

## U.S.C.G. Merchant Marine Exam

DDE-1000/4000 HP

Q630 Motor Plants

(Sample Examination)

**Choose the best answer to the following Multiple Choice Questions**

1. The theoretical minimum compression ratio necessary to ensure compression ignition in a direct injection diesel engine is \_\_\_\_\_.

- (A) 10:1
- (B) 12:1
- (C) 16:1
- (D) 20:1

*If choice B is selected set score to 1.*

2. The highest indicated lube oil pressure in a diesel engine should be expected when the engine oil is \_\_\_\_\_.

- (A) cold at idle
- (B) warm at idle
- (C) warm at full speed
- (D) warm at full speed and no fuel dilution exists

*If choice A is selected set score to 1.*

3. The part labeled "E", as shown in the illustration, is the \_\_\_\_\_. Illustration MO-0040

- (A) connecting rod bushing
- (B) bearing shell
- (C) connecting rod cap
- (D) piston pin bushing

*If choice C is selected set score to 1.*

4. Because of the close tolerances used in diesel engine fuel oil pumps, a worn plunger requires \_\_\_\_\_.

- (A) grinding the spare plunger to the barrel
- (B) replacing the plunger and the barrel
- (C) highly polishing both the plunger and barrel
- (D) replacing plunger only

*If choice B is selected set score to 1.*

5. The proper location for journal bearing oil grooves is \_\_\_\_\_.

- (A) in the region of the load bearing surface
- (B) as a side relief where the two shells meet
- (C) at the bottom of the bearing
- (D) halfway between bottom and where shells meet

*If choice B is selected set score to 1.*

6. In an auxiliary diesel engine, one reason for knurling the piston skirt is to \_\_\_\_\_.

- (A) improve skirt lubrication
- (B) allow for heat expansion
- (C) transmit forces evenly
- (D) improve the piston seal

*If choice A is selected set score to 1.*

7. In a modern internal combustion diesel engine, the load carrying part of the engine is referred to as the \_\_\_\_\_.

- (A) bedplate or base
- (B) sump or oil pan
- (C) cylinder block
- (D) frame

*If choice A is selected set score to 1.*

8. A decrease in the flash point of diesel engine lube oil indicates the lube oil has become \_\_\_\_\_.

- (A) contaminated with sludge
- (B) contaminated with carbon
- (C) diluted with fuel oil
- (D) diluted with water

*If choice C is selected set score to 1.*

9. The expansion tank for a diesel engine closed cooling system is designed to maintain a constant head on the system and \_\_\_\_\_.

- (A) provide an air-cushion
- (B) reduce water turbulence
- (C) allow for an increase in water volume as the engine warms up
- (D) reduce water temperature

*If choice C is selected set score to 1.*

10. The principal hazard to personnel when using a diesel engine fuel nozzle tester is \_\_\_\_\_.

- (A) electrical shock
- (B) toxic fumes
- (C) explosion
- (D) blood poisoning

*If choice D is selected set score to 1.*

**11.** Electric starting motors for diesel engines require high current for operation and \_\_\_\_\_.

- (A) require a generator as a source of power
- (B) will carry a 100% overload for a brief period
- (C) require a current/voltage regulator for proper operation
- (D) will overheat if operated continuously over 10 seconds

*If choice B is selected set score to 1.*

**12.** In the starting process of a diesel engine, the main object is to attain the compression conditions sufficient to \_\_\_\_\_.

- (A) turn the flywheel
- (B) reduce friction
- (C) overcome inertia
- (D) ignite the fuel

*If choice D is selected set score to 1.*

**13.** Which lubricating oil additive is used in diesel engines to reduce the tendency for sludge and varnish to form on the engine parts?

- (A) Flash point improvers
- (B) Pour point improvers
- (C) Inhibitors
- (D) Foam suppressors

*If choice C is selected set score to 1.*

**14.** A diesel engine exposed to widely varying ambient temperatures should use lubricating oil with \_\_\_\_\_.

- (A) a high viscosity index
- (B) a low viscosity index
- (C) extreme pressure additives
- (D) no additives

*If choice A is selected set score to 1.*

**15.** The water inlet manifold for the diesel engine shown in the illustration is represented by the letter or number \_\_\_\_\_ . Illustration MO-0122

- (A) "M"
- (B) "N"
- (C) "W"
- (D) "13"

*If choice B is selected set score to 1.*

**16.** Auxiliary diesel engines can be automatically shut down as a result of \_\_\_\_\_.

- (A) low lube oil temperature
- (B) low lube oil pressure
- (C) high exhaust temperature
- (D) high cooling water pressure

*If choice B is selected set score to 1.*

**17.** The over speeding of the diesel engine driving an electric generator could cause \_\_\_\_\_.

- (A) low voltage trip to trip
- (B) reverse power trip to trip
- (C) damage to the field windings
- (D) excessive exhaust temperatures

*If choice C is selected set score to 1.*

**18.** In addition to the main starting air compressor, another air compressor, driven by a separate power source, is installed to \_\_\_\_\_.

- (A) provide air for engine scavenging
- (B) provide air for engine supercharging
- (C) supply a backup source of starting air
- (D) supply the independent source of reversing air

*If choice C is selected set score to 1.*

**19.** A magnetic strainer is primarily used in diesel engine reduction gear oil systems to remove small particles of \_\_\_\_\_.

- (A) copper
- (B) Babbitt
- (C) ferrous materials
- (D) acidic materials

*If choice C is selected set score to 1.*

**20.** Fuel injector nozzles are usually of the multi-orifice type with the number and placement of the holes arranged according to the \_\_\_\_\_.

- (A) type of piston rings
- (B) pressure of the fuel system
- (C) size of the pump plunger spring
- (D) design of the combustion chamber

*If choice D is selected set score to 1.*

**21.** Hydraulic couplings will transmit torque equal to the input torque by means of energy changes in a rotating vortex of liquid. For the vortices to form there must be \_\_\_\_\_.

- (A) slip between the impeller and runner
- (B) less than 2 percent slip between the impeller and runner
- (C) axial thrust generated by the runner pinion shaft
- (D) momentary torsional vibration transmitted by the driving impeller

*If choice A is selected set score to 1.*

**22.** How many separate camshaft timing events must be controlled for the components of an air start cylinder head for a direct reversible, four-stroke diesel engine?

- (A) 4
- (B) 6
- (C) 7
- (D) 8

*If choice D is selected set score to 1.*

**23.** In a diesel engine exhaust system, the cooling of the exhaust gases below their dew point will result in \_\_\_\_\_.

- (A) increased engine back pressure
- (B) sulfuric acid corrosion
- (C) surface pitting of the turbocharger compressor blades
- (D) moisture impingement on the turbocharger compressor blading

*If choice B is selected set score to 1.*

**24.** The cetane number rates fuels for diesel engines according to its \_\_\_\_\_.

- (A) antiknock characteristics
- (B) ignition qualities
- (C) rates of vaporization
- (D) viscosity

*If choice B is selected set score to 1.*

**25.** Maintaining the proper fuel oil temperature will result in \_\_\_\_\_.

- (A) the elimination of valve wear
- (B) improved atomization
- (C) a decrease in cylinder blow-by
- (D) a decrease in cylinder mean effective pressure

*If choice B is selected set score to 1.*

**26.** If a hydraulic governor has been refilled with oil, the engine should be operated until it reaches normal temperature, then the air should be purged, and the \_\_\_\_\_.

- (A) rack position should be adjusted
- (B) compensating needle valve should be opened fully
- (C) compensating needle valve should be adjusted to stabilize operation
- (D) speed limiting device should be adjusted

*If choice C is selected set score to 1.*

**27.** Which of the air intake systems listed will result in the lowest specific fuel consumption?

- (A) Natural aspiration
- (B) Turbocharged
- (C) Roots blower
- (D) Piston blower

*If choice B is selected set score to 1.*

**28.** The injector rack of the diesel engine shown in the illustration is indicated by the component labeled \_\_\_\_\_ . Illustration MO-0122

- (A) "B"
- (B) "E"
- (C) "F"
- (D) "G"

*If choice D is selected set score to 1.*

**29.** Which of the terms listed below represents the operational speed at which excessive engine vibration is created?

- (A) Non-harmonic speed.
- (B) Critical speed.
- (C) Maximum speed.
- (D) Design maximum speed.

*If choice B is selected set score to 1.*

**30.** The main engine thrust bearing shown in the illustration contains how many thrust shoes? Illustration MO-0121

- (A) 6
- (B) 10
- (C) 12
- (D) 20

*If choice C is selected set score to 1.*

**31.** Which segment of the two-stroke cycle engine diagram shown in the illustration represents the exhaust event? Illustration MO-0037

- (A) I
- (B) II
- (C) III
- (D) IV

*If choice D is selected set score to 1.*

**32.** The formation of carbon monoxide in diesel exhaust gases is reduced by \_\_\_\_\_.

- (A) spraying water into the exhaust pipe
- (B) keeping the exhaust system free of carbon deposits
- (C) maintaining proper combustion and scavenging
- (D) avoiding light load operation

*If choice C is selected set score to 1.*

**33.** The process of scavenging a two-stroke cycle diesel engine serves to \_\_\_\_\_.

- (A) improve fuel flow volume
- (B) cool the exhaust valves
- (C) reduce the intake air charge density
- (D) increase the temperature of exhaust gases

*If choice B is selected set score to 1.*

**34.** The pressure-volume diagrams illustrated are of four internal combustion engine cycles. Which one represents the theoretical diesel cycle? Illustration MO-0102

- (A) A
- (B) B
- (C) C
- (D) D

*If choice B is selected set score to 1.*

**35.** The exhaust system for a turbocharged diesel engine functions to \_\_\_\_\_.

- (A) power the after coolers
- (B) power the turbocharger
- (C) reduce the cylinder scavenge effect
- (D) cool the turbocharger

*If choice B is selected set score to 1.*

**36.** In the diesel engine shown in the illustration, which of the following statements is true? Illustration MO-0005

- (A) The engine utilizes wet cylinder liners.
- (B) The camshaft turns at half the speed of the crankshaft.
- (C) The intake valves are operated with a valve bridge.
- (D) All of the above.

*If choice D is selected set score to 1.*

**37.** Trunk-type diesel engine pistons are most effectively cooled by heat \_\_\_\_\_.

- (A) conducted through the engine block
- (B) conducted to water-cooled cylinder walls
- (C) conducted through the piston crown
- (D) losses to escaping exhaust gases

*If choice B is selected set score to 1.*

**38.** The pinion of an auxiliary diesel-electric starting motor normally engages the flywheel ring gear by means of a/an \_\_\_\_\_.

- (A) automatic follow-up
- (B) magnetic type coupling
- (C) muff coupling and release
- (D) Bendix drive or similar mechanism

*If choice D is selected set score to 1.*

**39.** Starting air check valves are held firmly on their seats by \_\_\_\_\_.

- (A) cam rollers on the camshaft
- (B) spring force
- (C) air pressure on top of the valve differential piston
- (D) air pressure on the bottom of the valve differential piston

*If choice B is selected set score to 1.*

**40.** The diesel engine component labeled "5", shown in the illustration is known as the \_\_\_\_\_. Illustration MO-0122

- (A) heat sink space
- (B) piston crown
- (C) connecting rod end assembly
- (D) piston thrust washer

*If choice D is selected set score to 1.*

**41.** Whether using a centrifuge or a simple filter, oil cleaning and filtration will be the most effective when the oil is at a \_\_\_\_\_.

- (A) high temperature and a high viscosity
- (B) high temperature and a low viscosity
- (C) low temperature and a high viscosity
- (D) low temperature and a low viscosity

*If choice B is selected set score to 1.*

**42.** When a hydraulic valve lifter is on the base circle of the cam, "zero" valve lash is maintained by the \_\_\_\_\_.

- (A) valve spring
- (B) plunger spring
- (C) oil pressure
- (D) rocker arm

*If choice B is selected set score to 1.*

**43.** Which of the devices listed is installed on a diesel engine to isolate some of the crankshaft vibrations caused by rotational and reciprocating forces?

- (A) Planetary gear set
- (B) Torsional vibration damper
- (C) Friction clutch
- (D) Air bladder clutch

*If choice B is selected set score to 1.*

**44.** Sensitivity for a diesel engine governor is described as the \_\_\_\_\_.

- (A) governor's speed droop response to variations in engine load
- (B) ability to maintain desired engine speed without speed fluctuation
- (C) percent of speed change necessary for corrective action by the fuel control
- (D) ability to maintain constant speed regardless of engine load

*If choice C is selected set score to 1.*

**45.** Fuel injection systems are designed to primarily meter fuel, atomize fuel and \_\_\_\_\_.

- (A) create turbulence in the combustion chamber
- (B) aid in completing cylinder scavenging
- (C) inject fuel at the proper time
- (D) minimize fuel penetration into the cylinder

*If choice C is selected set score to 1.*

**46.** To minimize corrosion, fuel oil strainer disks, spacers and scraper blades are made of \_\_\_\_\_.

- (A) brass
- (B) copper
- (C) iron
- (D) monel metal or stainless steel

*If choice D is selected set score to 1.*

**47.** In a two-stroke cycle diesel engine, a Roots-type blower is usually \_\_\_\_\_.

- (A) gear driven by the engine
- (B) driven by an exhaust gas turbine
- (C) actuated by the intake valves
- (D) driven by separate motor

*If choice A is selected set score to 1.*

**48.** Which letter represents the exhaust gas exit point for the diesel engine shown in the illustration?  
Illustration MO-0122

- (A) "K"
- (B) "J"
- (C) "N"
- (D) "V"

*If choice D is selected set score to 1.*

**49.** Cooling the intake air supplied to a diesel engine will \_\_\_\_\_.

- (A) reduce mean effective pressure
- (B) decrease average compression ratio
- (C) decrease air charge density
- (D) increase peak power output

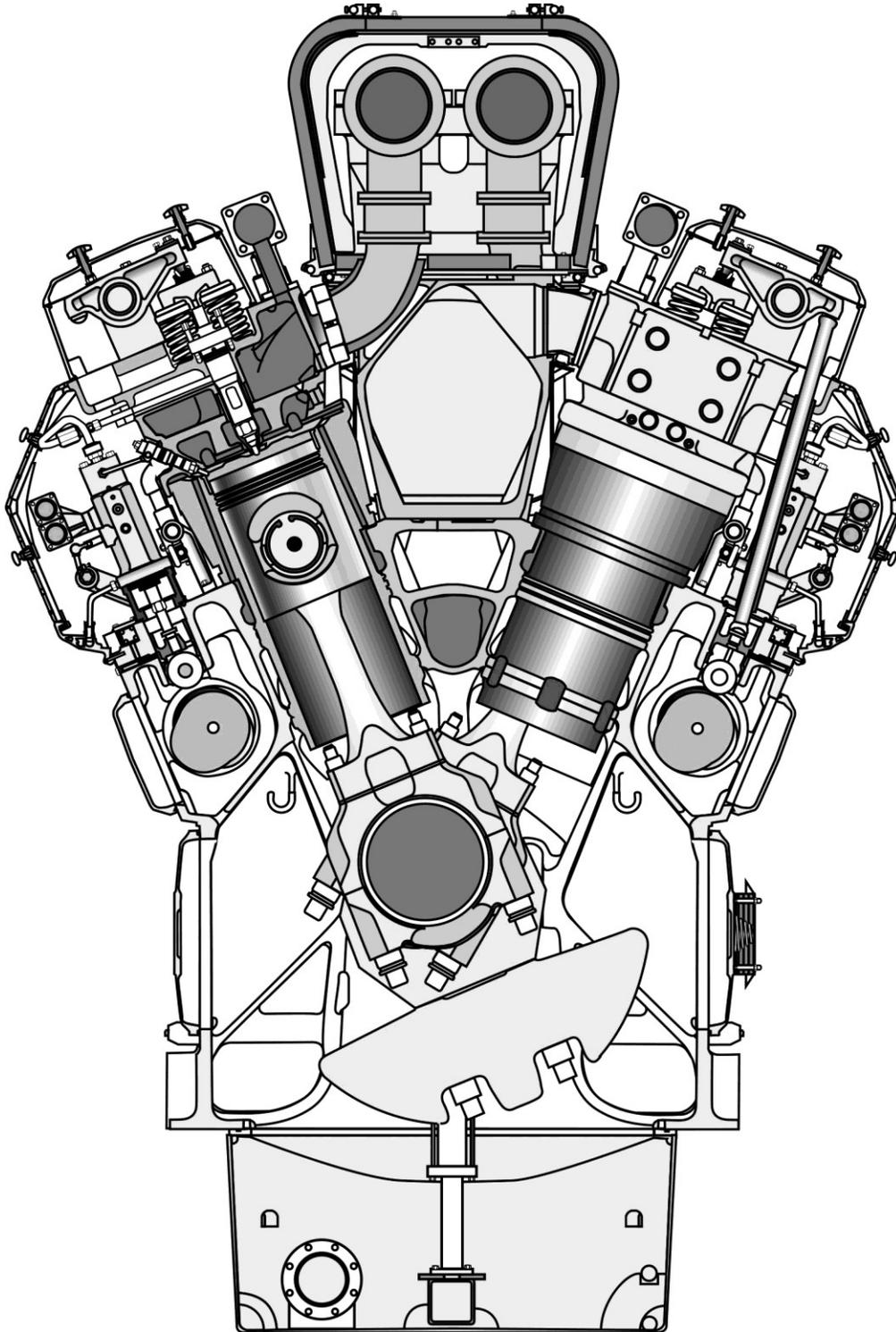
*If choice D is selected set score to 1.*

**50.** Which of the combustion chambers shown in the illustration is referred to as an "energy cell" used in some small diesel engines? Illustration MO-0068

- (A) A
- (B) B
- (C) C
- (D) D

*If choice A is selected set score to 1.*

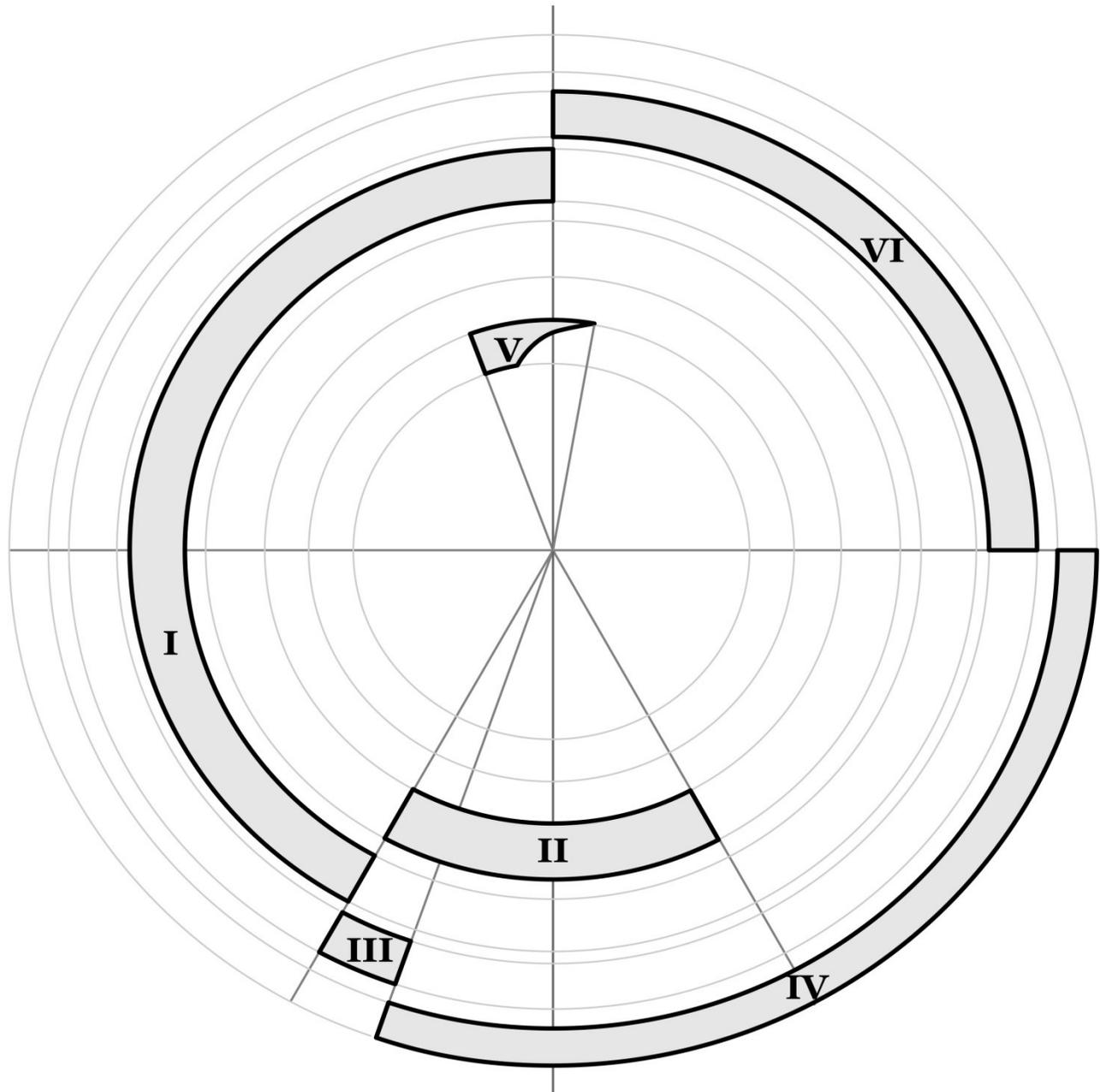
## MO-0005



Adapted for testing purposes only from Wartsilä 46 Instruction Manual  
Copyright © Wartsilä NSD

Further reproduction prohibited without permission.

## MO-0037

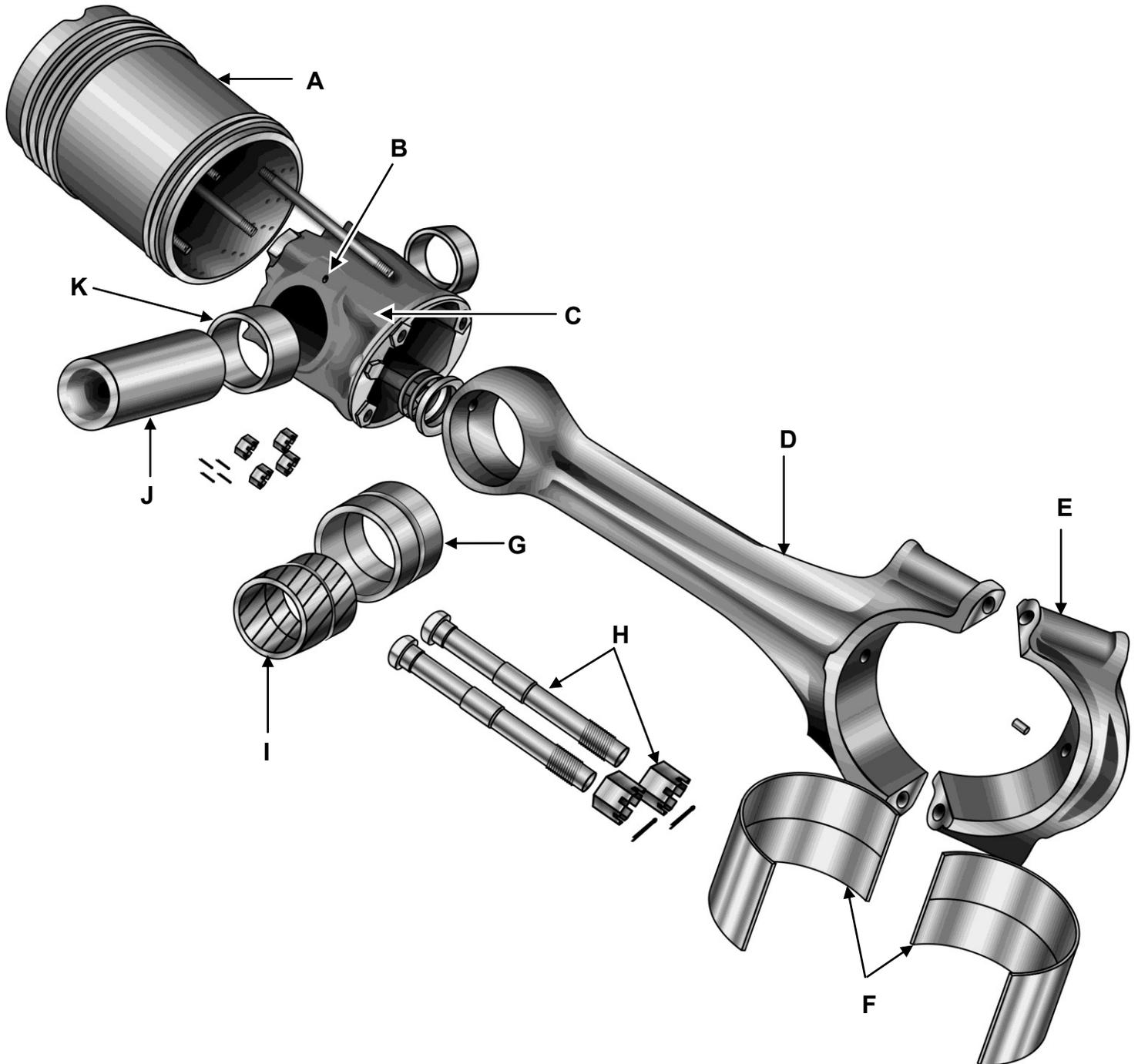


Adapted for testing purposes only from Charnews, Marine Diesel Engines.

Copyright © 2007 by Cornell Maritime Press

Further reproduction prohibited without permission.

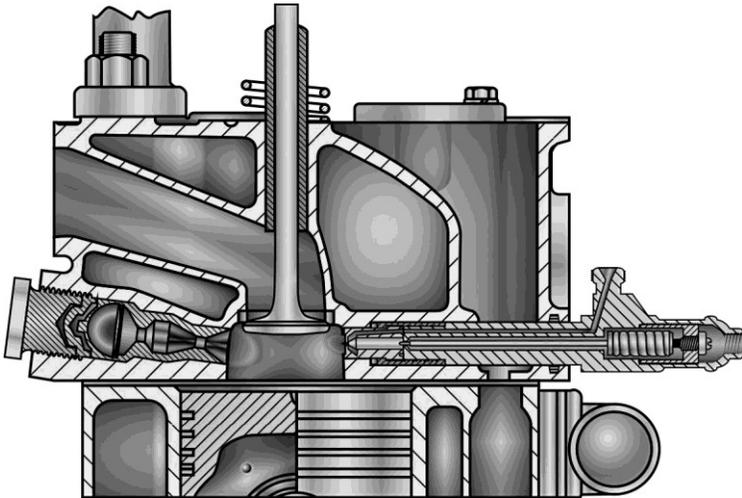
## MO-0040



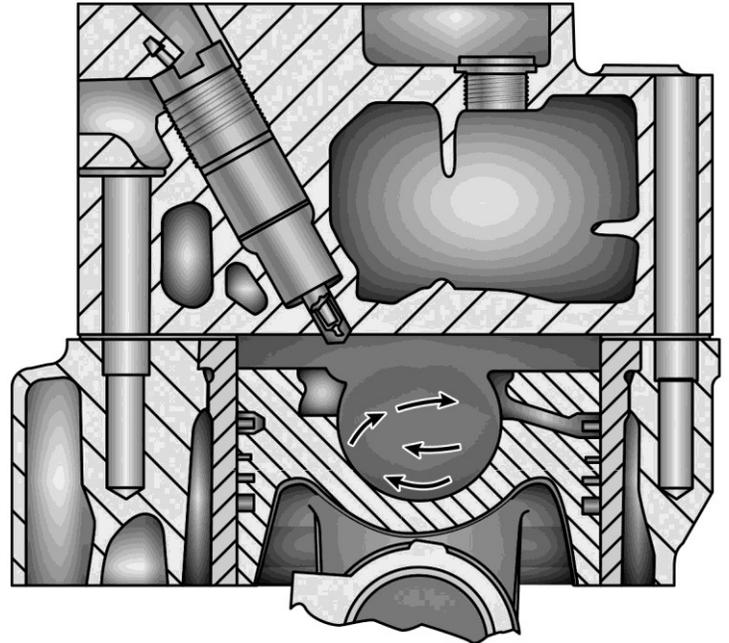
Adapted for testing purposes only from Engineman 3, NAVEDTRA 14331.  
Further reproduction prohibited without permission.

## MO-0068

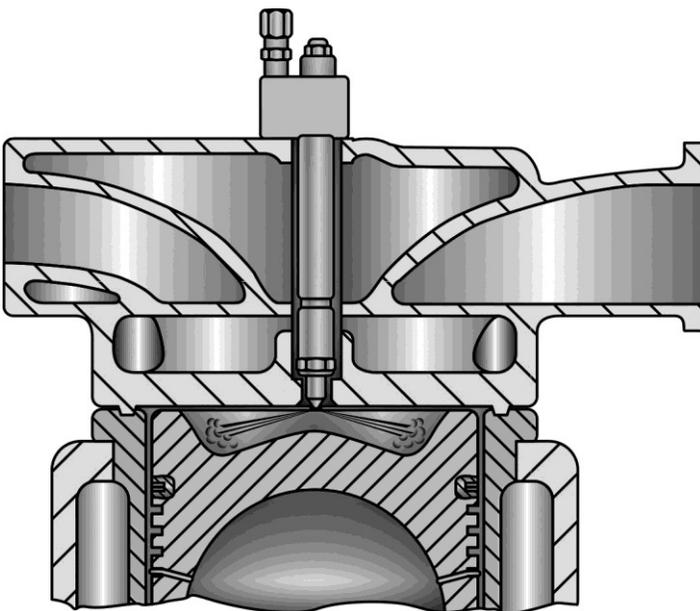
A



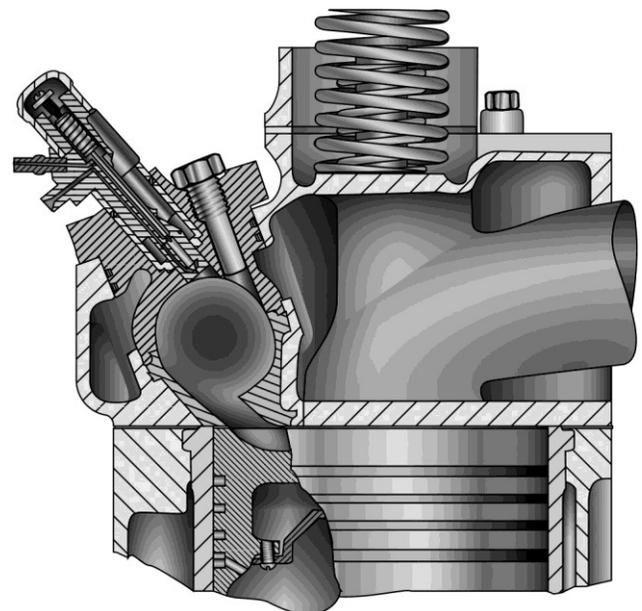
B



C



D



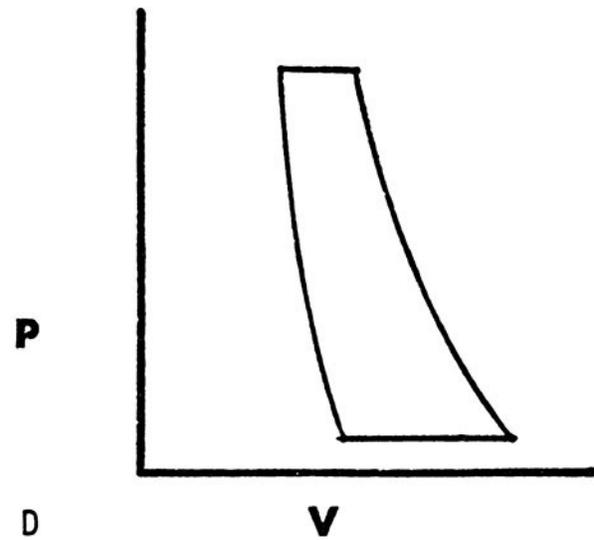
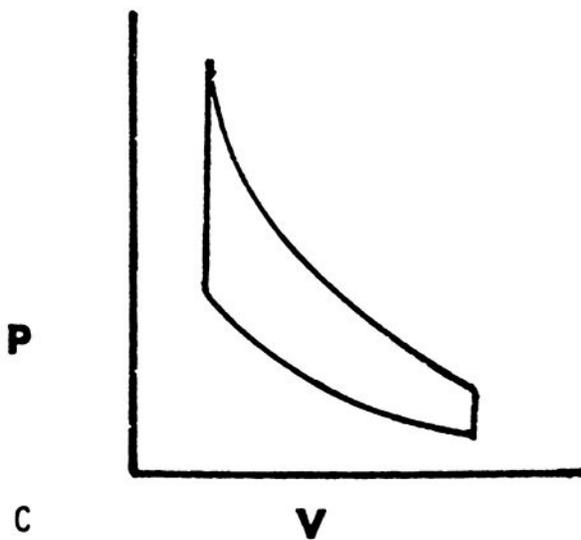
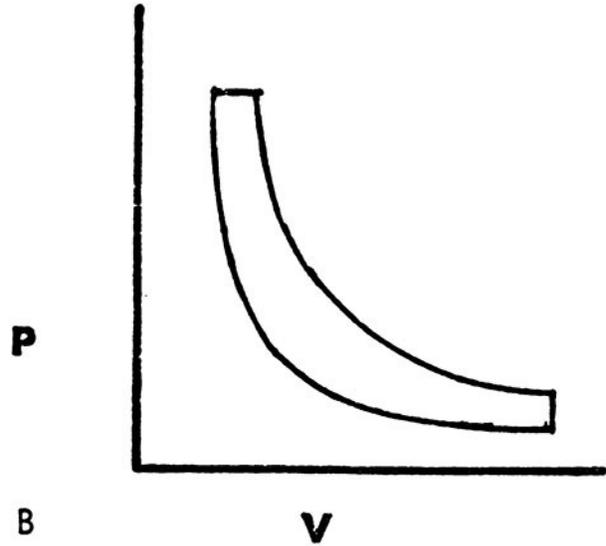
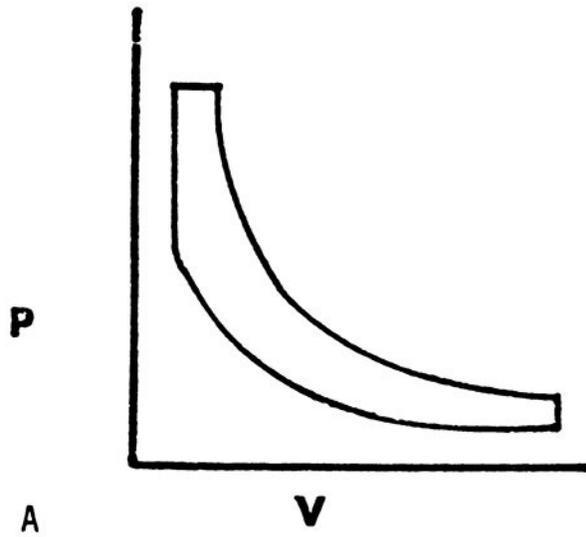
A & D

Adapted for testing purposes only from Toboldt,  
Diesel Fundamentals, Service, Repair Copyright  
© 1973 by The Goodheart-Willcox Co., Inc.  
Further reproduction prohibited without  
permission.

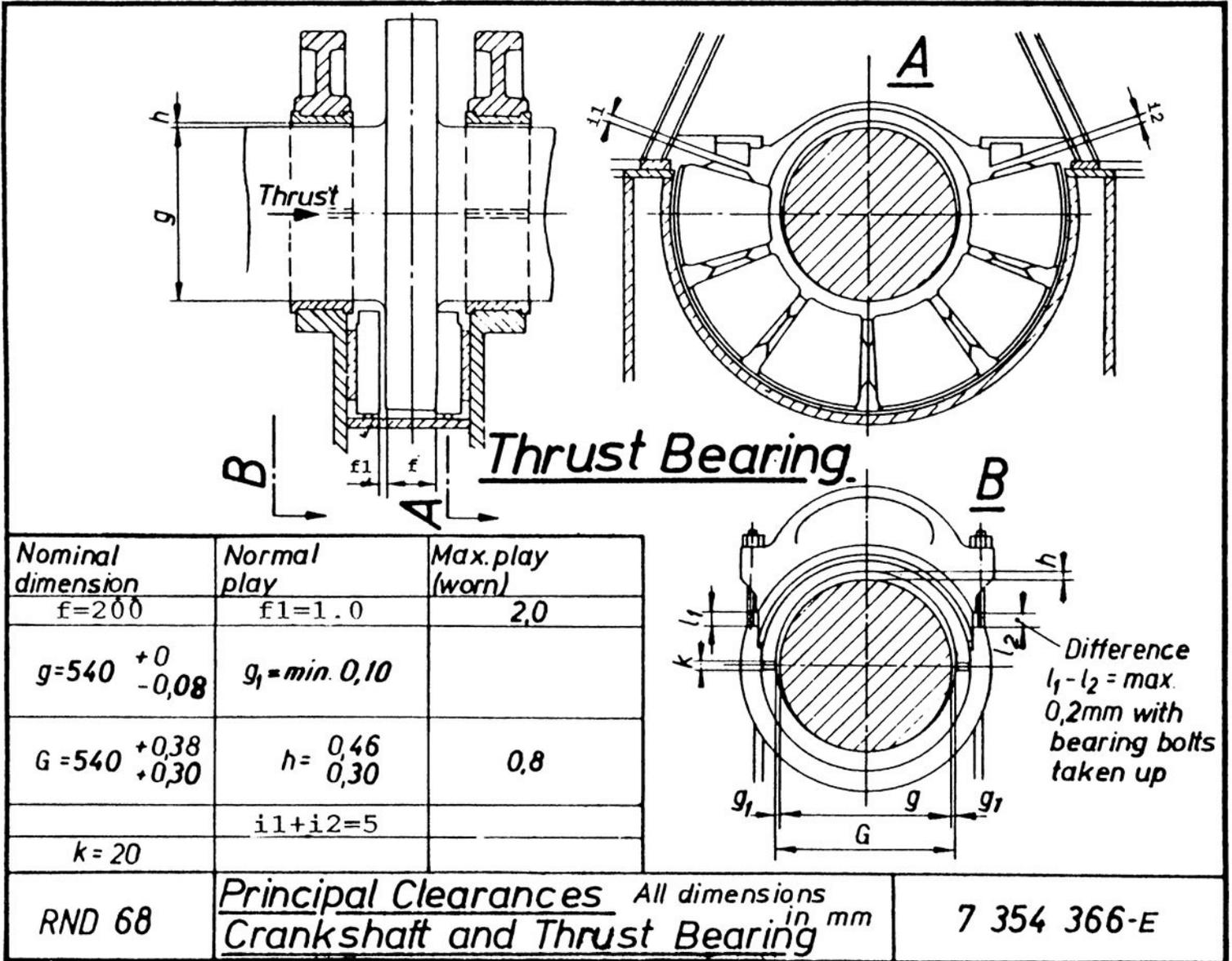
B & C

Adapted for testing purposes only from Lilly,  
Diesel Engine Reference Book Copyright © 1984  
by Butterworth and Co (Publishers) LTD  
Further reproduction prohibited without  
permission. Page 15 of 18  
Q630 Motor Plants

## MO-0102



## MO-0121



RND 68

Principal Clearances All dimensions in mm  
Crankshaft and Thrust Bearing

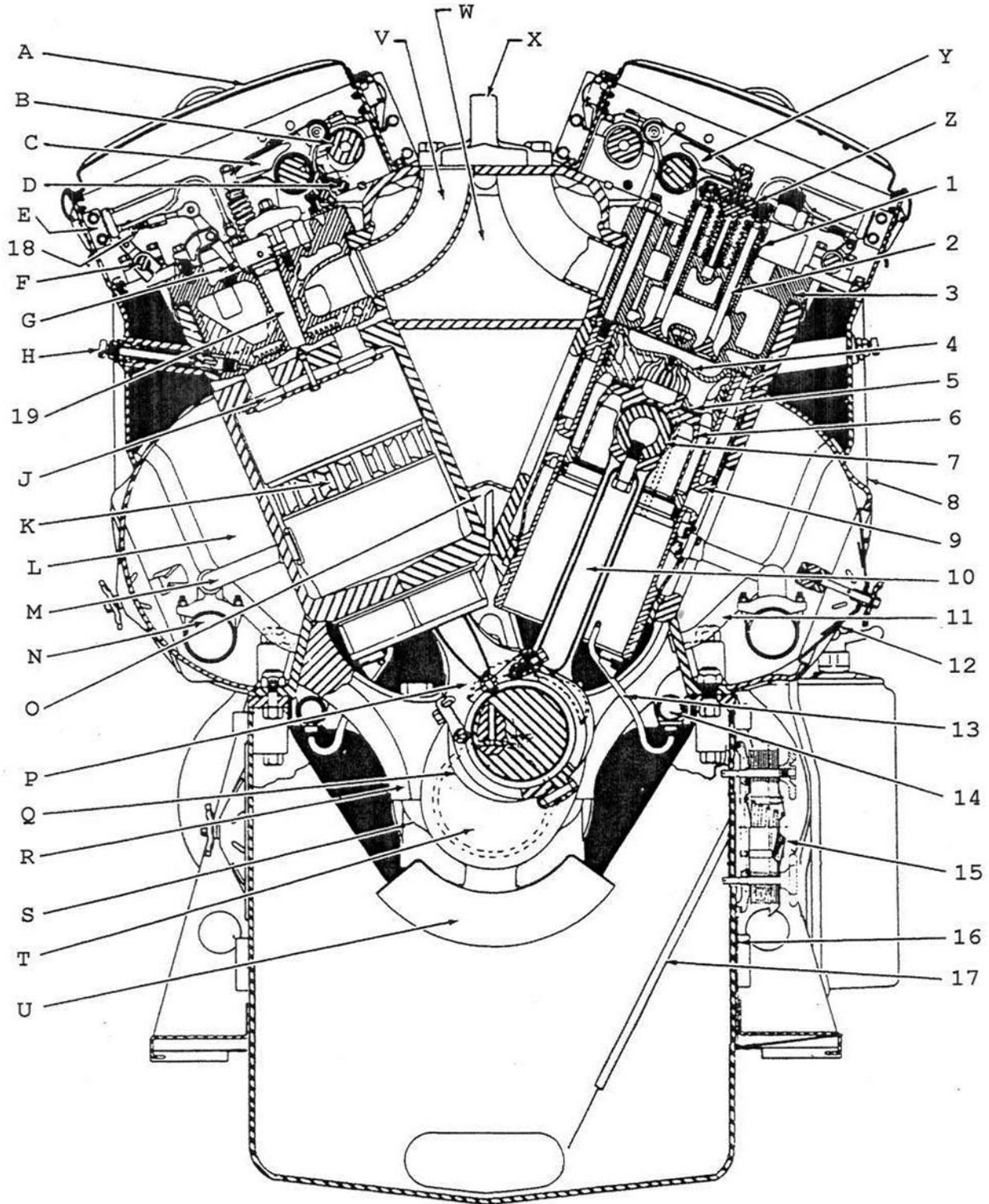
7 354 366-E

Adapted for testing purposes only from Sulzer, Description of and Operating Instructions for Sulzer Diesel Engines RND-M

Copyright © Sulzer Brothers Limited

Further reproduction prohibited without permission.

## MO-0122



Adapted for testing purposes only from EMD 645E9  
Turbocharged Engine Maintenance Manual  
Copyright © 1973 Electro-Motive Division, General Motors.  
Further reproduction prohibited without permission.