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# **Perkins 400 Series**

Models 403C-11, 403C-15, 404C-22 and 404C-22T

## **WORKSHOP MANUAL**

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|-----------------|---|
| <b>403C-11</b>  | <b>Three cylinder naturally aspirated diesel engine</b> |
| <b>403C-15</b>  | <b>Three cylinder naturally aspirated diesel engine</b> |
| <b>404C-22</b>  | <b>Four cylinder naturally aspirated diesel engine</b>  |
| <b>404C-22T</b> | <b>Four cylinder turbo charged diesel engine</b>        |

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**PACE**

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# 1

## General information

### Introduction

This workshop manual has been written to provide assistance for technicians who service and overhaul the Perkins 403C-11, 403C-15, 404C-22 and the 404C-22T engine. The assumption is made that the engine is removed from the application.

The engine conforms with USA EPA/CARB and EC emissions legislation for agricultural and industrial applications.

Where the information applies only to certain engine types, this is indicated in the text.

Special tools are available and listed in chapter 16. POWERPART recommended consumable products are listed in this chapter. There is a reference to the relevant special tools and consumable products at the beginning of each operation.

Danger is indicated in the text by two methods:

**Warning!** *This indicates that there is a possible danger to the person.*

**Caution:** *This indicates that there is a possible danger to the engine.*

**Note:** Is used where the information is important, but there is not a danger.

**Warning!** *Read and remember the "Safety precautions". They are given for your protection and must be used at all times.*

Generally, if new joints are to be fitted, it is accepted that the faces for the joint will be cleaned, as this is normal workshop practice. Also, it is understood that during assembly and inspection, all parts are to be thoroughly cleaned and lubricated, and where present, burrs and scale are to be removed.

All open ports of high-precision components e.g. fuel injection equipment must be covered until assembly, to prevent the entry of foreign matter.

When either the "left" or the "right" side of the engine is referred to, it is when viewed from the flywheel end.

When fitting setscrews or studs into holes that enter oil, coolant or air passages, a suitable sealant should be used to prevent leakage.

Micro encapsulated anaerobic sealant (M.E.A.S.) has been applied to the threads 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 the colour of the sealant.

With M.E.A.S. sealed studs, the sealed end must be fitted into the component. The threaded holes must have a 1,59 mm (0.0625 in) 45° chamfer to ensure that the M.E.A.S. sealant is not removed when the new fasteners are fitted. If the fasteners have to be removed and fitted again, the threads must be cleaned and a suitable sealant used.

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## Safety precautions

**These safety precautions are important.** You must refer also to the local regulations in the country of use. Some items only refer to specific applications

- Only use these engines in the type of application for which they have been designed.
- Do not change the specification of the engine.
- Do not smoke when you put fuel in the tank.
- Clean away fuel which has been spilt. Material which has been contaminated by fuel must be moved to a safe place.
- Do not put diesel fuel in the tank during engine operation (unless it is absolutely necessary).
- Do not add lubricating oil, or adjust the engine while it runs (unless you have had the correct training; even then extreme care must be used to prevent injury).
- Do not make adjustments that you do not understand.
- Ensure that the engine does not run in a location where it can cause a concentration of toxic emissions.
- Other persons must be kept at a safe distance while the engine or auxiliary equipment is in operation.
- Do not permit loose clothing or long hair near moving parts.
- Keep away from moving parts during engine operation. **Warning!** Some moving parts cannot be seen clearly while the engine runs.
- Do not operate the engine if a safety guard has been removed.
- Do not remove the filler cap or any component of the cooling system while the engine is hot and while the coolant is under pressure, because dangerous hot coolant can be discharged.
- Do not allow sparks or fire near the batteries (especially when the batteries are on charge) because the gases from the electrolyte are highly flammable. The battery fluid is dangerous to the skin and especially to the eyes.
- Disconnect the battery terminals before a repair is made to the electrical system.
- Only one person must control the engine.
- Ensure that the engine is operated only from the control panel or from the operators position.
- If your skin comes into contact with high-pressure fuel, obtain medical assistance immediately.
- Diesel fuel and lubricating oil (especially used lubricating oil) can damage the skin of certain persons. Protect your hands with gloves or a special solution to protect the skin.
- Do not wear clothing which is contaminated by lubricating oil. Do not put material which is contaminated with oil into the pockets of clothing.
- Discard used lubricating oil in accordance with local regulations to prevent contamination.
- Ensure that the control lever of the transmission drive is in the "out-of-drive" position before the engine is started.
- Use extreme care if emergency repairs must be made in adverse conditions.
- The combustible material of some components of the engine (for example certain seals) can become extremely dangerous if it is burned. Never allow this burnt material to come into contact with the skin or with the eyes.
- Always use a safety cage to protect the operator when a component is to be pressure tested in a container of water. Fit safety wires to secure the plugs which seal the hose connections of a component which is to be pressure tested.
- Do not allow compressed air to contact your skin. If compressed air enters your skin, obtain medical help immediately.
- Turbochargers operate at high speed and at high temperatures. Keep fingers, tools and debris away from the inlet and outlet ports of the turbocharger and prevent contact with hot surfaces.
- Do not clean an engine while it runs or while it is hot. If cold cleaning fluids are applied to a hot engine, certain components on the engine could be damaged.
- Fit only genuine Perkins parts.

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**Viton seals****Warnings!**

- *Some seals used in engines and in components fitted to engines are made of Viton. Viton is used by many manufactures and is a safe material under normal conditions of operation. If Viton is burned, a product of this burnt material is an acid which is extremely dangerous. Never allow this burnt material to come into contact with the skin or with the eyes. If it is necessary to come into contact with components which have been burnt, ensure that the precautions which follow are used:*
- *Ensure that the components have cooled.*
- *Use Neoprene gloves and discard the gloves safely after use.*
- *Wash the area with calcium hydroxide solution and then with clean water.*
- *Disposal of components and gloves which are contaminated must be in accordance with local regulations.*

If there is contamination of the skin or eyes, wash the affected area with a continuous supply of clean water or with calcium hydroxide solution for 15 - 60 minutes. **Obtain immediate medical attention.**

**Safety cautions when an engine is cleaned**

Care should be taken, when an engine is cleaned with a high pressure cleaning system.

**Cautions:**

- *Do not wash an engine while it runs or while it is hot. If cold cleaning fluids are applied to a hot engine, certain components on the engine could be damaged.*
- *Leave the engine to cool for at least one hour and disconnect the battery connections before cleaning.*
- *Do not wash any part of the fuel injection pump (FIP), cold start device, electrical shut off solenoid (ESOS) or electrical connectors.*
- *Ensure that the alternator, starter motor and any other electrical components are shielded and not directly cleaned by the high pressure cleaning system.*

If these cautions are ignored, the engine or certain components could be damaged, fail to operate and also make the manufacturer's warranty invalid.

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**POWERPART recommended consumable products**

Perkins have made available the products recommended below in order to assist in the correct operation, service and maintenance of your engine and your machine. The instructions for the use of each product are given on the outside of each container. These products are available from your Perkins distributor.

**POWERPART Antifreeze**

Protects the cooling system against frost and corrosion.

Part number 21825166.

**POWERPART Easy Flush**

Cleans the cooling system.

Part number 21825001.

**POWERPART Gasket and flange sealant**

To seal flat faces of components where no joint is used. Especially suitable for aluminium components.

Part number 21820518.

**POWERPART Gasket remover**

An aerosol for the removal of sealants and adhesives.

Part number 21820116.

**POWERPART Griptite**

To improve the grip of worn tools and fasteners.

Part number 21820129.

**POWERPART Hydraulic threadseal**

To retain and seal pipe connections with fine threads. Especially suitable for hydraulic and pneumatic systems.

Part number 21820121.

**POWERPART Industrial grade super glue**

Instant adhesive designed for metals, plastics and rubbers.

Part number 21820125.

**POWERPART Lay-Up 1**

A diesel fuel additive for protection against corrosion.

Part number 1772204.

**POWERPART Lay-Up 2**

Protects the inside of the engine and of other closed systems.

Part number 1762811.

**POWERPART Lay-Up 3**

Protects outside metal parts.

Part number 1734115.

**POWERPART Metal repair putty**

Designed for external repair of metal and plastic.

Part number 21820126.

**POWERPART Pipe sealant and sealant primer**

To retain and seal pipe connections with coarse threads. Pressure systems can be used immediately.

Part number 21820122.

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