

Product: INDUSTRIAL ENGINE  
Model: C1.6 INDUSTRIAL ENGINE C6J  
Configuration: C1.6 Industrial Engine C6J00001-UP

## Disassembly and Assembly C0.5, C0.7, C1.1, C1.5, C1.6 and and C2.2 Industrial Engines

Media Number -KENR6229-05

Publication Date -01/03/2007

Date Updated -14/07/2017

i02602643

# Inlet and Exhaust Valves - Remove and Install

SMCS - 1105-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-3527	Valve Spring Compressor	1

### Start By:

- a. Remove the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Remove".

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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**Note:** The removal procedure is identical for the two cylinder, the three cylinder and the four cylinder engines. The Illustrations show a four cylinder engine.

1. Clean the bottom face of the cylinder head. Check the depth of the valves below the face of the cylinder head before the valve springs are removed. Refer to Specifications, "Cylinder Head Valves" for the correct dimensions.

2. Place a temporary identification mark on the heads of the valves in order to identify the correct position.

**Note:** Do not stamp the heads of the valves. Stamping or punching the heads of the valves could cause the valves to fracture.



**Personal injury can result from being struck by parts propelled by a released spring force.**

**Make sure to wear all necessary protective equipment.**

**Follow the recommended procedure and use all recommended tooling to release the spring force.**

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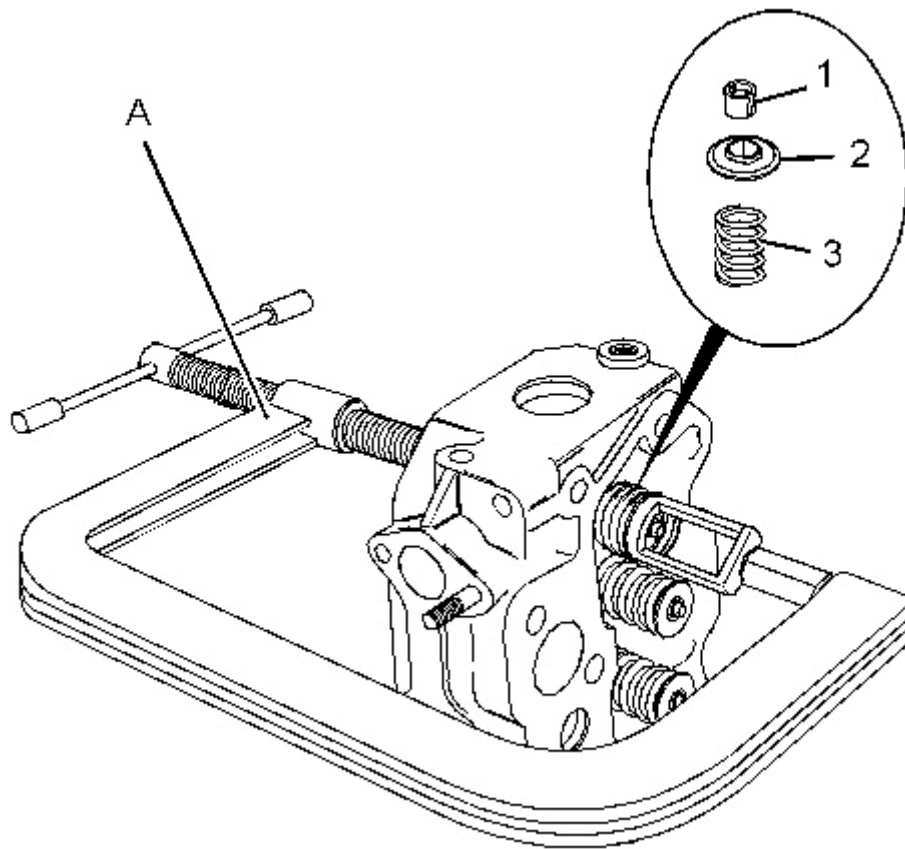
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### **NOTICE**

**Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.**

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Illustration 1  
Typical example

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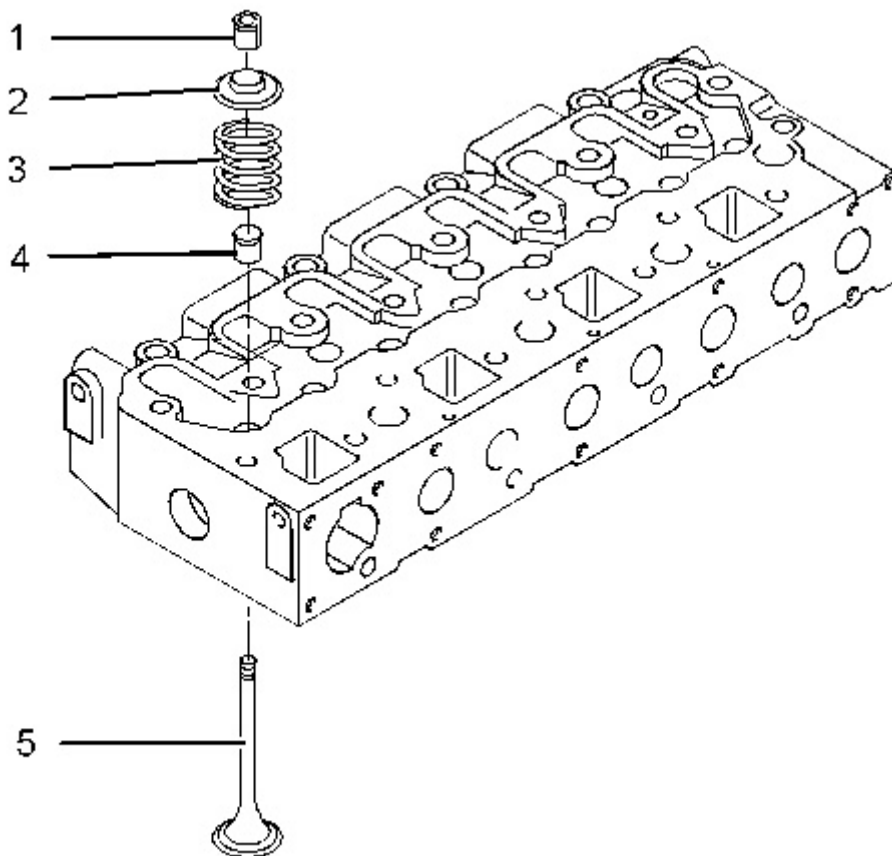


Illustration 2

g01325840

Typical example

3. Use Tooling (A) in order to compress the appropriate valve spring (3). Remove valve keepers (1).

**Note:** Do not compress the valve spring so that valve spring retainer (2) touches valve stem seal (4).

4. Remove Tooling (A).
5. Remove valve spring retainer (2). Remove valve spring (3).
6. Remove valve (5).
7. Remove valve stem seal (4).
8. Repeat Steps 3 to 7 for the remaining valves.

## Installation Procedure

Table 2

Required Tools			
Tool	Part Number	Part Description	Qty
A	1P-3527	Valve Spring Compressor	1

B <sup>(1)</sup>	304-6599	Valve Stem Seal Replacer	1
B <sup>(2)</sup>	256-4865	Valve Stem Seal Replacer	1

<sup>(1)</sup> C0.5 and C0.7 engines

<sup>(2)</sup> C1.1, C1.5, C1.6 and C2.2 engines

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## NOTICE

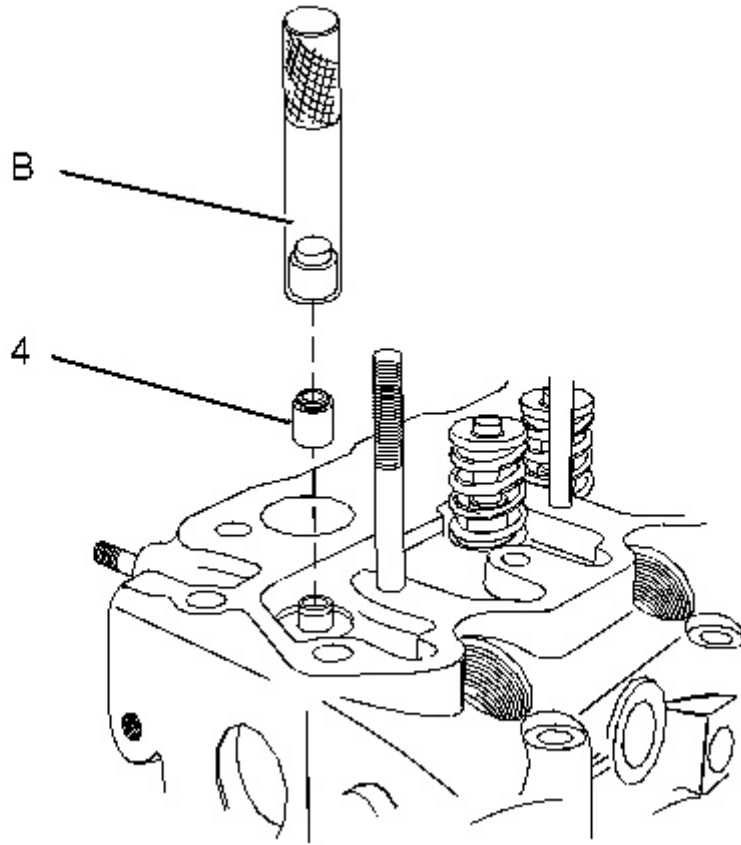
**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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**Note:** The installation procedure is identical for the two cylinder, the three cylinder and the four cylinder engines. The Illustrations show a four cylinder engine.

1. Clean all components of the cylinder head assembly. Ensure that all ports, all coolant passages and all lubrication passages in the cylinder head are free from debris. Follow Steps 1.a through 1.e in order to inspect the components of the cylinder head assembly. Replace any components that are worn or damaged.
    - a. Inspect the cylinder head for wear and for damage. Refer to Systems Operation, Testing and Adjusting, "Cylinder Head Inspect".
    - b. Inspect the valve seats for wear and for damage. Refer to Specifications, "Cylinder Head Valves" for further information.
    - c. Inspect the valve guides for wear and for damage. Refer to Specifications, "Cylinder Head Valves" and Systems Operation, Testing and Adjusting, "Valve Guide - Inspect" for further information.
    - d. Inspect the valves for wear and for damage. Refer to Specifications, "Cylinder Head Valves".
    - e. Inspect the valve springs for the correct length. Refer to Specifications, "Cylinder Head Valves".
-



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Illustration 3  
Typical example

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2. Use Tooling (B) to install new valve stem seals (4) onto each of the valve guides.

**Note:** The outer face of the valve guides must be clean and dry before installing the valve stem seals.

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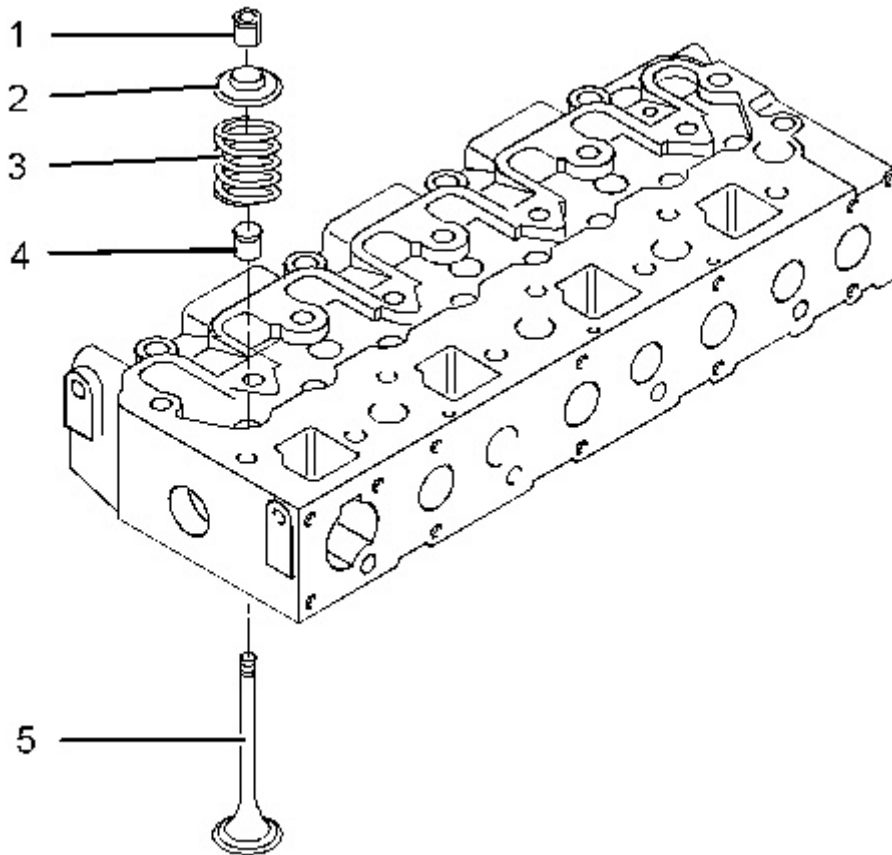


Illustration 4  
Typical example

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3. Lubricate the stem of valve (5) with clean engine oil. Install valve (5) in the appropriate position in the cylinder head. Check the depth of the valve below the face of the cylinder head. Refer to Systems Operation, Testing and Adjusting, "Valve Depth - Inspect" for more information.
4. Install valve spring (3) to the cylinder head. Position valve spring retainer (2) onto valve spring (3).

**! WARNING**

**Personal injury can result from being struck by parts propelled by a released spring force.**

**Make sure to wear all necessary protective equipment.**

**Follow the recommended procedure and use all recommended tooling to release the spring force.**

## NOTICE

Ensure that the valve spring is compressed squarely or damage to the valve stem may occur.

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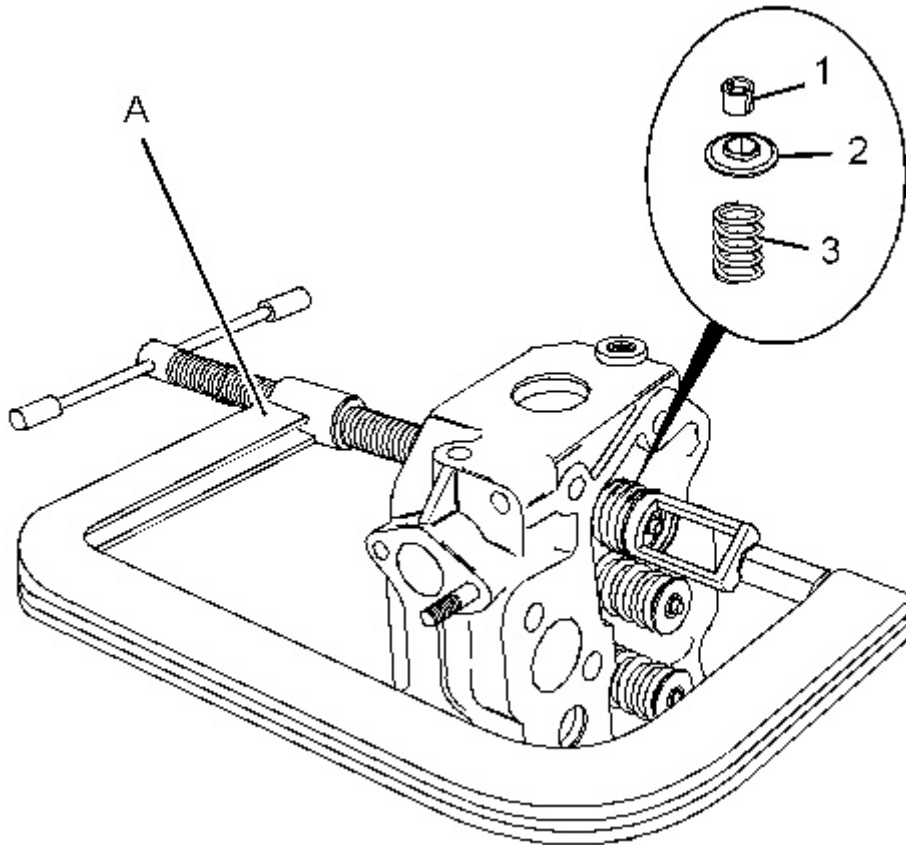


Illustration 5  
Typical example

g01315963

5. Use Tooling (A) in order to compress valve spring (3). Install valve keepers (1).

**Note:** Do not compress the spring so that valve spring retainer (2) touches valve stem seal (4).

### **WARNING**

The valve spring keepers can be thrown from the valve when the valve spring compressor is released. Ensure that the valve spring keepers are properly installed on the valve stem. To help prevent personal injury, keep away from the front of the valve spring keepers and valve springs during the installation of the valves.

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6. Remove Tooling (A).
7. Repeat Steps 4 to 6 for the remaining valves.
8. Place the cylinder head on a suitable support. Ensure that the heads of the valves are not obstructed. Gently strike the top of the valves with a soft hammer in order to ensure that valve keepers (1) are properly installed.

**End By:**

- a. Install the cylinder head. Refer to Disassembly and Assembly, "Cylinder Head - Install".
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## **Disassembly and Assembly C0.5, C0.7, C1.1, C1.5, C1.6 and and C2.2 Industrial Engines**

Media Number -KENR6229-05

Publication Date -01/03/2007

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i02601947

# **Engine Oil Line - Remove and Install**

SMCS - 1307-010

## **Removal Procedure**

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### **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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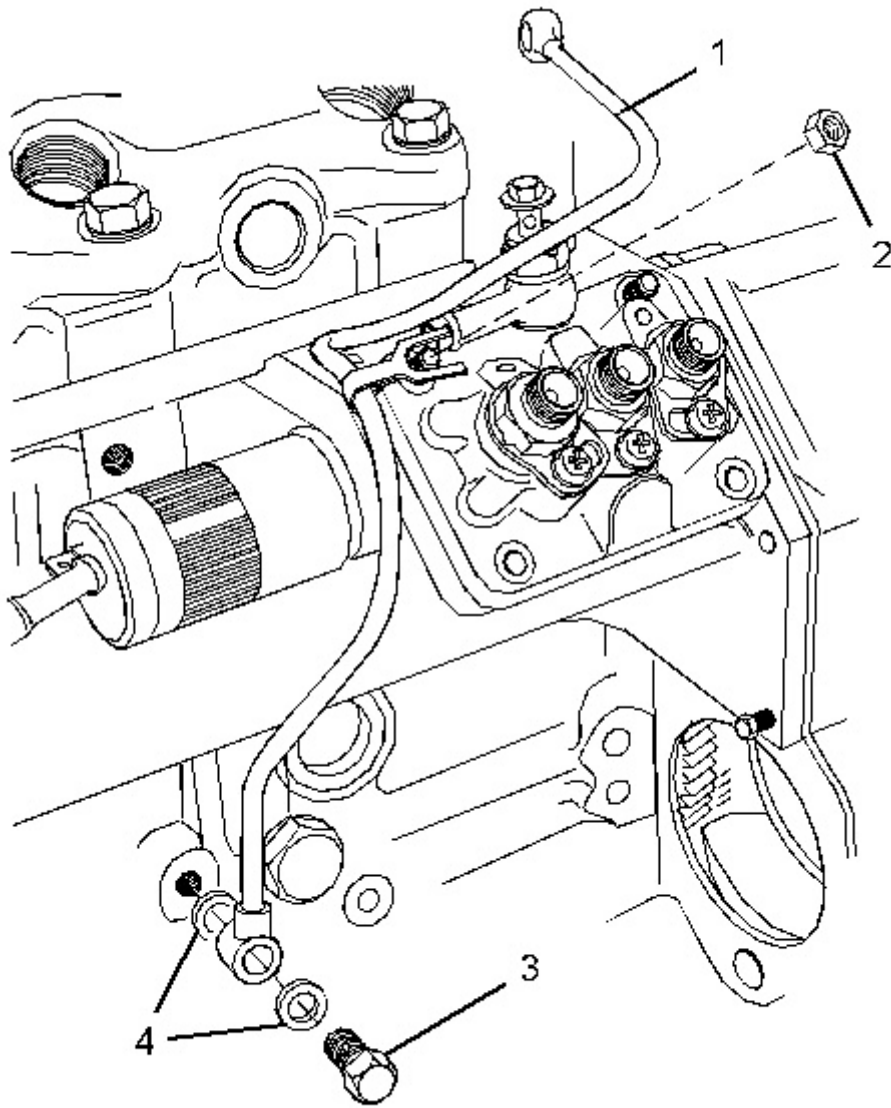
### **NOTICE**

**Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.**

**Dispose of all fluids according to local regulations and mandates.**

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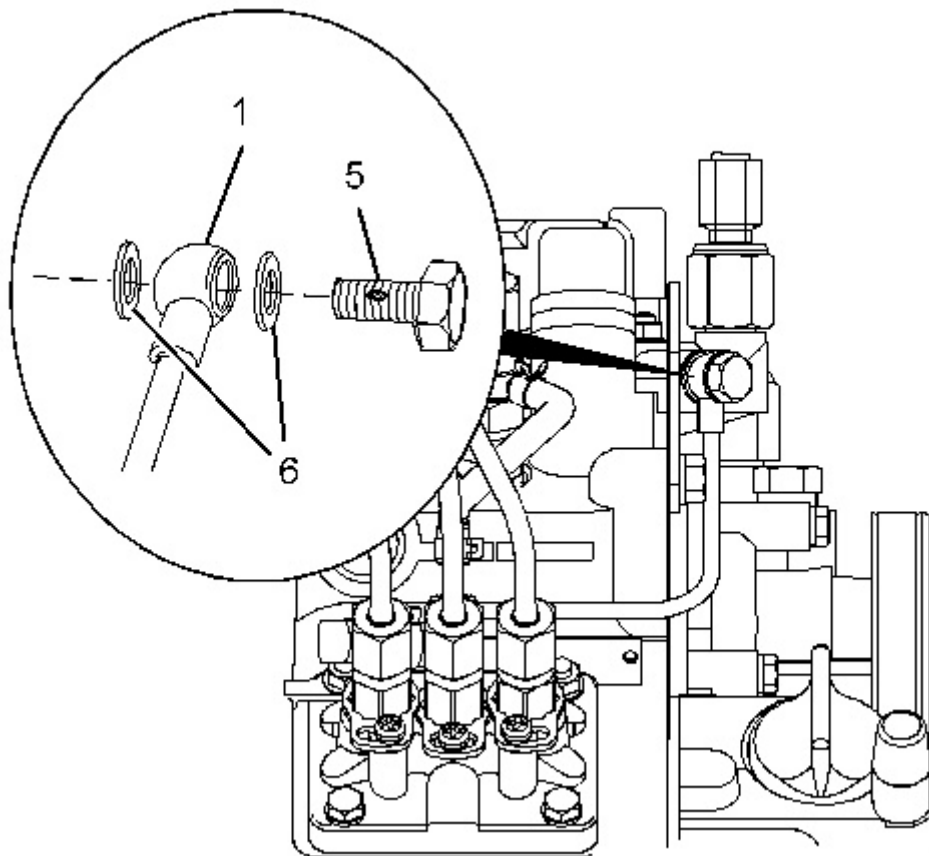


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Illustration 1  
Typical example

g01304820

1. Loosen nut (2) that attaches the clip on oil line (1) to the fuel injection pump.
  2. Remove banjo bolt (3) and remove washers (4) from the cylinder block.
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Illustration 2  
Typical example

g01307372

3. Remove banjo bolt (5) and remove washers (6) from the cylinder head.
4. Remove oil line (1) from the engine.

## Installation Procedure

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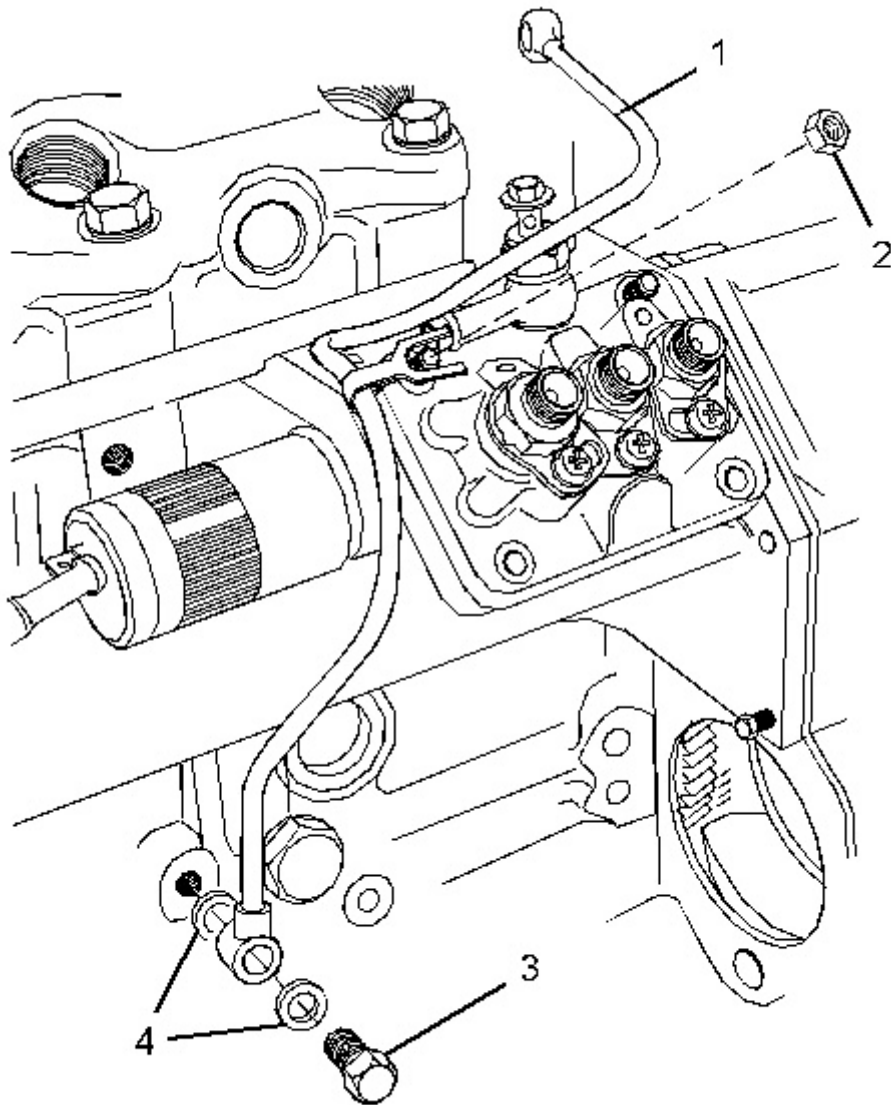
### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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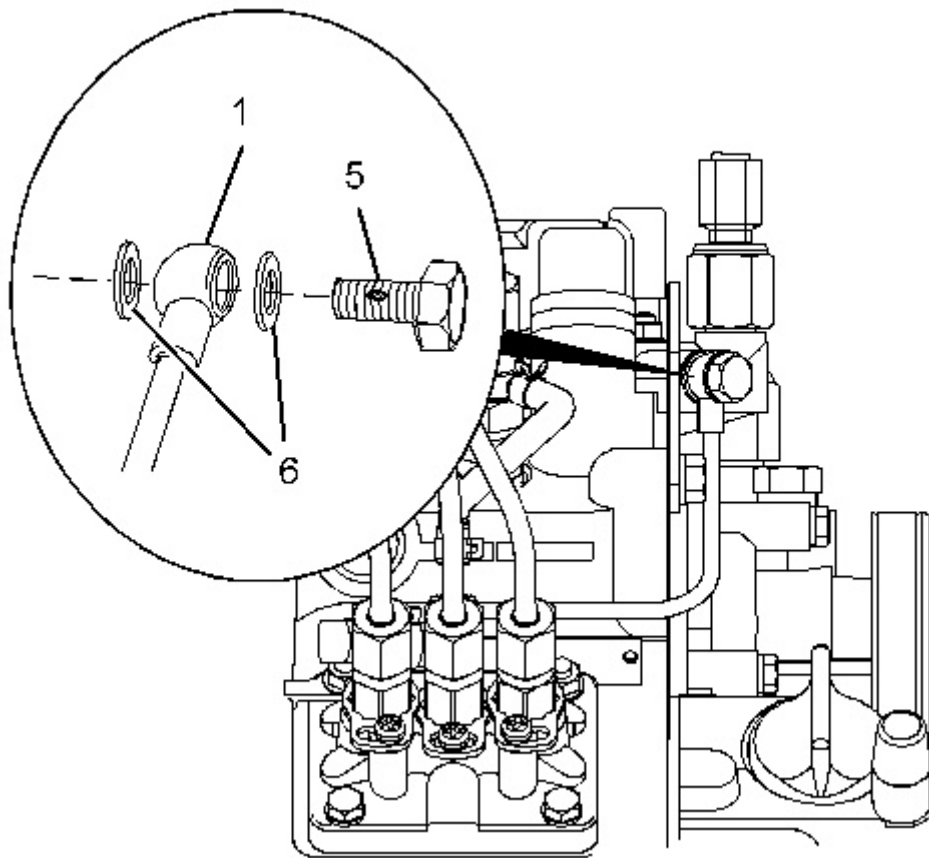


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Illustration 3  
Typical example

g01304820

1. Place oil line (1) on the engine. Ensure that the clip on the oil line is located below nut (2).
  2. Position banjo bolt (3) and new washers (4) onto oil line (1). Install the banjo bolt and oil line to the cylinder block finger tight.
-



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Illustration 4

g01307372

Typical example

3. Position banjo bolt (5) and new washers (6) onto oil line (1). Install the banjo bolt and the oil line to the cylinder head finger tight.
  4. Tighten nut (2) that attaches the clip on oil line (1) to the fuel injection pump.  
For C0.5, C0.7, C1.1 and C1.6 engines, tighten nut (2) to a torque of 6 N·m (53 lb in).  
For C1.5 and C2.2 engines, tighten nut (2) to a torque of 15 N·m (133 lb in).
  5. Tighten banjo bolts (3) and (5) to a torque of 12 N·m (106 lb in).
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## Disassembly and Assembly C0.5, C0.7, C1.1, C1.5, C1.6 and and C2.2 Industrial Engines

Media Number -KENR6229-05

Publication Date -01/03/2007

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i02602628

# Engine Oil Cooler - Remove and Install

SMCS - 1378-010

## Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	185-3630	Strap Wrench	1

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### NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

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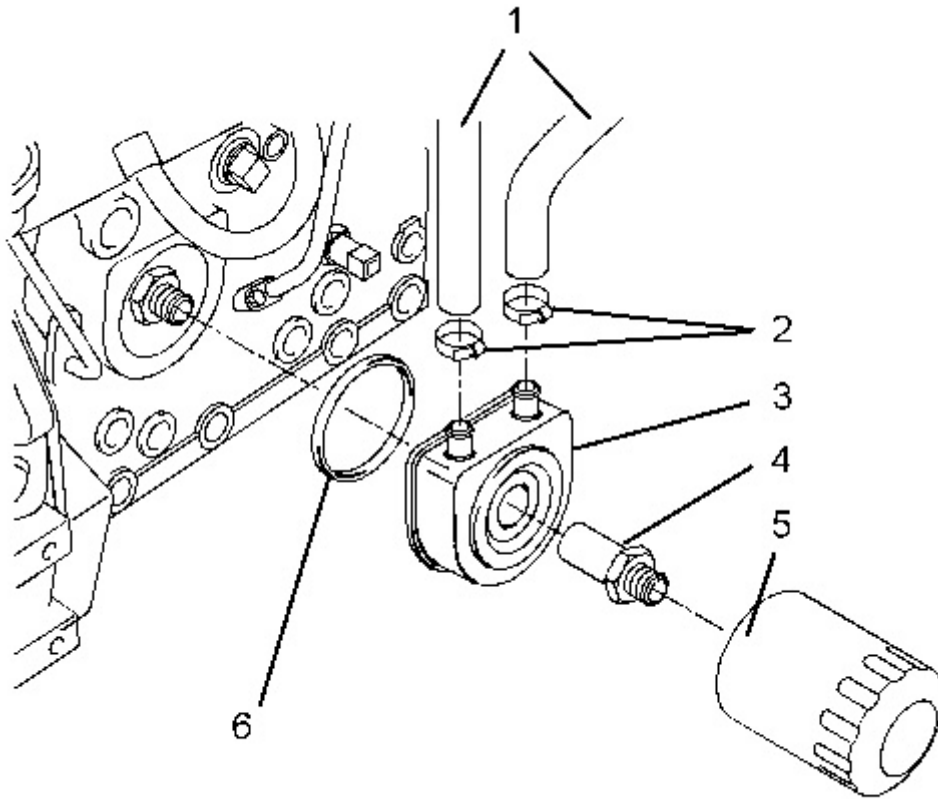
### NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

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1. Drain the coolant from the cooling system into a suitable container. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Drain" for the correct procedure.
  2. Drain the engine lubricating oil into a suitable container. Refer to Operation and Maintenance Manual, "Engine Oil and Filter - Change" for the correct procedure.
- 



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Illustration 1  
Typical example

g01304837

3. Use Tooling (A) to remove oil filter element (5).
4. Loosen hose clamps (2) and disconnect hoses (1). Note the positions of the coolant inlet and the coolant outlet for installation.
5. Remove adapter (4) and remove oil cooler (3) from the cylinder block.

**Note:** Make a temporary mark in order to show the orientation of the oil cooler for installation.

6. Remove O-ring seal (6) from oil cooler (3).

## Installation Procedure

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**NOTICE**

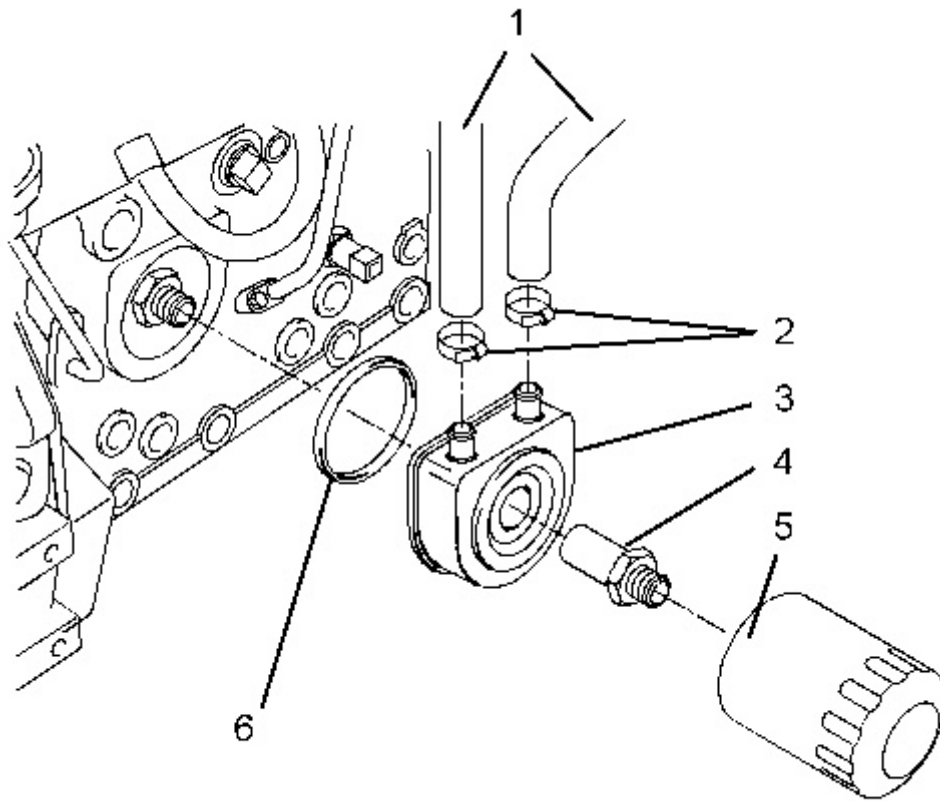


**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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1. Ensure that the oil cooler is clean and free from damage. Clean the mating surfaces of the cylinder block.
- 



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Illustration 2

g01304837

Typical example

2. Install a new O-ring seal (6) to oil cooler (3). Position oil cooler (3) on the cylinder block and install adapter (4). Tighten adapter (4) to a torque of 34 N·m (25 lb ft).

**Note:** Ensure that the oil cooler is correctly oriented.

3. Connect hoses (1) to the coolant inlet and the coolant outlet on oil cooler (3). Tighten hose clamps (2).
4. Install a new oil filter element (5).
5. Fill the cooling system to the correct level. Refer to Operation and Maintenance Manual, "Cooling System Coolant - Fill" for the correct procedure.
6. Fill the engine oil pan to the correct level. Refer to Operation and Maintenance Manual, "Engine Oil Filter - Change" for the correct procedure.

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## **Disassembly and Assembly C0.5, C0.7, C1.1, C1.5, C1.6 and and C2.2 Industrial Engines**

Media Number -KENR6229-05

Publication Date -01/03/2007

Date Updated -14/07/2017

i02602633

# **Engine Oil Relief Valve - Remove and Install**

SMCS - 1315-010

## **Removal Procedure**

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### **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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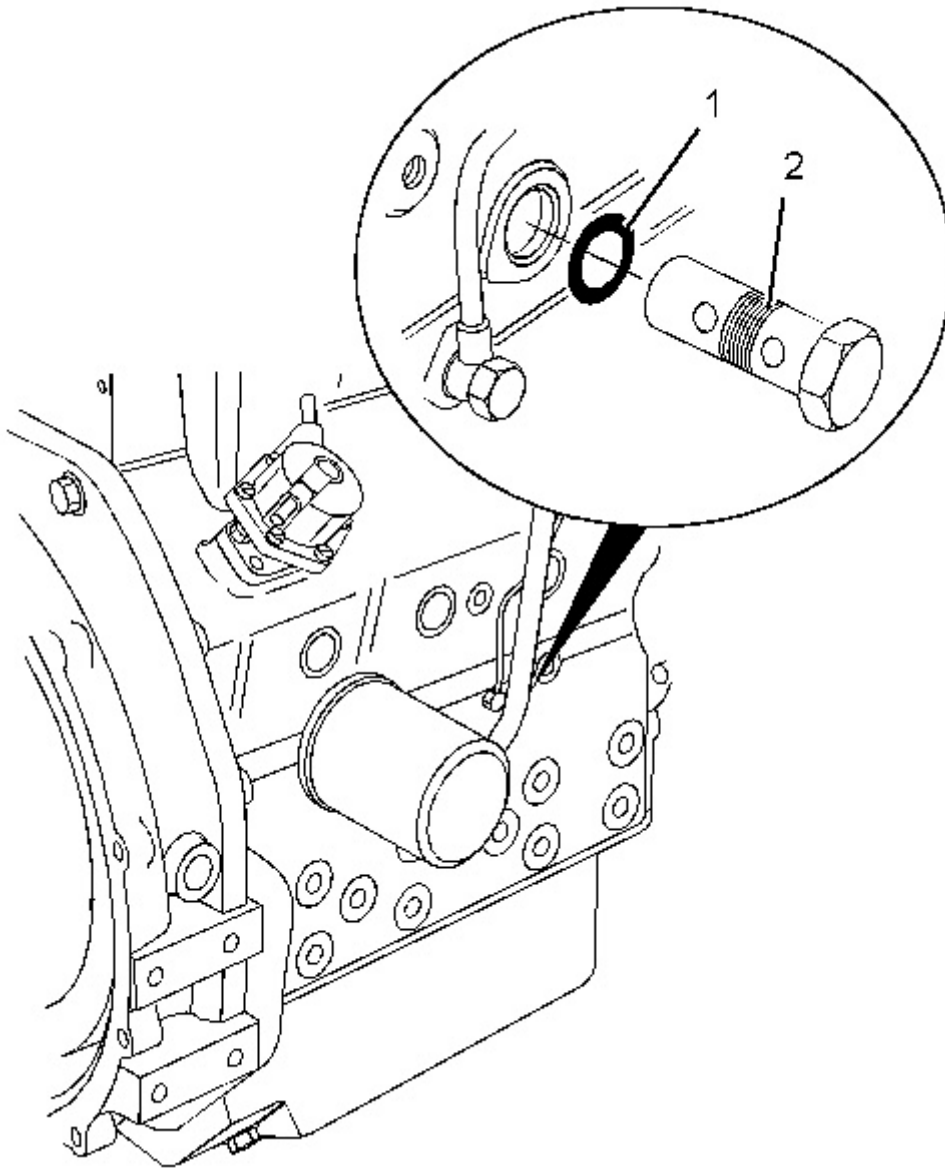
### **NOTICE**

**Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.**

**Dispose of all fluids according to local regulations and mandates.**

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Illustration 1  
Typical example

g01316066

1. Remove engine oil relief valve (2) from the cylinder block.
2. Remove O-ring seal (1) from engine oil relief valve (2).

## Installation Procedure

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### NOTICE

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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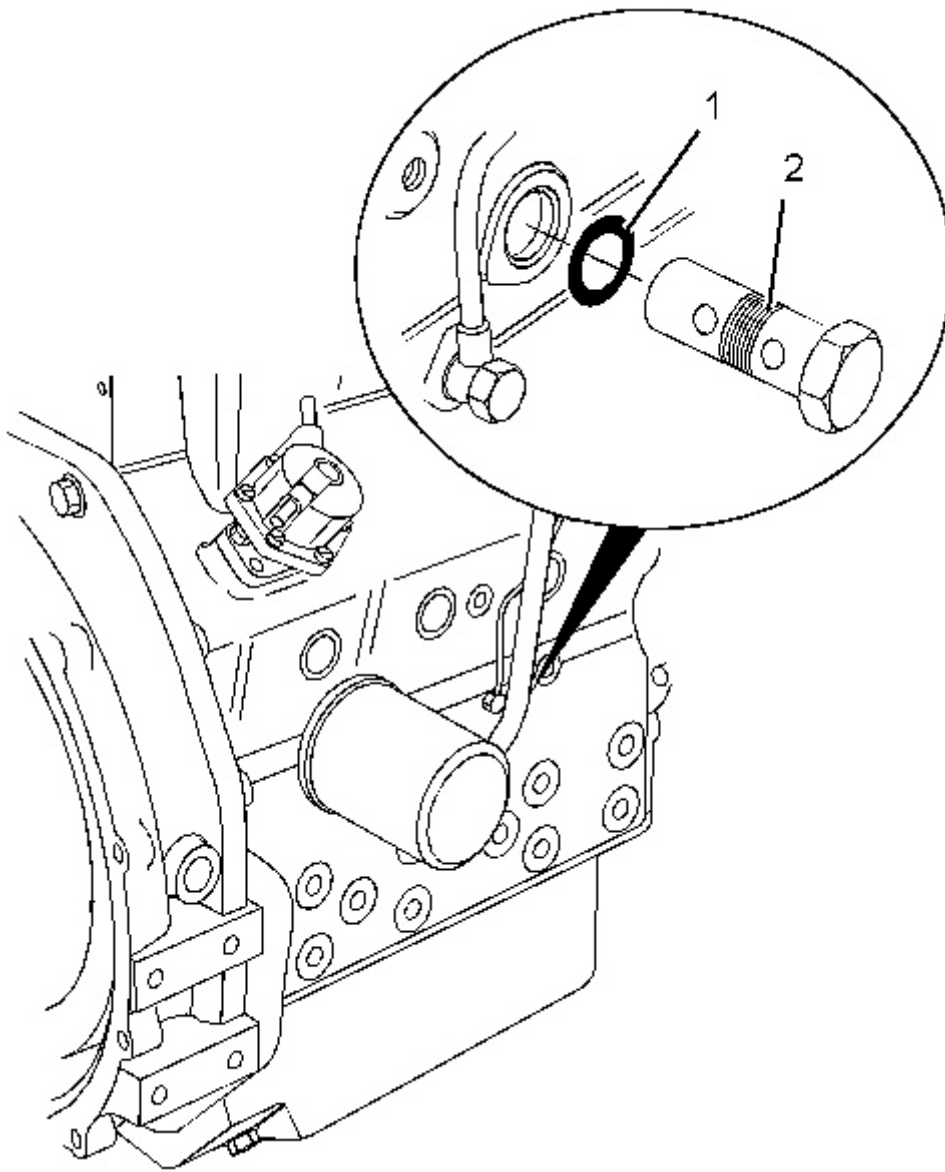


Illustration 2  
Typical example

g01316066

1. Install a new O-ring seal (1) to engine oil relief valve (2).
  2. Lubricate engine oil relief valve (2) with clean engine oil.
  3. Install engine oil relief valve (2) into the cylinder block. Tighten the engine oil relief valve to a torque of 64 N·m (47 lb ft).
-

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## **Disassembly and Assembly C0.5, C0.7, C1.1, C1.5, C1.6 and and C2.2 Industrial Engines**

Media Number -KENR6229-05

Publication Date -01/03/2007

Date Updated -14/07/2017

i02602632

# **Engine Oil Pump - Remove**

SMCS - 1304-011

## **Removal Procedure**

### **Start By:**

- a. Remove the front housing. Refer to Disassembly and Assembly, "Housing (Front) - Remove".

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### **NOTICE**

**Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.**

**Dispose of all fluids according to local regulations and mandates.**

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### **NOTICE**

**Keep all parts clean from contaminants.**

**Contaminants may cause rapid wear and shortened component life.**

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## NOTICE

If the front housing is not installed, do not turn the crankshaft.  
Damage to the engine may occur.

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### Engine Oil Pump

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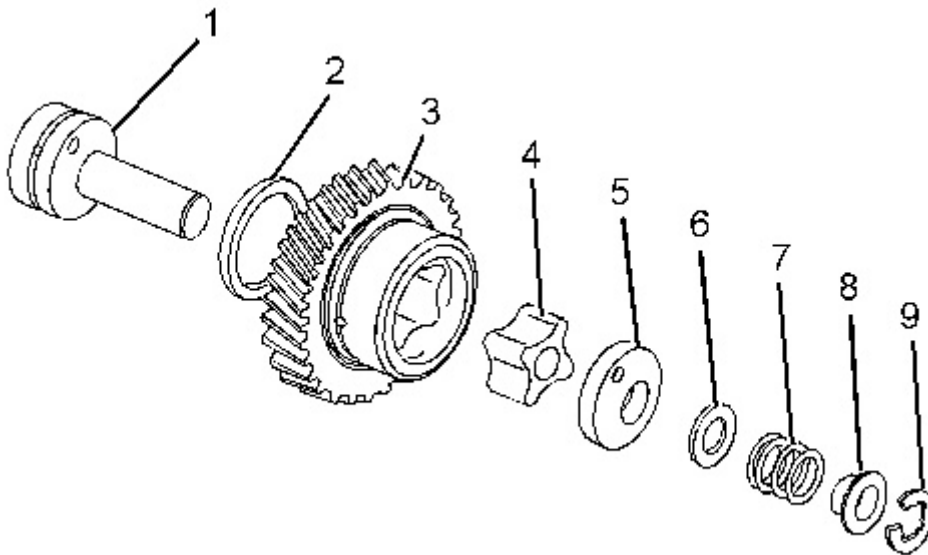


Illustration 1

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### **WARNING**

**Personal injury can result from being struck by parts propelled by a released spring force.**

**Make sure to wear all necessary protective equipment.**

**Follow the recommended procedure and use all recommended tooling to release the spring force.**

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1. Remove C-clip (9) that retains idler gear (3) on idler hub (1).
2. Remove the following items from idler hub (1):
  - Collar (8)
  - Spring (7)

- Shim (6)
  - Oil pump cover (5)
3. Remove idler gear (3) from idler hub (1).
  4. Remove inner rotor (4) from idler hub (1).
  5. Remove thrust washer (2) from idler hub (1).
  6. In order to remove the suction pipe, follow Steps 6.a through 6.d .

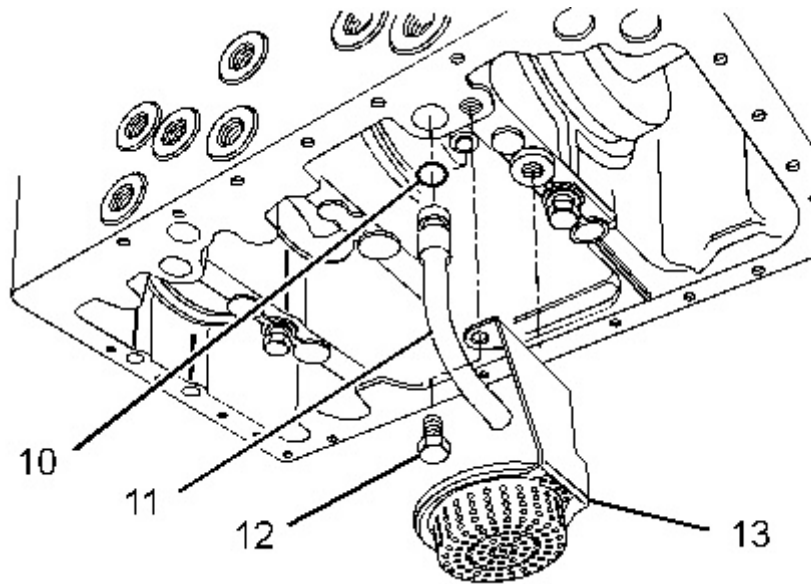


Illustration 2

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- a. Remove the engine oil pan. Refer to Disassembly and Assembly, "Engine Oil Pan - Remove and Install".
- b. Remove bolts (12) and oil strainer (13) from the cylinder block. Inspect the oil strainer for damage. If the oil strainer is damaged, use a new part for replacement.
- c. Remove suction pipe (11) from the cylinder block.
- d. Remove O-ring seal (10) from the suction pipe.

## Idler Hub

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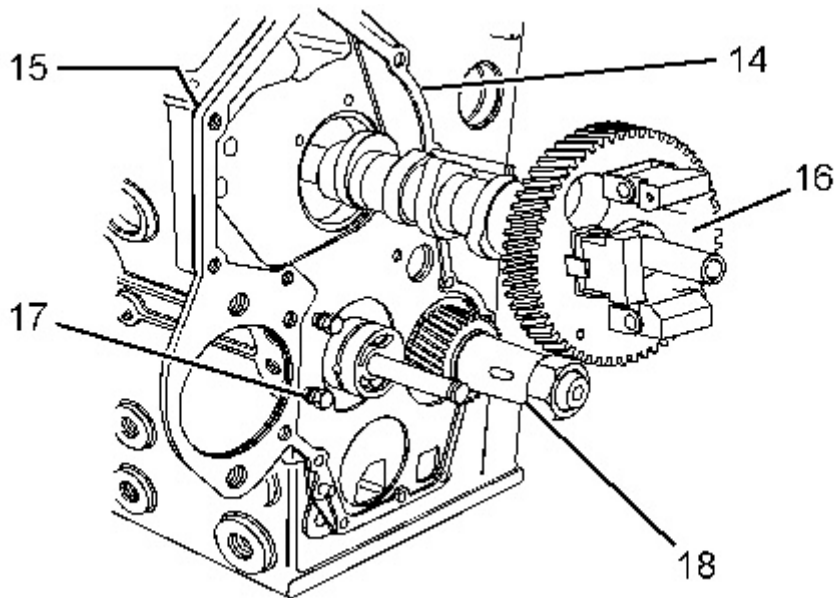


Illustration 3  
Typical example

g01320621

1. Remove camshaft (16). Refer to Disassembly and Assembly, "Camshaft - Remove".
2. Remove bolts (17) and plate (14) from the cylinder block. Remove joint (15).
3. Remove crankshaft (18). Refer to Disassembly and Assembly, "Crankshaft - Remove".

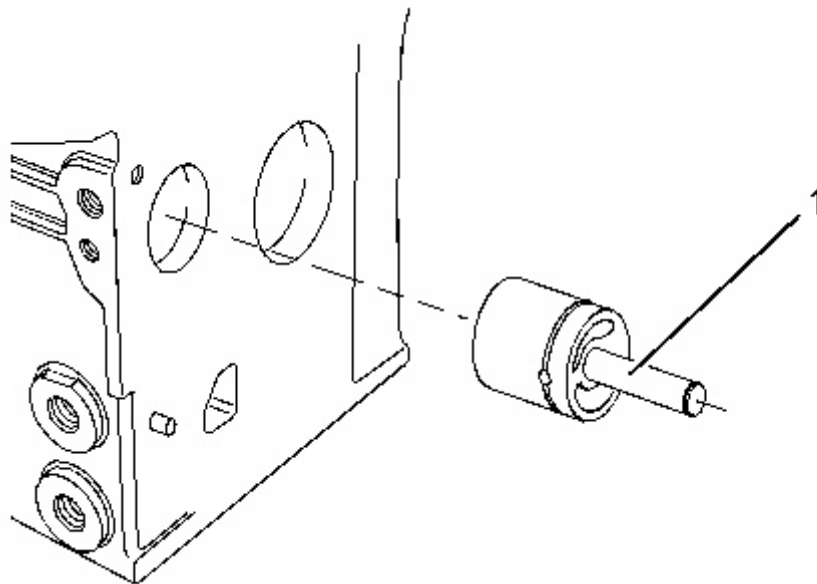


Illustration 4  
Typical example

g01311490

4. Use a hammer and use a suitable drift to remove idler hub (1) from the cylinder block. Align the drift to the rear face of the hub and drive the hub from the inside of the cylinder block outward.



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