

TROUBLESHOOTING DART® OR VERIFY™ BOWIE-DICK TEST CARD RESULTS

The Bowie-Dick test is a specific type of chemical indicator test that was developed to monitor the effectiveness of air removal from prevacuum (mechanical air removal) steam sterilizers. The DART and the Verify Bowie-Dick Test Card are designed to be functionally equivalent to the Bowie-Dick type test described in the Association for the Advancement of Medical Instrumentation (AAMI) Standards. The indicator ink of the DART or Verify Bowie-Dick Test Card should undergo a uniform color change to black after a steam prevacuum cycle using the recommended parameters. If the prevacuum cycle is not successful in producing the prescribed color change end point in the DART or Verify Bowie-Dick Test Card, the following items should be checked:

- 1) **Review test cycle procedures:** Review sterilizer charts and printouts to verify cycle parameters, and type of cycle (prevacuum). Prevacuum levels, exposure temperature, and exposure time must be adequate. Refer to the DART or Verify Bowie-Dick Test Card instructions for information regarding the cycle exposure time and temperature. Refer to the sterilizer manual for information on the sterilizer prevacuum cycle parameters.
 - The DART and the Verify Bowie-Dick Test Card are designed for use in a 132°-134°C (270°-273°F) prevacuum cycle with an exposure time of 3-1/2 to 4 minutes.
 - The DART should be placed directly over the drain opening in an otherwise empty chamber.
 Alternatively, the DART may be suspended over the drain in the sterilizer chamber using the beaded plastic tie provided in the DART dispenser box.
 - The Verify Bowie-Dick Test Card should be placed in an otherwise empty chamber. The Test Card should be placed in a Verify Test Card Holder on the lowest shelf over the sterilizer drain, with the chemical indicator bars of the test card facing up.
- 2) **Run a warmup cycle:** Be sure that the sterilizer jacket is at operating temperature prior to the DART or Bowie-Dick test. It is advisable to run a preliminary nonprocessing cycle before the DART test.
- 3) **Verify the storage conditions:** The DART or the Verify Bowie-Dick Test Card should be stored at the proper conditions prior to testing. The DART should be stored below 75°F (24°C) at a relative humidity of 30 percent to 80 percent. The Verify Bowie-Dick Test Card should be stored below 75° (24°C) under dry conditions.

The expiration date is labeled on each DART or Verify Bowie-Dick Test Card (catalog number S3095). The devices should not be used after the expiration date has elapsed.

- 4) **Run a chamber leak test cycle:** Many steam sterilizers have a built-in chamber leak test cycle which determines the leak rate of the sterilizer chamber and some of the associated piping. If this cycle is available, utilize the sterilizer leak test cycle to determine the leak rate of the chamber, and compare the rate to previous leak test results performed during commissioning or validation. If the leak rate is not within acceptable limits, the unit should be evaluated by service.
 - 5) **Evaluate the function of the sterilizer:** Have the function of the sterilizer checked by qualified personnel using appropriate safety and health practices. If a leak due to a poor seal or connection is suspected, some basic maintenance items to check include:
 - Verify door gasket(s) is in good condition and is not leaking.
 - Check sterilizer pipe fittings and gaskets for leaks. PTFE (polytetrafluoroethylene) gaskets may creep (deform slowly under constant stress) and vacuum cycling of piping components may loosen flange bolts. A possible method may be to check for any positive pressure leaks from the chamber using bubble testing solutions such as Snoop® Liquid Leak Detector (Nupro Company), or Leak-Tec® (American Gas & Chemical Co. Ltd.) or equivalent. An ultrasonic leak detector may be used to check for vacuum or pressure leaks.
 - Inspect the validation port(s); replace port gaskets, if necessary.
 - Verify that the chamber safety valve is not leaking.
 - Determine if the sterilizer check valves or process control valves are leaking internally.
- Maintenance items** (other than leaks) that may affect the vacuum rate or the steam charge rate include:
- Verify that the screen in the chamber that covers the chamber drain opening is free of debris.
 - Verify condensate traps on the jacket and chamber are clean and functioning properly. (A cold trap may indicate the trap has failed closed.) Ultrasonics and temperature measurement may be used to evaluate trap function.
 - Verify that the domestic water supply to the vacuum pump or water ejector is at the correct pressure and temperature (see the sterilizer maintenance manual).

Higher seal water temperatures may cause cavitation and a reduction in pump efficiency.

- Verify that the strainers on steam supply and condensate piping are clean.
- Verify that the water strainer on domestic water supply to the vacuum pump or water ejector is clean.
- Verify that there is no excessive back pressure on the discharge piping from the vacuum pump or ejector due to a blocked heat exchanger.

6) Verify the utility specifications: Verify that the utilities supplied to sterilizer meet the requirements specified by the sterilizer manufacturer.

- The domestic water supply to the sterilizer vacuum pump or water ejector should be at the correct pressure and temperature.

- No excessive levels of noncondensable gases (e.g. oxygen or carbon dioxide) should be present in the sterilizer steam supply (possibly due to inadequate deaeration of the steam generator feedwater).

7) Verify the calibration: Verify the calibration of temperature and pressure channels of sterilizer using National Institute of Standards and Technology (NIST) traceable measurements (or measurements traceable to other appropriate standards).

Summary

The above-listed items should be considered for the effective use of the DART, Verify Bowie-Dick Test Cards, and prevacuum steam sterilization cycles.

For further information, please contact:

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