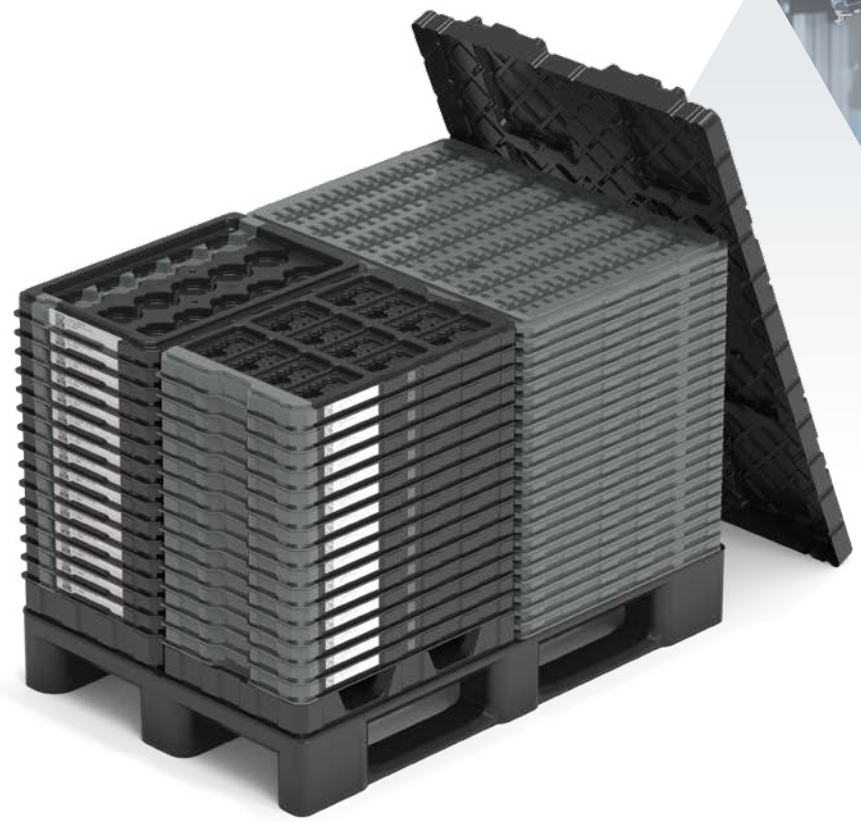


Thermoformed load carriers

Customized solutions for transporting and automated handling of workpieces.

SÖHNER

Precision thermoforming

What is thermoforming?

Thermoforming, also known as deep-drawing or vacuum forming, is a manufacturing method for plastics processing. In this process, thermoplastics are heated, molded using a tool, cooled, and refined until the finished products are ready.

The process is highly efficient, flexible, and cost-effective. Comparatively low tool costs enable even smaller projects and small series to be implemented quickly and at low initial investment costs.

Thermoforming specialist

We have over 50 years of experience in thermoforming. We develop, design, and manufacture plastic load carriers and packaging systems. Our solutions stand out for their maximum precision, functionality, durability, and environmental friendliness. We support our customers from initial idea to finished series part. Because we're only satisfied when you are.

Since 2001
Quality standard according to **ISO 9001**

Since 2008
Environmental standard according to **ISO 14001**

Since 2013
Energy standard according to **ISO 50001**

The four steps of thermoforming

1. Heating up

Plastic sheets or films are heated above their softening temperature to a thermoelastic state.

2. Reshaping

The heated sheets or films are sucked onto a tool using a vacuum and given their shape.

3. Cooling down

The molded parts are cooled using cooling air and controlled tool temperatures.

4. Final shape

The dimensionally stable parts are released from the tool using compressed air and sent for finishing.

Recycling of remaining material
We recycle 100% of the plastic waste generated during production.

Positive and negative forming

Essentially, the forming process can be divided into two methods: positive and negative forming. The chosen method determines which side of the molded part will have accurate dimensions.

Negative formng

In negative forming, the plastic is drawn into the tool. The tool side is the visible side. The outside is shaped to precise dimensions.

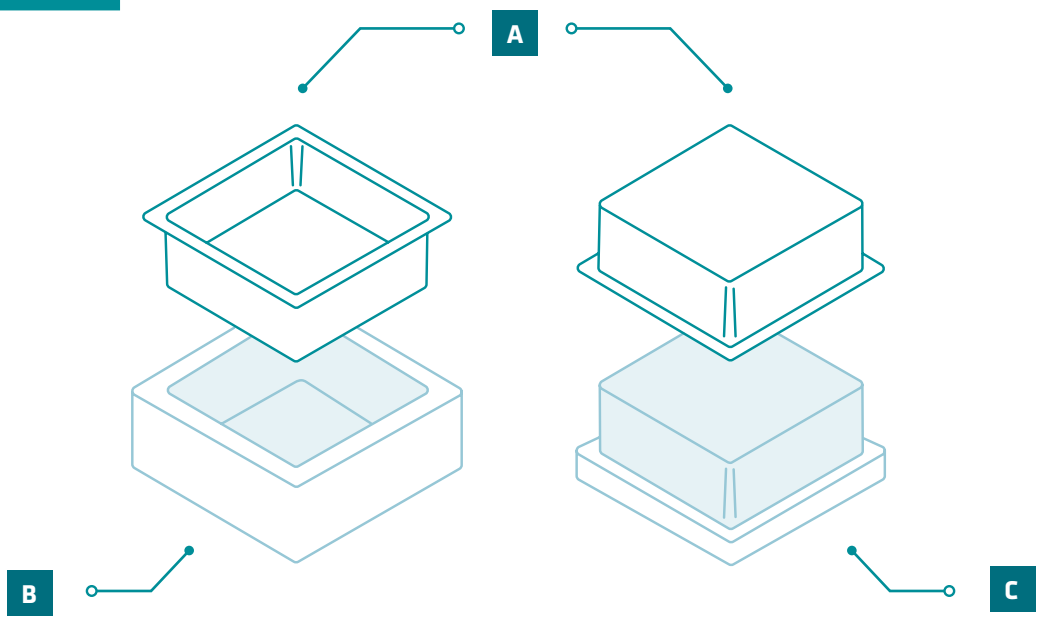
Positive forming

In positive forming, the plastic is draped over the tool like an “inside-out” layer. The side facing away from the tool is the visible side. The interior is shaped to precise dimensions.

A Material (sheet / molded part)

B Negative tool

C Positive tool



The advantages and limitations of thermoforming

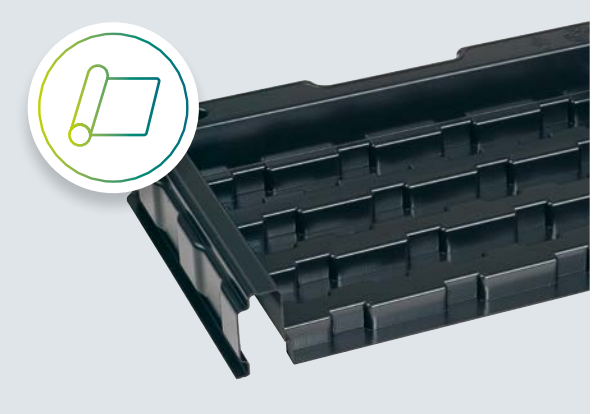
Advantages

+ Low tool costs
+ Fast implementation times
+ Wide range of materials
+ Many dimensions and shapes (including large parts)
+ From small quantities
+ 100% recyclable

Limitations

+ Limitations with complex geometries
+ Temperature stress over the service life
+ Higher material costs than injection molding

Our thermoforming processes

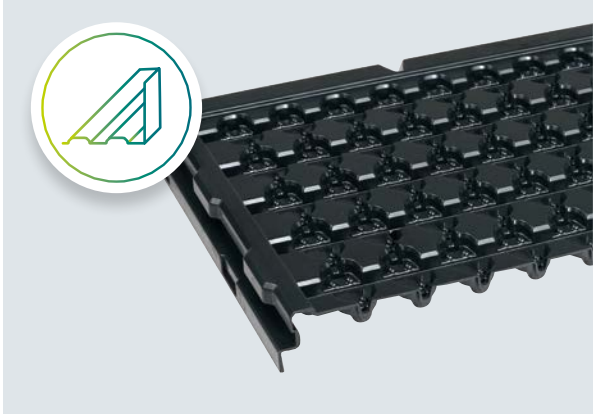


Film processing

In film processing, thermoplastic films, which are available in rolls, are processed in a roll-fed machine. To do this, a roll is clamped into the machine and pulled in. The film is heated and molded onto a tool using a vacuum and compressed air. The film then cools and sets in the desired shape. The molded parts are punched out and stacked.

Technical data

+ Molded part size up to 695 x 500 mm
+ Molded part height up to 140 mm
+ Material thickness from 0.8 to 2.5 mm

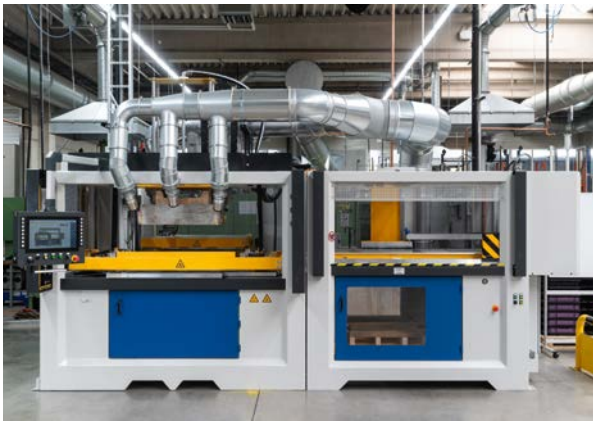


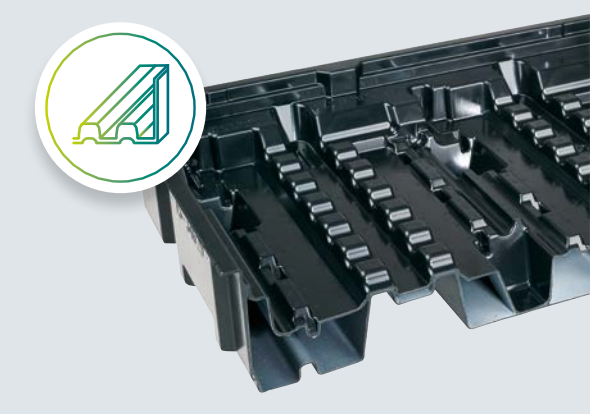
Single/Sheet thermoforming

In the single-sheet process, a thermoplastic sheet is heated on both sides and pre-stretched by blowing in compressed air. A tool then moves into position and the heated sheet is sucked onto the tool using a vacuum. The molded part is created. Cooling air and tool temperature control cool the molded part to below its solidification temperature and, in the final step, the molded part is released from the tool using compressed air.

Technical data

+ Molded part size up to 2550 x 1750 mm
+ Molded part height up to 800 mm
+ Material thickness up to 12 mm
+ Precise geometry on one side





Twin//Sheet thermoforming

In the twin-sheet process, two thermoplastic sheets are simultaneously molded and pressed together to form one molded part. To achieve this, two sheets are heated and drawn into upper and lower molds using vacuum pressure. During molding, the tools close and press the upper and lower parts together, forming one high-strength molded part. The double-walled molded part is then cooled using tool temperature control and cooling air and removed.

Technical data

+ Molded part size up to 2700 x 1600 mm
+ Material thickness up to 12 mm (2x)
+ Precise geometry on both sides
+ Reinforcements and inserts can be integrated
+ Different shapes and colors on the top and bottom

Additive manufacturing (3D printing)

In addition to thermoforming, we also use an additive technology: Fused deposition modeling (FDM). In the FDM process, an object is “printed” layer by layer from filament. For this purpose, the filament is fed to an extrusion head, melted, and applied to a build platform through a nozzle. Once a layer has been successfully extruded, the build platform lowers and a new layer can be applied. This process is repeated until the molded part is complete.

Technical data

+ Assembly space up to 850 x 405 x 1400 mm
+ Molded part size up to 800 x 400 mm
+ No tools required
+ Various orientations (lying flat, standing upright, 45° angle)

Thermoforming **project sequence**

From inquiry ...

A thermoforming project typically involves several steps, which we at Söhner carry out together with you, our customers.

These steps include layout development, tool construction, sample production, and several quality controls and approvals.

Customer

01 **Request**

02 **Quote**

Söhner

03 **Layout order**

04 **Layout development**

We work with you to develop the requirements profile for your load carrier and then create a technical drawing of the layout.

Everything from a single source

You can rely on us for expert support on all aspects of load carriers. We accompany you through every step of the project and offer you a comprehensive, worry-free package. We provide all the services you need from a single source – consulting, development, design, toolmaking, manufacturing, and recycling.

What sets us apart

+ Over 50 years of experience
+ Design expertise
+ In-house toolmaking
+ Modern 3D CAD software
+ Additive manufacturing (3D printing)
+ Multiple thermoforming processes
+ Recycling of load carriers

... to series production

Thanks to our structured approach and close coordination, we can identify and remedy weaknesses at an early stage, but also incorporate any requested changes quickly and easily. This ensures you always receive your load carriers on time and at the desired quality.

05 Layout approval and nest sample order

Once the layout has been approved, our toolmakers make the tool and one or more nest samples are produced for you.

06 Nest sample production (tool and molded parts)

07 Nest sample approval and series tool order

Once the nest sample has been approved, we manufacture the series tool and produce the first series samples, known as initial samples.

08 Initial sample production (series tool and molded parts)

09 Initial sample approval and series order

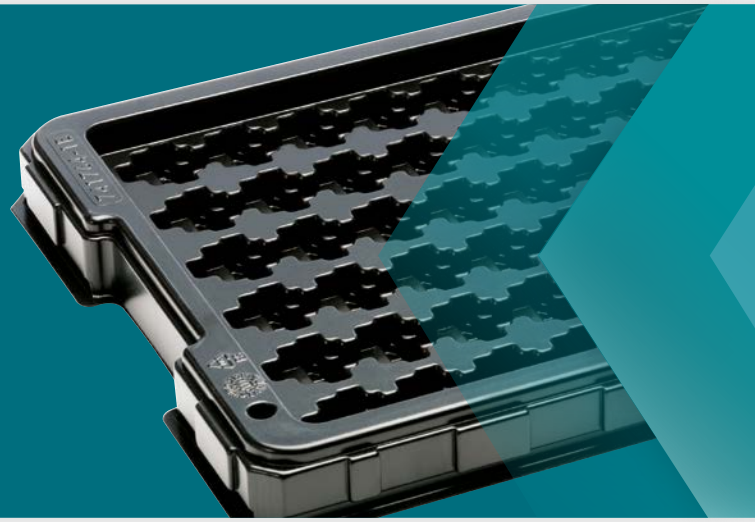
After successful sampling and final approval, we will start series production of your load carriers.

10 Series production

Load carriers
for every weight class

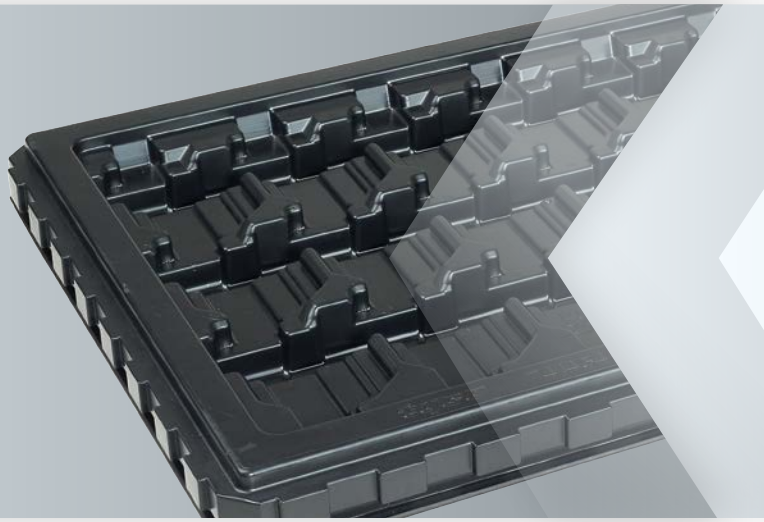
Load carriers for light workpieces

We manufacture thermoplastic film load carriers for reliable storage and safe shipping of lightweight components. The thin-walled load carriers are very light and stable.



Load carriers for moderately heavy workpieces

We produce suitable load carriers using the sigle-sheet process for the transport and storage of moderately heavy components such as coil bodies, rails, and connectors. The precisely dimensioned part seats makes them ideal for use in automated production lines.



Load carriers for heavy workpieces

We ensure the safe handling of large and heavy components such as brake discs, rotors, and batteries using special double-walled load carriers. Thanks to their sandwich-like structure, they are exceptionally rigid and capable of carrying heavy loads.

Features

+ **Thermoforming process:**
  Film processing
+ **Material thickness:**
  0.8 to 2.5 mm
+ **Formats (in mm):**
  300 x 200, 350 x 250, 400 x 300, 500 x 400, 600 x 400, etc.

Design options

+ Blister packaging
+ Inserts
+ Workpiece carriers

Features

+ **Thermoforming process:**
  Single-sheet
+ **Material thickness:**
  up to 12 mm
+ **Formats (in mm):**
  400 x 300, 600 x 400, 600 x 500, 800 x 600, 1200 x 800, etc.

Design options

+ Workpiece carrier
+ Inserts
+ Interlayers
+ Containers

Features

+ **Thermoforming process:**
  Twin-sheet
+ **Material thickness:**
  up to 12 mm (2x)
+ **Formats (in mm):**
  600 x 400, 800 x 600, 1000 x 600, 1200 x 800, 1200 x 1000, etc.

Design options

+ Containers
+ Workpiece carrier
+ Interlayers
+ Pallets

Workpiece carriers

Thermoforming processes

Film

Single/Sheet

Twin//Sheet

Formats

from 220 x 120 mm to 2600 x 1500 mm

Component position

Elevated

For optimal automated handling

Thermoformed **workpiece carriers**, also known as thermoform trays, feature precise, custom-fit mounts for securing parts and components and holding them in the desired position. Workpiece carriers not only protect parts from contamination and damage during transport, they can also be used in automated manufacturing and assembly systems, including robot handling.

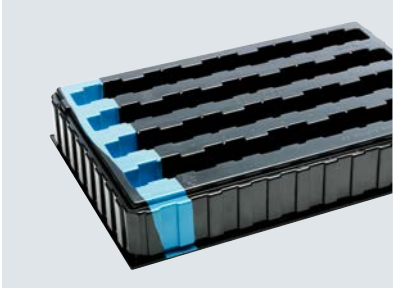
Advantages

+ Ideal for automated handling
+ Elevated, easily accessible component position
+ External contour with centering options
+ Safe stacking (stackable and rotary stackable)

Application examples

Stackable workpiece carrier

Workpiece carrier 340 x 260 mm with molded pins. Workpiece: Gears.



Workpiece carrier with color strips (crosswise)

Workpiece carrier 600 x 400 mm with color strips and anti-twist protection. Workpiece: Gearbox.

Workpiece carrier with color strips (lengthwise)

Workpiece carrier 595 x 495 mm with 3 different nest sizes. Workpiece: Combipack.

Containers

Thermoforming processes

Film

Single/Sheet

Twin//Sheet

Formats

from 400 x 300 mm
to 2600 x 1500 mm

Component position

Recessed

For damage-free transport

Thermoformed **containers** have precisely fitting part seats, but differ from workpiece carriers in that they have a raised rim and a closed interior. This protects parts and components from external influences such as dust, dirt, and splash water. Parts can be stored and transported safely and without damage.

Advantages

- High stability thanks to sturdy frame construction
- Closed, dust-protected interior
- Safe stacking (stackable and rotary stackable)
- Suitable for automated handling
- Available with dust cover

Application examples

Container in ESD version

Single-sheet container 400 x 400 mm made of conductive PS. Workpiece: Coils with SMD components.

Container in solid color and with color strips

Container 340 x 260 mm made of blue ABS with gray color strips. Workpiece: Bearing caps.

Container with abrasion-resistant surface

Twin-sheet container 800 x 600 mm made of abrasion-resistant ABS-TPU. Workpiece: Clutch disks.

Inserts

Thermoforming processes

Film

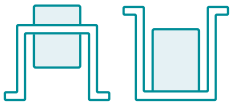
Single/Sheet

Twin//Sheet

Formats

from 240 x 160 mm
to 750 x 550 mm

Component position



Elevated Recessed

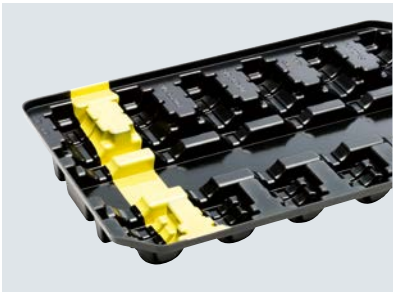
For use in containers

If components need to be transported in a plastic container (e.g. VDA-KLT, RAKO, EUROTEC), it's best to first secure them in a thermoformed insert, which is then placed inside the chosen container. Depending on the height of the container, several inserts can also be stacked on top of each other. When changing components, the insert can be removed while the container continues to be used.

Advantages

+ Suitable for KLT Boxes and all common container types
+ Secure and organized component positioning
+ Stable packaging unit
+ Easy handling
+ Stackable and rotary stackable
+ In combination with foam or flocked material

Application examples



Insert in KLT 6147

Insert made of regenerated ABS with yellow color strips. Workpiece: Guide boxes.

Insert in KLT 6429

Stackable PS insert with recessed handles. Workpiece: Contact plug.

Insert in R-KLT 6415 ESD

Insert made of conductive ABS-TPU with beveled corners. Workpiece: Electric motor components.

Interlayers

Thermoforming processes

Film

Single/Sheet

Twin//Sheet

Formats

from 1000 x 600 mm
to 2700 x 1600 mm

Component position

Elevated

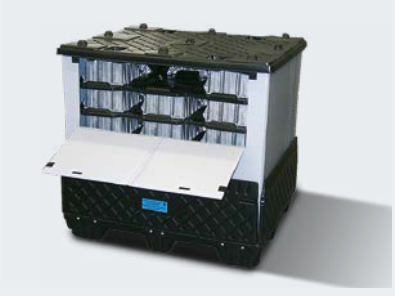
For high packing density and stability

Thermoformed interlayers are used to achieve the highest possible packing density in a larger load carrier. They are designed so that the upper contour provides a precise fit for the component, while the lower contour acts as a cover for the component below. This means that no unnecessary space is wasted when stacking. The weight is distributed across the components.

Advantages

- Suitable for large load carriers, stake racks, pallets
- High packaging unit stability
- Easy handling
- Easier workpiece identification
- Automated handling possible

Application examples



Interlayers in large load carriers

When placed in MegaPack large load carriers, interlayers allow components to be stored securely in multiple layers.

Interlayers in stake racks

When used with a stake rack, interlayers can support heavy components, with the load borne by the stake.

Interlayers on pallets

Interlayers can be used to stack complete assemblies on pallets. The interlayers prevent the parts from being scratched.

Blister packaging

Thermoforming processes

Film

Single/Sheet

Twin//Sheet

Formats

from 220 x 120 mm to 695 x 500 mm

Component position

Recessed

For short-term use

Blisters are thermoformed packaging made from thin film material that is suitable for short-term multiple use. The material thickness is no more than 2.5 mm. Blisters are available in the form of workpiece carriers, containers, and inserts, as well as transparent hinged and display packaging.

Advantages

+ Low weight
+ Stackable and rotary stackable
+ Cost-efficient solution
+ 100% recyclable
+ Suitable for automated handling

Application examples

Conductive blister

Workpiece carrier made of conductive PS. Workpiece: Plug connector.

Transparent blister

Thin-walled workpiece carrier made of transparent PET.

Folding blister

Packaging with hinge and clamping fastener for easy opening and resealing.

Material

Thermoplastics suitable for thermoforming

We use various thermoplastics to manufacture thermoformed load carriers. The thermoplastic used depends on the respective component and process requirements as well as the thermoforming process. Additives can be used to meet specific requirements for mechanical strength, UV stability, or electrical conductivity.

ABS (acrylonitrile butadiene styrene)

+ Very high accuracy
+ Very high rigidity
+ Low tolerances

ABS-TPU (ABS with TPU coating)

+ Very high abrasion resistance
+ High accuracy
+ Anti-slip effect

PE-HD (high-density polyethylene)

+ Very high impact resistance
+ Very good chemical resistance
+ Good UV resistance

PC (polycarbonate)

+ High temperature resistance
+ Very high accuracy
+ Transparent

PS (polystyrene)

+ Very high accuracy
+ High rigidity
+ Also available in transparent

PS-PE blend (HIPS)

+ High impact resistance
+ High accuracy
+ Good chemical resistance

PET (polyethylene terephthalate)

+ Transparent
+ High impact resistance
+ Good chemical resistance

Virgin / regenerated material

Thermoplastics are available as virgin or regenerated material, as well as blends of regenerated and virgin material. Regenerated material is typically anthracite to black, while virgin material can be supplied in nearly any color upon request.

Coextrusion

We use two multi-layer plastics: **ABS-TPU** and **PE-TPE**. The top layers (TPU, TPE) can be on one or both sides. They are characterized by very high abrasion resistance, good chemical resistance, anti-slip effect, and soft-touch surface.

Bioplastics

made from 100% renewable raw materials

Ocean plastic

from old fishing nets

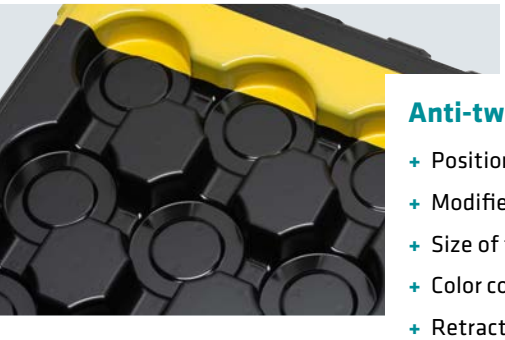
ESD plastics

electrostatically conductive or dissipative

Load carrier systems
and equipment features

For optimum production and storage processes

The design of load carriers and the development of load carrier systems are both key stages in ensuring the safe, efficient, and space-saving transport, storage, and handling of workpieces and components. We are at your side from the start of the project, working with you to define the features and options for your load carrier.



Anti-twist protection

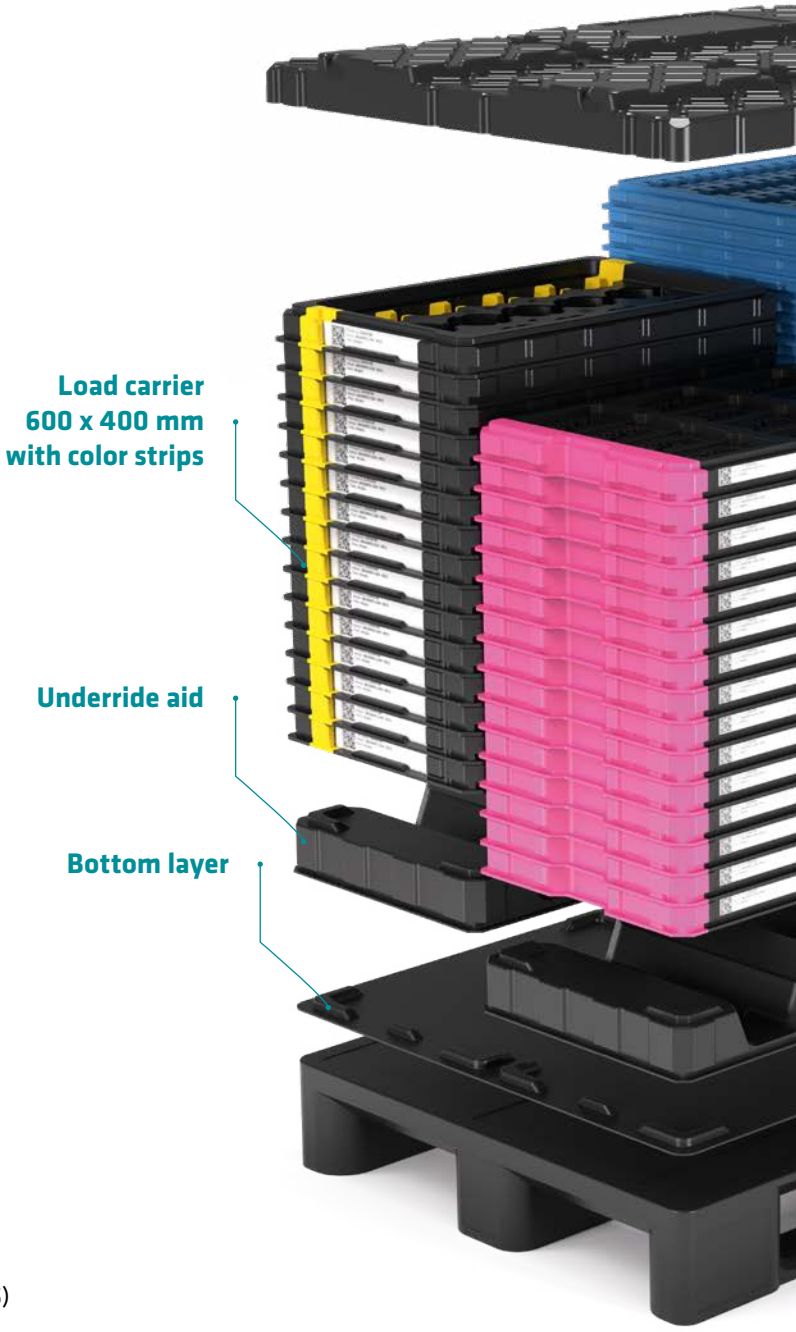
+ Positioning cam
+ Modified corners (radius, chamfer)
+ Size of the handle recess
+ Color coding
+ Retracted characters

Centering

+ External geometry
+ Centering cone
+ Prisms
+ Handle recess size

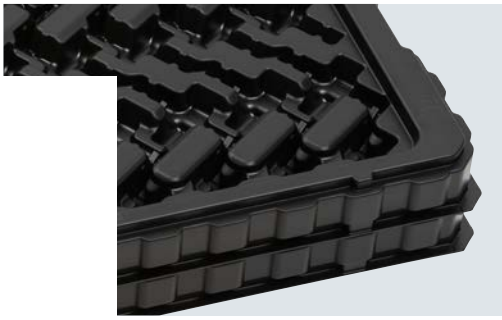
Labeling

+ Embossing (engraving)
+ Adhesive labels
+ Document pockets
+ Barcodes and data matrix codes (e.g. QR codes)
+ Transponders (RFID, Bluetooth, GPS)



Stacking

+ Self-stacking
+ Supportive
+ Over components



Ergonomics

+ Finger recesses (component)
+ Recessed handles
+ Cutout handles

Handling

+ Manual
+ Automated

Color strips available in the following standard colors:

RAL 1016	RAL 3015	RAL 5010	RAL 6029
RAL 1018	RAL 3020	RAL 5012	RAL 7000
RAL 1023	RAL 4003	RAL 5015	RAL 7035
RAL 2009	RAL 4005	RAL 6018	RAL 8001
RAL 2011	RAL 4010	RAL 6027	RAL 9003

Other colors on request.

Wide range of applications

Cleaning of load carriers

The requirements for the cleanliness of workpieces are constantly increasing, especially with regard to residual dirt and contamination (“technical cleanliness”). A load carrier must be clean to prevent harmful particles from transferring to components and to avoid recontamination.

We therefore design our load carriers for easy cleaning and advise you on how to configure effective cleaning procedures.

The following cleaning methods can generally be used:

+ Blowing with ionized air
+ Washing
+ Dry ice blasting

Washing temperature max.

Drying temperature max.

All cleaning process parameters should be carefully selected and tested in advance, as thermoplastics can deform at excessively high temperatures.

Washing/drying time must be kept as short as possible.

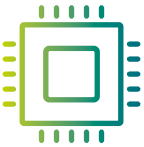
Industries

For more than 50 years, customers have placed their trust in our thermoformed load carriers. Whether in the automotive or electronics industry, in mechanical engineering or medical technology, our solutions protect workpieces, simplify handling, automate processes, and increase productivity wherever they are used.

Automation

Automotive

Chemical and pharmaceutical industry



Electronics industry

Aerospace

Mechanical engineering

Medical technology

Solar technology

Application examples

Packaging unit 800 x 600 x 984 mm with pallet, bottom layer, containers and end cover for shipping differentials.

Load carrier with steel pallet and plastic lid for transporting cooling plates for battery cases (2244 x 1324 x 1468 mm).

Packaging unit consisting of pallet, containers and lid for panoramic glass roofs (1466 x 1231 x 1473 mm).

Load carrier in stake rack 1220 x 820 x 1000 mm for rotor and stator lamination stacks.

Shelf dividers with workpiece carriers for handling cell contact systems (1230 x 830 x 1210 mm).

Container in 600 x 400 mm format for HDP trays and lids. Use in an automated assembly facility.

Automate now

With thermoformed load carriers from the specialists

Do you have any questions about our workpiece carriers, containers, inserts, interlayers, and blister packaging? Then do not hesitate to contact us.

Our experts will be happy to advise you and to develop a solution that is precisely tailored to your workpiece and your processes. Customized and with real added value for your company.

www.soehner.de

Everything about our company, our products and services.

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