

# RAIL VEHICLES

Essentials air filters



Your partner for filter technology

## APPLICATION MOBILE SYSTEMS

Clean air is vital for people. Combustion processes create harmful particles of particulate matter whose degree of fineness steadily increases in cities and industrial regions.

The ambient air is composed of coarse, fine and suspended dust particles. The pollution of the ambient air with fine and suspended dust particles is particularly dangerous as they can freely enter the human organism. Their percentage share in the ambient air is meanwhile highly dependent on the location (urban, maritime or rural zone). Mobile systems are confronted with various particle compositions in the ambient air every day.



**PM<sub>10</sub>**  
Particle sizes ≤ 10 µm



**PM<sub>2,5</sub>**  
Particle sizes ≤ 2,5 µm



**PM<sub>1</sub>**  
Particle sizes ≤ 1 µm

## INDOOR AIR QUALITY



The appearance of fine dust is particularly critical in air conditioning and ventilation units as large quantities of fresh air need to be delivered to supply people.

As we spend around 80% of our time indoors, the air quality has a vital role to play for the well-being of people and their quality of life.

To guarantee that the machines, components and electronics of the mobile systems run smoothly, they need to be supplied with treated air as well.

## HYGIENE

Air pollution control has an important role to play in rail vehicles as passengers and staff are exposed to the indoor air for longer periods of time. The Association of German Engineers' Standard VDI 6032 – Ventilation and indoor-air quality in vehicles – defines minimum requirements for the air quality accordingly. Filter class G4 is defined as a minimum requirement for the use of air filters.

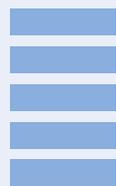


Kalthoff panel filter with FIBERPLAST frame



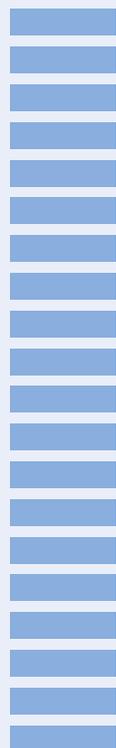
Panel filter with cardboard frame

VDI 6032 moreover requires the use of inert materials to prevent metabolization by microorganisms and/or not facilitate it. Hygienically clean units can therefore not be guaranteed if filters with cardboard frames are used, as those can be a source of microbiological infestation and germ growth.



The Kalthoff panel filters GRISU WU and WU/5510 are based on synthetic nonwovens (polyester). Their combination with the synthetic FIBERPLAST frame leads to a fully synthetic design that renders the filter hygienic, moisture-proof and fully combustible. The requirements of VDI 6032 are met.

## FIRE PROTECTION



The safety of passengers and personnel has the highest priority in rail vehicles. This makes the implementation of effective fire protection requirements an essential duty. EUROSPEC requires

certification under the European fire protection specification EN 45545-2, which sets new standards in this regard.



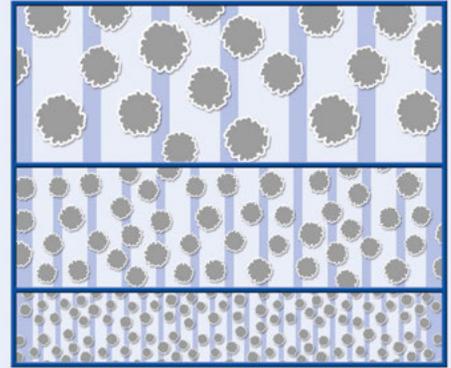
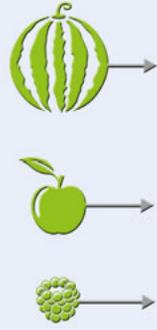
This standard describes the product requirements by way of three different hazard levels. The requirements for tunnel applications (> 5 km) without sideway evacuation options are defined in the highest level, HL-3.

Kalthoff panel filters GRISU WU are certified under EN 45545-2/HL 1-3 according to the R5 set of requirements, and Kalthoff panel filters WU/5510 under the national standard DIN 5510-2.

# DEPTH FILTRATION

To guarantee clean air in rail vehicles, Kalthoff uses filters with a depth filtration principle. The particles are collected across the entire filter surface area and incorporated in the depth of the filter media.

Kalthoff panel filters GRISU WU and WU/5510 are additionally equipped with a progressive filter media structure. This means that the distances between and diameters of the synthetic fibres used decrease in the direction of the clean-air side. A fractional separation is enabled from coarse to fine particles, ensuring that the entire filter media is put to an optimal use. This guarantees the separation of larger dust volumes – even with larger airflow and low pressure drop.



*Principle of progressive depth filtration*

The use of the panel filters GRISU WU and WU/5510 with pleated, progressively-structured filter media defines the current state of the art for HVAC units in rail vehicles while simultaneously also pointing the way for future developments.

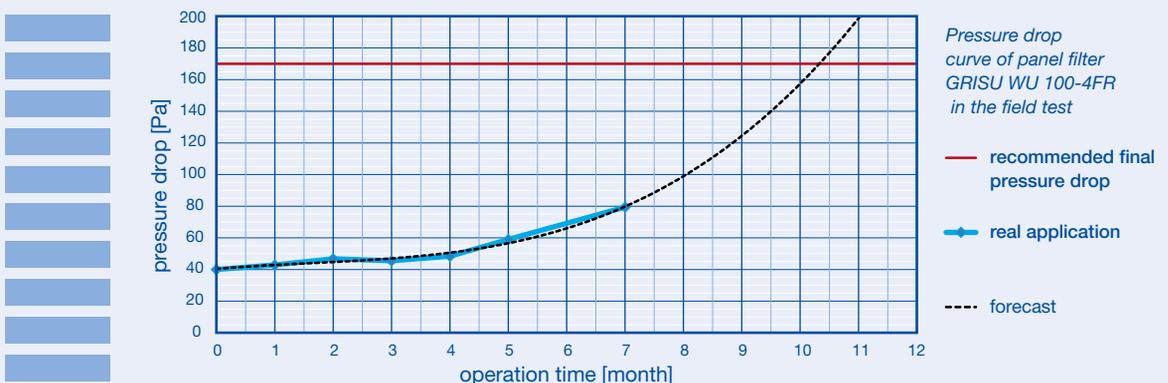
## ADVANCE BY KALTHOFF PANEL FILTERS

Kalthoff panel filters GRISU WU and WU/5510 meet all the filtration requirements for rail vehicles. They are based on panel filters from various ISO groups according to ISO 16890 and panel filters in filter classes G4 and M5 according to EN 779. These are characterized by large filter surface areas and effective filter media with a positive effect on the energy efficiency of the filter.

In addition to this, Kalthoff panel filters GRISU WU and WU/5510 also meet the maintenance requirements. They can be changed quickly, easily and cleanly. Their proper fit into the device helps to avoid leaks, making particle penetrations a thing of the past.

The longer service lives of Kalthoff panel filters extend the maintenance intervals considerably, while the maintenance costs are massively reduced. Performed field trials have shown that the Kalthoff GRISU WU panel filters offer clear cost advantages by way of their lifecycle costs.

Kalthoff panel filters GRISU WU and WU/5510 are ideally suited for the restricted spatial conditions in rail vehicles. They are highly effective, long-lived and easy to handle.



## TYPE GRISU WU



Certified according to EN45545-2 / HL1-3

- pleated filter media made of progressively-structured filter media
- thermally bonded, flame-retarding, synthetic nonwoven
- KALTHOFF hot-melt pleating system
- synthetic FIBERPLAST frame
- compliant with VDI 6032
- available in various ISO groups according to ISO 16890
- available in filter classes G4-M5 according to EN 779

## TYPE WU/5510



Certified according to DIN 5510-2

- pleated filter media made of progressively-structured filter media
- thermally bonded, synthetic nonwoven
- KALTHOFF hot-melt pleating system
- synthetic FIBERPLAST frame
- compliant with VDI 6032
- available in various ISO groups according to ISO 16890
- available in filter classes G4-M5 according to EN 779

## TYPE VNF 295

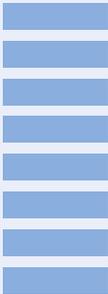


Certified according to DIN 5510-2

- synthetic nonwoven
- progressive construction of filter layer
- thermally bonded
- compliant with VDI 6032
- available in the ISO group ISO Coarse 90 % according to ISO 16890
- available in filter class G4 according to EN 779

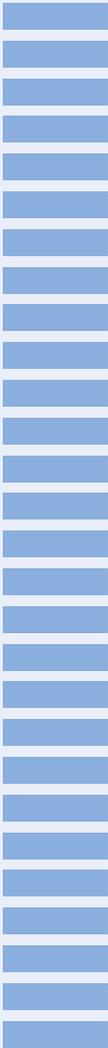
## QUALITY

Compliance with the high performance level is checked regularly during the individual production stages and in the laboratory. We guarantee the durable high product quality of all Kalthoff air filters to our customers. We document this quality assurance by technical data sheets and certificates that we will gladly provide you with.



## SERVICE

As a respected manufacturer, Kalthoff is an active member of both the VDMA and UNIFE. Kalthoff supports you as a partner with professional consultation in the planning and selection. Customer- and/or object-related labelling and packaging as well as further service offers help us make the procurement of the filters as convenient and easy as possible for you.



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