AGCO SISU POWER

Workshop Manual

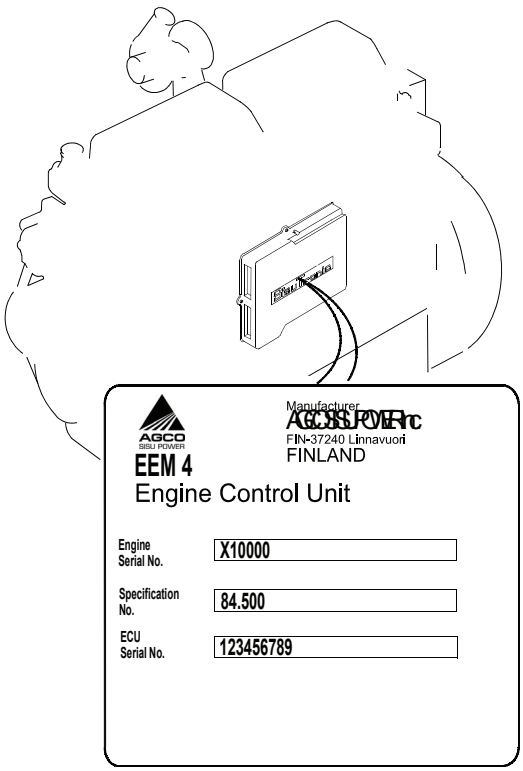
4th Generation Engines

8370 79492

AGCO
SISU POWER

MARKING OF THE EEM 4 CONTROL UNIT

The model specification is indicated on the type plate of the EEM 4 control unit. This specification must always be stated when ordering a control unit or requesting adjusted settings.



Note! The engine meets EU97/68/EC Stage IIIB and EPA 40 CFR 89 Tier 4i emission requirements.

Do not fit any components on the engine other than those originally intended for it. The use of parts other than original Sisu Power spare parts will invalidate the responsibility of AGCO SISU POWER Inc. with respect to the fulfilment of the emission requirements.

LIFTING THE ENGINE

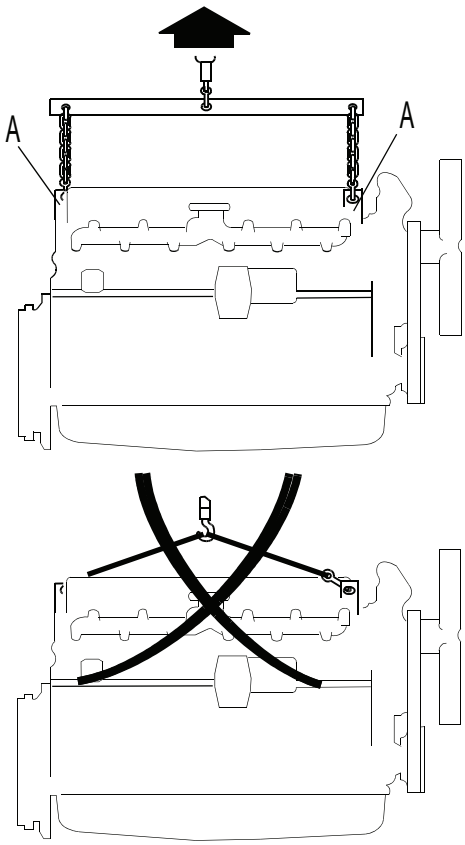
Safe lifting of the engine is done with a lifting device where the lifting force affects the lifting eyes vertically.

Weight of engine

Engine type	Weight kg *)
33	330
44	345
49	345
66	515
74	525
84	650
98	790

*) Dry weight without flywheel, electrics, SCR and CCV components

A = Engine lifting eyes



Depth of valve head face below cylinder head surface:
- inlet valve . . . . . 0.65...0.85 mm
. . . . . (max. 2.20mm)
- exhaust valve . . . . . 0.45...0.65 mm
. . . . . (max. 2.20mm)
Valve spring free length . . . . . 75.1 mm
Spring pressure when spring compressed to a length of:
- 41.0 mm . . . . . 300 ± 10 N
- 31.0 mm . . . . . 420 ± 15 N
Rocker arm shaft diameter . . . . . 24.970...24.990 mm
Diameter of rocker arm bore . . . . . 25.000...25.021 mm
Free length of rocker arm spring . . . . . 88 mm
Spring pressure when spring compressed to a length of 66 mm . . . . . 75...95 N

Tappets and Push Rods

Outside diameter of tappet . . . . . 29.939...29.960 mm
Diameter of tappet bore in cylinder block . . . . . 30.000...30.043 mm
Max. permissible push rod deflection (when free). . . . . 0.4 mm
Overall length of push rod (33, 44, 49, 66, 74) . . . . . 245...246.3 mm
Overall length of push rod (84, 98) . . . . . 286...287.3 mm

Camshaft

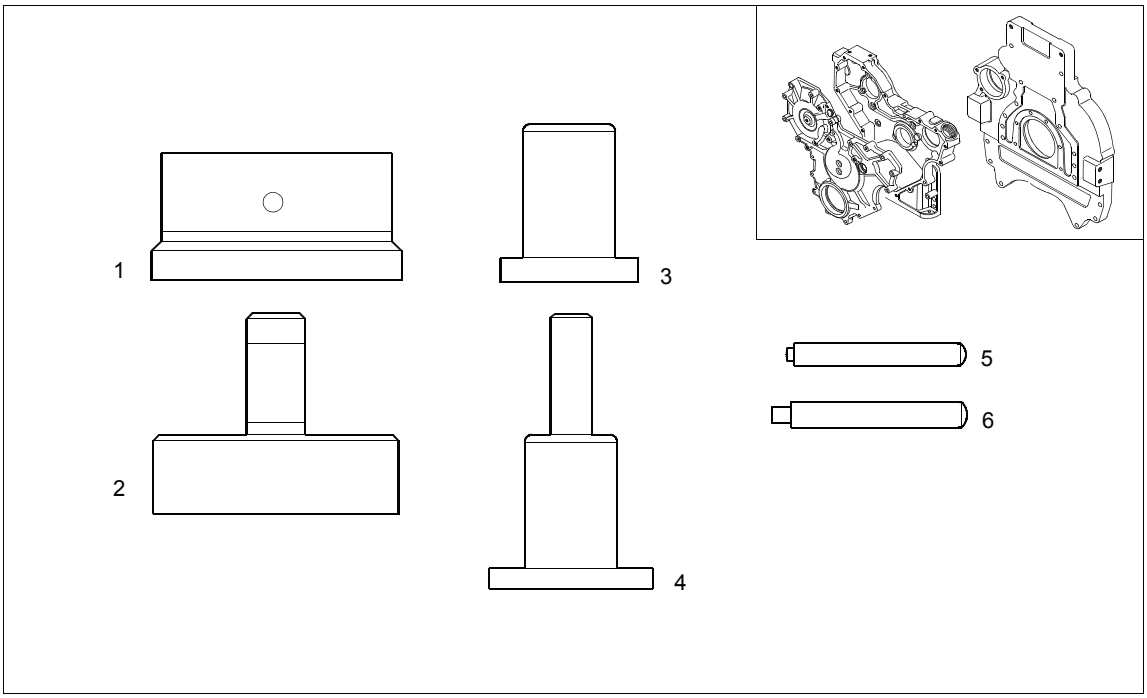
Diameter of camshaft bearing journal no. 1 . . . . . 49.875...49.900 mm
Diameter of camshaft bearing journals others (33, 44, 49). . . . . 49.885...49.910 mm
Diameter of camshaft bearing journals nos. 2-4 (66, 74, 84), 2-5 (98) . . . . 49.865...49.890 mm
Diameter of camshaft bearing journal no. 5 (66, 74, 84), 6 (98) . . . . . 49.885...49.910 mm
Camshaft clearance in bearing bush no. 1 . . . . . 0.140...0.185 mm
Camshaft clearance in bearing bush nos. 2-4 (33, 44, 49) . . . . . 0.120...0.205 mm
Camshaft clearance in bearing bush nos. 2-4 (66, 74, 84), 2-5 (98). . . . . 0.110...0.160 mm
Camshaft clearance in bearing bush no. 5 (66, 74, 84), 6 (98). . . . . 0.100...0.185 mm
Camshaft end play . . . . . 0.7...1.2 mm
Cam height (distance between back of cam and tip of cam):
- inlet valve . . . . . 43.180...43.680 mm
- exhaust valve . . . . . 41.700...42.200 mm
Cam lift:
- inlet valve . . . . . 6.18 mm
- exhaust valve . . . . . 7.70 mm
Width of cam . . . . . 19.70...20.30 mm
Camshaft max. permissible deflection (total indicator reading). . . . . 0.03 mm

Crankshaft

33, 44, 49, 66 and 74 Engines

Crankpin diameter:
- standard . . . . . 67.981...68.000 mm
- 1st undersize 0.25 mm . . . . . 67.731...67.750 mm
- 2nd undersize 0.50 mm . . . . . 67.481...67.500 mm
- 3rd undersize 1.00 mm . . . . . 66.981...67.000 mm
- 4th undersize 1.50 mm . . . . . 66.481...66.500 mm
Crankpin length . . . . . 40.000...40.160 mm
Main bearing journal diameter (33, 44, 49 and 66 engines):
- standard . . . . . 84.985...85.020 mm
- 1st undersize 0.25 mm . . . . . 84.735...84.770 mm
- 2nd undersize 0.50mm . . . . . 84.485...84.520 mm
- 3rd undersize 1.00 mm . . . . . 83.985...84.020 mm

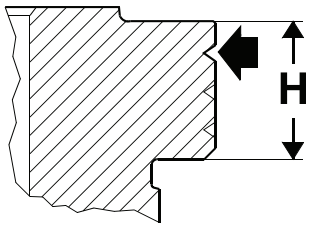
Timing Gear and Flywheel Housing



Ref	Description	Order no.	33	44	49	66	74	84	98
1	Centring tool for flywheel housing	9052 46400	x	x	x	x	x		
		9104 52700						x	x
2	Drift for fitting rear crankshaft seal	9052 46300	x	x	x	x	x		
		9104 52600						x	x
3	Drift for fitting front crankshaft seal	9103 94600	x	x	x	x	x	x	
4	Drift for fitting front crankshaft seal	9235 17520							x
5	Drift for tension pins in timing gear housing	9025 98800	x	x	x	x	x		
6	Drift for tension pins in timing gear- and flywheel housing	9025 98700	x	x	x	x	x	x	x

84- and 98-Engines

Order no.	H	Marking grooves pcs
8368 67048	$9.03^{+0.02}$	- (std.)
8368 67050	$9.08^{+0.02}$	1
8368 67051	$9.13^{+0.02}$	2
8368 67052	$9.23^{+0.02}$	3



Cylinder liners with oversize flanges (higher flanges) are marked with grooves on the outer circumference as follows:

1st oversize, 0.05 mm = 1 marking groove
2nd oversize, 0.10 mm = 2 marking grooves
3rd oversize, 0.20 mm = 3 marking grooves

Note! Recess depth is adjusted with a cylinder liner recess cutter 9101 65600 or 9104 52000 (84 and 98 engines).

7. If the liner height of a cylinder liner is not the same all the way round, the cylinder liner flange and the cylinder block recess depth should be checked. Cylinder liners with warped flanges should be discarded.

8. Fit the O-rings into the grooves in the cylinder liner. For 84 and 98 engines, fit the O-rings into the grooves in the cylinder block. Fit the green O-ring (A) into the lowest groove. Lubricate the O-rings with a liquid soap (not with engine oil).

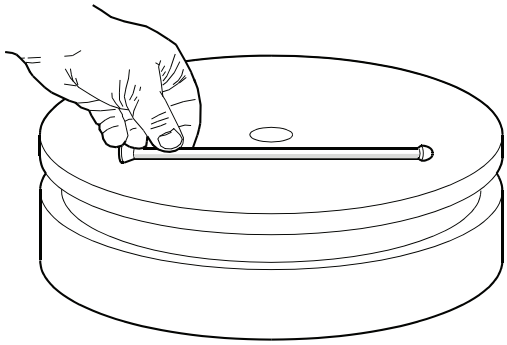
Note! Stretch the O-rings as little as possible when fitting them. Max. permissible stretch is 6%.

9. Press the cylinder liners into the cylinder block. It should be easy to press them fully home. Make sure that the liners do not rise up after fitting.

4. VALVE MECHANISM

4.1. Reconditioning Valve Mechanism

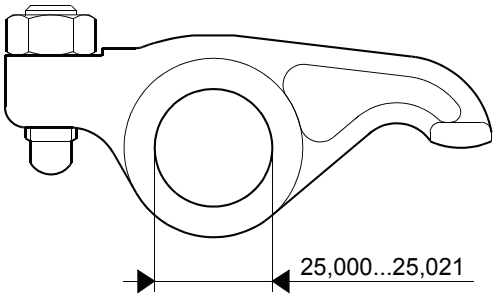
1. Check the valve tappets, especially the contact surface against the camshaft. Worn or damaged tappets should be discarded.



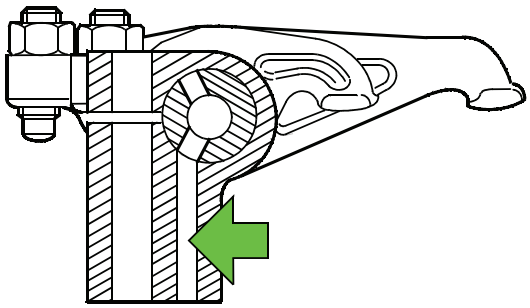
2. Check the straightness of the push rods by rolling them on a surface table. Also check the spherical surfaces at the ends. Notice the length difference between the push rods in different engine types:

Engine	Total Length of Push Rod, mm	Order Number of Push Rod
33/44/49/66/74	245...246.3	8370 70119
84/98	286...287.3	8370 69014

3. Dismantle and clean the rocker arm mechanism. Check the shaft for wear and check that the oilways are clean.

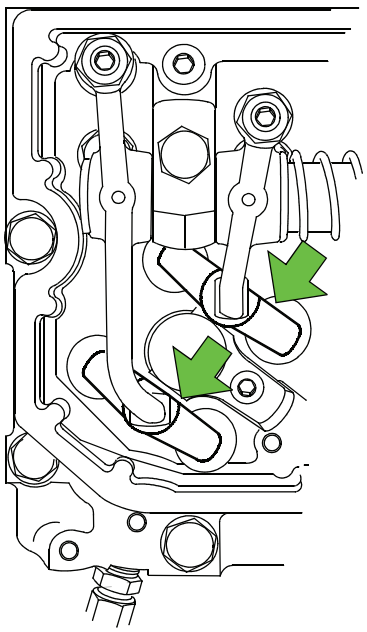


4. Check the diameter of the rocker arm bore, **25.000...25.021 mm**. Change the worn or damaged rocker arm. Where necessary, grind the rocker arm valve contact surface to the correct shape. Do not grind more than necessary, as the hardened layer is thin.



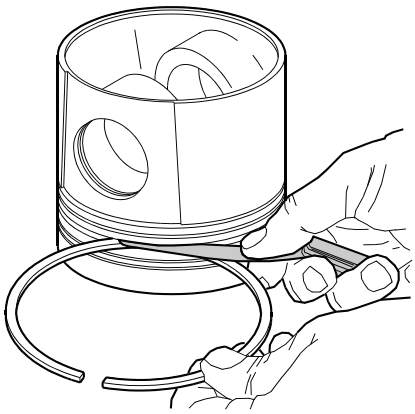
5. Fit the plug to the other end of the rocker arm shaft. Lubricate the shaft and fit various parts in the correct order. Note the correct position of the shaft and the bearing brackets. Fit the other end plug and tighten plugs to **25 Nm.**

6. Fit the connecting parts onto the valves in position as shown in the picture.

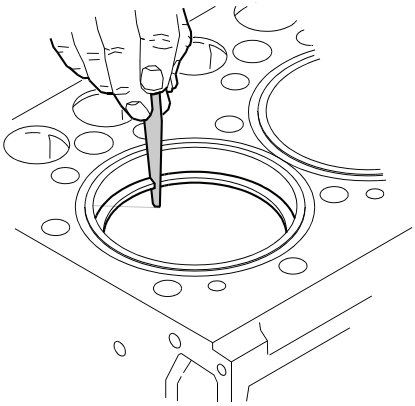


6.4. Changing Piston Rings

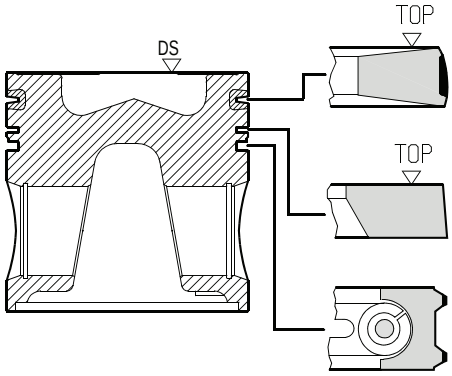
1. Remove the piston rings with piston ring pliers 9052 46900. Do not open the rings more than is necessary. If the rings are to be used again ensure that they are fitted in the same groove.



2. Clean the piston ring grooves and measure the piston ring clearance, which must not exceed **0.15 mm**. Determine whether too large a clearance is due to worn rings or a worn groove. Change worn parts.



3. Measure the piston ring gap by pushing one piston ring at a time into the cylinder bore. The piston ring gap must not exceed **1 mm** on the 1st and 3rd piston rings and **1.5 mm** (84/98-engines: **1.3 mm**) on the 2nd piston ring.

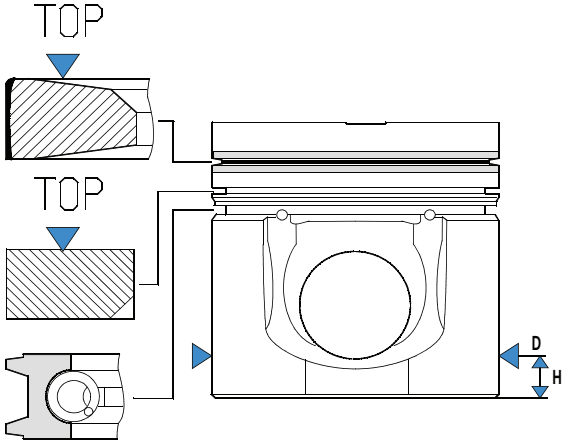


4. Fit the piston rings on the piston using the piston ring pliers. Ensure that the rings are fitted in the correct groove and that "TOP", or the manufacturer's designation, faces upwards.

6.5. Checking Pistons

Check the condition of the pistons and piston pins. Pay special attention to any cracks on the edge of the combustion chamber and on the upper edge of the piston pin hole. Measure the diameter of the piston at the point shown in the figure below. Replace the piston if needed.

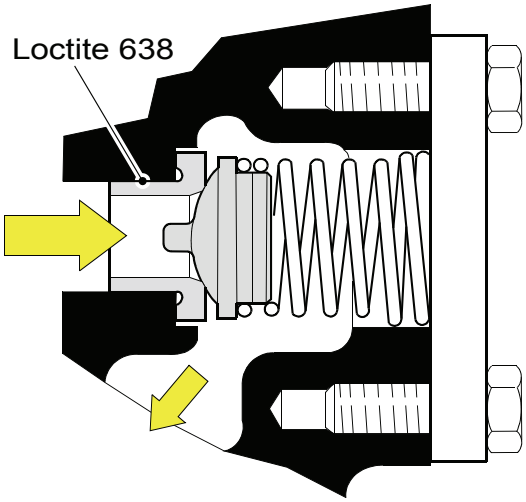
Engine	D (mm)	H (mm)
33, 44, 66	107.883...107.897	17.0
49, 74	107.893...107.907	19.0
84, 98	110.863...110.877	15.0



10. LUBRICATION SYSTEM

10.1. Oil Pressure Regulating Valve

If the pressure of the engine lubricating oil is insufficient or varies, the oil level then the regulating valve should be checked.



1. Remove the cover and the spring with the valve plate.

2. Clean the parts and check that the sealing surfaces are undamaged. Damaged parts should be changed. Scrape off any remains of the gasket.

Note! There are two types of spring.

3. Apply locking fluid (e.g. Loctite 638, 62737) onto the outside of the valve seat. Tap the new valve seat into the cylinder block using a suitable drift. Place the spring with valve plate into the cylinder block and fit the cover with a new gasket.

10.2. Removing and Dismantling Lubricating Oil Pump

1. Drain the engine oil and remove the oil sump.

2. Remove the oil pump suction and pressure pipe.

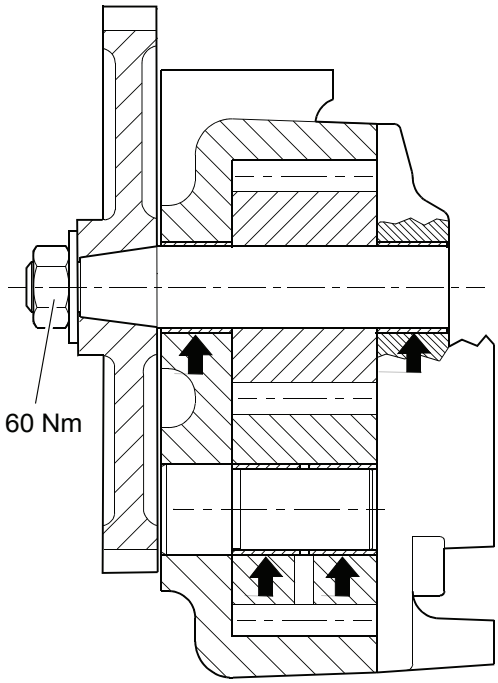
3. Remove the oil pump together with any shims between the pump and the cylinder block.

4. Remove the pump cover and the gasket. Remove the gear on the dead axle.

5. Clamp the pump gear across the teeth in a vice fitted with soft jaws, and loosen the drive gear nut. Knock the gear wheel off by hitting the end of the shaft with a soft hammer. Pull out the drive shaft gear wheel.

6. Clean the parts and check for wear and other damage. See "**Technical data**", point "**Oil pump**". Change damaged parts and all seals.

7. On the 66-, 74-, 84- and 98-engines, the bearing points are provided with separate bearing bushings. If you change the bushings, machine them to a size of **18.000...18.018 mm** after fitting.



Pump with Flexonic belt, 84 and 98 Engines

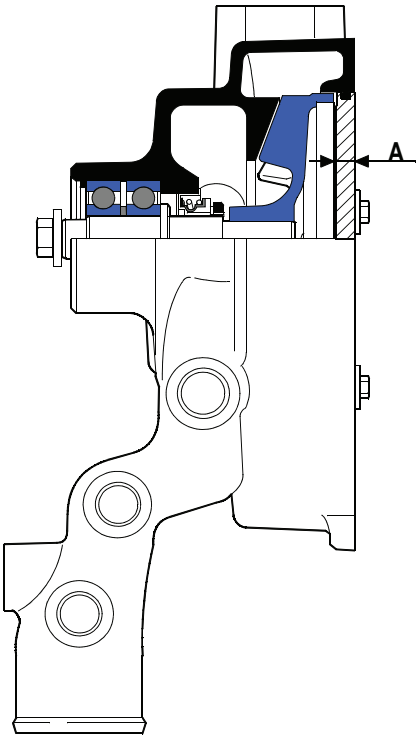
Some 84 and 98 engines have coolant pump driven by Flexonic belt. This coolant pump is mounted on the front face of the cylinder block without a separate mounting plate. Note the following points when reconditioning the coolant pump.

1. The reconditioning is done mainly according to instruction 11.3. Remove the belt pulley and bearing lock ring. Remove the pump back plate and press the axle with bearings out from the pump body. Press out the water seal with a suitable drift. Clean the parts to be re-used. **Note:** this pump does not have an axle seal between the bearing and water seal.

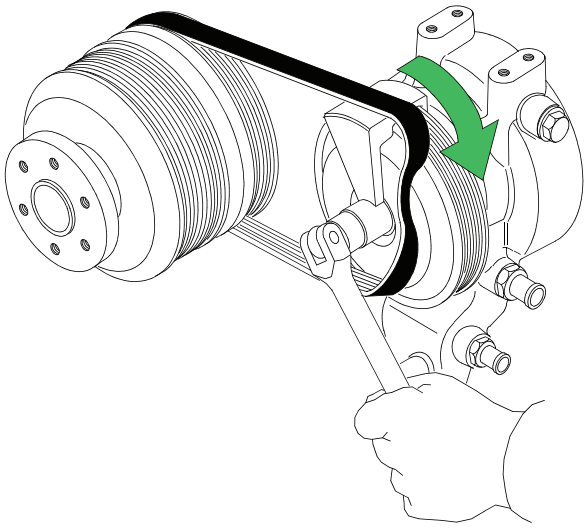
2. Start the reassembly by pressing the inner bearing on the axle and assemble the parts in the pump body. Lubricate the bearings with ball bearing grease. We recommend Isoflex Topas NB52 or NLGI 2 class grease, amount abt. 5 gr. Press the outer bearing into its place and fix the lock ring.

3. Press the water seal into its place with drift xxxx xxxxx. Press the impeller into its place while supporting the axle on the other end.The mounting depth of the impeller is **8,6...9,0 mm** from the body rear surface (measurement A).

4. Fit the pump rear plate and the belt pulley. Tighten the belt pulley nut to **50 Nm**.



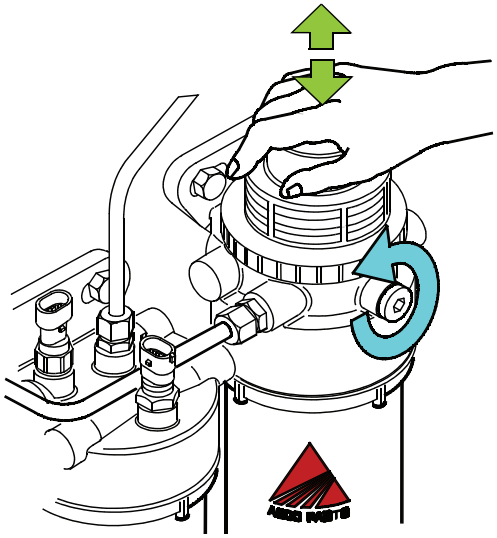
5. Mount the pump to the engine. Fit a new drive belt with fitting tool 9201 86480 or a fitting device delivered with the replacement belt. Note: The Flexonic belt does not have a separate tensioner. Belt replacing is recommended after every 3000 running hours or when it has been removed.



13.2. Bleeding Fuel System

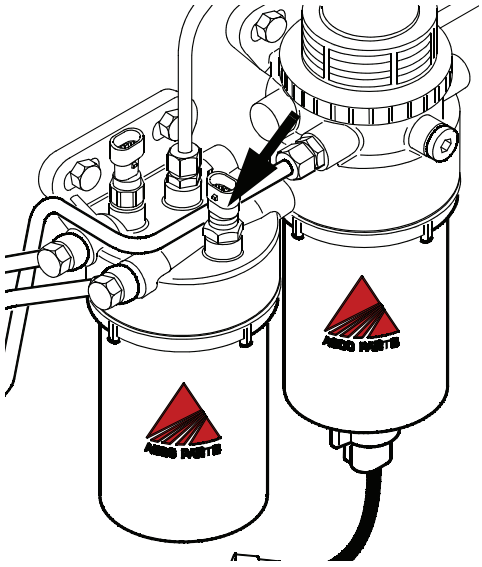
Note! Do not open high-pressure pipe connectors on the fuel system when the engine is running. Wait at least 30 sec. after the engine has stopped. If the jet of high-pressure fuel comes into contact with your skin, the fuel will penetrate the skin causing severe injuries. Get medical help immediately!

- Open the bleeding plug on the pre-filter bracket.
- Put a transparent hose in the plug hole and lead it into a suitable container
- Pump fuel with the hand pump on top of the pre-filter bracket.
- Pump with the hand pump until there are no air bubbles in the fuel stream.
- Remove the hose and turn back the bleeding plug.
- Clean the engine of eventual overspill fuel.
- Start the engine. The fuel system removes automatically the air left in the system.



Note! Do not use any tools and/or excessive force on the pre-filter hand pump!

13.3. Measuring Fuel Feed Pressure



1. Clean the pre-filter, the fuel filter and the related fuel pipes from the outside.

2. Disconnect the temperature sensor (arrowed) from the fuel filter and connect the pressure gauge instead (the thread is M14x1.5).

3. Run the engine at low idling speed for a while and compare the gauge reading with the prescribed value (~5,5...6,5 bar).

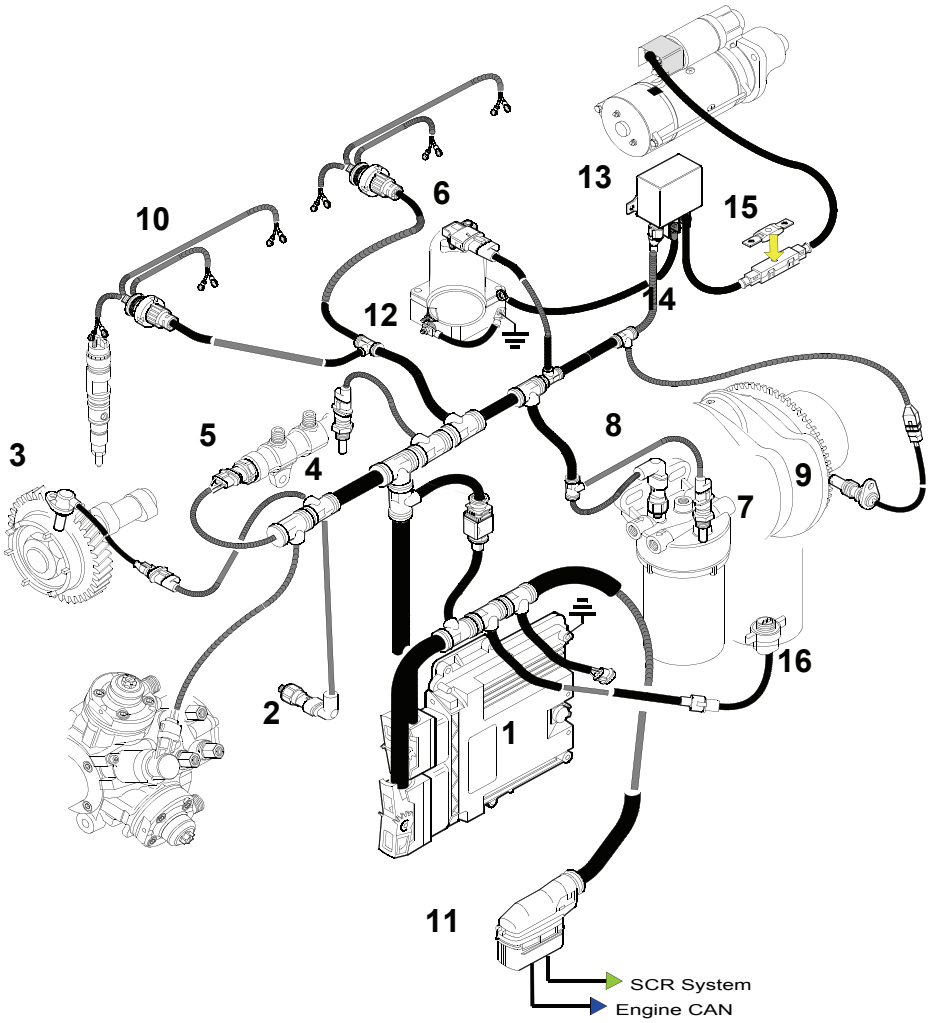
If the pressure is below the prescribed value, this may be caused by:

- Clogged fuel filters.
- Suction piping clogged or leaking air.
- Empty fuel tank or unsuitable fuel (e.g. summer fuel in the winter).

14. EEM4 ENGINE CONTROL SYSTEM

4th Generation engines meet the emission requirements set by the authorities (EU97/68/EC Stage III B and EPA 40 CFR 89 Tier 4i). The manufacturer guarantees that all engines of this type are equivalent to the engine that is officially approved. Please note that the service schedule should be followed carefully, especially when performing periodical maintenance. Any adjustment and repair work to the injection system or the engine control unit should only be carried out by a representative authorised by AGCO SISU POWER Inc. When performing any service or repair work, only use original AGCO Sisu Power spare parts. Inadequate or delayed service and the use of parts other than original AGCO Sisu Power spare parts will invalidate the responsibility of AGCO SISU POWER Inc. with respect to the fulfilment of the emission requirements.

14.1. Construction of the EEM4



Parts of the Engine Control System

1. Electronic control unit (ECU)
2. Oil pressure sensor
3. Speed sensor (camshaft)
4. Coolant temperature sensor
5. Rail pressure sensor
6. Boost pressure sensor
7. Fuel temperature sensor
8. Fuel pressure sensor
9. Speed sensor (crankshaft)
10. Injector wiring
11. Vehicle connector
12. Inlet air heater
13. Inlet air heater solenoid
14. Heater wiring
15. Fuse
16. Water detector (fuel)