
Q650 - Motor Plants

1. An air box fire on a turbocharged, two-stroke cycle main propulsion engine as fitted on your general purpose supply vessel can cause the destruction of a turbocharger due to overheat and overspeed. Upon inspection, besides blistering of paint on handhole covers, what is distinctive evidence that an air box fire had occurred?

- The complete absence of any residue or accumulations.
- **The presence of white ash residue within the air box.**
- The presence of heavy oil accumulations within the air box.
- The presence of heavy soot accumulations within the air box.

Note:
White ash residue indicates complete combustion of oil and deposits, confirming a prior air box fire. This contrasts with the presence of oil, sludge, or soot, which suggest incomplete combustion or fouling, not a fire.

---

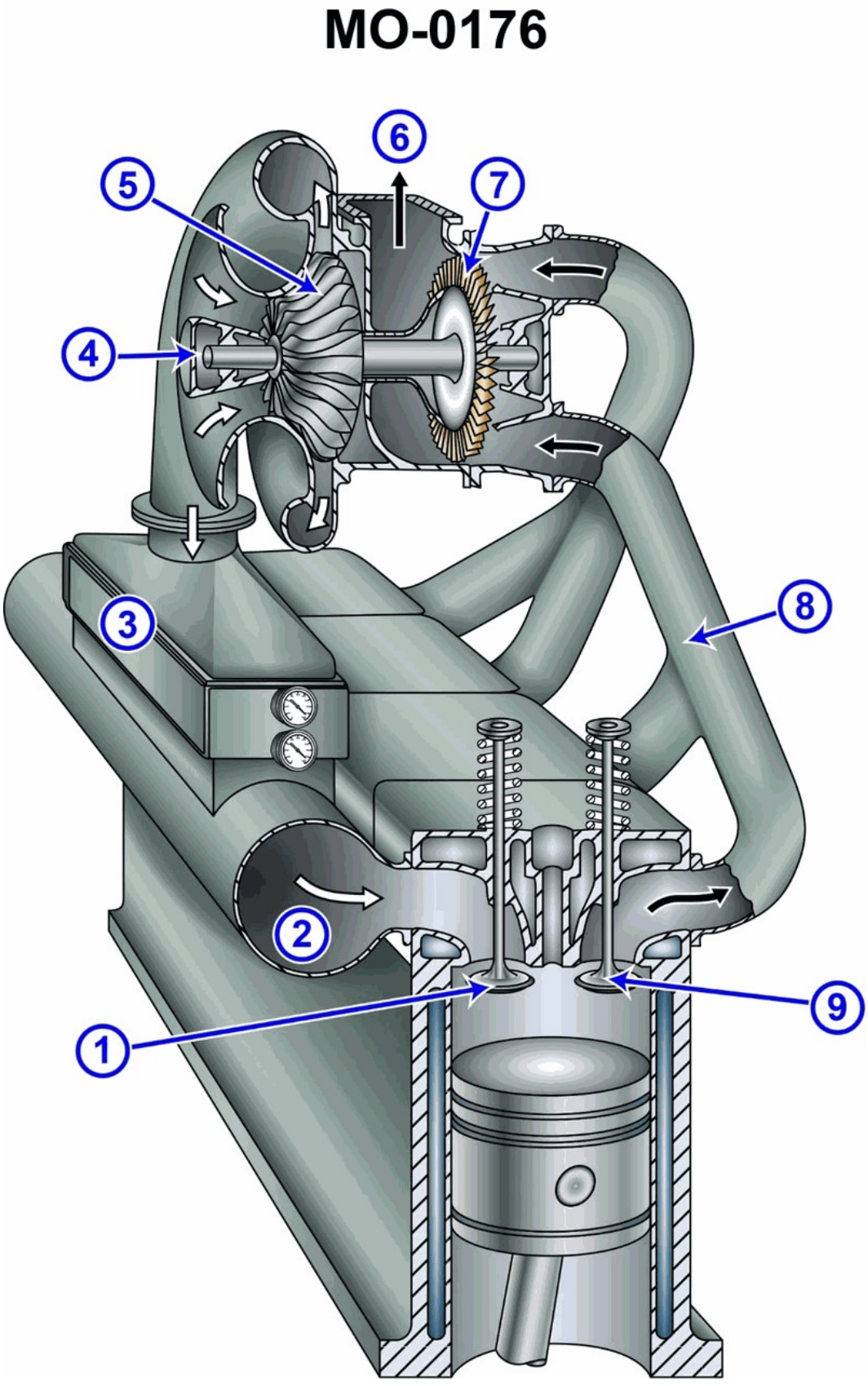
2. You are analyzing the data used for trend analysis for one of the main propulsion diesel engines on the OSV to which you are assigned. The cylinder exhaust temperature of one of the cylinders is significantly lower than the others. When analyzing compression and firing pressure data, however, the numbers are within the normal range for this particular cylinder. What condition would produce these results?

- **Excessive carbon build-up on exhaust pyrometer probe of affected cylinder**
- Excessive carbon build-up on air inlet ports or valves of affected cylinder
- Leaking exhaust valve on affected cylinder
- Leaking fuel injector needle valve for affected cylinder

Note:
Carbon build-up on the exhaust pyrometer probe can cause a falsely low exhaust temperature reading while maintaining normal cylinder compression and firing pressure.

---

3. The anchor handling supply vessel to which you are assigned has diesel generator engines fitted with intake and exhaust systems as shown in the illustration. What type of turbo-charging configuration is used



- Boost-controlled turbocharging
- Constant pressure turbocharging

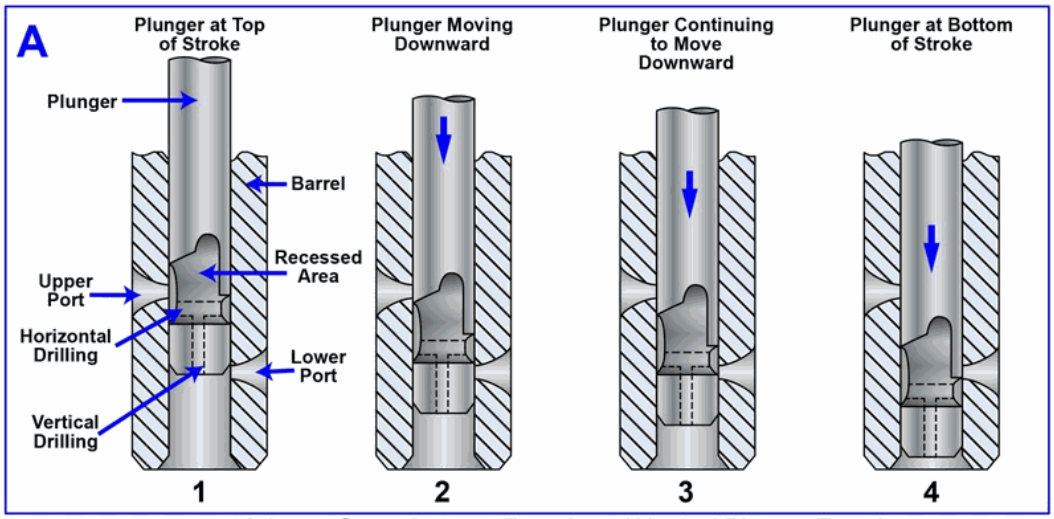
- 2-stage turbocharging
- **Pulse turbocharging**

Note:
The illustration depicts individual exhaust runners directly feeding the turbine, characteristic of pulse turbocharging. This configuration preserves exhaust pulses for turbine energy, differentiating it from constant pressure systems which use a common manifold to smooth pulses, and two-stage systems which utilize multiple turbochargers. Boost control refers to pressure regulation, not the exhaust manifold layout.

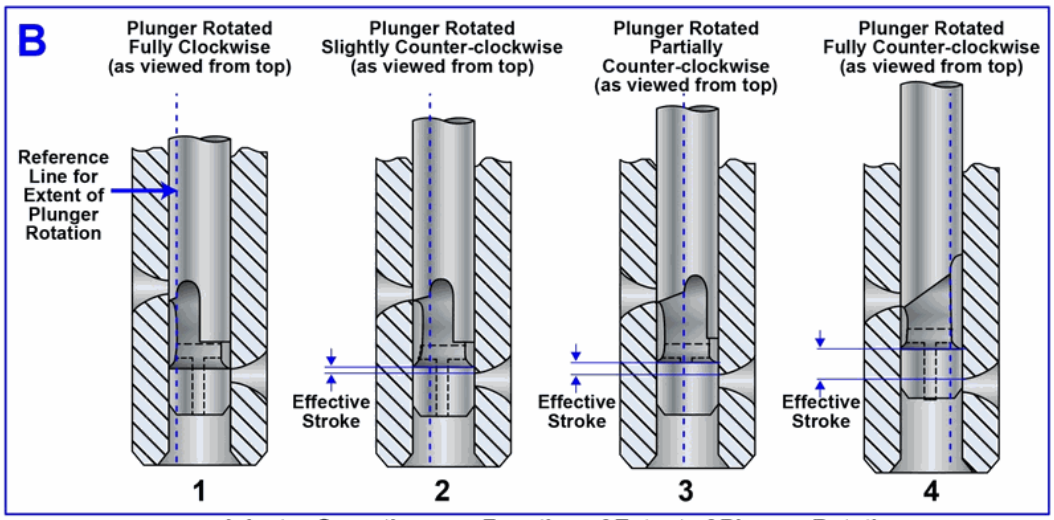
---

4. The river push boat to which you are assigned has diesel generators fitted with fuel injectors with the operating principle as shown in the illustration. In figure "B" which plunger rotation position corresponds to the engine running under no load at idle RPM

MP-FI-12



Injector Operation as a Function of Vertical Plunger Travel

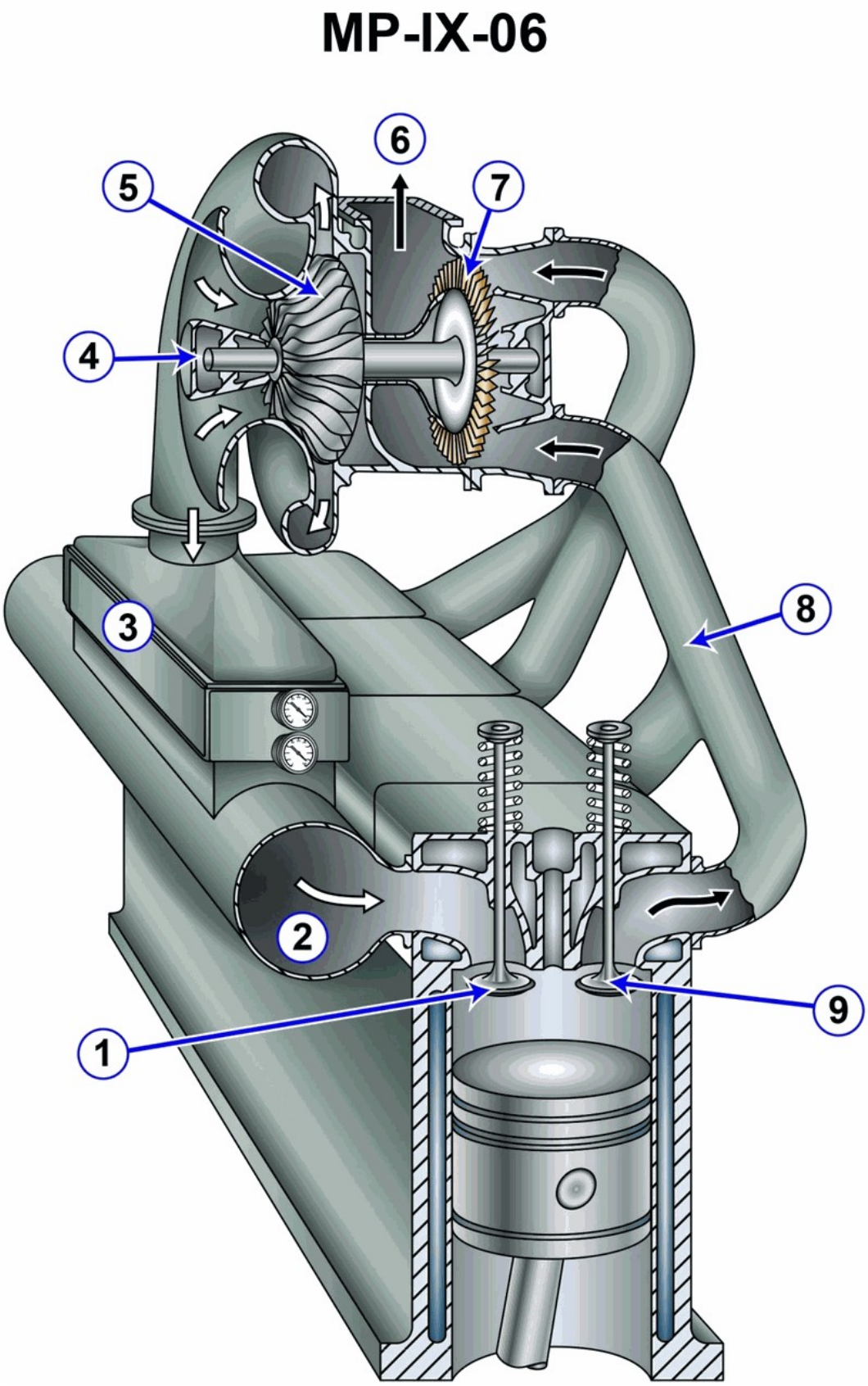


Injector Operation as a Function of Extent of Plunger Rotation

- 1
- **2**
- 3
- 4

Note:
Position 2 corresponds to no-load idle because it provides a minimal, non-zero fuel quantity by limiting the effective stroke.

5. The river push boat to which you are assigned has diesel generators fitted with intake and exhaust systems as shown in the illustration. What does the component labeled "3" represent



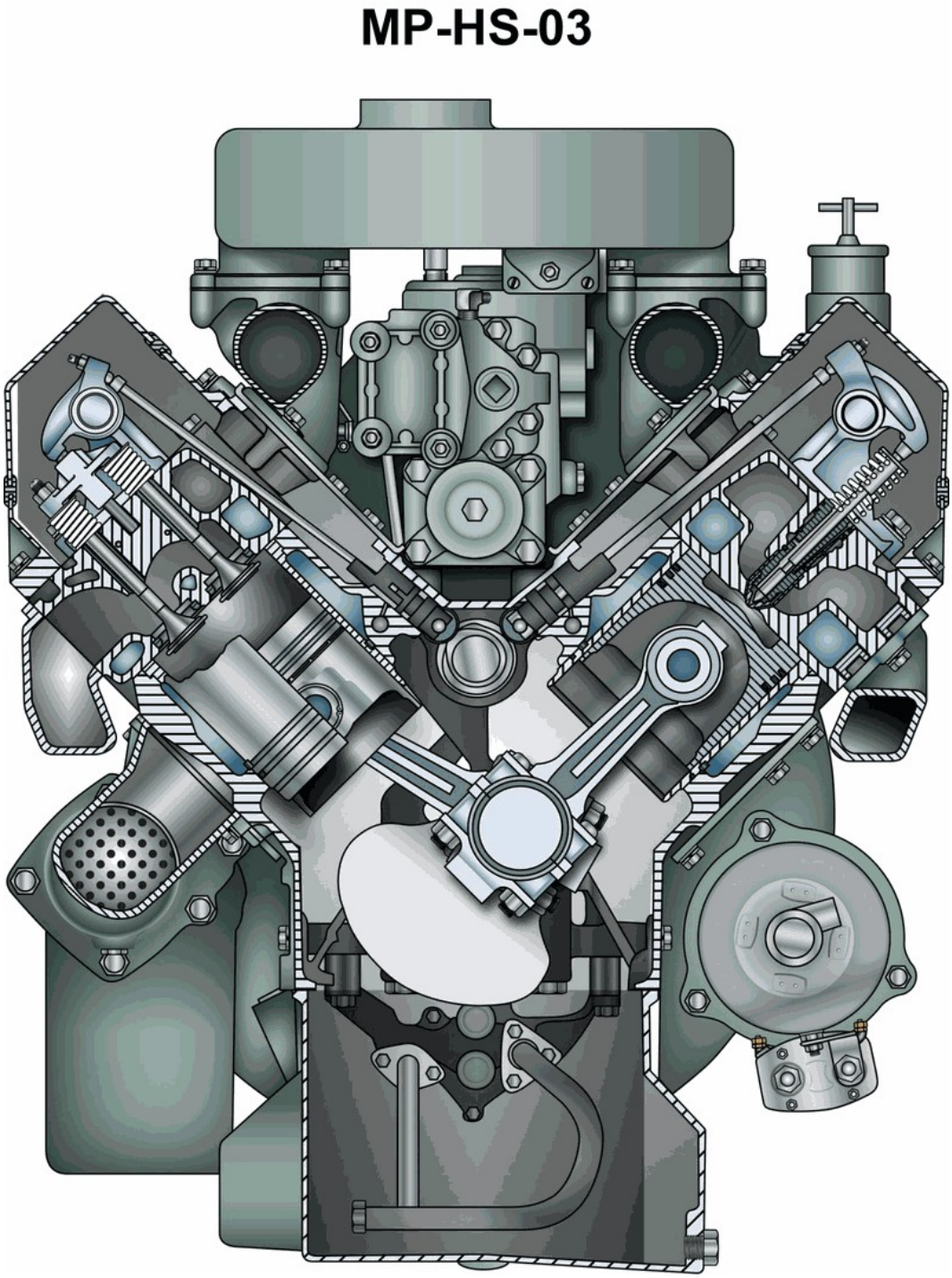
- Wet muffler
- **Charge air cooler**
- Charge air manifold

- Exhaust manifold

Note:
The component labeled '3' is a charge air cooler, positioned in the intake path after the turbocharger compressor to cool the compressed air and increase its density before it enters the engine cylinders.

---

6. The anchor handling vessel to which you are assigned is fitted with generator drive engines of the type shown in the illustration. In terms of operating cycle and cylinder configuration, what statement is true

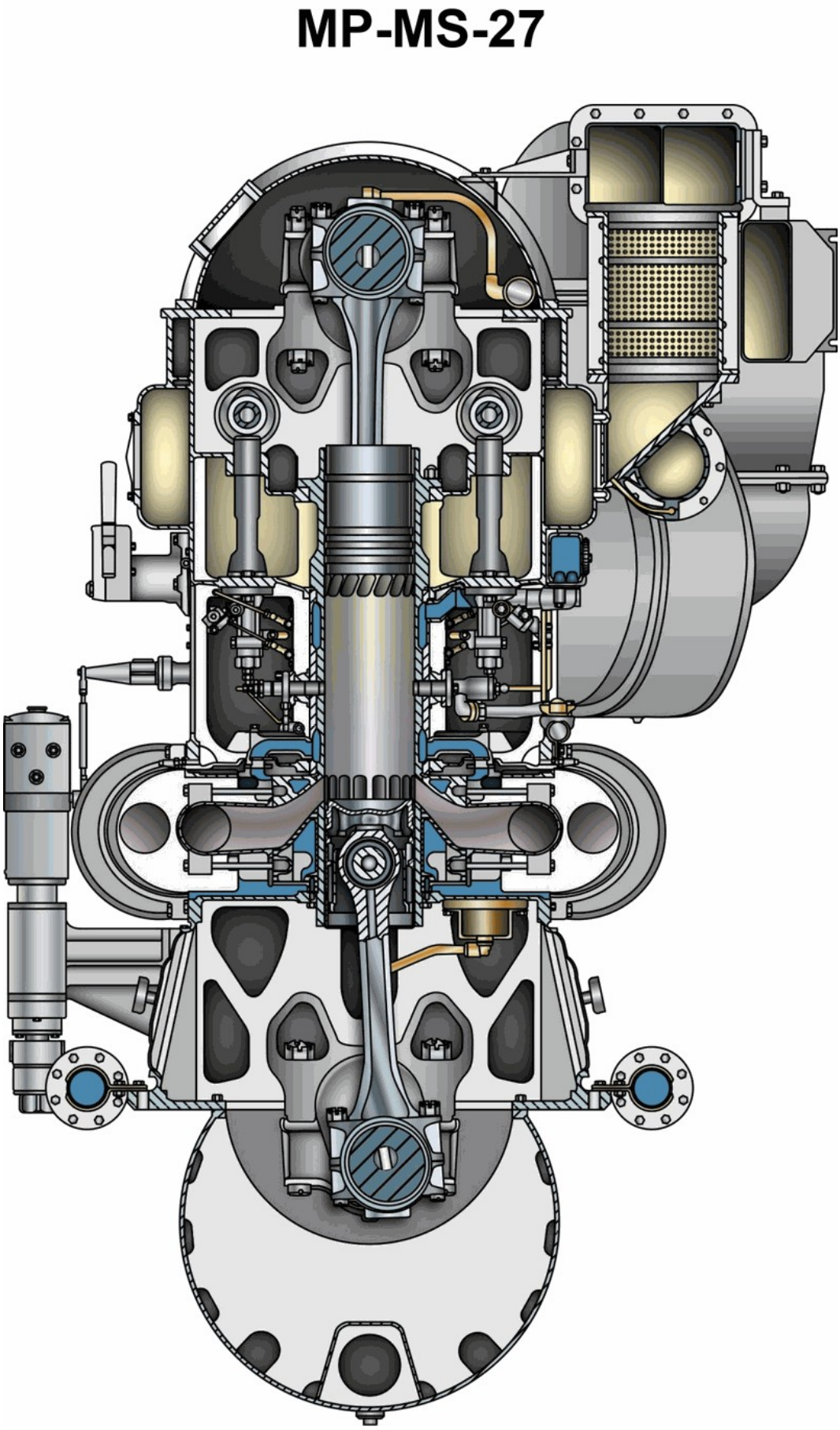


- This is a two-stroke cycle, 90° V-type engine
- This is a four-stroke cycle, 90° V-type engine
- This is a four-stroke cycle, 60° V-type engine
- **This is a two-stroke cycle, 60° V-type engine**

Note:
The engine is a two-stroke cycle with a 60 V-type configuration, as evidenced by the scavenge ports in the cylinder liner and the narrow angle between the cylinder banks.

---

7. The fishing industry factory ship to which you are assigned has a main propulsion engine of the type shown in the illustration. In terms of piston action, operating cycle, and piston type, what statement is true concerning this engine type



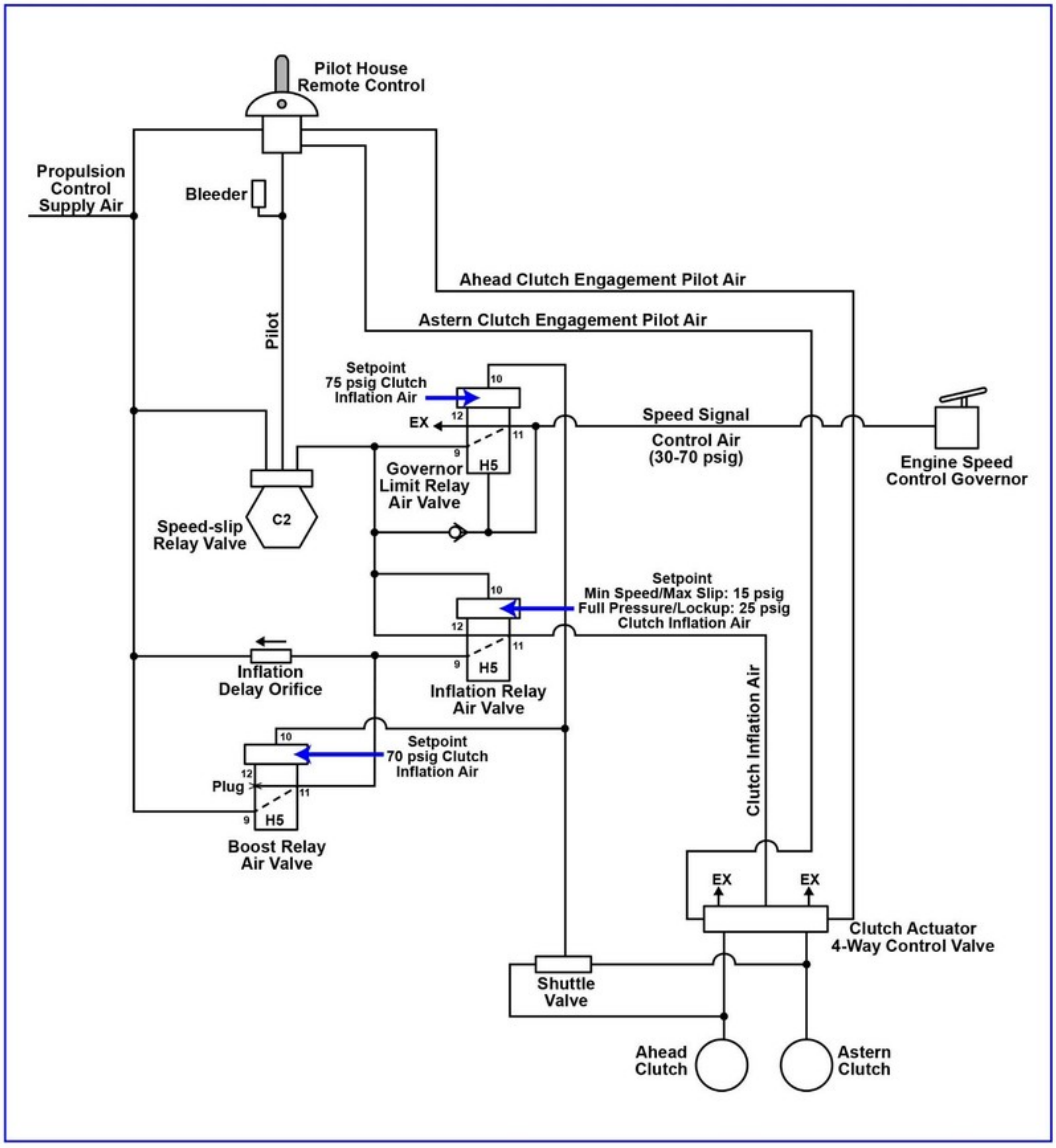
- This is a double-acting, four-stroke cycle, opposed piston type engine.
- **This is a single-acting, two-stroke cycle, opposed piston type engine.**
- This is a double-acting, two-stroke cycle, crosshead piston type engine.
- This is a single-acting, two-stroke cycle, crosshead piston type engine.

Note:
The engine features two pistons within a single cylinder, combustion occurring between their crowns, and utilizes ports for intake and exhaust, indicating a single-acting, two-stroke cycle, opposed-piston design. This configuration distinguishes it from engines with cylinder heads, crosshead pistons, or double-acting mechanisms, and the presence of ports and a blower confirms the two-stroke cycle.

---

8. The anchor handling vessel to which you are assigned has a pneumatic propulsion control system as shown in the illustration. Which control valve is responsible for by-passing the inflation delay orifice to insure rapid and positive reversals and to protect the clutches from excessive slip

MP-IC-08

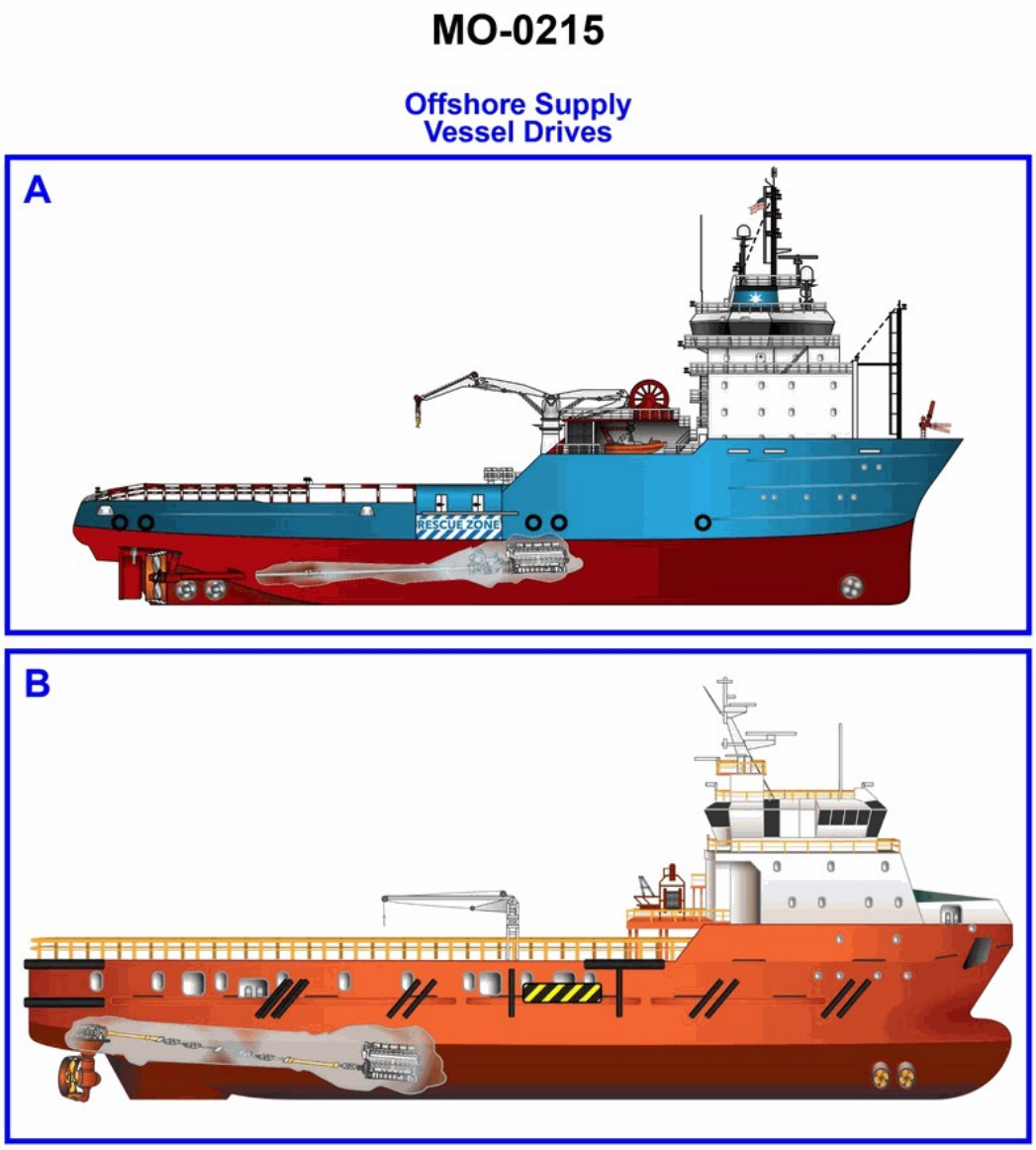


- **H5 boost relay air valve**
- C2 speed-slip relay valve
- H5 inflation air relay valve
- H5 governor limit relay air valve

Note:
The H5 boost relay air valve bypasses the inflation delay orifice to enable rapid reversals and protect clutches from slip. This valve provides an alternate, unrestricted path for air, circumventing the orifice's restrictive effect during reversals or when fast clutch engagement is needed. Other valves control different aspects of the system and do not provide this bypass function.

---

9. You are assigned to an anchor handling supply vessel with a propulsion system as shown in figure "B" of the illustration. What type of propulsion system is illustrated

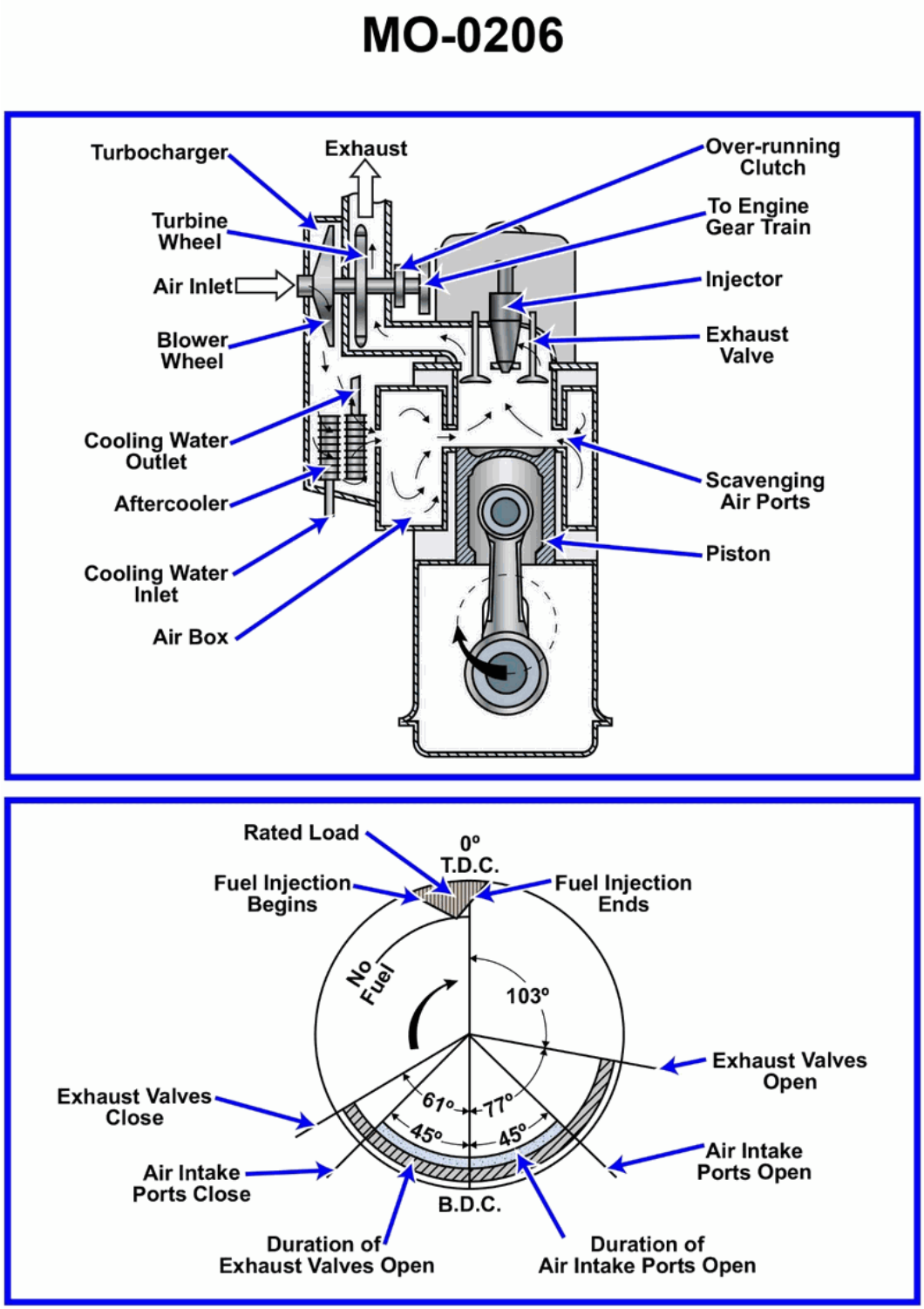


- **<u>Schottel-azimuthing drive (z-drive)</u>**
- Conventional fixed pitch propeller
- Controllable pitch propeller
- Voith-Schneider drive

Note:
The illustration depicts a Schottel-azimuthing drive (z-drive) due to the presence of fully rotatable azimuth thruster units under the stern without a rudder, which is characteristic of this propulsion system.

---

10. You are assigned to a river push boat fitted with main propulsion diesel engines operating on the cycle represented in the polar timing diagram shown in the illustration. What combustion cycle event has a duration of 103°



- Intake
- Exhaust
- **Power**
- Compression

Note:
The 103 duration on the timing diagram represents the power stroke, occurring from top dead center to the point where exhaust valves open in this two-stroke diesel engine.