CASE
PROFESSIONAL PARTNER

REPAIR MANUAL
FOR CNH U.K. ENGINES

667TA/EEG
667TA/EEC
667TA/EBF
667TA/EED
667TA/EBD

CE

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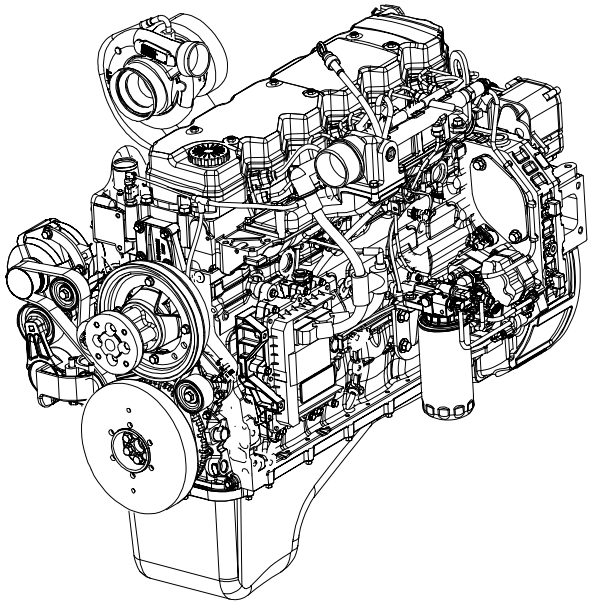
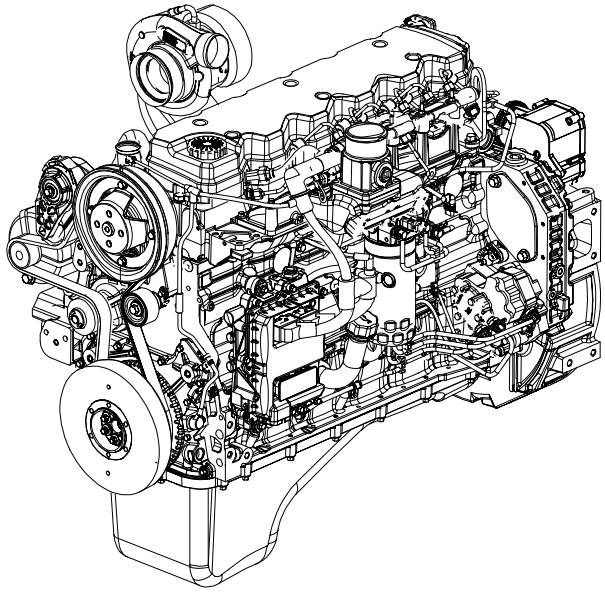
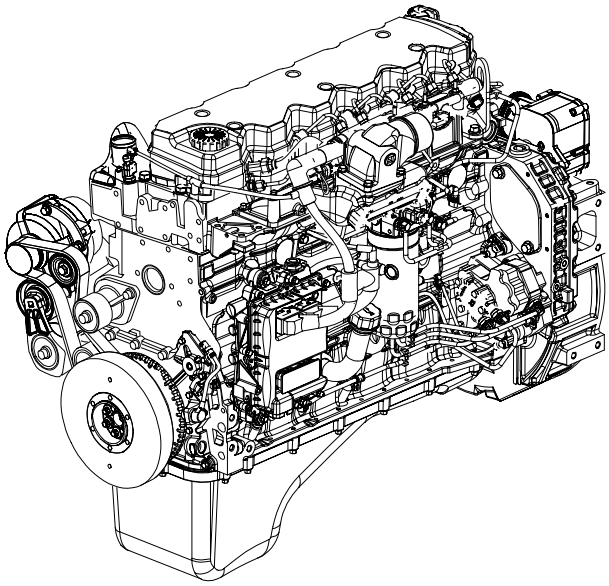


667TA/EEG - 667TA/EEC



667TA/EBF - 667TA/EED



667TA/EED - 667TA/EBD

Every information, illustration and specification contained in the present manual is based on the most recent information available at the time of printing.

CNH Italia S.p.A. reserves the right, to modify the text at any time without prior communication.

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INTRODUCTION

TO THE READER

- ❑ This manual was written for a skilled technician and contains all the technical information needed to repair this vehicle.
- ❑ Read this manual carefully for the information concerning repairing operations.

FURTHER REFERENCES

PAGE NUMBER

- ❑ Every page carries a number on the top right corner. Every page contains the following information:

Example: **T 1 - 2 - 3**

- → Progressive page number for each group
- → Group number (if any)
- → Section number
- → **S:** Safety rules
- → **T:** Technical section { Operation principle / Performance tests / Fault diagnosis
- → **W:** Instruction section for excavator repairing
- → **EW:** Instruction section for engine repairing

SYMBOLS

This manual contains safety warning symbols and indications referring to possible injuries or vehicle damages.

This symbol regards safety.

Use great care when you see this symbol because possible injuries to the personnel may occur.

Strictly observe the precautions marked with this symbol.

The safety warning symbol is used also to draw attention on the weight of a component or an element.

Make sure you are always using the right equipment and lifting techniques when handling heavy loads, in order to prevent injuries or damages.

UNIT OF MEASURE

This manual adopts the units of measure based on the International System.

The MKSA system units of measure are indicated within brackets after the units of measure of the International System.

Example: 24.5 Mpa (250 kgf/cm2).

The following table converts the International System units of measure in some of the main units belonging to other systems.

Quantity	To convert from (IS)	in (Others)	Multiply by
Length	mm	in	0.03937
	mm	ft	0.003281
Volume	L	US gal	0.2642
	L	US qt	1.057
	m^3	yd^3	1.308
Mass	kg	lb	2.205
Force	N	kgf	0.10197
	N	lbf	0.2248
Torque	N.m	kgf.m	0.10197
	N.m	lbf.ft	0.7375

Quantity	To convert from (IS)	in (Others)	Multiply by
Pressure	MPa	kgf/cm^2	10.197
	MPa	psi	145.0
Power	kW	PS	1.360
	kW	HP	1.341
Temperature	°C	°F	°C x 1.8 + 32
Speed	km/h	mph	0.6214
	min^{-1}	rpm	1.0
Capacity	L/min	US gpm	0.2642
	mL/rev	cc/rev	1.0

ENGINES

INDEX OF SECTIONS

DIAGNOSTICS

INDEX

DIAGNOSTICS

FOREWORD

A good diagnosis is carried out with the competence acquired from years of experience and taking part in repair courses.

When a user complains about a bad efficiency or operating anomalies, his indications must be kept into due account, taking from them those useful information that will be used to guide our intervention.

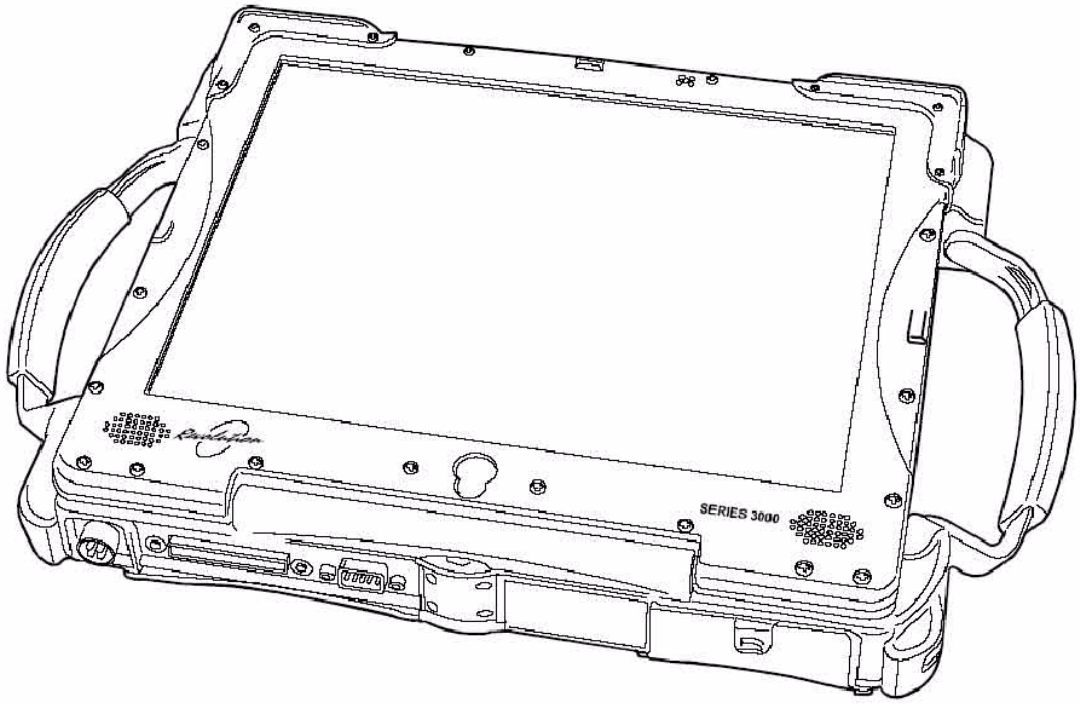
After having detected the anomaly, it is advisable to carry out failure search operations by decoding self–diagnosis data of the central electronic unit of theEDC (Engine Diesel Control) system.

With the use of computerised tools, it is also possible to establish a bi–directional communication with the central unit with which it is possible not only to decode the error codes, but also to address the image in its memory to obtain those further necessary information to go back to the anomaly origin.

Every time an inconvenience occurs and its existence is detected, it is necessary to proceed with the electronic unit query through one of the pointed–out ways and then proceed with the diagnostic survey through tests and measures through which an outline of operating conditions is obtained and the real anomaly reasons are identified.

In case the electronic unit does not provide indications, one will have to proceed with one's experience by adopting traditional diagnostic modes.

CNH – EST DIAGNOSTIC TOOL



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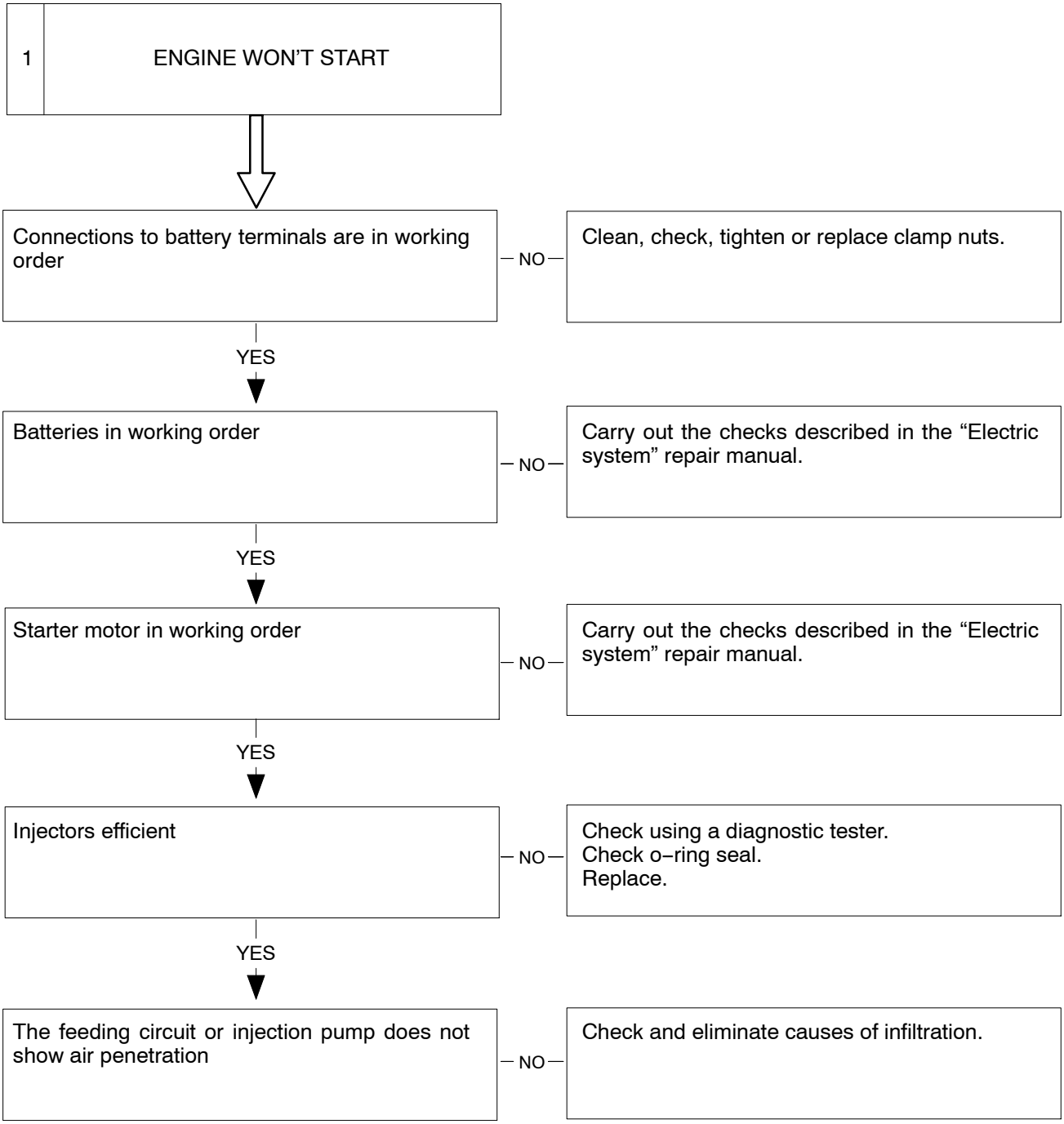
The EST system allows carrying out diagnoses onmainmachine assemblies by detecting the operating parameters of electronic control components (control units, sensors etc.) and the check of flow–rates, pressures and temperatures; it is further arranged for searching inconveniences and detect data for electronically–controlled CNH engines.

Code	Description	Language
380060157	CE EST diagnostic kit	Italiano
380060158		French
380060159		English
380060160		German
380060161		Spanish
380060162		Holland
380060163		Danish
380060164		Portuguese

MAIN ENGINE OPERATING ANOMALIES

1 – Engine won't start;
2 – Engine overheats;
3 – Engine lacks power and works erratically;
4 – Engine exhaust smoke black or dark grey;
5 – Engine exhaust smoke grey (verging on white);
6 – Engine exhaust smoke light blue;
7 – Engine knocks irregularly;
8 – Engine stops;
9 – Excessive or insufficient oil pressure;
10 – Excessive fuel consumption;



(to be continued)

DIAGNOSTICS

The feeding circuit or pump does not show traces of water — NO → Check and clean the feeding circuit (including the tank).

YES ↓

Prescribed compression ratio — NO → Overhaul the engine or make repairs only on concerned parts (valves, piston rings, etc.).

YES ↓

Fuel filters in working order — NO → Replace.

YES ↓

Pre–post heating system efficient — NO → Check using a diagnostic tester.

YES ↓

High pressure pump efficient — NO → Check using a diagnostic tester.

2	ENGINE OVERHEATS

YES ↓

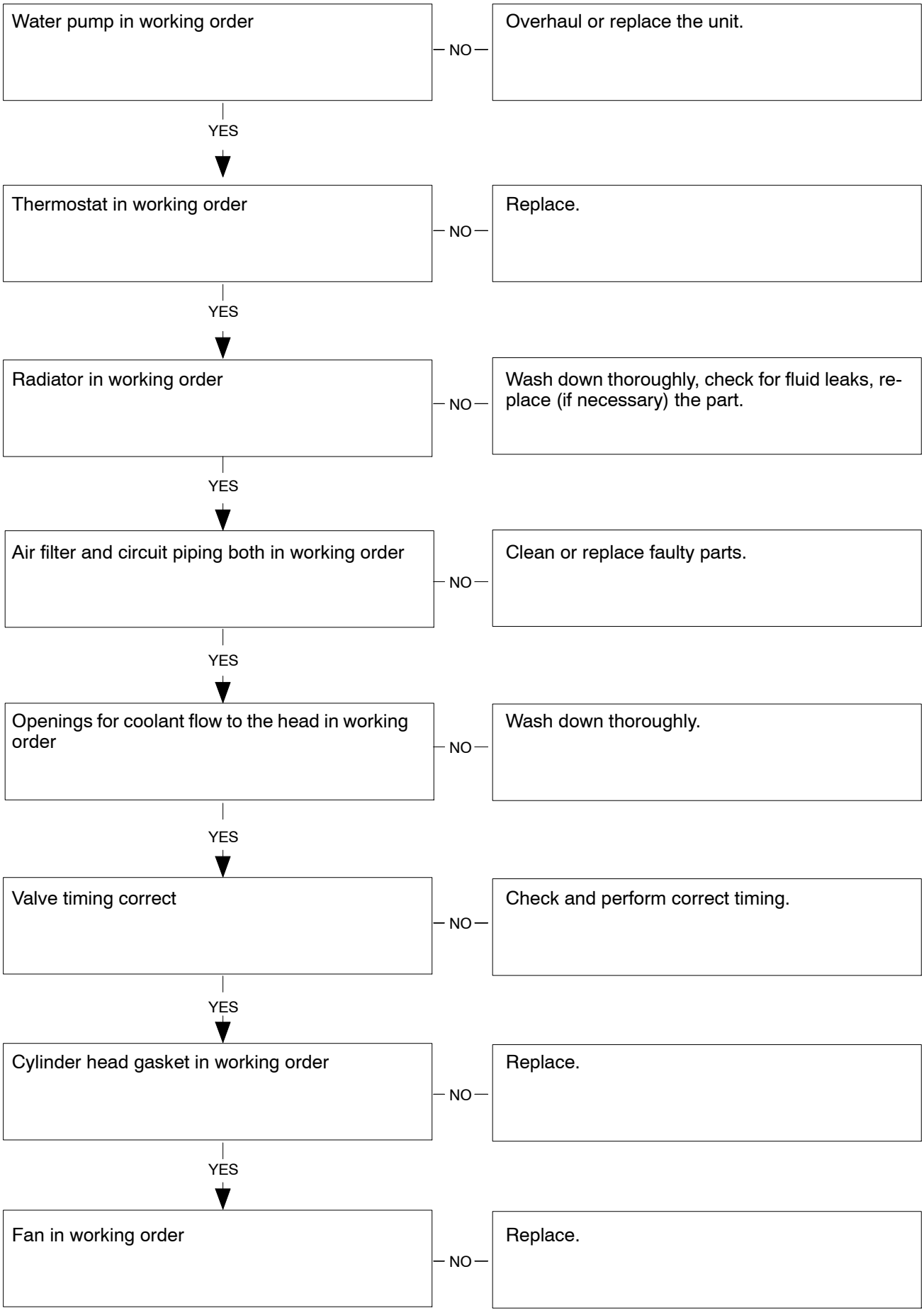
Coolant level correct — NO → Check for leaks and restore the level.

YES ↓

Fan and water pump drive belts in working order — NO → Check for leaks and restore the level.

(to be continued)

DIAGNOSTICS



3 ENGINE LACKS POWER AND WORKS ERRATICALLY

Air filter in working order
— NO — Clean the unit and replace (if necessary) the filter element.

YES

Fuel filters in working order
— NO — Replace by following the instructions given in the “Owner Handbook”.

YES

Feeding circuit in working order
— NO — Check and make (if necessary) the required repairs.

YES

The feeling circuit does not show impurities and/or traces of water
— NO — Take off the pipes and injection pump, clean them thoroughly, then clean (if necessary) and dry the fuel tank.

YES

Thermostat in working order
— NO — Replace.

YES

High pressure pump efficient
— NO — Check using a diagnostic tester and replace if necessary.

YES

Injectors efficient
— NO — Check using a diagnostic tester.
Replace.

(to be continued)

Rail pressure relief valves efficient — NO → Disconnect fuel return pipe from rail and check for leaks.

YES ↓

Correct play between the valves and rocker arms — NO → Adjust the play between the valves and rocker arms.

YES ↓

Prescribed compression ratio — NO → Check using a diagnostic tester.

YES ↓

Turbocharger in working order — NO → Repair or replace the unit.

4	ENGINE EXHAUST SMOKE BLACK OR DARK GREY

⇩

Air filter in working order — NO → Replace.

YES ↓

Injectors efficient — NO → Check using a diagnostic tester. Replace.

YES ↓

Prescribed compression ratio — NO → Check using a diagnostic tester.

(to be continued)

DIAGNOSTICS

High–quality diesel fuel — NO → Clean the tank and replace the diesel oil filter.

5 ENGINE EXHAUST SMOKE GREY (VERGING ON WHITE)

Injectors efficient — NO → Check using a diagnostic tester. Replace.

YES

Coolant level correct — NO → Possible flow of coolant into the combustion chamber; replace the cylinder head gasket or overhaul the engine.

YES

High–quality diesel oil — NO → Clean the tank and replace the diesel oil filters.

6 ENGINE EXHAUST SMOKE LIGHT BLUE

Excessive oil consumption — NO → Check: oil vapour breather; cylinder compression. Leaks into or out of turbocharger. Leaks from valve guides
Overhaul cylinder head or engine if necessary.

DIAGNOSTICS

7 ENGINE KNOCKS IRREGULARLY

Knock detected in the drive shaft
— YES — Check the following items: journal play and out–of–roundness; screw fastening for bed caps and engine flywheel; oil pressure. Replace the parts or overhaul the engine.

NO ↓

Knock detected in the connecting rods
— YES — Check the following items: crankpin play and out–of–roundness; screw fastening for connecting rod caps; connecting rod squaring. Replace the parts or overhaul the engine.

NO ↓

Knock detected in pistons
— YES — Check the following items: play between the pistons and the cylinder liners; integrity of piston rings; play between the pins and the piston hubs. Replace the parts or overhaul the engine.

NO ↓

Knock detected in the cylinder head
— YES — Check the following items: operation play between the rocker arms and the valves; injection pump timing; valve timing. Adjust.

NO ↓

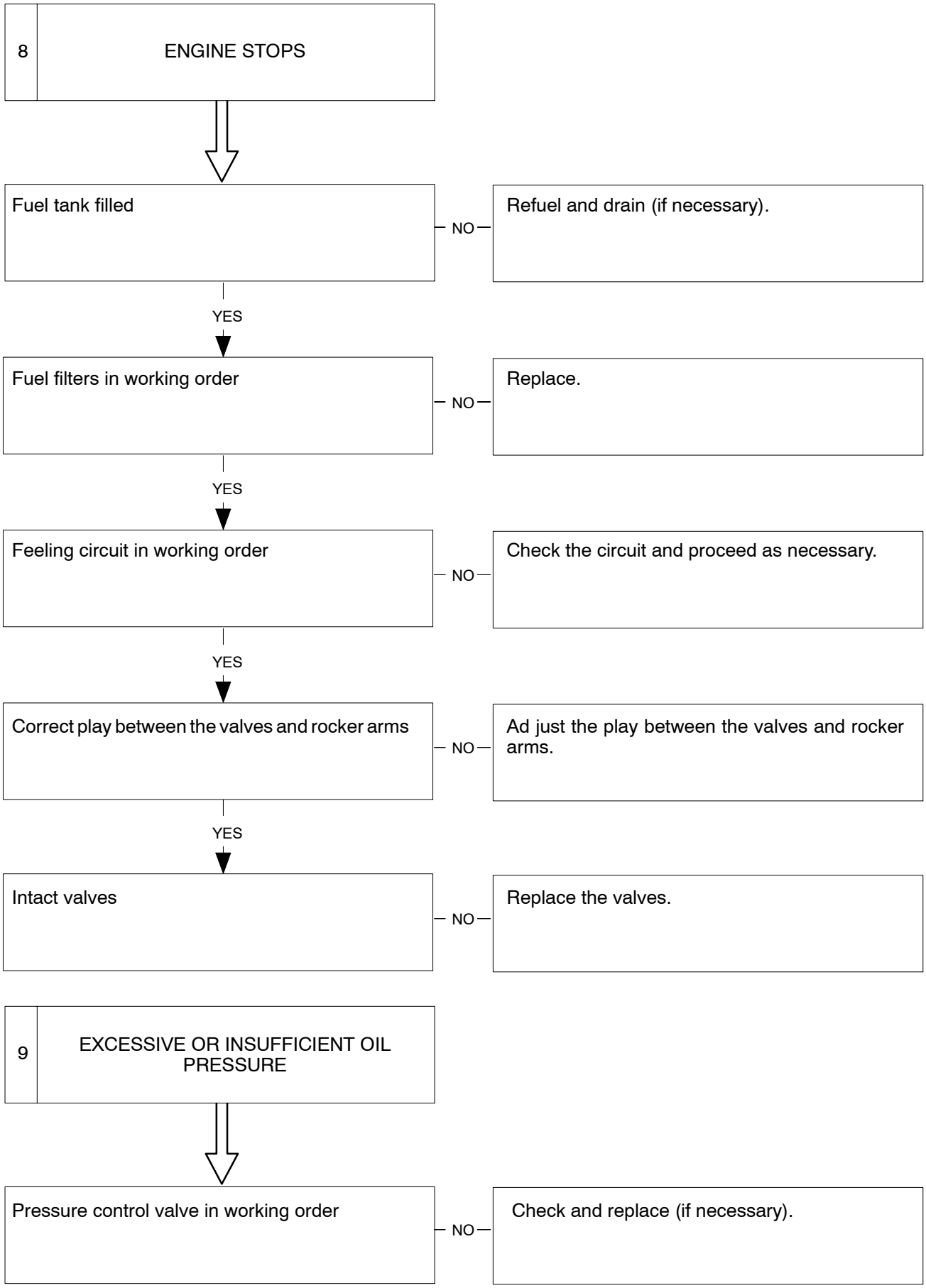
Knock detected in the valve gear
— YES — Check and replace (if necessary) the gears; moreover, check for broken springs, for excessive play between the stems and guides, the tappets and seats. Adjust the play between the valves and rocker arms.

NO ↓

Knock detected in injectors
— YES — Check using a diagnostic tester.
Replace.

NO ↓

Knock detected in the engine flywheel
— YES — Replace loose screws and tighten all screws to the specified torque and angles.



(to be continued)

Oil pump and delivery pipes both in working order — NO → Check and replace (if necessary).

YES ↓

Main bearings and connecting rod bearings both in working order — NO → Replace the bearings and reface (if necessary) the drive shaft.

YES ↓

Engine oil SAE viscosity conforming to standards — NO → Replace the engine oil with equivalent of adequate viscosity.

10 EXCESSIVE FUEL CONSUMPTION

Fuel tank and pipes in working order — NO → Eliminate leaks (if any) and replace the worn parts.

YES ↓

Air filter in working order — NO → Replace.

YES ↓

Injectors efficient — NO → Check using a diagnostic tester. Replace.

NOTES

ENGINE OVERHAUL

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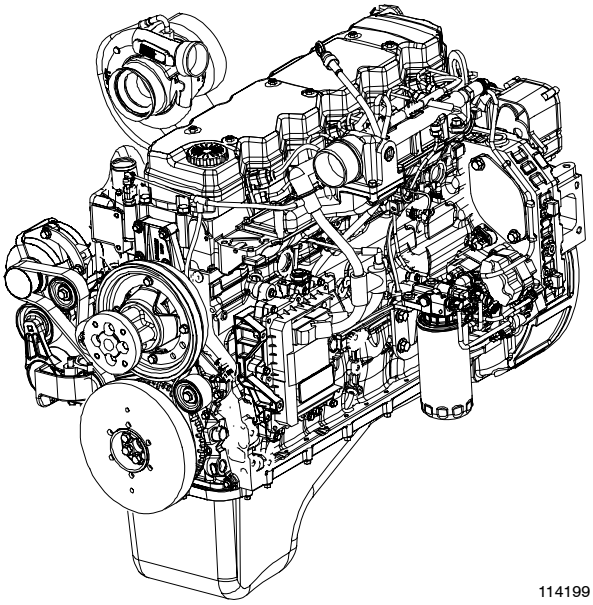
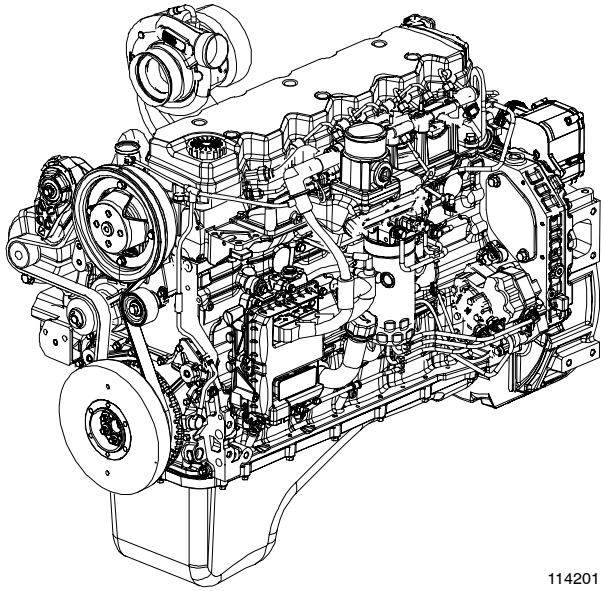
Figure 1



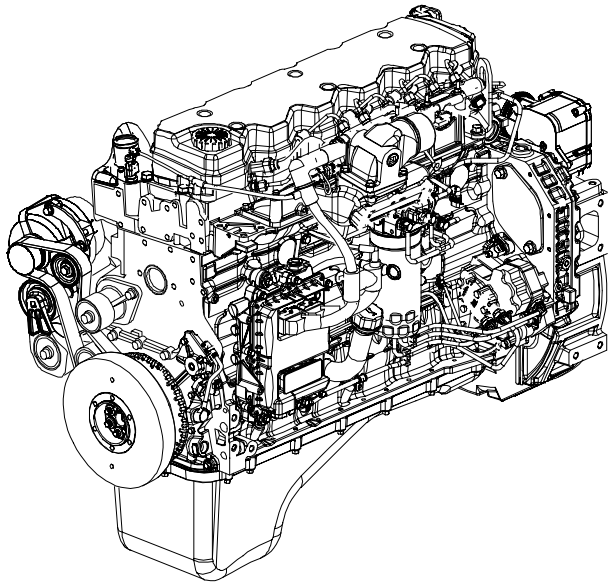
ENGINES: 667TA/EEG – 667TA/EEC

Figure 2



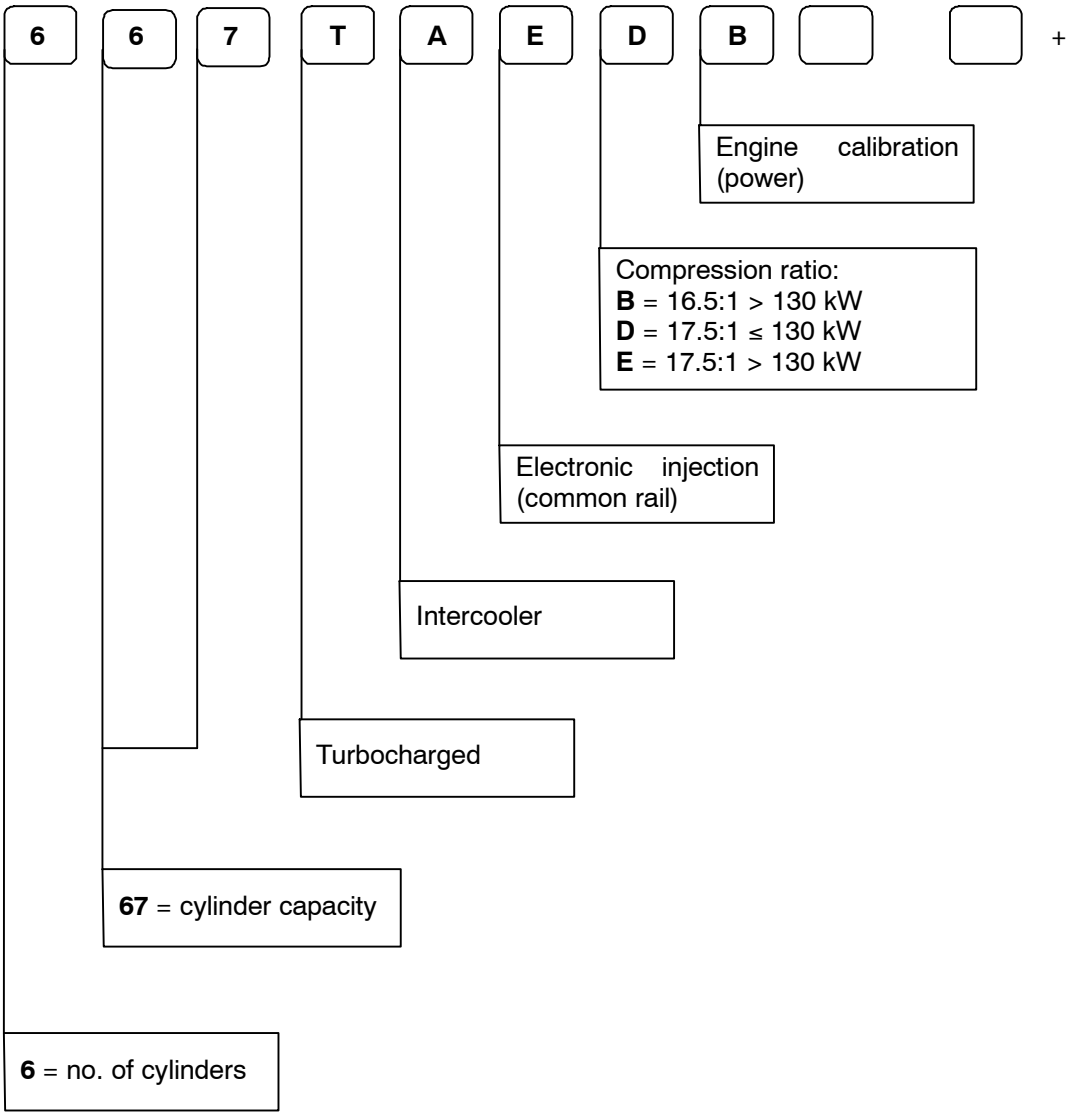
ENGINES: 667TA/EED – 667TA/EBF

Figure 3



ENGINES: 667TA/EED – 667TA/EBD

CODING OF SOURCE ENGINES

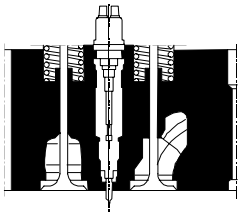


MAIN ENGINES FEATURES

A	**667TA**	**667TA**	**667TA**	**667TA**	**667TA**	**667TA**
B	**EEG**	**EEC**	**EBF**	**EED**	**EED**	**EBD**
C						
D	6728 cm^3					
E	137 kW 2100 rpm	148 kW 2100 rpm	157 kW 2000 rpm	145 kW 2000 rpm	145 kW 2000 rpm	169 kW 2000 rpm

Net power at flywheel (ISO 14396)

F — Direct injection



G — (common rail)

H — **T.A.A.**
(Boosted by intercooler)

- **A** Type of engine
- **B** Engine model
- **C** Number of cylinders
- **D** Total displacement
- **E** Max. power currently available
- **F** Type of injection
- **G** Injection system
- **H** Air supply system

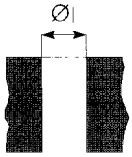
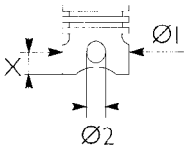
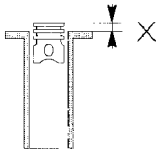
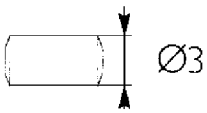
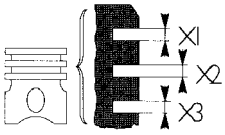
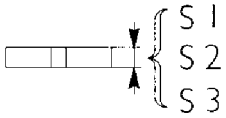
GENERAL ENGINES FEATURES

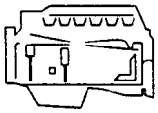
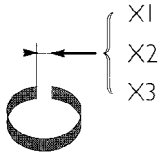
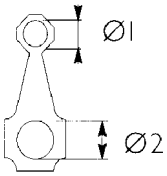
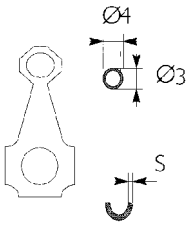
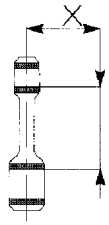
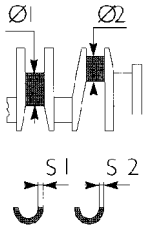
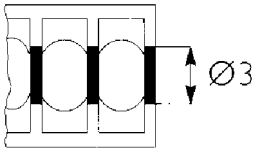
			667TA				
	Type		EEG	EEC	EBF	EED	EBD
	Cycle		4–stroke diesel engine				
	Feeding		Boosted by intercooler				
	Injection		Direct				
	Number of cylinders		6 in–line				
	Bore	mm	104				
	Stroke	mm	132				
	Total displacement	cm^3	6728 cm^3				
	Compression ratio		–				
	Max. rating*	kW min^{-1}	137 2100	148 2100	157 2000	145 2000	169 2000
	Max. torque	Nm (kgm) min^{-1}	710 1400	810 1400	952 1400	860 1400	1002 1400
	No–load idle rpm	min^{-1}	700				
	No–load peak rpm	min^{-1}	–				
	BOOSTING Type of turbocompressor:		With intercooler HOLSET HX35				
	LUBRICATION		Forced by means of gear pump. pressure relief valve. oil filter				
	Oil pressure with hot engine: at idle rpm at peak rpm	 bar bar	 1.2 3.8				

* Net power at flywheel (ISO 14396)

	Type		667TA				
			EEG	EEC	EBF	EED	EBD
COOLING			By fluid				
	Water pump drive:		By means of belt				
	Thermostat: Start of opening:	°C	81± 2				
	FILLING						
Ambra Mastergold HSP	Total capacity 1st filling:	litres kg	– –		– –		
	– engine sump	litres kg	– –		– –		
	– engine sump + filter	litres kg	17 –		19 –		
	FEEDING Bosch–type injection		high pressure Common Rail				
	Pump setting						
	Start of delivery	mm					
	Type of injector		CRIN 1		CRIN 2		
	Injection sequence		1 – 5 – 3 – 6 – 2 – 4				
	Injection pressure	bar	–		250 to 1600	250 to 1400	250 to 1600

ASSEMBLING PLAY – SPECIFICATIONS

	Type		667TA				
			EEG	EEC	EBF	EED	EBD
CRANK GEAR COMPONENTS AND CYLINDER ASSEMBLY			mm				
	Cylinder liners	1	104.000 to 104.024				
	Pistons: supplied with standard spares						
	Type						
	Measurement dimension	X	49.5				
	Outer diameter	∅1	103.759 to 103.777				
	Pin seat	∅2	38.010 to 38.016				
	Piston – cylinder liners		0.235 to 0.273				
	Piston diameter	∅1	0.4				
	Position of pistons from crankcase	X	–				
	Gudgeon pin	∅3	37.994 to 38.000				
	Gudgeon pin–Pin seat		0.01 to 0.022				
	Type of piston	X1*	2.705 to 2.735				
	Piston ring slots	X2	2.420 to 2.440				
		X3	4.03 to 4.05				
	* measured on ∅ of 101 mm						
	Piston rings	S1*	2.560 to 2.605				
		S2	2.350 to 2.380				
		S3	3.977 to 3.990				
	* measured 1.5 mm away from the external ∅						
	Piston rings – Slots	1	0.100 to 0.175				
		2	0.04 to 0.09				
		3	0.040 to 0.083				
	Piston rings		0.4				

	Type	667TA				
		EEG	EEC	EBF	EED	EBD
CRANK GEAR COMPONENTS AND CYLINDER ASSEMBLY		mm				
	Piston ring end opening in cylinder liner: X1 X2 X3	 0.3 to 0.4 0.6 to 0.8 0.3 to 0.55				
	Connecting rod small–end bushing seat ∅1 Connecting rod bearing seat ∅2	40.987 to 41.013 72.987 to 73.013				
	Connecting rod small–end bushing diameter Outer ∅4 Inner ∅3	41.279 to 41.553 38.019 to 38.033				
	Connecting rod small–end bushing – seat	0.266 to 0.566				
	Gudgeon pin – Bushing	0.019 to 0.039				
	Measurement dimension X Max. error on connecting rod axis parallelism =	– –				
	Journals ∅1 Crankpins ∅2 Main half bearings S1* Connecting rod half bearings S2* * supplied with spares	82.99 to 83.01 68.987 to 69.013 2.456 to 2.464 1.955 to 1.968				
	Bed supports no.: n. 1–7 ∅3 n. 2–3–4–5–6	 87.982 to 88.008 87.977 to 88.013				