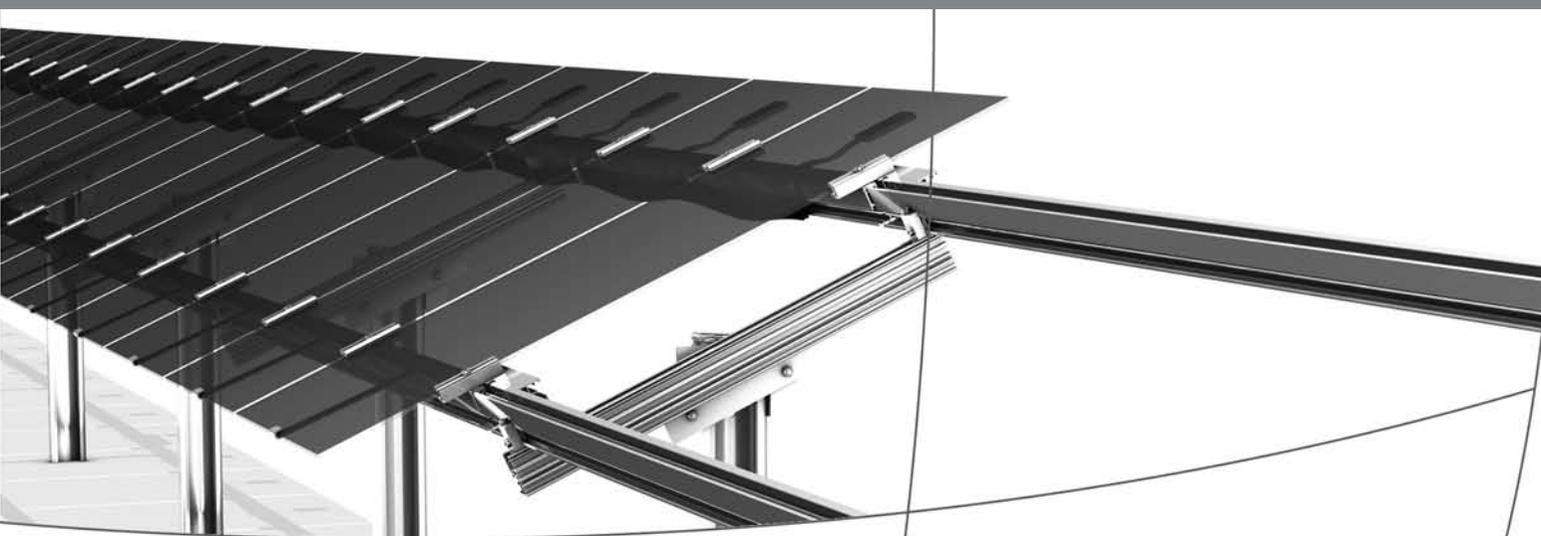


Open area system Sigma

Installation manual



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# 1 Introduction

## 1.1 Short description

Sigma is a mounting system for installing photovoltaic elements on open areas. It was developed as a frame for laminates, though it can also be used for framed modules\*.

The system is made of extruded aluminium and galvanised steel which means that it requires little maintenance. The use of Quickstones makes installation simple and secure.

Sigma satisfies guidelines and standards valid at the time of delivery, is up to date with current technology and complies with recognised safety-related regulations.

## 1.2 Intended use

Sigma is exclusively designed to accommodate photovoltaic laminates and modules. Any other use is deemed not to be as intended.

Intended use also includes compliance with the specifications stated in this installation manual. Mounting Systems shall not be held liable for damages arising from a failure to observe and follow the installation manual, particularly the safety instructions, or from any improper use of the product.

\* When ordering framed modules, please remember to include the appropriate module (end) clamps. For enquiries and custom designs, please contact the Mounting Systems service department (telephone number PTO).

## 1.3 Standards and technical directives

Sigma complies with the following standards:

- | DIN 18800: Design and construction of steel structures
- | DIN 1055, EUROCODE 9: Action on structures
  - | Part 1: Densities and weights of building materials, structural elements and stored materials
  - | Part 4: Wind loads (on structures which are not susceptible to vibration)
  - | Part 5: Snow loads and ice loads

## 1.4 About this manual

### Subject of this manual

The subject of this manual is the installation of the Sigma.

The manual describes the installation of a laminate. Other modules or laminates can be installed in the same way.

Specifications for the Sigma system can be found in the last chapter.

### User group

The manual is intended to be used by the operator or by a group of people possessing technical skills and basic mechanical knowledge who have been trained by the operator.

### Signposts

The following notes will make it easier for you to use this manual:

### Item numbers

In the illustrations, individual parts are labelled with item numbers and are shown in the form  and .

### Step-by-step procedure

Start of the step-by-step procedure is a description of the objective. Individually numbered steps follow which may be interspersed with background information or warnings.

### Headers

The headers show the title of each current chapter.

### Footers

The footers display the name of the product, name of the document, and page number.

### Pictograph



Denotes background and additional information for step-by-step procedures.

## 2 Safety

### 2.1 Basic safety instructions

The following basic safety instructions and warning symbols form an essential part of this manual and are of fundamental importance when handling this product.

- | Do not remove or disable any safety devices.
- | Wear work clothes in accordance with the regulations of the Employer's Liability Insurance Association.
- | Comply with the relevant safety regulations.
- | The presence of a second party who can provide help in the event of an accident is obligatory during the entire installation process.
- | Keep a copy of this installation manual in the immediate vicinity of the system.

### 2.2 Warnings

The warning symbols used in this installation manual indicate information important for safety. They consist of the following:

- | Warning symbol (pictograph)
- | Indicator word showing the level of risk
- | Details of the nature and source of the risk
- | Information on the possible consequences of disregarding the risk
- | Instructions on what to do to avert the risk and prevent injuries or damage to property

The indicator word in the warning:



#### **DANGER**

Denotes an immediately hazardous situation, failure to observe which could lead to serious injury or death.



#### **WARNING**

Denotes a potentially dangerous situation which may lead to serious or moderate physical injury.



#### **CAUTION**

Denotes a potential danger, which may cause damage to property.

### 2.3 Responsibilities of the owner/operator

The system operator has the following safety-related responsibilities:

- | To ensure that installation of the system is only carried out by individuals with specialist technical knowledge and basic knowledge of mechanical engineering.
- | To ensure that those commissioned to perform the work can evaluate their assigned tasks and recognise possible risks.
- | To ensure that those commissioned to perform the work are familiar with the system components.
- | To ensure that the installation manual is available during installation. The installation manual is an integral part of the product.

- | Ensure that the installation manual, and in particular the safety instructions, are read and understood by the relevant personnel before installation.
- | Ensure that the permissible operating conditions (see Chapter 3.1, page 4) are observed. Mounting Systems is not liable for damage occurring when these conditions are not adhered to.
- | Ensure the durability of all connections and the attachment of the system.
- | Ensure that suitable lifting gear is used for installation.
- | Ensure that only Mounting Systems components are used when parts need to be replaced. Otherwise any warranty claim is null and void.

## 3 Important installation instructions

### 3.1 Operating conditions

Sigma is designed to withstand the following maximum loads:

- | Snow load: 0,8 kN/m<sup>2</sup> maximum
- | Wind load: 25 m/s maximum



The prevailing statics must be checked on site. If stresses are higher, it may be possible to adapt the system. For more detailed information, please contact the Mounting Systems service department or a local structural engineer.

The ground at the site of the proposed installation must be suitable for the use of foundation posts (sigma posts). A project-related assessment report on the ground from an expert assessor is required. The project-related ground assessment report will reveal the necessary anchoring depth and any change required in the distance between the posts.



Regarding the anchoring depth make sure that there is a distance of at least 50 cm between the cables of the laminates/modules and the ground. This avoids damages by animals.

### 3.2 Preparation for installation

The following tools are required to install the Sigma system:

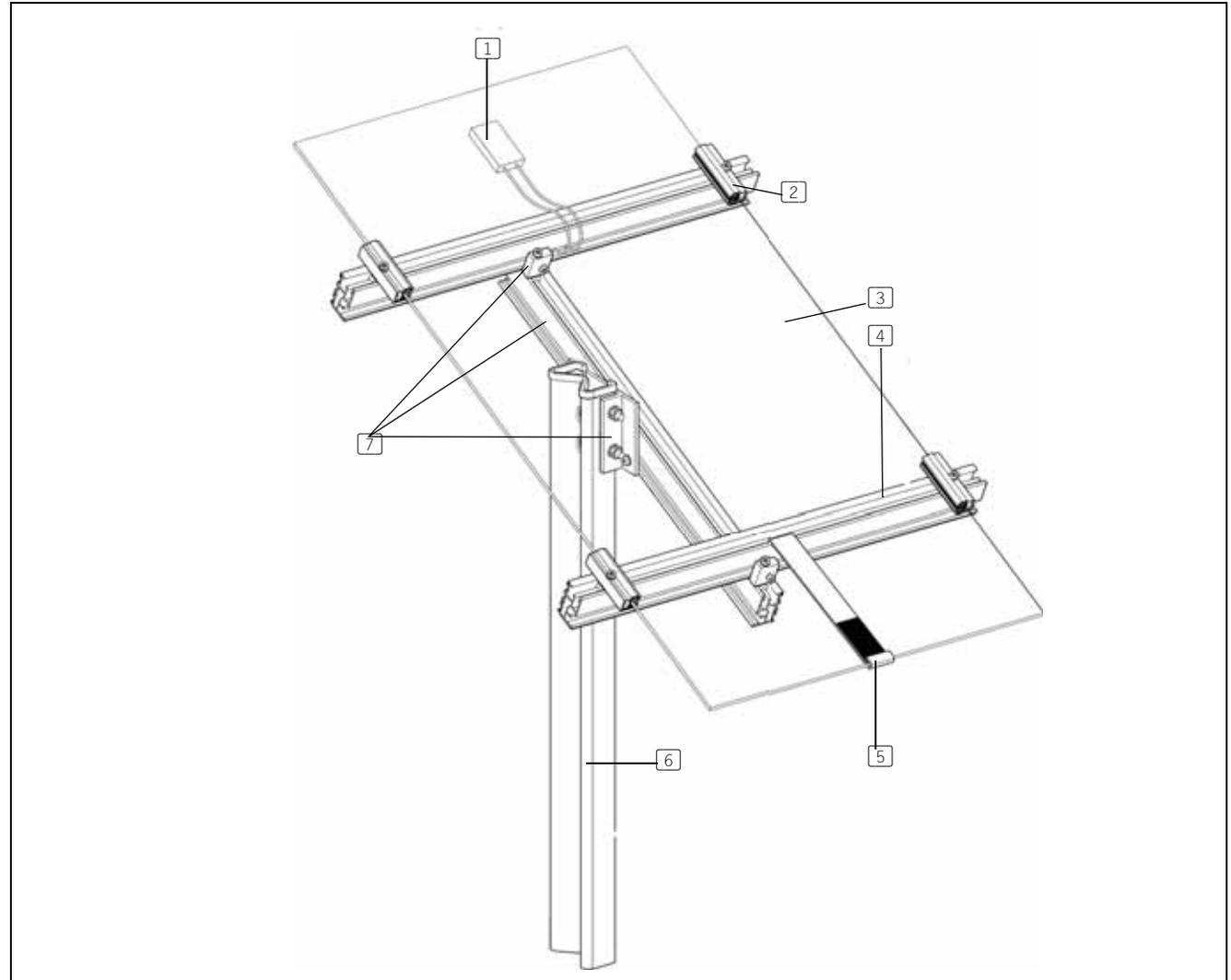
- | Allen key, 6 mm
- | Open-end spanner or socket, WAF 13
- | Two open-ended spanners or sockets, WAF 17

## 4 System overview

The system overview shows all system parts of the Sigma.

The scope of supply may vary depending on your order.

- 1 Connection for cable
- 2 Laminate (end) clamp
- 3 Laminate
- 4 Base rail
- 5 Anti-slip protection
- 6 Foundation posts
- 7 Adapter, pre-assembled, comprising
  - | Adapter plate
  - | Chevron
  - | 2x X-Stones



## 5 Installing the system

### 5.1 Installation procedure

The following pages list the individual steps for installing the Sigma in the correct sequence.

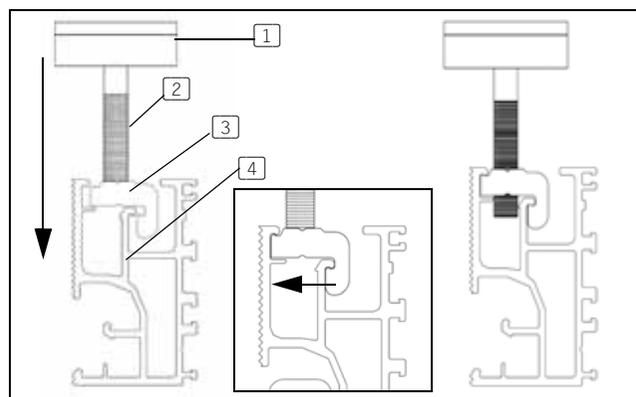
The pages feature three columns. Each column represents a complete sequence of actions. The sequence of actions consists of an illustration, the corresponding steps and additional information and safety instructions.

### 5.2 Quickstone and X-Stone

During the installation of Sigma, Quickstones are used. The Quickstone is a special nut used to connect several parts of the Sigma. The only tool needed for installation is a 6 mm Allen key.

The Quickstone can be used on both channels of the base rail.

For a cross-installation of two layers of base rails, X-Stones are used. These consist of an aluminium block with two pre-assembled Quickstones.



- 1 Element to be fixed (e.g. module clamp)
- 2 Allen bolt
- 3 Quickstone
- 4 Base rail

#### Installing the Quickstone



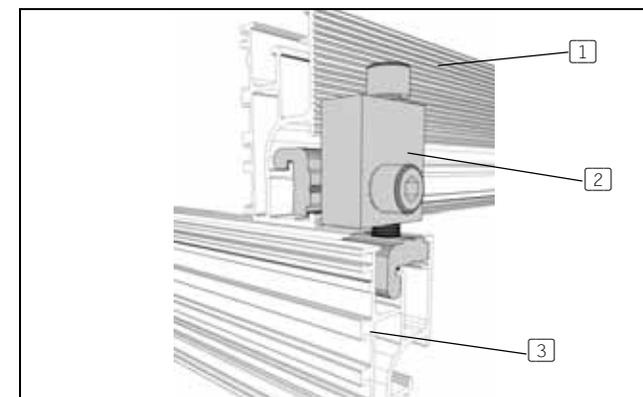
#### Material damage through faulty installation

Incorrectly installed Quickstone connections can rip out of the profile.

- | Install all Quickstone connections as described below.

#### Installation

- | If necessary, adjust the bolt so that it does not protrude the Quickstone
- | Fit the Quickstone from above into the profile channel so that it wedges underneath the protruding rail hooks. When fitted correctly, the Quickstone matches the form of the profile exactly.
- | Tighten the bolt with a torque of 8 Nm.



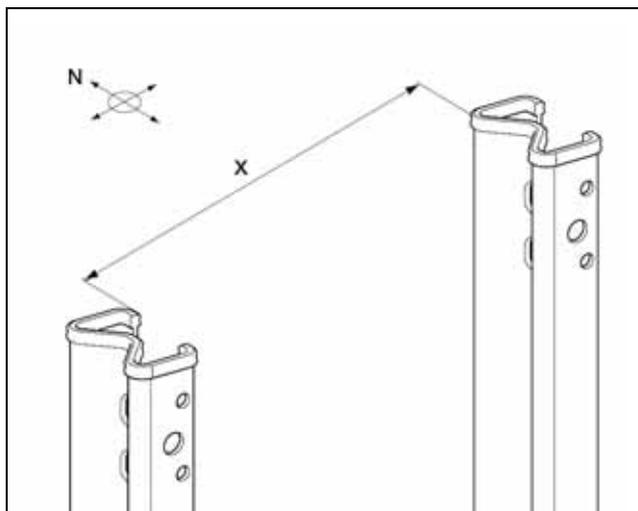
- 1 Horizontal base rail
- 2 X-Stone with 2 Quickstones
- 3 Vertical base rail

#### Installing the X-Stone

#### Installation

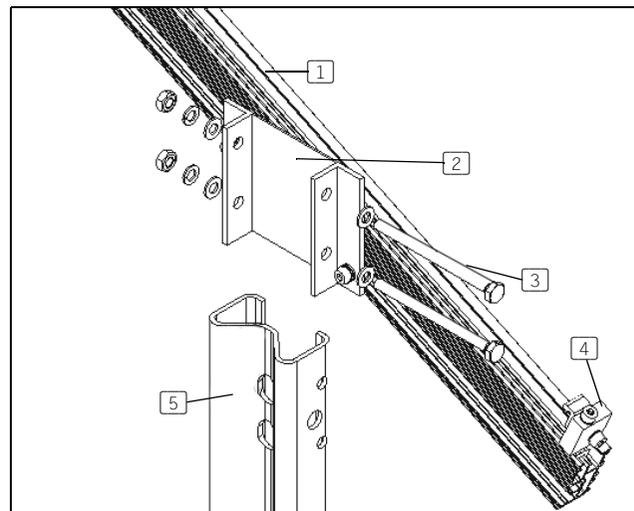
- | Install both Quickstones as described above.
- | Make sure the upper rail lays flat on the lower one.
- | Completely tighten both Quickstones only when you have put the rails in their final position.

## 5.3 Installing the frame parts

**Sinking posts into the ground**

The distance  $x$  between posts, as well as the length per post and the ramming depth depend on the soil assessment, the site specifications and the project details. The ramming depth needs to be verified additionally by tests on site.

Sink the posts into the ground in such a way that the open side of the Sigma profile faces east. The anchoring depth and the distance between posts can be found in the project-specific ground assessment report or the planning documents.

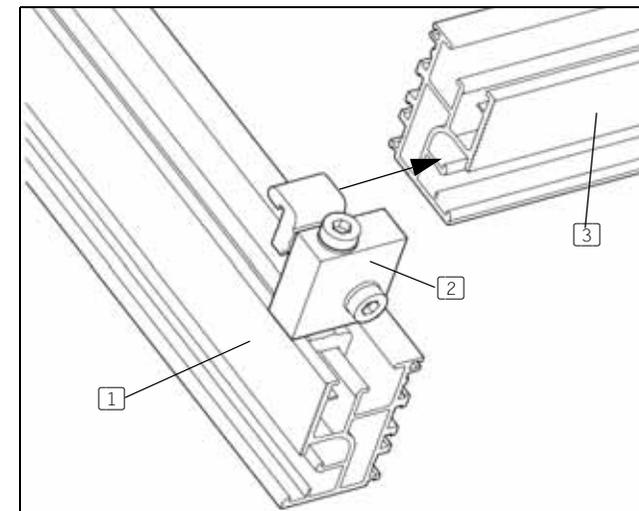


- 1 Chevron
- 2 Adapterplate
- 3 Small parts
- 4 X-Stone
- 5 Post

**Fitting the adapter to the posts**

The adapter is delivered pre-assembled and comprises adapterplate, chevron and 2 X-Stones.

- Hold the adapter up to the post so that the post is positioned between the two angle brackets and the open side of the Sigma profile rests against the adapter.
- Screw the adapter angle brackets to the post with the hexagon head bolts (2x M10 x 140 mm), washers (4x M10), spring washers (2x M10) and nuts (2x M10) (tightening torque 50 Nm).
- Repeat steps 1 and 2 on all other posts.



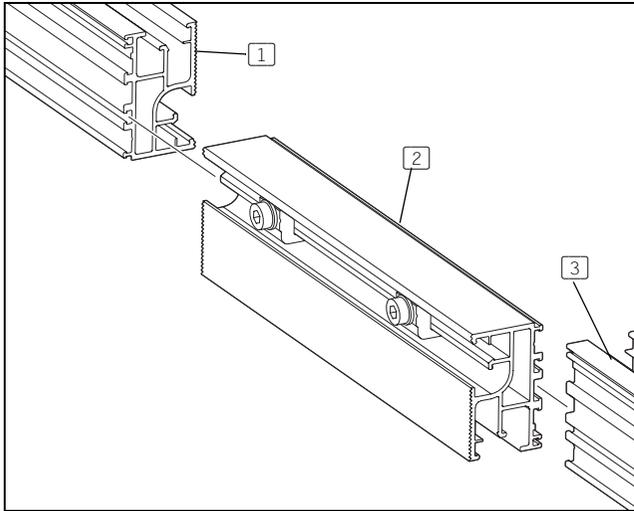
- 1 Chevron
- 2 X-Stone
- 3 Base rail

**Fitting the base rails**

Base rails of different lengths can be used alternately on the Sigma system.

You will find the fitting sequence in your planning documents.

- Lay the base rails upright onto the chevrons. Please find the planned projection in your planning documents.
- Fully hook the base rail into the Quickstone on the X-Stone (see Chapter 5.1, page 6)
- Tighten the Allen bolt to fasten the base rail (Tightening torque 10 Nm).
- Repeat steps 1 to 3 for the opposite rail.



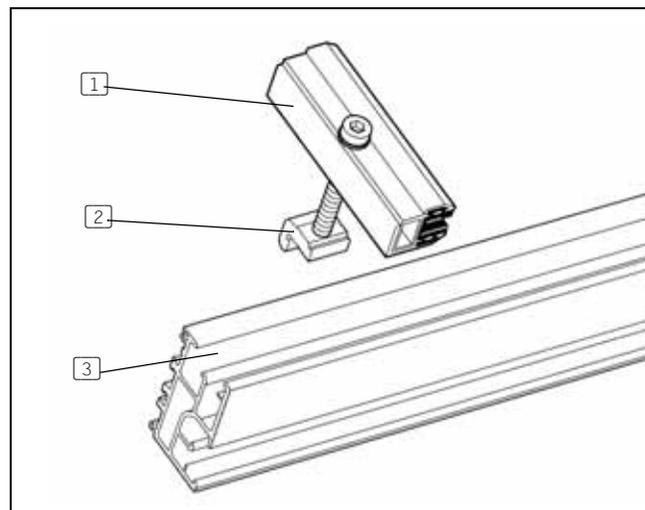
- 1 Base rail
- 2 Splice with 2 Quickstones
- 3 Base rail

### Joining the base rails

Splices with one Quickstone and two Quickstones can be used on the Sigma system. Splices with two Quickstones lock the base rails together, whereas splices with one Quickstone act as an expansion joint in order to accommodate variations in rail length due to temperature changes.

- | Slide the splice halfway onto the first base rail.
- | Slide the next base rail into the splice, leaving a 5 cm space between base rails.
- | Tighten the Quickstone Allen bolt (1 x or 2 x).
- | Repeat steps 1 to 3 for the other base rails. Make sure that splices with one and two Quickstones are used according to your planning documents.

## 5.4 Fitting laminates



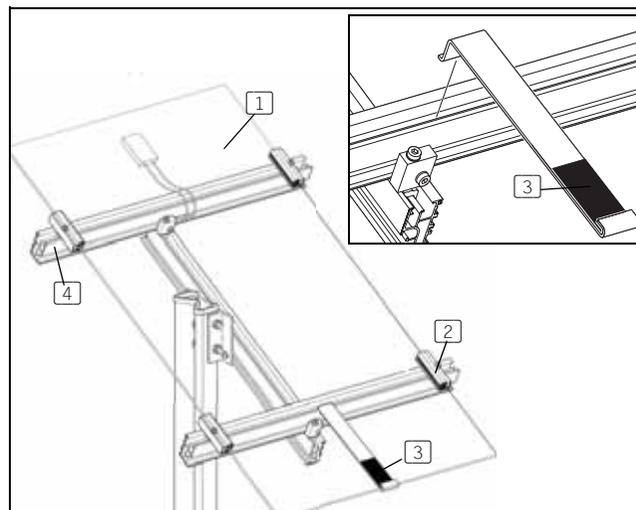
- 1 Laminate end-clamp
- 2 Quickstone
- 3 Base rail

## Fitting the laminate end clamps



The laminate clamps are open on two sides and overlaid with rubber so that they can hold one laminate on each side. To hold the first and last laminates, there are laminate end clamps which are only open on one side.

- | Hook two laminate (end) clamps with Quickstones into each upper rail channel of both base rails so that two laminate (end) clamps are positioned opposite each other. The distance between the two laminate (end) clamps in the rail channel is determined by the width of the laminates.



- 1 Laminate
- 2 Laminate end clamp
- 3 Anti-slip protection bracket
- 4 Base rail

## Fixing the laminates

- | Hook the anti-slip protection bracket into the upper rail channel of the lower base rail.
- | Turn the laminate so that the connections are close to the upper base rail.
- | Lay the laminate onto both base rails and slide it into the anti-slip protection bracket. Take care not to damage the rubber overlay.
- | Place the four loose laminate (end) clamps on the laminate, as prescribed by the laminate producer.
- | Tighten the Allen bolts on the laminate (end) clamps. Make sure that the Quickstones are fully hooked into the rail channel (see Chapter 5.2, page 6).

- | Route the laminate cables to the junction box and fasten them with cable ties. Make sure that there is a distance of at least 50 cm between the cables and the ground.

- | Fix further laminates in the same way.

**Laminate breakage**

Laminates installed over expansion joints can break.

- | As indicated in your planning documentation, do not install laminates over expansion joints (i.e. splices with only one Quickstone fastening).

**Material damage through faulty installation**

Incorrectly installed Quickstone connections can rip out of the profile.

- | Install all Quickstone connections as described (see Chapter 5.2, page 6).

## 6 Specifications

<b>Installation site</b>	Ground
<b>Wind load<sup>a</sup></b>	Max. 25 m/s
<b>Snow load<sup>a</sup></b>	Max. 0.8 kN/m <sup>2</sup>
<b>Laminates/modules</b>	Framed and unframed
<b>Module arrangement</b>	In a row, up to approx. 10 m per frame unit
<b>Module orientation</b>	Portrait
<b>Tilt angle<sup>b</sup></b>	Standard pitch 25° and 30°
<b>Distance between lower edge of module and ground</b>	Standard distance 70 cm, customer-specific heights possible on request
<b>Distance between ramming posts<sup>c</sup></b>	Dependent on type of laminate or module and local conditions.
<b>Ramming depth of the ramming posts<sup>d</sup></b>	Dependent on type of laminate or module and local conditions.
<b>Materials</b>	Frame section: extruded aluminium, EN AW 6063 T6, adaptor plate anodised Sigma-posts: galvanised steel Small parts: stainless steel (V2A)
<b>Colour</b>	Natural extruded aluminium

- a. The prevailing statics must be checked on site. For more detailed information, please contact the Mounting Systems service department during the initial stage of our planning (contact PTO).
- b. For further information, please contact the Mounting Systems service department during the initial stage of your planning (contact PTO).
- c. A project-related assessment report on the ground needs to be handed in as a basis for the calculation of the specific distances. For further information, please contact the Mounting Systems service department during the initial stage of your planning (contact PTO).
- d. The ramming depth will be calculated during the planning stage of the project on the basis of the ground assessment report and the project specifics. However, the thus calculated result must be double-checked on-site by way of pull-out tests.

For further information

[www.mounting-systems.de](http://www.mounting-systems.de)

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