY

OIL PUMP ..... PAG. 4
LUBRICATION COMPONENTS: OIL RADIATOR ..... PAGE 6
LUBRICATION COMPONENTS: HEAD DELIVERY CONDUCT ..... PAGE 9
LUBRICATION COMPONENTS: OIL TUBING SUPPORT PLATE ..... PAGE 10
OIL FILTER REPLACEMENT ..... PAGE 11
LUBRICATING CIRCUIT SCHEME ..... PAGE 14

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LUBRICATION

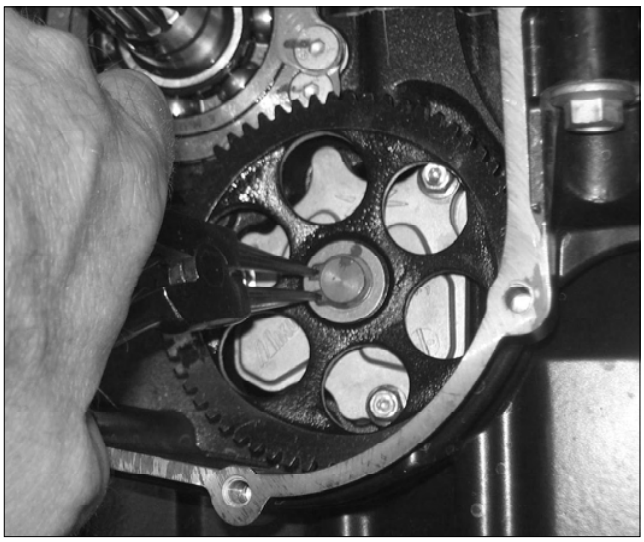


		A	B	C	D	E	F	G	H	I	L
Tightening torque	Nm	8	12	8	10	10	10				
Thread blockers		medium			medium	medium					

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

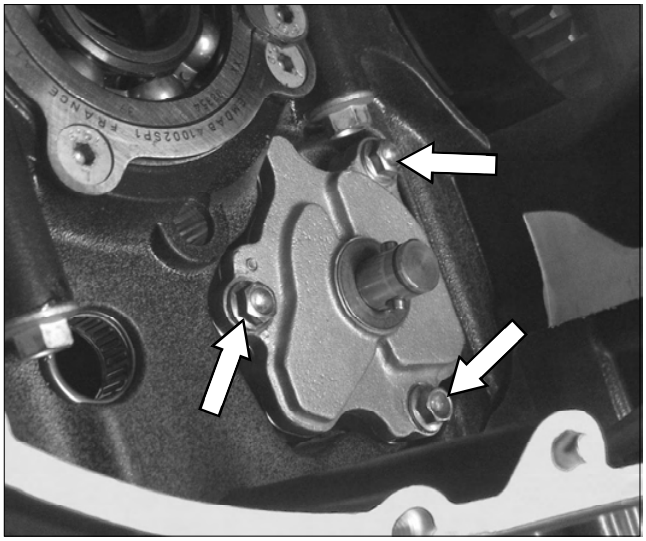
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Oil pump
Remove the clutch and the gear as described in the relative paragraphs.
Remove the seeger and the oil pump gearing.



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Remove the 3 tightening screws.



Push the oil pump shaft from the gear end and slide the oil pump body from the clutch end.



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NOTE **The oil pump does not require maintenance. Do not take the oil pump apart. Any attempts to take the components of the water pump apart will invalidate the guarantee.**

If necessary, replace the oil pump with a new one available to rechange

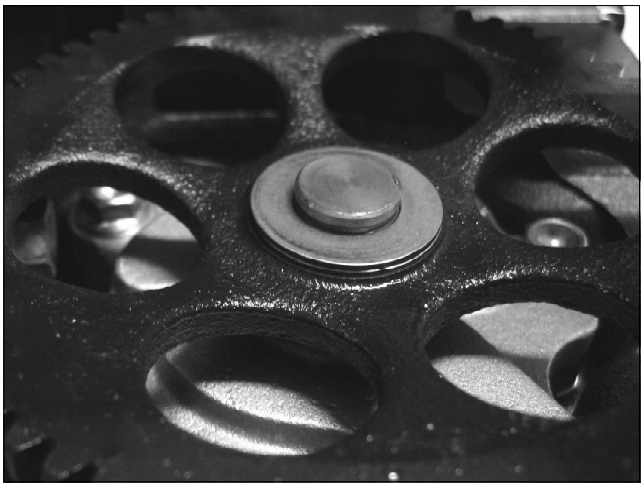
Grease evenly the gasket and put into its seat (prevently cleaned and degreased) on the oil pump.



Insert the oil pump in the crankcase. Tighten the 3 screws at 8 N·m with MEDIUM THREAD BLOCKER carefully degreasing them before reassembly.

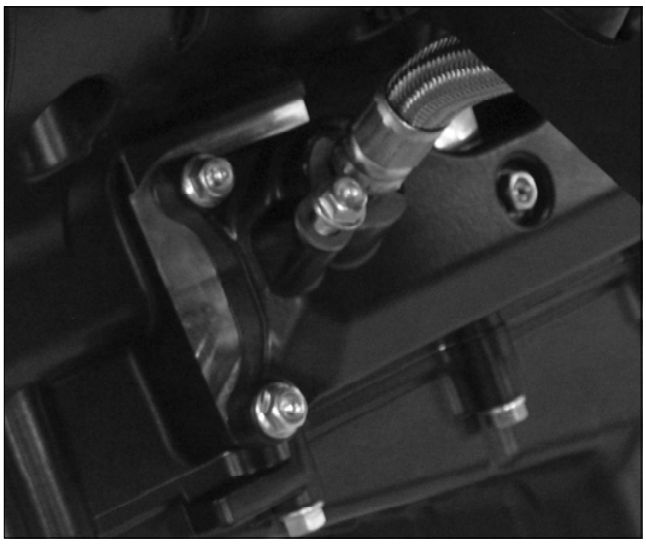


Reassembly the shim washer th..0,5 mm on the oil pump axle, insert the pin, the gear, **the washer th**. 1,5 mm and the seeger ring.



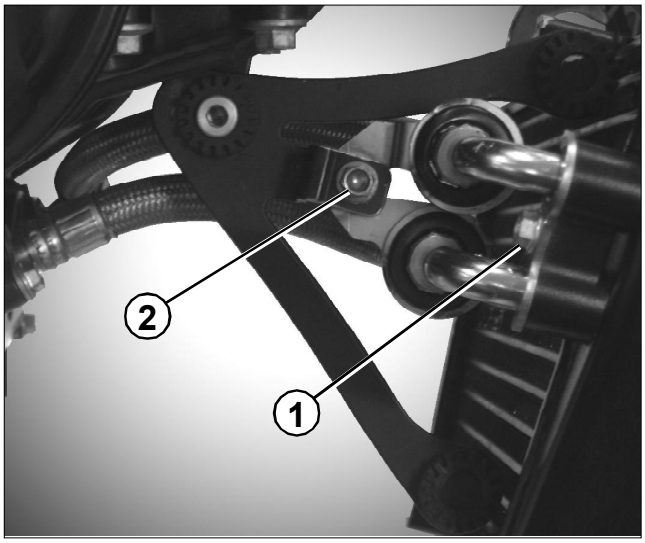
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LUBRICATION COMPONENTS: OIL RADIATOR
Disassembling
undo the fixing screws and remove the plates which retain the hoses to support plate.

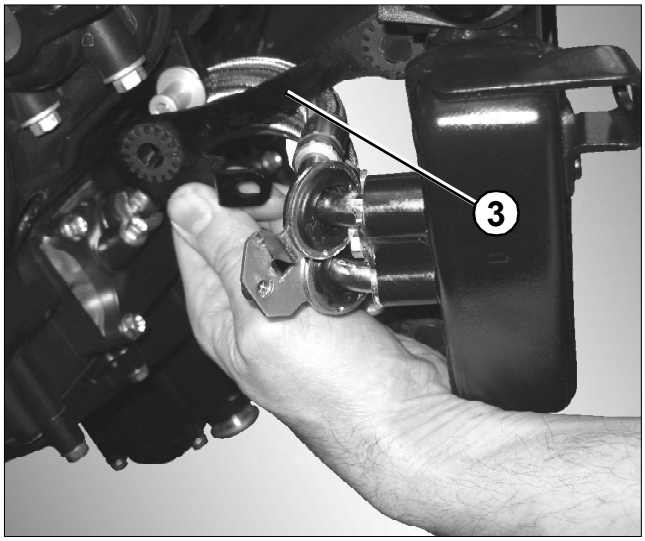


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Loose the screw (1) that fixing the hoses retaining plate and remove the screw (2) for release the hoses guide plate.



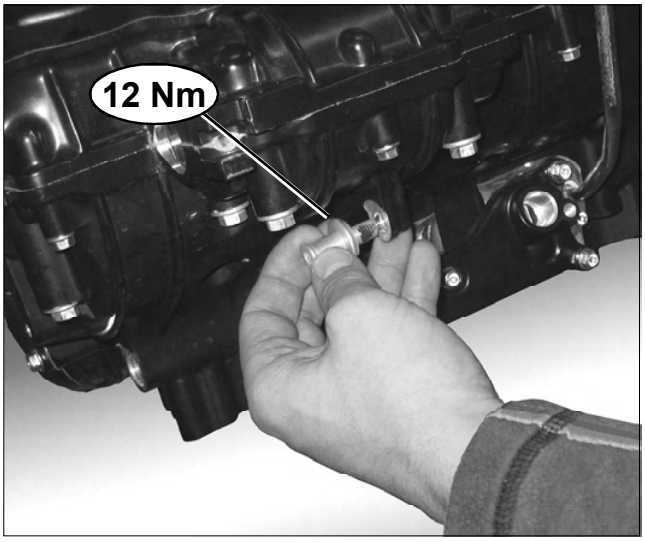
Disconnect the radiator-engine anchoring rod (3) and, sustaining the radiator, slide the hoses out of the support plate.





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Reassembly
If the pin was previously removed, reinsert on thr lower semi-carter and tighten to a torque of 12 Nm with medium thread blocker.



Verify the O-rings placed on the oil delivery conduit for wear and substitute them, if necessary.

When reassembling, grease the O-rings and insert them in the respective seats, preventively cleaned and greased, on the oil hoses.
Grease the two rubbers inside, insert them on the plate and put the plate on the pipes oil.
Insert the oil hoses in the respective seats on the oil radiator, place the hose retaining plates and manually turn the screws without tighten.

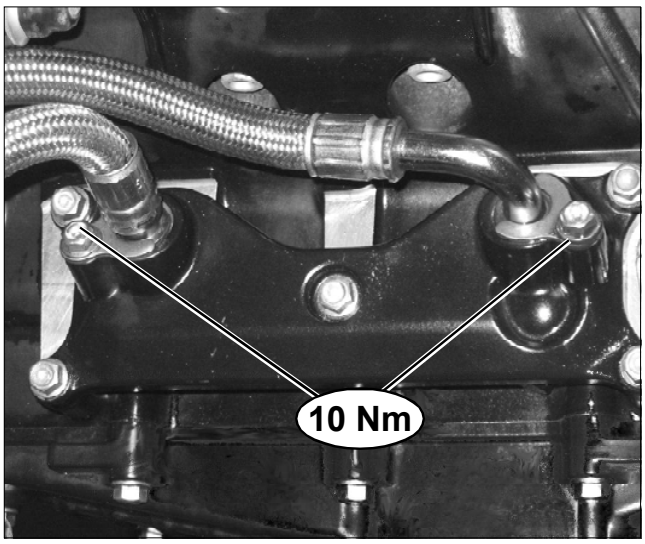




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Insert the hoses into their seats on the support plate, mount the retaining plates and tighten the screws to a torque of 10 Nm with medium thread-blocker.

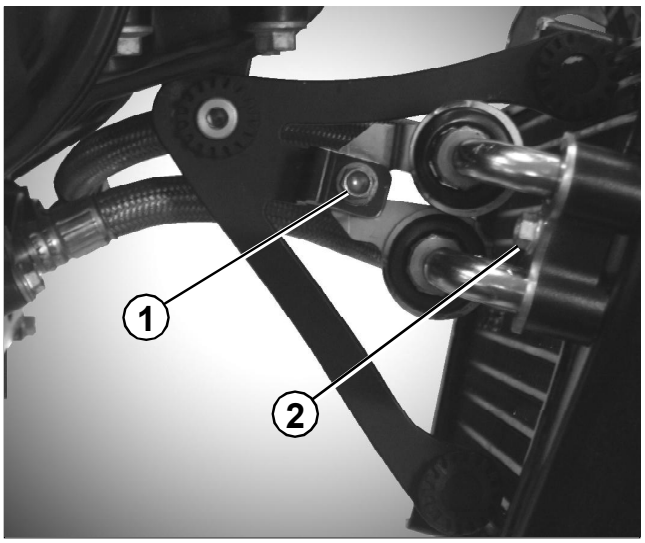




Assemble the holder plate with the thre rubbers on the pin and insert the radiator's pin on the older plate.



Insert the screw (1) that fix the hoses plate to the holder plate and tight to a torque of 8 Nm.
Finally tight the screw (2) that fix the hoses retaining plate to a torque of 8 Nm.

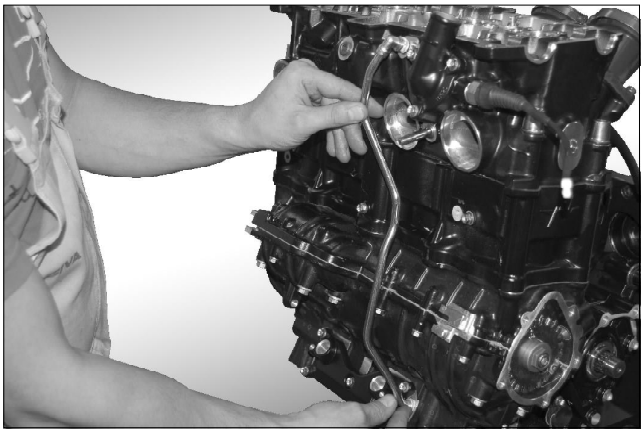


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LUBRICATION COMPONENTS:
Head delivery conduit
Disassembling
Remove the two fixing screws and the plates which retain the head delivery oil pipe



Slide the head delivery.



Reassembly
Verify the O-rings placed on the oil head delivery conduit for wear and substitute them, if necessary. When reassembling, grease both O-rings and position the upper part of the conduit in the seat arranged within the head and the lower part of the counduit in the seat arranged in the lower semi-carter. Place the pipe retaining plates as indicated in figure and tighten the upper fixing screw of the oil head delivery conduit to a clamping torque of 10 Nm.

Carry out the same operation for the lower fixing screw by tightening it to a clamping torque of 10 Nm.



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LUBRICATION COMPONENTS:
OIL TUBING SUPPORT PLATE
Disassembling
Undo the five fixing screws and remove the plate



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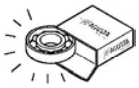
When reassembling, clean accurately the surfaces of the oil piping support plate.
Verify the two O-rings placed in the back part of the oil tubing support plate for wear and substitute them, if necessary.Grease the O-rings before reassembling the plate.



Position the plate on the base and fix it by using the five screws, tightening them to a clamping torque of 10 Nm.

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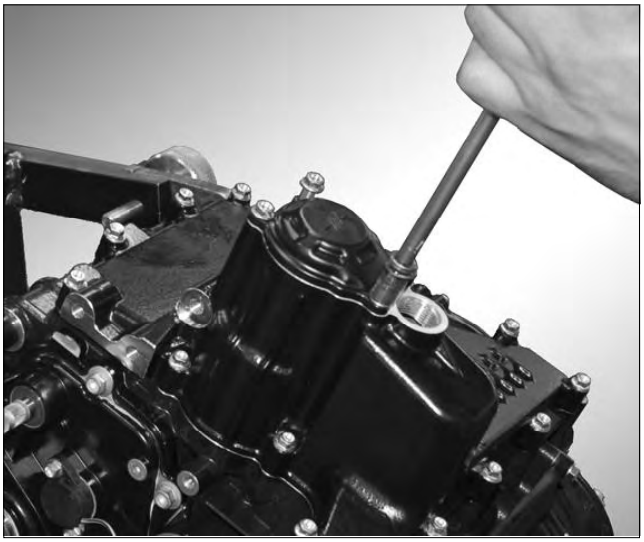
OIL FILTER REPLACEMENT
Take the oil filter out from the new engine oil filter kit



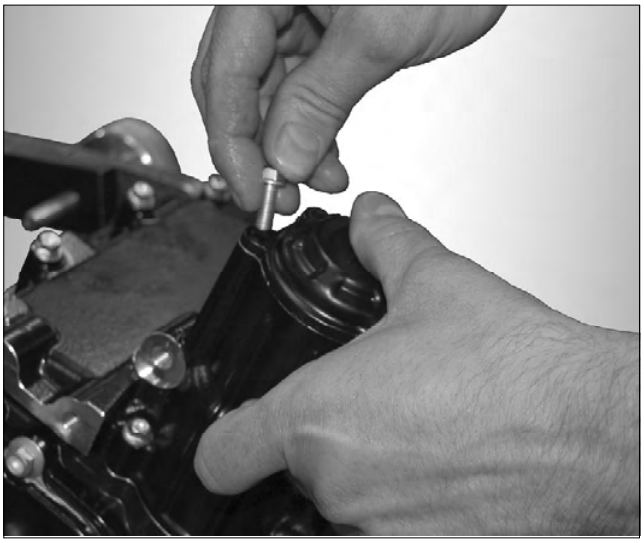
Oil filter kit: **Part. Code 8000B3439**

Use only original components of MV Agusta.

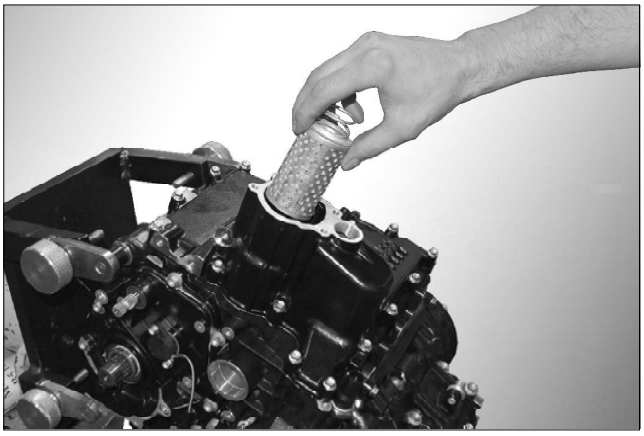
Loosen the four screws of the oil filter cover



Remove the four screws applying a light pressure on the cover in order to oppse the spring action.

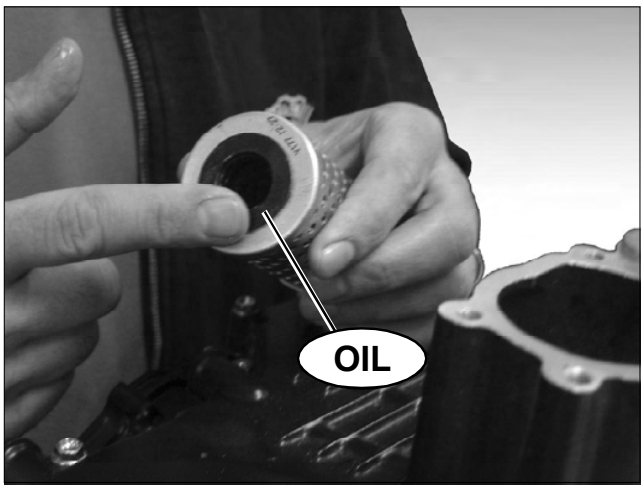


Remove the cover and the seal ring and extract the engine oil filter.



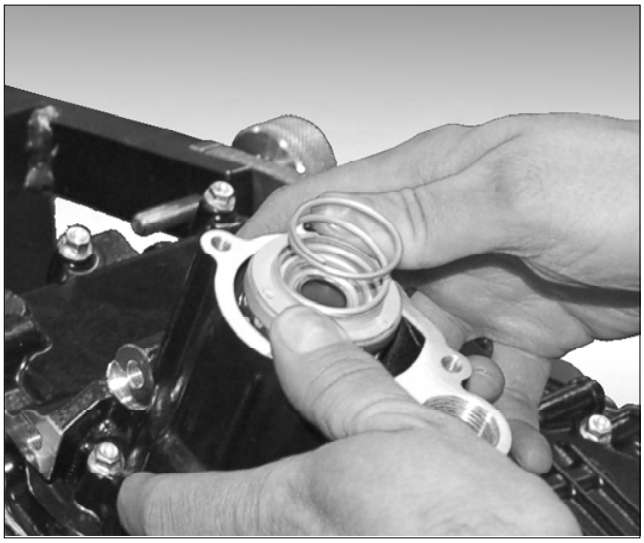
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Lubricate the gasket on the filter with engine oil.

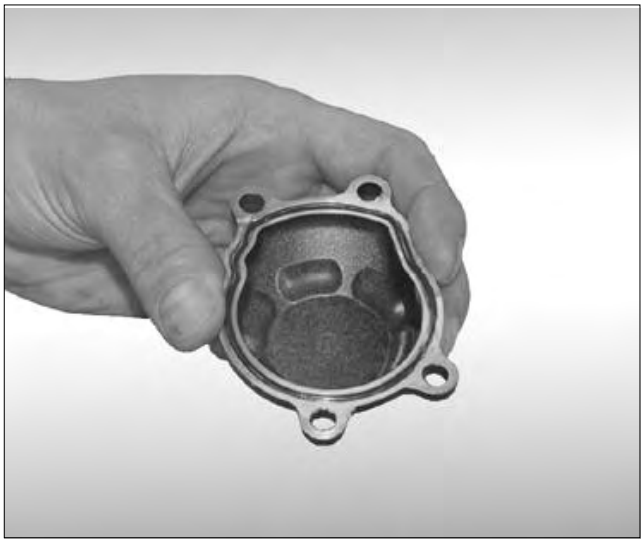


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Insert the filter in its seat.

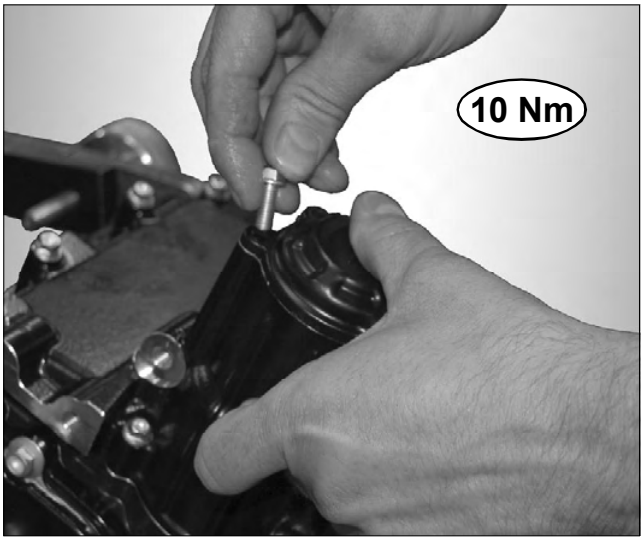


Lubricate evenly the seal ring with grease and mount it in its seats on oil filter cover.

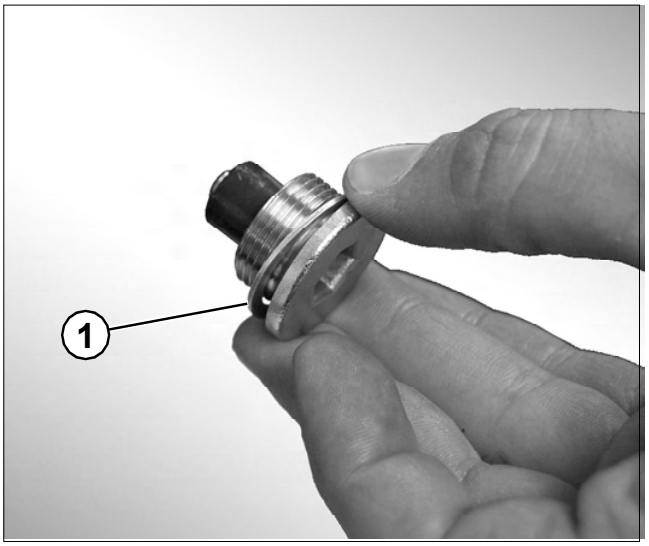


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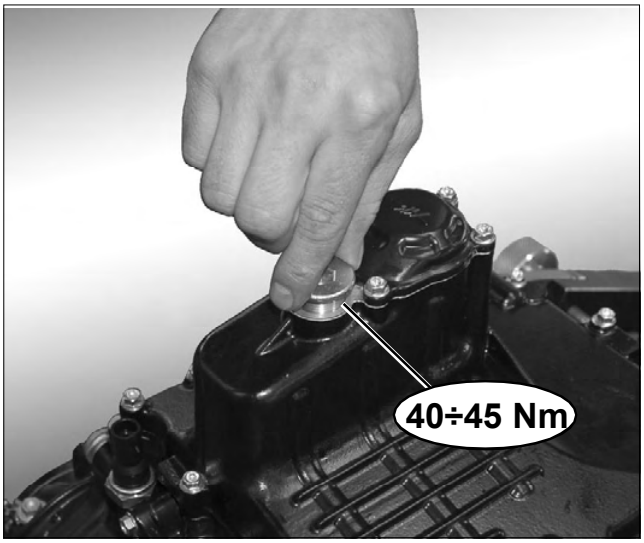
Mount the oil filter cover maintaining it in beat with the sump and insert the screws by hand.
Tighten the four screws to a torque of 10 Nm.



Clean the oil discharge plug from possible metal residues and degrease accurately the thread.
When reassembly use a new sealing washer (1) available to rechange.

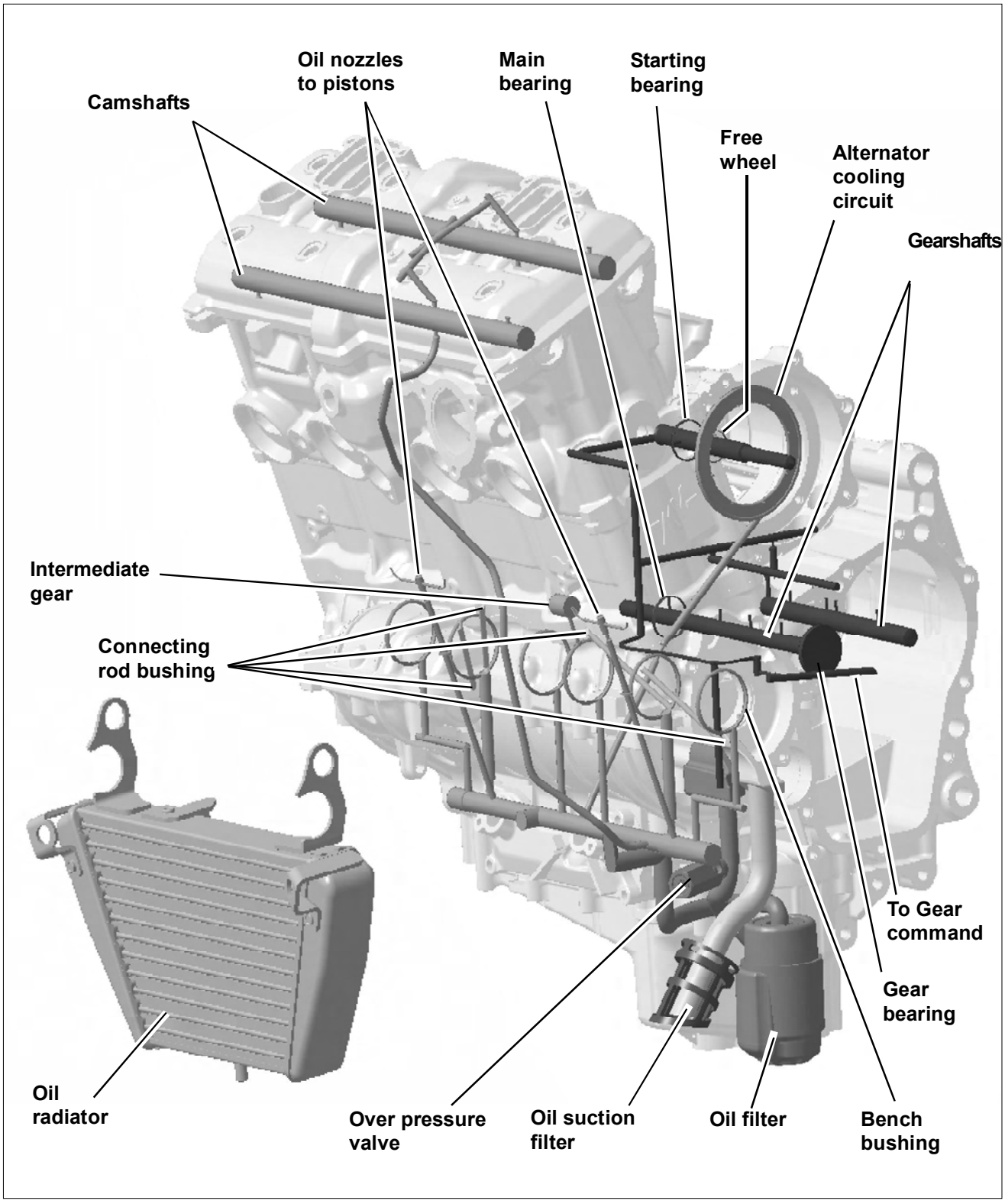


Insert the oil discharge plug and tighten to a torque of 40÷45 Nm.

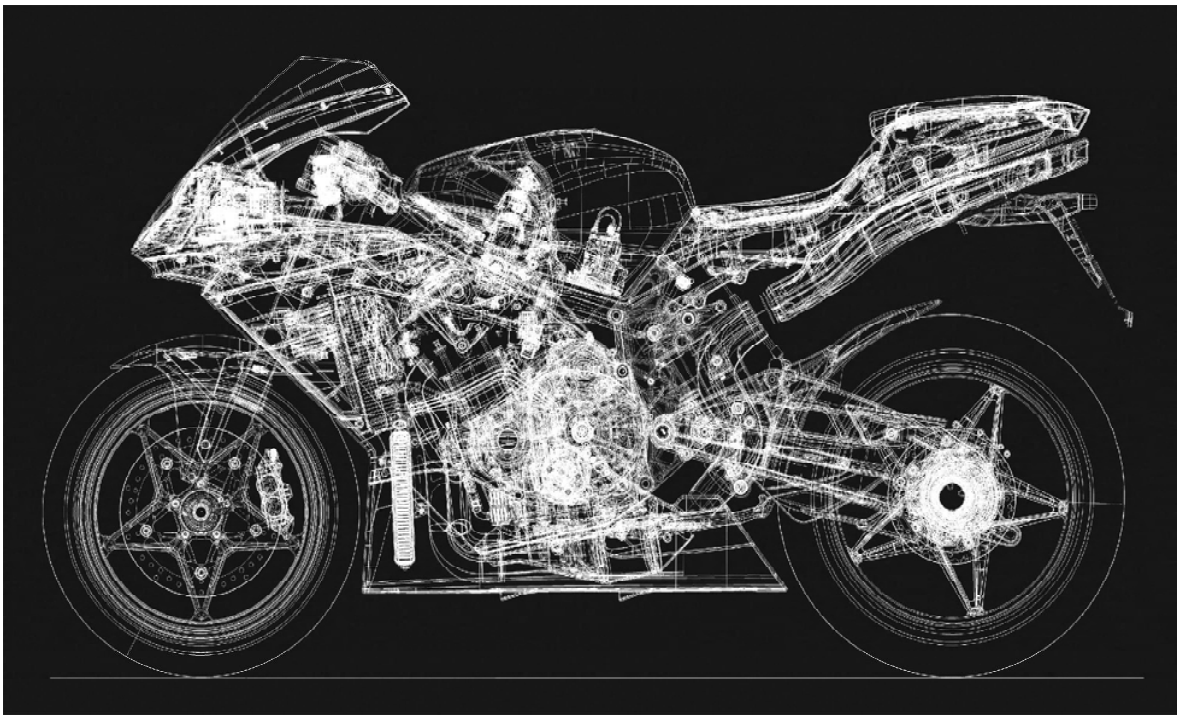


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In the scheme below are indicated the components of the lubricating circuit and the oil run



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F

SECTION F

REVISION 0

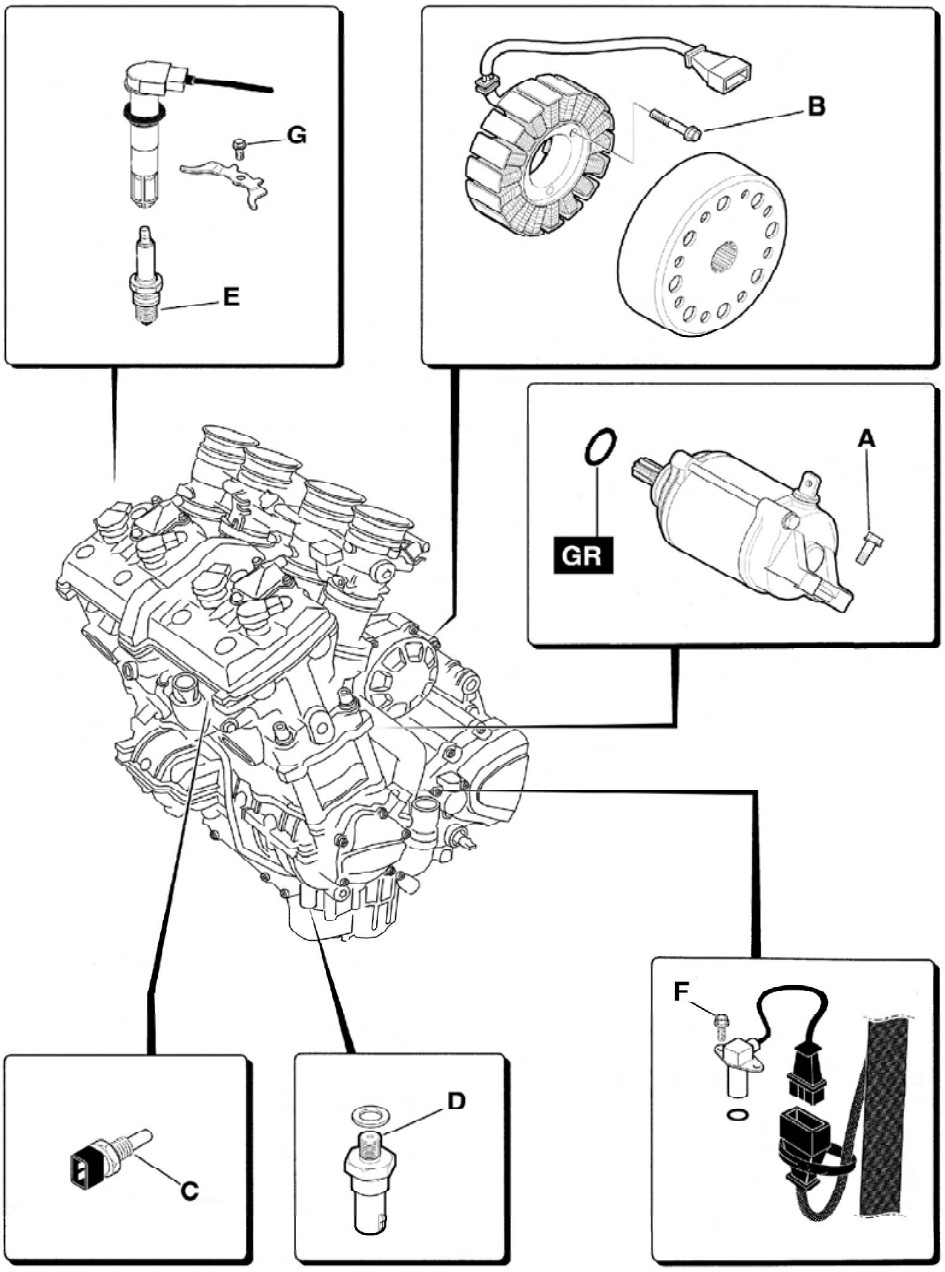
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ELECTRICAL COMPONENTS ..... PAG. 3

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ELECTRICAL COMPONENTS

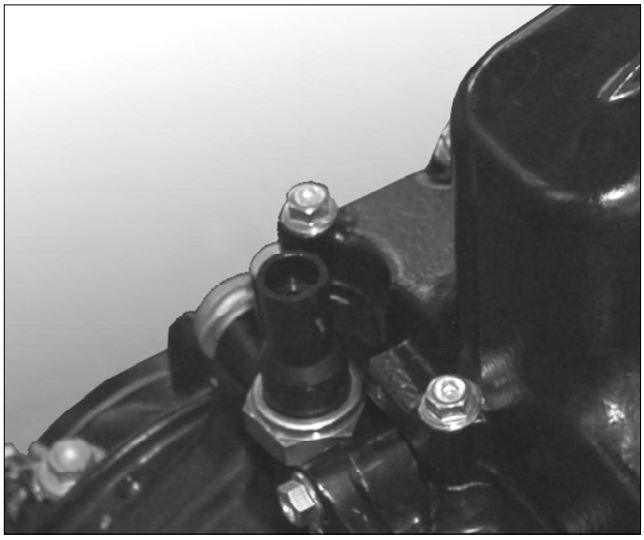


Tightening torques		A	B	C	D	E	F	G	H	I	L
	Nm	10	10	22	22	12	6	8			
Thread blockers		medium	medium	medium	medium		medium				

OIL	Apply motor oil	**NO OIL**	Do not apply neither oil nor other types of substances
GR	Apply grease	**SS**	Apply silicone sealing
HSC	Apply HSC Molikote	**M**	Apply mastic for gaskets

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Engine oil pressure sensor
Remove the connector and check (with the engine off) that there is no continuity between the pole of the sensor and the engine mass.
Otherwise, replace the sensor.
Apply a medium strength thread-locking compound on the thread of the sensor and tighten to a torque of 22 Nm.



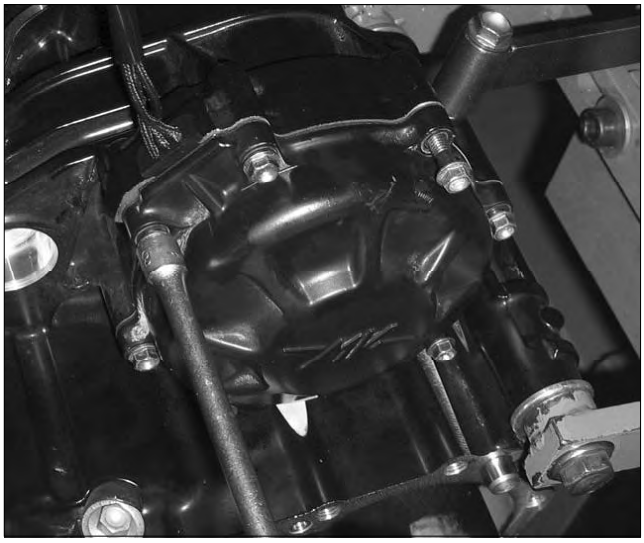
F

Alternator
- Check:
  For this operation it is sufficient to disconnect the connector of the alternator from the system.

  Switch the tester to Ohm and check that when the poles are connected two by two, there is an impedence of 0.2 Ohm

  Switch the tester to continuity and check that there is no continuity between each pole and the engine mass.

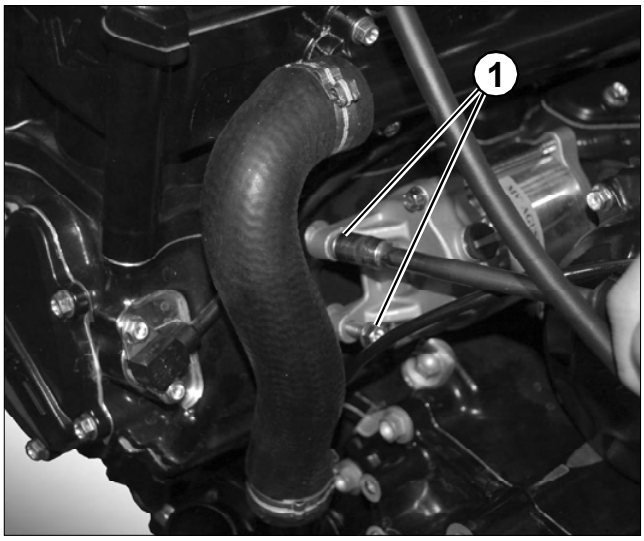
- Removal and Assembly:
  Refer to the information given in section D on page 28 of this manual.



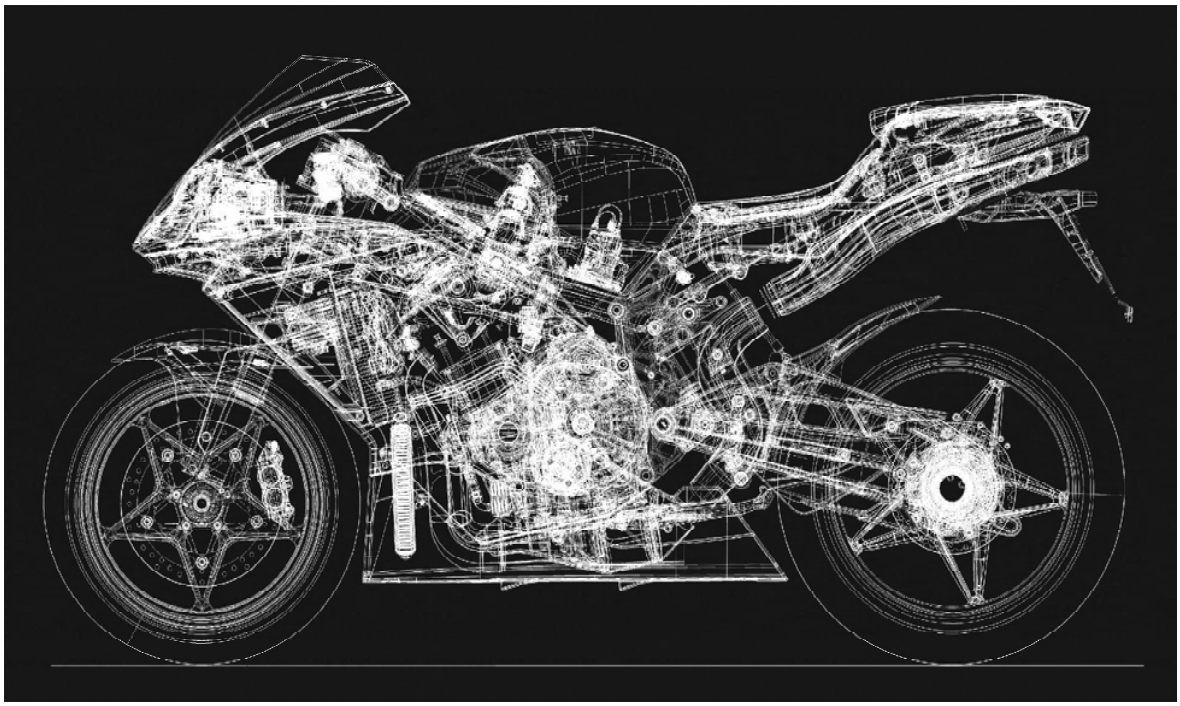
Starter motor
- Check:
  Using the tester, check that there is continuity between the positive pole and the engine mass. Otherwise replace the starter.

- Removal:
  Remove the two fixing screws (1). Pull out the starter motor, taking care not to damage the O-Ring on the shaft.

- Assembly:
  Evenly grease the O-ring and re-assemble to the shaft.
  Re-assemble the starter motor on the engine block. Insert the two screws (1) by hand, then tighten to the prescribed torque.



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SECTION G

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TIGHTENING TORQUES ..... PAGE 3

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TIGHTENING TORQUES TABLE

DESCRIPTION	Nm	Thread blockers
HEAD		
Camshaft and gear screws	21	strong
Sliding block distribution screws	8	medium
Stand screws	12	
Valve cap and Reed cover screws	10	
Head tightening nuts	50 (35+15)	
Chain tightening screws	10	
Exhaust pipes stud bolts	36	
Spark plug coil screws	8	
Chain tightening cap	12	
CLUTCH		
Clutch nut	140	medium
Disk thrust plate screws	10	
GEAR SHIFT		
Pinion nut	140	medium
Gear selection drum tightening screws	25	medium
M6 gear control screws	8	medium
CRANKCASE ACCESSORIES		
Alternator tightening screws	25	
Motor starter tightening screws	10	
Water pump tightening screws	8	
Neutral switch screws	10	
FREE WHEELSTARTING		
Frre wheel axle fixing plate screw	10	medium
Rotor fixing nut	65	strong
M6 starting flange tightening screws	10	medium
SUMP		
Oil drain Plug	40	
Sump tightening screws	10	

TIGHTENING TORQUES: CONVERSION FACTOR
To convert a tightening torque, refer to the following table.

	Nm	Kgm	ftlbs
Nm	------	0,10197	0,7375
Kgm	9,807	------	7,233
ftlbs	1,3559	0,13826	------

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TIGHTENING TORQUES TABLE

DESCRIPTION	Nm	Thread blockers
CRANKCASE		
M6 clutch cover screws	8	
M6 starting bearing screw	12	medium
M6 main bearing screw	10	medium
M8x80mm fixing screws	10+ 45°	
M8x50mm fixing screws	10+ 40°	
M8 fixing screws	25	
Plate screws for oil radiator connectors	10	
Inlet/outlet connectors for radiator oil	21	medium
CONNECTING ROD		
Cap screws	(*)	

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(*) See assembling notes

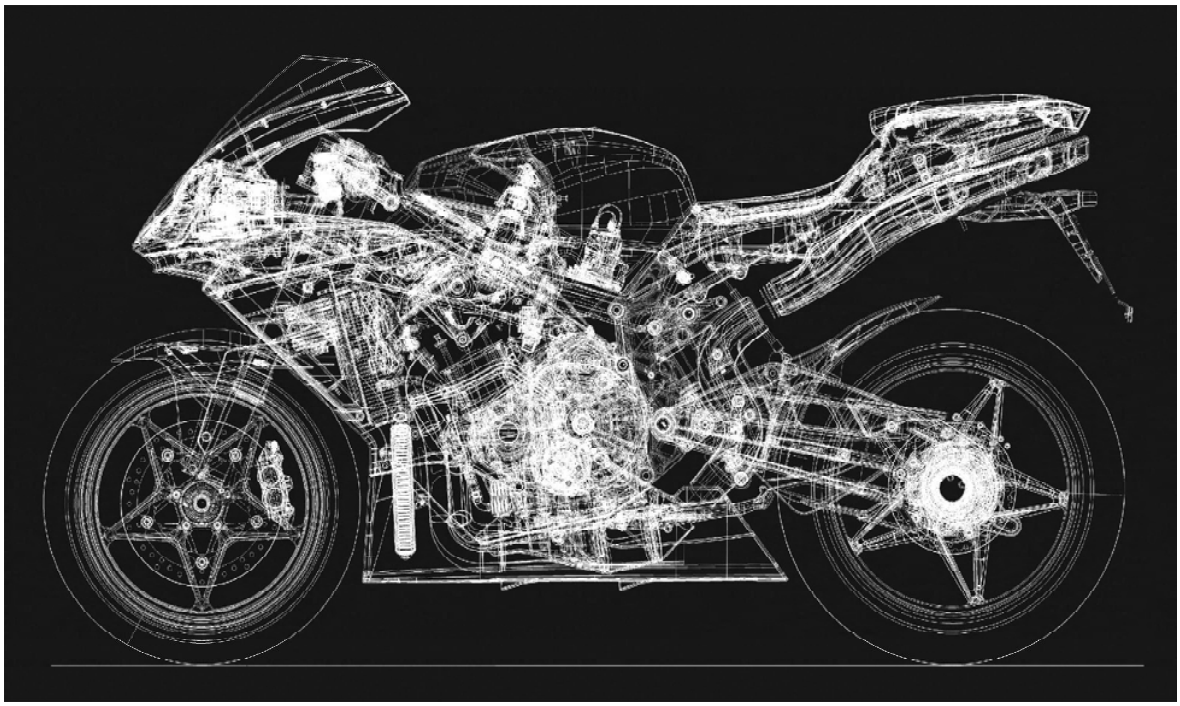
STANDARD TORQUES
If not otherwise specified, for tighten refer to the torque values indicated in the table below.

Thread Diameter	Tightening torque		
	Kgm	Nm	ftlbs
M5	0,6 ÷ 0,8	6 ÷ 8	4,34 ÷ 5,79
M6	0,8 ÷ 1,0	8 ÷ 10	5,79 ÷ 7,23
M8	2,4 ÷ 2,6	24 ÷ 26	17,36 ÷ 18,8
M10	4,2 ÷ 4,5	42 ÷ 45	30,38 ÷ 32,55

TIGHTENING TORQUES: CONVERSION FACTOR
To convert a tightening torque, refer to the following table.

	Nm	Kgm	ftlbs
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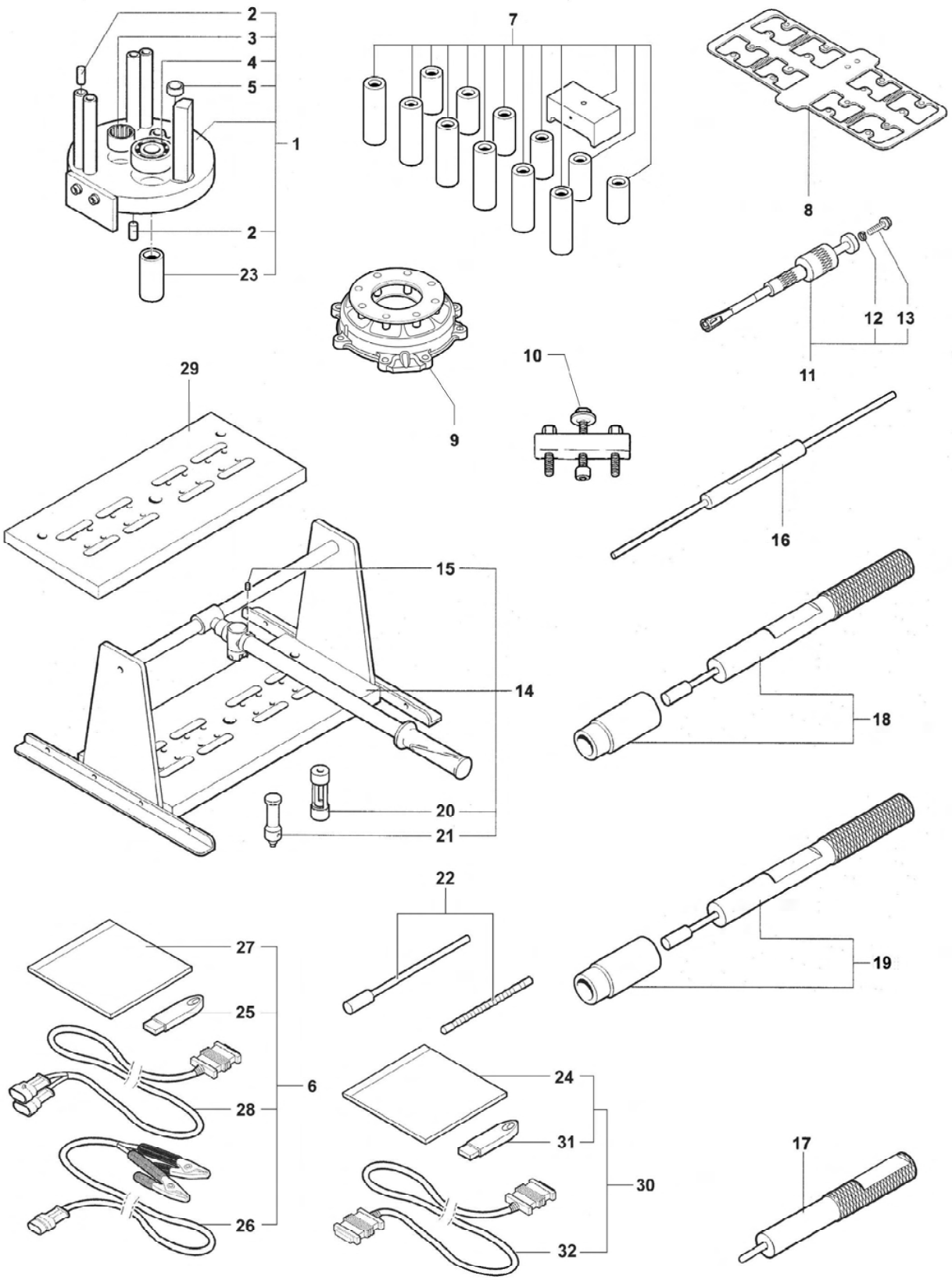


SECTION H

REVISION 0

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H



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N.	Code	Q.ty	Note	F4 1000	DESCRIPTION
1	8A0094792	1		•	CHANGE GEAR ASSEMBLY TOOL
2	800086119	8		•	DOWELBUSH
3	8000A1087	1		•	BEARING
4	800098405	1		•	BEARING
5	800087300	1		•	BEARING
6	8A00A5394	1	❶	•	DIAGNOSTIC SOFTWARE
6	8B00A5394	1	❷	•	DIAGNOSTIC SOFTWARE
7	8000A3406	1		•	PISTON PROJECTION MEASURING TOOL
8	800094797	1		•	HEAD COVER SHAPED PLATE
9	8000B4304	1		•	FREE WHEEL BLOCKING TOOL
10	8000B4305	1		•	FREE WHEEL EXTRACTOR
11	800094798	1		•	VALVE RUBBER RINGS TOOL
12	62N115538	1		•	SPRING WASHER
13	8C0069056	3		•	SCREW M8X30
14	800094796	1		•	VALVES ASSEMBLY/DISASSEMBLY TOOL
15	800051521	2		•	CONTROL PAD
16	800095429	1		•	TAMPONE CONTROLLO
17	800095581	1		•	VALVE SEAL ASSEMBLY TOOL JOINTS
18	8000A2385	1		•	EXHAUST GUIDE ASSEMBLYPAD
19	8000B4368	1		•	INLET GUIDE ASSEMBLYPAD
20	800095179	1		•	HALF-CONES DISASSEMBLYTOOL
21	800095180	1		•	HALF-CONES ASSEMBLING TOOL
22	8000A2625	1		•	BROACH FOR VALVE GUIDE
23	8A00B2859	1		•	PIPE D39-d27,2-L74,5
24	8000B2118	1	❶	•	POWER UNIT SOFTWARE CD-ROM
24	8A00B2118	1	❷	•	POWER UNIT SOFTWARE CD-ROM
25	8000A7688	1		•	USB KEY
26	8000A5393	1		•	INTERFACE CABLE
27	8C0093878	1	❶	•	DIAGNOSTIC SOFTWARE CD-ROM
27	8D0093878	1	❷	•	DIAGNOSTIC SOFTWARE CD-ROM
28	8000A7689	1		•	SERIAL/USB ADAPTER
29	8000A9639	1	❸	•	BASE PLATE
30	8000B2114	1	❶	•	POWER UNIT PROGRAMMING SOFTWARE
30	8A00B2114	1	❷	•	POWER UNIT PROGRAMMING SOFTWARE
31	8000B2116	1		•	USB KEY
32	8000B2117	1	❶	•	SERIALCABLE
32	8A00B2117	1	❷	•	SERIALCABLE

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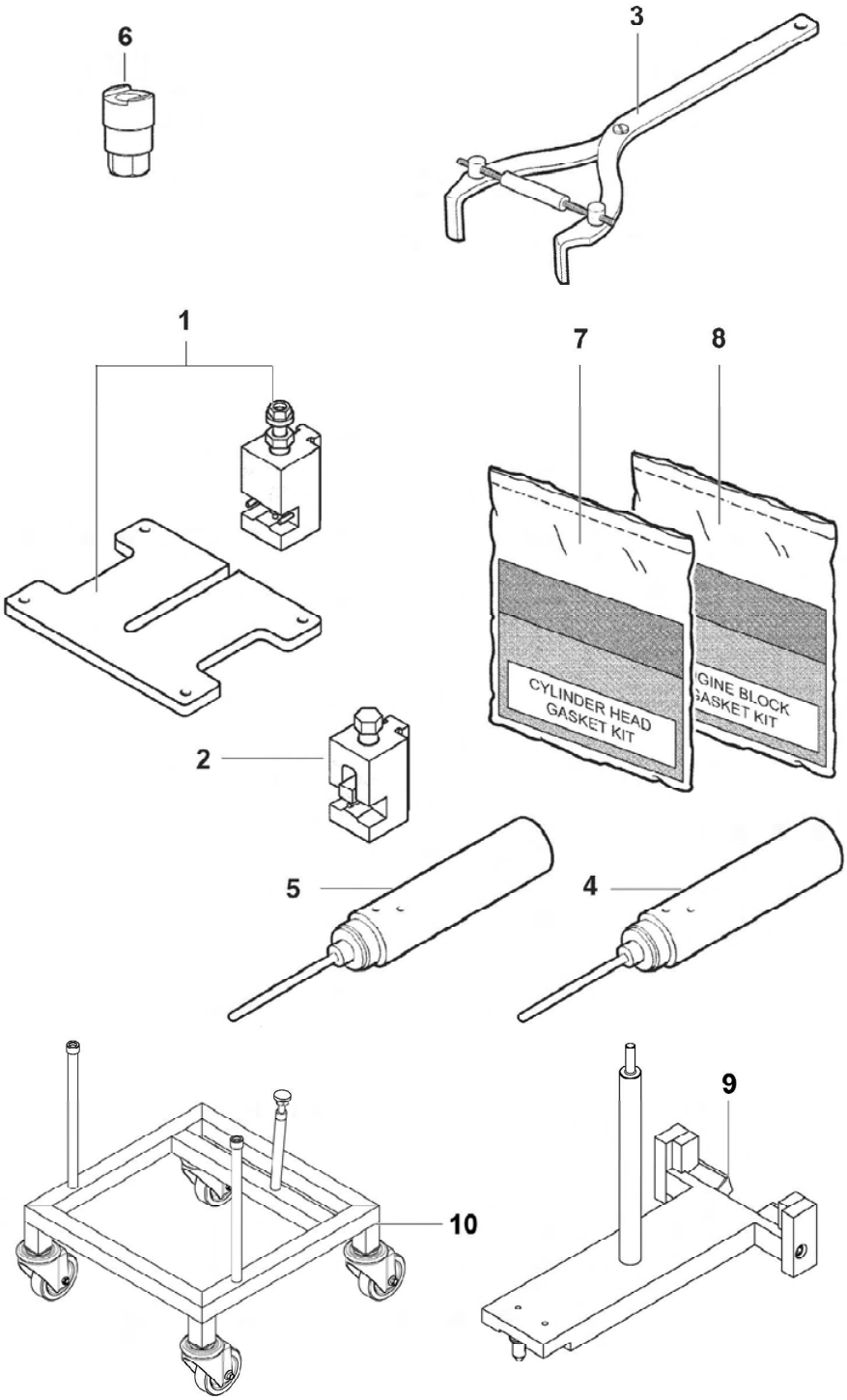
❶ **Windows 98 version**

❷ **Windows Vista version**

❸ **To be used with part number No. 14 (Code No. 800094796)**

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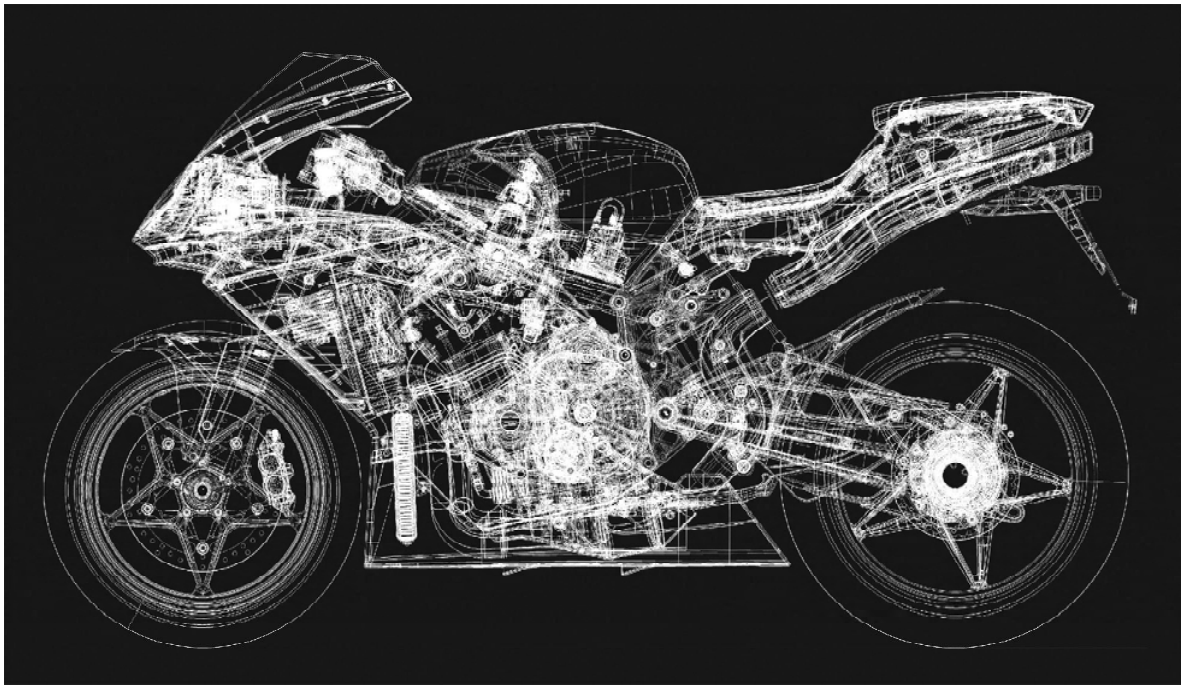
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N.	Code	Q.ty	Note	F4 1000	DESCRIPTION
1	8000A2281	1		•	TIMING CHAIN CUTTING TOOL
2	8000A2280	1		•	TIMING CHAIN MOUNTING TOOL
3	800079015	1		•	CLUTCH BLOCKING TOOL
4	800095318	1		•	PAD FOR EXHAUST VALVE SEAT
5	800095319	1		•	PAD FOR INTAKE VALVE SEAT
6	8000B2051	1		•	EXHAUST SUPPORT SCREW FIXING TOOL
7	8000B4309	1		•	CYLINDER-CYLINDER HEAD GASKET KIT
8	8000B4310	1		•	ENGINE-BLOCK GASKET KIT
9	8000B4414	1		•	FUEL TANK BRAKET
10	8000B4417	1		•	ENGINE MOUNTING SUPPORT

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I

SECTION I

REVISION 0

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I

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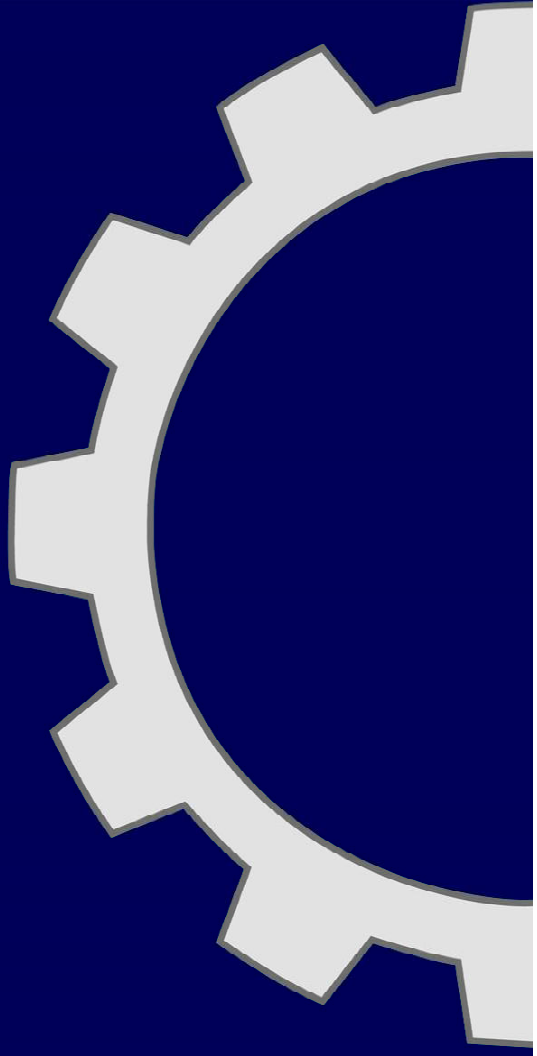
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Via Giovanni Macchi, 144 - 21100 Varese (VA) ITALY
Tel. (Italy) 800.36.44.06 - (abroad) ++39 0332 254.712
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