

**LINING
MATERIALS**



ISOKON is part of the European chemical and rubber processing industry, and is one of the leading companies in its field.

We are a **Member of *Constantia* Industries AG**. We are a subsidiary of Isosport GmbH, from Eisenstadt, Austria. Our company headquarters are located in Slovenske Konjice, Slovenia.

The beginnings of our production and processing of PE and PP plastics into intermediate goods and final products reach back into the year of 1975. The company operates in compliance with an International Quality Management Standard ISO 9001.

Our strengths:

- Customer relations and partnership building,
- Our own development, strong engineering support and consulting services, as well as adaptability to the needs of our customers,
- Large compression-moulded polyethylene (PE) and polypropylene (PP) sheets from our own production for processing into products using CNC machine tools,
- Production of complex products according to plans, models and samples provided by customers using our own and third-party intermediate goods, as well as the possibility of using recycled products,
- Mixed materials of specific quality in accordance with customer's requirements regarding their intended use, dimensions and colour, which reflects as flexibility required, for small batches,
- Technology development projects



Company strengths

Our high degree of adaptability to the needs of our customers, as well as our quality and prices set us apart from our competition.

We are a partner in all branches of industry.

We build upon our plastics processing tradition with our experience and newly acquired knowledge and adapt to the needs of our customers and future requirements through computerized processing.

Our intermediate goods and final products under the KOTERM® trademark are used in mining and bulk material transport:
lining of silos, bunkers, chutes and discharge and transport equipment.



Materials

The choice of material is crucial to lining effectiveness. The range of suitable materials and sizes we offer is exceptional. The polyethylenes of ultra-high molecular weight, also known as PE1000 or PE9000, are the preferred choice for lining. Additives are used to enhance their basic characteristics, thus adapting them even further to specific purposes.

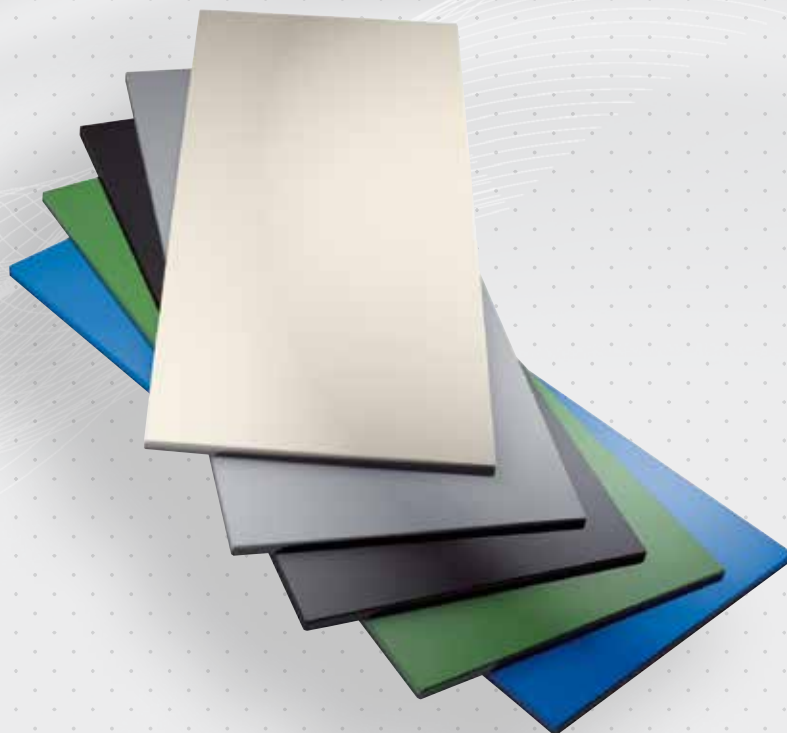
- ▶ **Koterm X-slide**
- ▶ **Koterm PE 1000**
- ▶ **Koterm PE 1000R**
- ▶ **Koterm PE 500**

Thickness 8 -20 mm

Sheet size in mm. **2500 x 6100, 1020 x 2020, 1220 x 3030, 1020 x 6100, 1220 x 6100**

We offer a wide selection of standard colours:

- **natural – white**
- **black**
- **green**
- **grey**
- **blue**



We also offer custom colours and dimensions according to the customers' wishes.

Lining

In many industries where bulk materials are produced, stored, transported and processed, stoppages are very common and inconvenient.

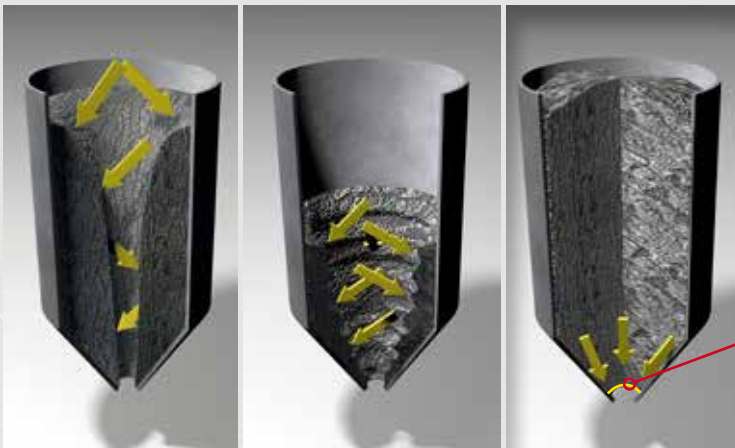
DIFFICULTIES

- ▶ Work is often interrupted when using bulk materials due to adhesion and clotting, especially at low temperatures.
- ▶ This happens due to the inadequate friction ratios between the wall and the poured material, which prevents the material from being poured out evenly.
- ▶ This causes blockages and stoppages.

ISOKON has over 30 years of experience in resolving these problems

SOLUTION

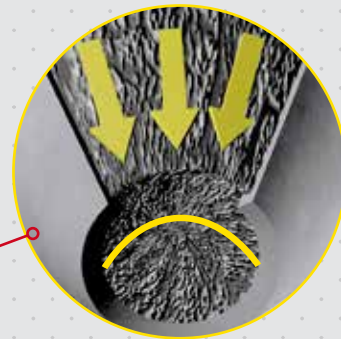
- ▶ Due to their excellent sliding properties, linings using KOTERM® materials reduce the possibility of sticking to the walls and has a key impact on the flow properties of bulk materials.



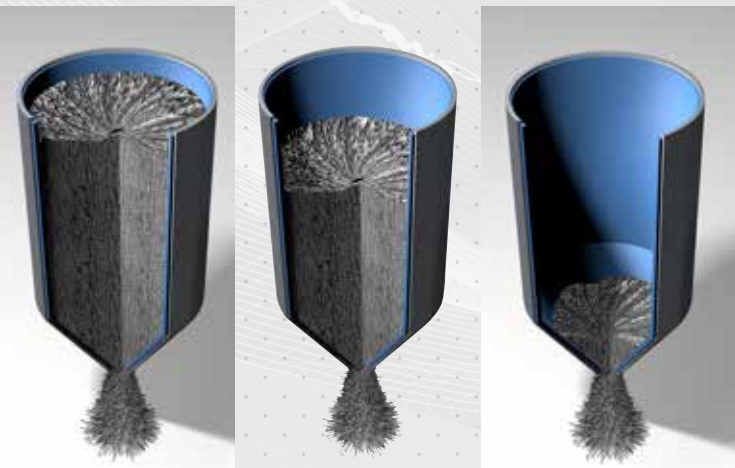
Ratholing effect

Caking effect

Bridging effect



Ideal – expected silo discharge



Ratholing effect – only part of the material inside the silos moves towards the discharge opening, while the stagnating material reduces the effective volume of the silo

Bridging/Arching – the material randomly forms an arch, thus preventing the discharge of the remaining material

Caking – the material clots and reduces the effective volume of the silo

Fields of application

Mining

- Off Road Truck Beds
- Chutes
- Hoppers
- Scrapers
- Shovel liners
- Stacker/Reclaimer Bucket Liners
- Dragline Bucket Liners
- Front-End Loader Buckets

Transportation

- On-Road Truck Beds
- Railcars/Wagons
- Ship Holds

Storage and Handling

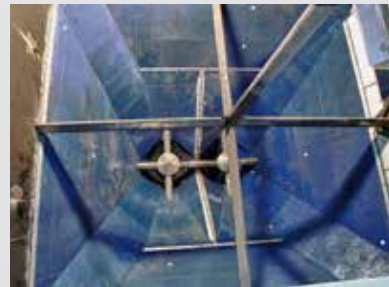
- Silos, Bins, Bunkers
- Reclaim Hoppers
- Truck Dump Hoppers
- Rail Dump Hoppers
- Receiving Hoppers
- Dozer Blade Liners
- Slider Beds
- Skirting
- Belt Scrapers

Processing

- Day Bins
- Surge Bins
- Batch Hoppers
- Storage Silos and Bins
- Hoppers
- Chutes
- Feeders
- Screw Conveyors

Bulk materials handled

- Coal
- Iron ore
- Clay
- Copper concentrate
- Limestone
- Soda ash
- Chemical powders
- Nickel ore
- Peat
- Synthetic gypsum
- Kaolin clay
- Silica sand
- Wood chips
- Soap detergent
- Potash
- Zink concentrate
- Phosphate
- Salt
- Dust
- Talcum
- Bauxite
- Asphalt



Advantages

High- and ultra-high-molecular-weight high-density polyethylene is distinguished by a number of specific properties

Material properties

due to the excellent physical properties of the material:

- high impact toughness up to -200°C
- very low coefficient of friction
- hydrophobicity
- self-lubrication
- exceptional service temperature range of -200°C to +180°C
- very good specific electrical resistance and dielectric strength
- physiological soundness (most of materials are FDA-approved)

Using additives, the properties of the material are even further adapted for its intended use.

Protection of wagons, cargo containers, truck beds, trailers, intake and outpouring locations, docks

Material wear resistance index

The index informs us of the material's resistance to wear, and even though abrasion does occur over time, it is reduced to the extent that the investment in the lining soon pays for itself.

Aluminium in particular is extremely soft and is not very resistant to wear, but is still being used due to its low mass and relatively high hardness and rigidity.

Excellent SLIDING PROPERTIES

prevent materials from sticking to KOTERM®; this is further prevented by the permanent ability of the material to self-lubricate.

CHEMICAL RESISTANCE

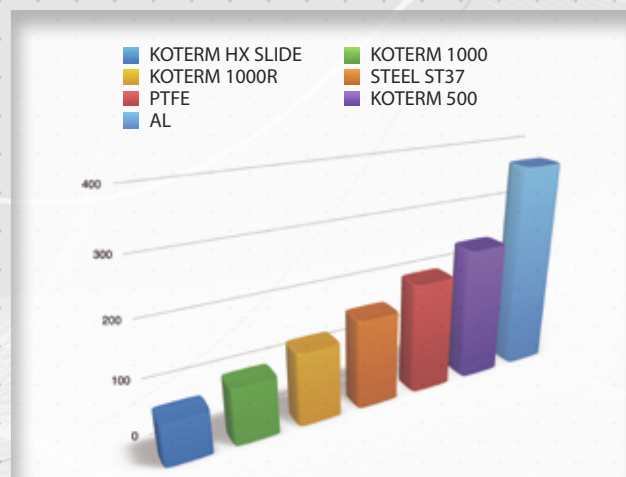
The chemical resistance of KOTERM® increases the useful life of the base material.

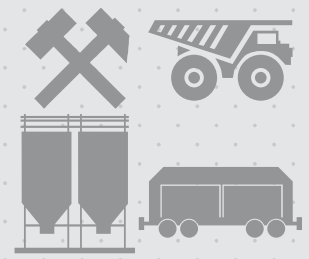
WEAR PROTECTION

With their exceptional wear and abrasion resistance, KOTERM® materials effectively protect the base material

INSULATION

All KOTERM® materials have excellent thermal and electrical insulation capabilities, and thanks to special additives, they are also antistatic. In addition, the material is naturally sound-absorbing.





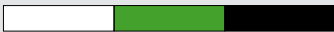
KOTERM HX-SLIDE (blue)

- PE-UHMW with excellent wear and abrasion resistance compared to KOTERM 1000
- Improved sliding properties
- Withstands loads as hot as 180 °C (including hot asphalt)



KOTERM 1000 (natural, green, black)

- PE-UHMW with balanced properties
- Very good wear and abrasion resistance
- Good sliding properties
- Excellent impact properties
- FDA approved



KOTERM X-SLIDE (black)

- PE-UHMW with balanced properties
- Very good wear and abrasion resistance
- Excellent sliding properties



KOTERM 1000 FR (black, silver)

- PE-UHMW with balanced properties
- Very good wear and abrasion resistance
- PE-UHMW with self-extinguishable properties
- meets requirements of UL 94 class V0



KOTERM 1000 FREX (black)

- PE-UHMW with balanced properties
- Very good wear and abrasion resistance
- PE-UHMW with self-extinguishable properties (UL 94 class V0)
- antistatic



KOTERM 1000 AST (black)

- PE-UHMW with balanced properties
- Very good wear and abrasion resistance
- PE-UHMW with lower surface resistivity



KOTERM 1000 R (black –reprocessed)

- Overall lower properties and lower cost compared to the virgin KOTERM 1000
- A favorable price-performance ration for less demanding applications



KOTERM 500 (natural, green, black)

- For less demanding applications with respect to wear and impact resistance
- KOTERM 500 may present an economical alternative to KOTERM 1000



	KOTERM HX-SLIDE	KOTERM 1000	KOTERM X-SLIDE	KOTERM 1000 FR	KOTERM 1000 FREX	KOTERM 1000 AST	KOTERM 1000 R	KOTERM 500
Wear resistance	+++	++	++	++	++	++	+	+
Sliding properties	+++	++	+++	++	++	++	+	+
Flammability	-	-	-	+++	+++	-	-	-
UV resistance	+++	optional	++	optional	optional	++	optional	optional
Service temp. °C continous	-250..110	-250..80	-250..80	-250..80	-250..80	-250..80	-250..80	-250..80
Service temp. °C shortly	-250..180	-250..130	-250..130	-250..130	-250..130	-250..130	-250..130	-250..130

+++ excelent ++ good + moderate ≈ optional - not good

Lining Techniques

The appropriate material, fixing method and working conditions are selected according to the type of lining and the desired improvement to ensure the best results.

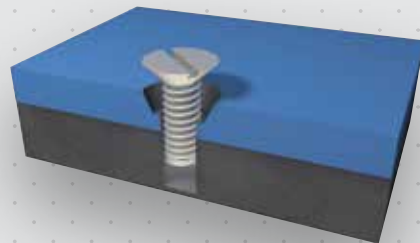
Polyethylene sheets must be cut to the required dimensions and then fixed using one of the methods below or a combination of them. The most appropriate type of joint is selected according to the lining requirements, the type of medium and the level of complexity.

The fixing method depends on the base material and allowable deformations or visible damage. KOTERM® fixing points can be masked using a cap fixed inside the hole, or the screw head can be visible. Aluminium or stainless fixing elements are used if necessary.

Direct screwing

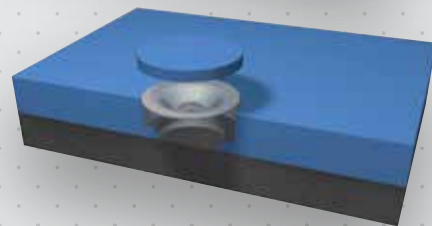
Screwing onto the base is the basic method of fixing.

Different options can be used, depending on the specific process.



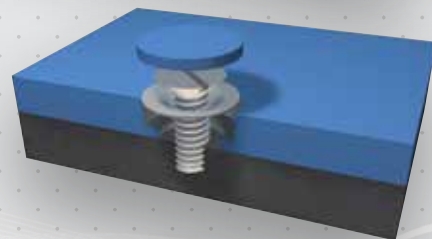
Weld stepped washer

is suitable for a wide range of applications. When the base is made of a weldable material, it can be welded onto it, otherwise it is bolted in.



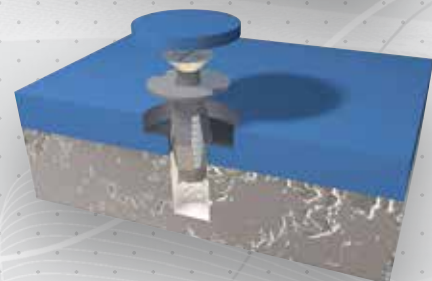
Bolt stepped washer

the screwing can be carried out in a number of different ways, either by threading the base material or using a nut.



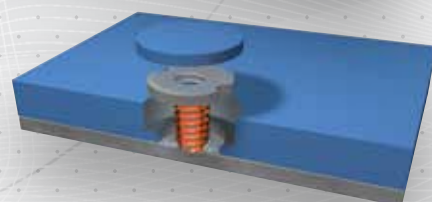
Screwing into concrete

Fixing to concrete bases is carried out using expansion bolts or special adhesives.



Stud welding

A method where the shank of a special screw is welded onto the base and the plastic is fixed using a purpose-made nut.



Fixing techniques

There are many different methods for fixing lining. For most applications, the most reliable and suitable method is welding threaded screws onto the construction and creating graduated holes in the plastic.



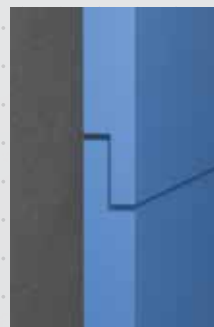
The basic type of joint is the simplest and quickest and is always an option.



Angled joints are suitable for wall lining (silos, walls), where the material slips continuously unilaterally.



Batten joints are suitable for floor applications, where it is required to retain the partial dilatation of the material while preventing the material from making contact with the floor.



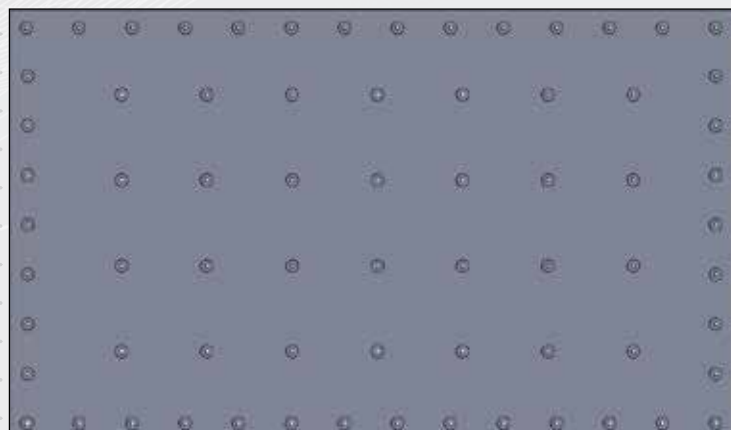
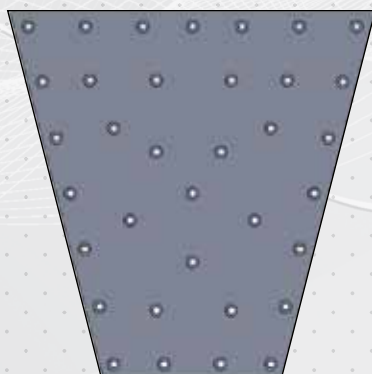
Step joints are a variant of angled joints.



Overlap joints are suitable for lining large surfaces.

Fixing scheme

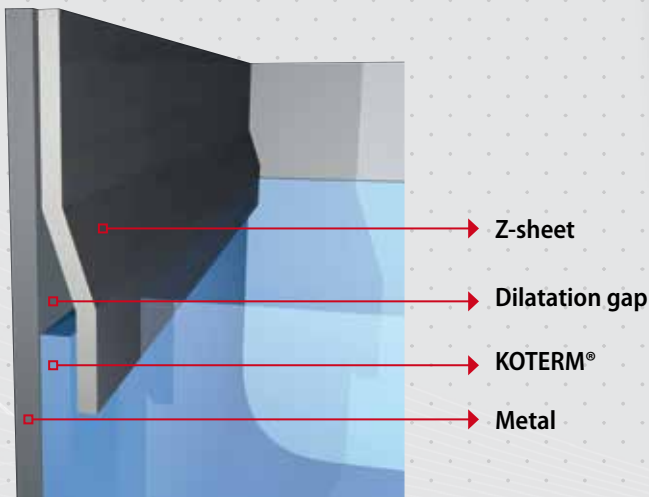
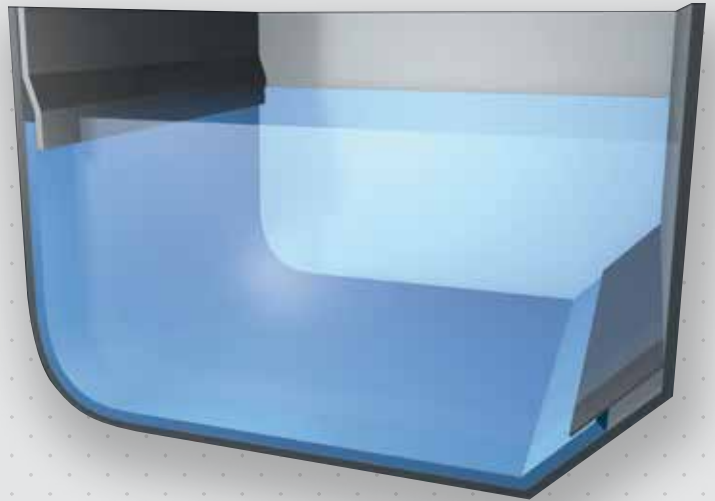
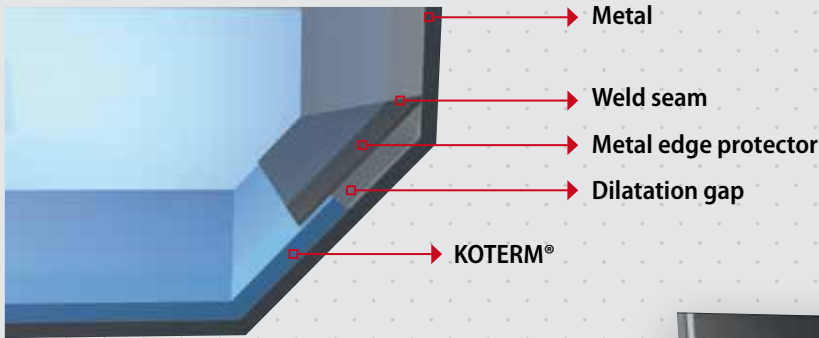
The fixing layout depends on many factors. Through CNC processing and bending, we can adapt to even the most demanding fixing sites. The average fixing density amounts to 20 elements per m². It is denser at the edges and sparser in the middle.



Installation – dilatation gap

The lining must be finished in such a way to make it impossible for the material to come between the Koterm lining and the base material. This is easily achievable using metal battens welded onto the base material in such a way that they fix the Koterm sheet and simultaneously allow it to contract and expand as a result of temperature changes.

The room required for it must be calculated in advance; the length of the dilatation gap must be 2mm per 10°C temperature change per 1 metre of the unfixed length.



A typical example of an application on a worn out lorry bed

The abrasiveness of the transported materials reduces the thickness of the truck's walls, while the lining can be carried out on new as well as worn out trucks.

Advantages:

- ◆ reusable bed
- ◆ lighter than if steel/aluminium sheets were welded on
- ◆ greater surface smoothness
- ◆ better wear resistance
- ◆ less risks due to material retention

% weight reduction compared to AL

43%

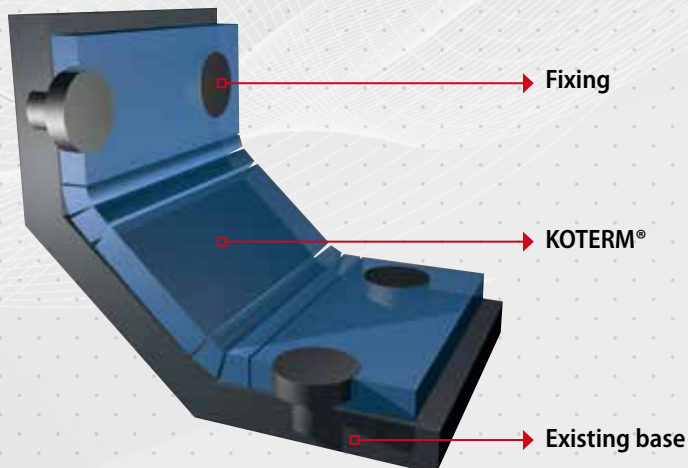
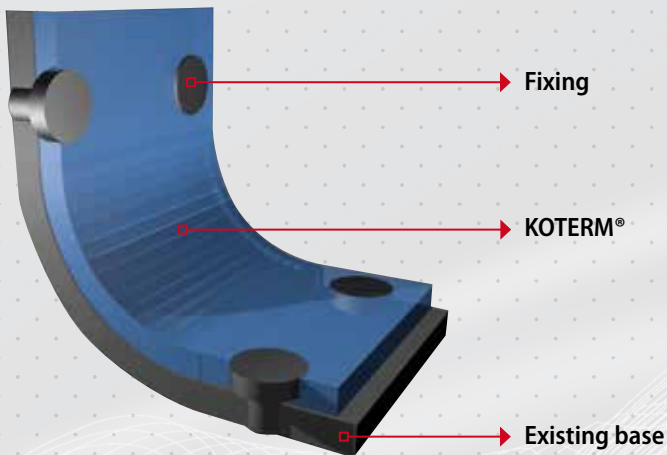
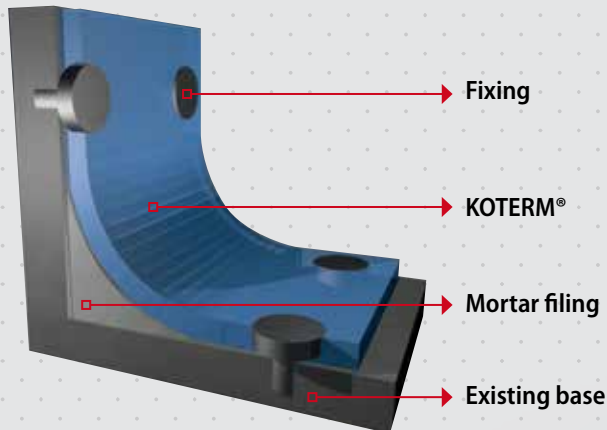
% weight reduction compared to Hardox

64%



Bending

Bending is carried out in cases when the material must fit the shape of the base as best as possible, and requires special procedures. The easiest method for bending the lining plastics is to use a combination of cutting and heating. The greater the thickness of the plastic, the harder it is to bend and the greater the force required. The plastic can be heated up to 140°C and bent when it softens. Depending on the method of fitting, one of the procedures shown below is selected.



The Koterm sheet is heated and cut so that it is easier to fit onto the fixing spot.

This causes minimal changes in the material which do not have a significant effect on the functionality of the product. The bending cuts are made using a hand-held circular saw, and the spot must be marked beforehand to make perfectly straight cuts, which must not trap the material (e.g. for asphalt lining).



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