StoFix mounting elements
Technical documentation /
application guideline

Table of contents

Please note that the details, illustrations, general technical information, and drawings contained in this brochure are only general proposals and details which merely describe the basic functions schematically. They are not dimensionally accurate. The applicator/customer is solely responsible for determining the suitability and completeness of the products used for the respective construction project. Neighbouring works are described only schematically. All specifications and information must be adjusted or agreed in the light of local conditions and do not constitute work, detail, or installation plans. Please note that the products StoFix UMP-TRI, StoFix Trawik F, and StoFix Trawik L do not have technical approval. These mounting elements must therefore not be used to fix safety-related loads, such as railings or Juliet balconies, if the fixings of these elements need to be structurally verified. The technical specifications and product information included in the Technical Data Sheets and system descriptions/approvals must be observed.

Overview of mounting elements

Properties and area of applications

Determine which element is suitable according to the loads.

		Substrate		Bonding the element / Mechanical fixing		Screws			Recommended working load, shear force with bonding and embedded mesh (kN)	Recommended working load, tensile force with bonding and embedded mesh (kN)	Characteristic breaking load, shear force without bonding and embedded mesh (kN)
StoFix Spiral		D		-	-	B	H	-	0.01 - 0.05*		
StoFix Cap		D		P	-	B	H	-	0.11	0.06	-
StoFix Zyrillo	Ø 70 mm	D		P	-	B	H	-	0.09 - 0.18	0.09 - 0.17	
StoFix Ashlar HD Maxi	198 x 198 mm	M	B	K	-	B	H	-	-	-	
	238 x 138 mm	M	B	K	-	B	H	-	-	-	
StoFix Ashlar ND Mini/Midi	98 x 98 mm	M	B	K	-	B	H	-	0.15 - 0.28	0.19	
	138 x 98 mm	M	B	K	-	B	H	-	0.22 - 0.39	0.27	
StoFix UMP-TRI		M	B	K	S	B	-	M	-	-	7.70 - 25.90
StoFix Trawik L		M	B	K	S	B	-	M	-	-	0.80 - 2.50
StoFix Trawik F		M	B	K	S	B	-	M	-	-	0.70 - 2.70
StoFix Eldoline		D		P	-	B	H	-	0.51 - 0.75	0.15 - 0.60	

M	Masonry	**S**	Screw-in anchors	**B**	Sheet-metal screws
B	Concrete	**K**	Bonding mortar	**H**	Wood screws
D	Insulation boards	**P**	PU adhesive	**M**	Screws with metric thread

*Without bonding

Characteristic breaking load, tensile force without bonding and embedded mesh (kN)	Roller shutter guide tracks	Temperature sensors	Lightweight signs and advertising panels	Electrical switches / motion detectors	Pipe clamps	Clothes hanger rails	Window blinds / stop for window shutters	Porch roofs	Awnings	Guide rails for sliding shutters	Stairs	Railings (Juliet balconies)	Pintles for window shutters	Page
	+	+	+	+	+									6
-	++	++	++											7
					+	+	+							10
								✳	✳			✳		15
								✳	✳			✳		15
			++		++									17
			++			++								17
24.10								++	++		++			21
1.30 - 2.30														27
2.30 - 2.60										++			++	33
				+										39

++   This area of application is suitable for external wall insulation systems.

+   This area of application is only suitable for external wall insulation systems with EPS boards.

✳   The mounting element is only suitable as a compression underlay for external wall insulation systems for this area of application.

StoFix Spiral

Description

StoFix Spirals are spiral-shaped plastic anchors with a sealing washer and integrated screw-in sleeve.

Dimensions
• Length: 60 mm
• Head diameter: 25 mm

Areas of application

To anchor lightweight building elements e.g. lamps, letter boxes, and house numbers into Sto insulation systems made of EPS insulant at least 60 mm thick. This method is simple, free from thermal bridges, and can be performed when the insulation system is already finished. Screw the building element into the integrated screw-in sleeve of the StoFix Spiral using sheet-metal or wood screws.
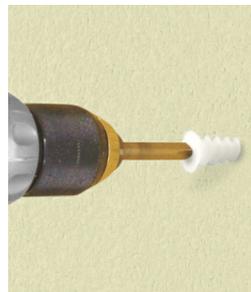
Properties

Permitted tensile force PZ in EPS rigid foam: 5 kg/screw. The value is based on a screw diameter of 5 mm.
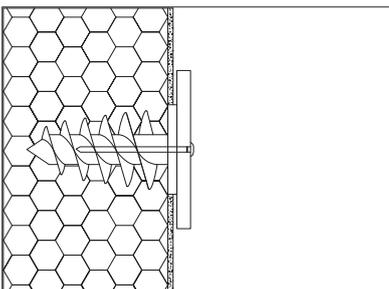
Installation and subsequent work

Install only after the EWIS is completed and the finishing render is dry.

Insert or screw the sealing washer supplied onto the StoFix Spiral and...
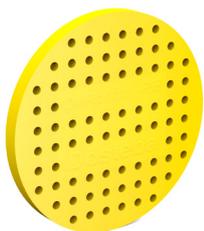

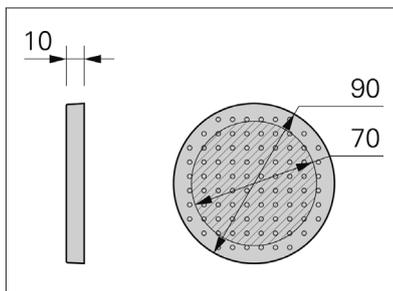... screw in with a suitable tool (cordless screwdriver with Torx 40 bit) so that it is flush with the surface.

Screw the building element into the StoFix Spiral with a 4 - 5 mm sheet-metal/ wood screw.

StoFix Cap

Description

The StoFix Cap mounting disc is made of high-quality plastic. The inner side has a bumpy texture, while the outer surface is perforated.

Dimensions
- Diameter: 90 mm
- Diameter of usable area: 70 mm
- Thickness: 10 mm

Fixing
- Adhesive: StoColl Fix

Areas of application

The StoFix Cap mounting disc is ideal for installing third-party products in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW) in a way that is free from thermal bridges.
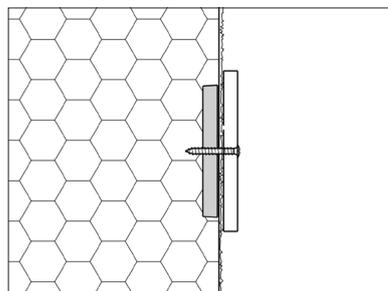Only use wood or sheet-metal screws for screwing into the StoFix Cap mounting disc.
The StoFix Cap mounting disc guarantees that third-party installations are free from thermal bridges, e.g. for:
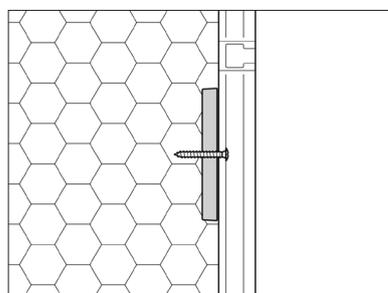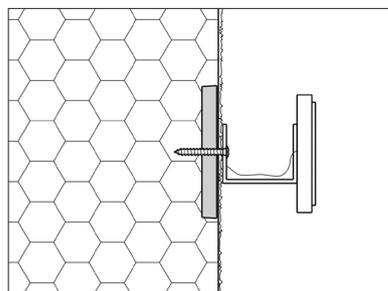

Roller shutter guide tracks
Screw connection with wood or sheet-metal screws. Bonding is not required.

Lightweight signs
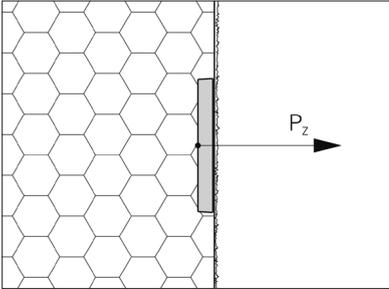Screw connection with wood or sheet-metal screws

Temperature sensors
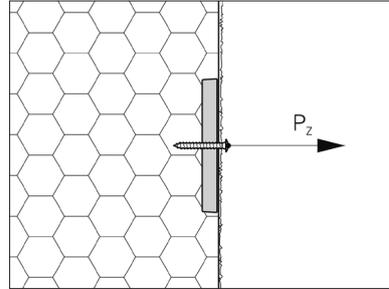Screw connection with wood or sheet-metal screws

StoFix Cap

Properties

**Recommended working load, tensile force P_z
on the installed element**
On correctly bonded StoFix Caps in
EPS insulation boards 15 kg/m³: 0.06 kN
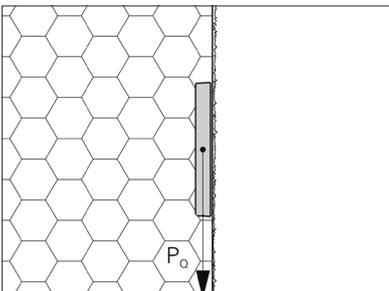Stone wool insulation boards 120 kg/m³: 0.06 kN

On non-bonded StoFix Caps in
EPS insulation boards 15 kg/m³: 0.06 kN
Stone wool insulation boards 120 kg/m³: 0.06 kN

**Recommended working load, tensile
force P_z on screw connection**
Tensile force per screw: 0.10 kN

Values based on
screw diameter: 4 mm

**Recommended working load, shear force P_Q
on the installed element**
On correctly bonded StoFix Caps in
EPS insulation boards 15 kg/m³: 0.11 kN
Stone wool insulation boards 120 kg/m³: 0.11 kN

On non-bonded StoFix Caps in
EPS insulation boards 15 kg/m³: 0.11 kN
Stone wool insulation boards 120 kg/m³: 0.11 kN

The specified values take into account embedded mesh
with 0.25 kN/5 cm.
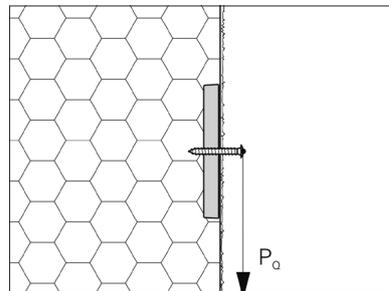
**Recommended working load,
shear force P_Q on screw connection**
Without secure intermediate layer
Shear force per screw: 0.10 kN

Values based on
screw diameter: 4 mm

StoFix Cap

Installation

Carry out any sanding work required on insulated surfaces before putting the StoFix Caps into place.

Mill the recess in the insulation board with the milling tool for the StoFix Cap and remove the milling dust.

Apply StoColl Fix to the circular area of the StoFix Cap.

If the StoFix Cap is only stressed by shear force, then it is not necessary to bond the caps. Consumption for StoFix Cap: 9 - 12 ml

Press the StoFix cap into the recess so that it is flush with the insulation board.

Subsequent work

StoFix Caps can be coated with commercially-available coating materials for external wall insulation systems without an undercoat. Mounting objects are mounted on the render coating. The coating must withstand the compression forces which arise due to the mounting object. Use wood or sheet-metal screws for screwing into StoFix Cap. Screws with a metric thread (M screws) and self-tapping screws are not suitable.
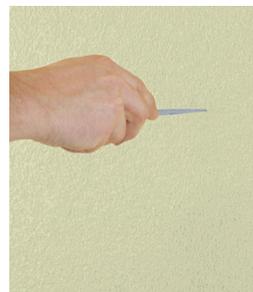
Determine the exact position of the StoFix Cap by tapping the render coating.

Indenting with a bradawl makes it easier to set the screw.
Pre-drilling is not necessary.

Screw the mounting object into the StoFix Cap.

StoFix Zyrillo

Description

The StoFix Zyrillo mounting cylinder is a moulded cylinder made of EPS with a wave-like surface and a high volume weight.
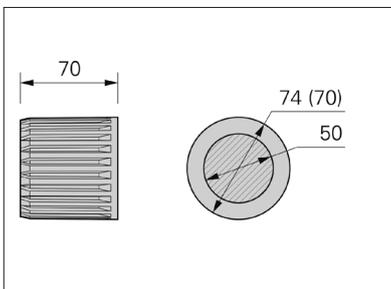
Dimensions
- Diameter: 70 mm
- Diameter of usable area: 50 mm
- Thickness: 70 mm

Technical data
- Volume weight: 170 kg/m³
- Thermal conductivity group: 045
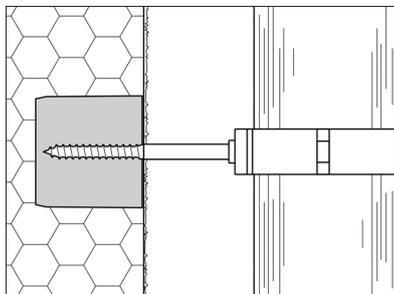- Reaction to fire in accordance
  with DIN 4102: B2

Fixing
- Adhesive: DoPurCol PU adhesive

StoFix Zyrillo

Areas of application

Thanks to the tough elasticity of its rigid foam, StoFix Zyrillo is ideal for installing third-party products in external wall insulation systems made of expanded polystyrene (EPS) in a way that is free from thermal bridges. Use wood or sheet-metal screws and screws with a cylindrical thread and large pitch (frame screws) to screw into the StoFix Zyrillo mounting cylinder.

It is possible to install third-party products in a way that is free from thermal bridges, e.g. for:
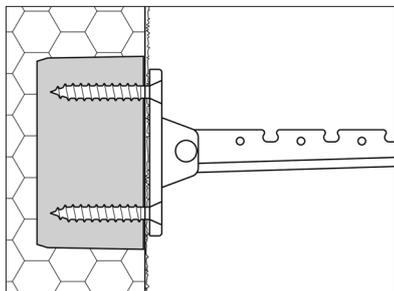
Roller shutter box

Screw connection with wood or sheet-metal screws as well as screws with a cylindrical thread and large pitch (e.g. frame screws)
Screw diameter: min. 5 mm
Embedment depth: min. 60 mm

This application is only suitable for EPS facades.

Pipe clamps with wood thread
for roof outlets

This application is only suitable for EPS facades.
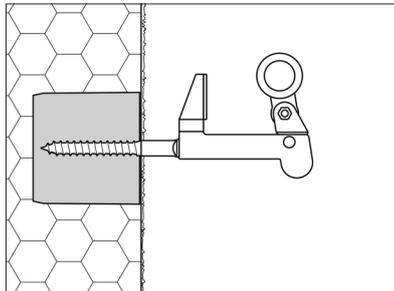
Retainers and casement fasteners with wood thread
for window shutters

This application is only suitable for EPS facades.

Stop for window shutters

Screw connection with wood or sheet-metal screws as well as screws with a cylindrical thread and large pitch (e.g. frame screws)

Screw diameter: min. 5 mm
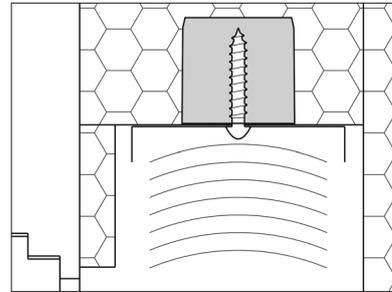Embedment depth: min. 60 mm

This application is only suitable for EPS facades.

Clothes hanger rails

Screw connection with wood or sheet-metal screws as well as screws with a cylindrical thread and large pitch (e.g. frame screws)
Screw diameter: min. 5 mm
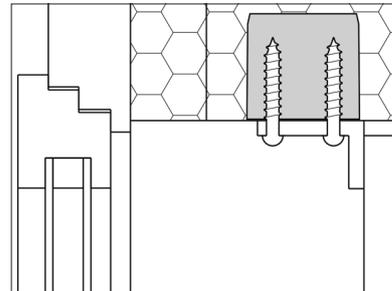Embedment depth: min. 60 mm

This application is only suitable for EPS facades.

StoFix Zyrillo

Properties
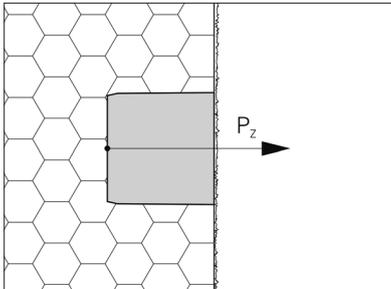
Recommended working load, tensile force P_z on the installed element
On correctly bonded StoFix Zyrillo mounting cylinders
Ø 70 mm in
EPS insulation boards 15 kg/m³: 0.17 kN
Stone wool insulation boards 120 kg/m³: 0.09 kN
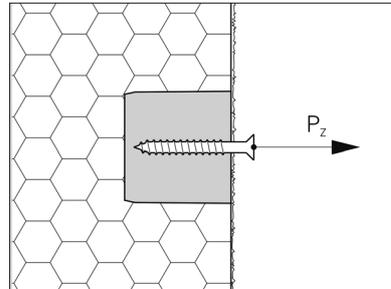
Recommended working load, tensile force P_z on screw connection
Tensile force per screw: 0.30 kN

Values based on
screw diameter: 7 mm
Embedment depth: 60 mm
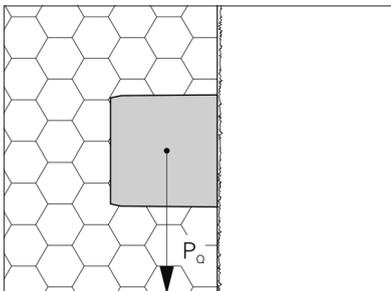
Recommended working load, shear force P_Q on the installed element
On correctly bonded StoFix Zyrillo mounting cylinders
Ø 70 mm in
EPS insulation boards 15 kg/m³: 0.18 kN
Stone wool insulation boards 120 kg/m³: 0.09 kN

The specified values take into account embedded mesh with 0.25 kN/5 cm.
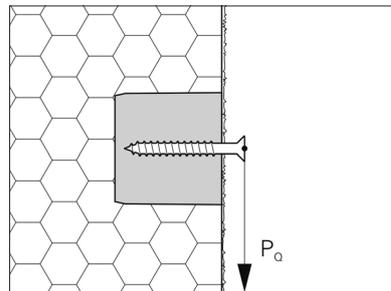
Recommended working load, shear force P_Q on screw connection
Without secure intermediate layer
Shear force per screw: 0.15 kN

Values based on
screw diameter: 7 mm
Embedment depth: 60 mm

StoFix Zyrillo

Installation

Carry out any sanding work required on insulated surfaces before putting the StoFix Zyrillo mounting cylinders into place.
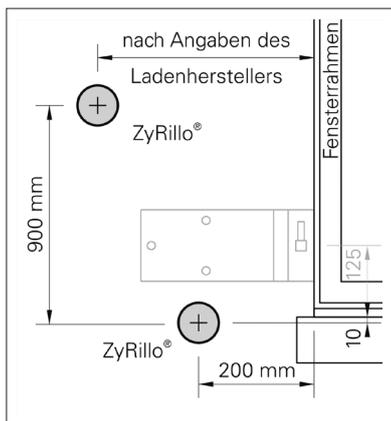
Placing diagram for uses as mounting underlay for retainers and casement fasteners

Dimensions which deviate from this diagram must be clarified on site.

Measure the exact location and draw in on the blueprint for subsequent third-party installations.

Mill the recess in the insulation board with the StoFix Zyrillo milling tool and remove the milling dust.

When using the milling tool for the StoFix Zyrillo, push the guide pins into the facade beforehand and leave them to protrude by 20 mm.

Apply a bead of DoPurCol PU adhesive to the curved inner surface of the recess and smooth with a spatula.

Apply a bead of the DoPurCol PU adhesive to the circular area of the StoFix Zyrillo.

Consumption
for StoFix Zyrillo mounting cylinder
Ø 70 mm: 16 - 20 ml

Press the StoFix Zyrillo into the recess so that it is flush with the insulation board.

StoFix Zyrillo

Subsequent work

StoFix Zyrillo mounting cylinders can be coated with commercially-available coating materials for external wall insulation systems without an undercoat.

Mounting objects are mounted on the render coating.

The coating must withstand the compression forces which arise due to the mounting object.

Use wood or sheet-metal screws and screws with a cylindrical thread and large pitch (frame screws) to screw into the StoFix Zyrillo mounting cylinder. Screws with a metric thread (M screws) and self-tapping screws are not suitable.

Determine the exact position of the StoFix Zyrillo mounting cylinder by tapping the render coating.

Indenting with a bradawl makes it easier to set the screw. Pre-drilling is not required.

Screw the mounting object in the StoFix Zyrillo mounting cylinder.

An adapter plate can be used if the usable area is too small.

StoFix Ashlar HD Maxi

Description

The StoFix Ashlar HD Maxi mounting ashlar is made of rot-resistant and CFC-free rigid PUR foam (polyurethane).
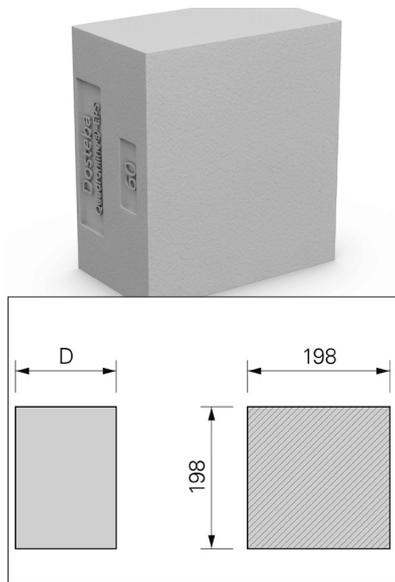
Dimensions
- Size: 198 x 198 mm
- Usable area: 198 x 198 mm
- Thickness D: 60 - 300 mm

Technical data
- Volume weight: 200 kg/m³
- Thermal conductivity group: 040
- Reaction to fire in accordance
  with DIN 4102: B2

Areas of application

StoFix Ashlars HD Maxi are ideal as a compression underlay for high compressive loads in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW). Anchor the elements directly in the masonry as the rigid polyurethane foam is brittle and only has 200 kg/m³. Screw connections directly in the StoFix Ashlar HD Maxi are not permitted. StoFix Ashlars HD Maxi are UV-resistant to a limited extent and generally do not require a protective cover during the construction period. Installations as compression underlays are possible, e.g. for:
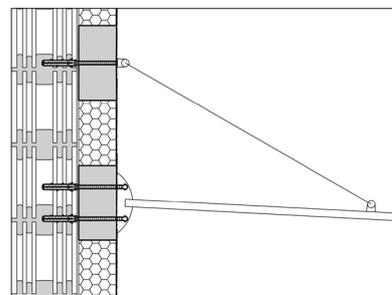
Porch roofs
Anchorage of the third-party installation in the masonry with screw-in anchor or injection anchor

This application forms a thermal bridge.
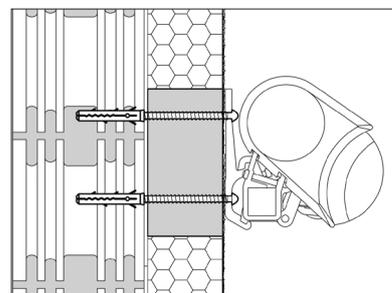
Awnings
with a large contact surface

Anchorage of the third-party installation in the masonry with screw-in anchor or injection anchor

This application forms a thermal bridge.

StoFix Ashlar HD Maxi

Properties
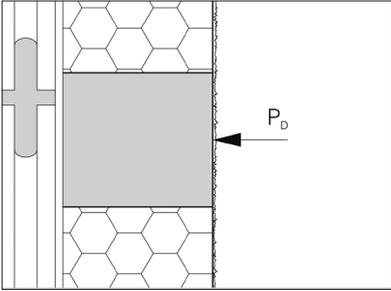
Recommended working load, compression force P_D on entire ashlar surface
198 x 198 mm: 5.90 kN
238 x 138 mm: 4.90 kN

Requirements for the substrate
for bonding Bond strength: 0.25 N/mm

The bond strength of the substrate must be determined with tests if necessary. Full-surface bonding is required. It is not possible to provide a warranty for the bonding.
The recommended working loads are determined with a global safety factor from the characteristic breaking loads.

Installation

We recommend putting the StoFix Ashlar HD Maxi into place at the same time as bonding the insulation boards.

Apply bonding mortar to the adhesive surface of the StoFix Ashlar HD Maxi. The entire surface of the element must be bonded onto the load-bearing substrate.

Consumption for StoFix Ashlar HD Maxi at a layer thickness of 5 mm
198 x 198 mm: 0.25 kg
238 x 138 mm: 0.21 kg

Press on the StoFix Ashlar HD Maxi so that it is flush with the insulation board.

StoFix Ashlar HD Maxi

Subsequent work

StoFix Ashlars HD Maxi can be coated with commercially-available coating materials for external wall insulation systems without an undercoat. Mounting objects are mounted on the render coating. The coating must withstand the compression forces which arise due to the mounting object. StoFix Ashlars HD Maxi must only be used as a compression underlay. Screw connections directly in the StoFix Ashlar HD Maxi are not permitted.

Determine the exact position of the StoFix Ashlar HD Maxi by tapping the render coating.

Drill an anchor hole through the StoFix Ashlar HD Maxi up into the masonry.

Anchor the mounting object in the masonry with screw-in anchors.

To prevent impressions in the StoFix Ashlar HD Maxi, flush and fully supported contact surfaces are required for the elements to be mounted. If this cannot be guaranteed, use pressure distribution plates. Create the penetrations in a way that prevents water from entering the external wall insulation system.

StoFix Ashlar ND Mini/Midi

Description

punkt.metten@gmx.de

StoFix Ashlars ND Mini/Midi are moulded ashlars made of EPS with a high volume weight. They are available in two different sizes.
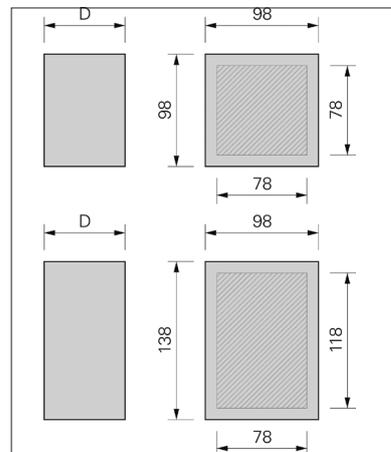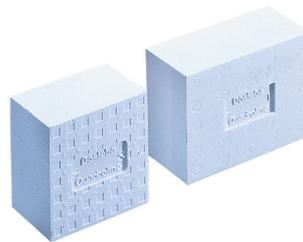
Dimensions
- Sizes:
  StoFix Ashlar ND Mini: 98 x 98 mm
  StoFix Ashlar MD Midi: 138 x 98 mm

- Usable areas:
  StoFix Ashlar ND Mini: 78 x 78 mm
  StoFix Ashlar MD Midi: 118 x 78 mm

- Thicknesses D: 60 - 300 mm

Technical data
- Volume weight: 170 kg/m³
- Thermal conductivity group: 045
- Reaction to fire in accordance
  with DIN 4102:   B2

StoFix Ashlar ND Mini/Midi

Areas of application

Properties

Thanks to the tough elasticity of the rigid foam, the StoFix Ashlars ND Midi/Mini are ideal for installing third-party products in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW) in a way that is free from thermal bridges. They are also suitable for use as a compression underlay for medium loads. Wood or sheet-metal screws and screws with a cylindrical thread and large pitch (frame screws) are suitable for the screw connection in the StoFix Ashlars ND Mini/Midi. It is possible to install third-party products in a way that is free from thermal bridges, e.g. for:

Pipe clamps with wood thread
for roof outlets

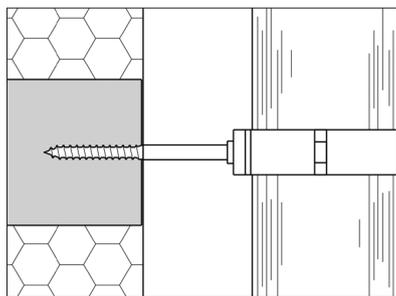**Recommended working load, compression force P_D on entire ashlar surface**

98 x 98 mm:	1.20 kN
138 x 98 mm:	1.70 kN
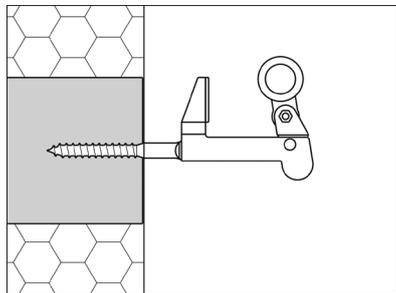
Retainers and casement fasteners with wood thread
for window shutters

Clothes hanger rails
Screw connection with wood or sheet-metal screws, as well as with cylindrical thread and large pitch (e.g. frame screws)

Screw diameter:
min. 5 mm
Embedment depth: min. 60 mm
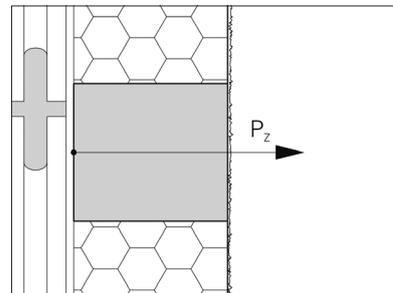
Recommended working load, tensile force P_Z on the installed element
On the bond between the element and the substrate

98 x 98 mm:	0.19 kN
138 x 98 mm:	0.27 kN

Advertising panels
Screw connection with wood or sheet-metal screws, as well as with cylindrical thread and large pitch (e.g. frame screws). Screw selection depends on the weight of the advertising panel

StoFix Ashlar ND Mini/Midi

Properties
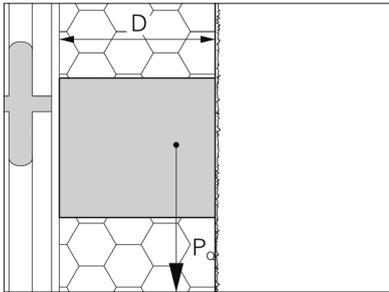
Recommended working load, shear force P^Q on the installed element
The specified values take into account embedded mesh with 0.25 kN/5 cm.

Recommended working load, tensile force P$_z$ on screw connection

Tensile force per screw:	0.30 kN
Values based on	
screw diameter:	7 mm
Embedment depth:	60 mm

Size of element	98 x 98 mm	138 x 98 mm horizontal	98 x 138 mm vertical
D mm	P$_Q$ kN	P$_Q$ kN	P$_Q$ kN
60	0.28	0.39	0.39
80	0.24	0.34	0.34
100	0.22	0.31	0.31
120	0.20	0.28	0.28
140	0.19	0.27	0.27
160	0.18	0.26	0.26
180	0.17	0.25	0.25
200	0.17	0.24	0.24
220	0.17	0.23	0.23
240	0.16	0.23	0.23
260	0.16	0.22	0.22
280	0.16	0.22	0.22
300	0.15	0.22	0.22

The specified values take into account embedded mesh with 0.25 kN/5 cm.
Requirements for the substrate for bonding
Bond strength: 0.25 N/mm
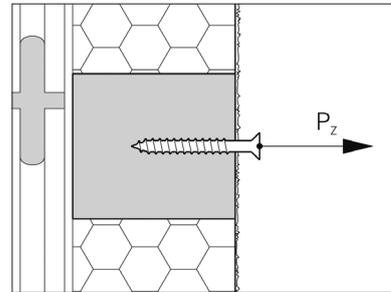
Recommended working load, shear force P$_Q$ on screw connection
Without secure intermediate layer
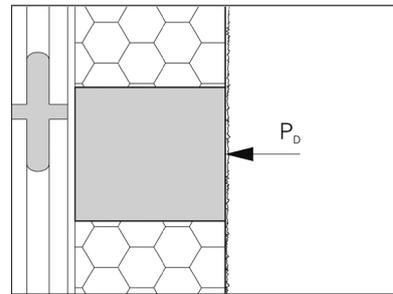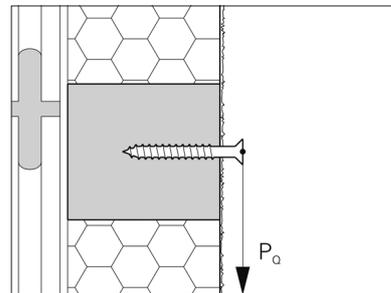
Shear force per screw:	0.15 kN
Values based on	
screw diameter:	7 mm
Embedment depth:	60 mm

The bond strength of the substrate must be determined with tests if necessary. Full-surface bonding is required. It is not possible to provide a warranty for the bonding.

The recommended working loads are determined with a global safety factor from the characteristic breaking loads.

StoFix Ashlar ND Mini/Midi

Installation

Placing diagram for uses as mounting underlay for retainers and casement fasteners. Dimensions which deviate from this diagram must be clarified on site. Measure the exact location and draw in on the blueprint for subsequent third-party installations.

nach Angaben des Ladenherstellers
Fensterrahmen
StoFix Quader®
900 mm
125
StoFix Quader®   200 mm
10
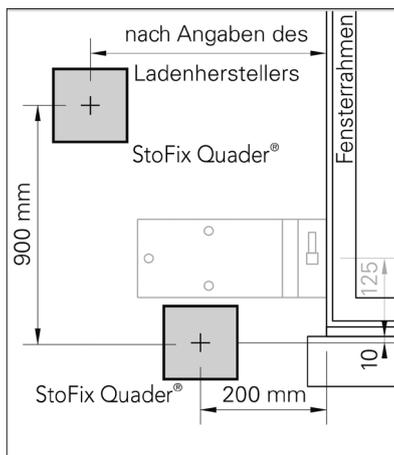
We recommend putting the StoFix Ashlar ND Mini/Midi into place at the same time as bonding the insulation boards.
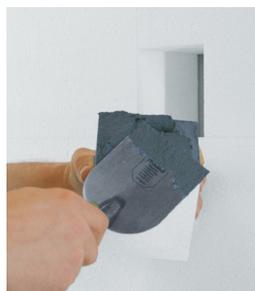
Apply bonding mortar to the adhesive surface of the StoFix Ashlar ND Mini/Midi. The entire surface of the element must be bonded onto the load-bearing substrate. Consumption for StoFix Ashlar MD Mini/Midi at a layer thickness of 5 mm

| 98 x 98 mm: | 0.07 kg |
| 138 x 98 mm: | 0.10 kg |

Press on the StoFix Ashlar ND Mini/Midi so that it is flush with the insulation board.

Subsequent work

StoFix Ashlars ND Mini/Midi can be coated with commercially-available coating materials for external wall insulation systems without an undercoat.

Mounting objects are mounted on the render coating.

The coating must withstand the compression forces which arise due to the mounting object.

Installing third-party products in the StoFix Ashlars ND Mini/Midi using screws is only permitted for lightweight, immovable loads. Heavy loads must be anchored in the substrate.

Use wood or sheet-metal screws and screws with a cylindrical thread and large pitch (frame screws) to screw into the StoFix Ashlar ND Mini/Midi. Screws with a metric thread (M screws) and self-tapping screws are not suitable.

Determine the exact position of the StoFix Ashlar ND Mini/Midi by tapping the render coating.

Indenting with a bradawl makes it easier to set the screw. Pre-drilling is not required.

Screw the mounting object in the StoFix Ashlar ND Mini/Midi.

An adapter plate can be used if the usable area is too small.

StoFix UMP-TRI

Description

The StoFix UMP-TRI mounting element is made of black, rot-resistant, CFC-free, rigid polyurethane foam with two foamed-in steel brackets for a force-transmitting screw connection with the substrate, an aluminium plate to screw the mounting object in place, and a compact plate (HPL) which ensures optimum pressure distribution on the surface. Four screw-in anchors are supplied on request.

Areas of application

The StoFix UMP-TRI mounting element is ideal for installing third-party products in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW) in a way that is free from thermal bridges. StoFix UMP-TRI mounting elements are UV-resistant to a limited extent and generally do not require a protective cover during the construction period.

Important note

The StoFix UMP-TRI does not have technical approval. This mounting element must therefore not be used to fix safety-related loads, such as railings or Juliet balconies, i.e. if these fixings need to be structurally verified on this element – unless special approval has been obtained from DiBt. This also applies to some of the following examples.

Stairs

Awnings
with a large contact surface
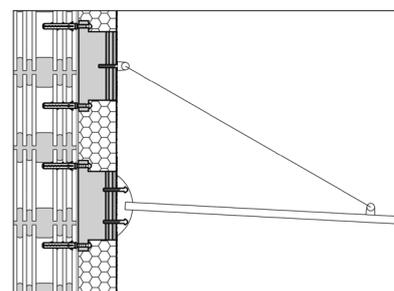
Porch roofs

Dimensions
- Size: 240 x 138 mm
- Compact plate: 182 x 130 x 10 mm
- Aluminium plate: 182 x 130 x 8 mm
- Usable area: 162 x 80 mm
- Thicknesses D: 80 - 300 mm
- Hole spacing: 212 x 110 mm

Mechanical fixing
- Screws: Fischer FUR 14 x 140 F US
- Drill bit diameter: 14 mm
- Min. drill depth: 115 mm
- Min. anchorage depth: 70 mm
- Tool holder: ⬦17, Torx T50

Technical data
- PU volume weight: 300 kg/m³
- Reaction to fire in accordance with DIN 4102: B2

Properties

The strength is a result of the rigid polyurethane foam and the foamed-in reinforcements. There are no metallic connections between the lower foamed-in steel brackets and the upper foamed-in aluminium plate.

Verification of the utilisation of the StoFix UMP-TRI mounting element

$$\beta = \frac{F_V \cdot \gamma}{F_{VR}} + \frac{M \cdot \gamma}{M_R} \leq 1.0$$
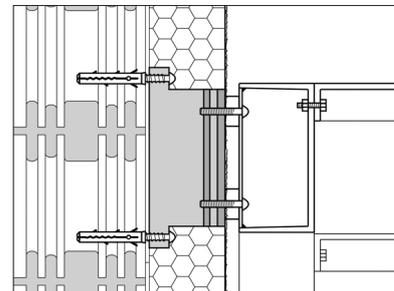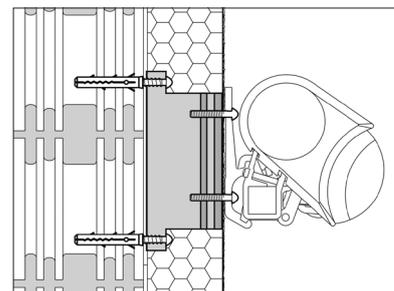
F_V Shear load on mounting element (characteristic value)

M   Bending load on mounting element (characteristic value)

F_{VR} Breaking load of the shear force on mounting element (characteristic value) acc. to bottom-left table

M_R Breaking load of the bending moment on mounting element (characteristic value) acc. to bottom-left table

γ Global safety factor, see page 25
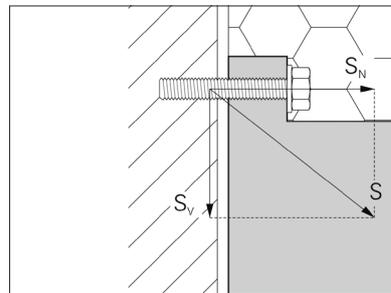
Characteristic breaking load, shear force with bend

Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw

$S_N = 0.00262 \cdot F_V \cdot D + 2.617 \cdot M$

S_V Shear force on screw

$S_V = 0.25 \cdot F_V$

S   Diagonal tensile force on screw

$S = \sqrt{S_N^2 + S_V^2}$

S_N, S_V, S, F_V in kN | M in kNm | D in mm

For verification of the utilisation of the mechanical fixing, see page 24

	1 Element fixed mechanically **without** bonding and embedded mesh		2 Element fixed mechanically **with** bonding and embedded mesh	
D **mm**	**F_{VR}** **kN**	**M_R** **kNm**	**F_{VR}** **kN**	**M_R** **kNm**
80	19.4	2.6	25.3	2.6
100	18.2	2.6	23.8	2.6
120	17.0	2.6	22.3	2.6
140	15.8	2.6	20.8	2.6
160	14.6	2.6	19.3	2.6
180	13.4	2.6	17.8	2.6
200	12.2	2.6	16.3	2.6
220	11.0	2.6	14.9	2.6
240	9.9	2.6	13.4	2.6
260	8.7	2.6	11.9	2.6
280	7.5	2.6	10.4	2.6
300	6.6	2.6	8.9	2.6

StoFix UMP-TRI

Properties

Characteristic breaking load, tensile force with bend

D	**1** Element fixed mechanically **without** bonding and embedded mesh		**2** Element fixed mechanically **with** bonding and embedded mesh	
D mm	F_{ZR} kN	M_R kNm	F_{ZR} kN	M_R kNm
80	25.3	2.6	28.1	2.6
100	25.1	2.6	27.7	2.6
120	24.8	2.6	27.3	2.6
140	24.6	2.6	26.9	2.6
160	24.4	2.6	26.5	2.6
180	24.2	2.5	26.2	2.5
200	24.0	2.5	25.8	2.5
220	23.8	2.5	25.4	2.5
240	23.6	2.5	25.0	2.5
260	23.3	2.5	24.6	2.5
280	23.1	2.5	24.2	2.5
300	22.9	2.4	23.8	2.4

Verification of the utilisation of the StoFix UMP-TRI mounting element

$$\beta = \frac{F_Z \cdot \gamma}{F_{ZR}} + \frac{M \cdot \gamma}{M_R} \leq 1.0$$

F_Z Tensile load on mounting element (characteristic value)

M Bending load on mounting element (characteristic value)

F_{ZR} Breaking load of the tensile force on mounting element (characteristic value) acc. to bottom table

M_R Breaking load of the bending moment on mounting element (characteristic value) acc. to top table

γ Global safety factor, see page 25

Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw

$S_N = 0.25 \cdot F_Z + 2.617 \cdot M$

S_N, F_Z in kN | M in kNm

For verification of the utilisation of the mechanical fixing, see page 24

Characteristic breaking load, shear force and tensile force

F_{ZR} See left-hand table

F_{VR} See table on page 22

Verification of the utilisation of the StoFix UMP-TRI mounting element

$$\beta = \frac{F_s \cdot \cos \alpha \cdot \gamma}{F_{ZR}} + \frac{F_s \cdot \sin \alpha \cdot \gamma}{F_{VR}} \leq 1.0$$

F_s Diagonal load on mounting element (characteristic value)

F_{ZR} Breaking load of the tensile force on mounting element (characteristic value) acc. to left-hand table

F_{VR} Breaking load of the shear force on mounting element (characteristic value) acc. to table on page 22

γ Global safety factor, see page 25

Properties

**Loads on mechanical fixing
(characteristic values per screw)**

S_N Tensile force on screw

$$S_N = 0.00262 \cdot F_V \cdot D + 0.25 \cdot F_Z$$

S_V Shear force on screw

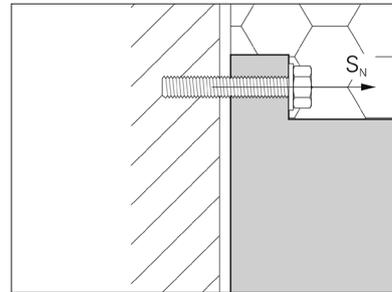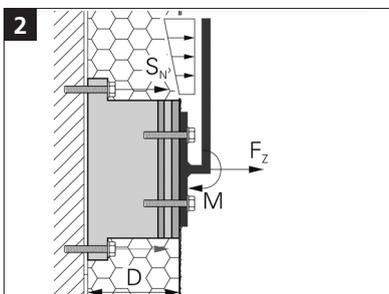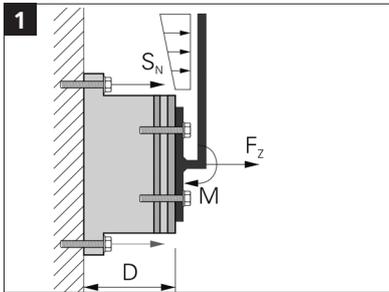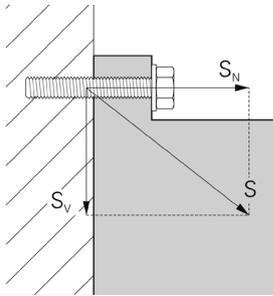$$S_V = 0.25 \cdot F_V$$

S Diagonal tensile force on screw

$$S = \sqrt{S_N^2 + S_V^2}$$

S_N, S_V, S, F_V, F_Z in kN | M in kNm | D in mm
For verification of the utilisation of the mechanical fixing,
see bottom right
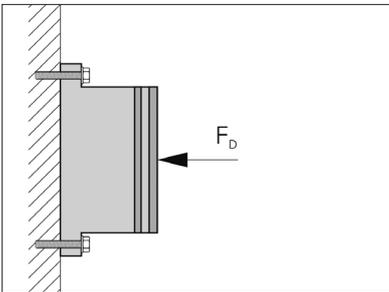
**Recommended working load,
compression force on entire compact
plate**

Compression force F_D 16.6 kN

**Service values[1] of the load-bearing capacities
Fischer FUR 14 x 140 F US**

Anchorage substrate	$S_{R,Zul}$ kN
Concrete ≥ C12/15 or B15	1.3[5]
Solid brick ≥ Mz12	0.6[2]
Solid sand-lime masonry ≥ KS12	0.6[2]
Vertical coring brick ≥ Hlz12[3]	0.5
Cored sand-lime masonry ≥ KSL6	0.6
Lightweight concrete hollow block ≥ Hbl2[4]	0.3
Lightweight concrete solid masonry ≥ V2	0.5
No-fines lightweight concrete TGL	0.7

1) Limitations for continuous tensile loads, see approval Z-21.2-1204, section 3.2.3.

2) The permissible load for uncored solid bricks or uncored solid sand-lime masonry (no grip ridge) can be increased to 0.8 kN.

3) Bulk density ≥ 1.0 kg/dm³; for other stone strength classes, the permissible load must be determined through tests on the construction.

4) The expanding part of the anchor must be anchored in the web of the brick (see approval Z-21.2-1204), attachment 6.

5) As a result of insufficient axis spacings, the values from approval Z-21.2-1204 have been reduced.

The permissible service values for the load-bearing capacities for Fischer FUR 14 x 140 F US apply to tensile load, shear load, and diagonal pull under every angle in accordance with the national technical approval Z-21.2-1204. The regulations in this approval are definitive. The reduced axis spacings are taken into account in the specified, permissible service values.

Verification of the utilisation of the mechanical fixing

$$\beta = \frac{S}{S_{R,Zul}} \leq 1.0$$

S Diagonal tensile load on anchor (characteristic value)

$S_{R\,perm}$ Permissible diagonal tensile load on anchor

StoFix UMP-TRI

Properties

Recommended working load, tensile force on screw connection in the aluminium plate

Tensile force P_z per M6 screw: 4.2 kN
Tensile force P_z per M8 screw: 5.5 kN
Tensile force P_z per M10 screw: 6.8 kN
Tensile force P_z per M12 screw: 8.0 kN

The values specified are the withdrawal forces of an individual screw from the aluminium plate.

For the global safety factor, the following partial safety factors are recommended:

VerkrallungszwischenlageSafety factor of the effect
$\gamma_E = 1.4$
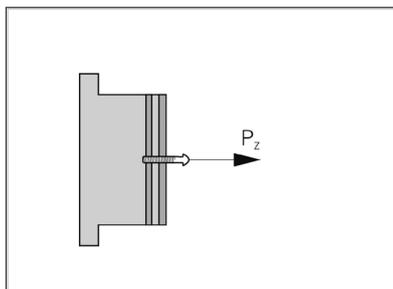Material safety factor $\gamma_M = 1.6$
Safety factor of long-term effects and temperature $\gamma_L = 1.8$
Recommended global safety factor $\gamma = \gamma_E \cdot \gamma_M \cdot \gamma_L = 4.0$

The recommended safety factors must be checked carefully and adjusted if necessary. Observe the comments under "Areas of application" on page 21.

The recommended safety factors apply under the following conditions:

Requirements for the mechanical fixing
Check the suitability of the fixing material provided for the available substrate. If the substrate is not known, pull-out tests are required for the fixing element before it is installed on the project. For more information: www.fischer.de

Requirements for bonding
Full-surface bonding is required for the StoFix UMP-TRI mounting element. The bond strength of the bond between the insulation board and the substrate and that of the bond between the StoFix UMP-TRI mounting element and the substrate must be at least 8.0 N/cm (EN 13499). At least 40 % of the surface of the insulation boards must be bonded to the substrate with bonding mortar. The insulation boards which adjoin the StoFix UMP-TRI mounting element must be bonded carefully. The bond strength and compressive strength of the bond must be determined using tests if necessary.

Requirements for the insulation boards and glass fibre mesh
Tensile strength of the integrated glass fibre mesh
(EN 13499):   > 40.0 N/mm
Tensile strength of the insulation board perpendicular
to the surface (EN 13499):   > 10.0 N/cm²
Compressive stress of the insulation board at
10 % compression CS(10)60 (EN 13163):   > 6.0 N/cm²

Installation

We recommend putting the StoFix UMP-TRI into place before bonding the insulation boards.

Mark drill holes, drill, and remove drilling dust; drill the perforated masonry without impact.

Apply bonding mortar to the adhesive surface of the StoFix UMP-TRI mounting element.

The entire surface of the element must be bonded onto the load-bearing substrate.

Consumption per StoFix UMP-TRI at a layer thickness of 5 mm: 0.29 kg

Put the StoFix UMP-TRI mounting element into place with screw-in anchor. Check the suitability of the screw-in anchor provided for the available substrate. If these are not suitable, they must be exchanged at the purchaser's expense. Tighten the screw-in anchor until the StoFix UMP-TRI mounting element is positioned flush in the outer insulation board row and fully embedded in the bonding mortar. After the bonding mortar has cured, retighten the screw-in anchor firmly once again.
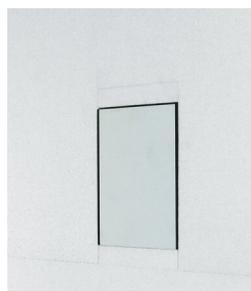
Adjust the insulation boards so they are free from joints.

StoFix UMP-TRI

Subsequent work

The StoFix UMP-TRI mounting elements can be coated with commercially-available coating materials for external wall insulation systems without an undercoat. Mounting objects are mounted on the render coating. The coating must withstand the compression forces which arise due to the mounting object. Use sheet-metal screws or screws with a metric thread (M screws) to screw into the StoFix UMP-TRI mounting element. Wood screws and self-tapping screws are not suitable.

Pre-drilling for M screws:

M6 drill bit diameter	5.0 mm
M8 drill bit diameter	6.8 mm
M10 drill bit diameter	8.5 mm
M12 drill bit diameter	10.2 mm

Pre-drilling for sheet-metal screws:
Pre-drill the drill bit diameter according to the information from the screw supplier. The drill depth must be 40 - 50 mm. Drill the drill hole through the compact plate and aluminium plate.

Cutting thread for M screws:
Cut the thread through the compact plate and aluminium plate.

Cutting thread for sheet-metal screws:
Not required

Screw the mounting object into the StoFix UMP-TRI mounting element. The depth of the screw connection in the StoFix UMP-TRI mounting element must be at least 30 mm to ensure that the screw is connected through the entire thickness of the foamed-in aluminium plate. To determine the total depth of the screw connection, the thickness of the coating on the StoFix UMP-TRI mounting element must be known. The screw length required results from the screwing depth, the thickness of the coating, and the thickness of the mounting object.

An adapter plate can be used if the usable area is too small.

Clamp force F_{VM}

per M6 screw:	7.7 kN
per M8 screw:	10.1 kN
per M10 screw:	12.6 kN
per M12 screw:	14.7 kN

F_{VM} = 0.7 x screw withdrawal breaking load

Tightening torque M_A

per M6 screw:	7.9 Nm
per M8 screw:	13.7 Nm
per M10 screw:	21.4 Nm
per M12 screw:	29.9 Nm

M_A = 0.17 x F_{VM} x screw diameter

Observe the manufacturer's information for the tightening torques of the screws.

StoFix Trawik L

Description

The StoFix Trawik L angled mounting element is made of black, rot-resistant, CFC-free rigid polyurethane foam with a foamed-in steel plate for a force-transmitting screw connection with the substrate, an aluminium plate to screw the mounting object in place, and a compact plate (HPL) which ensures optimum pressure distribution on the surface. Three screw-in anchors are supplied on request.

Areas of application

The StoFix Trawik L angled mounting element is ideal for installing third-party products in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW) in a way that is free from thermal bridges. StoFix Trawik L angled mounting elements are UV-resistant to a limited extent. They do not require a protective cover during the construction period.

Railings
between door and window reveal (Juliet balcony)

Fixing window blinds
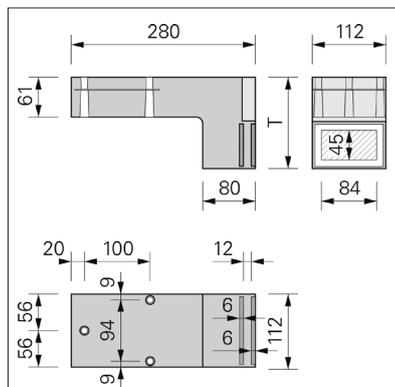
Dimensions
- Types T: 80 - 300 mm
- Adhesive surface: 280 x 112 mm
- Compact plate: 104 x 65 x 6 mm
- Aluminium plate: 104 x 65 x 6 mm
- Usable area: 84 x 45 mm
- Hole spacing: 100 x 94 mm

Mechanical fixing
- Screws: Fischer FUR 8 x 100 T
- Drill bit diameter: 8 mm
- Min. drill depth: 86 mm
- Min. anchorage depth: 70 mm
- Tool holder: Torx T30

Technical data
- PU volume weight: 250 kg/m3
- Reaction to fire in accordance with DIN 4102: B2

StoFix Trawik L

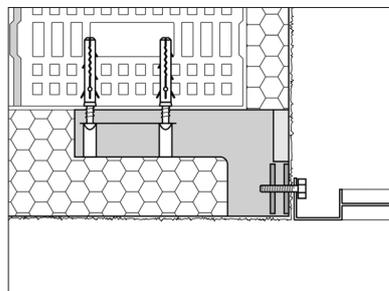## Properties

The strength is a result of the rigid polyurethane foam and the foamed-in reinforcements. There are no metallic connections between the lower foamed-in steel plate and the upper foamed-in aluminium plate.

Characteristic breaking load, shear force with bend

	1 Element fixed mechanically **without** bonding and embedded mesh		**2** Element fixed mechanically **with** bonding and embedded mesh	
T mm	**F_{VR}** kN	**M_R** kNm	**F_{VR}** kN	**M_R** kNm
80	2.4	0.40	4.6	0.40
100	2.0	0.40	4.5	0.40
120	1.7	0.40	4.5	0.40
140	1.5	0.40	4.4	0.40
160	1.2	0.40	4.4	0.40
180	1.0	0.40	4.3	0.40
200	0.9	0.40	4.3	0.40
220	0.7	0.35	4.2	0.35
240	0.7	0.35	4.1	0.35
260	0.6	0.35	4.1	0.35
280	0.6	0.35	4.0	0.35
300	0.6	0.40	4.0	0.40

Verification of the utilisation of the StoFix Trawik L angled mounting element

$$\beta = \frac{F_v \cdot \gamma}{F_{VR}} + \frac{M \cdot \gamma}{M_R} \leq 1.0$$

F_v Shear load on mounting element (characteristic value)

M Bending load on mounting element (characteristic value)

F_{VR} Breaking load of the shear force on mounting element (characteristic value) acc. to top table

M_R Breaking load of the bending moment on mounting element (characteristic value) acc. to top table

γ Global safety factor, see page 30

Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw
$S_N = (0.0106 \cdot T - 0.383) \cdot F_v$

S_v Shear force on screw

$S_v = \sqrt{1.411 \cdot F_v^2 + 27.021 \cdot M^2 + 12.05 \cdot F_v \cdot M}$

S Diagonal tensile force on screw

$S = \sqrt{S_N^2 + S_v^2}$

S_N, S_v, S, F_v in kN | M in kNm | T in mm

For verification of the utilisation of the mechanical fixing, see page 30

StoFix Trawik L

Properties

Characteristic breaking load, tensile force with bend

	1 Element fixed mechanically **without** bonding and embedded mesh		**2** Element fixed mechanically **with** bonding and embedded mesh	
T **mm**	F_{ZR} **kN**	M_R **kNm**	F_{ZR} **kN**	M_R **kNm**
80	1.5	0.30	2.3	0.30
100	1.5	0.30	2.5	0.30
120	1.4	0.30	2.6	0.30
140	1.4	0.30	2.7	0.30
160	1.4	0.30	2.9	0.30
180	1.4	0.30	3.0	0.30
200	1.4	0.30	3.2	0.30
220	1.4	0.30	3.3	0.30
240	1.3	0.30	3.5	0.30
260	1.3	0.25	3.6	0.25
280	1.3	0.25	3.8	0.25
300	1.3	0.25	3.9	0.25

Verification of the utilisation of the StoFix Trawik L angled mounting element

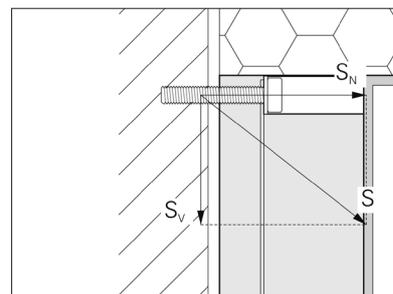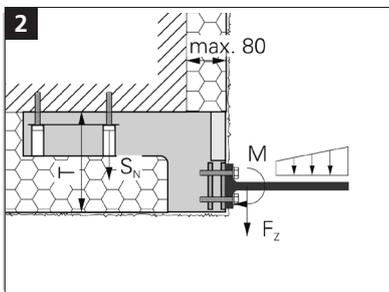$$\beta = \frac{F_z \cdot \gamma}{F_{ZR}} + \frac{M \cdot \gamma}{M_R} \le 1.0$$

F_z Tensile load on mounting element (characteristic value)

M Bending load on mounting element (characteristic value)

F_{ZR} Breaking load of the tensile force on mounting element (characteristic value) acc. to bottom table

M_R Breaking load of the bending moment on mounting element (characteristic value) acc. to top table

γ Global safety factor, see page 30
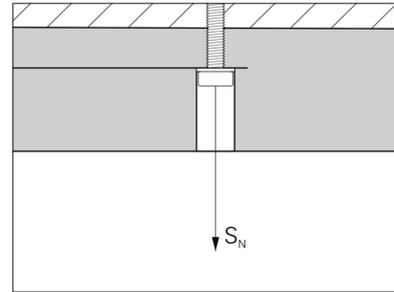
Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw

$S_N = 1.26 \cdot F_z + 5.0 \cdot M$

S_N, F_z in kN | M in kNm

For verification of the utilisation of the mechanical fixing, see page 30
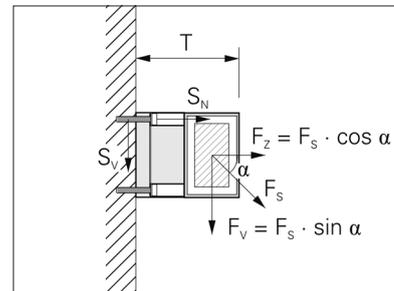
Characteristic breaking load, shear force and tensile force (diagonal pull)

F_{ZR} See left-hand table
F_{VR} See table on page 28

Verification of the utilisation of the StoFix Trawik L angled mounting element

$$\beta = \frac{F_s \cdot \cos\alpha \cdot \gamma}{F_{ZR}} + \frac{F_s \cdot \sin\alpha \cdot \gamma}{F_{VR}} \le 1.0$$

F_s Diagonal load on mounting element (characteristic value)

F_{ZR} Breaking load of the tensile force on mounting element (characteristic value) acc. to left-hand table

F_{VR} Breaking load of the shear force on mounting element (characteristic value) acc. to table on page 28

γ Global safety factor, see page 30

StoFix Trawik L

Properties

**Loads on mechanical fixing
(characteristic values per screw)**

S_N Tensile force on screw

$S_N = F_V (0.0106 \cdot T - 0.383) + 1.26 \cdot F_Z$

S_V Shear force on screw
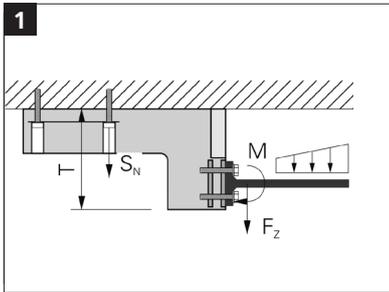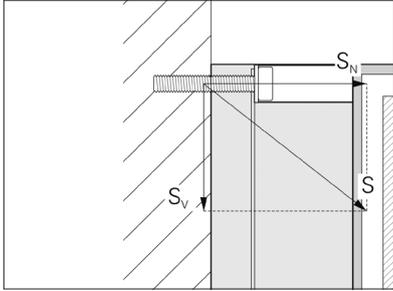
$S_V = 1.188 \cdot F_V$

S Diagonal tensile force on screw

$S = \sqrt{S_N^2 + S_V^2}$

S_N, S_V, S, F_V, F_Z in kN | T in mm

For verification of the utilisation of the mechanical fixing,
see top right

Service values of the load-bearing capacities Fischer FUR 8 x 100T

Anchorage substrate	$S_{R,Zul}$ kN	$S_{R,empf}$ kN
Concrete ≥ C12/15 or B15	1.0	1.2
Solid brick ≥ Mz12	0.4[2]	0.7
Solid sand-lime masonry ≥ KS12	0.4[2]	1.1
Vertical coring brick ≥ Hlz12[3]	-	0.13
Cored sand-lime masonry ≥ KSL6	-	0.63
Lightweight concrete hollow block ≥ Hbl2[4]	-	0.17
Lightweight concrete solid masonry ≥ V2	-	0.56

1) Limitations for continuous tensile loads, see approval Z-21.2-1204, section 3.2.3.

2) The permissible load for uncored solid bricks or uncored solid sand-lime masonry (no grip ridge) can be increased to 0.6 kN.

3) Bulk density ≥ 1.0 kg/dm³; for other stone strength classes, the permissible load must be determined through tests on the construction work.

4) The expanding part of the anchor must be anchored in the web of the brick (see approval Z-21.2-1204, attachment 6).

The permissible service values for the load-bearing capacities for Fischer FUR 8 x 100 T apply to tensile load, shear load, and diagonal pull under every angle in accordance with the national technical approval Z-21.2-1204. The regulations in this approval are definitive.

Verification of the utilisation of the mechanical fixing

$$\beta = \frac{S}{S_{R,Zul}} \leq 1.0 \quad \text{resp.} \quad \beta = \frac{S}{S_{R,empf}} \leq 1.0$$

S Diagonal tensile load on anchor (characteristic value)

$S_{R,rec}$ Recommended diagonal tensile load on anchor

$S_{R,perm}$ Permissible diagonal tensile load on anchor

Recommended working load, tensile force on screw connection in the aluminium plate

Tensile force P_Z per M6 screw:	3.1 kN
Tensile force P_Z per M8 screw:	3.9 kN
Tensile force P_Z per M10 screw:	5.1 kN
Tensile force P_Z per M12 screw:	6.7 kN

The values specified are the withdrawal forces of an individual screw from the aluminium plate.

For the global safety factor, the following partial safety factors are recommended:

Safety factor of the effect	$\gamma_E = 1.4$
Material safety factor	$\gamma_M = 1.6$
Safety factor of long-term effects and temperature	$\gamma_L = 1.8$
Recommended global safety factor	$\gamma = \gamma_E \cdot \gamma_M \cdot \gamma_L = 4.0$

The recommended safety factors must be checked carefully and adjusted if necessary. Observe the comments under "Areas of application" on page 27.

The recommended safety factors apply under the following conditions:

Requirements for the mechanical fixing

StoFix Trawik L

Properties

Check the suitability of the fixing material provided for the available substrate. If the substrate is not known, pull-out tests are required for the fixing element before it is installed on the project. For more information: www.fischer.de

Requirements for bonding
Full-surface bonding is required for the StoFix Trawik L angled mounting element. The bond strength of the bond between the insulation board and the substrate and that of the bond between the StoFix Trawik L angled mounting element and the substrate must be at least 8.0 N/cm (EN 13499). At least 40 % of the surface of the insulation boards must be bonded to the substrate with bonding mortar. The insulation boards which adjoin the StoFix Trawik L angled mounting element must be bonded carefully. The bond strength and compressive strength of the bond must be determined using tests if necessary.

Requirement for the insulation boards and glass fibre mesh
Tensile strength of the embedded glass fibre mesh
(EN 13499):   > 40.0 N/mm
Tensile strength of the insulation board perpendicular
to the surface (EN 13499):   > 10.0 N/cm^2
Compressive stress of the insulation board at
0 % compression CS(10)60 (EN 13163):   > 6.0 N/cm^2

Installation

We recommend moving the StoFix Trawik L angled mounting element into place at the same time as bonding the insulation boards.

Apply bonding mortar to the adhesive surface of the StoFix Trawik L angled mounting element. The entire surface of the element must be bonded onto the substrate. Consumption per StoFix Trawik L angled mounting element at a layer thickness of 5 mm: 0.23 kg

Press on the StoFix Trawik L angled mounting element so that it is flush with the insulation board. The projection of the StoFix Trawik L angled mounting element must be a maximum of 80 mm.

Only carry out the mechanical fixing after the bonding mortar has cured. Check the suitability of the screw-in anchor provided for the available substrate. If these are not suitable, they must be exchanged at the purchaser's expense. Drill the perforated masonry without impact.

Cut a fitting piece from the insulation board material for the recess, apply bonding mortar, and press it on so that it is flush with the insulation board.

StoFix Trawik L

Subsequent work

StoFix Trawik L angled mounting elements can be coated with commercially-available coating materials for external wall insulation systems without an undercoat. Mounting objects are mounted on the render coating. The coating must withstand the compression forces which arise due to the mounting object. Use sheet-metal screws or screws with a metric thread (M screws) to screw into the StoFix Trawik L angled mounting element. Wood screws and self-tapping screws are not suitable.

Pre-drilling for M screws:

M6 Drill bit diameter	5.0 mm
M8 Drill bit diameter	6.8 mm
M10 Drill bit diameter	8.5 mm
M12 Drill bit diameter	10.2 mm

Pre-drilling for sheet-metal screws:
Pre-drill the drill bit diameter according to the information from the screw supplier. The drill depth must be 36 - 46 mm. Drill the drill hole through the compact plate and aluminium plate.

Cutting thread for M screws:
Cut the thread through the compact plate and aluminium plate.

Cutting thread for sheet-metal screws:
Not required

Screw the mounting object into the StoFix Trawik L angled mounting element.

The depth of the screw connection in the StoFix Trawik L angled mounting element must be at least 26 mm to ensure that the screw is connected through the entire thickness of the foamed-in aluminium plate. To determine the total depth of the screw connection, the thickness of the coating on the StoFix Trawik L angled mounting element must be known. The screw length required results from the screwing depth, the thickness of the coating, and the thickness of the mounting object.

If installing railings between the reveals, this must be carried out without torsional stress.

An adapter plate can be used if the usable area is too small.

Clamp force F_{VM}

per M6 screw:	5.7 kN
per M8 screw:	7.1 kN
per M10 screw:	9.3 kN
per M12 screw:	12.3 kN

F_{VM} = 0.7 x screw withdrawal breaking load

Tightening torque M_A

per M6 screw:	5.8 Nm
per M8 screw:	9.7 Nm
per M10 screw:	15.9 Nm
per M12 screw:	25.2 Nm

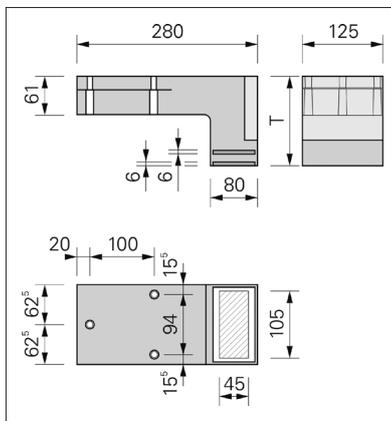M_A = 0.17 x F_{VM} x screw diameter

Observe the manufacturer's information for the tightening torques of the screws.

StoFix Trawik F

Description

The StoFix Trawik F angled mounting element is made of black, rot-resistant, CFC-free rigid polyurethane foam with a foamed-in steel plate for a force-transmitting screw connection with the substrate, an aluminium plate to screw the mounting object in place, and a compact plate (HPL) which ensures optimum pressure distribution on the surface. Three screw-in anchors are supplied on request.

Areas of application

The StoFix Trawik F angled mounting element is ideal for installing third-party products in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW) in a way that is free from thermal bridges. StoFix Trawik F angled mounting elements are UV-resistant to a limited extent. They do not require a protective cover during the construction period.

Important note

The StoFix Trawik F does not have technical approval. This mounting element must therefore not be used to fix safety-related loads, such as railings or Juliet balconies, i.e. if these fixings need to be structurally verified on this element – unless special approval has been obtained from DiBt. This also applies to some of the following examples.

Dimensions
- Types T: 80 - 300 mm
- Usable surface: 280 x 125 mm
- Compact plate: 117 x 65 x 6 mm
- Aluminium plate: 117 x 65 x 6 mm
- Usable area: 105 x 45 mm
- Hole spacing: 100 x 94 mm

Technical data
- PU volume weight: 250 kg/m³
- Reaction to fire in accordance
  with DIN 4102:   B2

Mechanical fixing
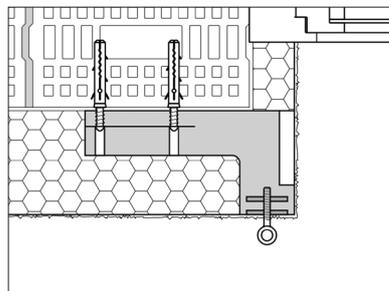- Screws: Fischer FUR 8 x 100 T
- Drill bit diameter: 8 mm
- Min. drill depth: 86 mm
- Min. anchorage depth: 70 mm
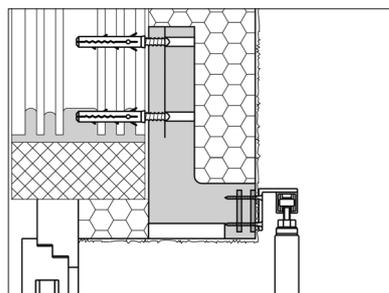- Tool holder: Torx T30

Pintles for window shutters
(Plate pintles and lag bolt pintles)

Guide rails for sliding shutters
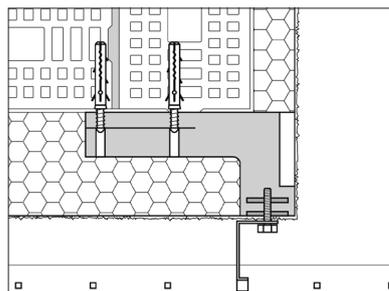
Railing installations on building corners

StoFix Trawik F

Properties

The strength is a result of the rigid polyurethane foam and the foamed-in reinforcements. There are no metallic connections between the lower foamed-in steel plate and the upper foamed-in aluminium plate.

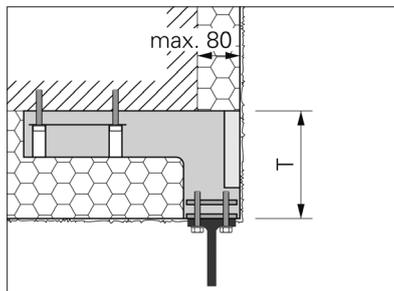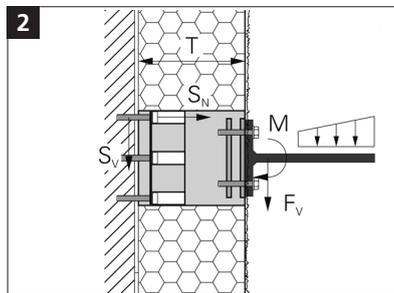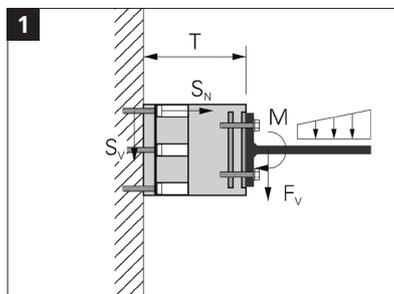|	**1** Element fixed mechanically **without** bonding and embedded mesh		**2** Element fixed mechanically **with** bonding and embedded mesh	
T mm	F_{VR} kN	M_R kNm	F_{VR} kN	M_R kNm
80	2.4	0.3	5.9	0.3
100	2.3	0.3	5.7	0.3
120	2.2	0.3	5.6	0.3
140	2.0	0.3	5.4	0.3
160	1.9	0.3	5.2	0.3
180	1.8	0.3	5.1	0.3
200	1.7	0.3	4.9	0.3
220	1.6	0.3	4.7	0.3
240	1.5	0.3	4.6	0.3
260	1.4	0.3	4.4	0.3
280	1.2	0.3	4.2	0.3
300	1.1	0.3	4.1	0.3

Characteristic breaking load, shear force with bend

Verification of the utilisation of the StoFix Trawik F angled mounting element

$$\beta = \frac{F_V \cdot \gamma}{F_{VR}} + \frac{M \cdot \gamma}{M_R} \leq 1.0$$

F_V Shear load on mounting element (characteristic value)

M Bending load on mounting element (characteristic value)

F_{VR} Breaking load of the shear force on mounting element (characteristic value) acc. to top table

M_R Breaking load of the bending moment on mounting element (characteristic value) acc. to top table

γ Global safety factor, see page 36

Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw
$S_N = F_V \cdot (0.0106 \cdot T + 10.64)$

S_V Shear force on screw

$S_V = 1.027 \cdot F_V$

S Diagonal tensile force on screw

$S = \sqrt{S_N^2 + S_V^2}$

S_N, S_V, S, F_V in kN | M in kNm | T in mm

For verification of the utilisation of the mechanical fixing, see page 36
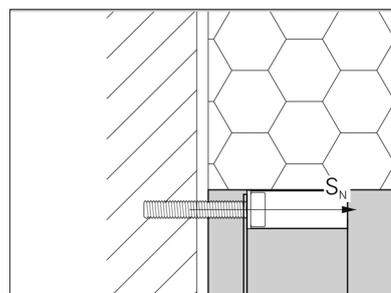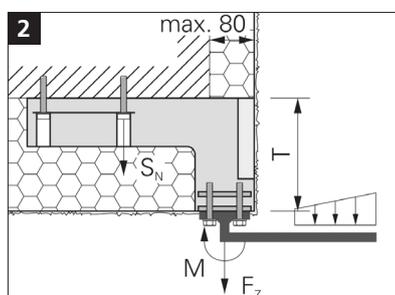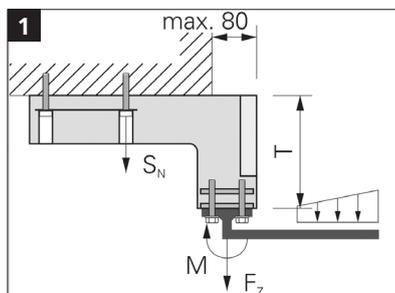
StoFix Trawik F

Properties

Characteristic breaking load, tensile force with bend

T mm	**1** Element fixed mechanically **without** bonding and embedded mesh		**2** Element fixed mechanically **with** bonding and embedded mesh	
	F_{ZR} kN	M_R kNm	F_{ZR} kN	M_R kNm
80	2.3	0.4	5.3	0.4
100	2.4	0.4	5.3	0.4
120	2.4	0.4	5.3	0.4
140	2.4	0.4	5.4	0.4
160	2.4	0.4	5.4	0.4
180	2.4	0.4	5.4	0.4
200	2.5	0.4	5.4	0.4
220	2.5	0.4	5.4	0.4
240	2.5	0.4	5.4	0.4
260	2.5	0.4	5.4	0.4
280	2.6	0.4	5.5	0.4
300	2.6	0.4	5.5	0.4

Verification of the utilisation of the StoFix Trawik F angled mounting element

$$\beta = \frac{F_z \cdot \gamma}{F_{ZR}} + \frac{M \cdot \gamma}{M_R} \leq 1.0$$

F_z Tensile load on mounting element (characteristic value)

M Bending load on mounting element (characteristic value)

F_{ZR} Breaking load of the tensile force on mounting element (characteristic value) acc. to bottom table

M_R Breaking load of the bending moment on mounting element (characteristic value) acc. to top table

γ Global safety factor, see page 36

Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw

$$S_N = 5.0 \cdot M + 1.1 \cdot F_z$$

S_N, F_z in kN | M in kNm

For verification of the utilisation of the mechanical fixing, see page 36

Characteristic breaking load, shear force and tensile force

F_{ZR}	See left-hand table
F_{VR}	See table on page 34

Verification of the utilisation of the StoFix Trawik F angled mounting element

$$\beta = \frac{F_s \cdot \cos \alpha \cdot \gamma}{F_{ZR}} + \frac{F_s \cdot \sin \alpha \cdot \gamma}{F_{VR}} \leq 1.0$$
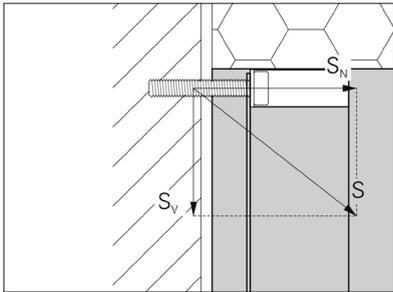
F_s Diagonal load on mounting element (characteristic value)

F_{ZR} Breaking load of the tensile force on mounting element (characteristic value) acc. to left-hand table

F_{VR} Breaking load of the shear force on mounting element (characteristic value) acc. to table on page 34

γ Global safety factor, see page 36

StoFix Trawik F

Properties

Loads on mechanical fixing (characteristic values per screw)

S_N Tensile force on screw
$S_N = F_V (0.0106 \cdot T + 10.64) + 1.1 \cdot F_z$

S_V Shear force on screw

$S_V = 1.027 \cdot F_V$

S Diagonal tensile force on screw

$S = \sqrt{S_N^2 + S_V^2}$

S_N, S_V, S, F_V in kN | T in mm

For verification of the utilisation of the mechanical fixing, see right-hand column

Service values of the load-bearing capacities Fischer FUR 8 x 100T

Anchorage substrate	$S_{R,Zul}$ kN	$S_{R,empf}$ kN
Concrete ≥ C12/15 or B15	1.0	1.2
Solid brick ≥ Mz12	0.4[2]	0.7
Solid sand-lime masonry ≥ KS12	0.4[2]	1.1
Vertical coring brick ≥ Hlz12[3]	-	0.13
Cored sand-lime masonry ≥ KSL6	-	0.63
Lightweight concrete hollow block ≥ Hbl2[4]	-	0.17
Lightweight concrete solid masonry ≥ V2	-	0.56

1) Limitations for continuous tensile loads, see approval Z-21.2-1204, section 3.2.3.

2) The permissible load for uncored solid bricks or uncored solid sand-lime masonry (no grip ridge) can be increased to 0.6 kN.

3) Bulk density ≥ 1.0 kg/dm³; for other stone strength classes, the permissible load must be determined through tests on the construction work.

4) The expanding part of the anchor must be anchored in the web of the brick (see approval Z-21.2-1204, attachment 6).

The permissible service values for the load-bearing capacities for Fischer FUR 8 x 100 T apply to tensile load, shear load, and diagonal pull under every angle in accordance with the national technical approval Z-21.2-1204. The regulations in this approval are definitive.

Verification of the utilisation of the mechanical fixing

$$\beta = \frac{S}{S_{R,Zul}} \leq 1.0 \text{ resp. } \beta = \frac{S}{S_{R,empf}} \leq 1.0$$

S Diagonal tensile load on anchor (characteristic value)

$S_{R,rec}$ Recommended diagonal tensile load on anchor

$S_{R,perm}$ Permissible diagonal tensile load on anchor

Recommended working load, tensile force on screw connection in the aluminium plate

Tensile force P_z per M6 screw: 3.1 kN
Tensile force P_z per M8 screw: 3.9 kN
Tensile force P_z per M10 screw: 5.1 kN
Tensile force P_z per M12 screw: 6.7 kN

The values specified are the withdrawal forces of an individual screw from the aluminium plate.

For the global safety factor, the following partial safety factors are recommended:

Safety factor of the effect $\gamma_E = 1.4$
Material safety factor $\gamma_M = 1.6$
Safety factor of long-term effects and temperature $\gamma_L = 1.8$
Recommended global safety factor $\gamma = \gamma_E \cdot \gamma_M \cdot \gamma_L = 4.0$

StoFix Trawik F

Properties / installation

The recommended safety factors must be checked carefully and adjusted if necessary. Observe the comments under "Areas of application" on page 33.

The recommended safety factors apply under the following conditions:
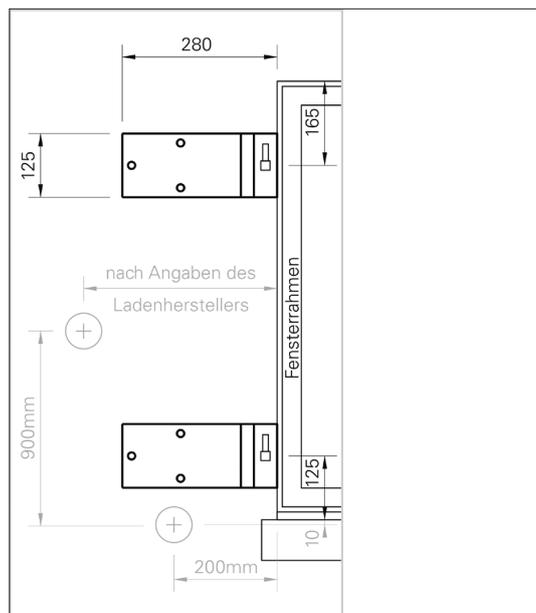
Requirements for the mechanical fixing
Check the suitability of the fixing material provided for the available substrate. If the substrate is not known, pull-out tests are required for the fixing element before it is installed on the project. For more information: www.fischer.de

Requirements for bonding
Full-surface bonding is required for the StoFix Trawik F angled mounting element. The bond strength of the bond between the insulation board and substrate and that of the bond between the StoFix Trawik F angled mounting element and the substrate must be at least 8.0 N/cm (EN 13499).
At least 40 % of the surface of the insulation boards must be bonded to the substrate with bonding mortar. The insulation boards which adjoin the StoFix Trawik F angled mounting element must be bonded carefully. The bond strength and compressive strength of the bond must be determined using tests if necessary.

Requirement for the insulation boards and glass fibre mesh
Tensile strength of the embedded glass fibre mesh (EN 13499):	> 40.0 N/mm
Tensile strength of the insulation board perpendicular to the surface (EN 13499):	> 10.0 N/cm^2
Compressive stress of the insulation board at 10 % compression CS(10)60 (EN 13163):	> 6.0 N/cm^2

Placement diagram
Dimensions which deviate from this diagram must be clarified on site.

Measure the exact location and draw in on the blueprint for subsequent third-party installations.

Installation

We recommend putting the StoFix Trawik F angled mounting element into place at the same time as bonding the insulation boards.
Apply bonding mortar to the adhesive surface of the StoFix Trawik F angled mounting element.
The entire surface of the element must be bonded onto the load-bearing substrate.
Consumption per StoFix Trawik F angled mounting element at a layer thickness of 5 mm: 0.26 kg

Press on the StoFix Trawik F angled mounting element so that it is flush with the insulation board.

Only carry out the mechanical fixing after the bonding mortar has cured. Check the suitability of the screw-in anchor provided for the available substrate. If these are not suitable, they must be exchanged at the purchaser's expense. Drill the perforated masonry without impact.

Cut a fitting piece from the insulation board material for the recess, apply bonding mortar, and press it on so that it is flush with the insulation board.

Subsequent work

StoFix Trawik F angled mounting elements can be coated with commercially-available coating materials for external wall insulation systems without an undercoat. Mounting objects are mounted on the render coating. The coating must withstand the compression forces which arise due to the mounting object. Use sheet-metal screw or screws with a metric thread (M screws) to screw into the StoFix Trawik F angled mounting element. Wood screws and self-tapping screws are not suitable.

Pre-drilling for M screws:

M6	Drill bit diameter	5.0 mm
M8	Drill bit diameter	6.8 mm
M10	Drill bit diameter	8.5 mm
M12	Drill bit diameter	10.2 mm

Pre-drilling for sheet-metal screws:
Pre-drill the drill bit diameter according to the information from the screw supplier. The drill depth must be 36 - 46 mm. Drill the drill hole through the compact plate and aluminium plate.

Cutting thread for M screws:
Cut the thread through the compact plate and aluminium plate.

Cutting thread for sheet-metal screws:
Not required

Screw the mounting object into the StoFix Trawik F angled mounting element.

The depth of the screw connection in the StoFix Trawik F angled mounting element must be at least 26 mm to ensure that the screw is connected through the entire thickness of the foamed-in compact plate.

Lag bolt pintles can be secured against twisting with counter-nuts. To determine the total depth of the screw connection, the thickness of the coating on the StoFix Trawik F angled mounting element must be known. The screw length required results from the screwing depth, the thickness of the coating, and the thickness of the mounting object.

An adapter plate can be used if the usable area is too small.

Clamp force F_{VM}

per M6 screw:	5.7 kN
per M8 screw:	7.1 kN
per M10 screw:	9.3 kN
per M12 screw:	12.3 kN

F_{VM} = 0.7 x screw withdrawal breaking load

Tightening torque M_A

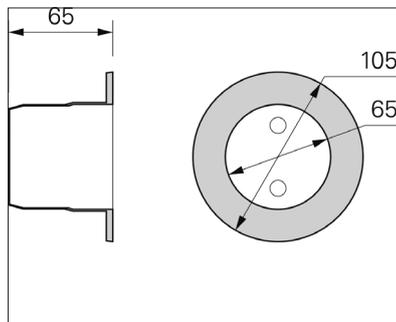|	
per M6 screw:	5.8 Nm
per M8 screw:	9.7 Nm
per M10 screw:	15.9 Nm
per M12 screw:	25.2 Nm

M_A = 0.17 x F_{VM} x screw diameter

Observe the manufacturer's information for the tightening torques of the screws.

StoFix Eldoline

Description

The StoFix Eldoline flush mounting box retainer is made of polyamide with limited combustibility. The surface is perforated.

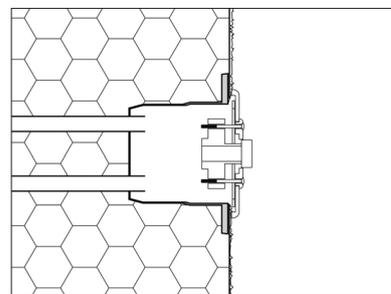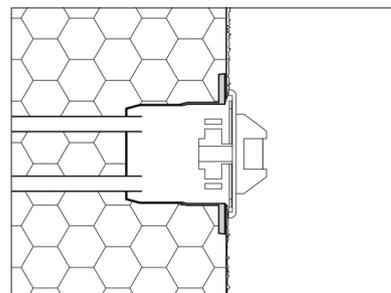## Areas of application

The StoFix Eldoline flush mounting box retainer is ideal for the installation of electrical switches and outlets in external wall insulation systems made of expanded polystyrene (EPS) and stone wool (SW) in a way that is free from thermal bridges. Only use wood or sheet-metal screws to screw into the StoFix Eldoline flush mounting box retainer. StoFix Eldoline flush mounting box retainers guarantee that third-party installations are free from thermal bridges, e.g. for:
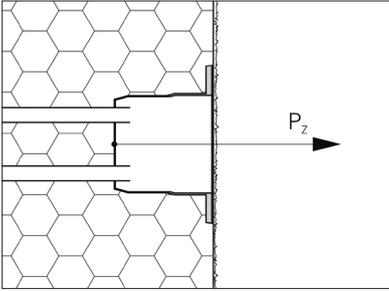
Electrical switches

Motion detectors

Dimensions
- Inner socket diameter: 65 mm
- Outer collar diameter: 105 mm
- Socket depth: 65 mm

Fixing
- Adhesive: StoColl Fix

StoFix Eldoline

Properties

Recommended working load,
tensile force P_z on the installed element
On correctly bonded StoFix Eldoline flush
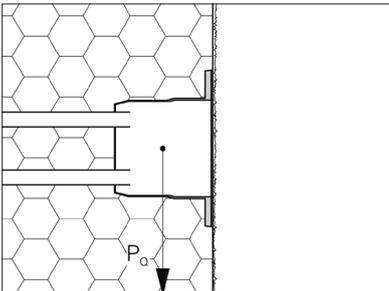mounting box retainer in

EPS insulation boards	15 kg/m³: 0.60 kN
Stone wool insulation boards	120 kg/m³: 0.15 kN
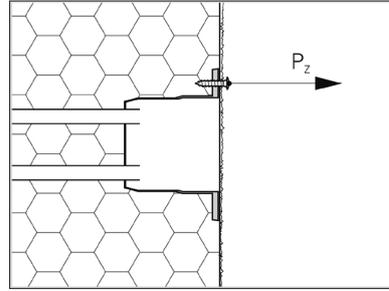
Recommended working load,
tensile force P_z on screw connection

Tensile force per screw:	0.15 kN
Values based on screw diameter:	4 mm

Recommended working load,
shear force P_Q on the installed element
On correctly bonded StoFix Eldoline flush
mounting box retainer in

EPS insulation boards	15 kg/m³: 0.75 kN
Stone wool insulation boards	120 kg/m³: 0.53 kN

The specified values take into account
embedded mesh with 0.25 kN/5 cm.
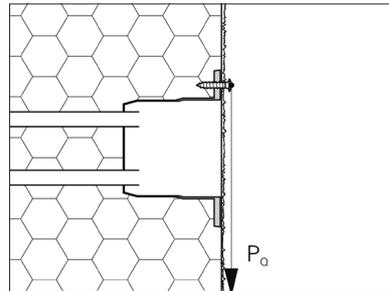
Recommended working load,
shear force P_Q on screw connection

Shear force per screw:	0.15 kN
Values based on screw diameter:	4 mm

The recommended working loads are
determined with a global safety factor from
the characteristic breaking loads.

StoFix Eldoline

Installation

Put the StoFix Eldoline flush mounting box retainers into place when bonding the insulation boards.

Measure the position of the StoFix Eldoline flush mounting box retainer marked by the electrician and mark on the insulation board.

Mill the recess on the outer side of the insulation board with the StoFix Eldoline milling tool and remove the milling dust.

Cut out recesses for electrical cables or cable conduits on the inner side of the insulation boards.

Bond the insulation board and bring electrical cables or cable conduits through the recesses at the same time.

Cut out feedthroughs in the StoFix Eldoline flush mounting box retainer.

StoFix Eldoline

Installation

Use fixing foam to seal recesses that have been cut too large on the inner side of the insulation board.

Apply StoColl Fix to the curved inner surface of the recess as a fixing aid and smooth with a spatula.

Apply StoColl Fix to the circular area of the StoFix Eldoline flush mounting box retainer.

Consumption per StoFix Eldoline flush mounting box retainer: 20 - 25 ml

Feed the electrical cables or cable conduits into the feedthroughs of the StoFix Eldoline electrical socket retainer and press the StoFix Eldoline electrical socket retainer into the recess so that it is flush with the insulation board.

Cut off the cables

(if no cable conduits have been used, this work stage is not necessary)

Subsequent work

StoFix Eldoline flush mounting box retainers can be coated with commercially-available coating materials for external wall insulation systems without an undercoat.

Mounting objects are mounted on the render coating.

The coating must withstand the compression forces which arise due to the mounting object.

Only use wood or sheet-metal screws to screw into the StoFix Eldoline flush mounting box retainer. Screws with a metric thread (M screws) and self-tapping screws are not suitable.
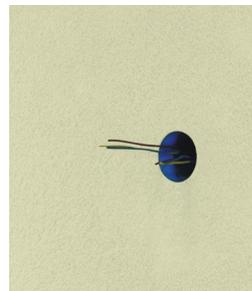
Connect the electrical cables before moving the electrical component into place.

Indenting with a bradawl makes it easier to set the screw. Pre-drilling is not required.

Screw the mounting element in the StoFix Eldoline flush mounting box retainer.

Glossary

Breaking loads
Breaking loads are forces which either break the anchorage, break or unplug the anchor, or destroy the mounting element.

Characteristic breaking loads
Characteristic breaking loads refer to the forces which are reached or exceeded in 95 % of all cases of failure (5 % quantile).

Compressive strength
Compressive strength refers to the durability of a material under the impact of compressive forces. If the compressive stress is greater than the compressive strength of a solid, then it will be destroyed. The compressive strength is the ratio between the breaking load and cross-sectional area of a sample. It is normally expressed as force by area (N/mm²) and therefore has the unit of a stress.

Compression force
Compression force is a force acting on an area; this force is perpendicular to the surface. It is therefore also referred to as normal force.

Compressive stress
Mechanical stress (symbol σ) is a term from strength of materials, a branch of technical mechanics. It is the force by area (N/mm²) which acts through a solid, liquid, or gas in a conceived cross-sectional area. If the compressive stress is greater than the compressive strength of a solid, then it will be destroyed.

Recommended working loads
Recommended working loads or maximum working loads already include a sufficient safety factor.

Bond strength
The bond strength (symbol β) is used as the characteristic value for the surface tensile strength of coatings on a substrate.

Quantile F
Quantile $F_{\varepsilon\%}$ (also fractile) signifies a certain characteristic value of a measurement series; only a certain percentage ε of all measured values lies under or over this. A quantile value like this can only be specified with a confidence level (W) as the quantile value is only determined from a limited number of measurements. Unless specified otherwise, the quantile value is determined using $\varepsilon = 5$ % and a confidence level W = 90 % in this documentation.

Shear force
The shear force is a force which acts perpendicularly to the primary axis of a linear coordinate system. The normal force acts perpendicularly to this, i.e. in the direction of the primary axis.

Safety factor
The safety factor specifies the factor by which the failure limit of the structure, building element, or material is higher than the value determined by the theoretical calculation. For the global safety assessment, as the name suggests, a global safety factor is used to verify the structural safety. This means that the characteristic breaking loads divided by the global safety factor must be greater than the characteristic working loads. The global safety factor γ is made up of a material safety factor γ_M and a safety factor of the effects γ_L.

Thermal bridge loss coefficient
The thermal bridge loss coefficient is a variable for performing detailed calculations of the transmission heating requirement or annual heating requirement. Quantitatively, it is expressed per running metre W/Km in the case of linear thermal bridges (using a psi value), and per thermal bridge W/K in the case of isolated thermal bridges (using a chi value).

Tensile force
In physics, tensile force refers to a force which pulls something, i.e. which acts on the generator of the force.

Validity
All information corresponds to the current state of the art at the time of printing. Guarantee or legal obligation for the application cannot be derived from said information as implementation and working conditions are out of our control. Amendments and further developments are generally reserved. The general terms and conditions come into force when placing an order. Amendments must be made in writing.

Kontakt os

Sto Danmark A/S
Avedøreholmen 48
2650 Hvidovre
Tlf. +45 70 27 01 43
kundekontakt@sto.com
www.sto.dk