

## TECHNICAL DATA

DIMENSIONS	Max. length .....	2065 mm
	Max. length (rear mudguard extension included) .....	2170 mm
	Max. width .....	750 mm
	Max. height (front part of the fairing included) .....	1180 mm
	Seat height .....	820 mm
	Distance between centres .....	1425 mm
	Min. ground clearance .....	140 mm
	Weight ready for starting .....	222 kg
ENGINE	Model .....	V990
	Type .....	60° longitudinal V-type, two-cylinder, 4-stroke, with 4 valves per cylinder, DOHC.
	Number of cylinders .....	2
	Total displacement .....	997.6 cm <sup>3</sup>
	Bore / stroke .....	97 mm / 67.5 mm
	Compression ratio .....	11.4 ± 0.5 : 1
	Starting .....	electric
	Engine idling rpm .....	1250 ± 100 rpm
	Clutch .....	multidisc in oil bath, with hydraulic control on the left side of the handlebar and PPC device.
	Lubrication system .....	dry pan with separate oil tank and cooling radiator
TRANSMISSION	Air cleaner .....	with dry filter cartridge.
	Cooling .....	liquid-cooled
TRANSMISSION	Type .....	mechanical, 6 gears with foot control on the left side of the engine
CAPACITY	Fuel (reserve included) .....	19 ℓ
	Fuel reserve .....	4.5 ± 1 ℓ
	Engine oil .....	oil change 3700 cm <sup>3</sup> - oil and oil filter change 3900 cm <sup>3</sup>
	Fork oil (per rod) .....	520 ± 2.5 cm <sup>3</sup>
	Coolant .....	2.5 ℓ (50% water + 50% antifreeze with ethylene glycol)
	Seats .....	2
	Vehicle max. load (driver + passenger + luggage) .....	182 kg

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GEAR RATIOS	Ratio	Primary	Secondary	Final ratio	Total ratio
	1st	31/60 = 1 : 1.935	14/35 = 1 : 2.500	16 / 41 = 1 : 2.563	12.399
	2nd		16/28 = 1 : 1.750		8.679
	3rd		19/26 = 1 : 1.368		6.787
	4th		22/24 = 1 : 1.090		5.411
	5th		23/22 = 1 : 0.956		4.744
	6th		27/23 = 1 : 0.851		4.225
DRIVE CHAIN	Type .....	endless (with no connection link) with sealed links			
	Model .....	525			
FUEL SUPPLY SYSTEM	Type .....	electronic injection (Multipoint)			
	Choke.....	Ø 51 mm			
FUEL SUPPLY	Fuel .....	premium grade unleaded petrol, min. O.N. 95 (N.O.R.M.) and 85 (N.O.M.M.).			
FRAME	Type .....	double two-beam frame with light alloy cast elements and extruded elements			
	Steering inclination angle.....	25°			
	Fore stroke .....	97 mm			
SUSPENSIONS	Front.....	upside-down telescopic adjustable fork with hydraulic operation, rod Ø 43 mm			
	Stroke.....	127 mm			
	Rear .....	light-alloy, oscillating rear fork with extruded arms and hydropneumatic adjustable mono-shock absorber			
	Wheel stroke .....	135 mm			
BRAKES	Front.....	with double floating disc - Ø 320 mm, calipers with four pins with differentiated diameter			
	Rear .....	disc brake - Ø 220 mm, caliper with double pin			
WHEEL RIMS	Type .....	in light alloy with withdrawable pin			
	Front.....	3.50 x 17"			
	Rear .....	6.00 x 17"			
FRONT TYRE	Type .....	120 / 70 ZR - 17"			
	Model .....	PIRELLI MTR 21 - DRAGON EVO E3 75 R 0053584			
	Alternative .....	BRIDGESTONE BT56F - BATTLAX E4 75 R 0000680			
		METZELER STEEL MEZ3 E3 75 R 0053906			
		MICHELIN PILOT SPORT E2 75 R 006549			
	Inflation pressure solo rider.....	240 kPa (2.4 bar)			
	Inflation pressure rider with passenger .....	250 ± 10 kPa (2.5 ± 0.1 bar)			

REAR TYRE	Type .....	180 / 55 ZR - 17"
	Model .....	PIRELLI MTR 22 - DRAGON EVO E3 75 R 0053585
	Alternative .....	BRIDGESTONE PT56R - BATTLAX E4 75 R 0000664
		METZELER STEEL MEZ3 E3 75 R 0053918
		MICHELIN PILOT SPORT E2 75 R 006566
	Inflation pressure solo rider.....	250 kPa (2.5 bar)
	Inflation pressure rider with passenger .....	280 ± 10 kPa (2.8 ± 0.1 bar)
SPARK PLUGS	Standard .....	NGK R DCPR9E
	Alternative .....	NGK R DCPR8E
	Spark plug gap .....	0.6 – 0.7 mm
	Resistance .....	5 kΩ
ELECTRIC SYSTEM	Battery.....	12 V - 12 Ah
	Main fuses.....	30 A
	Secondary fuses .....	15 A
	Generator (with permanent magnet) .....	12 V - 400 W
BULBS	Low beam (halogen) .....	12 V - 55 W
	High beam (halogen) .....	12 V - 60 W
	Front parking light .....	12 V - 5 W
	Direction indicators .....	12 V - 10 W
	Rear parking light/stoptlight .....	12 V - 5 / 21 W
	Number plate light .....	12 V - 3 W
	Revolution counter .....	12 V - 2 W
	Left multifunction display.....	12 V - 2 W
	Right multifunction display .....	12 V - 2 W
WARNING LIGHTS	Neutral .....	12 V - 3 W
	Direction indicators .....	12 V - 3 W
	Fuel reserve .....	12 V - 3 W
	High beam.....	12 V - 3 W
	Stand down .....	12 V - 3 W
	Engine oil pressure .....	LED
	Red line .....	LED

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## REGULAR SERVICE INTERVALS CHART

OPERATIONS TO BE CARRIED OUT BY THE **aprilia** Official Dealer (WHICH CAN BE CARRIED OUT EVEN BY THE USER)



Component	After running-in [1000 km (625 mi)]	Every 7500 km (4687 mi) or 8 months	Every 15000 km (9375 mi) or 16 months
Spark plugs		C (*)	S (*)
Air filter		C	S
Engine oil filter	S	S (*)	
Engine oil filter (on oil tank)	P		P
Light operation/direction		C	
Fork		C	
Light system	C	C	
Safety switches	C	C	
Clutch fluid		C	
Brake fluid		C	
Coolant			C
Engine oil	S	S (*)	
Tyres	C	every 1000 km (625 mi): C	
Tyre pressure	R	every month: R	
Engine idling rpm	R	R	
Engine oil pressure warning light LED	at every start: C		
Drive chain tension and lubrication	every 1000 km (625 mi): C		
Brake pad wear	before every trip and every 7500 km (4687 mi): C		
<b>C</b> = check and clean, adjust, lubricate or change, if necessary; <b>P</b> = clean; <b>S</b> = change; <b>R</b> = adjust. <b>Carry out the maintenance operations more frequently if you use the vehicle in rainy and dusty areas, on uneven ground or on racetracks.</b>			

(\*) = In case of use on racetracks, change every 3750 km (2343 mi).

# OPERATIONS TO BE CARRIED OUT BY THE **aprilia** Official Dealer

Component	After running-in [1000 km (625 mi)]	Every 7500 km (4687 mi) or 8 months	Every 15000 km (9375 mi) or 16 months
Rear suspension linkage bearings			C
Steering bearings and steering	C	C	
Wheel bearings		C	
Tappet clearance	R		R
Braking systems	C	C	
Cooling system		C	
Clutch fluid	every 2 years: S		
Brake fluid	every 2 years: S		
Coolant	every 2 years: S		
Fork oil	After the first 7500 km (4687 mi): S / every 22500 km (14000 mi): S		
Brake pads	if worn: S		
Nut, bolt, screw tightening	C	C	
Suspensions and attitude	C		C
Fuel pipes		C	every 4 years: S
<b>C</b> = check and clean, adjust, lubricate or change, if necessary; <b>P</b> = clean; <b>S</b> = change; <b>R</b> = adjust. <b>Carry out the maintenance operations more frequently if you use the vehicle in rainy and dusty areas, on uneven ground or on racetracks.</b>			





## LUBRICANT CHART





**Engine oil (recommended):**  EXTRA RAID 4, SAE 15W - 50 or  Agip TEC 4T SAE 15W - 50.





As an alternative to the recommended oil, it is possible to use high-quality oils with characteristics in compliance with or superior to the CCMC G-4, A.P.I. SG specifications.

**Fork oil (recommended):**  F.A. 5W or  F.A. 20 W fork oil;

an alternative  Agip FORK 5W or  Agip FORK 20W fork oil.

If you need an oil with intermediate characteristics in comparison with the  F.A. 5W and  F.A. 20 W or  Agip FORK 5W and  Agip FORK 20W, these can be mixed as indicated below:

SAE 10W =  F.A. 5W 67% of the volume, +  F.A. 20W 33% of the volume or  
 Agip FORK 5W 67% of the volume +  Agip FORK 20W 33% of the volume.

SAE 15W =  F.A. 5W 33% of the volume, +  F.A. 20W 67% of the volume or  
 Agip FORK 5W 33% of the volume +  Agip FORK 20W 67% of the volume.

**Bearings and other lubrication points (recommended):**  AUTOGREASE MP or  Agip GREASE 30.

As an alternative to the recommended product, use high-quality grease for rolling bearings, working temperature range -30 °C...+140 °C, dripping point 150 °C...230 °C, high protection against corrosion, good resistance to water and oxidation.

**Protection of the battery poles:** neutral grease or vaseline.

**Spray grease for chains (recommended):**  CHAIN SPRAY or  Agip CHAIN LUBE.



### WARNING

**Use new brake fluid only.**

**Brake fluid (recommended):**  F.F., DOT 5 (DOT 4 compatible) or  Agip BRAKE 5.1, DOT 5 (DOT 4 compatible).

### WARNING

**Use new clutch fluid only.**

**Clutch fluid (recommended):**  F.F., DOT 5 (DOT 4 compatible) or  Agip BRAKE 5.1, DOT 5 (DOT 4 compatible).

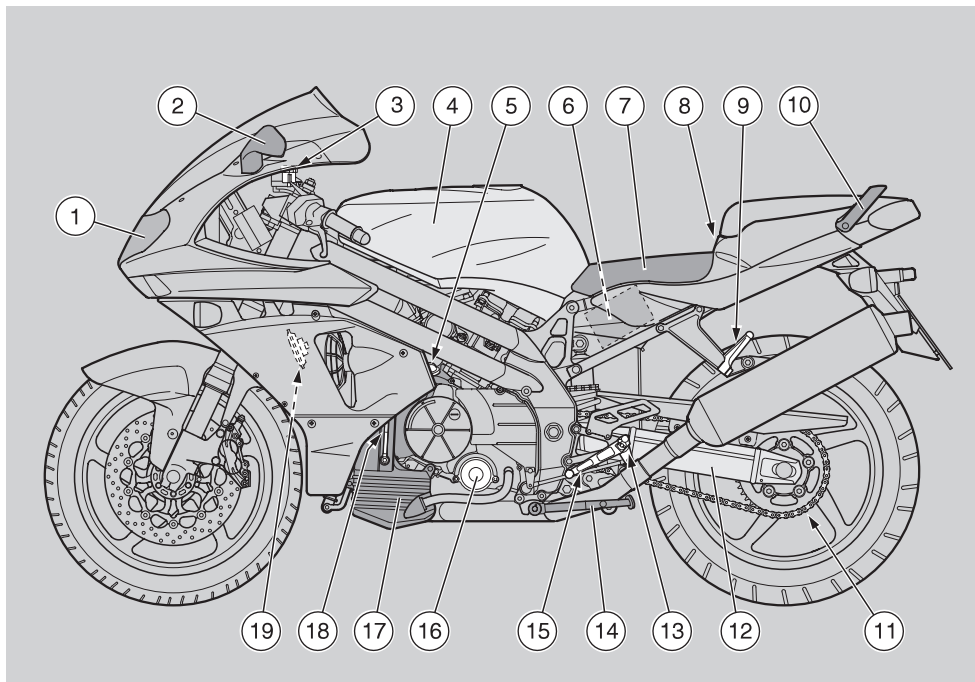
### WARNING

**Use only antifreeze and anticorrosive without nitrite, ensuring protection at -35 °C at least.**

**Engine coolant (recommended):**  ECOBLU -40 °C or  Agip COOL.

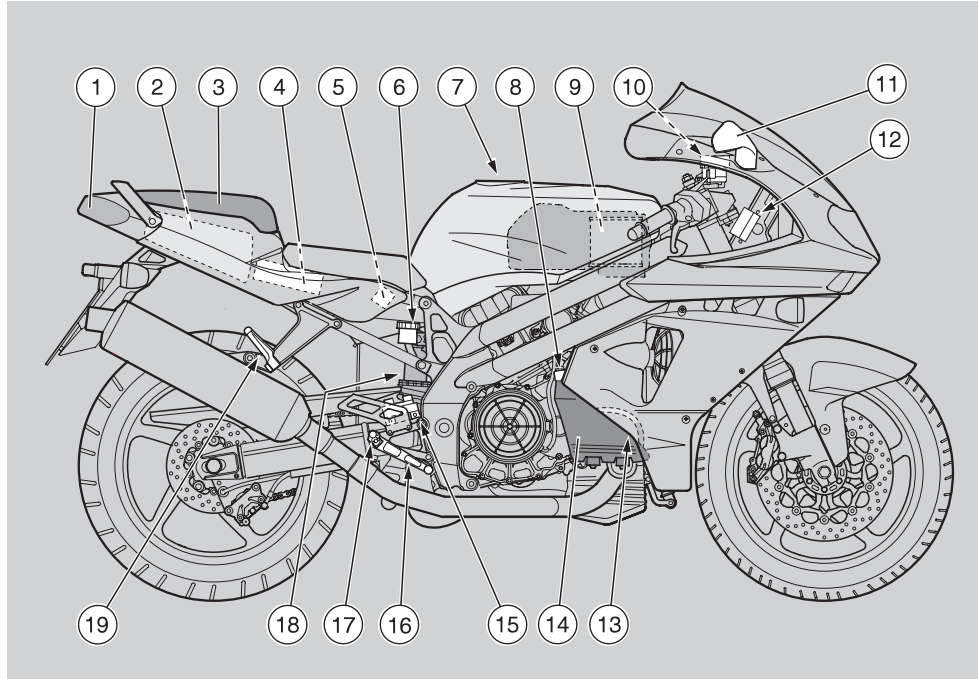
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## ARRANGEMENT OF THE MAIN ELEMENTS



### KEY

- |                                    |                                                       |                       |
|------------------------------------|-------------------------------------------------------|-----------------------|
| 1) Headlight                       | 9) Passenger left footrest<br>(snapping, closed/open) | 15) Shifting lever    |
| 2) Left rear-view mirror           | 10) Passenger grab rail                               | 16) Engine oil filter |
| 3) Clutch fluid reservoir          | 11) Drive chain                                       | 17) Engine oil tank   |
| 4) Fuel tank                       | 12) Rear fork                                         | 18) Engine oil level  |
| 5) Engine oil tank cap             | 13) Rider left footrest<br>(with spring, always open) | 19) Horn              |
| 6) Battery                         | 14) Side stand                                        |                       |
| 7) Rider saddle                    |                                                       |                       |
| 8) Glove/tool kit compartment lock |                                                       |                       |



## KEY

- |                                                                        |                                   |                                                         |
|------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------|
| 1) Rear light                                                          | 7) Fuel tank plug                 | 15) Rear brake pump                                     |
| 2) Glove/tool kit compartment                                          | 8) Coolant expansion tank cap     | 16) Rear brake control lever                            |
| 3) Passenger seat<br>(alternatively: glove/tool kit compartment cover) | 9) Air cleaner                    | 17) Rider right footrest<br>(with spring, always open)  |
| 4) Electronic unit                                                     | 10) Front brake fluid tank        | 18) Rear shock absorber                                 |
| 5) Main fuse carrier (30 A)                                            | 11) Right rear-view mirror        | 19) Passenger right footrest<br>(snapping, closed/open) |
| 6) Rear brake fluid tank                                               | 12) Secondary fuse carrier (15 A) |                                                         |
|                                                                        | 13) Coolant level                 |                                                         |
|                                                                        | 14) Expansion tank                |                                                         |



## TECHNICAL SPECIFICATIONS

ENGINE	
Model	V990
Type	60° longitudinal V-type, two-cylinder, 4-stroke, with 4 valves per cylinder, DOHC.
Number of cylinders	2
Total displacement <b>RSV RSV R</b> ('98 – '99 – 2000 models) <b>SL</b>	997.6 cmC
Total displacement <b>RSV RSV R</b> (models starting from 2001) <b>ETV</b>	998 cmC
Total displacement <b>RST</b>	997.62 cmC
Max. rated power (to driving shaft)	86.5 kW (118 HP) at 9250 rpm
Max. rated power (to driving shaft) <b>RSV RSV R</b> <b>F</b>	70 kW (94 HP) at 9250 rpm
Max. rated power (to driving shaft) <b>SL</b> <b>F</b>	77 kW (104 HP) at 9250 rpm
Max. torque	96.5 Nm (9.65 kgm) at 7250 rpm
Max. torque <b>RSV RSV R</b> <b>F</b>	82 Nm (8.2 kgm) at 7000 rpm
Max. torque <b>SL</b> <b>F</b>	90 Nm (9.0 kgm) at 7000 rpm
Bore/stroke	97 mm/67.5 mm
Compression ratio <b>RSV RSV R</b> <b>SL</b>	11.4 ± 0.5 : 1
Compression ratio <b>RST</b>	11.8 ± 0.5 : 1
Compression ratio <b>ETV</b>	10.4 ± 0.5 : 1
Average piston speed	22.5 m/s at 10000 rpm
Camshaft during intake stroke <b>RSV RSV R</b> ('98 – '99 – 2000 models) <b>SL</b>	262°, valve lifting= 10.60 mm
Camshaft during intake stroke <b>RSV RSV R</b> (models starting from 2001)	262°, valve lifting= 11.40 mm
Camshaft during intake stroke <b>RST</b>	259°, valve lifting= 10.60 mm
Camshaft during intake stroke <b>ETV</b>	242°, valve lifting= 9.50 mm
Camshaft during exhaust stroke <b>RSV RSV R</b> <b>SL</b> <b>RST</b>	259°, valve lifting= 10.60 mm
Camshaft during exhaust stroke <b>ETV</b>	242°, valve lifting= 9.50 mm
Valve advance (with valve clearance 1mm) <b>RSV RSV R</b> <b>SL</b>	opening during intake stroke = 20° before TDC closing during intake stroke = 62° after BDC opening during exhaust stroke = 64° before TDC closing during exhaust stroke = 15° after BDC
Valve advance (with valve clearance 1 mm) <b>RSV RSV R</b> <b>SL</b> (models starting from 2001)	opening during intake stroke = 25° before TDC closing during intake stroke = 59° after BDC opening during exhaust stroke = 65° before TDC closing during exhaust stroke = 15° after BDC
Valve advance (with valve clearance 1mm) <b>RST</b>	opening during intake stroke = 20° before TDC closing during intake stroke = 59° after BDC opening during exhaust stroke = 64° before TDC closing during exhaust stroke = 15° after BDC
Valve advance (with valve clearance 1mm) <b>ETV</b>	opening during intake stroke = 25° before TDC closing during intake stroke = 37° after BDC opening during exhaust stroke = 57° before TDC closing during exhaust stroke = 5° after BDC
Valve clearance during intake stroke	0.12 – 0.17 mm
Valve clearance during exhaust stroke	0.23 – 0.28 mm
Diameter of the inlet valve plate	36.0 mm
Diameter of the exhaust valve plate	31.0 mm
# Engine revolutions at minimum rpm <b>RSV RSV R</b> <b>SL</b> <b>RST</b>	1250 ± 100 rpm
# Engine revolutions at minimum rpm <b>ETV</b>	1200 ± 100 rpm
# Engine revolutions at peak rpm <b>RSV RSV R</b> <b>SL</b>	10250 ± 100 rpm
# Engine revolutions at peak rpm <b>RST</b>	10500 ± 100 rpm
# Engine revolutions at peak rpm <b>ETV</b>	9000 ± 100 rpm
Ignition	electronically controlled
Starting	electric

Follow

ENGINE	
Spark advance	At start: 5° before TDC, additional advance depending on specific consumption levels
Starter motor gear ratio	$i = 49/9 \cdot 30/11 \cdot 64/30 = 31.677$
Clutch	multidisc in oil bath, with hydraulic control on the left side of the handlebar and PPC device - # 9 friction discs; thick 3.5 mm - # 10 steel discs; thick 1.5 mm
Transmission	Mechanical, 6 gears with foot control on the left side of the engine
Lubrication system	dry pan with separate oil tank, # 2 trochoidal pumps and cooling radiator
Lubrication pressure	min 500 kPa (5 bar) at max 80 °C (176 °F) and 6000 rpm
Air cleaner	with dry filter cartridge
Cooling	liquid-cooled
Coolant pump gear ratio	$i_{wp} = 28/27 \cdot 28/28 = 1.037$
Coolant pump delivery (with thermal expansion valve open)	90 l /min and 9000 rpm
Thermal expansion valve opening start temperature	65 ± 2 °C (149 ± 5 °F)
Engine dry weight	~ 65 – 67 kg

DRIVE <small>RSV</small> <small>RSV R</small>					
GEAR RATIOS	Ratio	Primary	Secondary	Final ratio	Total ratio
	1 <sup>a</sup>	31/60 = 1: 1.935	14/35 = 1: 2.50	17/42 = 1: 2.470	11.948
	2 <sup>a</sup>		16/28 = 1: 1.750		8.368
	3 <sup>a</sup>		19/26 = 1: 1.368		6.543
	4 <sup>a</sup>		22/24 = 1: 1.090		5.216
	5 <sup>a</sup>		23/22 = 1: 0.956		4.573
	6 <sup>a</sup>		27/23 = 1: 0.851		4.073
# sprocket teeth	17				

DRIVE <small>SL</small>					
GEAR RATIOS	Ratio	Primary	Secondary	Final ratio	Total ratio
	1 <sup>a</sup>	31/60 = 1: 1.935	14/35 = 1: 2.50	16/41 = 1: 2.563	12.399
	2 <sup>a</sup>		16/28 = 1: 1.750		8.679
	3 <sup>a</sup>		19/26 = 1: 1.368		6.787
	4 <sup>a</sup>		22/24 = 1: 1.090		5.411
	5 <sup>a</sup>		23/22 = 1: 0.956		4.744
	6 <sup>a</sup>		27/23 = 1: 0.851		4.225
# sprocket teeth	16				

DRIVE <small>RST</small>					
GEAR RATIOS	Ratio	Primary	Secondary	Final ratio	Total ratio
	1 <sup>a</sup>	31/60 = 1: 1.935	14/35 = 1: 2.50	16/43 = 1: 2.687	13.00
	2 <sup>a</sup>		16/28 = 1: 1.750		9.102
	3 <sup>a</sup>		19/26 = 1: 1.368		7.117
	4 <sup>a</sup>		22/24 = 1: 1.090		5.674
	5 <sup>a</sup>		23/22 = 1: 0.956		4.975
	6 <sup>a</sup>		27/23 = 1: 0.851		4.431
# sprocket teeth	16				

DRIVE <small>ETV</small>					
GEAR RATIOS	Ratio	Primary	Secondary	Final ratio	Total ratio
	1 <sup>a</sup>	31/60 = 1: 1.935	14/35 = 1: 2.50	17/45 = 1: 2.647	12.804
	2 <sup>a</sup>		16/28 = 1: 1.750		9.041
	3 <sup>a</sup>		19/26 = 1: 1.368		7.006
	4 <sup>a</sup>		22/24 = 1: 1.090		5.582
	5 <sup>a</sup>		23/22 = 1: 0.956		4.896
	6 <sup>a</sup>		27/23 = 1: 0.851		4.358
# sprocket teeth	17				

Follow

Follow

FUEL SUPPLY SYSTEM	
Type	electronic injection
Choke <b>RSV</b> <b>RSV R</b> <b>SL</b> <b>RST</b>	Ø 51 mm
Choke <b>ETV</b>	Ø 47 mm

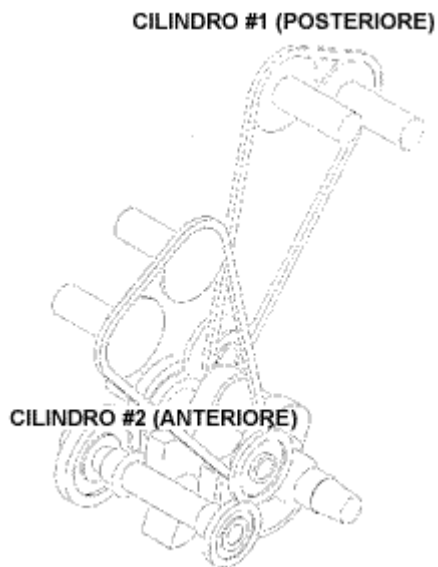
FUEL SUPPLY	
Type	indirect injection (MULTIPOINT)
Fuel	premium grade unleaded petrol, min. O.N. 95 (N.O.R.M.) and 85 (N.O.M.M.).

SPARK PLUGS	
Standard	NGK R DCPR9E
Spark plug gap	0.6 – 0.7 mm
Resistance	5 kΩ

ELECTRIC SYSTEM	
Generator (with permanent magnet) <b>RSV</b> <b>RSV R</b> <b>SL</b> <b>RST</b>	12 V – 400 W (350 W for models <b>RSV</b> <b>RSV R</b> up to 2000)
Generator (with permanent magnet) <b>ETV</b>	12 V – 470 W
Starter	12 V/0.9 kW
Starter motor gear ratio	$i = 49/9 * 30/11 * 64/30 = 31.677$

## TIMING SYSTEM

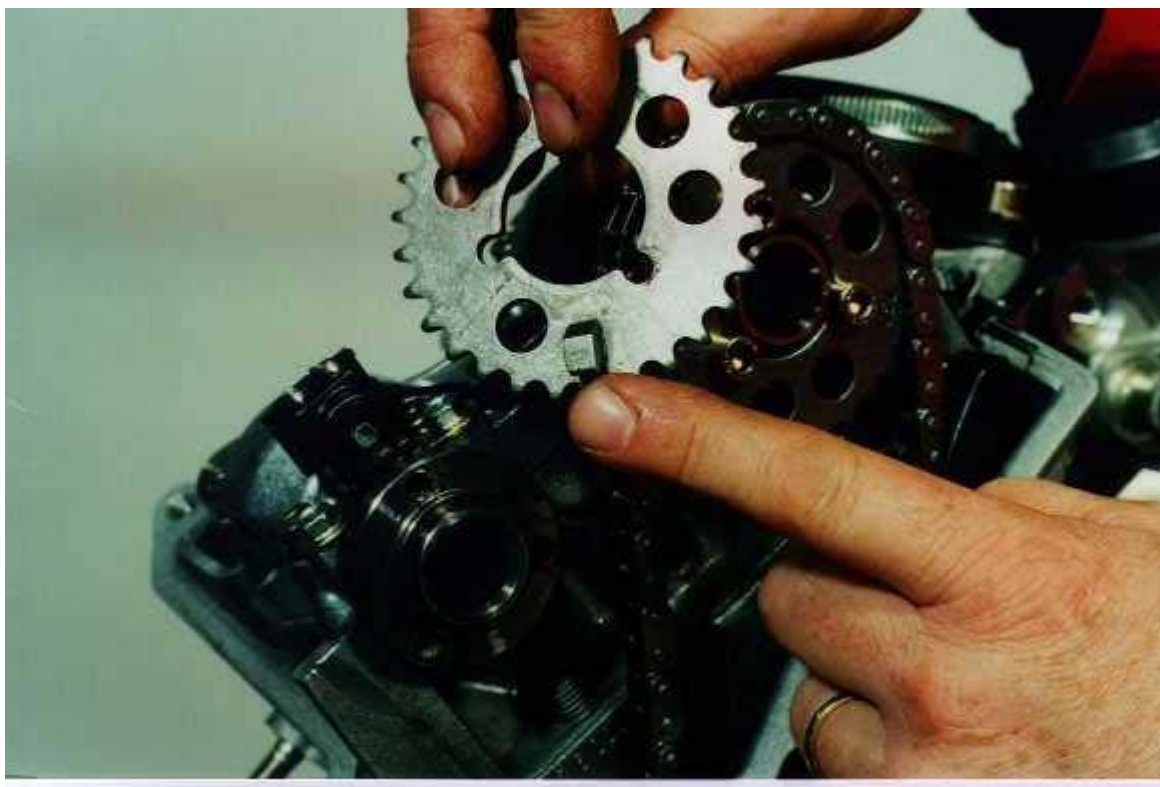
- DOHC
- Mixed gear-and-chain drive
- 4 valves per cylinder



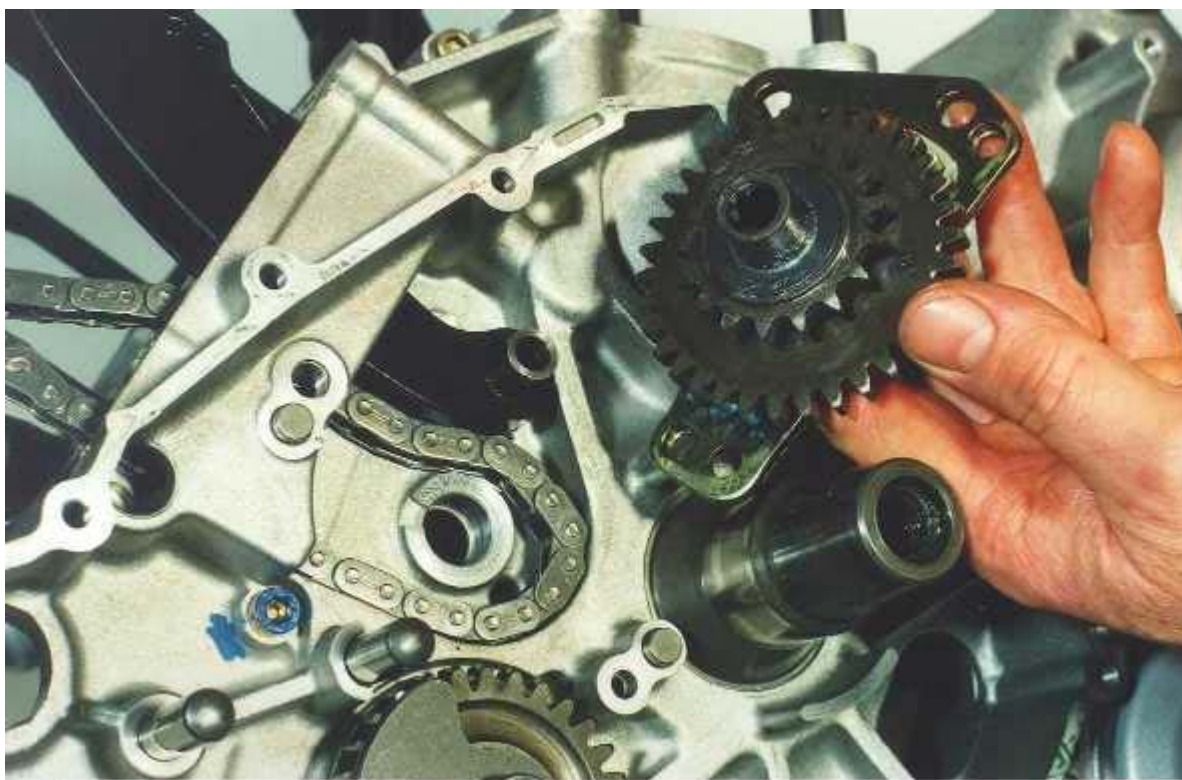
- Camshaft gears



- The exhaust camshaft of the front cylinder features a tab for the camshaft sensor.
- The purpose of the camshaft sensor is to tell the sequential fuel injection system when the front cylinder is performing its intake stroke (the camshaft gear performs one revolution every two revolutions of the crankshaft)



- Front cylinder timing gear (operated by countershaft) - flywheel side

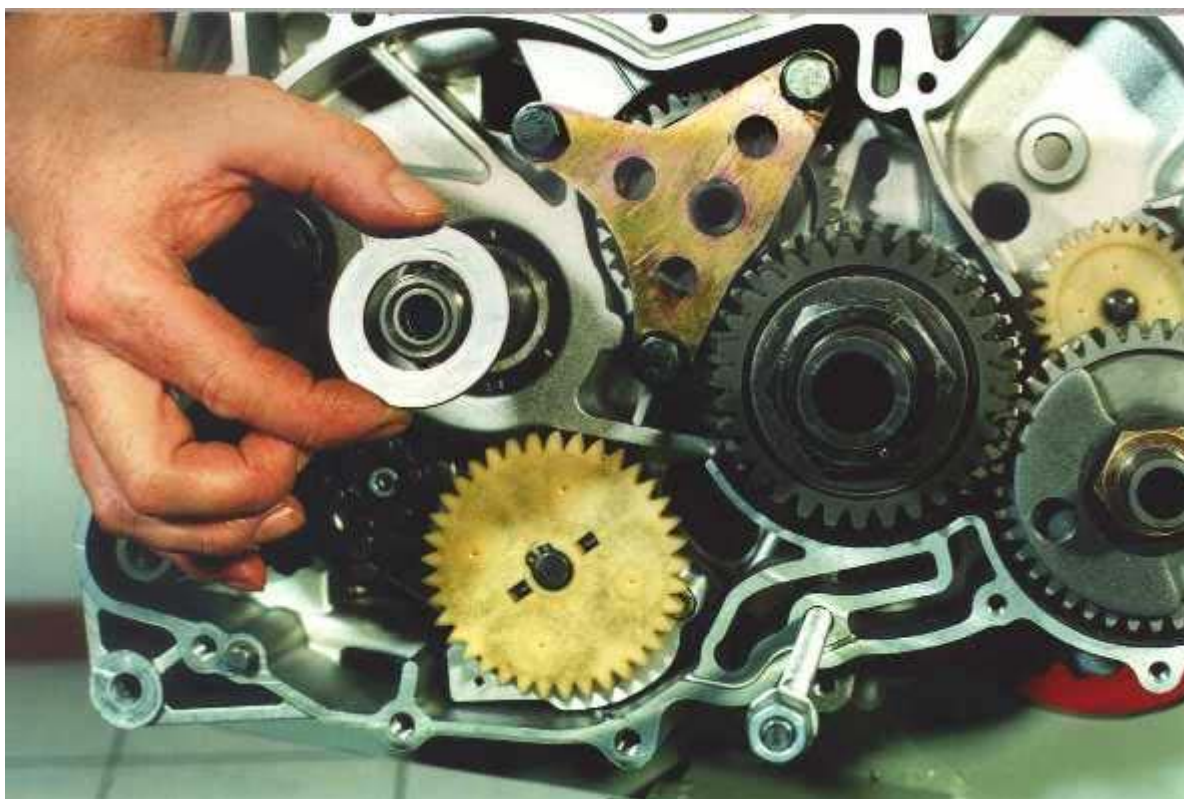


- Detail of the two roller bearings and washer





Rear cylinder timing gear (operated by crankshaft) - clutch side





- Multiple cam profiles: intake (above) / exhaust (below)

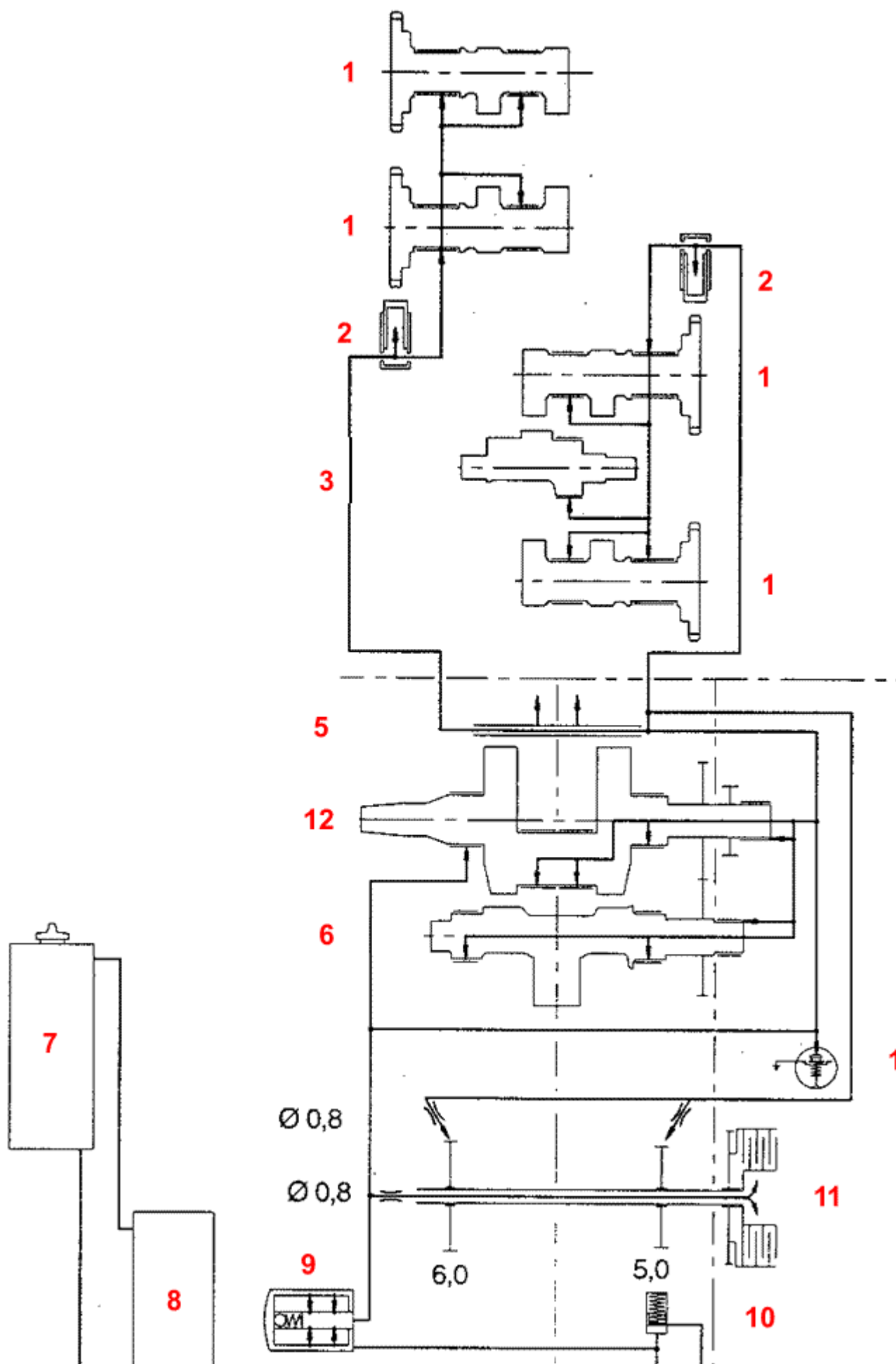




## LUBRICATION

### LUBRICATION SYSTEM

- Dry-sump lubrication
- Double coaxial trochoidal pump
- Oil cooler
- Capacity 3.5 l.

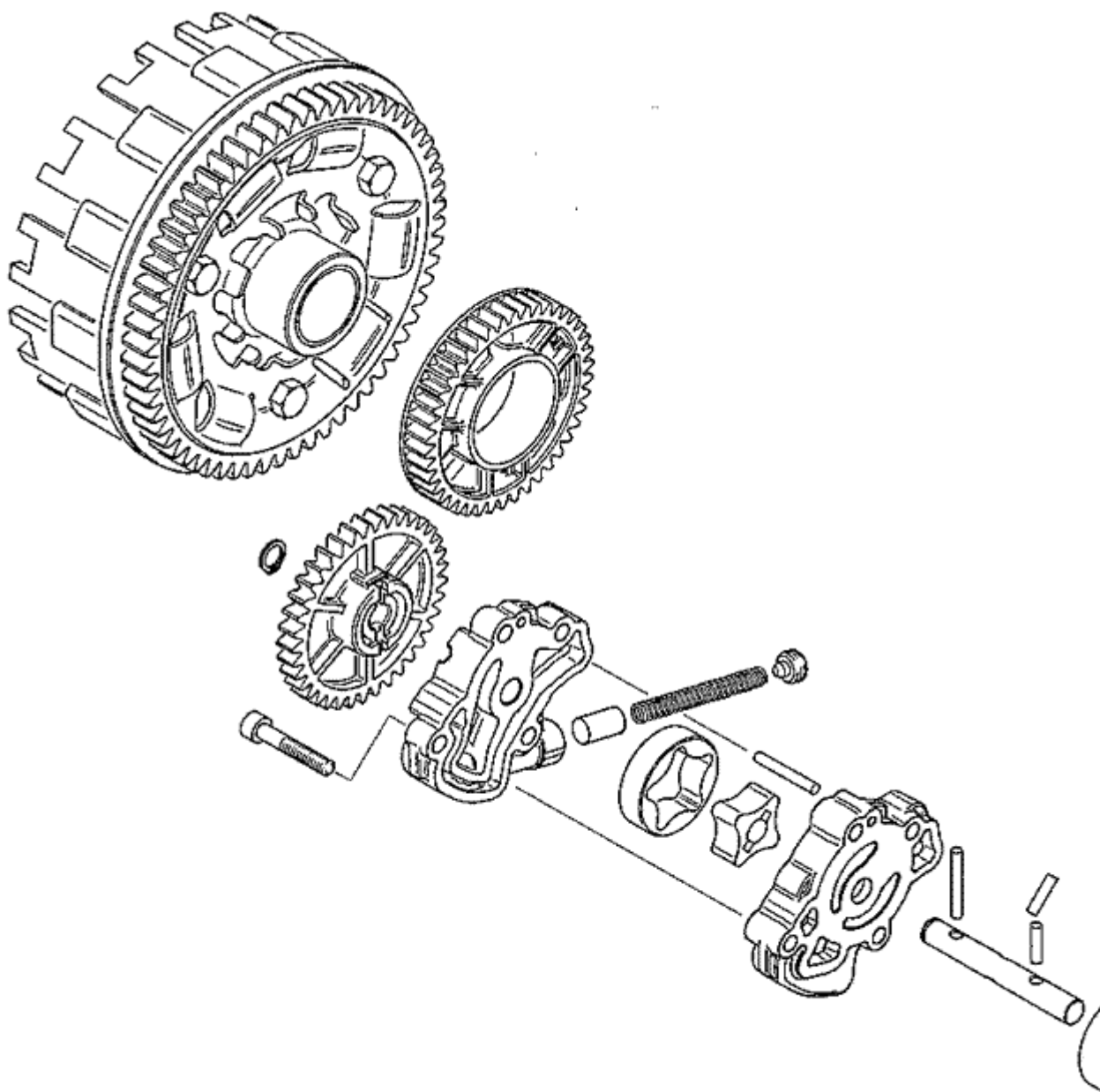


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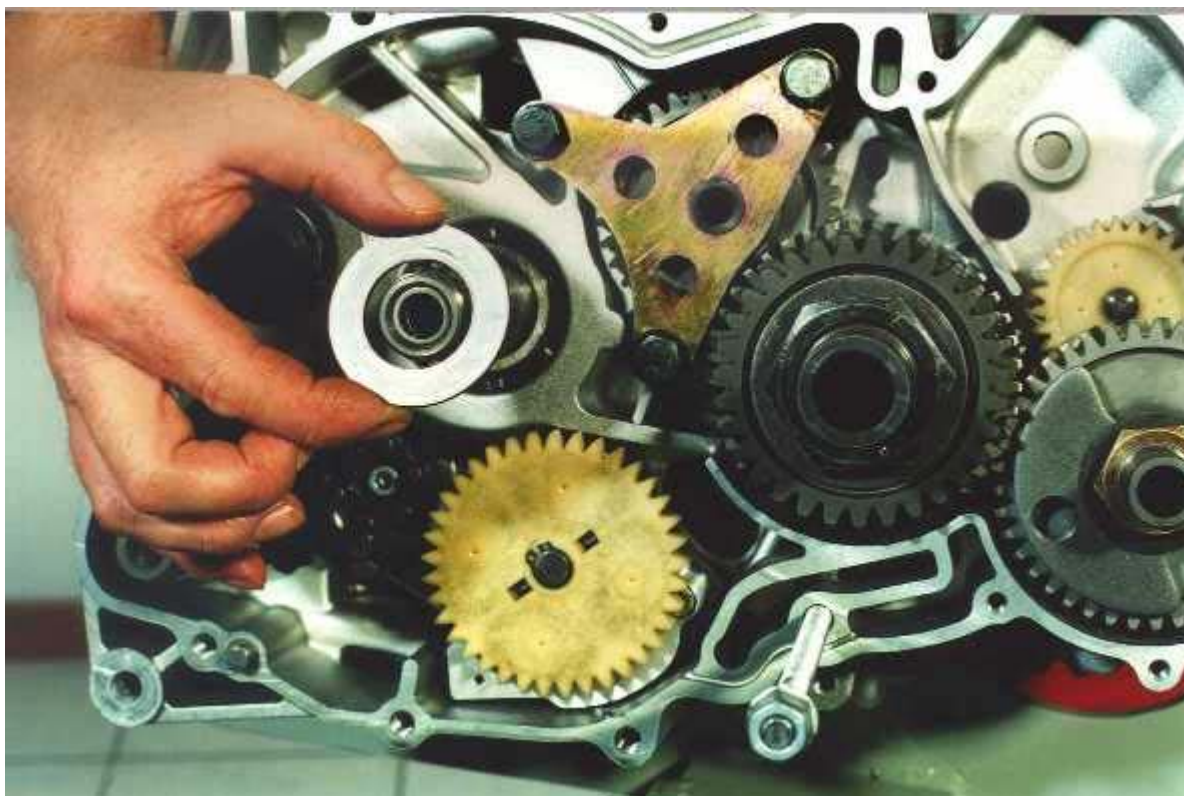
1. CAMSHAFT
2. CHAIN TENSIONER
3. UPPER BALANCING SHAFT
4. HEAD/CYLINDER
5. OIL NOZZLE
6. LOWER BALANCING SHAFT
7. OIL TANK
8. OIL COOLER
9. OIL FILTER
10. ADJUSTER VALVE
11. CLUTCH SHAFT/GEARS/CLUTCH
12. CRANKSHAFT
13. OIL PRESSURE SWITCH
14. SUCTION PUMP
15. PRESSURE PUMP



**CAUTION:** Both the oil pump body and the oil pump housing in the crankcase are a differ



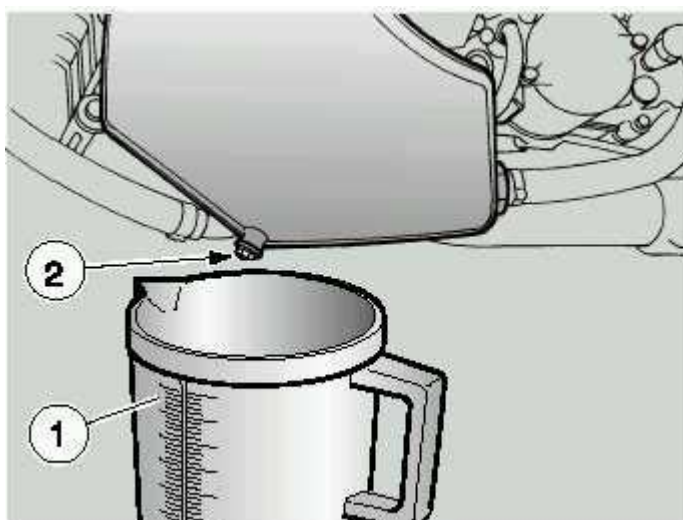
- Oil pump gear (white gear at the lower end) - operated by primary shaft



- Oil filter housing - screw to separate casings is inside

- Oil drain screw (oil reservoir)

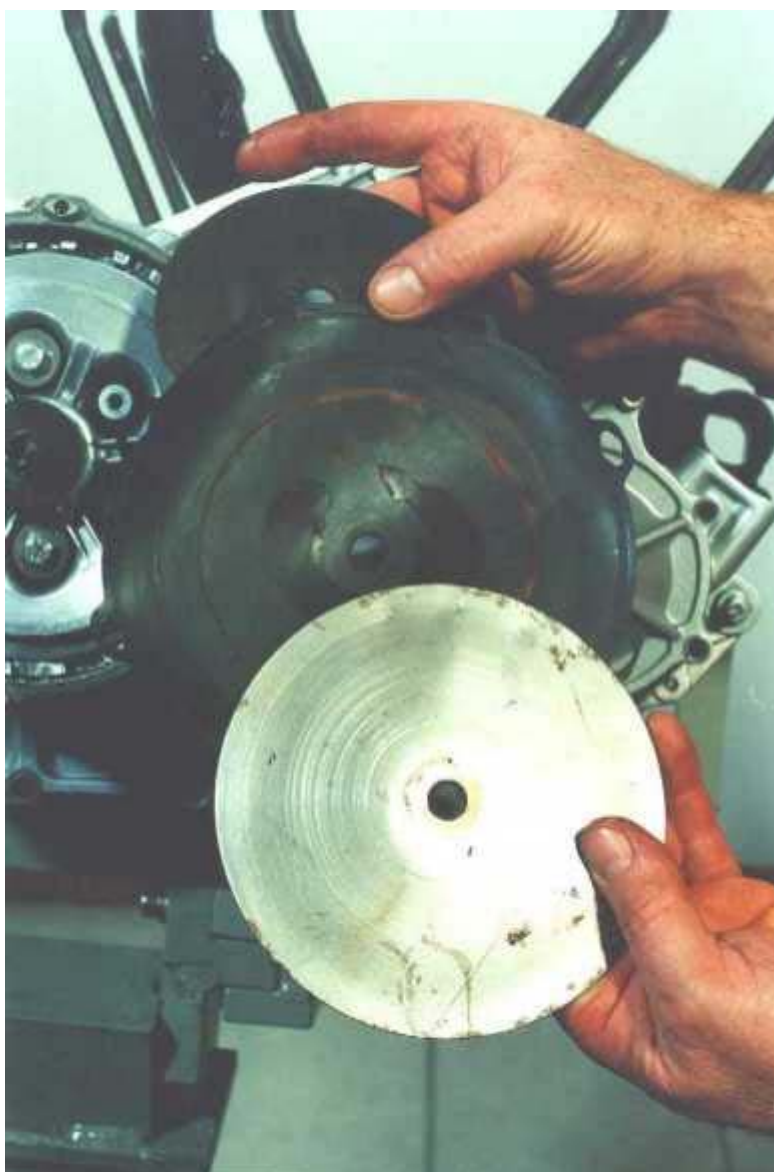
- Oil drain screw (oil reservoir) the SP version



## SERVO CLUTCH

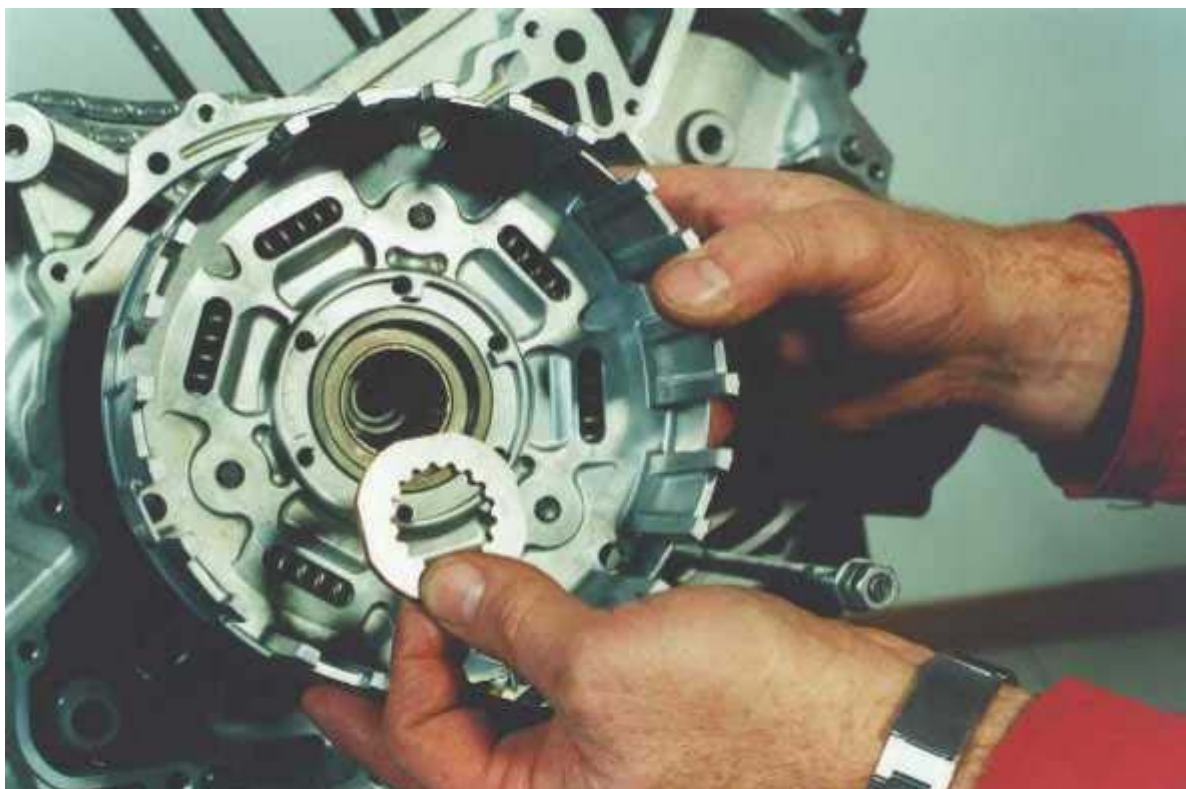
### CLUTCH / PPC (PNEUMATIC POWER CLUTCH)

- Wet multiplate clutch
- Hydraulic control
- PPC
- PPC components

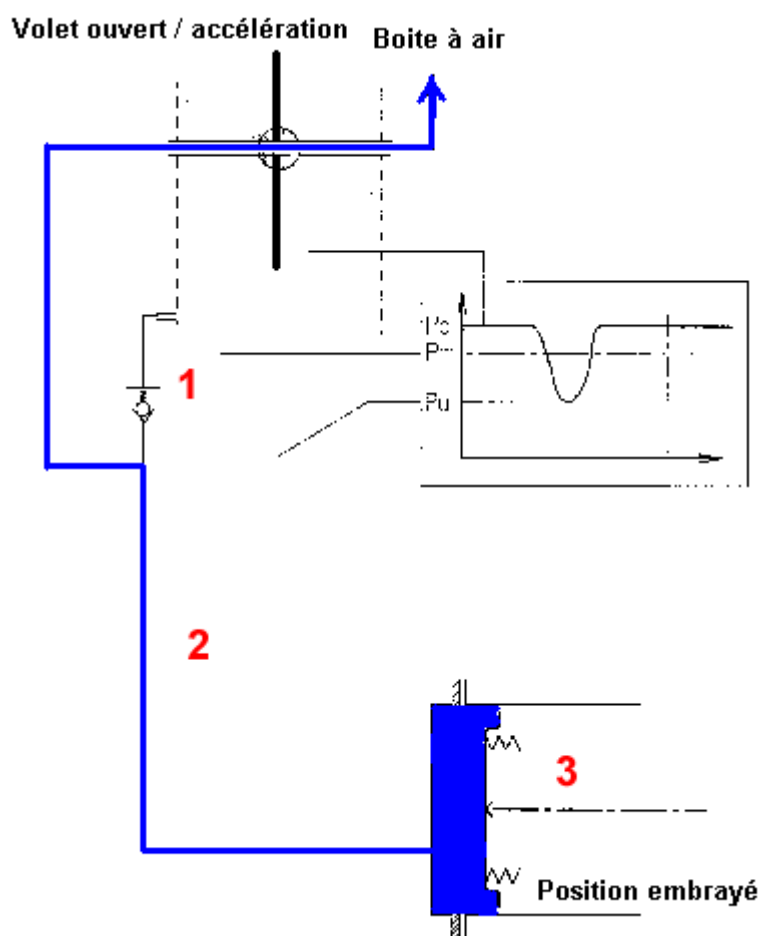


- Rubber cush drive

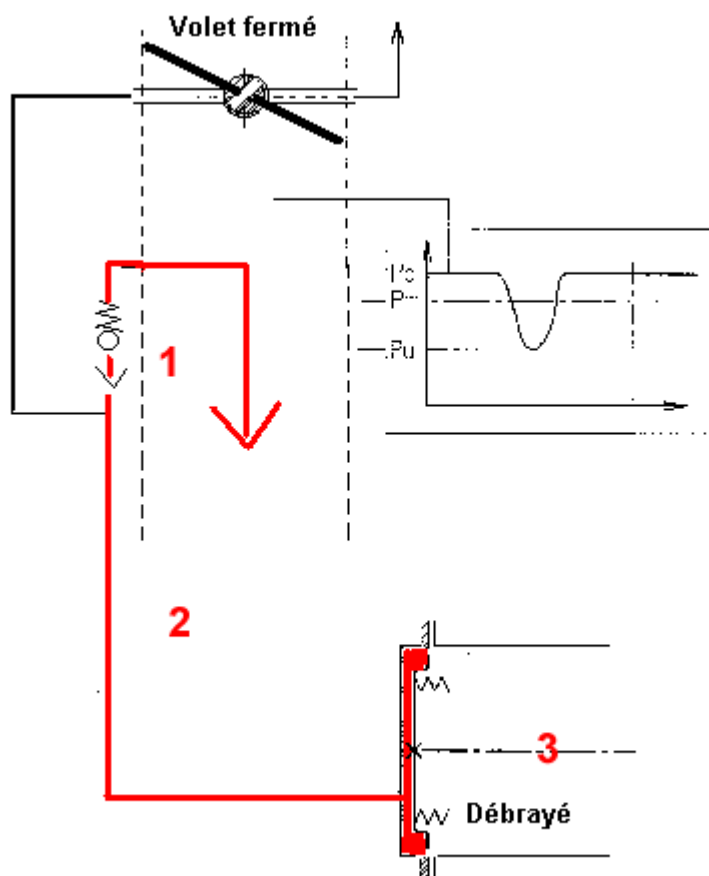




- PPC operation

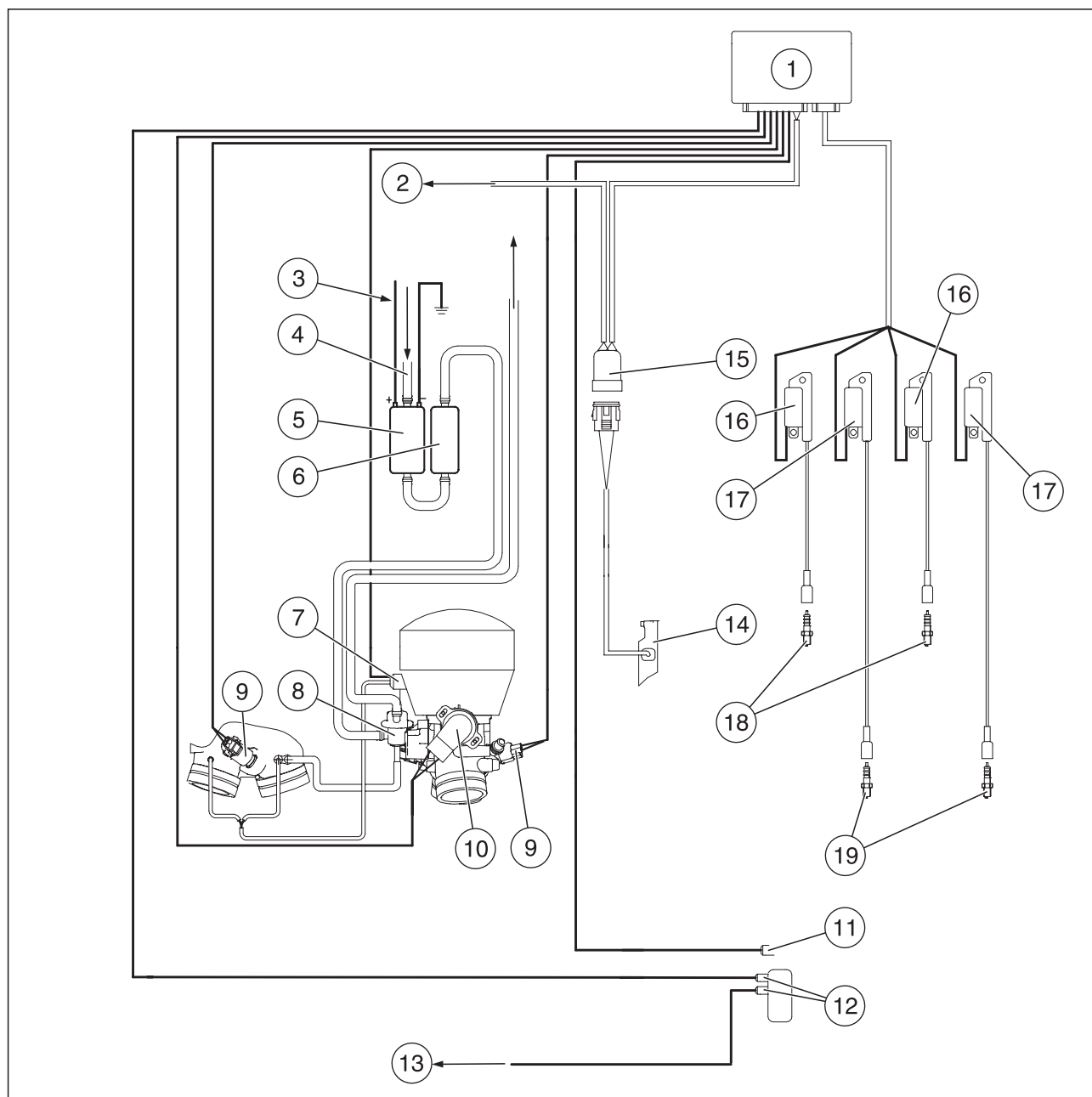


1. CHECK VALVE
2. INTAKE DUCT
3. CLUTCH



1. CHECK VALVE
2. INTAKE DUCT
3. CLUTCH

## INJECTION SYSTEM DIAGRAM



### Key

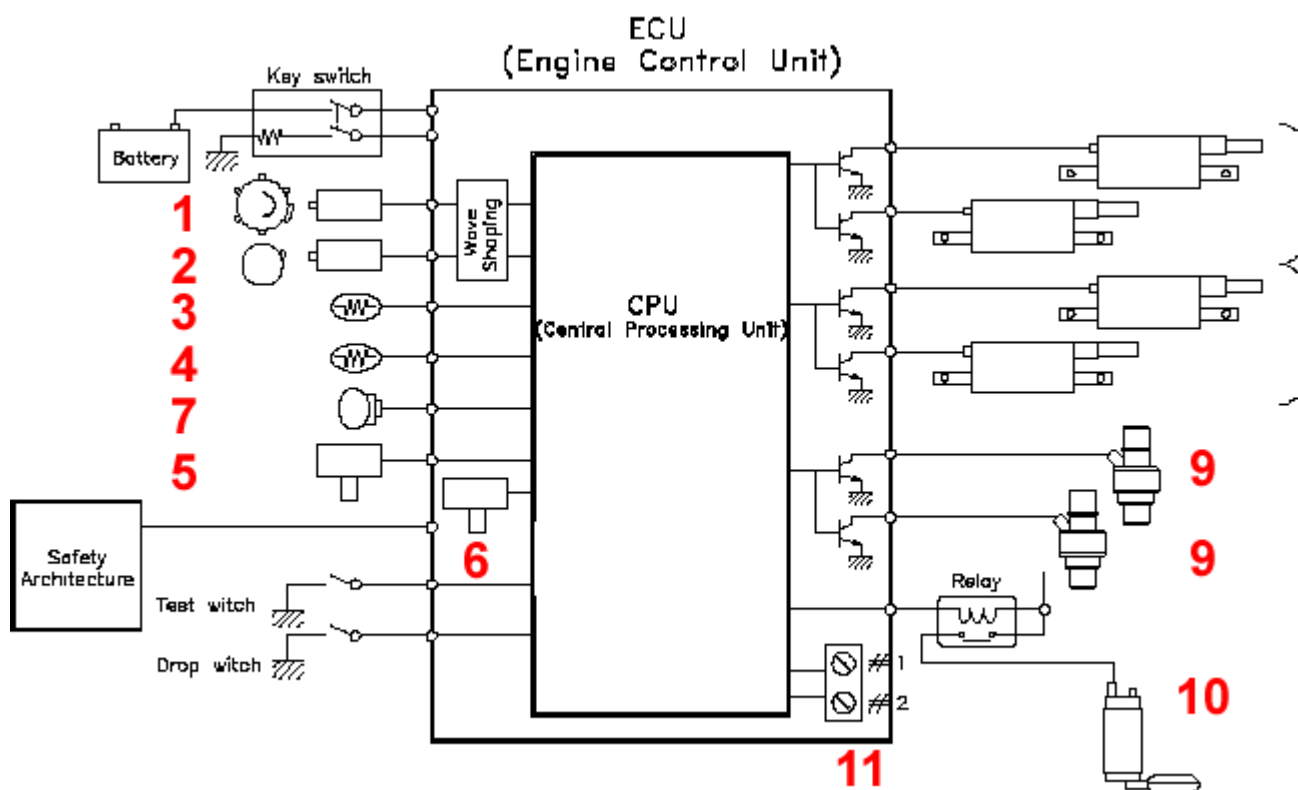
- |                                  |                                                           |
|----------------------------------|-----------------------------------------------------------|
| 1) Electronic unit               | 12) Coolant temperature thermistors.                      |
| 2) To voltage regulator          | 13) To multifunction display, right-hand side             |
| 3) Supply voltage                | 14) Driving shaft position sensor and generator           |
| 4) Fuel suction from tank        | 15) Driving shaft position sensor and generator connector |
| 5) Fuel pump                     | 16) HV ignition coil cylinder "1" (front)                 |
| 6) Fuel filter                   | 17) HV ignition coil cylinder "2" (rear)                  |
| 7) Intake pressure sensor        | 18) Spark plug cylinder "1" (front)                       |
| 8) Fuel pressure regulator       | 19) Spark plug cylinder "2" (rear)                        |
| 9) Injectors                     |                                                           |
| 10) Throttle valve potentiometer |                                                           |
| 11) Camshaft position sensor     |                                                           |



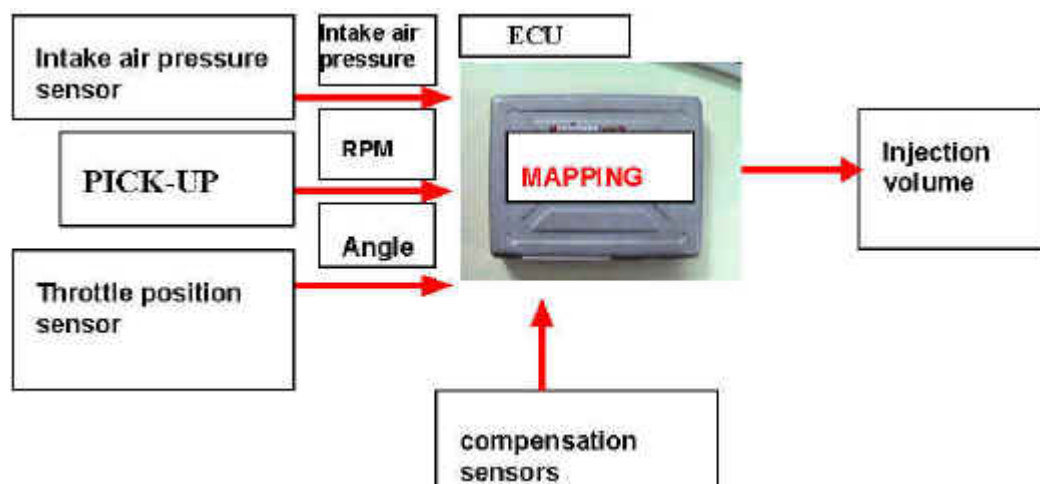
## "DENSO" ELECTRONIC FUEL INJECTION - TYPE : SEQUENTIAL / MULTI-PC

### SENSORS / ACTUATORS:

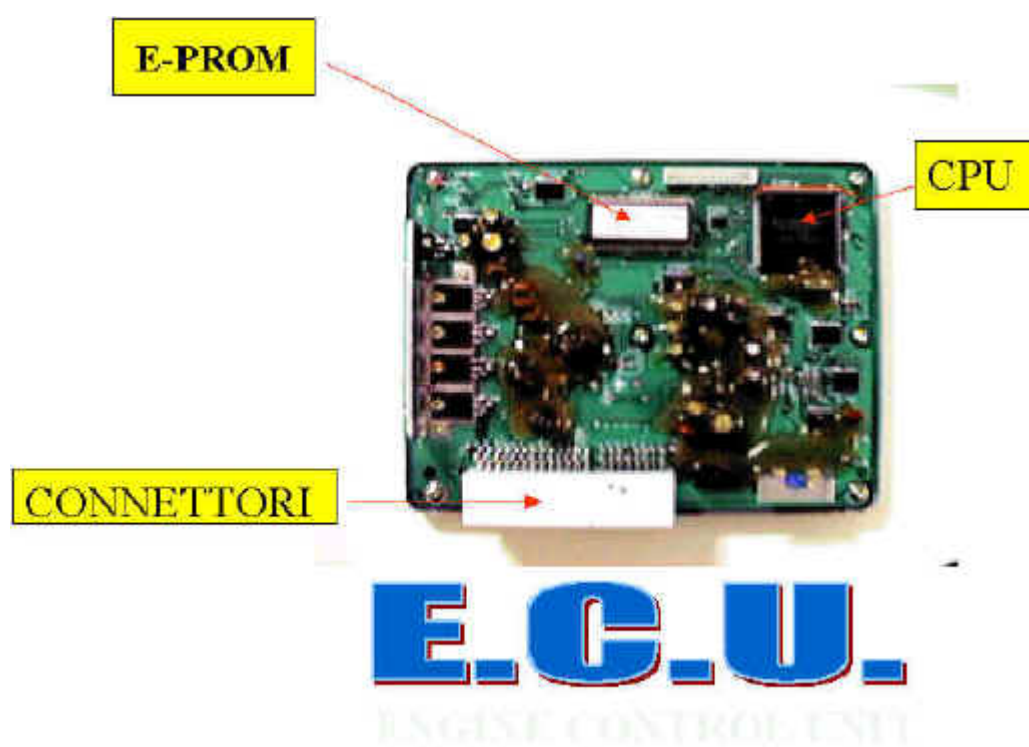
1. Crankshaft position sensor (pickup)
2. Camshaft position sensor
3. Coolant temperature sensor
4. Intake air temperature sensor
5. Intake air pressure sensor (vacuum sensor)
6. Atmospheric pressure sensor
7. Throttle position sensor (TPS)
8. 4 ignition coils
9. 2 DENSO injectors
10. Volumetric electric fuel pump
11. EARLY MODELS ONLY: CO adjusting screws



Fuel requirement calculation for fuel injection:



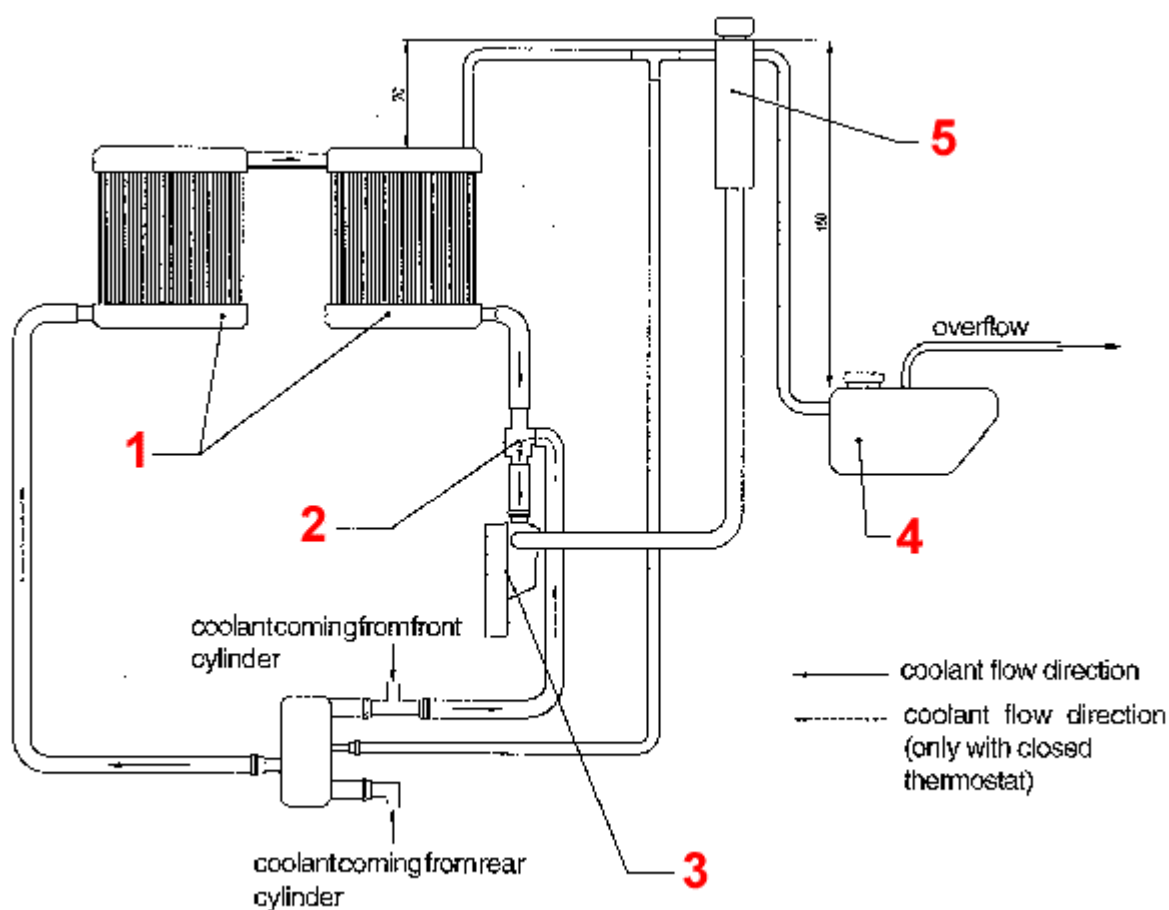
ECU COMPONENTS:



## SCHEMA IMPIANTO RAFFREDDAMENTO

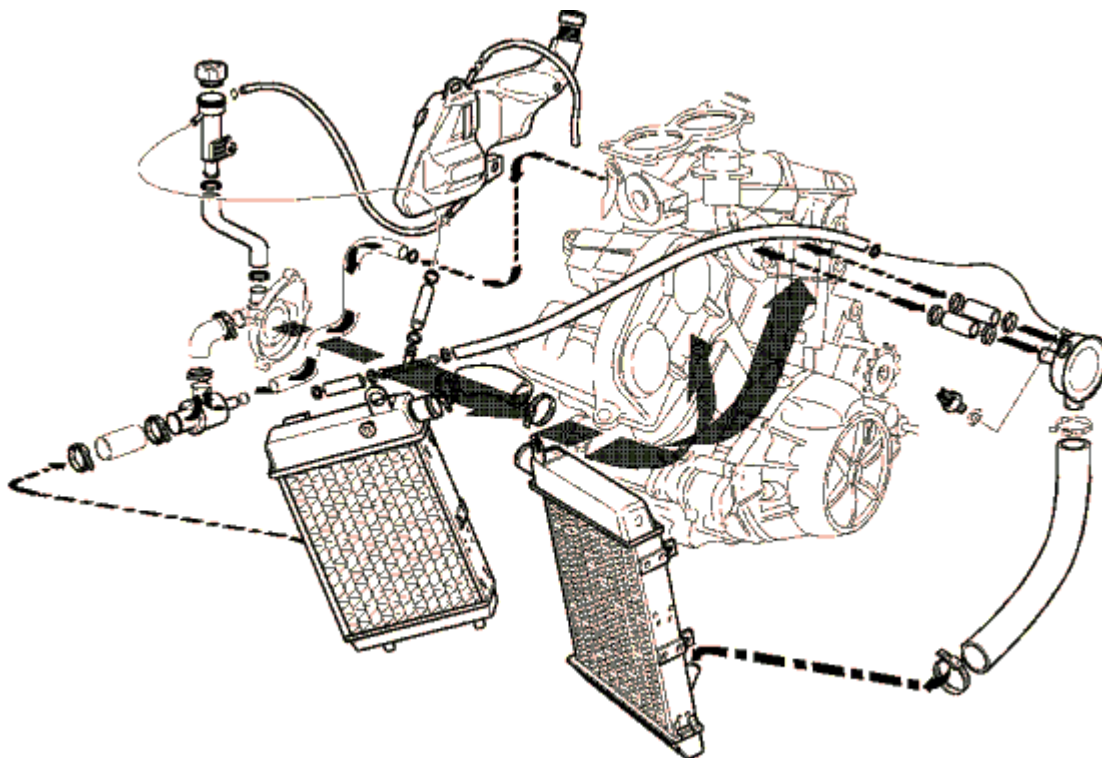
## COOLING SYSTEM

- Liquid cooling with 3-way circuit and double radiator
- Capacity 2.6 l.

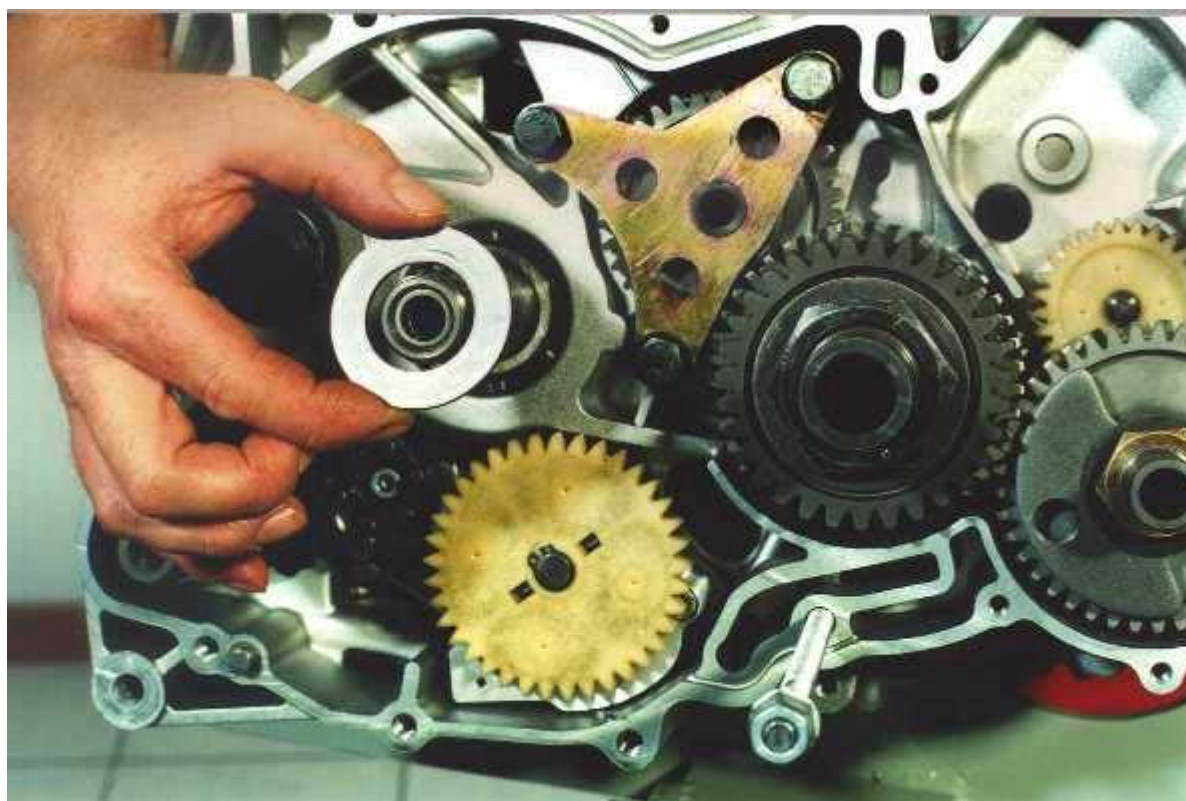


## Legenda:

1. Radiatore
2. Termostato
3. Pompa acqua
4. Serbatoio espansione
5. Bocchettone riempimento



- Coolant pump gear (small white gear on the right) - operated by primary countershaft



- Coolant pump - detail of coolant drain screw
- Detail of the two coolant pump gear guide washers

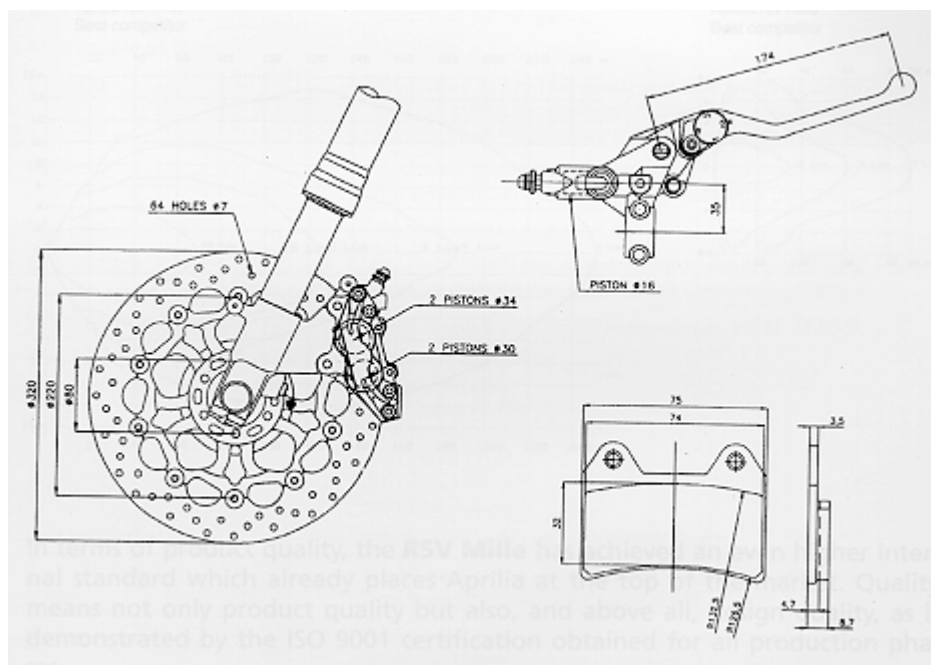


## SCHEMA IMPIANTO FRENANTE

### BRAKING SYSTEM (UP TO MY 2000)

#### FRONT BRAKE

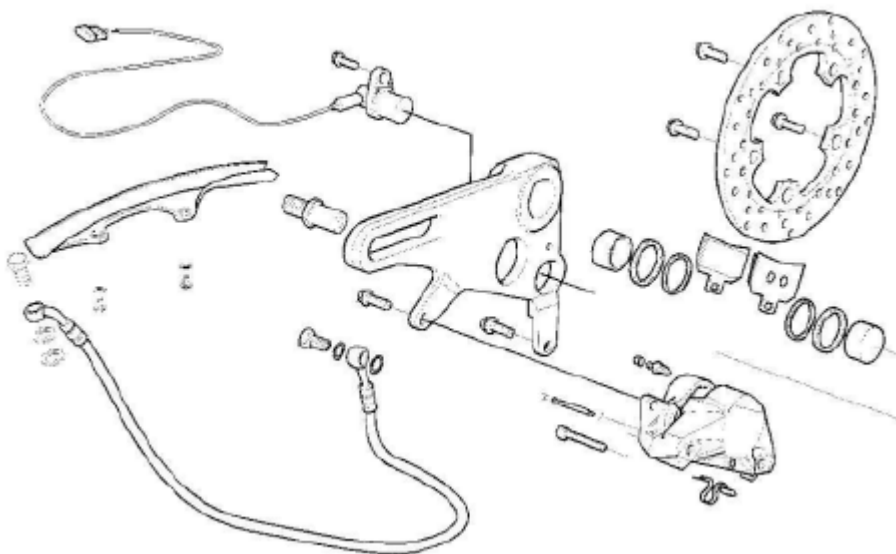
- Brembo twin disc
- Diameter 320 mm
- 4-piston callipers (34 mm and 30 mm)
- Brake master cylinder diameter 16 mm



#### REAR BRAKE

- Single disc
- Diameter 220 mm
- 2-piston calliper (32 mm)
- Brake master cylinder diameter 11 mm





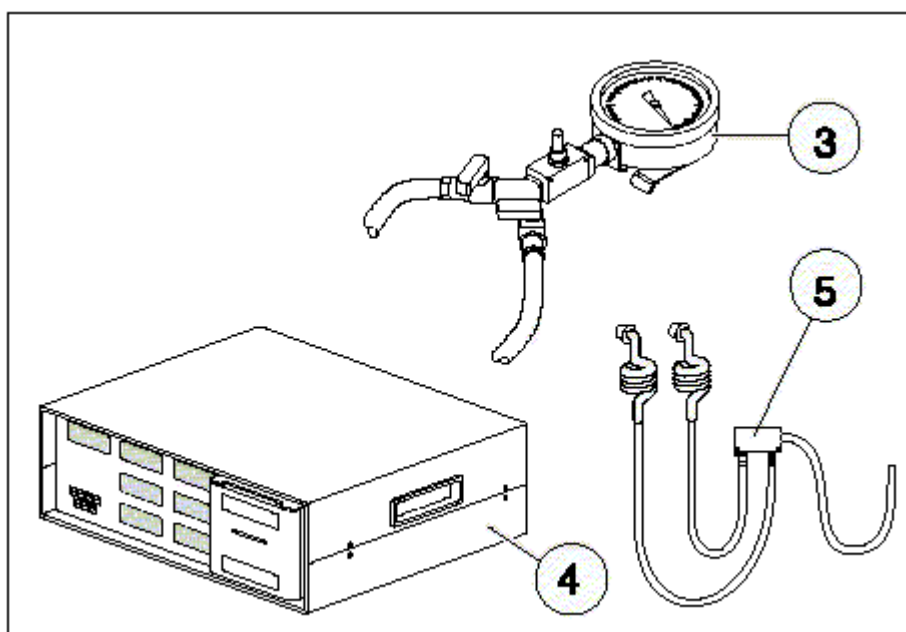
**WARNING:** Do not install sintered brake pads to the rear brake callipers of the RED SERIES.

## REGOLAZIONE CO E BILANCIAMENTO

### CO SETTING AND CYLINDER SYNCHRONIZATION

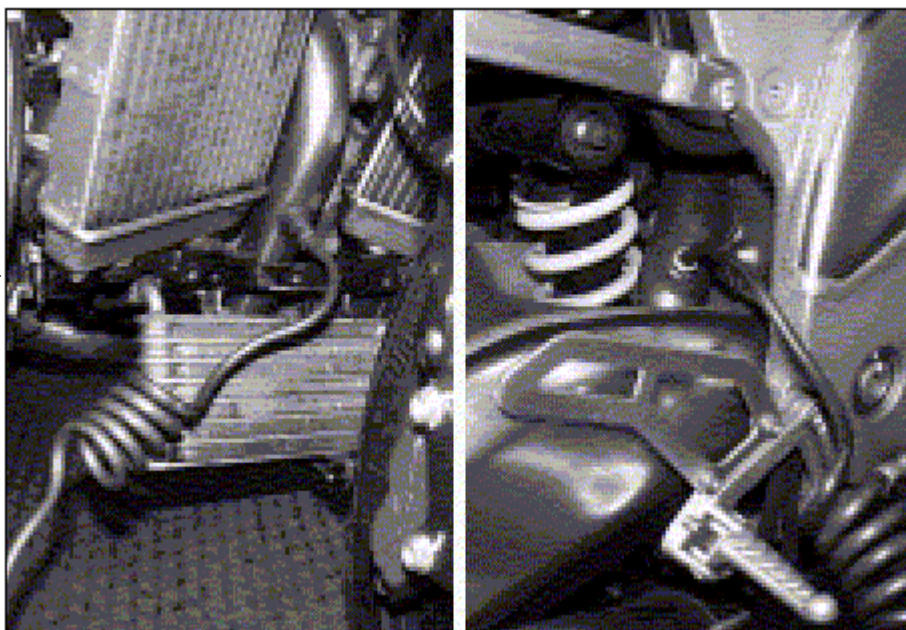
#### REQUIRED EQUIPMENT:

- VACUUM METER
- EXHAUST GAS ANALYZER
- EXHAUST GAS ANALYZER CONNECTION TUBES



#### PROCEDURE:

- Raise the tank
- Connect the tubes of the exhaust gas analyser (pic 1)
- Connect the vacuum meter to the throttle body nozzles (there is one dedicated nozzle, set the other one free after removing the PPC tube) (pic 2)
- Start the engine: coolant temperature 80-100°C
- Idle speed: 1250 +- 100 rpm
- Check the CO rates: 0.8-1.3 % at 1250 +- 100 rpm (same rate for both cylinders)
- If the CO rate measured in one or both cylinders is other than specified, set correct value using one or both bypass



Pic 01

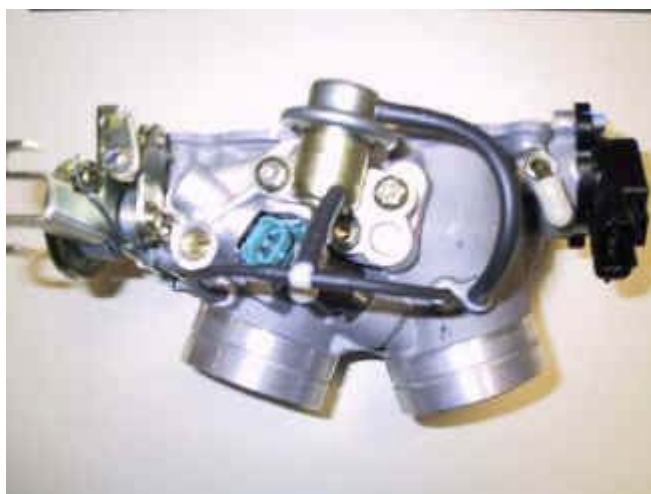


screws on the throttle body (pic 3).

- Check idle speed and repeat process, if needed.
- Check depression in both cylinders: correct range is 300 +- 30 mbar at 1250 +- 100 rpm



Pic 02



Pic 03

## ELECTRONIC INTEGRATED DIAGNOSTIC SCAN TOOL

# AXONE 2000

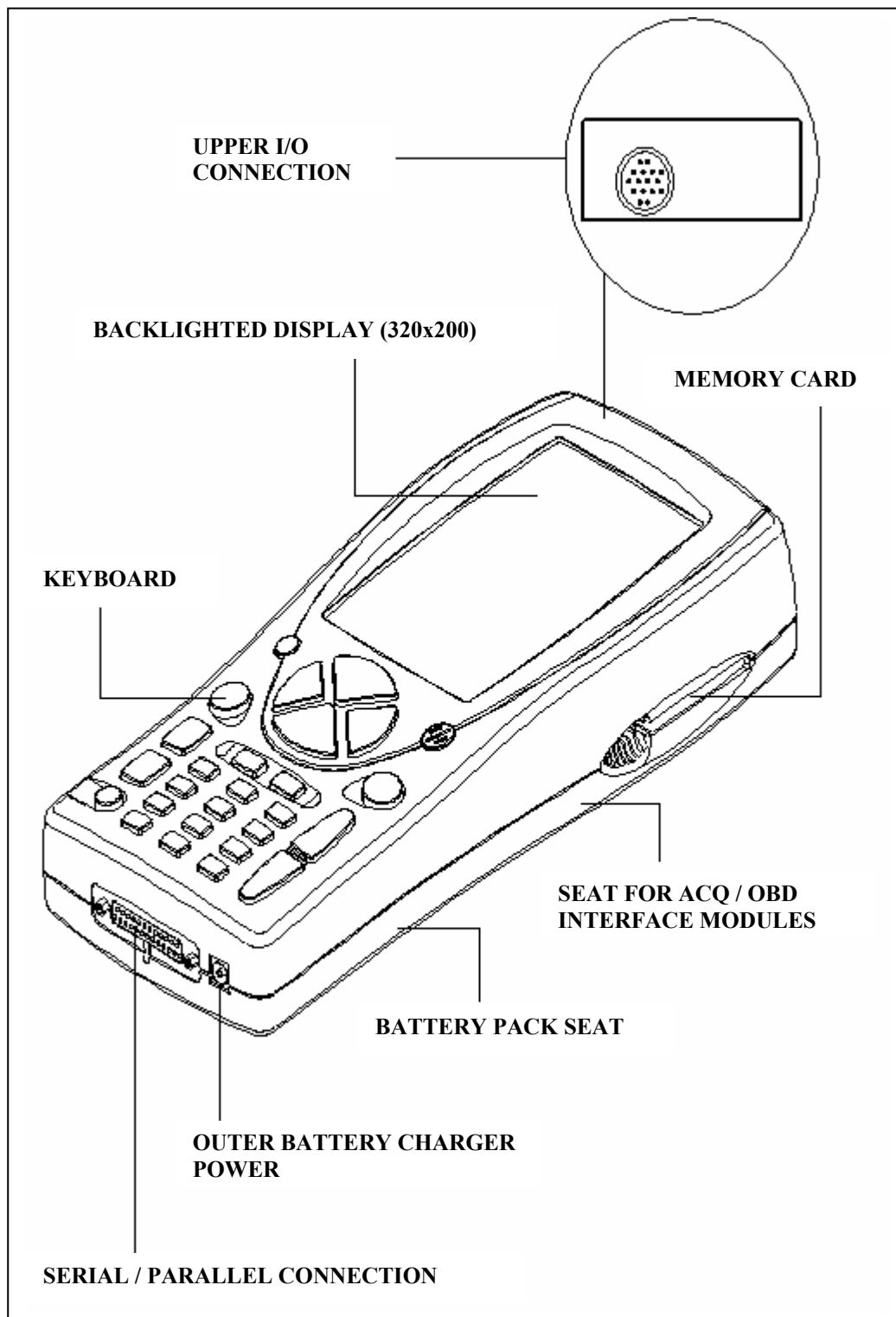
## SHORT USER'S GUIDE

Chapter 1	<b>Description</b> of AXONE 2000 scan tool	Page 2
Chapter 2	<b>How to activate</b> AXONE 2000 Scan tool	Page 8
Chapter 3	<b>SELF-DIAGNOSIS</b>	Page 13
Chapter 4	<b>DIAGNOSIS</b>	Page 20
Chapter 5	<b>TESTING</b>	Page 21
Chapter 6	<b>UPDATING</b>	Page 22

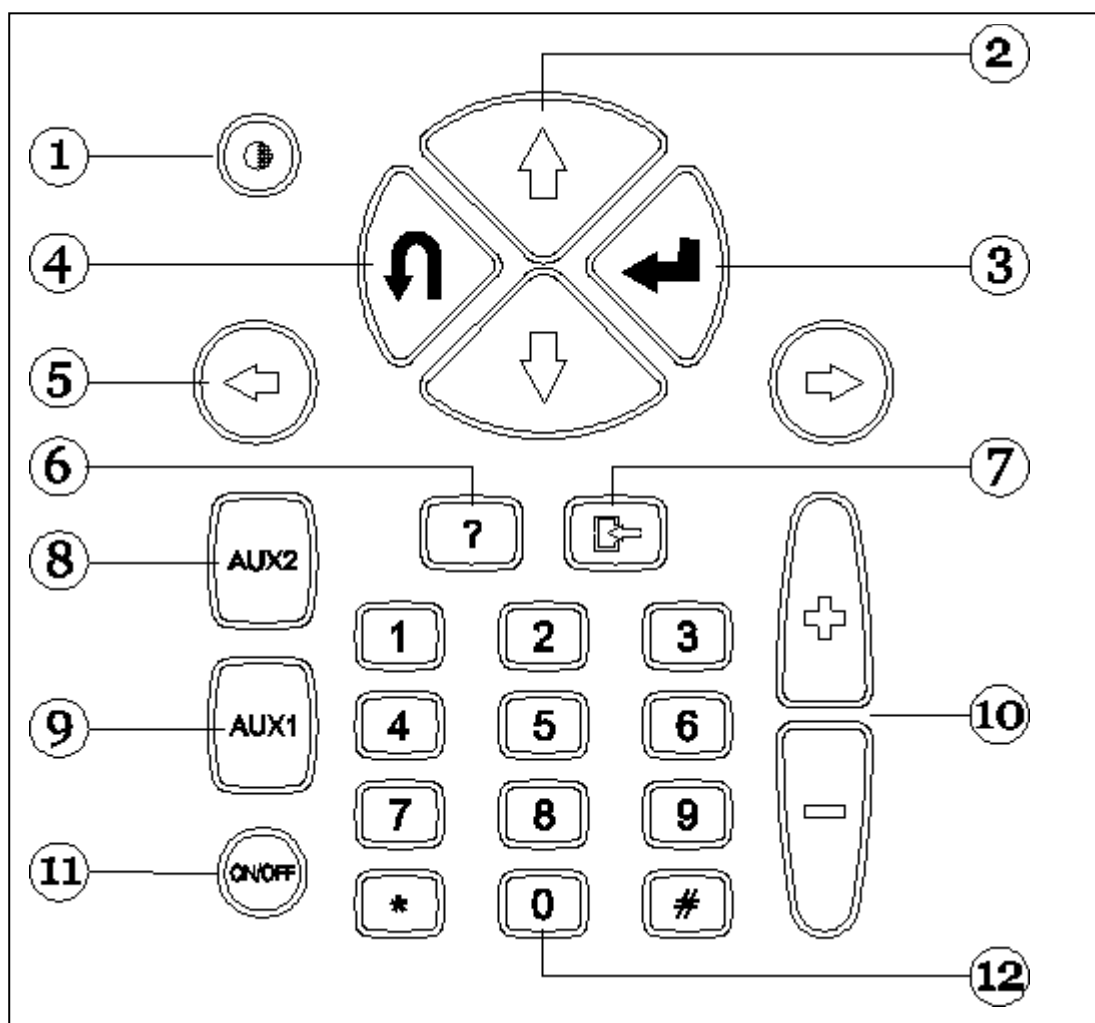


## DESCRIPTION of AXONE 2000 Scan Tool

1

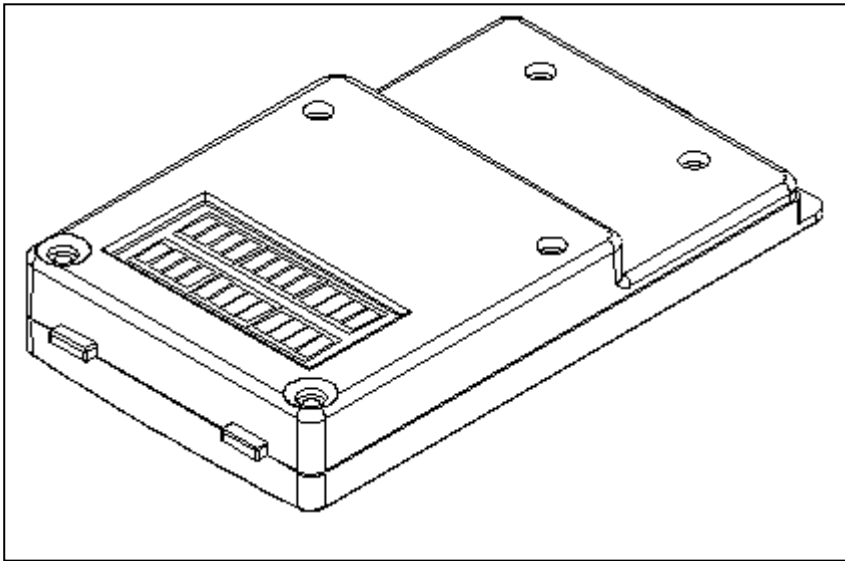


## KEYBOARD:



1. Contrast control (in combination with up/down direction keys)
2. Up/down direction keys (shift cursor up/down)
3. ENTER key (confirms entry)
4. CANCEL/EXIT key (returns to previously enabled function)
5. Left/right direction keys (shift cursor to the left/right)
6. HELP key (displays online guide, if available)
7. DELETE key (deletes single stored error)
8. AUX 2 key (auxiliary functions)
9. AUX 1 key (auxiliary functions, error alarm silencing)
10. SCROLL UP/DOWN keys (scroll up/down displayed pages)
11. ON/OFF key
12. Numeric keyboard

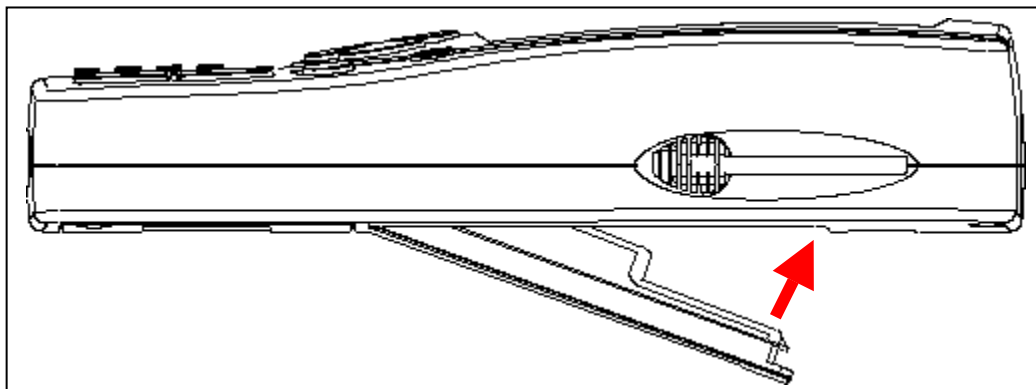
## INTERFACE MODULES



### AVAILABLE MODULES:

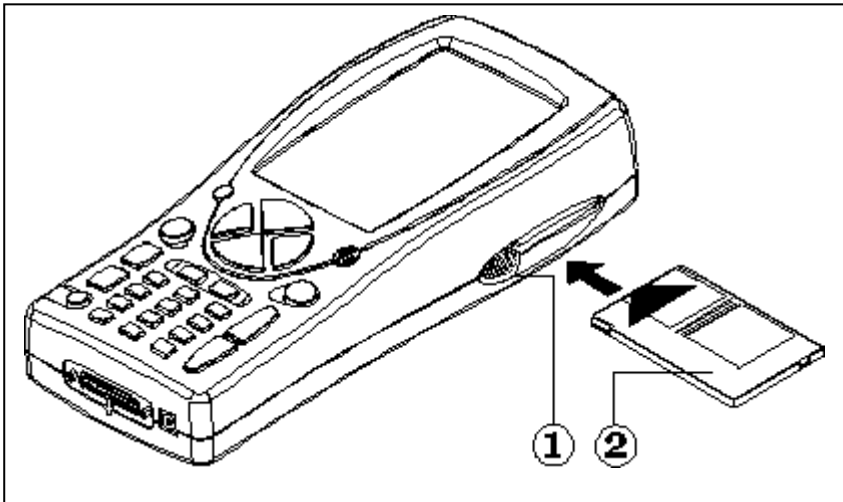
- OBD (On Board Diagnosis)** - self-diagnosis module
- ACQ (Acquisition)** – classic / multimeter / oscilloscope diagnosis module
- MDM 56 (MODEM)** - AXONE updating system via the Internet

AXONE2000 communication system is controlled through the upper connector.  
Module installation (when AXONE 2000 Scan Tool is OFF)



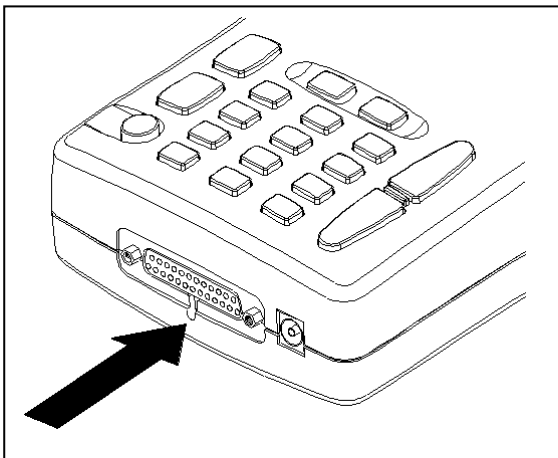
## MEMORY CARD

16 MB FLASH-ROM card for software and stored data  
(to be installed when AXONE2000 Scan Tool is OFF)

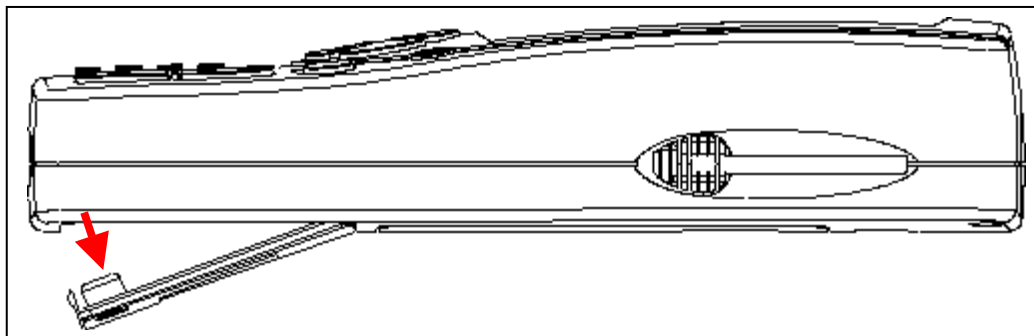


## POWER SUPPLY

Input voltage: 12-15 V D.C.  
Absorbed power: 10 W  
Inner Ni-MH battery pack: (operating range: 2 hours)



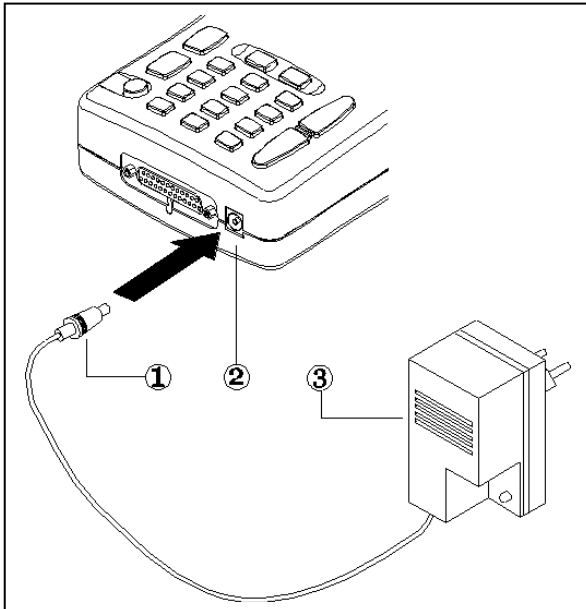
**Opening the battery cover:**  
insert a screwdriver bit where  
shown and release the tab. The  
battery cover will open.



## RECHARGING THE BATTERY PACK:

Connect the battery charger (transformer) to a 220V outlet.

**Never use AXONE2000 Scan Tool when under recharge. Battery charger must only be used to recharge the battery.**

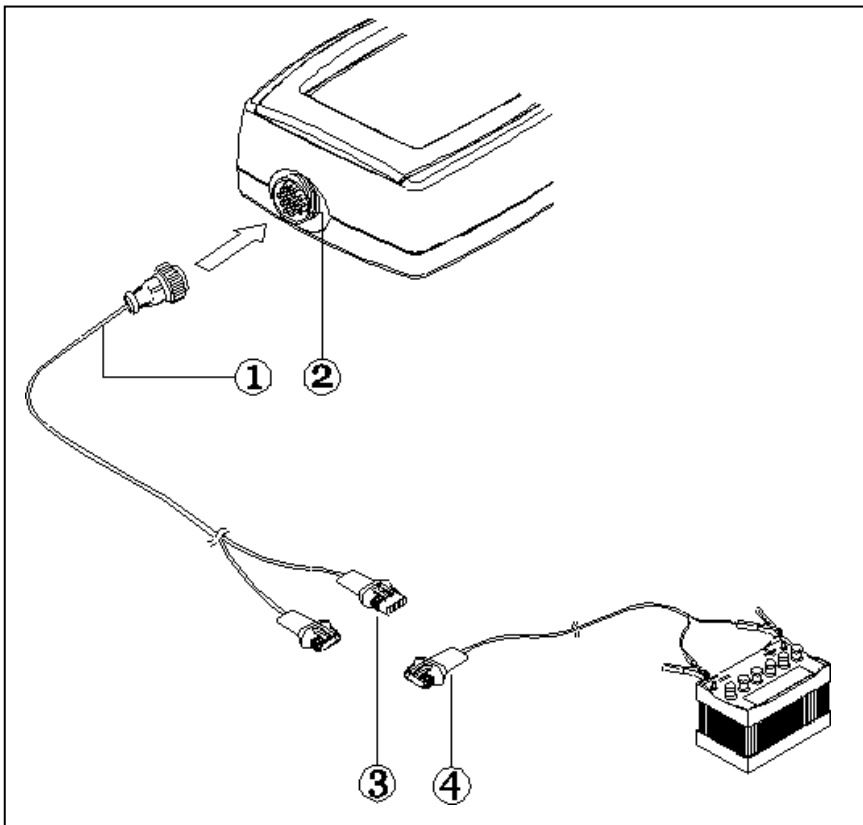


### NOTE ON BATTERY PACK RECHARGE

1. **The first two charges of the battery pack must last at least 12 hours.**
2. The battery charger will turn automatically off after a complete charging cycle.
3. AXONE2000 Scan Tool must be recharged only at room temperature (20°C)

## AXONE2000 SCAN TOOL POWER SUPPLY VIA VEHICLE BATTERY

**NOTE:** CONNECT AXONE2000 SCAN TOOL TO COMMUNICATE WITH OBD MODULE: THE SCAN TOOL CAN COMMUNICATE WITH THE MODULE ONLY IF CONNECTED TO THE MODULE GROUND REFERENCE, I.E. BATTERY NEGATIVE POLE



1. Connection cable
2. AXONE2000 Scan Tool connector
3. Connector
4. Connection cable to battery

**NOTE:** when AXONE2000 Scan Tool is power supplied via vehicle battery, the scan tool battery pack is also charged.

## How to activate AXONE 2000 Scan tool

1. Install the battery pack as described above.
2. Power on AXONE2000 Scan tool. If battery charge is low, recharge for at least 12 hours (see procedure described above).
3. The activation program is automatically started.
4. Registration Code is prompted by the activation program.
5. The Registration Code can be applied for as follows:
  - a) call +39 0422 707458 8.00-12.00 a.m. and 2.00-6.00 p.m. applying for Axone Aprilia activation Registration Code to Mr. Giovanni Pivetta.  
Please mention Axone Scan Tool serial number on tool back and all identification data;
  - b) Fax the next page to +39 0422 841412: a fax reply will be received within 24 hours (Saturdays / Sundays and Italian holidays excluded) indicating Axone Scan Tool Registration Code;
  - c) send an e-mail to [gpivetta@texa.it](mailto:gpivetta@texa.it) indicating the following information: serial number, software version (on display left top), language version, name and last name of scan tool owner, company name, address, telephone number, fax number or e-mail address.  
An e-mail will be received within 24 hours (Saturdays / Sundays and Italian holidays excluded) indicating Axone Scan Tool Registration Code.
6. Select Registration Code digits through the direction keys and enter the Registration Code.
7. Press ENTER after each digit to confirm.
8. Once AXONE Registration Code has been entered, the scan tool is automatically activated.



Software Version: 1.0

Enter Registration Code...



to change (0,1,...,9,a,b,...,f)



to cancel last digit



to confirm



to exit



APRILIA AXONE 2000 SCAN TOOL ACTIVATION REFERENCE DATA

<b>SERIAL NUMBER</b> (on the back side of the scan tool: on the black label)	<b>s/n T.....</b>
<b>SOFTWARE VERSION</b> (Instrument ON. The number displayed at the left top)	
<b>LANGUAGE VERSION</b>	
<b>FIRST AND LAST NAME of the OWNER</b>	
<b>COMPANY NAME</b>	
<b>ADDRESS</b>	
<b>PHONE NUMBER</b>	
<b>FAX NUMBER or E-MAIL address</b>	

Send by fax to **+39 0422 707458** or  
e-mail as attachment to **gpivetta@texa.it**

## OBD module updating procedure (FIRMWARE)

OBD module (FIRMWARE) of AXONE2000 scan tool should be updated from memory card when using it for the first time.

- ❑ Power AXONE Scan Tool ON and select the icon "SERVICE" through the direction keys.
- ❑ Press ENTER.



- ❑ Select the option "Update firmware" through the direction keys.
- ❑ Press ENTER

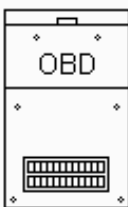



Press ENTER to confirm firmware updating.


(Press BACK for no updating).

Aggiornamento firmware OBD

Vuoi eseguire la  
procedura di aggiornamento  
firmware del modulo OBD?



 NO

 SI

Updating will last approx. 4 minutes:  
press ENTER to start and wait.

Aggiornamento firmware OBD

\*\*\*\*\* ATTENZIONE \*\*\*\*\*

Questa procedura durerà  
circa 4 minuti.  
Premere INVIO e attendere.



 CONTINUA

**Do not hit any keys** when updating.



OK (thumb up): OBD module successfully updated. Press ENTER to quit.





## SELF-DIAGNOSIS

3



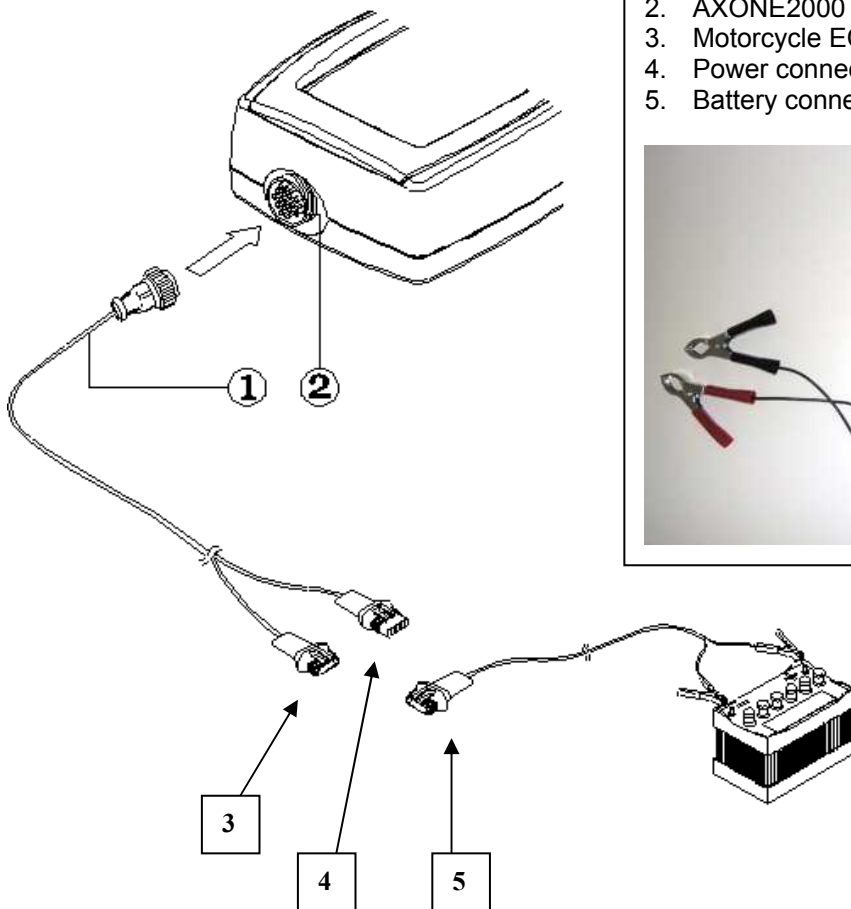
**The black triangle highlights the selected function: position the cursor to SELF-DIAGNOSIS and press ENTER. OBD MODULE IS NEEDED.** Power AXONE2000 Scan Tool off and install the OBD module.

**THE ECU CONNECTION CABLE IS NEEDED. THE BATTERY CONNECTION CABLE MUST BE ABSOLUTELY CONNECTED TO THE VEHICLE BATTERY AND NEVER TO AN OUTER BATTERY.**

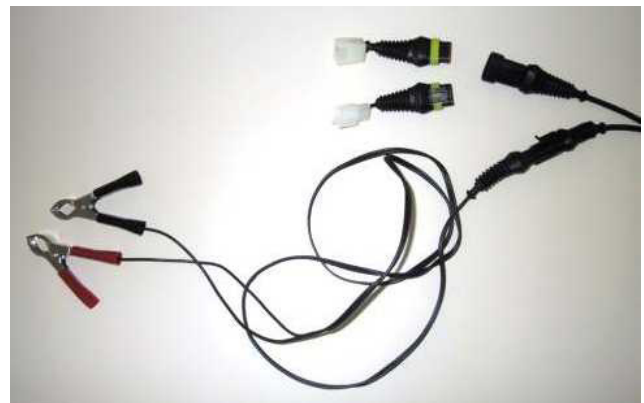
The self-diagnosis system reads all information by communicating directly with the vehicle ECU.

It is possible to:

- read operating parameters of all devices connected to the control unit
- automatically acquire diagnostic trouble codes, if any
- modify some engine control parameters.



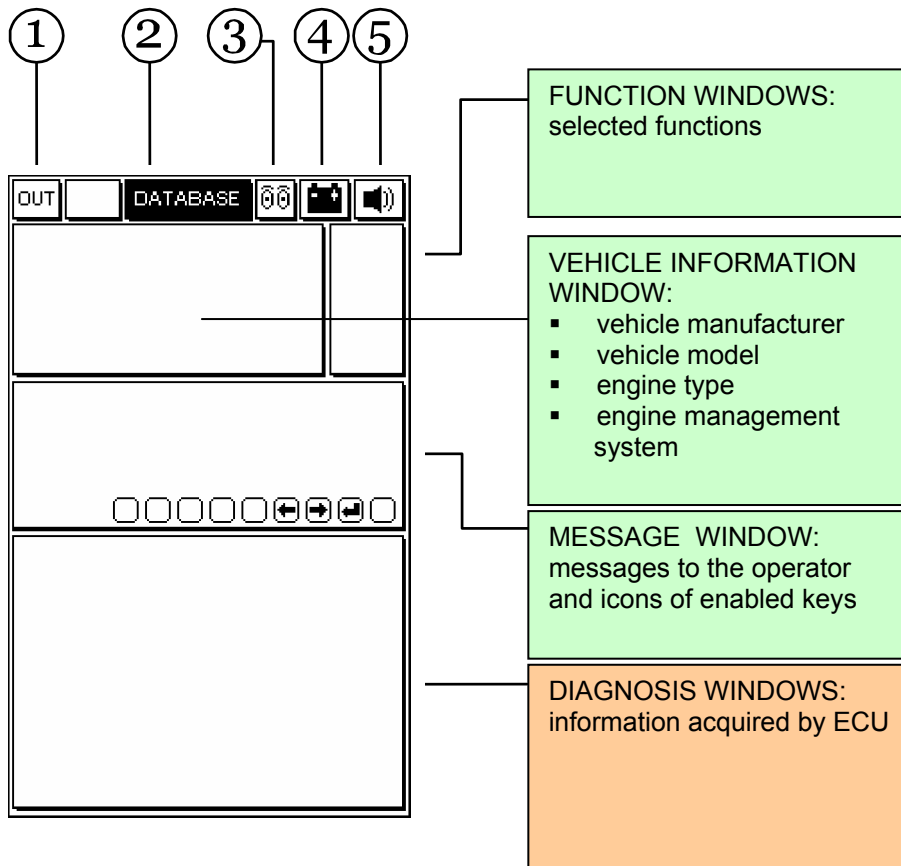
1. ECU connection cable
2. AXONE2000 connector
3. Motorcycle ECU connector
4. Power connector
5. Battery connection cable



**ADAPTER**  
To be used with ETV Capo Nord and RST Futura

## GENERAL SCREEN FEATURES

Screen profile



1. Exit Key: return to main menu
2. DATABASE menu: vehicle selection
3. Animated Icon: communication status between AXONE2000 Scan Tool and vehicle ECU. When communicating, the icon is a flashing bulb.
4. Battery Pack Icon: slow flashing: battery pack nearly flat – fast flashing: battery pack is flat and AXONE2000 Scan Tool will automatically turn off after 20 seconds.
5. Beep Icon: enable/disable Scan Tool beeper

**The following are VIDEO PAGES for SELECTING the CONNECTION to the vehicle; these pages are stored in Axone Scan Tool and not in the control module.**

SELECT VEHICLE  
MAKE

Press ENTER

SELECT MODEL  
Select one of the available models through  
up/down direction keys.  
Press ENTER

SELECT ENGINE

Press ENTER

SELECT OPERATION:

1. INJECTION = **SELF-DIAGNOSIS** of the **injection system**
2. REPROGRAM = **remap ECU with mappings which can be stored in the memory card**

Press ENTER

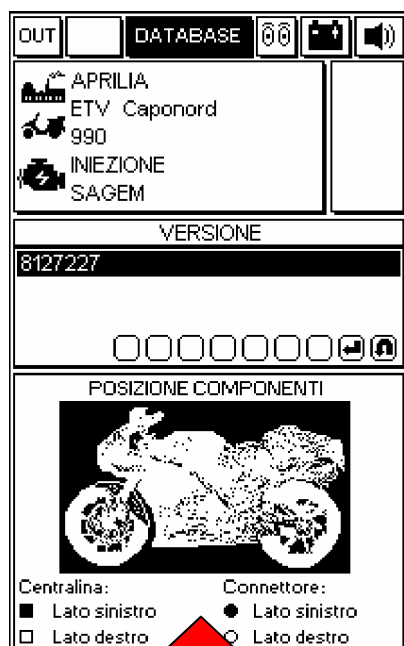
FIRST 5 DIGITS OF THE  
FRAME NUMBER

Press ENTER

INJECTION SYSTEM  
MANUFACTURER

Press ENTER





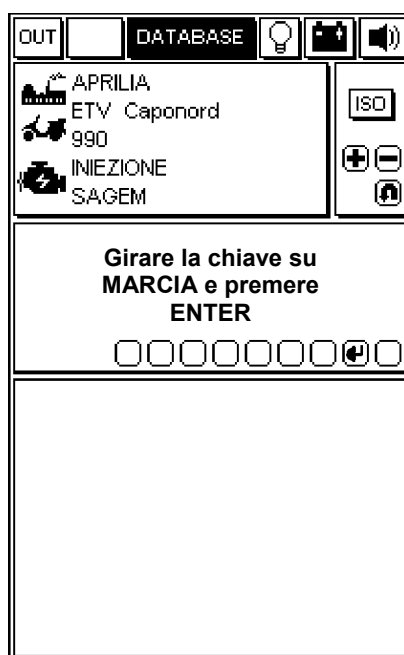
ECU AND DIAGNOSIS  
CONNECTION POSITION



TYPE OF CONNECTOR TO  
CONNECT AXONE2000  
SCAN TOOL TO ECU



CONNECT AXONE2000  
SCAN TOOL TO VEHICLE  
BATTERY



Active communication  
between AXONE2000 Scan  
Tool and ECU is signaled by a  
flashing bulb icon.

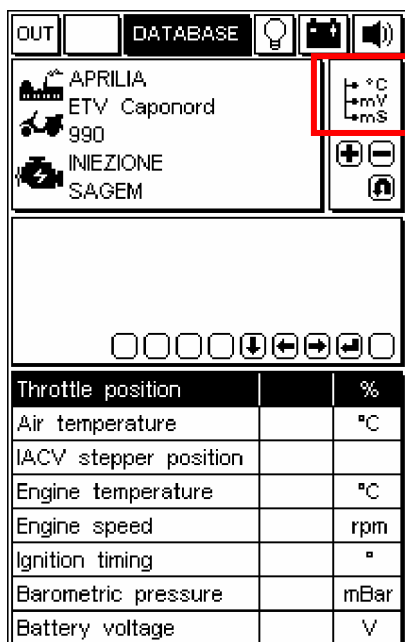
If a trouble code is detected in  
the ECU or a trouble code is  
stored in ECU, AXONE2000  
Scan Tool will beep.  
Please refer to [Trouble Code  
Page](#) in case of troubles.

The first page shows **ECU  
IDENTIFICATION DATA**  
If communication fails the  
message:  
**"COMMUNICATION  
INTERRUPTED. START  
AGAIN?"** will show.

## OPERATING PAGES (connection with the control unit is ensured if the bulb symbol is flashing)

**PRESS “+” AND “-” TO SCROLL PAGES UP/DOWN**

PAGE SUBJECT IS SYMBOLIZED BY THE ICON IN FUNCTION WINDOWS AT TOP RIGHT.

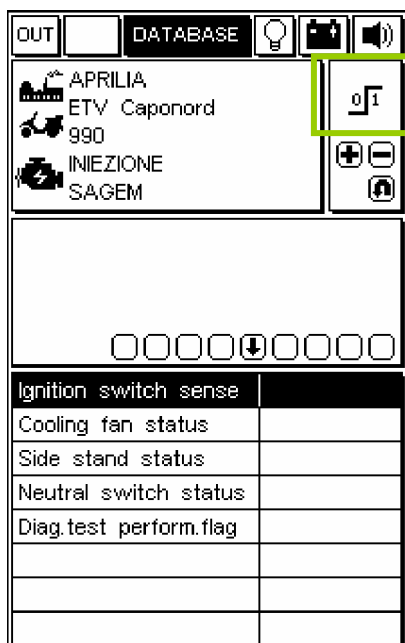


### ENGINE PARAMETERS READING

To read a parameter:



1. select the required parameter through the UP/DOWN direction keys
2. Press ENTER to confirm

Only eight parameters can be displayed on each video page.  
To replace a displayed parameter with another one, select the required parameter through the RIGHT/LEFT direction keys and then press ENTER to confirm.



### DEVICES STATUS

The status of some devices connected to ECU is shown.  
Status may be expressed with certain values.

OUT	DATABASE	
 APRILIA	ETV Caponord	
 990	INIEZIONE	
 SAGEM		
<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>		
<b>Adaptive stepper position</b>		
Idle fuelling adjust.		
Off idle fuelling adjust.		
Closed throttle position		
Date last serviced		
Dealer last serviced 1-2		
Dealer last serviced 3-4		
Dealer last serviced 5-6		

### **MODIFY PARAMETERS**

To modify a parameter:

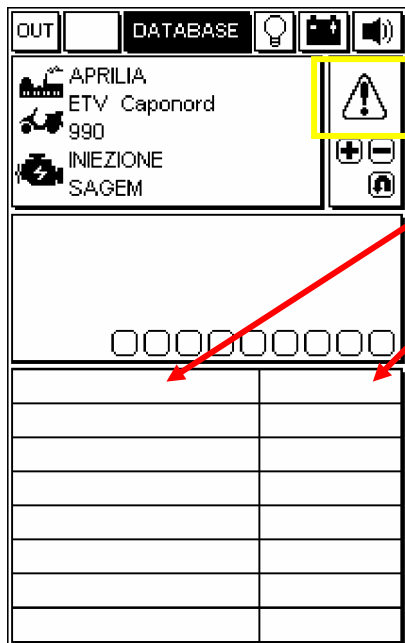
1. select the required parameter through the UP/DOWN direction keys
2. press ENTER to start the procedure

OUT	DATABASE	  
 APRILIA	ETV Caponord	
 990	INIEZIONE	 
 SAGEM		
<div> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </div>		
<b>Cancellazione errori</b>		

### **ENABLE DEVICES (IF FITTED)/DELETE DIAGNOSTIC TROUBLE CODES**

Press ENTER to confirm deletion of all stored diagnostic trouble codes.

Press ENTER to enable the selected actuator, if fitted.



### DIAGNOSTIC TROUBLE CODES (DTCs)

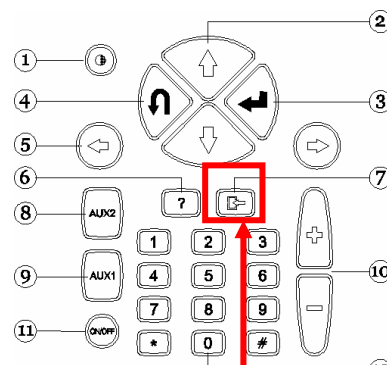
When the ECU detects a DTC, the window below will show.

DTC status is displayed on the right.

status	description	alarm
<b>ACT</b>	trouble code currently active	ON
<b>MEM</b>	stored trouble code not necessarily active	ON
<b>STO</b>	trouble code deleted from ECU memory. Trouble codes are no longer displayed after AXONE2000 is disconnected from ECU.	OFF

### **DELETION OF SINGLE DIAGNOSTIC TROUBLE CODES**

SELECT SINGLE DTCs THROUGH THE UP/DOWN DIRECTION AND PRESS "DELETE".



**DELETE KEY**

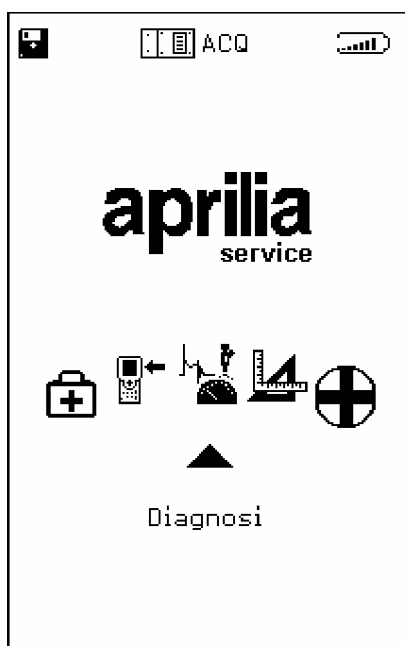
### **EXITING PROGRAM AND POWERING AXONE2000 SCAN TOOL OFF**

- ❑ TO RETURN TO THE MAIN MENU FROM ANY PAGE: PRESS EXIT UNTIL **CONFIRM EXIT** IS DISPLAYED
- ❑ PRESS ENTER
- ❑ PRESS EXIT UNTIL STARTING PAGE IS DISPLAYED (EMPTY PAGE)
- ❑ SELECT **OUT** ICON WITH DIRECTION KEYS (TOP LEFT)
- ❑ PRESS ENTER
- ❑ POWER OFF AXONE2000 SCAN TOOL.



## DIAGNOSIS

4



**ACQ MODULE NEEDED.** Power AXONE2000 Scan Tool off and install the ACQ module.

DIAGNOSIS allows classic diagnosis procedure, i.e. the physical analysis of signals from all devices connected to the control unit: sensors (input signals) and actuators (output signals).

The operator is guided online through the operations for all **Aprilia** models.

Available models:

HABANA 50  
LEONARDO 125  
RSVMille  
SCARABEO 50  
SR 50 DITECH  
SR 50 air cooled  
SR 50 L.C.



Select the icons at the top through the ← → direction keys.  
Press ENTER to enable the function.

### ICONS – LEGEND

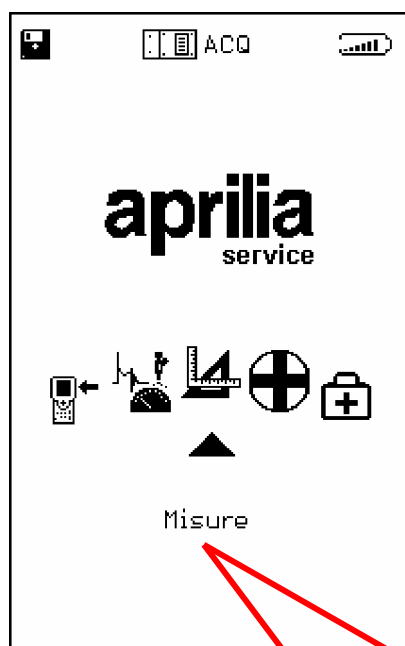
1. OUT = return to MAIN MENU
2. CHEQUERED FLAG= flashing during the test
3. OPTIONS = available TESTS
4. CLOCK = pointers move when the program is active
5. BATTERY = flashing if scan tool battery pack is nearly flat
6. BEEP = enable/disable scan tool beeper
7. OPTIONS WINDOW = available options
8. ECU ICON = selected injection system
9. MODEL ICON = selected vehicle model
10. FACTORY ICON = selected vehicle manufacturer

For further details please refer to Axone2000 user's guide on CD-ROM (included in Axone2000 Scan Tool package).

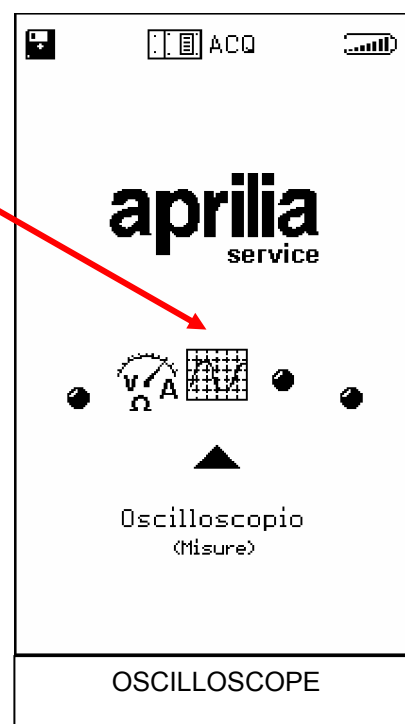


## TESTING

5



**INSTALL THE ACQ MODULE WHEN AXONE SCAN TOOL IS OFF.**  
< Select "Test" icon shown on the side



For further details please refer to Axone2000 user's guide on CD-ROM (included in Axone2000 Scan Tool package).

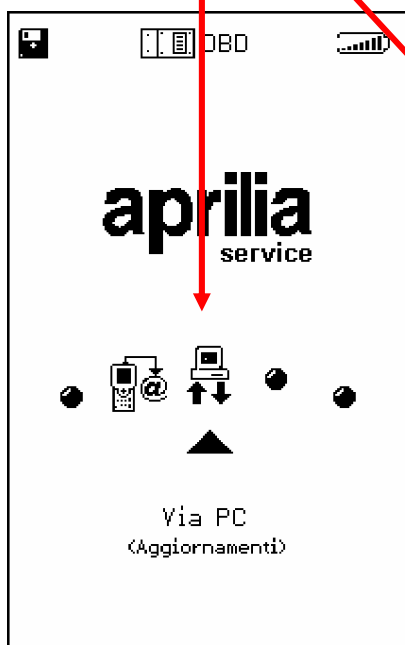


## UPDATING

6

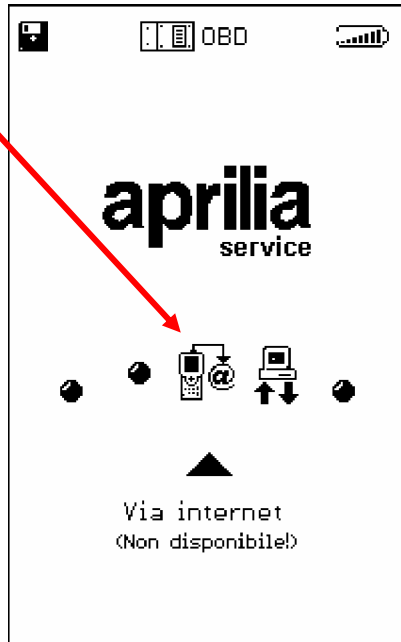


- ☐ Scroll options and select "UPDATING"
- ☐ Press ENTER to confirm



### VIA PC

Connect to a PC via serial cable. The memory card can be updated via PC.



### MODEM MDM 56 MODULE NEEDED

This MEMORY CARD updating system requires the installation of the MODEM module supplied with Axone Scan Tool to establish a connection through the telephone line in dial-up mode.

For further details please refer to Axone2000 user's guide on CD-ROM (included in Axone2000 Scan Tool package).