5 Job card overview

5.1 Sorted alphabetically

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Activity	Job card	Maintenance group
Checking and setting fuel injectors	W 07-07-05	Fuel system
Checking and setting plunger lift of injection pumps	W 07-06-04	Fuel system
Checking axial backlash of crankshaft (crankshaft installed)	W 02-01-04	Drive system
Checking axial backlash of crankshaft (crankshaft removed)	W 02-01-04	Drive system
Checking piston overhang	W 01-04-09	Cylinder head
Checking the camshaft	W 04-05-06	Engine control
Checking the compression pressure	W 00-02-06	General
Checking the con rod	W 02-03-01	Drive system
Checking the crankshaft	W 02-01-07	Drive system
Checking the overhang of the cylinder liner	W 03-03-08	Crankcase
Checking the piston	W 02-09-07	Drive system
Checking the piston rings and piston ring grooves	W 02-10-03	Drive system
Checking the valve guide	W 01-06-03	Cylinder head
Checking the valve lag	W 01-07-08	Cylinder head
Checking the valves	W 01-05-04	Cylinder head
Checking thermostat (removed state)	W 09-08-01	Cooling system
Disassembling, assembling and checking the rocker arm and rocker arm bracket	W 01-02-06	Cylinder head
Dismantling and assembling fuel injector	W 07-07-02	Fuel system
Dismantling and assembling genset support	W 03-08-03	Crankcase
Grinding the cylinder head sealing surface	I 01-04-08	Cylinder head
Installing and removing turning gear	W 04-06-03	Engine control
Mounting engine on assembly block and demounting	W 00-05-01	General
Removing and installing charge air pipe (A-bank)	W 06-07-03	Exhaust system / Charging
Removing and installing charge air pipe (B-bank)	W 06-07-03	Exhaust system / Charging
Removing and installing connecting pipe	W 06-02-05	Exhaust system / Charging
Removing and installing connecting pipe (Railway)	W 06-02-05	Exhaust system / Charging
Removing and installing coolant pump	W 09-07-08	Cooling system
Removing and installing crankcase breather (oil separator)	W 03-01-11	Crankcase
Removing and installing exhaust line (A-bank)	W 06-01-05	Exhaust system / Charging
Removing and installing exhaust line (B-bank)	W 06-01-05	Exhaust system / Charging
Removing and installing exhaust manifold	W 06-01-07	Exhaust system / Charging

Activity	Job card	Maintenance group
Removing and installing exhaust manifold (A-bank) (Railway)	W 06-01-07	Exhaust system / Charging
Removing and installing exhaust manifold (B-bank) (Railway)	W 06-01-07	Exhaust system / Charging
Removing and installing exhaust pipe (A-bank)	W 06-01-06	Exhaust system / Charging
Removing and installing exhaust pipe (B-bank)	W 06-01-06	Exhaust system / Charging
Removing and installing flame glow plug	W 07-01-02	Fuel system
Removing and installing flame glow plug (Railway)	W 07-01-02	Fuel system
Removing and installing flywheel	W 12-06-01	Other components
Removing and installing fuel pipes	W 07-10-06	Fuel system
Removing and installing fuel pipes (flame glow plugs)	W 07-01-04	Fuel system
Removing and installing fuel pipes (flame glow plugs) (Railway)	W 07-01-04	Fuel system
Removing and installing fuel pipes (Railway)	W 07-10-06	Fuel system
Removing and installing fuel pressure holding valve	W 07-13-01	Fuel system
Removing and installing fuel pressure holding valve (Railway)	W 07-13-01	Fuel system
Removing and installing fuel shut-off valve (flame glow plugs)	W 07-01-03	Fuel system
Removing and installing fuel shut-off valve (flame glow plugs) (Railway)	W 07-01-03	Fuel system
Removing and installing gear case cover (Railway)	W 04-04-09	Engine control
Removing and installing genset support	W 03-08-01	Crankcase
Removing and installing hydraulic pump drive	W 12-08-04	Other components
Removing and installing injection pump camshaft	W 04-05-07	Engine control
Removing and installing injection pumps (cylinder A1)	W 07-04-01	Fuel system
Removing and installing injection pumps (cylinder A2-B3)	W 07-04-01	Fuel system
Removing and installing lubricating oil pan (Railway)	W 08-04-07	Lube oil system
Removing and installing oil pressure pick-up	W 08-11-09	Lube oil system
Removing and installing oil suction pipe (Railway)	W 08-04-06	Lube oil system
Removing and installing pressure sensor/temperature sensor (charge air)	W 13-08-01	Electrical system
Removing and installing pressurestat	W 08-11-10	Lube oil system
Removing and installing rear cover	W 03-09-01	Crankcase

Activity	Job card	Maintenance group
Removing and installing small end bush	I 02-03-03	Drive system
Removing and installing tappets, checking tappet bores	W 04-02-02	Engine control
Removing and installing temperature transmitter	W 07-09-01	Fuel system
Removing and installing temperature transmitter	W 09-12-01	Cooling system
Removing and installing the cable harness	W 13-01-02	Electrical system
Removing and installing the camshaft	W 04-05-05	Engine control
Removing and installing the charge air line	W 06-02-03	Exhaust system / Charging
Removing and installing the connection housing	W 03-09-04	Crankcase
Removing and installing the crankshaft	W 02-04-01	Drive system
Removing and installing the cylinder head	W 01-04-04	Cylinder head
Removing and installing the cylinder liner	W 03-03-02	Crankcase
Removing and installing the fuel injectors	W 07-07-01	Fuel system
Removing and installing the fuel supply pump	W 07-11-01	Fuel system
Removing and installing the gearcase cover	W 04-04-09	Engine control
Removing and installing the generator (V-belt drive)	W 13-02-03	Electrical system
Removing and installing the impulse transmitter (camshaft)	W 05-07-03	Speed governing
Removing and installing the impulse transmitter (crankshaft)	W 05-07-01	Speed governing
Removing and installing the lubricating oil pan	W 08-04-07	Lube oil system
Removing and installing the oil cooler	W 08-08-02	Lube oil system
Removing and installing the oil suction pipe	W 08-04-06	Lube oil system
Removing and installing the piston and con rod	W 02-09-03	Drive system
Removing and installing the piston cooling nozzle	W 02-15-01	Drive system
Removing and installing the rocker arm and rocker arm bracket	W 01-02-02	Cylinder head
Removing and installing the starter	W 13-03-02	Electrical system
Removing and installing the valves	W 01-05-01	Cylinder head
Removing and installing thermostat	W 09-08-02	Cooling system
Removing and installing thermostat housing	W 09-08-04	Cooling system
Removing and installing torsional vibration damper	W 12-01-04	Other components
Removing and installing turbocharger	W 06-06-04	Exhaust system / Charging
Removing and installing turbocharger (A-bank) (Railway)	W 06-06-04	Exhaust system / Charging
Removing and installing turbocharger (B-bank) (Railway)	W 06-06-04	Exhaust system / Charging
Removing and installing, testing camshaft bearing	W 03-11-01	Crankcase

Activity	Job card	Maintenance group
Renewing injection pipes (A-bank)	W 07-03-01	Fuel system
Renewing injection pipes (B-bank)	W 07-03-01	Fuel system
Renewing the crankshaft sealing ring (flywheel side)	W 02-02-02	Drive system
Renewing the crankshaft sealing ring (opposite side to flywheel)	W 02-02-04	Drive system
Renewing toothed starter flywheel ring	W 12-06-03	Other components
Renewing valve guide (oversize, pressed version)	I 01-06-04	Cylinder head
Repairing the collar rest of the cylinder liner	I 03-10-05	Drive system
Replacing valve seat insert (oversize)	I 01-07-09	Cylinder head
Setting valve clearance	W 01-01-01	Cylinder head
Testing the cylinder liner	W 03-03-01	Crankcase

5.2 Sorted numerically

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Job card	Activity	Maintenance group
I 01-04-08	Grinding the cylinder head sealing surface	Cylinder head
I 01-06-04	Renewing valve guide (oversize, pressed version)	Cylinder head
I 01-07-09	Replacing valve seat insert (oversize)	Cylinder head
I 02-03-03	Removing and installing small end bush	Drive system
I 03-10-05	Repairing the collar rest of the cylinder liner	Drive system
W 00-02-06	Checking the compression pressure	General
W 00-05-01	Mounting engine on assembly block and demounting	General
W 01-01-01	Setting valve clearance	Cylinder head
W 01-02-02	Removing and installing the rocker arm and rocker arm bracket	Cylinder head
W 01-02-06	Disassembling, assembling and checking the rocker arm and rocker arm bracket	Cylinder head
W 01-04-04	Removing and installing the cylinder head	Cylinder head
W 01-04-09	Checking piston overhang	Cylinder head
W 01-05-01	Removing and installing the valves	Cylinder head
W 01-05-04	Checking the valves	Cylinder head
W 01-06-03	Checking the valve guide	Cylinder head
W 01-07-08	Checking the valve lag	Cylinder head
W 02-01-04	Checking axial backlash of crankshaft (crankshaft removed)	Drive system
W 02-01-04	Checking axial backlash of crankshaft (crankshaft installed)	Drive system
W 02-01-07	Checking the crankshaft	Drive system
W 02-02-02	Renewing the crankshaft sealing ring (flywheel side)	Drive system
W 02-02-04	Renewing the crankshaft sealing ring (opposite side to flywheel)	Drive system
W 02-03-01	Checking the con rod	Drive system
W 02-04-01	Removing and installing the crankshaft	Drive system
W 02-09-03	Removing and installing the piston and con rod	Drive system
W 02-09-07	Checking the piston	Drive system
W 02-10-03	Checking the piston rings and piston ring grooves	Drive system
W 02-15-01	Removing and installing the piston cooling nozzle	Drive system
W 03-01-11	Removing and installing crankcase breather (oil separator)	Crankcase
W 03-03-01	Testing the cylinder liner	Crankcase
W 03-03-02	Removing and installing the cylinder liner	Crankcase
W 03-03-08	Checking the overhang of the cylinder liner	Crankcase

Job card	Activity	Maintenance group
W 03-08-01	Removing and installing genset support	Crankcase
W 03-08-03	Dismantling and assembling genset support	Crankcase
W 03-09-01	Removing and installing rear cover	Crankcase
W 03-09-04	Removing and installing the connection housing	Crankcase
W 03-11-01	Removing and installing, testing camshaft bearing	Crankcase
W 04-02-02	Removing and installing tappets, checking tappet bores	Engine control
W 04-04-09	Removing and installing the gearcase cover	Engine control
W 04-04-09	Removing and installing gear case cover (Railway)	Engine control
W 04-05-05	Removing and installing the camshaft	Engine control
W 04-05-06	Checking the camshaft	Engine control
W 04-05-07	Removing and installing injection pump camshaft	Engine control
W 04-06-03	Installing and removing turning gear	Engine control
W 05-07-01	Removing and installing the impulse transmitter (crankshaft)	Speed governing
W 05-07-03	Removing and installing the impulse transmitter (camshaft)	Speed governing
W 06-01-05	Removing and installing exhaust line (A-bank)	Exhaust system / Charging
W 06-01-05	Removing and installing exhaust line (B-bank)	Exhaust system / Charging
W 06-01-06	Removing and installing exhaust pipe (A-bank)	Exhaust system / Charging
W 06-01-06	Removing and installing exhaust pipe (B-bank)	Exhaust system / Charging
W 06-01-07	Removing and installing exhaust manifold	Exhaust system / Charging
W 06-01-07	Removing and installing exhaust manifold (A-bank) (Railway)	Exhaust system / Charging
W 06-01-07	Removing and installing exhaust manifold (B-bank) (Railway)	Exhaust system / Charging
W 06-02-03	Removing and installing the charge air line	Exhaust system / Charging
W 06-02-05	Removing and installing connecting pipe	Exhaust system / Charging
W 06-02-05	Removing and installing connecting pipe (Railway)	Exhaust system / Charging
W 06-06-04	Removing and installing turbocharger	Exhaust system / Charging
W 06-06-04	Removing and installing turbocharger (A-bank) (Railway)	Exhaust system / Charging
W 06-06-04	Removing and installing turbocharger (B-bank) (Railway)	Exhaust system / Charging
W 06-07-03	Removing and installing charge air pipe (A-bank)	Exhaust system / Charging
W 06-07-03	Removing and installing charge air pipe (B-bank)	Exhaust system / Charging
W 07-01-02	Removing and installing flame glow plug	Fuel system

Job card	Activity	Maintenance group
W 07-01-02	Removing and installing flame glow plug (Railway)	Fuel system
W 07-01-03	Removing and installing fuel shut-off valve (flame glow plugs)	Fuel system
W 07-01-03	Removing and installing fuel shut-off valve (flame glow plugs) (Railway)	Fuel system
W 07-01-04	Removing and installing fuel pipes (flame glow plugs)	Fuel system
W 07-01-04	Removing and installing fuel pipes (flame glow plugs) (Railway)	Fuel system
W 07-03-01	Renewing injection pipes (A-bank)	Fuel system
W 07-03-01	Renewing injection pipes (B-bank)	Fuel system
W 07-04-01	Removing and installing injection pumps (cylinder A1)	Fuel system
W 07-04-01	Removing and installing injection pumps (cylinder A2-B3)	Fuel system
W 07-06-04	Checking and setting plunger lift of injection pumps	Fuel system
W 07-07-01	Removing and installing the fuel injectors	Fuel system
W 07-07-02	Dismantling and assembling fuel injector	Fuel system
W 07-07-05	Checking and setting fuel injectors	Fuel system
W 07-09-01	Removing and installing temperature transmitter	Fuel system
W 07-10-06	Removing and installing fuel pipes	Fuel system
W 07-10-06	Removing and installing fuel pipes (Railway)	Fuel system
W 07-11-01	Removing and installing the fuel supply pump	Fuel system
W 07-13-01	Removing and installing fuel pressure holding valve	Fuel system
W 07-13-01	Removing and installing fuel pressure holding valve (Railway)	Fuel system
W 08-04-06	Removing and installing the oil suction pipe	Lube oil system
W 08-04-06	Removing and installing oil suction pipe (Railway)	Lube oil system
W 08-04-07	Removing and installing the lubricating oil pan	Lube oil system
W 08-04-07	Removing and installing lubricating oil pan (Railway)	Lube oil system
W 08-08-02	Removing and installing the oil cooler	Lube oil system
W 08-11-09	Removing and installing oil pressure pick-up	Lube oil system
W 08-11-10	Removing and installing pressurestat	Lube oil system
W 09-07-08	Removing and installing coolant pump	Cooling system
W 09-08-01	Checking thermostat (removed state)	Cooling system
W 09-08-02	Removing and installing thermostat	Cooling system

Job card	Activity	Maintenance group
W 09-08-04	Removing and installing thermostat housing	Cooling system
W 09-12-01	Removing and installing temperature transmitter	Cooling system
W 12-01-04	Removing and installing torsional vibration damper	Other components
W 12-06-01	Removing and installing flywheel	Other components
W 12-06-03	Renewing toothed starter flywheel ring	Other components
W 12-08-04	Removing and installing hydraulic pump drive	Other components
W 13-01-02	Removing and installing the cable harness	Electrical system
W 13-02-03	Removing and installing the generator (V-belt drive)	Electrical system
W 13-03-02	Removing and installing the starter	Electrical system
W 13-08-01	Removing and installing pressure sensor/temperature sensor (charge air)	Electrical system

5.3 Job card references

5

00 General

Job card	Activity and additional job cards necessary for its execution				
W 00-02-06	Checking the compression pressure				
	W 01-01-01	W 07-07-01			
W 00-05-01	Mounting engine on assembly block and demounting				
	W 13-02-03				

01 Cylinder head

Job card	Activity and additional job cards necessary for its execution				
W 01-01-01	Setting valve clearance				
	W 04-06-03				
W 01-02-02	Removing and installing the rocker arm and rocker arm bracket				
	W 01-01-01	W 04-06-03	W 07-03-01 (A-bank)	W 07-03-01 (B-bank)	
W 01-02-06	Disassembling, assembling and checking the rocker arm and rocker arm bracket				
	W 01-02-02				
W 01-04-04	Removing and installing the cylinder head				
	W 01-02-02	W 01-04-09	W 06-01-05 (A-bank)	W 06-01-05 (B-bank)	W 06-07-03 (A-bank)
	W 06-07-03 (B-bank)	W 07-07-01			
I 01-04-08	Grinding the cylinder head sealing surface				
	W 01-05-01				
W 01-04-09	Checking piston overhang				
	W 01-04-04	W 04-06-03			
W 01-05-01	Removing and installing the valves				
	W 01-04-04				
W 01-05-04	Checking the valves				
	W 01-05-01				
W 01-06-03	Checking the valve guide				
	W 01-05-01				
I 01-06-04	Renewing valve guide (oversize, pressed version)				
	W 01-05-01	W 01-06-03			
W 01-07-08	Checking the valve lag				
	W 01-04-04				
I 01-07-09	Replacing valve seat insert (oversize)				
	W 01-05-01	W 01-07-08			

02 Drive system

Job card	Activity and additional job cards necessary for its execution				
W 02-01-04	Checking axial backlash of crankshaft (crankshaft removed)				
	W 02-04-01				
W 02-01-04	Checking axial backlash of crankshaft (crankshaft installed)				
	W 03-08-01	W 03-09-01			
W 02-01-07	Checking the crankshaft				
	W 02-04-01				
W 02-02-02	Renewing the crankshaft sealing ring (flywheel side)				
	W 12-06-01				
W 02-02-04	Renewing the crankshaft sealing ring (opposite side to flywheel)				
W 02-03-01	Checking the con rod				
	W 02-09-03				
I 02-03-03	Removing and installing small end bush				
W 02-04-01	Removing and installing the crankshaft				
	W 02-01-04	W 02-01-07	W 03-08-01	W 03-09-01	W 07-07-01
W 02-09-03	Removing and installing the piston and con rod				
	W 01-04-04	W 02-10-03	W 08-04-06	W 08-04-06 (Railway)	
W 02-09-07	Checking the piston				
	W 02-09-03				
W 02-10-03	Checking the piston rings and piston ring grooves				
	W 02-09-03				
W 02-15-01	Removing and installing the piston cooling nozzle				
	W 02-09-03				

03 Crankcase

Job card	Activity and additional job cards necessary for its execution				
W 03-01-11	Removing and installing crankcase breather (oil separator)				
W 03-03-01	Testing the cylinder liner				
	W 03-03-02				
W 03-03-02	Removing and installing the cylinder liner				
	W 02-09-03	W 03-03-01	W 03-03-08		

03 Crankcase (continuation)

Job card	Activity and additional job cards necessary for its execution				
W 03-03-08	Checking the overhang of the cylinder liner				
	W 01-04-04				
W 03-08-01	Removing and installing genset support				
	W 02-02-04	W 06-07-03 (A-bank)	W 06-07-03 (B-bank)	W 08-04-06	W 09-07-08
	W 09-08-04				
W 03-08-03	Dismantling and assembling genset support				
	W 03-08-01				
W 03-09-01	Removing and installing rear cover				
	W 02-02-02	W 03-09-04	W 08-04-07		
W 03-09-04	Removing and installing the connection housing				
	W 05-07-01	W 06-01-07	W 12-06-01	W 13-03-02	
I 03-10-05	Repairing the collar rest of the cylinder liner				
	W 03-03-02				
W 03-11-01	Removing and installing, testing camshaft bearing				
	W 04-05-05				

04 Engine control

Job card	Activity and additional job cards necessary for its execution				
W 04-02-02	Removing and installing tappets, checking tappet bores				
	W 04-05-05				
W 04-04-09	Removing and installing the gearcase cover				
	W 06-06-04				
W 04-04-09	Removing and installing gear case cover (Railway)				
	W 07-13-01 (Railway)				
W 04-05-05	Removing and installing the camshaft				
	W 01-02-02	W 02-04-01	W 04-05-06	W 05-07-03	W 06-06-04
	W 07-04-01 (cylinder A1)	W 07-04-01 (cylinder A2-B3)	W 07-06-04		
W 04-05-06	Checking the camshaft				
	W 04-05-05				
W 04-05-07	Removing and installing injection pump camshaft				
	W 01-02-02	W 02-02-02	W 03-08-01	W 03-09-04	W 04-06-03
	W 05-07-03	W 06-06-04	W 07-04-01 (cylinder A1)	W 07-04-01 (cylinder A2-B3)	W 07-06-04

04 Engine control (continuation)

Job card	Activity and additional job cards necessary for its execution				
W 04-06-03	Installing and removing turning gear				

05 Speed governing

Job card	Activity and additional job cards necessary for its execution				
W 05-07-01	Removing and installing the impulse transmitter (crankshaft)				
	W 04-06-03				
W 05-07-03	Removing and installing the impulse transmitter (camshaft)				
	W 04-06-03	W 06-06-04			

06 Exhaust system / Charging

Job card	Activity and additional job cards necessary for its execution				
W 06-01-05	Removing and installing exhaust line (A-bank)				
	W 06-01-06 (A-bank)				
W 06-01-05	Removing and installing exhaust line (B-bank)				
	W 06-01-06 (B-bank)				
W 06-01-06	Removing and installing exhaust pipe (A-bank)				
W 06-01-06	Removing and installing exhaust pipe (B-bank)				
W 06-01-07	Removing and installing exhaust manifold				
	W 06-01-06 (A-bank)	W 06-01-06 (B-bank)	W 06-06-04		
W 06-01-07	Removing and installing exhaust manifold (A-bank) (Railway)				
	W 06-06-04 (A-bank)				
W 06-01-07	Removing and installing exhaust manifold (B-bank) (Railway)				
	W 06-06-04 (B-bank)				
W 06-02-03	Removing and installing the charge air line				
W 06-02-05	Removing and installing connecting pipe				
	W 07-01-04				

06 Exhaust system / Charging (continuation)

Job card	Activity and additional job cards necessary for its execution				
W 06-02-05	Removing and installing connecting pipe (Railway)				
	W 07-01-04 (Railway)				
W 06-06-04	Removing and installing the turbocharger				
	W 06-02-03				
W 06-06-04	Removing and installing turbocharger (A-bank) (Railway)				
W 06-06-04	Removing and installing turbocharger (B-bank) (Railway)				
W 06-07-03	Removing and installing charge air pipe (A-bank)				
	W 03-01-11	W 06-02-05	W 07-03-01 (A-bank)		
W 06-07-03 (B-bank)	Removing and installing charge air pipe (B-bank)				
	W 06-02-05	W 07-03-01 (B-bank)			

07 Fuel system

Job card	Activity and additional job cards necessary for its execution				
W 07-01-02	Removing and installing flame glow plug				
	W 07-01-04				
W 07-01-02	Removing and installing flame glow plug (Railway)				
	W 07-01-04 (Railway)				
W 07-01-03	Removing and installing fuel shut-off valve (flame glow plugs)				
W 07-01-03	Removing and installing fuel shut-off valve (flame glow plugs) (Railway)				
W 07-01-04	Removing and installing fuel pipes (flame glow plugs)				
	W 06-02-03				
W 07-01-04	Removing and installing fuel pipes (flame glow plugs) (Railway)				
W 07-03-01	Renewing injection pipes (A-bank)				

07 Fuel system (continuation)

Job card	Activity and additional job cards necessary for its execution				
W 07-03-01	Renewing injection pipes (B-bank)				
	W 06-02-03				
W 07-04-01	Removing and installing injection pumps (cylinder A1)				
	W 04-06-03	W 06-07-03 (A-bank)	W 07-10-06	W 07-10-06 (Railway)	
W 07-04-01	Removing and installing injection pumps (cylinder A2-B3)				
	W 03-01-11	W 04-06-03	W 07-03-01 (A-bank)	W 07-03-01 (B-bank)	W 07-10-06
	W 07-10-06 (Railway)				
W 07-06-04	Checking and setting plunger lift of injection pumps				
	W 04-06-03	W 06-06-04	W 06-06-04 (A-bank) (Railway)	W 06-06-04 (B-bank) (Railway)	W 07-04-01 (cylinder A1)
	W 07-04-01 (cylinder A2-B3)				
W 07-07-01	Removing and installing the fuel injectors				
	W 07-03-01 (A-bank)	W 07-03-01 (B-bank)	W 07-07-05		
W 07-07-02	Dismantling and assembling fuel injector				
	W 07-07-01	W 07-07-05			
W 07-07-05	Checking and setting fuel injectors				
	W 07-07-01	W 07-07-02			
W 07-09-01	Removing and installing temperature transmitter				
	W 06-07-03 (B-bank)				
W 07-10-06	Removing and installing fuel pipes				
	W 06-07-03 (A-bank)	W 06-07-03 (B-bank)			
W 07-10-06	Removing and installing fuel pipes (Railway)				
W 07-11-01	Removing and installing the fuel supply pump				
W 07-13-01	Removing and installing fuel pressure holding valve				
	W 06-07-03 (A-bank)				

07 Fuel system (continuation)

Job card	Activity and additional job cards necessary for its execution				
W 07-13-01	Removing and installing fuel pressure holding valve (Railway)				

08 Lube oil system

Job card	Activity and additional job cards necessary for its execution				
W 08-04-06	Removing and installing the oil suction pipe				
	W 08-04-07				
W 08-04-06	Removing and installing oil suction pipe (Railway)				
	W 08-04-07 (Railway)				
W 08-04-07	Removing and installing the lubricating oil pan				
	W 13-03-02				
W 08-04-07	Removing and installing lubricating oil pan (Railway)				
W 08-08-02	Removing and installing the oil cooler				
	W 06-07-03 (A-bank)	W 09-08-04			
W 08-11-09	Removing and installing oil pressure pick-up				
W 08-11-10	Removing and installing pressurestat				
	W 03-01-11	W 06-07-03 (B-bank)			

09 Cooling system

Job card	Activity and additional job cards necessary for its execution				
W 09-07-08	Removing and installing coolant pump				
W 09-08-01	Checking thermostat (removed state)				
	W 09-08-02				
W 09-08-02	Removing and installing thermostat				
	W 09-08-01	W 09-08-04			
W 09-08-04	Removing and installing thermostat housing				
	W 07-01-04				

09 Cooling system (continuation)

Job card	Activity and additional job cards necessary for its execution				
W 09-12-01	Removing and installing temperature transmitter				

12 Other components

Job card	Activity and additional job cards necessary for its execution				
W 12-01-04	Removing and installing torsional vibration damper				
W 12-06-01	Removing and installing flywheel				
W 12-06-03	Renewing toothed starter flywheel ring				
	W 12-06-01				
W 12-08-04	Removing and installing hydraulic pump drive				
	W 06-01-06 (A-bank)				

13 Electrical system

Job card	Activity and additional job cards necessary for its execution				
W 13-01-02	Removing and installing the cable harness				
	W 06-02-03				
W 13-02-03	Removing and installing the generator (V-belt drive)				
W 13-03-02	Removing and installing the starter				
W 13-08-01	Removing and installing pressure sensor/temperature sensor (charge air)				

6 Job cards

6

Checking the compression pressure

Commercial available tools:
– Compression pressure tester 8005

Special tools:
– Connector 100130
– Grooved nut wrench 110130

– W 01-01-01
– W 07-07-01

Checking the compression pressure

- Check and set valve clearance.

  W 01-01-01

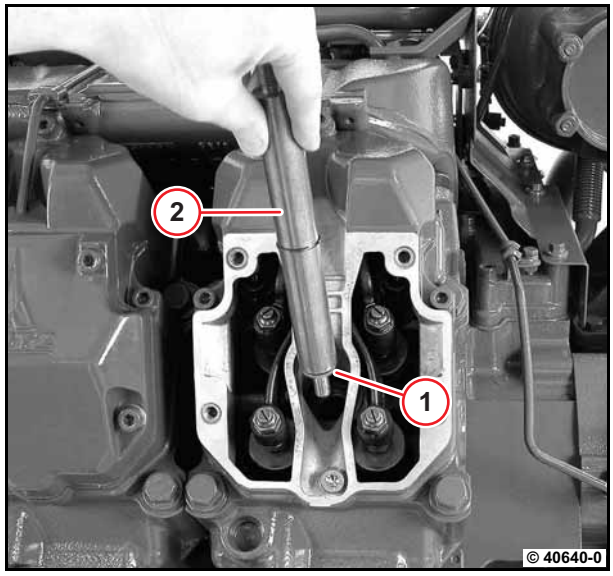
- Removing fuel injectors.

  W 07-07-01

- Mount sealing ring (1).

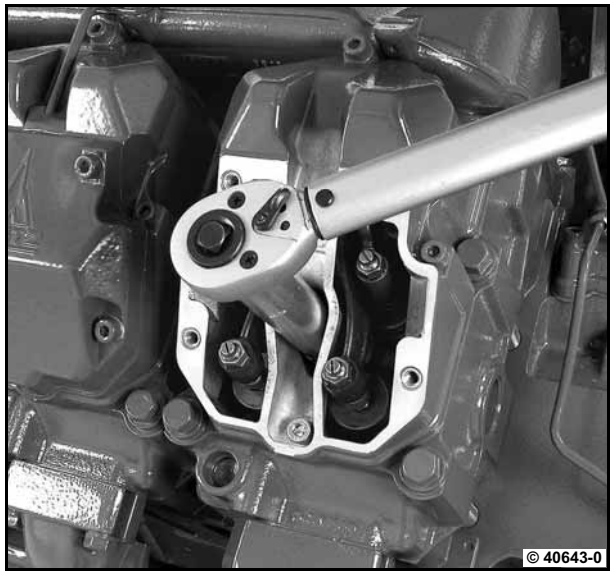
  Use sealing ring (1) for fuel injector.

- Insert connector (2).

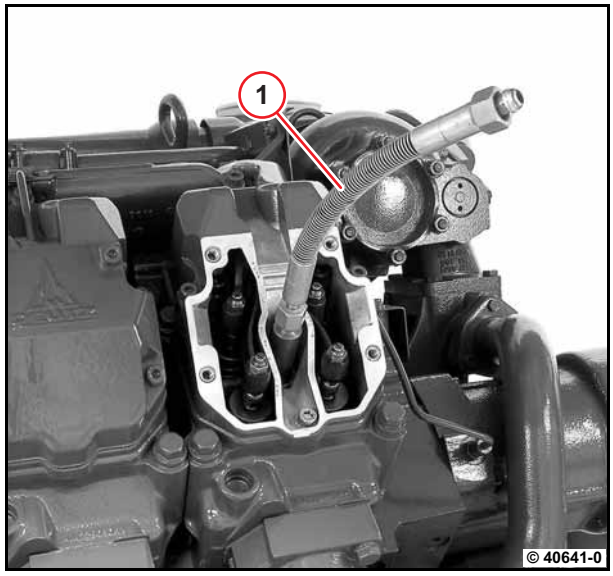


- Tighten union screw with grooved nut wrench.

  A07 001



- Connect adapter (1) to connector.

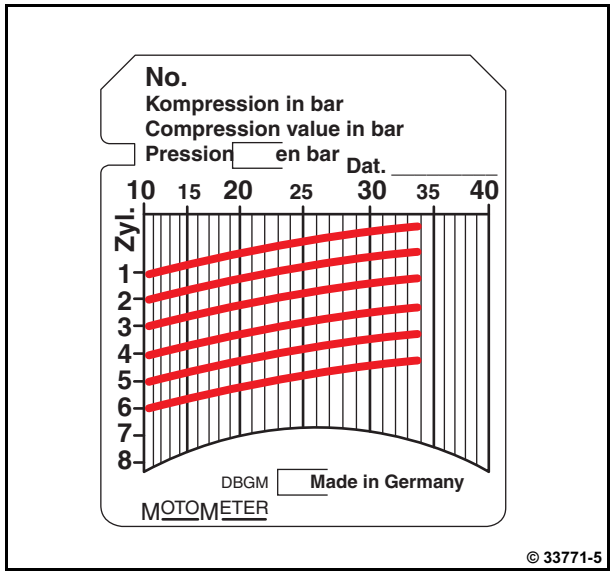


6

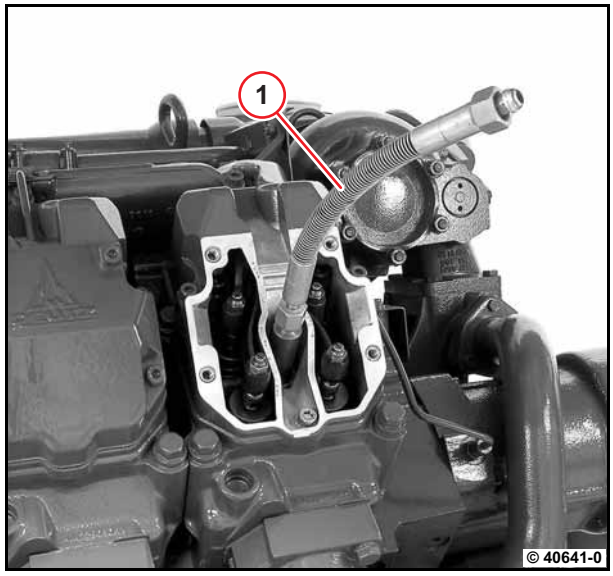
- Mount the compression tester on the adapter.
- Turn over engine with starter.

P00 51

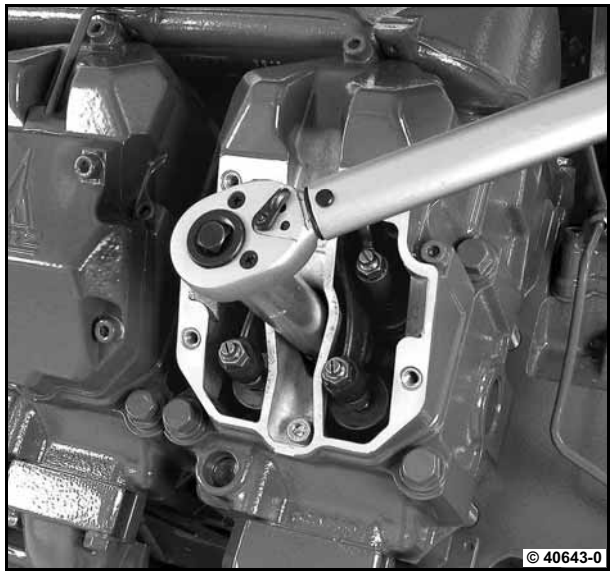
The measured compression pressure depends on the starting speed during the measuring process and the altitude of the engine installation site. Therefore, limit values cannot be determined exactly. The compression pressure measurement is only recommended as a reference measurement of all cylinders of an engine to each other. If more than 15% deviation has been determined, the cause should be determined by disassembling the cylinder unit concerned.



- Remove the compression pressure tester.
- Remove adapter (1).

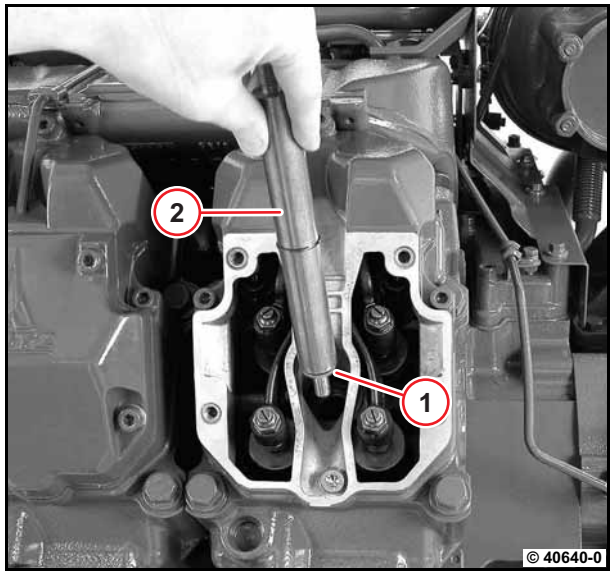


- Unscrew union screw with grooved nut wrench.



- Remove connector (2).
- Remove sealing ring (1).
- Install fuel injectors.

W 07-07-01



6

Mounting engine on assembly block and demounting

Commercial available tools:
– Lifting gear
– Suspension ropes

Special tools:
– Assembly block incl. adapter plates 6066
– Clamping bracket 6066/151

– W 13-02-03

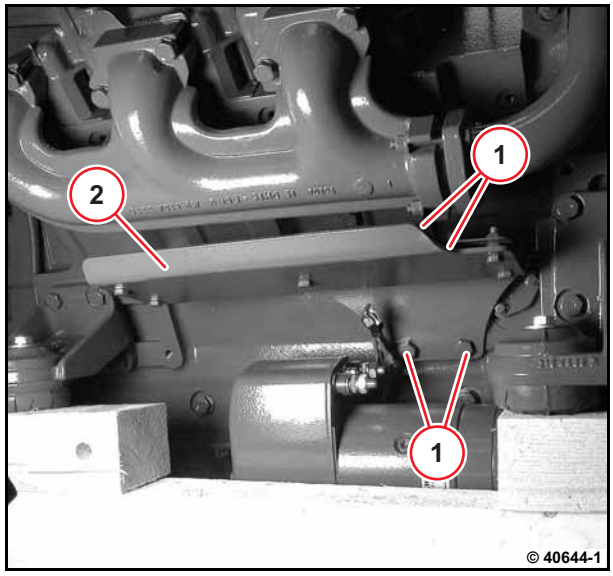
Different customer scopes are not taken into account in the repair sequence shown here, accessories which deviate from the standard equipment are not shown.

Mounting engine on assembly block

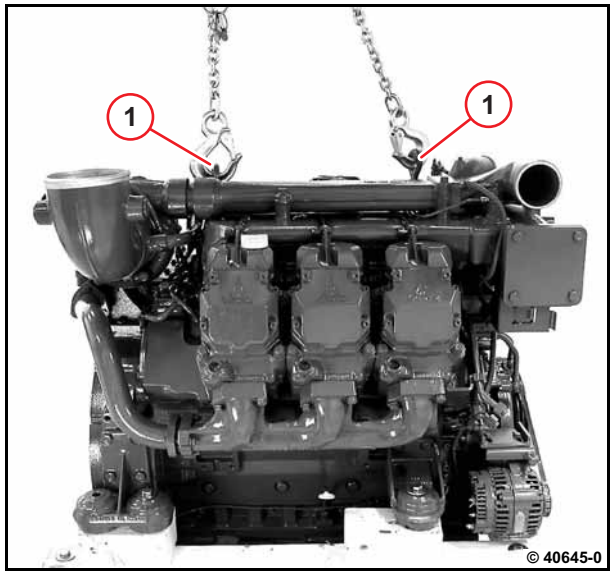
- Remove generator.

  W 13-02-03

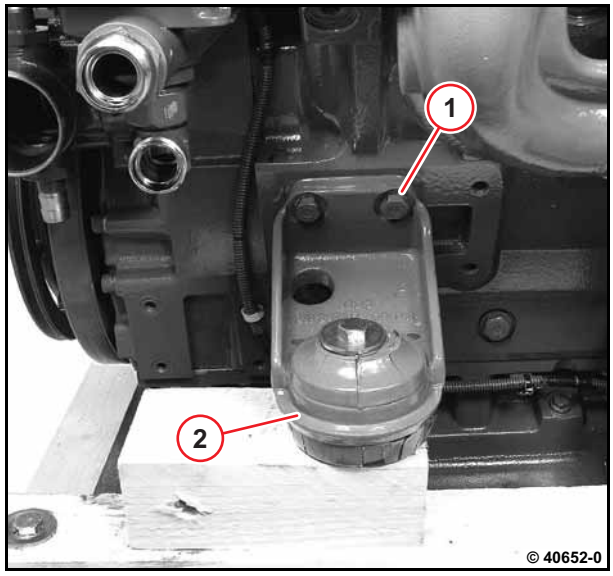
- Unscrew screws (1).
- Remove heat shield (2).



- Screw in eyelet bolts (1).
- Hang engine on workshop crane.



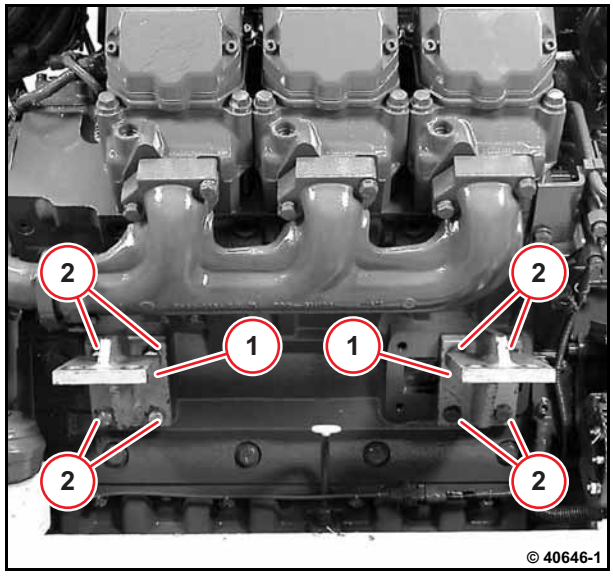
- Unscrew all screws (1).
- Remove all mounting feet (2).



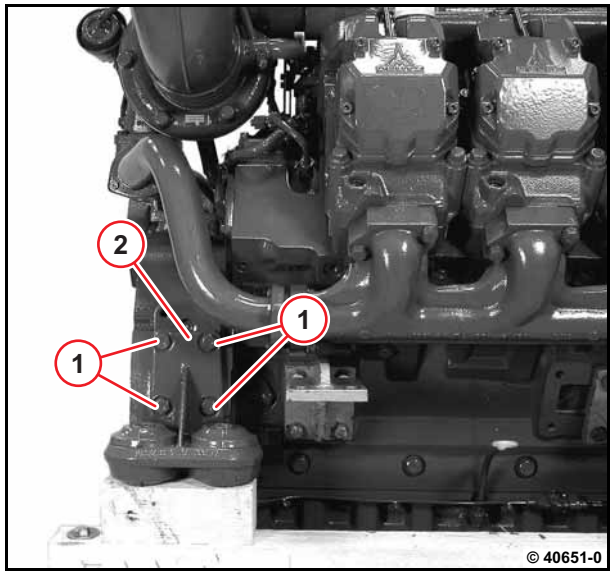
6

- Mount all clamping brackets (1).
- Tighten screws (2).

A00 001

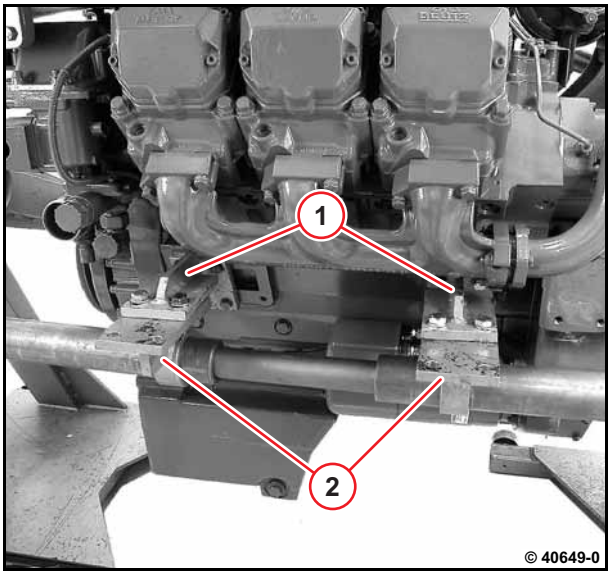


- Unscrew screws (1).
- Remove all mounting feet (2).

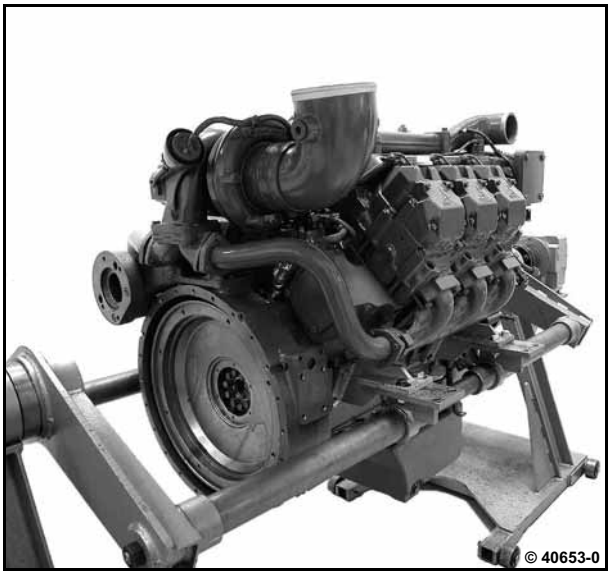


- Insert engine in engine block.
- Mount clamping bracket on the adapter plates.
- Align all clamping brackets (1) on the adapter plates (2) of the assembly block.
- Tighten screws .

A00 002

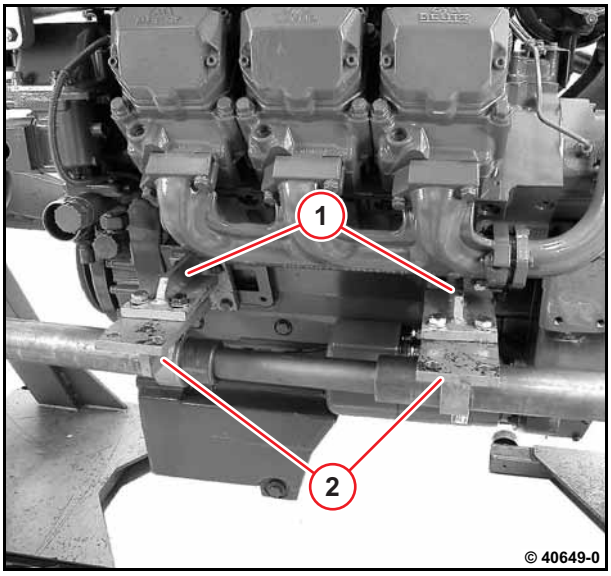


- Align engine on engine block.
- Unhook the engine from the workshop crane.



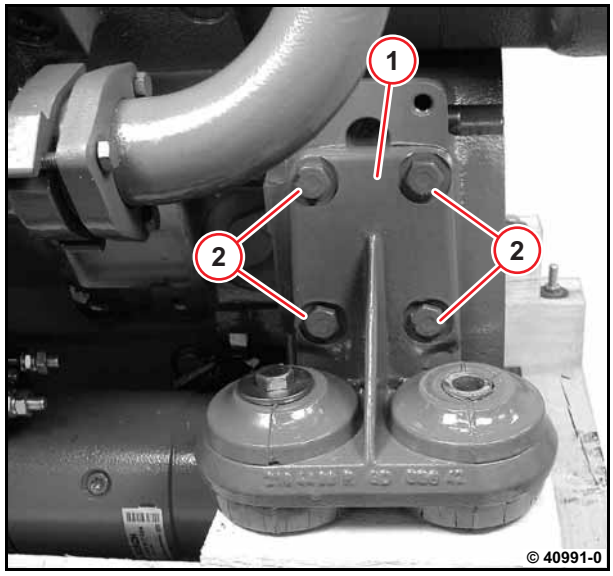
Demounting engine from assembly block

- Hang engine on workshop crane.
- Remove screws.
- Remove all clamping brackets (1) from the adapter plates (2).
- Lift engine off the assembly block.

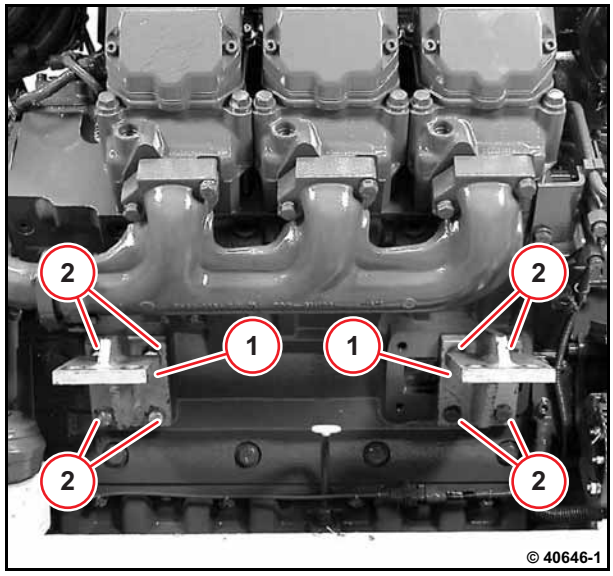


- Mount all mounting feet (1).
- Tighten screws (2).

A00 003

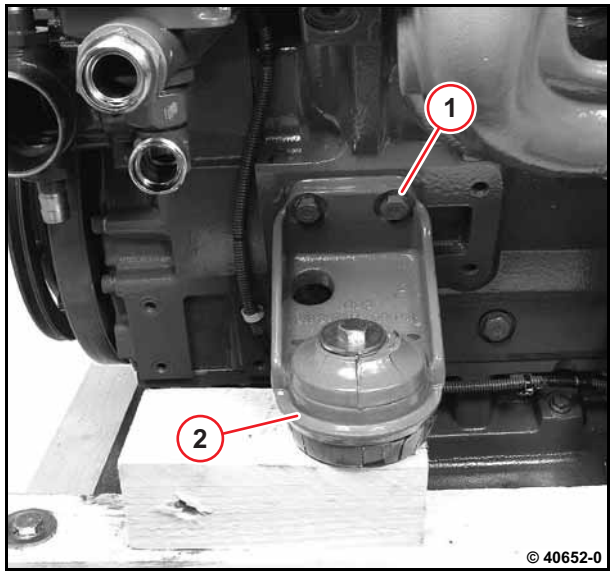


- Unscrew screws (2).
- Remove all clamping brackets (1).

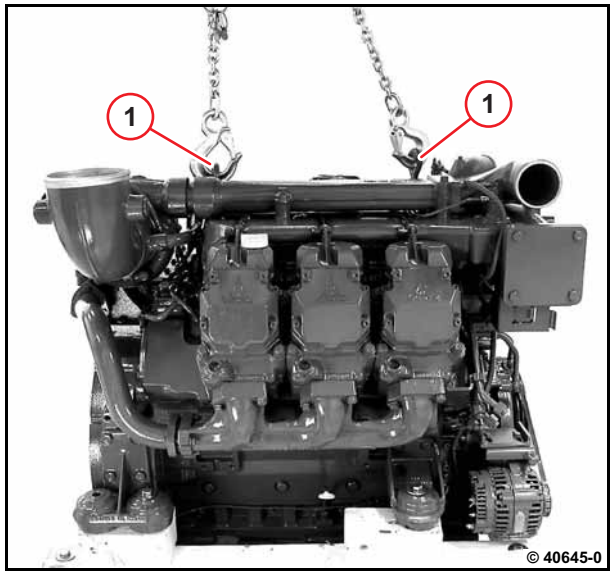


- Mount all mounting feet (2).
- Tighten all screws (1).

A00 003



- Set down engine.
- Unhook the engine from the workshop crane.
- Unscrew eyelet bolts (1).

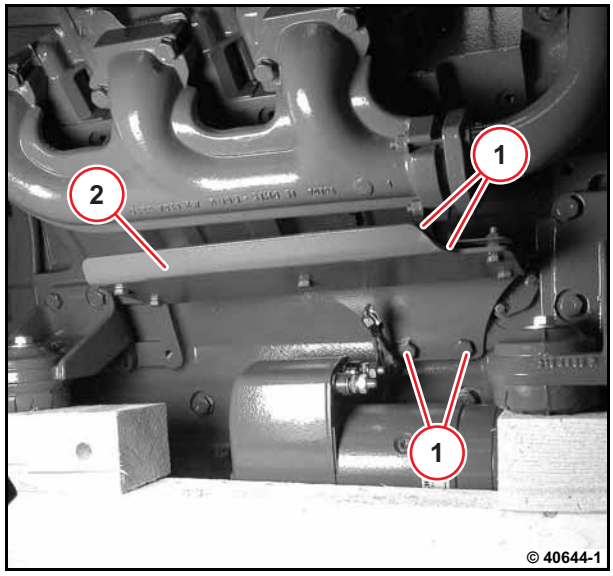


- Mount heat shield (2).
- Tighten screws (1).

A13 006

- Install generator.

W 13-02-03



Setting valve clearance

Commercial available tools:
– Rotation angle disc 8190
– Screwdriver insert for slotted screws. 8191
– Open wrench size 13 8196

– Locking agent DEUTZ DW 59

– W 04-06-03

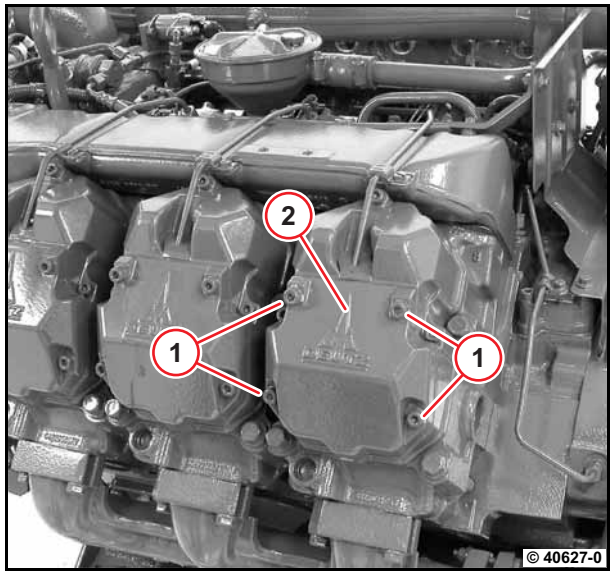
Allow the engine to cool down for at least 30 minutes before setting the valve clearance. Engine oil temperature < 80 °C

The following work process describes setting of the valve clearance on an exhaust valve. The setting procedure for an inlet valve is analogous under consideration of the specified rotation angle size.

6

- Unscrew screws (1).
- Remove cylinder head cover (2).
- Remove gasket.
- Attach turning gear.

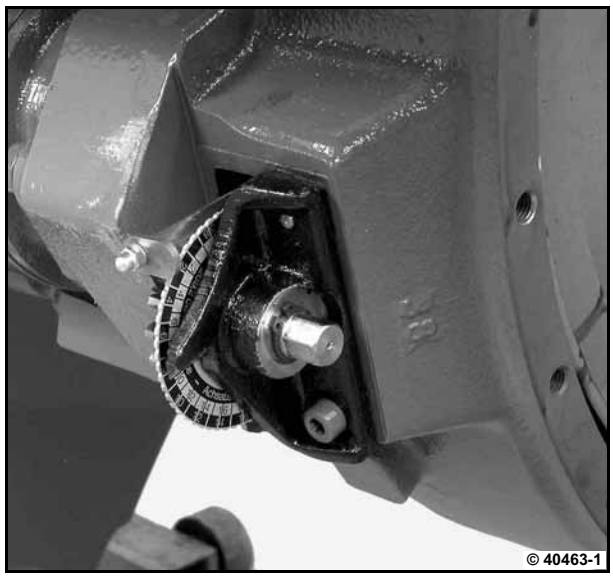
W 04-06-03



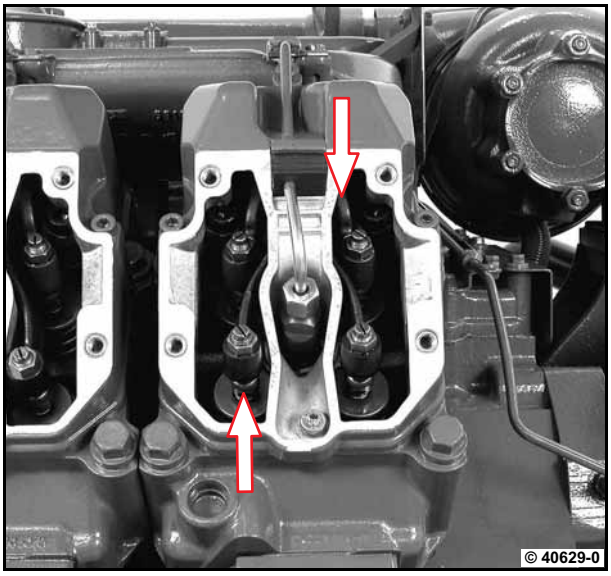
Setting engine to valve overlap

- Turn crankshaft using the turning gear until the valve overlap of cylinder A1 is reached.

T01 63

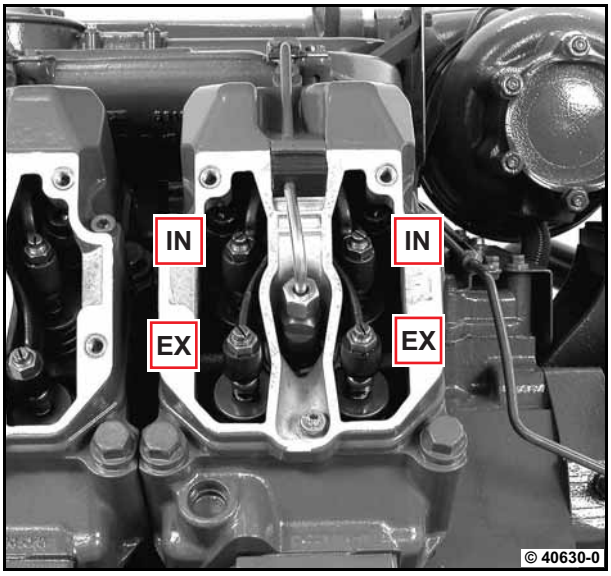


Valve overlap means:
The inlet valve starts opening,exhaust valve closes.



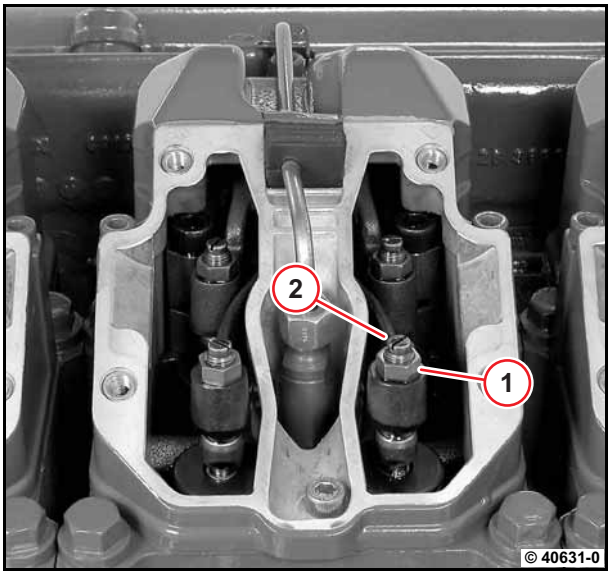
6

Arrangement of the inlet and exhaust valves.
IN = inlet valve
EX = exhaust valve



Setting valve clearance

- Loosen lock nut (1).
- Press in the adjusting screw (2) to the stop.

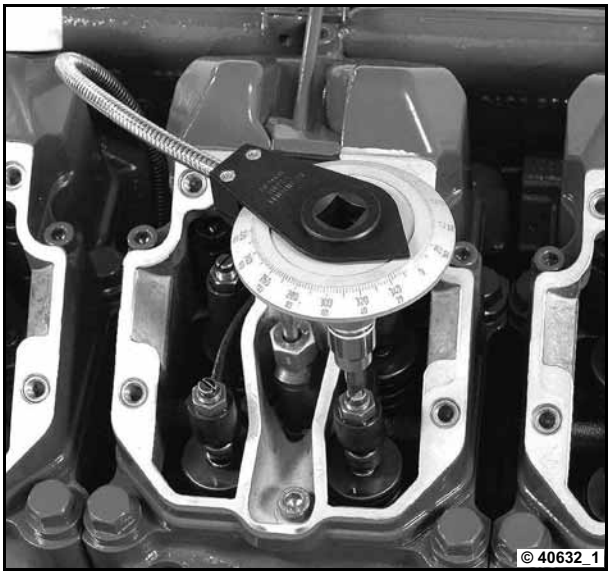


- Set the rotation angle disc with a screwdriver insert at the adjusting screw.
- Fix magnet of rotation angle disc on cylinder head.
- Set rotation angle disc to "0".

Do not rotate adjusting screw.

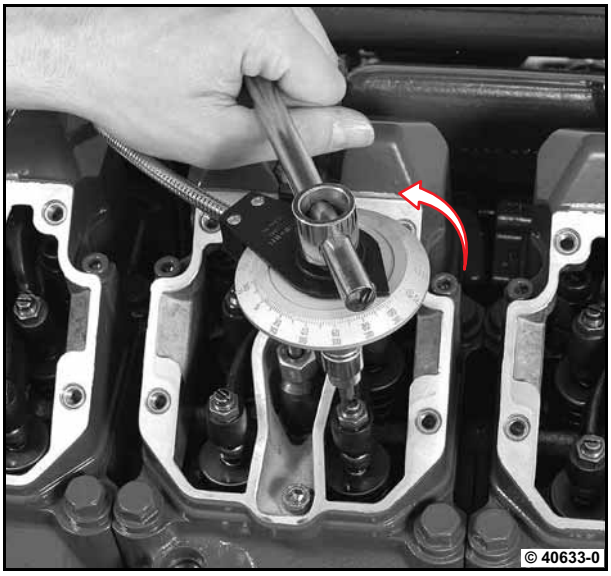
P01 61

P01 62



- Turn the adjusting screw in the direction of the arrow.

P01 62



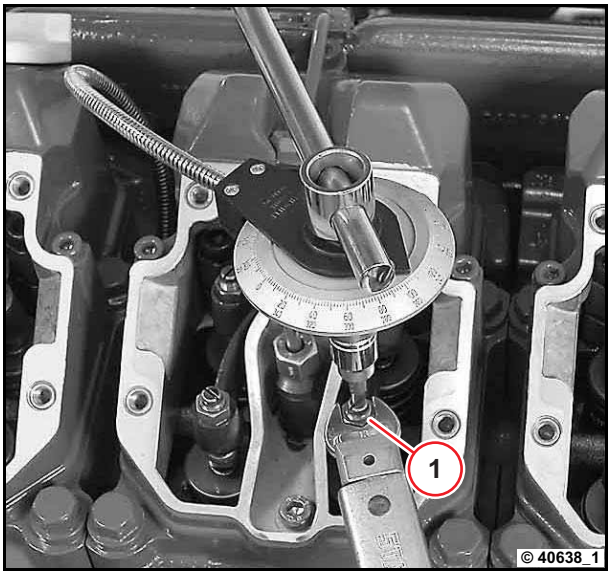
- Tighten lock nut (1) with open wrench.

A01 003

Do not rotate adjusting screw.

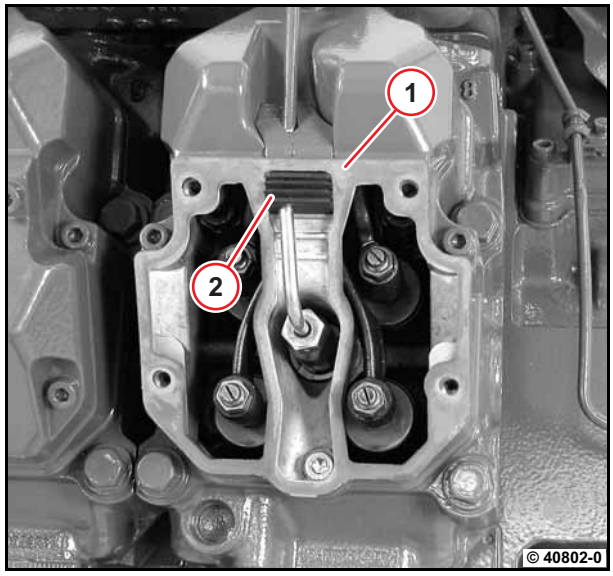
- Remove rotation angle disc.

Set all other valves according to the valve setting schematic T01 63.



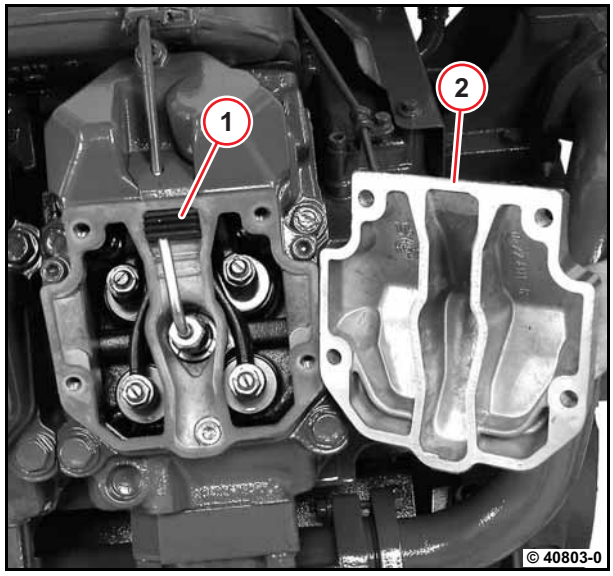
- Clean sealing surfaces.
- Mount new gasket (1).

Note installation position.
Position gasket over the profile washer (2).



- Mount cylinder head cover.

Profile washer (1) may not be trapped underneath the sealing surface (2) of the cylinder head cover.

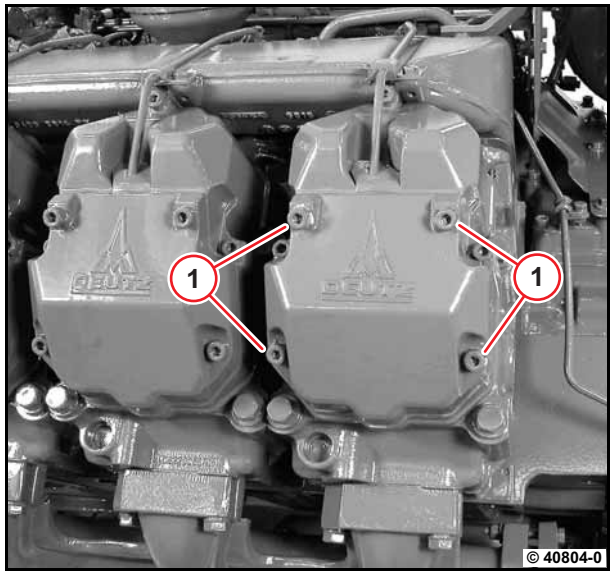


- Lightly oil screws (1).
- Tighten screws (1).

A01 005

- Remove turning gear.

W 04-06-03



Removing and installing the rocker arm and rocker arm bracket

Commercial available tools:
– Feeler gauges

– Locking agent
DEUTZ DW 59

– W 01-01-01
– W 04-06-03
– W 07-03-01 . . . . . (A-bank)
– W 07-03-01 . . . . . (B-bank)

Removing the rocker arm and rocker arm bracket

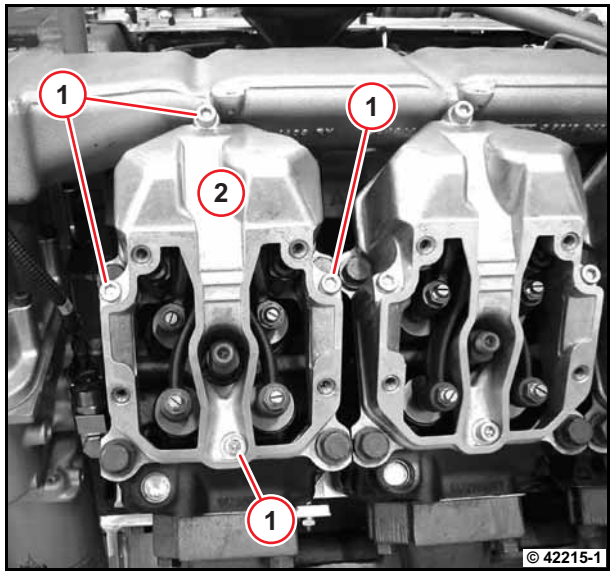
- Removing high pressure pipes (A-bank).

  W 07-03-01

- Removing high pressure pipes (B-bank).

  W 07-03-01

- Unscrew screws (1).
- Remove cylinder head cowling (2).
- Remove gasket.

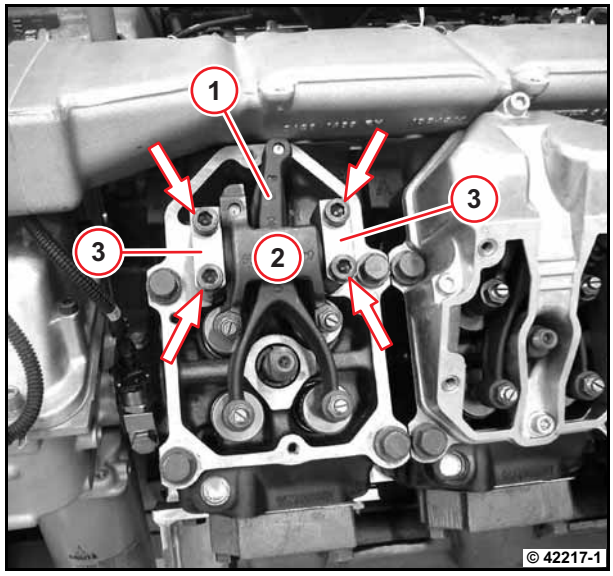


- Unscrew screws (arrows).

Loosen screws evenly to avoid tension on the rocker arm brackets.

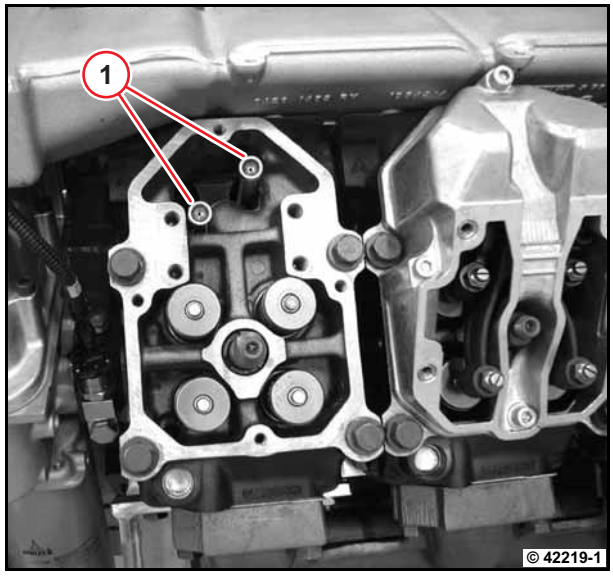
- Remove rocker arms (1), (2) and rocker arm brackets (3) together.

Lay out components in the order in which they should be installed.



- Remove push rods (1).

Lay out components in the order in which they should be installed.

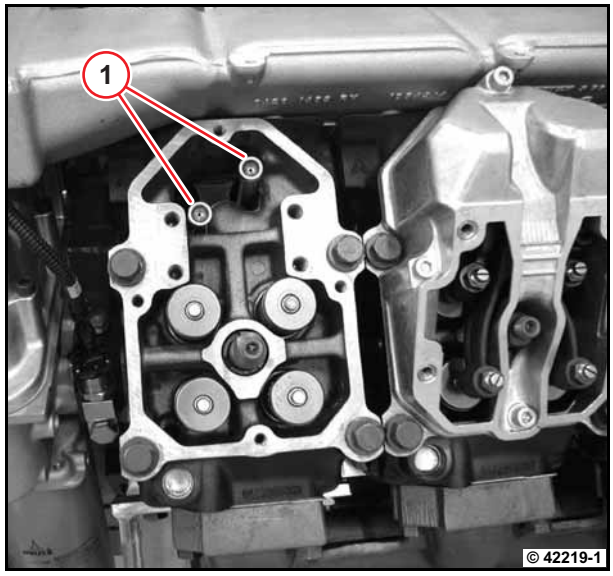


- Visually inspect the components.

Installing the rocker arm and rocker arm bracket

- Insert stop rods (1).

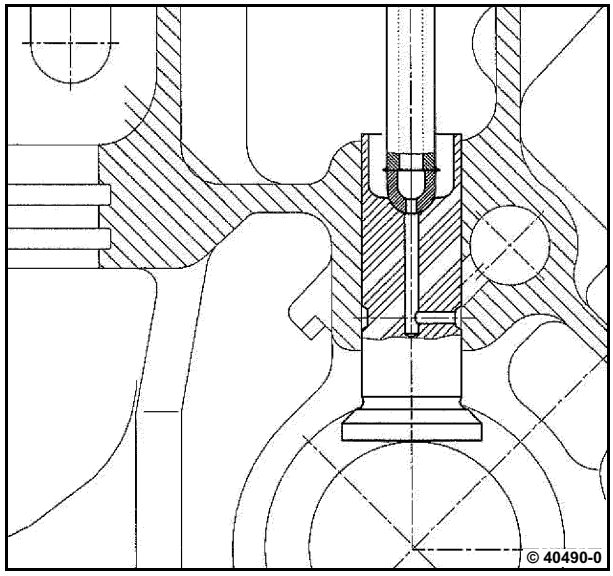
Note assignment!



The pushrod must be seated with the ball head in the ladle of the tappet.

- Attach turning gear.

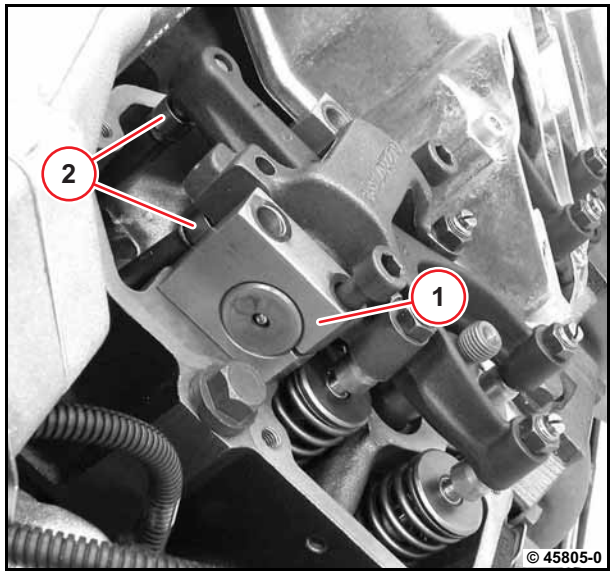
W 04-06-03



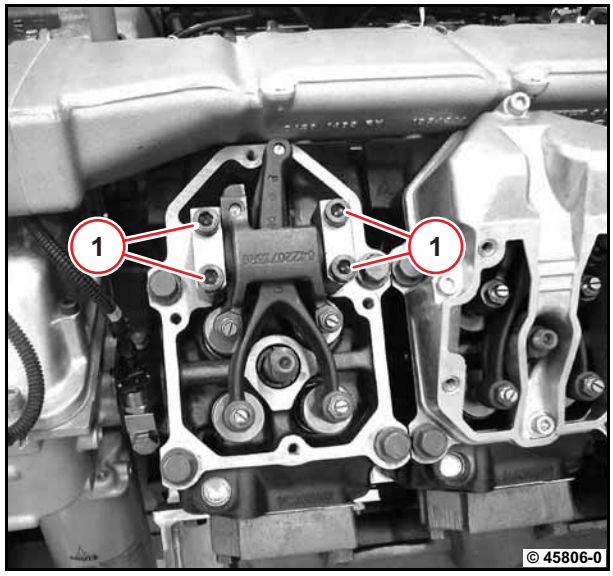
- Turn crankshaft until reaching the base circle position of inlet and exhaust cams of the respective cylinder.
- Mount rocker arm bracket.

Attention!
The longer side (1) must point upwards.

The ball heads (2) must be seated in the ladles of the pushrods .



- Align rocker arm to the pushrods/valves.
- Tighten screws (1) alternately.



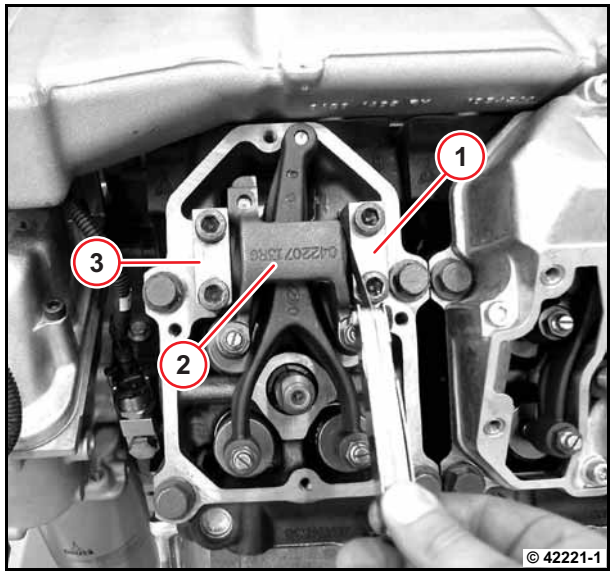
Checking axial backlash of the rocker arm

- Measure the axial backlash between the rocker arm bracket (1) and rocker arm (2) with a feeler gauge.

P01 75

The rocker arm (2) is on the opposite side on the rocker arm bracket (3).

The setting is made by moving the rocker arm brackets.

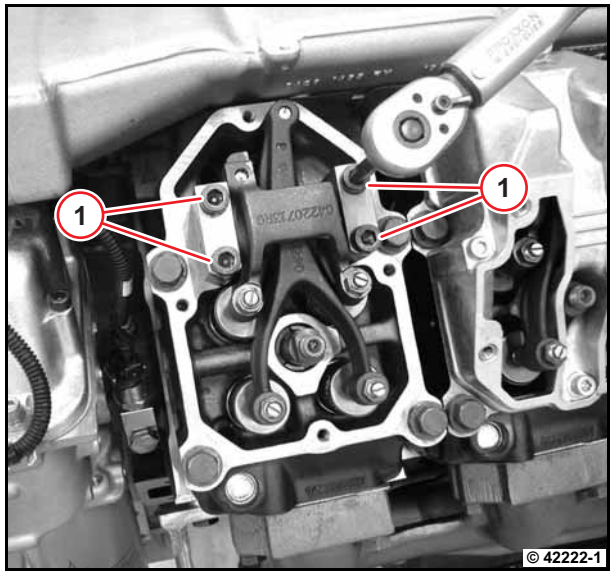


- Tighten screws (1) alternately.

A01 002

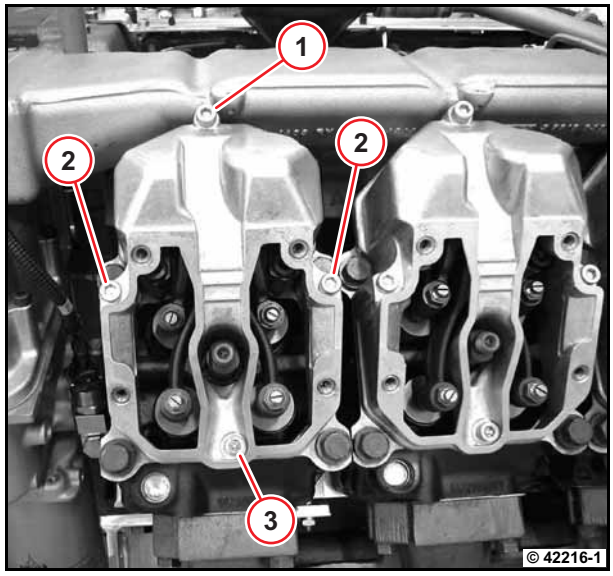
- Check and set valve clearance.

W 01-01-01



- Clean sealing surfaces.
- Mount new gasket.
- Mount cylinder head cover.
- Fasten screws.

Screw length:
M8 x 80 mm (1)
M8 x 70 mm (2)
M8 x 30 mm (3)



- Tighten screws .

  A01 004

- Installing high pressure pipes (A-bank)

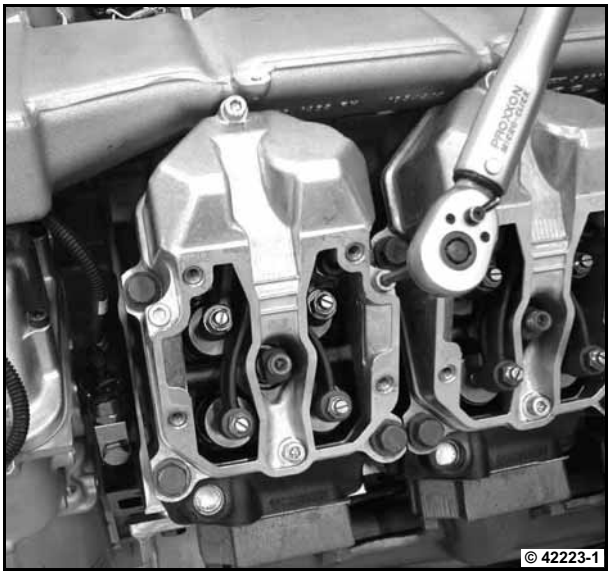
  W 07-03-01

- Installing high pressure pipes (B-bank)

  W 07-03-01

- Remove turning gear.

  W 04-06-03



Disassembling, assembling and checking the rocker arm and rocker arm bracket

Commercial available tools:
– Internal measuring device
– Micrometer gauge

Special tools:
– Dial gauge. 100400
– Disassembly/assembly tool 170120

– W 01-02-02

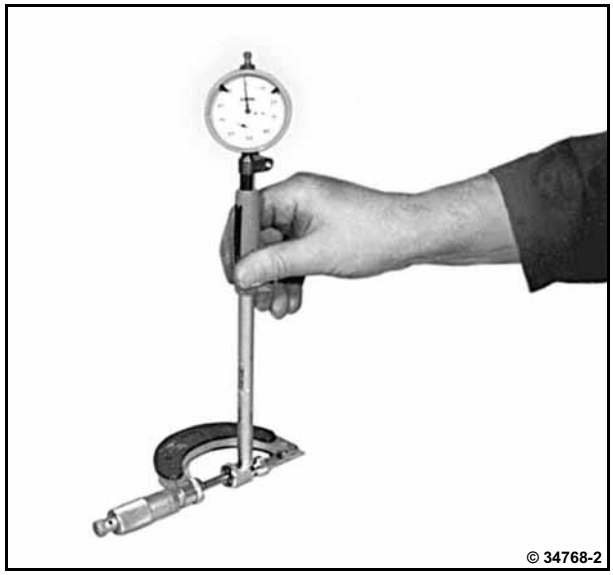
Disassembling the rocker arm bracket

- Remove rocker arm and rocker arm bracket.

  W 01-02-02

Checking rocker arm (inlet valves)

- Prepare internal measuring device:
  - Mount probe bolt for the appropriate measuring range in the internal measuring device.
  - Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  - Set micrometer gauge to 28 mm.
  - Balance the internal measuring device between the test surfaces of the micrometer gauge and set the dial gauge to the reversal point of the pointer to "0".

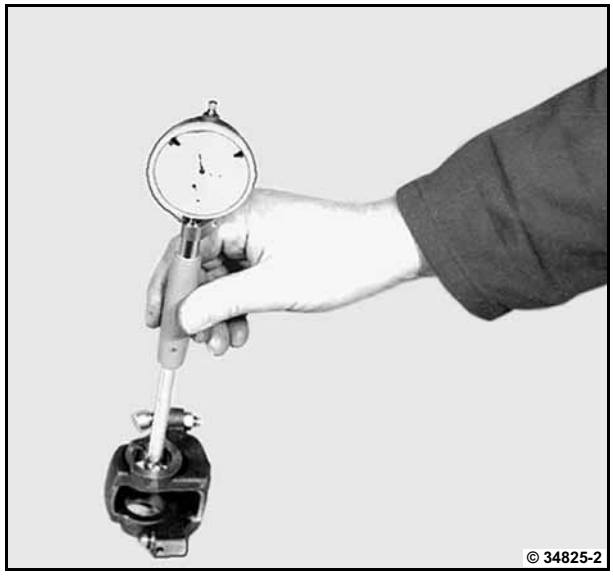


6

- Measure rocker arm bore.

P01 73

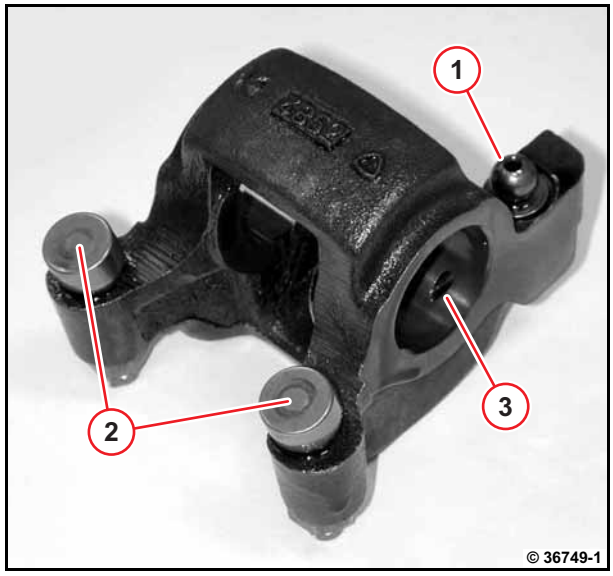
When the wear limit is reached the rocker arm must be renewed.



- Visually inspect the components.
- Check ball stud (1) and adjusting screws (2) for wear.

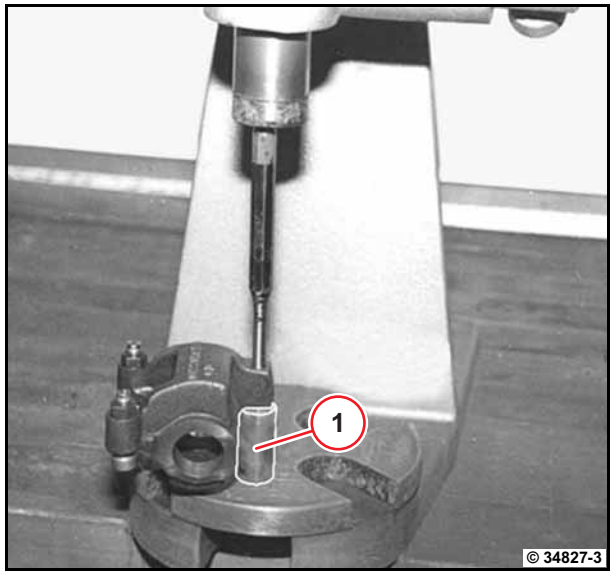
The components must be renewed in case of excessive wear.

- Check oil channel (3) for free passage.



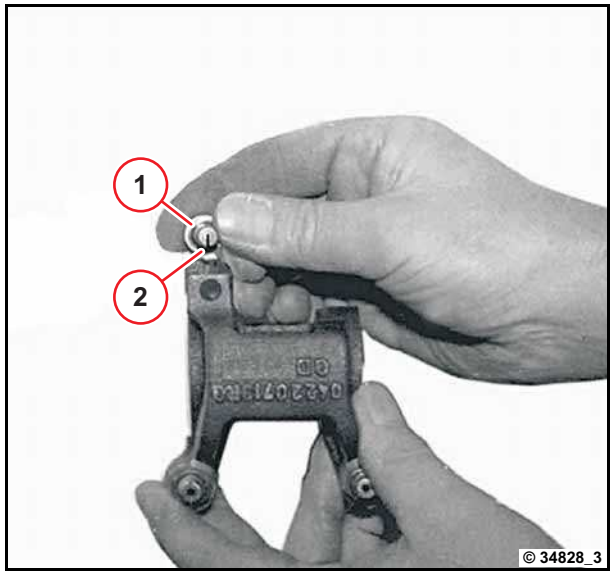
Renewing ball stud

- Place disassembly/assembly tool (1) underneath.
- Press out ball stud.

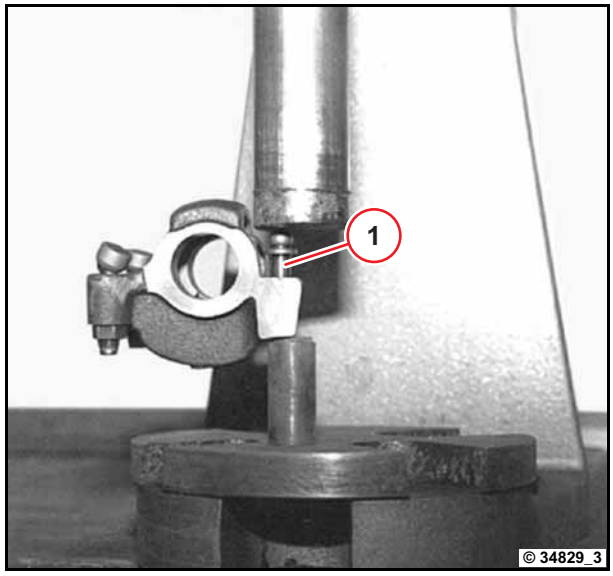


- Mount new ball stud (1).

Notch (2) faces vertically to the rocker arm shaft.



- Place disassembly/assembly tool underneath.
- Press in ball stud (1).
- Check oil channel for free passage.

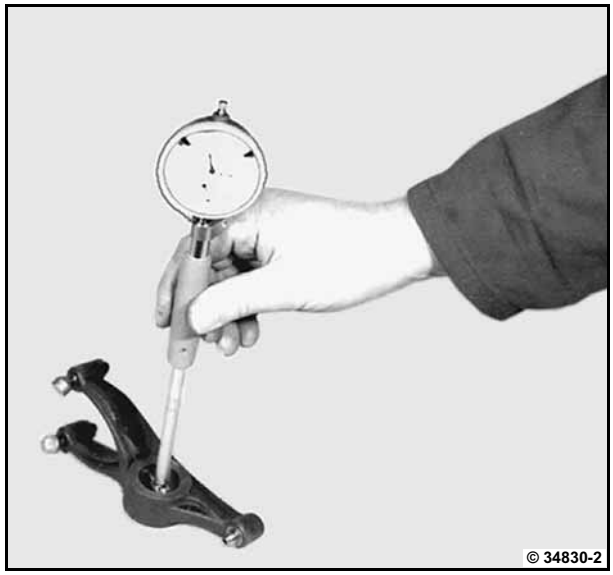


Checking rocker arm (exhaust valves)

- Measure rocker arm bore.

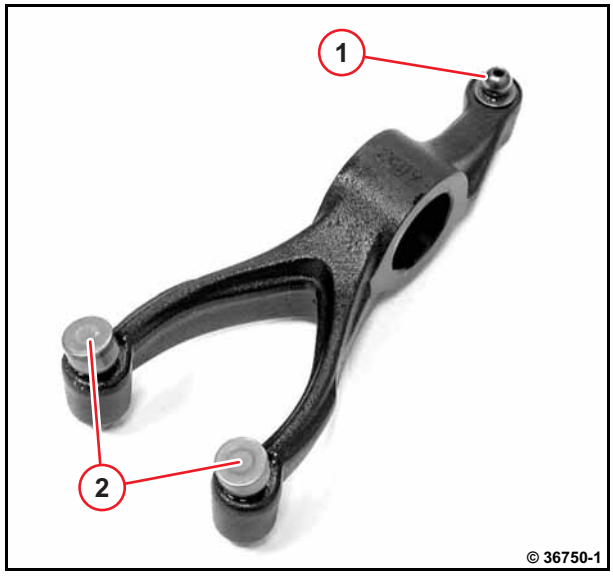
P01 72

When the wear limit is reached the rocker arm must be renewed.



- Visually inspect the components.
- Check ball stud (1) and adjusting screws (2) for wear.

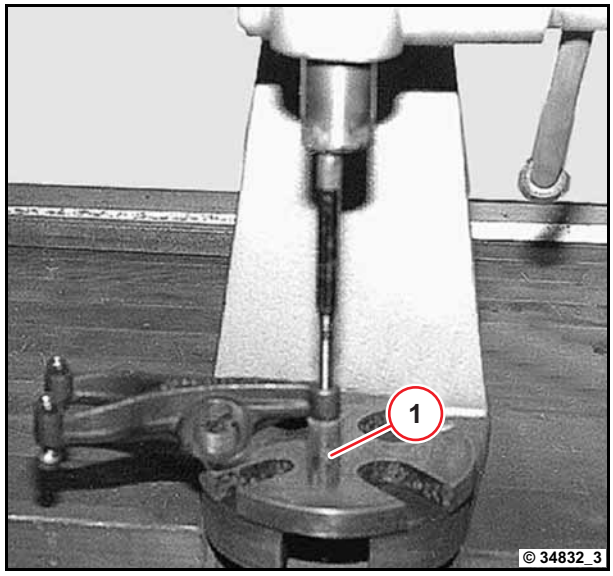
The components must be renewed in case of excessive wear.



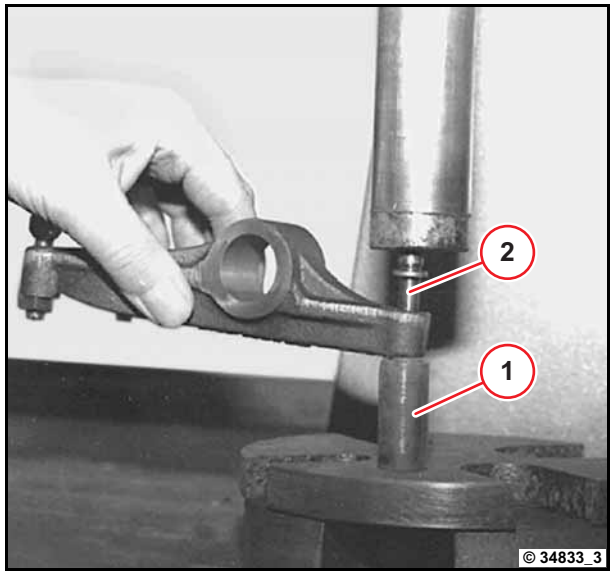
6

Renewing ball stud

- Place disassembly/assembly tool (1) underneath.
- Press out ball stud.



- Place disassembly/assembly tool (1) underneath.
- Press in new ball stud (2).



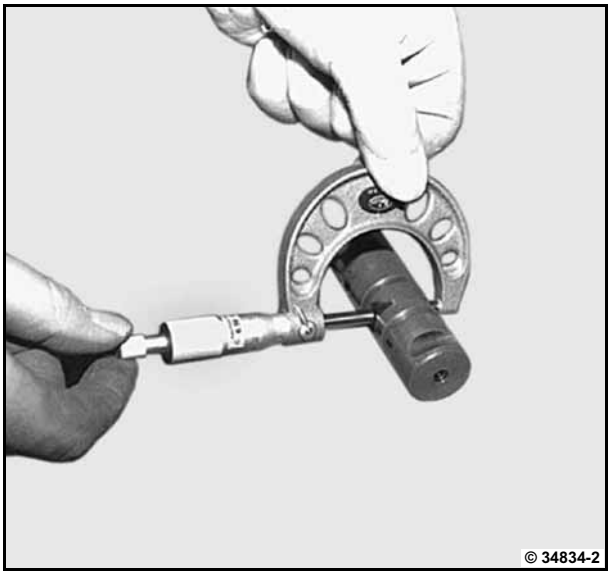
Checking rocker arm shaft

- Measure diameter with micrometer gauge.

P01 74

When the wear limit is reached the rocker arm shaft must be renewed.

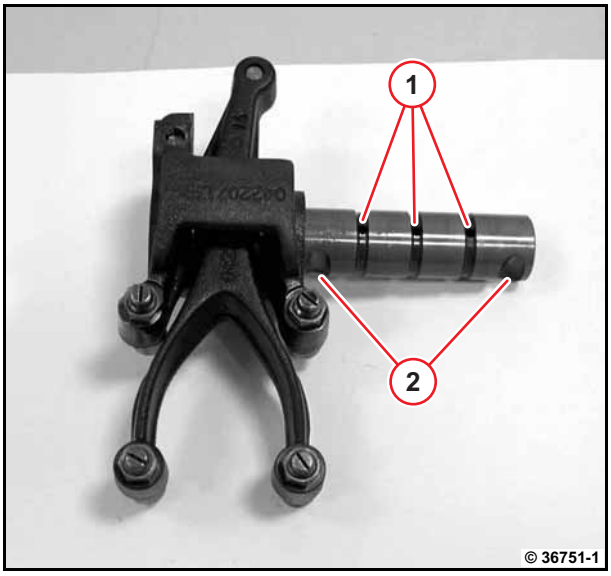
- Check oil channels for free passage.



Assembling the rocker arm bracket

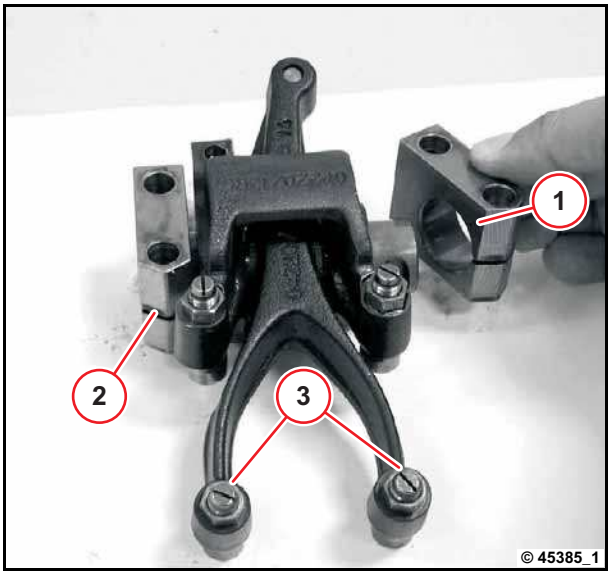
- Push rocker arm onto rocker arm shaft.

The oil bores (1) must face upwards and the recess clearances (2) for the screws of the rocker arm brackets to the adjusting screws.



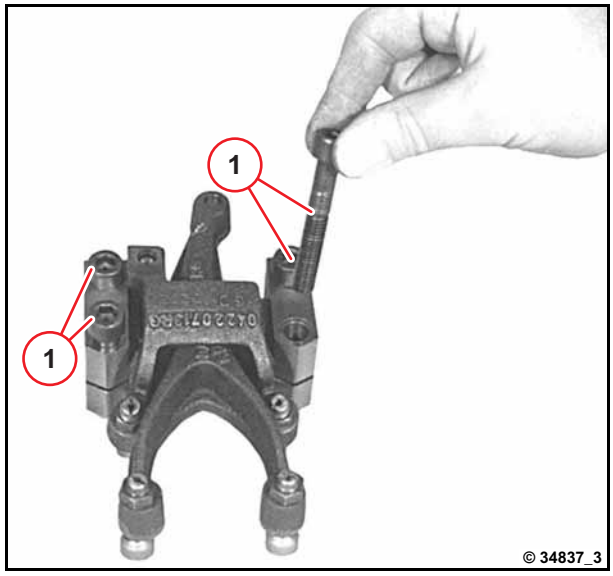
- Push rocker arm brackets onto rocker arm shaft.

Attention!
The longer side (1) must point upwards. The clamping grooves (2) must face the adjusting screws (3) .



- Insert all screws (1).
- Install rocker arm and rocker arm bracket.

W 01-02-02



Grinding the cylinder head sealing surface

Commercial available tools:
– Surface milling machine
– Roughness measuring unit
– Depth-measuring appliance

– W 01-05-01

The relevant manufacturer's specifications must be observed when working with the surface milling machine.

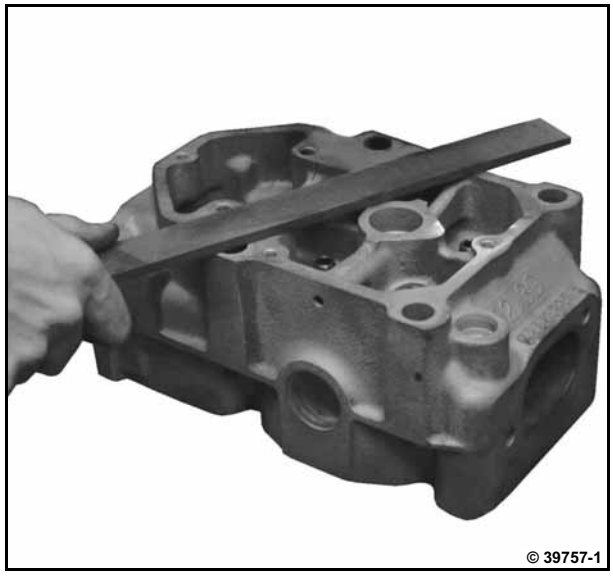
Prepare cylinder head

- Remove valves.

  W 01-05-01

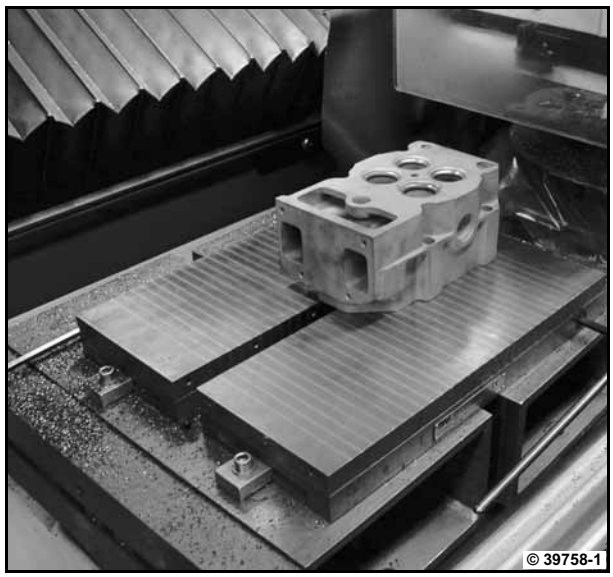
- Deburr the upper face of the cylinder head.

The upper face of the cylinder head must be burr-free and free of gasket remains to guarantee correct clamping of the cylinder head.



Grinding cylinder head surface

- Clamp cylinder head on surface milling machine.
- Align cylinder head.
- Align tool of the surface milling machine with the cylinder head.



- Grind cylinder head sealing surface.
- Check the cylinder head sealing surface.

If the cylinder head sealing surface is not level, recognisable from differences in colour of the machined surface, the surface must be reground.

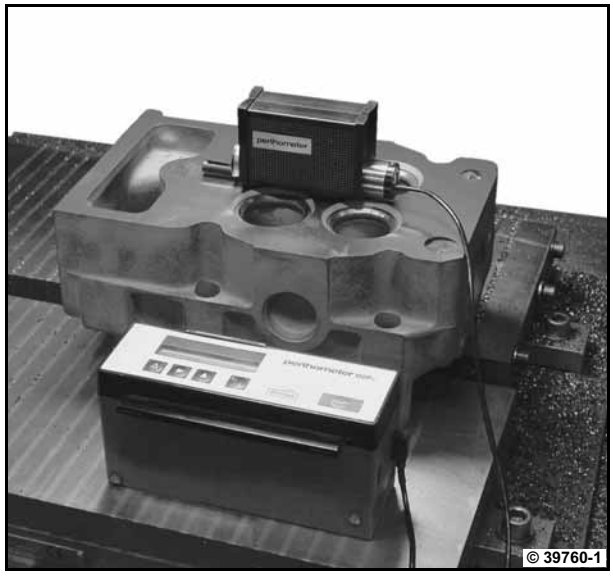
The adjustment range of the tool is a maximum 0.2 mm per grind.

Checking the cylinder head sealing surface

- Visually inspect the cylinder head sealing surface.
- Visually inspect the combustion chamber surface.
- Measure the roughness of the cylinder head sealing surface with the roughness measuring instrument.

P01 93

If the measured value is out of tolerance, the cylinder head sealing surface must be remachined with different setting data for the surface milling machine.

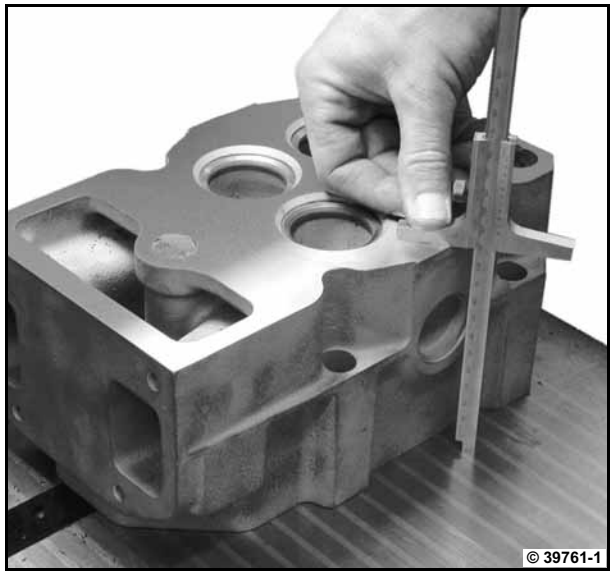


- Measure cylinder head height with depth measuring appliance.

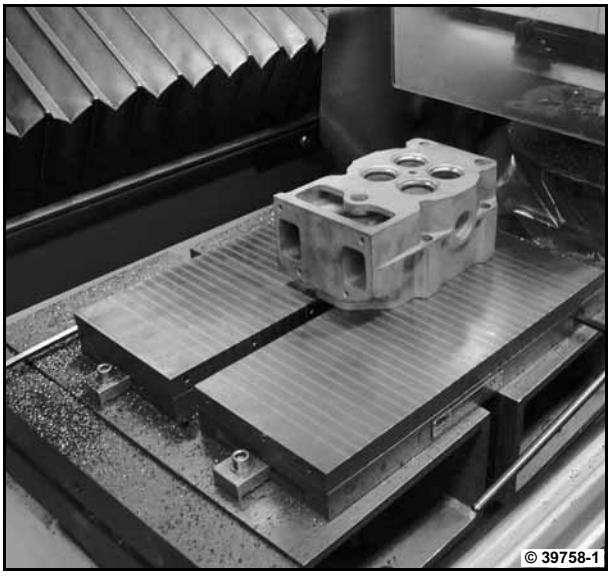
P01 08

P01 09

When the wear limit is reached, the cylinder head must be renewed.



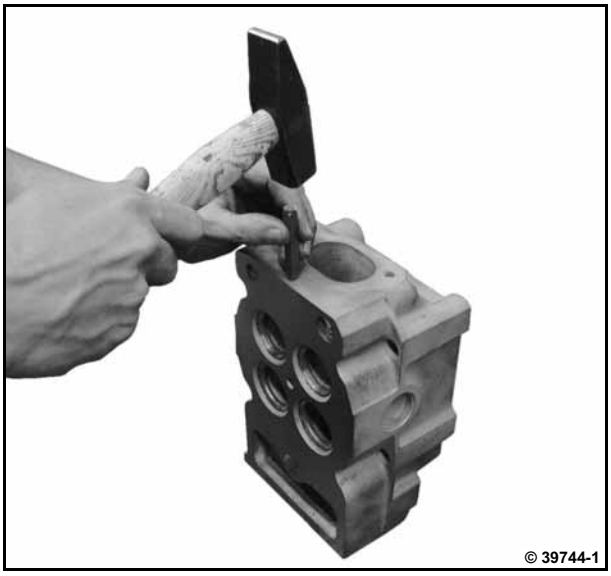
- Remove cylinder head from the surface milling machine.



- Attach the repair date and company logo to the cylinder head.

Attention!
Do not mark identification on a sealing surface.

Mark the cylinder head after every repair.



- Install valves.

W 01-05-01

Removing and installing cylinder head

Commercial available tools:
– Socket wrench insert 8016
– Rotation angle disc 8190

– W 01-02-02
– W 01-04-09
– W 06-01-05 . . . . . (A-bank)
– W 06-01-05 . . . . . (B-bank)
– W 06-07-03 . . . . . (A-bank)
– W 06-07-03 . . . . . (B-bank)
– W 07-07-01

Removing the cylinder head

- Remove charge air pipe (A-bank).

  W 06-07-03
- Remove charge air pipe (B-bank).

  W 06-07-03
- Remove exhaust line (A-bank)

  W 06-01-05
- Remove exhaust pipe (B-bank)

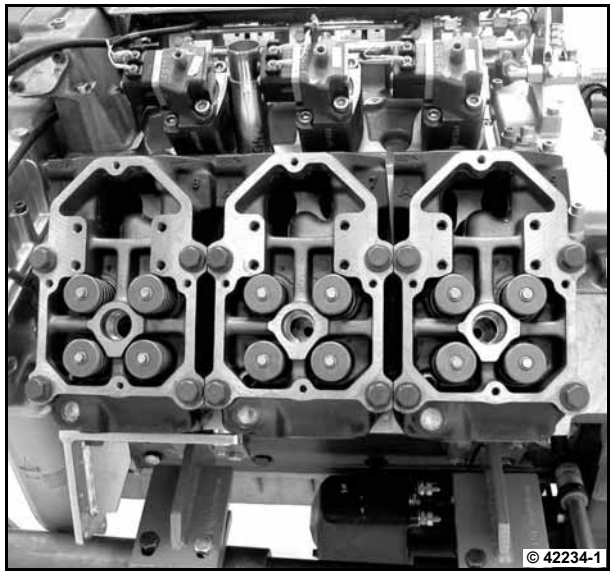
  W 06-01-05

- Remove rocker arm and rocker arm bracket.

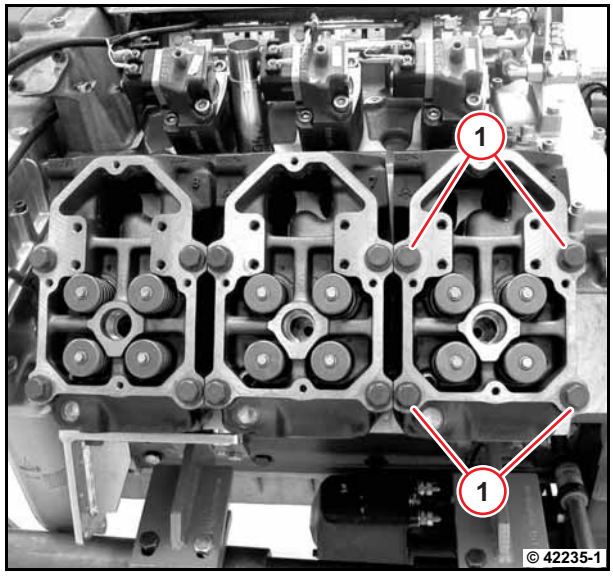
  W 01-02-02
- Removing fuel injectors.

  W 07-07-01

Lay out components in the order in which they should be installed.



- Unscrew screws (1) with the socket wrench insert.
- Remove cylinder head.
- Remove gasket.
- Visually inspect the components.



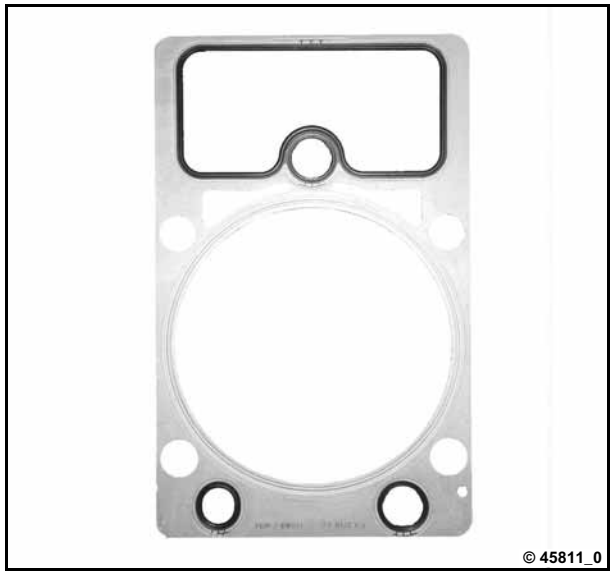
6

Installing the cylinder head

- Check piston overhang.

W 01-04-09

Determine the cylinder head gasket separately for every cylinder.



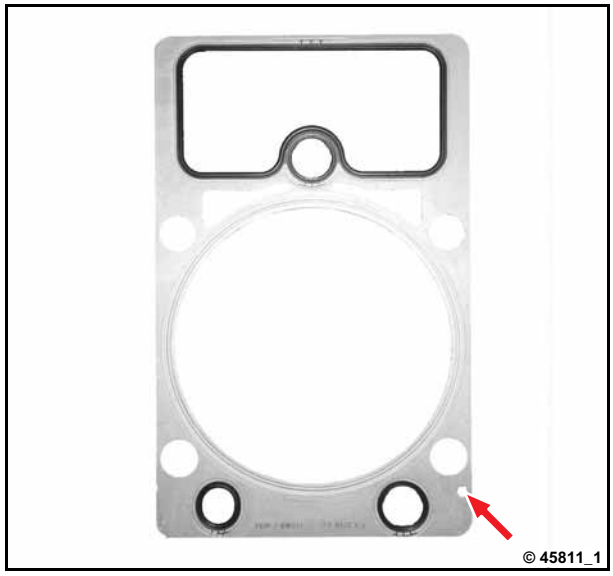
- Select new cylinder head gasket according to measured piston overhang.

P02 75

P02 76

P02 77

Example: Piston overhang = 0.05 mm, corresponds to cylinder head gasket with 1 hole (arrow).



- Clean sealing surfaces.
- Fit a new cylinder head gasket.

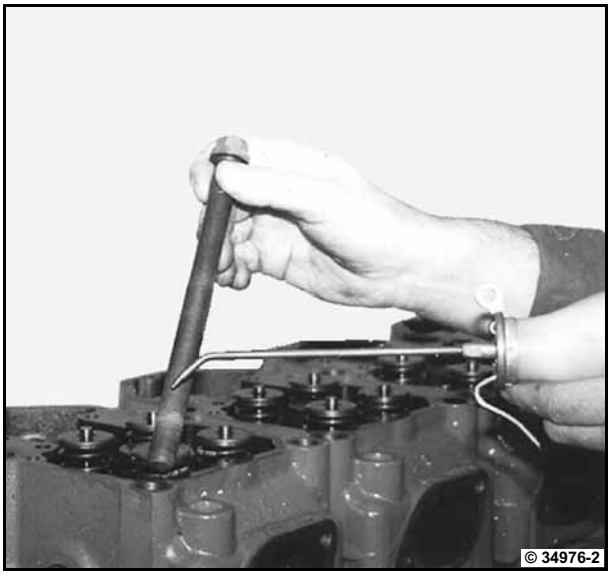
The sealing surfaces for the cylinder head gasket must be clean and free of oil.

Label OBEN / TOP facing the cylinder head.

- Fit cylinder head.
- Oil the cylinder head screws slightly.

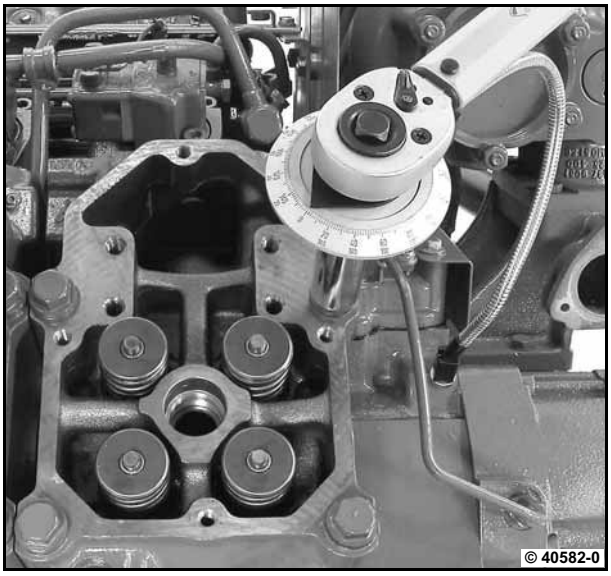
Attention!
Screws can be reused a maximum 3 times with written documentation.

- Fasten screws.



- Tighten screws alternately with rotation angle disc and socket wrench insert.

A01 001



- Install rocker arm and rocker arm bracket.

  W 01-02-02
- Install fuel injectors.

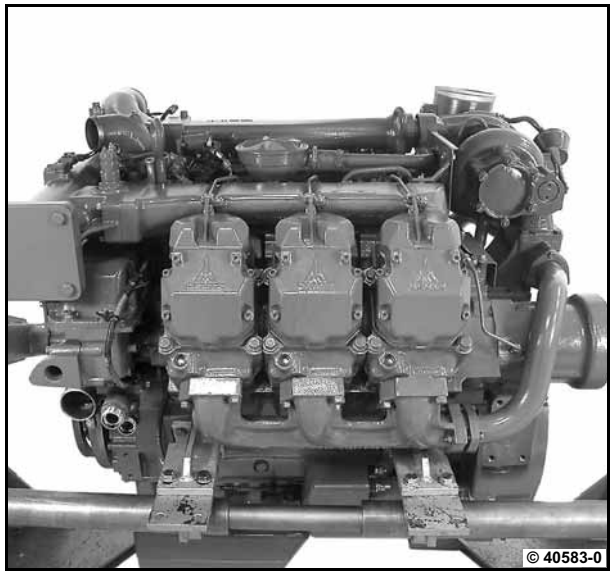
  W 07-07-01
- Install charge air pipe (A-bank)

  W 06-07-03
- Install charge air pipe (B-bank)

  W 06-07-03
- Install exhaust pipe (A-bank)

  W 06-01-05
- Install exhaust pipe (B-bank)

  W 06-01-05



Checking piston overhang

Commercial available tools:
– Magnetic measuring stand

Special tools:
– Dial gauge. 100400
– Measuring instrument with measuring plate 100850

– W 01-04-04
– W 04-06-03

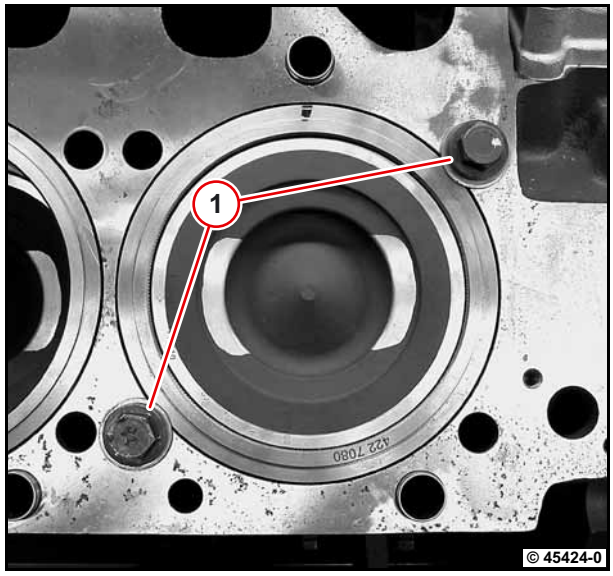
Checking piston overhang

- Remove cylinder head.

  W 01-04-04

- Insert screws and washers (1) diagonally opposed.
- Tighten screws until they touch the cylinder liner.

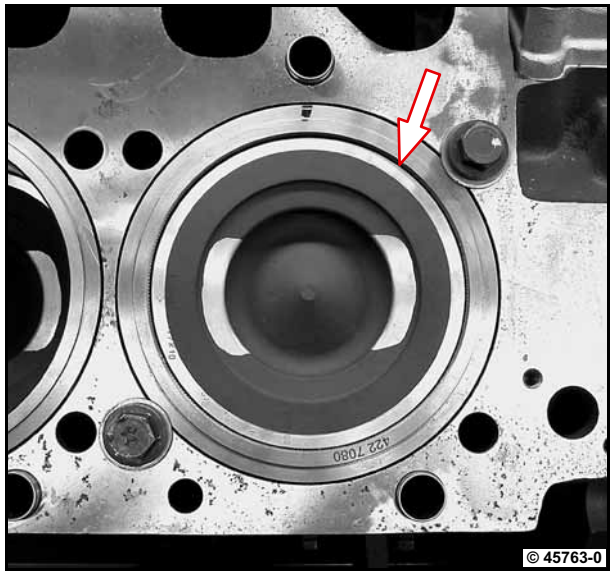
Washers:
Maximum thickness 4 mm
Screw length:
M16 x 90



- Attach turning gear.

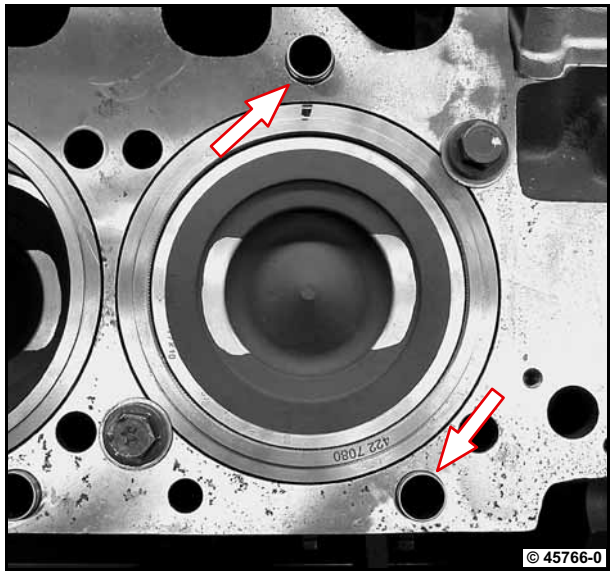
  W 04-06-03

- Turn the crankshaft until the respective piston is just in front of the top dead centre (arrow).

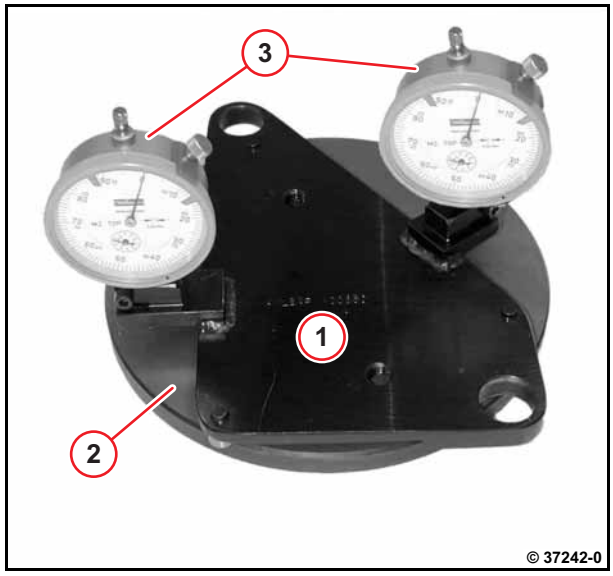


6

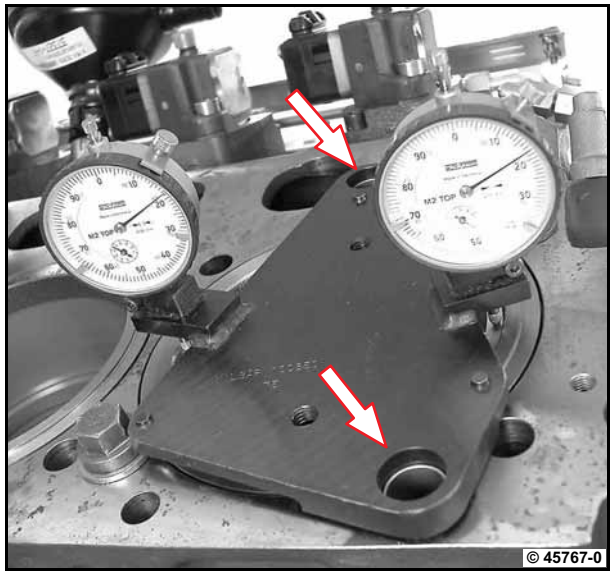
- Make sure the clamping bushings (arrows) are in place.



- Place measuring instrument (1) on measuring plate (2).
- Insert dial gauges (3) with pre-tension in the measuring instrument.
- Turn the dial until the pointer points to "0".



- Place the measuring instrument over the clamping bushings (arrows).
- Read off measured value of both dial gauges.
- 1st dial gauge:
  - Note measured value, dimension (a).
- 2nd dial gauge:
  - Note measured value, dimension (b).



- Form and note average value.

Calculation example	
Desired:	Dimension x (average value of both dial gauges)
Given:	-
Measured:	Dimension a (measured value 1st dial gauge) Dimension b (measured value 2nd dial gauge)
Calculation:	Dimension x = (dimension a + dimension b) : 2 (0.39 mm + 0.45 mm) : 2
Result:	= 0.42 mm

P02 75

P02 76

P02 77

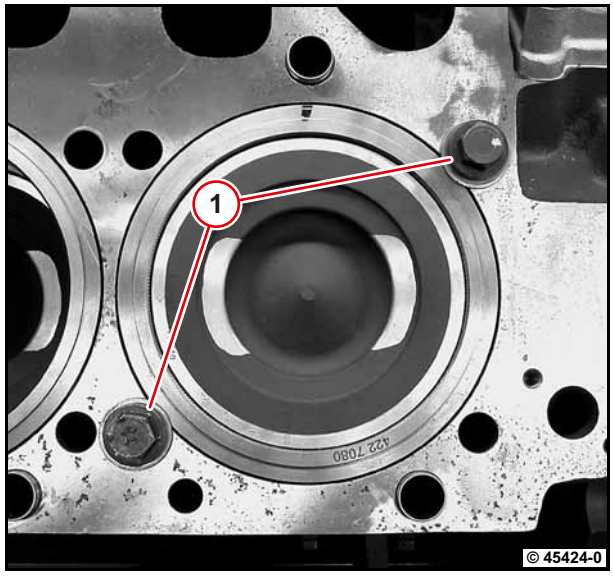
- Remove measuring instrument.

- Unscrew screws (1).
- Remove turning gear.

W 04-06-03

- Install cylinder head.

W 01-04-04



6

Removing and installing the valves

Commercial available tools:
– Slide gauge
– Assembly pliers. 8024
– Assembly lever 9017

Special tools:
– Support bracket 120900
– Base plate. 120910
– Assembly tool 121410
– Assembly sleeves. 121420

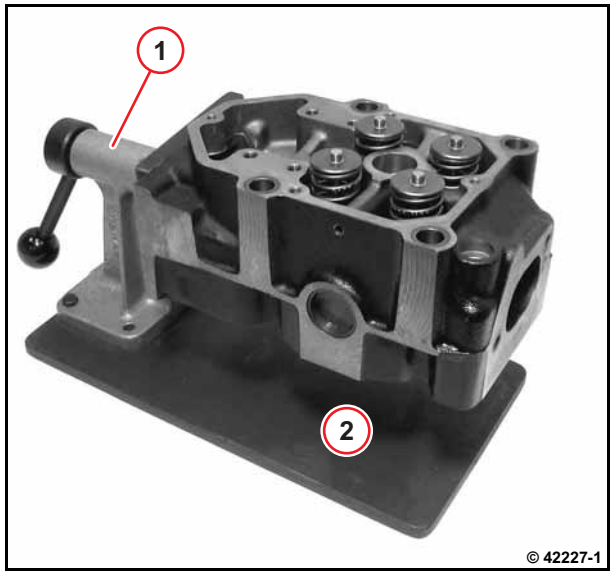
– W 01-04-04

Removing the valves

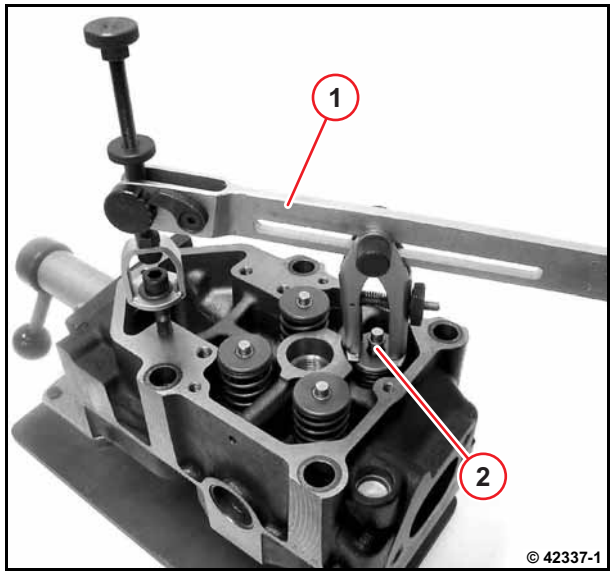
- Remove cylinder head.

  W 01-04-04

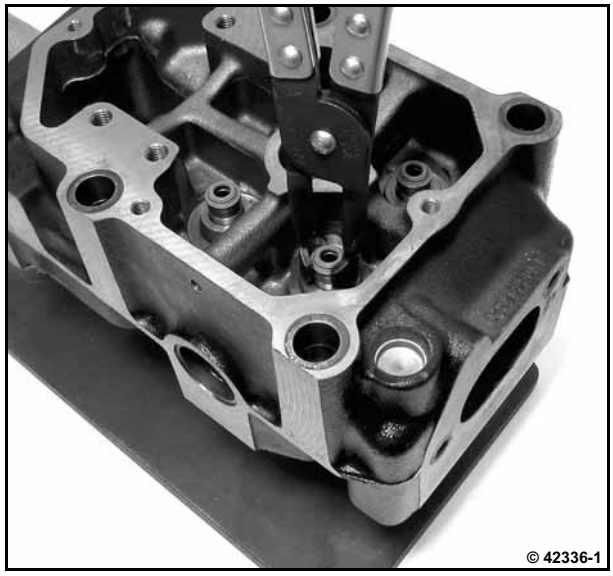
- Mount support bracket (1) on base plate (2).
- Mount cylinder head on support bracket.



- Install assembly lever (1).
- Press down valve spring with assembly lever.
- Remove both tapper collets (2).
- Remove valve spring plates, valve springs and valves.
- Remove assembly lever.

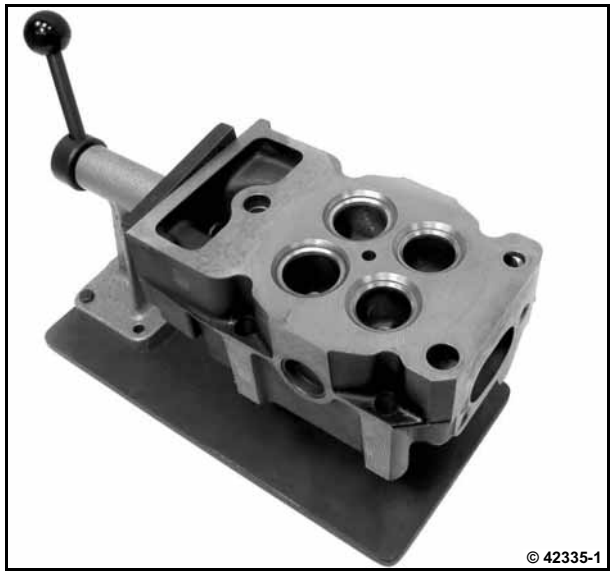


- Disassemble valve stem gasket with assembly plier.



6

- Clean cylinder head.
- Check cylinder head.
- Visually inspect the components.

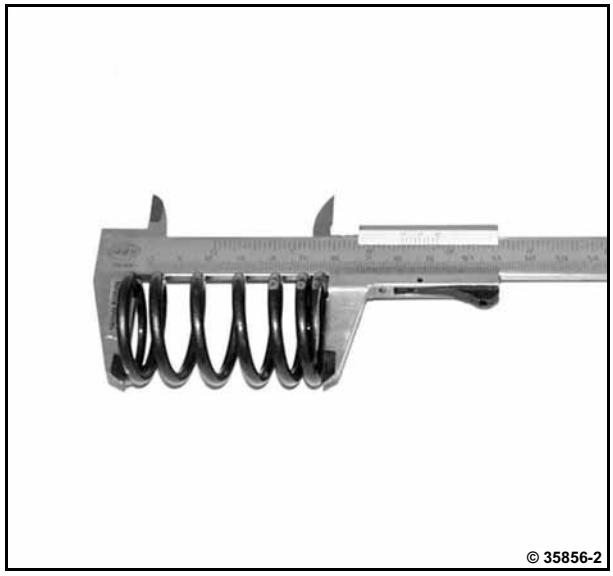


Installing the valves

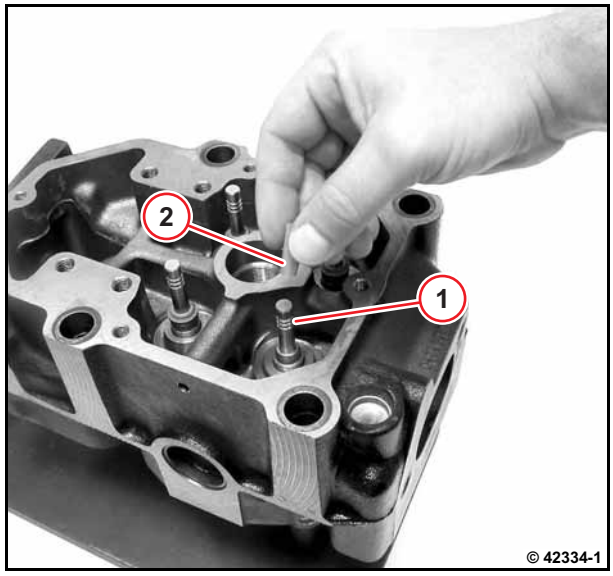
- Measure valve spring length with slide gauge.

P01 51

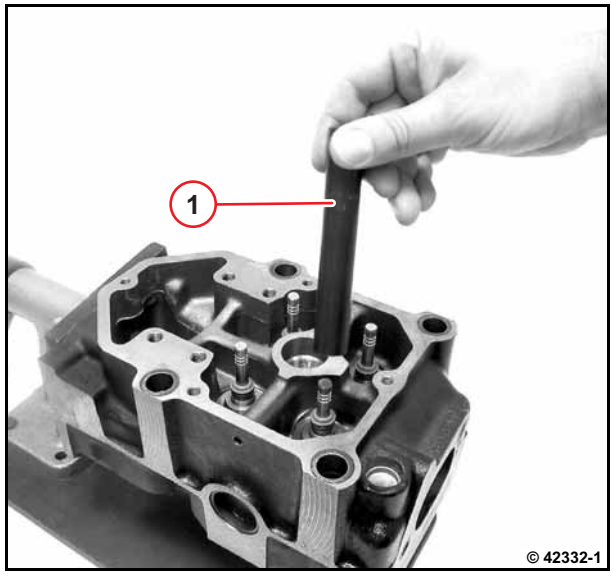
When the wear limit is reached, the valve spring must be renewed.



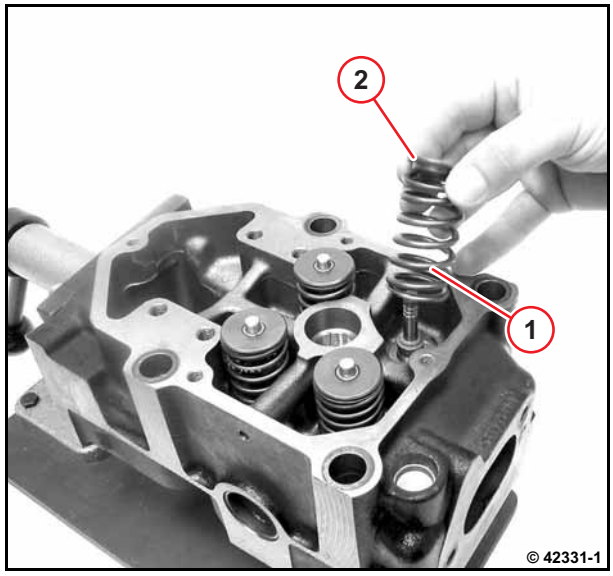
- Oil the valve stem lightly.
- Insert and hold valve.
- Push assembly sleeve (2) over the valve V-grooves (1).



- Push new valve stem seal onto valve guide over the assembly sleeve with assembly tool (1).
- Remove assembly sleeve.

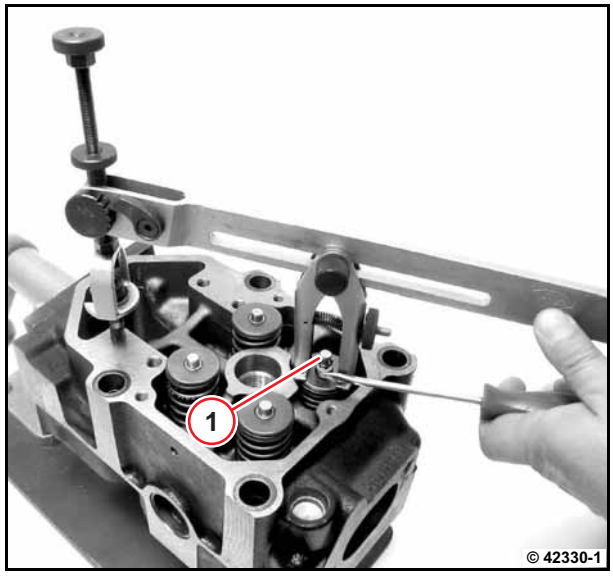


- Insert valve spring (1).
- Insert valve spring plate (2).



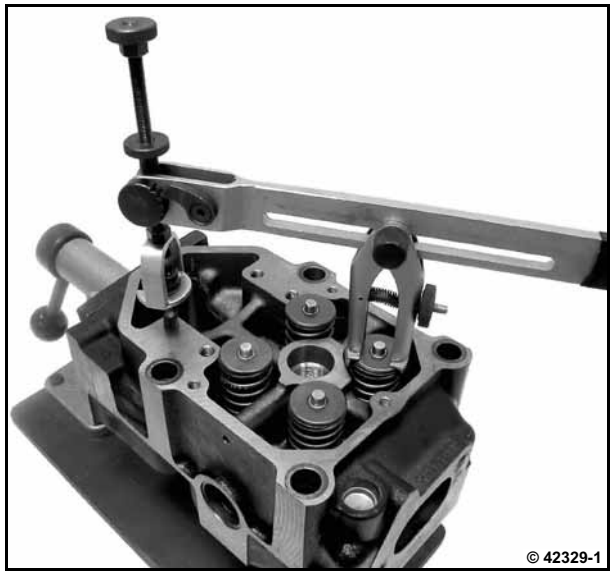
- Mount assembly lever.
- Press down the valve spring with the assembly lever and insert both tapper collets (1).

Make sure the tapper collets fit correctly in the valve keyway.



- Remove assembly lever.
- Remove cylinder head from support bracket.
- Install cylinder head.

W 01-04-04



Checking the valves

Commercial available tools:
– Micrometer gauge
– Slide gauge

– W 01-05-01

Clean valves before testing.

When the wear limit is reached, the valve must be renewed.

Checking valve stem diameter

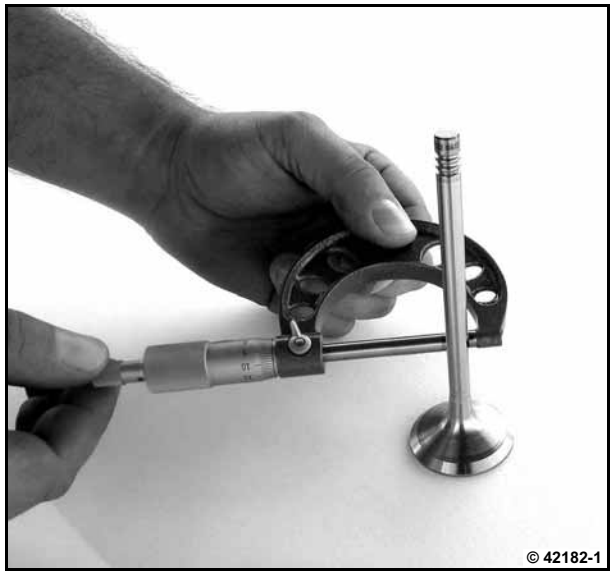
- Remove valves.

  W 01-05-01

- Measure valve stem diameter with micrometer gauge.

  P01 31

  P01 32



Checking valve edge thickness

- Measure valve edge thickness with slide gauge.

  P01 35

  P01 36

Checking valve head diameter

- Measure valve head diameter with slide gauge.

  P01 37

  P01 38

- Install valves.

  W 01-05-01

6

Checking the valve guide

Commercial available tools:
– Magnetic measuring stand

Special tools:
– Dial gauge. 100400

– W 01-05-01

New valves are used for testing.

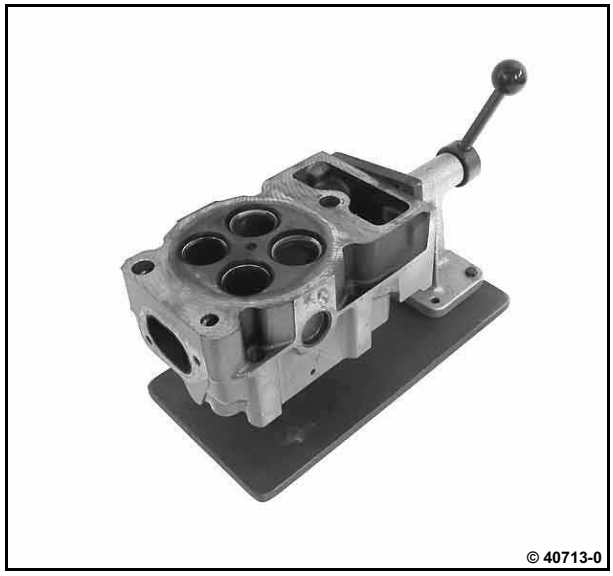
When the wear limit is reached, the valve guide must be renewed.

Checking the valve guide

- Remove valves.

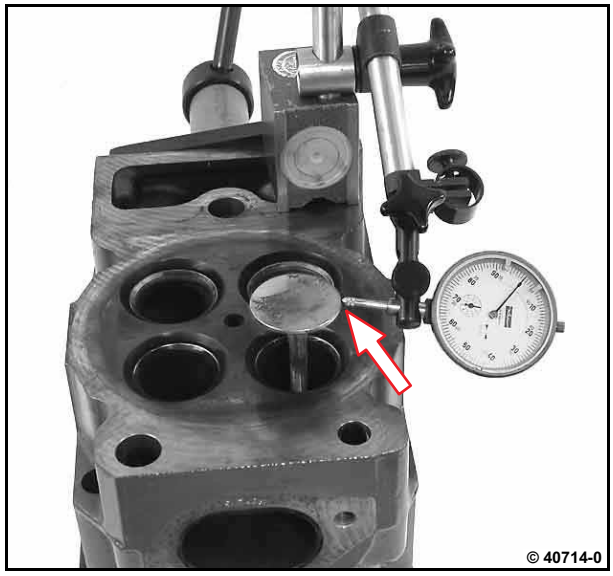
  W 01-05-01

- Visually inspect valve guide for wear.



Measure valve stem clearance

- Mount magnetic measuring stand.
- Insert dial gauge.
- Insert new valve.
- Place stylus under pre-tension on the valve head (arrow).
- Turn the dial until the pointer points to "0".

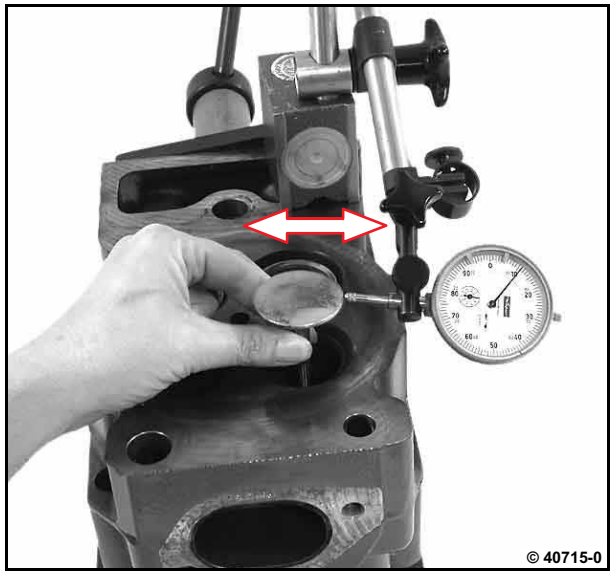


- Move valve back and forth in direction of arrow.

P01 33

P01 34

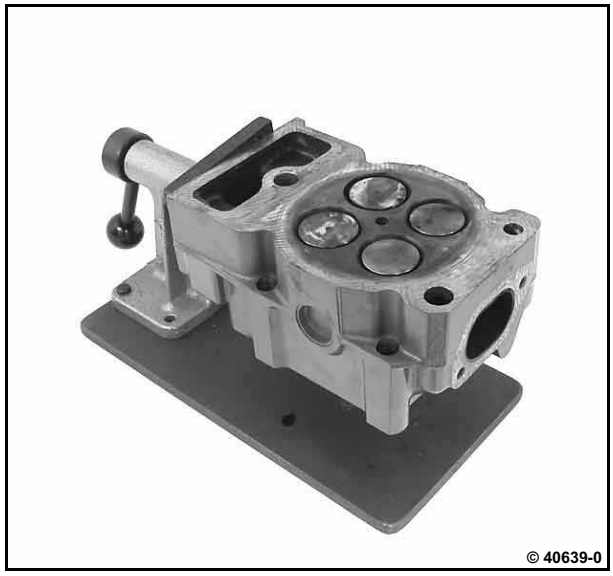
The valve stem ends must be flush with the valve guide.
The whole tilt distance must be taken into account.



6

- Remove magnetic measuring stand.
- Remove dial gauge.
- Install valves.

W 01-05-01



Renewing the valve guide (oversize, pressed version)

Commercial available tools:
– Reamers
– Plug gauges
– Cylinder head machining tool
– Press
– Press-out pin
– Press-in pin
– Industrial vacuum cleaner

– Nitrogen (liquid)

– W 01-05-01
– W 01-06-03

Danger!

Danger of injury, do not touch supercooled components or the liquid nitrogen!

Wear protective gloves and glasses!

Attention!

The press-in process must be carried out without interruption as a result of the temperature difference between the cylinder head and the valve seat insert.
The necessary work steps must be practised before pressing in.

The relevant manufacturer's specifications must be observed when working with the cylinder head machining tool.

6

Checking the valve guide

- Check valve guides.

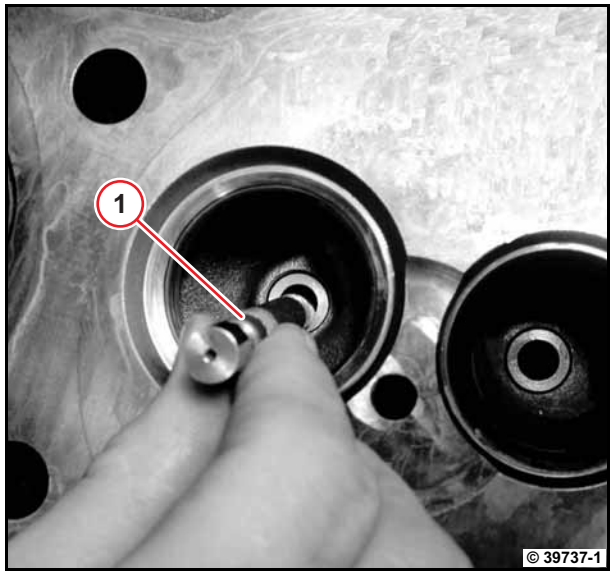
  W 01-06-03

- Check valve guide with plug gauge (1).

  P01 14

  P01 15

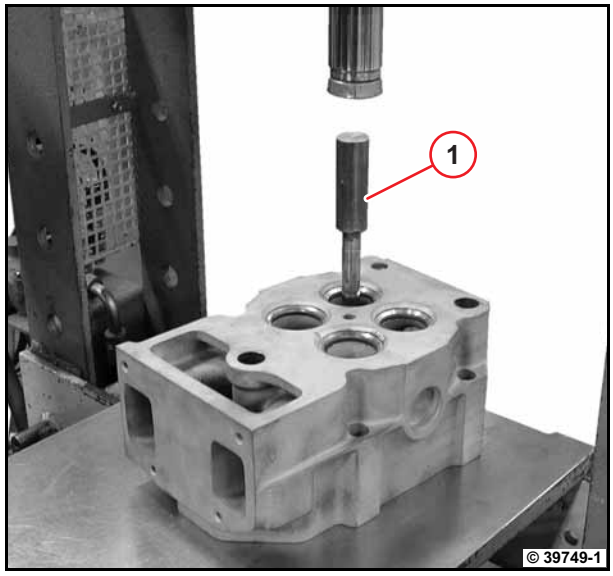
The target area of the plug gauge must be able to move upwards and downwards with light suction.



6

Pressing out valve guide

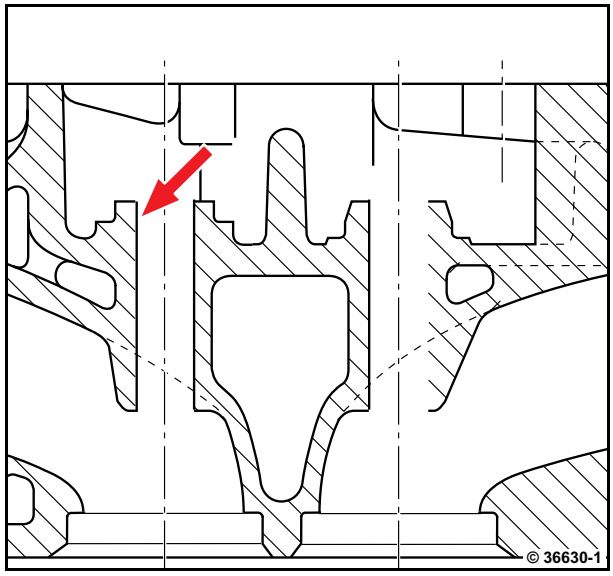
- Press out valve guide with press-out pin (1).



Check housing bore for valve guide

- Visually inspect housing bore (arrow).

If the housing bore is heavily scored, the housing bore must be reamed to the next oversize dimension.



- Check housing bore for valve guide with plug gauge (1).

P01 05

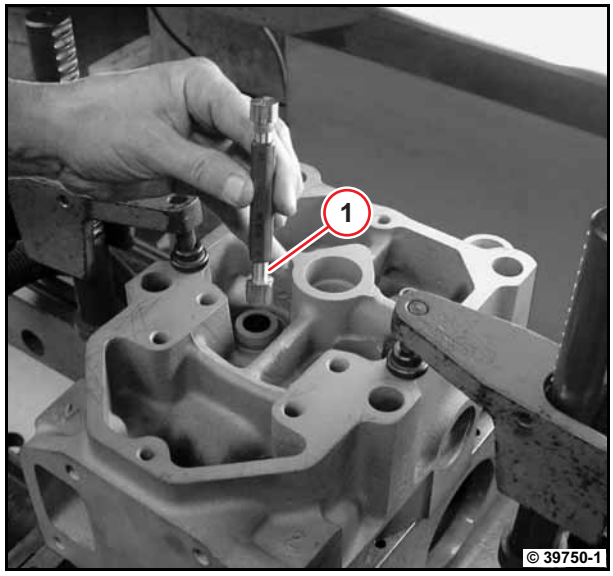
P01 06

P01 07

The target area of the plug gauge must be able to move upwards and downwards with light suction.

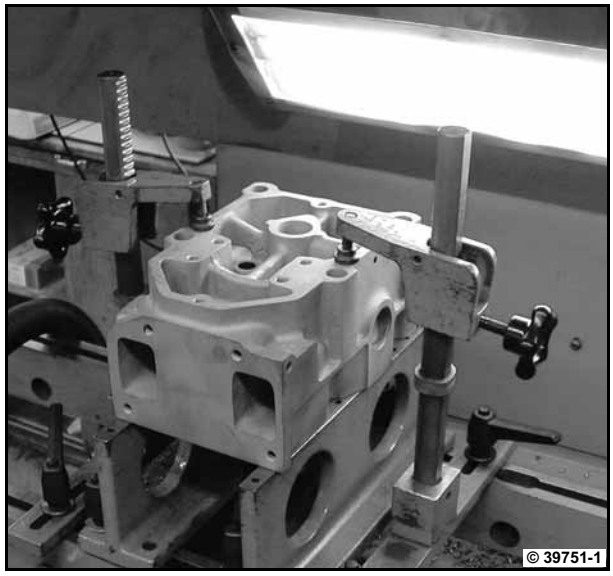
The no-go limit of the gauge plug must not fit into the housing bore. If the no-go limit fits, it must be reamed to the next oversize.

When the wear limit of the 2nd oversize stage is reached, the cylinder head must be renewed.



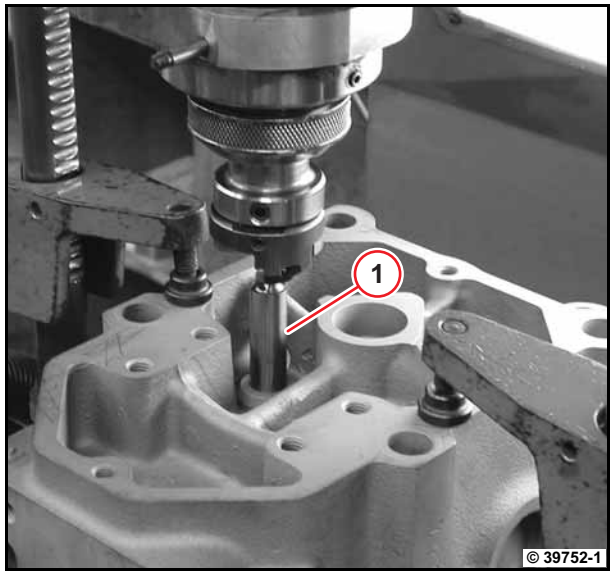
Prepare housing bore for the valve guide (oversize)

- Clamp cylinder head on cylinder head machining tool.
- Seal coolant channels.
- Align cylinder head.



- Align bore unit and mandrin guide (1) with the housing bore.

The housing bores can have different diameters, a suitable mandrin guide for alignment with the bore unit must therefore be selected. The mandrin guide must move easily in the housing bore without noticeable resistance.



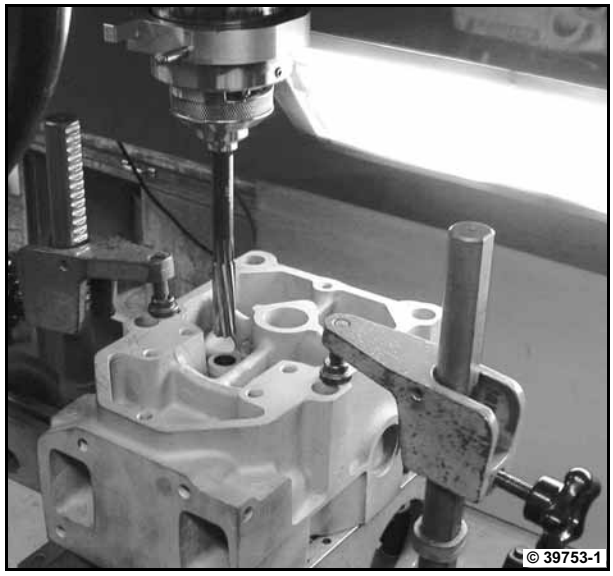
- Ream housing bore to oversize level.

P01 06

P01 07

Attention!
The reamer has a left twist and must always be turned in or out in clockwise direction. Never turn reamers anti-clockwise. The cuttings resulting from removing the material can get stuck and damage the cutting.

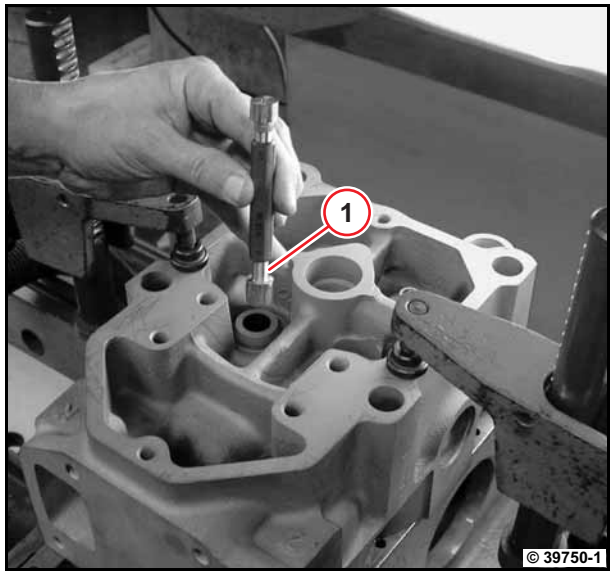
- Blow out housing bore with compressed air.



- Check housing bore for valve guide with plug gauge (1).

Use corresponding plug gauge.

The target area of the plug gauge must be able to move upwards and downwards with light suction.



6

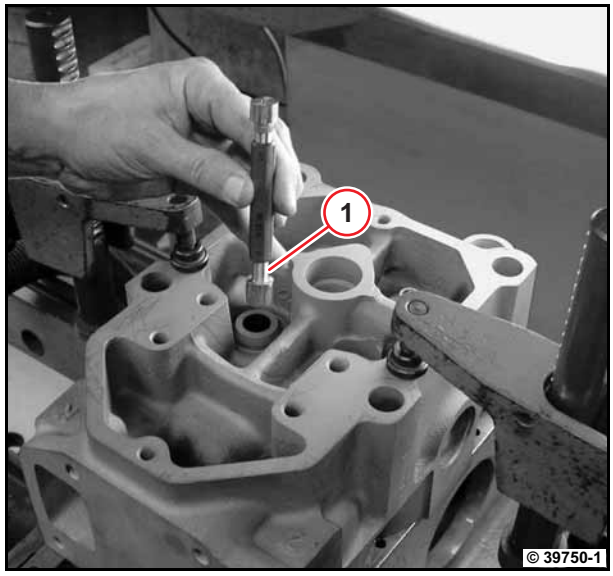
The no-go limit of the gauge plug (1) must not fit into the housing bore.

If the no-go limit fits, it must be reamed to the next oversize.

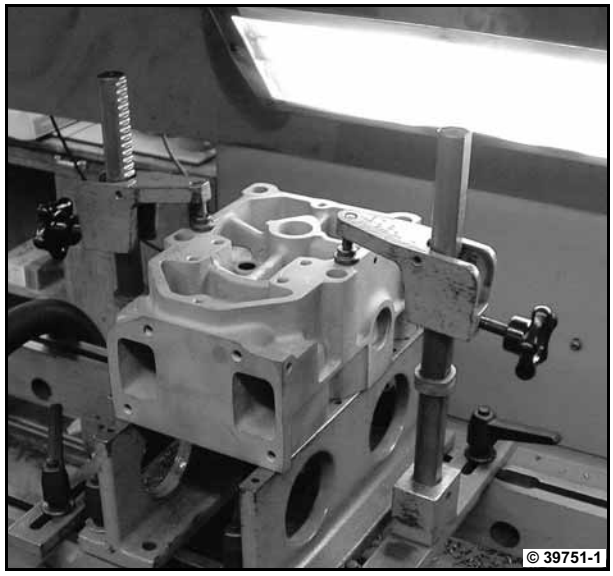
When the wear limit of the 2nd oversize stage is reached, the cylinder head must be renewed.

P01 06

P01 07



- Unclamp cylinder head.
- Blast cylinder head clean with compressed air.



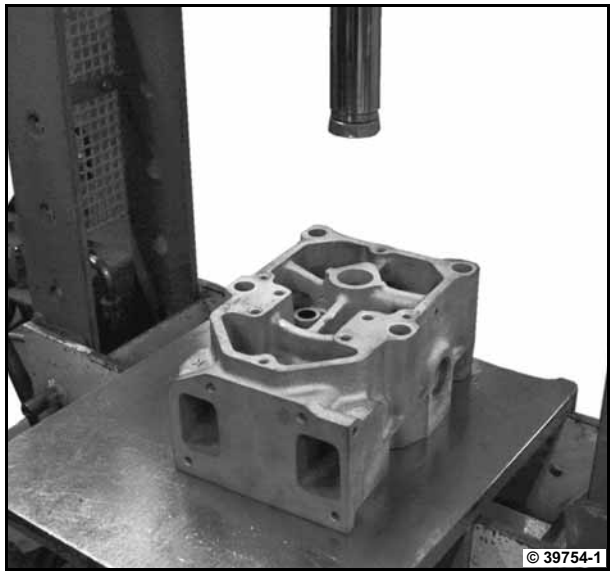
Press in valve guide

- Mount cylinder head.
- Select valve guide to fit housing bore.

P01 11

P01 12

P01 13



- Supercool valve guide in liquid nitrogen.

Use a suitable container for the liquid nitrogen and a suitable tool for inserting and removing the components.

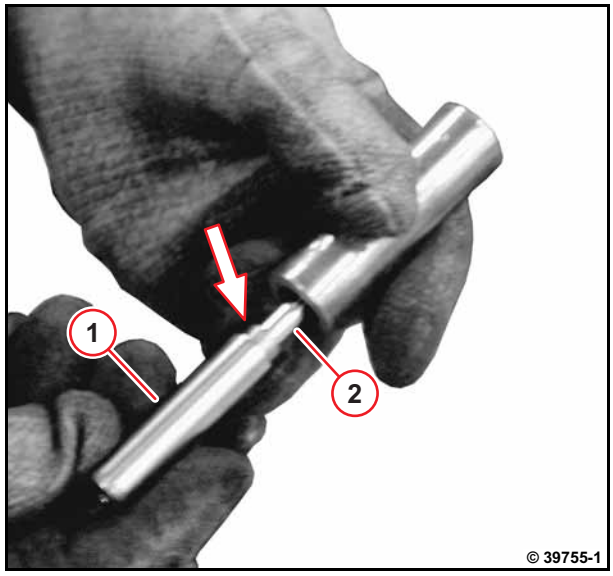
At the beginning of the metal cooling, the liquid nitrogen boils strongly, the bubbling up process continues until the metal parts have reached the temperature of the liquid nitrogen (-196 °C).

The valve guide has the correct temperature if the bubbling up process of the nitrogen has finished.

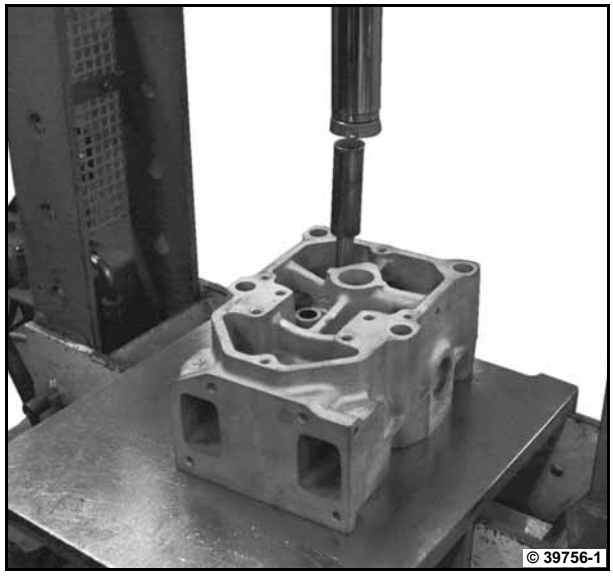
- Push valve guide (1) onto press-in pin (2).

Note post-assembly position of the valve guide.

The remote side (arrow) must face the press-in pin.



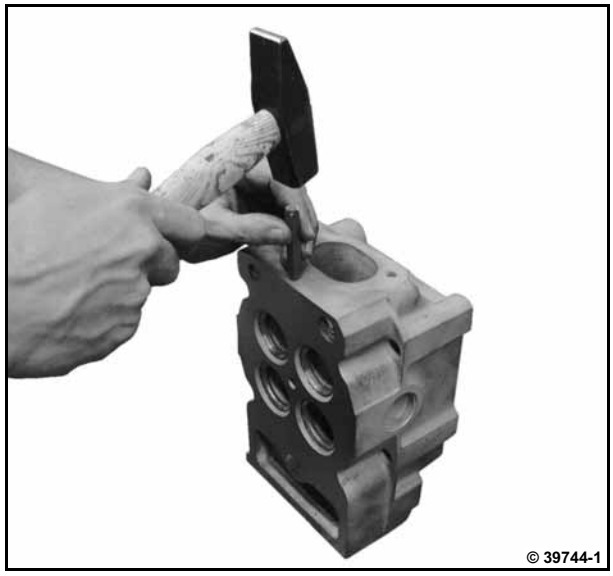
- Press in valve guide until it touches the press-in pin.
- Remove the press-in pin.
- Remove the cylinder head.



- Attach the repair date and company logo to the cylinder head.

Attention!
Do not mark identification on a sealing surface.

Mark the cylinder head after every repair.



- Install valves.

W 01-05-01

Checking the valve lag

Commercial available tools:
– Depth-measuring appliance

Special tools:
– Support bracket 120900
– Base plate. 120910

– W 01-04-04

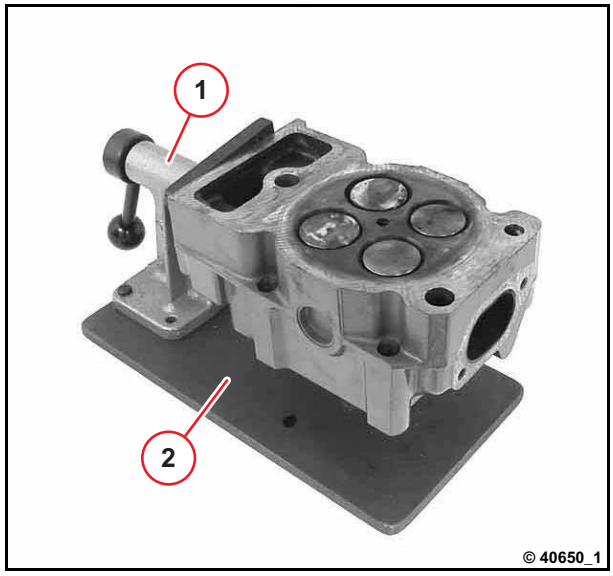
Attention!
When the wear limit is reached, the valve seat insert and/or valve must be renewed.

Checking the valve lag

- Remove cylinder head.

  W 01-04-04

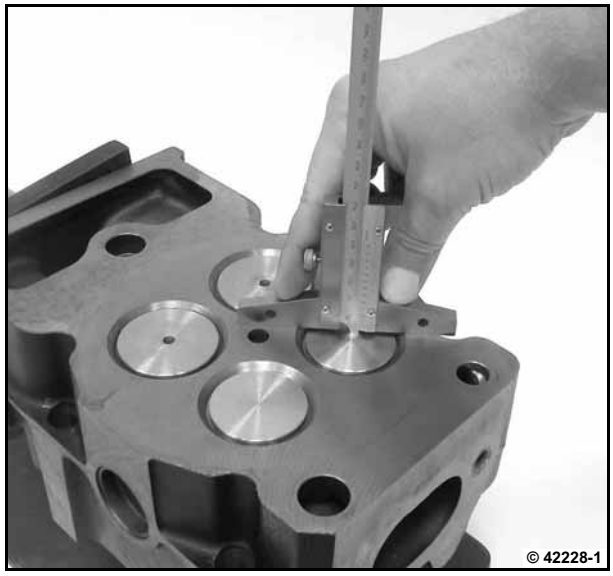
- Mount support bracket (1) on base plate (2).
- Mount cylinder head on support bracket.



- Mount depth measuring appliance on cylinder head sealing surface.
- Measure valve stand back.

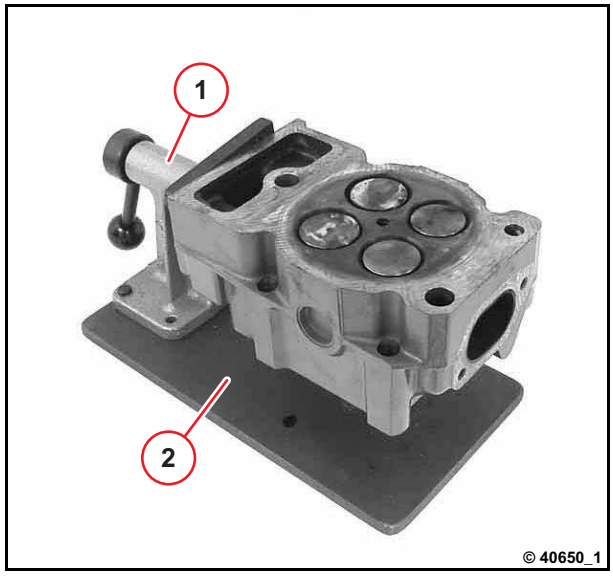
  P01 45

  P01 46



- Remove cylinder head from support bracket (1).
- Remove support bracket from base plate (2).
- Install cylinder head.

W 01-04-04



6

Renewing valve seat insert (oversize)

Commercial available tools:
– Tenon milling machine, 10 mm
– Internal measuring device
– Slide gauge
– Cylinder head machining tool
– Press
– Industrial vacuum cleaner
– Press-in pin
– Upright drilling machine

– Nitrogen (liquid)

– W 01-05-01
– W 01-07-08

Danger!

Danger of injury, do not touch supercooled components or the liquid nitrogen!

Wear protective gloves and glasses!

Attention!

The press-in process must be carried out without interruption as a result of the temperature difference between the cylinder head and the valve seat insert.
The necessary work steps must be practised before pressing in.

The relevant manufacturer's specifications must be observed when working with the cylinder head machining tool.

The respective valve guide must be available for replacing a valve seat insert.

- Check valve stand back.

  W 01-07-08

- Remove valves.

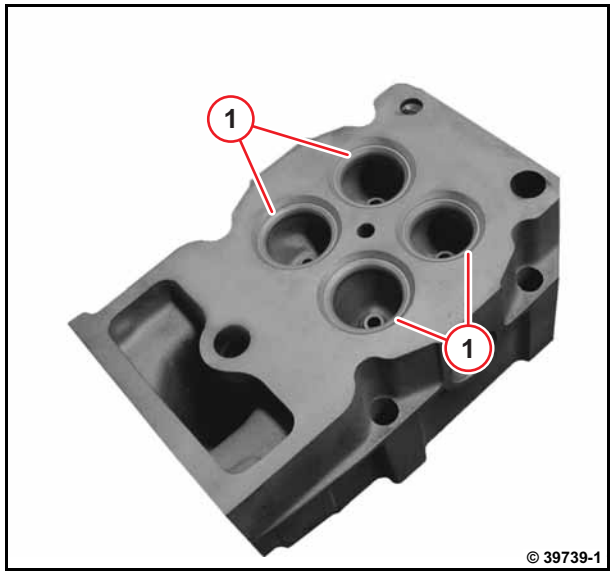
  W 01-05-01

© 40639-0

Checking valve seat insert

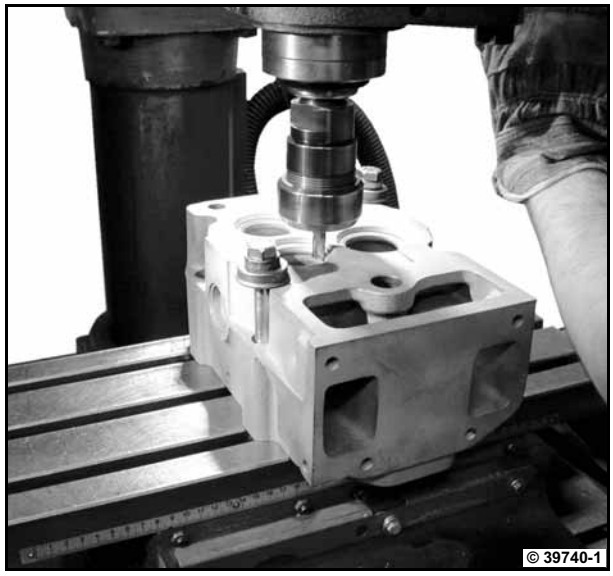
- Check valve seat inserts (1).

Ensure that the installation location is free from faults.



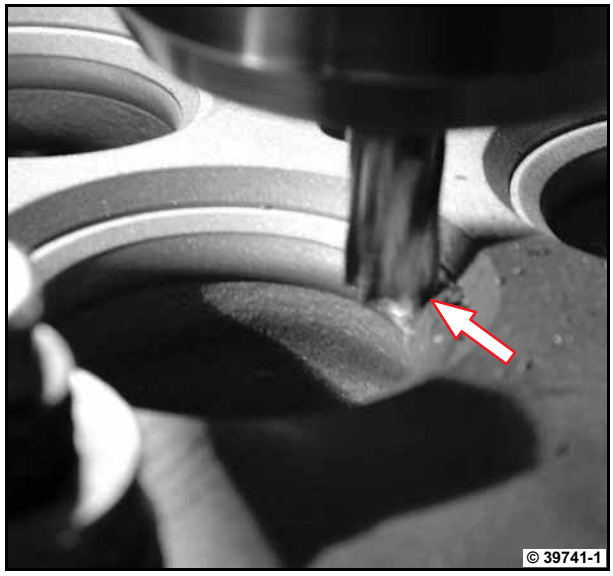
Removing valve seat insert

- Clamp in cylinder head.
- Align valve seat insert with tenon milling machine.



- Mill valve seat insert on the sides (arrow) until it can be removed without tension.

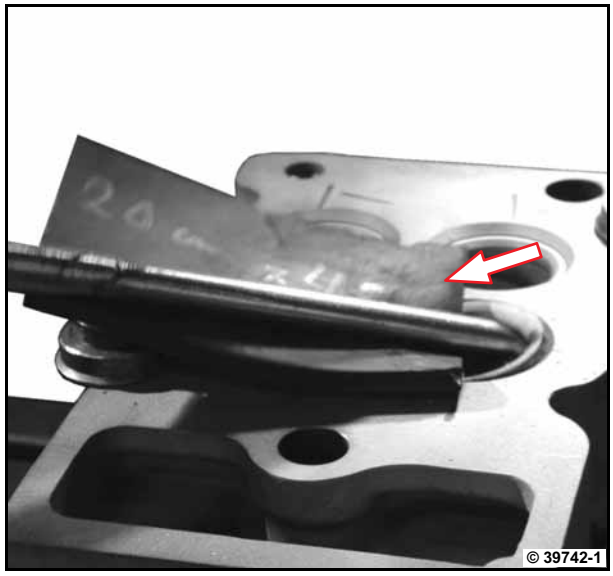
Attention!
Do not damage cylinder head.



- Fit protective underlay (arrow).
- Lever valve seat insert out.

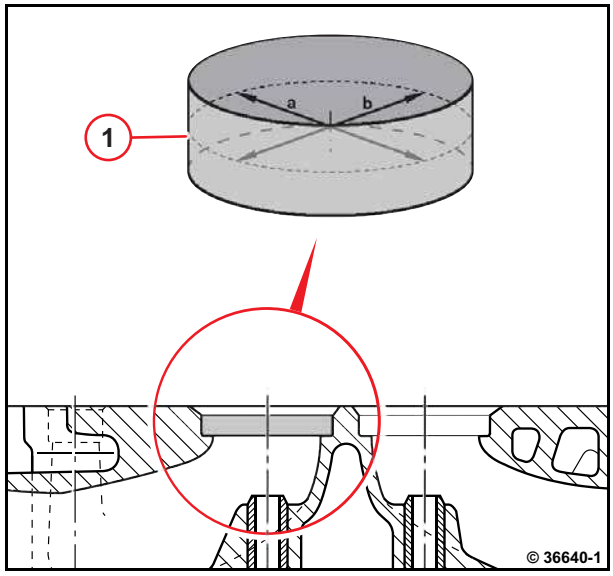
Attention!
Do not damage cylinder head.

- Unclamp cylinder head.



Checking housing bore for valve seat insert

Diagram for measuring the housing bore at the points "a" and "b", in the centre of level "1".



- Measure housing bore with internal measuring device.

Measuring points see diagram.

- Read off measured value.

P01 01

P01 02

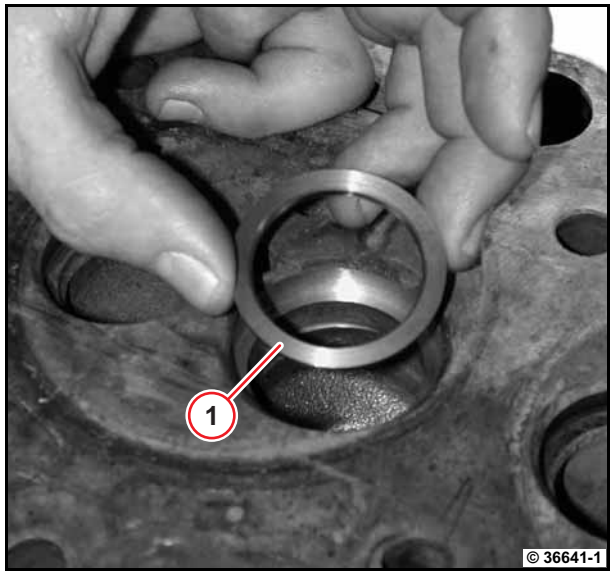
P01 03

P01 04

When the wear limit of the 2nd oversize stage is reached, the cylinder head must be renewed.

Alternatively, the diameter of the housing bore can be determined with the aid of a measuring guide ring (1).

The measuring guide ring can, for example, be a valve seat insert turned to half its size in height which is inserted in the hole.

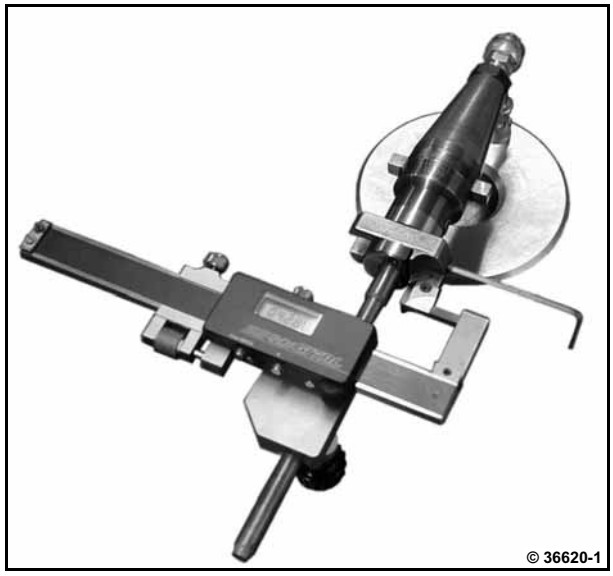


Prepare housing bore for the valve seat insert (oversize)

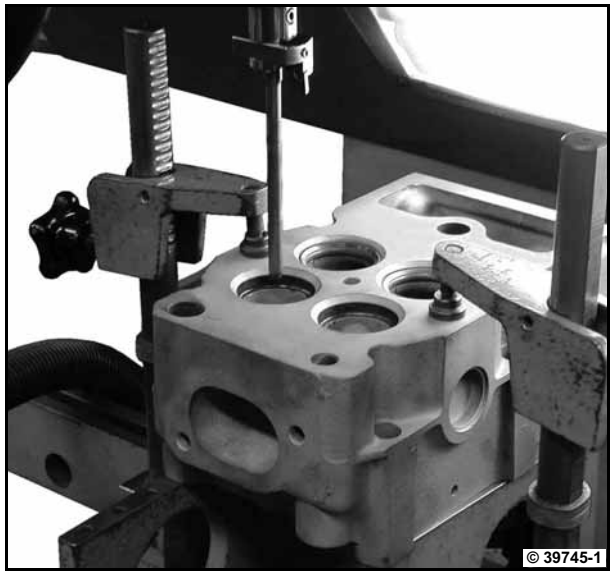
- Set cutting tool.

P01 03

P01 04

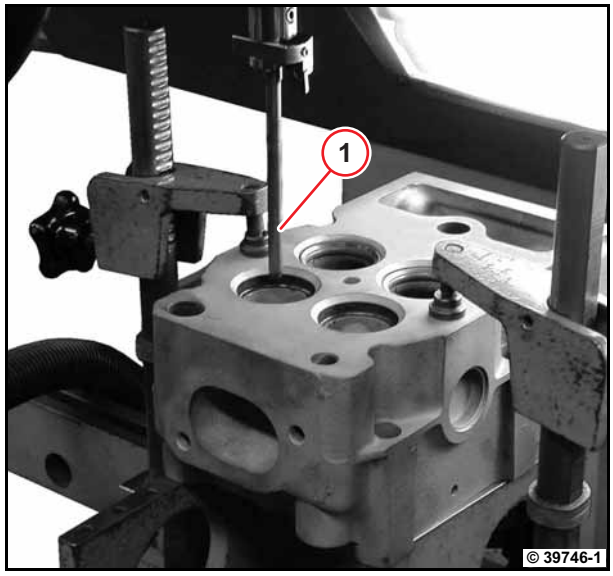


- Clamp cylinder head on cylinder head machining tool.
- Seal coolant channels.
- Align cylinder head.



The valve guides can have different diameters, a suitable mandrin guide for alignment with the bore unit must therefore be selected. The mandrin guide must move easily in the valve guide without noticeable resistance.

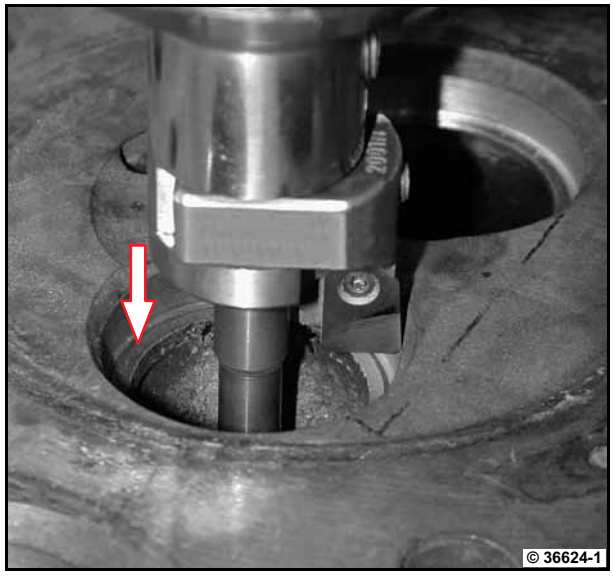
- Align bore unit and mandrin guide (1) with the housing bore.



- Bore housing bore to oversize level.

Attention!
The valve seat insert support (arrow) must not be machined with the cutting tool.

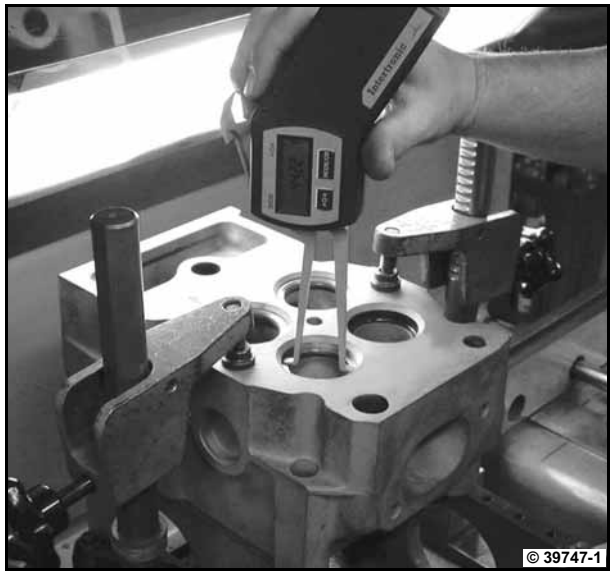
- Remove chips thoroughly.



- Measure housing bore with internal measuring device.

P01 03

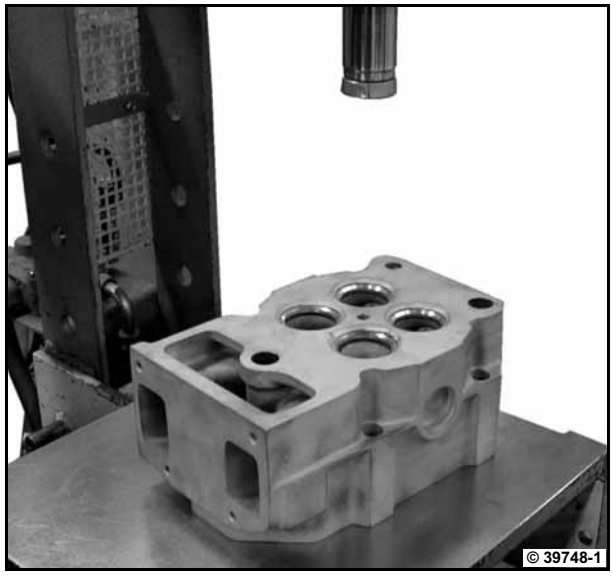
P01 04



Press in valve seat insert

- Mount cylinder head.
- Select valve seat insert to fit housing bore.

P01 21
P01 22
P01 23
P01 24

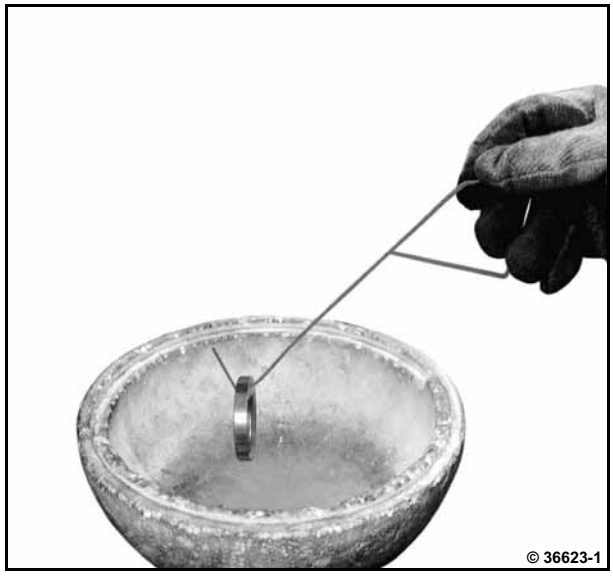


- Supercool valve seat insert in liquid nitrogen.

Use a suitable container for the liquid nitrogen and a suitable tool for inserting and removing the components.

At the beginning of the metal cooling, the liquid nitrogen boils strongly, the bubbling up process continues until the metal parts have reached the temperature of the liquid nitrogen (-196 °C).

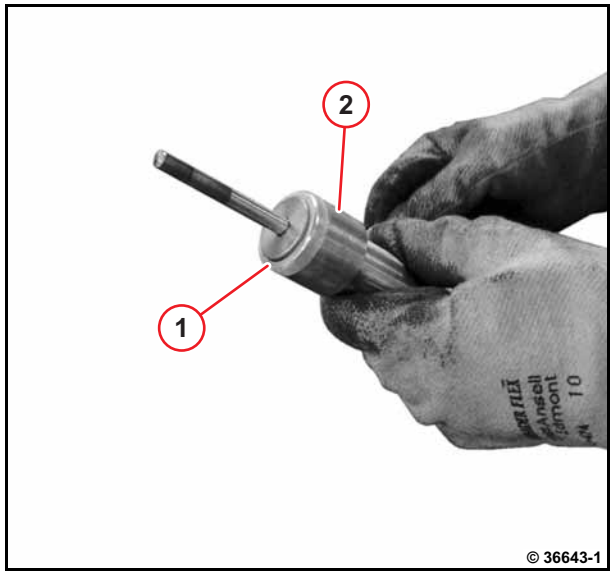
The valve seat insert has the correct temperature if the bubbling up process of the nitrogen has finished.



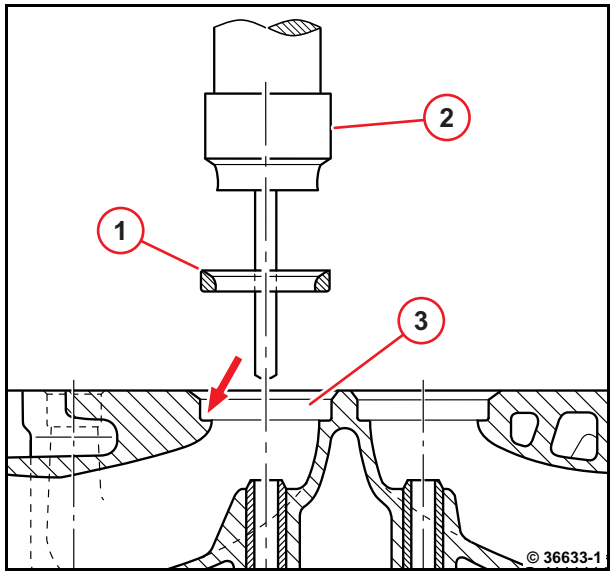
- Push valve seat insert (1) onto press-in pin (2).

Note installation position.

The valve seat surface must point to the press-in pin.



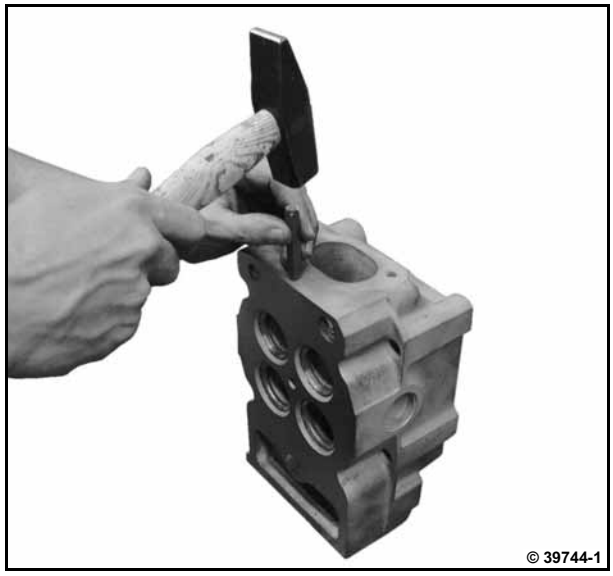
- Press the valve seat insert (1) with press-in pin (2) into the housing bore (3) until it is in position (arrow).
- Remove the cylinder head.
- Machine valve seat insert.



- Attach the repair date and company logo to the cylinder head.

Attention!
Do not mark identification on a sealing surface.

Mark the cylinder head after every repair.

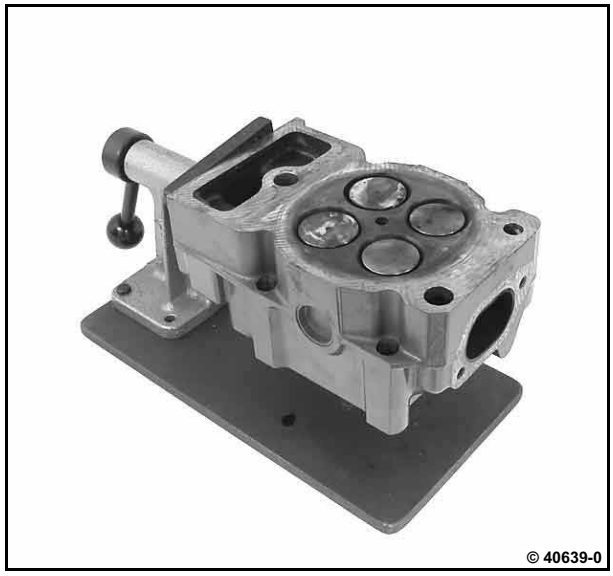


- Install valves.

W 01-05-01

- Check valve stand back.

W 01-07-08



6

Checking axial backlash of crankshaft (crankshaft removed)

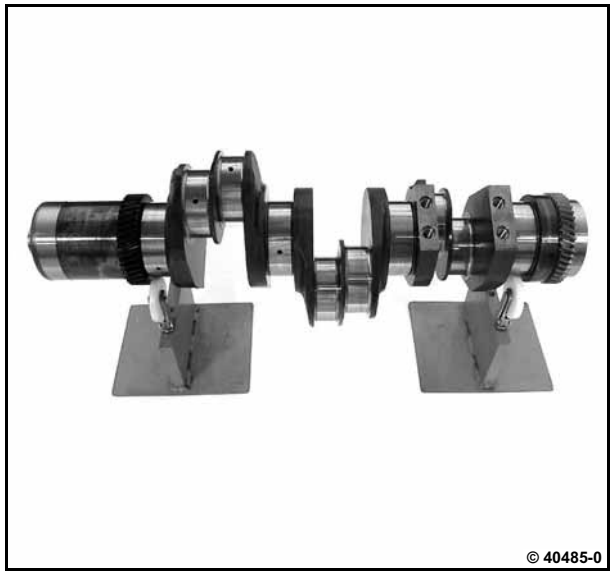
Commercial available tools:
– Micrometer gauge
– Internal measuring device

– W 02-04-01

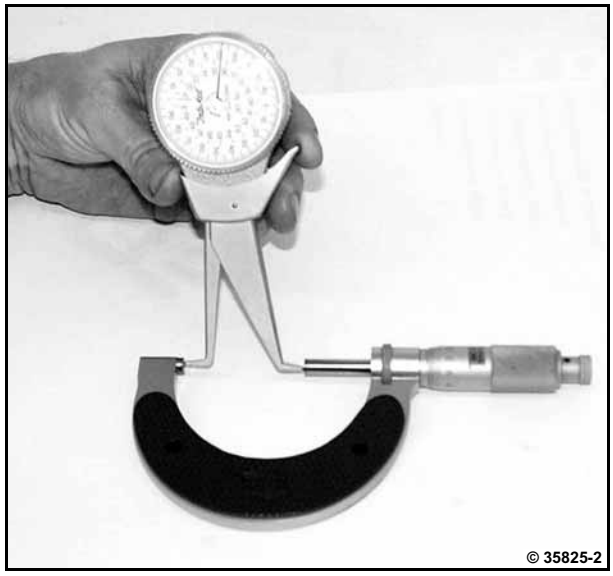
Checking the axial backlash

- Remove crankshaft.

  W 02-04-01

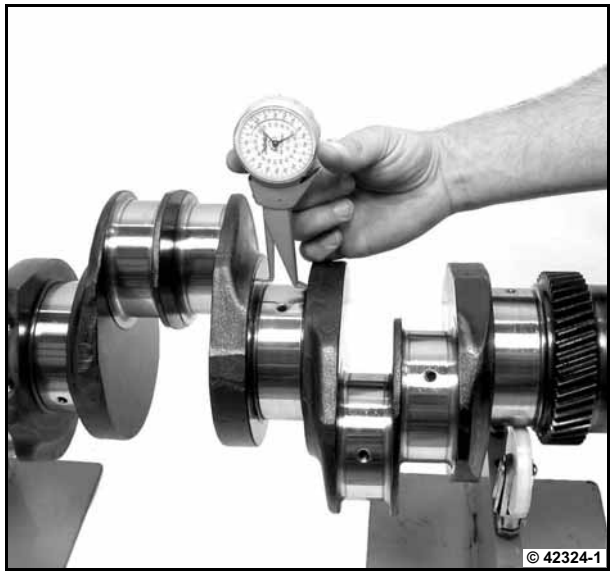


- Set micrometer gauge to 38 mm.
- Push the internal measuring device between the test surfaces of the micrometer gauge and set to "0".



- Measure locating bearing width
- Note measured value, dimension (a).

P02 11
P02 12
P02 13



6

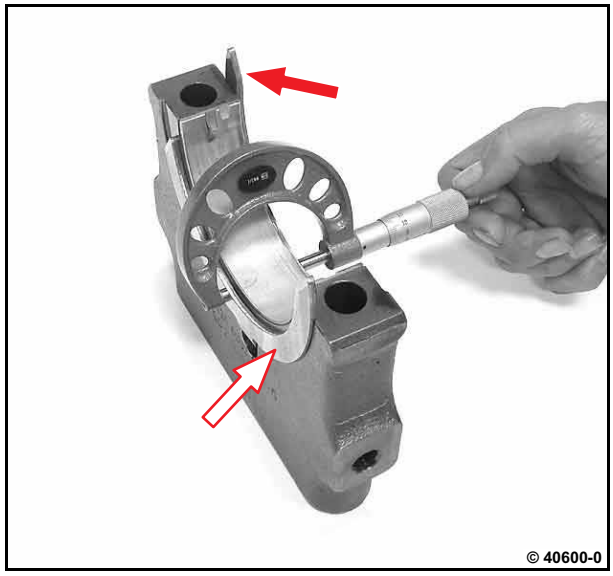
- Place thrust ring halves on bearing caps (arrows).
- Measure width with micrometer gauge.
- Note measured value, dimension (b).
- Determine axial backlash.

Calculation example	
Desired:	Axial backlash
Given:	-
Measured:	(a) = 38.6 mm
	(b) = 38.4 mm
Calculation:	Axial backlash = dimension (a) - dimension (b)
	38.6 mm - 38.4 mm
Result:	= 0.2 mm

P02 34

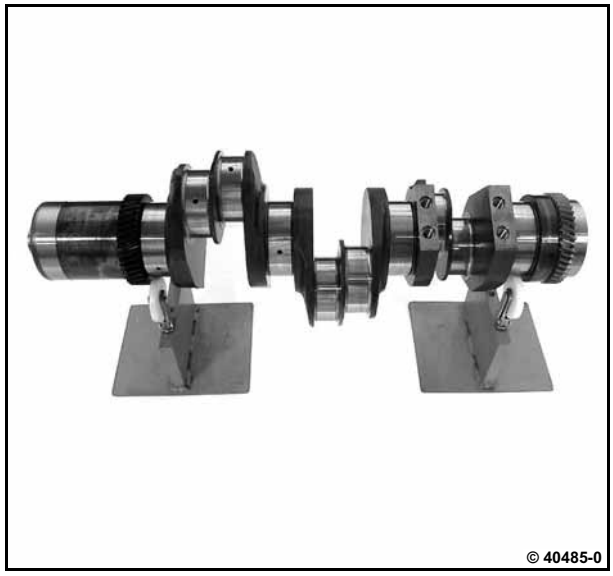
With deviating axial backlash:

Set axial backlash by changing the thrust ring halves.



- Install crankshaft.

W 02-04-01



Checking axial backlash of crankshaft (crankshaft installed)

Commercial available tools:
– Magnetic measuring stand
– Micrometer gauge
– Socket wrench insert, size 24, reinforced
– Socket wrench insert 8035
– Rotation angle disc 8190

Special tools:
– Dial gauge. 100400

– W 03-08-01
– W 03-09-01

6

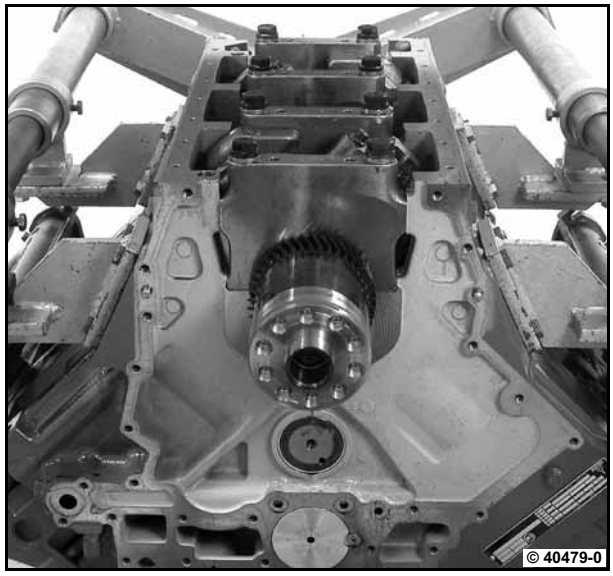
Checking the axial backlash

- Remove genset support.

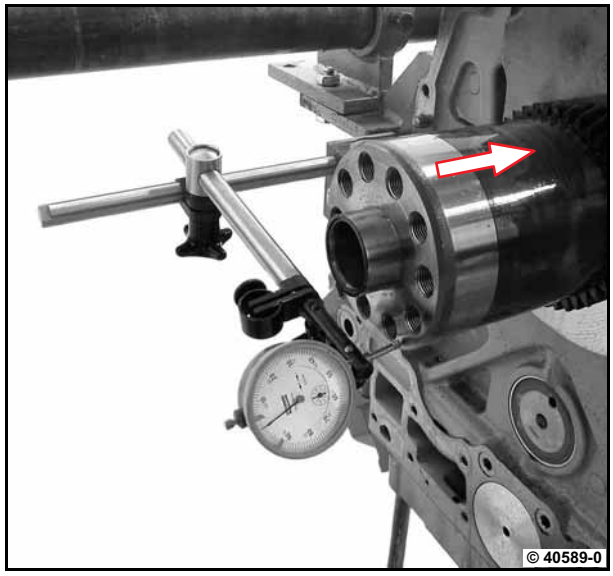
  W 03-08-01

- Remove rear cover.

  W 03-09-01



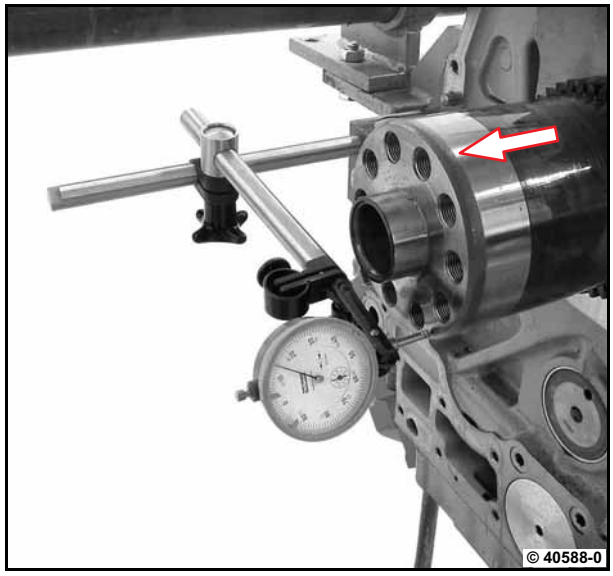
- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus to the crankshaft end with pre-tension.
- Press crankshaft in direction of arrow.
- Turn the dial until the pointer points to "0".



- Press crankshaft in direction of arrow.
- Read off measured value.

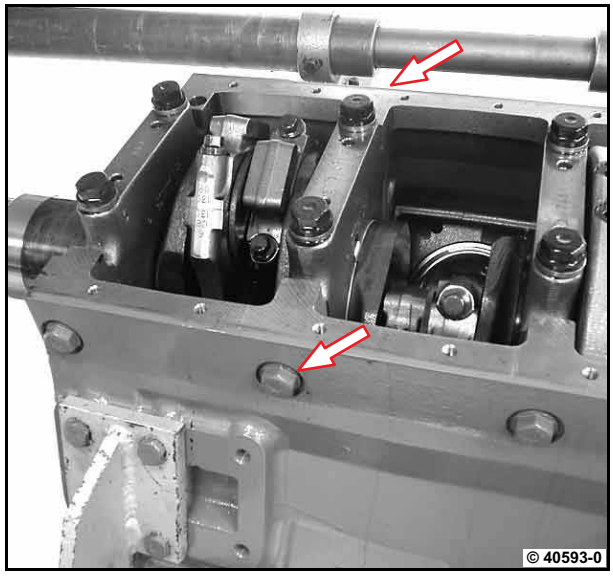
P02 34

With deviating axial backlash:
Note measured value, dimension (a).
Set axial backlash by changing the thrust ring halves.

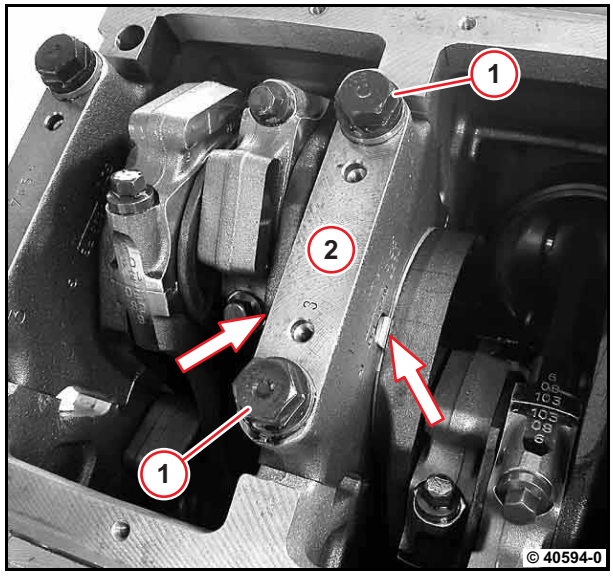


Changing thrust ring halves

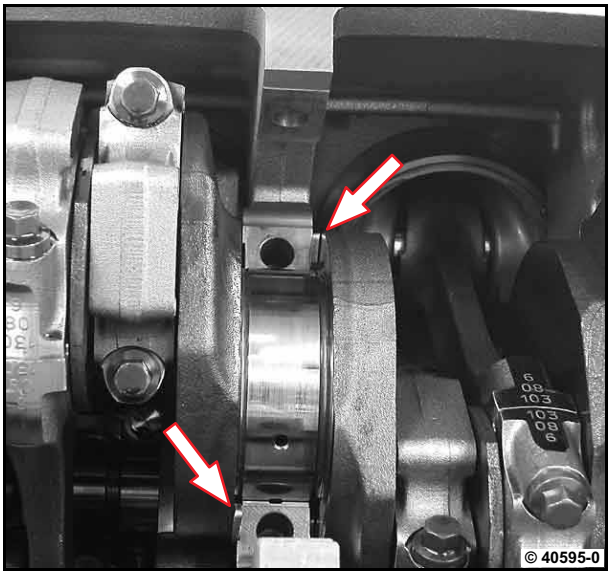
- Unscrew screws (arrows) with the socket wrench insert 8035.



- Unscrew screws (1) with the socket wrench insert size 24.
- Remove bearing cap (2).
- Remove lower bearing shell.
- Remove bottom thrust ring halves (arrows).



- Remove top thrust ring halves (arrows).



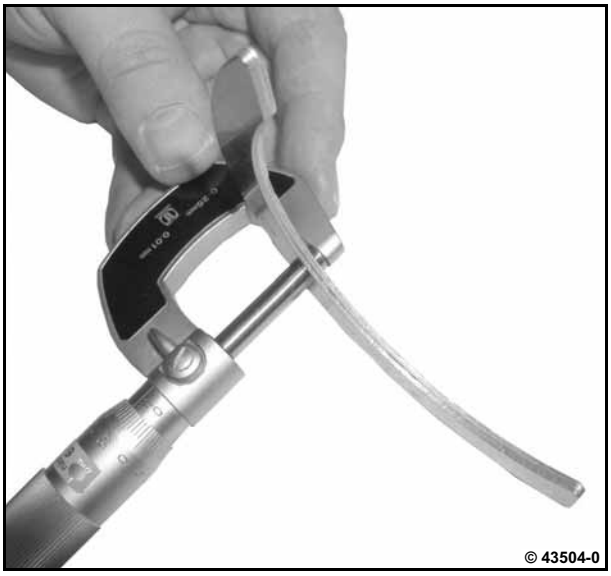
- Measure thickness of the top and bottom thrust ring halves.
- Note measured value, dimension (b).
- Determine thickness of the new thrust ring halves.

P02 35

P02 36

P02 37

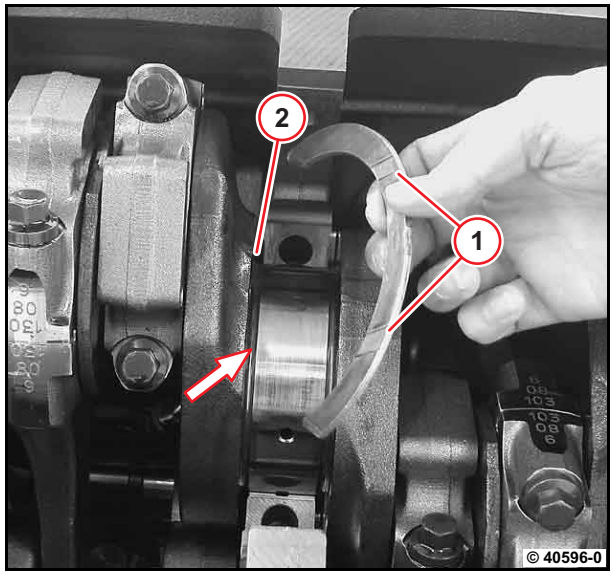
Calculation example	
Desired:	Thickness of the new thrust ring halves
Given:	(x) = thickness for standard, oversize level 1 and 2
	(y) = axial backlash (nominal)
	(values from the technical data)
Measured:	(a) = 0.4 mm axial backlash (actual)
	(b) = 3.26 mm (thickness of the old thrust ring halves)
Calculation:	(x) - (b) = (c)
	3.36 mm - 3.26 mm = 0.1 mm
	Dimension (a) - Dimension (c)
Result:	= 0.3 mm
	Value must be within the given axial backlash (y).



- Select new thrust ring halves according to calculated value.

- Install upper thrust ring halves according to measured axial clearance.

Oil grooves (1) of the thrust ring halves face the crankshaft web face (2).
Insert thrust ring halves between crankcase and crankshaft web (arrow).

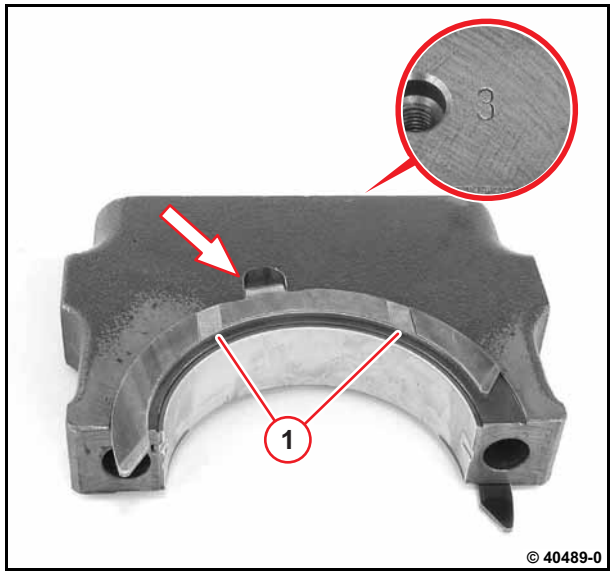


- Fix thrust ring halves with a little grease to the bearing cap.
- Install lower thrust ring halves according to measured axial backlash.

Use thrust ring halves with guide lug (arrow).

The oil grooves (1) face the crankshaft web face.

Bearing cap has identification “3“.

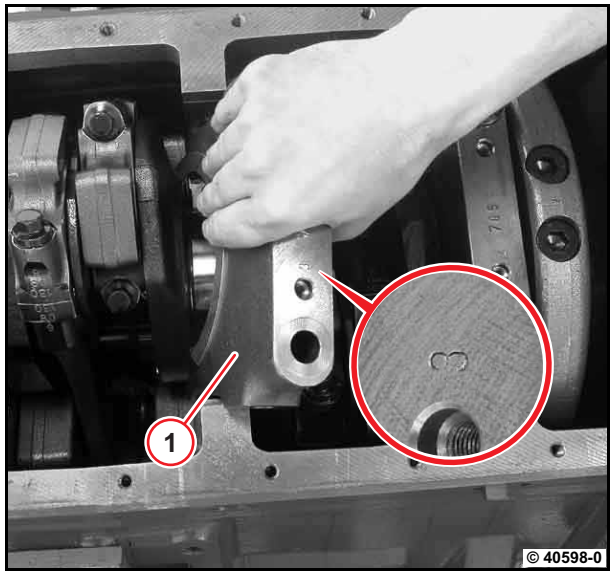


- Insert bearing cap (1).

The identification "3" on the bearing cap must be legible from the flywheel side.

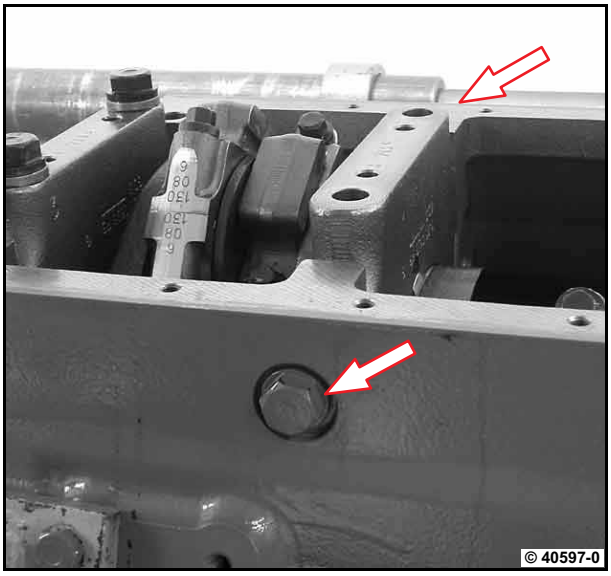
- Align bearing cap.

Press the crankshaft to the flywheel side first and then in the opposite direction.



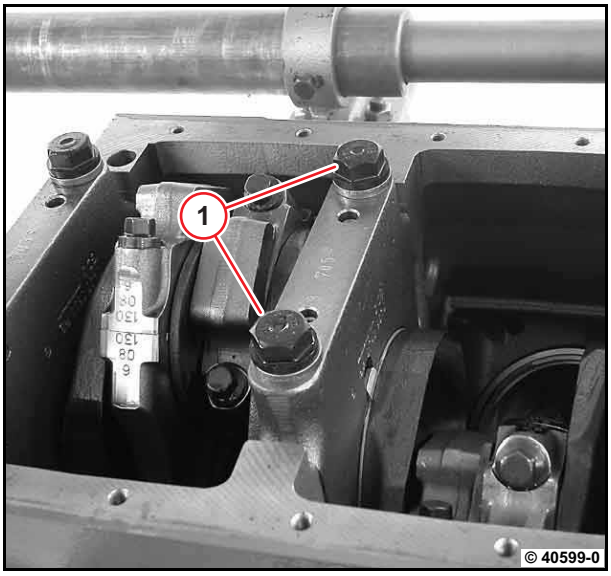
- Tighten screws (arrows).

Attention!
Screws can be reused a maximum 3 times with written documentation.



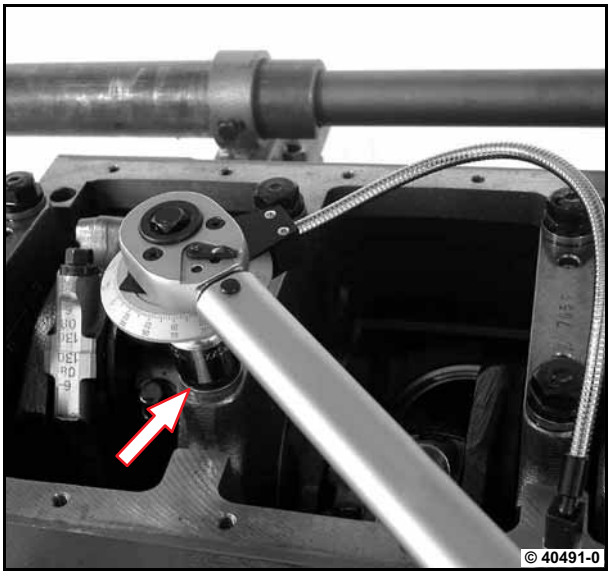
- Lightly oil screws (1).
- Tighten screws (1).

Attention!
Screws can be reused a maximum 3 times with written documentation.



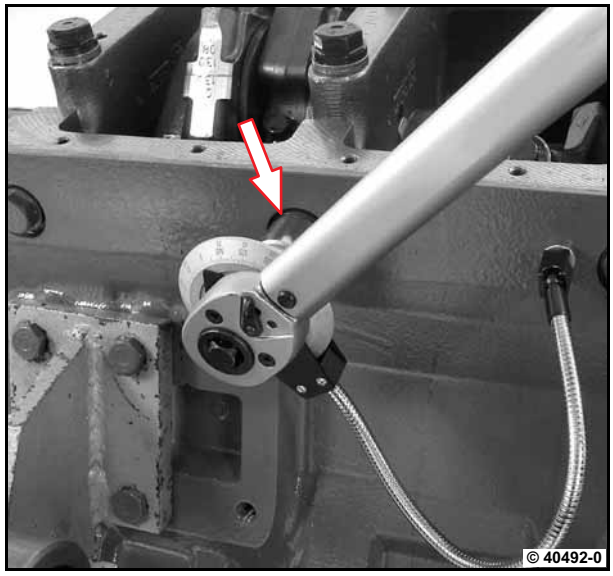
- Tighten screws (arrow) with the socket wrench insert size 24 and rotation angle disc.

A02 010



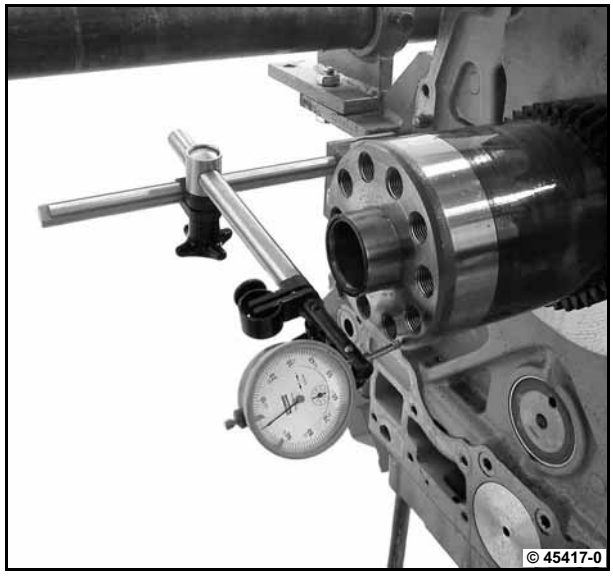
- Tighten screws (arrow) with the socket wrench insert 8035 and rotation angle disc.

  A02 011



- Check axial backlash of crankshaft.

  P02 34

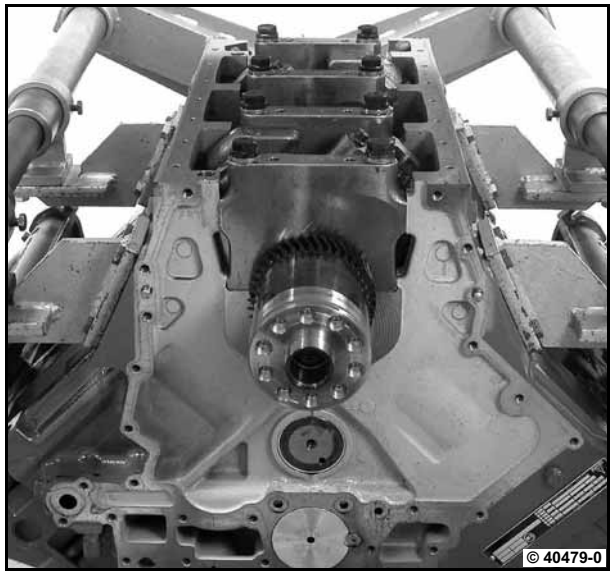


- Remove magnetic measuring stand.
- Remove dial gauge.
- Install genset support.

  W 03-08-01

- Mount rear cover.

  W 03-09-01



Checking the crankshaft

Commercial available tools:
– Magnetic measuring stand
– Micrometer gauge
– Internal measuring device
– Prisms
– Hardness tester

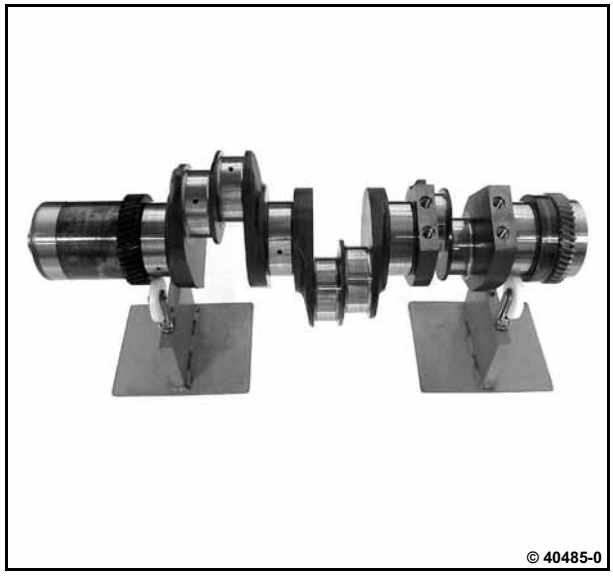
Special tools:
– Dial gauge. 100400

– W 02-04-01

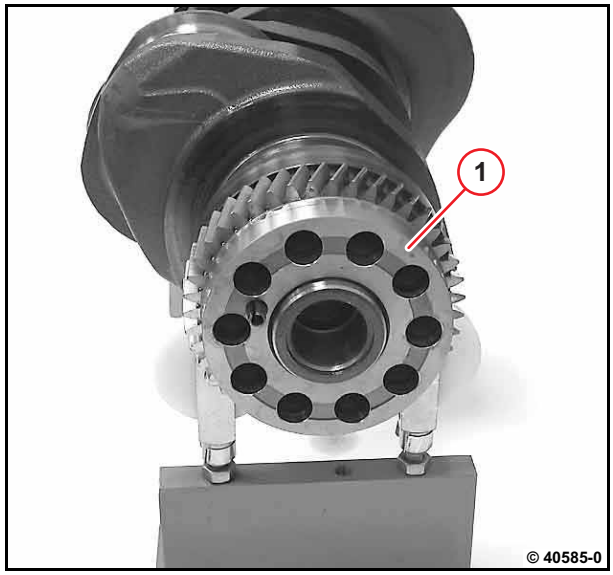
- Remove crankshaft.

  W 02-04-01

- Place crankshaft on prism.

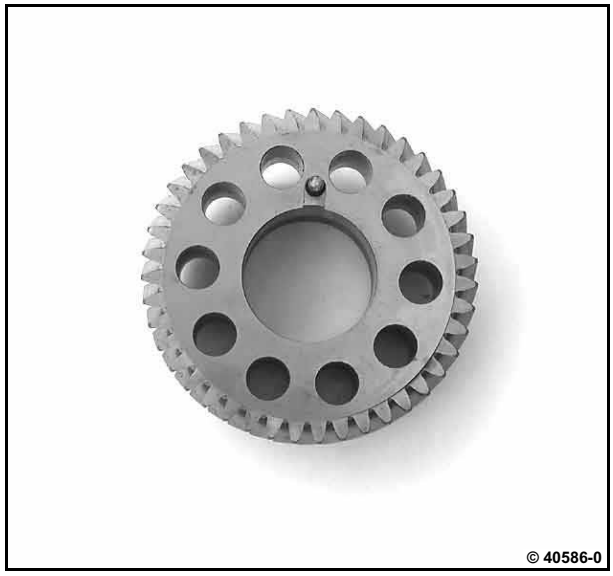


- Pull off gear wheel (1).
- Remove friction disc.



6

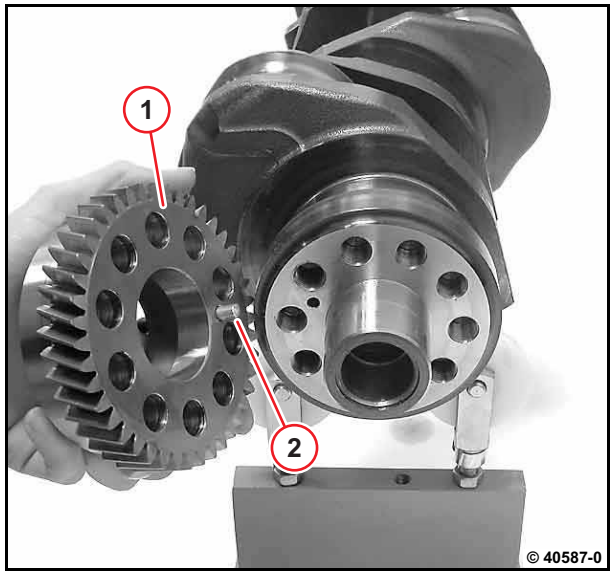
- Visually inspect the components.



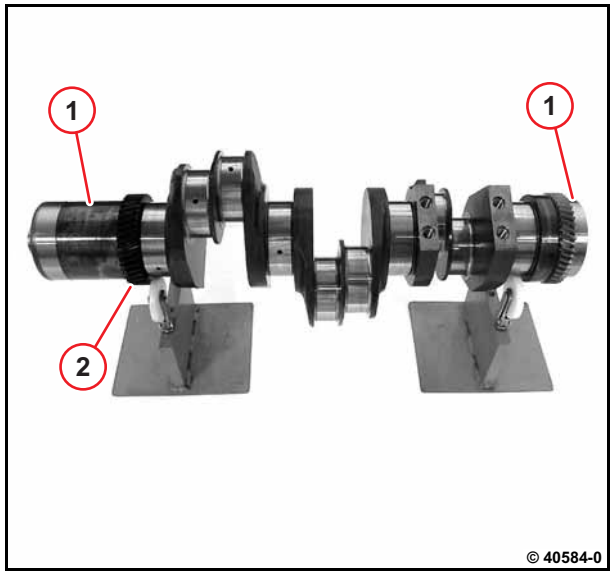
- Position friction disc on parallel pin (2).

Use friction disc with locating hole.

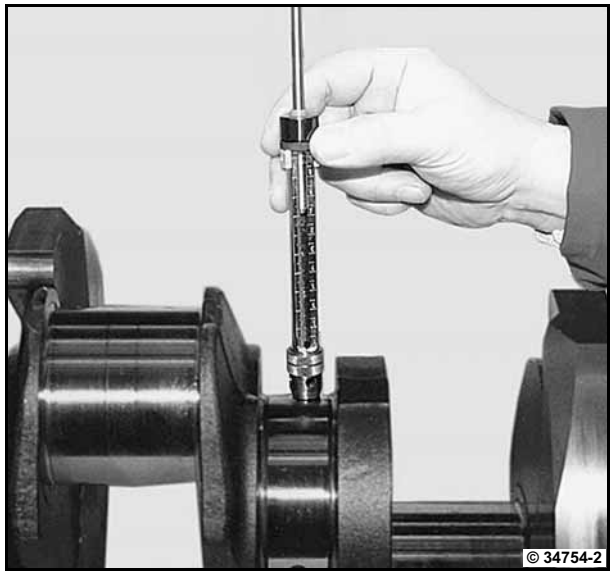
- Mount gear wheel (1).



- Visually inspect peripheral surfaces (1).
- Visually inspect gear wheel (2).

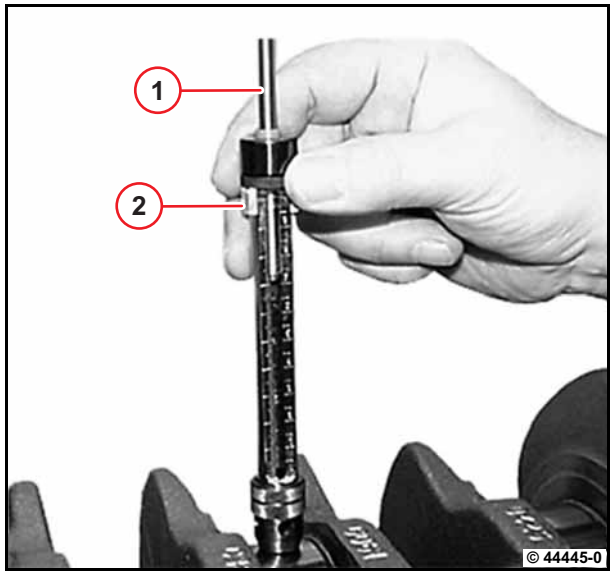


- Put hardness tester on journal.



- Raise stylus (1) and press release (2).

Stylus (1) falls down, briefly strikes the surface and jumps up to the measured value.



- Read off displayed value (arrow) from hardness tester.

P02 07

The measured value is to be converted according to the table of the measuring device.

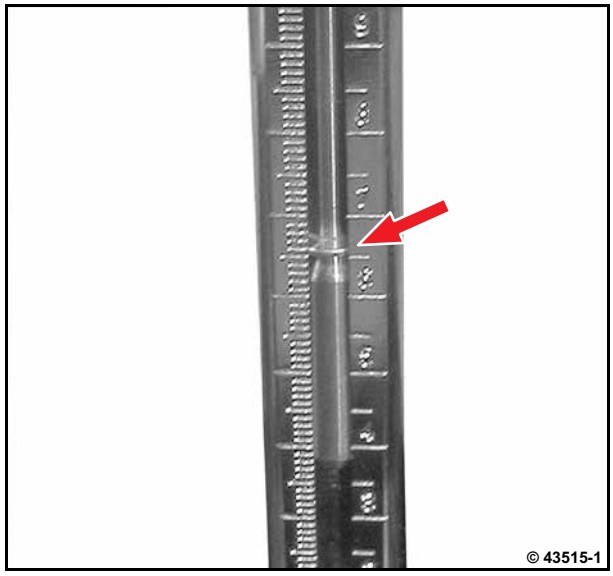
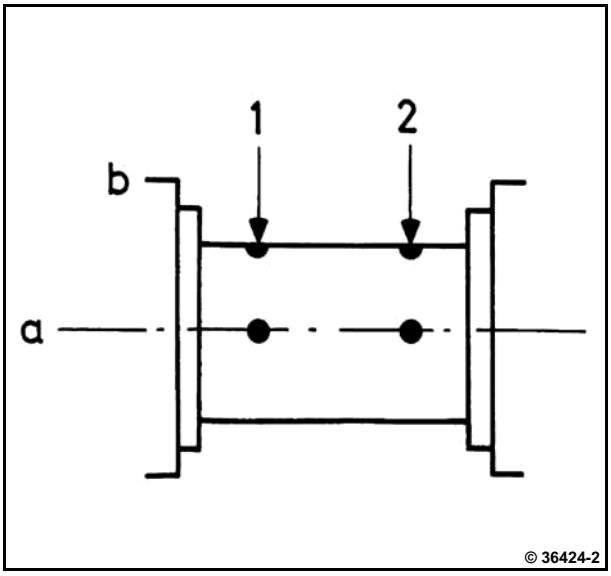


Diagram for measuring the journals at the points 1 and 2 in the levels a and b.



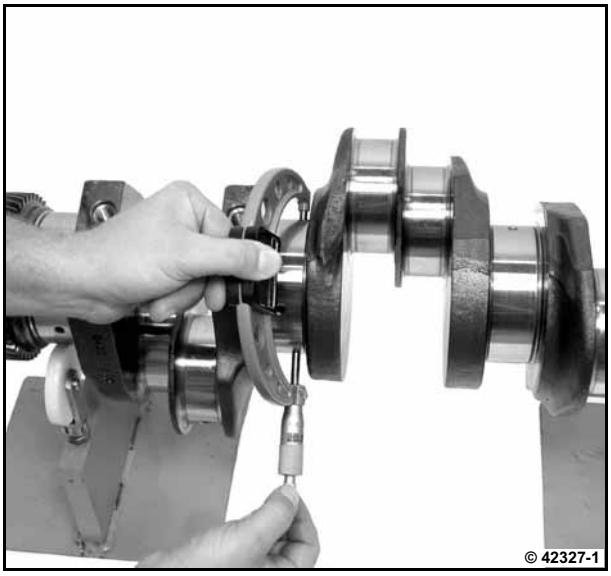
6

Checking the diameter of the main bearing pins

- Measure main bearing pin with micrometer gauge.

P02 03
P02 04
P02 06

Measuring points see diagram.

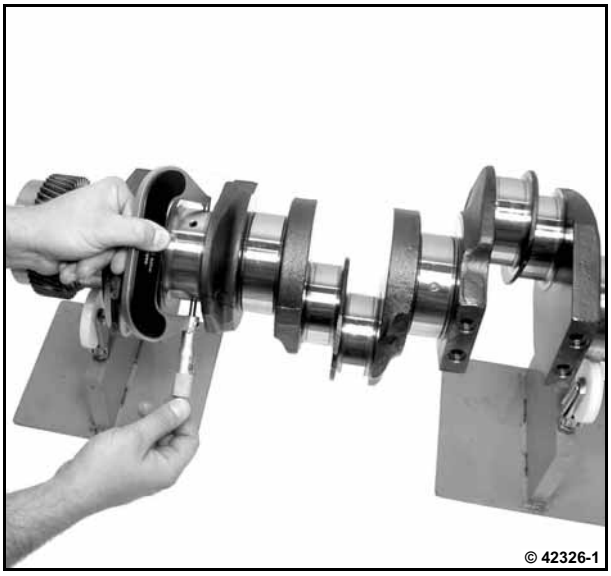


Checking the diameter of the lifting journals

- Measure lifting journal with micrometer gauge.

P02 22
P02 23
P02 25

Measuring points see diagram.

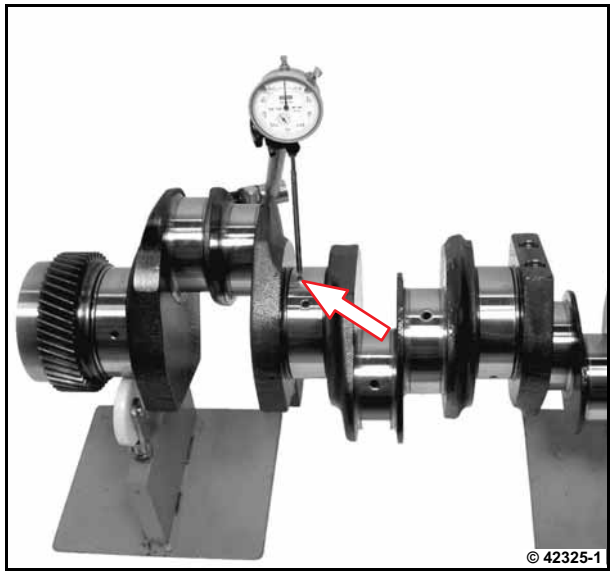


Checking the rotation

- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus to the main bearing pin with pre-tension (arrow) and adjust dial gauge to "0".
- Turn crankshaft evenly and check rotation.

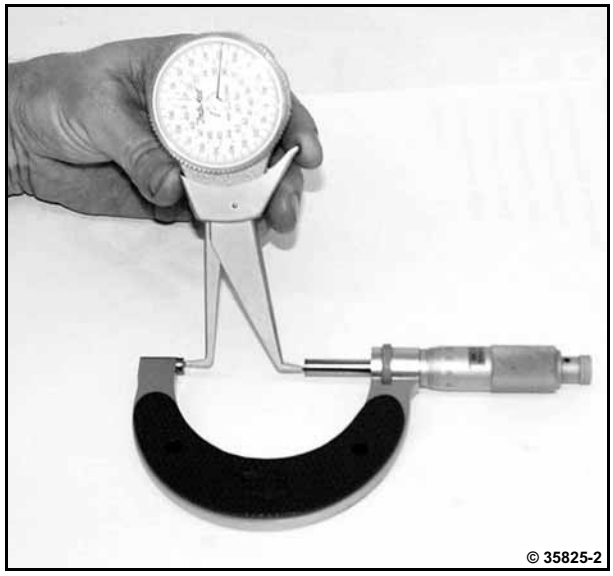
P02 26

- Remove magnetic measuring stand.
- Remove dial gauge.



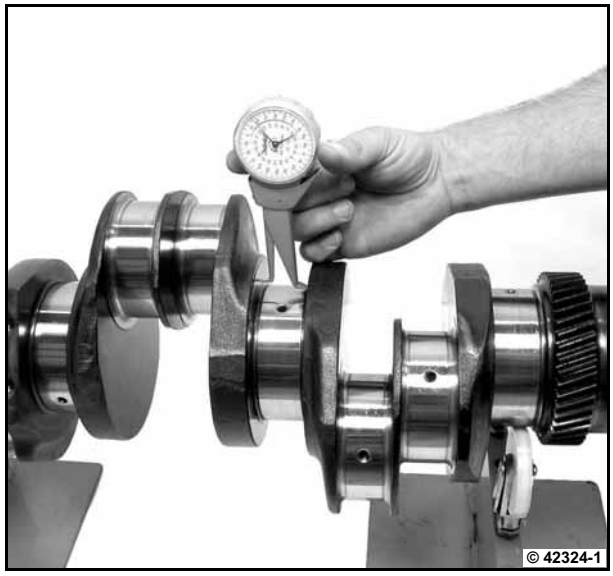
Measuring the fit bearing width

- Set micrometer gauge to 38 mm.
- Push the internal measuring device between the test surfaces of the micrometer gauge and set to "0".



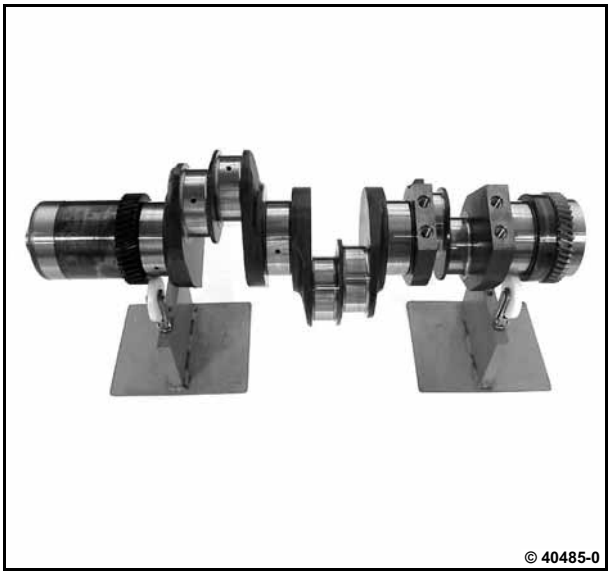
- Measure bearing width with internal measuring device between thelay-on surfaces of the thrust rings.

P02 11
P02 12
P02 13



- Install crankshaft.

W 02-04-01



Renewing the crankshaft sealing ring (flywheel side)

Commercial available tools:
– Depth-measuring appliance
– Pricker. 8198
– Assembly lever 9017

Special tools:
– Assembly tool 142650

– Self-tapping screw
– Washer

– W 12-06-01

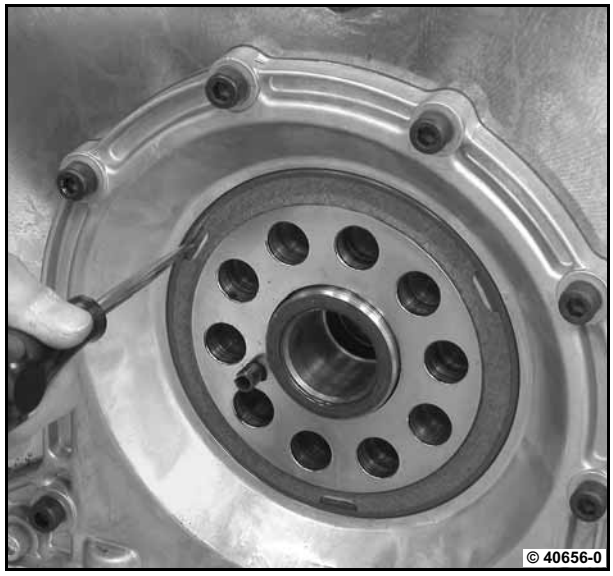
Removing the crankshaft sealing ring

- Remove flywheel.

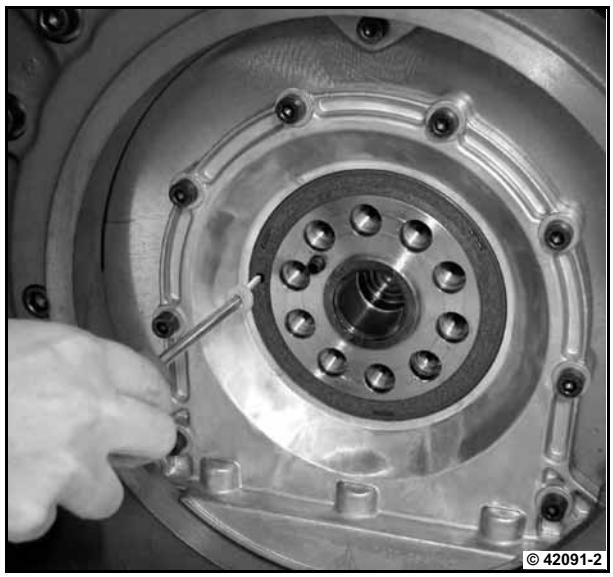
  W 12-06-01

- Loosen crankshaft sealing ring in its seat evenly with a mandrel.
- Make a hole in the crankshaft sealing ring with a pricker.

Attention!
Do not damage the rear cover and crankshaft!



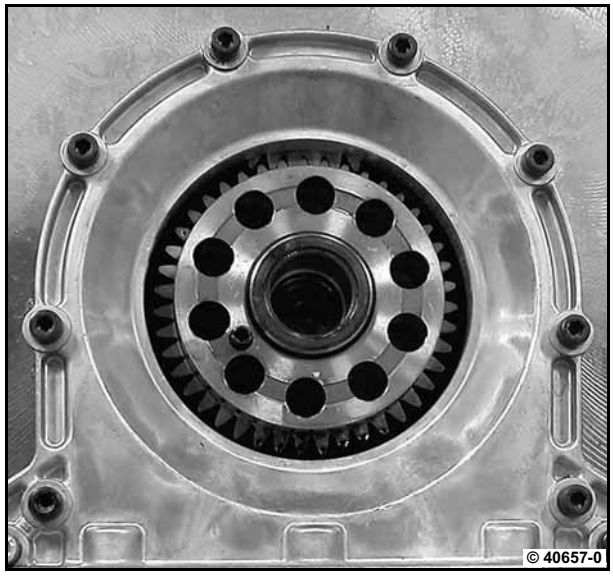
- Turn in a self-tapping screw with washer.



6

- Pull out the crankshaft sealing ring with assembly lever.

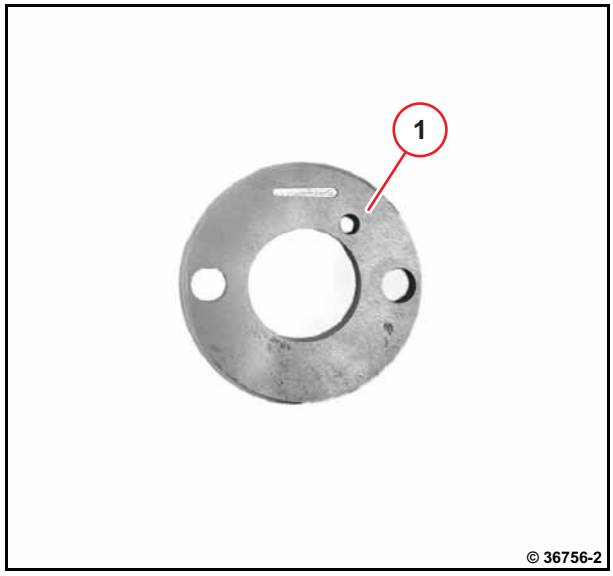
- Visually inspect all running surfaces.



Install crankshaft sealing ring

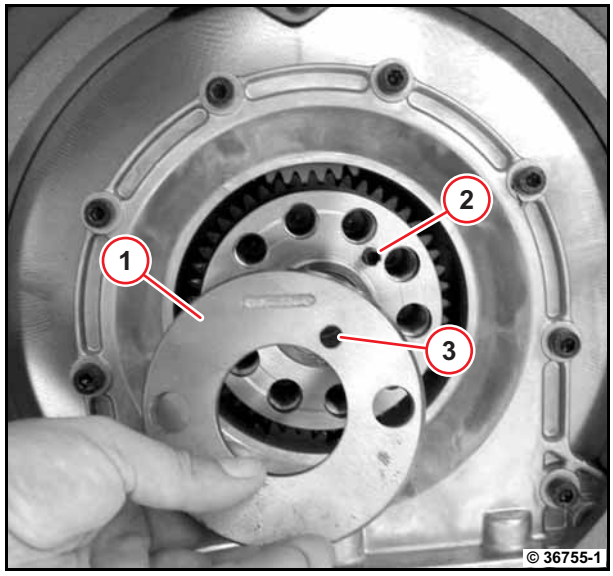
- Select shim (1).

Use the shim with identification "Rep-Stage".

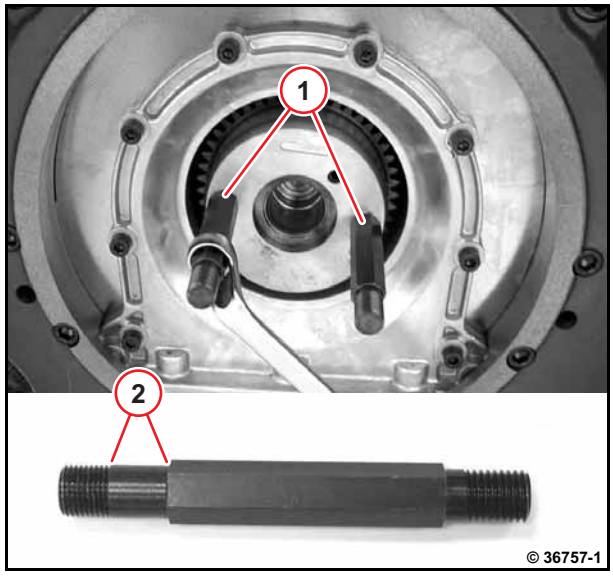


- Mount shim (1).

Pay attention to alignment of the clampingbushing (2) and locating hole (3).



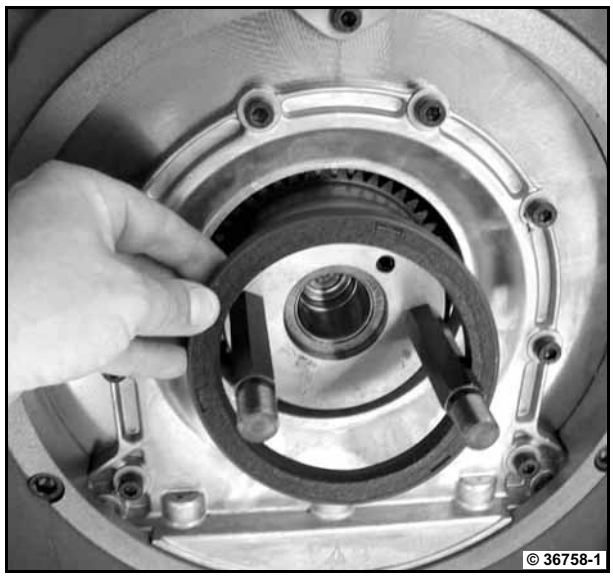
- Turn bolt (1) with thread (2) into crankshaft.



Use new crankshaft sealing ring.

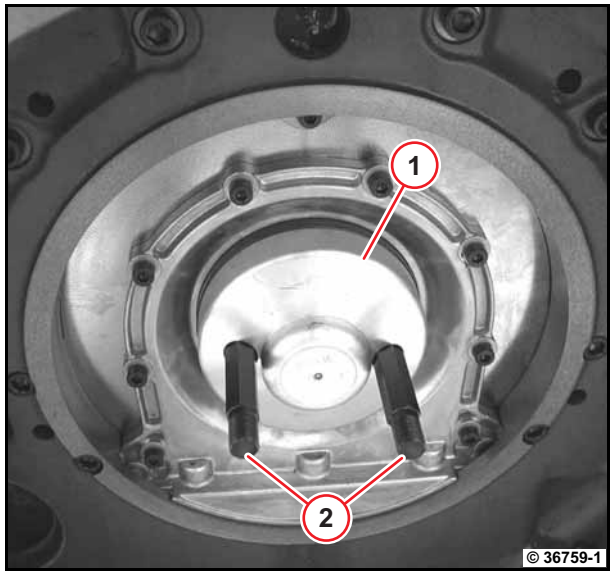
- Oil the sealing lip of the crankshaft sealing ring lightly.
- Place the crankshaft sealing ring carefully on the peripheral surface.

The sealing lip faces the crankcase.

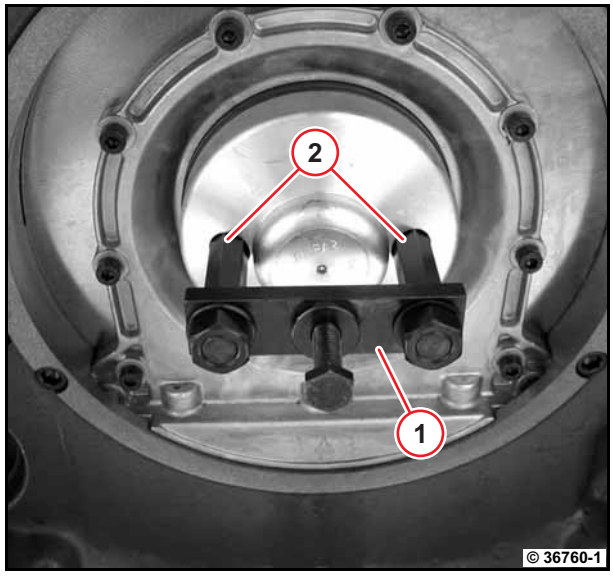


- Place assembly sleeve (1) on bolt (2).
- Press on assembly sleeve.

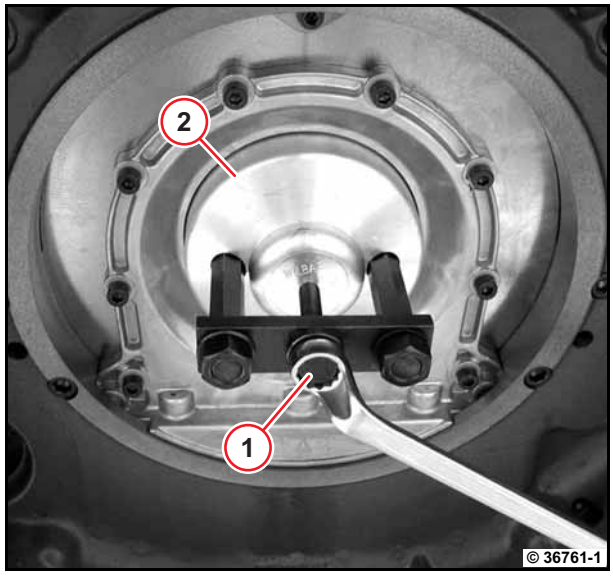
The assembly sleeve is evenly in contact with the crankshaft sealing ring.



- Push pressure cross-member (1) onto bolt (2).
- Mount washers.
- Screw on nuts.



- Tighten screw (1) until the assembly sleeve (2) is touching.
- Remove assembly tool.

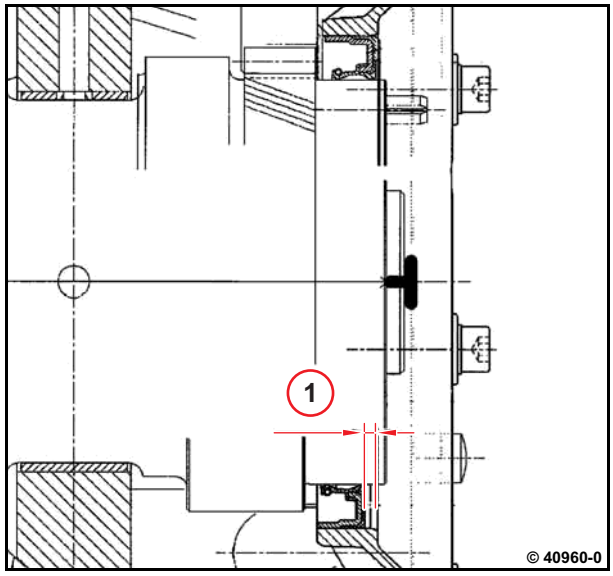


- Check installation depth (1) with depth measuring appliance.

  P03 25

- Install flywheel.

  W 12-06-01



6

Renewing the crankshaft sealing ring (opposite side to flywheel)

Commercial available tools:
– Depth-measuring appliance
– Pricker. 8198
– Assembly lever 9017

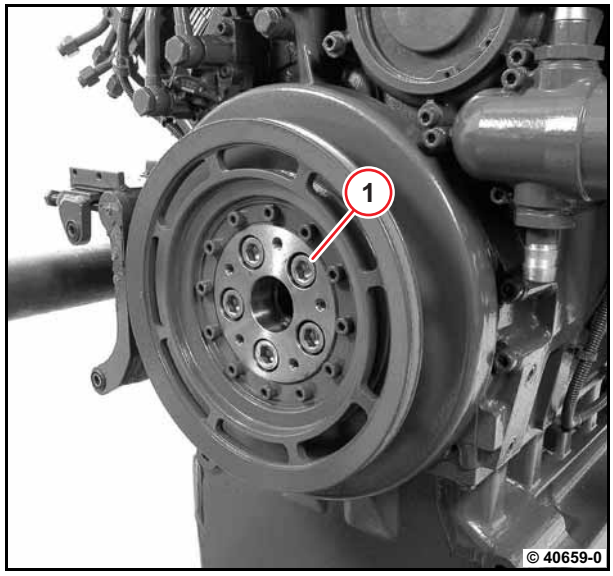
Special tools:
– Assembly tool 142640

– Self-tapping screw
– Washer

Removing the crankshaft sealing ring

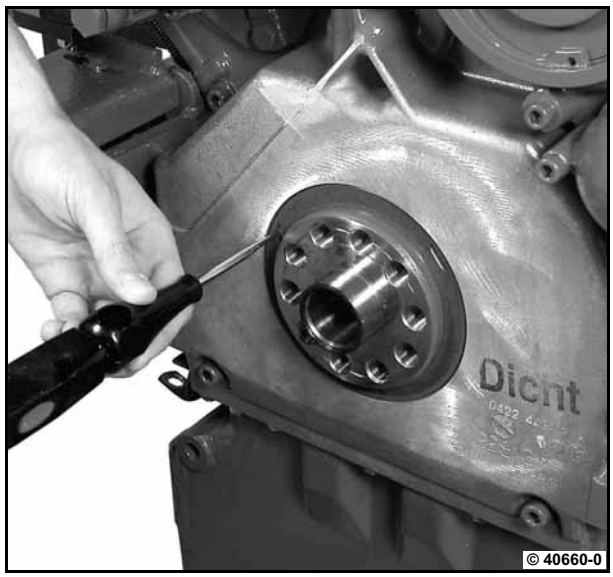
- Unscrew all screws (1).
- Remove flanged hub with torsional vibration damper and V-belt pulley.

Block flywheel with suitable tool.



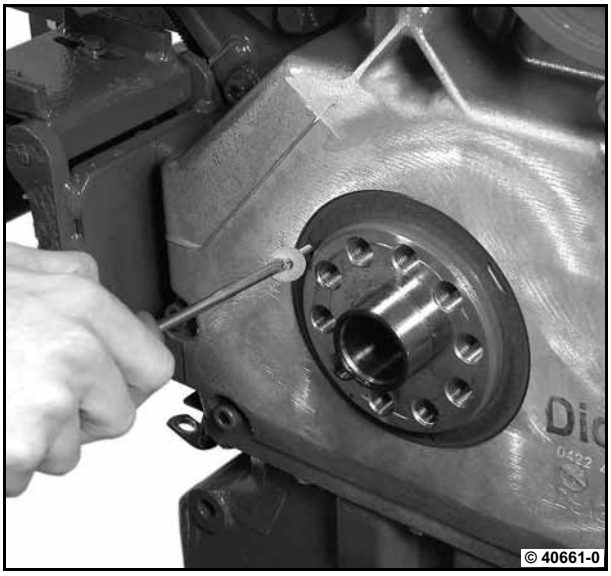
- Loosen crankshaft sealing ring in its seat evenly with a mandrel.
- Make a hole in the crankshaft sealing ring with a pricker.

Attention!
Do not damage the genset support and crankshaft!

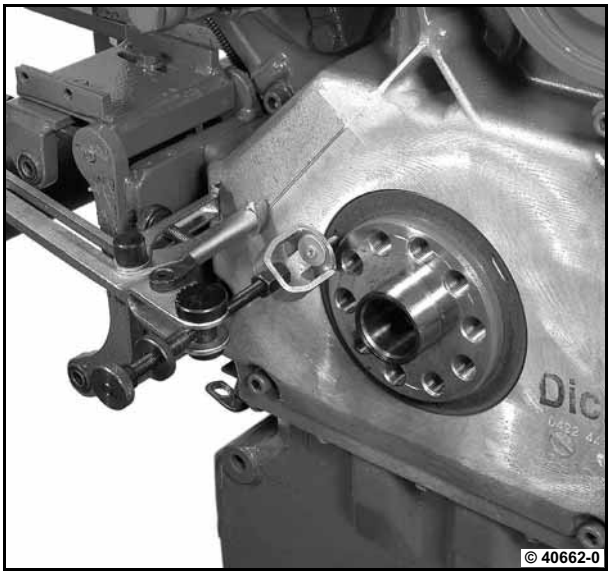


6

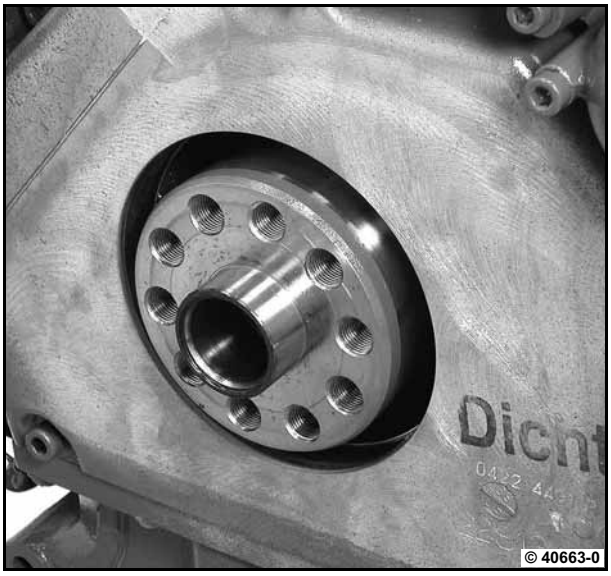
- Turn in a self-tapping screw with washer.



- Pull out the crankshaft sealing ring with assembly lever.



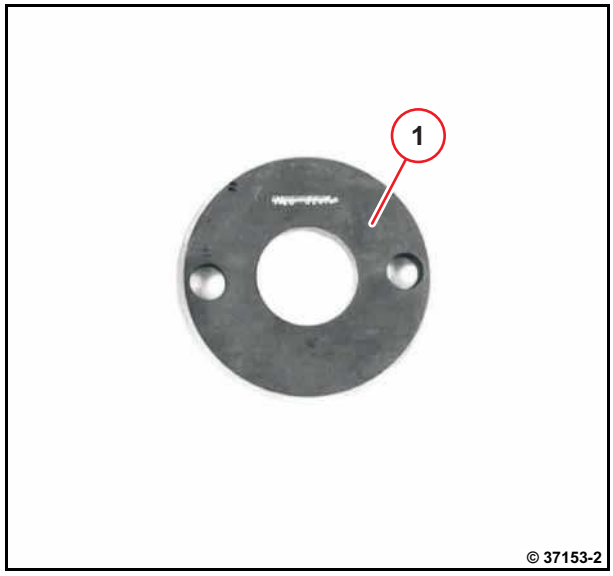
- Visually inspect all running surfaces.



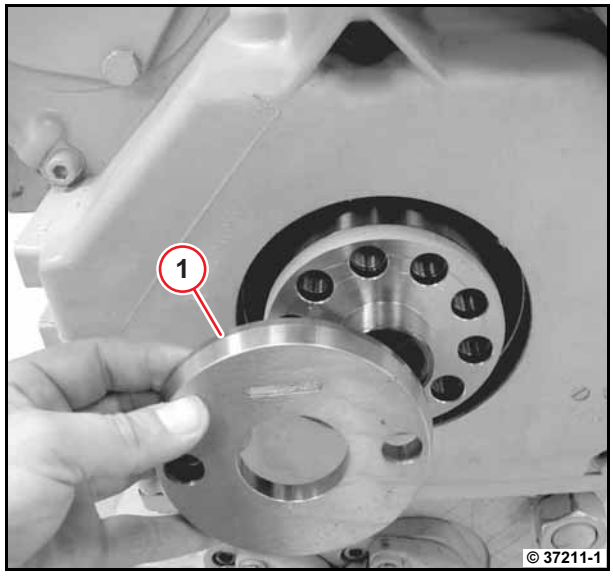
Install crankshaft sealing ring

- Select shim (1).

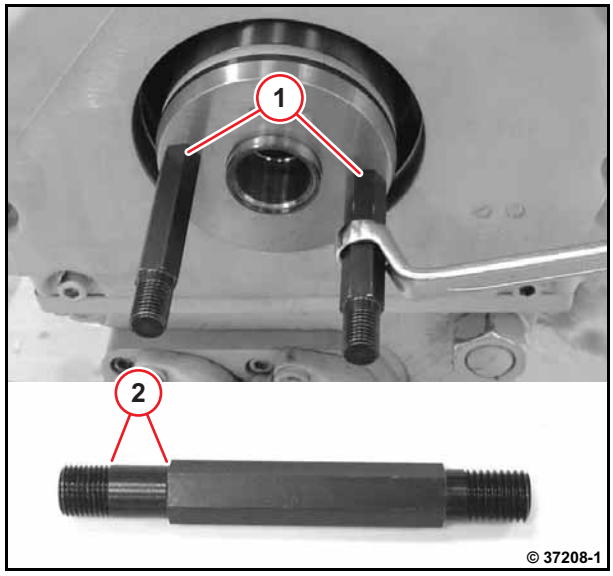
Use the shim with identification "Rep-Stage".



- Mount shim (1).



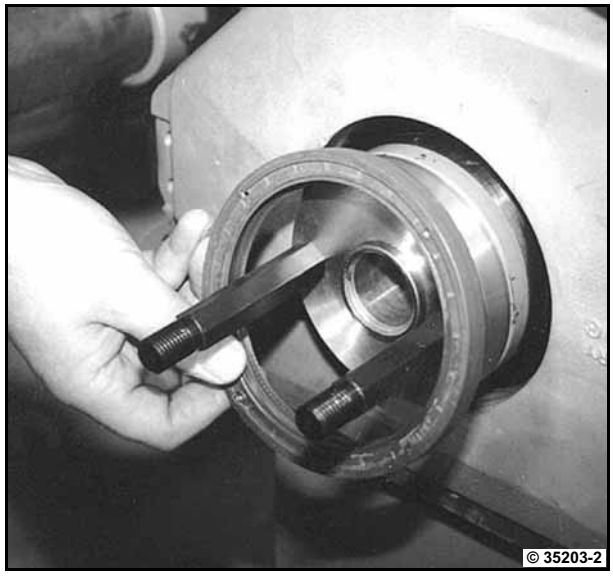
- Turn bolt (1) with thread (2) into crankshaft.



Use new crankshaft sealing ring.

- Oil the sealing lip of the crankshaft sealing ring lightly.
- Place the crankshaft sealing ring carefully on the peripheral surface.

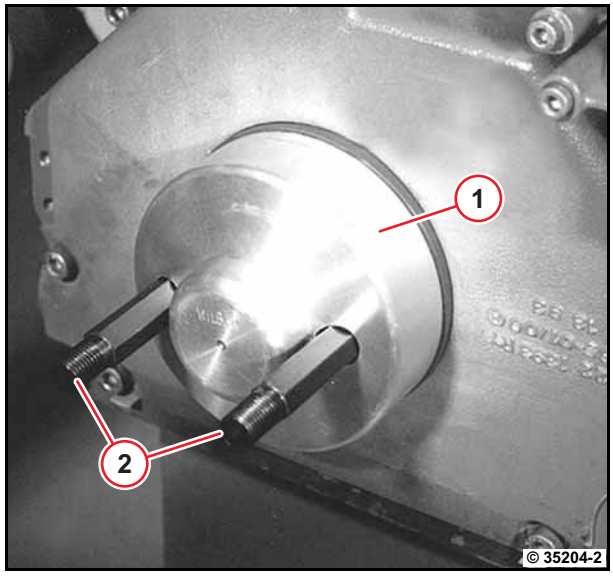
The sealing lip faces the crankcase.



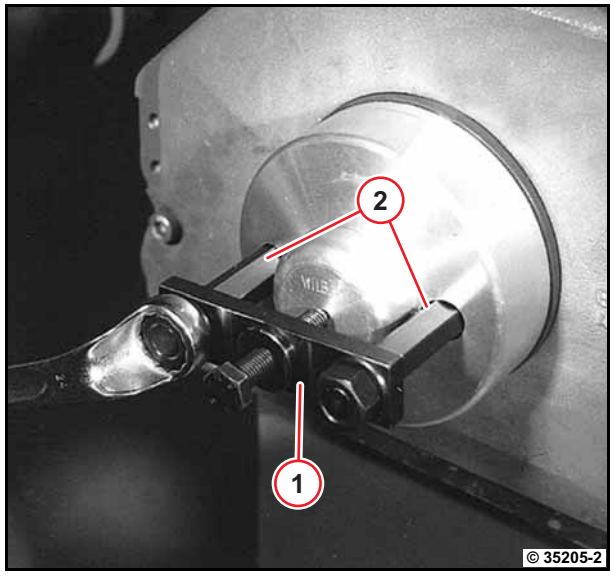
6

- Place assembly sleeve (1) on bolt (2).
- Press on assembly sleeve.

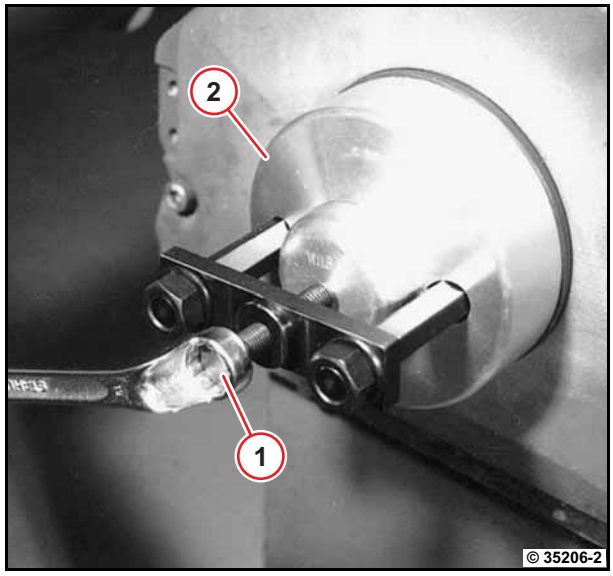
The assembly sleeve is evenly in contact with the crankshaft sealing ring.



- Push pressure cross-member (1) onto bolt (2).
- Mount washers.
- Screw on nuts.

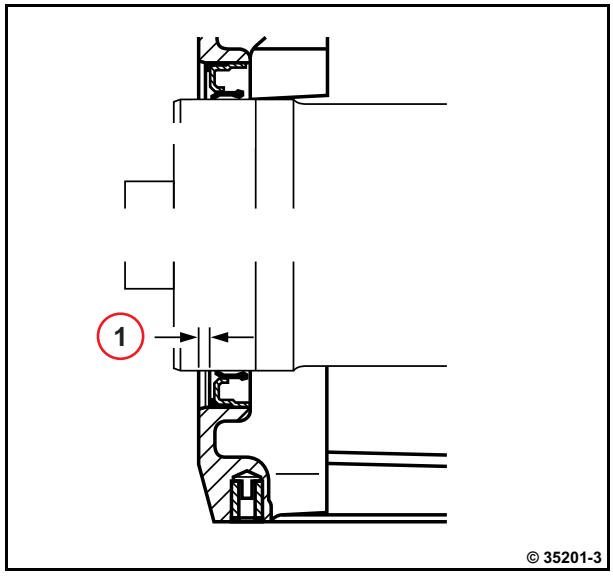


- Tighten screw (1) until the assembly sleeve (2) is touching.
- Remove assembly tool.



- Check installation depth (1) with depth measuring appliance.

P03 26

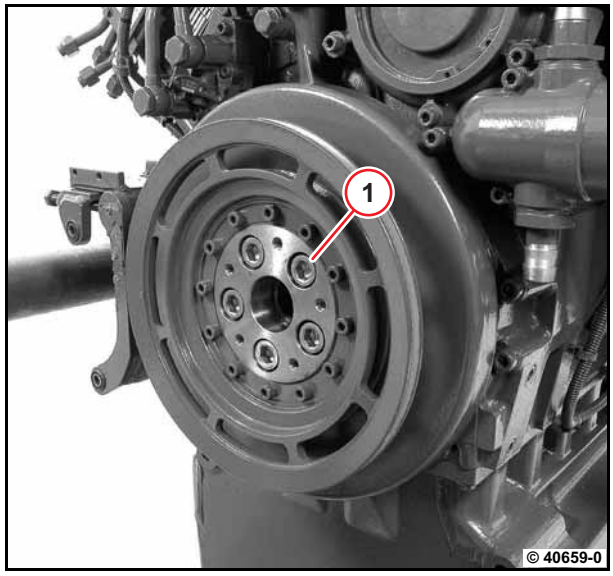


- Remove flanged hub with torsional vibration damper and V-belt pulley.
- Lightly oil screws (1).

Block flywheel with suitable tool.

- Tighten all screws (1) alternately.

A12 030



6

Checking the con rod

Commercial available tools:
– Micrometer gauge
– Internal measuring device
– Con rod test device

Special tools:
– Dial gauge. 100400

– W 02-09-03

- Remove piston and connecting rod.

  W 02-09-03

Checking small end bush

- Prepare internal measuring device:
  – Mount probe bolt for the appropriate measuring range in the internal measuring device.
  – Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  – Set micrometer gauge to 52 mm.
  – Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to "0".

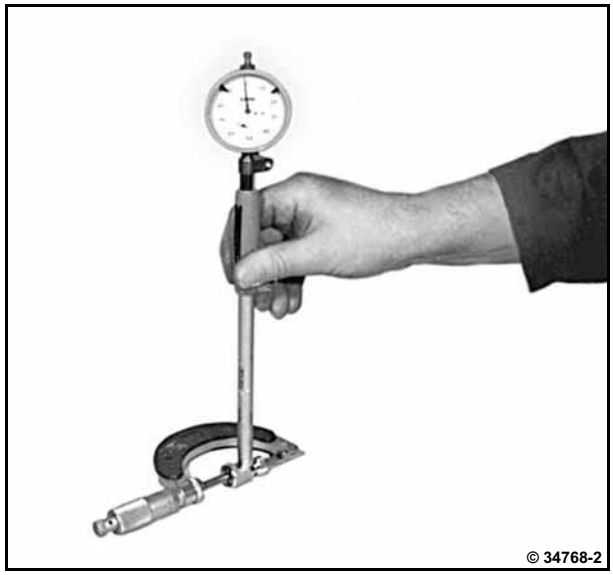
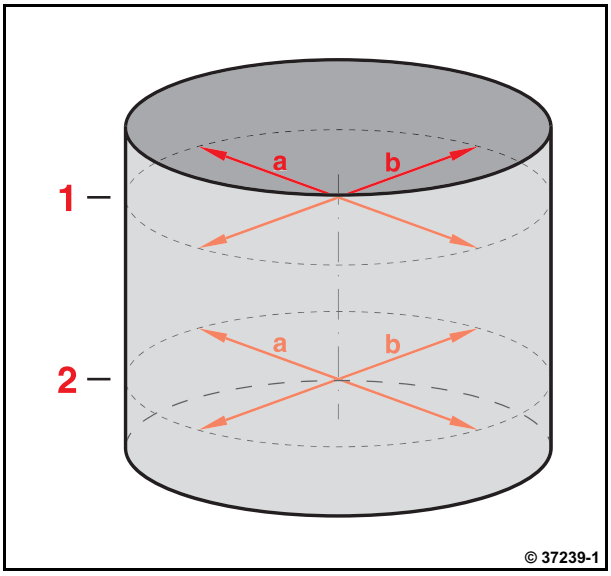


Diagram for measuring the small end bush at the points "a" and "b" in the levels "1" and "2".



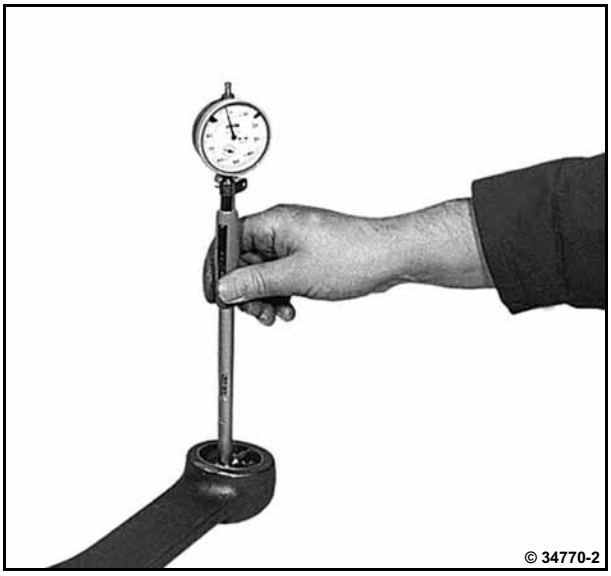
6

- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

P02 43

Measuring points see diagram.

- Note measured value, dimension (a).

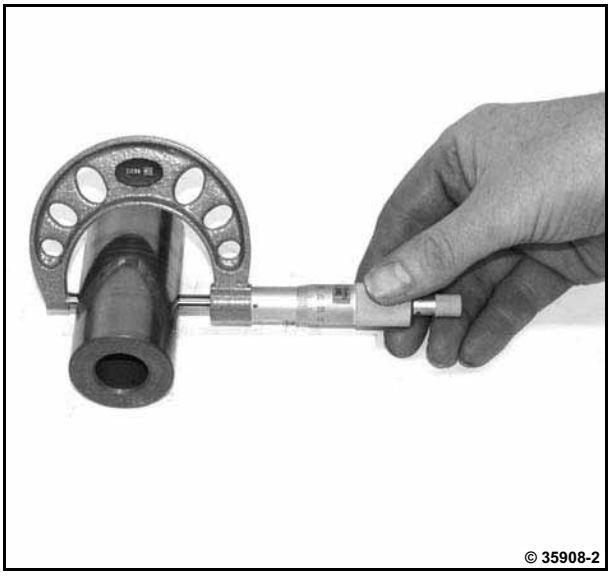


Checking piston pin

- Measure piston pin with micrometer gauge.

P02 61

- Note measured value, dimension (b).



Determining piston pin clearance

The piston pin clearance is given by the difference between the internal diameter of the small end bush (a) and the piston pin diameter (b).

P02 45

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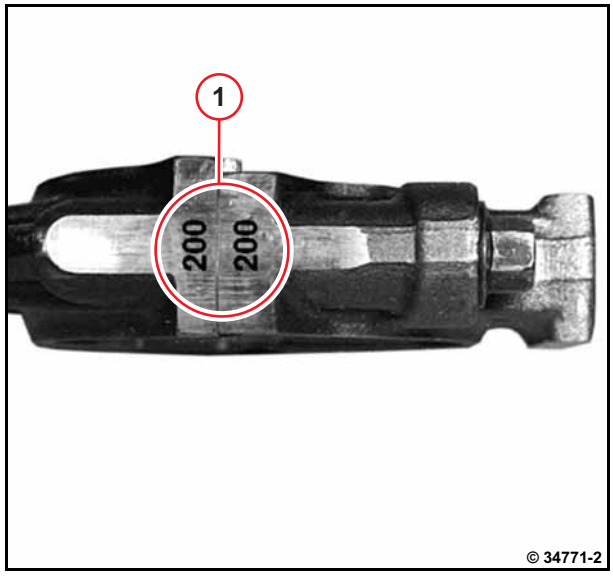
Calculation example	
Desired:	Piston pin clearance
Given:	-
Measured:	Internal diameter small end bush (a) (a) = 52.040 mm Diameter piston pin (b) (b) = 52.000 mm
Calculation:	Dimension (a) - Dimension (b) 52.040 mm - 52.000 mm
Result:	= 0.040 mm

Checking the con rod bearing bore

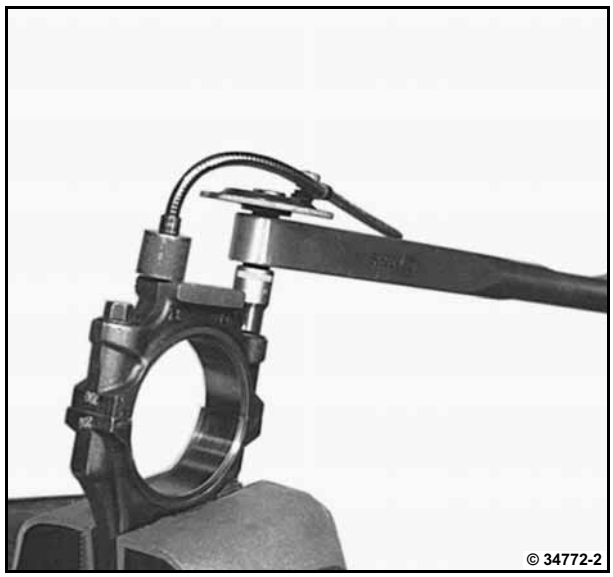
- Mount big end bearing cap.

Attention!
Note the assignment of the big end bearing cap.
The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



- Tighten screws .

A02 020



6

- Prepare internal measuring device:
  - Mount probe bolt for the appropriate measuring range in the internal measuring device.
  - Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  - Set micrometer gauge to 95 mm.
  - Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to "0".

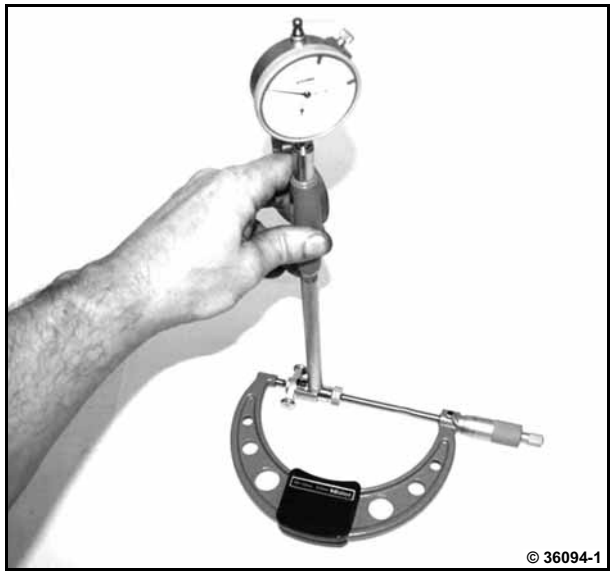
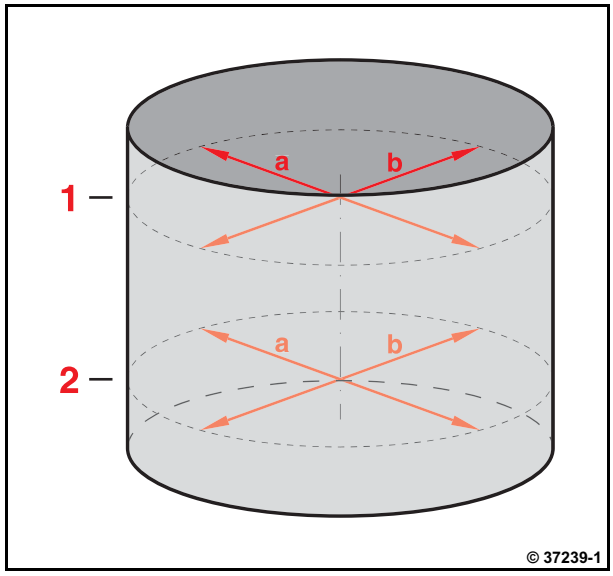


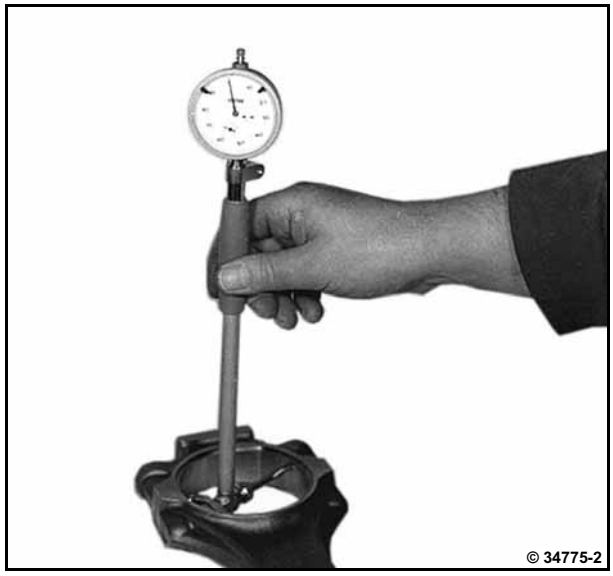
Diagram for measuring the con rod bearing bore at the points "a" and "b" in the levels "1" and "2".



- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

P02 55

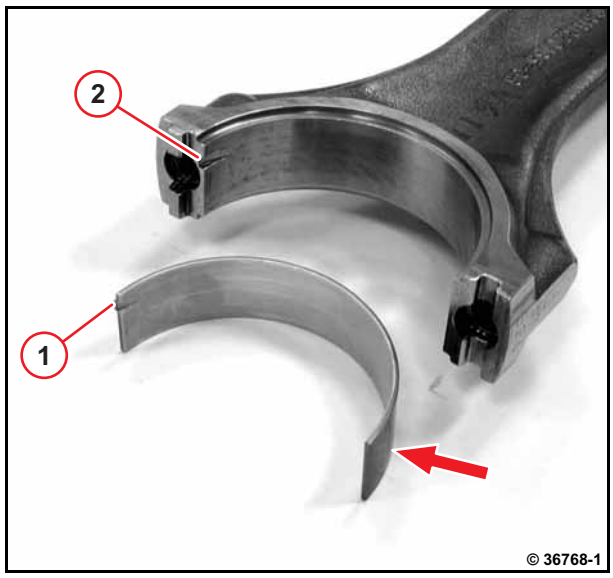
If the measured values deviate slightly, additional measurements must be made with new bearing shells.



Checking internal diameter of the con rod bearing shells

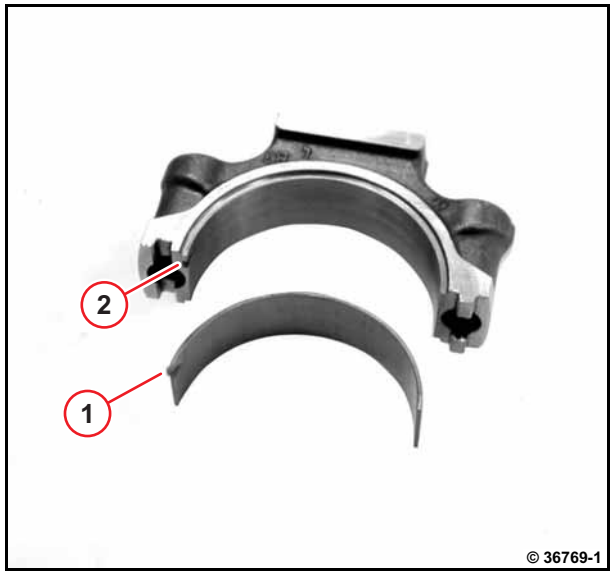
- Remove screws.
- Remove the con rod bearing cover.
- Insert bearing shell in the con rod.

Attention!
Note the assignment of the bearing shells.
Insert big end bearing shell with the black anodised rear side (arrow) in the connecting rod.
The anti-rotation lock (1) must lock in groove (2).



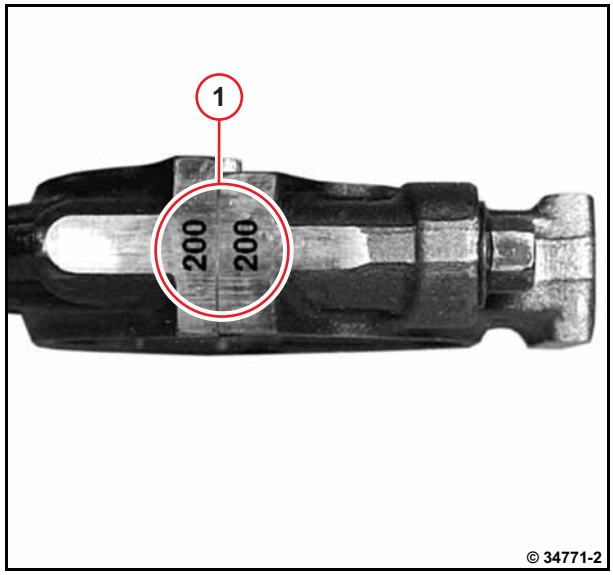
- Insert bearing shell in the respective big end bearing cap.

Attention!
Note the assignment of the bearing shells.
The anti-rotation lock (1) must lock in groove (2).



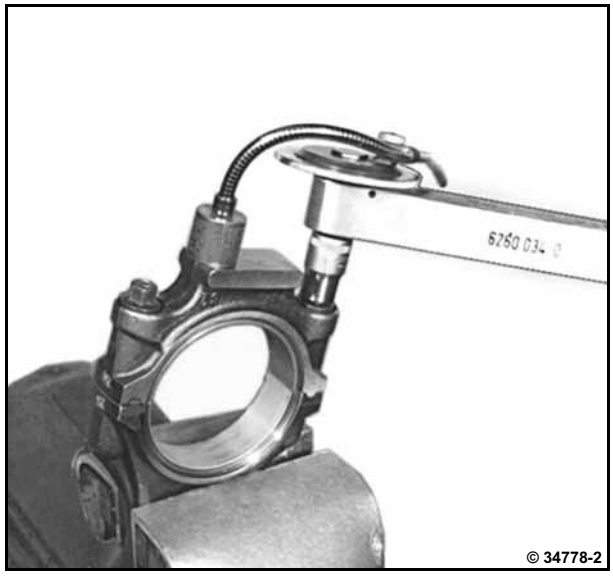
- Mount big end bearing cap.

Attention!
Note the assignment of the big end bearing cap.
The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



- Tighten screws .

  A02 020



6

- Prepare internal measuring device:
  - Mount probe bolt for the appropriate measuring range in the internal measuring device.
  - Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  - Set micrometer gauge to 91 mm.
  - Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to "0".

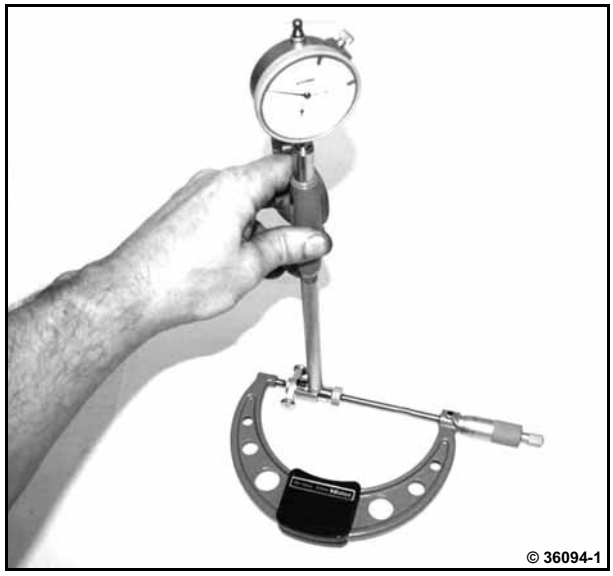
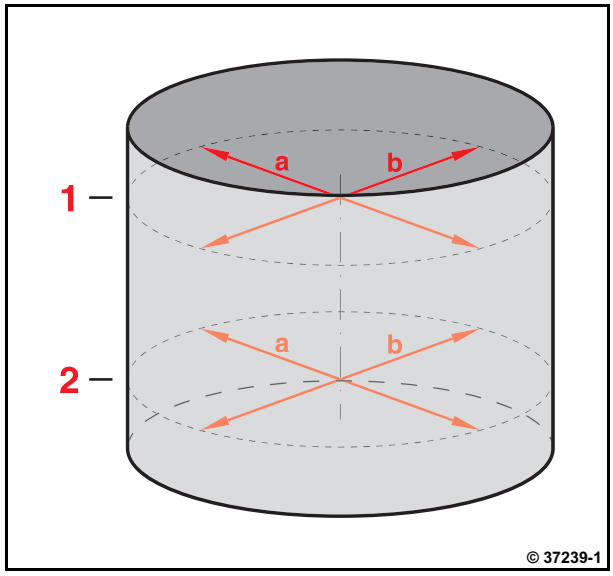


Diagram for measuring the inside diameter of the con rod bearing shells at the points "a" and "b" in the levels "1" and "2".



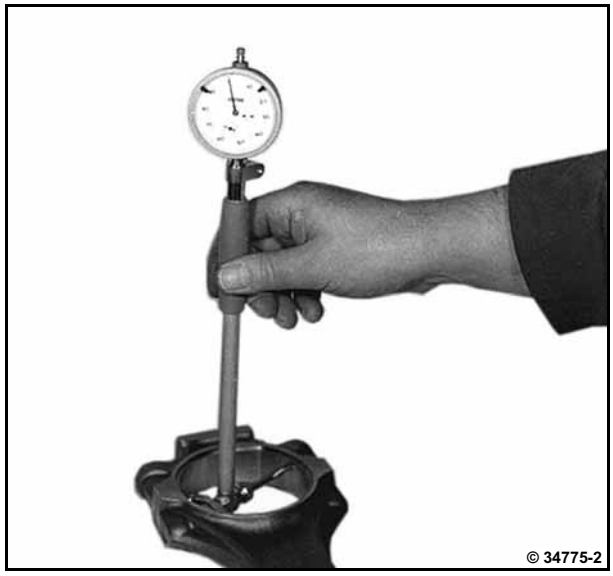
- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.
- Note measured value, dimension (a).

P02 52

P02 54

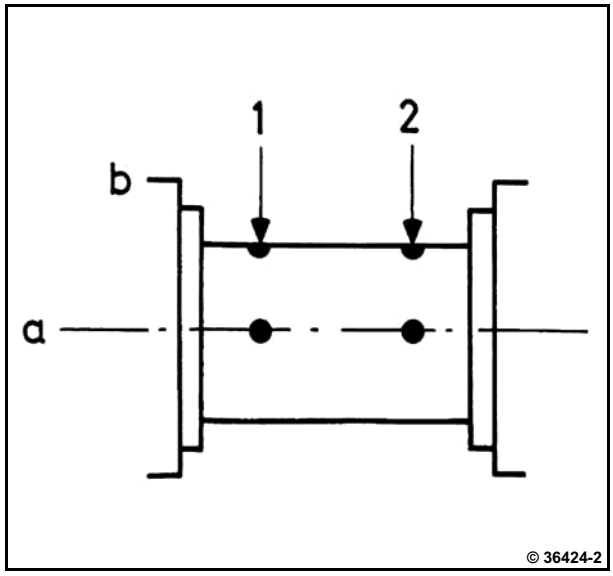
If the values up to maximum 0.015 mm are above the bearing tolerances, the connecting rod can still be used.

When the limit value is reached, the connecting rod must be replaced.



Checking the diameter of the lifting journals

Diagram for measuring the journals at the points 1 and 2 in the levels a and b.



- Measure lifting journal with micrometer gauge.

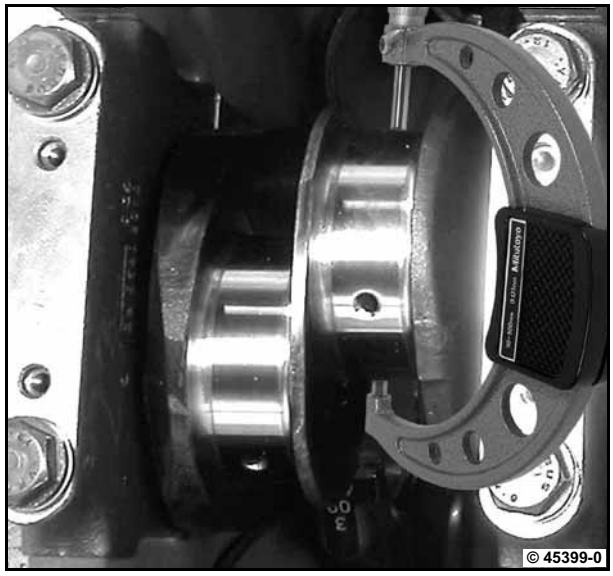
P02 22

P02 23

P02 25

Measuring points see diagram.

- Note measured value, dimension (b).



Determine big end bearing clearance

The big end bearing clearance is given by the difference between the internal diameter of the big end bearing shell (a) and the lifting journal diameter (b).

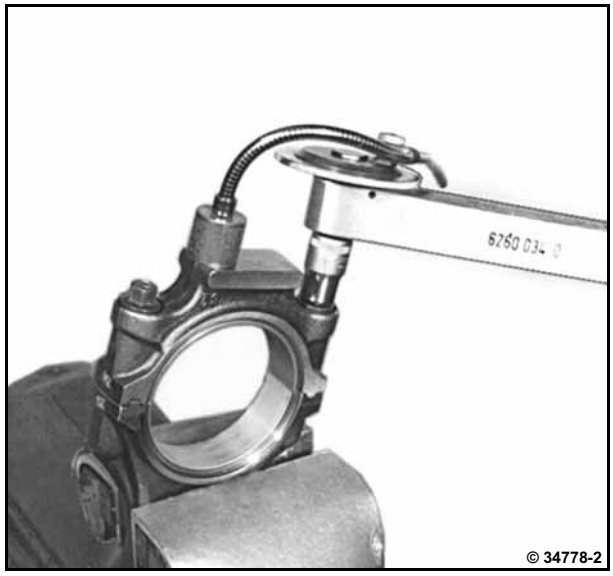
P02 56

P02 57

Calculation example	
Desired:	Big end bearing clearance
Given:	-
Measured:	Internal diameter big end bearing shell (a) (a) =88.060 mm Diameter lifting journal (b) (b) = 88.000 mm
Calculation:	Dimension (a) - Dimension (b) 88.060 mm - 88.000 mm
Result:	= 0.60 mm

6

- Remove screws.
- Remove the con rod bearing cover.
- Remove con rod bearing shells.



Checking the con rod

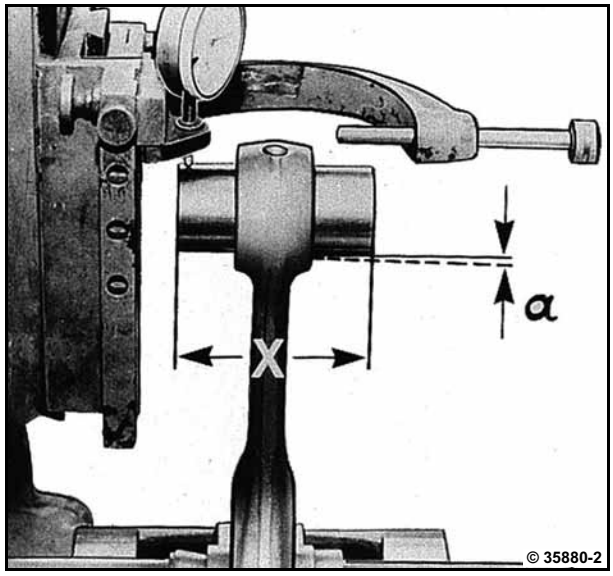
Attention!
Aligning the con rod is not permissible.

- Check that the con rod is parallel.

P02 41

Check con rod without bearing shells on the con rod test device.

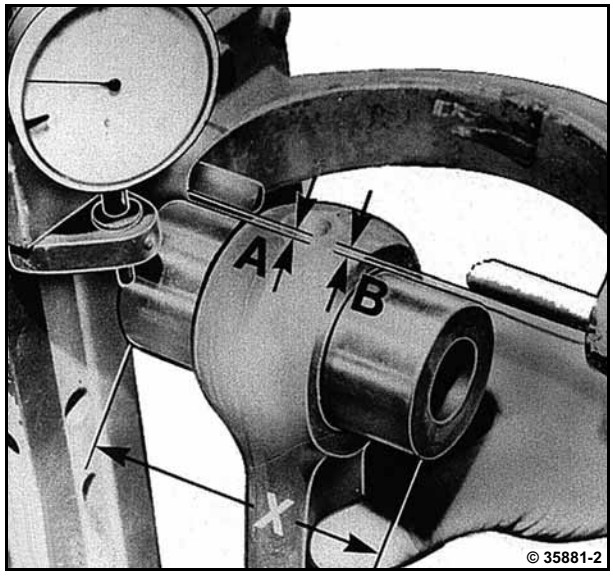
Permissible deviation (a) at a distance of (x).



- Check the angle of the con rod.

P02 42

Permissible deviation from (A) to (B) at a distance of (x).



- Install piston and connecting rod.

W 02-09-03

6

Removing and installing small end bush

Commercial available tools:
– Press or threaded spindle

Special tools:
– Base plate 131200
– Assembly tool kit 131210

– Nitrogen (liquid)
– Degreasing agent/cleaning agent
– Compressed air
– Heating oven

Danger!

Danger of injury, do not touch hot parts!

Danger of injury, do not touch supercooled components or the liquid nitrogen!

Wear protective gloves and glasses!

Attention!

The press-in process must be carried out without interruption as a result of the temperature difference between the small end bush and the connecting rod.
The necessary work steps must be practised before pressing in.

The pressing out of the small end bush is shown with pneumatic press.

A threaded spilndle can also be used alternatively.

6

Removing the small end bush

Attention!

Never hammer out the small end bush!

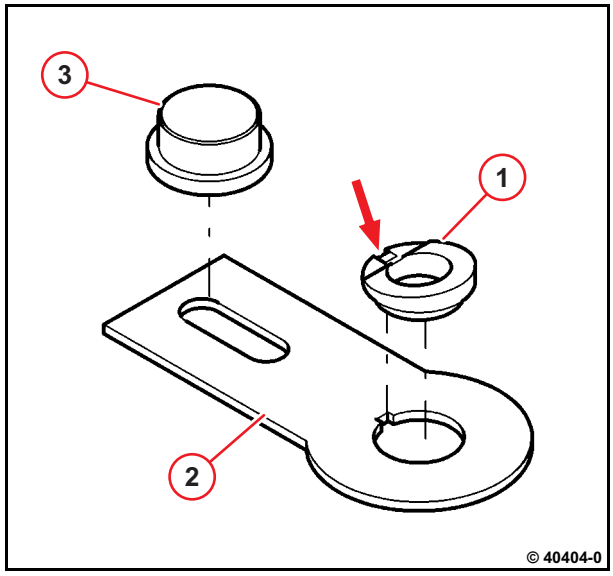
- Insert big end bearing holder (3) in base plate (2).
- Insert removal gauge (1) in base plate.

Attention!

Do not confuse the removal gauge with the installation gauge!

The groove (arrow) must face the big end bearing holder.

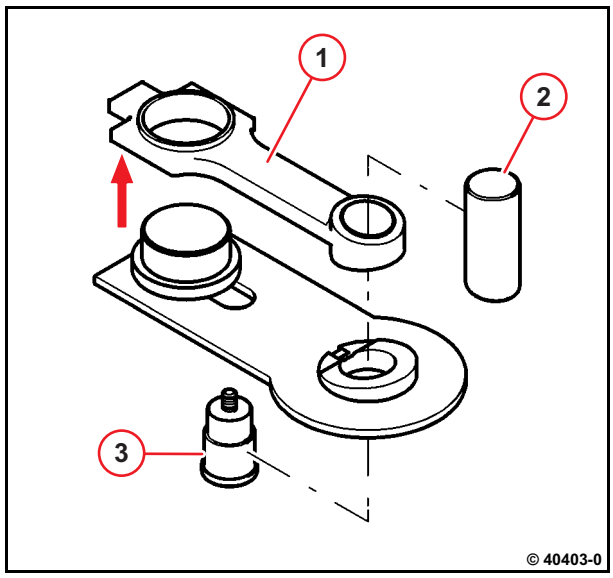
Make sure the removal gauge is inserted flush!



- Insert the bottom part of the assembly tool (3) into the removal gauge from below.
- Place the connecting rod (1) on the base plate.

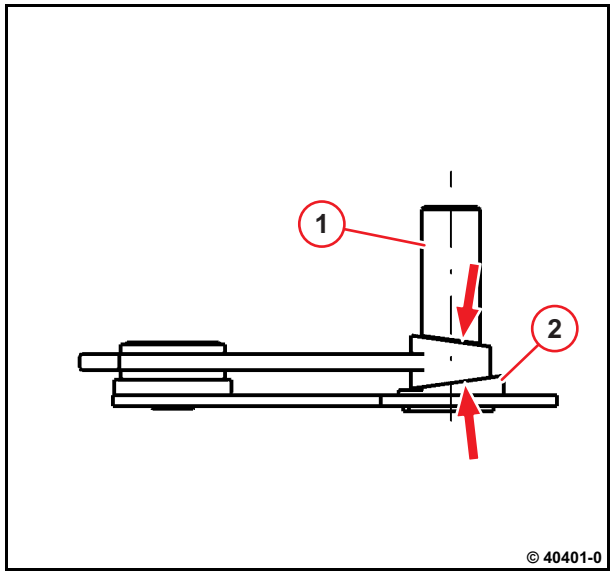
The flat side (arrow) of the connecting rod must face down.

- Turn the bottom part (3) into the top part (2) of the assembly tool.

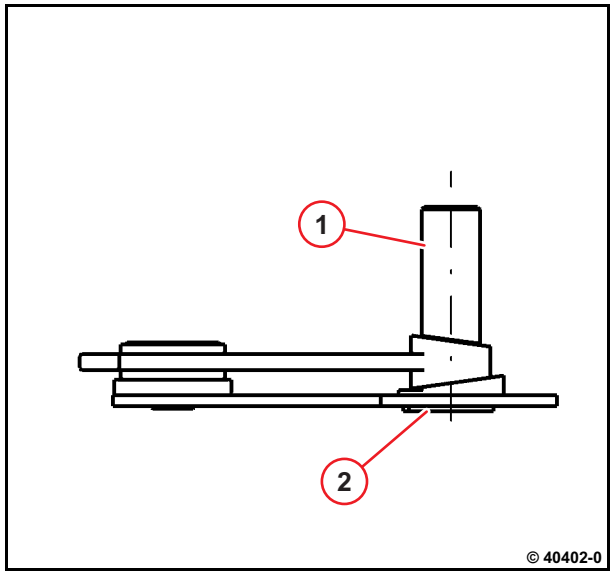


- Align the top part (1) of the assembly tool and removal gauge (2).

The top part of the assembly tool and the removal gauge are level with the angled surfaces (arrows) of the big end bearing.

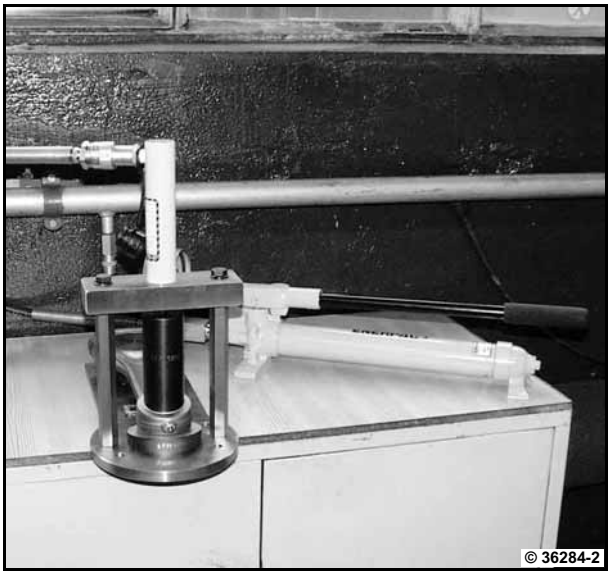


- Screw the top part (1) and bottom part (2) of the assembly tool together.



- Align the pneumatic press horizontally on the base plate.

The press-out die is in the centre above the top of the assembly tool.



- Press out the small end bush with slight pressure.
- Clean the bush bore.

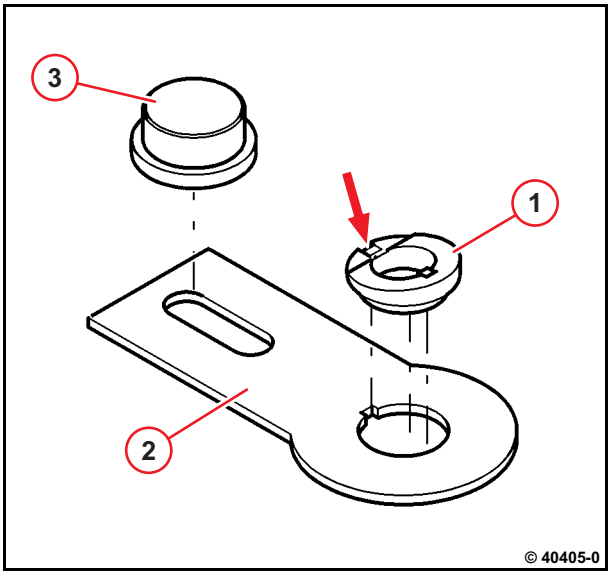
The bush bore must be free from grease and dirt.

Installing small end bush

- Insert big end bearing holder (3) in base plate (2).
- Insert installation gauge (1) in base plate.

The groove (arrow) must face the big end bearing holder.

Make sure the installation gauge is inserted flush.

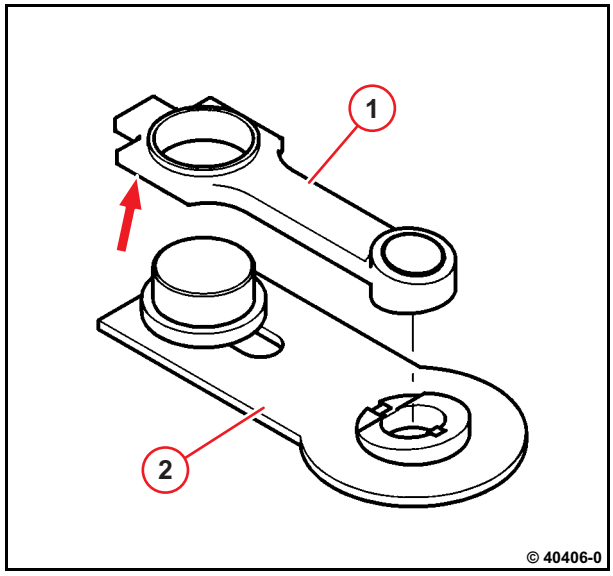


- Heat up the connecting rod (1).

P02 47

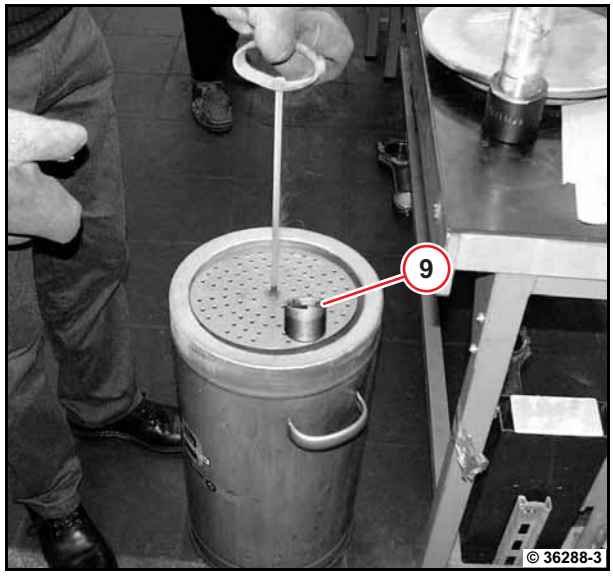
- Place the connecting rod on the base plate (2).

The flat side (arrow) of the connecting rod must face down.



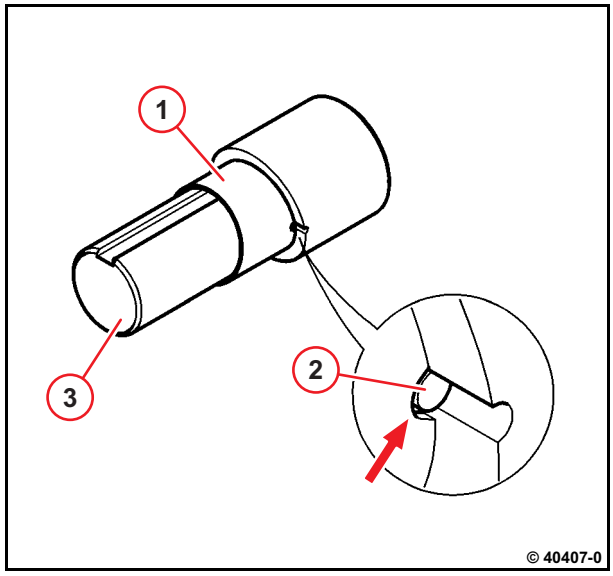
- Cool down the small end bush (1) in liquid nitrogen.

P02 46



- Place supercooled small end bush (1) on installation mandrel (3).

The index pin (2) is sitting correctly in the groove (arrow) of the small end bush.



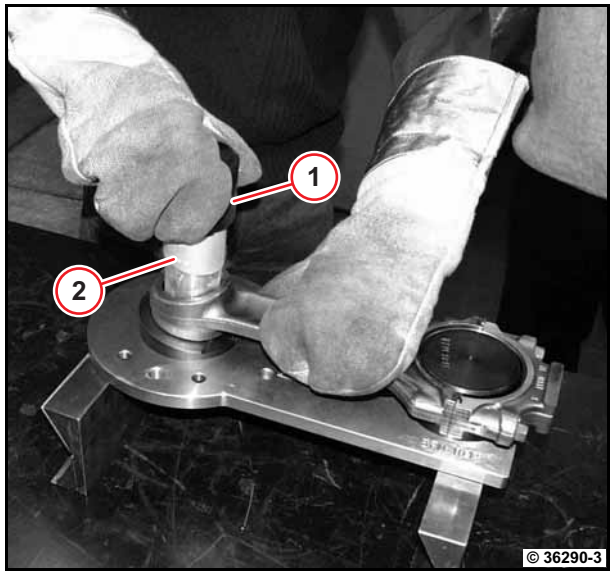
- Insert installation mandrel (1) with small end bush (2) in con rod bore.

The small end bush must be insertable in the connecting rod bore with little force.

Note installation position of the small end bush.

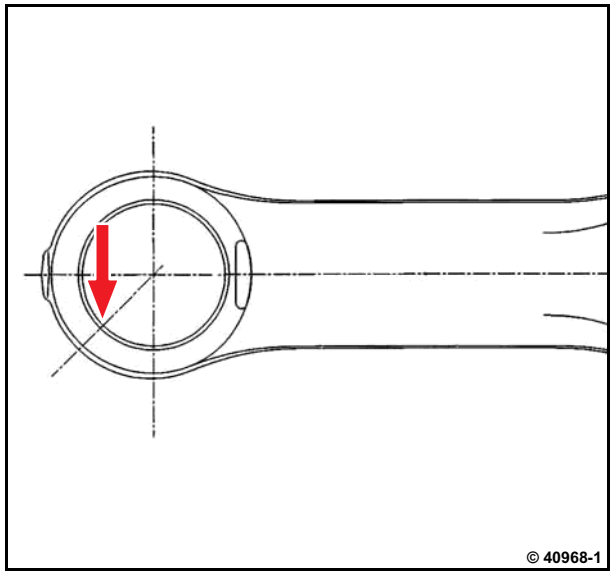
- Pull out the installation mandrel.

The small end bush may not slip.



- Check installation position.

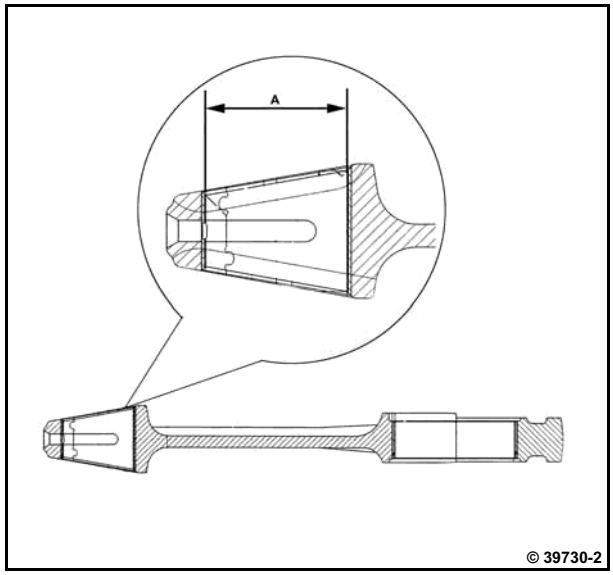
Position of the bush joint (arrow) looking at the flat side of the connecting rod shank.



Mechanical machining of the small end bush is necessary after assembly work.

- Spindle the small end bush to dimension A.

Dimensions	Maximum dimension	Minimum dimension
Bore of small end bush dimension A	52.055 mm	52.040 mm
Piston pin diameter	52.000 mm	51.992 mm
Theoretical clearance	0.063 mm	0.040 mm



6

Removing and installing the crankshaft

Commercial available tools:
– Socket wrench insert, size 24, reinforced
– Socket wrench insert, size 14, reinforced 8015
– Socket wrench insert, size 22, reinforced 8035
– Rotation angle disc 8190

Special tools:
– Turn-over gear 100350

– W 02-01-04 . . . . . (crankshaft removed)
– W 02-01-04 . . . . . (crankshaft installed)
– W 02-01-07
– W 03-08-01
– W 03-09-01
– W 07-07-01

Removing crankshaft

- Removing fuel injectors.

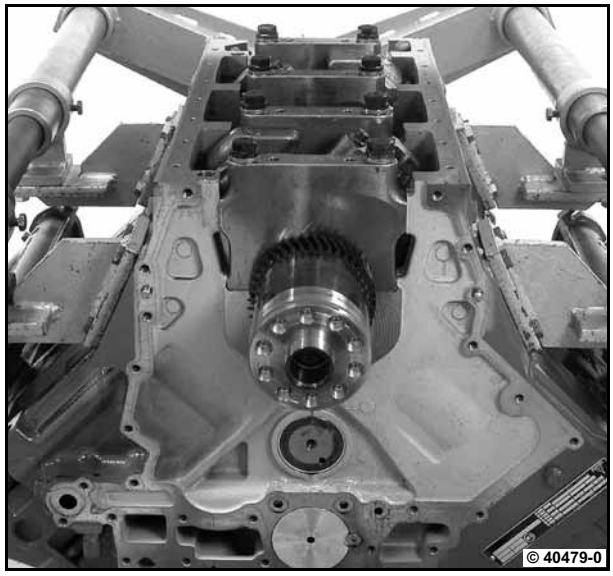
  W 07-07-01

- Remove genset support.

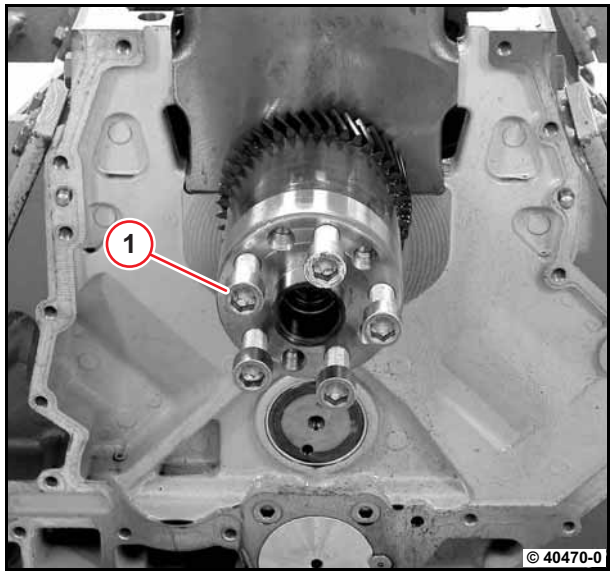
  W 03-08-01

- Remove rear cover.

  W 03-09-01

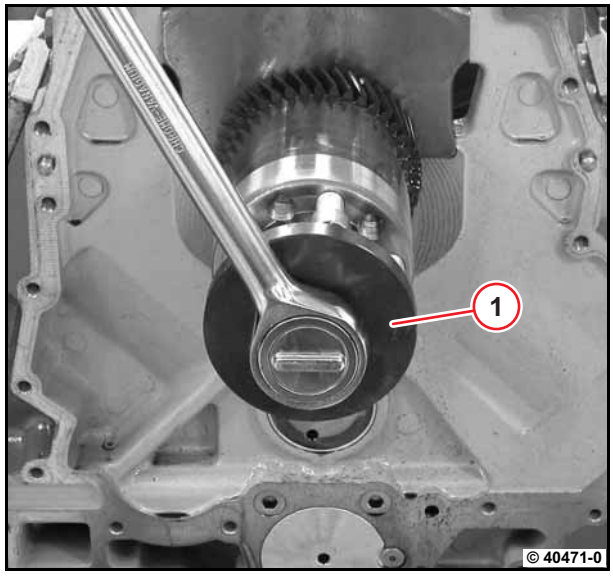


- Fasten all screws (1).



6

- Mount turning gear (1).

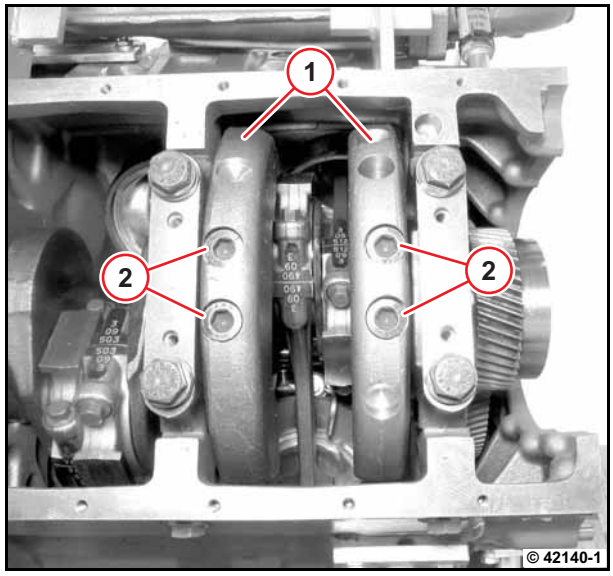


- Set the counterweights (1) of cylinders A1/B1 at bottom dead centre.

T00 81

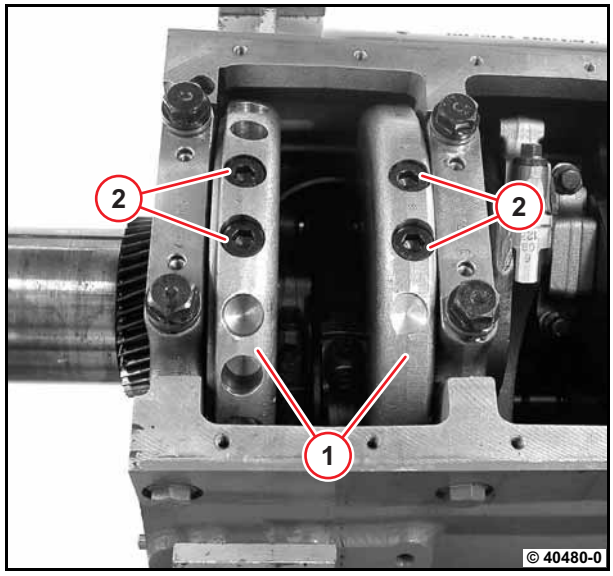
- Turn the crankshaft with the turning gear.
- Unscrew screws (2).
- Remove counterweights (1).

Lay out components in the order in which they should be installed.



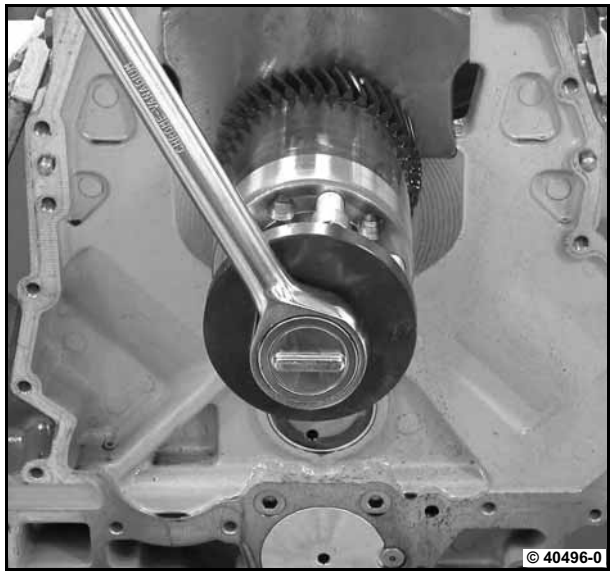
- Set the counterweights (1) of cylinders A3/B3 at bottom dead centre.
- Unscrew screws (2).
- Remove counterweights (1).

Lay out components in the order in which they should be installed.



- Place lifting journal of the respective cylinder at bottom dead centre (BDC).

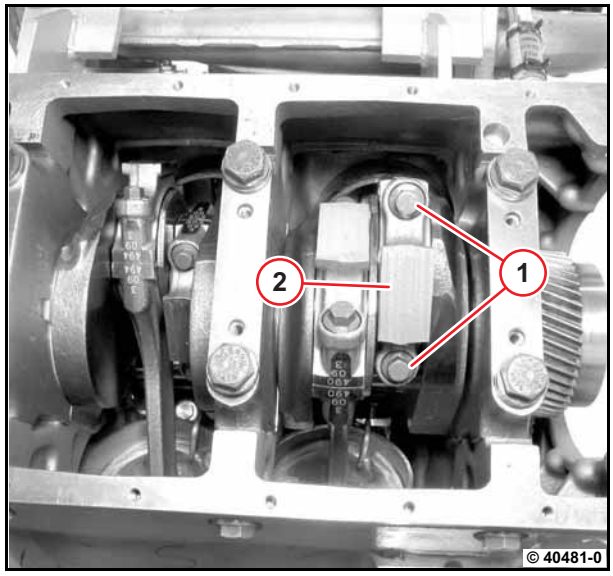
Attention!
Do not jam the con rods when turning the crankshaft.



- Unscrew screws (1) with the socket wrench insert 8015.
- Remove all big end bearing caps (2).
- Remove bearing shell.

Lay out components in the order in which they should be installed.

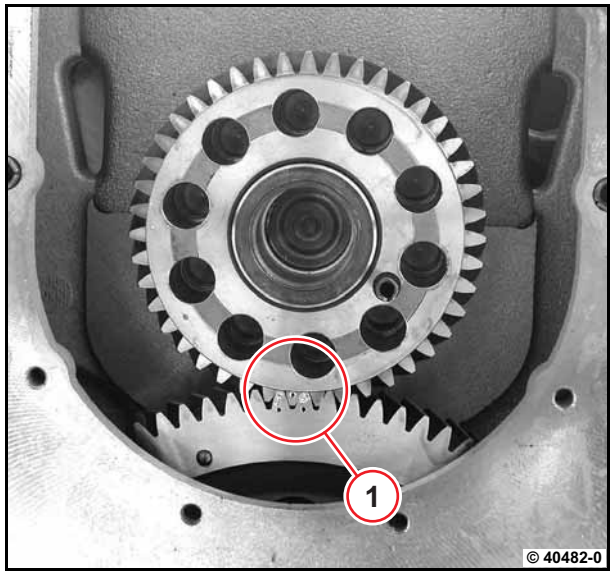
Note order of cylinders.



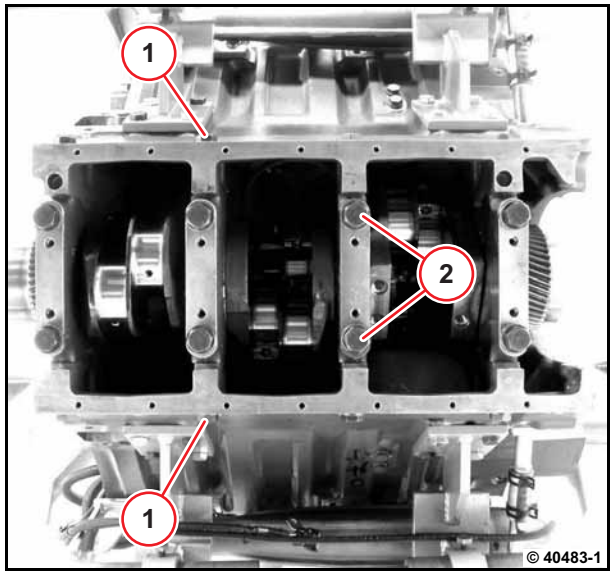
Attention!
Do not jam the con rods when turning the crankshaft.
Do not damage the big end bearing shells.

- Turn the crankshaft with the turning gear evenly.

The marking on the crankshaft gear wheel must be between the markings on the camshaft gear wheel (1).



- Unscrew all screws (1) with the socket wrench insert 8035.
- Unscrew all screws (2) with the socket wrench insert size 24.

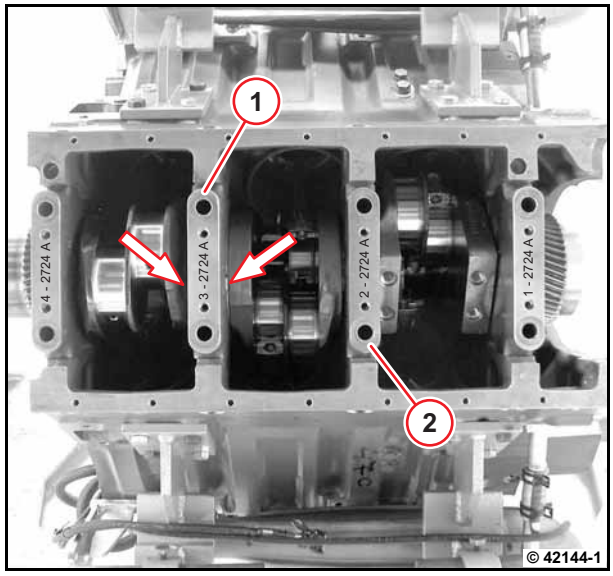


6

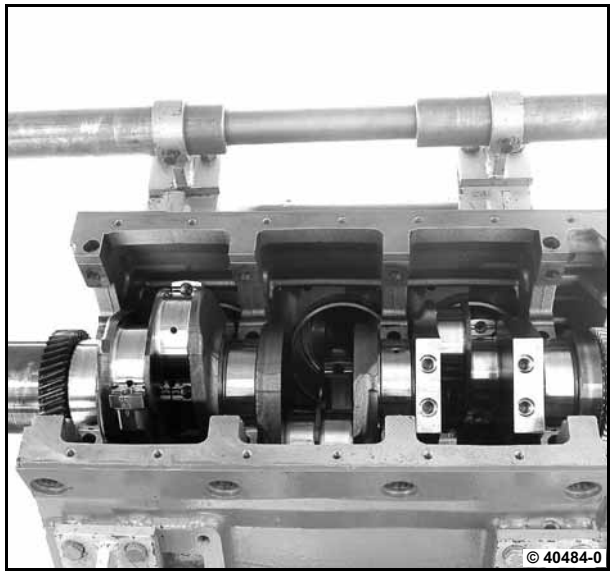
- Remove bearing cap (1).
- Remove bearing shell.
- Remove bottom thrust ring halves (arrows).
- Remove all main bearing covers (2).
- Remove the main bearing shells.

Lay out components in the order in which they should be installed.

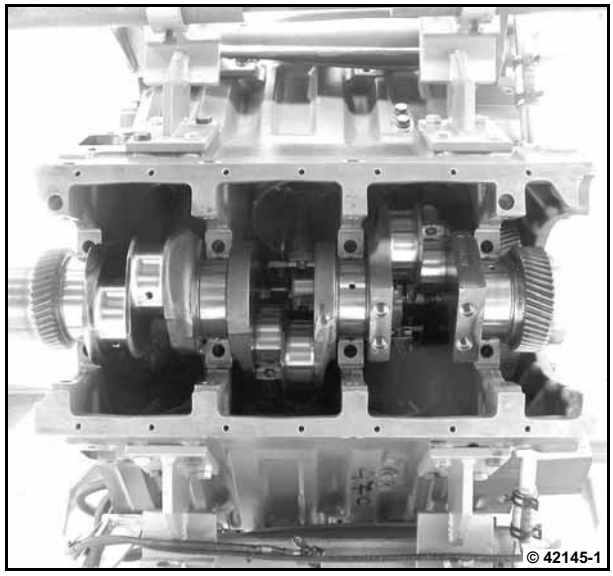
Note order of cylinders.



- Press the con rods carefully out of the lifting journal.



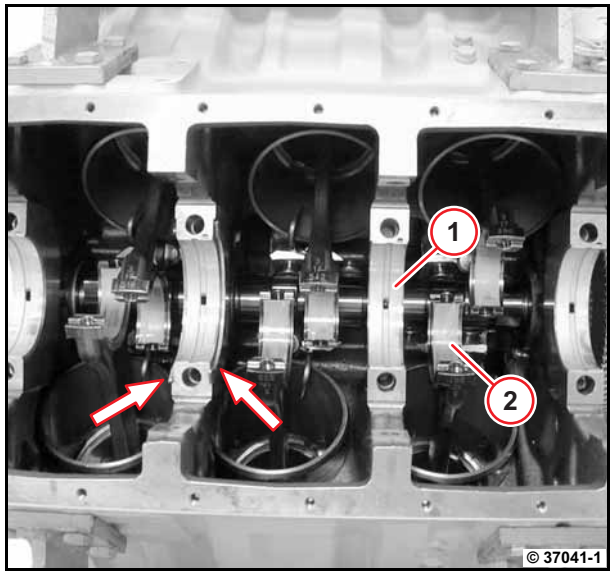
- Remove turn-over gear.
- Lift out the crankshaft.
- Place crankshaft on prism.



- Remove top thrust ring halves (arrows).
- Remove all main bearing shells (1).
- Remove all big end bearing shells (2).
- Visually inspect the components.

Lay out components in the order in which they should be installed.

Note order of cylinders.

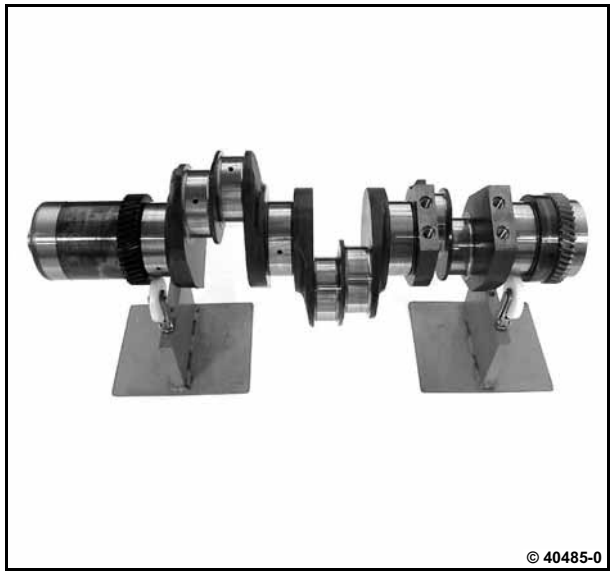


- Check crankshaft.

W 02-01-07

- Check axial backlash of crankshaft (crankshaft removed).

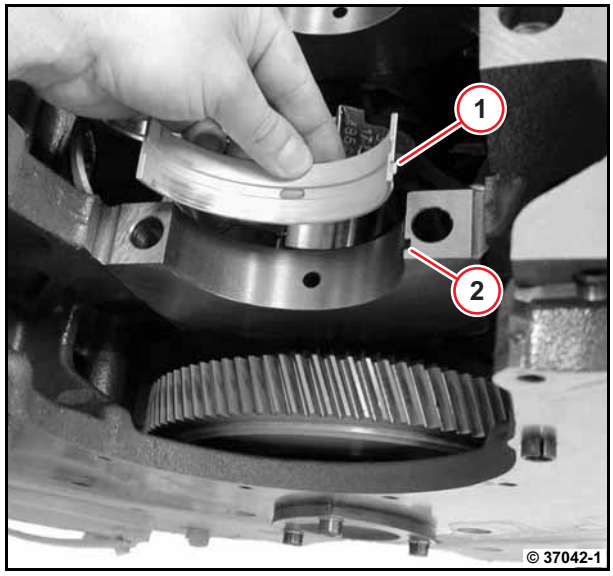
W 02-01-04



Installing the crankshaft

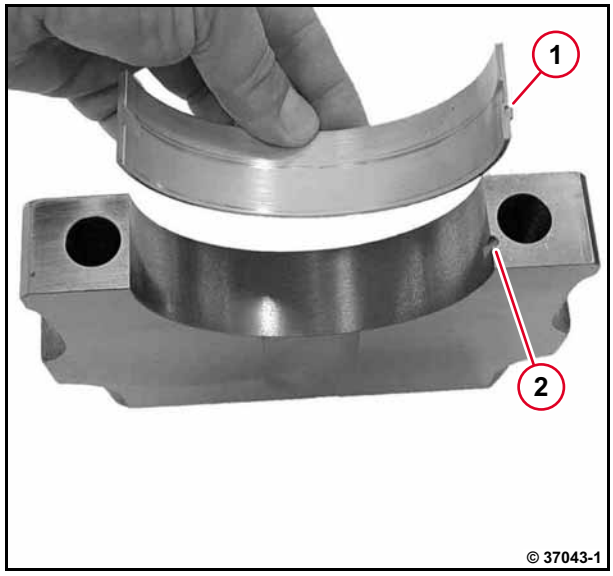
- Insert upper main bearing shells.

Attention!
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



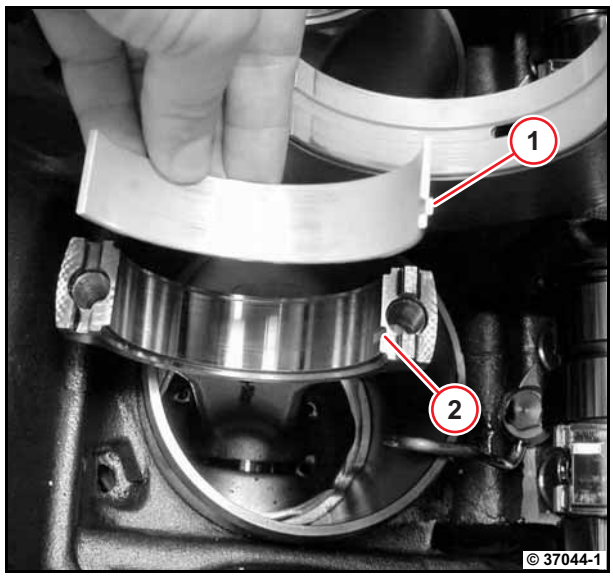
- Insert lower main bearing shells in the respective main bearing cover.

Attention!
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



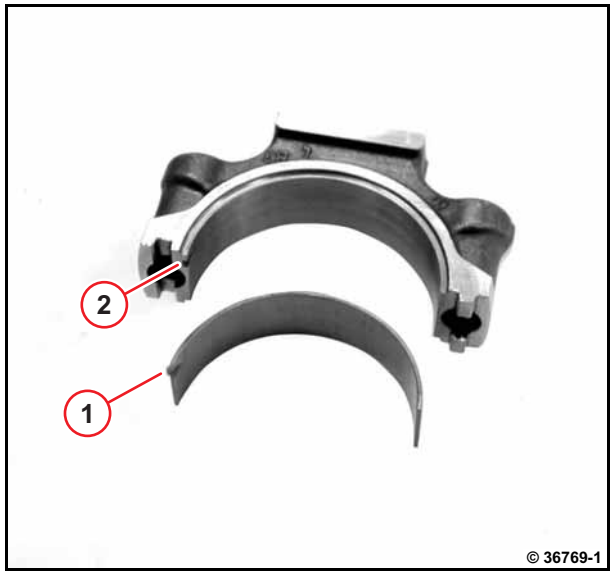
- Insert bearing shell in the con rod.

Attention!
Note the assignment of the bearing shells. Insert big end bearing shell with the black anodised rear side in the connecting rod. The anti-rotation lock (1) must lock in groove (2).

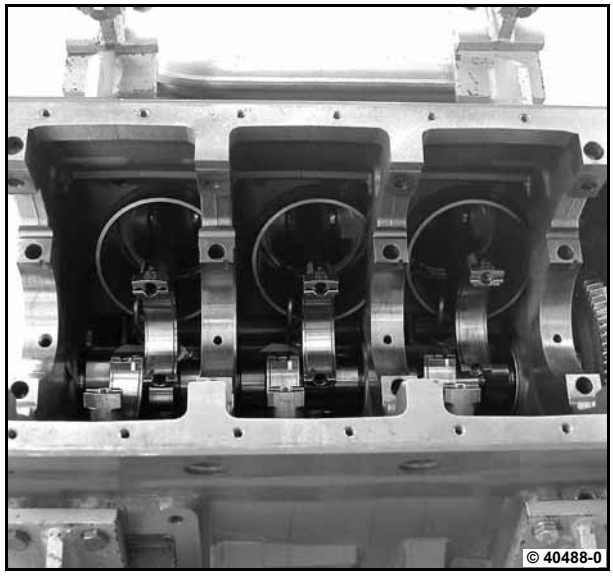


- Insert big end bearing shells in the respective big end bearing cap.

Attention!
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Lightly oil bearing surfaces.

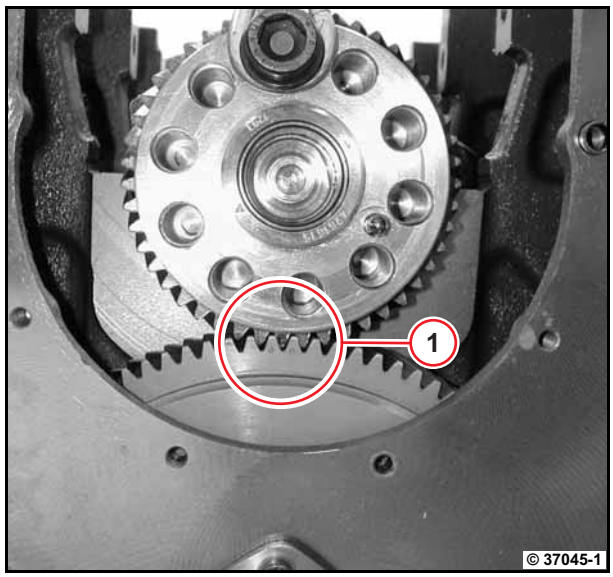


- Insert the crankshaft carefully in the crankcase.

Attention!
Do not jam the con rods when inserting the crankshaft!

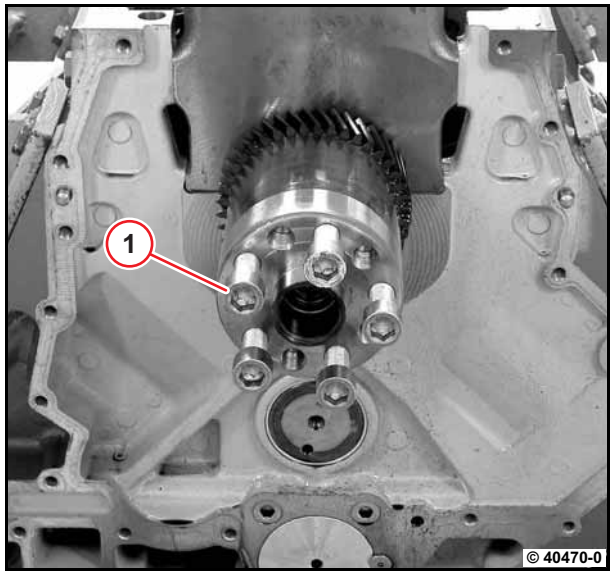
- Set the crankshaft in line with the camshaft (1) .

The marking on the crankshaft gear wheel must be between the marking points on the camshaft gear wheel.



6

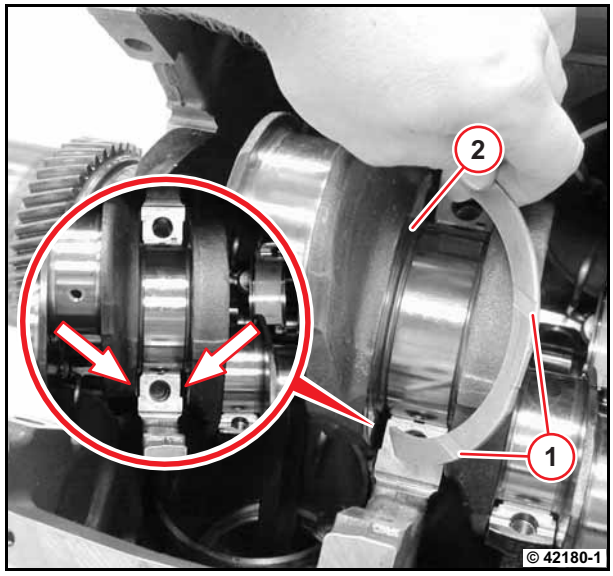
- Fasten all screws (1).
- Mount the turning gear.



- Install upper thrust ring halves according to measured axial clearance.

The oil grooves (1) face the crankshaft web face (2).

Insert thrust ring halves between crankcase and crankshaft web (arrows).

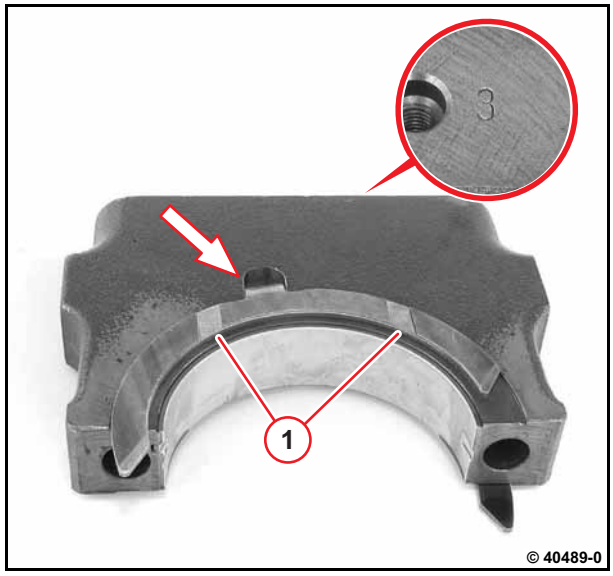


- Install lower thrust ring halves according to measured axial backlash.
- Fix thrust ring halves with a little grease to the bearing cap.

Use thrust ring halves with guide lug (arrow).

Oil grooves (1) face the crankshaft web face.

Bearing cap has identification “3“.



- Insert bearing cap (1).
- Insert main bearing covers (2).

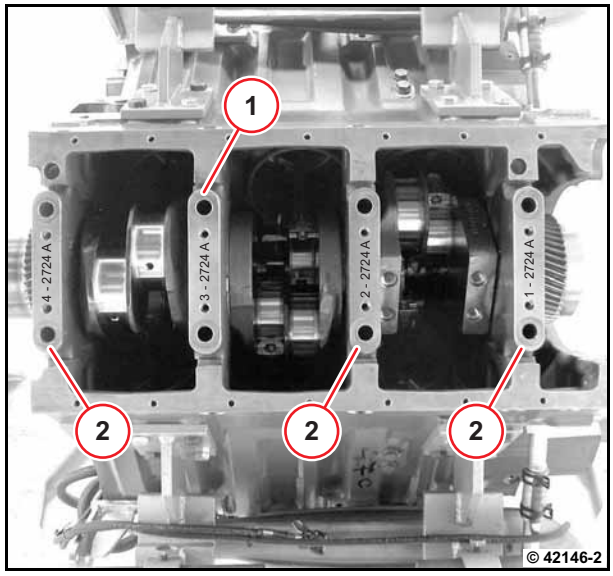
Note assignment and installation position:

Assignment of the main bearing covers:

With identification "1" = flywheel side.

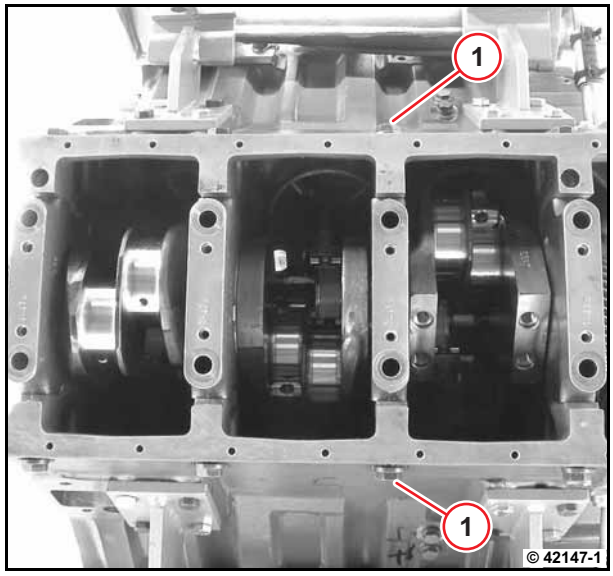
With identification "4" = side opposite flywheel side.

Identifications legible from the flywheel side.



- Fasten all screws (1).

Attention!
Screws can be used a maximum 3 times with written documentation.

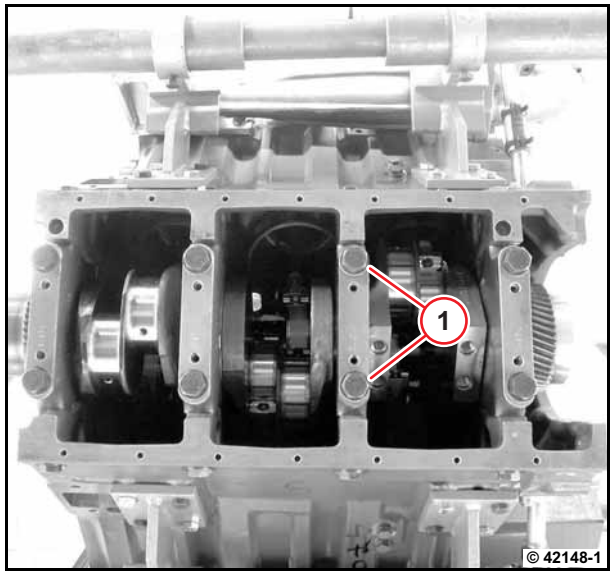


- Oil the screws lightly.
- Fasten all screws (1).

Attention!
Screws can be used a maximum 3 times with written documentation.

- Move the crankshaft axially to and fro.

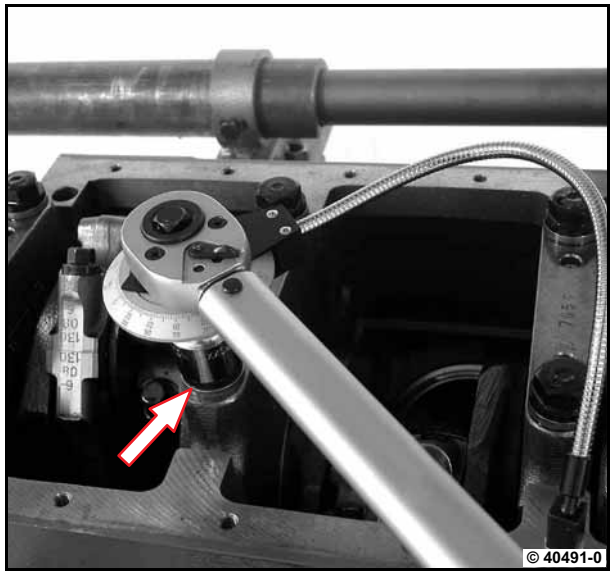
The bearing is aligned in position as a result.



- Tighten all screws (arrow) with the socket wrench insert size 24 and rotation angle disc.

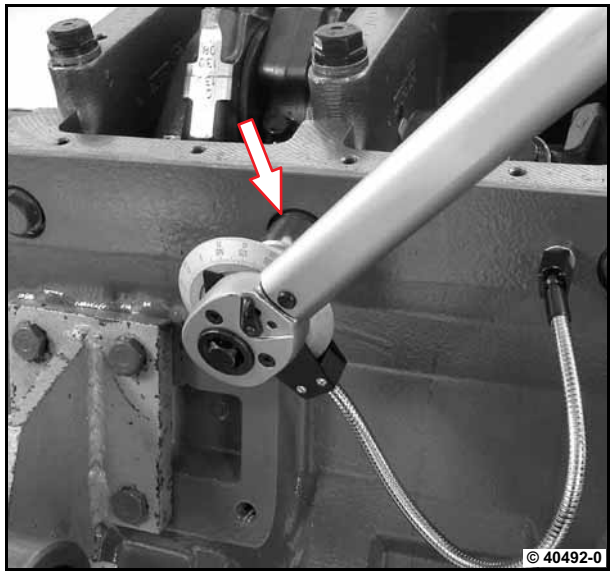
A02 010

Attention!
Do not jam the main bearing cover.



- Tighten all screws (arrow) with the socket wrench insert 8035 and rotation angle disc.

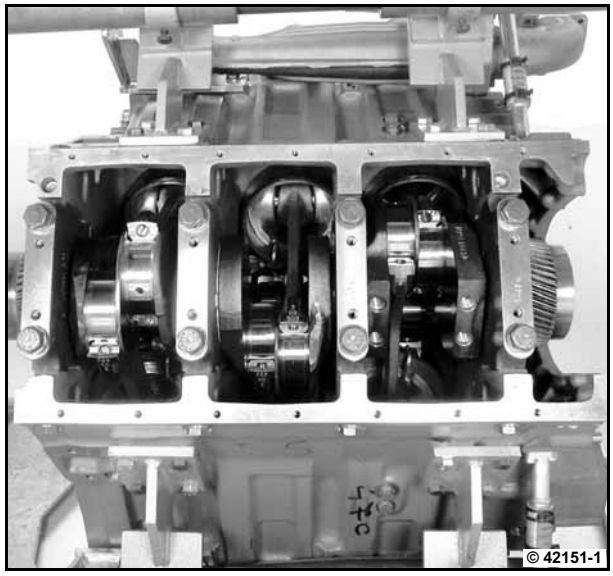
A02 011



- Check installation position of the connecting rods.

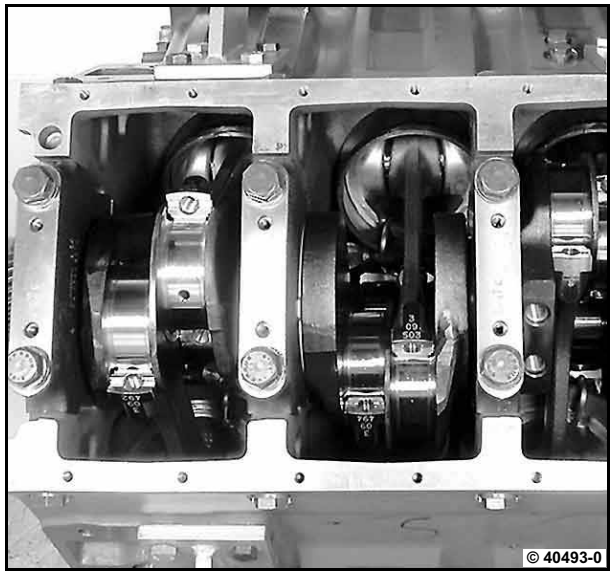
The flattened side (arrow) faces the flywheel on the A-bank and the genset support on the B-bank.

- Pull con rods carefully on to the lifting journal.



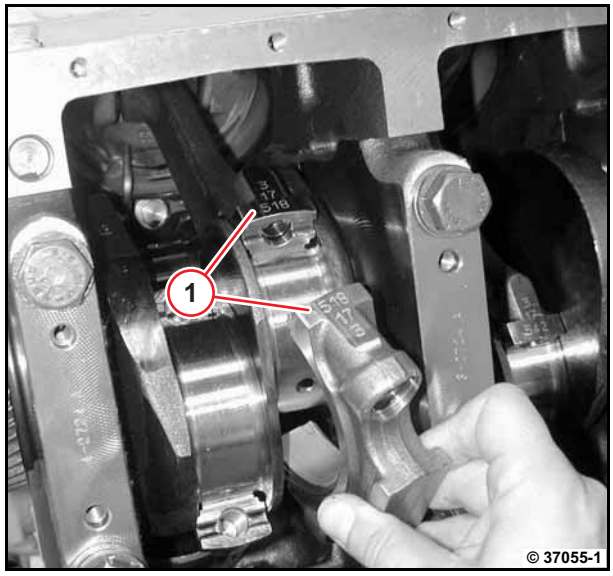
- Place lifting journal of the respective cylinder at bottom dead centre (BDC).

Attention!
Do not jam the con rods when turning the crankshaft.



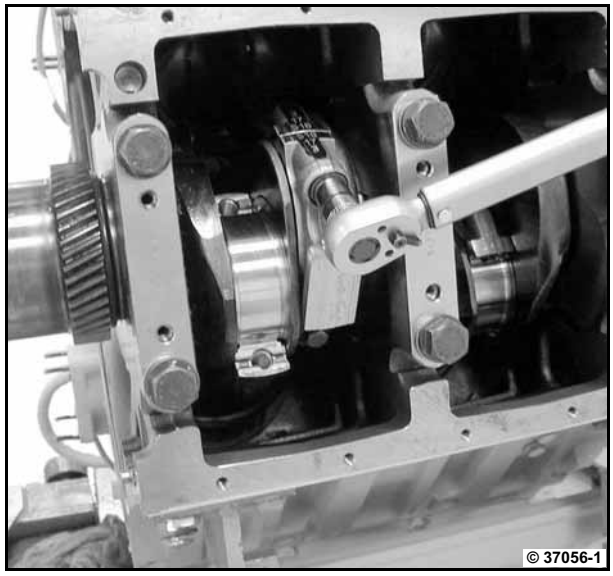
- Mount big end bearing cap.

Attention!
Note assignment and installation position: The identification numbers (1) on the connecting rod and the big end bearing cover must be identical and opposite to each other when assembled.



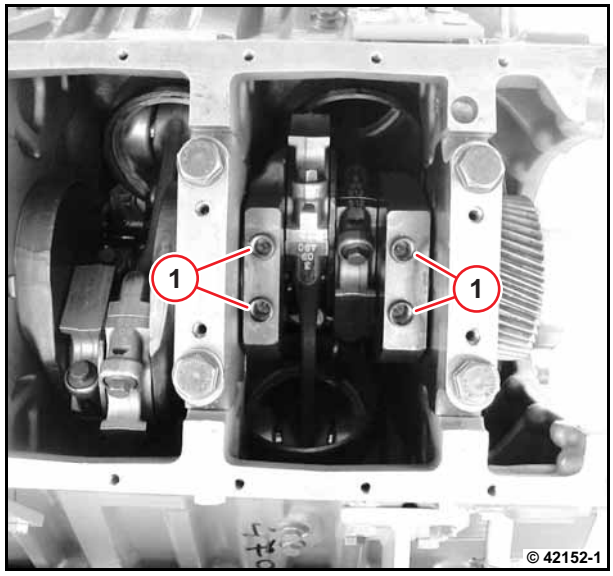
- Tighten new screws with the socket wrench insert 8015 and rotation angle disc.

A02 020

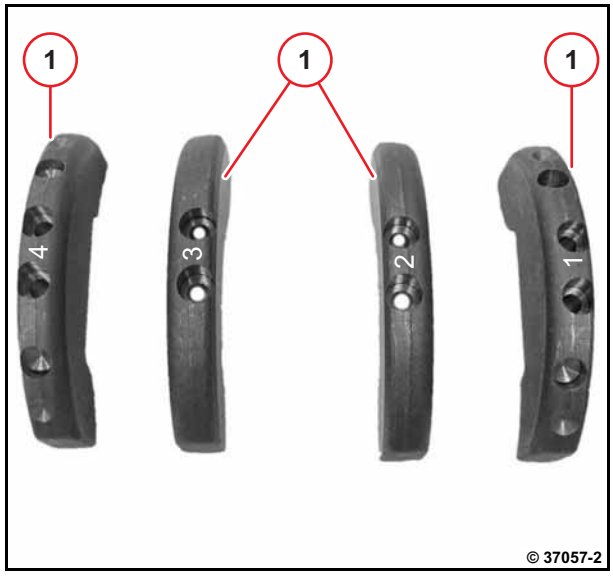


6

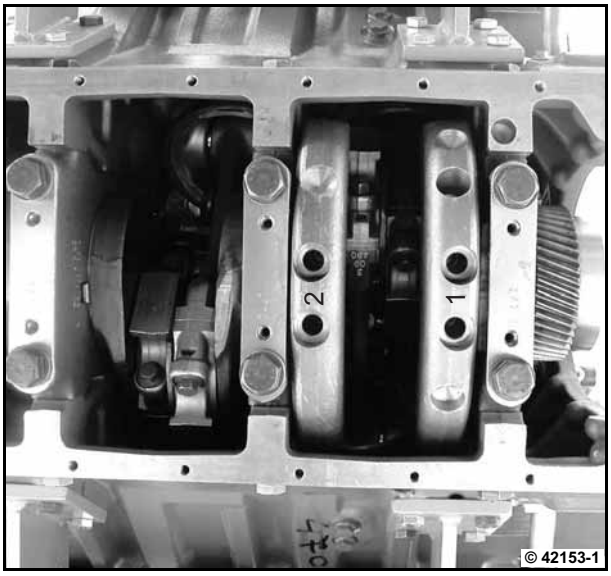
- Place crankshaft web of the respective cylinder at bottom dead centre (BDC).
- Pay attention to clamping bushing (1).



Attention!
Note assignment and installation position:
Assignment of the counterweights:
Counterweight with
identification "1" = flywheel side.
Flattened sides (1) face the main bearing cover.

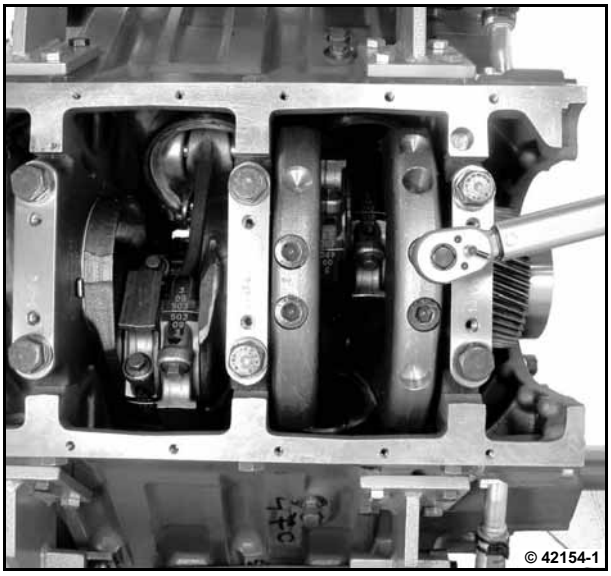


- Insert counterweights according to the identification.

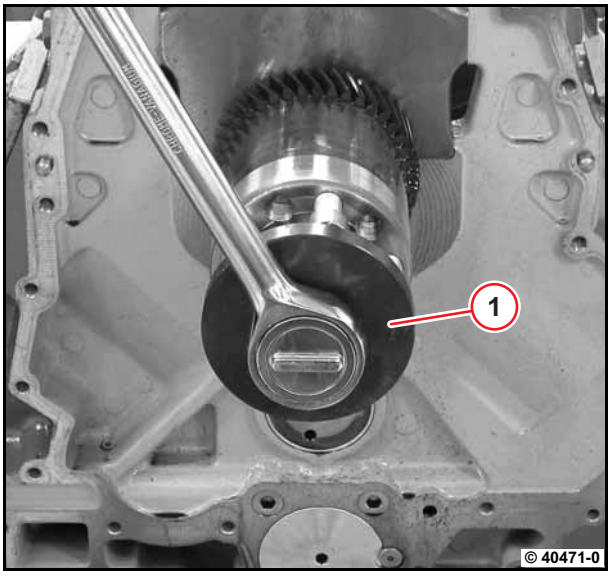


- Oil the screws lightly.
- Tighten screws .

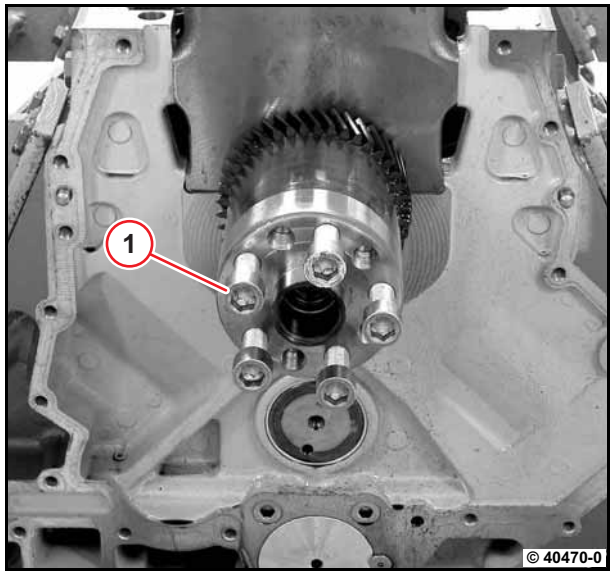
A02 001



- Remove turning gear (1).

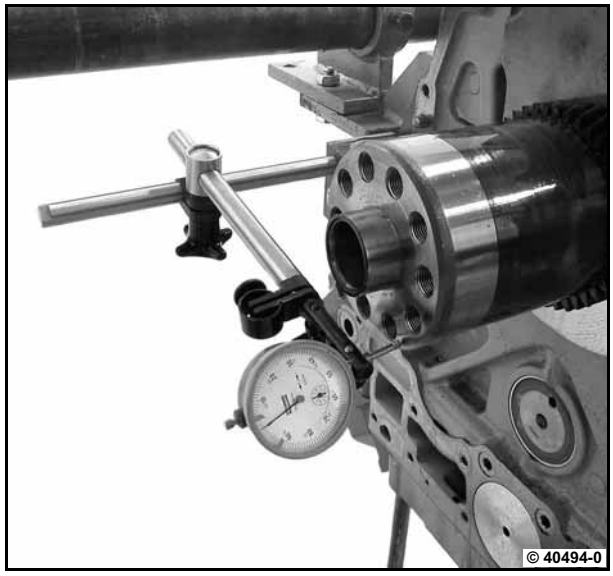


- Unscrew all screws (1).



- Check axial backlash of crankshaft (crankshaft installed).

W 02-01-04



- Mount rear cover.

W 03-09-01

- Install genset support.

W 03-08-01

- Install fuel injectors.

W 07-07-01

Removing and installing the piston and con rod

Commercial available tools:
– Locking ring pliers
– Socket wrench insert 8015
– Rotation angle disc 8190

Special tools:
– Piston ring compressor 130650

– W 01-04-04
– W 02-10-03
– W 08-04-06
– W 08-04-06 . . . . . (Railway)

Removing the piston and con rod

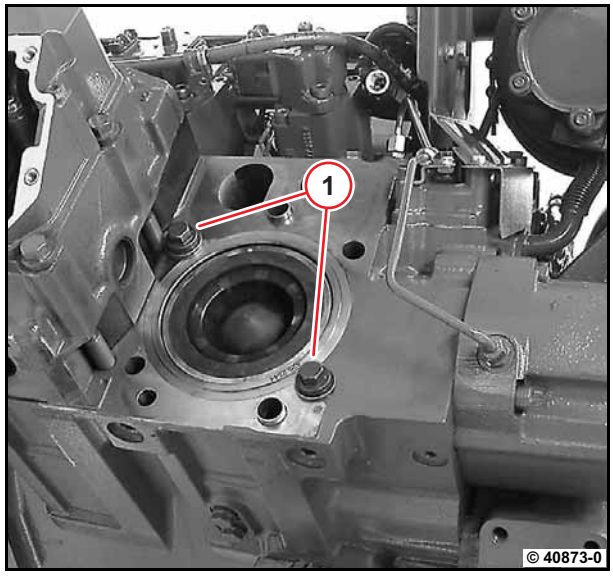
- Remove cylinder head.

  W 01-04-04

- Insert screws and washers (1) diagonally opposed.

  Washers:
  Maximum thickness 4 mm
  Screw length:
  M16 x 90

- Tighten screws until they touch the cylinder liner.

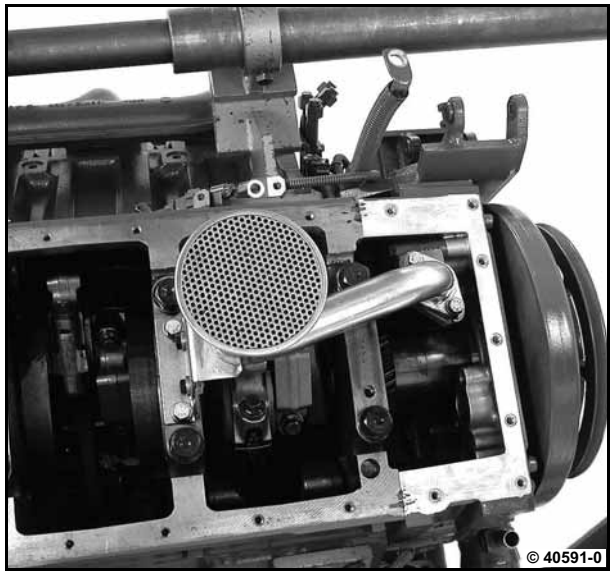


- Remove oil suction pipe

  W 08-04-06

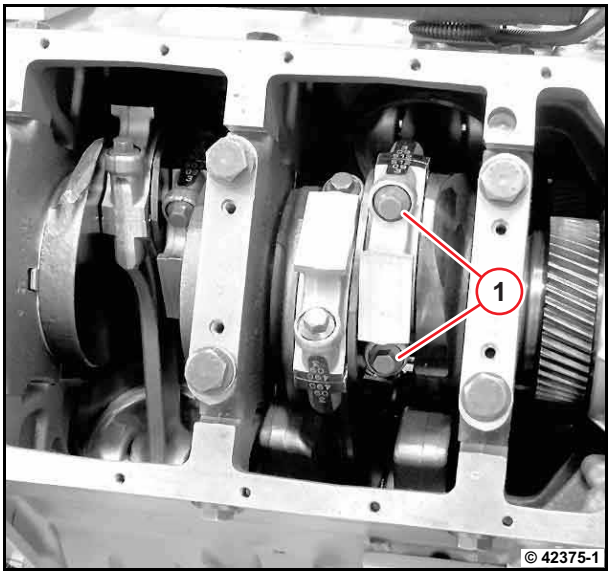
- Remove oil suction pipe (Railway).

  W 08-04-06



6

- Set piston at bottom dead centre (BDC).
- Unscrew screws (1) with the socket wrench insert.



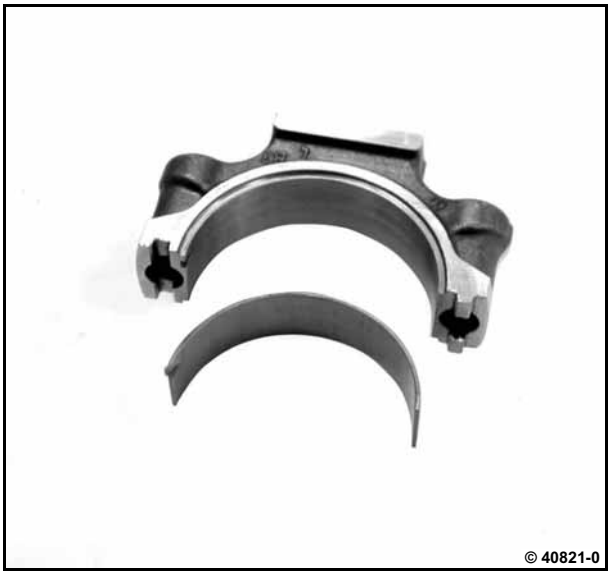
- Remove big end bearing cover with bearing shell.

Lay out components in the order in which they should be installed.

Note order of cylinders.

T00 81

- Visually inspect the components.

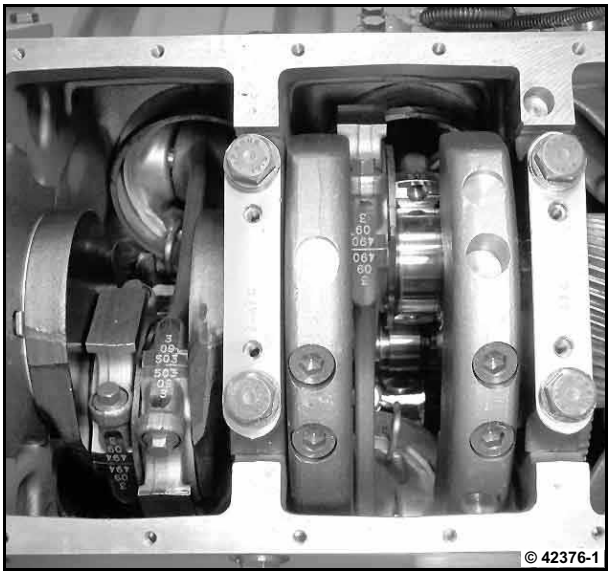


- Set piston at top dead centre (TDC).
- Remove bearing shell.
- Press out the piston and connection rod.

Attention!
Do not jam the connecting rod in the cylinder liner when removing!

Lay out components in the order in which they should be installed.

Note order of cylinders.



- Visually inspect the components.

- Remove locking ring with locking ring pliers.
- Press out piston pin.
- Remove locking ring with locking ring pliers.
- Visually inspect the components.

Attention!
Make sure the surface of the piston is flawless.

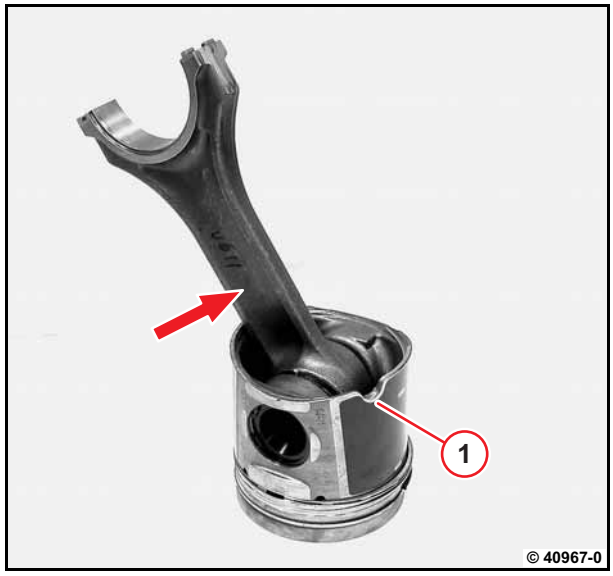
Installing the piston and con rod

- Insert new locking ring.

Ensure that the installation location is free from faults.

- Insert con rod.

Attention!
The concave surface (arrow) of the connecting rod must face the recess (1) for the piston cooling nozzle on the piston.

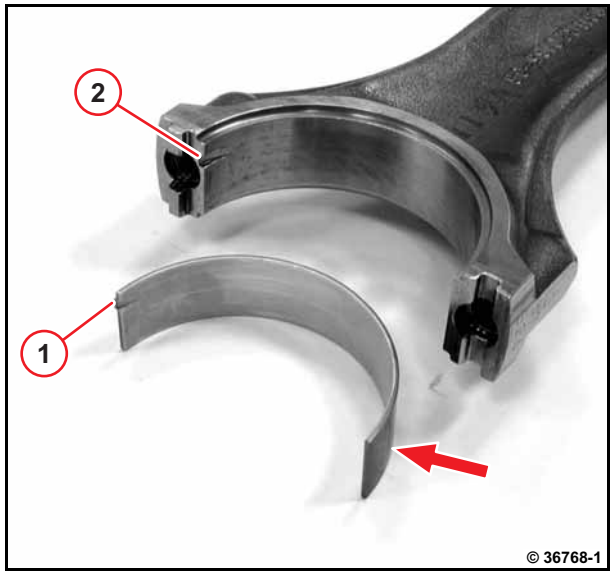


- Oil the piston bolt lightly.
- Insert piston pin in piston.
- Insert new locking ring.

Ensure that the installation location is free from faults.

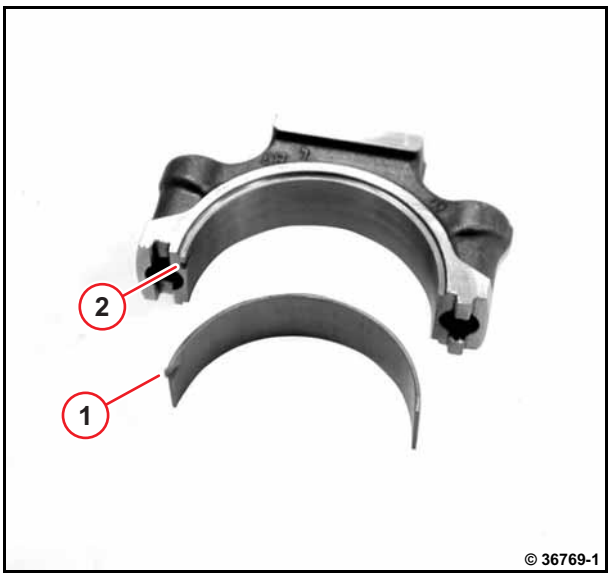
Attention!
Note the assignment of the bearing shells. Insert big end bearing shell with the black anodised rear side (arrow) in the connecting rod.
The anti-rotation lock (1) must lock in groove (2).

- Insert bearing shell in the con rod.



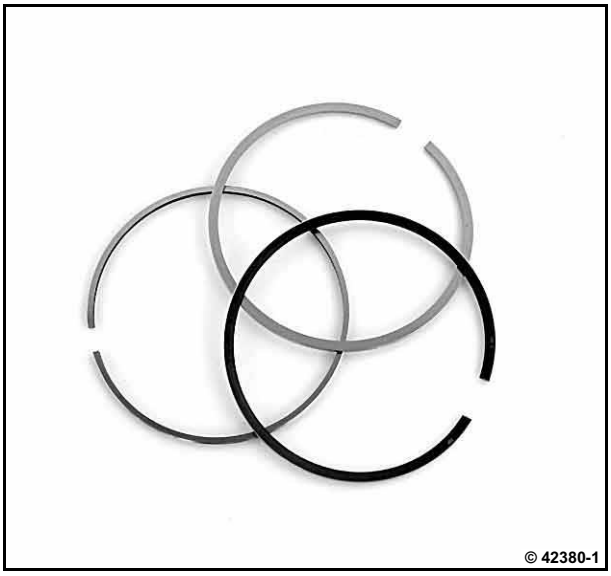
- Insert bearing shell in the respective big end bearing cap.

Attention!
Note the assignment of the bearing shells. The anti-rotation lock (1) must lock in groove (2).



- Arrange the piston ring joints with an offset of about 120° to each other.
- Check piston rings and piston ring grooves.

W 02-10-03



- Lightly oil cylinder running surface, piston, piston rings and lifting bearing journal lightly.
- Clamp piston rings with piston ring compressor (1).

Do not turn the piston rings any further.

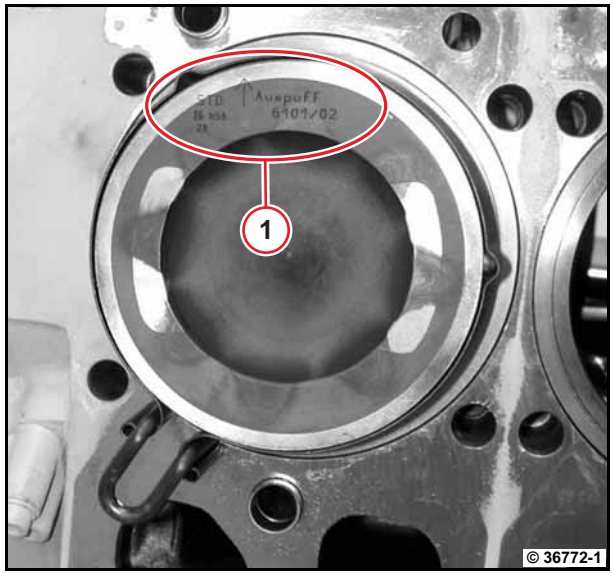
- Set lifting journal at bottom dead centre (BDC).
- Push piston and con rod completely into cylinder liner.

Note the cylinder assignment of the piston.

Note identification (1) of the installation position on the piston base.

The arrow must point to the exhaust gas side.

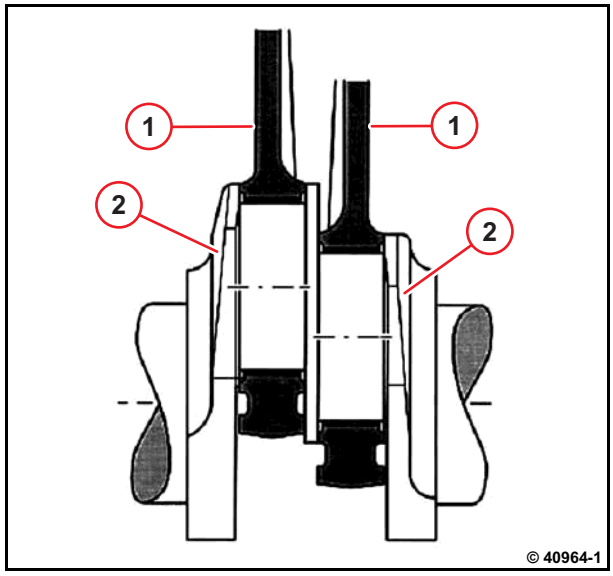
The piston ring compressor must lie flat on the cylinder liner.



6

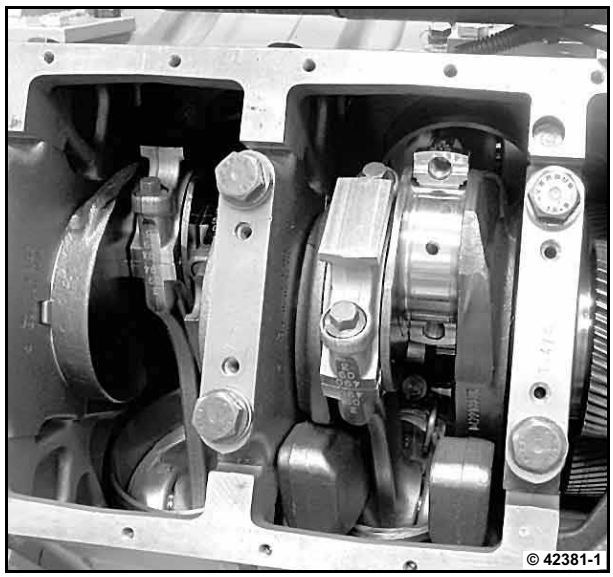
- Check installation position of the connecting rods.

Attention!
The flattened side (1) must face the adjacent lifting crank web (2).



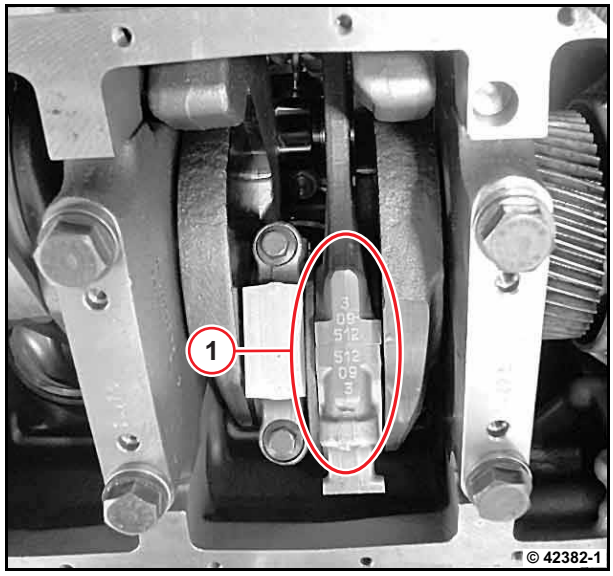
- Press the con rod carefully against the lifting journal.

Attention!
Do not jam the con rod with the crankshaft.
Do not damage the piston cooling nozzle.



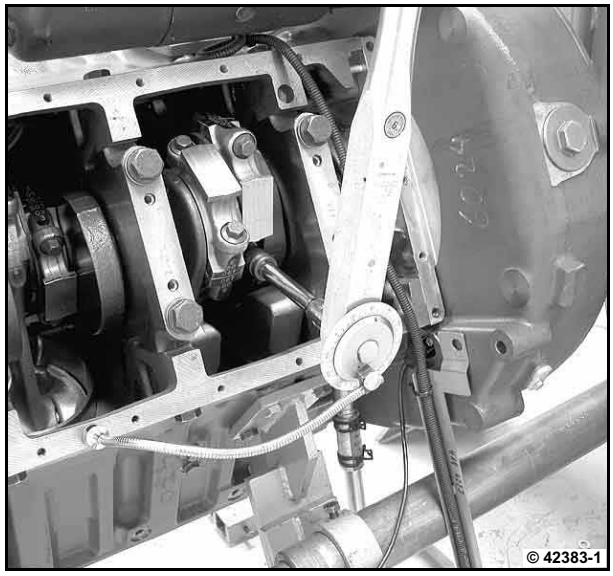
- Mount big end bearing cap.

Attention!
Note the assignment of the big end bearing cap.
The identification numbers (1) on the con rod and the big end bearing cap must be identical and opposite to each other when assembled.



- Tighten new screws with the socket wrench insert and rotation angle disc.

A02 020

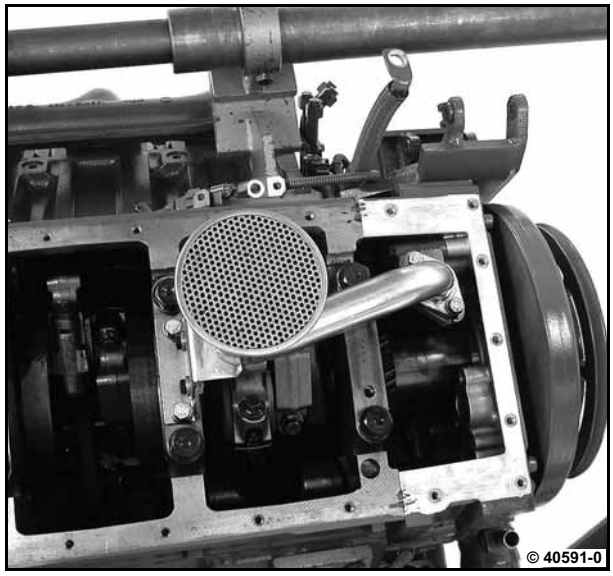


- Install oil suction pipe.

W 08-04-06

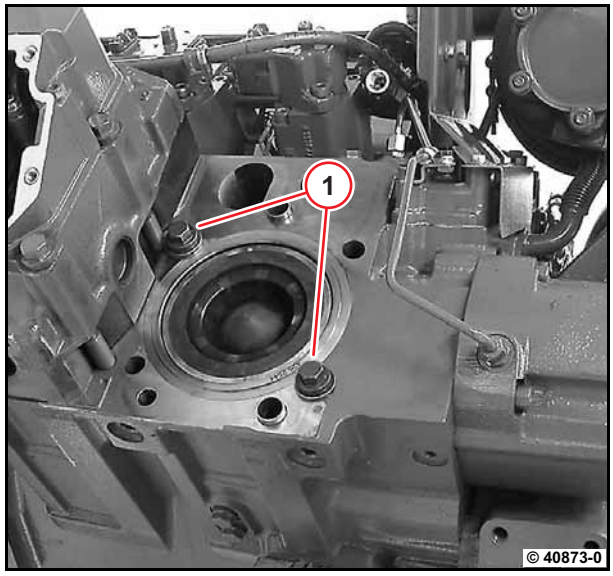
- Install oil suction pipe (Railway).

W 08-04-06



- Unscrew screws with washers (1).
- Install cylinder head.

W 01-04-04



Checking the piston

Commercial available tools:
– Micrometer gauge
– Internal measuring device

Special tools:
– Dial gauge. 100400

– W 02-09-03

When the piston wear limit is reached, the piston must be renewed.

Checking the piston bolt bore

- Remove piston and connecting rod.

  W 02-09-03

- Prepare internal measuring device:
  – Mount probe bolt for the appropriate measuring range in the internal measuring device.
  – Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  – Set micrometer gauge to 52 mm.
  – Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to "0".

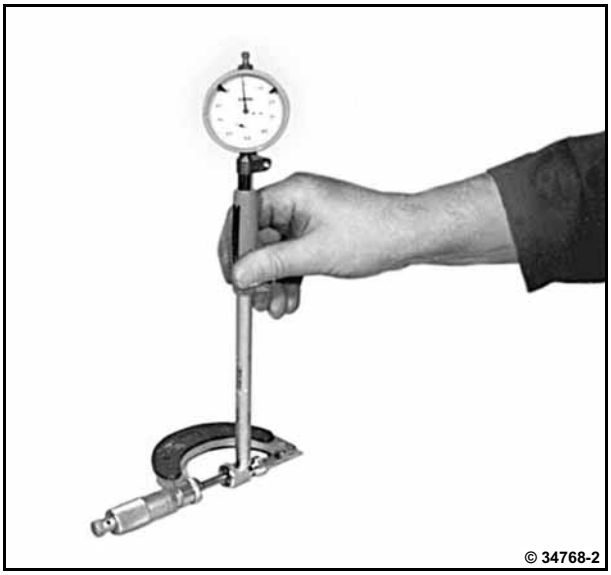
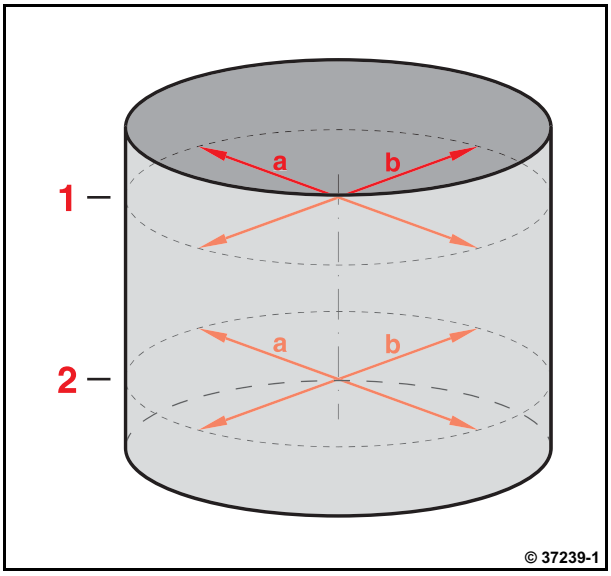


Diagram for measuring the piston bolt bore at the points "a" and "b" in the levels "1" and "2".



6

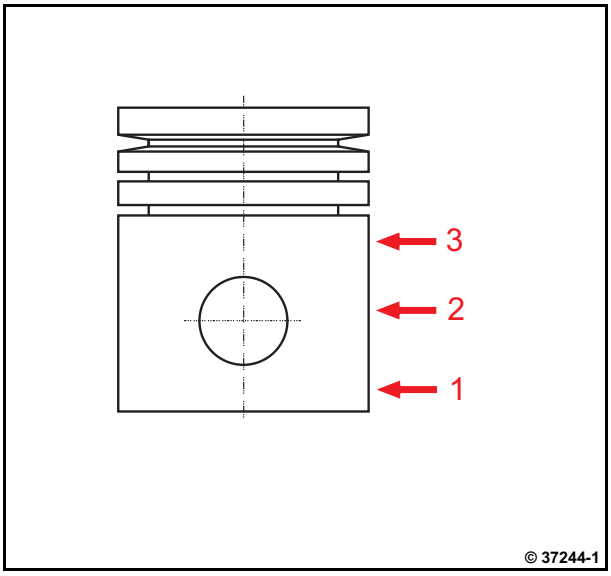
- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

P02 78

Measuring points see diagram.

Checking the piston diameter

Diagram for measuring the piston diameter at the measuring points "1, 2 and 3", transverse to the piston bolt bore.



- Measure diameter with micrometer gauge.

Measuring points see diagram.

P02 71

P02 72

P02 73

- Install piston and connecting rod.

W 02-09-03

6

Checking the piston rings and piston ring grooves

Commercial available tools:
– Feeler gauges

Special tools:
– Universal piston ring pliers 130300
– Trapezoidal groove wear gauge 130400

– W 02-09-03

Checking the piston rings and piston ring grooves

- Remove piston and connecting rod.

  W 02-09-03

- Set universal piston ring pliers to the piston diameter.

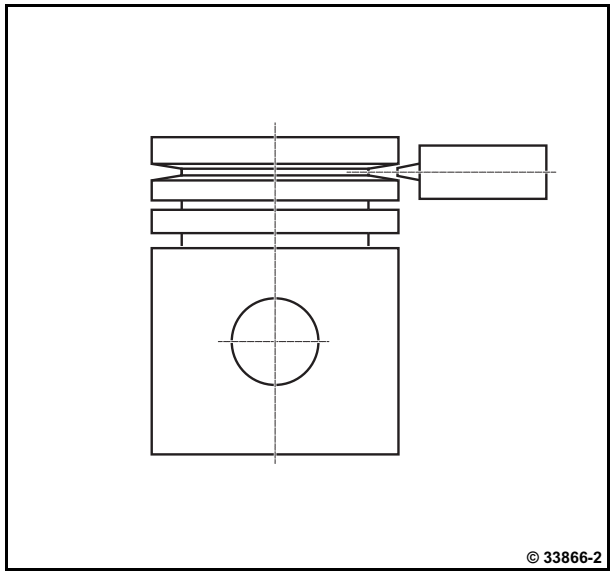
  P02 73

- Remove piston rings with universal piston ring pliers.

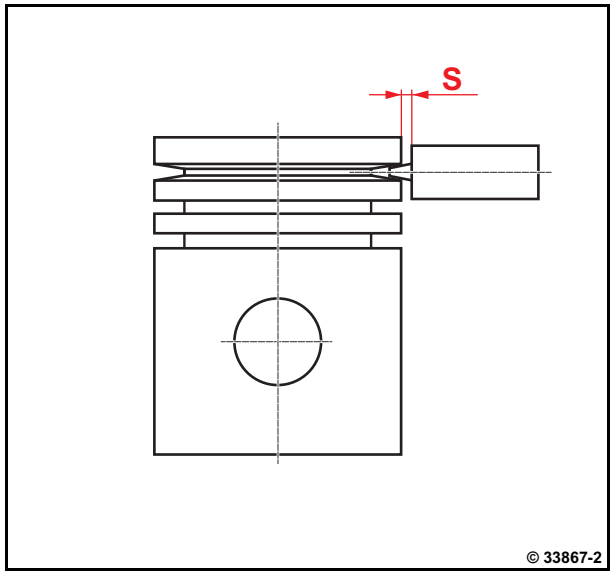
- Clean piston.
- Clean piston ring grooves.
- Visually inspect the components.

6

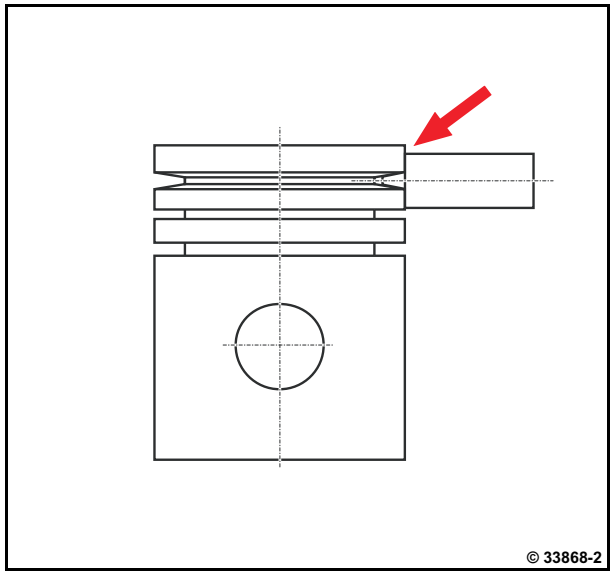
- Measure piston ring groove for first piston ring with trapezoidal groove wear gauge.



If there is a gap "S" between the trapezoidal groove wear gauge and piston, the piston can be used again.

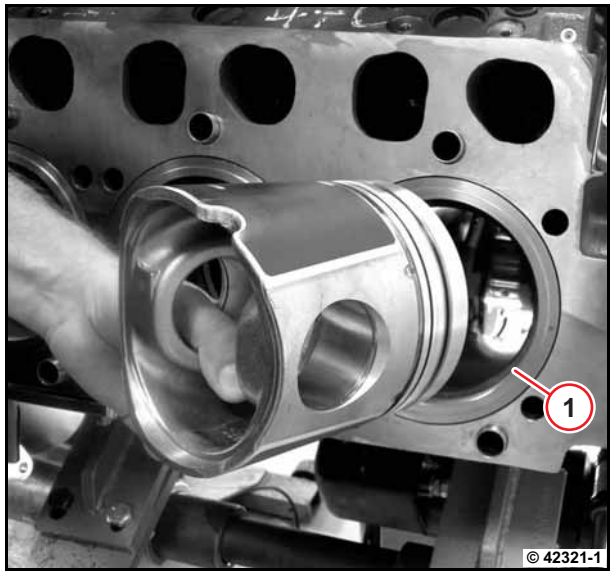


If the trapezoidal groove wear gauge is touching the piston (arrow), the piston must be changed.



Checking the piston ring joint clearance

- Insert the piston ring (1) in the cylinder.
- Align the piston ring in the cylinder by pushing the piston.



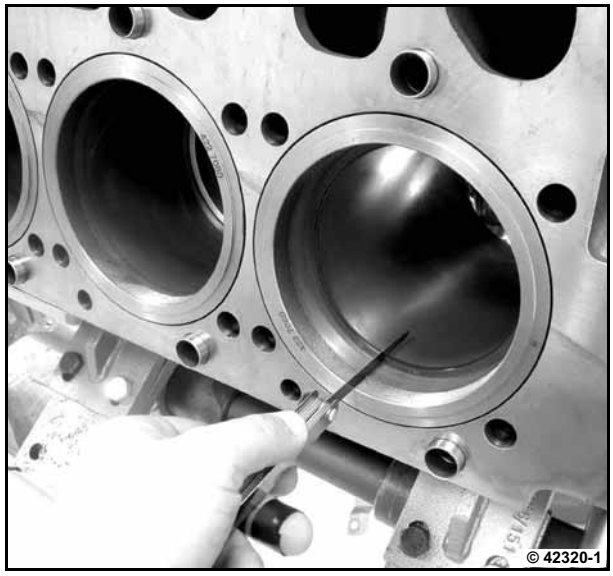
- Measure the piston ring joint clearance with a feeler gauge.

P02 84

P02 85

P02 86

When the wear limit is reached, the piston ring must be renewed.

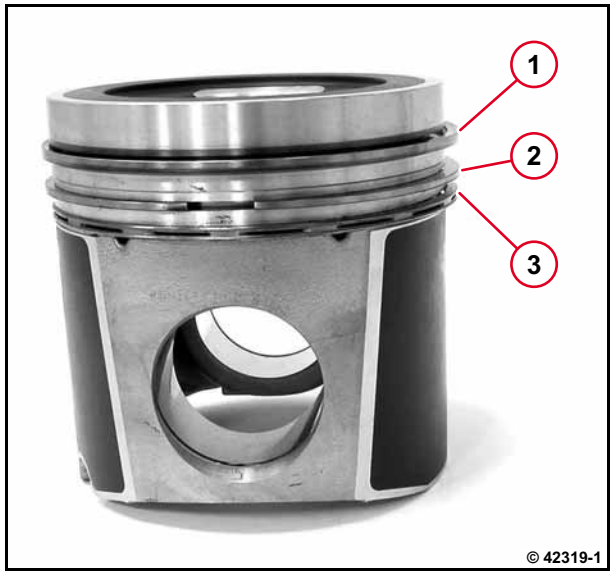


Installing piston rings

Order and position of the piston rings as seen from the piston base:

- Double-sided keystone ring (1)
- Taper-faced ring (2)
- Bevelland-edge oil control ring with coiled spring expander (3)

Identification “Top“ in (1) and (2) facing combustion chamber



- Install piston rings with universal piston ring pliers.

Set spring joint of the bevelland-edge oil control ring 180° to the ring joint.

6

Checking the piston ring axial clearance

Check with new piston rings.

- Check axial backlash with feeler gauge between piston ring and piston ring groove.

P02 88

P02 89

When the piston wear limit is reached, the piston must be renewed.

- Install piston and connecting rod.

W 02-09-03

Removing and installing the piston cooling nozzle

Commercial available tools

Special tools:
– Tester 102560
– Dipstick 102565

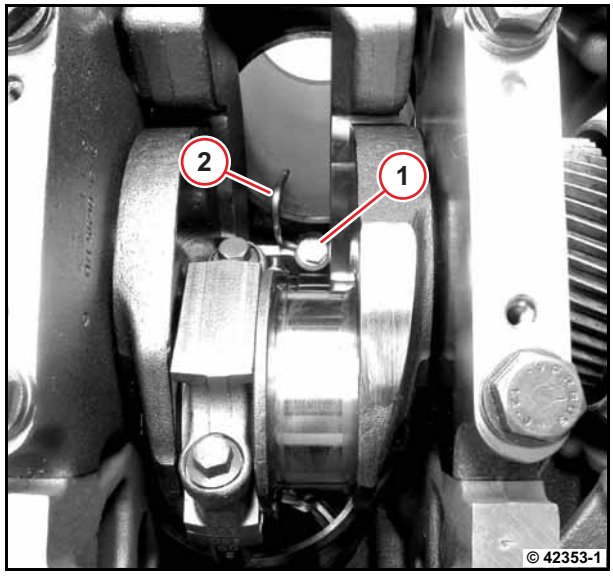
– W 02-09-03

Removing the piston cooling nozzle

- Remove piston and connecting rod.

  W 02-09-03

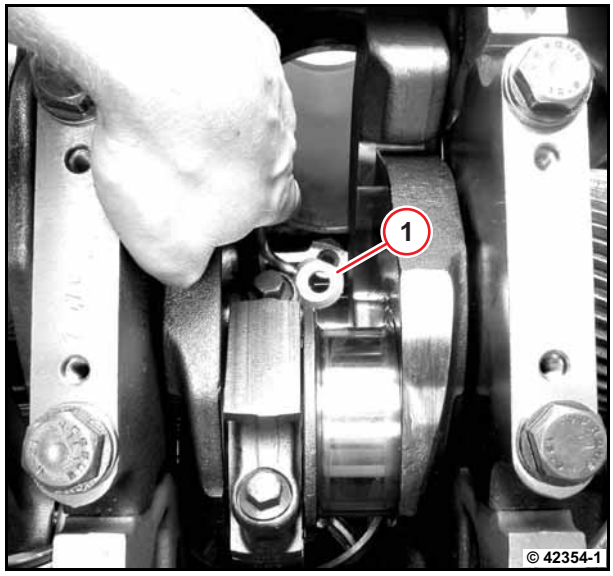
- Unscrew relief valve (1).
- Remove piston cooling nozzle (2).



Installing the piston cooling nozzle

- Mount piston cooling nozzle.
- Screw on the relief valve hand tight.

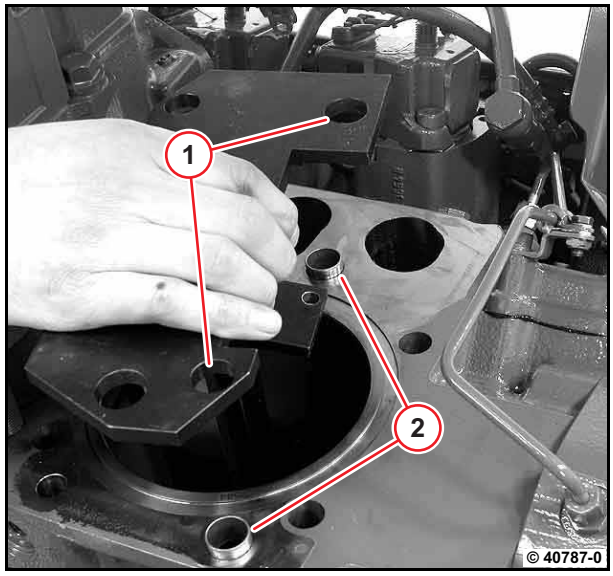
The flattened side (1) faces the cylinder liner.



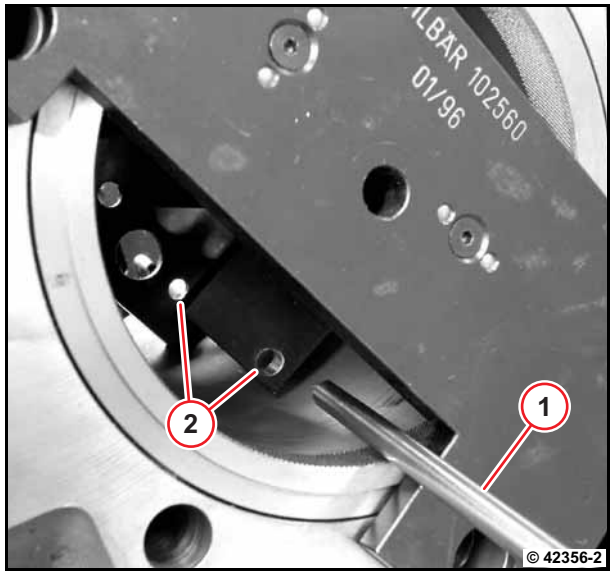
Check the jet position of the piston cooling nozzle.

Attention!
Do not damage the cylinder liner when inserting the tester.

- Insert tester in cylinder liner.
- Set tester with the bores (1) over the clamping bushings (2).



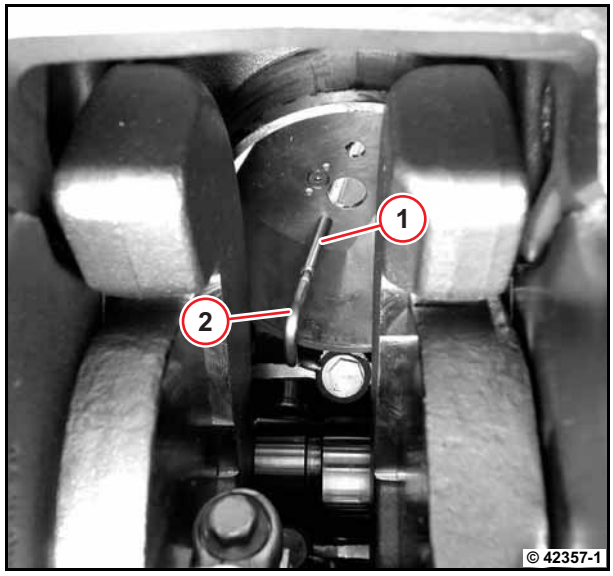
- Insert dipstick (1) in the bores (2) of the tester.



- Insert the tip of the dipstick (1) without using force into the opening in the piston cooling nozzle (2).

The piston cooling nozzle must be turned.

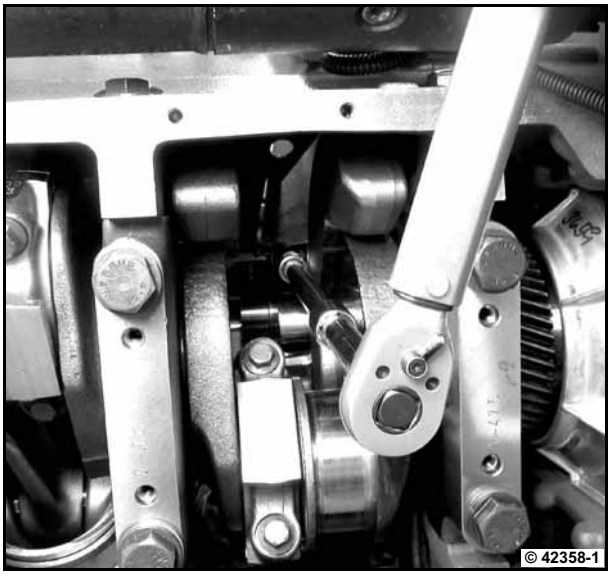
Attention!
If it cannot be turned, the piston cooling nozzle must be renewed!
The piston cooling nozzle may not be bent!
The piston cooling nozzle must be in line with the dipstick!



- Tighten the relief valve.

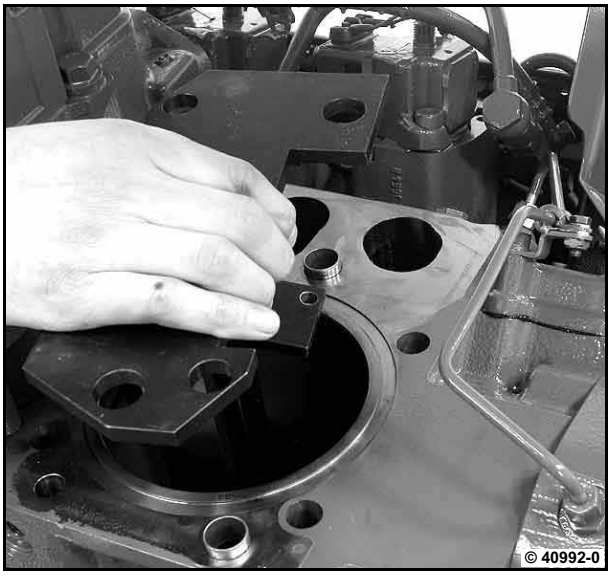
A08 081

Attention!
Make sure the piston cooling nozzle is not twisted!



- Remove the dipstick.
- Remove the tester.
- Install piston and connecting rod.

W 02-09-03



6

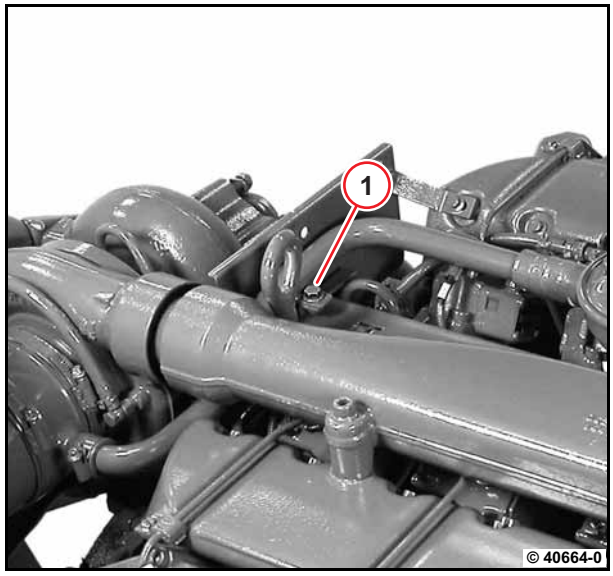
Removing and installing the crankcase breather (oil separator)

Commercial available tools

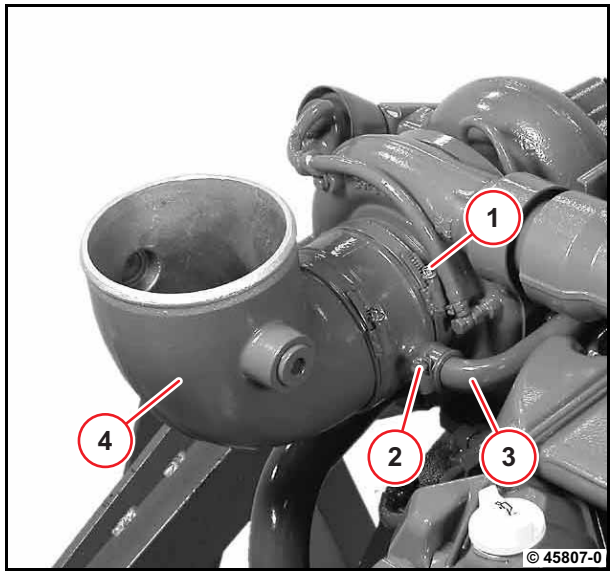
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the crankcase bleeding

- Unscrew screw (1).

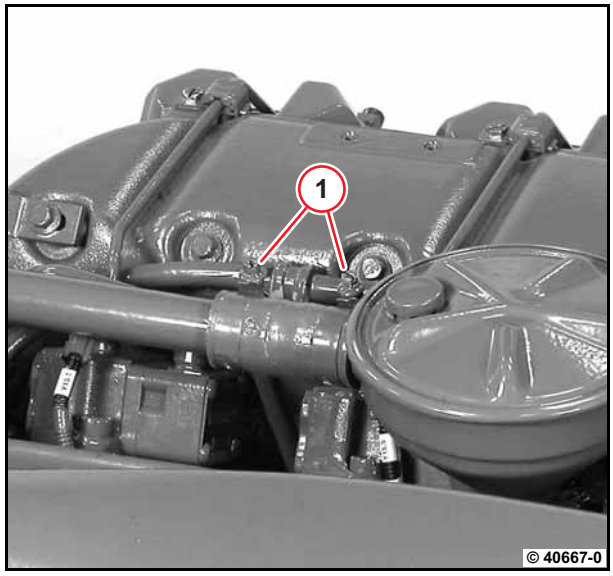


- Loosen hose clip (1).
- Loosen hose clip (2).
- Pull out pipe (3).
- Remove intake elbow (4).

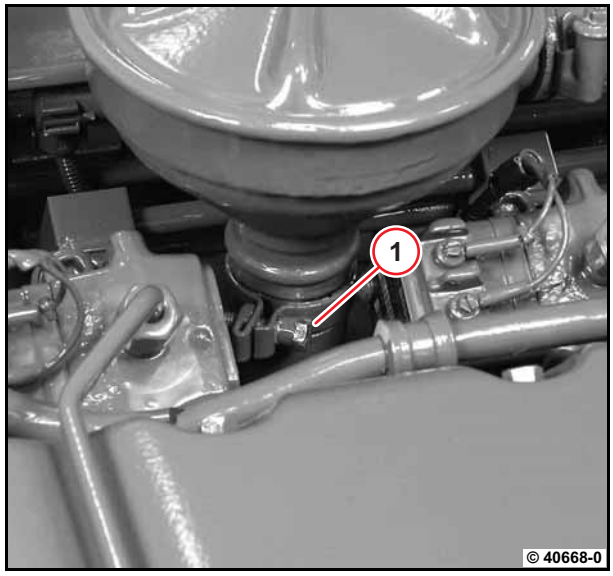


6

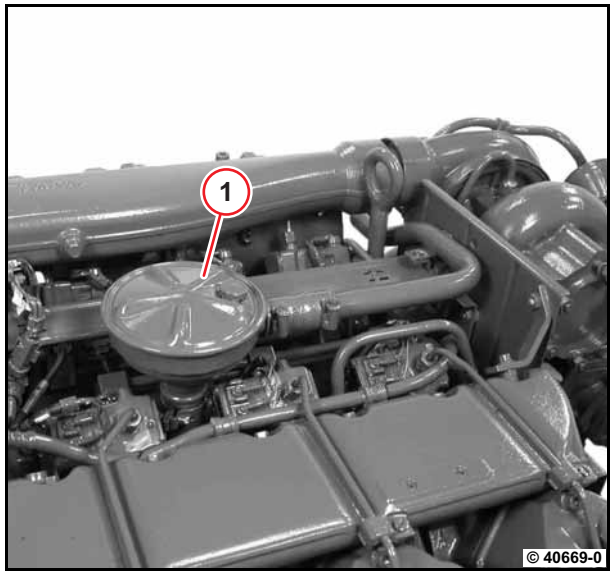
- Loosen hose clips (1).



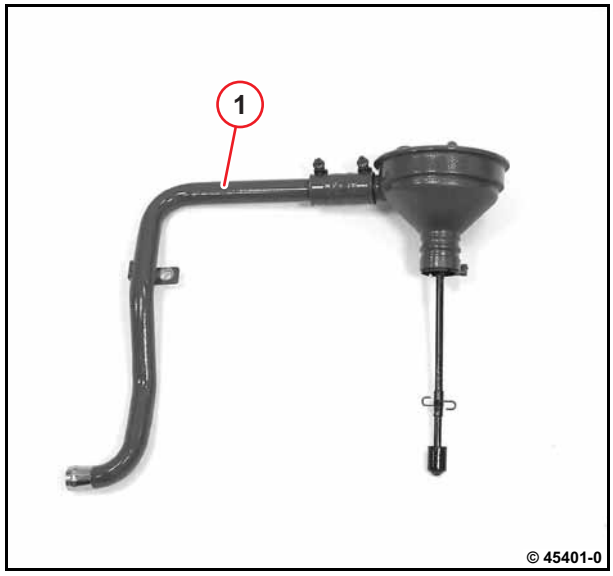
- Loosen pipe clamp (1).



- Pull out oil separator (1) together with pipe.



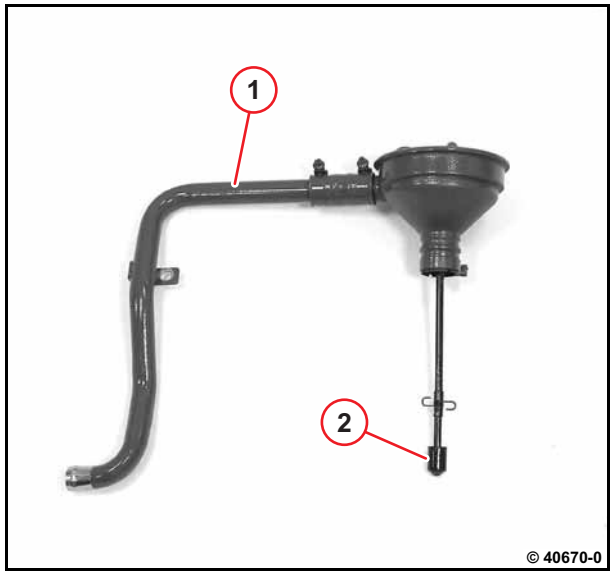
- Pull off pipe (1).



- Visually inspect the components.

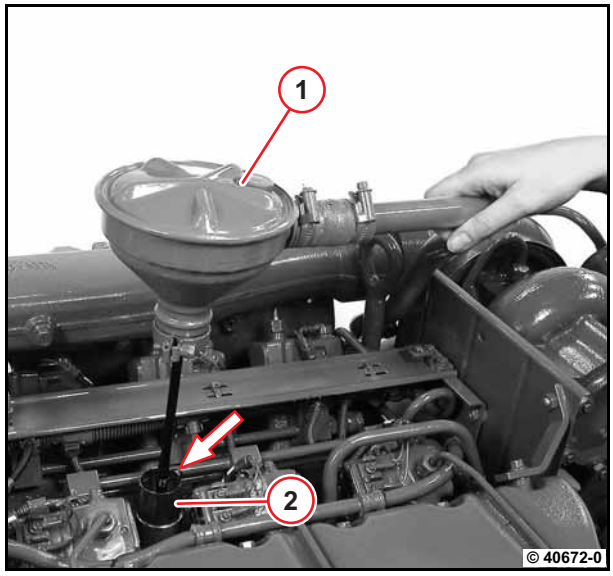
Install crankcase bleeding

- Mount pipe (1).
- Fill oil syphon (2) with engine oil.



- Insert oil separator (1) in flanged pipe (2).

Do not move the spring (arrow).



- Mount intake elbow (4).

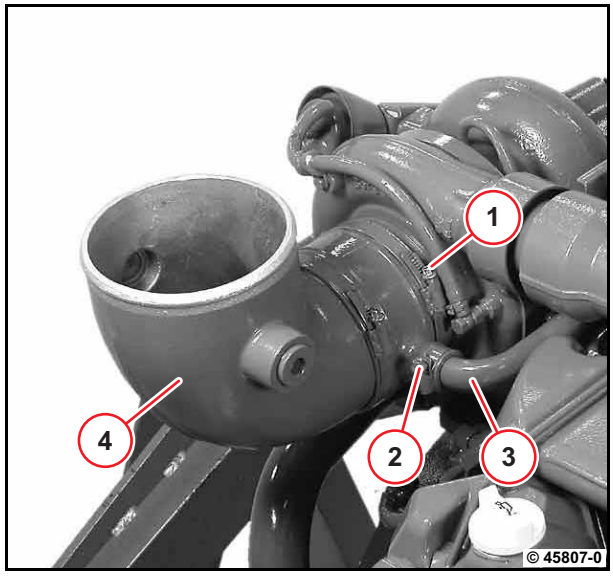
Note installation position.

- Position hose clip (1).
- Tighten hose clip (1).

A06 021

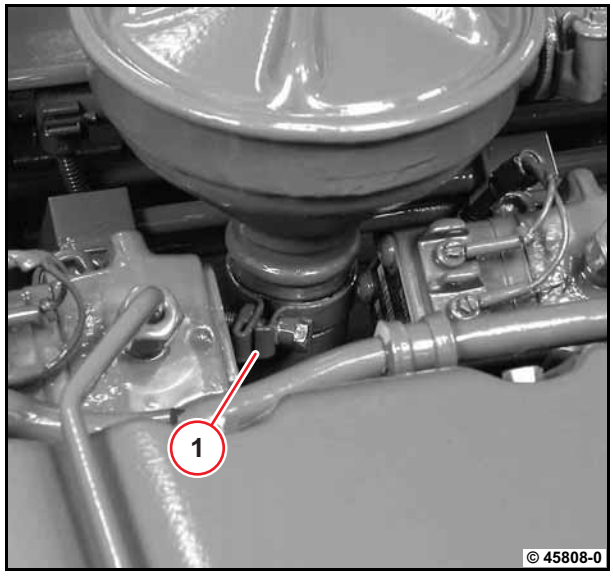
- Mount pipe (3).
- Position hose clip (2).
- Tighten hose clip (2).

A03 064



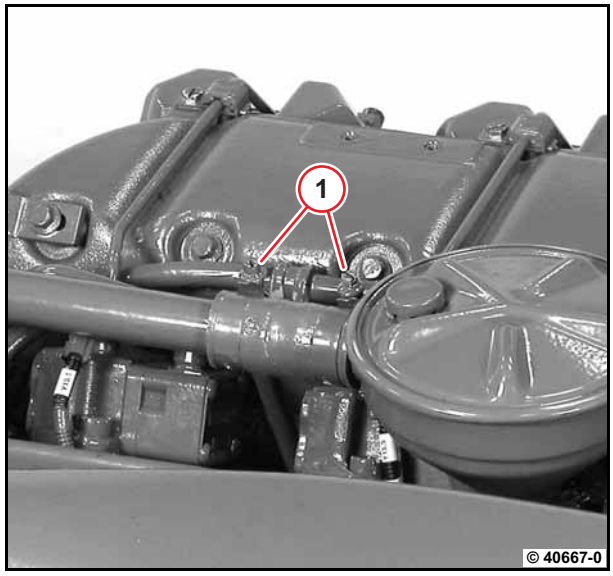
- Position pipe clamp (1).
- Tighten pipe clip (1).

A03 060



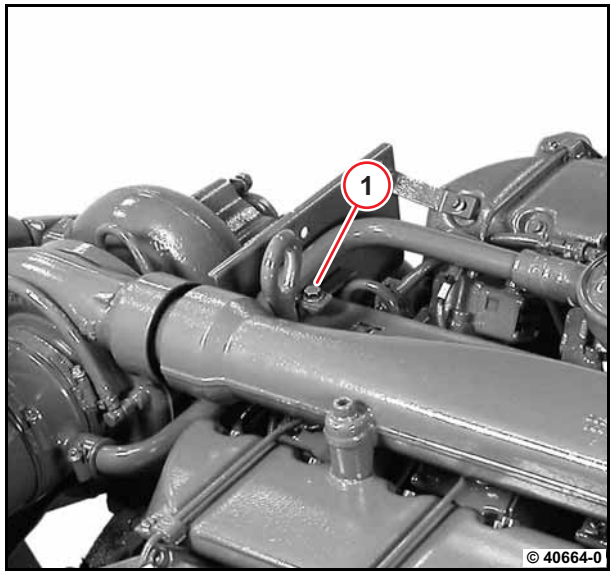
- Position hose clips (1).
- Tighten hose clips (1).

A03 064



- Tighten screw (1).

A03 069



Testing the cylinder liner

Commercial available tools:
– Depth-measuring appliance
– Micrometer gauge
– Internal measuring device

Special tools:
– Dial gauge. 100400

– W 03-03-02

The following work sequence must be carried out on every cylinder unit of a cylinder bank.

Testing the cylinder liner

- Remove cylinder liner.

  W 03-03-02

- Visually inspect the cylinder running surface.

- Prepare internal measuring device:
  – Mount probe bolt for the appropriate measuring range in the internal measuring device.
  – Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  – Set micrometer gauge to 42 mm.
  – Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to "0".

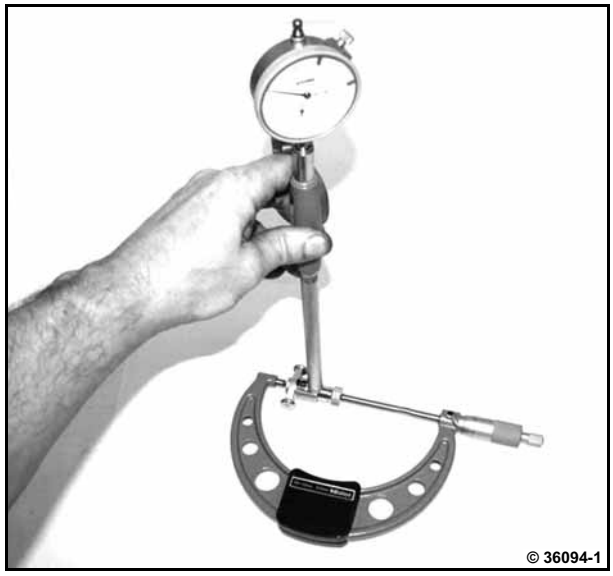
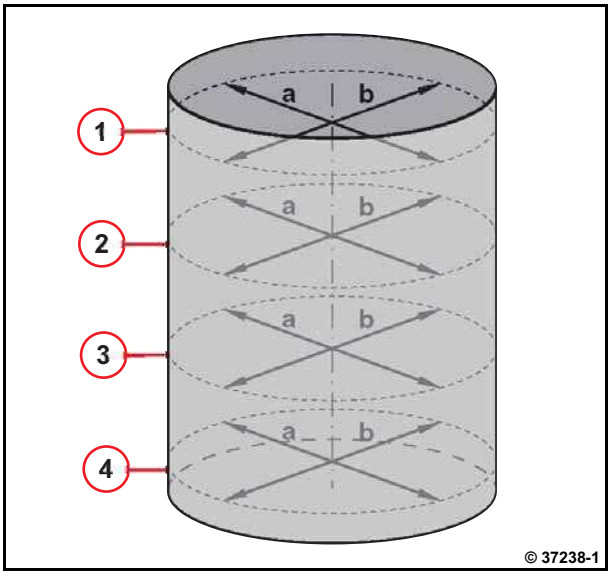
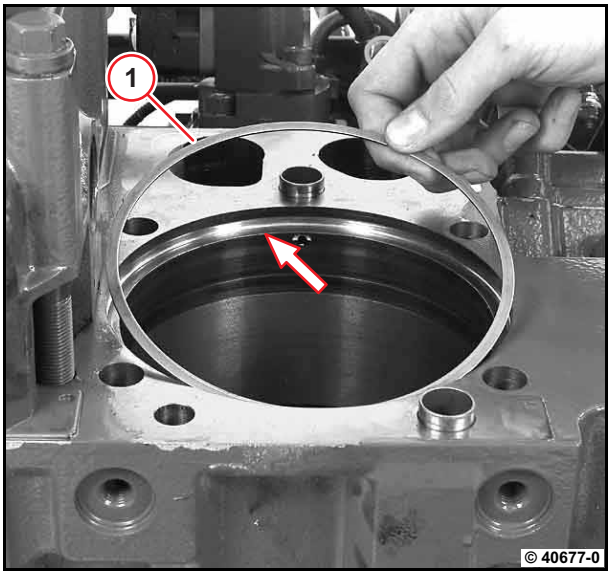


Diagram for measuring the cylinder running surface at the points "a" and "b" in the levels "1 - 4".



- Remove shim ring (1).
- Visually inspect collar rest (arrow).
- Visually inspect sealing surface.



- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

P03 31

Measuring points see diagram.

When the wear limit is reached, the cylinder liner must be renewed.

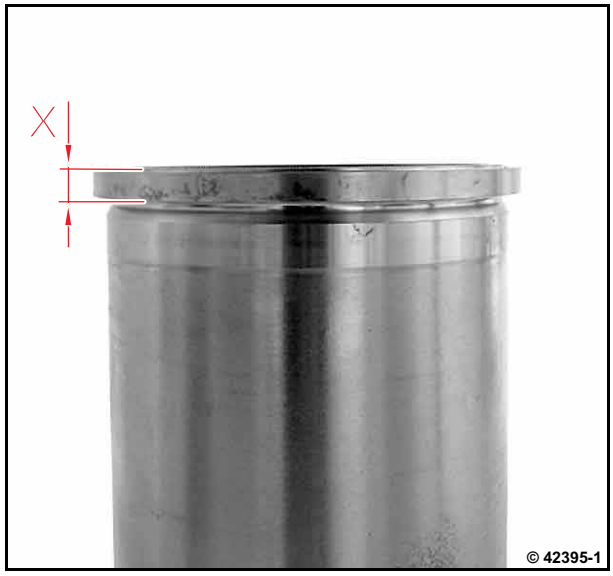
- Measure collar height in area (X) with micrometer gauge.

P03 36

Carry out the measurement at several places on the collar rest.

- Install cylinder liner.

W 03-03-02



6

Removing and installing the cylinder liner

Commercial available tools:
– Depth-measuring appliance

Special tools:
– Assembly device 150120
– Extraction tool 150130

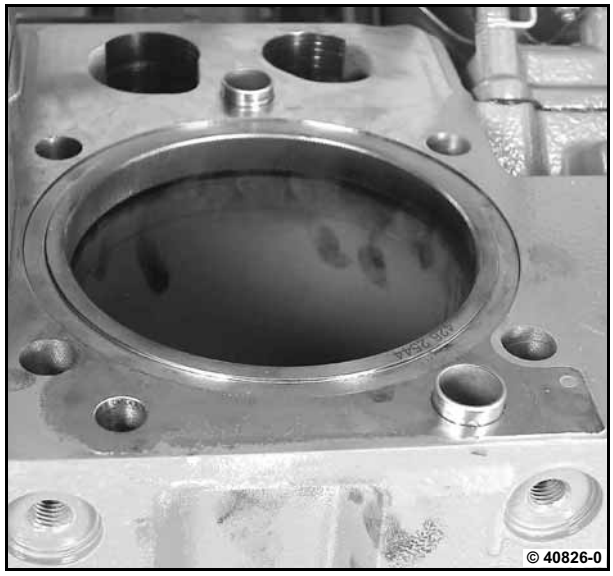
– Fitting compound DEUTZ AP1908

– W 02-09-03
– W 03-03-01
– W 03-03-08

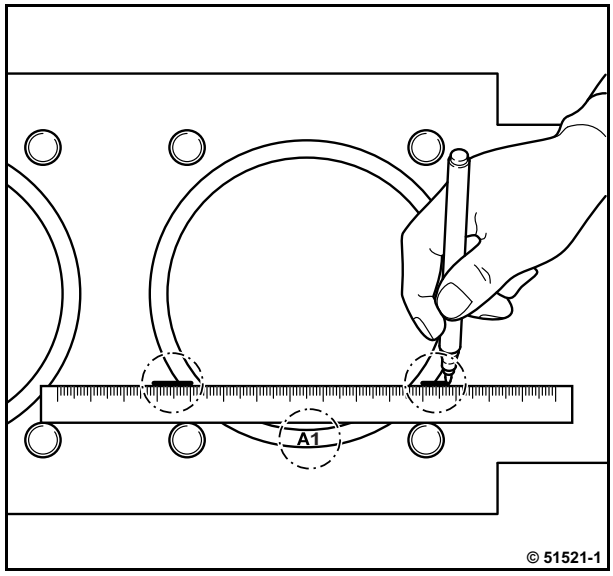
Removing the cylinder liner

- Remove piston and connecting rod.

  W 02-09-03



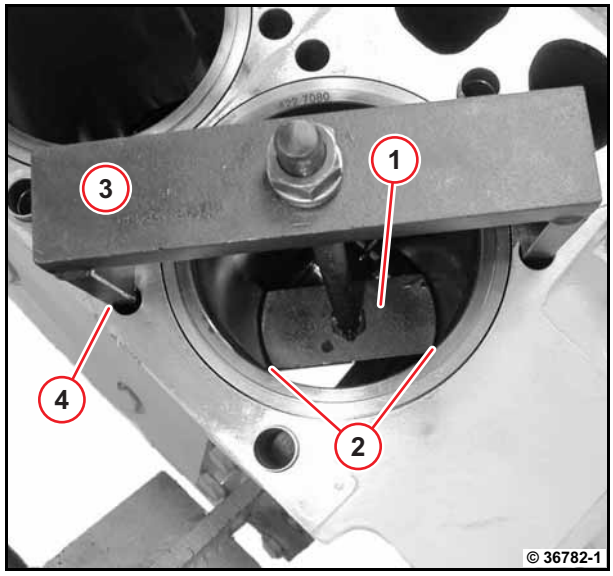
- Mark installation position of the cylinder liner on the crankcase.
- Mark cylinder liner with the cylinder designation.



- Fold back plate and insert puller.
  - Place the plate (1) with the lay-on surfaces against the cylinder liner (2) and hold them together.
  - Mount the counter holder (3) on the crankcase (4) .

Attention!
Do not damage the peripheral surfaces and the sealing surfaces.
Do not damage the piston cooling nozzle.

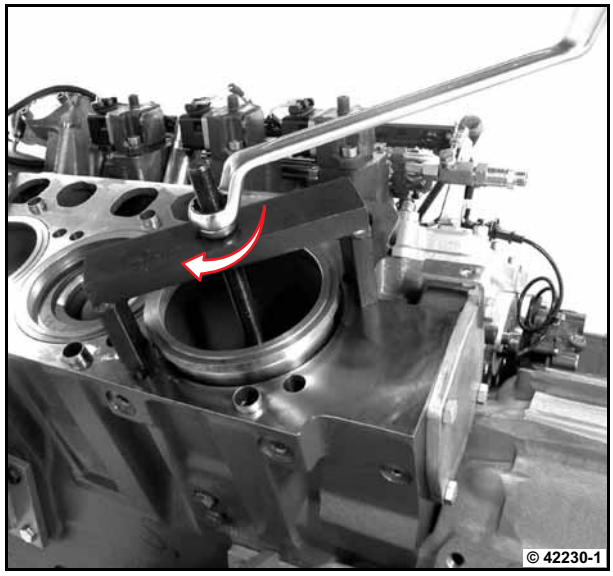
The counterweights of the crankshaft face the lubricating oil pan.



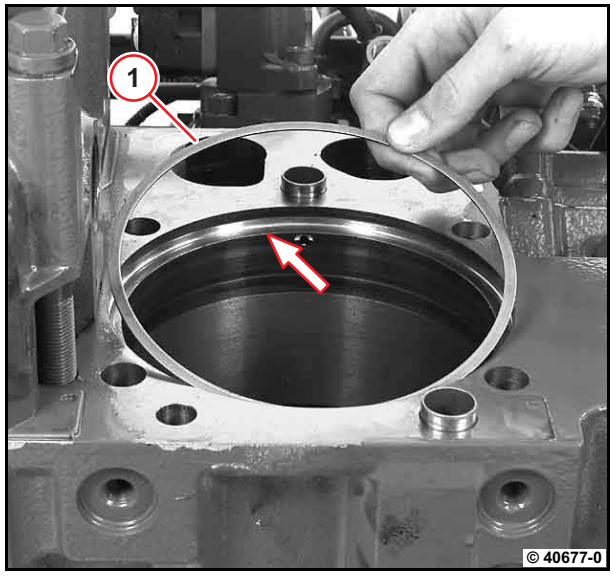
- Pull the cylinder liner up and out.

Turn the nut in the direction of the arrow.

- Remove the disassembly device.
- Pull the cylinder liner up and out.

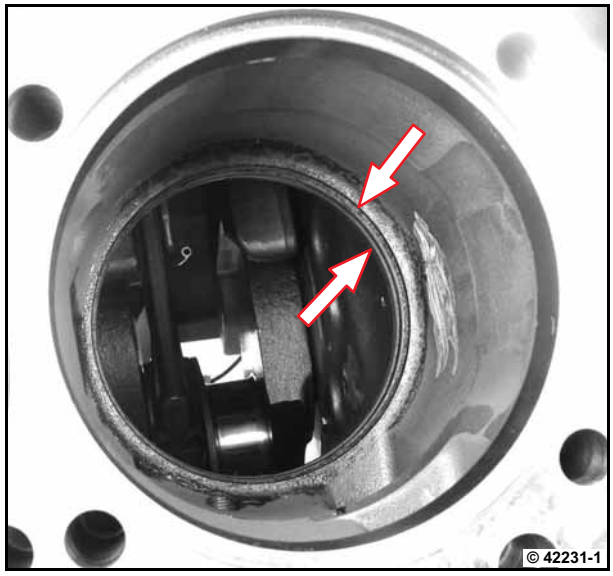


- Remove shim ring (1).
- Visually inspect collar rest (arrow).
- Visually inspect sealing surface.



- Remove both O-rings (arrows).
- Test the cylinder liners.

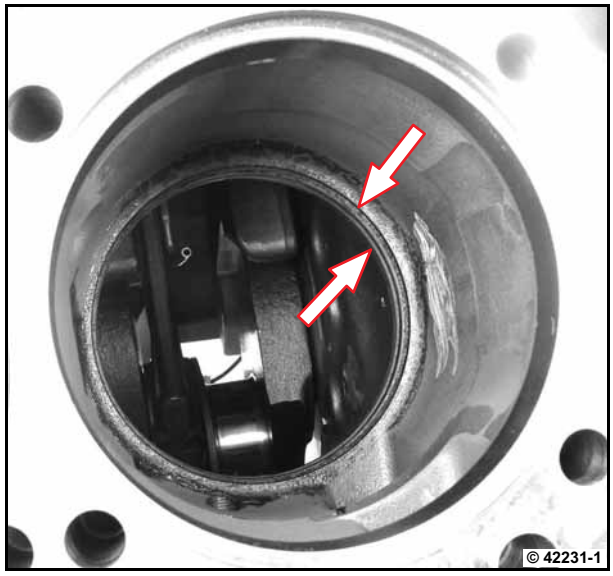
W 03-03-01



Install cylinder liner

- Insert new O-rings (arrows).

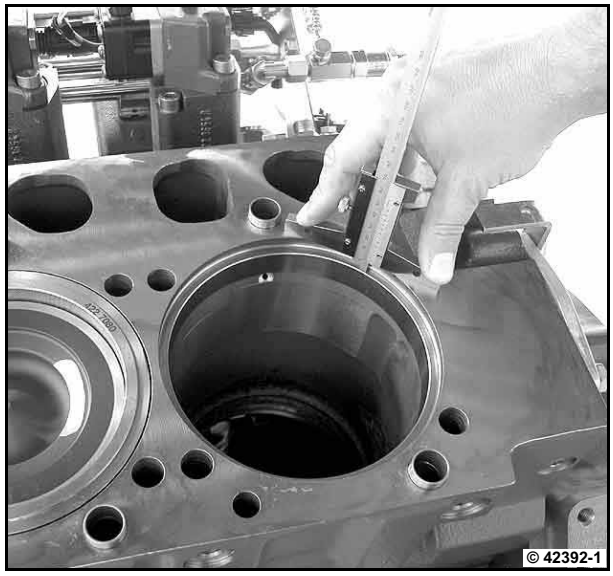
Pull the O-rings apart slightly to prevent them falling out during assembly.



- Measure collar rest with depth measuring appliance.

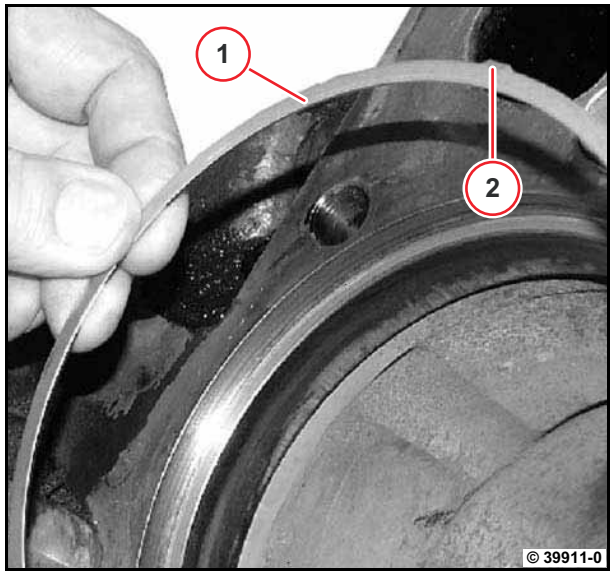
P03 35

Carry out the measurement at several places on the collar rest.



- Insert shim ring (1).

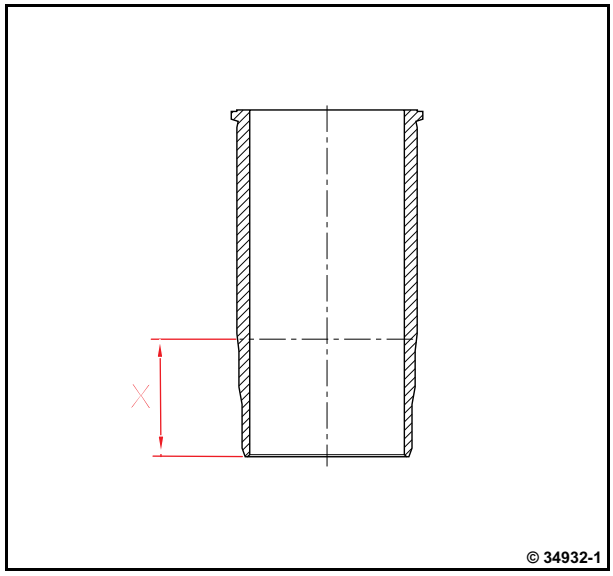
A centring lug (2) points up.



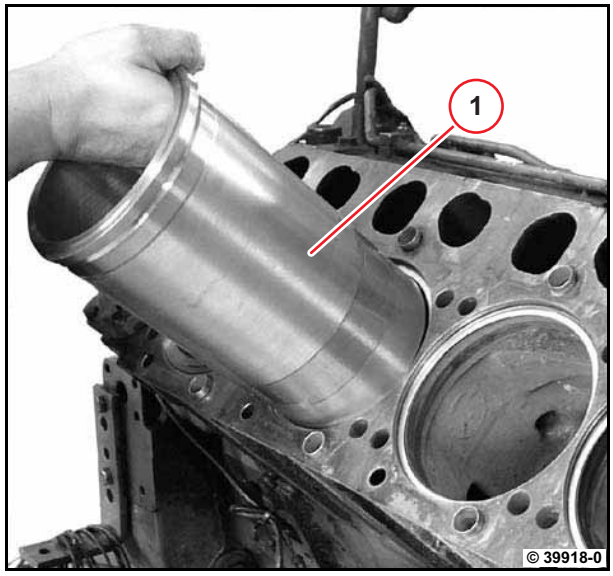
6

- Coat the cylinder liner in the "X" area with fitting compound.

Make sure that the liner surface and the crankcase are absolutely clean before installing the cylinder liner.



- Insert the cylinder liner (1) in the crankcase.

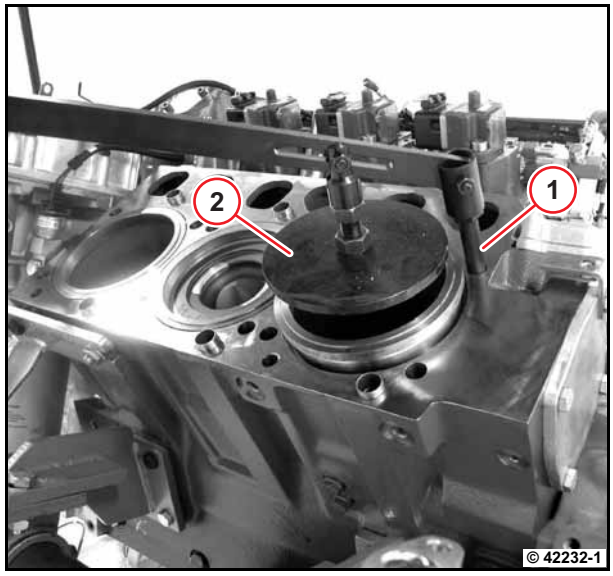


- Screw in retaining pins (1).

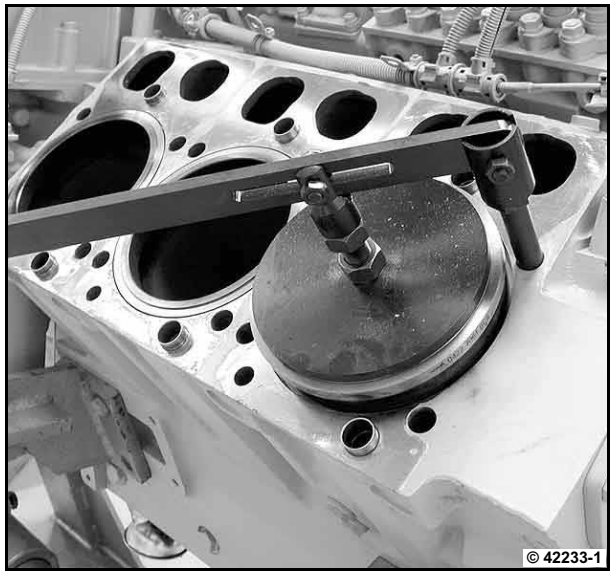
Screw retaining pins into a threaded bore for screws of the cylinder head.

- Mount pressure plate (2) on cylinder liner.

Make sure the pressure plate is fit evenly.



- Press in cylinder liner to stop.
- Remove the assembly device.

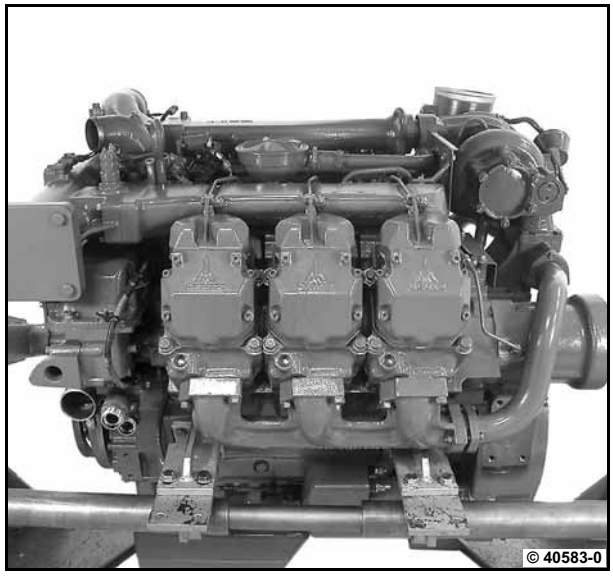


- Check the overhang of the cylinder liner.

W 03-03-08

- Install piston and connecting rod.

W 02-09-03



Checking the overhang of the cylinder liner

Commercial available tools:
– Magnetic measuring stand

Special tools:
– Dial gauge. 100400

– W 01-04-04

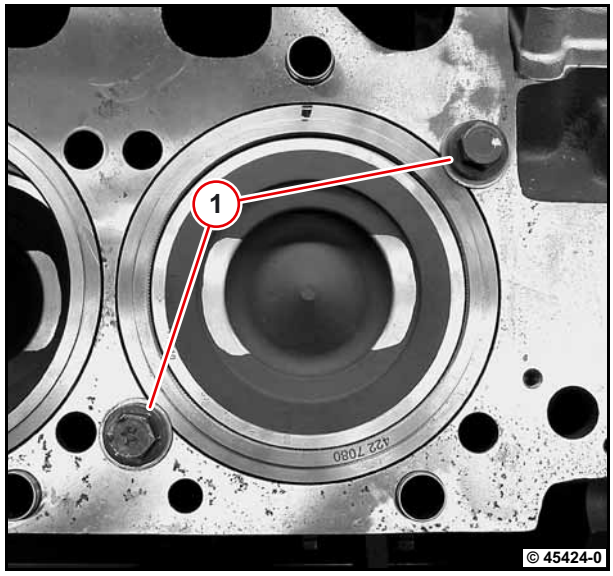
Checking the overhang of the cylinder liner

- Remove cylinder head.

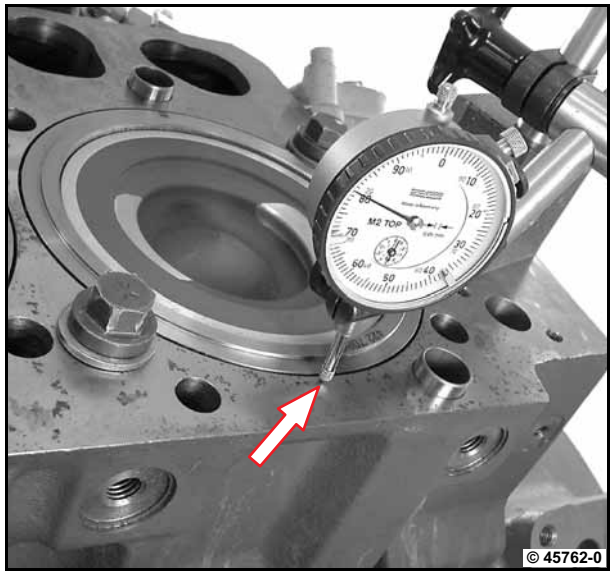
  W 01-04-04

- Insert screws and washers (1) diagonally opposed.
- Tighten screws until they touch the cylinder liner.

Washers:
Maximum thickness 4 mm
Screw length:
M16 x 90



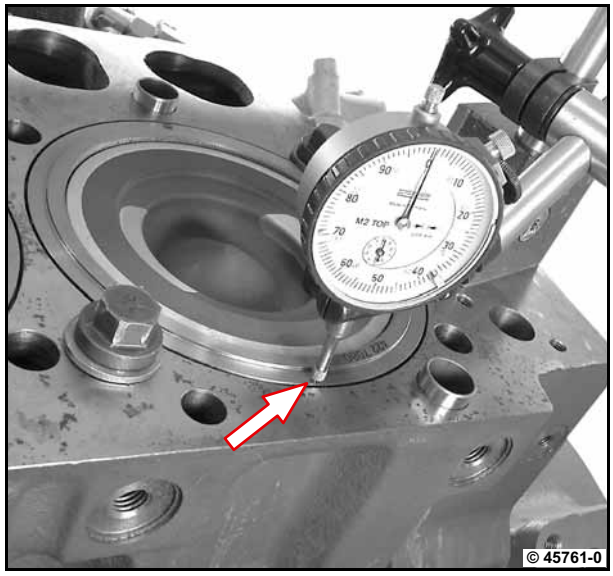
- Mount magnetic measuring stand.
- Insert dial gauge.
- Apply stylus of the dial gauge to the crankcase sealing surface with pre-tension (arrow).
- Turn the dial until the pointer points to "0".



- Loosen magnetic measuring stand.
- Turn the magnetic measuring stand carefully until the stylus is touching the sealing surface of the cylinder liner (arrow).
- Mount magnetic measuring stand.
- Read off measured value.

P03 39

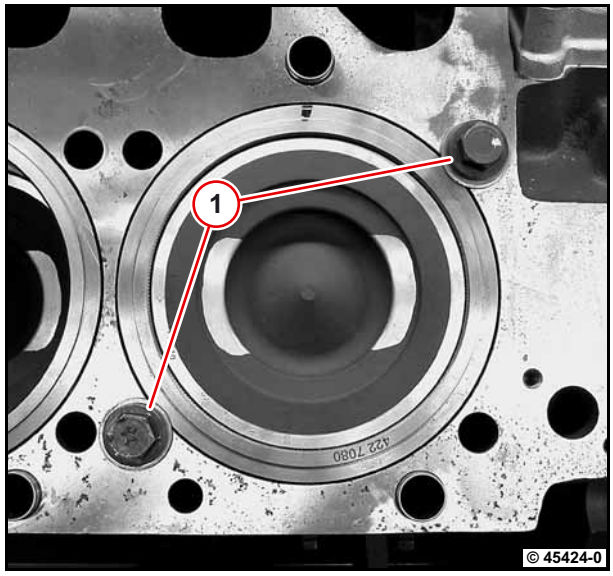
Make measurements at at least 3 other points on the cylinder liner.



6

- Unscrew screws (1).
- Install cylinder head.

W 01-04-04



Removing and installing genset support

Commercial available tools:
– Open wrench size SW 22

– Packing compound
DEUTZ DW 47

– W 02-02-04
– W 06-07-03 . . . . . (A-bank)
– W 06-07-03 . . . . . (B-bank)
– W 08-04-06
– W 09-07-08
– W 09-08-04

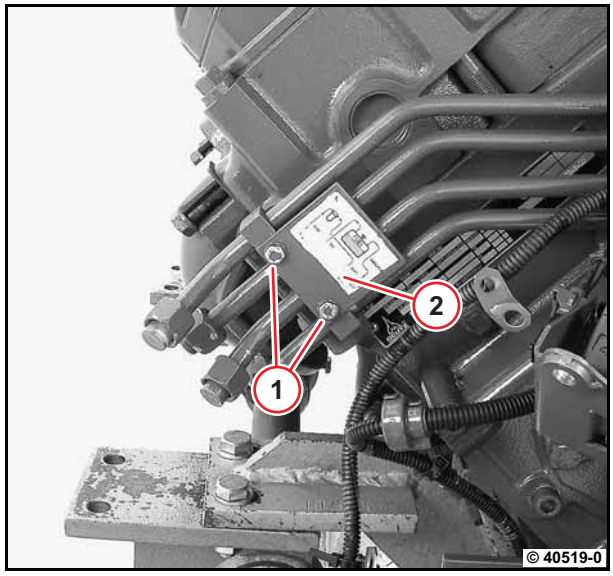
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing genset support

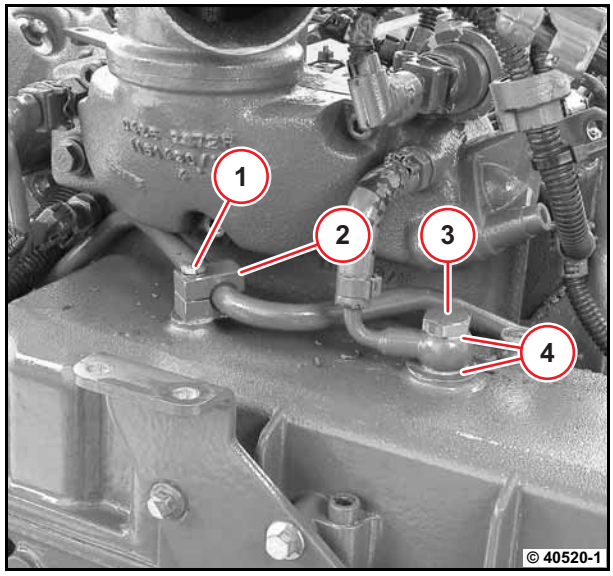
- Remove charge air pipe (A-bank).

  W 06-07-03
- Remove charge air pipe (B-bank).

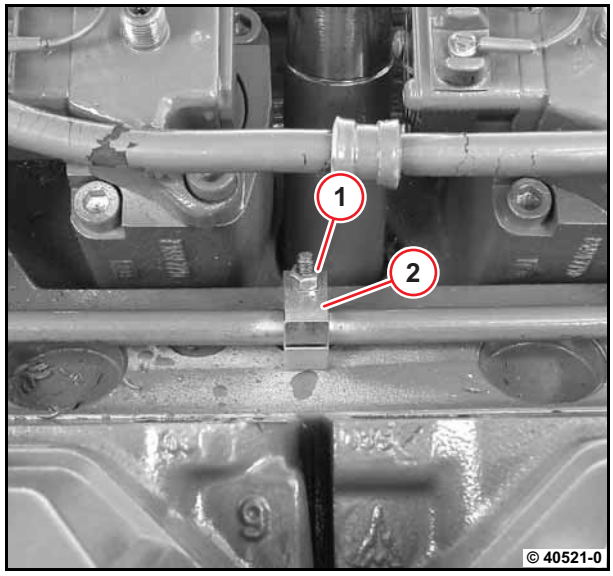
  W 06-07-03
- Unscrew screws (1).
- Remove the holder (2).



- Unscrew screw (1).
- Remove the holder (2).
- Unscrew hollow screw (3).
- Remove sealing rings (4).



- Unscrew nut (1).
- Remove the holder (2).

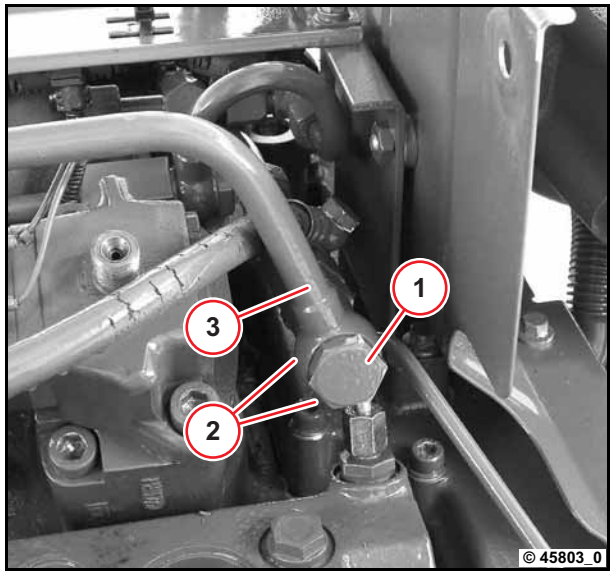


6

- Unscrew hollow screw (1).

Hold overflow valve.

- Remove fuel pipe (3).
- Remove sealing rings (2).



- Remove thermostat housing.

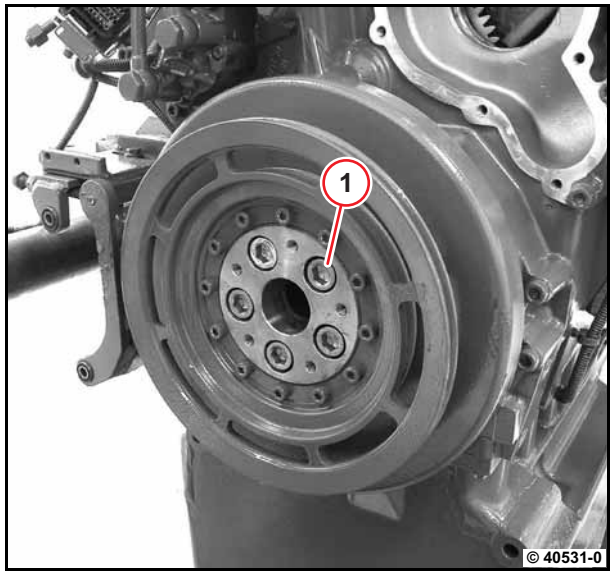
W 09-08-04

- Remove coolant pump.

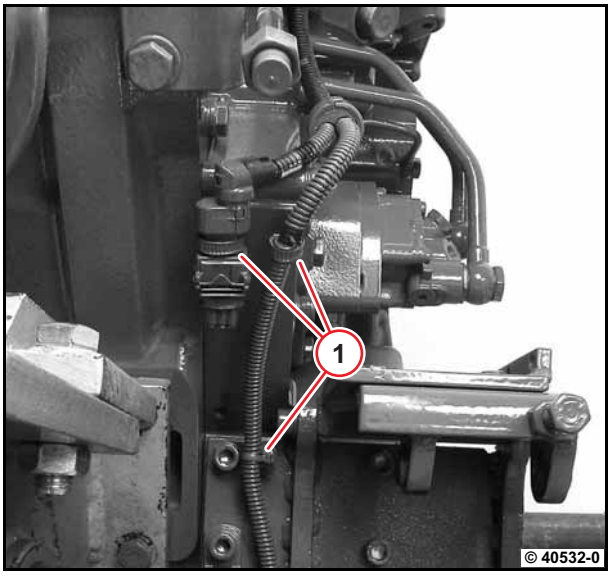
W 09-07-08

- Unscrew all screws (1).
- Remove flanged hub with torsional vibration damper and V-belt pulley.

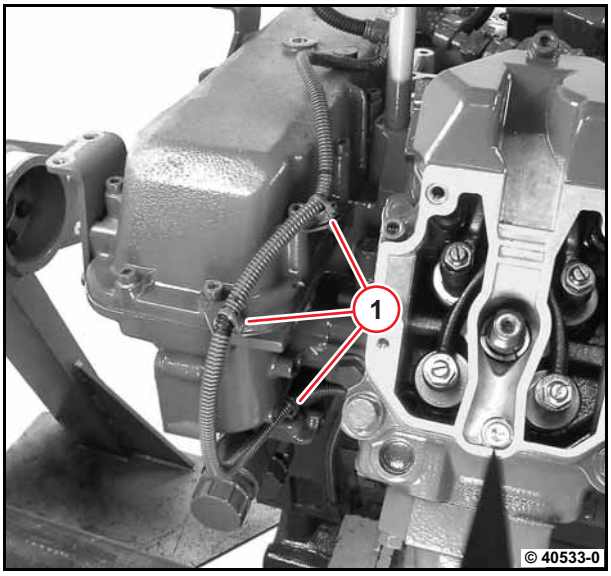
Block flywheel with suitable tool.



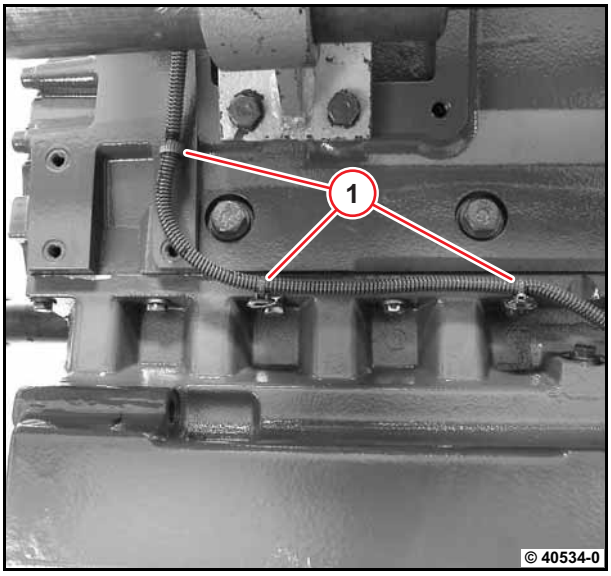
- Remove cable tie (1).



- Remove cable tie (1).



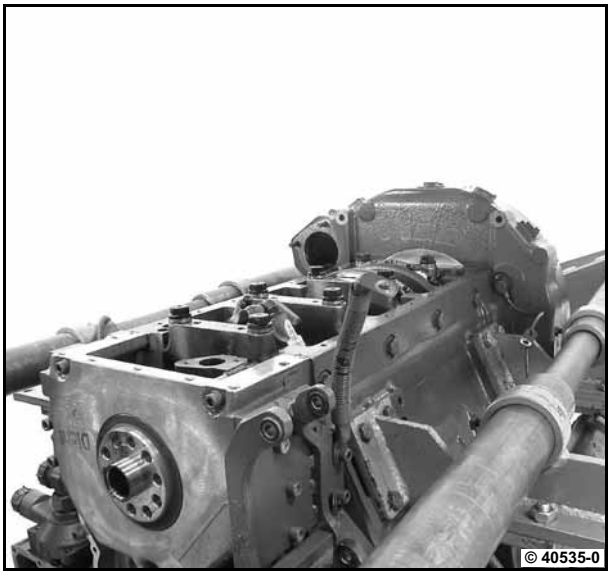
- Remove cable tie (1).



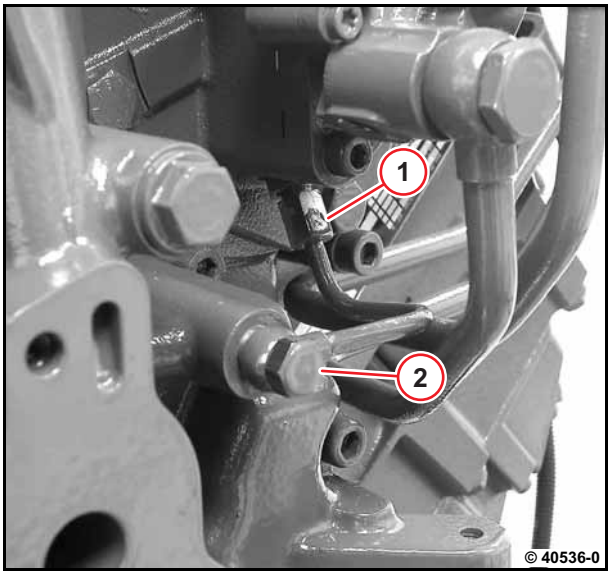
6

- Remove oil suction pipe.

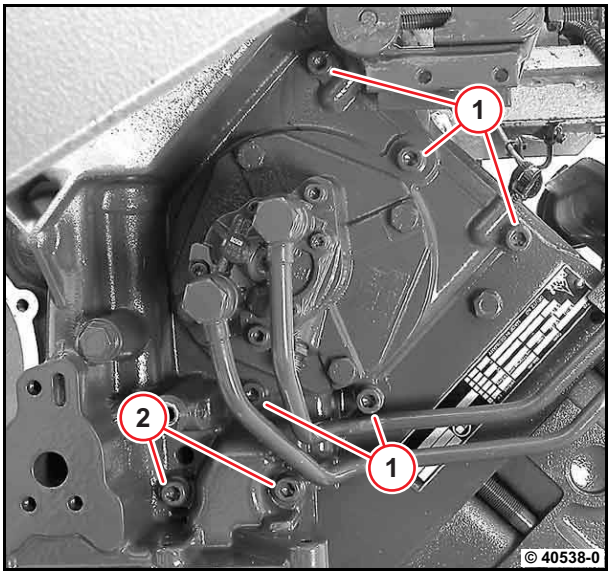
W 08-04-06



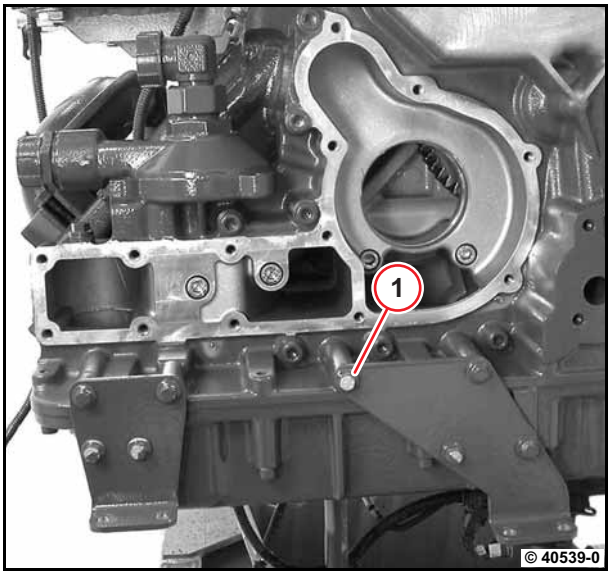
- Unscrew lock nut (1).
- Unscrew hollow screw (2).
- Remove lubricating oil pipe.
- Remove sealing rings.



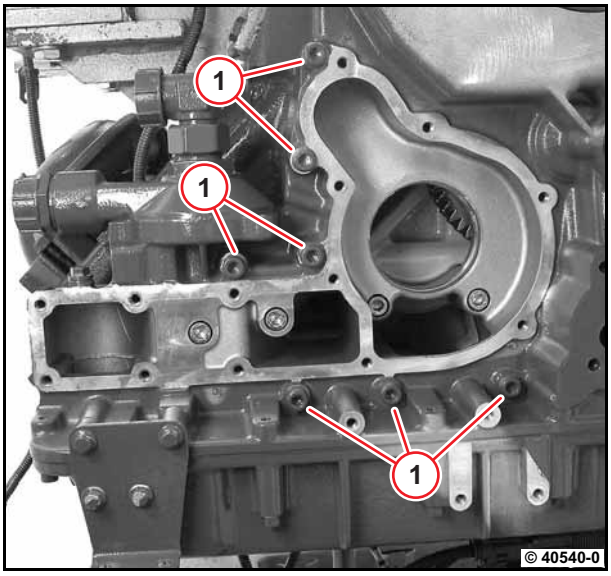
- Unscrew screws (1).
- Unscrew screws (2).



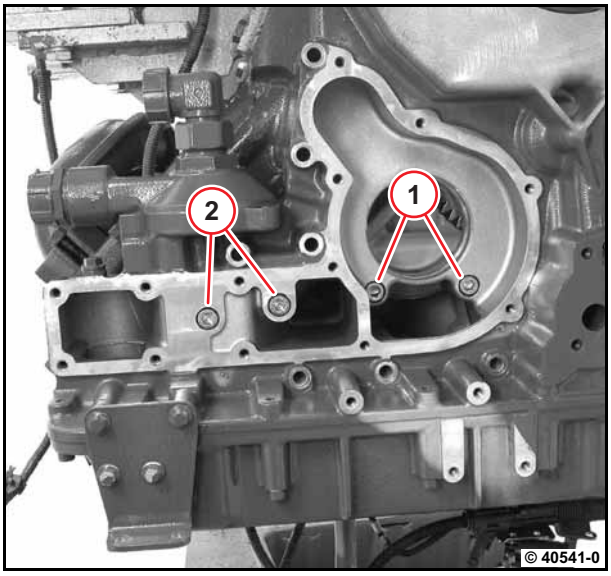
- Unscrew all screws (1).
- Remove holder.



- Unscrew screws (1).



- Unscrew screws (1).
- Unscrew screws (2).

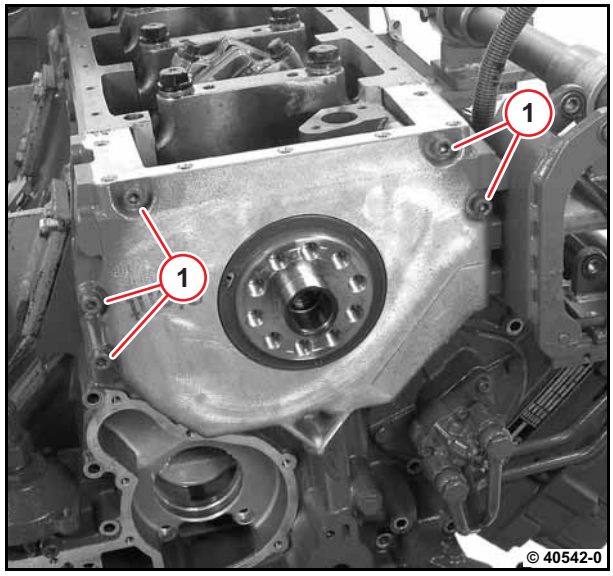


- Unscrew screws (1).
- Remove genset support.
- Remove gasket.

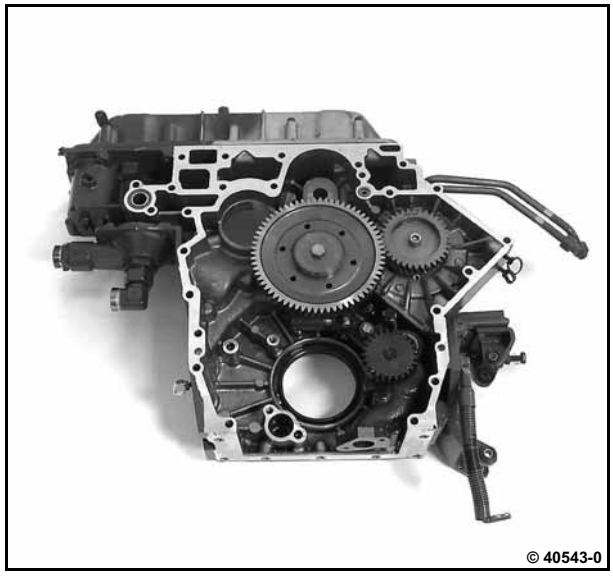
Attention!
Do not damage the crankshaft journal when removing the genset support.

The teeth of the oil pump gears and the idler gear must grip the teeth of the crankshaft drive wheel.

Use suitable workshop crane.

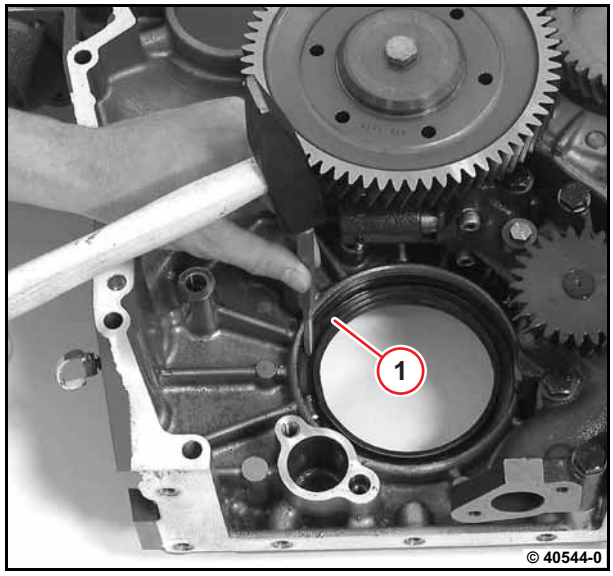


- Visually inspect the components.



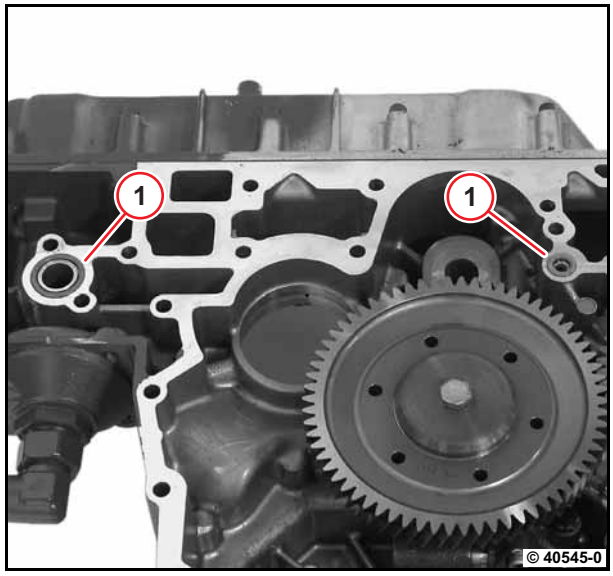
- Knock out crankshaft sealing ring (1).

Attention!
Do not damage sealing surface when knocking out.



Installing genset support

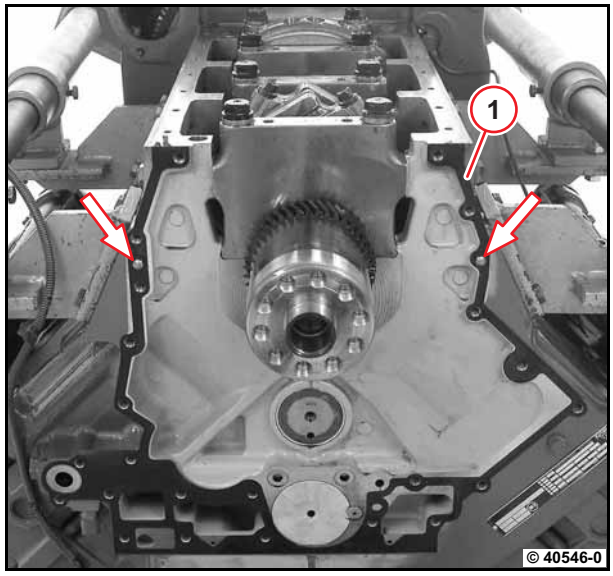
- Clean sealing surfaces.
- Fix new O-rings (1) with a little grease.



- Fix new gasket (1) to the crankcase with a little grease.

The oil pan sealing surface on the crankcase must face upwards.

Make sure the parallel pins (arrows) are in place.



- Install genset support.

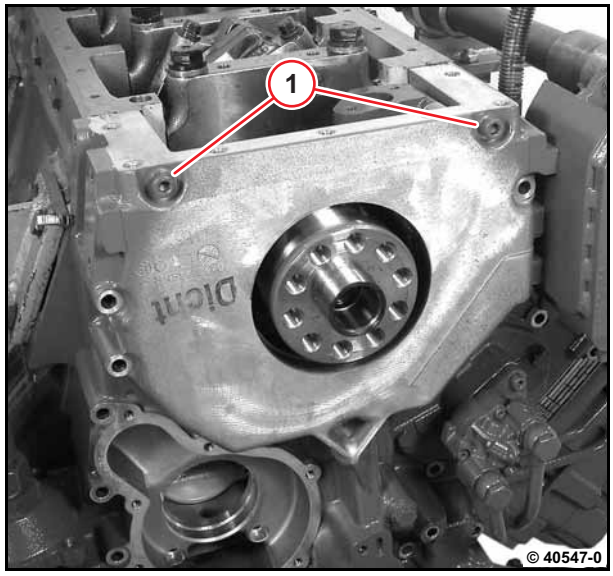
Use suitable workshop crane.

- Centre genset support above the parallel pins.
- Fix genset support with screws (1).

The teeth of the oil pump gears and the idler gear must grip the teeth of the crankshaft drive wheel.

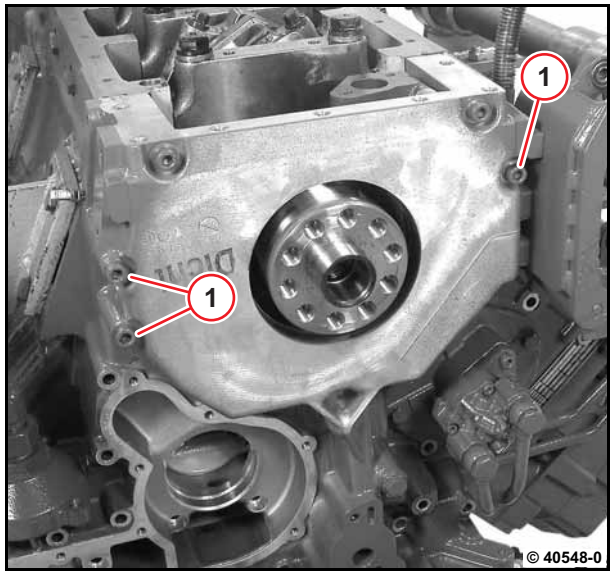
Screw length:

M10 x 150 mm



- Tighten screws (1) alternately.

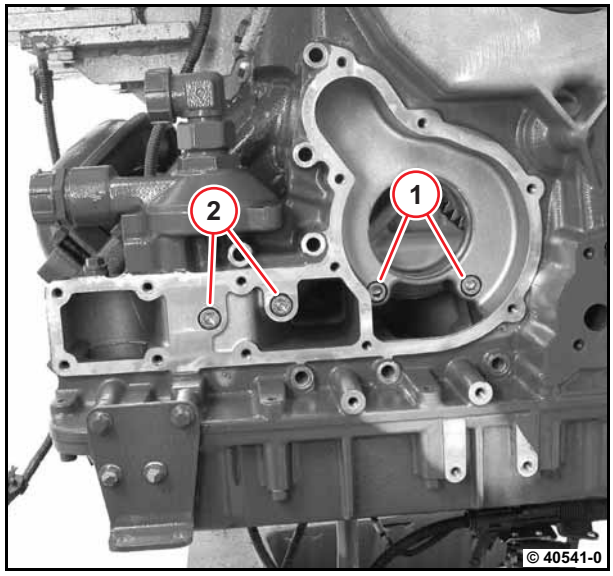
Screw length:
M10 x 150 mm



6

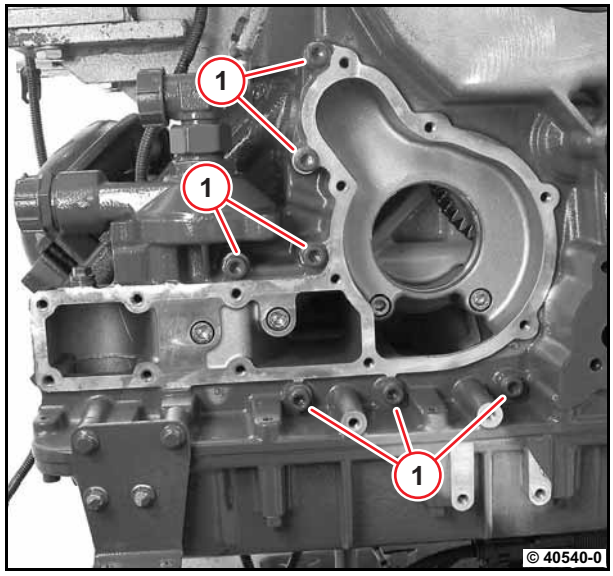
- Tighten screws alternately.

Screw length:
M10 x 65 mm (1)
M10 x 100 mm (2)



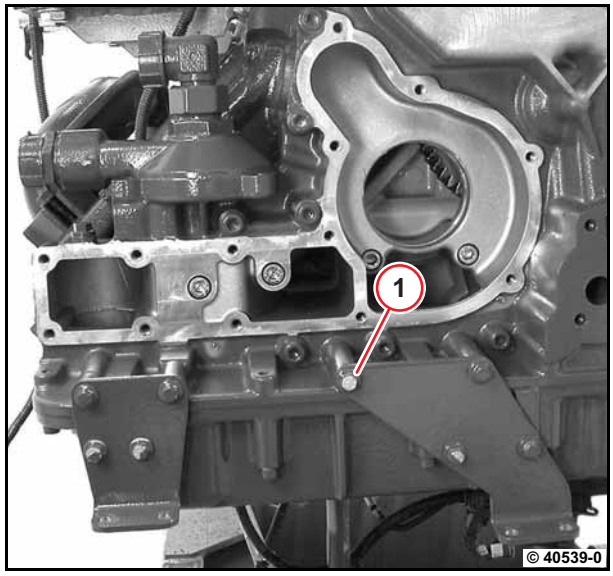
- Tighten screws (1) alternately.

Screw length:
M10 x 110 mm



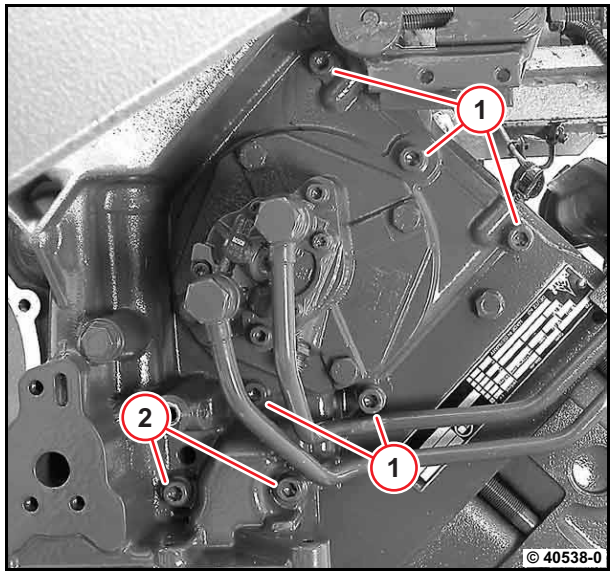
- Mount holder.
- Fasten all screws (1).

TIghten screws only after mounting the connecting pipe.



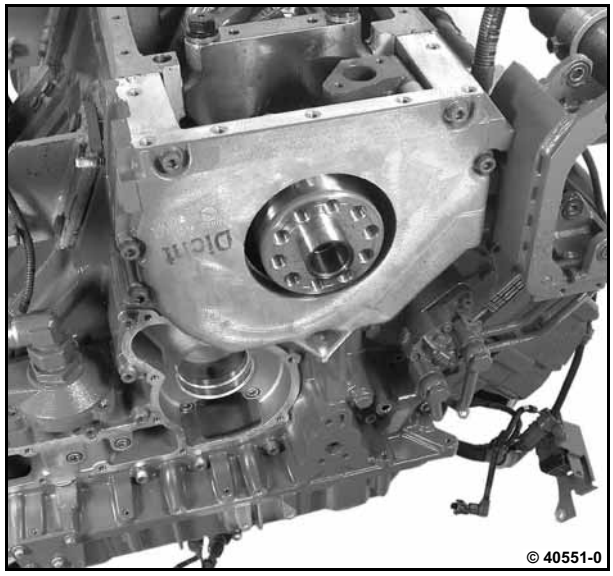
- Tighten screws alternately.

Screw length:
M10 x 70 mm (1)
M10 x 110 mm (2)

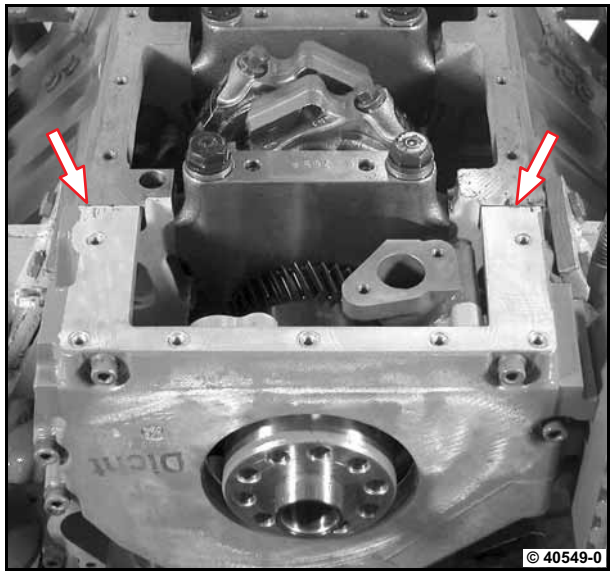


- Tighten screws alternately.

A03 020

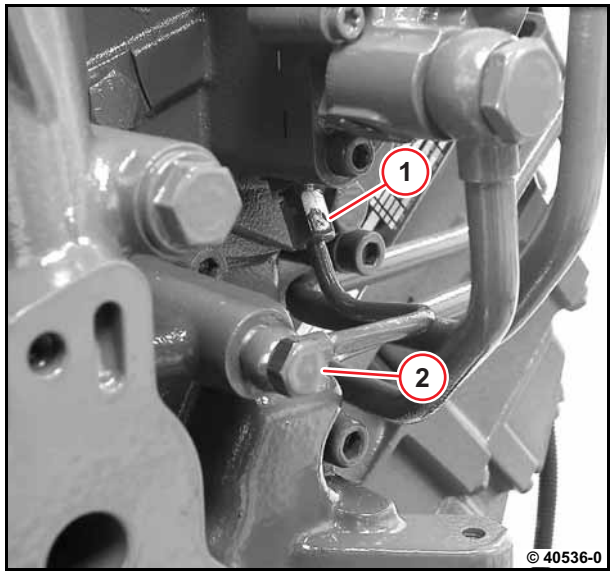


- Cut off overhanging gasket (arrows) flush with the sealing surface of the oil tray.



6

- Mount new sealing rings.
- Mount the lubricating oil pipe.
- Screw on hollow screw (2).
- Screw on lock nut (1).

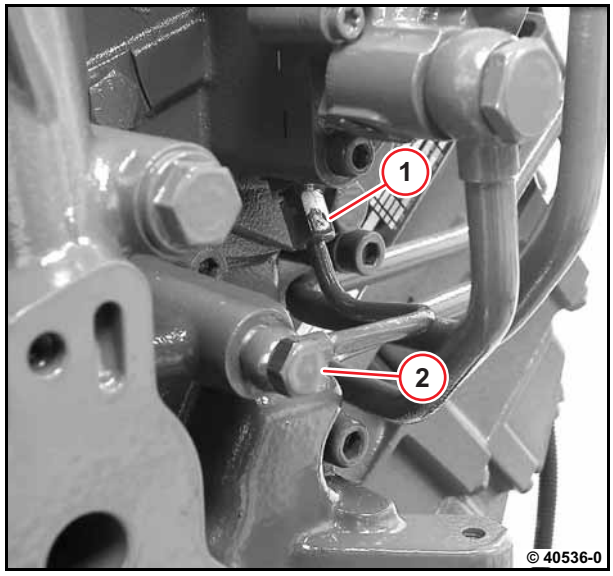


- Tighten hollow screw (2).

  A08 013

- Tighten lock nut (1).

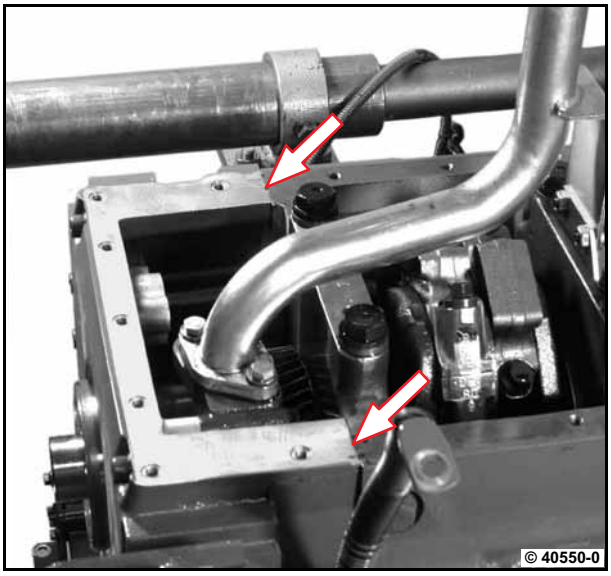
  A08 014



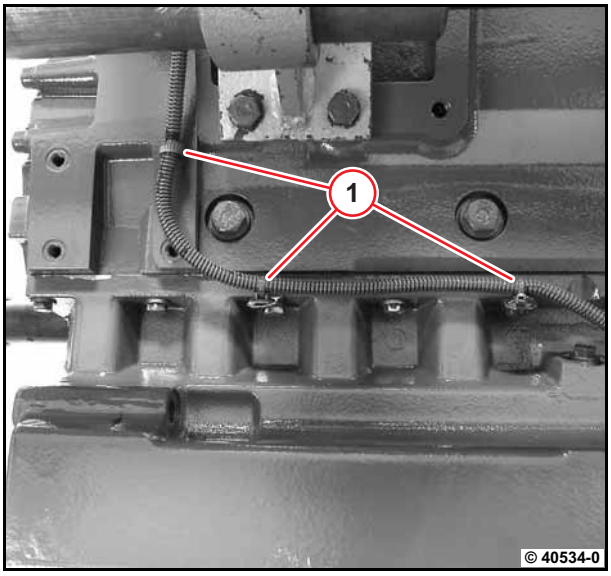
- Clean sealing surfaces.
- Install oil suction pipe.

W 08-04-06

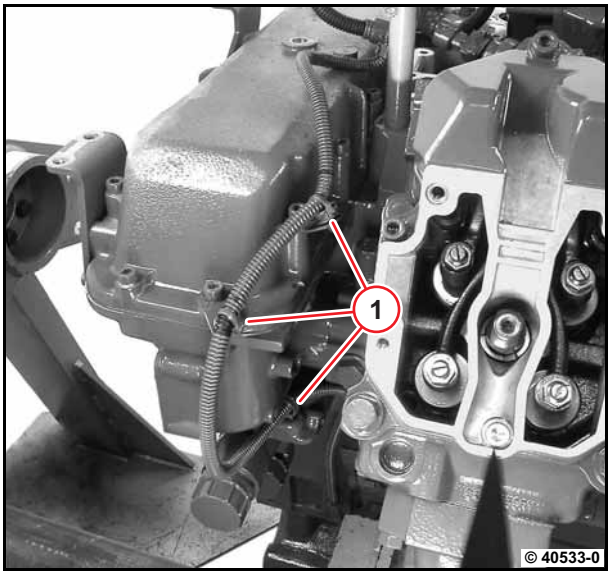
Before mounting the lubricating oil pan, fill in the joints crankcase/genset support (arrows) with packing compound.



- Fix the cable strand with cable tie (1) without tension.

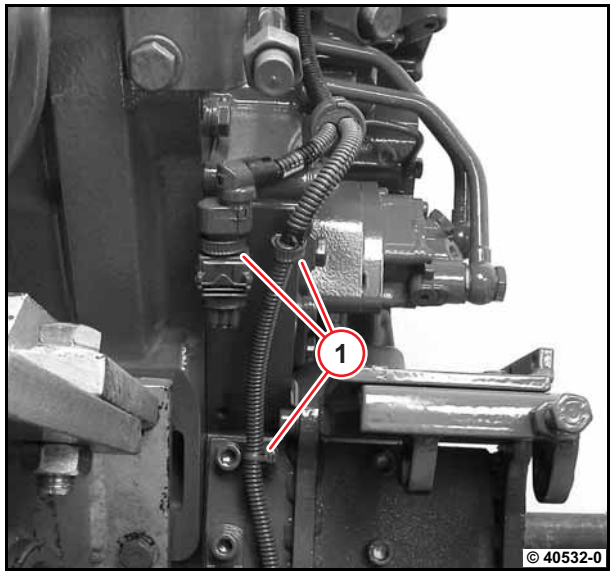


- Fix the cable strand with cable tie (1) without tension.



- Fix the cable strand with cable tie (1) without tension.
- Install crankshaft sealing ring (opposite side to flywheel)

W 02-02-04



6

- Mount the torsional vibration damper.
- Tighten all screws (1) alternately.

A12 030

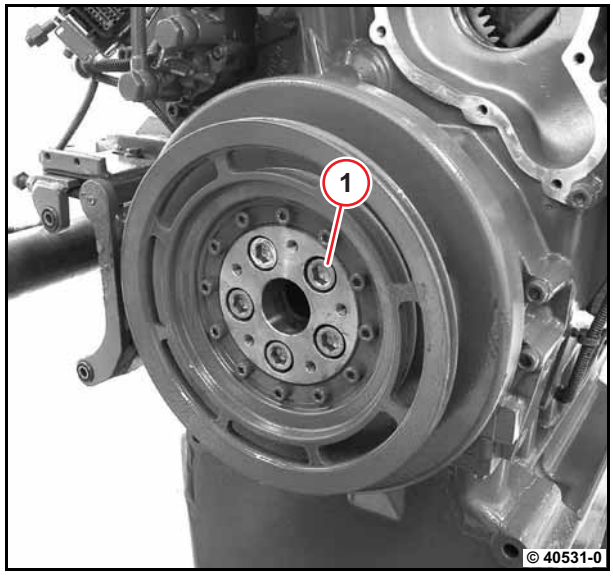
Block flywheel with suitable tool.

- Install coolant pump.

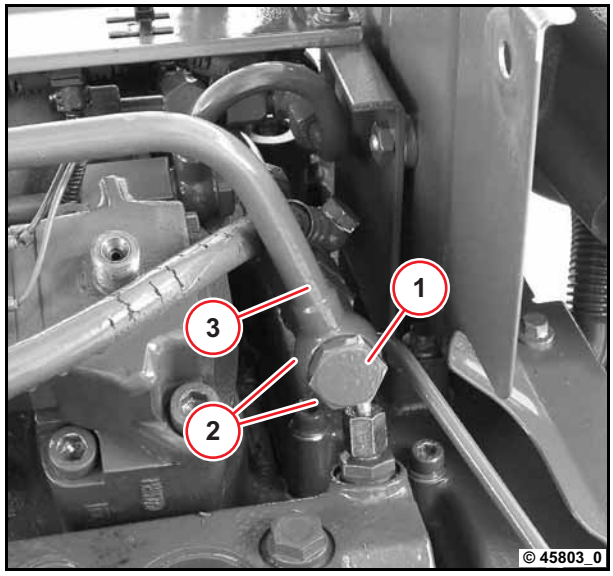
W 09-07-08

- Install thermostat housing.

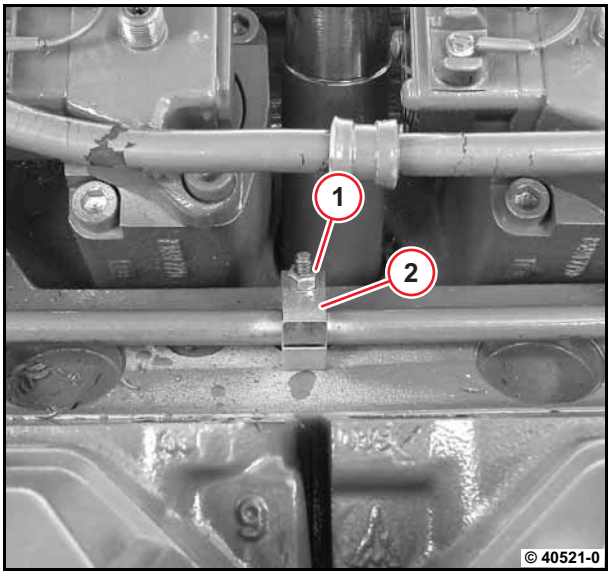
W 09-08-04



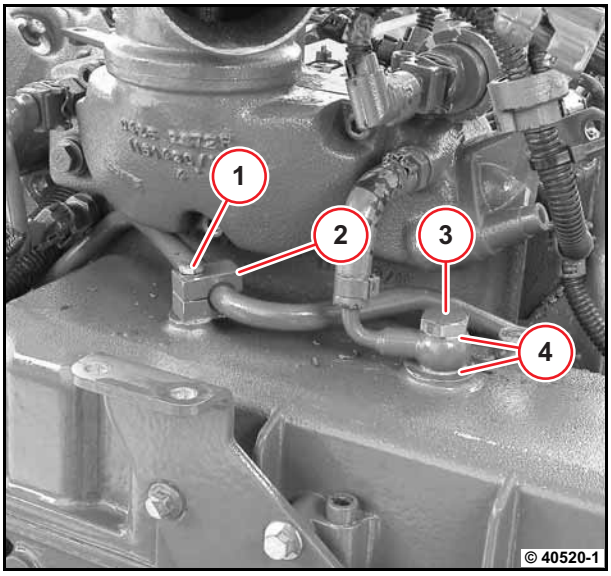
- Insert new sealing rings (3).
- Mount fuel pipe (2).
- Screw on hollow screw (1).



- Oil the thread lightly.
- Mount holder (2).
- Screw on nut (1).



- Mount new sealing rings (4).
- Screw on hollow screw (3).
- Mount holder (2).
- Oil thread and head contact surface lightly.
- Fasten screw (1).



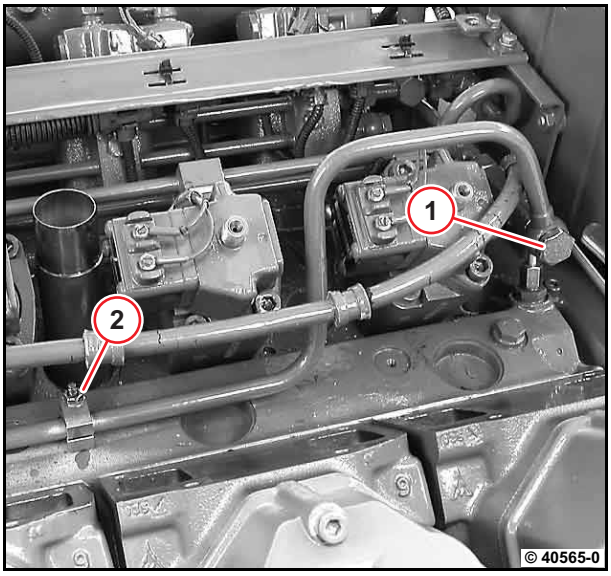
- Tighten hollow screw (1).

Hold overflow valve.

A12 093

- Tighten nut (2).

A07 044

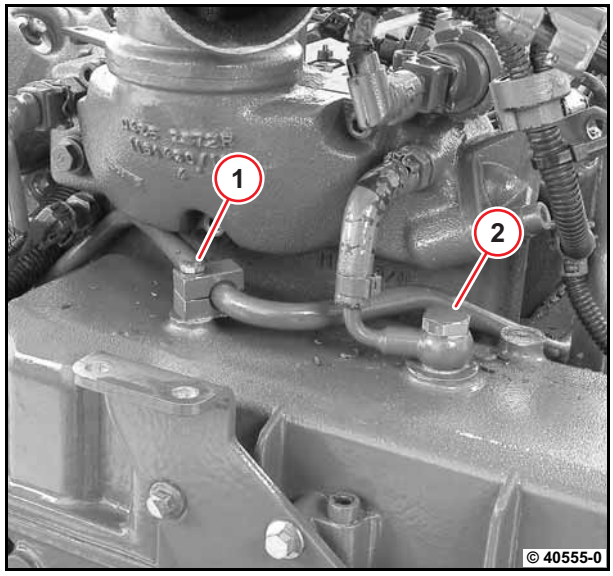


- Tighten screw (1).

  A07 044

- Tighten hollow screw (2).

  A12 092



- Mount holder (2).
- Tighten screws (1).

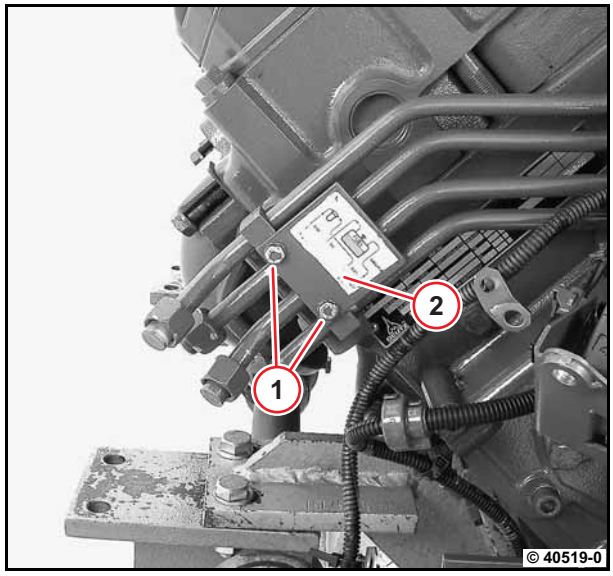
  A07 044

- Install charge air pipe (A-bank)

  W 06-07-03

- Install charge air pipe (B-bank)

  W 06-07-03



Dismantling and assembling genset support

Commercial available tools

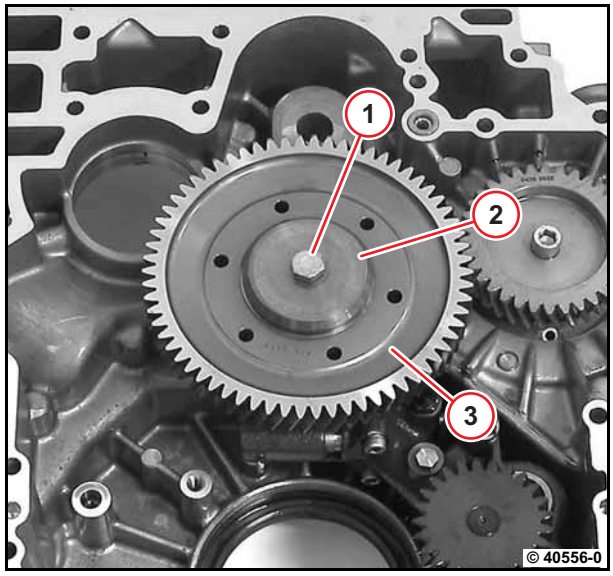
– W 03-08-01

Dismantling genset support

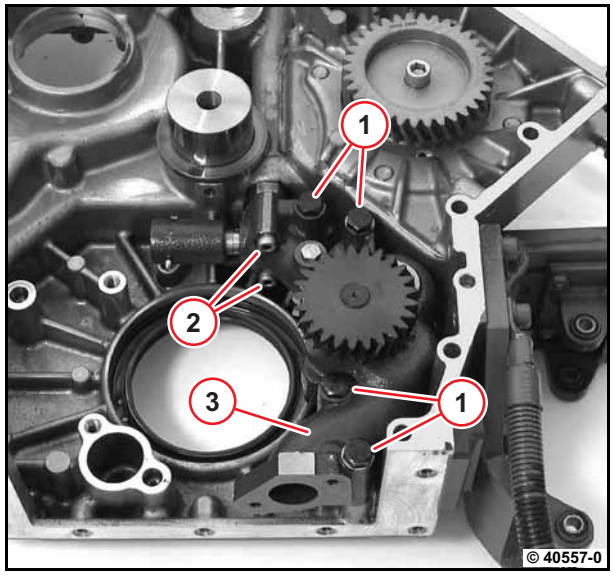
- Remove genset support.

  W 03-08-01

- Unscrew screw (1).
- Remove thrust washer (2).
- Remove idler gear (3).

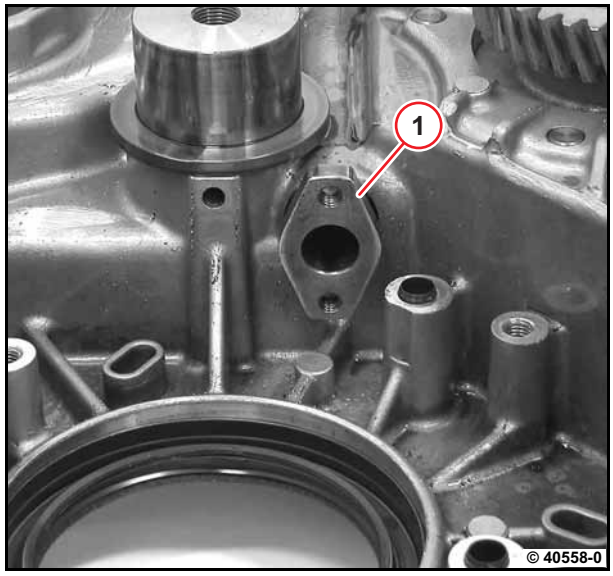


- Unscrew screws (1).
- Unscrew screws (2).
- Remove lubricating oil pump (3).

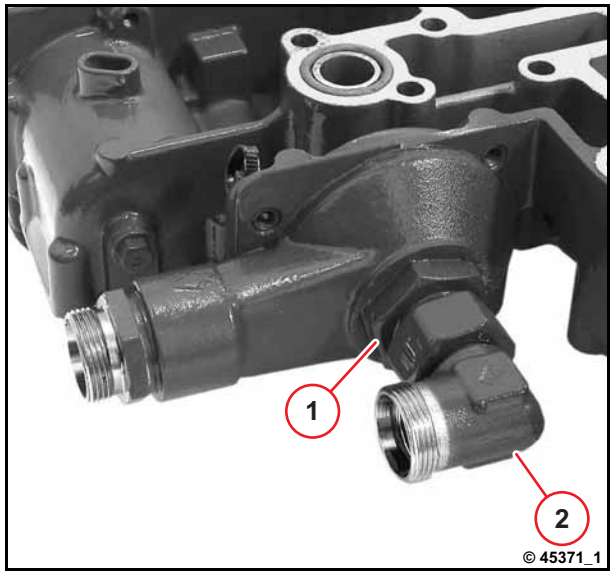


6

- Pull out plug element (1).



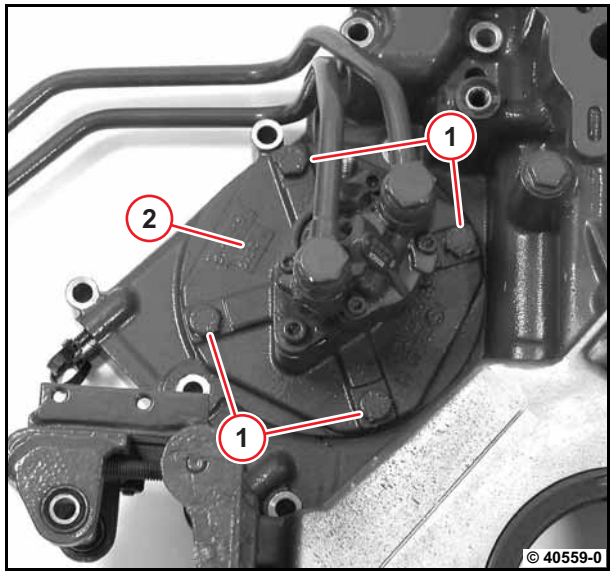
- Unscrew nut (1).
- Remove adapter (2).
- Remove O-rings.



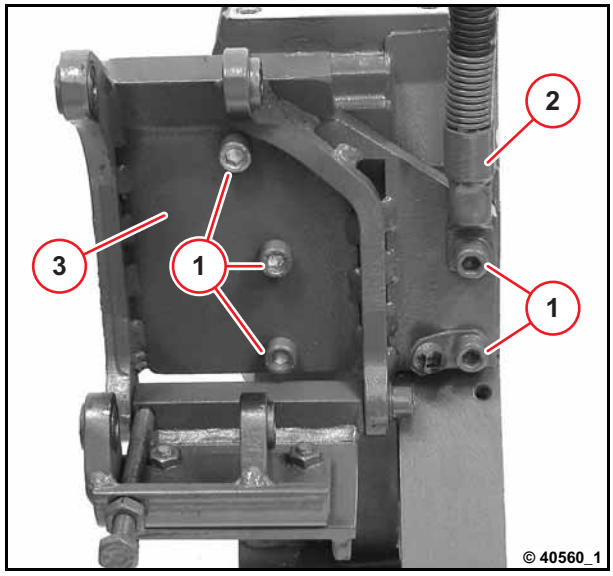
- Unscrew screws (1).
- Remove bearing housing (2).

The fuel supply pump, idler gear and fuel pipes remain installed on the bearing housing.

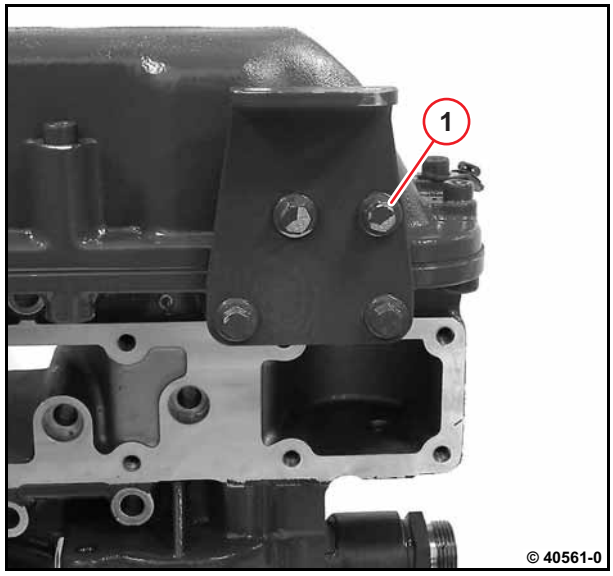
- Remove O-ring.



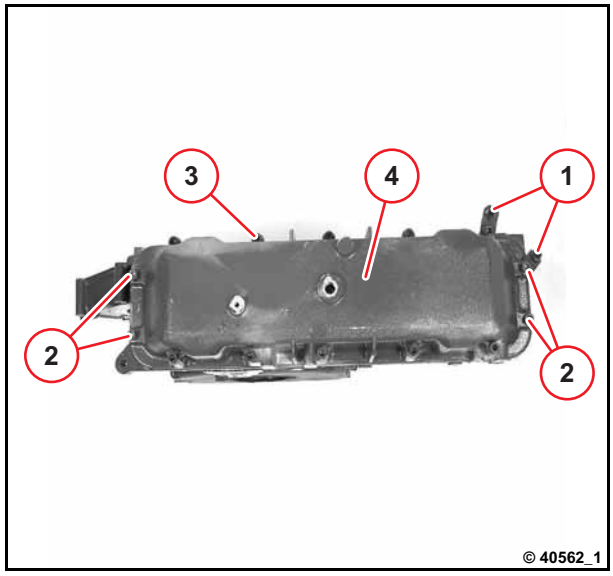
- Unscrew screws (1).
- Remove ground cable (2).
- Remove holder (3).



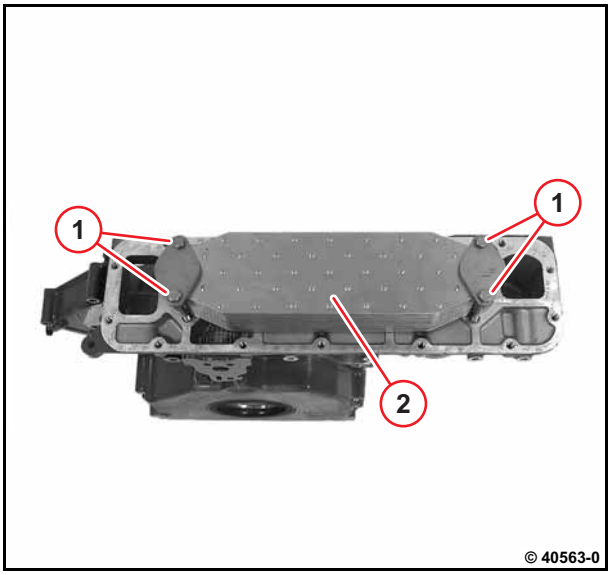
- Unscrew all screws (1).
- Remove holder.



- Unscrew all screws (3).
- Unscrew screws (2).
- Remove holder (1).
- Remove oil cooler cover (4).



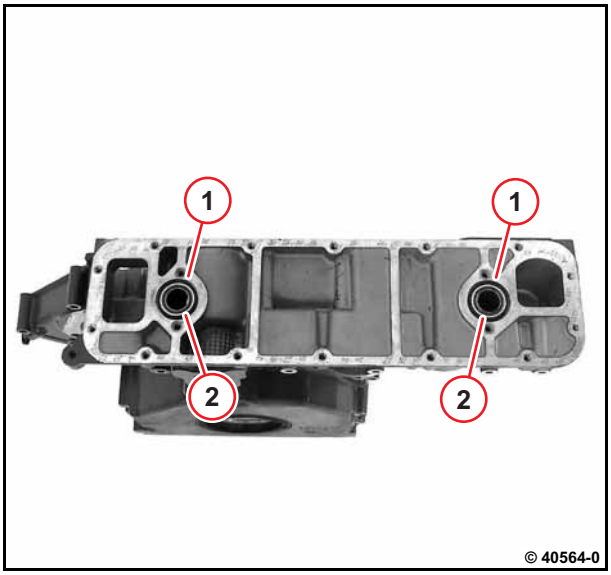
- Unscrew screws (1).
- Remove oil cooler (2).
- Remove O-rings.



6

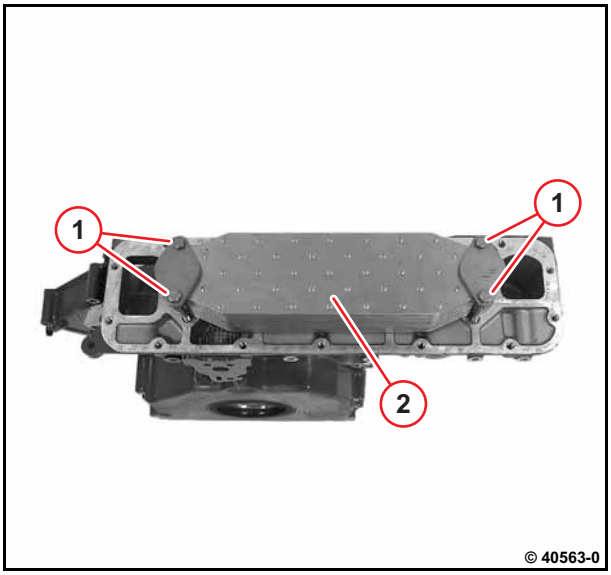
Assembling genset support

- Clean sealing surfaces.
- Insert new O-rings (1).
- Insert new O-rings (2).



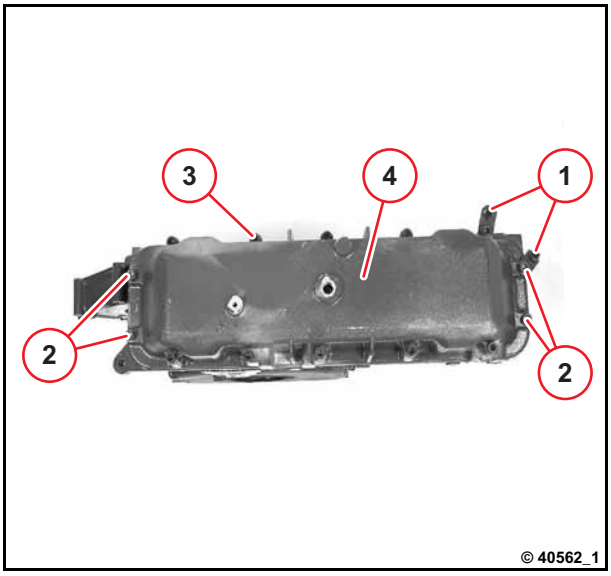
- Mount oil cooler (2).
- Tighten screws (1).

A08 051

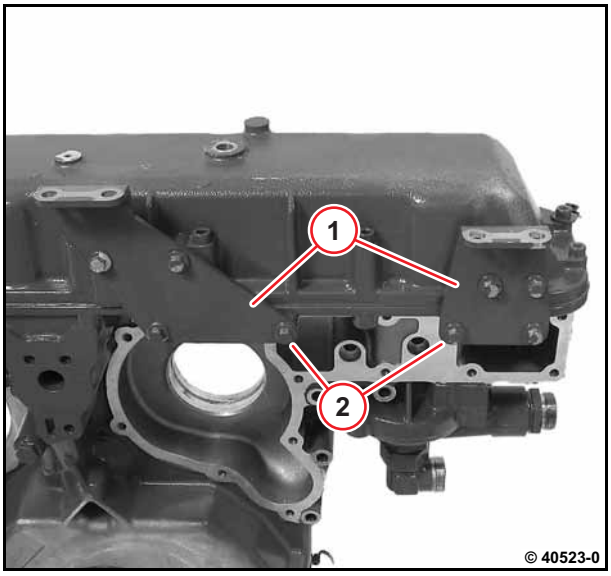


- Clean sealing surfaces.
- Mount new gasket.
- Mount oil cooler cover (4).
- Mount holder (1).
- Fasten all screws.

Screw length:
M8 x 35 mm (2)
M8 x 65 mm (3)



- Mount holder (1).
- Fasten all screws (2).



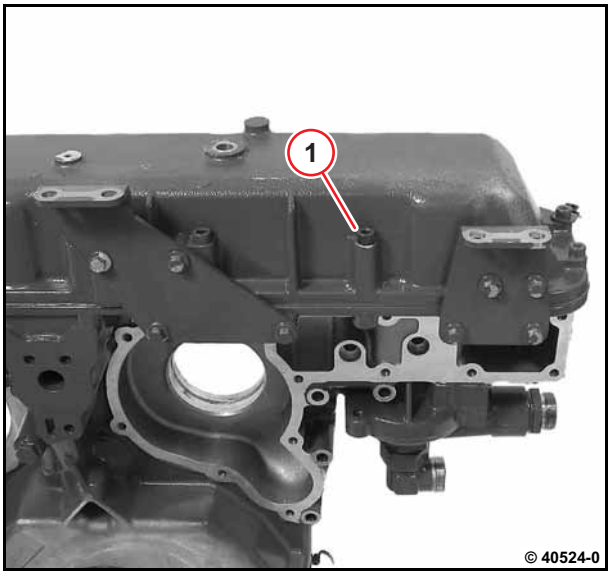
- Align oil cooler cover.

The lay-on surfaces of the oil cooler cover and the genset support must contact the holders.

Do not move gasket.

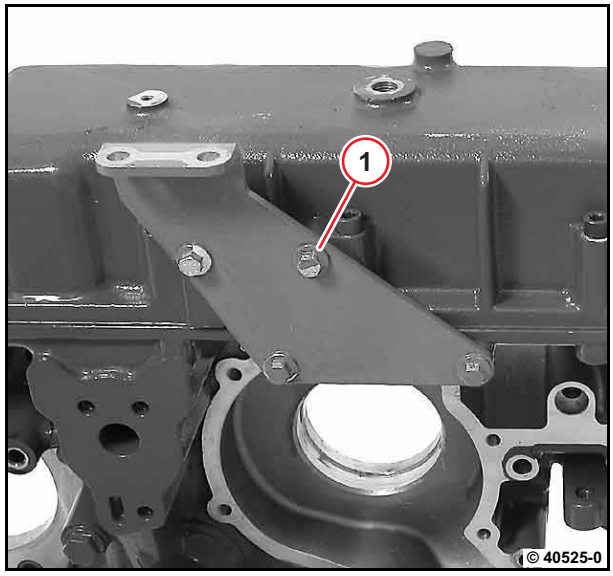
- Tighten all screws (1) alternately.

A08 050



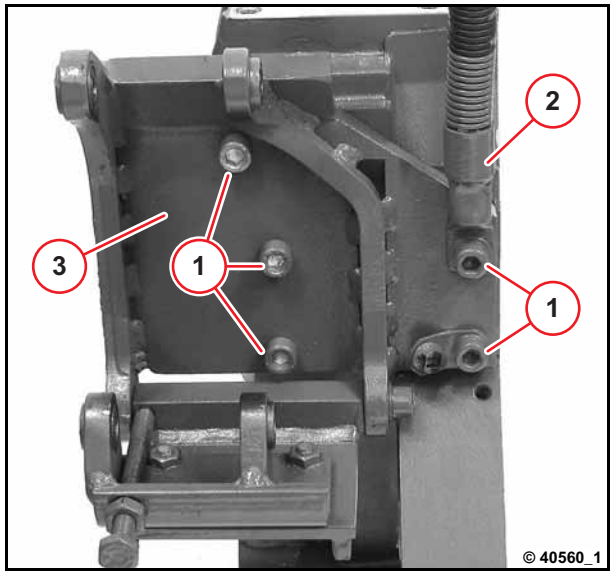
- Unscrew all screws (1).
- Remove holder.

The screws for both holders are not tightened until after mounting the connecting pipe.



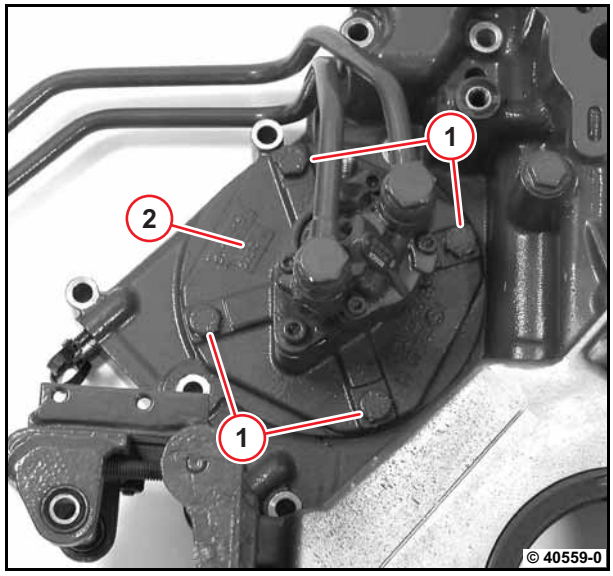
- Mount holder (3).
- Mount ground cable (2).
- Tighten screws (1).

A13 018



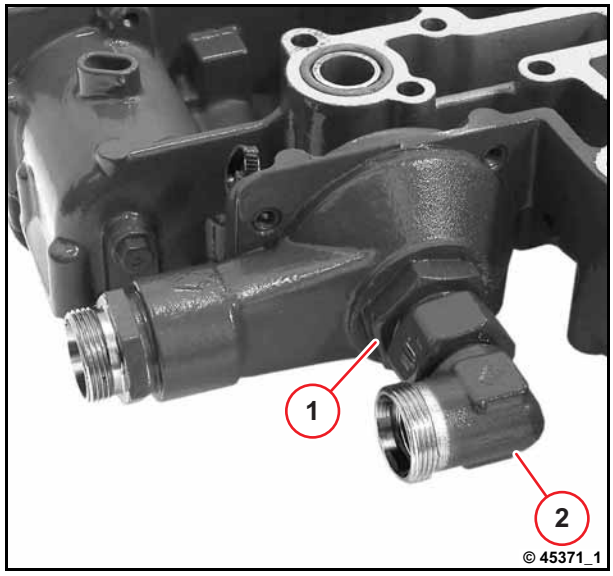
- Insert new O-ring.
- Insert bearing housing (2).
- Tighten screws (1).

A07 024

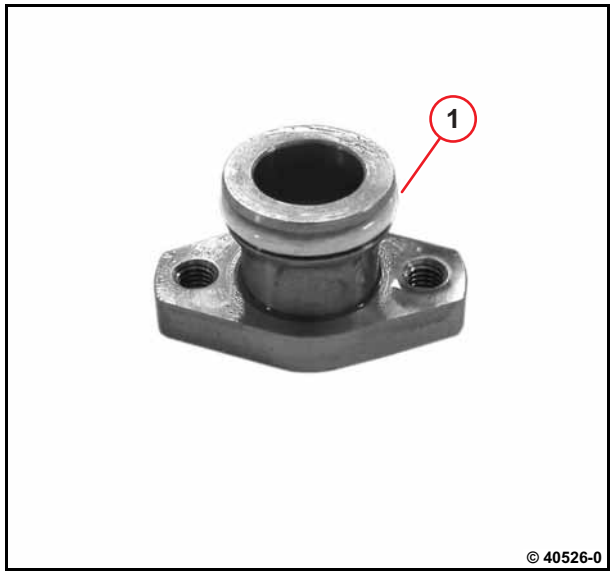


- Position O-rings.
- Mount adapter (2).
- Tighten nut (1).

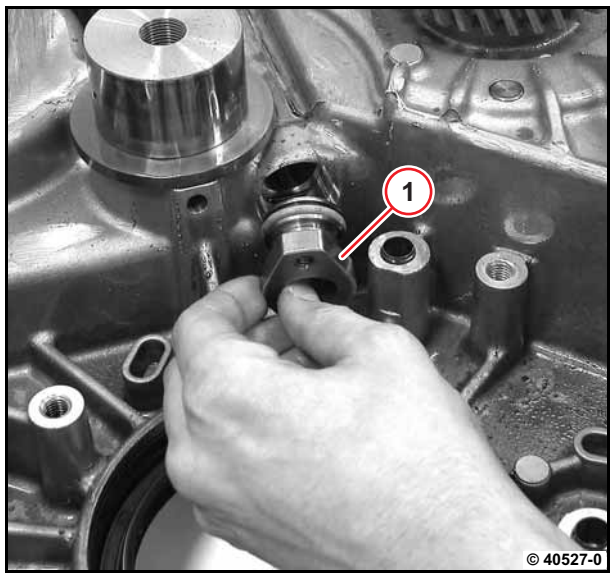
A08 002



- Lightly oil O-ring.
- Mount new O-ring (1).

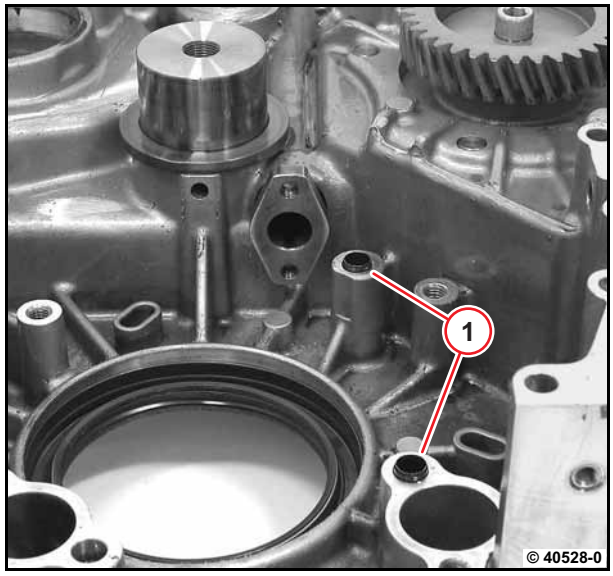


- Insert plug element (1).



6

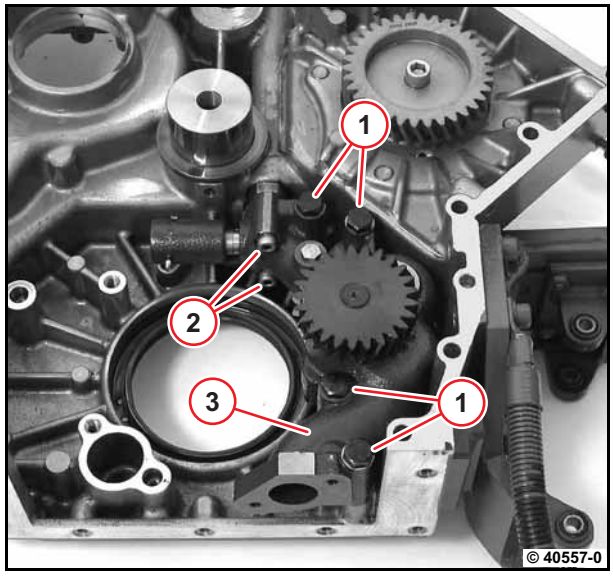
- Pay attention to clamping bushing (1).



- Insert new O-ring.

- Mount lubricating oil pump (3).
- Oil the screws lightly.
- Fasten screws.

Screw length:
M10 x 75 mm (1)
M8 x 45 mm (2).

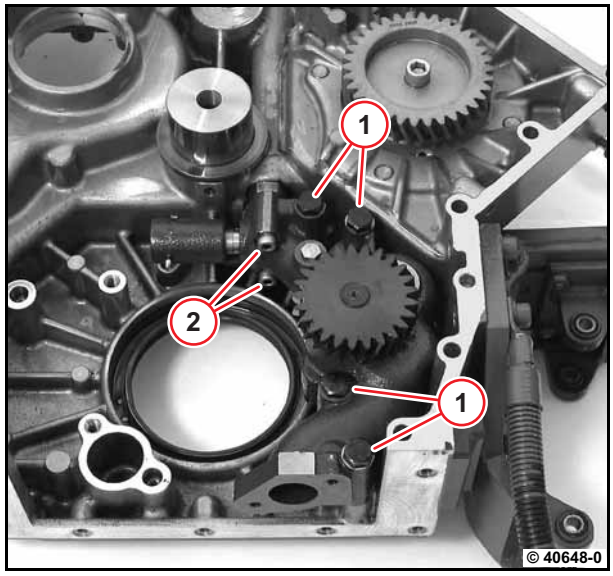


- Tighten screws (1).

  A08 010

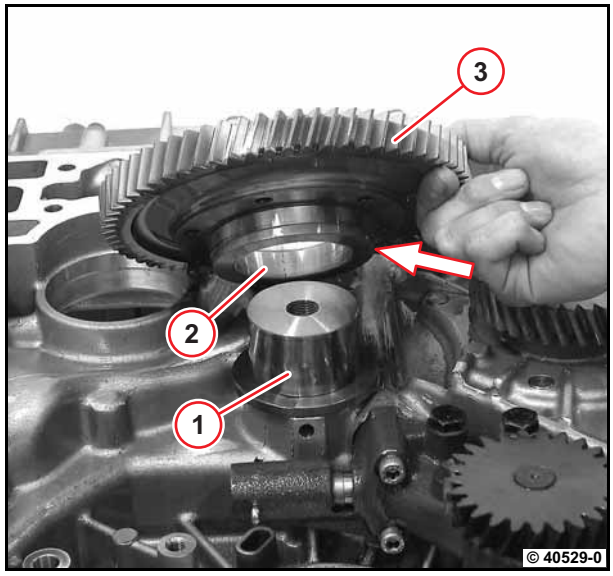
- Tighten screws (2).

  A08 011



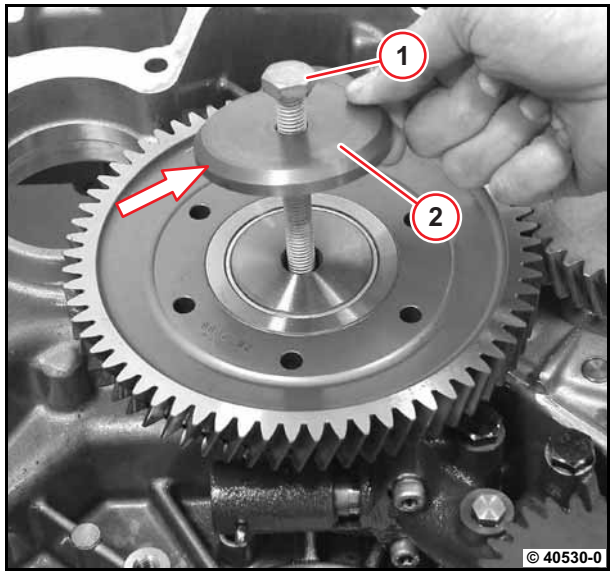
- Lightly oil journal (1).
- Lightly oil bearing bush (2).
- Mount idler gear (3).

The collar (arrow) of the idler gear faces the genset support.



- Mount thrust washer (2).
- Fasten screw (1).

The bevelled side (arrow) of the thrust washer must face upwards.

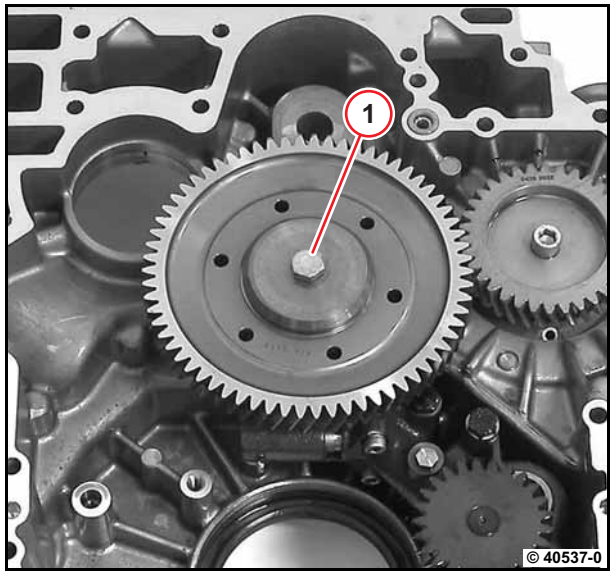


- Tighten screw (1).

  A04 011

- Install genset support.

  W 03-08-01



6

Removing and installing rear cover

Commercial available tools

– Locking agent
DEUTZ DW 59

– W 02-02-02
– W 03-09-04
– W 08-04-07

Removing rear cover

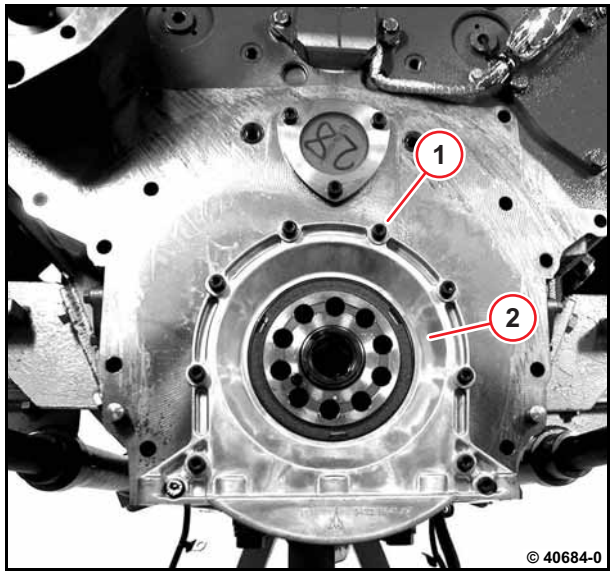
- Remove connection housing.

  W 03-09-04

- Remove lubricating oil pan.

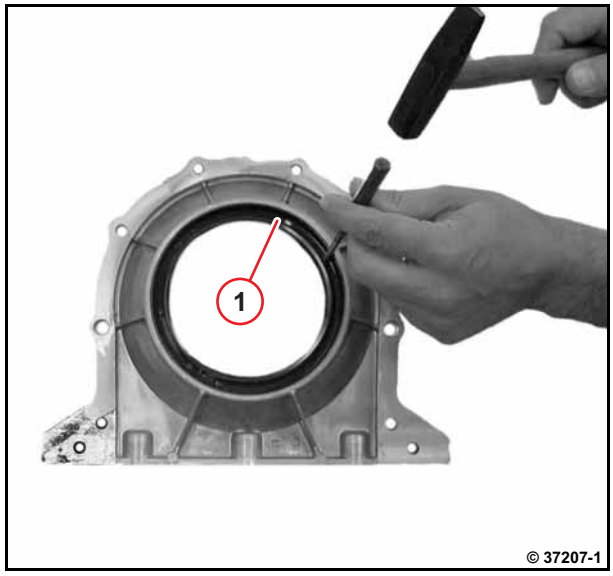
  W 08-04-07

- Unscrew all screws (1).
- Remove rear cover 2.
- Remove gasket.



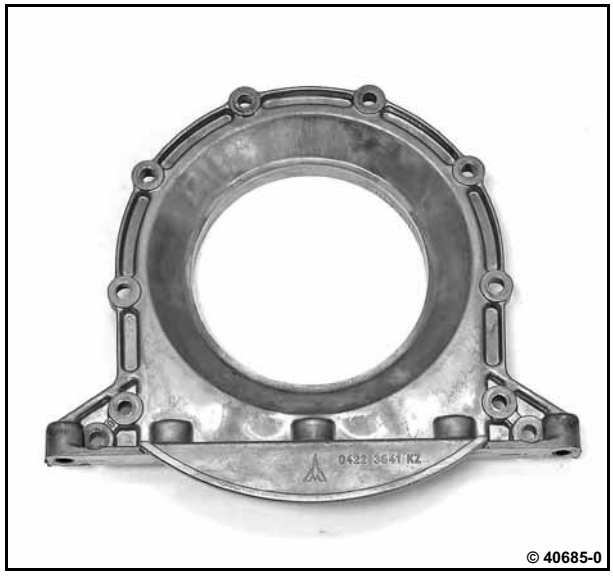
- Knock out crankshaft sealing ring (1).

Attention!
Do not damage the sealing surfaces.



6

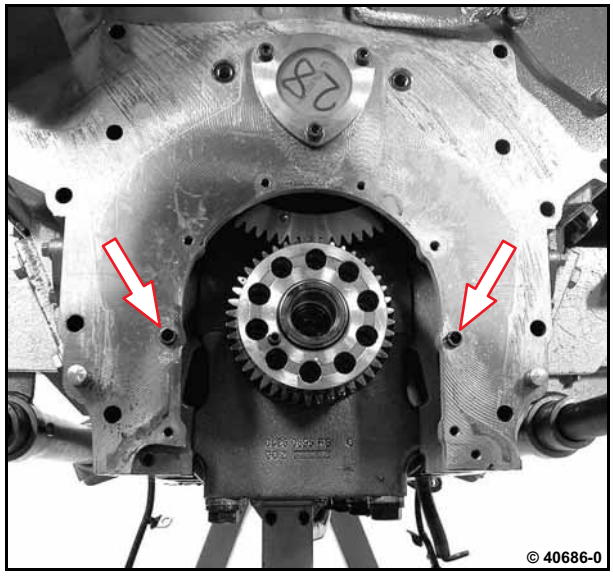
- Visually inspect the components.



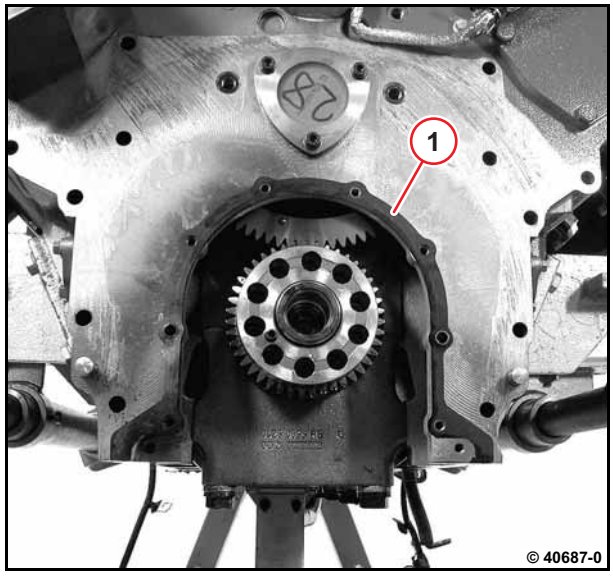
Installing rear cover

- Clean sealing surfaces.
- Make sure the clamping bushings (arrows) are in place.

The slots in the clamping bushings must face downwards.



- Insert new seal (1).



- Mount rear cover.

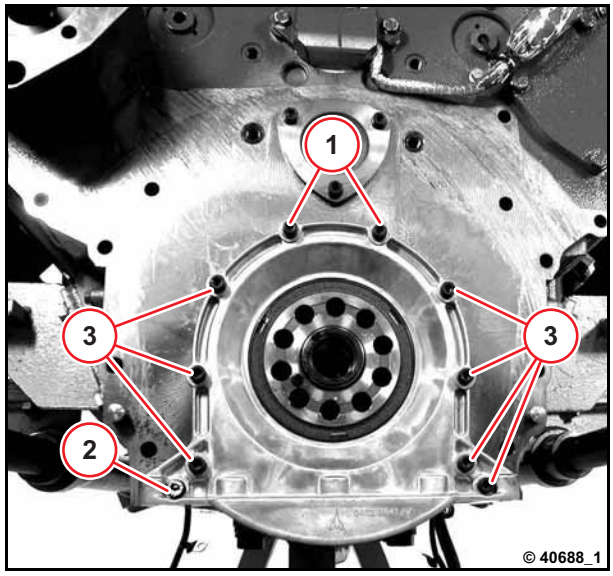
Use new sealing rings.

- Fasten screws.
- Insert screws (1) with locking agent.

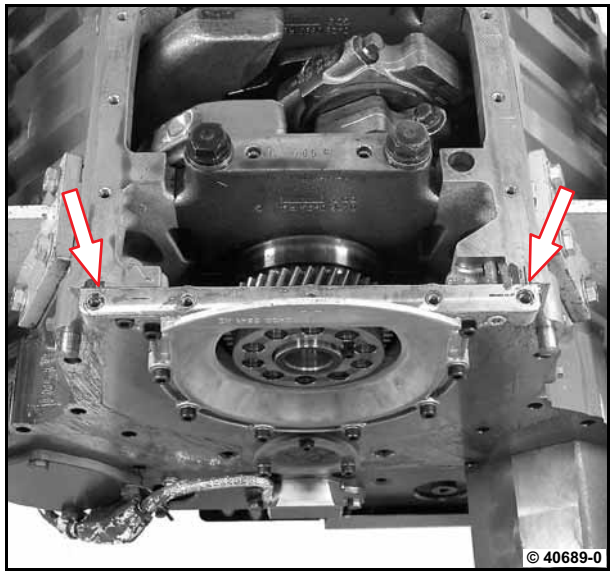
Screw length:
M8 x 30 mm (1),(3)
M8 x 45 mm (2)

- Tighten screws alternately.

A03 010



The gasket (arrows) must be flush with the sealing surface of the oil pan.



- Install lubricating oil pan.

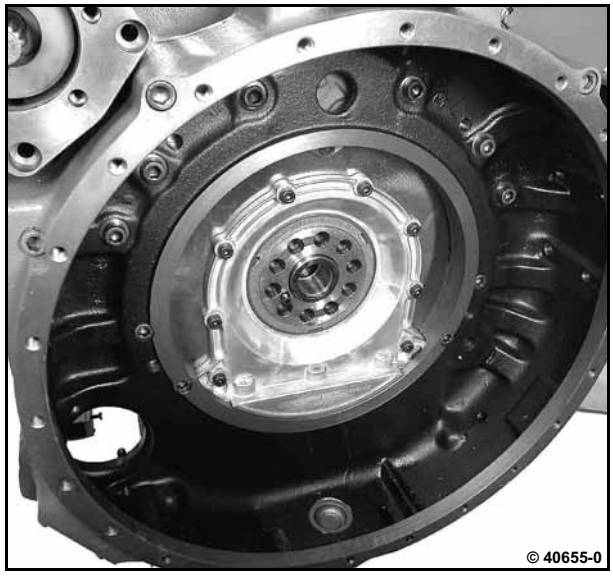
W 08-04-07

- Install connection housing.

W 03-09-04

- Renew crankshaft sealing ring (flywheel side).

W 02-02-02



6

Removing and installing the connection housing

Commercial available tools:
– Rotation angle disc 8190

– Locking agent
DEUTZ DW 59

– W 05-07-01
– W 06-01-07
– W 12-06-01
– W 13-03-02

Removing the connection housing

- Install impulse transmitter (crankshaft).

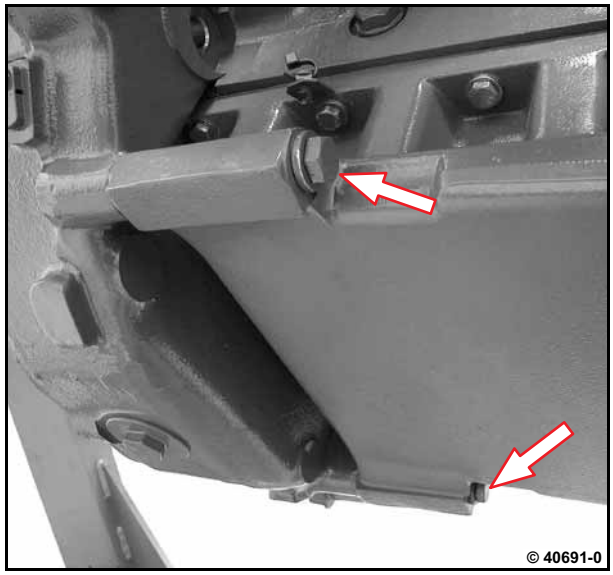
  W 05-07-01
- Remove starter.

  W 13-03-02
- Remove exhaust manifold.

  W 06-01-07
- Remove flywheel.

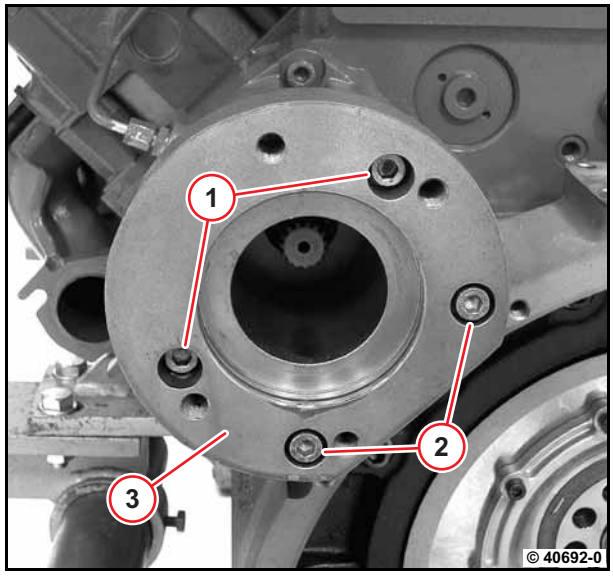
  W 12-06-01

- Unscrew screws (arrows).

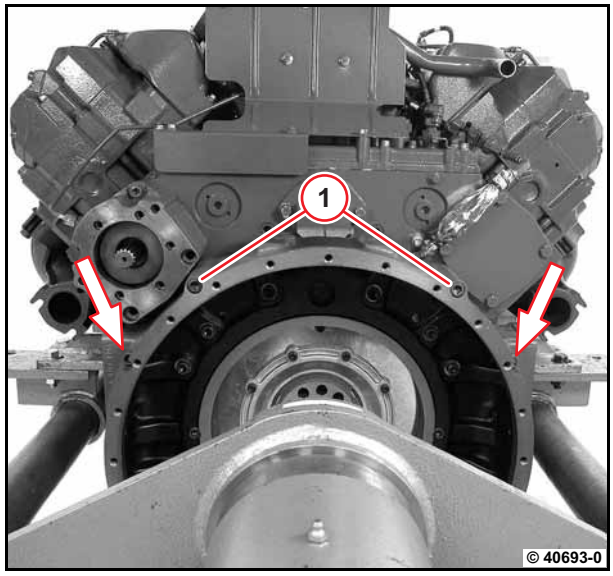


6

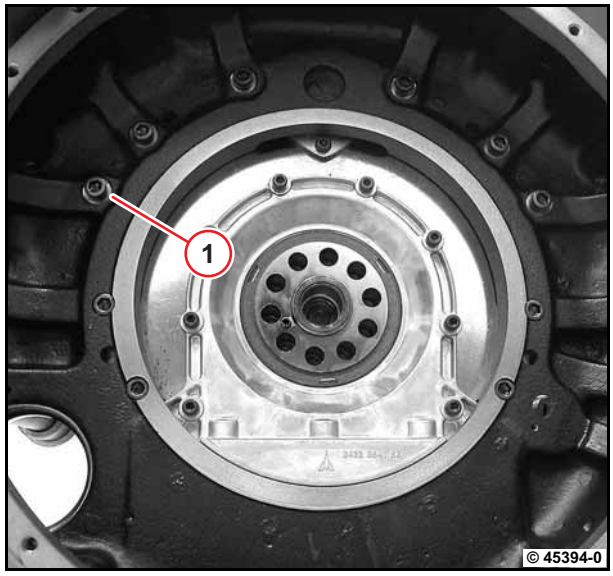
- Unscrew screws (1).
- Unscrew screws (2).
- Remove flange housing (3).



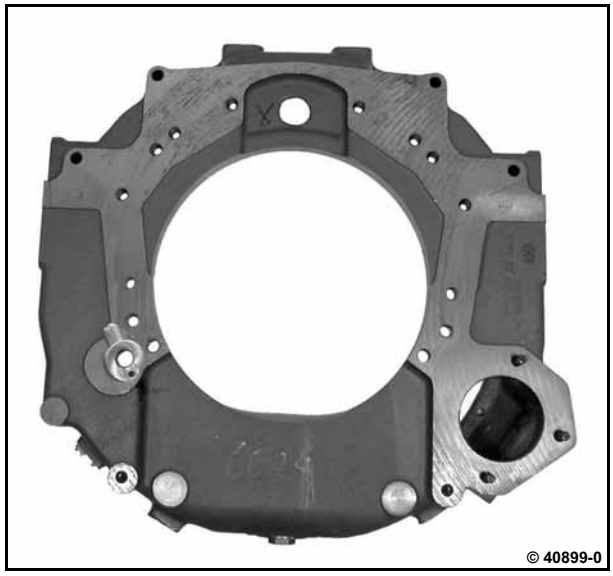
- Unscrew screws (1).
- Unscrew screws (arrows).



- Unscrew all screws (1).
- Remove connection housing.

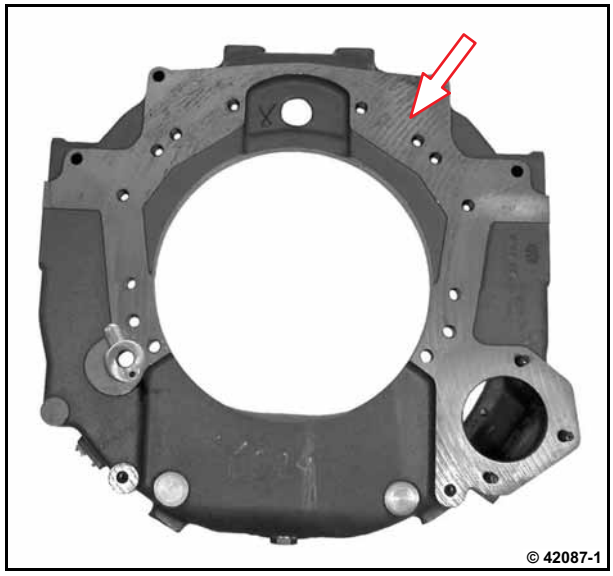


- Visually inspect the components.

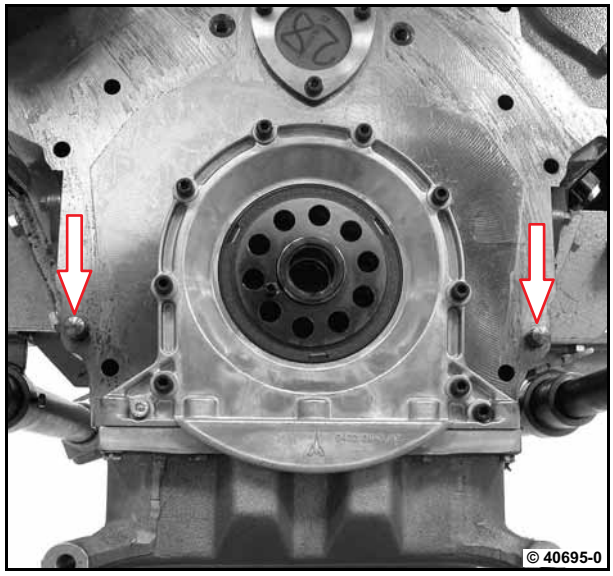


Installing the connection housing

- Clean contact surfaces.
- Coat connection housing on lay-on surface (arrow) with locking agent.



Make sure the parallel pins (arrows) are in place.



- Mount connection housing.

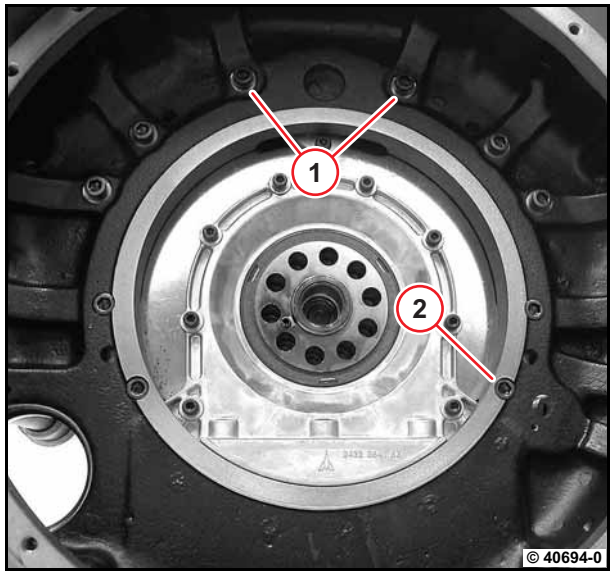
Centre above the parallel pins.

- Fasten screws.

Insert screws with locking agent.
Note different screw lengths.
M12 x 35 mm (1)
M12 x 90 mm (2).

- Tighten screws (1).

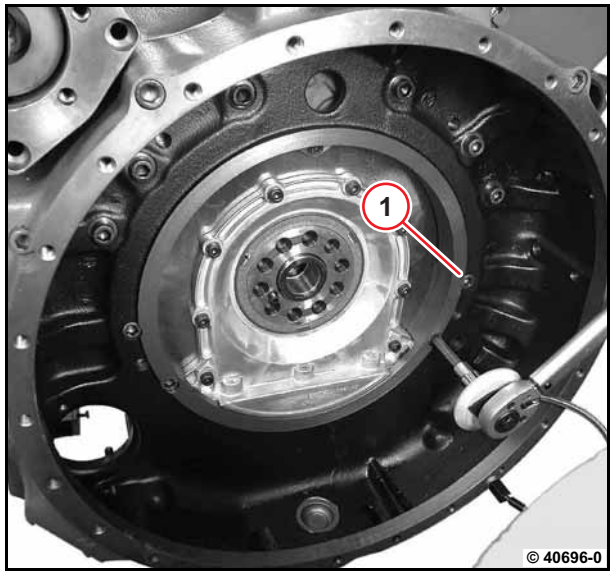
A03 081



6

- Tighten screws (1) alternately.

A03 082

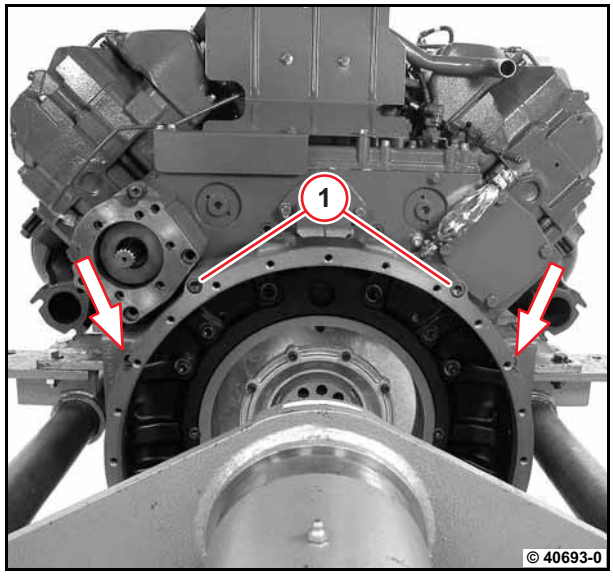


- Fasten screws.

Insert screws with locking agent.
Note different screw lengths.
M12 x 200 mm (1)
M12 x 175 mm (arrows).

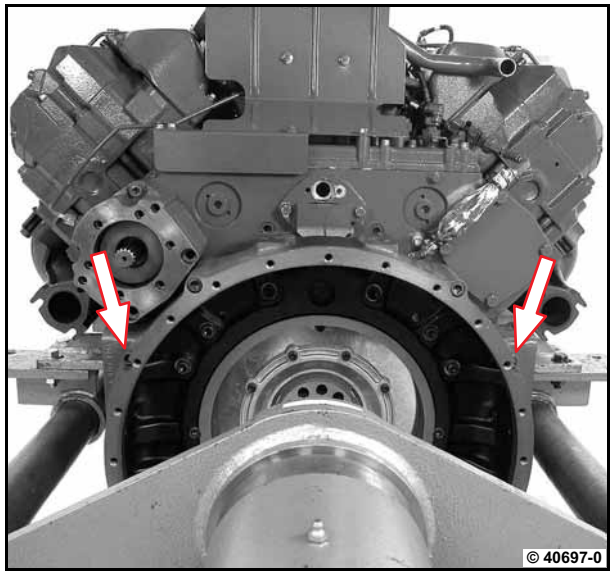
- Tighten screws (1) alternately.

A03 088

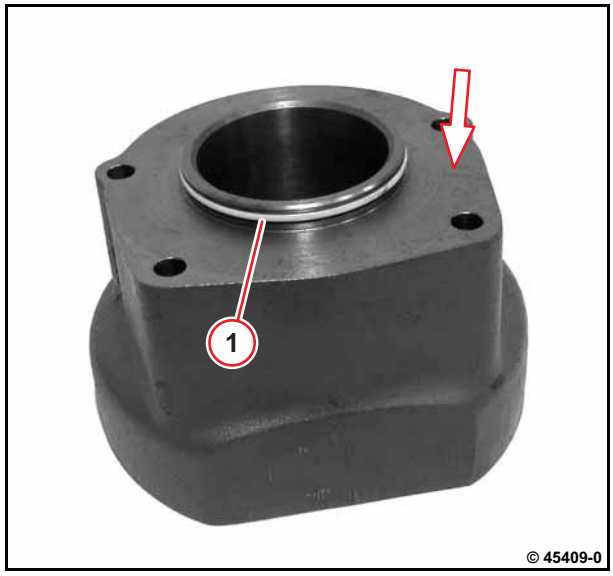


- Tighten screws (arrows).

A03 089



- Mount new O-ring (1).
- Coat lay-on surface (arrow) with locking agent.



- Mount flange housing (3).
- Lightly oil screws (1).
- Tighten screws (1).

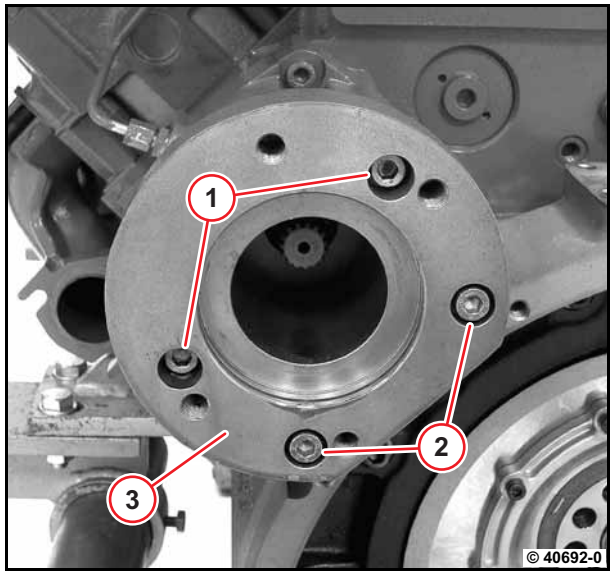
Screw length:
M10 x 110 mm

- Insert screws (2) with locking agent.
- Tighten screws (2).

Screw length:
M10 x 210 mm

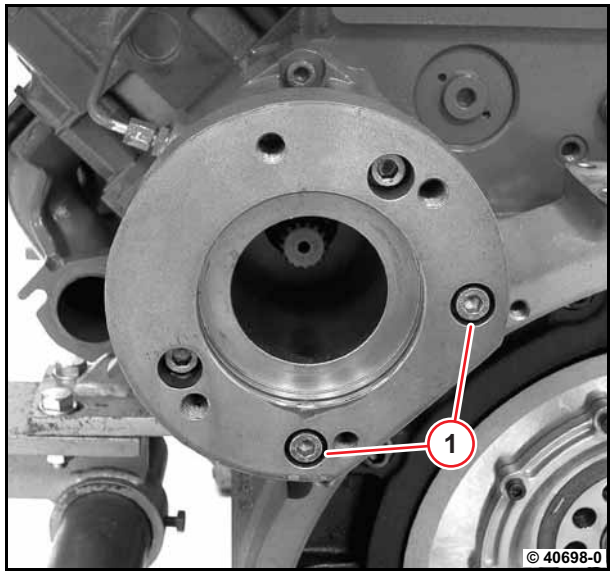
- Tighten screws (1).

A12 058



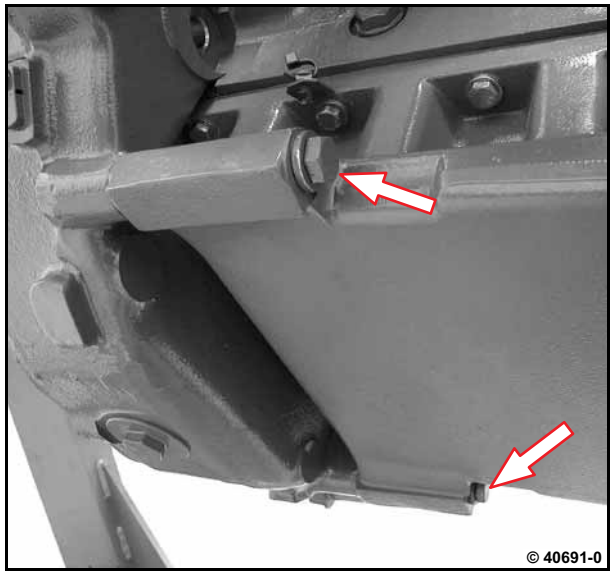
- Tighten screws (1).

  A12 059



- Tighten screws (arrows).

  A03 080



- Install flywheel.

  W 12-06-01

- Install starter.

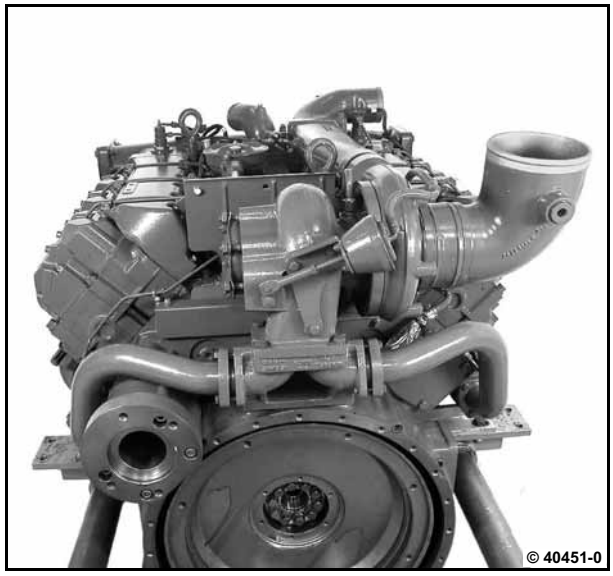
  W 13-03-02

- Install impulse transmitter (crankshaft).

  W 05-07-01

- Install exhaust manifold.

  W 06-01-07



Repairing the collar rest of the cylinder liner

Commercial available tools

Special tools:
– Tool kit. 150030

– Repair kits
– Fitting compound DEUTZ AP 1908
– Cleaning agent (e.g. commerically available brake cleaner)

– W 03-03-02

In case of coolant leakage or damage to the sealing assembly crankcase/cylinder liner/cylinder head, the collar rest of the cylinder liner in the crankcase can be repaired.

The following work sequence must be carried out on every cylinder unit of a cylinder bank.

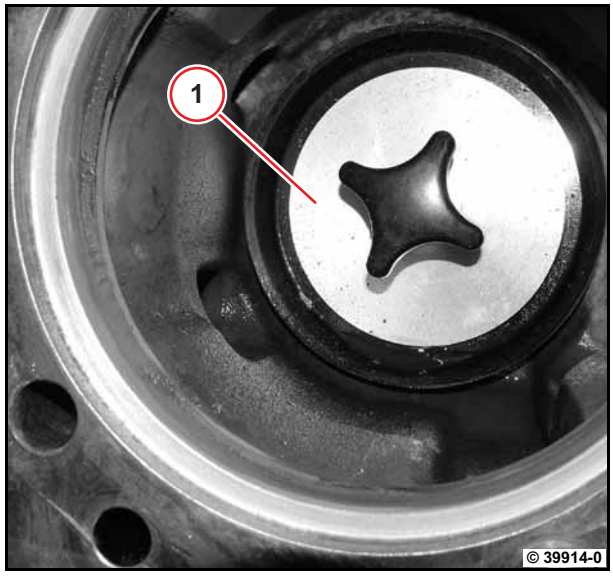
6

Grinding in collar rest surface

- Remove cylinder liner.

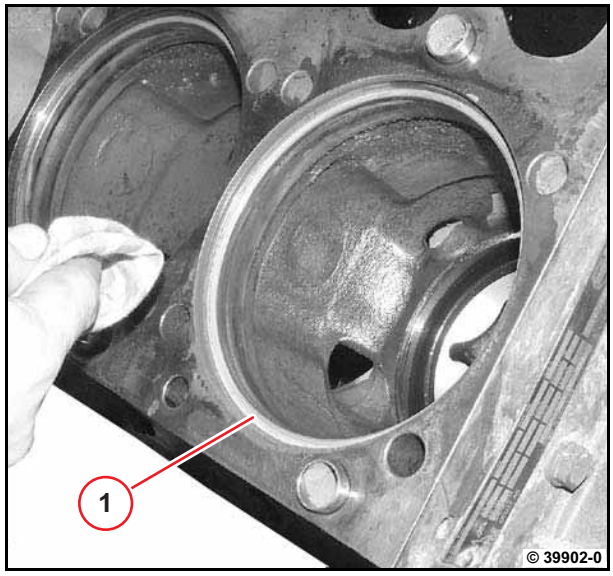
  W 03-03-02

- Seal the insides of the crankcase with cover plates (1).



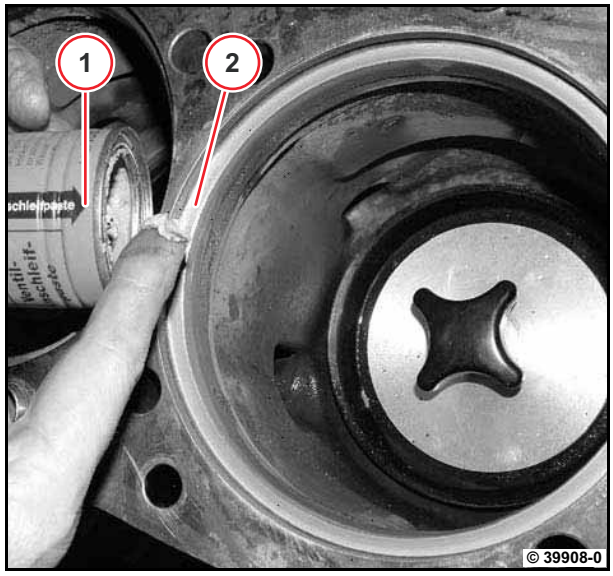
- Clean collar rest (1).
- Clean inside of the crankcase.

Use cleaning agent.



Grinding for cleaning the collar rest

- Apply post-grinding paste (1) to the collar rest (2).
- Add a little clean water.



- Mount the bracket and handles on the grinding/surface plate.

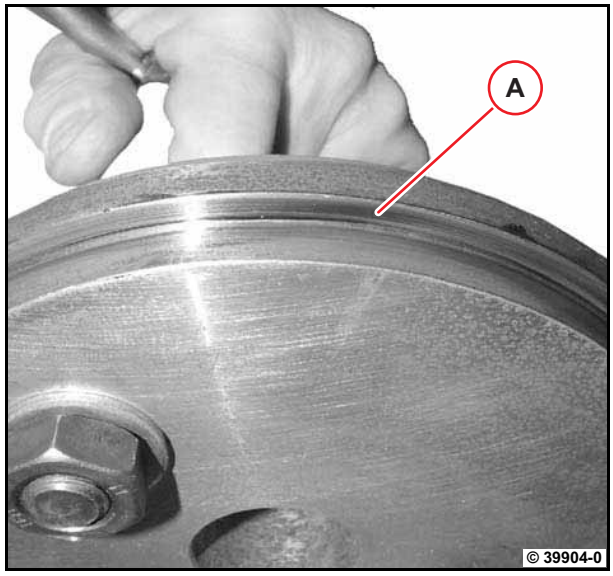
Note the different processing sides of the grinding/surface plate:

A - grinding side

B - surface side

Grinding side “A“ faces down.

- Place grinding side “A“ on collar rest.

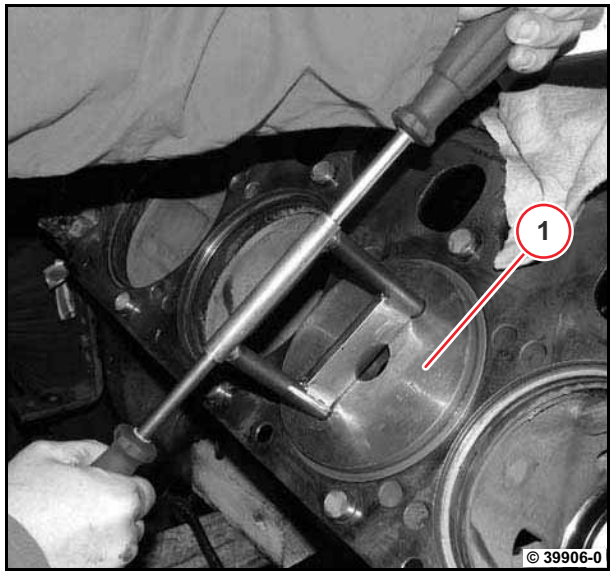


- Turn the grinding/surface plate (1) forwards and backwards evenly (approx. 180°).
- Grind the collar rest lightly.

Note soft grinding noise.

- Clean the collar rest.
- Remove grind paste and grinding particles.

Use cleaning agent.



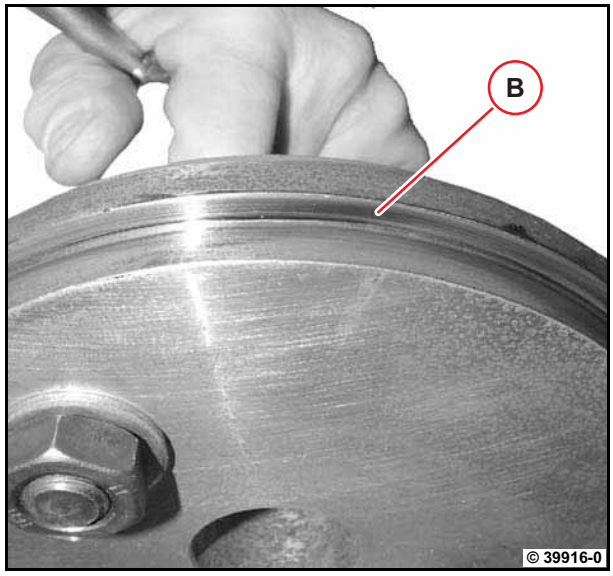
Check

- Move the bracket on the griding/surface plate.

Spotting side “B“ facing downwards.

- Apply surface paste thinly to the surface side “B“.

Applying it too thickly makes it impossible to detect recesses in the collar rest.



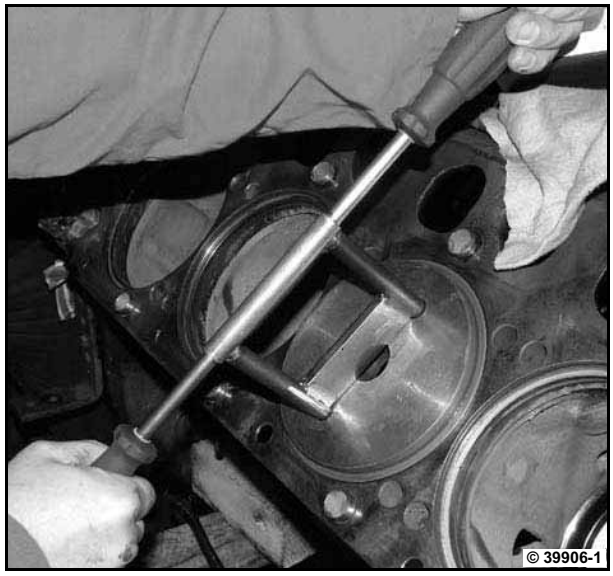
- Place surface side “B“ on collar rest.

Note the different processing sides of the grinding/surface plate:

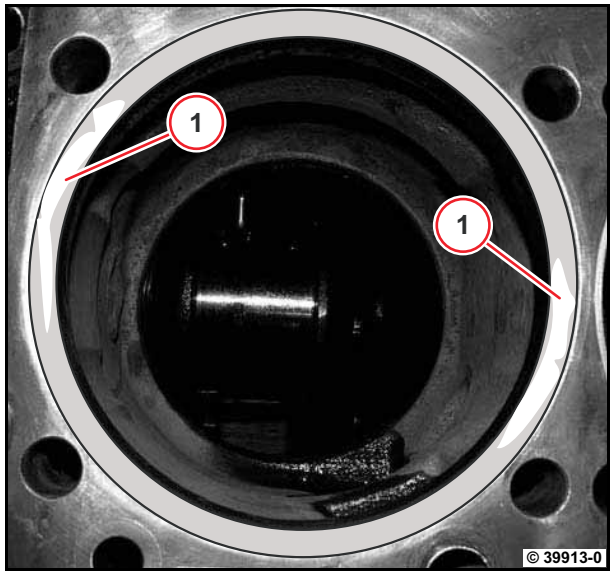
A - grinding side

B - surface side

- Surface the collar rest.



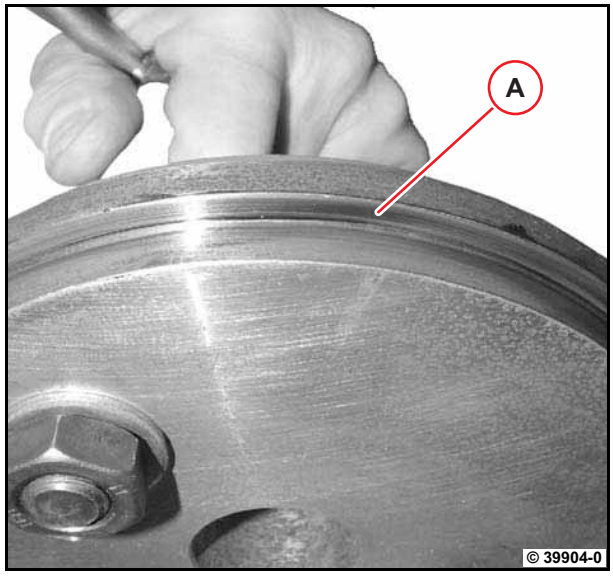
The surfacing shows up recesses (1) in the collar rest.



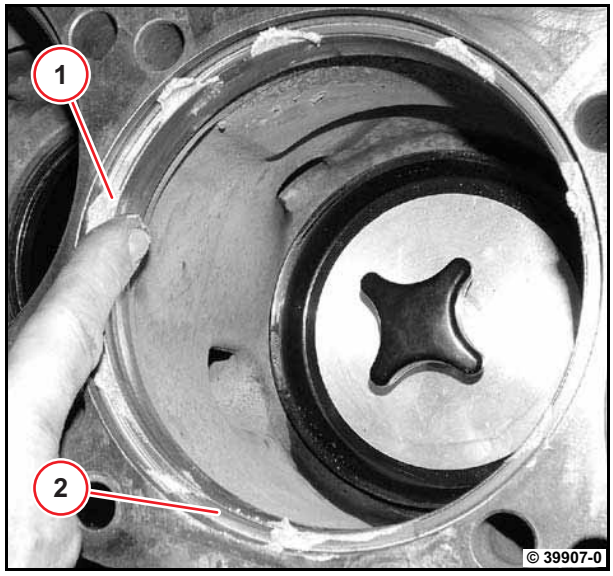
Grinding

- Move the bracket on the griding/surface plate.

Grinding side “A“ faces down.



- Apply pre-grinding paste (1) to the collar rest (2).
- Add a little clean water.



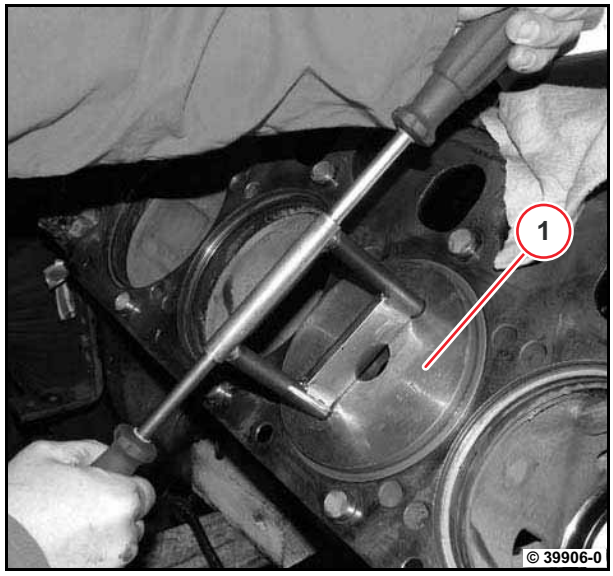
- Place grinding side “A“ on collar rest.
- Turn the grinding/surface plate (1) forwards and backwards evenly (approx. 180°).

Lift the grinding/surface plate slightly several times for the grinding paste to spread evenly.

Note rough grinding noise.

- Remove grind paste and grinding particles.
- Clean the collar rest.

Use cleaning agent.



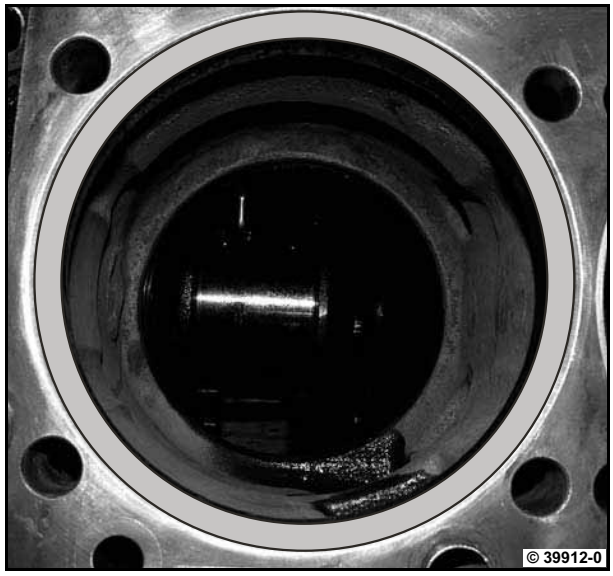
Check

- Check the contact pattern.

An **even** contact pattern must exist.

Otherwise, repeat the grinding and surface process.

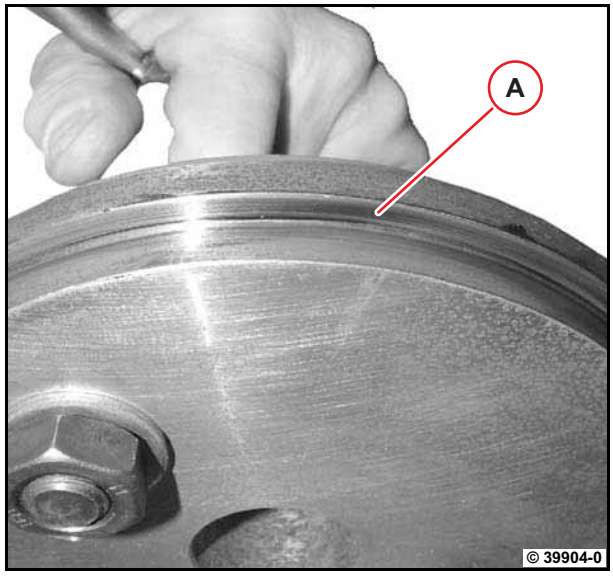
- Clean the collar rest.



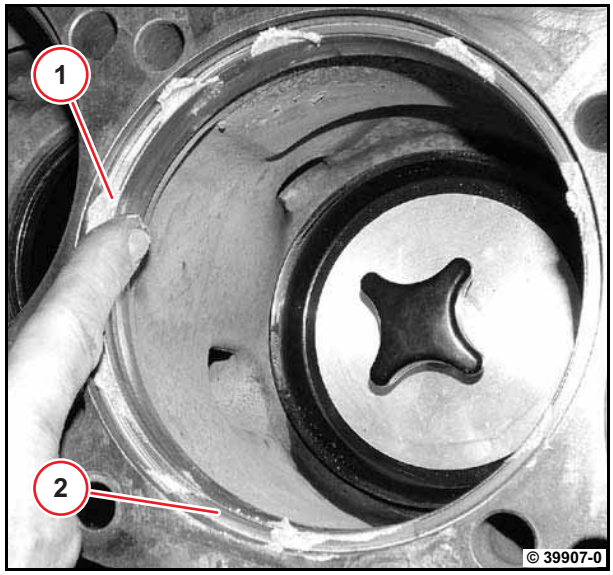
Regrinding

- Move the bracket on the griding/surface plate.

Grinding side “A“ faces down.



- Apply post-grinding paste (1) to the collar rest (2).
- Add a little clean water.



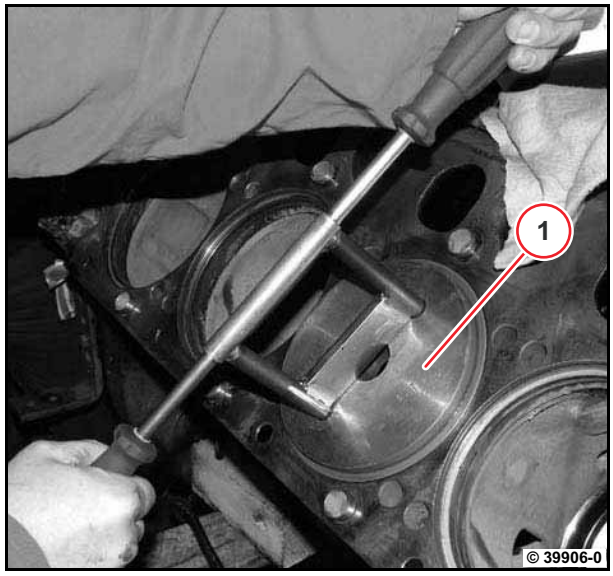
- Turn the grinding/surface plate (1) forwards and backwards evenly (approx. 180°).

Lift the grinding/surface plate slightly several times for the grinding paste to spread evenly.

Note soft grinding noise.

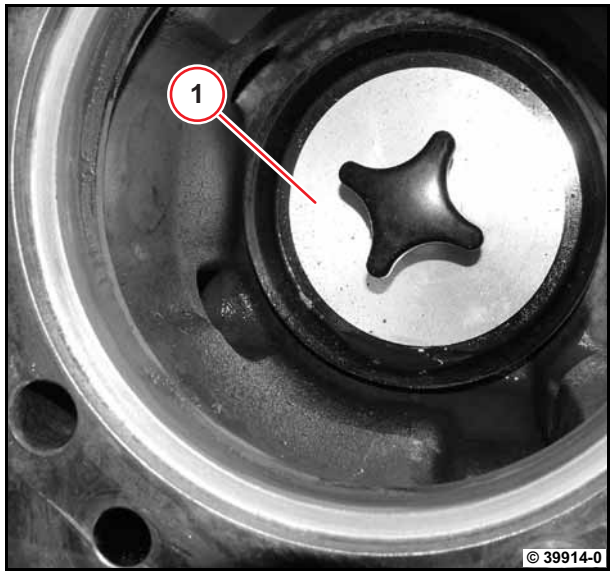
- Clean the collar rest.
- Remove grind paste and grinding particles.

Repeat the surface process to check.



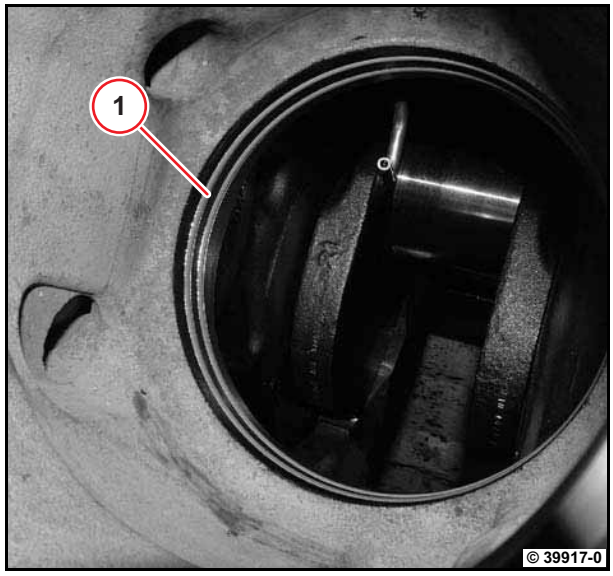
- Clean inside of the crankcase.
- Remove cover plates (1).
- Check the inside of the crankcase for cleanliness.

The tool set must be cleaned and the grinding/surface plate oiled slightly for corrosion protection.



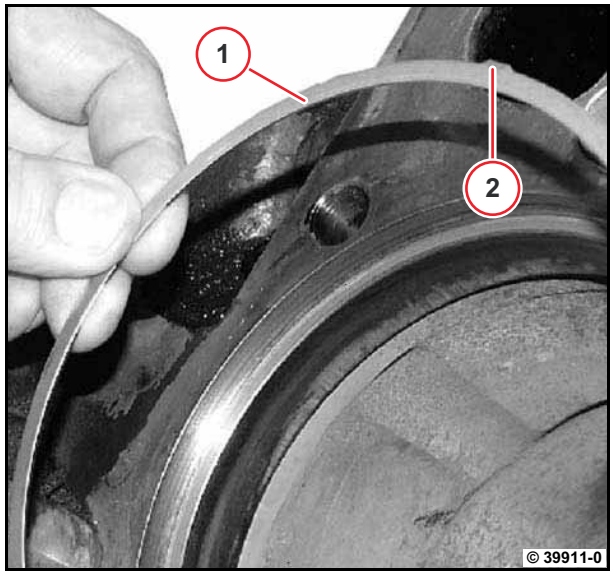
Assembly

- Insert new O-rings (1).
- Coat the O-rings with fitting compound.



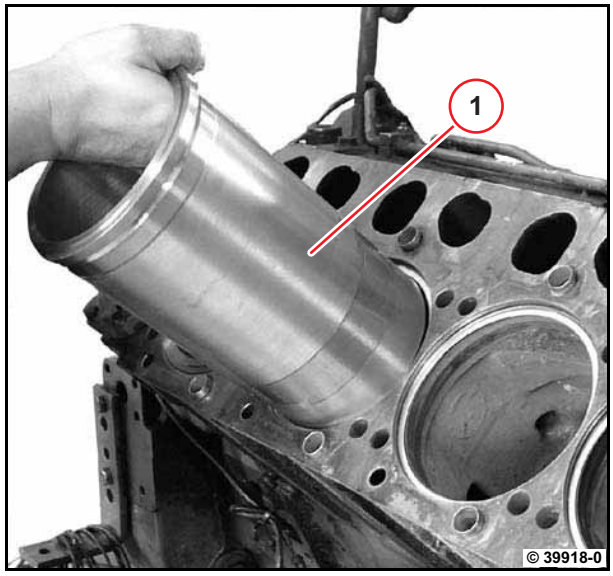
- Insert shim ring (1).

A centring lug (2) points up.



- Insert new cylinder liner (1).

W 03-03-02



Removing and installing, testing camshaft bearing

Commercial available tools:
– Micrometer gauge
– Internal measuring device

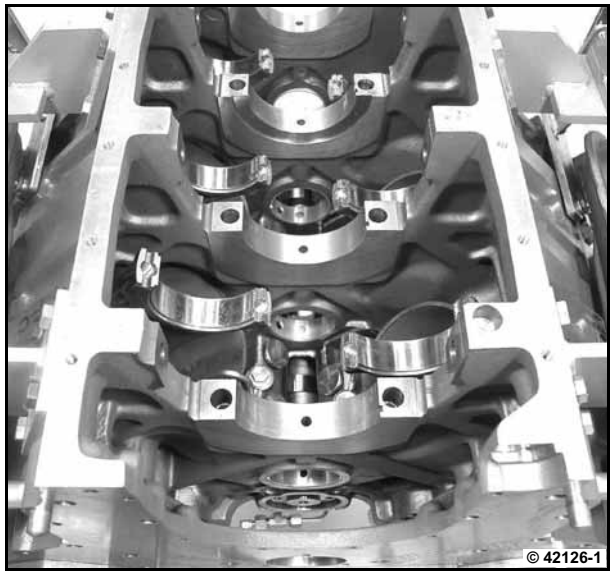
Special tools:
– Dial gauge. 100400
– Assembly tool 143830

– W 04-05-05

Testing camshaft bearing

- Remove camshaft.

  W 04-05-05



- Prepare internal measuring device:
  – Mount probe bolt for the appropriate measuring range in the internal measuring device.
  – Mount dial gauge with approx. 1 mm pre-tension in the internal measuring device.
  – Set micrometer gauge to 70 mm.
  – Balance the internal measuring device between the test surfaces of the micrometer gauge and set the meter at the reversal point of the pointer to "0".

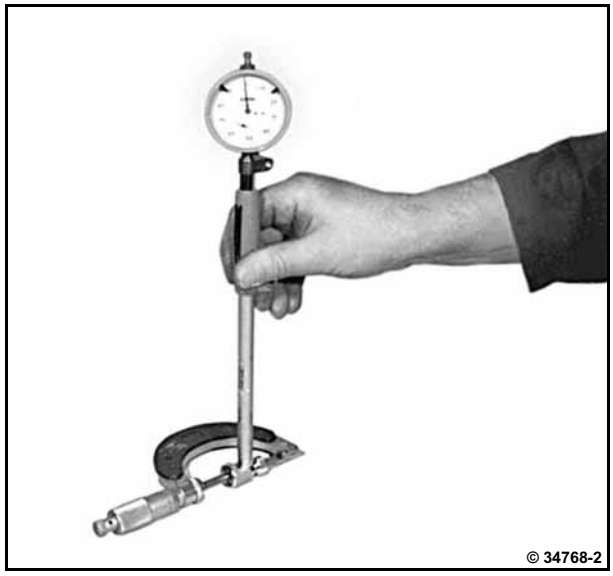
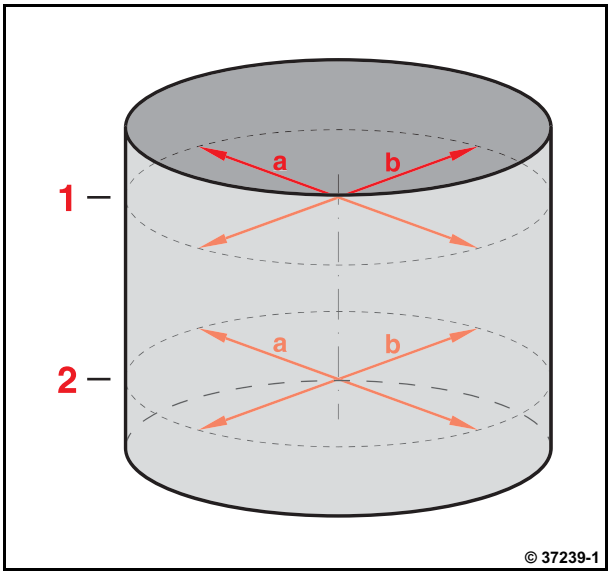


Diagram for measuring the camshaft bearing at the points "a and b" in the levels "1 and 2".



6

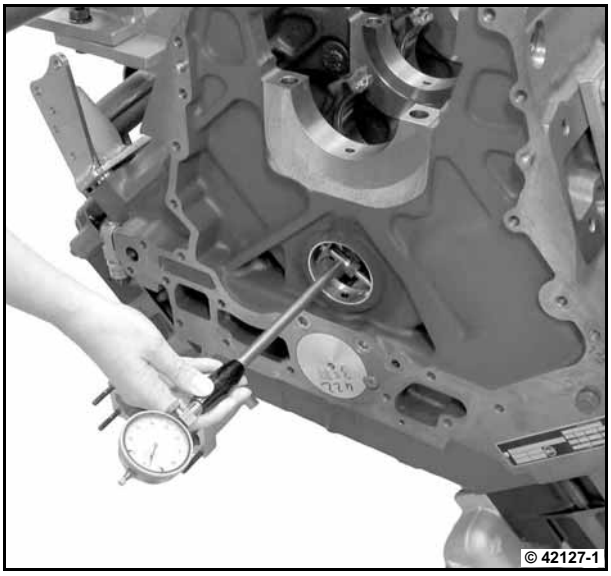
- Insert internal measuring device.
- Balance the internal measuring device at the given measuring points and read off the measured value at the reversal point of the pointer.

P03 13

P03 14

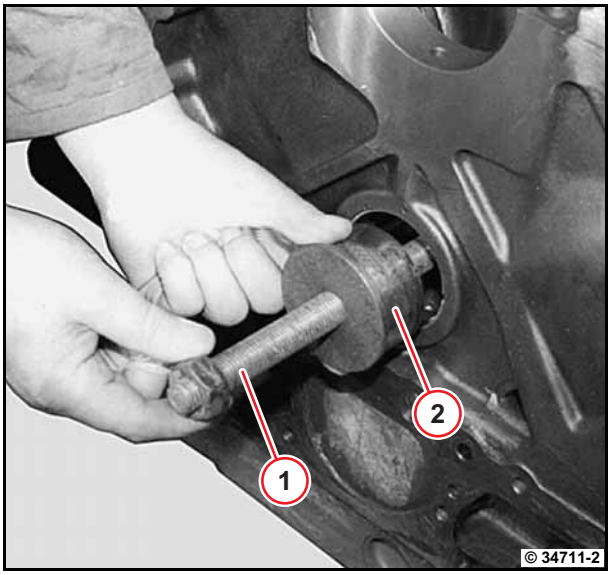
Measuring points see diagram.

When the wear limit is reached, the camshaft bearing must be replaced.

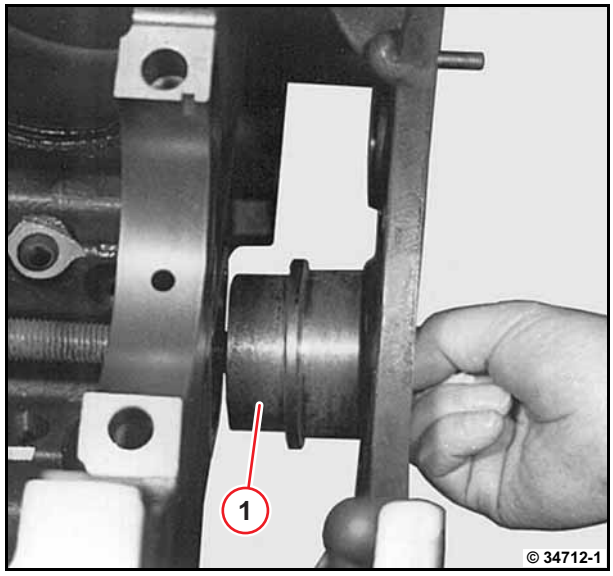


Removing camshaft bearing

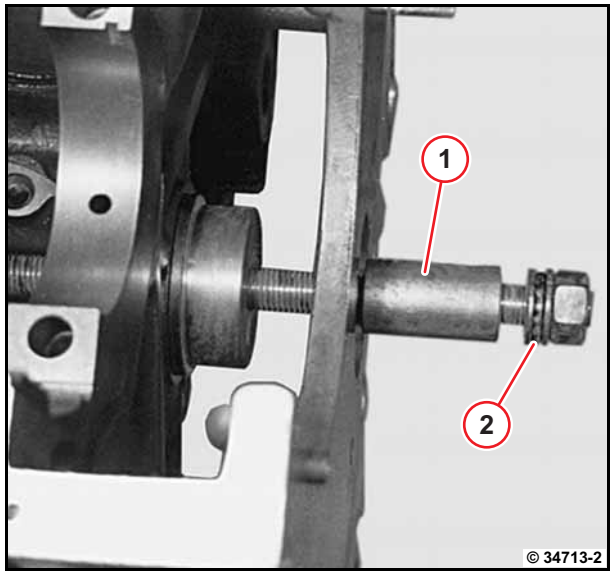
- Insert spindle (1) with puller bush (2) on the opposite side to the flywheel.



- Insert counter bearing (1) on the flywheel side.

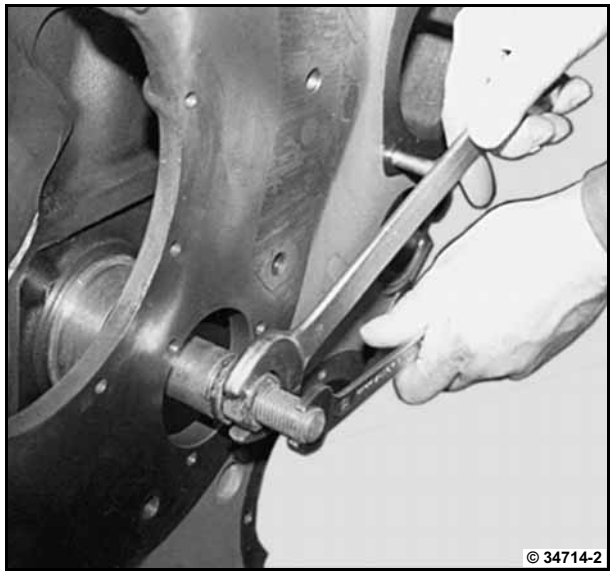


- Mount spacing sleeve (1).
- Mount ball bearing (2).
- Screw on nut.

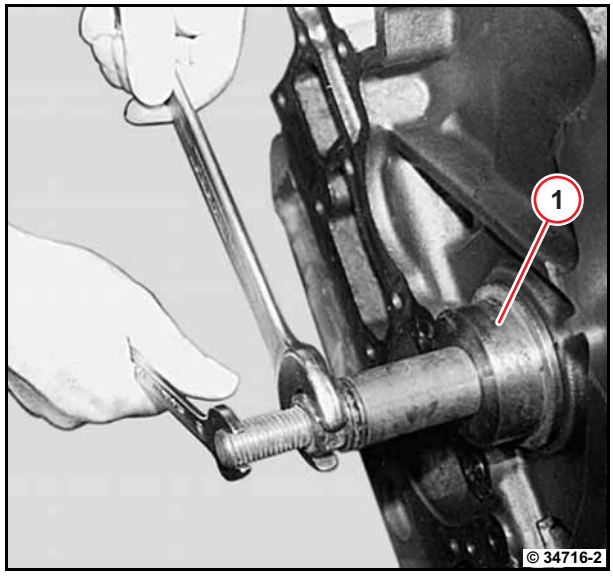


- Pull out the camshaft bearings one after another.

Do not pull out the camshaft bearing (flywheel side).



- Insert spindle with puller bush on flywheel side.
- Mount counter bearing (1) on flywheel side.
- Mount spacing sleeve.
- Mount ball bearing.
- Screw on nut.
- Pull out flywheel side camshaft bearing.

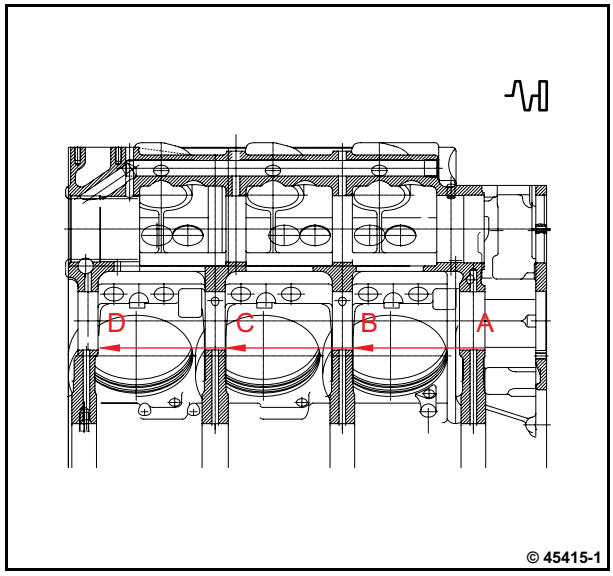


6

Installing camshaft bearing

Diagram for the installation depth of the camshaft bearings.

Measuring the depth from the flywheel side		
A	0	mm
B	172,5 $^{+0,2}_{-0,2}$	mm
C	337,5 $^{+0,2}_{-0,2}$	mm
D	502,5 $^{+0,2}_{-0,2}$	mm

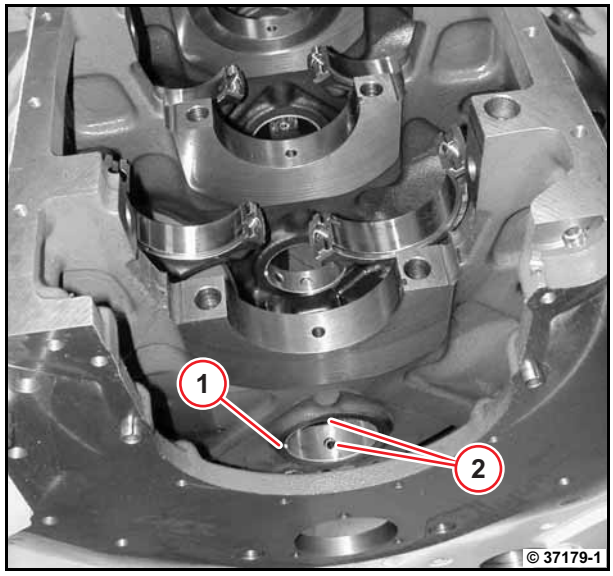


- Mount the new camshaft bearing (flywheel side) so that the recess (1) faces the flywheel.

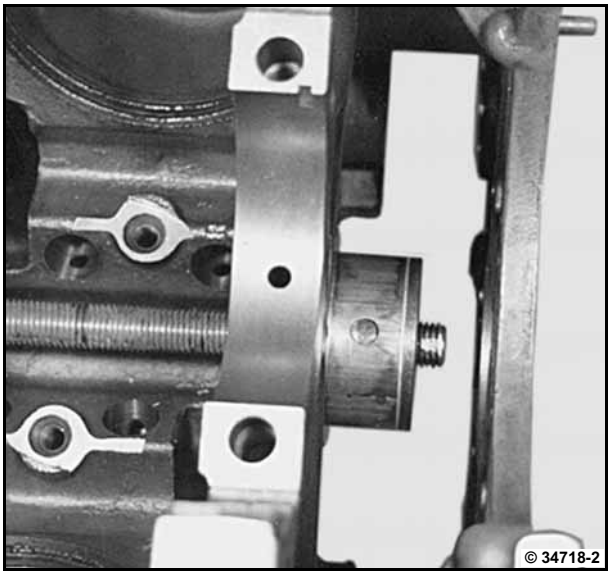
The diagram shows the camshaft bearing in the installed state.

The camshaft bearing (flywheel side) has two lubricating oil bores.

Make sure the lubricating oil bores (2) in the camshaft bearing and crankcase are in line.

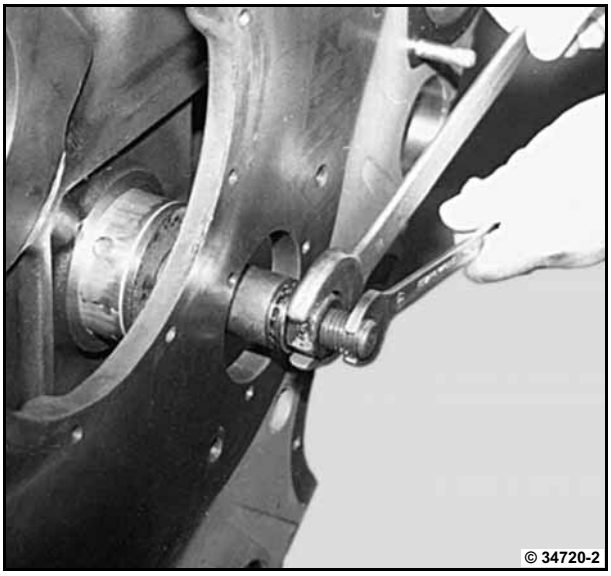


- Insert spindle with counter bearing on the opposite side to the flywheel.
- Insert puller bush in camshaft bearing and push onto the spindle.



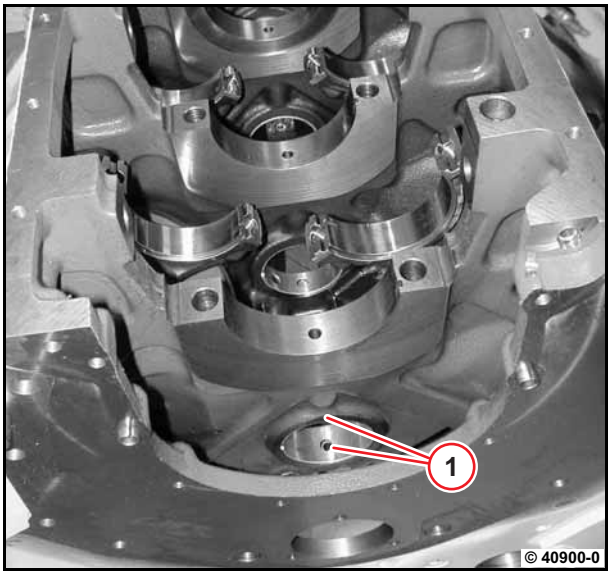
- Mount spacing sleeve.
- Mount ball bearing.
- Screw on nut.
- Press in camshaft bearing (flywheel side).

Installation depth, see diagram.



- Check that the lubricating oil bores (1) are in line.

If the lubricating oil bore is not in line, the camshaft bearing must be removed and re-installed.

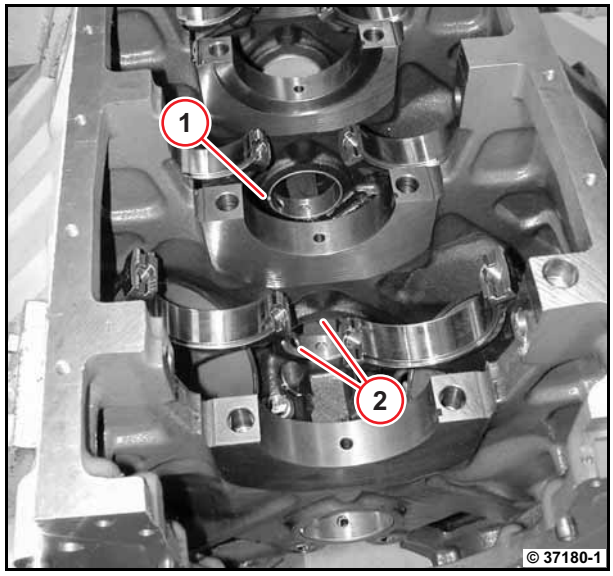


- Mount the new middle camshaft bearings on the opposite side to the flywheel so that the recess (1) faces the flywheel.

The diagram shows the camshaft bearing in the installed state.

The middle camshaft bearings have three lubricating oil bores.

Make sure the lubricating oil bores (2) in the camshaft bearing and crankcase are in line.

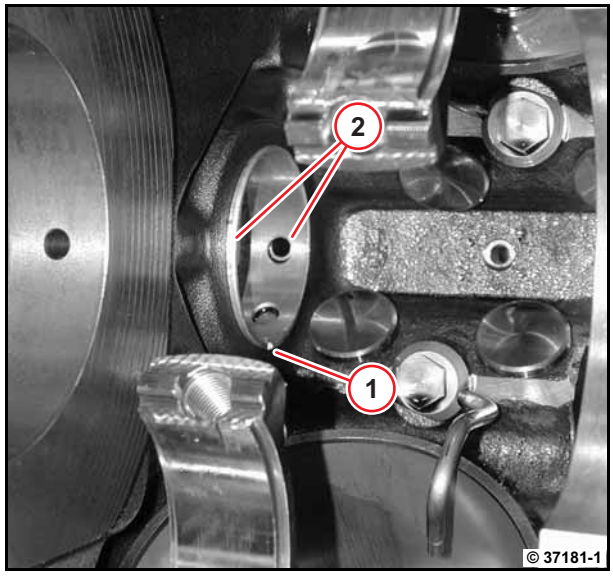


- Mount the new camshaft bearing (opposite side to flywheel) so that the recess (1) faces the flywheel.

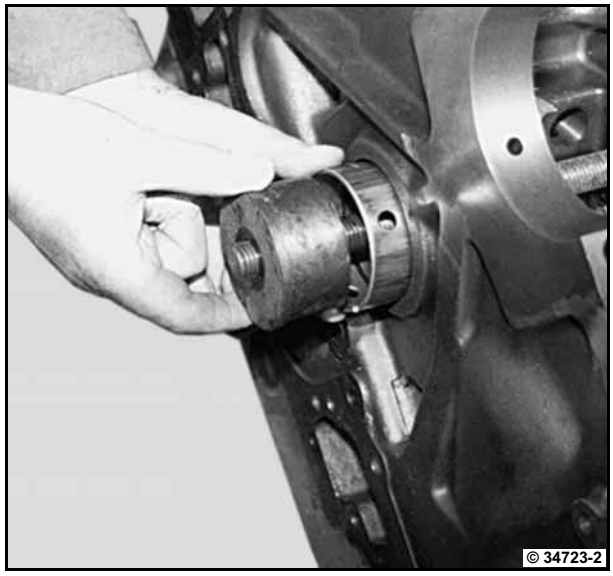
The diagram shows the camshaft bearing in the installed state.

The camshaft bearing (opposite side to flywheel) has three lubricating oil bores.

Make sure the lubricating oil bores (2) in the camshaft bearing and crankcase are in line.



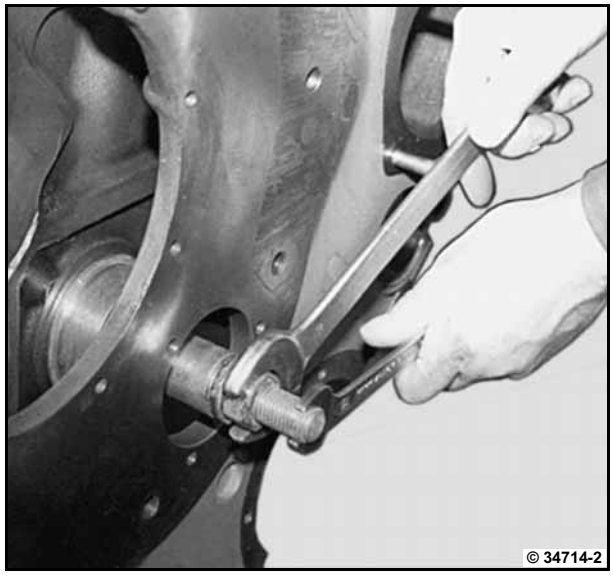
- Insert puller bush in camshaft bearing.
- Insert spindle with puller bush on flywheel side.



- Mount counter bearing.
- Mount spacing sleeve.
- Mount ball bearing.
- Screw on nut.
- Insert the camshaft bearings one after another.

Attention!
Do not damage the camshaft bearings when moving the assembly tool!

Installation depth, see diagram.

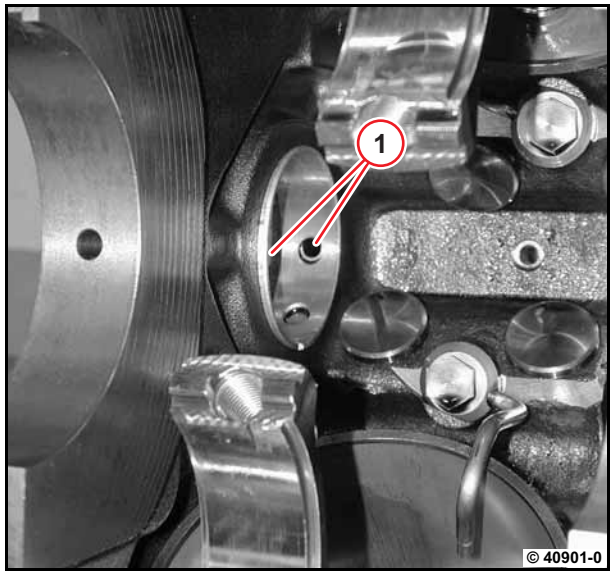


- Check that the lubricating oil bores (1) are in line.

If the lubricating oil bore is not in line, the camshaft bearing must be removed and re-installed.

- Install the camshaft.

W 04-05-05



6

Remove and installing tappets, checking tappet bores

Commercial available tools:
– Micrometer gauge
– Internal measuring device

– W 04-05-05

Removing tappets.

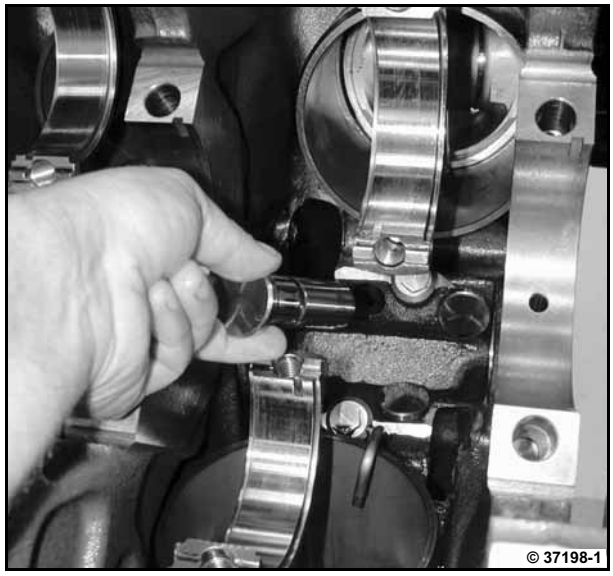
- Remove camshaft.

  W 04-05-05

- Remove tappets.

Lay out components in the order in which they should be installed.

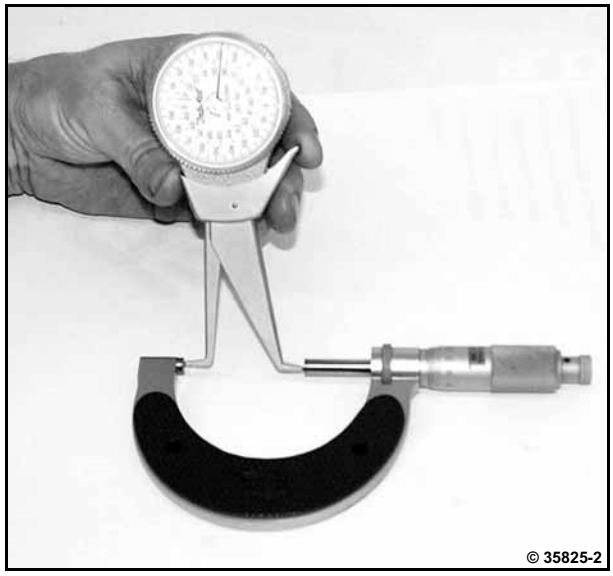
Note order of cylinders.



- Visually inspect the components.

Measuring tappet bores

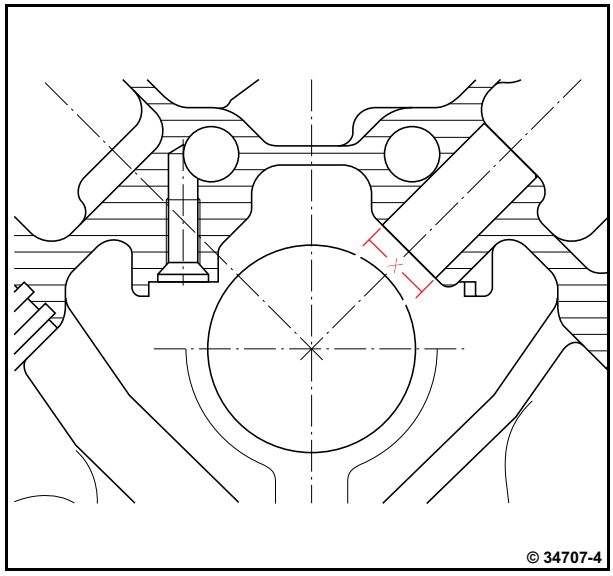
- Set micrometer gauge to 25 mm.
- Push the internal measuring device between the test surfaces of the micrometer gauge and set to "0".



6

- Measure tappet bore with internal measuring device.

P03 23
P03 24



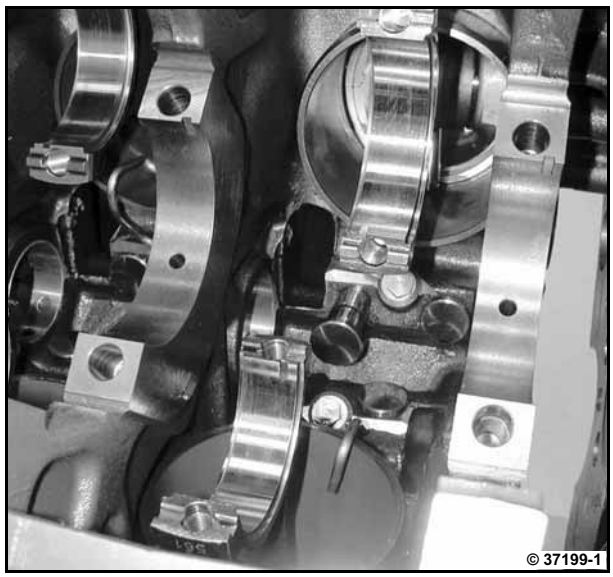
Installing tappets

- Oil all tappets lightly.
- Insert all tappets.

Note the assignment of the tappets.

- Install the camshaft.

W 04-05-05



Removing and installing the gearcase cover

Commercial available tools

– Packing compound
DEUTZ DW 48

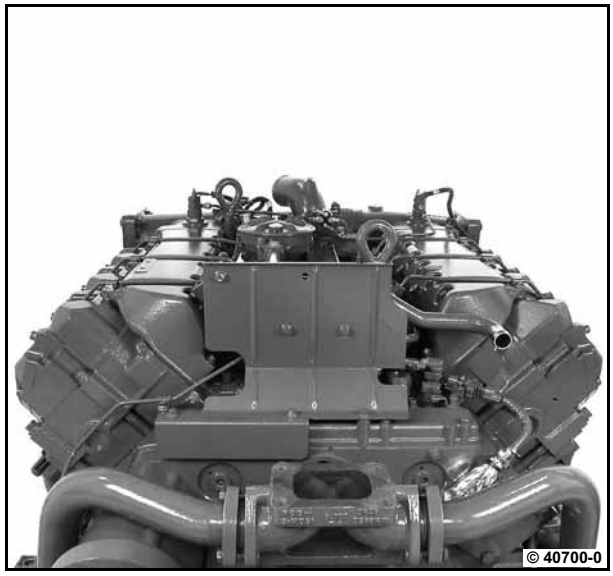
– W 06-06-04

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

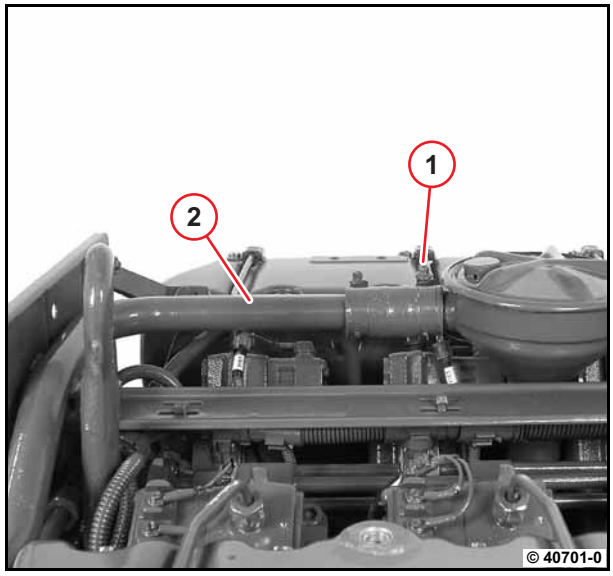
Removing the gearcase

- Remove turbocharger.

  W 06-06-04

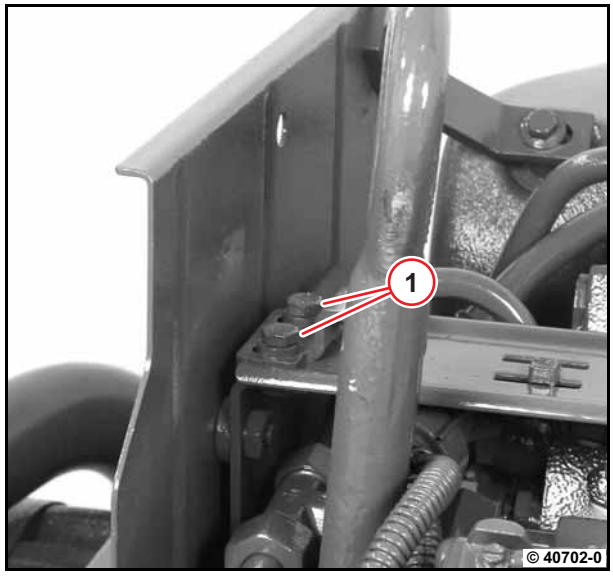


- Loosen hose clip (1).
- Pull off pipe (2).

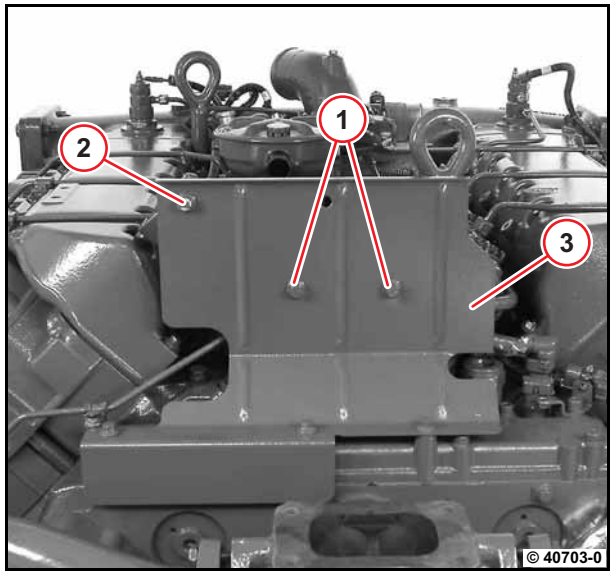


6

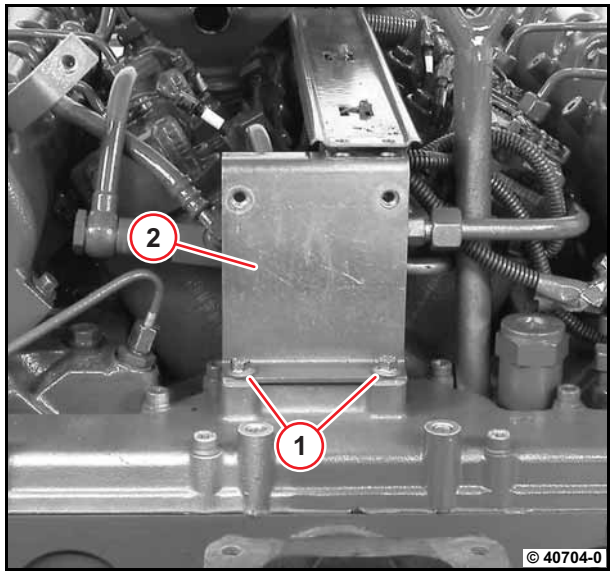
- Unscrew screws (1).



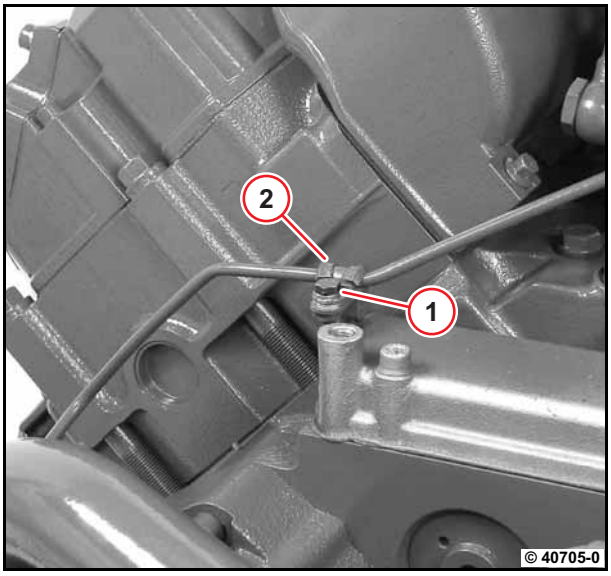
- Unscrew screws (1).
- Remove spacing sleeves.
- Unscrew all screws (2).
- Remove heat shield (3).



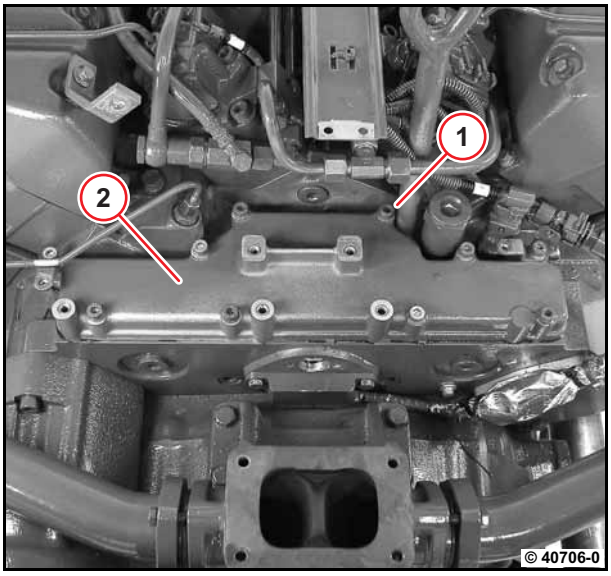
- Unscrew screws (1).
- Remove the holder (2).



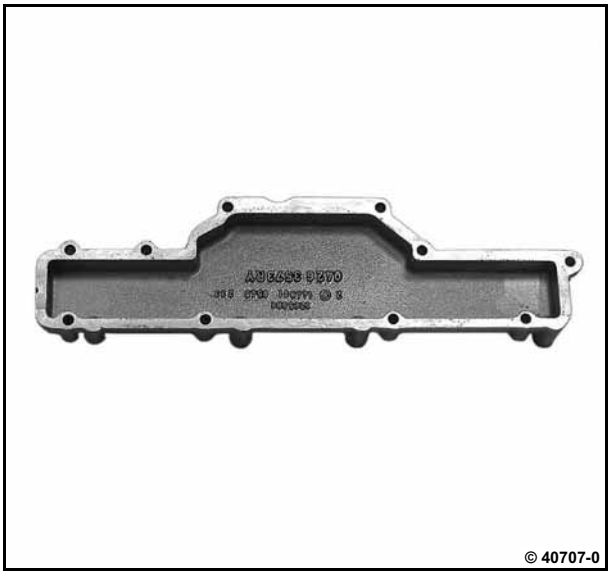
- Unscrew screw (1).
- Remove pipe clamp (2).



- Unscrew all screws (1).
- Remove gear case cover (2).



- Visually inspect the components.

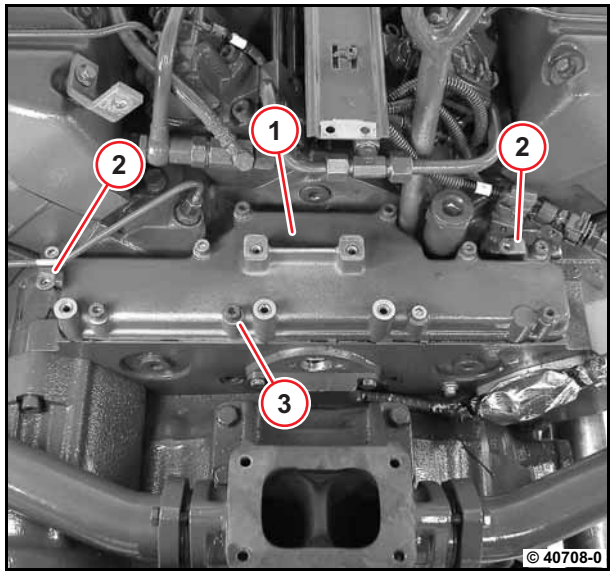


Installing the gearcase cover

Attention!
Do not damage the sealing surfaces.

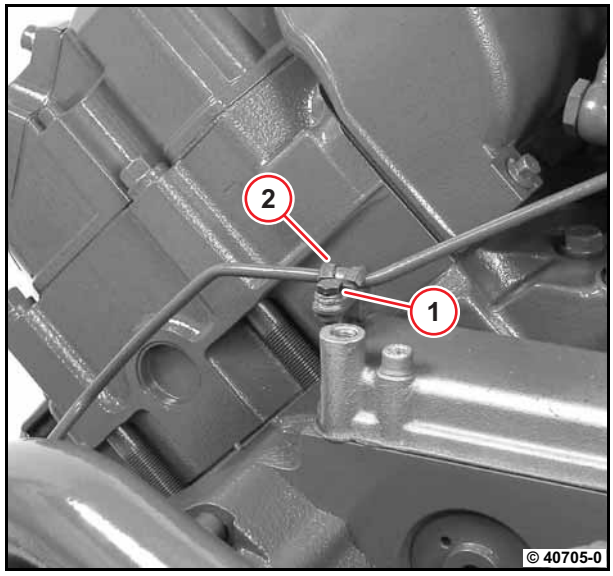
- Clean sealing surfaces.
- Apply packing compound evenly to the sealing surface.
- Mount gear case cover (1).
- Mount holder (2).
- Tighten all screws (3) alternately.

A04 020



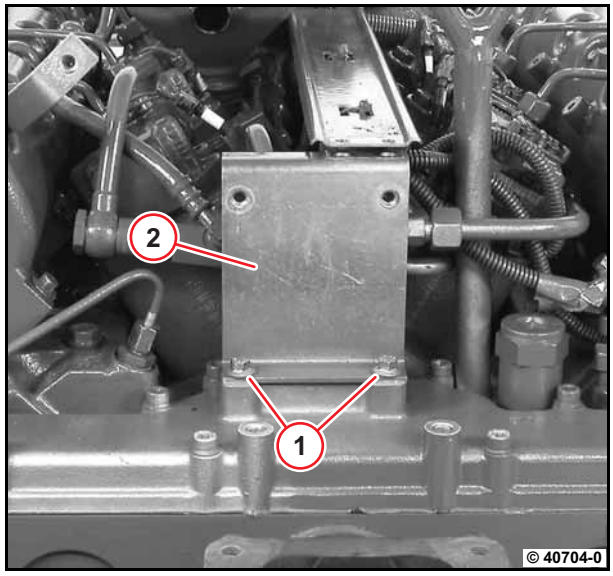
- Mount pipe clamp (2).
- Tighten screw (1).

A08 045



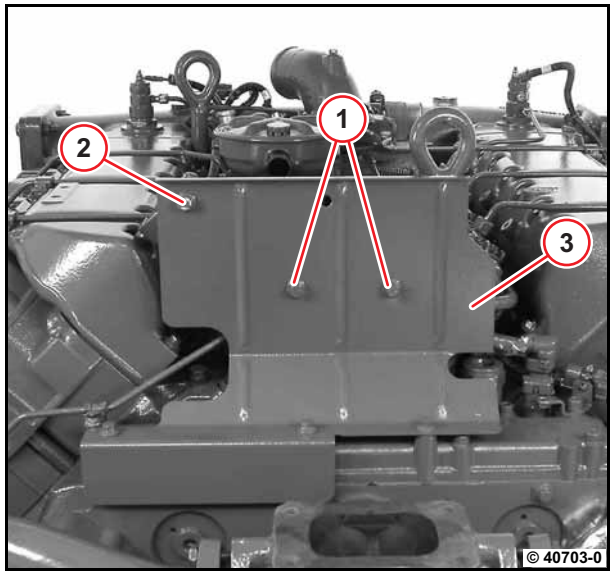
- Mount holder (2).
- Tighten screws (1).

A12 071



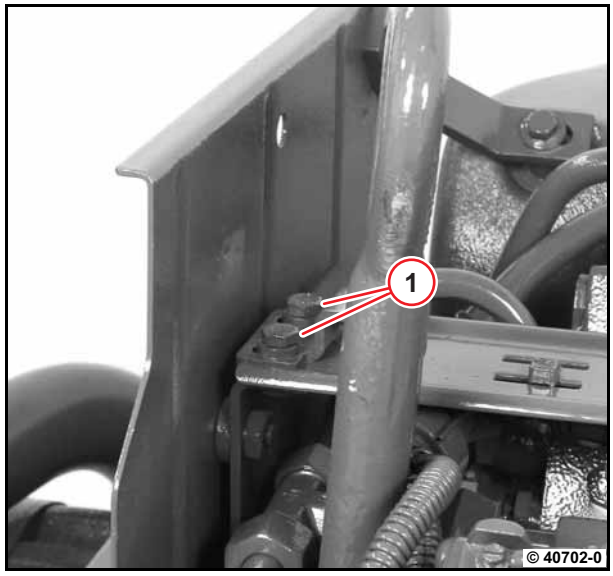
- Mount heat shield (3).
- Insert spacing sleeves with screws (1).
- Tighten screws (1).
- Fasten all screws (2).
- Tighten all screws.

A12 071



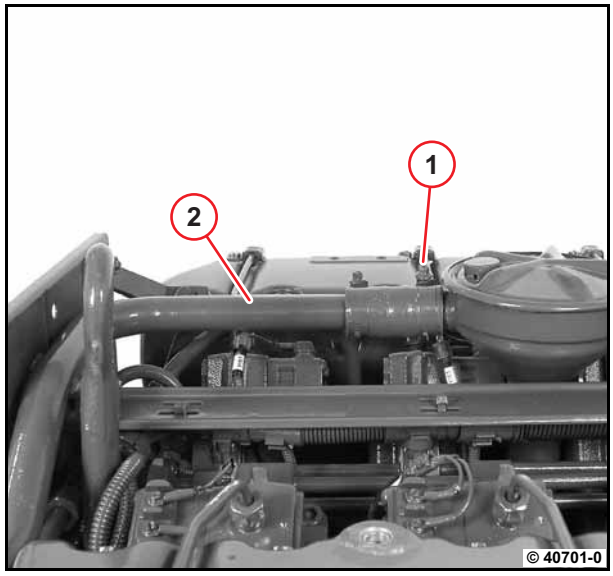
- Tighten screws (1).

A13 094



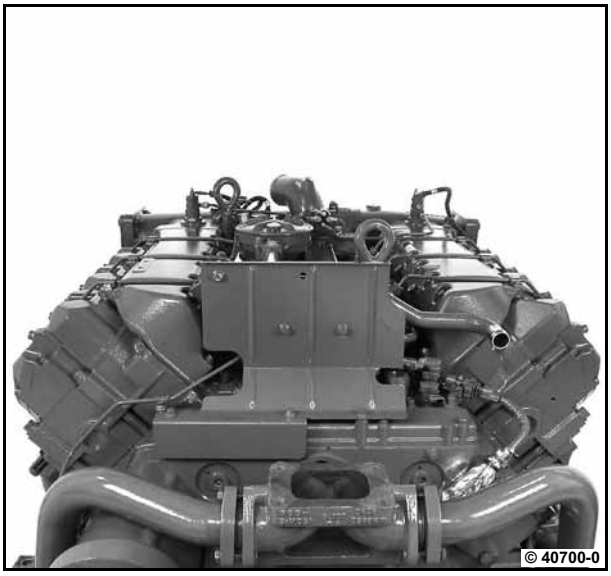
- Push on pipe (2).
- Tighten hose clip (1).

A03 064



- Install the turbocharger.

W 06-06-04



Removing and installing the gearcase cover

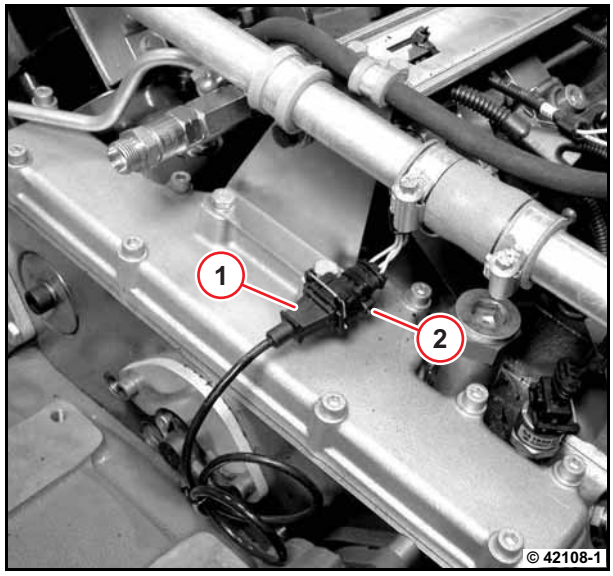
Commercial available tools

– W 07-13-01 . . . . . (Railway)

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

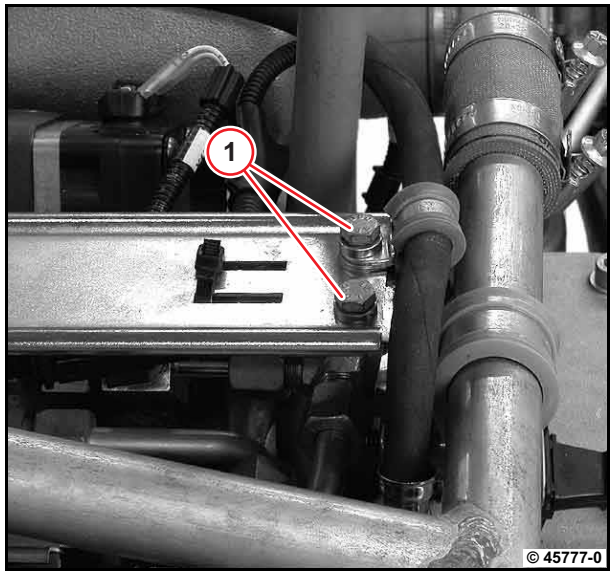
Removing the gearcase

- Unlock cable plug (1) and remove.
- Remove cable tie (2).
- Lay cable bare.

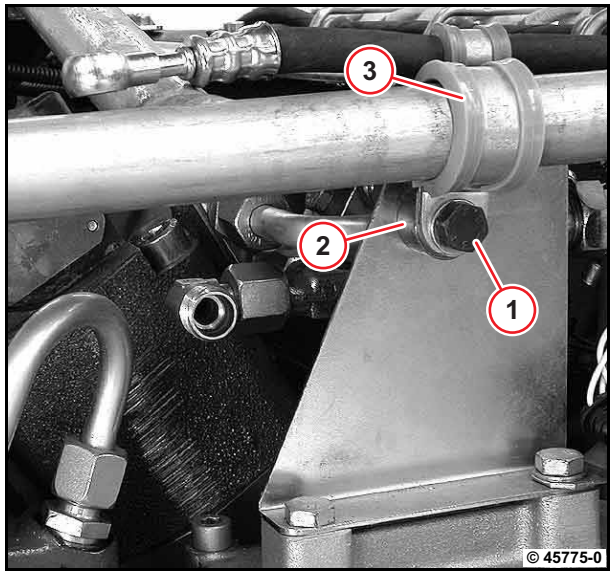


- Unscrew screws (1).
- Remove washers.
- Remove fuel pressure holding valve.

W 07-13-01

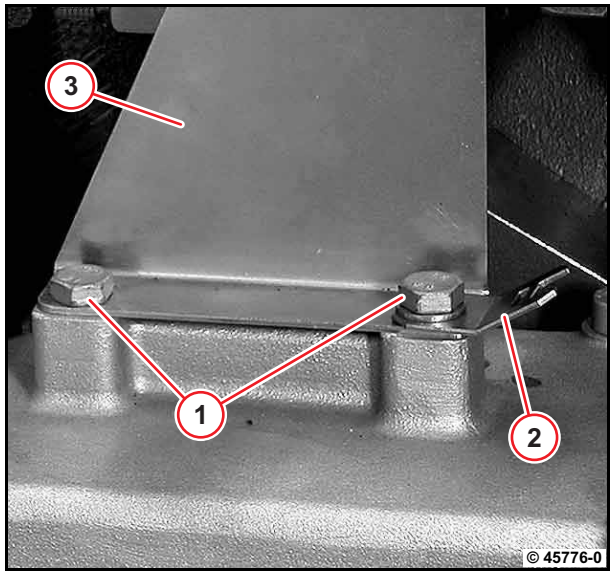


- Unscrew screw (1).
- Remove washer.
- Remove spacing sleeve (2).
- Loosen pipe clamp (3).

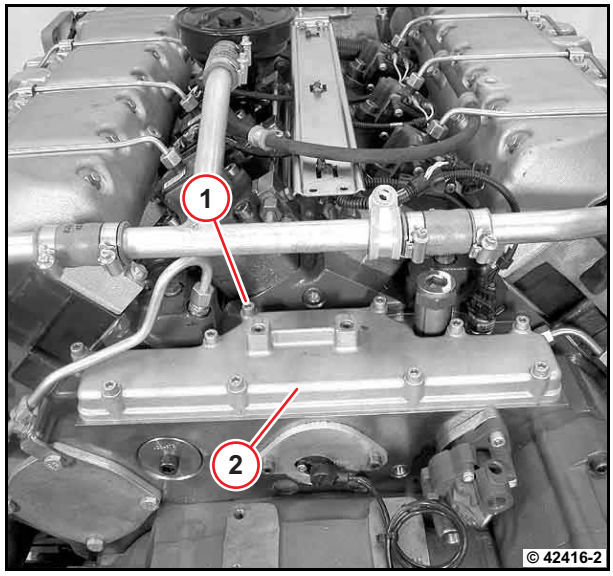


6

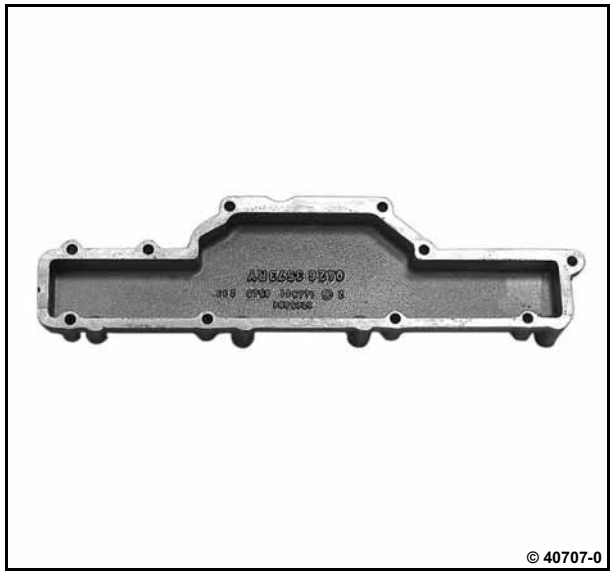
- Unscrew screws (1).
- Remove washer.
- Remove the holder (2).
- Remove holder (3).



- Unscrew all screws (1).
- Remove gear case cover (2).
- Remove gasket.



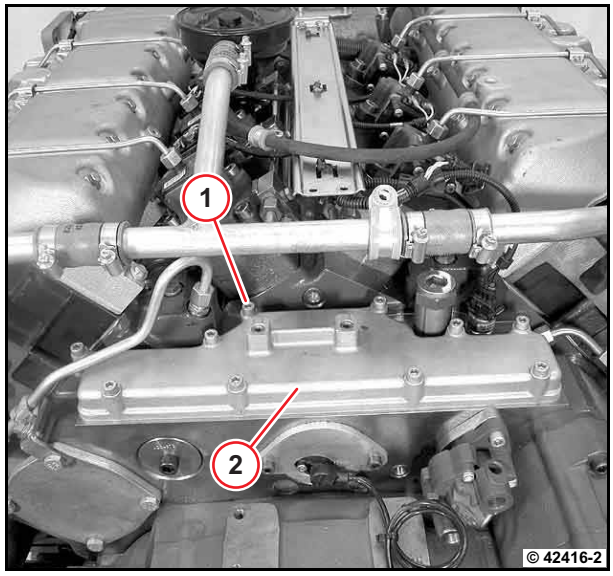
- Visually inspect the components.



Installing the gearcase cover

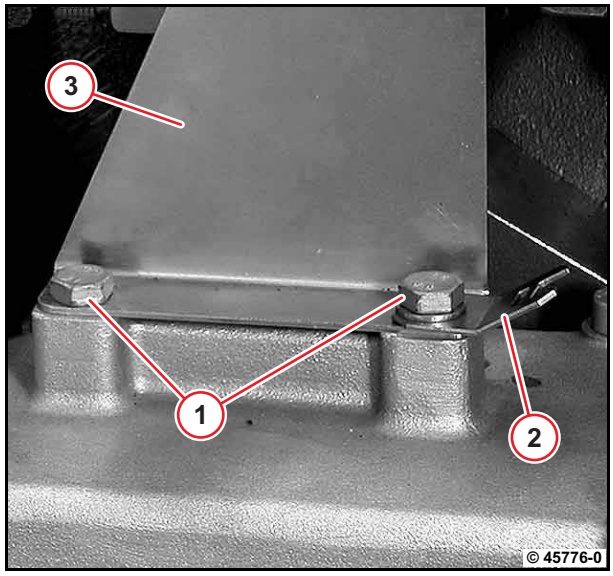
- Clean sealing surfaces.
- Mount new gasket.
- Mount gear case cover (1).
- Tighten screws (2) alternately.

A04 020



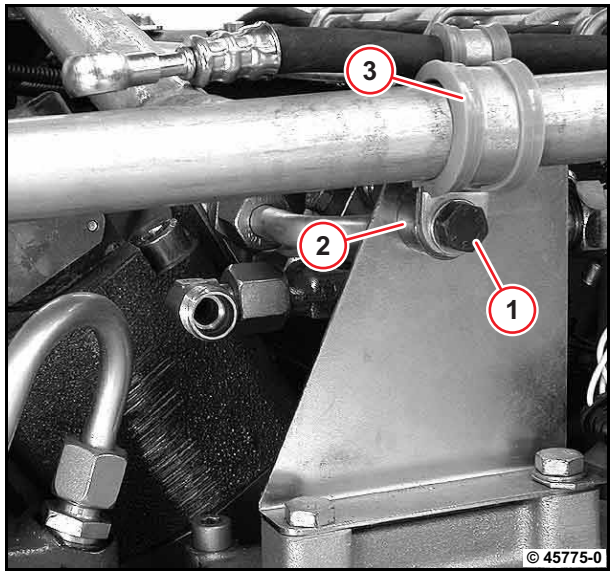
- Mount holder (3).
- Mount holder (2).
- Mount washer.
- Tighten screws (1).

A12 071



- Position pipe clamp (3).
- Position spacing sleeve (2).
- Mount washer.
- Tighten screw (1).

A12 096

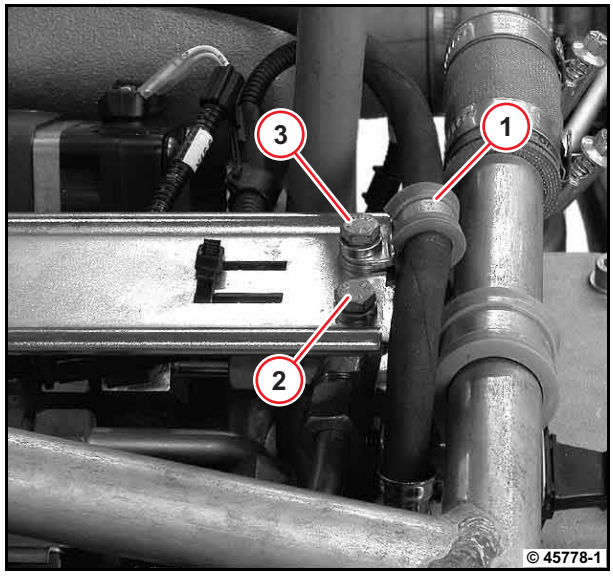


- Position cable harness rail with cable harness.
- Position pipe clamp (1).
- Mount washers.
- Fasten screws.

Note different screw lengths:
M6 x 12 mm (1)
M6 x 16 mm (2)

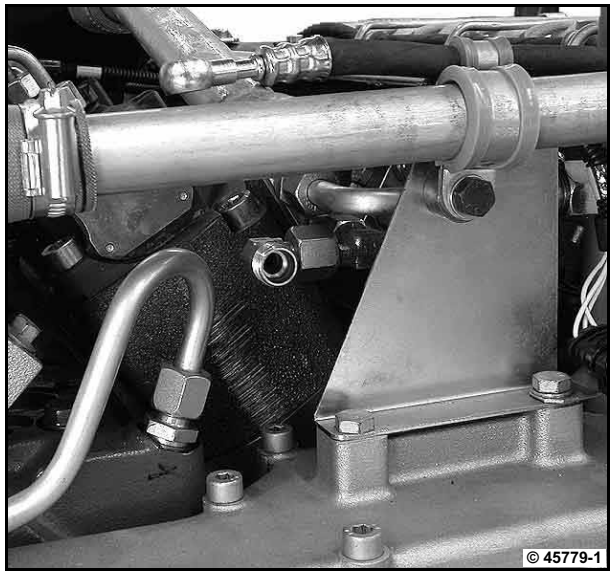
- Tighten screws .

A13 094



- Install fuel pressure holding valve.

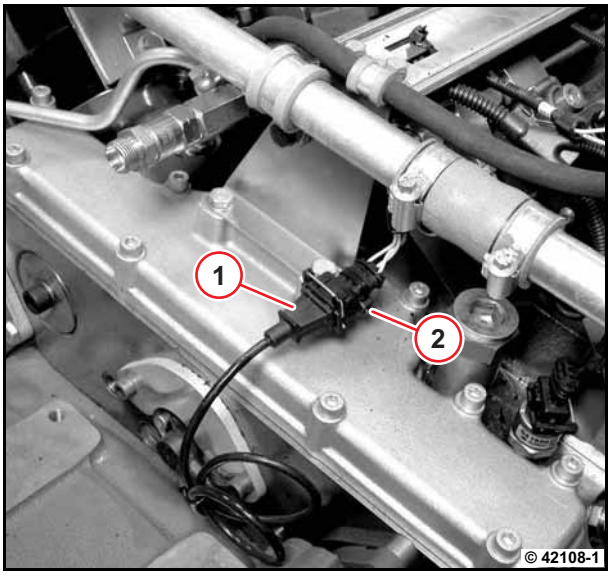
W 07-13-01



- Plug in the cable plug (1).

Ensure that the cables are connected properly.

- Fix cable with cable tie (2).



Removing and installing the camshaft

Commercial available tools:
– Lifting gear
– Depth-measuring appliance
– Magnetic measuring stand
– Rotation angle disc 8190

Special tools:
– Dial gauge. 100400
– Counter support 144150

– Packing compound DEUTZ DW 48
– Locking agent DEUTZ DW 72

– W 01-02-02
– W 02-04-01
– W 04-05-06
– W 05-07-03
– W 06-06-04
– W 07-04-01 . . . . . (Cylinder A1)
– W 07-04-01 . . . . . (Cylinder A2-B3)
– W 07-06-04

6

Removing the camshaft

- Remove rocker arm brackets.

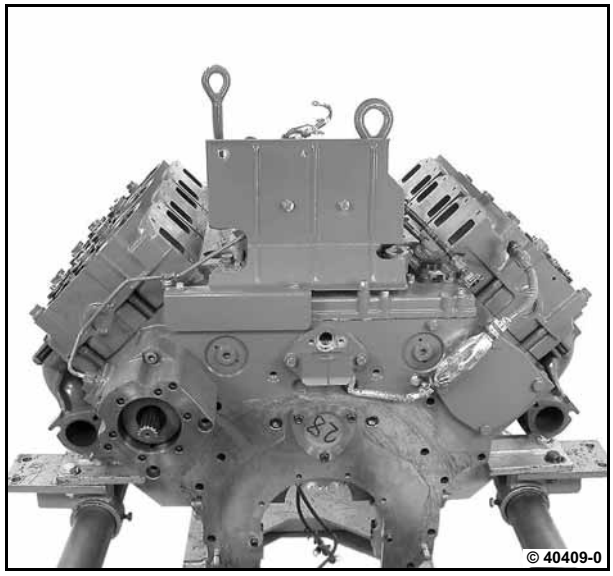
  W 01-02-02

- Remove crankshaft.

  W 02-04-01

- Remove impulse transmitter (camshaft).

  W 05-07-03



- Remove injection pumps (cylinder A1).

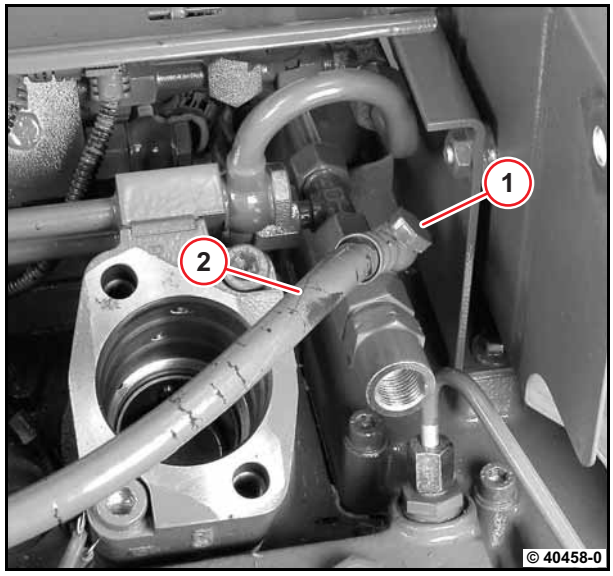
  W 07-04-01

- Remove injection pumps (cylinder A2-B3).

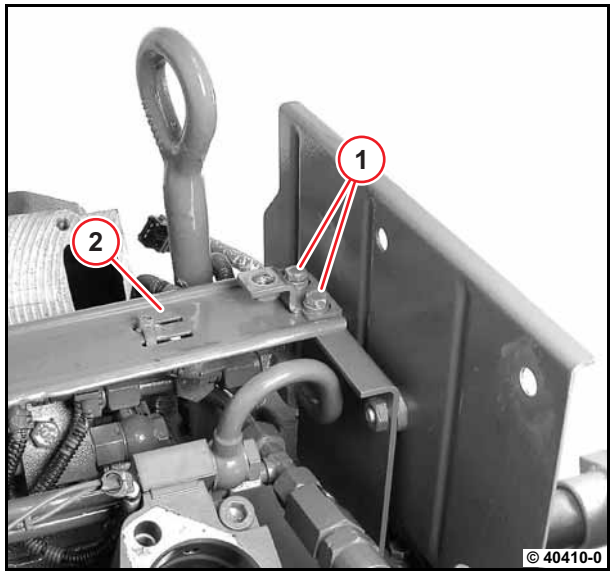
  W 07-04-01

Do not remove injection pump housing.

- Unscrew hollow screw (1).
- Place fuel hose (2) to one side.
- Remove sealing rings.

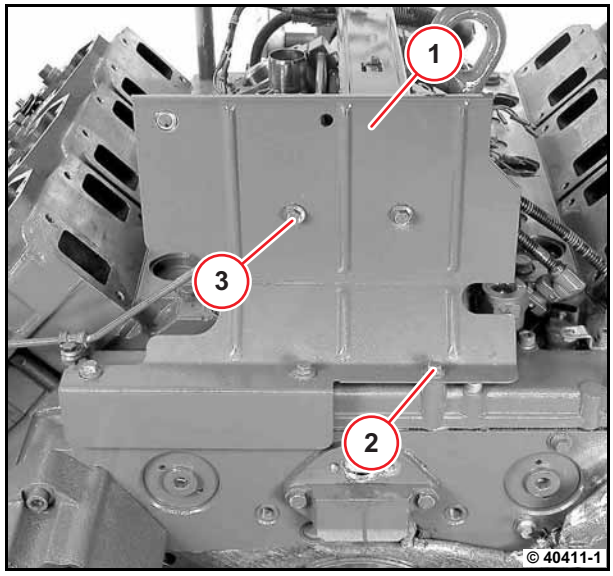


- Unscrew screws (1).
- Place cable harness rail (2) with cable harness to one side.

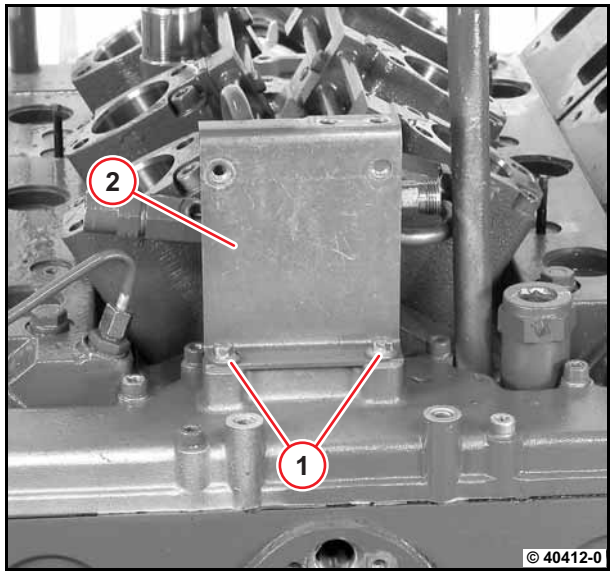


6

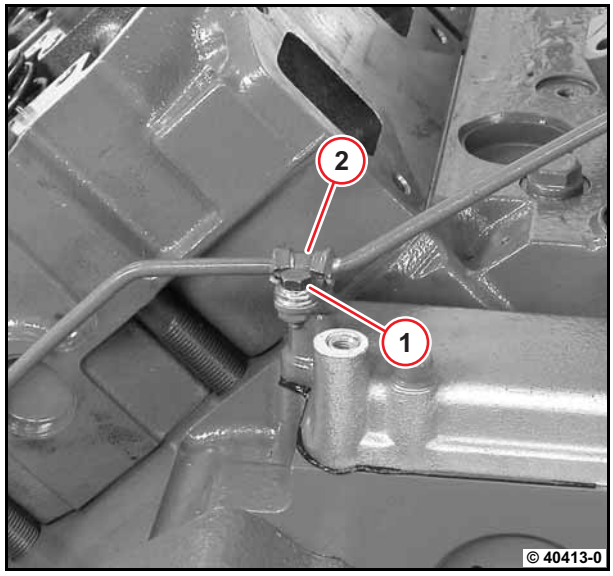
- Unscrew all screws (3).
- Remove spacing sleeves.
- Unscrew all screws (2).
- Remove heat shield (1).



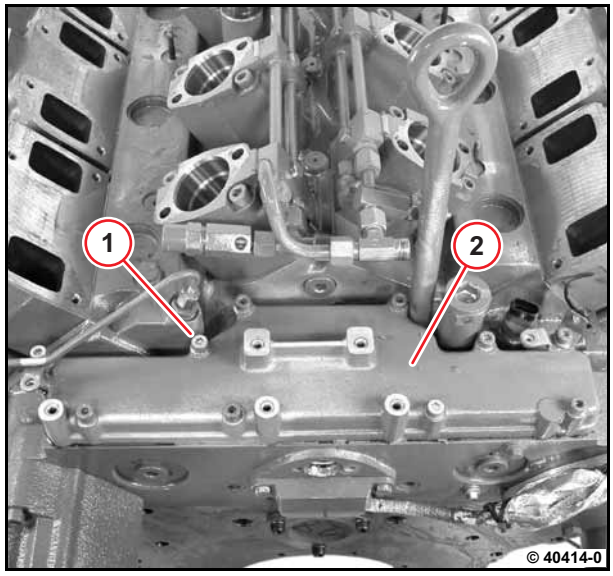
- Unscrew screws (1).
- Remove the holder (2).



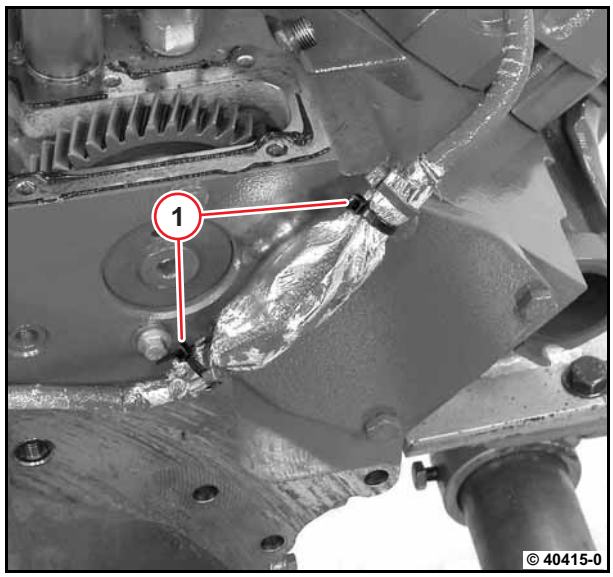
- Unscrew screw (1).
- Remove pipe clamp (2).



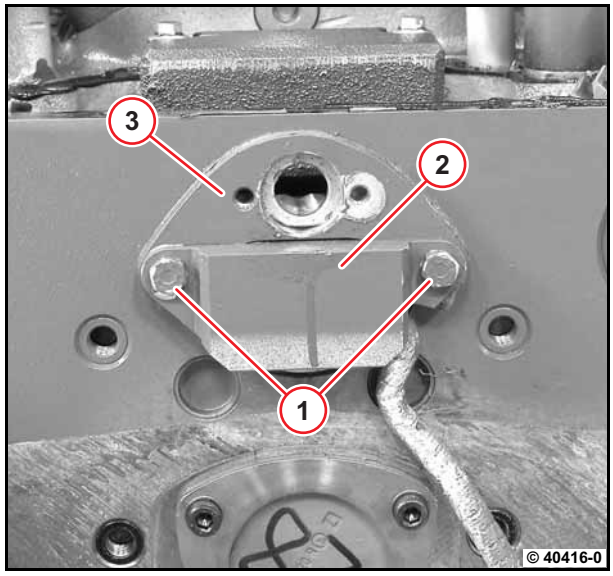
- Unscrew all screws (1).
- Remove gear case cover (2).



- Remove cable tie (1).

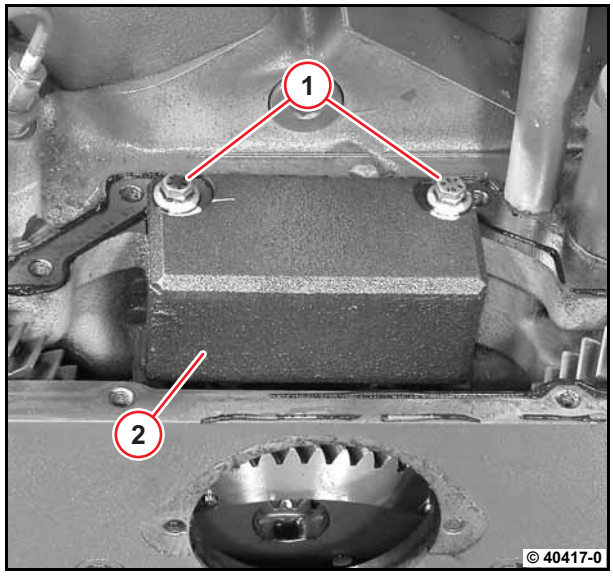


- Unscrew screws (1).
- Remove cover (2) .
- Remove cover (3).



6

- Unscrew screws (1).
- Remove pad thrust bearing (2).

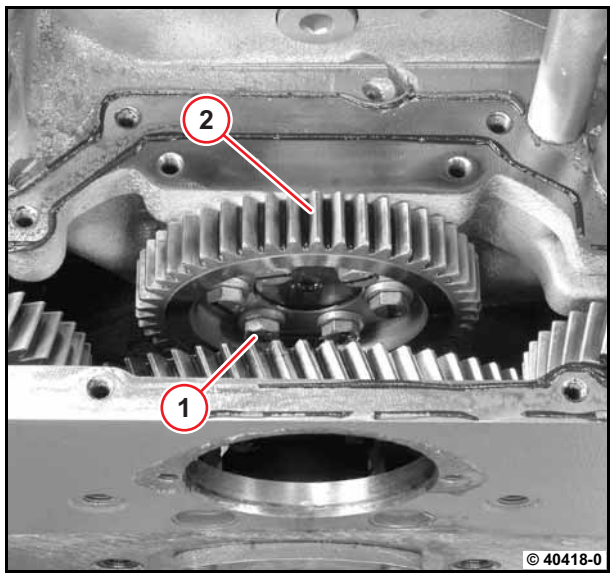


- Unscrew all screws (1).
- Remove gear wheel (2).

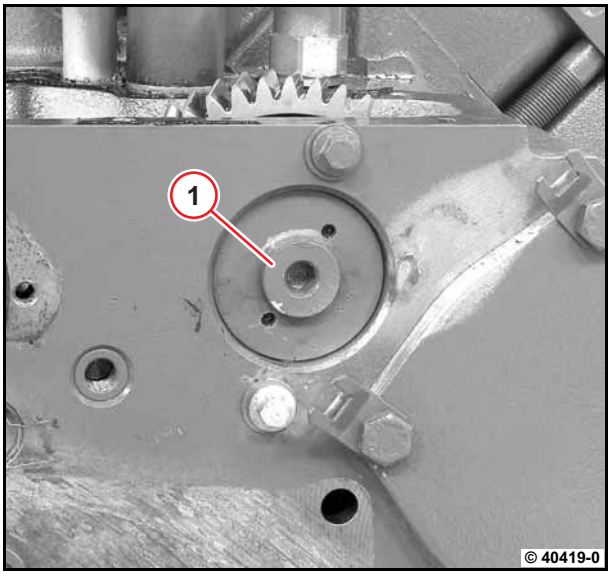
Attention!
Make sure no parts fall into the crankcase!

Concealed screws can be accessed by turning the crankshaft with the turning gear.

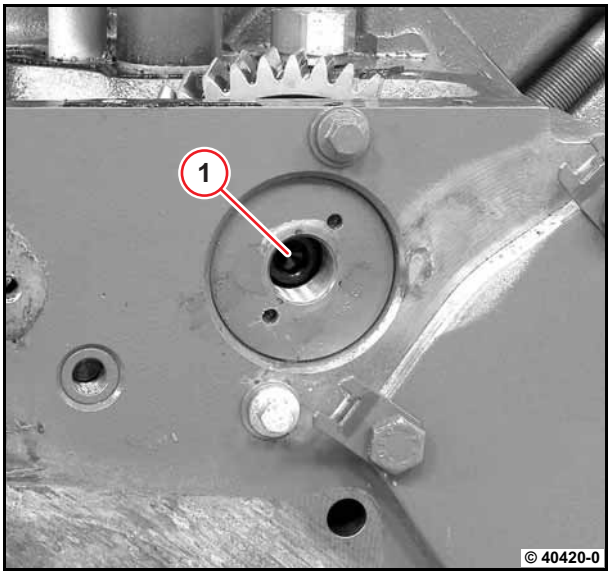
Press back the injection pump camshaft carefully as far as it goes.



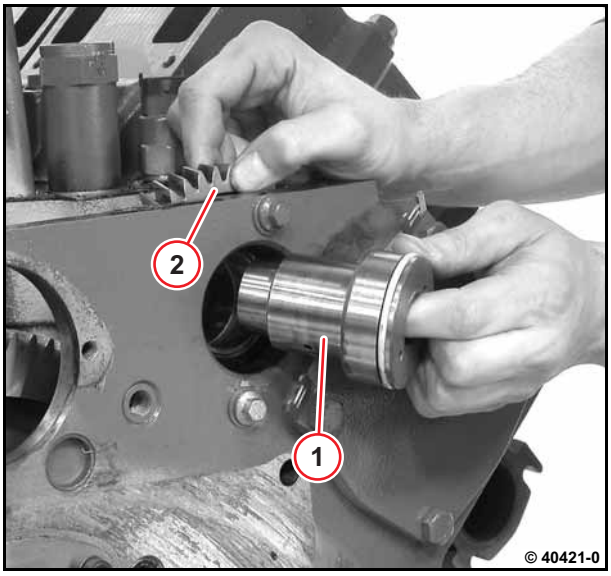
- Unscrew screw (1).



- Unscrew screw (1).

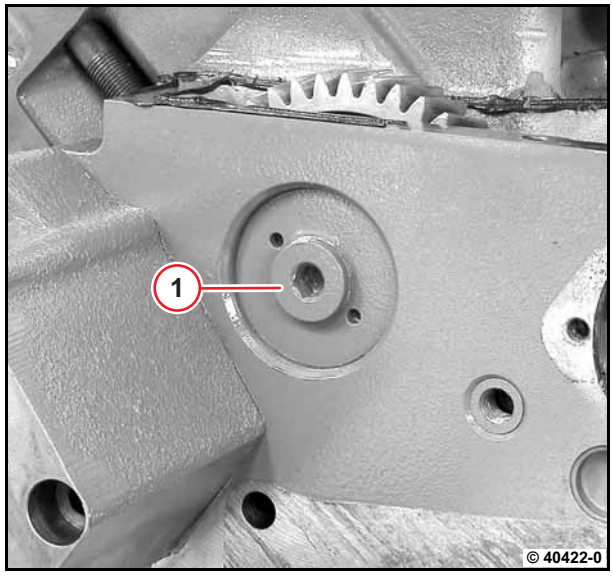


- Remove bolt (1).
- Remove idler gear (2).

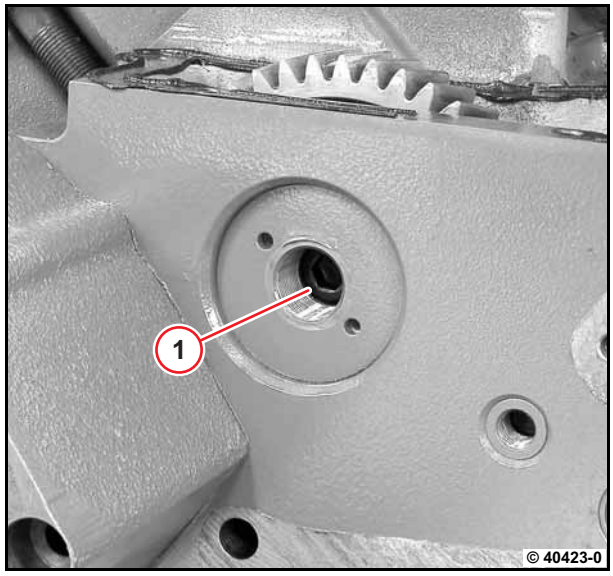


6

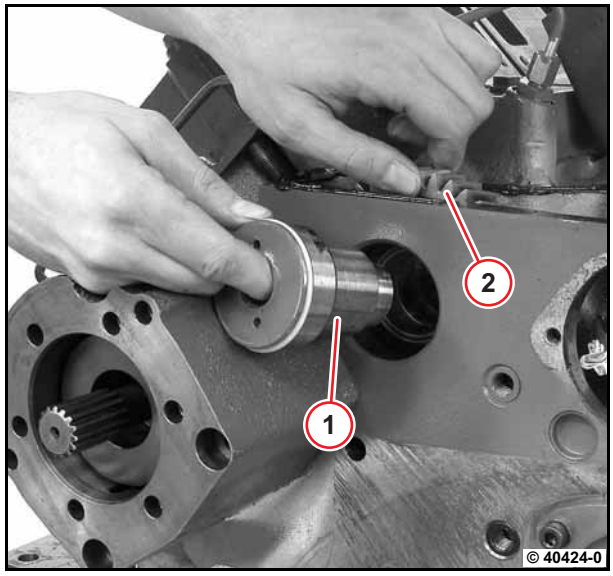
- Unscrew screw (1).



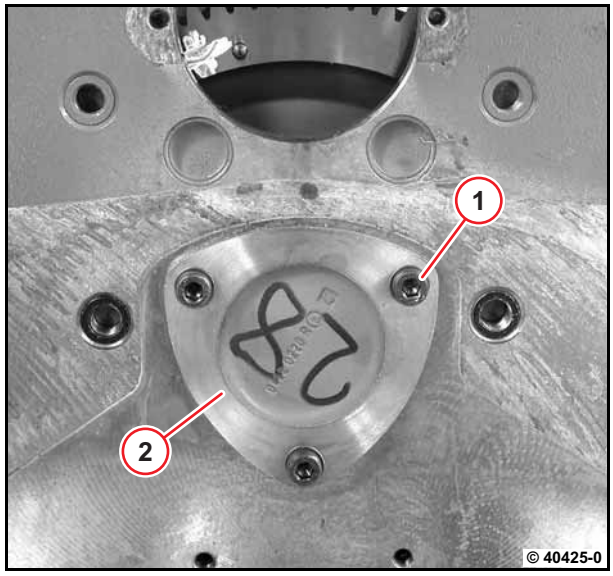
- Unscrew screw (1).



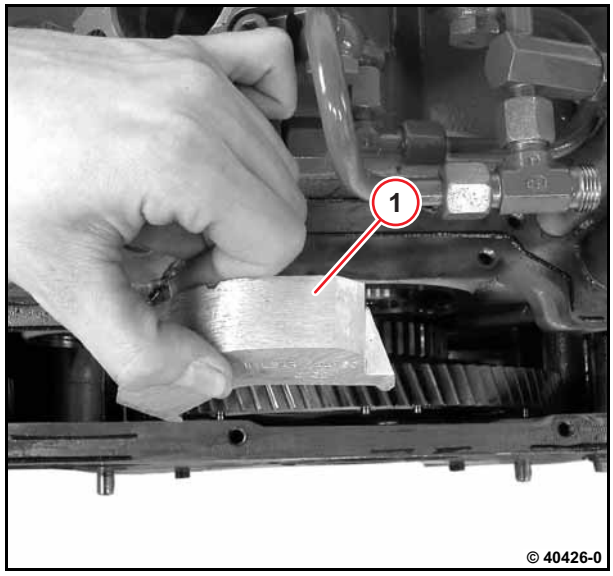
- Remove bolt (1).
- Remove idler gear (2).



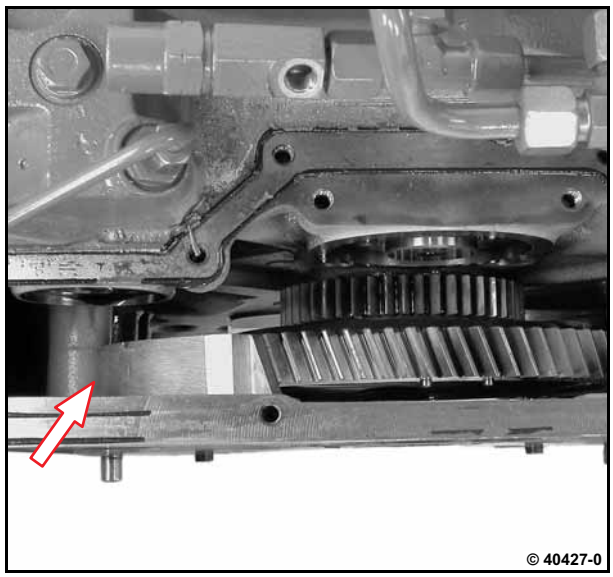
- Unscrew all screws (1).
- Remove cover (2) .
- Remove gasket.



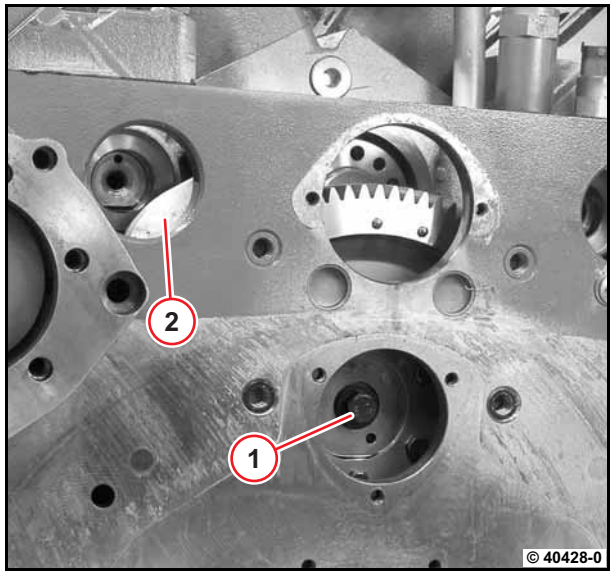
- Insert counter support (1) in the toothing of the camshaft gear wheel.



- Turn the camshaft gear wheel in the direction of the A-bank.
- Block the camshaft gear wheel with the counter holder on the crankcase (arrow).

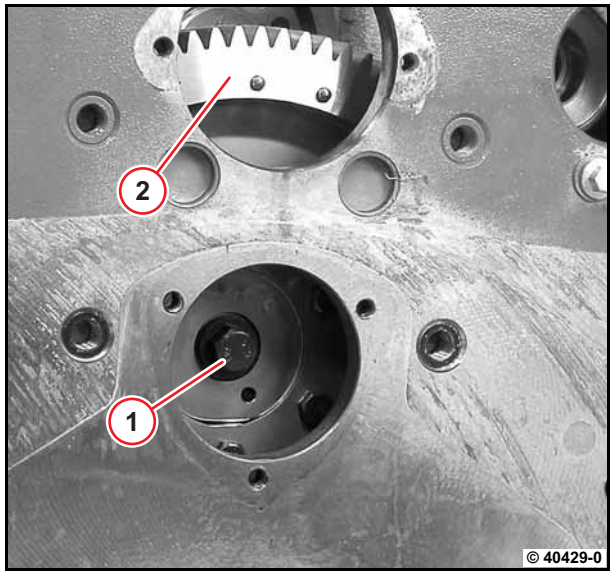


- Loosen screw (1).
- Turn back the camshaft gear wheel.
- Remove counter holder (2).

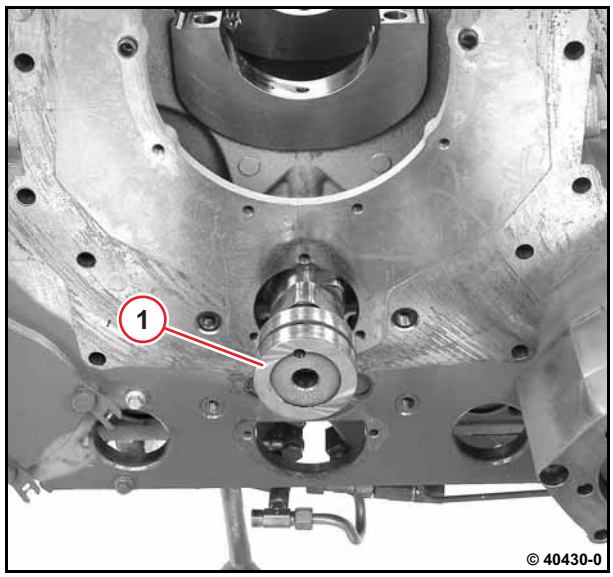


- Unscrew screw (1).
- Remove camshaft toothed wheel (2).

Press back the injection pump camshaft carefully as far as it goes.



- Turn engine **180°**.
- Press in all tappets.
- Hang engine on workshop crane.
- Unhook the engine from the assembly block on one side.
- Pull out the camshaft (1) carefully to the flywheel side.



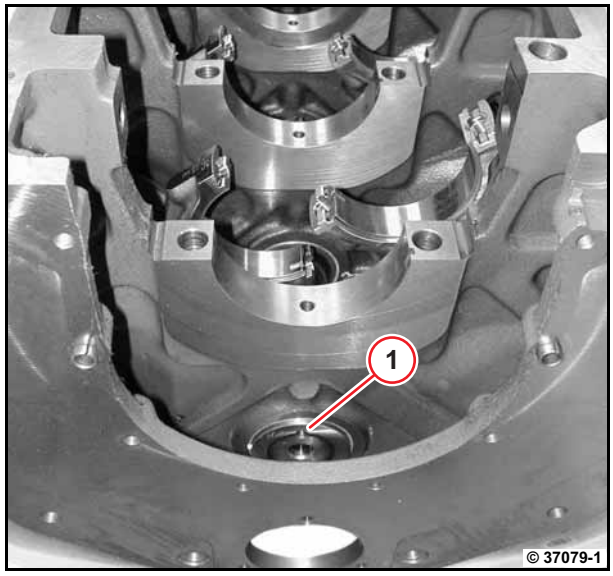
- Check camshaft.

W 04-05-06

Installing the camshaft

- Oil camshaft bearing lightly.
- Oil cam shaft pin lightly.
- Insert camshaft carefully.

The locating hole (1) of the camshaft faces towards the lubricating oil pan.



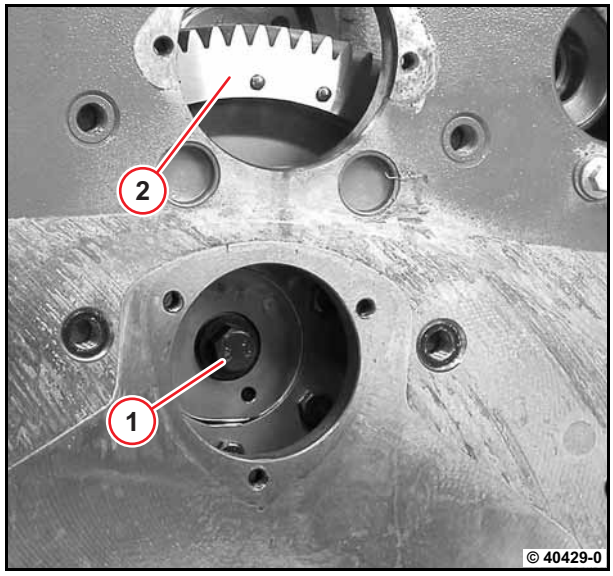
- Measure the overhang of the parallel pin with the depth measuring appliance.

P04 39

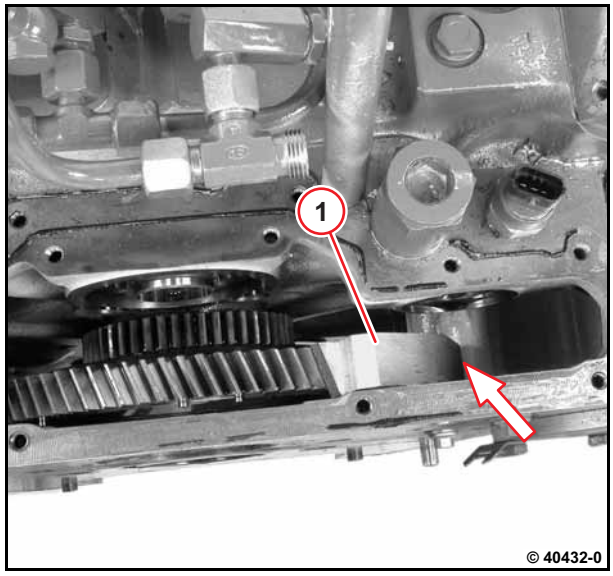
- Correct overhang.

- Insert camshaft gear wheel (2).
- Lightly oil screw (1).
- Fasten screw (1).

Make sure that the parallel pin on the camshaft gear wheel and the locating hole on the camshaft are in line.



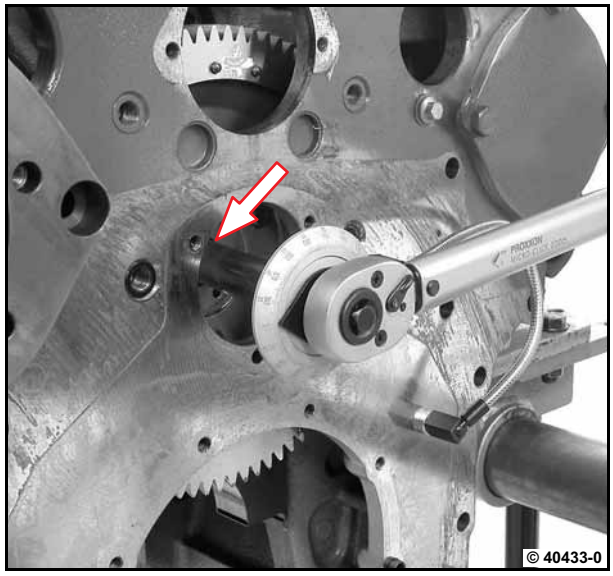
- Insert counter support (1) in the toothing of the camshaft gear wheel.
- Turn the camshaft gear wheel in the direction of the B-bank.
- Block the camshaft gear wheel with the counter holder on the crankcase (arrow).



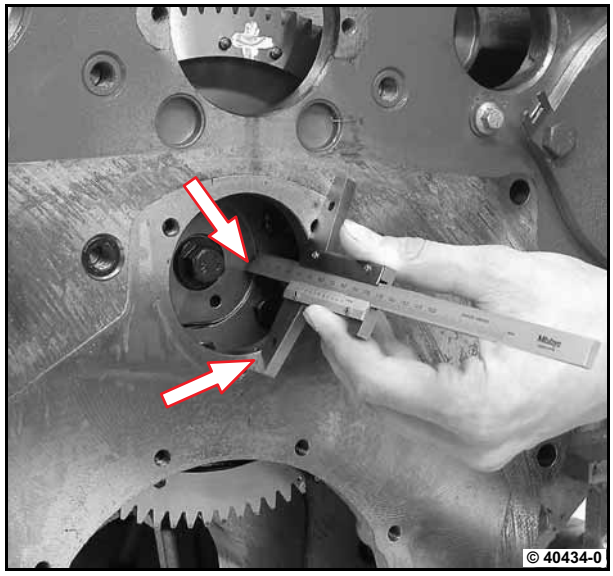
- Tighten screw (arrow).

A04 001

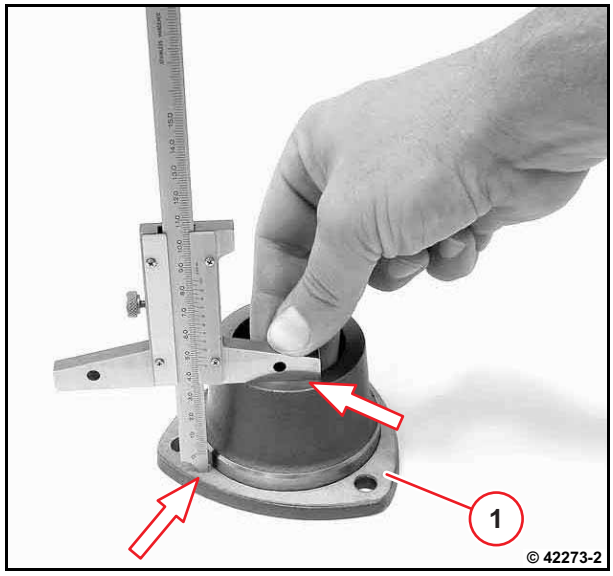
- Turn back the camshaft gear wheel.
- Remove counter holder.



Determining axial backlash of the camshaft



- Push back the camshaft as far as it goes.
- Measure the camshaft stand back from the lay-on surface on the camshaft gear wheel to the crankcase with the depth measuring appliance (arrows).
- Note measured value, dimension (a).



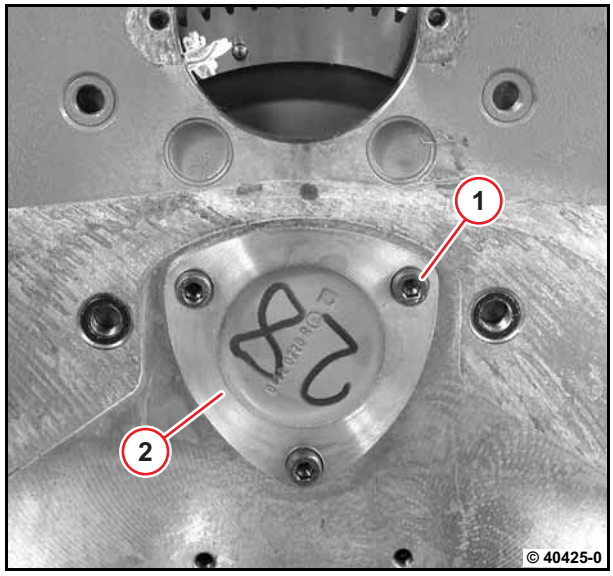
- Mount new gasket (1).
- Measure the flange height from the running surfaces to the lay-on surface with the depth measuring appliance (arrows).
- Note measured value, dimension (b).
- Determine axial backlash.

P04 35

Calculation example	
Desired:	Axial backlash
Given:	-
Measured:	(a) = 45.80 mm
	(b) = 45.50 mm
Calculation:	Axial backlash = dimension (a) - dimension (b)
	45.80 mm - 45.50 mm
Result:	= 0.30 mm

- Correct deviation with gaskets.

P04 37



- Mount cover (2).

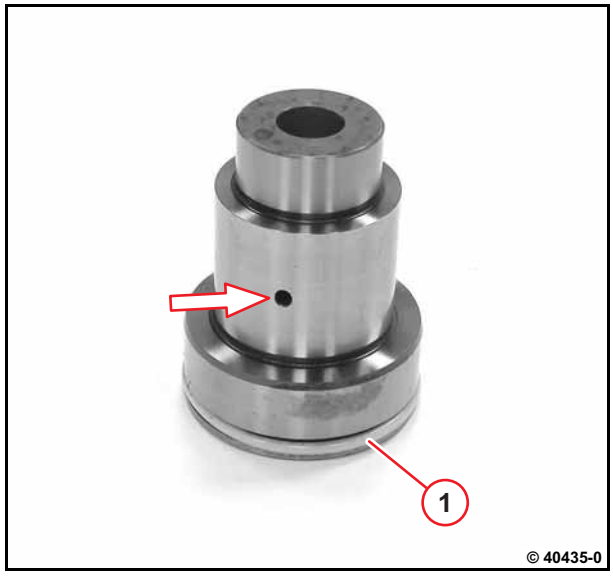
Insert screws with locking agent.

- Fit new sealing rings.
- Tighten all screws (1).

A04 002

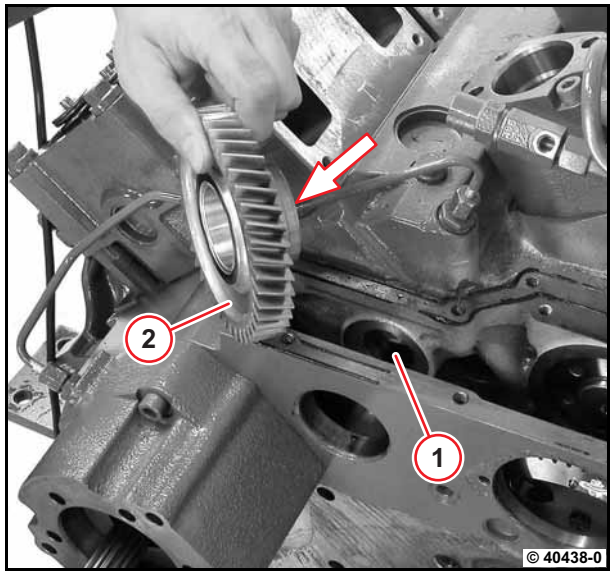
6

- Mount new O-ring (1).
- Lightly oil O-ring.
- Check oil channel (arrow) for free passage.

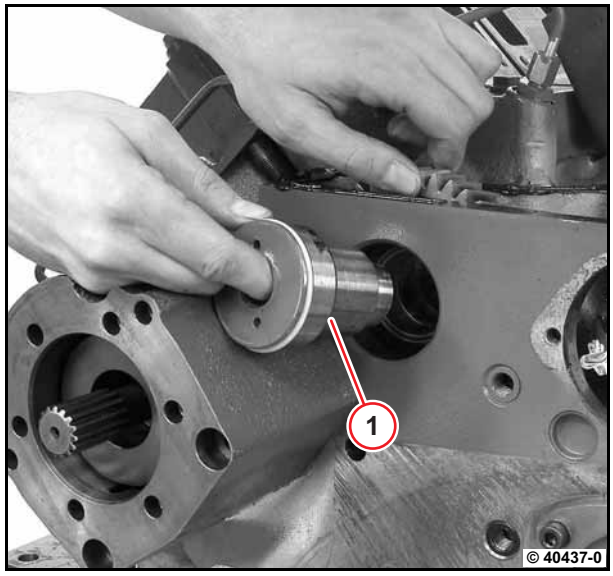


- Lightly oil bearing liner (1) with engine oil.
- Insert idler gear (2).

The collar (arrow) faces the bearing bush.



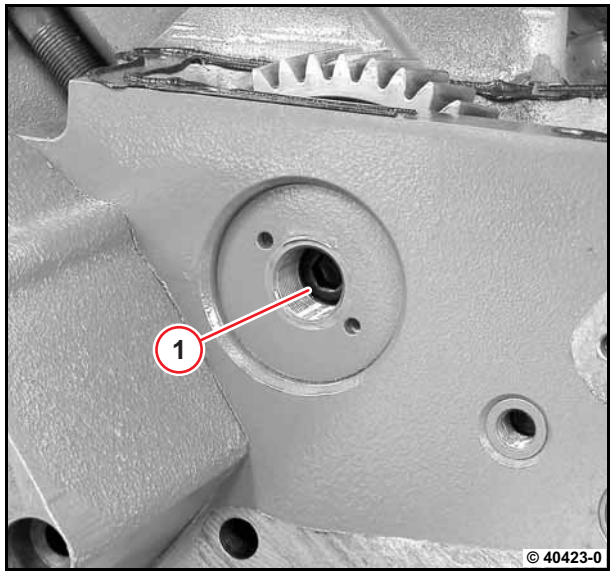
- Insert bolt (1).



- Lightly oil screw (1).
- Tighten screw (1).

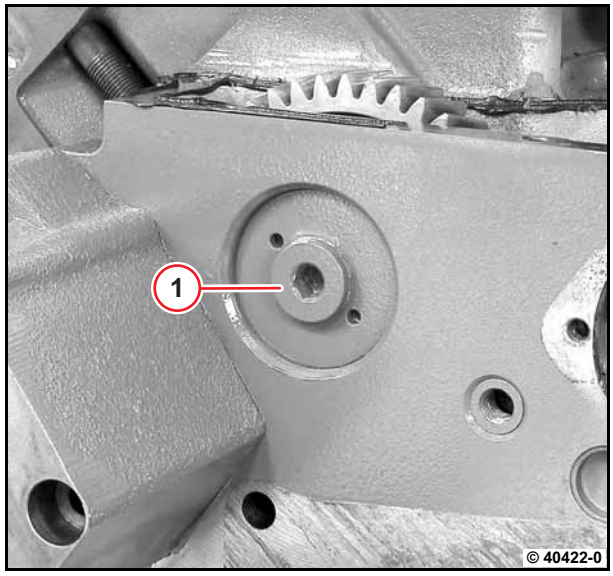
A04 013

Screw length:
M12 x 80 mm

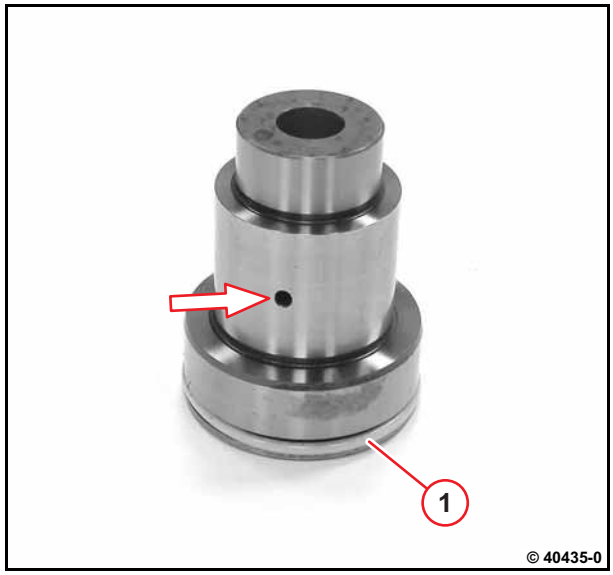


- Lightly oil screw (1).
- Tighten screw (1).

A04 012

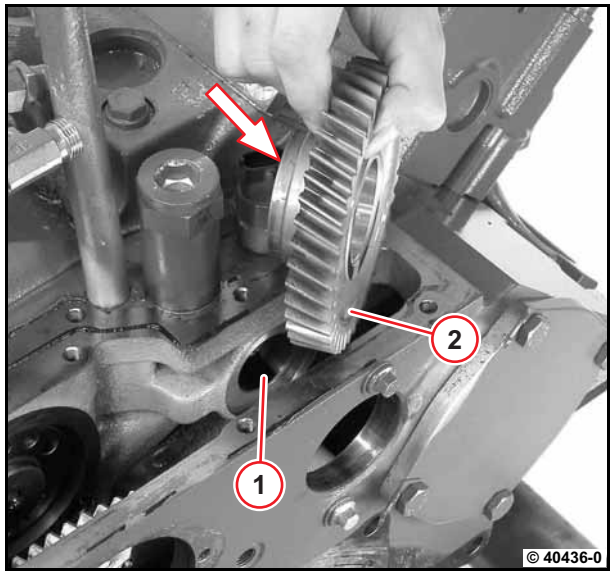


- Mount new O-ring (1).
- Lightly oil O-ring.
- Check oil channel (arrow) for free passage.

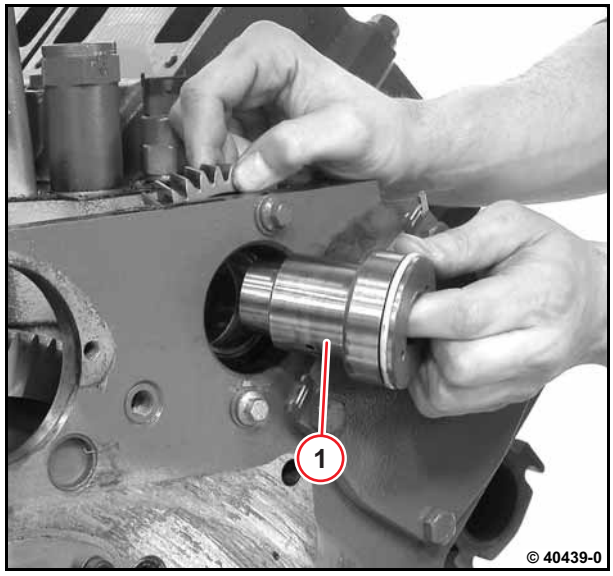


- Lightly oil bearing liner (1) with engine oil.
- Insert idler gear (2).

The collar (arrow) faces the bearing bush.



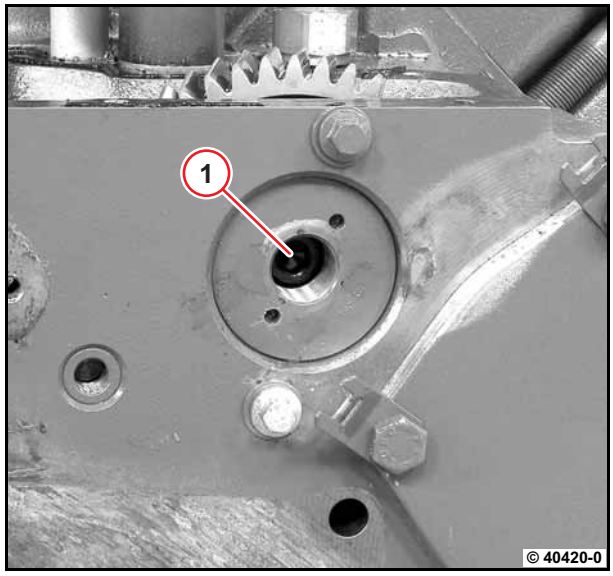
- Insert bolt (1).



- Lightly oil screw (1).
- Tighten screw (1).

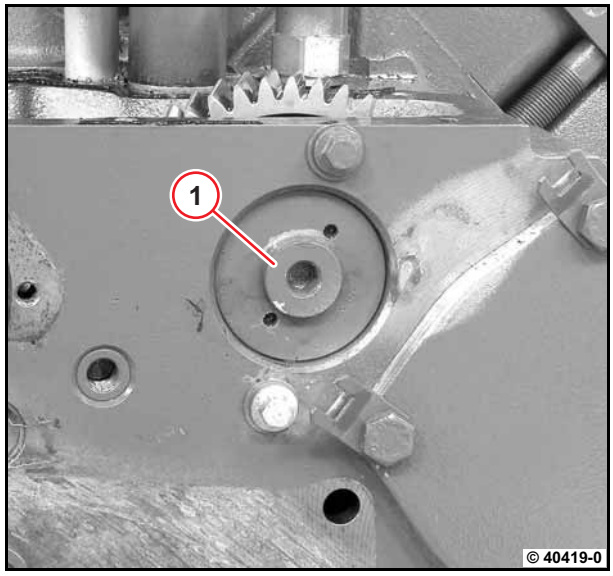
A04 013

Screw length:
M12 x 100 mm



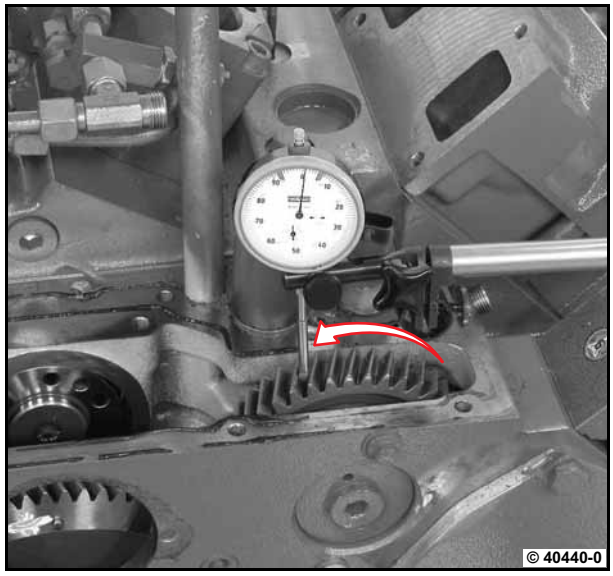
- Lightly oil screw (1).
- Tighten screw (1).

A04 012



Checking the tooth edge clearance of the idler gear (B-bank)

- Mount magnetic measuring stand.
- Insert dial gauge.
- Turn idler gear in direction of arrow until it stops.
- Apply stylus under pre-tension to a tooth flank.
- Adjust dial gauge to "0".

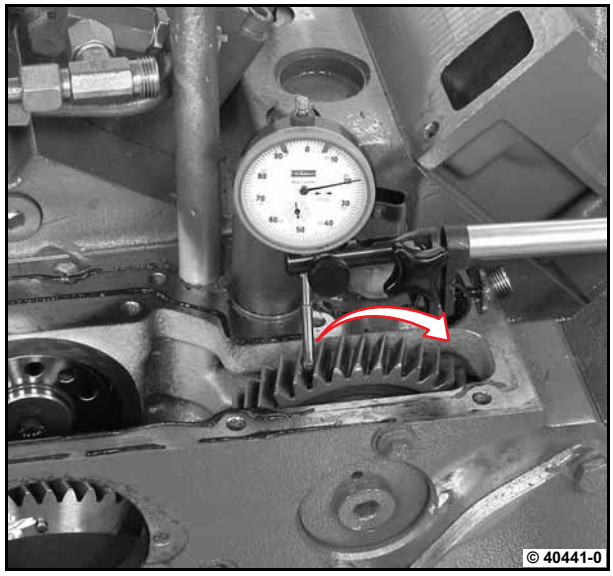


- Turn idler gear in direction of arrow until it stops.
- Read off measured value.

P04 44

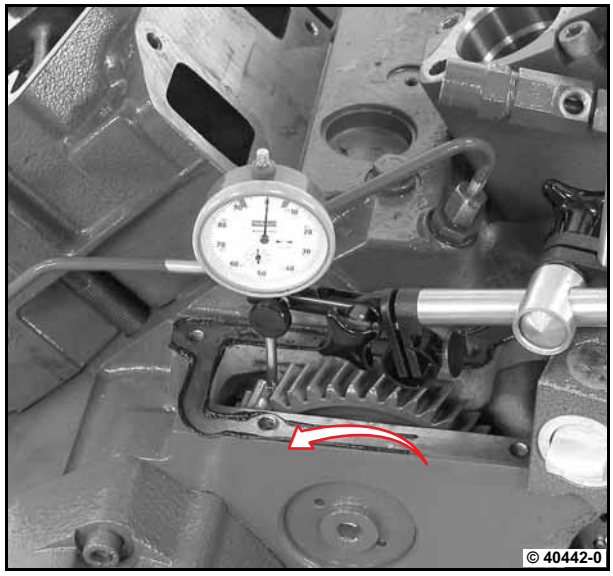
Repeat the measuring process on several tooth flanks.

- Remove magnetic measuring stand.
- Remove dial gauge.



Checking the tooth edge clearance of the idler gear (A-bank)

- Mount magnetic measuring stand.
- Insert dial gauge.
- Turn idler gear in direction of arrow until it stops.
- Apply stylus under pre-tension to a tooth flank.
- Adjust dial gauge to "0".



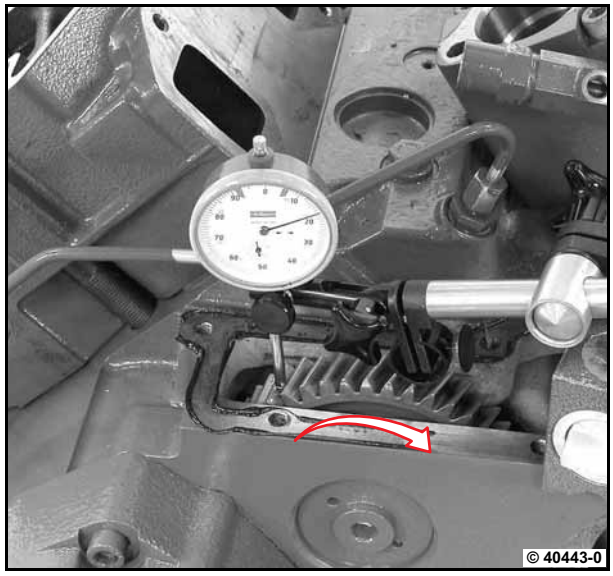
6

- Turn idler gear in direction of arrow until it stops.
- Read off measured value.

P04 44

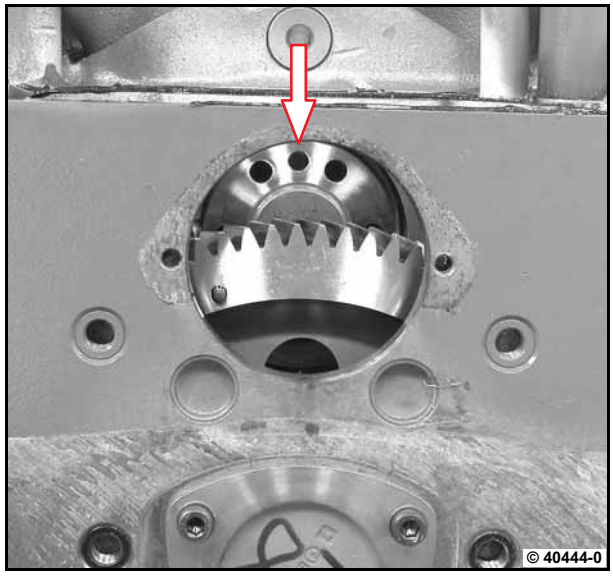
Repeat the measuring process on several tooth flanks.

- Remove magnetic measuring stand.
- Remove dial gauge.



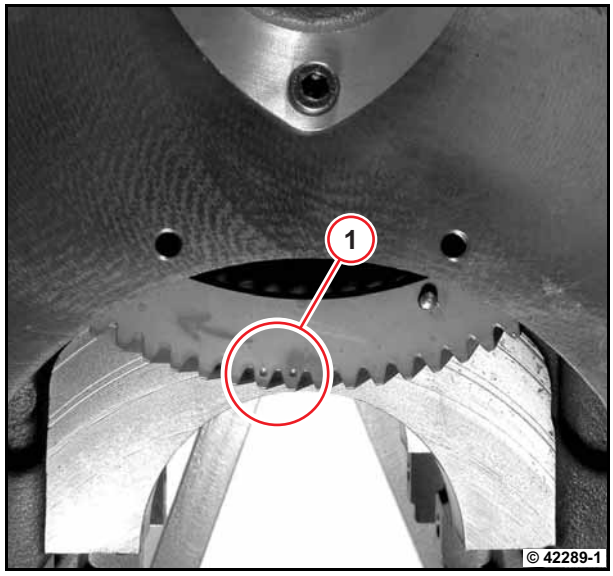
- Position the injection pump camshaft.

The locating hole (arrow) faces upwards.



- Position camshaft gear wheel.

The marking (1) faces towards the crankshaft.



Overview of the gear train and the markings of the control times:

Injection pump camshaft gear wheel (1)

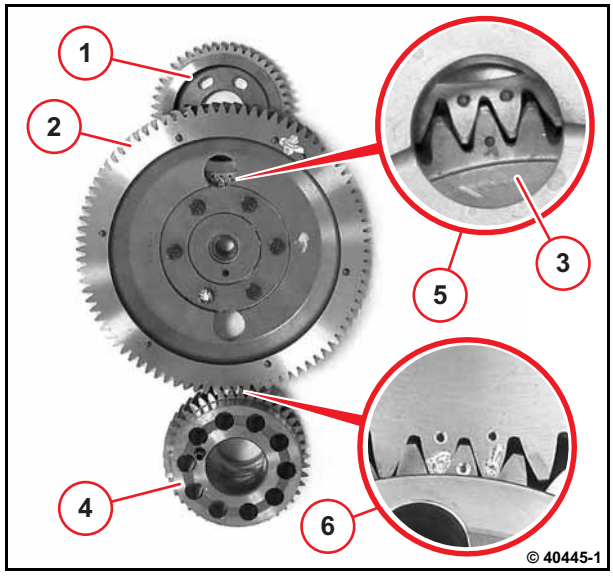
Camshaft gear wheel (2)

Idler gear (3).

Crankshaft gear wheel (4)

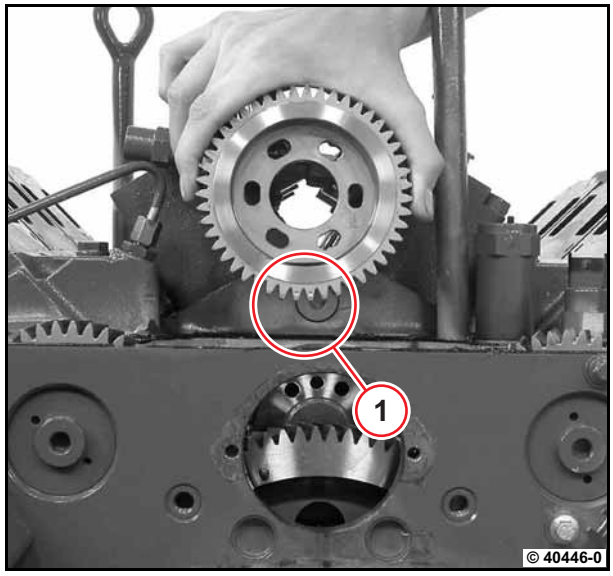
Marking injection pump camshaft / idler gear (5)

Marking camshaft / crankshaft (6)



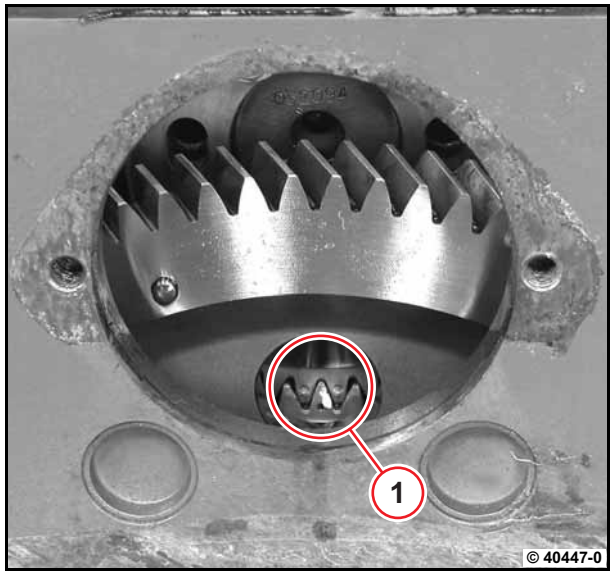
- Position injection pump camshaft gear wheel.

The marking (1) faces the camshaft gear wheel.



- Insert the injection pump camshaft gear wheel in the camshaft gear wheel.

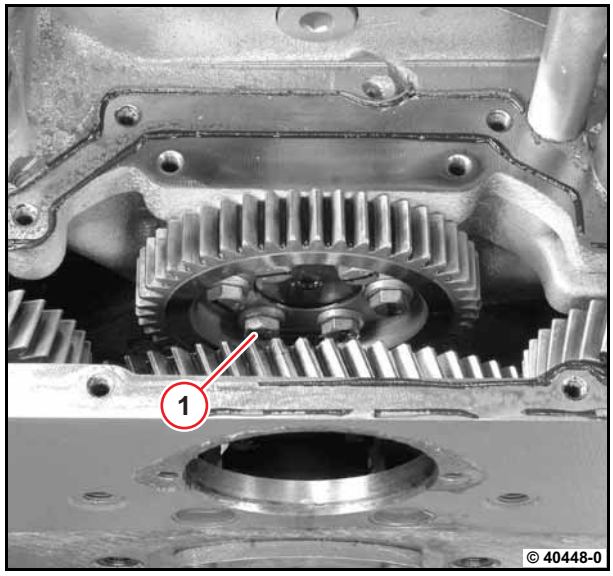
The marking on the gear wheel must be between the markings of the injection pump camshaft gear wheel (1).



Attention!
Make sure no parts fall into the crankcase!

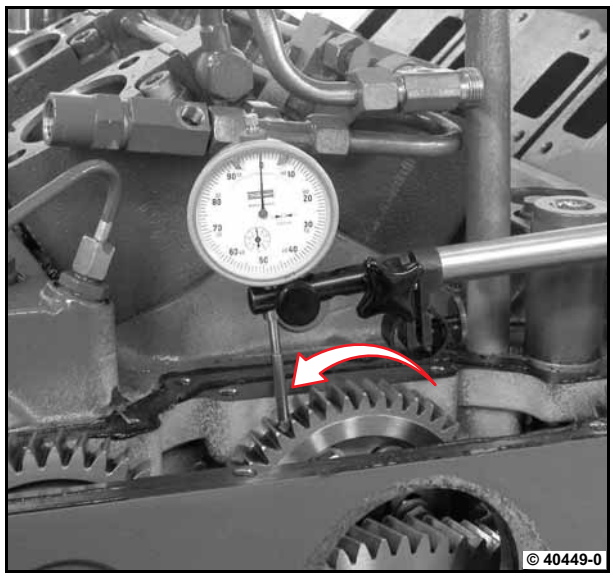
- Fasten all screws (1).

Concealed screws can be accessed by turning the crankshaft with the turning gear.



Checking the tooth edge clearance of the injection pump camshaft gear wheel

- Mount magnetic measuring stand.
- Insert dial gauge.
- Turn gear wheel in direction of arrow until it stops.
- Apply stylus under pre-tension to a tooth flank.
- Adjust dial gauge to "0".

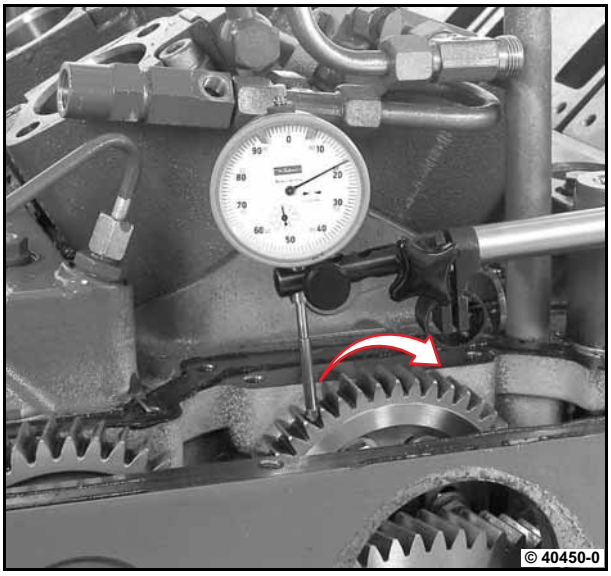


- Turn gear wheel in direction of arrow until it stops.
- Read off measured value.

P07 20

Repeat the measuring process on several tooth flanks.

- Remove magnetic measuring stand.
- Remove dial gauge.



- Install crankshaft.

W 02-04-01

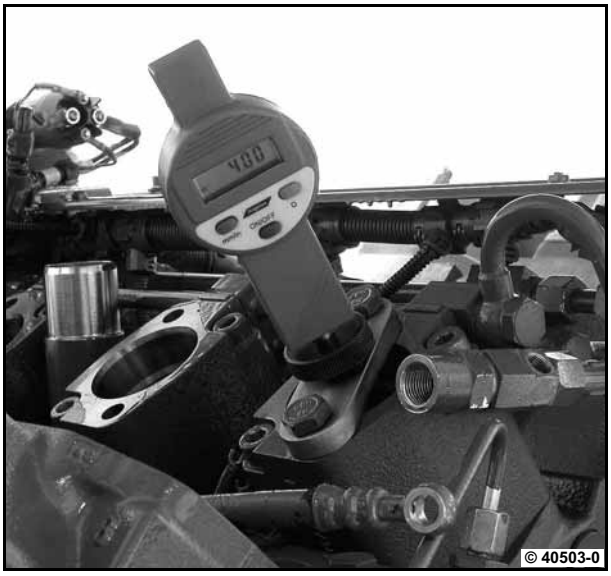
Do not install the turbocharger.

- Install rocker arm brackets.

W 01-02-02

- Check and set plunger lift of injection pumps.

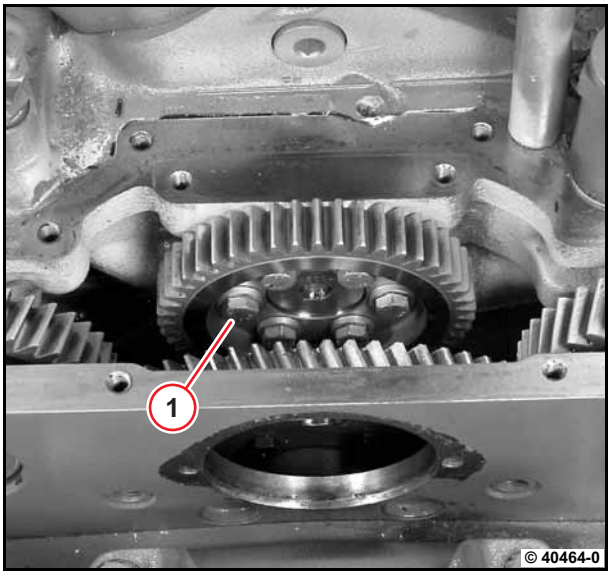
W 07-06-04



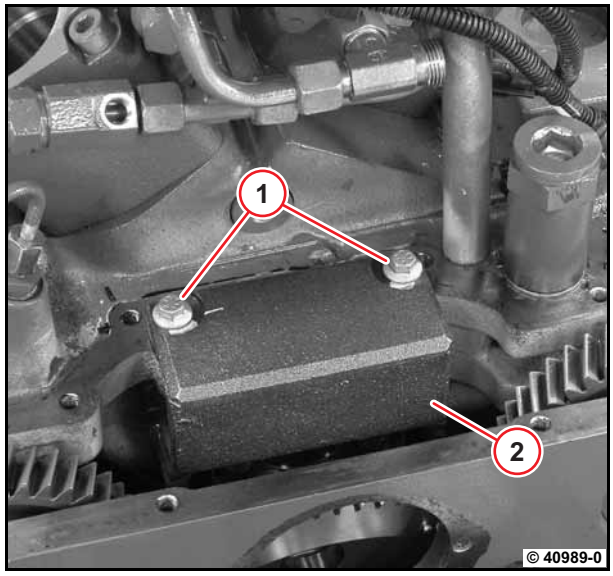
- Tighten all screws (1).

A04 004

Concealed screws can be accessed by turning the crankshaft with the turning gear.



- Mount pad thrust bearing (2).
- Lightly oil screws (1).
- Tighten screws (1).

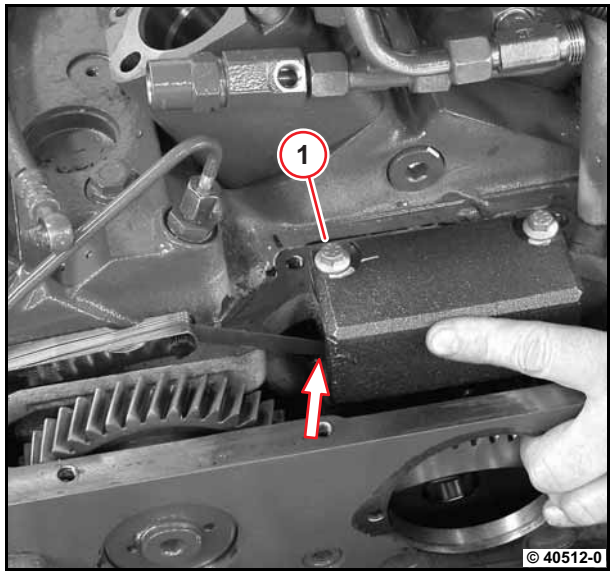


6

Checking and setting axial backlash of the injection pump camshaft

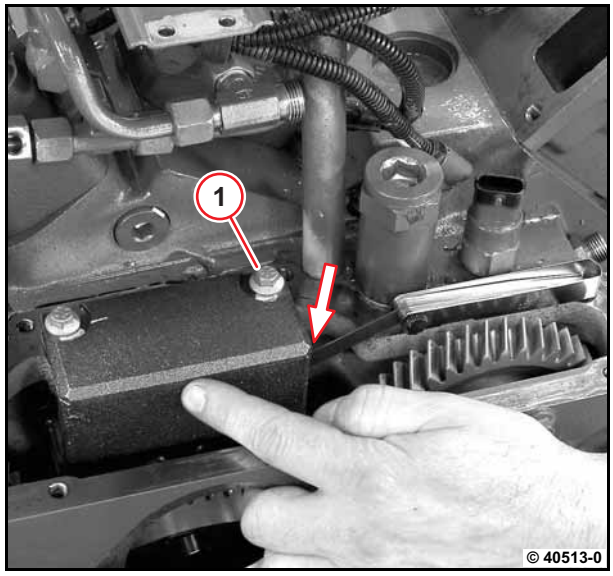
- Insert feeler gauge blade between gear wheel of the injection pump camshaft and the pad thrust bearing (arrow).
- Press the pad thrust bearing onto the feeler gauge blade.
- Fasten screw (1).
- Check axial backlash.

P04 43



- Insert feeler gauge blade between gear wheel of the injection pump camshaft and the pad thrust bearing (arrow).
- Press the pad thrust bearing onto the feeler gauge blade.
- Fasten screw (1).
- Check axial backlash.

P04 43



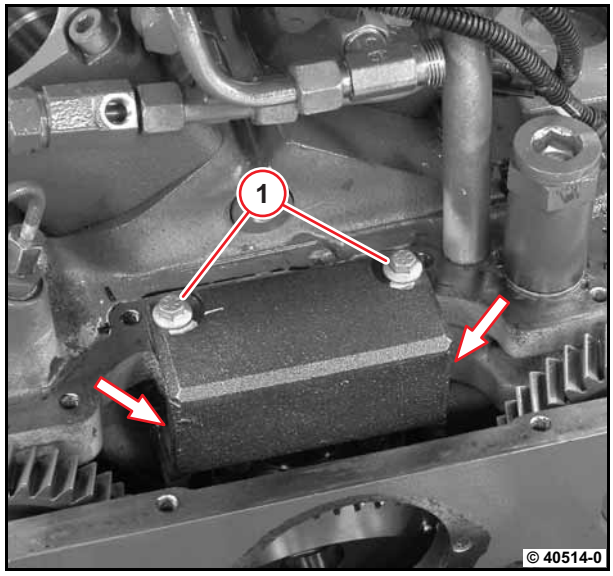
- Tighten screws (1).

A04 015

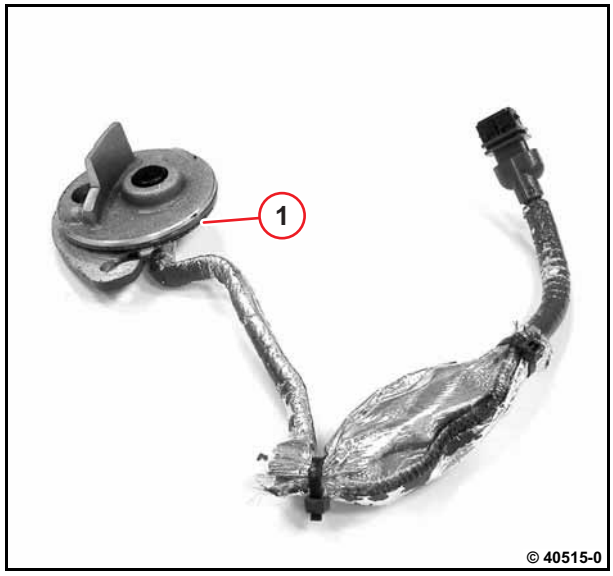
- Check axial backlash again.

P04 43

Check axial backlash on both sides between
pad thrust bearing and gear
wheel (arrows).



- Clean sealing surfaces.
- Mount new O-ring (1).
- Lightly oil O-ring.

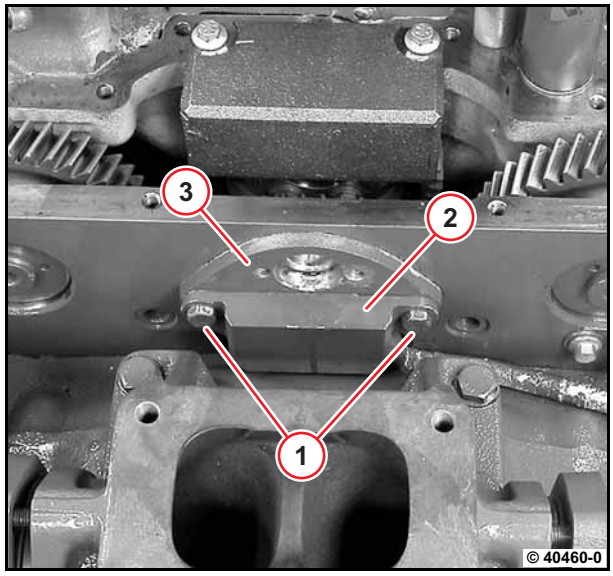


- Press in the cover (3) to the stop.
- Mount cover (2).

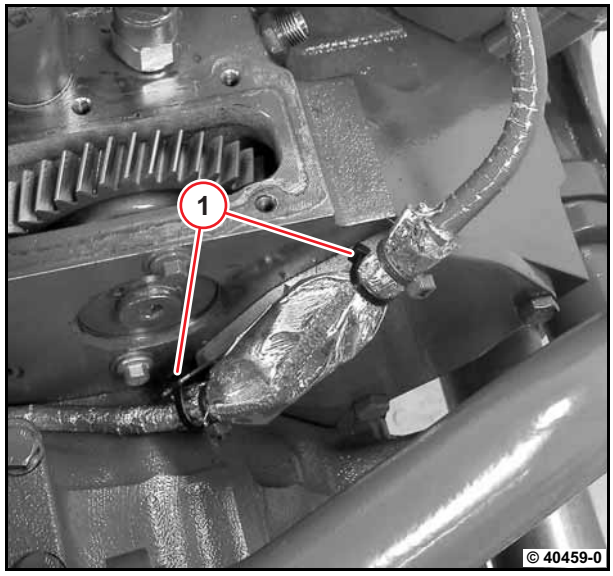
Insert screws with locking agent.

- Tighten screws (1).

A04 022



- Fix cable tie (1).



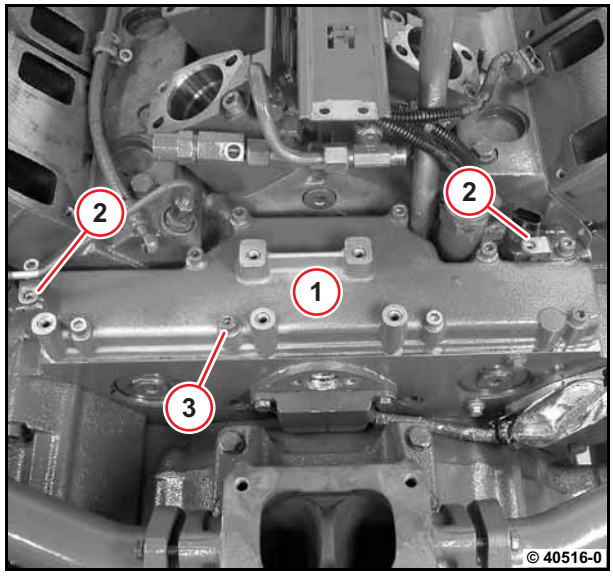
6

- Clean sealing surfaces.
- Apply packing compound evenly to the sealing surface of the gear case.

Use packing compound DEUTZ DW 48.

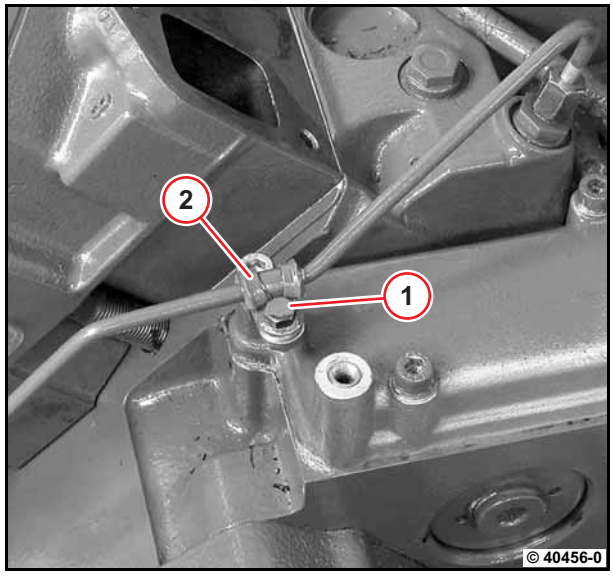
- Mount gear case cover (1).
- Mount holder (2).
- Tighten all screws (3) alternately.

A04 020



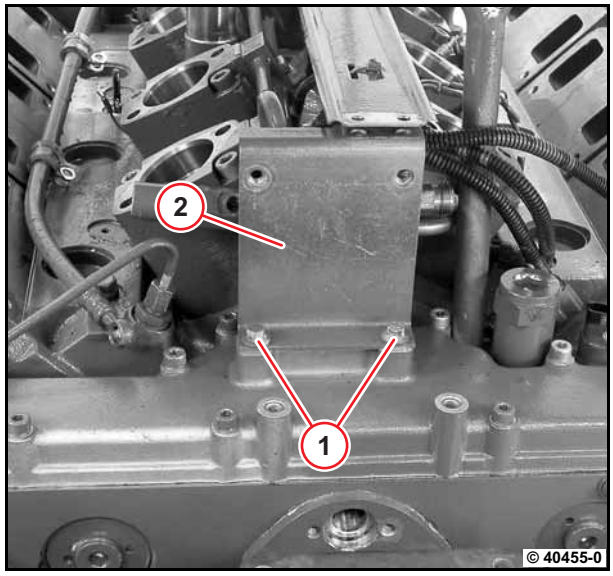
- Mount pipe clamp (2).
- Tighten screw (1).

A08 045



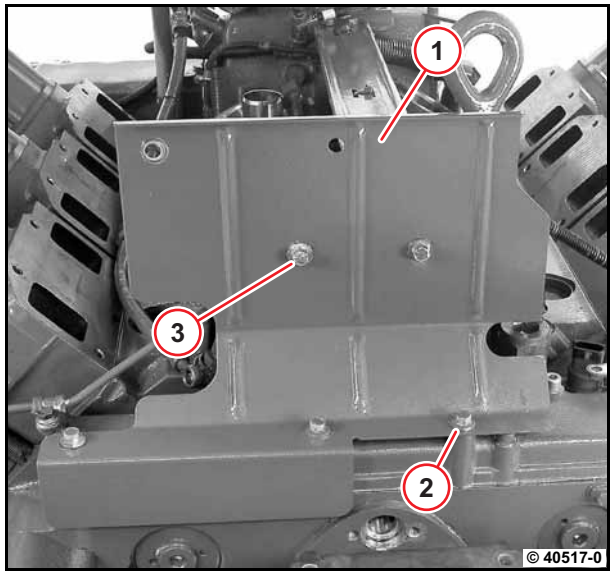
- Mount holder (2).
- Tighten screws (1).

A12 071



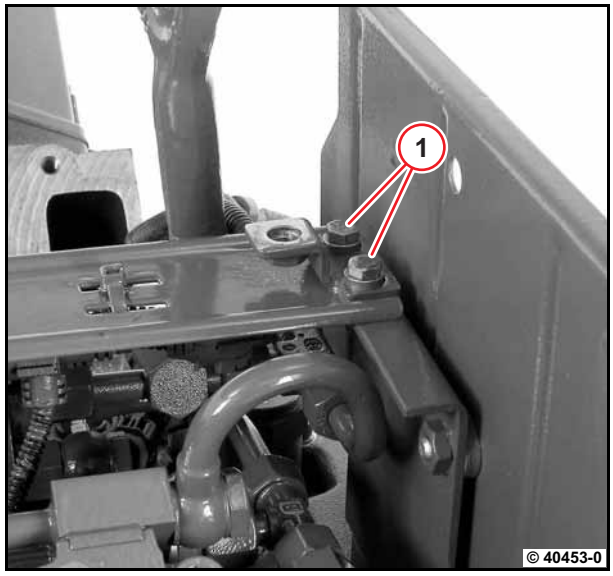
- Mount heat shield (1).
- Insert screws (3) with spacing sleeves.
- Tighten screws (2).
- Tighten screws (2 and 3) alternately.

A12 071



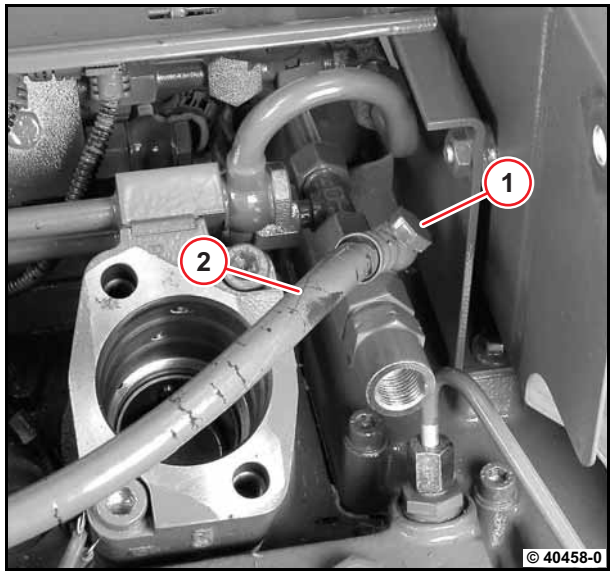
- Tighten screws (1).

A13 094



- Mount new sealing rings.
- Position fuel hose (2).
- Tighten hollow screw (1).

A12 090



- Install impulse transmitter (camshaft).

W 05-07-03

- Install injection pumps (cylinder A1).

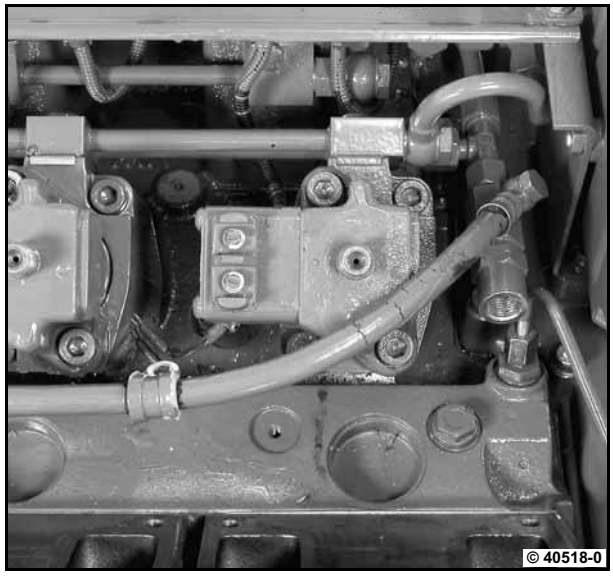
W 07-04-01

- Install injection pumps (cylinder A2-B3).

W 07-04-01

- Install the turbocharger.

W 06-06-04



Checking the camshaft

Commercial available tools:
– Depth-measuring appliance
– Micrometer gauge

– W 04-05-05

Checking the camshaft

- Remove camshaft.

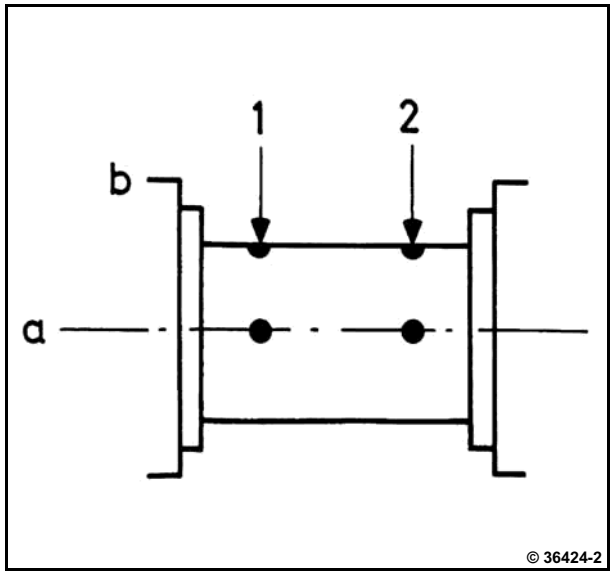
  W 04-05-05

- Visually inspect cams and bearing pins for wear.

Repairing the camshaft is not permissible.
The camshaft must be renewed.

- Visually inspect the components.

Diagram for measuring the journals at the points 1 and 2 in the levels a and b.

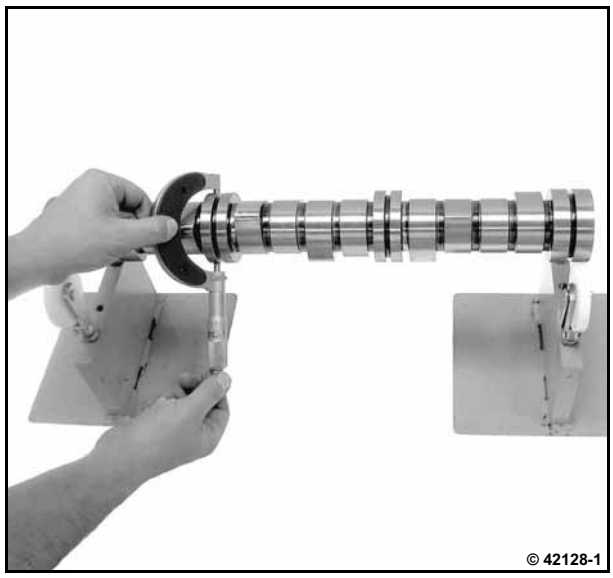


- Measure the diameter of journals with the micrometer gauge.

P04 31

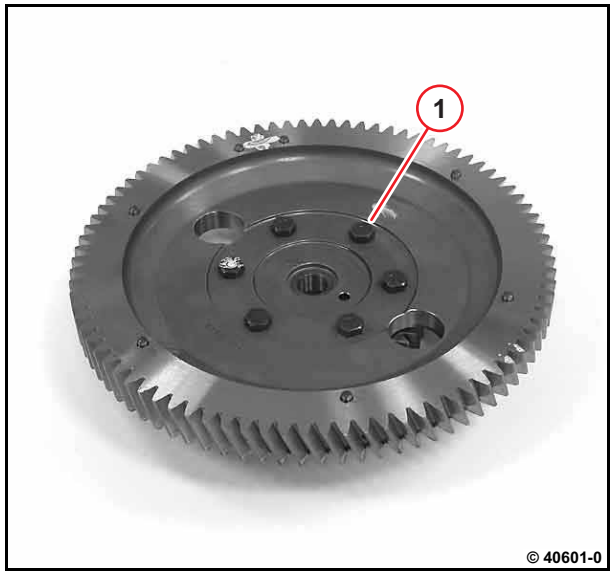
Measuring points see diagram.

When the wear limit is reached, the camshaft must be renewed.

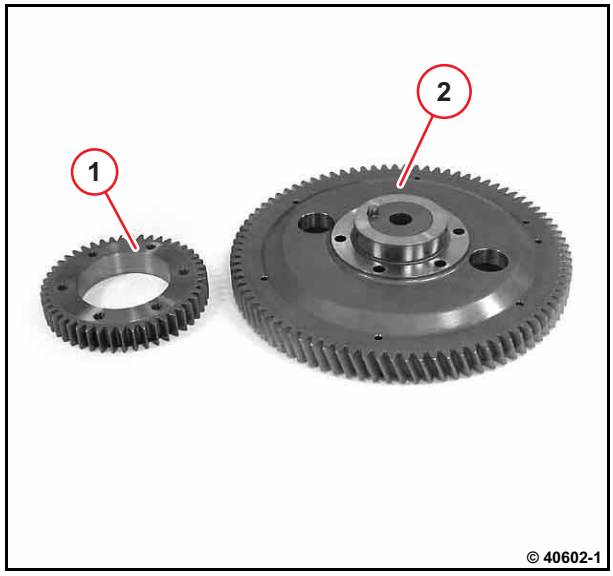


Checking the camshaft gear wheel

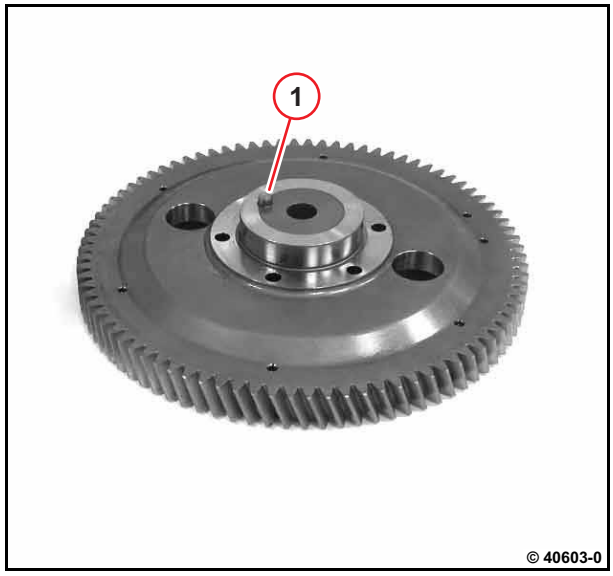
- Unscrew all screws (1).



- Remove idler gear (1).
- Visually inspect the idler gear (1) for wear.
- Visually inspect the camshaft gear wheel (2) for wear.



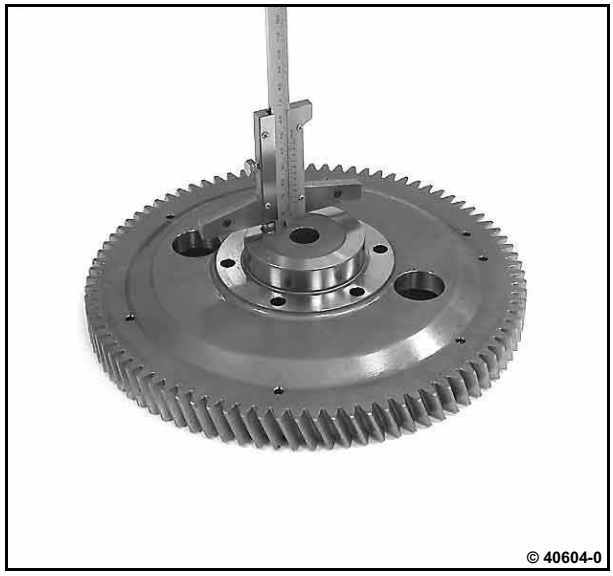
- Insert parallel pin (1).



- Measure the overhang of the parallel pin with the depth measuring appliance.

P04 39

- Correct overhang.

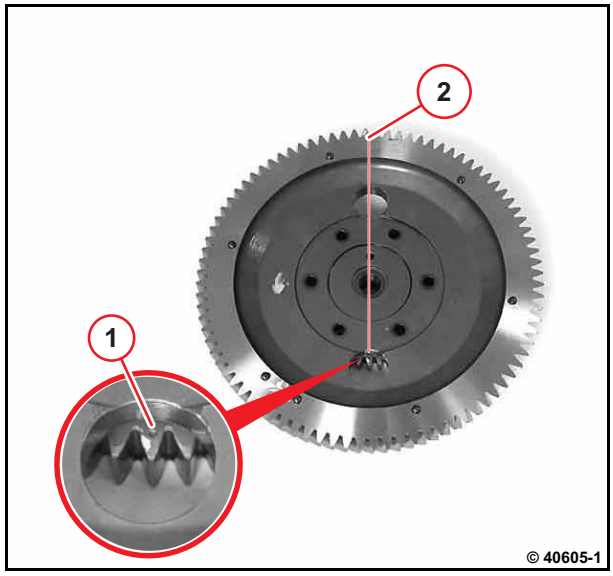


- Place camshaft gear wheel on idler gear.

Note installation position.

The marking (1) on the idler gear faces the camshaft gear wheel.

The markings (1) and (2) must be opposite in line.

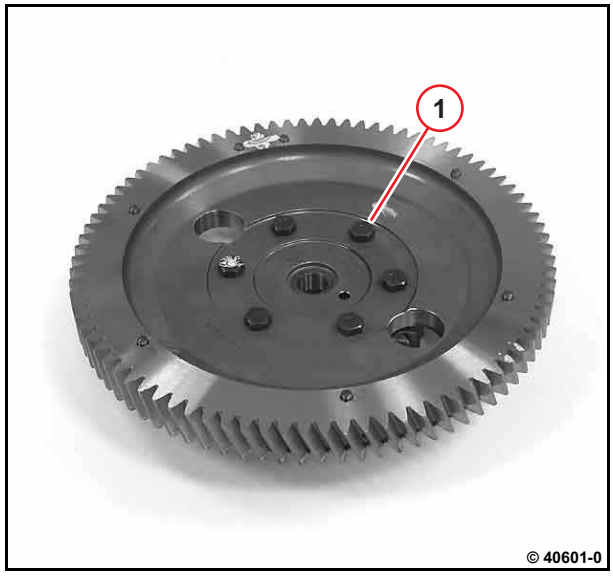


- Lightly oil screws (1).
- Tighten screws (1) alternately.

  A04 003

- Install the camshaft.

  W 04-05-05



6

Removing and installing injection pump camshaft

Commercial available tools:
– Depth-measuring appliance
– Magnetic measuring stand

Special tools:
– Turn-over gear 100350
– Dial gauge. 100400
– Counter support 144150

– Packing compound DEUTZ DW 48
– Locking agent DEUTZ DW 72

– W 01-02-02
– W 02-02-02
– W 03-08-01
– W 03-09-04
– W 04-06-03
– W 05-07-03
– W 06-06-04
– W 07-04-01 . . . . . (Cylinder A1)
– W 07-04-01 . . . . . (Cylinder A2-B3)
– W 07-06-04

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

6

Removing injection pump camshaft

- Remove impulse transmitter (camshaft).

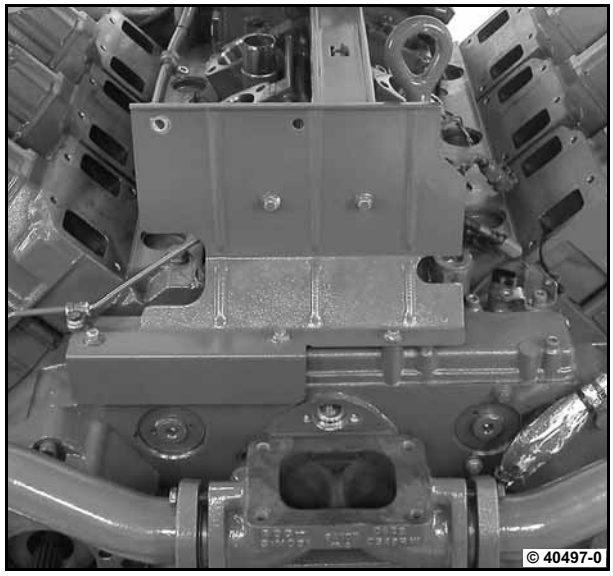
  W 05-07-03
- Remove injection pumps (cylinder A1).

  W 07-04-01
- Remove injection pumps (cylinder A2-B3).

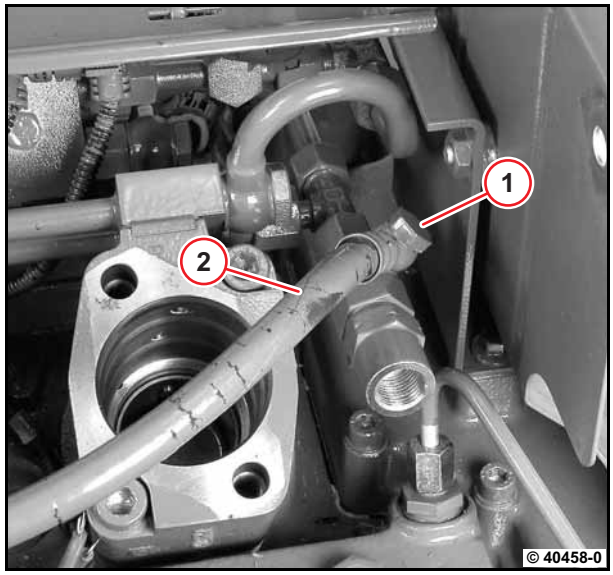
  W 07-04-01
- Remove genset support.

  W 03-08-01
- Remove turbocharger.

  W 06-06-04

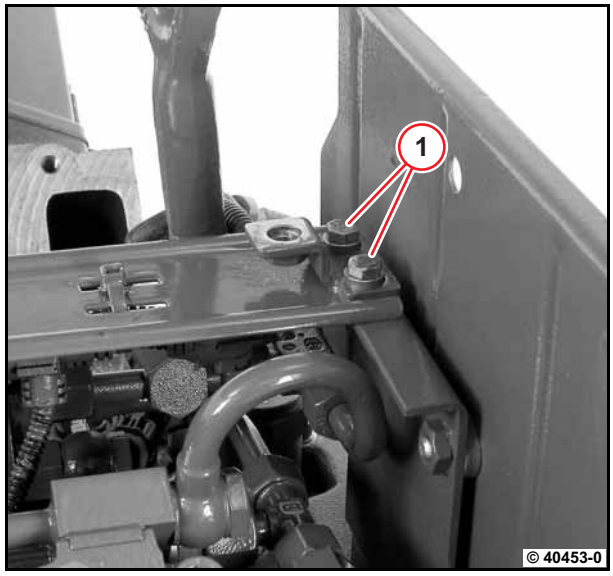


- Unscrew hollow screw (1).
- Place fuel hose (2) to one side.
- Remove sealing rings.

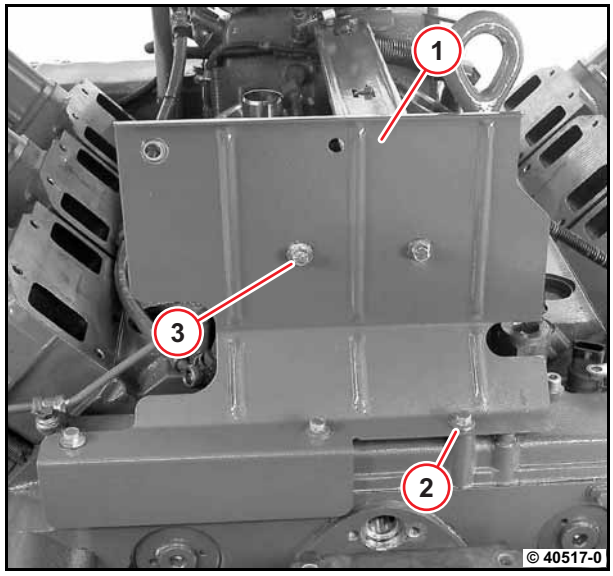


6

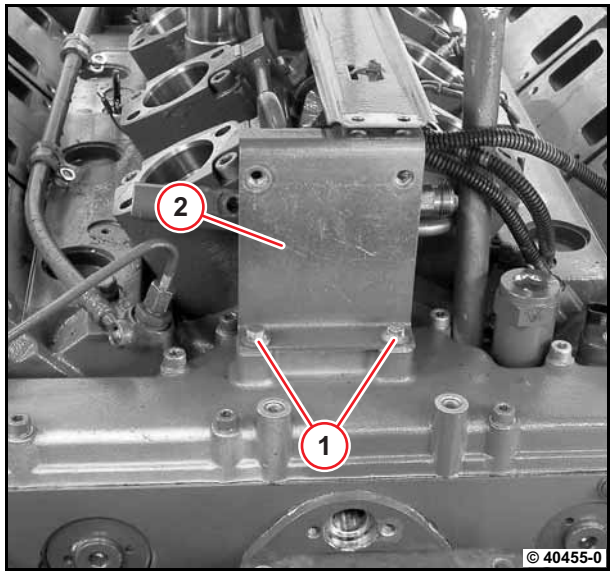
- Unscrew screws (1).



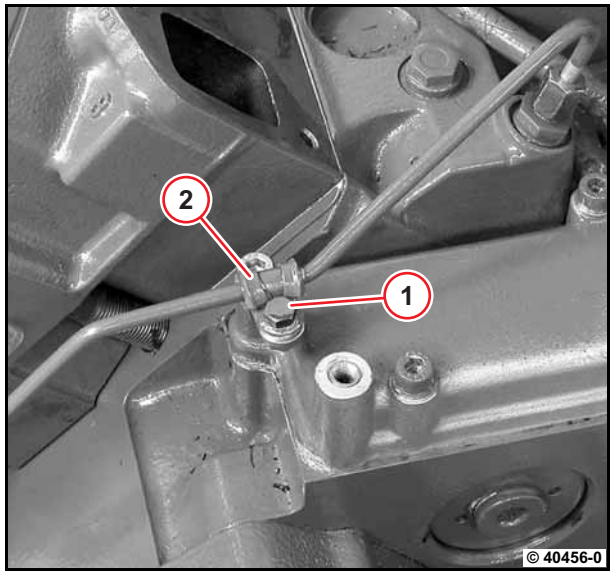
- Unscrew all screws (3).
- Remove spacing sleeves.
- Unscrew all screws (2).
- Remove heat shield (1).



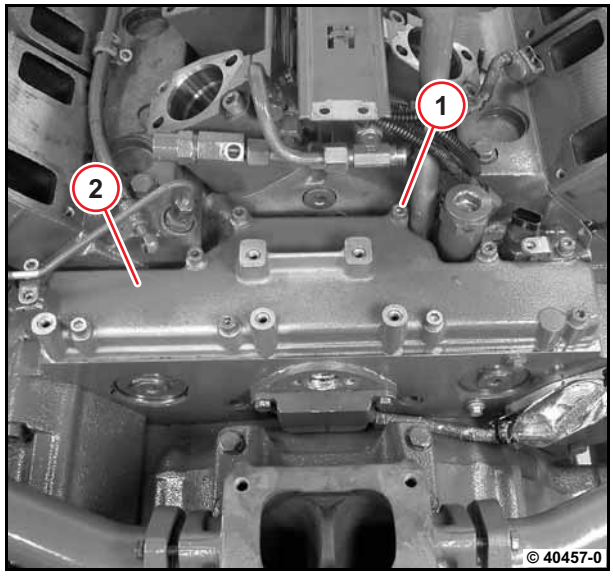
- Unscrew screws (1).
- Remove the holder (2).



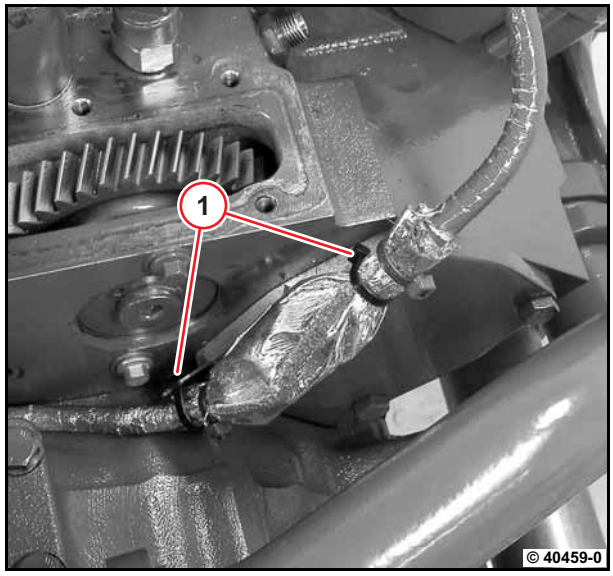
- Unscrew screw (1).
- Remove pipe clamp (2).



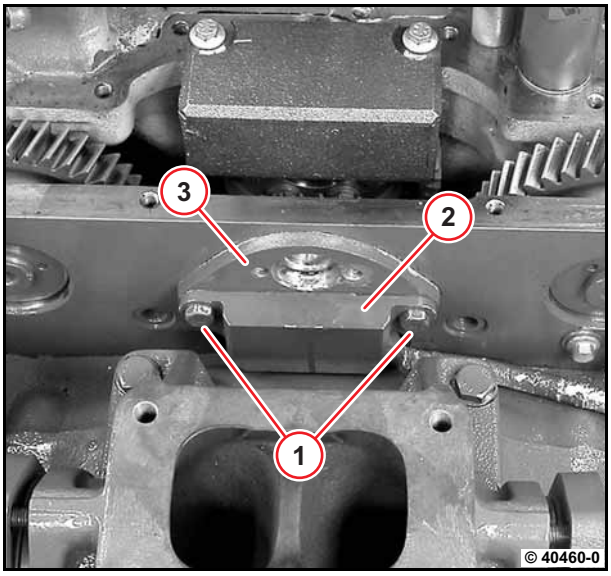
- Unscrew all screws (1).
- Remove gear case cover (2).



- Remove cable tie (1).



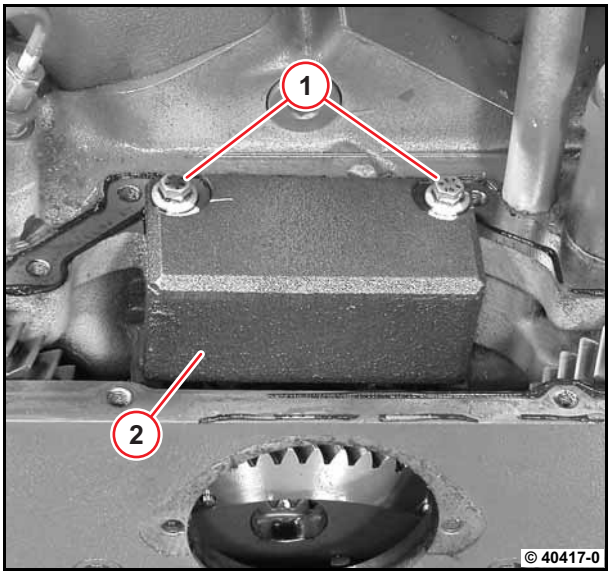
- Unscrew screws (1).
- Remove cover (2) .
- Remove cover (3).



6

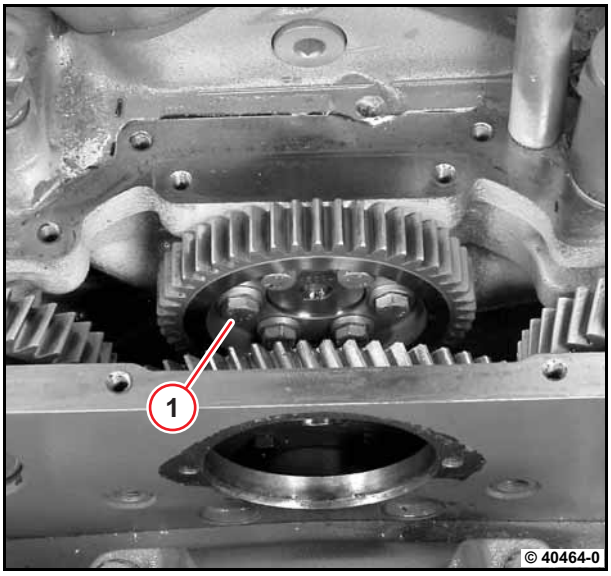
- Unscrew screws (1).
- Remove pad thrust bearing (2).
- Attach turning gear.

W 04-06-03



- Loosen all screws (1).

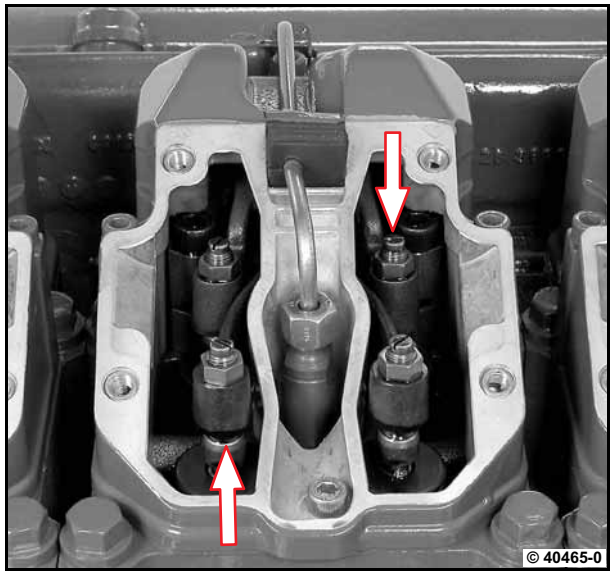
Concealed screws can be accessed by turning the crankshaft with the turning gear.



- Turn over crankshaft until the valve overlap is achieved on cylinder no. B2.

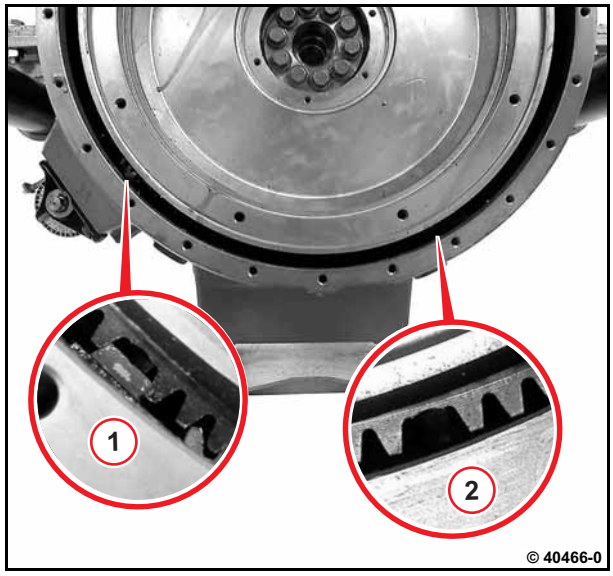
T01 63

Valve overlap means:
The inlet valve starts opening,exhaust valve closes.



The locking pin of the turning gear must snap into the tooth notch (1) of the starter ring gear.

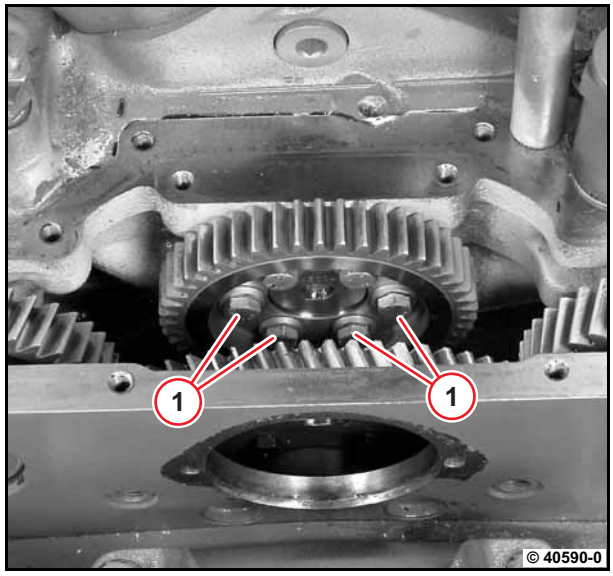
The second tooth notch (2) must face the B-bank.



Attention!
Make sure no parts fall into the crankcase!

- Unscrew screws (1).
- Pull locking pin.

Concealed screws can be accessed by turning the crankshaft with the turning gear.



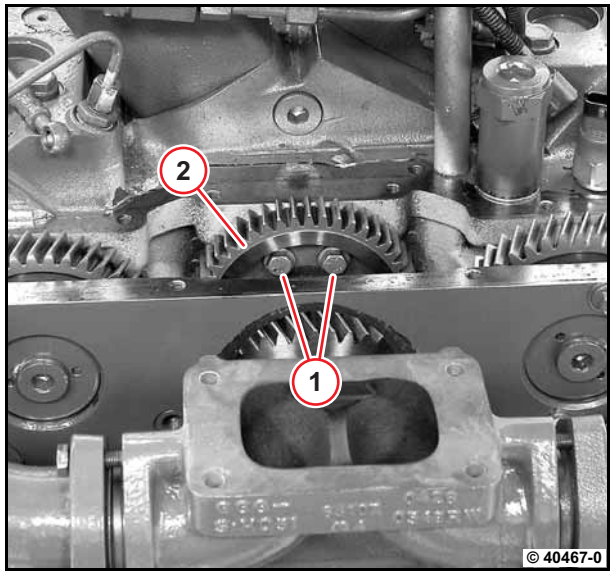
- Turn over crankshaft until the valve overlap is achieved on cylinder no. B2.
- Unscrew screws (1).
- Remove gear wheel (2).

Attention!
Make sure no parts fall into the crankcase!

Press back the injection pump camshaft carefully as far as it goes.

- Remove turning gear.

W 04-06-03



- Remove rocker arm brackets.

W 01-02-02

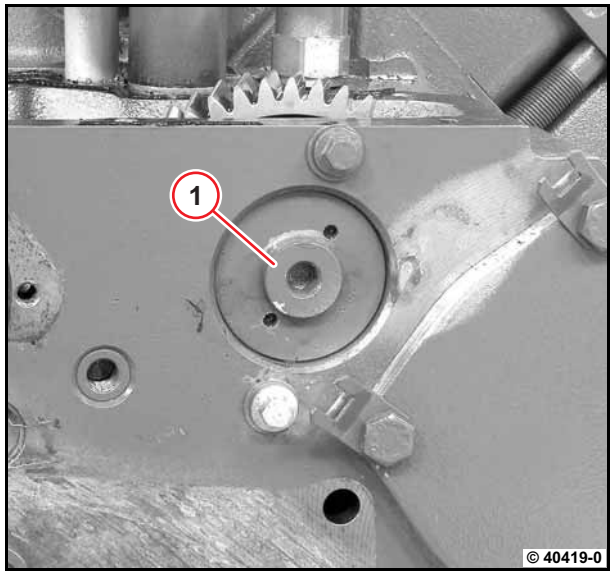
- Remove connection housing.

W 03-09-04

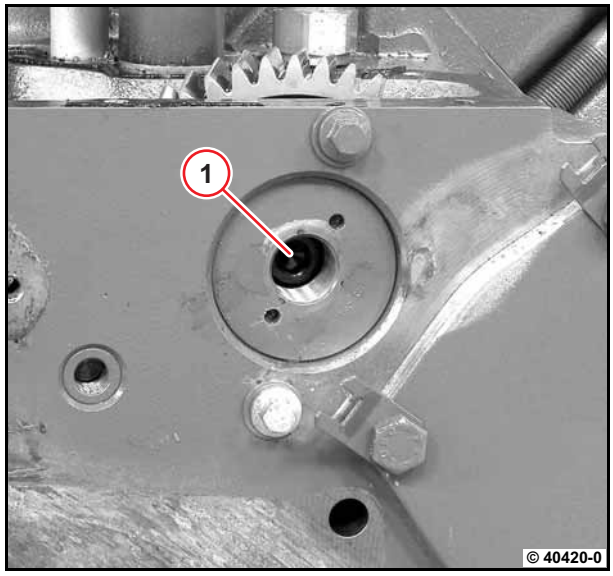
- Remove crankcase sealing ring (flywheel side)

W 02-02-02

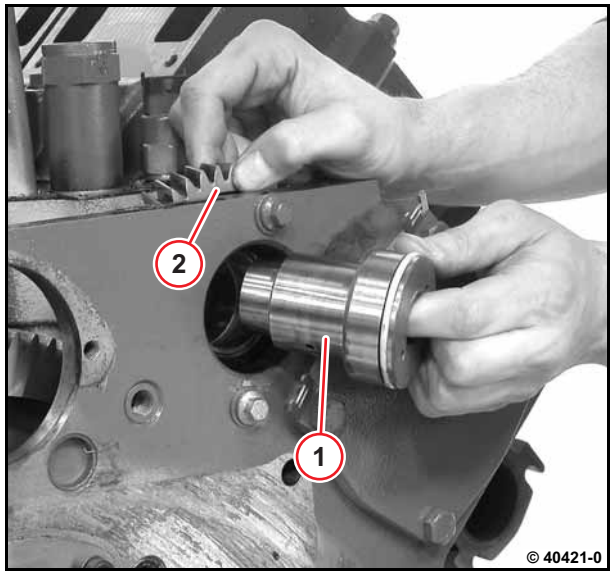
- Unscrew screw (1).



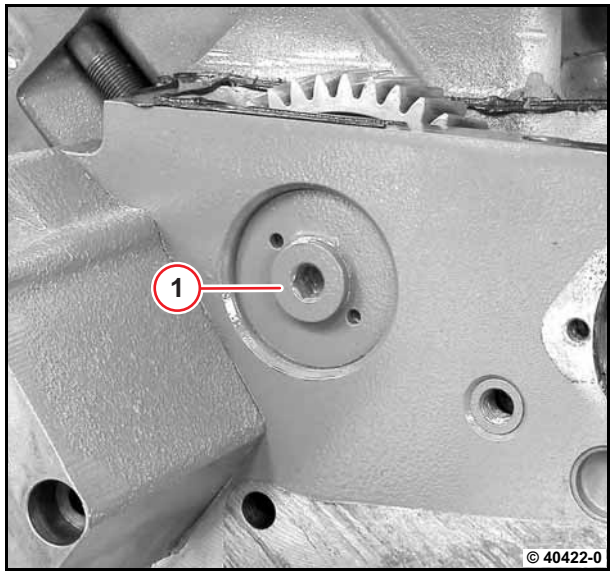
- Unscrew screw (1).



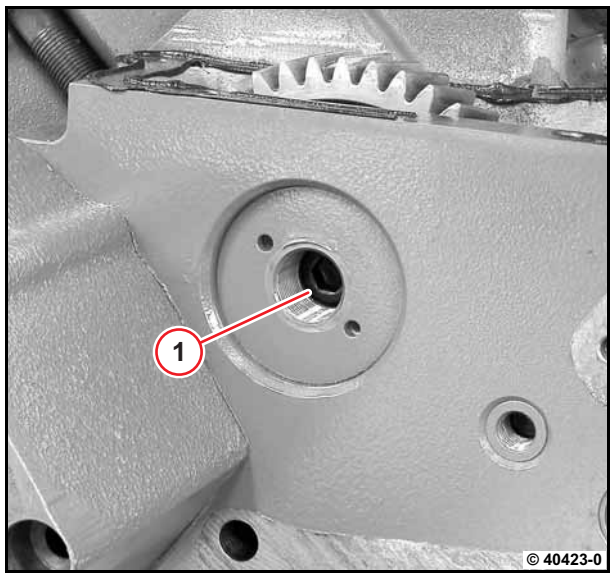
- Remove bolt (1).
- Remove idler gear (2).



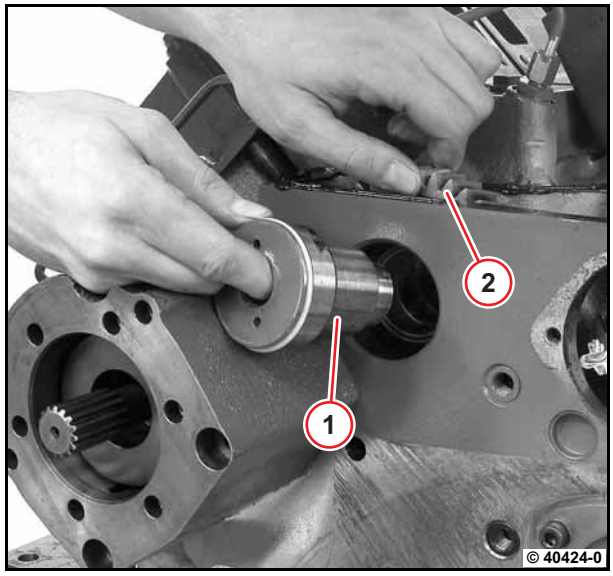
- Unscrew screw (1).



- Unscrew screw (1).



- Remove bolt (1).
- Remove idler gear (2).



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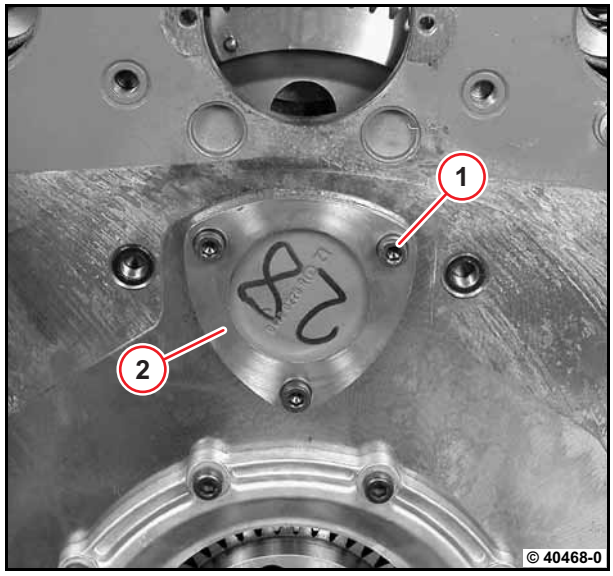
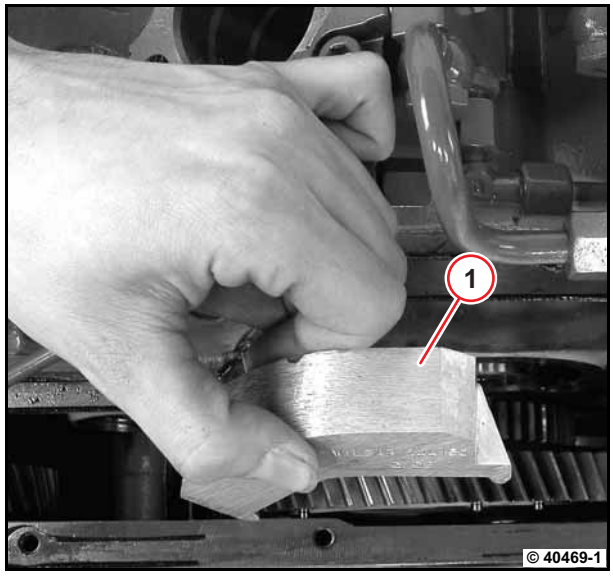
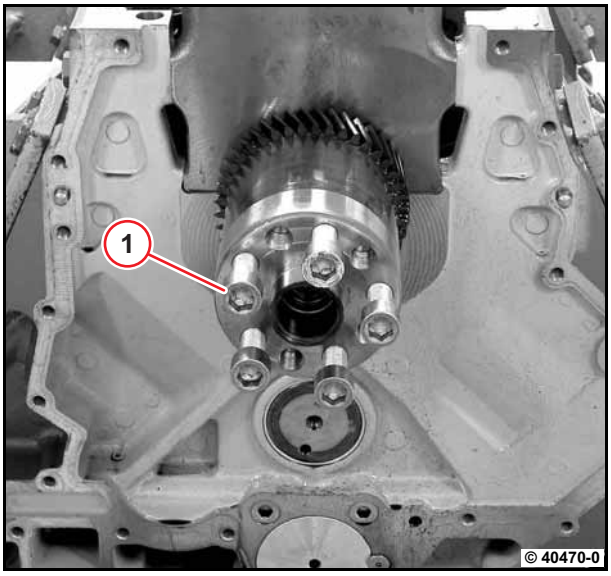
- Unscrew all screws (1).
- Remove cover (2) .
- Remove gasket.



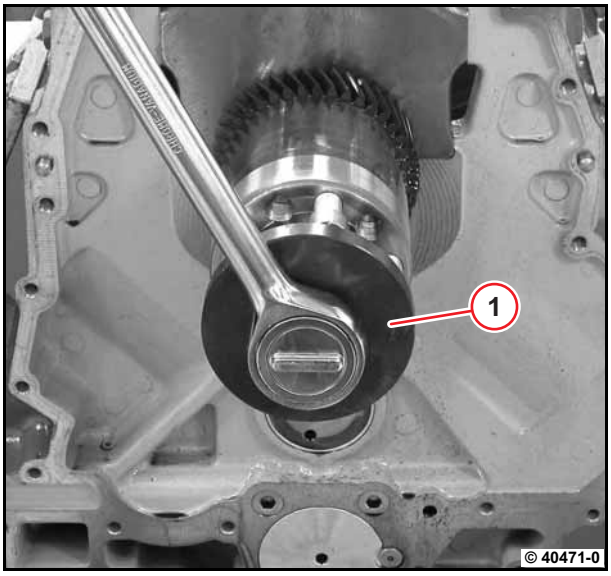
- Insert counter support (1) in the toothing of the camshaft gear wheel.



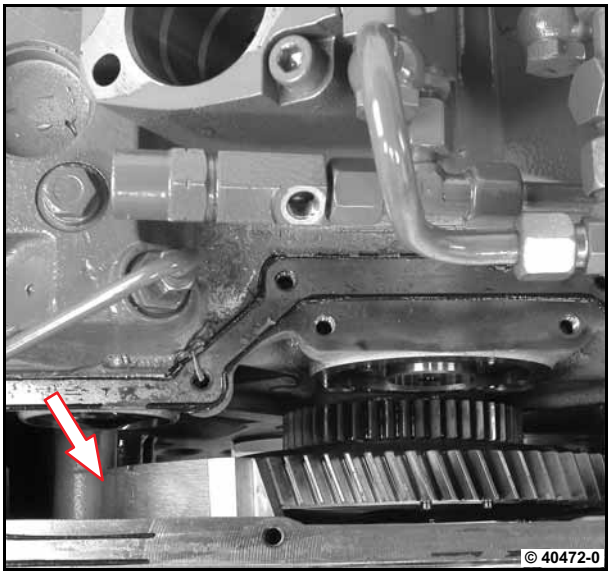
- Fasten all screws (1).



- Mount turning gear (1).

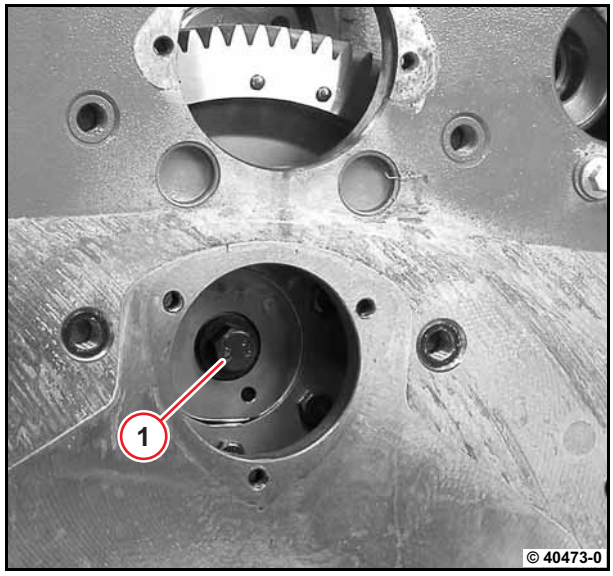


- Turn the camshaft gear wheel in the direction of the A-bank.
- Block the camshaft gear wheel with the counter holder on the crankcase (arrow).



6

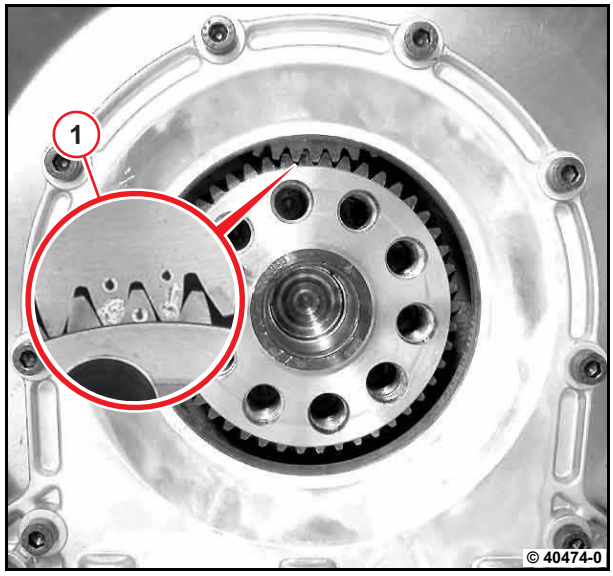
- Loosen screw (1).



- Turn the crankshaft with the turning gear evenly.

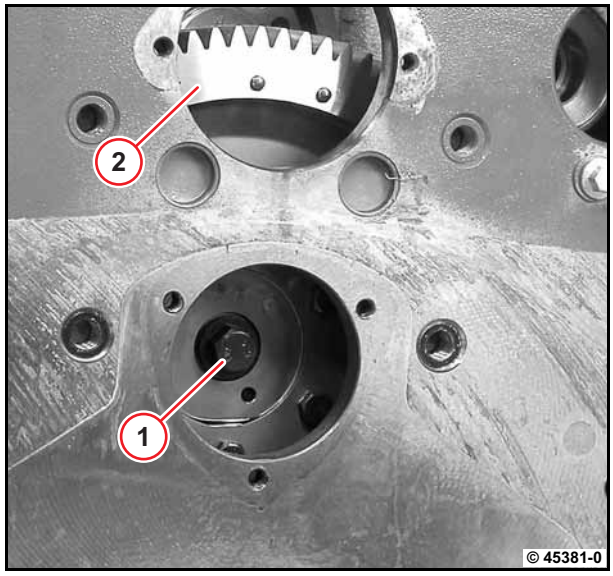
The marking on the crankshaft gear wheel must be between the markings on the camshaft gear wheel (1).

- Remove counter holder.



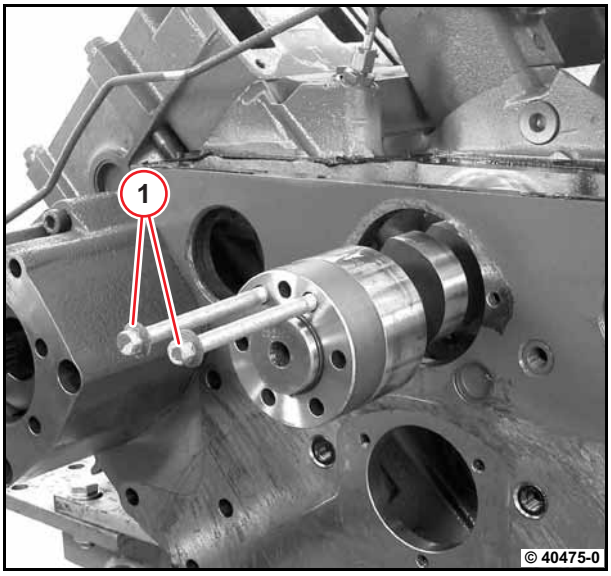
- Unscrew screw (1).
- Remove camshaft gear wheel (2)

Push back the camshaft carefully as far as it goes.



- Tighten screws (1).
- Pull out the injection pump camshaft carefully.

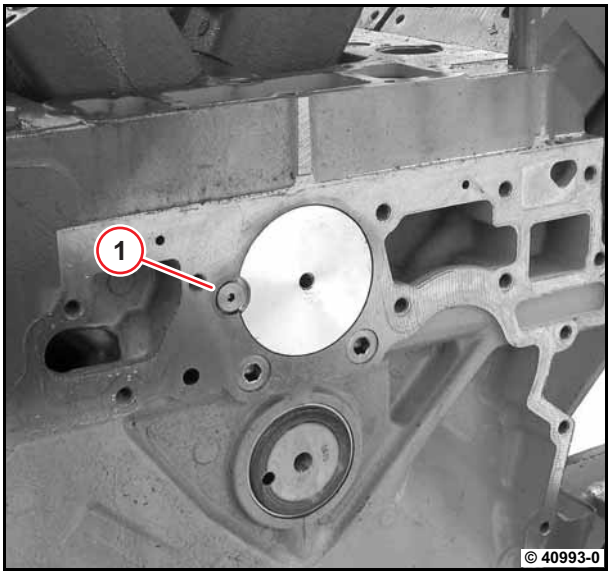
Attention!
Do not damage the camshaft and camshaft bearing!



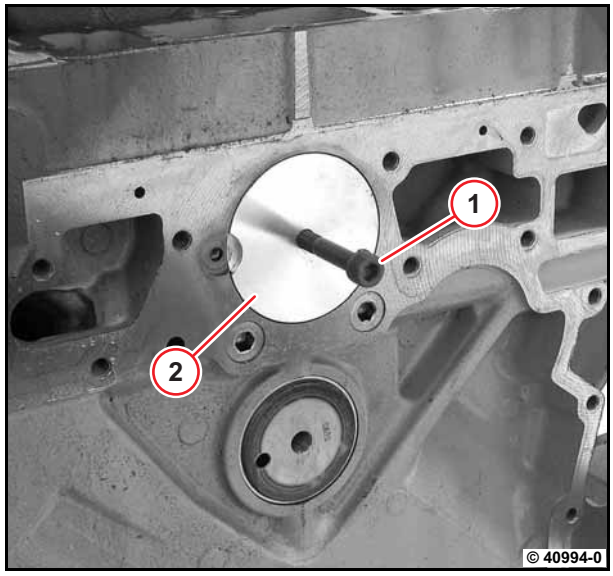
- Visually inspect the components.

Installing injection pump camshaft

- Unscrew screw (1).

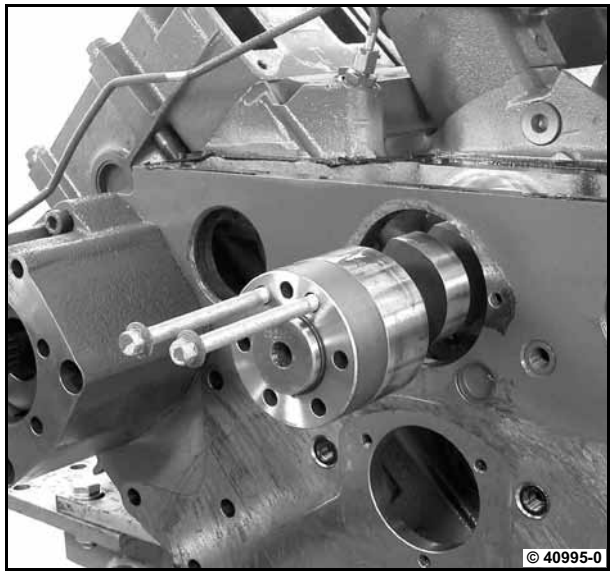


- Fasten screw (1).
- Pull out cover (2).



6

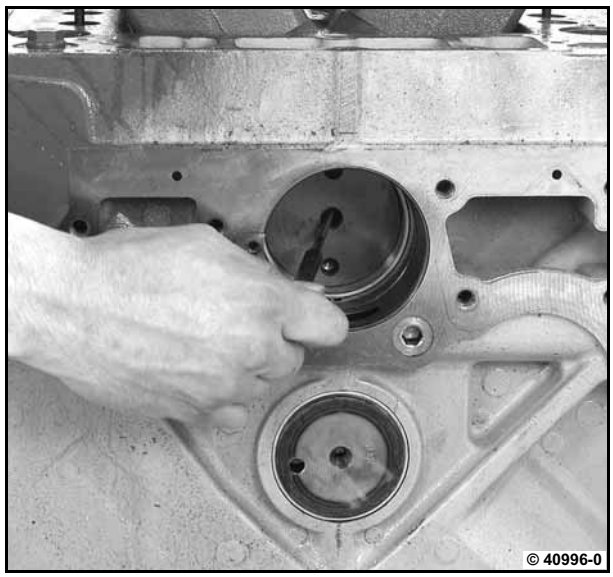
- Oil camshaft bearing lightly.
- Oil cam shaft pin lightly.
- Insert the injection pump camshaft carefully.



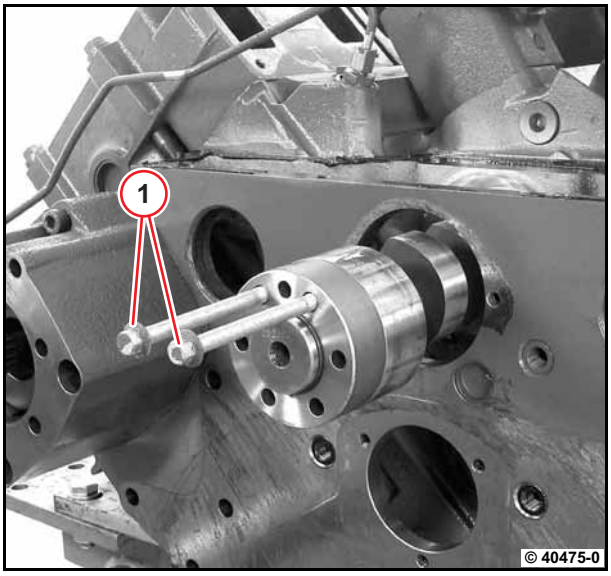
Attention!
Do not damage the camshaft and camshaft bearing!

- Move the injection pump camshaft over the opposite side to the flywheel.

Use a suitable tool.

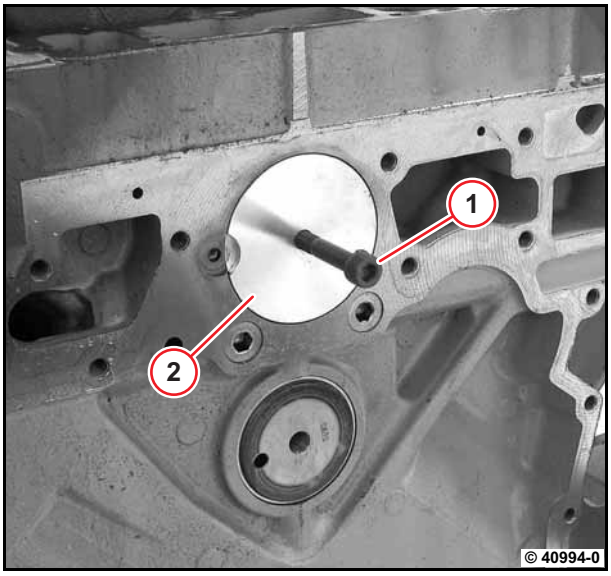


- Unscrew screws (1).



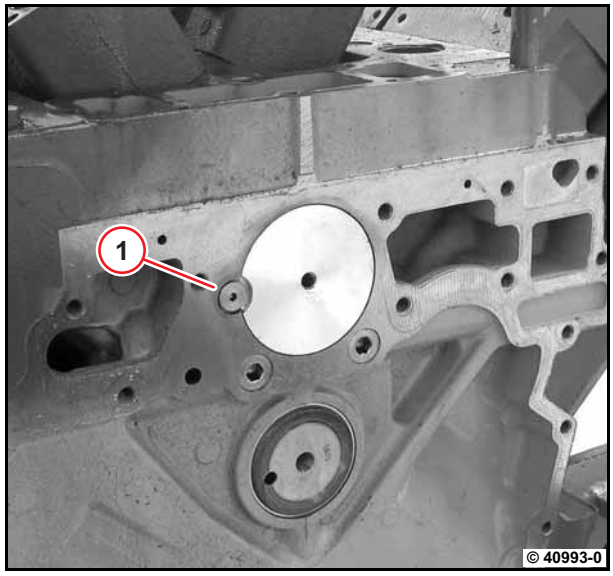
- Mount new O-ring (1).
- Lightly oil O-ring.

- Mount cover (2).
- Unscrew screw (1).



- Lightly oil screw (1).
- Tighten screw (1).

A04 005



6

Installing camshaft gear wheel

Overview of the gear train and the markings of the control times:

Injection pump camshaft gear wheel (1)

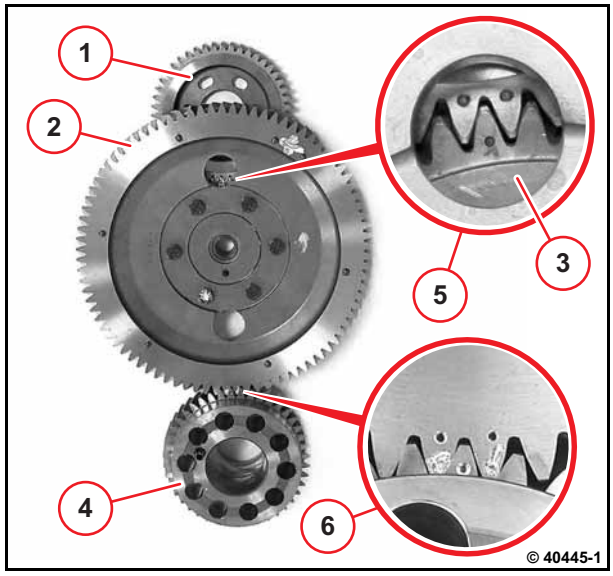
Camshaft gear wheel (2)

Idler gear (3).

Crankshaft gear wheel (4)

Marking injection pump camshaft / idler gear (5)

Marking camshaft / crankshaft (6)



- Measure the overhang of the parallel pin with the depth measuring appliance.

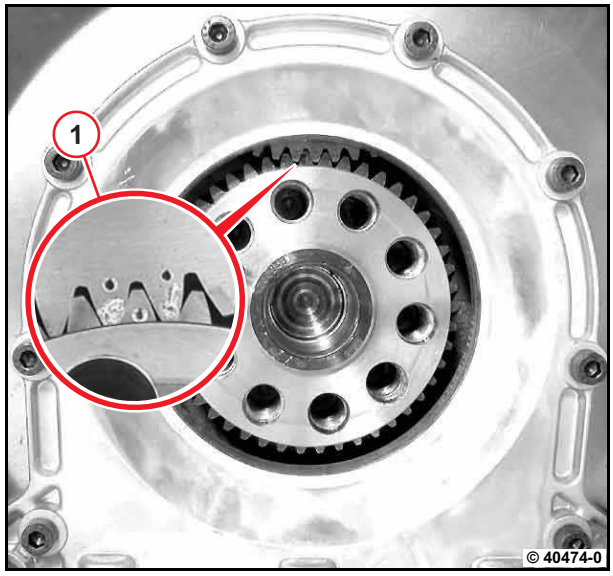
P04 39

- Correct overhang.

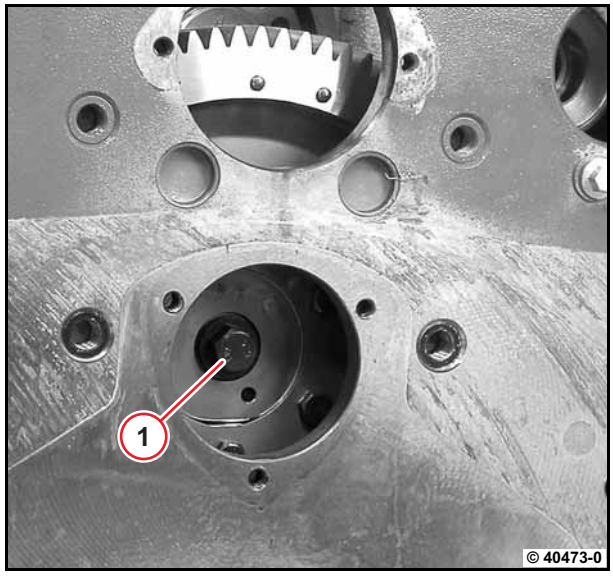
- Insert camshaft gear wheel.

The marking on the crankshaft gear wheel must be between the markings on the camshaft gear wheel (1).

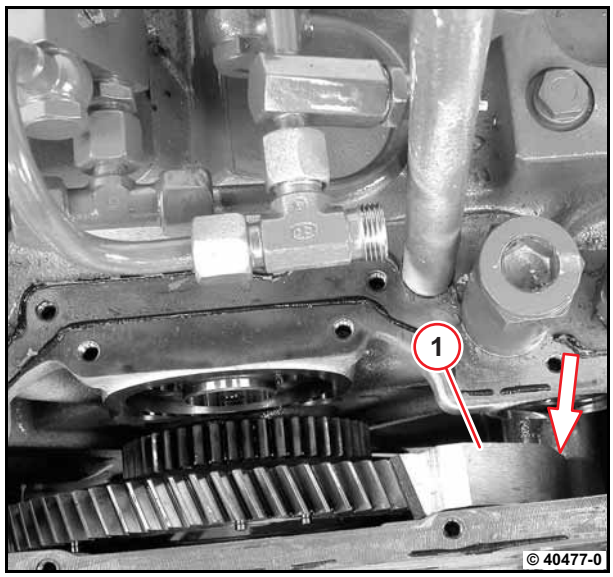
Make sure that the parallel pin on the camshaft gear wheel and the locating hole on the camshaft are in line.



- Lightly oil screw (1).
- Fasten screw (1).

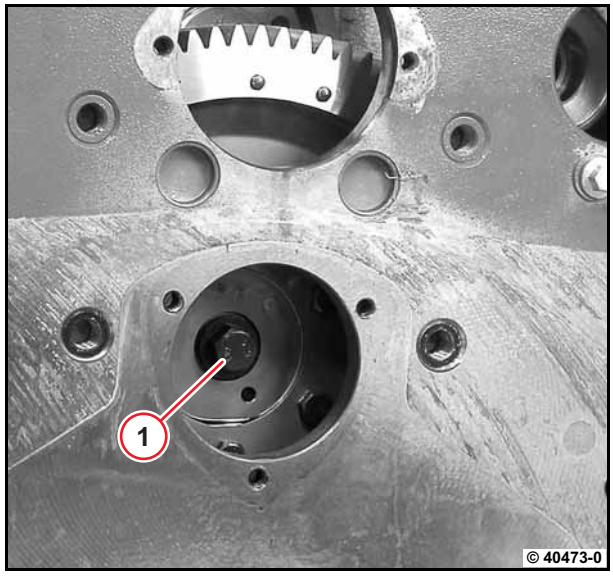


- Insert counter support (1) in the toothing of the camshaft gear wheel.
- Turn the crankshaft evenly with the turning gear until the counter holder blocks on the B-bank of the crankcase (arrow).



- Tighten screw (1).

A04 001

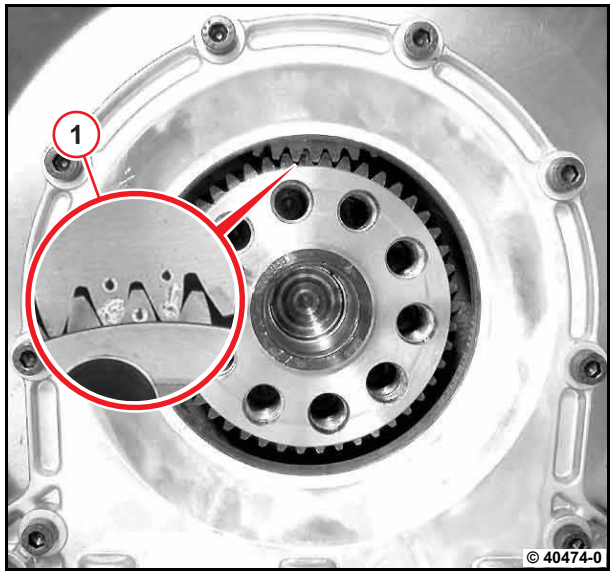


6

- Turn the crankshaft with the turning gear evenly.

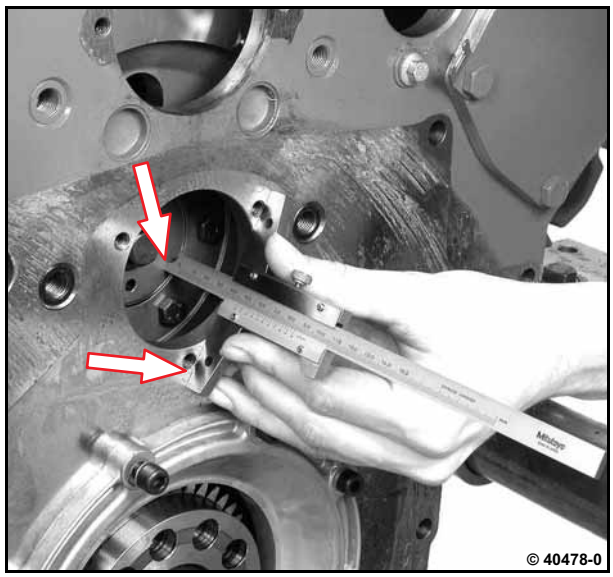
The marking on the crankshaft gear wheel must be between the markings on the camshaft gear wheel (1).

- Remove counter holder.



Determining axial backlash of the camshaft

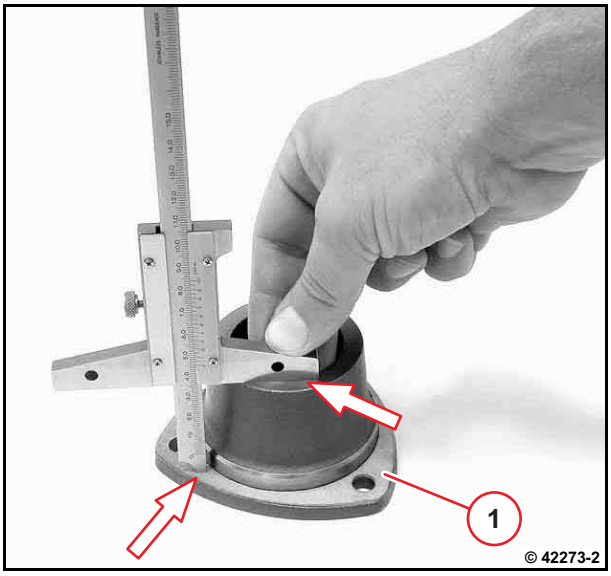
- Push back the camshaft as far as it goes.
- Measure the camshaft stand back from the lay-on surface on the camshaft gear wheel to the crankcase with the depth measuring appliance (arrows).
- Note measured value, dimension (a).



- Mount new gasket (1).
- Measure the flange height from the running surfaces to the lay-on surface with the depth measuring appliance (arrows).
- Note measured value, dimension (b).
- Determine axial backlash.

P04 35

Calculation example	
Desired:	Axial backlash
Given:	-
Measured:	(a) = 45.80 mm
	(b) = 45.50 mm
Calculation:	Axial backlash = dimension (a) - dimension (b)
	45.80 mm - 45.50 mm
Result:	= 0.30 mm



- Correct deviation with gaskets.

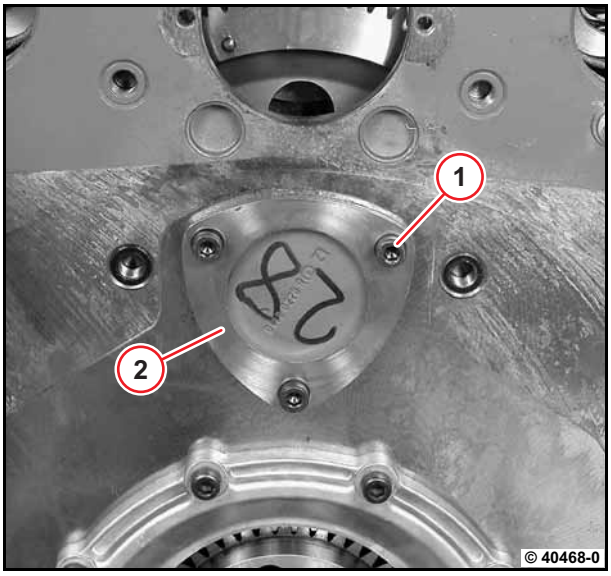
P04 37

- Mount cover (2).

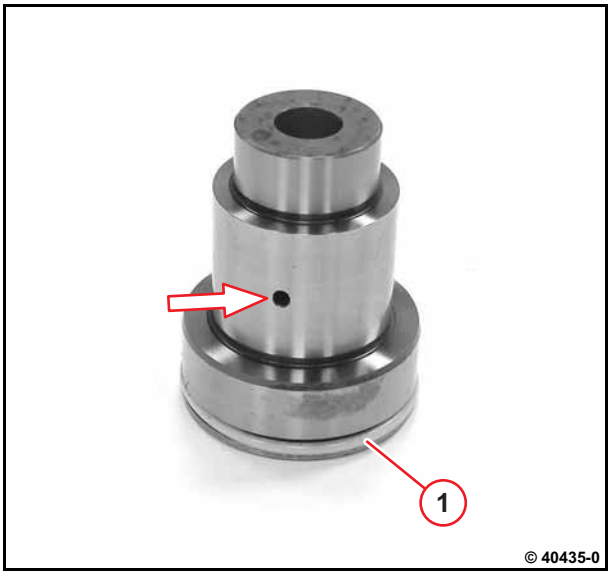
Insert screws with locking agent.

- Fit new sealing rings.
- Tighten all screws (1).

A04 002

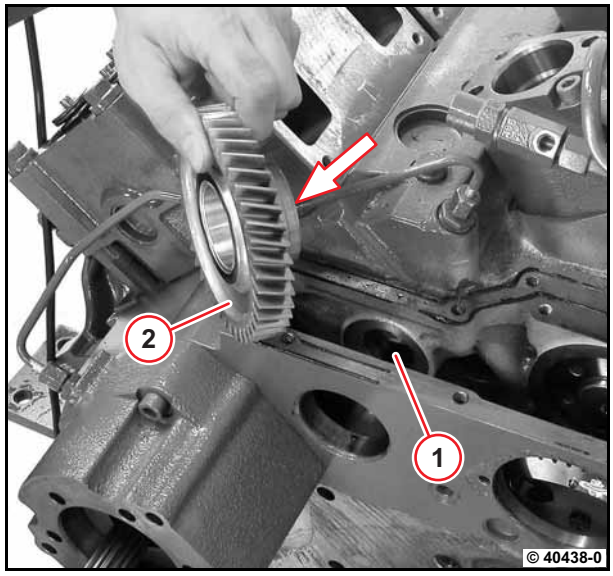


- Mount new O-ring (1).
- Lightly oil O-ring.
- Check oil channel (arrow) for free passage.

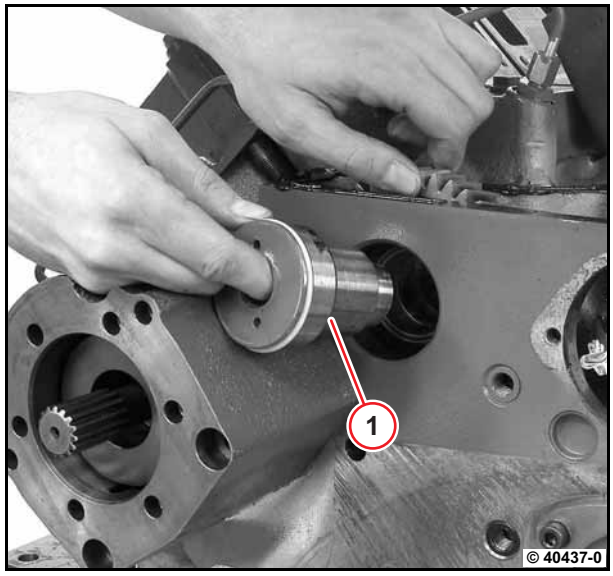


- Lightly oil bearing liner (1) with engine oil.
- Insert idler gear (2).

The collar (arrow) faces the bearing bush.



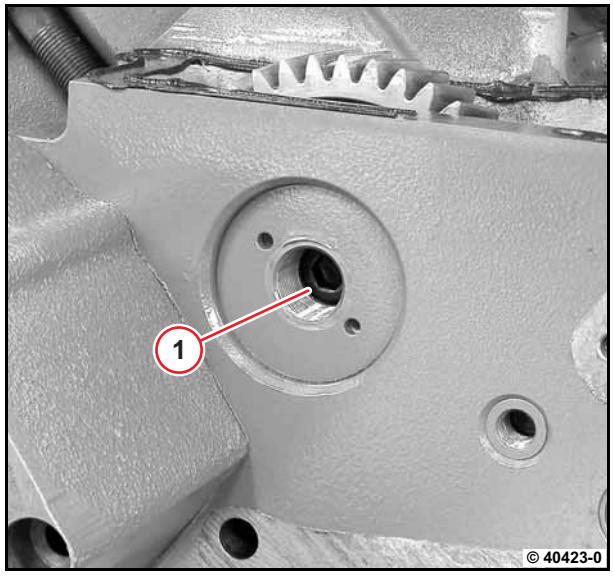
- Insert bolt (1).



- Lightly oil screw (1).
- Tighten screw (1).

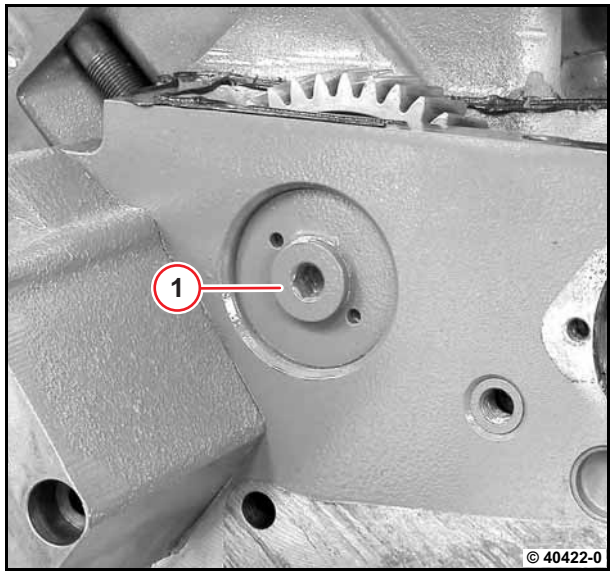
A04 013

Screw length:
M12 x 80 mm

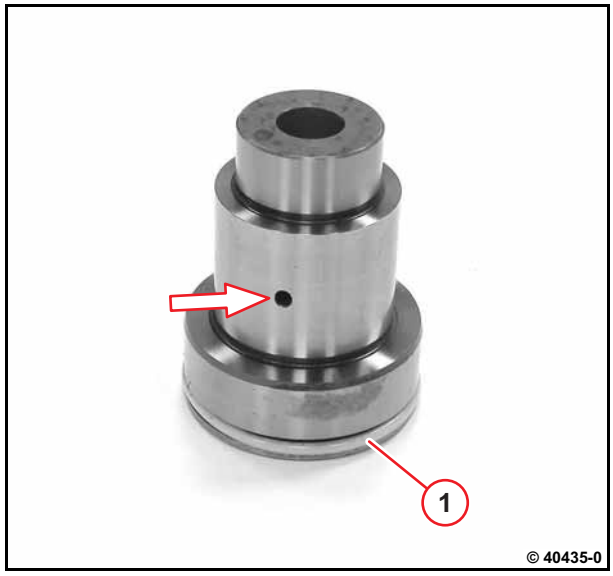


- Lightly oil screw (1).
- Tighten screw (1).

A04 012

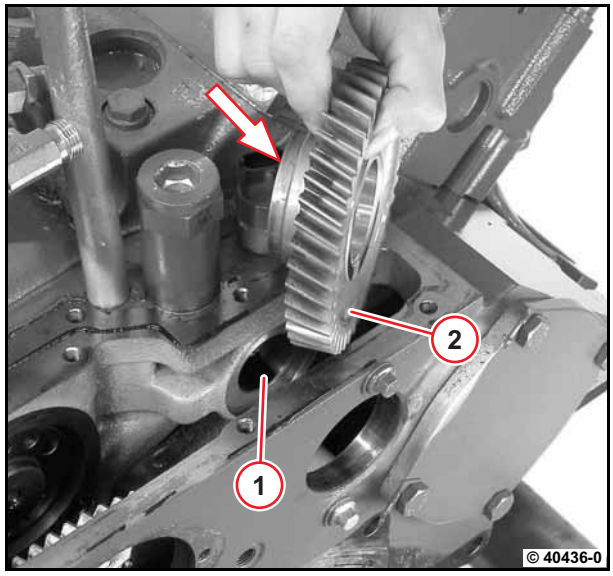


- Mount new O-ring (1).
- Lightly oil O-ring.
- Check oil channel (arrow) for free passage.



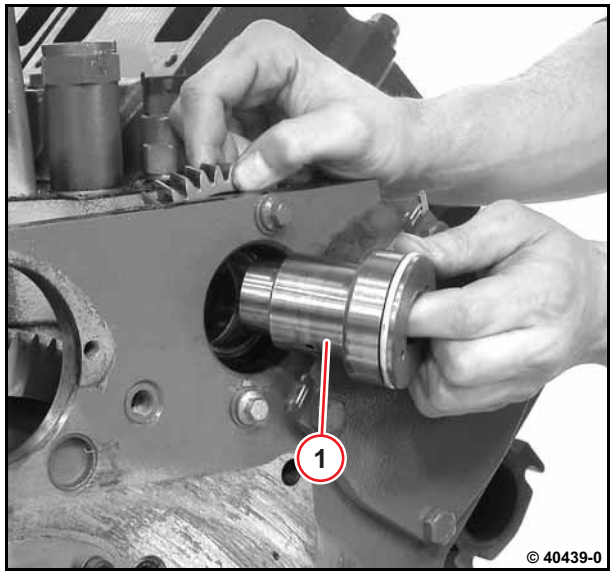
- Lightly oil bearing liner (1) with engine oil.
- Insert idler gear (2).

The collar (arrow) faces the bearing bush.



6

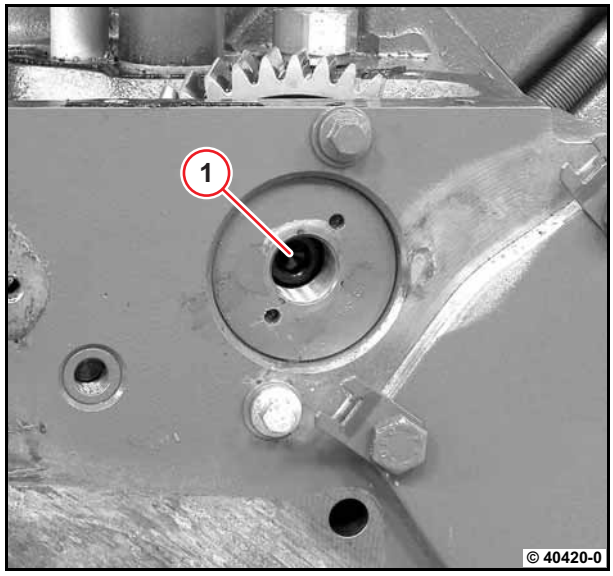
- Insert bolt (1).



- Lightly oil screw (1).
- Tighten screw (1).

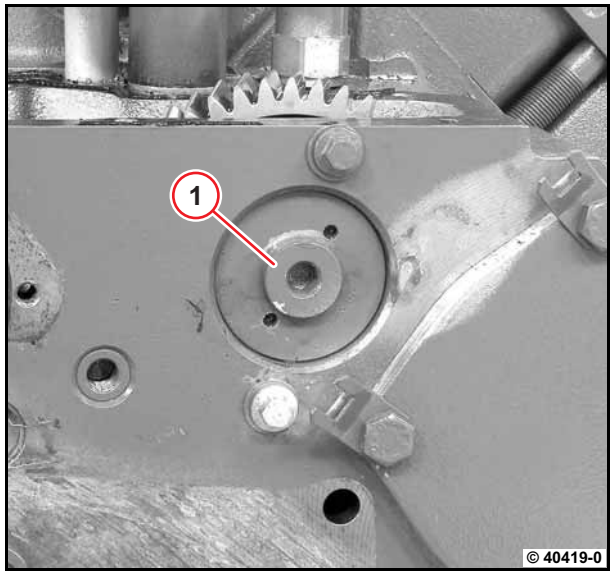
A04 013

Screw length:
M12 x 100 mm



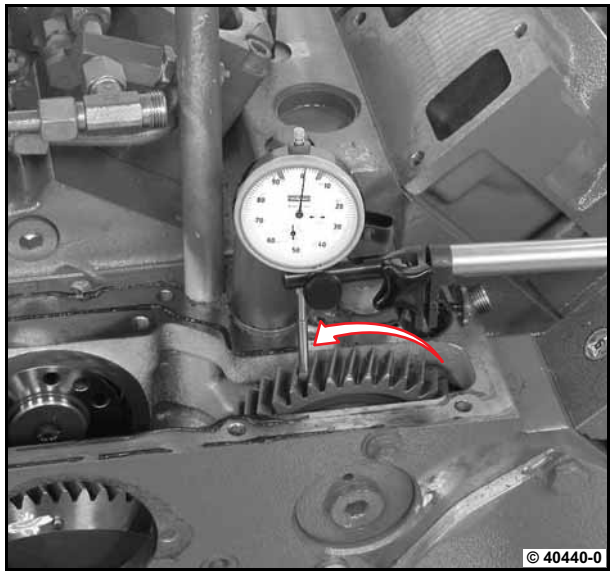
- Lightly oil screw (1).
- Tighten screw (1).

A04 012



Checking the tooth edge clearance of the idler gear (B-bank)

- Mount magnetic measuring stand.
- Insert dial gauge.
- Turn idler gear in direction of arrow until it stops.
- Apply stylus under pre-tension to a tooth flank.
- Adjust dial gauge to "0".

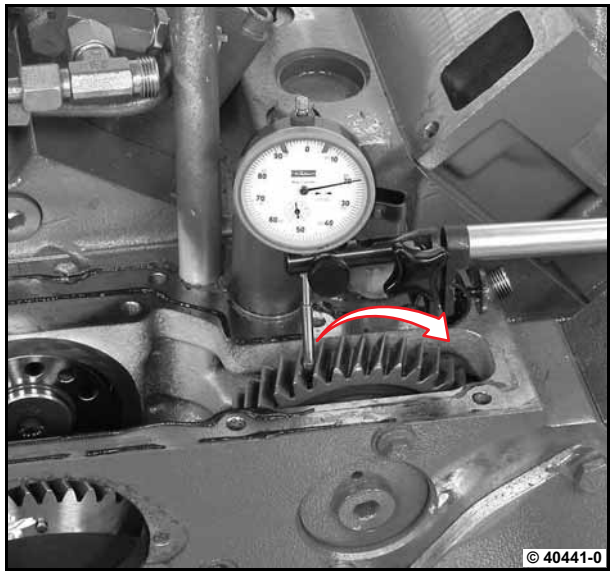


- Turn idler gear in direction of arrow until it stops.
- Read off measured value.

P04 44

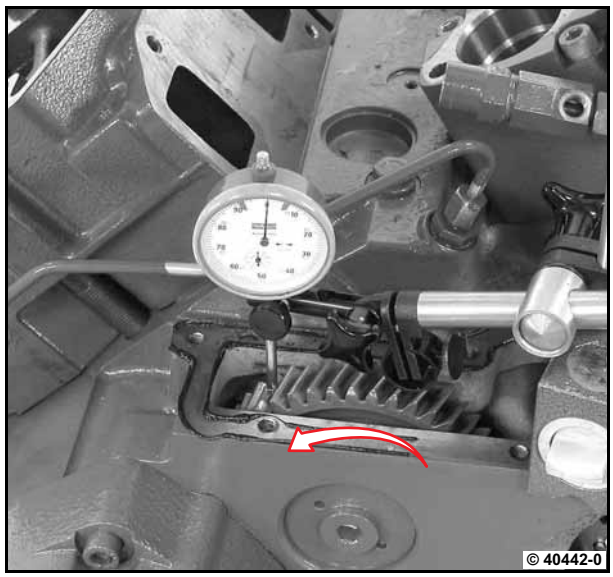
Repeat the measuring process on several tooth flanks.

- Remove magnetic measuring stand.
- Remove dial gauge.



Checking the tooth edge clearance of the idler gear (A-bank)

- Mount magnetic measuring stand.
- Insert dial gauge.
- Turn idler gear in direction of arrow until it stops.
- Apply stylus under pre-tension to a tooth flank.
- Adjust dial gauge to "0".

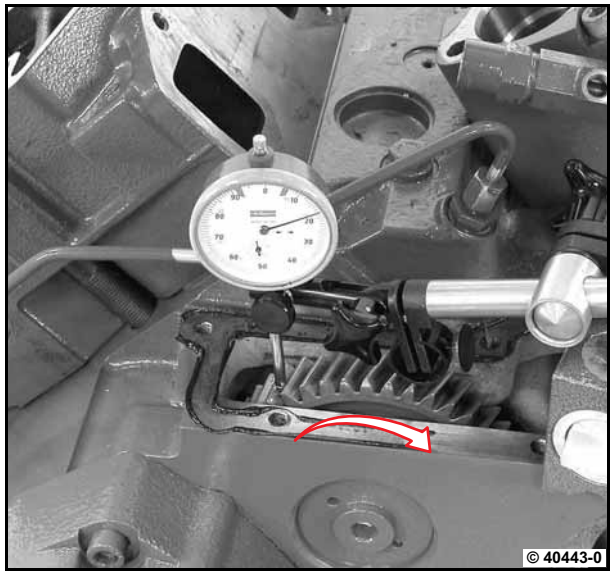


- Turn idler gear in direction of arrow until it stops.
- Read off measured value.

P04 44

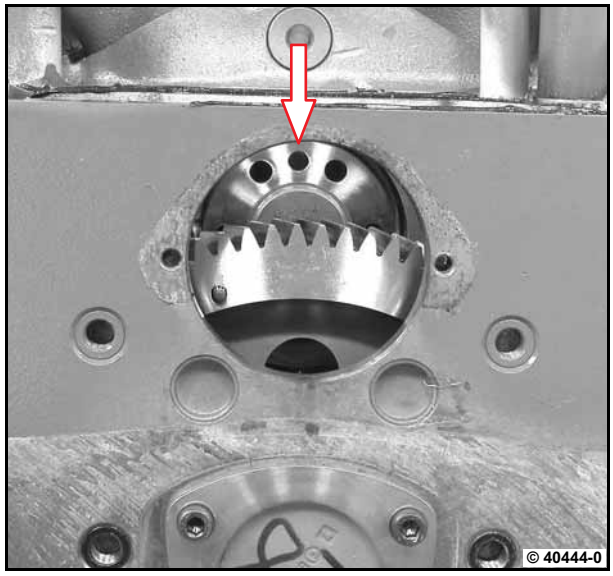
Repeat the measuring process on several tooth flanks.

- Remove magnetic measuring stand.
- Remove dial gauge.



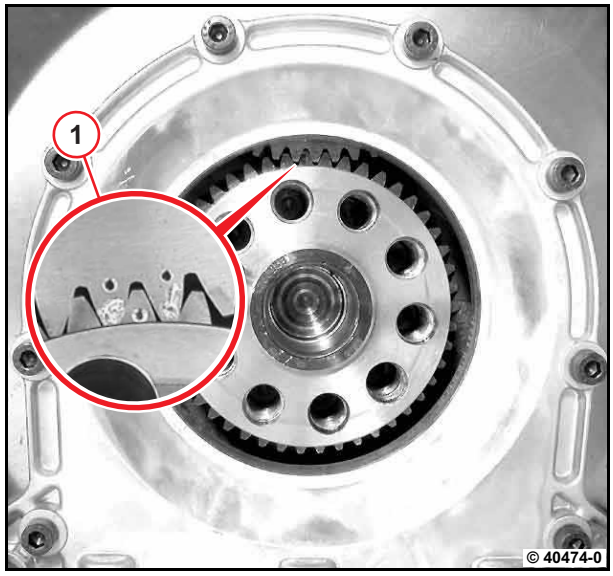
- Position the injection pump camshaft.

The locating hole (arrow) faces upwards.

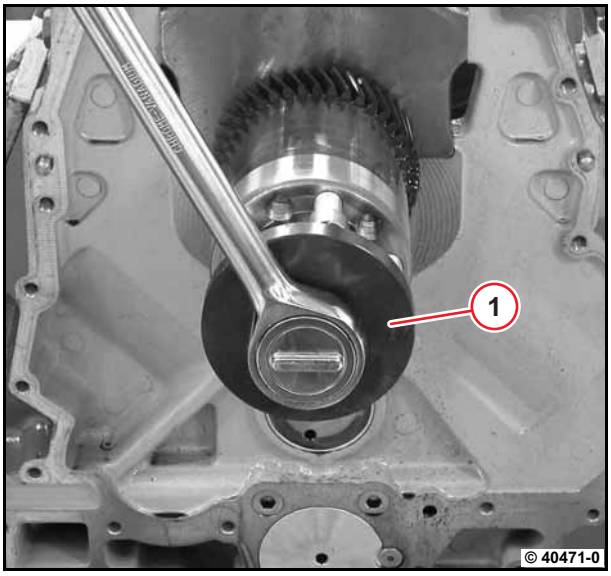


- Turn the crankshaft with the turning gear evenly.

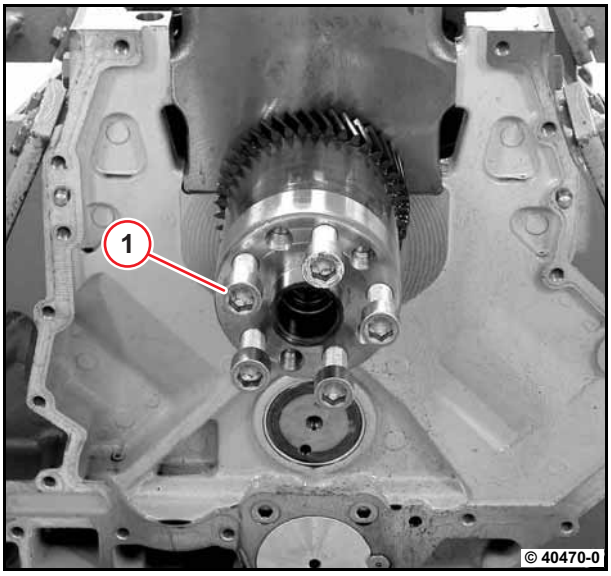
The marking on the crankshaft gear wheel must be between the markings on the camshaft gear wheel (1).



- Remove turning gear (1).

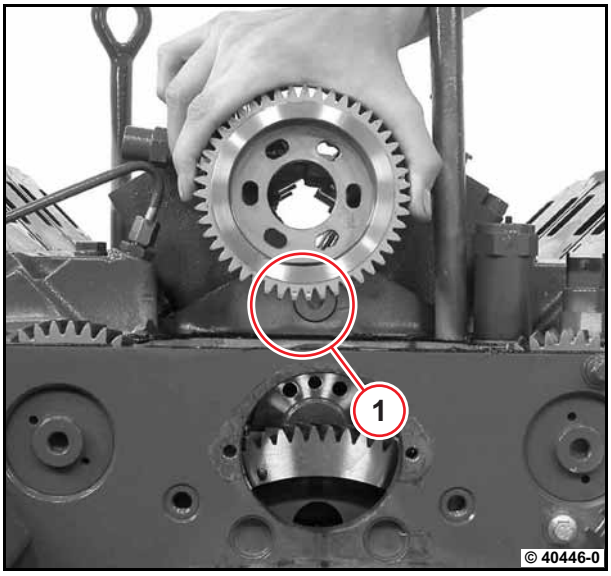


- Unscrew all screws (1).



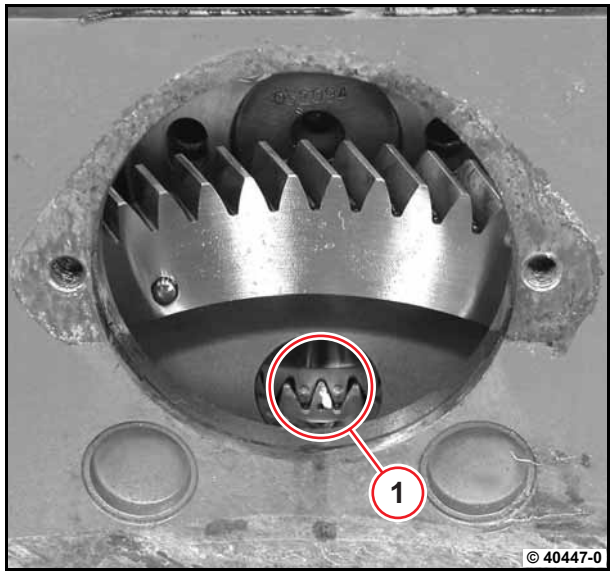
- Position injection pump camshaft gear wheel.

The marking (1) faces the camshaft gear wheel.



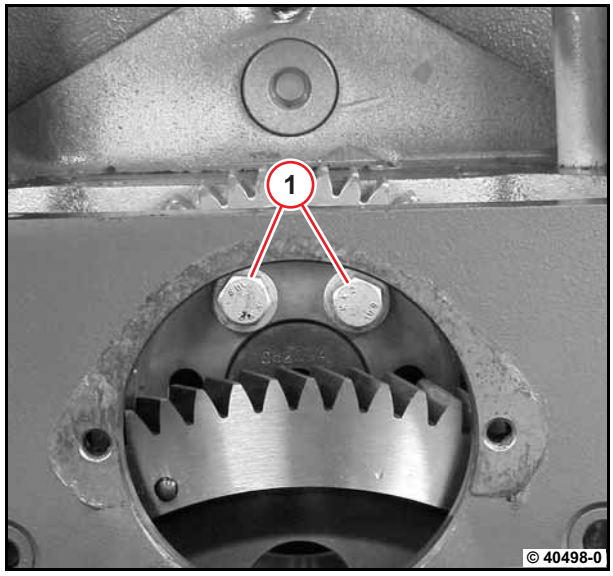
- Insert the injection pump camshaft gear wheel in the camshaft gear wheel.

The marking on the gear wheel must be between the markings of the injection pump camshaft gear wheel (1).



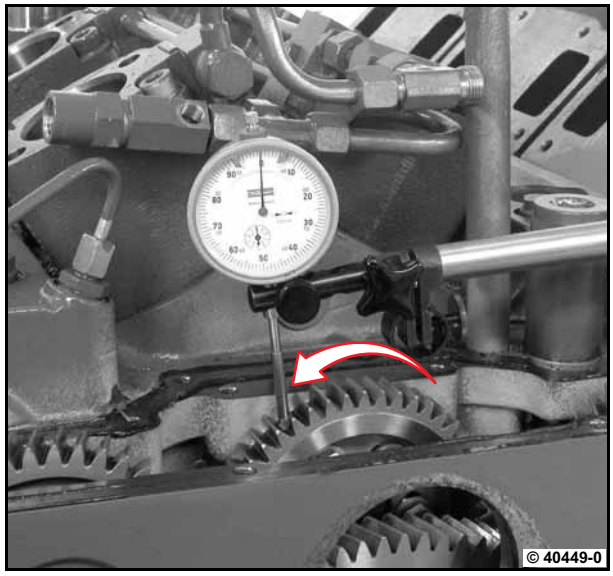
- Tighten screws (1).

Attention!
Make sure no parts fall into the crankcase!



Checking the tooth edge clearance of the injection pump camshaft gear wheel

- Mount magnetic measuring stand.
- Insert dial gauge.
- Turn gear wheel in direction of arrow until it stops.
- Apply stylus under pre-tension to a tooth flank.
- Adjust dial gauge to "0".

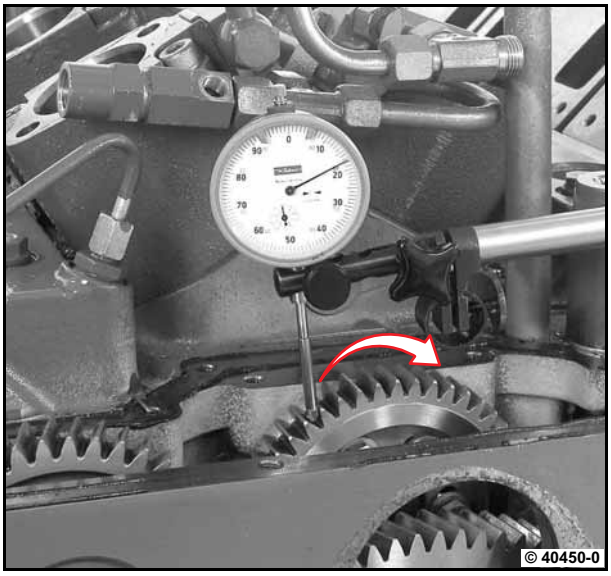


- Turn gear wheel in direction of arrow until it stops.
- Read off measured value.

P07 20

Repeat the measuring process on several tooth flanks.

- Remove magnetic measuring stand.
- Remove dial gauge.



- Install crankshaft sealing ring (flywheel side)

W 02-02-02

- Install connection housing.

W 03-09-04

Do not install the turbocharger.

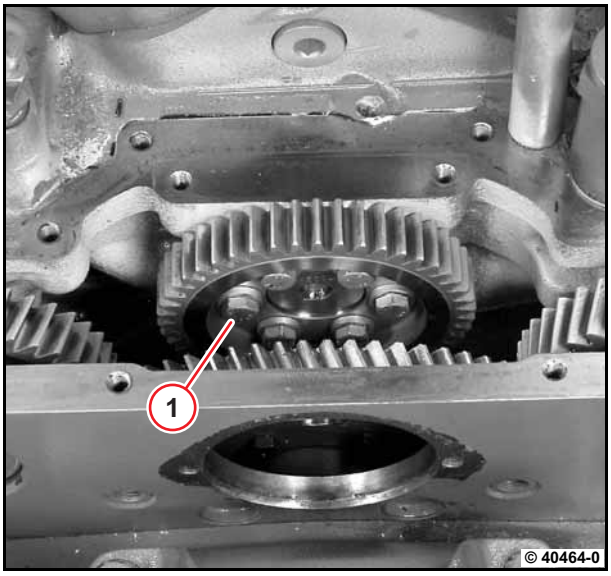
- Attach turning gear.

W 04-06-03

Attention!
Make sure no parts fall into the crankcase!

- Fasten all screws (1).

Concealed screws can be accessed by turning the crankshaft with the turning gear.



- Install genset support.

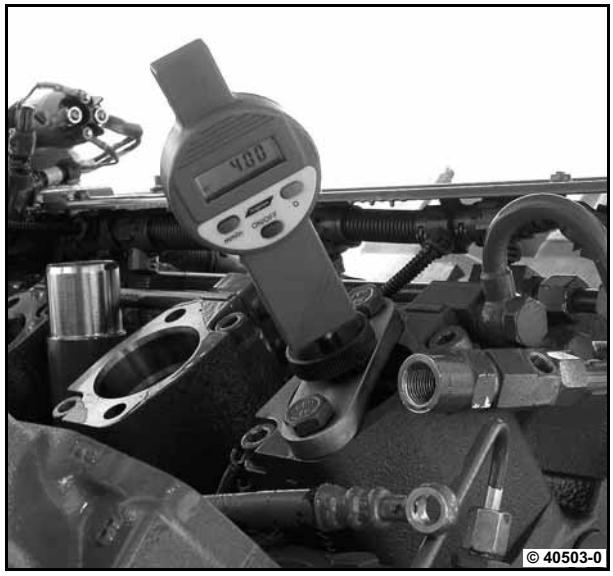
  W 03-08-01

- Install rocker arm brackets.

  W 01-02-02

- Check and set plunger lift of injection pumps.

  W 07-06-04

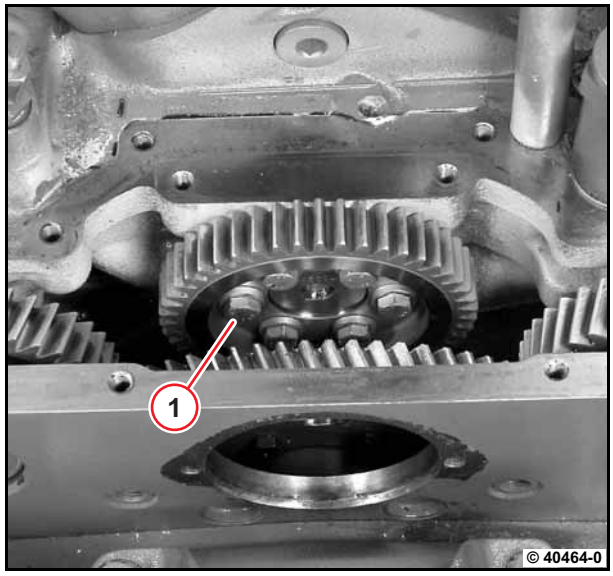


6

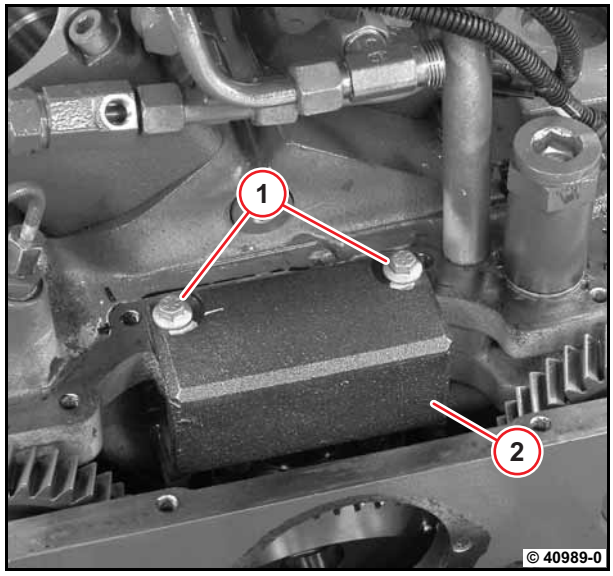
- Tighten all screws (1).

  A04 004

Concealed screws can be accessed by turning the crankshaft with the turning gear.



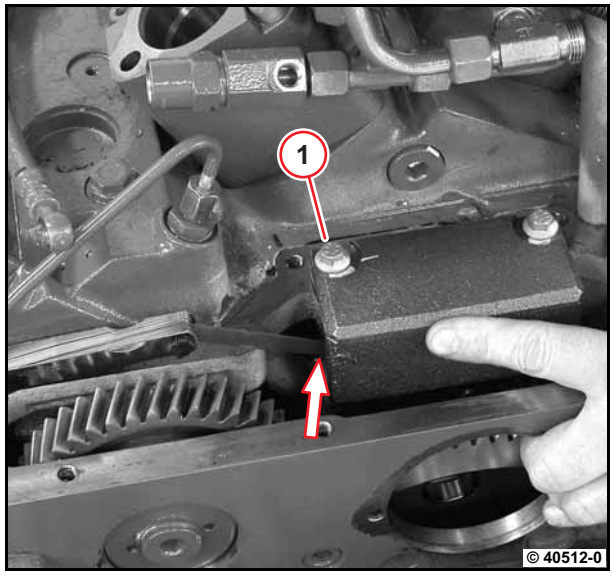
- Mount pad thrust bearing (2).
- Lightly oil screws (1).
- Tighten screws (1).



Checking and setting axial backlash of the injection pump camshaft

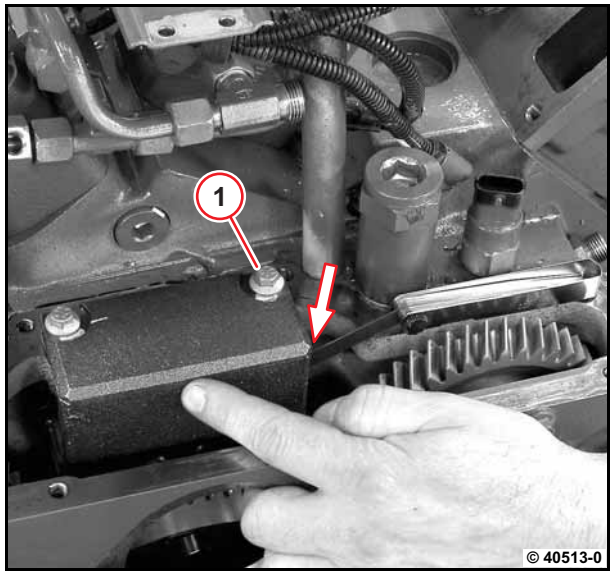
- Insert feeler gauge blade between gear wheel of the injection pump camshaft and the pad thrust bearing (arrow).
- Press the pad thrust bearing onto the feeler gauge blade.
- Fasten screw (1).
- Check axial backlash.

P04 43



- Insert feeler gauge blade between gear wheel of the injection pump camshaft and the pad thrust bearing (arrow).
- Press the pad thrust bearing onto the feeler gauge blade.
- Fasten screw (1).
- Check axial backlash.

P04 43



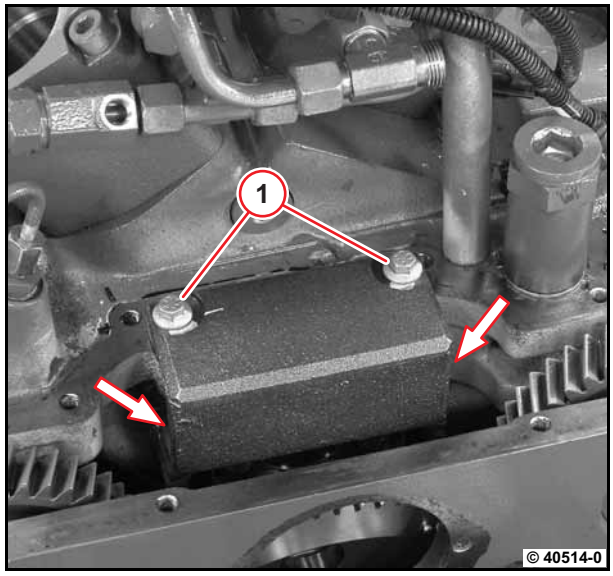
- Tighten screws (1).

A04 015

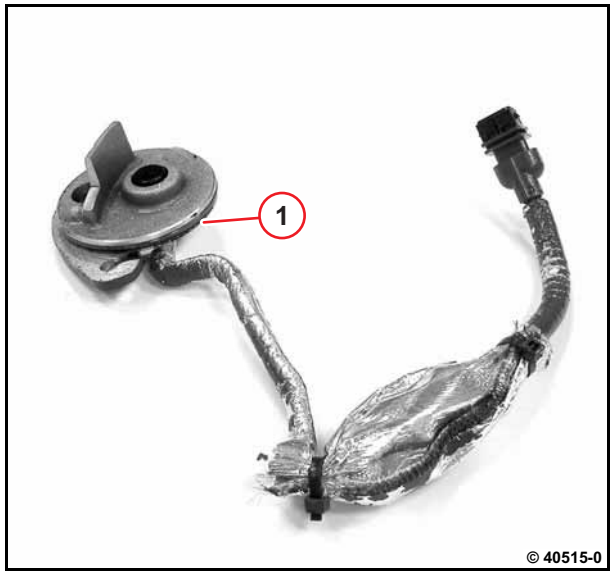
- Check axial backlash again.

P04 43

Check axial backlash on both sides between pad thrust bearing and gear wheel (arrows).



- Clean sealing surfaces.
- Mount new O-ring (1).
- Lightly oil O-ring.

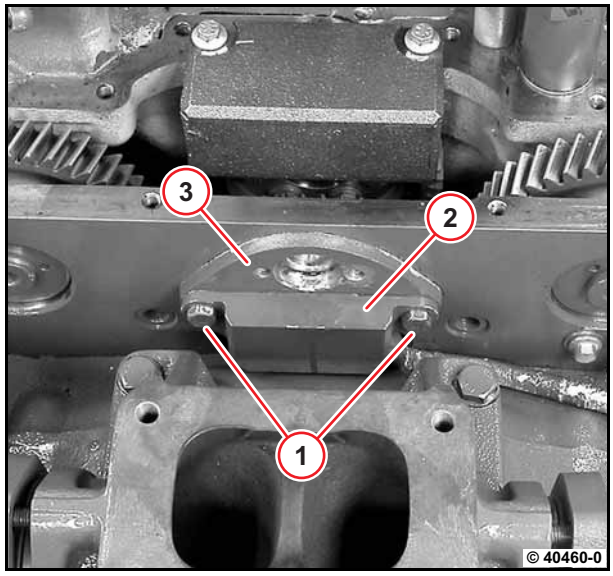


- Press in the cover (3) to the stop.
- Mount cover (2).

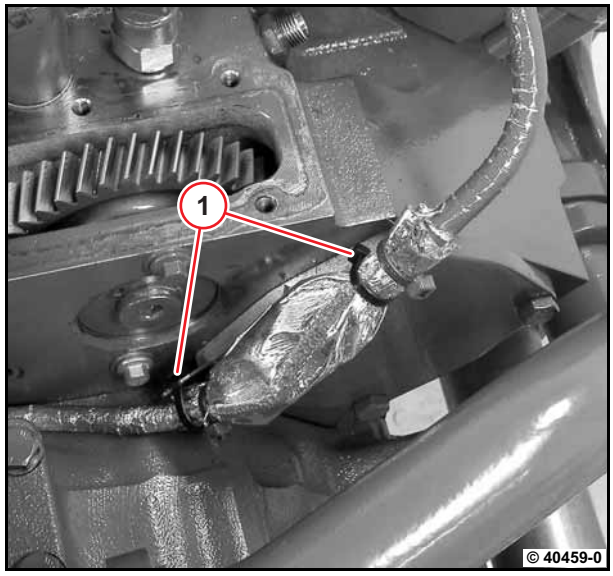
Insert screws with locking agent.

- Tighten screws (1).

A04 022



- Fix cable tie (1).

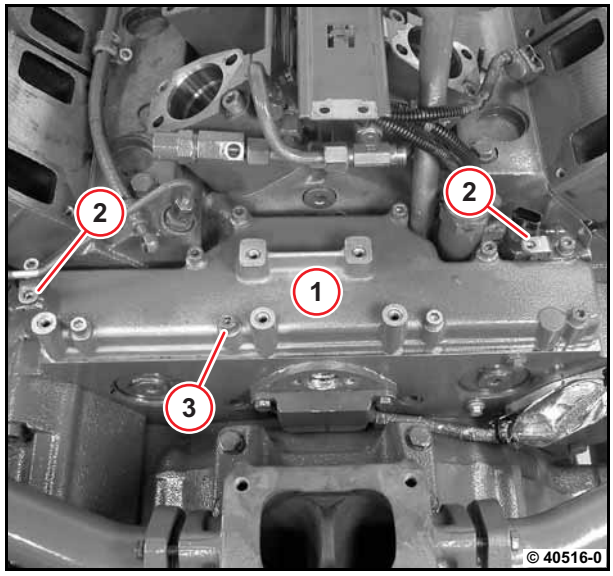


- Clean sealing surfaces.
- Apply packing compound evenly to the sealing surface of the gear case.

Use packing compound DEUTZ DW 48.

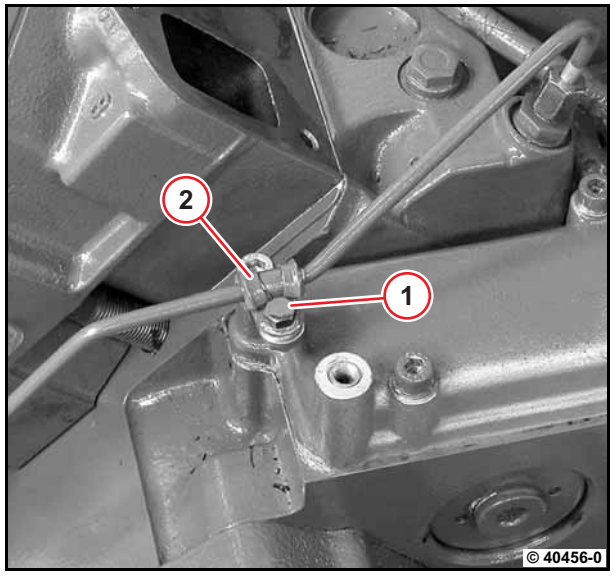
- Mount gear case cover (1).
- Mount holder (2).
- Tighten all screws (3) alternately.

A04 020



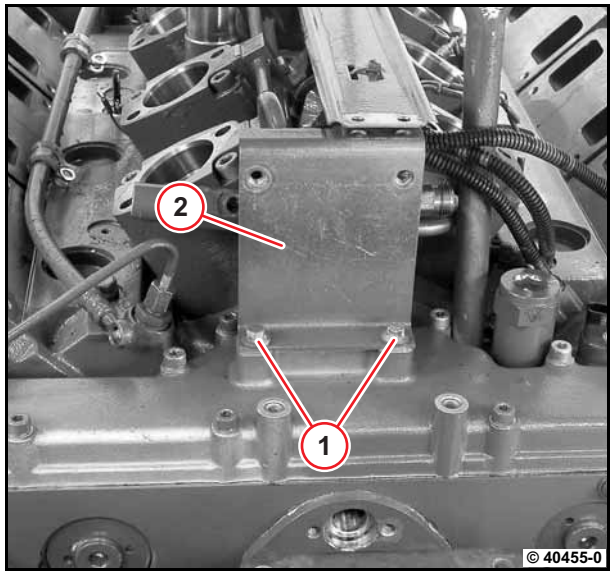
- Mount pipe clamp (2).
- Tighten screw (1).

A08 045



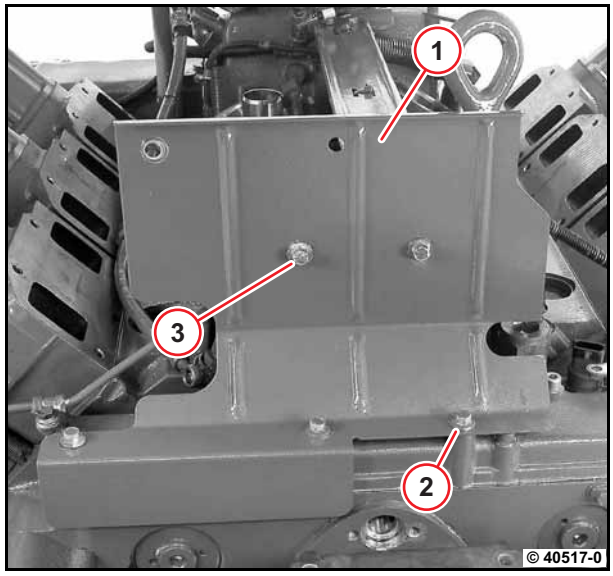
- Mount holder (2).
- Tighten screws (1).

A12 071



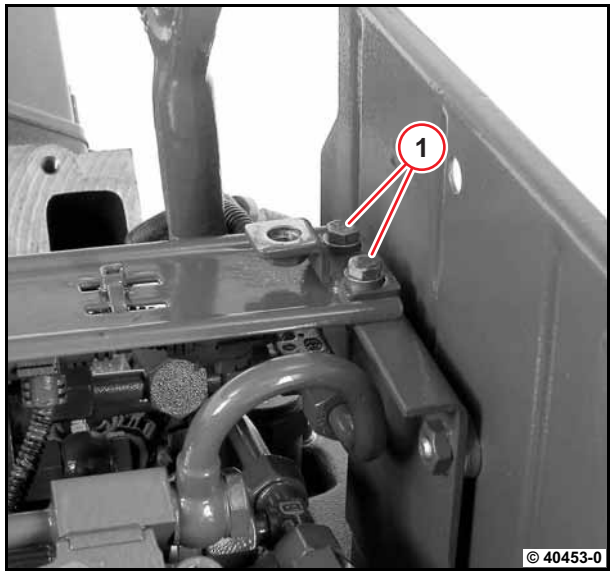
- Mount heat shield (1).
- Insert screws (3) with spacing sleeves.
- Tighten screws (2).
- Tighten screws (2 and 3) alternately.

A12 071



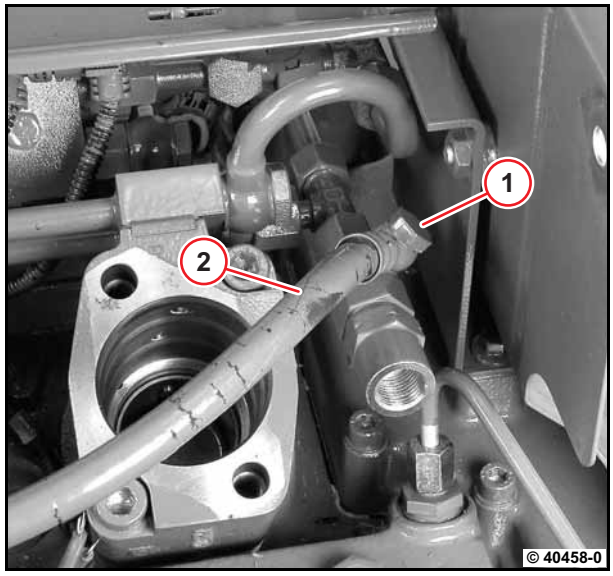
- Tighten screws (1).

A13 094



- Mount new sealing rings.
- Position fuel hose (2).
- Tighten hollow screw (1).

A12 090



- Install injection pumps (cylinder A1).

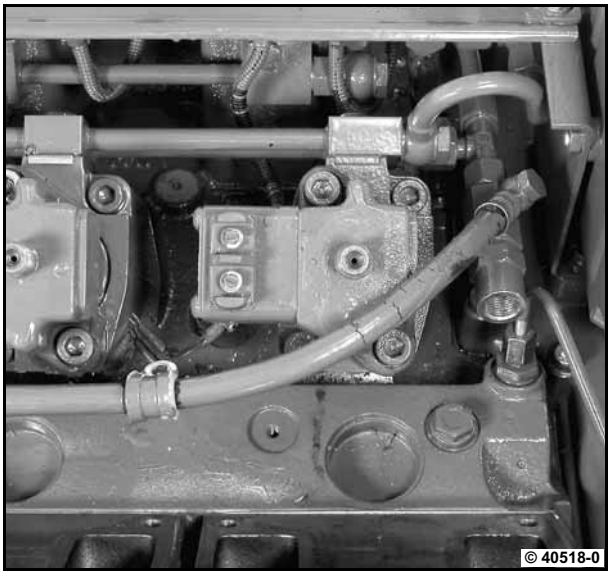
  W 07-04-01
- Install injection pumps (cylinder A2-B3).

  W 07-04-01
- Install impulse transmitter (camshaft).

  W 05-07-03
- Install the turbocharger.

  W 06-06-04
- Remove turning gear.

  W 04-06-03



6

Installing and removing turning gear

Commercial available tools

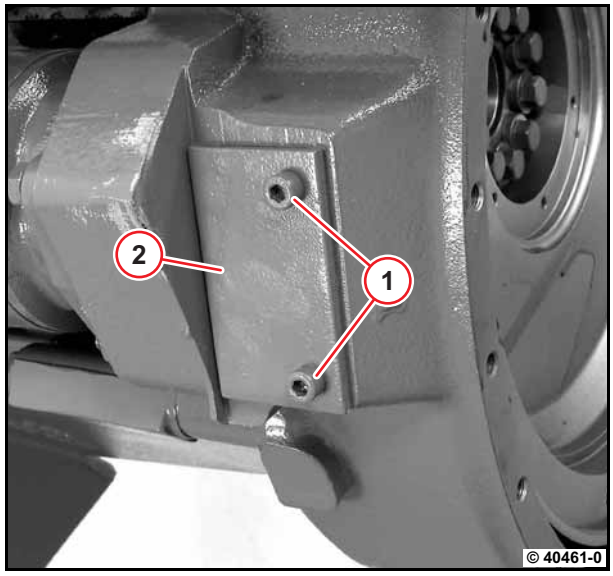
Special tools:
– Turn-over gear 100300

– Locking agent
DEUTZ DW 59

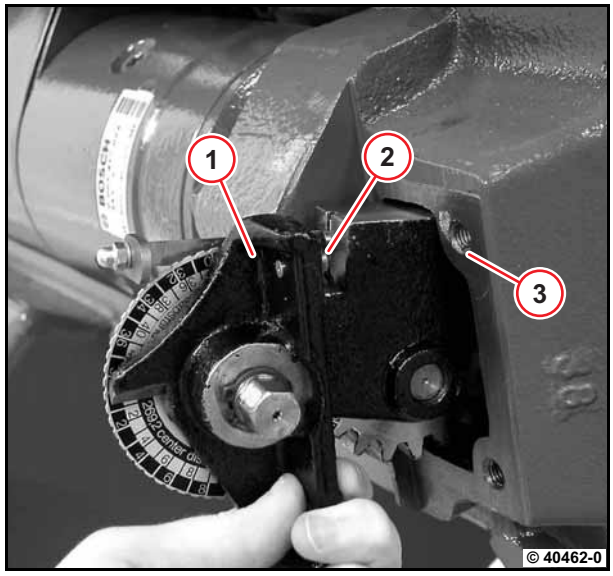
The turning gear 100350 can be used at the front end of the crankshaft depending on the installation relations.

Attaching turning gear

- Unscrew screws (1).
- Remove cover (2).
- Remove gasket.



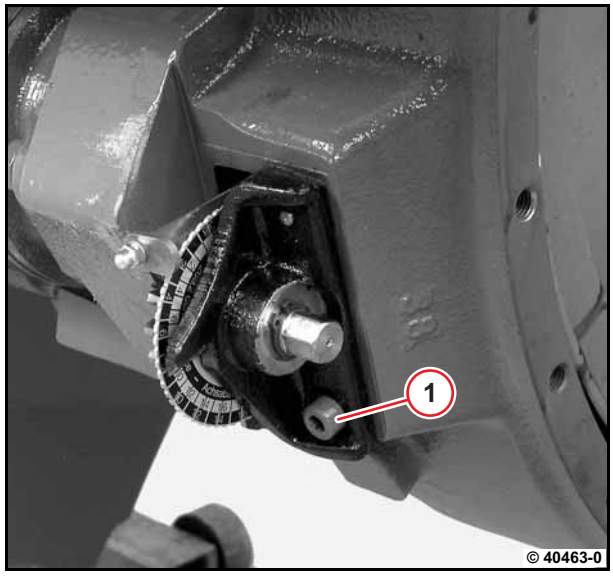
- Insert turn-over gear (1).
- Insert centering pin (2) in threaded bore (3).



- Tighten screw (1).

A03 085

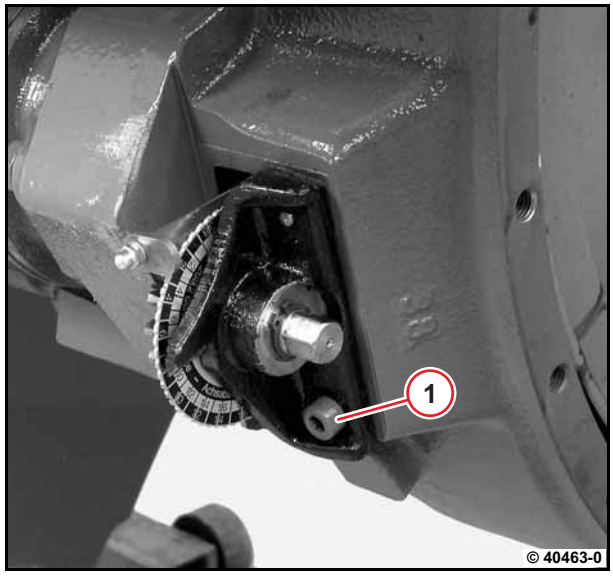
Gear wheel of the turning gear grips the starter gear ring.



6

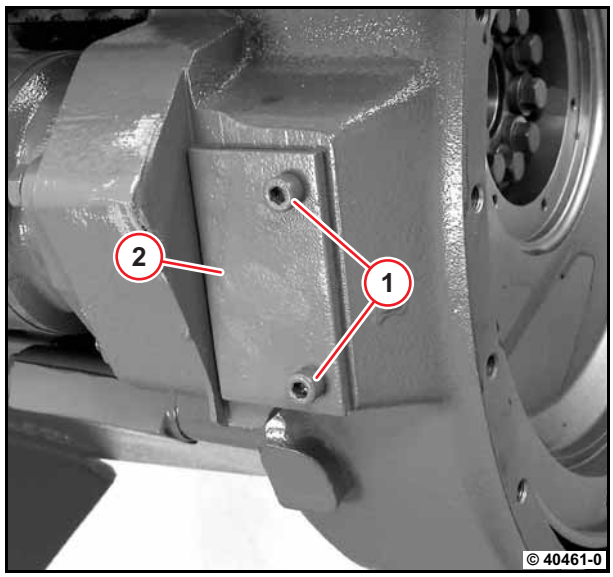
Removing turning gear

- Unscrew screw (1).
- Remove turn-over gear.



- Clean sealing surfaces.
- Mount new gasket.
- Mount cover (2).
- Insert screws (1) with locking agent.
- Tighten screws (1).

A03 085



Removing and installing the impulse transmitter (crankshaft)

Commercial available tools

Special tools:
– Dial gauge. 100400
– Dial gauge adapter 101830
– Turn-over gear 100300

– Fitting compound
DEUTZ AP1908

– W 04-06-03

Read out error memory of the motor control timer with SERDIA.

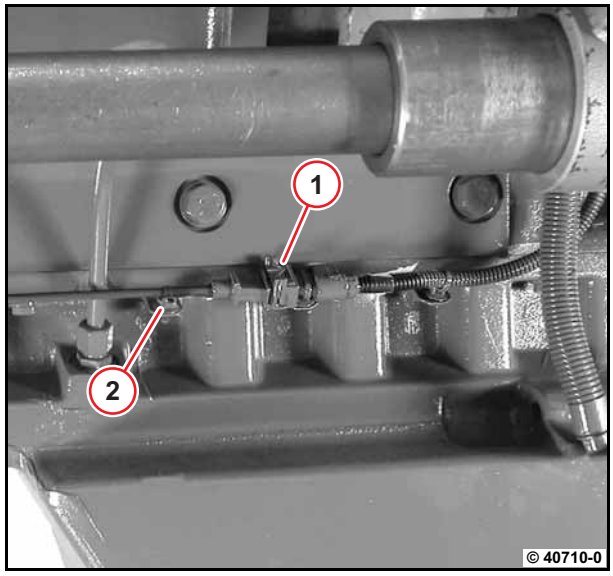
6

Removing the impulse transmitter

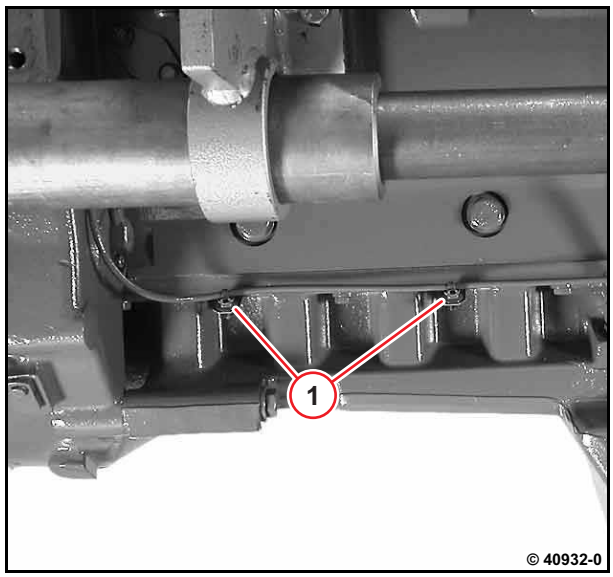
- Attach turning gear.

  W 04-06-03

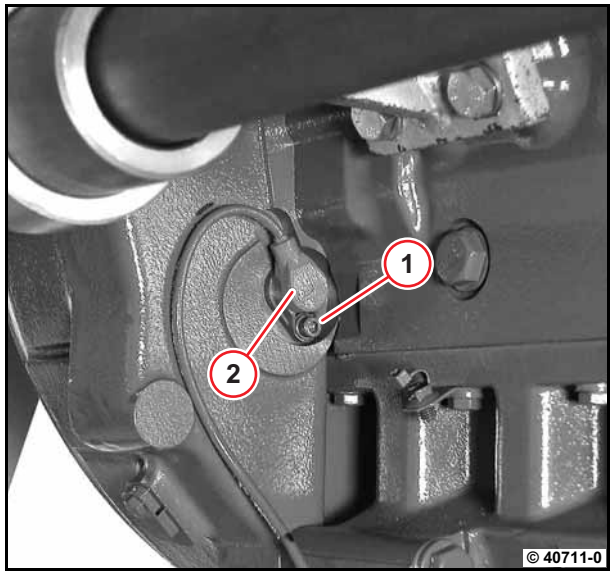
- Unlock cable plug (1) and disconnect.
- Remove cable tie (2).



- Remove cable tie (1).



- Unscrew screw (1).
- Remove impulse transmitter (2).
- Remove seals.



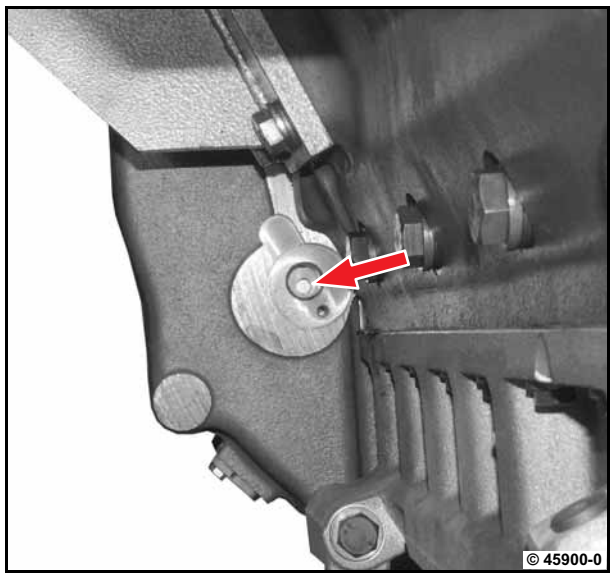
6

- Visually inspect the components.
- Clean components.
- Clean sealing surfaces.

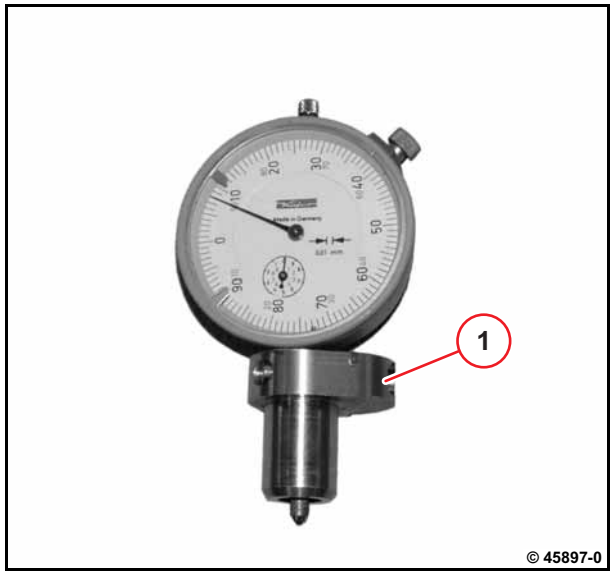
Installing the impulse transmitter

- Turn the crankshaft with the turning gear evenly.

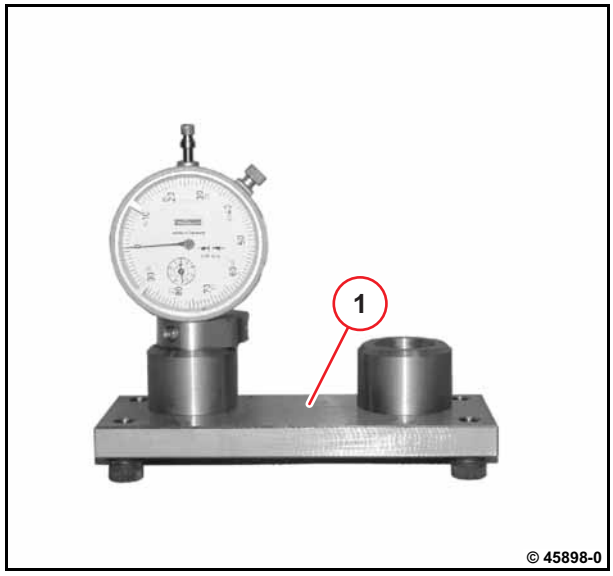
Through the installation opening of the impulse transmitter, **no** bore (arrow) may be visible on the flywheel.



- Insert dial gauge in adapter (1).



- Insert adapter with dial gauge under pre-tension in the base plate (1).
- Fix dial gauge in adapter.
- Turn the dial until the pointer points to "0".



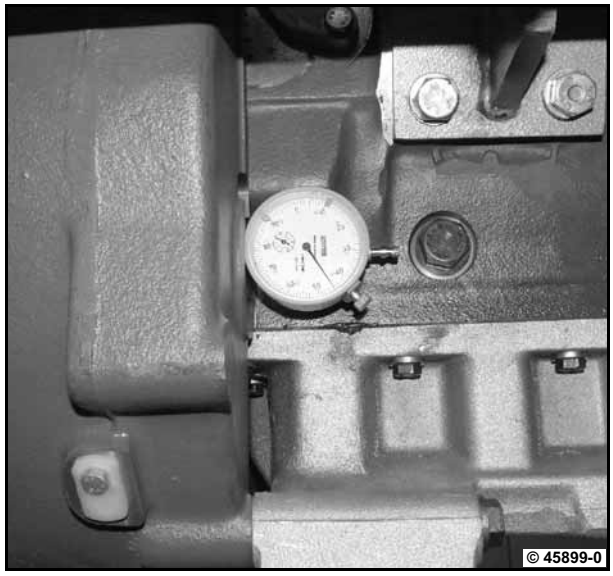
- Insert and press in adapter with dial gauge into the connection housing until it stops.

The stylus of the dial gauge must touch the level flywheel surface.

- Note measured value.
- Make 120° orientation marks on the vibration damper.

Attention!
Remove adapter and dial gauge **before** turning the crankshaft.

- Turn the crankshaft to the next 120° mark in direction of rotation.
- Note measured value.
- Select lowest measured value of 3 measurements, dimension (a).

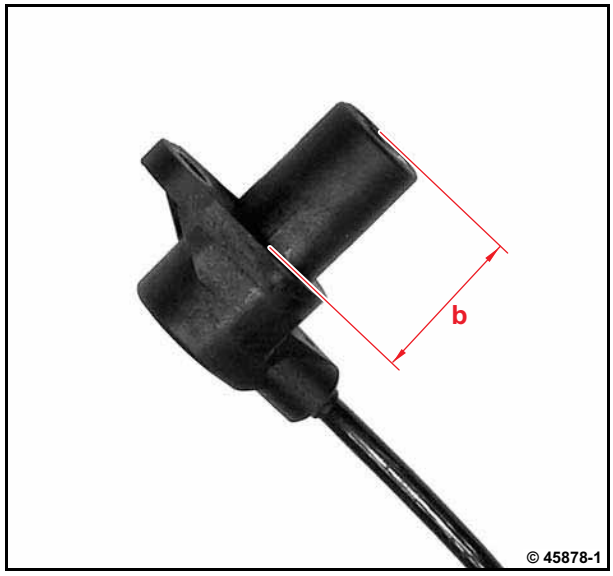


- Measure distance, dimension (b).

  24 $^{+0,1}_{-0,2}$ mm

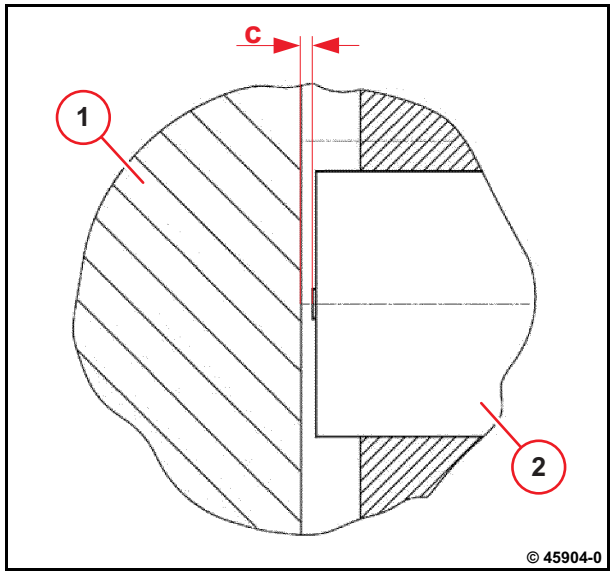
- Note measured value.
- Calculate difference between dimension (a) and dimension (b), dimension (y).

Calculation example	
Desired:	Dimension (y)
Given:	Dial gauge adapter dimension = 24.00 mm
Measured:	Dimension (a) = dial gauge adapter dimension + lowest measured value
	Dimension (a) = 24.00 mm + 0.49 mm
	Dimension (a) = 24.49 mm
	Dimension (b) = 24.00 mm
Calculation:	Dimension (y) = dimension (a) - dimension (b)
	Dimension (y) = 24.49 mm - 24.00 mm
Result:	Dimension (y) = 0.49 mm



- Determine tightness of the impulse transmitter under compliance with the permissible distance dimension (c).

Calculation example	
Desired:	Compliance with the permissible distance, dimension (c)
	Gasket
Given:	MInimum distance dimension (c1) = 1.00 mm
	Dimension (y)
	Thickness of gasket = 0.30 mm
	Thickness of gasket = 0.50 mm
Measured:	-
Calculation:	Dimension (c) = minimum distance dimension (c1) - dimension (y) + thickness of the gasket
	Dimension (c) = 1.00 mm - 0.49 mm + 0.50 mm
	Dimension (c) = 1.01 mm
Result:	Dimension (c) corresponds to the permissible distance, therefore a gasket with a thickness of 0.50 mm must be used.



- Permissible distance (c) between flywheel (1) and impulse transmitter (2).

  P05 91

- Select new gaskets.

Gaskets are available in thickness of 0.3 mm and 0.5 mm.

The correct distance (c) is reached by placing the appropriate number of gaskets underneath.

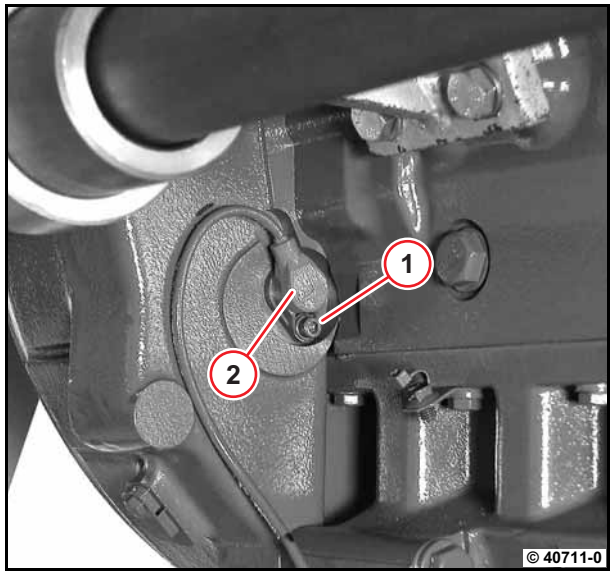
- Remove dial gauge.

- Mount new gasket(s) according to the determined distance.
- Press in impulse transmitter (2).

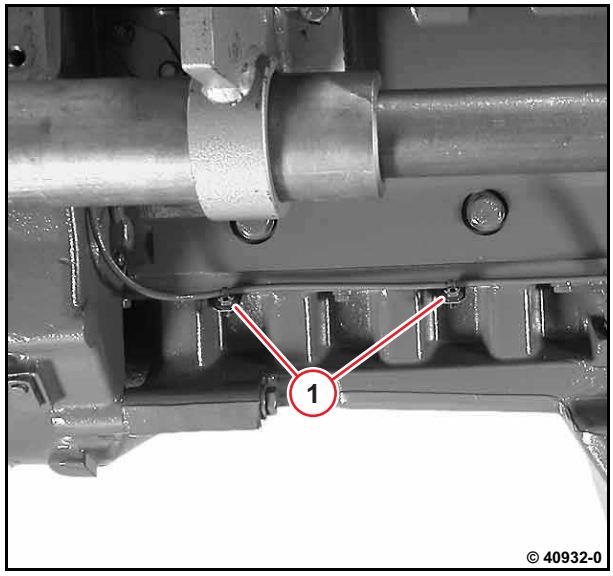
Attention!
Do not damage the component.

- Tighten screw (1).

A05 011



- Fix cable tie (1).



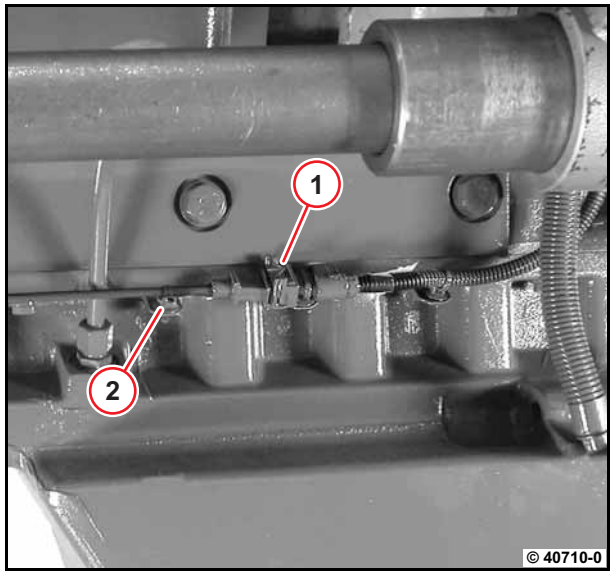
- Plug cable plugs (1) together.

Ensure that the cables are connected properly.

- Fix cable tie (2).
- Remove turning gear.

W 04-06-03

Delete error entry in the error memory of the motor control timer with SERDIA.



Removing and installing the impulse transmitter (camshaft)

Commercial available tools

Special tools:
– Dial gauge adapter 101830
– Turn-over gear 100300

– Fitting compound
DEUTZ AP 1908
– Locking agent
DEUTZ DW 72

– W 04-06-03
– W 06-06-04

Read out error memory of the motor control timer with SERDIA.

6

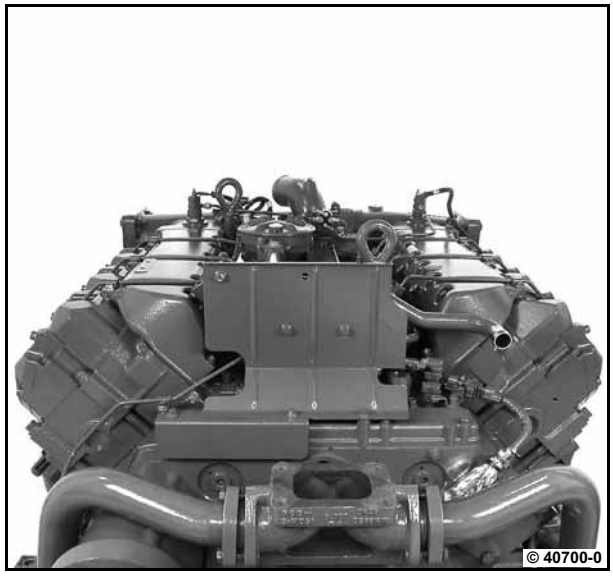
Removing the impulse transmitter

- Attach turning gear.

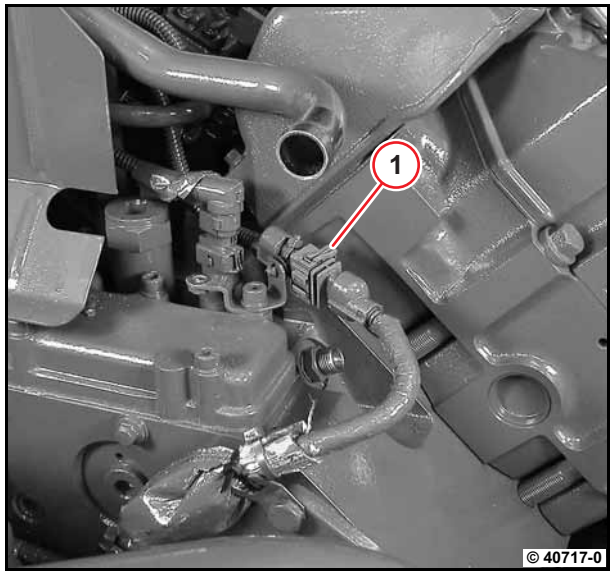
  W 04-06-03

- Remove turbocharger.

  W 06-06-04

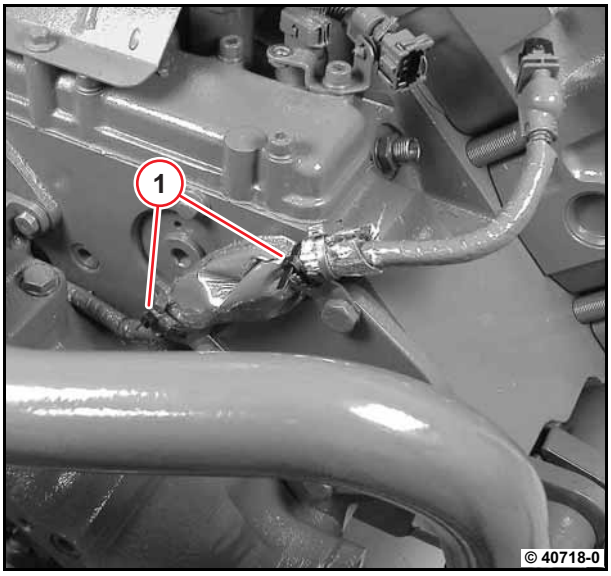


- Unlock cable plug (1) and disconnect.

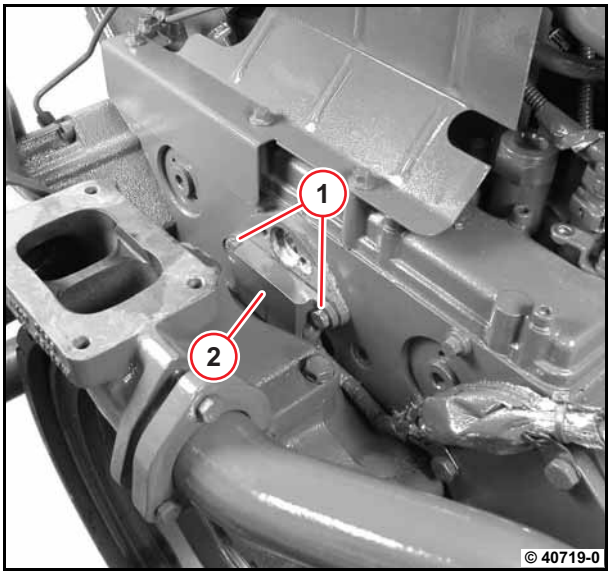


6

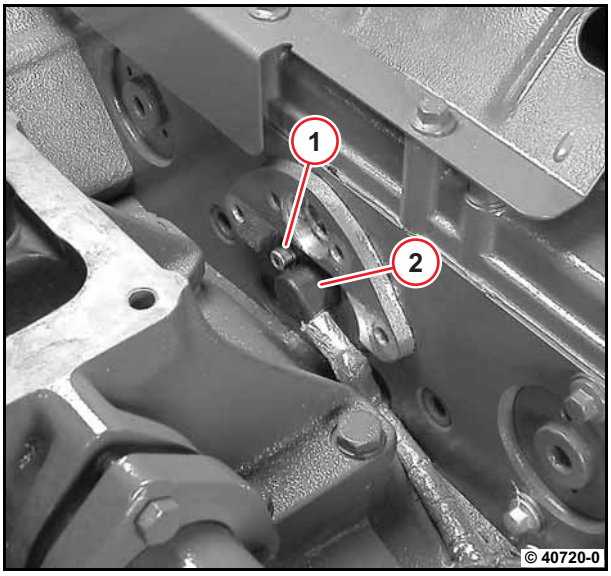
- Remove cable tie (1).



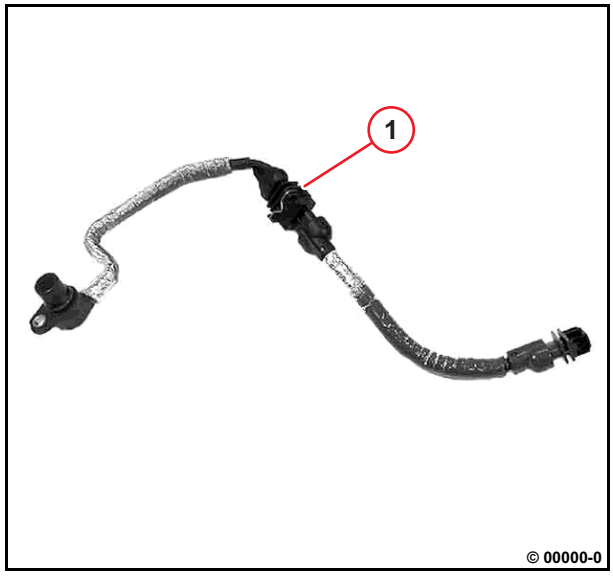
- Unscrew screws (1).
- Remove cover (2) .



- Unscrew screw (1).
- Remove impulse transmitter (2).
- Remove seals.



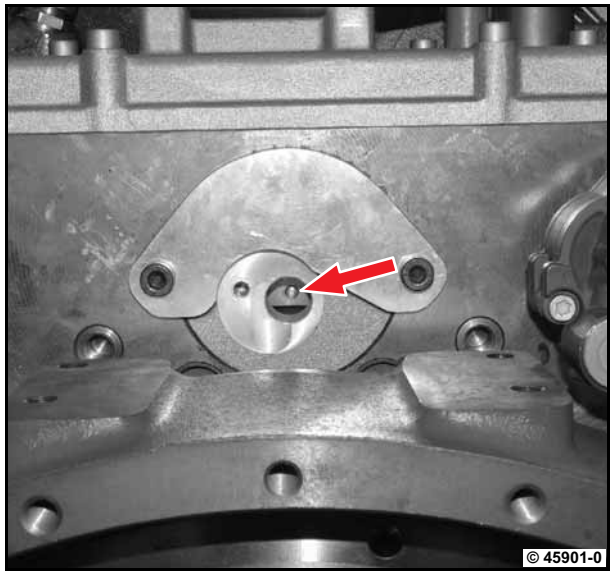
- Remove protective foil.
- Unlock cable plug (1) and disconnect.
- Visually inspect the components.
- Clean components.



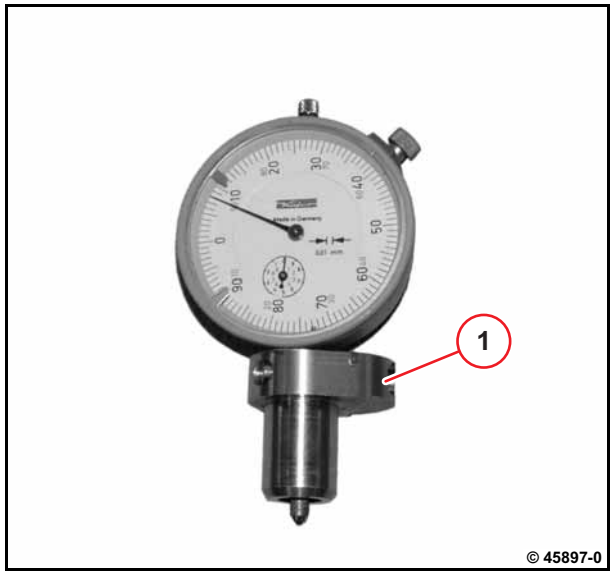
Installing the impulse transmitter

- Turn the crankshaft with the turning gear evenly.

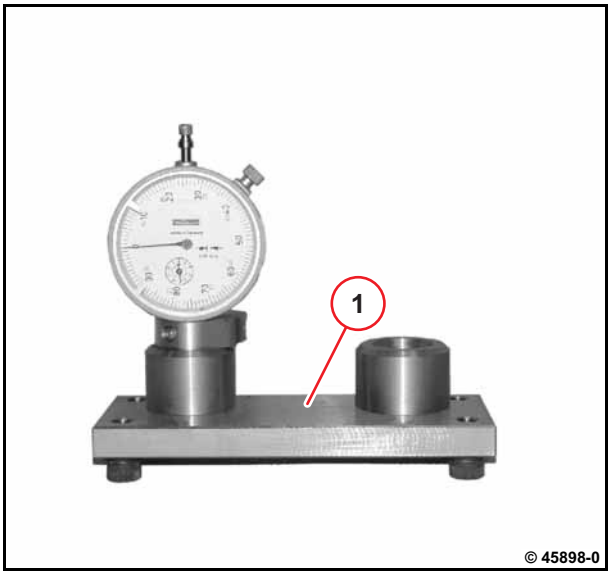
The pin (arrow) must be in the centre of the installation opening.



- Insert dial gauge in adapter (1).



- Insert adapter with dial gauge under pre-tension in the base plate (1).
- Fix dial gauge in adapter.
- Turn the dial until the pointer points to "0".



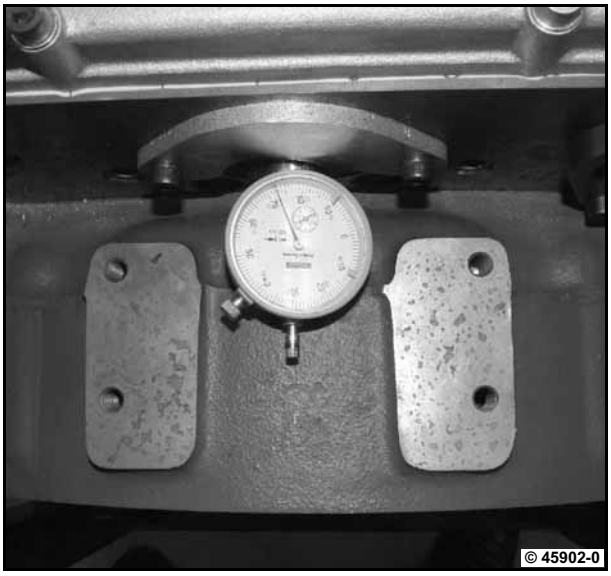
- Insert and press in adapter with dial gauge into the connection housing until it stops.

The stylus of the dial gauge must touch the pin of the camshaft gear.

- Note measured value.
- Make 120° orientation marks on the vibration damper.

Attention!
Remove adapter and dial gauge **before** turning the crankshaft.

- Turn the crankshaft to the next 120° mark in direction of rotation.
- Note measured value.
- Select lowest measured value of 3 measurements, dimension (a).

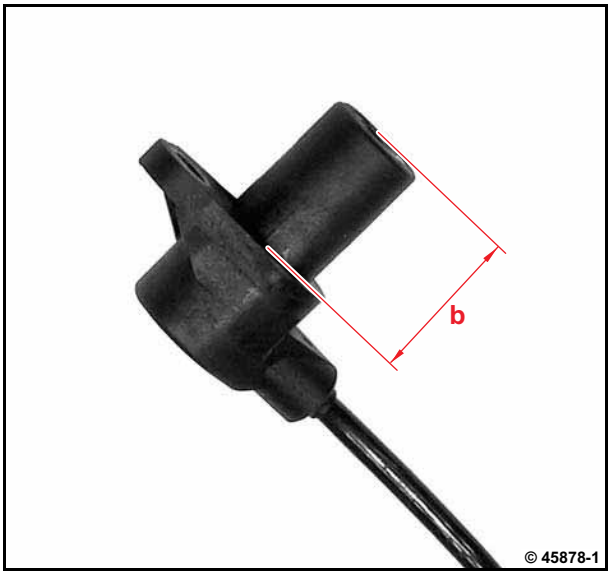


- Measure distance, dimension (b).

24 $^{+0,1}_{-0,2}$ mm

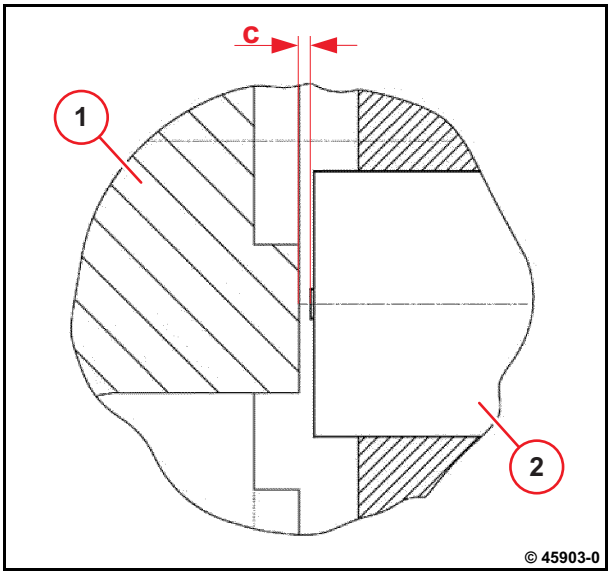
- Note measured value.
- Calculate difference between dimension (a) and dimension (b), dimension (y).

Calculation example	
Desired:	Dimension (y)
Given:	Dial gauge adapter dimension = 24.00 mm
Measured:	Dimension (a) = dial gauge adapter dimension + lowest measured value
	Dimension (a) = 24.00 mm + 0.76 mm
	Dimension (a) = 24.76 mm
	Dimension (b) = 23.90 mm
Calculation:	Dimension (y) = dimension (a) - dimension (b)
	Dimension (y) = 24.76 mm - 23.90 mm
Result:	Dimension (y) = 0.86 mm



- Determine tightness of the impulse transmitter under compliance with the permissible distance dimension (c).

Calculation example	
Desired:	Compliance with the permissible distance, dimension (c) Gasket
Given:	Minimum distance dimension (c1) = 0.30 mm Dimension (y) Thickness of gasket = 0.30 mm Thickness of gasket = 0.50 mm
Measured:	-
Calculation:	Dimension (c) = minimum distance dimension (c1) - dimension (y) + thickness of the gasket Dimension (c) = 0.30 mm - 0.86 mm + (2x0.50 mm) Dimension (c) = 0.44 mm
Result:	Dimension (c) corresponds to the permissible distance, therefore two gaskets with a thickness of 0.50 mm must be used.



- Permissible distance (c) between camshaft gear wheel (1) and impulse transmitter (2).

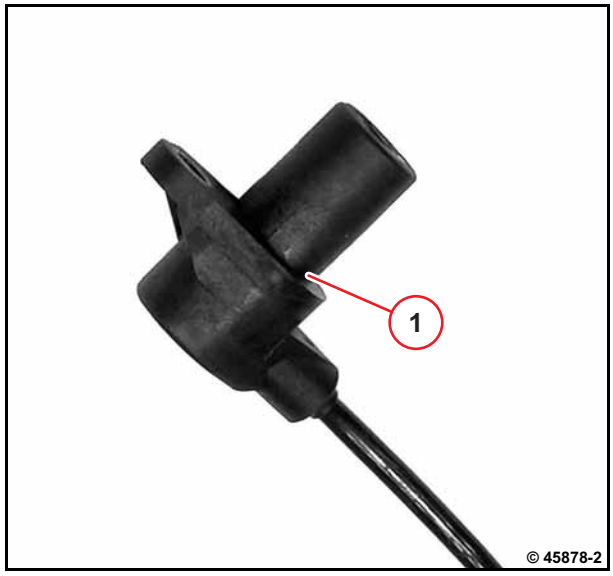
P05 92

- Select new gaskets.

Gaskets are available in thicknesses of 0.3 mm and 0.5 mm.

The correct distance (c) is reached by placing the appropriate number of gaskets underneath.

- Remove dial gauge.
- Mount new O-ring (1).
- Coat the O-ring (1) with fitting compound.

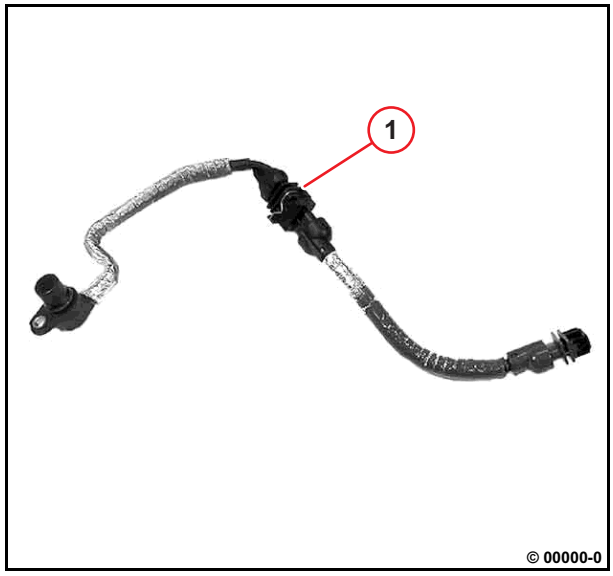


6

- Plug cable plugs (1) together.

Ensure that the cables are connected properly.

- Wrap the cable plug in protective foil.

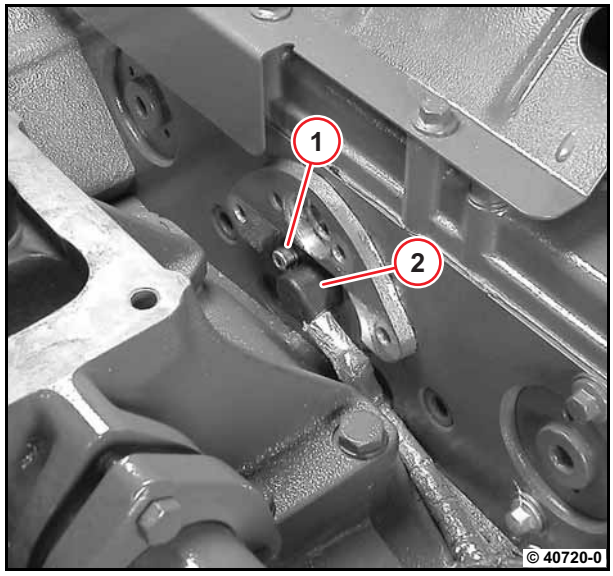


- Clean sealing surfaces.
- Mount new gasket(s) according to the determined distance.
- Press in impulse transmitter (2).

Attention!
Do not damage the component!

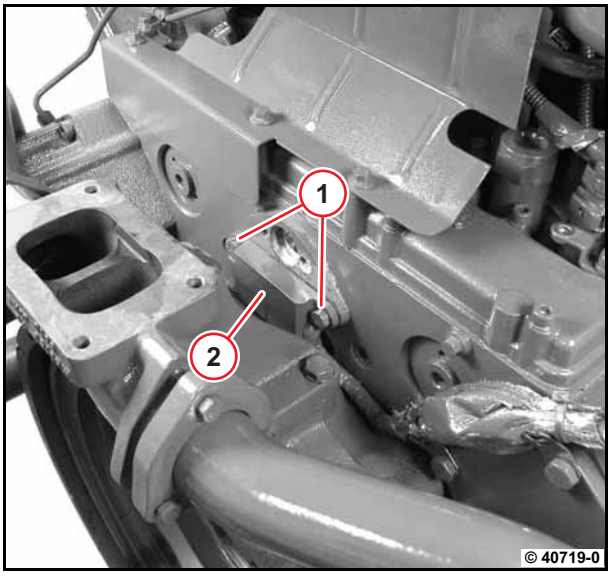
- Tighten screw (1).

A05 012

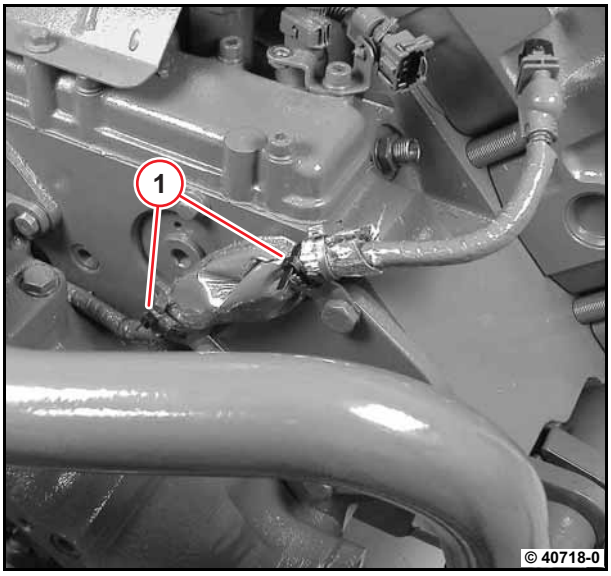


- Mount cover (2).
- Insert screws (1) with locking agent.
- Tighten screws .

A04 022

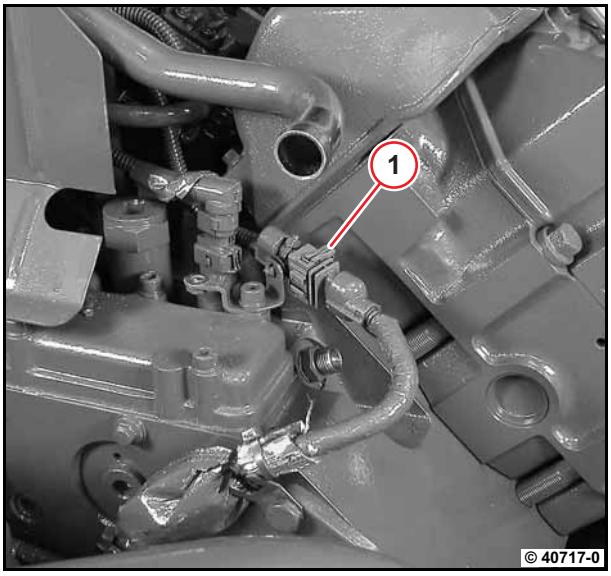


- Fix cable tie (1).



- Plug cable plugs (1) together.

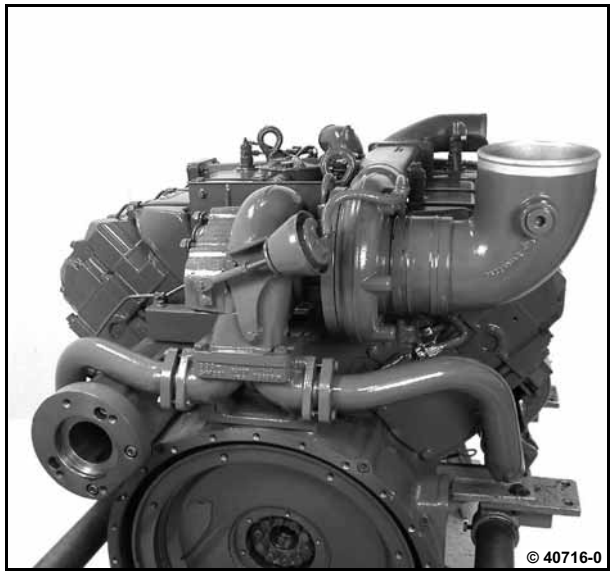
Ensure that the cables are connected properly.



- Install the turbocharger.

W 06-06-04

Delete error entry in the error memory of the motor control timer with SERDIA.



Removing and installing exhaust line (A-bank)

Commercial available tools

– Fitting compound
DEUTZ S1

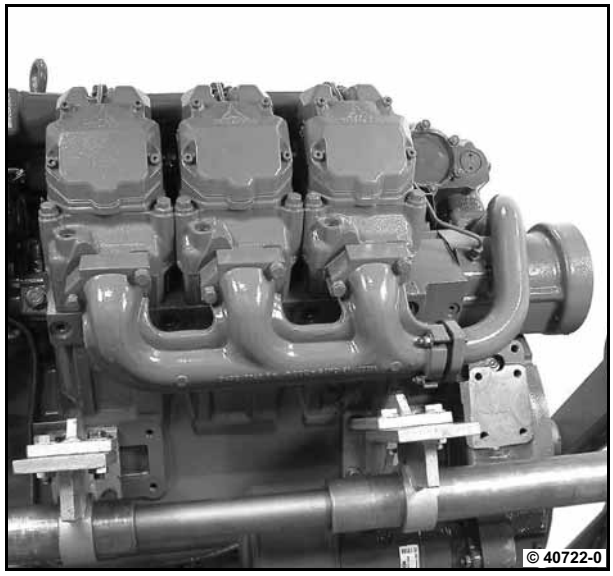
– W 06-01-06 . . . . . (A-bank)

6

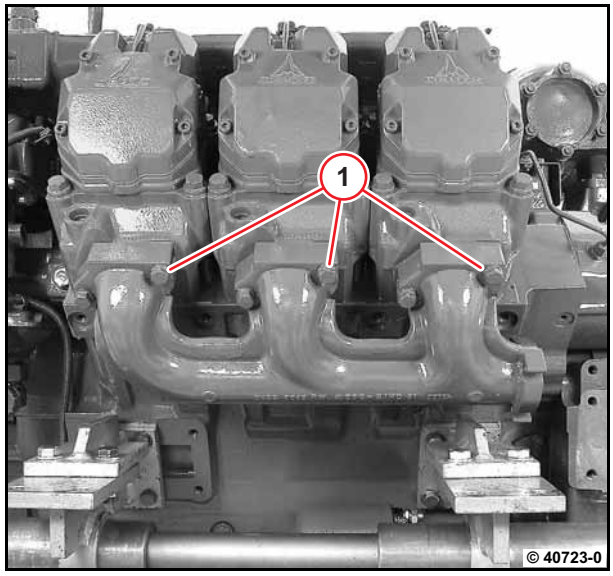
Removing exhaust line

● Remove exhaust pipe (A-bank).

W 06-01-06

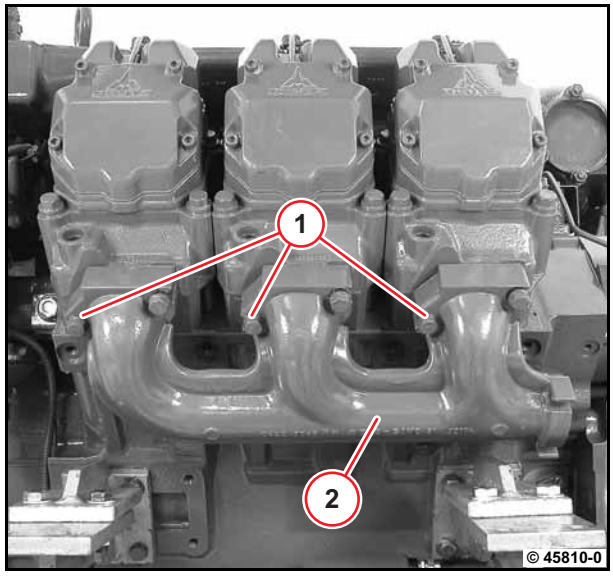


● Loosen screws (1).

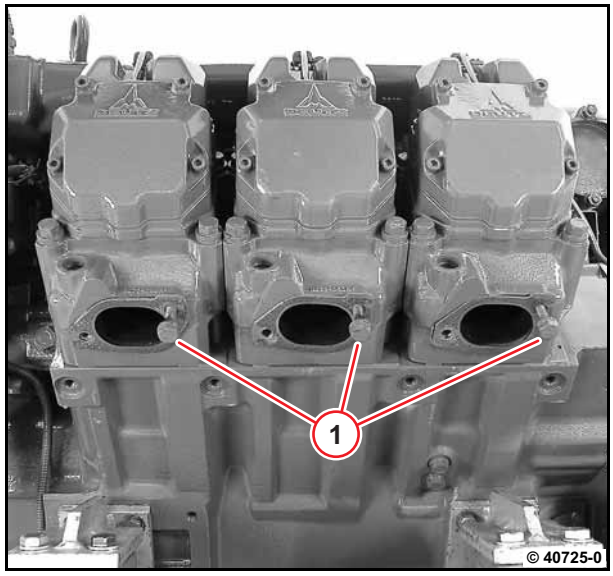


6

- Unscrew screws (1).
- Remove exhaust line (2).



- Unscrew screws (1).
- Remove seals.



- Visually inspect the components.

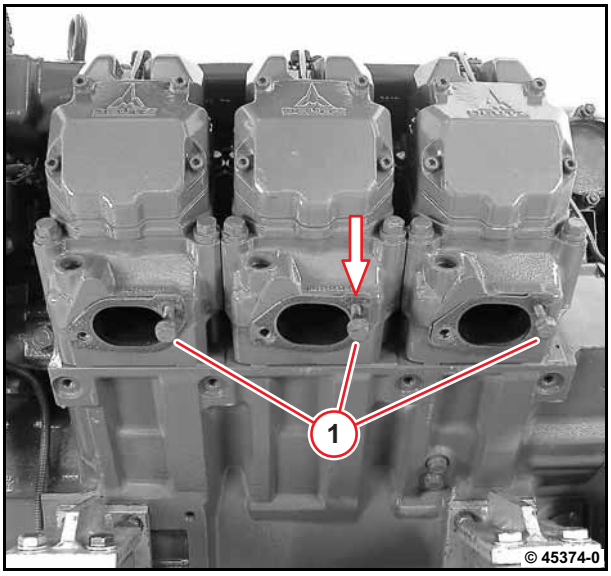
Installing exhaust line

- Clean sealing surfaces.
- Mount new gaskets.

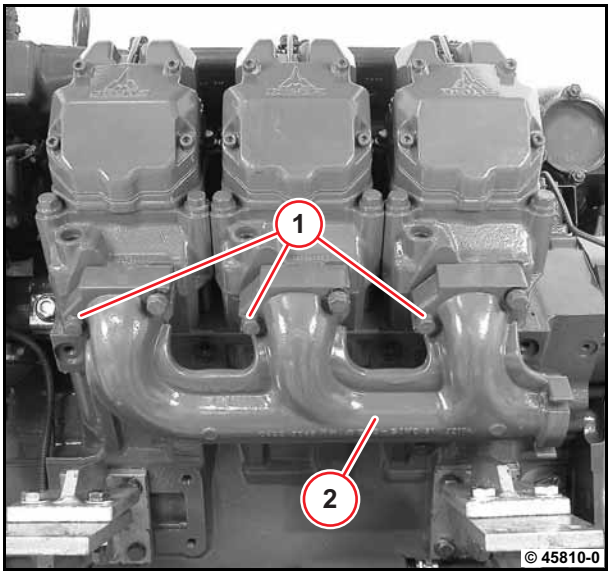
Note installation position.

The strap (arrow) must face the cylinder head cover.

- Coat the screws with fitting compound .
- Tighten screws (1).

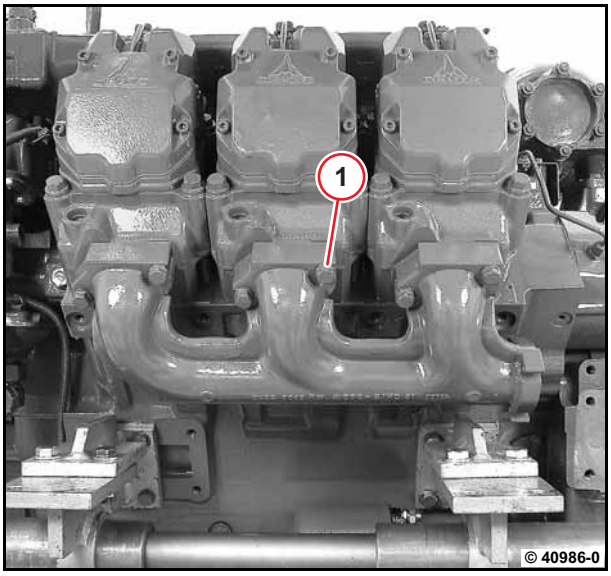


- Mount exhaust line (2).
- Coat the screws with fitting compound .
- Tighten screws (1).



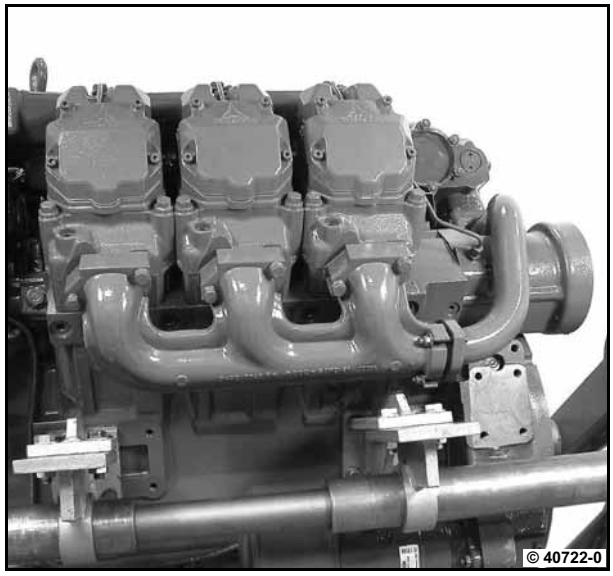
- Tighten all the screws (1) alternately from the centre outwards.

A06 001



- Install exhaust pipe (A-bank).

W 06-01-06



Removing and installing exhaust line (B-bank)

Commercial available tools

– Fitting compound
DEUTZ S1

– W 06-01-06 . . . . . (B-bank)

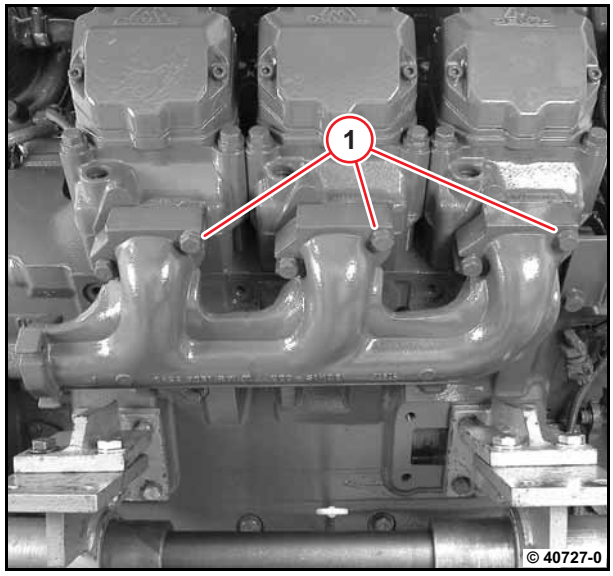
6

Removing exhaust line

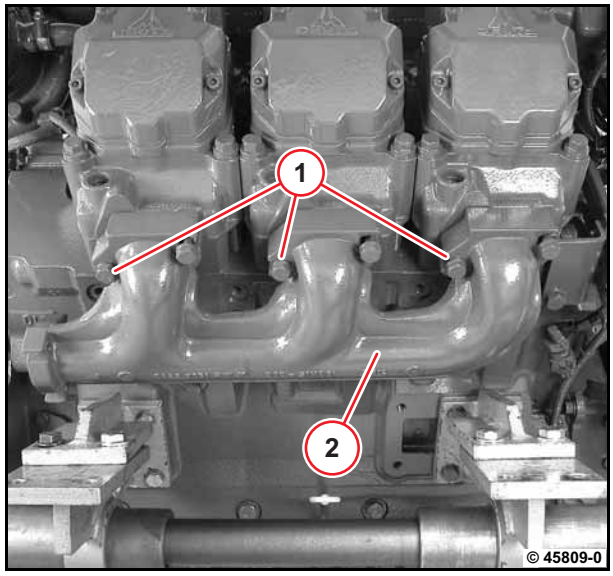
- Remove exhaust pipe (B-bank).

  W 06-01-06

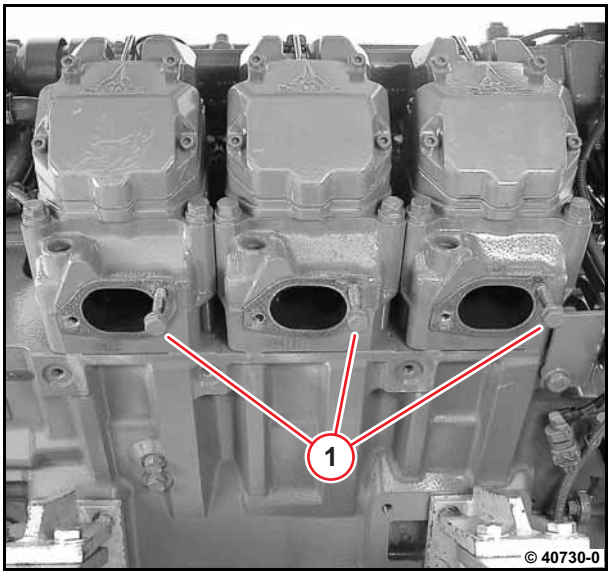
- Loosen screws (1).



- Unscrew screws (1).
- Remove exhaust line (2).



- Unscrew screws (1).
- Remove seals.



- Visually inspect the components.

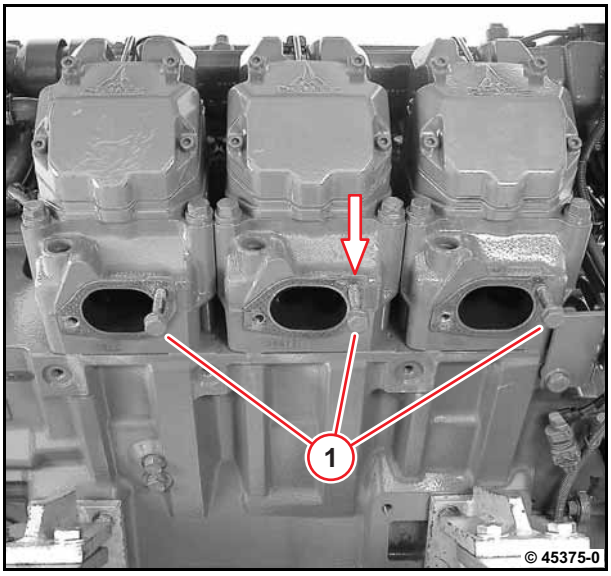
Installing exhaust line

- Clean sealing surfaces.
- Mount new gaskets.

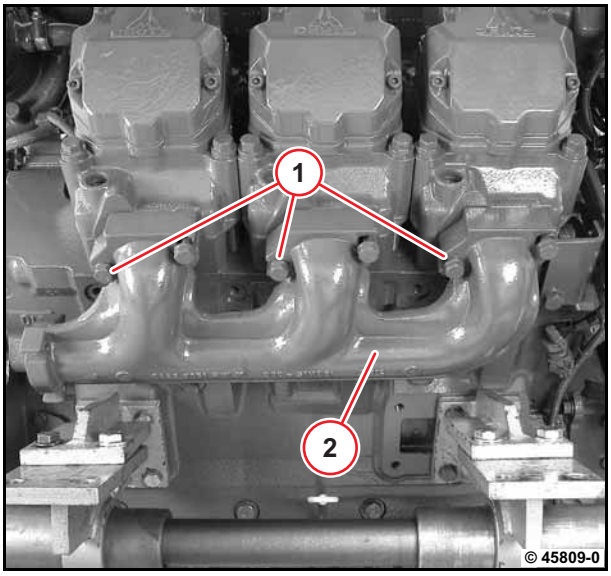
Note installation position.

The strap (arrow) must face the cylinder head cover.

- Coat the screws with fitting compound .
- Tighten screws (1).



- Mount exhaust line (2).
- Coat the screws with fitting compound .
- Tighten screws (1).

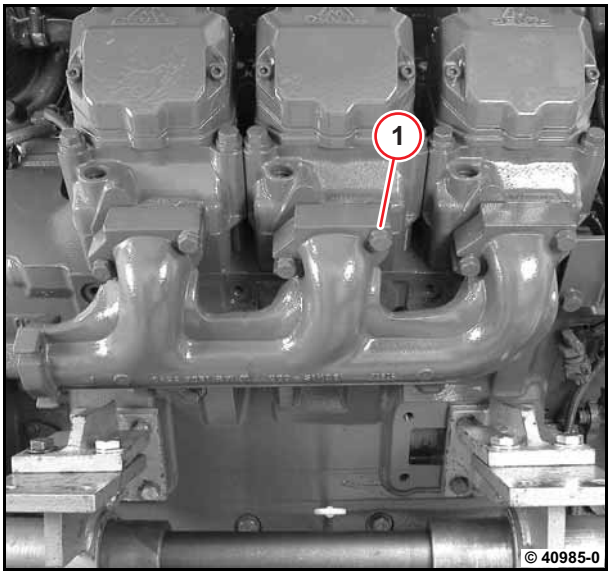


- Tighten all the screws (1) alternately from the centre outwards.

A06 001

- Install exhaust pipe (B-bank).

W 06-01-06



6

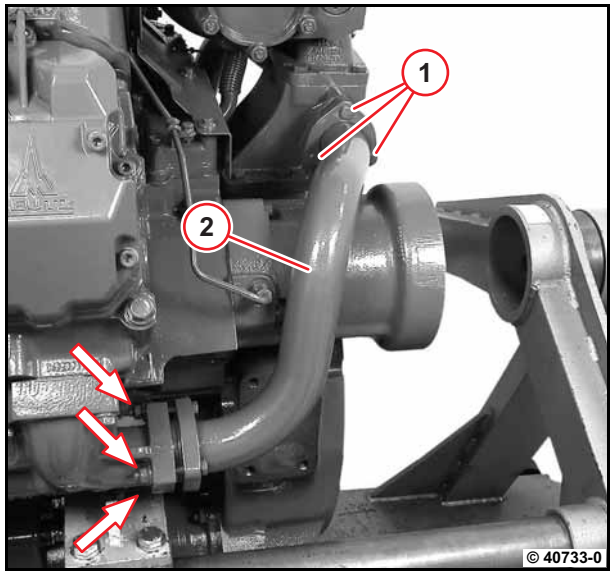
Removing and installing exhaust pipe (A-bank)

Commercial available tools

– Fitting compound
DEUTZ S1

Removing exhaust pipe

- Unscrew nuts (arrows).
- Remove screws.
- Unscrew screws (1).
- Remove sealing rings.
- Remove exhaust pipe (2).



Install exhaust pipe.

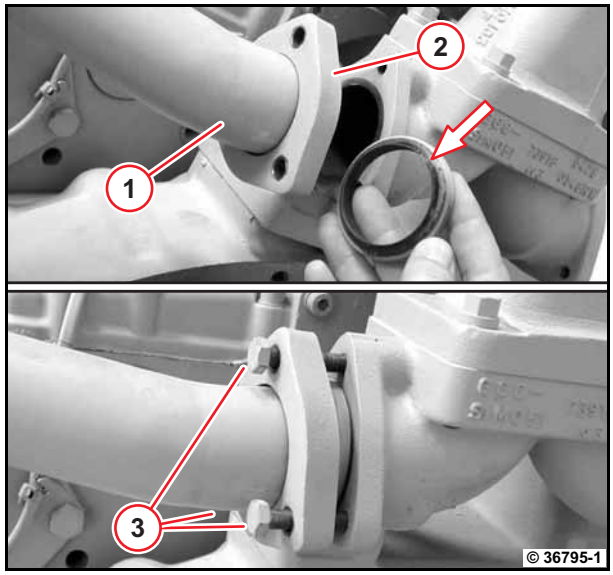
- Position exhaust pipe (1).

Note installation position.

- Insert sealing ring.

Note installation position.
The cone (arrow) faces the exhaust pipe.

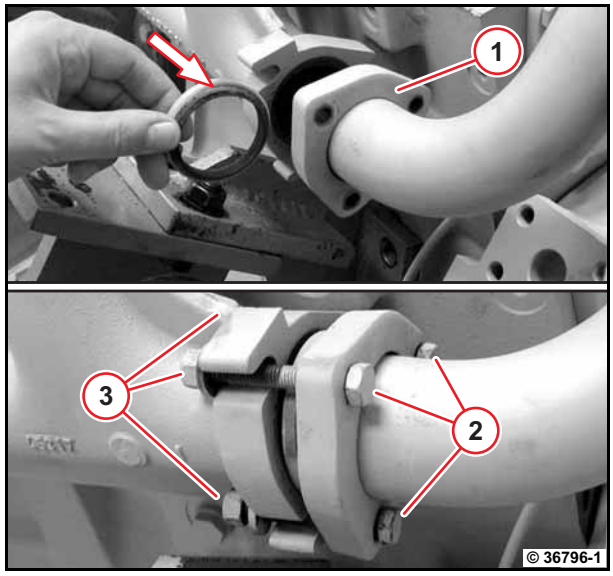
- Mount flange (2) on exhaust manifold.
- Coat the screws with fitting compound .
- Fasten screws (3).



- Insert sealing ring.

Note installation position.
The cone (arrow) faces the exhaust pipe.

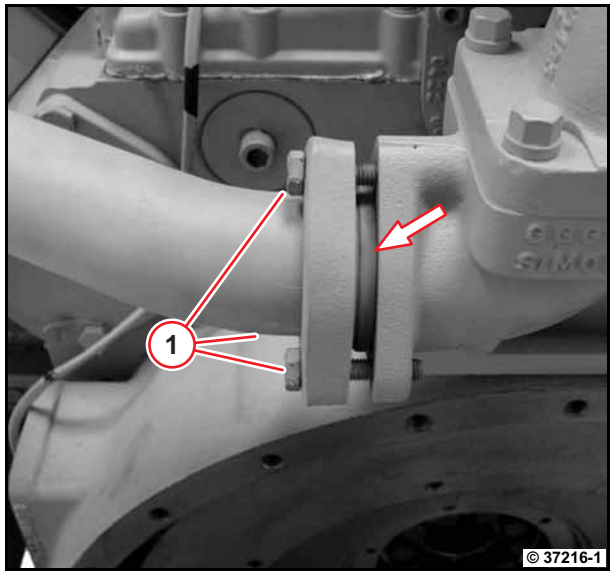
- Mount flange (1) on exhaust line.
- Coat the screws with fitting compound .
- Tighten screws (2).
- Screw on nuts (3).



- Tighten screws (1) alternately.

A06 002

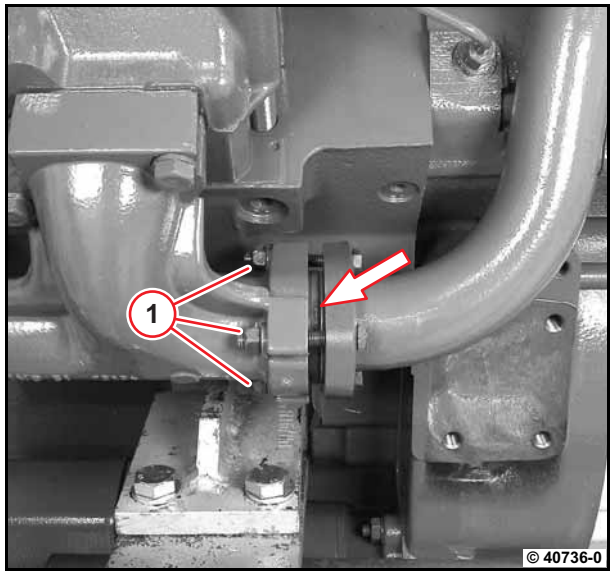
Ensure uniform distance (arrow) of flange connection.



- Tighten nuts (1) alternately.

A06 003

Ensure uniform distance (arrow) of flange connection.



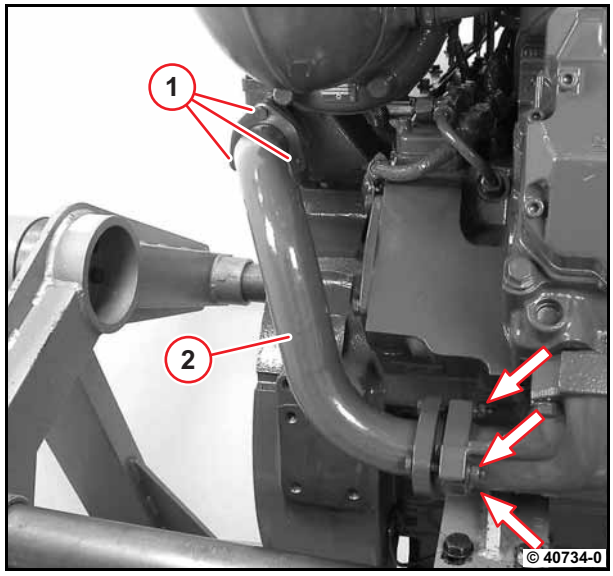
Removing and installing exhaust pipe (B-bank)

Commercial available tools

– Fitting compound
DEUTZ S1

Removing exhaust pipe

- Unscrew nuts (arrows).
- Remove screws.
- Unscrew screws (1).
- Remove sealing rings.
- Remove exhaust pipe (2).



Install exhaust pipe.

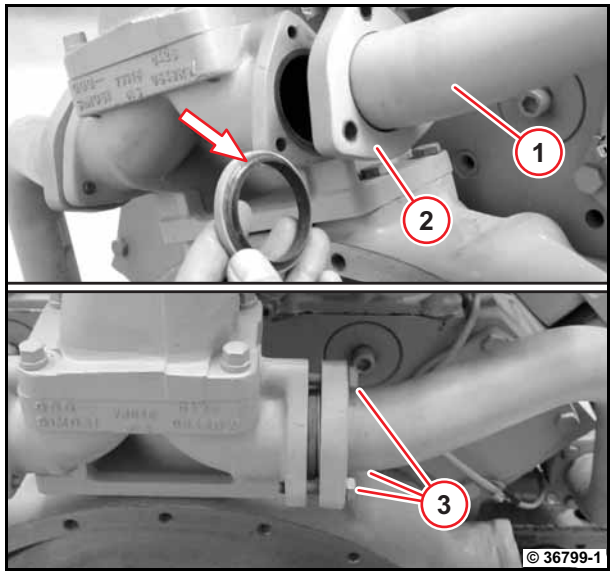
- Position exhaust pipe (1).

Note installation position.

- Insert sealing ring.

Note installation position.
The cone (arrow) faces the exhaust pipe.

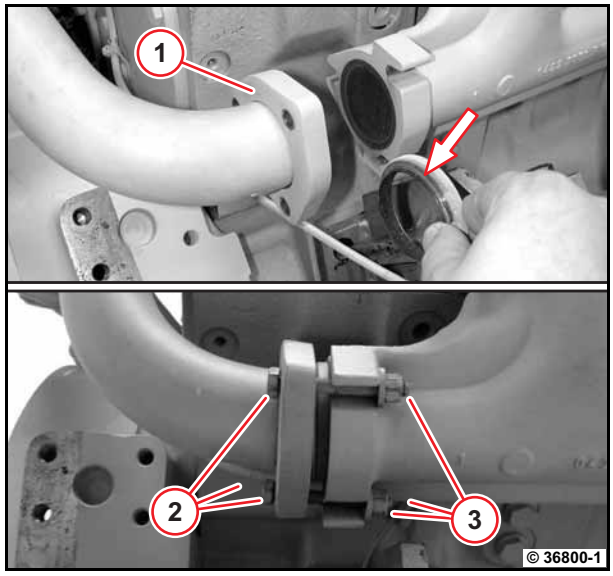
- Mount flange (2) on exhaust manifold.
- Coat the screws with fitting compound .
- Fasten screws (3).



- Insert sealing ring.

Note installation position.
The cone (arrow) faces the exhaust pipe.

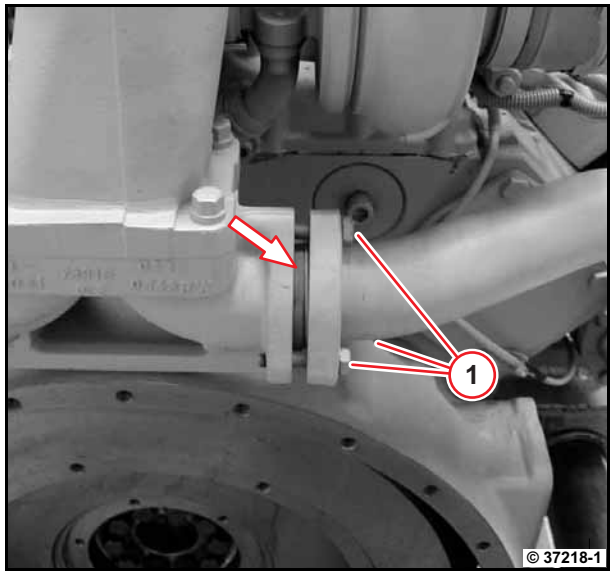
- Mount flange (1) on exhaust line.
- Coat the screws with fitting compound .
- Tighten screws (2).
- Screw on nuts (3).



- Tighten nuts (1) alternately.

A06 002

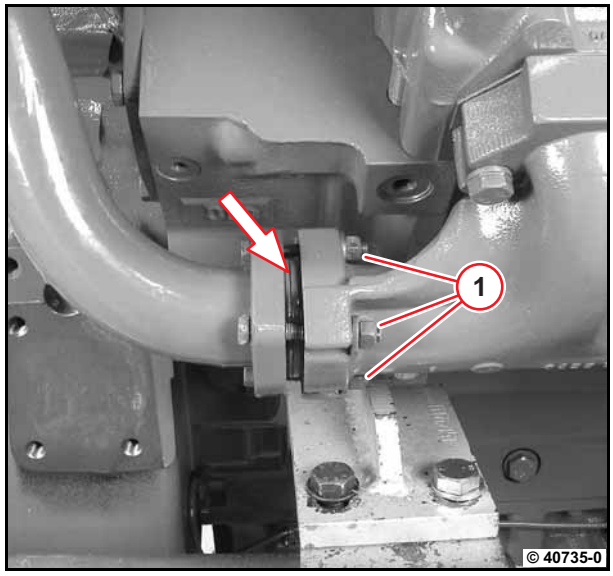
Ensure uniform distance (arrow) of flange connection.



- Tighten nuts (1) alternately.

A06 003

Ensure uniform distance (arrow) of flange connection.



Removing and installing exhaust manifold

Commercial available tools

– W 06-01-06 . . . . . (A-bank)
– W 06-01-06 . . . . . (B-bank)
– W 06-06-04

6

Removing exhaust manifold

- Remove turbocharger.

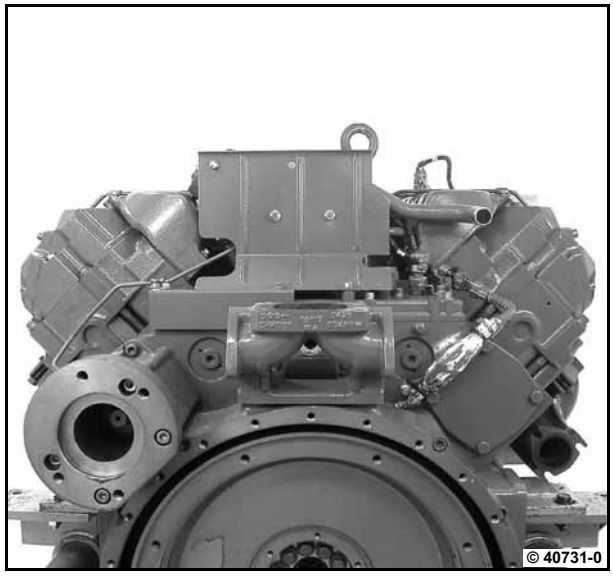
  W 06-06-04

- Remove exhaust pipe (A-bank).

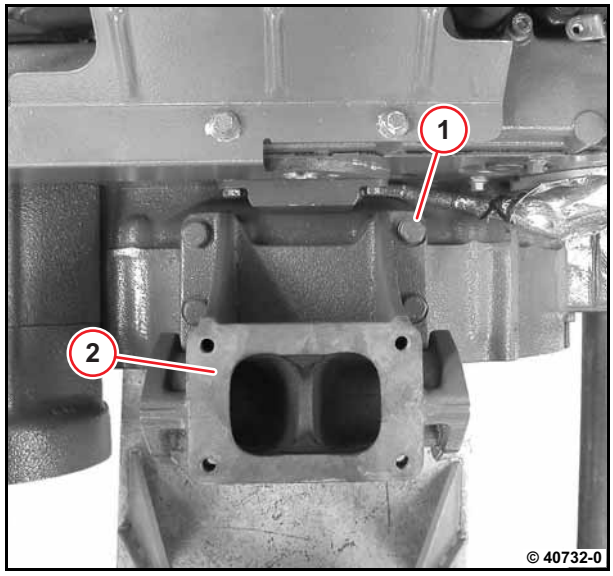
  W 06-01-06

- Remove exhaust pipe (B-bank).

  W 06-01-06



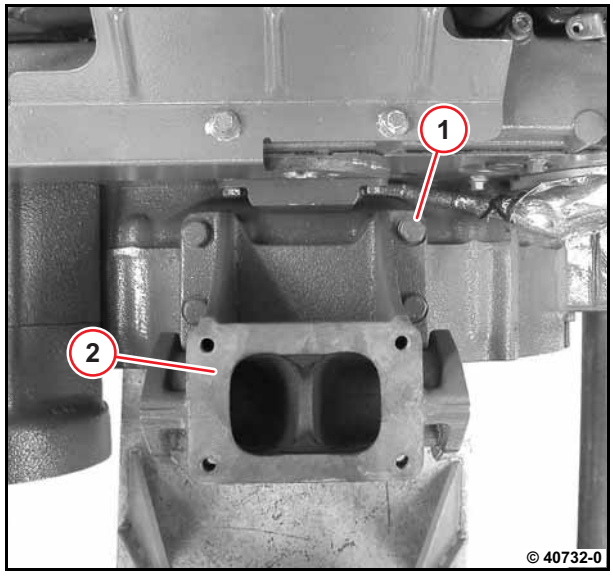
- Unscrew all screws (1).
- Remove exhaust manifold (2).
- Visually inspect the components.



Installing exhaust manifold

- Mount exhaust manifold (2).
- Tighten all screws (1).

A06 010



- Install exhaust pipe (A-bank).

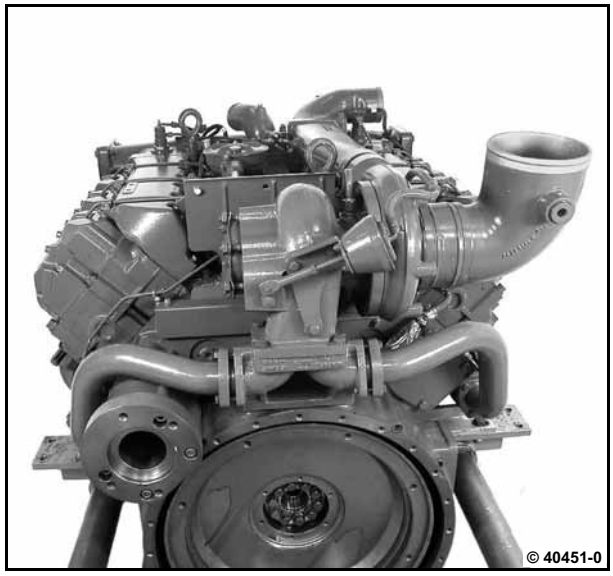
W 06-01-06

- Install exhaust pipe (B-bank).

W 06-01-06

- Install the turbocharger.

W 06-06-04



Removing and installing exhaust manifold (A-bank)

Commercial available tools

– Fitting compound DEUTZ S1

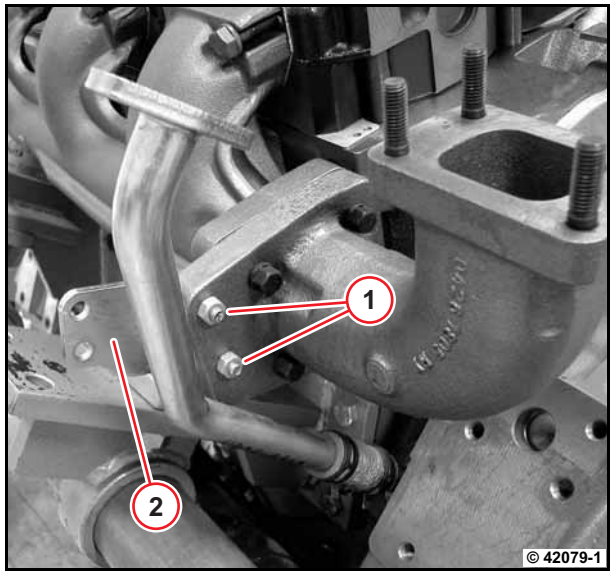
– W 06-06-04 . . . . . (A-bank)

Removing exhaust manifold

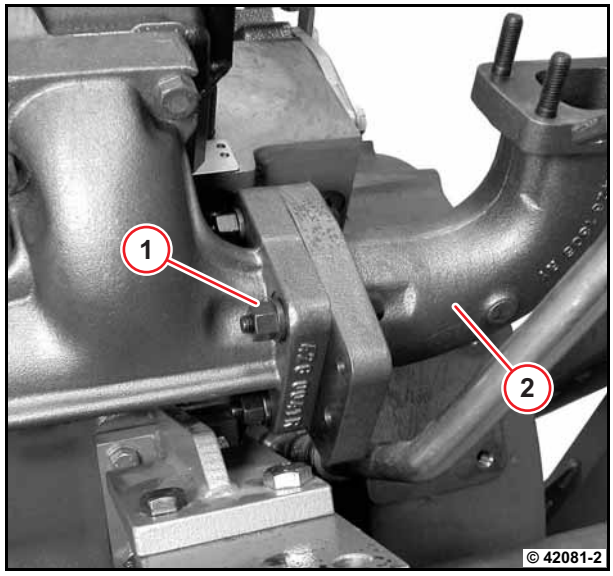
- Remove turbocharger (A-bank).

  W 06-06-04

- Unscrew nuts (1).
- Remove screws.
- Remove the holder (2).



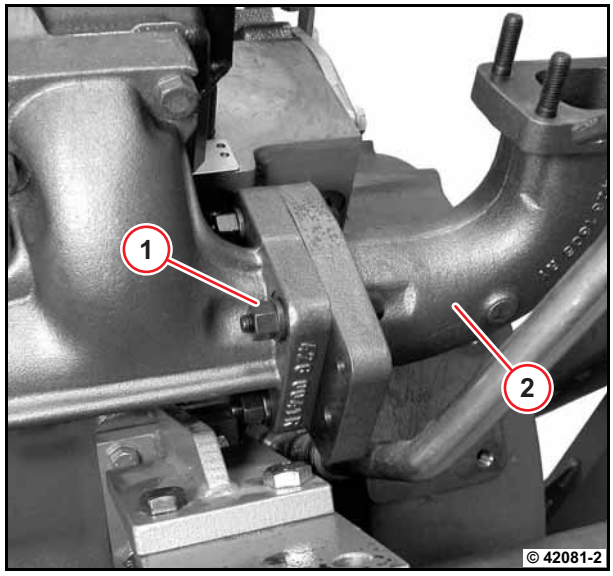
- Unscrew nuts (1).
- Remove washers.
- Remove screws.
- Remove exhaust manifold (2).
- Visually inspect the components.



Installing exhaust manifold

- Clean sealing surfaces.
- Mount exhaust manifold (2).
- Coat the screws with fitting compound .
- Insert screws.
- Mount washers.
- Tighten nuts (1).

A06 010

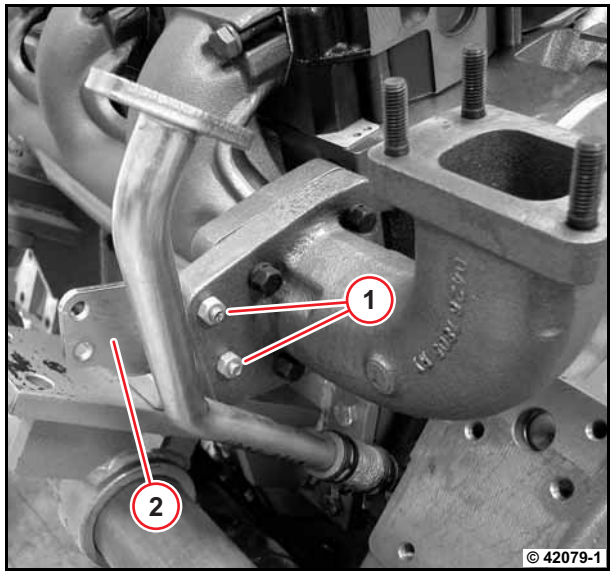


- Mount holder (2).
- Insert screws.
- Tighten nuts (1).

A06 034

- Install turbocharger (A-bank).

W 06-06-04



Removing and installing exhaust manifold (B-bank)

Commercial available tools

– Fitting compound
DEUTZ S1

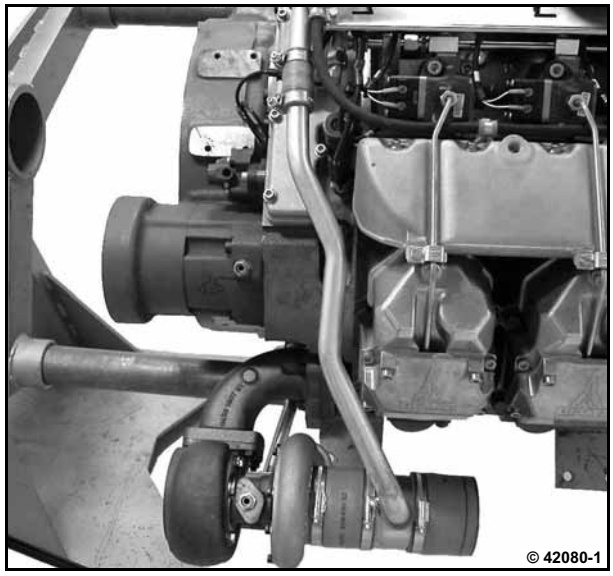
– W 06-06-04 . . . . . (B-bank)

6

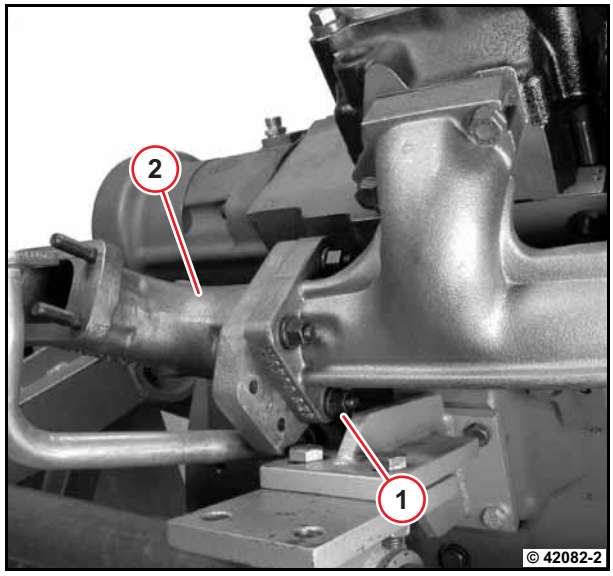
Removing exhaust manifold

- Remove turbocharger (B-bank).

  W 06-06-04



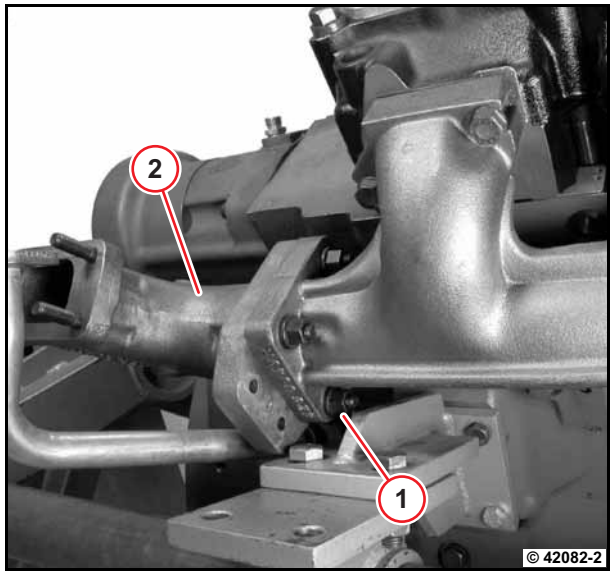
- Unscrew nuts (1).
- Remove washers.
- Remove screws.
- Remove exhaust manifold (2).
- Visually inspect the components.



Installing exhaust manifold

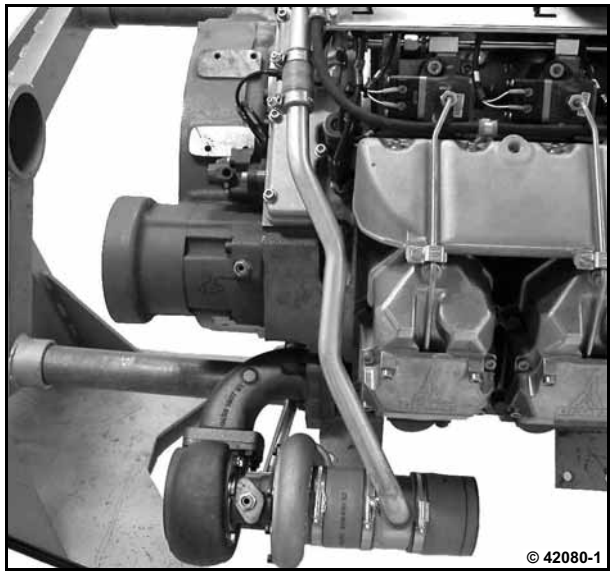
- Clean sealing surfaces.
- Mount exhaust manifold (2).
- Coat the screws with fitting compound .
- Insert screws.
- Tighten nuts (1).

A06 010



- Install turbocharger (B-bank).

W 06-06-04



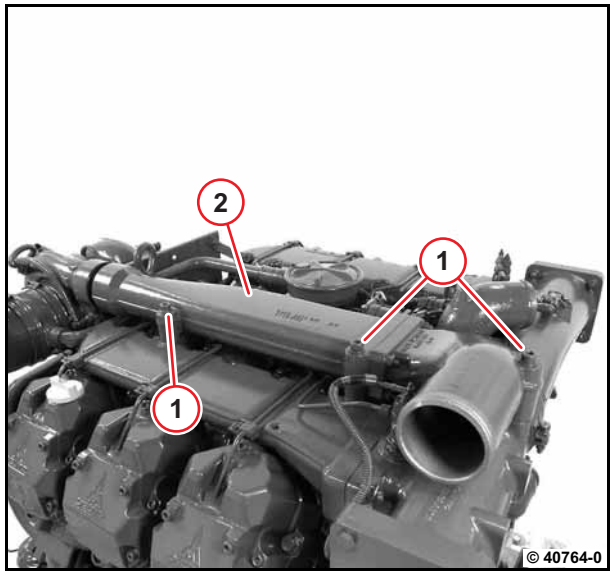
Remove and install the charge air line

Commercial available tools

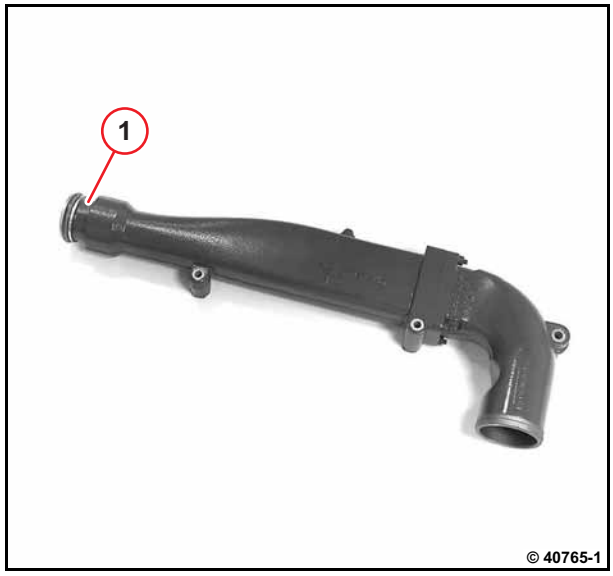
– Fitting compound
DEUTZ AP1908

Remove charge air line

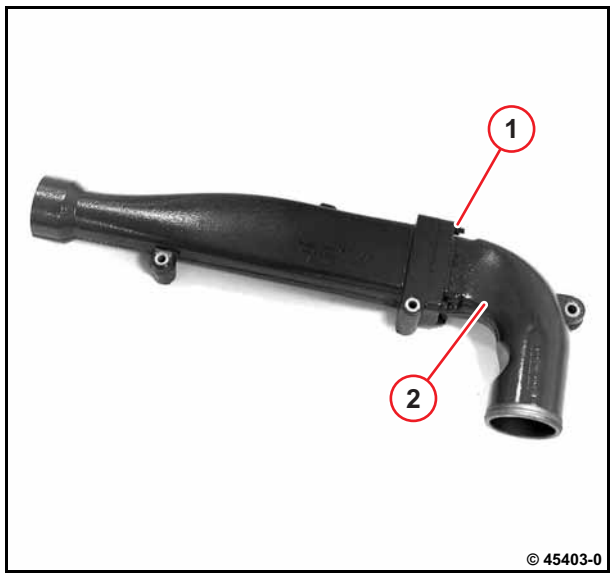
- Unscrew screws (1).
- Remove charge air pipe (2) with plug.



- Pull out plug element (1).



- Unscrew nuts (1).
- Remove washers.
- Remove charge air manifold (2).
- Remove gasket.
- Visually inspect the components.

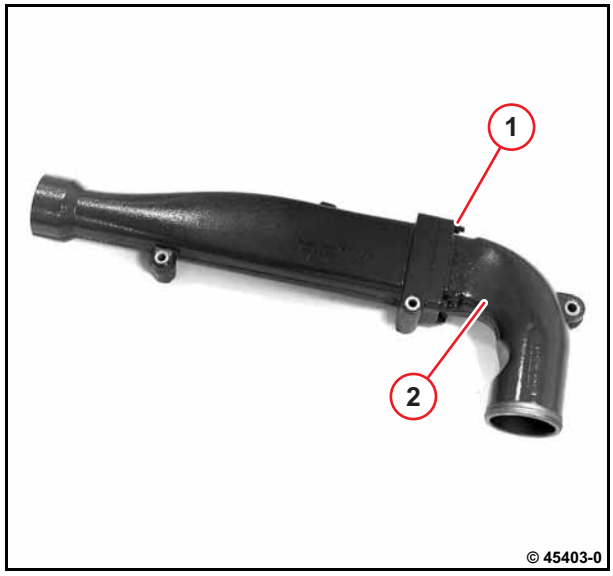


6

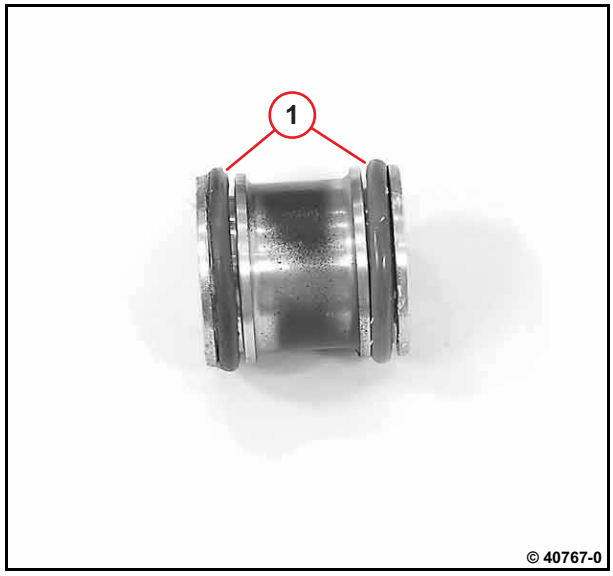
Install charge air line

- Mount new gasket.
- Mount charge air manifold (2).
- Mount washers and screw on nuts.
- Tighten nuts (1).

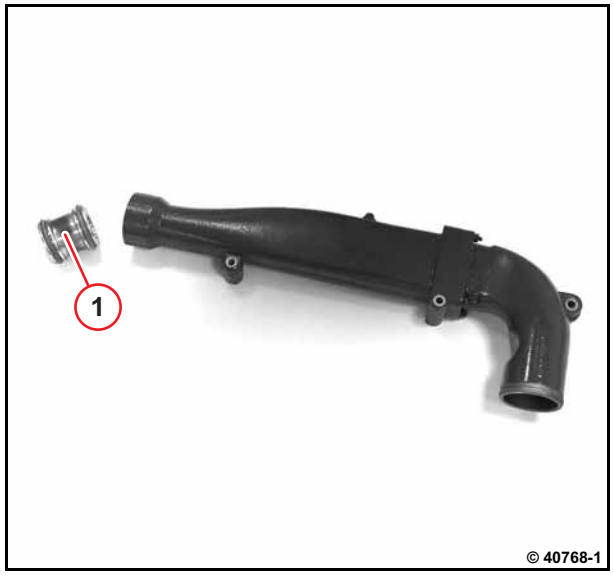
A06 046



- Mount new O-rings (1).
- Coat the O-rings with fitting compound.



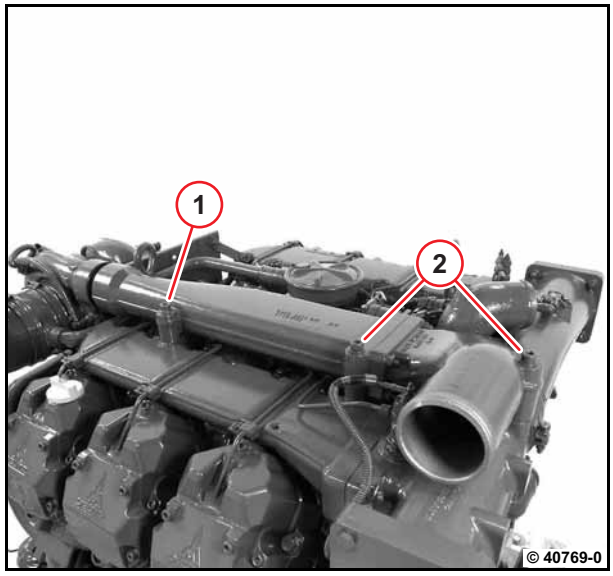
- Insert plug element (1).



- Clean sealing surfaces.
- Mount charge air line.
- Tighten screws .

A06 030

Screw length:
M10 x 65 mm (1)
M10 x 85 mm (2)



6

Removing and installing connecting pipe

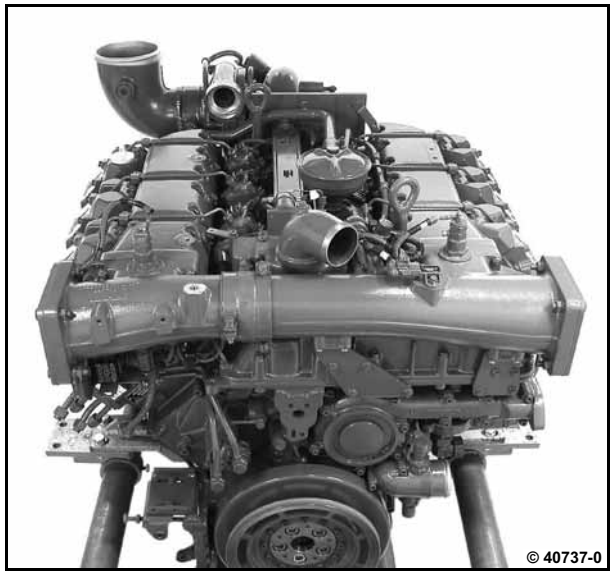
Commercial available tools

– W 07-01-04

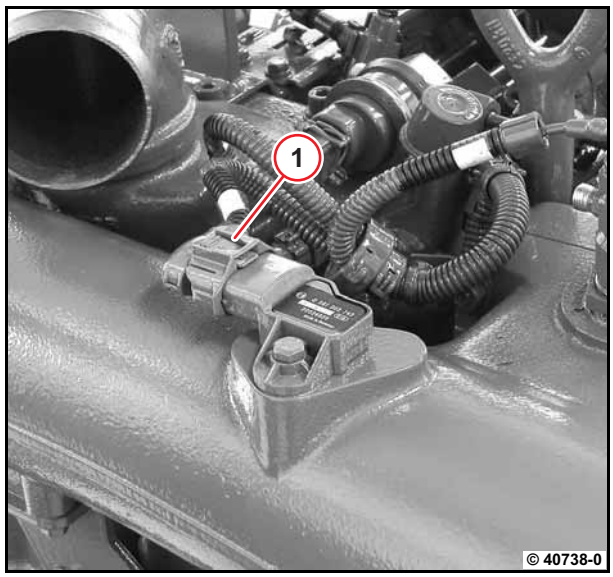
Removing connecting pipe

- Remove fuel pipes (flame glow plugs).

  W 07-01-04



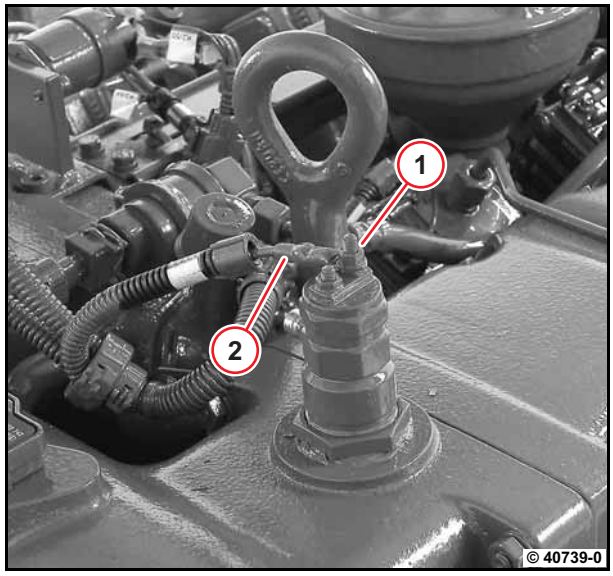
- Unlock cable plug (1) and remove.



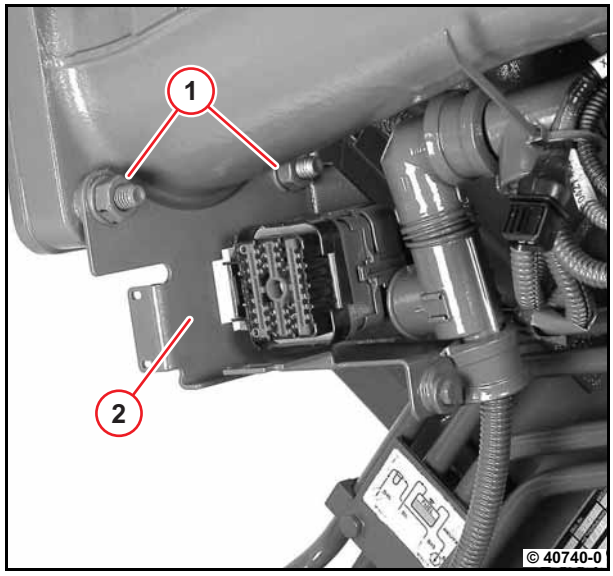
- Unscrew nut (1).

Mark assignment of cables/connections before removing.

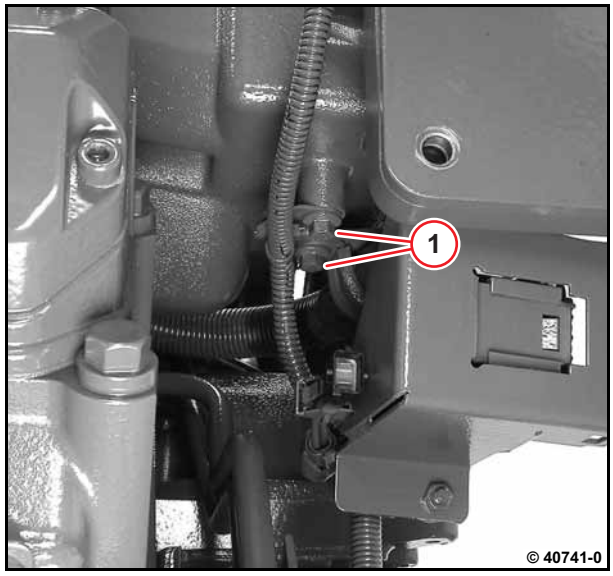
- Remove cables (2) from both flame glow plugs.



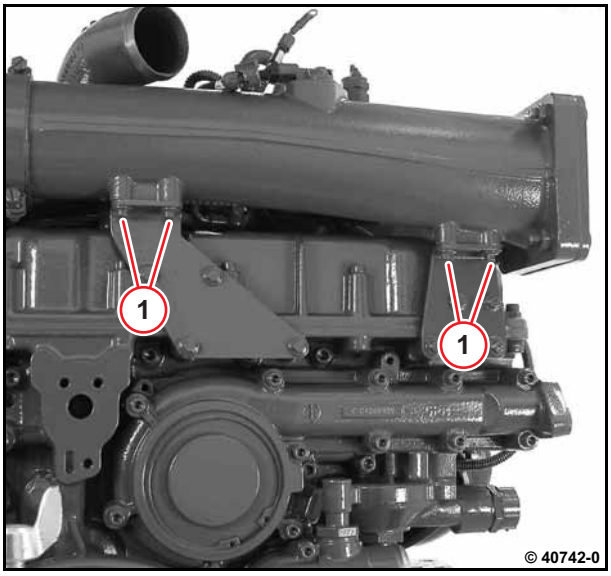
- Unscrew nuts (1).
- Remove the holder (2).
- Remove screws.



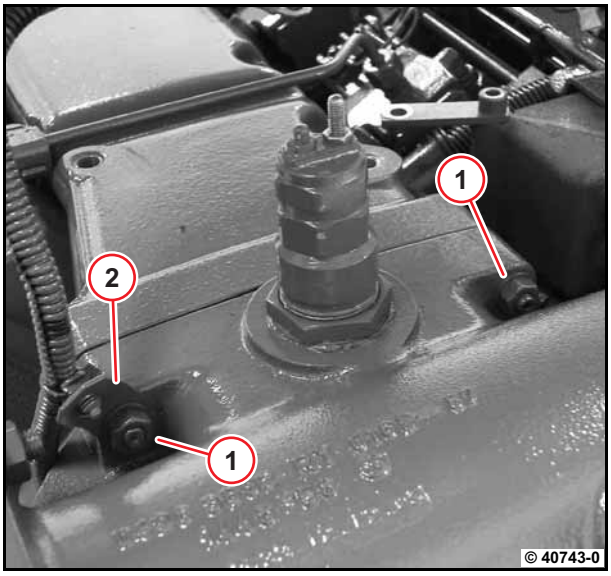
- Unscrew screws (1).
- Place cable harness to one side.



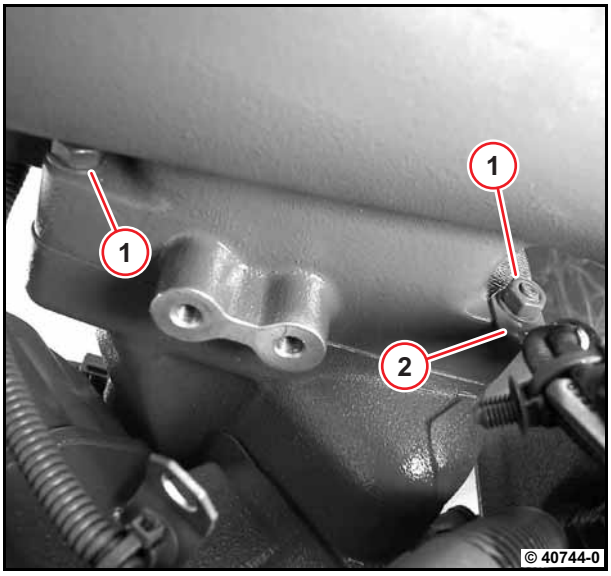
- Unscrew screws (1).



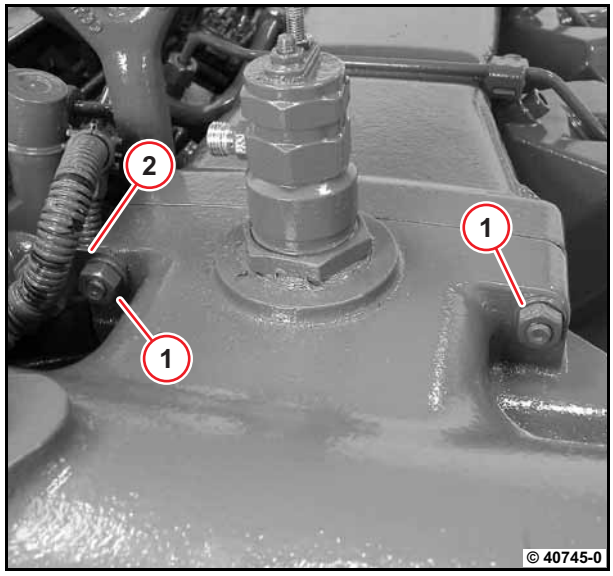
- Unscrew nuts (1).
- Remove the holder (2).



- Unscrew nuts (1).
- Remove the holder (2).

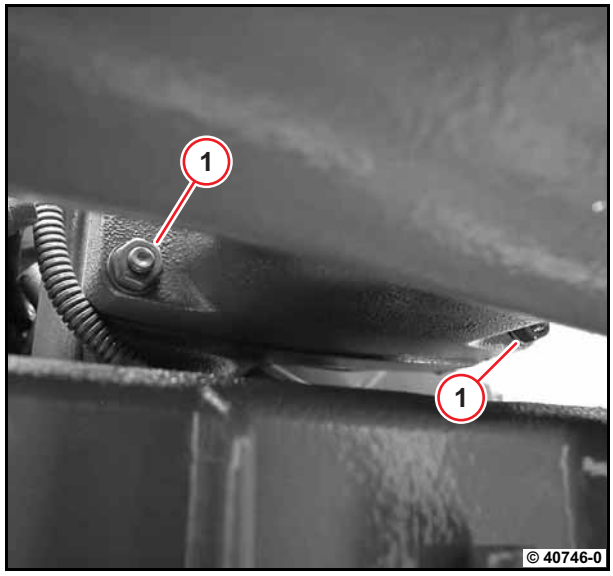


- Unscrew nuts (1).
- Remove the holder (2).

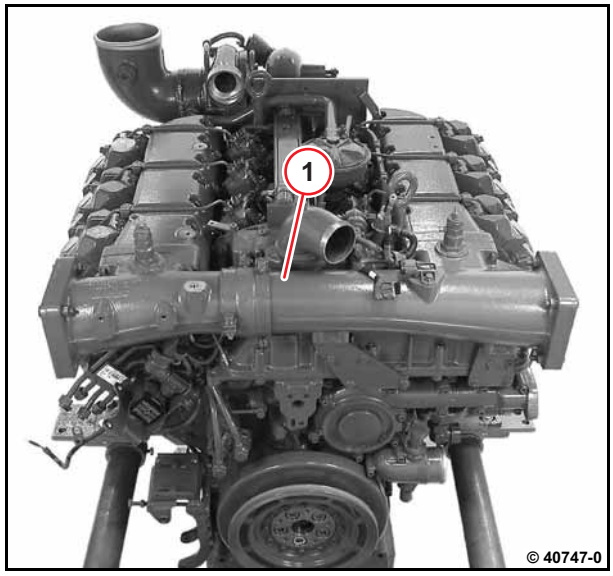


6

- Unscrew nuts (1).



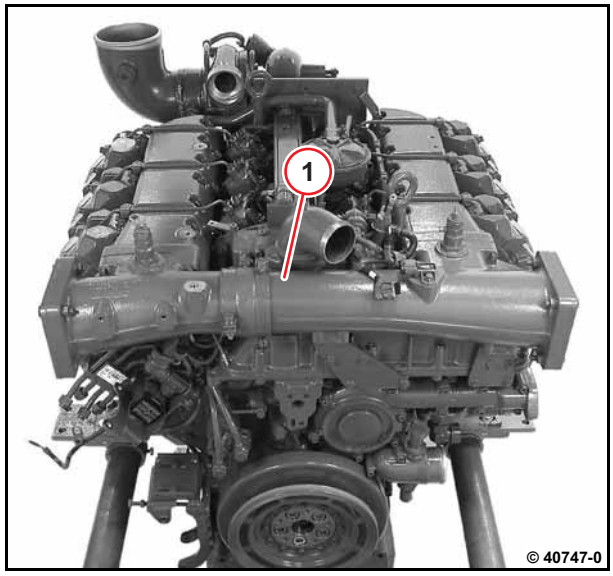
- Remove connecting pipe (1).
- Remove seals.



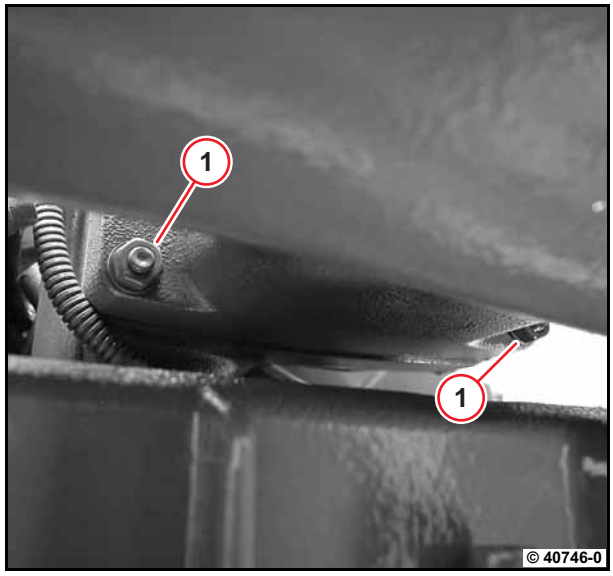
- Visually inspect the components.

Installing connecting pipe

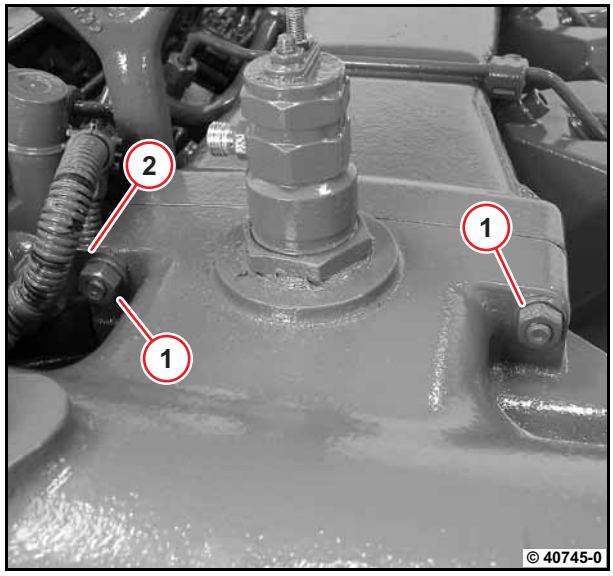
- Clean sealing surfaces.
- Mount new gaskets.
- Mount connecting pipe (1).



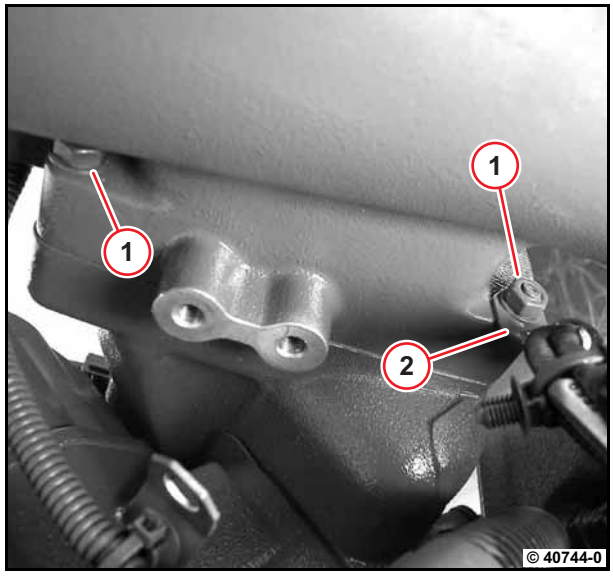
- Screw on nuts (1).



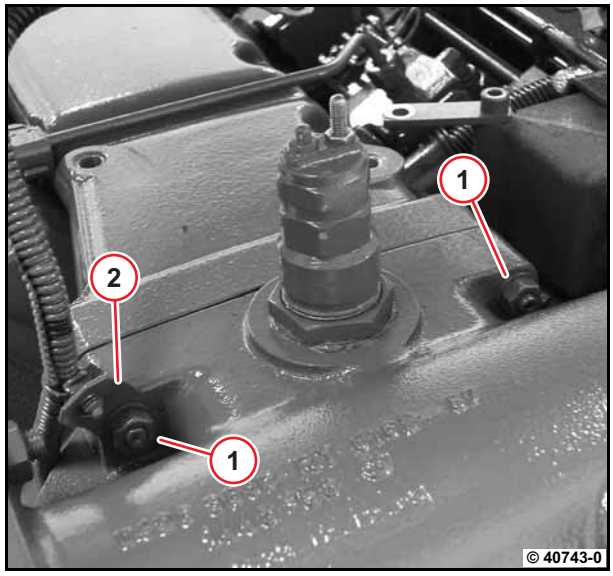
- Mount holder (2).
- Screw on nuts (1).



- Mount holder (2).
- Screw on nuts (1).

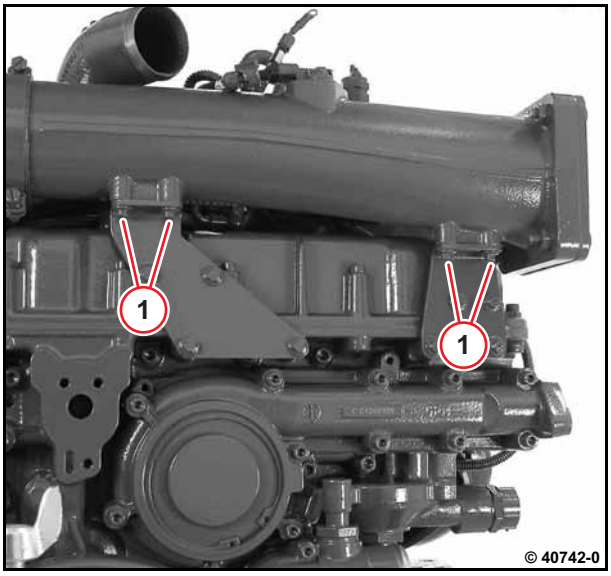


- Mount holder (2).
- Screw on nuts (1).



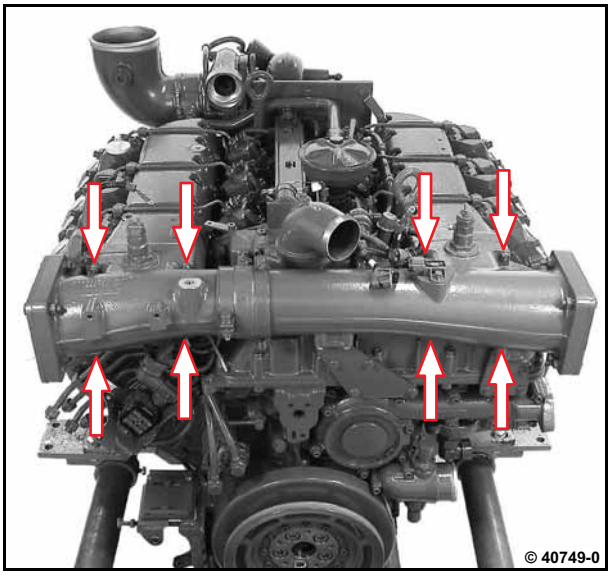
- Tighten screws (1).

A06 056



- Tighten nuts (arrows).

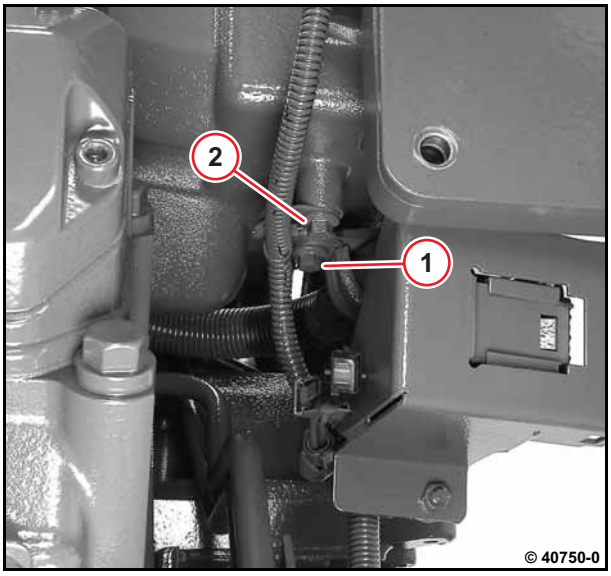
A06 033



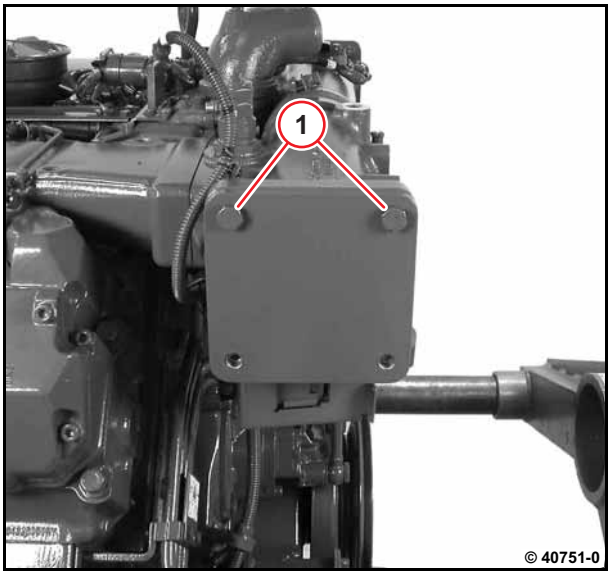
- Lay cable.
- Tighten screws .

A13 090

Screw length:
M8 x 20 mm (1)
M8 x 16 mm (2)

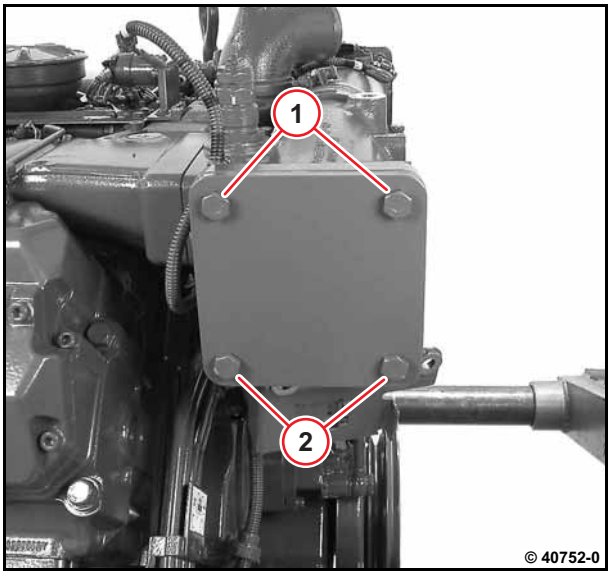


- Unscrew screws (1).
- Remove end plate.
- Remove gasket.



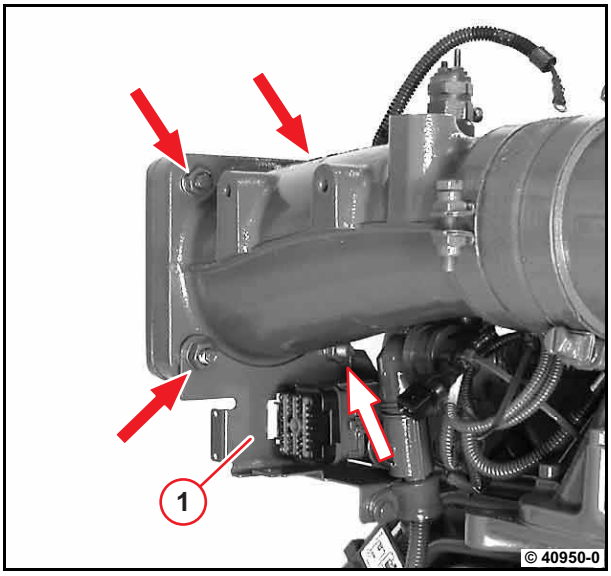
- Mount new gasket.
- Mount end plate.
- Insert screws.

Screw length:
M10 x 45 mm (1)
M10 x 55 mm (2)



- Mount holder (1).
- Tighten nuts (arrows).

A06 034



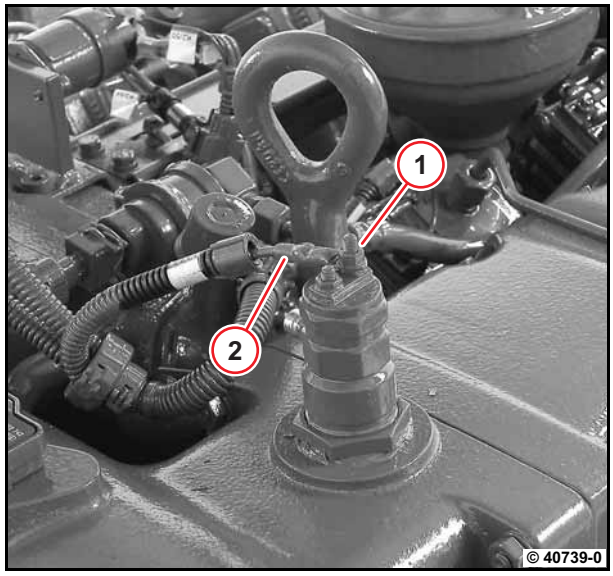
- Plug cables (2) to both flame glow plugs.

Attention!
Note assignment and polarity of the electrical connections!

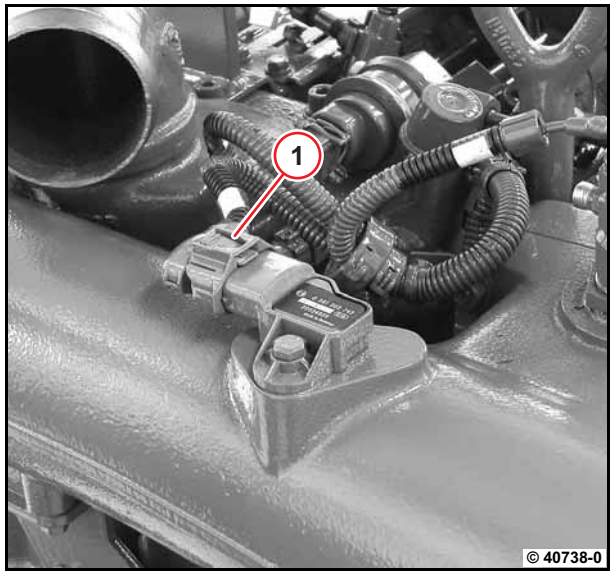
Connect cables according to marks made before removing.

- Mount washer.
- Tighten nut (1).

A13 035

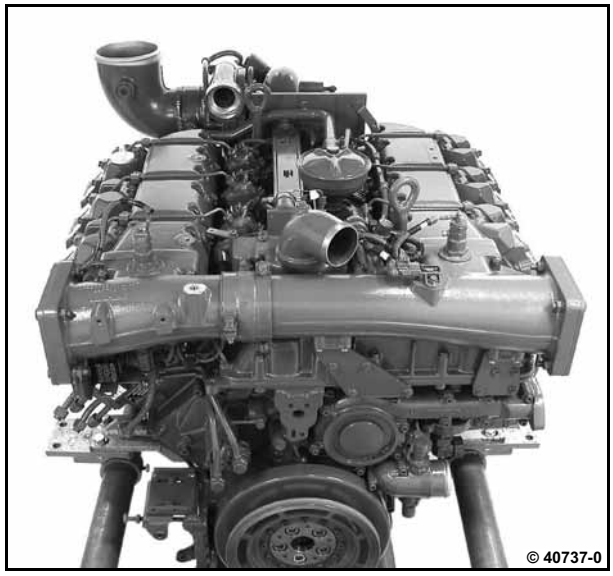


- Plug in the cable plug (1).



- Install fuel pipes (flame glow plugs).

W 07-01-04



6

Removing and installing connecting pipe

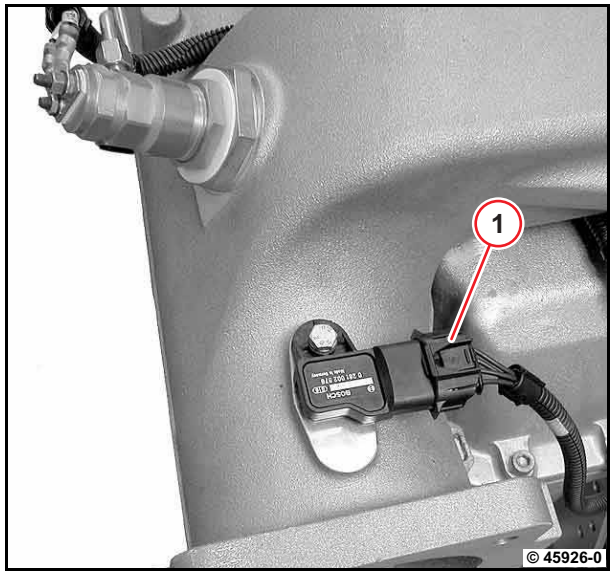
Commercial available tools

– W 07-01-04 . . . . . (Railway)

Ensure that the cables are connected properly.

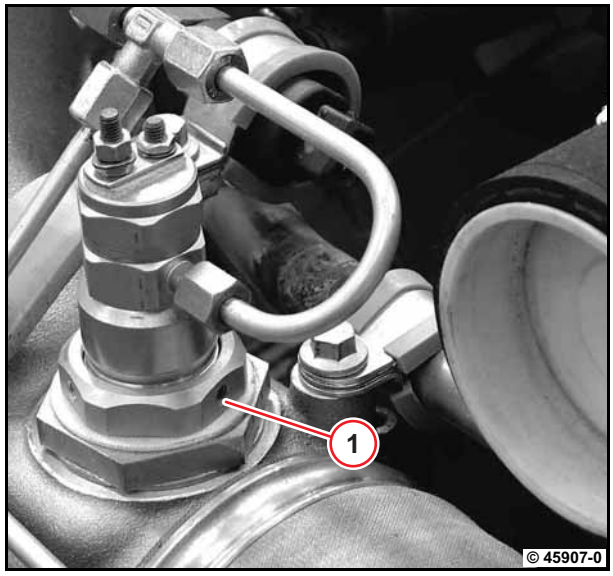
Removing connecting pipe

- Unlock cable plug (1) and remove.



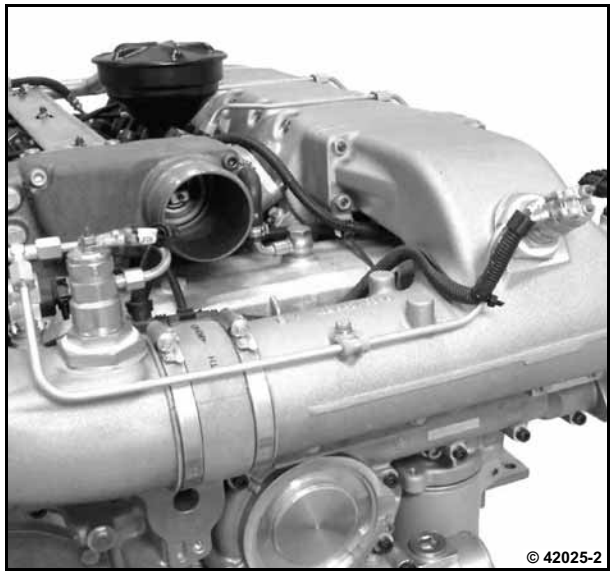
- Unscrew screw (1).
- Remove spring washer.
- Remove ground cable.

Mark assignment of cables/connections before removing.



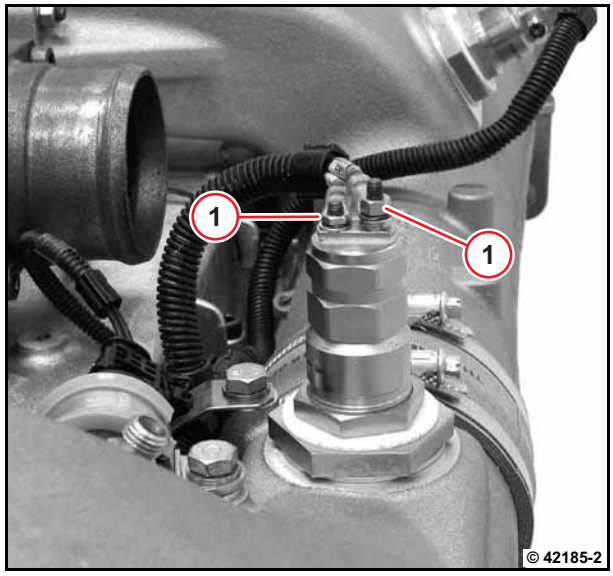
- Remove fuel pipes (flame glow plugs), (Railway).

W 07-01-04



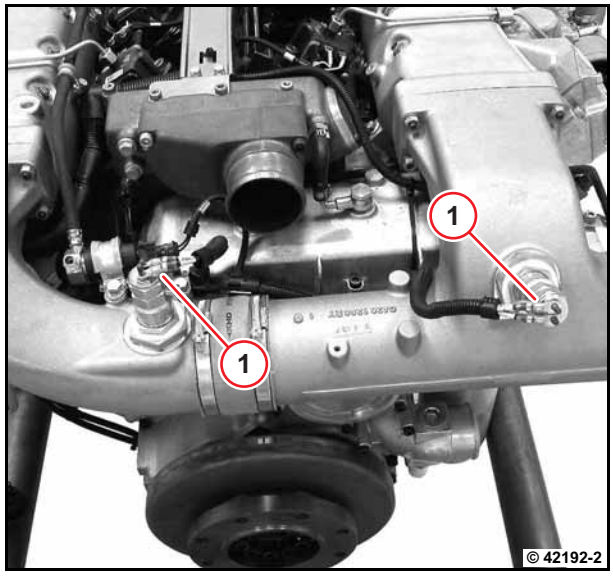
6

- Unscrew nuts (1).
- Remove washers.

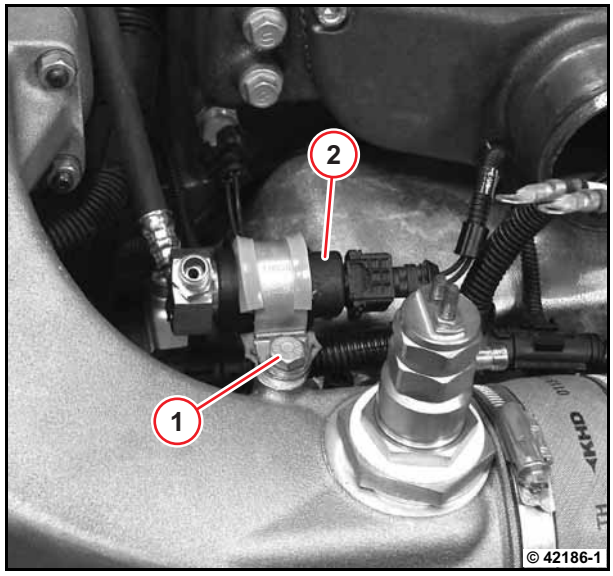


- Remove cables (1).

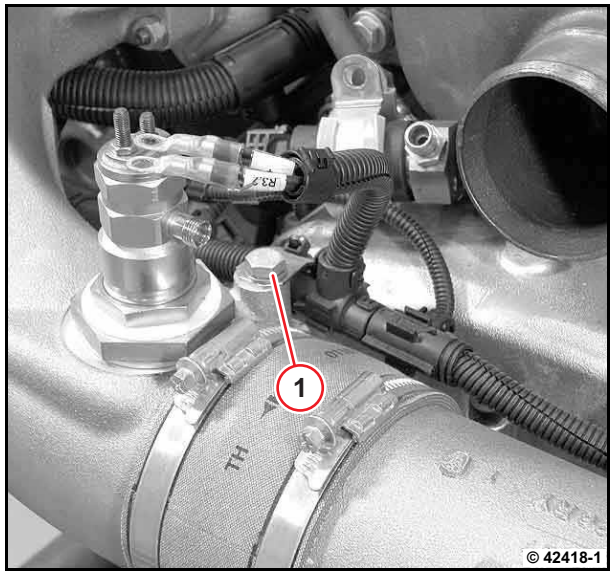
Mark assignment of cables/connections before removing.



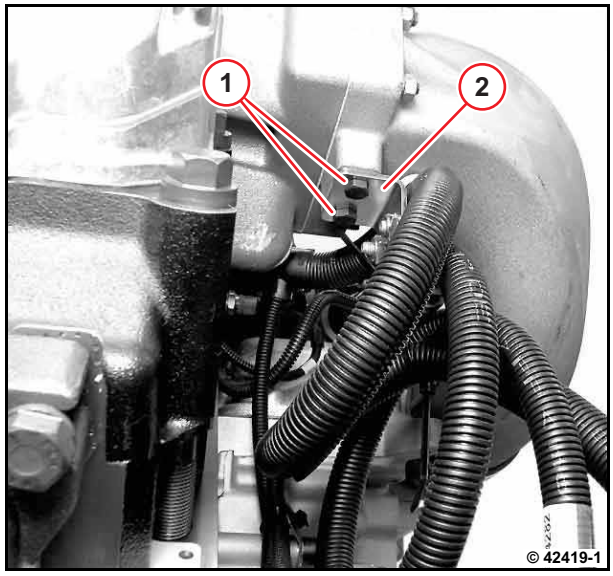
- Unscrew screw (1).
- Place fuel shut-off valve (2) to one side.



- Unscrew screw (1).
- Place cable harness to one side.

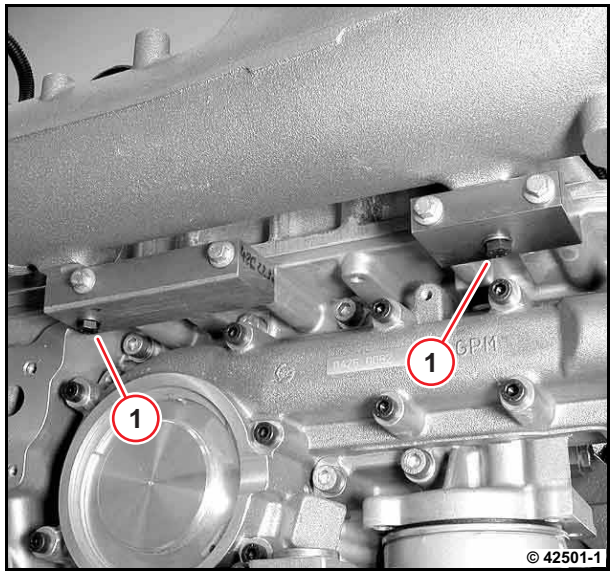


- Unscrew screws (1).
- Loosen the holder (2).

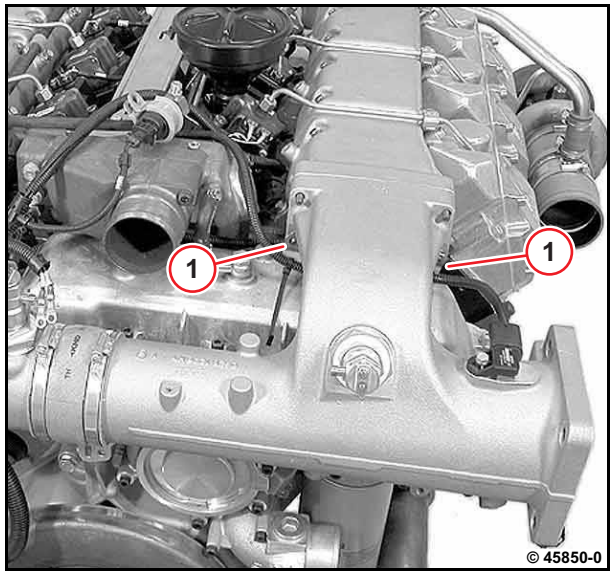


6

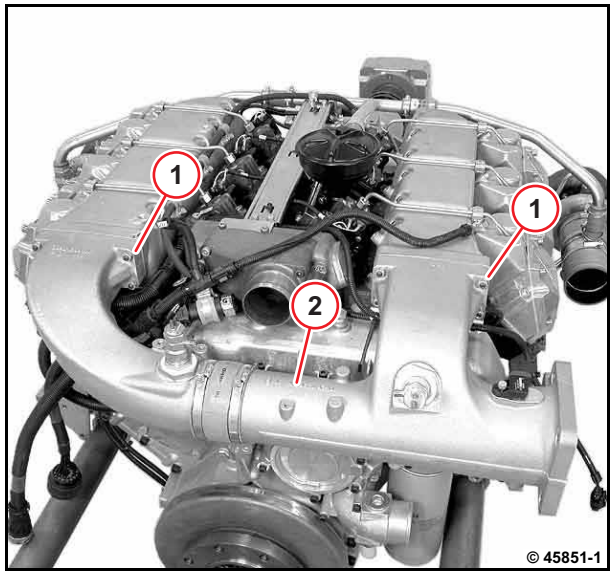
- Unscrew screws (1).



- Unscrew nuts (1).
- Remove washers.
- Remove holder.
- Place cables to one side.

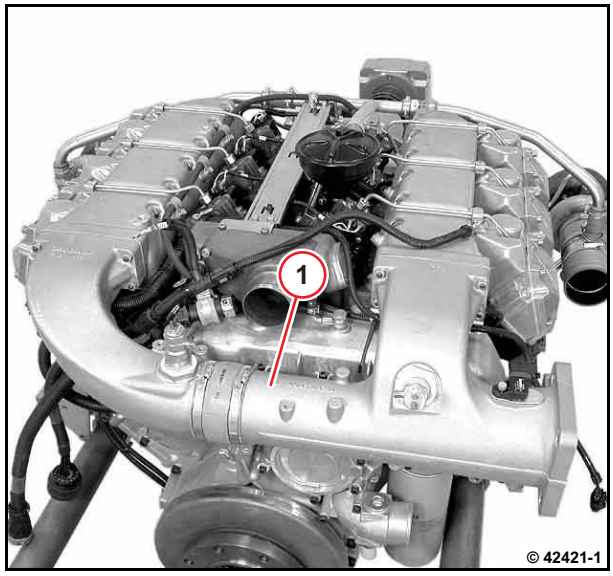


- Unscrew all nuts (1).
- Remove connecting pipe (2).
- Remove gasket.
- Visually inspect the components.

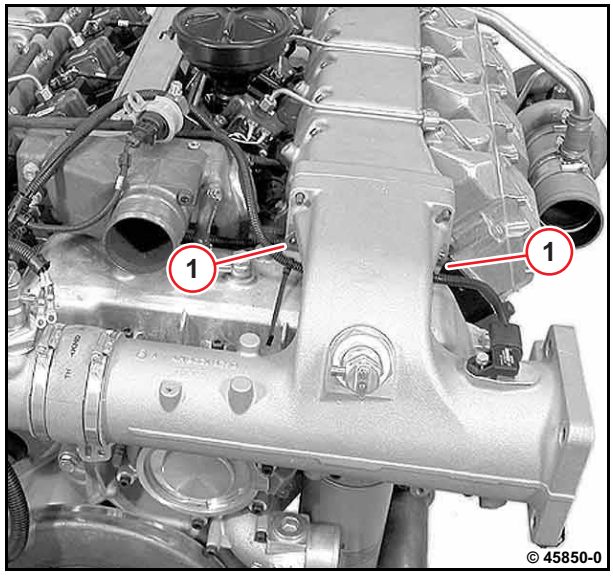


Installing connecting pipe

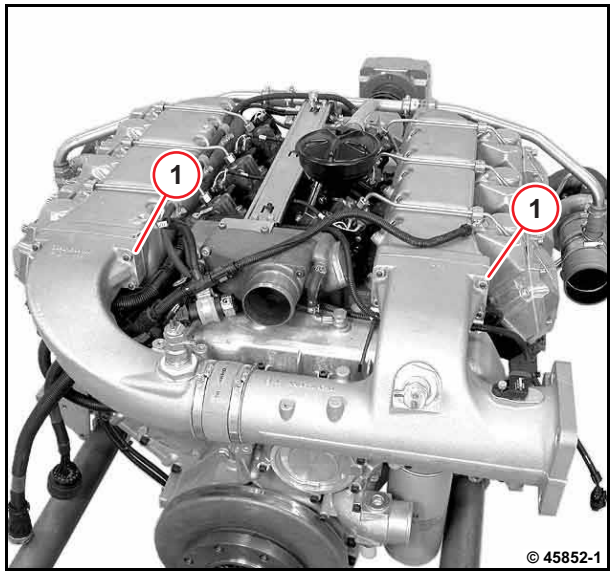
- Clean sealing surfaces.
- Mount new gaskets.
- Mount connecting pipe (1).



- Mount washers.
- Mount holder (1).
- Screw on nuts.

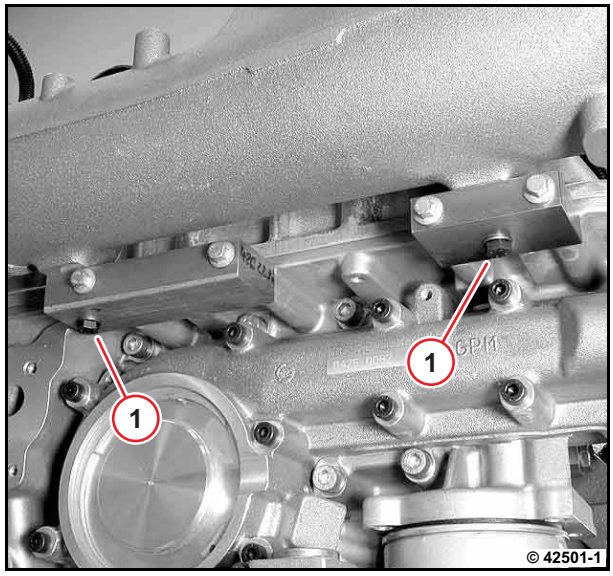


- Screw on all nuts (1).



- Tighten screws (1).

A06 056



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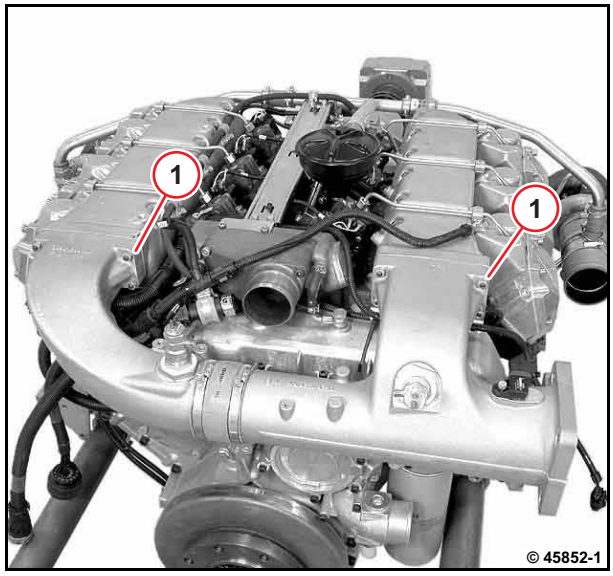
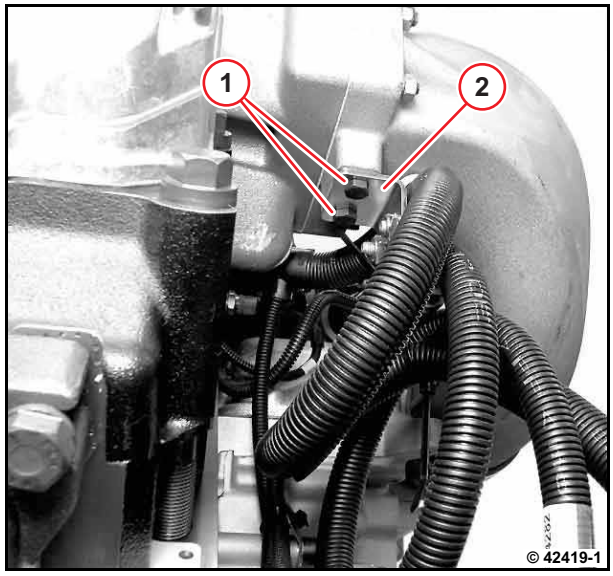
- Tighten all nuts (1).

A06 033



- Position holder (2).
- Tighten screws (1).

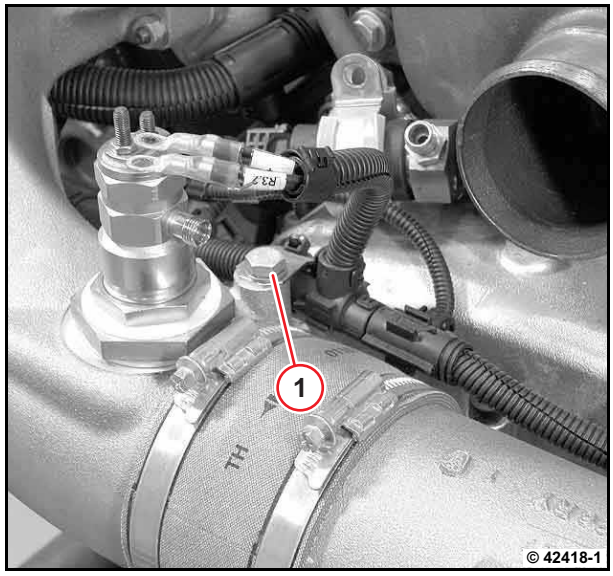
A13 090



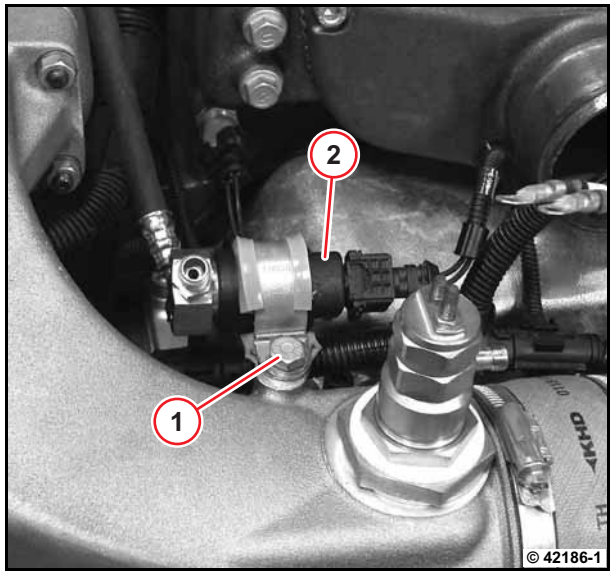
Attention!
Lay the cables free from chafing and tension.

- Tighten screw (1).

A13 090



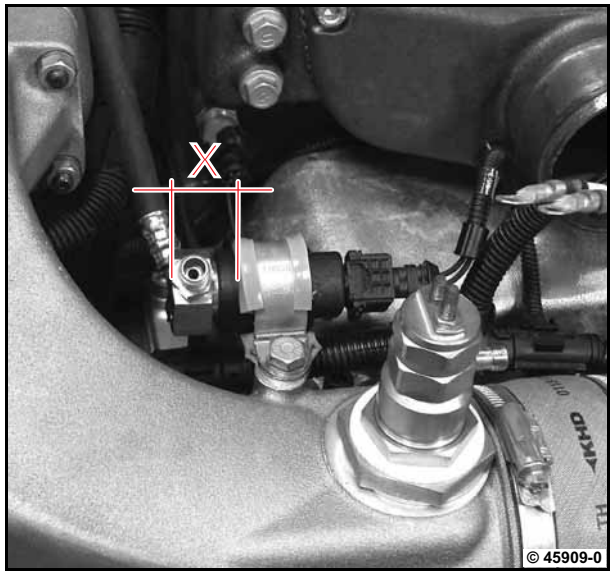
- Mount fuel shut-off valve (2).
- Position pipe clamp.
- Fasten screw (1).



- Position fuel shut-off valve.

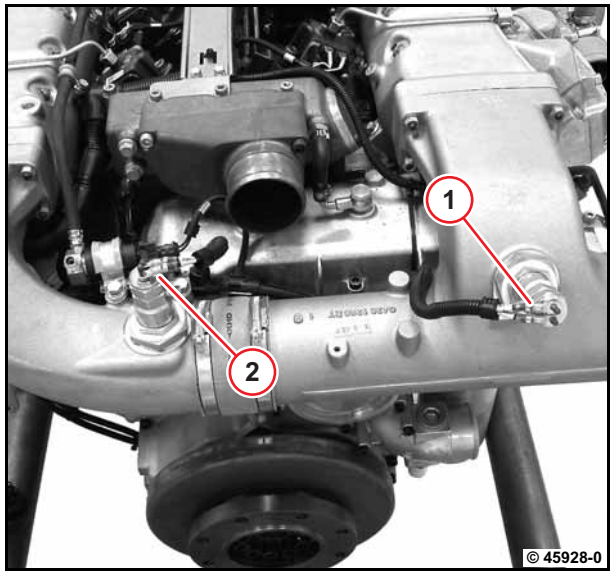
P07 91

Note installation dimensions (X).



Attention!
Note assignment and polarity of the electrical connections!

- Connect plus cable (R3.1) to flame glow plug (1).
- Connect plus cable (R3.2) to flame glow plug (2).
- Mount washers.
- Screw on nuts.

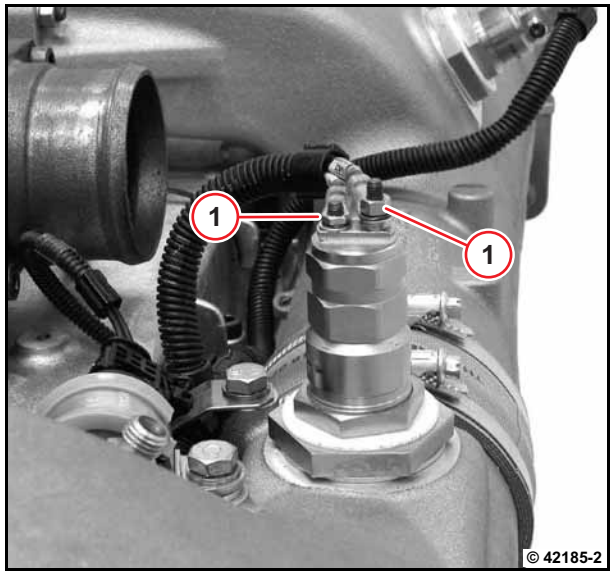


- Tighten nuts (1).

  A13 035

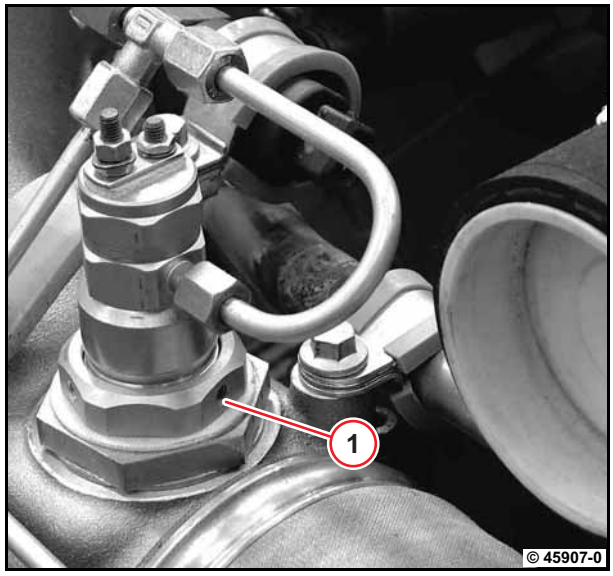
- Install fuel pipes (flame glow plugs), (Railway).

  W 07-01-04



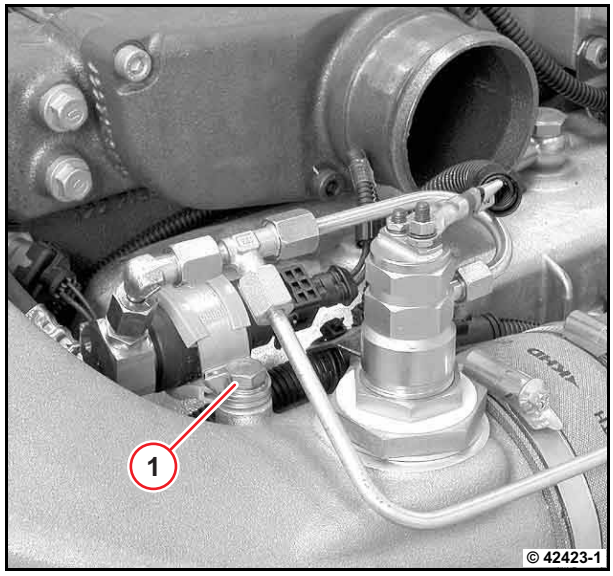
- Connect ground cable.
- Mount spring washer.
- Tighten screw (1).

  A07 058



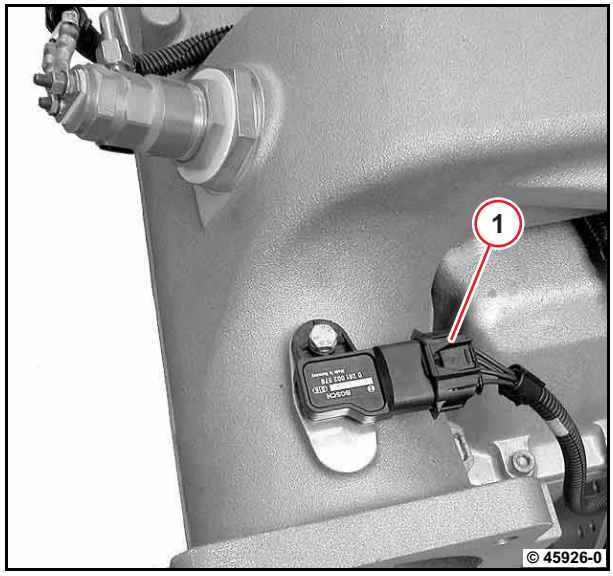
- Tighten screw (1).

  A13 090



- Plug in the cable plug (1).

  Ensure that the cables are connected properly.



6

6

Removing and installing the turbocharger

Commercial available tools

Special tools:
– Special wrench 170100

– Fitting compound
DEUTZ S1

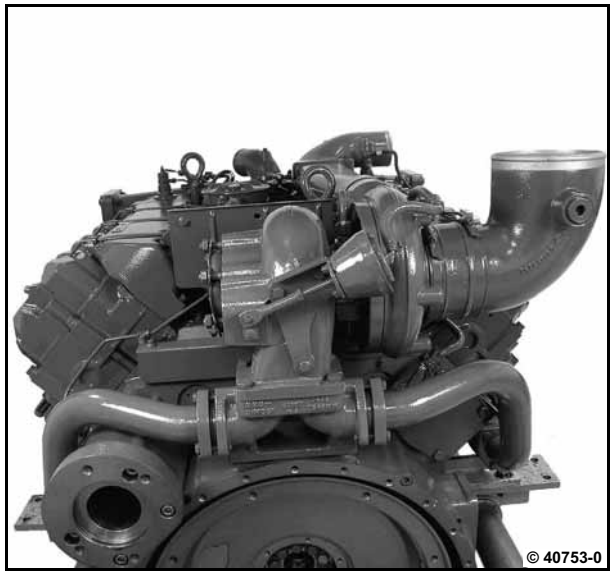
– W 06-02-03

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

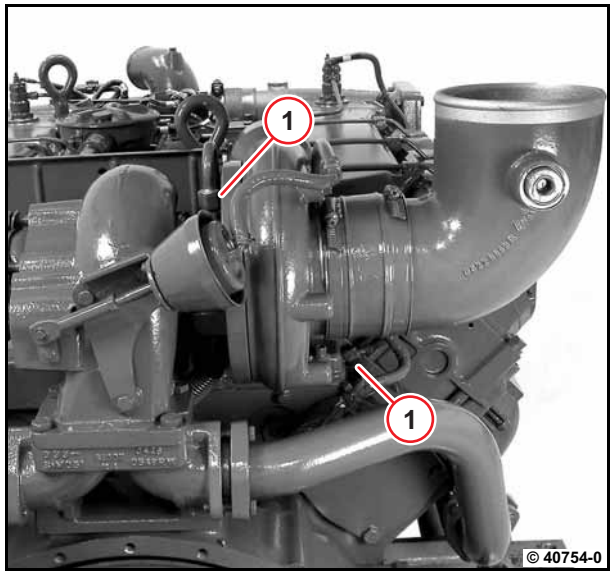
Removing turbocharger

- Remove the charge air pipe.

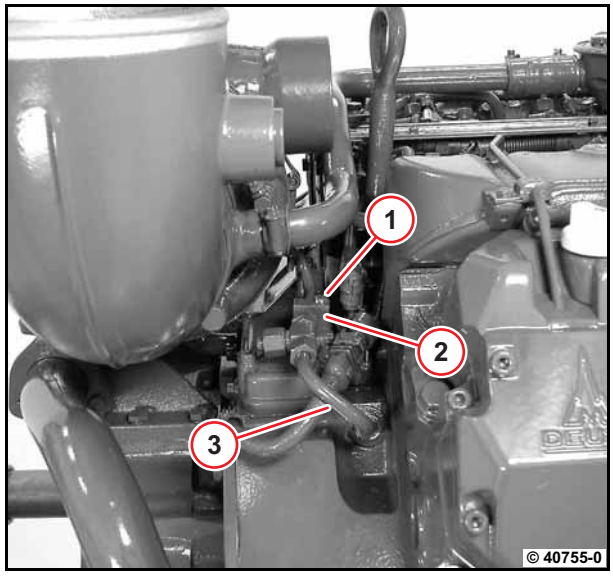
W 06-02-03



- Unscrew lock nuts (1) with special wrench.
- Remove screw-in nipple.
- Remove sealing rings.

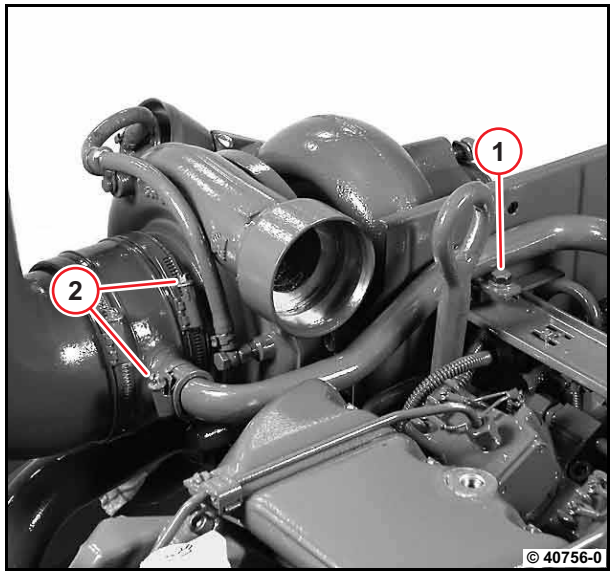


- Unscrew screw (1).
- Remove holder (2).
- Remove lubricating oil pipe (3).

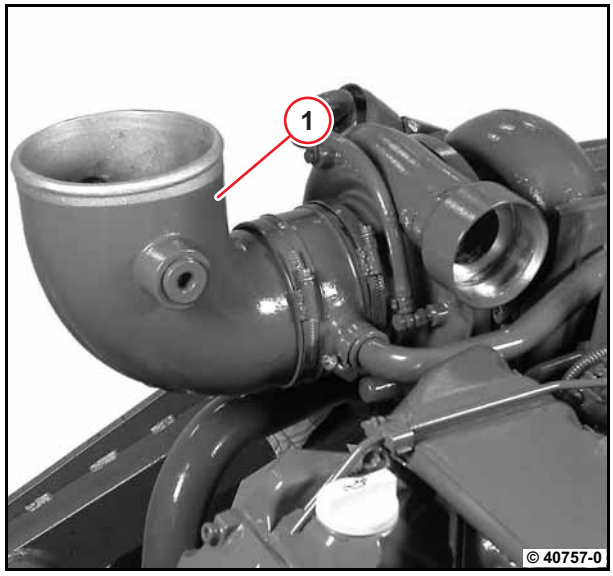


6

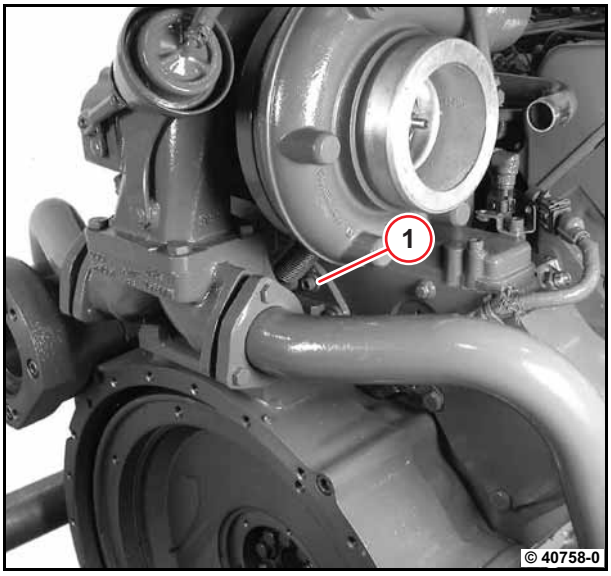
- Unscrew screw (1).
- Loosen hose clips (2).



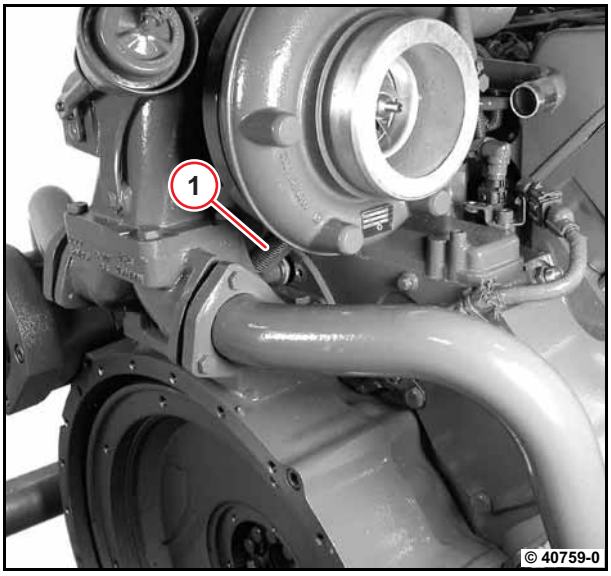
- Pull off pipe.
- Remove intake elbow (1).



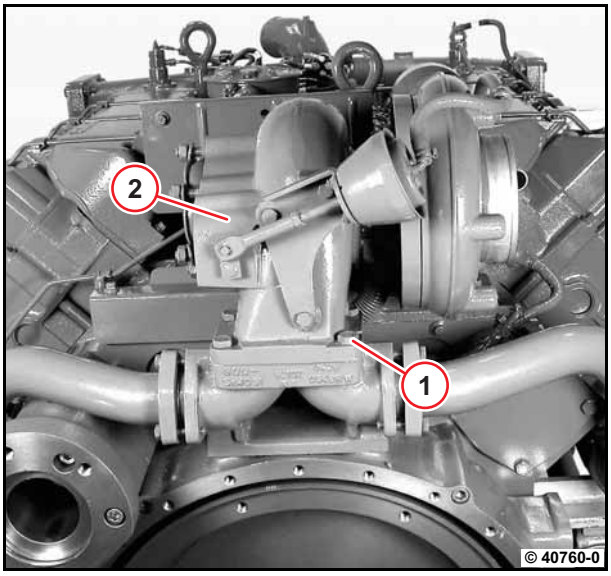
- Unscrew screw (1).



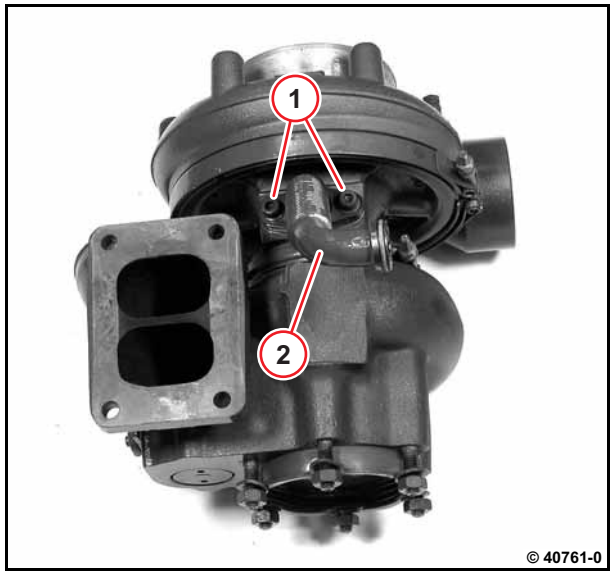
- Pull out oil return pipe (1).



- Unscrew all screws (1).
- Remove turbocharger (2).

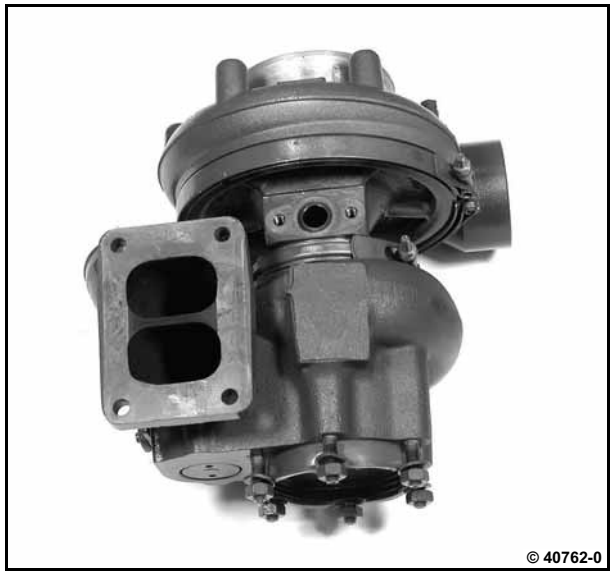


- Unscrew screws (1).
- Remove oil return pipe (2).
- Remove gasket.



6

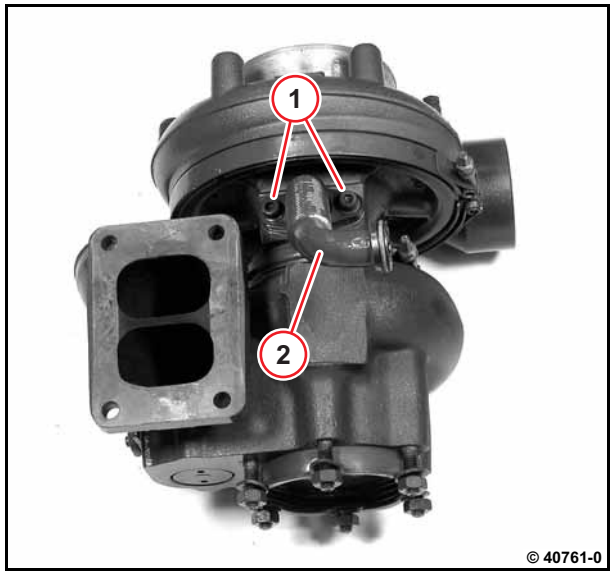
- Visually inspect the components.



Installing the turbocharger

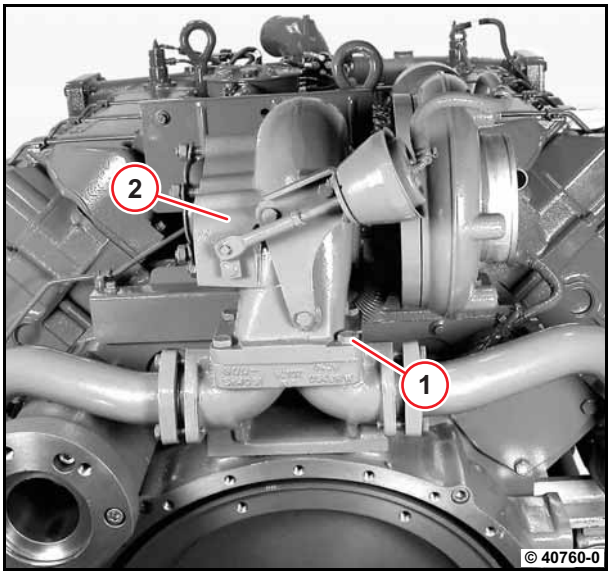
- Mount new gaskets.
- Mount oil return pipe (2).
- Tighten screws (1).

A08 044

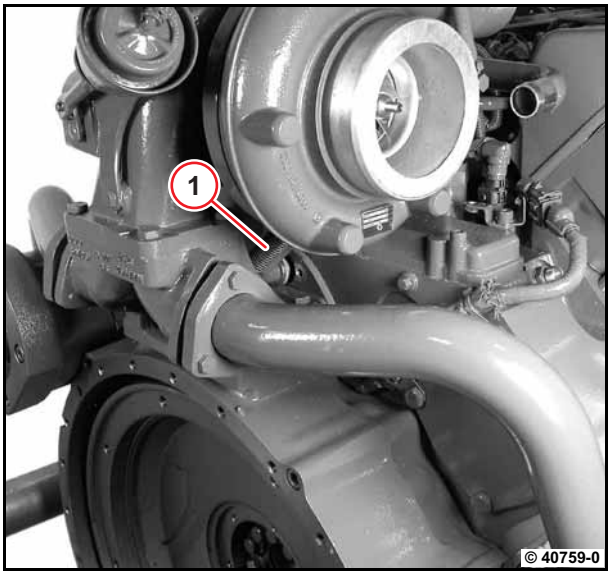


- Clean sealing surfaces.
- Mount turbocharger (2).
- Coat the screws with fitting compound .
- Tighten all screws (1).

A06 020

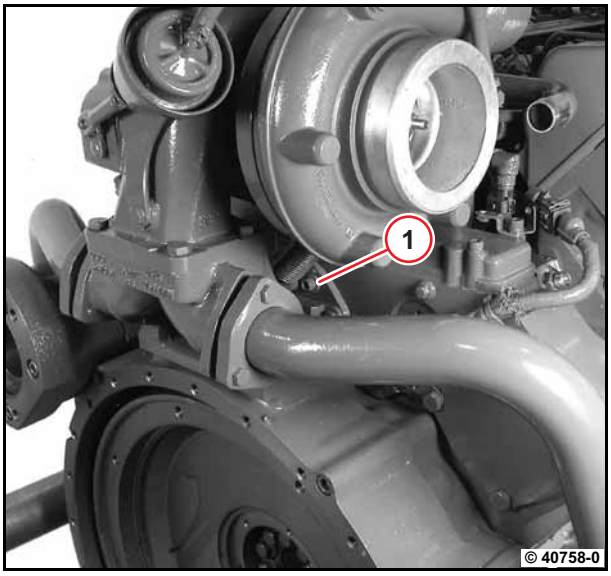


- Mount oil return pipe (1).



- Tighten screw (1).

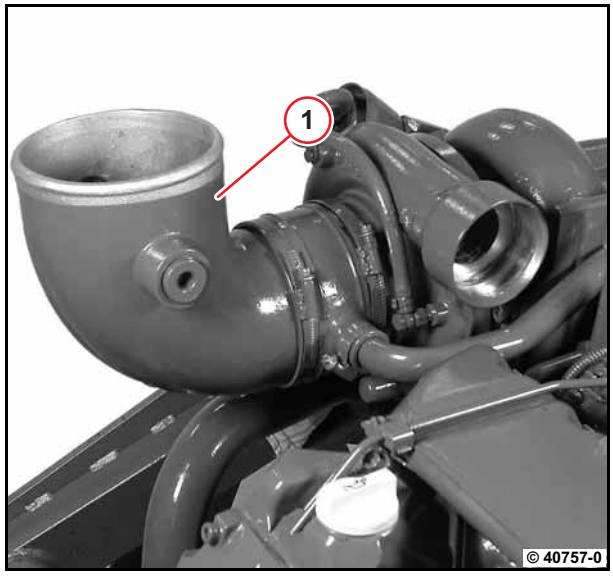
A08 044



- Mount intake elbow (1).

Note installation position.

- Insert pipe.



- Position hose clips.
- Tighten hose clip (2).

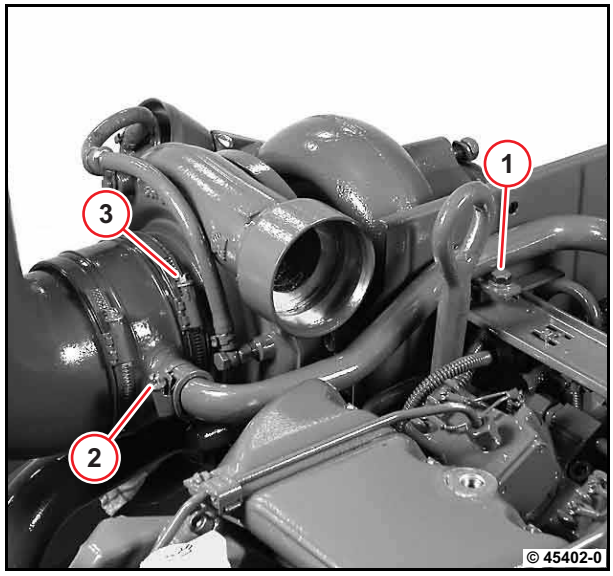
A03 064

- Tighten hose clip (3).

A06 021

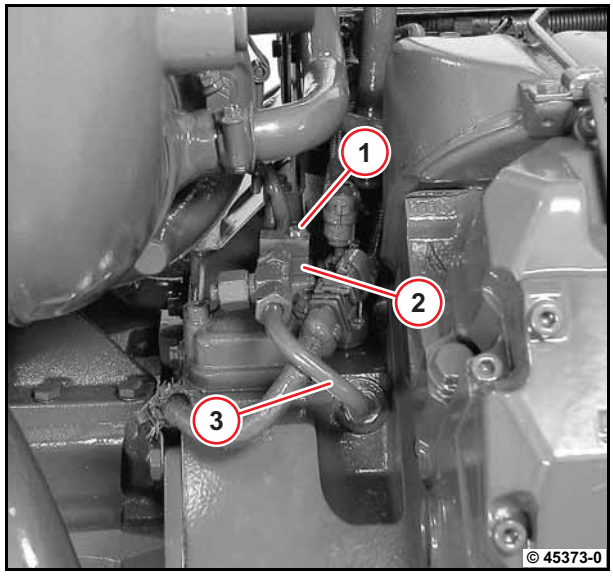
- Tighten screw (1).

A03 069



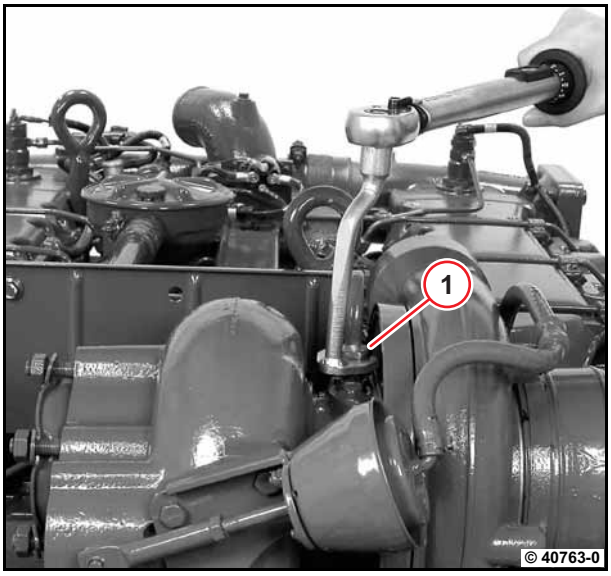
- Mount lubricating oil pipe (3).
- Position holder (2).
- Tighten screw (1).

A08 079



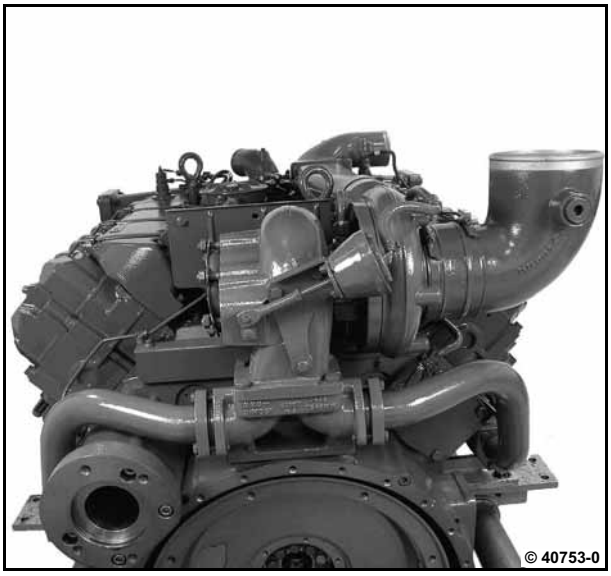
- Mount new sealing rings.
- Tighten screw-in nipple.
- Tighten both lock nuts (1) with a special wrench.

A08 040



- Install the charge air pipe.

W 06-02-03



Removing and installing turbocharger (A-bank)

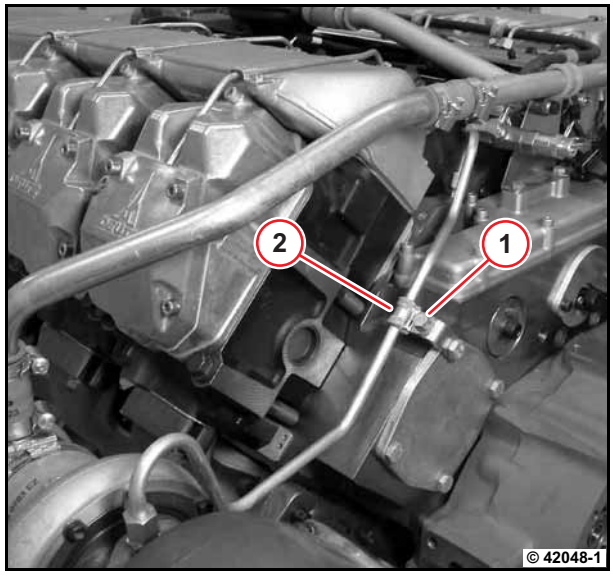
Commercial available tools

– Fitting compound
DEUTZ S1

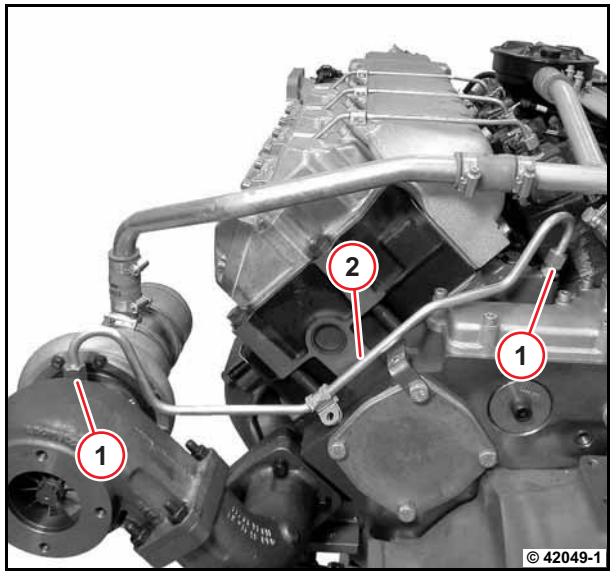
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing turbocharger

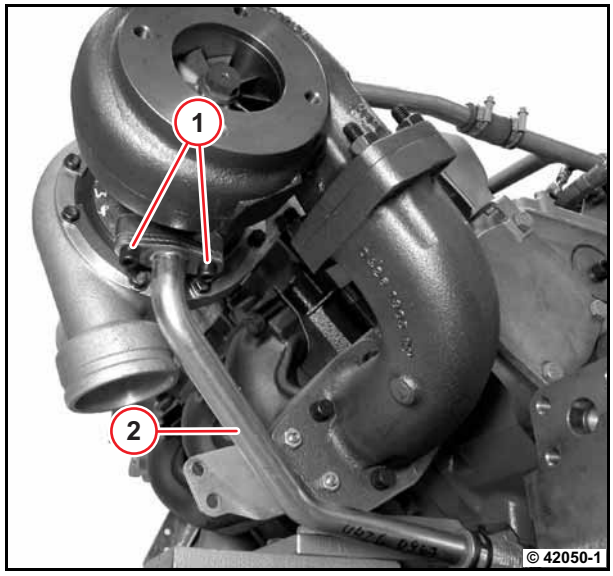
- Unscrew screw (1).
- Loosen pipe clip (2).



- Unscrew union nuts (1).
- Remove lubricating oil pipe (2).

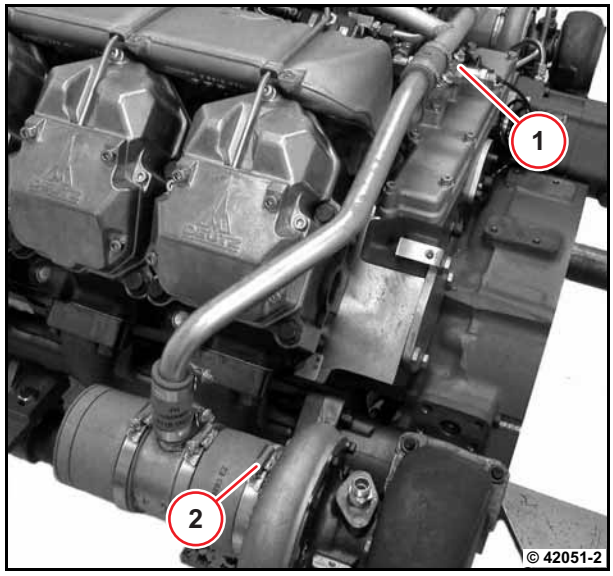


- Unscrew screws (1).
- Remove oil return pipe (2).
- Remove gasket.

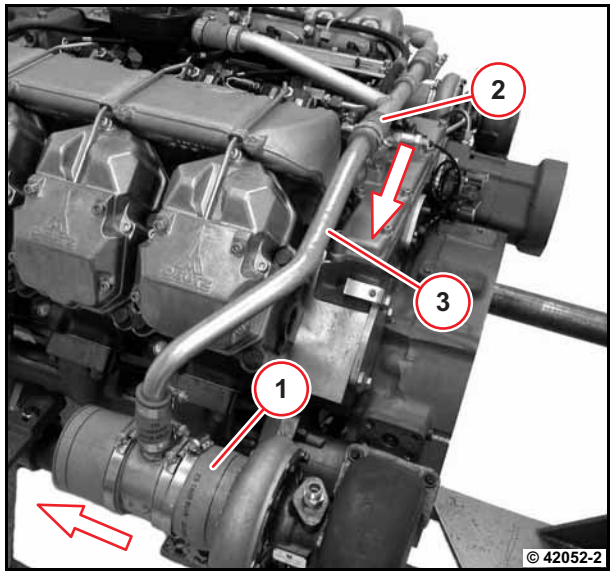


6

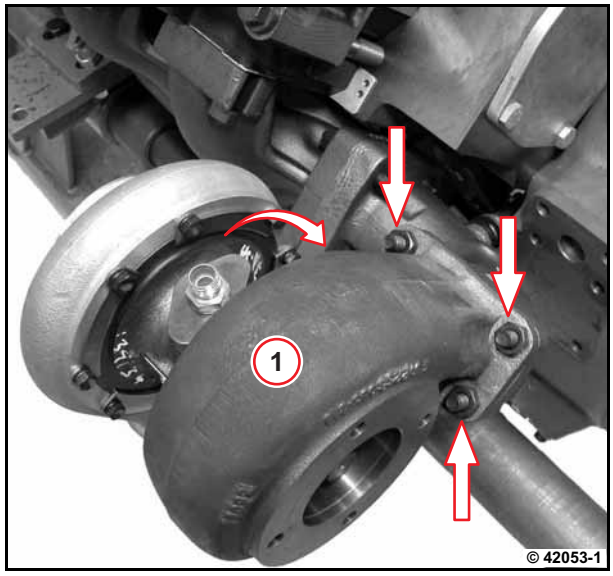
- Loosen hose clip (1).
- Loosen hose clip (2).



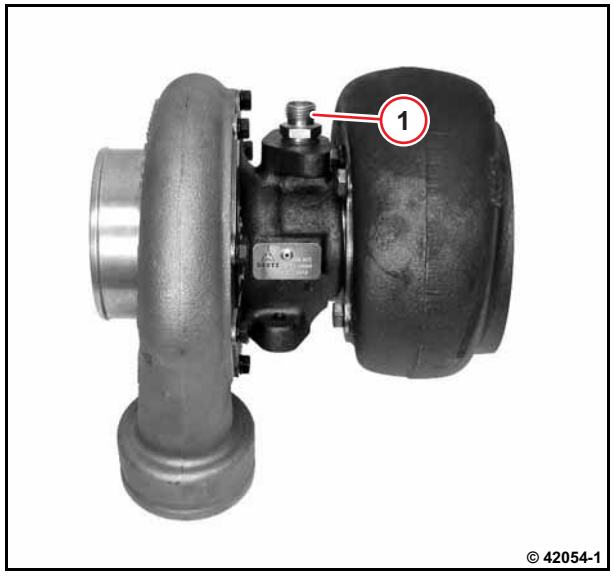
- Pull off tubing connection (1).
- Pull off bleeding hose (2).
- Remove breather pipe (3).



- Unscrew nuts (arrows).
- Remove turbocharger (1).



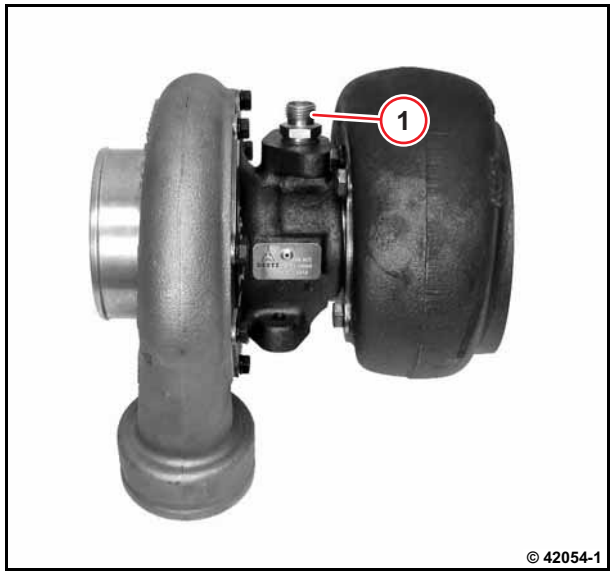
- Unscrew screw-in nipple (1).
- Remove sealing ring.
- Visually inspect the components.



Installing the turbocharger

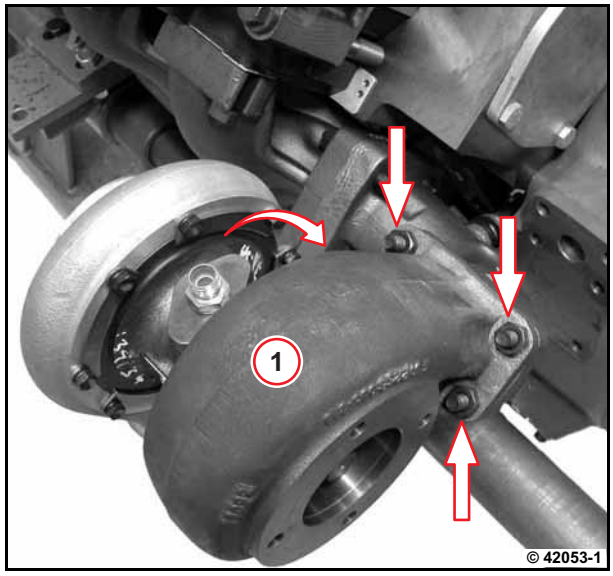
- Mount new sealing ring.
- Tighten screw-in nipple (1).

A12 098



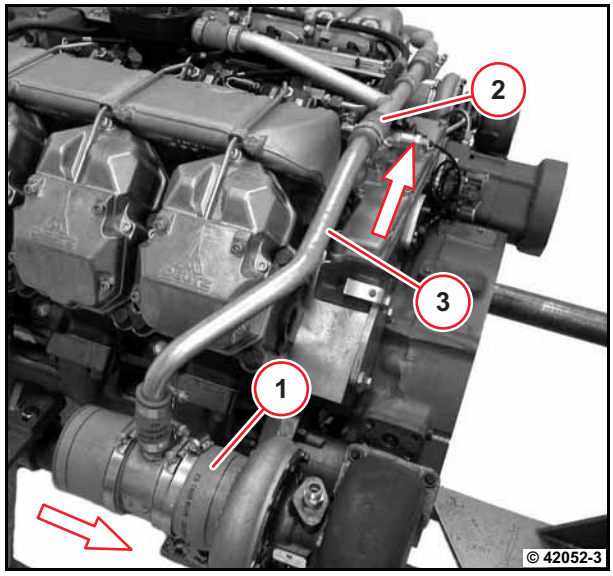
- Clean sealing surfaces.
- Mount turbocharger (1).
- Tighten nuts (arrows).

A06 020



6

- Mount breather pipe (3).
- Plug in breather pipe (2).
- Plug in the tubing connection (1).

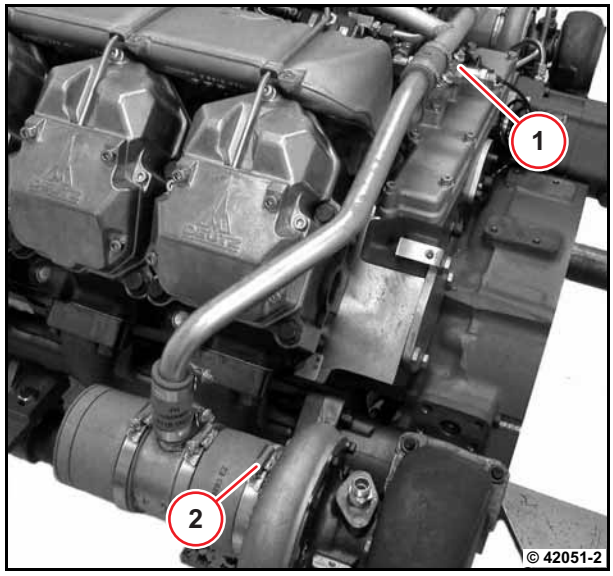


- Position hose clip (1).
- Tighten hose clip (1).

A03 070

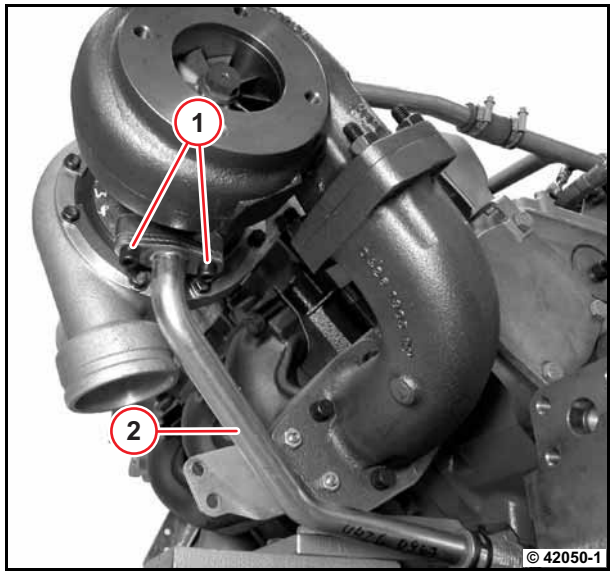
- Position hose clip (2).
- Tighten hose clip (2).

A06 024



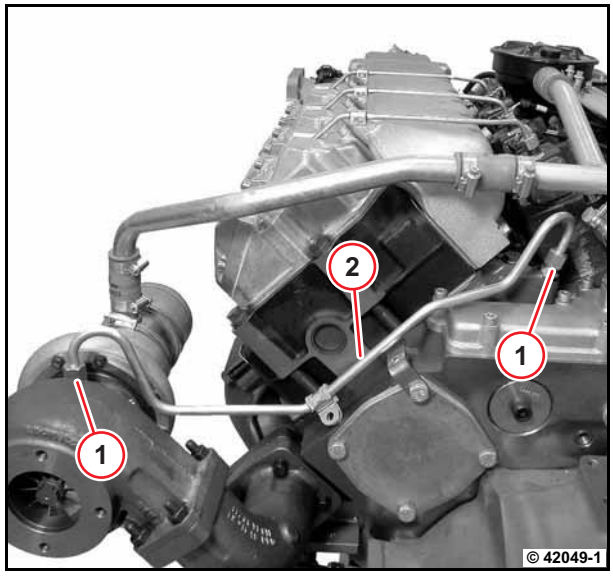
- Mount new gasket.
- Mount oil return pipe (2).
- Tighten screws (1).

A08 044



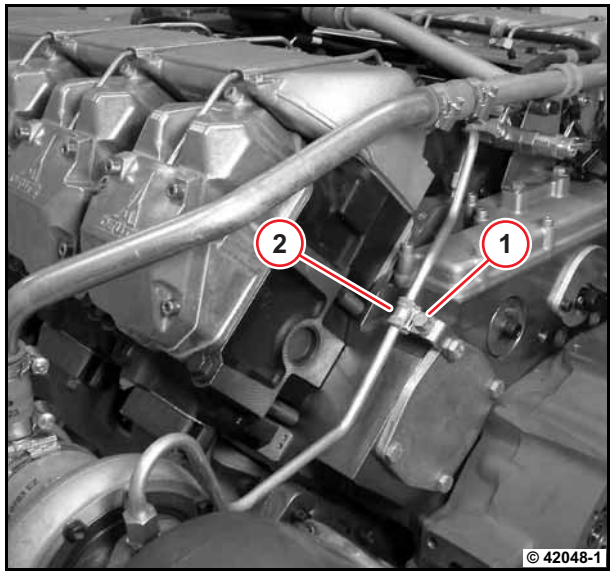
- Mount lubricating oil pipe (2).
- Screw on union nuts (1).

A12 082



- Position pipe clamp (2).
- Tighten screw (1).

A08 045



6

Removing and installing turbocharger (B-bank)

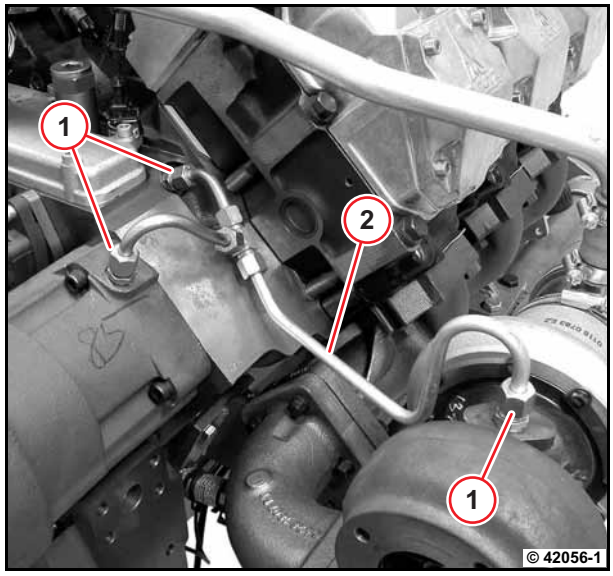
Commercial available tools

– Fitting compound
DEUTZ S1

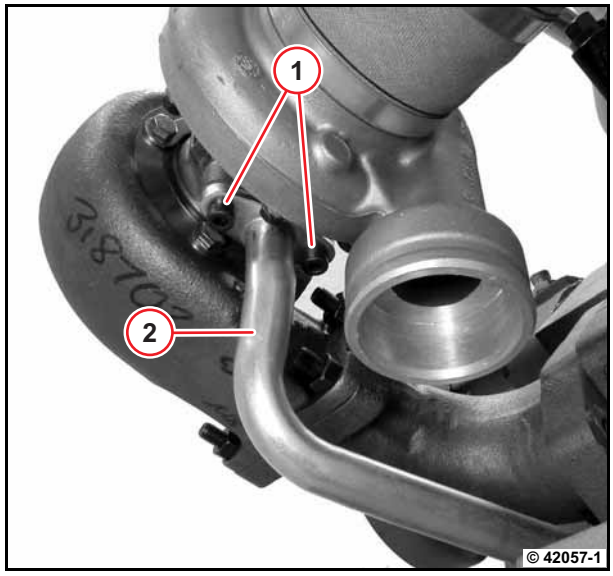
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing turbocharger

- Unscrew union nuts (1).
- Remove lubricating oil pipe (2).

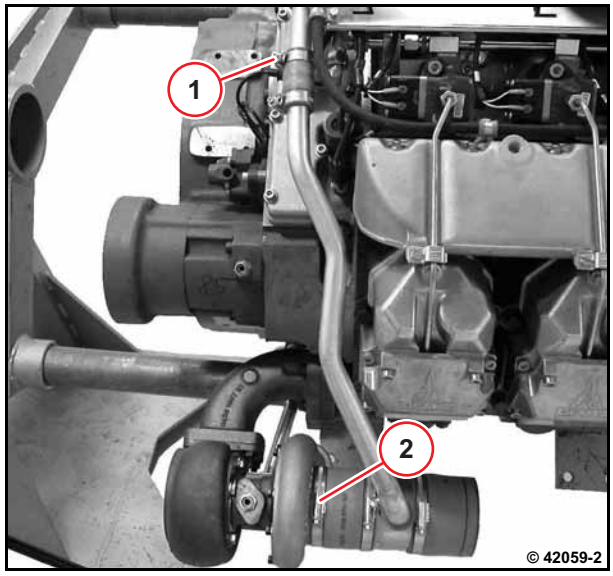


- Unscrew screws (1).
- Remove oil return pipe (2).
- Remove gasket.

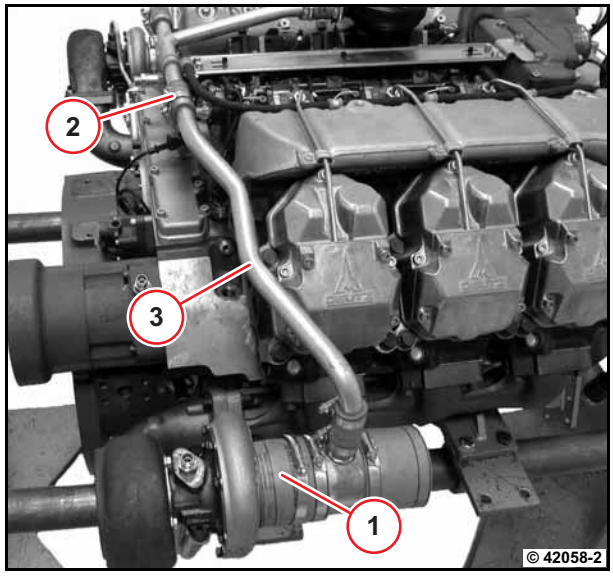


6

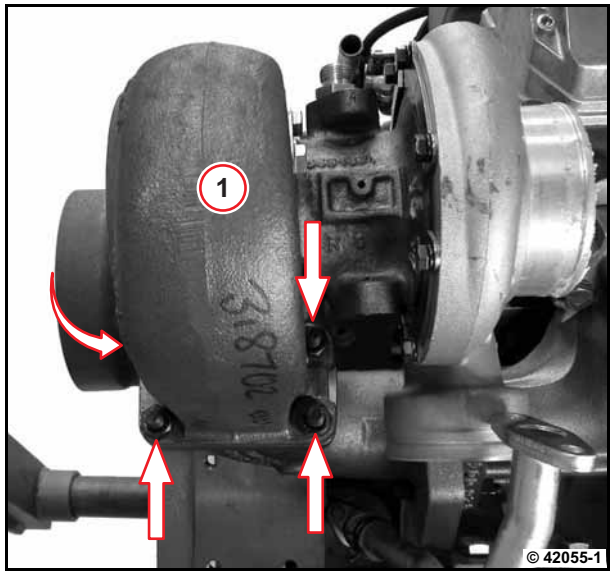
- Loosen hose clip (1).
- Loosen hose clip (2).



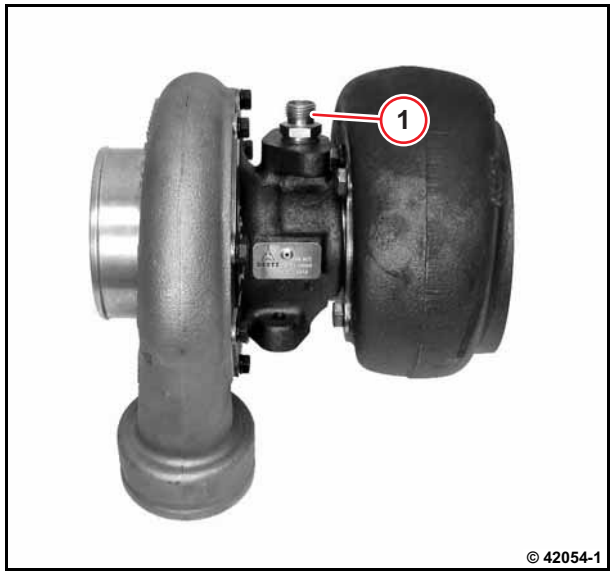
- Pull off tubing connection (1).
- Pull off bleeding hose (2).
- Remove breather pipe (3).



- Unscrew nuts (arrows).
- Remove turbocharger (1).



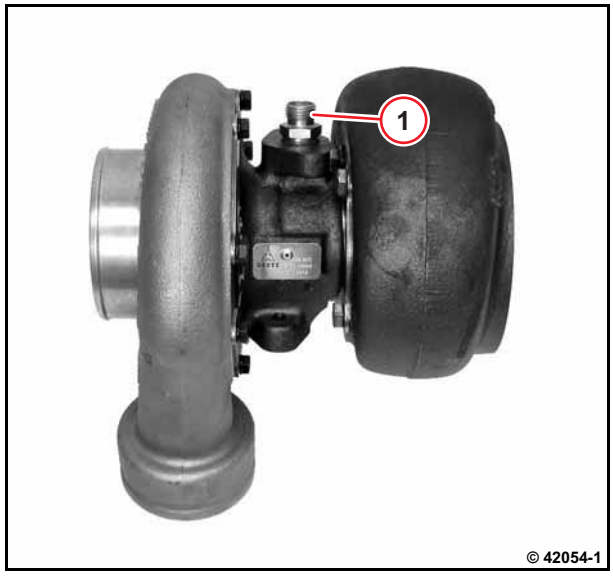
- Unscrew screw-in nipple (1).
- Remove sealing ring.
- Visually inspect the components.



Installing the turbocharger

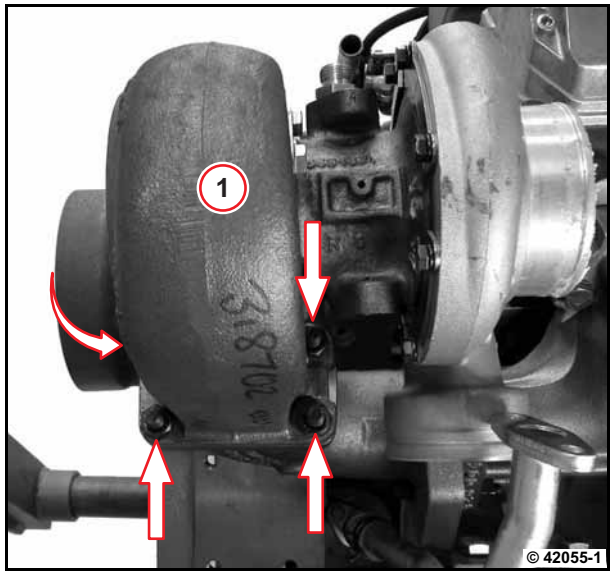
- Mount new sealing ring.
- Tighten screw-in nipple (1).

A12 098

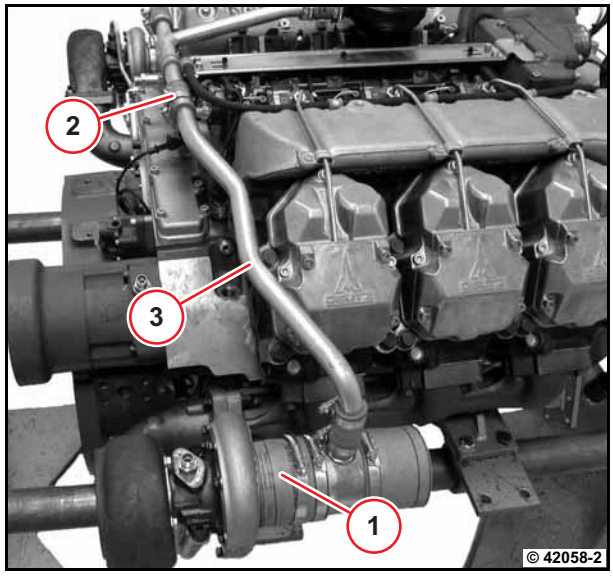


- Clean sealing surfaces.
- Mount turbocharger (1).
- Tighten nuts (arrows).

A06 020



- Mount breather pipe (3).
- Plug in breather pipe (2).
- Plug in the tubing connection (1).



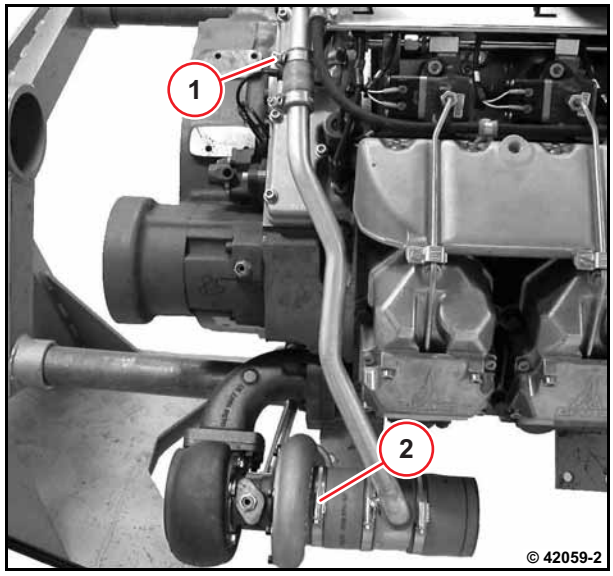
6

- Position hose clip (1).
- Tighten hose clip (1).

A03 070

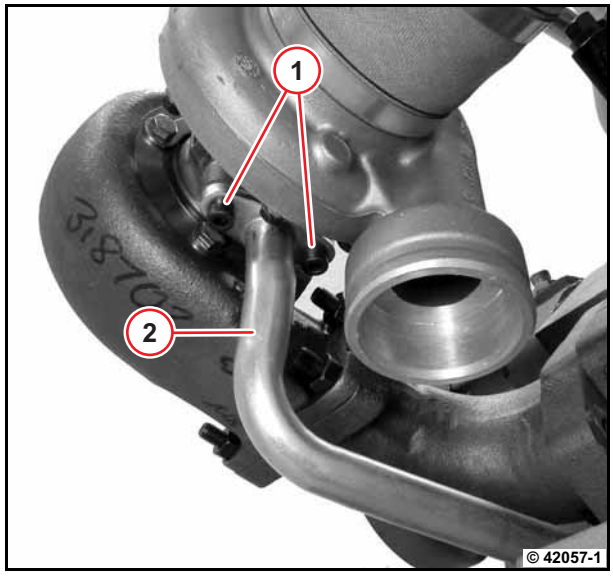
- Position hose clip (2).
- Tighten hose clip (2).

A06 024



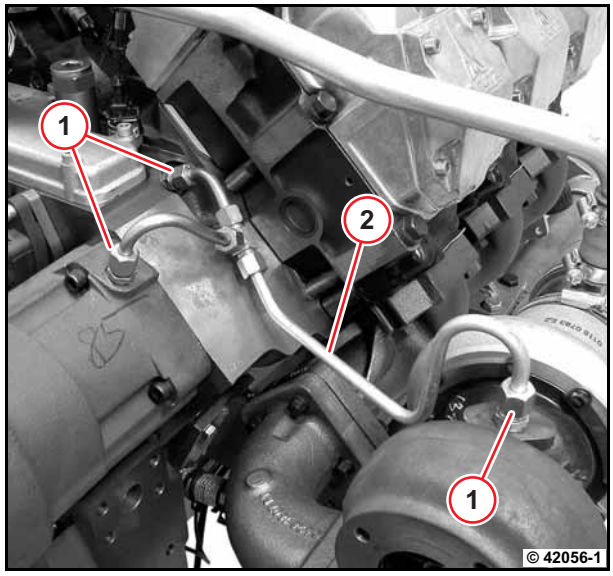
- Mount new gasket.
- Mount oil return pipe (2).
- Tighten screws (1).

A08 044



- Mount lubricating oil pipe (2).
- Screw on union nuts (1).

A12 082



6

Removing and installing charge air pipe (A-bank)

Commercial available tools

Special tools:
– Special wrench 110510

– W 03-01-11
– W 06-02-05
– W 07-03-01 . . . . . (A-bank)

Removing charge air pipe

- Remove connecting pipe.

  W 06-02-05

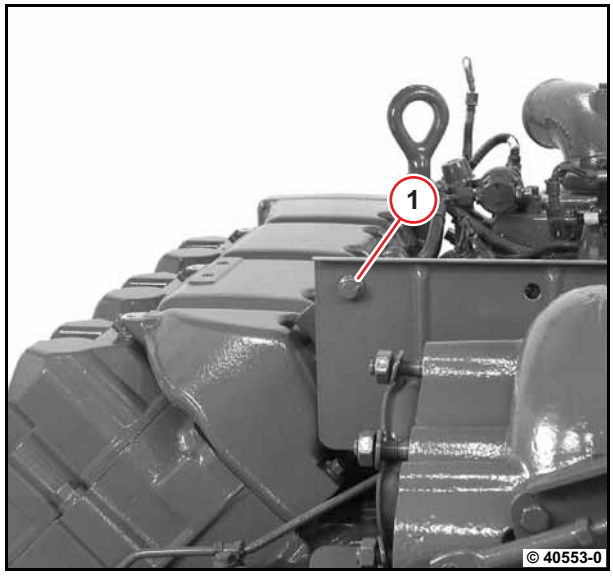
- Removing high pressure pipes (A-bank).

  W 07-03-01

- Removing the crankcase breather.

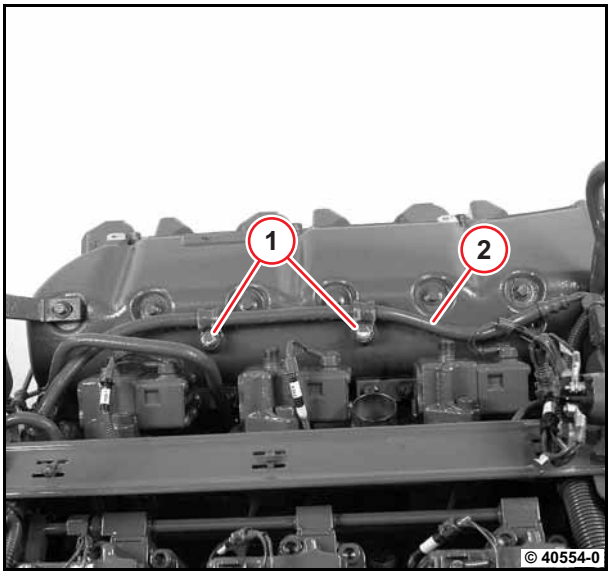
  W 03-01-11

- Unscrew screw (1).

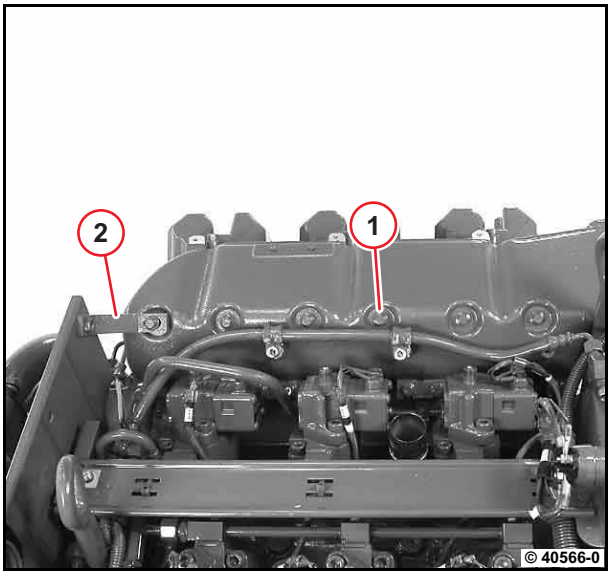


6

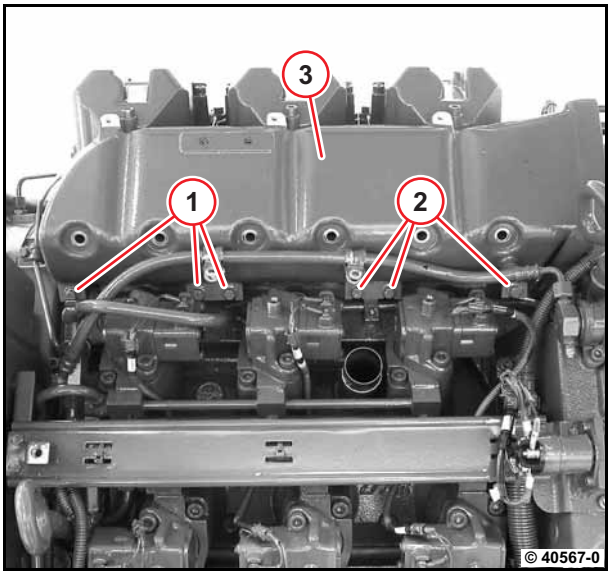
- Unscrew screws (1).
- Place fuel hose (2) to one side.



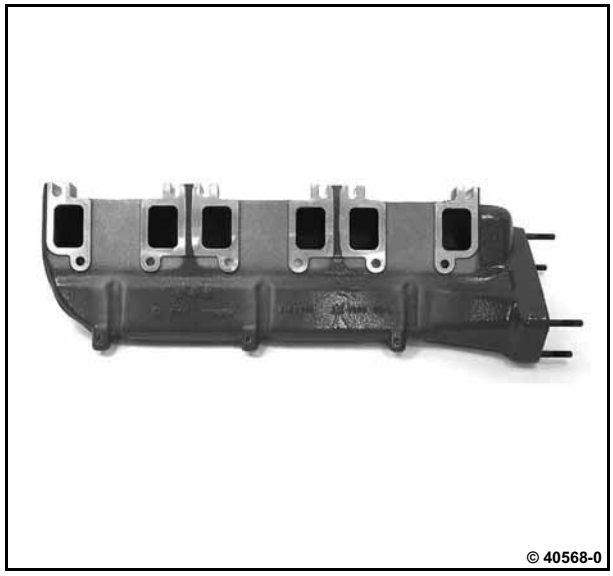
- Unscrew all screws (1).
- Remove the holder (2).



- Unscrew screws (1) with special wrench.
- Unscrew screws (2).
- Remove charge air pipe (3).
- Remove seals.



- Visually inspect the components.



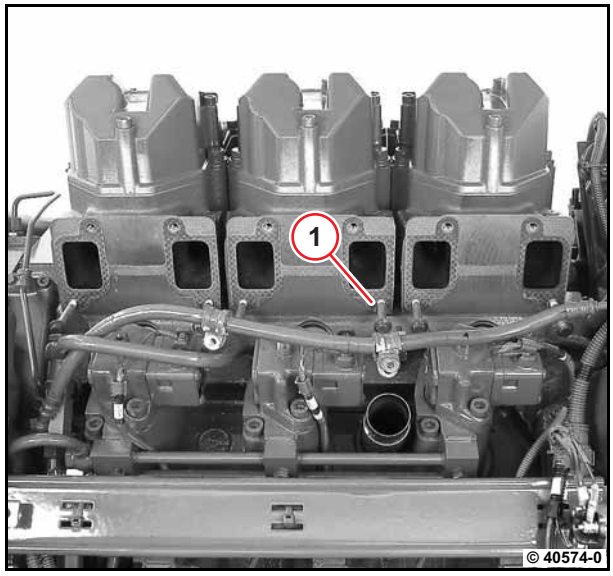
Installing charge air pipe

- Clean sealing surfaces.
- Mount new gaskets.

Note installation position.

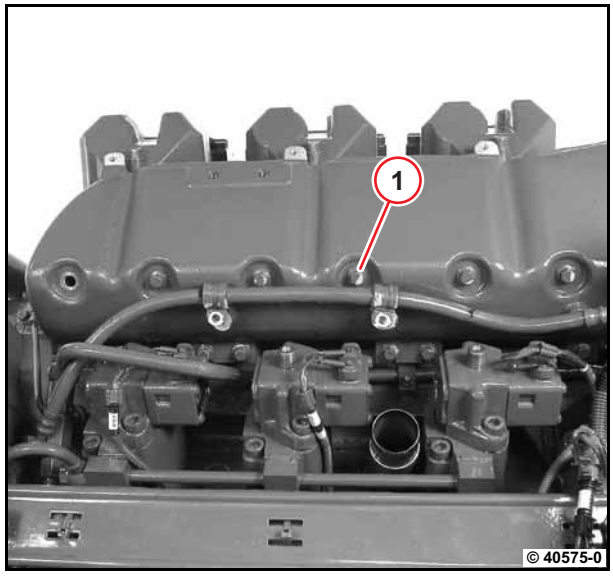
- Turn in all screws (1) a few turns.

Screw length:
M8 x 65 mm



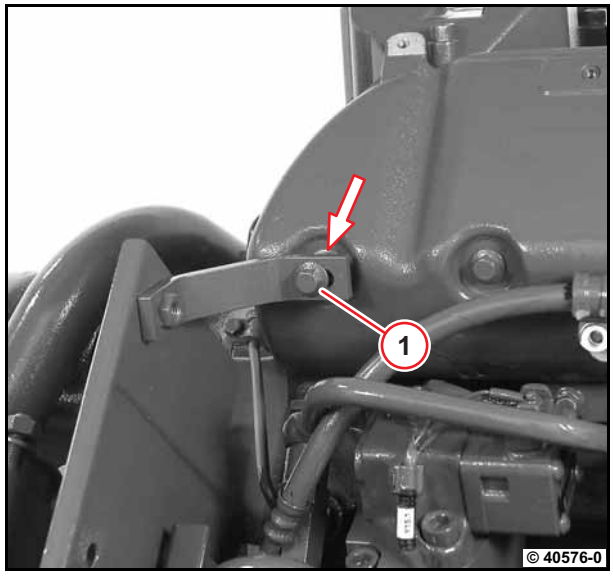
- Insert charge air pipe.
- Fasten all screws (1).

Screw length:
M8 x 100 mm



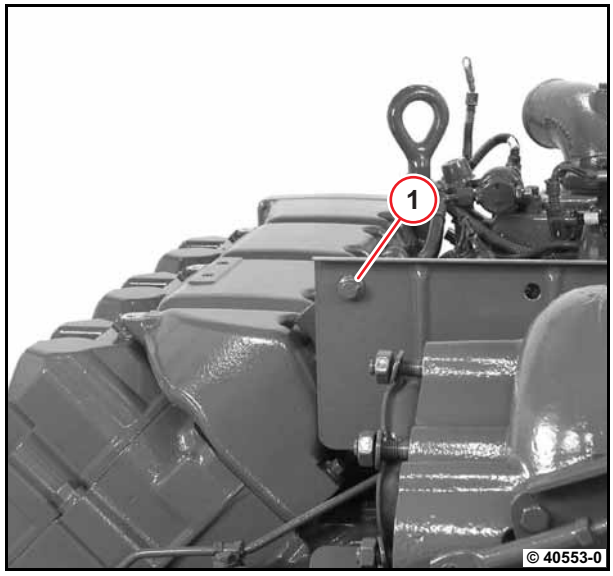
- Mount spacing sleeve (arrow).
- Mount holder.
- Fasten screw (1).

Screw length:
M8 x 120 mm



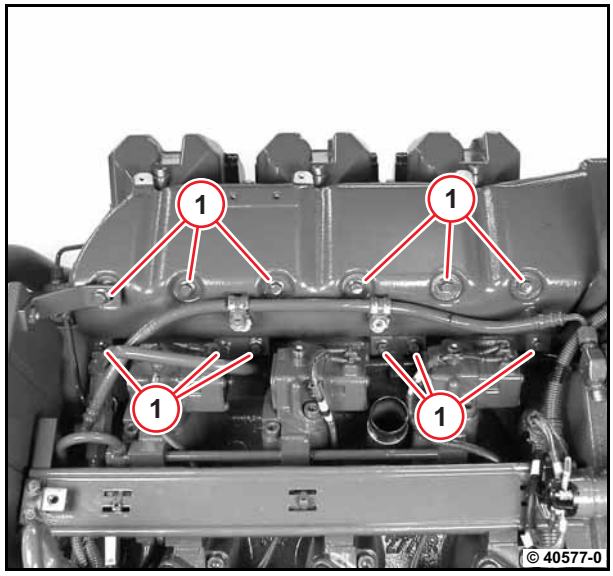
- Tighten screw (1).

A12 071



- Tighten screws (1) alternately with special wrench.

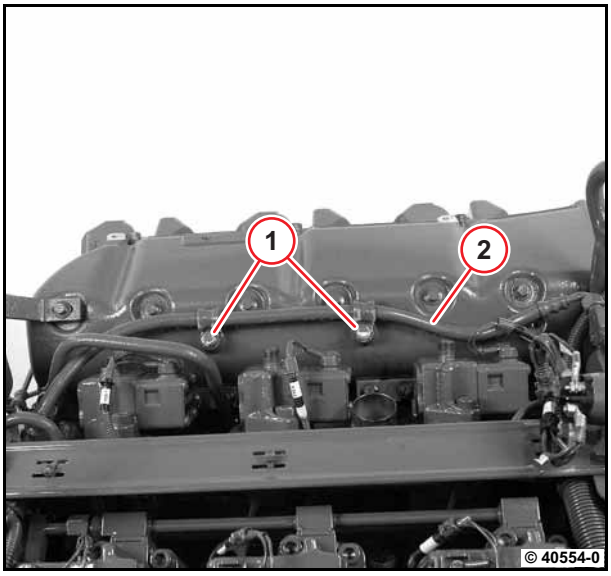
A06 030



- Position fuel hose (2).
- Tighten screws (1).

  A12 095
- Install crankcase breather.

  W 03-01-11



- Installing high pressure pipes (A-bank)

  W 07-03-01
- Install connecting pipe.

  W 06-02-05

6

Removing and installing charge air pipe (B-bank)

Commercial available tools

Special tools:
– Special wrench 110510

– W 06-02-05
– W 07-03-01 . . . . . (B-bank)

Removing charge air pipe

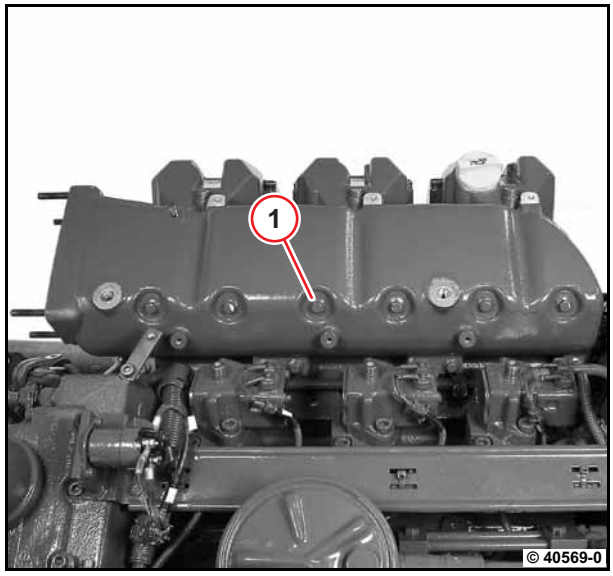
- Remove connecting pipe.

  W 06-02-05

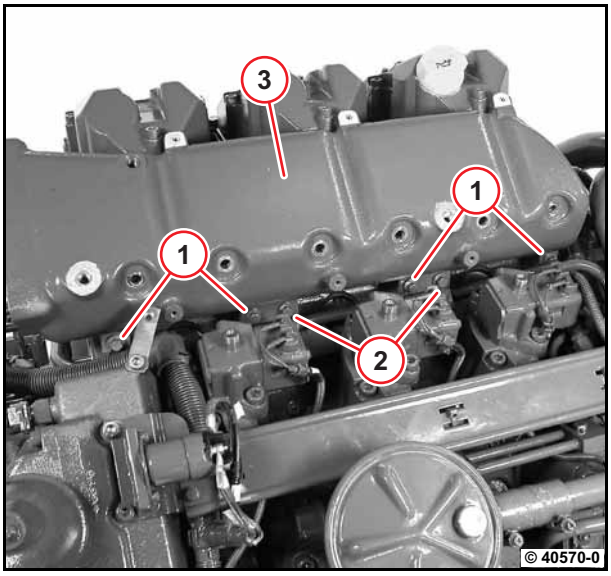
- Removing high pressure pipes (B-bank).

  W 07-03-01

- Unscrew all screws (1).

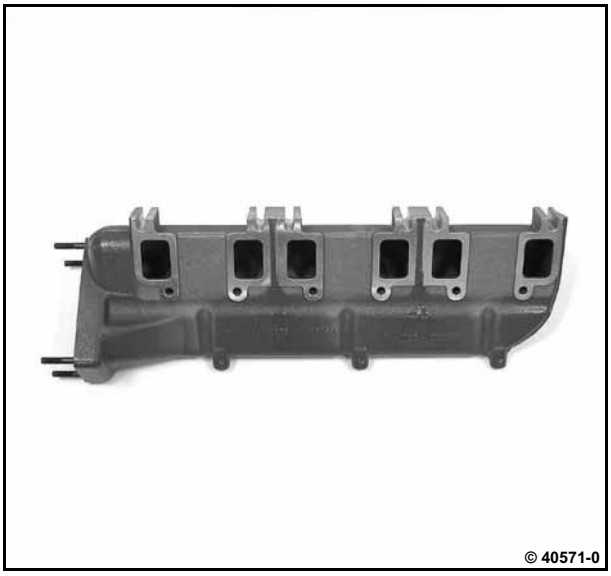


- Unscrew screws (1) with special wrench.
- Unscrew screws (2).
- Remove charge air pipe (3).
- Remove seals.



6

- Visually inspect the components.



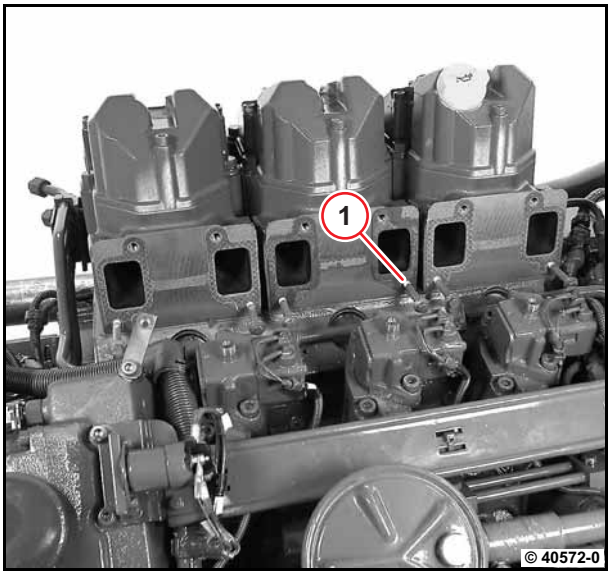
Installing charge air pipe

- Clean sealing surfaces.
- Mount new gaskets.

Note installation position.

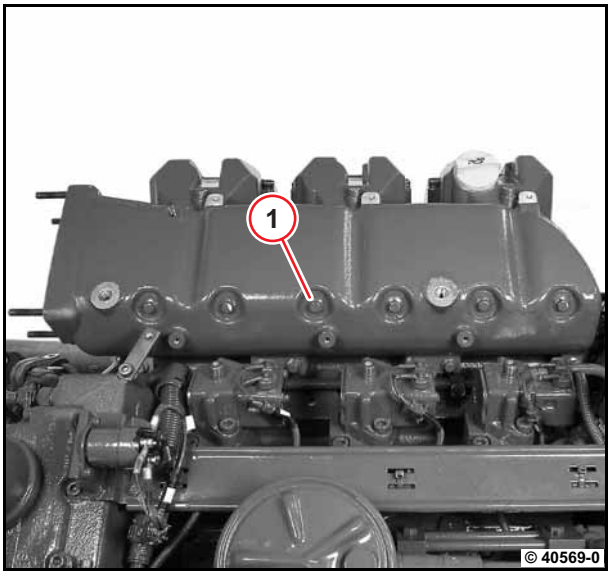
- Turn in all screws (1) a few turns.

Screw length:
M8 x 65 mm



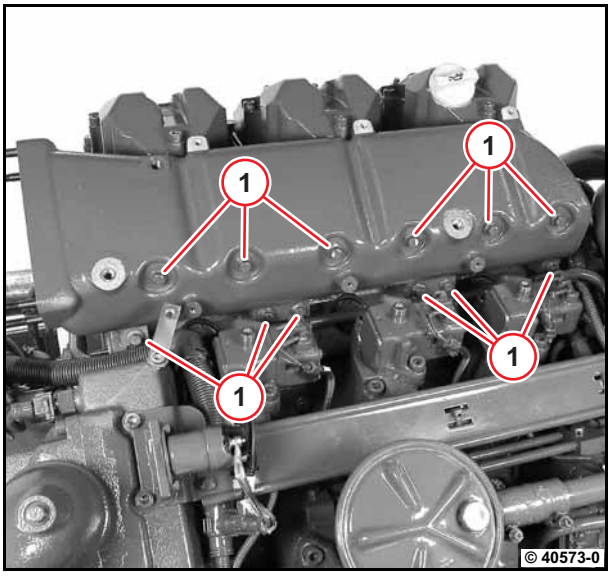
- Insert charge air pipe.
- Fasten all screws (1).

Screw length:
M8 x 100 mm



- Tighten screws (1) alternately with special wrench.

A06 030



- Installing high pressure pipes (A-bank)

W 07-03-01

- Install connecting pipe.

W 06-02-05

6

Removing and installing flame glow plug

Commercial available tools

Special tools:
– Plugs/caps 170160

– W 07-01-04

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

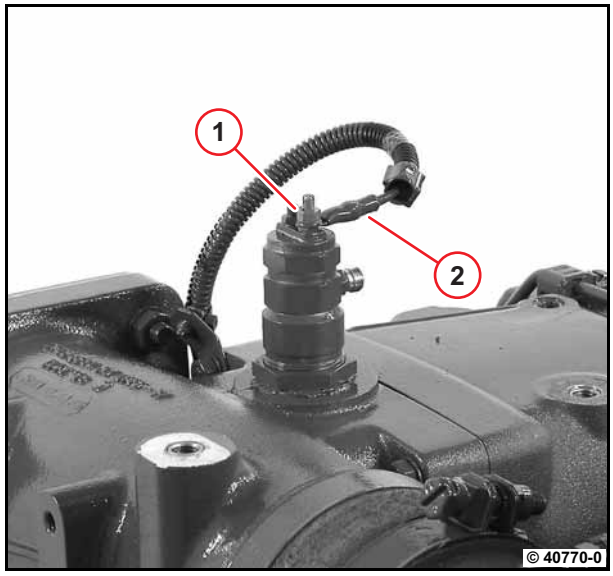
Removing flame glow plug

- Remove fuel pipes (flame glow plugs).

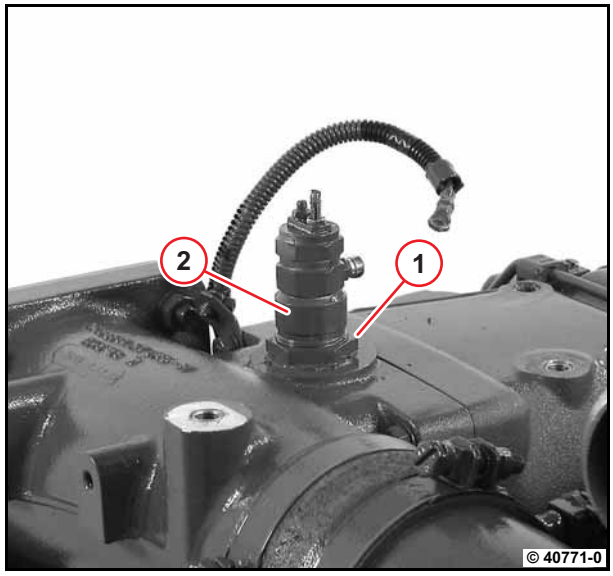
  W 07-01-04

- Unscrew nut (1).
- Remove cables (2).

Mark assignment of cables/connections before removing.



- Loosen lock nut (1).
- Unscrew flame glow plug (2).
- Remove gasket.



6

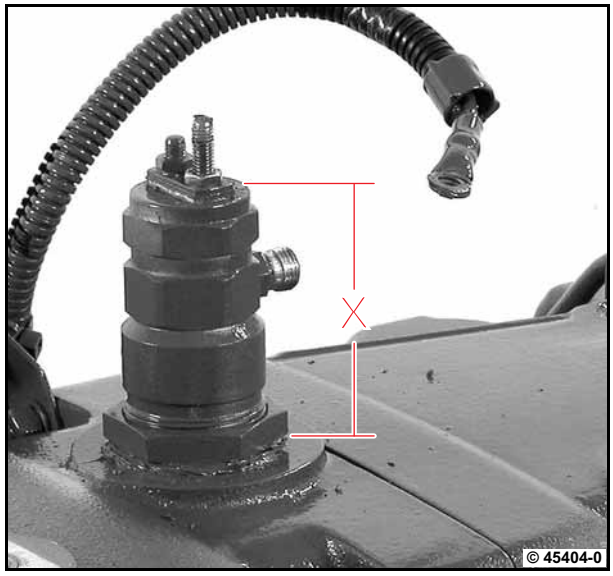
- Visually inspect the components.

Installing flame glow plug

- Mount new gasket.
- Screw in flame glow plug.

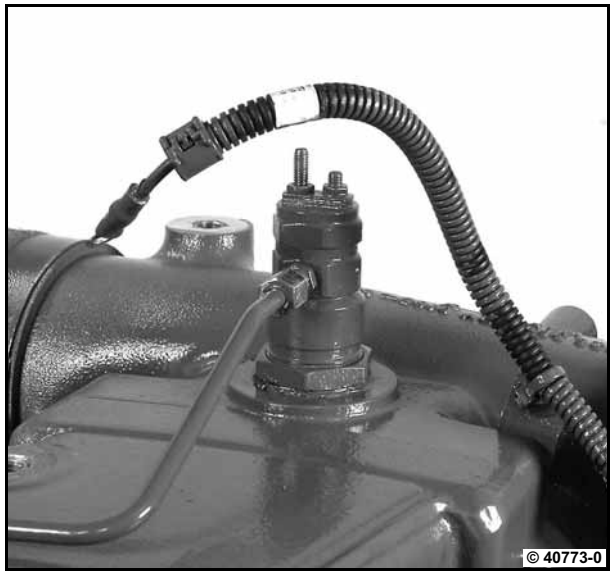
P13 66

Note screw-in height dimension (X).



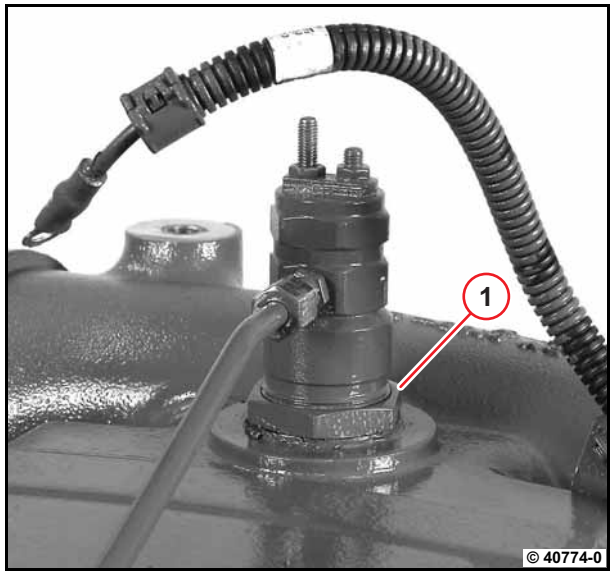
- Install fuel pipes (flame glow plugs).

W 07-01-04



- Tighten lock nut (1).

A07 059



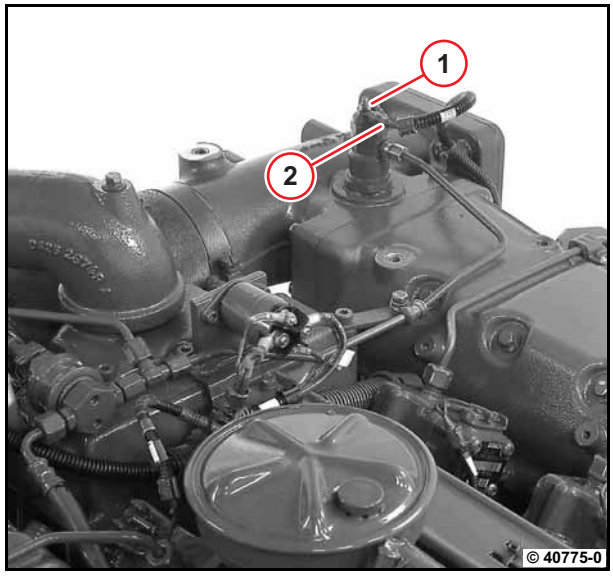
- Plug in cable lug (2).

Attention!
Note assignment and polarity of the electrical connections!

Connect cables according to marks made before removing.

- Mount washer.
- Tighten nut (1).

A13 035



6

Removing and installing flame glow plug

Commercial available tools

Special tools:
– Plugs/caps 170160

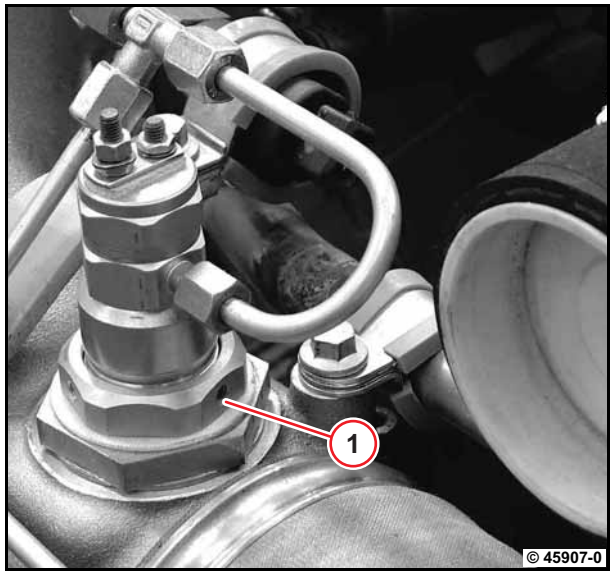
– W 07-01-04 . . . . . (Railway)

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing flame glow plug

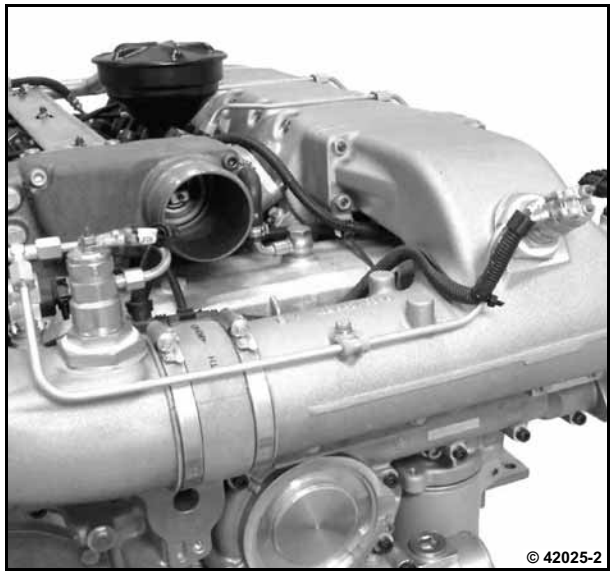
- Unscrew screw (1).
- Remove spring washer.
- Remove ground cable.

Mark assignment of cables/connections before removing.

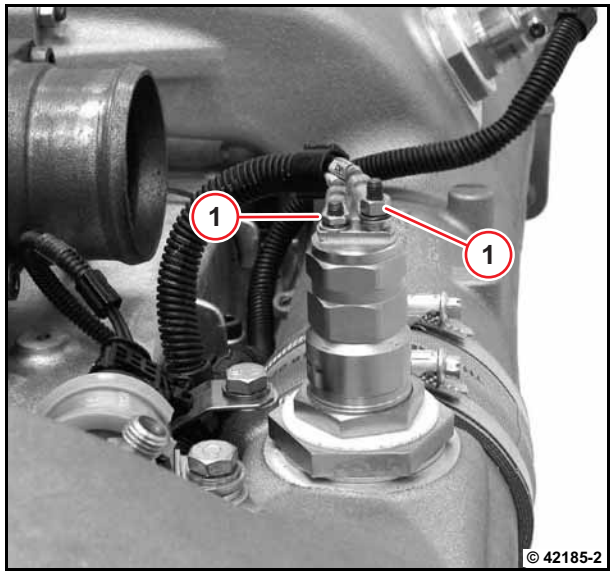


- Remove fuel pipes (flame glow plugs), (Railway).

W 07-01-04

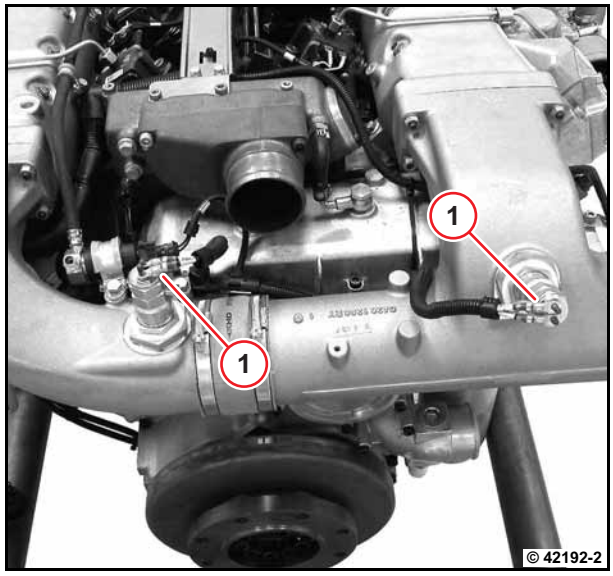


- Unscrew nuts (1).
- Remove washers.

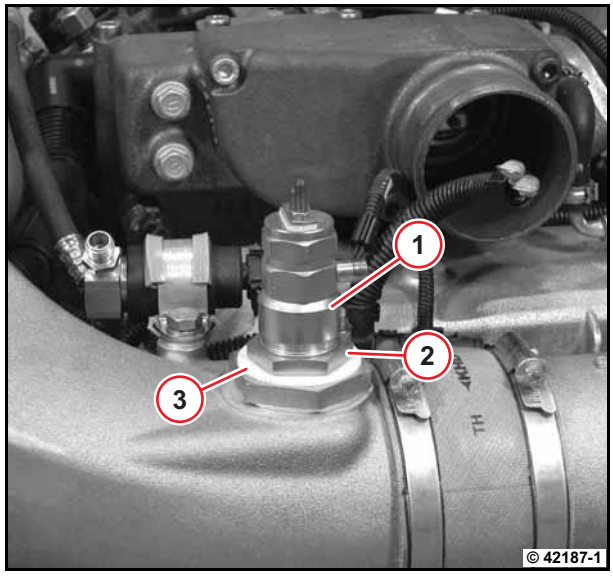


- Remove cables (1).

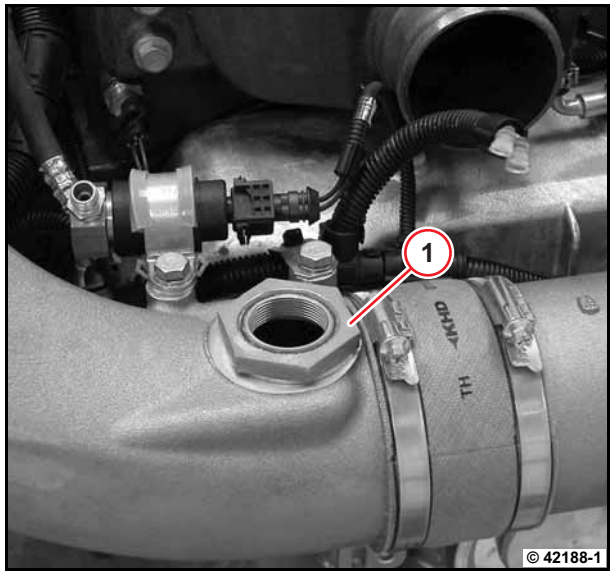
Mark assignment of cables/connections before removing.



- Loosen lock nut (2).
- Unscrew flame glow plug (1).
- Remove insulating washer (3).



- Unscrew adapter (1).
- Remove sealing ring.

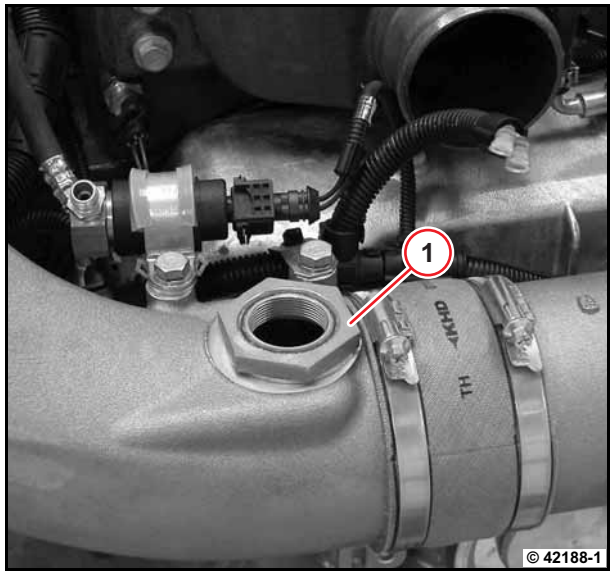


- Unscrew lock nut.
- Visually inspect the components.

Installing flame glow plug

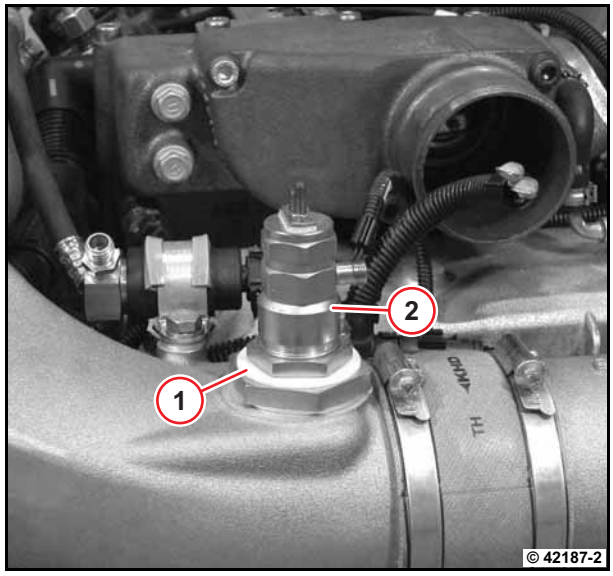
- Mount new gasket.
- Tighten adapter (1).

A07 057



- Screw on lock nut.

- Mount insulating washer (1).
- Screw in flame glow plug (2).

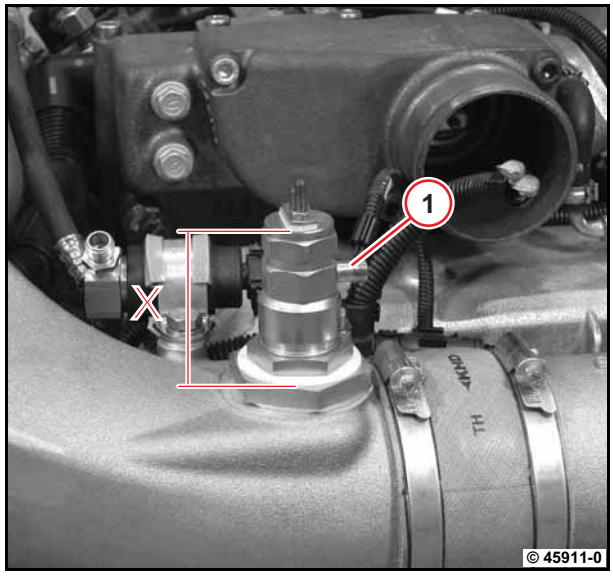


- Position flame glow plug.

P13 66

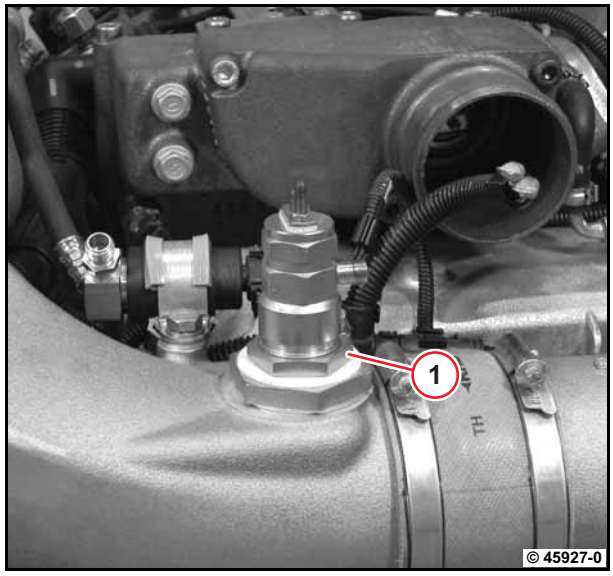
Note screw-in height dimension (X).

Screw-in nipple (1) faces crankshaft at a right angle (90°).



- Tighten lock nut (1).

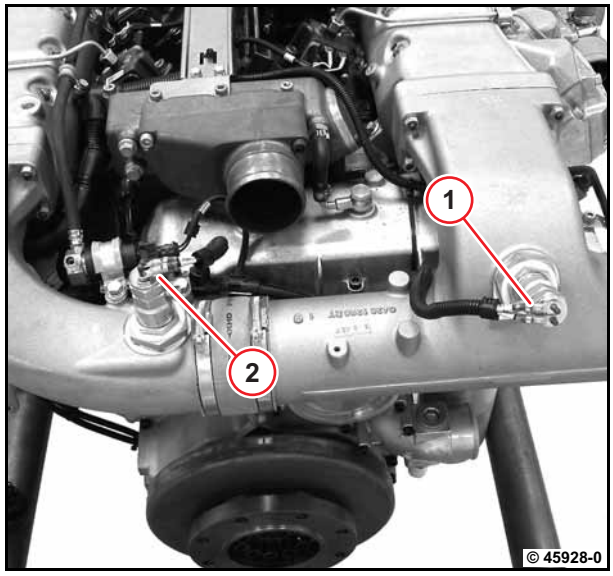
A07 059



Attention!

Note assignment and polarity of the electrical connections!

- Connect plus cable (R3.1) to flame glow plug (1).
- Connect plus cable (R3.2) to flame glow plug (2).

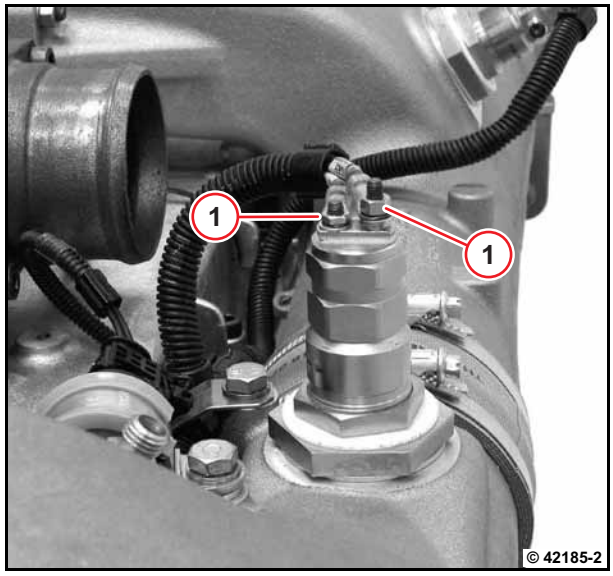


- Mount washers.
- Screw on nuts.
- Tighten nuts (1).

A13 035

- Install fuel pipes (flame glow plugs), (Railway).

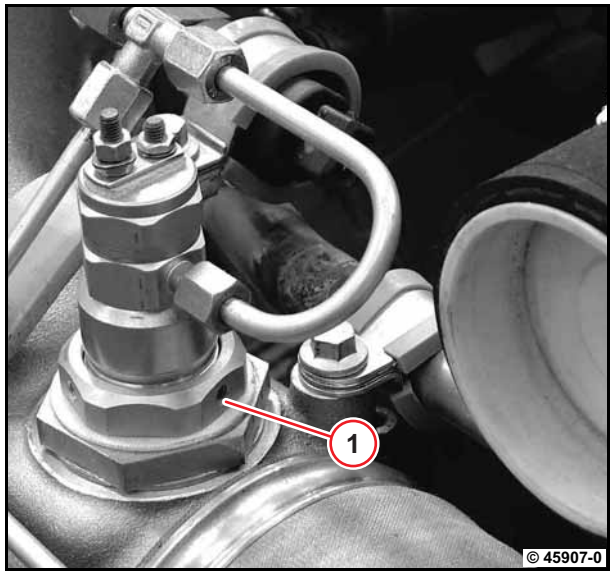
W 07-01-04



6

- Connect ground cable.
- Mount spring washer.
- Tighten screw (1).

A07 058



Removing and installing fuel shut-off valve (flame glow plugs)

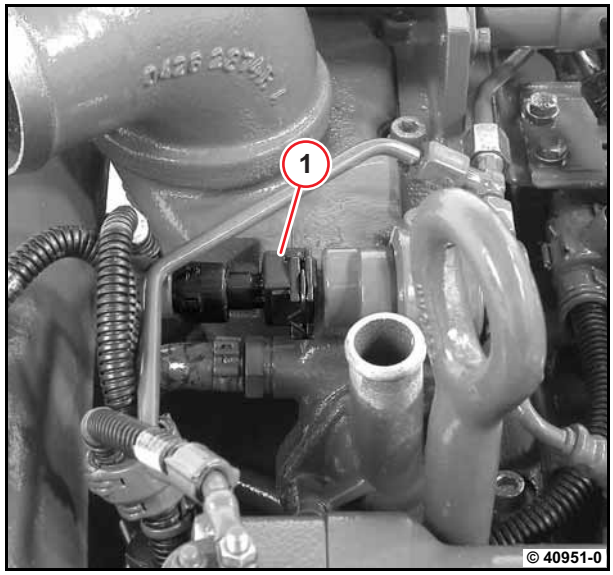
Commercial available tools

Special tools:
– Plugs/caps 170160

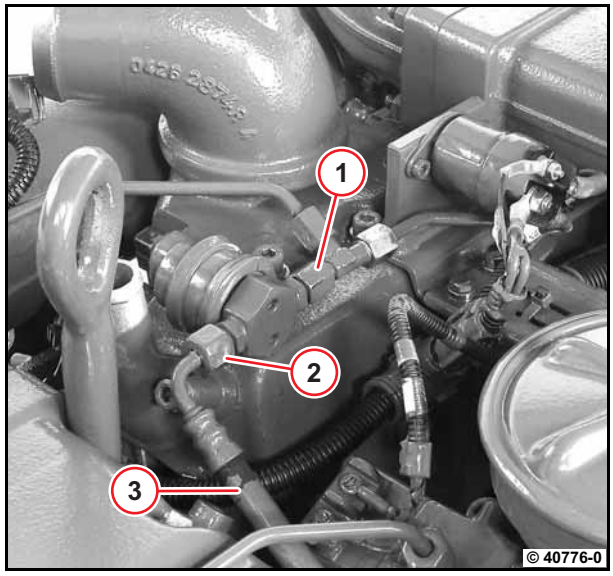
Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing fuel shut-off valve

- Unlock cable plug (1) and remove.

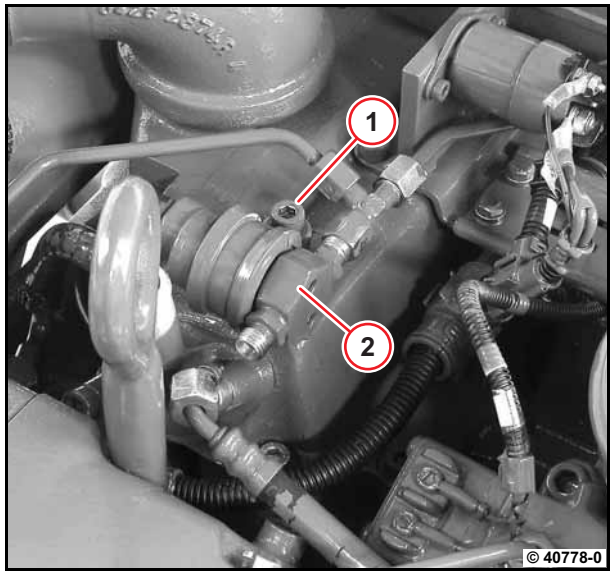


- Hold screw-in nipple.
- Unscrew lock nut (1).
- Hold screw-in nipple.
- Unscrew lock nut (2).
- Remove fuel pipe (3).

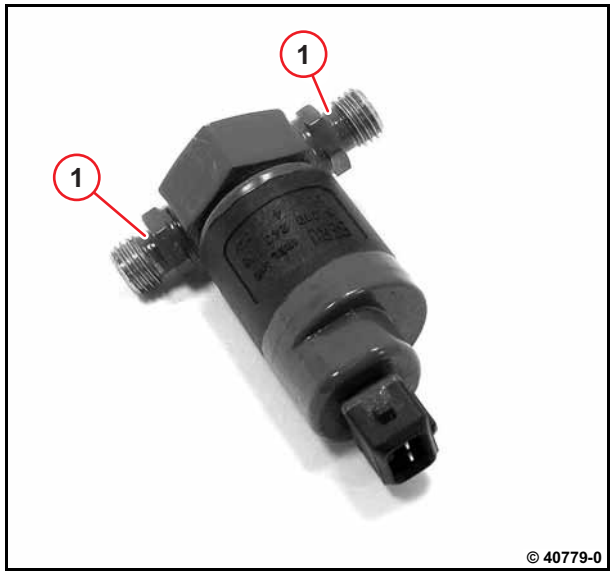


6

- Unscrew screw (1).
- Remove spacing sleeve.
- Remove fuel shut-off valve (2).
- Remove pipe clamp.



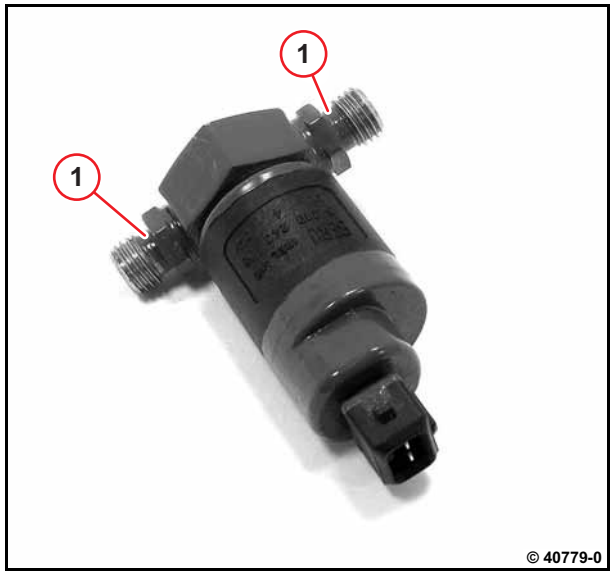
- Unscrew screw-in nipple (1).
- Visually inspect the components.



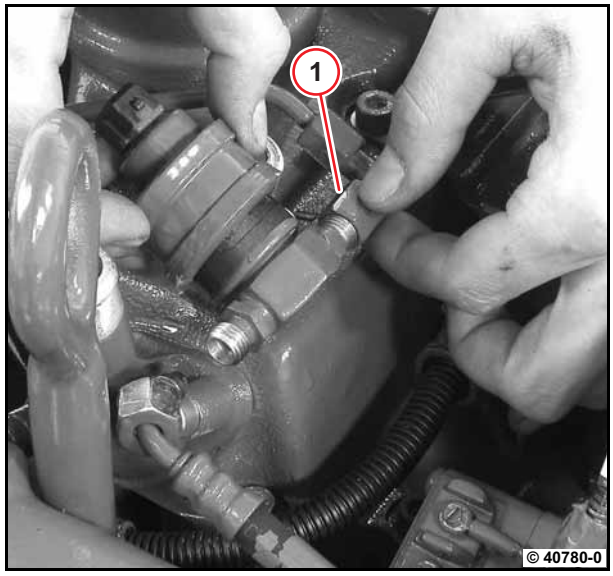
Installing fuel shut-off valve

- Tighten screw-in nipple (1).

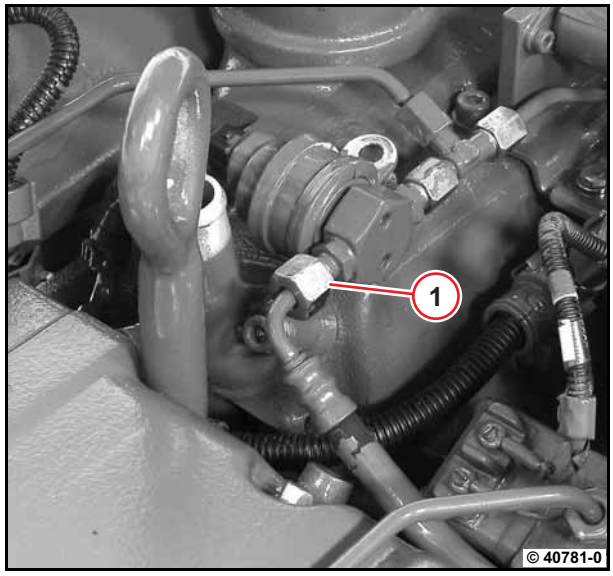
A07 068



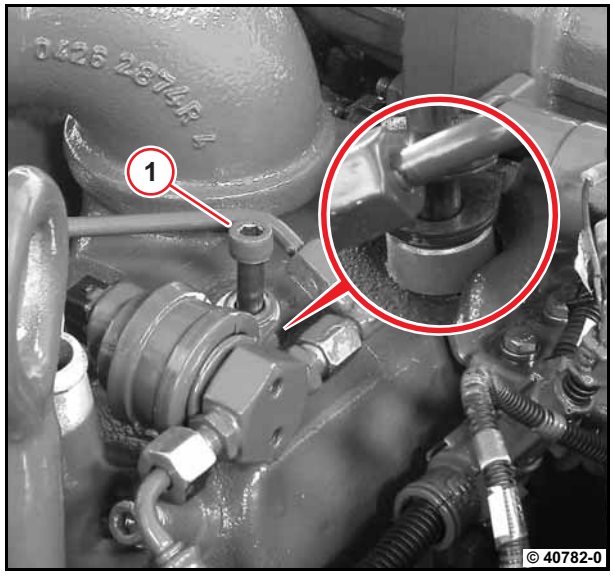
- Position pipe clamp.
- Screw on lock nut (1).



- Screw on lock nut (1).



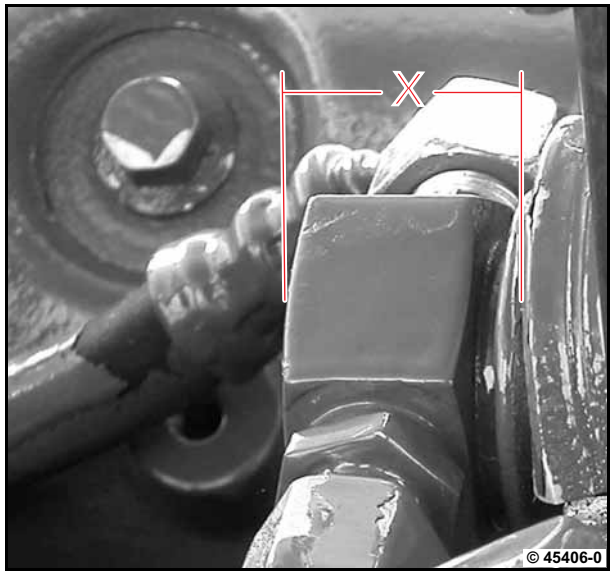
- Position spacing sleeve.
- Fasten screw (1).



- Position fuel shut-off valve.

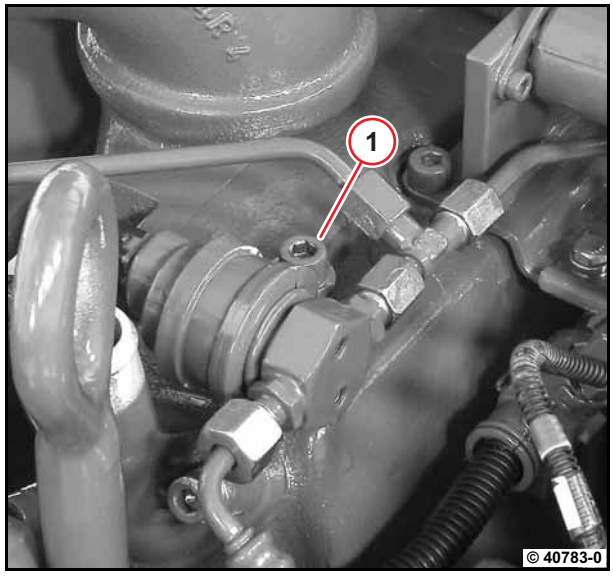
P07 91

Note installation dimensions (X).



- Tighten screw (1).

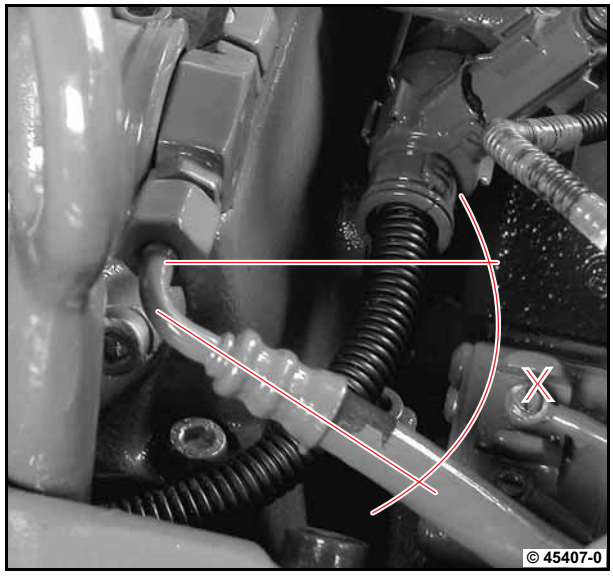
A07 093



- Position fuel pipe.

P07 92

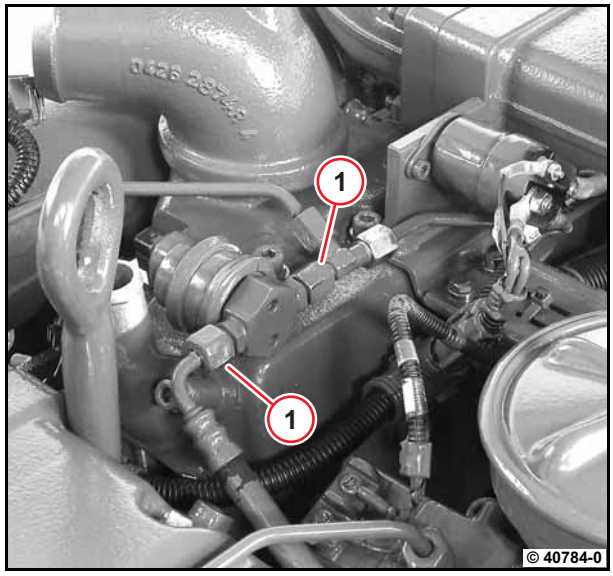
Note installation angle, dimension (X).



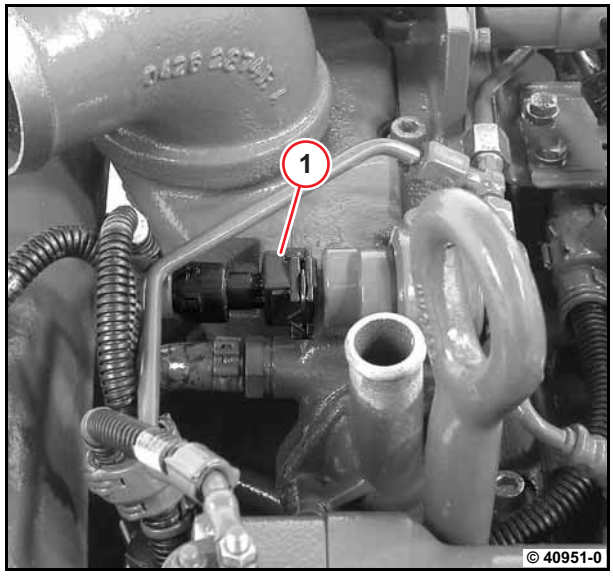
Attention!
Install fuel pipes tension free!

- Hold screw-in nipple.
- Tighten lock nuts (1).

A07 018



- Plug in the cable plug (1).



Removing and installing fuel shut-off valve (flame glow plugs)

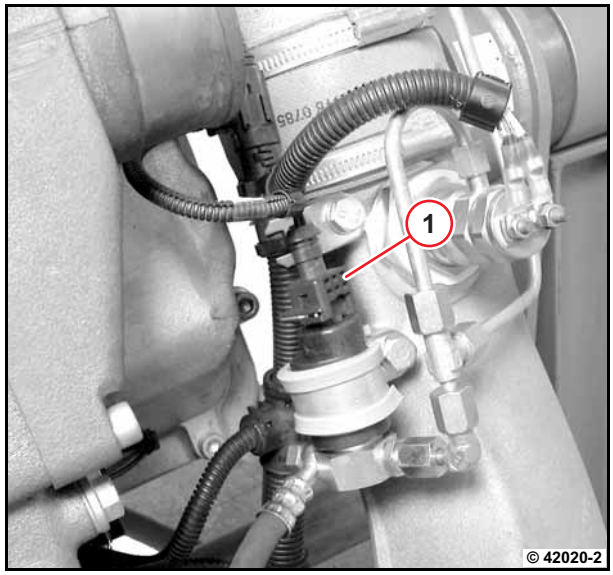
Commercial available tools

Special tools:
– Plugs/caps 170160

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing fuel shut-off valve

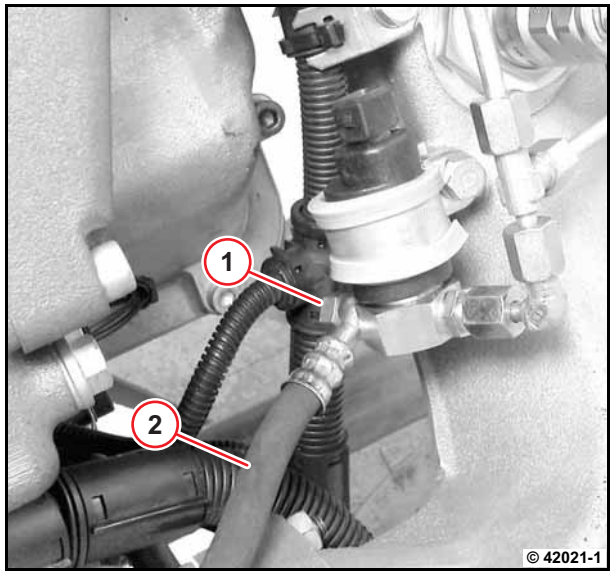
- Unlock cable plug (1) and remove.



- Unscrew hollow screw (1).
- Remove sealing rings.

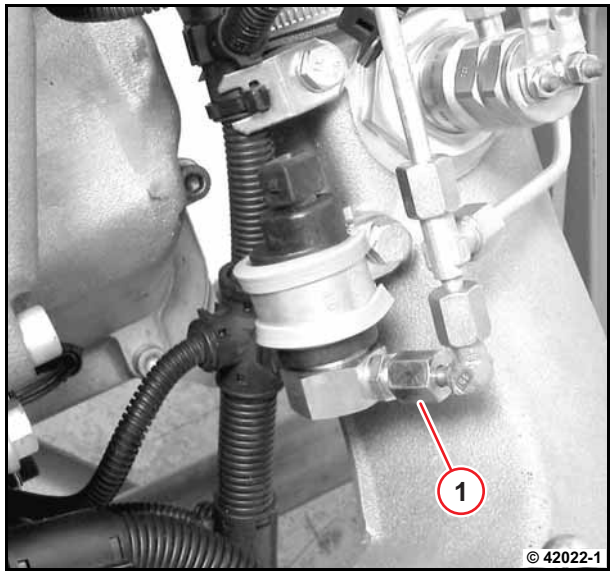
Collect draining fuel and dispose of according to regulations.

- Seal hose pipe (2).
- Place hose pipe (2) to one side.

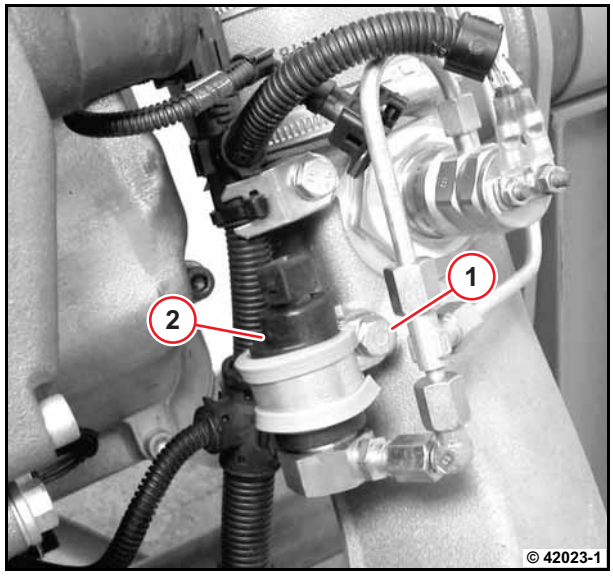


6

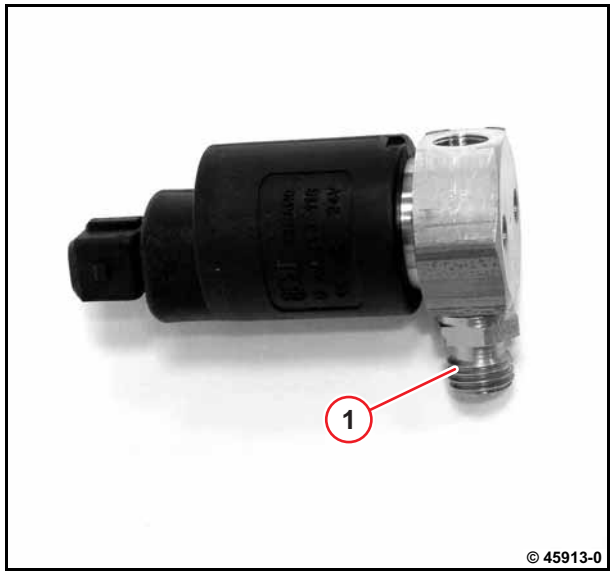
- Hold screw-in nipple.
- Unscrew lock nut (1).



- Unscrew screw (1).
- Remove fuel shut-off valve (2).
- Remove pipe clamp.



- Unscrew screw-in nipple (1).
- Visually inspect the components.

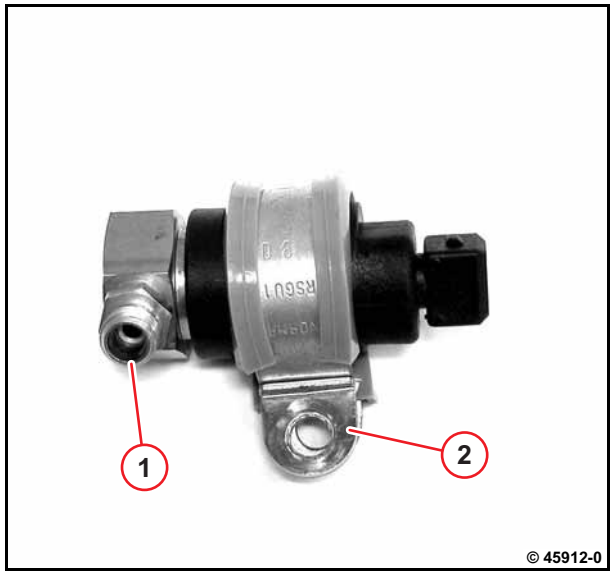


Installing fuel shut-off valve

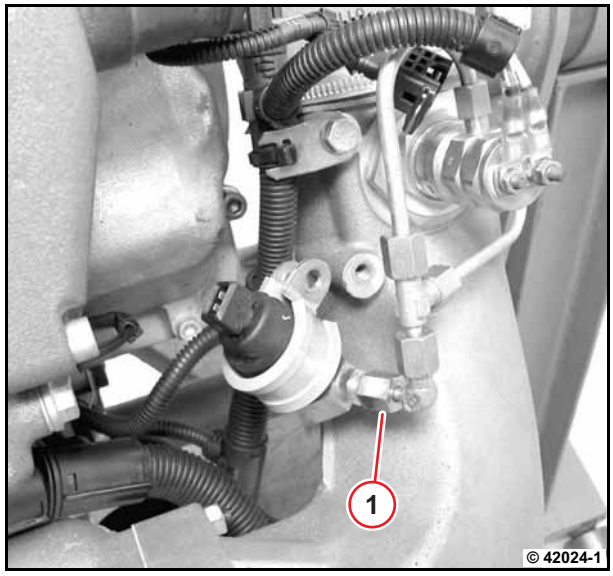
- Tighten screw-in nipple (1).

  A07 068

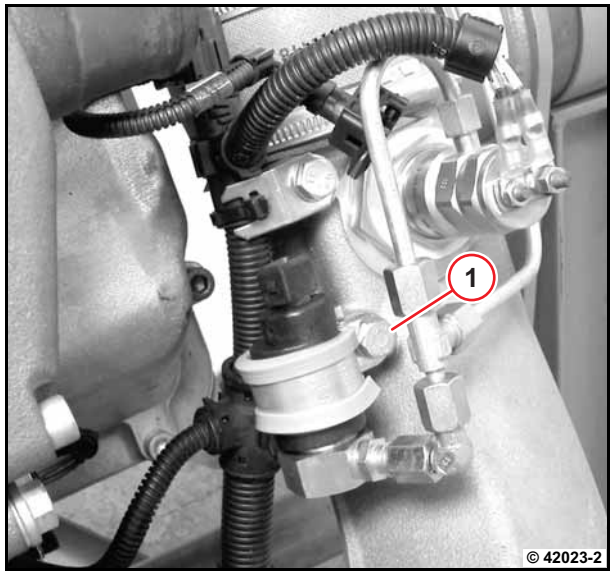
- Mount pipe clamp (2).



- Screw on lock nut (1).



- Position pipe clamp.
- Fasten screw (1).

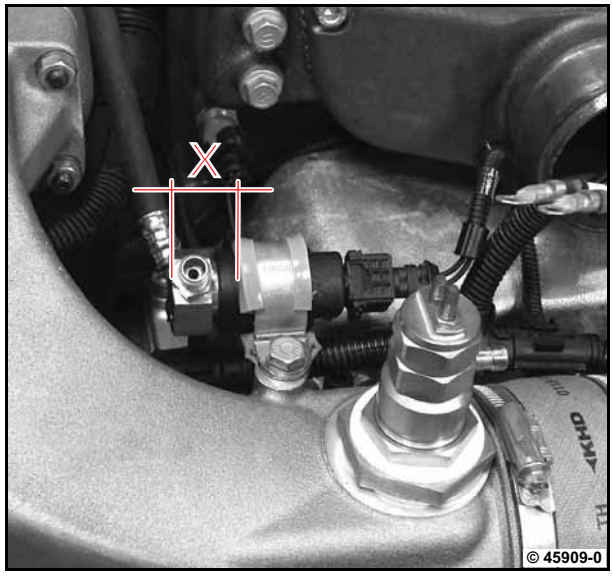


6

- Position fuel shut-off valve.

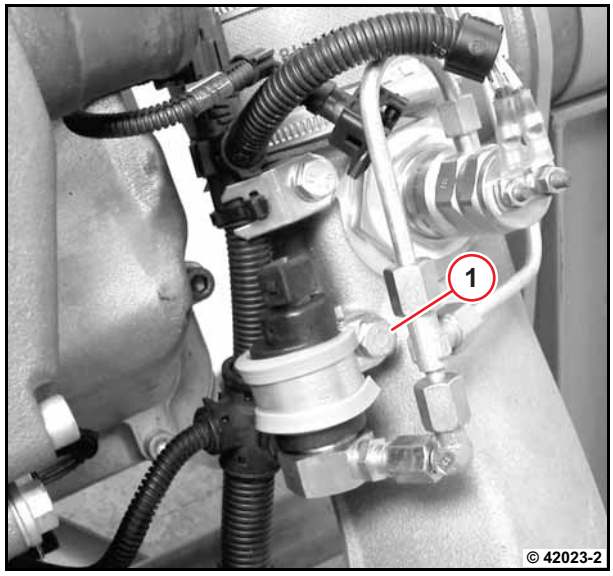
P07 91

Note installation dimensions (X).



- Tighten screw (1).

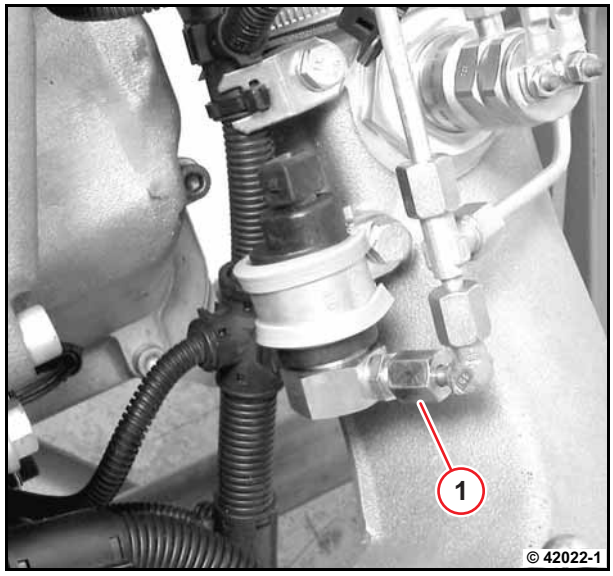
A07 093



- Hold screw-in nipple.
- Tighten lock nuts (1).

A07 018

Attention!
Install fuel pipes tension free!

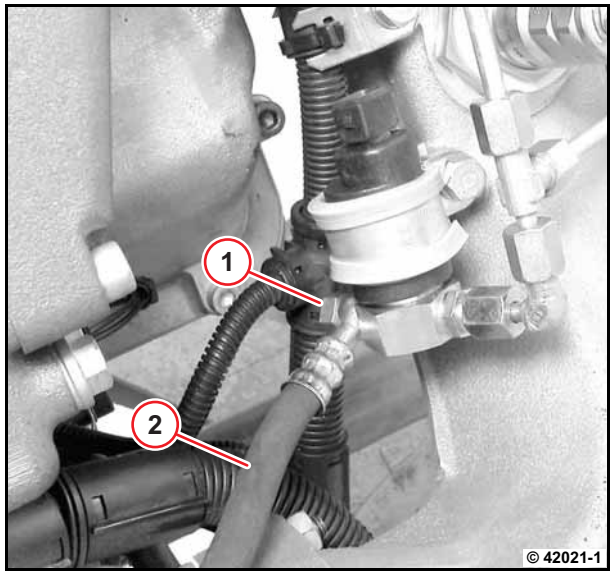


- Position hose pipe (2).

Attention!
Lay the hose pipe free from chafing and tension.

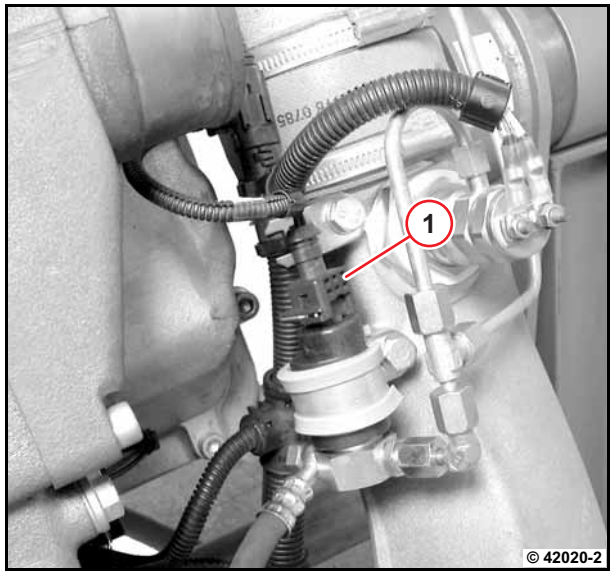
- Mount new sealing rings.
- Tighten hollow screw (1).

A12 090



- Plug in the cable plug (1).

Ensure that the cables are connected properly.



6

Removing and installing fuel pipes (flame glow plugs)

Commercial available tools

Special tools:
– Plugs/caps 170160

– W 06-02-03

Danger!
Wait 30 seconds after switching off the engine before working on the fuel system.

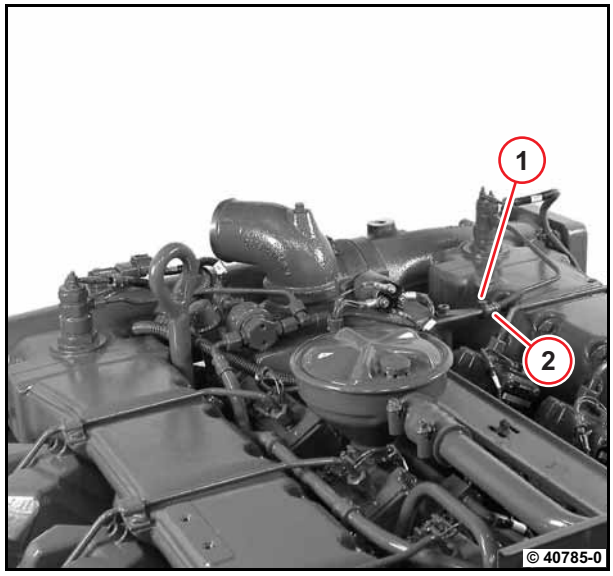
Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing fuel pipes

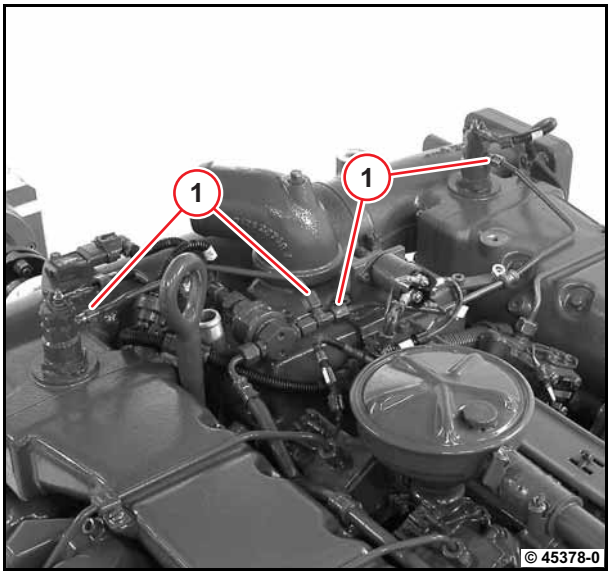
- Remove the charge air pipe.

  W 06-02-03

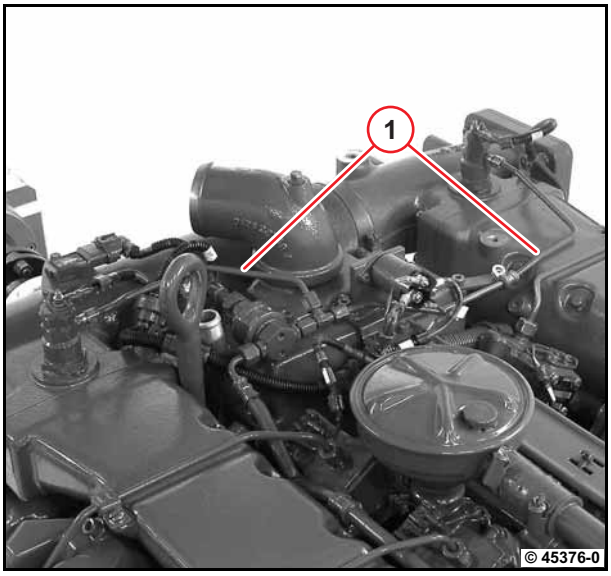
- Unscrew screw (1).
- Loosen pipe clip (2).



- Unscrew union nuts (1).



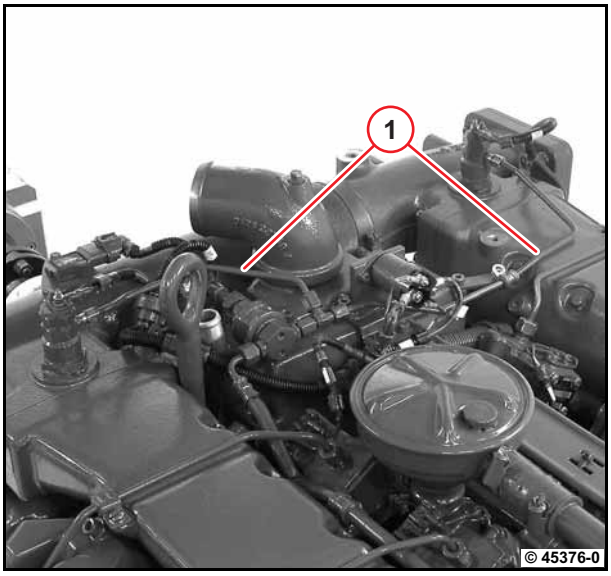
- Remove fuel pipes (1).



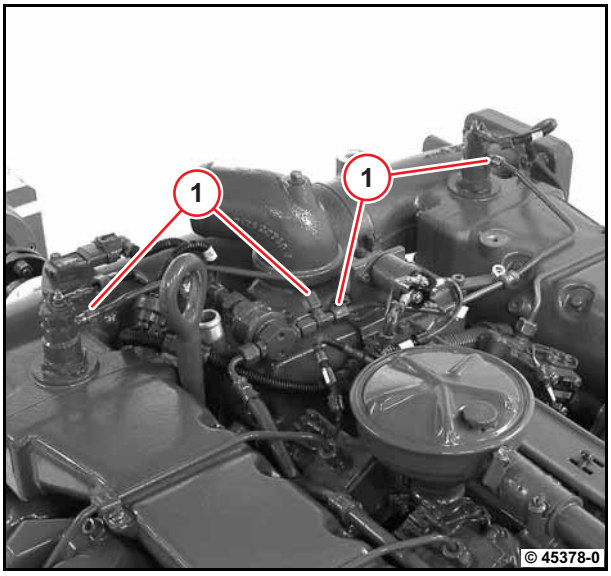
- Visually inspect the components.

Installing fuel pipes

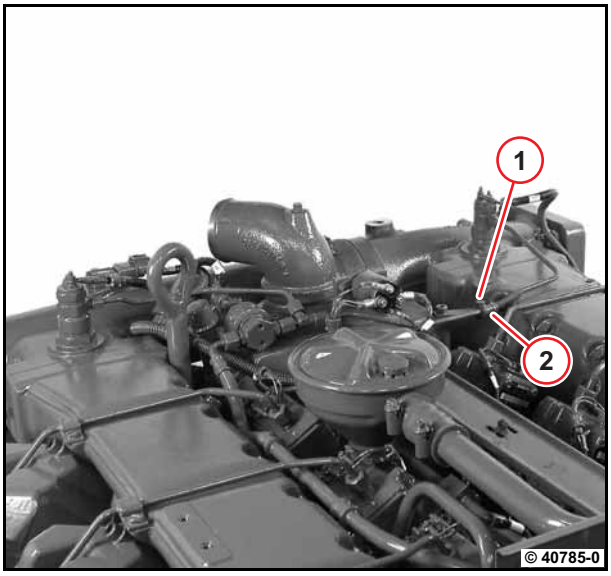
- Mount fuel pipes (1).



- Screw on union nuts (1).



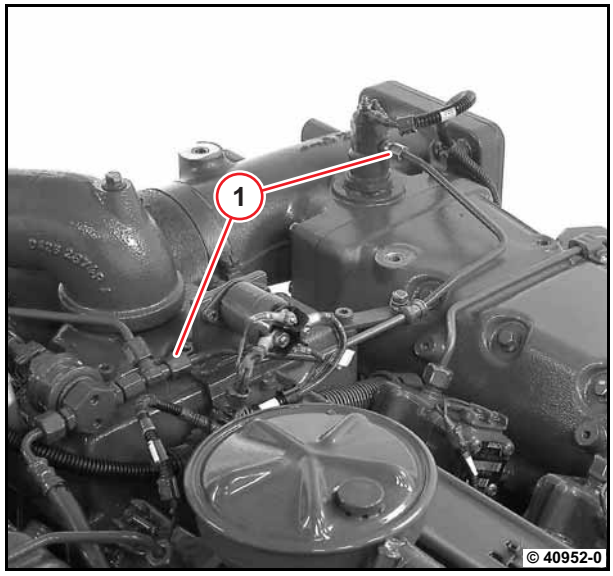
- Position pipe clamp (2).
- Fasten screw (1).



- Tighten lock nuts (1).

A12 080

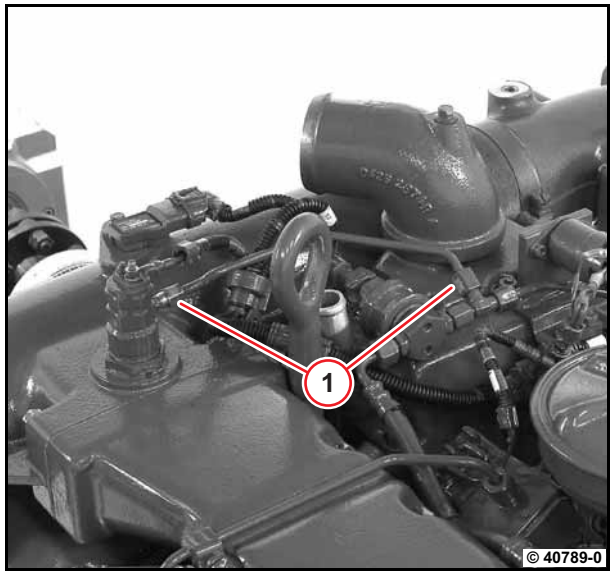
Attention!
Install fuel pipe tension free.



- Tighten lock nuts (1).

A12 080

Attention!
Install fuel pipe tension free.

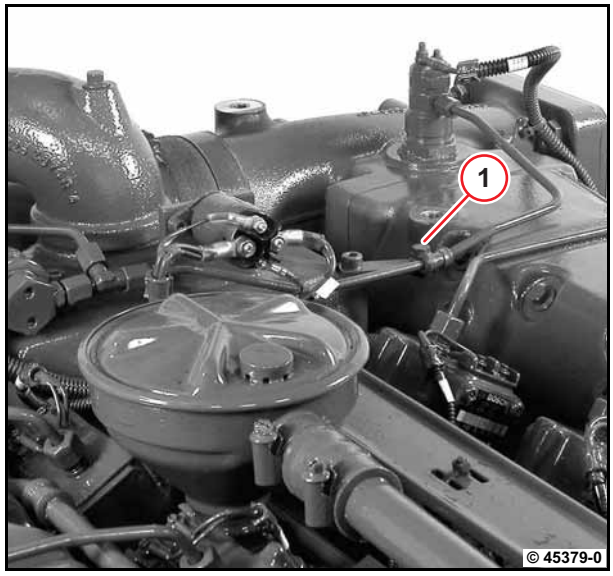


- Tighten screw (1).

A07 044

- Install the charge air pipe.

W 06-02-03



Removing and installing fuel pipes (flame glow plugs)

Commercial available tools

Special tools:
– Plugs/caps 170160

Danger!

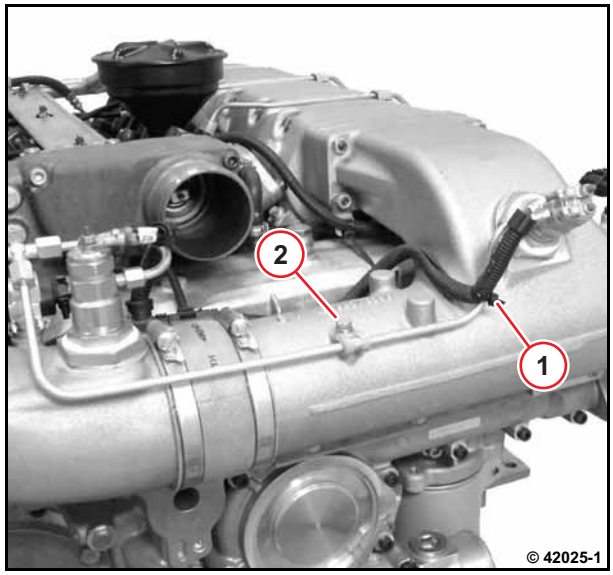
Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

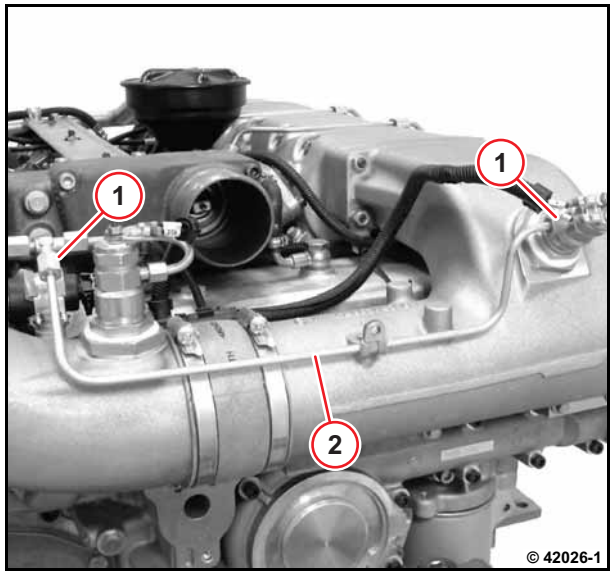
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing fuel pipes

- Remove cable tie (1).
- Unscrew screw (2).
- Loosen pipe clip.

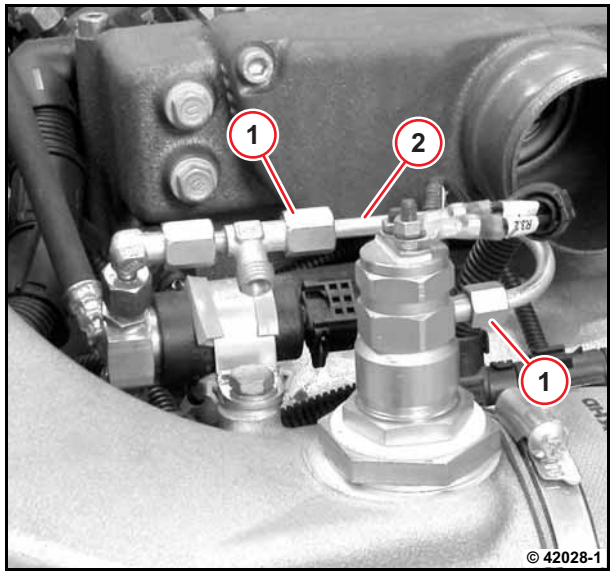


- Unscrew union nuts (1).
- Remove fuel pipe (2).

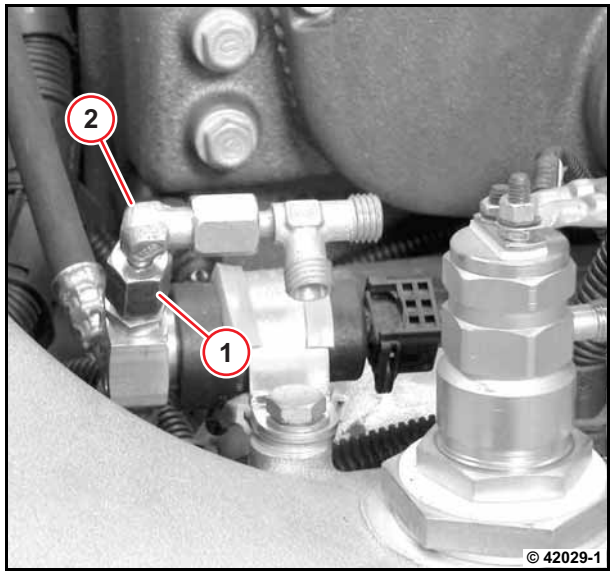


6

- Unscrew union nuts (1).
- Remove fuel pipe (2).



- Hold screw-in nipple.
- Unscrew lock nut (1).
- Remove distributor (2).
- Visually inspect the components.

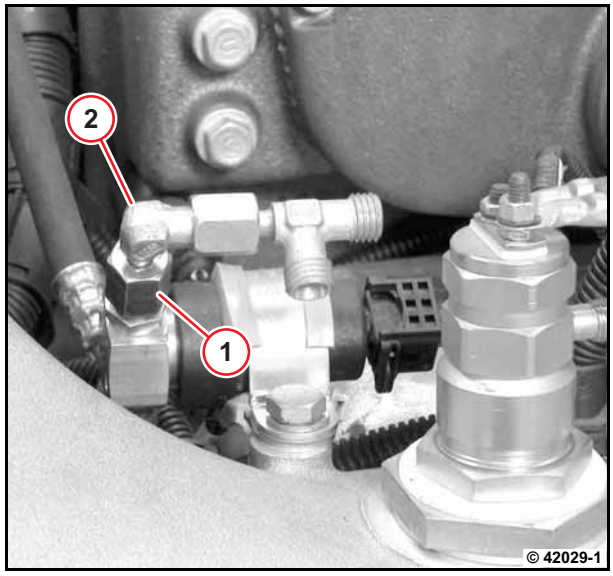


Installing fuel pipes

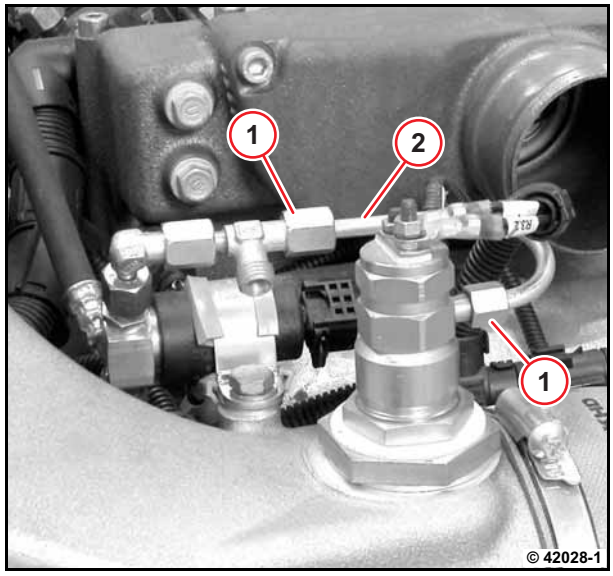
- Mount distributor (2).

Note installation position.

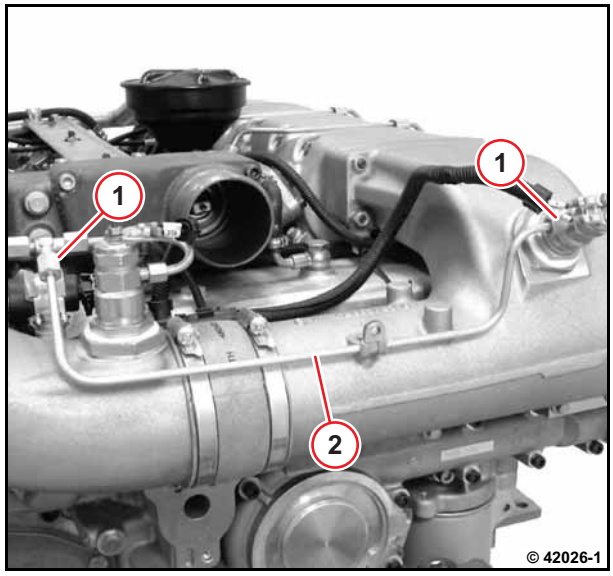
- Screw on lock nut (1).



- Mount fuel pipe (2).
- Screw on union nuts (1).



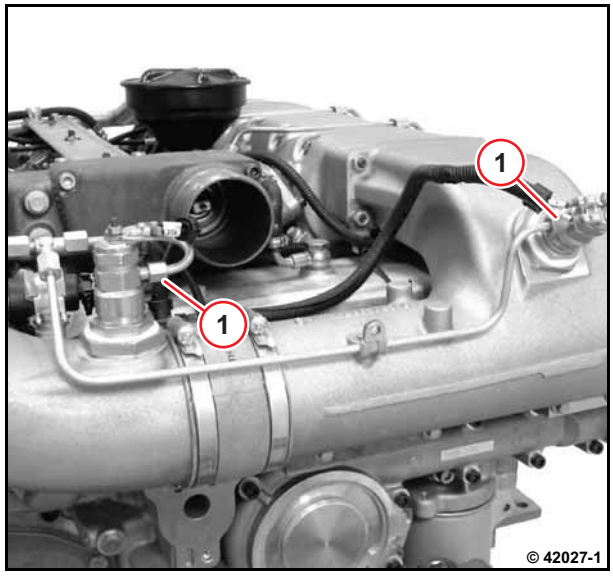
- Mount fuel pipe (2).
- Screw on union nuts (1).



Attention!
Install fuel pipe tension free.

- Tighten lock nuts (1).

A12 080



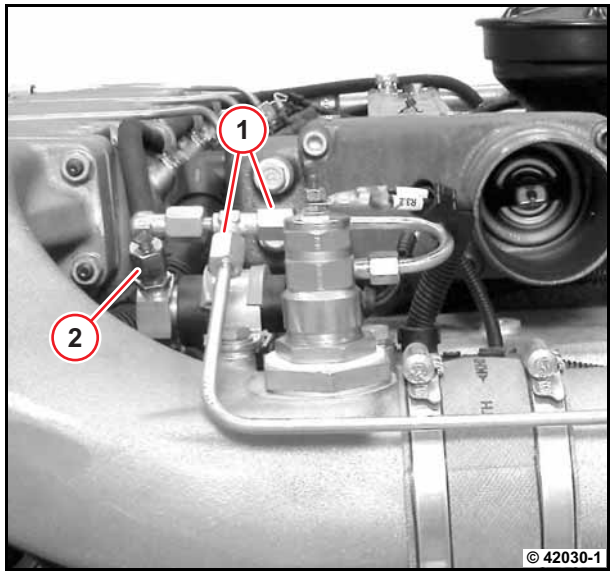
Attention!
Install fuel pipe tension free.

- Tighten lock nuts (1).

A12 080

- Hold screw-in nipple.
- Tighten lock nut (2).

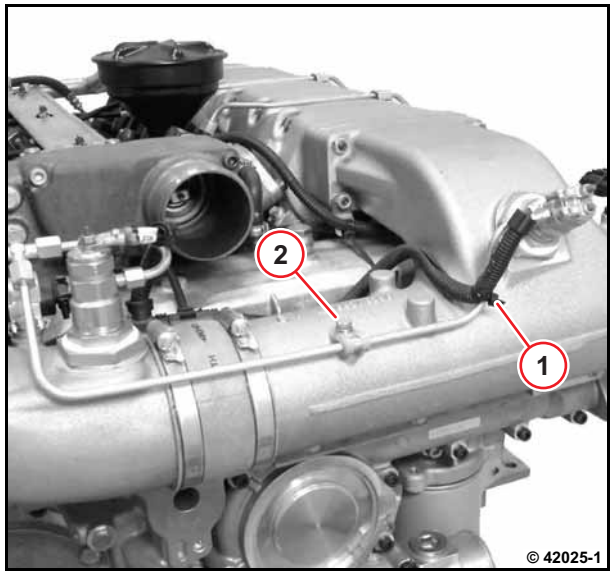
A07 018



- Position pipe clip.
- Tighten screw (2).

A07 044

- Lay cable harness and fix with cable tie (1).



Renewing injection pipes (A-bank)

Commercial available tools:
– Dog wrench. 8018

Special tools:
– Plugs/caps 170160

Danger!

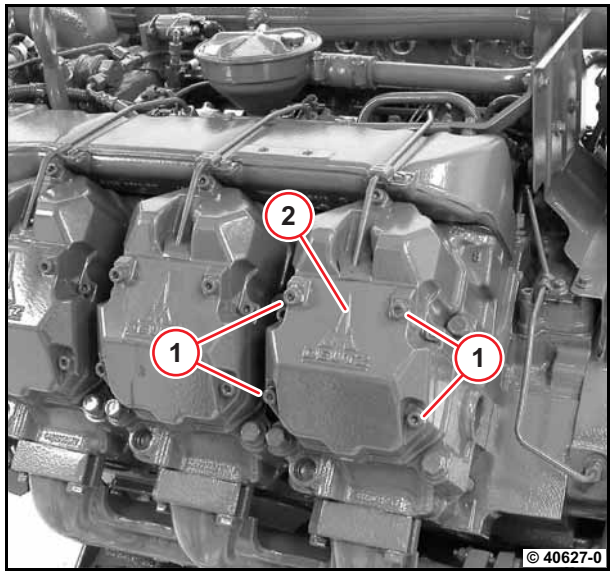
Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

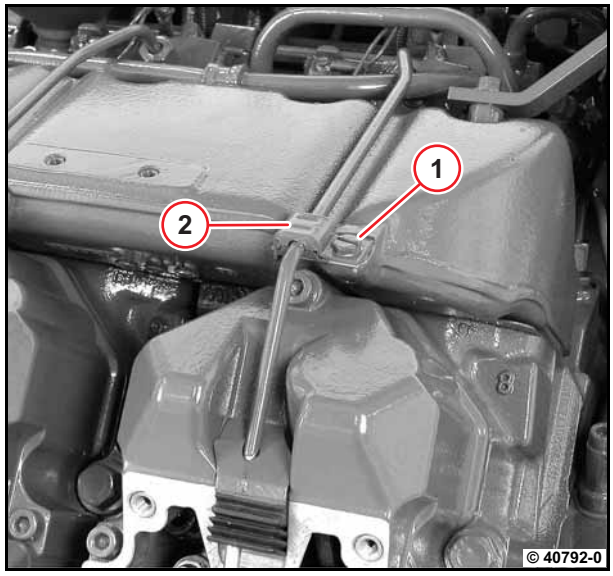
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.
Injection pipes may not be bent.

Removing injection pipes

- Unscrew screws (1).
- Remove cylinder head cover (2).
- Remove gasket.



- Unscrew screw (1).
- Remove pipe clamp (2).

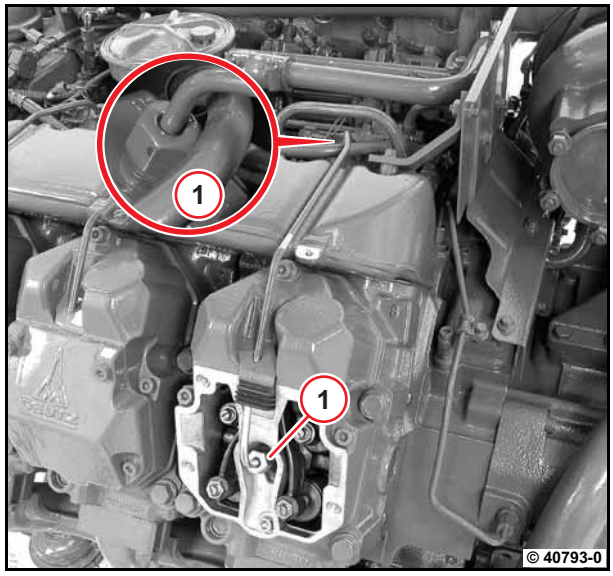


6

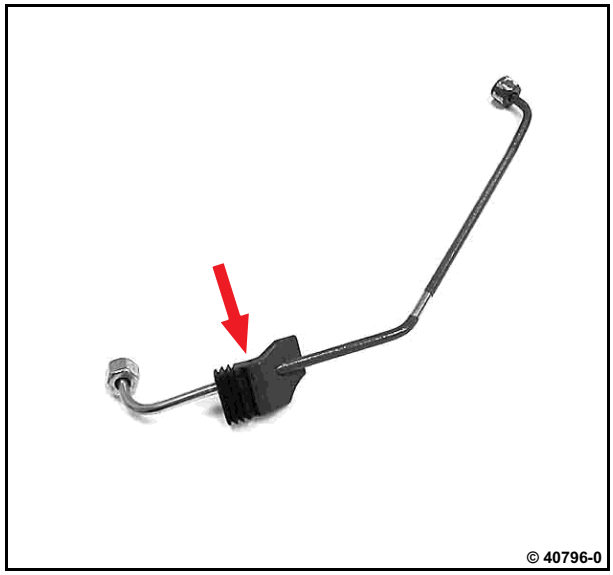
- Unscrew lock nuts (1) with dog wrench.
- Remove injection line.

Lay out components in the order in which they should be installed.

Note cylinder assignment.



- Visually inspect the components.
- Renew damaged profile washers.

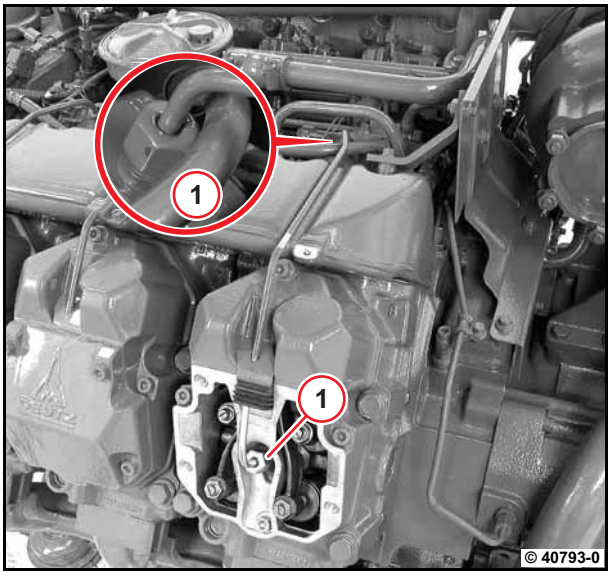


Installing injection pipes

- Mount new injection pipe.
- Screw on union nuts (1).

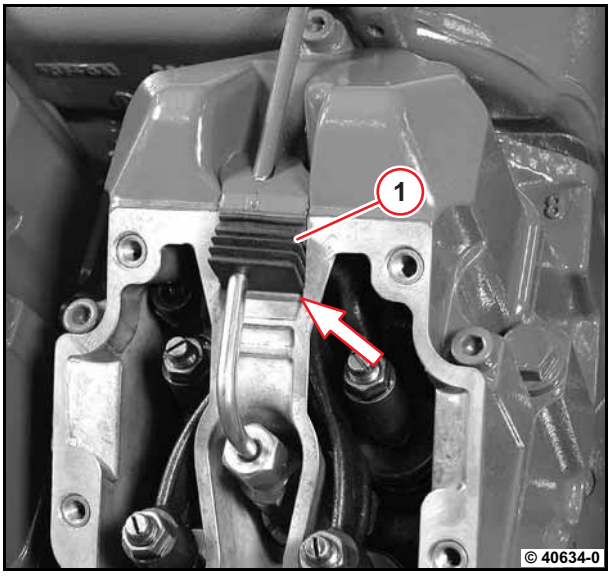
Attention!
Install injection pipes without tension!

Note assignment and installation position of the injection lines.



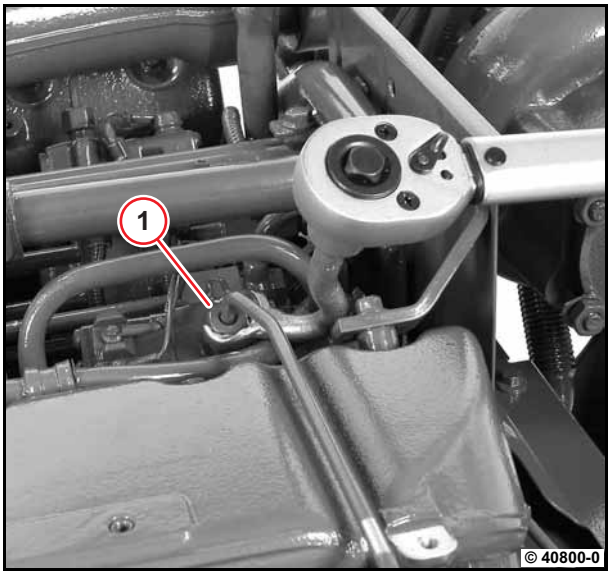
- Oil the injection pipe in the area of the profile washer (1).
- Position profile washer (1).

The profile washer must be at the upper web (arrow) of the cylinder head cowling.



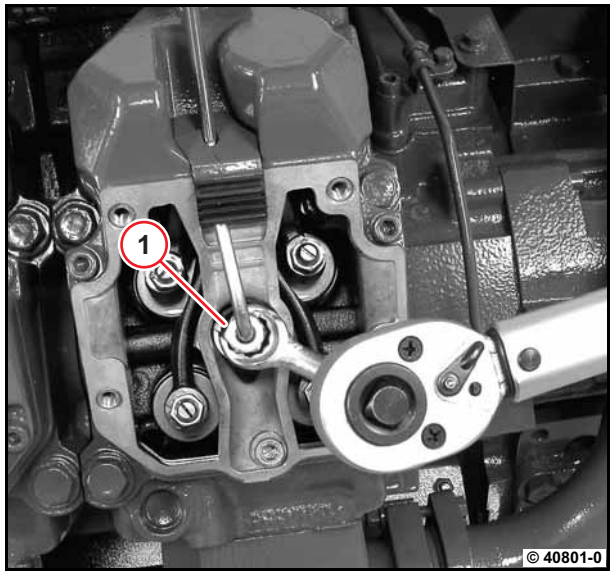
- Tighten lock nuts (1) with dog wrench.

A07 003



- Tighten lock nuts (1) with dog wrench.

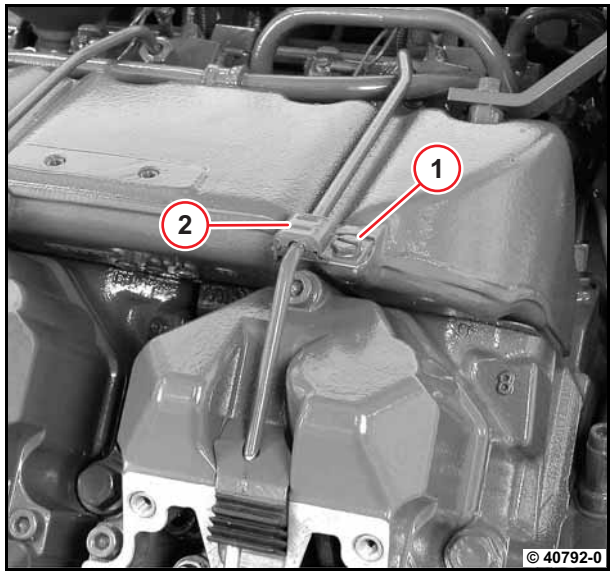
A07 003



6

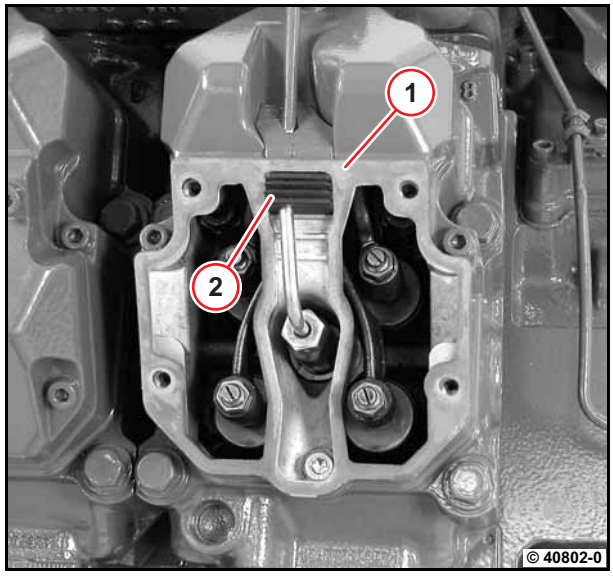
- Position pipe clamp (2).
- Tighten screw (1).

A07 006



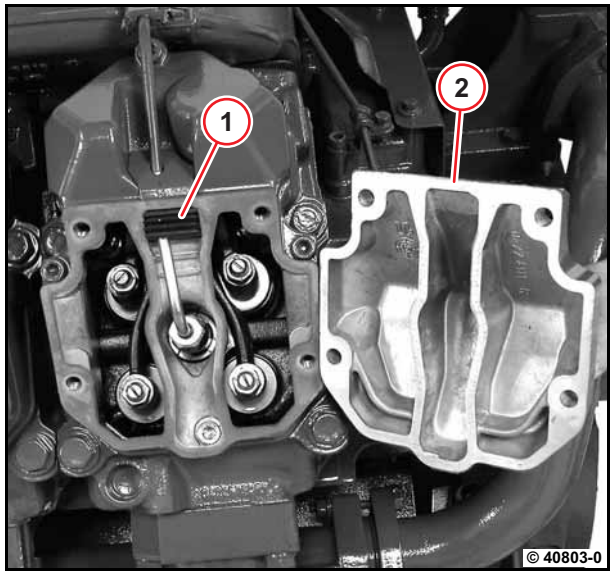
- Clean sealing surfaces.
- Mount new gasket (1).

Note installation position.
Position gasket over the profile washer (2).



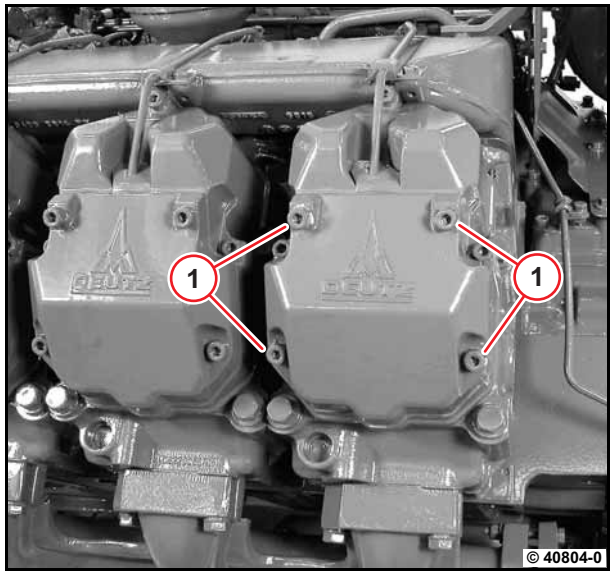
- Mount cylinder head cover.

Profile washer (1) may not be trapped underneath the sealing surface (2) of the cylinder head cover.



- Lightly oil screws (1).
- Tighten screws (1).

A01 005



Renewing injection pipes (B-bank)

Commercial available tools:
– Dog wrench. 8018

Special tools:
– Plugs/caps 170160

– W 06-02-03

Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.
Injection pipes may not be bent.

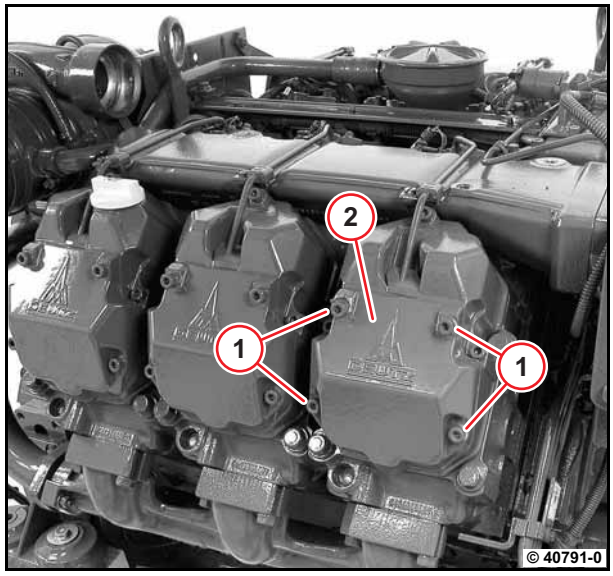
6

Removing injection pipes

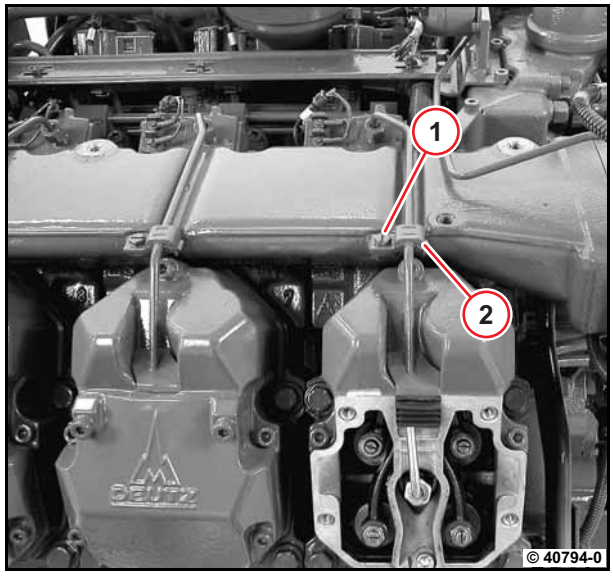
- Remove the charge air pipe.

  W 06-02-03

- Unscrew screws (1).
- Remove cylinder head cover (2).
- Remove gasket.



- Unscrew screw (1).
- Remove pipe clamp (2).

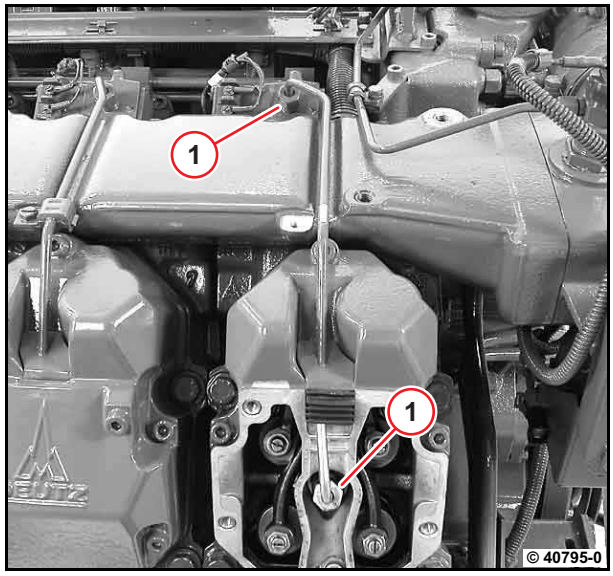


6

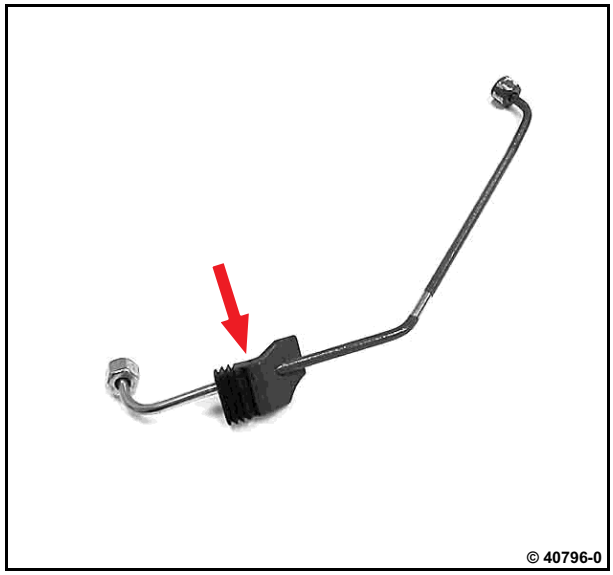
- Unscrew lock nuts (1) with dog wrench.
- Remove injection line.

Lay out components in the order in which they should be installed.

Note cylinder assignment.



- Visually inspect the components.
- Renew damaged profile washers.

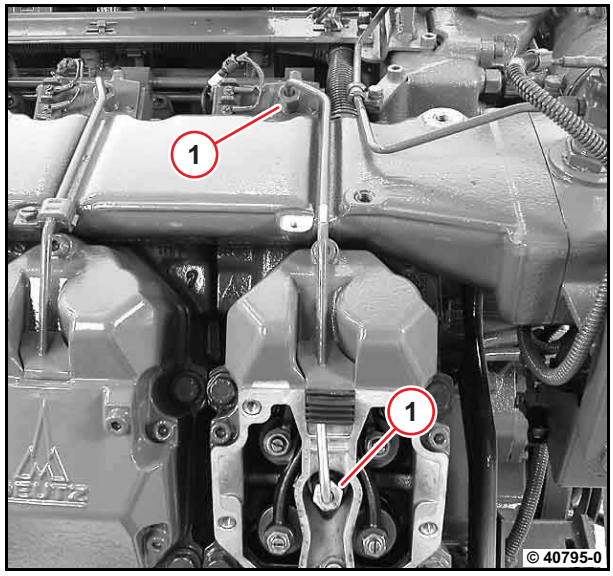


Installing injection pipes

- Mount new injection pipe.
- Screw on union nuts (1).

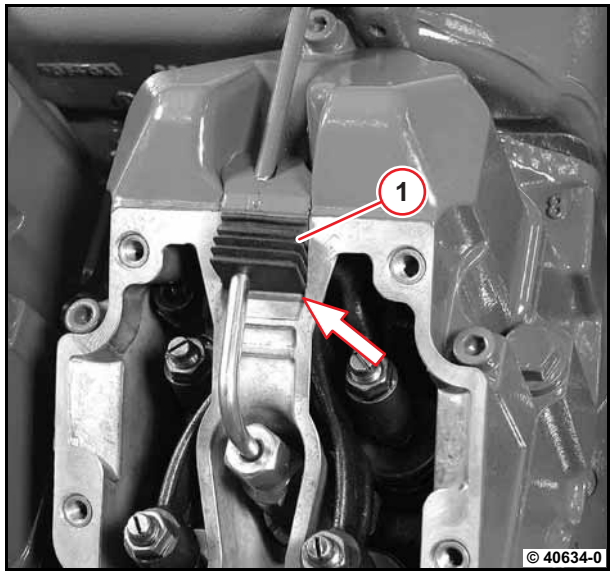
Attention!
Install injection pipes without tension!

Note assignment and installation position of the injection lines.



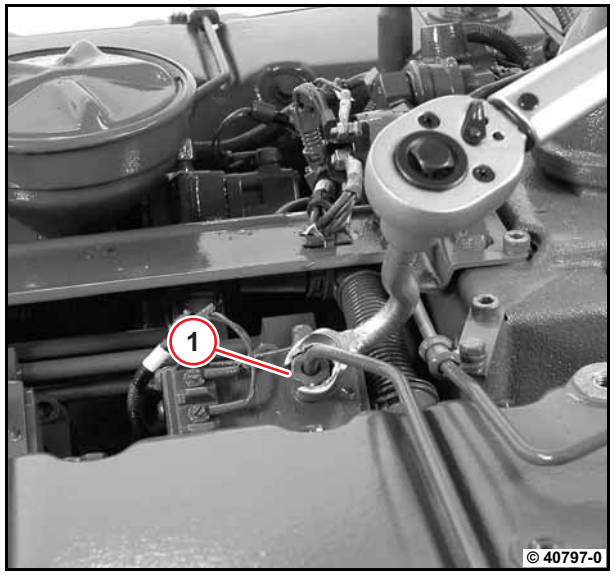
- Oil the injection pipe in the area of the profile washer (1).
- Position profile washer (1).

The profile washer must be at the upper web (arrow) of the cylinder head cowling.



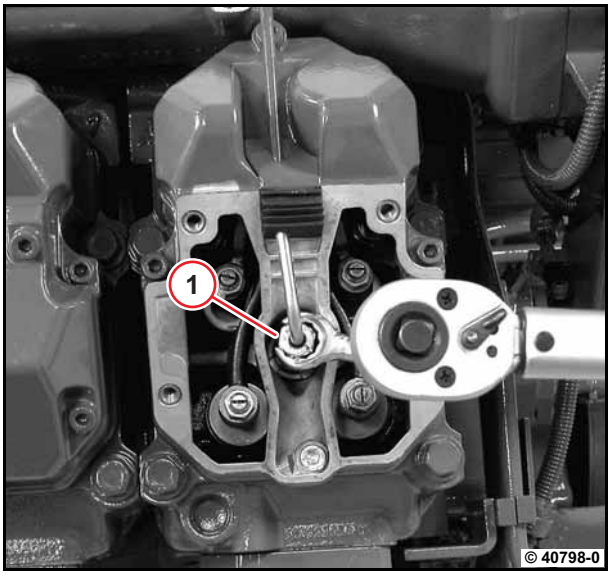
- Tighten lock nuts (1) with dog wrench.

A07 003



- Tighten lock nuts (1) with dog wrench.

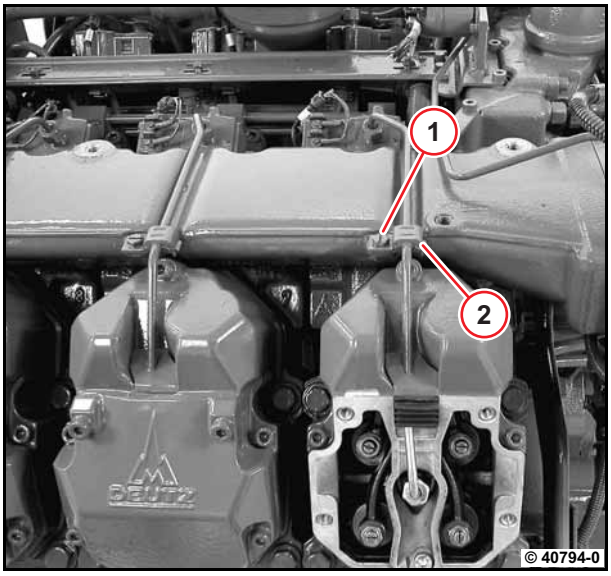
A07 003



6

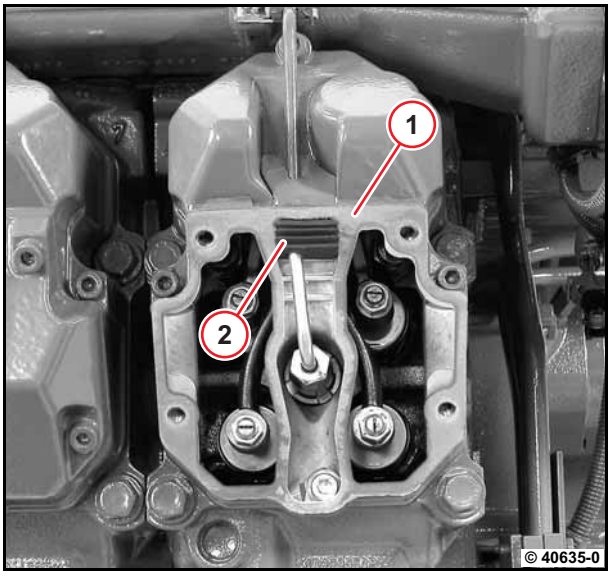
- Position pipe clamp (2).
- Tighten screw (1).

A07 006



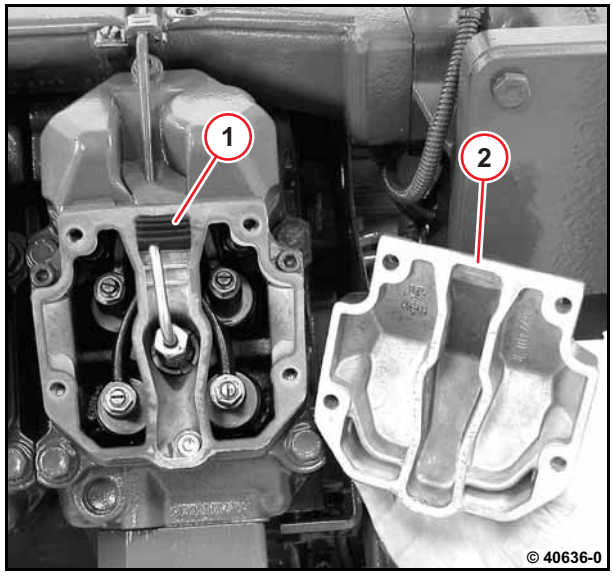
- Clean sealing surfaces.
- Mount new gasket (1).

Note installation position.
Position gasket over the profile washer (2).



- Mount cylinder head cover.

Profile washer (1) may not be trapped underneath the sealing surface (2) of the cylinder head cover.

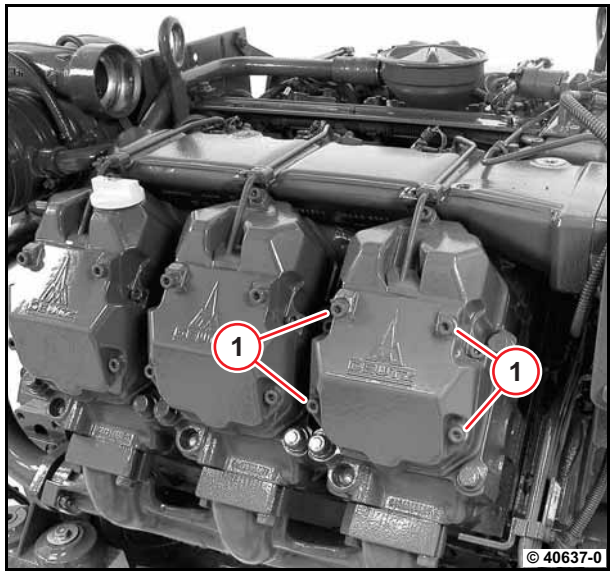


- Lightly oil screws (1).
- Tighten screws (1).

A01 005

- Install the charge air pipe.

W 06-02-03



6

Removing and installating injection pumps. (Cylinder A1)

Commercial available tools:
– Open wrench size SW 22

Special tools:
– Plugs/caps 170160

– Locking agent
DEUTZ DW 59

– W 04-06-03
– W 06-07-03 . . . . . (A-bank)
– W 07-10-06
– W 07-10-06 . . . . . (Railway)

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Read out error memory of the motor control timer with SERDIA.

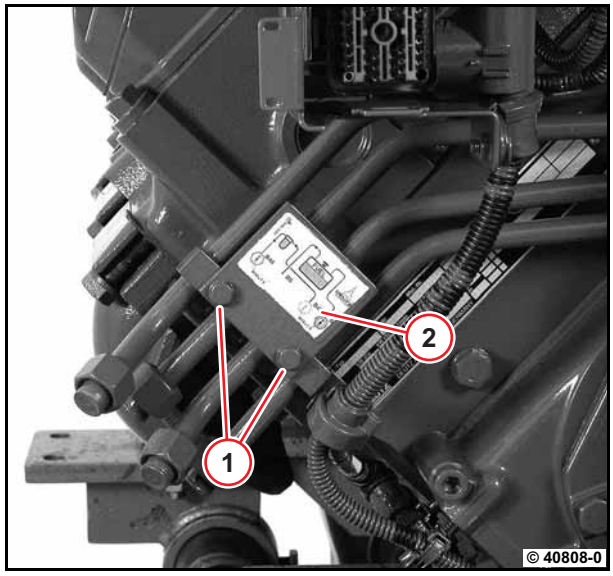
Removing the fuel injector pump

- Remove charge air pipe (A-bank).

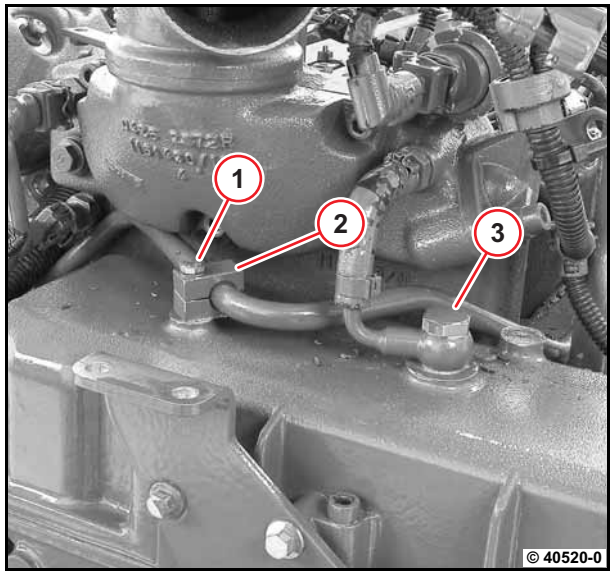
  W 06-07-03

6

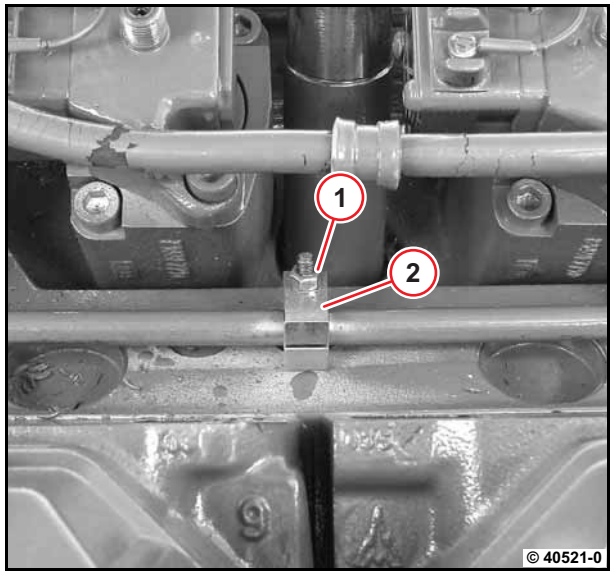
- Unscrew screws (1).
- Remove the holder (2).



- Unscrew screw (1).
- Remove the holder (2).
- Unscrew hollow screw (3).
- Remove sealing rings.



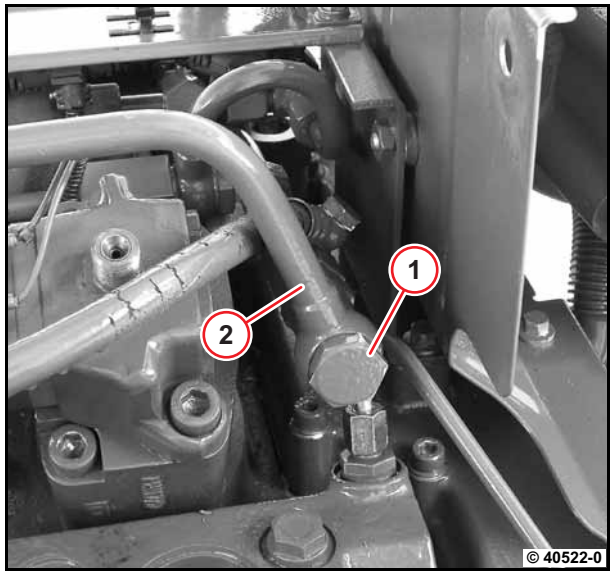
- Unscrew nut (1).
- Remove the holder (2).



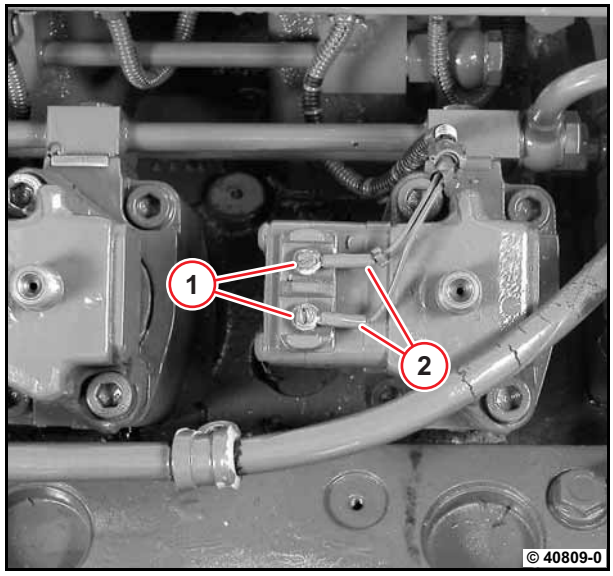
- Unscrew hollow screw (1).

Hold overflow valve.

- Remove fuel pipe (2).
- Remove sealing rings.



- Loosen screws (1).
- Pull off cables (2).

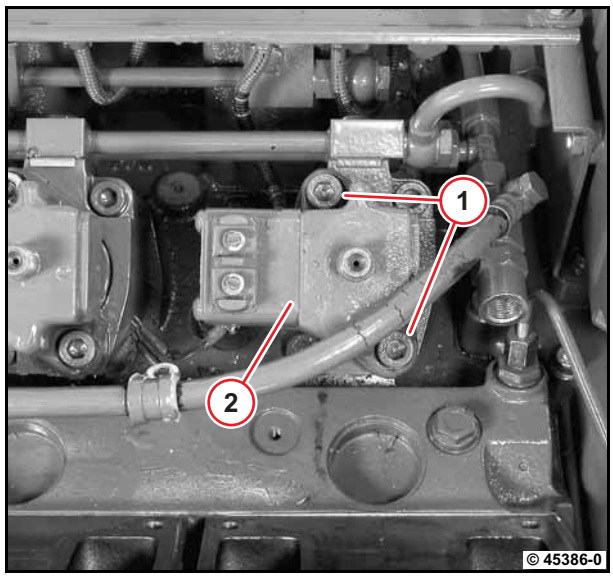


- Unscrew screws (1).

Loosen screws evenly to avoid jamming the injection pump.

- Remove fuel injector pump(2).

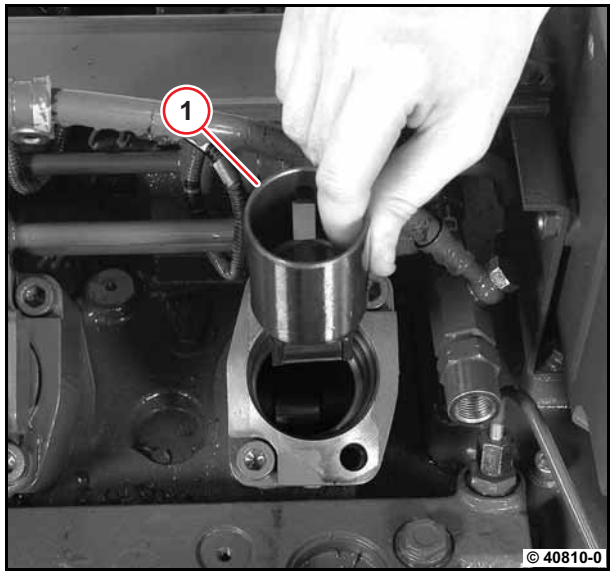
Lay out components in the order in which they should be installed.



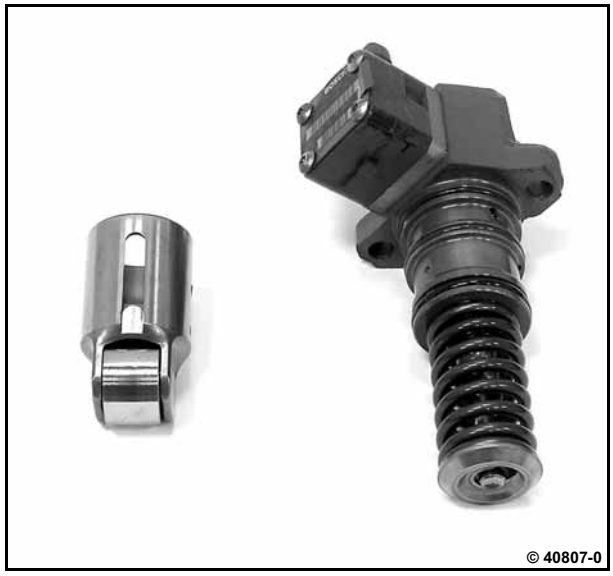
- Pull out roller tappet (1).

Attention!
Do not damage the roller tappet!

Lay out components in the order in which they should be installed.



- Visually inspect the components.



Removing injection pump housing

- Remove fuel pipes.

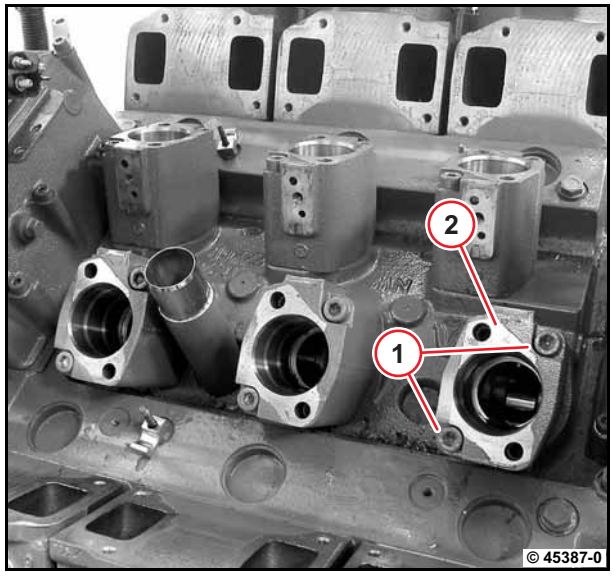
W 07-10-06

- Remove fuel pipes (Railway).

W 07-10-06

- Unscrew screws (1).
- Remove injection pump housing (2).

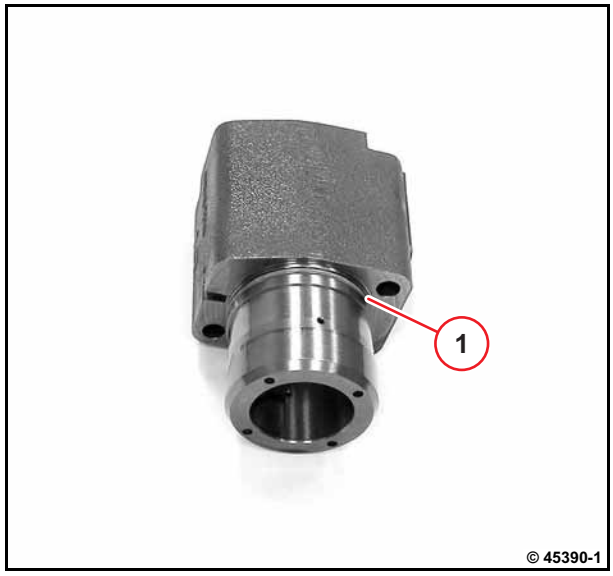
Lay out components in the order in which they should be installed.
Note cylinder assignment.



- Visually inspect the components.

Installing injection pump housing

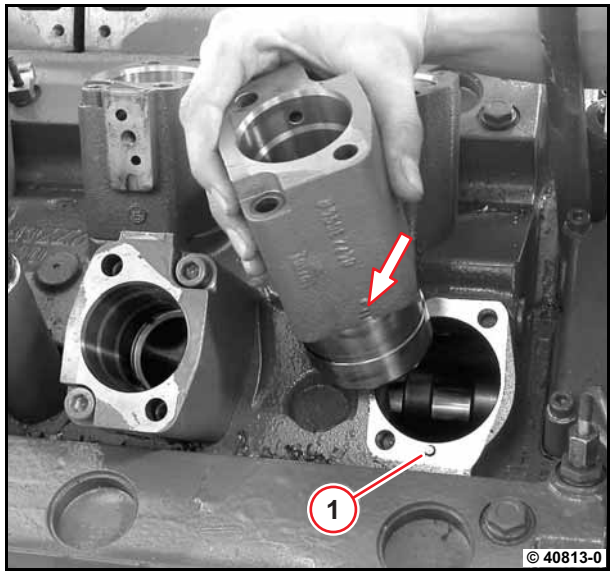
- Clean contact surfaces.
- Mount new O-ring (1).



- Oil the shank of the injection pump housing lightly.
- Press the injection pump housing into the stop in the crankcase.

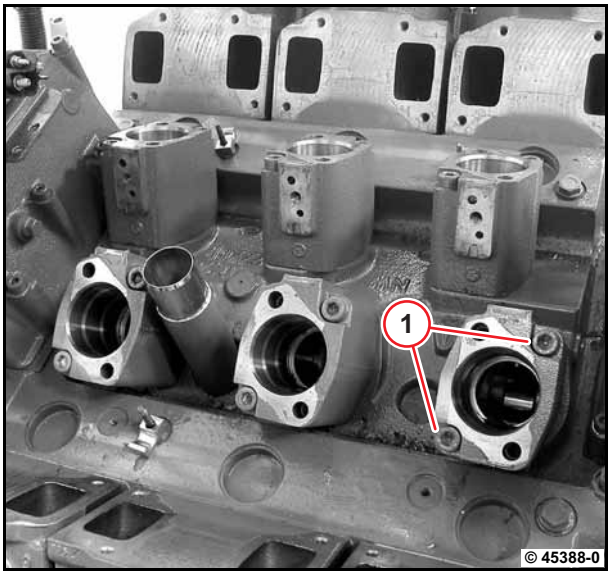
Note cylinder assignment.

The pilot pin (1) must lock in groove (arrow).



- Lightly oil screws (1).
- Tighten screws (1).

A07 009



6

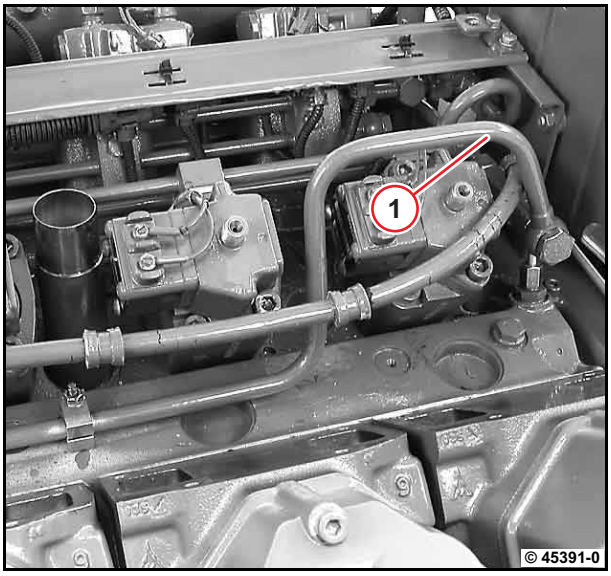
- Install fuel pipes.

W 07-10-06

- Install fuel pipes (Railway).

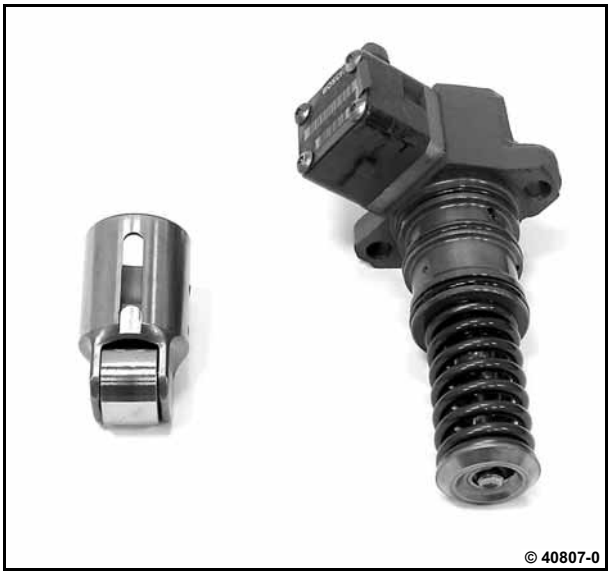
W 07-10-06

Do not install fuel pipe (1).
Do not install charge air pipe (A-bank).



Installing the fuel injector pump

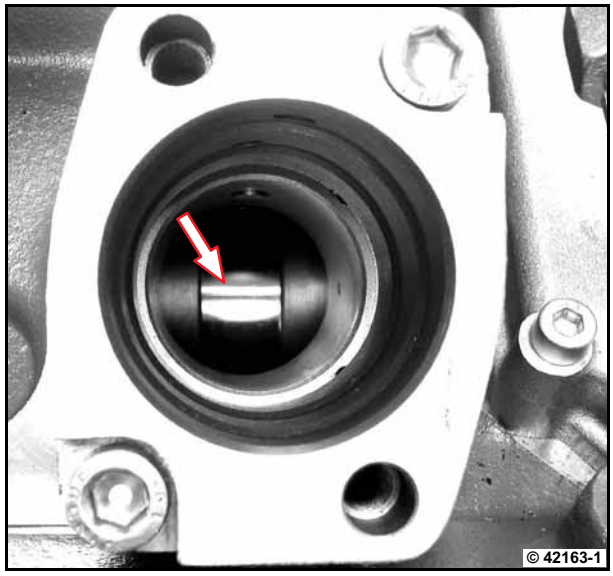
Note the assignment of the injection pump/ roller tappet when replacing the injection pump and/or roller tappet.



- Attach turning gear.

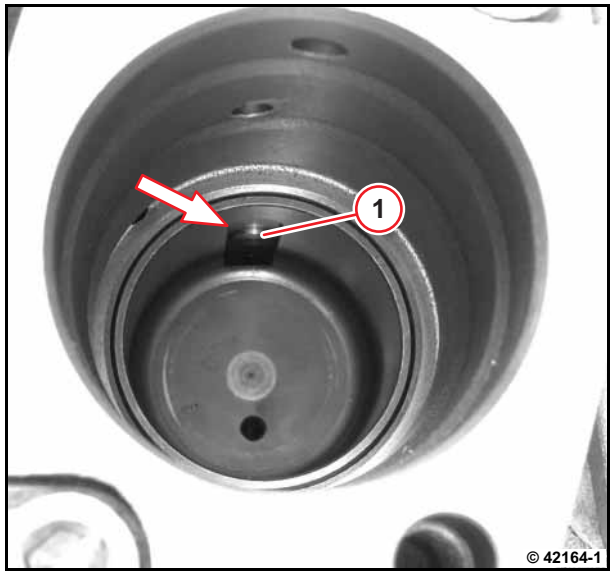
W 04-06-03

- Turn the injection pump camshaft with the turning gear until the cam for the injection pump is on the cam base circle (arrow).

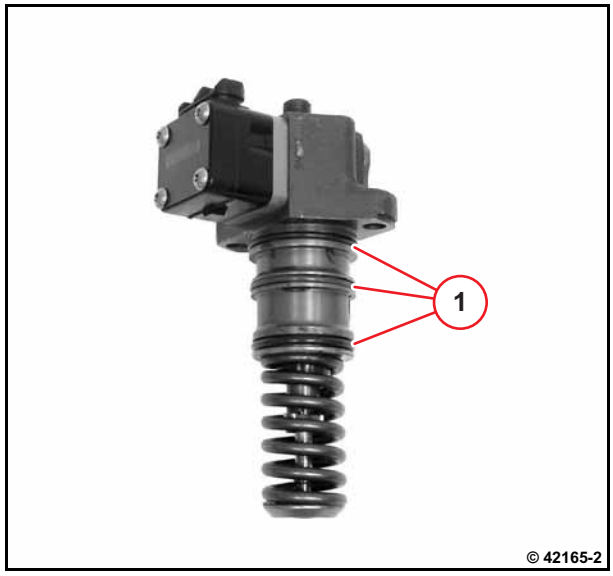


- Oil the roller tappet lightly.
- Insert roller tappet.

The pilot pin (1) must lock in groove (arrow).



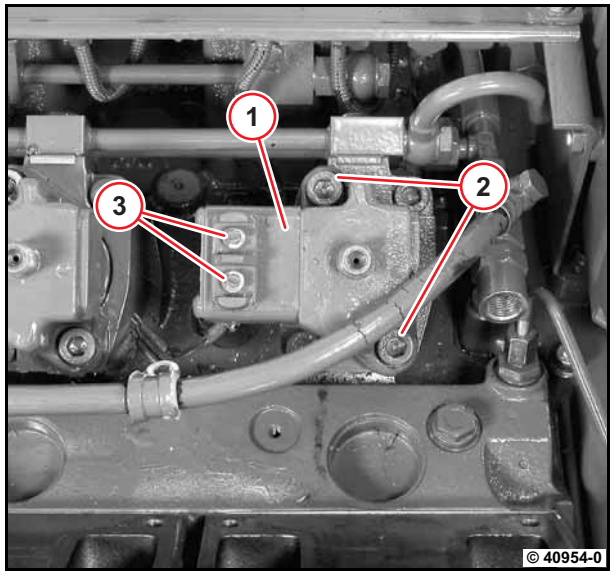
- Mount new O-rings (1).
- Oil O-rings lightly.



- Insert injection pump (1).

The cable connections (3) of the injection pumps must face the genset support.

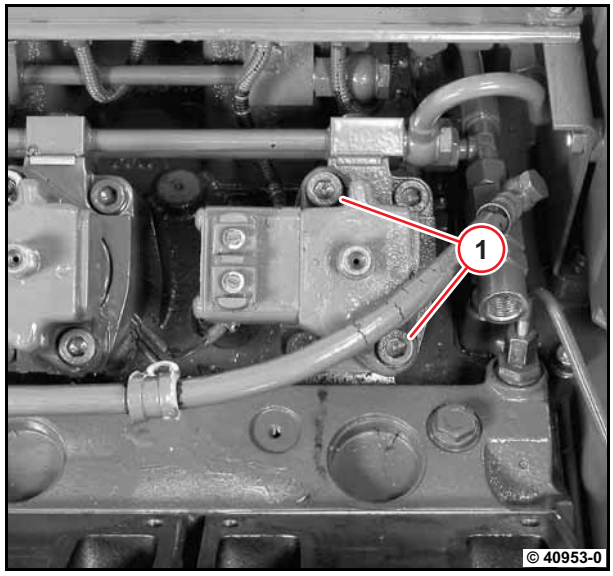
- Lightly oil screws (2).
- Tighten screws (2).



- Tighten screws (1) alternately.

A07 012

Attention!
Do not turn the camshaft until all the injection pumps are installed. Danger of breaking the tappet!



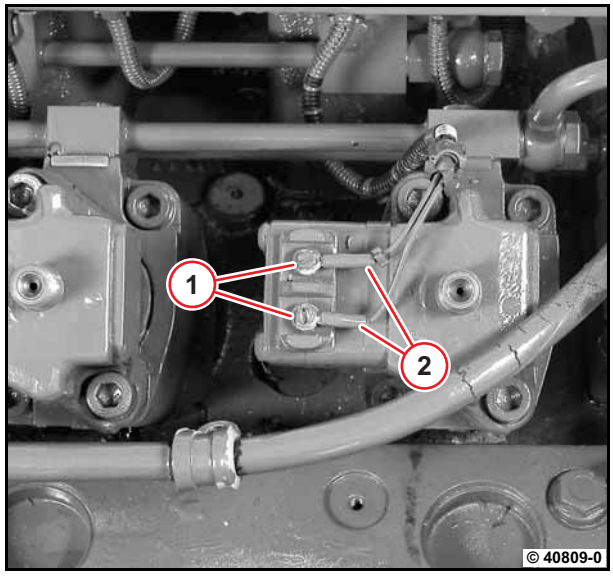
- Plug in cables (2).

T13 054

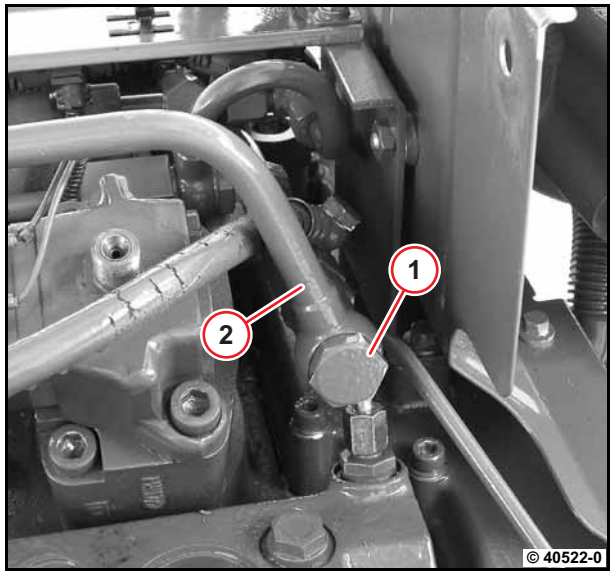
Note assignment!

- Tighten screws (1).

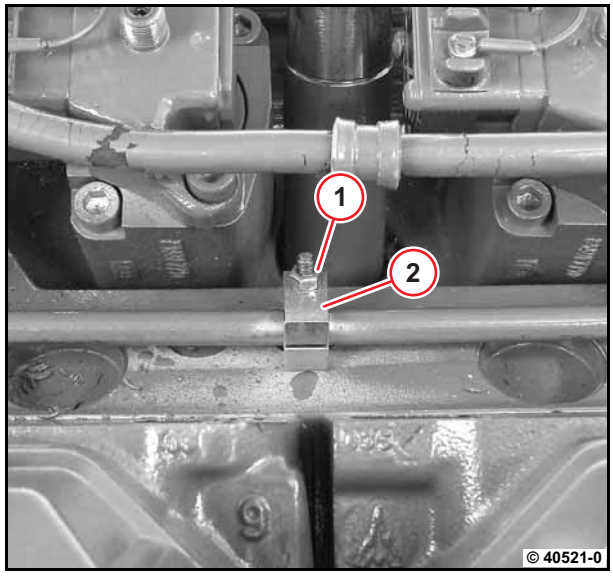
A13 054



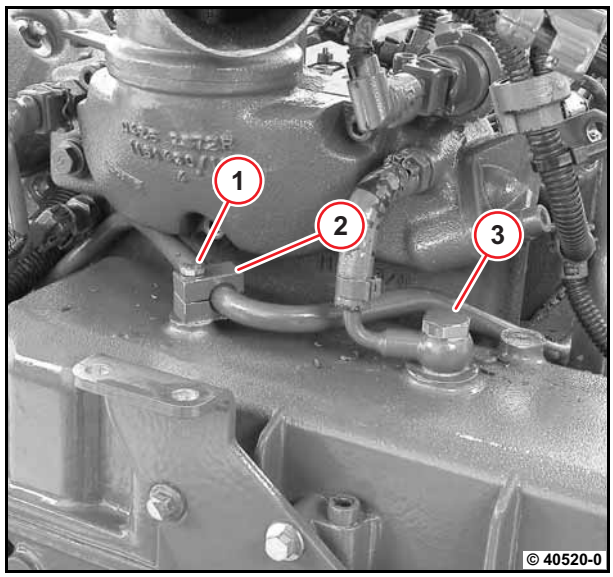
- Mount new sealing rings.
- Mount fuel pipe (2).
- Screw on hollow screw (1).



- Oil the thread lightly.
- Mount holder (2).
- Screw on nut (1).



- Mount new sealing rings.
- Screw on hollow screw (3).
- Mount holder (2).
- Oil thread and head contact surface lightly.
- Fasten screw (1).



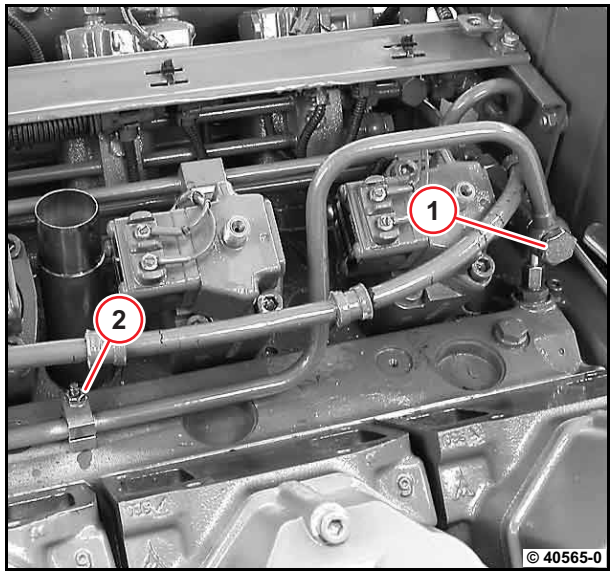
- Tighten hollow screw (1).

Hold overflow valve.

A12 093

- Tighten nut (2).

A07 044

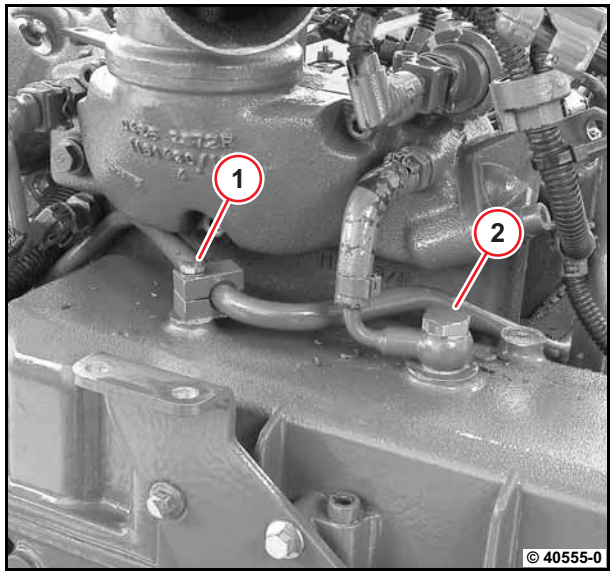


- Tighten screw (1).

A07 044

- Tighten hollow screw (2).

A12 092



- Mount holder (2).
- Tighten screws (1).

A07 044

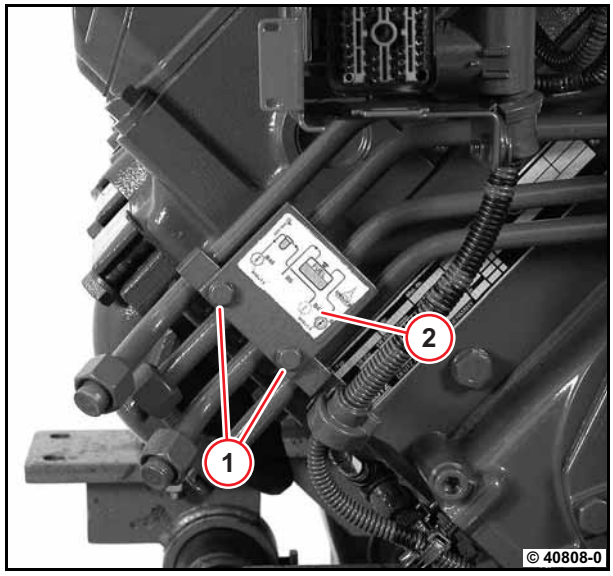
- Install charge air pipe (A-bank)

W 06-07-03

- Remove turning gear.

W 04-06-03

Delete error entry in the error memory of the motor control timer with SERDIA.



Removing and installing injection pumps (Cylinder A2-B3)

Commercial available tools

Special tools:
– Plugs/caps 170160

– Locking agent
DEUTZ DW 59

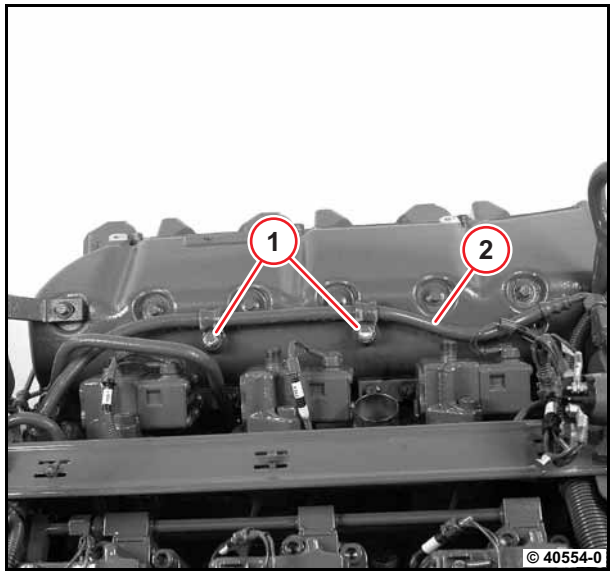
– W 03-01-11
– W 04-06-03
– W 07-03-01 . . . . . (A-bank)
– W 07-03-01 . . . . . (B-bank)
– W 07-10-06
– W 07-10-06 . . . . . (Railway)

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

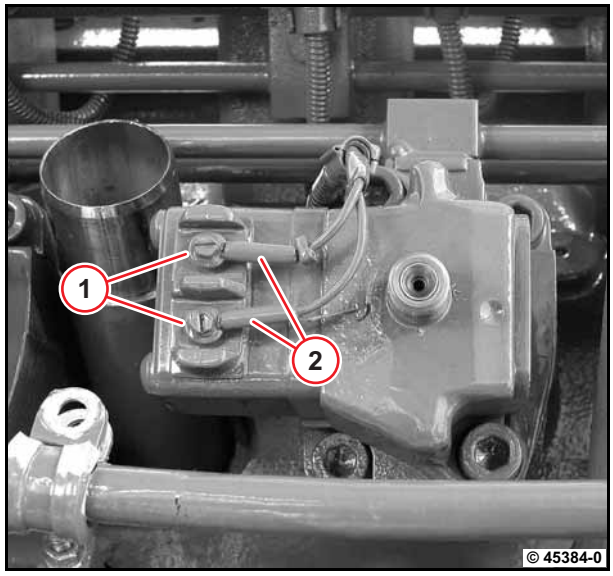
Read out error memory of the motor control timer with SERDIA.

Removing injection pumps

- Removing the crankcase breather.
  W 03-01-11
- Removing high pressure pipes (A-bank).
  W 07-03-01
- Removing high pressure pipes (B-bank).
  W 07-03-01
- Unscrew screws (1).
- Place fuel hose (2) to one side.



- Loosen screws (1).
- Pull off cables (2).



6

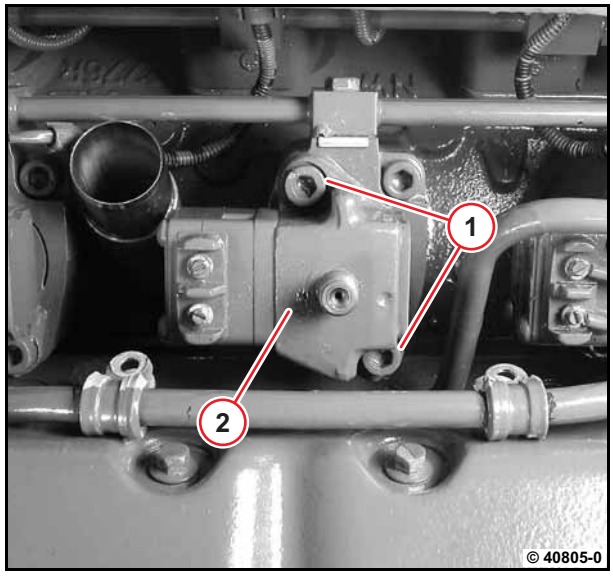
- Unscrew screws (1).

Loosen screws evenly to avoid jamming the injection pump.

- Remove fuel injector pump(2).

Lay out components in the order in which they should be installed.

Note cylinder assignment.

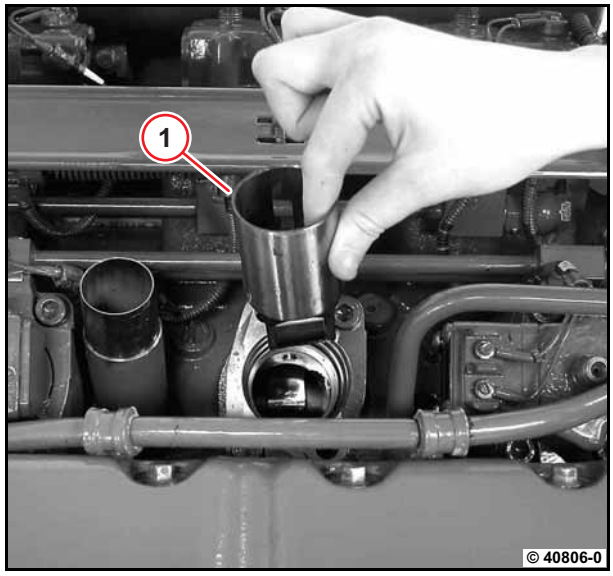


- Pull out roller tappet (1).

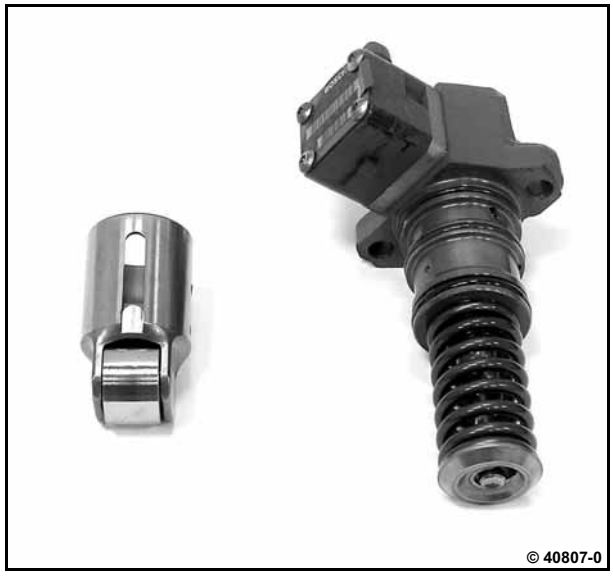
Attention!
Do not damage the roller tappet!

Lay out components in the order in which they should be installed.

Note cylinder assignment.



- Visually inspect the components.



Removing injection pump housing

- Remove fuel pipes.

W 07-10-06

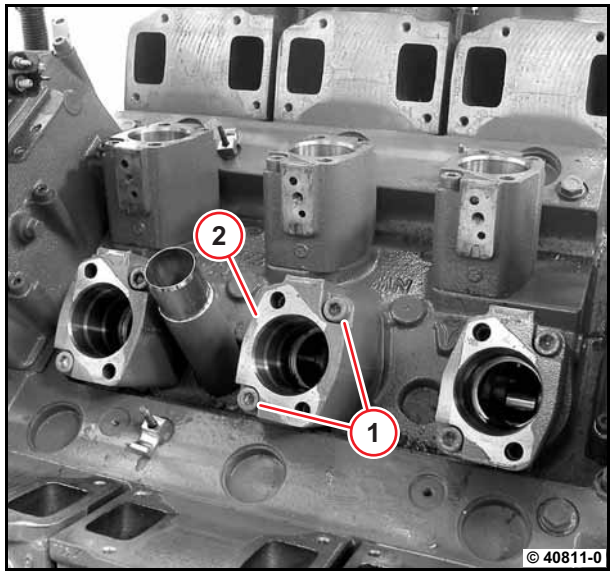
- Remove fuel pipes (Railway).

W 07-10-06

- Unscrew screws (1).
- Remove injection pump housing (2).

Lay out components in the order in which they should be installed.

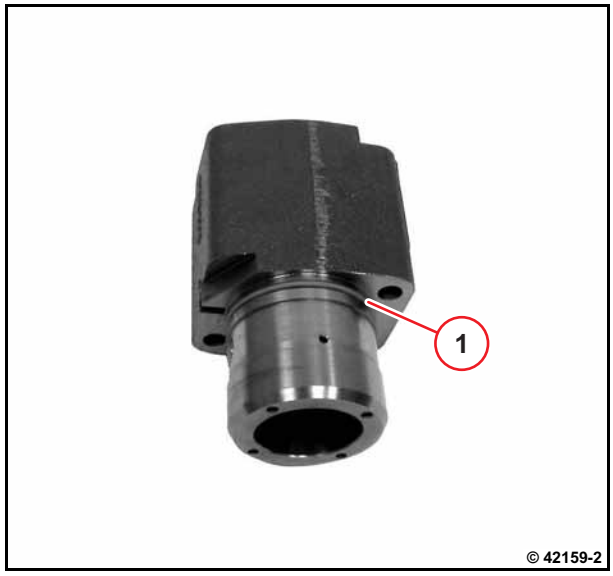
Note cylinder assignment.



- Visually inspect the components.

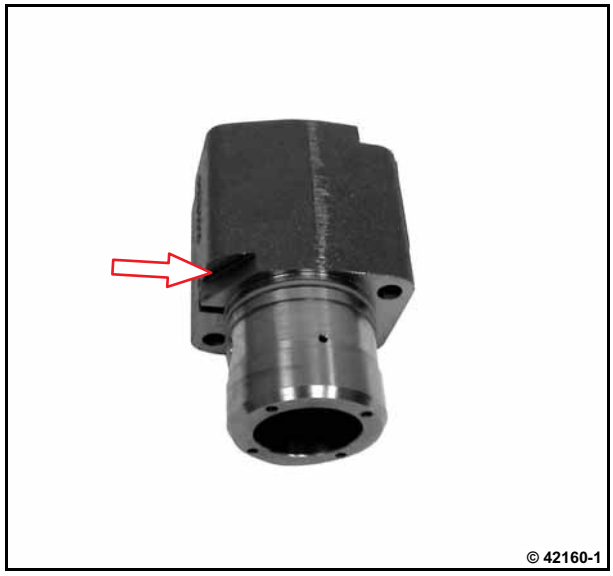
Installing injection pump housing

- Clean contact surfaces.
- Mount new O-ring (1).



The injection pump housings differ.

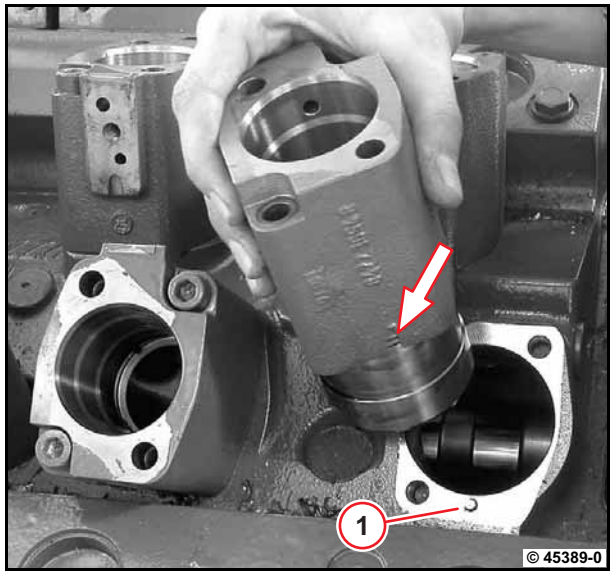
Mount the injection pump housing with the bevel (arrow) on the B-bank.



- Oil the shank of the injection pump housing lightly.
- Press the injection pump housing into the stop in the crankcase.

Note cylinder assignment.

The pilot pin (1) must lock in groove (arrow).

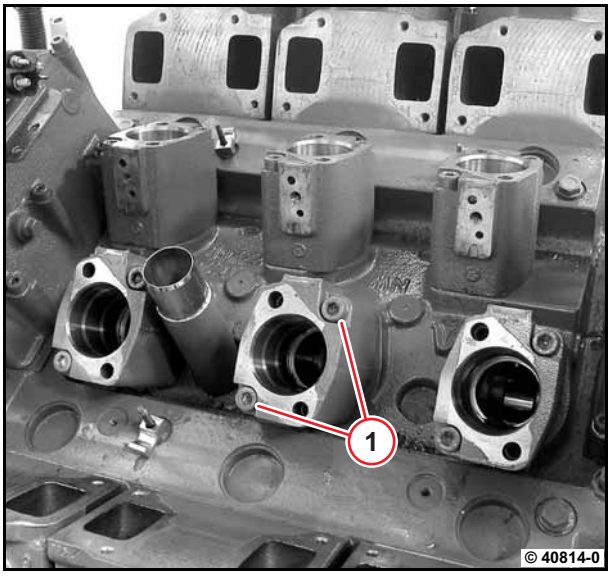


- Lightly oil screws (1).
- Tighten screws (1).

  A07 009
- Install fuel pipes.

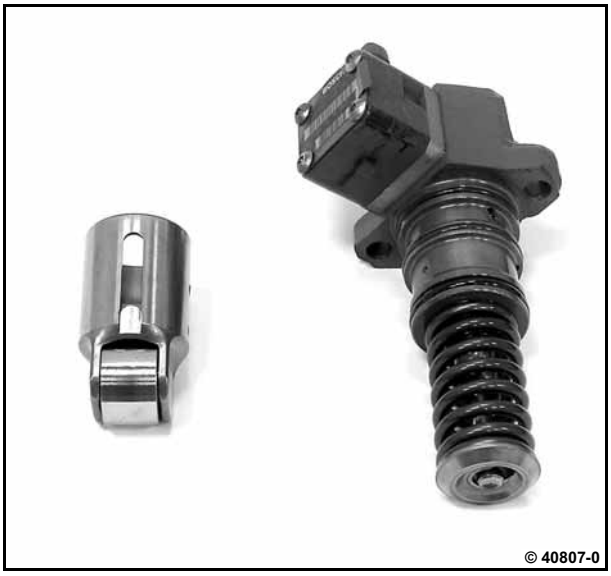
  W 07-10-06
- Remove fuel pipes (Railway).

  W 07-10-06



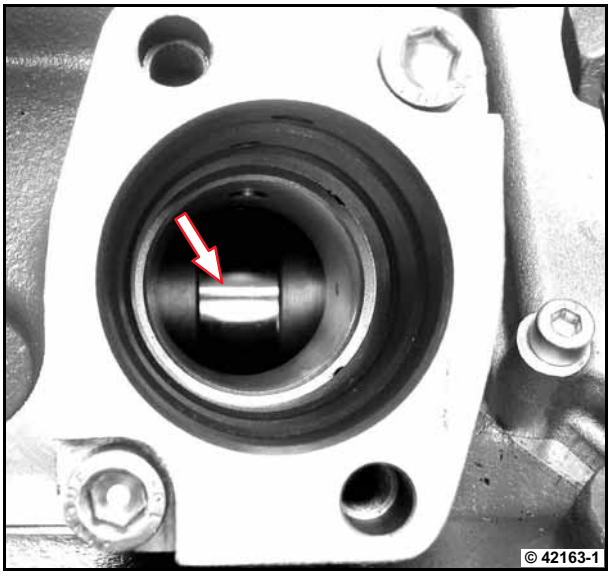
Installing injection pumps

Note the assignment of the injection pump/ roller tappet when replacing the injection pump and/or roller tappet.



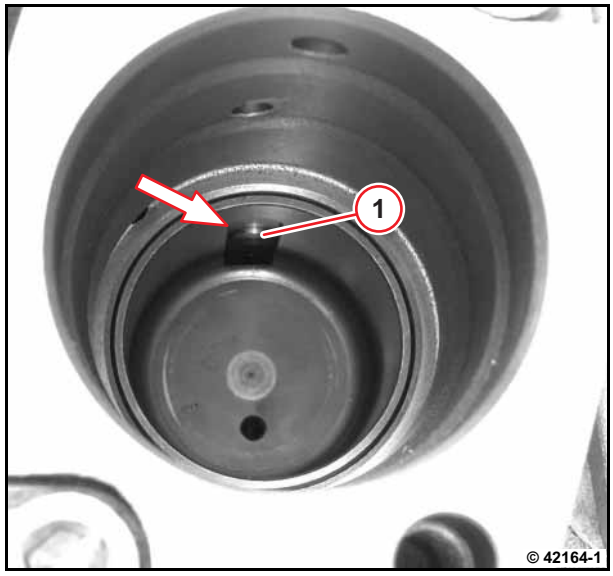
- Attach turning gear.

  W 04-06-03
- Turn the injection pump camshaft with the turning gear until the cam for the injection pump is on the cam base circle (arrow).

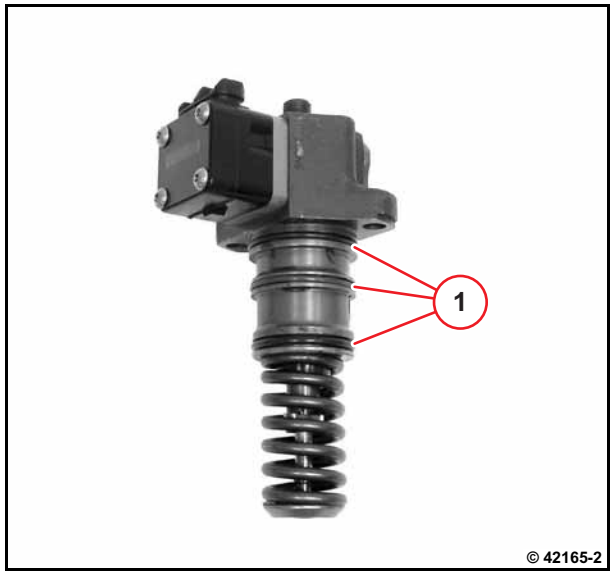


- Oil the roller tappet lightly.
- Insert roller tappet.

The pilot pin (1) must lock in groove (arrow).



- Mount new O-rings (1).
- Oil O-rings lightly.



- Insert injection pump (1).

Note assignment!

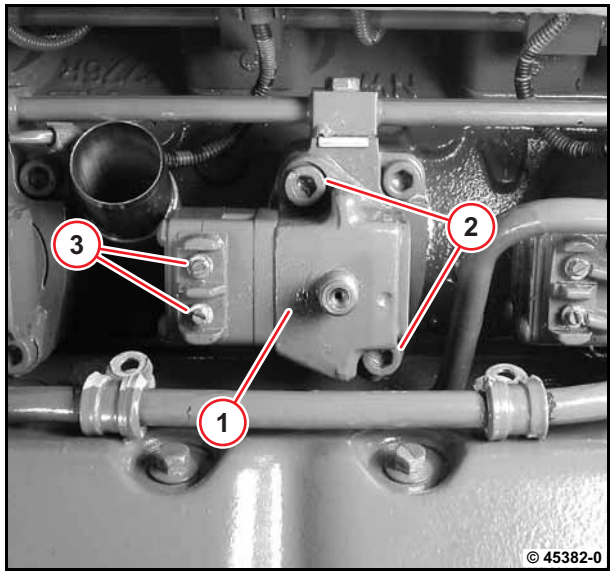
A-bank:

The cable connections (3) of the injection pumps must face the genset support.

B-bank:

The cable connections (3) of the injection pumps must face the flywheel.

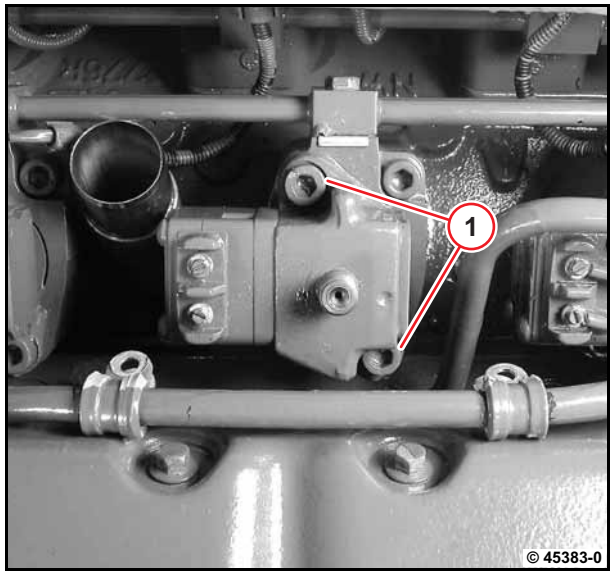
- Lightly oil screws (2).
- Tighten screws (2).



- Tighten screws (1) alternately.

A07 012

Attention!
Do not turn the camshaft until all the injection pumps are installed. Danger of breaking the tappet!



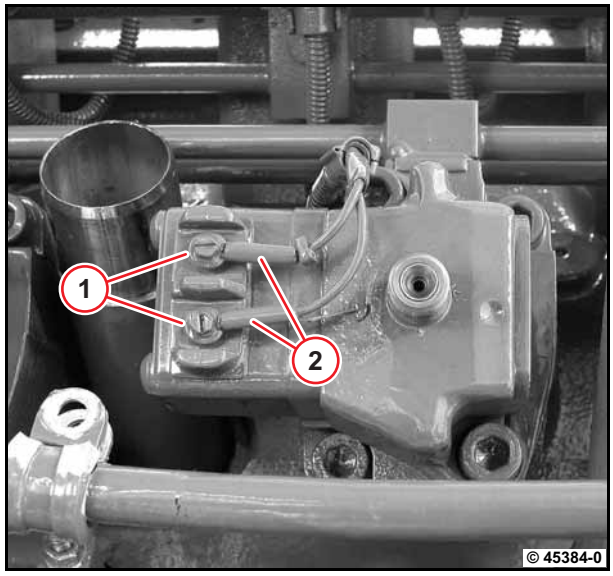
- Plug in cables (2).

T13 054

Note assignment!

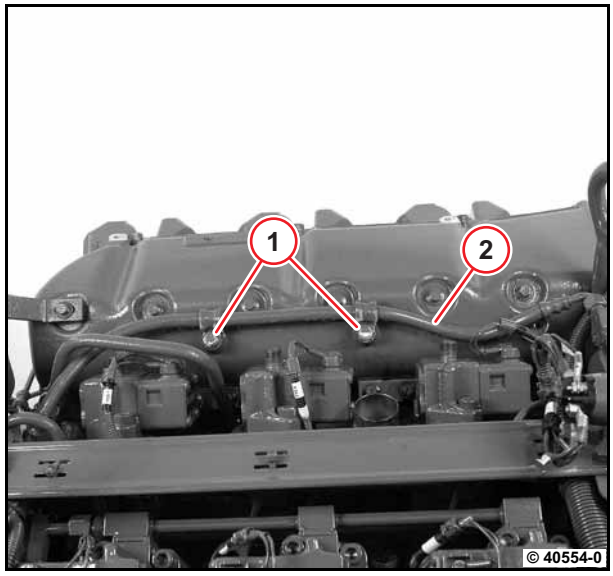
- Tighten screws (1).

A13 054



- Position fuel hose (2).
- Tighten screws (1).

A12 095



- Installing high pressure pipes (A-bank)

  W 07-03-01

- Installing high pressure pipes (B-bank)

  W 07-03-01

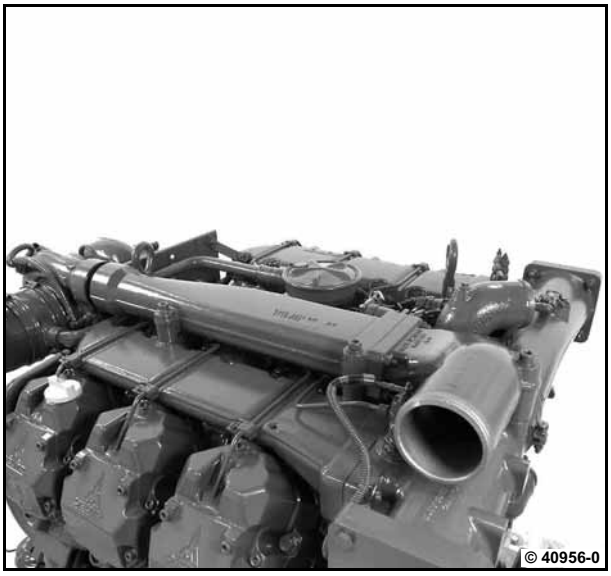
- Install crankcase breather.

  W 03-01-11

- Remove turning gear.

  W 04-06-03

Delete error entry in the error memory of the motor control timer with SERDIA.



6

Checking and setting plunger lift of injection pumps

Commercial available tools:
– Feeler gauges

Special tools:
– Dial gauge. 100410
– Dial gauge holder with stylus extension. 103240
– Measuring pin 110180
– Plugs/caps 170160

– Packing compound DEUTZ DW 48
– Locking agent DEUTZ DW 72

– W 04-06-03
– W 06-06-04
– W 06-06-04 . . . . . (A-bank, Railway)
– W 06-06-04 . . . . . (B-bank, Railway)
– W 07-04-01 . . . . . (Cylinder A1)
– W 07-04-01 . . . . . (Cylinder A2-B3)

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Read out error memory of the motor control timer with SERDIA.

Checking plunger lift of injection pumps

- Remove injection pumps (cylinder A1).

  W 07-04-01

- Remove injection pumps (cylinder A2-B3).

  W 07-04-01

Do not remove injection pump housing.

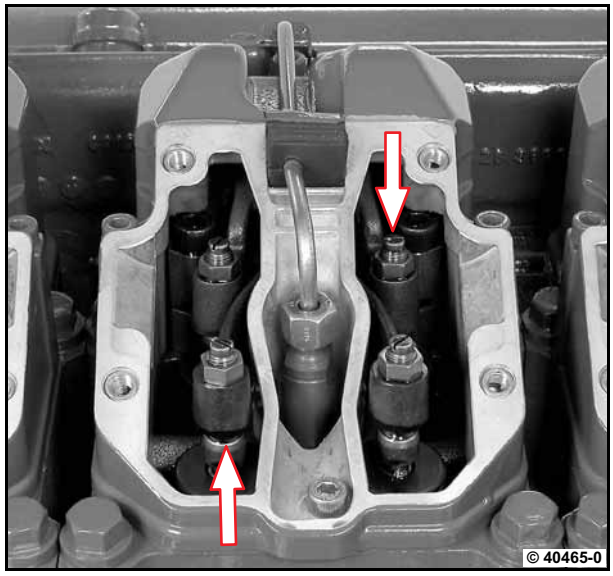
- Attach turning gear.

  W 04-06-03

- Turn over crankshaft until the valve overlap is achieved on cylinder no. B2.

T01 63

Valve overlap means:
Inlet valves begin to open and exhaust valves close.
Observe valve clearance setting diagram.

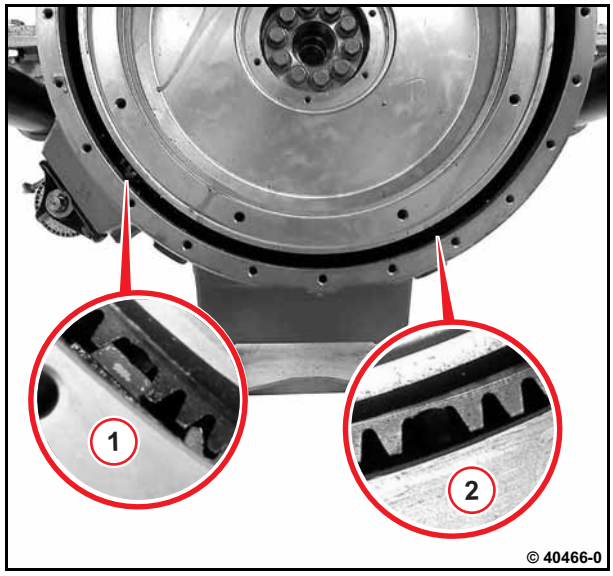


6

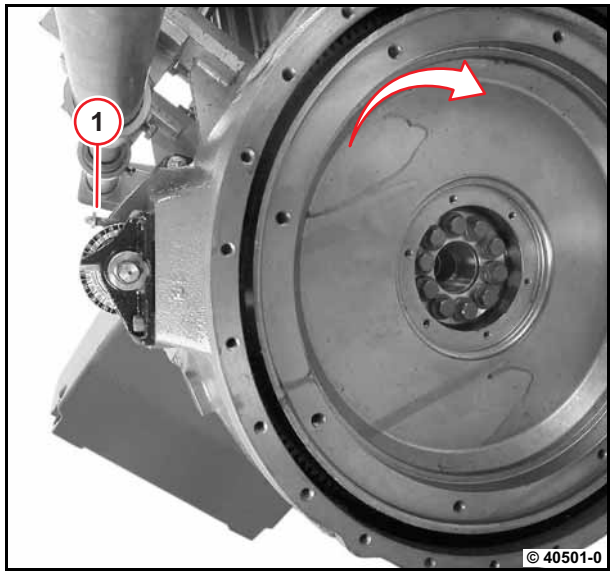
In case of valve overlap of cylinder no. B2:

The locking pin of the turning gear must snap into the tooth notch (1) of the starter ring gear.

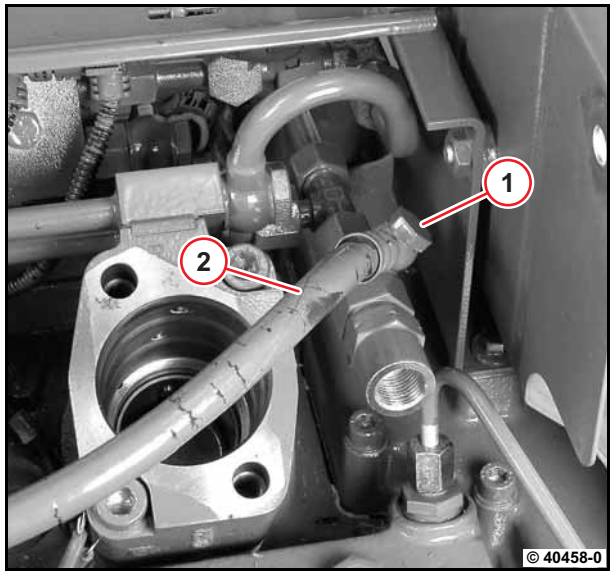
The second tooth notch (2) must face the B-bank.



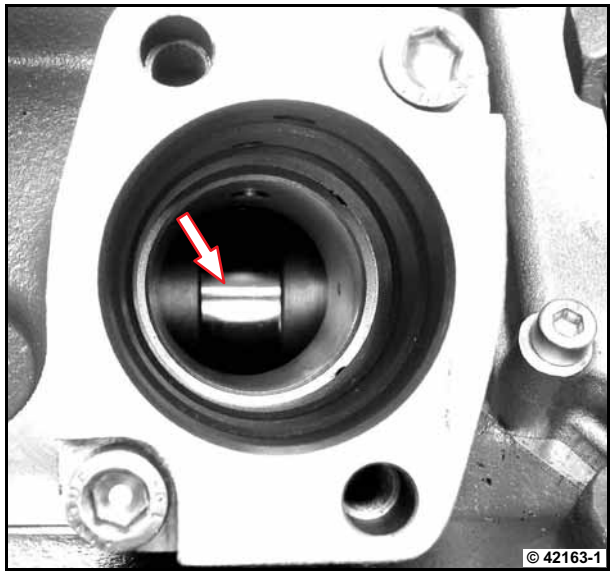
- Pull locking pin (1).
- Turn crankshaft in the opposite direction to the engine rotation (arrow) a ¼ turn with the turning gear.



- Unscrew hollow screw (1).
- Place fuel hose (2) to one side.
- Remove sealing rings.

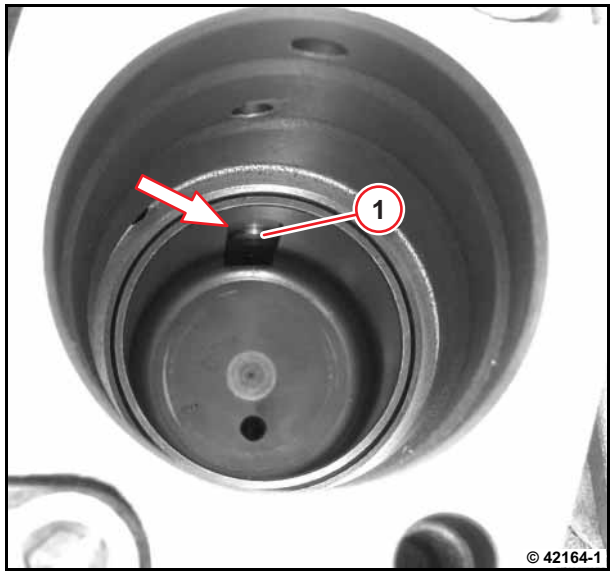


The injection pump cams for cylinder no. A1 must be on the base circle (arrow).



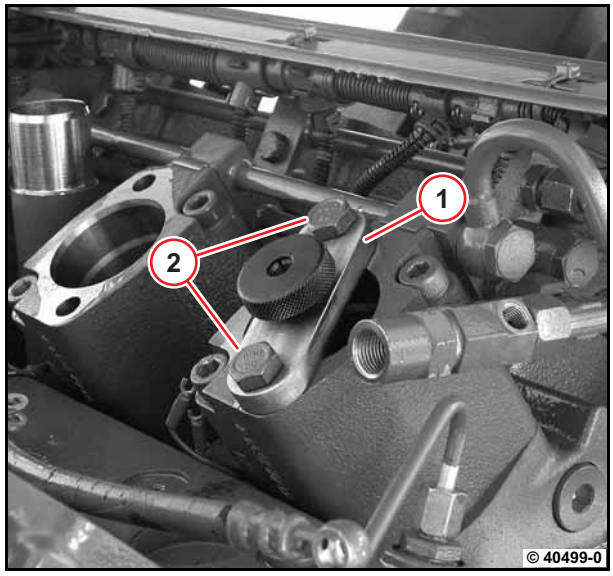
- Oil the roller tappet lightly.
- Insert roller tappet.

Note the assignment of the roller tappet.
The pilot pin (1) must lock in groove (arrow).



- Mount dial gauge holder (1).
- Tighten screws (2).

A07 012



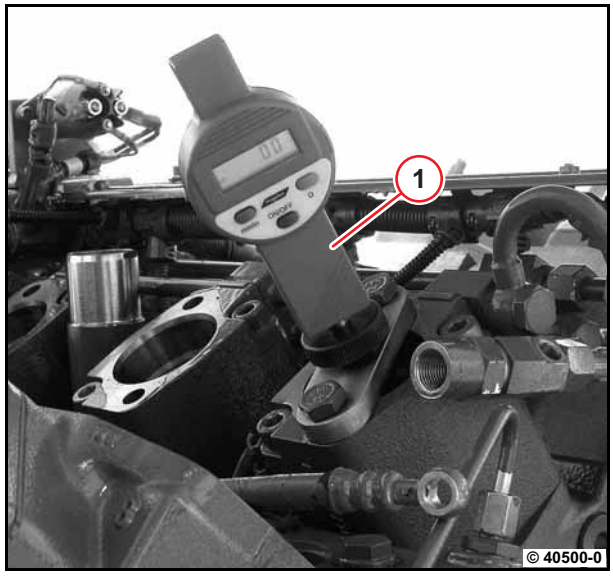
6

- Insert dial gauge holder (1) with stylus extension.
- Mount stylus with 6 mm pre-tension on the roller tappet.
- Turn the crankshaft alternately in and against engine direction.
- Check installation position of the dial gauge.

Dial gauge must run on the base circle of the injection camshaft.

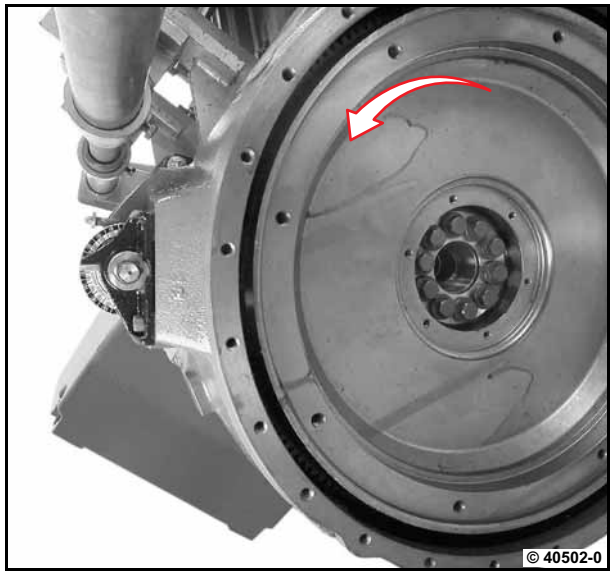
The display of the dial gauge may not move.

- Adjust dial gauge to "0".



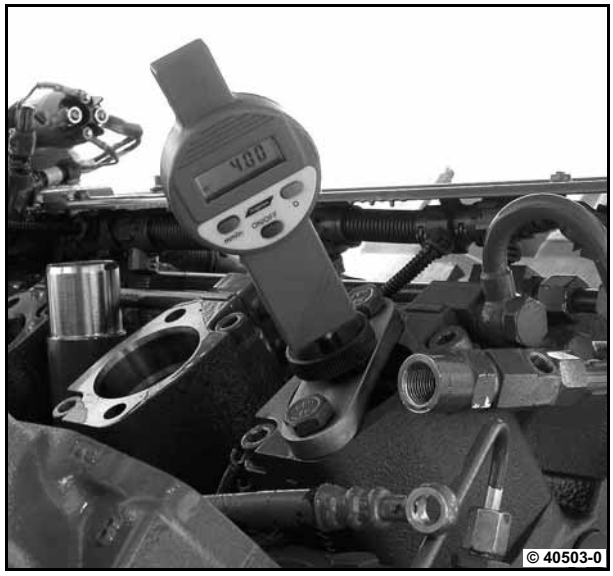
- Set crankshaft with turning gear in engine direction of rotation (arrow) to ignition TDC, cylinder no. A1.

The locking pin of the turning gear must snap into the starter gear ring.



- Read and note the measured value.

P07 19



Setting plunger lift of injection pumps

All injection pumps must be removed.

- Remove turbocharger.

W 06-06-04

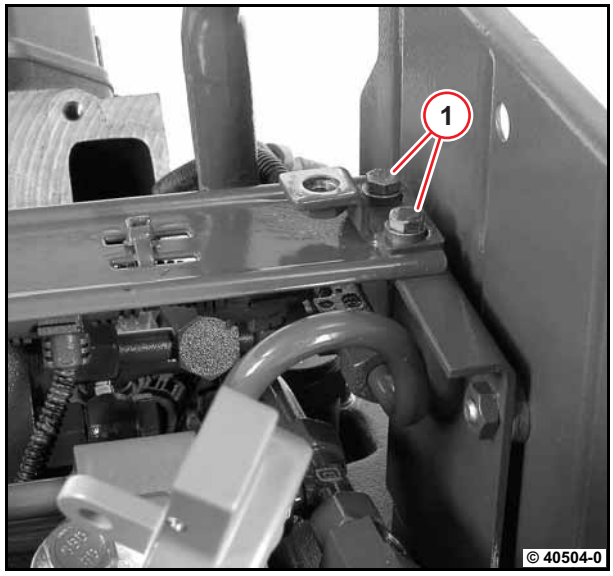
- Remove turbocharger (A-bank, Railway).

W 06-06-04

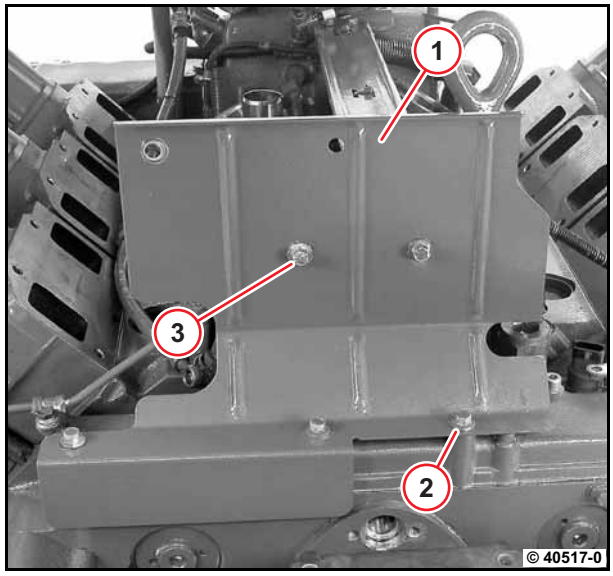
- Remove turbocharger (B-bank, Railway).

W 06-06-04

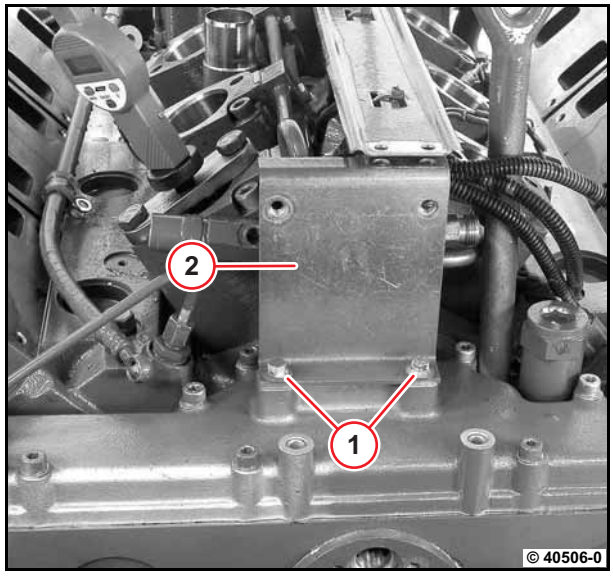
- Unscrew screws (1).



- Unscrew all screws (3).
- Remove spacing sleeves.
- Unscrew all screws (2).
- Remove heat shield (1).

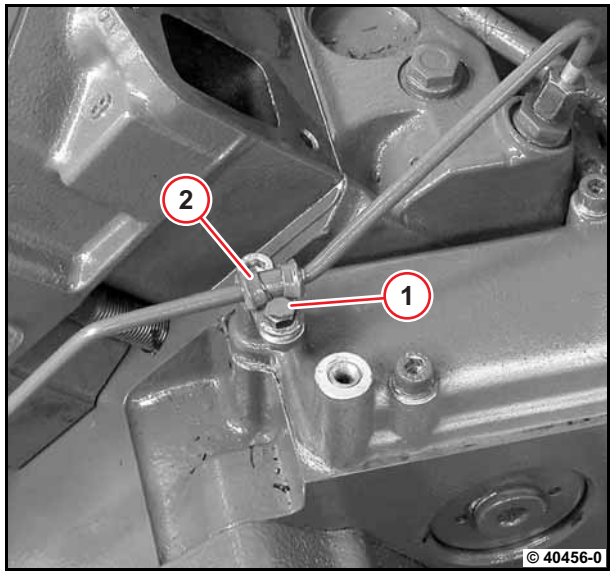


- Unscrew screws (1).
- Remove the holder (2).

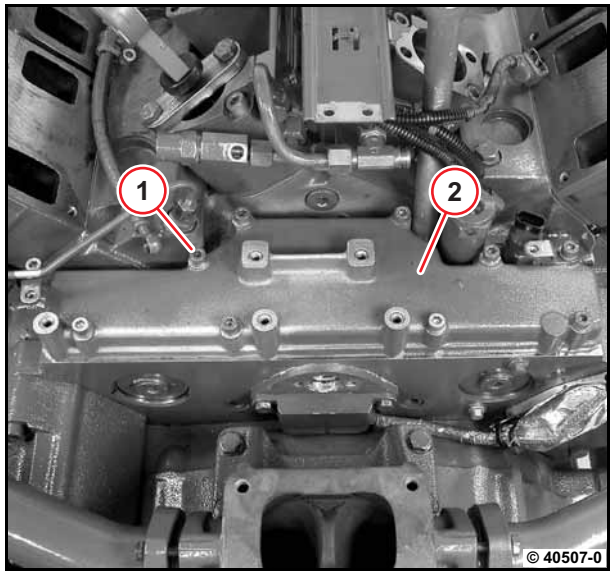


6

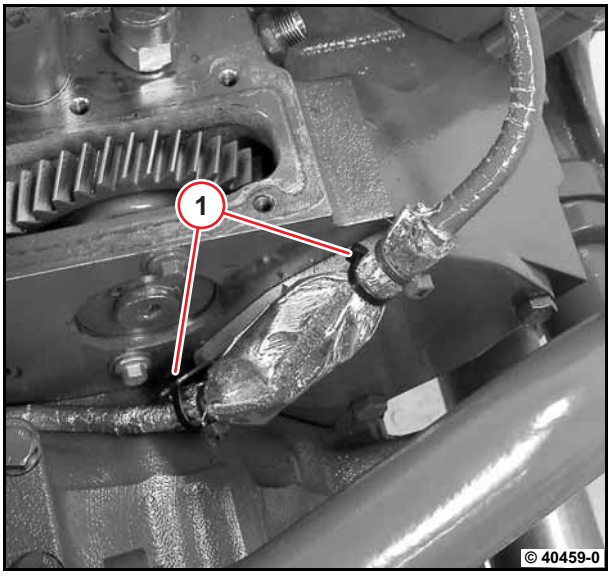
- Unscrew screw (1).
- Remove pipe clamp (2).



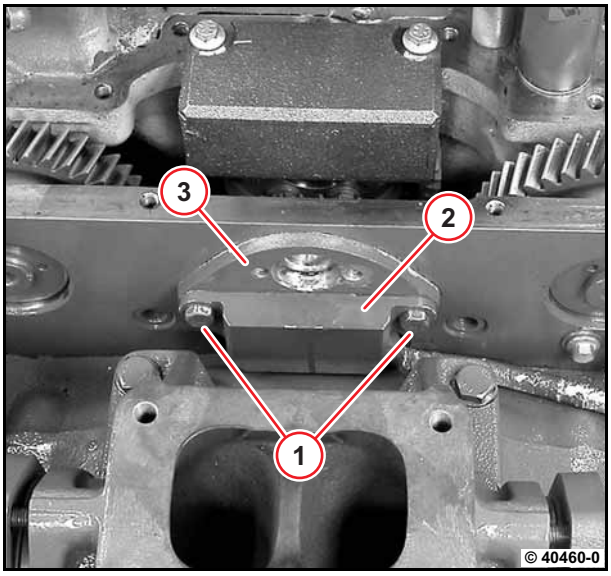
- Unscrew all screws (1).
- Remove gear case cover (2).



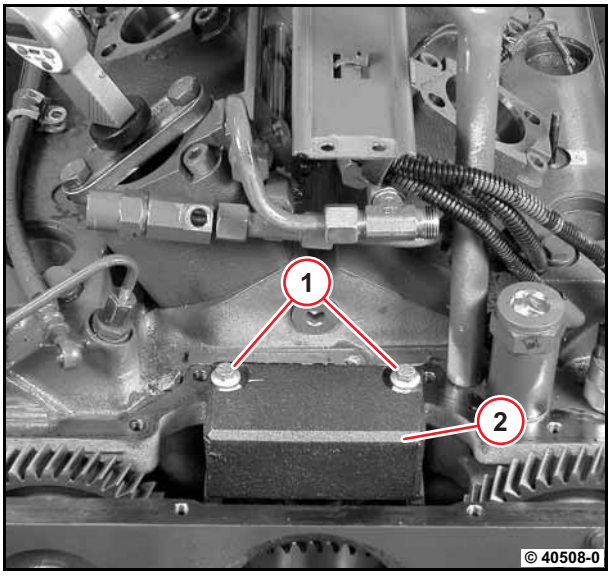
- Remove cable tie (1).



- Unscrew screws (1).
- Remove cover (2) .
- Remove cover (3).

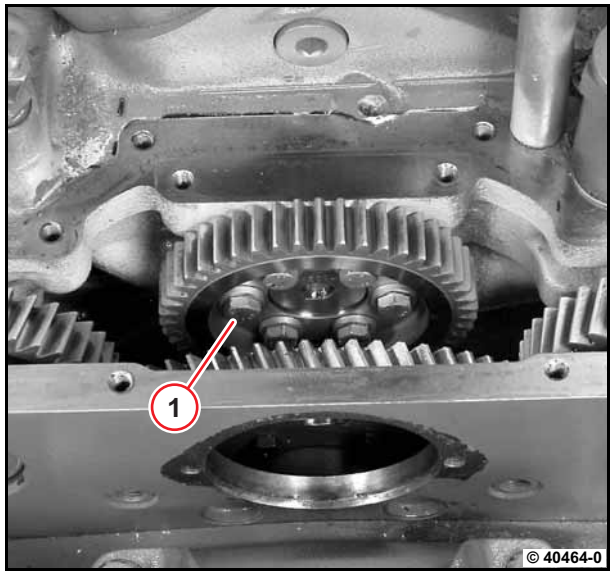


- Unscrew screws (1).
- Remove pad thrust bearing (2).



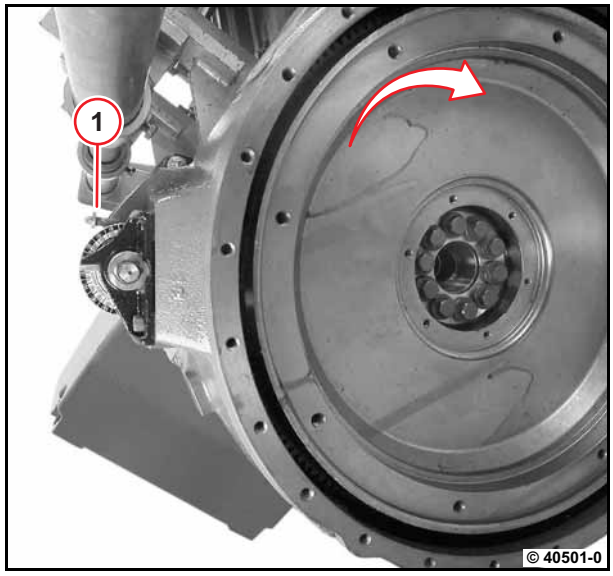
6

- Loosen all screws (1).



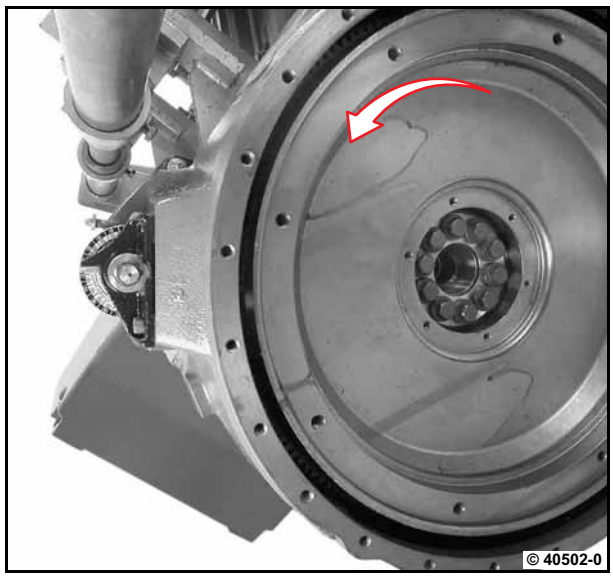
- Pull locking pin (1).
- Turn crankshaft in the opposite direction to the engine rotation (arrow) a ¼ turn with the turning gear.

Dial gauge must read "0" again.



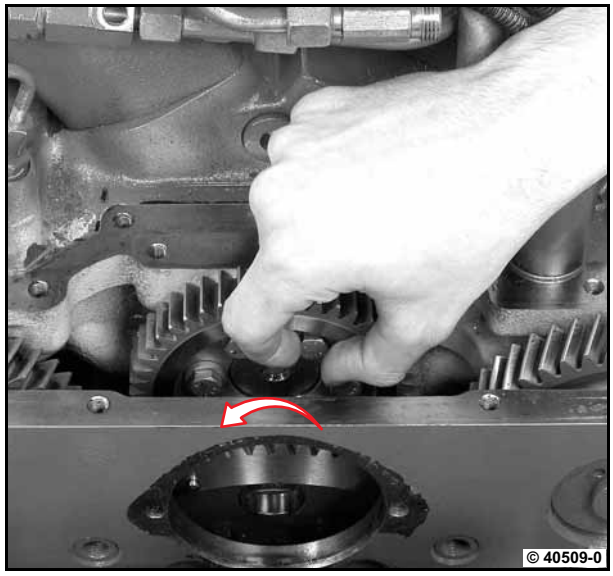
- Set crankshaft with turning gear in engine direction of rotation (arrow) to ignition TDC, cylinder no. A1.

The locking pin of the turning gear must snap into the starter gear ring.



- Turn the injection pump camshaft with the screws in engine direction of rotation (arrow) until the prescribed plunger lift is reached.

P07 19

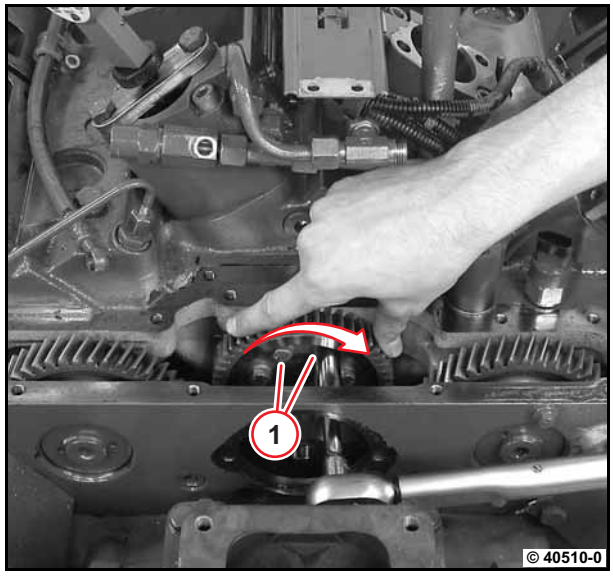


- Pre-tighten screws (1).

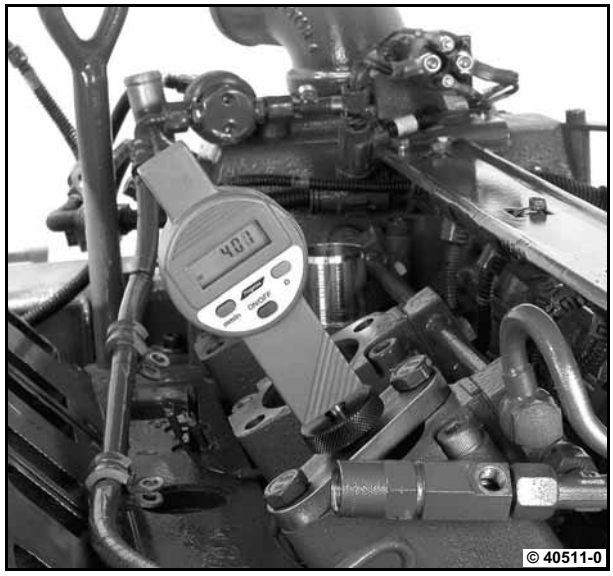
A04 004

When pre-tightening the screws, press the gear wheel lightly in the opposite direction to engine rotation (arrow) against the tooth flanks.

- Check the setting of the plunger lift again.



- Remove dial gauge.
- Remove dial gauge holder.

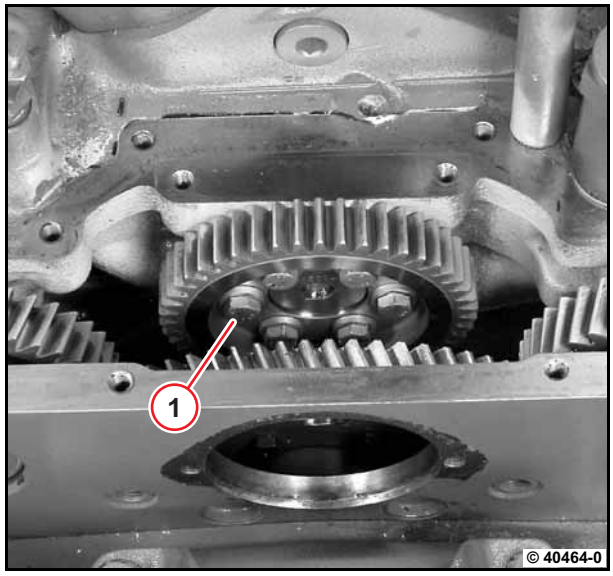


- Tighten all screws (1).

A04 004

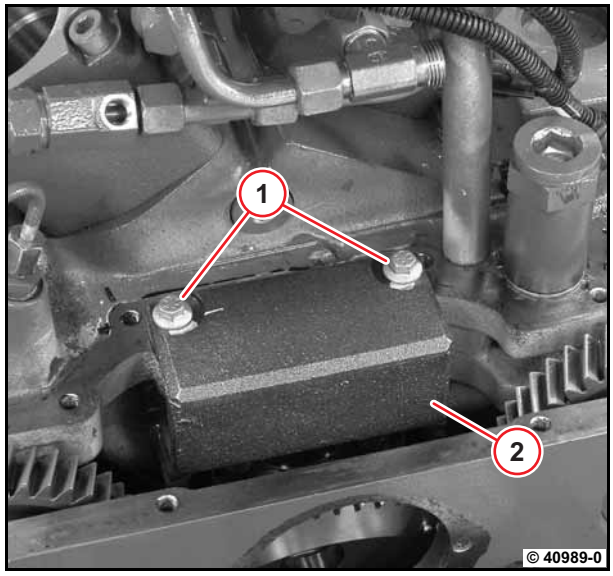
- Pull locking pin.

Concealed screws can be accessed by turning the crankshaft with the turning gear.



6

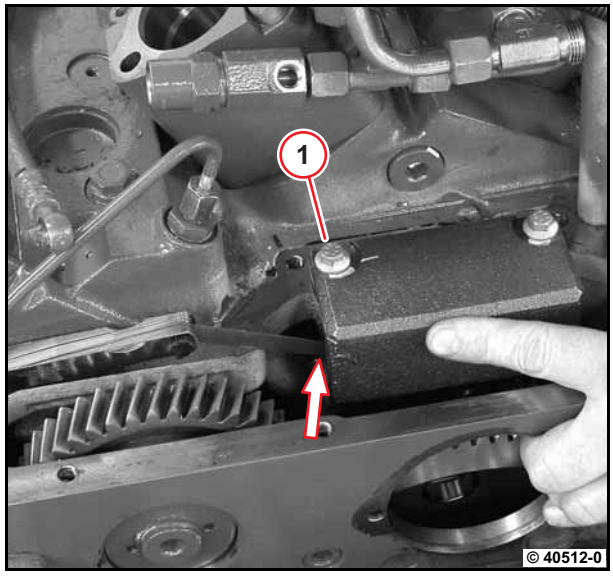
- Mount pad thrust bearing (2).
- Lightly oil screws (1).
- Tighten screws (1).



Checking and setting axial backlash of the injection pump camshaft

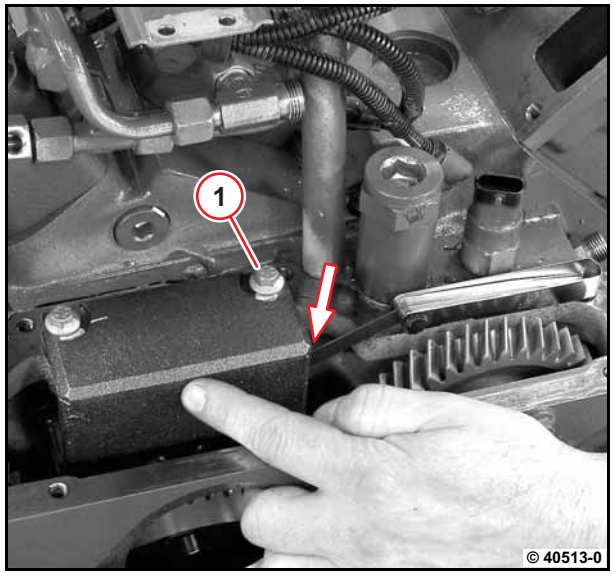
- Insert feeler gauge blade between gear wheel of the injection pump camshaft and the pad thrust bearing (arrow).
- Press the pad thrust bearing onto the feeler gauge blade.
- Fasten screw (1).
- Check axial backlash.

P04 43



- Insert feeler gauge blade between gear wheel of the injection pump camshaft and the pad thrust bearing (arrow).
- Press the pad thrust bearing onto the feeler gauge blade.
- Fasten screw (1).
- Check axial backlash.

P04 43



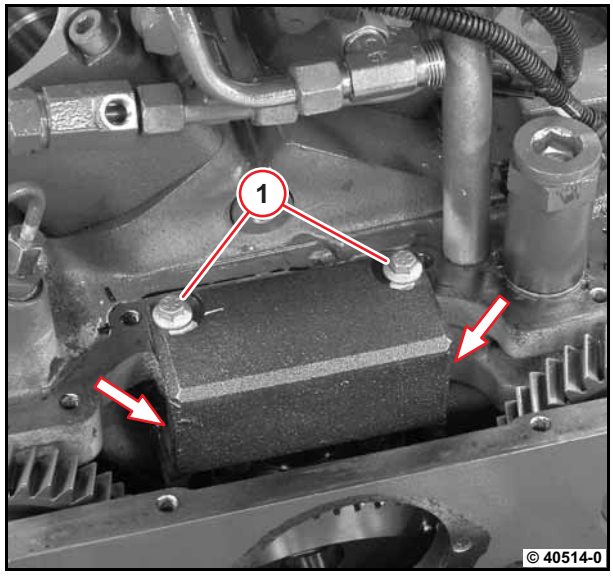
- Tighten screws (1).

A04 015

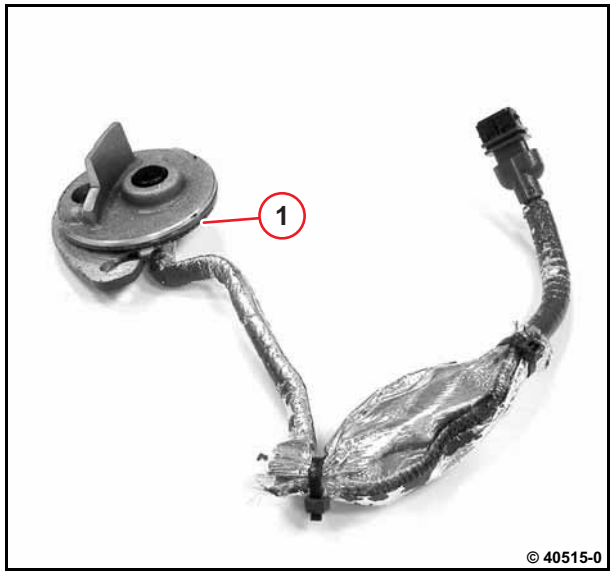
- Check axial backlash again.

P04 43

Check axial backlash on both sides between pad thrust bearing and gear wheel (arrows).



- Clean sealing surfaces.
- Mount new O-ring (1).
- Lightly oil O-ring.

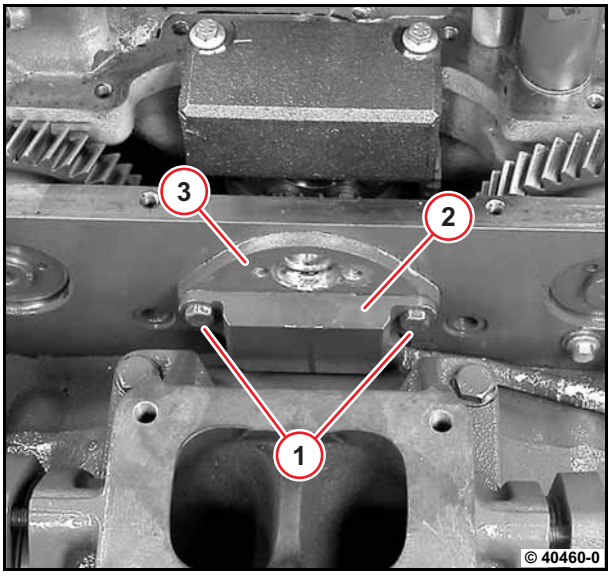


- Press in the cover (3) to the stop.
- Mount cover (2).

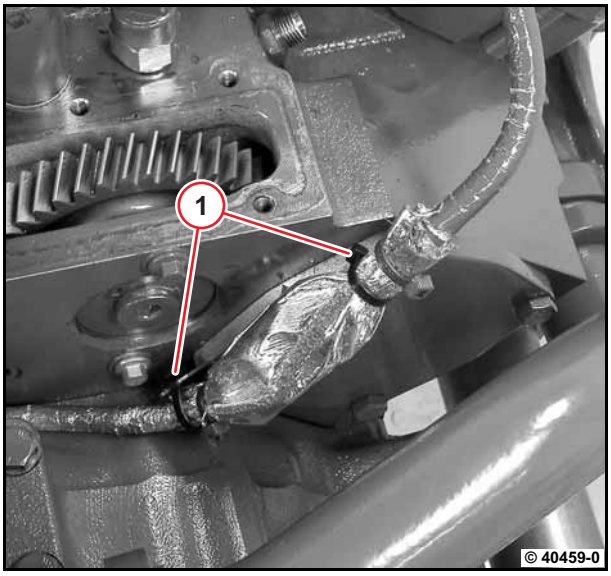
Insert screws with safety agent DEUTZ DW 72.

- Tighten screws (1).

A04 022

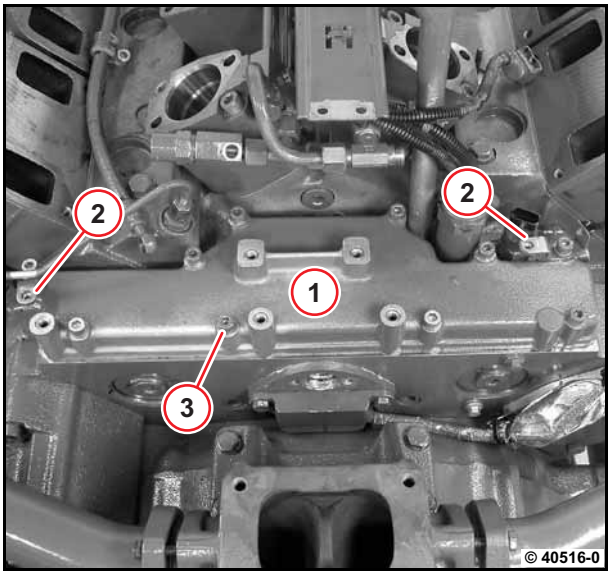


- Fix cables with cable ties (1).



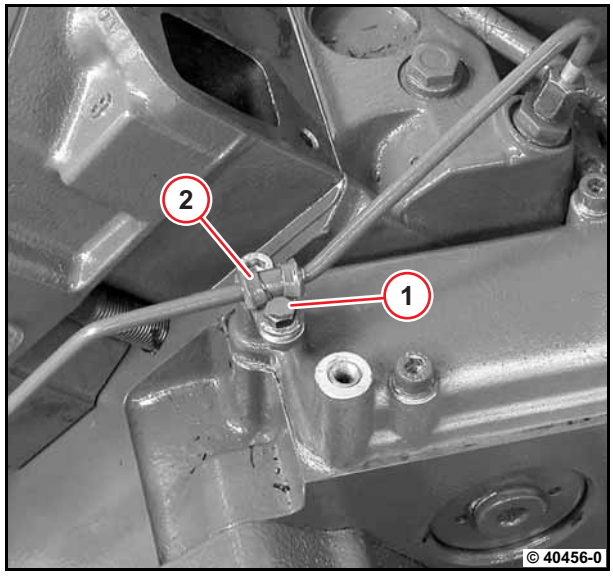
- Clean sealing surfaces.
- Apply packing compound evenly to the sealing surface of the gear case.
- Mount gear case cover (1).
- Mount holder (2).
- Tighten all screws (3) alternately.

A04 020



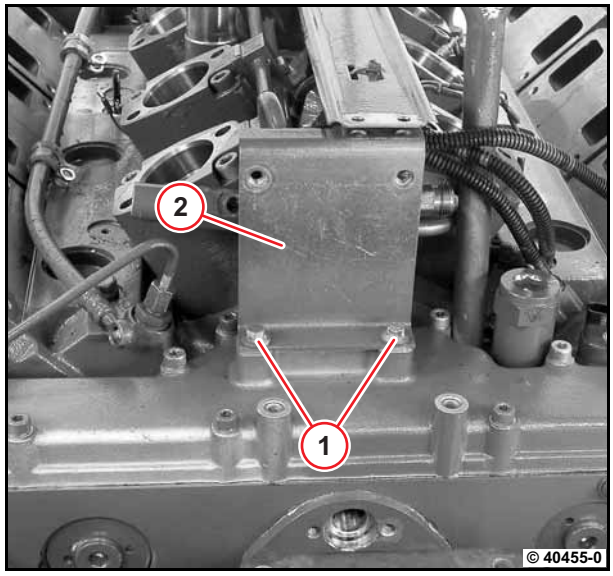
- Mount pipe clamp (2).
- Tighten screw (1).

A08 045



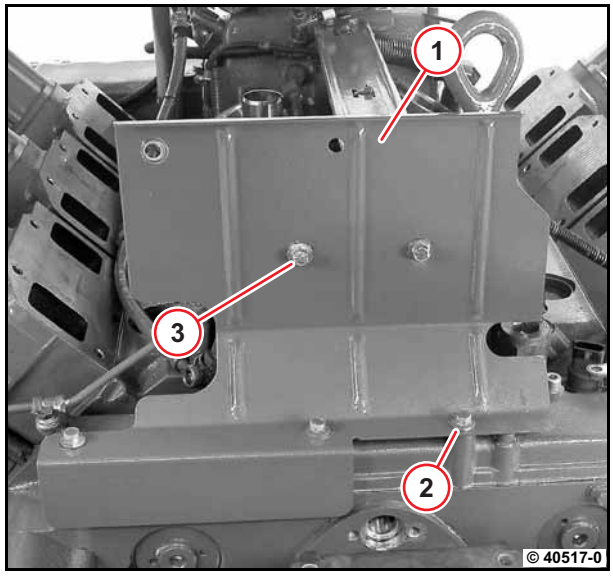
- Mount holder (2).
- Tighten screws (1).

A12 071



- Mount heat shield (1).
- Insert screws (3) with spacing sleeves.
- Tighten screws (2).
- Tighten screws (2 and 3) alternately.

A12 071



- Tighten screws (1).

  A13 094

- Install the turbocharger.

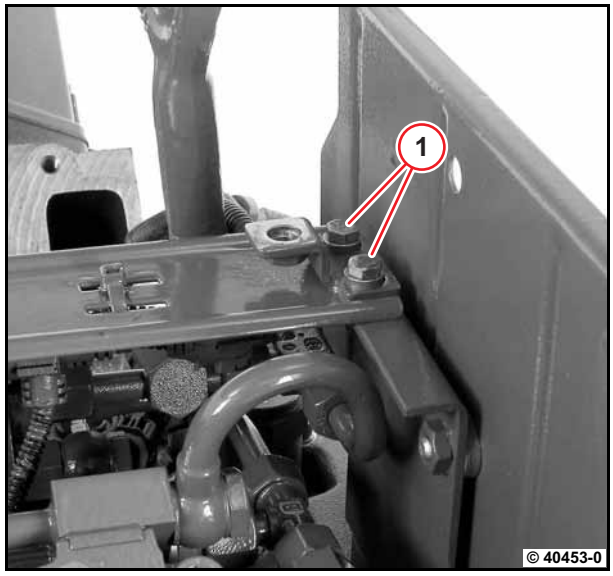
  W 06-06-04

- Install turbocharger (A-bank, Railway).

  W 06-06-04

- Install turbocharger (B-bank, Railway).

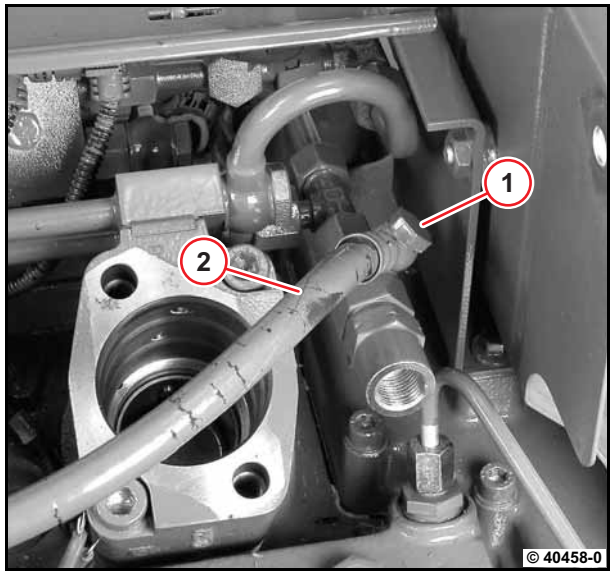
  W 06-06-04



6

- Mount new sealing rings.
- Position fuel hose (2).
- Tighten hollow screw (1).

  A12 090



- Install injection pumps (cylinder A1).

  W 07-04-01

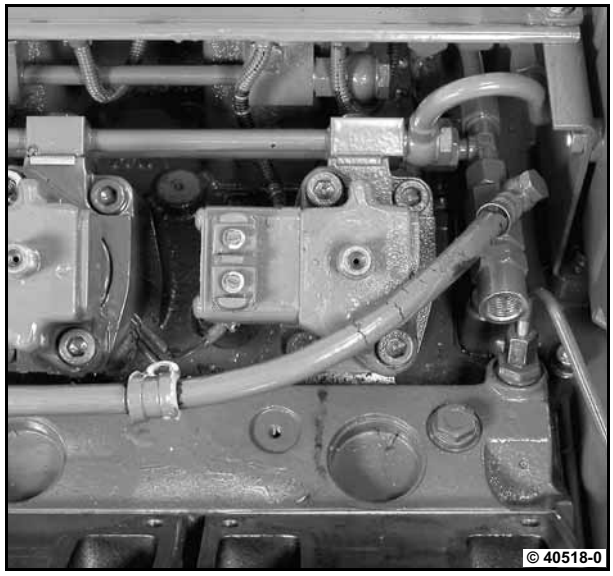
- Install injection pumps (cylinder A2-B3).

  W 07-04-01

- Remove turning gear.

  W 04-06-03

Delete error entry in the error memory of the motor control timer with SERDIA.



Removing and installing the fuel injectors

Commercial available tools:
– Assembly pliers. 8024

Special tools:
– Puller. 110030
– Grooved nut wrench 110130
– Disassembly tool. 110901
– Extraction tool. 120660
– Slide hammer 150800
– Plugs/caps 170160

– Fitting compound
DEUTZ S1

– W 07-03-01 . . . . . (A-bank)
– W 07-03-01 . . . . . (B-bank)
– W 07-07-05

Danger!

Wait 30 seconds after switching off the engine before working on the fuel system.

Attention!

Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

6

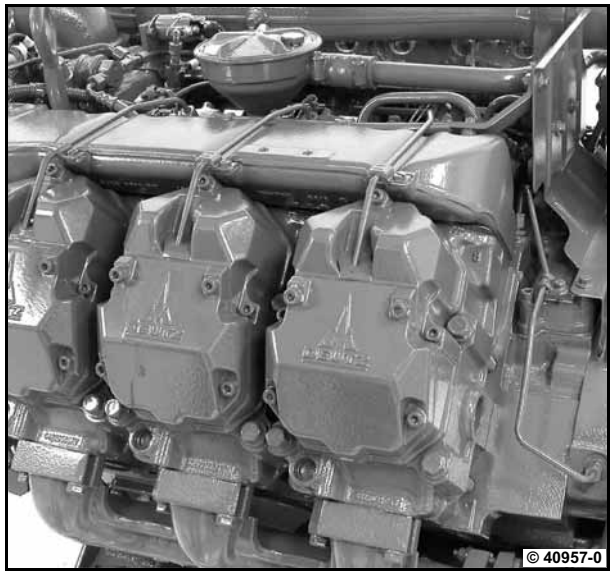
Removing fuel injector

- Removing high pressure pipes (A-bank).

  W 07-03-01

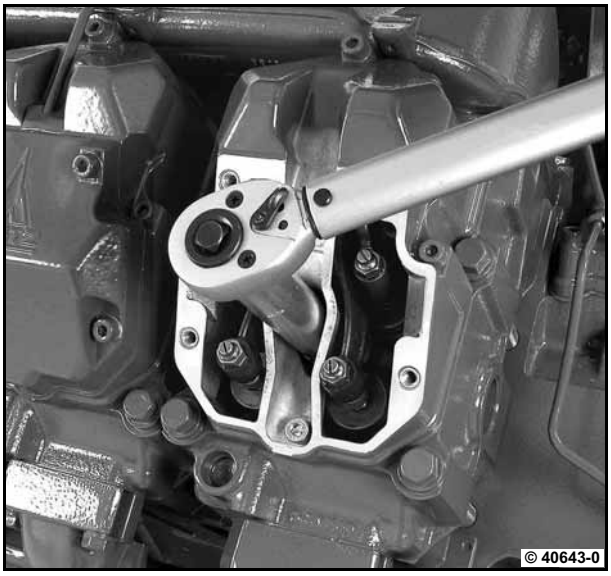
- Removing high pressure pipes (B-bank).

  W 07-03-01

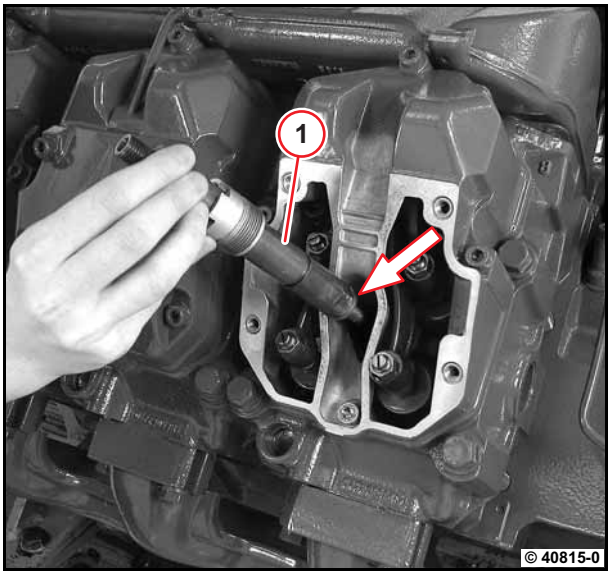


6

- Unscrew union screw with grooved nut wrench.

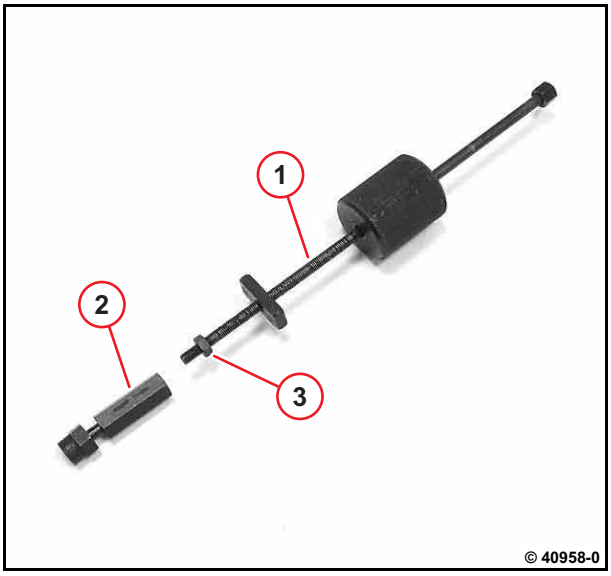


- Pull out fuel injector (1) and sealing ring (arrow).

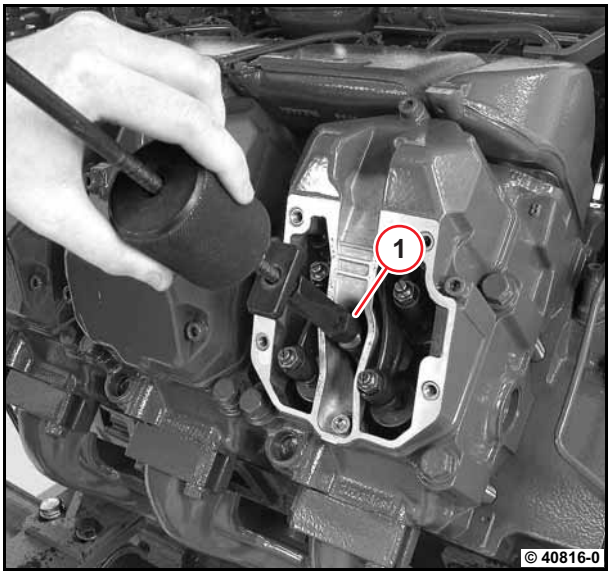


Removing stuck fuel injectors

- Assembly sliding hammer (1) and puller (2).
- Tighten lock nut (3).

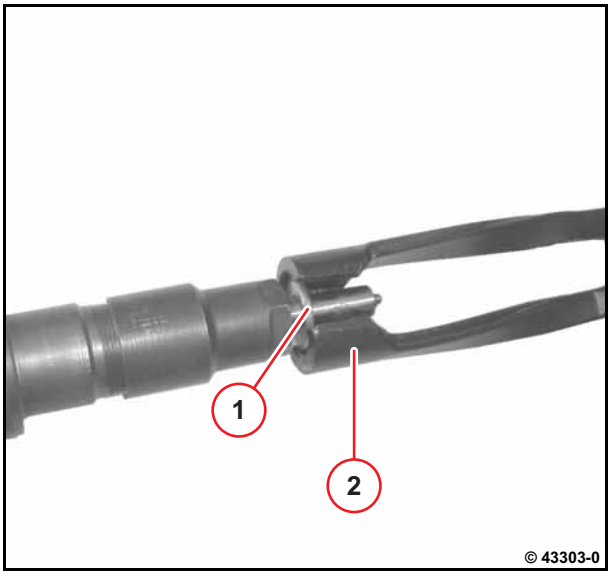


- Mount sliding hammer on fuel injector.
- Screw on lock nut (1).
- Pull out stuck fuel injector.



- Grip a tight sealing ring (1) with the assembly pliers (2) and pull off, turning slightly.

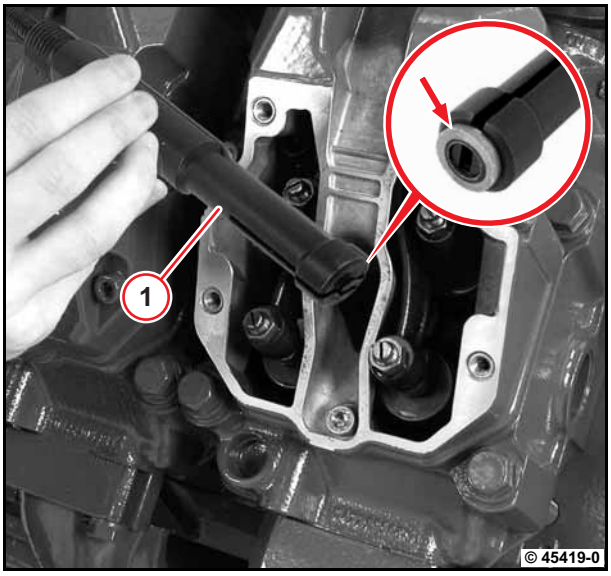
Attention!
Do not damage the nozzle tip!



Removing a tightly fixed sealing ring from the cylinder head

- Insert extraction device (1).

The holders (arrow) must sit in the bore of the sealing ring.

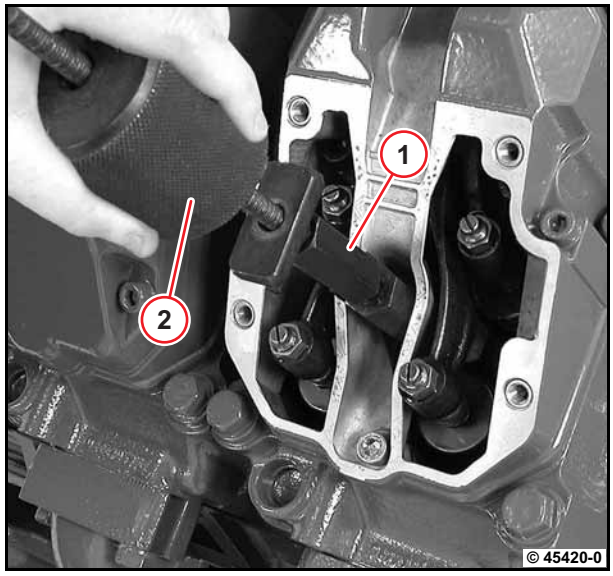


- Turn in the spindle.

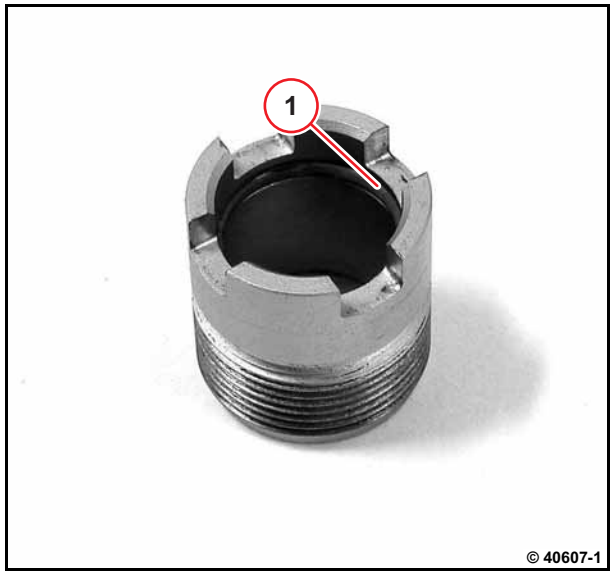
The sealing ring must be fixed on the puller.

Hold puller on hexagon.

- Mount adapter (1) and slide hammer (2) on extraction device.
- Remove tight sealing ring.



- Remove the O-ring (1) with the disassembly tool.

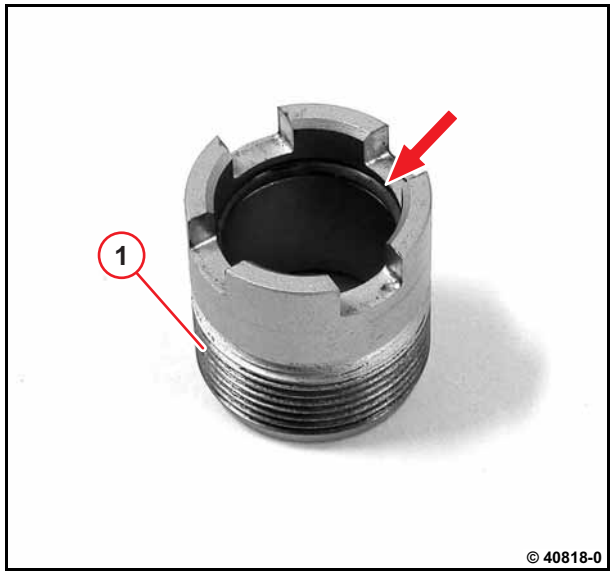


- Visually inspect the components.
- Check the fuel injector.

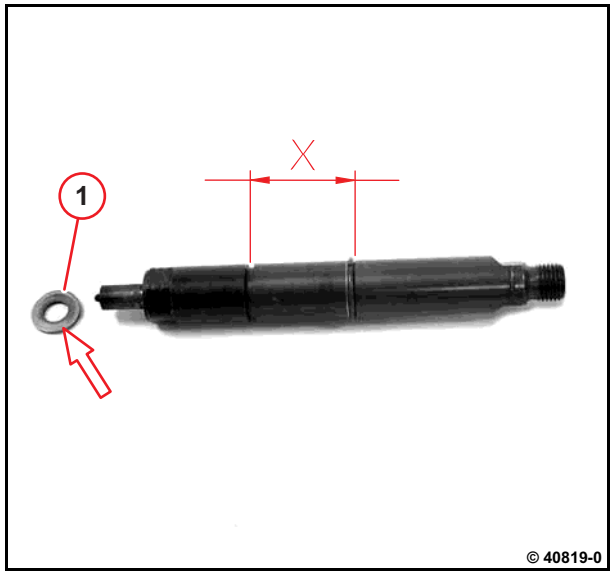
W 07-07-05

Installing the fuel injector

- Insert new O-ring (arrow).
- Coat the thread (1) with fitting compound.

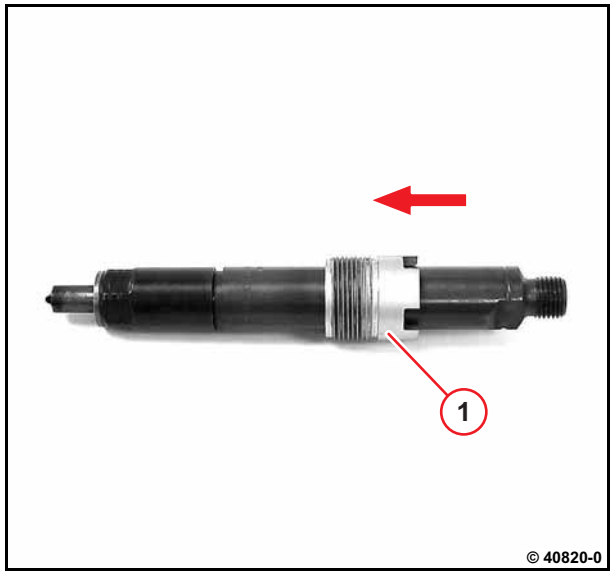


- Coat the nozzle holder shaft in the (X) area with fitting compound.
- Coat the lay-on surface of the sealing ring (arrow) with fitting compound.
- Mount new sealing ring (1) on fuel injector.



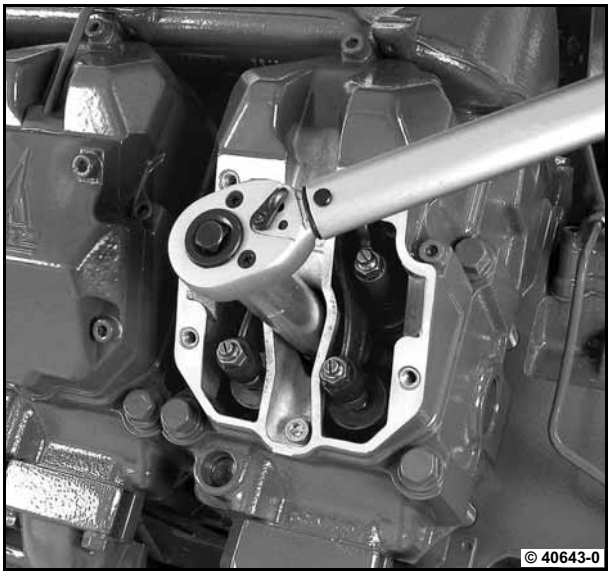
- Push the union screw (1) in the direction of the arrow.

Attention!
Do not damage the O-ring!



- Insert fuel injector.
- Tighten union screw with grooved nut wrench.

A07 001



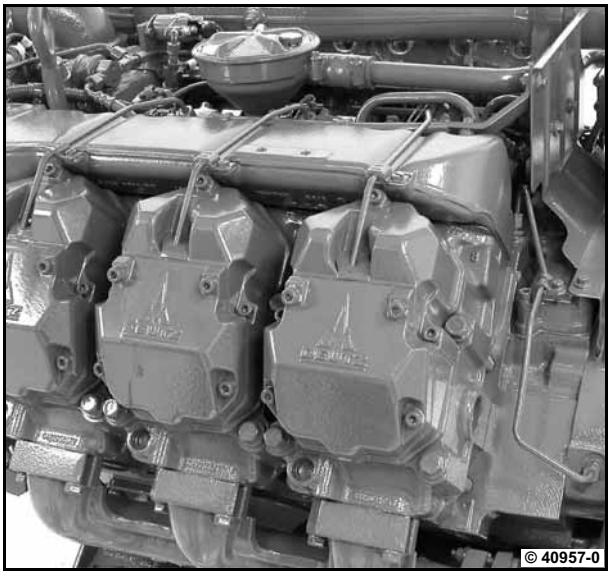
6

- Installing high pressure pipes (A-bank)

W 07-03-01

- Installing high pressure pipes (B-bank)

W 07-03-01



Dismantling and assembling fuel injector

Commercial available tools:
– Socket wrench insert 8017

Special tools:
– Holder 110110

– W 07-07-01
– W 07-07-05

Dismantling fuel injector

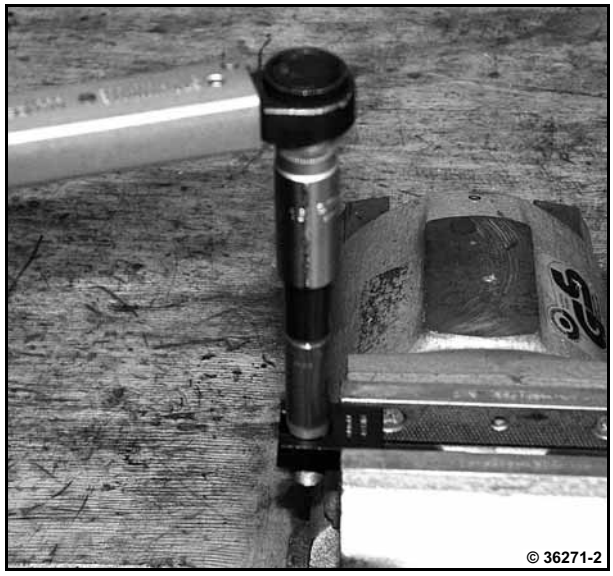
- Removing fuel injectors.

  W 07-07-01

- Check and set fuel injectors.

  W 07-07-05

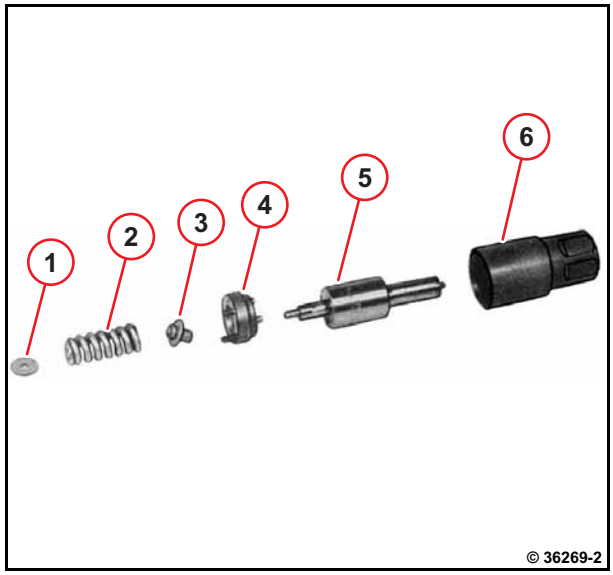
- Insert fuel injector in holder.
- Unscrew nozzle cap nut with socket wrench insert.



- Dismantle fuel injector.

Lay out components in the order in which they should be installed.

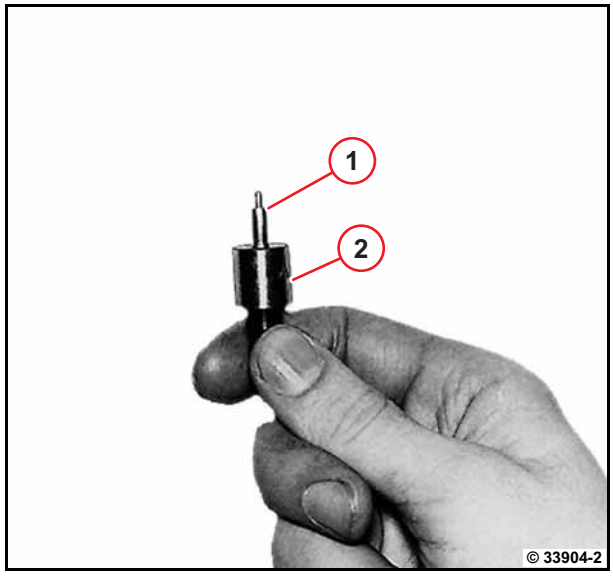
- Visually inspect the components.
  - Shim (1)
  - Compression spring (2)
  - Thrust bolt (3)
  - Intermediate piece (4)
  - Injection nozzle (5)
  - Nozzle cap nut (6)
- Clean the parts in clean diesel fuel.
- Blow components dry with air.



Assembling fuel injector

- Check injection nozzle.

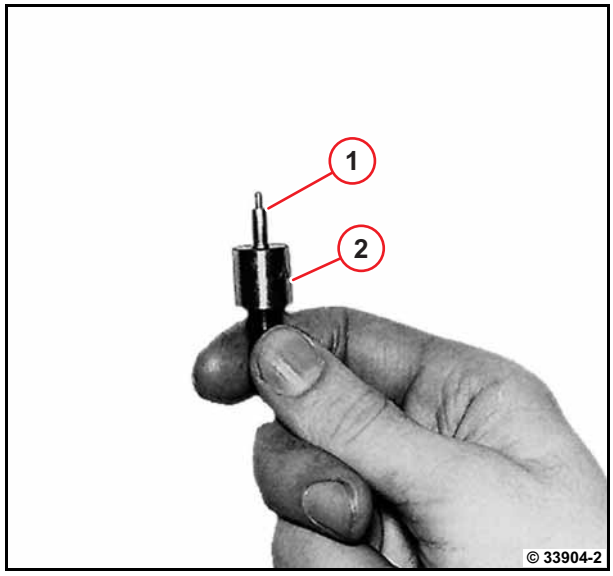
Attention!
Do not touch the nozzle needle with your fingers!
Nozzle needle (1) and nozzle body (2) are folded together and may not be switched or changed individually!



The nozzle needle (1) must slide slowly and without jolting into its seat by the force of its own weight with the nozzle body (2) held vertically.

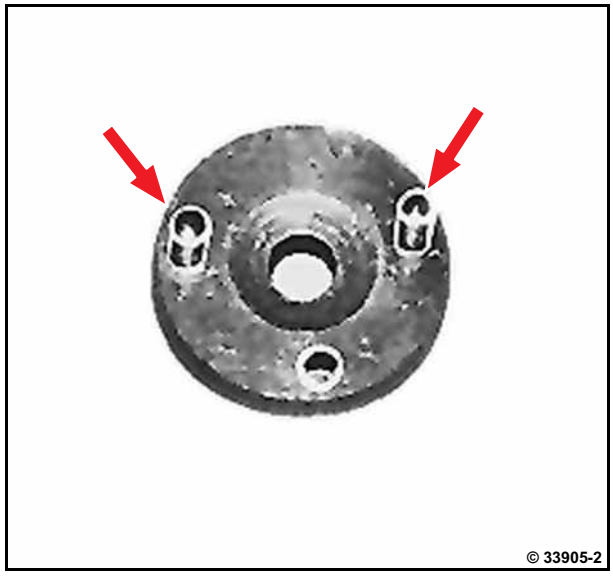
In case of abrupt sliding of the nozzle needle, clean the injection nozzle again in the diesel bath, renew if necessary.

Also clean the new injection nozzle in the clean diesel bath.



- Visually inspect the seat surfaces of the intermediate piece for wear.

Make sure the centering pins (arrows) are in place.

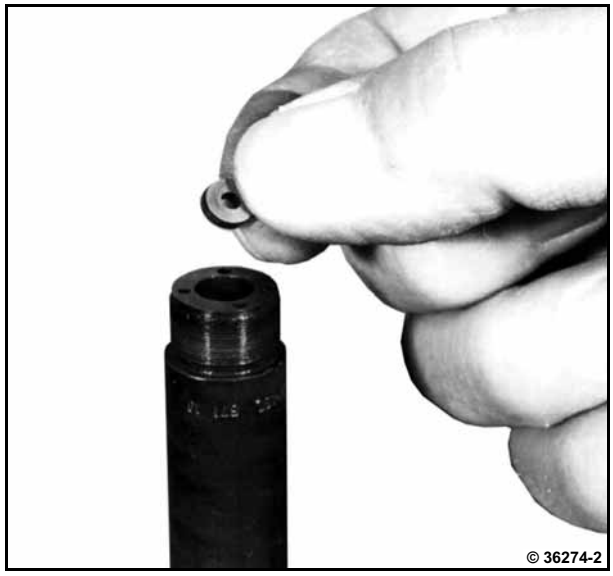


- Select shim for setting the opening pressure.

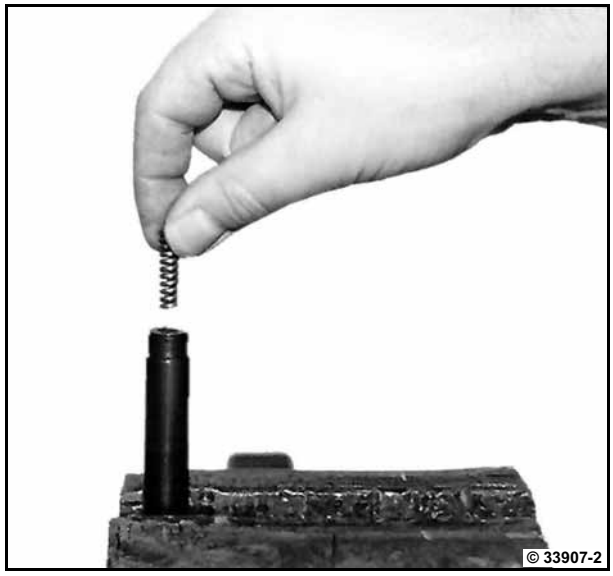
The opening pressure depends on the thickness of the shim.

A thicker shim gives a higher opening pressure.

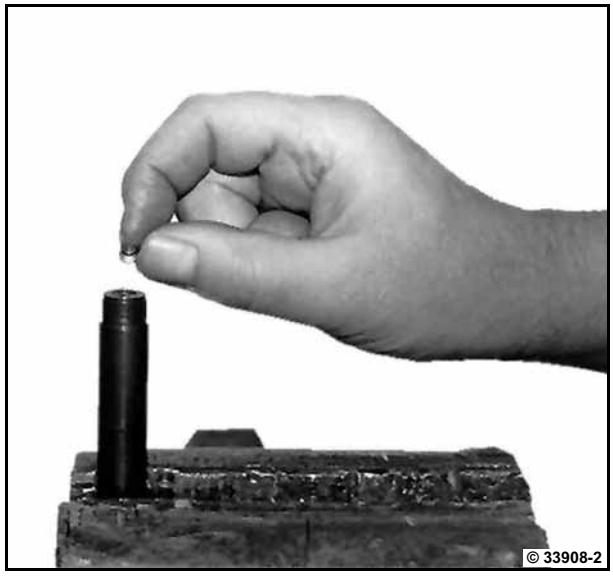
- Insert shim.



- Insert compression spring.



- Insert thrust bolt.



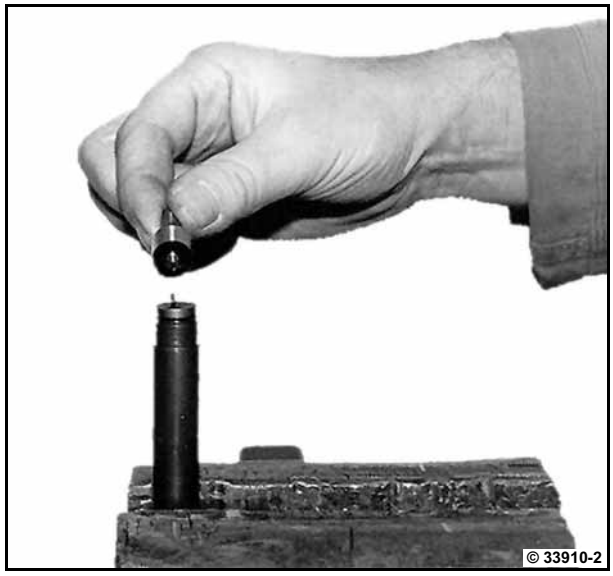
6

- Insert intermediate piece with the centering pins in the bores of the nozzle holder.

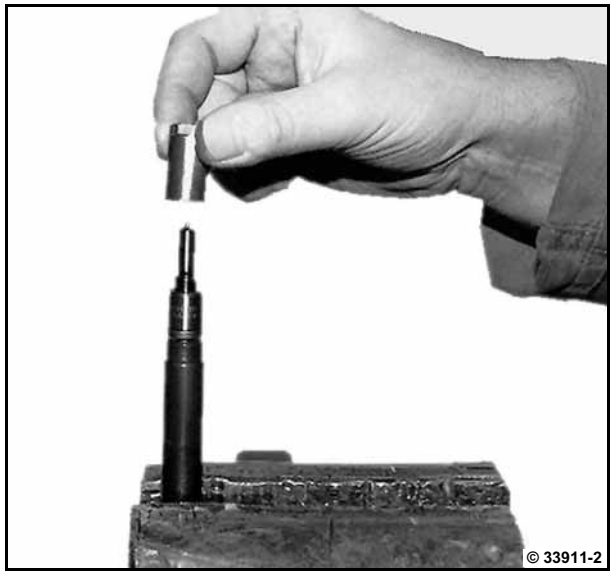
The countersink must face the thrust bolt.

- Mount the injection nozzle with the centre bores on the centering pins of the intermediate piece.

The nozzle needle may not fall out of the nozzle body.



- Screw on the nozzle cap nut.



- Tighten nozzle cap nut.

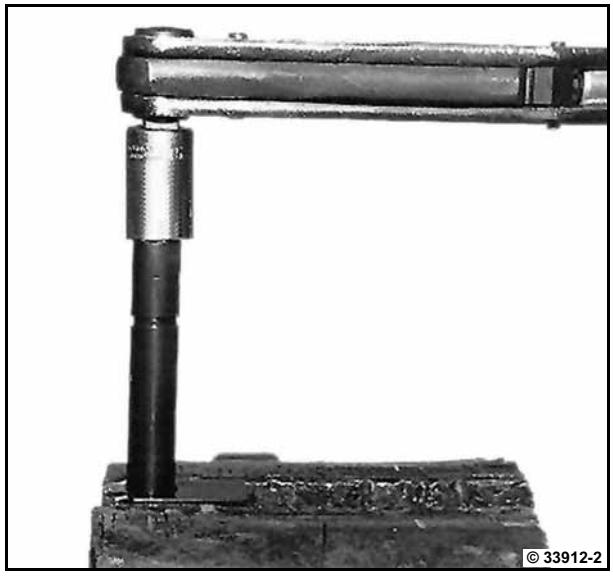
  A07 002

- Remove fuel injector from holder.
- Check and set fuel injectors.

  W 07-07-05

- Install fuel injectors.

  W 07-07-01



Checking and setting fuel injectors

Commercial available tools:
– Socket wrench insert 8017
– Nozzle tester. 8008

Special tools:
– Holder 110110

– W 07-07-01
– W 07-07-02

Danger!

Danger of injury when handling the nozzle tester.

The fuel penetrates deep into the flesh through the nozzle jet!

Caution, blood poisoning!

After about three or four actuations of the hand lever, the spring space above the nozzle needle in the injection valve fills up with diesel fuel/test oil. Then it is no longer possible to actuate the hand lever.

The nozzle cap nut must be loosened carefully before every test procedure to release pressure from the spring space.

Only use pure test oil according to ISO 4113 or clean diesel fuel to test the fuel injectors.

6

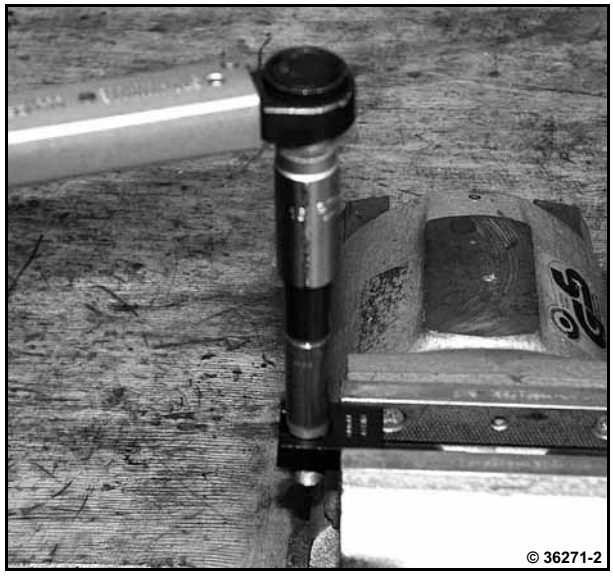
- Removing fuel injectors.

  W 07-07-01

Connecting the fuel injector to the nozzle tester

- Insert fuel injector in holder.
- Loosen nozzle cap nut approx. 180° with socket wrench insert (release pressure) and re-tighten.

A07 002



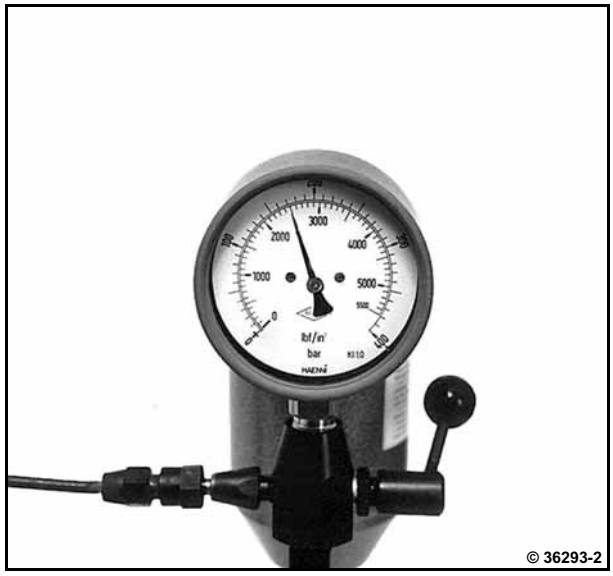
- Connect the fuel injector to the nozzle tester

Checking opening pressure

- Press down the lever of the nozzle tester slowly with the pressure gauge connected.
- Read off measured value.

The pressure at which the pointer stands still or suddenly drops is the opening pressure.

Repeat test 3 times.



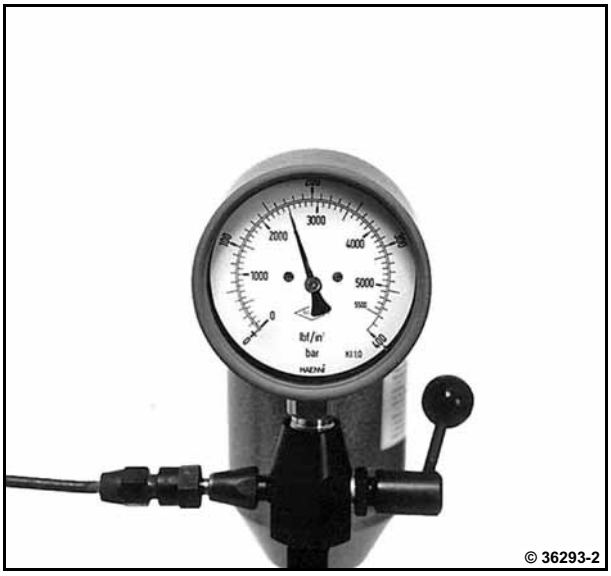
- Compare measured values.

P07 52

The measured values of three tests must match the test value.

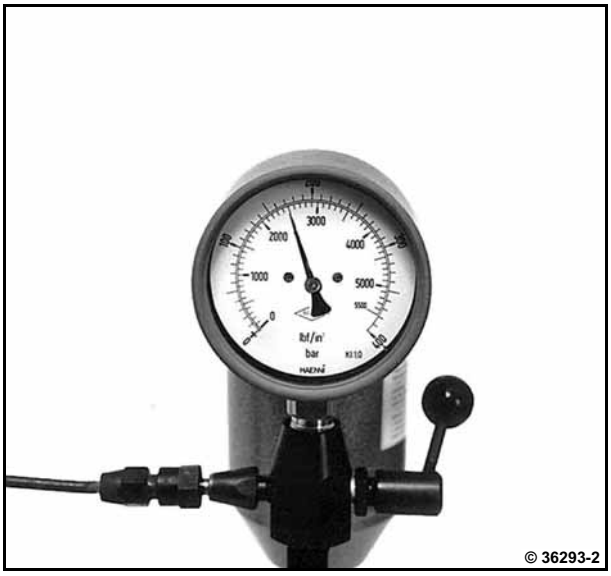
- In case of deviations from the test value, the fuel injector must be dismantled or exchanged.

W 07-07-02

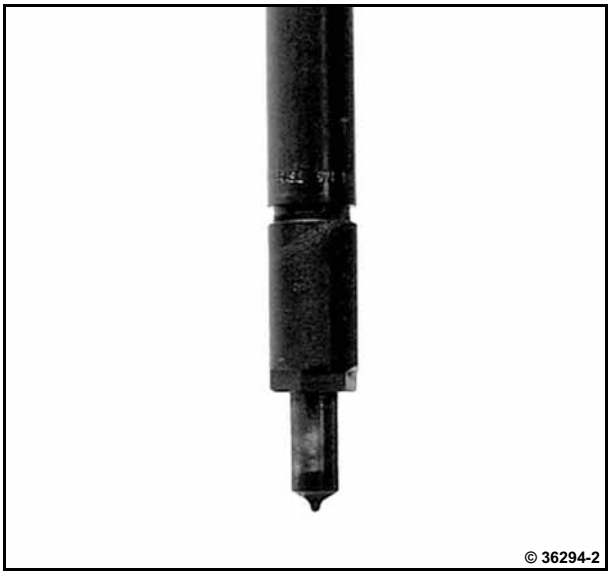


Checking tightness

- Blow the injection nozzle and nozzle holder dry with air.
- Press the hand lever of the tester down slowly until about 20 bar below the previously read opening pressure are reached.



Injection nozzle is tight if it does not drip within 10 seconds.



- If the injection nozzle drips, the fuel injector must be dismantled or exchanged.

W 07-07-02

Attention!
Repairs are not permitted!

6

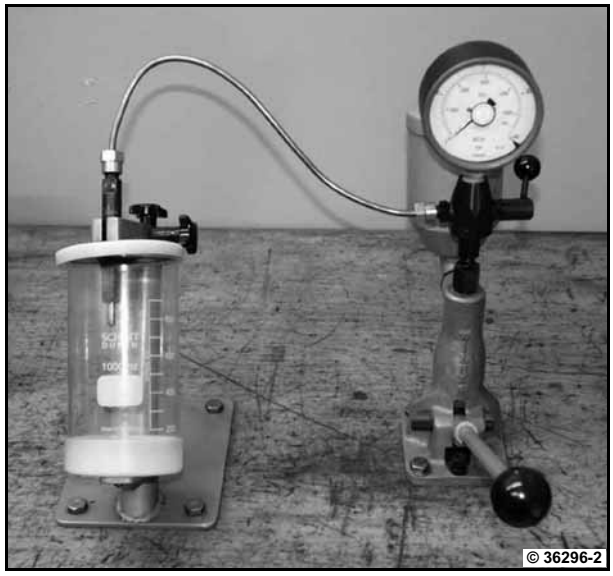
Checking the easy action of the nozzle needle

- Switch off the tester's pressure gauge.
- Carry out chatter and jet test of the nozzle needle.

The easy action of the nozzle needle in the nozzle body is checked by the acoustic chatter test.

Increasing wear in the needle seat of the fuel injectors changes the chatter behavior of the injecton nozzle.

A used fuel injector must buzz audibly and atomize the fuel finely when the lever is actuated quickly.

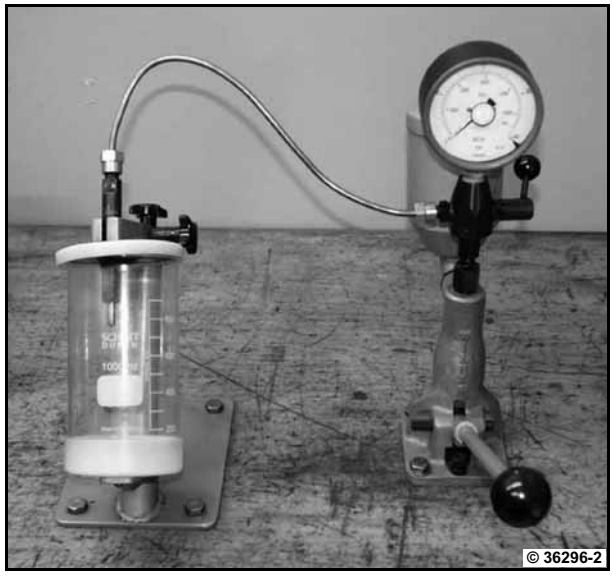


- If the injection nozzle does not buzz audibly, it must be dismantled and cleaned.

W 07-07-02

The injection nozzle must be changed if it does not buzz after cleaning.

The jet profile may deviate considerably from that of a new fuel injector.



Removing the fuel injector from the nozzle tester

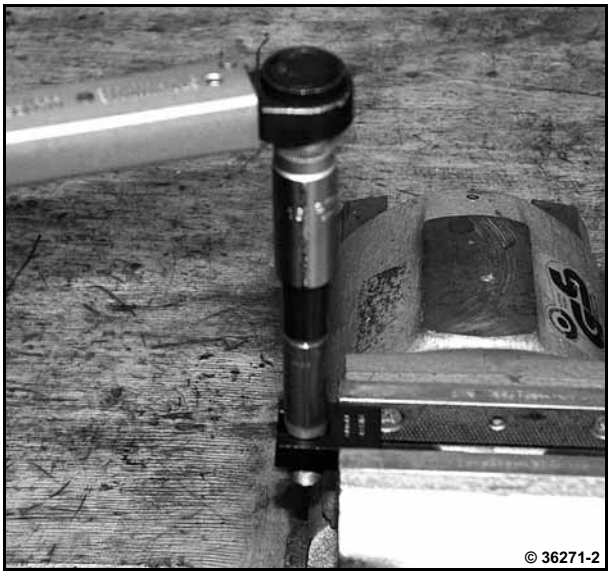
- Loosen nozzle cap nut approx. 180° with socket wrench insert (release pressure) and re-tighten.

A07 002

Attention!
The pressure in the spring space must be reduced before installing the fuel injectors.

- Install fuel injectors.

W 07-07-01



Removing and installing temperature transmitter

Commercial available tools

– W 06-07-03 . . . . . (B-bank)

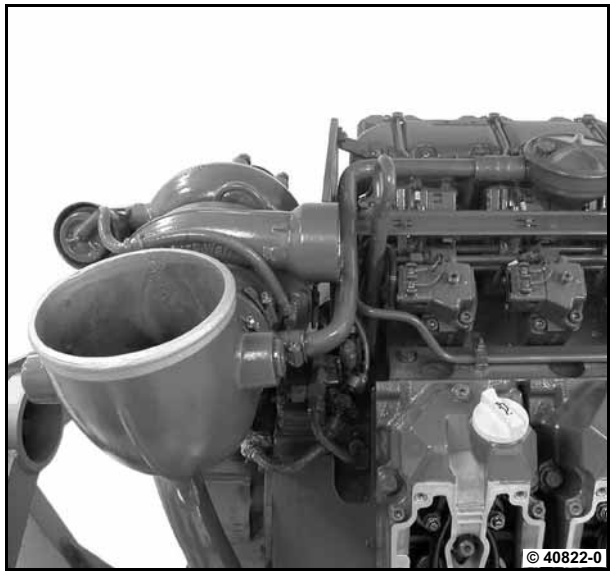
Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Read out error memory of the motor control timer with SERDIA.

Removing temperaure transmitter

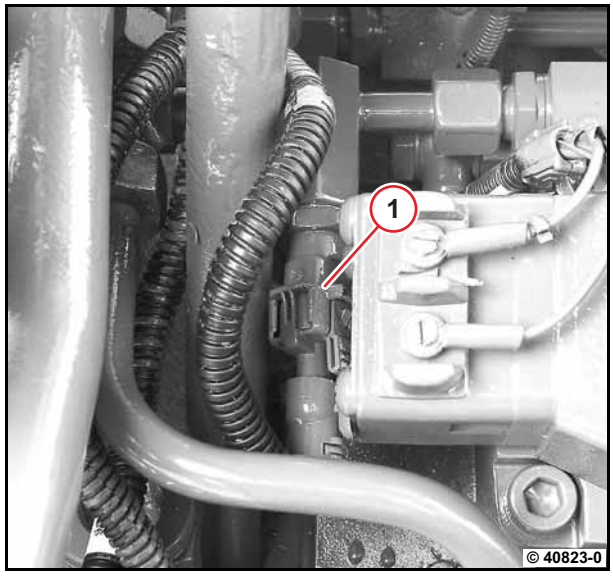
- Remove charge air pipe (B-bank).

  W 06-07-03

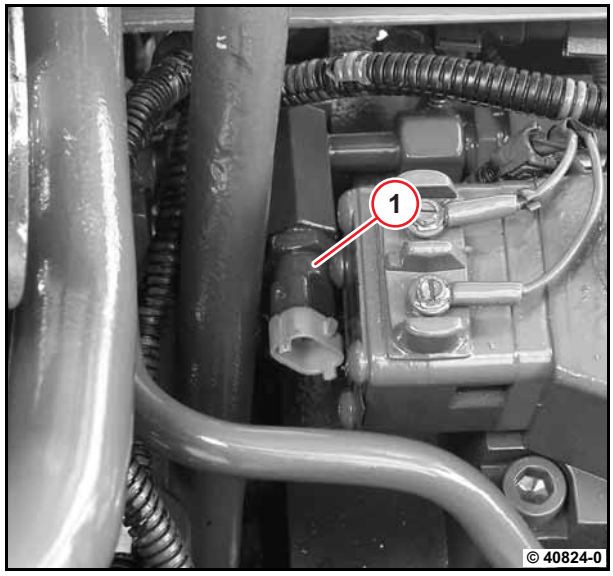


6

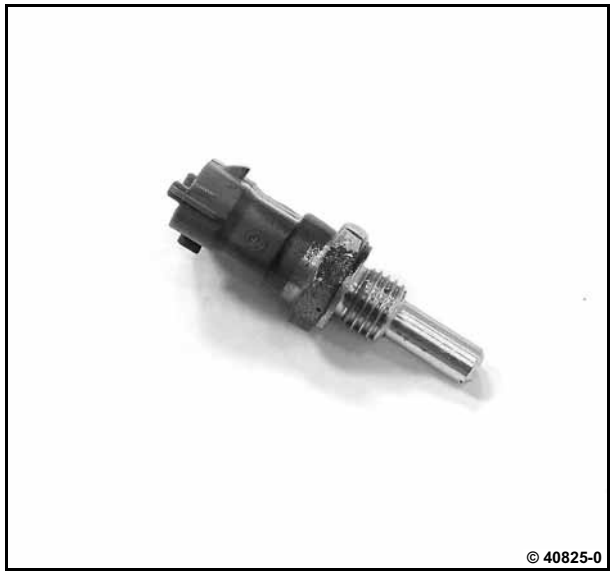
- Unlock cable plug (1) and remove.



- Unscrew temperature transmitter (1).



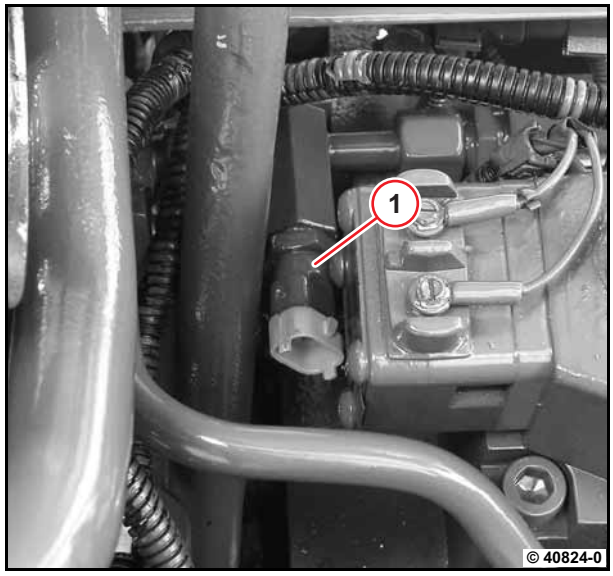
- Visually inspect the components.



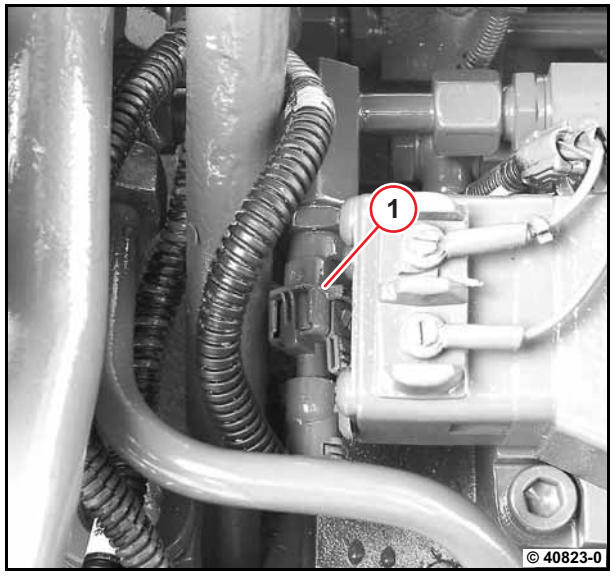
Installing temperature transmitter

- Tighten temperature transmitter (1).

A07 023



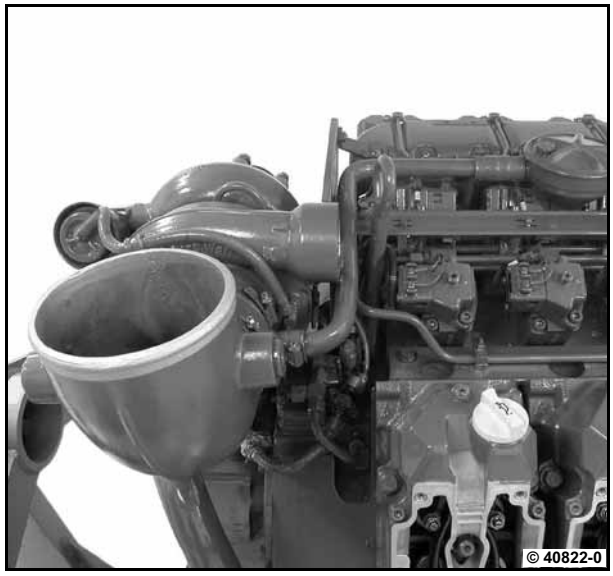
- Plug in the cable plug (1).



- Install charge air pipe (B-bank)

W 06-07-03

Delete error entry in the error memory of the motor control timer with SERDIA.



6

Removing and installing fuel pipes

Commercial available tools:
– Open wrench size SW 22

Special tools:
– Plugs/caps 170160

– W 06-07-03 . . . . . (A-bank)
– W 06-07-03 . . . . . (B-bank)

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Ensure that the cables are connected properly.

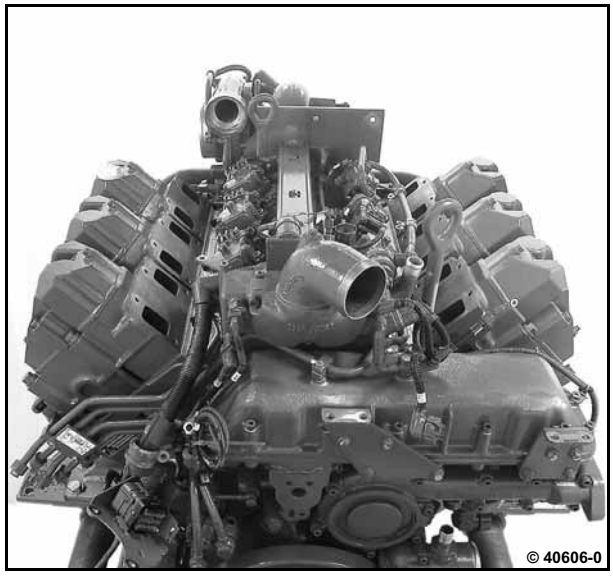
Removing fuel pipes

- Remove charge air pipe (A-bank).

  W 06-07-03

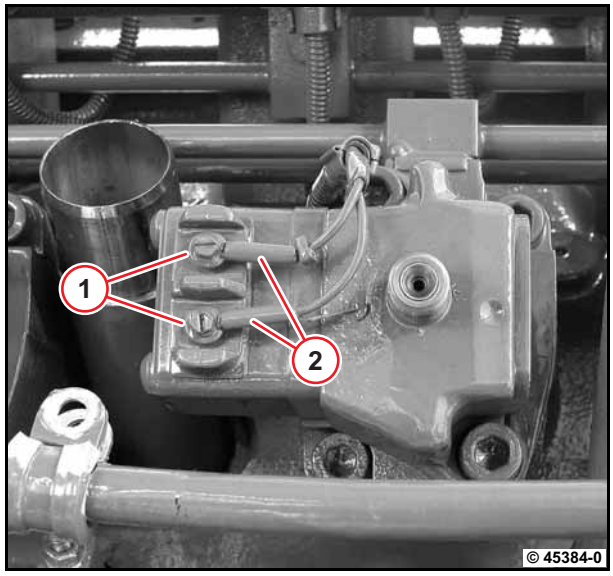
- Remove charge air pipe (B-bank).

  W 06-07-03



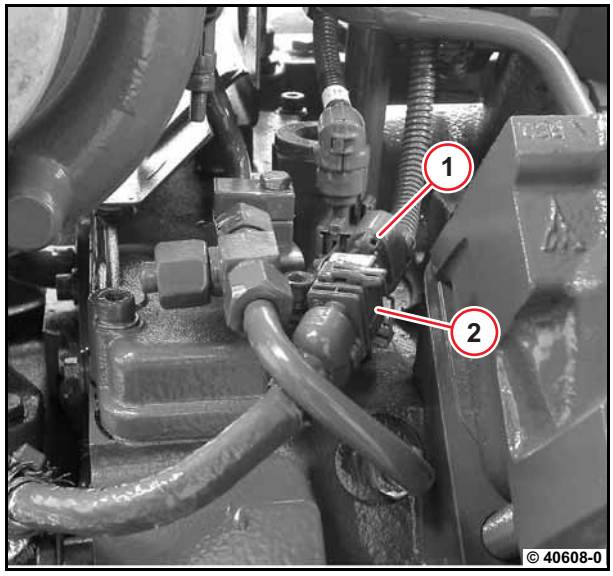
- Loosen screws (1).
- Pull the cables (2) off all injection pumps.

Mark assignment of cables/connections before removing.

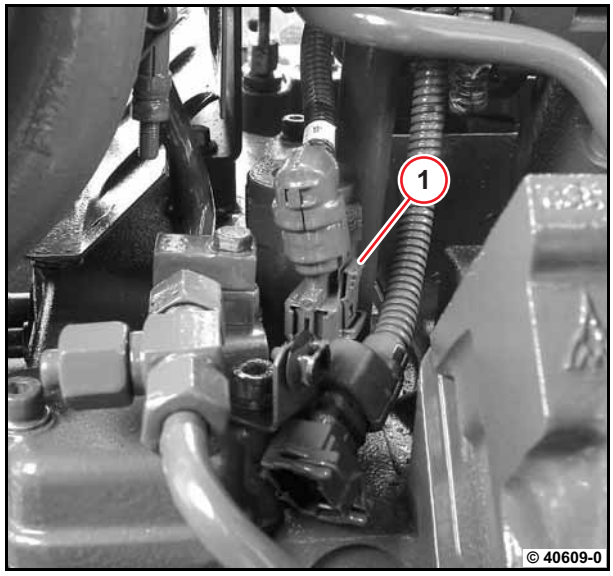


6

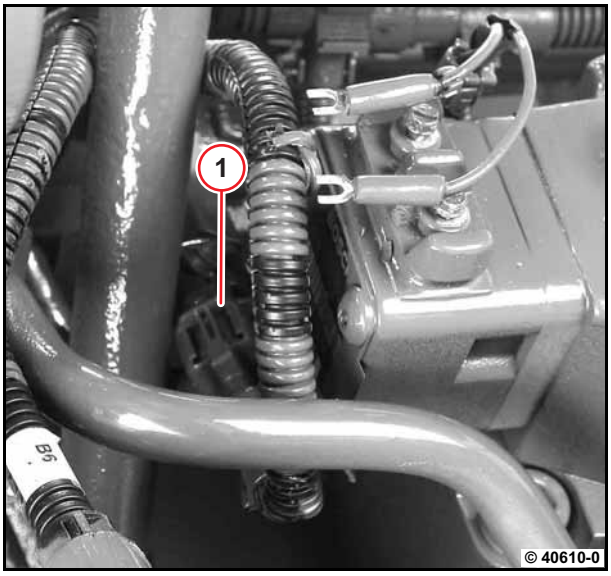
- Remove cable tie (1).
- Unlock cable plug (2) and disconnect.



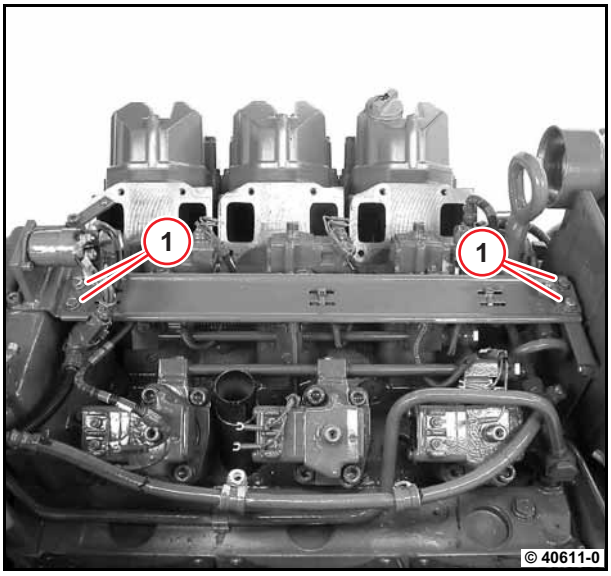
- Unlock cable plug (1) and remove.



- Unlock cable plug (1) and remove.



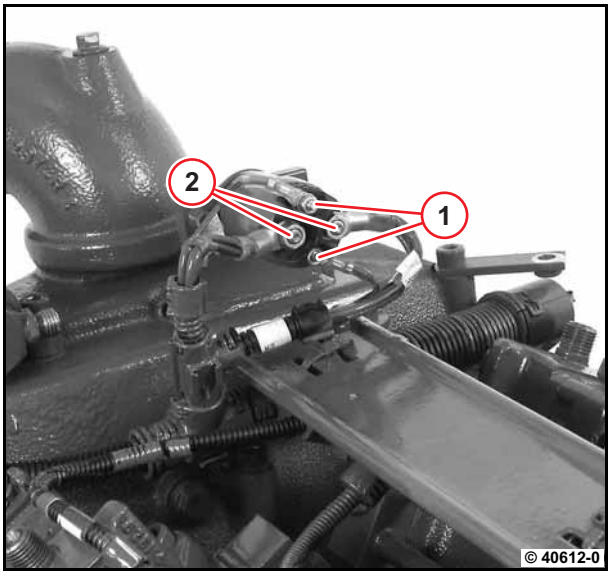
- Unscrew screws (1).



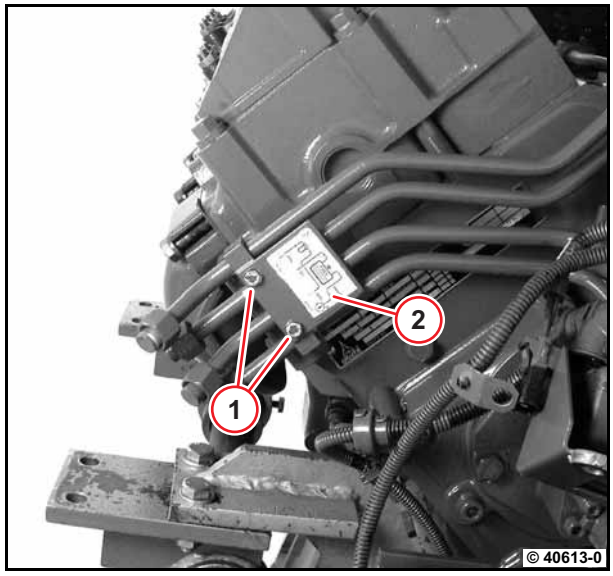
- Unscrew nuts (1).
- Unscrew the nuts (2).
- Remove washers.
- Remove cables.

Mark assignment of cables/connections before removing.

- Place cable harness rail with cable harness to one side.

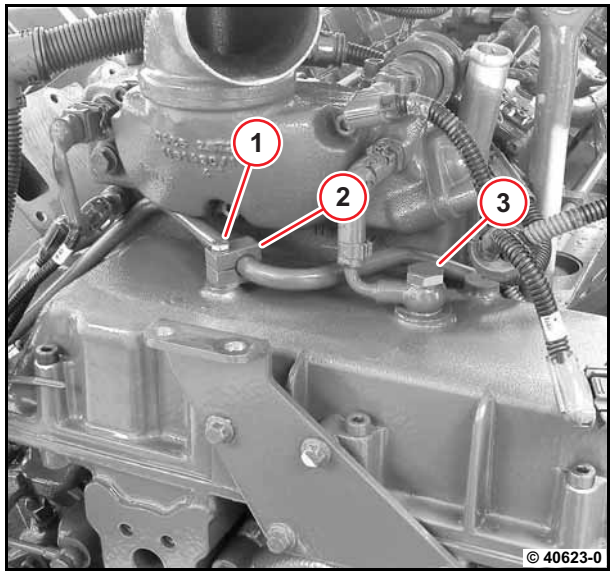


- Unscrew screws (1).
- Remove the holder (2).

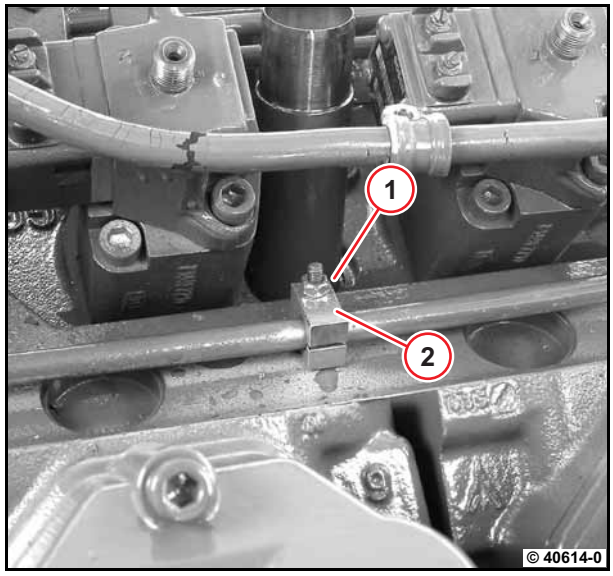


6

- Unscrew screw (1).
- Remove the holder (2).
- Unscrew hollow screw (3).
- Remove sealing rings.



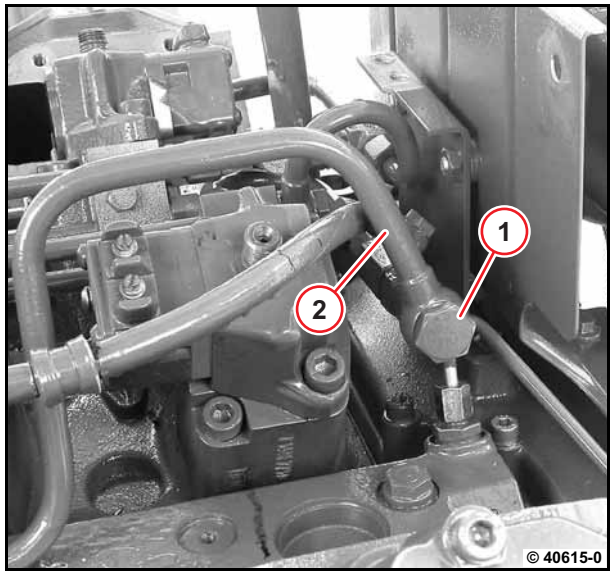
- Unscrew nut (1).
- Remove the holder (2).



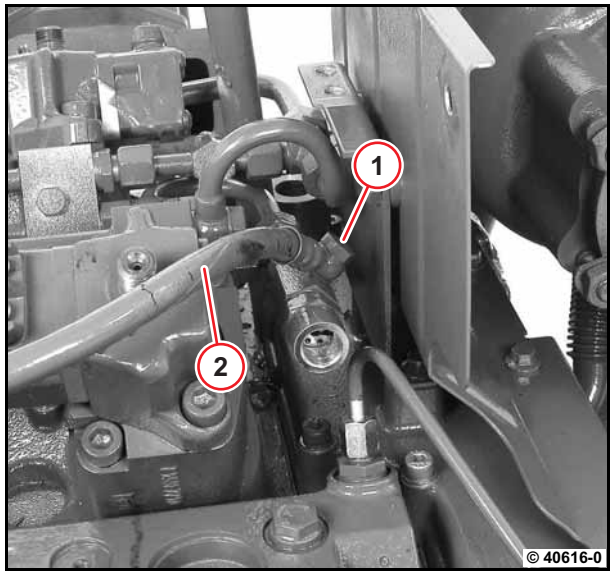
- Unscrew hollow screw (1).

Hold overflow valve.

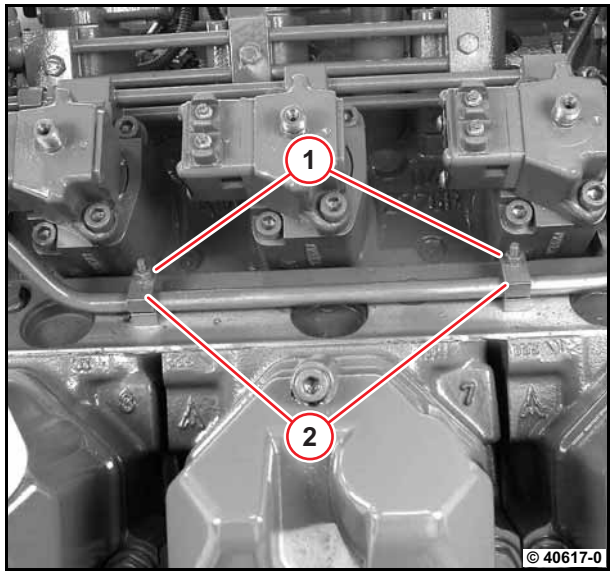
- Remove fuel pipe (2).
- Remove sealing rings.



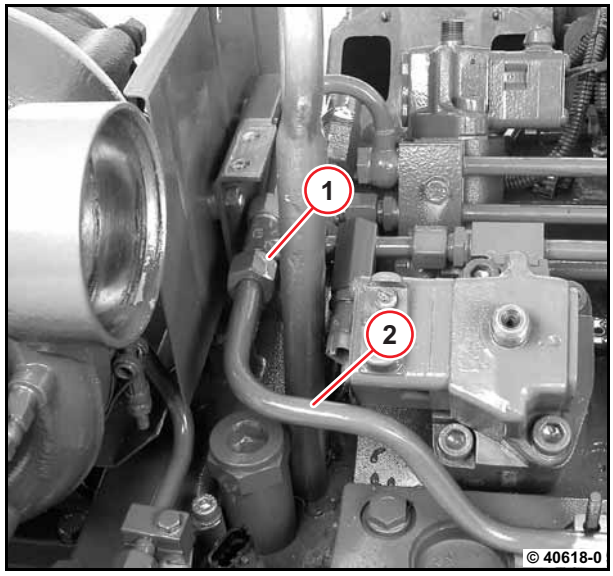
- Unscrew hollow screw (1).
- Remove sealing rings.
- Place fuel hose (2) to one side.



- Unscrew nuts (1).
- Remove the holder (2).

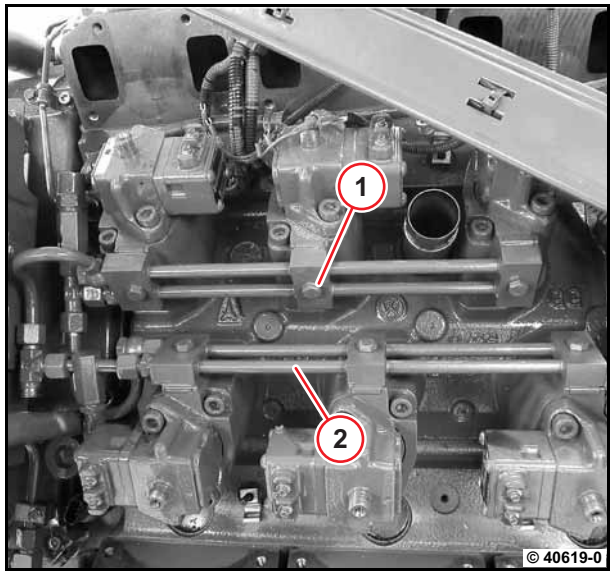


- Unscrew lock nut (1).
- Remove fuel pipe (2).

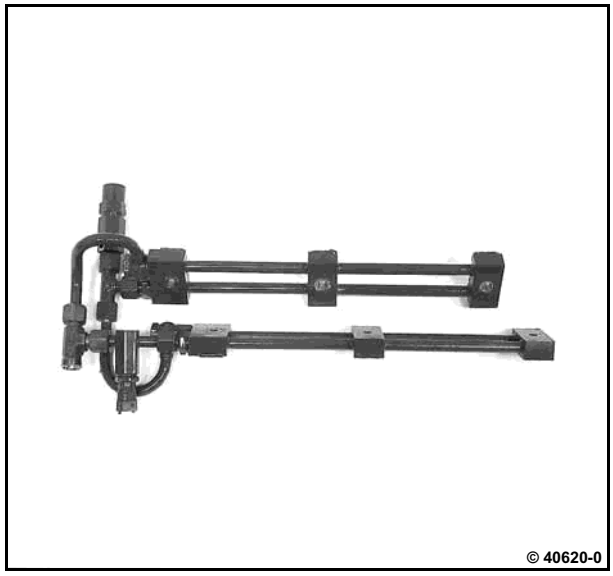


6

- Unscrew all screws (1).
- Remove fuel pipes (2).
- Remove seals.

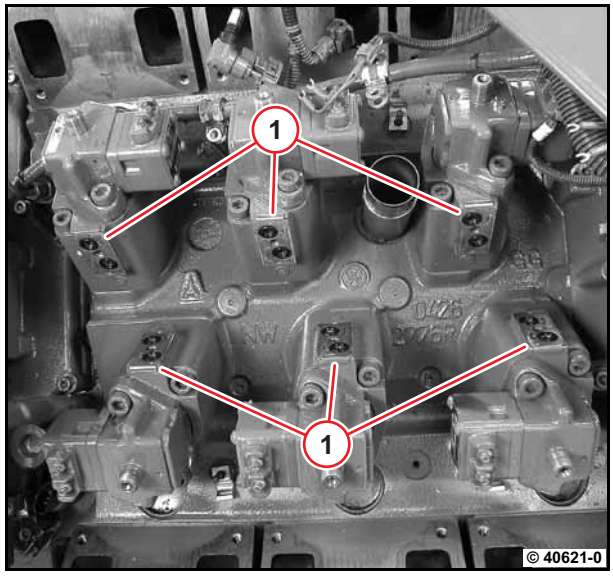


- Visually inspect the components.

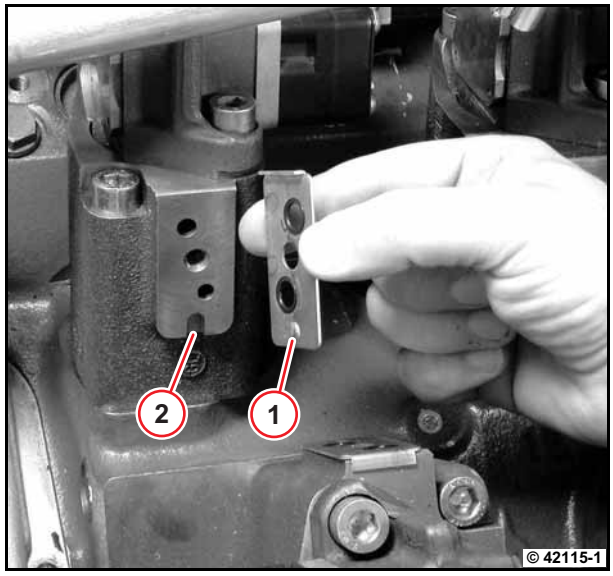


Installing fuel pipes

- Mount new gaskets (1).



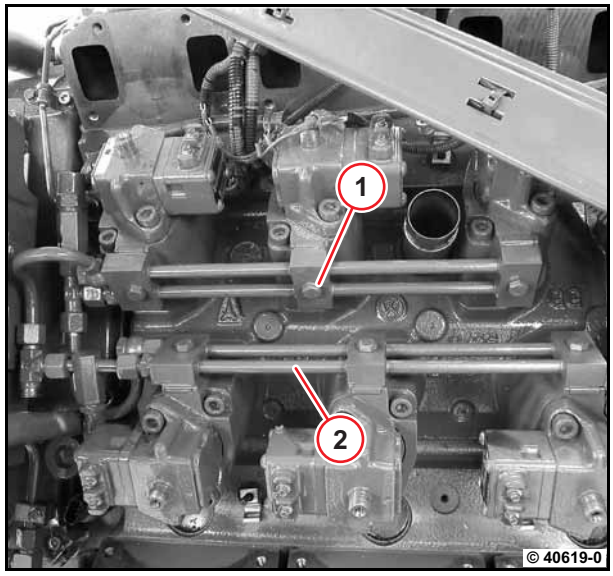
Note assignment!
The lug (1) must lock in groove (2).



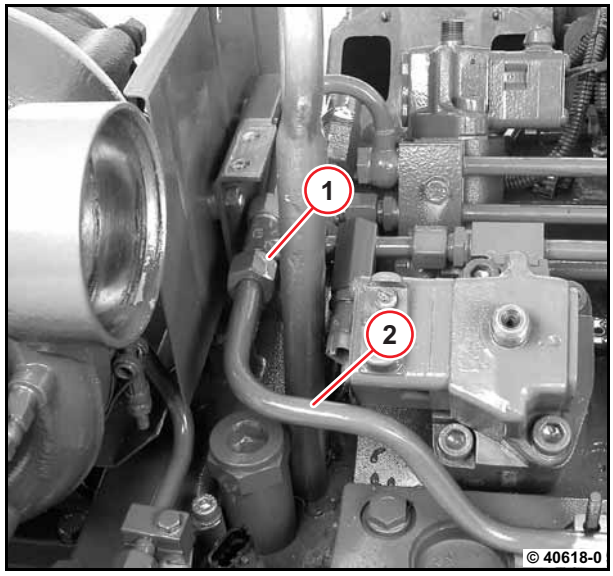
- Mount fuel pipes (2).
- Tighten all screws (1).

A07 015

Do not move the gaskets when mounting the fuel pipes.



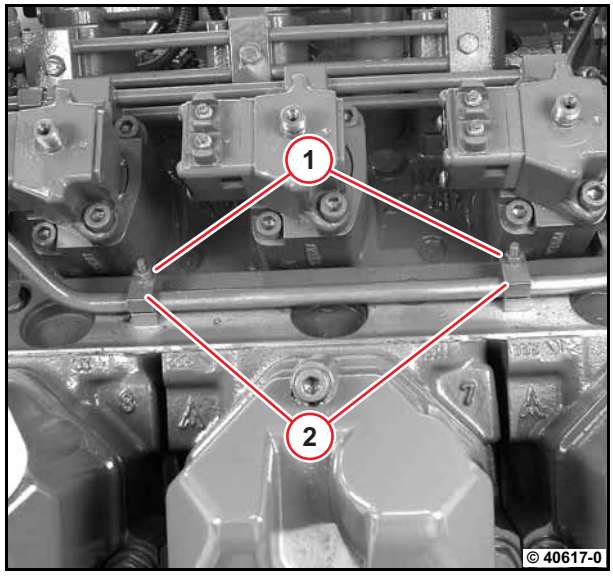
- Mount fuel pipe (2).
- Screw on lock nut (1).



6

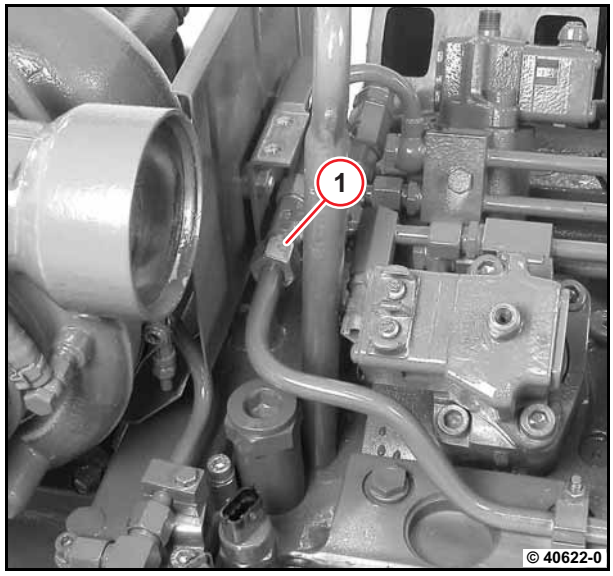
- Oil the thread lightly.
- Mount holder (2).
- Tighten nuts (1).

A07 044



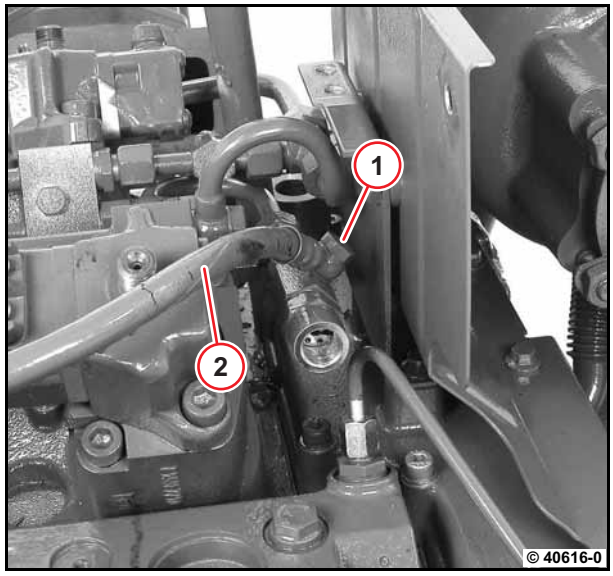
- Tighten lock nut (1).

A07 066

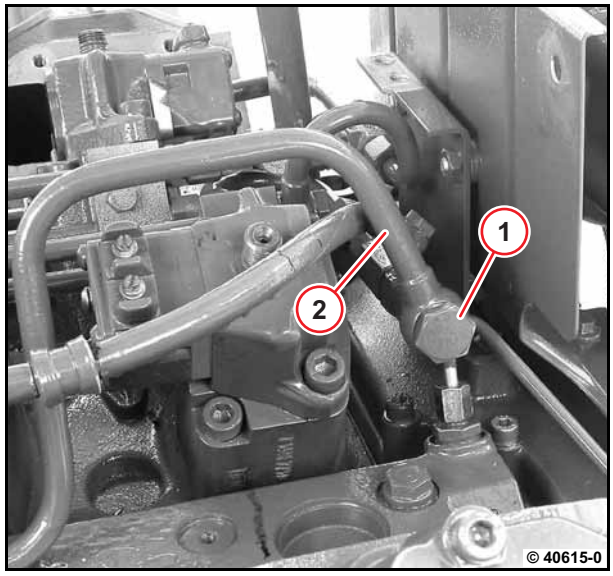


- Mount new sealing rings.
- Position fuel hose (2).
- Tighten hollow screw (1).

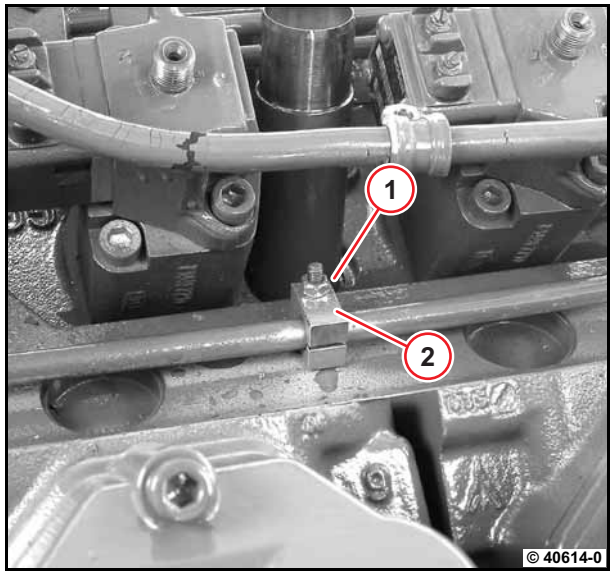
A12 090



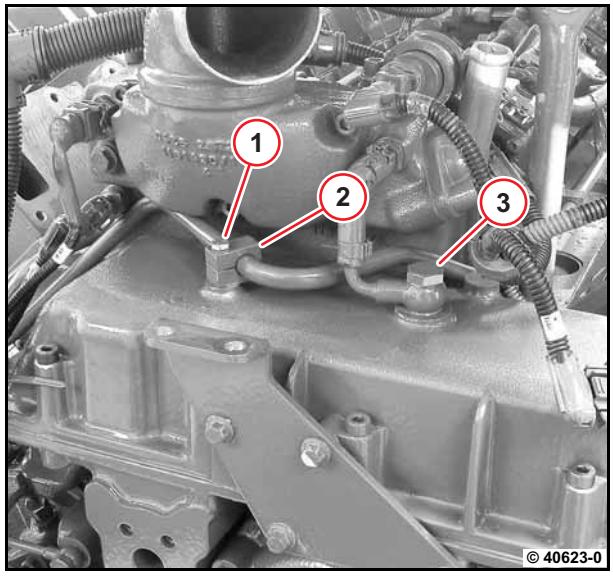
- Mount new sealing rings.
- Mount fuel pipe (2).
- Screw on hollow screw (1).



- Oil the thread lightly.
- Mount holder (2).
- Screw on nut (1).



- Mount new sealing rings.
- Screw on hollow screw (3).
- Mount holder (2).
- Oil thread and head contact surface lightly.
- Fasten screw (1).



6

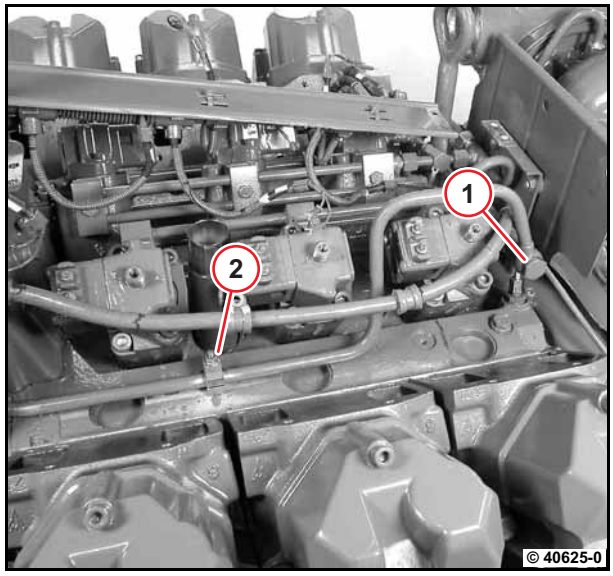
- Tighten hollow screw (1).

Hold overflow valve.

A12 093

- Tighten nut (2).

A07 044

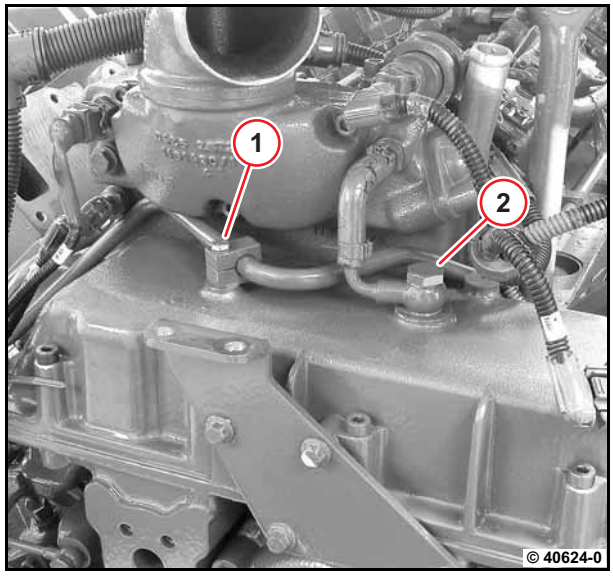


- Tighten screw (1).

A07 044

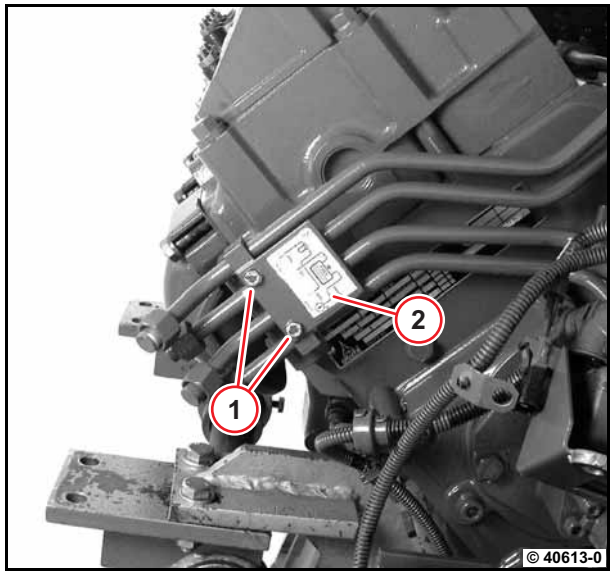
- Tighten hollow screw (2).

A12 092



- Mount holder (2).
- Tighten screws (1).

A07 044



- Position cable harness rail with cable harness.
- Plug cables.

Attention!
Note assignment and polarity of the electrical connections!

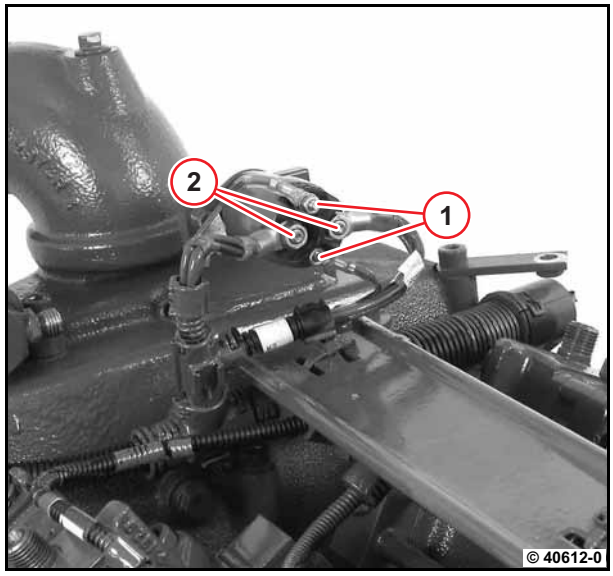
Connect cables according to marks made before removing.

- Mount washers.
- Tighten nuts (1).

A13 037

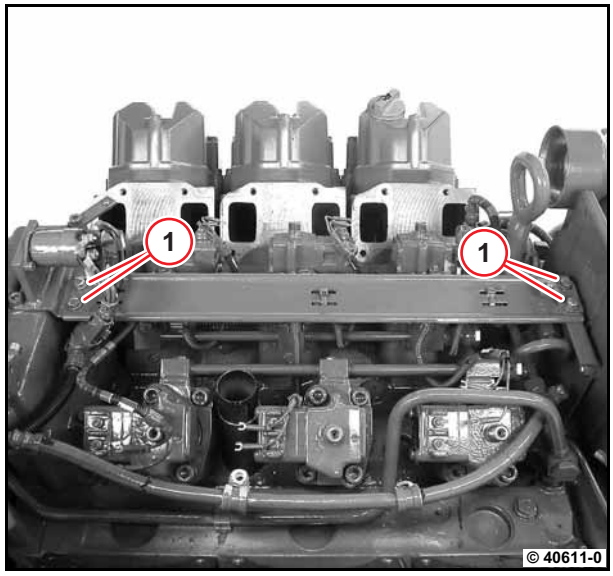
- Tighten nuts (2).

A13 038



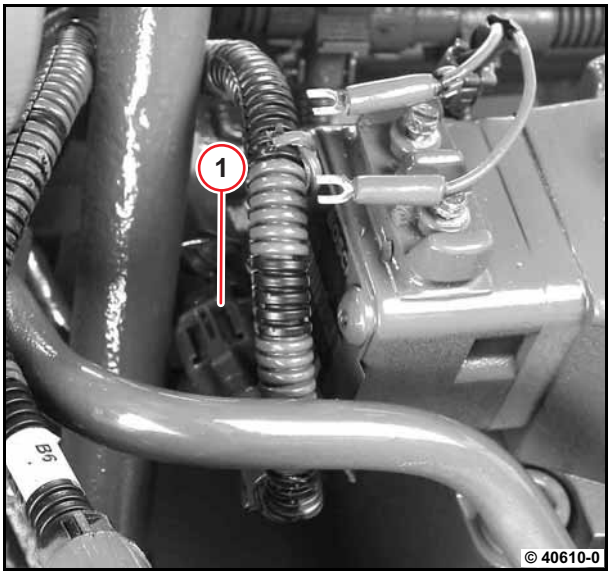
- Tighten screws (1).

A13 094

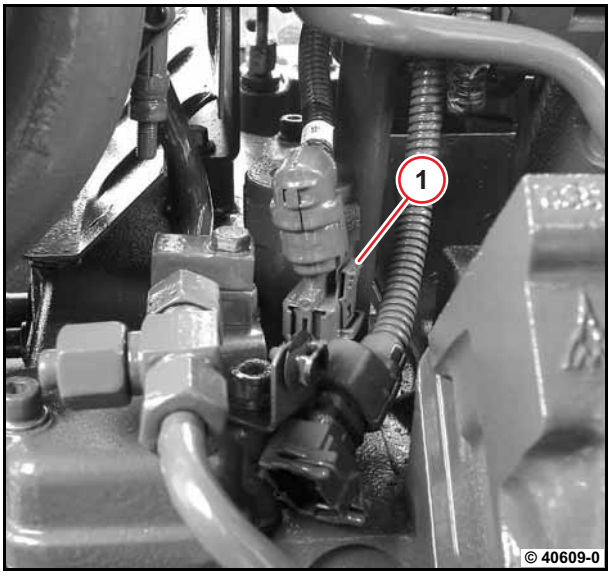


6

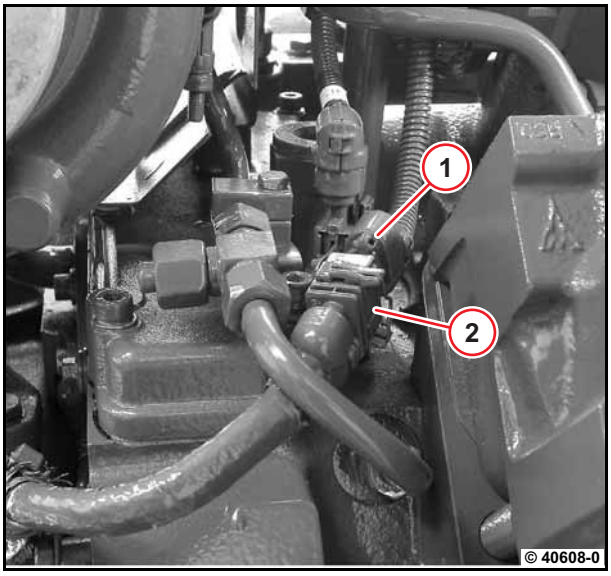
- Plug in the cable plug (1).



- Plug in the cable plug (1).



- Plug together the cable plugs (2).
- Fix cable tie (1).



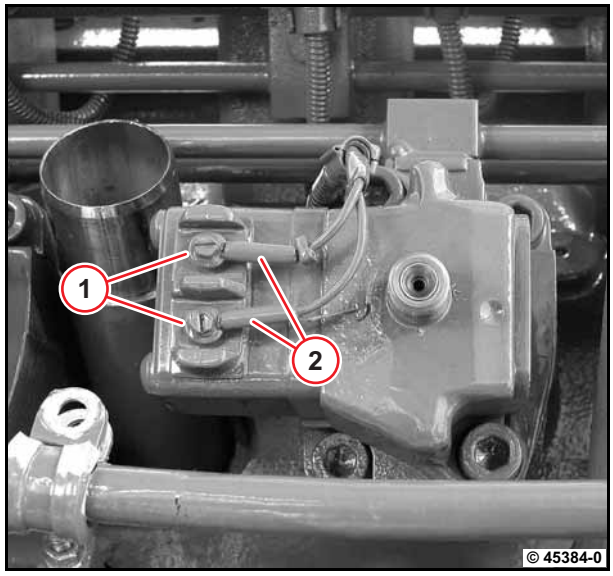
Clamp all injection pumps.

- Plug in cables (2).

  T13 054

- Tighten screws (1).

  A13 054



- Install charge air pipe (A-bank)

  W 06-07-03

- Install charge air pipe (B-bank)

  W 06-07-03

Removing and installing fuel pipes

Commercial available tools

Special tools:
– Plugs/caps 170160

Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

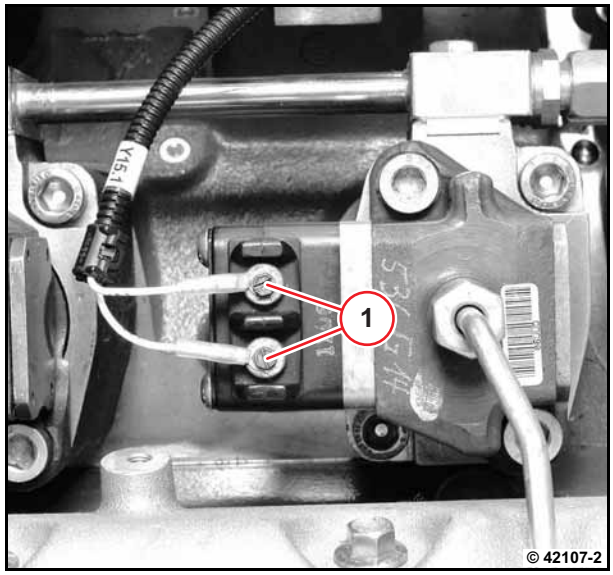
Ensure that the cables are connected properly.

Removing fuel pipes

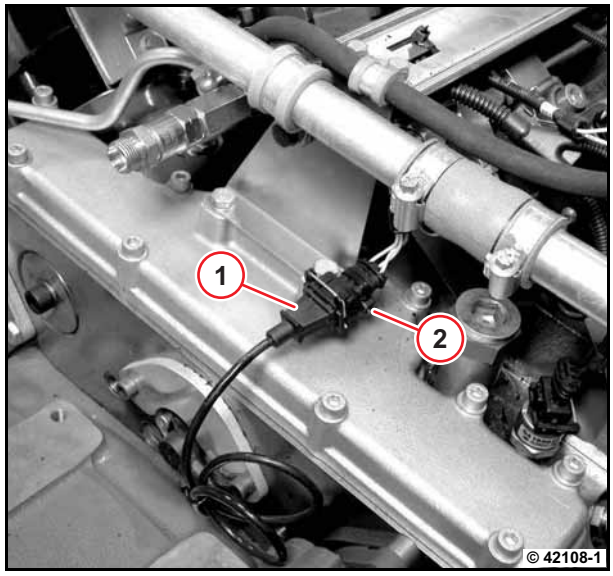
- Loosen screws (1).

Mark assignment of cables/connections before removing.

- Remove cables.



- Unlock cable plug (1) and remove.
- Remove cable tie (2).



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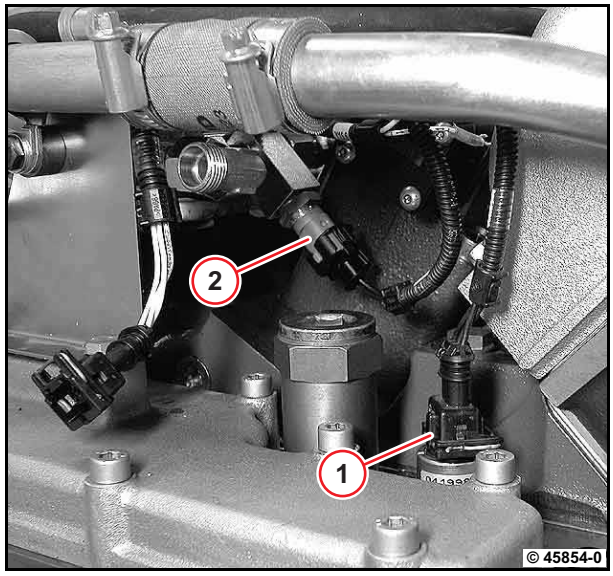
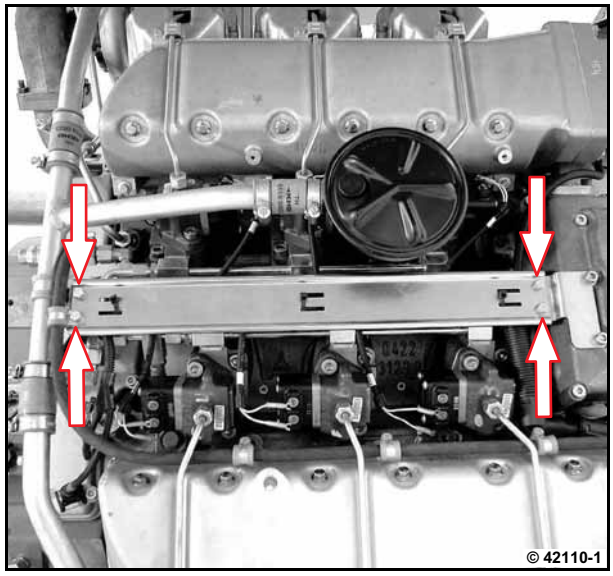
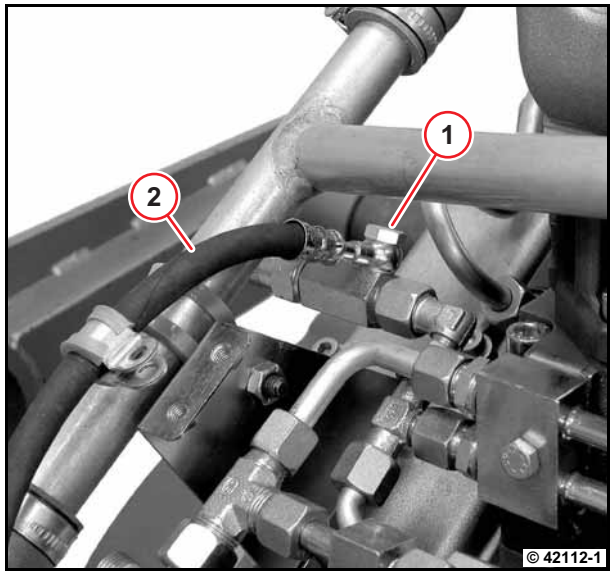
- Unlock cable plug (1) and remove.
- Unlock cable plug (2) and remove.



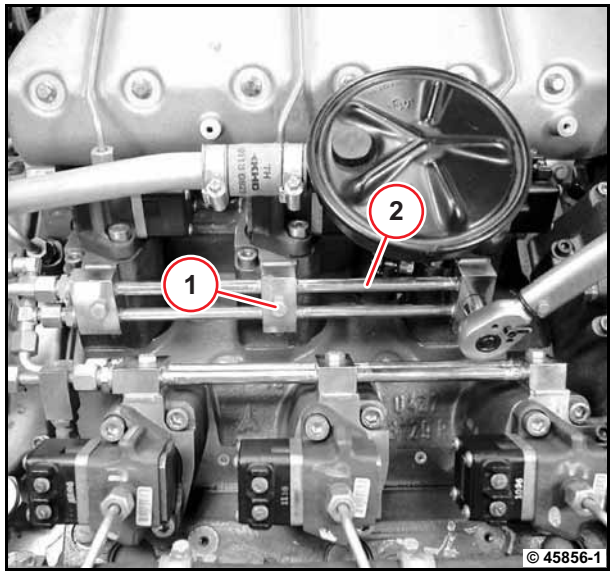
- Unscrew screws (arrows).
- Place cable harness rail with cable harness to one side.



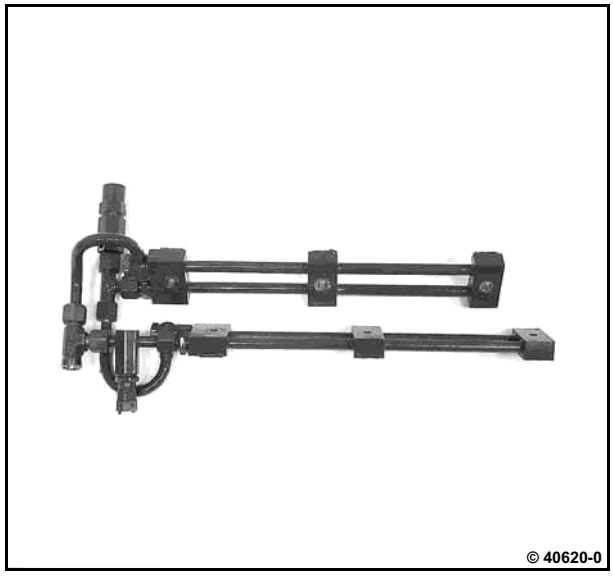
- Unscrew hollow screw (1).
- Remove sealing rings.
- Place hose pipe (2) to one side.



- Unscrew all screws (1).
- Remove fuel pipes (2).
- Remove seals.

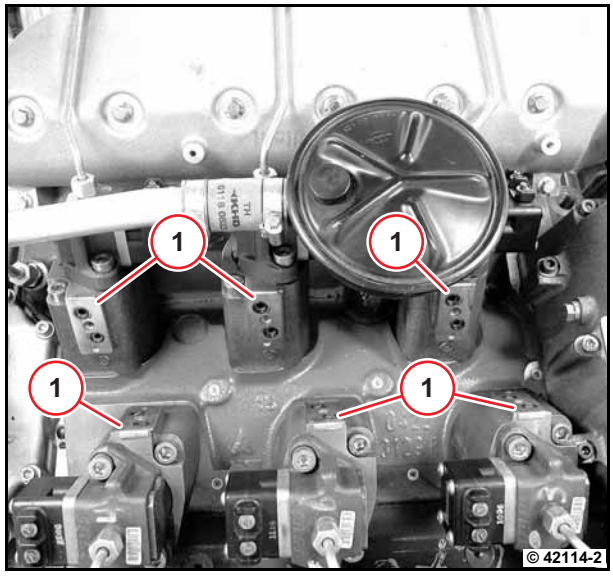


- Visually inspect the components.

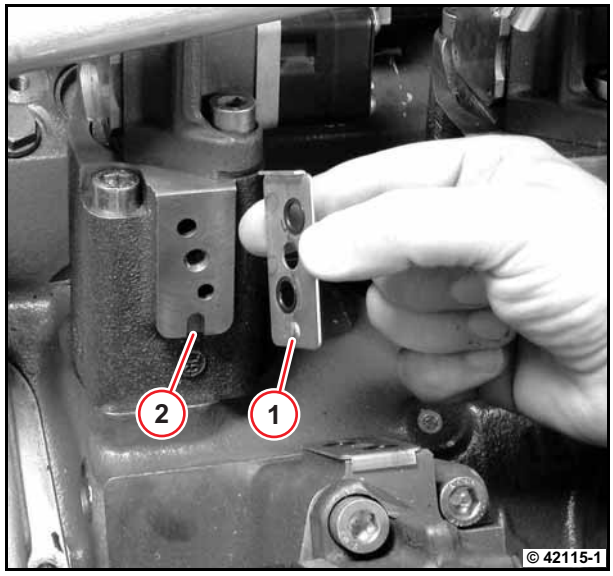


Installing fuel pipes

- Mount new gaskets (1).



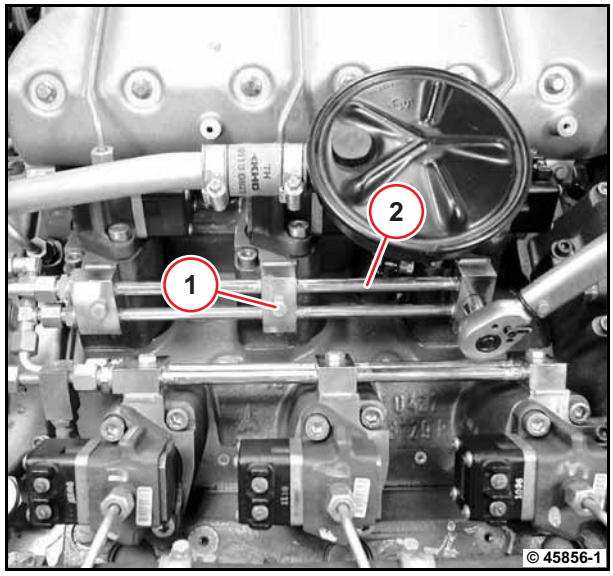
Note assignment!
The lug (1) must lock in groove (2).



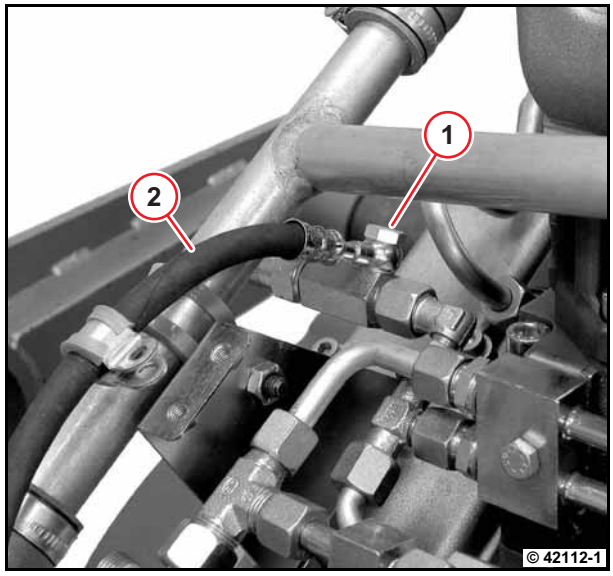
- Mount fuel pipes (2).
- Tighten all screws (1).

A07 015

Do not move the gaskets when mounting the fuel pipes.



- Mount hose line (2).
- Mount new sealing rings.
- Screw on hollow screw (1).

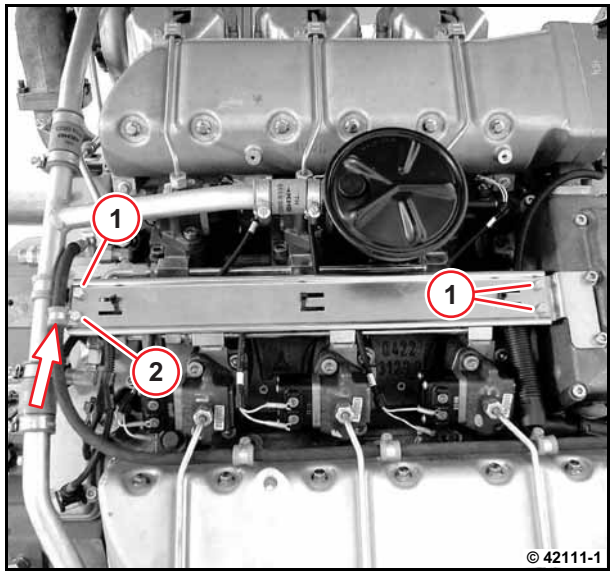


- Position cable harness rail with cable harness.
- Position pipe clamp (arrow).
- Fasten screws.

Note different screw lengths:
M6 x 12 mm (1)
M6 x 16 mm (2)

- Tighten screws .

A13 094

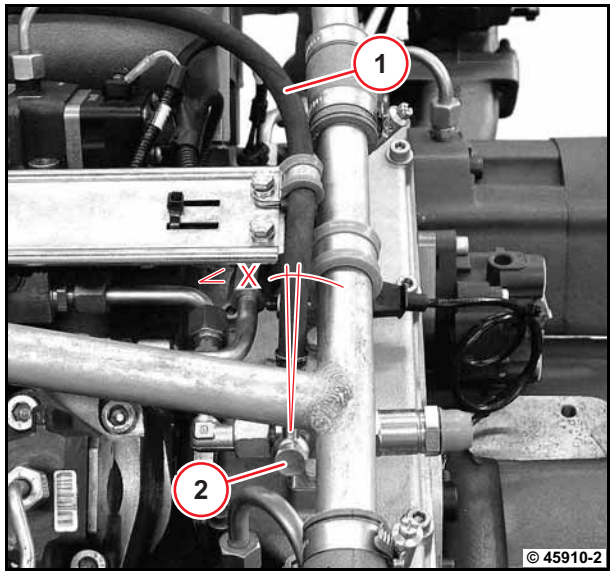


- Position hose line (1).

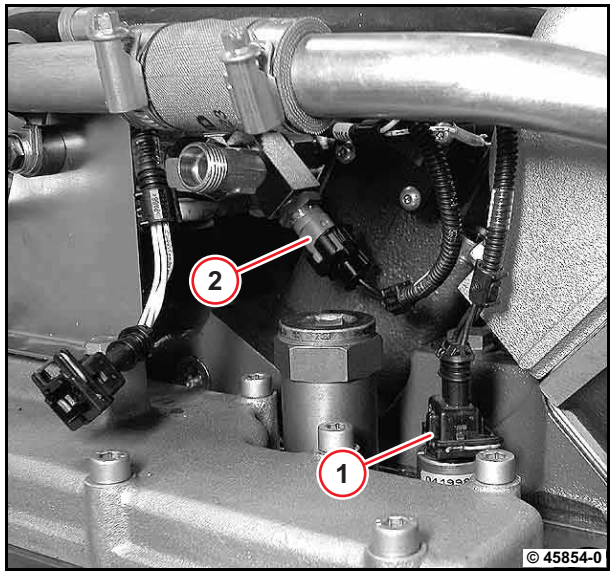
Observe installation angle dimension X = 10°.

- Tighten hollow screw (2).

A12 090



- Plug in the cable plug (1).
- Plug in the cable plug (2).



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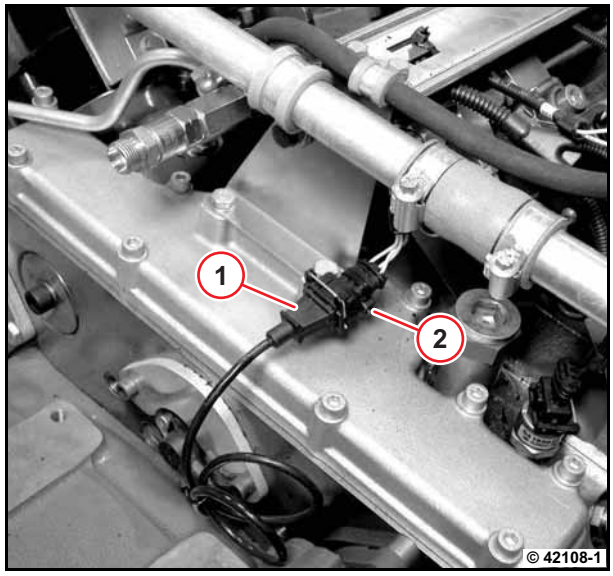
- Plug cable plugs (1) together.
- Fix cable with cable tie (2).



Clamp all injection pumps.

- Plug in cables (1).

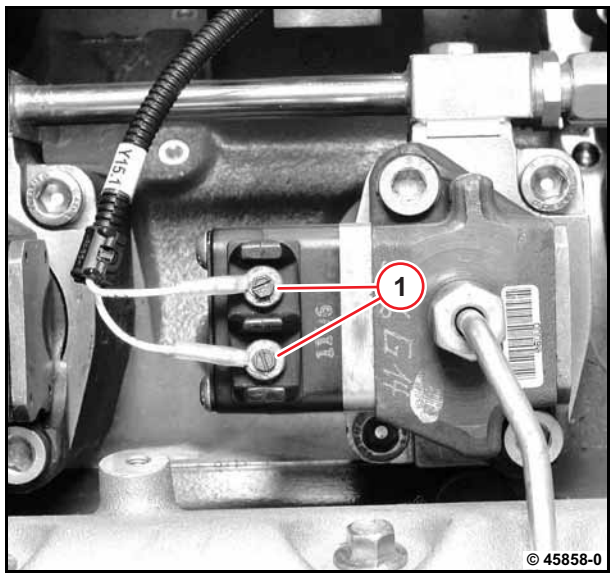
T13 054

Attention!
Note assignment and polarity of the electrical connections!

Connect cables according to marks made before removing.

- Tighten screws .

A13 054



Removing and installing the fuel supply pump

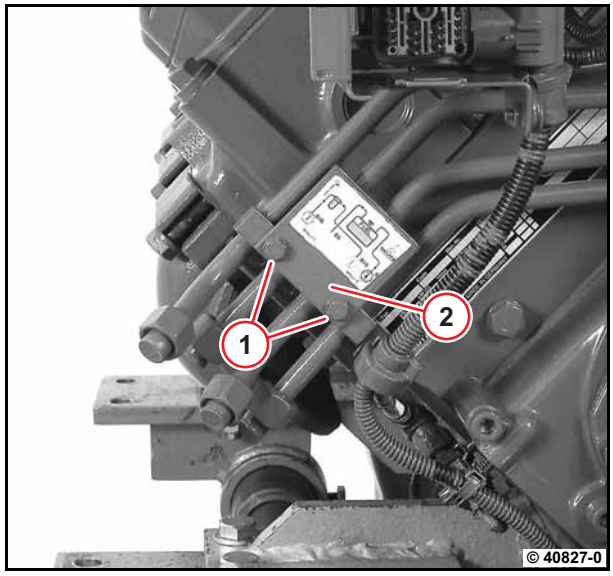
Commercial available tools:
– Magnetic measuring stand

Special tools:
– Plugs/caps 170160

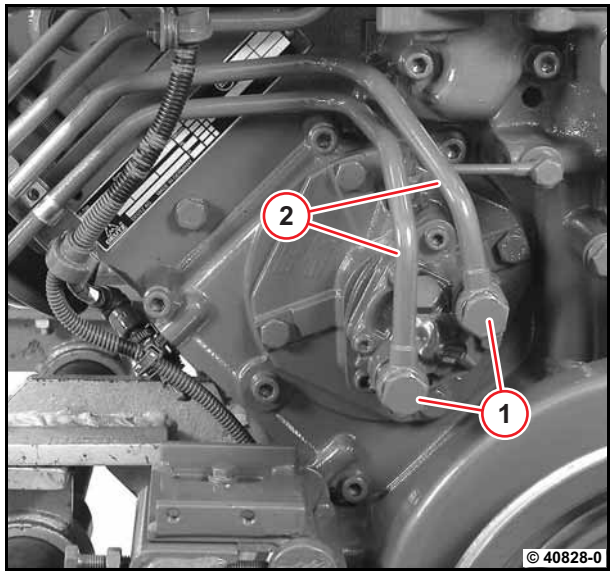
Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing the fuel supply pump

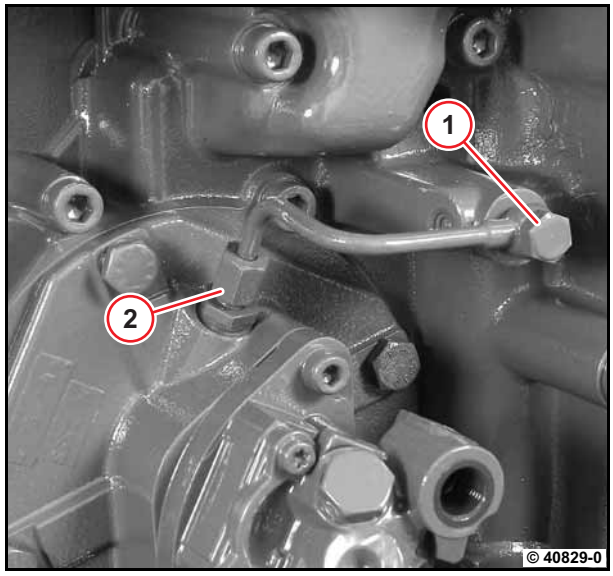
- Unscrew screws (1).
- Remove holder (2).



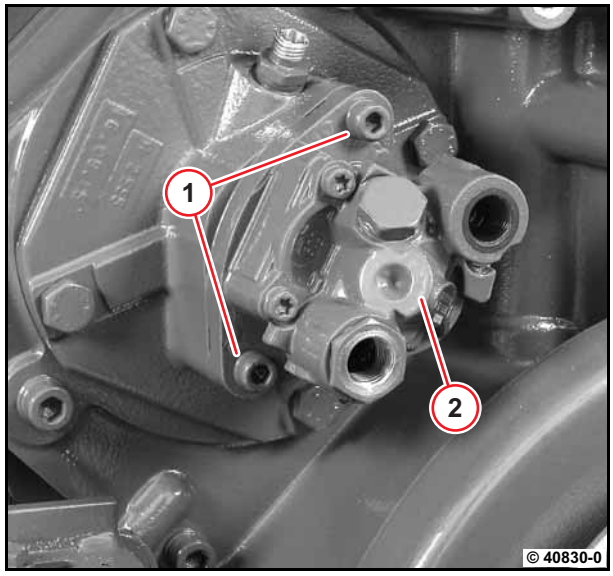
- Unscrew hollow screws (1).
- Remove fuel pipes (2).
- Remove sealing rings.



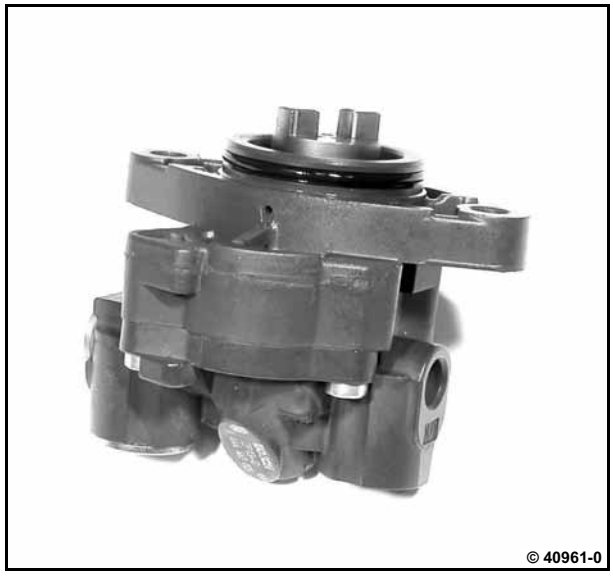
- Unscrew hollow screw (1).
- Unscrew lock nut (2).
- Remove lubricating oil pipe.
- Remove sealing rings.



- Unscrew screws (1).
- Remove fuel supply pump (2).

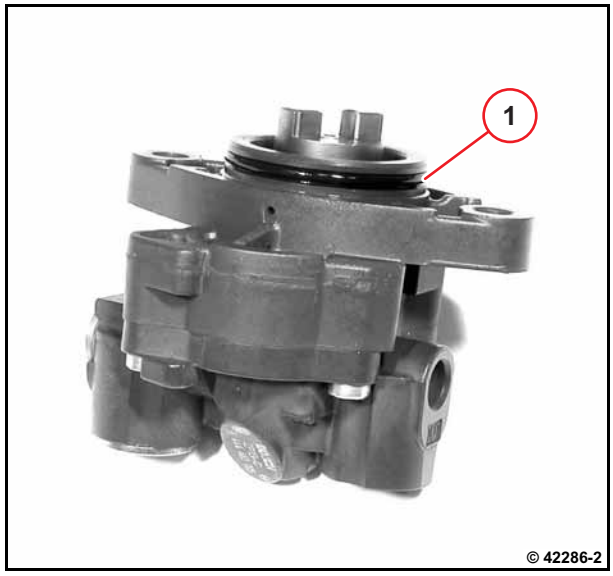


- Visually inspect the components.

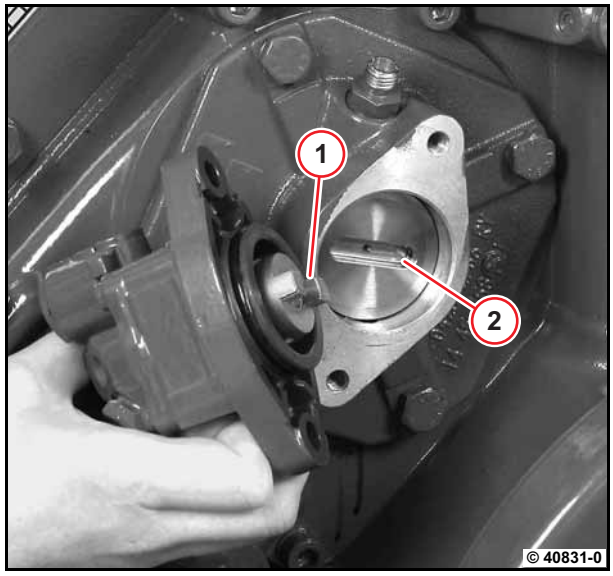


Installing the fuel supply pump

- Mount new O-ring (1).
- Lightly oil O-ring.

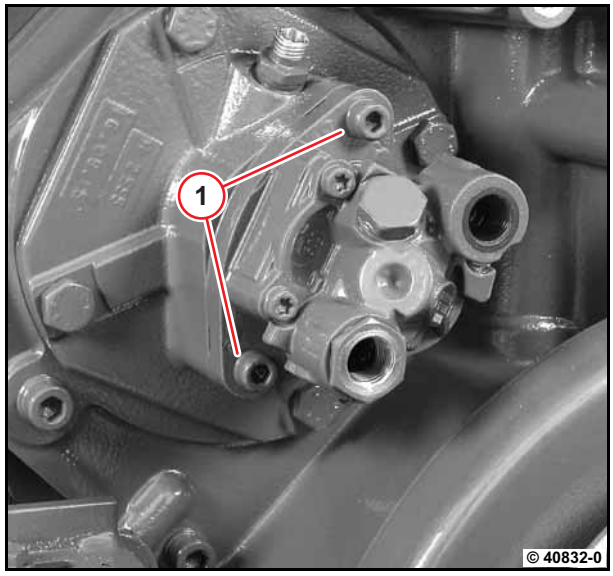


- Install fuel pump.
- Insert the driver (1) in the groove (2).



- Tighten screws (1).

A07 024



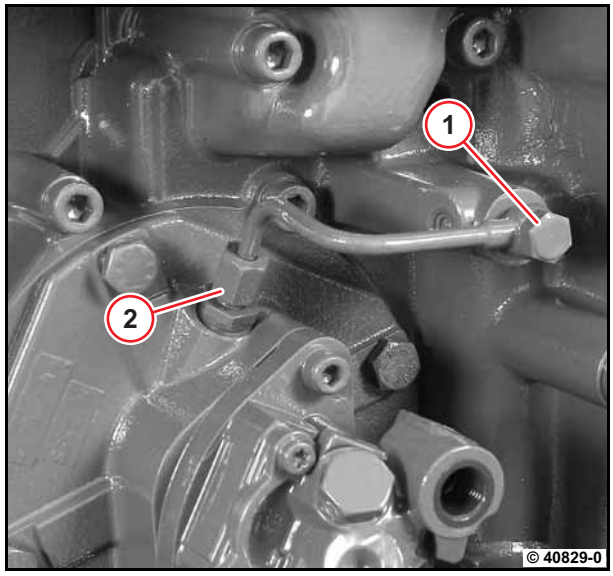
6

- Mount new sealing rings.
- Mount the lubricating oil pipe.
- Screw on hollow screw (1).
- Tighten lock nut (2).

A08 014

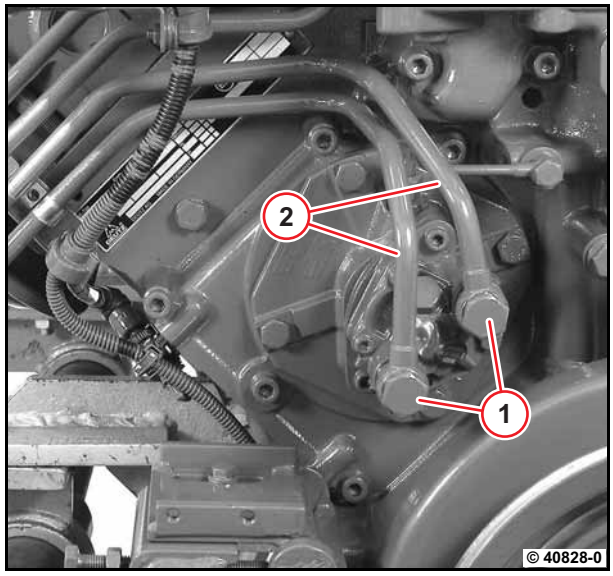
- Tighten hollow screw (1).

A08 013



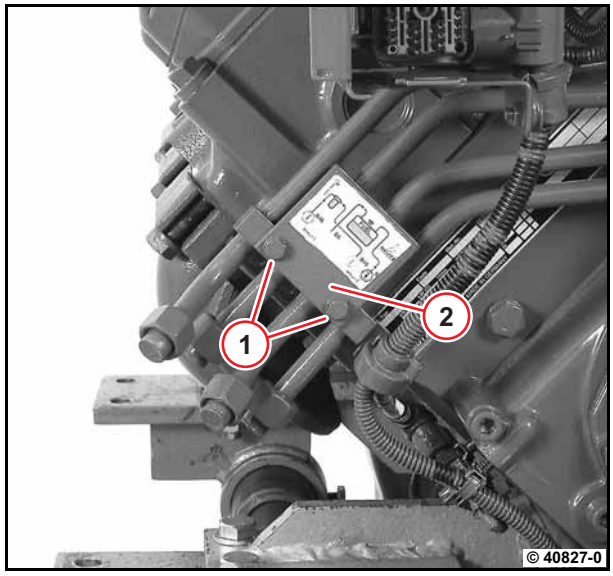
- Mount new sealing rings.
- Mount fuel pipes (2).
- Tighten hollow screws (1).

A07 034



- Mount holder (2).
- Tighten screws (1).

A07 044



6

Removing and installing fuel pressure holding valve

Commercial available tools:
– Open wrench size SW 22

Special tools:
– Plugs/caps 170160

– W 06-07-03 . . . . . (A-bank)

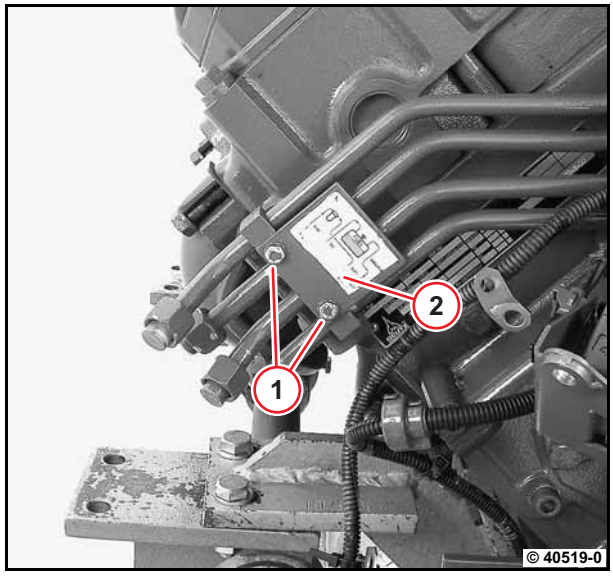
Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing fuel pressure holding valve

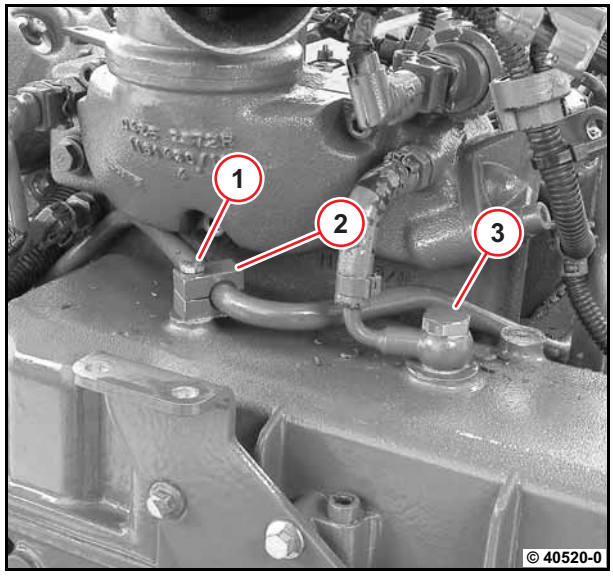
- Remove charge air pipe (A-bank).

  W 06-07-03

- Unscrew screws (1).
- Remove the holder (2).



- Unscrew screw (1).
- Remove the holder (2).
- Unscrew hollow screw (3).
- Remove sealing rings.



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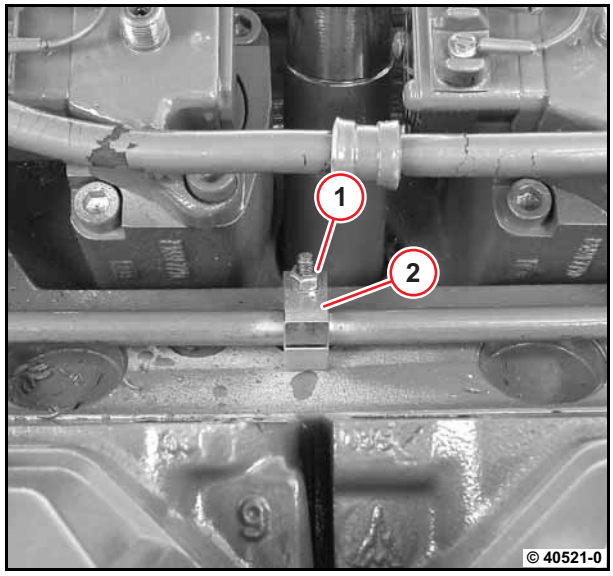
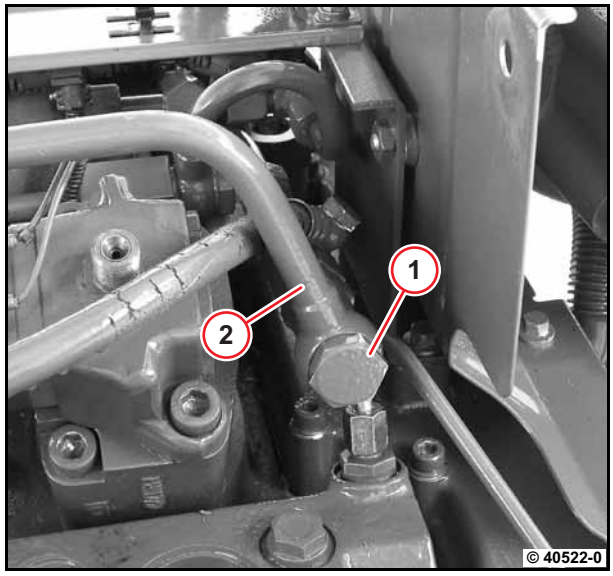
- Unscrew nut (1).
- Remove the holder (2).



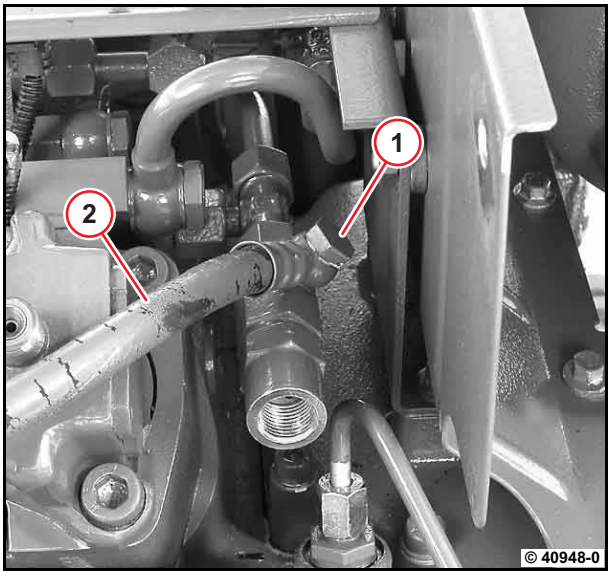
- Unscrew hollow screw (1).

Hold overflow valve.

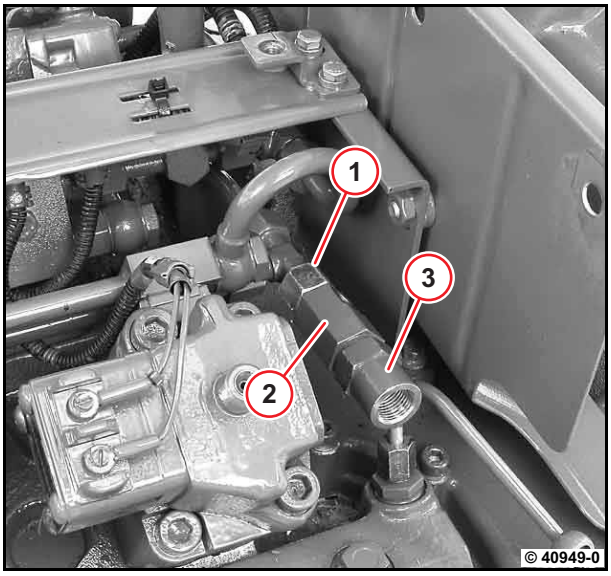
- Remove fuel pipe (2).
- Remove sealing rings.



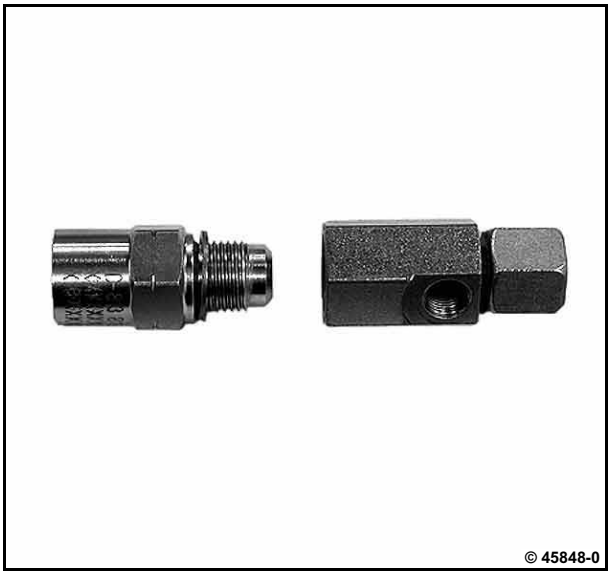
- Unscrew hollow screw (1).
- Remove sealing rings.
- Place hose pipe (2) to one side.



- Hold the connector.
- Unscrew overflow valve (3).
- Remove sealing ring.
- Unscrew lock nut (1).
- Remove connector (2).

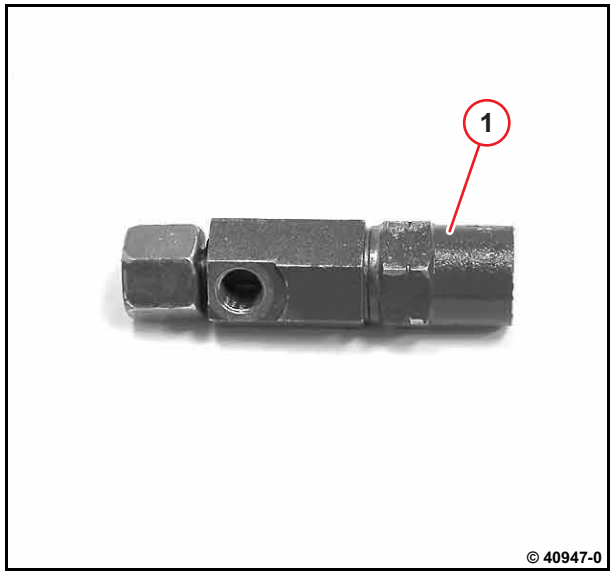


- Visually inspect the components.



Installing fuel pressure holding valve

- Mount new sealing ring.
- Screw on overflow valve (1).



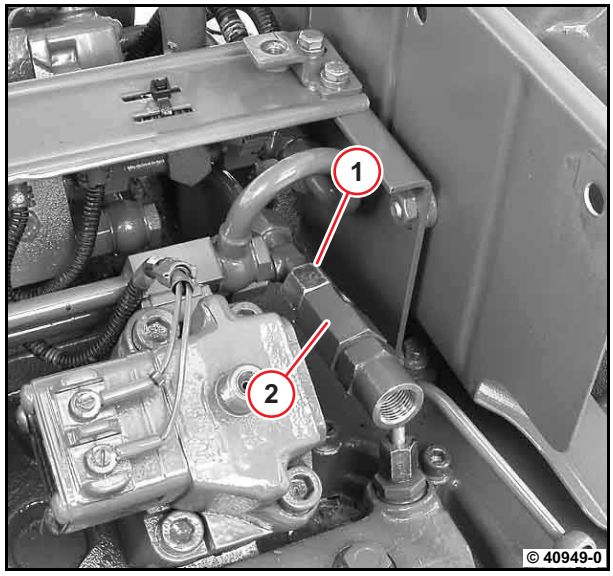
- Insert connector (2).

Note installation position.

Connection of the hose line faces the heat shield.

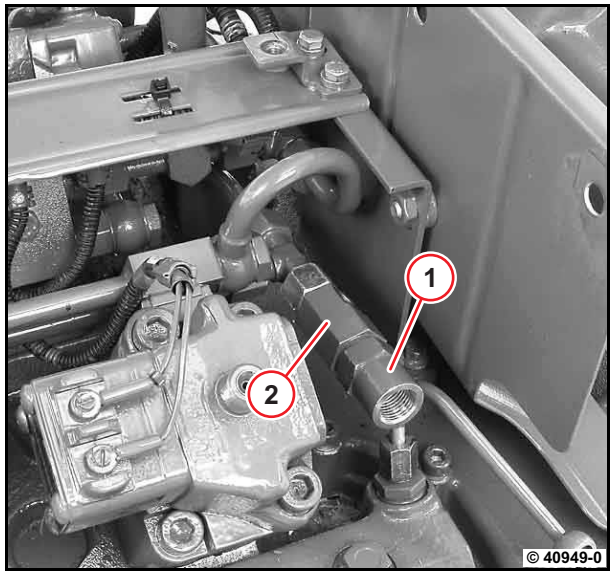
- Hold the connector.
- Tighten union nuts (1) with open wrench.

A07 066



- Hold the connector.
- Tighten overflow valve (1) with open wrench.

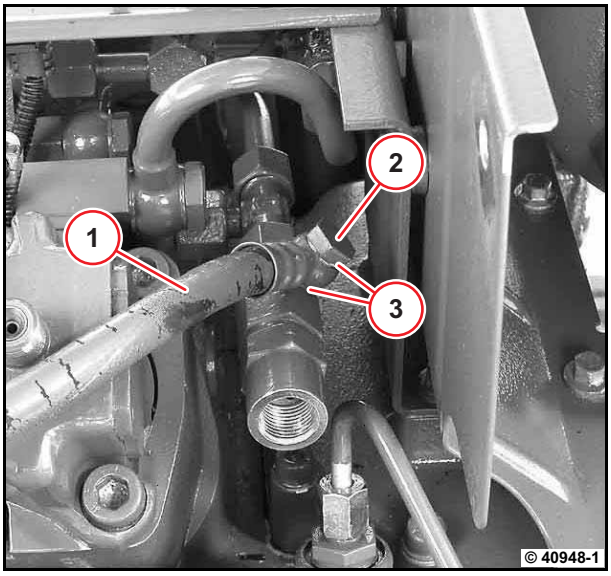
A07 067



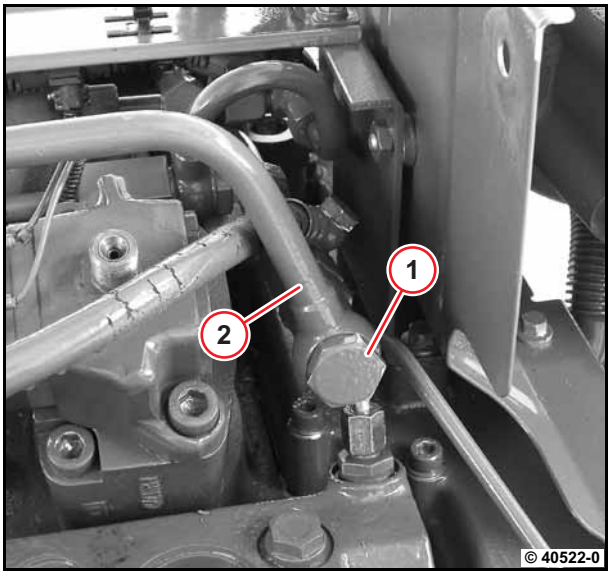
- Position hose line (1).
- Mount sealing rings (3).
- Tighten hollow screw (2).

A12 090

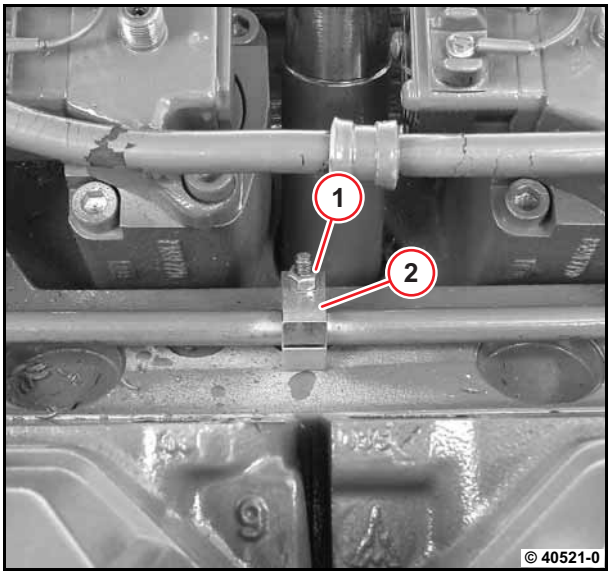
Attention!
Lay the hose pipe free from chafing and tension.



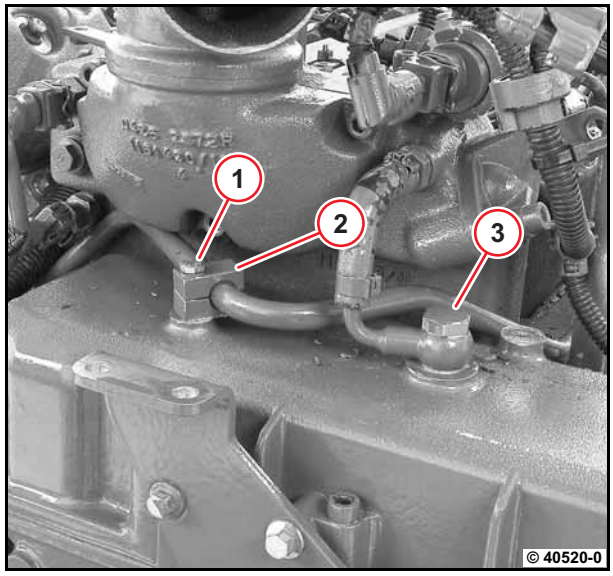
- Mount new sealing rings.
- Mount fuel pipe (2).
- Screw on hollow screw (1).



- Oil the thread lightly.
- Mount holder (2).
- Screw on nut (1).



- Mount new sealing rings.
- Screw on hollow screw (3).
- Mount holder (2).
- Oil thread and head contact surface lightly.
- Fasten screw (1).



6

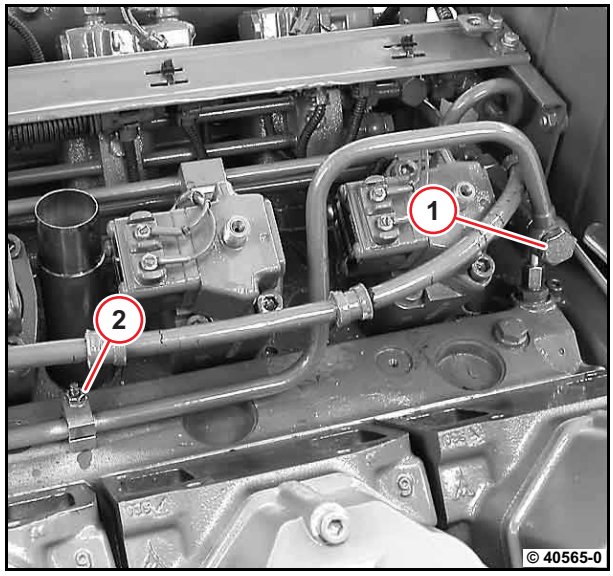
- Tighten hollow screw (1).

Hold overflow valve.

A12 093

- Tighten nut (2).

A07 044

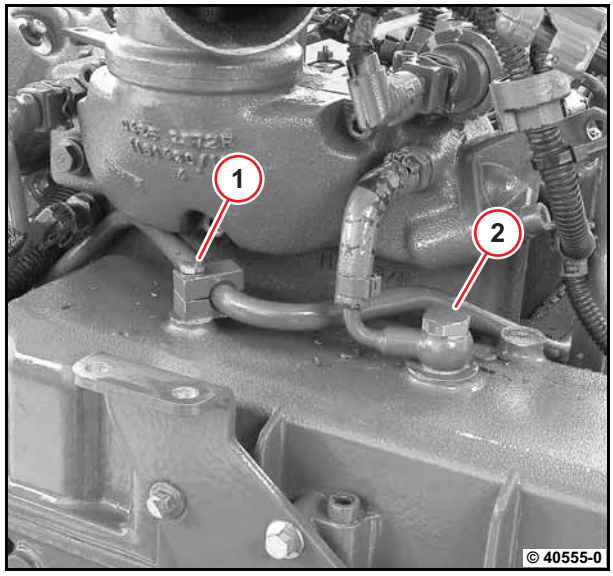


- Tighten screw (1).

A07 044

- Tighten hollow screw (2).

A12 092

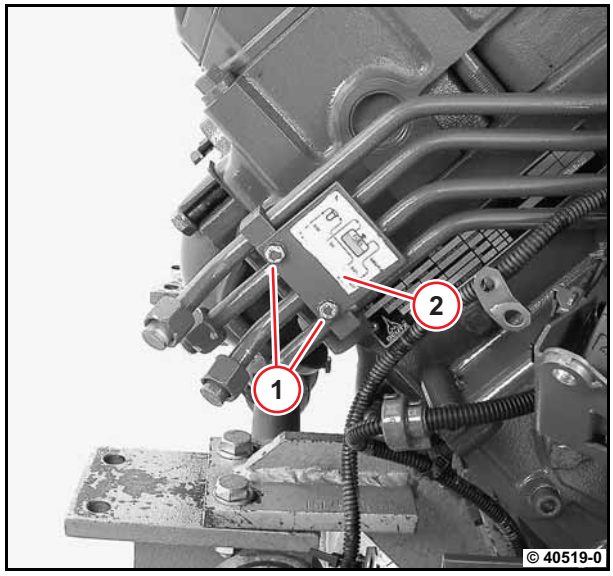


- Mount holder (2).
- Tighten screws (1).

  A07 044

- Install charge air pipe (A-bank)

  W 06-07-03



6

Removing and installing fuel pressure holding valve

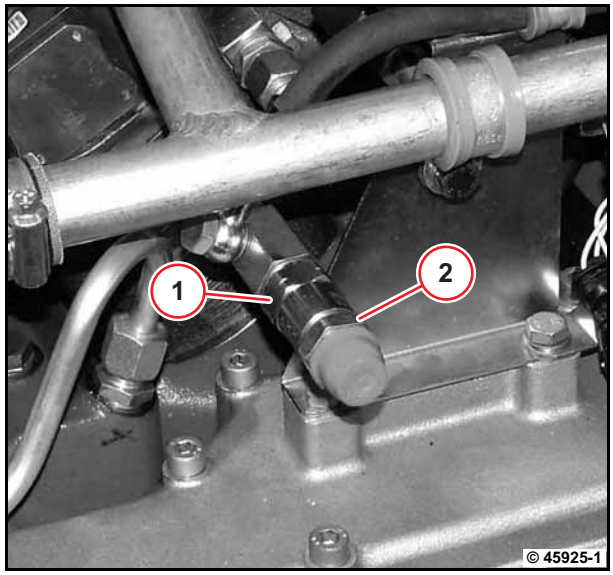
Commercial available tools:
– Open wrench size SW 22

Special tools:
– Plugs/caps 170160

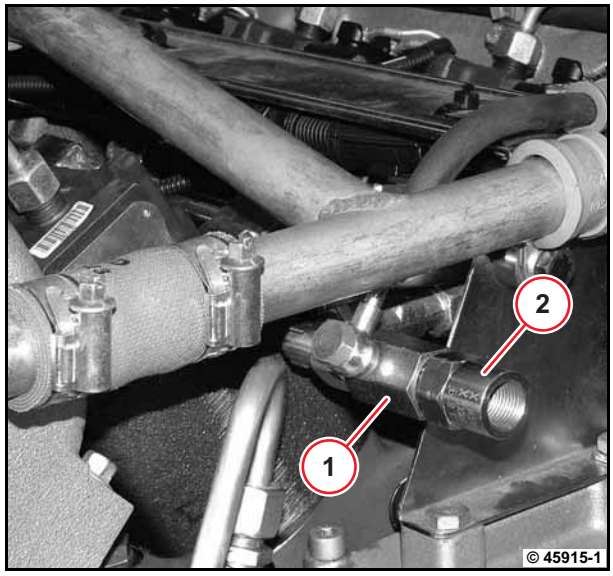
Attention!
Pay attention to utmost cleanliness when working on the fuel system.
Remove residue paint and particles of dirt before removing.
Clean the respective affected parts carefully. Blow damp areas dry with compressed air.
Observe the safety regulations and national specifications for handling fuels.
Close all connections immediately after opening with new, clean plugs/caps.
Do not remove plugs/caps until immediately before assembling.
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing fuel pressure holding valve

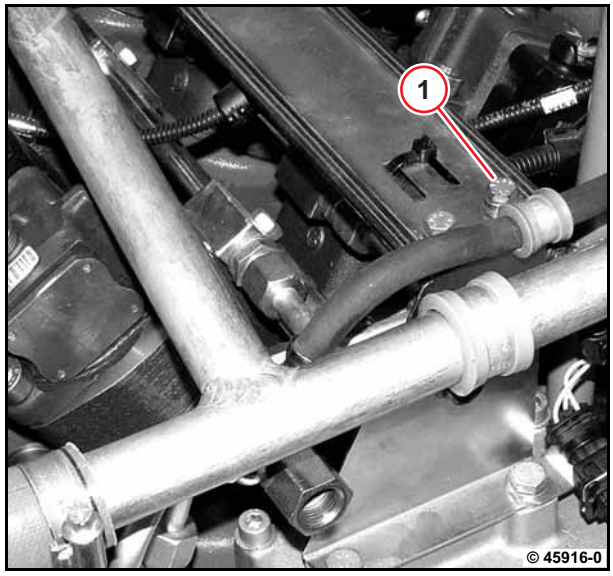
- Hold overflow valve (1).
- Unscrew screw-in nipple (2).
- Remove sealing ring.



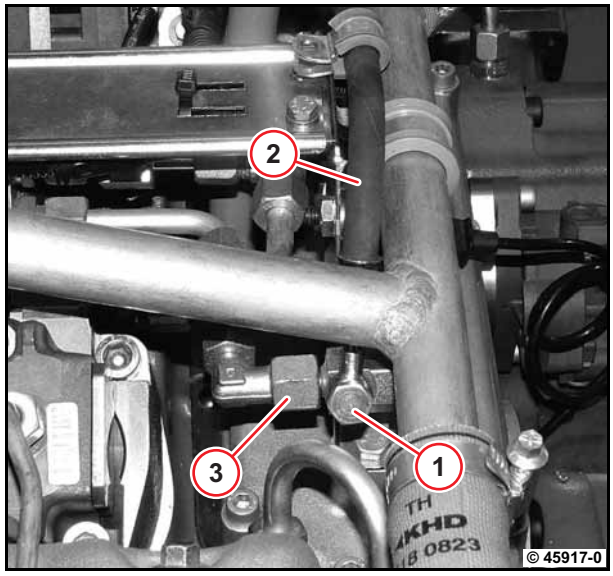
- Hold connector (1).
- Unscrew overflow valve (2).
- Remove sealing ring.



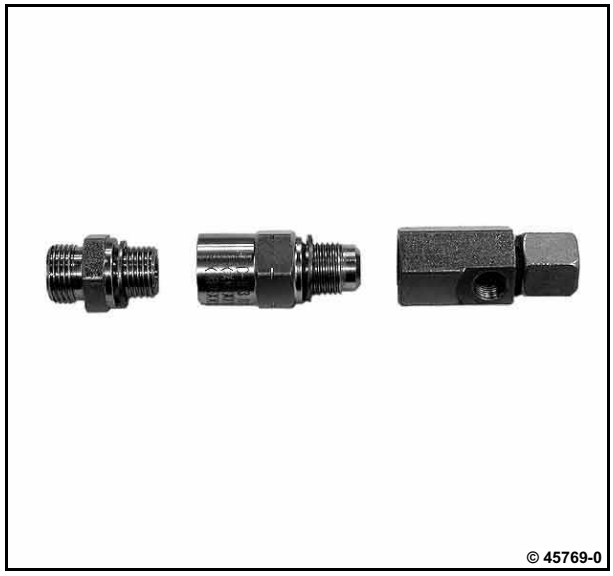
- Unscrew screw (1).
- Remove washer.
- Loosen pipe clip.



- Unscrew hollow screw (1).
- Remove sealing rings.
- Place hose pipe (2) to one side.
- Unscrew union nut (3).
- Remove connector.

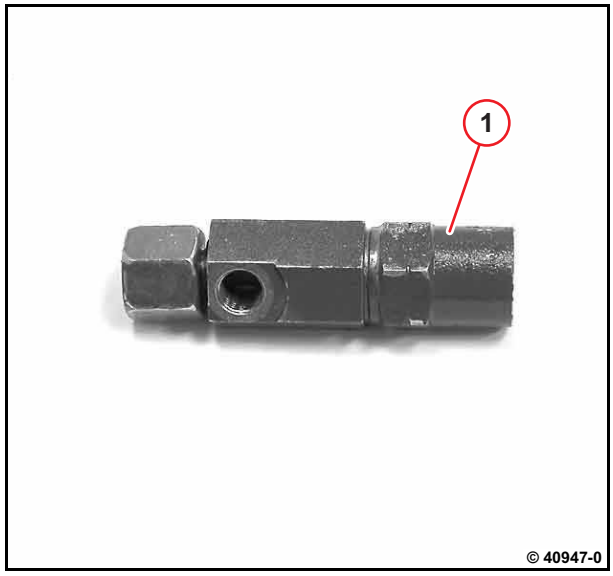


- Visually inspect the components.

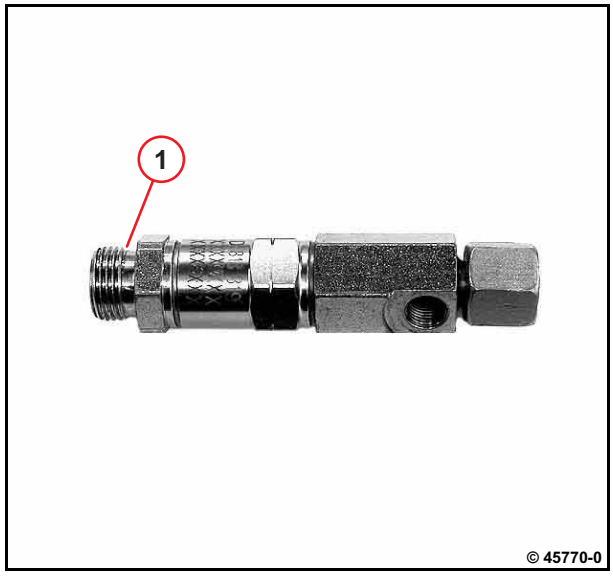


Installing fuel pressure holding valve

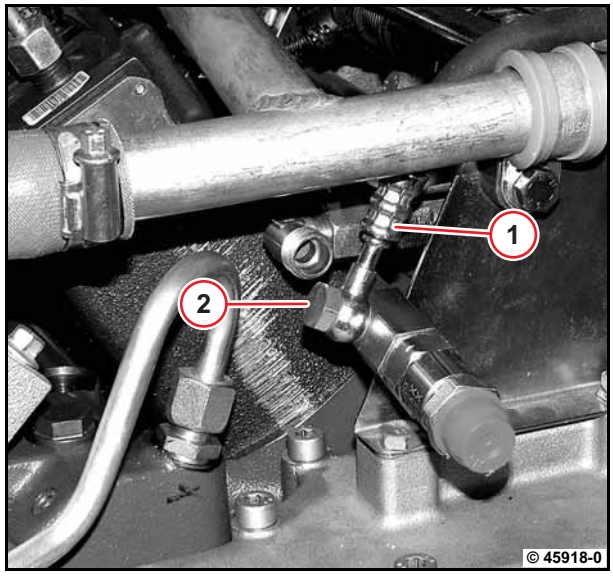
- Mount new sealing ring.
- Screw on overflow valve (1).



- Mount new sealing ring.
- Screw on screw-in nipple (1).

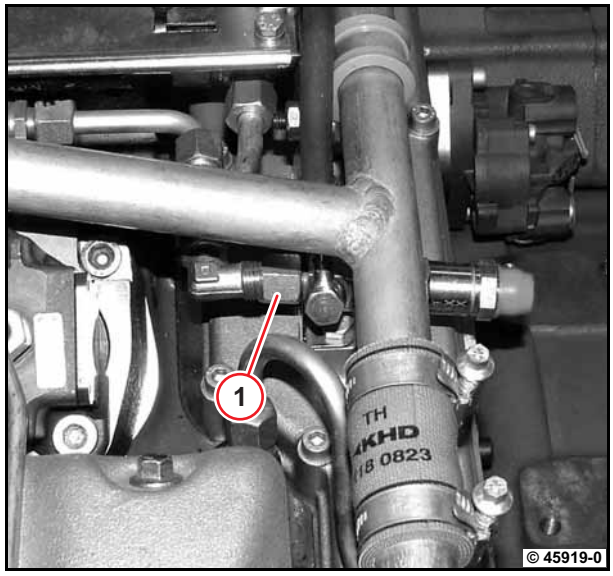


- Mount hose line (1).
- Mount new sealing rings.
- Screw on hollow screw (2).



6

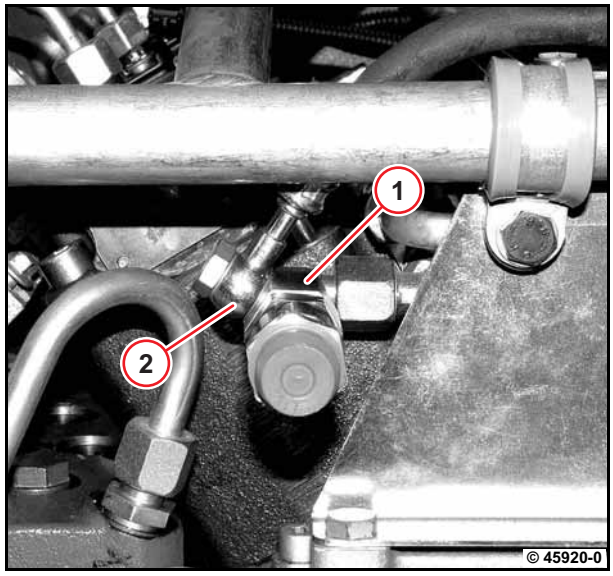
- Insert connector.
- Screw on lock nut (1).



- Position connector (1).

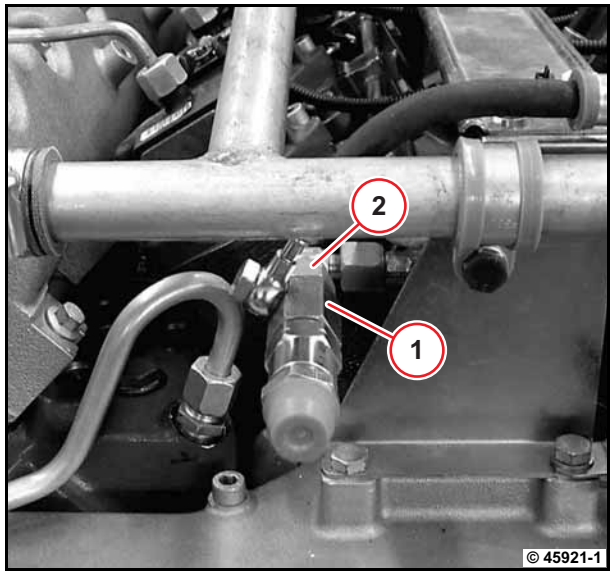
Arrange hexagon area (1) horizontally.

The connection (2) faces approx. 45° to the left.



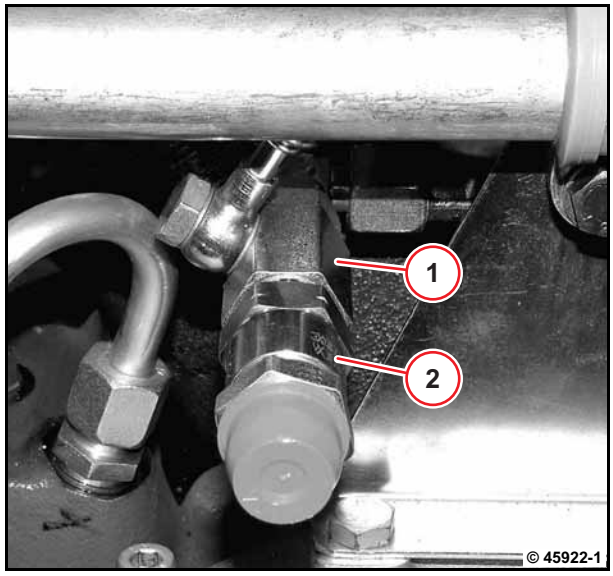
- Hold connector (1).
- Tighten union nuts (2) with open wrench.

A07 066



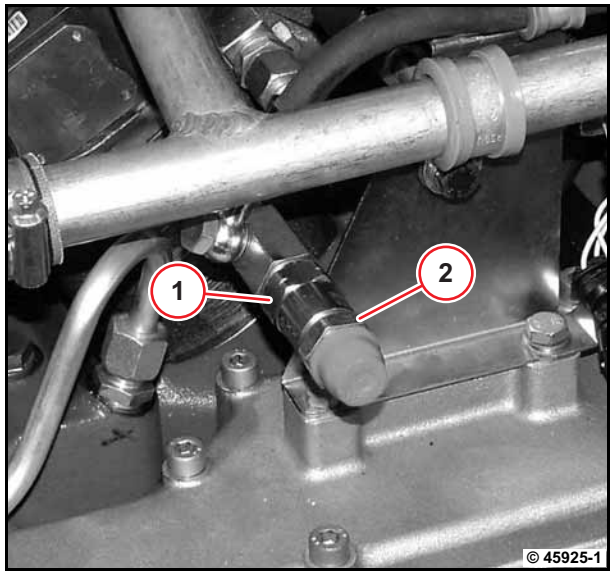
- Hold connector (1).
- Tighten overflow valve (2) with open wrench.

A07 067



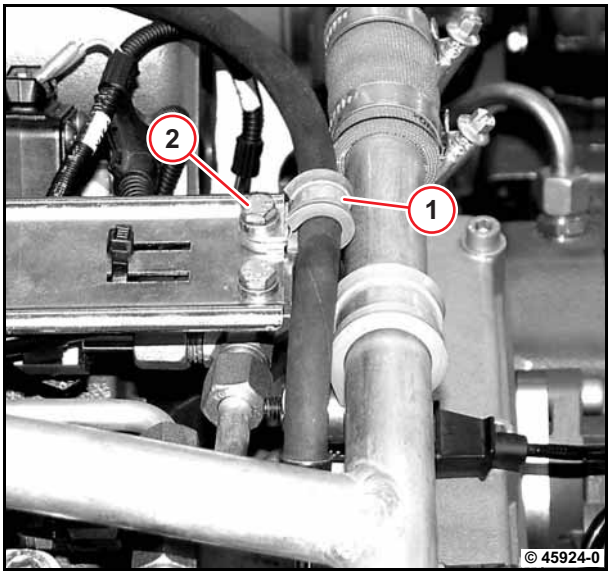
- Hold overflow valve (1).
- Tighten screw-in nipple (2).

A07 069



- Position pipe clamp (1).
- Mount washer.
- Tighten screw (2).

A13 094



6

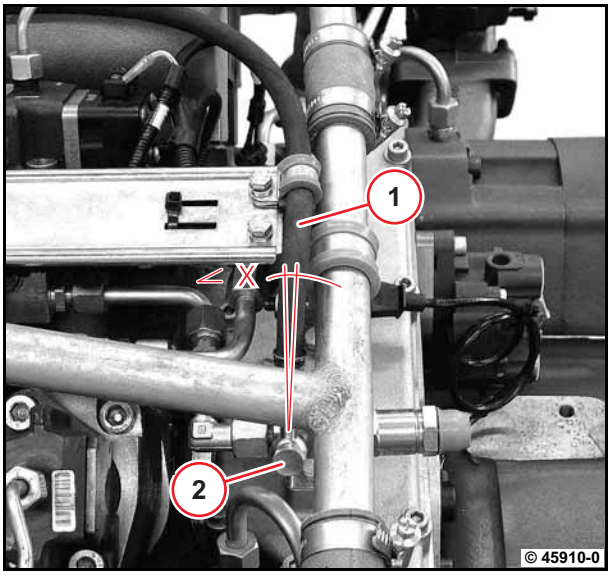
- Position hose line (1).

Observe installation angle dimension X = 10°.

Attention!
Lay the hose pipe free from chafing and tension.

- Tighten hollow screw (2).

A12 090



Removing and installing the oil suction pipe

Commercial available tools

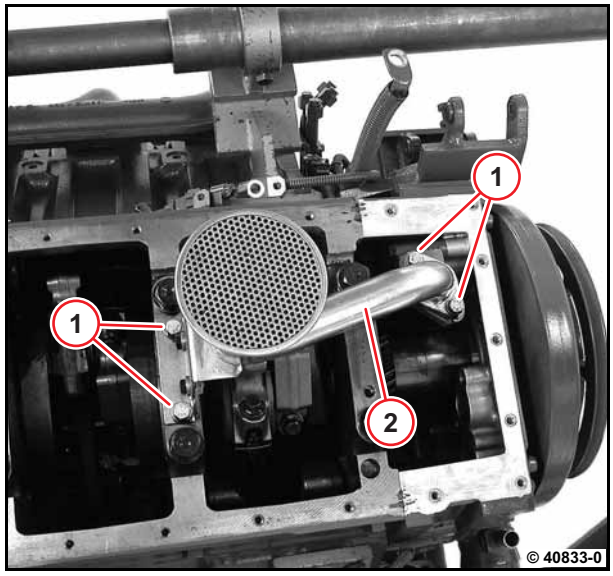
– W 08-04-07

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

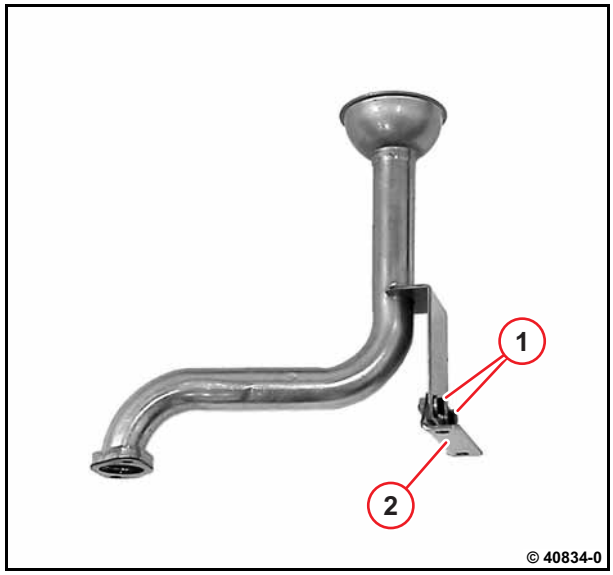
Removing the oil suction pipe

- Remove lubricating oil pan.

  W 08-04-07
- Unscrew screws (1).
- Remove oil suction pipe (2).
- Remove gasket.



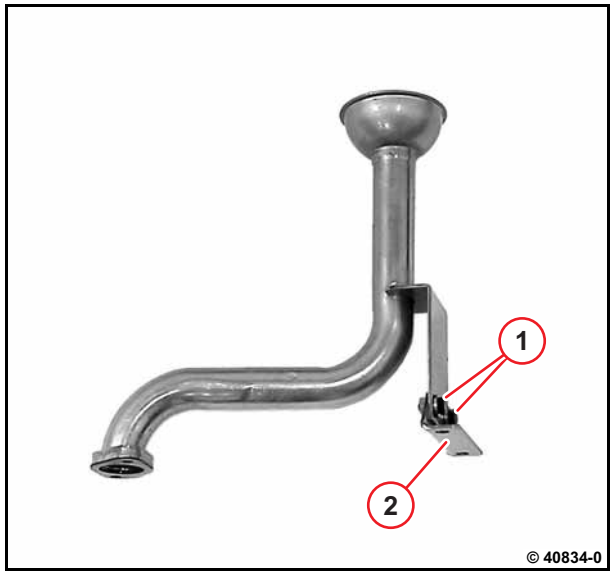
- Unscrew screws (1).
- Remove the holder (2).
- Visually inspect the components.



6

Installing the oil suction pipe

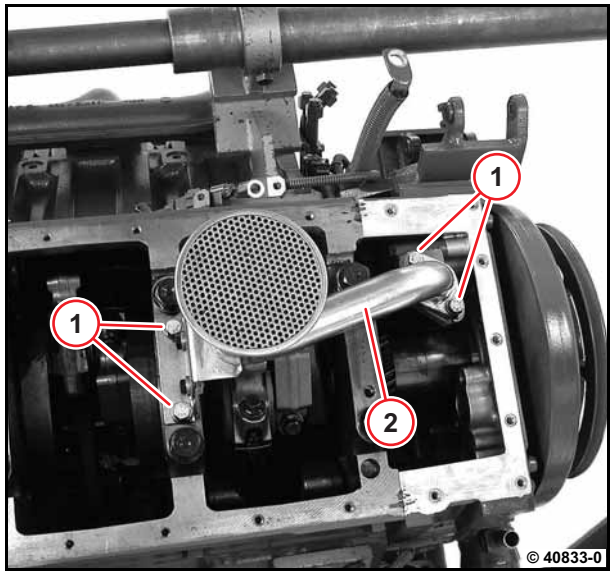
- Mount holder (2).
- Tighten screws (1).



- Clean sealing surfaces.
- Mount new gasket.
- Mount oil suction pipe (2).

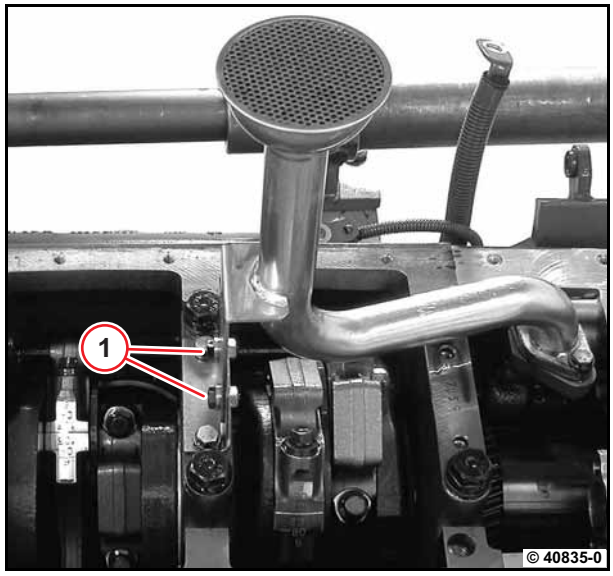
Attention!
Ensure that the installation location is free from faults.
Install tension-free.

- Tighten screws (1).



- Tighten screws (1).

A08 016



- Tighten screws (1).

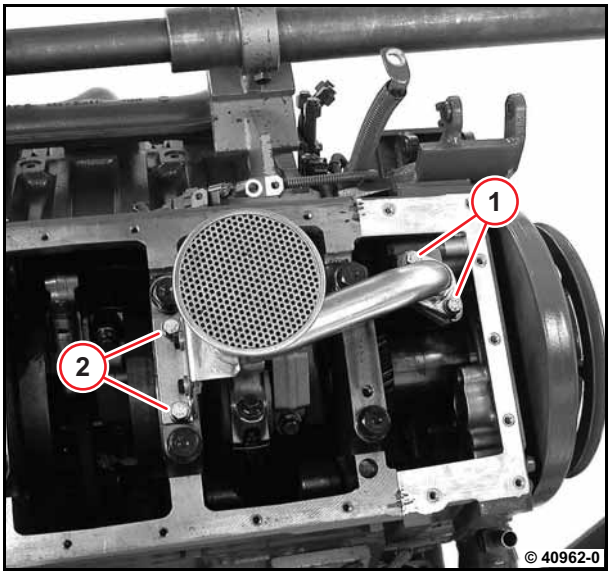
  A08 015

- Tighten screws (2).

  A08 016

- Install lubricating oil pan.

  W 08-04-07



6

Removing and installing the oil suction pipe

Commercial available tools

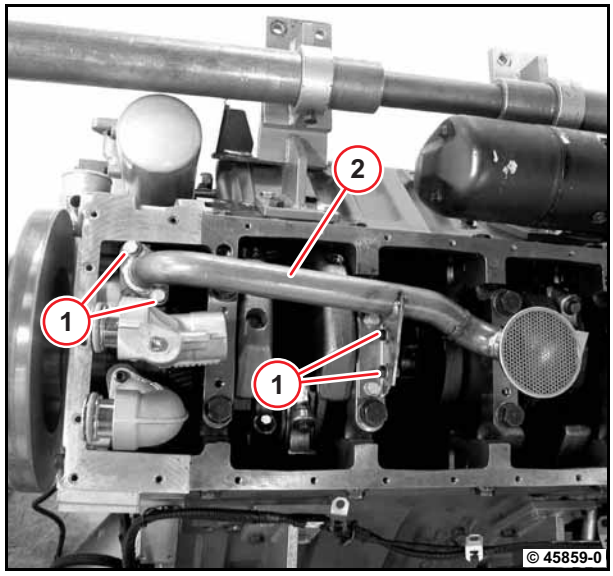
– W 08-04-07 . . . . . (Railway)

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

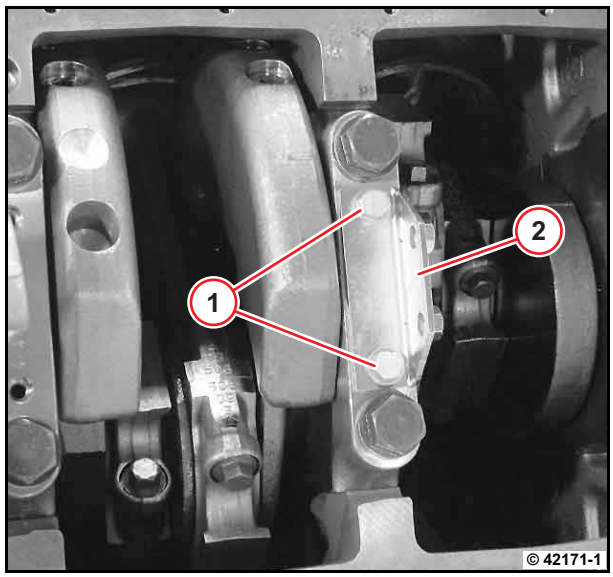
Removing the oil suction pipe

- Remove lubricating oil pan (Railway).

  W 08-04-07
- Unscrew screws (1).
- Remove oil suction pipe (2).
- Remove gasket.



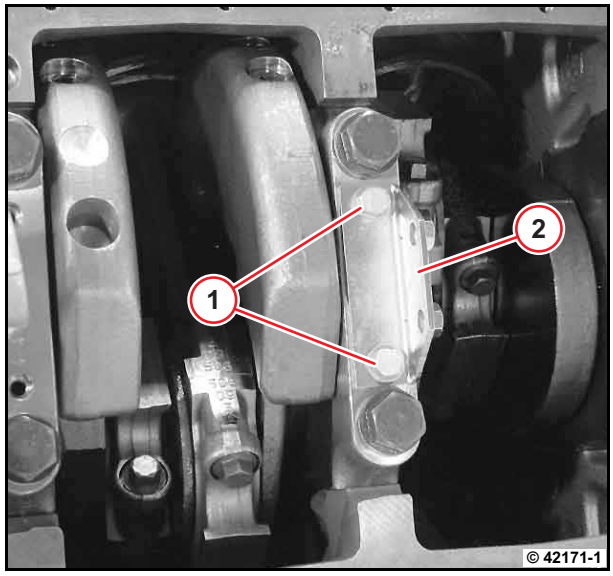
- Unscrew screws (1).
- Remove the holder (2).
- Visually inspect the components.



Installing the oil suction pipe

- Mount holder (1).
- Tighten screws (2).

A08 016



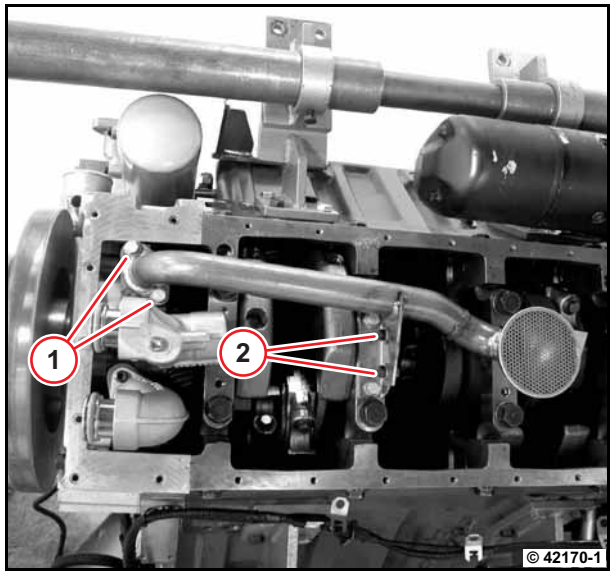
- Clean sealing surfaces.
- Mount new gasket.
- Mount oil suction pipe.
- Fasten screws.

Ensure that the installation location is free from faults.

Note different screw lengths:

M8 x 25 mm (1)

M8 x 20 mm (2)



- Tighten screws (1).

A08 015

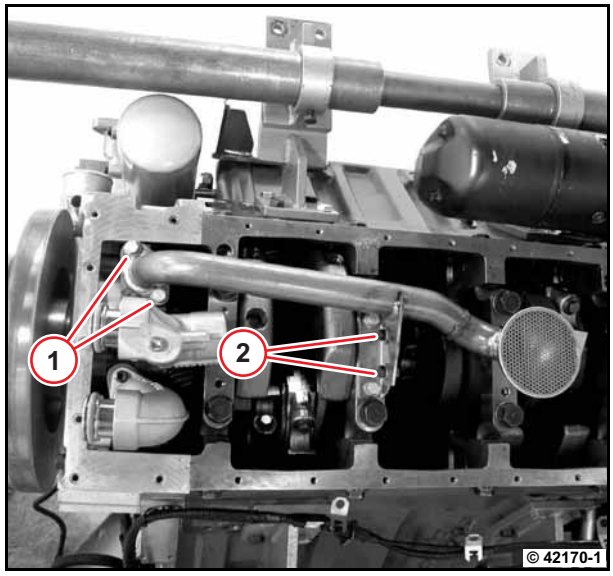
- Tighten screws (2).

A08 016

Attention!
Install tension-free!

- Install lubricating oil pan (Railway).

W 08-04-07



Removing and installing the lubricating oil pan

Commercial available tools

– Packing compound
DEUTZ DW 47
– Engine oil

– W 13-03-02

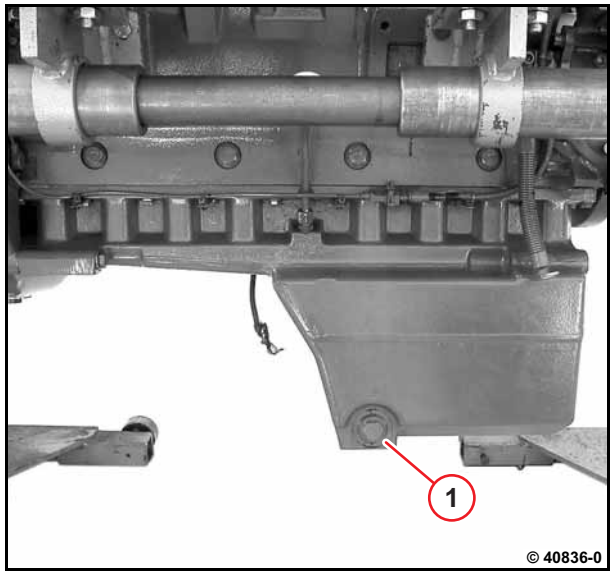
Collect leaking operating substances in suitable vessels and dispose of according to regulations.
The appropriate operating manual should be observed for emptying and filling the engine.

Removing the lubricating oil pan

- Remove starter.

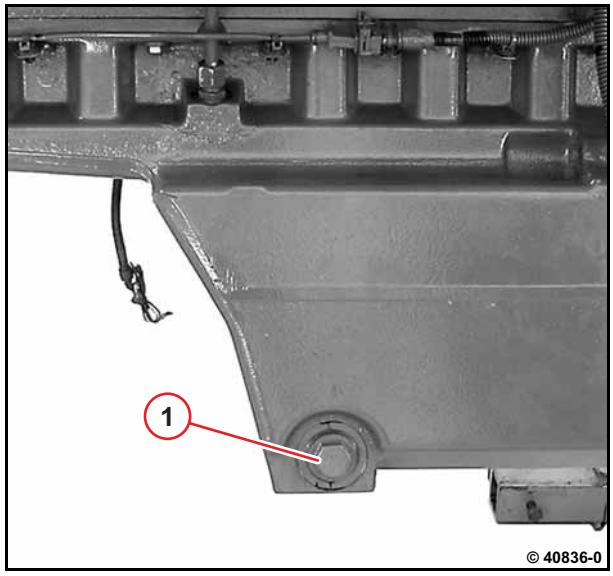
  W 13-03-02

- Unscrew locking screw (1).
- Drain, collect and dispose of engine oil according to regulations.

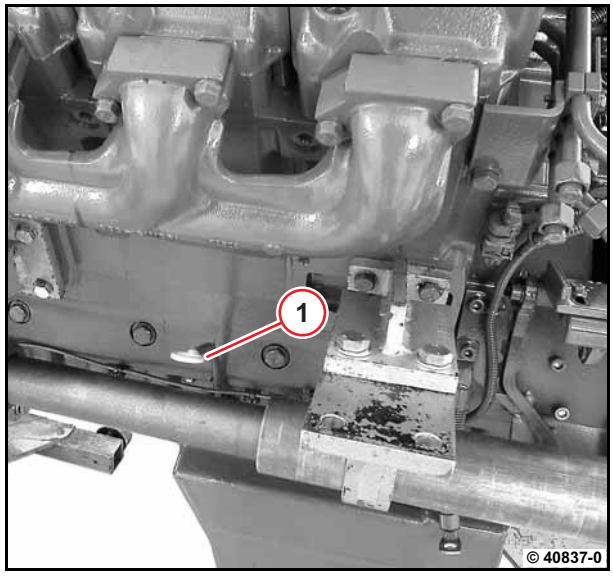


- Oil the screw plug lightly.
- Mount new sealing ring.
- Tighten screw plug (1).

  A03 031

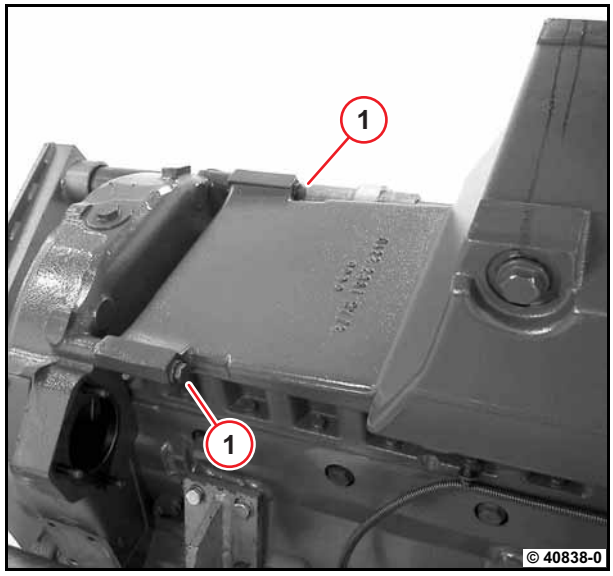


- Pull out oil dipstick (1).
- Turn engine **180°**.



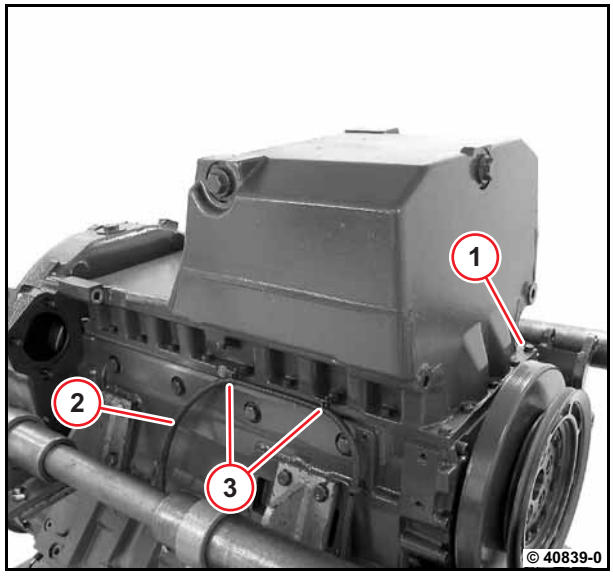
6

- Unscrew screws (1).

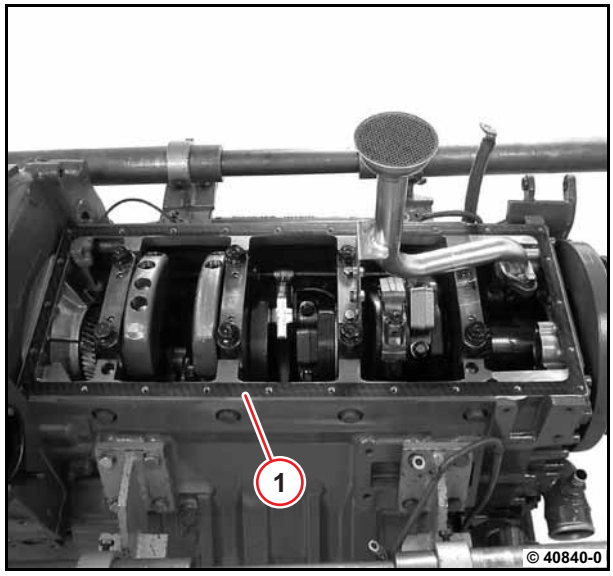


- Unscrew all screws (1).
- Remove cables (2).

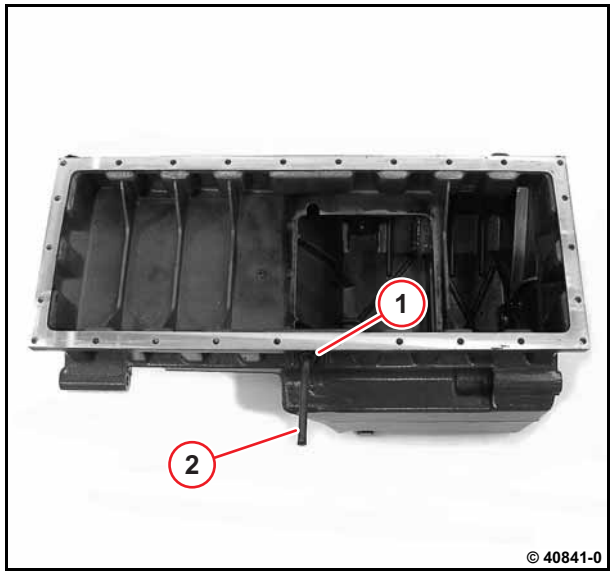
The holders (3) remain on the cables.



- Remove lubricating oil pan.
- Remove gasket (1).



- Unscrew lock nut (1).
- Remove guide tube (2).
- Remove screw-in nipple.
- Visually inspect the components.



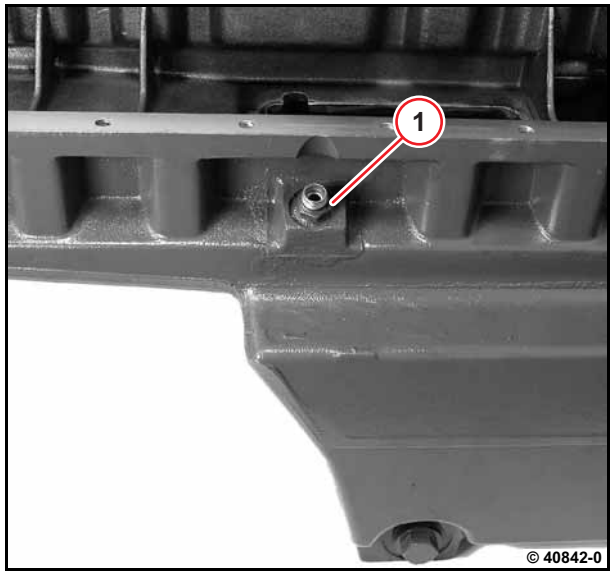
Installing the lubricating oil pan

- Tighten screw-in nipple (1).

A08 038

- Mount guide tube.
- Tighten union nut.

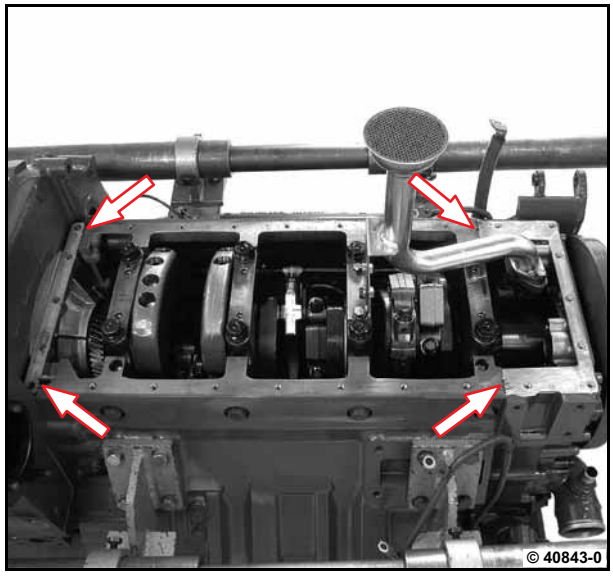
A08 035



- Clean sealing surfaces.

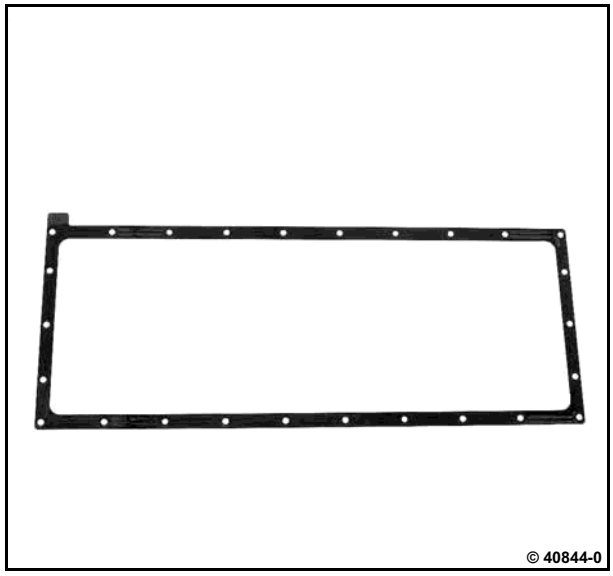
The sealing surfaces must be dry and free from grease and dirt.

- Apply packing compound to the joints (arrows).



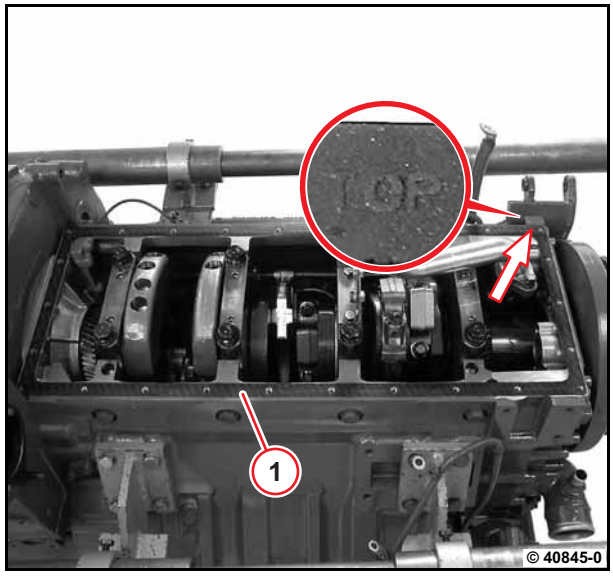
6

- Select new gasket.



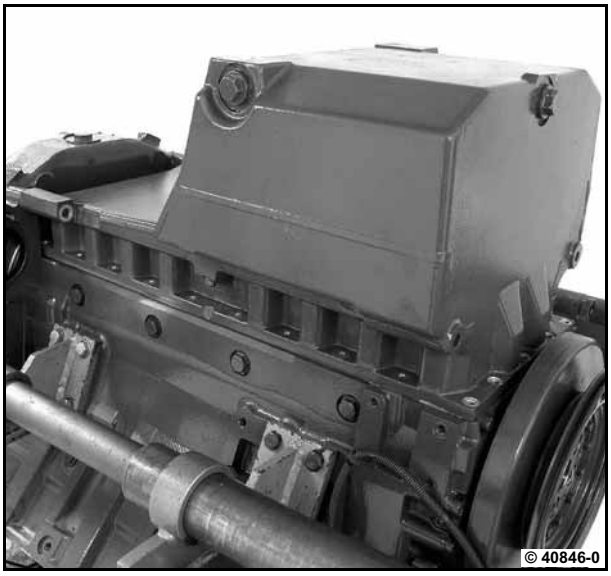
- Mount gasket (1).

Strap (arrow) faces generator.
“TOP“ label faces crankcase.

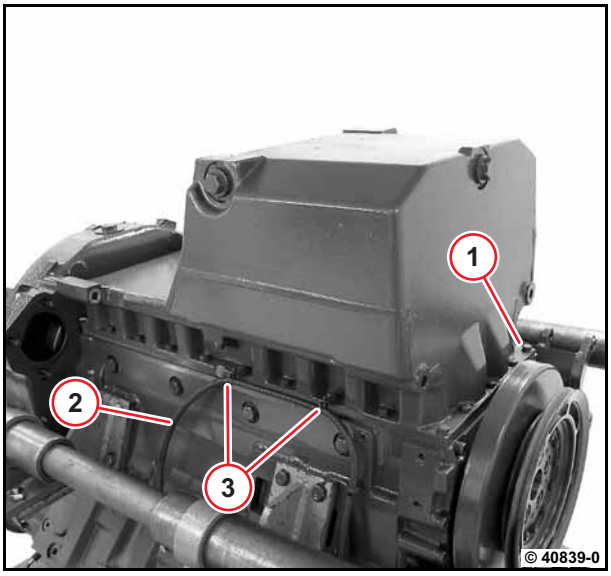


- Mount lubricating oil pan.
- Align lubricating oil pan to crankcase.

Ensure that the installation location of the gasket is free from faults.



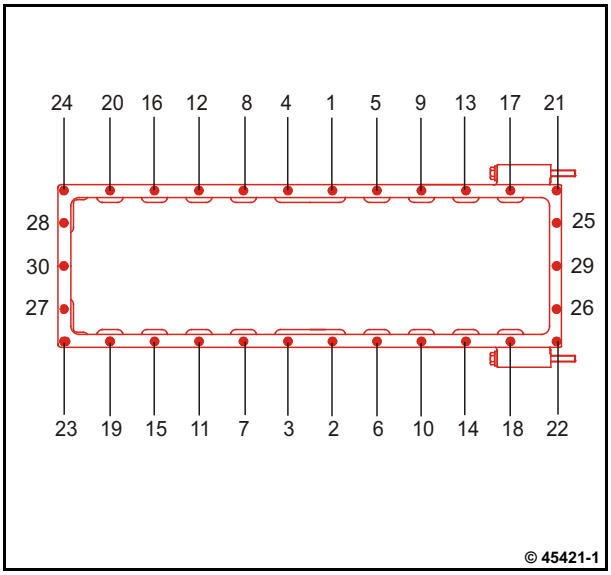
- Mount holder (3).
- Position cable (2).
- Tighten screws (1) alternately.



- Tighten all screws.

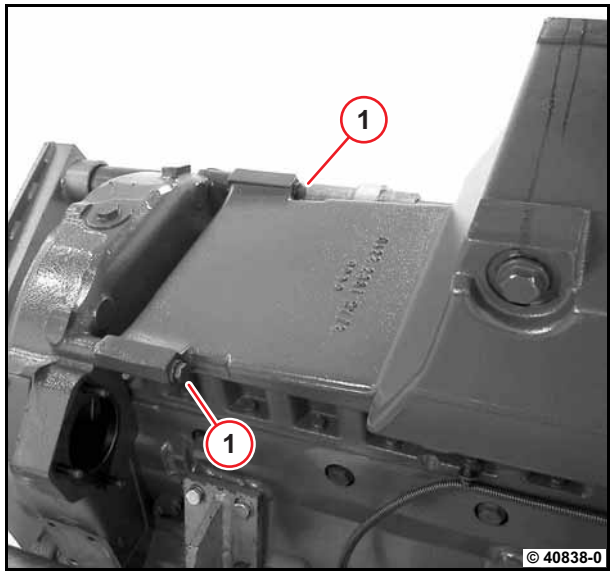
A03 030

See graphic for tightening sequence.

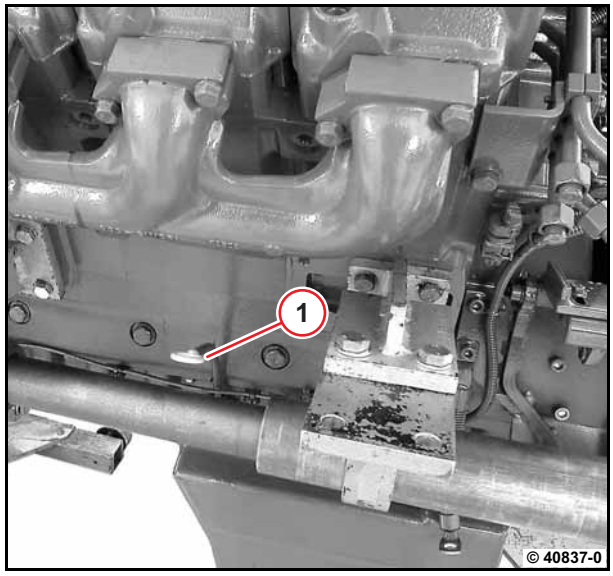


- Tighten screws (1).

A03 080

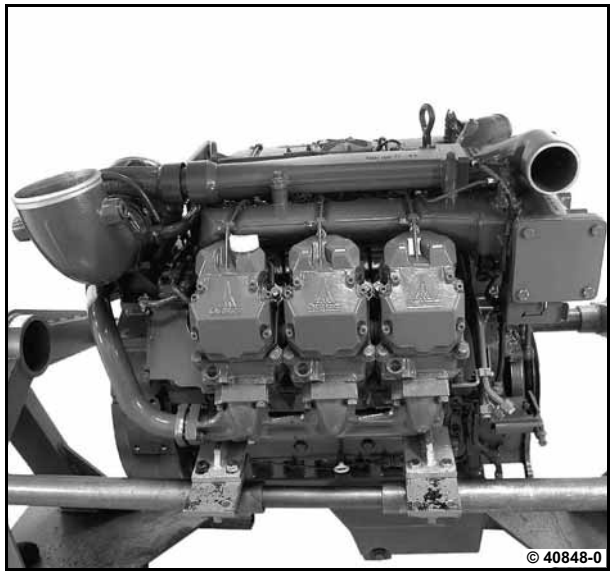


- Turn engine **180°**.
- Insert oil dipstick (1).



- Fill engine oil according to operating instructions.
- Install starter.

W 13-03-02



Removing and installing the lubricating oil pan

Commercial available tools

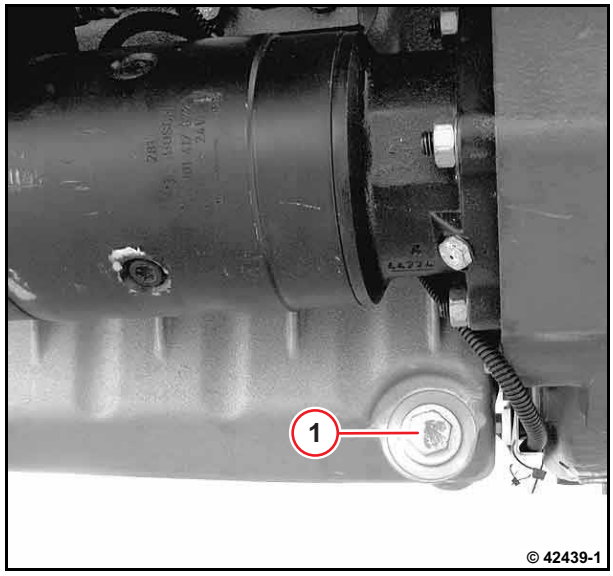
– Packing compound
  DEUTZ DW 47
– Fitting compound
  DEUTZ AP1908
– Engine oil

Collect leaking operating substances in suitable vessels and dispose of according to regulations.
The appropriate operating manual should be observed for emptying and filling the engine.

6

Removing the lubricating oil pan

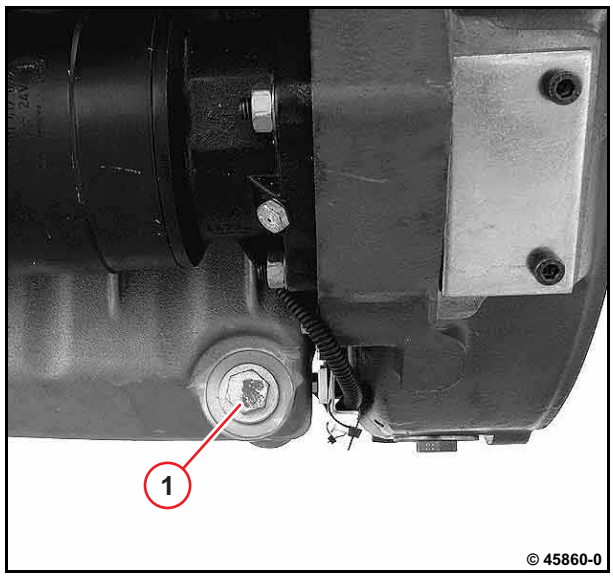
- Unscrew locking screw (1).
- Drain, collect and dispose of engine oil according to regulations.



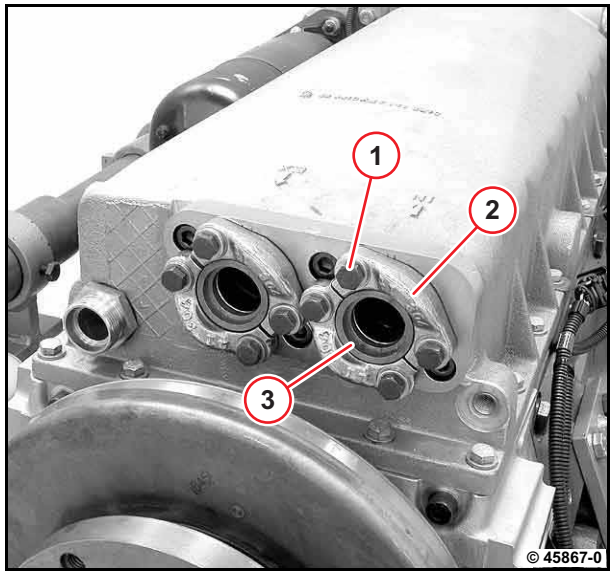
- Oil the screw plug lightly.
- Mount new sealing ring.
- Tighten screw plug (1).

  A03 031

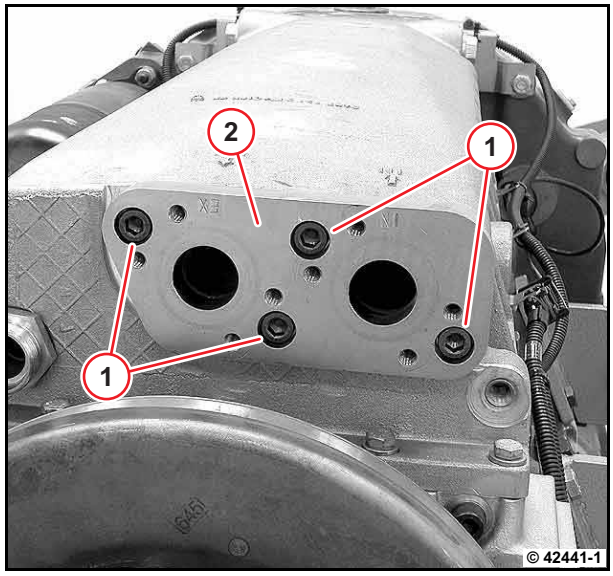
- Turn engine **180°**.



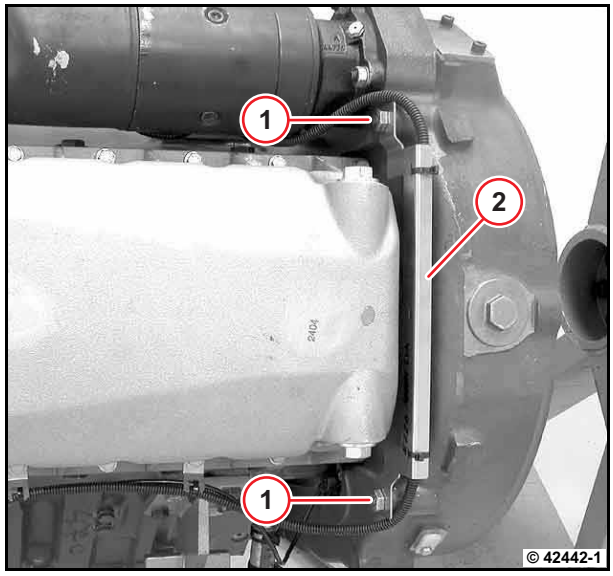
- Unscrew all screws (1).
- Remove washers.
- Remove all half-flanges (2).
- Remove both flanged sockets (3).



- Unscrew screws (1).
- Remove connecting flange (2).



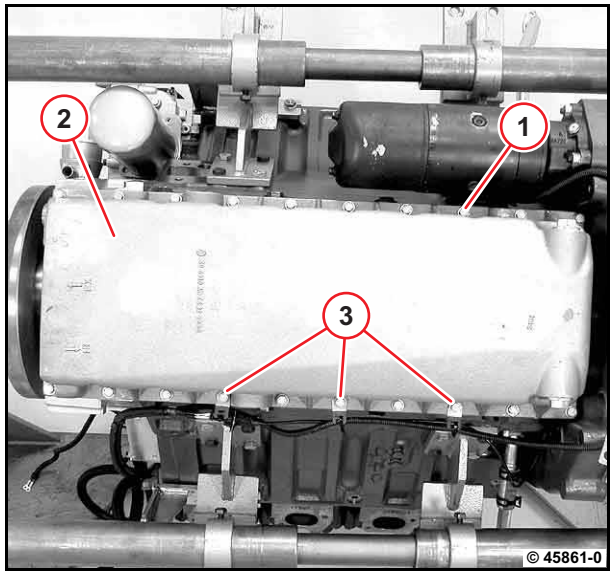
- Unscrew screws (1).
- Remove the holder (2).



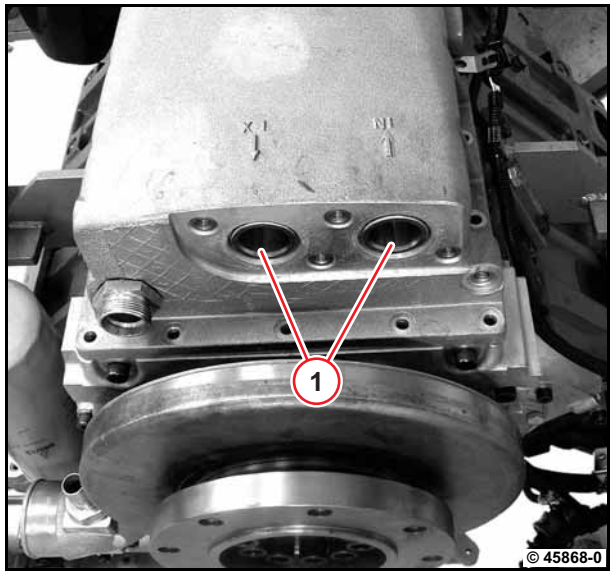
- Unscrew all screws (1).
- Remove cables (2).

The holders (3) remain on the cables.

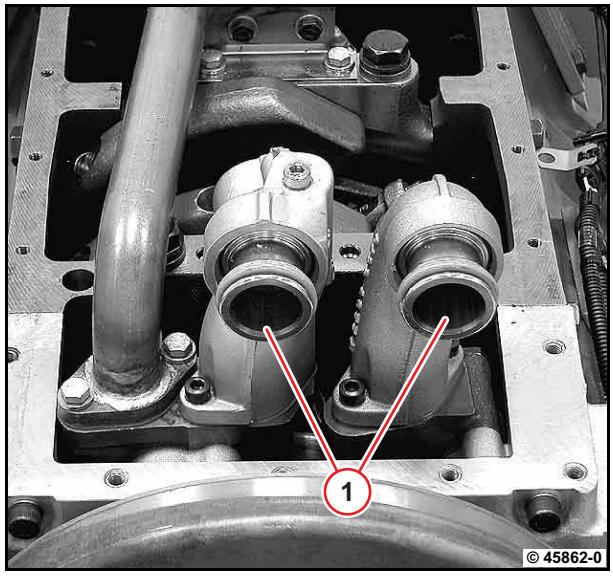
- Loosen lubricating oil pan.



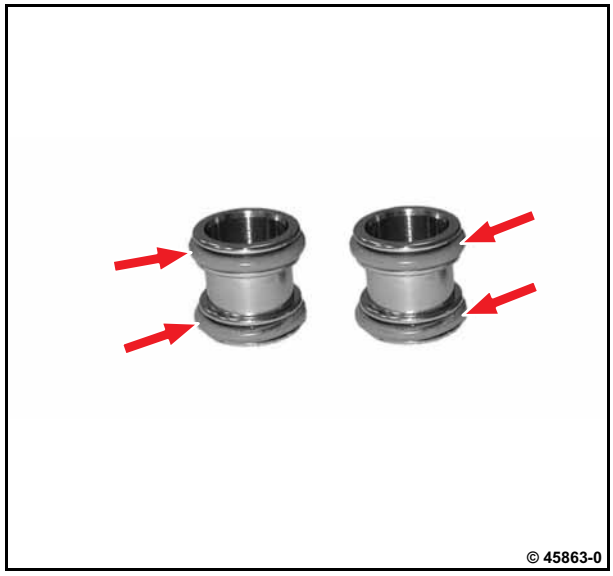
- Pull lubricating oil pan in direction of arrow.
- Remove lubricating oil pan.
- Remove gasket.
- Visually inspect the components.



- Pull out plug elements (1).

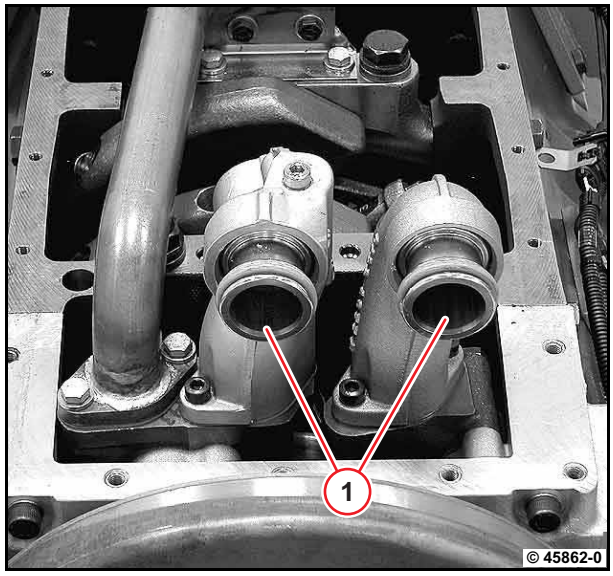


- Insert new O-rings (arrows).
- Coat the O-rings with fitting compound.



6

- Insert plug elements (1).

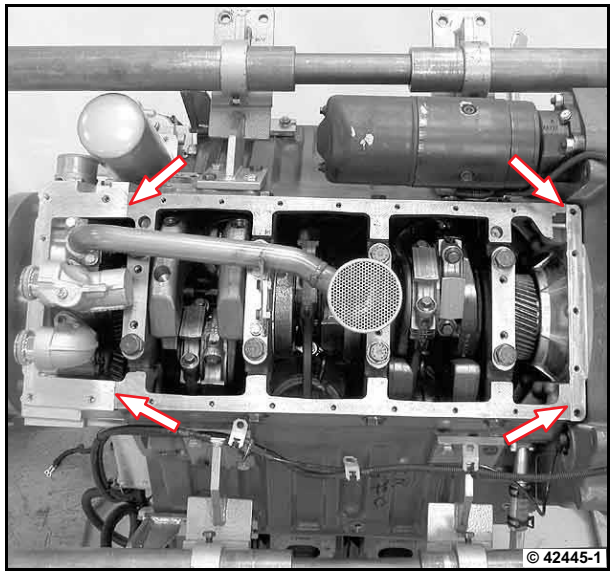


Mount lube oil tray with gasket.

- Clean sealing surfaces.

The sealing surfaces must be dry and free from grease and dirt.

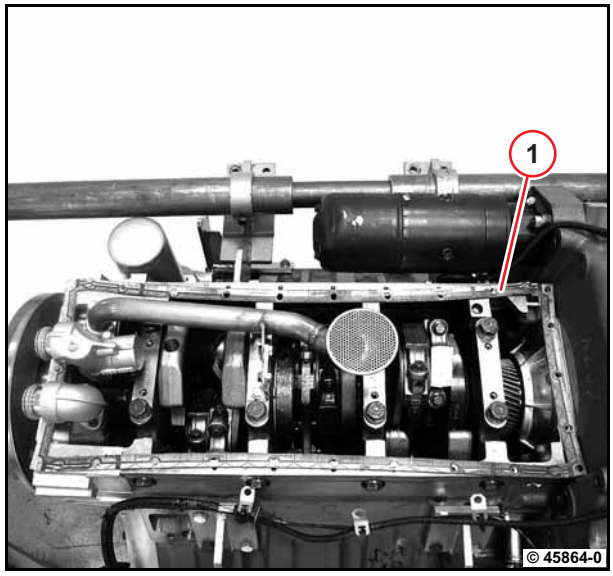
- Apply packing compound to the joints (arrows).



- Mount new gasket (1).

The bright side of the gasket faces the crankcase.

In case of metal bead seals, the beading faces the crankcase.



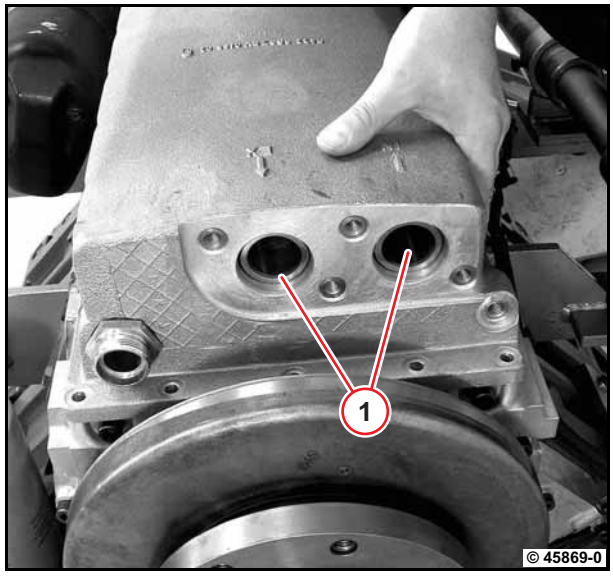
Mount lube oil tray with packing compound.

- Apply packing compound evenly to the sealing surface and in the beading of the lube oil tray.

Apply the packing compound in an even bead (thickness approx. 3.5 mm).
The position of the packing compound is only partly illlustrated.

- Mount lubricating oil pan.
- Push on lubricating oil pan in direction of arrow.

Attention!
Do not move or damage O-rings.

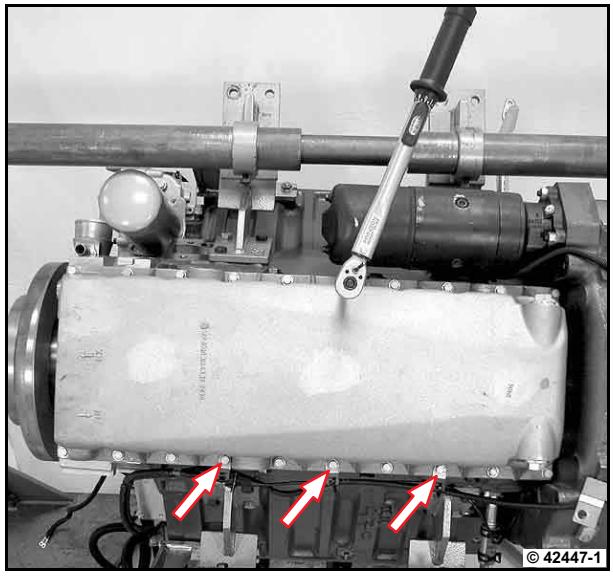


- Align lubricating oil pan to crankcase.

Attention!
Do not move gasket/packing compound.
Do not move the gasket when mounting the lubricating oil pan.

6

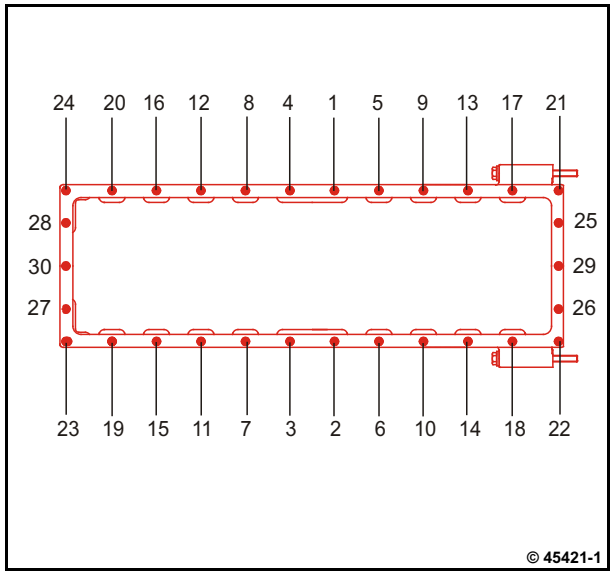
- Mount holder (arrows).
- Position cable.
- Tighten screws alternately.



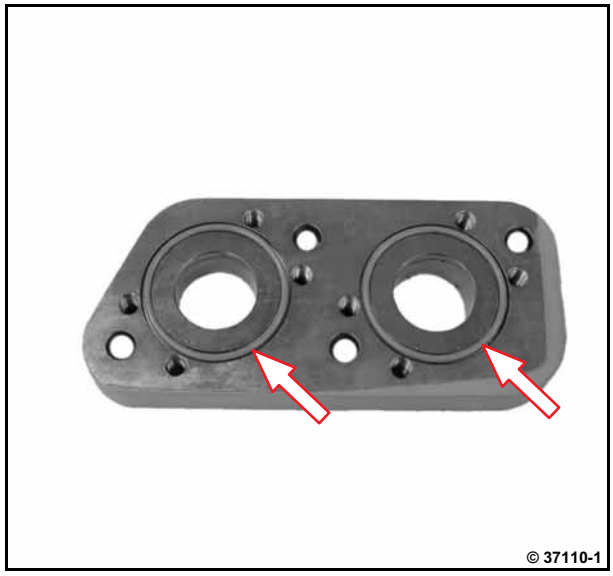
- Tighten all screws.

A03 030

See graphic for tightening sequence.



- Insert new O-rings (arrows).
- Coat the O-rings with fitting compound.

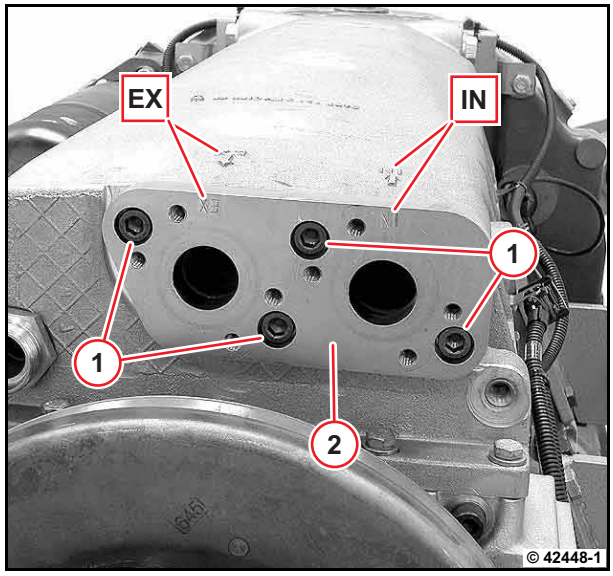


- Mount connecting flange (2).

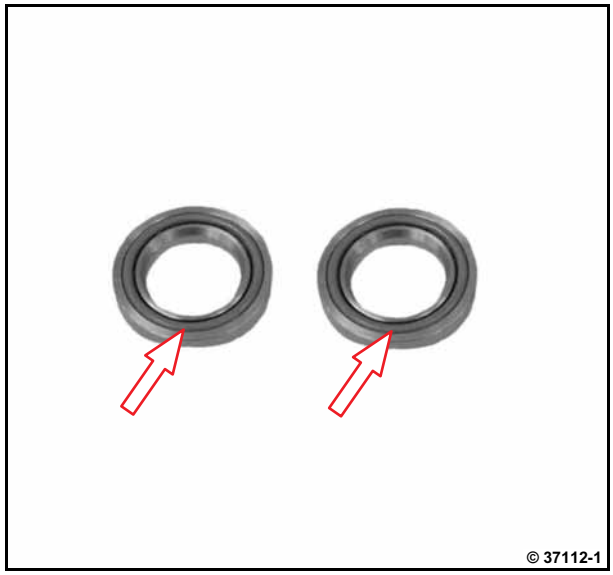
Attention!
The labels “IN“ and “EX“ on the connecting flange and the lubricating oil pan must match.

- Tighten screws (1).

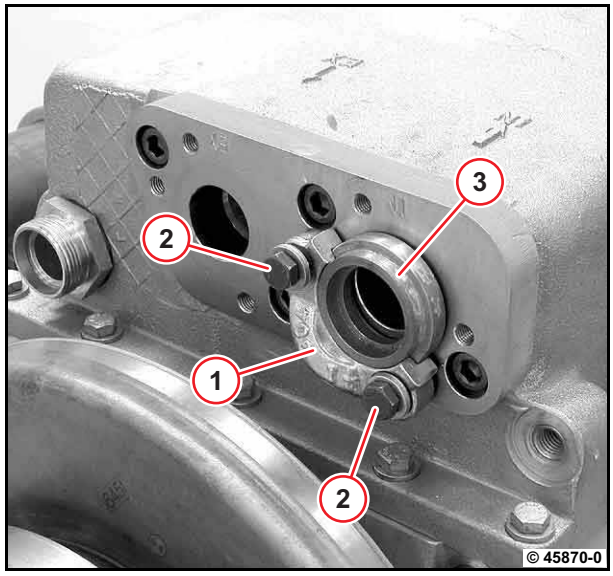
A03 035



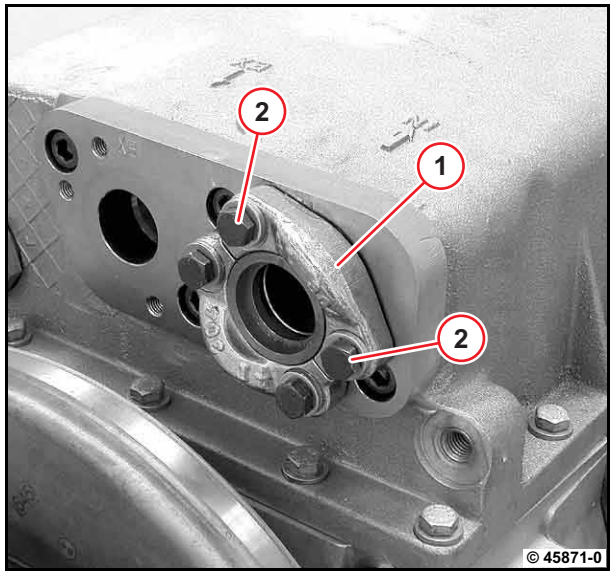
- Insert new O-rings (arrows).
- Coat the O-rings with fitting compound.



- Mount half-flange (1).
- Mount washers.
- Tighten screws (2).
- Insert flanged socket (3).

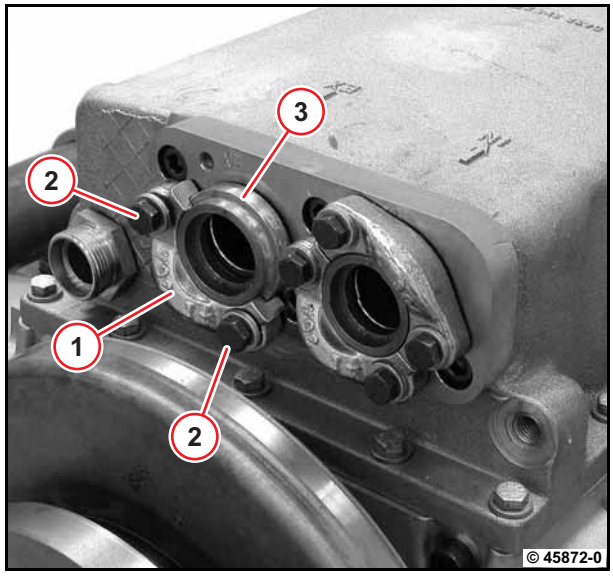


- Mount half-flange (1).
- Mount washers.
- Tighten screws (2).



- Mount half-flange (1).
- Mount washers.
- Tighten screws (2).
- Insert flanged socket (2).
- Align both flanged sockets centrally.
- Tighten all screws.

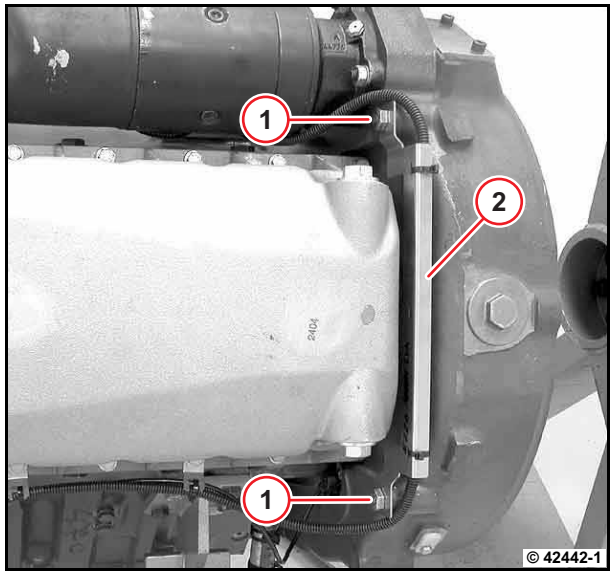
A03 034



- Mount holder (2).
- Tighten screws (1).

  A13 098

- Turn engine **180°**.
- Fill engine oil according to operating instructions.



6

Removing and installing the oil cooler

Commercial available tools

– W 06-07-03 . . . . . (A-bank)
– W 09-08-04

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

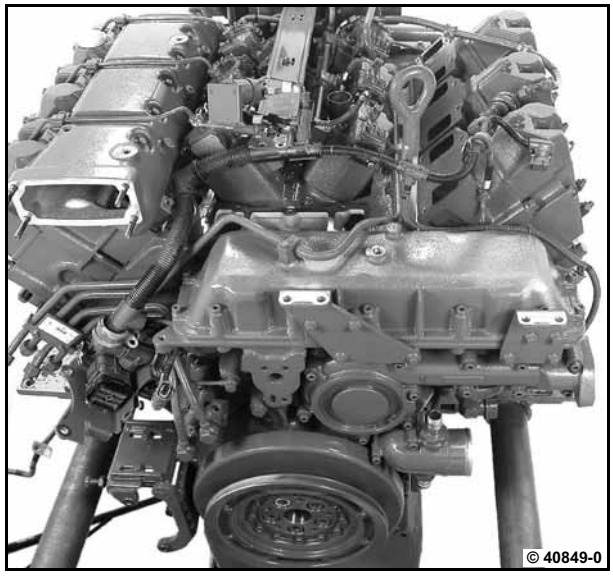
Removing the oil cooler

- Remove charge air pipe (A-bank).

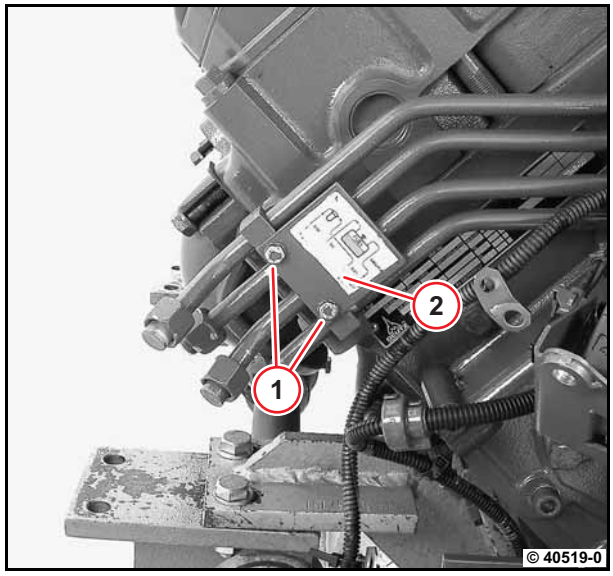
  W 06-07-03

- Remove thermostat housing.

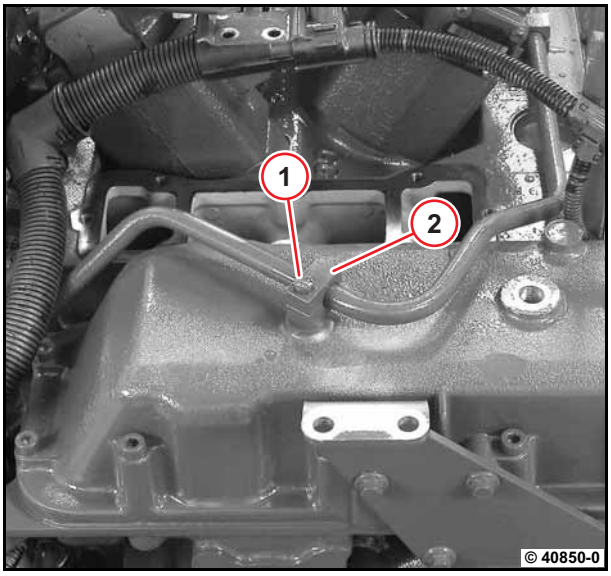
  W 09-08-04



- Unscrew screws (1).
- Remove the holder (2).

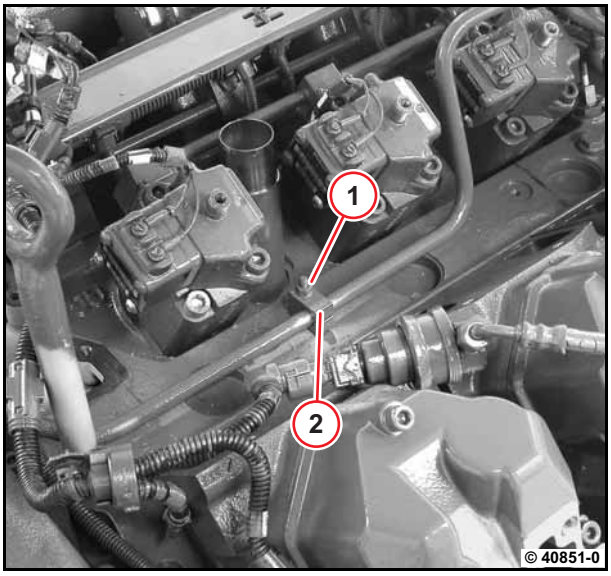


- Unscrew screw (1).
- Remove the holder (2).



6

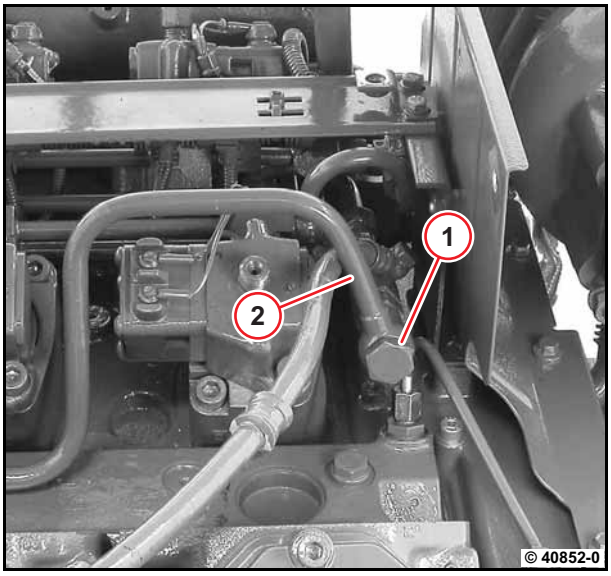
- Unscrew nut (1).
- Remove the holder (2).



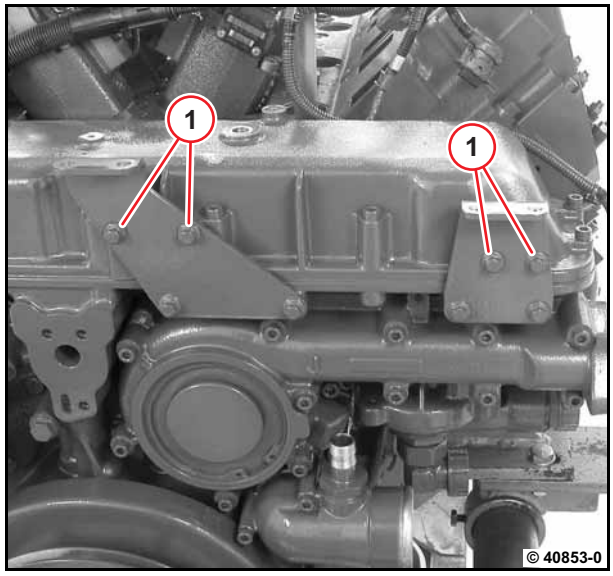
- Unscrew hollow screw (1).

Hold overflow valve.

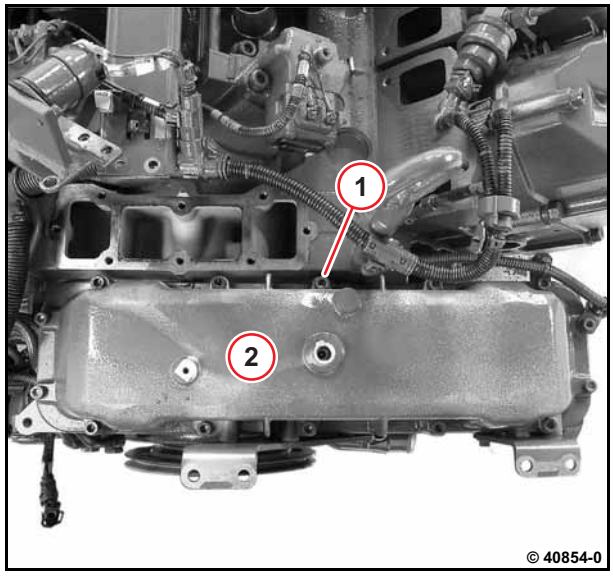
- Remove fuel pipe (2).
- Remove sealing rings.



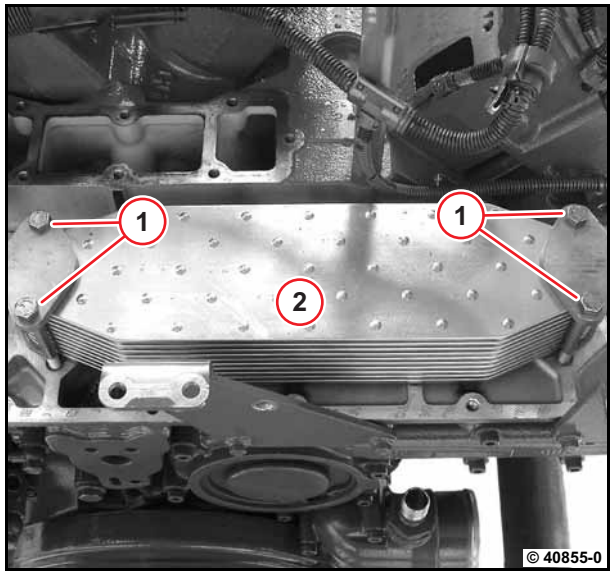
- Unscrew screws (1).



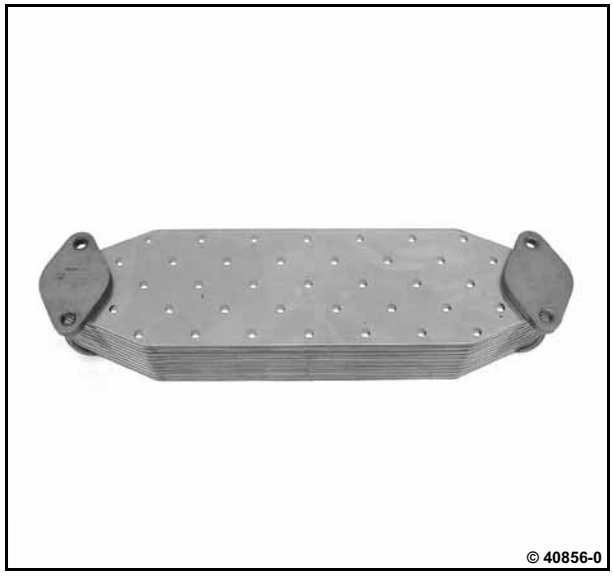
- Unscrew all screws (1).
- Remove oil cooler cover (2).
- Remove gasket.



- Unscrew screws (1).
- Remove oil cooler (2).
- Remove O-rings.



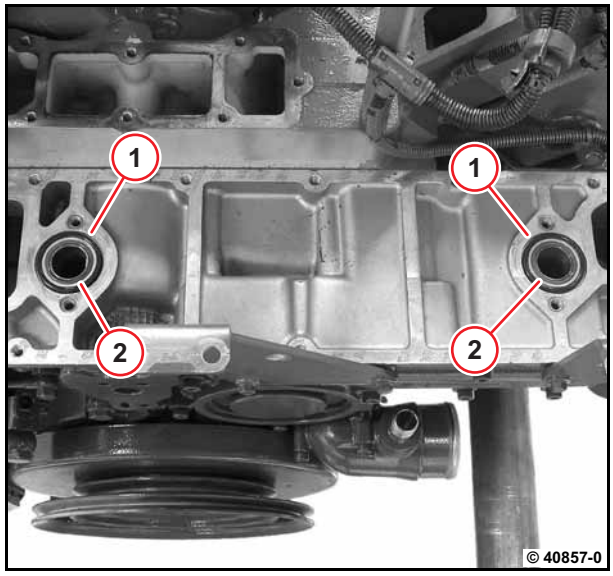
- Visually inspect the components.



6

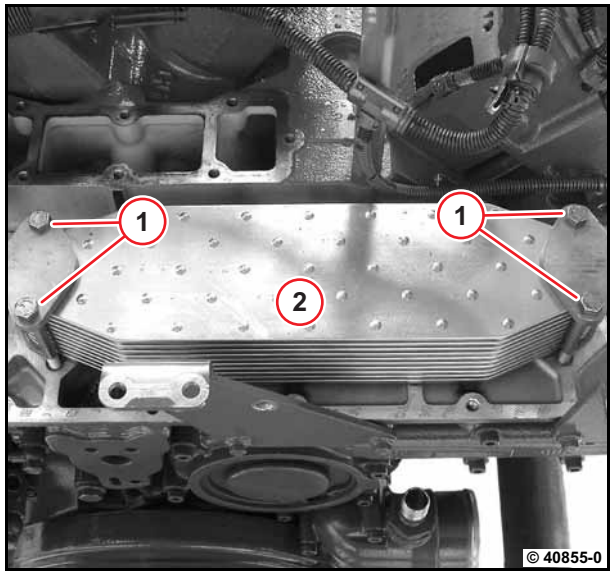
Installing the oil cooler

- Clean sealing surfaces.
- Insert new O-rings (1).
- Insert new O-rings (2).



- Mount oil cooler (2).
- Align oil cooler.
- Tighten screws (1).

A08 051

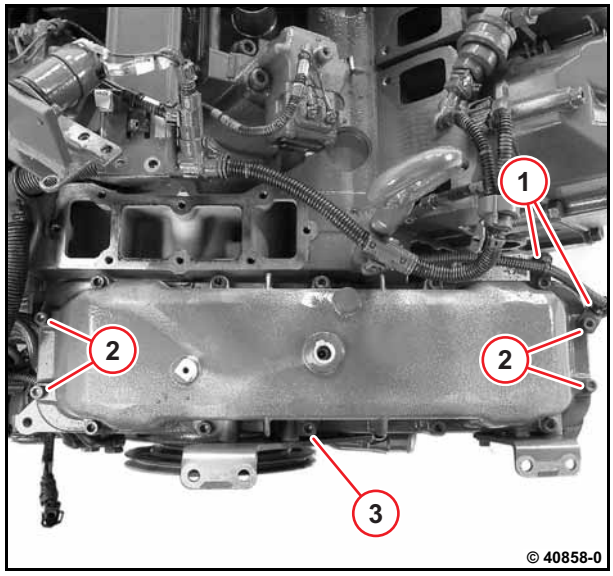


- Clean sealing surfaces.
- Mount new gasket.
- Mount oil cooler cover.
- Mount holder (1).
- Tighten screws (2).

Screw length:
M8 x 35 mm

- Fasten all screws (3).

Screw length:
M8 x 65 mm



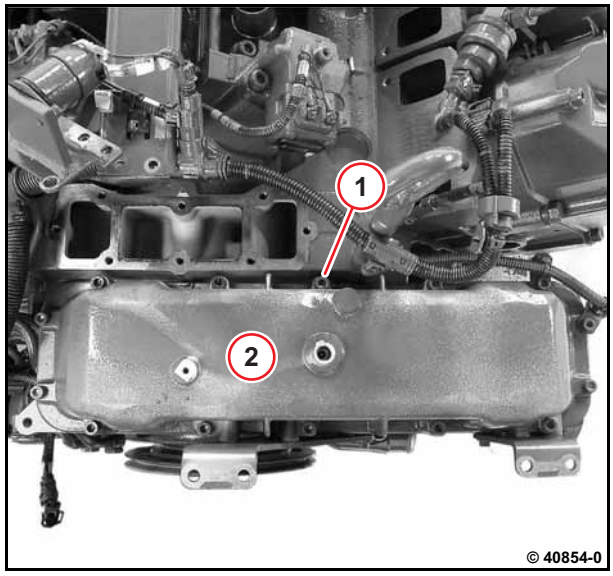
- Align oil cooler cover (2).

The lay-on surfaces of the oil cooler cover and the genset support must contact the holders.

Do not move gasket.

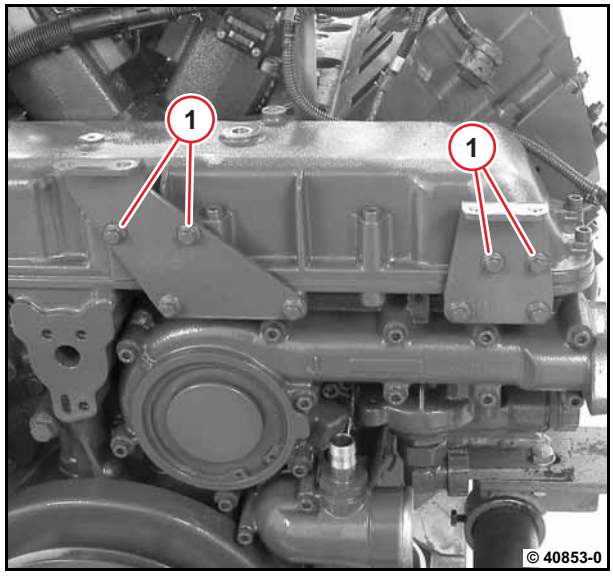
- Tighten all screws (1) alternately.

A08 050



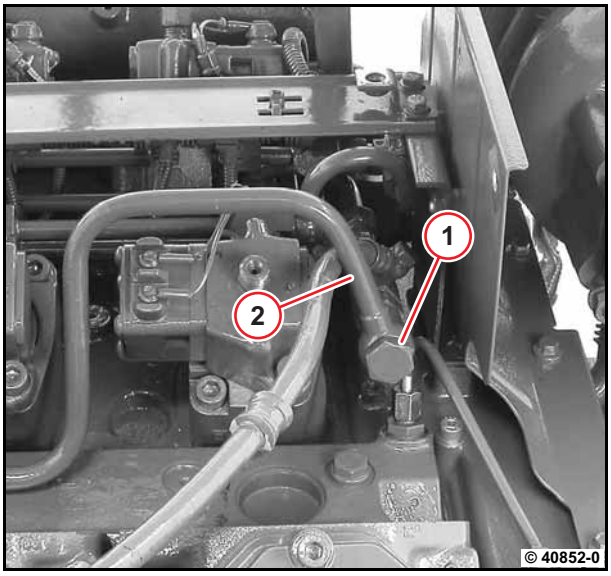
- Tighten screws (1).

A06 058



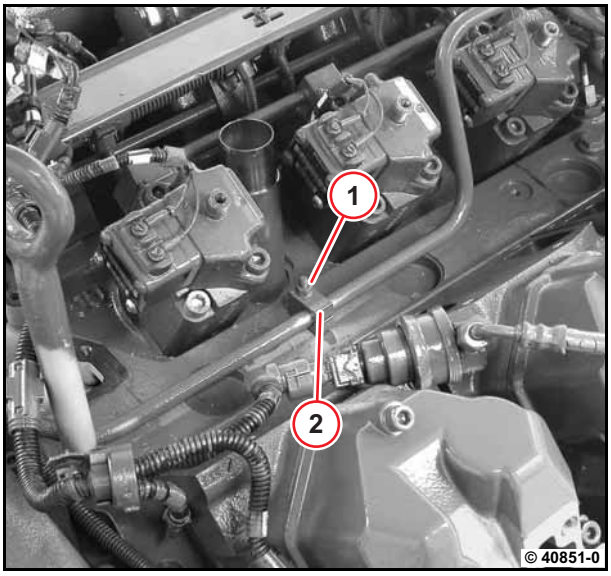
6

- Mount new sealing rings.
- Mount fuel pipe (2).
- Screw on hollow screw (1).

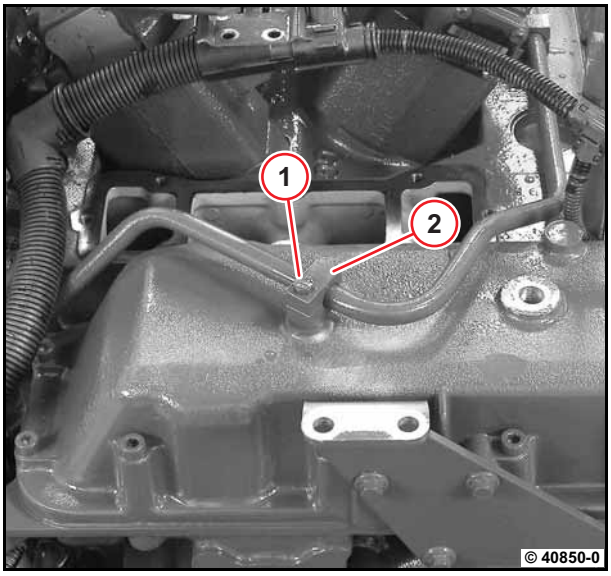


6

- Oil the thread lightly.
- Mount holder (2).
- Screw on nut (1).

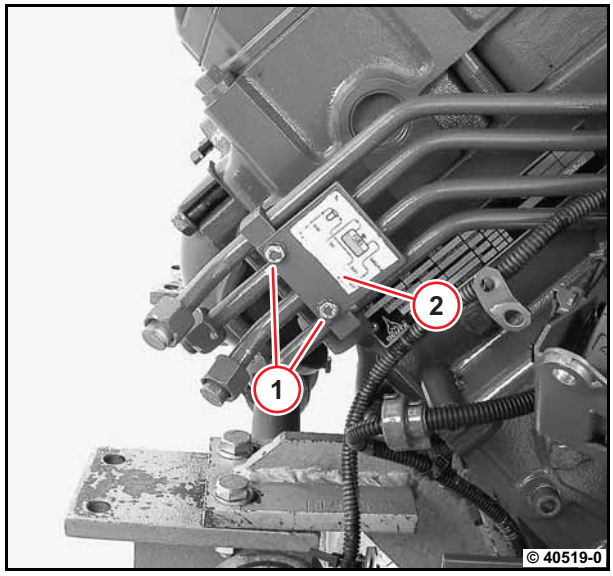


- Mount holder (2).
- Oil thread and head contact surface lightly.
- Fasten screw (1).



- Mount holder (2).
- Tighten screws (1).

A07 044



- Tighten hollow screw (1).

A12 093

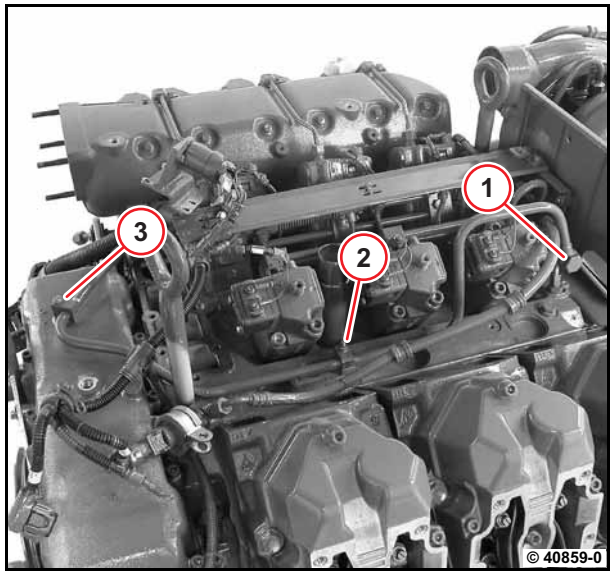
Hold overflow valve.

- Tighten nut (2).

A07 044

- Tighten screw (3).

A07 044

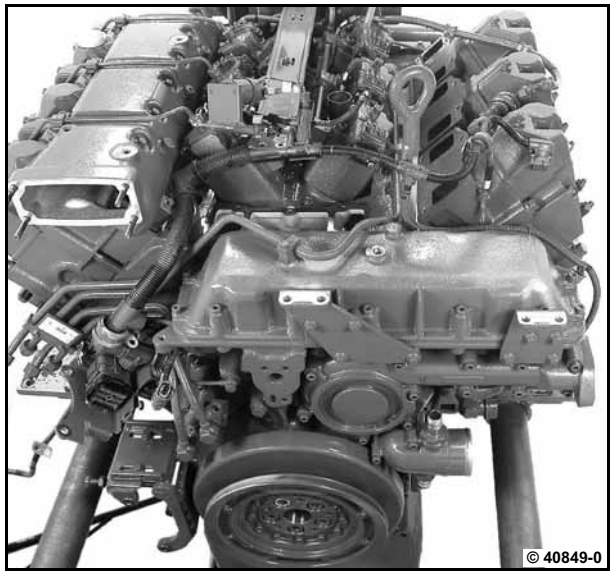


- Install thermostat housing.

W 09-08-04

- Install charge air pipe (A-bank)

W 06-07-03



6

Removing and installing oil pressure pick-up

Commercial available tools

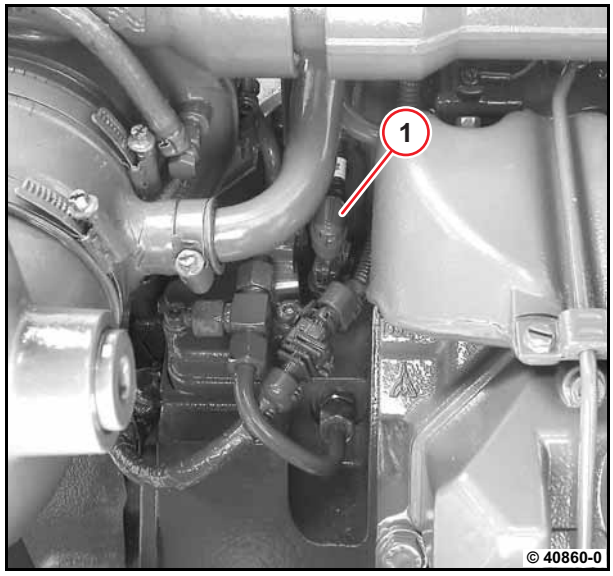
Special tools:
– Socket wrench insert 110700

Read out error memory of the motor control timer with SERDIA.

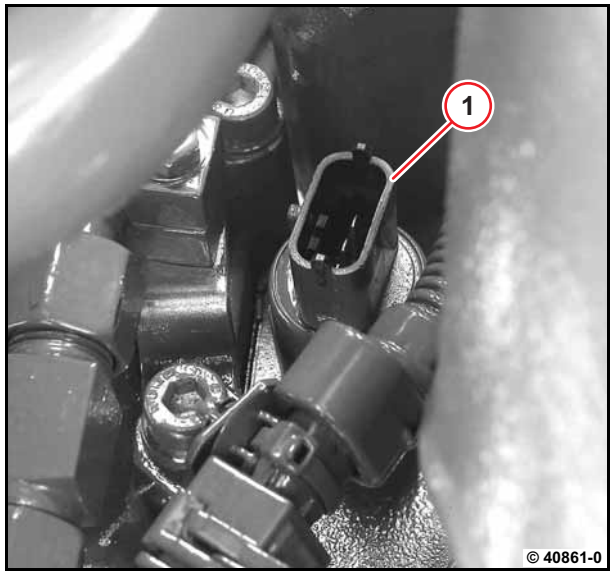
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing oil pressure pick-up

- Pull out cable plug (1).



- Unscrew oil pressure pick-up (1) with the socket wrench insert.



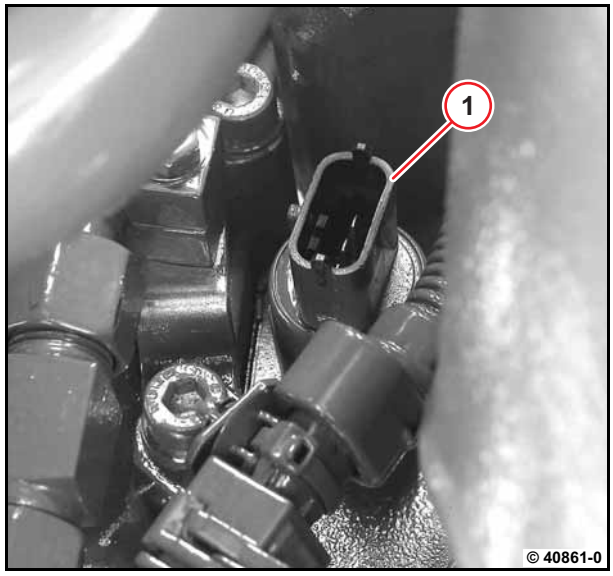
- Visually inspect the components.

6

Installing oil pressure pick-up

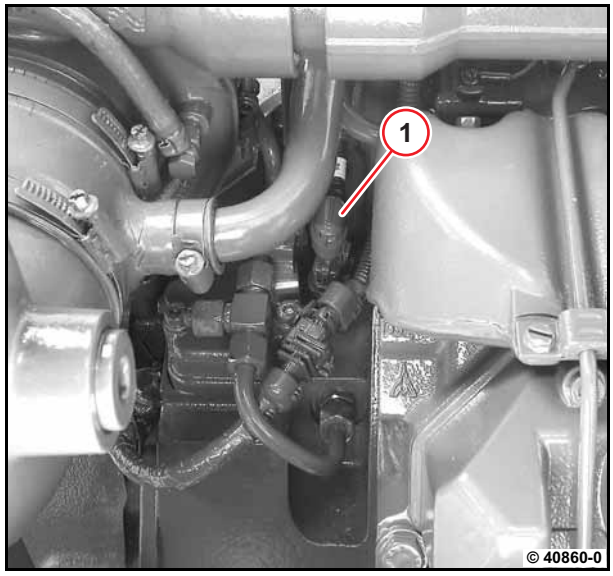
- Mount new gasket.
- Insert oil pressure pick-up (1).
- Tighten oil pressure pick-up with socket wrench insert.

A08 091



- Plug in the cable plug (1).

Delete error entry in the error memory of the motor control timer with SERDIA.



Removing and installing pressurestat

Commercial available tools:
– Depth-measuring appliance

– W 03-01-11
– W 06-07-03 . . . . . (B-bank)

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

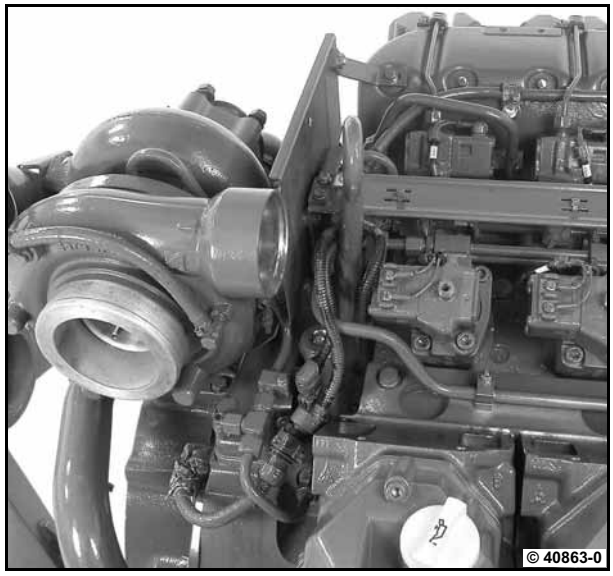
Removing pressurestat

- Removing the crankcase breather.

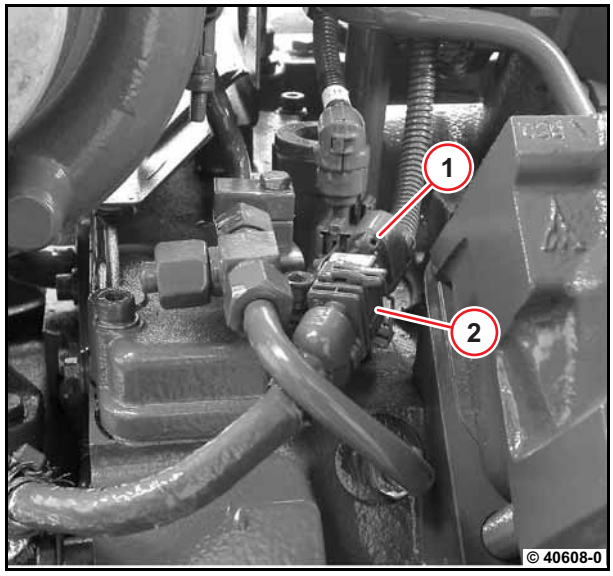
  W 03-01-11

- Remove charge air pipe (B-bank).

  W 06-07-03

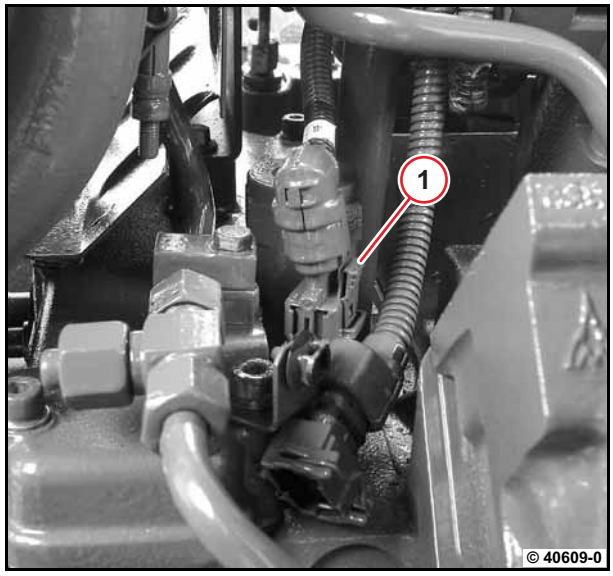


- Remove cable tie (1).
- Unlock cable plug (2) and remove.

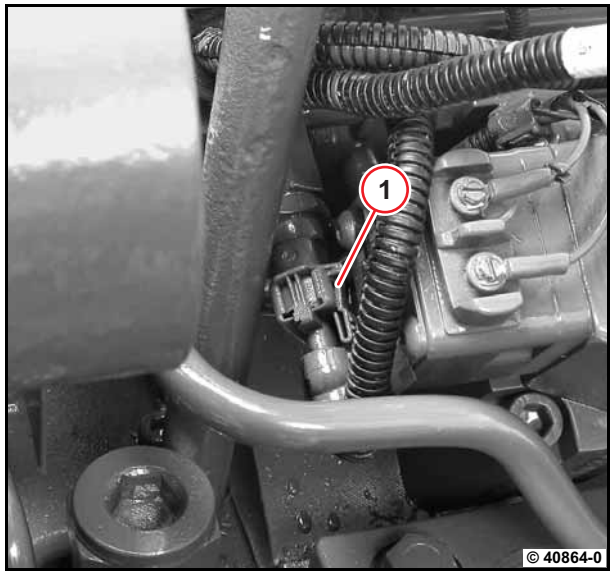


6

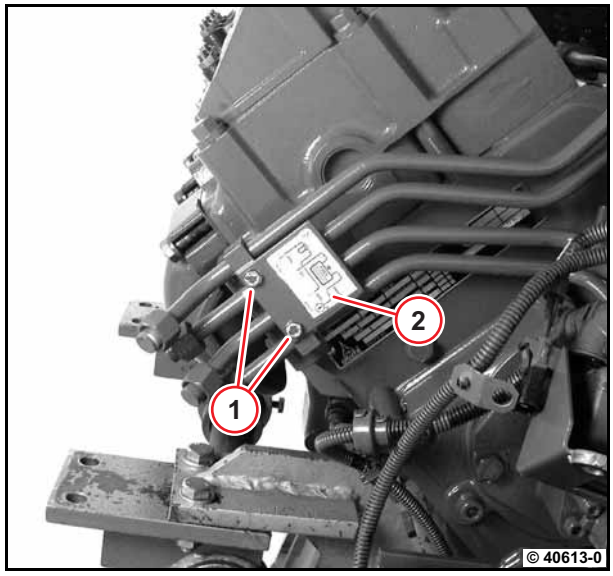
- Unlock cable plug (1) and remove.



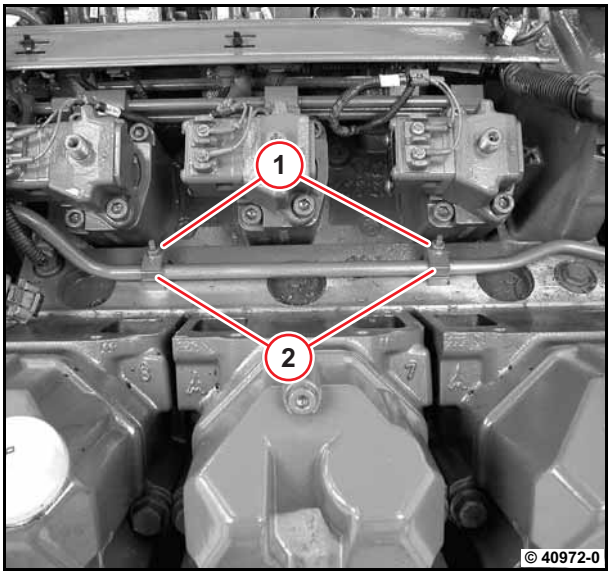
- Unlock cable plug (1) and remove.



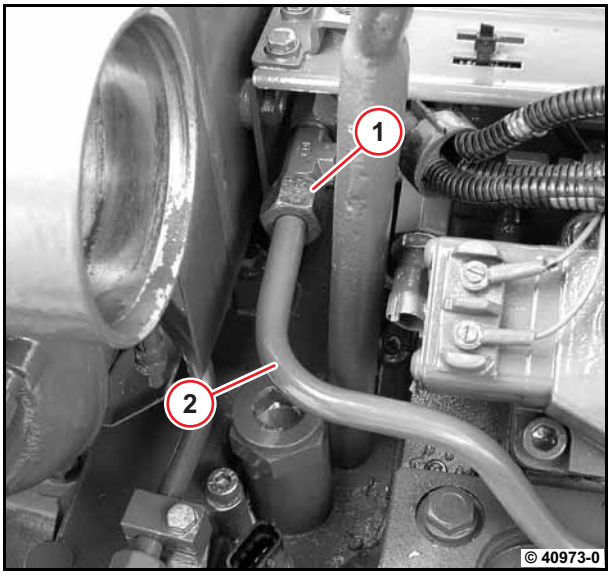
- Unscrew screws (1).
- Remove the holder (2).



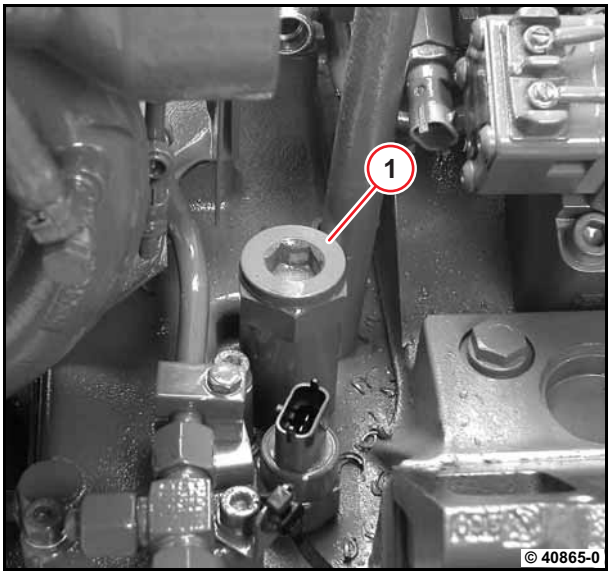
- Unscrew nuts (1).
- Remove the holder (2).



- Unscrew lock nut (1).
- Remove fuel pipe (2).

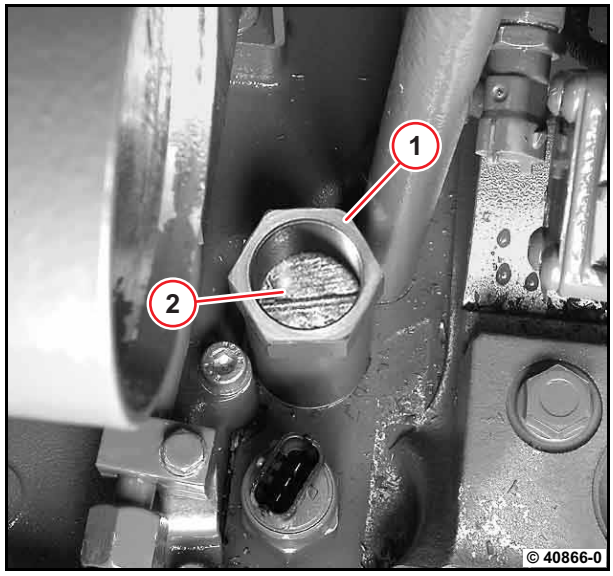


- Unscrew locking screw (1).
- Remove sealing ring.



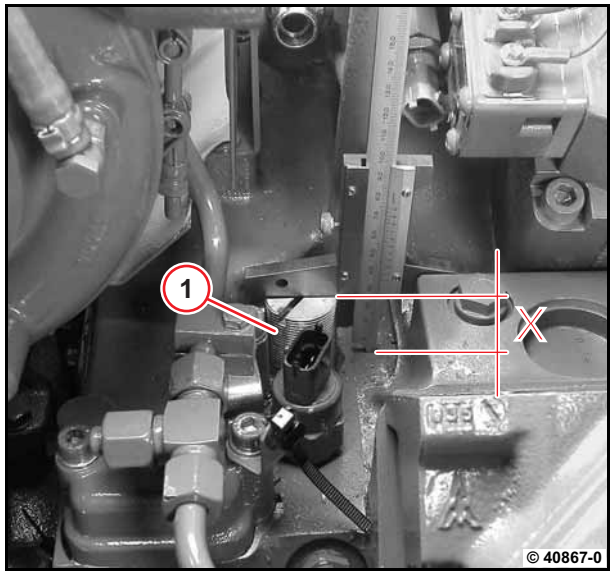
- Unscrew valve housing (1).
- Remove sealing ring.

Do not move the adjusting bolt (2).

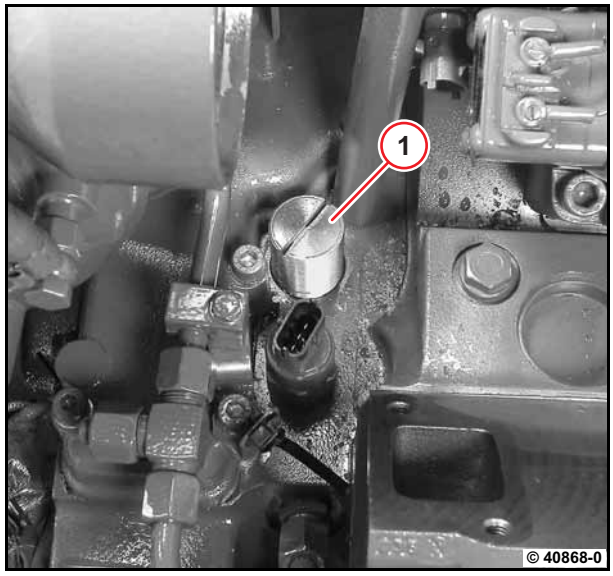


If the same oil pressure is to be set again, the overhang of the adjusting bolt must be measured before removing.

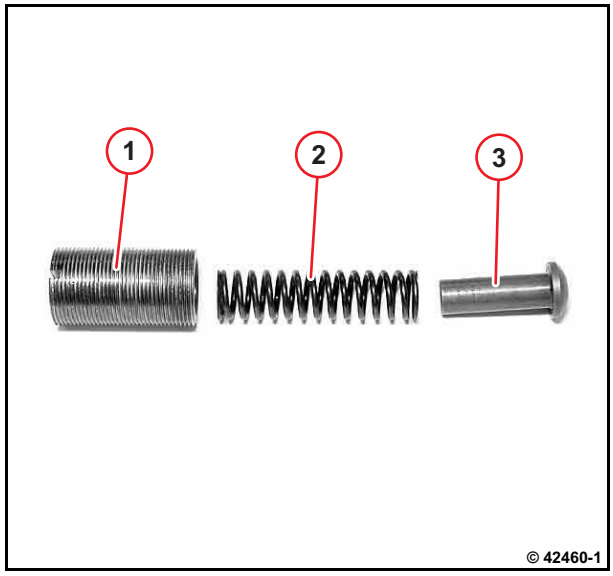
- Measure overhang (X) from adjusting bolt (1) to crankcase with the depth measuring appliance.
- Note measured value.



- Unscrew adjusting bolt (1).
- Remove compression spring.
- Remove valve plunger.



- Visually inspect the components.
  - Adjusting bolt (1).
  - Compression spring (2)
  - Valve plunger (3)

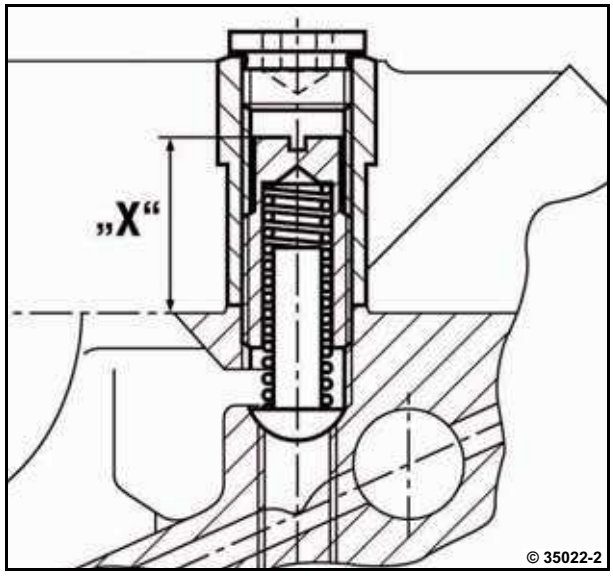


Installing pressurestat

Overhang dimension (X) for basic setting of adjusting bolt.

If the same oil pressure is to be set again, the overhang dimension (X) noted before removal must be reset.

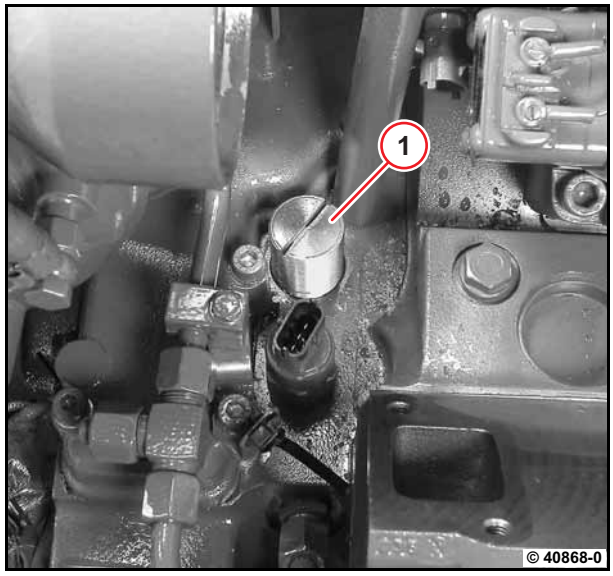
P08 63



- Insert valve plunger.
- Insert compression spring.
- Screw in adjusting bolt (1).

P08 63

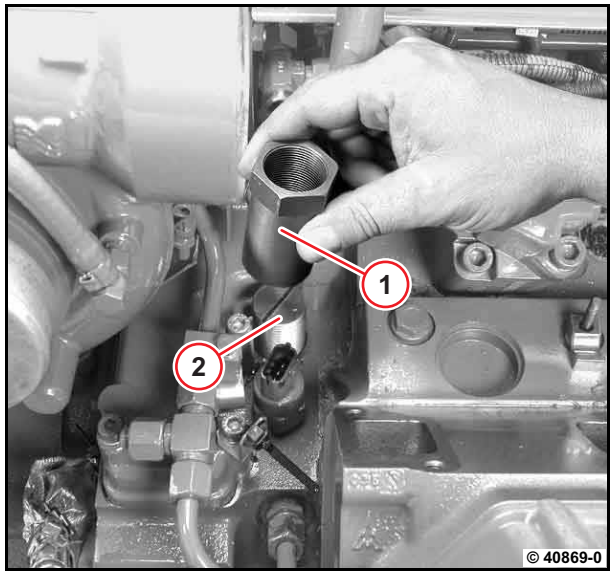
Note overhang dimension of the adjusting bolt.



- Mount new sealing ring.
- Oil the thread valve housing lightly.
- Tighten valve housing (1).

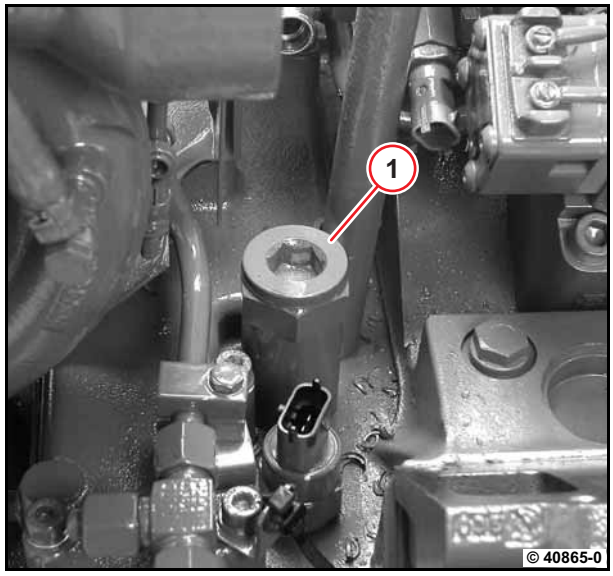
A03 051

Do not move the adjusting bolt (2).

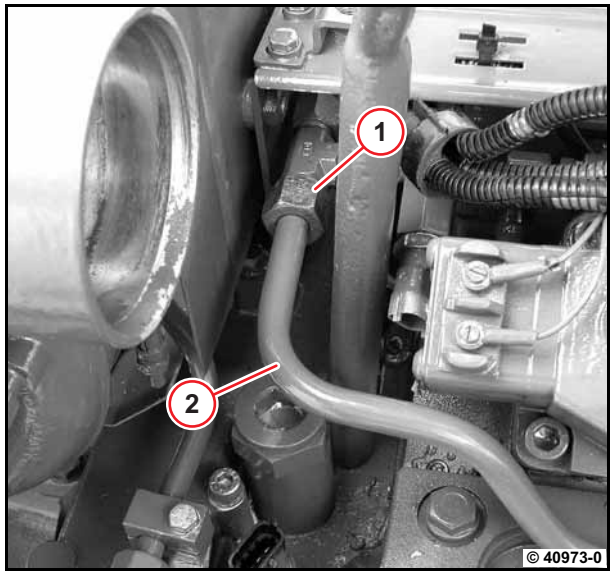


- Mount new sealing ring.
- Tighten screw plug (1).

A08 071

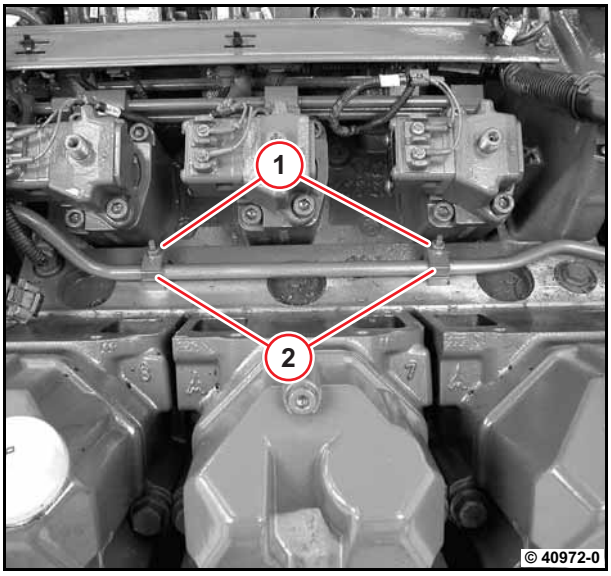


- Mount fuel pipe (2).
- Screw on lock nut (1).



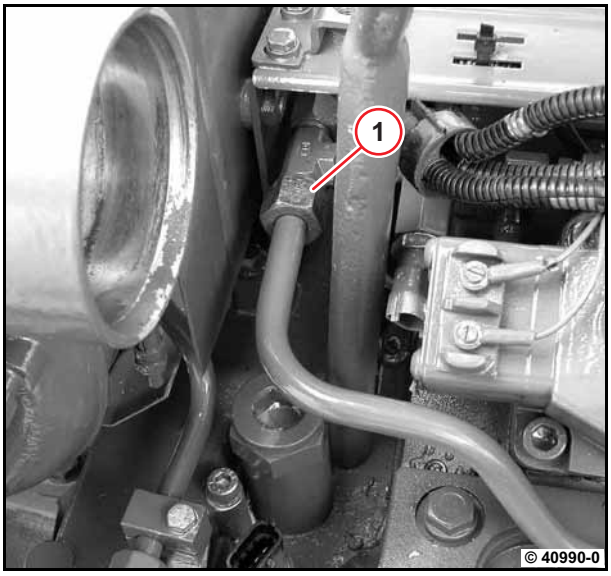
- Oil the thread lightly.
- Mount holder (2).
- Tighten nuts (1).

A07 044



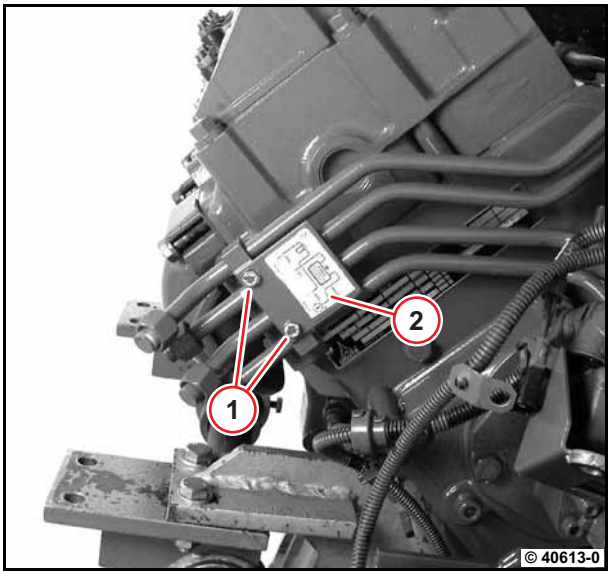
- Tighten lock nut (1).

A07 066



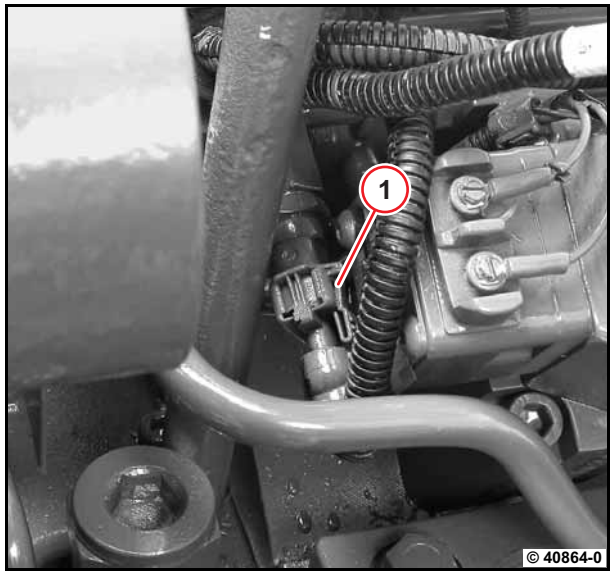
- Mount holder (2).
- Tighten screws (1).

A07 044

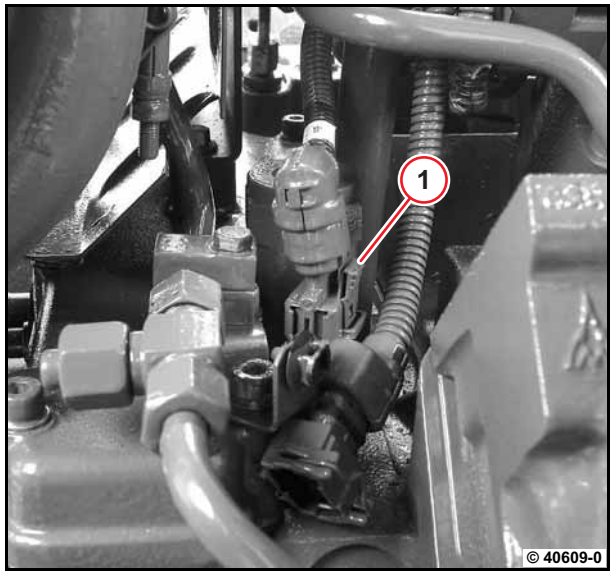


6

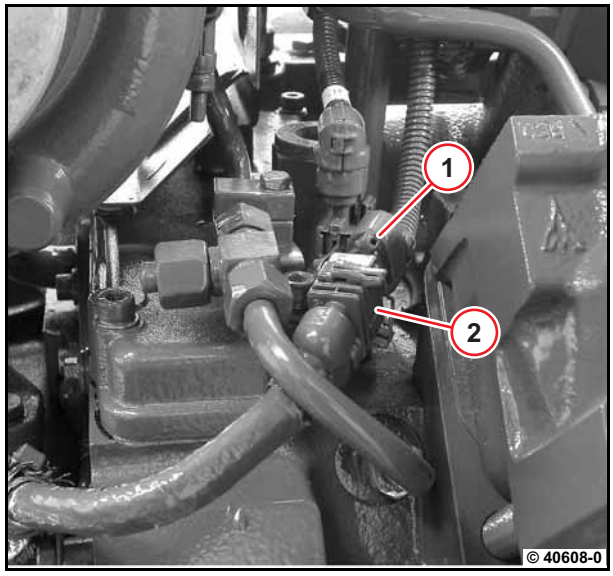
- Plug in the cable plug (1).



- Plug in the cable plug (1).



- Plug in the cable plug (2).
- Fix cable tie (1).

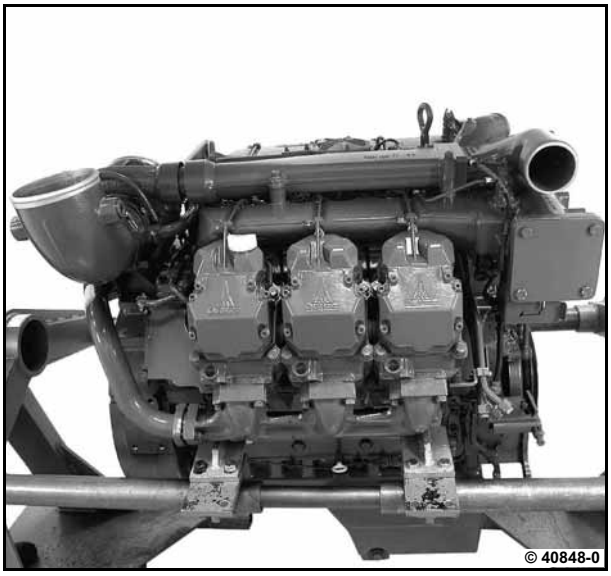


- Install charge air pipe (B-bank)

  W 06-07-03

- Install crankcase breather.

  W 03-01-11



Removing and installing the coolant pump

Commercial available tools

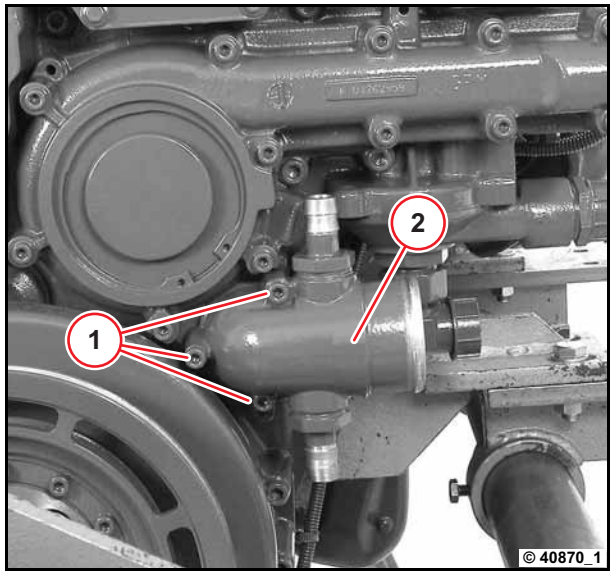
Special tools:
– Disassembly tool. 110901

– Fitting compound
DEUTZ AP1908

Collect leaking operating substances in suitable vessels and dispose of according to regulations.

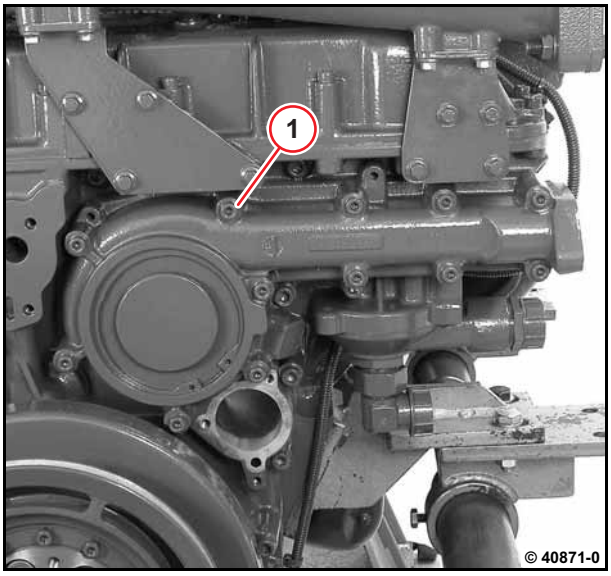
Removing coolant pump

- Unscrew screws (1).
- Removing screw-in nipple (2).
- Remove gasket.



- Visually inspect the components.

- Unscrew all screws (1).

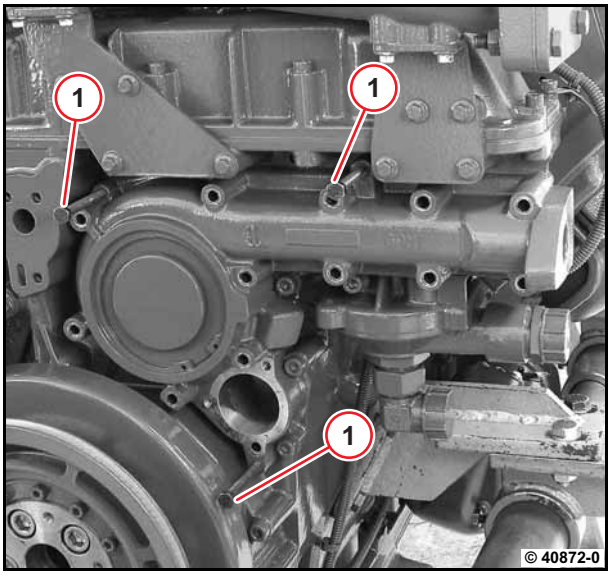


6

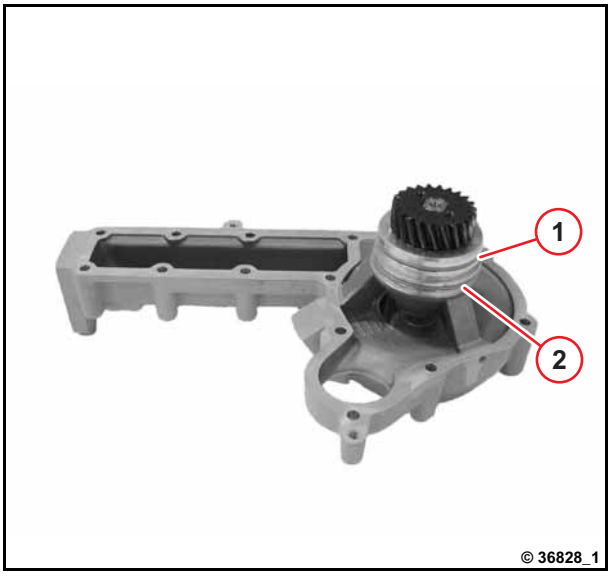
- Tighten screws (1).

Use three studs M8 to push the coolant pump off the genset support.

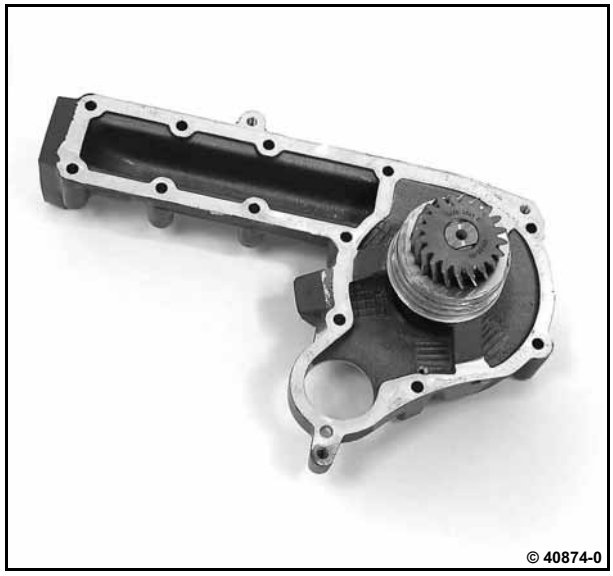
- Press off the coolant pump.
- Remove gasket.



- Remove screws.
- Remove the O-ring (1) with the disassembly tool.
- Remove the O-ring (2) with the disassembly tool.



- Visually inspect the components.

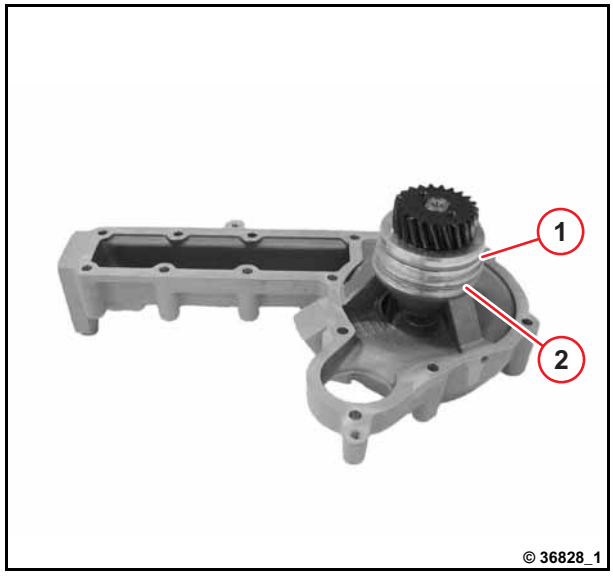


Installing coolant pump

- Insert new O-rings.

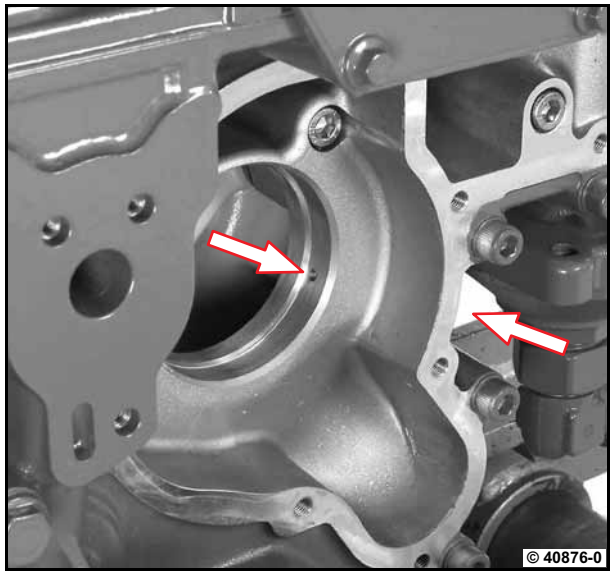
O-rings:
75 x 3 mm (1)
80 x 3 mm (2)

- Coat the O-rings with fitting compound.



- Clean sealing surfaces.

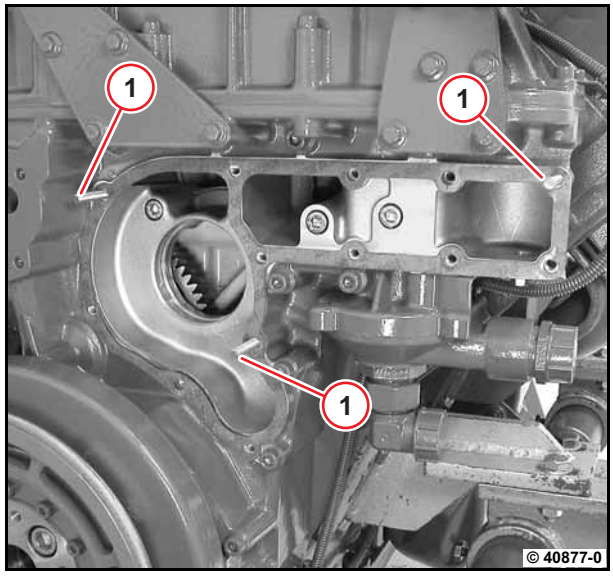
Check drainage holes (arrows) for free passage.



- Screw in studs (1).

To fix the gasket and the coolant pump.

- Mount new gasket.

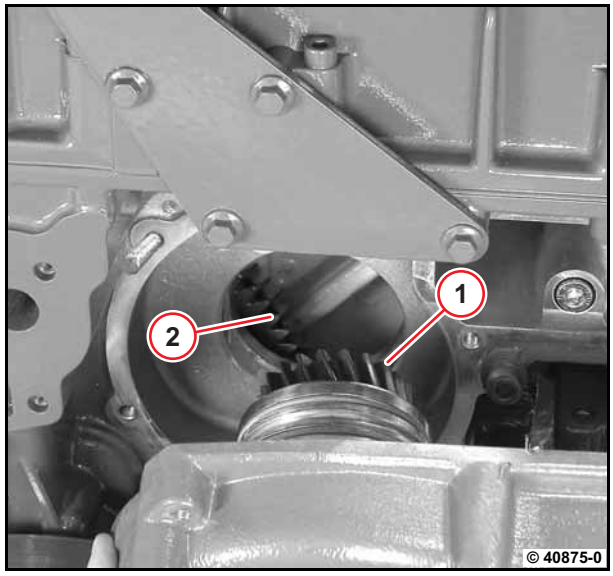


6

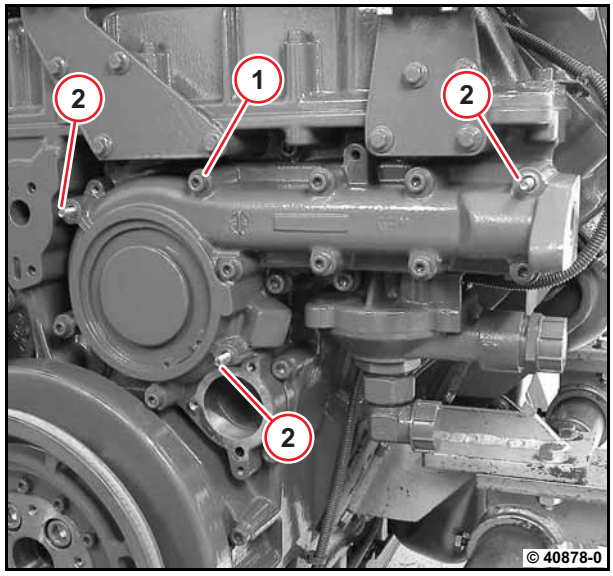
- Insert coolant pump.

The gear wheel (1) must engage the toothing of the idler gear (2).

Attention!
Do not damage the gasket.
Do not move gasket.

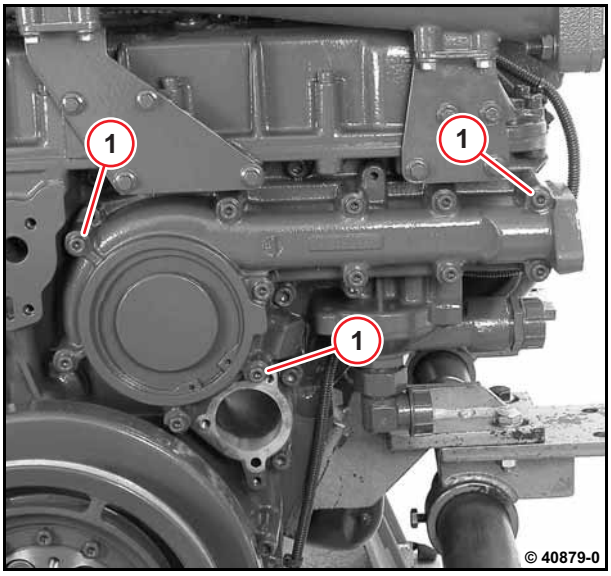


- Lightly oil screws (1).
- Fasten all screws (1).
- Unscrew studs (2).



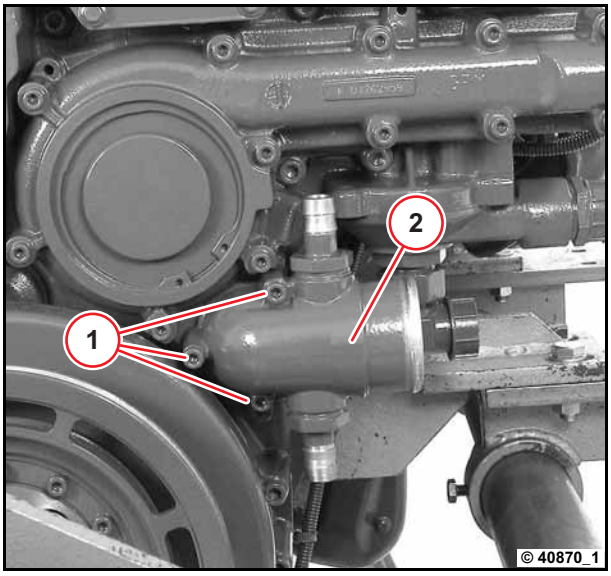
- Lightly oil screws (1).
- Tighten screws (1).
- Tighten screws (1) alternately.

A09 010



- Clean sealing surfaces.
- Mount new gasket.
- Mount inlet adapter (2).
- Lightly oil screws (1).
- Tighten screws (1).

A09 011



Checking the thermostat when uninstalled

Commercial available tools:
– Thermometer

– W 09-08-02

Danger!
Risk of injury!
Hot water and hot thermostat.

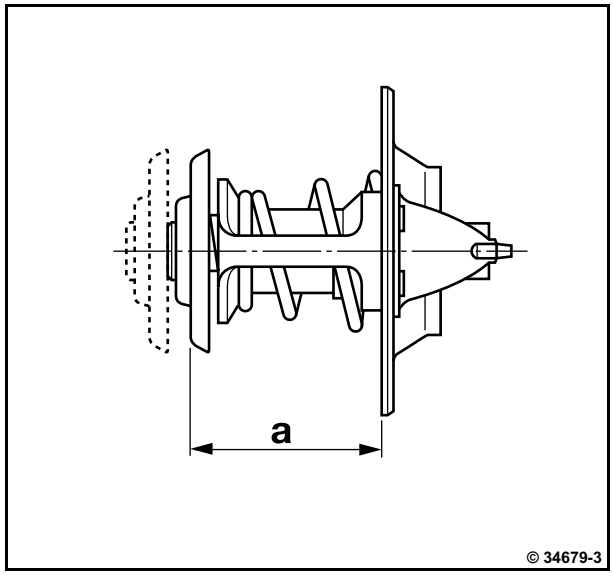
6

Checking thermostat

- Remove thermostats.

  W 09-08-02

- Measure beginning of stroke, dimension (a).
- Note measured value, dimension (a).



- Heat up the thermostat in the water bath.
- Determine beginning of opening.

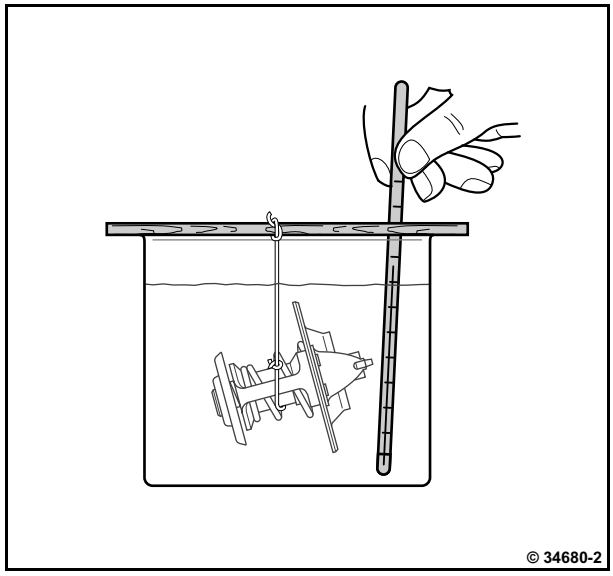
In order to determine the exact beginning of opening, the temperature should be measured as close as possible to the thermostat.

Do not touch the thermostat.

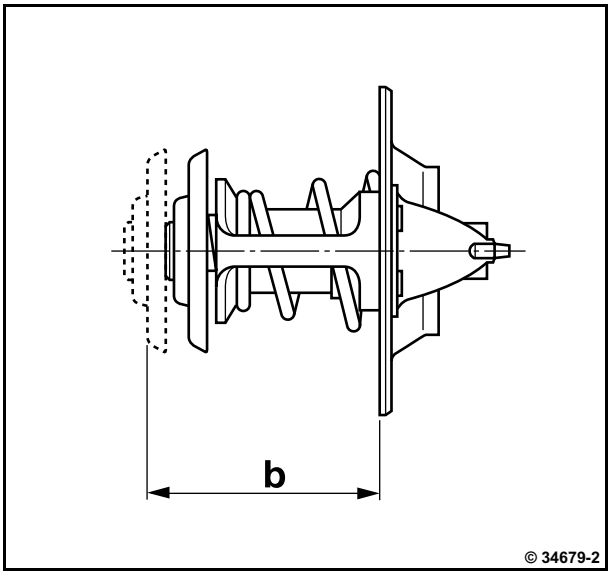
The water should be continuously stirred for an even temperature distribution. The temperature rise should not take place faster than 1°C/min. Otherwise the beginning of opening will be delayed accordingly.

P09 11

P09 12



- Measure end of stroke, dimension (b).
- Note measured value, dimension (b).



6

- Determine stroke.

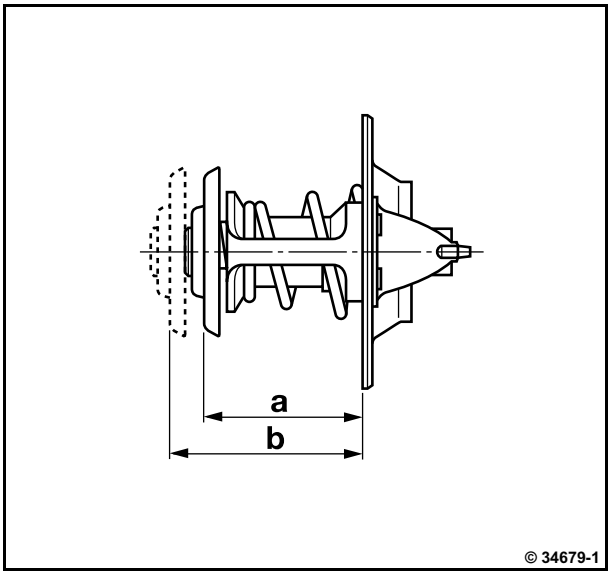
Calculation example	
Desired:	Stroke
Given:	-
Measured:	Beginning of stroke, dimension (a)
	End of stroke, dimension (b)
	Dimension (b) - dimension (a)
Result:	= stroke

- Compare result with setpoint value.

P09 13

- Install thermostats.

W 09-08-02



Removing and installing thermostats

Commercial available tools

– Fitting compound
DEUTZ AP1908

– W 09-08-01
– W 09-08-04

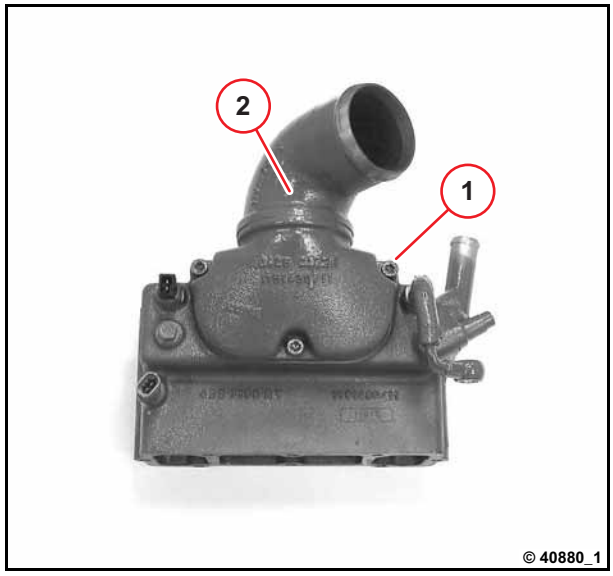
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing thermostats

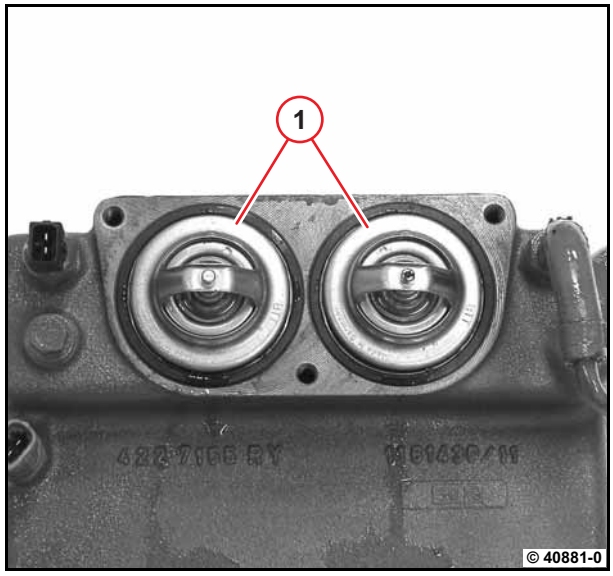
- Remove thermostat housing.

  W 09-08-04

- Unscrew all screws (1).
- Remove outlet nozzle (2).



- Remove thermostats (1).



- Visually inspect the components.
- Check thermostats.

W 09-08-01

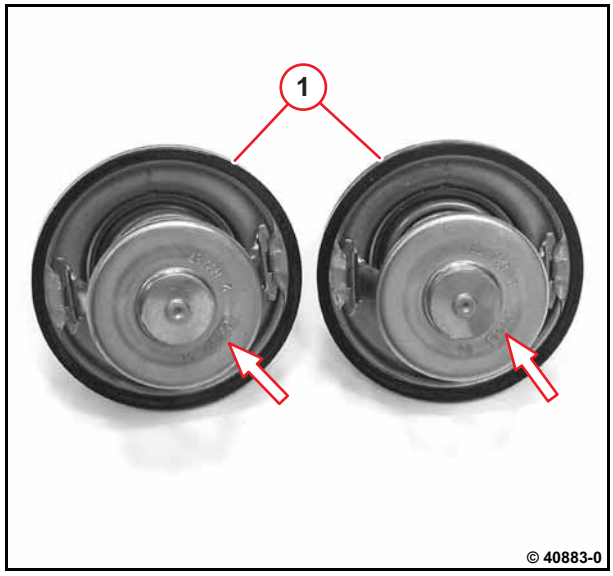
6

Installing thermostats

- Select thermostats.
- Coat the sealing rings with fitting compound.
- Fit new sealing rings (1).

Note different opening temperatures (arrows) of the thermostats.

P09 11
P09 12



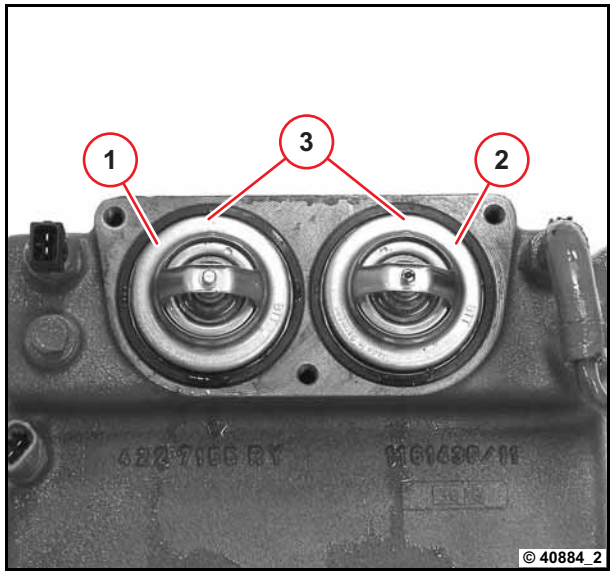
Note installation position.
The markings (3) face upwards.
Note thermostat assignment.

- Insert thermostat (1).

P09 12

- Insert thermostat (2).

P09 11

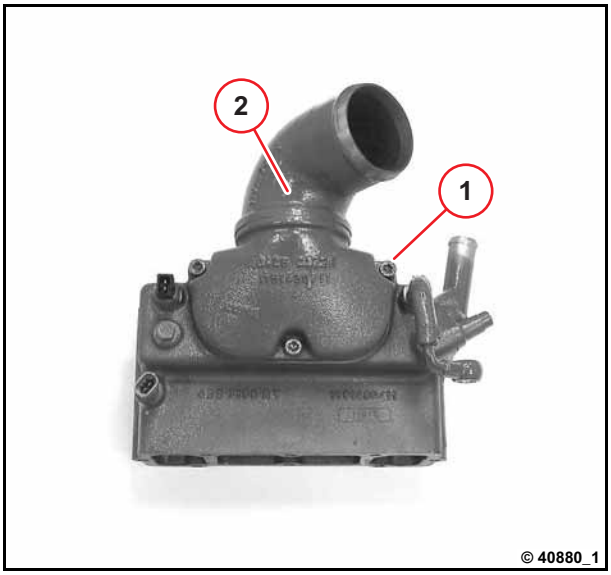


- Mount outlet nozzle (2).
- Tighten all screws (1).

A09 002

- Install thermostat housing.

W 09-08-04



6

Removing and installing the thermostat housing

Commercial available tools

– W 07-01-04

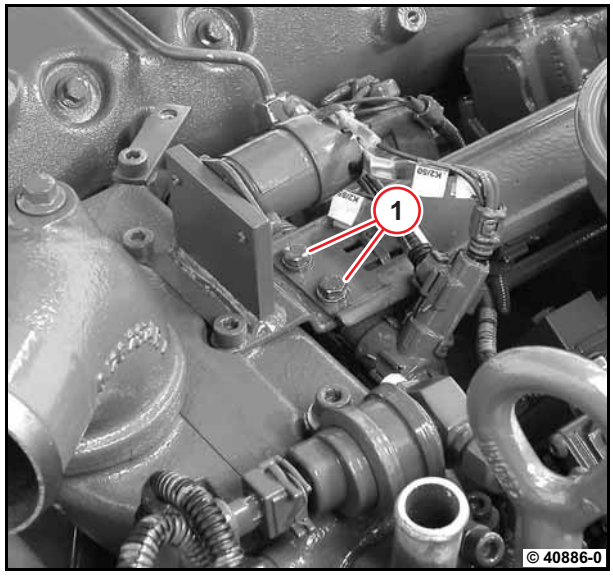
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing thermostat housing

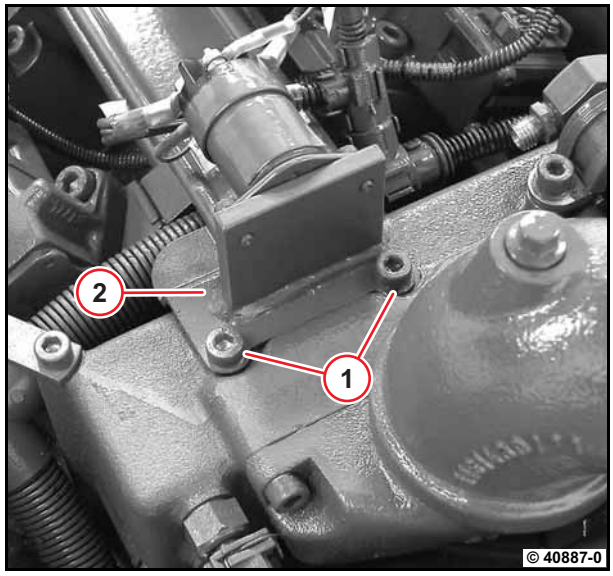
- Remove fuel pipes (flame glow plugs).

  W 07-01-04

- Unscrew screws (1).

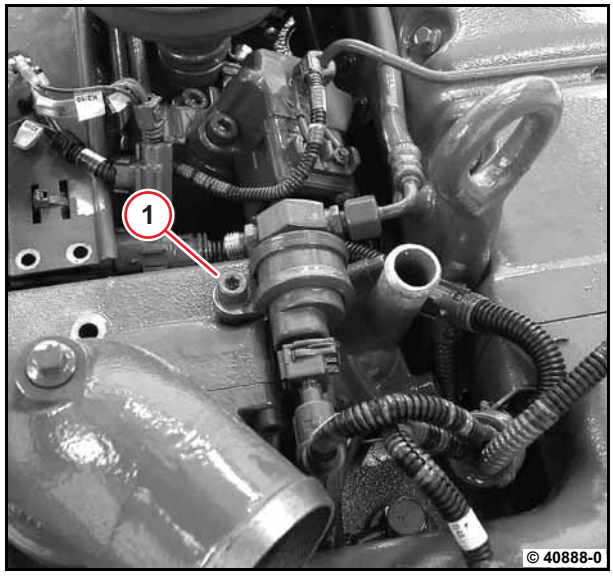


- Unscrew screws (1).
- Place holder (2) to one side.

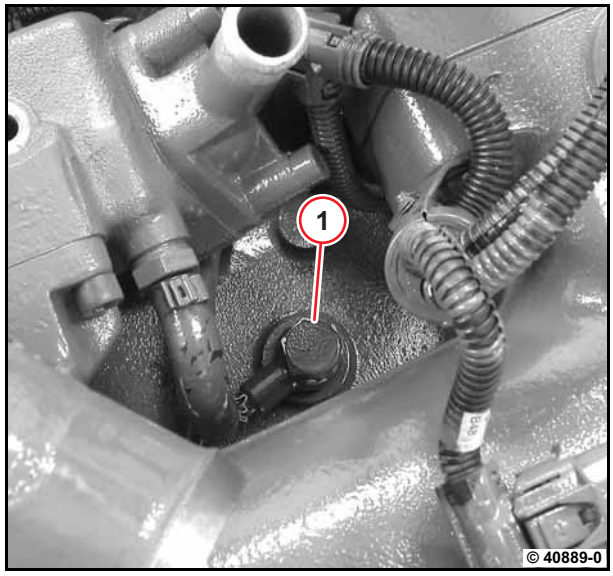


6

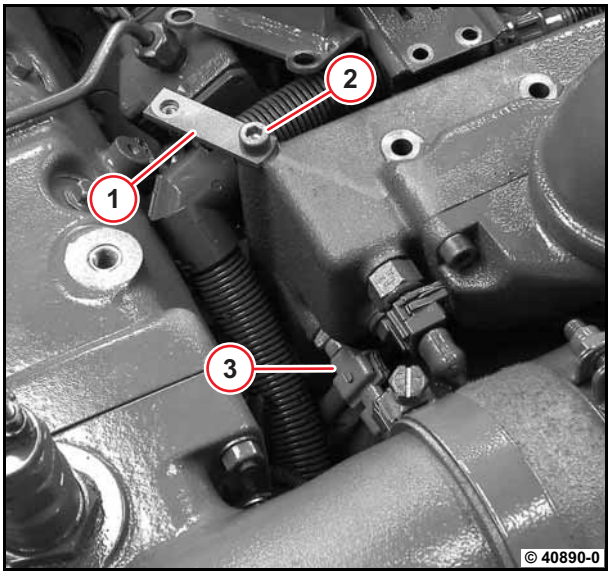
- Unscrew screw (1).
- Remove spacing sleeve.
- Place pipe to one side.



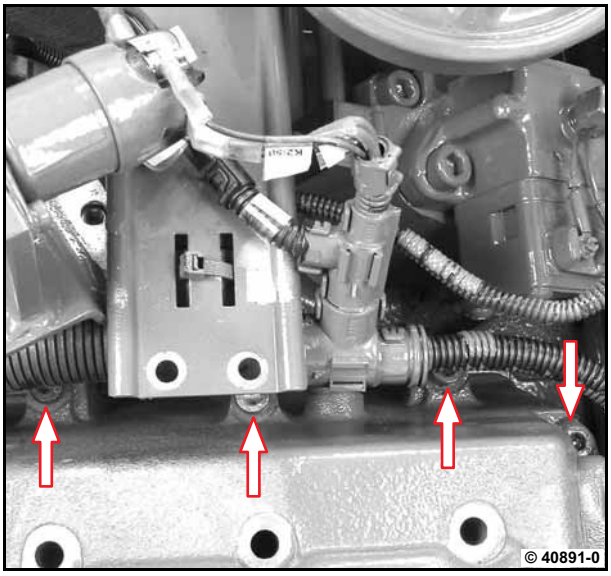
- Unscrew hollow screw (1).
- Remove sealing rings.



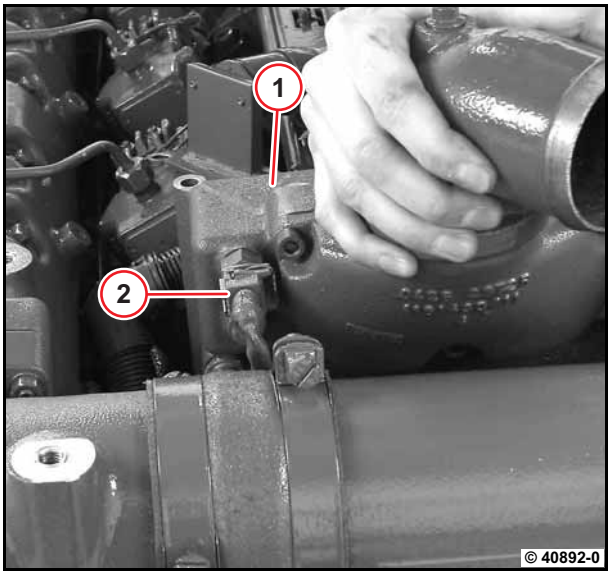
- Unscrew screw (2).
- Remove holder (1).
- Unlock cable plug (3) and remove.



- Unscrew screws (arrows).



- Remove the thermostat housing (1).
- Unlock cable plug (2) and remove.
- Remove gasket.



- Visually inspect the components.

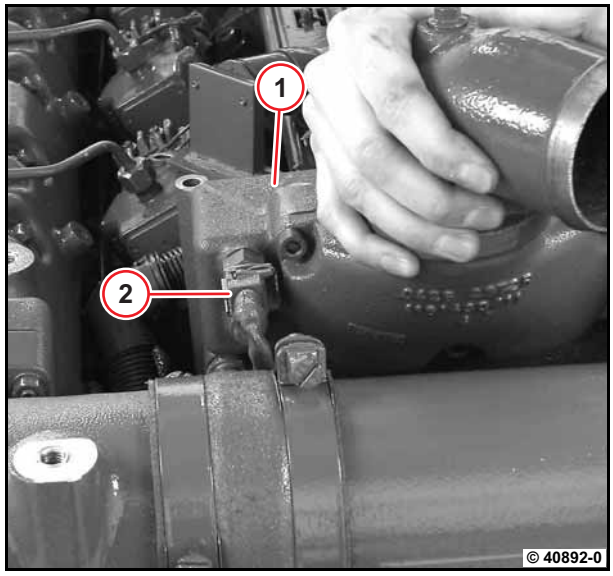
6

Installing thermostat housing

- Clean sealing surfaces.
- Mount new gasket.
- Mount thermostat housing (1).

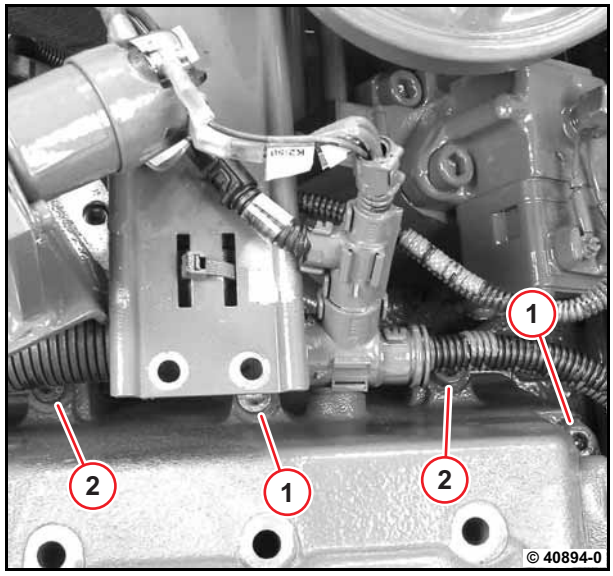
Do not move gasket.

- Plug in the cable plug (2).



- Fasten screws.

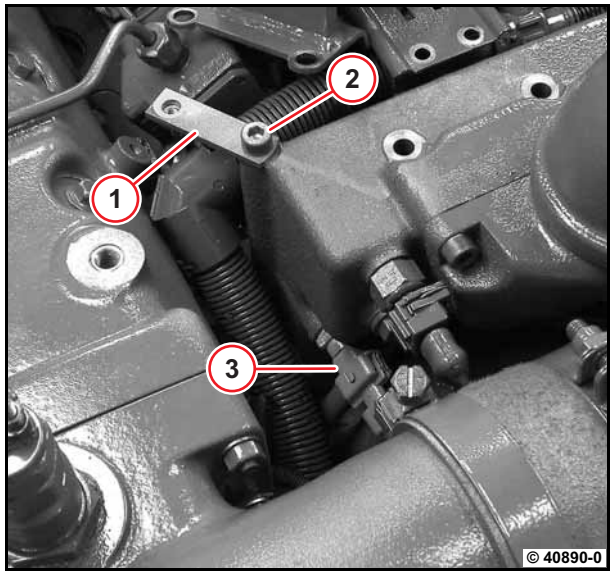
Note different screw lengths.
M8 x 90 mm (1)
M8 x 65 mm (2)



- Mount holder (1).
- Fasten screw (2).

Screw length:
M8 x 140 mm.
TIghten screw only after mounting the fuel pipes (flame glow plugs).

- Plug in the cable plug (3).

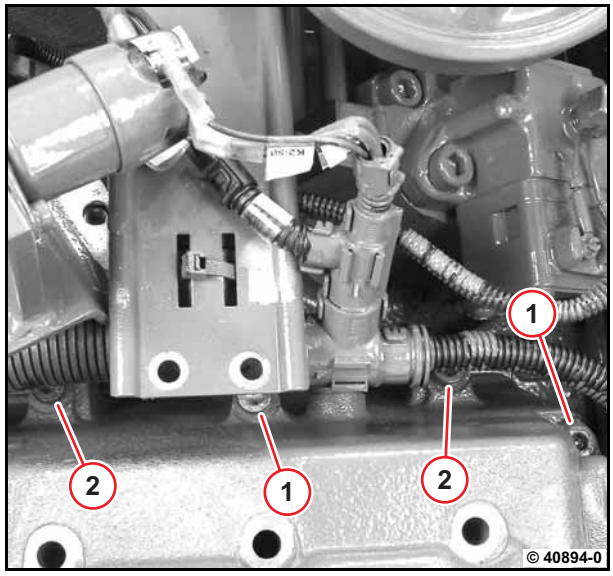


- Tighten screws (1).

A09 001

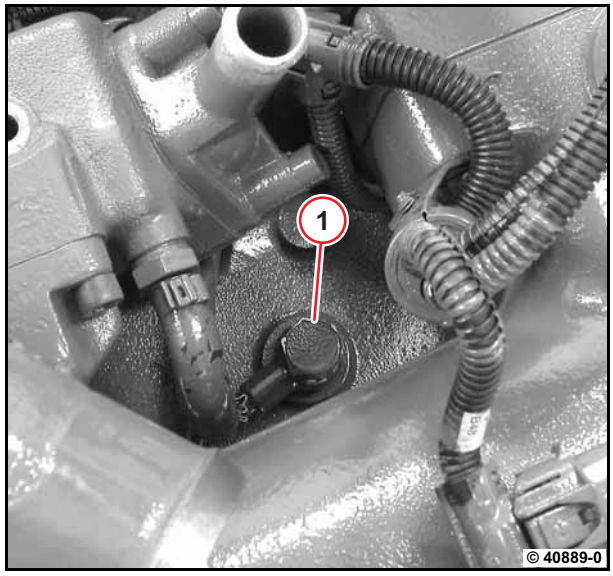
- Tighten screws (2).

A09 001

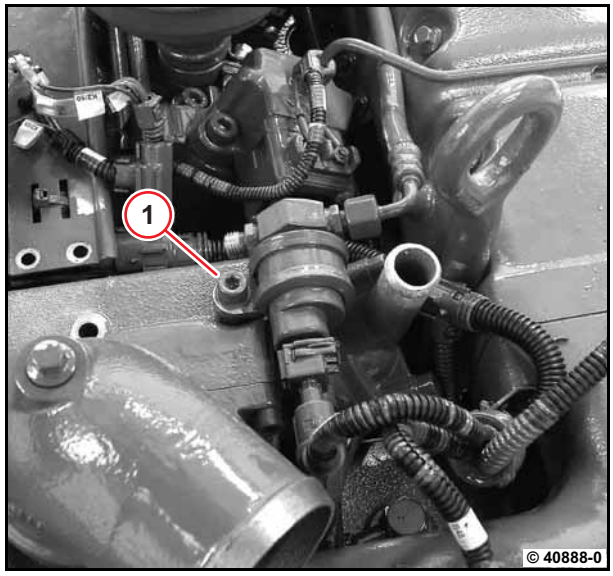


- Mount new sealing rings.
- Tighten hollow screw (1).

A12 092



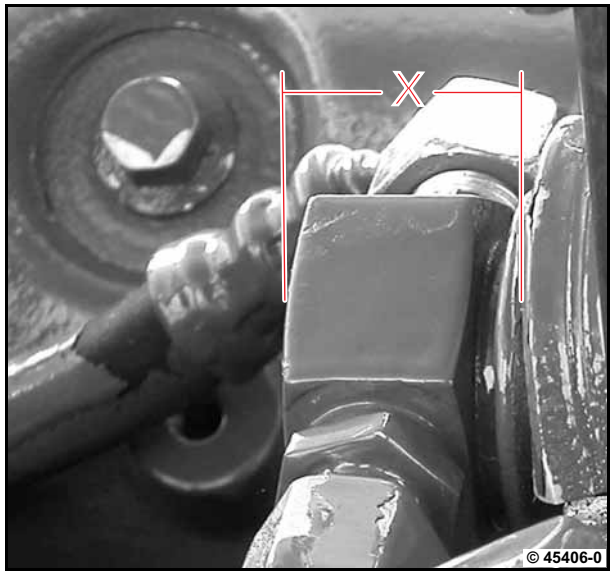
- Mount fuel pipe.
- Position spacing sleeve.
- Fasten screw (1).



- Position fuel shut-off valve.

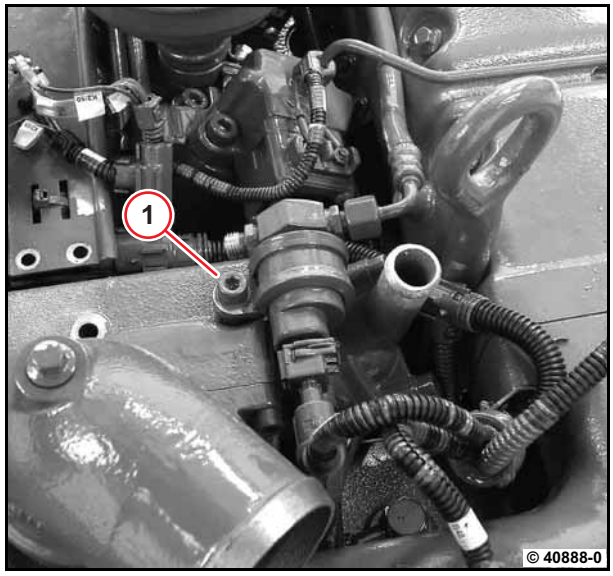
P07 91

Note installation dimensions (X).



- Tighten screw (1).

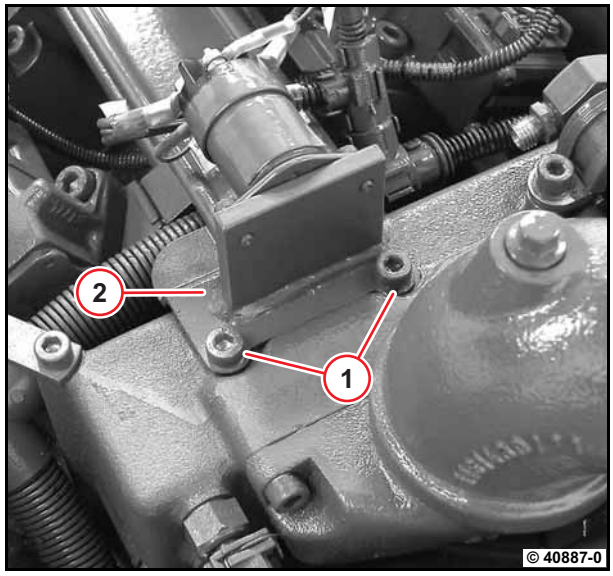
A07 093



- Mount holder (2).
- Tighten screws (1).

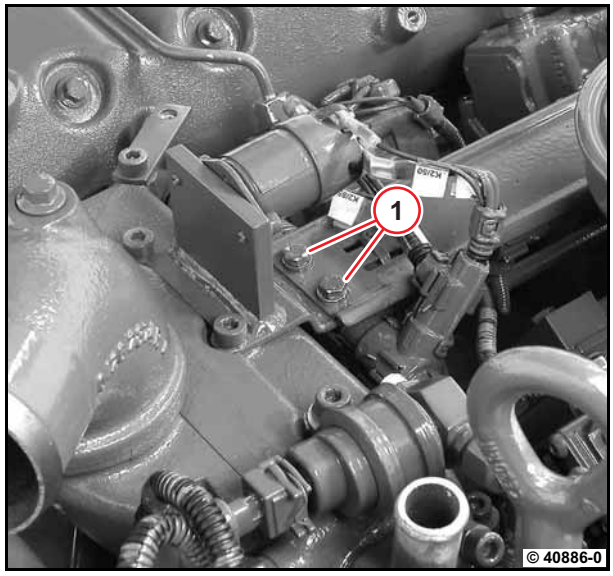
A09 001

Screw length:
M8 x 150 mm



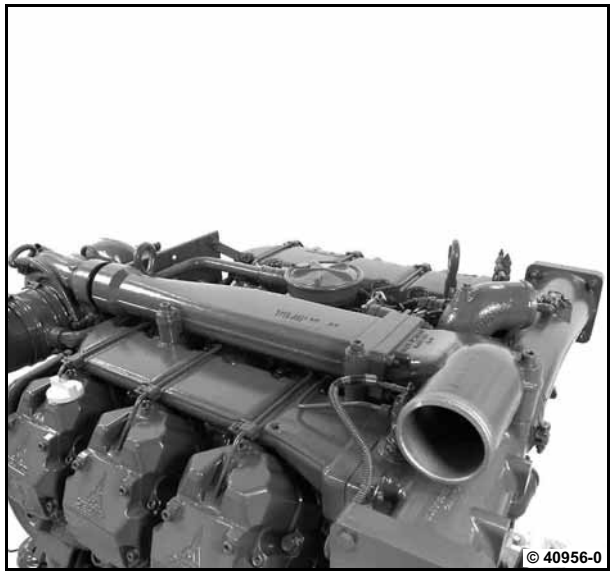
- Tighten screws (1).

A13 094



- Install fuel pipes (flame glow plugs).

W 07-01-04



6

Removing and installing temperature transmitter

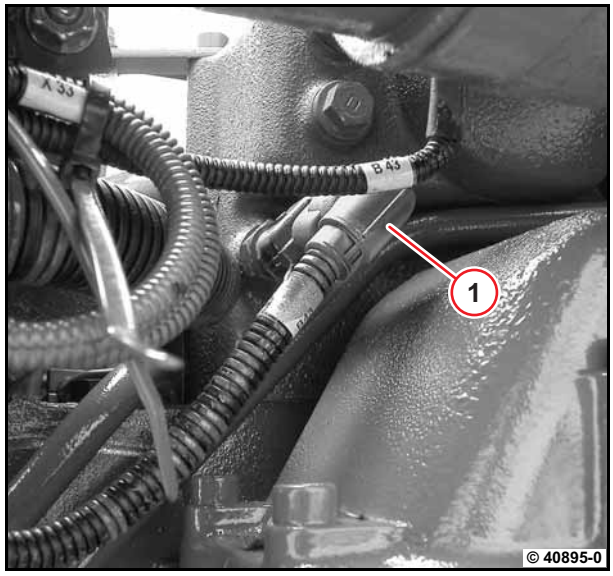
Commercial available tools

Read out error memory of the motor control timer with SERDIA.

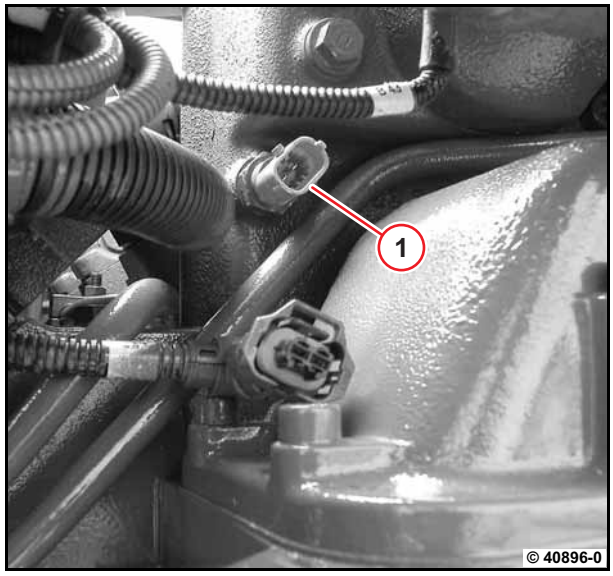
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing temperaure transmitter

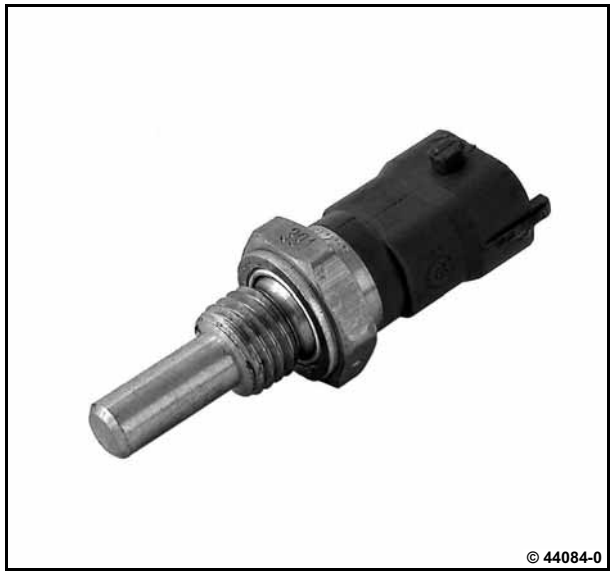
- Unlock cable plug (1) and remove.



- Unscrew temperature transmitter (1).



- Visually inspect the components.

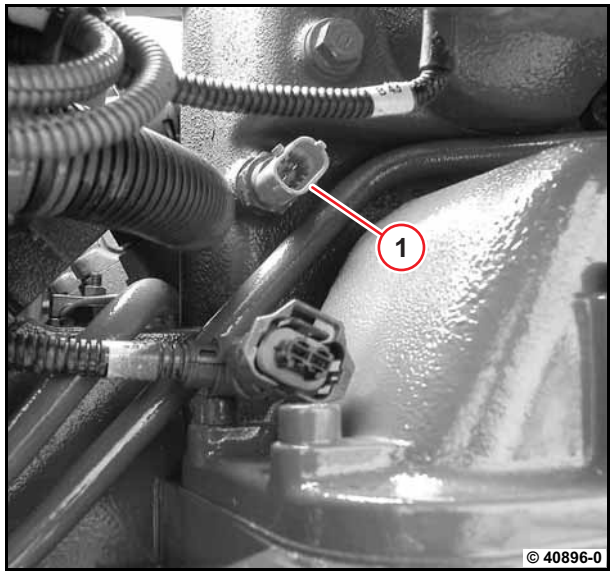


6

Installing temperature transmitter

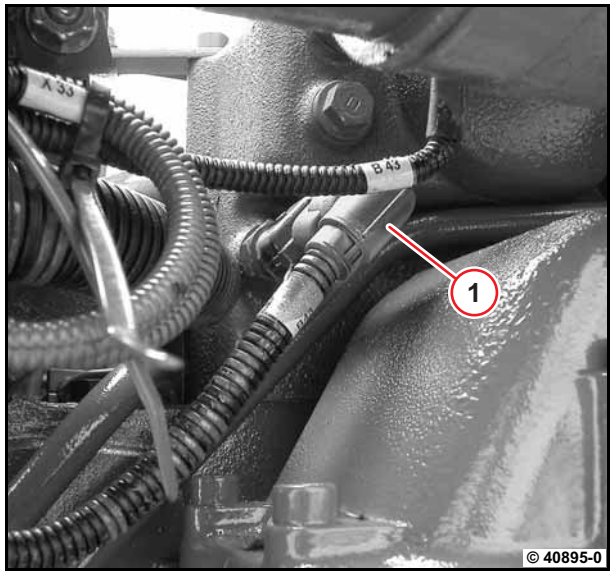
- Tighten temperature transmitter (1).

A09 031



- Plug in the cable plug (1).

Delete error entry in the error memory of the motor control timer with SERDIA.

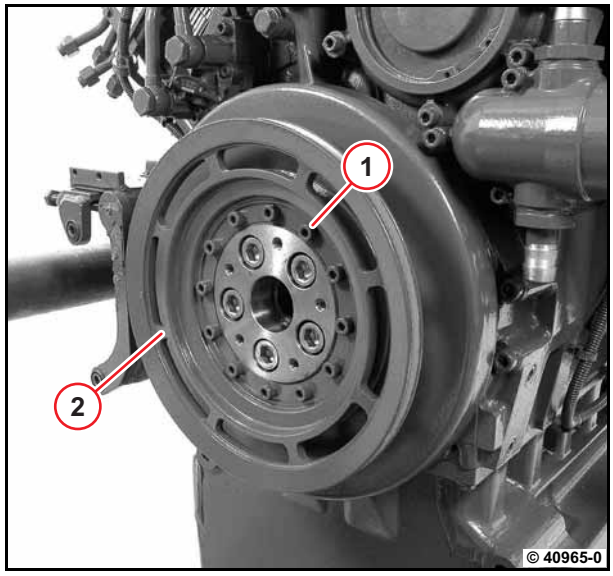


Removing and installing torsional vibration damper

Commercial available tools

Removing the torsional vibration damper

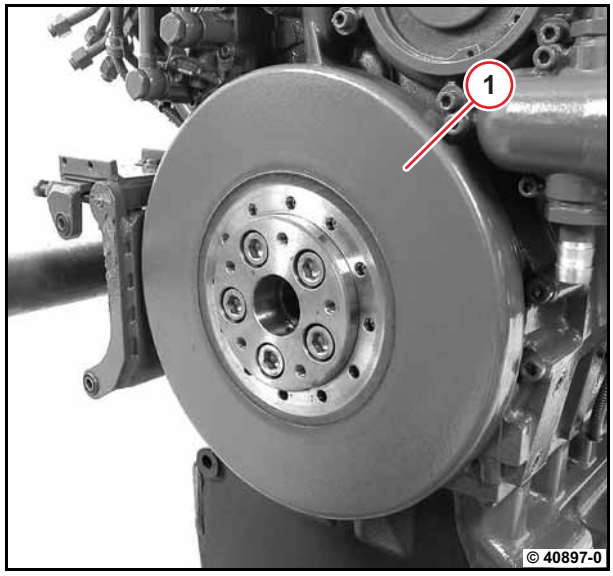
- Unscrew all screws (1).
- Remove V-belt pulley (2).



- Pull off torsional vibration damper (1).

Danger!

Risk of injury!

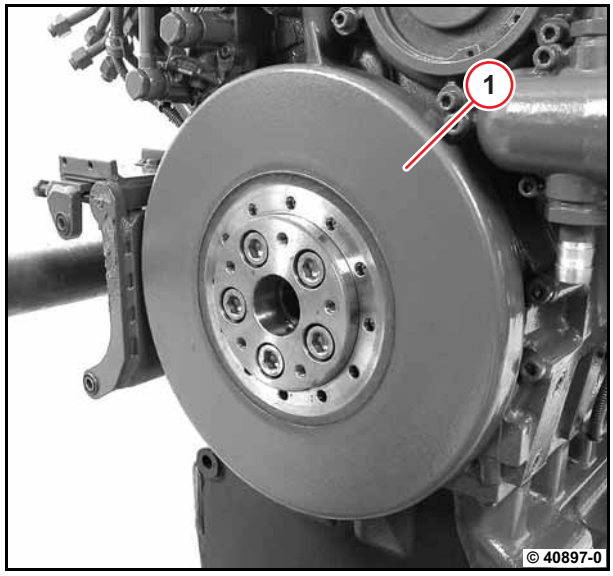


- Visually inspect the components.

6

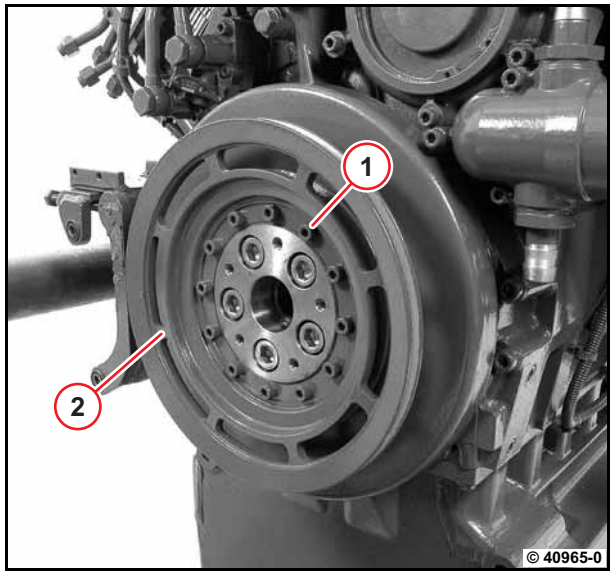
Installing the torsional vibration damper

- Mount torsional vibration damper (1).



- Mount V-belt pulley (2).
- Lightly oil screws (1).
- Tighten all screws (1) alternately.

A12 031



Removing and installing flywheel

Commercial available tools:
– Socket wrench insert 8016
– Rotation angle disc 8190

Special tools:
– Self-made mandrin guide

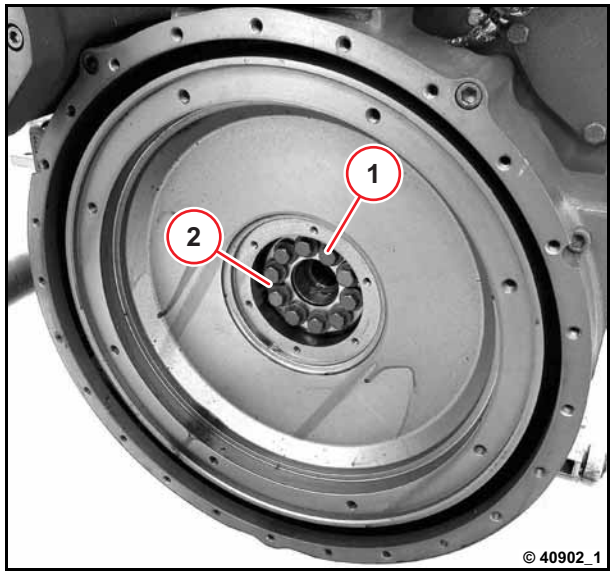
Attention!
Do not turn the crankshaft without screws/ mandrin guide.
The crankshaft gear wheel is positioned by screws/mandrin guide.
The position of the crankshaft gear wheel will change without fixing.

Removing flywheel

- Unscrew all screws (1).

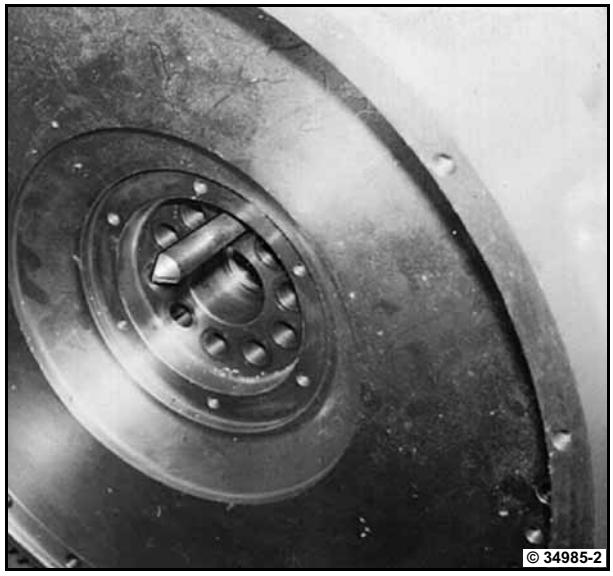
Block flywheel with suitable tool.

- Remove thrust washer (2).



- Insert self-made mandrin guide.
- Remove flywheel.
- Remove friction disc.

Attention!
Do not turn the crankshaft without screws/ mandrin guide.
The crankshaft gear wheel is positioned by screws/mandrin guide.
The position of the crankshaft gear wheel will change without fixing.



6

- Visually inspect the components.

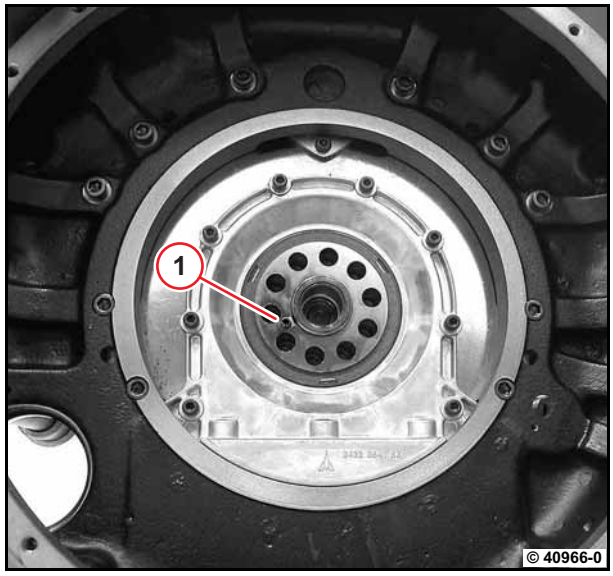
Install flywheel

- Position friction disc.

Make sure the clamping bushing (1) is in place.

- Mount flywheel.

Make sure the clamping bushing and locating hole are in line.



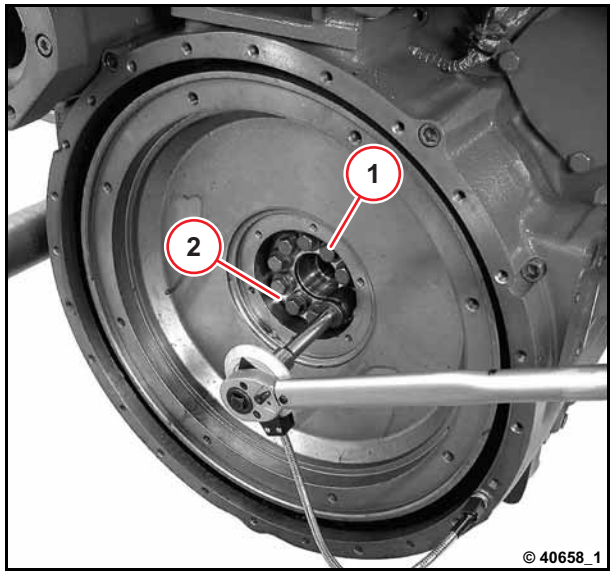
- Insert thrust washer (2).
- Lightly oil screws (1).
- Fasten all screws (1).
- Remove self-made mandrin guide.

Attention!
Renew screws every time they are loosened.

- Tighten all screws (1) with the socket wrench insert.

A12 001

Block flywheel with suitable tool.



Renewing toothed starter ring on the flywheel

Commercial available tools

– W 12-06-01

Danger!
Danger of injury, do not touch hot parts!

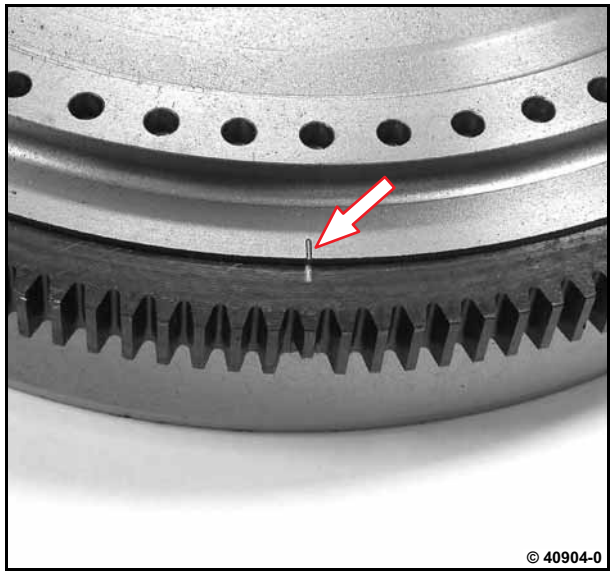
Removing toothed starter ring

- Remove flywheel.

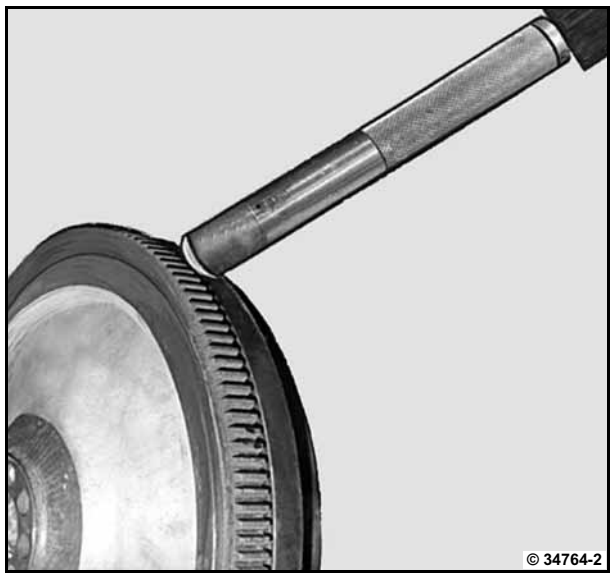
  W 12-06-01

- Check marking.

The marking (arrow) is on the flywheel and exactly in the middle of the tooth notch of the toothed starter ring.



- Remove toothed starter ring with suitable tool.



- Visually inspect joint (arrow) and contact surface.
- Clean flywheel.

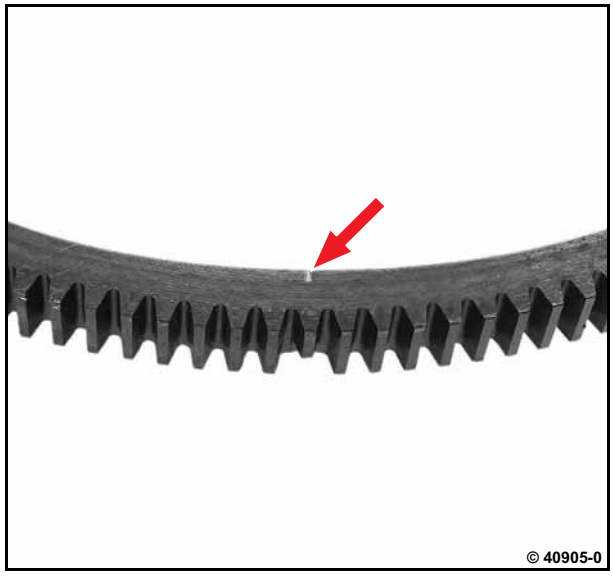
The joint and contact surface must be free from grease and dirt.

6

Install toothed starter ring

- Check marking of new toothed starter ring.

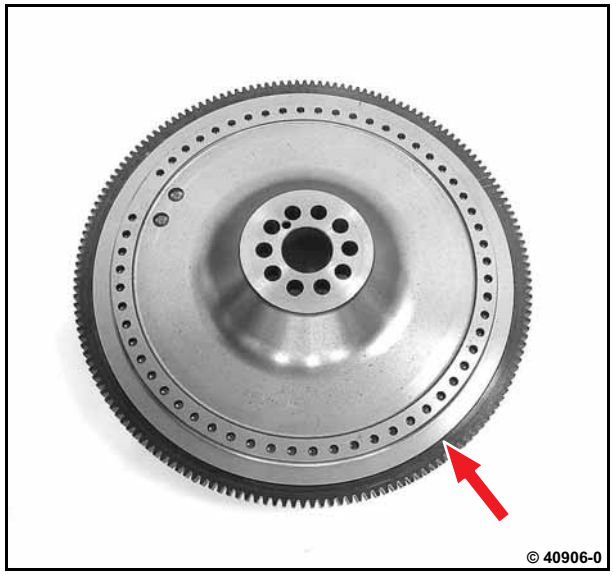
The marking (arrow) is on the flywheel and exactly in the middle of the tooth notch of the toothed starter ring.



- Heat up toothed starter ring to 220 °C.
- Place toothed starter ring on flywheel.

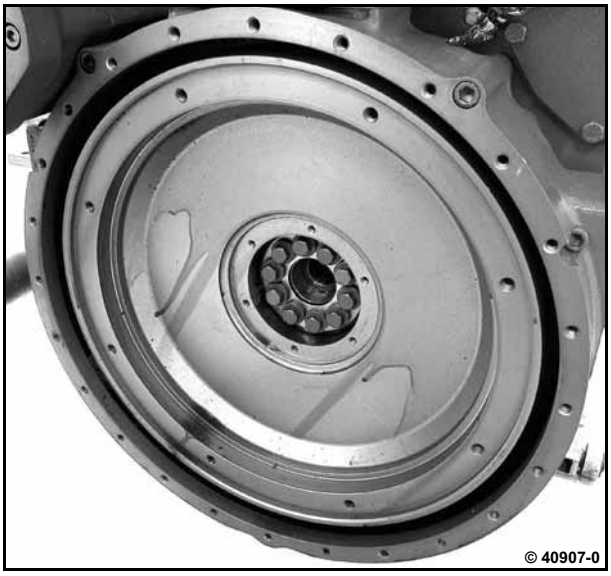
The markings on the flywheel and toothed starter ring must match.

The toothed starter ring must lie evenly on the joint of the flywheel.



- Install flywheel.

W 12-06-01



6

Removing and installing hydraulic pump drive

Commercial available tools

Special tools:
– Disassembly tool. 110901

– Fitting compound
DEUTZ AP1908
– Locking agent
DEUTZ DW 59

– W 06-01-06 . . . . . (A-bank)

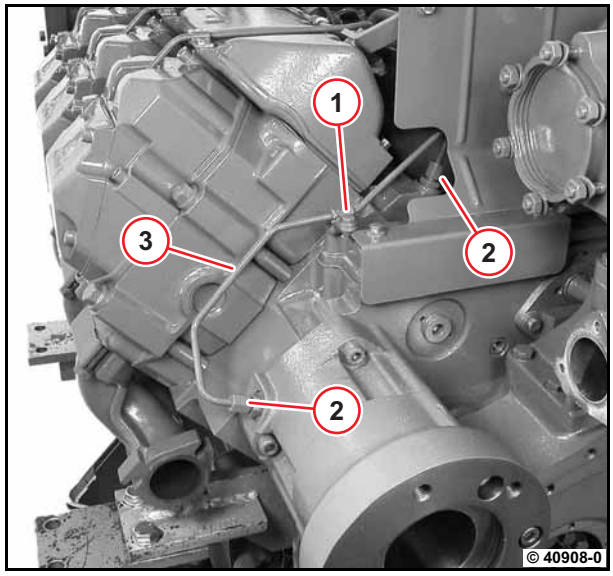
Collect leaking operating substances in suitable vessels and dispose of according to regulations.

Removing hydraulic pump drive

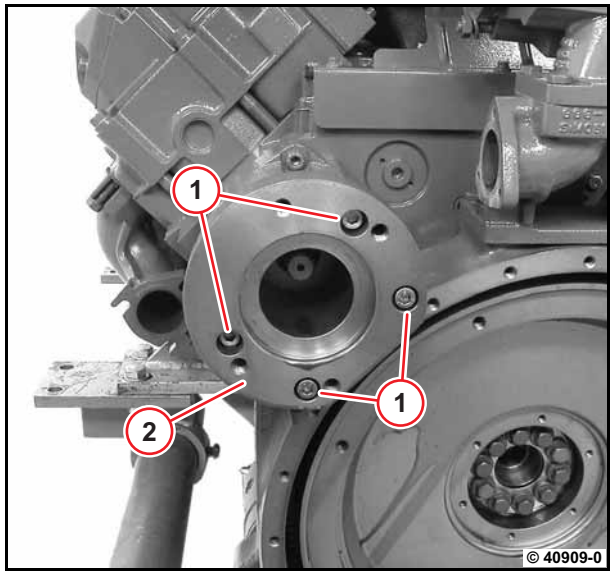
- Remove exhaust pipe (A-bank).

  W 06-01-06

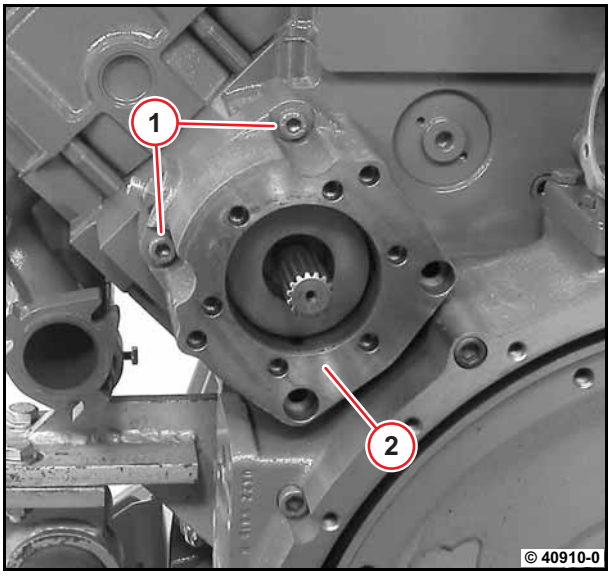
- Unscrew screw (1).
- Unscrew lock nuts (2).
- Remove lubricating oil pipe (3).



- Unscrew screws (1).
- Remove flange housing (2).

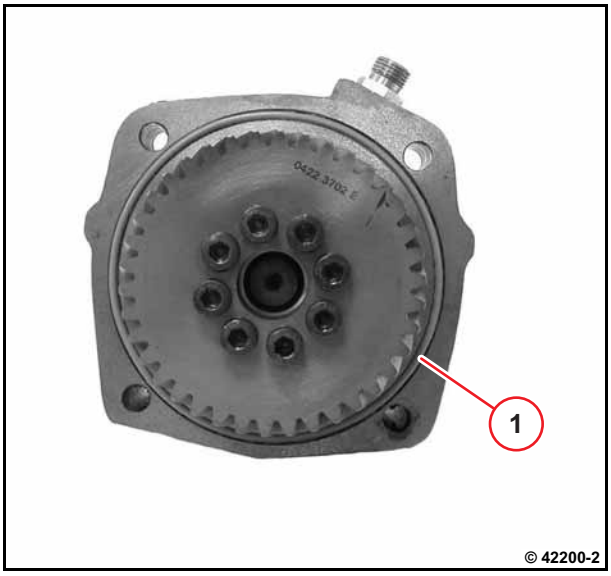


- Unscrew screws (1).
- Remove hydraulic pump drive (2).



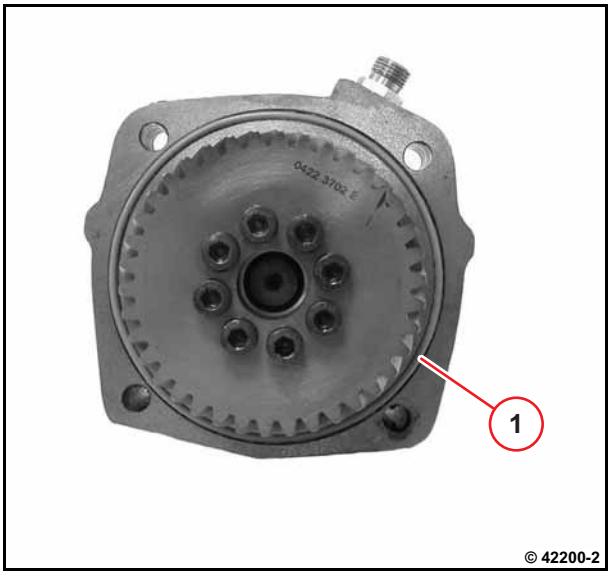
6

- Remove the O-ring (1) with the disassembly tool.
- Visually inspect the components.



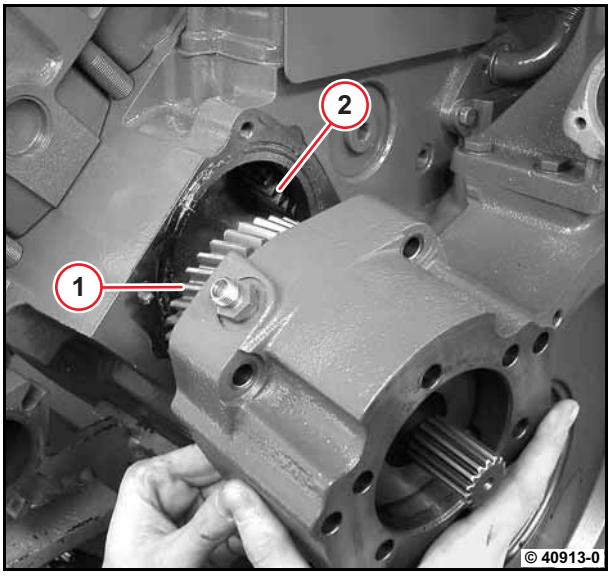
Installing hydraulic pump drive

- Mount new O-ring (1).
- Coat the O-ring with fitting compound.



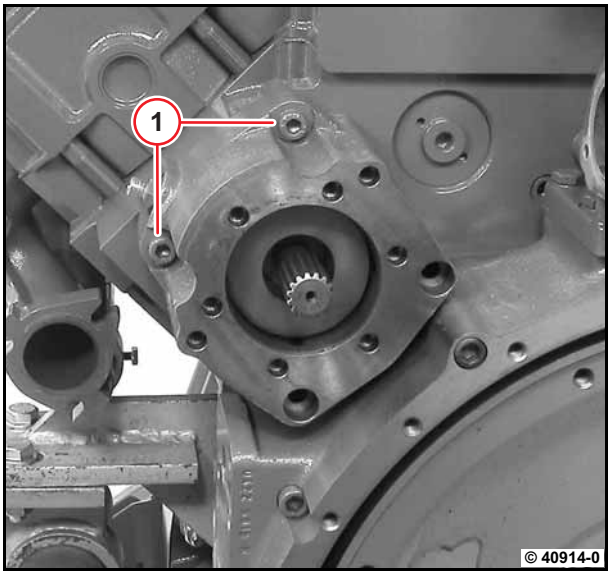
- Insert hydraulic pump drive.

The gear wheel (1) must engage the toothing of the idler gear (2).

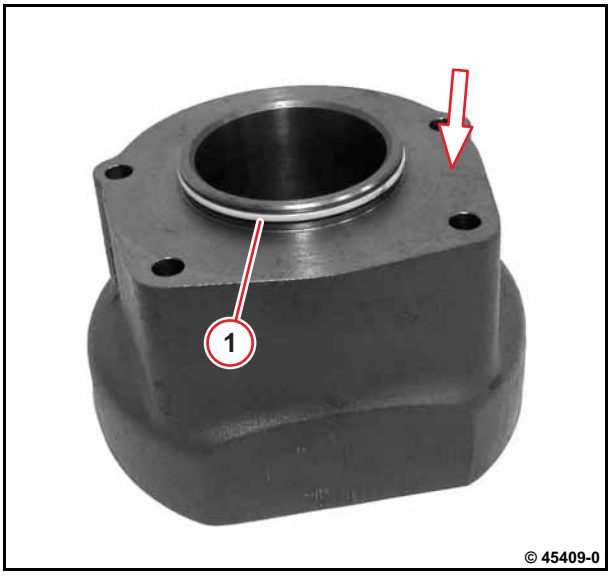


- Lightly oil screws (1).
- Tighten screws (1).

A12 057



- Mount new O-ring (1).
- Coat lay-on surface (arrow) with locking agent.

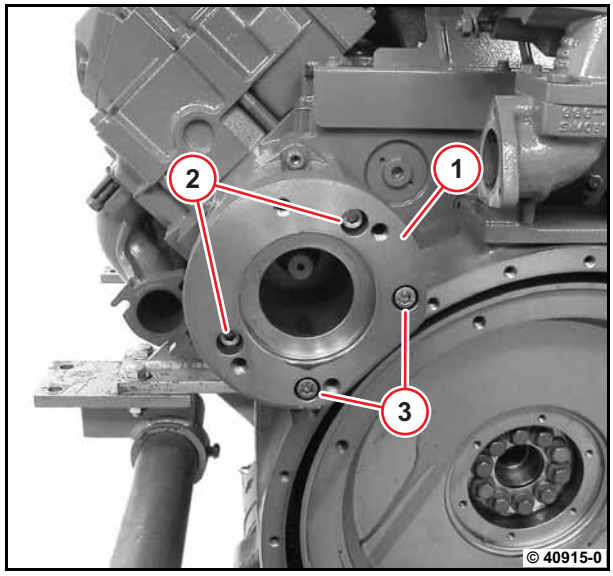


- Mount flange housing (1).
- Lightly oil screws (2).
- Tighten screws (2).

Screw length:
M10 x 110 mm

- Insert screws (3) with locking agent.
- Fasten screws (3).

Screw length:
M10 x 210 mm



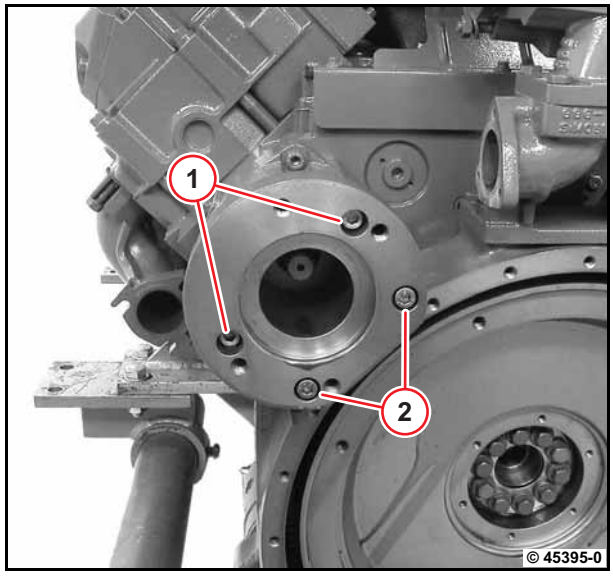
6

- Tighten screws (1).

A12 058

- Tighten screws (2).

A12 059



- Mount lubricating oil pipe (3).
- Fasten screw (1).
- Tighten lock nut (2).

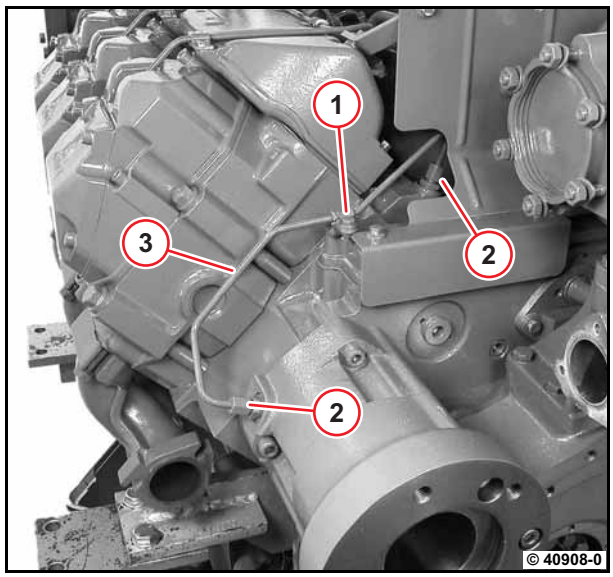
A12 082

- Tighten screw (1).

A08 045

- Install exhaust pipe (A-bank).

W 06-01-06



Removing and installing the cable harness

Commercial available tools

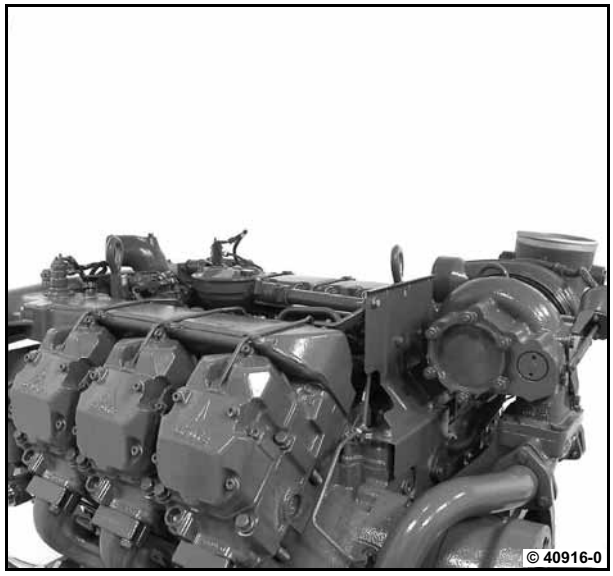
– W 06-02-03

Attention!
Note assignment and polarity of the electrical connections!

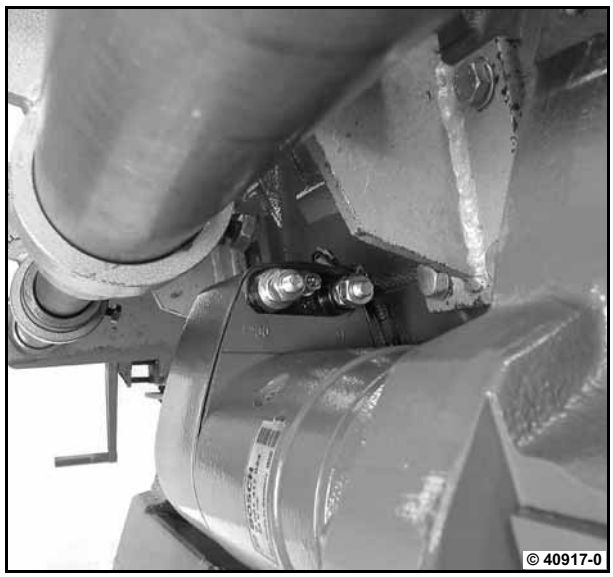
Removing the cable harness

- Remove the charge air pipe.

  W 06-02-03

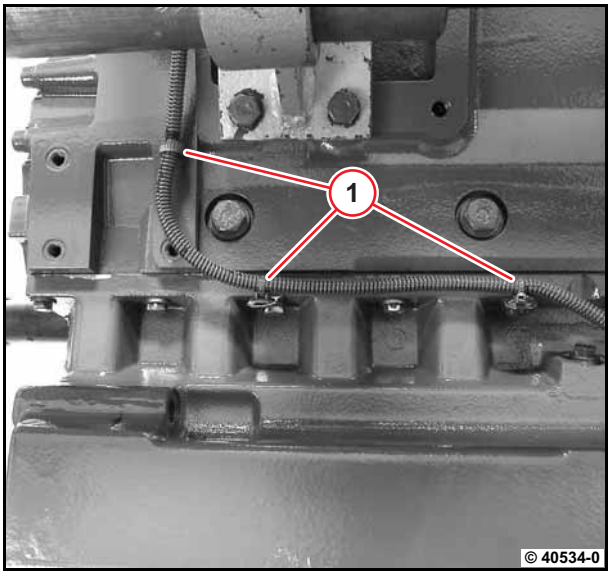


- Disconnect the battery's negative terminal.
- Disconnect cables.

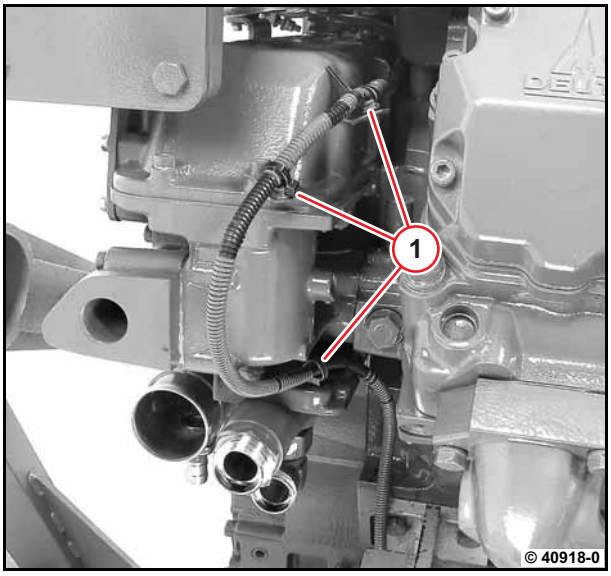


6

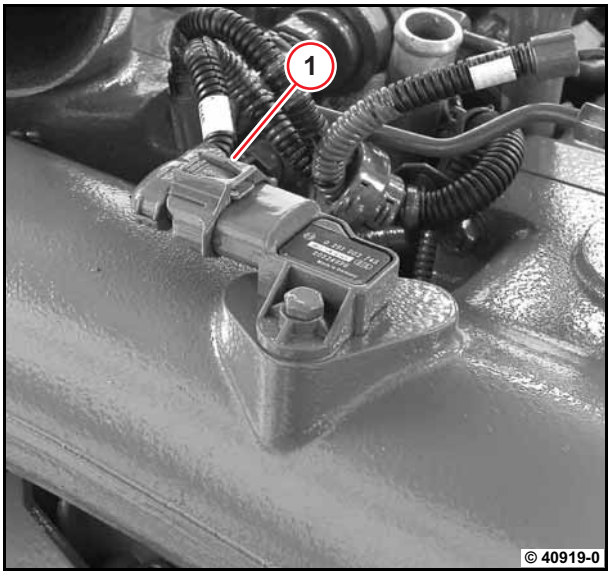
- Remove cable tie (1).



- Remove cable tie (1).

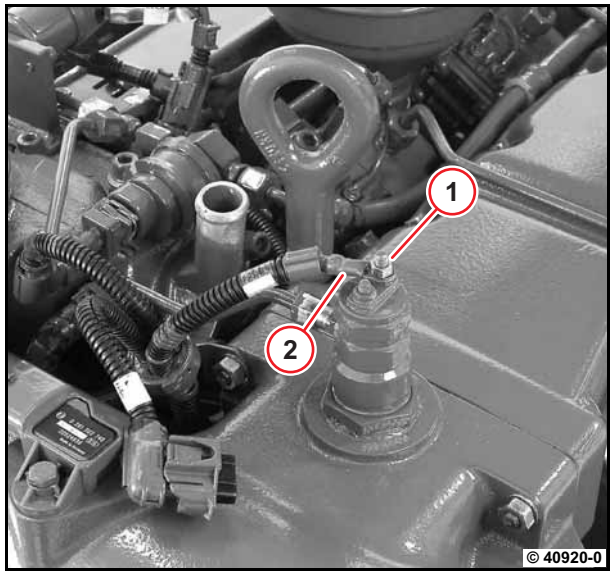


- Unlock cable plug (1) and remove.

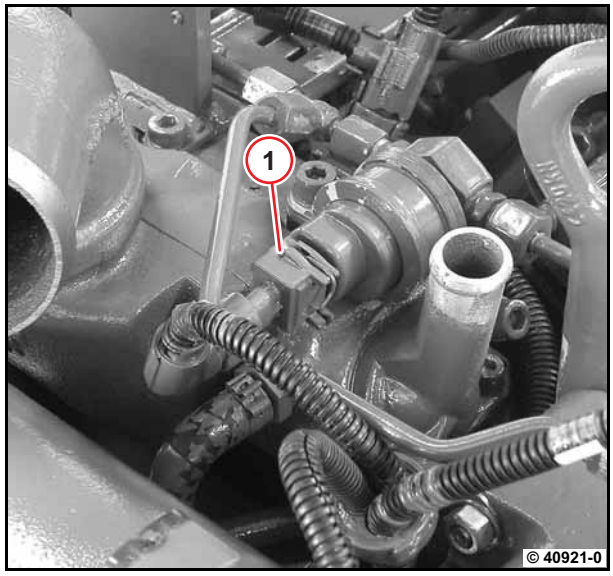


- Unscrew nut (1).
- Remove washer.
- Remove cables (2).

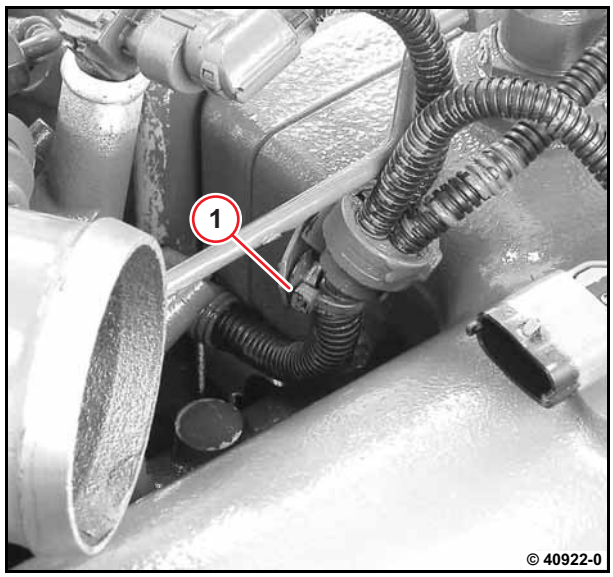
Mark assignment of cables/connections before removing.



- Unlock cable plug (1) and remove.

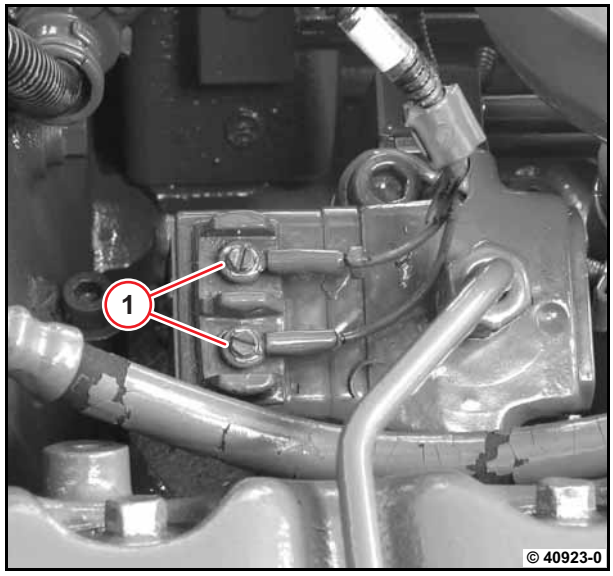


- Remove cable tie (1).



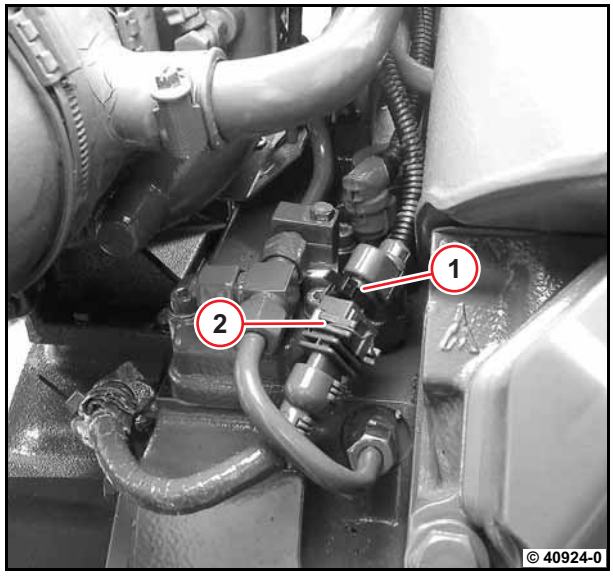
- Loosen screws (1).
- Pull cables off all injection pumps.

Mark assignment of cables/connections before removing.

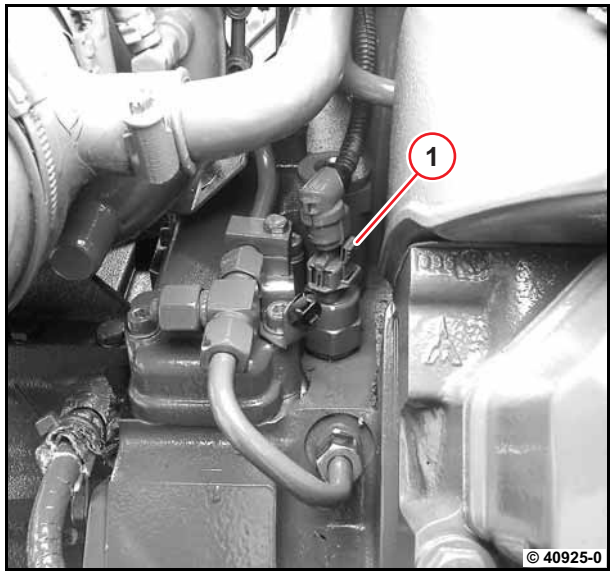


6

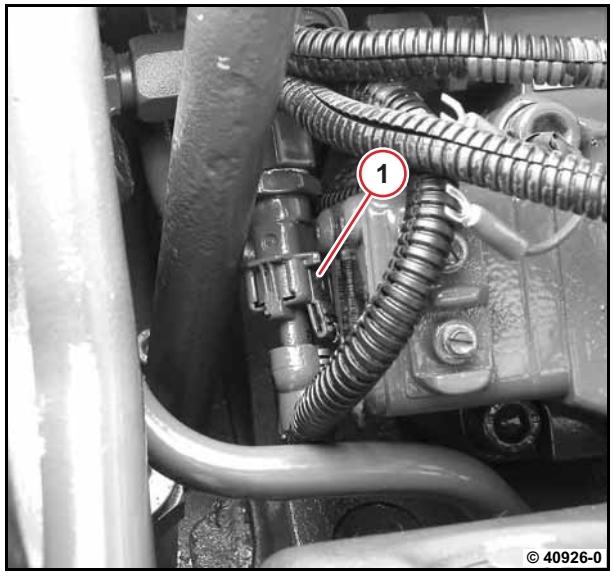
- Remove cable tie (1).
- Unlock cable plug (2) and disconnect.



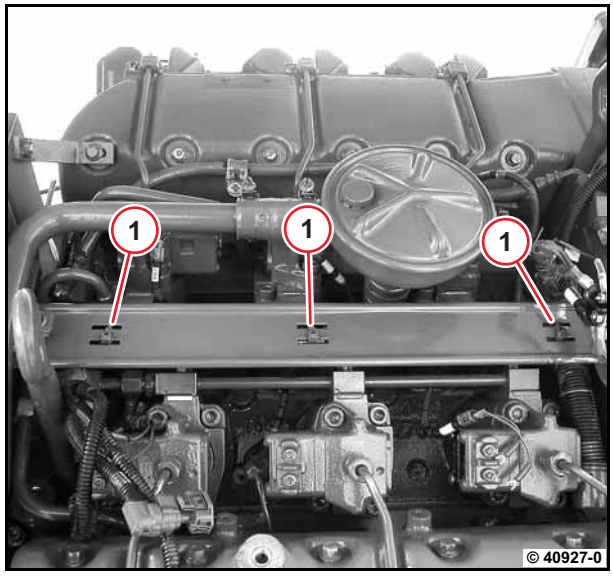
- Unlock cable plug (1) and remove.



- Unlock cable plug (1) and remove.

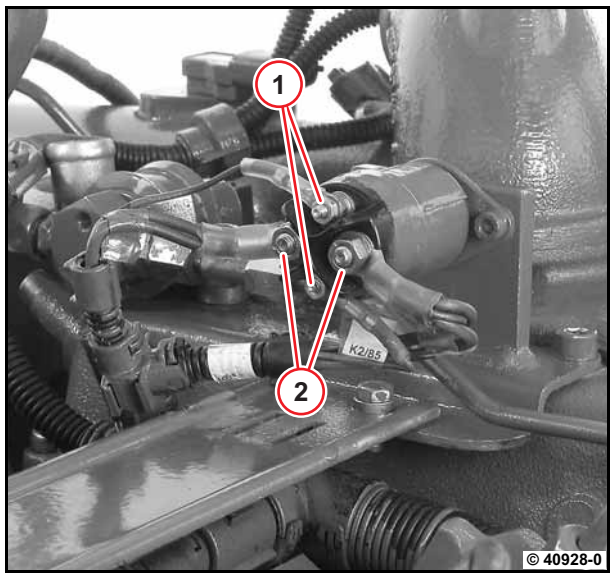


- Remove cable tie (1).



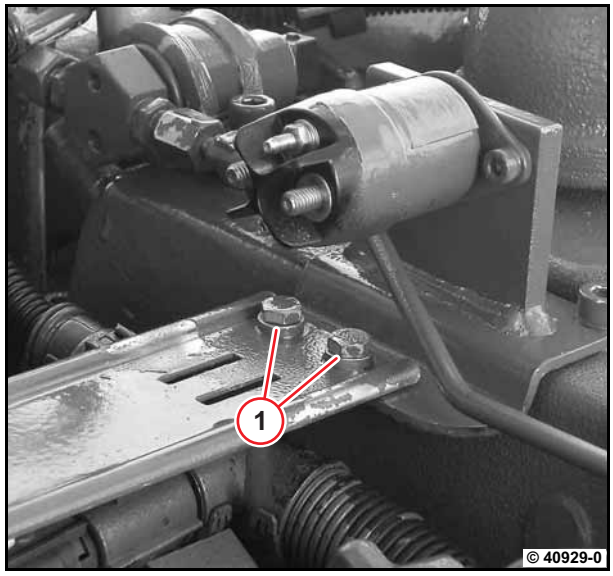
- Unscrew nuts (1).
- Unscrew the nuts (2).
- Remove washers.
- Remove cables.

Mark assignment of cables/connections before removing.



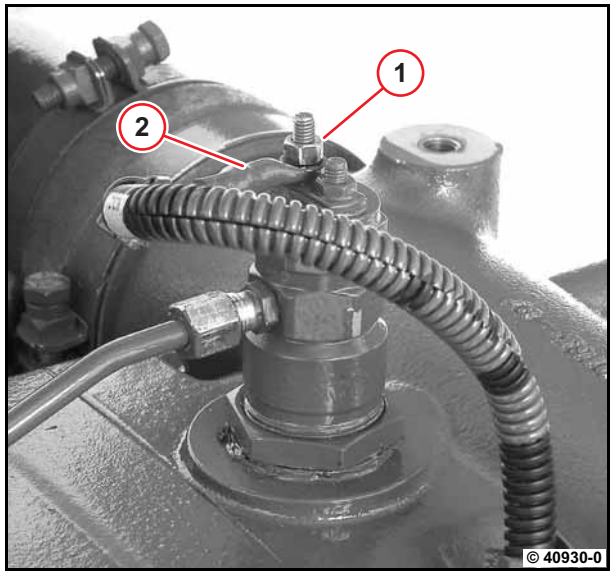
6

- Unscrew screws (1).

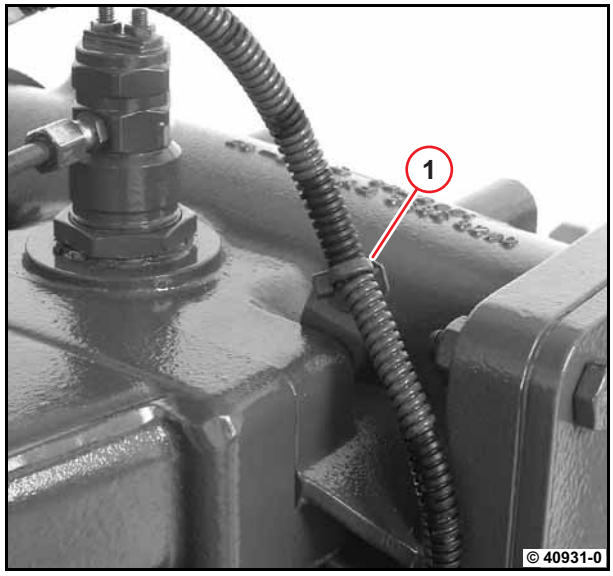


Mark assignment of cables/connections before removing.

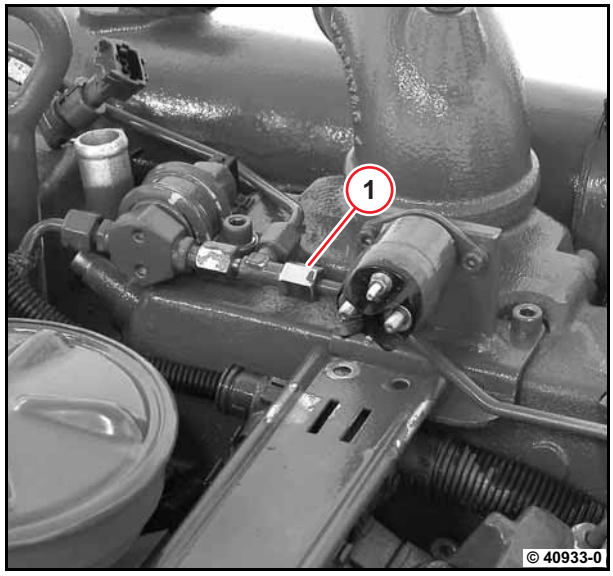
- Unscrew nut (1).
- Remove washer.
- Remove cables (2).



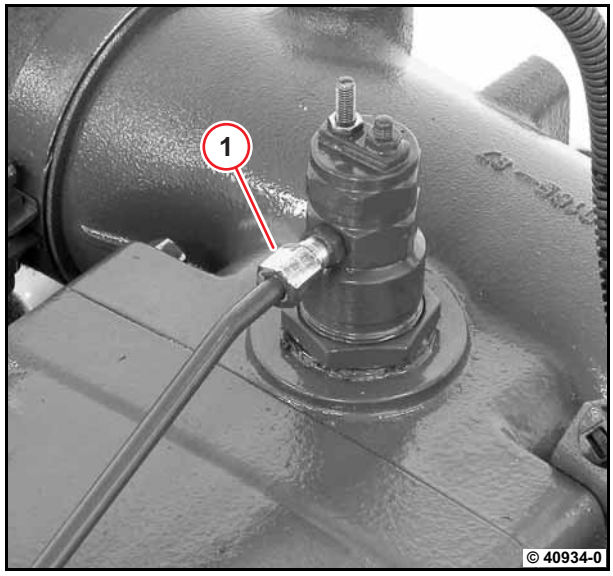
- Remove cable tie (1).



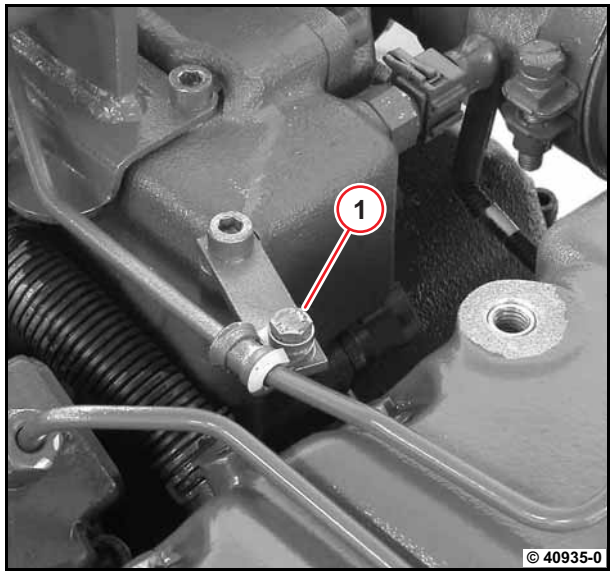
- Unscrew lock nut (1).



- Unscrew lock nut (1).

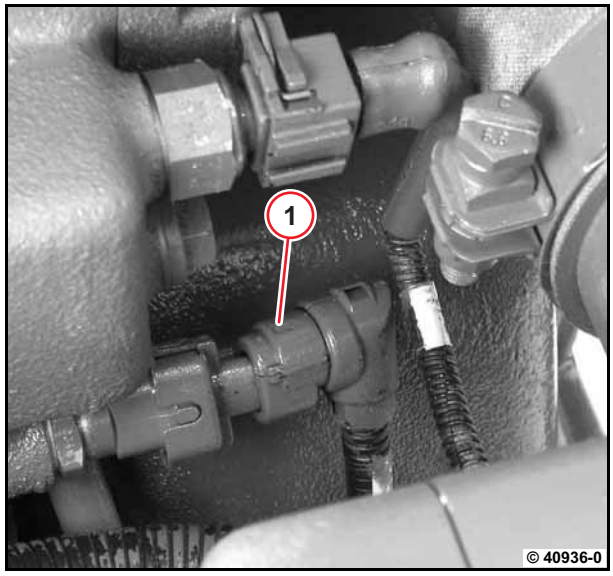


- Unscrew screw (1).
- Remove fuel pipe.

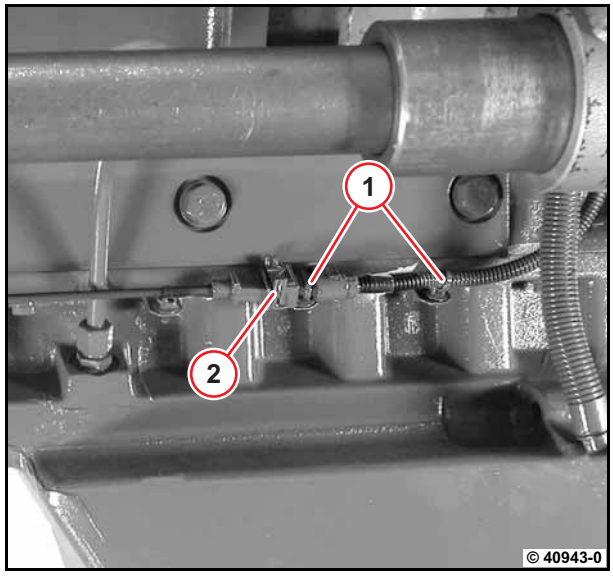


6

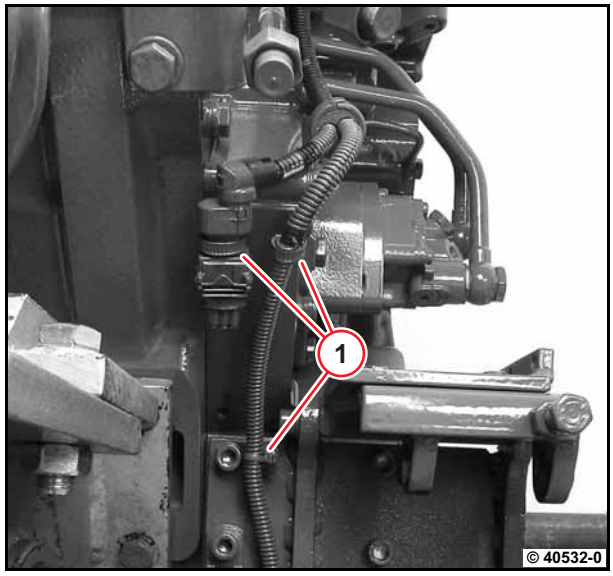
- Pull out cable plug (1).



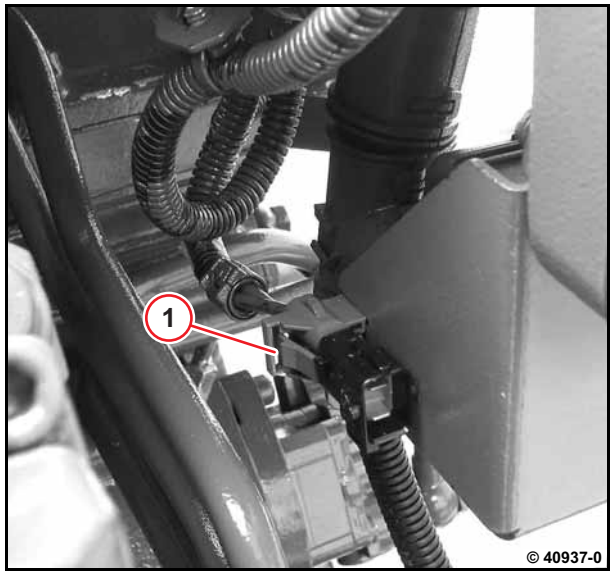
- Remove cable tie (1).
- Unlock cable plug (2) and disconnect.



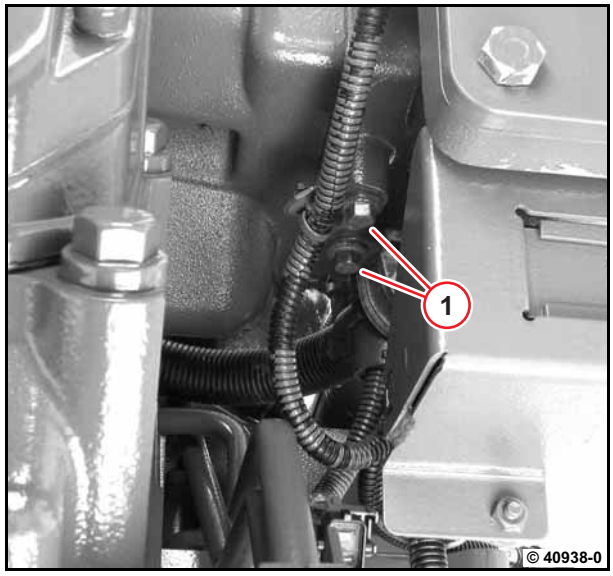
- Remove cable tie (1).



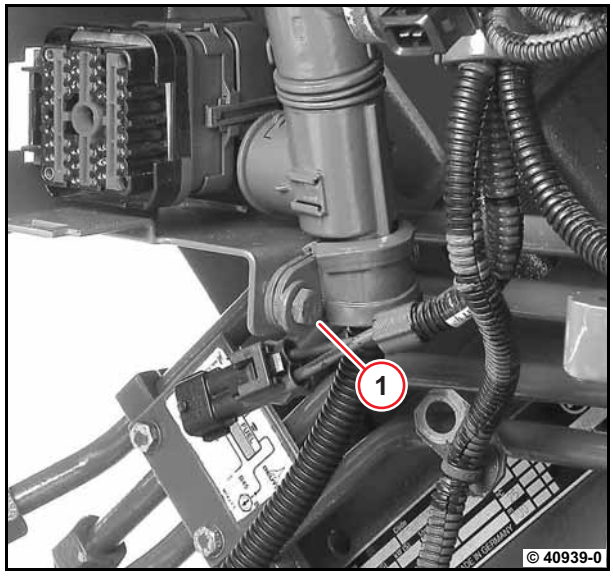
- Unlock cable plug (1) and remove.



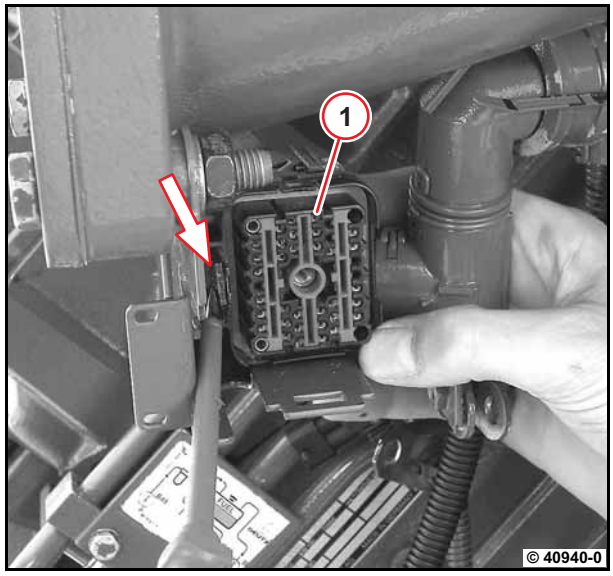
- Unscrew screws (1).



- Unscrew screw (1).

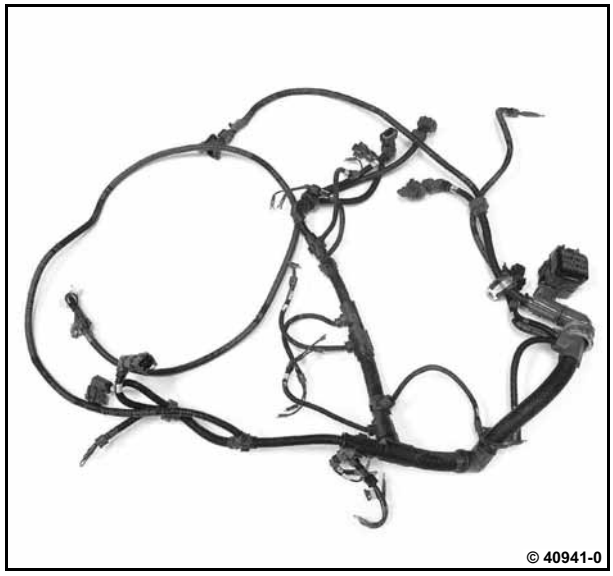


- Unlock central plug (1) (arrow) and pull off from holder.



6

- Visually inspect the components.

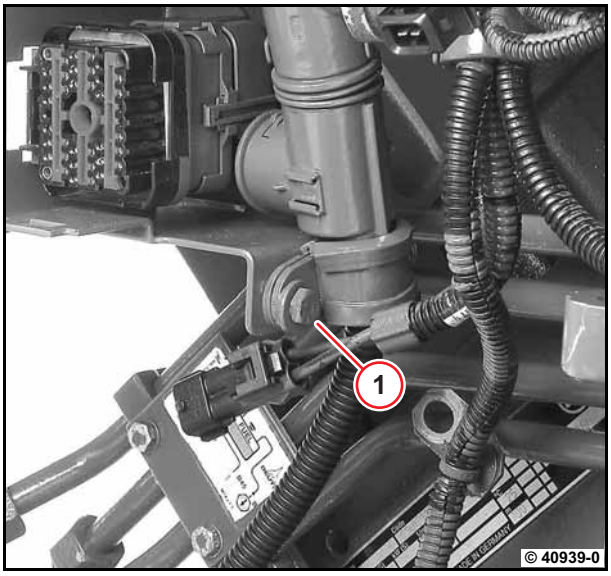


Installing the cable harness

- Position the cable harness on the engine accordingly.
- Lay the cable plugs to the individual components.

- Push the central plug onto the holder until it snaps in.
- Tighten screw (1).

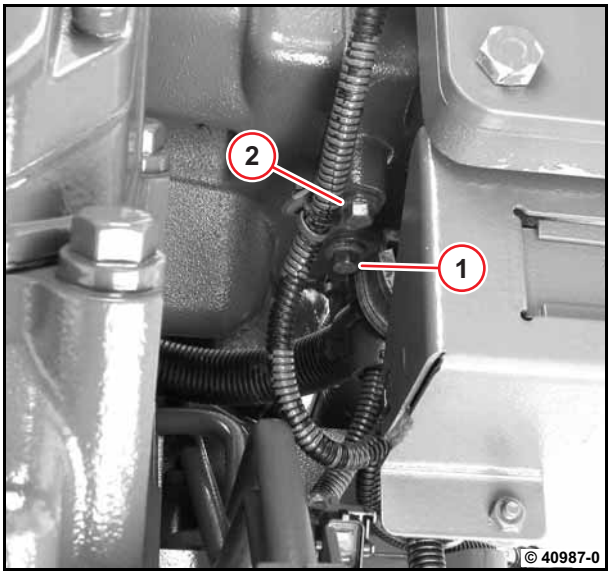
A12 095



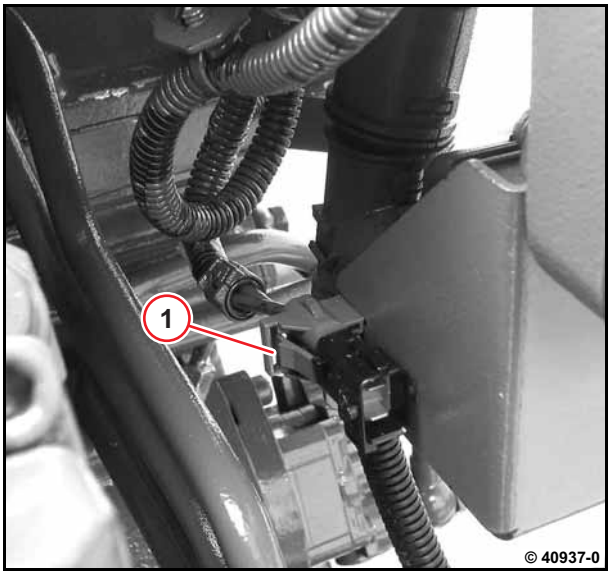
- Tighten screws .

A13 090

Screw length:
M8 x 20 mm (1)
M8 x 16 mm (2)

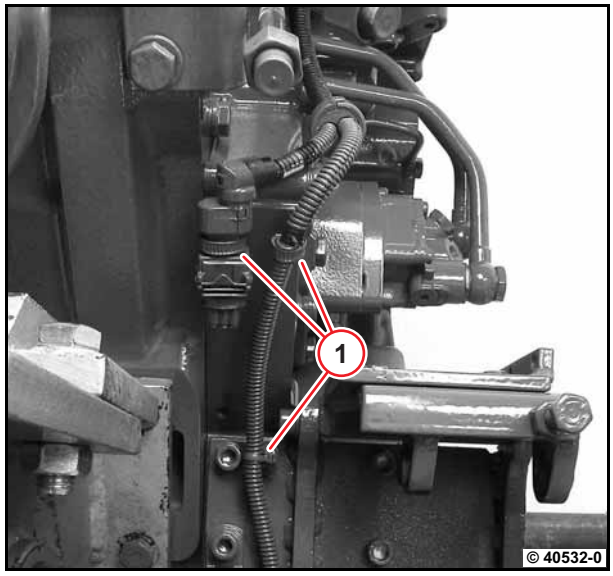


- Plug in the cable plug (1).

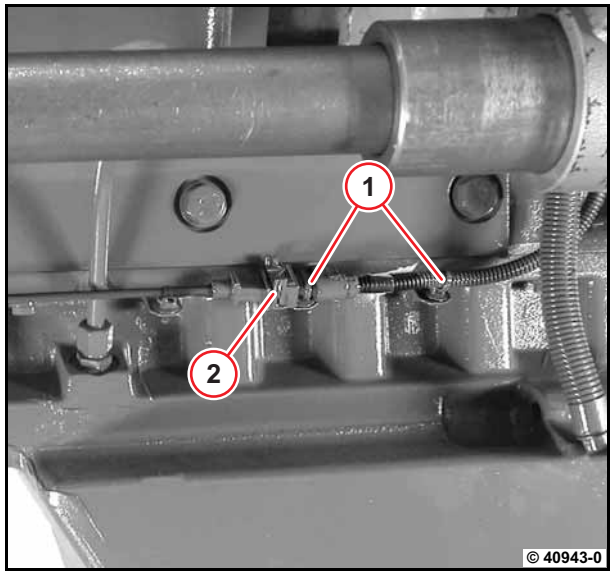


6

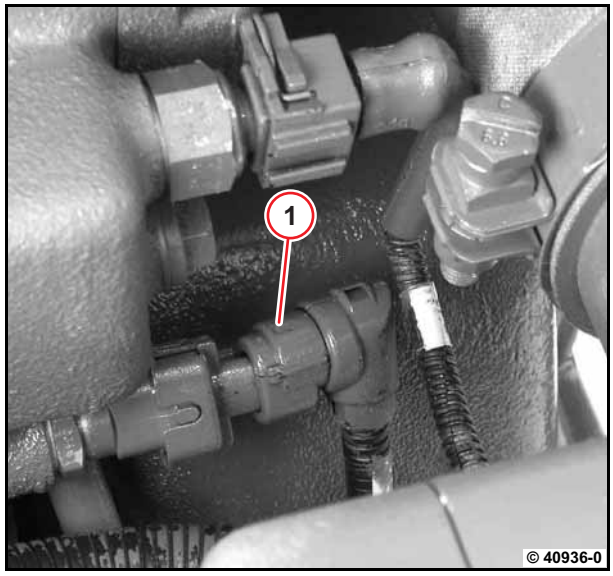
- Lay cable harness and fix with cable ties (1).



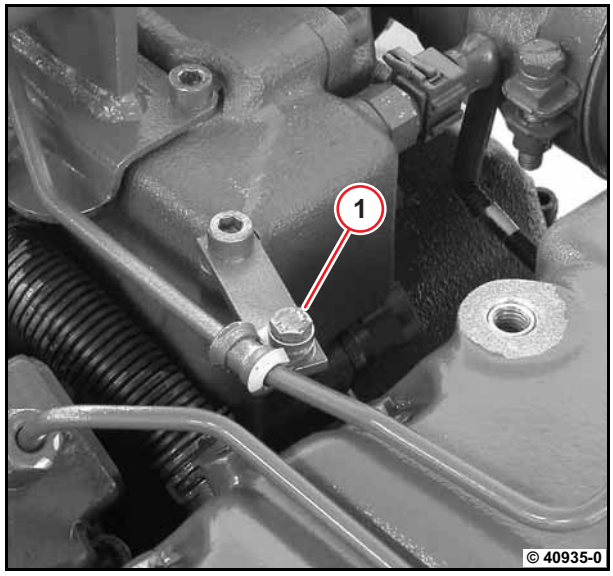
- Plug together the cable plugs (2).
- Lay cable harness and fix with cable ties (1).



- Plug in the cable plug (1).



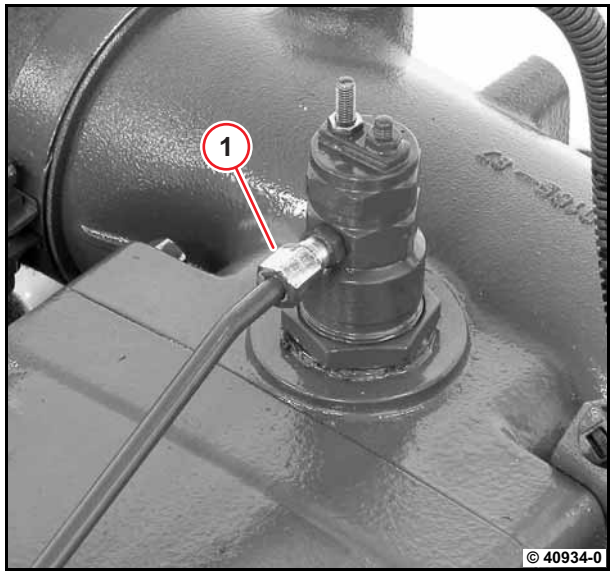
- Mount fuel pipe.
- Position pipe clip.
- Fasten screw (1).



- Tighten lock nut (1).

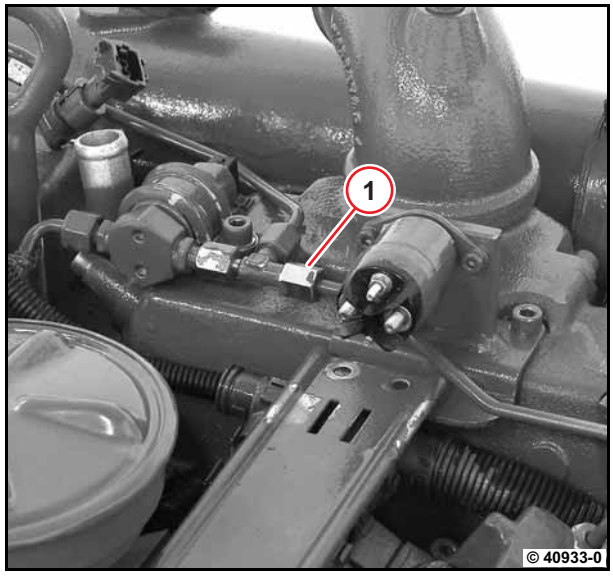
A12 080

Attention!
Install fuel pipe tension free.



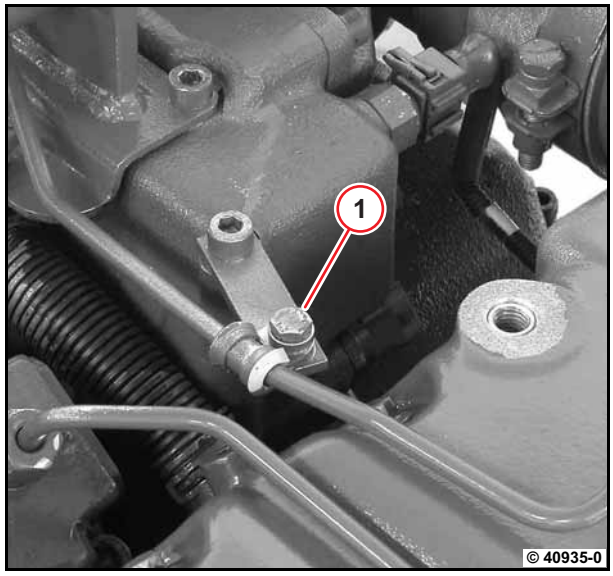
- Tighten lock nut (1).

A12 080



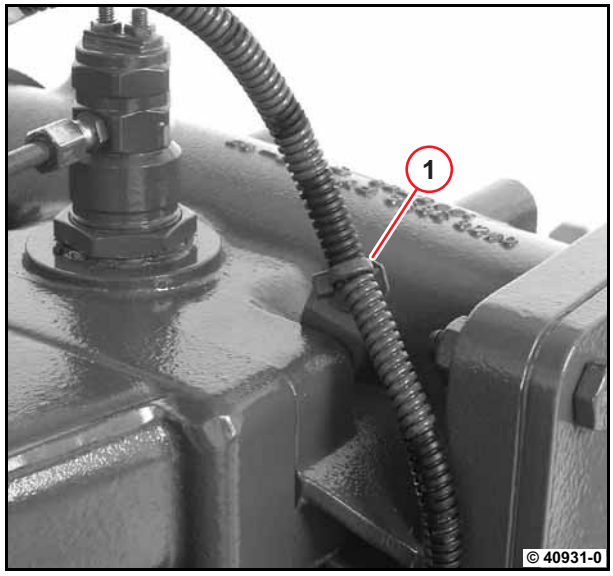
- Tighten screw (1).

A07 044



6

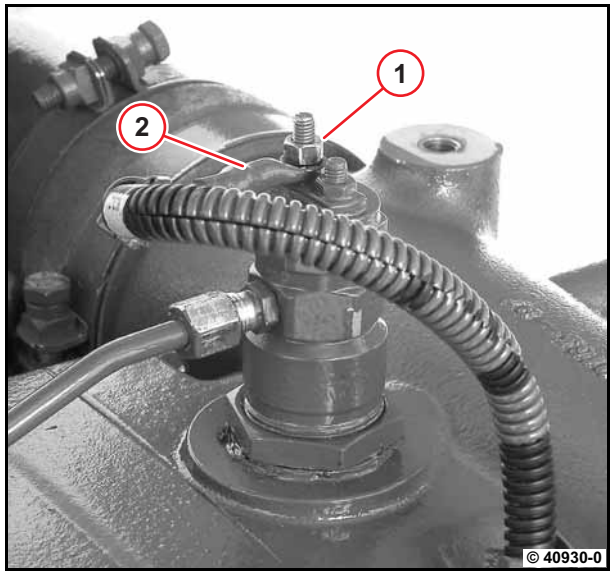
- Lay cable harness and fix with cable tie (1).



- Plug in cables (2).

Attention!
Note assignment and polarity of the electrical connections!

Connect cables according to marks made before removing.

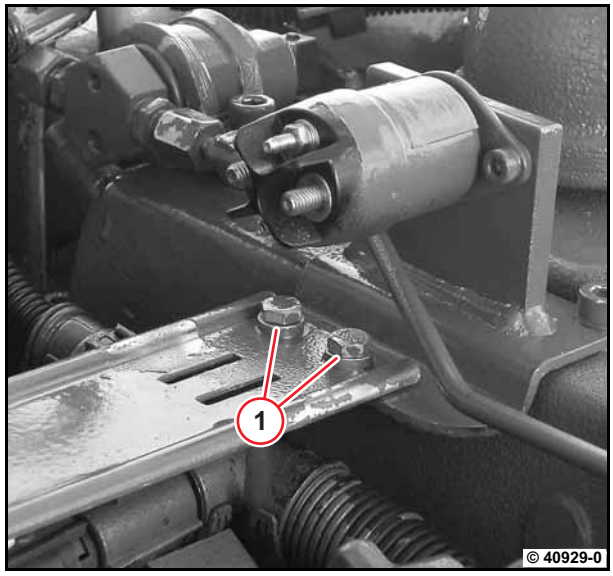


- Mount washer.
- Tighten nut (1).

A13 035

- Tighten screws (1).

A13 094



- Plug cables.

Attention!
Note assignment and polarity of the electrical connections!

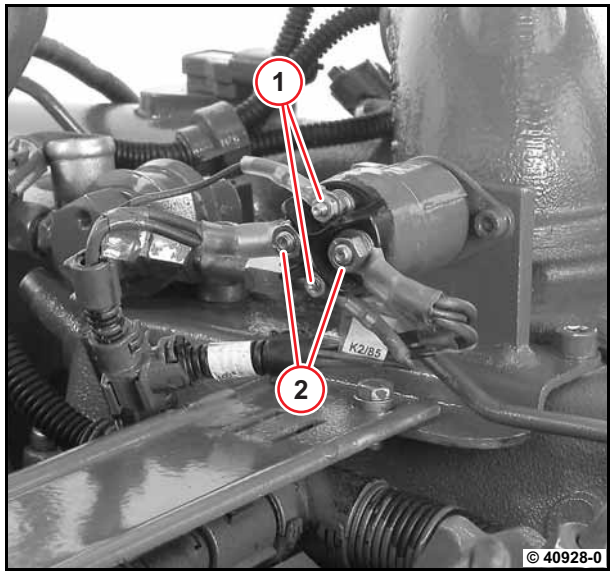
Connect cables according to marks made before removing.

- Mount washers.
- Tighten nuts (1).

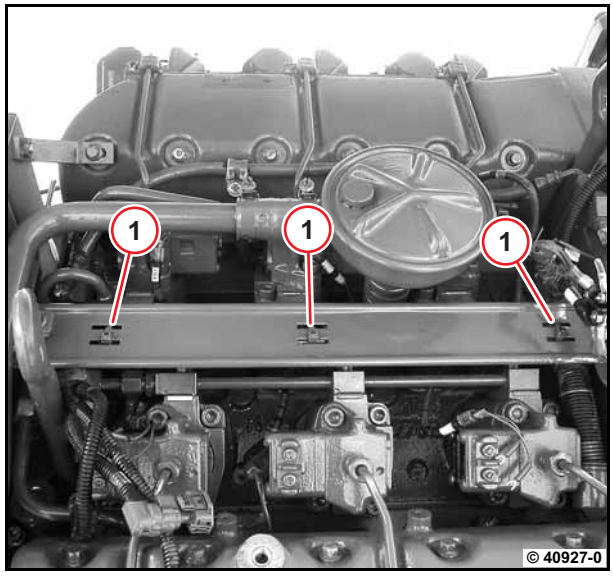
A13 037

- Tighten nuts (2).

A13 038

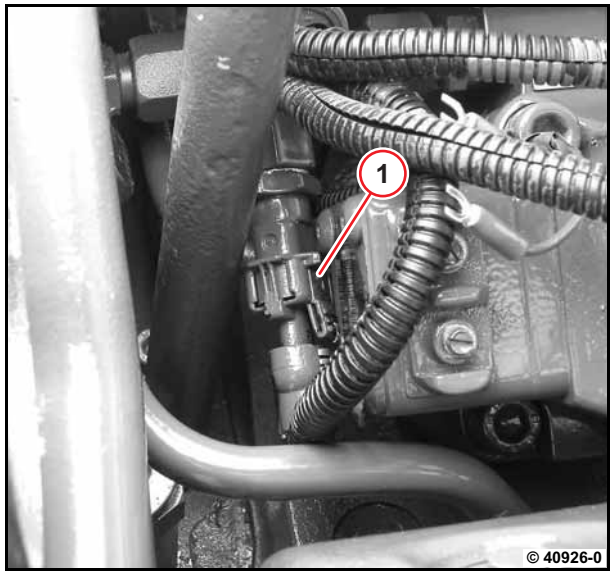


- Lay cable harness and fix with cable ties (1).

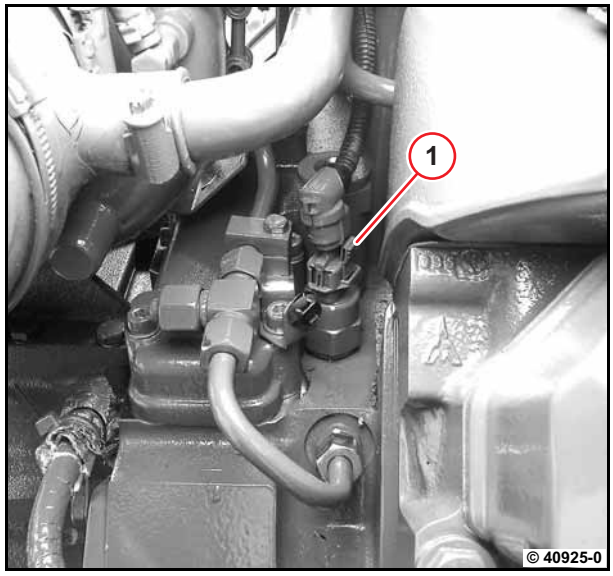


6

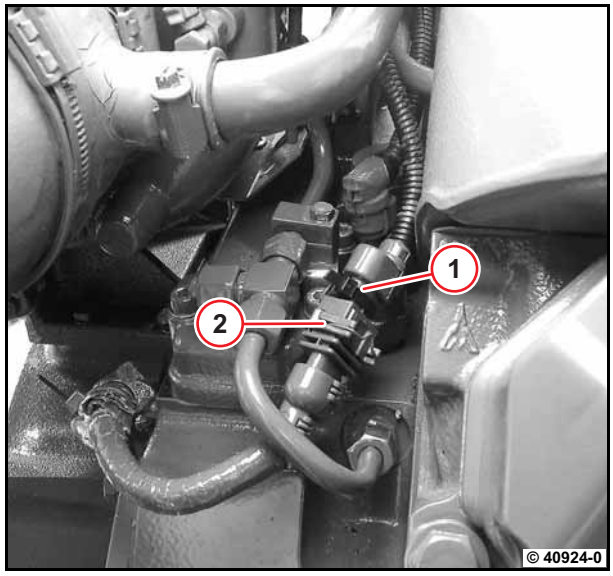
- Plug in the cable plug (1).



- Plug in the cable plug (1).



- Plug together the cable plugs (2).
- Lay cable harness and fix with cable tie (1).



- Plug cables to all injection pumps.

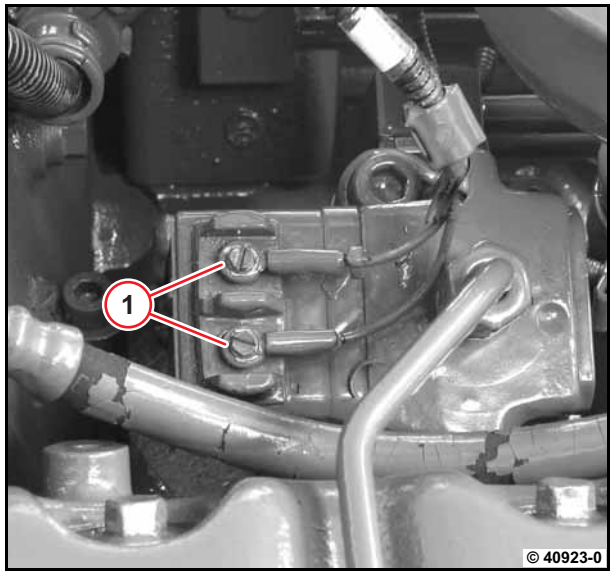
T13 054

Attention!
Note assignment and polarity of the electrical connections!

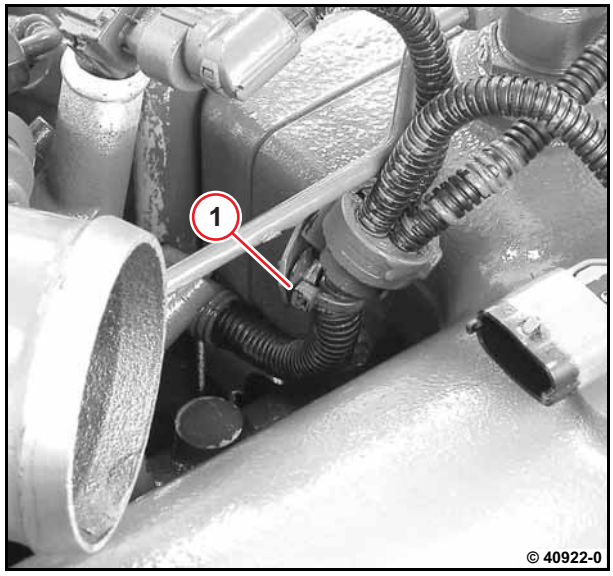
Connect cables according to marks made before removing.

- Tighten screws (1).

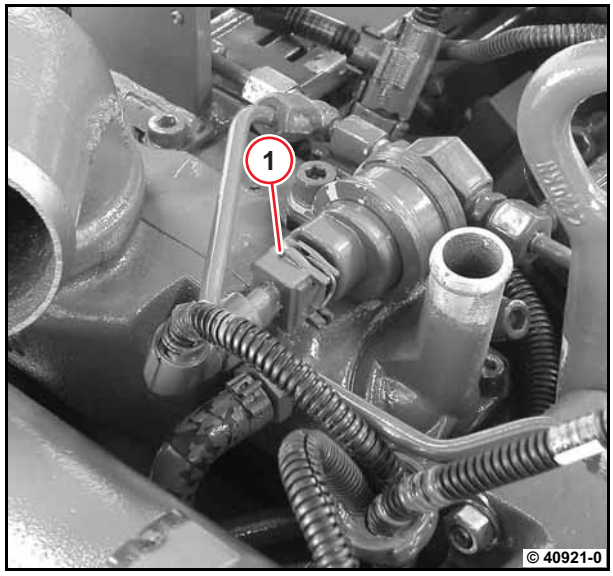
A13 054



- Lay cable harness and fix with cable tie (1).



- Plug in the cable plug (1).



6

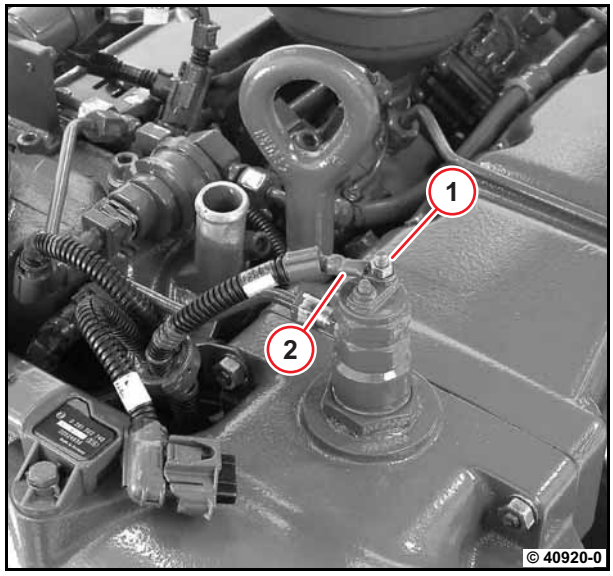
- Plug in cables (2).

Attention!
Note assignment and polarity of the electrical connections!

Connect cables according to marks made before removing.

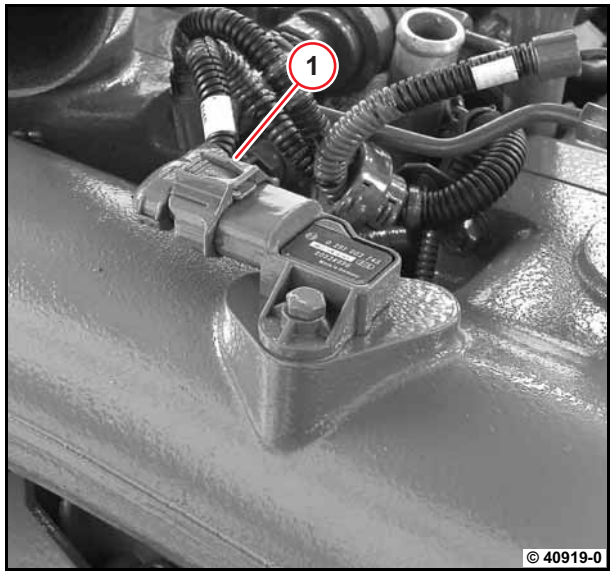
- Mount washer.
- Tighten nut (1).

A13 035

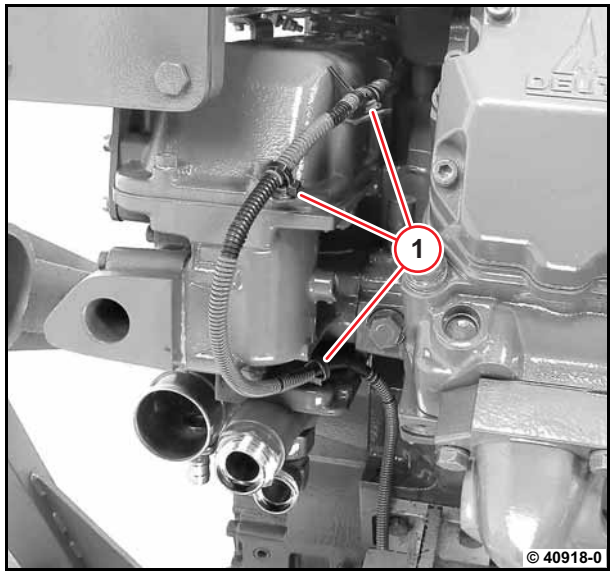


6

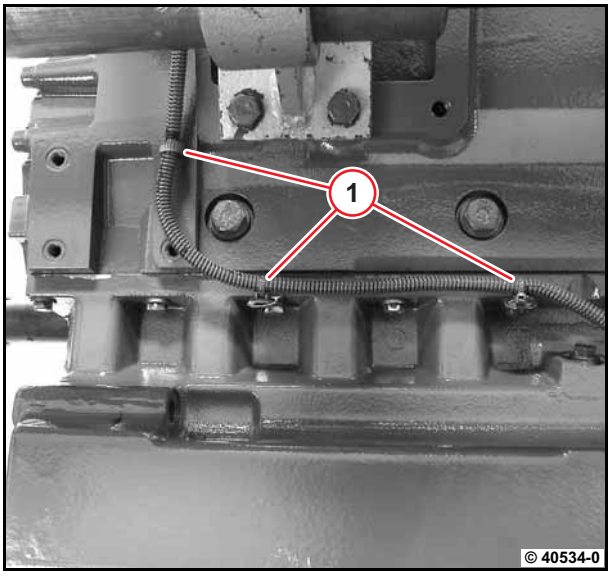
- Plug in the cable plug (1).



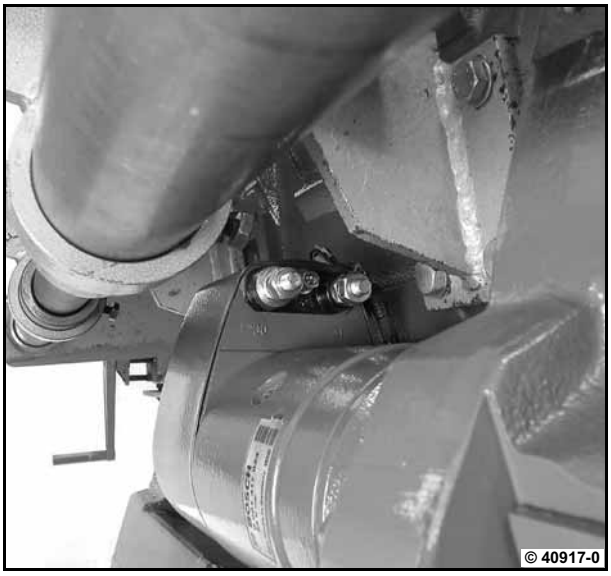
- Lay cable harness and fix with cable ties (1).



- Lay cable harness and fix with cable ties (1).

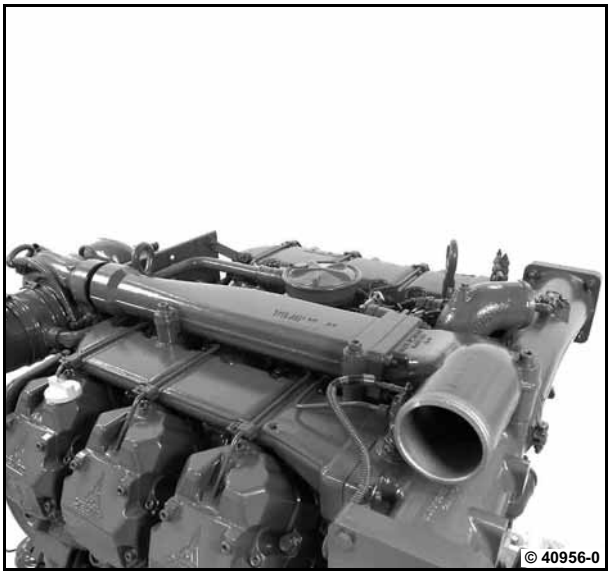


- Connect cables.
- Connect the battery's negative terminal.



- Install the charge air pipe.

W 06-02-03



6

Removing and installing the generator (V-belt drive)

Commercial available tools:
– V-belt tension measuring device 8115

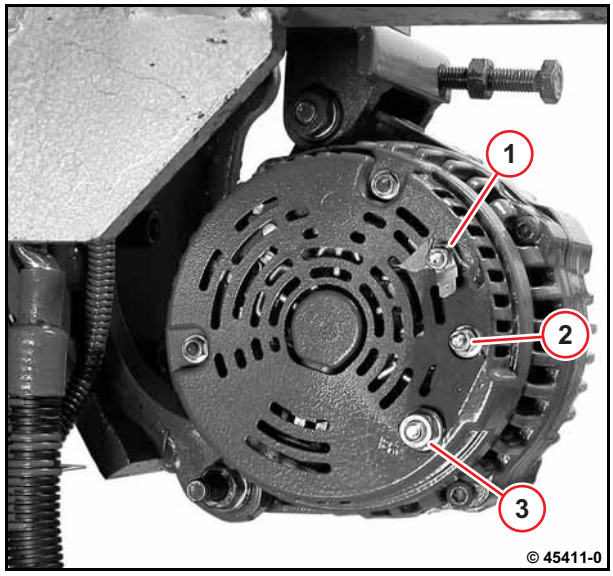
Attention!
Only test / tighten / renew V-belts when the engine is not running.

The V-belt tension of new V-belts must be checked after they have been running for 15 minutes.

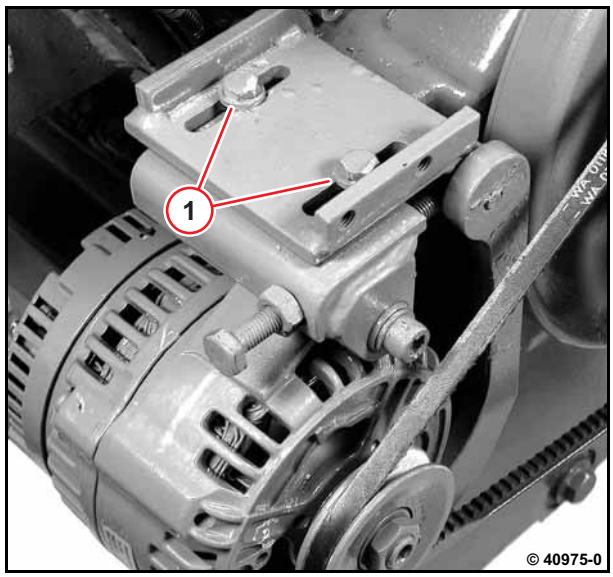
Removing the generator

- Disconnect the battery's negative terminal.
- Remove cable from generator.

Note assignment!
- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

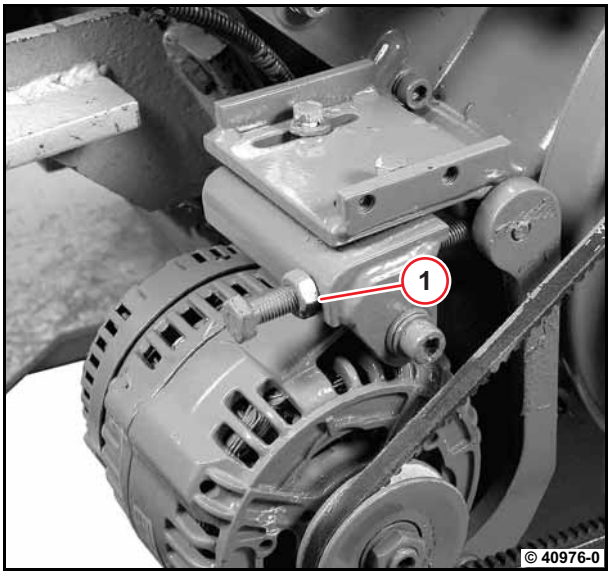


- Loosen screws (1).

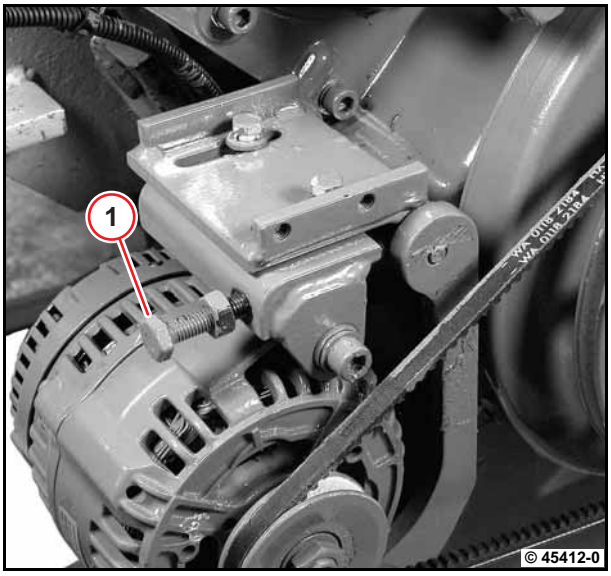


6

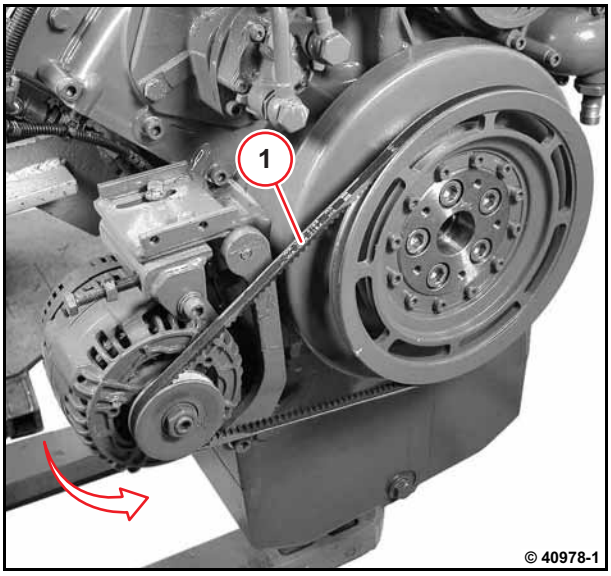
- Loosen nut (1).



- Loosen screw (1).



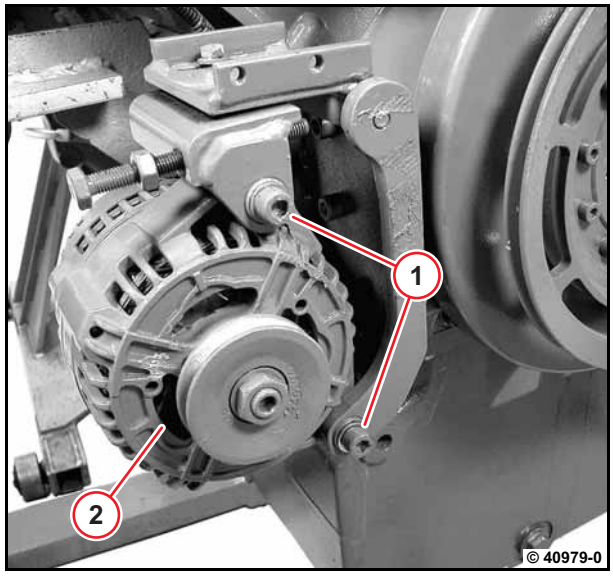
- Press generator in direction of arrow.
- Remove V-belt (1).



- Unscrew screws (1).

Hold nuts.

- Remove generator (2).



- Visually inspect the components.

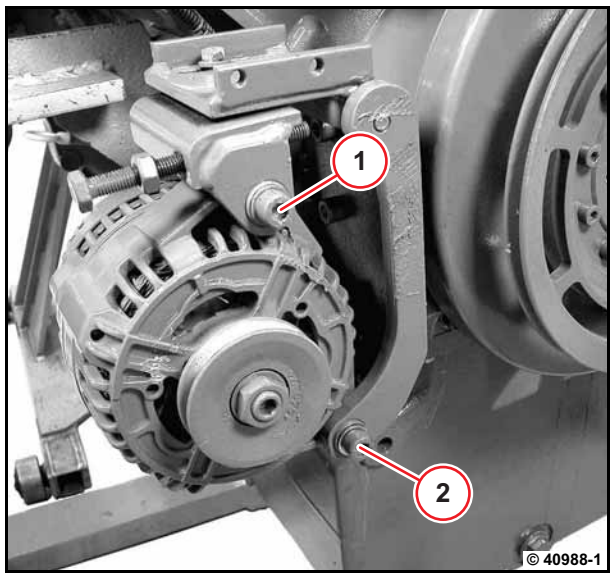
Installing the generator

- Mount generator.
- Insert screws.

Note different screw lengths:
M10 x 100 mm (1)
M10 x 120 mm (2)

- Fasten screws.

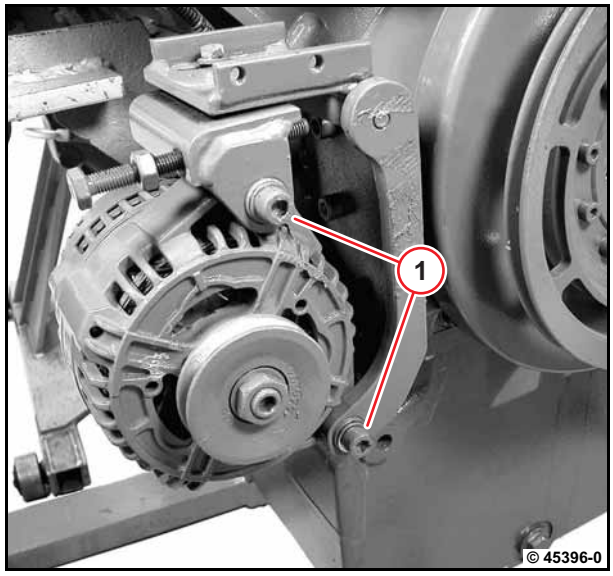
Hold nuts.



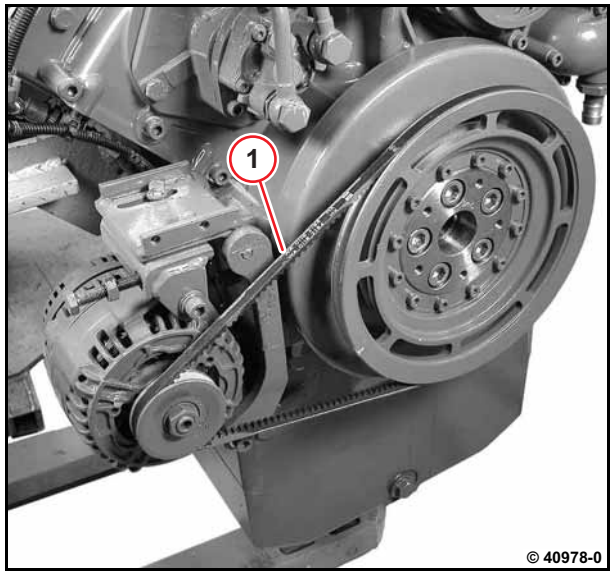
- Tighten screws (1).

A13 015

Hold nuts.



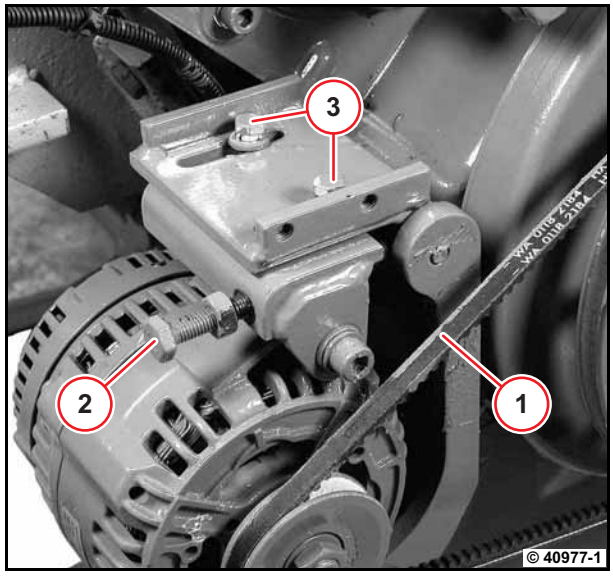
- Mount V-belt (1).



- Tighten V-belt (1) by turning the clamping screw (2).

A13 017

- Fasten screws (3).

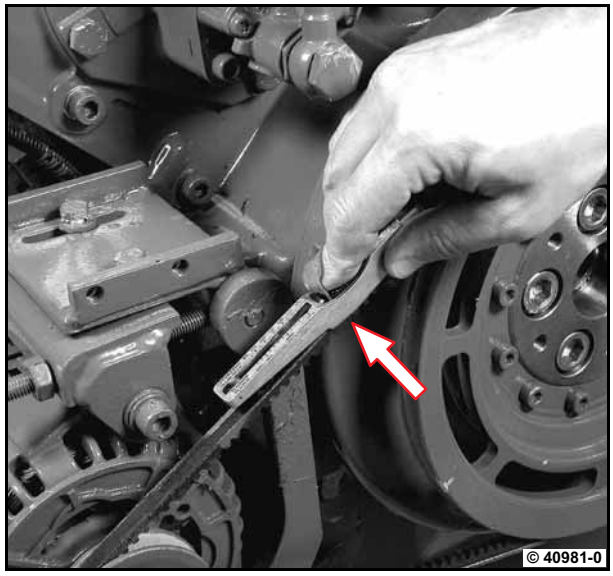


Check V-belt tension with V-belt tension measuring device

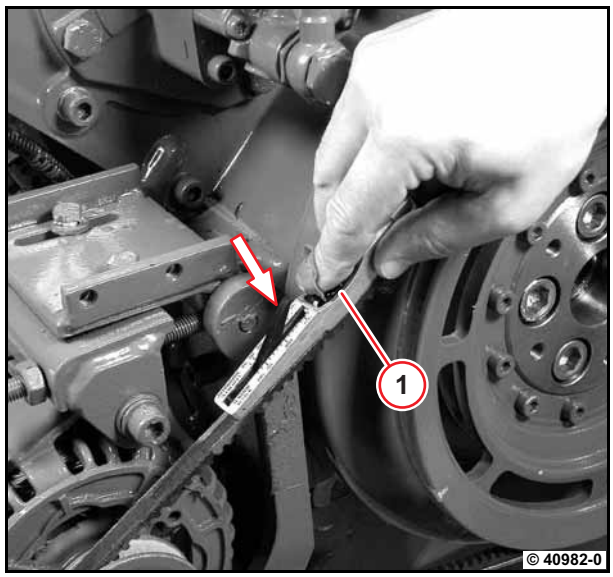
- Lower indicator arm (1) into V-belt tension measuring device.

- Mount V-belt tension measuring device on V-belt.

The V-belt must be between the guides (arrow).



- Press the V-belt measuring device against the V-belt with the button (1) until you hear it click.



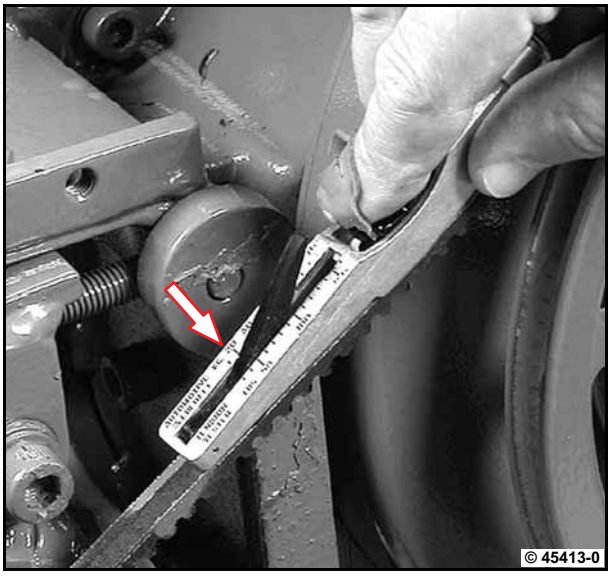
- Read measured value at the intersection (arrow) of the indicator arm and scale.

  P12 11

  P12 21

Note different units on the scale.

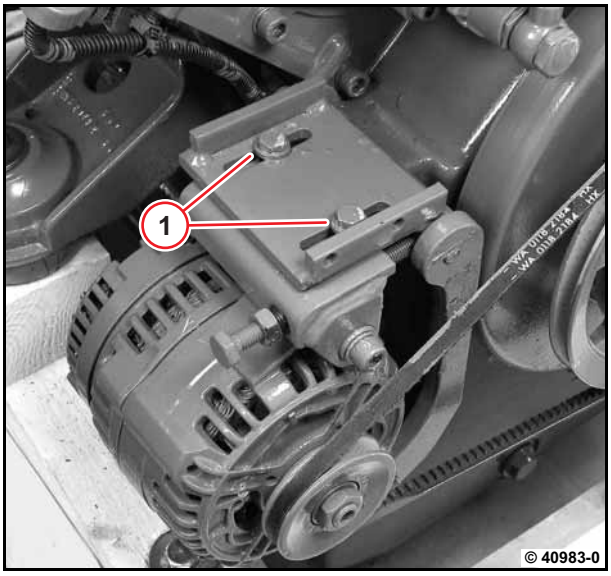
- If the nominal value is not reached, the tensioning process must be repeated.



6

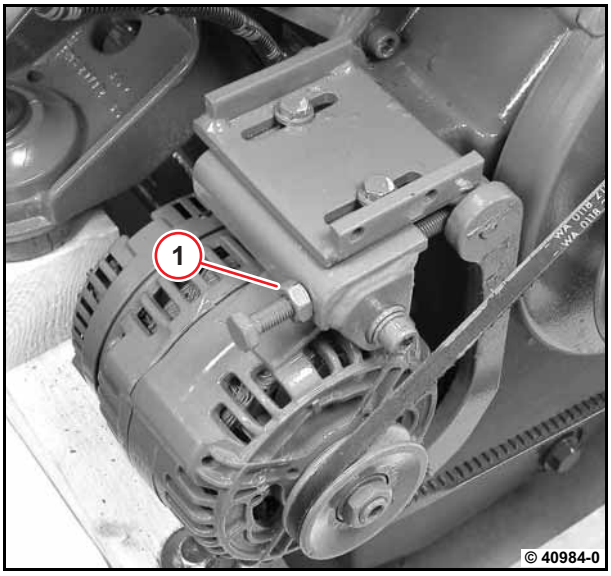
- Tighten screws (1).

  A13 012



- Tighten nut (1).

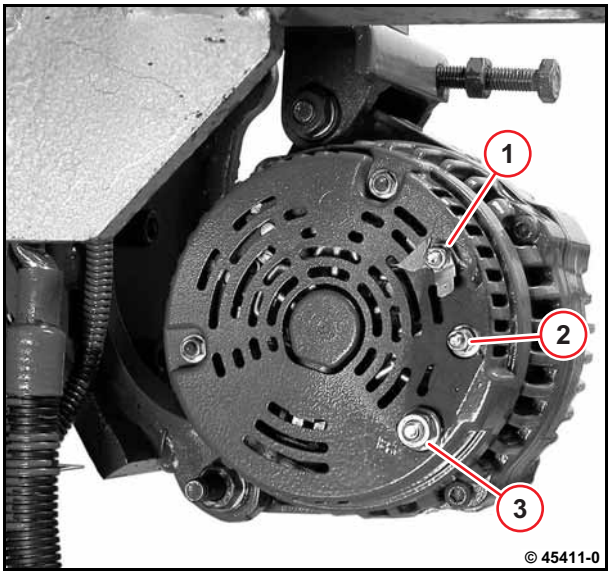
  A13 017



- Remove cable from generator.

Note assignment!
- (1) = terminal W
- (2) = terminal D+
- (3) = terminal B+

- Connect the battery's negative terminal.



Removing and installing the starter

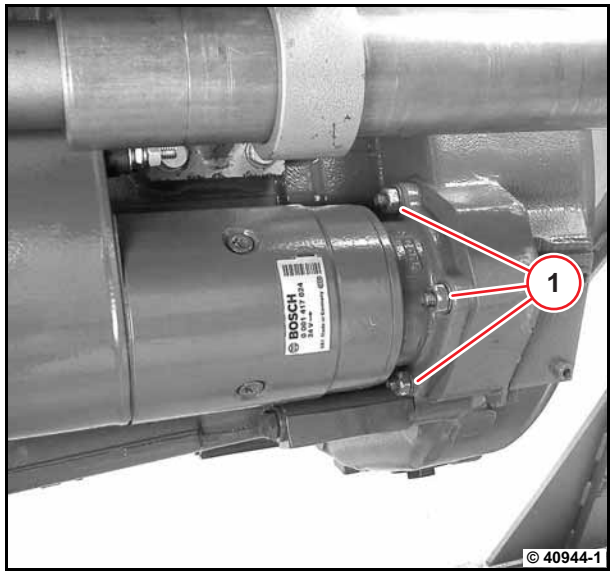
Commercial available tools

– Fitting compound
DEUTZ AP1908

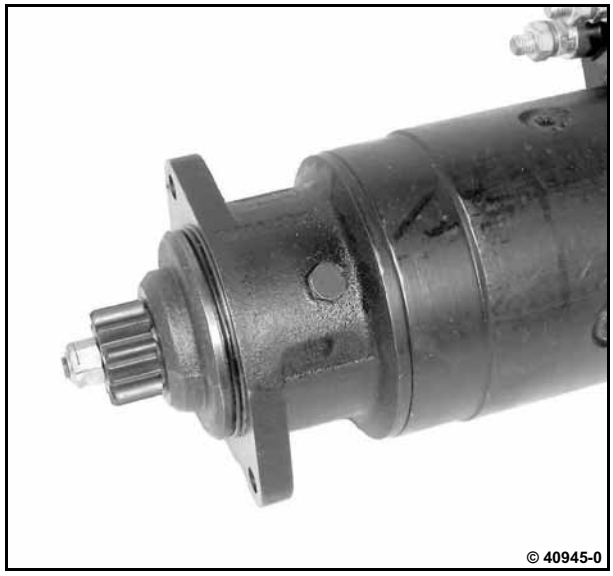
Removing the starter

- Disconnect the battery's negative terminal.
- Disconnect cables.

- Unscrew nuts (1).
- Remove starter.



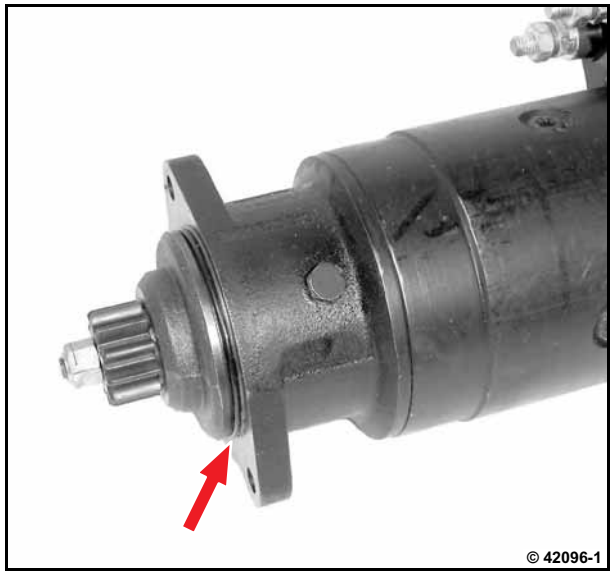
- Visually inspect the components.



6

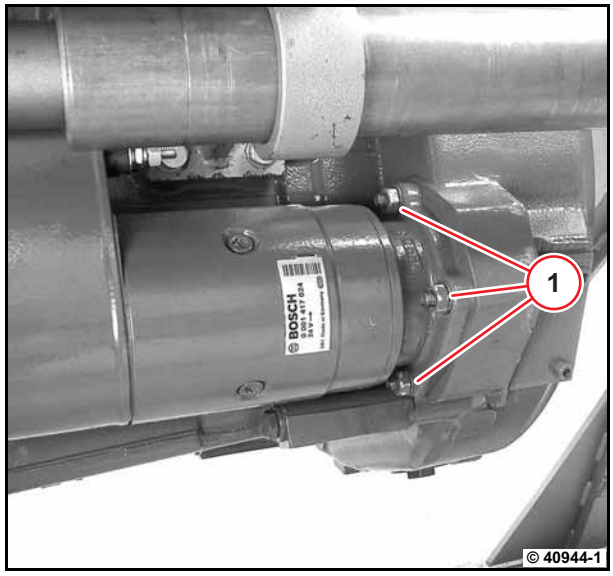
Installing the starter

- Insert new O-ring (arrow).
- Coat the O-ring with fitting compound.

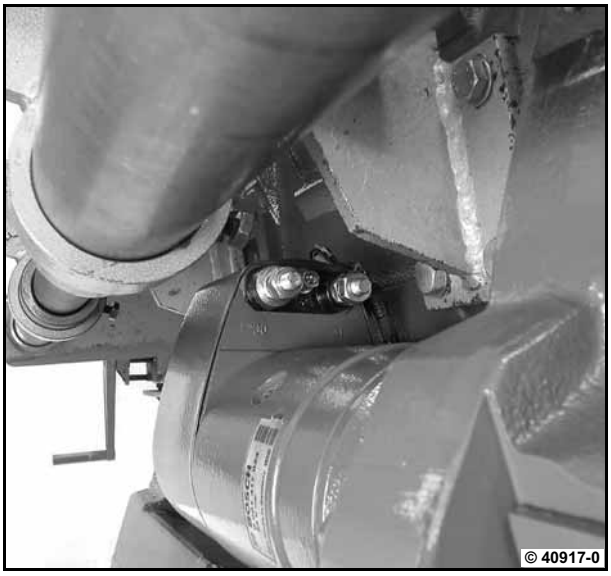


- Insert starter.
- Tighten nuts (1).

A13 001



- Connect cables.
- Connect the battery's negative terminal.



6

Removing and installing the pressure/temperature sensor (charge air)

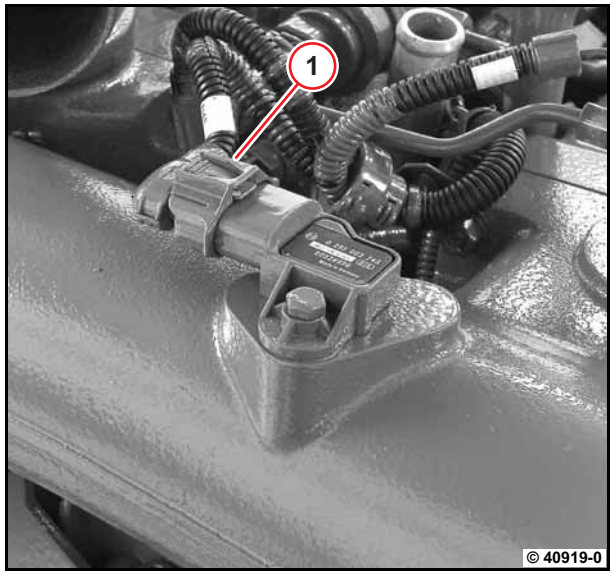
Commercial available tools

– Fitting compound
DEUTZ AP1908

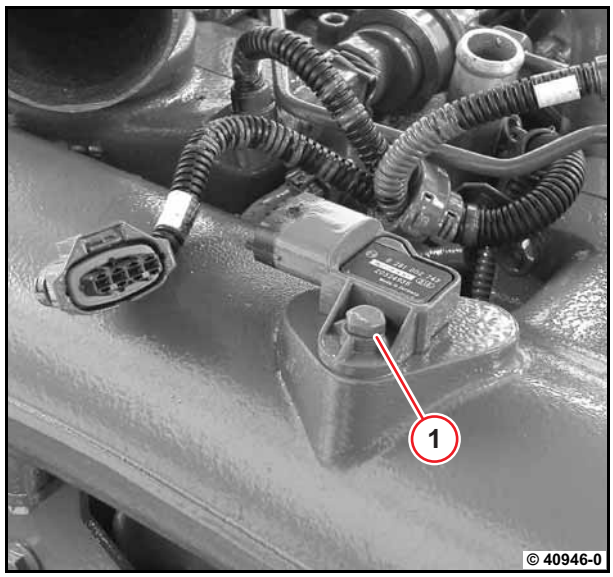
Read out error memory of the motor control timer with SERDIA.

Remove pressure/temperature sensor

- Unlock cable plug (1) and remove.

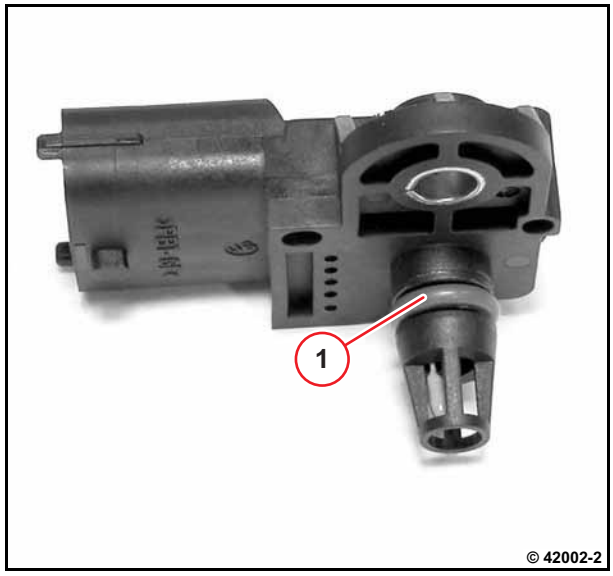


- Unscrew screw (1).
- Remove pressure/temperature sensor
- Visually inspect the components.



Installing the pressure/temperature sensor

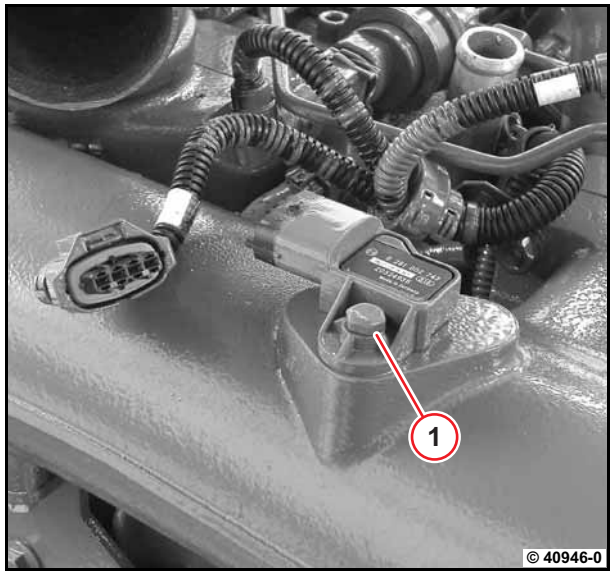
- Mount new O-ring (1).
- Lightly coat O-ring with fitting compound.



6

- Insert pressure/temperature sensor.
- Tighten screw (1).

A13 046



- Plug in the cable plug (1).

Delete error entry in the error memory of the motor control timer with SERDIA.