NEW HOLLAND AGRICULTURE

MDF1400A

T4040 – T4050 TRACTORS
SERVICE MANUAL

SECTIONS

T E C H N I C A L S U P P O R T

INTRODUCTION

- *This manual is divided into sections identified by two–figure numbers and each section has independent page numbering.*
  For easy reference, these sections have the same numbers and names as the Repairs Rate Book sections.

- *The different sections can easily be found by consulting the table of contents on the following pages.*

- *The document number of the manual and the edition/update dates are given at the bottom of each page.*

- *Pages updated in the future will be identified by the same document number followed by an additional digit: first edition standard manual 87744428A – 1st update 87744428A1 – 2nd update 87744484A2 – etc.*
  The update pages can replace or supplement the pages of the standard manual; the information necessary for the procedure for adding or replacing pages is given on the title page of the update.
  The publication will be completed with an appropriate index.
  If it is necessary to issue a new updated manual (2nd edition) it will have document number 87744428B, this indicates that the manual is composed of the standard version 87744484A completed with all the updates: 1st update 87744484A1 – 2nd update 87744428A2 – etc.

- *The information contained in this manual was current on the date printed on each section. As NEW HOLLAND constantly improves its product range, some information may be out of date subsequent to modifications implemented for technical or commercial reasons, or to meet legal requirements in different countries.*
  In the event of conflicting information, consult the NEW HOLLAND Sales and Service Departments.

IMPORTANT WARNINGS

- *All maintenance and repair work described in this manual must be performed exclusively by NEW HOLLAND service technicians, in strict accordance with the instructions given and using any specific tools necessary.*

- *Anyone performing the operations described herein without strictly following the instructions is personally responsible for any eventual injury or damage to property.*

- *The Manufacturer and all organisations belonging to the Manufacturer's distribution network, including but not restricted to national, regional or local distributors, will accept no responsibility for personal injury or damage to property caused by abnormal function of parts and/or components not approved by the Manufacturer, including those used for maintenance and/or repair of the product manufactured or marketed by the Manufacturer.*
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CONTENTS

GENERAL INSTRUCTIONS

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BATTERY

Before carrying out any kind of service operation disconnect and isolate the battery negative lead, unless otherwise requested for specific operations (e.g., operations requiring the engine to be running), after which it is necessary to disconnect the above–mentioned lead to complete the work.

SHIMMING

For each adjustment operation, select adjusting shims and measure individually using a micrometer, then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value indicated for each shim.

ROTATING SHAFT SEALS

For correct rotating shaft seal installation, proceed as follows:

– before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes;
– thoroughly clean the shaft and check that the working surface on the shaft is not damaged;
– position the sealing lip facing the fluid; with hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will deviate the fluid towards the inner side of the seal;
– coat the sealing lip with a thin layer of lubricant (use oil rather than grease) and fill the gap between the sealing lip and the dust lip on double lip seals with grease;
– insert the seal in its seat and press down using a flat punch; do not tap the seal with a hammer or mallet;
– whilst inserting the seal, check that the it is perpendicular to the seat; once settled, make sure that it makes contact with the thrust element, if required;
– to prevent damaging the seal lip on the shaft, position a protective guard during installation operations.

“O–RING” SEALS

Lubricate the O–RING seals before inserting them in the seats, this will prevent them from overturning and twisting, which would jeopardise sealing efficiency.

SEALING COMPOUNDS

Apply one of the following sealing compounds on the mating surfaces marked with an X: LOCTITE 518, LOCTITE 5205, SUPERBOND 559 MASCHERPA or BETABLOCK A272M GURIT ESSEX.
Before applying the sealing compound, prepare the surfaces as follows:

– remove any incrustations using a wire brush;
– thoroughly de–grease the surfaces using one of the following cleaning agents: trichlorethylene, petrol or a water and soda solution.

BEARINGS

When installing bearings it is advised to:

– heat the bearings to 176 to 194 °C (80 to 90 °C) before fitting on the shafts;
– allow the bearings to cool before installing them from the outside.

SPRING PINS

When fitting split socket elastic pins, ensure that the pin notch is positioned in the direction of the force required to stress the pin.
Spiral spring pins do not require special positioning.

SPARE PARTS

Use genuine parts only.
Only original spare parts guarantee the same quality, duration and safety as they are the same parts that are assembled during production.
Only **genuine parts** can offer this guarantee.
When ordering spare parts, always provide the following information:
– tractor model (commercial name) and frame number;
– engine type and number;
– part number of the ordered part, which can be found in the “Microfiches” or the “Spare Parts Catalogue”, used for order processing.

TOOLS

The tools that NEW HOLLAND propose and illustrate in this manual are:
– specifically researched and designed for use with NEW HOLLAND vehicles;
– essential for reliable repair operations;
– accurately built and rigorously tested so as to offer efficient and long–lasting operation.

By using these tools, repair personnel will benefit from:
– operating in optimal technical conditions;
– obtaining the best results;
– saving time and effort;
– working in safe conditions.

IMPORTANT NOTES

Wear limit values indicated for certain parts are recommended, but not binding. The terms “front”, “rear”, “right–hand” and “left–hand” (when referred to different parts) are intended as seen from the driving position with the vehicle in the normal direction of movement.

MOVING THE TRACTOR WITH THE BATTERY REMOVED

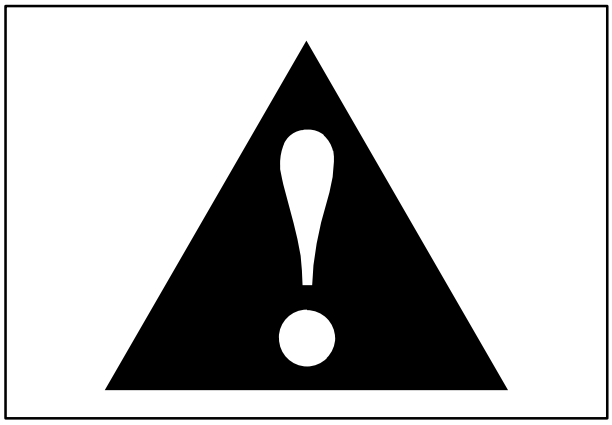
External power supply cables should only be connected to the respective positive and negative cable terminals, using efficient clamps that guarantee adequate and secure contact.
Disconnect all services (lights, windshield wipers, etc.) before starting the vehicle.
If the vehicle electrical system requires checking, carry out operations with the power supply connected; once checking is completed, disconnect all services and switch off the power supply before disconnecting the cables.

SAFETY REGULATIONS

PAY ATTENTION TO THIS SYMBOL

This warning symbol points out important messages concerning your safety.
Carefully read the following safety regulations and observe advised precautions in order to avoid potential hazards and safeguard your health and safety.
In this manual the symbol is accompanied by the following key–words:

***CAUTION** – Warnings concerning unsuitable repair operations that may jeopardise the safety of Service personnel.*
***DANGER** – Specific warnings concerning potential hazards for operator safety or for other persons directly or indirectly involved.*



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ACCIDENT PREVENTION

Most accidents or injuries that occur in workshops are the result of non–observance of simple and fundamental safety regulations. For this reason, IN MOST CASES THESE ACCIDENTS CAN BE AVOIDED by foreseeing possible causes and consequently acting with the necessary caution and care.

Accidents may occur with all types of vehicle, regardless of how well it was designed and built.

A careful and judicious service technician is the best guarantee against accidents.

Precise observance of the most basic safety rule is normally sufficient to avoid many serious accidents.

DANGER. Never carry out any cleaning, lubrication or maintenance operations when the engine is running.

SAFETY REGULATIONS

GENERAL GUIDELINES

– Carefully follow specified repair and maintenance procedures.
– Do not wear rings, wristwatches, jewellery, unbuttoned or loose articles of clothing such as: ties, torn clothing, scarves, open jackets or shirts with open zips that may remain entangled in moving parts. It is advised to wear approved safety clothing, e.g.: non–slip footwear, gloves, safety goggles, helmets, etc.
– Do not carry out repair operations with someone sitting in the driver's seat, unless the person is a trained technician who is assisting with the operation in question.
– Do not operate the vehicle or use any of the implements from different positions, other than the driver's seat.
– Do not carry out operations on the vehicle with the engine running, unless specifically indicated.
– Stop the engine and check that the hydraulic circuits are pressure–free before removing caps, covers, valves, etc.
– All repair and maintenance operations must be carried out using extreme care and attention.
– Service steps and platforms used in a workshop or in the field should be built in compliance with the safety rules in force.
– Disconnect the batteries and label all controls to indicate that the vehicle is being serviced. Any parts that are to be raised must be locked in position.
– Do not check or fill fuel tanks, accumulator batteries, nor use starting liquid when smoking or near naked flames, as these fluids are inflammable.
– Brakes are inoperative when manually released for repair or maintenance purposes. Use blocks or similar devices to control the machine in these conditions.
– The fuel nozzle should always be in contact with the filling aperture. Maintain this position until filling operations are completed in order to avoid possible sparks caused by the accumulation of static electricity.

– Only use specified towing points for towing the tractor. Connect parts carefully. Make sure that all pins and/or locks are secured in position before applying traction. Never remain near the towing bars, cables or chains that are operating under load.

– Transport vehicles that cannot be driven using a trailer or a low–loading platform trolley, if available.

– When loading or unloading the vehicle from the trailer (or other means of transport), select a flat area capable of sustaining the trailer or truck wheels. Firmly secure the tractor to the truck or trailer and lock the wheels in the position used by the carrier.

– Electric heaters, battery–chargers and similar equipment must only be powered by auxiliary power supplies with efficient ground insulation to avoid electrical shock hazards.

– Always use suitable hoisting or lifting devices when raising or moving heavy parts.

– Take extra care if bystanders are present.

– Never pour gasoline or diesel oil into open, wide or low containers.

– Never use gasoline, diesel oil or other inflammable liquids as cleaning agents. Use non–inflammable, non–toxic commercially available solvents.

– Wear safety goggles with side guards when cleaning parts with compressed air.

– Limit the air pressure to a maximum of 30.45 psi (2.1 bar), according to local regulations.

– Do not run the engine in confined spaces without suitable ventilation.

– Do not smoke, use naked flames, or cause sparks in the area when fuel filling or handling highly inflammable liquids.

– Never use naked flames for lighting when working on the machine or checking for “leaks”.

– All movements must be carried out carefully when working under, on or near the vehicle. Wear protective equipment: helmets, goggles and special footwear.

– When carrying out checks with the engine running, request the assistance of an operator in the driver’s seat. The operator must maintain visual contact with the service technician at all times.

– If operating outside the workshop, position the vehicle on a flat surface and lock in position. If working on a slope, lock the vehicle in position. Move to a flat area as soon as is safely possible.

– Damaged or bent chains or cables are unreliable. Do not use them for lifting or towing. Always use suitable protective gloves when handling chains or cables.

– Chains should always be safely secured. Make sure that the hitch–up point is capable of sustaining the load in question. Keep the area near the hitch–up point, chains or cables free of all bystanders.

– Maintenance and repair operations must be carried out in a CLEAN and DRY area. Eliminate any water or oil spillage immediately.

– Do not create piles of oil or grease–soaked rags as they represent a serious fire hazard. Always place them into a metal container.
Before starting the tractor or its attachments, check, adjust and block the operator’s seat. Also check that there are no persons within the tractor or implement range of action.

– Do not keep into your pockets any object which might fall unobserved into the tractor’s inner compartments.

– In the presence of protruding metal parts, use protective goggles or goggles with side guards, helmets, special footwear and gloves.

– When welding, use protective safety devices: tinted safety goggles, helmets, special overalls, gloves and footwear. All persons present in the area where welding is taking place must wear tinted goggles. NEVER LOOK DIRECTLY AT THE WELDING ARC WITHOUT SUITABLE EYE PROTECTION.

– Metal cables tend to fray with repeated use. Always use suitable protective devices (gloves, goggles, etc.) when handling cables.

– Handle all parts carefully. Do not put your hands or fingers between moving parts. Wear suitable safety clothing – safety goggles, gloves and shoes.

START UP

– Never run the engine in confined spaces that are not equipped with adequate ventilation for exhaust gas extraction.
– Never bring your head, body, arms, legs, feet, hands, fingers near fans or rotating belts.

ENGINE

– Always loosen the radiator cap slowly before removing it to allow any remaining pressure in the system to be discharged. Filling up with coolant should only be carried out with the engine stopped or idling (if hot).
– Never fill up with fuel when the engine is running, especially if hot, in order to prevent the outbreak of fire as a result of fuel spillage.
– Never check or adjust fan belt tension when the engine is running.
Never adjust the fuel injection pump when the vehicle is moving.
– Never lubricate the vehicle when the engine is running.

ELECTRICAL SYSTEMS

– If it is necessary to use auxiliary batteries, remember that both ends of the cables must be connected as follows: (+) with (+) and (–) with (–). Avoid short–circuiting the terminals. GAS RELEASED FROM BATTERIES IS HIGHLY INFLAMMABLE. During charging, leave the battery compartment uncovered to improve ventilation. Never check the battery charge using “jumpers” (metal objects placed on the terminals). Avoid sparks or flames near the battery zone. Do no smoke to prevent explosion hazards.
– Before servicing operations, check for fuel or current leaks. Eliminate any eventual leaks before proceeding with work.
– Never charge batteries in confined spaces. Make sure that there is adequate ventilation in order to prevent accidental explosion hazards as a result of the accumulation of gases released during charging operations.
– Always disconnect the batteries before performing any kind of servicing on the electrical system.

HYDRAULIC SYSTEMS

– A liquid leaking from a tiny hole may be almost invisible but, at the same time, be powerful enough to penetrate the skin; therefore, NEVER USE HANDS TO CHECK FOR LEAKS. Use a piece of cardboard or wood for this purpose. If any liquid penetrates skin tissue, call for medical aid immediately. Failure to treat this condition with correct medical procedure may result in serious infection or dermatosis.
– In order to check the pressure in the system use suitable instruments.

WHEELS AND TYRES

– Check that the tyres are correctly inflated at the pressure specified by the manufacturer.
Periodically check possible damages to the rims and tyres.
– Stand away from (at the side of) the tyre when checking inflation pressure.
– Only check pressure when the tractor is unloaded and the tyres are cold, to avoid incorrect readings as a result of over–pressure. Do not reuse parts of recovered wheels as improper welding, brazing or heating may weaken the wheel and make it fail.
– Never cut or weld a rim mounted with an inflated tyre.
– To remove the wheels, lock both the front and rear vehicle wheels. After having raised the vehicle, position supports underneath, according to regulations in force.
– Deflate the tyre before removing any object caught in the tyre tread.
– Never inflate tyres using inflammable gases; as this may result in explosions and injury to bystanders.

REMOVAL AND INSTALLATION

– Lift and handle all heavy parts using suitable hoisting equipment. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. Extra care should be taken if persons are present near the load to be lifted.
– Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing – safety goggles, gloves and shoes.
– Avoid twisting chains or metal cables. Always wear safety gloves when handling cables or chains.

CONSUMABLES

COMPONENT TO BE FILLED OR TOPPED UP	QUANTITY US gal. (litres)	RECOMMENDED NEW HOLLAND PRODUCTS	NEW HOLLAND SPECIFICATIONS	INTERNATIONAL SPECIFICATIONS
Cooling system: without cab	14,0	Water & liquid **AMBRA AGRIFLU 50% + 50%**	NH 900 A	–
Windscreen wash reservoir	2,0	Water & liquid	–	–
Fuel tank: – standard model – with double tank	 65 82	Decanted, filtered diesel fuel	–	–
Engine oil sump: without filter:	8,9	Oil **AMBRA MASTERGOLD HSP**	NH 324H (SAE 10W–30) NH 330H (SAE 15W–40)	API CI–4/CH$ ACEA E7/E5
with filter:	9,5			
Brake control circuit	0,7	Oil **AMBRA BRAKE LHM**	NH 610 A	ISO 7308
With front brakes	1,0			
Front axle:		**AMBRA MULTI G** oil	NH 410 B	API GL4 ISO 32/46 SAE 10W–30
axle casing	1.18 (4.5)			
final drives without brakes (each)	0.26 (1.0)			
final drives with brakes (each)	0.39 (1.5)			
Rear transmission (bevel drive, final drives and brakes), gearbox, hydraulic lift, PTO and hydraulic steering:	11.09 (42)			
Grease fittings	–	**AMBRA GR9** grease	NH 710 A	NLGI 2

SECTION 10 – ENGINE

Chapter 1 – Engine

CONTENT

GENERAL SPECIFICATIONS	
Engine, technical type:	
– Model T4040 type F4CE9484N*J601 (BOSCH pump)	
– Model T4050 – type F4CE9484M*J601 (BOSCH pump) . .	
Cycle	diesel, 4–stroke
Fuel injection	Direct
Number of cylinders in line	4
Piston diameter	104 mm
Piston stroke	132 mm
Total displacement	4485 cm^3
Compression ratio	16.5:1
Maximum Power Output:	
– Model T4040 – type F4CE9484N*J601	63 kW (86 Hp)
– Model T4050 – type F4CE0454C*D600/*D603	71 kW (97 Hp)
Maximum power speed	2300 rpm
– Maximum torque: Model T4040 – type F4CE9484N*J601 .	370 Nm
– Maximum torque: Model T4050 – type F4CE9484M*J601	418 Nm
Maximum torque speed	1300 rpm
Number of main bearings	5
Sump pan	structural, cast iron
Lube	forced, with lobe pump
Pump drive	from crankshaft
Engine speed/oil pump speed ratio	1:1
Oil filtration	mesh screen on oil pick–up and filter cartridge in delivery line
Normal oil pressure with motor warmed–up	
at slow idling	1.2 bar
at fast idling	3.9 bar

(continued)

(overleaf)

GENERAL SPECIFICATIONS	
Cooling	coolant circulation
Radiator	4 lines of vertical pipes with copper fins
Fan, attached to the pulley	intake, in plastic with 11 blades
Coolant pump	centrifugal vane–type
Engine speed/coolant pump speed ratio	1:1.977
Coolant thermometer	coloured scale divided into three sections
Temperature ranges corresponding to each section:	
– Initial blue section	40° ÷ 60 °C
– Middle green section (normal working conditions)	60° ÷ 110 °C
– Final red section	110° ÷ 120 °C
Temperature Control	via thermostat valve
– initial opening	81 ± 2 °C
Valve Timing	overhead valves operated by tappets, rods and rocker arms via the camshaft located in the engine block; the camshaft is driven by the crankshaft using straight–tooth gears
Intake:	
– start: before T.D.C.	10° ± 30’
– end: after B.D.C.	10° ± 30’
Exhaust:	
– start: before B.D.C.	64°
– end: after T.D.C.	26°
Clearance between valves and rocker arms with engine cold:	
– intake	0.25 ± 0.05 mm
– exhaust	0.50 ± 0.05 mm
Power supply	
Air filtering	dual cartridge dry air filter, with clogged filter indicator with centrifugal pre–filter and automatic dust ejector
Fuel pump	with double diaphragm
Fuel filtration	through wire filter in fuel supply pump, and replaceable cartridge on delivery line to injection pump
Minimum fuel flow rate with pump shaft rotating at 1800 rpm	127.6 l/h
Cam operated	via engine timing

(continued)

(overleaf)

GENERAL SPECIFICATIONS	
BOSCH Injection pump	rotating distributor type
All–speed governor, incorporated in pump:	
BOSCH	centrifugal counterweights
Automatic advance regulator, incorporated in pump:	
BOSCH	hydraulic
Turbocharger:	
– type	HOLSET HX25
Injection pump	rotating distributor with speed governor and advance variator incorporated
BOSCH pump:	
– Model T4040 – type F4CE9484N*J601	VE 4/12 F1150–2856534
– Model T4050– type F4CE9484M*J601	VE 4/12 F1150–2856537
Direction of rotation	anticlockwise
Injection order	1–3–4–2 (for all models)

SPECIFICATIONS

BOSCH–type injectors:	
F4CE9484N*J601/F4CE9484M*J601	2856255
Number of nozzle holes	6
Nozzle hole diameter mm:	
F4CE9484N*J601/F4CE9484M*J601	0.237
Calibration pressure bar	260 ÷ 274

ENGINE BLOCK DATA			mm
Engine sump			cast–iron monobloc with cylinder liners, crankshaft, camshaft and tappets
Cylinder bore diameter			104.000 ÷ 104.024
Oversized cylinder bore diameter			104.400 ÷ 104.424
Main journal half bearing seat diameter	external	no. 1–5	87.982 ÷ 88.008
	internal	no. 2–3–4	87.977 ÷ 88.013
Camshaft bushing seat diameter:			
– front			59.222 ÷ 59.248
– mid			59.222 ÷ 59.248
– rear			59.222 ÷ 59.248
Diameter of standard tappet bores in crankcase			16.000 ÷ 16.030

CRANKSHAFT AND BEARINGS DATA		mm
Crankshaft		balanced with integral counterweights
Standard journal diameter		82.99 ÷ 83.01
Journal undersizes		0.250 – 0.500
Main journal half bearing thickness		2.456 ÷ 2.464
Main bearing shell undersizes on internal diameter		0.250 – 0.500
Clearance between bearings and main journal	no. 1–5	0.022 ÷ 0.053
	no. 2–3–4	0.019 ÷ 0.055
Standard crankpin diameter		68.987 ÷ 69.013
Crankpin undersizes		0.250 – 0.500
Standard connecting rod half bearing thickness		1.955 ÷ 1.968
Big–end bearing shell undersizes on internal diameter		0.250 – 0.500
Bearing to crankpin clearance		0.019 ÷ 0.058
Standard crankshaft thrust washer width		37.280 ÷ 37.380
Width of main bearing for thrust		32.180 ÷ 32.280
Width of corresponding crankshaft journal		37.475 ÷ 37.550
Crankshaft assembly endfloat		0.095 ÷ 0.270

CONNECTING ROD DATA	mm
Connecting rods	printed in steel, oblique–cut type
Diameter of small end bushing seat	40.987 ÷ 41.013
Outside diameter of small end bushing	41.279 ÷ 41.553
Interference between small end bushing and seat	0.266 ÷ 0.566
Internal diameter of small end bushing (after press–fitting)	38.019 ÷ 38.033
Diameter of seat for bearing shells on connecting rod	72.987 ÷ 73.013
Connecting rod–crankpin end float	0.100 ÷ 0.330

PISTON DATA	mm
Pistons	light alloy with three compression rings, including two seal rings and one scraper ring
Standard piston diameter, measured at 61 mm from skirt base and perpendicularly to the gudgeon pin axis	103.714 ÷ 103.732
Piston clearance in cylinder liner	0.268 ÷ 0.310
Spare piston oversizes	0,400
Piston protrusion at T.D.C. from cylinder block face	0.280 ÷ 0.520
Gudgeon pin diameter	37.994 ÷ 38.000
Diameter of gudgeon pin seat in piston	38.010 ÷ 38.016
Gudgeon pin to seat clearance	0.010 ÷ 0.022
Gudgeon pin to small end bearing clearance	0.019 ÷ 0.039
Piston ring seat depth:	
– 1st ring (measured on a diameter of 99 mm)	2.705 ÷ 2.735
– 2nd ring	2.440 ÷ 2.460
– 3rd ring	4.030 ÷ 4.050
Piston ring thickness:	
– 1st ring	2.560 ÷ 2.605
– 2nd ring	2.350 ÷ 2.380
– 3rd ring	3.970 ÷ 3.990

(continued)

(overleaf)

PISTON DATA	mm
Piston ring groove clearance (measured vertically):	
– 1st ring	0.100 ÷ 0.175
– 2nd ring	0.060 ÷ 0.110
– 3rd ring	0.040 ÷ 0.080
Assembly clearance between piston ring ends in cylinder sleeves:	
– 1st ring	0.30 ÷ 0.40
– 2nd ring	0.60 ÷ 0.80
– 3rd ring	0.30 ÷ 0.55
Spare piston ring oversizing	0.400

VALVE TIMING GEAR DATA	mm
Internal diameter of camshaft support bushings (press–fitted and finished in seats):	
– front	54.083 ÷ 54.147
– mid	54.083 ÷ 54.147
– rear	54.083 ÷ 54.147
Diameter of camshaft journals:	
– front	53.995 ÷ 54.045
– mid	53.995 ÷ 54.045
– rear	53.995 ÷ 54.045
Clearance between camshaft journals and bushings	0.038 ÷ 0.152
Camshaft end float	0.230 ± 0.130
Crankshaft to camshaft teeth clearance	0.076 ÷ 0.280

TAPPET DATA	mm
Tappet bore in crankcase	16.000 ÷ 16.030
Outside diameter of standard tappets	15.929 ÷ 15.959
Tappet running clearance	0.041 ÷ 0.101

ROCKER ARM – VALVE DATA	mm
Rocker–arm shaft diameter	18.963 ÷ 18.975
Rocker–arm shaft seat diameter	19.000 ÷ 19.026
Rocker arm bore to shaft clearance	0.025 ÷ 0.063
Valve clearance for normal running (engine cold):	
– inlet valve	0.25 ± 0.05
– exhaust valve	0.50 ± 0.05
Cam lift:	
– inlet valve	6.045
– exhaust valve	7.239

CYLINDER HEAD DATA	mm
Cylinder head	in cast iron with fitted valve seats and seats for injectors and thermostat valve
Maximum face re–grinding depth. that can be removed from the cylinder head in the event of reboring	0.130
Diameter of valve stem seat in cylinder head	8.019 ÷ 8.039
Valve stem diameter	7.960 ÷ 7.980
Assembly clearance between valve stem and seat	0.039 ÷ 0.079
Valve seat angle in head:	
– inlet valve	60°
– exhaust valve	45°
Valve face angle:	
– inlet valve	60°
– exhaust valve	45°
Diameter on head for fitting valve seat:	
– inlet valve	46.987 ÷ 47.013
– exhaust valve	43.637 ÷ 43.663
Valve seat insert outside diameter:	
– inlet valve	47.063 ÷ 47.089
– exhaust valve	43.713 ÷ 43.739
Valve stand–in relative to cylinder head face:	
– inlet valve	1.00 ÷ 1.52
– exhaust valve	1.00 ÷ 1.52
Interference between valve seat and head:	
– inlet valve	0.050 ÷ 0.102
– exhaust valve	0.050 ÷ 0.102

(continued)

(overleaf)

CYLINDER HEAD DATA	**mm**
Valve head diameter:	
– inlet valve	44.870 ÷ 45.130
– exhaust valve	41.870 ÷ 42.130
Inlet and exhaust valve springs:	
– spring free length	63.500
– length under load of 329 N	49.020
– length under load of 641 N	38.200
Injector protrusion relative to head face:	
● BOSCH injectors 2856255	Not adjustable

TORQUE SETTINGS WITH ANGLE				
PARTS TO BE TIGHTENED	Thread	Tightening torque		Angle
		Nm	kgm	
Main bearing cap bolts				
phase 1	M12 x 1.5	50 ± 6	5.0 ± 0.6	–
phase 2	M12 x 1.5	80 ± 6	8.0 ± 0.6	–
phase 3	M12 x 1.5	–	–	90° ± 5°
Big–end cap bolts				
phase 1	M 10 x 1.25	30 ± 3	3.0 ± 0.3	–
phase 2	M 10 x 1.25	60 ± 5	6.0 ± 0.5	–
phase 3	M 10 x 1.25	–	–	60° ± 5°
Bolts securing cylinder head	M 12 x 1.75 x 70	50 ± 5	5.0 ± 0.5	90°
Note: *For the tightening sequence, see page 54, Fig. 120.*	M 12 x 1.75 x 140	40 ± 5	4.0 ± 0.5	180°
	M 12 x 1.75 x 180	70 ± 5	7.0 ± 0.5	180°
Bolts securing engine flywheel	M 12 x 1.25	30 ± 4	3.0 ± 0.4	60° ± 5°

TORQUE WRENCH SETTINGS			
PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	kgm
Bolts fastening pulley on crankshaft	M 12 x 1.75	110 ± 5	11.0 ± 0.5
Flywheel casing retaining bolts	M 12 x 120	85 ± 10	8.5 ± 1
	M 12 x 80	85 ± 10	8.5 ± 1
	M 10 x 80	49 ± 5	4.9 ± 0.5
	M 10 x 40	49 ± 5	4.9 ± 0.5
Oil sump retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
	M 8 x 1.50	60 ± 9	6 ± 0.9
Oil sump threaded plugs	M 22 x 1.5	50 ± 5	5 ± 0.5
Rocker arm support retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Tappet cover retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Exhaust manifold retaining bolts	M 10 x 1.50	53 ± 6	4.3 ± 0.6
Intake manifold retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Oil cooler retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Coolant pump retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Coolant inlet manifold retaining bolts	M 10 x 1.50	24 ± 4	2.4 ± 0.4
Thermostat valve assembly retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Fan support retaining bolts	M 8 x 1.25 x 50	10 ± 2	1 ± 0.2
	M 10 x 1.50 x 25	43 ± 6	4.3 ± 0.6
Injector fastener	–	60 ± 5	6.0 ± 0.5
Fuel pump retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Nuts securing turbine mod. T4050	M 10 x 1.25	43 ± 6	4.3 ± 0.5
Alternator retaining bolts	M 8 x 1.50	24 ± 4	2.4 ± 0.4
Starter motor retaining bolts	M 10 x 1.50	49 ± 5	4.9 ± 0.5
Camshaft plate retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Injection pump retaining bolts	M 8 x 1.25	12 ± 5	1.2 ± 0.5
Oil pump gear casing retaining bolts	M 8 x 1.25	24 ± 4	2.4 ± 0.4
Additional counterweight retaining bolts	M 10 x 1.5	48 ± 8	4.8 ± 0.8
Bolts securing camshaft gear	M 8 x 1.25	36 ± 4	3.6 ± 0.4

SPECIAL TOOLS

Warning – The operations described in this section can only be carried out with **ESSENTIAL** tools indicated by an **(X)**.

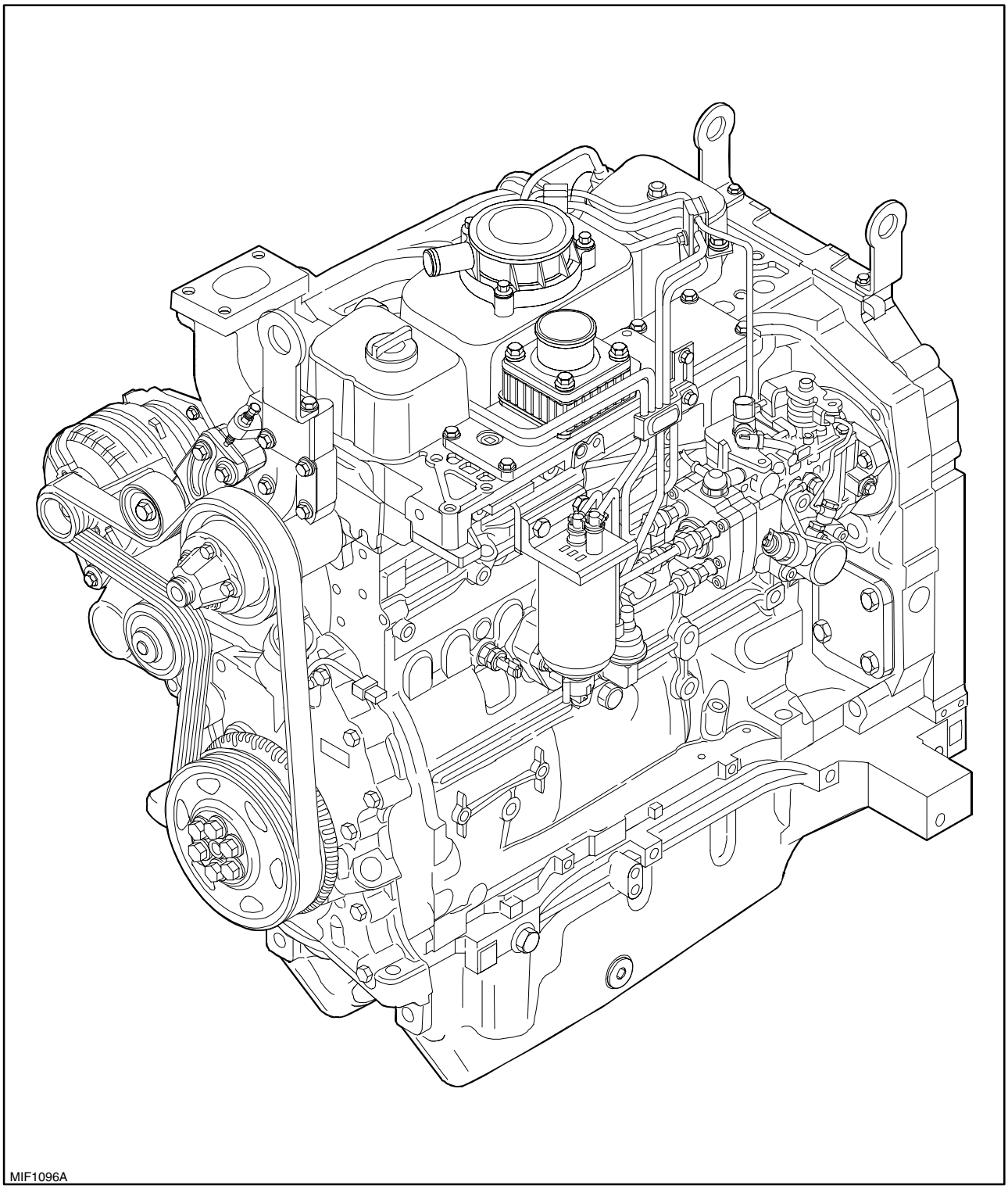
To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

List of specific tools required for the various operations described in this Section.

X	**380000216**	Engine removal and installation tool.
	380000220	Clamp for fitting piston in cylinder liner (60–125 mm).
X	**380000221**	Pliers for piston ring disassembly and reassembly (65–110 mm).
	380000301	Rotating stand for overhaul operations (capacity 1000 daN, torque 120 daN/m).
X	**380000302**	Tool for engine valve disassembly and reassembly.
	380000304	Pair of gauges for angular tightening with 1/2" and 3/4" square connection.
	380000362	Crankshaft lifting tool.
X	**380000364**	Dial gauge base for various measurements (use with **380000228**).
	380000569	Movable tool for dismantling tractors with bracket **380000500** and adapter plate **380000844**.
X	**380000661**	Engine mounting brackets for rotating stand **380000301**.
X	**380000663**	Tool to extract crankshaft rear seal.
X	**380000664**	Splining tool for fitting rear seal on crankshaft.
X	**380000665**	Tool to extract crankshaft front seal.
X	**380000666**	Splining tool for fitting front seal on crankshaft.
X	**380000667**	Drift for camshaft bushing disassembly and reassembly (use with **380000668**).
	380000668	Grip for interchangeable drifts.
X	**380000669**	Gasket extraction tool.
X	**380000670**	Tool for cartridge filter disassembly.
	380000671	Injector extraction tool.
	380000975	Box with full set of tools to regrind valve seats.
	380000976	Spring load test appliance.
	380001003	Complete square to check for connecting rod distortion.
	380001268	Belt tension gauge.

Injection pump bench test.

	380000228	Dial gauge (0–5 mm).
X	**380000732**	Tool for engine flywheel rotation (use with **380000988**).
X	**380000914**	Dial–gauge holder tool for rotary injection pump timing (use with **380000228**).
X	**380000988**	Plate for engine flywheel rotation tool with flywheel timing pin (use with **380000732**).



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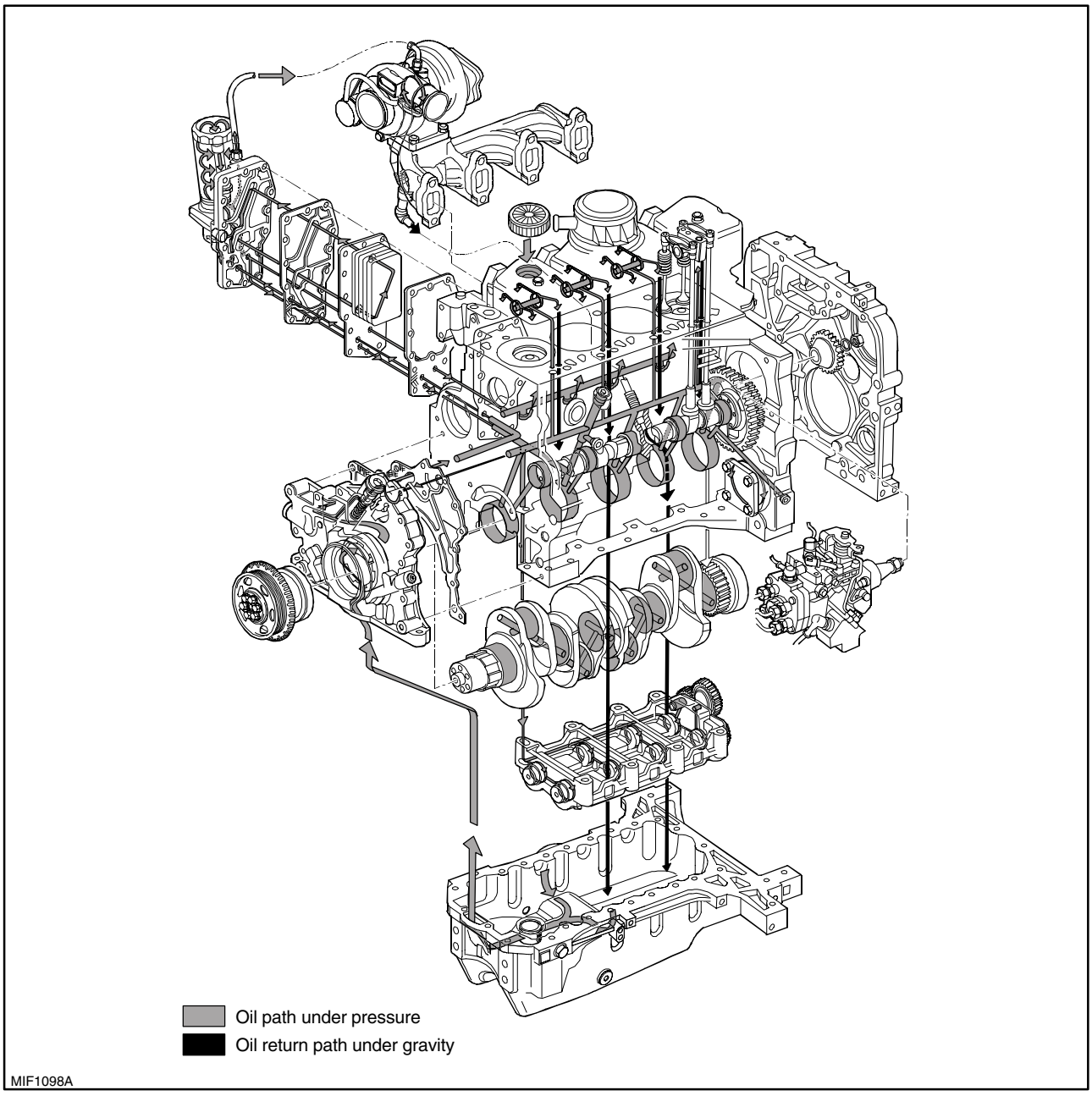
Engine view

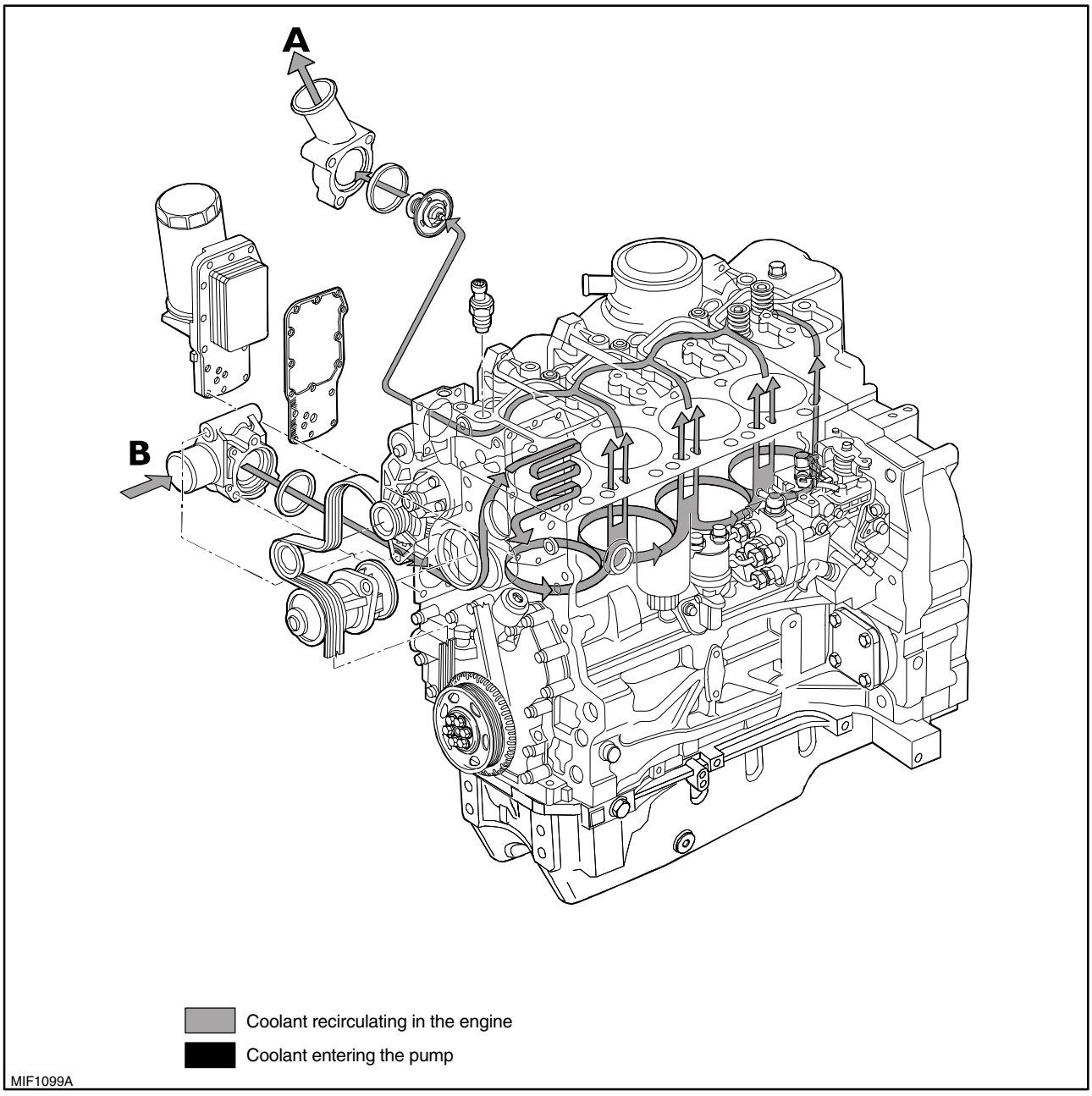


2

Engine lubrication diagram

Forced–circulation lubrication is accomplished by the following components:

- oil pump, housed at the front of the crankcase, driven by the grooved bushing keyed onto the shank of the crankshaft;
- water / oil cooler, housed in the crankcase;
- oil pressure control valve incorporated in the cooler assembly;
- by–pass valve to cut off clogged oil filter, incorporated in the cooler assembly;
- cartridge oil filter.

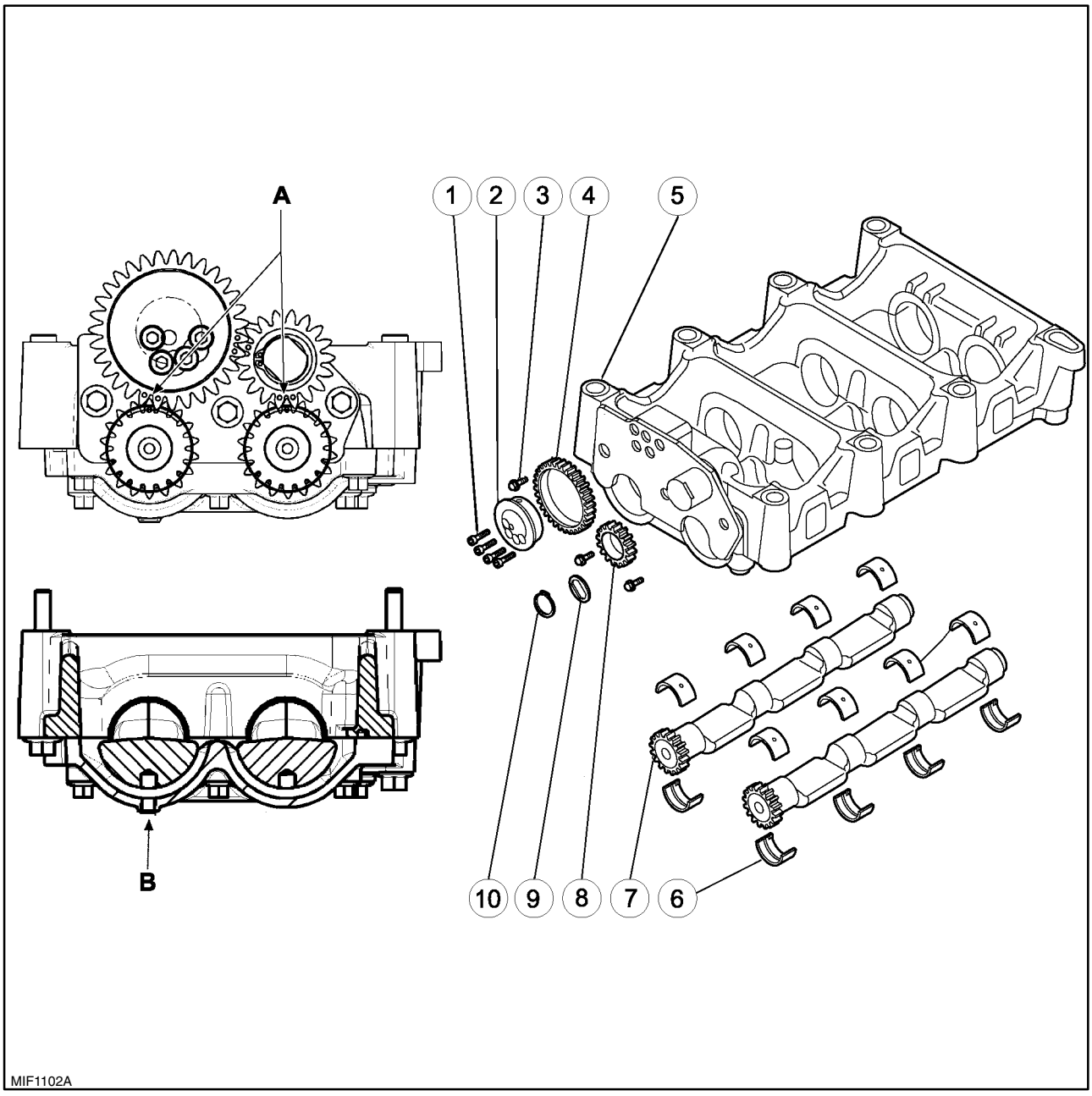


3

Cooling diagram

The forced circulation, closed–circuit engine cooling system is composed of the following components:

– a lubricating oil cooler;
– a centrifugal coolant pump housed at the front of the crankcase;
– a thermostat valve governing coolant circulation.



4

Additional counterweight diagram

1. Retaining bolts
2. Support
3. Retaining bolts
4. Gear
5. Balancing weight
6. Half bearings
7. Counter–shaft
8. Gear
9. Ring
10. O–rings