

U.S.C.G. Merchant Marine Exam
OSV-Assistant Engineer
Q652 General Subjects
(Sample Examination)

Choose the best answer to the following Multiple Choice Questions

1. Which term represents the ability of a speed control governor to maintain prime mover speed without hunting?
- (A) Dead band
 - (B) Stability
 - (C) Promptness
 - (D) Sensitivity

If choice B is selected set score to 1.

2. Which of the illustrated devices would be the LEAST accurate for the purposes of weighing-in a refrigerant charge? Illustration GS-RA-45
- (A) A
 - (B) B
 - (C) C
 - (D) D

If choice C is selected set score to 1.

3. Suppose the pressure switch used to control the "lead" potable water pump is set at 45 psig cut-in for pump start and 55 psig cut-out for pump stop. What would be an appropriate setting for the "lag" potable water pump?
- (A) 40 psig cut-in for pump start and 55 psig cut-out for pump stop.
 - (B) 45 psig cut-in for pump start and 50 psig cut-out for pump stop.
 - (C) 45 psig cut-in for pump start and 60 psig cut-out for pump stop.
 - (D) 50 psig cut-in for pump start and 60 psig cut-out for pump stop.

If choice A is selected set score to 1.

4. What statement is true with regard to the basic operating principle of gravity associated with an oily-water separator?
- (A) The density of oil is less than that of water and as a result the oil droplets in an oily-water mixture will tend to rise.
 - (B) The density of oil is greater than that of water and as a result the oil droplets in an oily-water mixture will tend to sink.
 - (C) The density of oil is greater than that of water and as a result the oil droplets in an oily-water mixture will tend to rise.
 - (D) The density of oil is less than that of water and as a result the oil droplets in an oily-water mixture will tend to sink.

If choice A is selected set score to 1.

5. In the illustrated pneumatically operated, diaphragm actuated control valve, what statement is true concerning the opening and closing forces acting upon the control diaphragm? Illustration GS-0051

- (A) The spring force acting on the control diaphragm is a valve opening force, and the pilot pressure acting on the bottom of the control diaphragm is a valve closing force.
- (B) The spring force acting on the control diaphragm is a valve closing force, and the pilot pressure acting on the top of the control diaphragm is a valve opening force.
- (C) The spring force acting on the control diaphragm is a valve opening force, and the pilot pressure acting on the top of the control diaphragm is a valve closing force.
- (D) The spring force acting on the control diaphragm is a valve closing force, and the pilot pressure acting on the bottom of the control diaphragm is a valve opening force.

If choice C is selected set score to 1.

6. Under what conditions is it permissible to pump machinery space bilges directly overboard without processing by an oily-water separator?

- (A) When the bilge water holding tank is full.
- (B) When presented with a flooding emergency.
- (C) When operating in international waters beyond the 200 mile limit.
- (D) When, by visual inspection, the bilges appear to be free of oil.

If choice B is selected set score to 1.

7. The device illustrated would be best used as a _____. Illustration GS-0058

- (A) power take-off driven lube oil pump
- (B) variable capacity pump
- (C) hydraulic hatch supply pump
- (D) variable or constant speed motor

If choice D is selected set score to 1.

8. Under which of the listed conditions can the engine room retake the throttle control from the bridge of an automated vessel?

- (A) Only with the master's permission.
- (B) Only after the throttle has been placed in stop.
- (C) After a 10 minute delay to the input command.
- (D) Any time it is deemed necessary.

If choice D is selected set score to 1.

9. On a bearing using an oiling ring as means of static oil feed, unless adverse conditions would indicate otherwise, how often should the oil be completely changed at a minimum?

- (A) Weekly
- (B) Monthly
- (C) Quarterly
- (D) Annually

If choice D is selected set score to 1.

10. Concerning steerable internal duct thrusters, what statement is true?

- (A) The thrust direction of the steerable internal duct thruster is determined by the direction of rotation of the pump.
- (B) The thrust direction of the steerable internal duct thruster is determined by reversing the pitch angle of the pump impeller.
- (C) The thrust direction of the steerable internal duct thruster is determined by the orientation of the pump inlet guide vanes.
- (D) The thrust direction of the steerable internal duct thruster is determined by the orientation of the water discharge vectoring ring.

If choice D is selected set score to 1.

11. An internal bypass is provided on some hydraulic system suction strainers to help reduce the possibility of _____.

- (A) spongy actuator movements
- (B) aeration of the oil
- (C) pump cavitation
- (D) contamination of the oil

If choice C is selected set score to 1.

12. What type of propeller consists of a flat disc set flush with the under surface of the vessel's hull with a number of vertical, rudder like blades projecting from it?

- (A) Contra-rotating propeller
- (B) Tandem propeller
- (C) Helicoidal propeller
- (D) Cycloidal propeller

If choice D is selected set score to 1.

13. By what means is electric current conveyed to the electric drive motor of a podded propulsor?

- (A) Current is conveyed from the source to a set of stationary brushes, then through a single rotating slip ring and then on to the motor windings.
- (B) Current is conveyed from the source to a set of stationary slip rings, then through a set of rotating brushes and then on to the motor windings.
- (C) Current is conveyed from the source to a set of stationary brushes, then through a set of rotating slip rings and then on to the motor windings.
- (D) Current is conveyed from the source to the stator of a synchronous transmitter, and by synchro action to the rotor of a synchronous receiver.

If choice C is selected set score to 1.

14. Which of the fasteners in illustration GS-0080 would be used in conjunction with figure "C" in illustration GS-0015?

- (A) figure A
- (B) figure F
- (C) figure K
- (D) figure D

If choice C is selected set score to 1.

15. If oil under pressure is supplied to the area identified as "N" in the illustration, what will occur? Illustration GS-0116

- (A) "O" will be hydraulically locked in place even though oil is returned to the main pump from the area between "M" and "I"
- (B) "O" will rotate clockwise as oil is returned from the area between "M" and "I"
- (C) "O" will rotate counter-clockwise as oil is returned from the area between "M" and "I"
- (D) "Q" will rotate counter-clockwise as oil is returned from the area between "M" and "I"

If choice C is selected set score to 1.

16. Rolling element bearings may experience fatigue failure after a length of service. What is the first evidence of the beginnings of fatigue failure?

- (A) Discoloration of the races or rolling elements.
- (B) The presence of metallic particles in the lubricant.
- (C) The presence of small cracks in the rolling elements.
- (D) The presence of small cracks in the races.

If choice D is selected set score to 1.

17. In a refrigeration system, the push-pull technique can be used for the recovery of the refrigerant in what state?

- (A) liquid only
- (B) vapor only
- (C) both liquid and vapor
- (D) should never be used with low-pressure systems

If choice C is selected set score to 1.

18. What is the pressure and condition of the refrigerant entering the receiver of a refrigeration system?

- (A) superheated low-pressure vapor
- (B) superheated high-pressure vapor
- (C) sub cooled low-pressure liquid
- (D) sub cooled high-pressure liquid

If choice D is selected set score to 1.

19. Even though bilge keels do provide some improvement in longitudinal strength at the bilge radius, what is the primary purpose of the bilge keels?

- (A) Dampen the tendency the ship has to heave.
- (B) Dampen the tendency the ship has to yaw.
- (C) Dampen the tendency the ship has to roll.
- (D) Dampen the tendency the ship has to pitch.

If choice C is selected set score to 1.

20. If a heat exchanger is designed to cool lubricating oil using sea water as a cooling medium, what statement is true?

- (A) The lubricating oil loses sensible heat, and the sea water loses sensible heat.
- (B) The lubricating oil loses sensible heat, and the sea water gains sensible heat.
- (C) The lubricating oil loses latent heat, and the sea water gains latent heat.
- (D) The lubricating oil gains sensible heat and the sea water loses sensible heat.

If choice B is selected set score to 1.

21. Alkyl benzene ISO 32 cSt synthetic refrigerant oil is miscible and suitable to use with which of the following refrigerants?

- (A) R-22
- (B) R-32
- (C) R-134a
- (D) R-143a

If choice A is selected set score to 1.

22. If the cutting edges of a drill are ground at different angles, the _____.

- (A) drill will not cut
- (B) hole will be oversized
- (C) hole will be undersized
- (D) drill will seize immediately

If choice B is selected set score to 1.

23. What is the operating principle of detergent type lubricating oil that provides the oil with its unique properties?

- (A) Detergent and dispersant additives are able to hold solids in suspension.
- (B) Detergent and dispersant additives chemically dissolve the solids.
- (C) Detergent and dispersant additives convert the solids into a soap-like substance.
- (D) Detergent and dispersant additives cause the solids to settle out.

If choice A is selected set score to 1.

24. When accomplishing welding repairs using the electric arc welding process, what statement is true concerning the characteristics of a good quality weld when welding a single-V butt joint?

- (A) There should be no overlap, but there should be undercut at the toe of the weld.
- (B) There should be both overlap and undercut at the toe of the weld.
- (C) There should be no overlap and no undercut at the toe of the weld.
- (D) There should be overlap, but there should be no undercut at the toe of the weld.

If choice C is selected set score to 1.

25. In the illustrated single zone HVAC system, what prevents the simultaneous flow of steam through the preheat coil and flow of chilled water through the cooling coil? Illustration GS-RA-09

- (A) The supply air duct thermostat controlling the steam flow is set several degrees lower than the design off-coil temperature associated with the cooling coil.
- (B) The supply air duct thermostat controlling the steam flow is set equal to the design off-coil temperature associated with the cooling coil.
- (C) The supply air duct thermostat controlling the steam flow is set several degrees higher than the design off-coil temperature associated with the cooling coil.
- (D) Simultaneous steam flow through the preheater and chilled water flow through the cooling coil is permitted for the purposes of space humidity control.

If choice A is selected set score to 1.

26. In the illustration, line "C" is a _____. Illustration GS-0006

- (A) dimension line
- (B) leader line
- (C) cutting plane line
- (D) phantom line

If choice A is selected set score to 1.

27. If a centrifugal pump were continually operated with the discharge valve closed, the _____.

- (A) motor controller overload would open
- (B) pump would eventually overheat
- (C) relief valve would continuously cycle open
- (D) motor would overheat

If choice B is selected set score to 1.

28. Which of the following statements is true regarding mechanical seals?

- (A) They may be used in lieu of conventional packing glands for any service other than salt water.
- (B) They are normally lubricated and cooled by the fluid being pumped.
- (C) They are not suitable for use on fuel oil transfer pumps.
- (D) Once placed into service, leakage between the dynamic seal surfaces may be reduced by monthly adjustment of the spring compression.

If choice B is selected set score to 1.

29. If a heat exchanger is designed to evaporate sea water using diesel engine jacket water as an evaporating medium, what statement is true?

- (A) The sea water gains latent heat, and the diesel engine jacket water loses latent heat.
- (B) The sea water loses latent heat, and the diesel engine jacket water gains sensible heat.
- (C) The sea water gains sensible heat and the diesel engine jacket water loses latent heat.
- (D) The sea water gains latent heat, and the diesel engine jacket water loses sensible heat.

If choice D is selected set score to 1.

30. Which of the listed valve types is typically used for the low-pressure stage of a reciprocating air compressor?

- (A) Rotary
- (B) Ring-plate
- (C) Strip-type
- (D) Sliding

If choice C is selected set score to 1.

31. What statement is true concerning the door interlock devices associated with a winding drum or traction drive passenger elevator onboard ship?

- (A) Door interlocks are used to prevent elevator operation if the doors are still open and only allow elevator operation if the doors are proved closed.
- (B) Door interlocks are used to prevent elevator operation if the doors are still closed and only allow elevator operation if the doors are proved open.
- (C) Door interlocks are used to prevent elevator operation in a shipboard emergency when elevators are not to be used.
- (D) Door interlocks are used to override elevator emergency status in a shipboard emergency when elevators are required to be used.

If choice A is selected set score to 1.

32. While at normal sea speed the rudder movement stops, but is restored after changing over power units. At the earliest opportunity the faulty power unit is placed in operation with the following results: The main pump discharge/return pressures are equal and there is no rotation of the rotary actuator, regardless of the direction of helm input. Which of the following is the probable cause of the failure?
Illustration GS-0123

- (A) solenoid coil No.2 in component "F" has burned out
- (B) stroke control linkage has mechanically failed with "M"
- (C) solenoid coil No.3 in component "F" has burned out
- (D) replenishing circuit relief valve is stuck open

If choice A is selected set score to 1.

33. Of the hydraulic tubing fittings illustrated, the flared fitting for high-pressure use is represented by figure _____. Illustration GS-0100

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

If choice B is selected set score to 1.

34. In a closed-loop process control system featuring negative feedback, what is the function of the error detector within the controller?

- (A) The error detector computes the sum of the measured value of the controlled variable and the desired value (set point).
- (B) The error detector computes the quotient of the measured value of the controlled variable and the desired value (set point).
- (C) The error detector computes the difference between the measured value of the controlled variable and the desired value (set point).
- (D) The error detector computes the product of the measured value of the controlled variable and the desired value (set point).

If choice C is selected set score to 1.

35. What statement is true concerning steam-heated, hot water heated, or electric-heated convectors?

- (A) Convectors draw in relatively cool air through an opening at the top and discharge relatively warm air through an outlet grille at the bottom and are located on bulkheads near the deck.
- (B) Convectors draw in relatively cool air through an opening at the top and discharge relatively warm air through an outlet grille at the bottom and are located on bulkheads near the overhead.
- (C) Convectors draw in relatively cool air through an opening at the bottom and discharge relatively warm air through an outlet grille at the top and are located on bulkheads near the deck.
- (D) Convectors draw in relatively cool air through an opening at the bottom and discharge relatively warm air through an outlet grille at the top and are located on bulkheads near the overhead.

If choice C is selected set score to 1.

36. Which characteristic or condition will have the greatest effect on increasing a hydraulic oil's viscosity?

- (A) Vacuum
- (B) Pressure
- (C) Cloud point
- (D) Pour point

If choice B is selected set score to 1.

37. For marine-type shell-and-tube heat exchangers, what is the most common arrangement for baffles?

- (A) Segmental
- (B) Disc
- (C) Doughnut
- (D) Solid

If choice A is selected set score to 1.

38. Which of the following statements is true concerning the gauge labeled "A" of the illustrated gauge manifold set? Illustration GS-RA-01

- (A) The gauge labeled "A" is a compound gauge and is usually color-coded blue.
- (B) The gauge labeled "A" is a compound gauge and is usually color-coded red.
- (C) The gauge labeled "A" is a standard pressure gauge and is usually color-coded blue.
- (D) The gauge labeled "A" is a standard pressure gauge and is usually color-coded red.

If choice A is selected set score to 1.

39. A metal scribe commonly found on a combination square measuring tool should only be used to _____.

- (A) remove packing
- (B) mark on metal
- (C) clean file teeth
- (D) punch gasket holes

If choice B is selected set score to 1.

40. If the speed of a drill is too great, the drill will _____.

- (A) cut faster
- (B) not cut
- (C) cut slower
- (D) rapidly dull

If choice D is selected set score to 1.

41. What is an example of an epicyclical gear?

- (A) Planetary gear
- (B) Articulated gear
- (C) Nested gear
- (D) Locked train gear

If choice A is selected set score to 1.

42. As shown in figure "A" of the illustrated block diagram of a central operating system configured for direct digital control, what does the output system block "ANALOG D/A" represent? Illustration EL-0095

- (A) It receives analog outputs from the CPU and converts these to digital signals for transmission to the digital actuators.
- (B) It receives analog outputs from the CPU and conditions these to analog signals for transmission to the analog actuators.
- (C) It receives digital outputs from the CPU and converts these to analog signals for transmission to the analog actuators.
- (D) It receives digital outputs from the CPU and conditions these to digital signals for transmission to the digital actuators.

If choice C is selected set score to 1.

43. Referring to the illustration, note that the solenoid in line "C" is closed. The check valve in line "E" is open. The separator service pump is running. The check valve in line "G" is closed. Valve "B" is open. Valve "D" is closed. What is the operational status of the oily-water separator unit? Illustration GS-0175

- (A) The oily-water separator is in the bilge water separation processing mode with water discharging back to the bilge water holding tank with an oil content less than 15 ppm.
- (B) The oily-water separator is in the bilge water separation processing mode with water discharging back to the bilge water holding tank with an oil content greater than 15 ppm.
- (C) The oily-water separator is in the bilge water separation processing mode with water discharging overboard with an oil content greater than 15 ppm.
- (D) The oily-water separator is in the bilge water separation processing mode with water discharging overboard with an oil content less than 15 ppm.

If choice D is selected set score to 1.

44. A coolant is usually used when cutting metal in a power hacksaw to prevent the _____.

- (A) blade from overheating
- (B) blade from bending
- (C) heat of friction
- (D) cut from clogging

If choice A is selected set score to 1.

45. A spur gear pump should be operated with the discharge valves _____.

- (A) slightly opened
- (B) halfway opened
- (C) throttled
- (D) fully opened

If choice D is selected set score to 1.

46. Which of the following statements represents the proper procedural sequence for adjusting the metering rate of an in-line lubricator as used in a ship's service air system hose station? Assume that the pressure regulator has been properly set.

- (A) Establish normal air flow. Determine drip rate. Further open needle valve to increase drip rate or further close needle valve to decrease drip rate, as appropriate.
- (B) Establish normal air flow. Determine drip rate. Further open needle valve to decrease drip rate or further close needle valve to increase drip rate, as appropriate.
- (C) Temporarily shut-off air flow. Determine drip rate. Further open needle valve to increase drip rate or further close needle valve to decrease drip rate, as appropriate. Re-establish normal air flow.
- (D) Temporarily shut-off air flow. Determine drip rate. Further open needle valve to decrease drip rate or further close needle valve to increase drip rate, as appropriate. Re-establish normal air flow.

If choice A is selected set score to 1.

47. The size of ball and roller bearings can be identified by the _____.

- (A) inner race cone width
- (B) outer ring width
- (C) manufacturer's numerical code
- (D) rolling member size

If choice C is selected set score to 1.

48. In an electro-hydraulic steering system, damage due to rudder shock is prevented by _____.

- (A) buffer springs
- (B) relief valves
- (C) oil flowing through the pumps
- (D) dashpots

If choice B is selected set score to 1.

49. A horizontal electro-mechanical anchor windlass is equipped with two warping heads, two wildcats, two manual brake hand wheels, two clutch control levers, and a multipoint lever-operated pedestal-mounted controller. What statement is true as it pertains to the operation of the pedestal-mounted controller?

- (A) The pedestal-mounted controller allows the wildcats to rotate in either direction of rotation, but the warping heads in only one direction of rotation at discrete speeds from zero to maximum.
- (B) The pedestal-mounted controller allows both the warping heads and the wildcats to rotate in either direction of rotation at discrete speeds from zero to maximum.
- (C) The pedestal-mounted controller allows both the warping heads and the wildcats to rotate in only one direction of rotation at discrete speeds from zero to maximum.
- (D) The pedestal-mounted controller allows the warping heads to rotate in either direction of rotation, but the wildcats in only one direction of rotation at discrete speeds from zero to maximum.

If choice B is selected set score to 1.

50. Which of the following direct pressure measuring instruments is most appropriately used for measuring most pressures, typically above 10 psig and is by far the most common type?

- (A) Diaphragm type pressure gauge
- (B) Bourdon tube pressure gauge
- (C) Spiral or helical type pressure gauge
- (D) Bellows type pressure gauge

If choice B is selected set score to 1.

51. What statement is true concerning the term "isochronous" as it applies to prime mover speed control governors?

- (A) Isochronous governors are able to maintain constant prime mover load regardless of speed by employing temporary speed droop.
- (B) Isochronous governors are able to maintain constant prime mover load regardless of speed by employing permanent speed droop.
- (C) Isochronous governors are able to maintain constant prime mover speed regardless of load by employing temporary speed droop.
- (D) Isochronous governors are able to maintain constant prime mover speed regardless of load by employing permanent speed droop.

If choice C is selected set score to 1.

52. According to the illustration, which of the following conditions would most likely cause pump "A" to short cycle? Illustration GS-0173

- (A) The hydro-pneumatic expansion tank is operating with an insufficient air charge.
- (B) The hydro-pneumatic tank is operating with a low water level.
- (C) A low water level exists in the potable water storage tank.
- (D) Pump "A" wearing rings have excessive clearance.

If choice A is selected set score to 1.

53. When renewing spiral packing in a centrifugal pump stuffing box, after the packing is firmly seated, the packing gland nuts should be _____.

- (A) loosened, and then retightened with the pump running under normal conditions
- (B) loosened until the gland clears the stuffing box
- (C) left in that position
- (D) tightened an additional 10% to compress the packing

If choice A is selected set score to 1.

54. Bridge orders must be promptly carried out and a record kept. What orders must be recorded?

- (A) Bridge orders need not be recorded
- (B) Changes in shaft RPM or direction
- (C) Changes in shaft RPM only
- (D) Changes in shaft direction only

If choice B is selected set score to 1.

55. What is another name for the control mode used in a process control system that uses two-point control?

- (A) Integral control
- (B) Derivative control
- (C) Proportional control
- (D) On-off control

If choice D is selected set score to 1.

56. Which of the following statements represents the proper criteria to decide when to drain a filter/moisture separator as used in a ship's service air system hose station?

- (A) The bowl should be drained daily with no need to check the moisture level.
- (B) The bowl should be drained whenever moisture droplets appear in the bowl.
- (C) The bowl should be drained before the moisture level reaches the lower baffle.
- (D) The bowl should be drained after the bowl completely fills with moisture.

If choice C is selected set score to 1.

57. Which of the following statements best describes the straining ability of a fine mesh metal lube oil strainer?

- (A) A 200 mesh screen has larger wires than a 100 mesh screen.
- (B) A 100 wire mesh screen will prevent passage of smaller particles than a 200 wire mesh screen.
- (C) A 200 wire mesh screen and a 100 wire mesh screen both prevent passage of the same size particles, but each allows a different number of particles to pass through.
- (D) A 200 wire mesh screen will prevent passage of smaller particles than a 100 wire mesh screen.

If choice D is selected set score to 1.

58. For a pneumatic transmission system for instrumentation purposes, if a pneumatic temperature indicator has a calibrated scale of -40 to $+40^{\circ}\text{F}$, what would be the actual measured temperature if the transmitted pneumatic signal pressure to the indicator is 9 psig, assuming the industry standard of 3 to 15 psig is used for instrument air?

- (A) -10°F
- (B) 0°F
- (C) $+10^{\circ}\text{F}$
- (D) $+25^{\circ}\text{F}$

If choice B is selected set score to 1.

59. The term, whole depth of the gear, shown in the illustration, is equal to _____. Illustration GS-0111

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

If choice D is selected set score to 1.

60. What type of pump is shown in the illustration? Illustration GS-0144

- (A) Deep well centrifugal pump
- (B) Simplex reciprocating pump
- (C) Triple screw rotary pump
- (D) Double screw rotary pump

If choice C is selected set score to 1.

61. Over pressurization of an air compressor intercooler is prevented by which of the following?

- (A) First-stage unloader.
- (B) Intercooler relief valve.
- (C) Last-stage unloader.
- (D) After cooler relief valve.

If choice B is selected set score to 1.

62. To prevent motor overload during start-up of a hermetically sealed centrifugal refrigeration system, what is true concerning the compressor suction gas variable inlet guide vanes?

- (A) opened until the motor is connected across the line at full voltage and current drawn is up to full load current
- (B) opened until the motor is connected across the line at full voltage and current drawn is below full load current
- (C) closed until the motor is connected across the line at full voltage and current drawn is up to full load current
- (D) closed until the motor is connected across the line at full voltage and current drawn is below full load current

If choice D is selected set score to 1.

63. As shown in figure "A" of the illustrated block diagram of a central operating system configured for direct digital control, what does the output system block "DIGITAL CONTACT" represent? Illustration EL-0095

- (A) It receives analog outputs from the analog device sensors and conditions these as analog signals for CPU processing.
- (B) It receives digital outputs from the binary device sensors and converts these to analog signals for CPU processing.
- (C) It receives analog outputs from the analog device sensors and converts these to digital signals for CPU processing.
- (D) It receives digital outputs from the binary device sensors and conditions these as digital signals for CPU processing.

If choice D is selected set score to 1.

64. What is meant by the term independent bilge suction?

- (A) The means by which the machinery space bilge is pumped out by a pump not normally used as a bilge pump but using either bilge manifolds or automatic bilge suction valves.
- (B) The means by which the machinery space bilge is pumped out by a pump normally used as a bilge pump but independent of any bilge manifolds or automatic bilge suction valves.
- (C) The means by which a cargo-hold bilge is pumped out by a pump normally used as a bilge pump but independent of any bilge manifolds or automatic bilge suction valves.
- (D) The means by which a cargo-hold bilge is pumped out by a pump not normally used as a bilge pump but using either bilge manifolds or automatic bilge suction valves.

If choice B is selected set score to 1.

65. A typical shipboard domestic multi-box refrigeration system operates with one compressor and condenser. What is the purpose of the sensing line connected to the thermal bulb at the evaporator coil outlet?

- (A) To direct evaporator outlet pressure to the lower part of the solenoid bellows.
- (B) To transmit the bulb pressure (proportional to the coil temperature) to the thermal expansion valve diaphragm.
- (C) To open or close the solenoid valve when the box temperature increases or decreases.
- (D) To open the back pressure regulating valve when evaporator coil pressure increases.

If choice B is selected set score to 1.

- 66.** Suppose the illustrated self-contained, internal-pilot, piston-operated temperature control valve is part of the temperature control system for a steam-heated heavy fuel oil service heater for a steam boiler. If there was a decrease in demand for fuel by the boiler, what statement correctly represents how the valve would initially respond? Illustration GS-0045
- (A) The fuel oil heater fuel outlet temperature would decrease, causing the remote bulb pressure to decrease and the control diaphragm to flex upward and through lever action, further open the pilot valve.
 - (B) The fuel oil heater fuel outlet temperature would increase, causing the remote bulb pressure to increase and the control diaphragm to flex upward and through lever action, further open the pilot valve.
 - (C) The fuel oil heater fuel outlet temperature would decrease, causing the remote bulb pressure to decrease and the control diaphragm to flex downward and through lever action, further close the pilot valve.
 - (D) The fuel oil heater fuel outlet temperature would increase, causing the remote bulb pressure to increase and the control diaphragm to flex downward and through lever action, further close the pilot valve.

If choice D is selected set score to 1.

- 67.** Referring to the illustrated diagram for a central-station hookup for a hot water heating system, what statement represents the configuration of the system? Illustration GS-0151
- (A) The system is a single zone system, with multiple circulating pumps and multiple heating coils.
 - (B) The system is a multi-zone system, with multiple circulating pumps and multiple heating coils.
 - (C) The system is a single zone system, with one circulating pump and one heating coil.
 - (D) The system is a multi-zone system, with one circulating pump and one heating coil.

If choice D is selected set score to 1.

- 68.** A device used to hold open the refrigeration compressor suction valve during starting to reduce the compression load is called what?
- (A) cylinder unloader
 - (B) relief valve
 - (C) suction line bypass
 - (D) discharge line bypass

If choice A is selected set score to 1.

69. What is the wet bulb temperature of air if the dry bulb temperature of the air is 90 degrees and the relative humidity is 65%? Illustration GS-RA-22

- (A) 62 degrees F
- (B) 63 degrees F
- (C) 77 degrees F
- (D) 80 degrees F

If choice D is selected set score to 1.

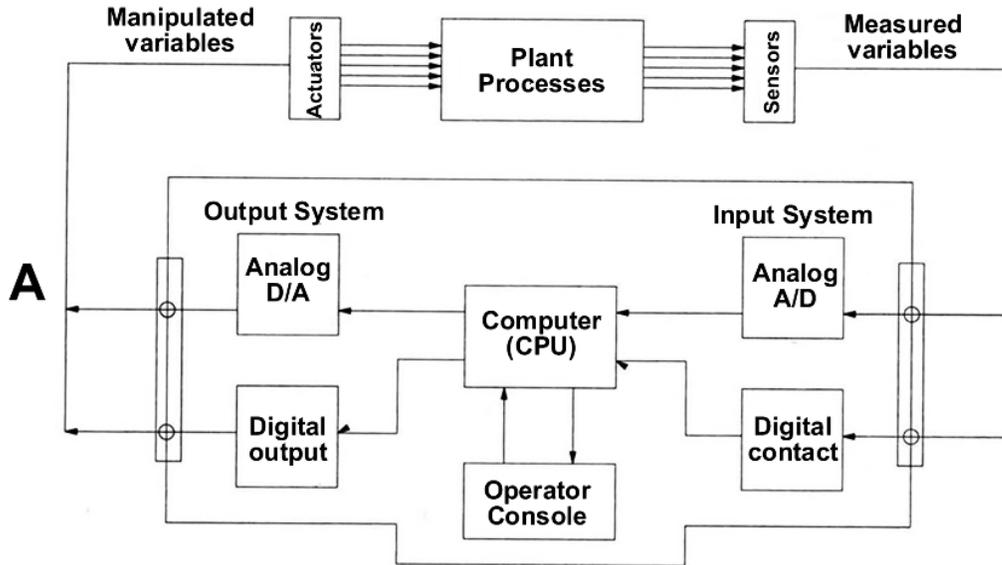
70. What is usually contained within the double bottom tanks associated with the machinery spaces?

- (A) Machinery space double bottom tanks generally contain liquid cargo.
- (B) Machinery space double bottom tanks generally are kept dry and function as void spaces.
- (C) Machinery space double bottom tanks generally contain fuel oil, lubricating oil, or fresh water.
- (D) Machinery space double bottom tanks generally contain sea water ballast.

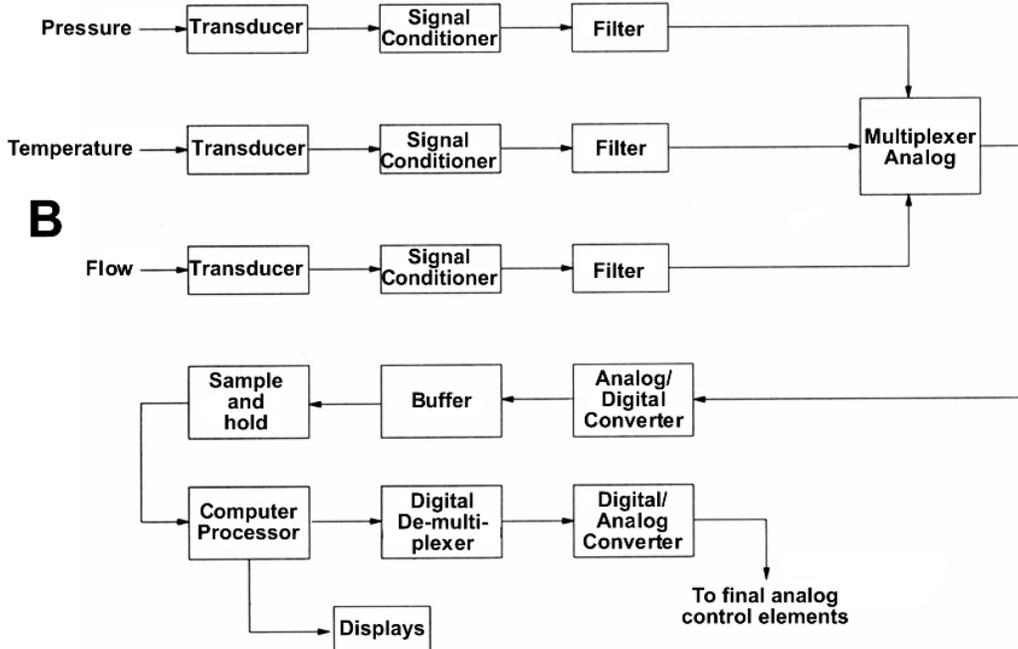
If choice C is selected set score to 1.

EL-0095

Direct Digital Control



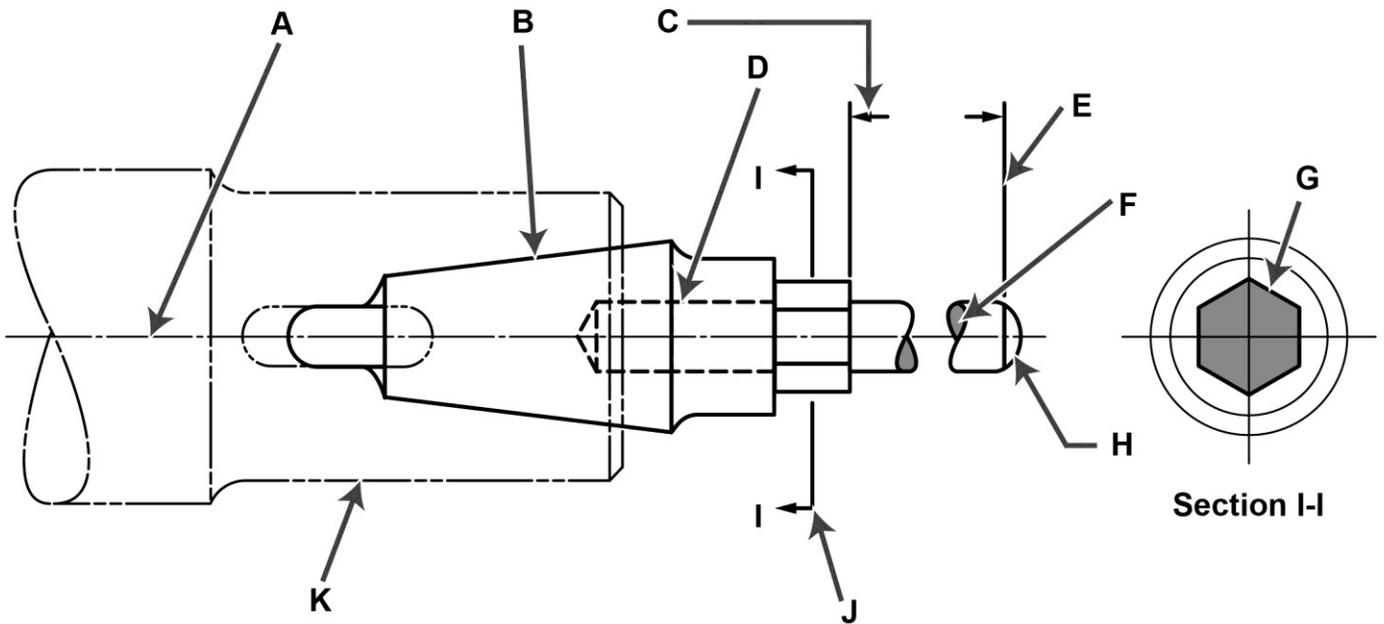
Signal Processing Flowpath



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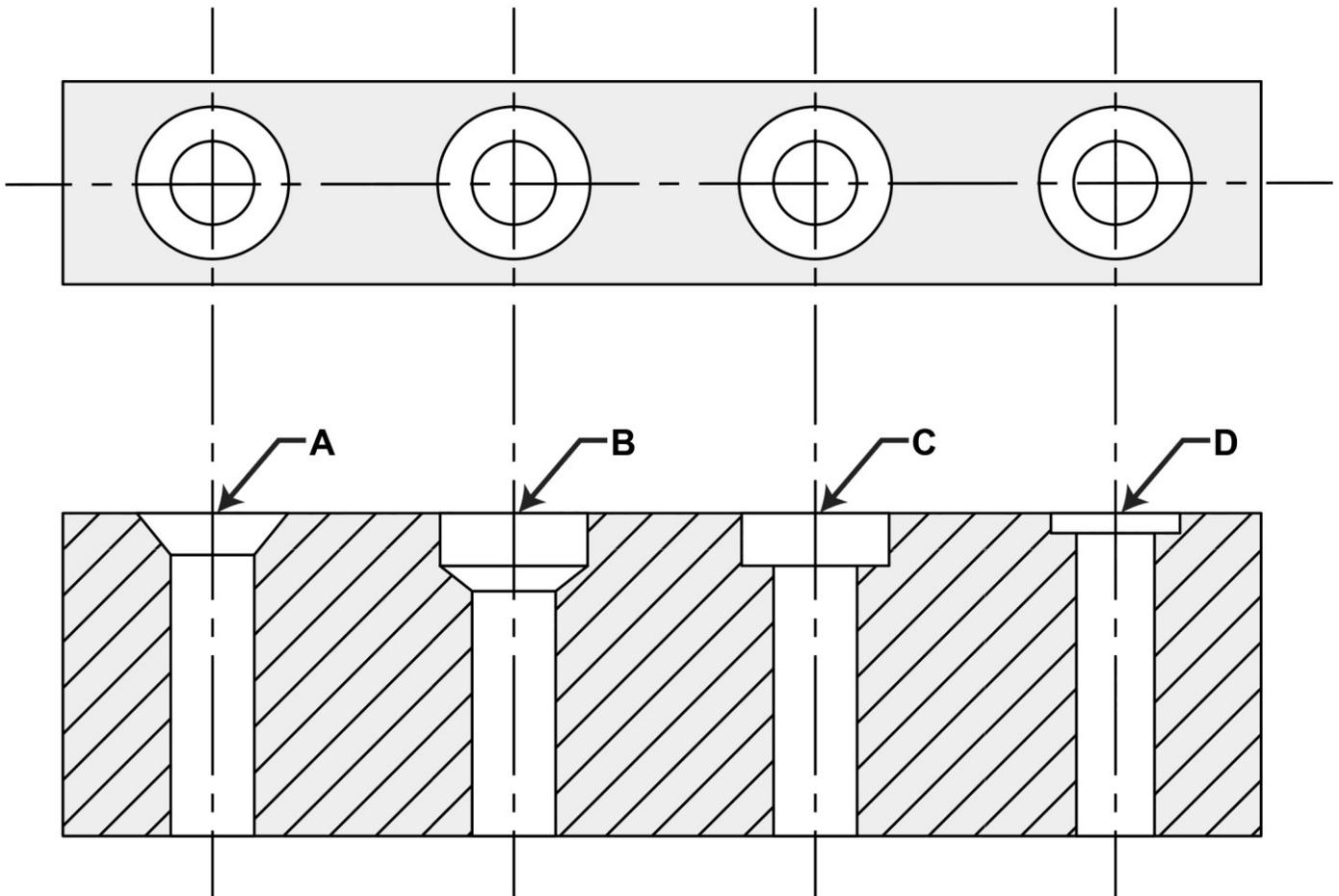
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GS-0006



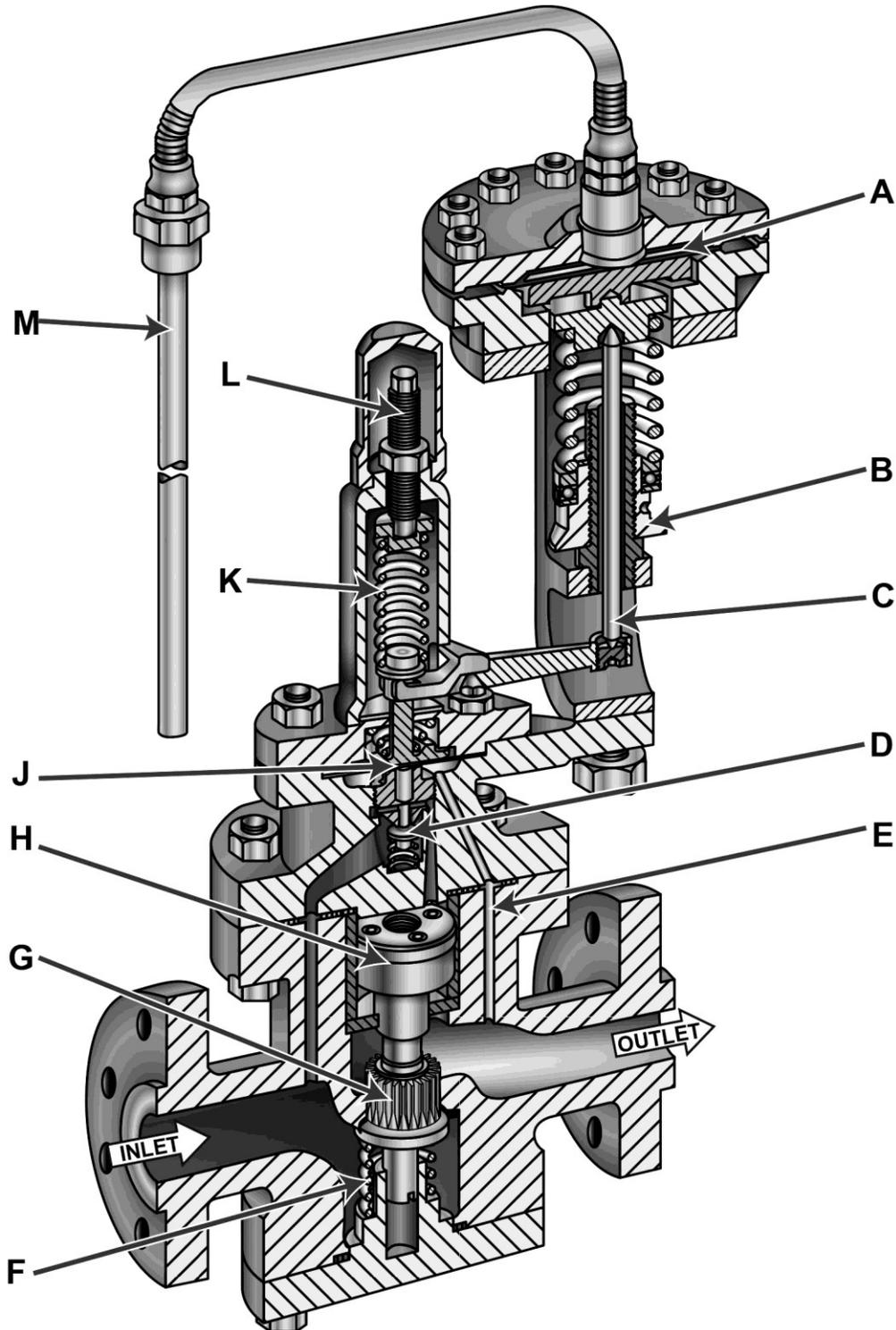
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GS-0015



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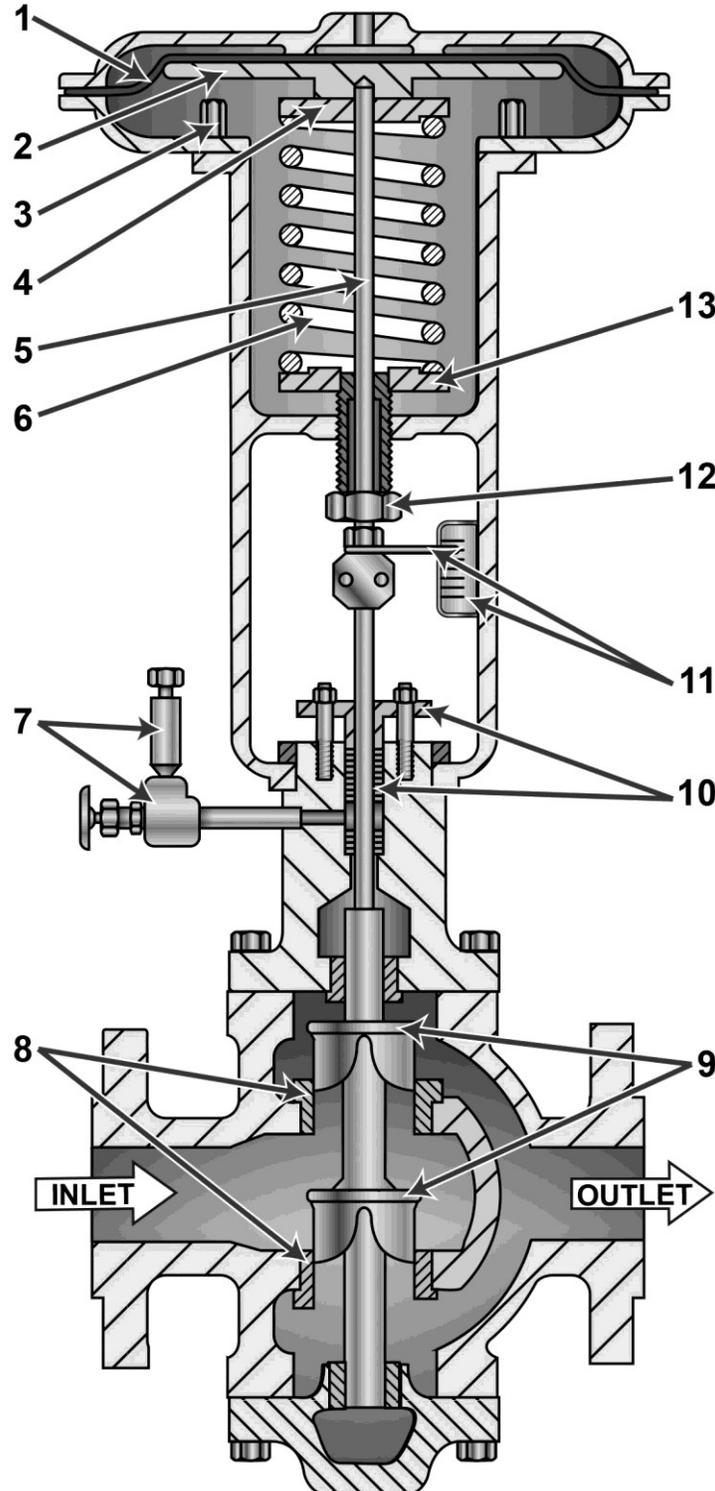
GS-0045



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GS-0051



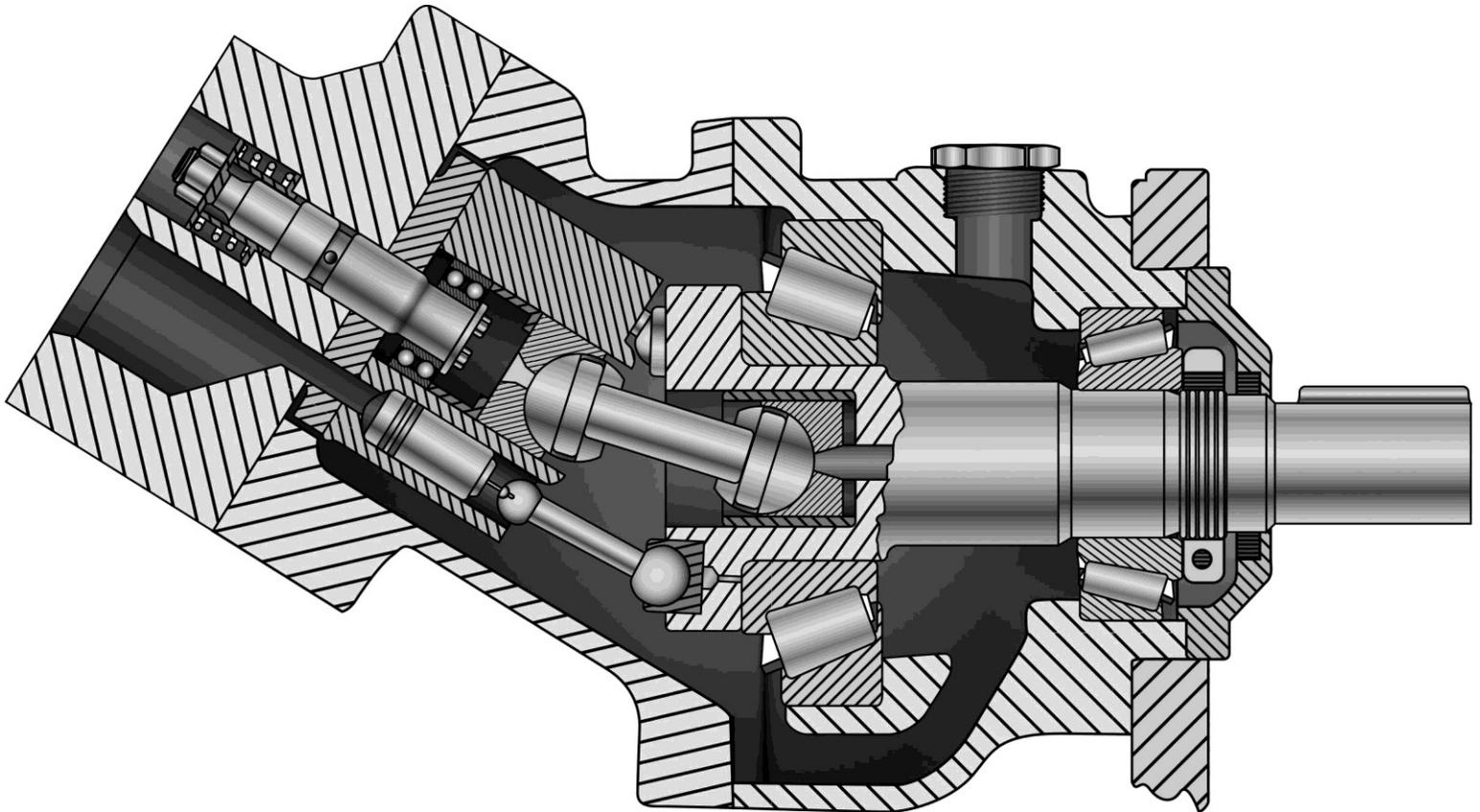
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GS-0080



A



B



C



D



E



F



G



H



I



J



K



L



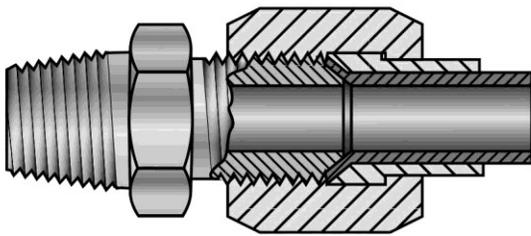
M



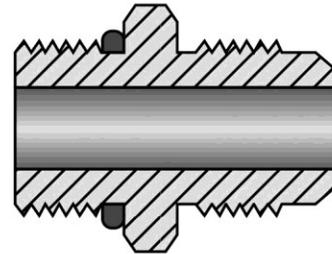
N

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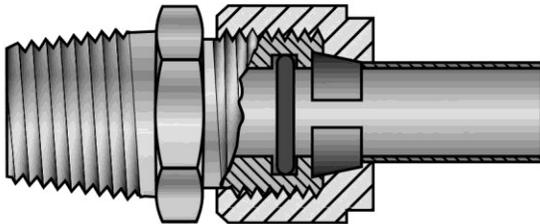
GS-0100



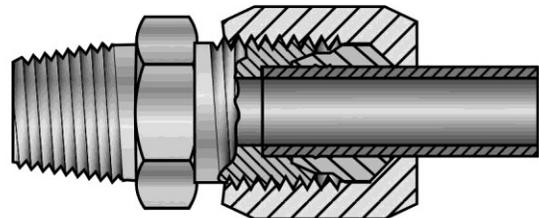
A



B



C



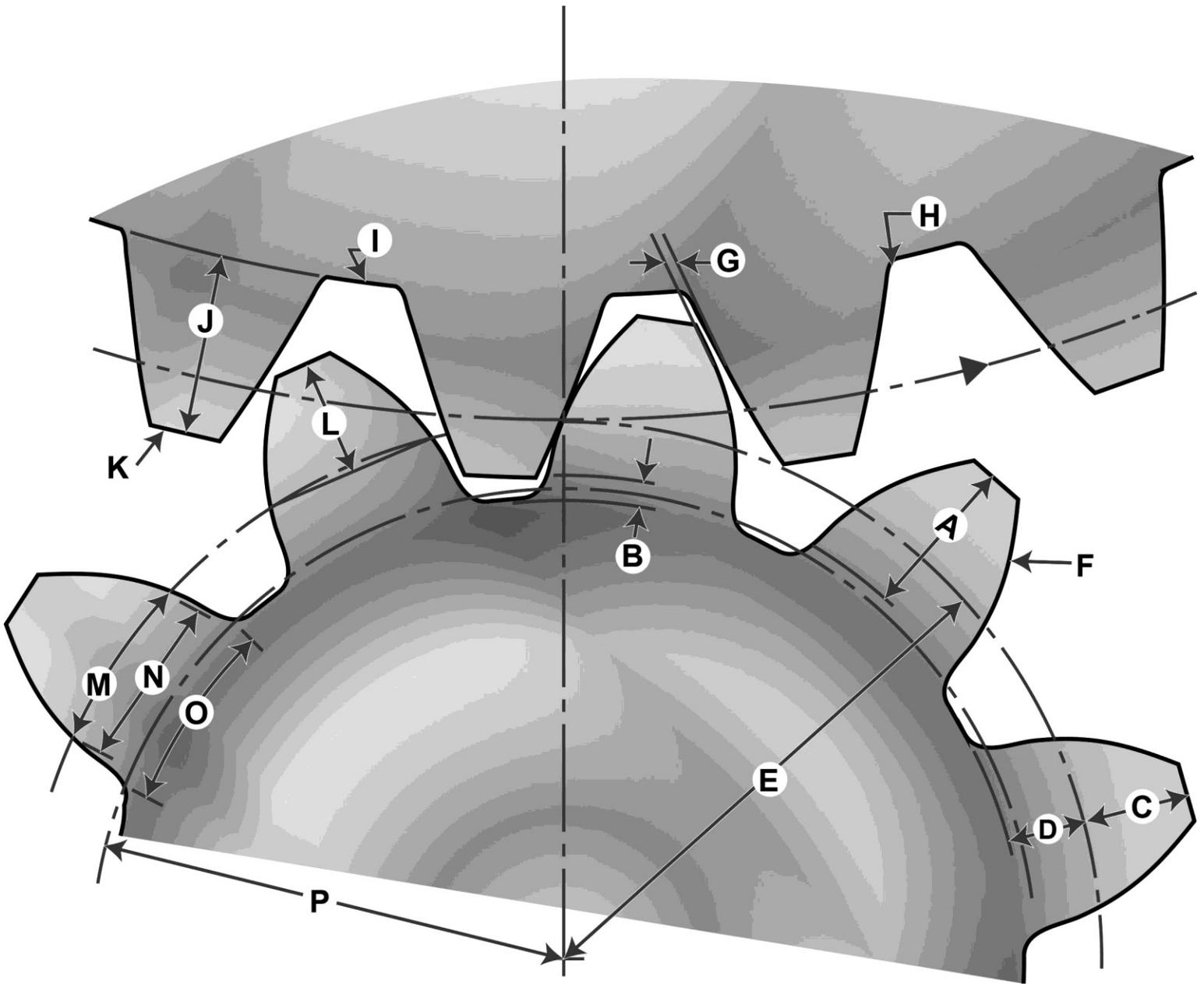
D

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GS-0111

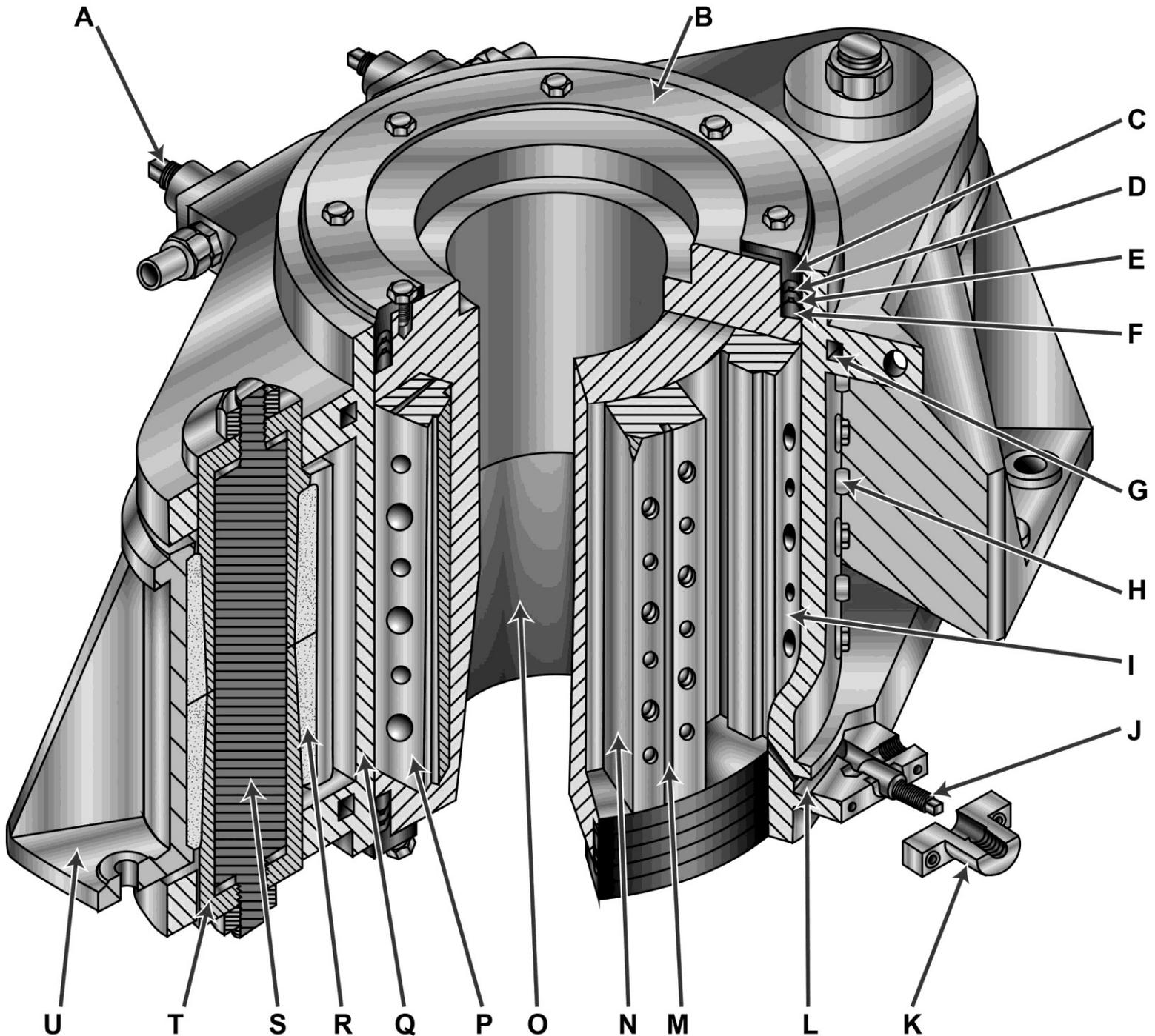


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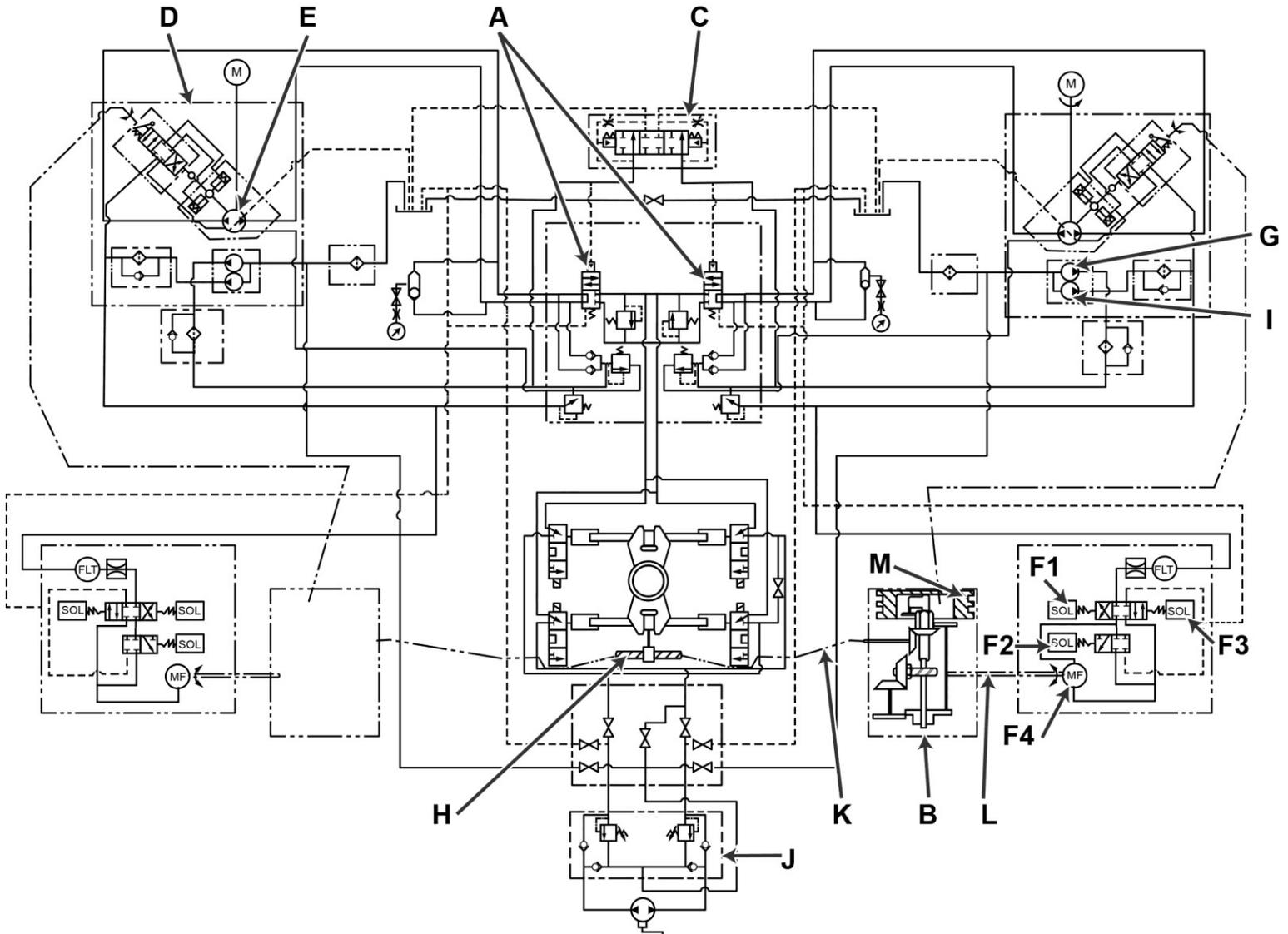


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GS-0123

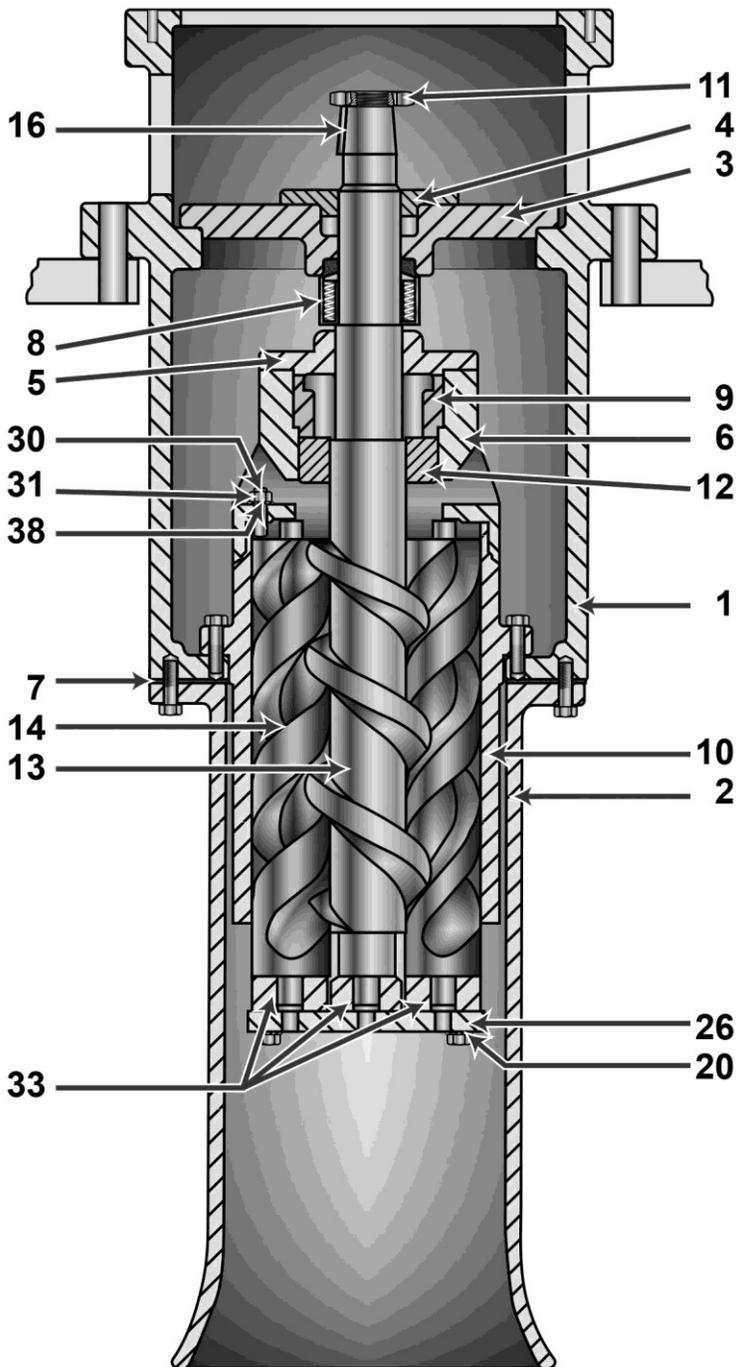


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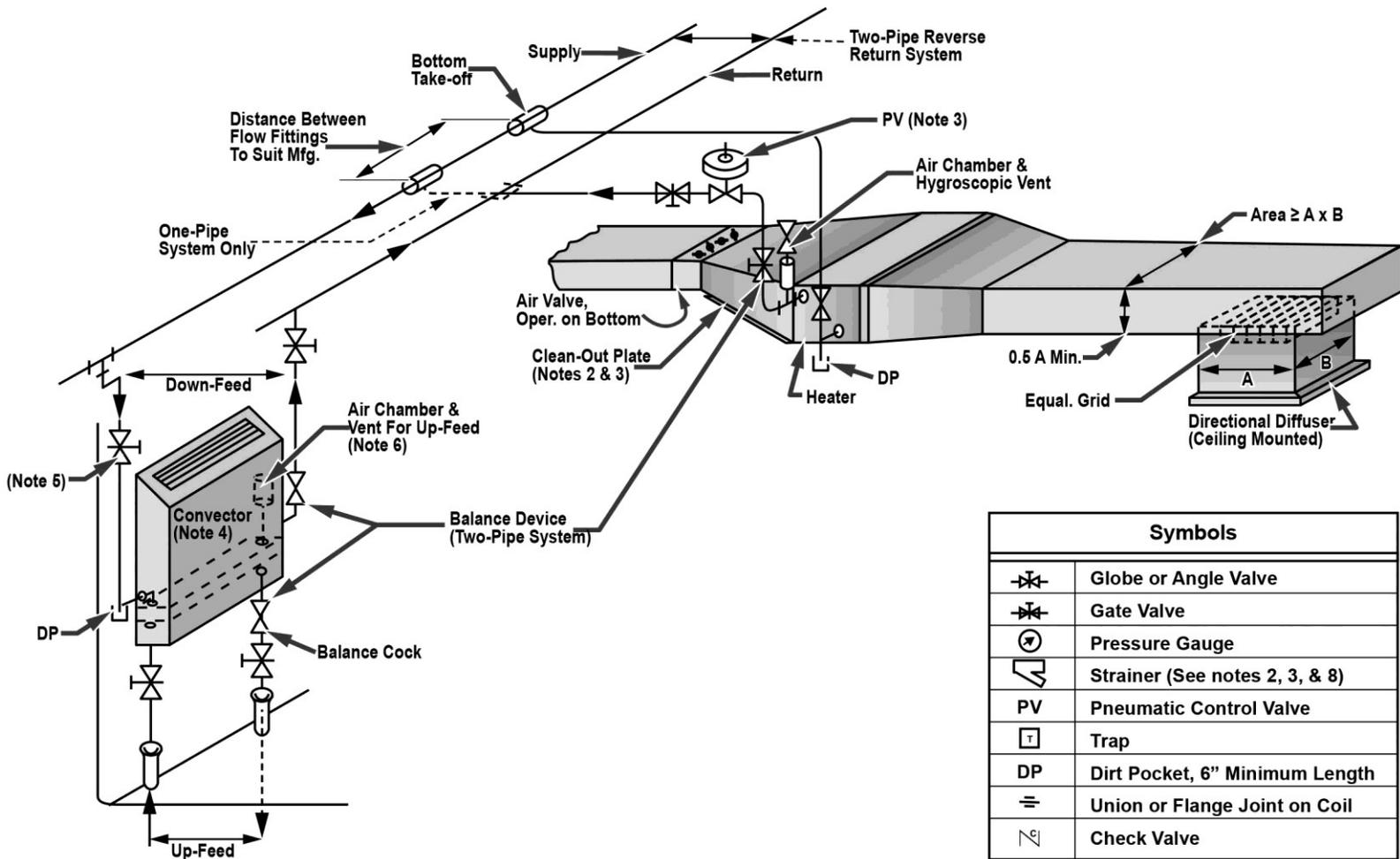
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GS-0144



PC NO.	NAME	Material
1	Pump Case	Cast Steel
2	Inlet Bell	Cast Steel
3	Seal Housing	Cast Steel
4	Packing Gland	Gun Metal
5	Bearing Retainer	Bearing Bronze
6	Balance Rotor Housing	Bearing Bronze
7	Gasket	Plant Fiber
8	Mechanical Seal for 2, 3, 8" Dia. Shaft	Steel & Syn. Rubber
9	Spacer	Bearing Bronze
10	Rotor Housing	Bearing Bronze
11	Check Nut	Steel
12	Balance Piston	Steel
13	Power Rotor	Steel
14	Idler Rotor	Steel
15	Socket Head Set Screw 1/4 - 20 x 7/16" long	Steel
16	Key	Steel
17	Bolt 3/8" - 16 x 1" long	Steel
18	Bolt 3/8" - 16 x 1 1/4" long	Steel
19	External Tooth Lockwasher	Steel
20	External Tooth Lockwasher	Steel
21	Bolt 1/4" - 13 x 1 1/4" Long	Steel
22	Socket Head Pipe Plug - 1/8" Size	Brass
23	Inlet Bell	Cast Steel
24	Bolt 1/2" - 13 x 1 1/2" Long	Steel
25	Spacer	Steel Pipe
26	Thrust Plate	Steel
27	Gasket	Plant Fiber
28	Oil Balance Tube	Steel
29	O Ring	Syn. Rubber
30	Stud 5/8" - 11" x 3 1/4" Long	Steel
31	Nut 5/8" - 11" THDS.	Steel
32	Bolt 1/2" - 13 x 4 1/2" Long	Steel
33	Thrust Shoe	Bearing Bronze
34	Lacing Wire 1/16" Dia. x 16 ft. Lg. (Cut to Suit)	Monel
35	Pkg. Ring for 2 3/8" Dia. Shaft 1/4" SQ	Symbol 430
36	Bolt 3/8" - 16" x 1 3/4" Long	Steel
37	Stud 3/4" - 10 x 3" Long	Steel
38	External Tooth Lockwasher	Steel
39	Spring Pin 3/32" x 3/8" Long	Steel
40	Name Plate (Serial)	Brass Sheet
41	Name Plate (Caution)	Brass Sheet
42	Name Plate (Rotation)	Brass Sheet

GS-0151



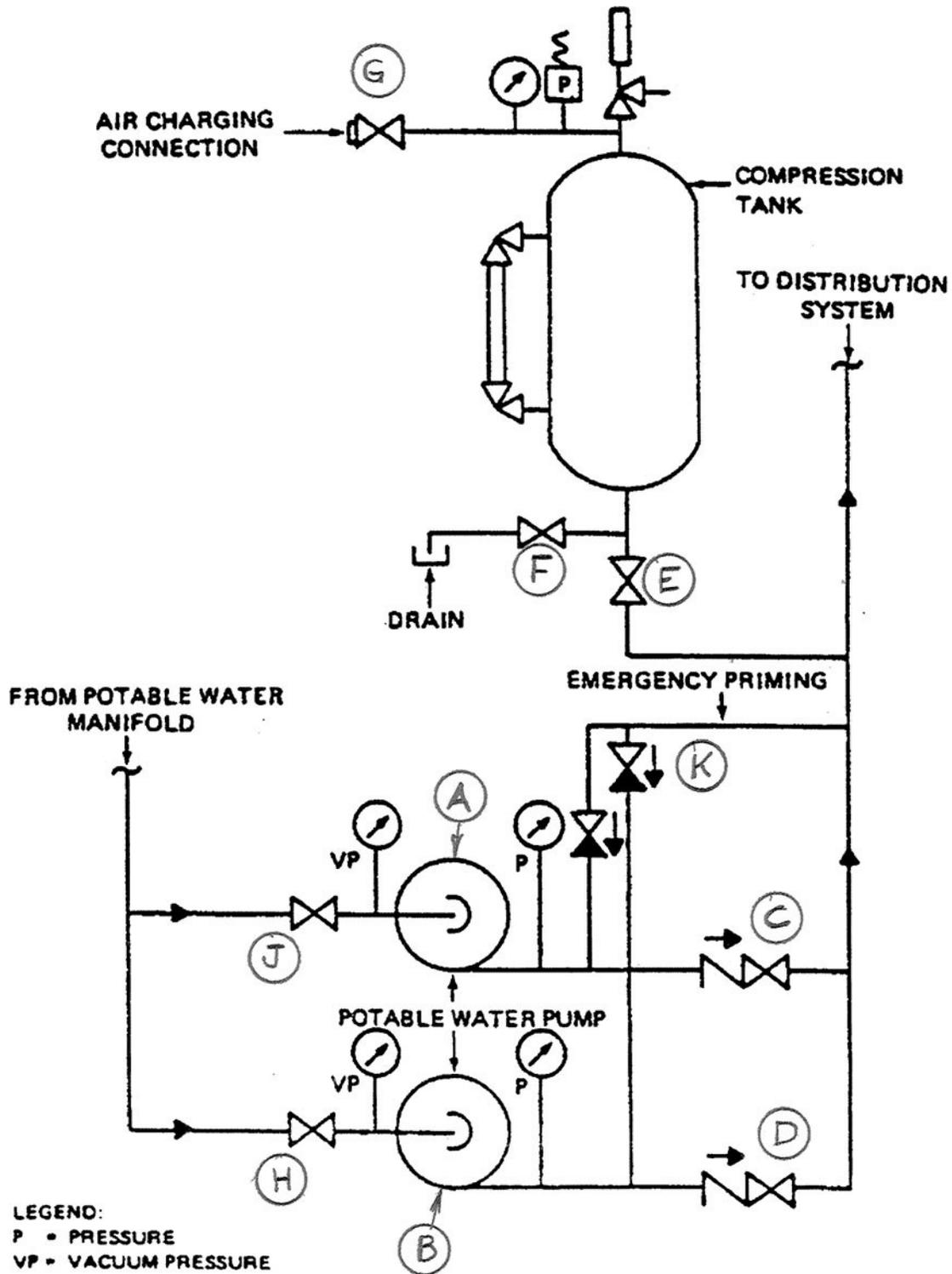
Symbols	
	Globe or Angle Valve
	Gate Valve
	Pressure Gauge
	Strainer (See notes 2, 3, & 8)
	Pneumatic Control Valve
	Trap
	Dirt Pocket, 6" Minimum Length
	Union or Flange Joint on Coil
	Check Valve

Notes

1. Mount convector on exposed (cold) bulkhead or bulkhead lining with 0.5" air space.
2. Clean-out plates should be 24" x 24" if possible.
3. Provide 24" x 24" hinged panel in joiner ceiling. Locate for easy access to air vent, valves, and clean-out.
4. The convector hook-up also applies to fin pipe elements.
5. Locate the shut-off valve for down-feed convectors approximately 6' above the deck.
6. The air vent must be operable through a side or discharge grille.

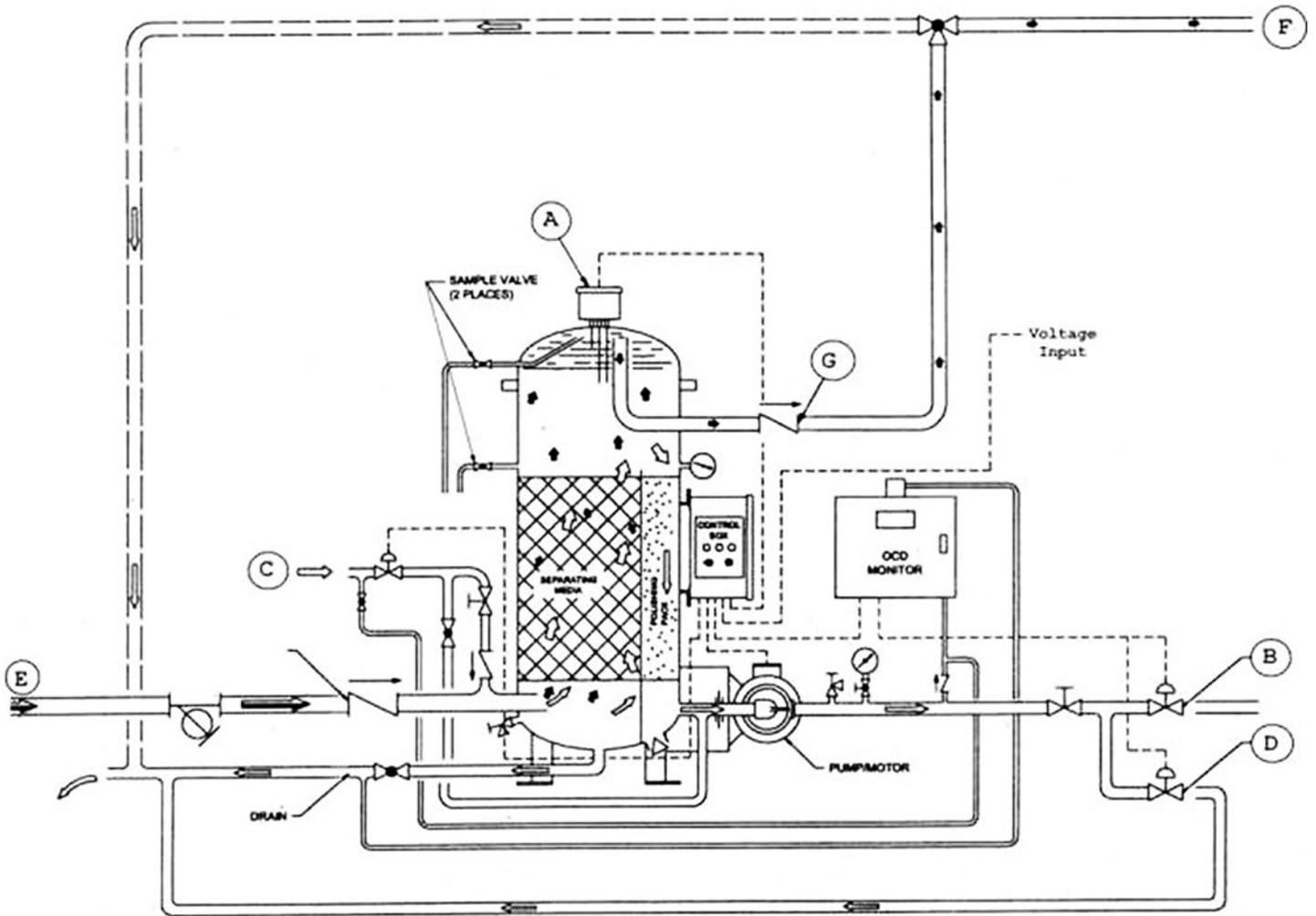
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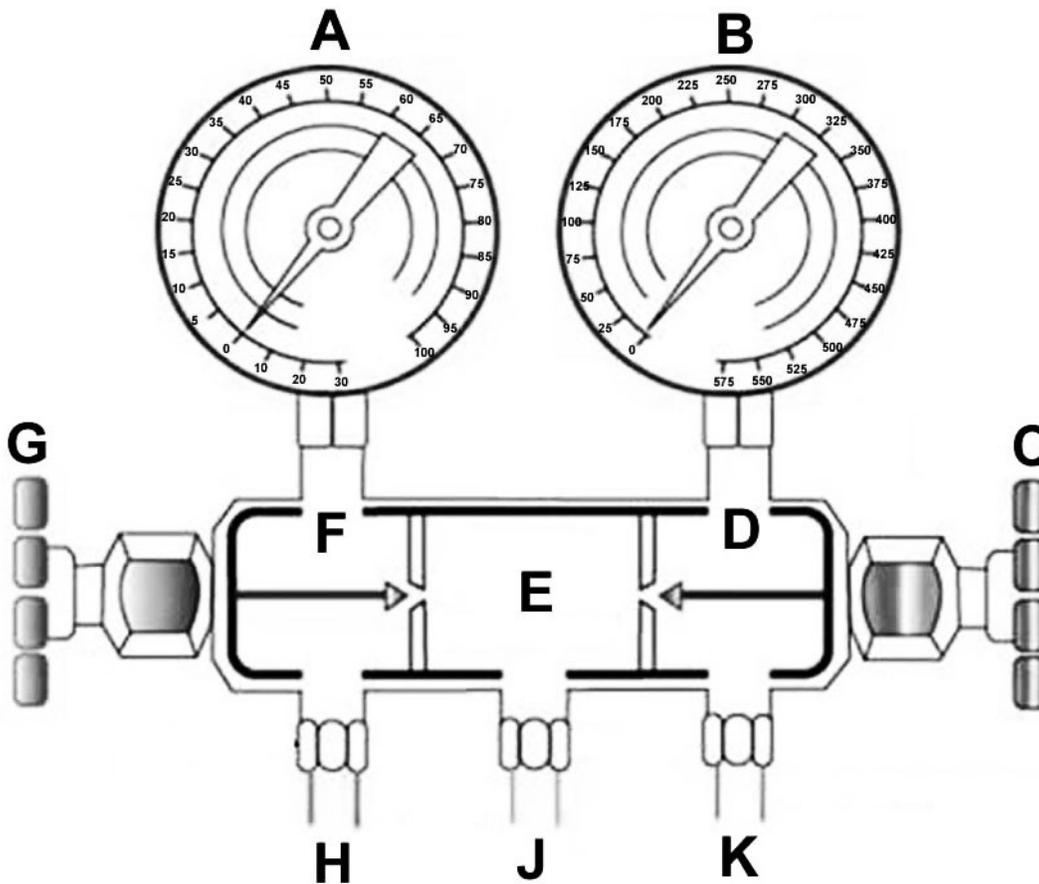


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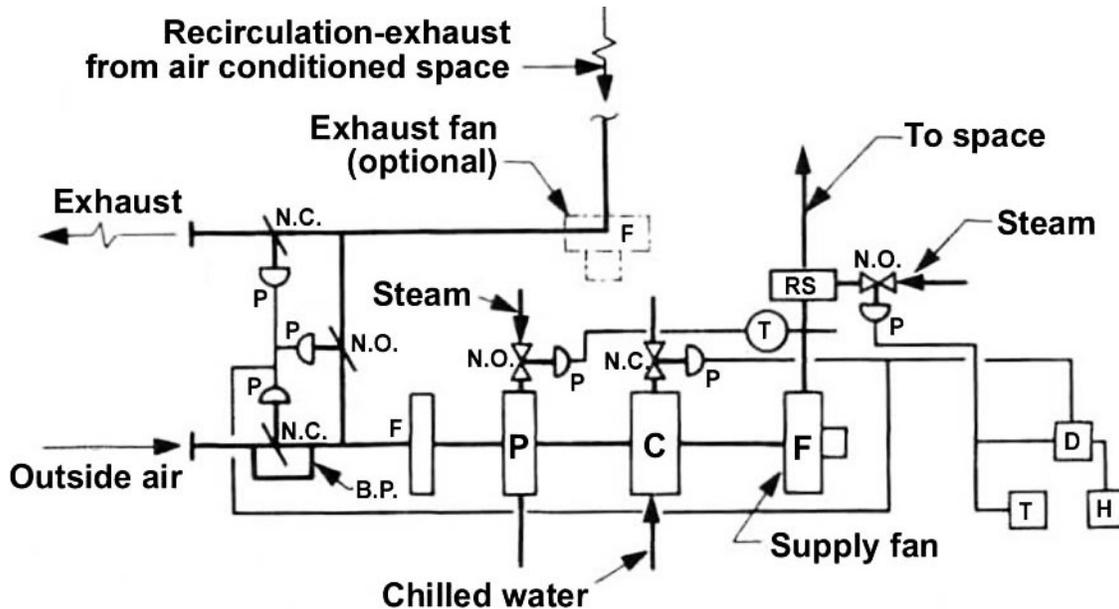
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GS-RA-01



GS-RA-09



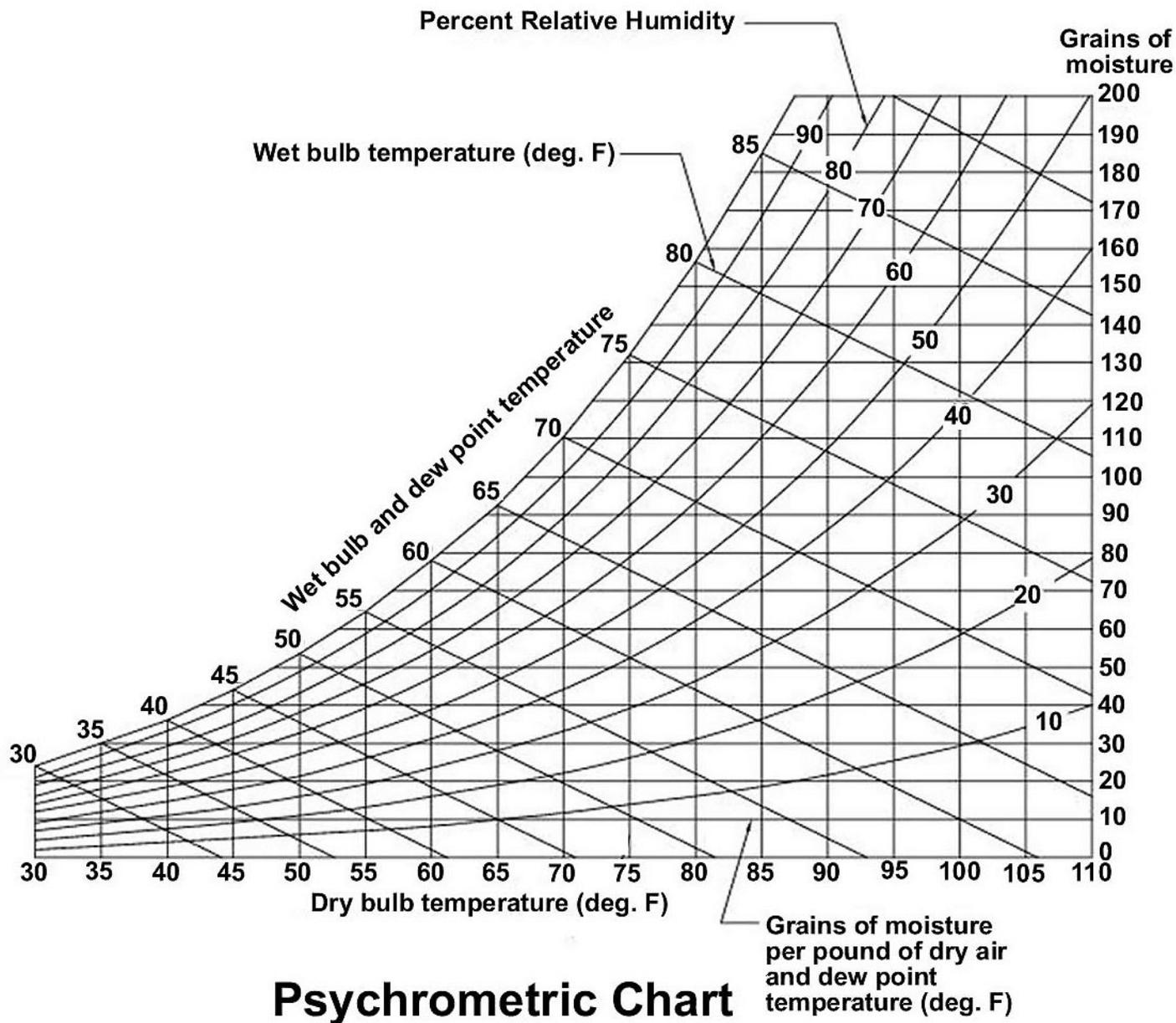
Legend

[H] Humidistat	[T] Room thermostat
[F] Fan	[M] Dual duct air mixing unit
F Filter	⊗ Pneumatic damper & motor
[C] Cooling coil	M Master
[P] Preheater (steam)	SM Sub-master
[R] Reheater (W=water, S=steam)	P Positive positioning relay
(T) Duct thermostat	⊗ Pneumatic control valve
N.O. Normally open (valve or damper)	[D] Diverting relay
N.C. Normally closed (valve or damper)	B.P. Minimum outside air bypass

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GS-RA-22



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GS-RA-45



A



B



C



D