

# Reliable Storage with Innovative Eppendorf Storage Boxes

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## Executive summary

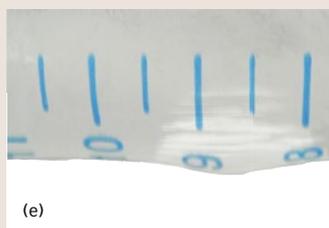
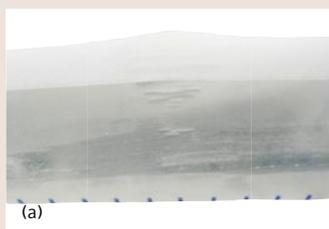
“What do you need in a storage box to safely store your materials in the ultra-low-temperature (ULT) freezer?” This is perhaps not a question one commonly asks. High quality polypropylene boxes offer the best of physical, mechanical and temperature stability while retaining the stable form and clarity comparable to polycarbonate boxes. Eppendorf Storage Box portfolio offers a wide range of boxes for all commonly used tube formats and sizes. Its quality and innovative design ensure maximum sample safety throughout your workflow.



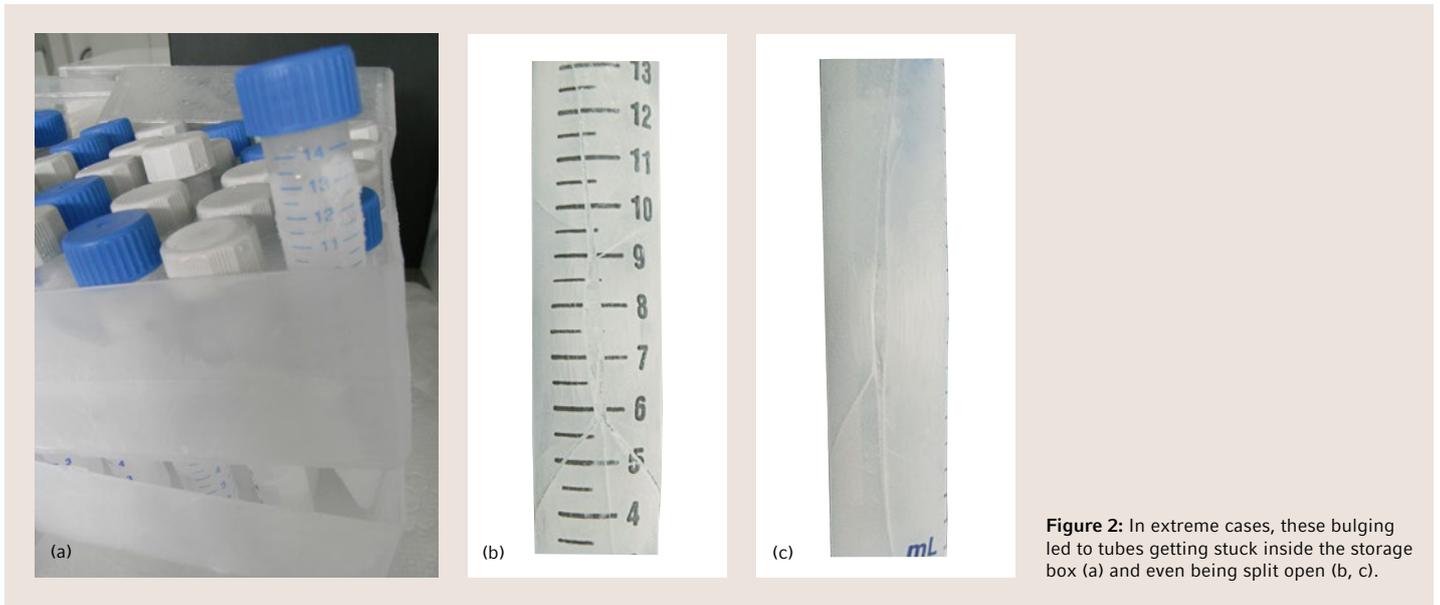
## Innovative and safe

When storing liquids in 15 and 50 mL conical tubes, these tubes frequently get damaged due to an uneven cooling rate: The upper region of the tubes above the storage box grid are more exposed to the cold air in the freezer and hence cool down faster compared to the box-enclosed region at the

bottom of the tubes. As a result, the liquid in the upper region solidifies first, creating a blockage for further liquid expansion when the bottom part freezes. This puts pressure on the sides of the tube and in extreme cases, causes tube deformations, cracks on the tubes or even tube breakage (Figure 1, 2).

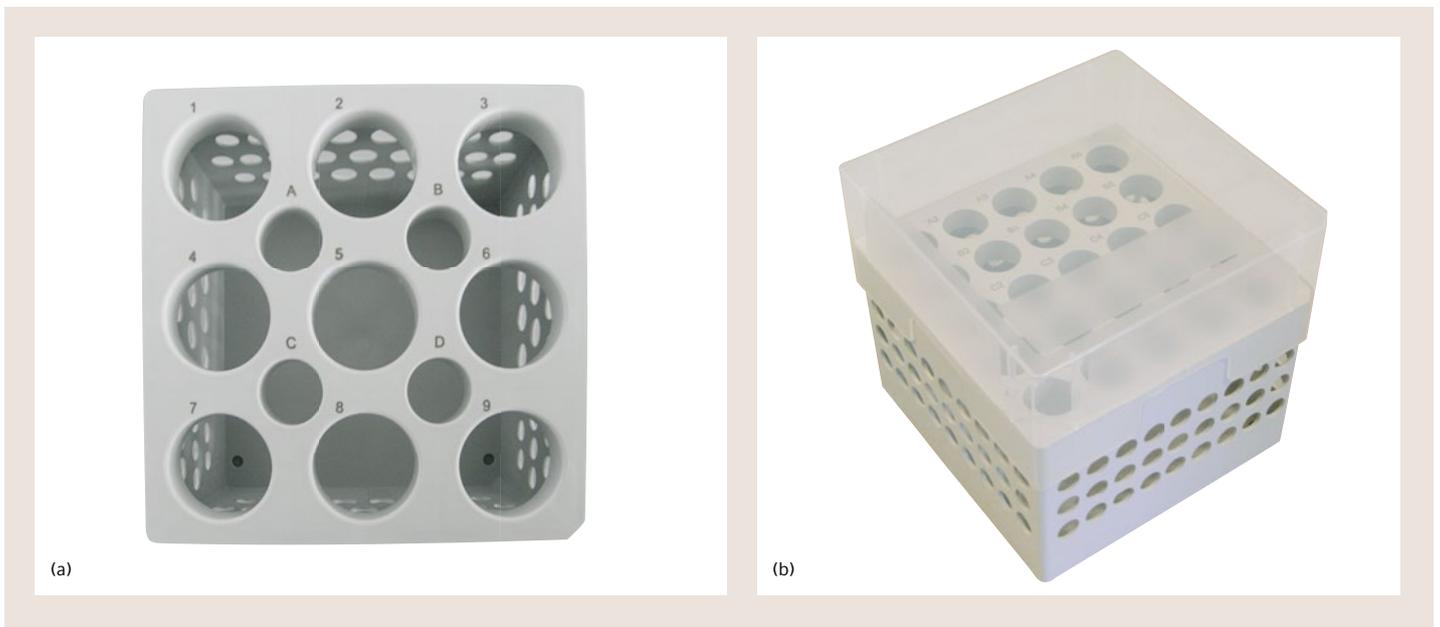


**Figure 1:** Stress lines and bulging (a-f) caused by increased pressure from liquid expansion in 15 mL and 50 mL conical tubes stored in various storage boxes from other manufacturers without temperature compensation vents.



A simple and effective solution to this is to introduce temperature compensation vents in the base part of the storage boxes, hence allowing cold air to reach the bottom part of the tubes and ensure more uniform cooling of the entire

tube. The Eppendorf Storage Boxes for 15 and 50 mL have this unique feature (Figure 3) to give maximum protection from sample loss and freezer contamination due to tube damage.



**Figure 3:** Eppendorf Storage Boxes for (a) 50 mL conical and (b) 15 mL conical tubes, with temperature compensation vents throughout the base of the boxes, designed to provide a homogeneous freezing process.

## Designed for utility

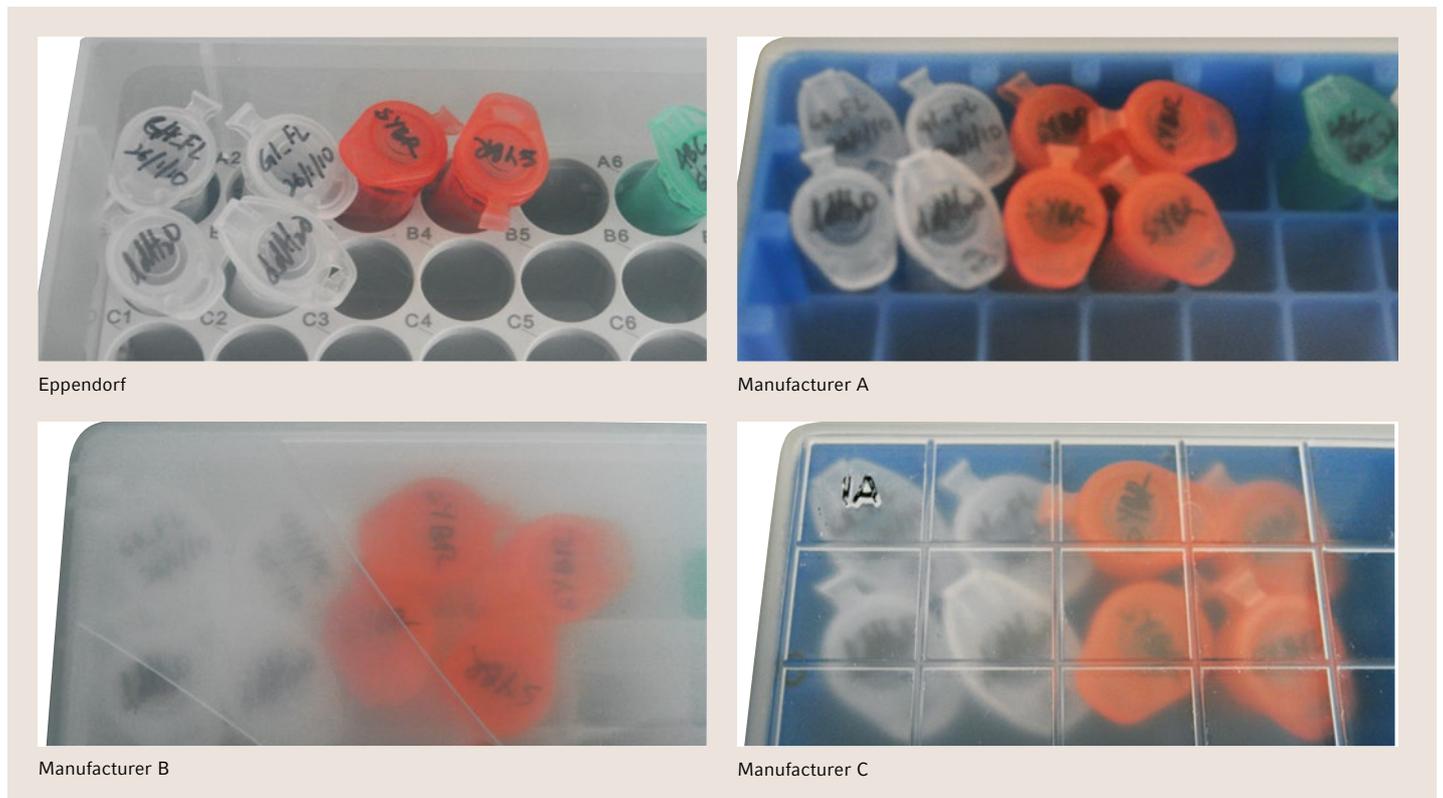
Product design is not simply a matter of aesthetic. User convenience should be at the forefront of any consideration, on top of features that solve certain user problems.

For storage box users, convenience means clear labelling, easy identification and user-friendly handling.

### Sample identification

Clarity of the lid allows easy identification of the items stored inside. As shown in Figure 4, Eppendorf lid has superior clarity that enables the user not only to easily identify what was labelled on the tubes, but also the alphanumeric grid labelling on the storage box. This would be greatly helpful

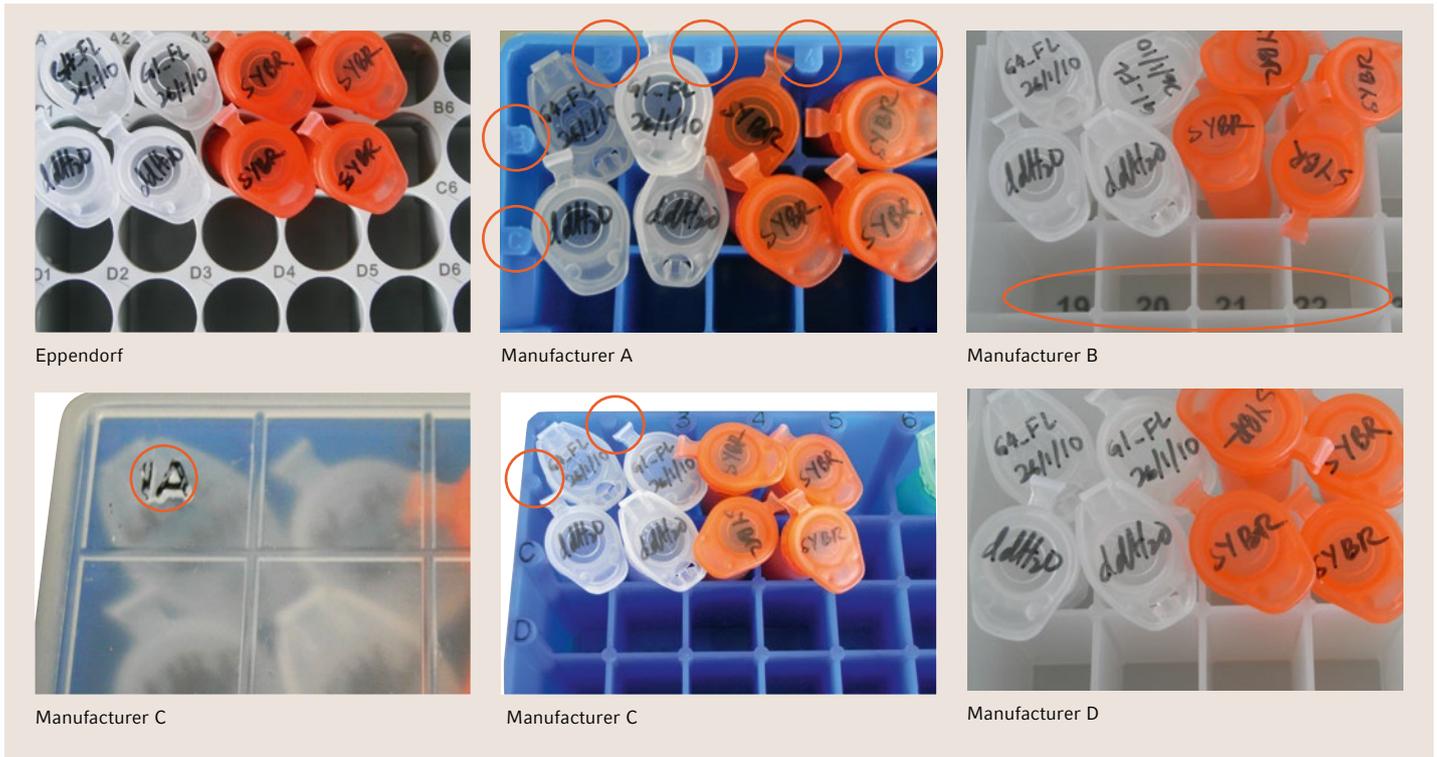
when the user has to identify the right box that stores the desired item without the need to take multiple potential boxes (and hence unnecessarily exposing non-relevant items to higher temperature) out of the freezer just to find the right item.



**Figure 4:** Top view on closed boxes: Comparison of lid clarity between storage boxes from various manufacturers for identification of stored items.

Grid labelling on storage boxes is meant to provide a reference for convenient organization and error-free inventory tracking. To be effective, labels must be clear, easily identifiable and strategically located. Eppendorf uses laser technology to provide high-contrast permanent alphanumeric

labelling of each location in contrast to other manufacturers' strategies (Figure 5). These labels are clearly and easily identifiable through closed lid even when the box is filled with sample tubes, thus minimizing risk of sample mix-up.



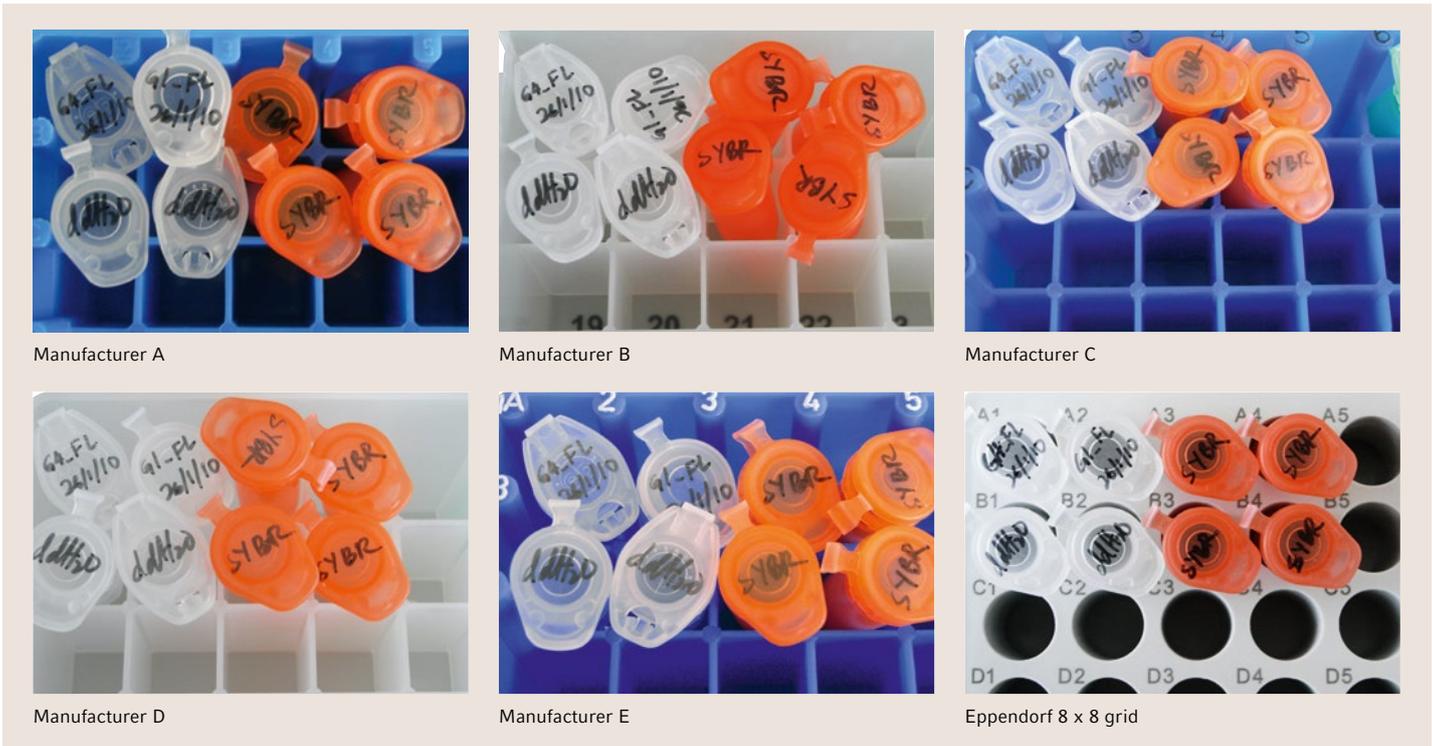
**Figure 5:** Comparison of different grid labelling location and clarity. Eppendorf uses high-contrast labelling lasered on the grid as opposed to same-colored emboss (Manufacturer A) or labels placed at the bottom of the storage box where they will be hidden when the well is filled with sample tube (Manufacturer B and C). Manufacturer D does not have any grid label at all.

**Accuracy of fit**

It takes attention to details and empathy to users' work to create appropriate design for a smooth workflow. The footprint of most storage boxes in the market is designed to fit into the dimensions of freezer racks. However, the inner design of storage boxes can differ greatly. A proper sample organization assumes that the right box format has been selected for the appropriate storage vessel/tube format. Due to lack of availability, very often boxes chosen do not really fit to the tube format. For example, 1-2 mL microcentrifuge tubes are often stored in 9 x 9 boxes designed for cryogenic vials. Usually, this is an inappropriate compromise. The larger cap dimension of microcentrifuge tubes leads to an overlapping of the tube caps. The tubes either have to be placed in an "up-down-up-down" fashion (Figure 6: Manufacturer A-E) or do not fit into the box row. It is often

inconvenient to remove tubes at the "down" layer. This delay, which might seem inconsequential at first glance, can accumulate when users need to remove multiple tubes and additionally contributes to the length of time the other tubes are unnecessarily exposed to warmer temperature out of a freezer.

Being true as the original inventor of the 1.5 mL microcentrifuge tube, the comprehensive Eppendorf Storage Box portfolio also includes a box format that ensures an optimal fit of 1-2 mL microcentrifuge tubes. This ensures an easy removal of tubes and an easy reading of alphanumeric grid label even when filled with tubes (Figure 6: Eppendorf 8 x 8 storage box).



**Figure 6:** Insufficient space for microcentrifuge tubes forces the user to place tubes in an "up-down-up-down" manner, which compromises ease of sample access. The 8 x 8 Eppendorf Storage box is designed to optimally meet 1-2 mL microcentrifuge tube dimensions, allowing easy access to individual tubes without tripping and accidentally removing other tubes due to overlapping from inadequate space.

## Eppendorf Quality: Stable form throughout your workflow

Currently, there are three common types of storage boxes in the market based on the materials they are made of – paper, polycarbonate (PC) and polypropylene (PP). Paper storage boxes usually cost less, but are mostly not reusable. Even when coated with water-resistant compound, they are eventually damaged from condensing liquid formed from being in and out of the freezer. Clear PC boxes have high clarity, ensuring easy labelling and sample recognition. They are also rigid, allowing a stable shape but are brittle compared to PP boxes, making them more susceptible to damage. Furthermore, PC boxes are not autoclavable. Hence, Eppendorf high quality polypropylene storage boxes offer optimal of physical, mechanical and temperature stability over the broad range from -86 °C to 120 °C.

The quality distinguisher for PP boxes becomes apparent when the storage boxes are exposed to low temperature during freezing (storage) and high temperature during cleaning (in dishwasher) and sterilization (autoclaving). At low temperature, the polypropylene expands, hardens and becomes more brittle. As separate parts (lid, base and grid) of the storage box may expand at a different level, the lid and base often become stuck together after freezing. This lead to a feeling of false security when handling the boxes and increased chances of improper grasping, which could lead to accidental dropping of the samples when the base is release from combination of weight and exposure to the higher ambient temperature (Figure 7).



Manufacturer D



Manufacturer D



Manufacturer E

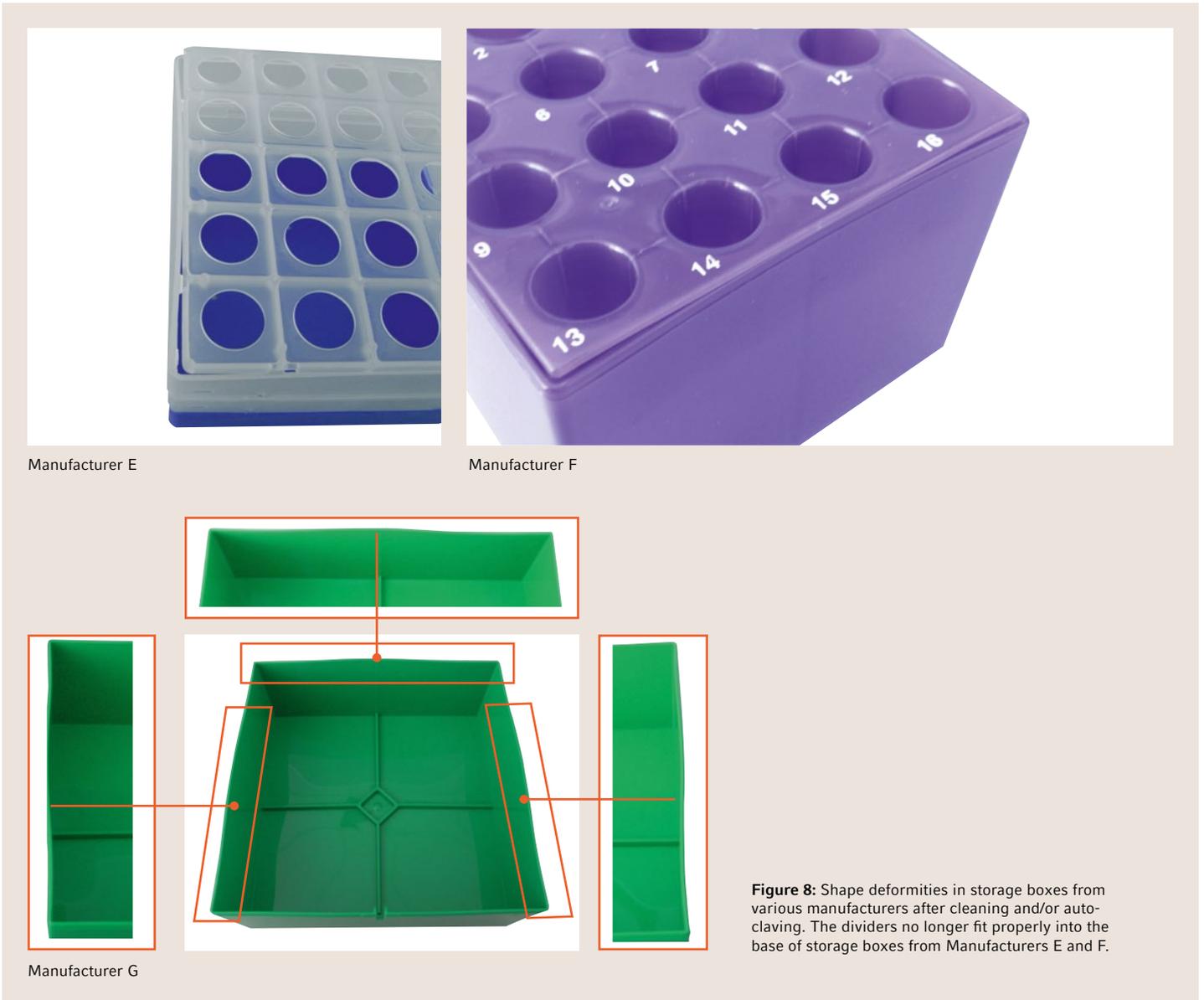


Manufacturer F

**Figure 7:** Various manufacturers' storage boxes where the lid and base became stuck together after freezing due to different rate of expansion. Accidental dropping of the base of the storage box of Manufacturer D caused the brittle polypropylene to break (marked by orange circles).

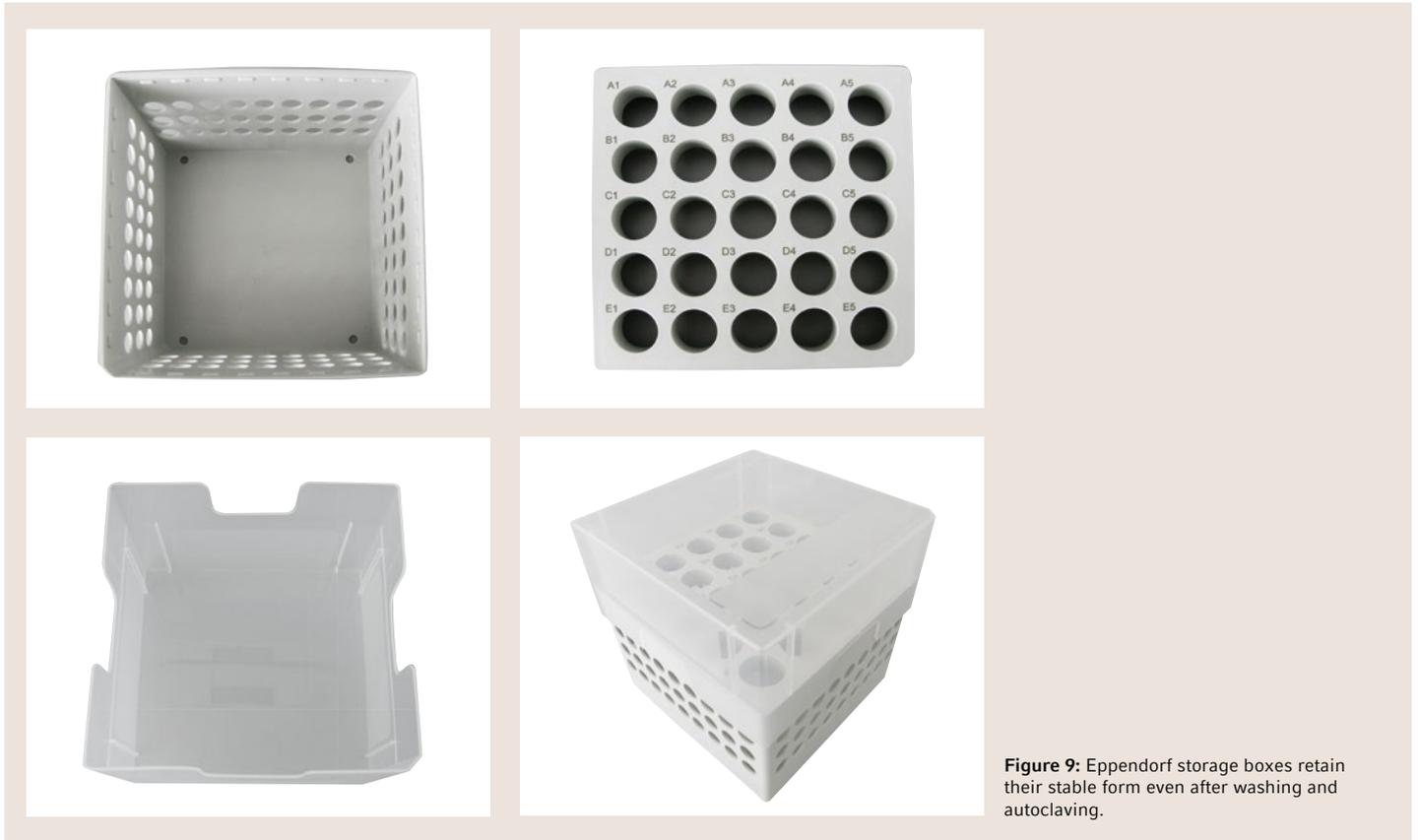
At higher temperature (i.e. when subjected to cleaning in a dishwasher or during sterilization by autoclaving), the polypropylene softens and then shrinks when temperature return to ambient. Deformation often happens during this process and additionally, as with lower temperature, the different parts of the storage box shrink at different rate.

The resulting changes in dimension and shape negatively impact the fitting of the different parts together, as shown in Figure 8. In other cases, such changes would lead to extremely tight fitting of the lid to the base of storage box, making it difficult and frustrating for the user to access the samples within.



Eppendorf uses high quality polypropylene for all parts of the storage box, coupled with thoughtful design that takes into account changing characteristics. This ensures that the storage boxes retain a form that allows easy access even after freezing.

Additionally, Eppendorf storage boxes are laboratory dishwasher safe and autoclavable (121°C/20 min), thus allowing users to easily clean and sterilize the storage boxes without compromising the shape and functionality of the boxes (Figure 9).



**Ordering information**

Description	Order no.
<b>Eppendorf Storage Box 10 x 10</b> , for 100 cryogenic tubes with internal thread, 3 pcs., height 52.8 mm, 2 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.508
<b>Eppendorf Storage Box 9 x 9</b> , for 81 screw cap (cryogenic) tubes 1-2 mL, 3 pcs., height 52.8 mm, 2 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.516
<b>Eppendorf Storage Box 9 x 9</b> , for 81 screw cap (cryogenic) tubes 3 mL, 2 pcs., height 76.2 mm, 3 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.540
<b>Eppendorf Storage Box 9 x 9</b> , for 81 screw cap (cryogenic) tubes 4-5 mL, 2 pcs., height 101.6 mm, 4 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.567
<b>Eppendorf Storage Box 8 x 8</b> , for 64 tubes 1-2 mL, 3 pcs., height 52.8 mm, 2 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.524
<b>Eppendorf Storage Box 5 x 5</b> , for 25 tubes 5 mL, 4 pcs., height 63.5 mm, 2.5 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.532
<b>Eppendorf Storage Box 5 x 5</b> , for 25 tubes 5 mL with screw cap, 2 pcs., height 76.2 mm, 3 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.613
<b>Eppendorf Storage Box 5 x 5</b> , for 25 tubes 15 mL, 2 pcs., height 127 mm, 5 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.583
<b>Eppendorf Storage Box 3 x 3</b> , for 9 tubes 50 mL and 4 tubes 15 mL, 2 pcs., height 127 mm, 5 inches, polypropylene, for freezing to -86 °C, autoclavable, with lid and alpha-numeric code	0030 140.591



For more information go to [www.eppendorf.com/eshop](http://www.eppendorf.com/eshop)

## About Eppendorf

Eppendorf is a leading life science company that develops and sells instruments, consumables, and services for liquid-, sample-, and cell handling in laboratories worldwide. Its product range includes pipettes and automated pipetting systems, dispensers, centrifuges, mixers, spectrometers, and DNA amplification equipment as well as ultra-low temperature freezers, fermentors, bioreactors, CO<sub>2</sub> incubators, shakers, and cell manipulation systems. Associated consumables like pipette tips, test tubes, microtiter plates, and disposable bioreactors complement the instruments for highest quality workflow solutions.

Eppendorf was founded in Hamburg, Germany in 1945 and has about 3,000 employees worldwide. The company has subsidiaries in 25 countries and is represented in all other markets by distributors.

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