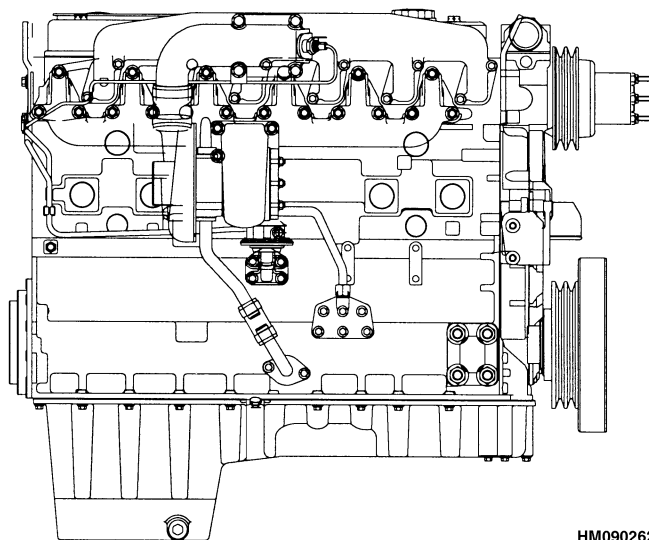


# PERKINS DIESEL ENGINES

1004-42 (AR), 1006-60 (YG), 1006-60T (YH)

H3.50-5.00XL (H70-110XL) [G005];  
S3.50-5.50XL (S70-120XL) [D004];  
H6.00-7.00XL (H135-155XL) [F006];  
S6.00-7.00XL (S135-155XL) [B024];  
H13.00-16.00XL (H300-360XL) [D019];  
H8.00-12.00XL (H165-280XL) [E007];  
H3.50-5.50XM (H70-120XM) [K005];  
H8.00-12.00XM (H170-280HD) [F007];  
H13.00-16.00XM (H300-360HD) [E019];  
H10.00-12.00XM-12EC (H360HD-EC) [E019];  
H3.50-5.50XM (H70-120XM) [E004, F004]



HM090262

# HYSTER

# SAFETY PRECAUTIONS

## MAINTENANCE AND REPAIR

- When lifting parts or assemblies, make sure all slings, chains, or cables are correctly fastened, and that the load being lifted is balanced. Make sure the crane, cables, and chains have the capacity to support the weight of the load.
- Do not lift heavy parts by hand, use a lifting mechanism.
- Wear safety glasses.
- **DISCONNECT THE BATTERY CONNECTOR** before doing any maintenance or repair on electric lift trucks.
- Disconnect the battery ground cable on internal combustion lift trucks.
- Always use correct blocks to prevent the unit from rolling or falling. See **HOW TO PUT THE LIFT TRUCK ON BLOCKS** in the **Operating Manual** or the **Periodic Maintenance** section.
- Keep the unit clean and the working area clean and orderly.
- Use the correct tools for the job.
- Keep the tools clean and in good condition.
- Always use **HYSTER APPROVED** parts when making repairs. Replacement parts must meet or exceed the specifications of the original equipment manufacturer.
- Make sure all nuts, bolts, snap rings, and other fastening devices are removed before using force to remove parts.
- Always fasten a **DO NOT OPERATE** tag to the controls of the unit when making repairs, or if the unit needs repairs.
- Be sure to follow the **WARNING** and **CAUTION** notes in the instructions.
- Gasoline, Liquid Petroleum Gas (LPG), Compressed Natural Gas (CNG), and Diesel fuel are flammable. Be sure to follow the necessary safety precautions when handling these fuels and when working on these fuel systems.
- Batteries generate flammable gas when they are being charged. Keep fire and sparks away from the area. Make sure the area is well ventilated.

**NOTE:** The following symbols and words indicate safety information in this manual:



### **WARNING**

**Indicates a condition that can cause immediate death or injury!**



### **CAUTION**

**Indicates a condition that can cause property damage!**

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This section is for the following models:

H3.50-5.00XL (H70-110XL) [G005];  
S3.50-5.50XL (S70-120XL) [D004];  
H6.00-7.00XL (H135-155XL) [F006];  
S6.00-7.00XL (S135-155XL) [B024];  
H13.00-16.00XL (H300-360XL) [D019];  
H8.00-12.00XL (H165-280XL) [E007];  
H3.50-5.50XM (H70-120XM) [K005];  
H8.00-12.00XM (H170-280HD) [F007];  
H13.00-16.00XM (H300-360HD) [E019];  
H10.00-12.00XM-12EC (H360HD-EC) [E019];  
H3.50-5.50XM (H70-120XM) [E004, F004]



## General

This section has the description and repair instructions for three models of the Series 1000 Perkins diesel engine. The three diesel engines described in this section:

- 1004-42 (AR).....four cylinder, normally aspirated
- 1006-60 (YG).....six cylinder, normally aspirated
- 1006-60T (YH).....six cylinder, turbocharged

### GENERAL SAFETY RULES



#### WARNING

Some seals used in this engine are made of synthetic materials called fluoroelastomers (a commercial name is Viton). These fluoroelastomers can decompose at temperatures greater than 316°C (600°F) or by burning and cause hydrofluoric acid to form on the surface of the seal or nearby equipment.

Do not touch gaskets, seals or O-rings which appear charred or black and sticky after exposure to temperatures greater than 316°C (600°F) or burning. Contact with this acid can cause severe burns of the skin and eyes. Burns can be delayed several hours after contact.

Do the following procedures to prevent exposure to hydrofluoric acid:

- Wear disposable neoprene or PVC gloves and discard the gloves after use.
- Wash the area with 10% calcium hydroxide solution to neutralize any acid and then clean with water.

If burned seal by-product touches the skin or eyes:

- Immediately flush with water for a minimum of 15 minutes.
- Apply 2.5% calcium gluconate gel to affected area of skin.
- Get medical help immediately for suspected hydrogen fluoride or hydrofluoric acid burn.



#### WARNING

Disconnect the battery cables before doing any disassembly and repair of the engine or parts

of the electrical system. Put a "DO NOT OPERATE" tag in the operator's area and on the battery connectors.

Long-term exposure to used engine oil can cause skin irritation or cancer. Wash with detergent and water.

Exhaust from internal combustion engines contains carbon monoxide and other harmful chemicals. Carbon monoxide is a colorless, odorless poison and can cause unconsciousness or death without warning. Long term exposure to exhaust or chemicals in the exhaust can cause cancer, birth defects, and other reproductive harm. Avoid exposure to engine exhaust.

Do not use diesel engines indoors where soot can accumulate.

If engines are operated in confined spaces, maintain adequate ventilation or vent exhaust to the outside. Do not exceed applicable air contaminant limits.

Follow the inspection and maintenance schedule and procedures in this manual. Do not alter exhaust, ignition, or fuel systems.



#### CAUTION

Disposal of lubricants and fluids must meet local environmental regulations.

Disposal of batteries must meet local environmental regulations.

The diodes and resistors in the electrical system can be damaged if the following cautions are not followed:

- Do not disconnect the battery when the engine is running. The voltage surge can damage the diodes and resistors.
- Do not disconnect an electric wire before the engine is stopped and the switches are "OFF".
- Do not cause a short circuit by connection of the electric wires to the wrong terminals. Make sure a correct identification is made of the wire before it is connected.
- Make sure a battery is the correct voltage and polarity before it is connected.

## Description

600 SRM 705

- **Do not check for current flow by making a spark because the electronic components can be damaged.**

**CAUTION**

When setscrews or studs are fitted into holes which are tapped through the cylinder block, a suitable sealant must be used to prevent leakage.

Micro encapsulated anaerobic sealant (M.E.A.S.) fasteners have been introduced instead of jointing compounds or other sealants when the fasteners are fitted in through holes into oil or coolant passages. The

identification of these fasteners, as supplied, is by a red, blue, or other color sealant around the fastener threads.

With M.E.A.S. sealed studs, the sealed end must be fitted into the cylinder head/cylinder block, etc. Ensure that the threaded holes have a 1.59 mm (0.0625 in.) 45° chamfer, to ensure that when the new fasteners are fitted, the M.E.A.S. sealant is not removed. If the fasteners have to be removed and fitted again, the threads must be cleaned and a suitable sealant used.

Observe the previous **WARNINGS** and **CAUTION** before repairing any equipment.

## Description

The cylinder head is cast iron and has one inlet valve and one exhaust valve for each cylinder. The valve seats and the valve guides are replaceable. The fuel injectors are in the cylinder head. The overhead valve assembly is actuated by a camshaft inside of the engine block. A gear train, turned by the crankshaft, turns the camshaft, coolant pump, injection pump, and a power-takeoff (PTO) is available for additional equipment. The hydraulic pump for the steering function or a compressor is normally turned by the PTO. The fuel pump is actuated by the camshaft. See Figure 1 and Figure 2.

The crankshaft in the six-cylinder models have seven main bearings. The crankshaft in the four-cylinder models have five main bearings. The main bearing in the center of the crankshaft is the thrust bearing and has thrust washers on both sides of the bearing.

The cylinder block is cast iron. The six-cylinder engines have cylinder liners that can be replaced during overhaul. The cylinders for the four-cylinder engine are bored directly into the cylinder block.

A Fastram™ combustion chamber in the top of each piston is a design to give an efficient mix of fuel and air. The pistons for the four-cylinder AR engines have two recesses in the top face for the valves. Each

piston has three piston rings (two compression rings, and an oil control ring). The top compression ring has a special insert for the groove to reduce wear. Axial location of the fully floating piston pin is by circlips. The piston pin is off-center to reduce the noise level. A jet for cooling oil to the bottom of the piston is installed. The four-cylinder AR engines have only one cooling jet installed in the number one cylinder.

The cooling fan and the alternator are turned by a drive belt. The cooling fan is not connected to the coolant pump. The coolant pump is turned by the gear for the fuel injection pump in the timing gear case.

The timing and quantity of fuel sent to the fuel injectors is controlled by a throttle and governor in the fuel injection pump. The static timing is set by the position of the fuel injection pump when it is installed. The throttle linkage must be correctly adjusted to control the quantity of fuel sent to the injectors. A mechanical governor is used to control the engine speed.

A Lucas DP200 series fuel injection pump is used on all engines. Special tools are needed to repair an injection pump and they are normally sent to an authorized repair station if repairs are necessary.