Woven **expertise**

Interesting facts about mesh made of metal and plastic wires as well as technical fibers

Woven metal mesh and filter solutions

GKD Group

Innovator and World market leader

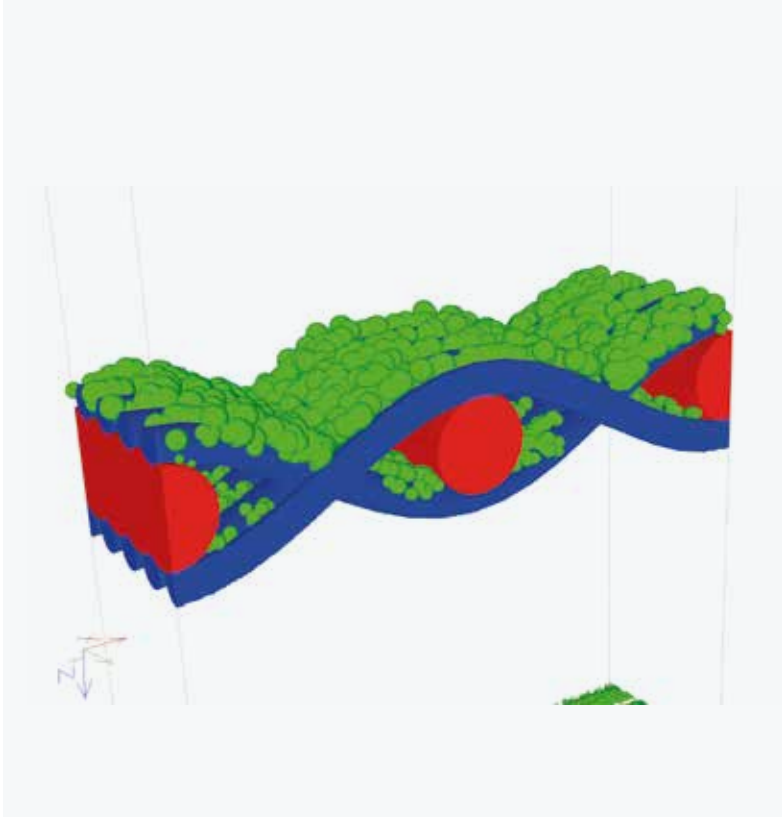
As a privately owned technical weaving mill, GKD - Gebr. Kufferath AG is the global market leader for metallic mesh, synthetic mesh, and spiral mesh solutions. Three independent business divisions bundle their expertise under one roof: **Industrial** Mesh (woven metal mash and filter solutions), **Process** Belts (belts made of woven mesh and spirals), **Metal**fabrics (façades, safety and interior design made of metallic fabrics) and **Media**mesh® (transparent media façades). GKD continuously develops new fields of application through manufacturing technology and process expertise. We use GKD meshes to create efficient systems, equipment, and components that are perfectly integrated into our customers' processes across all industrial sectors. Although its HQ is in Germany, GKD is a player on the international stage with six other production sites in the USA, South Africa, China, India, and Chile, branches in France, Spain as well as representatives all over the world.

Woven structures
for industrial applications

Innovative technology, a focus on development and cost leadership make the **Industrial** mesH business unit a provider of state-of-the-art media made of metallic wire mesh and other materials. Our product portfolio covers a variety of media and components for mechanical process technology.

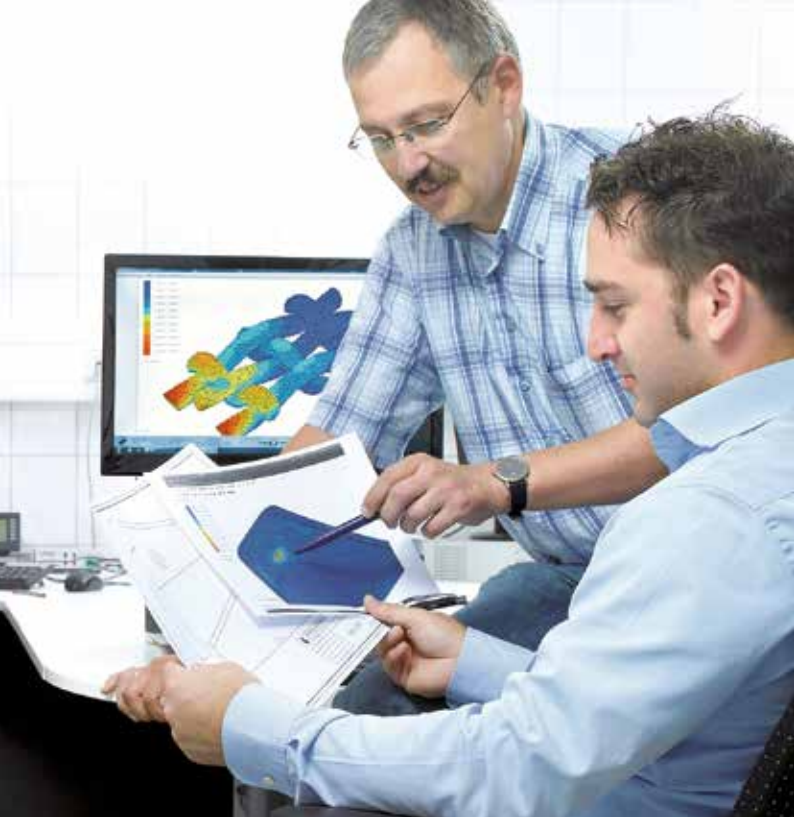
Innovative strength through laboratory expertise
As a technology developer with comprehensive laboratory expertise, we place a clear focus on developing and refining our products. As a result, more than half of our products have been on the market for five years or less. Thanks to this high innovation rate, we are able to consistently orient our range of products and services towards the needs of our customers.

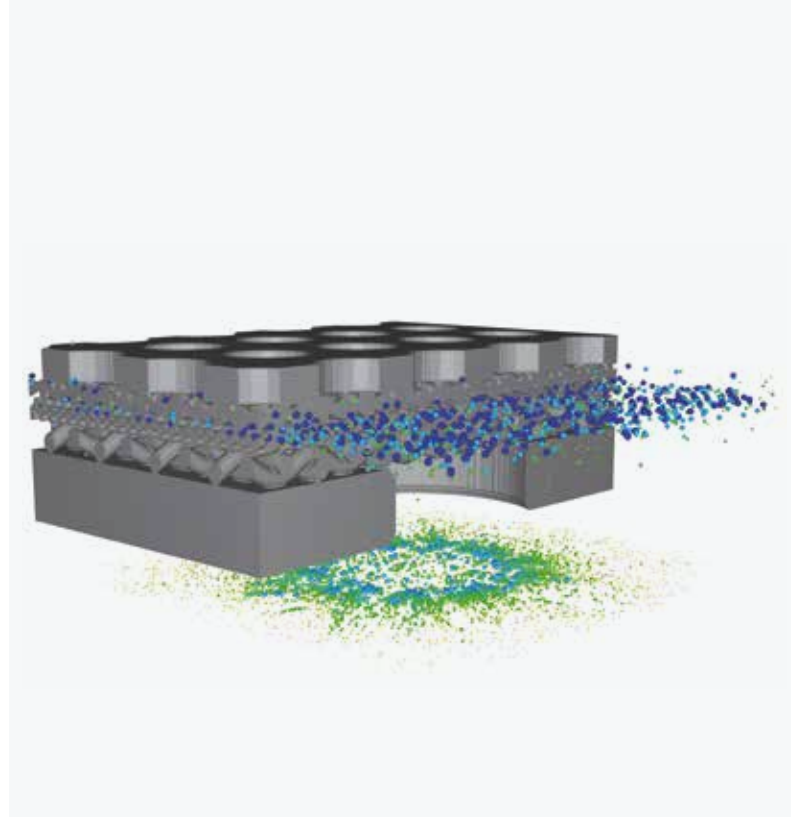
Certified manufacturing processes
We guarantee our first-class quality as well as the very highest manufacturing standards through certified processes. This allows us to produce some of the most reliable, high-performance filter media in the world. We adapt universal media or complex individual solutions perfectly to the manufacturing processes of our customers using the very latest simulation and testing techniques.



Individual
Product development

From the initial contact right through to the finished end product, our customers benefit from the support of experienced GKD development and application engineers. Together with our customers, they define the requirements in detail when developing new meshes. In accordance with these requirements, we then either individually adapt tried and tested mesh types to the customer's application or start to develop a new mesh. Moreover, we have been working successfully with renowned research institutions all over the world for many years. In order to secure this high innovative capacity and the very highest quality, we continuously work on new technical meshes and filtration systems. What's more, the entire process chain at GKD is closely interlinked – starting from the development of new products, right through to manufacturing and quality assurance in our own laboratories. In this way, our employees are able to utilize the practical expertise of production and in return ensure that the continuous improvements of our development department flow into manufacturing quickly. The end result: Our customers benefit from products with reproducible top quality.





Possibilities
of mesh simulation

The use of the very latest simulation software enables new meshes to be developed quickly while keeping costs down through rapid prototyping. In doing so, we can design single and multi-layer mesh designs on a computer using a completely virtual process. The subsequent flow simulations then allow us to make predictions on permeability or flow resistance at an early stage. It is also possible to simulate filtration given a specified particle size distribution. Only then is a digitally developed mesh manufactured in pre-series production for further testing.

Simulation calculations (Selection)

- Maximum pore size
- Pore size distribution
- Porosity (3d)
- Open area (2d)
- Mesh bottleneck
- Permeability
- Flow resistance
- Strength

Definitions

Warp/warp direction
Wires that are attached in the longitudinal direction on the loom and run parallel to the unwound length of the mesh roll.

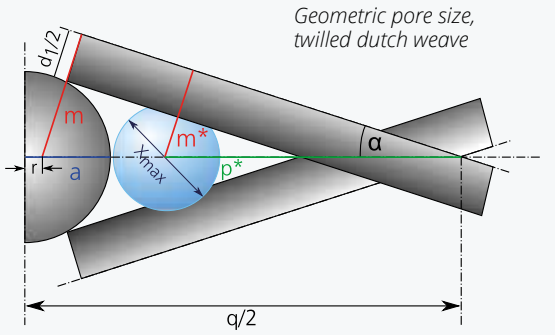
Weft/weft direction
Wires that are attached in the transverse direction on the loom and run parallel to the width of the mesh roll.

Mesh types/weave patterns
Differentiating between the various wire mesh versions.
Some of the mesh types and weave patterns are standardized and described in DIN ISO 9044, ASTM E2016 and ASTM E2814. Moreover, new weave types are constantly being developed and are therefore not yet covered by standards. The individual weave types offered by GKD are described in detail from page 10 of this brochure onwards.

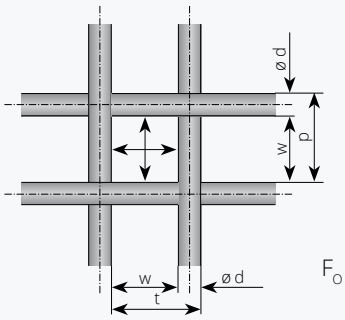
Mesh number/mesh count
Numerical description of the weave pattern in centimeters or inches (1 inch = 25.4 mm). In the case of mesh count, "mesh" is often used.
The first number always describes the number of warp wires, while the second figure indicates the number of weft wires. Examples: 9.4/43.3 per cm or 24/110 mesh. The number in the mesh designation is not standardized for all manufacturers. Therefore the geometric pore size should always be taken into account.

Mesh aperture [µm] or geometric pore size [µm]
Diameter of the largest spherical particle that can pass through a mesh. This is calculated on the basis of the weave type, wire diameters and spacing parameters. The calculation equations that form the basis for this were developed and experimentally validated at the Institute of Mechanical Process Engineering at the University of Stuttgart within the scope of AVIF projects A 224 and A 251. If this calculation method does not apply for some meshes, the pore size is determined physically through the glass bead test.

Open mesh area [%]
The percentage of all mesh openings on the overall screen surface for square, oblong and broad weave meshes. Permeability increases along with the open mesh area of the mesh. The definition is based on DIN ISO 9044 and is only valid and feasible for the aforementioned mesh types. All other filter media cannot be meaningfully defined on the basis of this standard.



Geometric pore size, twilled dutch weave



Formula for determining open area

w = mesh opening in mm
d = wire diameter in mm
t = w + d = spacing in mm
F_O = open mesh area

$$F_O = \frac{w^2}{(w+d)^2} \cdot 100 = \frac{w^2}{t^2} \cdot 100$$

Retention rate [%]
Value indicating the amount of solids retained by the filter in percent. When filtering liquids, the retention rate is given on the basis of a defined particle size or particle size distribution. For gas filtration, this is specified based on separated mass. This should be determined individually for each application, as the behavior of the filter media is dependent on the type of filtration (solid-liquid, solid-solid, solid-gaseous) and the individual process conditions.

Flow values / permeability [l/(m² * s) and l/(cm² * min)]
Key figures describing a mesh on the basis of its air and water permeability. Air permeability is determined at a temperature of 20° Celsius and a differential pressure of 200 Pa (20 mm H_2O or 2 mbar). The unit for this is l/(m² * s). Water permeability is specified at a temperature of 20° Celsius and a differential pressure of 20,000 Pa (2 m H_2O or 200 mbar). This is measured in l / (cm² * min). The values for other media (also non-Newtonian) can be calculated at GKD using a simulation tool. All such data is valid for single-layer mesh structures that are clean and not contaminated.

Porosity [%]
Ratio of empty space to total volume (empty volume compared to total volume and material) of a mesh. A high porosity generally also means high permeability.

Bubble point [mbar]
Differential pressure required by an air bubble to penetrate a mesh treated with isopropanol. The higher the bubble point, the smaller the geometric pore size of the mesh. However, this value is

dependent on the geometry of the opening. It can therefore only be used as a meaningful criterion in measurements comparing similar filter media. Even when the specific capillary pressure constant of the mesh is known, comparisons of different filter media (e.g. nonwovens and mesh) are only of limited relevance. The bubble point originates from the ASTM F316-03 and ASTM E1294 standards.

Tensile strength [n/mm²]

Unit of measurement for describing the rupture strength of a mesh. Due to the anisotropy of mesh, this value is determined separately for the warp and weft directions. This is an important difference to the values commonly used on many material data sheets, which normally refer to tensile strength in relation to diameter. Tensile strength is determined through standardized tensile tests in line with EN ISO 6892-1.

Material

The material grade for manufacturing a wire mesh is an important component of every mesh definition. The choice of material is based on the user's requirements and selection. It must be taken into account that wires of unlimited fineness cannot be manufactured from all materials. Furthermore, not all available wires possess the required mechanical properties for the production of wire mesh. Information on suitable materials can be found in the data sheets of the manufacturers. Attention: the resistance to corrosion is usually defined through removal rates for sheet metal. The low material thickness of meshes compared to that used in apparatus construction should therefore be taken into consideration when examining these corrosion resistance details from material manufacturers.

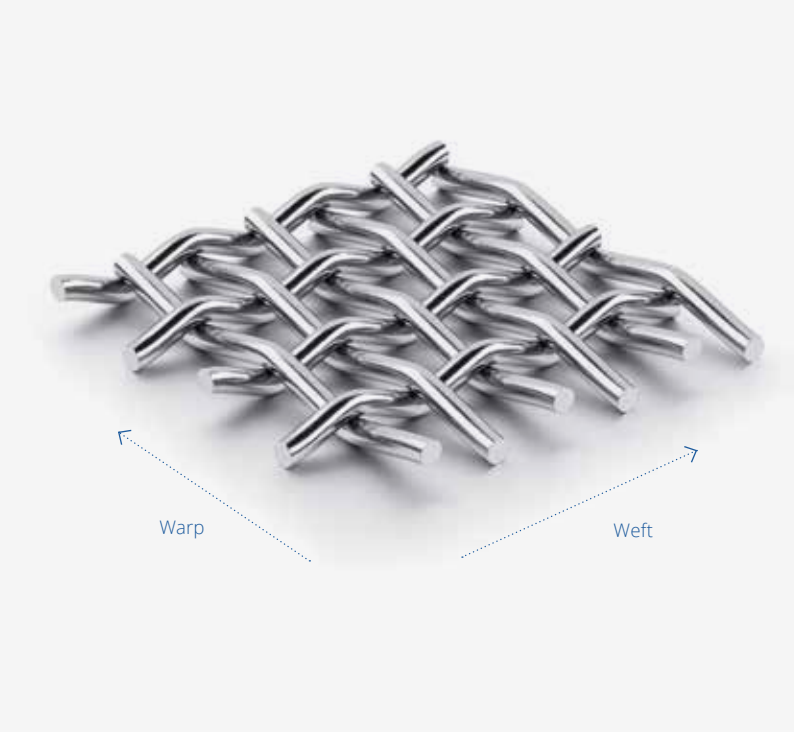
Square weave (SW): the classic choice

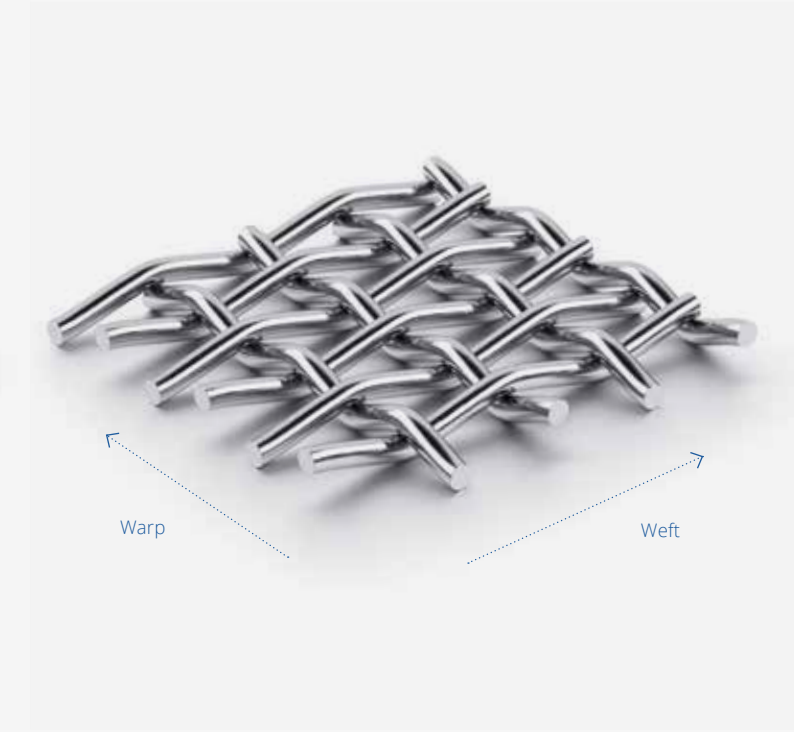
Square weaves are made of stainless steel or other material combinations. At GKD they are produced as plain weave (1/1) or twilled weave (2/2). The apertures range between 0.025 mm and 14 mm as standard. Depending on the aperture, production widths of between 1.3 m and 3 m are possible. Customized versions can be realized with a width of up to 8.1 m. Standard materials are stainless steels 316 / 316 L as well as 304 / 304L. Intelligent material combinations are employed in hybrid meshes in order to optimize the properties. These meshes are manufactured in accordance with DIN ISO 9044 for industrial wire mesh. This standard is adhered to and exceeded in all variants produced by GKD.

Applications (Selection)

- Automotive
- Sieving
- Filtration
- Shielding
- Lightning strike protection

Aperture > 25 µm





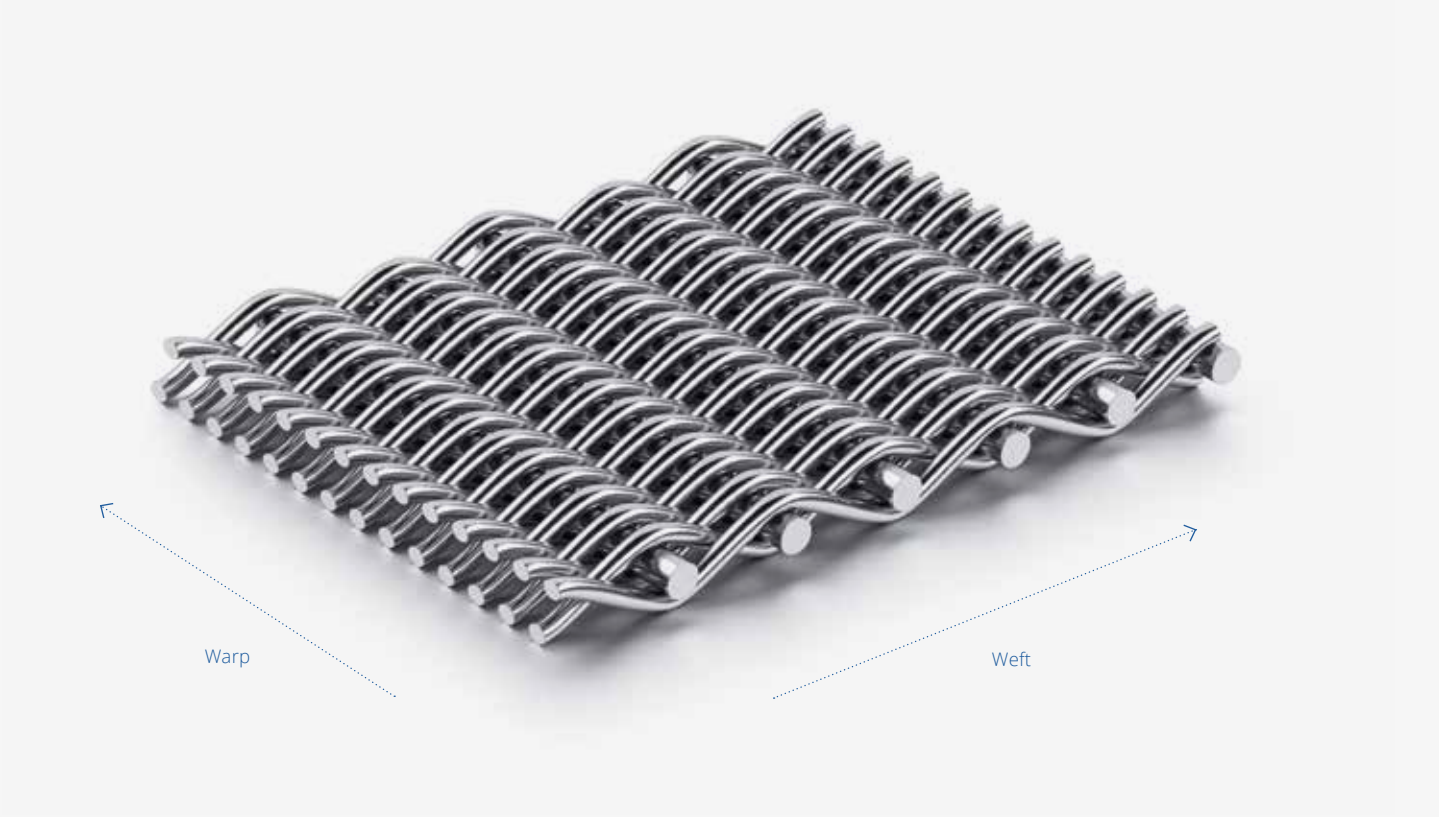
Oblong (OW) and broad (BW) weaves: more open mesh area

Oblong and **broad weaves** are a further development of square weave for increasing the open mesh area. With oblong weaves the number of weft wires is reduced, thus enlarging the weave in the warp direction. Broad weaves, on the other hand, have a reduced number of warp wires, enlarging the weave in the weft direction. The typical weave ratio of this asymmetrical mesh is 3:1. Customized weave ratios for specific customer requirements are also possible.

Applications (Selection)

- Sieving
- Shielding

Aperture > 25 µm



Plain dutch weave (PDW): the stronger solution

Plain dutch weaves are mechanically stronger meshes than square, oblong and broad weaves and are designed for industrial filtration. The surface is closed so that filtration takes place at the point where warp and weft join. The mesh is manufactured as plain weave (1/1) and with a fineness of 45 µm to 300 µm absolute opening. The warp wires are interwoven with wider spaces than the weft wires. GKD stocks plain dutch weave meshes from 45 µm to 300 µm made of stainless steels 304, 316 and 904 L, thereby covering most meshes required for industrial filtration. In contrast to square meshes, plain dutch weave is characterized by its significantly higher strength.

Applications (Selection)

- Drum filters
- Nutsche filters
- Cartridge filters
- Vertical pressure leaf filter

Pore size > 45 µm

Reversed plain dutch weave (RPDW)*: fine and robust

PZ Microdur weave, also known as reversed plain dutch weave, is used in solid-liquid filtration, where it combines the important properties of a fine metallic wire mesh with increased mechanical stability. The plain weave mesh has a high number of wires with thin diameters in the warp direction and a relatively small number of wires with a greater diameter in the weft direction. It has proved outstandingly successful in all applications in which high demands are placed on the mechanical stability of the metallic mesh due to backwashing, centrifugal filter cake removal or cleaning processes. GKD produces this mesh with a fineness of 21 µm to 200 µm absolute opening. In many cases, the PZ Microdur mesh is referred to as reverse plain dutch weave, or RPDW.

Applications (Selection)

- Vertical pressure leaf filters (Niagara filters)
- Horizontal pressure leaf filters
- Centrifuges
- Backwashable cartridge filters

Pore size > 21 µm

** PZ Microdur weave*

Dutch twilled weave (DTW): for the finest filter media

Dutch twilled weave is a particularly robust mesh in relation to its fineness, making it ideally suited to heavy-duty filtration tasks. These properties are realized through the high material density of this lightproof metallic mesh. The density is provided by a twilled weave (2/2) with a small number of thick warp wires and significantly more weft wires. GKD produces twilled dutch weaves with a fineness of 5 µm to 250 µm absolute opening. Because, due to the complex manufacturing process, production of this mesh takes longer than that of other meshes, GKD keeps pre-assembled dutch twilled weaves in stock for its customers. Twilled dutch weave is produced on the basis of the common materials in accordance with DIN 304 L / 316 L However, customized versions with special materials such as nickel or Hastelloy are also available on request.

Applications (Selection)

- Nutsche filters
- Precoat filter systems
- Sand control screens
- Cartridge filters

Pore size > 5 µm

Reversed dutch twilled weave (RDTW)*: maximum pore stability

RDTW meshes are reversed dutch twilled weave meshes developed for increased strength. In order to achieve this, the original plain weave of the PZ mesh was modified with a twilled weave. GKD's state-of-the-art weave technology enables an even pore size and stability, high flow rates and narrow tolerance regarding pore size. In many cases, the RDTW mesh is referred to as KPZ.

Applications (Selection)

- Pecoat filtration
- Horizontal pressure leaf filters
- Centrifuges
- Continuous polymer filters
- Sand control screens

Pore size > 60 µm

**KPZ Microdur weave*

5-heddle atlas weave (Tela): high flow rates

5-heddle atlas weaves or **Tela meshes**, are highly sophisticated filtration meshes that combine high flow rates with mechanical stability. On one side, the 5-heddle weave pattern mesh has a smooth surface, which ensures that the filter cake layers formed are particularly even. On the other side, the surface is coarse. This weave makes the mesh very easy to clean. Tela meshes have proven particularly successful in systems with drum filters or disc filters in which filter cake build-up, cleaning and backwashing are performed at regular intervals.

Applications (Selection)

- Sewage filtration
- Automotive
- Process water filtration
- Mining
- Distillation towers
- Filtration systems with continuous
- Cleaning / backwashing

Pore size > 50 µm

Multibraid weave (MW)*: weaving wire bundles

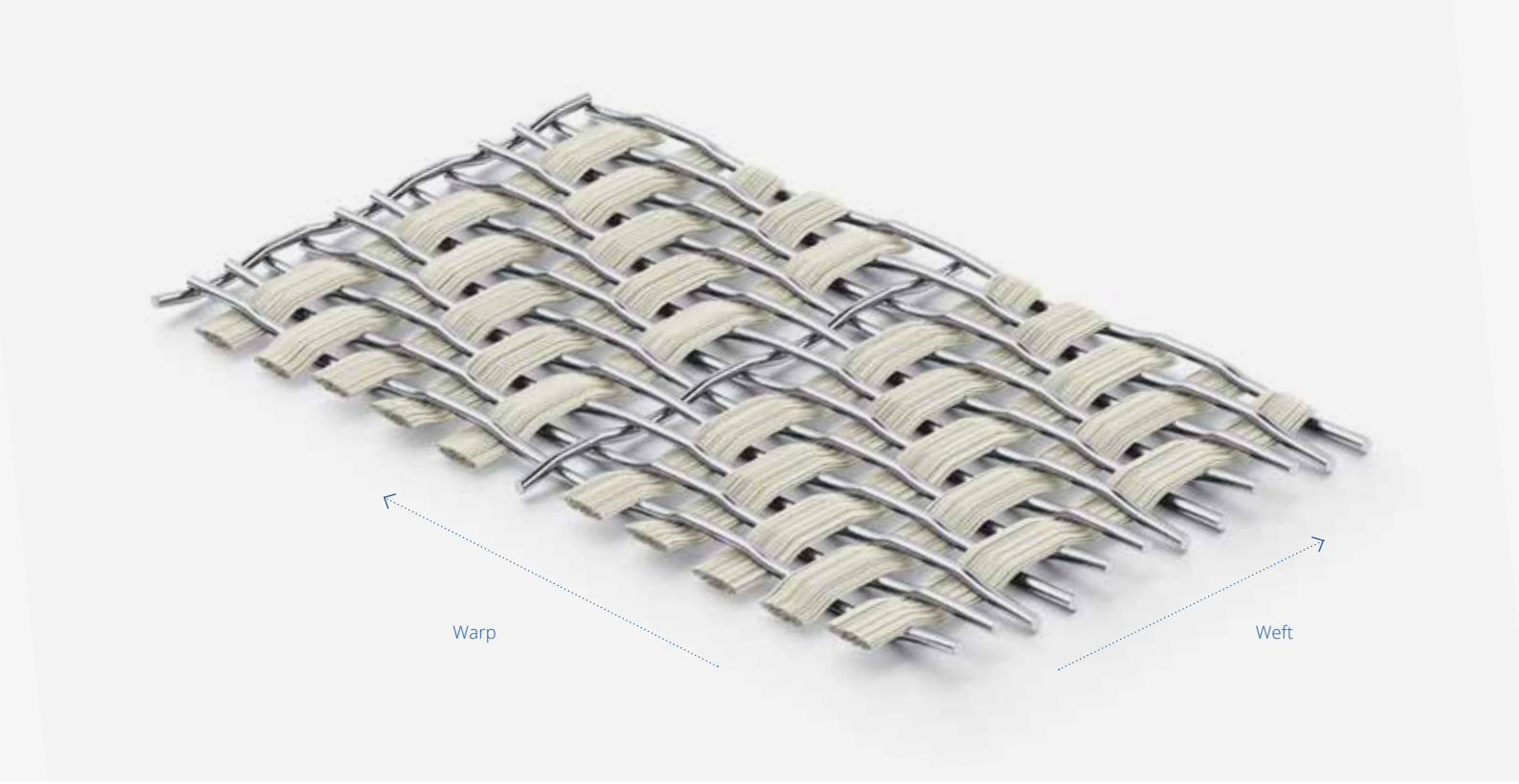
Multiplex or **multibraid mesh** is manufactured by weaving wire bundles in warp and weft direction and is particularly well-suited to large-area filters. The result is a mesh with higher overall strength and textile properties when tensioning across other structures. The wire bundle lends the mesh a perfect combination of flexibility and mechanical strength – which are particularly important for large filters. Moreover, the particularly smooth surface facilitates an even and stable filter cake build-up.

Applications (Selection)

- Drum filters
- Special applications, precoat filtration

Pore size > 80 µm

** Multiplex weave*



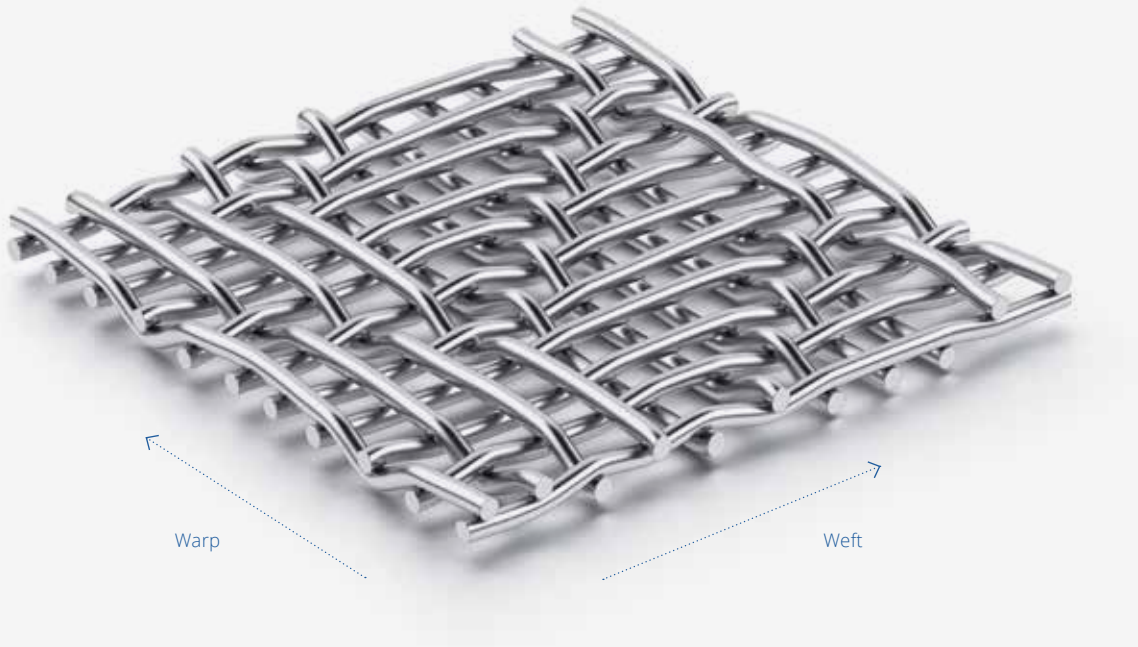
Hybrid weave (HW): intelligent material combination

Hybrid weaves consist of at least two materials woven together, thus ensuring optimal functionality and allowing the positive properties of the individual wires to be combined. This is generally possible for all mesh types. Numerous properties are optimized using this procedure, including mechanical characteristics such as strength, flexibility or weight reduction, and manufacturing costs can also be reduced when large quantities are purchased. The mesh usually consists of at least one metallic component. Common combinations include plastics (PTFE or PEEK) and metal or glass and metal, for example. Unorthodox material combinations are also possible here, thus allowing the creation of mesh surfaces with special properties.

Applications (Selection)

- Liquid-gas filtration (droplet separation)
- Flexible yet tear-resistant filtration mesh

Pore size > Variabel



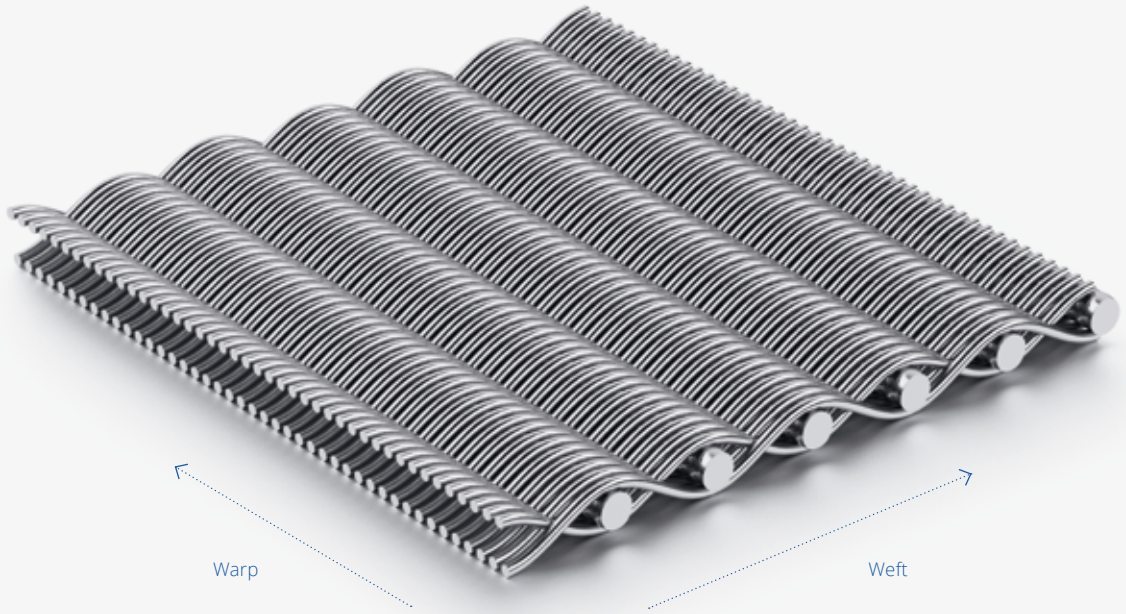
Volumetric weave (VOW): high volume porosity

With **volumetric weaves**, two-dimensional mesh weave successfully conquers the third dimension. It can be created using a variety of materials, thereby enabling many individual product characteristics such as temperature resistance or media resistance. In the filtration process, volumetric weave stands out thanks to its low pressure loss. An innovative weaving technique allows volume porosities of up to 90%, while the defined irregular filter openings guarantee reliable filtration even when the filtration area is reduced. Alongside the impressive functionality, the outstanding price-performance ratio makes it particularly attractive for cost-sensitive applications.

Applications (Selection)

- Automotive gas filtration
- Heat exchangers
- Drainage mesh

Pore size > 30 µm



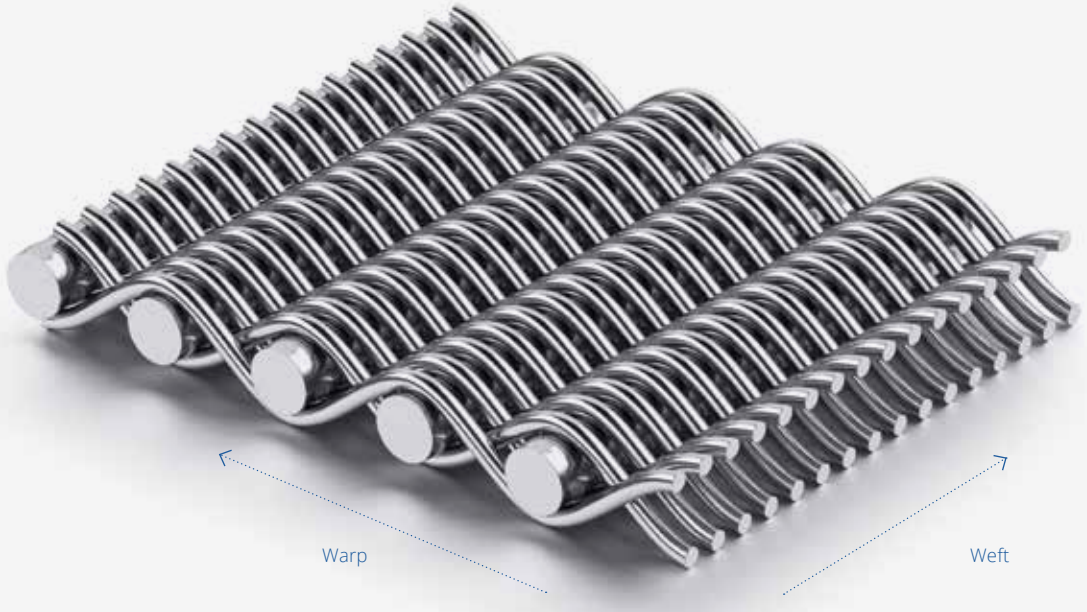
Optimized dutch weave (ODW): high permeability

Optimized dutch weave is obtained by refining plain dutch weave for ultrafine filtration and is made up of a small number of thick warp wires and numerous thin weft wires. Due to the larger number of fine weft wires, these are interlocked during the production process. The result: slot-like openings with very small pore sizes (small edge length), which deliver a high level of permeability. Like plain dutch weave, optimized dutch weave is also highly resistant to mechanical loads. One of the most frequent applications for this product is for the filtration of fresh water and sewage.

Applications (Selection)

- Water/sewage filtration
- Solid-liquid filtration
- Cartridge filters
- Disc filters
- Drum filters

Pore size > 5 µm



Reversed optimized dutch weave (RODW)*:
high stability

With the **optimized version** of **PZ Microdur mesh**, the number of thin warp wires is increased until they can be slid into each other. This creates a filtration surface with more, and smaller, openings, thus allowing flow rates to be significantly increased. This in turn results in good characteristics for backwashing and cleaning as well as for centrifugal filter cake removal processes.

Applications (Selection)

- Solid-liquid filtration
- Vertical pressure leaf filters (Niagara filters)
- Horizontal pressure leaf filters
- Centrifuges
- Backwashable cartridge filters

Pore size > 25 µm

** Optimized PZ Microdur weave*

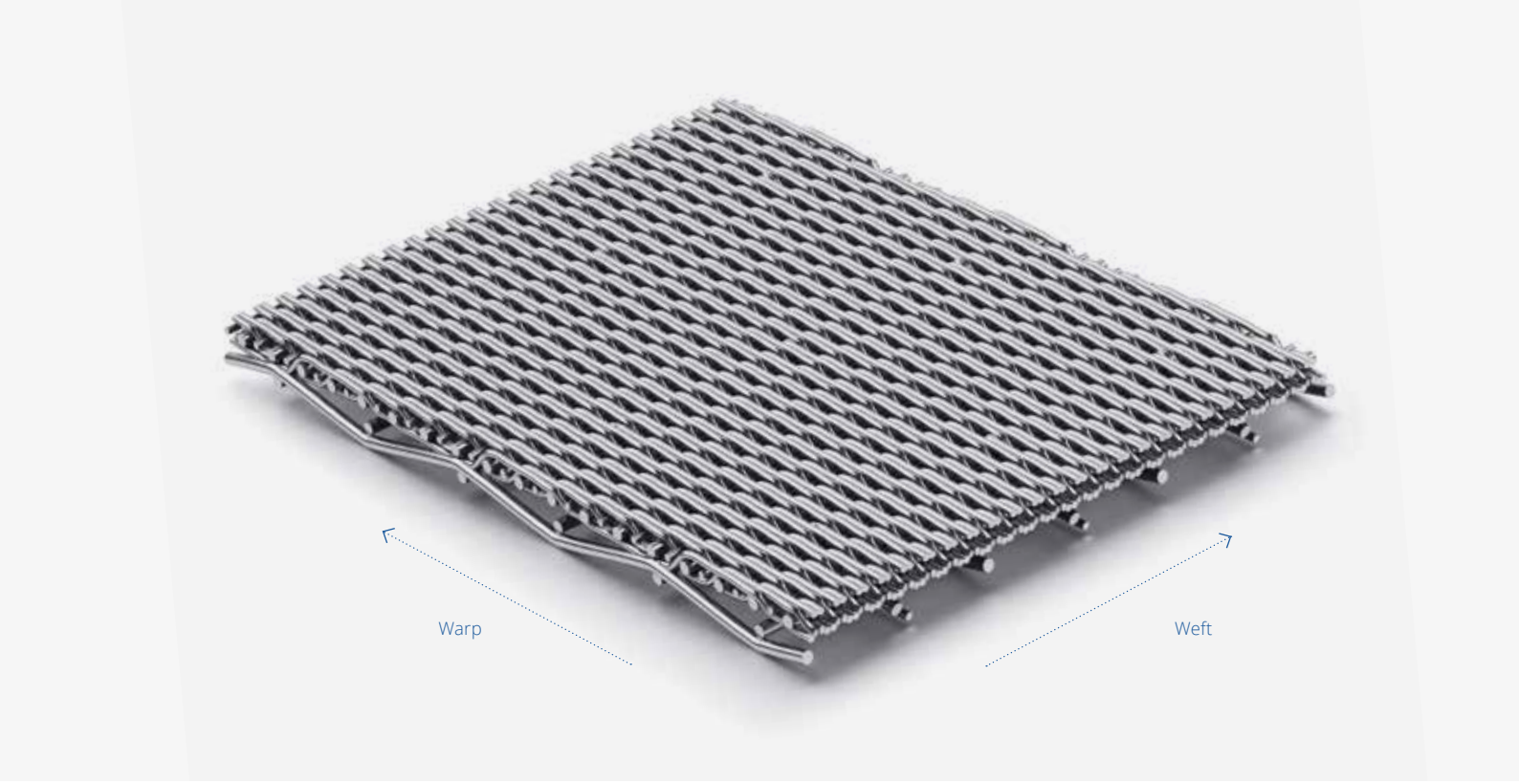
Porometric weave (PW): highest flow rate and dirt holding capacity

At a constant volume flow, the higher porosity of the **Porometric** filtration mesh resulting from its design reduces the highest, local pore velocity by up to 40% compared to conventional filtration meshes. The lower maximum pore velocity results in lower wear of the filter material through particles. At the same time, however, the flow rate increases significantly when using this new mesh type. Particles at the required separating limit are separated quickly and reliably. In addition, the slit oder slot-shaped pores create superior backwashing capabilities. The dirt holding capacity is also many times higher than in comparable filtration meshes thanks to the special pore arrangement. A broad spectrum of solid/liquid filtration applications can be covered thanks to a geometric pore size of 13 µm and 150 µm. This filter media was developed using our GeoDict simulation software.

Applications (Selection)

- Water / wastewater filtration
- Micro sieving
- Solid / liquid filtration
- Cartridge filters
- Disk filters

Pore size > 13 µm



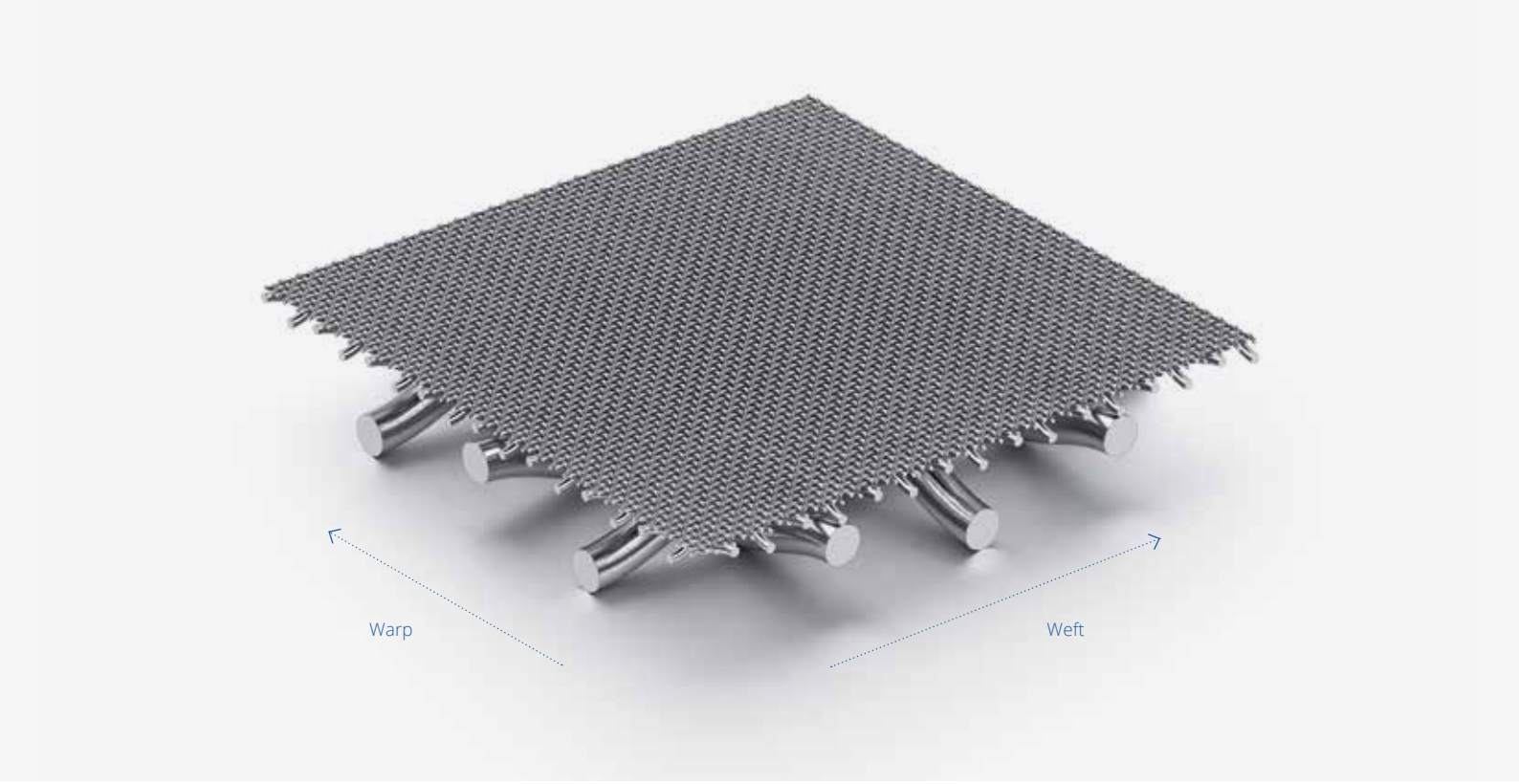
YMAX® weave:
the flexible alternative to wire mesh laminates

YMAX® mesh is the flexible, woven alternative to sintered wire mesh laminates (GEKUPLATE). Its dirt-holding capacity is just as high as a high-performance fleece, yet its pore size is absolutely uniform. This makes filtration processes easier to calculate and control. Thanks to its high level of flexibility, YMAX® mesh is easy to form and adapt, while at the same time its outstanding stability makes it resistant to compressive and tensile forces. All YMAX® filtration meshes are designed according to the composite principle, thus enabling a very good filtration result. Moreover, the mesh has good backwashing characteristics and is easy to clean. The composite mesh consists of monofilament wires and wire bundles, with the materials used always being adapted to the customer's specific requirements. The same also applies for the finishing of the manufactured mesh. Additional sintering is also possible on request.

Applications (Selection)

- High-temperature applications
- Fluidisation
- Cylinder filters
- Cone filters
- Pleated filters

Pore size > 10 µm



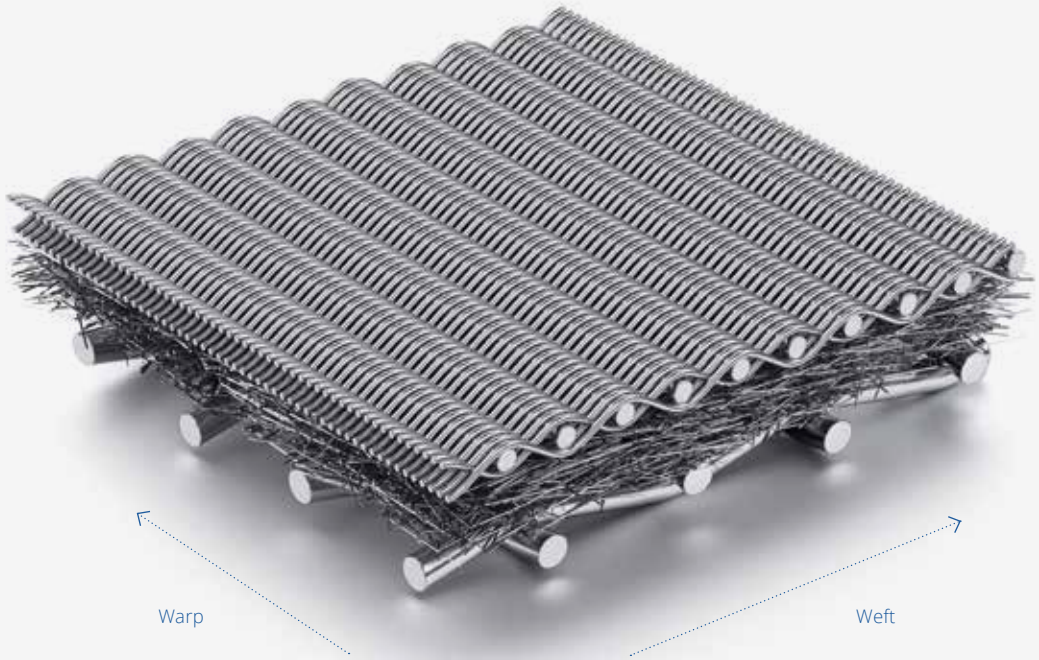
Gekuplate (GP): for demanding mechanical applications

GKD wire mesh laminates (**Gekuplate**) or sintered plates made of mesh are fine filter media for mechanically challenging tasks. They exhibit the same filtration properties as individual wire mesh layers of the same fineness. However, by sintering several wire mesh layers, highly robust structures are created. These are more stable than individual layers and can therefore be subjected to greater mechanical loads. There is a varied and virtually limitless array of possible layered combinations of different meshes, thus allowing us to meet even the toughest customer requirements. Today, many wire mesh laminates can be replaced by other metallic meshes from GKD without compromising on quality.

Applications (Selection)

- Solid-liquid filtration
- Hot gas filtration
- Fluidisation of bulk solids
- Quenching in the textile fibre industry
- Centrifuges
- Inherently stable filter cartridges
- Nutsche filters

Pore size > 10 µm



Trimetric:
Positive properties combined in a single medium

The innovative, highly porous filter medium **Trimetric** combines in one medium everything that efficient hot gas filtration requires: high retention rates, thermal resistance up to 600°C, mechanical robustness to vibrations, regenerability during operation; and external cleaning. With this new product range, GKD is making combinations of Optimized Dutch Weaves and nonwoven metal fiber mesh available for practical applications. Adaptable to specific applications, the inherently stable filter elements can be employed in all economical designs of standard dust filters – and also in bag filter systems with minimal adjustments to fixtures.

Applications (Selection)

- Standard and hot gas filtration
- Polymer filtration

GKD filter plates

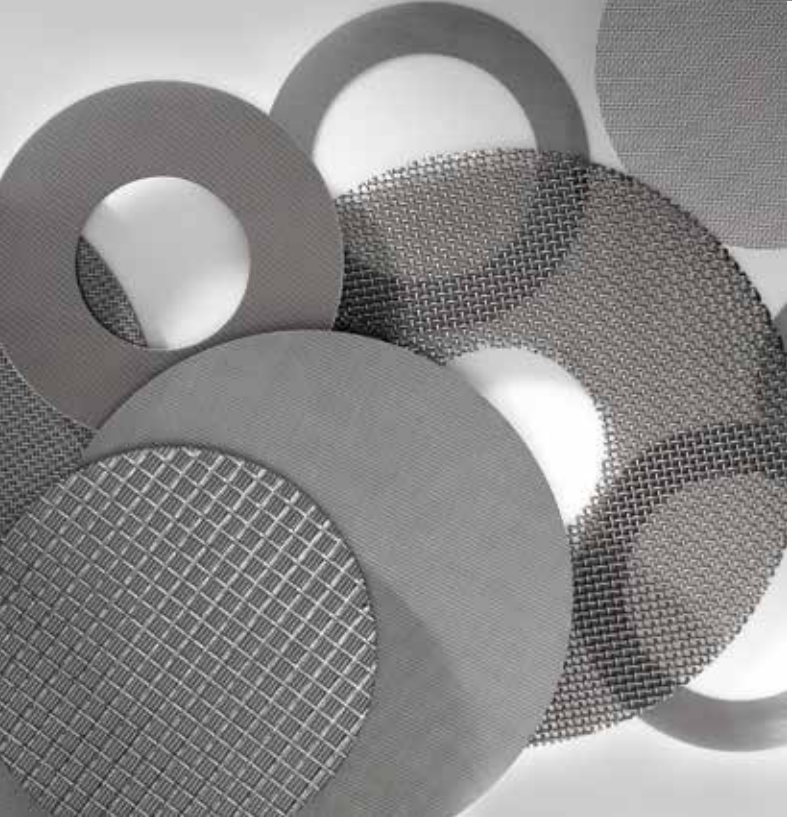
Process-specific cartridge filter design

Tailor-made
filter media + products

As well as manufacturing high-precision industrial mesh, GKD also focuses on immediately usable filter media for many fields of application. Whether horizontal pressure leaf filters, cartridge filters or one of the many other ready-for-use solutions: all systems are equipped with the versatile GKD meshes, making them a reliable and cost-efficient component in a large number of production processes the world over. In the manufacturing and finishing of industrial mesh, we also assemble ready-to-use products according to customer-specific requirements. Our customers thereby always benefit from high-quality filtration systems tailored to their processes.

Product expertise

- Modern filter media
- Universal mesh standards
- Complex individual solutions
- Certified quality standards throughout
- Perfectly matched products and systems
- Functional, efficient and long-lasting solutions
- Broad, sophisticated range of materials



Stamped parts

Mesh strips as semi-manufactured product

Applikations / filters (Selection)	**Markets** (Selection)
Horizontal pressure leaf filters	• Chemical and pharmaceutical industry • Food and drink industry
Vertical pressure leaf filters	• Chemical and pharmaceutical industry • Food industry
NeverLeak™ filter lraves	• Chemical and pharmaceutical industry • Food industry
Cartridge filters	• Chemical and pharmaceutical industry • Food industry • Ballast water (shipbuilding)
Disc filters	• Waste water treatment (environmental technology) • Mining • Paper and cellulose industry
Spinneret filters	• Plastics industry • Textile industry
Drum filters	• Waste water treatment (environmental technology) • Chemical industry • Plastics industry • Food industry
Centrifuges	• Chemical and pharmaceutical industry • Food industry • Energy technology

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