June 03, 2019

# MECHANICAL KEYING OF CORRUGATED CONSUMABLE CONTAINER THROUGH UNIQUE HOLE-PUNCHES IN CONTAINER WALL

HP INC



**Mechanical Keying of Corrugated Consumable Container through Unique Hole-Punches in Container Wall**

## Title

Mechanical Keying of Corrugated Consumable Container through Unique Hole-Punches in Container Wall

## Article

This disclosure relates to the field of mechanical design, and more specifically to controlling the use of consumable supplies within a greater mechanical system.

In applications in which multiple consumable supplies of different types/materials are used near one another, it may be critical to ensure that supplies of different types are always connected to the correct receptacle of the system in which they are implemented (i.e. cross-contamination of materials must be prevented). This may be accomplished through procedural controls, software controls, or physical lock-out (mechanical keying). One half of a mechanical key may be found on the system connector, which then mates only with a corresponding key of the same shape attached to the supply container's mating connector.

One disadvantage of using mechanical keys with interfacing connectors is that the hardware cost added to the supply container may be significantly (prohibitively) high, especially if the supply is produced in large volume. One example of an existing mechanical keying solution is the "DrumQuik Pro" system, a product of Colder Products Company (CPC). Typically, the connector cost becomes a more significant portion of the total supply cost as the supply volume decreases. For example, per-liter cost of the keying solution may be acceptable when used with a 200-liter container but unacceptably high with a 20-liter container. An alternative mechanical keying solution is proposed for "bag in box" consumable containers consisting of an interior bag encapsulated by a stiff outer shell made of corrugated fiberboard.

To reduce cost of the consumable while still maintaining a mechanical keying solution, a portion of the key may be punched/cut out of of the cardboard wall of the container. The shape/location of the punch-out is unique to each type of supply, therefore mating only with the system connector (or other system component) that matches exactly and preventing material cross-contamination. It is expected that some cost is added to the supply by the additional labor required with this process, but that it is less than the cost of adding a physical key ring and/or special connector to the supply.

Figures 1 and 2 depict one way to implement this idea. A uniquely-shaped ring is attached to the mating connector on the system-side, which interfaces only with a corresponding punch-out in the exterior wall of the corrugated box. The exterior, system-side connector cannot reach the interior, supply-side mating connector unless the key matches the punch-out.

Figures 3-5 depict an alternative implementation utilizing keying detail in a tray where the container/carton is placed for use in the system. Each tray's unique key mates with a unique carton cutout for each unique container. If the wrong container is loaded, the tray keying feature would prevent the supply from nesting correctly, making the mistake obvious or potentially keeping the interconnect from mating with the supply by prohibiting it from engaging. The carton cutout could be made at any point, minimizing the number of raw cartons required to be stocked. All the cutout options

could be kiss cut in the cartons and the correct tab removed at the end of the production line after the supply has been filled, further decreasing the overhead costs of such a keying solution.

*Disclosed by Nick Meisner, Kyle Humphrey and Dave Smith, HP Inc.*

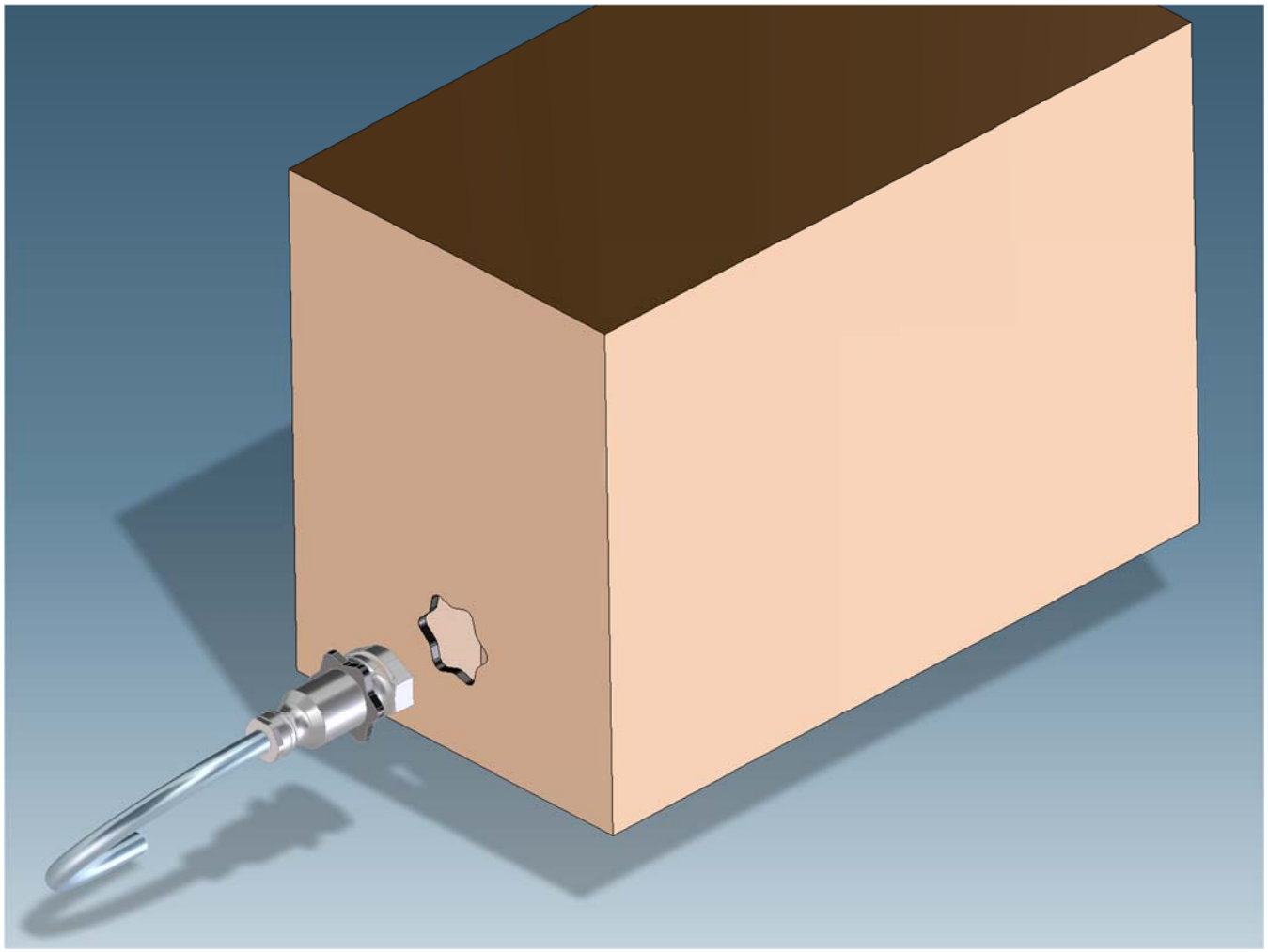

Figure 1

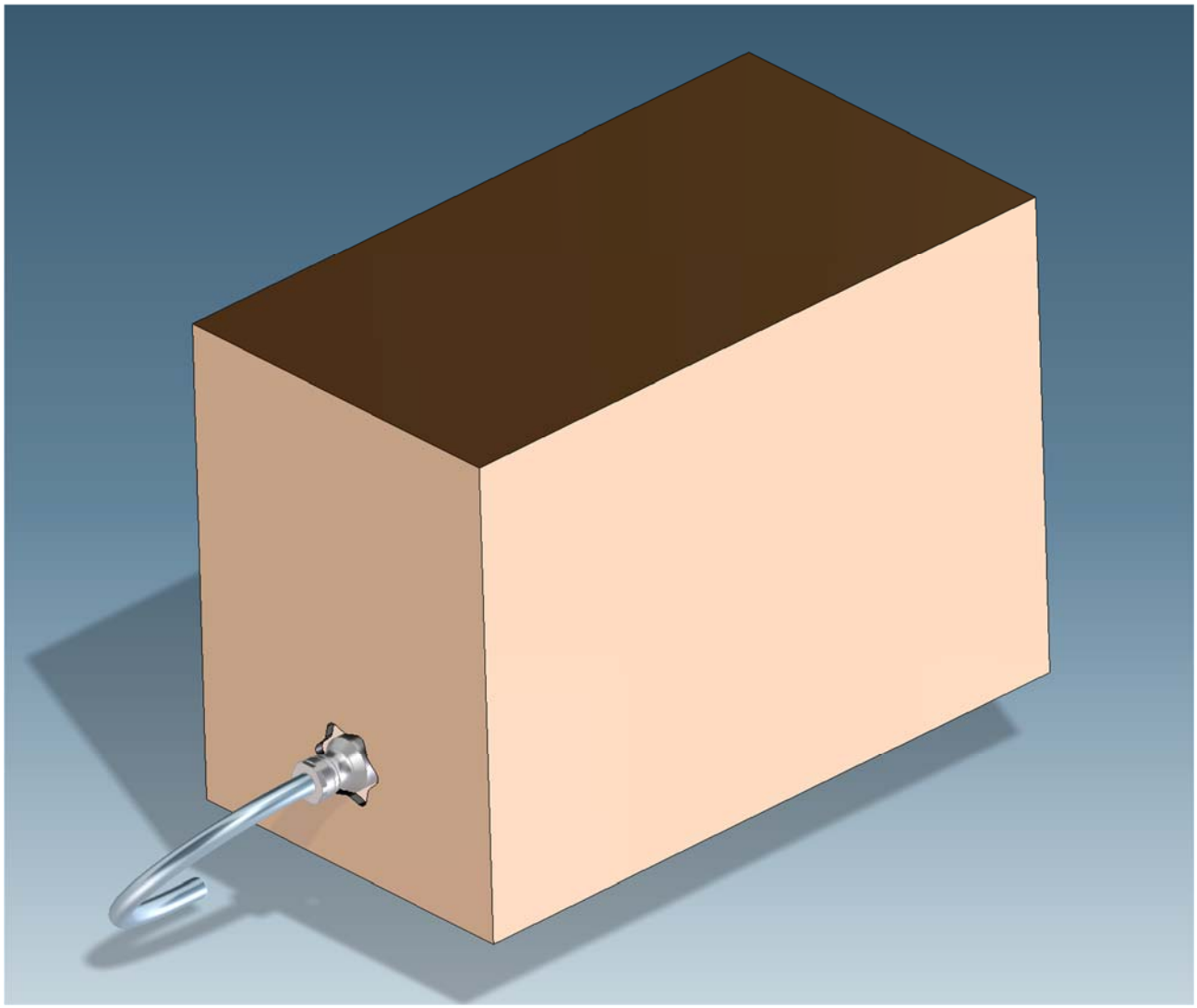

Figure 2

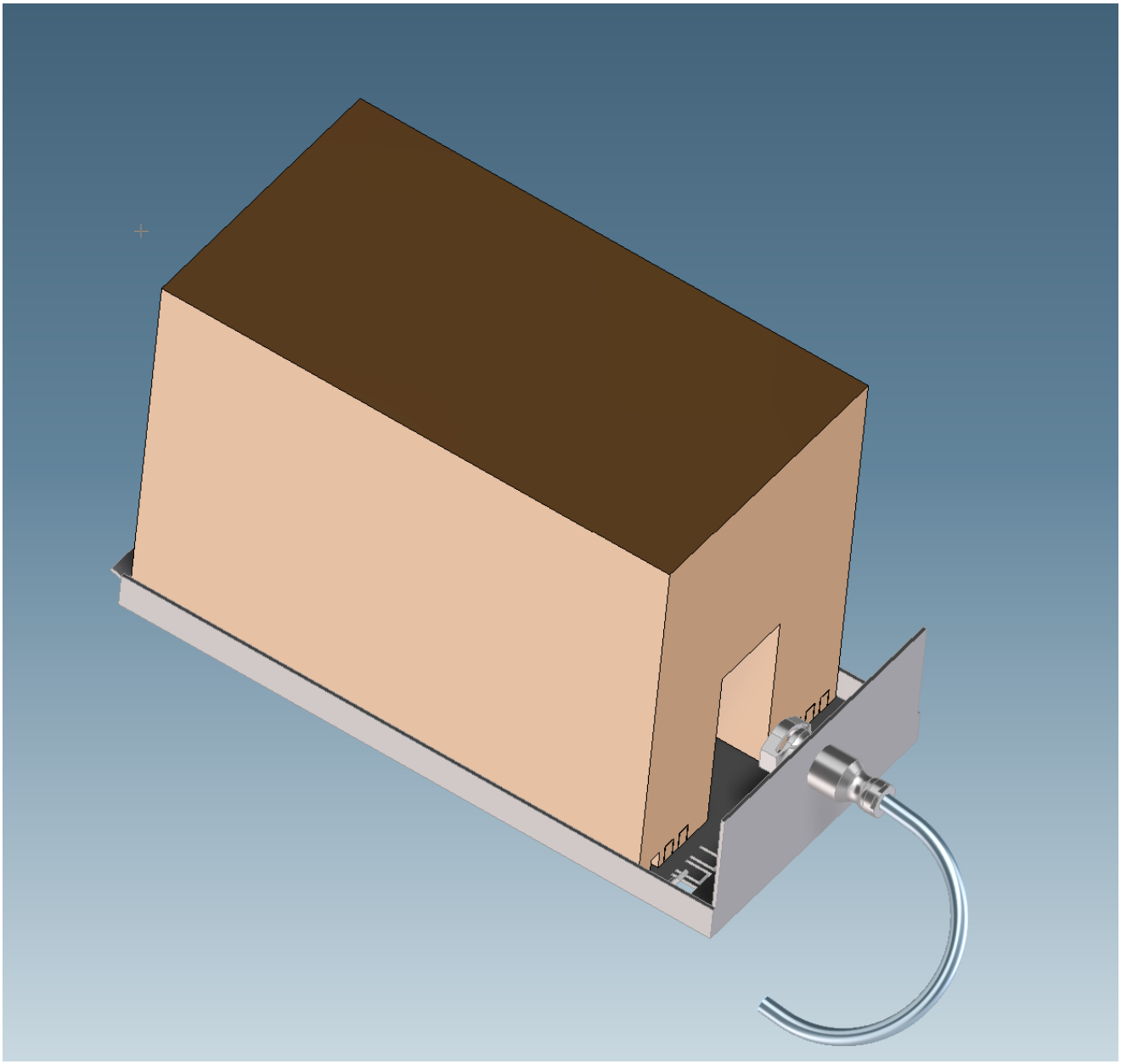

Figure 3

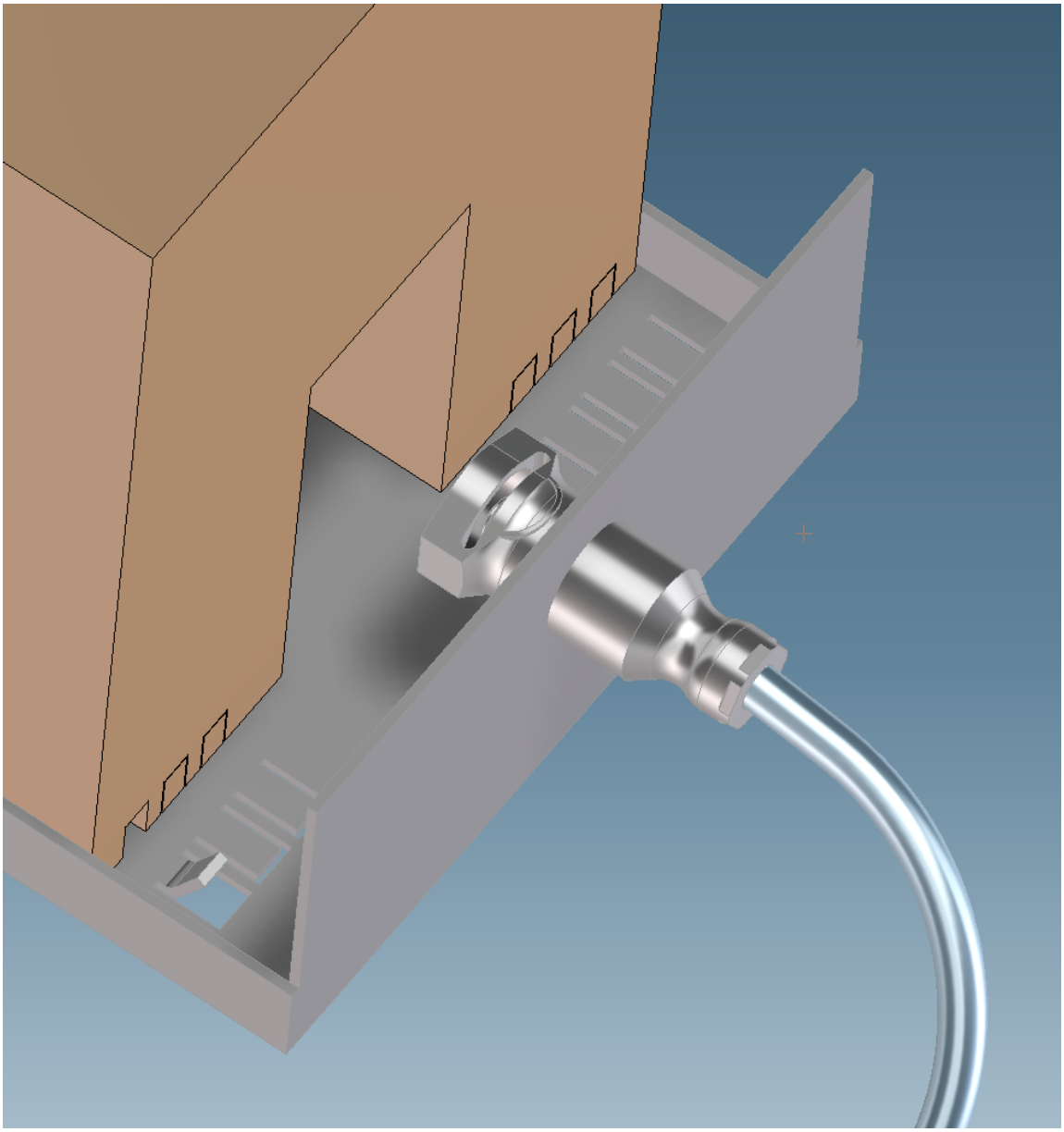

Figure 4

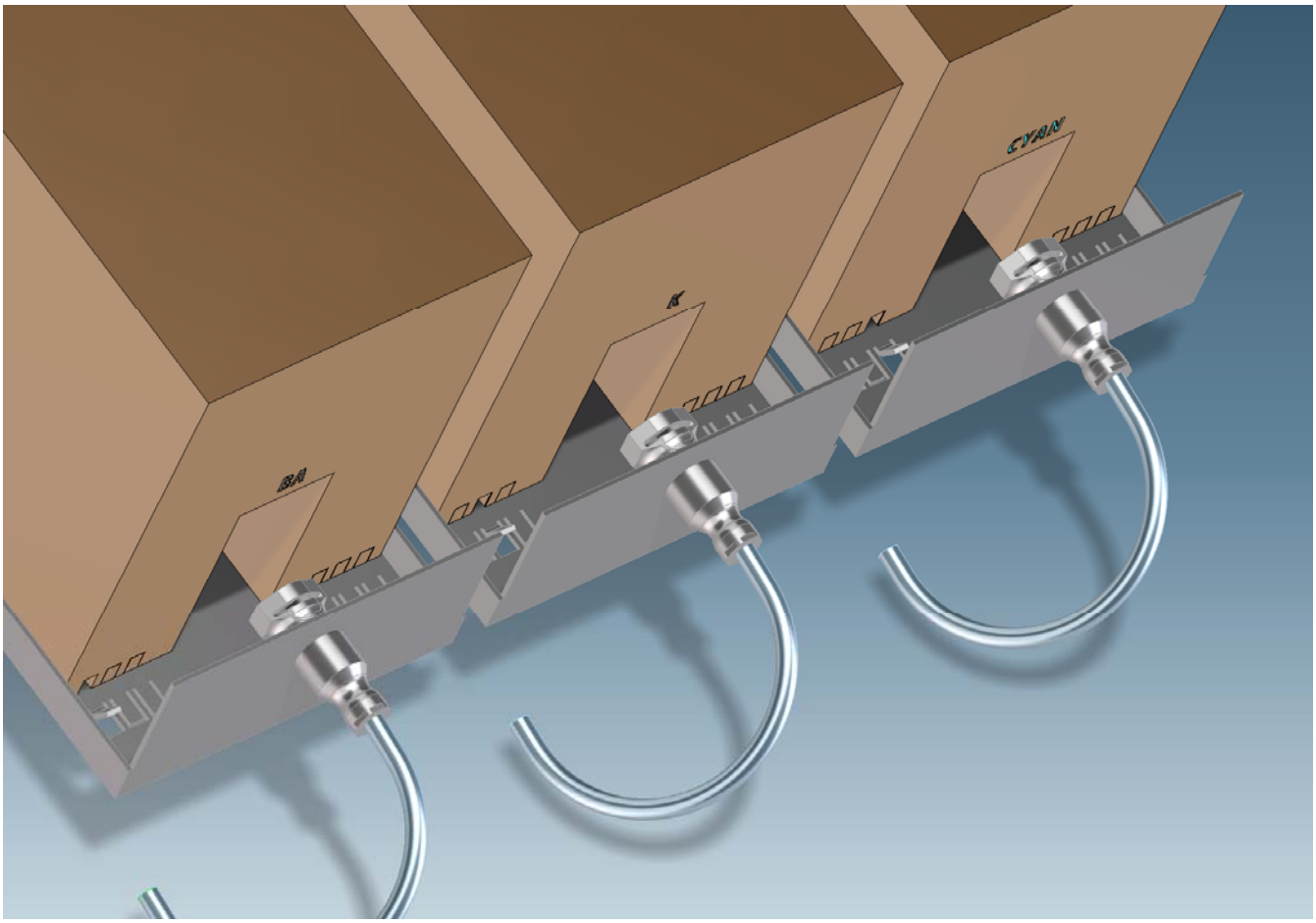


Figure 5