

KÖSTER

Roof waterproofing

Installation instructions for
KÖSTER TPO



Properties of KÖSTER TPO

For different requirements and areas of application.

- One material quality (no differences in top and bottom layers)
- Free of plasticizers
- High flexibility at low temperatures (≤ -50 °C)
- UV stable
- Root and rhizome resistant (FLL tested)
- Bitumen compatible
- Compatible with polystyrene
- Environmentally friendly, recyclable
- Resistant to flying sparks and radiant heat (hard roof)
- CE certified
EN 13956 (polymeric and elastomeric roofing membranes)
- EN 13967 (polymeric sheeting for structural waterproofing)
- Meets SPEC 20.000 - 201/202
- Quality Assurance certified according to ISO 9001: 2015



Products

For various requirements and areas of application.

Product name	Thickness (mm)	Loose laying	Mechanical installation	Strip adhesion	Full area adhesion
KÖSTER TPO with glass fleece reinforcement	1.5, 1.8, 2.0	*	*		
KÖSTER TPO F / F (FR) with centrally embedded glass fiber mesh and a fleece laminated underside	1.5, 1.8, 2.0	*	*	*	*
KÖSTER TPO SK with centrally embedded glass fiber mesh and a self-adhesive underside	1.5, 1.8, 2.0				*
KÖSTER TPO U Homogenous material	2.0	For the production of gully and vent flanges as well as for corner protection			
KÖSTER TPO Pro with centrally embedded glass fiber mesh and made with recycled granulates	1.2, 1.5, 1.8, 2.0		*		

Length: 20 m

Standard color: light grey

Special colors such as white, grey, slate grey, black, partly stock items; possible on request

Hand tools:

The basic equipment includes:

Hand welder (1),

with wide slot Nozzle 40 mm wide (2),

Measuring tool (3),

Scissors (4),

Knife (5),

Seam tester (6),

Kehlfix cornering tool(7),

Hand pressure roller 40 mm wide (8),

Wire brush (9).



Automatic welding machines

For the quick and economical welding of roof areas over 100 m² we recommend the use of an automatic welding machine. Thanks to the controlled advancement speed and constant welding temperature, weld seams of the highest quality are achieved in one operation. Use smooth nozzles for welding.



Welding seams – general

- Seam area must be clean
- Welding temperature
+ 400 °C to + 620 °C, depending on the
membrane thickness and ambient conditions
- Professional hot air welding
guarantees a homogeneous seam connection
- Min. 2 cm homogeneous weld width
- Seam overlap against the direction of water flow
is permitted for connections and terminations
as well as built-in assemblies
- Pre-treatment of the Seam is not necessary with
new roofing membranes
- The instructions for seam preparation in the
KÖSTER TPO Pro section must be observed
- Machine settings depend on the machine type
and the membrane thickness
- Guide values for test welds:
+600 °C at 2-3 m/min
- When using the Leister V2:
+620 °C at 3-4 m/min

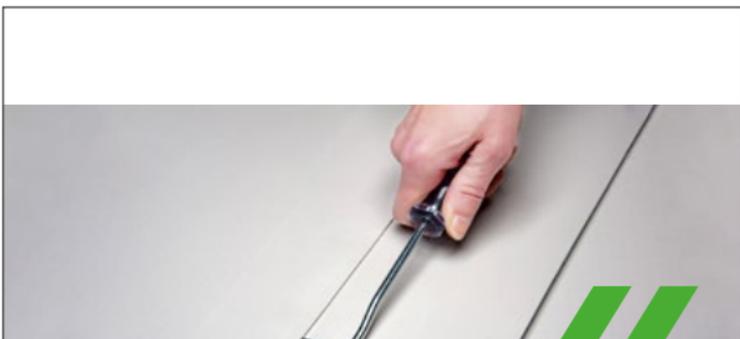
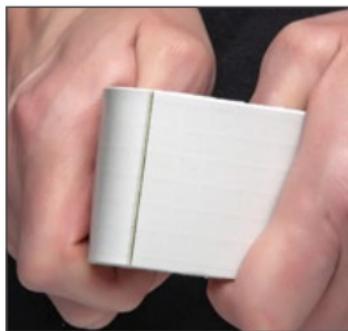


Test welds

- The Installer should be trained in the welding and processing of thermoplastic membranes.
- On-site welding tests must be carried out every day in order to determine the correct welding parameters.
- The settings must be checked and readjusted if necessary if conditions change.
- The seam is to be checked with a peel and shear test on an approx. 5 cm wide weld seam sample. The seam should not be separable. The leading edge of the seam must also be checked!
- Important: The test sample must be cooled down before the test!
- If the welding samples are of poor quality, the welding parameters such as temperature, speed, pressure, and air volume must be adjusted.
- If roofing membranes are welded later, for example at connections, welding tests must be carried out with the already installed KÖSTER TPO membranes.
- If the welding results are not satisfactory, it may be necessary to clean the installed membranes in the weld area or to roughen them mechanically, (refer to the chapter Installing on existing membranes).
- In the event of problems, please contact KÖSTER

BAUCHEMIE AG's Roofing Membrane Application
Technology department. (info@koster.eu; +49 4941 9709 0)

- The seam inspection of the installed roofing membrane should happen > 24 hours after processing and is carried out with a Weld Seam Tester. Ideally, the temperature of the membranes should be approximately + 20 °C.



Manual welding

When manually welding, a pre-welding must always be carried out. The membranes are to be welded within the overlap of approx. 4 cm from the edge of the membrane. The resulting pocket ensures a uniform and correct welding temperature during welding.



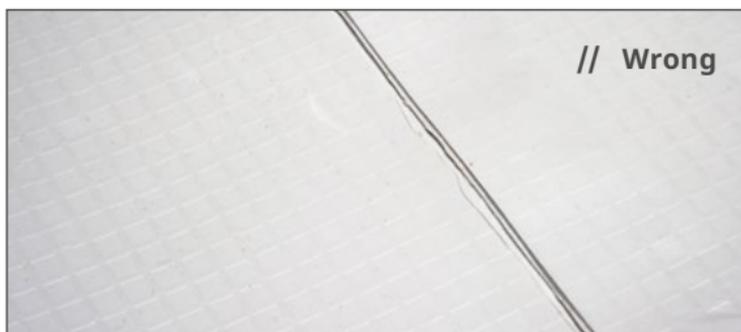
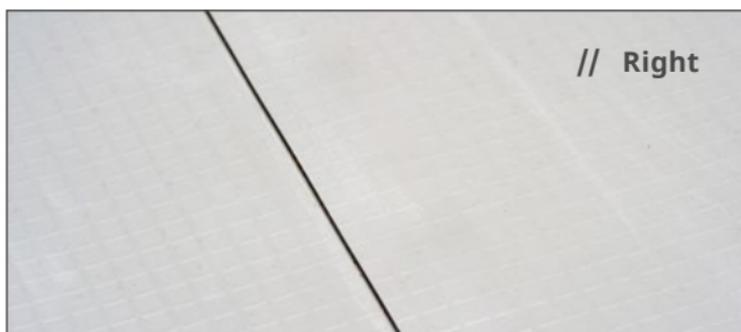
Manual welding

After pre-welding, the flat area of the welding nozzle is pulled evenly through the overlap area. The seam is sealed by evenly applying pressure with a silicone hand pressure roller. The Roller is guided parallel to the edge of the membrane. The distance between the nozzle and the roller must be at least 1 cm.



Manual welding

When welding with the hand welder, liquid material pressed from the seam is used to visually check the seam weld. The resulting weld bead should be approx. 1 mm. Avoid excessive material being pressed from the weld.



T Joints

T-joints must be welded very carefully to avoid capillary defects. It is not absolutely necessary to bevel the membrane edges. Pay attention that molten material exits in the area of the T Joint. After the roofing membrane has cooled down, the T Joint must be checked with a Weld Seam Tester.

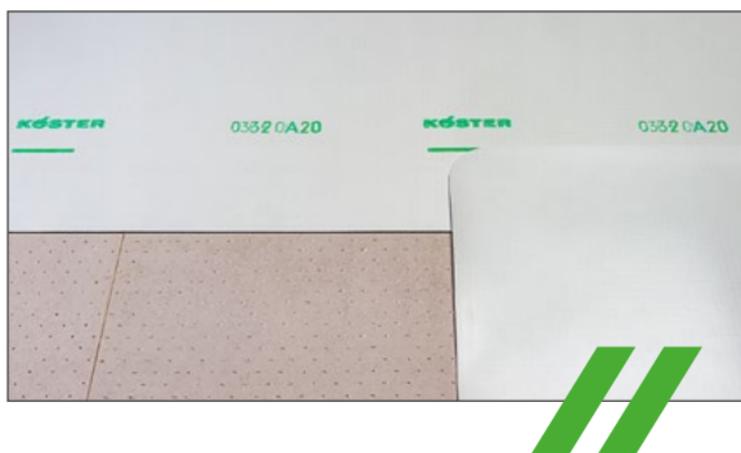


Overlapping

The lateral overlap of KÖSTER roofing and waterproofing membranes is at least 5 cm. The width of the overlap depends on the type of installation and the insulation material used. Weld seam overlap is according to the type of application:

Substrate	Loose laid with ballast	Strip adhesion / self adhesive	Full area adhesion	Mechanical fastening
All substrates	50 mm	50 mm	80 mm	110 mm
EPS Insulation	80 mm	80 mm	80 mm	110 mm

Note: All KÖSTER roofing membranes have a marking at 11 cm.



Separation layers

Generally no separating layers are necessary.

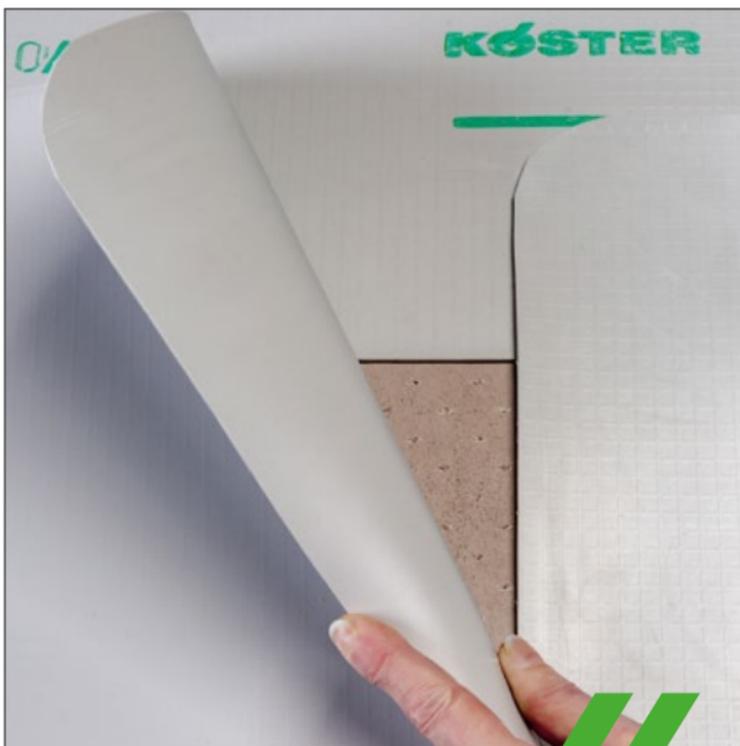
Exceptions are:

Substrate	Membrane	Installation method	Separation layer	Alternative
Bitumen roofing membranes	KÖSTER TPO	Freely weathered, mechanically fastened	synthetic fleece $\leq 300 \text{ g/m}^2$	KÖSTER TPO F
Old polymeric membranes	KÖSTER TPO	Freely weathered, mechanically fastened	Glass fleece A2 $\geq 120 \text{ g/m}^2$ or synthetic fleece $\leq 300 \text{ g/m}^2$	KÖSTER TPO F
Wood, concrete	KÖSTER TPO	Freely weathered, mechanically fastened, loose laid under ballast	synthetic fleece $\leq 300 \text{ g/m}^2$	KÖSTER TPO F

When laying KÖSTER TPO roofing membranes on bituminous substrates, discoloration can occur. This changes neither the quality nor the longevity of the plastic sheeting.

Butted membrane ends

Head butts are installed exactly like the connection of the membranes in the longitudinal direction. Any corners (e.g. at the end of the membrane) are rounded off with scissors to ensure that the membranes are correctly welded. This step applies to both the lower and the upper layer. The overlap is at least 5 cm.

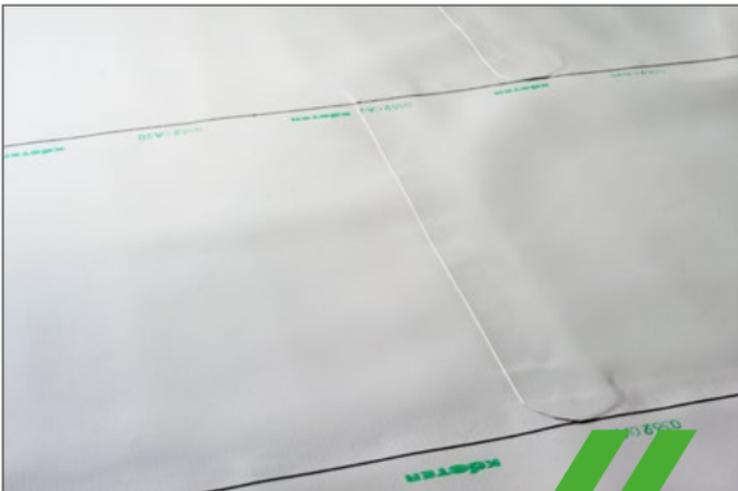
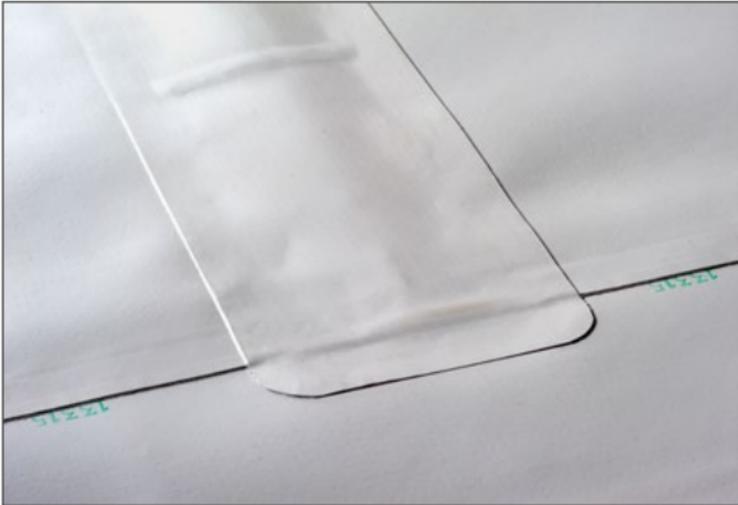


Butted membrane end installation:

KÖSTER TPO F, KÖSTER TPO SK (FR)

When applying KÖSTER TPO SK (FR) the membrane ends are overlapped approx. 5 cm (EPS approx. 8 cm) and tacked with a hand welder. When installing KÖSTER TPO F, the strips are to be butted at the end. The head joint is then covered with a 25 cm wide strip made of KÖSTER TPO and welded completely around. The strip must be at least 5 cm over the seam edge.

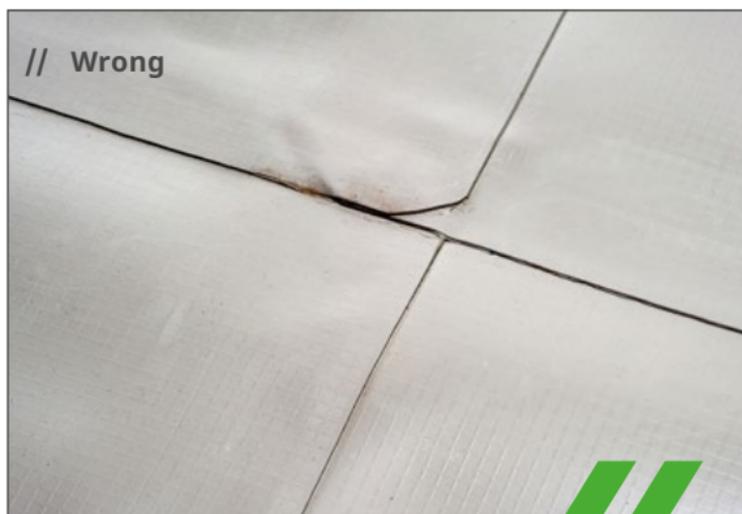


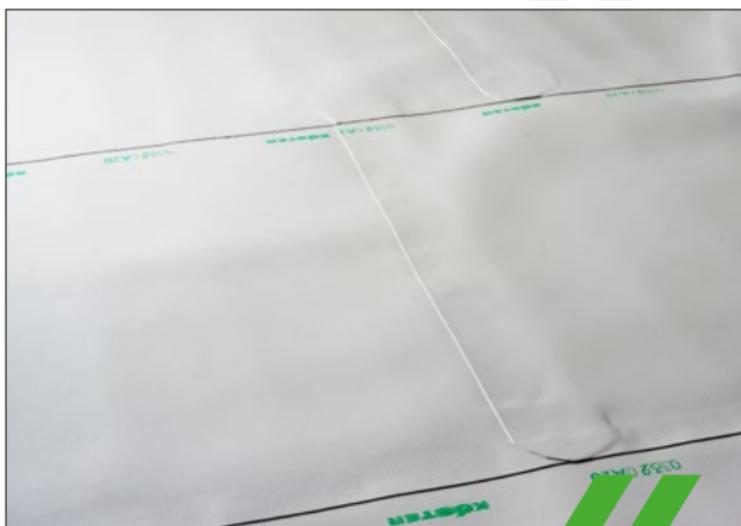


Cross joints

Avoid cross joints whenever possible. This can be achieved by staggering joints or by welding on a cover strip.

If a cross joint is unavoidable, it is welded over with a TPO patch ($\varnothing > 20$ cm) in order to divide the cross joint into four areas.





Installation over old membranes

Old and weathered KÖSTER TPO membranes can easily be welded to the new TPO membrane. Patina and dirt can be removed with a suitable sander. When welding older or longer weathered TPO membranes, a test weld shows whether pretreatment is necessary.



// For cleaning surfaces we suggest the use of a burnishing machine.



KÖSTER TPO Pro

Due to the high proportion of recycled polyethylene, the oxidation process on the surface begins earlier with KÖSTER TPO Pro than with KÖSTER TPO. This has no influence on the service life or function of the membrane. For this reason, KÖSTER TPO Pro requires seam pretreatment after one day of exposure. The area is cleaned with KÖSTER TPO Cleaner and KÖSTER cleaning cloth. Before welding, the cleaner must completely flash off. Alternatively, the seam area can also be cleaned mechanically (see section Weathered Membranes).



Installation methods

- Loose laying under ballast
- Mechanically fastened, freely weathered
- Strip adhesion installation, freely weathered
- Self-adhesive installation, freely weathered

Loose laying:

Loose laying KÖSTER TPO roofing membrane always requires a sufficient load to protect the roofing membrane against the effects of wind suction forces, (uplift).

Suitable ballast includes: round gravel 16/32 min. 5 cm layer thickness, paving stones at least 4 cm thick, green roofs with sufficient dry weight, etc.

In the case of loose laying under ballast, a suitable protective layer such as a rot-proof plastic fleece or a plastic sheeting with a minimum thickness of 1.2 mm must be used.



Mechanical fastening

Methods

- Lateral overlap fastening (hem fastening)
- Linear fastening with the KÖSTER Bar for Membrane Fastening
- Fastening by induction welding (information on this is available from the system manufacturers)

Fasteners

With mechanical fastening, the membranes are anchored to the substructure with special roof membrane fasteners. The subsurface and the insulation used determine the type and length of the screws and retaining plates. Fasteners should have a European technical approval. If the use of slope insulation is intended, suitable fastening elements must be used.



Mechanical fastening – hem fastening

The fasteners are installed in the overlapping area of the roof membrane. The roofing membrane fasteners are covered by the seam overlap, which must be 11 cm wide. The fasteners must be set linearly and 10 mm from the edge of the membrane.



Mechanical fastening – hem fastening

The fastener spacing and the width of the membrane overlap result from the specifications of the DIN EN 1991-1-4/NA 2010-12 and the substructure parameters. The fastening elements must not be pressed too deeply into the insulation Material. A minimum of 2 fasteners per m² are to be used. The roofing membrane is laid across the top chords of the trapezoidal metal sheet or wooden formwork.



Mechanical fastening – KÖSTER Bar for Membrane Fastening

When fastening the Bars, the roofing membranes are loosely laid and the seams are welded. Then the KÖSTER Bars for Membrane Fastening are installed according to the fastening plan. The Bars are covered with a strip of KÖSTER TPO 250 mm wide and welded on both sides. The Bars are installed at right angles to the top chords of the trapezoidal sheets or the wooden formwork.



Gluing

Membrane:

- KÖSTER TPO F

Adhesive:

- KÖSTER PUR Membrane Adhesive
- KÖSTER 2K PUR Membrane Adhesive
- Hot-melt bitumen

Adhesive quantities:

- According to manufacturer information
- According to wind suction calculation
- According to the information in the flat roof guidelines

Bonding:

- In strips for PUR adhesives
- full area with hot-melt bitumen
- Laminated insulation materials that are approved by the manufacturer for bonding, and concrete and bitumen roofs are suitable as substrates
- Information on other substrates can be requested from KÖSTER
- Subsequent layers below the waterproofing, e.g. Vapor barriers, insulation, or old roofs must each be secured or bonded against wind suction.

Bonding – with PUR Membrane Adhesives:

- The adhesive is to be applied in strips
- The width of the strip must be at least 2 cm
- It is necessary to press the membrane over the strips on to prevent the adhesive from showing through the membrane. This can be done with a roller or a broom
- The initial adhesion of KÖSTER Roofing Membrane Adhesive is low. The membrane is adhered depending on the weather.
- With KÖSTER 2K PUR roofing membrane adhesive, the bond is secure after approx. 10 minutes.



Bonding:

Self-adhesive with KÖSTER TPO SK (FR)

Substrate:

- The surface must be secure, clean, dry and free of oil and grease
- It may be necessary to pre-treat the substrate with KÖSTER SK Primer
- No processing may be done below +5 °C outside temperature

Not suitable are:

- Non-laminated certain insulation materials
- Rough tongue and groove boards
- Compacted gravel roofs
- Old synthetic membrane roofs

Information on the absorption of uplift forces can be obtained from KÖSTER.

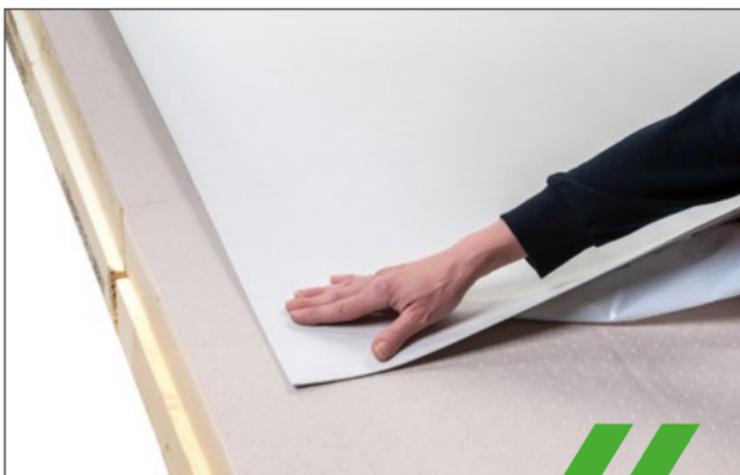
Substrate	Direct application	KÖSTER TPO SK Primer
EPS – non-laminated insulation	•	
XPS – non-laminated insulation	•	
PUR/PIR – Fleece laminated insulation*	•	
PUR/PIR – Aluminium laminated insulation*	•	
Fleece laminated mineral fiber insulation		•
Concrete		•

* Must be approved by the manufacturer for adhesion bonding.

Note: Consult with KÖSTER about other substrates.

Bonding:

Self-adhesive with KÖSTER TPO SK (FR)



Bonding:

Self-adhesive with KÖSTER TPO SK (FR)



// The cover film is pulled off to the side



// The Membrane is then be pressed on over the entire surface, ideally with a pressure roller.

Lateral edge fastening

The roofing membranes must be mechanically fastened to all connections and terminations, built-in parts and penetrations.

This can be achieved with a KÖSTER Bar for Membrane Fastening, custom configured KÖSTER TPO Metal Composite Sheet, or approved membrane fasteners.

// At least 3 fasteners must be used per meter. This applies to all types of membrane application!





Connections and Terminations

Connections or terminations of the roofing membrane at penetrations and building components are always made in two parts. They must be mechanically fastened to the top component and protected against water incursion. The connection height must be at least 15 cm. This also applies to roofs covered in paving, gravel or green roofs. For connection heights of up to 50 cm, the membranes can be laid loosely up to the connection. Over 50 cm they must be mechanically fastened at the midpoint with at least 3 fasteners per meter. Alternatively the membrane can be adhered over the entire surface with KÖSTER Contact Adhesive.



Parapet connection

Parapet connection <50 cm

Essentially, the design of the parapet connection corresponds to that of the wall connection, except that the mechanical fastening is carried out on the wall cap. The top of the wall must be properly covered with a parapet sheet cap. Optionally, a multi-edged composite sheet with drip edge and cover can be used. An expanding foam tape must be installed under the metal composite sheet to ensure windproofness.

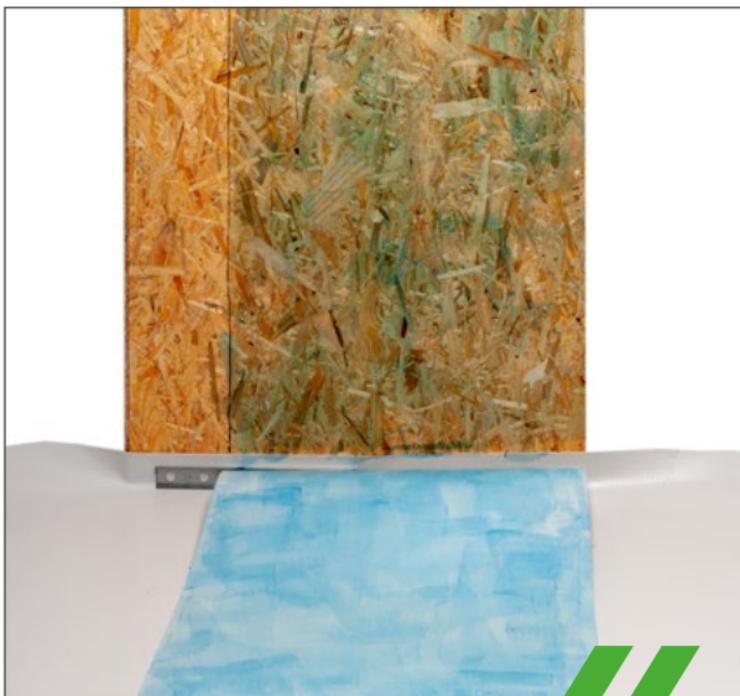
Parapet connection >50 cm

For parapet connections over 50 cm, the connecting membrane must be mechanically fastened in the middle with at least 3 fasteners per meter or the KÖSTER Bar and covered with a 25 cm wide strip. Alternatively, the parapet seal can be made in two parts. The advantage is that in preparation the two strips of membrane are connected homogeneously with the automatic welding machine and only attached in the next step. This intermediate fixation must be repeated every further 50 cm.





Alternatively, the membrane can also be adhered to the entire surface with KÖSTER Contact Adhesive. The contact adhesive must be applied over the entire surface both to the component and to the membrane to be bonded. The adhesive must dry briefly, this can be checked with a finger test. The glue must no longer pull threads.





Tensioned connection

Tensioned connections are a visually appealing variation of the parapet connection. Here the TPO membrane is mechanically attached to the parapet and to the horizontal roof surface. The vertical part is in tension between the fastening points.

Maximum parapet height = 1.2 m



Connection to skylights

Raised connection strips for skylights must be mechanically fastened to the skylight and protected against water incursion. The connection height must be at least 15 cm. The corners are each reinforced with a corner patch.

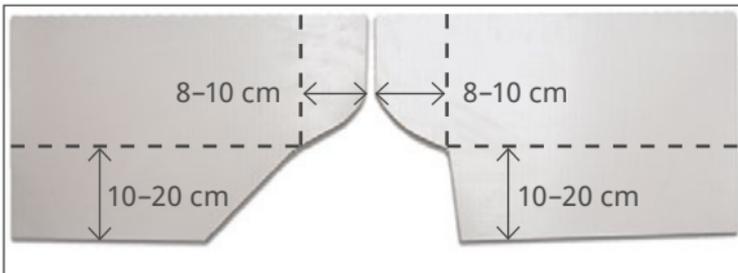




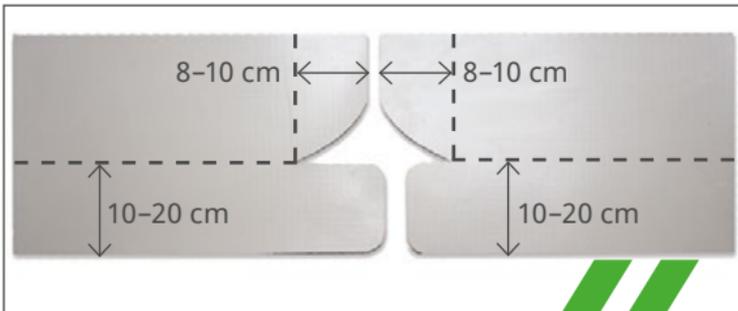
Cutting skylight corners

Corners should be made with two-part connection strips. The cuts are made according to the illustration. For corner protection prefabricated 90° KÖSTER inside and outside corners are used.

// Cutting inside corners



// Cutting outside corners



The cutting pattern also applies to the formation of skylight corners, etc.

If it is not possible to use the prefabricated inside and outside corners, use KÖSTER TPO 2.0 U. Make sure that the weld seam is always at least 2 cm wide.

Cutting manually formed corners



Formed parts for corner protection



The use of the KÖSTER Internal Corner universal RT 902 003 is suitable for corners that are not right-angled.



Manually formed inside corner protection

For corners that are other than 90°, the protection must be custom crafted from KÖSTER TPO 2.0 U. The corner is waterproofed and reinforced by a circular corner protection with a diameter > 5 cm. A weld seam width of at least 2 cm must be observed for all seams.

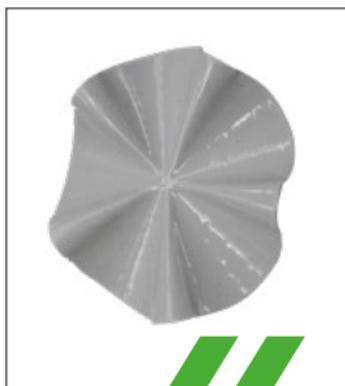


Manually formed outside corner protection

A diamond-shaped piece of TPO U with rounded corners is cut for the outer corner. Here, too, the minimum weld seam width of 2 cm must be observed.



The use of the KÖSTER External Corner universal RT 901 003 is suitable for corners that are not right-angled.



Connection to round penetrations

Molded parts

A large number of ready-made connection sleeves are available for connecting the roof waterproofing to circular penetrations such as pipes, fall protection devices and lightning rod bushings.



Connection to round penetrations:

Manual

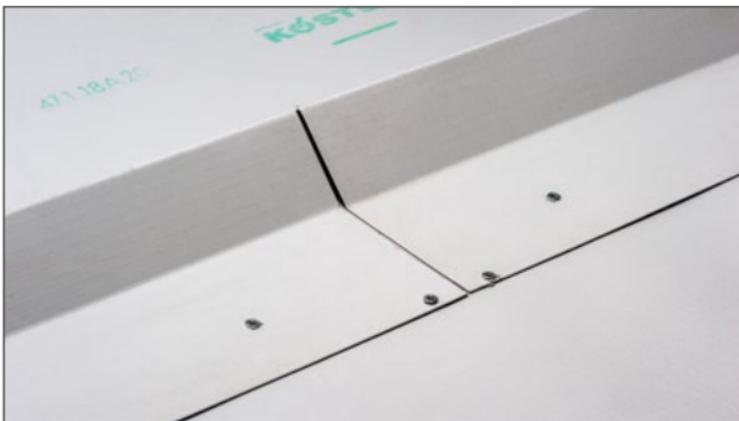
If the use of prefabricated pipe flashing is not possible, pipe penetrations can be waterproofed with a 50 x 50 cm flange and a cuff. A hole is cut in the flange at least 4 cm smaller than the pipe diameter. Then the flange is pulled over the pipe. The cuff is then welded onto the pipe, at least 2 cm onto the flange. The waterproofing must be carried up vertically at least 15 cm from the roof penetration. The upper end is secured with a stainless steel hose clamp band or suitable sealant.





KÖSTER TPO Metal Composite Sheet

KÖSTER TPO Metal Composite Sheets are used for custom details such as drip edges, eave flashing, or wall connections. The TPO Membrane can be connected



directly to the sheet metal by welding. Where the sheets are butted together, they are connected with strips of KÖSTER TPO U at least 10 cm wide. This is completely welded.



Connection to rain gutter

Eaves waterproofing must be carried out in such a way that no raised edges are created. Rainwater must be able to flow off unhindered. KÖSTER TPO composite sheet can also be used as a gutter inflow sheet. The KÖSTER TPO membranes can be welded directly onto the composite sheet.

Roof drainage

KÖSTER recommends using gullies with factory-fitted KÖSTER TPO flanges. They should be fastened mechanically with the membrane. Roof gullies with extension elements are to be used for roofs with insulation. When using clamp flange gullies, the manufacturer's instructions must be observed.

KÖSTER Roof Drain with TPO Flange



Emergency Overflow – Attica spouts

Various drains are available for drainage / emergency drainage through the parapet.

KÖSTER TPO U sleeves are welded to the rigid polyethylene flanges.



KÖSTER MS-Flexfolie

KÖSTER MS-Flexfolie is an environmentally friendly, one-component, solvent-free, highly elastic and crack-bridging waterproofing based on MS polymers. The material can be processed on both dry and slightly moist surfaces.

KÖSTER MS-Flexfolie is characterized by very good adhesion to a variety of substrates, such as TPO roofing membranes based on PE and PP, ECB roofing membranes, bitumen membranes, plastics, clinker, concrete, and metals.



Fields of application

- As a solution for difficult connections and details with KÖSTER TPO, TPO Pro, and ECB roofing membranes, for example. on patio doors
- For creating difficult details with KÖSTER synthetic roofing membranes such as I-beams
- For connecting KÖSTER roofing membranes with other synthetic membranes
- For connecting KÖSTER roofing membranes to other materials such as hard PVC, metals, bitumen, etc.
- As an independent waterproofing

Tools

- Paint brush
- Nylon fur roller
- Notched trowel
- Scissors
- Duct tape
- Safety goggles
- KÖSTER TPO Cleaning Tissue
- Sandpaper
- Grinding wheel
- Protective gloves

Substrate	Sanding the Surface	Cleaning with KÖSTER TPO Cleaner	KÖSTER TPO
KÖSTER TPO / TPO F / TPO SK (FR)	✓		
KÖSTER TPO Pro	✓	✓	
KÖSTER ECB / ECB F	✓		
TPO/FPO PE based roofing membranes ¹⁾	✓		
TPO/FPO PP based roofing membranes ¹⁾	✓		
PVC roofing membranes ¹⁾	✓		
Bitumenous membranes ¹⁾			
Metals ¹⁾²⁾	✓		
Plastics ¹⁾⁴⁾	✓		
Concrete			
Wood and wood products			

¹⁾ Check with bond test

²⁾ Besides copper

³⁾ With pull-off test if necessary

⁴⁾ Except for EPDM and PVC membranes

KÖSTER Primer	KÖSTER Primer PU 120	KÖSTER CT 121	KÖSTER Schnellreparaturssystem EP Primer 2K
✓			
✓			
✓			
✓			
✓			
✓			
✓ ³⁾	✓ ³⁾		
✓ ³⁾	✓ ³⁾		
		✓	
			✓

For other substrates, please contact the
KÖSTER BAUCHEMIE AG.

Important: Due to the variety of materials / products on the market, an adhesion test **must always** be carried out!



We are there for you – worldwide.

Issued: 3/2024

// Contact us

KÖSTER BAUCHEMIE AG
Dieselstraße 1-10 • D-26607 Aurich
Tel.: +49 4941 9709 0
E-Mail: info@koster.eu
www.koster.eu

KÖSTER
Waterproofing Systems

Follow us on social media:

