# Fine Art Logistics

Packing catalogue

hasenkamp**group**

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# The hasenkamp group

The hasenkamp group is the international Market-Leader in Art & Heritage Logistics. Our worldwide Brands and Members are over 1000 employees strong, all of whom adhere to the hasenkamp group ethos; Highest-Quality, Security, and Discretion.

Now in its fifth generation, the founding family still remain steeped in tradition and the driving force after over 100-years of service.

Mr. Hans Ewald Schneider &
Dr. Thomas Schneider head the prestigious Art & Heritage Logistics at the forefront of the industry.

# The art of packing

Besides discretion, the overriding principle in art logistics is the conscientious and sensitive handling of cultural assets and the preservation of their originality. Because: art cannot be replaced. In order to protect the sensitive artworks in the best possible way, they are, as the saying goes, „only touched with white gloves“. A transport is always planned and carried out, considering the individual object and location conditions. Here, the following rule applies: artwork - path - packing.

As an art logistics company, hasenkamp meets the diverse and exciting tasks with a team of highly qualified employees. In cooperation with owners, registrars, conservators and other specialists, object-specific solutions are developed to transport the works safely and efficiently to their destination.

A wide variety of packing concepts are available for the handling of art, whereby the starting point is always the work itself, as well as the customer‘s wishes. The packing portfolio ranges from simple soft-packing to shock-absorbing and fireresistant climate crates. All crate types are in-house developments, manufactured in our own carpentry. This packing catalogue provides an overview of different materials. The packing material, for example, is the first layer to come into direct contact with the object. In the following, various options for the interior fittings of the crates are discussed, as this sometimes makes the artwork transportable for the first time. This catalogue will illustrate object fixations and paddings, the different types
of crates with their characteristics and advantages. This is followed by information on the hasenkamp rolls systems, which are often used at museum exhibitions, warehouse relocations and art fairs.

At hasenkamp we
handle and pack
with great sensitivity

# The hasenkamp packages

## Softpacking / cardboard softpacking

In principle, the so-called softpacking can be distinguished from a crate, that does not require any further definition. Practice shows, that its definition is far less known.

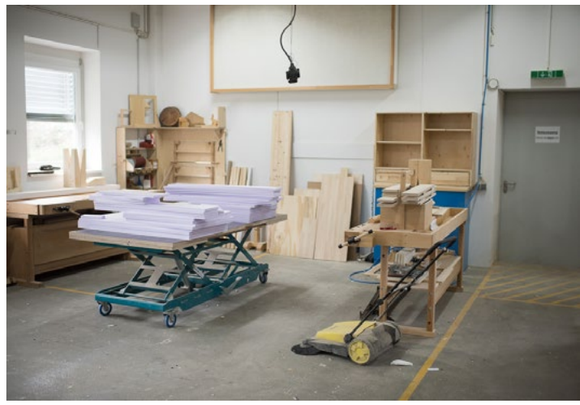
### Softpacking

The softpacking is the packing of a piece of art in soft, flexible materials. These are available to the art packer during the packing process on site. Usually, the packing structure is multi-layered. A suitable fleece or paper is selected as the first packing layer for direct contact with the object. In this way, even sen- sitive surfaces can be reliably protected. Examples are Tyvek or acid-free tissue paper. A tear-resistant film, usually a thick three-layer bubble foil is used as the second packing layer to protect against external influences such as physical impacts and climate fluctuations. In addition, the edges of two-dimensional artwork such as graphics, paintings, etc. can be protected by a so-called edge protection. These materials are fixed with adhesive tape. A soft pack is less resistant to mechanical forces than a case due to the packing materials used and their properties, but represents a favourable packing concept for robust objects of art.


### Cardboard softpacking

If the resistance of an object in softpacking against mechanical forces needs to be increased, the packing can be additionally reinforced with cardboard. This results in the so-called cardboard softpacking - a precursor to the hasenkamp „cardboard-standard" box construction method.

Softpacking and cardboard softpacking inexpensive and simple



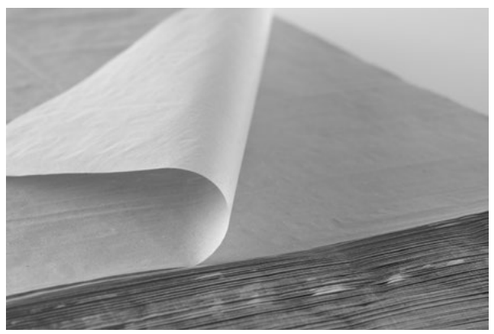
# The hasenkamp packing material

## Paper

### Packing silk

hasenkamp packing silk is a standard packing material, characterized by a high grip and heavy quality (grammage 28-30 g/m.). Due to the thickness of the paper, the packing silk is often and steadily used for simple wrapping primarily for three.dimensional artwork. Thanks to its co mpression, the packing silk is also well suited for filling cavities between the object and the crate -avery simple and efficient way of cushioning the object. The light grey silk is made of 100% pure recycled paper. The available sheet size is 75 x 100 cm as a loose-leaf collection, whereby one packing unit consists of approx. 240 sheets. If the packing silk needs to be glued, it is recommended to use the hasenkamp paper tape.

The hasenkamp packing silk in one unit – a so-called book.



Close-up of the hasenkamp packing silk.

| Packing silk | |
|---|---|
| **Physical properties** | • grammage 28-30 g/m$^2$<br>• dust-tight<br>• roughened on one side |
| **Other properties** | • easy to cut and tear<br>• gluable<br>• single sheet 75 x 100 cm (PU 240 pcs.)<br>• 100% recyclable |
| **Recommendation** | • temporary use in transport (no age-resistance)<br>• object-specific testing before use<br>• In case of object contact, an intermediate layer of inert material may be used |

Packing silk for efficient paper packing

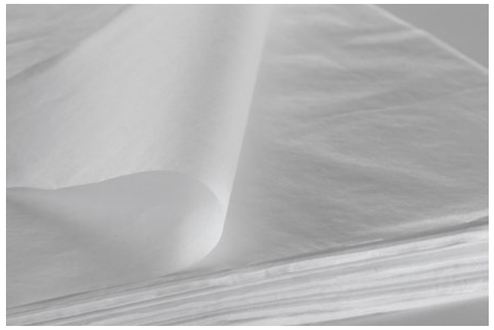
### Acid-free tissue paper

hasenkamp has a white, particularly soft and smooth quality in its range of tissue paper (grammage approx. 18g/m$^2$). In a simple softpacking, the acid-free tissue paper is used as the first packing layer for regular wrapping and wrapping of smaller objects. Furthermore, cavities in the outer packing can easily be filled with compressed tissue paper, to produce a slight cushioning effect. In case of stacked, unfraimed artworks, it is used as an intermediate layer. Another application is the simple, object-specific fixation for transport. For example, folded tissue paper tapes are ideal for securing objects securely in a folder for transport via corner fixation. In the warehouse,

Packing unit of acid-free bissue paper.

Because of its versatile use, acid-free tissue paper should always be on hand for packing and in the warehouse.

The tissue paper is often used as practical dust protection. If the objects are not packed in a box, they can simply be covered with acid-free tissue paper. The tissue paper has a sheet size of 50 x 75 cm – available as a packing unit of 500 sheets. Double-sized sheets in 100 x 75 cm are also available on special order.



Close-up of acid-free tissue paper.

| Acid-free tissue paper | |
|---|---|
| **Physical properties** | • grammage approx. 18/mÇ<br>• dust-tight<br>• smooth and soft (automatic smoothing) |
| **Chemical properties** | • pH-value: 6-8<br>• inert<br>• resistant to ageing, chemically stable |
| **Other properties** | • easy to cut and tear<br>• gluable<br>• single sheet 50 x 75 cm (PU 500 pcs.)<br>• 100 % recyclable |
| **Recommendation** | • for packing and long-term storage (resistant to ageing)<br>• object-specific testing before use |



## Fleece

## Tyvek

Tyvek 1623 E packing material is the standard for packing artwork – both for transport and for storage. Due to ist numerous positive properties the high-density polyethylene fleece (HD-PE) has been used for years in the entire art industry.

| Tyvek 1623 E | |
|---|---|
| **Physical properties** | • breathable<br>• dust-tight<br>• waterproof<br>• very light<br>• soft, flexible and foldable<br>• tearproof, puncture-proof<br>• abrasion-resistant and lint-free<br>• UV and heat resistant (up to 80 °C) |
| **Chemical properties** | • pH-neutral<br>• resistant to ageing, chemically stable<br>• resistant to chemicals<br>• ODDY test passed |
| **Other properties** | • sewable and to be glued, to be welded<br>• goods on rolls 152/304 cm x 50 running meter<br>• reusable<br>• 100 % recyclable |
| **Recommendation** | • suitable for packing and long-term storage (resistant to object-specific testing before use to ageing) |

Tyvek is a spunlaid fleece and consists of randomly superimposed, compressed fibres. With a surface weight of 41.5 g/m$^2$ and a thickness of 145 µm, it is a particularly light and hardwearing packing material.

Due to the needled micropores of 1623 E, this breathable but dust-proof fleece reduces the sisk of condensation and mould development. The application possibilities are many and varied. Due to its smooth surface structure, Tyvek is suitable for direct contact with artworks and is usually used as the first packing layer for (surface protection). It can be closed with conventional adhesive tape. Tyvek can also be sewn, stitched, welded or glued to produce protective covers for three-dimensional artworks (so-called slipcovers). It is a sensible alternative to tissue paper and is also waterproof. Tyvek is an excellent separating layer and is often used as an intermediate layer in rolled artworks. It can be handled in long rolls (152 or 304 cm (W) at 50 running metres). Furthermore, small Tyvek tapes can be used in the warehouse or depot for three-dimensional artworks, to avoid the complicated application of object stickers – identification are simply noted on the Tyvek tape.

A Tyvek tape with inventory number.

Tyvek – a standard as the first packing layer. It is dust-repellent, breathable and has a soft, supple surface.

Tyvek on the roll. Tyvek is a standard material for packing artworks. It is often used as the first packing layer.

Close-up of the hasenkamp packing silk.



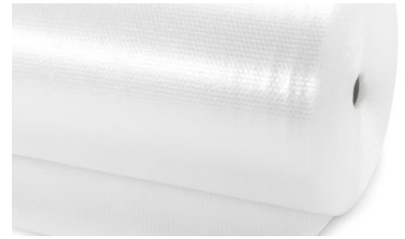
## Foil

### Bubble foil

Bubble foil is a standard packing material and is used for simple softpacking.The film is made of polyethylene (PE).
For the best possible protection, hasenkamp o ffers a p articularly strong, three-layered bubble foil. Depending on the roll size, the material thickness is up to 115µ. The following variants are available at hasenkamp:

- roll width 150 cm x 100 running meter
- roll width 200 cm x 100 running meter
- roll width 240 cm x 100 running meter

Usually as a second packing layer, bubble foil in combination with a suitable fleece or paper material completely wraps the artwork. Bubble foil basically serves the purpose of a lightly padding protective layer. If it is closed with adhesive tape, the object is additionally protected against dust and light water splashing. The foil is easy to use; it can be cut, using a cutter or scissors.



Bubble foil on the roll.

Bubble foil – often used as a second packing layer. An affordable way to protect artworks against light shocks, dust and splash water.

Close-up of bubble structure.

| Bubble foil | |
|---|---|
| **Physical properties** | • dust-tight<br>• water-resistant /-repellent<br>• lint-free |
| **Chemical properties** | • chemically neutral<br>• oil and acid resistant |
| **Other properties** | • three-layered<br>• gluable (adhesive tape)<br>• rolled goods<br>• 100 % recyclable |
| **Recommendation** | • temporary use in transport (not ageing stable)<br>• object-specific testing before use<br>• on object contact, intermediate layer of inert material if necessary |

## Laminated bubble foil

In addition to the conventional bubble foil, the hasenkamp material range includes a stable, fleece-laminated version. It offers an additional cushioning effect for simple softpacking. The film consists of polyethylene (PE) and a white fibre fleece made of polypropylene (PP). The particularly strong and three-layered film has a material thickness of 100 µ. The quality of the soft fleece layer facing the object is 35 g/m². The lamination makes the film soft and at the same time very robust against puncturing. Meanwhile, it is less supple than conventional bubble foil, which can be a great advantage, when packing flat objects. An example is the packing of historical furniture – e.g. an Art Deco chest of drawers. The fleece layer is slightly fluffy and not as smooth as Tyvek.

Laminated bubble foil offers good protection against punctures and is particularly suitable for packing large objects.


Laminated bubble foil on the roll.


Close-up of the air cushion with a white fleece layer, laminated on one side.

Taking into account object-specific criteria, it should therefore be considered, whether the fleece-laminated bubble foil or Tyvek should be used, followed by a non layered bubble foil.
The laminated bubble foil roll, can be cut with a cutter or scissors (150 cm (W) at 100 running metres).
Adhesive tape can be used to securely close the foil.

| Laminated bubble foil | |
|---|---|
| **Physical properties** | • dust-tight<br>• water-resistant /-repellent<br>• tear strength: 45 N/mm² (fleece)<br>• elongation at break: 55 N/mm² (fleece) |
| **Chemical properties** | • chemically neutral<br>• oil and acid-resistant |
| **Other properties** | • four-layered<br>• fibre fleece produced in a thermobonding process<br>• gluable (adhesive tape)<br>• rolled goods<br>• reusable<br>• 100 % recyclable |
| **Recommendation** | • temporary use in transport (no age resistance)<br>• object-specific testing before use<br>• on object contact, intermediate layer of inert material if necessary |

## PE foil

The PE film is in universal use at hasenkamp. Consisting of polyethylene (PE), it is a premium product and, thanks to its material thickness of 100 µ, particularly strong and tearresistant. The PE film is used, for example, in incompletely closed packing solutions, such as transport frames or beamframe packing, to protect the objects against dust and weather influences. It is also suitable for creating temporary "containment", crate covers etc. at the customer's site. The PE film is available on rolls in the following variants:

- 300 cm width (folded to 50 cm wide roll) x 100 running meter
- 400 cm width (folded to 50 cm wide roll) x 50 running meter

The folded rolls can easily be cut to size, using a cutter or scissors. The PE film can be fixed with adhesive tape.

PE film – robust and versatile in use.

Close-up of the PE film.

The PE film on the roll.

| PE film | |
|---|---|
| **Physical properties** | • dust-tight<br>• water-resistant and water-repellent<br>• temperature resistance approx. -40 to +80 °C<br>• (melting point: approx. 110 °C)<br>• density: approx. 0.92 g/cmÑ |
| **Chemical properties** | • oil and acid-resistant<br>• with UV stabilizer |
| **Other properties** | • gluable (adhesive tape)<br>• roll goods (folding)<br>• reusable<br>• 100 % recyclable |
| **Recommendation** | • temporary use in transport (no age resistance)<br>• object-specific testing before use<br>• on object contact, intermediate layer of inert material if necessary |

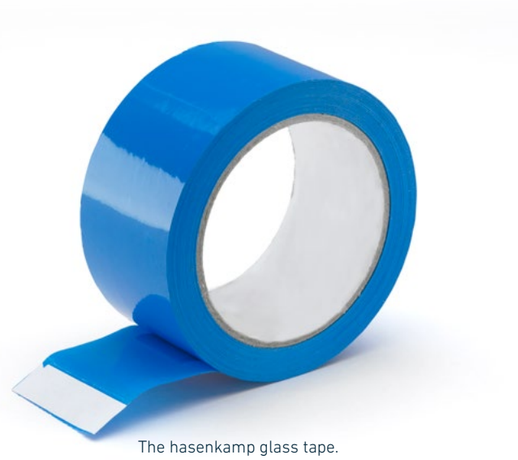


## Adhesive tape

### Adhesive tape for glassware

Glass breakage is possible, when glazed objects such as framed graphics, drawings and paintings are transported. In order to prevent damage to the underlying object surface during glass breakage, the full-surface masking of the glass has established itself in practice as a highly effective damage reduction. Any glass splinters are held together by the adhesive tape. After transport, the adhesive tape can be removed from the glazing without leaving any residue. The latter also applies to many common, high-quality, anti-reflective museum glasses. The hasenkamp adhesive tape for glassware consists of a rigid PVC film as carrier material and natural rubber as adhesive. It is available in rolls with a width of 50 mm and a running length of 60 metres – cutting to size is easily possible.

Glazed objects need special protection during transport.



The hasenkamp glass tape.

| Adhesive tape for glassware | |
|---|---|
| **Physical properties** | • self-adhesive, natural rubber adhesive<br>• purpose-related, reduced adhesive force 4.5 N/25mm<br>• tensile strength 125 N/25mm<br>• elongation at break 70 %<br>• rigid PVC film as carrier material<br>• film thickness 35 µ (total thickness incl. adhesive layer 60 µ)<br>• temperature-resistant up to +60 °C<br>• only partially UV-resistant (smearing of the adhesive) |
| **Chemical properties** | • chemically unstable |
| **Other properties** | • temporary storage (dark, dry, at room temperature: 12 months)<br>• rolled goods |
| **Recommendation** | • temporary transport application (easily removable without residue within 14 days, not resistant to ageing)<br>• glass-specific testing before use<br>• no object contact |

## Standard adhesive tape

The hasenkamp standard adhesive tape is particularly tearresistant. At the same time, it is characterized by its ductility and high adhesive strength. The application possibilities are versatile, e.g. the fixing of packing materials, such as the bonding of foils, cardboard, but also of covering materials.
The standard adhesive tape consists of white PVC film with a black and yellow hasenkamp logo imprint. The adhesive is based on natural rubber. The standard adhesive tape is available in rolls with a width of 50 mm and a running length of 60 metres – cutting to size is easily possible. The permanent adhesive force can be extended by increased contact pressure and flat adhesive surfaces.

The hasenkamp standard adhesive tape.

The hasenkamp standard adhesive tape for strong hold.

| Standard adhesive tape | |
|---|---|
| **Physical properties** | • self-adhesive, natural rubber adhesive<br>• purpose-related high adhesive strength 2.0 N/cm<br>• tensile strength 40 N/cm<br>• elongation at break 70 %<br>• rigid PVC film as carrier material<br>• film thickness 33 µ (total thickness incl. adhesive layer 55 µ)<br>• temperature-resistant approx. -20 °C to +70 °C (short-term)<br>• only partially UV-resistant (embrittlement of the adhesive causes loss of adhesion) |
| **Chemical properties** | • chemically conditionally resistant<br>• resistant to diluted acids and alkalis |
| **Other properties** | • temporary storage (dark, dry, at room temperature: 12 months)<br>• rolled goods |
| **Recommendation** | • temporary transport application (not resistant to ageing)<br>• packing-specific testing before use<br>• no object contact |





## Paper adhesive tape

The hasenkamp paper adhesive tape is particularly environmentally and userfriendly. Our customers love this product and use it quite frequently. It can be easily torn by hand, which considerably simplifies the packing processes. At the same time, it is characterised by a high adhesive strength, so that cardboard, fleece and film materials can be securely fixed. It can be easily recycled together with cardboard packing. The carrier material is a brown, impregnated, acid-free, semicrepe paper with a black hasenkamp logo imprint. The adhesive is a natural rubber. The paper adhesive tape is available in rolls with a width of 50 mm and a running length of 60 metres. The permanent adhesive force can be extended with increased contact pressure and flat adhesive surfaces.

The environmentally friendly adhesive tape in the hasenkamp product range.

The hasenkamp paper tape.

| Paper adhesive tape | |
|---|---|
| **Physical properties** | • self-adhesive, natural rubber adhesive<br>• high adhesive strength 2.5 N/cm<br>• tensile strength 35 N/cm<br>• elongation at break 70 %<br>• impregnated, acid-free, semi-crepe paper as carrier material<br>• total thickness including adhesive layer 135 µ<br>• particularly heat and cold resistant<br>• only partially UV-resistant (embrittlement of the adhesive causes loss of adhesion) |
| **Chemical properties** | • chemically unstable |
| **Other properties** | • temporary storage (dark, dry, at room temperature: 12 months)<br>• rolled goods |
| **Recommendation** | • temporary transport application (not resistant to ageing)<br>• packing-specific testing before use<br>• no object contact |

# The hasenkamp sheets

## Cardboard sheet

Cardboard sheets belong to the standard materials in the hasenkamp portfolio. They are always used, when packing needs to be convenient and fast. They are very light and therefore provide low dimensional stability or strength against mechanical forces – at least in comparison with other materials.[1] Cardboard sheets consist of recycled paper, further processed into a single-wall corrugated board sheet[2] with smooth paper lamination on both sides. The size of one panel is 136 x 200 cm, with a thickness of 0.4 cm. Due to their easy processability, cardboard sheets are very well suited to be processed by the hasenkamp art packer at the customer's site to a precisely fitting cardboard softpacking. They are also used as an intermediate layer for the simple packing of several, protectivepacked paintings in a hasenkamp rolls system, such as an Artcase or an Artcontainer.

Cardboard sheets – convenient and quick to process! The basis of softcardboard packing.

The cardboard sheet can be processed, for example into cardboard softpackings.

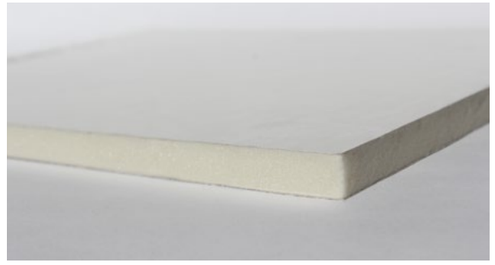
[1] Cardboard sheets have a basis weight of approx. 384 g/m2 and a puncture resistance of 2.6 J. Puncture resistance describes the resistance of corrugated board to the mechanical action of a sharp-edged object. The puncture force is specified in joules (J).

[2] Inside the corrugated sheet is a paper web, formed into a C-flute, enabling good suspension properties.



## Kapa plate

Light foam boards are mainly used at hasenkamp – as a rule, they are further processed into so-called multi-picture packing. An alternative use for example is as an intermediate layer in the hasenkamp rolls systems to separate paintings or framed graphics from each other. The light-weight foam boards have a core of polyurethane foam, coated with firm layers of smooth paper on both sides. The panels are used in thicknesses of 0.5 and 1 cm, depending on requirements. Their panel size is 153 x 305 cm. Light foam boards are light-weight, relatively torsionally stiff and they have a certain resistance to mechanical forces.[3] In addition, they can be sawn, cut and further processed in any shape – as well as glued.



Close-up of a Kapa plate.

Light foam boards: Convenient, light and durable at the same time.

Reinforced corrugated cardboard: The basis for convenient, strong crates and transport frames within the „Cardboards standard“

The illustrated, reinforced, corrugated cardboard is used as material for the hasenkamp „cardboard standard“ crate series – cardboard transport frames, cardboard crates, etc.

## Reinforced corrugated cardboard

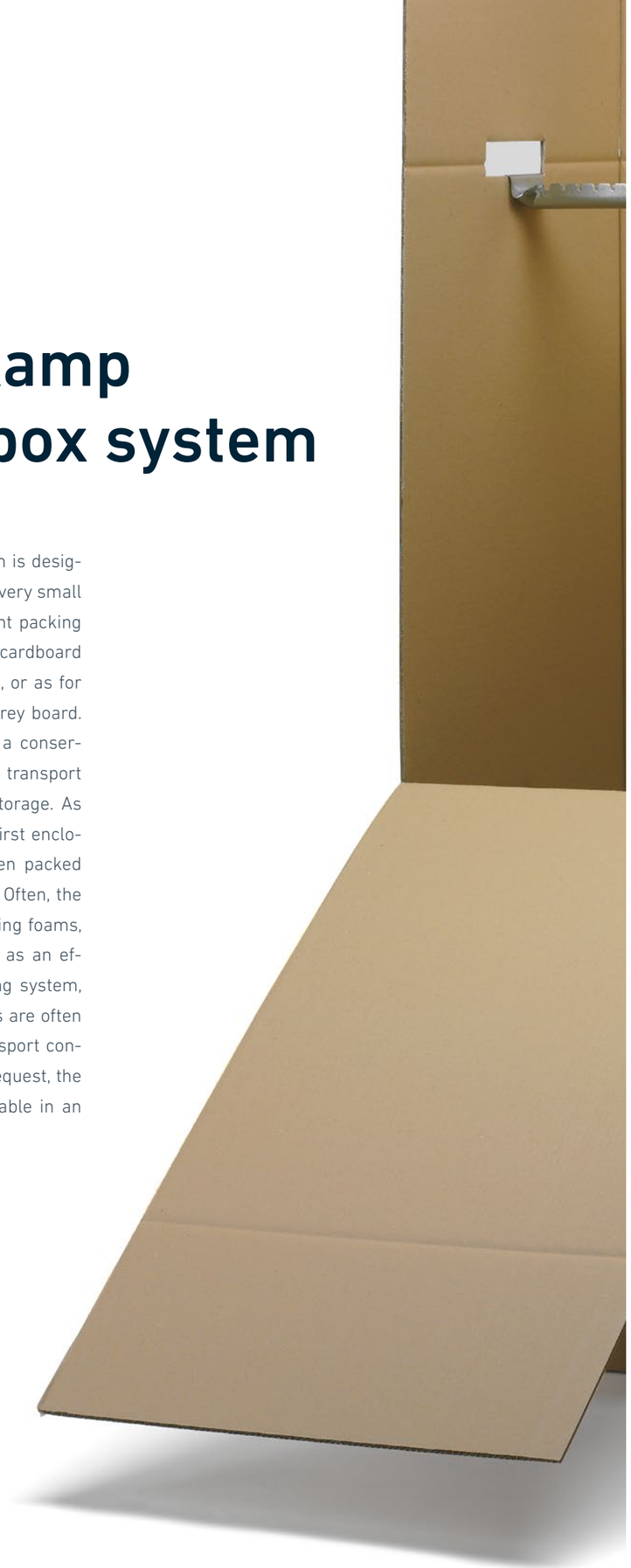
All hasenkamp cardboard boxes and cardboard transport frames in the series: "cardboard standard" are made of reinforced cardboard. Reinforced corrugated cardboard has a typical, multi-layered shape. A triple-shaft layer4 on the inside and a so-called kraft liner on both sides serve as a final, smooth outer layer. This makes the cardboard torsion resistant, stable and robust against mechanical forces. Accordingly, it has a high puncture resistance of 36.8 J. The board is cut to size in our own carpentry exclusively with professional saws or a milling machine, if it is to be mitred and further processed into crates. Cardboard box sheets consist of a fibre mixture of 15 % recycled paper and 85 % fresh fibres. At hasenkamp, they are available with a maximum cardboard size of 207 x 500 cm and a thickness of 1.5 cm.

[3] The compressive strength is approx. 0.16 N/mm2 for slabs 0.5 cm thick and approx. 0.37 N/mm2 for slabs 1 cm thick.

[4] The inner structure of a corrugated board consists of a triple A-flute, which is characterised by an excellent spring characteristic. Glued paper separating layers run between the corrugations. All in all, a seven-layer structure is created, which allows very high strengths to be achieved.

# The hasenkamp cardboard box system

The flexible hasenkamp cardboard system is designed for three-dimensional artworks, from very small to medium size. It is one of the convenient packing concepts in the hasenkamp portfolio. The cardboard boxes consist of sturdy, corrugated board, or as for the smaller special cardboard boxes, of grey board. They are made of recycled fibres. From a conservation point of view, it is therefore a pure transport system, rather than one for long-term storage. As a general rule, the objects are therefore first enclosed with inert packing materials and then packed in the hasenkamp cardboard box system. Often, the cardboard boxes are also filled with padding foams, which in turn are ODDY-tested. Designed as an efficient and particularly convenient packing system, the hasenkamp standard cardboard boxes are often used for warehouse moves or in the transport context of art fairs. Of course, upon special request, the cardboard boxes can also be made available in an acid-free version in archival quality.





## The hasenkamp standard cardboard boxes

The hasenkamp standard cardboard boxes are high-quality cardboard boxes in common dimensions and designs. Adapted to certain transport objects, the portfolio includes the following cardboard box options.

hasenkamp standard cardboard boxes are high-quality, strong and adapted to transported goods.

**The hasenkamp standard boxes:**

| | Inside dimensions (cm) | | |
|---|---|---|---|
| **Designation** | **Height** | **Width** | **Depth** |
| **Relocation** | 33 | 60 | 35 |
| **Book** | 33 | 50 | 35 |
| **Barrel** | 74 | 48 | 47 |
| **Clothes, high (with rail)** | 1333 | 60 | 51 |
| **Clothes, flat – suit jacket** | 23 | 76 | 50 |


The hasenkamp relocation box.


The hasenkamp book box.


The hasenkamp barrel box.

The hasenkamp clothing box, flat, adapted in size to folded suit jackets.

The hasenkamp clothes box, high, with optional metal clothes rail.

## hasenkamp system cardboard boxes

hasenkamp system cardboard boxes are customized in shape and size. According to the “matryoshka doll principle”, smaller cardboard boxes fit into the next larger, outer cardboard box. In the case of multi-part artworks or collections, these can first be safely packed individually and then together in a larger, outer cardboard box. This is how collections can be held together and even the transport of complex exhibitions with many small parts can be well organised. The hasenkamp system cardboard boxes can optionally be ordered with complete fillings of different upholstery materials. Precise fitting incisions allow even smaller, filigree and/or fragile objects to be well protected.

Our modular cardboard box system for the secure packing of very small and medium-sized, three-dimensional artworks.

**The hasenkamp system cardboard boxes:**

| | inside dimensions (mm) | | |
|---|---|---|---|
| **Designation** | **Height** | **Width** | **Depth** |
| **1 System cardboard box** | 45 | 73 | 37 |
| **½ System cardboard boxes (flat)** | 20 | 70 | 35 |
| **½ System cardboard boxes (high)** | 43 | 35 | 35 |
| **¼ System cardboard boxes** | 20 | 35 | 35 |
| **1/16 System cardboard boxes (acid-free)** | 9 | 32 | 14 |
| **1/32 System cardboard boxes (acid-free)** | 9 | 14 | 14 |
| **1/64 System cardboard boxes (acid-free)** | 4 | 14 | 14 |




Two ½ system cardboard boxes fit into the next larger version.


Four system cardboard boxes of the illustrated ¼ box fit into the next larger version.

Opened 1/64 cardboard box wirh inner foam filling.


Overview of hasenkamp system boxes.
Smaller boxes fit into the next larger version.

A diasec, protected by several layers: Tyvek, bubble foil and edge protection with inner hole reinforcement (black).

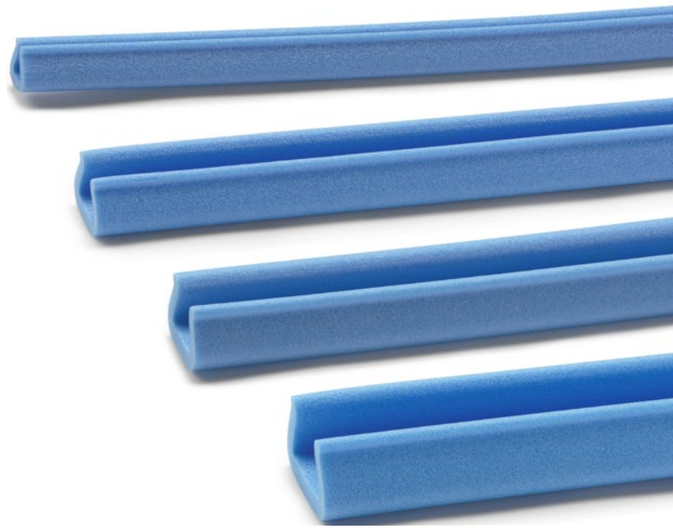
# The hasenkamp Padding System

## Edge protection

Edge protection is always used as part of a softpacking, if the object packing is to be particularly economical but at the same time additional impact protection is required at the edges. It is designed for framed objects. Available in different widths, the edge protection is placed precisely around the sides of the frame. In the area of the frame corners, it is bent to 90° by mitre cuts. Due to the high lip tension and the dimensional stability, the edge protection clamps to the frame. This provides good protection against edge crushing. Since the object, as part of the softpacking, was usually packed in Tyvek and bubble wrap beforehand, the cushioning edge protection can also be fixed with adhesive tape. Edge protection consists of a closed-cell, extruded polyethylene foam.

Best possible edge protection at the lowest possible price.

The use of an edge protection is essential for diasecs – the photographs mounted behind acrylic glass. They are often frameless. At the same time, their surfaces and edges are considered highly sensitive. Their high base weight, combined with a narrow front edge, results in a very high edge load. For this reason, special edge protectors, reinforced with an inner hole are used for these objects. The reinforcement ensures an even distribution of the edge load, so that the foam retains its cushioning, elastic property and the object can be protected in the best possible way.



A selection of edge protection profiles of different widths, to optimally protect the end faces of frames with varied depths.

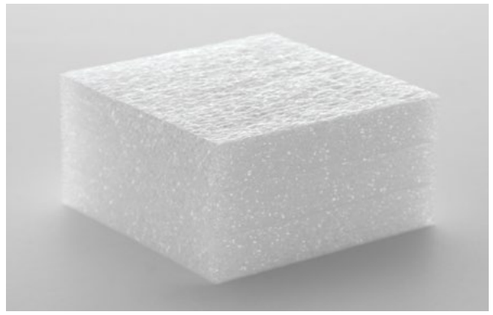
| Edge protection | |
|---|---|
| **Physical properties** | • dampening<br>• ensity approx. 25-65 kg/mN̆<br>• flexible and dimensionally stable<br>• supple<br>• waterproof<br>• light-weight<br>• abrasion-resistant and abrasion-proof<br>• weather-proof<br>• UV and heat-resistant (up to 100 °C) |
| **Chemical properties** | • chemically stable<br>• high chemical resistance |
| **Other properties** | • easy to cut<br>• bar stock / rolled goods<br>• reusable<br>• 100 % recyclable |
| **Recommendation** | • temporary use in transport (not resistant to ageing)<br>• object-specific testing before use<br>• on object contact, intermediate layer of inert material if necessary |

## Foams

### haska FP17.01

The foam haska FP17.01 is used by hasenkamp's as standard for object padding. It is used as a circumferential object cushion for multi-picture packing, for the full-surface interior padding of crates and for the complete filling of crates and cardboard boxes, as well as for the precisely fitting padding incision. haska FP17.01 is a closed-cell, extruded polyethylene foam. Due to the manufacturing process, it is constructed in several layers to ensure constant damping properties. The foam is available in plate size of 200 x 120 cm (l x w) and in a thickness of 2, 5 and 10 cm, whereby it is usually cut to size for the specific application. In the standard version it is glued, but thermal welding is also possible.

The foam haska FP17.01 cut to plate dimensions.



The foam haska FP17.01.

The hasenkamp standard padding material.

| haska FP17.01 | |
|---|---|
| **Physical properties** | • closed-cell<br>• extruded<br>• compression hardness (at 25 % compression) 39 kPa<br>• density approx. 22 kg/mN<br>• abrasion-resistant and abrasion-proof<br>• weather-proof<br>• UV and heat resistant (up to 100 °C) |
| **Chemical properties** | • resistant to ageing, chemically stable (inert)<br>• high chemical resistance<br>• ODDY test passed |
| **Other properties** | • easy to cut<br>• glueable, thermally weldable<br>• sheet goods<br>• reusable<br>• 100 % recyclable |
| **Recommendation** | • suitable for long-term storage (resistant to ageing)<br>• object-specific testing before use |

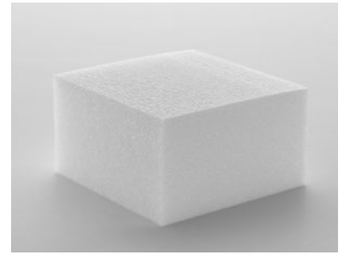


The padding base primarily made for heavy objects.

The foam haska EF220/ EF400 as a plate.

### haska EF220 / haska EF400

Due to their comparatively high compression hardness, haska EF220 and haska EF400 foams are mainly used as cushioning underlays for objects that tend to be heavy. Examples include the padding of archaeological stone works and outside steel sculptures. There are many possible applications. hasenkamp has two variants of compression hardness in its standard portfolio. For extremely heavy sculptures, in the weight range from several hundred kilos, configurations with even greater compression hardness are available upon special request. The mentioned materials are closed-cell, extruded polyethylene foams. Their maximum plate size is 275 x 60 cm (l x w) with an optional thickness of 2, 3, 5 or even 10 cm (d) upon special request. But here, too, the cutting is usually application-specific. haska EF220 and haska EF400 can be easily cut, sawed and glued.



The foam haska ef220/ef400.

The foam haska ef220/ef400 cut to plate dimensions.

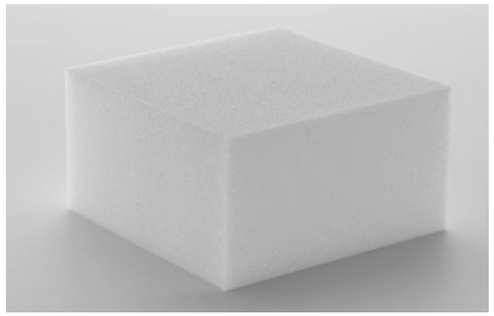
| haska EF220 | haska EF400 |
|---|---|
| **Physical properties** | • closed-cell<br>• extruded<br>• compression hardness (at 25 % compression)<br>• 100 kPa<br>• density approx. 35 kg/m³<br>• abrasion-resistant<br>• weather-proof<br>• UV and heat resistant<br>• compression hardness (at 25 % compression)<br>• 55 kPa<br>• density approx. 60 kg/m³ |
| **Chemical properties** | • Resistant to ageing, chemically stable (internal)<br>• High chemical resistance<br>• ODDY test passed |
| **Other properties** | • easy to cut<br>• thermally bondable and weldable<br>• sheet goods<br>• reusable<br>• 100 % recyclable |
| **Recommendation** | • suitable for long-term storage (resistant to ageing)<br>• object-specific testing before use |

The foam haska FB20 / FB40 as a plate.

## haska FB20 / haska FB40

The materials haska FB20 and haska FB40 are also used for the padding incision of three-dimensional artworks. For this purpose, crates, or in the case of small, light objects, also cardboard boxes, are filled with the foam materials in layers. Then, the individual layers are cut – according to the shape of the object – so that the pressure relief or object cushioning can be precisely matched to the object. The two padding materials differ significantly in their com- pression hardness. They are open-cell, extruded polyurethane foams and come in blocks of 200 x 115 cm (l x w) from which order-related blanks are cut. haska FB20 and haska FB40 can be cut and sawn.

The contour-specific incision is made for a precisely fitting- padding of three-dimensional artwork.



The foam haska FB20 / FB40.

| | Haska fb20 | Haska fb40 |
|---|---|---|
| **Physical properties** | • open-cell<br>• extruded<br>• compression hardness (at 25 % compression)<br>• 80 kPa<br>• density approx. 17 kg/m3<br>• abrasion-resistant<br>• not UV-resistant | • compression hardness (at 25 % compression)<br>• 210 kPa<br>• density approx. 40 kg/m3 |
| **Chemical properties** | • chemically stable<br>• ODDY test passed | |
| **Other properties** | • easy to cut<br>• glueable<br>• sheet goods<br>• reusable<br>• 100 % recyclable | |
| **Recommendation** | • object-specific testing before use | |



## haska FS150

The material haska FS150 is a foam tape, wound on a roll. It is cut by the art packers on site, as required, and is often used for local object padding. As a general rule, a separating layer of Tyvek or acid-free tissue paper is used to protect the object. The cushion tapes can also be wrapped lengthwise in tissue paper and fixed with hasenkamp adhesive tape to form a pad. Potential packing cavities can be easily filled with haska FS150. haska FS150 is a closed-cell and open-cell polyurethane foam. The roll dimensions are 600 x 15 cm (l x d) with a material thickness of 1.5 cm (d). This padding fabric can be cut and torn.

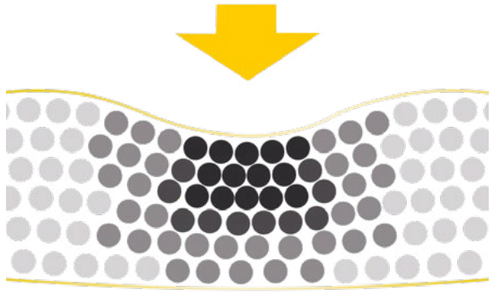
haska fs150 – foam tapes for local object padding.

The foam haska FS150 on the roll.

| | Haska FS150 |
|---|---|
| **Physical properties** | • closed and open-cell<br>• expanded<br>• compression hardness (at 25 % compression) approx. 4-6 kPa<br>• density approx. 35 - 40 kg/m3<br>• abrasion-resistant<br>• not UV-resistant |
| **Chemical properties** | • chemically stable<br>• ODDY test passed |
| **Other properties** | • easy to cut<br>• tearable<br>• rolled goods |
| **Recommendation** | • temporary use in transport (not resistant to ageing)<br>• before use, object-specific testing<br>• In case of object contact, an intermediate layer of inert material may be used. |

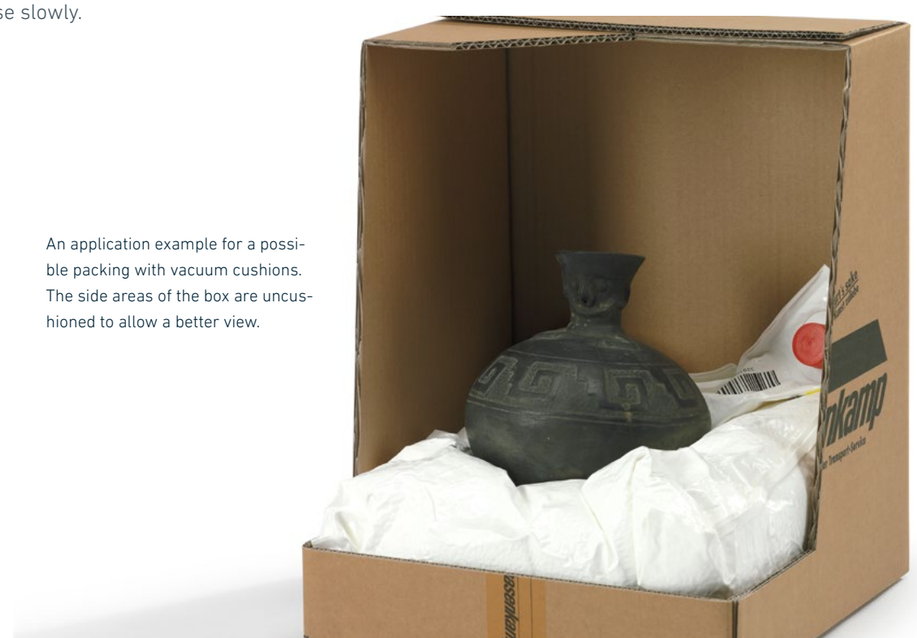
## Vacuum cushions

Vacuum cushions are special cushions with adaptive and stabilizing core properties – developed for three-dimensional artworks. They are easy and quick to handle. The underlying technology is borrowed from accident medicine and has been specially adapted to the requirements of art logistics in cooperation with conservators. The vacuum cushion consists of a stable but a supple outer shell and an inner filling of small foam beads. In addition, there is a valve unit. The cushion can be very precisely and individually adapted to the shape of the artwork by modulation. This makes it possible to control the pressure distribution in a targeted and controllable fashion. In an ideal case, the artwork, e.g. a fragile vase, is placed in a previously shaped hollow of the cushion. The edges of the cushion are then raised slightly and pressed lightly against the art- work to build a good fit. The innovative character of this padding technology reveals itself during the vacuuming process: for this purpose, the air is extracted from the cushion, using a vacuum pump. This stabilizes the cushion after valve closure, alongside the shape of the object, and the exhibit can no longer slip. At the same time, the padding does not exert any pressure on the artwork. If necessary, air can be refilled into the cushion via the valve –the contour fixing will release slowly.



Small beads within the vacuum pad created a moldable filling, which smoothly adapts to the shape of the object. The opposing forces on the object are absorbed by the vacuum pad via several contact points on neighboring beads.

Vacuum cushions can fix and pad sensitive objects at the same time.



An application example for a possible packing with vacuum cushions. The side areas of the box are uncushioned to allow a better view.

Vacuum cushions are generally suitable for air-freight. They are durable, reusable and help to avoid waste of packing materials. Vacuum cushions are also used as an aid in the restoration and documentation of objects. Thus three-dimensional artworks, such as sculptures and vases, can be safely positioned for processing even in an inclined position, irrespective of their exhibition area.

The vacuum cushion in its default state with enclosed vacuum pump.

A vase, securely fixed in a vacuum cushion.

The vacuumed cushion with visible vase imprint.

| Vacuum cushion sizes | Size S | Size M | Size L | Size XL |
|---|---|---|---|---|
| **Dimensions (cm)** | 50 x 52 | 53 x 85 | 70 x 94 | 95 x 131 |
| **Compatibility** | hasenkamp system cardboard box | hasenkamp system cardboardbox | 1/2 European pallet | European pallet |
| **Physical properties** | • stabilizing, cushioning<br>• supple<br>• volatile to heat and sunlight<br>• sensitive to pointed objects | | | |
| **Chemical properties** | • chemically stable<br>• ODDY test passed | | | |
| **Recommendation** | • functional test before transport<br>• vacuum check for long-term use<br>• object-specific testing before use | | | |




# The hasenkamp hanging system

In close cooperation with renowned museums, conservators and depot administrators, hasenkamp has developed a variable and sophisticated hanging system over decades. It has amo- dular design and is perfectly adapted to the requirements of transport, installation and art storage. In the mid-1980s, our in-house development started, having observed avoidable object loads due to the use of ring eyes, bolted into the back of the frame. In the case of multiple transports, the holes in the back of the frame became unusable, due to frequent unscrewing and screwing in. This required new drill holes, which caused gradual damage to the valuable, decorative frames. A solution had to be found. In 1992, the hasenkamp hanging system, which is used thousands of times today, was patented.

The hasenkamp hanging system set for hook mounting – shown here in standard size M.

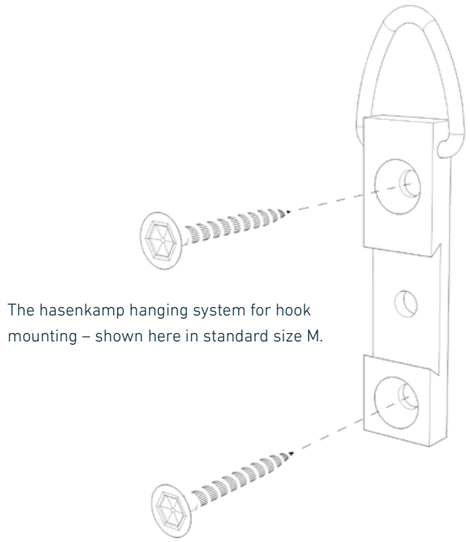
## System components

The hanging system is made of galvanized steel. It is available in two sizes, with components in diverse sets. Adapted to the installation possibilities at our customers' sites, the hasenkamp hanging system comes in two fundamentally different versions:

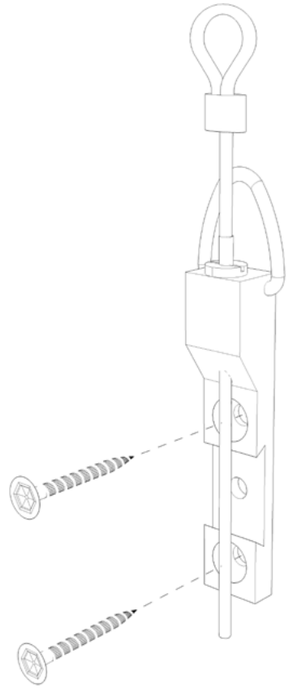
1) hasenkamp hanging system for hook mounting available in sizes S / M

2) hasenkamp VarioHanging system for wire rope installation available in sizes L1,8 / L1,0[5]

Regardless of hook or wire rope installation, the respective basic module is fixed to the rear of the frame. The double screw connection provides a more favourable load distribution, compare the conventional, single-screw ring eyelet. However, the biggest advantage of the hasenkamp hanging system is its flexibility – being an installation, transport and depot system.



The hasenkamp hanging system for hook mounting – shown here in standard size M.



The hasenkamp VarioHanging system for wire rope installation, here shown in size L1.8 (wire rope diameter = 1.8 mm)[5].

[5] The numerical outputs refer to the two available wire rope thicknesses in millimetres. The wire rope length is order-specific. The same applies to the diameter of the wire rope loop. The wire rope ends are twisted and soldered against split ends.

## Mounting system

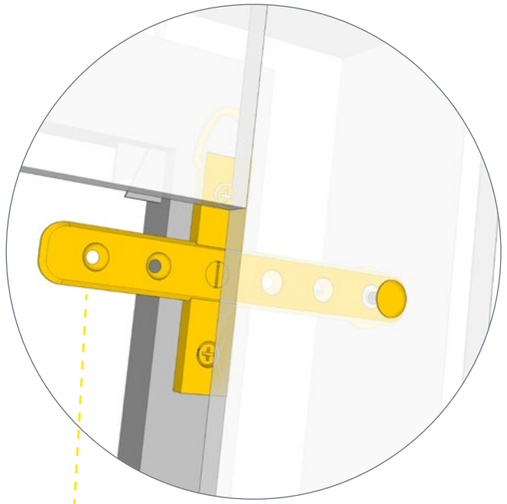
With the hasenkamp hanging system for hook mounting, the painting is fixed by placing the folding bracket of the hanging system into the wall-pegged L-hook. With the hasenkamp Vario Hanging system, a wire rope is guided through the wire rope safety device, which automatically locks down- wards. The painting can be precisely aligned horizontally by temporarily pressing in the rope guide sleeve. The different weights of paintings are taken into account with two rope thicknesses of 1.0 and 1.8 mm.

## Transport system

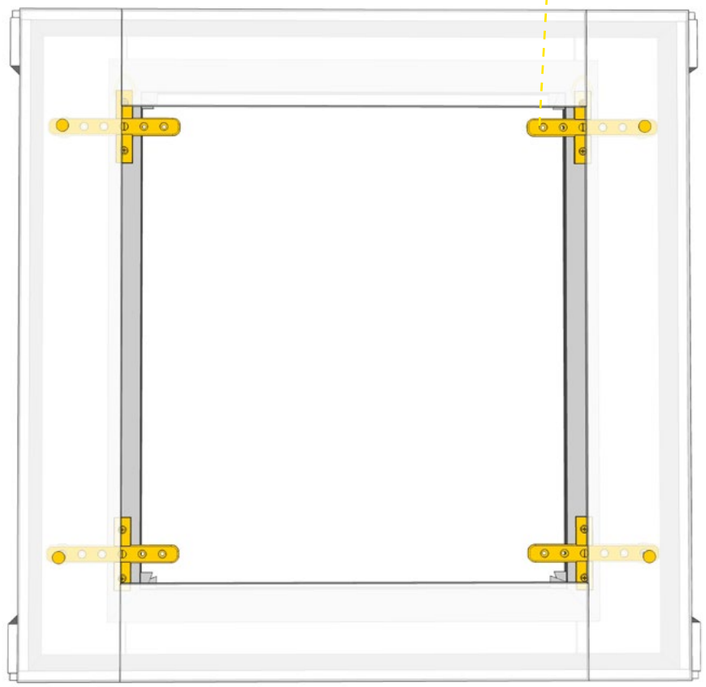
Both, the hasenkamp hanging system and the hasenkamp VarioHanging system, are designed as transport systems. The systems enable contact-free packing, as some painting surfaces are so sensitive, that contact with any packing materials must be avoided. The hasenkamp hanging system takes this challenge easily, as the works can be securely fastened in a transport frame or crate. For this purpose, the so-called perforated rail is pushed horizontally into the dovetail of the basic module installed at the rear of the frame and locked in place, using a securing screw.[6] The perforated rail protrudes frame behind the object and can be screwed to the transport frame or crate at the free end. The advantage is, that the perforated rail can also be used as a gripping aid for object handling. If it is no longer needed, it can be pushed and locked behind the painting in the dovetail and is then hidden from the front.

Sophisticated system for a safe picture mounting.

[6] Here, too, the hasenkamp claim to quality is evident. The screws are provided with a screw locking layer on the thread. This secures the screw connection in the event of shock and vibration. This layer must be replaced after mechanical loosening of the screw connection.



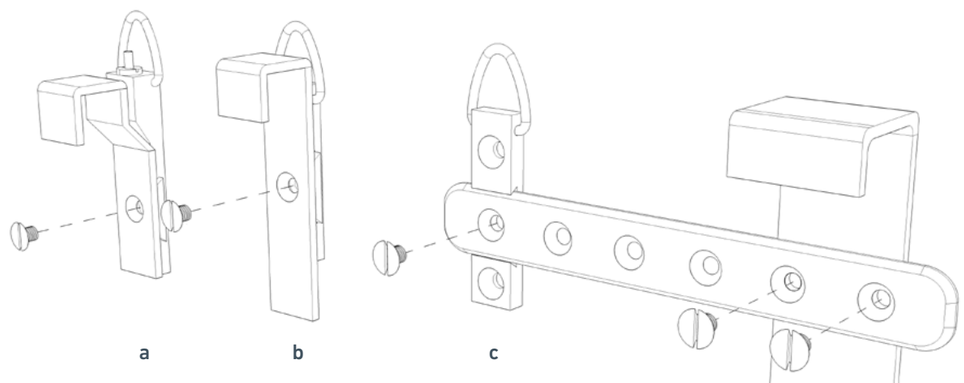
The basic module, mounted on the rear of the frame, is firmly connected to the rear wall of the transport frame via the perforated rail and the locking screw.



Rear of a transport frame with a painting, mounted with a hanging system.

## Depot system
## (extension for grid wall mounting)

Both, the wall and wire rope mounting systems, can be modified with depot hooks. This makes it easy to hang a painting on a lattice wall. For this purpose, a depot hook attachment is inserted into the dovetail guide of the basic module and locked in place, using a locking screw. A variation of the regular, perforated rail can also be equipped with a depot hook. Applicable for both hanging system variants, the hooks are then connected to the perforated rail via two screws on the outside. Perforated rails and depot hooks protrude beyond the frame leg, so that the object can be safely hung into the lattice wall. Conventional S-hooks can fall out of the lattice wall during object handling and damage works underneath. This risk can now be completely eliminated by using the hasenkamp hanging system.




The extension of the hasenkamp hanging system for grid wall mounting.

**a** VarioHanging system + depot hook

**b** Hanging system + depot hook

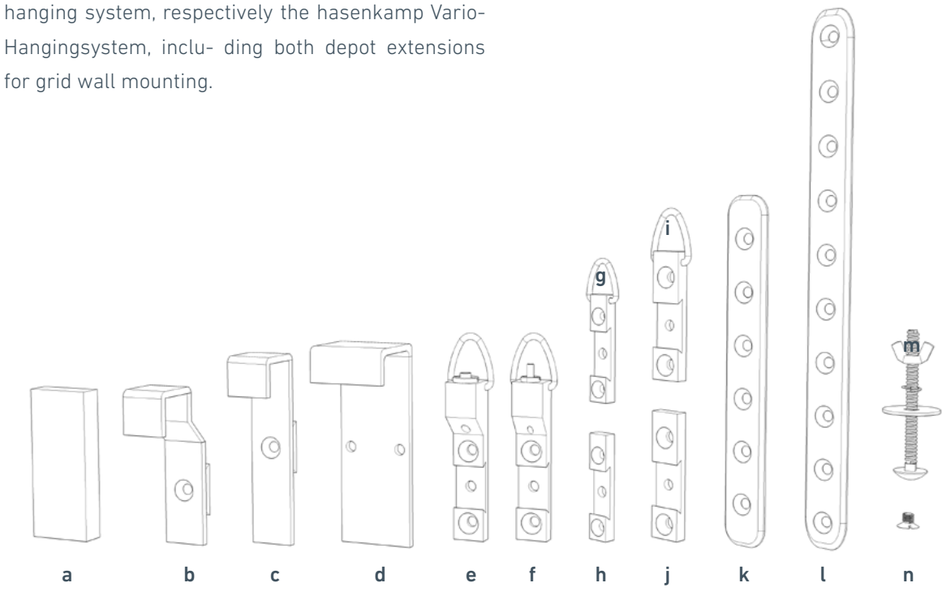
**c** Hanging system + perforated rail + depot hook





## Our portfolio

An overview of all components of the hasenkamp hanging system, respectively the hasenkamp Vario-Hangingsystem, inclu- ding both depot extensions for grid wall mounting.




**a** distance VarioHanging system

**b** depot hook VarioHanging system

**c** depot hook hanging system (S and M)

**d** depothooksupportrail

**e** varioHanging system L 1,0

**f** varioHanging system L 1,8

**g+h** hanging system with bracket and hanging system non-iron (S)

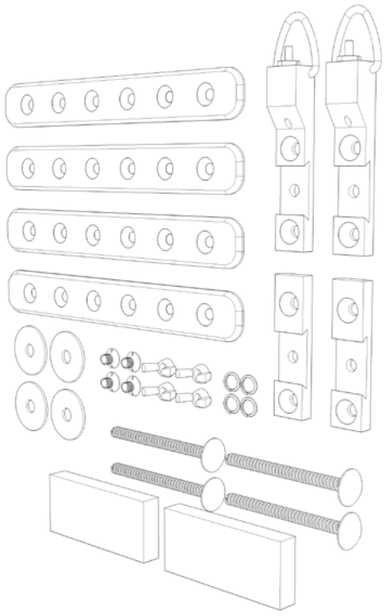
**i+j** hanging system with bracket and hanging system non-iron (M)

**k+l** support rail (M, L)

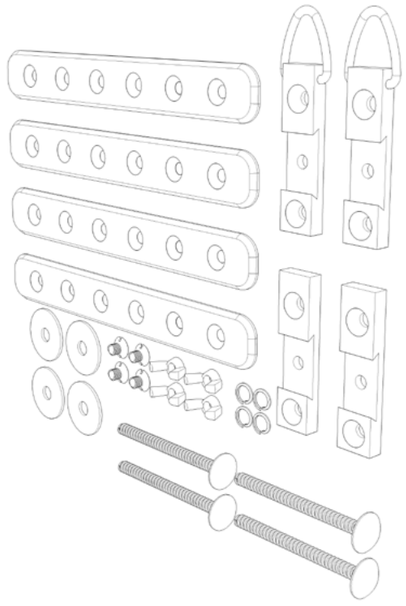
**m** screw kit (carriage bolt, wing screw, spring washer, flat washer)

**n** locking screw

**A hasenkamp hanging system set or a VarioHanging system set always consists of the components shown above.**



The hasenkamp VarioHanging system set – here shown in size L1,8.



The hasenkamp hanging system set – here shown in standard size M.





**Overview on the hanging system:**

| Designation | Scope of supply | No. of units | Configuration (mm) | Maximum shackle load (kg) |
|---|---|---|---|---|
| **Hasenkamp hanging system set (hook mounting)** | • basic module with bracket and non-iron | 2 + 2 | M (60 x 15 x 6)<br>S (50 x 10 x 6) | 75<br>30 |
| | • perforated rail | 4 | M (M5 / 160 x 22)<br>L (M5 / 250 x 22) | |
| | • locking screw | 4 | M5 / 5 x 6 | |
| | • carriage bolt | 4 | M5 / 5 x 50 | |
| | • flat washer | 4 | M5 / 5,3 x 25 | |
| | • spring washer | 4 | M5 / D 5,1 | |
| | • wing screw | 4 | M5 / 26 x 13 | |
| **Hasenkamp VarioHanging system set (wire rope installation)** | • basic module with bracket and non-iron | 2 + 2 | L 1,8Ø rope (75 x 15 x 15)<br>L 1Ø rope (75 x 15 x 15) | 75<br>75 |
| | • perforated rail | 4 | M (M5 / 160 x 22)<br>L (M5 / 250 x 22) | |
| | • locking screw | 4 | M5 / 5 x 6 | |
| | • carriage bolt | 4 | M5 / 5 x 50 | |
| | • flat washer | 4 | M5 / 5,3 x 25 | |
| | • spring washer | 4 | M5 / D 5,1 | |
| | • wing screw | 4 | M5 / 26 x 13 | |
| | • spacer | 4 | 60 x 30 x 10 | |
| **Hasenkamp replacement set** | • perforated rail | 2 | M (M5 / 160 x 22)<br>L (M5 / 250 x 22) | |
| | • locking screw | 2 | M5 / 5 x 6 | |
| | • carriage bolt | 2 | M5 / 5 x 50 | |
| | • flat washer | 2 | M5 / 5,3 x 25 | |
| | • spring washer | 2 | M5 / D 5,1 | |
| | • wing screw | 2 | M5 / 26 x 13 | |
| **Hasenkamp depot system set** | • depot hook for hanging system (S / M) | 2 | 90 x 20 x 26 | 100 |
| | • depot hook for VarioHanging system (L 1 / L 1,8) | 2 | 77 x 20 x 38 | 100 |
| | • depot hook for VarioHanging system (L 1 / L 1,8) | 2 | 90 x 35 x 24 | 100 |


# The hasenkamp interior systems for crates

The appropriate padding and fixation of an artwork always depends on the individual case. Therefore, in close consultation with our customers and the hasenkamp packing experts, an individual packing concept is developed in the run-up to a transport. The following is an introduction to tried and tested variants.

## Cushioning corners

Cushioning corners are usually used for painting packing in crates to absorb any vibrations that may occur during transport. With this system, a cushioning corner is placed on each corner of the painting and everything is then placed in the crate. With regard to their fit, the cushioning corners are precisely fabricated to the dimensions of the artwork and the inside dimensions of the crate. The object is well padded and at the same time securely fixed at the corners. On special order, the cushioning corners can be lined on the inside with Tyvek to provide protection for particularly sensitive surfaces.

A cushioning corner for simultaneous padding and fixation of a painting in a crate.

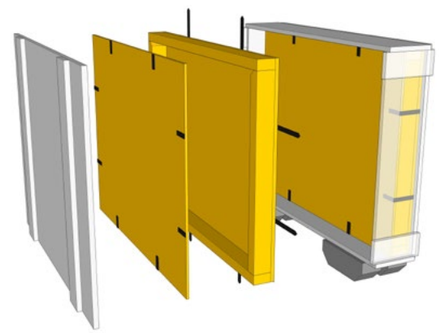
A painting, wrapped in Tyvek and fixed with four cushioning corners (crate: painting crate / hasenkamp standard).





## Multi-picture packing

Multi-picture packing (MPP) is a multi-layer inner packing. It is designed for the packing of framed works and is always used, when several objects of different sizes are to be transported in a common crate. The artworks do not necessarily have to be the same size – the system is very flexible here. The works are transported staggered in a crate. Each artwork is securely packed in its own MPP layer. The latter consists of a light and stable base panel e.g. a lightweight foamboard or a reinforced corrugated cardboard, with a surrounding padded bed. Each padded bed is custom-made to the exact dimensions of the artwork. The positive fit between the padding and the artwork ensures a secure fixation. The individual MPP layers are then placed into panels in the crate. When placed in front of each other, the back wall of one MPP layer serves as cover to the previous one. On special request, each MPP layer can be closed with its own light foam panel on the front. This MPP lid can be opened and closed reversibly via a Velcro fastener. The packing of the other artworks follows the described pattern. In this way, the objects are safely placed in one and the same crate.



Two multi-picture packings with lid (yellow) in an open crate. The front crate is open (crate: painting crate + skids (dark grey) / "ProArt standard").


Two staggered, multi-picture packings in front of an open crate (crate: painting crate / "Climate standard").

A graphic, wrapped in Tyvek, embedded in an MPP layer. In the background, the interior of the green-felted climate crate is depicted.

## Interior padding

„In principle, each crate in the hasenkamp portfolio can be lined on the inside with a padding layer to absorb possible, mechanical forces, acting on the artwork. The interior padding can be partial or full-surface, as well as all crate walls, or only applied on individual surfaces. For example, floor padding often makes sense for sculpture packing. On the other hand, the side walls of the crate do not necessarily have to be fully lined with padding – for example, if the sculpture is fixed in the crate by internal bracing. A crate with full-surface interior padding, on the other hand, can be useful when transporting a bundle of equally sized, framed graphics. For this purpose, the frames can be efficiently and safely placed one after the other in a collection crate, whose light interior padding size corresponds to the frame format. Light foam or cardboard sheets adapted to the frame format can also be used as partitions to separate the individual works. A number of materials with different properties are available for object padding.

- haska FP17.01
- haska EF220 / haska EF400

A crate, fully padded on all sides
(crate: painting crate / "hasenkamp standard").



## Slide-in frames

Slide-in frames are a variant of the crate interior. The outer crate is always a painting crate that can be opened at the side or on the top. The system is designed for two-dimensional artworks. Sliding systems are used particularly in the con- text of exhibition tours, since they are usually elaborately manufactured, consist of high-quality materials and are desig- ned for a long service life. The system's inherent advantage, is that several paintings can always be packed and transported as a bundle in one crate.

The standard slide-in frame for two-dimensional artworks, is a wooden construction with guide rails for parallel insertion of several frames of the same size or transport frames. The guide shafts are completely lined with felt to protect the frames. If a bundle of frames of different sizes are transported, stepped insertion levels can also be constructed. The advantage of the slide-in frames is, that packing materials can be completely dispensed.

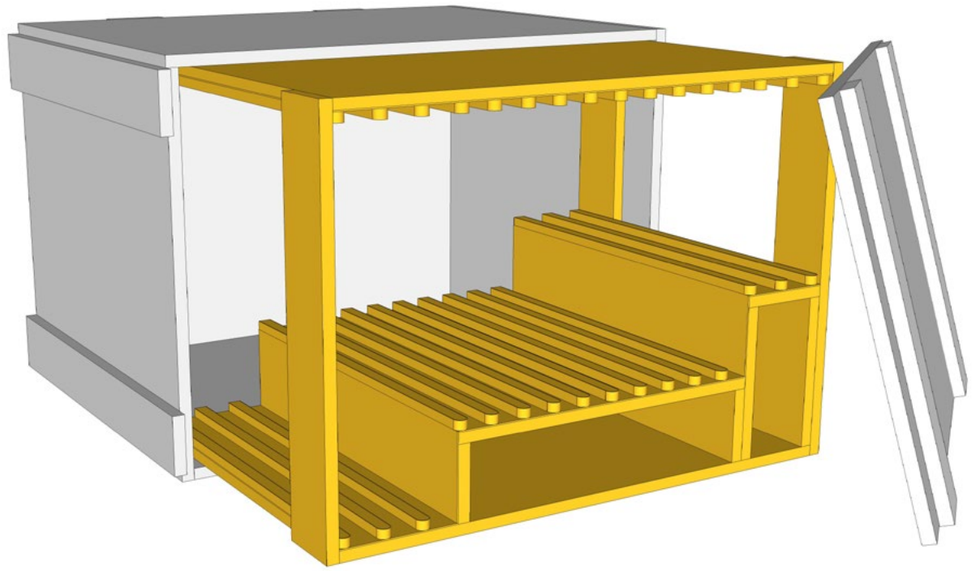


Illustration of a stepped slide-in frame for three different frame formats (yellow).

## Internal bracing

Bar fixing is a packing, or rather a securing technique. Three- dimensional artworks are fixed inside a crate and thus secured against slipping and tipping in all directions. Taking into account object-specific conditions, several beams are positioned precisely around the sculpture – their length corresponds to the clear inside dimensions of the crate. In practice, horizontal alignment and arrangement on so-called beam annuli has proven effective. In this case, at least four beams are arranged around the object. If necessary, additional pairs of beams or even individual beams can be installed, e.g. to relieve particularly sensitive areas by local force absorption. To fix them in place, the beams are firmly screwed to the crate body, using mounting angels. Crates with climate protection (series: “Climate standard”, “VarioSystem standard”, “Q+standard”) are of course excluded. Due to the insulation elements, it is not allowed to drill holes on the inside. If the requirement for bracing still exists, an additional inner crate or frame must be used for beam fastening. The beams can be covered with the usual hasenkamp padding materials and Tyvek. Protective felt layers are often also applied to the beam.

Bar fixing in a crate. Two beam annuli and padded contact areas secure the sculpture. The beams are connected via metal angels and wings screws with the crate (crate: object crate / “hasenkamp standard”).


The closed crate with the fixing Bar (crate: object crate / “hasenkamp standard”).





## Stencil packing

Stencil packing is used for fixing sculptures in object or pallet crates. The object is thus secured against slipping and tipping. Usually, the stencil packing consists of at least two horizontally arranged wood or hard foam panels, which are adapted to the clear inner crate dimensions. The stencil is always divided into two parts and has a section that corresponds to the cross-section of the sculpture. The sculpture is thus bordered very precisely from two sides. The wood or hard foam panels are inserted along the crate walls into a double-barrelled tape annulus. The contact surfaces facing the object can be equipped with an upholstery lip for large, heavy sculptures. Here, too, the sculpture is softly bordered. In order to fix a sculpture securely in a crate, several stencil levels are usually drawn in. Optional, lid and bottom side cushions can also be used to fix and cushion the sculpture along the vertical direction.


The closed pallet crate with the sculpture depicted above (crate: pallet crate / “Climate standard” + inner crate).


With this “crate in crate” variant, the inner crate is closed (crate: pallet crate / “Climate standard” + inner crate).


Stencil packing of a crate. The sculpture is secured with two horizontal stencil tapes, cut out to fit the hip and shoulder area of the sculpture (crate: pallet crate / “Climate standard” + inner crate).

## Padding incision

„Foam-filled boxes are very efficient for the proper packing of three-dimensional artworks. For this purpose, a box is filled in layers with a padding material. The room-filling cushion is then cut precisely to fit the contour of the object. This packing technology requires highly skilled and experienced art packers. At the same time, the padding can be adapted very precisely to the individual object conditions. On one hand, a high accuracy of fit between cushion and object can be achie- ved, on the other hand, it is possible to cut out particularly pressure-sensitive object parts in the cushion, according to individual specifications, to keep the object contact-free. A range of materials with different properties are available for the padding of objects:

- haska FP17.01
- haska EF220 / haska EF400
- haska FB 20 / haska FB 400

Close-up of the cut, padded with Tyvek lining.

Close-up of the inner filling. A vase is removed from the packing – The padding incision can be seen in the background.

Three examples of dampers.

## Dampers

The hasenkamp portfolio offers different types of dampers for particularly oscillation and vibration-sensitive objects. For some of our crates, they are already standard equipment (series: „VarioSystem-Standard“, „Q+Standard“). On request, however, dampers can also be used in any other crates.

If a damper system is used, a multi-part crate system, consis- ting of an outer and an inner crate or a transport frame, is indispensable. The dampers mechanically decouple the inner crate from the outer crate. To use a damper system in a climate crate, an inner frame needs to be added to the inner crate. This prevents the climate insulation elements from being damaged by the fixing screws of the dampers. There are at least two vertically arranged dampers on the bottom between the outer and inner crates. Two more are installed in the upper area. This allows vibrations and shocks in all spatial directions to be efficiently absorbed. In pallet crates, the internal con- struction is fixed to the floor exclusively by four dampers, similar to a four-point bearing. Several damper variants are available in the hasenkamp portfolio for optimum damping of mechanical vibration and shock loads. These are staggered according to load ranges – i.e. adjusted to the weight to be damped. For very heavy objects, the number of dampers is increased to match the object weight.



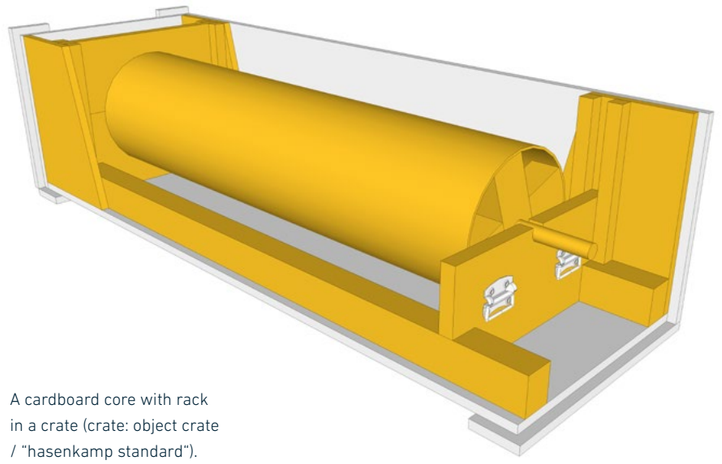
## Cardboard cores

If large carpets, tapestries or even oversized, paintings are transported, they sometimes have to be unstretched rolled up. Only then, they fit through doorways and staircase bends. To avoid damage, folding is usually no option. The hasenkamp portfolio offers roll cores of different diameters. For economic reasons, the standard version is made of conventional cardboard. A suitable packing materi- al (e.g. Tyvek) should always be used as a separating lay- er between the core of the roll and the object. An ac- idfree version is also available upon special request, this feature is ideal and necessary for long-term storage.

For safe transport and pressure relief, the cardboard core and the rolled object are usually hung in a specially manufactured transport rack. For particularly sensitive objects, the rack can also be protected with an optional crate. This provides increased protection against possible mechanical forces and climate fluctuations.

**The cardboard cores are available in the following variants:**

| Diameter ø inside (cm) | Diameter ø outside (cm) | Wall thickness (cm) | Standard length (cm) (cut to size) |
|---|---|---|---|
| 30 | 32 | 1 | 450 |
| 40 | 42 | 1 | 450 |
| 50 | 52 | 1 | 450 |

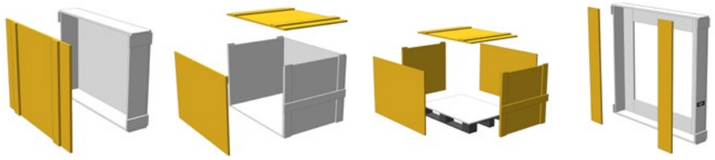


A cardboard core with rack in a crate (crate: object crate / “hasenkamp standard”).

# The hasenkamp crate types and series

Crates are of crucial importance for the transport of artworks. To prevent damage to the objects, they provide the best possible protection against any harmful influences, for ex- ample mechanical forces or climate fluctuations. hasenkamp offers a wide variety of different crate designs. There are basically four different types: the painting crate, the object crate, the pallet crate and the crate-similar transport frame. In order to meet individual protection, crate handling and crate price requirements, all of the listed crate types are available in different series. The following is a graphical overview:

## Our crates: in four different models



| Series/ Types | Painting crate | Objekt crate | Pallet crate | Transport frame |
|---|---|---|---|---|
| **“Cardboard standard“** | x | x | | x |
| **“ProArt standard“** | x | x | x | |
| **“hasenkamp standard“** | x | x | x | x |
| **“Climate standard“** | x | x | x | |
| **“VarioSystem standard“** | x | | | |
| **“Q+ standard“** | x | | | |

## Crate type: painting crate

The name “painting crate” already anticipates the object group, for which this crate type is intended. Painting crates are usually vertically aligned and can be opened at the front – also applicable a horizontal position. They can also come flat travelling (to be opened at the top). For pastels, for example, conservators often recommend transport in a horizontal position, to minimize the risk of losing weakly bound pigments. Depending on the crate construction, handles are attached to its sides to ensure safe object handling. Likewise, the lids of large-format painting crates can also be equipped with handles, as they sometimes have a high dead weight. This makes lid handling much easier and, above all, much safer. Furthermore, all painting crates, with the exception of the “cardboard standard” series, are equipped with skid bars underneath to allow easy sliding of the crate. At the same time, the create an edge as a contact point for a crate lifter.

Central functioning of the painting crate.

Optionally, particularly heavy painting crates can be equipped with skids[7] on the underside. They can thus be driven under with a lifting device and moved particularly gently. Of course, the painting crate comes with different interior fittings. Four cushioning corners are conceivable, in which the artwork is securely upholstered in the painting crate. A multi-picture packing (MPP), a full interieur padding or even fixed dampers are also suitable – the customer decides.

[7] Skids are used to drive a lifting device under a crate. They are comparable to pallet blocks, but slightly longer and come with bevelled edges underneath, to make the crate easy to move. Skids are less expensive and robust as pallet constructions.

## Crate type: object crate

The hasenkamp crate portfolio offers the object crate for three-dimensional artworks. These are open-angle crates, so that both, their front and topside can be opened. This allows for a particularly safe object adjustment and removal through a large crate opening. In addition, an open-angle accessibility is absolutely essential for some padding techniques and object securing measures.

Central functioning of an object crate.

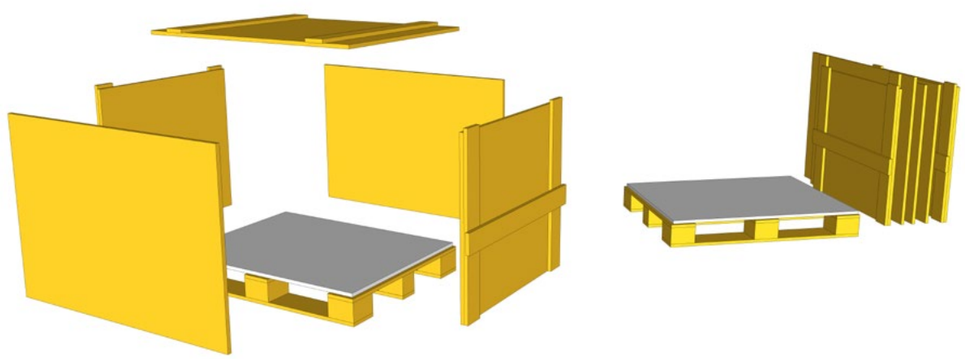
As usual in the hasenkamp crate portfolio, object crates are also equipped with handles on the outside for specific assemblies. Since object crates can be very heavy, they are equipped with sliding bars, which make handling easier. Very heavy object crates can optionally be provided with pallets underneath. This allows moving a lifting device under the crate for particularly gentle handling. The object crate interiors are also quite varied. Full-surface internal padding, padding incisions, or internal bracing of sculptures are possi- ble. Dampers can also be installed, which in turn requires an inner crate. Likewise, an art collection, consisting of a large number of small, three-dimensional artworks, as occurring in an ethnological collection for example, can be easily packaged in several, smaller crates. According to the "matryoshka doll principle", these can then be placed in an object crate. Object crates are also suitable for the packing of several framed objects. It is conceivable for example, to have a set of graphics separated with Kapa plate or packed in multi-picture packing, which can then be placed in an object crate. Consequently, object crates are very flexible and universally usable.


The simplest cardboard object crate with open top and front – shown here in closed condition. It is closed with Velcro tapes (crate: object crate / "cardboard standard").


The simplest cardboard object crate construction with open top and front – here with top lid (crate: object crate / "cardboard standard").

## Crate type: pallet crate

If heavy, three-dimensional artworks are transported, a hasenkamp pallet crate is ideal. The unique feature of this crate is its all-round opening. This means, that all crate walls can be dismantled and reassembled and thus loading is possible from all sides and objects can be accessed from all sides. In the standard system, the pallet crate has – as the designation implies – a pallet substructure. Depending on the series and crate size, pallet crates are also equipped with external handles. Although a pallet crate is conceived for moving it gently with a lifting device underneath, handles are incorporated to facilitate the movement of large or heavy crate walls. Pallet crates with any type of interior equipment are available upon request. For example, internal bracing or stencil packings have proven to be an effective method of securing sculptures. However, as it is generally the case in art logistics, that suitable packing depends on the object and customer's specifications.



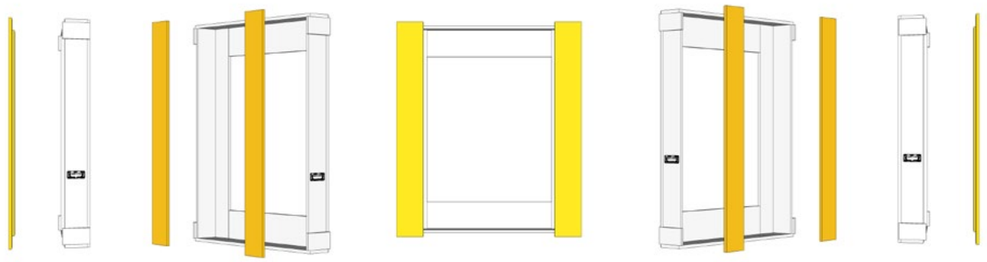
Central functioning of an object crate.

## Crate type: transport frame

Transport frames are designed for two-dimensional artworks. They serve as a protection against mechanical forces, whereby, for construction reasons, this mainly refers to the edge protection. In the standard version, transport frames are open at the rear and partly in the front. Nevertheless, they can be added for a crate-like packing systems. Compared to the other crate variants, their low weight makes them easy to handle – an aspect that is particularly important for large for- mats. Furthermore, thanks to their design, they tend to be among the most economical packing systems.

Usually transport frames are used in combination with the hasenkamp hanging system. This makes it possible to transport frameless paintings, relief collages or objects with very sen- sitive surfaces almost contactless but still well protected. The secure fixation of the painting to the rear slats of the transport frame creates a safety distance to all sides, including the front of the transport frame. This is why artworks with strongly profiled, cantilevered decorative frames (as were common in the rococo period, for example) are often packed into transport frames.

Furthermore, transport frames are often part of a complex crate system. If dampers are used in a crate, for example, transport frames are used as inner crates or inner frames. They come in various special configurations. Some customers would like a wooden or cardboard back or lid closure, others prefer a transparent film closure to protect the object against dust and to have a good object visibility.



Central functioning of the transport frame.


An empty, closed transport frame, (“crate”: transport frame / “hasenkamp standard”).

An open transport frame with a painting, fixed with the hasenkamp hanging system (“crate”: transport frame / “hasenkamp standard”).

A closed transport frame with a painting, fixed with the hasenkamp hanging system (“crate”: transport frame / “hasenkamp standard”).

## Series: “cardboard standard“

The “cardboard standard” series is the simplest variant of rigid packing. Tried and tested thousands of times in practical use, it is particularly suitable for small to medium-sized objects with low weight. It is often used as a collection crate for soft packed, small and filigree objects – often also for object convolutes. It can also be used as light-weight cardboard transport frames – which, optionally, with a matching slip lid, can be flexibly converted into a closed painting crate. Made of three-layered reinforced corrugated cardboard, the series is stable and extremely light. This one is particularly beneficial for safe and convenient handling. It is closed either by slip lids or Velcro tapes, which allow quick, uncomplicat- ed opening and closing. For safe gripping and carrying of the box, light plastic handles are installed on the sides. Due to the materials and design features used, it is less resistant to mechanical forces than the other crates in the hasenkamp portfolio. Nevertheless, it is the lightest and most economical series.

An open painting crate in “cardboard standard” (crate: painting crate / ”cardboard standard”).

The cardboard crate series – mechanical protection and very low weight.


A closed painting crate in “cardboard standard” (crate: painting crate / ”cardboard standard”).





## Series: “proart standard“

The “ProArt Standard” series stands for simple, stable wooden crates. Often used in practice, they provide protection against mechanical forces for objects of all sizes and weights. They are made of IPPC-certified[8] plywood. To facilitate their handling, the crates are equipped with metal or hinged handles. Lid support and guide tapes are available for easy and secure closing of the crate. The lid is closed with wood screws, to ensure an access-safe closure. The “ProArt standard” is a robust, smartly conceived and easy-to-handle crate concept – at an unbeatable price. At hasenkamp, ProArt crates are the convenient wooden crates.

An open painting crate in “ProArt standard“ (crate: painting crate / “ProArt standard”).

low price, high performance – this distinguishes the proart series.


A closed painting crate in “ProArt standard“ (crate: painting crate / “ProArt standard”).

[8] IPPC (International Plant Protection Convention), is an international plant protection convention to prevent the introduction and spread of harmful organisms with packing wood. In global trade, the IPPC certification stamp proves, that wood treatment is in line with ISPM no. 15 guidelines. hasenkamp is registered as a manufacturer of wood packing materials according to IPPC standard ISPM No. 15 and is frequently tested by the responsible authority.

## Series: “hasenkamp standard“

Our customers most often require “hasenkamp standard” crates. All types of crates can be produced in this series – paint- ing crates, object crates, pallet crates, or transport frames. It is suitable for objects of all types, almost every size and every weight. Crates, manufactured to the “hasenkamp standard”, can be used in many ways and can be easily modified accord- ing to our customer‘s specifications – almost everything has already been built under this series. The entire crate body is made of very robust, torsion-resistant, high-quality blockboard with HDF (high density fiberboard) face veneer – of course IPPC-certified.[9] Glued tapes further reinforce the construction. Depending on their application, they have various functions: made of screen printing plate, they serve as sliding tapes under the crate body, mounted on the side, they are used to guide the lid. This allows a comfortable assembly and disassembly of the crate lid and walls. The crate is closed with wood screws, so that access is also secure here. A tool is always required for opening. For safe handling, folding metal handles or handle tapes are mounted on the outside. In addition to the basic equipment, other fitting material is also available as an option. And, of course, the crate can be built to special order with a threaded connection and a rubber lid seal – in some cases also with full-surface and thermal insulation. This provides increased insulation and, applying a special varnish, protection against moisture. Crates of this series are always manufactured with great precision and offer high stability. A high degree of form- fitness and torsional rigidity can also be guaranteed for over- sized crate formats. The usual hasenkamp quality always comes with a neat appearance.

This construction method convinces with mechanical resistance, high-quality work- manship at an attractive price.

The “hasenkamp standard“ – the name says it all! High mechanical resilience, precise manufacturing and an attractive price!

An open painting crate “hasenkamp standard”.


A closed painting crate “hasenkamp standard”.

[9] IPPC (International Plant Protection Convention), is an international plant protection convention to prevent the introduction and spread of harmful organisms with packing wood. In global trade, the IPPC certi- fication stamp proves that wood treatment is in line with ISPM no. 15 guidelines. hasenkamp is registered as a manufacturer of wood packing materials according to IPPC standard ISPM No. 15 and is regularly tested by the responsible authority.



## Series: “climate standard“

The crates manufactured in “Climate standard” are the first crate series with a multi-layer structure as standard, to reliably protect climate-sensitive objects of all sizes and weights. In addition to protection against climate fluctuations, the crates are very resistant against mechanical influences, which generally provides high object protection in this series. Almost all common crate types can be manufactured in the “Climate standard”: painting crates, object crates and also pallet crates. As a result, the series can be used for a wide range of applications. The high mechanical protective effect results from the solidly built, torsion-resistant crate body, made of resistant blockboard. The wood-based materials used are, of course, IPPC-certified10. The multi-layer, internal construction also contributes to the high mechanical protection effect. Temperature fluctuations are shielded by thermal insulation materials installed over the entire surface of the crate body. At the same time, hygroscopic active materials regulate the relative humidity. The efficiency of the climate crate was confirmed in an independent test, carried out by TÜV-Rheinland (German Technical Supervising Authority, Rhineland branch). The resistance to climate fluctuations is measured in the so-called half-life period:

- “cooling sequence” (outside the crate: approx. Δ20 °C): half-life period: 2 hrs. 28 min.
- “heating sequence” (outside the crate: approx. Δ20 °C): half-life period: 2 hrs. 41 min.

[10] IPPC (International Plant Protection Convention), is an international plant protection convention to prevent the introduction and spread of harmful organisms with packing wood. In global trade, the IPPC certification stamp proves that wood treatment is in line with ISPM no. 15 guidelines. hasenkamp is registered as a manufacturer of wood packing materials according to IPPC standard ISPM No. 15 and is regularly tested by the responsible authority.


A closed painting crate „Climate standard“

An open painting crate „Climate standard“

All crate interiors are fully lined with a standard, abrasion- resistant felt. This provides protection against abrasion, if the object comes into contact with the inner surface. Each opening is insulated with two parallel rubber seals. This is how the high tightness between the body and lid is achieved – a basic prerequisite for insensitivity to climatic fluctuations. The cover is fixed by means of bolts, screwed into threaded sheets on the body side. Thanks to the long service life of this locking system, the crate can be opened and closed many times – a great advantage over standard bolted crates. The "Climate standard" design is therefore particularly interesting for touring exhibitions. On the outside, all "Climate standard" crates are lacquered with white paint and thus splash-water repellent. For safe handling of the crate, robust metal folding spring handles, spacer tapes and plastic edge, protection tapes are mounted on the outside. The bottom of the crate is provided with strong sliding tapes. This means, that a crate can be moved even in confined spaces, which is particularly advantageous for crate handling in the depot and when loading in trucks. Sliders and edge protectors also serve as top and guide tapes for lids, so that even large crates can be conveniently opened and securely resealed. The "Climate standard" series is very resilient against the action of mechanical forces. It also protects artworks reliably against climate fluctuations. These multi-purpose crates are characterised by precise production and high quality features. Climate crates are used, when very valuable objects need special protection. Accordingly, they are often used for muse- um loans. Nowadays, it is impossible to imagine airfreight shipments without them. hasenkamp recommends the use of climate crates to protect artworks in the best possible way.

Crates of the „climate standard" series are mechanically extremely robust and offer a very efficient climate insulation


Close-up of the painting crate in "Climate standard" with hinged handle and IPPC certification stamp.

## Rental climate crates

Since climate crates are often used as painting crates, especially for museum loans, hasenkamp has developed a rent- al crate system, that has been tried and tested for several decades. The rental climate crates are used several times and overhauled after each use. If a crate no longer meets the high quality requirements of hasenkamp, it is discarded. By using the hasenkamp rental climate crate system, it is not necessary to build a new climate crate for every transport of paintings. For conscientious handling of resources and finance, you will find your appropriate crate in the hasenkamp inventory. Over the years, we have built a large stock of very well maintained rental climate crates, which we are very happy to offer to our customers.


A closed painting crate "Climate standard".

**In this range, the following sizes are available:**

| Climate crates for rent – sizes | Picture dimensions (max.h x w,cm) | Possible configurations (available in all sizes) |
|---|---|---|
| **S** | 95 x 95 | 1 painting in cushioning corners, 2 paintings |
| **M** | 135 x 135 | in MPP, 3 paintings in MPP |
| **L** | 235 x 235 | 1 painting in cushioning corners, 2 paintings in MPP |
| **XL** | from 236 x 236 (upon request) | 1 painting in cushioning corners |

## Climate crates to purchase

If no suitable rental climate crate is available at hasenkamp, a new climate crate can of course be produced according to customer specifications, taking individual object dimensions into account.

## Series: „variosystem standard“

The patented VarioSystem crates are functionally designed exclusively for two-dimensional artworks.[11] They offer very reliable protection against mechanical forces. In addition, this series have a built-in damper system as standard. This is to counteract against possible shock and vibration loads on the object. Climate insulation is also part of the standard equipment. In terms of shielding against climate fluctuations, the VarioSystem crates even outperform the crates manu- factured to “Climate-standard“. In an Independent test carried out by TÜV-Rheinland (German Technical Supervising Authority, Rhineland branch), the half-live periods were determined were as follows:

- “cooling sequence“ (outside the crate: approx. Δ20 °C): half-life period: 3 hrs. 41 min.
- “heating sequence” (outside the crate: approx. Δ20 °C): half-life period: 3 hrs. 53 min.

However, the unique selling proposition of the Vario System crates is their flexible, shock-mounted, aluminium inner frame.[12] This crate is size-adjustable, so that different painting formats can be transported with one and the same crate. The inner frame consists of four frame legs, which can be flexibly adapted to the frame format of the object via a rail system – this means the height, the width as well as the depth. To secure the painting, it is placed in stable painting corners connected to the aluminium frame. On the inside, the painting corners are lined with a cushion for gentle object storage. At the front, the painting corners are again closed with padded “corner blocks“. In this way, the artwork is protected against dropping.

Very robust crate body. Reliable climate protection. Shock- and vibration-damped, continuously adjustable inner frame. With a variosystem crate, paintings of various sizes can be transported with the best protection – and at an attractive rental price.

[11] Patent no.: 43 18 045 (D) Patent no.: 94 107 400.7 (EU) Patent no.: 5,518,118 (USA)

[12] The patented system was developed together with conservators and thoroughly tested and optimized by TÜV and the Fraunhofer Institute for Material Flow and Logistics (IML).

An open painting crate from the “VarioSystem-standard”.




VarioSystem crates are made of high-quality materials and offer high-precision features. It goes without saying at hasenkamp, that the wood-based materials used are IPPC-certi- fied.13 The crate body consists of a multi-layered, very resistant structure. To make the crates insensitive to moisture, they are painted in several layers. Furthermore, the crate interior is caulked against the crate lid by two parallel rubber seals. The cover is fixed again by means of threaded bolts, screwed into the threaded sheets on the body side. The lid can therefore be easi- ly opened and closed. The positive fit and contact pressure of the cover, in addition to the insulation elements, ensure reliable shielding of the ambient climate. Constructive top and lid guide tapes at the bottom and sides of the crate facilitate safe handling of the crate lid. Easy-to-reach folding spring handles make are attached for crate handling. To move the crate even in confined spaces, as can sometimes become necessary in the depot or when loading on the truck, the crates are underneath equipped with skids. No additional packing material is required for a VarioSystem crate, making this crate series one of the most sustainable packing concepts in the hasenkamp portfolio – it is both resource-saving and economical. With its underlying rental concept and system flexibility, the new production of an object-specific crate is no longer necessary – at least for objects of common formats and sizes.


A closed painting crate from the “VarioSystem-standard”.

**The “VarioSystem standard” comes in the following configurations:**

| variosystem-crates (h x w x d) | Size S | Size M | Size L | Size XL |
|---|---|---|---|---|
| **min. painting dimensions (cm)** | 45 x 40 x 2,5 | 65 x 50 x 2,5 | 90 x 100 x 2,5 | 155 x 137 x 2,5 |
| **max. painting dimensions (cm)** | 100 x 100 x14 | 118 x 120 x 14 | 159 x 180 x 14 | 196 x 217 x 14 |
| **External crate dimensions (cm)** | 149 x 146 x 45 | 165 x 165 x 45 | 209 x 225 x 45 | 240 x 264 x 45 |
| **Tara (kg)** | 125 | 145 | 225 | 236 |

[13] IIPPC (International Plant Protection Convention), is an international plant protection convention to prevent the introduction and spread of harmful organisms with packing wood. In global trade, the IPPC certi- fication stamp proves that wood treatment is in line with ISPM no. 15 guidelines. hasenkamp is registered as a manufacturer of wood packing materials according to IPPC standard ISPM No. 15 and is regularly tested by the responsible authority.

## Series: “Q+Standard“

At hasenkamp, the highest quality crate series is defined with the “Q+Standard”. Q+Crates offer the highest possible mechanical and climatic protection. They are always used, when objects are particularly valuable and/or have very special protection requirements due to their sensitivity. Q+Crates can be produced for all object sizes and weight classes in crate type painting crates. Here, too, the property requirements and customer wishes are always taken into account. The patented Q+Crates are only available on a rental basis.[14] The essential crate features result from an extremely robust body in multi-layer construction. Furthermore, the Q+Crates always have an inner frame and inner crate in “hasenkamp standard”. The inner frame and inner crate are part of the multi-layered, coordinated protection concept. Several damp- ers are installed between the inner frame and the inner crate, depending on the weight of the object and the crate size. The inner crate is mechanical decoupled from the outer crate. Possible shock and vibration events are thus reliably absorbed– and the object loads are reduced to a minimum. Q+Crates also have unrivalled climate stability. Here, an efficient dual strategy is followed in favour of the best possible object protection – hygroscopic active materials on one hand and highly, thermally insulating materials on the other. The insulation elements are special vacuum panels. They are used to line all crate walls and lids in a double layer over their entire surface, with offset joints and form-fitting. In principle, this follows the function of a thermos flask, as heat transport via convection flow is not possible in a vacuum room, so that the best insulation values can be achieved. This makes the crate particularly suitable for use in airfreight transport.

[14] Patent-Nr.: 1403193 (EP) Patent-Nr.: 7140508 (USA)






The unsurpassed shielding of the crate interior against even serious climate fluctuations could be proven in an independent test by TÜV-Rheinland (German Technical Supervising Authority, Rhineland branch). For this purpose, the half-life period was determined, although it should be noted that the prognostic values were overachieved due to the extremely reliable climate insulation. The shielding of climatic fluctuations was too good to allow the usual evaluation period of 24 hours to determine the half-life period:

- “cooling sequence” (outside the crate: approx. Δ20 °C): half-life period: 26 hrs. 30 min.
- “heating sequence” (outside the crate: approx. Δ20 °C): half-life period: 26 hrs. 00 min.

The Q+Crate also offers a protective effect in the worst pos- sible accident – a fire incident. In tests for external fire expo- sure, the Q+Crate could be classified as fire resistant. In a com- bustion chamber, it withstood a load of over 700 °C for almost an hour. Only after 55 minutes did the temperature inside the crate rise to over 50 °C.

A closed painting crate in “Q+Standard”.

Q+Crate fulfill premium quality requirements. In addition to the extremely high manufacturing precision, the materials used play a decisive role. The wood-based materials are entirely IPPC-certified.[15] We also attach great importance to small de- sign details. By adding them together, the best possible protection and optimum manageability of the artworks can be guaranteed. An example is the water-repellent exterior coating of the Q+Crates. Double-guided lid seals are used to seal the crate against environmental influences. As is usual with high- quality hasenkamp crates, the lid is closed with machine screws and threaded sheets – the crates are designed for a long ser- vice life. They are therefore particularly suitable for transports of exhibition tours. The crates can be opened and resealed with reliable tightness. To protect the slightly protruding lid screw heads, robust spacer tapes are fitted on the outside of the crate.

At the same time, they allow a force-locked and thus safe fix- ing of the crate to the truck interior. Strong edge protection tapes are also fitted along the corners of the crate. When the lid is open, these protrude around the depth of the lid, so that they serve as a guide when the lid is closed. Sliding tapes are also fitted underneath the crate. They make it possible, to move the crates even in confined spaces, e.g. in the museum depot or when loading in an art truck. The sliding tapes also protrude slightly when the lid is open, which makes them the guide rail of the lid. This facilitates the handling of crate and lid and thus providing a high degree of safety. For safe handling, the Q+Crates also have strong folding spring handles. In the case of large crate formats, these are also attached to the lid – because sometimes the crate lids also have high tara. Especially devel- oped crate lifters are available for very heavy Q+Crates.

The high-end q+crate offers exceptional object protection! Extremely robust against mechanical forces, fire-resistant and unsurpassed in terms of protection against climate fluctuations, they also feature a damper system as standard.


An entirely opened painting crate in “Q+standard“ (outer and inner crate).

[15] IPPC (International Plant Protection Convention), is an international plant protection convention to prevent the introduction and spread of harmful organisms with packing wood. In global trade, the IPPC certification stamp proves that wood treatment is in line with ISPM no. 15 guidelines. hasenkamp is registered as a manufacturer of wood packing materials according to IPPC standard ISPM No. 15 and is regularly tested by the responsible authority.


An open painting crate in “Q+Standard“ with the interior crate still closed.


# Climate performance of the hasenkamp crates

The “Climate standard”, “VarioSystem standard” and “Q+- Standard” series have been extensively tested to prove the performance of the hasenkamp crates. Their independent testing was carried out by TÜV-Rheinland (German Technical Supervising Authority, Rhineland branch). It was examined, to which extent the crates can shield larger temperature fluctuations and whether a preferably constant, relative humidity can be maintained in the crate interior. With the aim of comparability, the term half-life period has established itself in the museum sector to describe the efficiency of climate crates.[16] In the present case, too, the same was determined. For reasons of transparency and in order to depict to the reality of the logistics processes, hasenkamp crates were subject to climate tests, which had already been used on museum objects. In simulating the climate impacts, the worst-case scenario in an art transport was deliberately selected. It is conceivable, for example, to refuse access to a crate, standing unprotected on the airport tarmac. In order to illustrate loading scenario and to prove the performance of the hasenkamp crates, the crates were exposed to extreme climatic stress in a climatic chamber. Starting from the usual museum climate at 20 °C, 55 % RH, a test run simulated a temperature drop to 0 °C (“cooling sequence”). In another test, however, the climate followed a significant increase in temperature to 40 °C (“heating sequence”) – again based on the museum climate. Using precisely calibrated data loggers, the climate data inside and outside the crates were electronically recorded and subsequently evaluated. Under the described extreme climatic conditions, roughly corresponding to the annual mean of Moscow and Abu Dhabi, the following half-live periods were determined:

| Cooling sequence | Climate fluctuations | | | | |
|---|---|---|---|---|---|
| | (in climate chamber) | (in crate) | | | (in courier case) |
| | | Climate standard | VarioSystem standard | Q+ standard | Courier case climate standard |
| **Starting point** | 20 °C / 55 % RH | 20 °C / 55 % RH | 20 °C / 55 % RH | 20 °C / 55 % RH | 20 °C / 55 % RH |
| **End point (after 24 hours)** | 0 °C / (71 % RH, uncontrolled) | 0 °C / 45 % RH | 0 °C / 46 % RH | 11 °C / 50 % RH | 0 °C / 45 % RH |
| **Reached half-life period (10 °C)** | | 2 h 28 min | 3 h 41 min | (26 h 30 min) | 2 h 17 min |
| **Reached half-life period (10 °C)** | | 9 h 53 min | 16 h 58 min | / | 9 h 25 min |

| Heating sequence | Climate fluctuations | | | | |
|---|---|---|---|---|---|
| | (in climate chamber) | (in crate) | | | (in courier case) |
| | | Climate standard | VarioSystem standard | Q+ standard | Courier case climate standard |
| **Starting point** | 20 °C / 55 % RH | 20 °C / 55 % RH | 20 °C / 55 % RH | 20 °C / 55 % RH | 20 °C / 55 % RH |
| **End point (after 24 hours)** | 0 °C / (71 % RH, uncontrolled) | 40 °C / 60 % RH | 40 °C / 60 % RH | 29 °C / 59 % RH | 39 °C / 62 % RH |
| **Reached half-life period (10 °C)** | | 2 h 41 min | 3 h 53 min | (26 h 00 min) | 3 h 48 min |
| **Reached half-life period (10 °C)** | | 11 h 17 min | 19 h 28 min | / | / |

The values clearly prove the high performance of the crates. From a conservation point of view, the values for relative humidity are particularly important, since fluctuations in humidity are generally much more harmful to artworks than fluctuations in temperature. The TÜV investigations proved positively, that over the complete evaluation period of 24 hours, for all crate construction methods, only slight or very slight changes in relative humidity were detectable inside the crates.[17] The maximum changes inside the crates for the three crate series were:

| | Fluctuation rate of relative humidity | |
|---|---|---|
| | „Cooling Sequence“ | „Heating Sequence“ |
| **Painting crate “Climate standard“** | Δ 10 % RH | Δ 5 % RH |
| **Painting crate “VarioSystem-standard”** | Δ 9 % RH | Δ 6 % RH |
| **Painting crate „Q+standard“** | Δ 5 % RH | Δ 4 % RH |
| **Courier case “Climate standard“** | Δ 10 % RH | Δ 7 % RH |
| **Climate chamber** | Δ 16 % RH | Δ 29 % RH |

For comparison: Outside the hasenkamp crates, the relative humidity fluctuated by up to 29 % RH. If the artwork had been unprotected, the enormous strain would most probably have entailed climate damage.

[16] Originally borrowed from physics, the term half-life describes radioactive decay. In the context of crate tests, the loading conditions have a significant influence on the „half-life“ determined. In art logistics, however, there is no standard that defines the starting point, the end point and the load duration. Without a doubt, however, there is a diffe- rence whether the range of a climatic load is between 20° and 10 °C (Δ 10 °C), or whether it is twice as large and opens up between 20° and 0 °C (Δ 20 °C). In the first case the half-life is determined at 15 °C, in the second case at 10 °C. Due to different initial and final temperatures, as well as the spans, the half-lives of the climate crates offered by the art logistics companies are actually not comparable with each other. This is why hasenkamp has decided to test the load factor in a „real-case scenario“.

[17] For comparison: The measurement uncertainty of hygrometric standard data loggers is already approx. 2 % RH.

# The hasenkamp crate extensions & underneath substructures

## Anti-tilt protection

High crates with a narrow footprint are subject to a high risk potential. Due to the unfavourable centre of gravity, they can easily fall over. This is especially significant for painting crates. An anti-tilt here serves to prevent damage. Attached to the front of the crate body, two triangular boards increase the depth of the crate – and the danger is considerably reduced. It should be noted, that crates equipped with an anti-tilt are only partially suitable for airfreight. They cannot be palletized with other crates in a form-fit manner. Likewise, lashing to the side wall of the truck is not possible. For the above-mentioned reasons, there are anti-tilts that can be reversibly attached to the crate by means of a threaded screw connection and can also be released. If the crate is otherwise secured, the anti-tilts are unscrewed or screwed on again before it is unsecured.

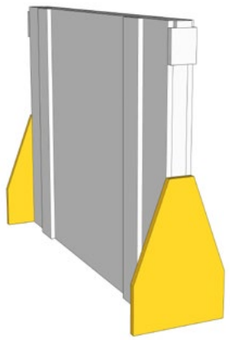


Illustration of an anti-tilt protection.

anti-tilt protection – a small measure with a high effect.

## Pallets

hasenkamp pallets are used for safe handling of heavy objects or for transports, loaded by crane. The objects can be transported directly on a pallet, well secured. This is a way to haul outdoor sculptures – even without a crate enclosure. In addition, all hasenkamp crate variants can be firmly connected to a pallet, to build a secure unit. hasenkamp pallets are made to order. In order to be driven under with a lifting device, the pallets must have a minimum depth of 80 cm. Only IPPC-certified woods are used as materials.[18] Three pallet series are available. Their main distinguishing features are crane handling and loading capacity.

## ProArt pallet

A “ProArt” pallet is the cheapest and simplest type of a hasenkamp pallet. It consists of a double-layer carrier plate with inclined, underside pallet blocks, so-called skids, to make the pallet easily moveable. Its maximum standard dimensions are 240 x 120 cm – in addition, our in-house carpentry designs any kind of special solution.

hasenkamp pallets – a pragmatic solution for heavy and extremely heavy loads

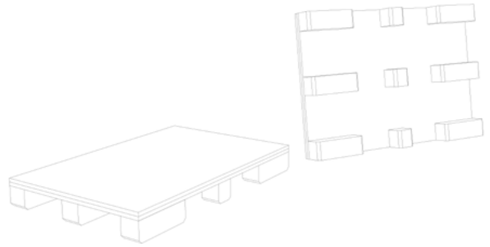


Illustration of a ProArt pallet.

| | |
|---|---|
| **Admissible surface load** | 0,5 t |
| **Pallet base height** | approx. 14 cm |
| **Pallet truck** | yes, 4-ways |
| **Craneable** | no |

[18] IPPC (International Plant Protection Convention), is an international plant protection convention to prevent the introduction and spread of harmful organisms with packing wood. In global trade, the IPPC certification stamp proves that wood treatment is in line with ISPM no. 15 guidelines. hasenkamp is registered as a manufacturer of wood packing materials according to IPPC standard ISPM No. 15 and is regularly tested by the responsible authority.

[19] For this purpose, the specifications of the airline must be requested in ad- vance. The regulations are subject to regular change, so

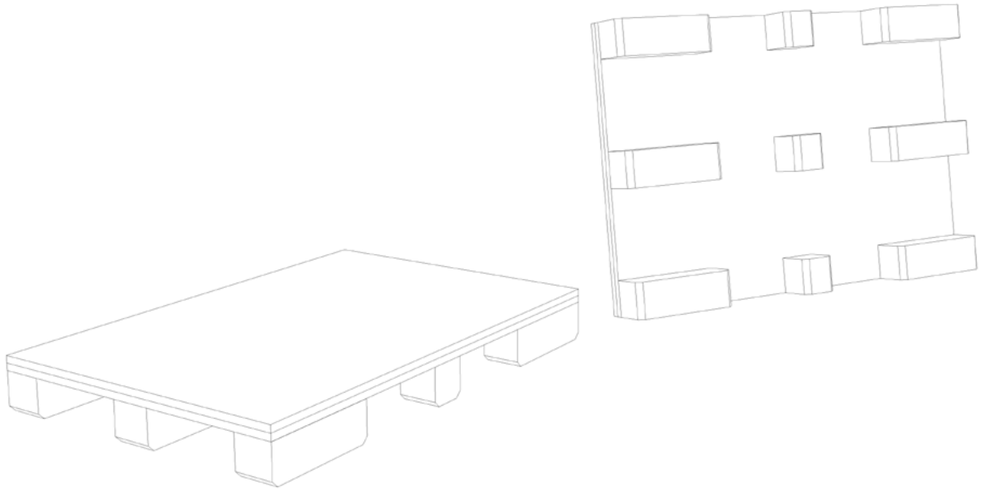


Illustration of a hasenkamp standard pallet.

## hasenkamp standard pallet

“hasenkamp standard” pallets are the most frequently used pallet types. They are comparatively inexpensive and have a high loading capacity. They follow the European pallet design. The pallet base consists of a double-layer, stable carrier plate. This is stored on pallet blocks, framed with transverse beams for even load distribution. The base beams are made from screen printing plate, for the pallet to be slipped, if the weight allows. “hasenkamp standard” pallets can be produced in any size.

| | |
|---|---|
| **Admissible surface load** | 1,5 t |
| **Height pallet base** | approx. 15 cm |
| **Pallet truck** | yes, 4-ways |
| **Craneable** | no |

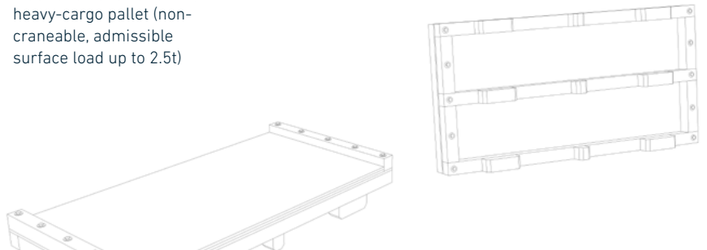




## Heavy-cargo pallet

As the name implies, the heavy-cargo pallet is an extremely robust pallet construction, supporting extreme loads. It is also available in two versions. These differ in terms of loading capacity, lift truck access and possible crane handling. A heavy-cargo pallet consists of a multi-layered, extremely robust carrier plate laterally framed by stable beams. Furthermore, the non-craneable variant is underlaid with skids (variant A), whereas the craneable variant is equipped with a further layer of cross beams; therefore it only offers lift truck access on two sides (variant B). Heavy- cargo pallets can be produced in any conceivable size.

Illustration of a variant A, heavy-cargo pallet (non-craneable, admissible surface load up to 2.5t)



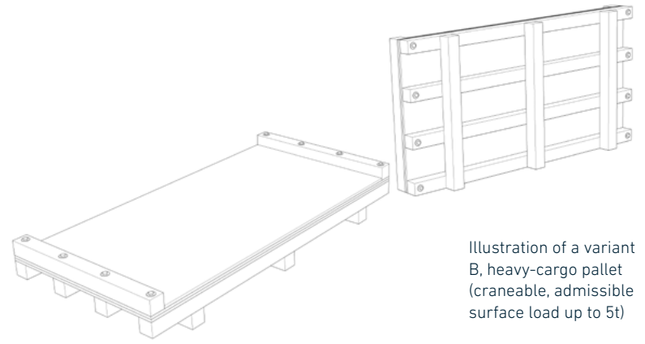


Illustration of a variant B, heavy-cargo pallet (craneable, admissible surface load up to 5t)

| Vacuum cushion sizes | A | B |
|---|---|---|
| **Admissible surface load** | 2,5 t | 5,0 t |
| **Height pallet base** | approx. 24 cm | approx. 26 cm |
| **Pallet truck** | yes, 4-ways | yes, 2-ways |
| **Craneable** | no | yes |




# The hasenkamp roll system

The hasenkamp roll systems meet the requirements for maxi- mum mobility and best possible protection. They are designed as rollable, easy-to-use, collection containers for two- and three-dimensional artworks. With their robust structure, they can easily withstand permanent loads, as sometimes occur in museum and depot moves, as well as in temporary exhibitions. For our roll systems, we offer rental systems distinguishing themselves with their adaptation to economic and ecologic needs: their multiple use can significantly reduce the consump- tion of packing materials. hasenkamp roll systems are available in two variants – the Artcase and the Artcontainer.



## The artcase

A hasenkamp Artcase is a rollable crate system, designed like a chest. Thanks to its composite materials with aluminium, wood and plastic, it is resilient against mechanical forces. All its walls are fully padded on the inside. Artcases can be modularly adjusted in height, according to transport requirements, by means of intermediate rings. The following variants are available:

Artcase: the mobile, easy-to-handle transport case for collection movements and trade fair set-up

| Artcase-variants | Size S (chest) | Size M (chest + 1 intermediate ring) | Size L (chest + 2 intermediate ring) |
|---|---|---|---|
| **Inner dimensions (h x w x d, cm)** | 89,0 x 149,5 x 71,5 | 140,0 x 149,5 x 71,5 | 190,5 x 149,5 x 71,5 |
| **Outer dimensions (h x w x d, cm)** | 110 x 157 x 79 | 161 x 157 x 79 | 211 x 157 x 79 |
| **Tara (kg)** | 60 | 85 | 108 |

The body, any intermediate rings and the lid are securely connected using butterfly quick-release fasteners. The system is also used with a lot of flexibility in practice. Two persons can easily carry out opening and closing, insertion and removal of intermediate rings. A seemingly complex collection move- ment or even the construction and dismantling of an art fair become rather easy with the hasenkamp Artcase. They are loaded from the upside, which makes them ideal for the transport of paintings in softpacking. The objects can be separated by cardboard sheets and potential cavities filled with cushions, before the Artcase is closed. Nothing else to do, as the strong body provides a good mechanical protection.


An open Artcase with intermediate rings on the sides and a lid (Size L).


A closed Artcase (Size L).

## The artcontainer

hasenkamp Artcontainers are rollable crate systems in cabinet construction – i.e. they can be opened from the front. Thanks to their design features and materials, they support strong mechanical loads. In addition, the interior is equipped with a full-surface thermal insulation, followed by a padding layer. This enables reduction of potential climatic and mechanical loads. Since Artcontainers are often used for the movement of three- dimensional artworks, the interior of an Artcontainer follows the dimensions of the hasenkamp special cardboard system. Optional, two shelves can be used to create three sections. Accordingly, two types of container variants are available:

Artcontainer: the all-rounder – mobile, easy-to-load with significant protection against mechanical and climatic influences.

| Artcontainer variants | Size S | Size M |
|---|---|---|
| **Configuration** | 2,9 hasenkamp system cardboard boxes (3 x 3) t | 12 hasenkamp system cardboard boxes (4 x 3) |
| **Inner dimensions (h x w x d, cm)** | 160 x 119 x 75 | 160 x 156 x 75 |
| **Outer dimensions (h x w x d, cm)** | 192 x 131 x 86 | 192 x 170 x 87 |
| **Max. base load (kg)** | 250 | 250 |
| **Max. shelf load (kg)** | 100 | 100 |
| **Tara (kg)** | 184 | 244 |

If the objects are not packed in cardboard boxes, the load can also be secured using lashing eyes and straps.


An open Artcontainer (Size S).


A closed Artcontainer (Size S).

# The hasenkamp courier case

## The courier case

The hasenkamp courier case is used, when the transport of small, highly valuable objects requires complete, visual courier monitoring. In practice, courier cases are used for smaller valu- ables, such as reliquaries or cabinet pieces, valuable graphics and sometimes also small-format paintings. In addition to road transport, courier cases are often used for art trans- ports by plane. The courier case can be carried into the aircraft passenger compartment, up to the maximum permitted size of hand luggage.[19]

In consultation with the loading supervisor, the courier case is separately secured in the luggage compartment or stowed on a specially booked seat for the object, to allow for continuous supervision by the courier. Courier cases are manufactured to order, taking into account individual object and customer requirements. Various interior fittings such as cushioning layers, thermal insulation materials and hygroscopic active materials are available.

Courier cases – literally a handy, supervised packing and transport solution for valuable objects.

that no general rule applies. However, it is also possible to book a separate seat for the suitcase; in this case, larger dimensions may be allowed.



Current researches revealed, that hasenkamp courier cases protect excellent against climate fluctuations. The courier case is completely coated with multiple insulation layers in the interior. Hygroscopic active materials regulate the relative humidity. The effeciency of the hasen- kamp courier case was proven by independent researches of the TÜV Rheinland. The resistance against climate fluctuations os indicated with the following half-life period:

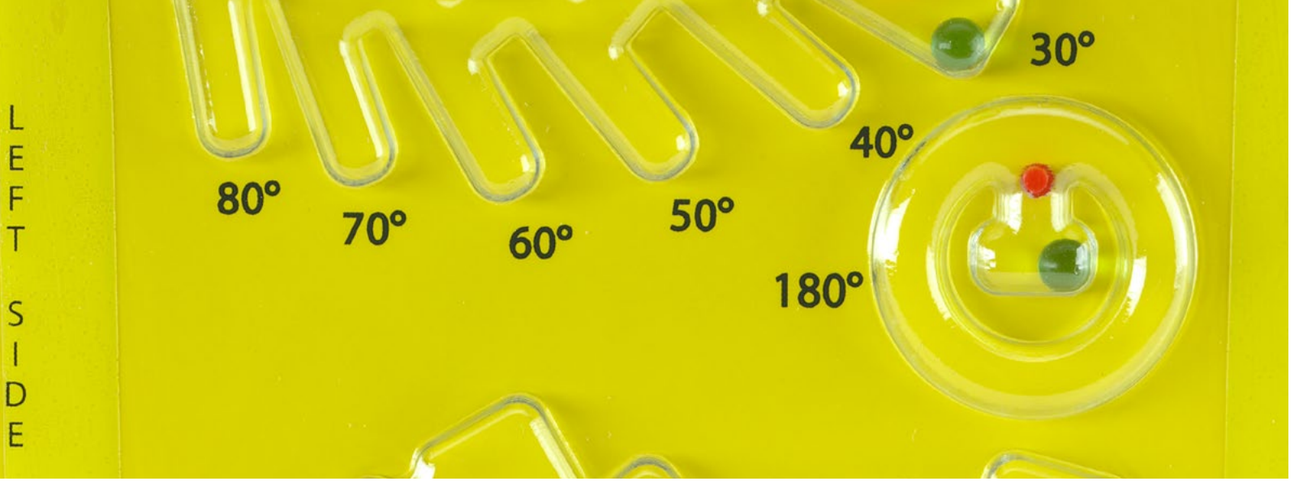
| | | Half-life period |
|---|---|---|
| **„Cooling Sequence“ (outside the courier case)** | ca. Δ 20 °C | 2 Std. 17 Min. |
| **„Heating Sequence“ (outside the courier case)** | ca. Δ 20 °C | 3 Std. 48 Min. |

All types of courier cases have a strong construction. Thanks to their metal-reinforced edges and torsion-resistant bodies, courier cases are resilient against mechanical forces. In order to protect the case from dust and splash water, the outer surface is covered with resistant hard plastic film. For safe operation, carrying handles are attached to the outside, their number and position being defined by the customer. At hasenkamp, we offer courier cases in the below maximum dimensions, but larger special productions are always possible. However, very large courier cases proved to be impractical – in such cases, the use of other packing solutions is recommended.

| courier case type | maximum outer dimensions (h x w x d cm) |
|---|---|
| **a) Vertical transportation – two-dimensional artwork** | 60 x 70 x 25 |
| **b) Horizontal transportation – two-dimensional artwork** | 25 x 60 x 50 |
| **c) Open-angle – three dimensional objects** | 50 x 50 x 50 |

A closed courier case (vertical position).

An opened courier case with a graphic, wrapped in Tyvek (horizontal position).




# The hasenkamp accessories

## Tilt and position indicator

Tilt indicators are used for the verification of correct, usually upright position during the movement of goods. If the crate is tilted above an angle defined in the specification, this is immediately and irrevocably visible via the indicator by means of a permanent colour change. With the standardly used tilt indicators, the critical tilt angle corresponds to 83°. There are also position indicators with a qualified tilt angle display in the range of 30 - 80°. They also indicate an upside-down position (180°). A position indicator is equipped with a specific rail, where a non-magnetic ball interlocks upon inclination.


Tilt indicator to prove the correct transport position.


A tilt indicator with inclination display.

Tilt and position indicators:
a simple variant for the proof of correct positioning during transportation.





The indicators are usually attached to the outside of the crate. They are provided with a visible serial number. If noted on the transport document, an improper position becomes immediately obvious, as it allows no exchange.

## Data logger

When highly sensitive objects are moved, a data logger can be added to monitor the transport process upon customer's request. The recording enables to evaluate any climate fluctu- ations. As a general rule, the loggers are placed in the sealed crate, close to the artworks. Due to increasingly strict airfreight safety regulations, certain types of batteries and rechargeable batteries may no longer be used in airfreight. hasenkamp has carried out an evaluation and uses loggers, which are also suit- able for transport by plane.

Data logger for the evaluation of transport processes.

**Example of a data logger**

| General | external, permanently connected temperature and humidity sensor with dew point display |
|---|---|
| **Dimensions** | 149 x 53 x 27 (h x w x d, mm) |
| **Airfreight suitable** | yes |
| **Power supply** | 3 x AlMn Typ AAA |
| **Measuring cycle** | 10 sec - 24 h, relative humidity: 0 to 100 % RH |


Data logger for the evaluation of transport processes

## Thank you for your interest in the hasenkamp product portfolio.

Of course, the present catalogue can only provide an overview of the variety of packing materials, crate variants and possible interiors. The appropriate packing, transport and storage of art always follows object-specific aspects. In art logistics, for example, the principle of "goods – route – packing" generally applies. In order to find the best possible, individually adapted logistics solutions for you and your properties, hasenkamp experts will be happy to advise you. We also provide assistance in customs and/or insurance matters. You will find our contact details in the following contact overview – we look forward to hearing from you.

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