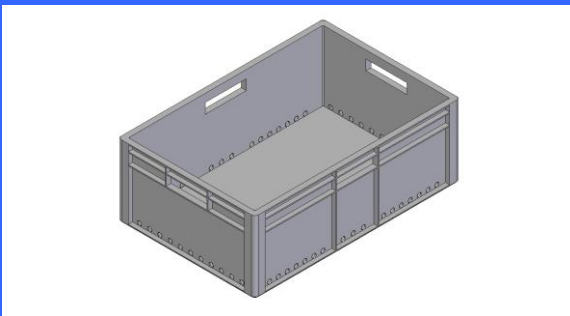


## pro-K Lager- und Transportsysteme



Position paper  
*Fire protection for  
plastic load carriers*

## Foreword

Plastic load carriers<sup>1</sup> are standard in automated warehouses. They are robust, stable, durable and easy to recycle. When designing new warehouses, however, the manufacturers of the plastic load carriers are usually only included once the warehouse planning has already been completed. The plastic load carriers may then have to be adapted to the warehouse and automation technology. This can lead to increased planning effort and delays for builders and investors, resulting in additional costs. Therefore, the manufacturers and their expertise in the design and manufacture of plastic load carriers must be included in the warehouse planning right from the start.

This planning recommendation has been coordinated with the global industrial property insurance company FM (headquarter USA) and Europe's largest institute for corporate security VdS Schadenverhütung GmbH. It is expressly aimed at warehouse planners.

The working group is made up of the following companies:

- bekuplast GmbH
- BITO-Lagertechnik Bittmann GmbH
- Georg Utz GmbH
- Ringoplast GmbH
- Schoeller Allibert GmbH
- SSI Schäfer Fritz Schäfer GmbH

This planning recommendation and position paper reflects the interpretation of the manufacturers of the pro-K working group for storage and transport systems, organized in the *pro-K Fachgruppe Lager- und Transportsysteme*, on the current fire protection specifications of the FM and VdS Schadenverhütung GmbH with regard to the construction of plastic load carriers/pallets.

### Important note:

This document is primarily for information purposes. The information contained in this document has been compiled according to the current state of knowledge and to the best of our knowledge and belief. pro-K does not assume any absolute guarantee for the accuracy and completeness of the information. Each reader must therefore ensure for themselves whether the information is correct and suitable for their purposes.

As of: February 2025

Image credit cover sheet: Georg Utz GmbH

### Fachgruppe Lager- und Transportsysteme

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pro-K is the sponsoring association of the Gesamtverband Kunststoffverarbeitende Industrie e.V.



<sup>1</sup> Also KLT, plastic storage container, plastic storage box, plastic storage tray, plastic storage box

## Contents

1.	General classification: storage concept and plastic load carriers/pallets .....	4
1.1	Plastic load carriers and pallets.....	4
1.2	Design possibilities and limitations in the development of plastic load carriers – complexity of the manufacturing processes.....	4
1.3	Consideration of the fire risk of plastic load carriers.....	4
1.4	Flame-retardant plastic load carriers .....	5
1.5	Plastic pallets in warehouses .....	5
2.	Fire protection guidelines for plastic load carriers .....	5
3.	Insurers' requirements for fire protection for plastic load carriers.....	6
3.1	Plastic load carriers according to FM .....	6
3.2	Plastic load carriers according to VdS.....	6
4.	Myth: Conflicting objectives in automated warehouses due to the regulations of the FM Data Sheets and the VdS Schadenverhütung GmbH with regard to water permeability.....	6
5.	Recommendations of the manufacturers of plastic load carriers for fire protection .....	6
6.	Appendix: Note on older existing systems.....	8

## 1. General classification: storage concept and plastic load carriers/pallets

Warehouses must be planned holistically. An optimal warehouse concept is only possible if all parties are involved at the start of the planning process: building owners, operators, warehouse planners, steel construction, manufacturers of plastic load carriers/pallets, fire protection technology and fire protection experts.

A warehouse should be designed for the best possible firefighting. According to the current status of FM data sheet 8-34 or 8-9 and the VdS guideline, a distinction is no longer made between water-permeable and water-impermeable plastic load carriers. This applies to all automated warehouse systems.

### 1.1 Plastic load carriers and pallets

Plastic load carriers and pallets have been standard in automated warehouses for many years. Plastics meet many requirements when selecting load carriers. Thermoplastics are generally used. Load carriers made of these plastics are light, robust and durable.

In addition, plastic load carriers and pallets are easy to reuse. They can be recycled: damaged load carriers can be ground up and processed directly into a load carrier of similar quality. This makes load carriers and plastic pallets as reusable solutions sustainable and environmentally friendly products.

### 1.2 Design possibilities and limitations in the development of plastic load carriers – complexity of the manufacturing processes

The project requirements include a high degree of customization. The design and manufacture of a high-tech load carrier often requires high investments. The requirements must therefore already be fixed at the time of planning. The requirements of the load must also be taken into account.

If the manufacturers of plastic load carriers and pallets are included in the warehouse concept from the outset and a holistic warehouse concept is pursued, standard options can be better taken into account when selecting the load carriers and investments and costs can be kept within the planned framework.

### 1.3 Consideration of the fire risk of plastic load carriers

Plastic load carriers are classified separately by property insurers and by national and international building regulations. It is particularly important to note that these storage and logistics resources have an influence on the fire load calculations carried out by experts. Currently, experts often make a distinction between load carriers and contents that is unclear to warehouse operators/planners. For greater clarity, the guidelines of property insurers should therefore be taken into account, in particular those of VdS Schadenverhütung GmbH, a subsidiary of GDV - German Insurance Association, and those of FM, which represent the international market.

#### 1.4 Flame-retardant plastic load carriers

Flame retardants or flame inhibitors change the ignition temperature and the course of the fire. However, the calorific value of plastics remains unchanged by the addition of flame retardants and thus the fire load also remains the same.

For various reasons, flame retardants are generally not used in plastic load carriers:

- Plastic load carriers with added flame retardants may be less robust under certain circumstances.
- Material recycling is only possible if special requirements are met and at greater financial expense.
- During processing at the manufacturer and in the event of a fire, the addition of flame retardants can lead to higher pollutant emissions.

#### 1.5 Plastic pallets in warehouses

Pallets made of polypropylene, polyethylene, polystyrene and plastics with similar fire behaviour are located according to the definition of packaging when determining the fire risk and are evaluated during classification. If the warehouse is designed to use plastics in accordance with fire protection regulations, it is therefore possible to switch from wooden to plastic pallets.

## 2. Fire protection guidelines for plastic load carriers

In Germany, when developing plastic load carriers to meet fire protection requirements, the FM data sheet 8-34 PROTECTION FOR AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (as of July 2023) / data sheet 8-9 STORAGE OF CLASS 1, 2, 3, 4 AND PLASTIC COMMODITIES (January 2022) and the VdS guideline CEA 4001 Section K.7 (as of January 2024) are used in particular. DIN EN 12845 is currently being revised in parts and in its current version (as of November 2020) does not always represent the state of the art.

However, there are other guidelines and requirements from regional insurers and institutions worldwide that must be taken into account, such as the US National Fire Protection Association (NFPA).

In practice, the fire protection technology is determined by specialist planners or installers. The person working on site is responsible for classifying a warehouse. The risks of German property insurers are determined by VdS Schadenverhütung GmbH.

Contact: <https://vds.de/pruefung-erkennung/technische-pruefstelle>

Information on FM Data Sheets: <https://www.fm.com/resources/fm-data-sheets>

Information on FM: <https://www.fm.com/de>

### 3. Insurers' requirements for fire protection for plastic load carriers

#### 3.1 Plastic load carriers according to FM

With the data sheet from July 2023, all previous specifications for water-permeable containers (vented and open top containers) have been eliminated at FM. Every plastic load carrier in an automated storage area is treated equally – regardless of vented, solid wall, etc. The basis for this are the latest complex tests and examinations by FM, which allow shelf sprinkler concepts with vertical sprinkler spacings of up to 4.5 m.

#### 3.2 Plastic load carriers according to VdS

In the VdS CEA 4001 "Guidelines for sprinkler systems - planning and installation", as of 2024, plastic load carriers<sup>2</sup> are no longer differentiated according to their water permeability. Fire tests have shown that the positive effect of water permeability is very small and also depends on the specific shelf construction. Therefore, all flammable load carriers are assessed uniformly in the above-mentioned guideline.

### 4. Myth: Conflicting objectives in automated warehouses due to the regulations of the FM Data Sheets and the VdS Schadenverhütung GmbH with regard to water permeability.

In the past, the definition of water permeability has repeatedly led to confusion in the market. One directive wanted openings that would slow down the potential progression of a fire, while others advocated general water permeability. However, these conflicting objectives no longer exist:

- In the event of liquid containers stored in the load carrier breaking, warehouse operators often require that a minimum volume of liquid is collected in the load carrier in order to avoid any contamination of the conveyor systems. For example, the warehouse operator requires a collection volume of 2.5 to 5 liters for a load carrier with basic dimensions of 600 mm x 400 mm, but this was not feasible according to the old VdS CEA 4001 specifications.
- The reliable detection of the load carrier by light barriers or barcode scanners was made more difficult by technical specifications. Today, it is up to each manufacturer to find solutions for this. Holes on the sides of the load carrier are no longer required in FM Datasheet 8-34 or VdS Guideline 4001. Water drainage holes, if required for structural reasons, can now be positioned so that there are no conflicts with light barriers or the positions of the barcode ID labels.

### 5. Recommendations of the manufacturers of plastic load carriers for fire protection

In order to achieve planning security for the use of plastic load carriers, the internationally relevant insurance guidelines from FM and those of VdS Schadenverhütung should be taken into account. The example of fire protection shows that the guidelines are becoming more and more similar. It is advisable to establish contact with the above-mentioned insurers and other relevant organizations

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<sup>2</sup> Term VdS CEA 4001 K.7: Storage container

via the pro-K association. The fact is: the decisive parameters for ensuring the fire protection of plastic load carriers can only be determined in close and early cooperation between automatic storage system providers (including fire protection technology), load carrier manufacturers and risk carriers (insurers). In the global market, the requirements of the FM data sheets for the design of shelving systems are becoming increasingly important.

## 6. Appendix: Note on older existing systems

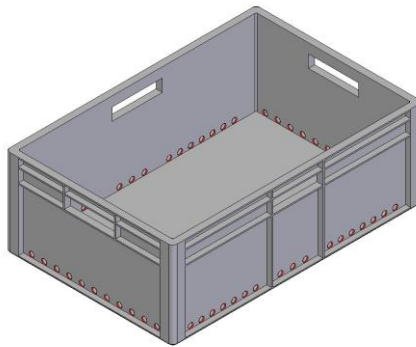
For existing systems or systems planned according to the old guidelines, the building regulations at the time of construction generally apply. In concrete terms, this means that there are still many existing systems that will be assessed according to the guidelines until January 2021. The water permeability requirements continue to apply to these, which will be discussed below.

### Integration of FM data sheet 8-34, as of July 2023:

- FM Global data sheet 8-34 does not require water-permeable load carriers.
- Water-permeable load carriers affect the configuration of the sprinkler system.
- The load carrier has a solid base without a lid and is open at the top.
- The load carrier allows water to drain away as quickly as possible along the entire circumference.
- The load carrier, which the definition of data sheet 8-34 usually corresponds to, has perforations in the side walls. (see graphic 1)

### Graphic representation of water permeability:

As the incoming extinguishing water must be drained to the outside, the plastic load carrier must be viewed from the inside. The 13 mm of the inside measured vertically from the floor are used. In this area, at least 30 percent of the wall surface must be open (Figure 1).



*Figure 1*

*Interpretation of the water-permeable load carrier according to FM Global Data Sheet 8-34*

*In red: opening from the inner floor all the way around 13 mm vertically. Minimum*

Example of a constructive option for interpreting water permeability according to FM data sheet 8-34 for “vented containers”. Other options for implementing the FM description include elongated holes or slots (Figure 2). The bottom remains closed.



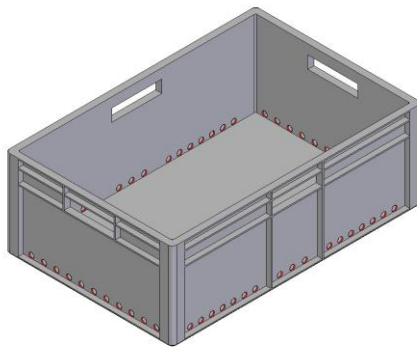


Figure 2

Example of interpretation of the water-permeable charge carrier according to FM

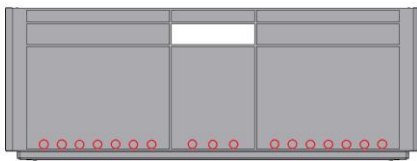


Figure 3

Example of interpretation of the water-permeable charge carrier according to FM: long side

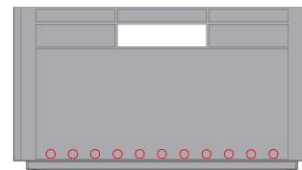


Figure 4

Example of interpretation of the water-permeable charge carrier according to FM: short side

## VdS

### Interpretation of the working group on double walls:

Functional and design-related elements such as beams, lifting shafts or sandwich floors, which are absolutely necessary for storage requirements, are generally not to be regarded as double-walled.

### Definition of water-permeable load carriers according to VdS CEA 4001 K.7 (according to the guidelines as of 01-2021):

- Maximum water level of 10 mm (from the inner floor) with a water load of 20 mm/min.
- This water permeability can be achieved by evenly distributing 50 holes with a diameter of 5 mm in the container base per square meter of container base area. Example: For a load carrier with dimensions of 600 mm x 400 mm, this is 12 holes (Figure 6).
- Other solutions are permissible if the above requirements for the water level are not exceeded.
- If this requirement is met, it is irrelevant whether the openings are in the bottom of the container or the sides (Figure 5 or Figure 6).
- The decisive factor is the behaviour when loaded.

### Interpretation of the working group on water permeability according to VdS CEA 4001 K.7:

The main guide values are the water level and the water load. The holes mentioned are a suggestion that should be understood as an optional solution. Other solutions are permissible if the requirements

for the water level are not exceeded. If this requirement is met, it is irrelevant whether the openings are in the bottom of the container or the sides.

#### Example for the interpretation of water permeability according to VdS:

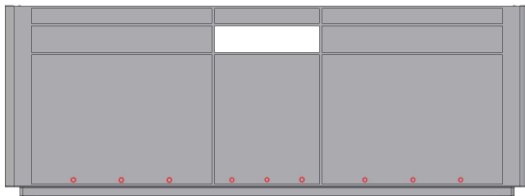


Figure 5

Example of the interpretation of the water-permeable load carrier according to VdS CEA 4001 K.7 with a container dimension of 600 mm x 400 mm:

The water permeability is given if a water level of 10 mm is not exceeded in the load carrier when water is applied at a rate of 20 mm/min.

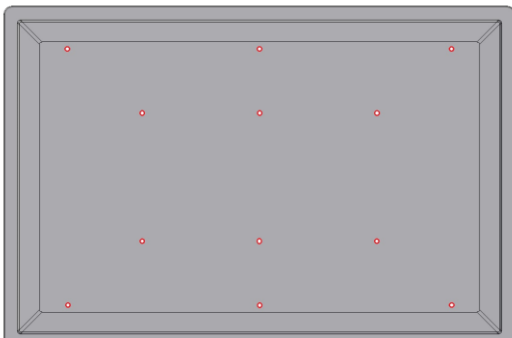


Figure 6

Interpretation of the water-permeable load carrier according to VdS CEA 4001 K.7 with a container dimension of 600 mm x 400 mm: 12 holes in the bottom

If the requirement for the water level is met, it is irrelevant whether the openings are in the container bottom or the sides.

The manufacturers of plastic load carriers check the maximum water level in their own laboratories. If in doubt, the water permeability when loaded must be proven in an accredited laboratory (e.g. VdS).