

Technical Report

SterilAmp® II 5230

I. Introduction

SterilAmp II 5230 is a biological indicator (BI) produced for the manufacturers of sterile solutions using low temperature steam sterilization. The bacterial spores in this unit respond predictably to specific F_0 exposures measured inside the product container by certified thermocouples. SterilAmp II 5230 is a self-contained unit, making it easy to use with no sophisticated laboratory testing or analysis required. SterilAmp II 5230 consist of 10^6 *Bacillus subtilis* 5230 strain 35021 spores suspended in a specially formulated culture medium.

SterilAmp II 5230 contains 0.3 mL of a spore/medium suspension sealed inside a small, thin-walled, pharmaceutical-grade glass ampoule. These ampoules are approximately 6.75 mm diameter and 27 mm long. This size allows them to be placed inside small product vials or ampoules and also allows them to be packaged inside the small medical device plastic trays containing liquid. These units can also be placed inside thermowells to effectively monitor Sterilization-in-Place (SIP) of product transport lines and filling machines.

II. Storage

SterilAmp II 5230 should be stored refrigerated at 2° - 8° C. Protect from light.

Bacillus subtilis 5230 has a wide growth range of 15° C - 57° C (59° F to 134° F). If temperatures reach this range at any time during shipping, storing or handling, the spores will germinate and proliferate, rendering the product useless. Mesa's shipping method maintains SterilAmp II 5230 below 15° C for up to five days, therefore expediated shipping methods must be used. If other shipping methods are used, such as freight forwarding companies, Mesa will not be responsible if the product is compromised upon receipt.

III. Shelf Life

SterilAmp II 5230 has a 15-month shelf life from the date of manufacture when stored at recommended conditions.

Do not use after expiration date printed on package. Dispose of positive or expired indicators by autoclaving at 121° C for not less than 30 minutes.

IV. Medium

The growth medium has a pH color indicator to aid in the early detection of growth. The pH indicator is red/orange when the ampoules are manufactured. Spores that have survived the sterilization process will then turn the media inside the ampoule from red/orange to yellow upon incubation. If any ampoules show signs of a visual color change or turbidity prior to use, they should be autoclaved and discarded.

V. Use

The ampoules should be placed inside identical product containers as the product being sterilized. If more than one size container is used, then each different size should be monitored.

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The product containers should be filled to the same level or fill volume used for the product. If extremely small volumes are used, 1 to 2 mL, the volume displacement and mass of the SterilAmp II 5230 must be considered.

Each SterilAmp II 5230 displaces approximately 0.8 mL of liquid and weighs approximately 0.7 g. The liquid may be the product or simulated product. If a simulated product is used, it should have similar heat transfer characteristics. This most often varies with viscosity. The "product packages" should be closed in a similar manner as the actual product being sterilized.

The positions in the load should be based on thermocouple profiling of the loaded chamber to assure that the "most difficult to sterilize" locations are being monitored. Generally, locations consist of placing BIs top to bottom, front to back, and in the geometric center of the load.

Following sterilization, the BIs should be removed from the load, cooled at least to incubation temperature 35 - 39 °C and then placed into the incubator. The SterilAmp II 5230 may remain inside the product container if the color change can be easily observed.

VI. Incubation and Readout Time

The recommended incubation for SterilAmp II 5230 is seven days at 35° - 39°C. Placement in an optimized growth environment which maintains the incubation temperature is necessary to gain accurate results.

Since SterilAmp II 5230 is a totally self-contained system, it can be incubated in either a water bath or standard bacteriological incubator. If the SterilAmp II 5230 is incubated inside the product container, the time to reach incubation temperature will vary based on the mass of the product container and solution, as well as the start temperature of the container and contents. SterilAmp II 5230 ampoules can be placed in zip lock bags for convenience during incubation.

VII. Interpretation

The appearance of a yellow color indicates bacterial growth. No color change indicates the spores were killed in the sterilization process.

Act on a positive test (a color change to yellow) as soon as the color change is noted. Color change is to be interpreted as 'inadequate sterilization'. Carefully review sterilizer process records to ensure that all physical process parameters are within specification. Always ensure that loading configuration and product and package specifications are in agreement with the sterilization validation process.

A positive control should be run for each cycle tested or at least once per week. As soon as a control turns yellow, it should be appropriately recorded and then autoclaved and discarded. The control is intended to assure the user that viable spores are present in the BI lot prior to testing the sterilizer. Positive controls are not intended to be a 'color standard' for comparing test results.

A true negative or no growth in a positive control is a serious problem. Fortunately, the causes are few: a grossly malfunctioning incubator; inadvertent sterilization of the control vial; or inadvertent sterilization of the box of indicators due to improper storage.

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Negative Controls: The negative control (media ampoule without spores) was developed for those users who run a longer sterilization cycle. The longer sterilization cycles break down certain growth media components and make it difficult to distinguish whether a SterilAmp II 5230 is turning positive.

The negative control is placed in the sterilizer load along with units that contain spores. Color changes due to thermal degradation can be observed and compared. This demonstrates the normal shift in color from the process. The negative control is used as a visual comparison to show what a negative result should look like even if the media experiences color change due to the thermal insult of the cycle. After incubation of both processed ampoules, the ampoule that contained spores is compared to the negative control ampoule. If there is a significant change in the color of the ampoule that contained spores as compared to the negative control ampoule, the result is recorded as positive. If there is not a significant change in the color of the ampoule that contained spores as compared to the negative control ampoule, the result is recorded as negative.

The negative control is manufactured with the same media formulation as the SterilAmp II 5230 with spores. The distinguishing characteristic of the negative control is a 2-mm stainless steel bead that is placed in the glass tube before it is sealed.

VIII. Resistance Performance Characteristics

Steam resistance assessment testing is performed by exposing SterilAmp II 5230 ampoules in a steam resistometer conforming to ANSI/AAMI/ISO 18472:2018. Exposure conditions are at $110^{\circ}\text{C} \pm 0.5$, $115^{\circ}\text{C} \pm 0.5$ and $118^{\circ}\text{C} \pm 0.5$ in saturated steam using a pre-vacuum cycle. D-value is determined using the Fraction Negative method.

Z-value is calculated using 110°C , 115°C and 118°C D-values.

Survival and Kill times at 110°C , 115°C and 118°C are calculated per the equations in ISO 11138-1, Annex E, using a population value and a D-value rounded to four decimal places.

D-value at 121°C is extrapolated data.

IX. Population Determination

Detailed population assay instructions, TS-404 SterilAmp II, SterilAmp II “5230” and MagnaAmp, are available on Mesa’s website.

X. Compliance

SterilAmp II 5230 is manufactured in compliance with Mesa Laboratories’ quality standards, USP, ISO 11138 guidelines and all appropriate subsections.