

ELIOS	240-210 (A28)
NEXOS	VE 230-210 (A25)
NEXOS	VL 240-210 (A26)
NEXOS	F 240-210 (A27)
NEXOS	230-220 FB (A29)



Repair manual



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TOOLING

Technical support
Nexos Elios
240-210

Repair – Issue 06.2011

Reference n° 00 1142 849 0

TOOLING PER CHAPTER

01	00 1131 511 0	00 1131 407 0	08
00 1130 886 0	00 1131 512 0	00 1131 409 0	00 1141 391 0
00 1130 887 0	00 1131 513 0	00 1131 410 0	00 1141 393 0
00 1130 888 0	00 1135 520 0	00 1131 412 0	00 1141 394 0
00 1130 889 0	00 1135 521 0	00 1131 413 0	00 1142 452 0
00 1130 890 0	00 1141 391 0	00 1131 415 0	00 1142 453 0
00 1130 892 0	00 1141 392 0	00 1131 416 0	00 1142 454 0
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00 1141 387 0	00 1142 431 0	00 1131 425 0	
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60 0500 556 6	77 0138 805 8	00 1142 440 0	
77 0138 811 1	77 0138 808 0	00 1142 441 0	10
77 0138 816 9	77 0138 837 9	00 1142 442 0	00 1135 095 0
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		00 1142 445 0	
		00 1142 447 0	
		00 1142 449 0	
		00 1142 450 0	
		00 1142 451 0	
		60 0500 653 4	
02	03		
00 1131 405 0	00 1131 397 0		
00 1131 502 0	00 1131 401 0		
00 1131 503 0	00 1131 402 0		
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00 1131 509 0	00 1131 404 0		
00 1131 510 0	00 1131 406 0		

TOOLING PER REFERENCE

00 0178 310 0



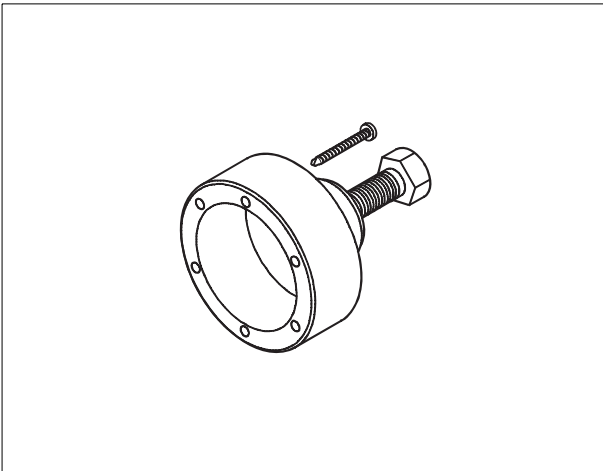
Data acquisition and pressure readings base kit.

00 0178 320 0



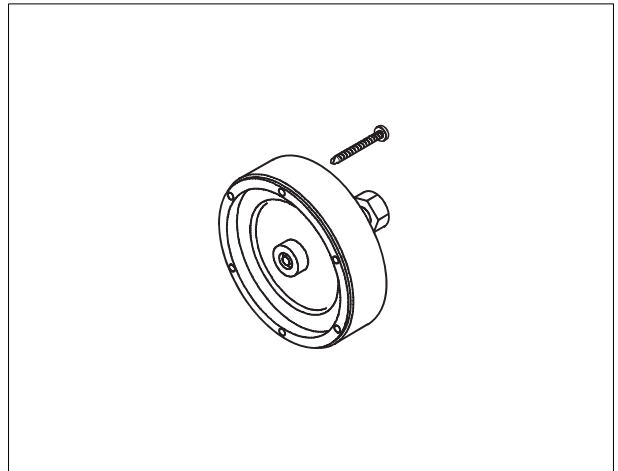
Additional flow reading kit.

00 1130 886 0



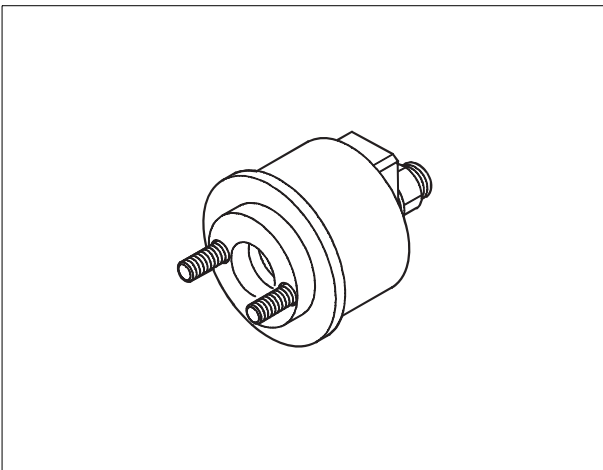
Front bearing gasket removing tool

00 1130 887 0



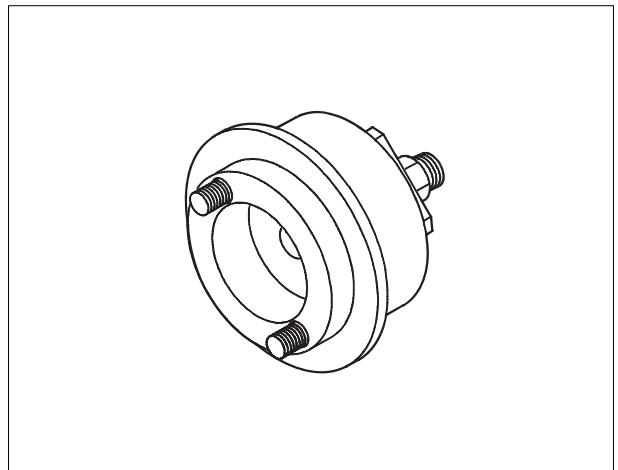
Rear bearing gasket removing tool

00 1130 888 0



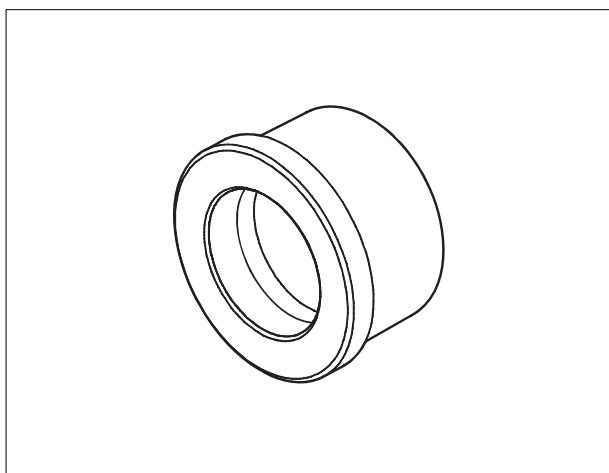
Front bearing gasket fitting tool

00 1130 889 0



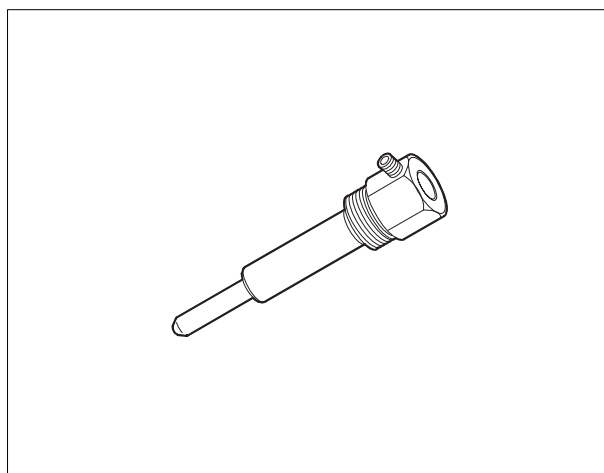
Rear bearing gasket fitting tool

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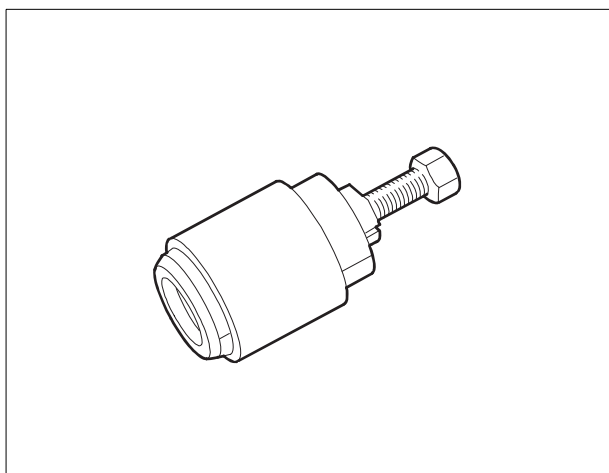
Camshaft bushes fitting / removing tool

00 1130 892 0



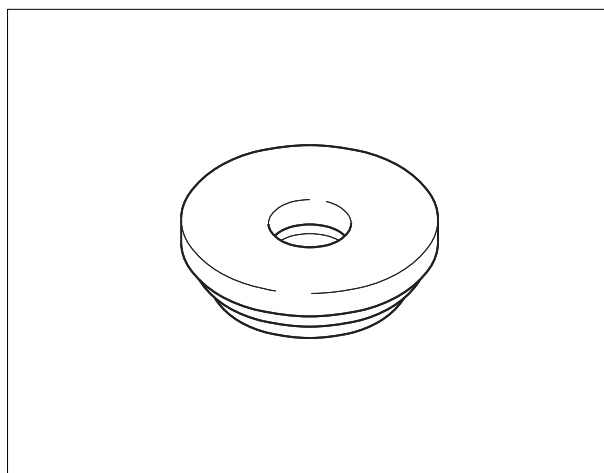
Top dead centre checking tool

00 1131 095 0



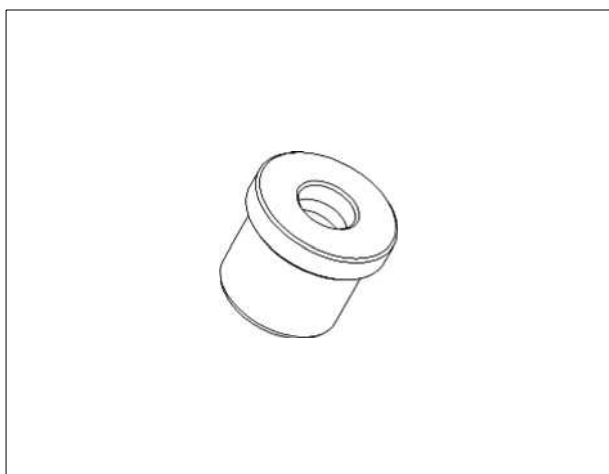
Top dead centre checking tool

00 1131 397 0



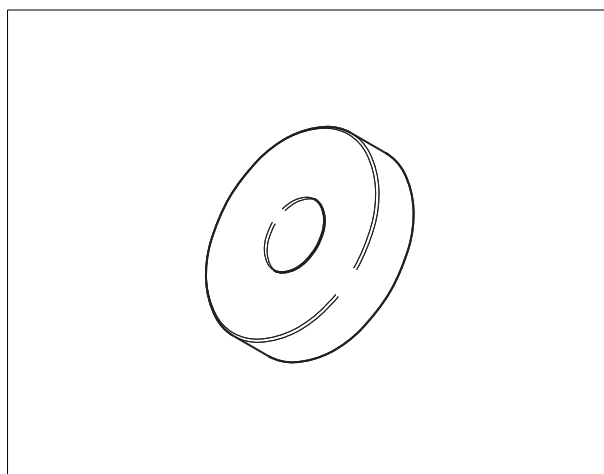
Bearing cup engaging tool

00 1131 401 0



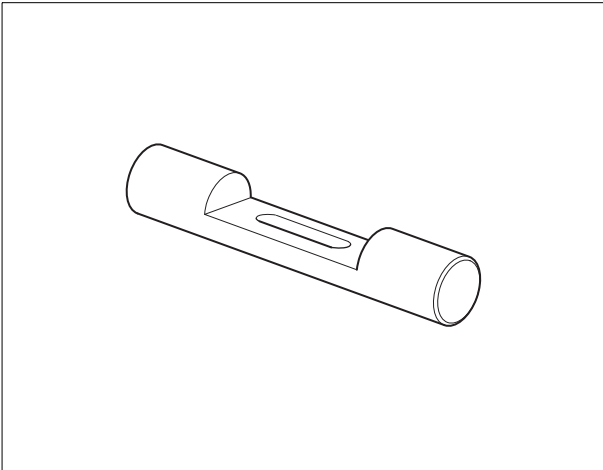
Bush engaging tool

00 1131 402 0



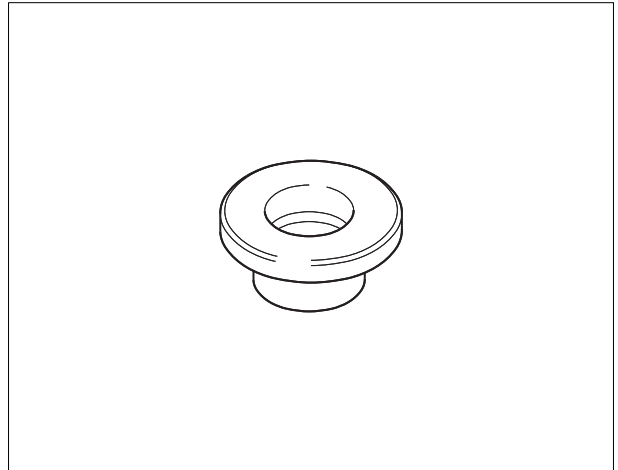
Differential bearing

00 1131 403 0



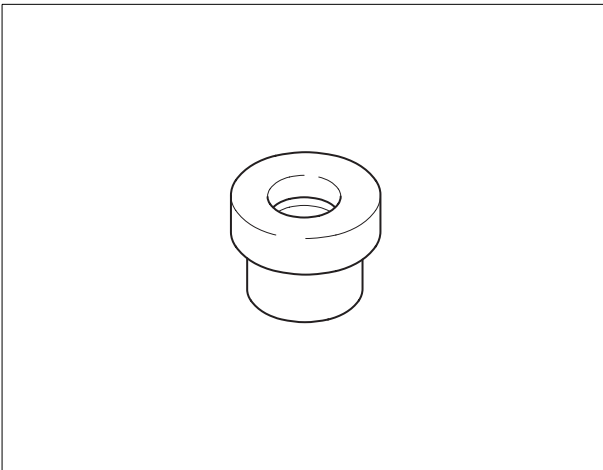
Conical distance measuring tool

00 1131 404 0



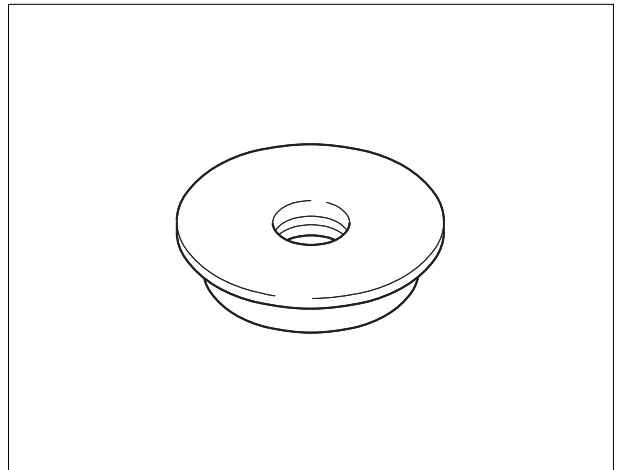
Bush engaging tool

00 1131 405 0



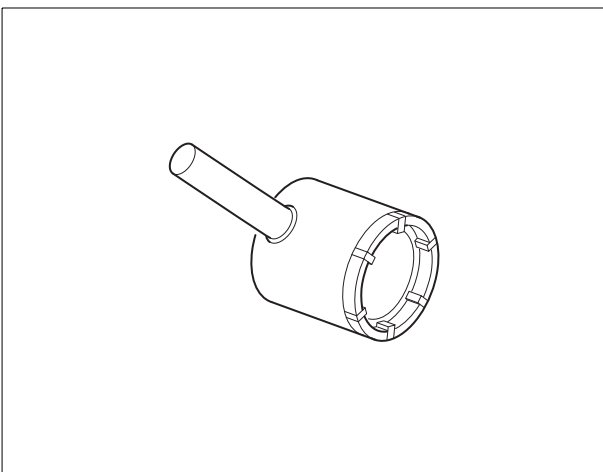
4WD gasket engaging tool

00 1131 406 0



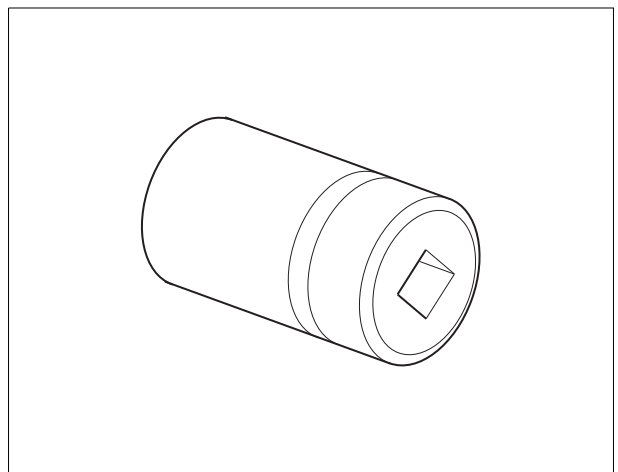
Gasket engaging tool

00 1131 407 0



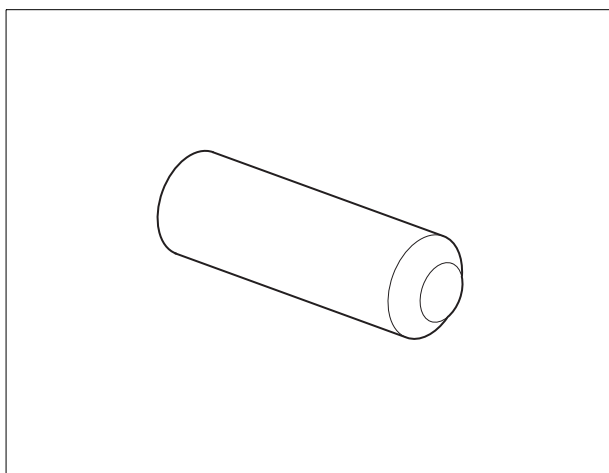
Nut wrench

00 1131 409 0



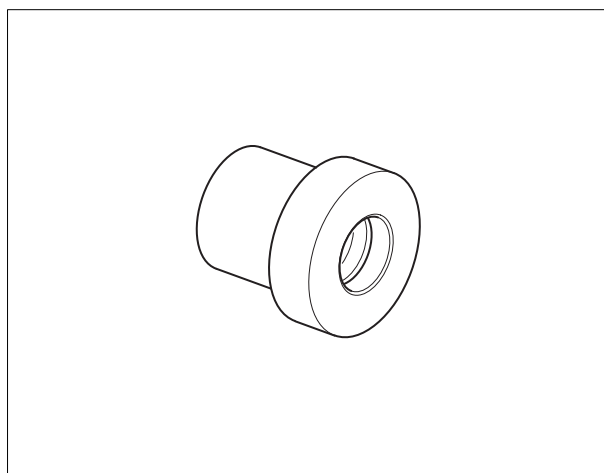
Wrench for conical gear

00 1131 410 0



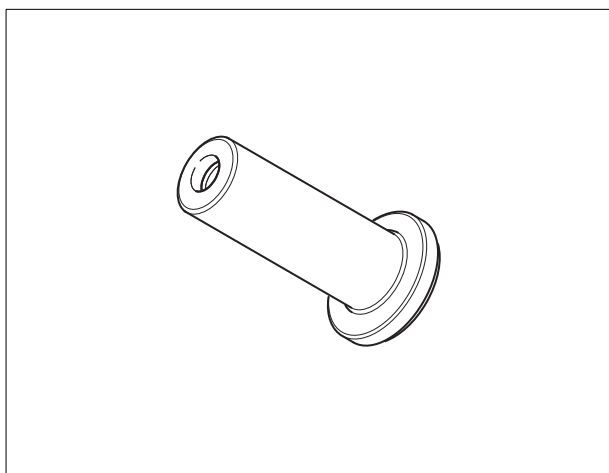
Bearing cone engaging tool

00 1131 412 0



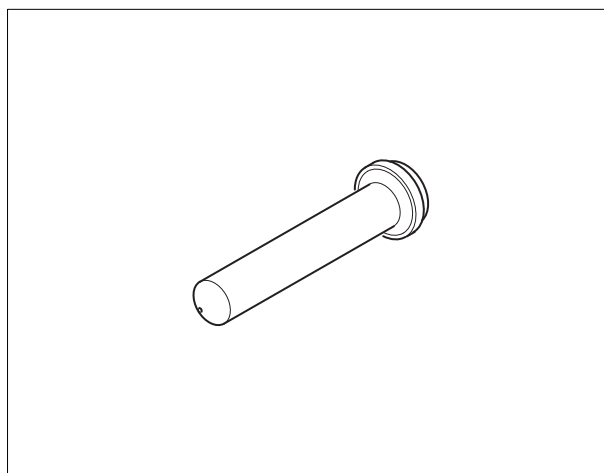
Bush engaging tool

00 1131 413 0



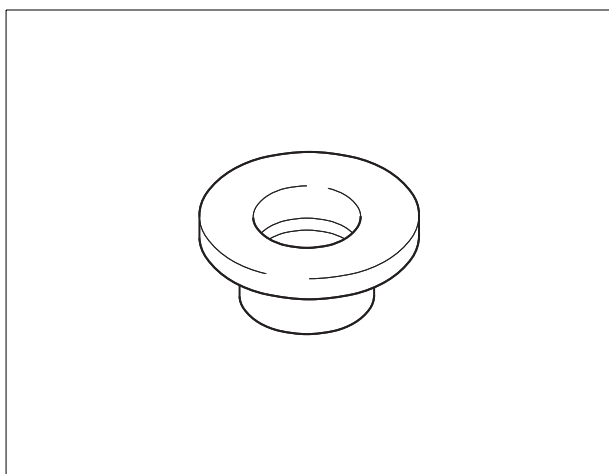
Gasket engaging tool

00 1131 415 0



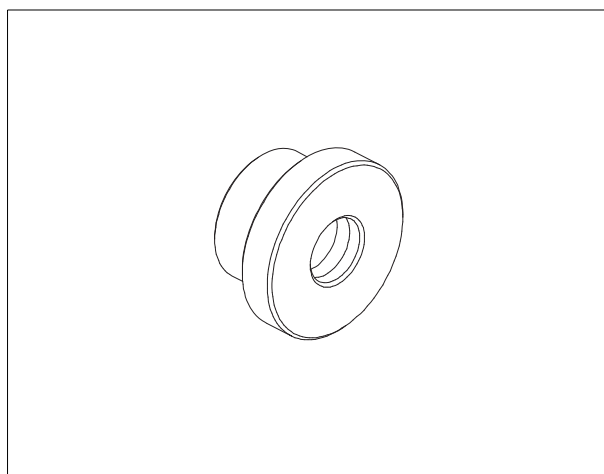
Bush engaging tool

00 1131 416 0



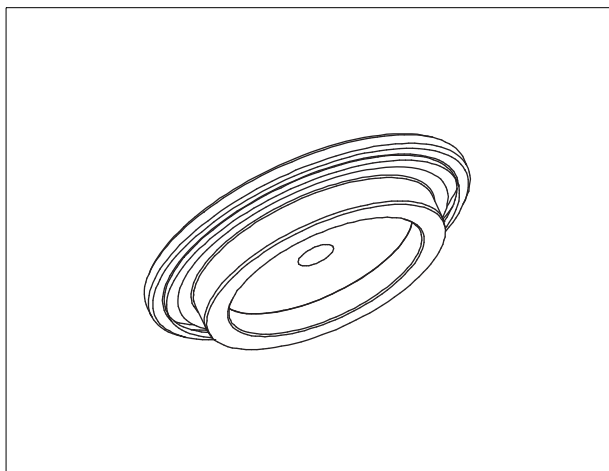
Gasket engaging tool

00 1131 423 0



Gasket engaging tool

00 1131 425 0



Cassette gasket engaging tool

00 1131 502 0



Gear cup fitting tool

00 1131 503 0



Attack gear simulation tool

00 1131 504 0



Conical distance tool

00 1131 509 0



Engaging tool for the reinforced shaft tube outer cup

00 1131 510 0



Engaging tool for the reinforced shaft tube inner cup

00 1131 511 0



Engaging tool for the non reinforced shaft tube outer gasket

00 1131 512 0



Engaging tool for the non reinforced shaft tube inner gasket

00 1131 513 0



Engaging tool for the narrow shaft tube cup

00 1135 095 0



Multimeter case

00 1135 520 0



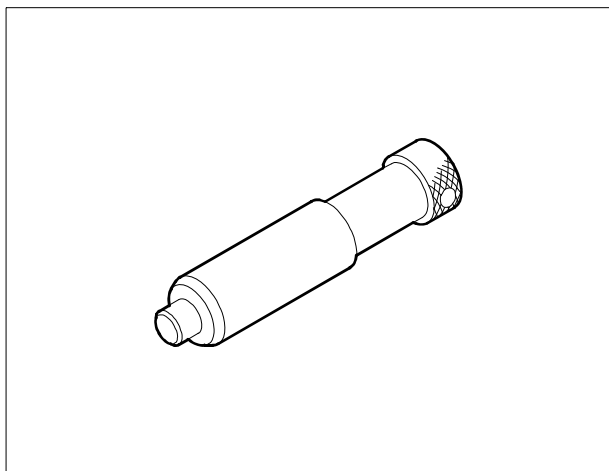
ISC clutch gaskets compression tool

00 1135 521 0



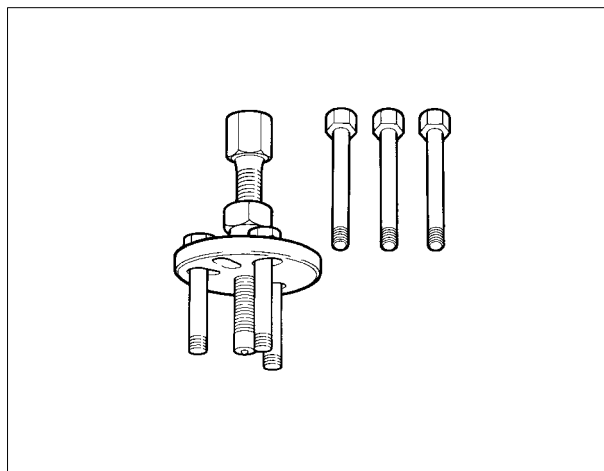
ISC clutch gaskets fitting tool

00 1141 387 0



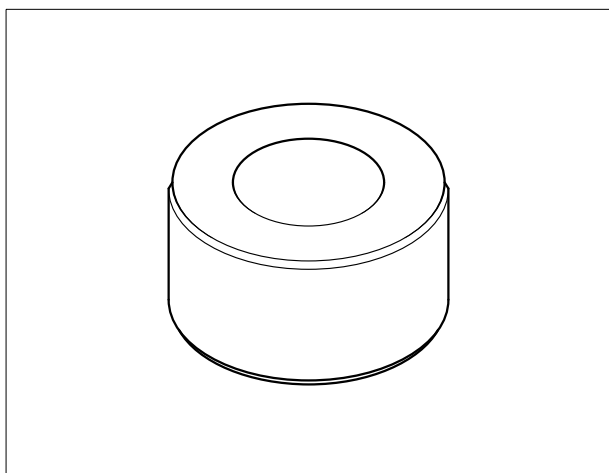
Flywheel timing gauge

00 1141 389 0



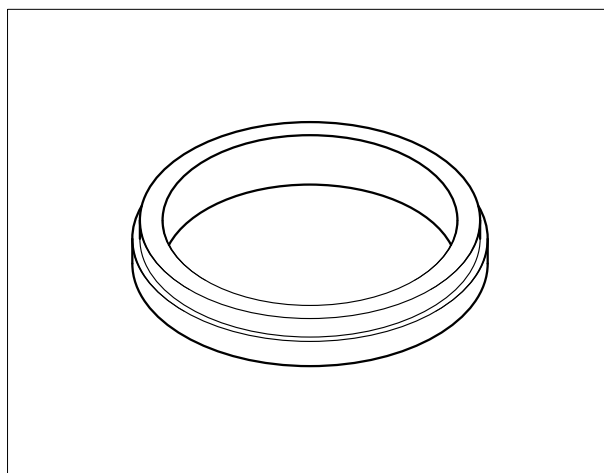
Injection pump gear puller

00 1141 391 0



ISC clutch compression washer

00 1141 392 0



Hydraulic doubler clutch compression washer

00 1141 393 0



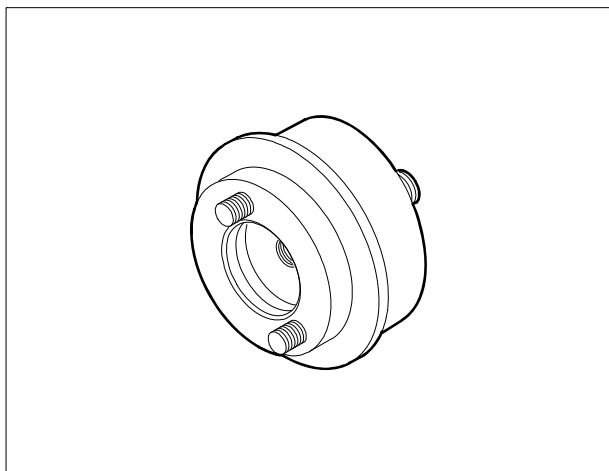
Power take-off clutch gaskets fitting tool

00 1141 394 0



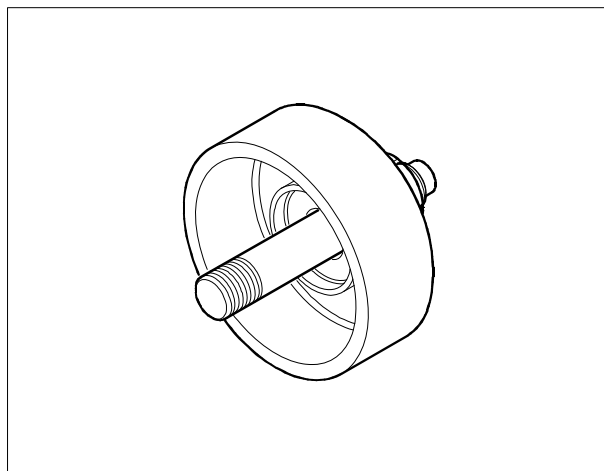
Power take-off clutch gaskets compression tool

00 1142 423 0



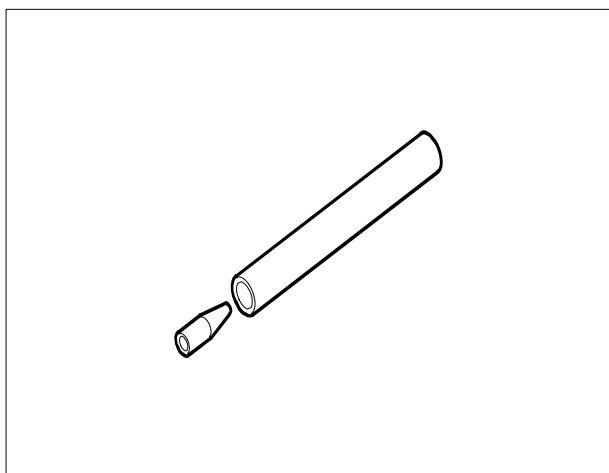
Rear bearing gasket fitting tool

00 1142 424 0



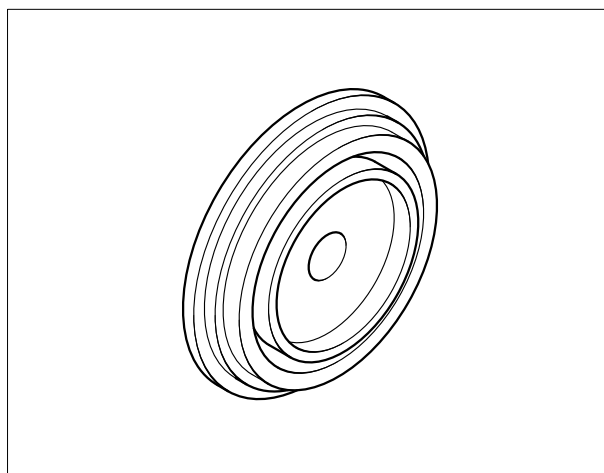
Front bearing gasket fitting tool

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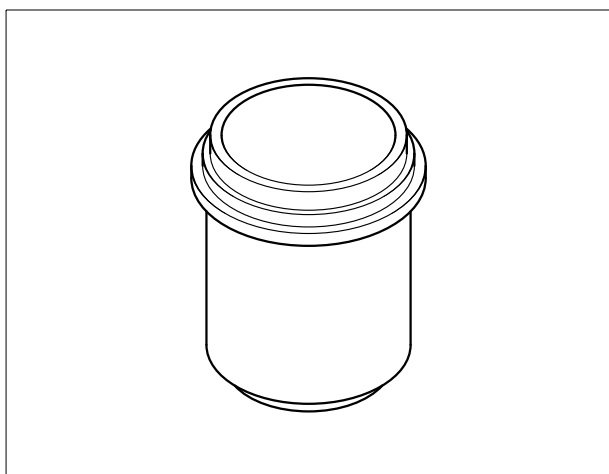
Valve gaskets fitting tool

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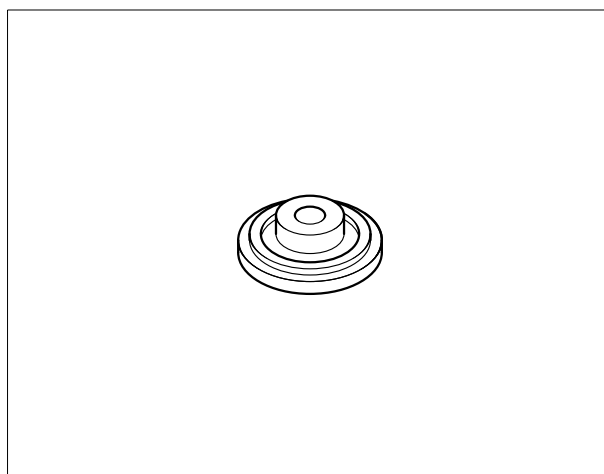
Engaging tool for the reinforced shaft tube outer gasket

00 1142 427 0



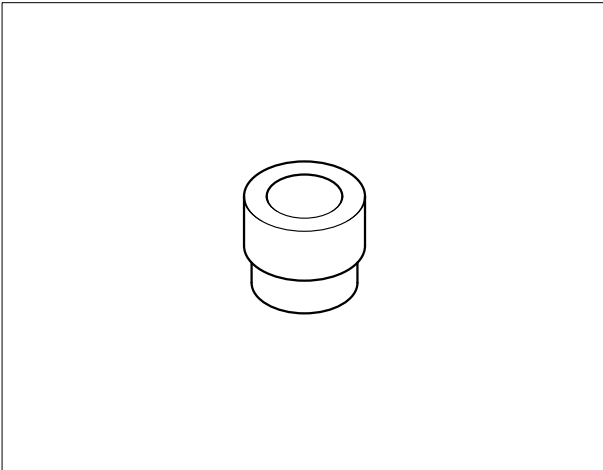
Engaging tool for the reinforced shaft tube inner gasket

00 1142 431 0



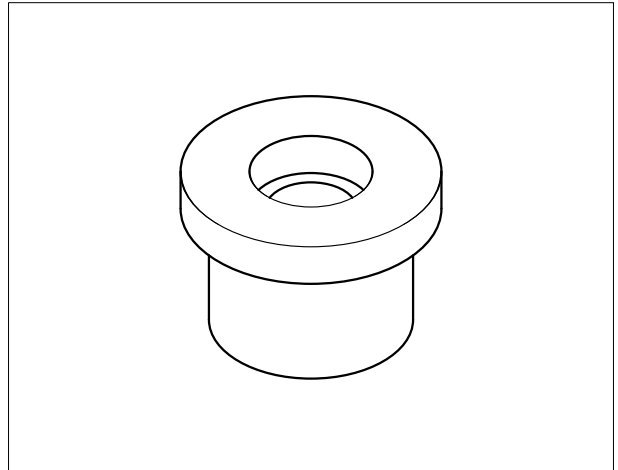
Engaging tool for the gearbox gasket

00 1142 432 0



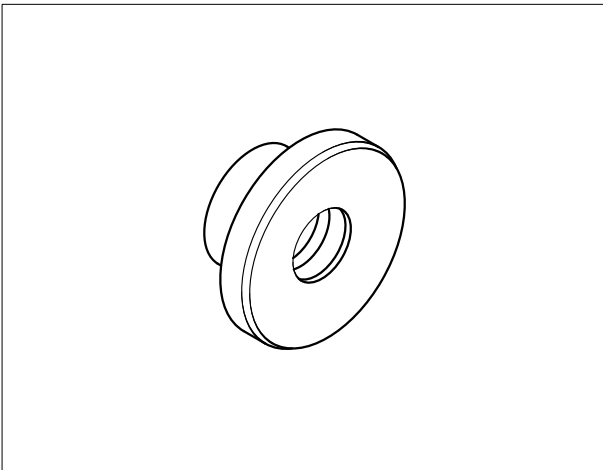
Engaging tool for the gearbox gasket

00 1142 433 0



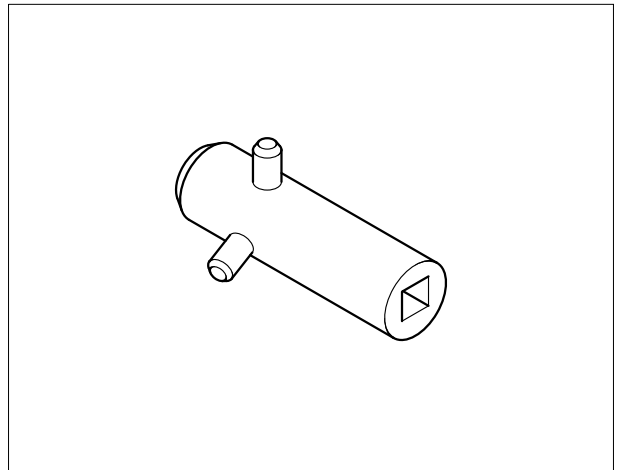
Bush engaging tool

00 1142 434 0



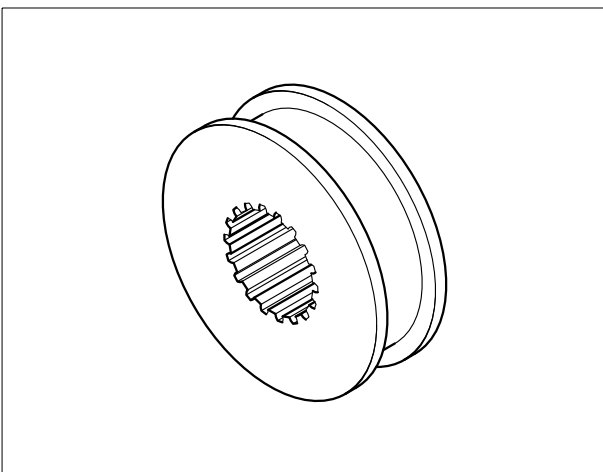
Gasket engaging tool

00 1142 435 0



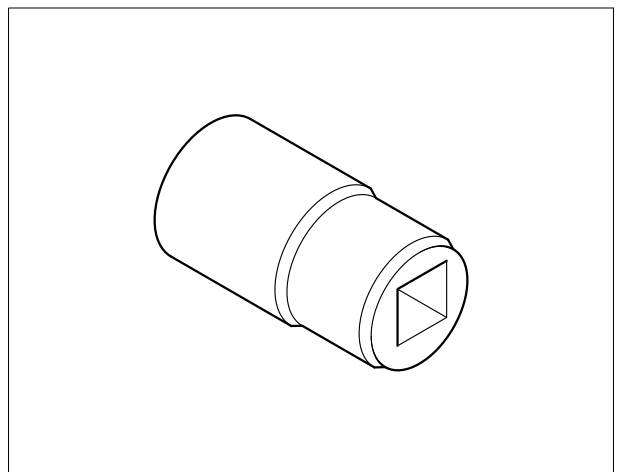
Nut locking wrench

00 1142 438 0



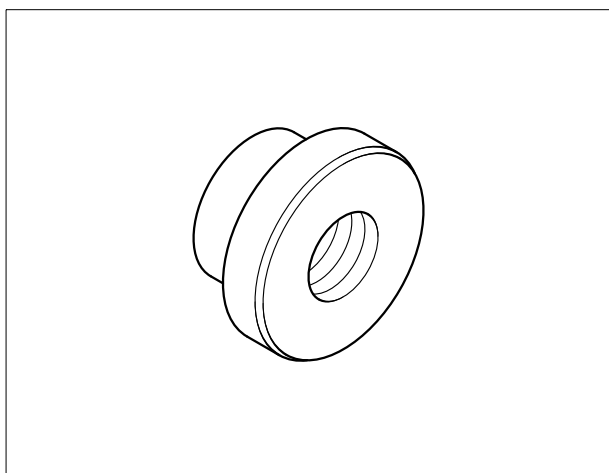
Preload measuring tool

00 1142 439 0



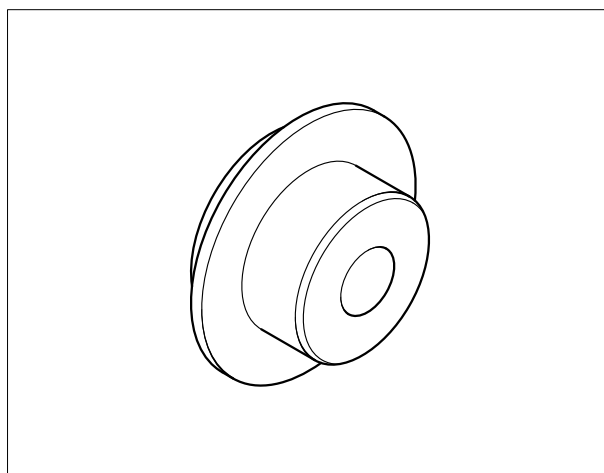
Wrench for conical gear

00 1142 440 0



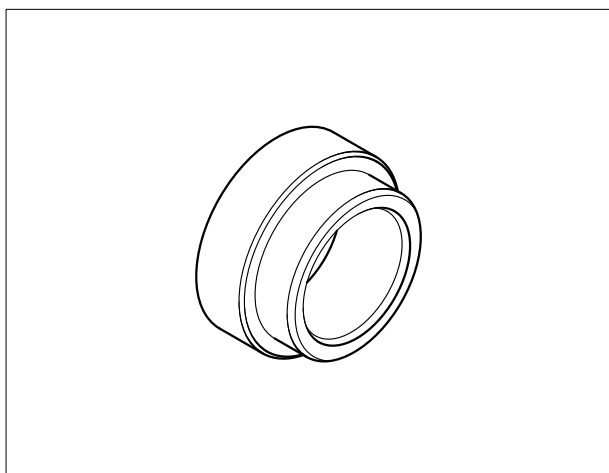
Gasket engaging tool

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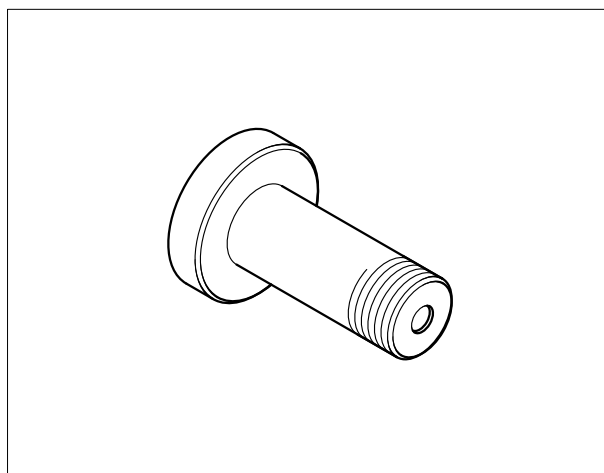
Gasket engaging tool

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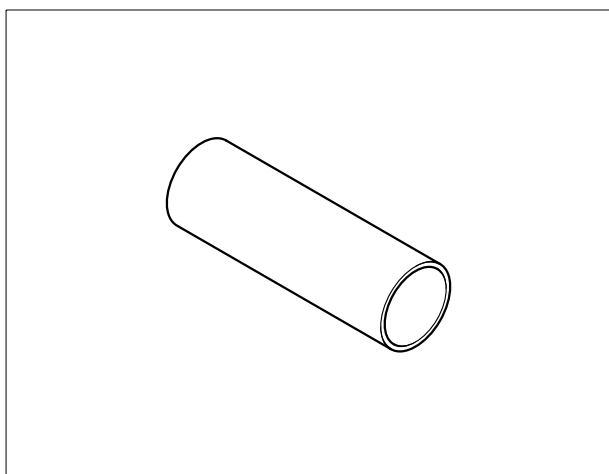
Bush engaging tool

00 1142 443 0



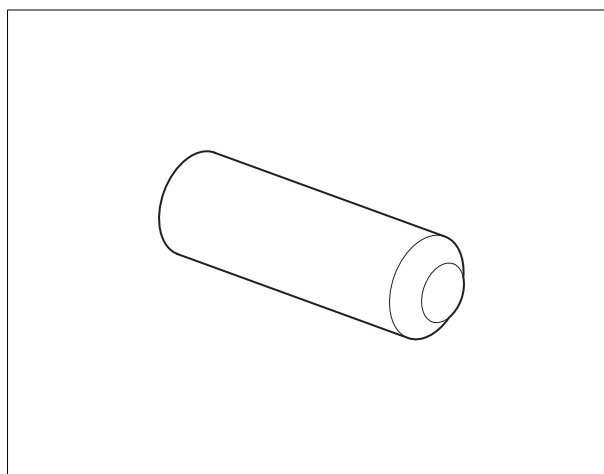
Conical false gear

00 1142 444 0



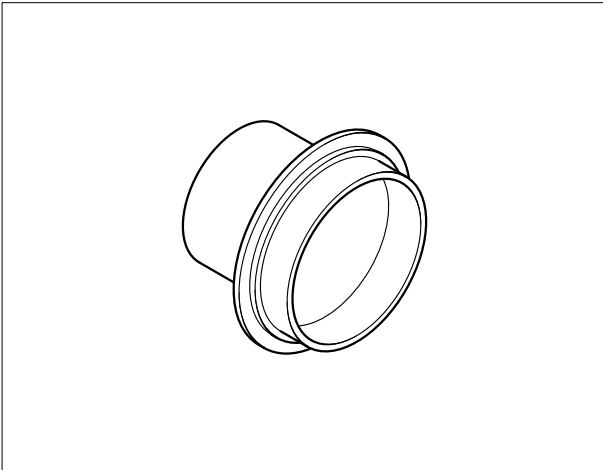
Conical distance adjusting tool

00 1142 445 0



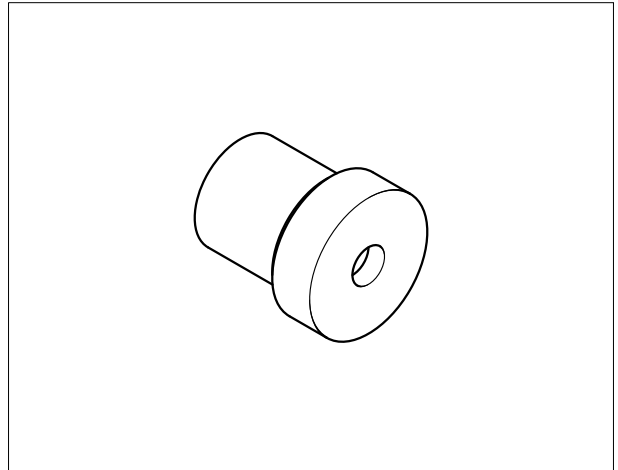
Bearing cone engaging tool

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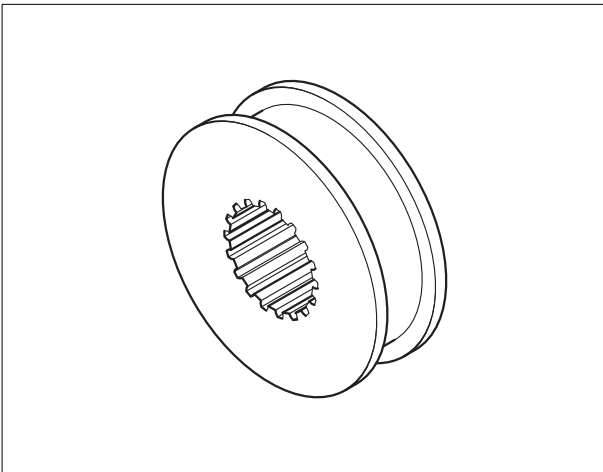
Gasket engaging tool

00 1142 449 0



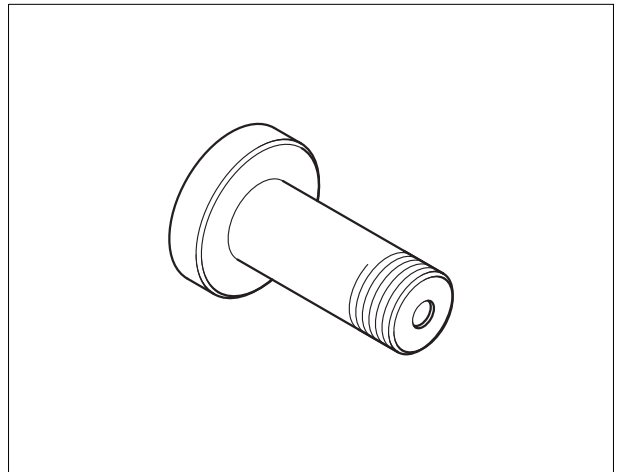
Bush engaging tool

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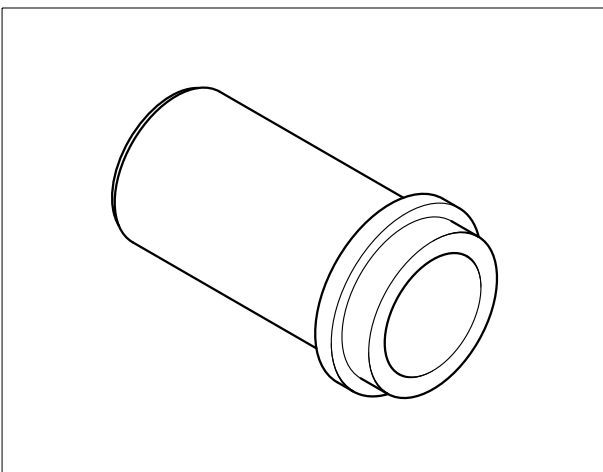
Preload measuring tool

00 1142 451 0



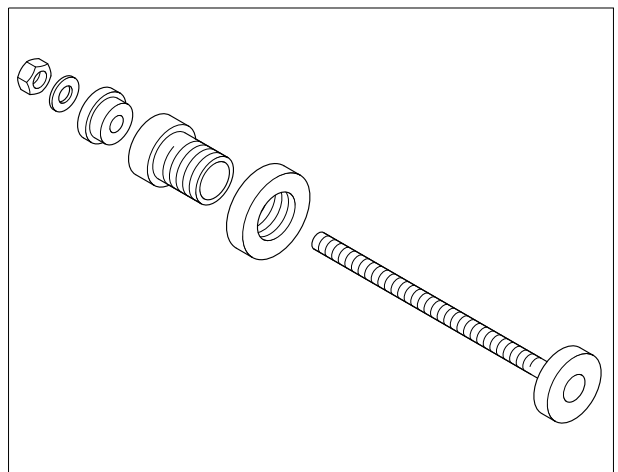
Conical false gear

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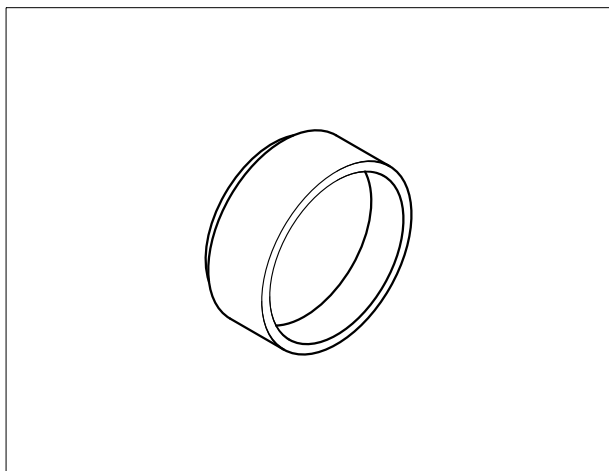
Engaging tool for the power take-off bearing gasket

00 1142 453 0



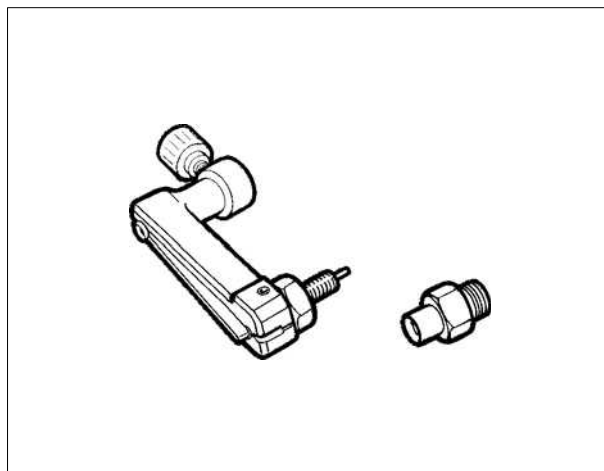
Power take-off shaft puller

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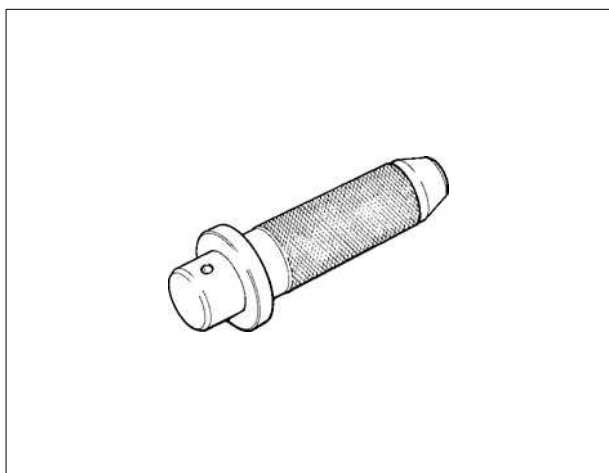
Power take-off brake compression tool

60 0500 556 0



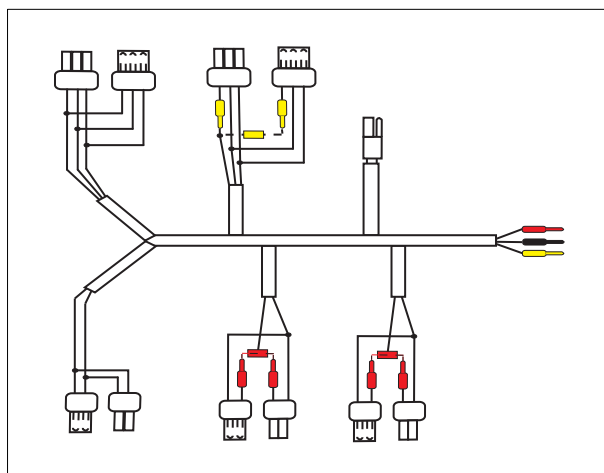
Injection pump timing tool

60 0500 556 6



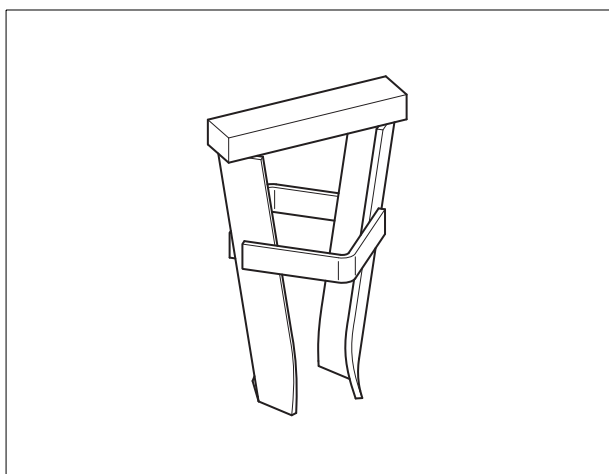
Camshaft bushes fitting / removing tool

60 0500 573 4



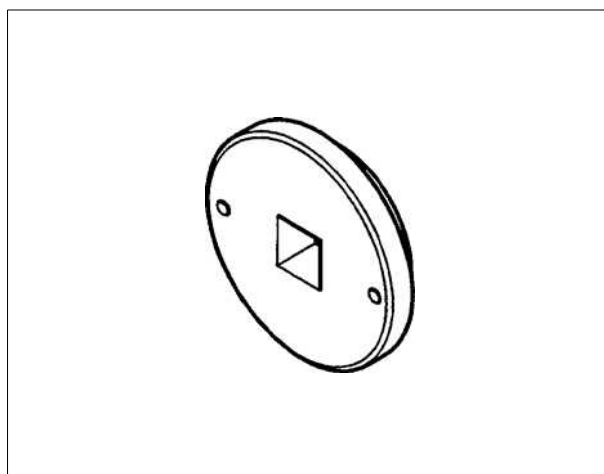
Solenoid valves checking harness

60 0500 615 3



Compression tool

60 0500 653 4



Nut locking wrench

60 0571 280 0



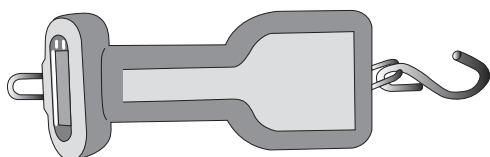
Depollution station

60 0571 297 1



Depollution station filter

77 0138 800 8



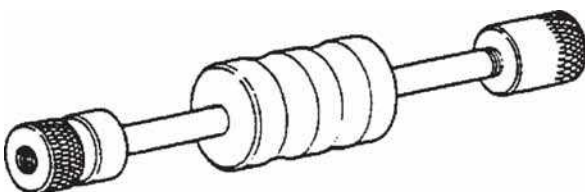
Torquemeter

77 0138 803 1



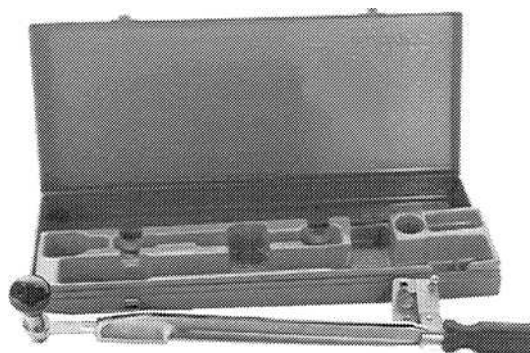
Depth gauge

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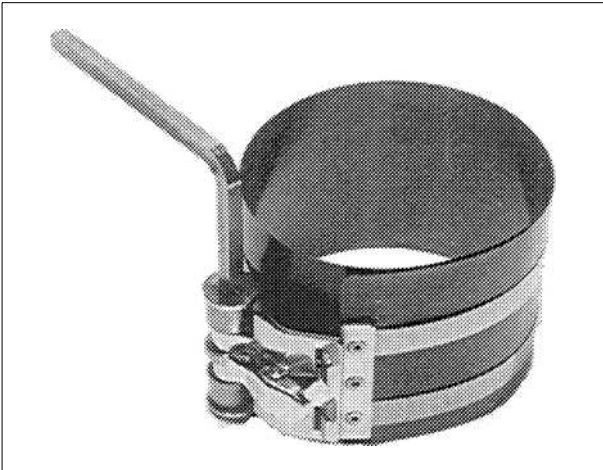
Impact hammer

77 0138 808 0



Torque wrench

77 0138 811 1



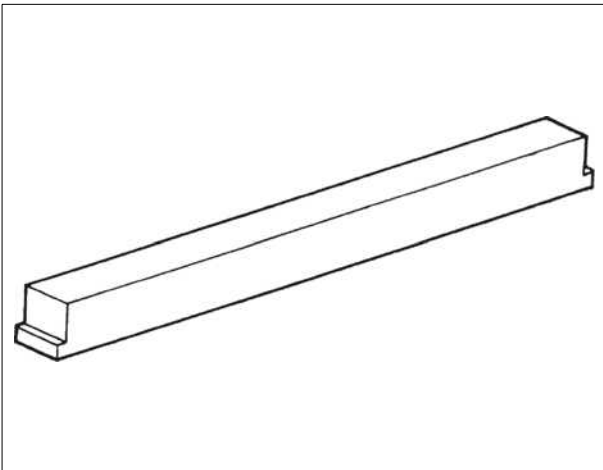
Piston-ring compressor

77 0138 816 9



Flywheel rotation tool

77 0138 837 9



Rule

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01 ENGINE - F5C

Technical support
Nexos Elios
210-220-230

Repair – Issue 09.2010

Reference n° 00 1142 850 0

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INTRODUCTION

Introduction

Workshop manuals are subdivided into Parts and Sections, each characterized by a number, with its content specified in the general summary.

Sections with mechanical content present the technical data, tightening torque sets, lists of tools, removal-refitting of groups, revisions on bench, diagnostic and maintenance plans.

Sections or parts of the electrical/electronic systems describe the electrical network and electronic systems of the unit, electrical diagrams, specifications of components, coding of components and diagnostic corresponding to the specific units of the electrical system.

Section 1 describes the specifications of the engines, as well as their general operation.

Section 2 describes the type of fuel supply.

Section 3 covers operating more specifically, and includes four separate parts:

1. Mechanical part dedicated to engine maintenance, limited to the components differentiated according to specific use.
2. Electrical part related to wiring, electrical and electronic devices differentiated according to specific use.
3. Scheduled maintenance and specific revision.
4. Part of the diagnostic dedicated to those who, when providing technical support, must have simple and direct indications to troubleshoot the main problems.

Sections 4 and 5 concern overhaul operations of the engine fitted on the swivel cradle and the tools required for its performance.

The appendix enumerates the general safety standards which everyone, whether the installers or handlers, must apply to avoid severe accidents.

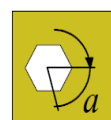
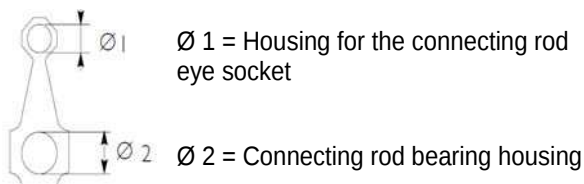
In its descriptions, the manual uses appropriate symbols to classify the information indicated. More particularly, we have defined a series of symbols to classify remarks and another for support operations.

Symbols

	Danger for persons Non compliance with these instructions may result in severe danger for persons.
	Risk of severe damage to the unit Partial or total non-observation of these prescriptions results in the risk of severe damage to the unit and may sometimes cancel the warranty.
	Danger Covers all the risks of both warnings mentioned above.
	Environmental protection Indicates the correct behavior required to ensure the unit is used with maximum compliance with the environment.
NOTE	Provides an additional explanation for a piece of information.

Support operation

Example:



Close at torque
Close at torque+
angular value

	Removing Disconnect		Unloading
	Refitting Connect		Operation
	Disassembly Detail		Compression ratio
	Assembly Composition		Tolerance Weight difference
	Close at torque		Bearing torque
	Close at torque + angular value		Rotation
	Embossing or chamfering		Angle Angular value
	Adjustment Adjustment		Pre-loading
	Visual inspection Fitting position check		Number of rotations
	Measuring Dimension to record Check		Temperature
	Tooling		Pressure
	Surface to machine Machining finish		Increased Above Maximum
	Interference Forced fitting		Decreased Below..... Minimum
	Thickness Gap		Selection Classes Increases
	Grease Dampen Grease		Temperature < 0° C Cold Winter
	Sealing compound Glue		Temperature > 0° C Hot Summer

	Air purge		
	Suction		

General notes



The notes indicated are not representative of all danger situations likely to occur. Therefore, we recommend referring to your supervisor in case of hazard situation not described.

Use specific and generic equipment as described in their operating and maintenance manuals. Check the operating condition of tools not subject to periodical checks.

Manual load handling must be calculated beforehand as it depends on the weight, but also dimensions and route.

Handling using mechanical means must include appropriate lifts while considering the weight, shape and volume.

Elevators, cables and hooks used must feature clear indication on the maximum acceptable load. The use of these tools is authorized only to certified staff. Keep a safe distance from the load and in any event never stand below it.

During removal operations, always apply the instructions, during part extraction phases, avoid any accidental shock with workshop staff.

The workshop activities performed by two must always be performed safely ; avoid any operations which may be hazardous for the colleague due to lack of visibility or an incorrect position.

Keep staff not involved in the operations away from the zone.

Learn the appropriate operating and safety notions required before any intervention on it. Observe scrupulously all safety warnings present on the unit.

Never leave the unit without monitoring during the repair interventions.

In case of intervention on the unit when lifted from the ground, ensure it is laid sturdily on the appropriate supporting cradles, and manual/automatic safety devices are activated when lifting using a gantry.

Remove the radiator cap only when the engine is cold, by unscrewing it slowly to allow residual pressure of the circuit to exhaust.

Flammable fuels and all fluids and liquids must be handled with care, as specified in 16-point sheets on toxic materials.

Refill in the open air with the engine stopped, while avoiding to light a cigarette, open flames or sparks to prevent explosions or fires. Store flammable, corrosive and polluting fluids and liquids as per currently enforced regulations. Never use food grade containers to store toxic liquids. Avoid puncturing or burning pressurized containers and throw cloths impregnated with flammable substances in containers planned to this effect.

Worn, damaged or wear-prone parts must be changed with original CLAAS spare parts.

During the workshop activity, the workstation must be clean and neat at all times ; clear or clean the floors of any accidental stain of liquids and oil. Power outlets and electrical devices required to perform repairs must comply with applicable safety standards.



If required by the intervention, wear clothing and protections specified in safety standards; contact with moving parts may cause severe injuries. Wear appropriate clothes, preferably tight and avoid wearing any jewelry, scarfs, etc.

Do not run the engine in the workshop without any exhaust gas evacuation tube to the outside.

Avoid contact with hot water or steam produced by the engine, radiator and hoses, which may cause severe burns. Avoid direct contact with liquids and fluids of the vehicle's circuits ; in case of accidental contact, refer to the 16-point data sheets for the measures required.



Clean the units and carefully inspect their integrity before the overhaul.

Check the condition of parts locking the screws: washers, pins, fasteners, etc. Always change locknuts.

Avoid contact of rubber elements with diesel fuel.

Always apply screw and nut tightening instructions ; the CLAAS sales and support network is available to provide any explanations required for repair interventions not described in this publication.



All liquids and fluids must be disposed according to all appropriate specific standards.

General notes on the electrical circuit



In case of intervention on the electrical / electronic circuit, remove the batteries from the circuit, by first disconnecting the chassis grounding cable from the negative terminal of the batteries.

Check the circuit is properly isolated before connecting the batteries.

Disconnect the external charger from mains before removing the clamps from the battery terminals.

Do not check voltage presence on the circuit by causing sparks.

Do not use a test lamp to check continuity of a circuit, but only appropriate checking devices.

Check the wiring of the electronic devices (length, type of conductor, location, tightening, sheath connection to the shielding, grounding, etc.) comply with the CLAAS circuit and are restored scrupulously after the repair or maintenance interventions.

Measuring in the electronic units, connections and electrical connections to components can be performed only on appropriate test lines, using pins and sockets. Never use non appropriate means, such as metallic wires, screwdrivers, staples or similar. In addition to the risk of short-circuit, this could damage star connections, causing subsequent contact problems.



Do not use fast chargers to start the engine. Starting must be performed only with the separate batteries or using a trolley.

Invalid polarization of the power supply voltage of electronic boards (e.g. wrong battery polarization) may damage them permanently.

Disconnect the batteries from the circuit while they are being charged with an external device.

In the connection phase, screw the wing nuts of the connectors (temperature probes, pressure sensors, etc.) only at the tightening torque recommended.

Before disconnecting the junction connector of an electronic unit, isolate the circuit.

Do not supply directly the components depending on electronic units with the nominal vehicle voltage.

Lay out the cables in parallel with the reference plane, i.e. as close as possible to the frame/body structure.

At the end of the intervention on the electrical circuit, restore the connectors and wiring in the original position.

NOTE The connectors present are seen in the cable side. The views of the connectors in the manual represent the cable side.

Grounding and shielding

Negative conductors connected to a grounding point of the circuit must be as short as possible and connected in a 'star' pattern, while ensuring they are tightened in a sequenced and appropriate way (Figure 1 ref. M).

Also apply the following instructions to electronic components:

- Electronic units must be connected to circuit ground when fitted with a metallic envelope.
- Negative cables of electronic units must be connected to a ground point of the circuit, e.g. the ground of the dashboard compartment (while avoiding 'serial' or 'chain' connections), or to the negative terminal of the batteries.
- Although analog grounds (sensors) are not connected to the circuit ground/negative battery terminals, they must provide excellent isolation. Therefore, particular care must be given to parasite resistance of the lugs: oxidization, faulty fastening, etc.
- The metallic sheath of shielded circuits must be in electrical contact only from the end directed by the unit in which the signal enters (Figure 2).
- In the presence of junction connectors, the non shielded passage d, close to them, must be as short as possible (Figure 2).
- The cables must be laid as to be parallel with the reference plane, i.e. as close as possible to the frame/body structure.

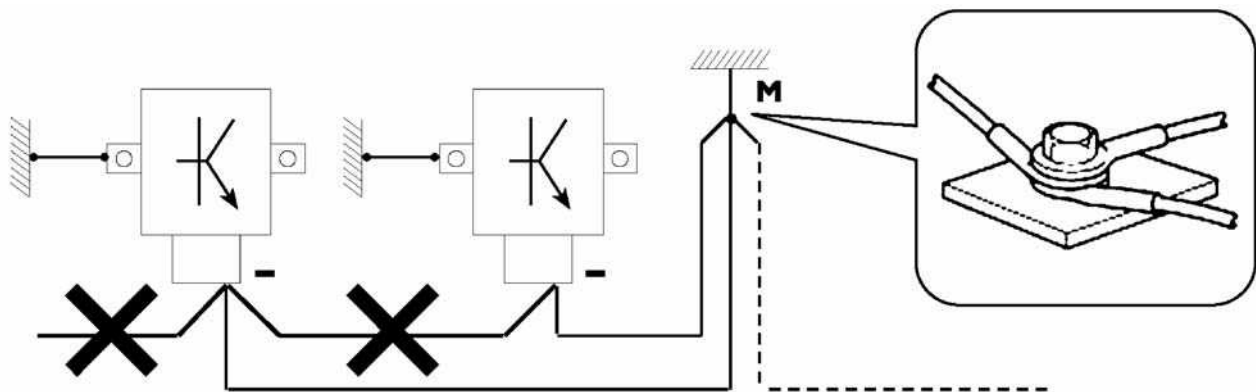


Fig. 1

1. 'STAR' CONNECTION OF NEGATIVE CABLES TO GROUND ON CIRCUIT M

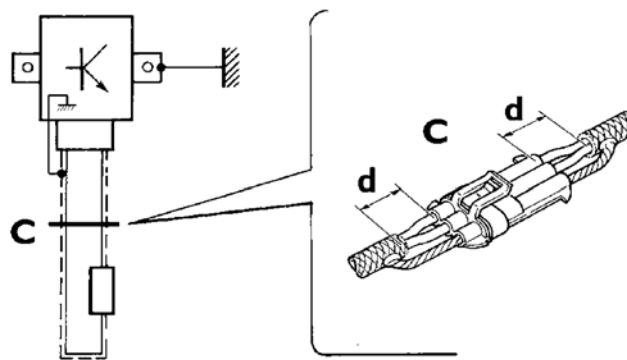


Fig. 2

2. SHIELDING BY METALLIC SHEATH OF A CABLE TO AN ELECTRONIC COMPONENT

C: CONNECTOR - d: DISTANCE → 0

Conversions between the main measurement units of the international system and current use derived magnitudes

Power

1 kW = 1.36 CV

1 kW = 1.34 HP

1 CV = 0.736 kW

1 CV = 0.986 HP

1 HP = 0.746 kW

1 HP = 1.014 CV

Torque

1 Nm = 0.1019 mkg

1 mkg = 9.81 Nm

Number of rotations

1 rad/s = 1 rpm x 0.1046

1 rpm = 1 rad/s x 9.5602

Pressure

1 bar = 1.02 kg/cm²

1 kg/cm² = 0.981 bar

1 bar = 10⁵ Pa

In case of lack of particular precision requirement:

– the Nm unit is transformed for simplicity into kgm according to the ratio 10:1

1 kgm = 10 Nm;

– for simplicity, the bar unit is transformed into kg/cm² according to the ratio 1:1

1 kg/cm² = 1bar.

– Temperature

0 °C = 32 °F

1 °C = (1x1.8+32) °F

GENERAL

Engine views

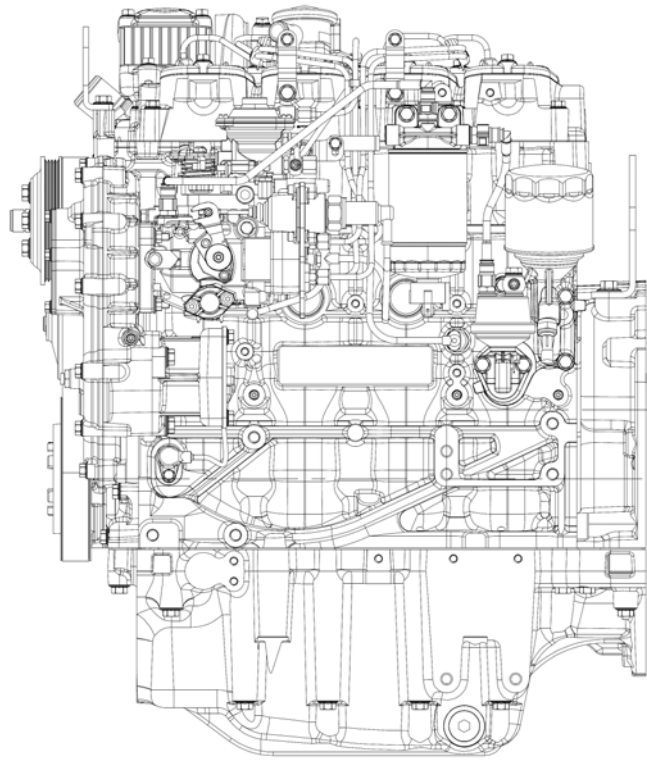


Fig. 3

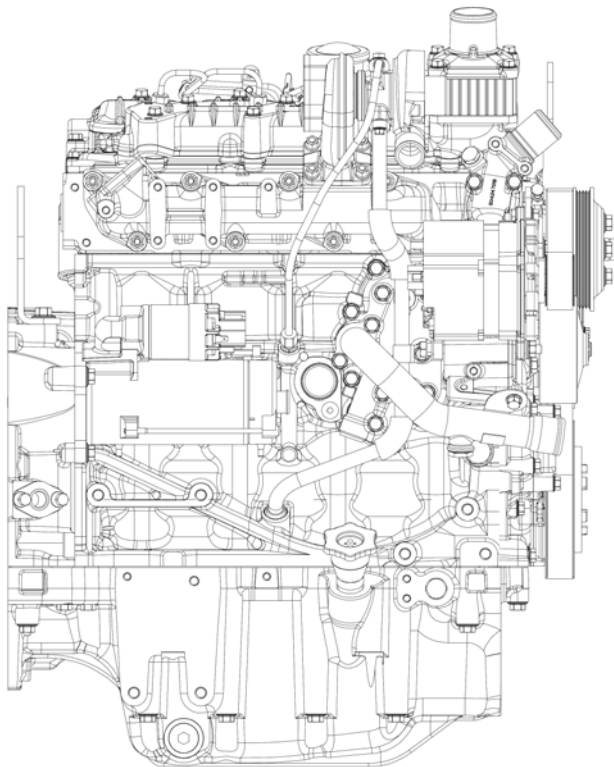


Fig. 4

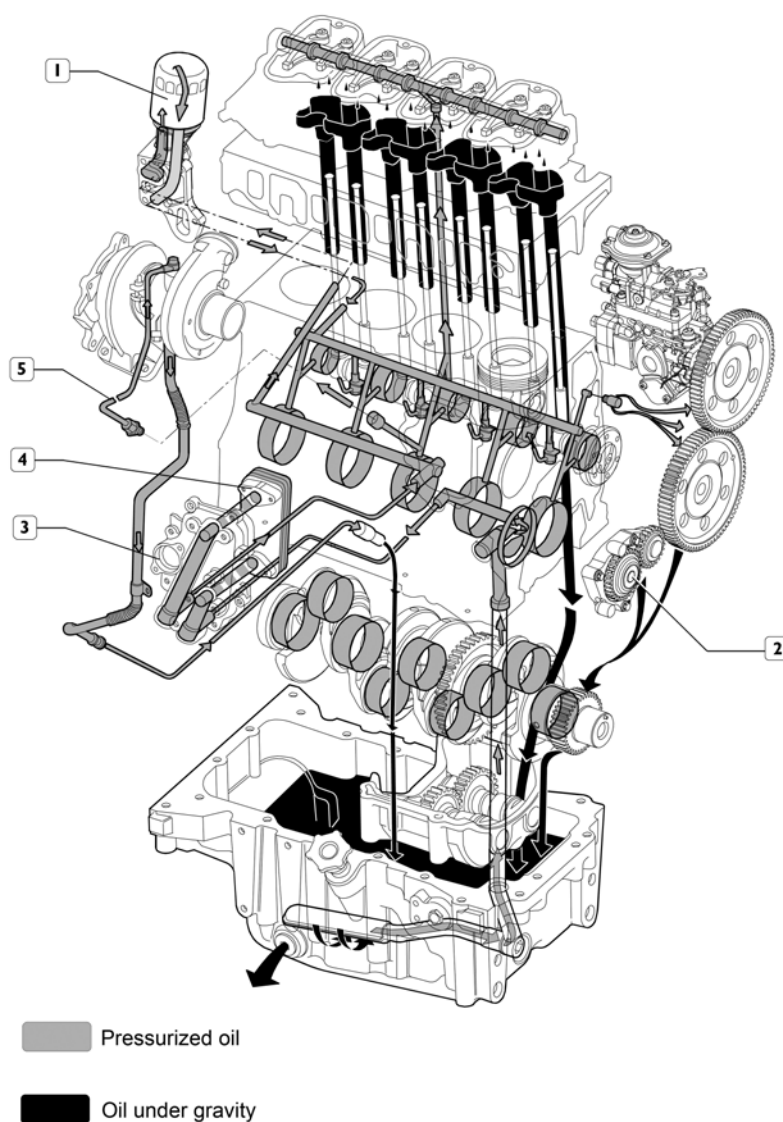
Engine lubrication

Lubrication by forced circulation is ensured by the rotor lobe pump housed at the front of the engine block and driven by the straight tooth gear inserted onto the crankshaft stem.

Lubrication oil is pumped into the oil pan and sent to the crankshaft, the camshaft and valve drive.

Lubrication also includes a heat exchanger, turbo blower for turbocharged versions, and may include a compressor for the compressed air circuit.

These components often vary according to the application and are covered in specific parts.

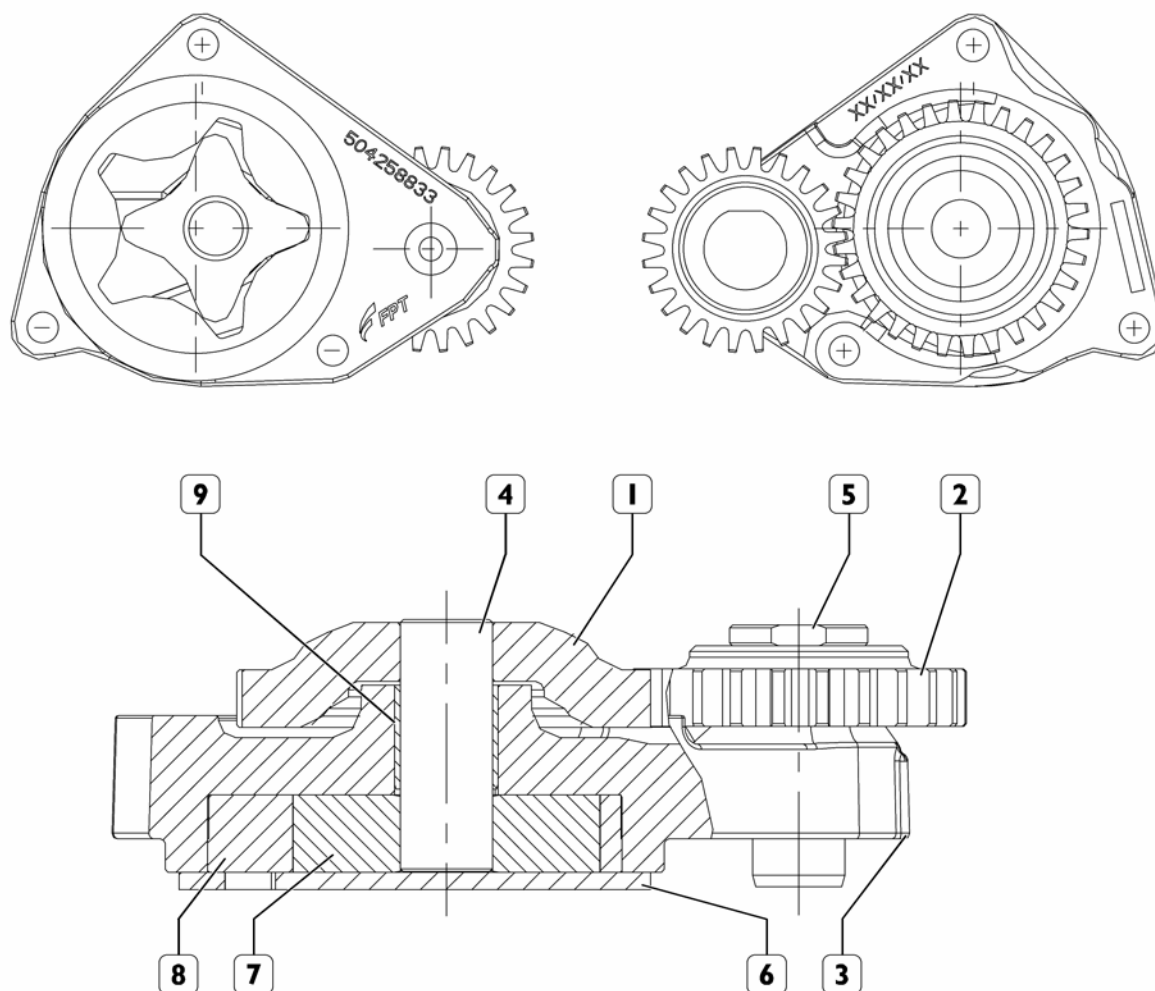


LUBRICATION DIAGRAM

1. Oil filter - 2. Oil pump - 3. Heat exchanger body - 4. Heat exchanger -
5. Turbocharger lubrication out hose

Fig. 5

Oil pump

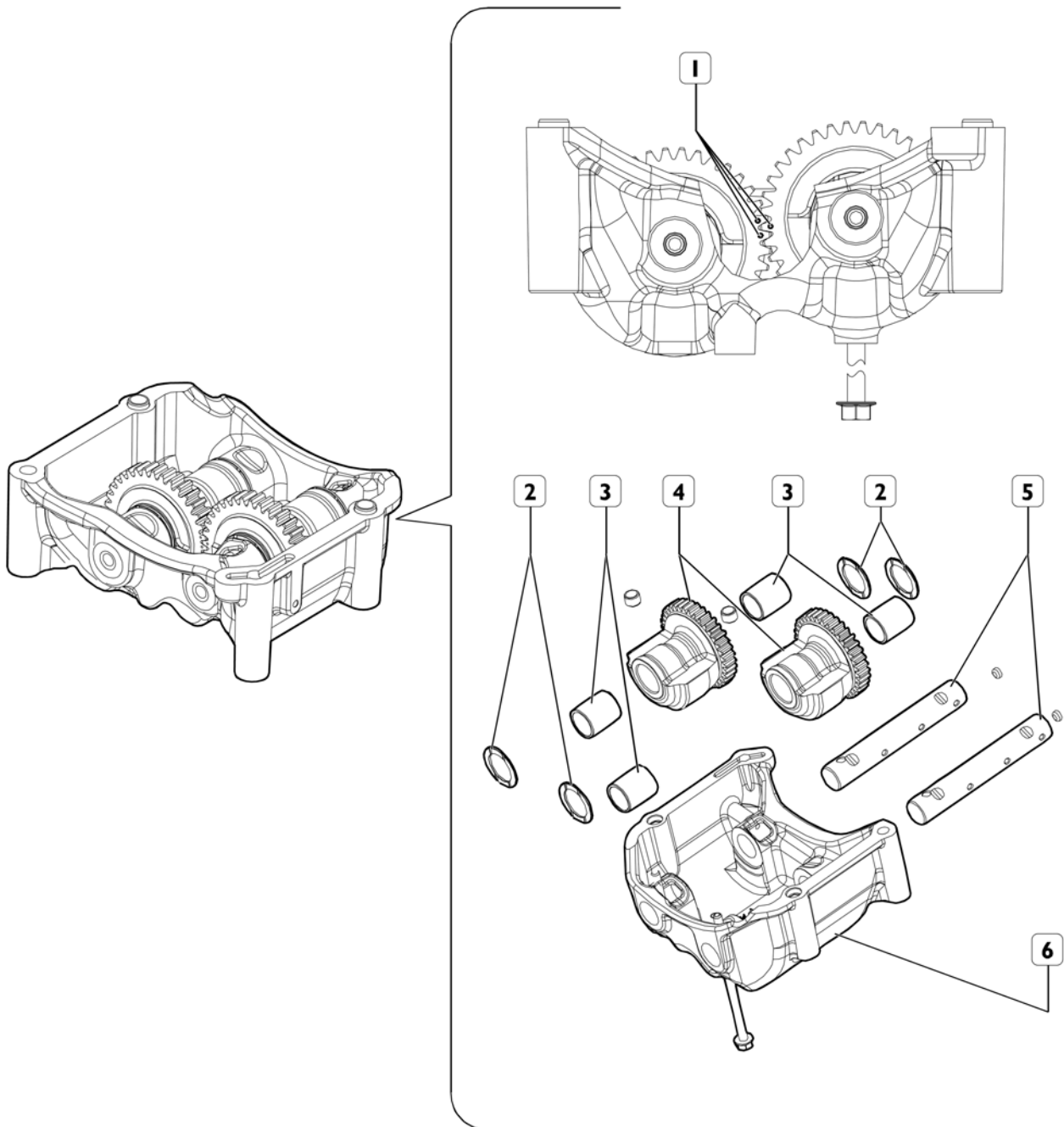


1. Primary gear - 2. Secondary gear - 3. Pump body - 4. Drive shaft - 5. Secondary shaft -
6. Cover - 7. Inner rotor - 8. External rotor - 9. Socket.

Fig. 6

SPECIFICATIONS OF THE PUMP	
Speed of rotation	750 rpm - 4200 rpm
Start pressure	2 Bar - 4 Bar
Nominal flow rate	12.2 l/min - 75.9 l/min
Type of oil	CLAAS AGRIMOT SDX 15W-40; CLAAS AGRIMOT SDX FE 15W-30
Max oil temperature	80 °C

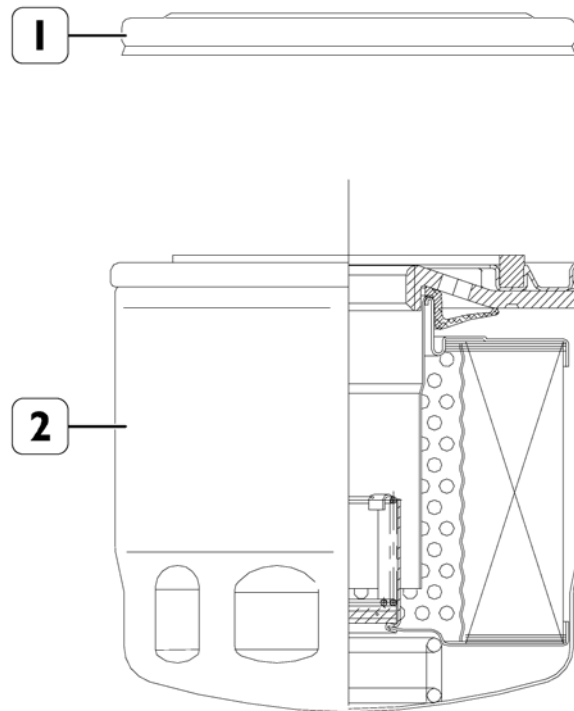
Balancing system with counter-rotating counterweights



1. Alignment and timing marks - 2. End stop bushes - 3. Sockets -
4. Counter-rotating counterweights - 5. Shafts - 6. Housing

Fig. 7

Oil filter

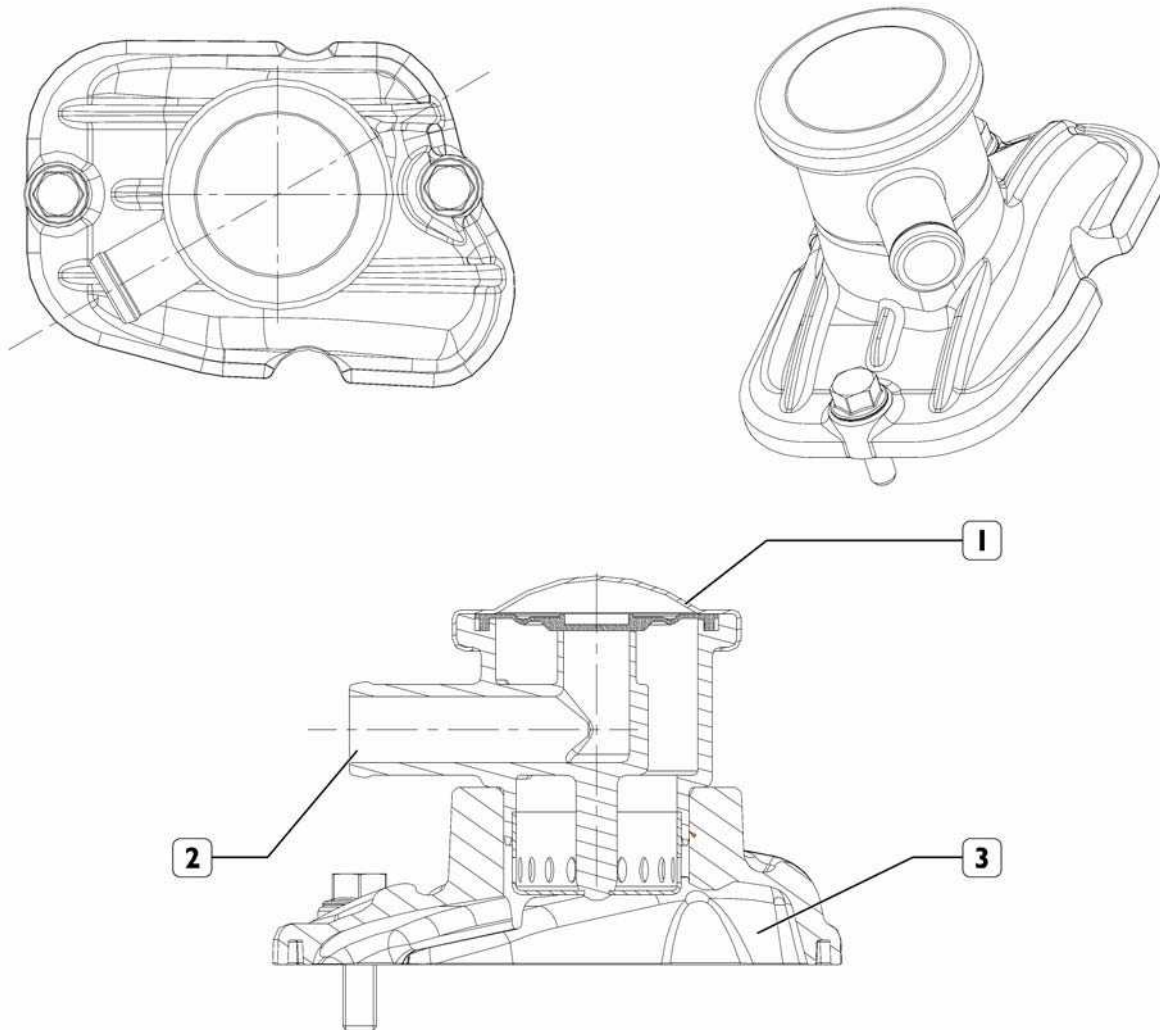


1. Protection cover - 2. Cartridge.

Fig. 8

SPECIFICATIONS OF THE FILTER	
Burst pressure	20 bar (ISO 4548/3)
Thrust pressure:	0 - 15 bar (1Hz) > 50 000 cycles (ISO 4548/5)
Operating temperature:	-40 / +140°C
Tightening torque:	32.5 ± 2.5Nm
Maximum flow rate:	50 l/min
Load loss at end of life:	2.5 bar
Build-up power:	> 15 g with a load loss of 2.5 bar (ISO 16889)

Oil gas recycling



1. Valve - 2. Breather - 3. Rocker cover.

Fig. 9

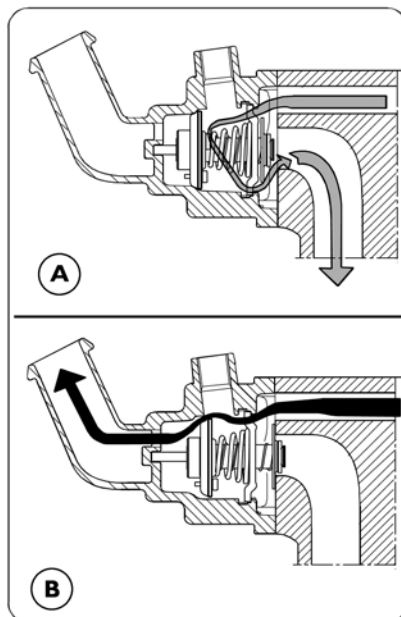
Fitted on the rocker cover (3), the valve (1) condenses oil vapors by ensuring they fall by gravity into the rocker cover (3). Uncondensed vapors remaining are conveyed through the breather (2) for example in intake (these vapors must be conveyed by the preparator).

Cooling

The engine cooling circuit, by closed circuit forced flow, includes the following elements:

- Expansion tank: its location, shape and dimensions may vary according to the engine layout;
- Radiator: it dissipates heat extracted from the engine by the coolant. The location and dimension of this element also depend on the type of layout;

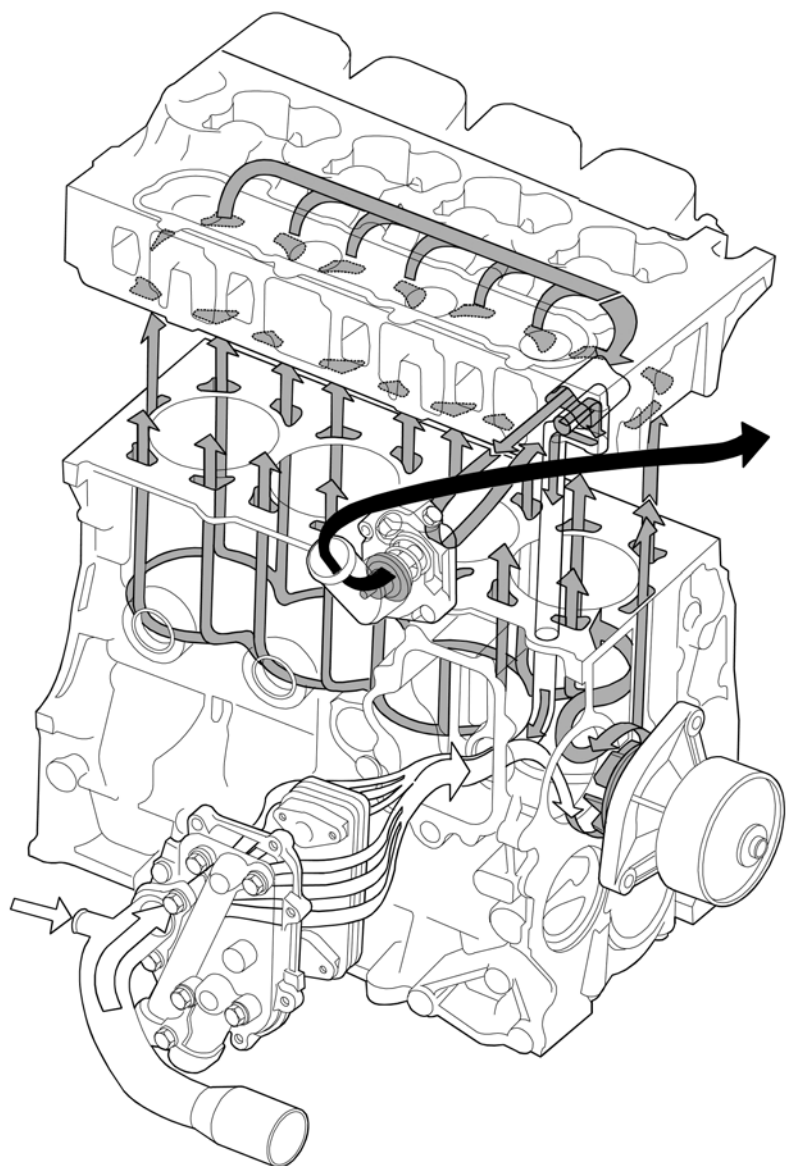
- Fan: it increases the dissipating power of the radiator. It is also part of the specific layout of the engine;
- A heat exchanger to cool lubrication oil. It is also part of the specific layout of the engine;
- A centrifuge water pump housed at the front of the engine block;
- A coolant regulation thermostat.



A Thermostat closed

B Thermostat open

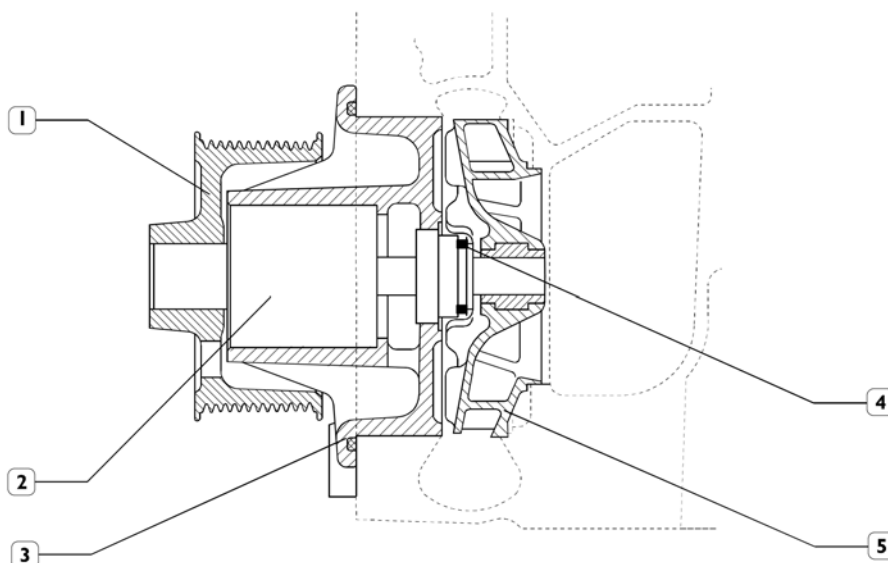
-  Inlet water
-  Water flowing in the engine
-  Water at thermostat outlet



COOLING CIRCUIT DIAGRAM

Fig. 10

Water pump



CROSS-SECTION OF THE WATER PUMP

1. Hub - 2. Shaft with bearing - 3. Pump body - 4. Gasket - 5. Crown gear.

Fig. 11

The water pump is of the centrifuge with vanes type. The pump bearing (2) forms one piece with the crown gear shaft. Sealing between the pump body (3) and the shaft (2) is ensured by a gasket (4).

Thermostat

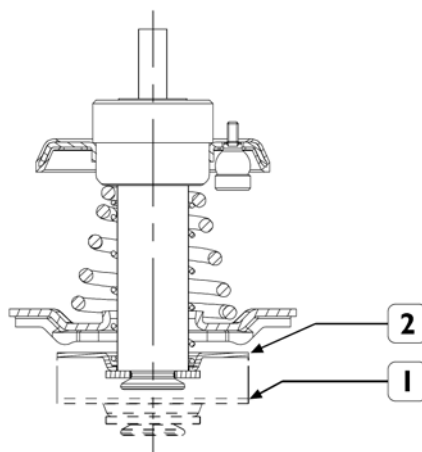


Fig. 12

Operation

When the engine is cold, water exits from the front of the cylinder head and enters a port housing the thermostat, bypassing the water flow to the radiator. Water flow then only occurs between the pump and engine to allow fast temperature build-up. The thermostat valve starts opening at about 80°C to allow water flow through the radiator, while closing direct return to the engine. Check the operation of the thermostat, in case of doubt, change it.

1 Stroke start at 79°±2°C

2. Stroke 7 mm at 94°±2°C

Heat exchanger

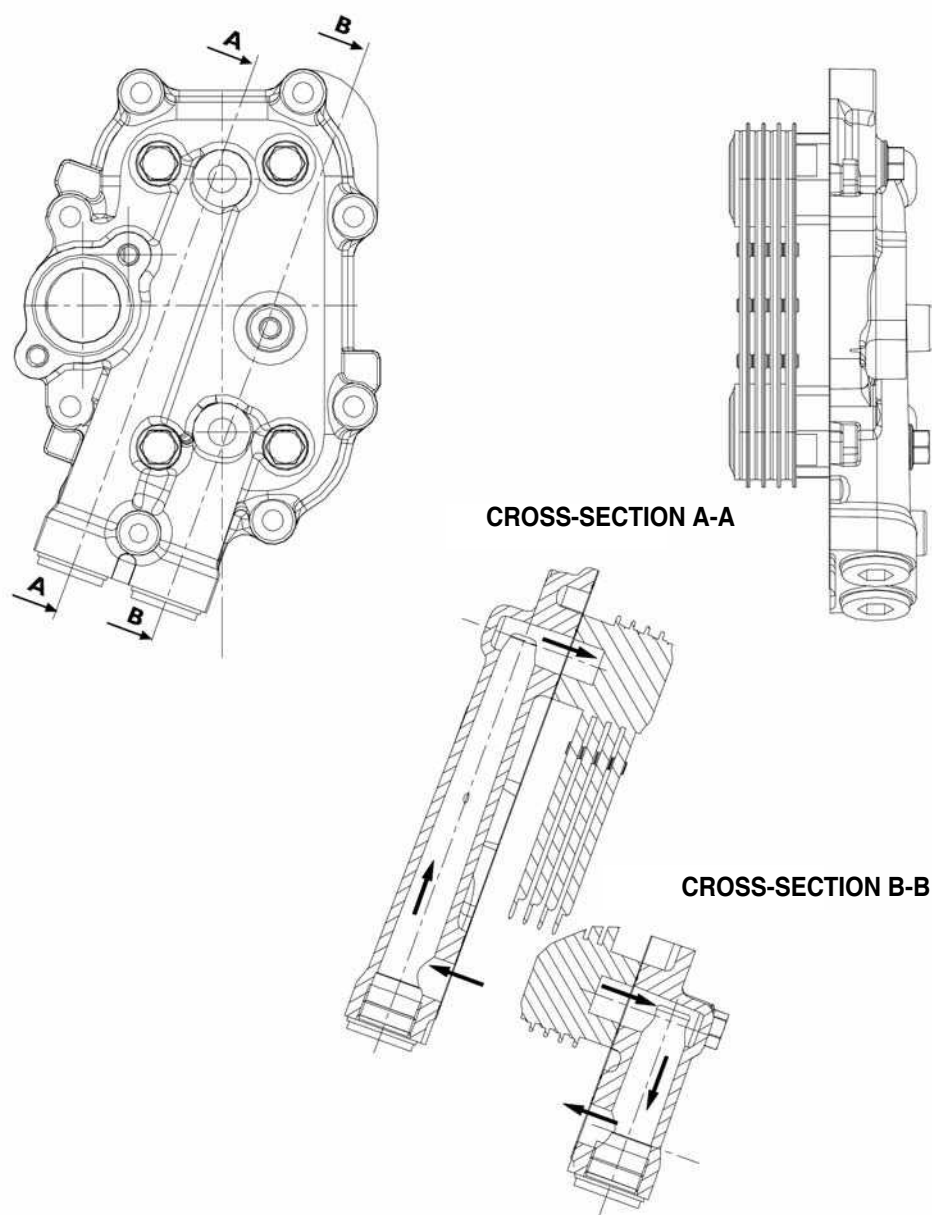


Fig. 13

Integrated to the engine cooling circuit, the purpose of the exchanger is to regulate the oil temperature by eliminating heat by the means of the coolant.

Exhaust Gas Recirculation (EGR) system

Exhaust gases may reflow partially in the cylinders to reduce the maximum values of combustion temperatures responsible for production nitrogen oxide (NOx).

By reducing combustion temperature, the exhaust gas recirculation system (EGR) is an effective system for controlling NOx emissions.

Internal EGR acting on intake valves

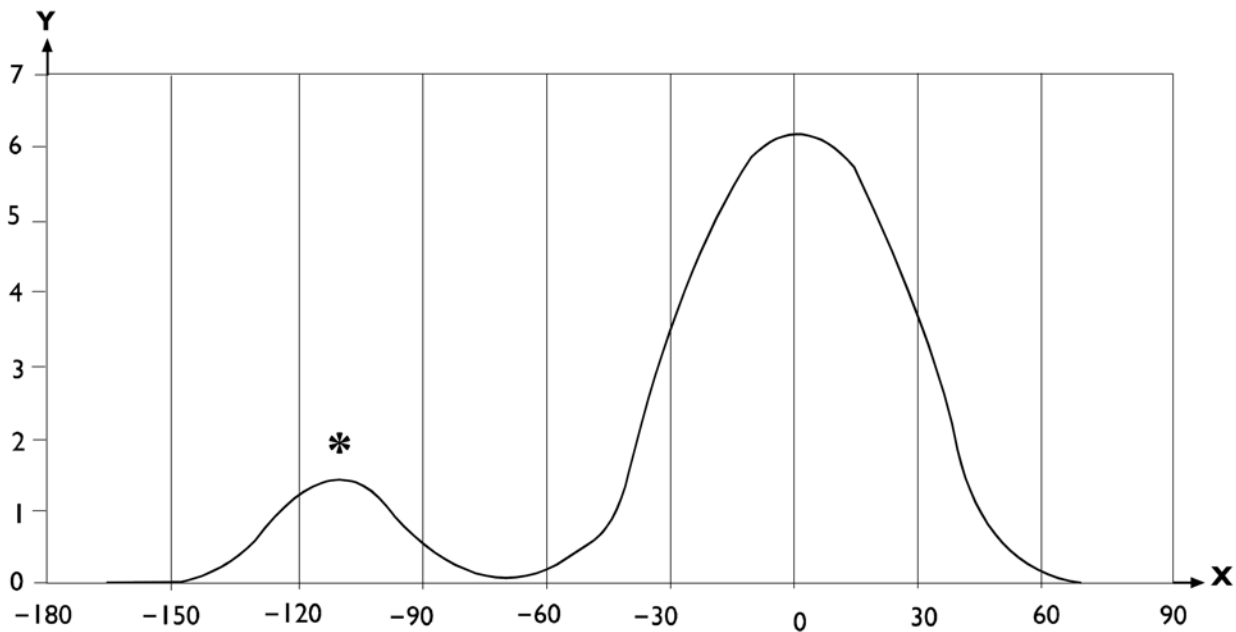
Thanks to a specific design of the intake cams, the internal EGR system allows part of the exhaust gases to be reintroduced into engine cylinders.

This type of EGR, internal EGR, is fitted with no electronically controlled element, the system is active permanently.

Its configuration does not require additional elements, such as control valves, pipes or heat exchangers, explaining why the engine remains intact.

In addition to the main lobe, the intake cam has another lobe compared with the configuration without EGR. During the cylinder exhaust phase examined, this lobe allows brief anticipated opening of the intake valves (*). Therefore, part of the exhaust gases are trapped in the intake duct and then during the intake phase of the cylinder, it is reintroduced in cylinder loading for the combustion phase.

Profile of the intake cams



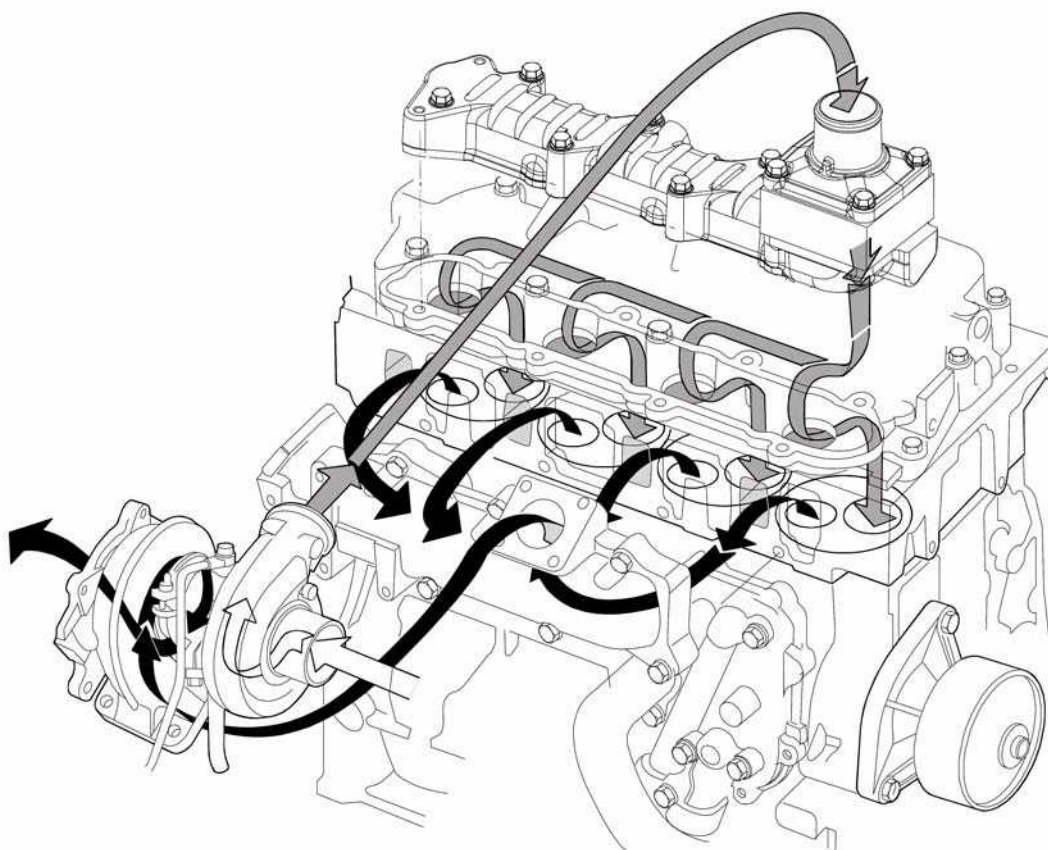
X. Cam rotation angle in degrees - Y. Valve lift in mm.

Fig. 14

Supercharging

The circuit includes:

- an air filter,
- a fixed geometry turbocharger,
- an 'intercooler' radiator (where present).



-  Intaken air
-  Hot compressed air
-  Engine exhaust gas

Fig. 15

FUEL SUPPLY

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