SERVICE MANUAL

S3L2

Engine

Part number 84523916
1st edition English
July 2012

NEW HOLLAND AGRICULTURE

Contents

INTRODUCTION

Contents

INTRODUCTION

Foreword

This service manual describes the specifications, maintenance and service procedures for Mitsubishi diesel engines.

To maintain the performance of the engine for many years and to ensure safe operation, it is important to use the engine correctly and conduct regular inspection and maintenance, and also to take necessary measures which involves the disassembly, inspection, repair and reassembly of the engine and engine parts.

Read this manual carefully and understand the work procedures fully before disassembling, inspecting, repairing or reassembling the engine.

The contents of the manual are based on the engine models that are being produced at the time of publication. Due to improvements made thereafter, the actual engine that you work on may differ partially from the one described in this manual.

Foreword - Ecology and the environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances required by advanced technology, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

NOTE: *The following are recommendations that may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use, and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

Helpful hints

- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems that may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil, but should be collected and disposed of properly.
- Do not open the air-conditioning system yourself. It contains gases that should not be released into the atmosphere. Your CNH dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system properly.
- Repair any leaks or defects in the engine cooling or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.

Safety rules

Standard safety precautions

Be informed and notify personnel of the laws in force regulating safety, and provide documentation available for consultation.

- Keep working areas as clean as possible.
- Ensure that working areas are provided with emergency boxes. They must be clearly visible and always contain adequate sanitary equipment.
- Fire extinguishers must be properly identified and always be clear of obstructions. Their efficiency must be checked on a regular basis and personnel must be trained on proper interventions and priorities.
- Keep all emergency exits free of obstructions and clearly marked.
- Smoking in working areas subject to fire danger must be strictly prohibited.

Prevention of injury

- Wear suitable work attire and safety glasses with no jewelry such as rings and chains when working close to engines and equipment in motion.
- Wear safety gloves and goggles when performing the following operations:
  - Topping off or changing lubrication oils.
  - Using compressed air or liquids at a pressure greater than **2 bar** (**29 psi**).
- Wear a safety helmet when working close to hanging loads or equipment working at head level.
- Always wear safety shoes and fitting clothes.
- Use protection cream for hands.
- Change wet clothes as soon as possible.
- In the presence of voltages exceeding **48 - 60 V**, verify the efficiency of the ground and mass electrical connections. Ensure that hands and feet are dry and use isolating foot boards. Workers should be properly trained to work with electricity.
- Do not smoke or start an open flame close to batteries and any fuel material.
- Place soiled rags with oil, diesel fuel or solvents in specially provided anti-fire containers.
- Do not use any tool or equipment for any use other than what it was originally intended for. Serious injury may occur.
- If running an engine indoors, make sure there is a sufficient exhaust fan in use to eliminate exhaust fumes.

During maintenance

- Never open the filler cap of the cooling system when the engine is hot. High temperature liquid at operating pressure could result in serious danger and risk of burn. Wait until the temperature decreases under **50 °C** (**122 °F**).
- Never add coolant to an overheated engine and use only appropriate liquids.
- Always work when the engine is turned off. Certain circumstances require maintenance on a running engine. Be aware of all the risks involved with such an operation.
- Always use adequate and safe containers for engine fluids and used oil.
- Keep engine clean of any spilled fluids such as oil, diesel fuel, and or chemical solvents.
- Use of solvents or detergents during maintenance may emit toxic vapors. Always keep working areas aerated. Wear a safety mask if necessary.
- Do not leave soiled rags that may contain any flammable substances close to the engine.
- Always use caution when starting an engine after any work has been performed. Be prepared to cut off intake air in case of engine runaway.
- Never disconnect the batteries while the engine is running.

- Disconnect the batteries prior to performing any work on the equipment.
- Disconnect the batteries to place a load on them with a load tester.
- After any work is performed, verify that the battery clamp polarity is correct and that the clamps are tight and safe from accidental short circuit and oxidation.
- Before disconnecting any pipelines (pneumatic, hydraulic, fuel pipes, etc.), verify that all pressure has been released. Take all necessary precautions bleeding and draining residual pressure. Always wear the proper safety equipment.
- Do not alter the lengths of any wires.
- Do not connect any electronic service tool to the engine electrical equipment unless specifically approved by Iveco.
- Do not modify the fuel system or hydraulic system unless approved by Iveco, Any unauthorized modification will compromise warranty assistance and may affect engine operation and life span.

For engine equipped with an electronic control unit

- Do not weld on any part of the equipment without removing the control unit.
- Remove the in case of work requiring heating over **80 °C** (**176 °F**).
- Do not paint the components and the electronic connections.
- Do not alter any data filed in the electronic control unit driving the engine. Any manipulation or alteration of electronic components will void engine warranty assistance and may affect the correct working order and life span of the engine.

Respect of the Environment

- Respect of the environment should be of primary importance. Take all necessary precautions to ensure personnel's safety and health.
- Inform the personnel of the laws regarding the dispensing of used engine fluids.
- Handle batteries with care, storing them in a well ventilated environment and within anti-acid container.

Safety rules

Personal safety

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual and on machine decals, you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

⚠ DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. The color associated with DANGER is RED.

⚠ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The color associated with WARNING is ORANGE.

⚠ CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The color associated with CAUTION is YELLOW.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: *Notice indicates a situation which, if not avoided, could result in machine or property damage. The color associated with Notice is BLUE.*

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

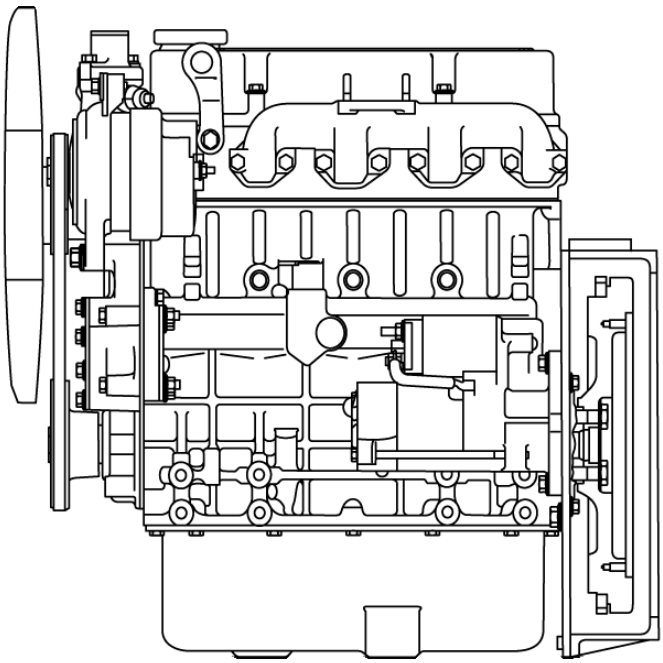
NOTE: *Note indicates additional information which clarifies steps, procedures, or other information in this manual.*

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

NEW HOLLAND AGRICULTURE

SERVICE MANUAL

Engine



S3L2

Contents

Engine - 10

Engine - 10

Engine and crankcase - 001

S3L2

Contents

Engine - 10

Engine and crankcase - 001

Engine - General specification

Engine	
Type	Water cooled, 4-stroke cycle diesel
No. of cylinders	3
Combustion type	Swirl chamber
Valve mechanism	Overhead valve type
Cylinder bore x stroke	**78 mm** x **92 mm** (**3.07 in** x **3.62 in**)
Total displacement	**1.3 l** (**79 in³**)
Compression ratio	22:1
Fuel used	JIS K2204, Diesel fuel or its equivalent (ASTM diesel fuel oil No. 2-D)
Firing order	1 - 3 - 2
Direction of rotation	Counterclockwise as viewed from flywheel side
Length	**512 mm** (**20.2 in**)
Width	**453 mm** (**17.8 in**)
Height	**563 mm** (**22.2 in**)
Dry weight	Approximately **140 kg** (**309 lb**)

Inspection point	Nominal	Standard	Limit	Remark
Maximum rotation speed (rated rotation speed used as reference)	Varies depending on specification of destination			
Minimum rotation speed	Varies depending on specification of destination			
Compression ratio @ **290 RPM**		**29 bar** (**421 psi**) or above	**26 bar** (**377 psi**) or less	When oil and water temperatures at **20 - 30 °C** (**68 - 86 °F**)
Valve timing Intake - Open - Close Exhaust - Open - Close		 BTDC **15 °** ABDC **41 °** BBDC **54 °** ATDC **10 °**		With **2 mm** (**0.079 in**) clearance on valve side, when cold. Values are only for checking valve timing and are different from the actual ones.
Rocker arm Rocker arm inside diameter Rocker shaft outside diameter Clearance between rocker arm and rocker shaft (oil clearance)	 **18.9 mm** (**0.744 in**) **18.9 mm** (**0.744 in**) 	 **18.910 - 18.930 mm** (**0.7445 - 0.7453 in**) **18.880 - 18.930 mm** (**0.7433 - 0.7453 in**) **0.012 - 0.050 mm** (**0.0005 - 0.0020 in**)	 **0.200 mm** (**0.0079 in**)	 Replace rocker arm
Valve Valve stem outside diameter - Intake - Exhaust Valve guide inside diameter - Intake - Exhaust Clearance between valve guide and valve stem	 **6.6 mm** (**0.260 in**) **6.6 mm** (**0.260 in**) **6.6 mm** (**0.260 in**) **6.6 mm** (**0.260 in**) 	 **6.565 - 6.580 mm** (**0.2585 - 0.2591 in**) **6.530 - 6.550 mm** (**0.2571 - 0.2579 in**) **6.600 - 6.615 mm** (**0.2598 - 0.2604 in**) **6.600 - 6.615 mm** (**0.2598 - 0.2604 in**) 	 **6.500 mm** (**0.2559 in**) **6.500 mm** (**0.2559 in**) 	

Inspection point	Nominal	Standard	Limit	Remark
- Intake		**0.020 - 0.050 mm** (**0.0008 - 0.0020 in**)	**0.100 mm** (**0.0039 in**)	Replace valve and valve guide
- Exhaust		**0.050 - 0.085 mm** (**0.0020 - 0.0033 in**)	**0.150 mm** (**0.0059 in**)	
Valve seat angle	**45 °**			
Valve sinkage	**0 mm** (**0.00 in**)	**0.25 - 0.75 mm** (**0.0098 - 0.0295 in**)	**1.50 mm** (**0.0591 in**)	
Valve head width	**1.6 mm** (**0.063 in**)	**1.30 - 1.80 mm** (**0.0512 - 0.0709 in**)	**2.50 mm** (**0.0984 in**)	
Valve margin	**1.5 mm** (**0.059 in**)	**1.35 - 1.65 mm** (**0.0531 - 0.0650 in**)	**0.50 mm** (**0.0197 in**)	
Valve guide mounting length	**10 mm** (**0.39 in**)	**9.5 - 10.5 mm** (**0.374 - 0.413 in**)		
Valve spring				
Free length		**47 mm** (**1.85 in**)	**46 mm** (**1.81 in**)	
Length @ **131 - 145 N** (**29 - 33 lb**)		**39.0 mm** (**1.535 in**)	**-15 %**	
Length @ **279 - 309 N** (**63 - 69 lb**)		**30.1 mm** (**1.185 in**)	**-15 %**	
Push rod runout		**0.3 mm** (**0.012 in**)		Replace
Cylinder head distortion		**0.05 mm** (**0.0020 in**)	**0.10 mm** (**0.0039 in**)	
Cylinder				
Cylinder block distortion (Deck)		**0.05 mm** (**0.0020 in**) or less	**0.10 mm** (**0.0039 in**)	Repair
Inside diameter	**78 mm** (**3.071 in**)	**78 mm** (**3.071 in**)	**78.2 mm** (**3.079 in**)	Repair to oversize or replace
Cylindericity		**0.01 mm** (**0.0004 in**) or less		
Piston				
Outside diameter				
- STD	**78.00 mm** (**3.0709 in**)	**77.93 - 77.95 mm** (**3.0681 - 3.0689 in**)	**77.80 mm** (**3.0630 in**)	
- **0.25 mm** (**0.010 in**) OS	**78.25 mm** (**3.0807 in**)	**78.18 - 78.20 mm** (**3.0780 - 3.0787 in**)	**78.05 mm** (**3.0728 in**)	
- **0.50 mm** (**0.020 in**) OS	**78.50 mm** (**3.0906 in**)	**78.43 - 78.45 mm** (**3.0878 - 3.0886 in**)	**78.30 mm** (**3.0827 in**)	
Weight difference within an engine		+ / - **5 g** (**0.18 oz**) or less		
Piston pin outside diameter	**23 mm** (**0.91 in**)	**22.994 - 23.000 mm** (**0.9053 - 0.9055 in**)		
Clearance between piston pin bore and piston pin		**0.006 - 0.018 mm** (**0.0002 - 0.0007 in**)	**0.050 mm** (**0.0020 in**)	
Clearance between piston and cylinder		**0.035 - 0.086 mm** (**0.0014 - 0.0034 in**)	**0.300 mm** (**0.0118 in**)	Repair to oversize or replace

Inspection point	Nominal	Standard	Limit	Remark
Piston ring Clearance between the piston ring and ring groove				
- Top compression ring		**0.09 - 0.11 mm** (**0.0035 - 0.0043 in**)	**0.30 mm** (**0.0118 in**)	Replace the rings until the limits are reached, then replace the piston.
- Intermediate ring		**0.07 - 0.11 mm** (**0.0028 - 0.0043 in**)	**0.20 mm** (**0.0079 in**)	Replace the rings until the limits are reached, then replace the piston.
- Oil ring		**0.03 - 0.07 mm** (**0.0012 - 0.0028 in**)	**0.20 mm** (**0.0079 in**)	Replace the rings until the limits are reached, then replace the piston.
Piston ring end gap				
- Top compression ring		**0.15 - 0.30 mm** (**0.0059 - 0.0118 in**)	**1.50 mm** (**0.0591 in**)	Replace
- Intermediate ring		**0.15 - 0.30 mm** (**0.0059 - 0.0118 in**)	**1.50 mm** (**0.0591 in**)	Replace
- Oil ring		**0.20 - 0.40 mm** (**0.0079 - 0.0157 in**)	**1.50 mm** (**0.0591 in**)	Replace
Connecting rod Bend and torsion (over a **100 mm** (**3.9 in**) span		**0.05 mm** (**0.0020 in**) or less	**0.15 mm** (**0.0059 in**)	
End play		**0.10 - 0.35 mm** (**0.0039 - 0.0138 in**)	**0.50 mm** (**0.0197 in**)	Replace the connecting rod
Crankshaft Crank journal outside diameter	**52 mm** (**2.05 in**)	**51.985 - 52.000 mm** (**2.0467 - 2.0472 in**)		
Crank pin outside diameter	**48 mm** (**1.89 in**)	**47.950 - 47.965 mm** (**1.8878 - 1.8884 in**)		
Crankshaft runout		**0.025 mm** (**0.0010 in**) or less	**0.050 mm** (**0.0020 in**)	Repair or replace
Main bearing oil clearance		**0.030 - 0.077 mm** (**0.0012 - 0.0030 in**)	**0.100 mm** (**0.0039 in**)	Replace main bearing
Connecting rod bearings oil clearance		**0.025 - 0.072 mm** (**0.0010 - 0.0028 in**)	**0.150 mm** (**0.0059 in**)	Replace connecting rod bearings
End play		**0.050 - 0.175 mm** (**0.0020 - 0.0069 in**)	**0.500 mm** (**0.0197 in**)	Replace flanged No. 3 main bearing
Timing gear backlash Between crankshaft gear and idler gear		**0.04 - 0.12 mm** (**0.0016 - 0.0047 in**)	**0.30 mm** (**0.0118 in**)	Replace
Between idler gear and valve camshaft gear		**0.04 - 0.12 mm** (**0.0016 - 0.0047 in**)	**0.30 mm** (**0.0118 in**)	Replace
Between idler gear and pump camshaft gear		**0.04 - 0.12 mm** (**0.0016 - 0.0047 in**)	**0.30 mm** (**0.0118 in**)	Replace

Inspection point	Nominal	Standard	Limit	Remark
Between valve camshaft gear and PTO gear		**0.08 - 0.19 mm** (**0.0031 - 0.0075 in**)	**0.30 mm** (**0.0118 in**)	Replace
Between pump camshaft gear and oil pump gear		**0.07 - 0.20 mm** (**0.0028 - 0.0079 in**)	**0.30 mm** (**0.0118 in**)	Replace
Cam height		**35.62 - 35.82 mm** (**1.4024 - 1.4102 in**)	**34.72 mm** (**1.3669 in**)	Replace
Flywheel flatness		**0.15 mm** (**0.0059 in**) or less	**0.50 mm** (**0.0197 in**)	Repair
Clearance between tappet and cylinder block bore			**0.15 mm** (**0.0059 in**)	Replace tappet
Clearance between camshaft journal and bushing		**0.05 - 0.125 mm** (**0.0020 - 0.0049 in**)	**0.15 mm** (**0.0059 in**)	Replace
Clearance between idler gear bushing and idler shaft		**0.02 - 0.07 mm** (**0.0008 - 0.0028 in**)	**0.20 mm** (**0.0079 in**)	Replace idler gear or idler shaft