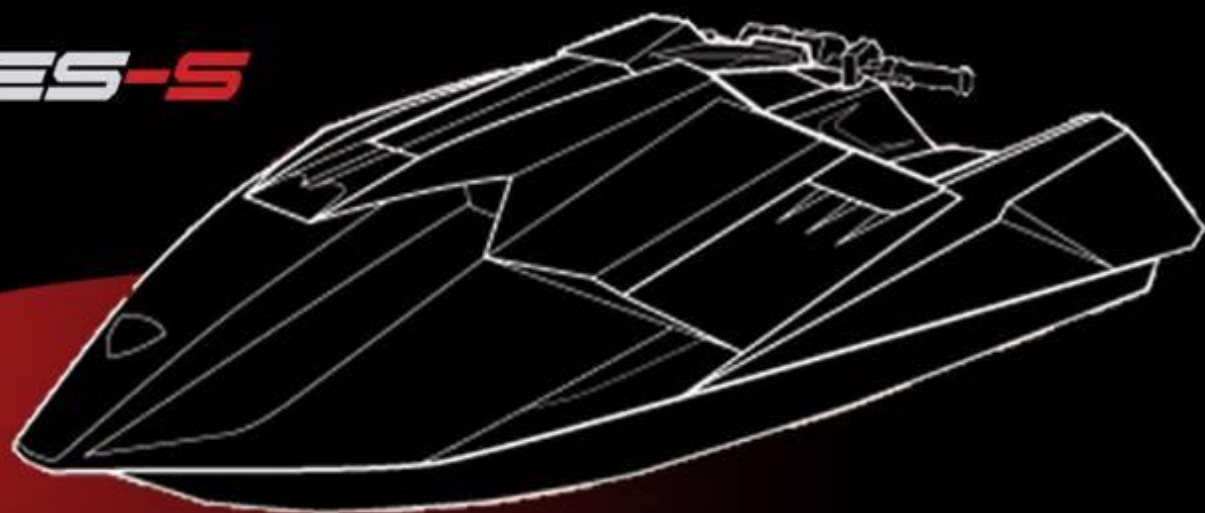




HSR-BENELLI
MOMENTS BEFORE FLYING

SERIES-S



SERIES-R



SERVICE MANUAL 2008



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1 *GENERAL INFORMATION*





1. General Information

1.1 Introduction

This manual contains an introductory description of the **HSR-Benelli Series-R** and **Series-S** Personal Water Craft (PWC) together with the procedures for control/intervention and revision of the main components. It is designed primarily for use by trained mechanics in a properly equipped workshop. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. All adjustments, maintenance, and repair should be carried out only by qualified mechanics in accordance with this service manual.

* The present manual has been prepared on the basis of state-of-the-art specifications valid at the date of publication. In the case of modifications carried out after this date, differences may exist between the contents of the manual and the PWC under review.

* The illustrations in this manual are used to highlight the fundamental principles and procedures of basic interventions. They may not show exactly the PWC in your possession.

SYMBOLS

Whenever you see these ATTENTION symbols, heed their instructions!
Always follow safe operating and maintenance practices.



ATTENTION - Be aware that you will find death or serious injury, in case the instructions are not observed.



WARNING - Possibility of lesions in case the instructions are not observed.

NOTE - The aim of this message is trying to avoid any damages to the vehicle, things or environment.





OILING - Indicates the type of oil to use.



TIGHTENING - Indicates the correct tightness value to carry out.



SPECIFIC VALUE - indicates the specific value using precision instruments.



SPECIFIC INSTRUMENTS - indicates the specific instruments to use.





1.2 Service guidelines

1.2.1 Safety Warnings



ATTENTION:

Clean inside and outside of watercraft prior to servicing.

Clean all parts before installing.

Always use a service apron to prevent damage to foot well and top-deck fiberglass.

Watch for sharp edges which can cause personal injury.

Protect hands and arms when working with sharp components.

Always use a soft-faced hammer and extreme care when removing difficult or stuck components.

Some fasteners are installed with locking agents or lubricants. Use of impact drivers will aid in fastener removal.

Always follow torque specifications located throughout manual.

Fasteners secured with either too little or too much torque may fail and cause severe property damage, injury or death.

Always follow torque sequence patterns when founding this manual.

Tighten each fastener evenly and to the specified torque value, and with specified locking agent.

Always use new gaskets, o- rings and seals, clips, cir- clips, and snap rings when assembling components.

Never reuse self-locking nuts when assembling components.

Never reuse hose clamps when removed from fuel lines. Replace with small gear clamps.



WARNING:

Always use HSR-Benelli authorized lubricants, greases, and locking agents when assembling components. Failure to do so may cause severe engine or vehicle damage.

Always disconnect the black (-) negative cable first from the battery when removing the battery. When installing the battery, attach the red (+) positive cable first, then the black (-) negative cable.

Wear appropriate clothing, eye protection, and rubber gloves when working with batteries. Battery acid contains sulphuric acid and is extremely poisonous. Serious burns can result when in contact with skin, clothing, eyes or internal body components. If battery acid is ingested, drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call a physician immediately. Flush eyes for 15 minutes with water and seek





prompt medical attention if acid comes in contact with eyes. Thoroughly wash affected external body parts that come in contact with battery acid with water.

Keep hands, arms, legs, feet and hair away from rotating parts, hot engine and exhaust components, drive pump and impeller and engine induction when engine is running.

Never attempt engine or driveline inspections and/or repairs without first removing lanyard and battery cables.

Gasoline is highly flammable and explosive under certain conditions.

Always exercise extreme care when handling gasoline.

Do not smoke or allow open flames in or near the area where refuelling is performed or where gasoline is stored.

Always refuel the watercraft outdoors and in a well ventilated area.

Do not fill the tank to the fuel cap.

If you get gasoline or oil on your skin or clothing, wash it off immediately with soap and water and change clothing.

The engine exhaust from this product contains chemicals known to cause cancer, birth defects or other reproductive harm.

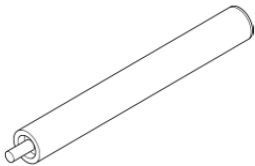
Only run engine outdoors or in a well ventilated area.

Never run the engine for more than 10 seconds without cooling water supply.

1.2.2 Service Tools

	HSR-BENELLI DIAGNOSTIC SYSTEM (Benelli engine version)
	IMPELLER TOOL
	FLYWHEEL PULLER



	T.D.C. MEASURER
	TRANSMISSION GEAR PULLER
	GEAR NUT REMOVAL TOOL
	COUPLER REMOVING TOOL
	VALVE OIL SEAL REMOVING TOOL
	OIL REMOVING TOOL



1.2.3 Operating materials



WARNING:

Using of not recommended operating materials causes damage to the engine and voiding of the warranty.

- **Fuel**

- Super petrol unleaded DIN 51607, Octane between 95 and 98 ROZ/85 MOZ.
- US premium Unleaded gasoline (91/92/93 Octane) or 95/98 ROZ ISO 5146.

In case of emergency, unleaded fuel with 91 ROZ [RON] or 82.5 MOZ [MON] may be used for a short time.



ATTENTION:

Lower-quality fuels could only be used in case of emergency. If used regularly, they cause decreases in performance and possibly damage to the engine.

- **Recommended lubricants**

LUBRICANT	SPECIFICATIONS	Series-S	Series-R
Engine Oil specification	HSR-Benelli engine oil 10w60, ACEA, A3/B3/B4, API SL		
Engine Oil Filling volumes	Initial filling (completely dry system)	2,3 litres	2,7 litres
	Oil change without changing filter	1,7 litres	2,1 litres
	Oil change with filter	2,0 litres	2,4 litres





LUBRICANT	SPECIFICATIONS	Series-S	Series-R
Transmission oil	Lubricated by Engine oil system - HSR-Benelli engine oil 10w60, ACEA, A3/B3/B4, API SL	see engine oil volumes	see engine oil volumes
Coolant	Permanent type of antifreeze based on monoethylene glycol, GREEN, freezing point < -38°C	Total amount: 2,5 litres	Total amount: 3,0 litres
Trim system liquid	Brake fluid DOT4		

1.2.4 Engine Brake-In



WARNING:

HSR-BENELLI recommends not to operate the engine over 6,000 r/min [RPM] during first five hours of operation. This protective braking-in has a positive effect on the engine's lifespan.

1.2.5 Operating the engine on vehicle outside of water



WARNING:

If PWC is outside of water its engine may be operated at idle speed only for maximum of 30 seconds. Never run the engine for more than 30 seconds without cooling water supply.

If it is necessary to operate the engine longer than 30 seconds on vehicle out of water, the flushing equipment must be used.

Use flushing system to operate vehicle out of water

An auxiliary cooling supply may be used if the watercraft cannot be operated in water during adjustments.

If possible, always operate the watercraft in water rather than use an auxiliary cooling supply.

See chapter *Maintenance – Flushing system connection*.



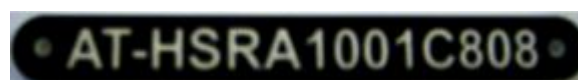


1.3 Unit identification

1.3.1 HSR-BENELLI Personal Watercraft Identification Numbers

The engine Serial number and VIN number are used to register the watercraft. They are unique numbers that distinguish each watercraft from others of the same model. If the watercraft is ever stolen these numbers will help identify it. The owner should keep a record of these numbers in a place other than the watercraft

1.3.2 VIN number



AT : Manufacturing Country

HSR : HSR-BENELLI

A: Model Code

1001: Sequential Serial Numbers

Production Month: **C** (Month code)

Production Year : **8**

Model Year : **08** (Model year : **8** = 2008)

You will find the serial number at the right rear side of your PWC

1.3.3 Engine number

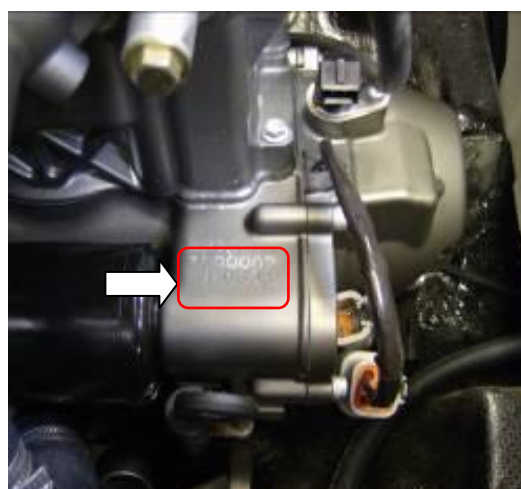
Number is beside the starter motor.

Engine Number:

BH33 Engine Type

000001 Serial Number

JJ808 Model and Year Code





1.3.4 Three stars – ultra low emission

The three-star label identifies engines that meet the Air Resources Board's Personal Watercraft and Outboard marine engine 2008 exhaust emission standards. Engines meeting these standards have 65% lower emissions than One Star – Low Emission Engines.



1.3.5 Safety instructions



For Series-S ONLY

Safety Instructions sticker is placed under the handle pole on the Series-S models.



For Series-R ONLY

Safety Instructions sticker is placed on the Luggage Cover on the Series-R





1.4 General specifications

1.4.1 General data

2009 HSR-BENELLI

Series – S	Series - R
Length: 2,32 m	Length: 3,23m
Width:..... 0,70 m	Width:..... 1,20 m
Height:..... 0,67 m	Height:..... 1,03 m
Dry Weight:..... 168kg	Dry Weight:..... 263 kg
Category: Stand-up	Category: Runabout
Riders:..... 1 person	Riders:.....1 – 3 persons
Fuel Capacity: 18 litres 4, 75 US Gal	Fuel Capacity: 70 litres 18,47 US Gal

Emission Certification: Three Star - Ultra Low Emission

ENGINE	
EMISSION CONTROL SYSTEM	SFI (Sequential Fuel Injection)
FUEL	Recommended fuel: - Super petrol unleaded DIN 51607, Octane between 95 and 98 ROZ/85 MOZ. - US premium Unleaded gasoline (91/92/93 Octane) or 95/98 ROZ ISO 5146.
SPARK PLUG	CHAMPION RG4HC
SPARK PLUG GAP	0,75 – 0,8 mm (0.0028 – 0.032 in.)
ENGINE DISPLACEMENT	1130 cc
NUMBER OF CYLINDER	3
CYLINDER LINING SURFACE	Nicasil
BORE x STROKE	88 x 62 mm
COMPRESSION RATIO	12 -13:1
CYLINDER COMPRESSION	9,6 +/- 1 bar (140 +/- 14,5 psi)
MAXIMUM HORSEPOWER	Series-S Pro Edition - 142 hp, Series-S Race Edition - 162 hp, Series-R Naked Edition - 142 hp, Series-R Pro Edition - 172 hp
COOLING SYSTEM	- closed loop with thermostat; - auxiliary opened loop oil & exhaust cooling systems
THERMOSTAT	70°C
EXHAUST OVERHEATING WARNING	Exhaust Manifold Overheat switch – engine limiter activation
COOLANT OVERHEATING WARNING	Cooling manifold Sensor – 90° engine limiter activation
ENGINE LUBRICATION SYSTEM	Wet Sump
ENGINE OIL SPECIFICATIONS	HSR-BENELLI Engine oil 10w60, ACEA, A3/B3/B4, API SL





RPM LIMITER	9200 – 9300 1/min – Determined by ECU
EXHAUST SYSTEM	Waterbox with water injector
ENGINE MANAGEMENT SYSTEM	
FUEL DELIVERY	WALBRO Multi-point fuel injection
IDLE SPEED	1700 1/min +/- 50
MAGNETO GENERATOR OUTPUT	13.5V / 48A at 5000 rpm
BATTERY	Series-R: 12 Volts 20Ah Series-S: 12 Volts 14Ah
FUSES	30A – Alternator, 15A – Fuel Pump, 7,5A – Stop switch, 30A - Main
STARTER	Electric Motor 12V – 850 W
PROPULSION	
JET PUMP TYPE	SOLAS – Axial Flow – 12 Veins – Steel stator
IMPELLER	Stainless steel – 3 blade Series-S Pro Edition – 14/25, Series-S Race Edition – 15/26, Series-R Naked Edition – 11/19, Series-R Pro Edition – 11/19 XL
COUPLING TYPE	Six piece coupler + Damper
MINIMUM DEPTH FOR OPERATION	60cm (2 Ft)
HULL / BODY	
HULL MATERIAL	Fiberglass, RTM Process

1.4.2 Standard Torque Specifications

The following torque specifications are to be used as a general guideline.

Use standard torque values for the appropriate size fastener when torque values are not specified.

Always consult the specific manual section for torque values of fasteners and use of locking agent.

RECOMMENDED TORQUE SPECIFICATION STAINLESS STEEL FASTENERS (METRIC)	
4 mm	3 -3,5 NM (40–42 in.lbs.)
5 mm	4 – 4,5 NM (45-52 in.lbs.)
6 mm	5,5 – 6,5 NM (66-78 in.lbs.)
7 mm	17 – 23 NM (13-16 ft.lbs.)
10 mm	35 – 40 NM (26-30 ft.lbs.)
12 mm	54 – 60 NM (40-44 ft.lbs.)





1.4.3 Conversion Chart

ft. lbs.	x 12	= in. lbs.
in. lbs.	x 0,0833	= ft. lbs.
ft. lbs.	x 1,356	= Nm
in. lbs.	x 0,115	= kg-m
Nm	x 0,7376	= ft. lbs.
kg-m	x 7,233	= ft. lbs.
kg-m	x 86,796	= in. lbs.
kg-m	x 10	= Nm
in.	x 25,4	= mm
mm	x 0,03937	= in.
in.	x 2,54	= cm
mile (mi.)	x 1,6	= km
Km	x 0,6214	= mile (mi.)
Ounces (oz.)	x 28,35	= Grams (g)
Grams (g)	x 0,035	= Ounces (oz.)
lb.	x 0,454	= kg
kg	x 2,2046	= lb.
Cubic inches (cu in)	x 16,387	= Cubic centimeters (cc)
Cubic centimeters (cc)	x 0,061	= Cubic inches (cu in)
Imperial pints (Imp pt)	x 0,568	= liters (l)
Liters (l)	x 1,76	= Imperial pints (imp pt)
Imperial quarts (Imp qt.)	x 1,137	= liters (l)
Liters (l)	x 0,88	= Imperial quarts (Imp qt)
Imperial quarts (Imp qt.)	x 1,201	= US quarts (US qt)
Liters (l)	x 1,057	= US quarts (US qt)
US gallons (US gal)	x 3,785	= Liters (l)
Liters (l)	x 0,264	= US gallons (US gal)
Pounds – force per square inch (psi)	x 6,895	= Kilopascals (kPa)
Kilopascals (kPa)	x 0,145	= Pounds – force per square inch (psi)
Kilopascals (kPa)	x 0,01	= Kilograms- force per square cm
Kilograms- force per square cm	x 98,1	= Kilopascals (kPa)

°C to °F: $9 (°C + 40) \mid 5 - 40 = °F$

°F to °C: $5 (°F + 40) \mid 9 - 40 = °C$





2 *MAINTENANCE*





2 Maintenance

The table in chapter **Periodic maintenance table** provides the manufacturer's recommended intervals for maintenance work. Following the maintenance recommendations, a long life span of the vehicle can be achieved and unnecessary environmental damage prevented. The Maintenance intervals specified in the table should not be exceeded by more than 10%.

All activities described in this manual must be carried out by trained service staff.

In case of warranty repairs HSR-BENELLI reserves the right to request warranty approval documents for performed periodic maintenance of eligible PWC.



ATTENTION:

The vehicle owner or user is responsible adhering to the maintenance intervals. HSR assumes no liability for damage that arises due to maintenance not carried out.



2.1 Flushing system attachment

For service purposes engine of vehicle could be started out of water using Flushing system to provide cooling by tap water.



ATTENTION:

Engine could be operated only at idle rpm even if flushing kit is attached. Do not run engine when flushing kit is attached continuously for a period over 5 minutes to prevent overheating.



Flushing system hose (Series-R, LEFT SIDE)



Flushing system fitting



Flushing system hose (Series-S, RIGHT SIDE)



2.2 Periodic maintenance chart

Jobs to be performed	After the first 10 hours of operation	At 25 h of operation	At 50 h of operation	At 75 h of operation	At 100 h of operation	Each additional 25 h	Each additional 100 h
Visual Check of all hoses, pipes, hose clips,	X	X	X	X	X	X	X
Visual Check of all nuts, bolts and fixing elements	X	X	X	X	X	X	X
Change oil and oil filter	X	X	X	X	X	X	X
Lubricate throttle housing cable connection	X	X	X	X	X	X	X
Lubricate steering pivot (dismantle)	X	X	X	X	X	X	X
Check valve clearance and adjust in necessary	X	X	X	X	X	X	X
Check clean Flame Arrestor	X	X	X	X	X	X	X
Check / tighten engine mount bolts	X	X	X	X	X	X	X
Check valve for fuel ventilation	X	X	X	X	X	X	X
Check throttle operation system	X	X	X	X	X	X	
Check and clean jet pump (including cooling system sieve)	X	X	X	X	X	X	
Check / renew drive damper	X	X	X	X	X	X	
Check steering and lanyard operation	X	X	X	X	X	X	
Replace rubber duckbills if necessary (Series-S only)	X	X	X	X	X	X	
Check and grease Battery clamps	X	X	X	X	X	X	
Check/ adjust TPS	X	X	X	X	X	X	
Check impeller torque 100 Nm	X	X	X	X	X	X	
Replace Pump Seal, check Pump Bearing / replace if necessary	X	X	X	X	X	X	
Change Spark plugs					X		X
Check free play of the damper coupler and replace if necessary	X	X	X	X	X	X	
Check the transmission oil line banjo bolts for tightness	X	X	X	X	X	X	
Replace inline Filter in the exhaust cooling (water injection) system	X	X	X	X	X	X	



2.3 Periodic maintenance procedures

2.3.1 Oil level check

NOTE:

Use a clean, lint-free cloth

PWC must be leveled to perform oil level verification. Check the oil level when engine is cold by pulling the oil dipstick out of the engine. The oil level must be within the minimum and maximum marks. When engine is warm proceed the same way but insure your check is done five minutes after engine is stopped to enable the remaining oil to go back to the bottom of the engine. Oil level may be higher than at cold engine since the oil volume increases in warm condition.

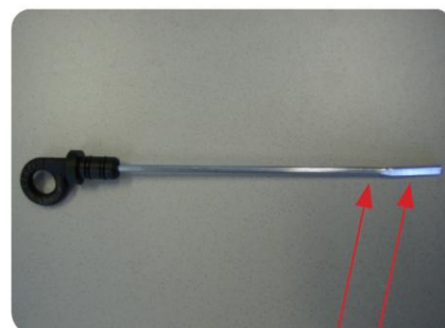


WARNING:

Engine oil may be hot.

Note: Engine must be cold

If the valve clearance is out of specifications take note about your current reading for adjustment.



max-min



2.3.2 Engine oil and filter replacement

Remove the dipstick.

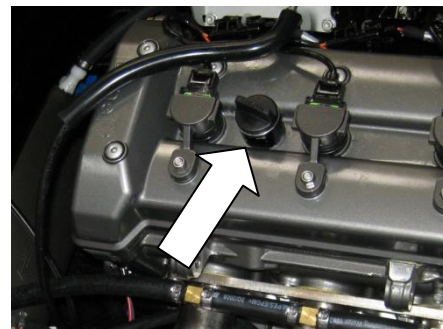
To suck the oil out with an oil removing pump, put the suction hose as deep as possible into the engine into dipstick tube.

Suck the oil out of the engine completely.

Take out old oil filter

Before installation of new oil filter, grease filter O-ring slightly with engine oil.

Install new oil filter and tighten with specified tightening torque.



Open oil filling cap on engine valve cover (*shown by arrow*).

Refill the engine with new engine oil.



ATTENTION:

ALWAYS USE HSR-BENELLI ENGINE OIL.



NOTE: FOR SERIES-S

Volumes of oil in the engine: min 1,7 litres (without change of oil filter), max 2,0 litres (change of oil filter included). In case of completely dry engine: 2,3 litres.



Required torque for oil filter cover: 24 Nm

Required torque for ignition coils: 10 Nm

Required torque for spark plugs: 12 Nm



WARNING:

Never fill with more than 2,3 l of oil into the engine (oil filter included).

NOTE: FOR SERIES-R

Volumes of oil in the engine: min 2,1 litres (without change of oil filter), max 2,4 litres (change of oil filter included). In case of completely dry engine: 2,7 litres.



Required torque for oil filter cover: 24 Nm

Required torque for ignition coils: 10 Nm

Required torque for spark plugs: 12 Nm



WARNING:

Never fill with more than 2,7 l of oil into the engine (oil filter included).



2.3.3 Spark plugs replacement



ATTENTION:

Replace spark plugs only when engine is COLD. In other case there is a risk to damage cylinder head thread. Use only spark plugs of recommended type in order to avoid engine damage.

NOTE: RECOMMENDED SPARK PLUGS

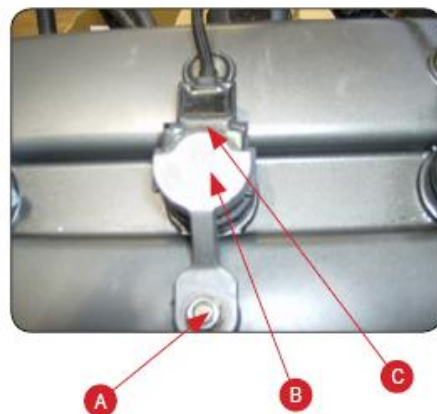
CHAMPION RG4HC

Replace engine spark plugs every 100 hrs. Check electrode gap and spark plug condition after the break-in period (10-12hrs).

1. Unscrew nut A
2. Remove ignition plate B
3. Remove ignition coil C
4. Unscrew spark plug

To reinstall:

Follow the procedure exactly in the opposite way.



WARNING:

Do not tighten spark plugs with torque over 12Nm not to damage cylinder head thread.



Electrode gap spark plug: 0,75 – 0,80 mm

2.3.4 Valve clearance inspection

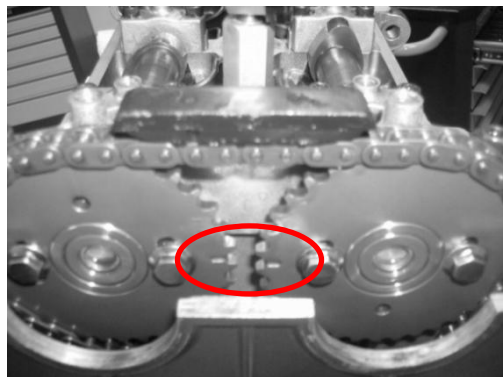


ATTENTION:

Valve clearance must be checked and adjusted when the engine is cold (room temperature)

Remove cylinder head cover to access cylinder head
(See Head cover Removal)

Taking the engine's cylinder 1 to the TDC verify that also the marks and of the Camshaft sprockets are aligned between them and with the head plain.



Measure the clearance between camshaft and valve cap by a thickness gauge making sure that the clearance is in the specific range.



Start from measuring clearance on:

Cylinder 2 EXHAUST valves;

Cylinder 3 INTAKE valves

Proceed the measurement for other valves, rotating the engine using a wrench on a special nut of camshaft (measure the clearance when the cams corresponding to eligible valves are in upwards position):

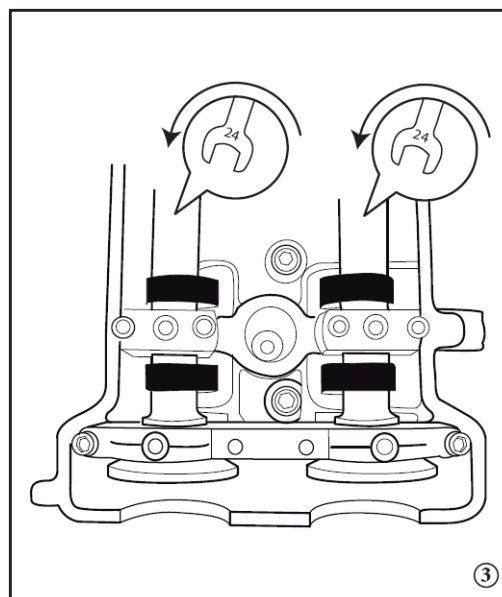
Cylinder 1 EXHAUST valves;

Cylinder 2 INTAKE valves

and

Cylinder 3 EXHAUST valves;

Cylinder 1 INTAKE valves





SPECIFIC VALUE

Intake = 0.30 ~ 0.35 mm

Exhaust = 0.35 ~ 0.40 mm

Note: Engine must be cold

If the valve clearance is out of specifications take note about your current reading for adjustment.

2.3.5 Valve clearance adjustment

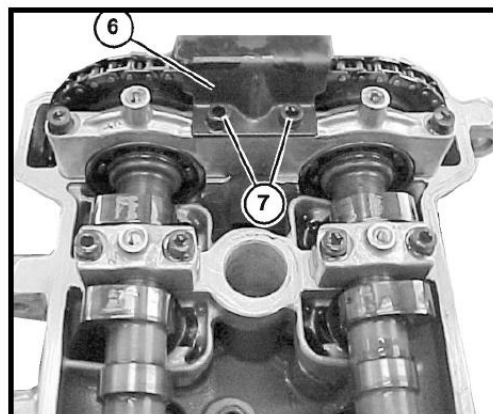


ATTENTION:

To prevent falling of removed parts into crankcase please use proper sealing material at timing chain drive casing.



Remove the chain pad (6), unscrewing the two fixing screws (7).

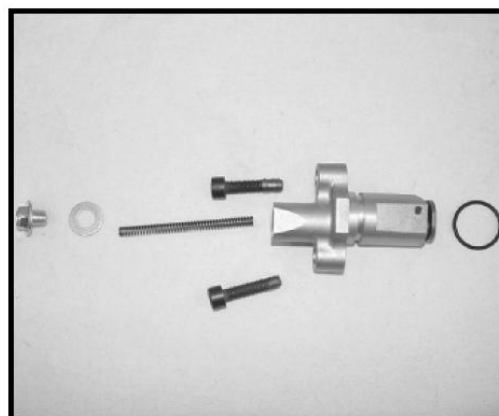




ATTENTION:

Make sure that the distribution chain does not fall into the casing.

Remove the chain tensioner.

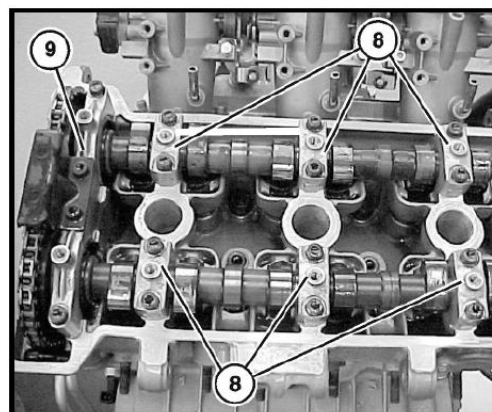


ATTENTION:

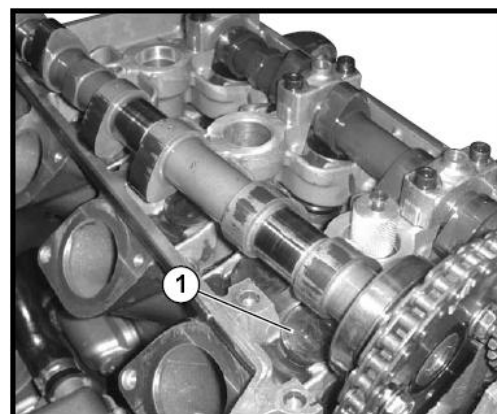
Mark the removed elements for correct reassembling (cylinder number, camshaft IN/EX, etc).

Remove mounting screws of camshaft holders (8) and remove them. Take care of removing metal bushings of each holder.

Remove the bridge (9), unscrewing the fixing screws.



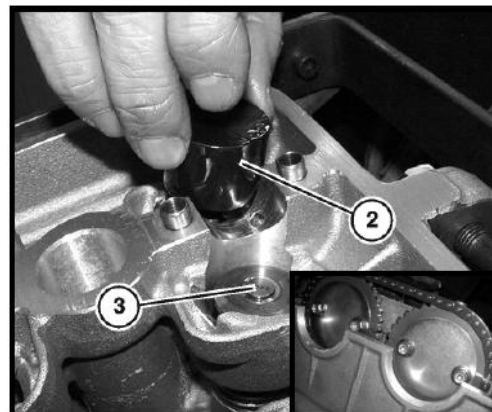
Raise the camshaft paying attention to keep all teeth of the timing chain in place, allowing the removal of the valve caps (1).



Remove the cap (2) of the valve which requires adjustment using a magnet. To change the valve clearance, replace the shim with one of a different thickness. Measure the thickness of the removed shim.

NOTE:

Mark and record the locations of the valve caps and shims so that they can be reinstalled in their original positions.



Valve clearance calculation:

In order to set a proper valve clearance, please follow the points below:

1. Measure the clearance of each individual valve and make note about this reading (at cold engine).
2. Check the present shim size.
3. Calculate the thickness of the replacement shim.

Example: your reading on the intake valve is 0,27mm (spec. 0.30 ~ 0,35mm)

Clearance is less than specified. The shims are available in 0,025 mm steps of thickness. Present shim gives 0,27mm clearance with its thickness 2,350 mm.

Shim size calculation:

Present clearance: 0,27mm. 0,30 ~ 0,35mm needs to be achieved by reducing shim size. Using of 2 size thinner shim 2,300mm ($=2,350\text{mm} - 2 \times 0,025\text{mm}$) increases the valves clearance: $0,27\text{mm} + 2 \times 0,025\text{mm} = 0,32\text{mm}$. The result meets specified range. The present 2,350mm shim is to be replaced by 2,300mm shim.

4. Assemble the removed parts of cylinder head (see Camshaft installation above), tighten the fasteners according to given specifications.
5. Remeasure the valve clearance and readjust if necessary.

Installing Cylinder Head cover



ATTENTION:

Always use new gaskets.

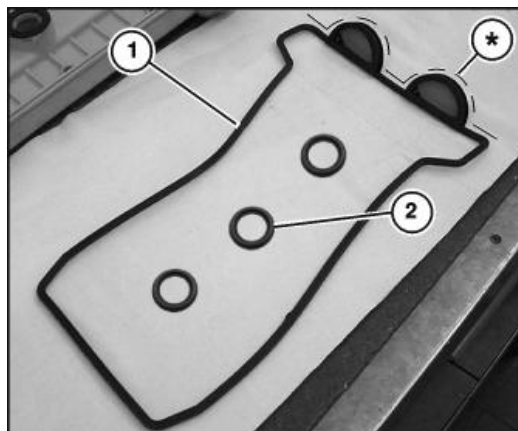
Position the gaskets of the head cover (1 and 2).



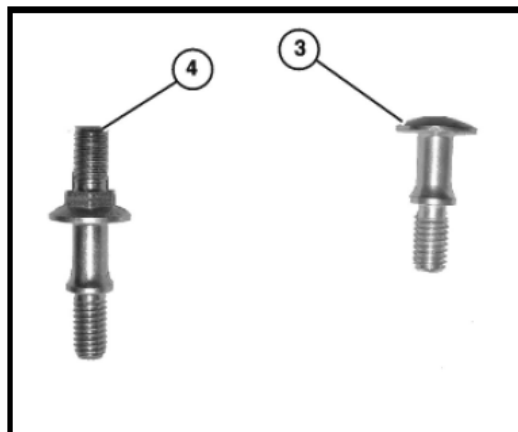
ATTENTION:

Make sure that gaskets (2) do not fall into the head during cover installation.

*Apply THREEBOND® paste as shown on the drawing.



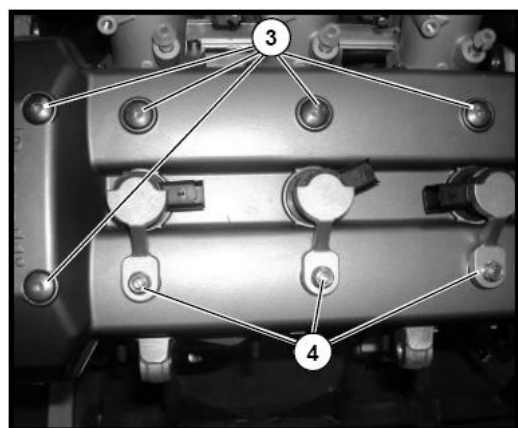
Install the cylinder head cover and insert rubber bushings and the screws (3) and (4) as shown on the figure.



NOTE:

Replace the rubber bushings of the screws (3) and (4) during reassembly.

Tighten the head cover mounting screws to the specific torque, take care not to cut or damage rubber bushings.



Tightening torque: 10 N·m (1 Kg-m)



2.3.6 Refilling of coolant



WARNING:

This process is a very sensitive and requires special attention. The risk is that air bubbles remain in the cooling system so that the heat of the engine cannot be transferred into the radiator of the Jet Pump.

The total volume of coolant is:

for SERIES-S 2,5 litres;

for SERIES-R 3,0 litres.

1. Fill the cooling system with cooling liquid of recommended type as much as possible.
2. Press on the coolant hoses and ensure to get a maximum of air bubbles out of it. Add more coolant.
3. Repeat this process 2-3 times until no more coolant can be added.
4. Do a test run in the water to heat the engine. Stop the engine couple of times and check the anti freeze coolant level. Add coolant if necessary.
5. Repeat this process couple of times until the thermostat has opened and the entire amount of coolant circulates in the cooling system.



WARNING:

If the engine is hot the Jet Pump is hot too and might be dangerous for your health.

NOTE: Ensure the engine is fully filled with coolant after thermostat was opened.



WARNING:

Changing the battery ensure that engine is cold.

NOTE: Use only high quality coolant (See recommended lubricants)







3 Engine

3.1 Engine Removal and Installation

The installation of the engine and engine subsystems is the reverse to their removal. During engine installation, several important notes must be made.

- Always verify the correct number of engine mounting strap shims are installed on each engine mounting post. Remove the pump to check driveshaft alignment, add shims to move the engine up or down to align properly.
- Always verify that the engine does not interfere with critical routings such as the steering cable, cooling hoses, and main wiring harness.
- Steering cable must be fixed on front left engine mounts to avoid damage from engine.

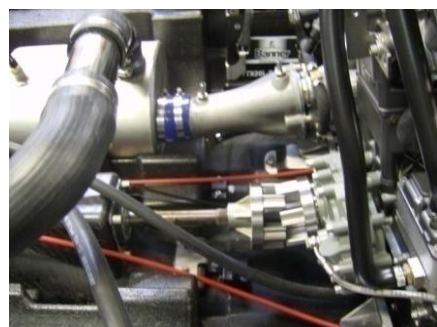


**Engine installation into the PWC:
(shown for Series-R Pro)**

Lift the engine into the PWC using a lifting device.



Insure you hook on the exhaust hose and the and inline the Spider Couplers.

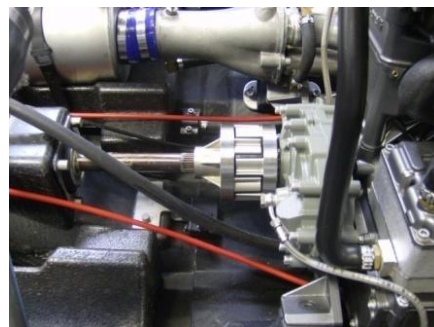


Position the Engine into the 4 x engine supports on the hull.





Ensure the exhaust hose and the Spider Couplets are properly aligned.



Take a metal ruler like shown on the picture and check the alignment of the Spider coupler to see if the engine is positioned properly according to propulsion system.



If the engine position needs to be adjusted use special washer with 0,5 and 1 mm thickness to align the system.



NOTE: If the engine needs to be heightened you have to use washers on all four engine supports.

Apply blue Loctite on the screws and tighten the screws of the engine support with specified torque.



Tightening torque: 30 N·m





Tighten the exhaust hose with a screw driver.
 Plug in the cooling hose for the 3 in 1 hose.
 Plug in the water relieve hose for the 3 in 1 hose.



Plug in the water relieve hose for the exhaust manifold



Tighten the fuel hose to the fuel rail
NOTE: Take care to install the sealing rings



Plug in the cooling water supply lines as shown on the picture into the oil cooler.





Plug in the water relieve hoses from the oil cooler.



Plug in the water supply hose for the waterpump.



Plug in the coolant hose for the temperature thermostat.





Plug in the Ignition wires for the ignition coils.

NOTE: Ignition wires are marked with numbers of corresponding cylinders.



Plug in the wires for the injectors.

NOTE: Injector wires are marked with numbers of corresponding cylinders.

Plug in the connector for the heat sensor.



Plug in the TPS sensor.



Plug in the pick-up coil sensor.





Plug in the oil pressure sensor.



Plug in the SSSA connector.



Tighten the ground wire.



Connect the wires of the voltage regulator on the ignition cover.





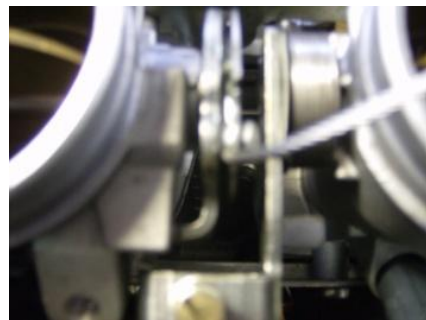
Connect the positive wire from the starter to the starter relays.



Connect the positive starter cable to the positive starter connector.



Connect the acceleration wire to the throttle bodies.



For adjustment of the acceleration wire insure the throttles are on open wide throttle position.





Adjust the acceleration wire until specified free play on throttle lever is given.



SPECIFIC VALUE
CLEARANCE (A) = 2 - 3 mm



NOTE: Insure that engine oil and coolant liquid are on proper level.

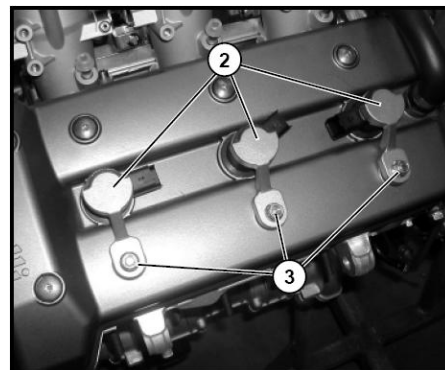
NOTE: REMOVING THE ENGINE IS A REVERSE PROCEDURE TO DESCRIBED ABOVE

3.2 Engine Disassembly/Assembly

3.2.1 CYLINDER HEAD

- Head cover removal

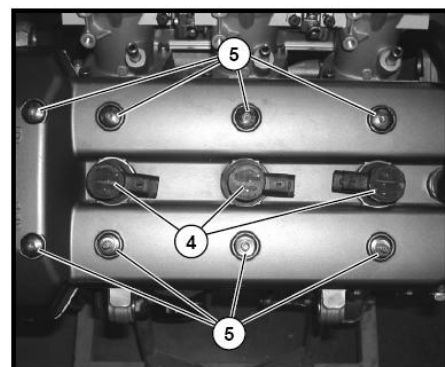
Loosen and remove self-locking nuts (3) and coil support rods (2).



Slip off ignition coils (4).
Remove the spark plugs using 16mm spark plug wrench.
Unscrew 8 valve cover mounting screws (5)



ATTENTION:
Take note of the position of the screws for correct reassembling.



NOTE:

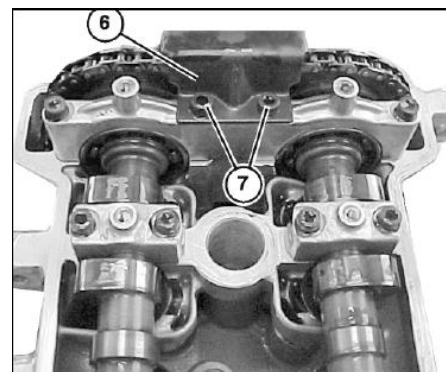
Replace 8 screws rubber bushings (5) during reassembling.

• **Removing Camshafts**

Remove the head cover.

Remove the chain pad (6),

Unscrewing the two fixing screws (7).



ATTENTION:

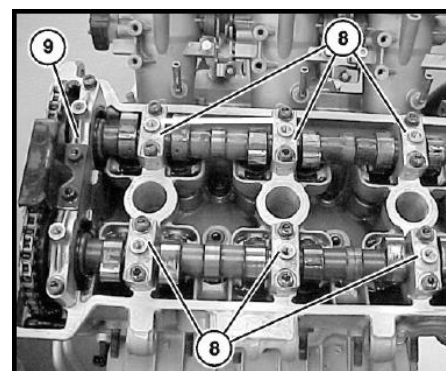
Make sure that the distribution chain does not fall into the casing.

Remove the chain tensioner.



ATTENTION:

Note the position of the elements for correct remounting.



Unscrew the fixing screws of the large caps (8) and remove them.

Remove the bridge (9), unscrewing the fixing screws.

Remove the camshafts and the chain.

• **Camshafts Inspection**

Check that camshafts with a micrometer, as shown on the picture.

If the value does not enter within the specific measure, change the element.

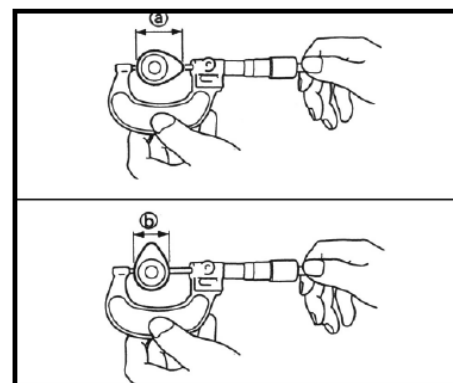


INTAKE SHAFT VALUE LIMIT:

A= 36.6 mm B= 27.85 mm

EXHAUST SHAFT:

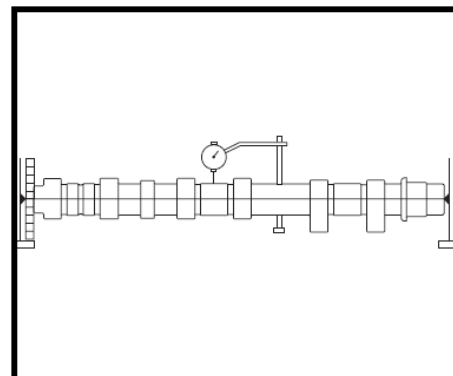
A= 36.6 mm B= 27.85 mm



Check the deformation of the camshaft with a comparator, as shown on the picture.
If the value does not enter within the specific measure, change the element.



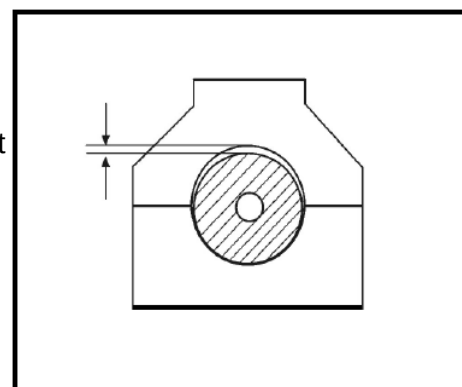
**INTAKE AND EXHAUST SHAFT DIMENSIONS
LIMIT:
MAX. VALUE = 0.03 mm**



The maximum play between the distribution camshaft and seat is 0.1 mm.
If the value does not enter within the specific value, change the element.

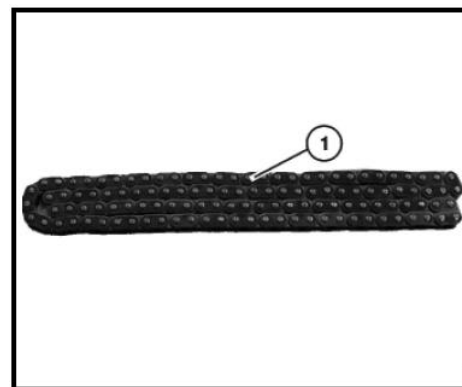


**VALUE LIMIT
CAMSHAFT AND SEAT
Max. play= 0.01 mm**



- **Chain, Sprocket Wheels and Camshaft Chain Guide Inspection**

Check the state of wear of the camshaft distribution chain (1). If the element has blocked links, is excessively worn, change it.



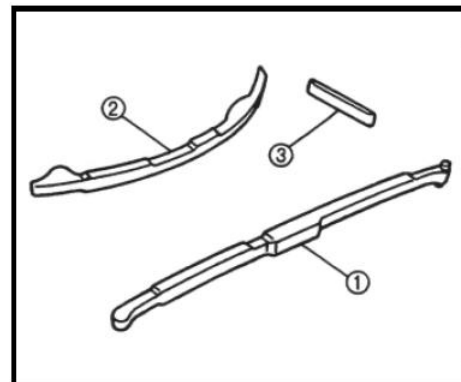
Visually check the timing chain guides:

- 1) Fixed guide (FRONT PART)
- 2) Mobile guide (REAR PART)
- 3) Upper guide (FIXED ON HEAD)

If one or more elements are worn, change it/them.

NOTE

Always replace chain guides if timing chain is to be replaced.



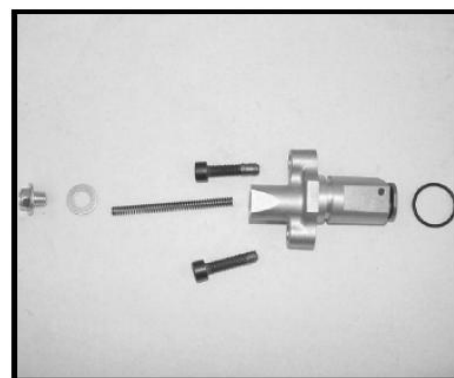
• Chain Tensioner Inspection

Check the free sliding of the chain stretcher rod.

Check the state of the chain stretcher spring.

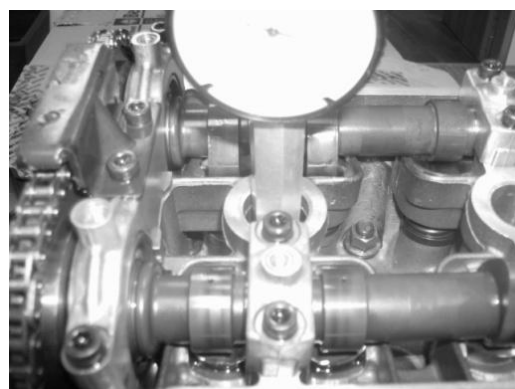
Check the integrity of the chain stretcher.

If an element or its components are damaged or ruined, change it/them.

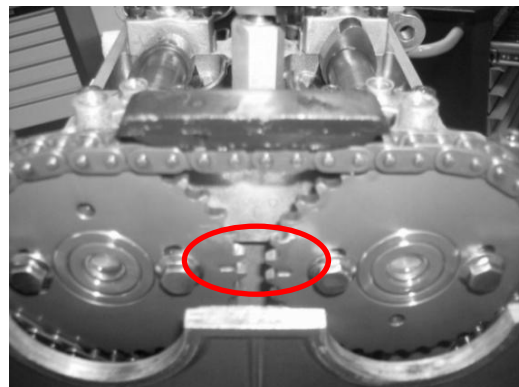


• Camshafts installation

Using a special tool set the piston of cylinder #1 to TDC position.



NOTE: Ensure that during assembling engine crankshaft is not moved from 1st cylinder TDC position and camshafts marks are aligned as shown on the picture.



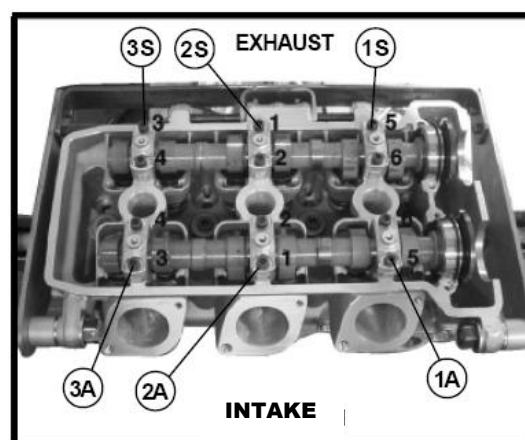
Position the exhaust shaft and the timing chain, position the holders in their original direction (written on the outside) and tighten the fixing screws according to the diagram in the figure.



Tightening torque:

1st phase: 6 N·m;

2nd phase: 13 N·m



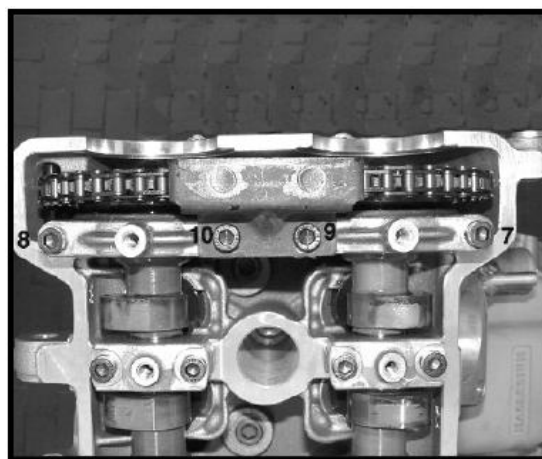
Position the intake shaft and the timing chain, position the holders in their original (mark on the outside of holder should match the number engraved on inside of cylinder head) and tighten the fixing screws according to the diagram in the figure.



Tightening torque:

1st phase: 6 N·m;

2nd phase: 13 N·m



Position the timing chain on the camshaft sprockets.

Position the bridge and the upper chain pad and tighten the fixing screws in two phases in shown sequence.



Tightening torque:

1st phase: 6 N·m;

2nd phase: 13 N·m

NOTE:

Always oil the sliding parts with Teflon SINTOFLON paste.

Position the chain tensioner (1) complete with O-ring (2) and tighten two screws (6).



Tightening torque: 10 N·m

Position the rod pushing spring (3) and the washer (4) and tighten tensioner cap nut (5).



Tightening torque: 7 ÷ 8 N·m

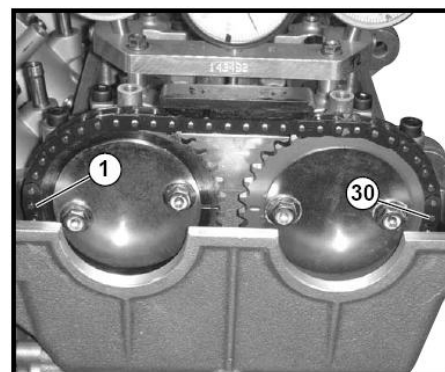
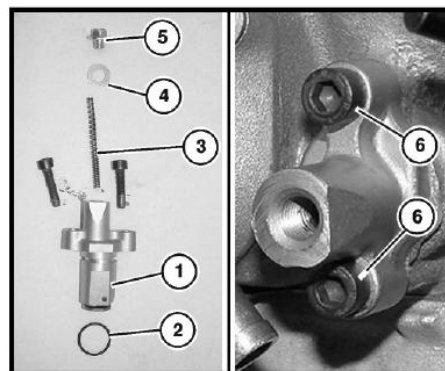


ATTENTION:

Always check that chain tensioner is in position 0 before mounting it.

Align the marks on the camshaft sprockets as shown on the figure.

Count 30 chain pins from position 1 to position 30 as indicated on the figure.



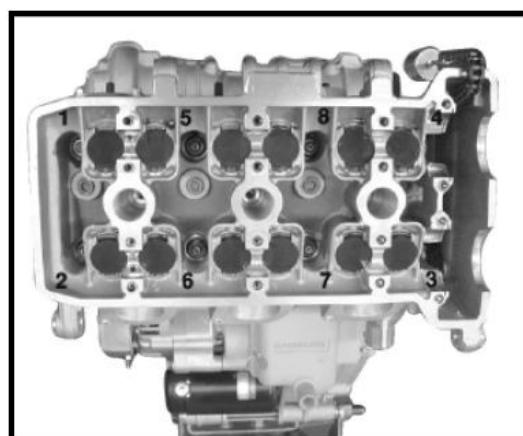
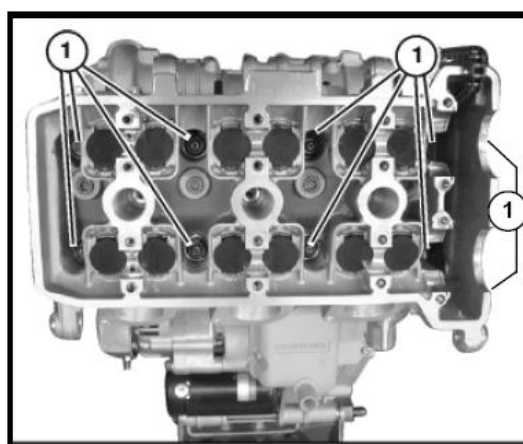
Check that cylinder 1 cams are turned towards each other as on the figure.



- **Remove Cylinder Head**

Remove the chain tensioner, chain pads, camshafts (see above).

Loosen and remove the eight nuts and washers (1) indicated in the figure according to the shown sequence and two screws on the right side of the engine (timing chain side).





• Cylinder Head Inspection

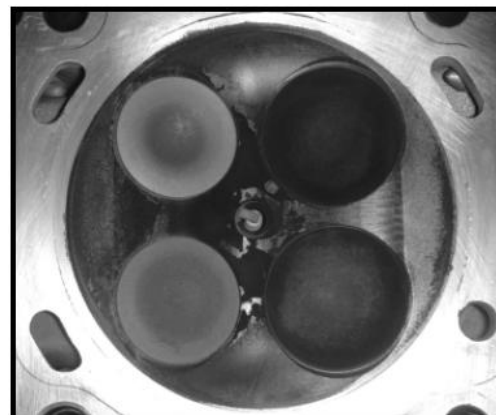


WARNING:

Do not use a pointed instrument to avoid
damaging or scratching:

Spark plug hole threading

Valve seats



Check and eventually eliminate carbon deposits in the combustion chamber with a rounded-off scraper.

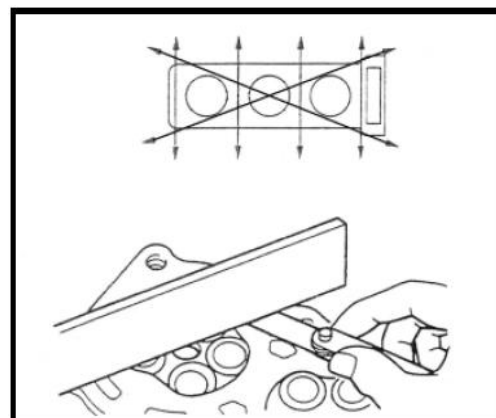
If the surface is damaged or scratched, change the element. Check the distortion of the cylinder head as indicated in the figure. If it is outside the specific value, rectify the head.



VALUE LIMIT

HEAD DISTORTION

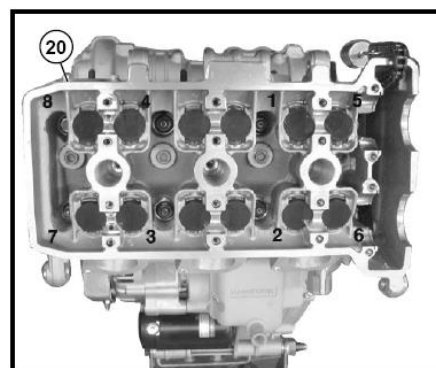
max. distortion = 0.2 mm



• Mounting Cylinder Head

NOTE:

Always use new gaskets. Clean and degrease the head surface and the cylinders.



Position the head/cylinder gasket.

Position the cylinder head. Position the fixing washers and nuts.



Tighten to the specified torque following the shown sequence in following phases:

1st phase: 10 Nm;

2nd phase: 30 Nm;

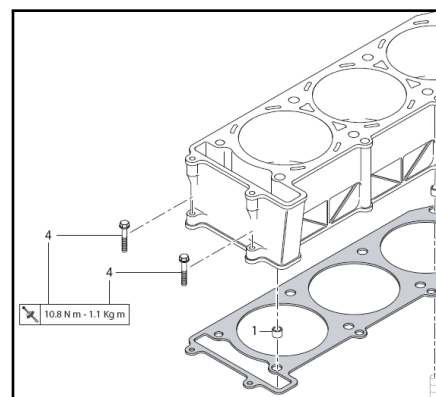
3rd phase: 45 Nm;

4th phase: angle of 100°;

5th phase: tighten 2 bolts on timing chain side with 10.8 Nm

NOTE:

Apply grease to the fixing nuts to oil the threading (MOLIKOTE® BR2 PLUS grease).

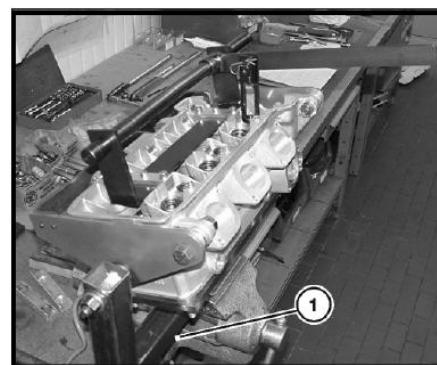


- **Valves and Valve Spring**

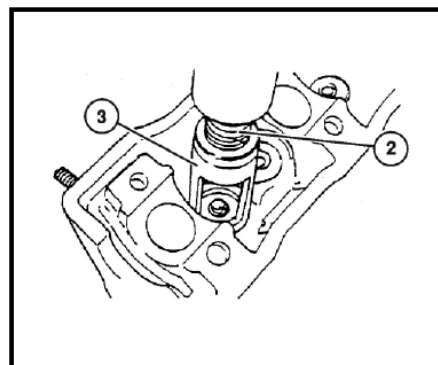
- **Remove Valves**

Remove the cylinder head (see ("REMOVE CYLINDER HEAD").

Position the head on a slightly inclined surface to show the valves to remove, perpendicular to the surface.



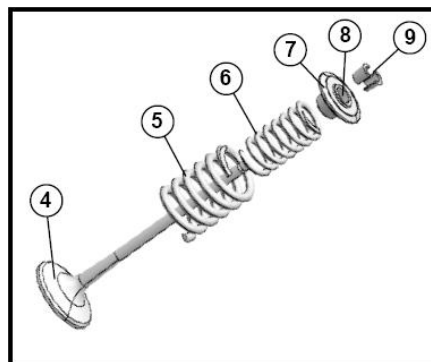
To remove the valves use a valve dismantling instrument (2) with correct attachment (3), press the valve down and take off the two semi-cones.
Loosen the clamp and remove the valve and its components as shown on picture.



The following procedure is applied to the valves (4), the springs (5 and 6) and relative components (7, 8 and 9).

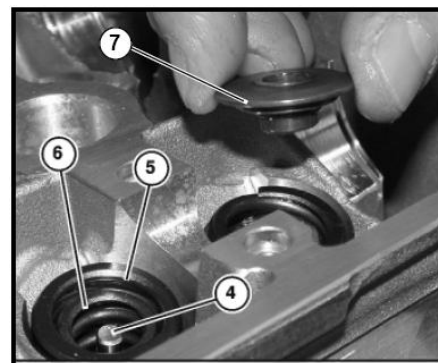
NOTE:

Make sure that valve (4) has a perfect seal by pouring petrol into the conduits and making sure that there are no losses through the valves. Make sure that the valves are perfectly sealed.



Remove the small bowls taking note of the position on each valve and coupling them to their pads.

Free the pusher spring plate (7) using the specified instrument to remove the two lock cones.
Remove the external spring (5), the internal spring (6), valve (4), the valve seal ring and the lower cup.



• Valves and Valve Guide Inspection

The following procedure must be carried out on all valves and relative valve guides.
Check that values (A) and (B) are within the tolerance of the specific values.
If values (A) and (B) are not within the value limits, change the elements.

INTAKE VALVE DIAMETER LIMIT

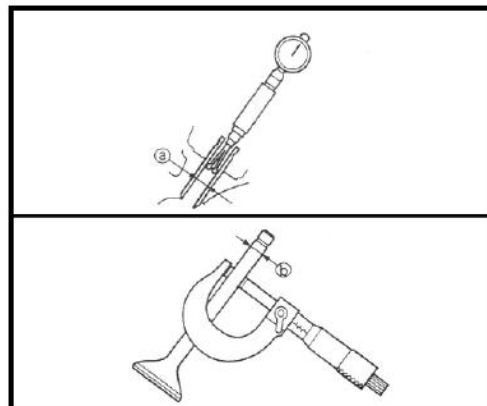


A max. = 5.05 mm
B min. = 4.965 mm

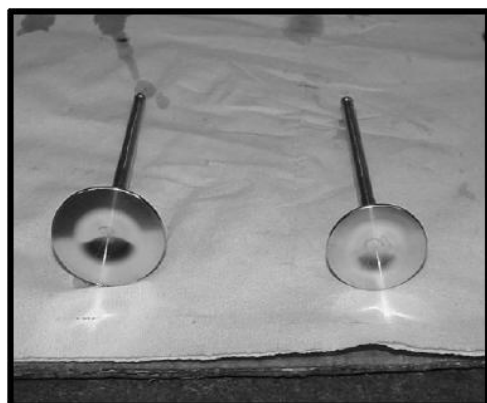
EXHAUST DIMENSION LIMITS



A max. = 5.05 mm
B min. = 4.955 mm



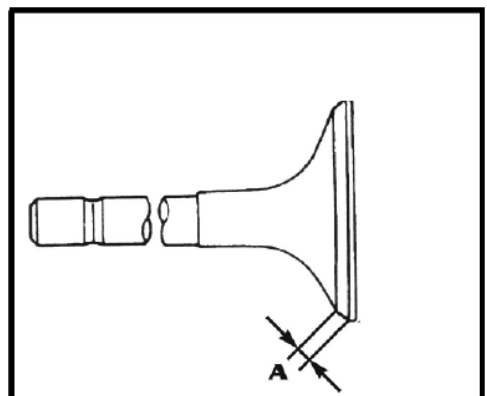
Check condition of the surfaces of the valves.
Eliminate eventual carbon deposits.
If the surface is excessively ruined, change the element.



Check thickness (A) indicated in the figure.



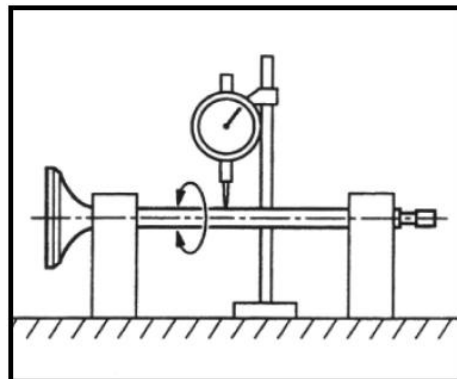
VALVE THICKNESS VALUE LIMIT
A = 1,0 ÷ 1,3 mm



Check the deformation of the legs of the valve.
If the concentricity value does not enter within the margin, change the element.

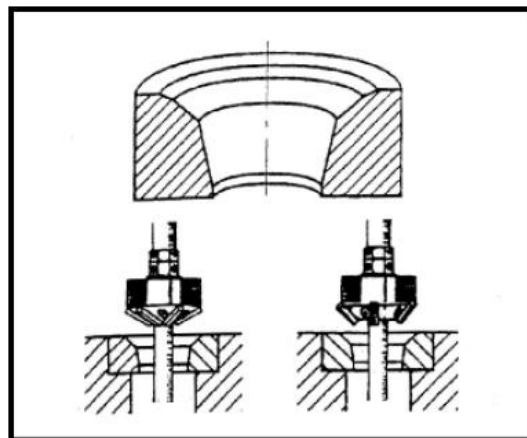


VALVE REFORMATION
VALUE LIMIT
0.01 mm



- **Valve Seat Inspection**

The following procedure must be applied to all the valve seats. Eliminate eventual carbon deposits.



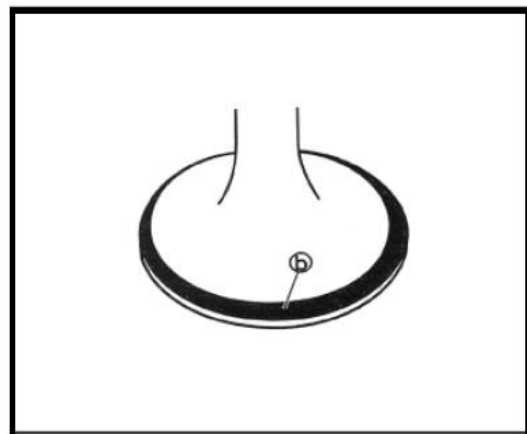
Apply the tincture of bluing (b) on the face of the valve.
Install the valve into the appropriate seat.
Press it using the guide on the seat to leave an evident impression.
Measure the width of the seat of the valve.

NOTE:

It will be necessary to remove the bluing at the point at which the seat and the face of the valve touch.

NOTE:

If the trace is not partial or not uniform, carry out a



smoothing operation on the face and the seat of the valve.

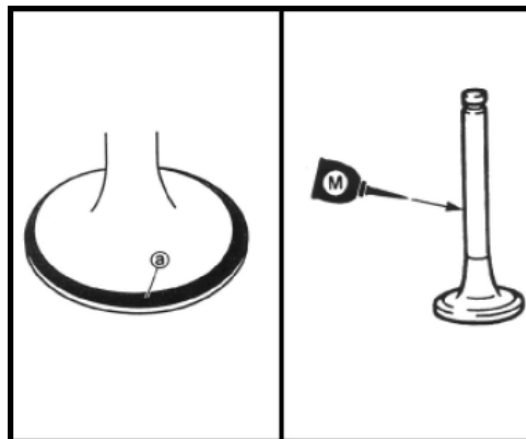
Smooth:

- the face of the valve
- the seat of the valve

NOTE:

After having changed the cylinder head or the valve and the relative guide, it will be necessary to smooth the seat and face of the valve.

Apply a coarse grained paste (a) for smoothing on the face of the valve.



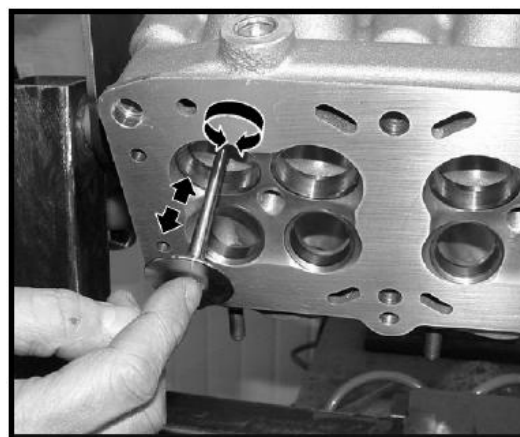
ATTENTION:

Do not allow the smoothing paste to enter into the space between the stem of the valve and the guide.

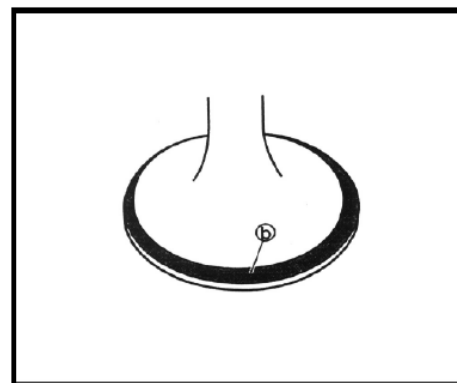
Apply disulfide of molybdenum to the stem of the valve. Insert the valve into the cylinder head. Rotate the valve until its face and seat shine uniformly, Then remove the smoothing paste.

NOTE:

To obtain optimum smoothing results, strike the seat of the valve lightly while turning it forwards and backwards in your hands.



Apply a fine grained paste to the face of the valve and repeat the above operations. Completely eliminate the smoothing paste from the face and the seat of the valve at the end of each operation. Apply the tincture of bluing (b) on the face of the valve. Install the valve in the cylinder head. Press the valve through the valve guide and on the valve seat to leave a clear trace.



• Valve Spring Inspection

The following procedure is valid for all valve springs.

Measure the length (a) of the free valve.

If the value does not enter within the envisaged limits, change the spring.



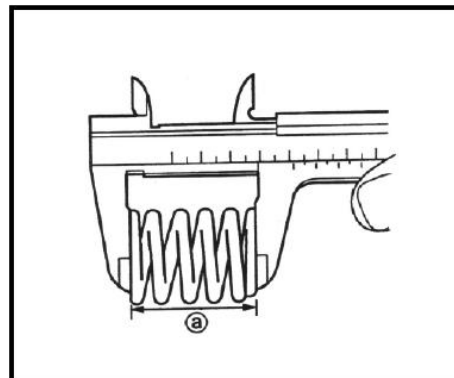
FREE VALVE SPRING LENGTH

External valve spring

Tolerance limit: 37 mm

Internal valve spring:

Tolerance limit: 34.0 mm



Bring the spring to a value length (c) and check the value of the load:



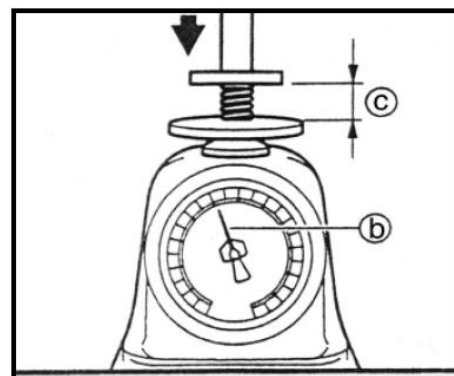
VALUE LIMIT

External spring length: 23.2 mm

Load value limit: 565 N

Internal spring length: 21.2 mm

Load value limit: 314 N



Check the inclination (a) of the valve spring as illustrated in the figure.

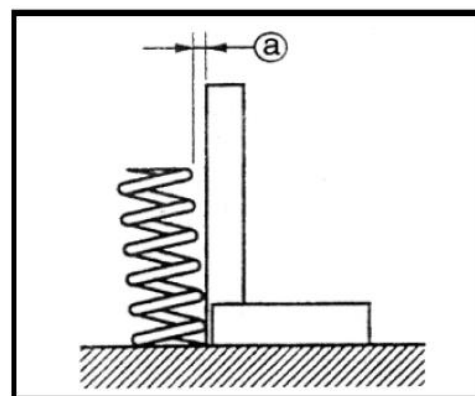
If (a) does not enter within the specific value, change it.



VALUE LIMIT

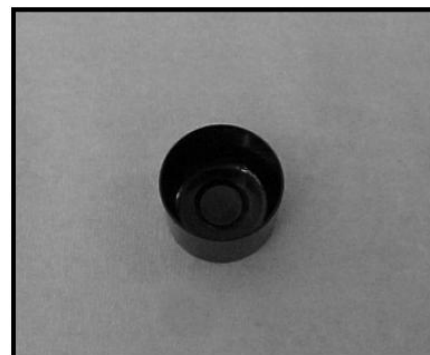
INCLINATION SUCTION SPRING A = 2 mm

INCLINATION EXHAUST SPRING A = 2 mm



• Valve Caps Inspection

The following procedure must be applied to all valve caps. Check that caps are not broken or scratched, in other case replace them.



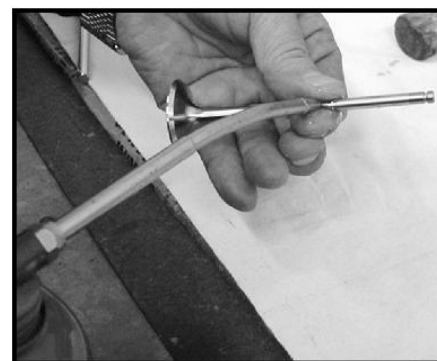
• Mount Valve

The following procedure must be applied to all the valves and relative components.

Oil the valve stem with the recommended oil.

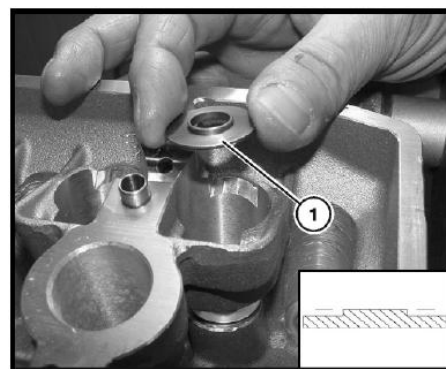
RECOMMENED OIL

Disulfide of molybdenum oil



Mount the lower small cup (1).

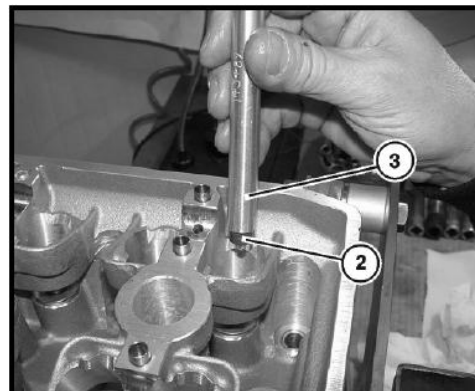
Check that the thickness of the small cap is 1.5 mm.





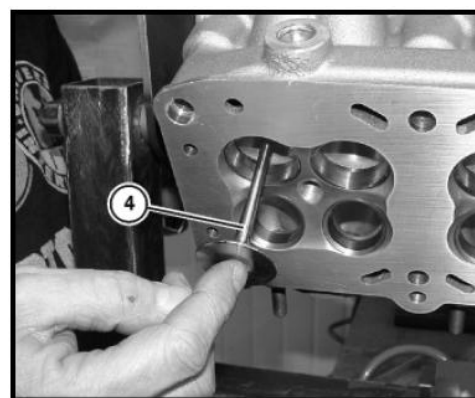
WARNING:
Always use new gaskets and oil seals.

Mount the rubber valve seal (2) with the appropriate pad (3).

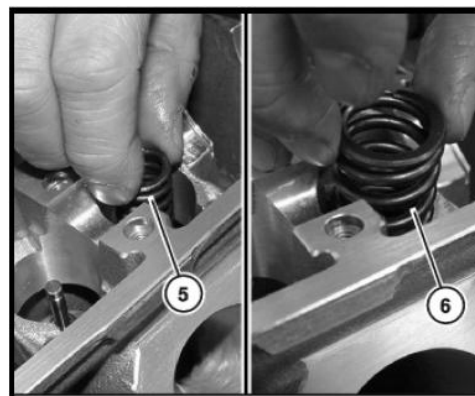


ATTENTION:
Intake valves are larger than the exhaust valves.

Insert the valves (4).



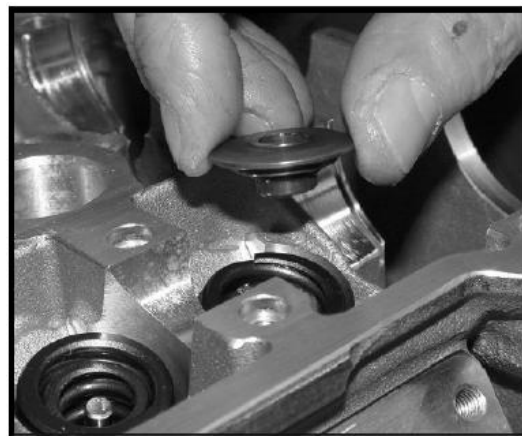
Position the internal (5) and external (6) springs as shown in the figure.



Insert the two lock cones (7) into the upper small cup (8).



Position the small cap as shown in the figure.
Use the dismantling valve instrument making sure that the valve is correct.



Position the calibrated pads (9) and valve caps (10).

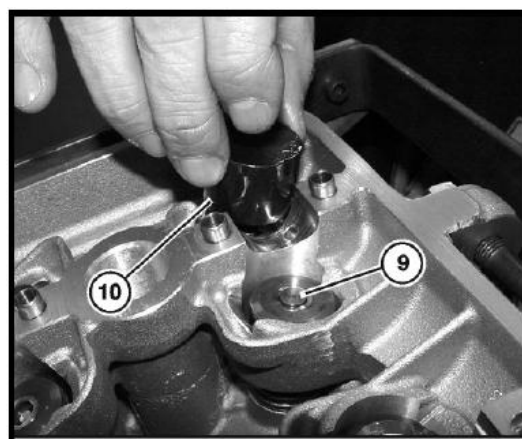


ATTENTION

Make sure that the individual valve lifters and the valve guide are re-mounted in the original position.

NOTE:

Check that valve caps turn easily by rotating them with a finger.

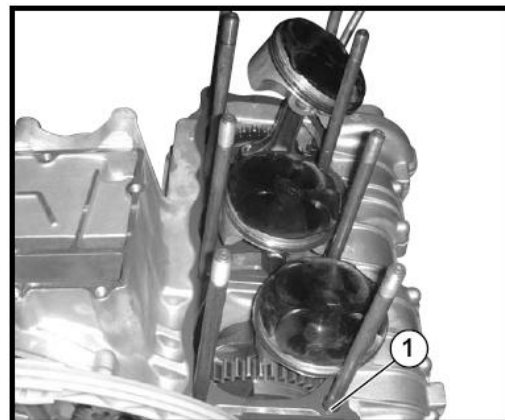


3.2.2 Cylinder and Pistons

- Dismantle Cylinder Body

Remove the cylinder head (see "REMOVE CYLINDER HEAD").

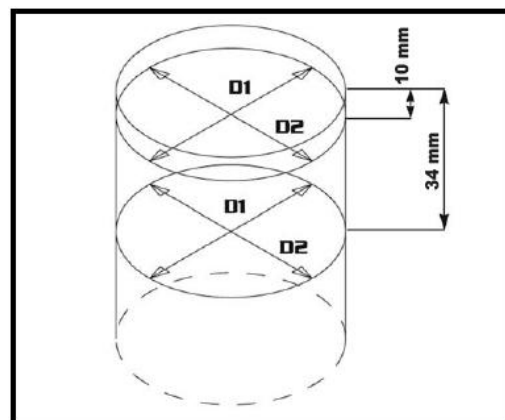
Remove the gasket of the head, the cylinder body (1) and the base of the cylinders gasket beneath.



Check that the walls do not present signs of seizure with the pistons. Check the ovalisation of the cylinders as indicated in the figure.

ATTENTION:

In the case of changing the cylinder block also change the pistons and the elastic straps, if necessary. The cylinder is distinguished by a letter that indicates the class it belongs to. The cylinder-piston coupling must be carried out among the same classes that they belong to.

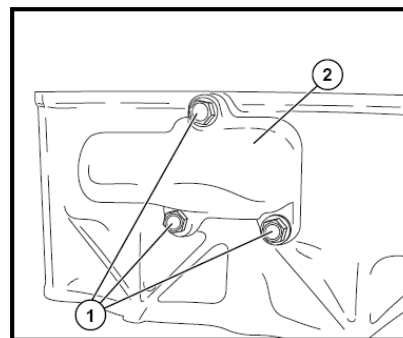


The letters are on the external front part (exhaust side) of the cylinder.

CLASS	D1/D2
A	ø 88,00-88,01
B	ø 88,011-88,021
C	ø 88,022-88,032

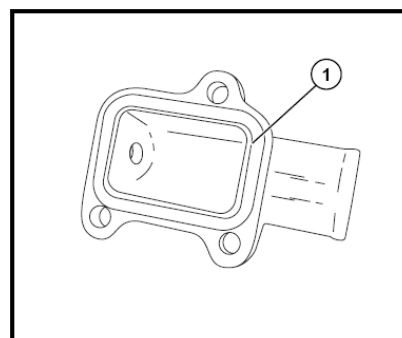
- **Dismantle Water Collector**

Unscrew and remove the three screws (1) and remove the collector (2).



- **Check Water collector**

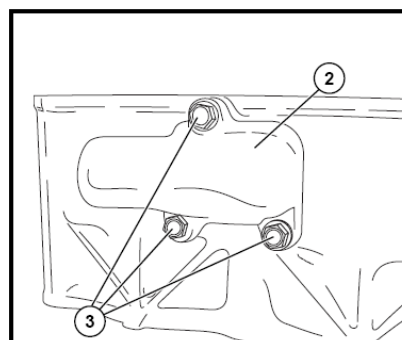
Check eventual breaks on the collector and if necessary change the piece.



- **Mount Water Collector**

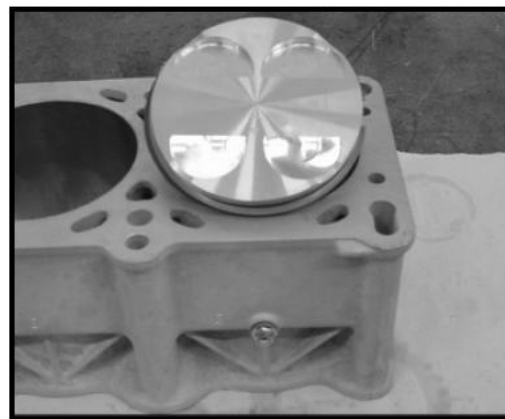
ATTENTION:
Always use new gaskets.

Position the gasket (1) and the collector (2) and tighten the screws (3).



- Piston
- Dismantle Piston

Remove the cylinder (see "DISMANTLE CYLINDER BODY").

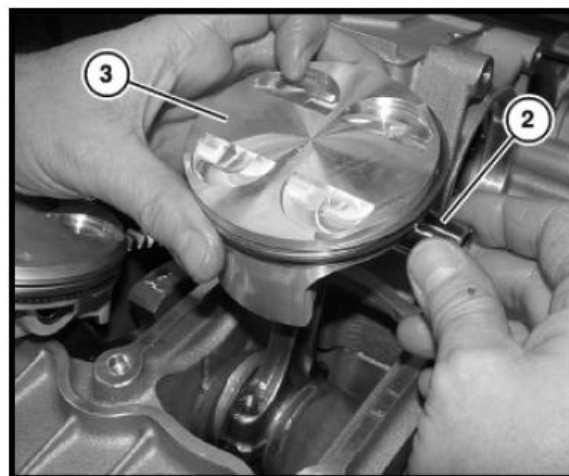


The following procedure must be applied to all 3 pistons.
Remove the elastic ring (1).



ATTENTION:
Do not use hammers for the piston pin removal (2).

Remove pin (2) and remove piston (3).

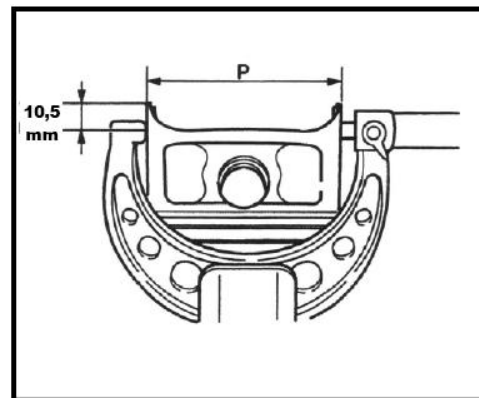
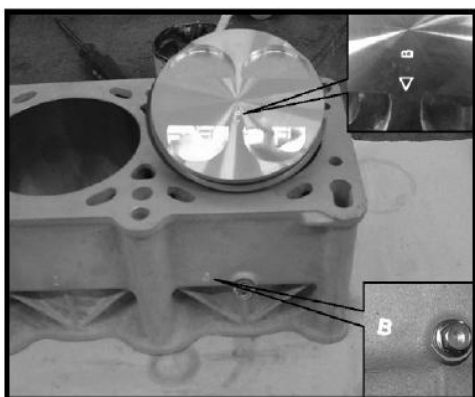


• Check Piston

The following procedure must also be applied to all the other pistons.

Check eventual breaks on the piston.

Use a micrometer, as shown in the figure, to check that the value (P) enters within the specific value.



CLASS	P
A	$\varnothing 87,950 \div 87,960$
B	$\varnothing 87,961 \div 87,971$
C	$\varnothing 87,972 \div 87,982$

ATTENTION:

In the case of changing one or more pistons:

The piston is distinguished by a letter that indicates the class it belongs to.

The cylinder-piston coupling must be carried out among the same classes that they belong to.

NOTE:

The maximum play of the piston is of 0.1 mm.

Change the piston if necessary.

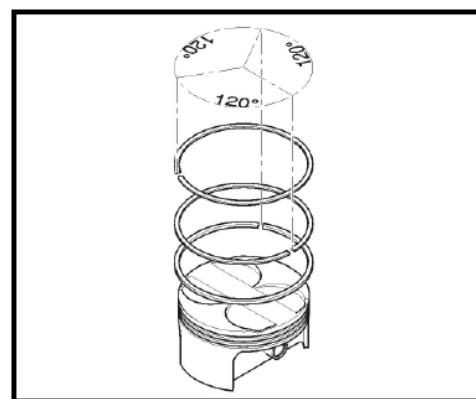
• Check Piston Rings

The following procedure must be applied to all the piston rings.

Check the absence of scuffing and traces of shrinkage on every Piston ring.

Check that the edge of the section is well defined and free in the housings.

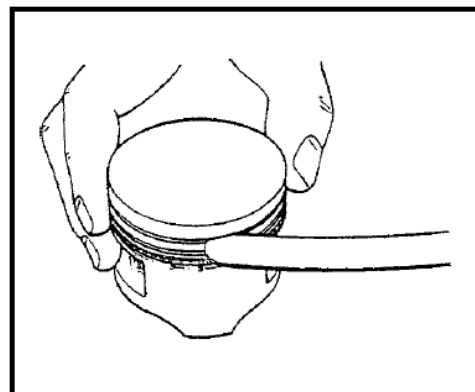
Whenever wear in the segments is found, change the pistons as well.



• Piston Ring Play

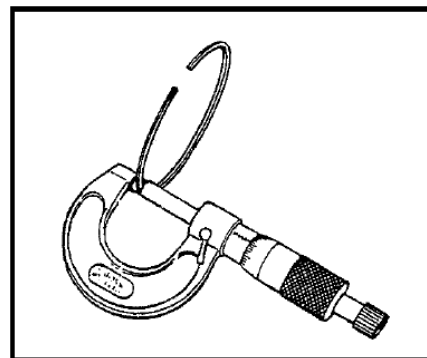
Measure the lateral play of the 1st and 2nd segment using a feeler. If one of the two plays exceeds the limit specified, change both the piston and the segments.

PISTON RING PLAY
SERVICE LIMIT:(1st): 0.20 mm
(2nd): 0.18 mm



PISTON RING WIDTH
STANDARD:(1st): 1.02 – 1.04 mm
(2nd): 1.01 – 1.03 mm
(OIL RING): 2.01-2.03

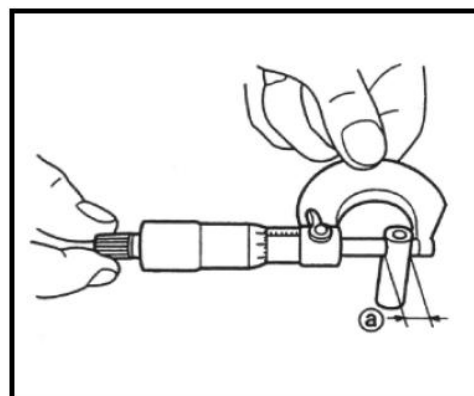
PISTON RING THICKNESS
STANDARD:(1st): 0.97 – 0.99 mm
(2nd): 0.97-0.99 mm



• Check Piston Pin

The following procedure must be applied to all the piston pins. Check that value (a) enters within the specific value.

NOMINAL VALUE
a = 18,995 ÷ 19,000 mm



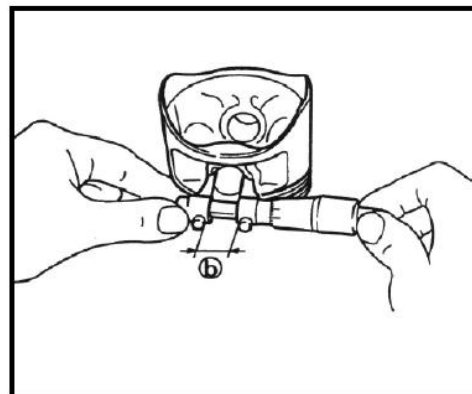
Check the value of (b).

NOMINAL VALUE

b = 19,002 ÷ 19,008 mm

NOTE:

If the play between the piston pin and the pin is more than 0.03 mm, change the piston.



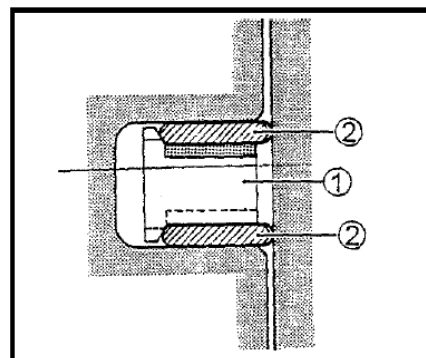
• **Mounting Piston Rings:**

Install the piston rings in the order: oil ring , 2nd piston ring , 1st piston rings.

The first element to insert into the slot of the oil ring is the spacer (1). After having positioned the spacer, insert its lateral rings (2).

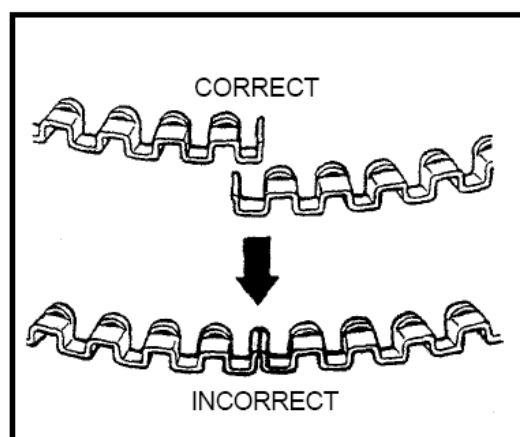
NOTE:

The spacer and the lateral rings do not possess a particular upper or lower side so they can be inserted in any way.



WARNING:

When installing the spacer, pay attention so that its ends are not superimposed in the cable.





Install the 2nd piston ring (3) and the 1st piston ring (4).

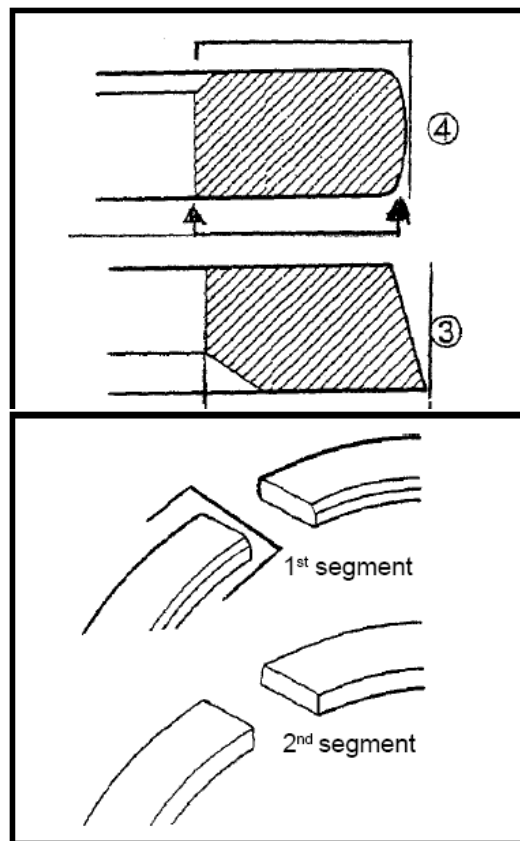
NOTE:

The form and width of the 1st and 2nd piston ring are different.

$$W4 = 3.1 \pm 0.1 \text{ mm}$$

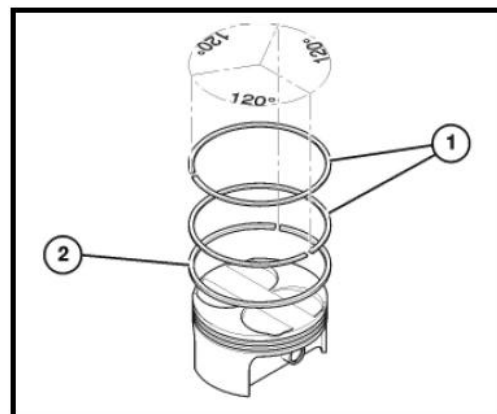
$$W3 = 3.7 \pm 0.1 \text{ mm}$$

The 1st and 2nd piston ring have the letter "N" on the upper side. Make sure that the marked side is turned upwards when being installed on the piston.

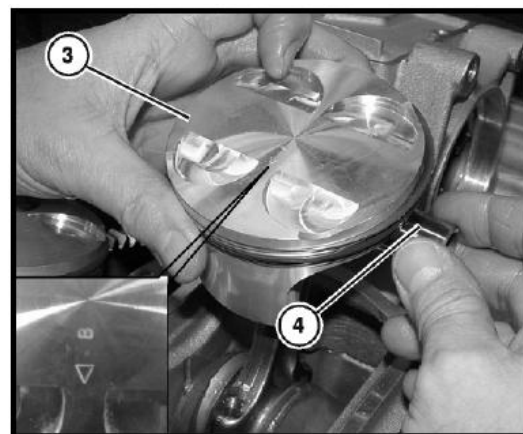


• Piston Installation

Position the two piston rings (1) and the oil ring (2) on the piston, positioning the opening at 120° from each other.



Position the piston (3), as shown in the figure, with the arrow on the piston pointing towards the exhaust.
Insert the pin (4).



ATTENTION:

*Always use new elastic rings for mounting the pistons.
To avoid breaks that can take place with the rings bent.*

Position the two elastic rings (5), one for each side pay attention not to deform them.





3.2.3 Engine Bottom end

• Crankcase Disassembling

Remove the cylinder head (see "CYLINDER HEAD REMOVAL")

Remove the cylinder block (see "DISMANTLING CYLINDER BLOCK")

Remove the pistons (see "DISMANTLING PISTONS").



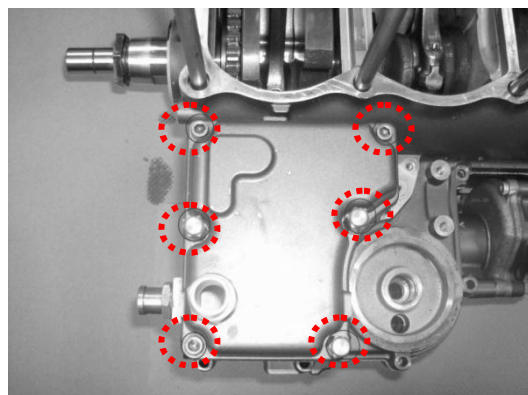
ATTENTION:

*Ensure that there is no oil left inside the engine before dismantling crankcase.
Remove engine oil using oil pump tool if necessary.*



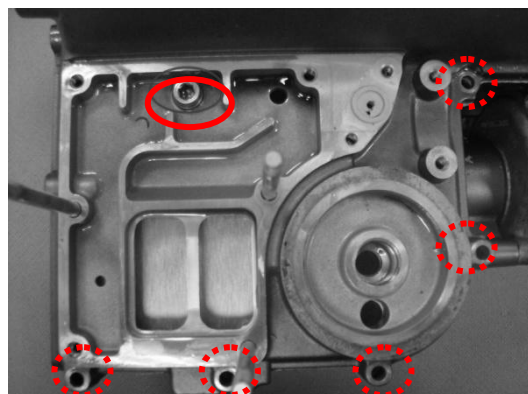
ATTENTION: After reassembling ensure to rotate the engine with its electric starter without spark plugs but with transmission installed on it and filled with engine oil for 60 seconds before installing the engine into the PWC to ensure that all bearings are sufficiently lubricated with oil before the first test run in the PWC.

Remove the roll-over valve block unscrewing 6 mounting screws shown on the figure.

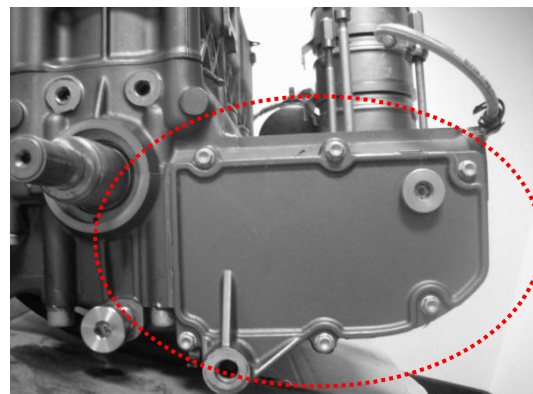


Remove the fixing bolt under roll-over valve cover (shown on the figure).

Remove 5 crankcase bolts shown by circle marks.



Remove the oil pump cover:



Oil Pump and Oil Sump removal

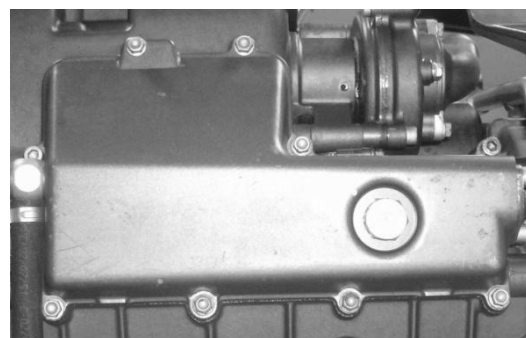
Rotate the engine 180° to access its bottom side.

Remove the oil hose attachment from the oil sump cover.

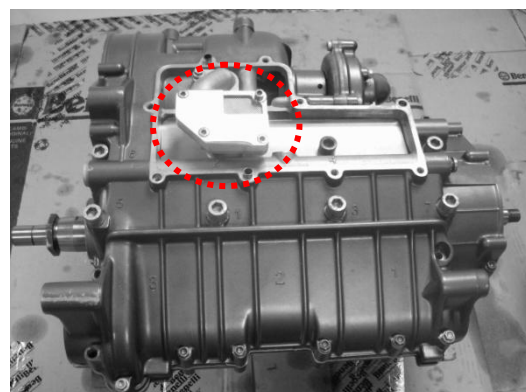
Remove the dipstick tube connection.

Untighten and remove oil sump cover mounting screws.

Remove the oil sump cover.



Dismantle Oil Pump intake tube and Oil Sump filter Assy.

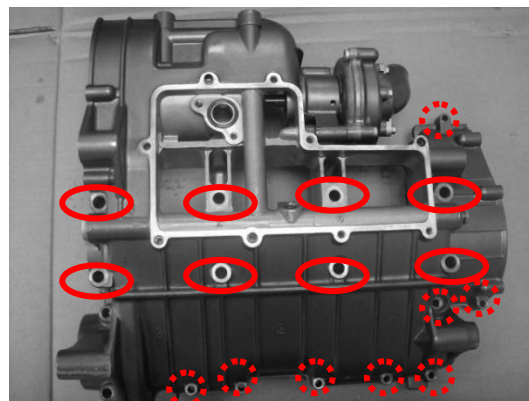


ATTENTION:

Note the position of the screws for correct remounting

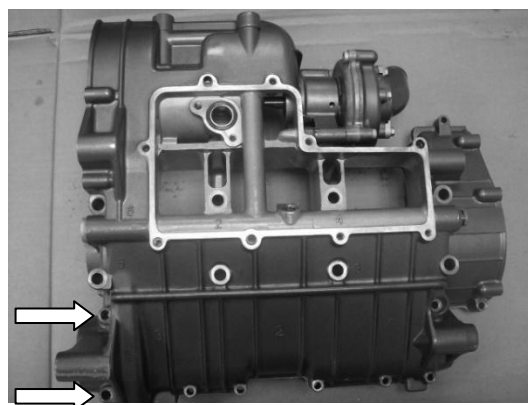
Remove the screws shown by circle marks on the figure.

Then remove 8 crankcase bolts shown by oval marks.

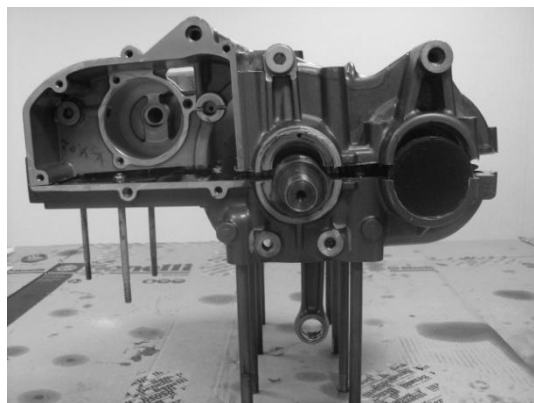




Remove 2 balance shaft screws shown on the picture.



Remove the lower crankcase part pulling it up. Use a soft hammer if necessary.

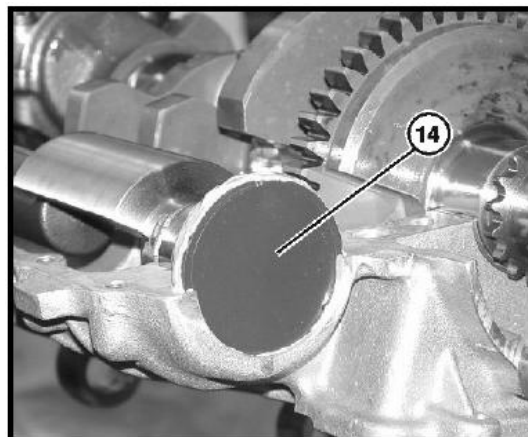


NOTE:

Pay attention to prevent crankshaft and balance shaft of falling down during casing removal.

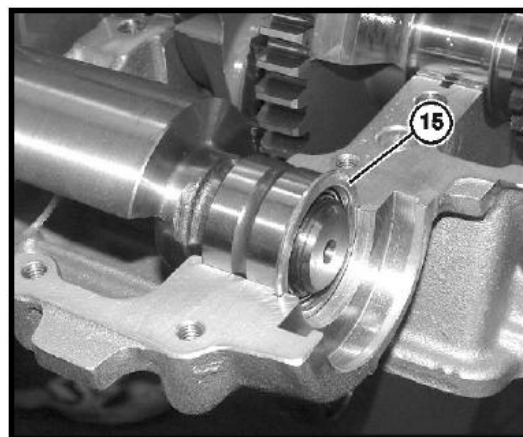


Remove 2 large plastic lock nuts on both sides of balance shaft. (14).



Remove the ring (15).

Remove the balance shaft.
Remove engine crankshaft.



ATTENTION:

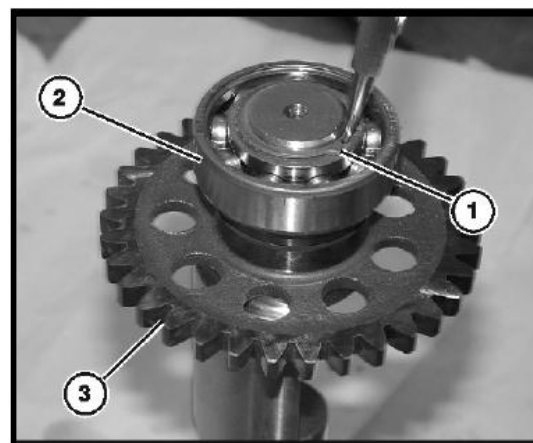
Take note of crankshaft plain bearings position for correct reassembling.

Remove the plain bearings.

Dismantling Balance Shaft



Remove the circlip (1).
Remove the ball-bearing (2) and the toothed wheel (3).



Remove the ball-bearing (4).



Dismantling Crankshaft

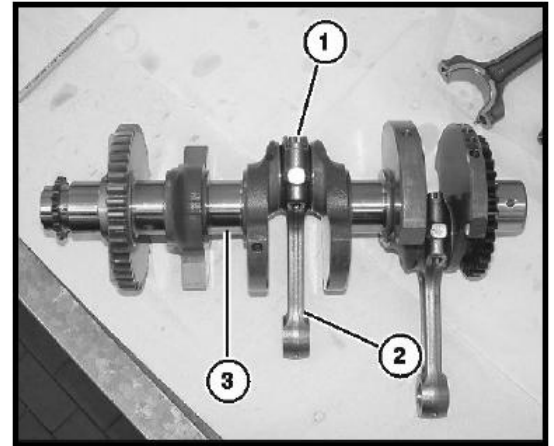


ATTENTION:
Take note of crankshaft parts position for correct reassembling.

The following procedure must be applied to all connecting rods mounted on the crankshaft shaft.

Unscrew and remove bolts (1).

Remove connecting rod (2) from the crankshaft (3).

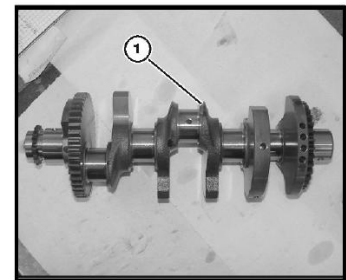


Check Engine Shaft and Connecting Rod

Check eventual breaks or excessive wear on the whole engine shaft (1).

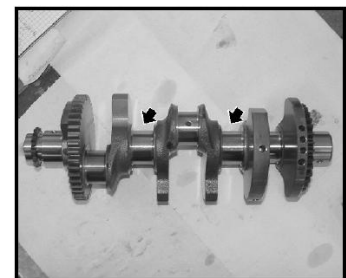
Change the piece if necessary.

Support the engine shaft with two "V" blocks and with the two ends resting upon the blocks, install a comparator and turn the engine shaft slowly.



Check the deformation of the engine shaft at the points indicated in the figure.

If the deformation does not enter within the specific value, change the piece.

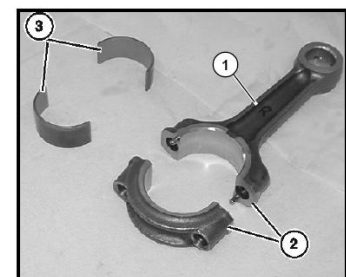


DEFORMATION

VALUE LIMIT = 0,040 mm

Check eventual breaks or excessive play on the connecting rod (2) and on the two semi-bronze bearings.

In case of replacement of the connecting rod, verify the belonging class marked on the shank (1).





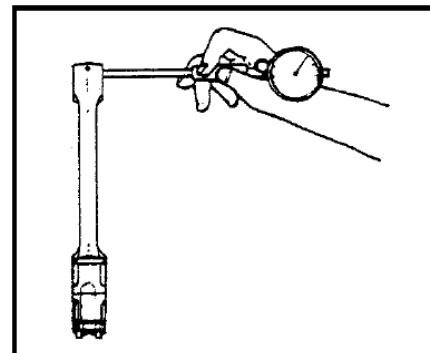
SELECTION SHEET		
TYPE	COLOUR	Ø CONNECTING ROD HEAD
A	Red	40.395/40.401
B	Blue	40.401/40.407
C	Yellow	40.407/40.413
TYPE	COLOUR	WEIGHT (g)
K1	Black	412/416
K2	Green	396/400
K3	White	400/404
K4	Brown	404/408
K5	Orange	408/412

Internal Diameter Connecting Rod Foot

Using a caliber for small holes, measure the internal diameter of the connecting rod foot.

INTERNAL DIAMETER CONNECTING ROD FOOT SERVICE LIMIT: 19.040 mm

If the internal diameter of the connecting rod foot exceeds the specified limit, change the connecting rod.



Connecting Rod Head Lateral Play:

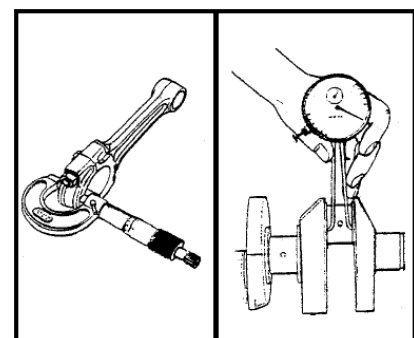
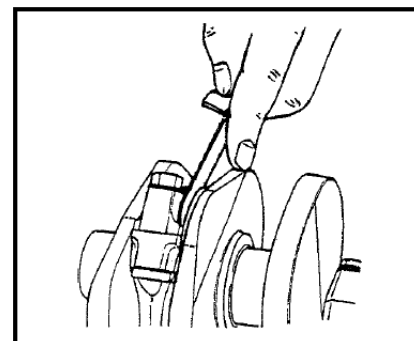
Check the lateral play of the connecting rod with a feeler.

If the play exceeds the specified limit, remove the connecting rod and check the width of the connecting rod head and pin. If the width exceeds the specified limit, change the connecting rod or the engine shaft.

CONNECTING ROD HEAD LATERAL PLAY SERVICE LIMIT: 0.40 mm

CONNECTING ROD HEAD WIDTH STANDARD: 2,18 - 2,19 mm

CONNECTING ROD PIN WIDTH STANDARD: 22,0 - 22,05 mm



• Crankcase Assembling

Mounting Crankshaft

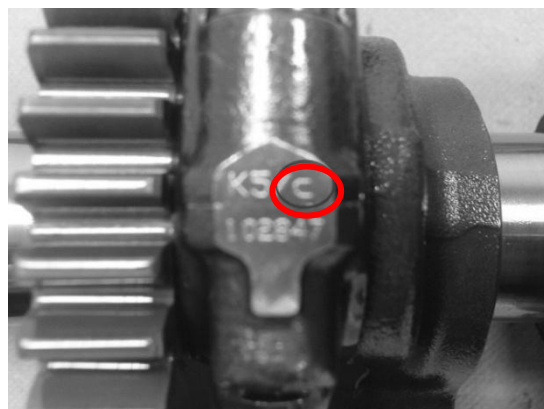
NOTE:

There are 3 different sizes of connecting rod plain bearings marked by colors mentioned in the chart.

CONNECTING ROD SEMI-BALL-BEARING		
STD	COLOUR	SELECTION
A	Red	1.680 - 1.684
B	Blue	1.684 - 1.688
C	Yellow	1.688 - 1.692
Ø seat std A red		40.395 - 40.401
Ø seat std B blue		40.401 - 40.407
Ø seat std C yellow		40.407 - 40.413
Ø single std shaft		36.976 - 36.986

Position each con-rod plain bearings according to the marks on the rod flange (see picture).

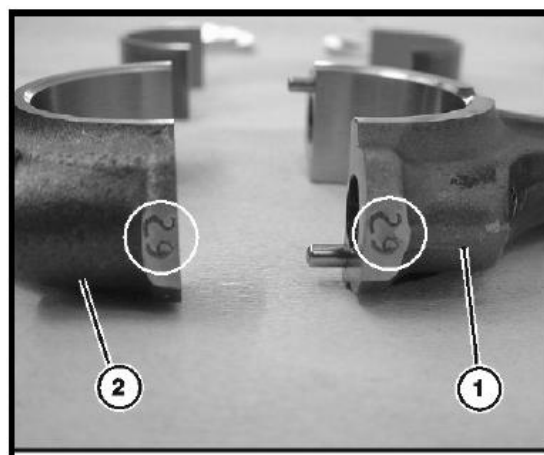
Take care the bearings are installed to relative slots.



ATTENTION:

Two marks shown on the figure must couple for connection rod body (1) and big end cap (2).

Assemble the connecting rod on the crankshaft so that the marks (1) and (2) are aligned as shown on picture.





NOTE: Apply MOLIKOTE® grease on the inner halves of con-rod plain bearings and ensure the outer halves and the con-rod bodies are cleaned with fuel to increase the friction between both parts.



RECOMMENDED OIL
MOLIKOTE® BR2 PLUS GREASE

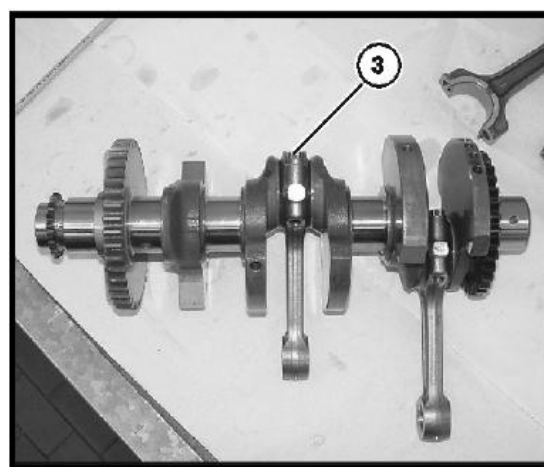


ATTENTION:
Always change connecting rod bolts by new after each dismantling.

Oil the thread and the diameter under the flanging of the fixing bolts (3) with the recommended grease.
Tighten the fixing bolts (3) slightly.



RECOMMENDED OIL
MOLIKOTE® BR2 PLUS GREASE



NOTE: Apply MOLIKOTE® grease on the inner halves of crankshaft plain bearings and ensure the outer halves and their crankcase seats are cleaned with fuel to increase the friction between both parts.



Position the crankshaft on the upper part of crankcase.

Tighten connecting rod bolts in three phases:



Tightening torque:

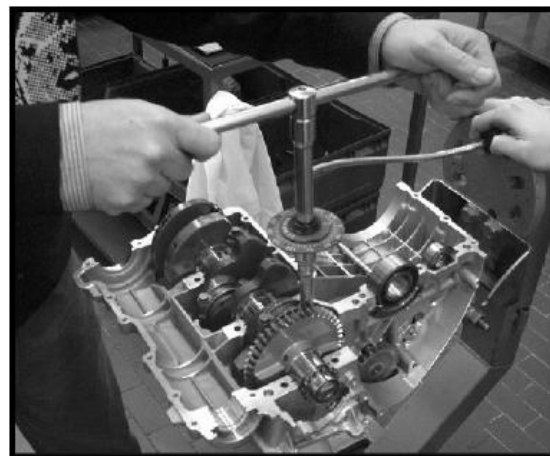
1st phase: 15 N·m (1,5 Kg-m)

2nd phase: 25 N·m (2,5 Kg-m)

3rd phase: + 50°

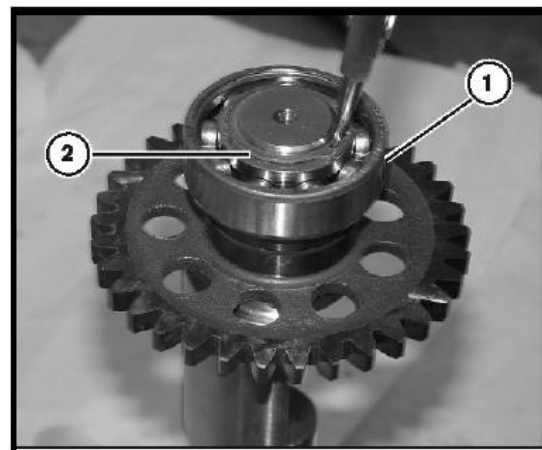
NOTE:

An angle torque control wrench is required to carry out the third tightening phase.

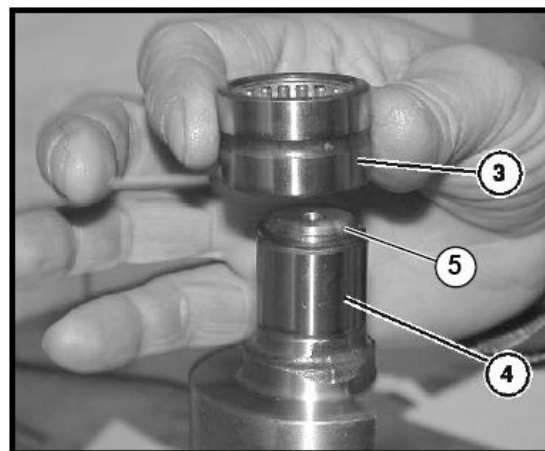


Mounting Balance Shaft

Position the ball-bearing (1) and fix with the circlip (2).



Position the bushing (4).
 Position the ring(5).
 Position the roller bearing (3) on the balance shaft.



Mounting Casting

NOTE:

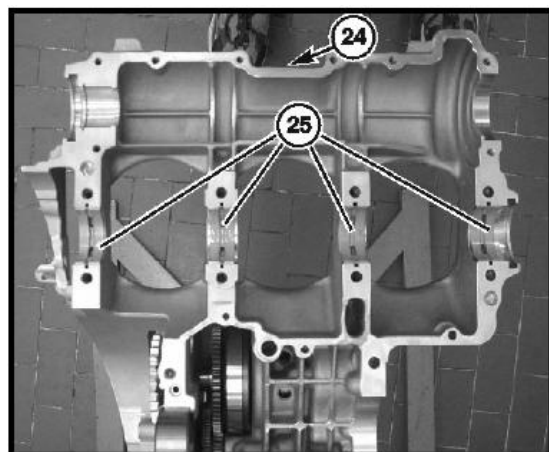
There are 3 different sizes of crankshaft plain bearings marked by colors mentioned in the chart.

BENCH SEMI-BALL-BEARING		
STD	COLOUR	SELECTION
A	Red	1.918 - 1.922
B	Blue	1.922 - 1.926
C	Yellow	1.926 - 1.930
Ø seat std A red		41.830 - 41.836
Ø seat std B blue		41.836 - 41.843
Ø seat std C yellow		41.843 - 41.849
Ø single std shaft		37.960 - 37.970

NOTE:

Reading the letters must always be carried out starting from timing chain side.

Position and center four semi-bronze plain bearings (25) each slotted with the correct color according to its letter stamped on the exhaust side of the crankcase (24).



LETTER	COLOUR
A	Red
B	Blue
C	Yellow

Position the crankshaft as shown on the figure.

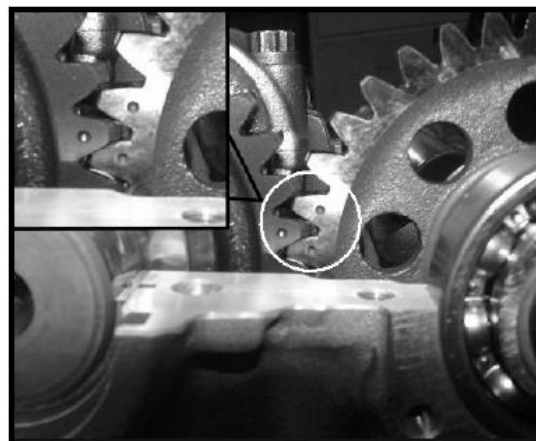
Position the balance shaft.



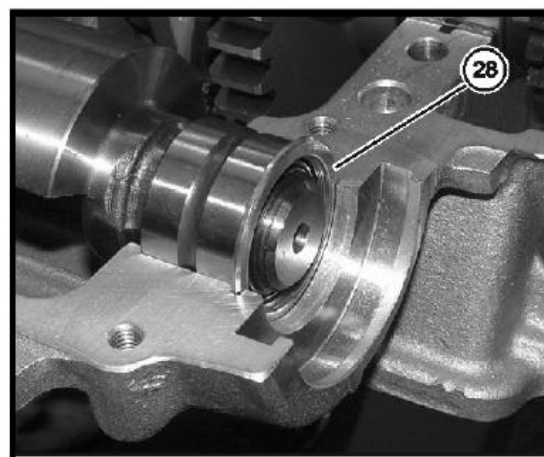


NOTE:

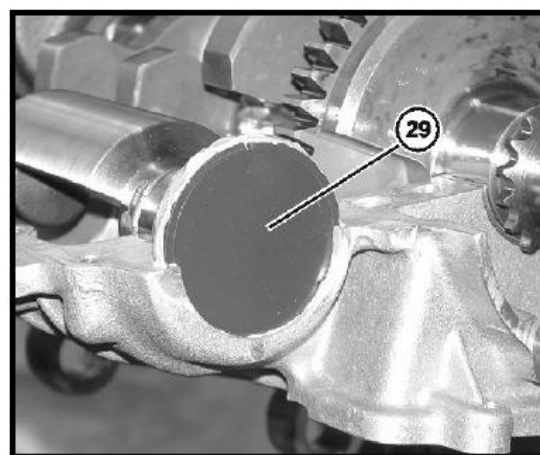
Make sure that sprocket wheels marks of the balance shaft and the crankshaft are aligned as shown on the figure.



Position balance shaft ring (28).



Install 2 large plastic lock nuts on both sides of balance shaft. (29).



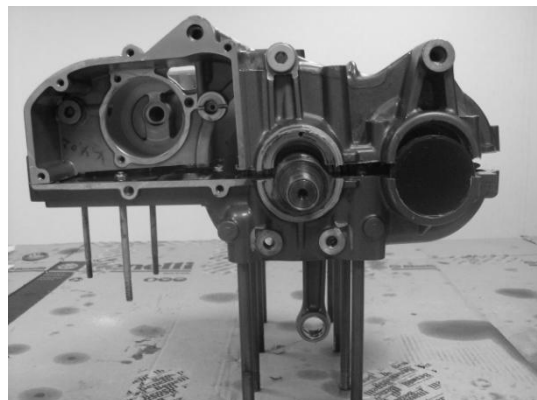
NOTE:

Apply proper amount of recommended sealant to the contact surfaces of both crankcase parts.



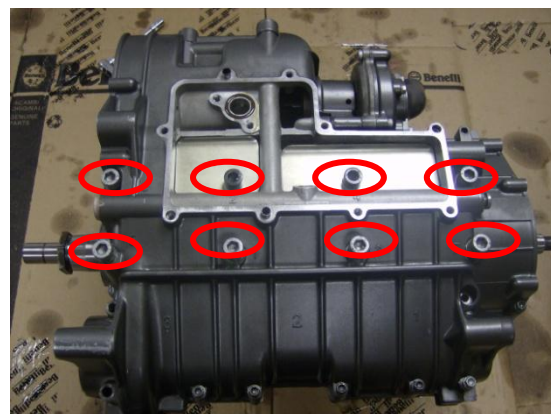
RECOMMENDED SEALANT
LOCTITE 5699 FLANGE SEALANT

Position the lower casing part on the upper.



ATTENTION:
Follow the mounting phases correctly.

Position eight crankcase screws with washers, apply recommended grease for their threads and tighten to specified torque in three phases according to the sequence marked on engine carter.



RECOMMENDED OIL
MOLIKOTE® BR2 PLUS GREASE



Tightening torque:

1st phase: 13 N·m (1,3 Kg-m)

2nd phase: 25 N·m (2,5 Kg-m)

3rd phase: 45 N·m (4,5 Kg-m)

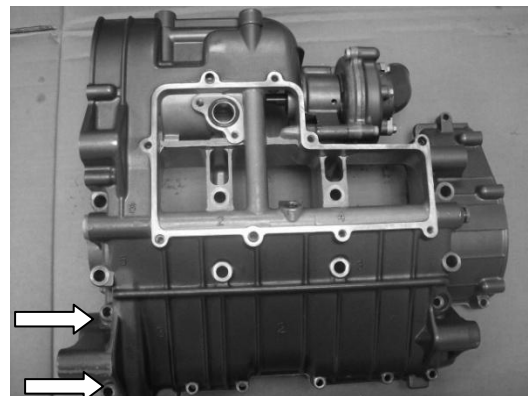
Tighten balance shaft M8 screws shown by arrows in two phases:



Tightening torque:

1st phase: 10 N·m (1,0 Kg-m)

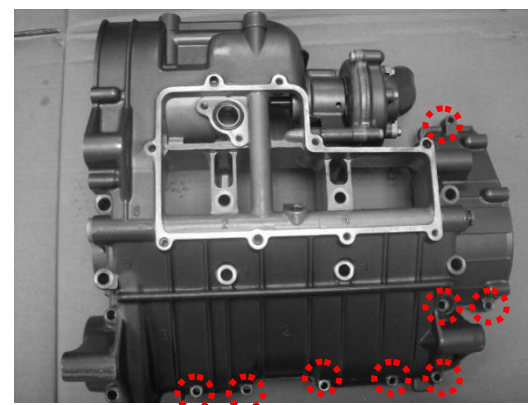
2nd phase: 25 N·m (2,5 Kg-m)



Tighten screws shown by circle marks with specified torque:



Tightening torque: 10 N·m (1,0 Kg-m)



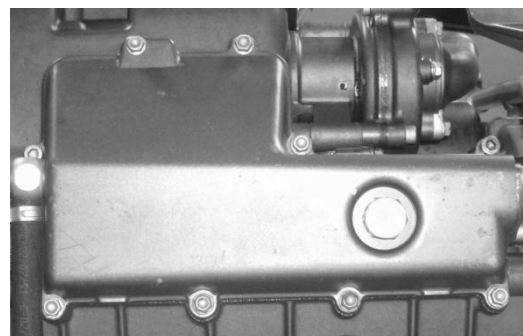
ATTENTION:
Always use new gaskets.

Install Oil pump intake tube, Oil sump filter and oil sump cover. Tighten cover screws with a specified torque:

**Oil sump filter mounting screws: 10 N·M (1,0 Kg-m) +
LOCTITE 243®**



Tightening torque: 10 N·m (1,0 Kg-m)



Rotate the engine 180° to be placed on its bottom side.

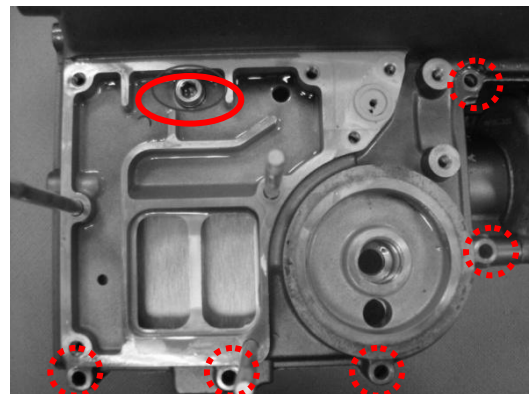
Tighten the bolt under roll-over valve in two phases (shown in oval-mark)



Tightening torque:

1st phase: 10 N·m (1,0 Kg-m)

2nd phase: 25 N·m (2,5 Kg-m)



Tighten five screws (shown in circle-marks) with specified torques:

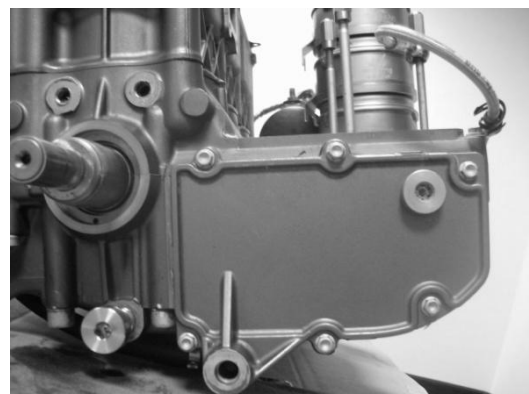


Tightening torque: 10 N·m (1,0 Kg-m)

Install Oil pump cover and tighten its screws with specified torque:



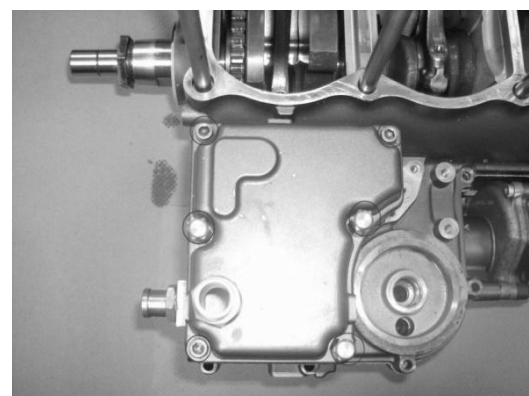
Tightening torque: 10 N·m (1,0 Kg-m)



Install roll-over valve assembly and tighten its fasteners with a specified torque.



Tightening torque: 10 N·m (1,0 Kg-m)



3.2.4 Cooling system Thermostat and Water pump

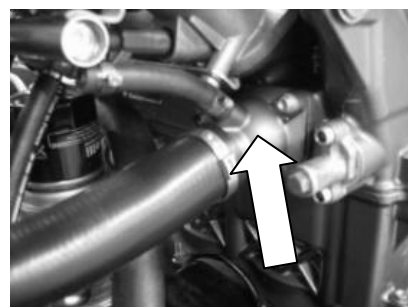
- Thermostat:
- Dismantling Thermostat:



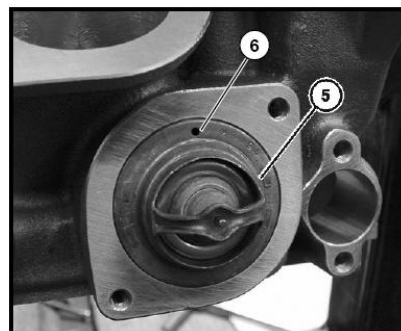
WARNING:

Always use new gaskets and oil seals.

Disconnect cooling system hose, loosen and remove mounting screws and remove the thermostat cover.

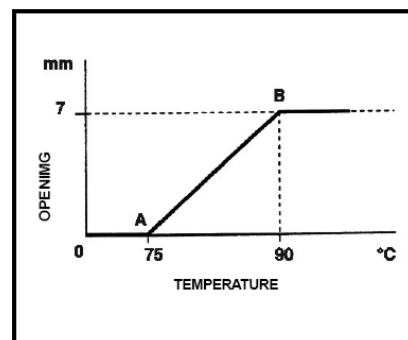


Remove the thermostat (5).
Verify that the by-pass hole (6) is not obstructed.



- Check Thermostat

The thermostat begins and opens at around 75°C and reaches 7 mm minimum opening at 90°C, as shown in the diagram on the figure.



Check whether the thermostat pad is cracked.

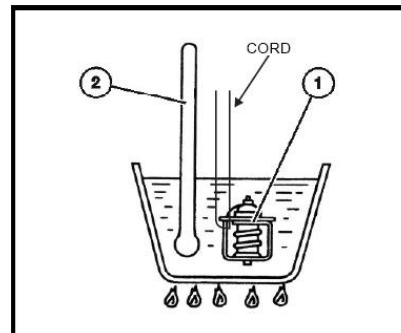
Pass a cord through the flange as indicated in the figure.

Check the above-mentioned conditions by immersing the thermostat (1) in a container with water, maintaining it in suspension.

Slowly heat the water and check the temperature with a thermometer (2).

When a temperature of 75°C is reached, the thermostat valve begins to open and arrives at a temperature of 90°C.

The thermostat valve reaches an opening of at least 7 mm.



Change thermostat if necessary.

Check that the thermostat cover and the tubes connected to it are not broken, otherwise change the damaged element.

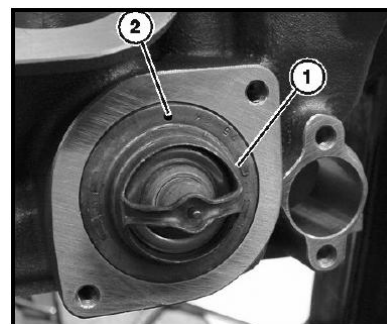
- **Mounting the Thermostat**



WARNING:

The thermostat must be mounted with the by-pass hole (2) turned upwards, as shown on the figure.

Position thermostat (1) as indicated on the figure.



Position the thermostat cover and tighten with the two mounting screws with specified torque:

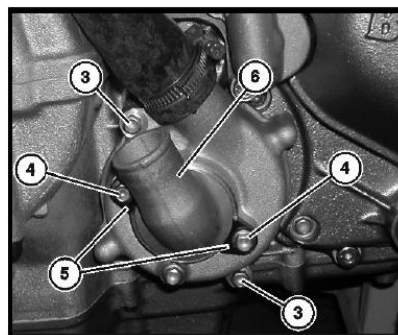


10 N·m 1 Kg-m

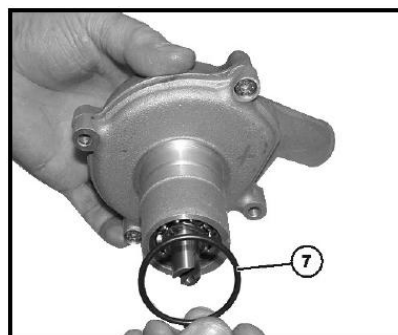


- **Dismantle Water Pump**

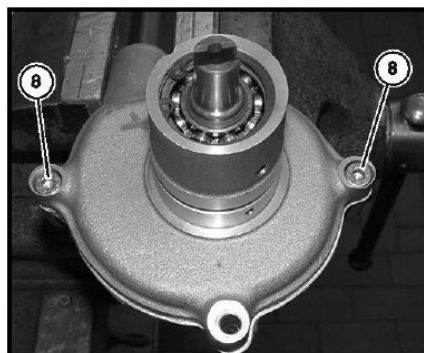
Loosen and remove the two screws (4) and the small plates (5).
Remove the entry elbow (6).
Loosen and remove the two screws (3) and remove the water pump from the engine.



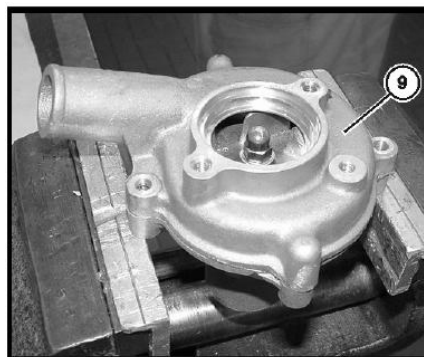
Remove O-Ring (7).



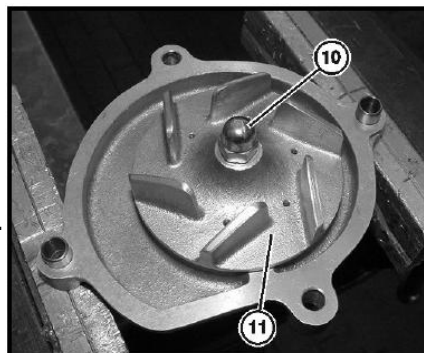
Loosen and remove two screws (8).



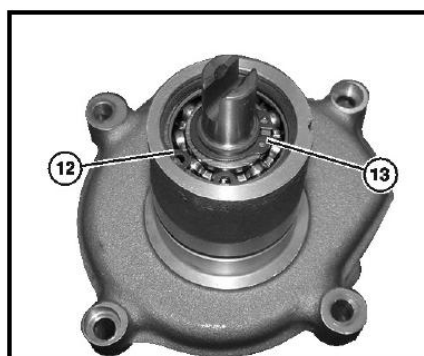
Remove the cover (9).



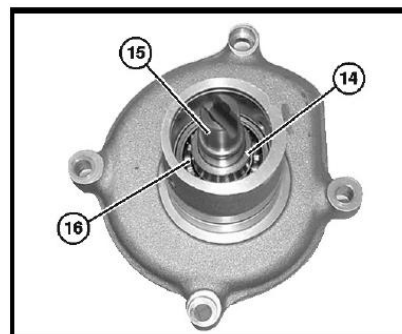
Loosen and remove the nut (10) and remove the rotor (11).



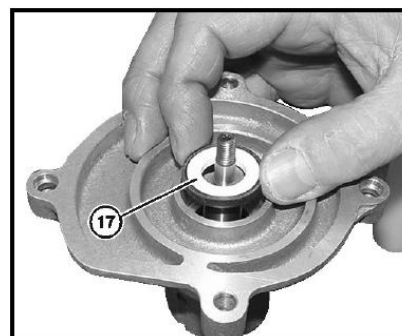
Remove the external circlip (12), the internal circlip (13) and the ball-bearing beneath.



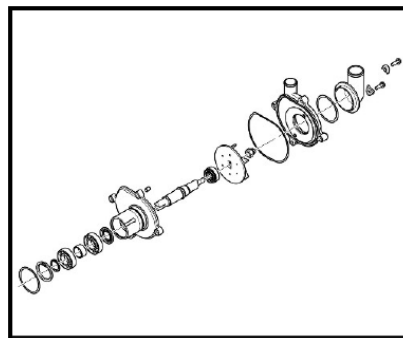
Remove the liner (14), the shaft (15), the ball-bearing (16) and oil seal beneath.



Remove the mechanical seal (17).

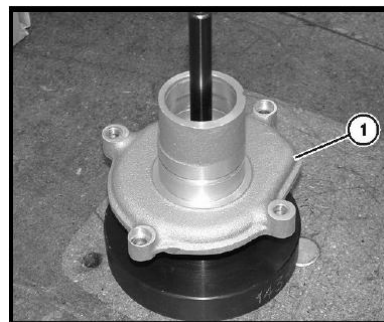


Check the state of wear of the various components of the pump.
Check that the various elements are not broken.
Change worn or damaged elements if necessary.



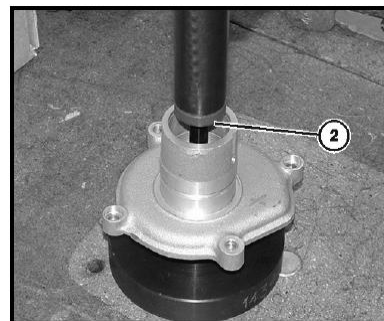
- **Water Pump Assembly**

Position the pump body (1) on a support.

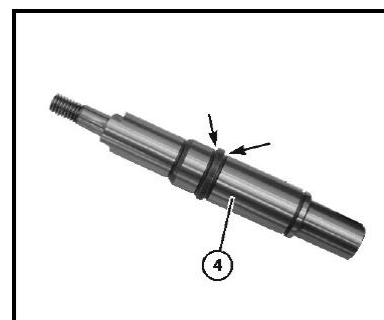


ATTENTION:
The oil seal must be inserted downwards with the lip closed.

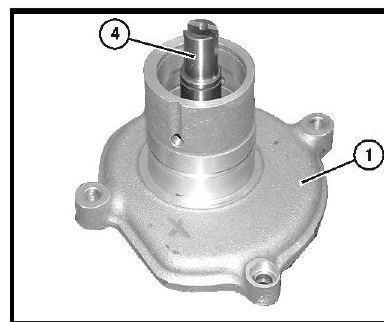
Position oil seal until it touches (2).



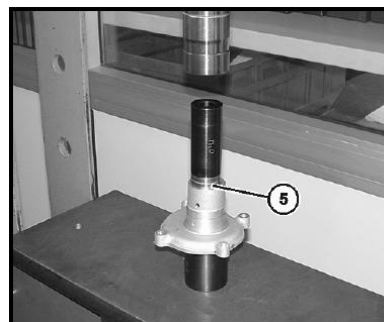
Grease the shaft (4) at the points indicated on the figure.



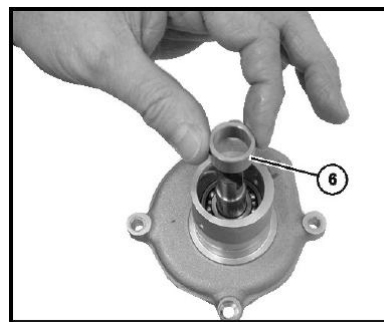
Position the shaft (4) inside the pump body (1).



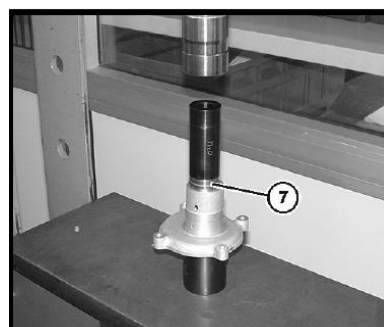
Position the first ball-bearing (5), using a press to make it touch.



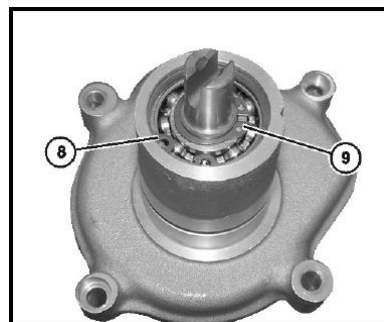
Position the liner (6).



Position the second ball-bearing (7), using a press to make it touch.

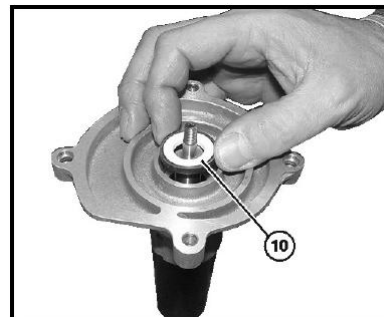


Fix the ball-bearings with the external (8) and internal (9) circlips.

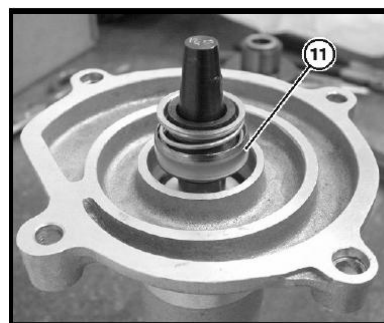


ATTENTION:
While mounting the counter-face and mechanical seal make sure that they are clean and bear no traces of grease.

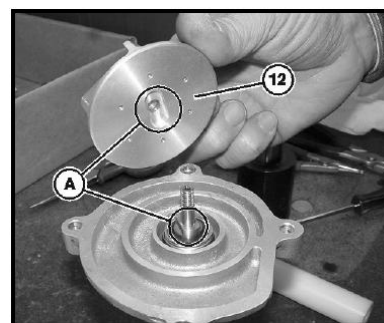
Position the counter face as in the figure (10).



Position the mechanical seal (11) until it touches as shown in the figure.



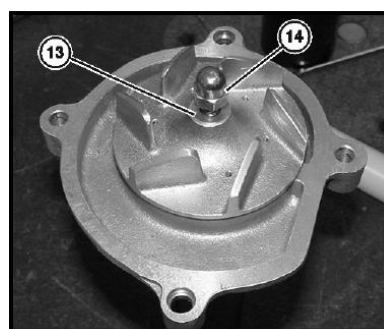
Position the rotor (12) making it meets clutch (A).



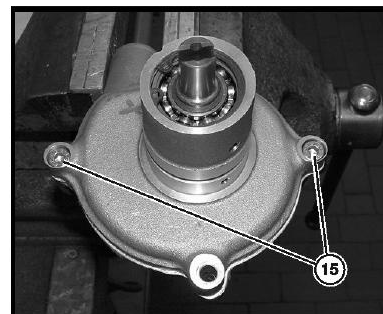
Position the sealing washer (13) and fix it tight with the nut (14).



8 N·m 0.8 Kg-m
Always use LOCTITE 243®



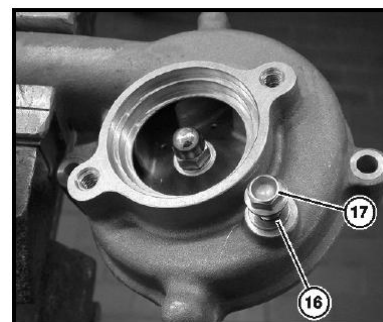
Position the cover and lock it tight with the two screws (15).



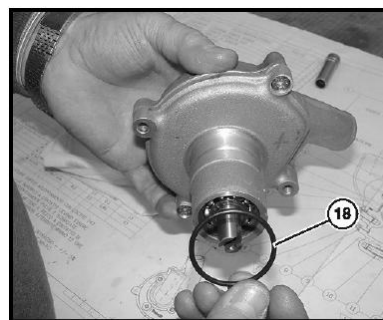
Position the sealing washer (16) and tightly screw the purge screw (17) up.



10 N·m 1 Kg-m
Always use LOCTITE 243®



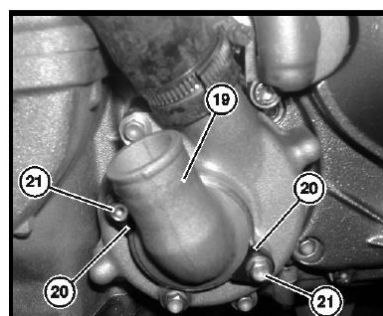
Position the O-Ring (18) on the pump body.



Position the entry elbow (19) and fix with the two small plates (20) and the two screws (21) tightly.



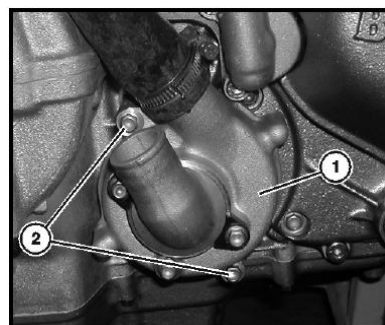
10 N·m 1 Kg-m



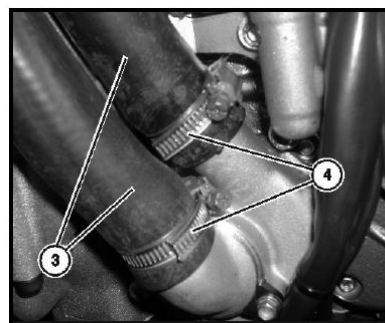
Position the pump (1) as in the figure and screw the two screws (2) up tightly.



10 N·m 1 Kg-m
Always use LOCTITE 243®



Reposition the entry and exit tubes (3) of the pump, tightening two hose clamps (4).





4 DRIVE SYSTEM





4 Transmission

4.1 Transmission Dismantling

Remove engine out of the PWC (see Engine Removal chapter).



Remove the engine oil by opening the oil plug screw on the bottom of the engine

(19 mm socket required). Use suitable equipment to collect the engine oil.

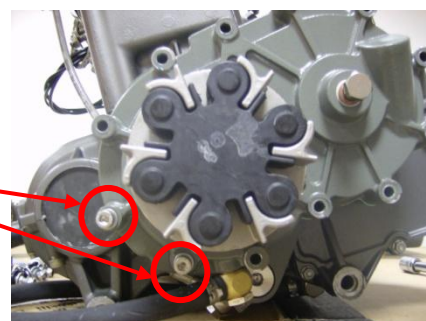


Remove the following parts:

- Oil return line to the bottom of the engine
- Oil supply line
- Rear engine Support
- Coupler cover



Remove 2 x short and 10 x long 5mm mounting screws
Take note of short screw position (shown on figure)



Remove transmission cover with a suitable tool.

NOTE: do not damage the gasket surface of the casting.



Remove the right hand thrust washer carefully and place beside.





Remove carefully the left hand transmission gear assy and place beside.



Remove carefully the second thrust washer and place beside.



Remove carefully the 3 x needle cage bearings and place beside.

Remove carefully the left had thrust bearing and place it beside.



Remove Nut (41 mm) with an impact tool



Remove transmission gear with the gear wheel remover.



Tighten the screws of gear wheel remover in X-method, stopping the gear with a suitable tool.

Remove the gear and place it beside.



Remove 2 x transmission casing mounting screws and lower banjo bolt.

NOTE: Remove the copper washer of lower banjo bolt.



Remove transmission gear box casing and place it beside.



Disassembling transmission cover

Support the transmission cover and use special tools to open the coupler. Loosen and remove the coupler.



NOTE: The washer in between the bearing and the gear has a thickness of 4,5mm





Remove circlip and bearing

NOTE: The washer in between the oil seal and the bearing has a thickness of 1,5mm.



Disassembling transmission housing:

Remove the oil seal and the O-ring.



4.2 Transmission Assembling

Assembling the transmission cover

Grease new oil seal on the seal lips and on the oil seal groove. Press in the oil seal by hand.



Press in the bearing and put in place the circlip to secure the bearing.



Subassembly of the PTO gear.

Press and glue the aluminum plug into the PTO gear with Loctite 648 as shown on the pictures below. Put the washer (4,5 mm) in place.



Install washer (1,5mm) in between the oil seal and the bearing using suitable tool.



Assemble coupler into the PTO gear using grease and tighten the coupler with specified torque.



Tightening torque: 80 N·m

Assembling transmission housing

Apply grease on the inside and sealing lips of the oil seal. Press in the oil seal.

NOTE: The greased side of the oil seal needs to be on the same side like the painted side of the oil seal cover.



Put in place the O- ring. Apply Loctite 5699 on the O – Ring.



Apply Loctite 5699 on the surface of the transmission cover



Assembling transmission on the engine

Put in place the transmission housing and tighten 3 x bolts.



NOTE: Pay attention not to damage the oil seal by thread of the crankshaft

NOTE: Insure that the oil delivery line will be placed in between the engine and the transmission housing.



Apply **RED Weicon Lock AN 305-86** on the thread of all 3 screws. Ensure the copper gasket is used on the bigger one.



Tighten the 3 bolts with specified torque



Tightening torque: 45 N·m



Pressing in the transmission bolt

During pressing in the transmission bolt ensure the lubrication holes are orientated to the right side (90 deg. to the right).



Assembling the right hand side gear:

NOTE: For correct Crankshaft gear installation apply Loctite 648 on the surface of the inner side of the cone.



Assembling the right hand side gear tightening nut:

NOTE: Apply RED Weicon Lock AN 305-86 on the thread of the tightening nut.



Block the gear and tighten the nut with a specified torque.



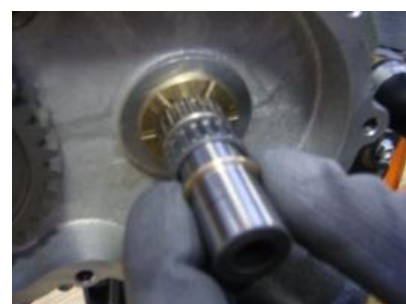
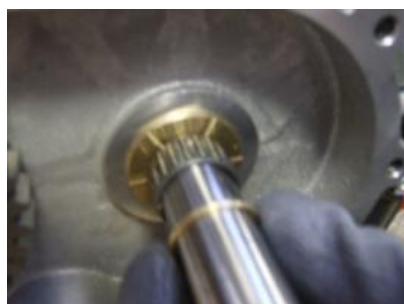
Tightening torque: 160 N·m

Put in place transmission parts on the right hand side of the transmission:

Put in place the thrust washer

Put in place the 1st cageless needle bearing

Put in place the 1st thrust ring.



Put in place the 2nd cageless needle bearing

Put in place the 2nd thrust ring.

Put in place the 3rd cageless needle bearing

Oil the bearing system:



Put in place the right hand gear assembly.

Put in place the thrust washer of the right hand transmission gear.



Put in place the thrust washer of the left hand transmission gear.

Put in place the 3 x cage needle bearing



Oil the bearing system

Ensure the 2 x location pins are in place

Apply Loctite 5699 on the transmission housing sealing surface.



Put the Paper gasket for the transmission cover in place.

Apply Loctite 5699 on the sealing surface of the transmission cover.



NOTE: The short screws are to be used on the left hand side of the transmission like shown on the figure.



Tighten using the other 10 screws

Tighten all 12 screws according to the tightening procedure and with specified torque.



Tightening torque: 10 N·m

Install the oil lines in the order your removed them.

Apply **RED Weicon Lock AN 305-86** and tighten the banjo bolt with specified torque.



Tightening torque: 25 N·m





Apply **RED Weicon Lock AN 305-86** and tighten both banjo bolts of oil supplying line with specified torque.



Tightening torque: 20 N·m



WARNING:

Pay attention for amount of used Locking agent on the oil line banjo bolts thread. There is a risk of blocking oil passages.

Tighten the oil plug screw with specified torque.



Tightening torque: 30 N·m



Refill the proper oil volume in the engine.



ATTENTION:

Use only original HSR-Benelli engine oil

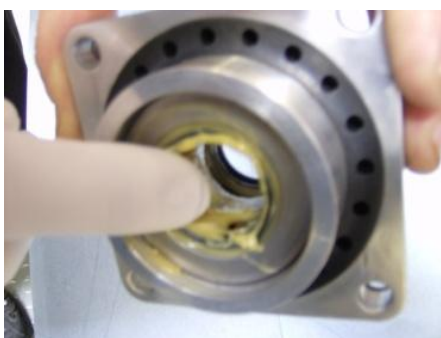


4.3 Center flange bearing

Assembly of the flange bearing:



Grease the oil seal lips with water resistance grease on both sides.



RECOMMENDED LUBRICANT:
FUCHS URETHYN E/M 2

Use new pre-coated screws or apply blue Loctite 243



Put in place the flange bearing and tight
4 screws with specified torque.
Support the bearing with a hammer to put
the bearing on the top position.



Tightening torque: 30 N·m



Put in place the flange bearing cover apply blue Loctite 243 on the thread of the screws and tighten the screws with specified torque.



Tightening torque: 10 N·m, in X-method





S *PUMP AND IMPELLER*



5 PUMP AND IMPELLER

5.1 Jet Pump overview

(Series-R Pro pump shown)



NOTE:

Series-S and Series-R engines have closed-loop cooling system. The radiator is integrated into jet pump housing which is connected to the cooling system lines.



WARNING:

Each time JET PUMP STATOR or JET PUMP assembly were removed from the hull, engine coolant could flow out.

After reassembling jet pump to the vehicle always perform engine coolant level check and refill to specified volume if necessary.



5.2 JET PUMP DISASSEMBLING

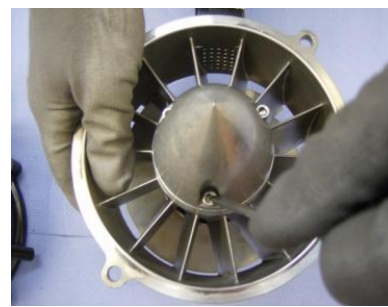
Remove the O- rings from the jet pump and place it beside.



Remove 4 x Allen screws (m5) locking the Nozzle.

Remove Jet Pump housing, Impeller housing with the Stator.

Remove 3 x screws of the stator cone.



Remove cone.

NOTE: Pay attention on the white O-ring in order not to lose it.



Cleaning of the water sieve in the Jet Pump:

NOTE: The water sieve protects the exhaust cooling system from sand and other particles to block the water supply.

A heat sensor will warn you and slow down your personal PWC into the “limp home mode” of 4000 rpm. This requires regular maintenance.

(There is a second one in the water injection of the exhaust system).

Remove the sieve out of the housing with a tool.



Removing of the Impeller:

Remove the impeller from the impeller shaft by loosen the impeller with a Special Tool.

Block the impeller shaft. (See Photo beside).



NOTE: Remove the Impeller shaft with a soft tool in order to avoid damages on the thread.

Remove the impeller shaft.



Disassembly of the Stator Housing of the Jet Pump:

Remove the bearings out of the housing with a soft tool.



NOTE: Take care of bearings place for correct assembling.



Disassembly of the Jet Pump Housing

Disassembly of the Jet Pump Housing carrying the Liner for the engine Radiator.

NOTE: The Jet Pump housing and the Liner cannot be taken apart and need to be replaced as one for repair.



Remove the cooling water supply hose.

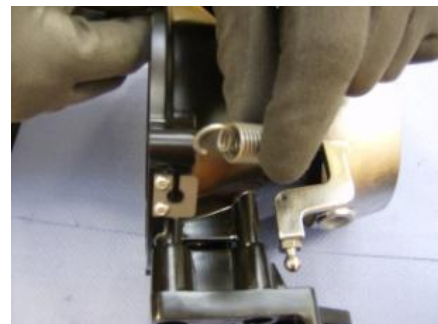


Disassembly of the Jet Pump nozzles:

Open with an allen screw driver (M 6mm) the screws on the left and right hand side of the steering nozzle.



Remove the spring located on the Nozzles.



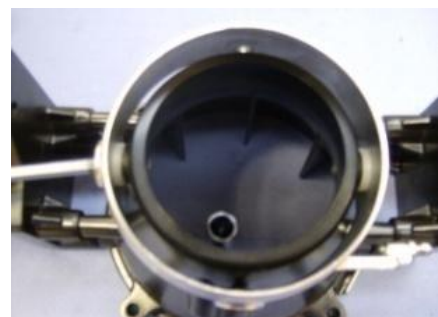
Remove the Steering nozzle.



Remove plastic bushings from the steering nozzle with a soft tool carefully.

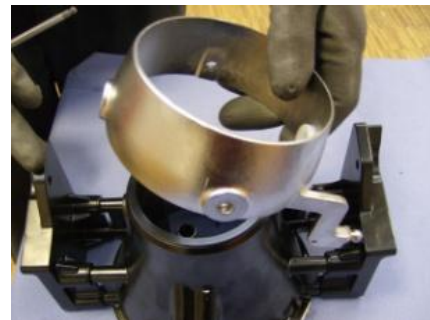


Remove the allen screw (M 6 mm) from the trim nozzle.





Remove the Trim Nozzle.



Remove the plastic bushing with a soft tool carefully.



NOTE: For Reverse Equipped PWC only:

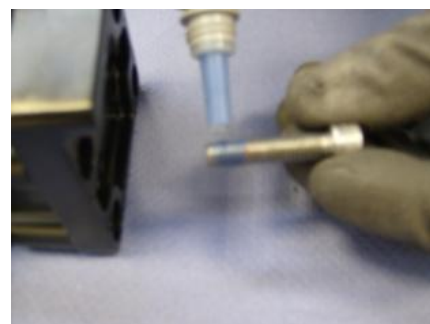
Remove the reverse support from the jet pump with an allen screw Driver (M 6mm)



5.3 ASSEMBLING THE JET PUMP

NOTE: For Reverse Equipped PWC only

Apply blue Loctite 243 on the threads of the screws



Tighten the reverse support on the Jet Pump Housing.

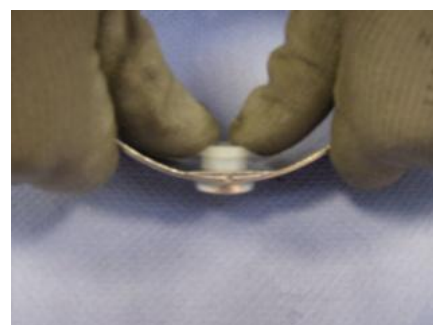


Tightening torque: 20 N·m



Reinstall the jet pump nozzles

Press in the new plastic bushings into the trim nozzle



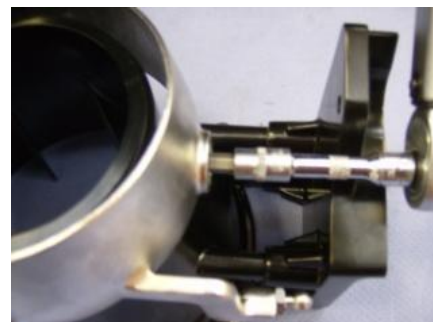
Apply blue Loctite 243 on the threads of the screw tightening the Trim nozzle.



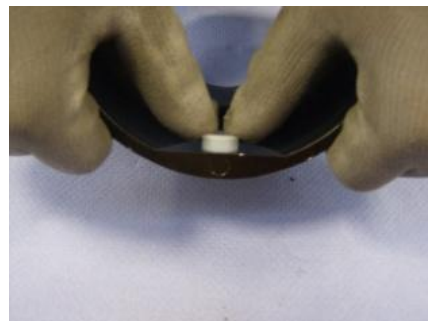
Tighten the screw with specified torque.



Tightening torque: 20 N·m



Press in the new plastic bushings into the steering nozzle



Apply blue Loctite 243 on the beginning of the threads of the screw and tighten the screws with specified torque.



Tightening torque: 20 N·m



Proceed the same process on both sides of the pump.

Assembly of the Stator Housing of the Jet Pump



Assembly of the Jet Pump Housing:

Put in place the first (smaller in diameter) bearing.



Press in the first bearing (smaller in diameter) bearing with a tool.



Put in place the second (smaller in diameter) bearing with a tool.



Press in the second bearing (smaller in diameter) bearing with a tool.



Put in place the distance sleeve.



Put in place the third bearing (bigger diameter).



Press in the third bearing (bigger diameter) with a special tool.



Take a new oil seal and apply grease in the lips.
Place the oil seal on the sleeve.



RECOMMENDED LUBRICANT:
FUCHS URETHYN E/M 2



Press in the new oil seal with a tool very carefully



Apply grease on the remaining sleeve and put it in place.



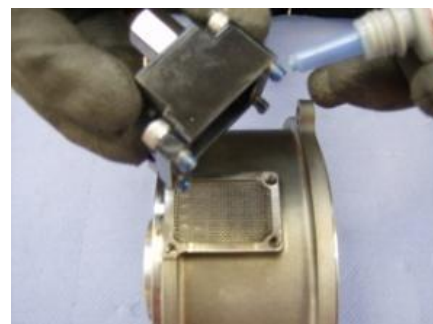
RECOMMENDED LUBRICANT:
FUCHS URETHYN E/M 2



Put in place the sieve in the housing.



Put in place the sieve housing and apply blue Loctite on the beginning of the thread



Tighten the screws for the sieve housing with specified torque.



Tightening torque: 10 N·m, in X-method



Apply grease on the impeller shaft all the way around.



**RECOMMENDED LUBRICANT:
FUCHS URETHYN E/M 2**



Press in the Impeller Shaft.

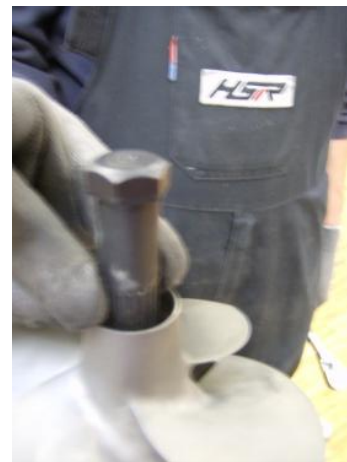


Assembly of the Impeller:

Screw carefully the Impeller on the Impeller Shaft and tighten it by hand.



Use a special tool to tighten the impeller to the final torque.



Tighten the Impeller to the specified torque.



Tightening torque: 100 N·m



Put in place the white plastic ring.



Apply blue Loctite 243 on the screws of the cone and tighten it with a specified torque.



Tightening torque: 7 N·m



Apply blue Loctite 243 in the thread of the water supply tube
And tighten the tube on the housing.
Put in place the O-Ring and apply slightly grease on the surface.



Apply grease on the sockets of the Impeller housing.



Put in place the Stator Housing on the Impeller Housing



Put in place the Nozzle assembly



Apply blue Loctite 243 on the beginning of the threads of the screws.



Tighten the screws with specified torque.

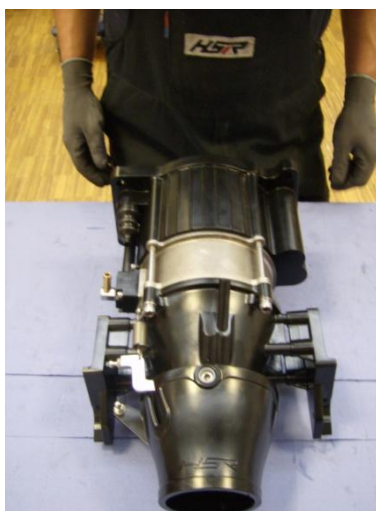


Tightening torque: 25 N·m, in X-method

Put in place the O – Rings and the rubber cone and the rubber seal.

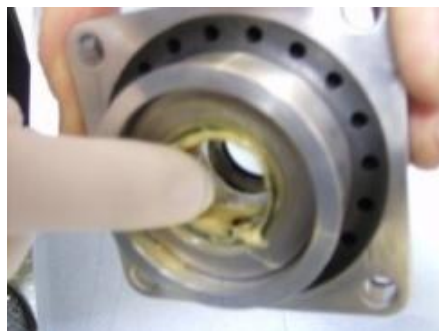


Final assembly of the Jet Pump.



5.4 Jet Pump Assembly into the PWC

Grease the sealing lips of the jet pump.



Assemble the Flange bearing with its 4 screws into the rear of jet pump tunnel. Apply blue Loctite 243 on the threads of the screws or take new micro coated screws.



Support the Flange bearing during assembly with a hammer to pull it on the top position during tightening.

Tighten the screws with specified torque.



Tightening torque: 30 N·m, in X-method



In order to put the O - Rings on the jet pump housing grease the grooves for easy assembly.



Apply blue Loctite 243 on the thread of the screws. Tighten the screws with specified torque.



Tightening torque: 30 N·m, in X-method

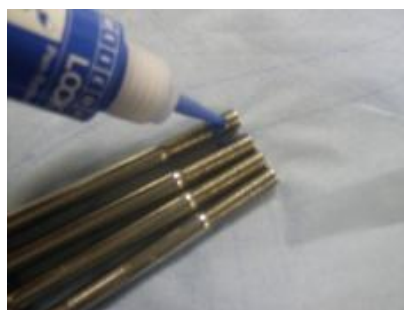
Put in place the impeller housing with the impeller on the jet pump housing.



Apply blue Loctite 243 on the threads of the screws and tighten with Tighten the screws with specified torque.

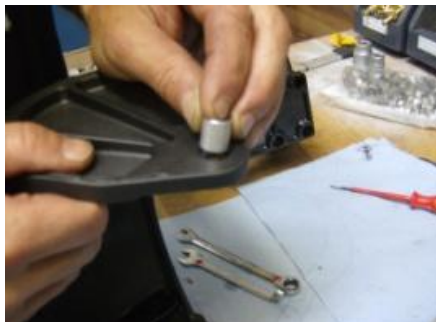


Tightening torque: 20 Nm.



5.5 Assembly of the Reverse Gear (For Series – R Pro Model only)

Put in place the sleeves of the reverse shield.



Apply blue Loctite 243 on the thread of the screws and put 2x per side the washer in place.



Tightening torque: 10 Nm.

NOTE: Ensure the reverse shield moves easily.

5.6 Assembling riding plate

Apply blue Loctite 243 on the thread of the screws.

Put in place the Riding Plate and tighten 4 x screws with specified torque.



Tightening torque: 12 Nm.



5.7 Steering cable setting

- Hold the steering in straight forward position. The distance of the jet nozzle to the jet drive outlet must be the same on the left and the right side. Otherwise, adjust the steering cable accordingly.
- To disconnect the steering cable from the jet nozzle at the ball joint, you must first pull the steering cable back. Then, pull up on the connection. The cable will be free from the connection.



The distance should be the same on both sides. (x)



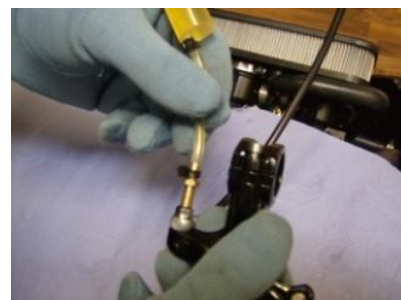
WARNING:

Pay special attention when assembling components of steering system. Non proper assembling could result lost of contol during riding vehicle.

5.8 Trim system bleeding

NOTE: Put protection on the hull to avoid brake liquid contact with the paint of the hull!

Fill an injector like shown in the picture with brake liquid half the way (10 cm³) and screw a bleeding nipple into the trim system. Put covering material on the PWC in order to protect the paint of the deck.



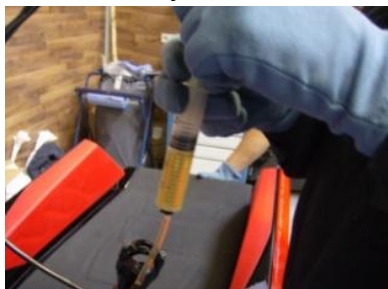
Attach the Injector with a hose and tighten it with a plastic clamp.
Press the injector 10 times.



Put the nozzle in top position and repeat the injector pump process 10 times.
Put the nozzle in bottom position and repeat the injector pump process 10 times.

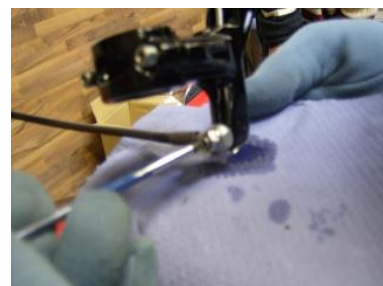
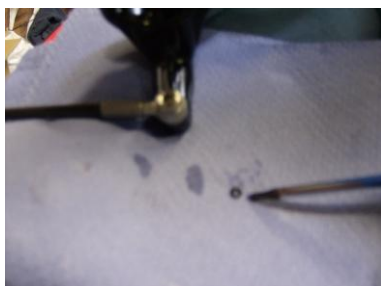
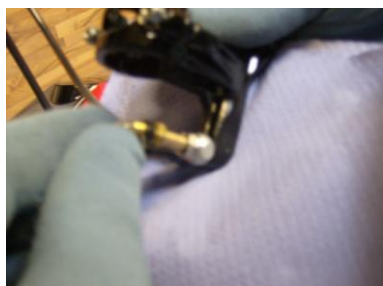


Keep the Injector pressurized and pump the nozzle up and down until no air bubbles are released to Injector.



Put paper underneath the trim lever to collect remaining brake liquid.

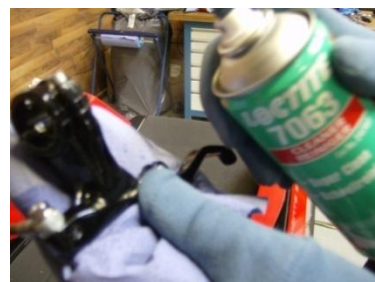
Remove the Injector, bleeding nipple, put in place O – Ring and screw the plug loosely into the Trim lever body.



Tilt the nozzle to the top position and ensure the excessive brake fluid will be released of the trim lever.

Tighten the plug screw.

Clean the trim leaver with a cleaner in order to avoid brake liquid contact with the paint of the hull.





6 *FUEL SYSTEM*



6 Fuel system

6.1 Fuel Tank and Fuel Pump

Fuel tank disassembly out of the PWC:
(Shown for Series-R Pro)

Remove the 2 x screws of the fuel tank belts on the bottom of the hull.



Unscrew the clamp of the fuel filling hose and remove the hose.



NOTE: Pump out any remaining fuel out of the tank if required.

Remove the fuel tank out of the hull.

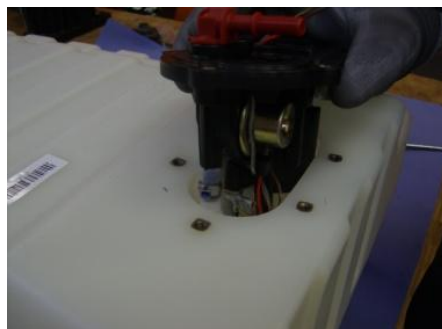


Disassembly of the fuel pump out of the fuel tank:

Unscrew the 6 x screw from the fuel pump.



Pull out the fuel pump carefully out of the fuel tank.



Fuel pump filter and fuel pressure regulator are located on the fuel pump.



Assembly of the fuel pump into the fuel tank:

Put back in place the fuel pump for assembly.

NOTE: It is EXTREMELY important to insure that THE FUEL FILTER IS NOT SQUECED INBETWEEN THE FUEL PUM AND THE TANK.

There is the risk of leaking fuel into the hull.



Apply blue Loctite 243 on the thread of the screws of the fuel tank.



Screw in the screws and tighten them with specified torque.



Tightening torque: 5 N-m, in X-method



Leak test of the subassembly of the Fuel Pump/Fuel Tank

Note: Always perform a leak test during fuel tank disassembly/ fuel pump inspection.

Apply a pressure of 0,3 bar into the tank system and check for loss of pressure with the help a spray test. (see picture)



Release the pressure carefully by opening the fuel cap as shown in the picture.

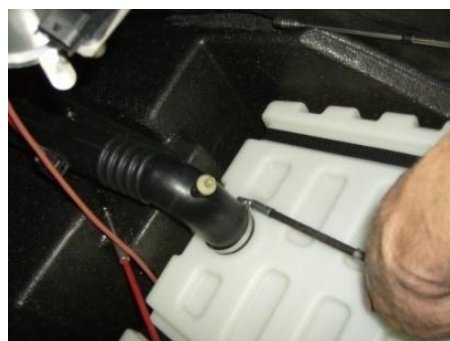


Assembly of the Fuel tank into the PWC:

Put back the fuel tank into the PWC as shown in the picture.



Reinstall the fuel tank hose with the clamp on the fuel tank.



Apply blue Loctite 243 on the thread of the screw and tighten with specified torque.



Tightening torque: 10 N·m





7 EXHAUST SYSTEM



7 Exhaust system

7.1 Muffler and Hoses:

(Shown for Series-R Pro)

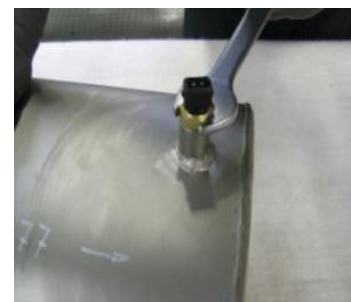
Overview of the exhaust system in the Hull



Inject 15 ml of engine oil into the exhaust muffler ensuring the temperature sensor will recognize the exhaust temperature in the exhaust system.



Put in place the copper gasket and the temperature sensor
Apply green Loctite 278 and tighten the sensor with specified torque.



Tightening torque: 20 N·m

Apply Loctite on the thread of the screw tightening the exhaust mounting belt.



Put the exhaust hose on the fitting in the Jet pump tunnel.



Put in place the remaining hoses and tubes for the exhaust system shown on the pictures.



Tighten the exhaust end flange with 6 x screws and apply Blue Loctite 243 on the threads and tighten in with 5 Nm



7.2 Exhaust Manifold:

In order to assemble the Exhaust Manifold following parts have to be assembled.



NOTE: There are two different injectors with different Inner diameters.



Apply green Loctite 278 on the thread of the water injectors used on exhaust tubes of exhaust manifold.

Tighten the water injectors on its predefined position on the exhaust manifold to be in line.



Apply Green Loctite 278 on the thread of the fitting, tighten it and turn it into the final position.



There are three different fittings for the 3 in 1 exhaust hose.



Take the fitting with smaller inner diameter, apply green Loctite 278 on the thread and tighten the fitting as shown on the picture.



Take the fitting with the bigger inner diameter apply green Loctite 278 and tighten it.

Take the L - fitting and apply green Loctite 278 and tighten it to the position like shown on the photo.



The view of the final assembly:



Apply gasket seal Loctite 5699 on both sides of the exhaust gasket.



Put the applied gasket on the exhaust manifold as shown on the picture.

NOTE: the cut edge of the gasket needs to be inline with the shape of the exhaust manifold.



Apply blue Loctite 243 on the thread of the screws and tighten them with specified torque.



Tightening torque: 30 N·m

Final assembly of the exhaust manifold and the 3 to 1 exhaust hose view:

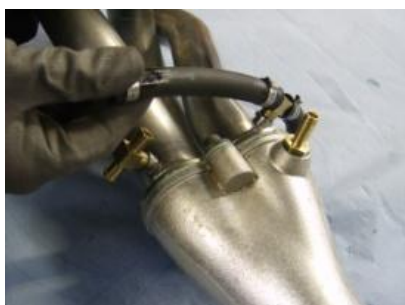


7.3 Assembling the hoses on exhaust manifold

There are two hoses of 135 mm length that need to be installed between the fittings of the exhaust manifold. Clamps are tightening the hoses.



Install 2 x 80mm hoses like shown on the pictures. Clamp in the same way as shown above.



Assemble and clamp the big hose like shown on the picture.



7.4 Leak test of the Exhaust hose:

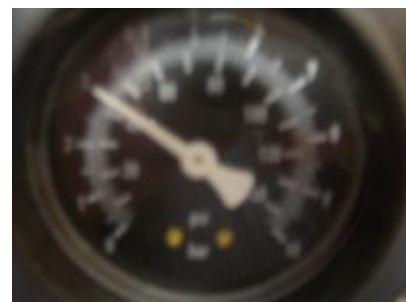
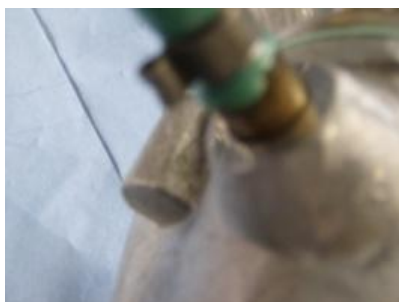
The equipment of the leak test is shown bellow.

1. Manometer
2. Long hose
3. Short hose



Link the test equipment in between the outlet of the manifold and the outlet of the 3 in 1 exhaust hose fitting.

The circle of the water jacket should be closed by the mentioned equipment for the test.
Apply air pressure of 3 bar into the system.



Put the exhaust system into a water bath and check for air bubbles.



7.5 Assembling the exhaust manifold on the engine

Apply blue Loctite 243 on the stainless steel nut and hand tight them on the stud screws of the cylinder head.



Tighten the screws in the X - Method with a specified torque starting with the 2nd cylinder continuing on 1st or 3rd cylinder and finalizing respectively on the 3rd or 1st cylinder.



Tightening torque: 10 N·m





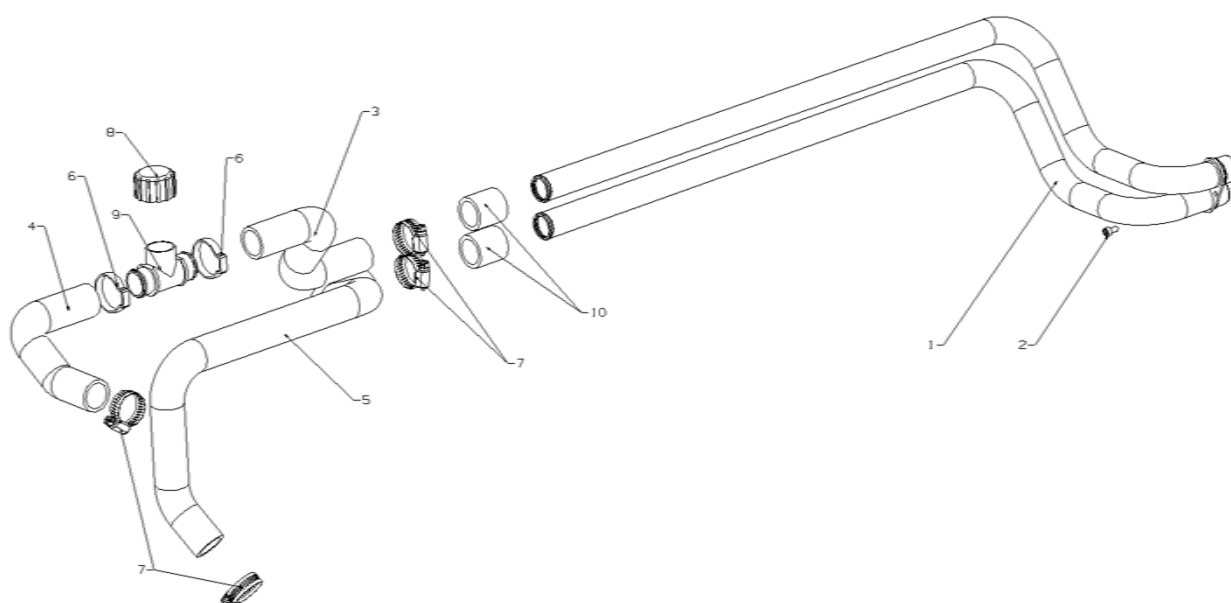
COOLING SYSTEM



8 Cooling system

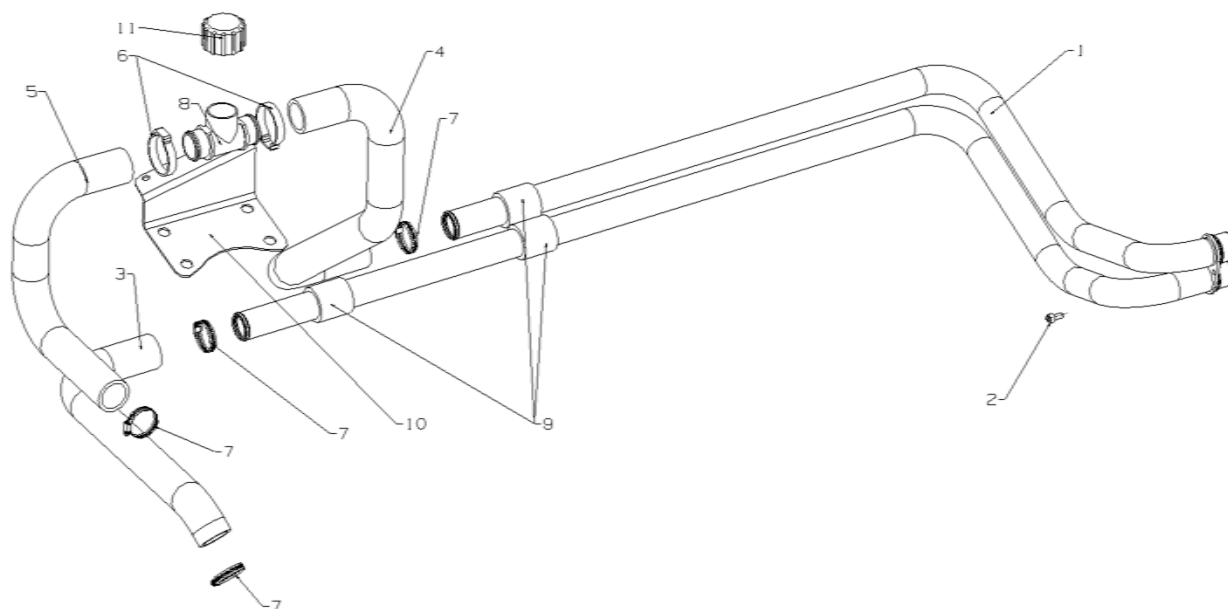
8.1 Closed circuit cooling system

Series-S



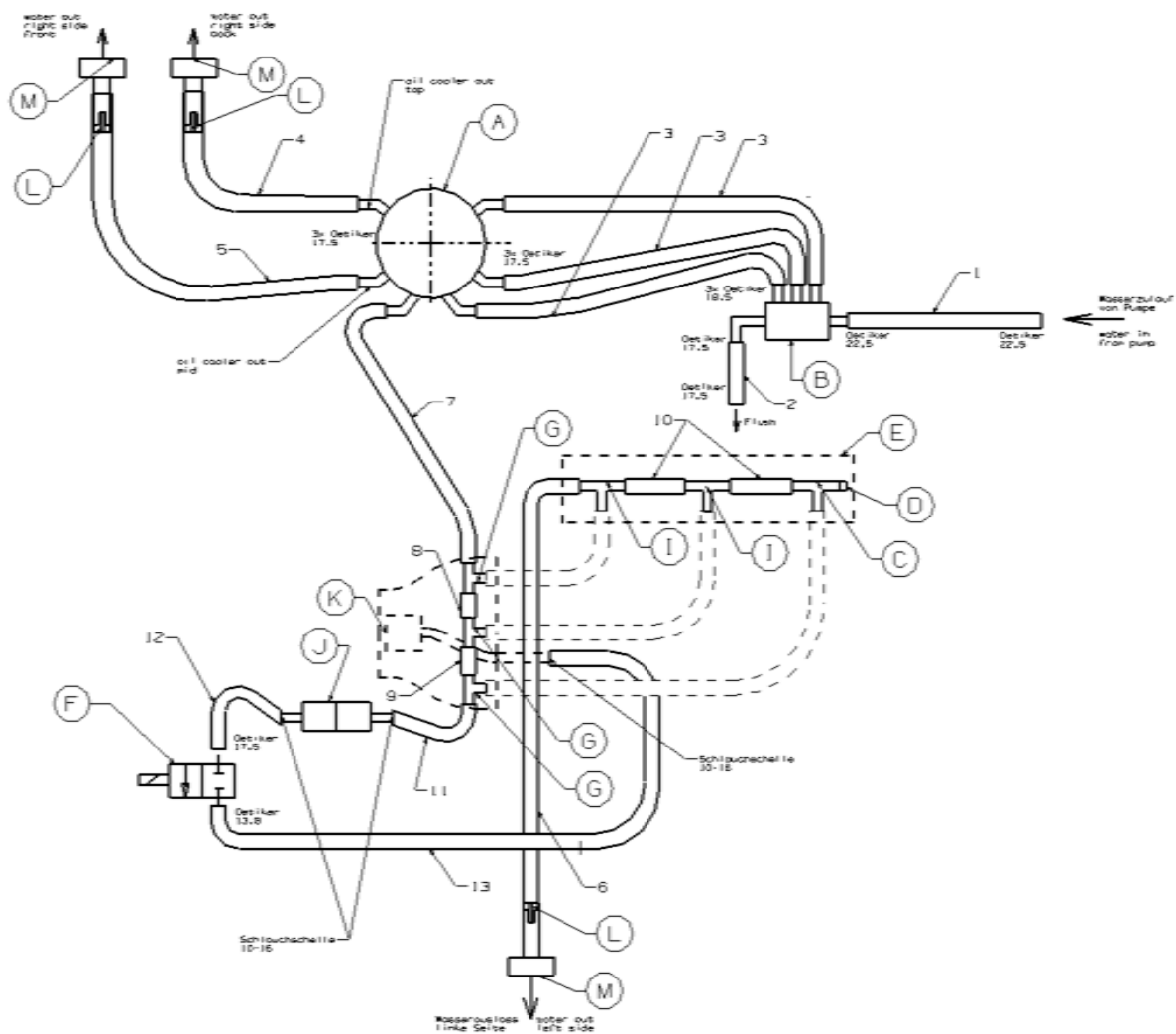
Pos.	Part description	Q-ty
1	ASM COOLING PIPES ENGINE	1
2	SCREW	1
3	COOLING HOSE HOT 1	1
4	COOLING HOSE HOT 2	1
5	COOLING HOSE COLD	1
6	HOSE CLAMP 38,1	2
7	HOSE CLAMP 25-40	4
8	SCREW CAP 1,4 BAR	1
9	THREADED T-PIECE	1
10	PADS	2

Series-R



Pos.	Part description	Q-ty
1	ASM COOLING ENGINE	1
2	SCREW M5X10	1
3	COOLING HOSE COLD 3Z	1
4	COOLING HOSE HOT SHORT 3Z	1
5	COOLING HOSE HOT LONG 3Z	1
6	HOSE CLAMP 38,1	2
7	HOSE CLAMP 25-40	4
8	THREADED T-PIECE	1
9	PADS	3
10	BRACKET COOLING HOSE	1
11	SCREW CAP	1

Series-S



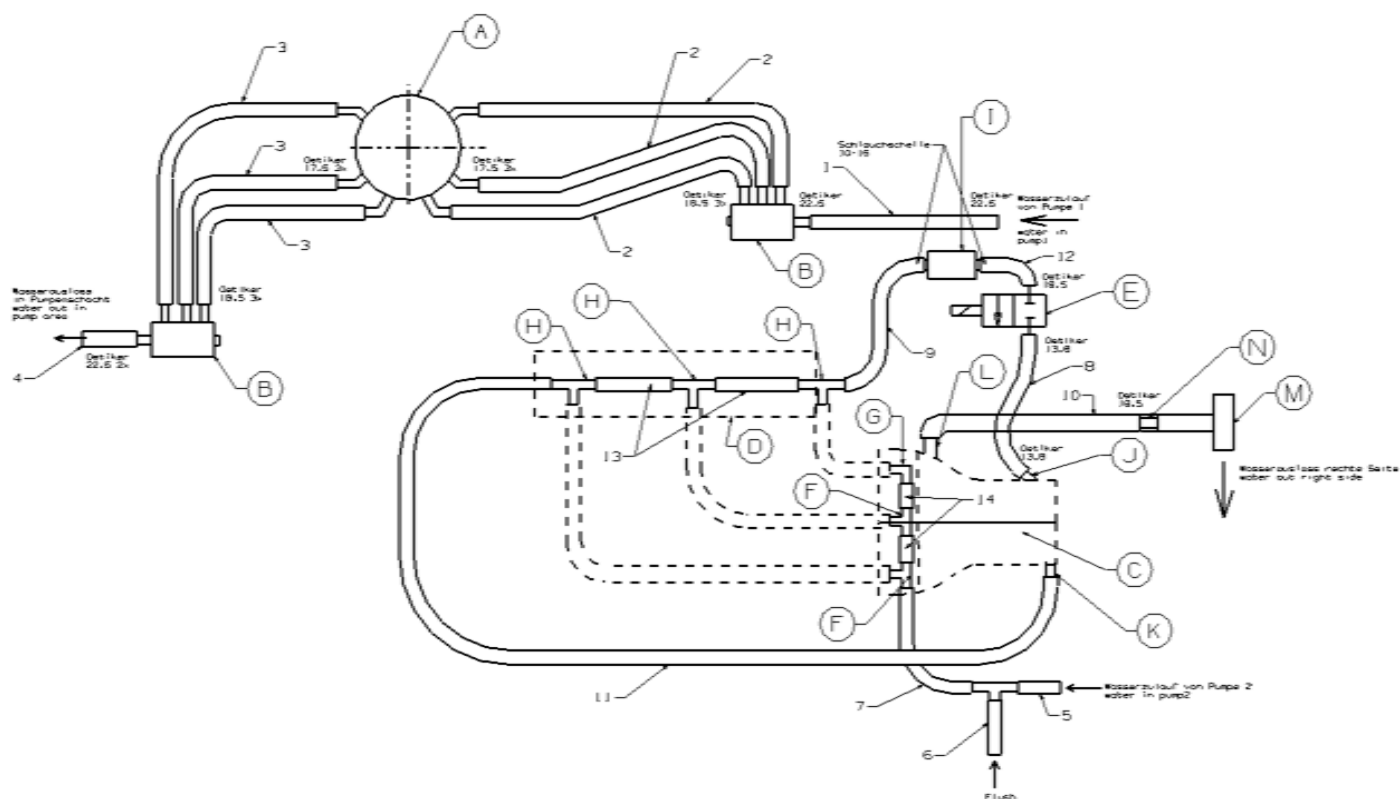

Series-S cooling system components:

Pos.	Part description	Q-ty
A	OIL COOLER	1
B	WATER MANIFOLD	1
C	T-TYPE FITTING, M8 THREAD	1
D	PLUG BLOT M8X10	1
E	EXHAUST MANIFOLD	
F	MAGNETIC VALVE IP67	1
G	T-TYPE FITTING	3
J	INLINE FILTER	1
K	INJECTOR EXHAUST	1
L	REDUCTION FITTINGSLEEVE 4,5 MM	3
M	BYPASS FITTING DN9 BLACK	3
1	INTAKE LINE OIL COOLING HOSE, INNER D 13MM	120CM
2	FLUSHING SYSTEM HOSE, INNER D 10MM	30 CM
3	INTAKE LINE OIL COOLING HOSE, INNER D 10MM	10/10/10 CM
3	EXIT LINE OIL COOLING HOSE, INNER D 10MM	50/45/40 CM
4	EXIT LINE OIL COOLING HOSE, INNER D 10MM	33CM
5	EXIT LINE OIL COOLING HOSE, INNER D 10MM	35CM
6	EXIT LINE EXHAUST COOLING HOSE, INNER D 13MM	36CM
7	INTAKE LINE EXHAUST COOLING HOSE, INNER D 10MM	80CM
8	EXHAUST MANIFOLD COOLING HOSE, INNER D 10MM	10CM
9	EXHAUST MANIFOLD COOLING HOSE, INNER D 10MM	11,5CM
10	EXHAUST MANIFOLD COOLING HOSE, INNER D 10MM	8,5CM
11	INLINE FILTER HOSE, INNER D 10 MM	25,5CM
12	INLINE FILTER HOSE, INNER D 10 MM	36CM
13	MAGNETIC VALVE HOSE, INNER D 6 MM	40CM





Series-R



Series-R cooling system components:

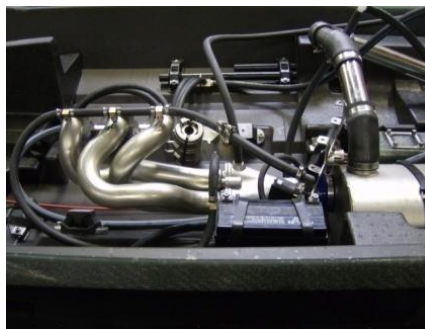
Pos.	Part description	Q-ty
A	OIL COOLER	1
B	WATER MANIFOLD	2
C	3IN1 EXHAUST HOSE	1
D	EXHAUST MANIFOLD	1
E	MAGNETIC VALVE IP67	1
F	T-TYPE FITTING 5MM	2
G	L-TYPE FITTING 5MM	1
H	T-TYPE FITTING 3MM	3
I	INLINE FILTER	1
J	SPREDSERT M6 X 12,7	1
K	ELBOW SCREW-IN NOZZLE	1
L	SCREW-IN HOSE NOZZLE	1
M	BYPASS FITTING DN9 BLACK	1
N	REDUCTION FITTINGSLEEVE 4,5 MM	1



1	INTAKE LINE OIL COOLING HOSE, INNER D 13MM	85CM
2	INTAKE LINE OIL COOLING HOSE, INNER D 10MM	50/45/40 CM
3	EXIT LINE OIL COOLING HOSE, INNER D 10MM	50/45/40 CM
4	EXIT LINE OIL COOLING HOSE, INNER D 13MM	105CM
5	INTAKE LINE EXHAUST COOLING HOSE, INNER D 10MM	115CM
6	FLUSHING SYSTEM HOSE, INNER D 10MM	50 CM
7	INTAKE LINE EXHAUST COOLING HOSE, INNER D 10MM	25CM
8	MAGNETIC VALVE HOSE, INNER D 6 MM	27CM
9	INLINE FILTER HOSE, INNER D 10 MM	15CM
10	EXIT LINE EXHAUST COOLING HOSE, INNER D 10MM	150CM
11	EXHAUST MANIFOLD COOLING HOSE, INNER D 10MM	85CM
12	INLINE FILTER HOSE, INNER D 10 MM	10CM
13	EXHAUST MANIFOLD COOLING HOSE, INNER D 10MM	8CM
14	EXHAUST MANIFOLD COOLING HOSE, INNER D 10MM	13,5CM

8.2.1 Exhaust cooling system

Overview of the exhaust cooling system (Shown for Series-R):



The flow of the cooling liquid:

The water enters the system through wards the Jet Pump tunnel.



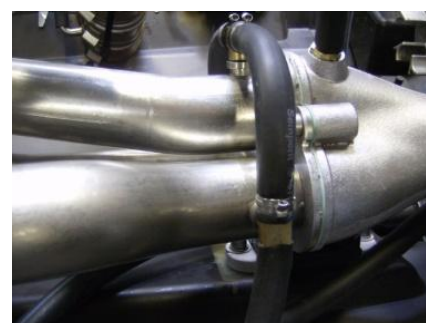
The T – Fitting splits the water flow into the exhaust manifold and the



Flushing system hose.



The hose for the exhaust manifold cooling system feeds first the end of the manifolds





and goes through wards the tubes up to the end where the headed liquid is collected. It leaves the system on the left hand side of the manifold and



returns to the 3 to 1 hose on order to cool it.



It leaves the 3 in 1 hose through wards a fitting to exit the system via a hose to left rear part of the PWC.





8.2.2 Oil cooling system

The coolant for the oil cooler is supplied with hose from the Jet Pump at the rear of the PWC.



The coolant is split into the oil cooler through wards the coolant water manifold.



It passes the oil cooler and enters a second water manifold



And goes through the hull to be released through wards a fitting in the jet pump tunnel.





9 *STEERING SYSTEM*

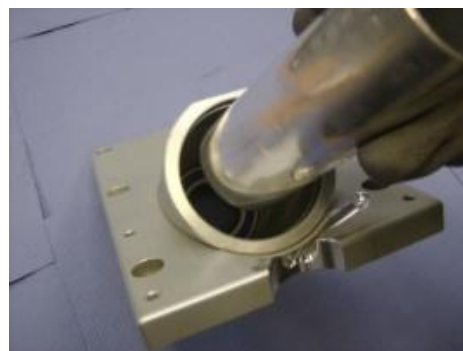
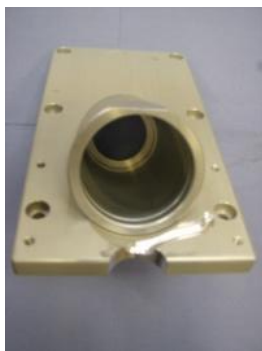


9 Steering system

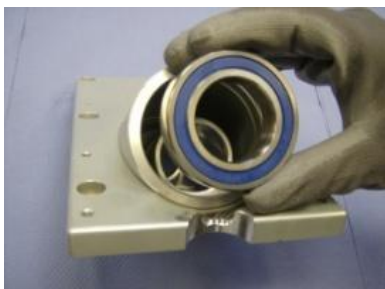
SERIES-R STEERING SYSTEM

9.1 Steering Support Assembly (For Series-R model only)

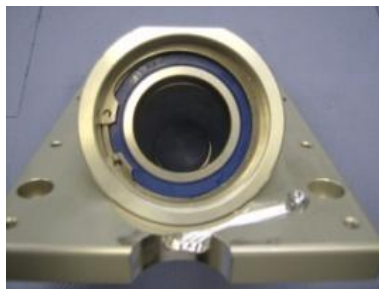
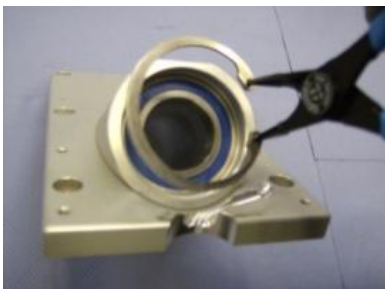
Take the steering support and press in the bearing inside the steering support by hand.
Put the steering tube in place



Put in place the second bearing and press it in by hand.



Use a tool to install bearing circlip in place.



Grease the oil seal and press it in by hand.
Oil seal needs to be in line with Steering support.



Put in place steering axle and put it in carefully with a soft hammer.

NOTE: Ensure the parts are in line and are sliding carefully.

Put in place the ring.



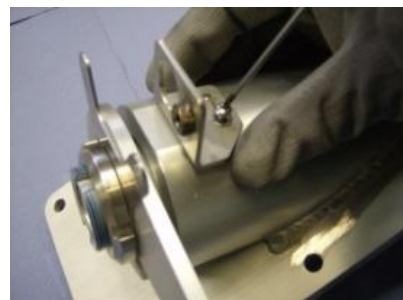
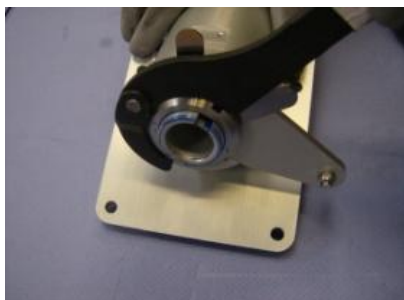
Put in place the steering lever.

Put in place the indicator disc.

Apply **BLUE Weicon Lock AN 302-43** on the thread and tighten nut with specified torque.



Tightening torque: 25 N·m



Assemble and tighten SSSA sensor support with 2 x screws
(Apply **BLUE Weicon Lock AN 302-43** on screws thread)

NOTE: SSSA sensor needs to be flattened to the support before tightening screws.



After final assembly please perform a check. Steering shaft should move easily.



9.2 Assembly of the Steering Support on the PWC

(For Series-R model only)

Put in place steering support by tilting it.
Apply blue Loctite on thread of 6 mount screws.



Tighten the screws with specified torque.



Tightening torque: 20 N·m, in X-method



9.3 Handle Bar assembly (For Series-R model only)

Assembly of the handelbar:

Assembling grips on the handle bar.



Apply Loctite 435 to insure the grips will not become loose.



Press by hand the grips on the handle bar after the Loctite has been applied.



Final assembly of the handle bar.



Assembly of the handlebar on the PWC:

Ensure you put in place Start-Stop switch wire first.



Put in place the handle bar cover.



Apply **BLUE Weicon Lock AN 302-43** on the threads of handlebar cover screws.

Tighten screws with specified torque.





Tightening torque: 25 N·m, in X-method



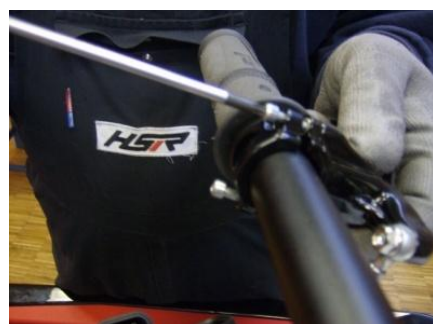
Put throttle cable end in the throttle lever hole.



Assemble Trim oil line with the banjo-bolt.



Tighten trim lever on the handlebar.



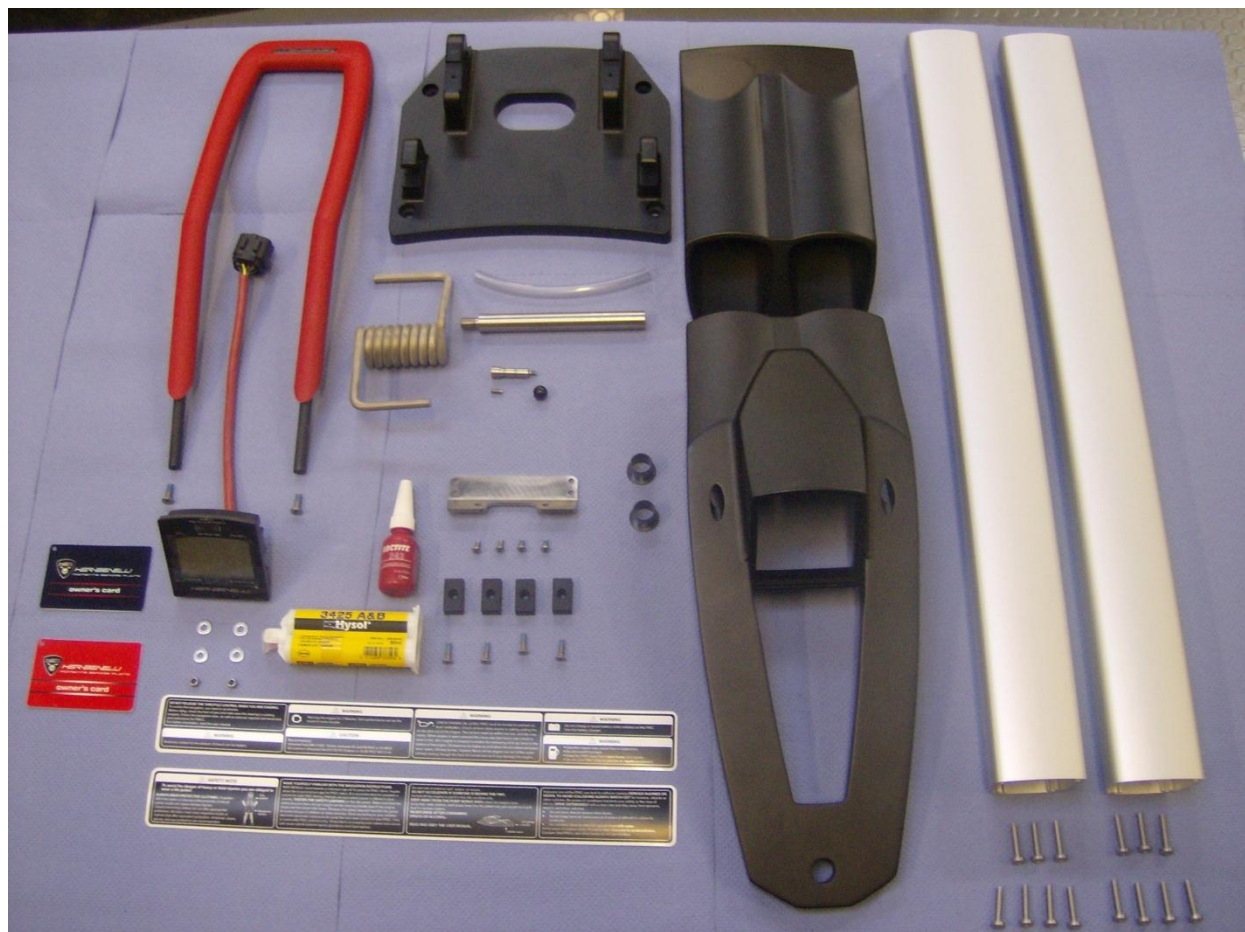
Tighten the Start-Stop switch on the handle bar.



SERIES-S STEERING SYSTEM

9.4 Handle Pole Assembly:

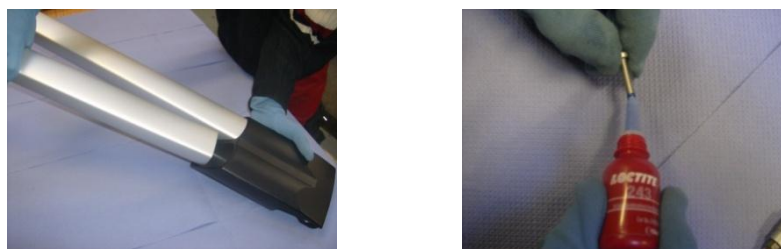
Parts for the Handle Pole assembly:



Assemble the red protection bar and tighten the screws for the extension



Stick two aluminum profiles into the Handle Pole plate as shown in the picture



Apply Loctite 243 on the thread of the 8 screws (M5 x 35) as shown on the photo.
Tighten the screws into the handle bar and tighten them with specified torque.



Tightening torque: 5 N-m, X-method



Apply Loctite 3425 A&B on the top end of the handle bar and stick it together like shown on the photo.



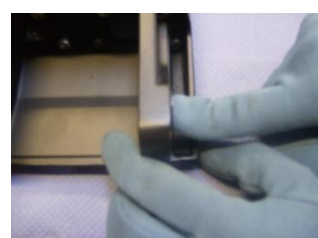
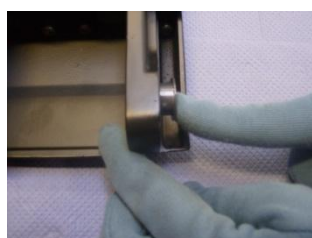
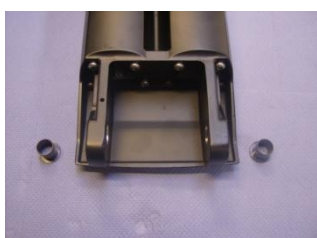
Apply Loctite 243 on the thread of the screws and tighten them with specified torque.



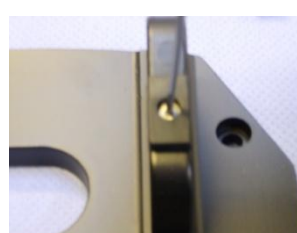
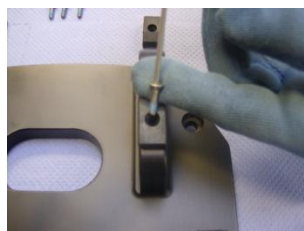
Tightening torque: 5 N·m



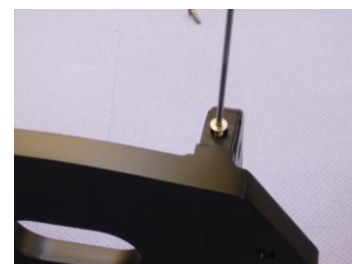
Put the bushings in place and press them in with your fingers.



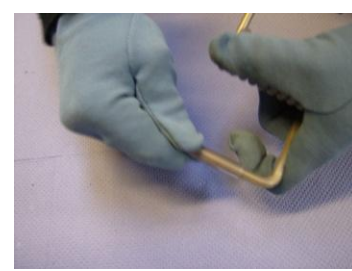
Put the rubber protector of the lower handle plate in place and ensure the flatten side will be in position as shown on the photos. Tighten the screws.



Put the rubber protector of the lower handling plate in place. Ensure the flatten side will show to the upper side as shown on the photos. Tighten the screws.



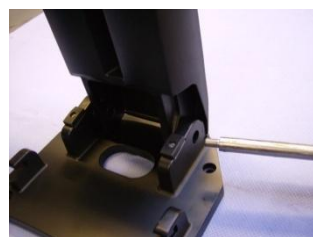
Assemble the springs of the handle bar. Warm the hose if needed and pull it on the spring.



Cut the remaining hose 3- 5 mm from the end of the spring with a knife.



Grease the Handle bar shaft and put it in place as shown on the photos.



Put in place the spring for the Handle bar and push carefully the bolt through the pushing.



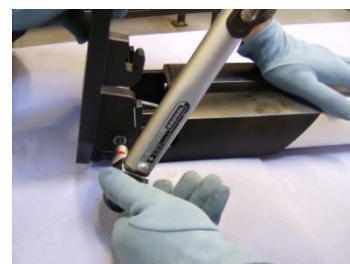
Press down the spring and screw in the bolt with a tool.

NOTE: Do not use hammer to install the bolt. This will lead to destroy the thread on the handle bar support.



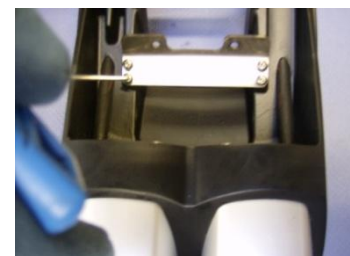
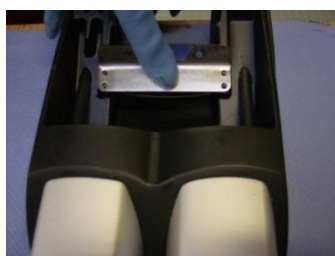
Tighten the bolt with a torque meter.

Tightening torque: 25 N·m

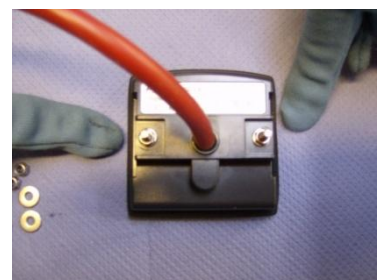


Assembly of the dashboard in the handle bar:

Put in place the bracket for the dashboard. And assemble it according to the pictures.



Assemble the dashboard like shown on the photos bellow.



Put 2 washers on the screws to insure the proper distance.



Put in place the dashboard into the handle bar. Tighten the dash board on the handle bar with 3 NM.



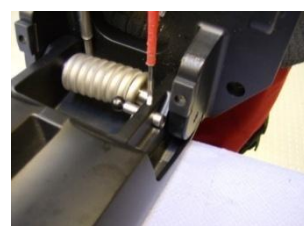
Assembly of the locking pin for the handle bar:



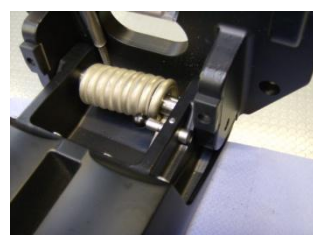
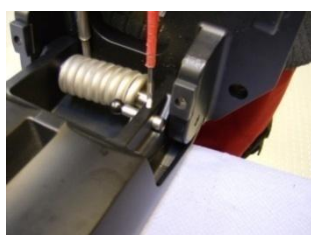
Put in place the location pin into the handle bar support.



Put in place the locking pin ball by hand



Put in place the location pin holder and tighten it



Clean the aluminum part of the handle bar and put the safety stickers on it. Put in place the sticker for the load of the vehicle.



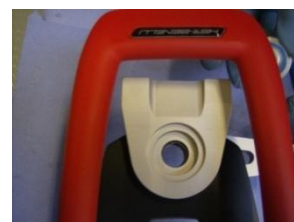
9.5 Handle Bar Assembly



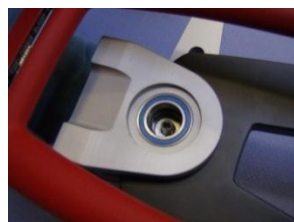
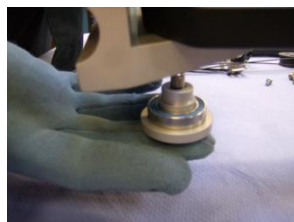
Apply Loctite 243 on the Screw for the steering control bushing. Put the bearing in place and press it on the steering control bushing.



Put the steering control lever in place.



Put the subassembly of the steering control bushing in place. Put in place the second ball bearing and press it in.



Apply Loctite 243 on the thread of the second steering control bushing and put it in place.

Tighten the system with a torque meter.

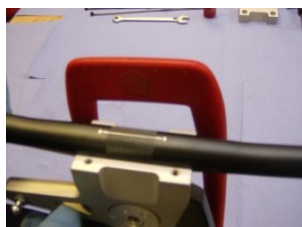


Tightening torque: 20 N·m



Take the ball joint screw and apply Loctite 243 on the thread of the screw. Tighten the ball joint.

Put the Handle bar, clamp and mounting screws in place.



Tighten the screws with a torque meter.



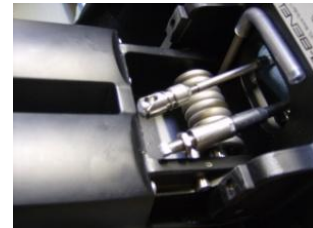
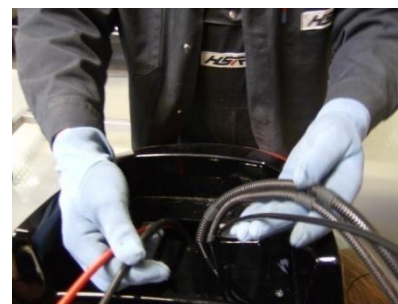
Tightening torque: 20 N·m

9.6 Assembly of the Handle Bar on the PWC

Place on the RIGHT SIDE of PWC: Trim, Dashboard and the Start Stop switch wire

Place on the LEFT SIDE of PWC: Throttle and Steering cables

Take left two cables for Throttle and Steering and put them through the handle bar



Take the other 3 cables for Trim system, Dashboard and from Start-Stop switch (two wires) and put it through the handle bar .



Apply Loctite 243 on the 4 screws for the fixation of the handle bar.

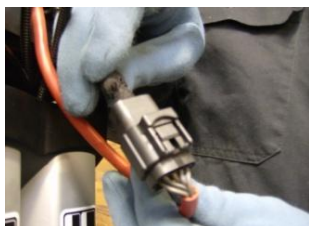
Tighten screws with specified torque in x Method



Tightening torque: 30 N·m



Connect the dashboard wire and place it into the handle bar.



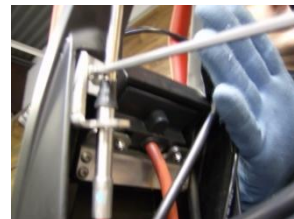
Put in place the Start-Stop Switch and connect the wires.



Put in place throttle cable on the throttle lever and put assemblies (throttle lever and Start-Stop switch) on the steering system.



Put in place wiring protection clamp. Tighten the screws on the handle bar.



Fix cable with a tie rap.



NOTE: for initial adjustment of the steering cable install the fastener on steering cable thread (steering plate side) with 12 full turns. Do the same for cable end on Jet pump side. This should lead to a proper balanced adjustment of the steering system.

Connect steering cable with the Steering lever and Jet pump steering nozzle.

Do a control measurement as follows:

Take a ruler and align it on the nozzle of the jet pump.

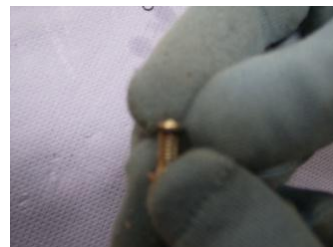


Take a measurement tool and measure the adjustment for the jet pump on both sides.
Adjust it accordingly.

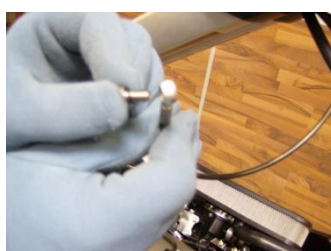


Assembly of the Trim lever:

Put the O – Ring in place



Put banjo-bolt into the fitting of trim system line, put second O-ring in place and Tighten the bolt.



Bleed the system: See *Trim system bleeding* in PUMP chapter.

Assemble the hand grips

Put Loctite 435 in the hand grips and distribute it internally. Pull hand grips on the handle bar.



Tighten Throttle lever assembly, Trim lever and Start-Stop switch body.

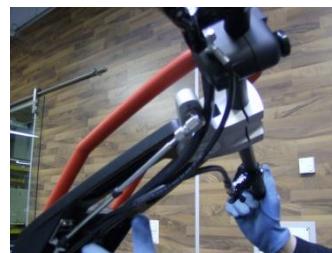




Put in place rubber grommet for the wires/cables of the handle pole



NOTE: Please check that cables are moving freely



WARNING:

If throttle cable is not moving freely PWC could suddenly accelerate on its own while steering.

Put in place handle bar protector with two tie raps and cut the extending tie rap ends.



Install the Throttle cable and insure there is free play of 2-3 mm on the throttle lever.



Do a final test on Start-Stop switch buttons to check electrical system operation.





10*HULL*



10 Hull

10.1 Dashboard cover (For Series-R model only)

Disassembly of dashboard cover



Remove the support plate screw from the dashboard and carefully remove the dashboard equipment by hand.

NOTE: Take care not to damage the gasket.

Reassembly of the dashboard cover



NOTE: Take care not to damage dashboard gasket.

Apply **BLUE Weicon Lock AN 302-43** on the screws like shown on the photo.



NOTE: It is very important to tighten the dashboard screws with the proper torque of 2 Nm.

The other two screws need to be tightened with 5 Nm.

Assembly on the PWC

Put in place the dashboard cover on the PWC



Apply **BLUE Weicon Lock AN 302-43** on thread of the screws (2 types of screws: Top M6 x 12 below M6 x 20)

Tighten the 6 screws with specified torque.



Tightening torque: 3 N·m, in X-method

10.2 Drainage box

Those are the products you need to assemble a drainage box.

Note: The Method of gluing requires 2 components:

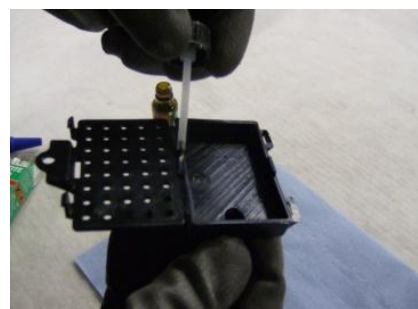
The Primer and the glue

Apply Primer on the surface that need to be glued.

Apply liquid Loctite on the surface that need to be glued.

Ensure you are putting primer and glue on the latches connecting both halves of the drainage box.

Apply **BLUE Weicon Lock AN 302-43** on the thread of the screw to put in place the drainage box in the hull.



Tighten the screw for the drainage box.



Put in place the Hose sucking the water out of the hull into the Jet Pump tunnel to be released.



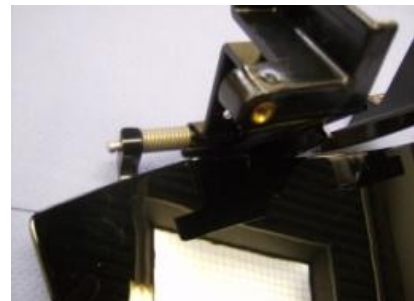
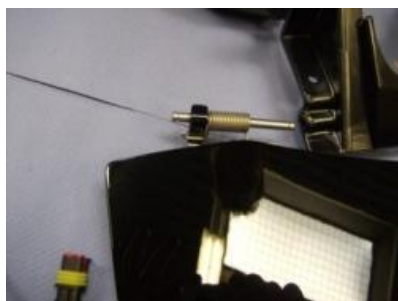
10.3 Baggage Cover:

Assembly of baggage cover (electric Reverse button for Sereis-R Pro only)

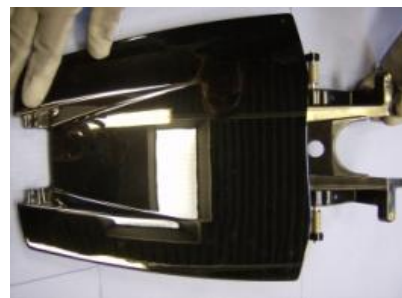
Those are the parts involved in the assembly of the Baggage Cover.



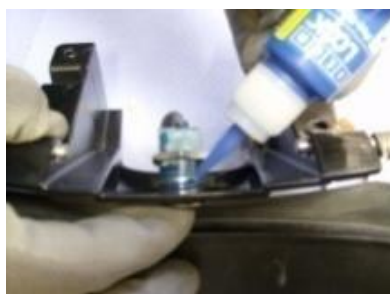
Assemble the axles with the springs and put it into the baggage cover on both sides.



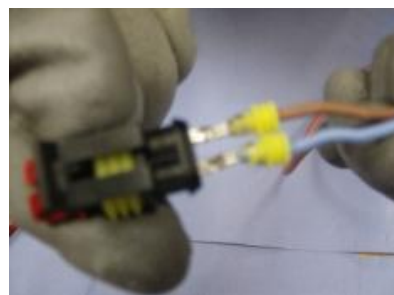
Put in place the circlips with a suitable tool in order to lock the springs. Insure the system is working easily and properly.



Note: For Series – R Pro only (Reverse Switch). Put in place the reverse switch and wire. Apply **BLUE Weicon Lock AN 302-43** on the thread as shown on the picture.



Put in place the connectors for the electric reverse cable.



Assembly of the hood latch:

Install the axel into the latch through wards the spring. Tighten the latch with 2 x screws.

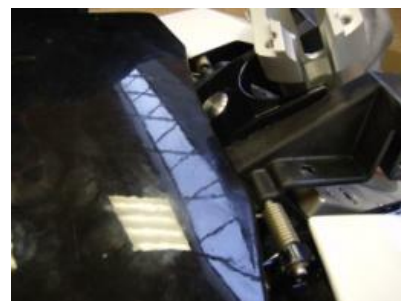


Final view of baggage hood

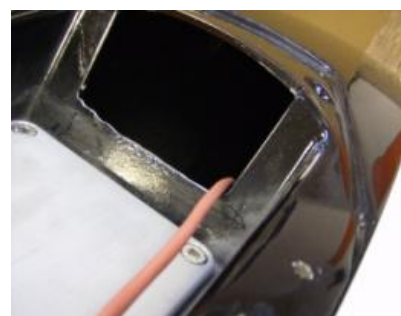


Assembly of the luggage on the PWC deck.

Put in place the baggage cover on the PWC by hooking in the levers with the spring under plastic covers.



NOTE: for Models with electric reverse only.
Put the electric cable through the hole of the dashboard.



Apply **BLUE Weicon Lock AN 302-43** on the thread of the screws of the baggage latch cover.



Tighten the screws with a specified torque in x – method.



Tightening torque: 5 Nm, in X-method



10.4 Side Cover Assembling

Apply **BLUE Weicon Lock AN 302-43** on the thread of the base stud.



Screw in the base stud by hand and let the Loctite dry out.



Put in place the side cover.



Put in place the rubber washers and tighten self-locking nut carefully by hand.



10.5 Sponsons assembling

Apply **BLUE Weicon Lock AN 302-43** on the thread of the screws
Put in place the sponsons ground plate.

Tighten it with specified torque.



Tightening torque: 15 N·m



Put in place the sponsons and tighten it with 5 Nm



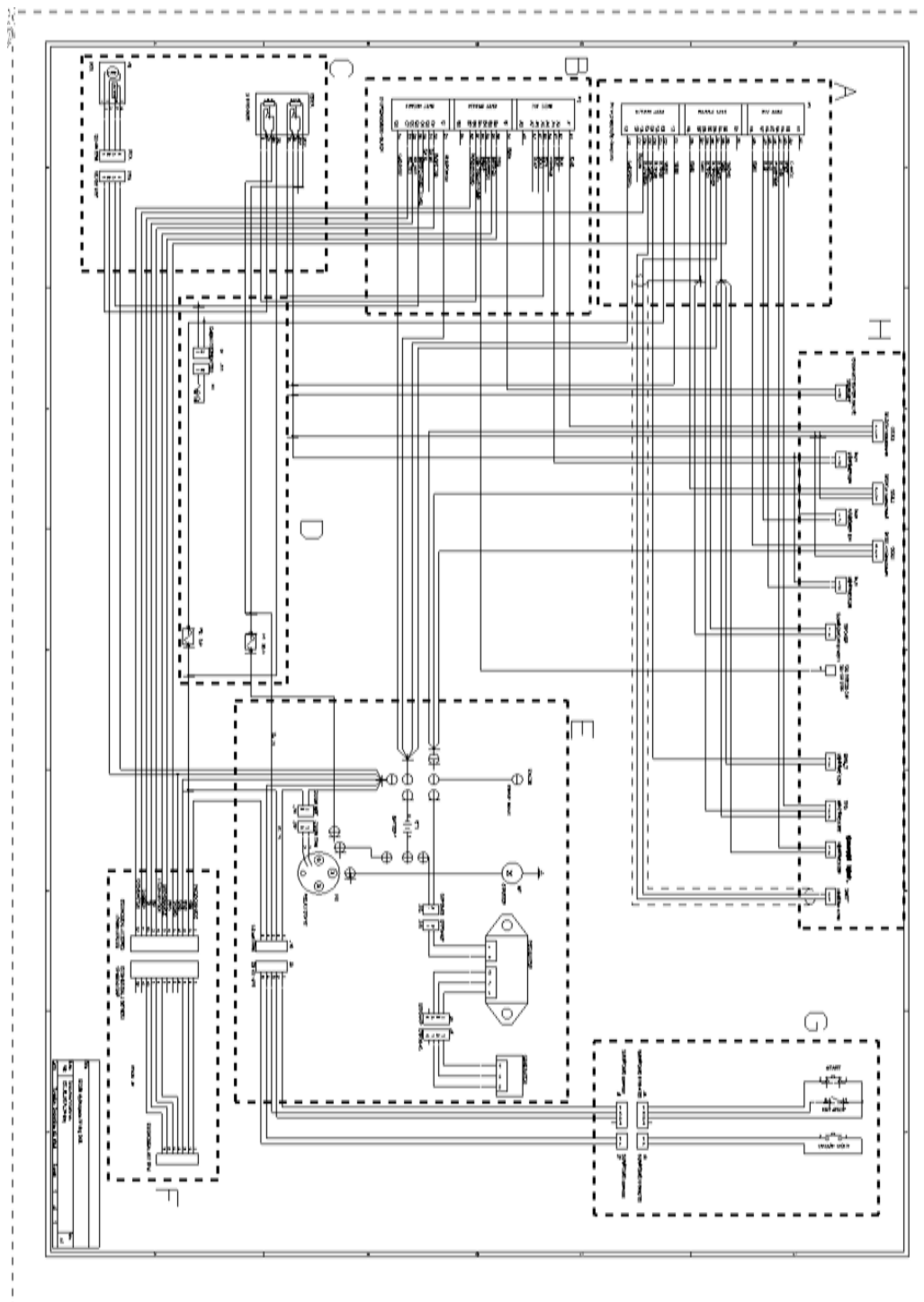


22 ELECTRICAL SYSTEM



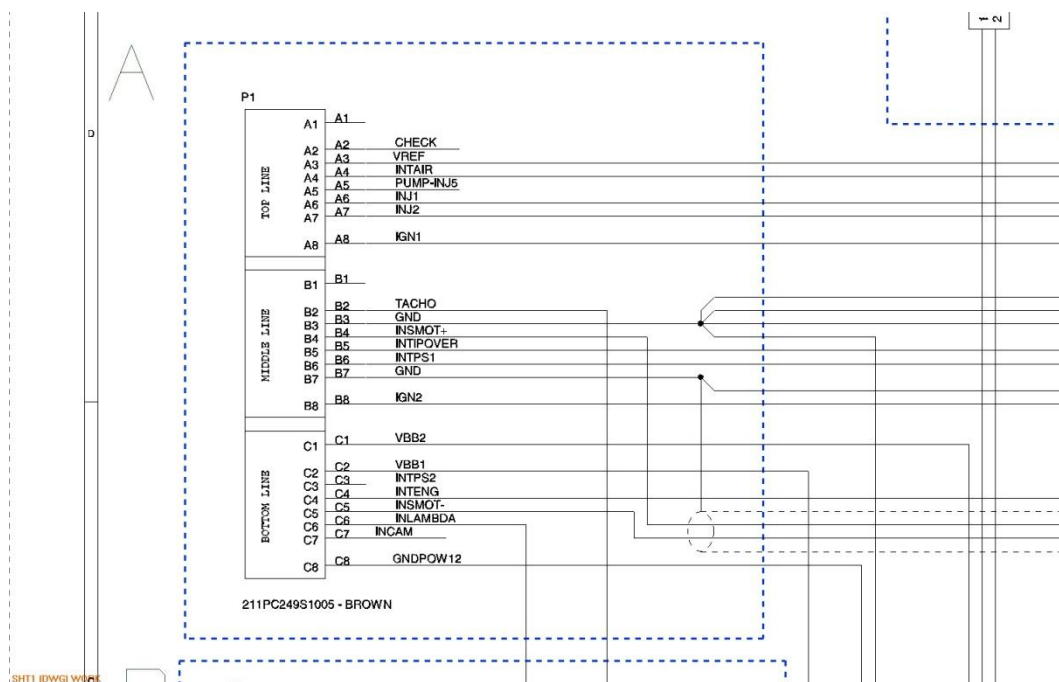
11 Electrical System

11.1 General view (SERIES-S wiring diagram)

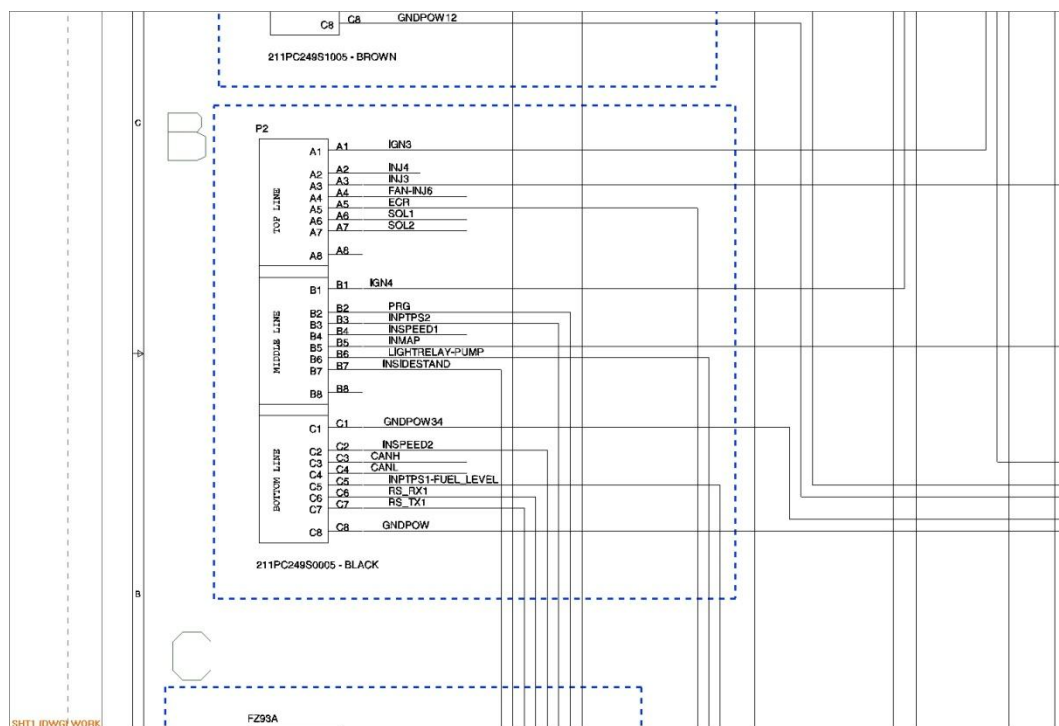




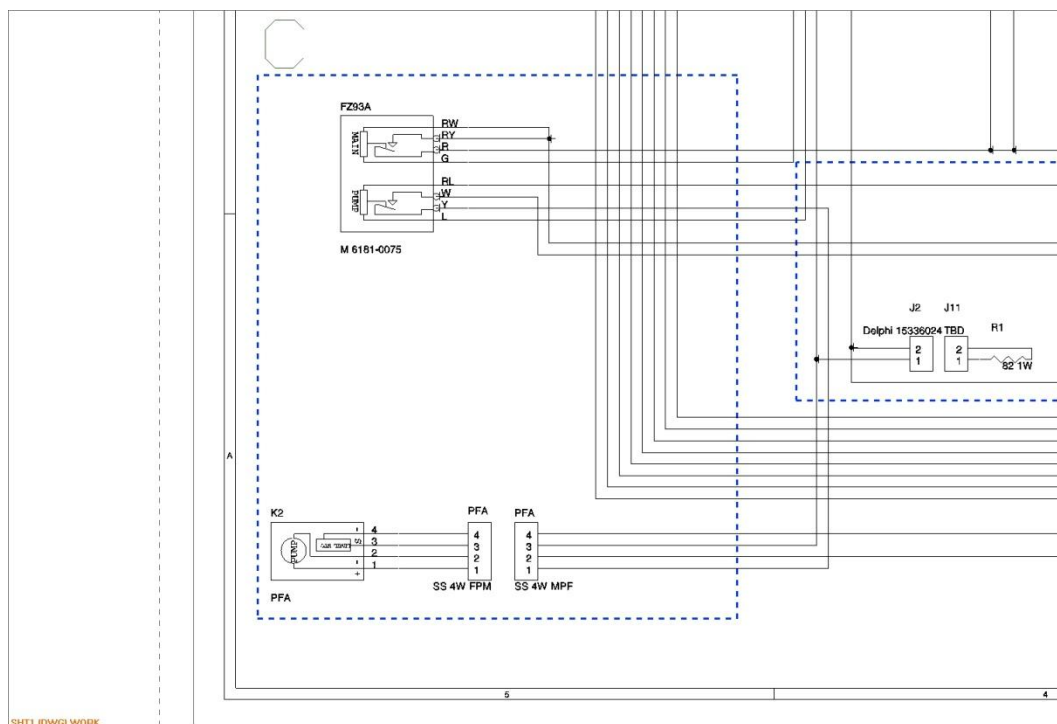
11.1.1 Sector A



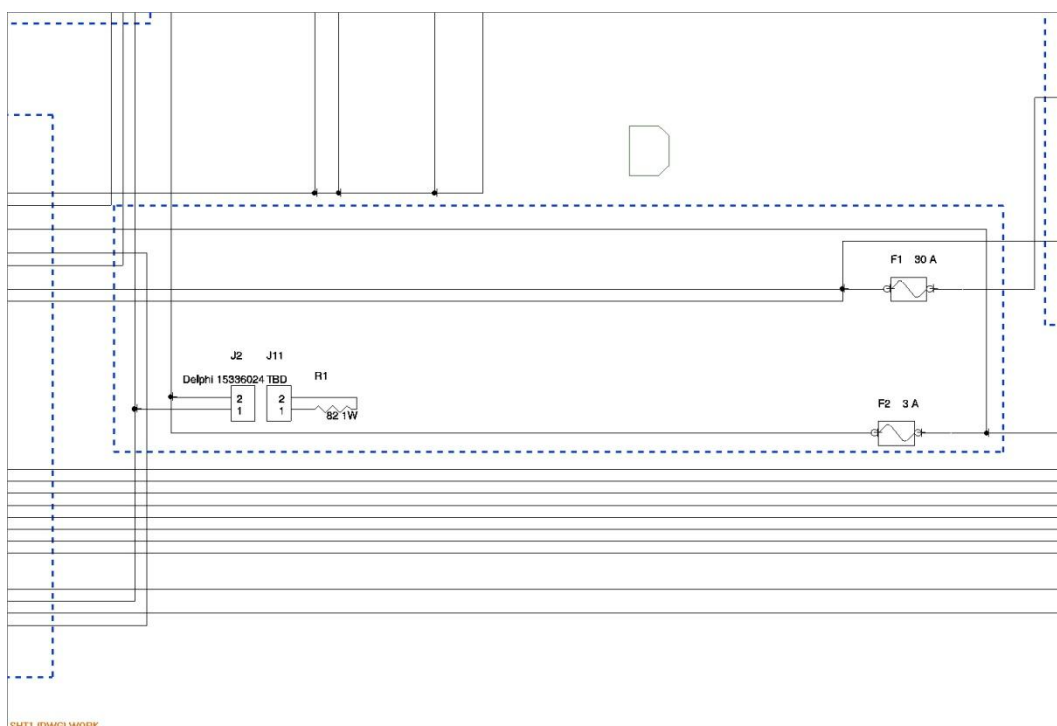
11.1.2 Sector B



11.1.3 Sector C

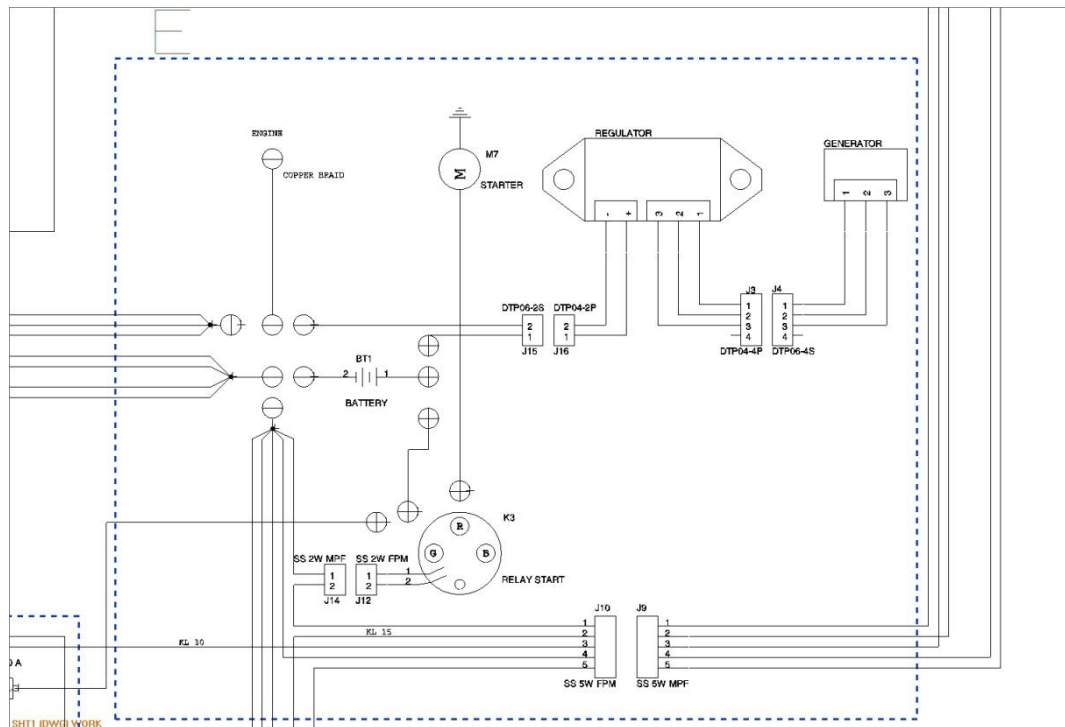


11.1.4 Sector D

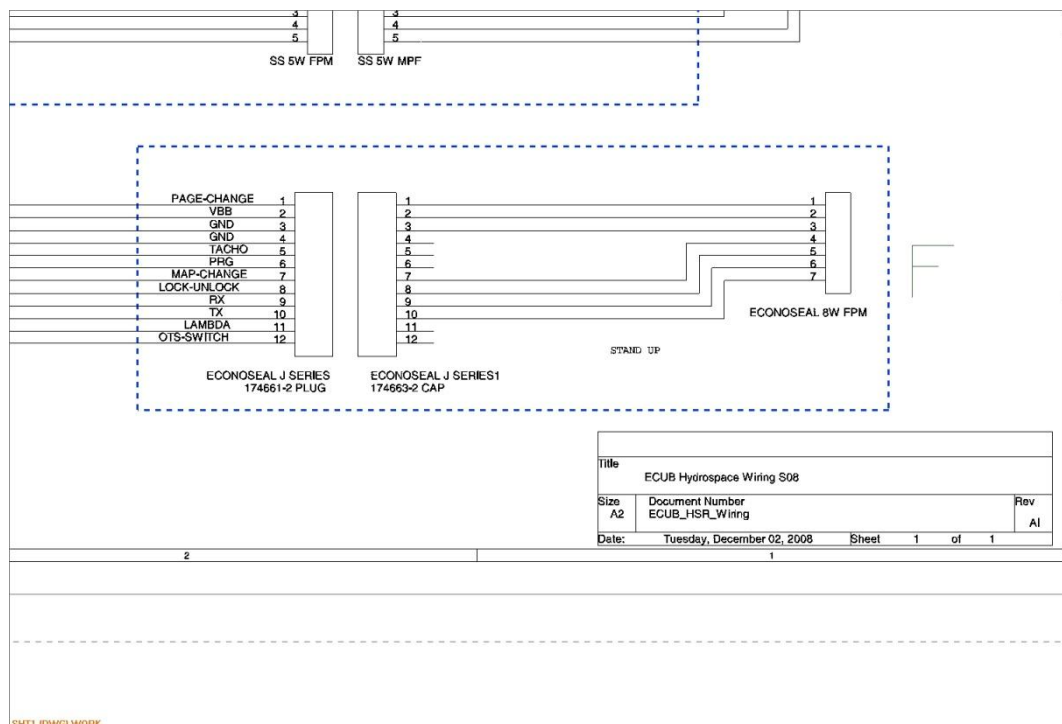




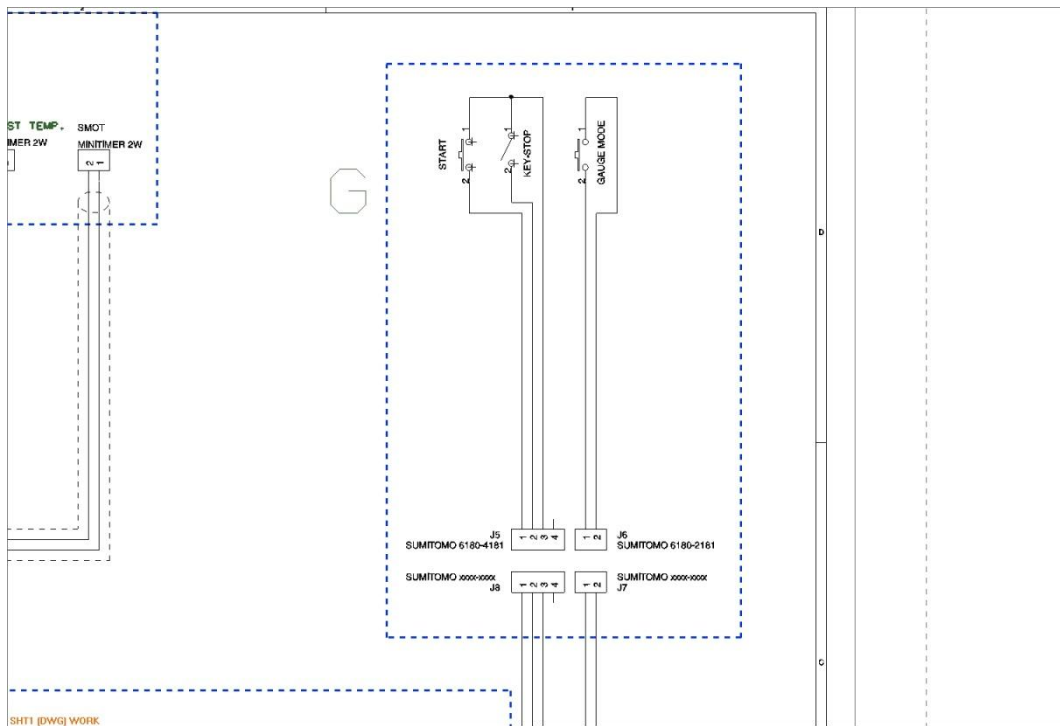
11.1.5 Sector E



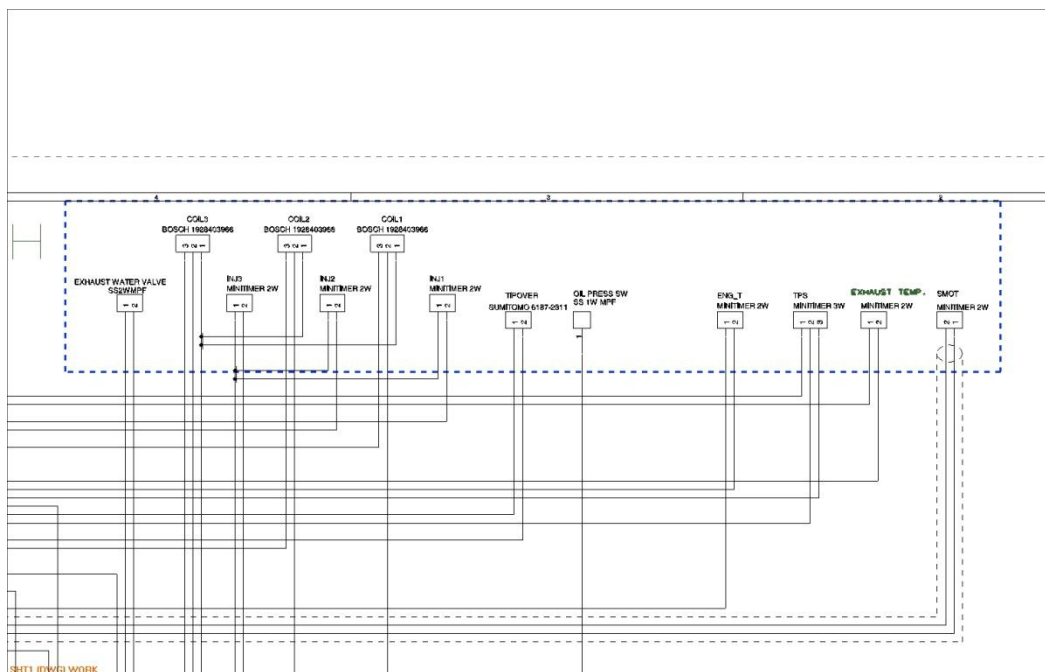
11.1.6 Sector F



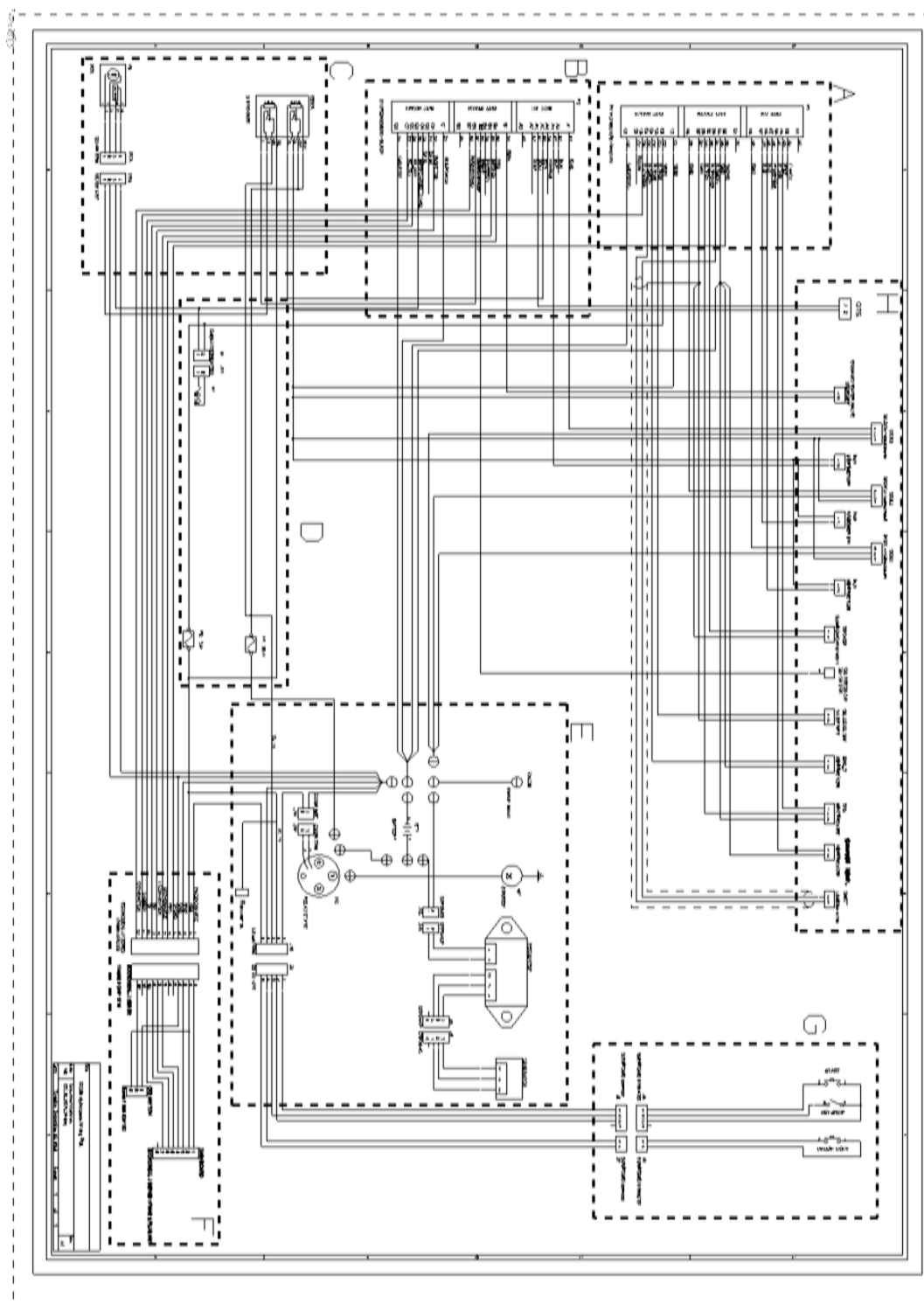
11.1.7 Sector G



11.1.8 Sector H

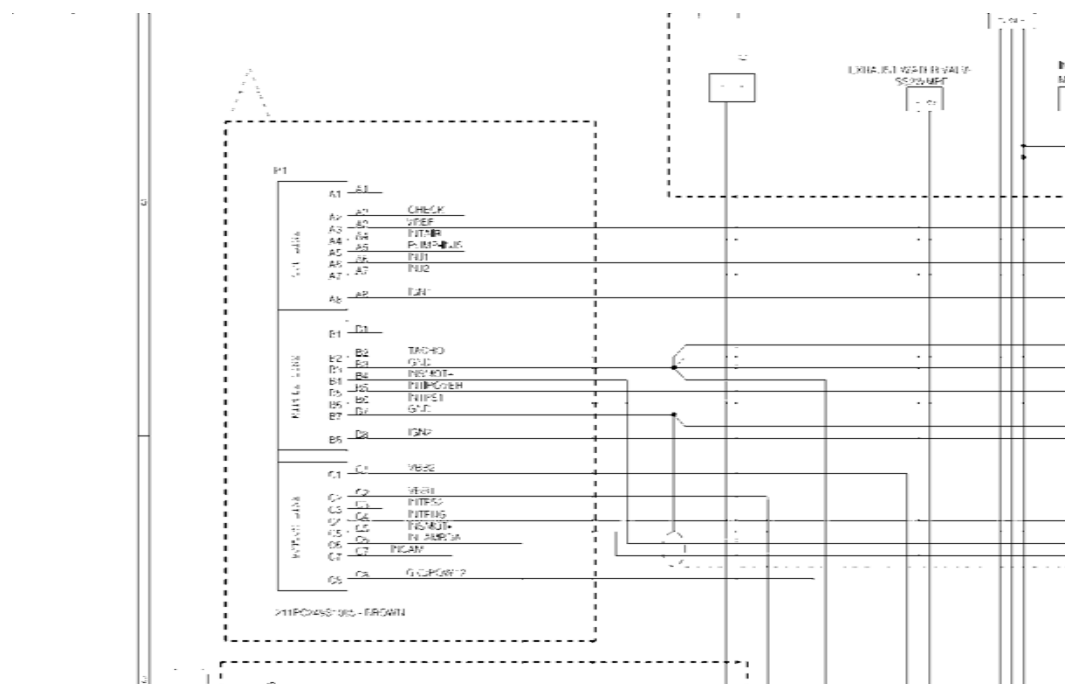


11.2 General view (SERIES-R wiring diagram)

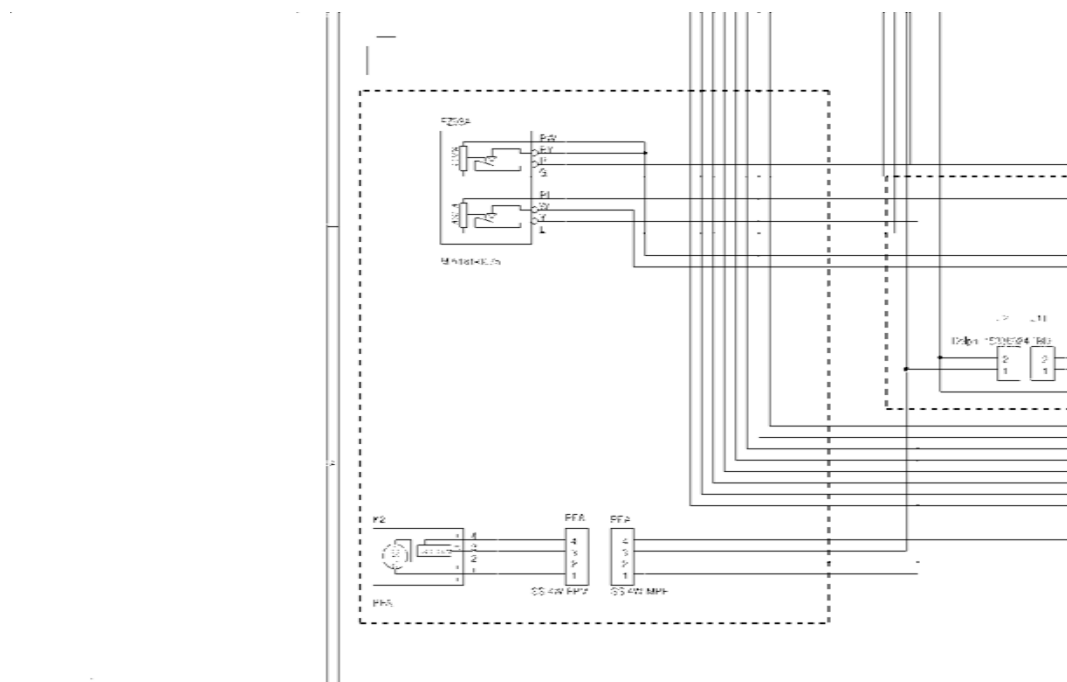




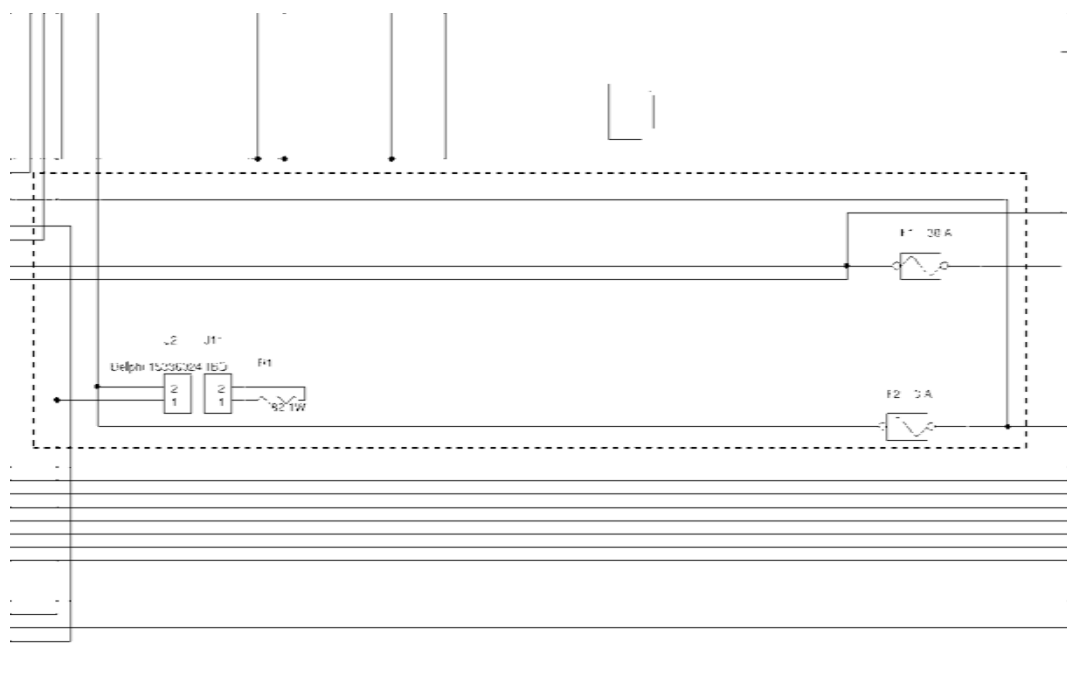
11.2.1 Sector A



11.2.3 Sector C

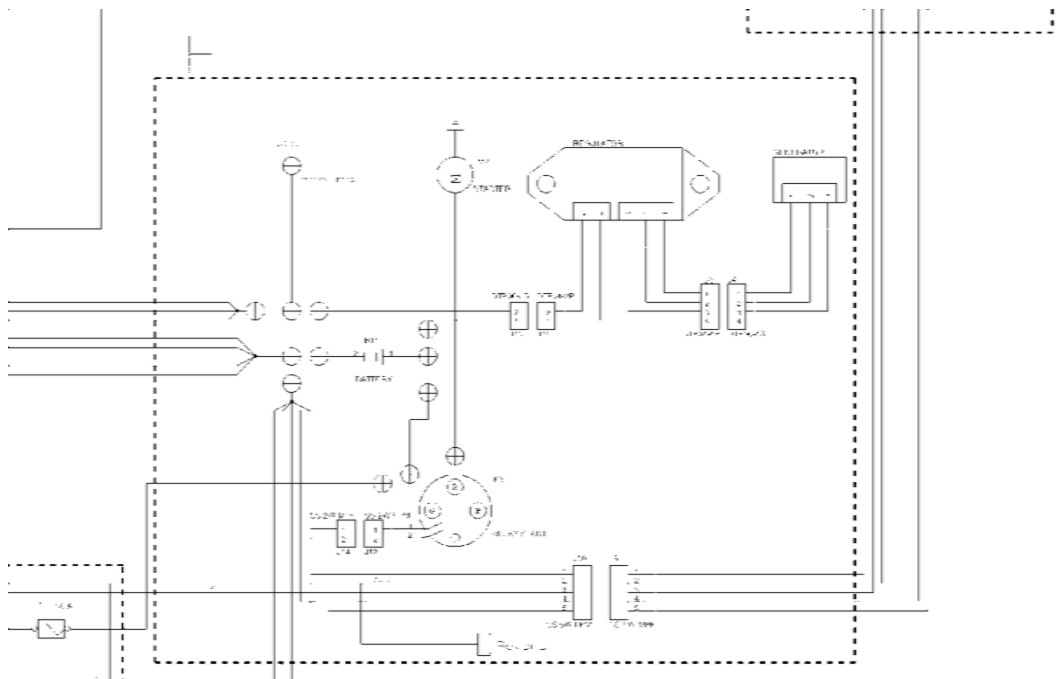


11.2.4 Sector D

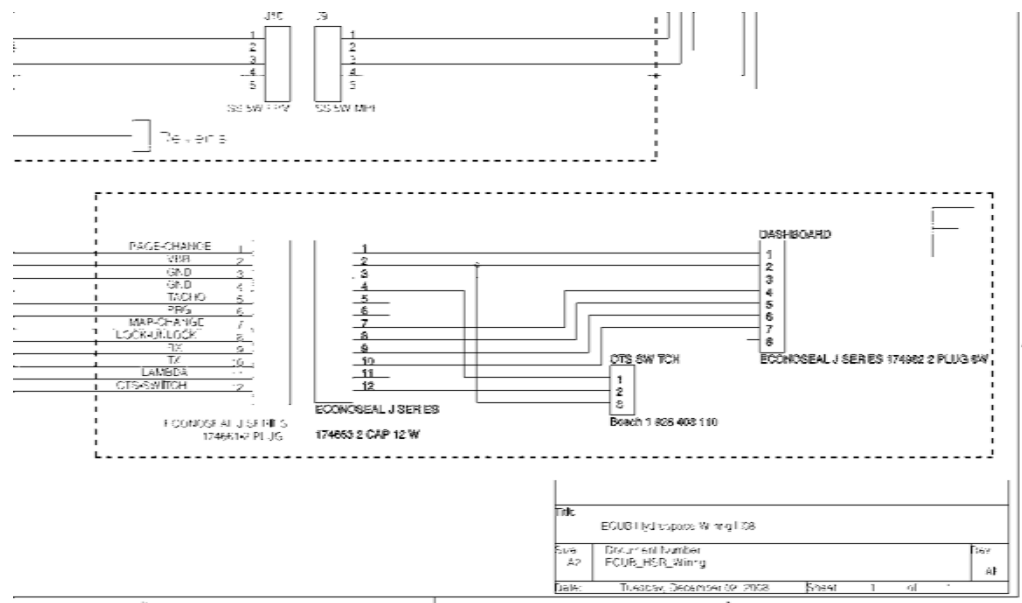




11.2.5 Sector E



11.2.6 Sector F



[illegible]



12 *HSR-BENELLI* *DIAGNOSTIC SYSTEM*

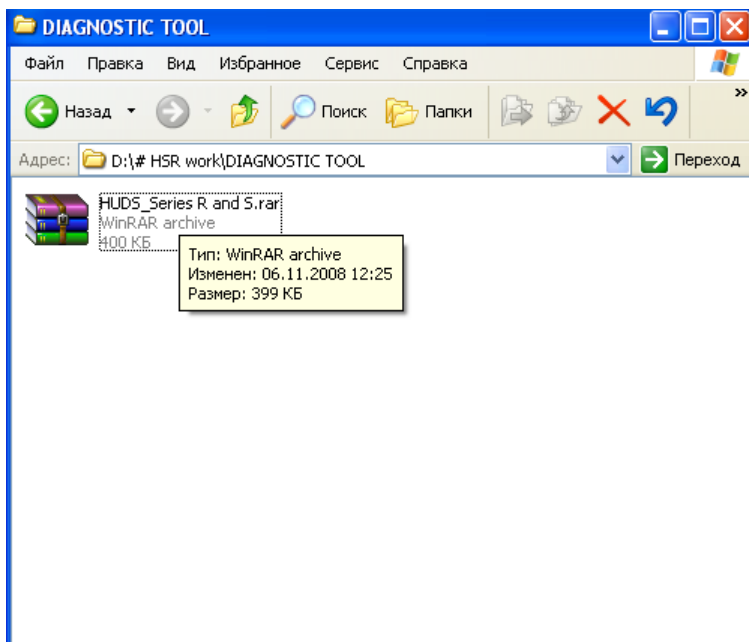




12 HSR-Benelli diagnostic system

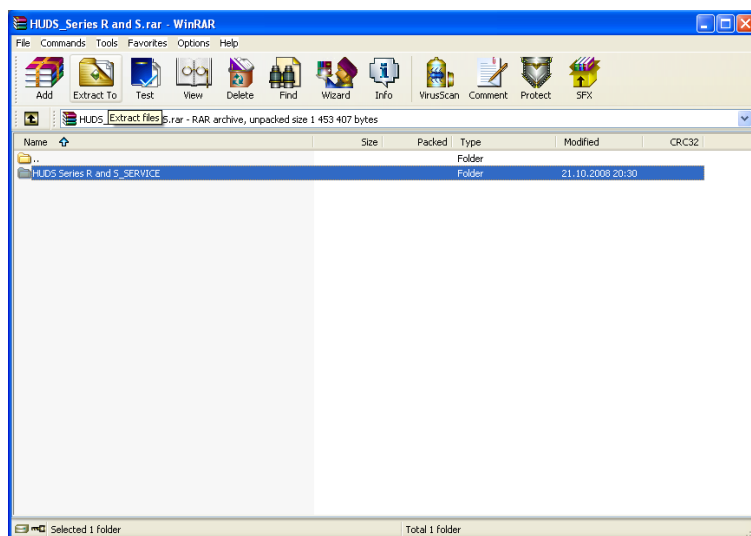
12.1 HSR-Benelli Utility Diagnostic System (HUDS) installation (Benelli engine version)

1. Save provided file “HUDS_Series R and S.rar” to the hard disk of your computer.
2. Open this file from location where you’ve saved it (WinRAR or analog software is required):

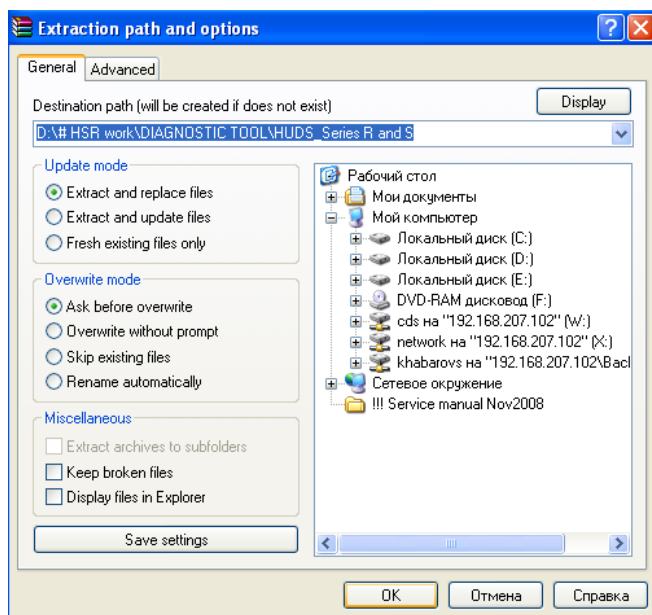


3. Select folder “HUDS_Series R and S” and press button “Extract To” on the upper bar.





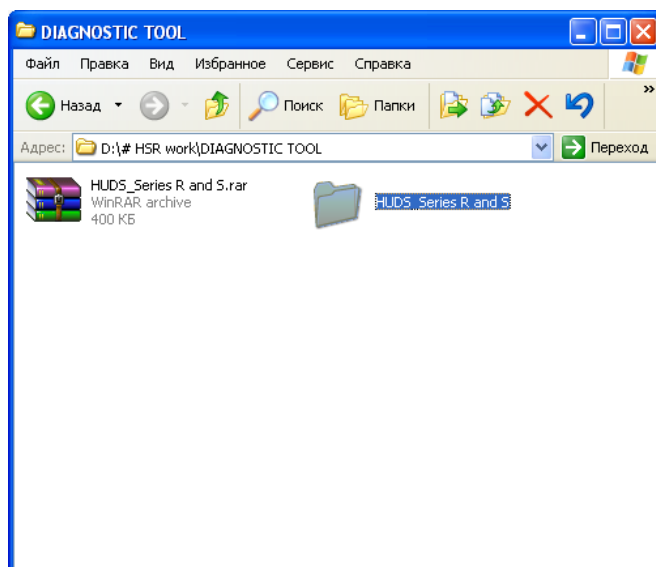
4. Click OK to Extract folder to the directory were your RAR-file was saved. (To change destination folder use right explorer panel to choose it, then press OK).



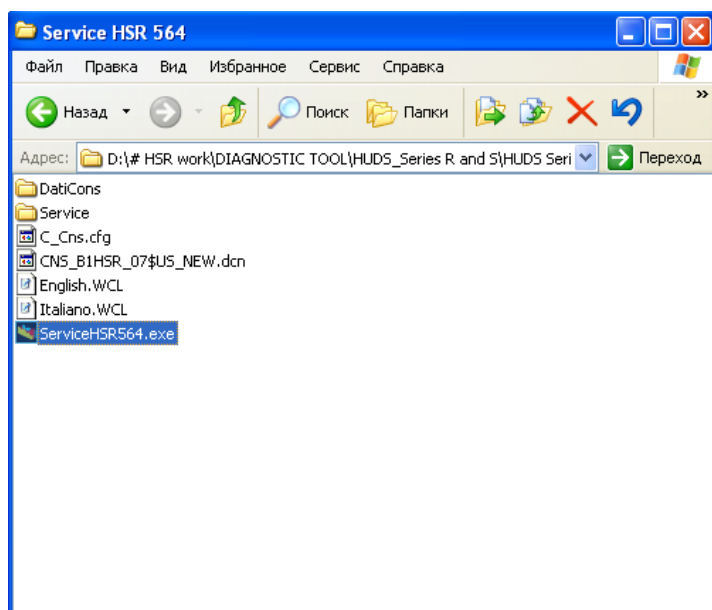
5. Close WinRAR window. Go to the location folder of RAR-file.

Folder “HUDS_Series R and S” should appear:



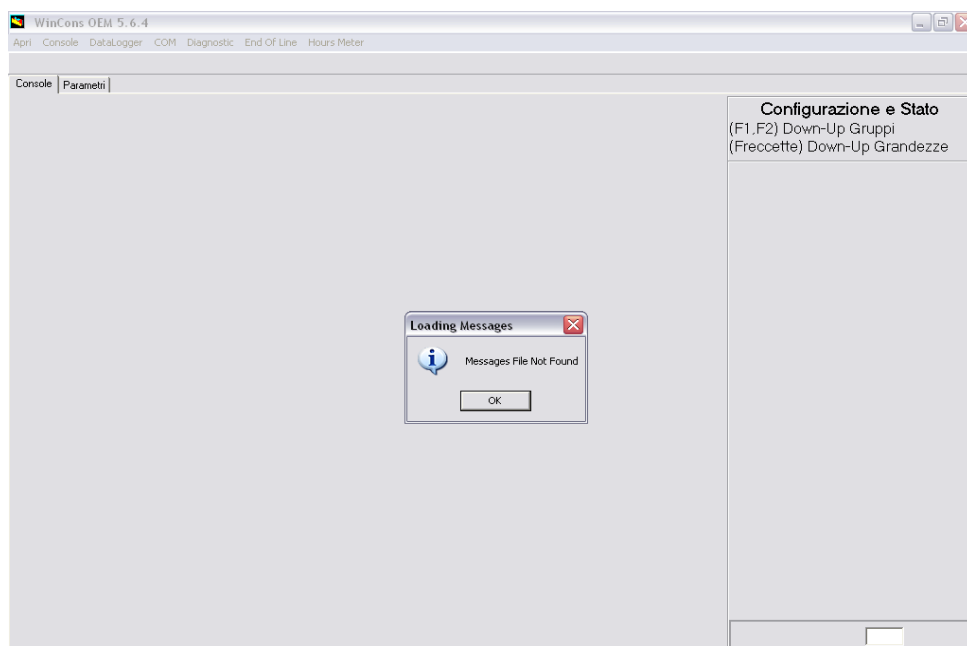


6. Open folder “HUDS_Series R and S” and start the file “ServiceHSR564.exe”:



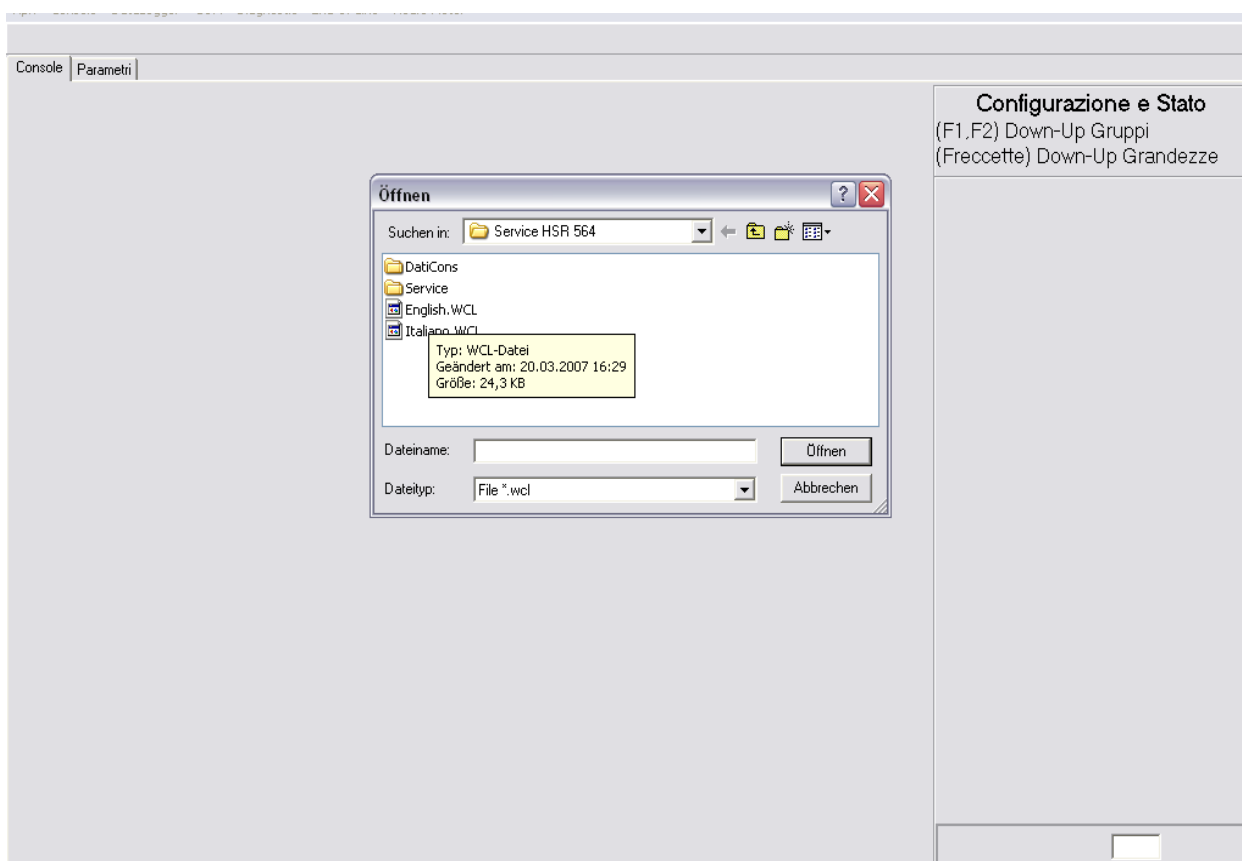
7. The following window should appear:





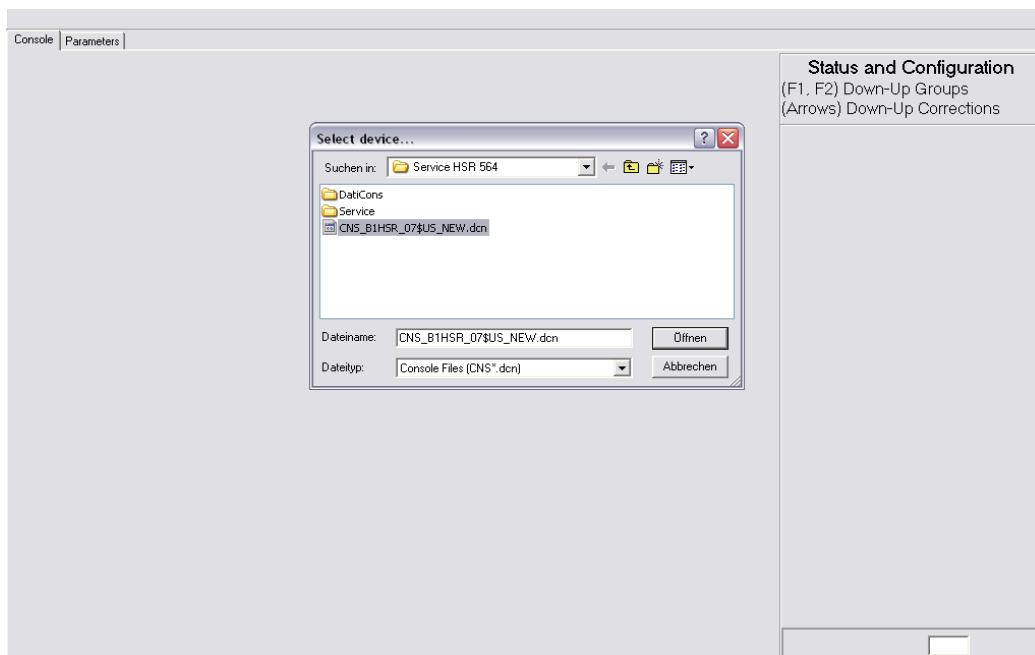
8. Click "OK" and choose language file (English or Italian are currently available), press "Open" button:



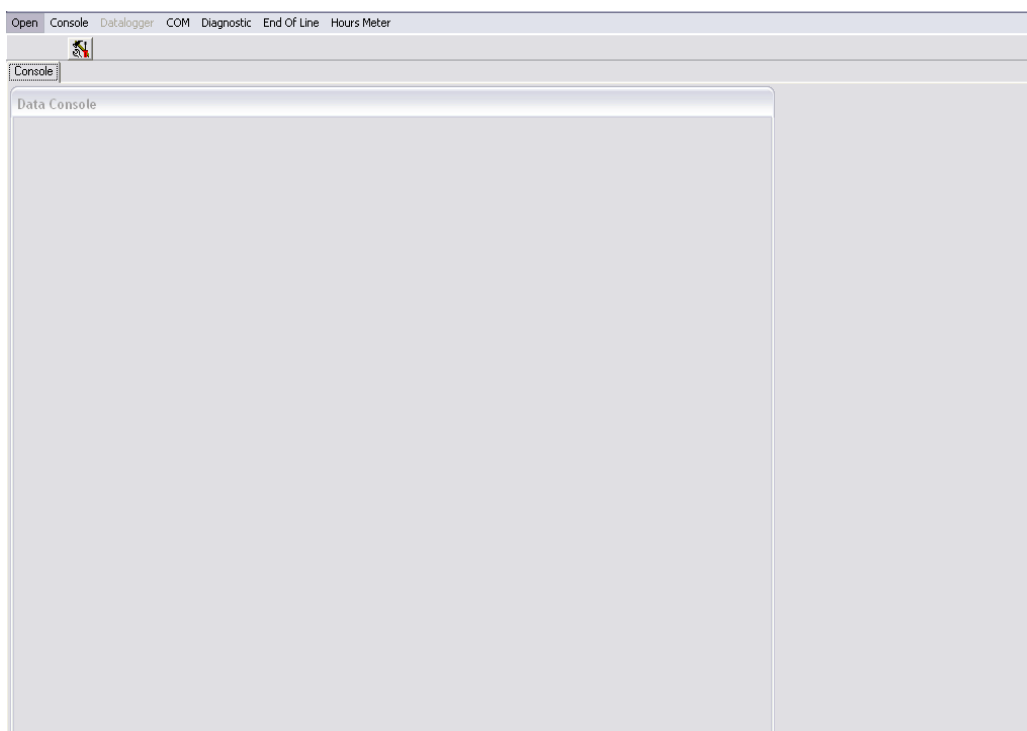


9. Next window “Select device” will open.

Choose file “CNS_B1HSR_07\$US_NEW.dcn” and click “Open”:



10. Program start view:

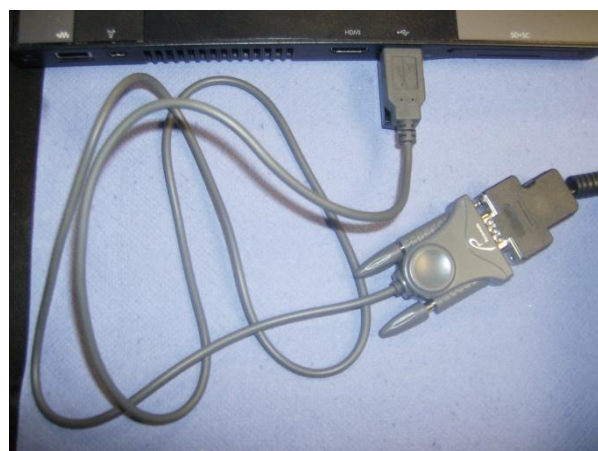


NOTE: *If your computer isn't equipped with a COM port, see "using USB-to-COM adapter" chapter below:*

Using USB-to-COM adapter

If direct COM (RS-232) connection is not possible for your computer USB-to-COM adapter should be used to complete Diagnostic or Registration process.

USB-to-COM adapters are after-market available . The general view of adapter is shown on the picture.





Adapter settings.

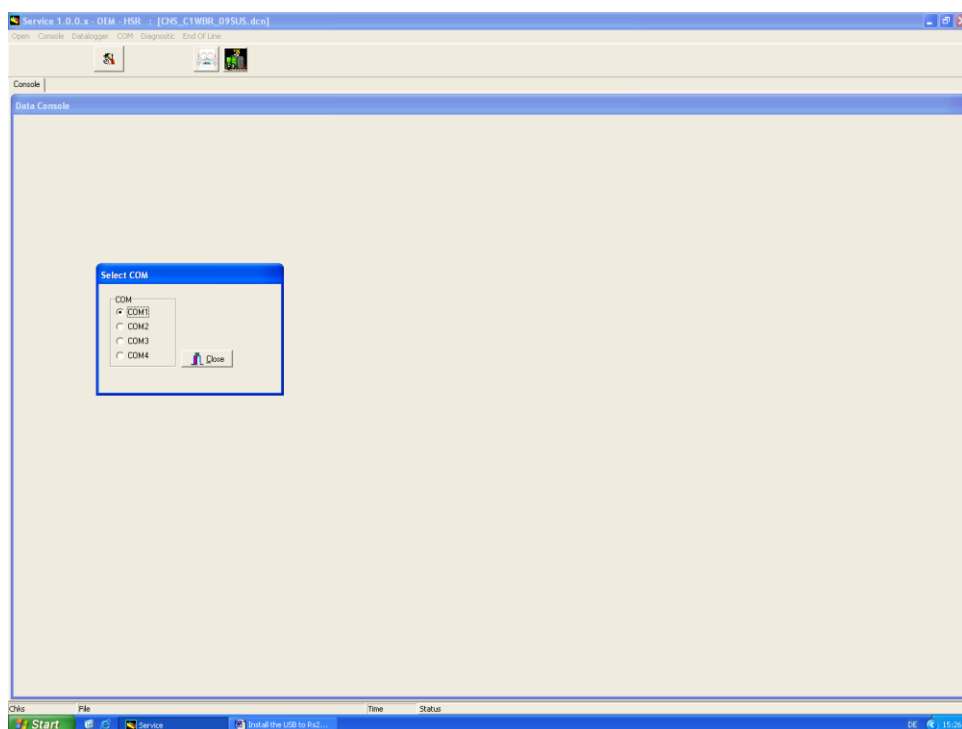
NOTE: For a perfect operation the adapter should be configured in a range COM1-COM4 of your system.

Please contact your IT administrator if required to complete this setting.

12.2 HSR Diagnostic Tool settings

Start Diagnostic software as described above. Press “COM” button of the upper panel.

The window will appear:



Select the COM port equal to your Adapter system settings (see above) and click “Close” button.

Now the **HSR Diagnostic Tool** should work correctly. If there are any problems please contact your IT Administrator.



12.3 Vehicle registration process

NOTE: ECU of each new vehicle is limited to maximum 2500 rpm before registration process is completed. Warranty period starts from date of registration.



WARNING:

ECU could be registered only ONCE. Do not attempt to register ECU for troubleshooting purposes.

Install HUDS software as described above.

NOTE: Check that Diagnostic cable is attached to a proper connector of vehicle with its one end and to the COM-port of your computer with other end. (see using USB-to-COM adapter if necessary).

Attachment of Diagnostic cable to Series-R connector.

(Placed at rear left side of vehicle engine compartment, close to battery.

Corresponding connector of wire harness is to be disconnected during diagnostic process.)



Ensure that safety lanyard is inserted to the STOP button of vehicle (ignition is on)



Starting Registration process.

Start program by “ServiceHSR564.exe” file.

Click “End Of Line” button on the upper panel. The “Line End Parameters” window should appear:

The screenshot shows the 'Line End Parameters' window with the following fields and values:

Field	Value
TPS_MIN	37
TPS_MAX	201
CO_IDLE_0	1,000
CO_IDLE_1	1,000
INJ_ADJ_0	1,000
INJ_ADJ_1	1,000
CHASSIS_NUMBER	HSR100081809000000000
ENGINE_NUMBER	BH33000016JL08080000
UNLOCK_CODE	
DAY	0
MONTH	0
YEAR	0
MAP_ID	21610
ECU_CODE	26968

Buttons: Set Line End Parameters, Read Line End Parameters. TPS Value: 36.

This window should be used to complete vehicle warranty registration (put VIN (Chassis number), *1, Engine number, *2)

To get the activation code for releasing ECU to full power mode please copy ECU code from field “ECU_CODE” (*3) and insert this number during vehicle warranty registration procedure using on-line B2B system. (see *B2B 2nd generation features below*).





Registration in B2B system.

Use the following link to access B2B system:

<http://hsrtest.xpml.at/>

Fill in your Login and Password and click "Login" button.

Fill in corresponding fields with unit's data:

- VIN number (=CHASSIS NUMBER, to be copied from field *1 of Line End parameters, see above)
- Engine number (to be copied from field *2)
- ECU number (=ECU CODE, to be copied from field *3)
- Select Usage Type
- Enter Customer Information fields
- Attach invoice (scanned copy) proving unit's sale.

Unit Information	
VIN (Serial No.): *	
Engine No.: *	
ECU No.: *	
Usage: *	Choose Usage Type

Customer Information	
First name: *	
Last name: *	
Street: *	
Postal Code: *	
City: *	
District: *	
Country: *	
Area: *	Choose Area

Invoice	
File: *	Durchsuchen...

Register >>

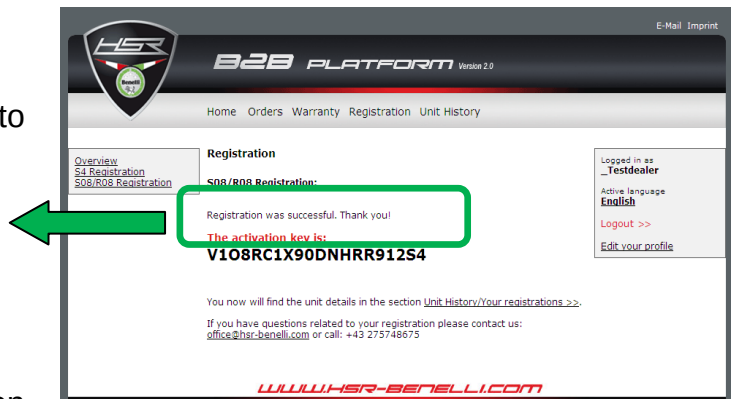
Click "Register" button to complete Registration.





Activation Code will appear in next window:

Copy the activation key and go back to Diagnostic system.



Finalizing Registration process.

Once received from B2B the Activation

code should be copied and pasted to the field "UNLOCK_CODE" (*4) of End Line Parameters window.

To complete the ECU Unlocking procedure press "Set Line End Parameters" button (*5).

ECU is unlocked now, vehicle could be operated in full power mode.

12.4 Periodic maintenance registration process

Periodic Maintenance registration

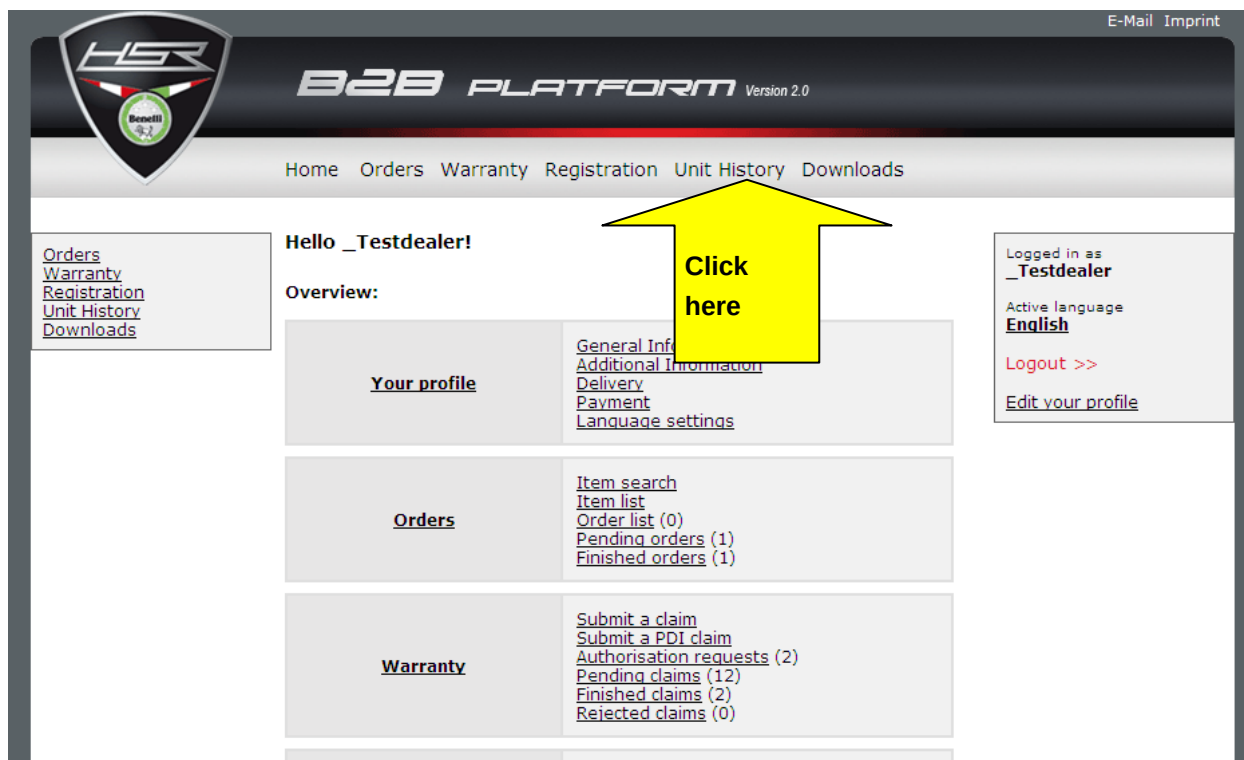
NOTE: In order to maintain Warranty during the warranty period it is absolutely necessary to record the maintenance based on periodic maintenance schedule in time in the B2B unit history.

The maintenance schedule is available in B2B download area.

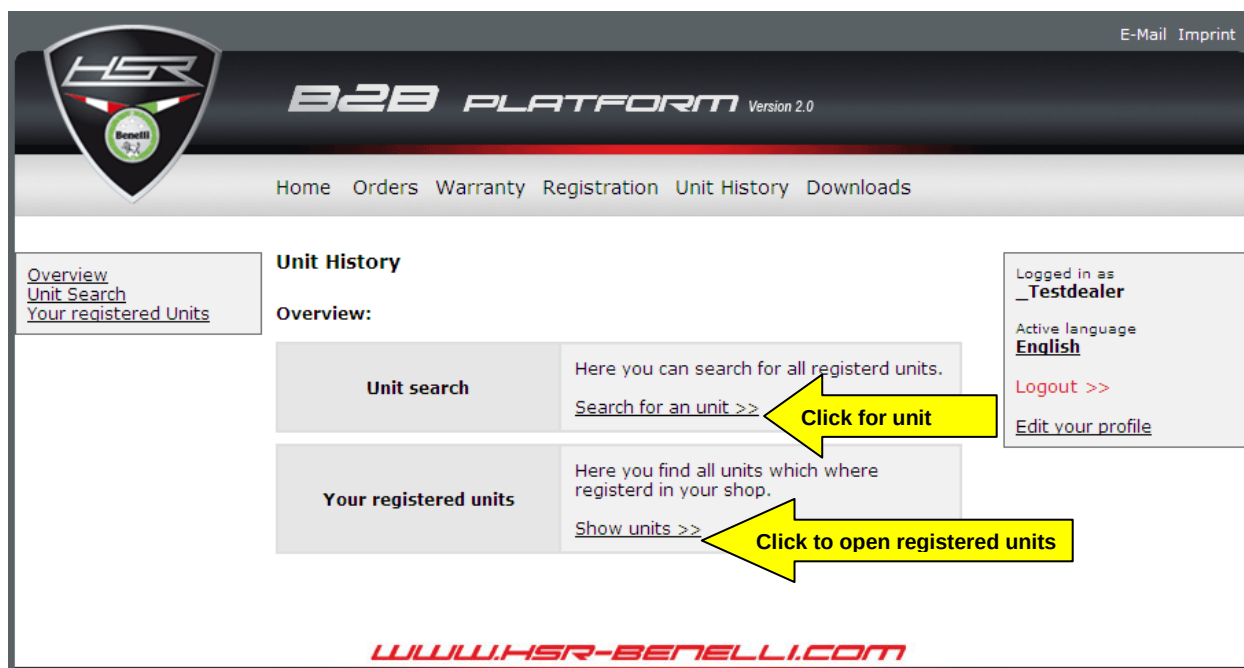




To start Maintenance registration click “Unit History” button on the upper panel:



Next window view:





Registered Unit window example:

B2B PLATFORM Version 2.0

[E-Mail](#) [Imprint](#)

[Overview](#)
[Unit Search](#)
[Your registered Units](#)

Unit History

Your registered Units

	VIN	Purchase Date	Model	Buyer
	HSR223498012	2008-05-05	S04	Mathias Moser
	HSRA0001C808	2008-04-10	S08 Pro	Mathias Moser
	HSR00810C708	2008-02-23	S04	Erwin Lasslsberger
	HSR223498011	2008-02-03	S04	asdf asdf

Logged in as
_Testdealer

Active language
English

[Logout >>](#)

[Edit your profile](#)

[Click to select](#)

WWW.HSR-BENELLI.COM

Scroll Unit History page to reach Maintenance field. Example of Maintenance field:

Maintenance	
10 hours Maintenance	2008-03-10: Hours: 12.00 Dealer: _Testdealer Document: test.dcn Document2: service without problems!
25 hours Maintenance	2008-07-22: Hours: 24.00 Dealer: _Testdealer Document: HUDS File.jpg Document2: Changed Oil Calve gap adjustment
25 hours Maintenance	2008-08-22: Hours: 27.00 Dealer: _Testdealer Document: HSR-BENELLI C DEALERS FRANCE 2008.xls Document2: Valve check and adjusted Changed Oil and Oilfilter Changed Oil seals and bearings on Jet Pump
50 hours Maintenance	2008-08-22: Hours: 49.00 Dealer: _Testdealer Document: ECU File Original.jpg Document2: Checked and adjusted Valve clearance changed oilfilter and oil changed jet pump changed bearing and oilseals
50 hours Maintenance	2008-09-18: Hours: 50.00 Dealer: _Testdealer Document: HUDS File .doc.docx Document2: Periodical check for the S8 Owner Manual.xls Ölgewechselt und nach Serviceintervall gearbeitet.
Add maintenance entry >>	

[Click to register new maintenance](#)





Maintenance Entry window will open. To register performed maintenance fill the following fields:

- **Maintenance Interval** – Select performed maintenance (10 hours, 25 hours, 50 hours, 75 hours, etc.)
- **Hours** – Enter vehicle current Motor Hours value
- **Comment** – Add your comments if necessary
- **ECU-File** – Ensure the filled in HUDS file (screenshot) is attached
- **ECU- File** – Ensure the invoice for performed service (scanned copy) is attached

Click “Add maintenance entry” button to save Maintenance Entry in Unit’s history. Maintenance Registration is complete.





23 STORAGE





13 Storage

The decommissioning of the vehicle is necessary ...

- at the end of the season if the vehicle will be decommissioned during the winter months.
- if the vehicle will not be used for more than 30 days.

In addition to the maintenance work described in the maintenance interval table under **end of the season**, various other service work is also required.

- **Conserve the cylinders**

Check spark plugs. See Chapter Checking the spark plugs.

Fill approx. 10 ml [0.34 oz (US)] of clean motor oil directly through the spark plug holes. Before you replace the spark plugs, crank up the motor briefly with the starter. Replace the spark plugs.



ATTENTION:

Never fill more motor oil than specified into the spark plug holes. Too much motor oil can cause engine damage.

- **Fill the fuel tank all the way**

Full fuel tank prevents the formation of condensation inside the tank.

- **Add fuel stabilizer**

After approx. 30 days, fuel begins to decompose. You can use any common fuel stabilizer in order to maintain the fuel quality.





24 *APPENDIX*





14 Appendix

Company	HSR-Benelli GmbH
Address	Wiener Straße 71 3380 Pöchlarn Austria
Internet	www.hsr-benelli.com
E-Mail	office@hsr-benelli.com

Directives

HSR-Benelli thus confirms that the construction of the engine corresponds to the following pertinent conditions:

- EU directive about sport boats 94/25/EG with addendum 2003/44/EG
- USA EPA Federal Register 40 CFR Part 91
- USA CARB 13 California Code of Regulation Article 4.7 Spark Ignition Marine Engines

