TECHNOLOGICAL EXCELLENCE

NEF ENGINE

N45 MNA M10
N67 MNA M15

TECHNICAL AND REPAIR MANUAL

MARCH 2006 EDITION

IVECO MOTORS

FPT POWERTRAIN TECHNOLOGIES

FOREWORD

We strongly recommend that you carefully read the indications contained in this document: compliance with them protects the engine against irregular operation and assures its reliability, safeguarding sea-going and maintenance personnel against accident hazards.

The indications contained in this document pertain to the N45 MNA M10.00, N45 MNA M10.01, N67 MNA M15.00, N67 MNA M15.01 marine engine and complement the IVECO MOTORS publication of "Marine Diesel Engines Installation Handbook" that the reader should refer to for anything that is not explained herein.

Technical engineers and fitters are required to comply with safety regulations on work. They have to implement and adopt the device required for individual personal safeguard while carrying out maintenance or checks.

Safety rules are reported in Section 9 of this publication.

Regulations on handling engine are reported at the end of Section 6 of this publication.

In order to start the engine, strictly follow the procedure stated at the end of Section 5 of this publication.

To get the best possible performance out of the engine, it is mandatory to conform with its intended mission profile. The engine must not be used for purposes other than those stated by the manufacturer.

IVECO MOTORS is available beforehand to examine requirements for special installations, if any.

In particular

- ❑ Use of unsuitable fuels and oils may compromise the engine's regular operation, reducing its performance, reliability and working life;
- ❑ Exclusive use of IVECO Original Parts is a necessary condition to maintain the engine in its original integrity;
- ❑ Any tampering, modifications, or use of non-original parts may jeopardize the safety of service personnel and boat users.

To obtain spare parts, you must indicate:

- Commercial code, serial number and indications shown on the engine tag;
- Part number of the spare as per spare part catalog.

The information provided below refer to engine characteristics that are current as of the publication date.
IVECO MOTORS reserves the right to make modifications at any time and without advance notice, to meet technical or commercial requirements or to comply with local legal and regulatory requirements.

**We refuse all liability
for any errors and omissions.**

The reader is reminded that the IVECO MOTORS Technical Assistance Network is always at the Customer's side with its competence and professionalism.

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SECTION CONTENTS

Indications for consultation

The different versions of the motors are generally hown using the same pictures and descriptions, however important differences are shown separately.
Sections 1-2-3 are intended for sales personnel, to provide them with exact knowledge of the product's characteristics and enable them to meet the Customer's demands with precision.

The remaining sections are meant for personnel in charge of carrying out ordinary and extraordinary maintenance; with an attentive consultation of the chapter devoted to diagnosing, they will also be able to provide an effective technical assistance service.

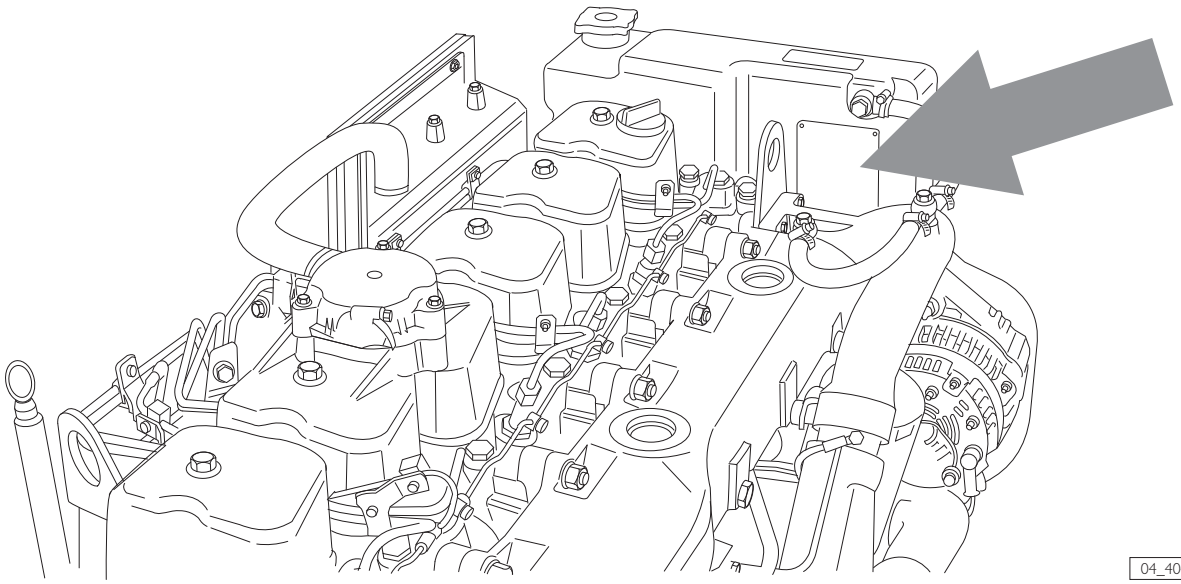
SECTION 1

OVERVIEW

(continues on next page)

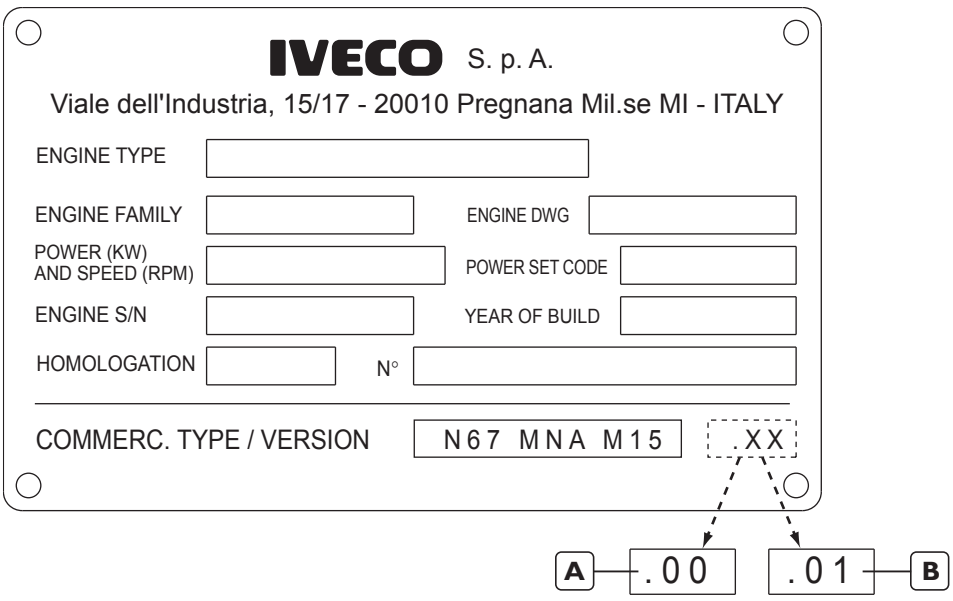
IDENTIFYING DATA

Figure 1



The engine identification data are stenciled on a tag positioned aside the coolant tank.

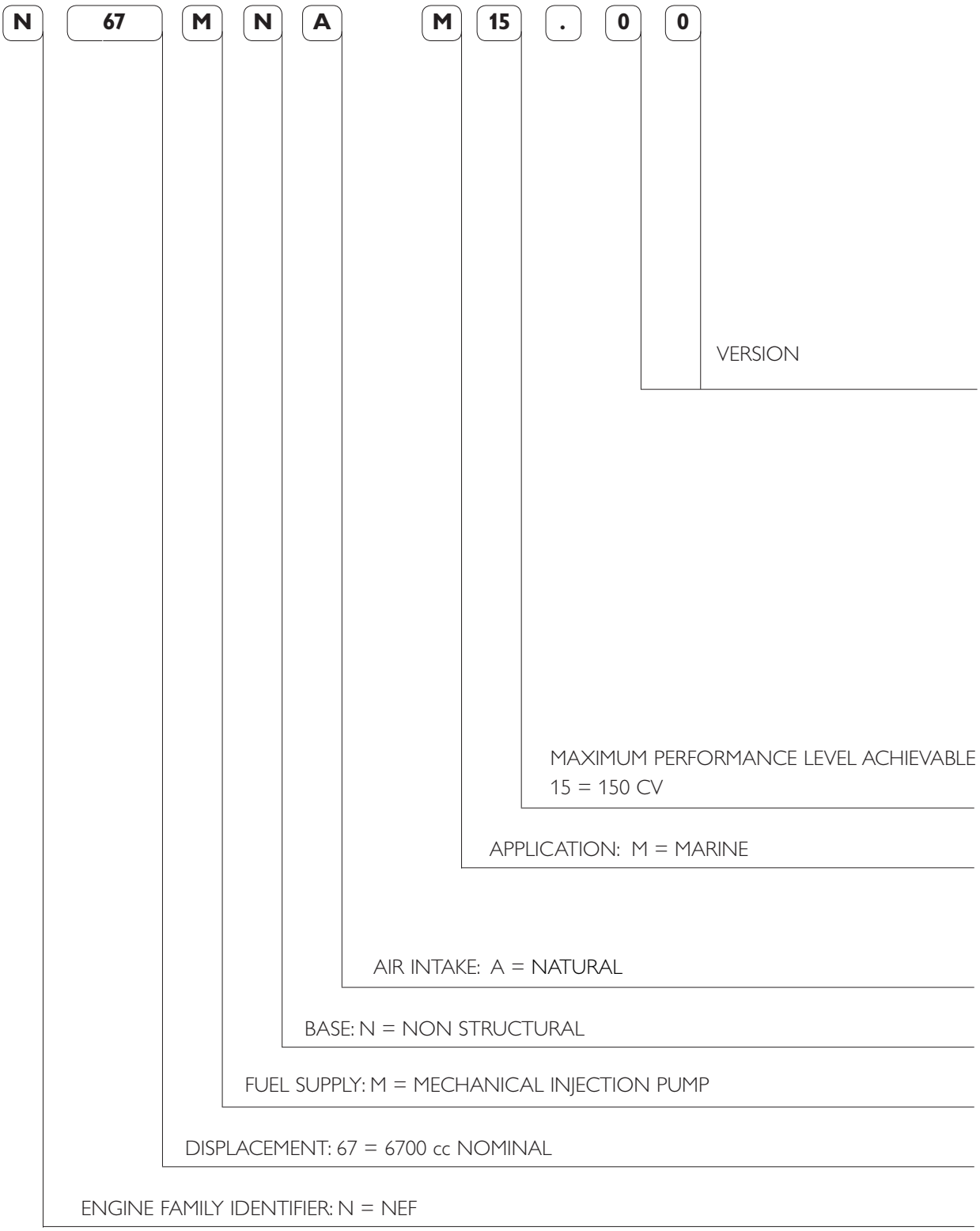
Figure 2



The last two figures of the commercial code refer to the engine model (detail A or B in figure n. 2).
Until the beginning of the year 2006 the engines produced had the code N45 MNA M10.00 or N67 MNA M15.00 (detail A in figure n. 2).
During the year 2006 relevant modifications have been made to the electric system and to the fuel supply circuit and a new model identified with the code N45 MNA M10.01 or N67 MNA M15.01 was created (detail B in figure 2).
This document concerns both the models. The relating contents are developed in different chapters which can be identified thanks to the presence in each title of the extension M10.00/M15.00 or M10.01/M15.01.

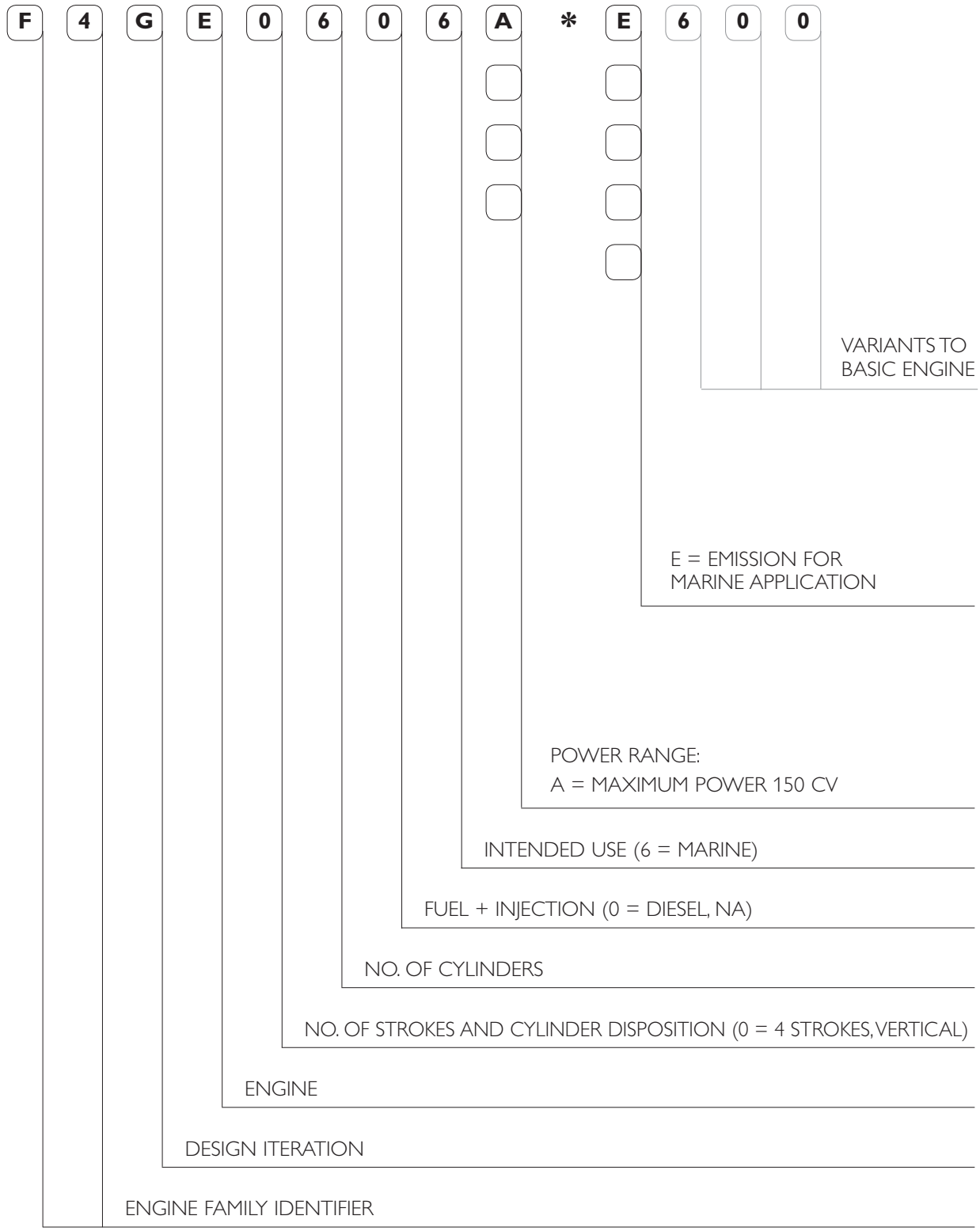
COMMERCIAL CODE

The purpose of the commercial code is to make the characteristics of the product easier to understand, categorizing the engines according to their family, origins and intended application. The commercial code, therefore, cannot be used for the technical purpose of recognizing the engine's components, which is served by the "ENGINE S/N".



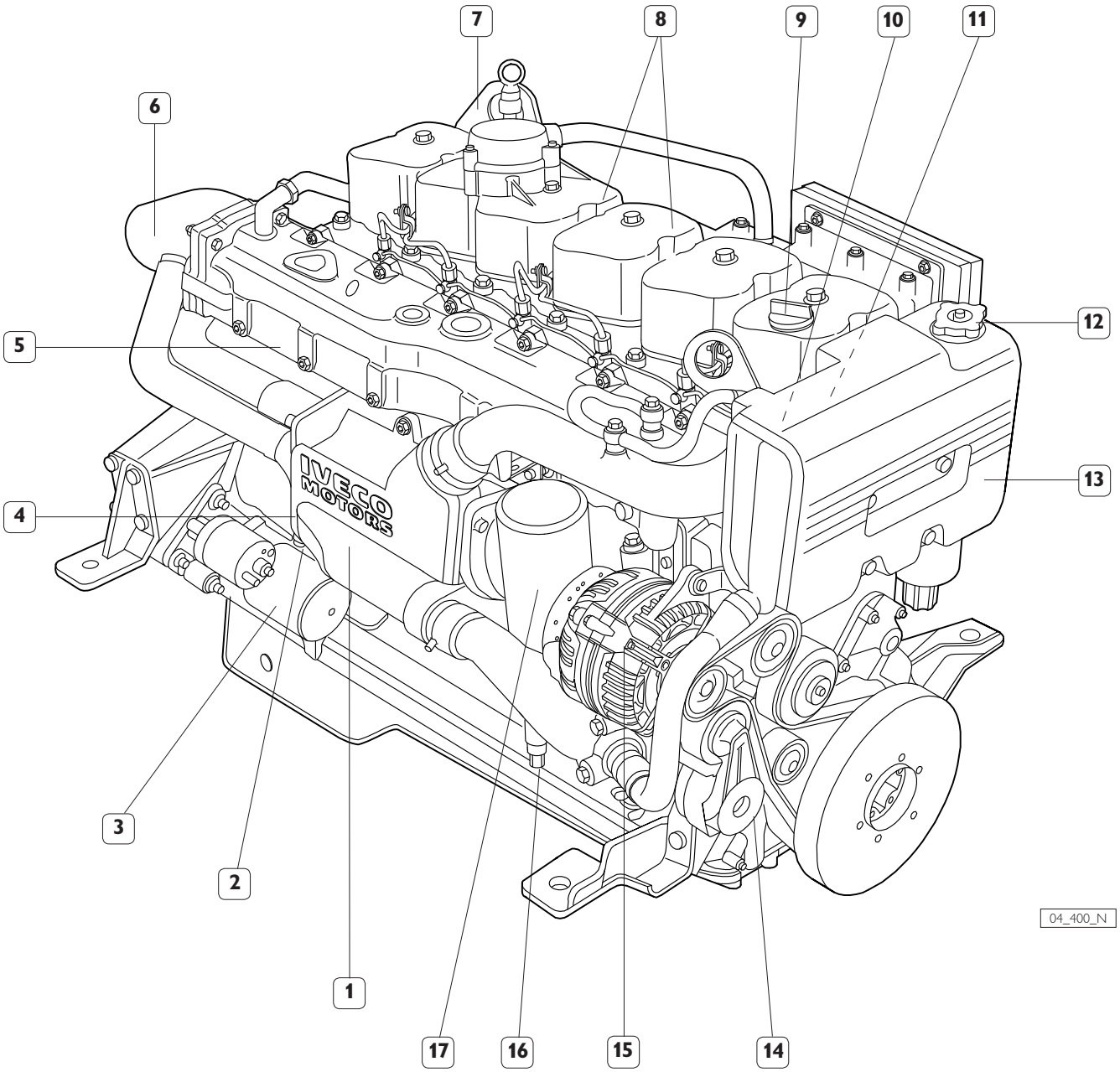
PRODUCT MODEL NUMBER

The model number is assigned by the manufacturer; it is used to identify the main characteristics of the engine, and to characterize its application and power output level. It is stamped on a side of crank-case, close to oil filter.



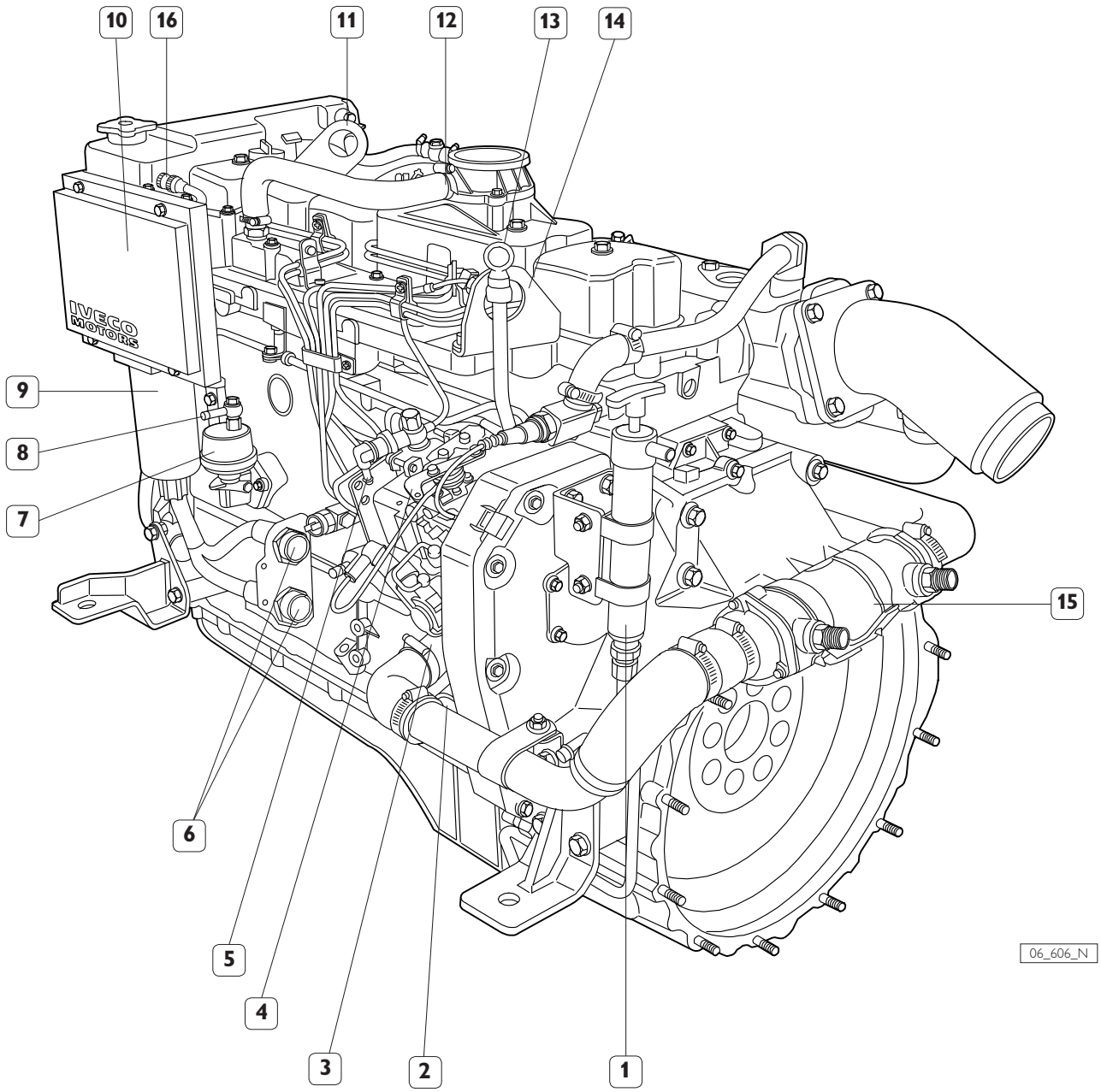
ENGINE PARTS AND COMPONENTS

Figure 3



1. Tube bundle engine coolant / sea-water heat exchanger - 2. Engine coolant discharge cap - 3. Electric starter motor - 4. Location of sacrificial anode - 5. Cooled exhaust manifold - 6. Exhaust gas and sea-water discharge pipeline - 7. Lifting eyebolt - 8. Rocker arm covers - 9. Oil refill cap - 10. Location of thermostatic valve - 11. Cap for engine coolant outlet to sanitary water heating system - 12. Coolant refill cap - 13. Engine coolant tank - 14. Auxiliary belt automatic tensioner - 15. Alternator - 16. Cap for engine coolant discharge and recirculation from sanitary water heating system - 17. Oil filter.

Figure 4



1. Manual lubricating oil extraction pump - 2. Sea-water inlet - 3. Sea-water pump - 4. Throttle lever lever on injection pump - 5. Rubber holder junction for fuel outflow to the tank - 6. Wiring connectors N45 MNA M10.00 and N67 MNA M15.00 - 7. Low pressure mechanical feed pump - 8. Fuel intake fitting - 9. Fuel filter - 10. Combustion air filter - 11. Lifting eyebolt - 12. Oil vapours vent - 13. Oil dipstick - 14. Lifting eyebolt - 15. Sea-water junction pipe from after-cooler to engine coolant/sea-water heat exchanger (Oil gearbox heat exchanger, on request) - 16. Connector for instrument panel connection wire harness N45 MNA M10.01 and N67 MNA M15.01.

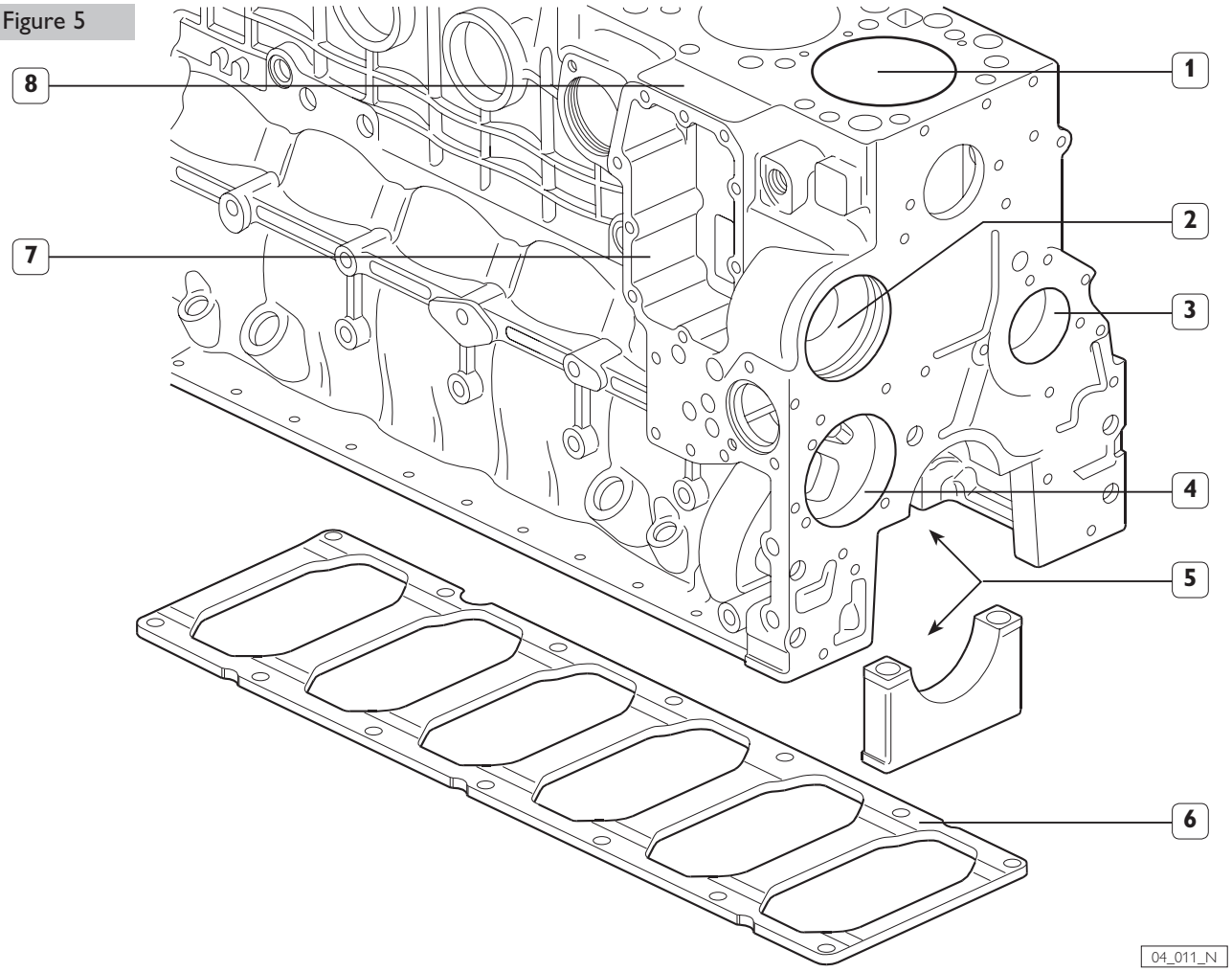
ENGINE ARCHITECTURE

NEF engines are the highest expression of design and engineering efficiency that IVECO MOTORS makes available on the market place. They are highly innovative engines designed to be able to comply now with the regulations on fumes and acoustic emissions that will be enforced in the near future.
Designed with innovative techniques and manufactured with advanced working processes, they are the result of hundreds of years of design and engineering tradition as well as of an important international cooperation.
The excellent performance of NEF engines originates from induction and exhaust ducts of new design where, by improving the gas exchange phases, the intaken air turbolence is improved, thus enabling the complete exploitation of the new injection system capacity.

The new criteria chosen in defining the parameters setting the combustion conditions, metering and injection, enable to obtain new balance between high performance and consumption reduction. NEF engines can be fitted with a mechanical pump or a total electronic controlled "Common Rail" fuel supply system.
Every technical solution has been accurately devised so as to assure qualitative product perfection. The configuration of the engine itself has been designed in such a way as to facilitate access to each individual part thus reducing maintenance time.
Cylinder head fitted with two valves per cylinder, rear timing control, new design connecting rods and aluminum-nickel pistons are components of an engine fitted with 40% less elements than an engine of equivalent performance.

Crankcase

Figure 5

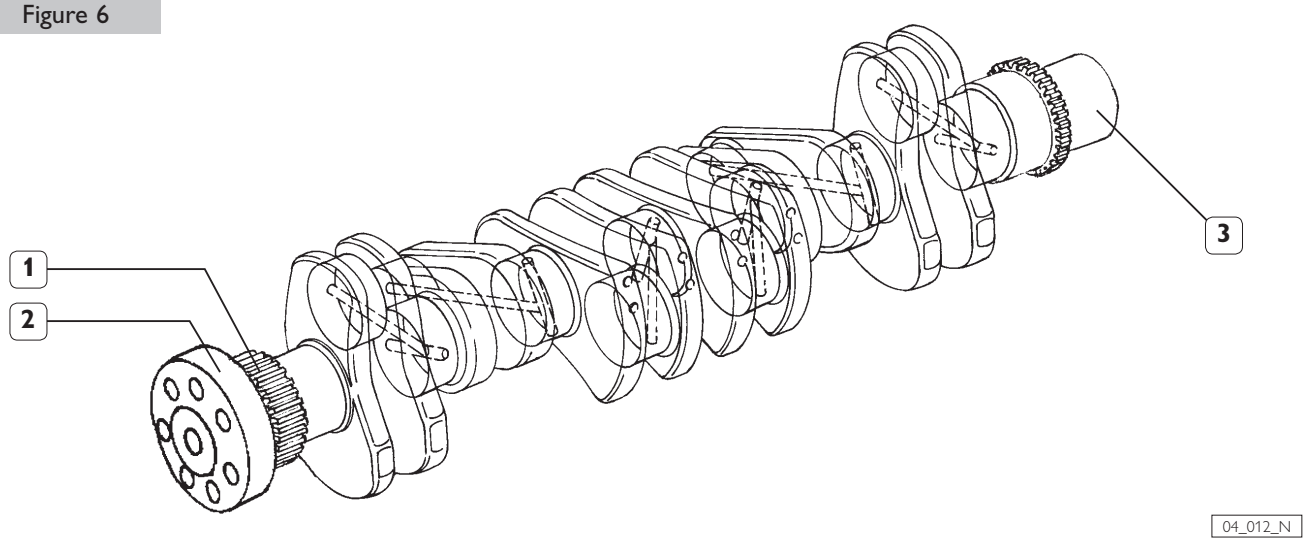


1. Reconditionable integral cylinder barrels - 2. Water pump seat - 3. Camshaft bushing seat - 4. Oil pump seat - 5. Main bearings - 6. Crankcase backing plate - 7. Oil cooler (water/oil) seat - 8. Product model number location.

Moreover, within the cast iron crankcase, coolant circulation grooves, ducts for lubrication loops for the various machine parts and the seat for push rod bushings have been grooved in. The backing plate (6) applied to the lower part makes the crankcase tougher and improves resistance to stress.

Crankshaft

Figure 6

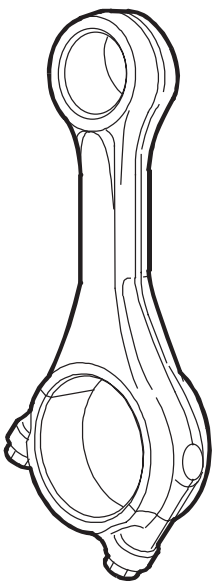


1. Timing system driving gear - 2. Flywheel connecting hub - 3. Oil pump driving gear.

The crankshaft is made in steel hardened by induction and rests on seven mountings; inside the hollow shaft are the ducts for the lubrication oil circulation.
On the front tang, the oil pump driving gear, the phonic wheel, the flywheel connecting hub and the driving pulley of the ancillary components are keyed on.
On the rear tang the camshaft driving gear and the coupling flange to the engine flywheel are keyed on.
The bench half bearings are in cast babbitt lining steel and the 6th is fitted with a shoulder ring to contain the end play of the driving shaft.
Details 1 and 2 in the figure, assembled by negative allowance on the rear tang, are not replaceable. The front and rear retaining rings are of the slide type with radial seal and require special fixtures to be assembled and disassembled.

Connecting Rods

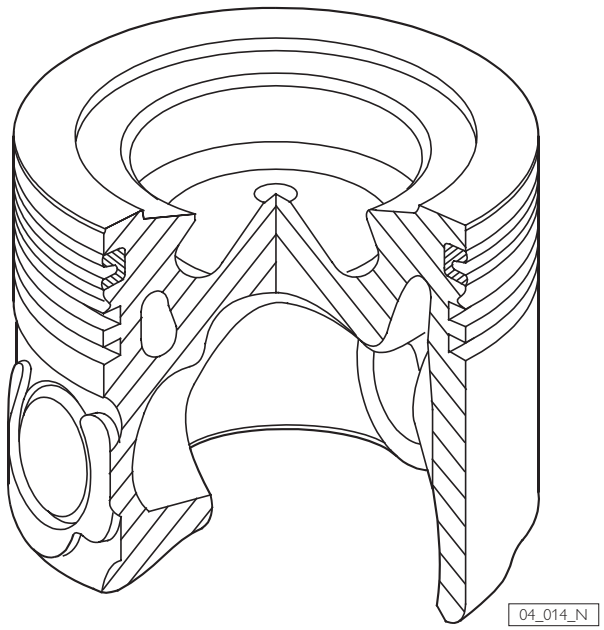
Figure 7



They are made in steel, manufactured by pressing, with small end oblique edged and cap separation obtained by fracture splitting technique.
The connecting rod half bearings are cast babbitt lining steel.
Every connecting rod is marked on the body and on the cap by a number that identifies their coupling and the cylinder into which it is to be assembled; moreover, a letter is impressed on the body stating its weight class.
In case a replacement were necessary, only one type of connecting rod is available as spare part of an intermediate class weight that can be used to replace any other. Therefore, connecting rods that are still efficient, do not need to be replaced even if they are of a different class weight.

Pistons

Figure 8

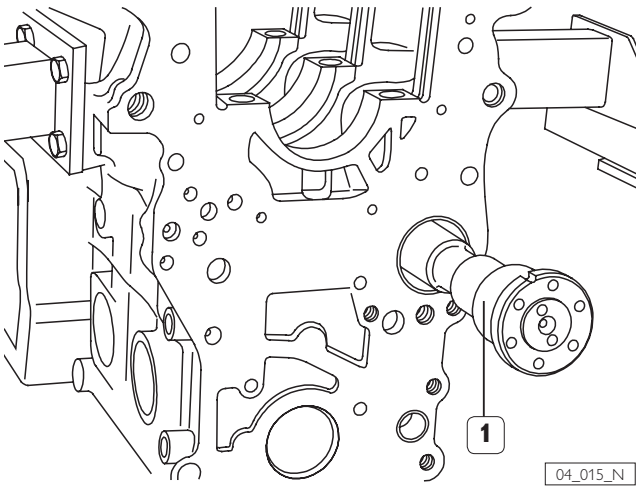


The pistons integrate the high swirl combustion chamber; the annular chambers inside the junk ring enable an effective heat elimination obtained by circulating the lubrication oil delivered by the spray nozzles mounted on the crankcase. On the piston skirt the are three seats for the retaining rings; the first one of these is obtained by a special trapezoidal section cast iron insert.
The piston rings have different functions and different geometry.

- The 1st piston ring has a trapezoidal section and ceramic chrome plating;
- The 2nd piston ring has a a torsional conical rectangular seal;
- The 3rd piston ring has a double oil scraper with internal spring.

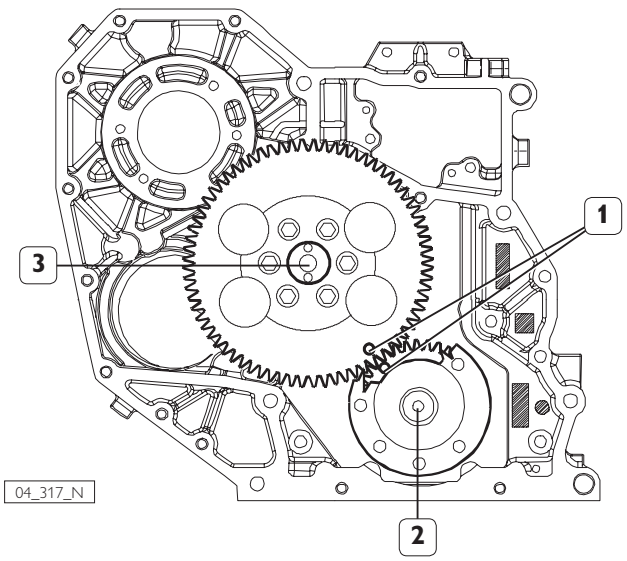
Timing system driving gear

Figure 9



The timing system driving gear machine is a push rods and rockers type, with a camshaft (1) that is located in the crankcase and set into rotation directly by the crankshaft.

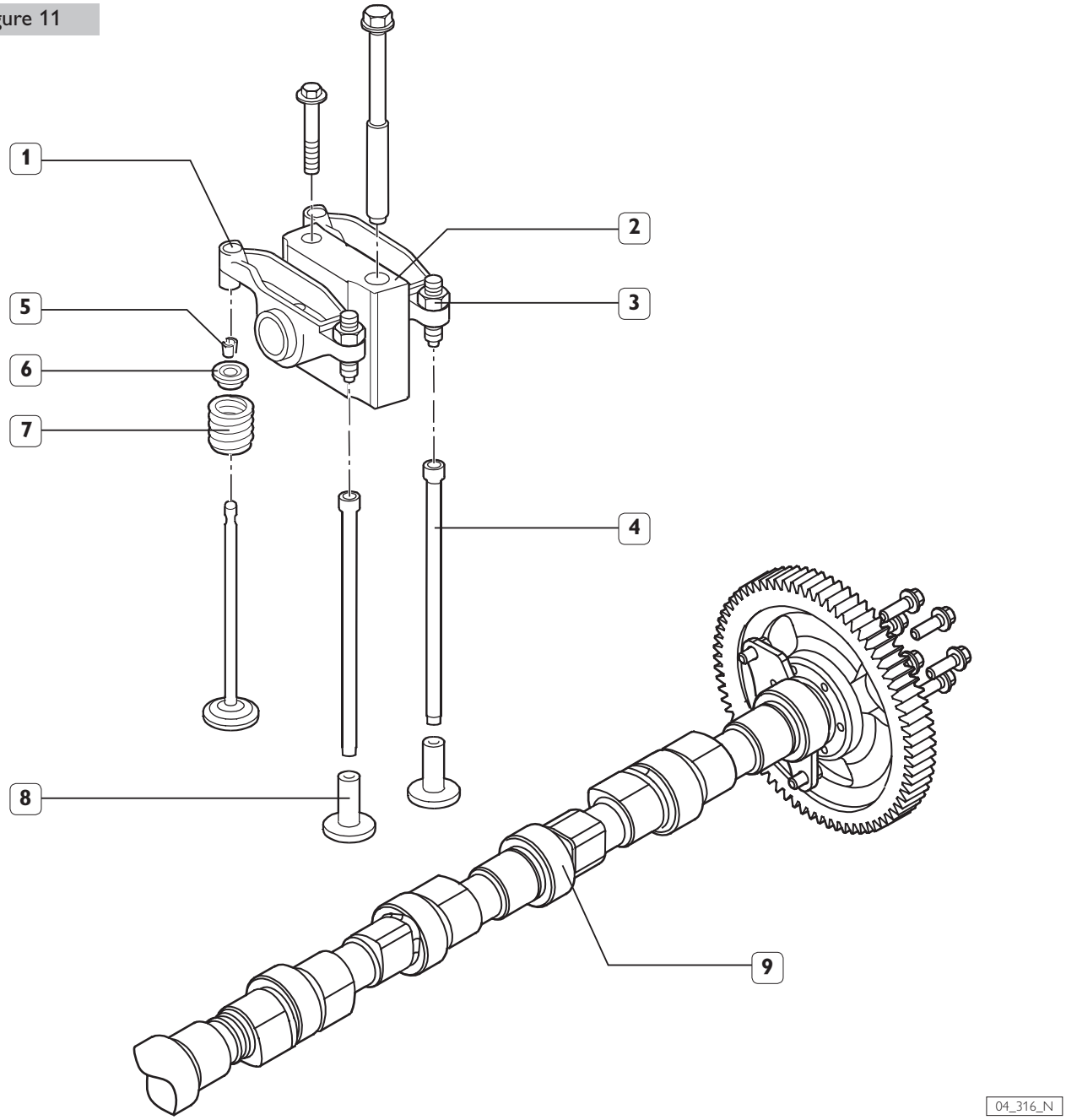
Figure 10



1. Positioning reference - 2. Crankshaft - 3. Camshaft.

The figure illustrates the position that the toothed wheel has to have to set the correct timing strokes.

Figure 11



1. Rocker - 2. Rocker support - 3. Adjuster screw - 4. Rod - 5. Cotters - 6. Cup - 7. Spring - 8. Tappet - 9. Camshaft.

The timing camshaft rests on seven mountings; the mounting points at front and rear end, are fitted with cast babbitt lining steel bushings, assembled by negative allowance.
The timing camshaft is set into rotation by the crankshaft with direct coupling to a straight toothed wheel.