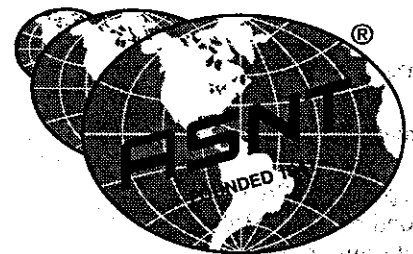


Questions and Answers

Levels I, II, and III

Halogen Diode Detector

*Supplement to
Recommended Practice
No. SNT-TC-1A
Book HH*



The American Society
for Nondestructive Testing, Inc.



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This publication contains suggested questions and answers in the Halogen Diode Test method for use in conjunction with *Recommended Practice No. SNT-TC-1A for Personnel Qualification and Certification in Nondestructive Testing*. *Recommended Practice No. SNT-TC-1A* is available from ASNT.

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Recommended Training References

Halogen Diode Detector Leak Testing

The following references were used in formulating the questions contained in this book.

- A. *Instructions for type LS-20 Leak Standard*. Yokogawa Corp, 2 Dart Rd., Shenandoah, GA 30265. Publication 198, 450K52-001EMI.
- B. *Leakage Testing Handbook*, revised edition. Prepared by General Electric and NASA under contracts CR-952, NAS 7-396, and NASA CR 06139. NASA Report #N69-38843 is available from NTIS, Springfield, VA, as report #IST-295. U.S. Department of Commerce, National Technical Information Service (NTIS). 1969.
- C.* *Annual Book of ASTM Standards*, Volume 03.03, *Nondestructive Testing*. "Standard Terminology for Nondestructive Examinations," Standard ASTM E 1316. Philadelphia, PA: American Society for Testing and Materials. Latest edition.
- D.* *Annual Book of ASTM Standards*, Volume 03.03, *Nondestructive Testing*. "Standard Guide for Preparation of a Leak Testing Specification," Standard ASTM E 479. Philadelphia, PA: American Society for Testing and Materials. Latest edition.
- E.* *Annual Book of ASTM Standards*, Volume 03.03, *Nondestructive Testing*. "Standard Guide for Selection of a Leak Testing Method," Standard ASTM E 432. Philadelphia, PA: American Society for Testing and Materials. Latest edition.
- F.* *Annual Book of ASTM Standards*, Volume 03.03, *Nondestructive Testing*. "Standard Practice for Testing for Leaks Using the Halogen Leak Detector (Alkali-Ion Diode)," Standard ASTM E 427. Philadelphia, PA: American Society for Testing and Materials. Latest edition.
- G. *Operating Instructions for Ferret (Type H-25) Leak Detector*. Yokogawa Corp., 2 Dart Rd., Shenandoah, GA. Publication 198 450K15-001c.
- H.* McMaster, R.C., ed. *Nondestructive Testing Handbook*, second edition: Volume 1, *Leak Testing*. Columbus, OH: The American Society for Nondestructive Testing, Inc. 1982.

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Each question found in this book contains letter(s) and page number(s) in bold type immediately following the answers. For example,

13. Which of the following refrigerants would it be permissible to use when a halogen diode detector test procedure specifies the use of R-12?

- a. Genetron 12
- b. Freon 12
- c. Isotron 12
- d. any of the above

H.551

In this example, the letter "H" refers to Reference H in the list provided above and "pg. 551" is the specific page in Reference H where the answer to the question can be found.

Reference Usage List

Halogen Diode Detector Leak Testing

Reference A: Total = 5

Level I (5)
Level II (0)
Level III (0)

Reference B: Total = 26

Level I (7)
Level II (10)
Level III (9)

Reference C: Total = 7

Level I (2)
Level II (3)
Level III (2)

Reference D: Total = 0

Level I (0)
Level II (0)
Level III (0)

Reference E: Total = 3

Level I (0)
Level II (2)
Level III (1)

Reference F: Total = 9

Level I (2)
Level II (5)
Level III (2)

Reference G: Total = 8

Level I (5)
Level II (3)
Level III (0)

Reference H: Total = 94

Level I (28)
Level II (31)
Level III (35)

Level I Questions

Halogen Diode Detector Leak Testing

1. Good operating practice dictates that the period of time to allow for warm up of the halogen diode detector prior to calibrating is:
 - a. 30 minutes
 - b. 15 minutes
 - c. 1 h
 - d. as recommended by the manufacturer

F; H.116, 569, 599, 601-602
2. An operator smoking a cigarette while performing a halogen diode leak detector test in a confined area discovers repeated erratic signals on the instrument meter. Which of the following is *most likely* the cause of the signals?
 - a. a dirty instrument sensing element
 - b. high background caused by the halogen rich cigarette smoke
 - c. low line voltage to the instrument control unit air pump
 - d. low line voltage to the instrument

H.579
3. When preparing objects for halogen diode leak testing, the areas to be tested must be free of:
 - a. dirt
 - b. grease
 - c. moisture
 - d. all of the above

H.579, 622
4. For accurate leak location during halogen leak testing, if air movement is encountered which does not reduce the required sensitivity of the test, the:
 - a. probing operation should begin at the first located leak and proceed in a clockwise direction
 - b. probing operation should begin at the downstream side of the draft
 - c. probing operation should begin at the upstream side of the draft
 - d. test should be stopped and the detector recalibrated

H.600
5. When performing a halogen diode detector probe (sniffer) test of a large object, in the absence of significant air movement, sniffing or scanning should normally proceed from the:
 - a. weld furthestmost from the test manifold
 - b. highest to the lowest point in the test system
 - c. leeward to the windward side of the test system
 - d. lowest to the highest point in the test system

H.600
6. Halogen diode type leak detectors should never be used in an explosive atmosphere because:
 - a. this is a violation of good safety practices and OSHA Standards
 - b. the sensing element of the instrument which operates at a very high temperature could ignite the explosive mixture
 - c. the instrument contains electrical circuits which could ignite the explosive mixture
 - d. all of the above are applicable

B; H.562, 579, 588
7. As the surrounding temperature increases, the maximum pressure attainable from a bottle of halogen rich refrigerant gas:
 - a. increases
 - b. remains the same
 - c. decreases
 - d. varies with the square of the temperature

H.533
8. When recharging a reservoir type halogen standard leak with refrigerant, personnel should:
 - a. always use the "Freon" brand of refrigerant
 - b. for economy, use whatever refrigerant number that is on hand, i.e., R-11, R-12, R-22, etc.
 - c. always wear safety glasses with side shields to protect their eyes
 - d. always wear asbestos gloves to keep from burning their hands

A.13

Table 1 (for question number 9)

For Systems Pressurized from Atmospheric Pressure with Refrigerant % by Volume Halogen Concentration																
Halogen Pressure	Test Pressure — PSIG															
PSIG	2	5	10	15	20	25	30	35	40	45	50	55	60	65	70	
2	12	10	8	6.7	5.7	5	4.5	4	3.6	3.3	3.1	2.9	2.7	2.5	2.3	
5		25	20	16.7	14.3	12.5	11.1	10	9.1	8.3	7.7	7.1	6.7	6.3	5.9	
40									72.7	66.6	61.5	57.1	53.3	50	47.1	
45										75	69.2	64.3	60	56.3	53	

Table 2 (for question number 10)

% by Volume Halogen Concentration	Halogen Standard Leak Setting — Std. cm ³ /s				
	Required Test Sensitivity — Std. cm ³ /s				
	1×10^{-2}	1×10^{-3}	1×10^{-4}	1×10^{-5}	1×10^{-6}
1	1×10^{-4}	1×10^{-5}	1×10^{-6}	1×10^{-7}	
2	2×10^{-4}	2×10^{-5}	2×10^{-6}	2×10^{-7}	
5	5×10^{-4}	5×10^{-5}	5×10^{-6}	5×10^{-7}	
10	1×10^{-3}	1×10^{-4}	1×10^{-5}	1×10^{-6}	1×10^{-7}

9. A halogen diode detector test procedure requires 34 kPa (5 psig) of R-12 and a total pressure of 310 kPa (45 psig) for the test. From Table 1 above, the percent by volume halogen mixture at test pressure is:

a. 6.7
b. 8.3
c. 40
d. 75

H.584

10. A halogen diode detector test is to be performed at a test sensitivity of 1×10^{-4} std. cm³/s with a 5 percent by volume halogen mixture in the test object. From Table 2 above, the approximate maximum size standard leak setting that should be used to calibrate the halogen leak detector for the test is:

a. 2×10^{-4} std. cm³/s
b. 5×10^{-5} std. cm³/s
c. 5×10^{-6} std. cm³/s
d. 2×10^{-7} std. cm³/s

H.585

11. When erratic signals are indicated during a halogen diode detector probe (sniffer) test, one cause of the problem could *most likely* be:

a. erratic sniffing technique by the operator
b. halogen background from a large leak
c. a downstream virtual leak
d. inadequate instrument sensitivity

B; H.583

12. Good operating practice dictates that the sensitivity of the halogen diode detector should be determined before and after testing and at intervals of _____ minimum while scanning.

a. 2 h
b. 1 h
c. 0.5 h
d. 3 h

H.565, 580

13. While increasing the leak rate setting on a reservoir type variable halogen standard leak, if the instrument pointer continues to go up the scale after the INCREASE valve is closed, this is an indication that the:

- a. DECREASE valve is not firmly closed
- b. gas reservoir is overpressurized
- c. liquid tank is too full
- d. INCREASE valve is not firmly closed

A.5; H.115

14. When adjusting a reservoir type variable halogen standard leak, if the DECREASE valve is opened when the INCREASE valve is not fully closed, the:

- a. valve between the liquid tank and gas reservoir will close
- b. instrument pointer will rapidly go to the top of the scale
- c. refrigerant will vent from the standard leak reservoir and refilling will most likely be necessary
- d. instrument pointer will slowly decrease to half scale

A.6

15. The basis for the scanning or sniffing direction during a halogen diode detector probe (sniffer) test is that refrigerant gas:

- a. is heavier than air and will settle to the lowest point
- b. is lighter than air and will rise during testing
- c. is the same weight as air and will stay in the immediate area of the leak or leaks from which it is escaping
- d. will rapidly change chemical composition as it escapes into the surrounding air

B; H.357, 554

16. Which of the listed items could temporarily plug leaks in a test object?

- a. water
- b. cleaning solvent
- c. paint
- d. all of the above

B; H.564, 579, 622

17. A halogen diode detector test procedure specifies the use of R-12 as the source of tracer gas. Which of the following refrigerants would it be permissible to use?

- a. Genetron 12
- b. Freon 12
- c. Ucon 12
- d. any of the above

G; H.551

18. Materials that contain halogens are usually called:

- a. fluorines
- b. inert
- c. halides
- d. ozone

B; C; H.560

19. While adjusting a reservoir type variable halogen standard leak, the operator accidentally vents the gas from the only standard leak available. Which of the following actions would quickly resolve the problem?

- a. replace the standard leak
- b. replace the cylinder in the standard leak
- c. recharge the standard leak
- d. send the standard leak to the manufacturer for recharging

A.12

20. The test connections used for pressurizing a halogen diode detector probe (sniffer) test system should be halogen leak tested prior to performing the halogen diode detector probe test of the system, in order to:

- a. complete the training of the operator and qualify that individual in this test method
- b. check the adequacy of the instrument calibration
- c. detect and eliminate leakage that could create background contamination
- d. verify the adequacy of the soak time

H.579

21. Placing the sniffer probe or gun of a halogen diode leak detector in a stream of pure refrigerant:

- a. is a rough method of checking instrument sensitivity in the absence of a standard leak
- b. will temporarily or permanently contaminate and shorten or end the life of the instrument sensing element
- c. is a method of determining the percentage of halogen compound in the refrigerant
- d. enables the operator to simulate background contamination

B; G; H.565, 579

22. One purpose of a built-in automatic zeroing circuit in a halogen diode leak detector is to:

- a. enable the operator to use a faster scanning speed
- b. eliminate the steady background signal caused by local atmospheric halogen content
- c. ensure that the operator will not miss a leak
- d. make it easier to more rapidly pinpoint very small leaks

G.5; H.405, 563, 572

Halogen Diode Detector Leak Testing, Level I

23. The size of the smallest leakage detectable with a halogen leak detector is known as:
- total leakage rate
 - leak indicator range
 - response time
 - sensitivity
- C; G; H.558, 581**
24. When pressurizing a vessel or component with a mixture of compressed air and halide refrigerant, adding the refrigerant to the system first:
- reduces the total quantity of refrigerant required for the test
 - aids in the dispersion and mixing of the refrigerant throughout the system
 - minimizes the possibility of the operator missing leaks due to the higher concentration of tracer gas at the start of scanning
 - speeds the stratification of refrigerant within the test system which increases the reliability of the results
- H.589, 607**
25. While performing a halogen diode detector test, the leak detector becomes difficult to zero and the pointer on the leak rate meter repeatedly swings up scale. The most likely cause of the problem could be the use of too high a sensitivity range, shorted element, excessive heater voltage, or:
- poor air flow
 - sensing element is too new
 - high halogen background
 - faulty leak rate meter
- G; H.556, 563, 608**
26. When venting a halogen mixture from a vessel or component in order to repair detected leaks, the location of the end of the vent or exhaust line:
- is dependent on the percent by volume mixture
 - is unimportant since the initial test is already complete
 - must be downwind and far enough away to prevent the halogen mixture from re-entering the test area
 - is not important at this stage of the test since the repairs can be made without releasing the pressure from the system
- B; F; H.584**
27. Which of the following leak rate values does *not* match any of the halogen standard leak settings shown in Figure 1.1?
- 5.3×10^{-2} oz. per year
 - 1.2×10^{-6} std. cm³/s
 - 2.6×10^{-5} std. cm³/s
 - 1.5×10^{-1} oz. per year
- A; H.578**
28. One of the better methods of assuring that the distance between the sniffer probe tip and the test surface does not exceed the maximum allowed by the code and/or test procedure is to:
- fit the end of the sniffer with a notched piece of plastic that projects no more than the allowed maximum distance beyond the tip of the sniffer
 - trim the tip of the sniffer by the amount of allowed maximum distance
 - tape a wire rod to the sniffer with the end projecting beyond the tip of the sniffer by twice the required maximum distance
 - estimate the distance between the sniffer and the test surface during scanning
- H.576, 580**

Figure 1.1.

