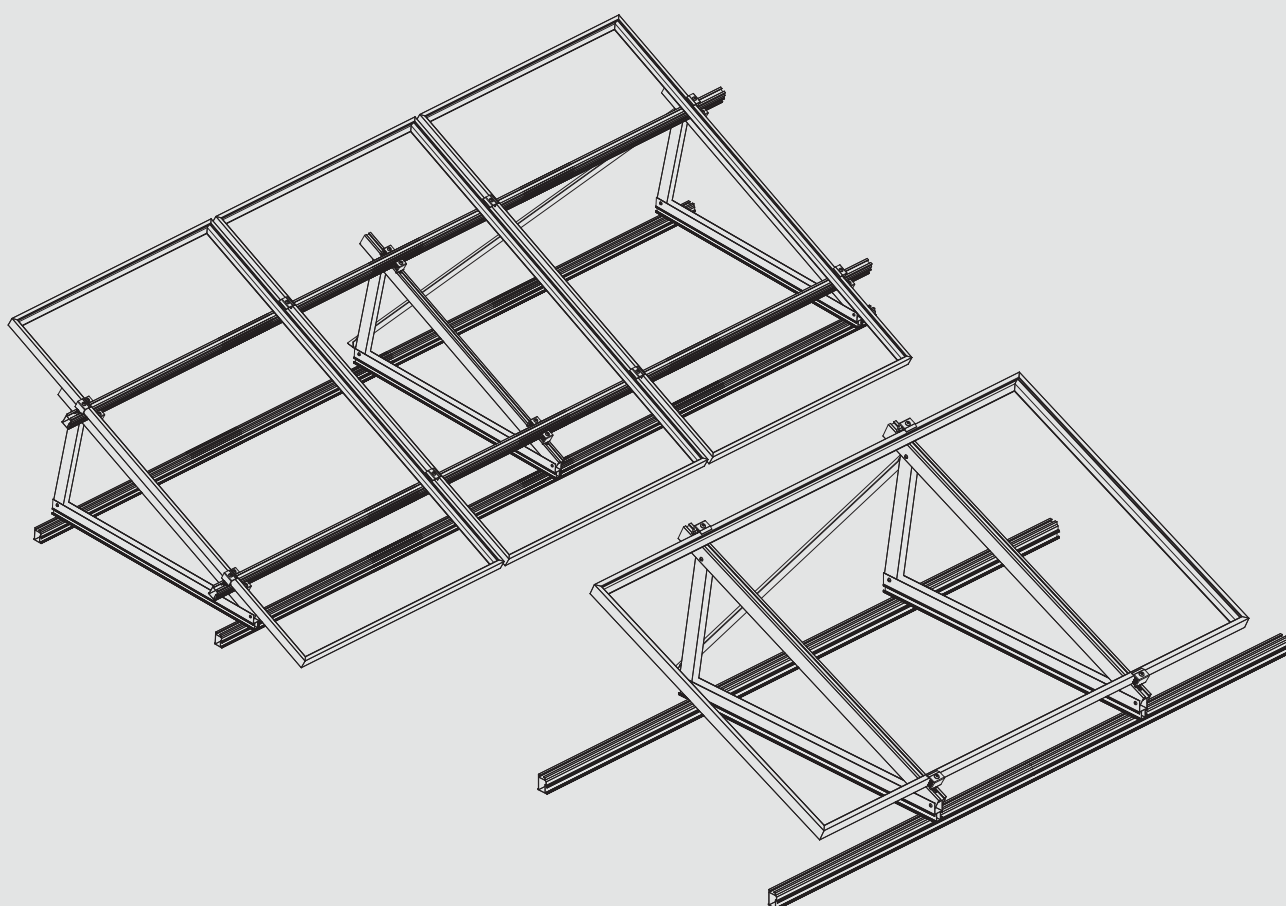


**TS+**

DE | Installationsanleitung  
GB | Installation Instructions  
FR | Notice d'installation  
IT | Manuale di installazione  
ES | Manual de instalación  
PT | Manual de instalação



DE | Lesen Sie diese Installationsanleitung vor Montagebeginn!  
Montage nur durch sachkundige, qualifizierte Personen!

GB | Read these instructions before installation!  
Installation should only be carried out by skilled, qualified personnel!

FR | Prenez soin de lire le présent manuel d'installation avant le début du montage!  
Montage seulement par des personnes compétentes et qualifiées!

IT | Leggere le presenti istruzioni di installazione prima di intraprendere i lavori di montaggio!  
Il montaggio è consentito esclusivamente a personale esperto e qualificato!

ES | Lea estas instrucciones de instalación antes de comenzar el montaje!  
El montaje solo debe realizarlo personal experto y cualificado.

PT | Leia estas instruções antes da instalação!  
A instalação apenas deve ser realizada pessoal qualificado!



## DE | Verwendung

Aufständerungsdreieck von 10° bis 35° für Solarmodule auf verschiedenen Dachanbindungen.

Bitte lesen Sie diese Installationsanweisungen vor Montagebeginn sorgfältig durch. Eine statische Berechnung muss angefragt und mit örtlichen Gegebenheiten abgepasst werden.

### Installationsrichtlinien

Aufgrund von thermischen Längenausdehnungen empfiehlt es sich nach 12m eine Unterbrechung des Montagesystems zu berücksichtigen.

Die Anbindung und/oder die Sicherung der Anlage werden durch Verschraubung erreicht. Dieses ist objektspezifisch zu wählen.

Die Montage der Module kann in Landscape oder Portrait Orientierung erfolgen. Entsprechend sind die Komponenten vor der Installation zu definieren.

Das Querverstrebungsprofil ist bei Landscape Montage auf der Rückseite eines jeden Dreiecks zu montieren. Bei Portrait Montage können die Aussteifungen alle 12 m installiert werden, wobei immer zwei Aussteifungen je Reihe verwendet werden müssen. Die Aussteifungen müssen in entgegengesetzte Richtungen zeigen.

Solarmodule sollen gemäß den Herstellervorgaben installiert werden

### Prüfung/Zertifizierung

TÜV (2PFG): 0000048970

### Mitgeltende Dokumente

"Allgemeine Installations-, Wartungs- und Montagehinweise"

"Sicherheitshinweise zur Installationsanleitung"

"Garantiebedingungen und Haftungsausschluss."

Diese Dokumente sind verfügbar unter [www.renusal.com](http://www.renusal.com)

### Gewährleistung

Die Garantie von Renusal gilt nur bei Verwendung der originalen TS+ Komponenten und Einhaltung der Garantiebedingungen. Für die gesetzliche Mängelhaftung/Gewährleistung beachten Sie bitte die Allgemeinen Geschäftsbedingungen von Renusal.



**Vor Montage muss die Standsicherheit des PV-Systems nachgewiesen werden. Die Gebäudekonstruktion muss die zusätzlichen Lasten sicher aufnehmen können.**



## GB | General Guidelines

Support triangle from 10° to 35° for solar modules on various roof connections.

Please read through the installation instructions carefully prior to installation. A structural calculation must be requested and matched to on-site conditions.

### Installation guidelines

Due to longitudinal thermal expansion, we recommend including a joint in the installation system every 12 m.

The system is connected and/or secured using fittings, which should be selected subject to the type of building.

The modules can be installed with landscape or portrait orientation. Relevant components must be defined prior to installation.

In the case of landscape installation, install the cross-brace profile on the back of every triangle. With portrait installation, the reinforcing struts can be installed every 12 m; two struts must always be used for each row. The struts must point in opposite directions.

Solar modules should be installed in accordance with the manufacturer's instructions

### Inspection/certification

TÜV (2PFG): 0000048970

### Applicable Documents

"General installation, maintenance and assembly instructions"

"Safety Instructions for Installation Instructions"

"Warranty and Disclaimer."

These documents are available at [www.renusal.com](http://www.renusal.com)

### Warranty

The warranty only applies if an original TS+ complete system is used and the warranty terms are met. The current version of these installation instructions is available at:

[www.renusal.com](http://www.renusal.com)



**The structural stability of the PV system must be verified before installation. The building must be able to support the additional weight safely.**



## FR | Recommendations generales

Triangle de surélévation de 10° à 35° pour modules solaires sur différentes fixations de toit.

Prenez soin de lire attentivement ces instructions d'installation avant de procéder au montage. Il faut faire la demande d'un calcul statique et un ajustement aux conditions locales est nécessaire.

### Directives d'installation

En raison de la dilatation thermique longitudinale, il est conseillé de veiller à une interruption du système de montage après 12 mètres.

Des raccords vissés servent à la fixation et/ou à la sécurisation de l'installation. Ils sont à choisir en fonction de l'objet.

Les modules peuvent être montés au format paysage ou portrait. Il convient de définir les composants en fonction avant l'installation.

Le profil transversal doit être monté à l'arrière de chaque triangle dans le cas d'un montage au format paysage. En cas de montage au format portrait, les renforts peuvent être installés tous les 12 m. Deux renforts doivent toujours être utilisés par rangée. Les renforts doivent être orientés à l'opposé.

Les modules solaires doivent être installés selon les indications du fabricant.

### Essai/Certification

TÜV (2PFG): 0000048970

### Document afférents

"Remarques générales our l'installation"

"Sonsignes de sécurité pour les instructions d'installation"

"Obligation de garantie et l'exclusion de responsabilité"

Les documents sont disponibles à [www.renusal.com](http://www.renusal.com)

### Garantie

La garantie fabricant n'est valable que dans le cas de l'utilisation du système TS+ original intégral.

La version actuelle de cette notice de montage est disponible sur le site:

[www.renusal.com](http://www.renusal.com)



**Avant le montage, la stabilité statique du système photovoltaïque doit être prouvée. La construction du bâtiment doit pouvoir absorber sûrement les charges supplémentaires.**



## IT | Avvertenze generali

Triangolo di supporto da 10° a 35° per moduli solari su diversi collegamenti del tetto.

Leggere attentamente le presenti istruzioni di installazione prima di iniziare il montaggio. È necessario richiedere un calcolo statico, da adattare alle condizioni locali.

### Direttive per l'installazione

Considerate le espansioni termiche sulla lunghezza, si consiglia di prevedere un'interruzione del sistema di montaggio dopo 12 m.

Il collegamento e/o il fissaggio dell'impianto si ottengono mediante avvvitamento. Questo metodo deve essere scelto specificamente per l'oggetto.

Il montaggio dei moduli può essere effettuato con orientamento orizzontale o verticale. I componenti devono essere definiti prima dell'installazione in base all'orientamento scelto.

Nel montaggio orizzontale, il profilato trasversale di controventatura deve essere montato sul retro di ciascun triangolo. Nel montaggio verticale è possibile installare gli elementi di rinforzo ogni 12 metri, utilizzandone sempre due per fila. Gli elementi di rinforzo devono essere rivolti nella direzione opposta.

Installare i moduli solari in base alle indicazioni del costruttore.

### Verifica/Certificazione

TÜV (2PFG): 0000048970

### Altri documenti applicabili

"Istruzioni generali d'uso e di montaggio e dettagli di manutenzione"

"Norme di sicurezza per il montaggio"

"Condizioni di garanzia e limitazioni di responsabilità"

Condizioni di garanzia e limitazioni di responsabilità [www.renusal.com](http://www.renusal.com)

### Garanzia legale

La validità della garanzia legale sottintende l'impiego del sistema TS+ originale nella sua completezza.

La versione aggiornata delle istruzioni di montaggio sono reperibili al sito web: [www.renusal.com](http://www.renusal.com)



**Il montaggio può aver luogo solo previa certificazione della sicurezza statica dell'impianto fotovoltaico. La struttura dell'edificio deve essere in condizione di sopportare in sicurezza i carichi supplementari su esso applicati.**



## ES | Indicaciones generales

Triángulo de soporte de 10° a 35° para módulos solares en distintos amarres de tejado.

Lea atentamente estas instrucciones de instalación antes de comenzar el montaje. Deberá solicitarse un cálculo estático y adaptarse en función de las condiciones locales.

### Pautas de instalación

Debido a la dilatación térmica lineal se recomienda tener en cuenta una interrupción del sistema de montaje después de los 12 m.

El amarre y/o el aseguramiento de la instalación se llevan a cabo mediante atornilladuras. Deberá seleccionarse en función del objeto.

El montaje de los módulos se puede realizar en formato horizontal o vertical. Los componentes deberán definirse correspondientemente antes de la instalación.

En el montaje horizontal deberá montarse el perfil travesero en la parte posterior de cada triángulo. En el montaje vertical, los rigidizadores pueden instalarse cada 12 m y deben emplearse dos rigidizadores por fila. Los rigidizadores deben mirar en sentidos opuestos.

Los módulos solares deben instalarse de acuerdo con las indicaciones del fabricante

### Inspección/certificación

TÜV (2PFG): 0000048970

### Documentación adicional obligatoria

"Notas generales sobre la instalación"

"Indicaciones de seguridad sobre la manual de instalación"

"Condiciones de la garantía y exención de la responsabilidad"

Condiciones de la garantía y exención de la responsabilidad

### Garantía

La garantía solo tiene validez si se usa el sistema completo TS+ original.

Encontrará la última actualización de las instrucciones de montaje en:

[www.renusal.com](http://www.renusal.com)



**Antes del montaje se debe verificar la estabilidad del sistema fotovoltaico. El edificio debe poder recibir con seguridad las cargas adicionales.**



## PT | Instruções gerais

Triângulo de montagem elevada, entre 10° e 35°, para módulos solares em diferentes ligações do telhado.

Leia atentamente as presentes instruções de instalação antes de iniciar os trabalhos de montagem. Tem de ser obtido um cálculo estático que tem de ser adaptado às características locais.

### Diretivas sobre a instalação

Devido às dilatações longitudinais térmicas recomenda-se que após os 12 m seja considerada uma interrupção do sistema de montagem.

A ligação e/ou fixação do equipamento são obtidas por aparafusamento. Isto deve ser escolhido especificamente para o objeto.

A montagem dos módulos pode realizar-se na horizontal ou na vertical. Os componentes devem ser definidos antes da instalação em conformidade.

Para a montagem na horizontal, o perfil da trave deve ser montado na parte de trás de cada triângulo. Para a montagem na vertical podem ser instalados reforços a cada 12 m, devendo ser utilizados dois reforços por série. Os reforços têm de estar virados em direcções opostas.

Os módulos solares devem ser instalados de acordo com as especificações do fabricante

### Inspeção/Certificação

TÜV (2PFG): 0000048970

### Documentos aplicáveis

"Instalação geral, manutenção e instruções de montagem"

"Instruções de segurança a instalação"

"Garantia e isenção de responsabilidade."

Estes documentos estão disponíveis no nosso website: [www.renusal.com](http://www.renusal.com)

### Garantia

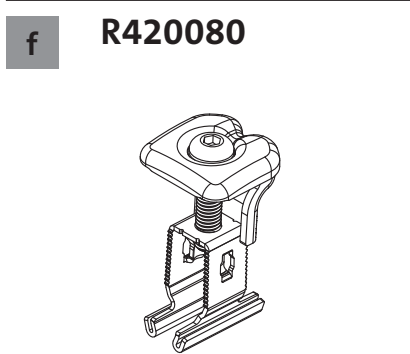
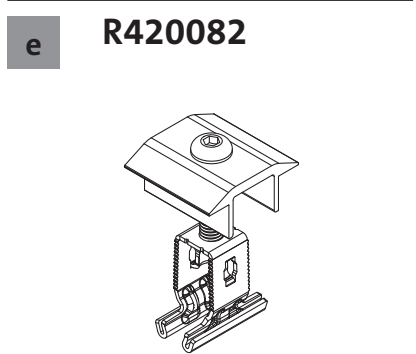
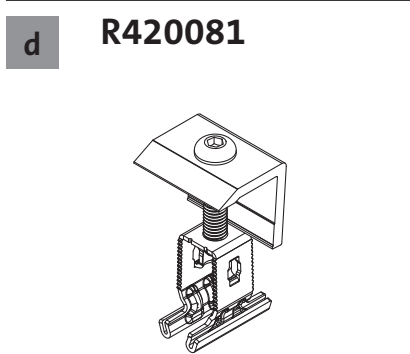
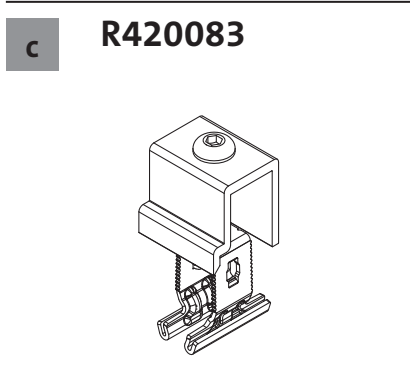
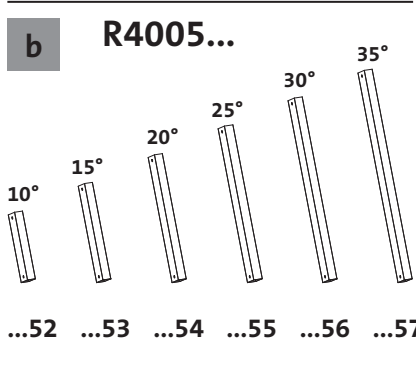
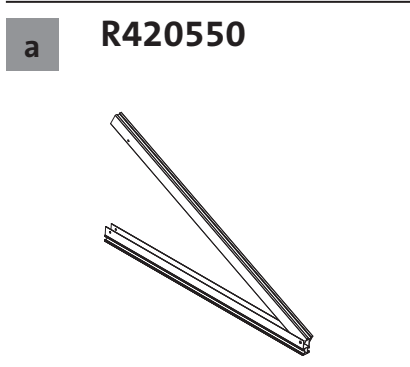
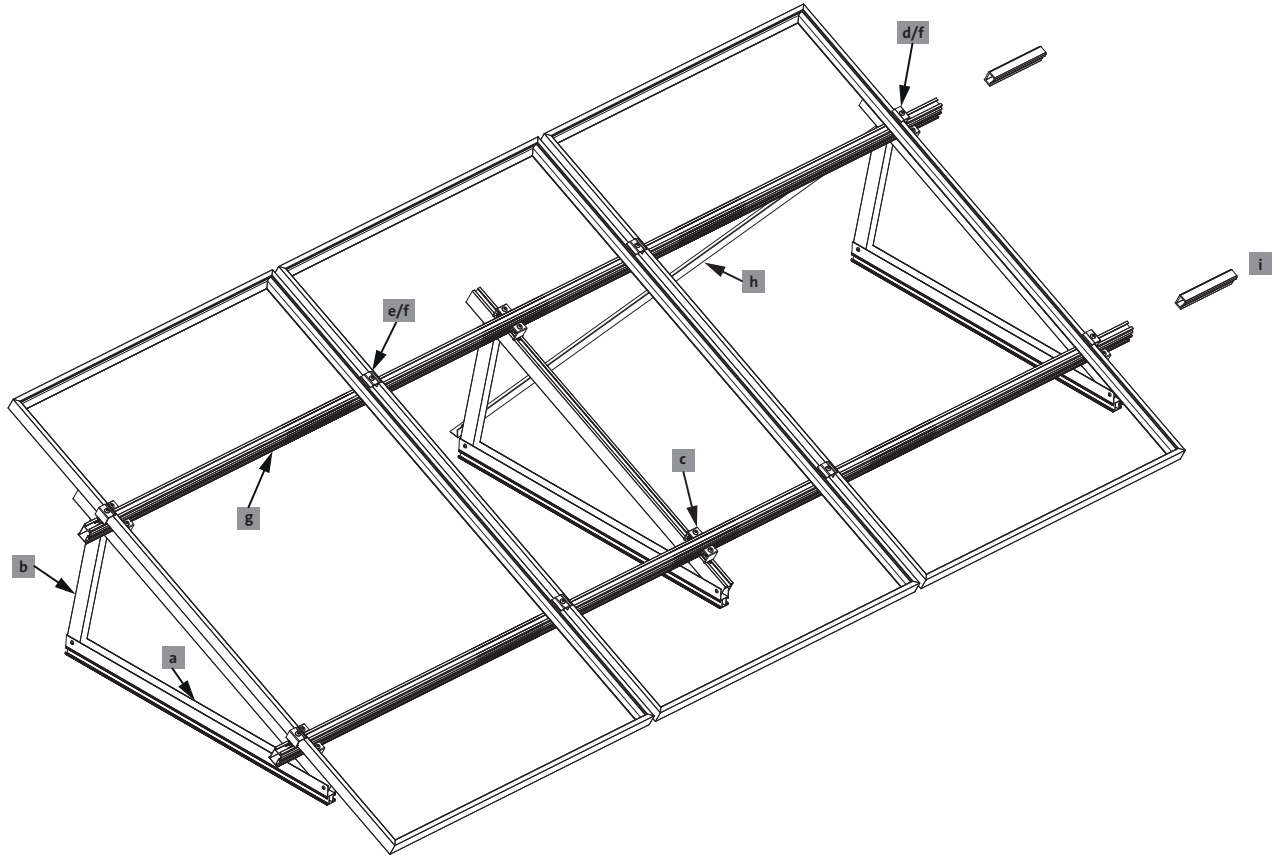
A garantia só se aplica se um sistema completo TS+ original é usado.

A versão actual desta guia de instalação está disponíveis em:

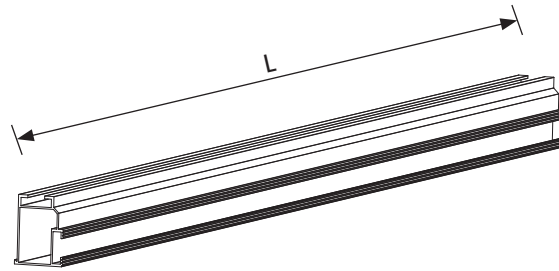
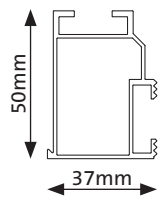
[www.renusal.com](http://www.renusal.com)



**A estabilidade estrutural do sistema fotovoltaico deve ser verificado antes da instalação. O edifício tem de ser capaz de suportar o peso adicional com segurança.**

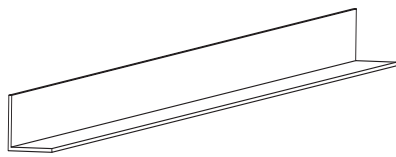
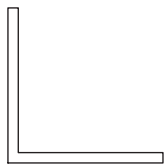


**g R4005...**

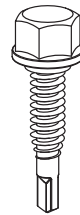


3200mm	R400502
4200mm	R400505
6200mm	R400506

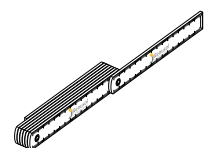
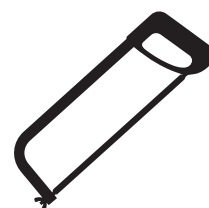
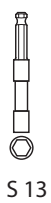
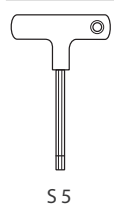
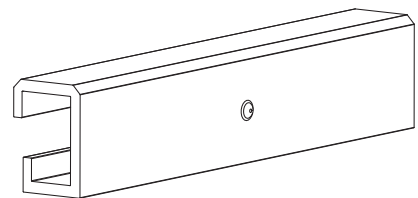
**h R420600**

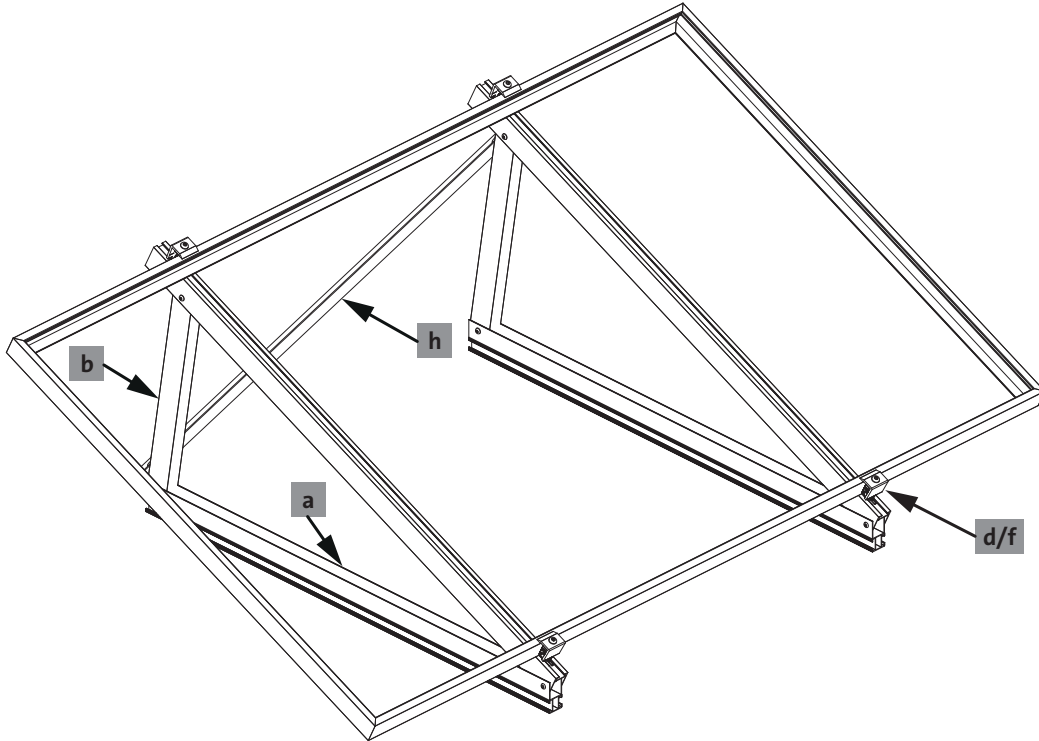


2x

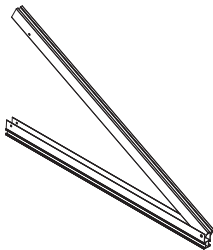


**i R400532**

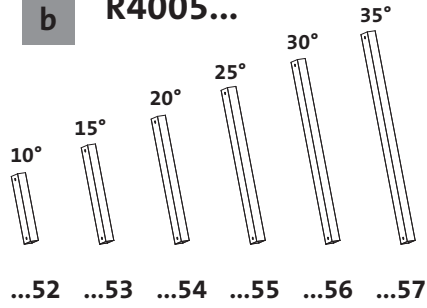




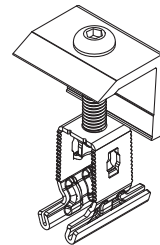
**a** R420550



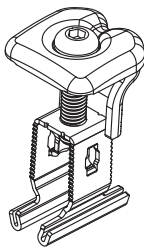
**b** R4005...



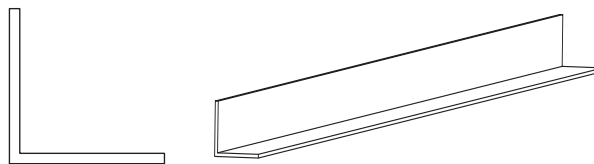
**d** R420081



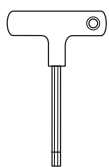
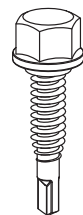
**f** R420080



**h** R420600



2x



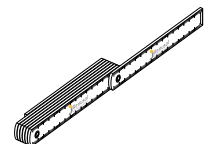
S 5



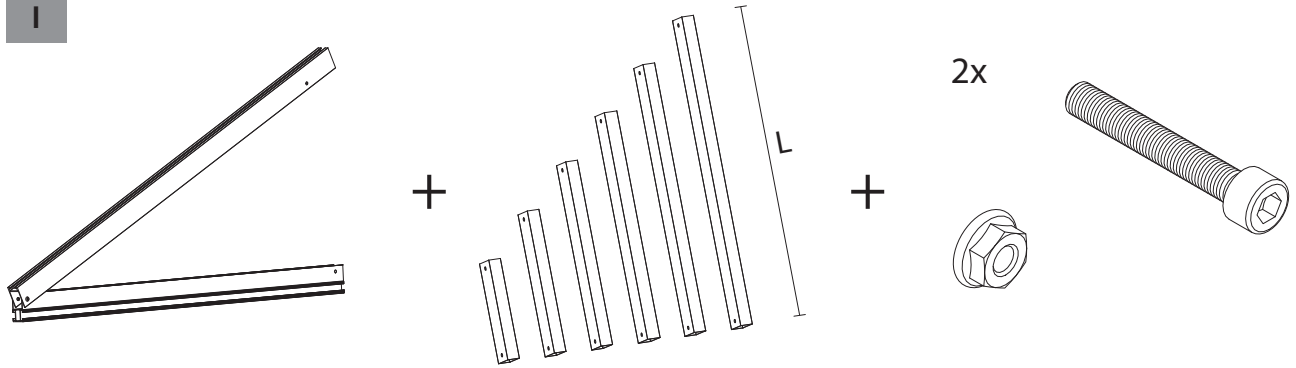
S 13


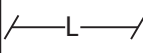



S 10

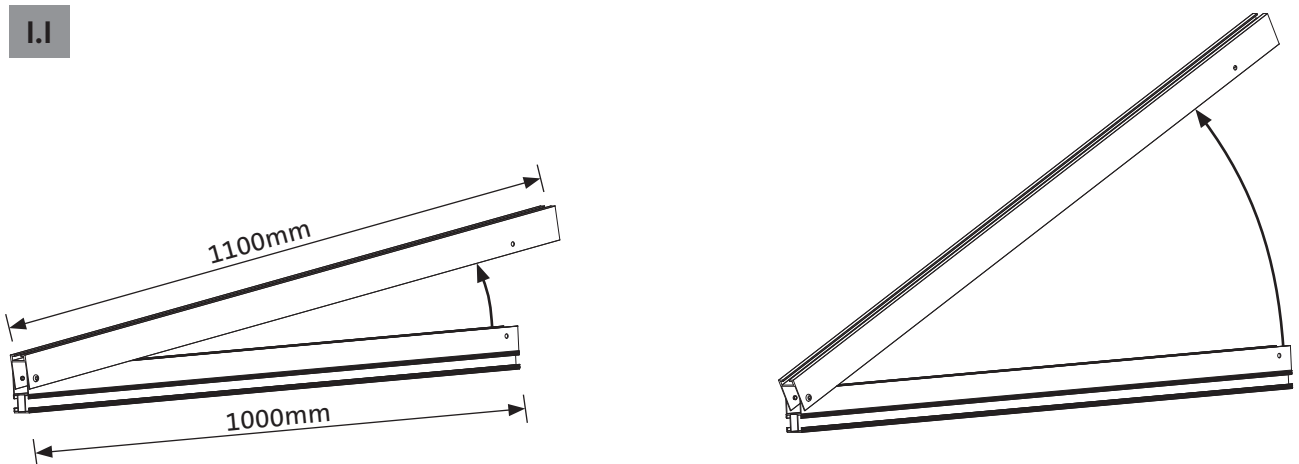


I

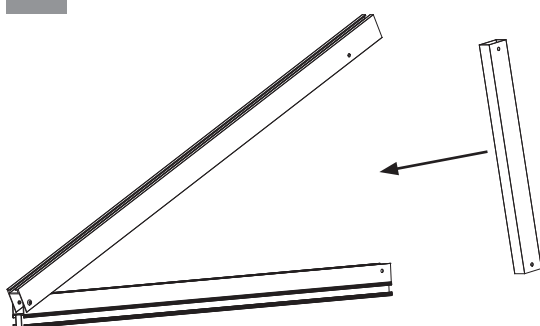


		
10°	198mm	R400552
15°	282mm	R400553
20°	366mm	R400554
25°	450mm	R400555
30°	532mm	R400556
35°	613mm	R400557

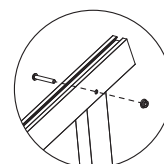
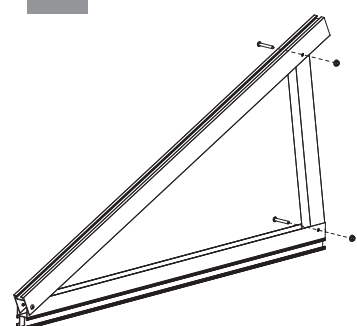
I.I



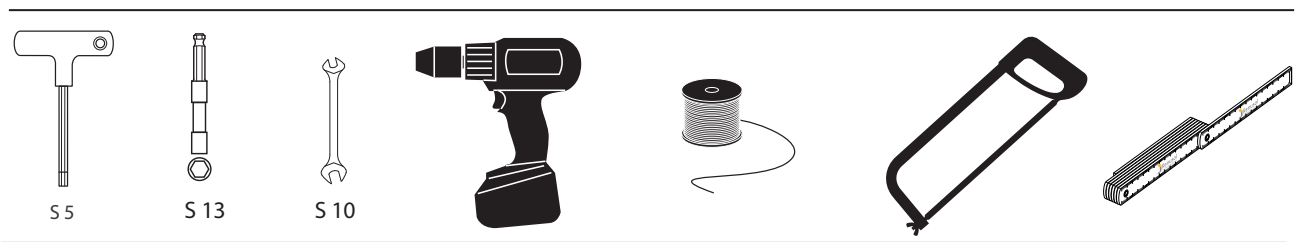
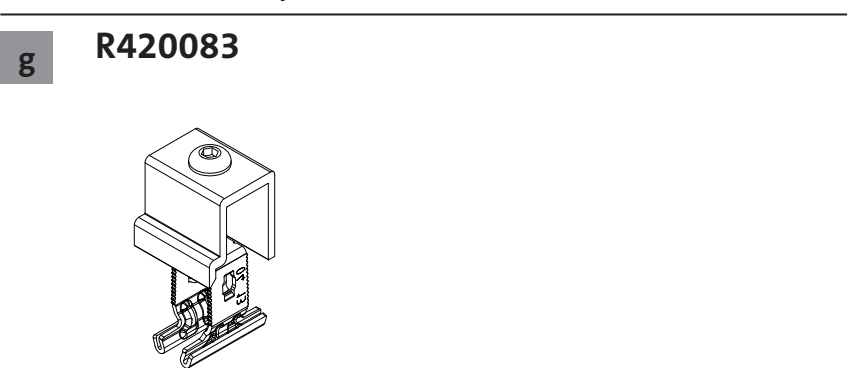
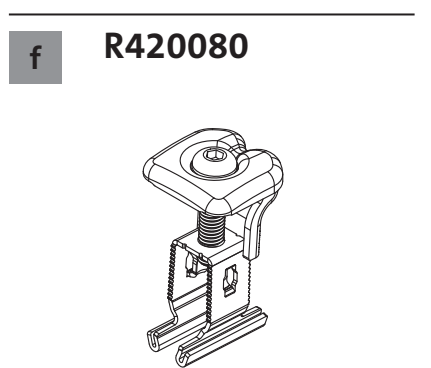
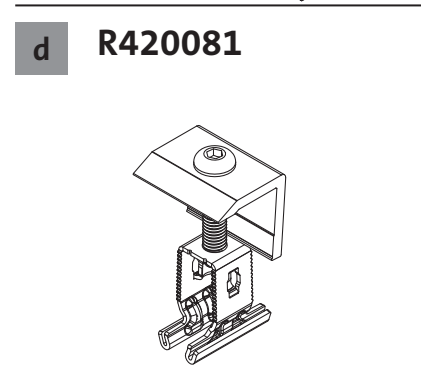
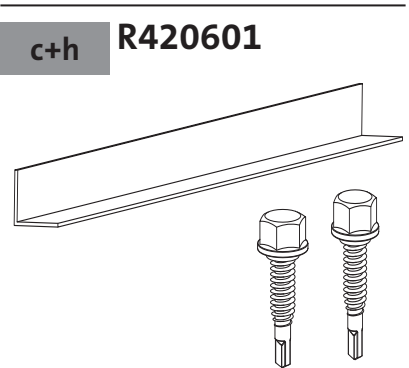
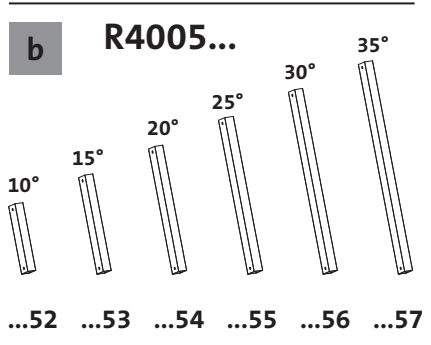
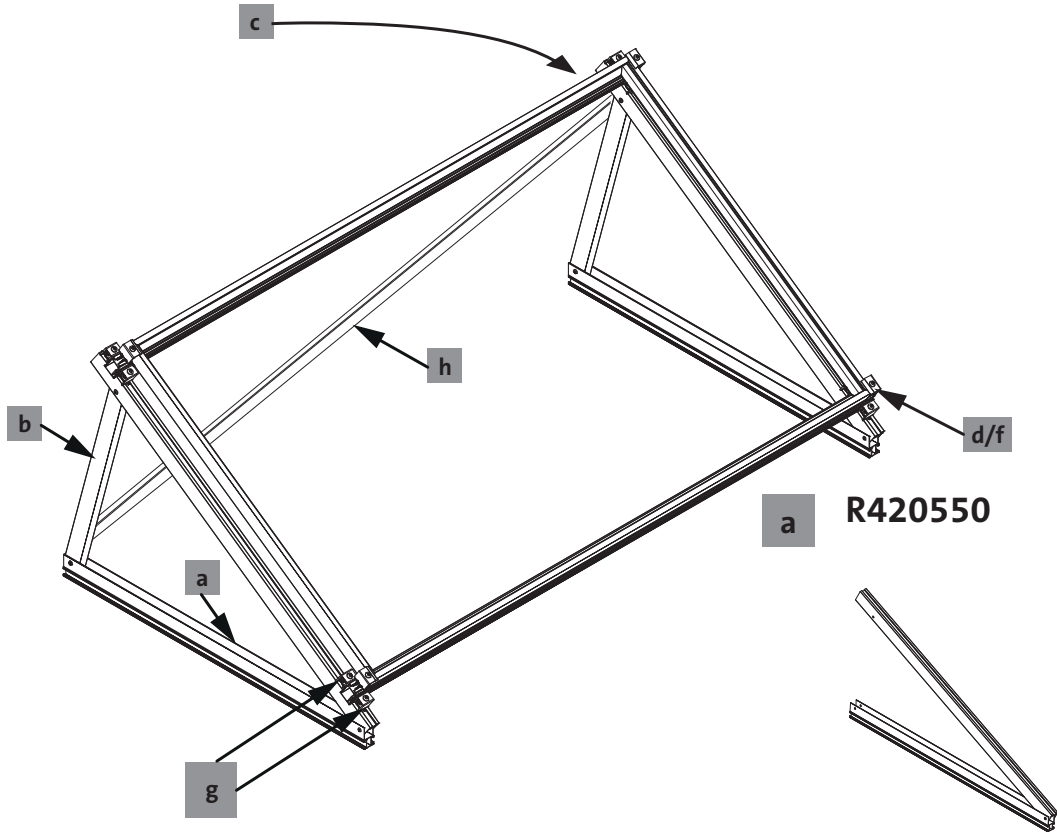
I.II



I.III

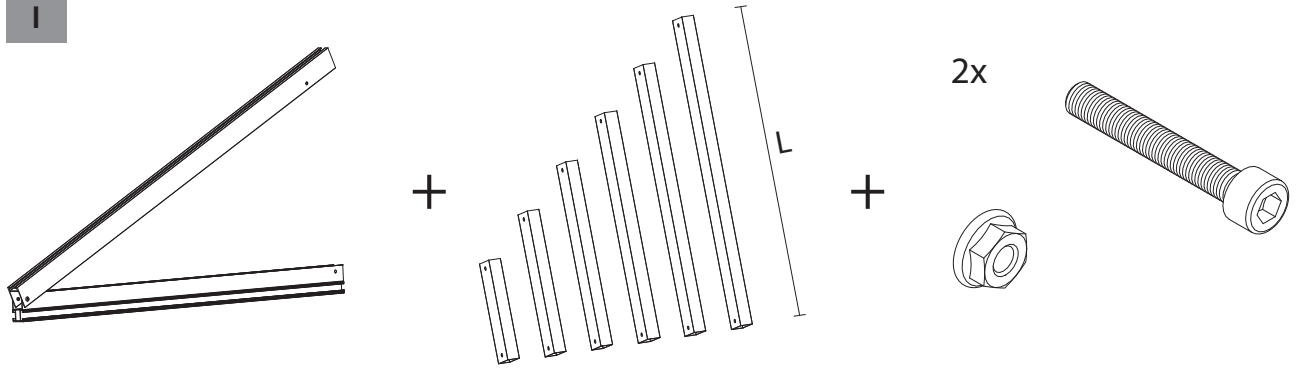


4 Nm



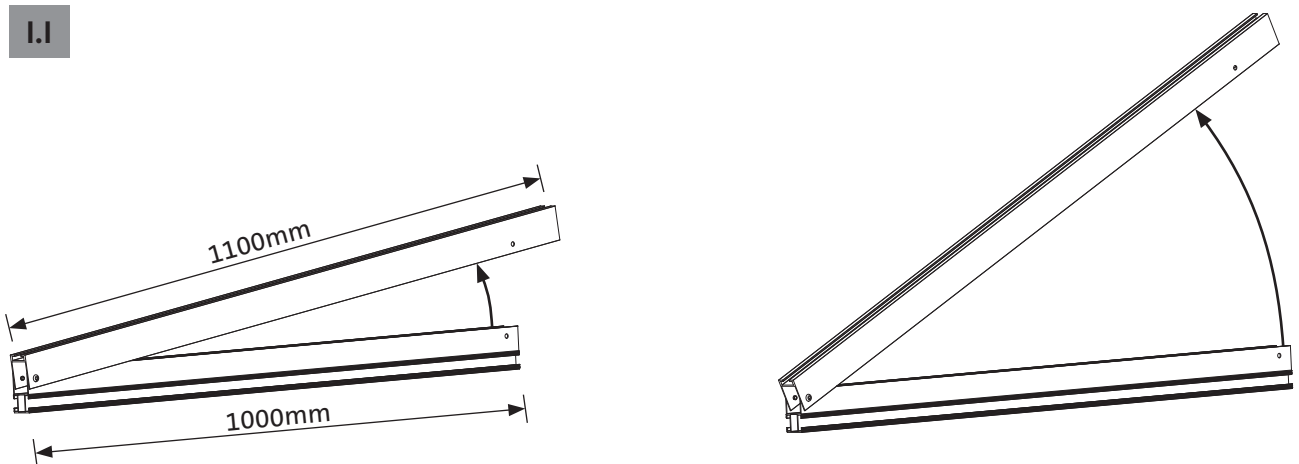


I

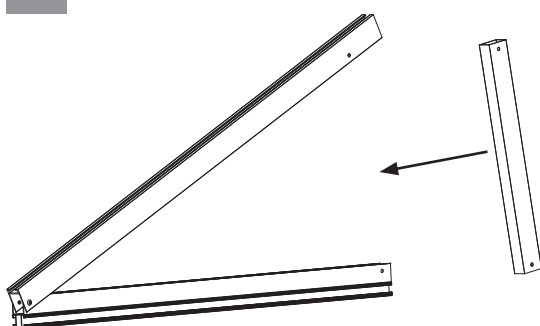


10°	198mm	R400552
15°	282mm	R400553
20°	366mm	R400554
25°	450mm	R400555
30°	532mm	R400556
35°	613mm	R400557

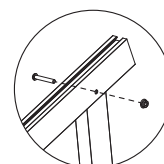
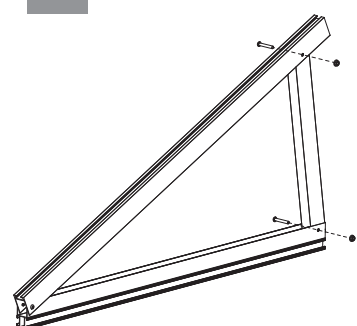
I.I



I.II

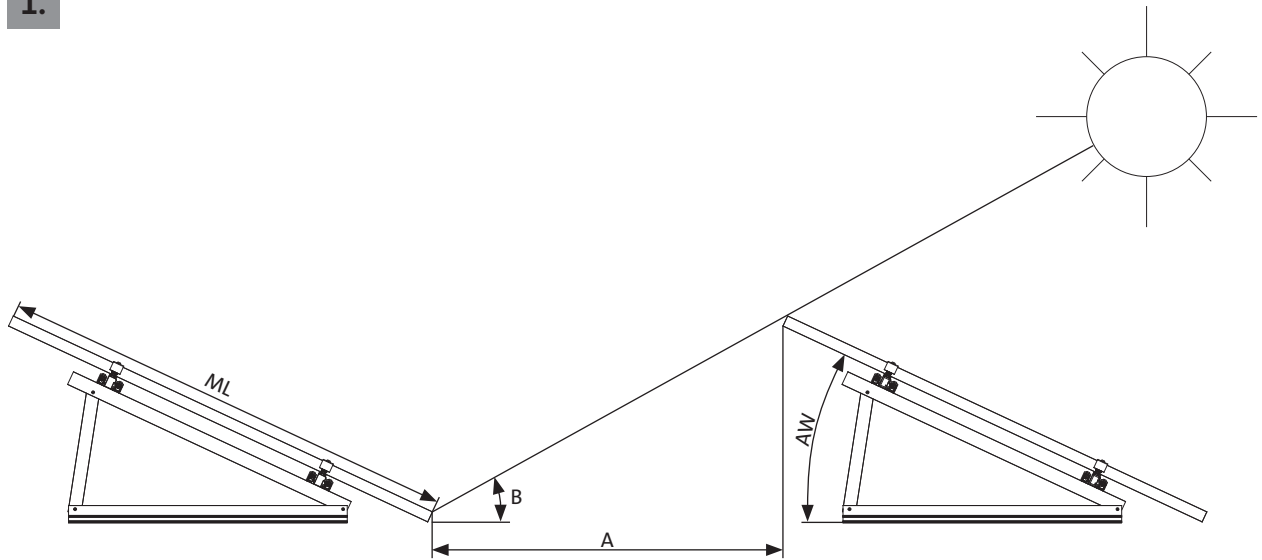


I.III



4 Nm

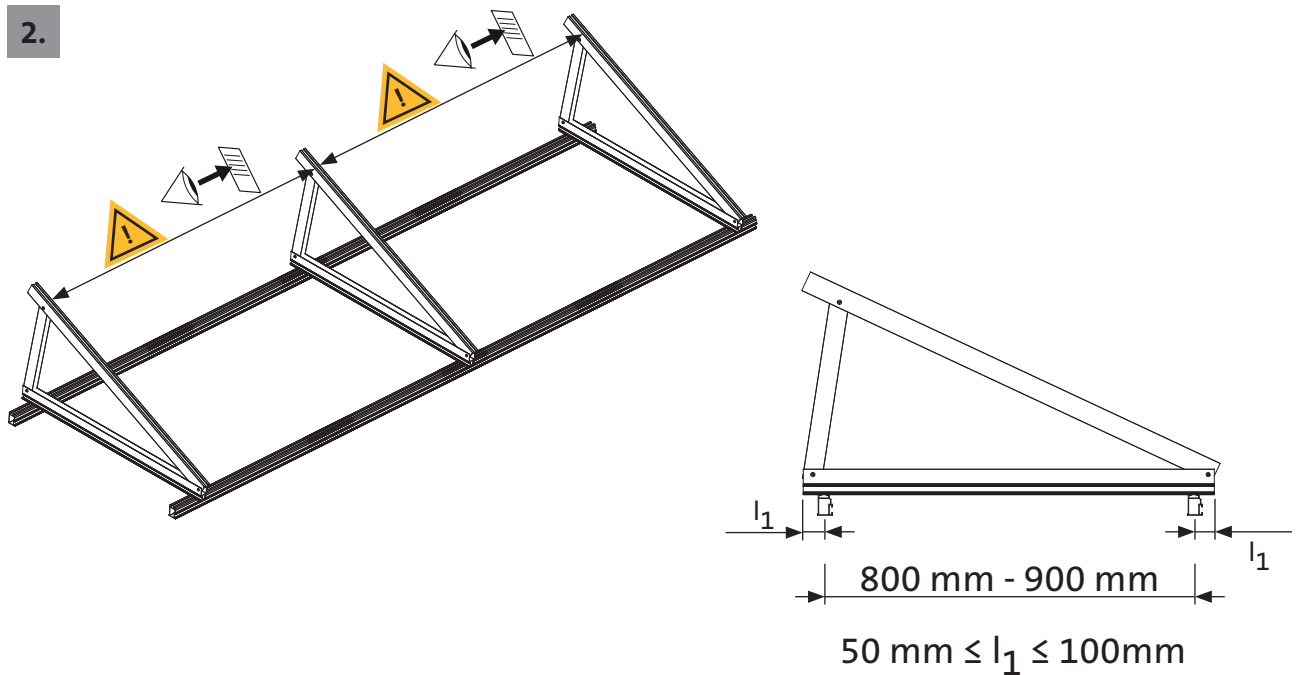
1.



A min [mm]		AW [°]						B [°] *
		10	15	20	25	30	35	
ML [mm]	1580	1.024	1.526	2.017	2.492	2.948	3.382	15
		588	877	1.159	1.432	1.694	1.943	25
	1600	1.037	1.545	2.042	2.524	2.986	3.425	15
		596	888	1.174	1.450	1.716	1.968	25
	1620	1.050	1.565	2.068	2.555	3.023	3.468	15
		603	899	1.188	1.468	1.737	1.993	25
	1640	1.063	1.584	2.093	2.587	3.060	3.511	15
		611	910	1.203	1.486	1.759	2.017	25
1660	1.076	1.603	2.119	2.618	3.098	3.553	15	
	618	921	1.218	1.504	1.780	2.042	25	
1680	1.089	1.623	2.144	2.650	3.135	3.596	15	
	626	932	1.232	1.523	1.801	2.066	25	
1700	1.102	1.642	2.170	2.681	3.172	3.639	15	
	633	944	1.247	1.541	1.823	2.091	25	

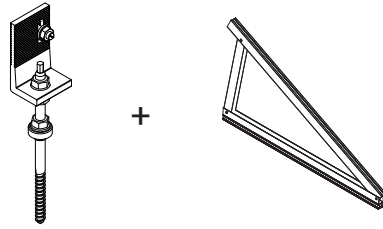
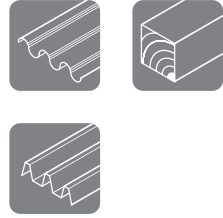
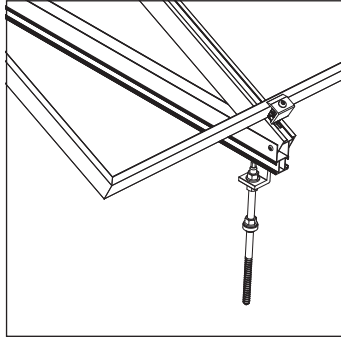
\* 15°=Hamburg, Germany; 25°=Marseille, France

2.

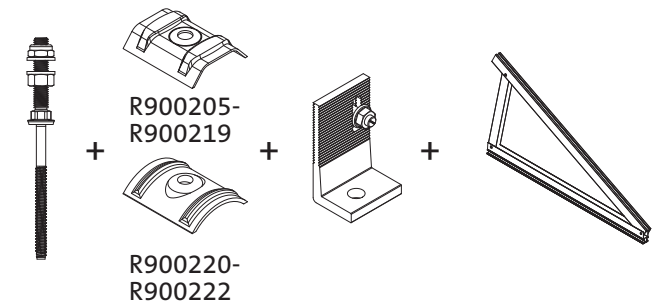
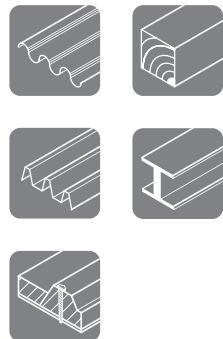
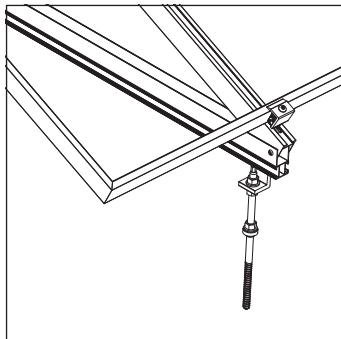


3.

a

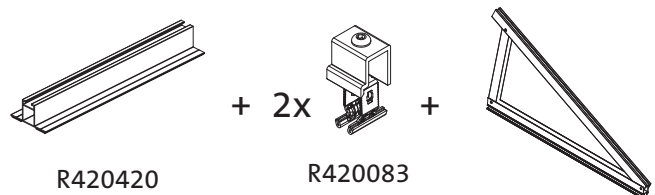
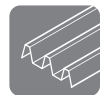
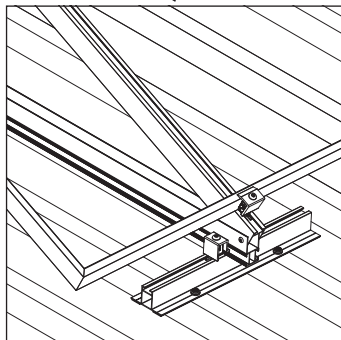


b



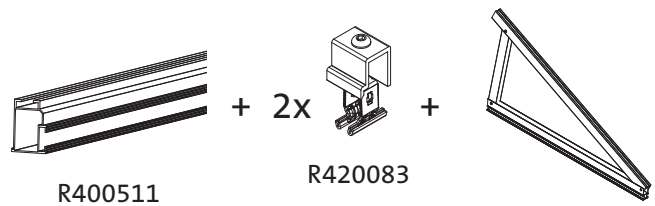
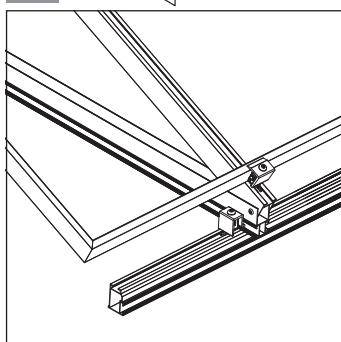
c

MS+ Portrait

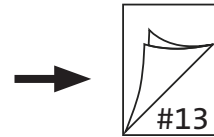
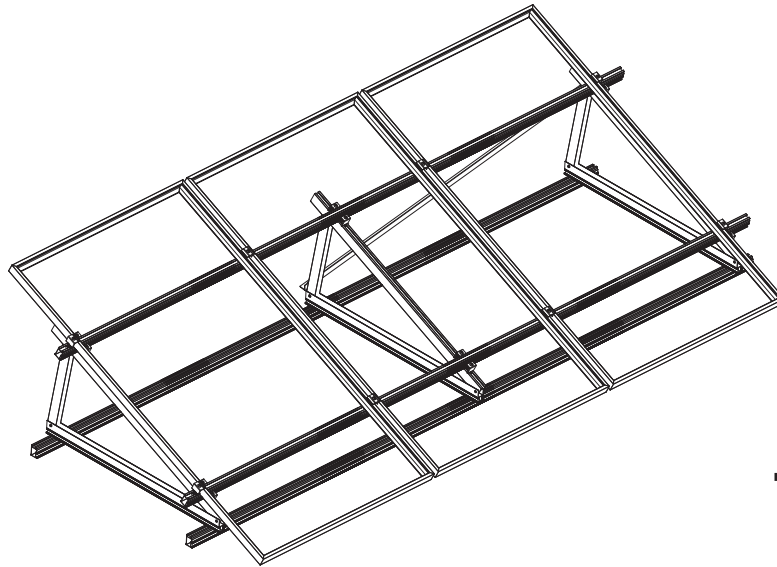


d

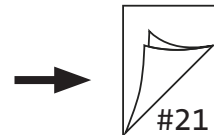
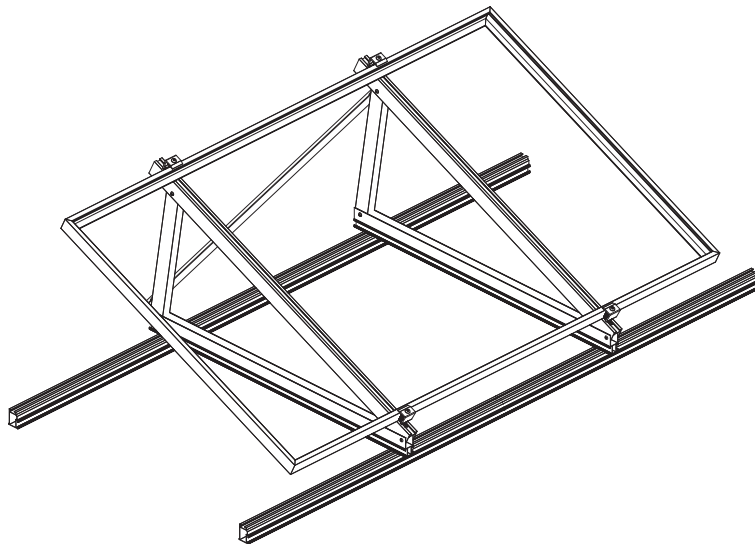
VS+



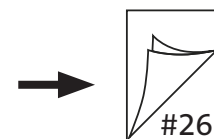
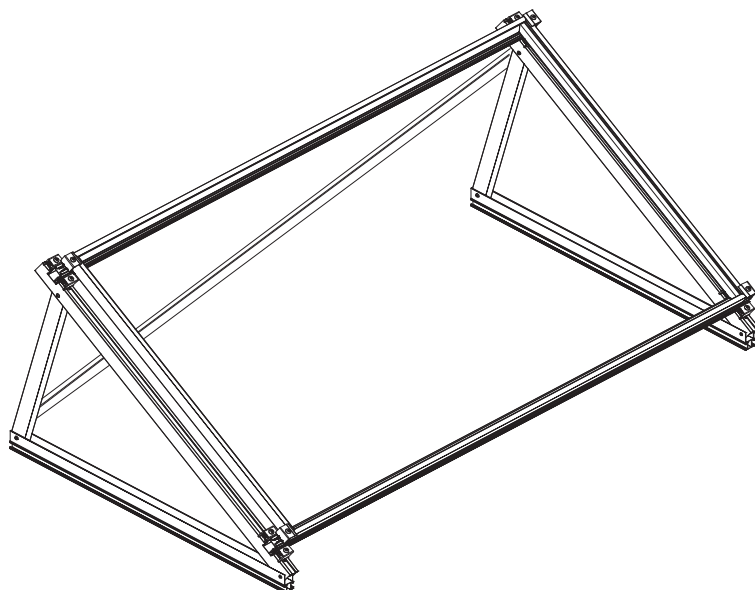
**TS+ Portrait**



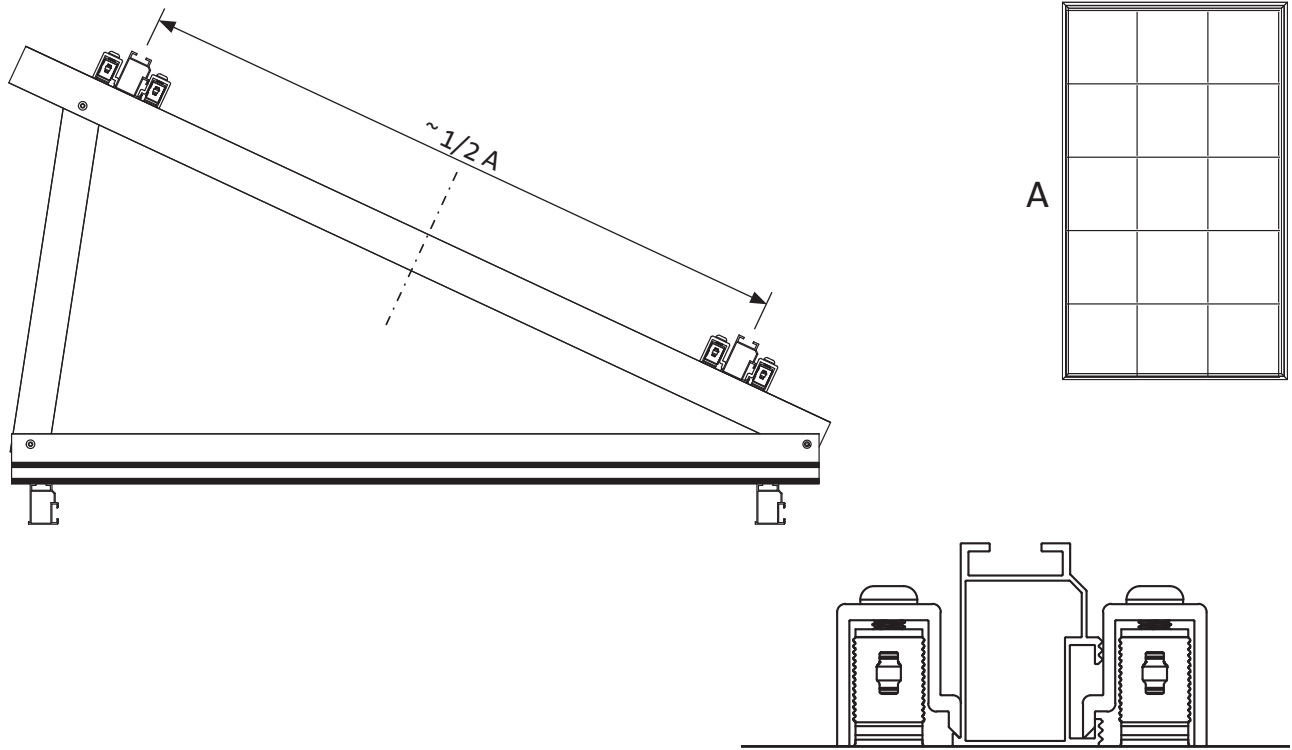
**TS+ Landscape**



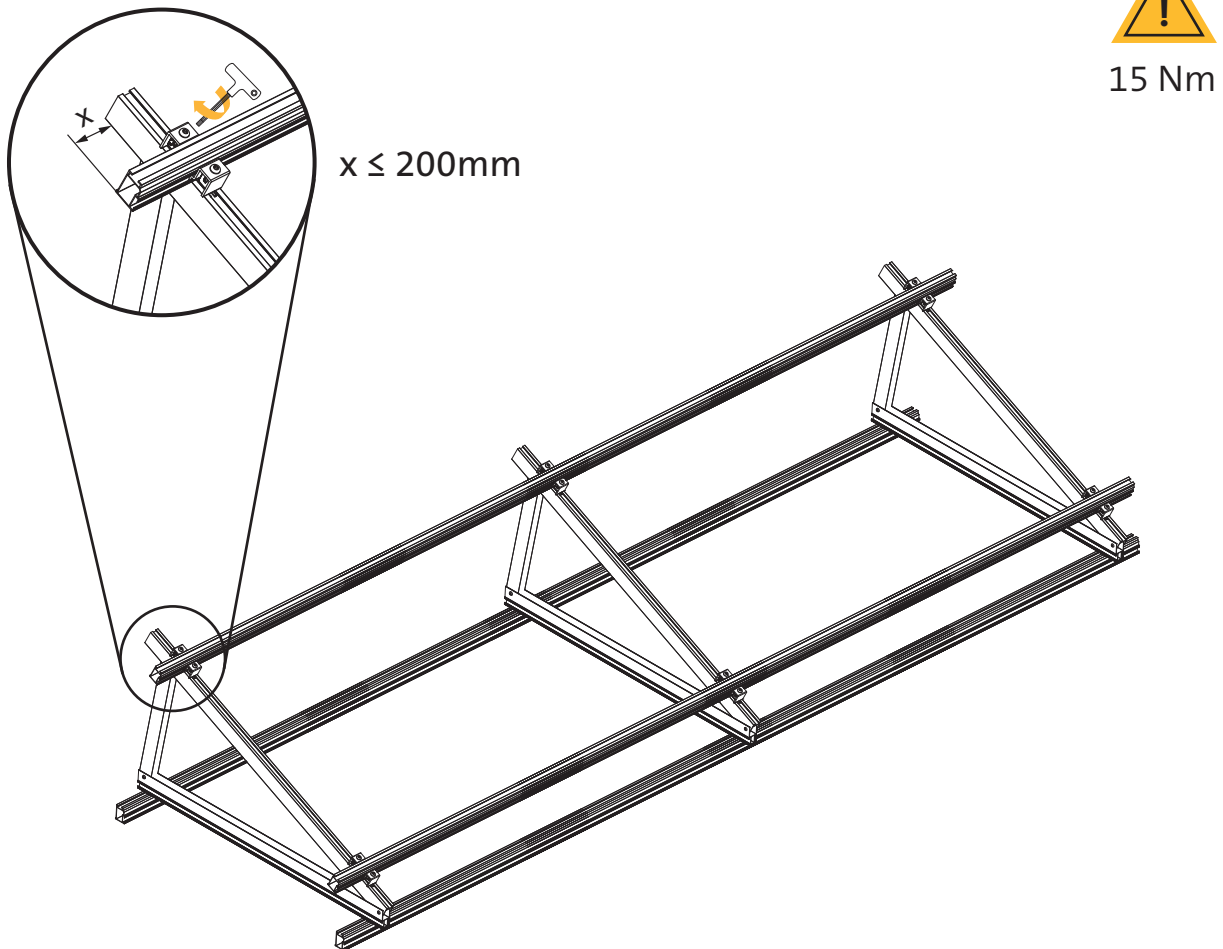
**TS+ Bifacial**



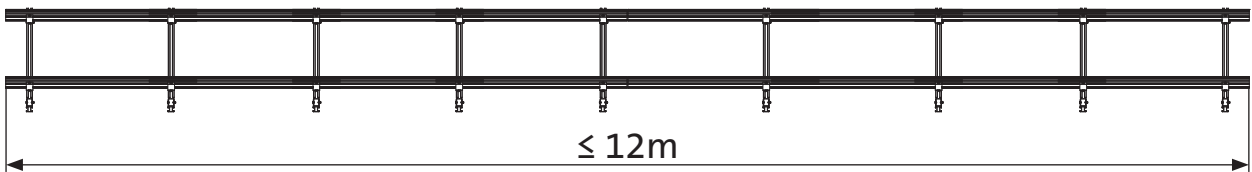
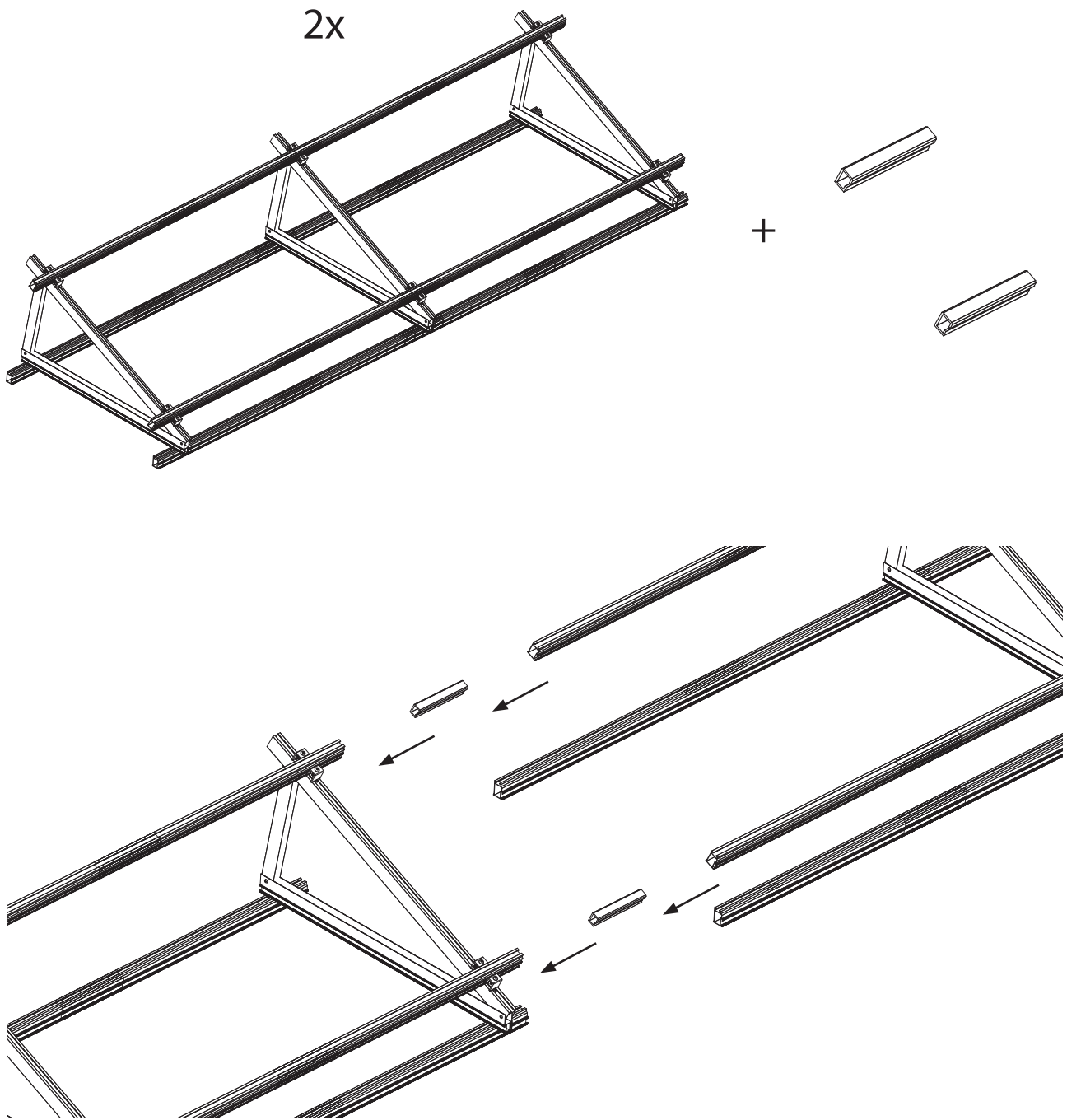
4.



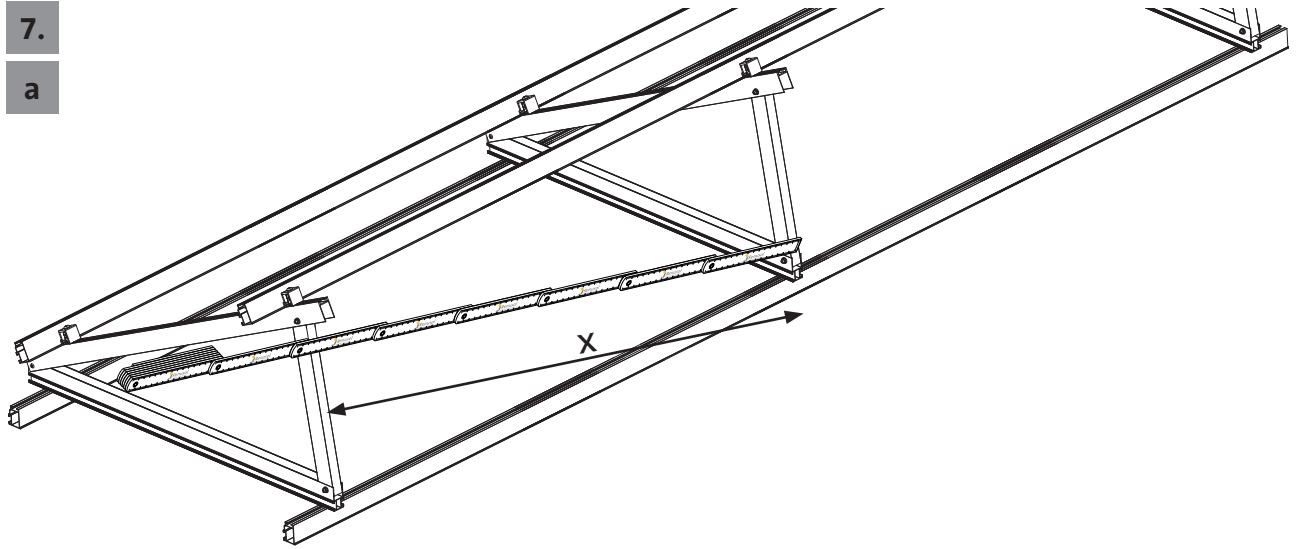
5.



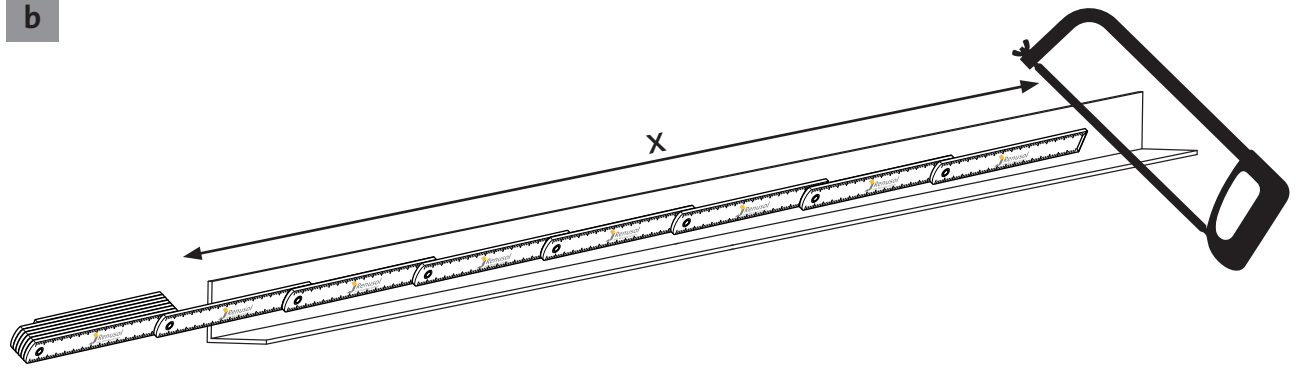
6.



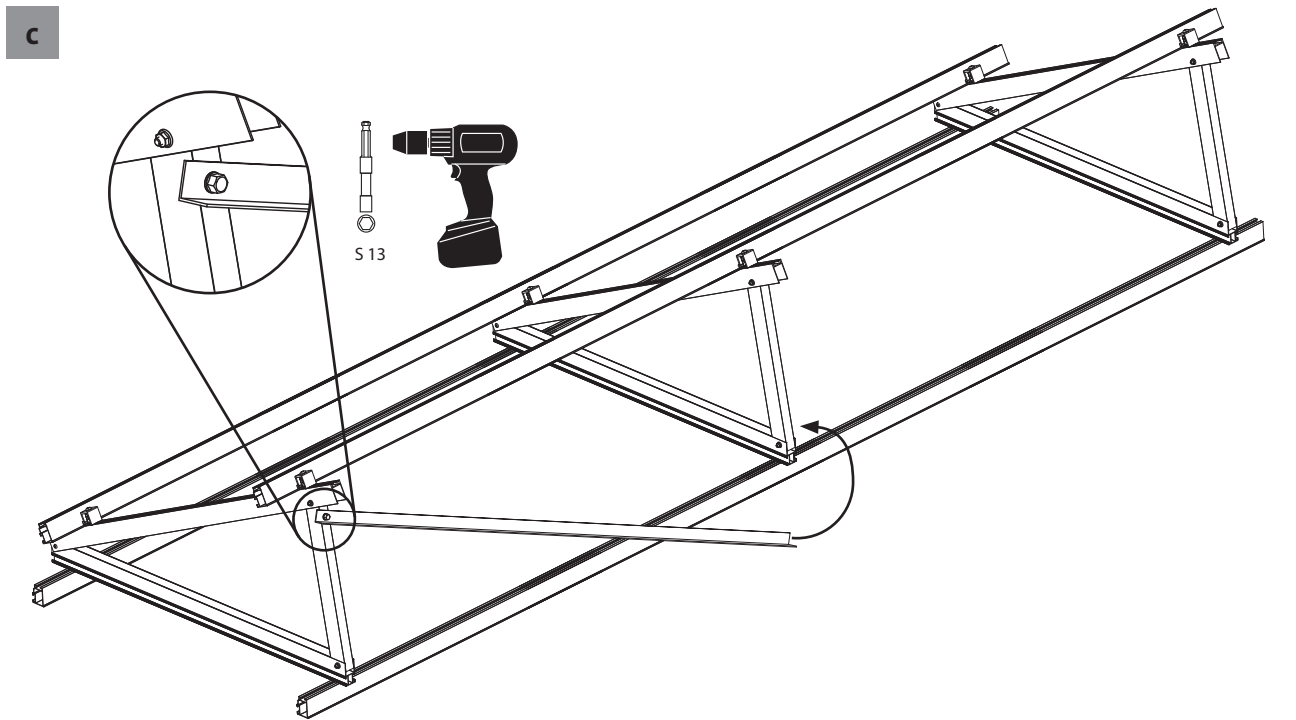
7.  
a



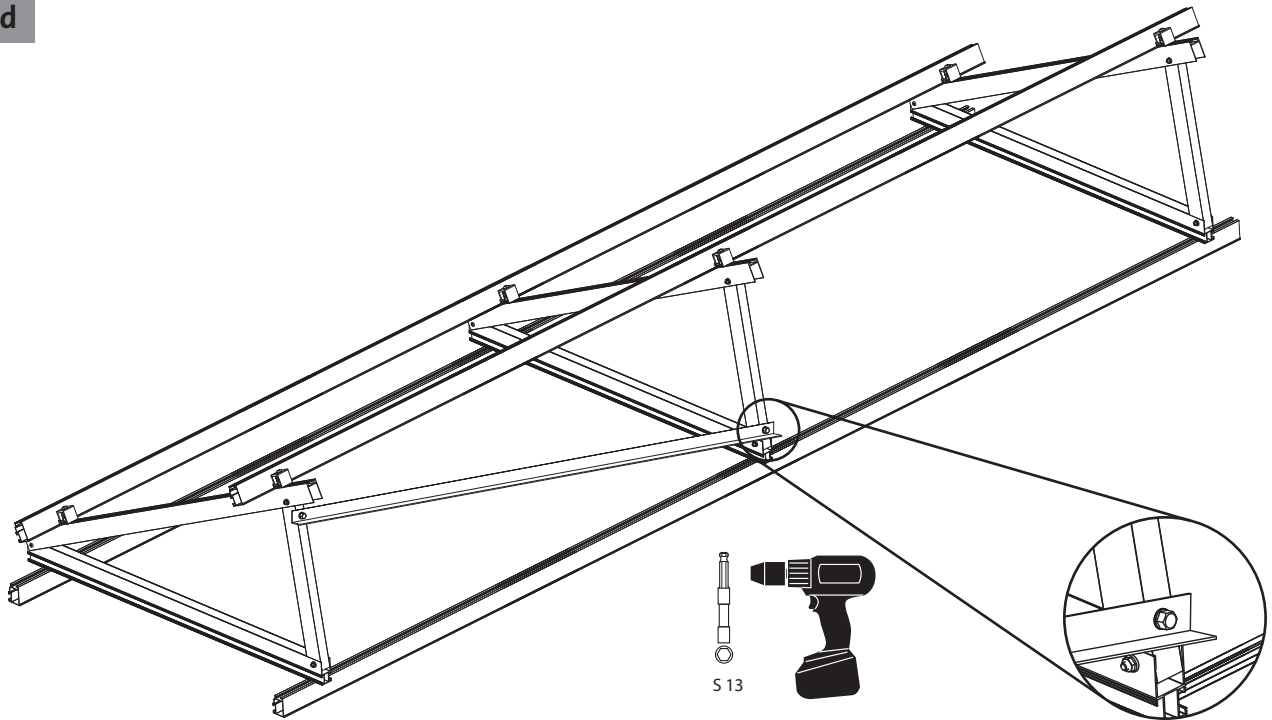
b



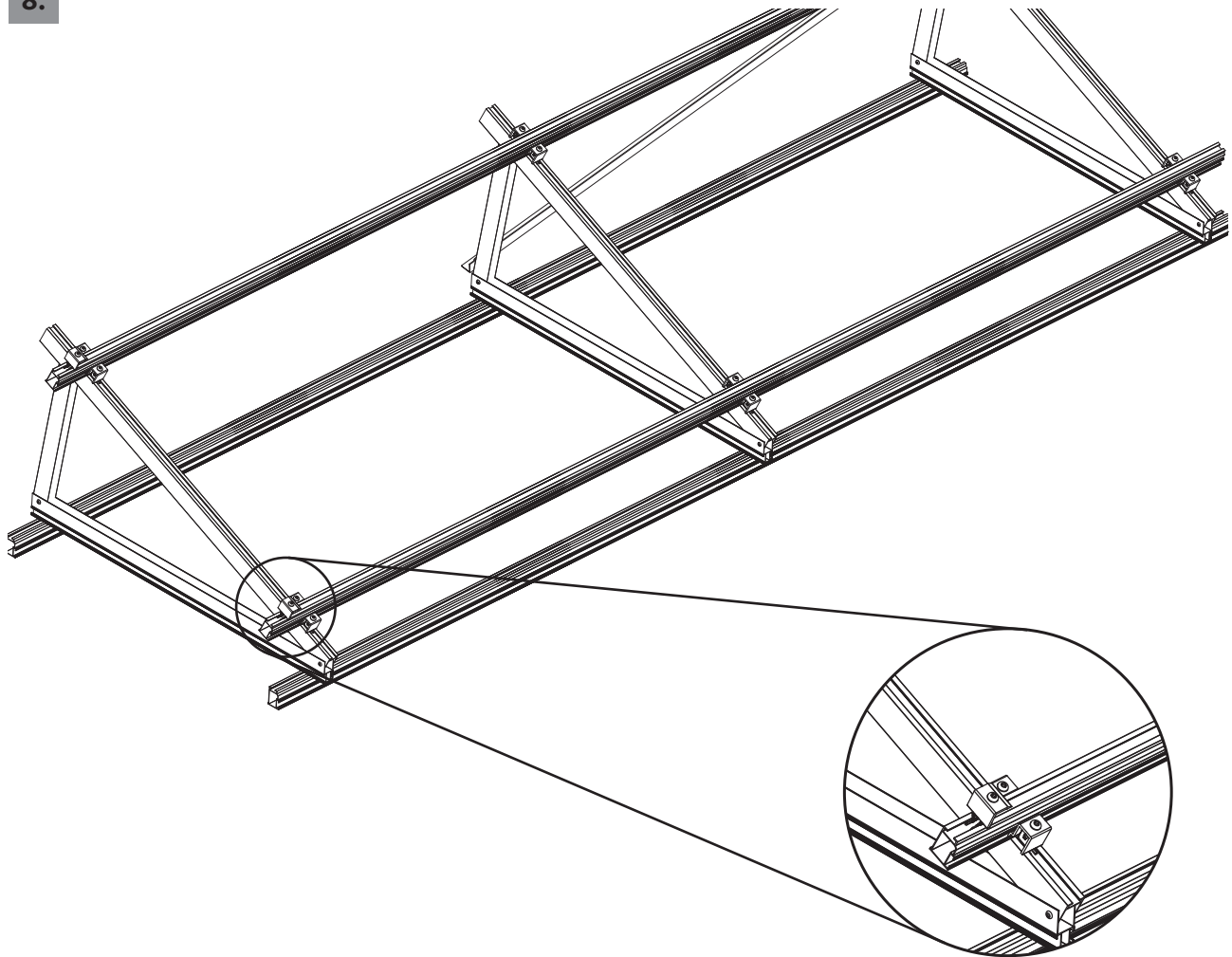
c



d

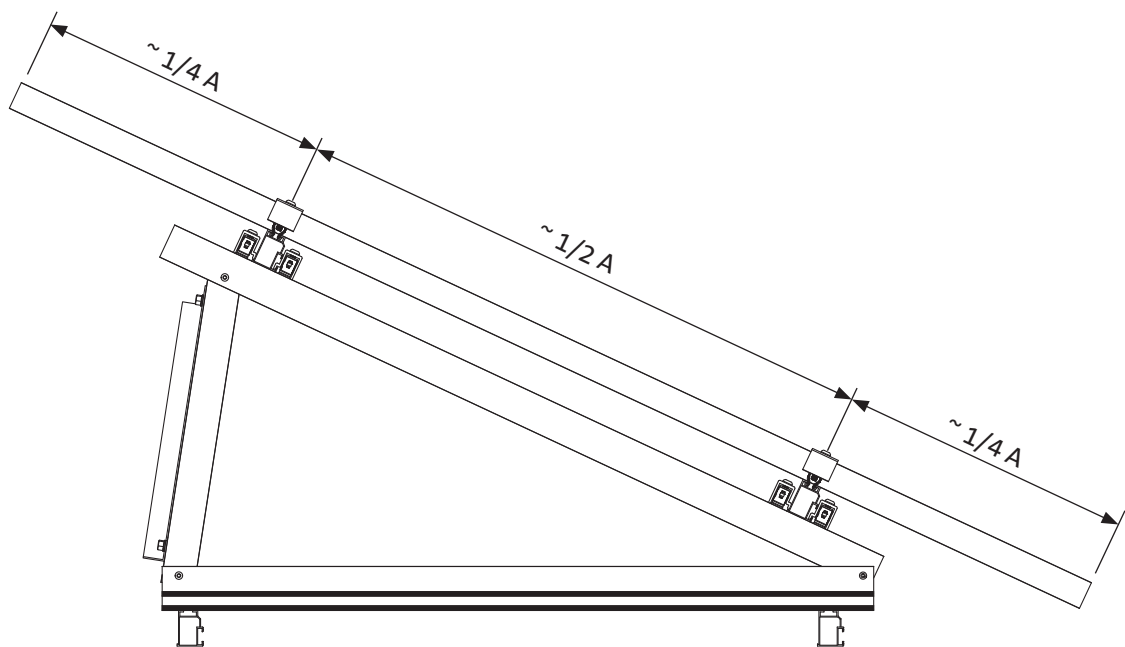
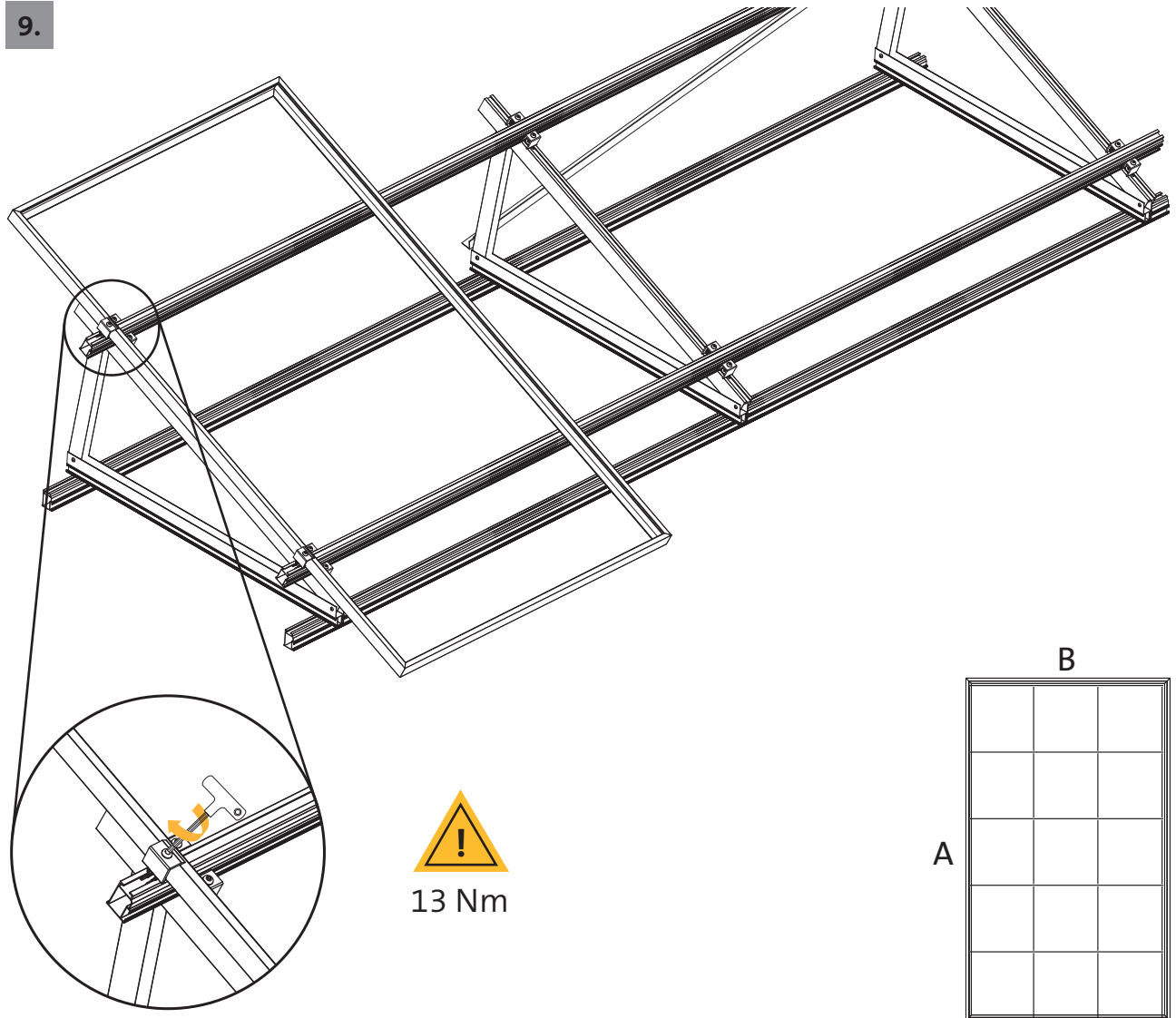


8.

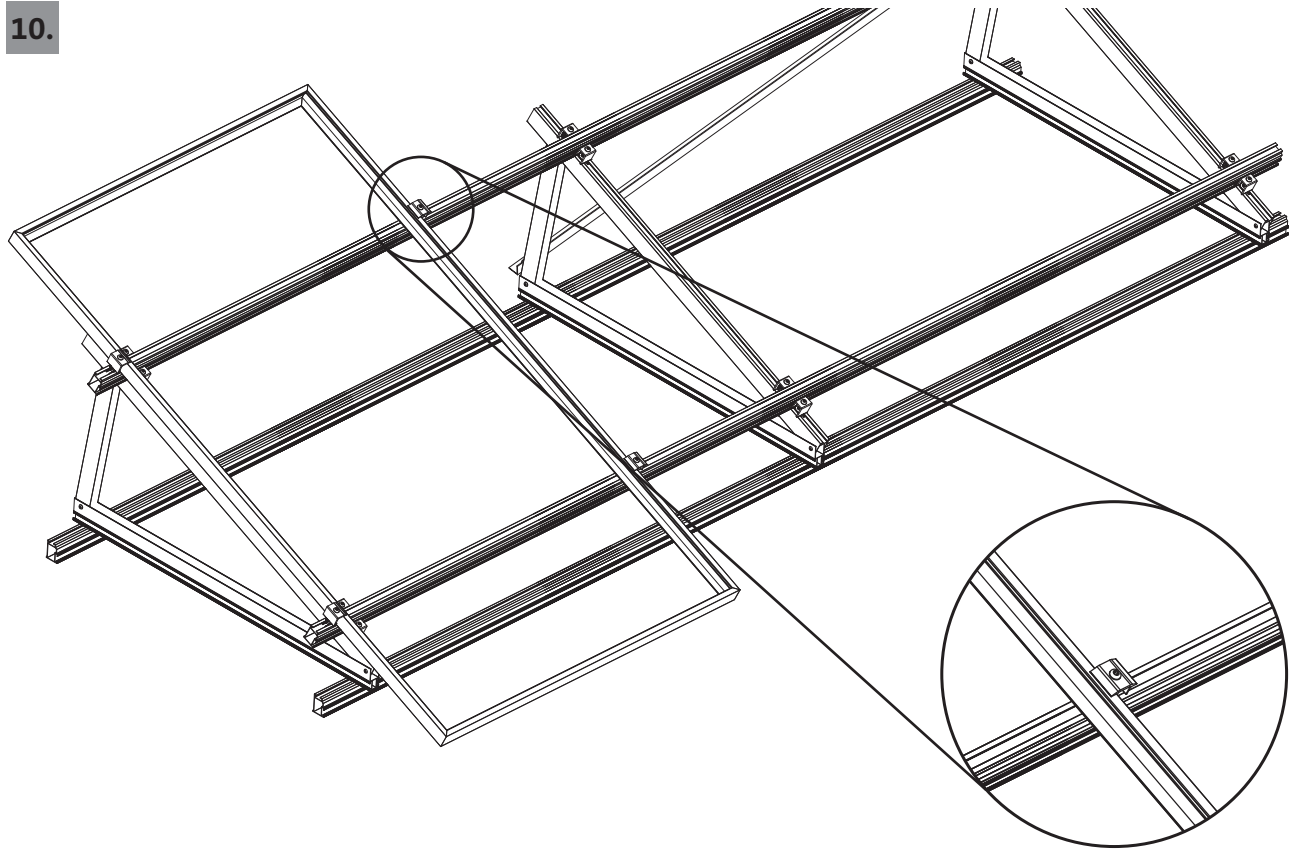




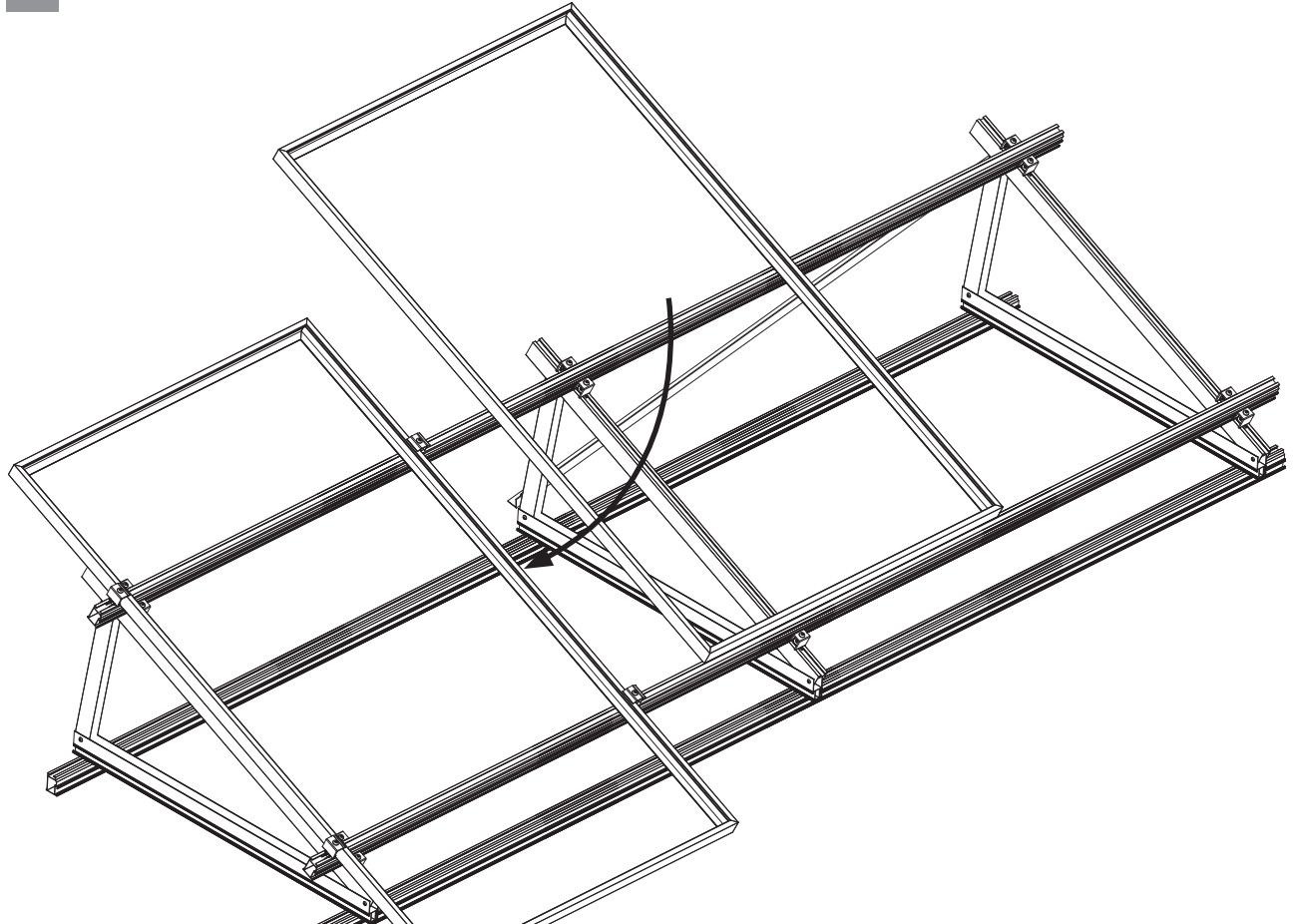
9.



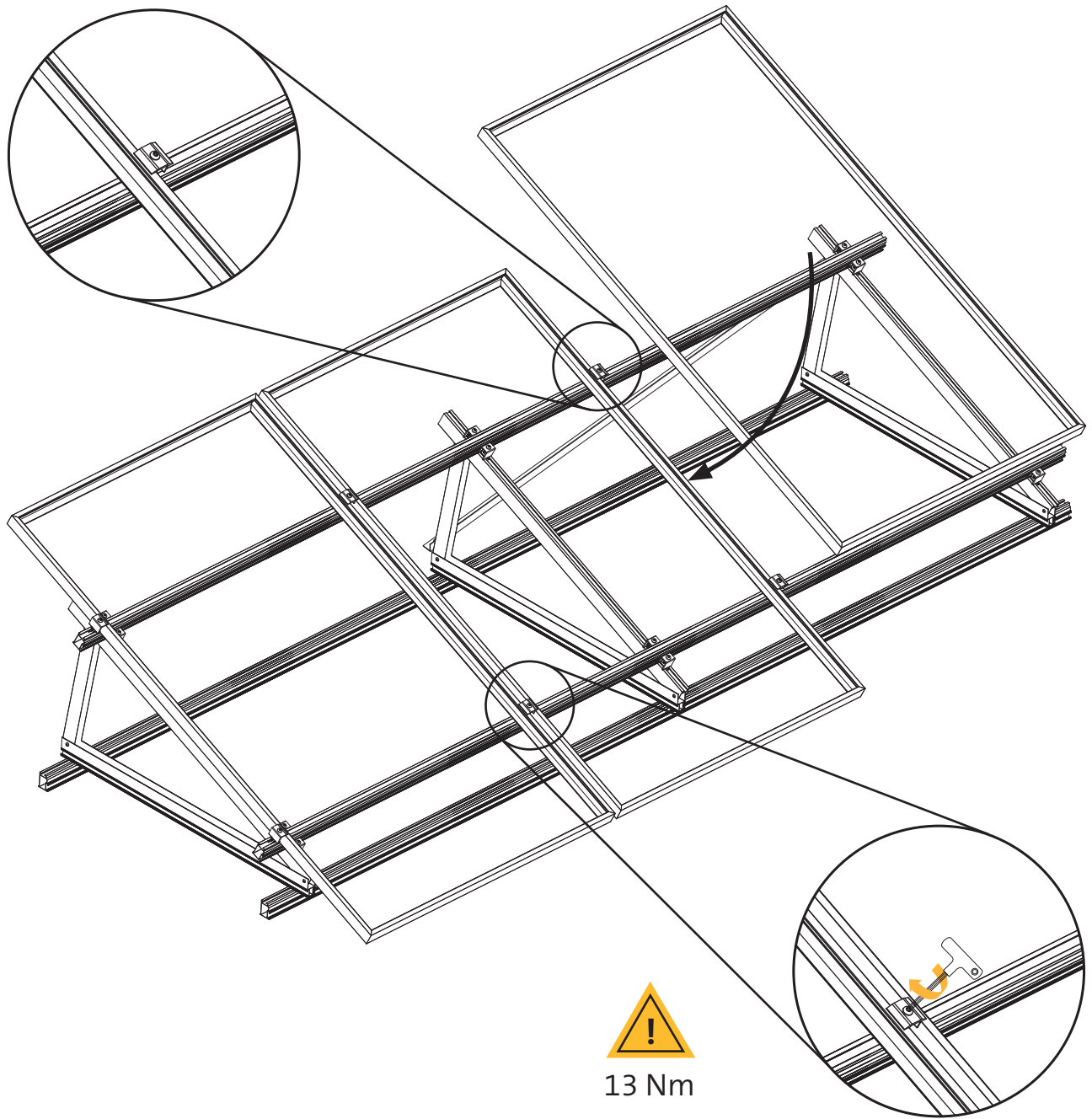
10.



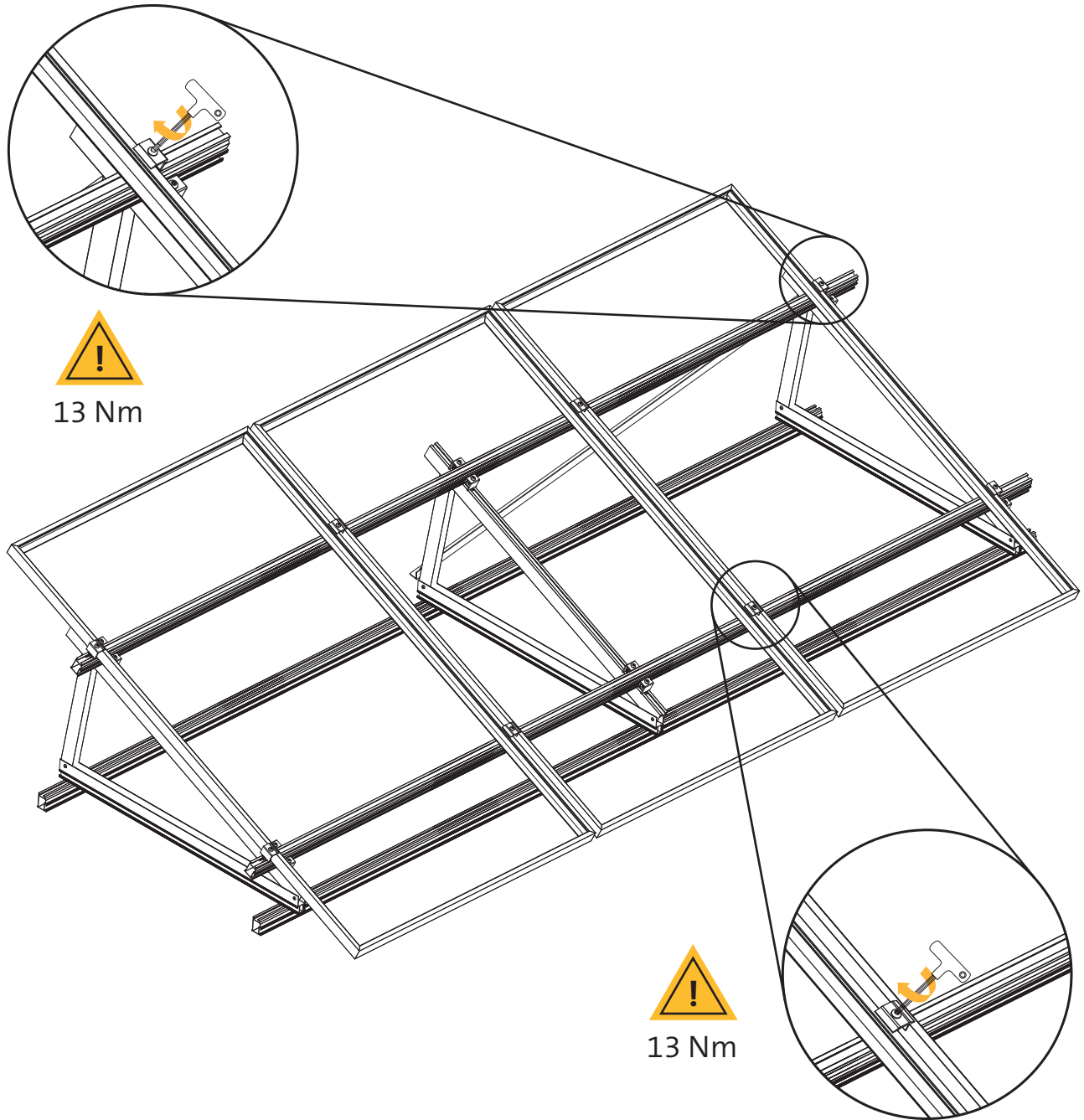
11.



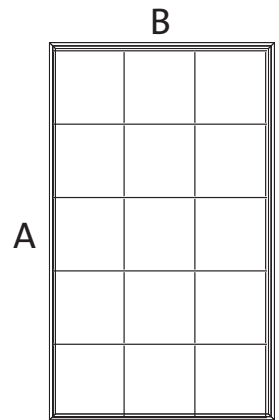
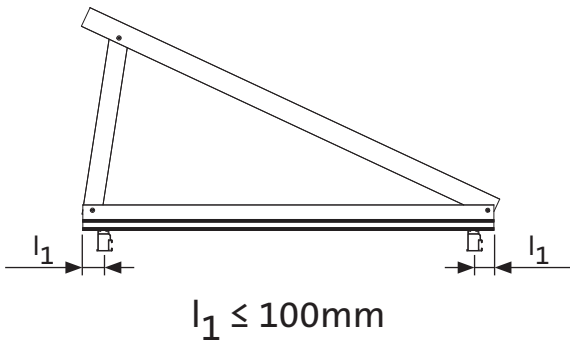
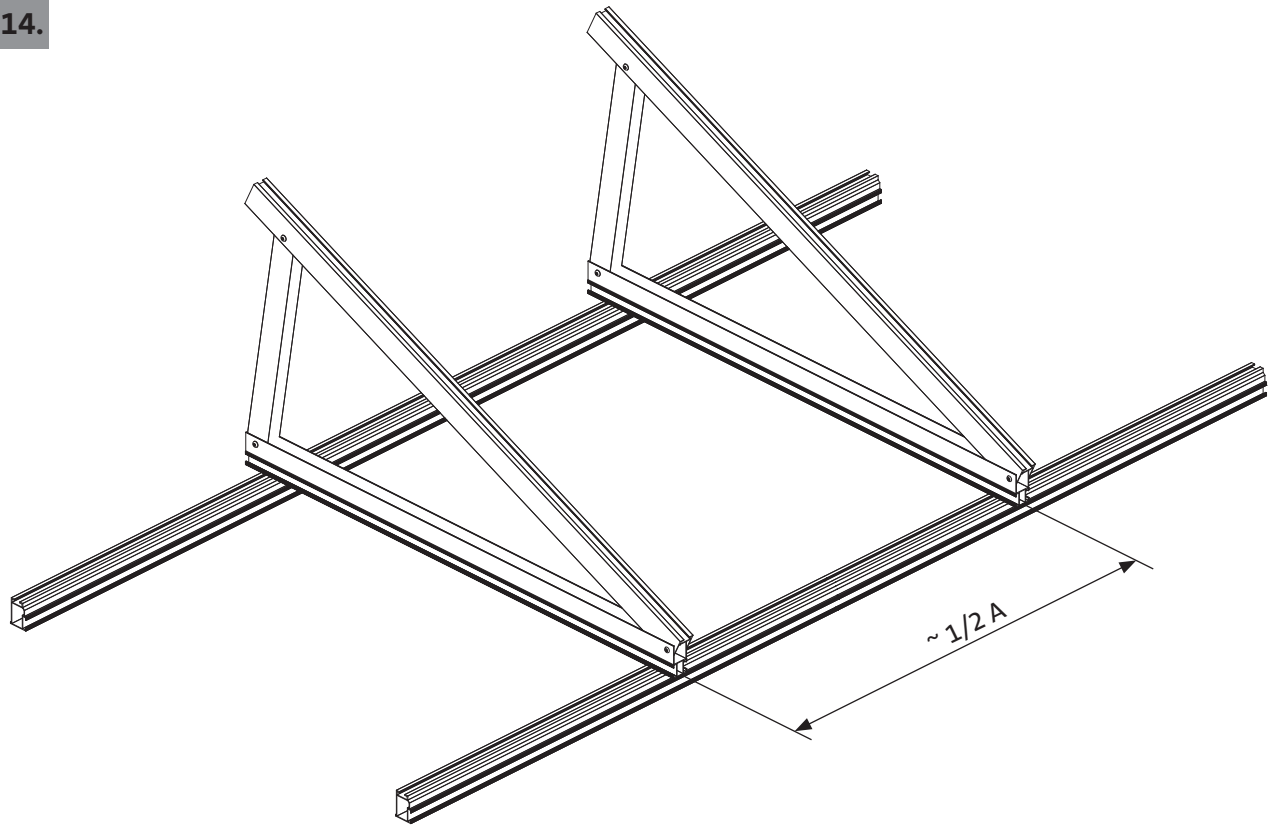
12.



13.

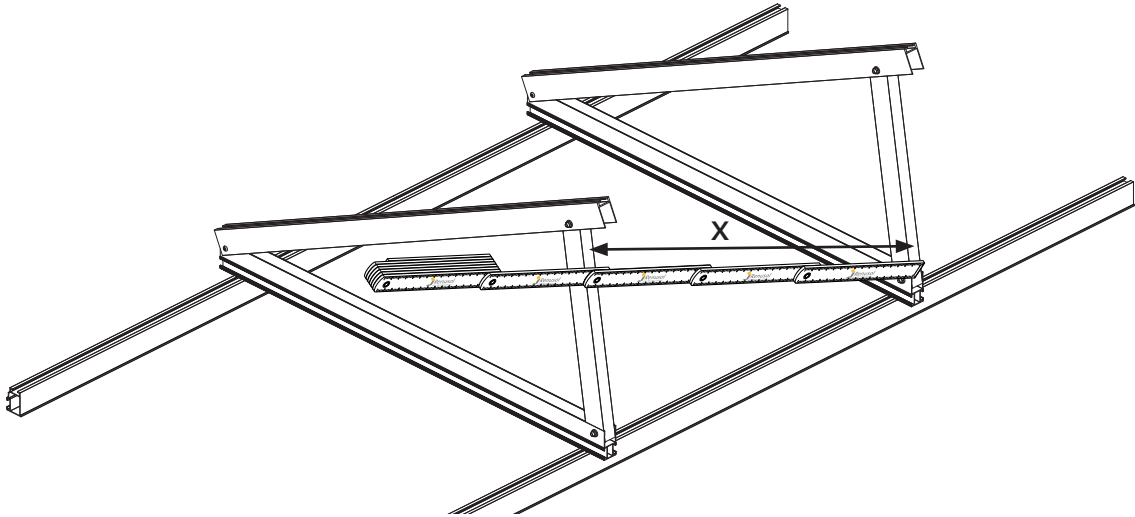


14.

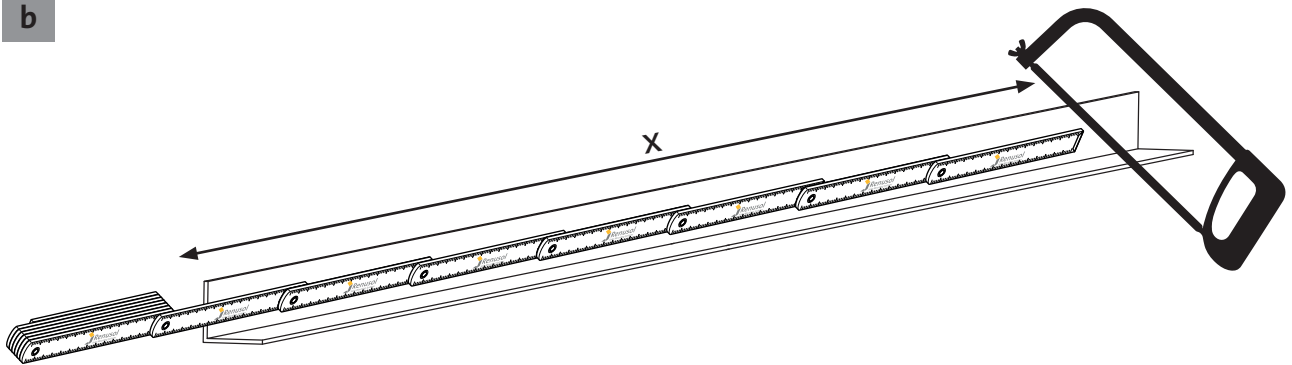


15.

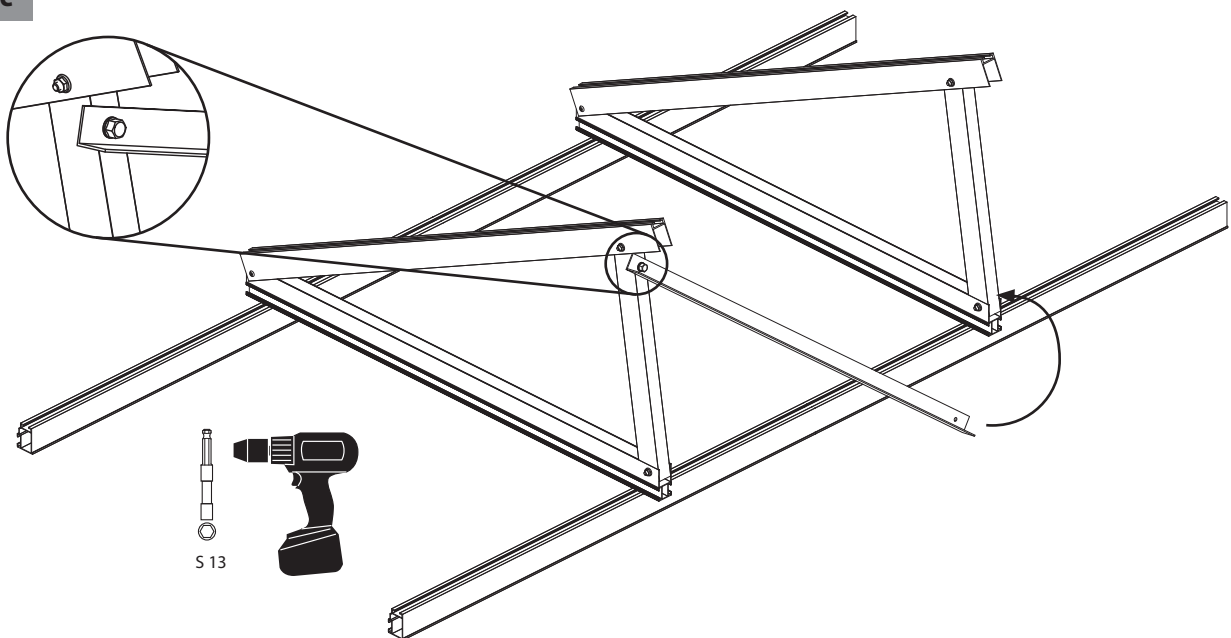
a



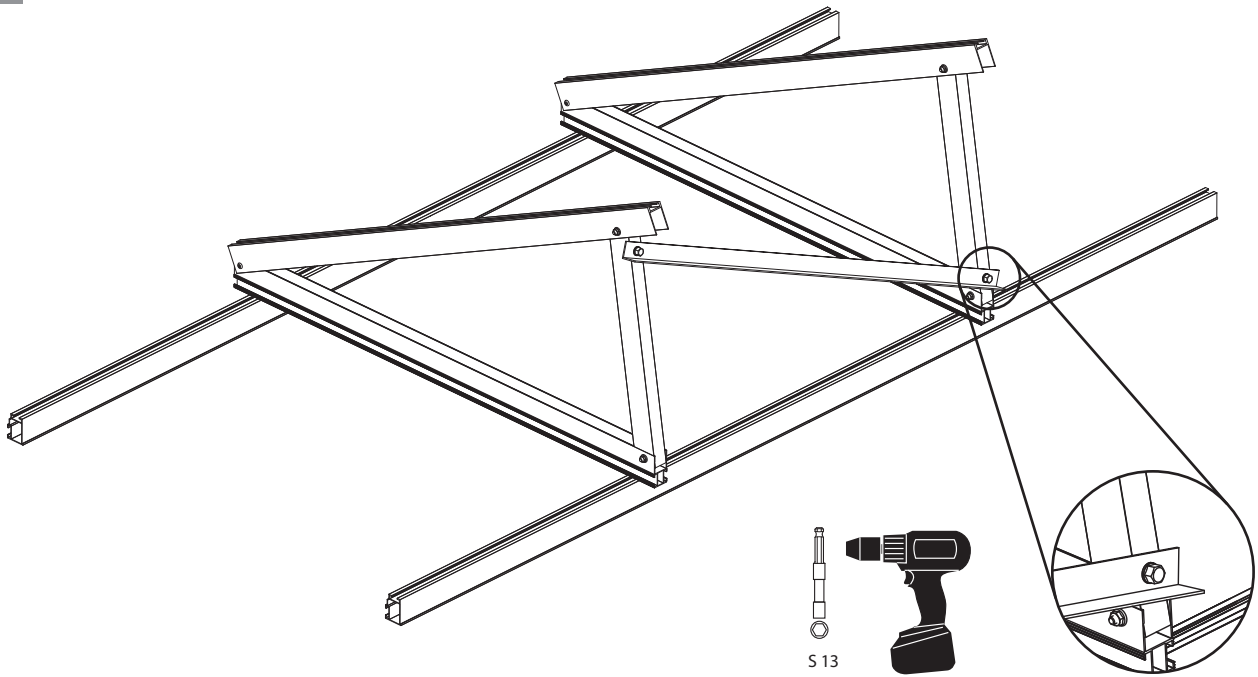
b



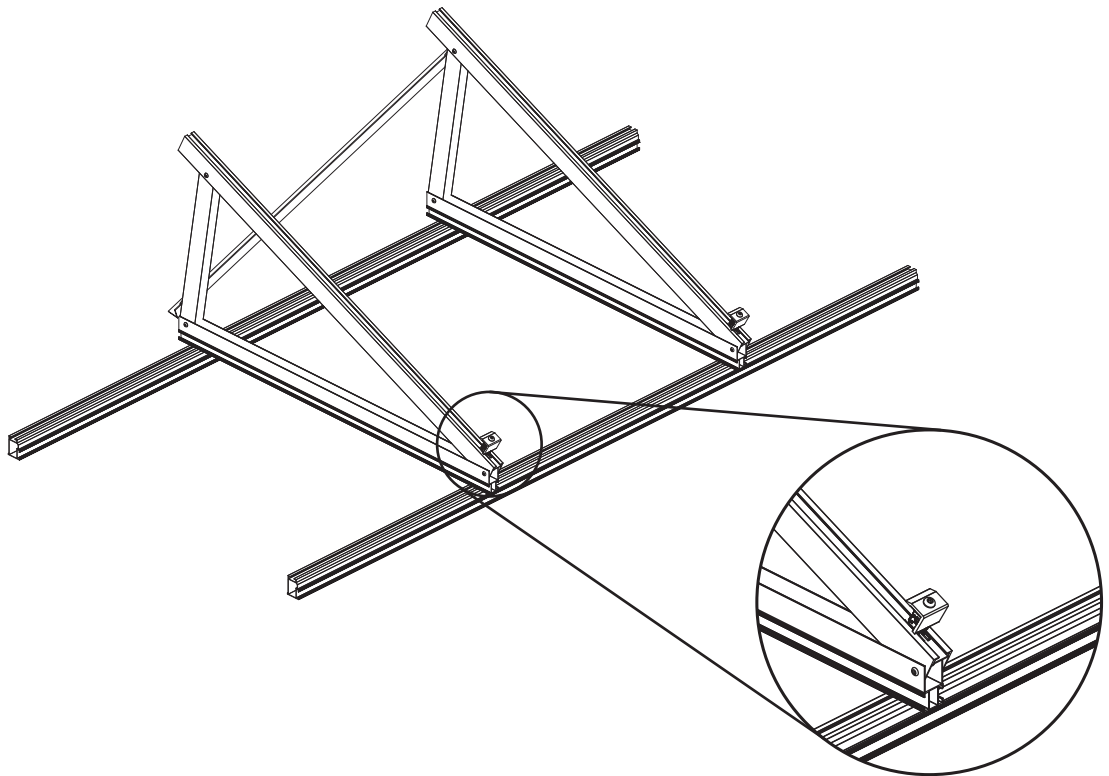
c



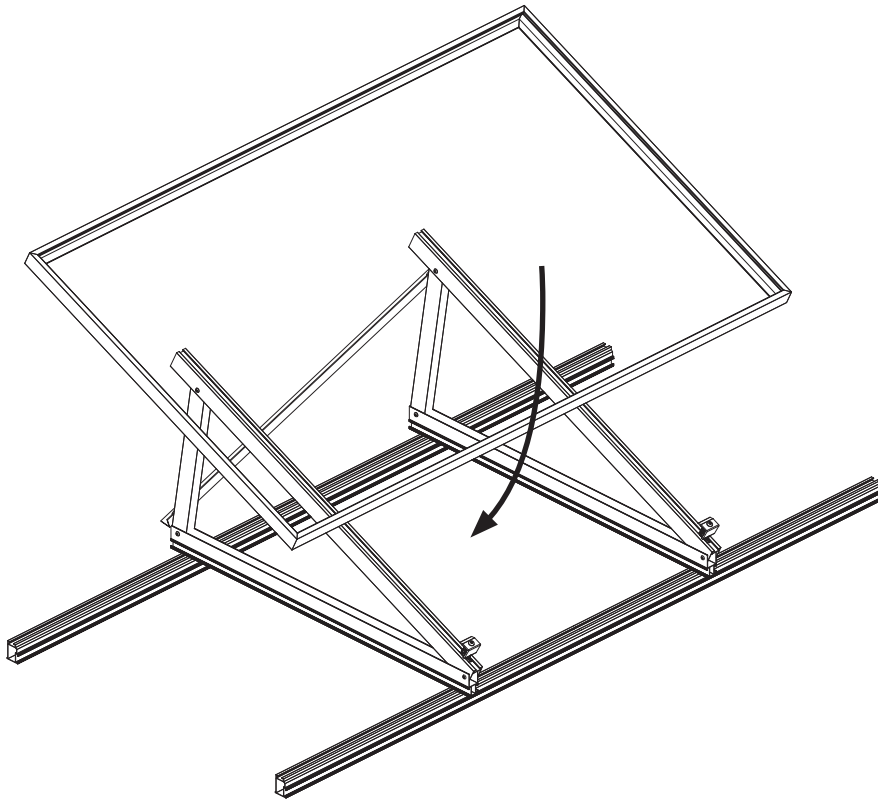
d



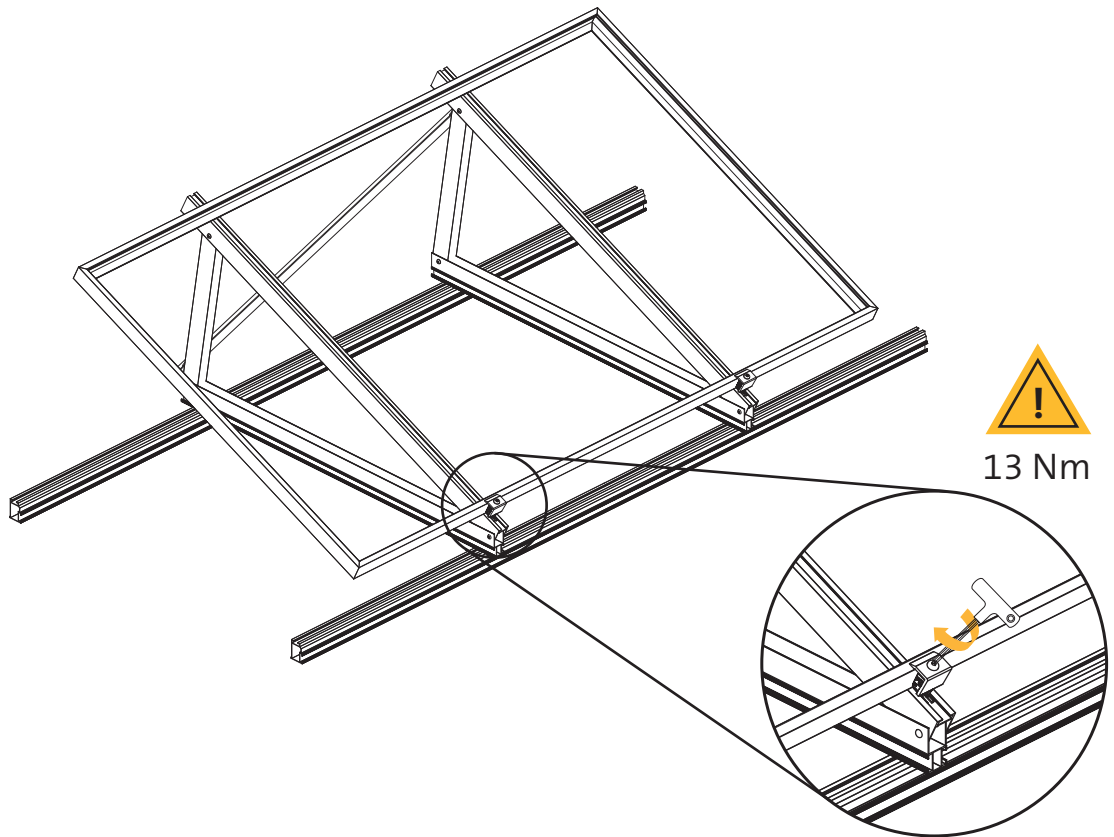
16.



17.

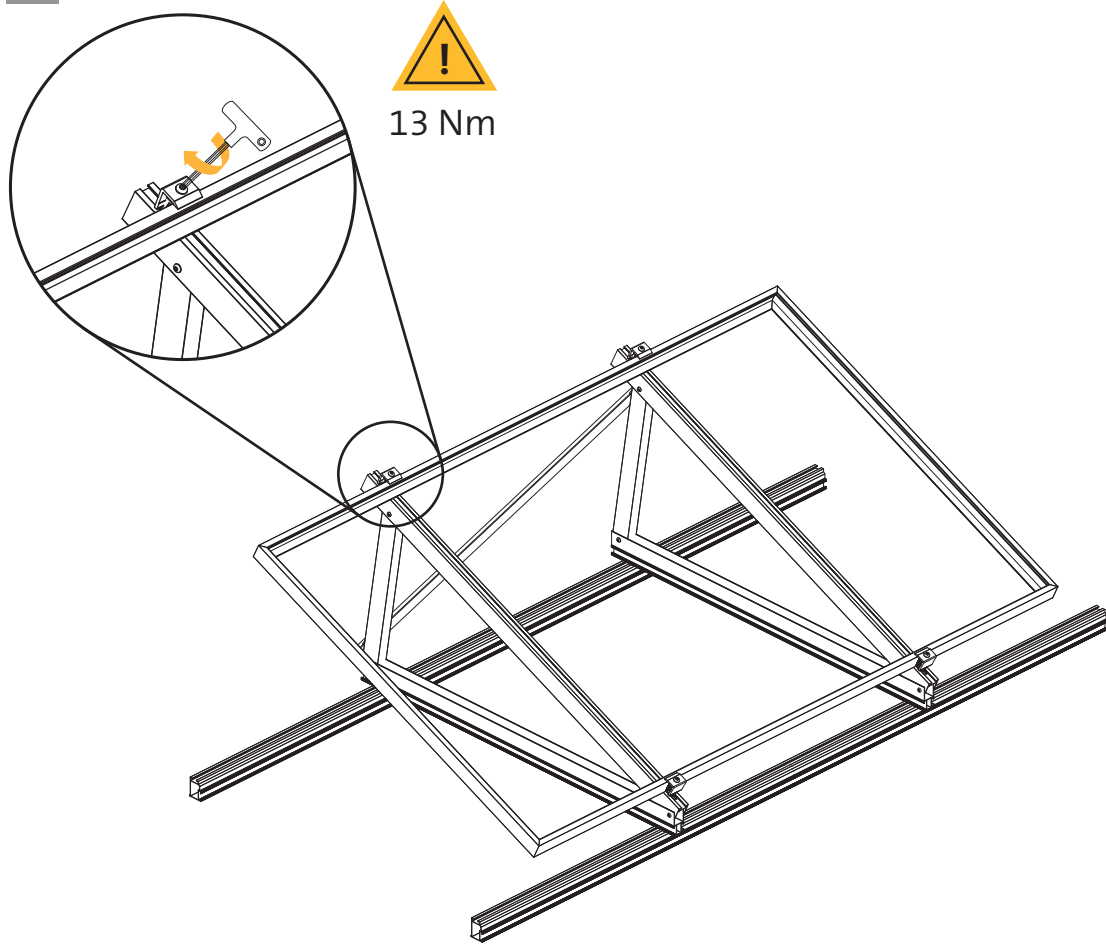


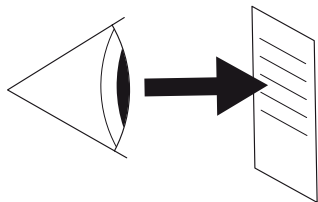
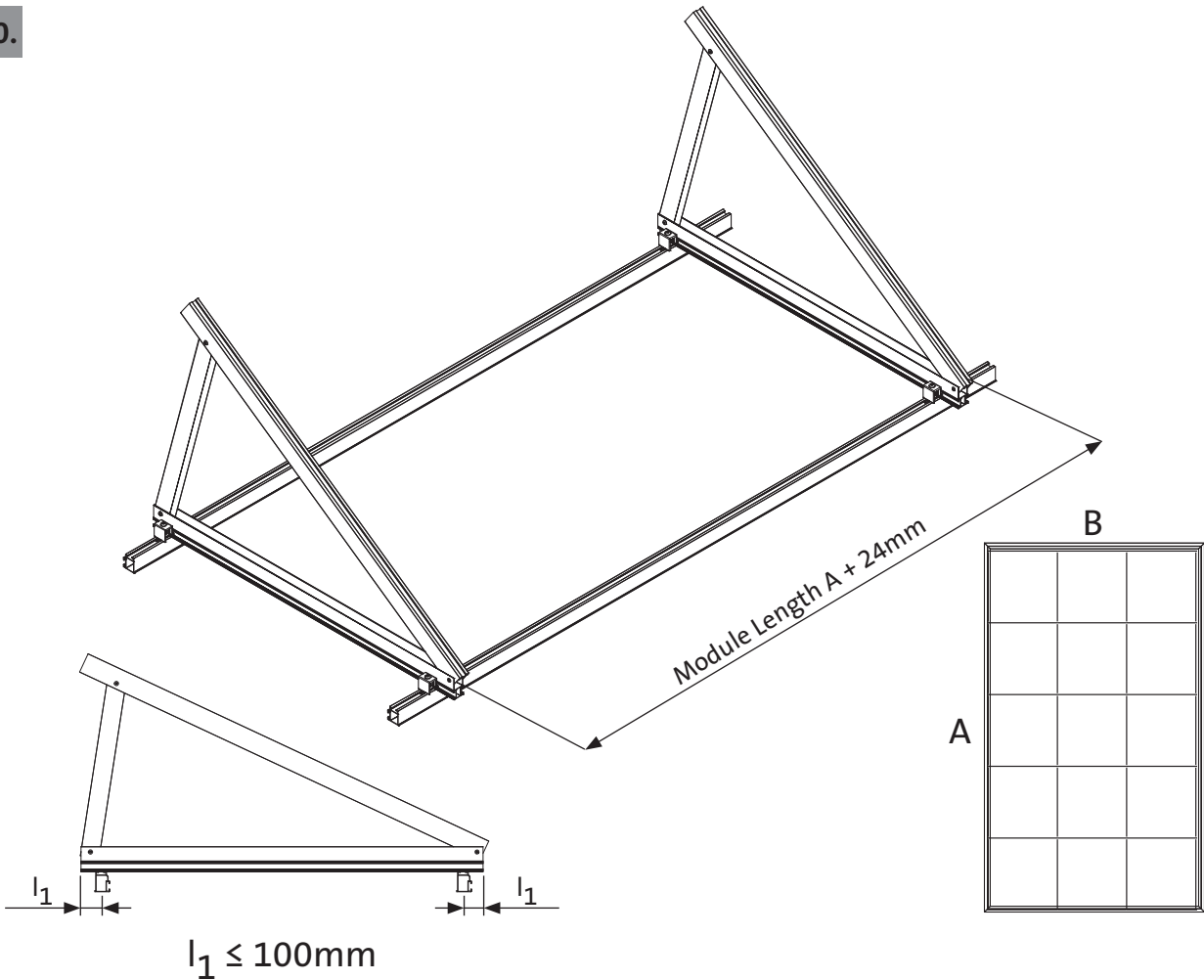
18.



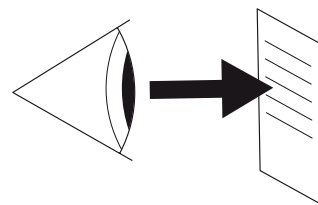


19.





**60 Cell Module** →



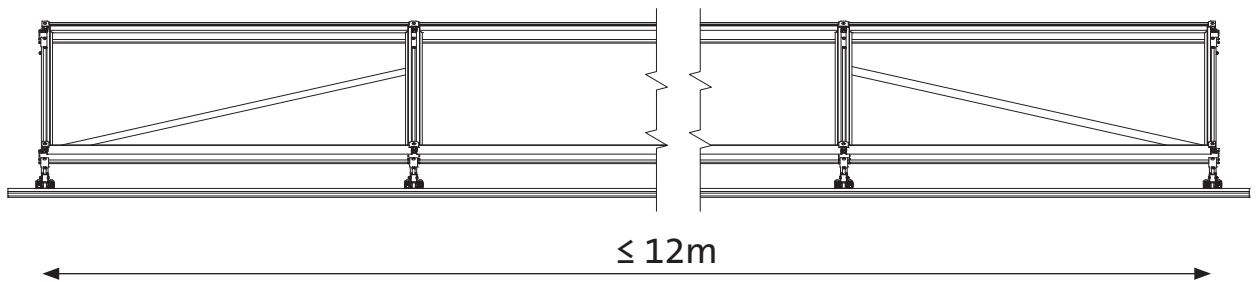
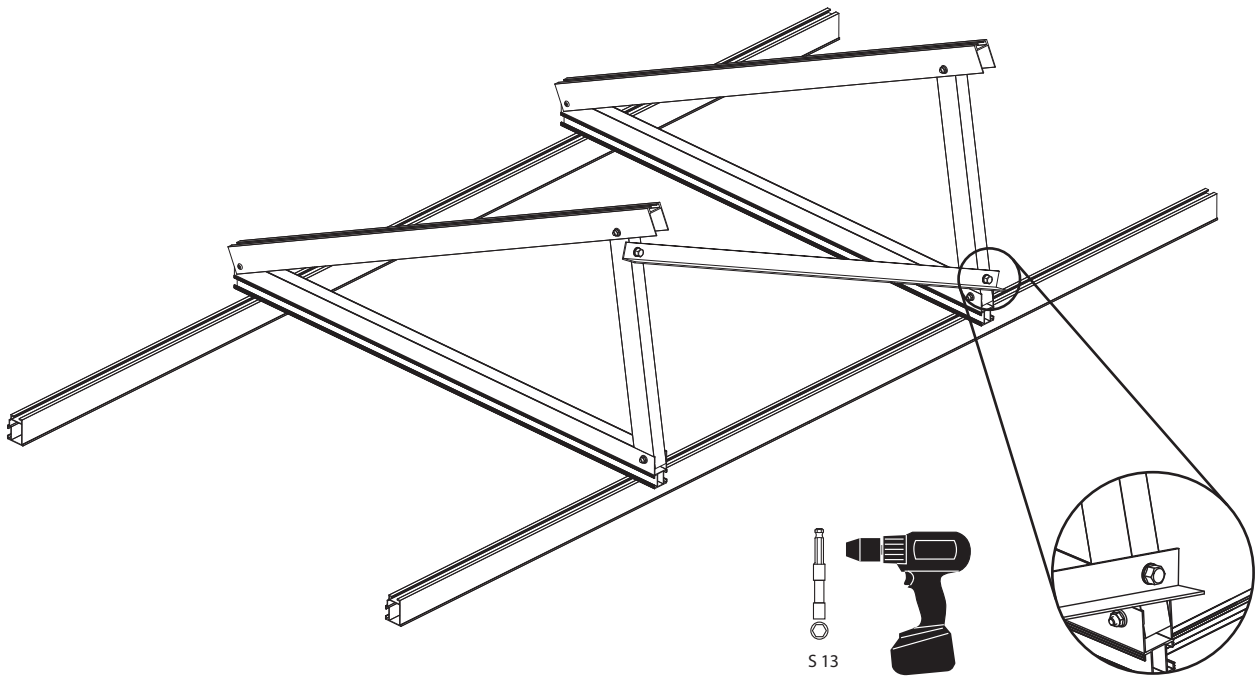
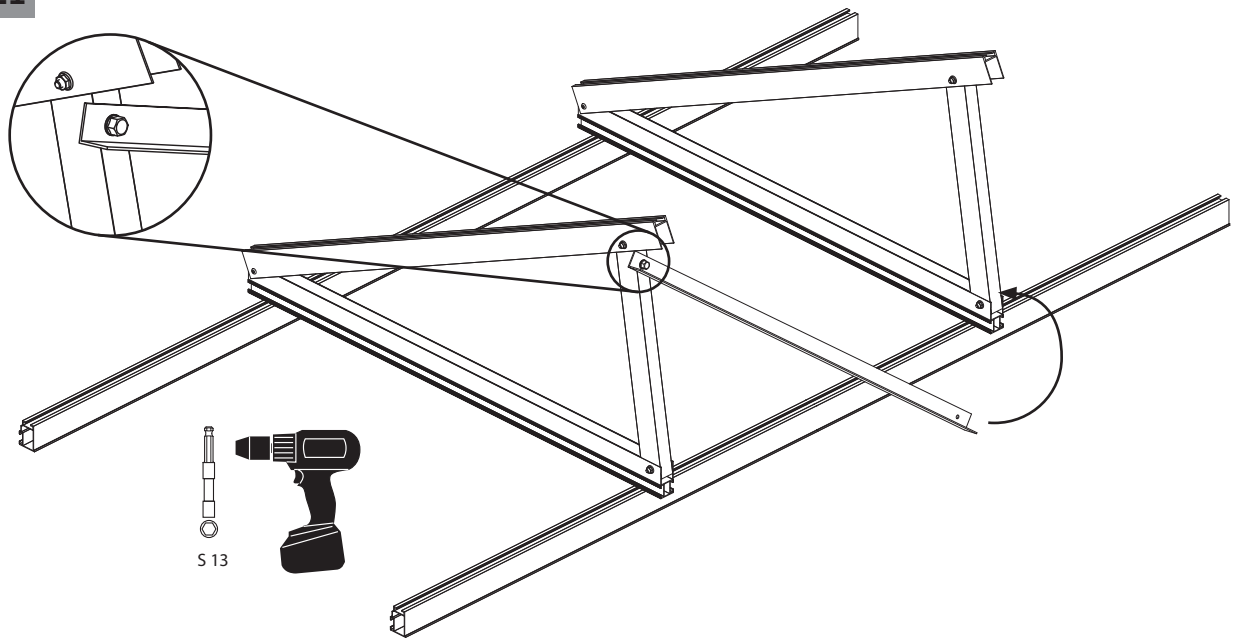
**72 Cell Module** →



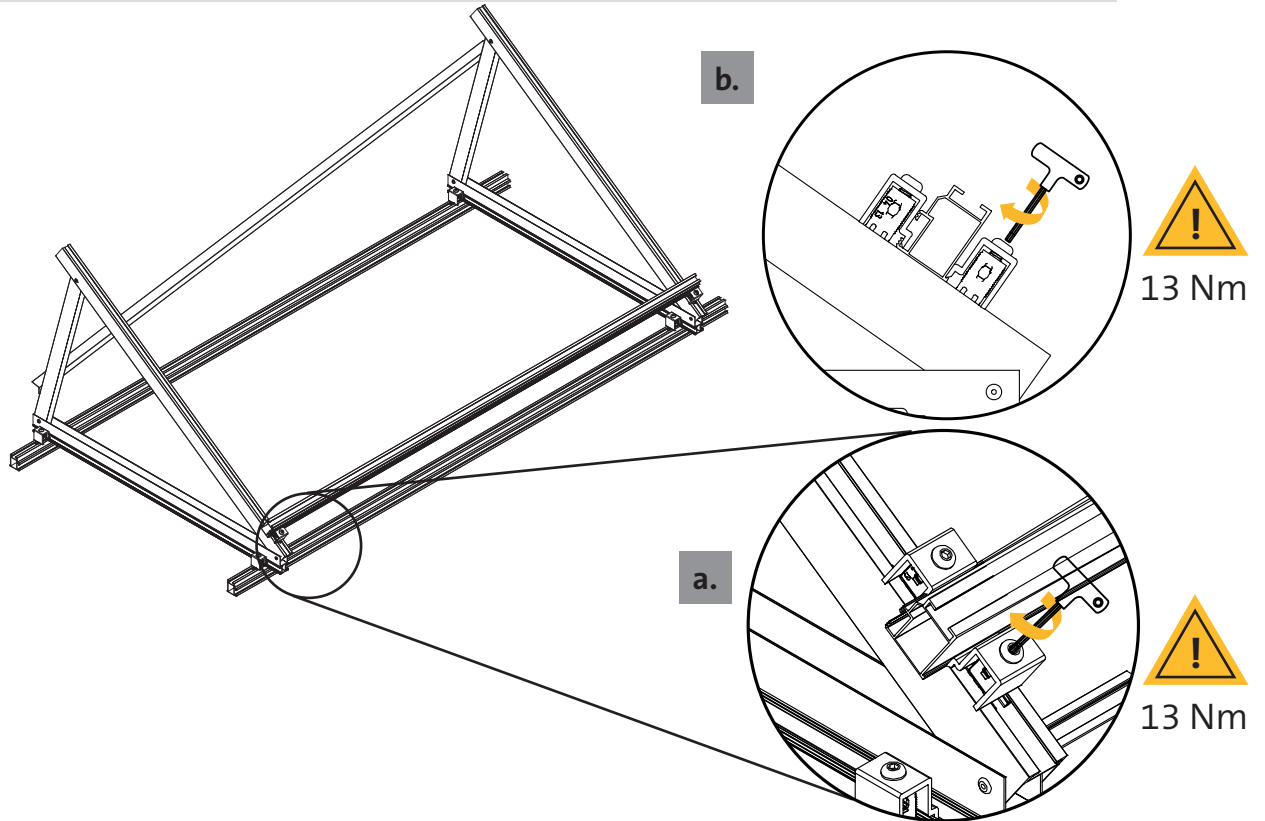
**Maximum Loads: 72 Cell Module TS+ Distance 2m**

$w_i > s_k$	Wind	$w_i =$	0,50	[kN/m <sup>2</sup> ]
	Snow	$s_k =$	0,35	[kN/m <sup>2</sup> ]
$s_k > w_i$	Wind	$w_i =$	0,40	[kN/m <sup>2</sup> ]
	Snow	$s_k =$	0,70	[kN/m <sup>2</sup> ]

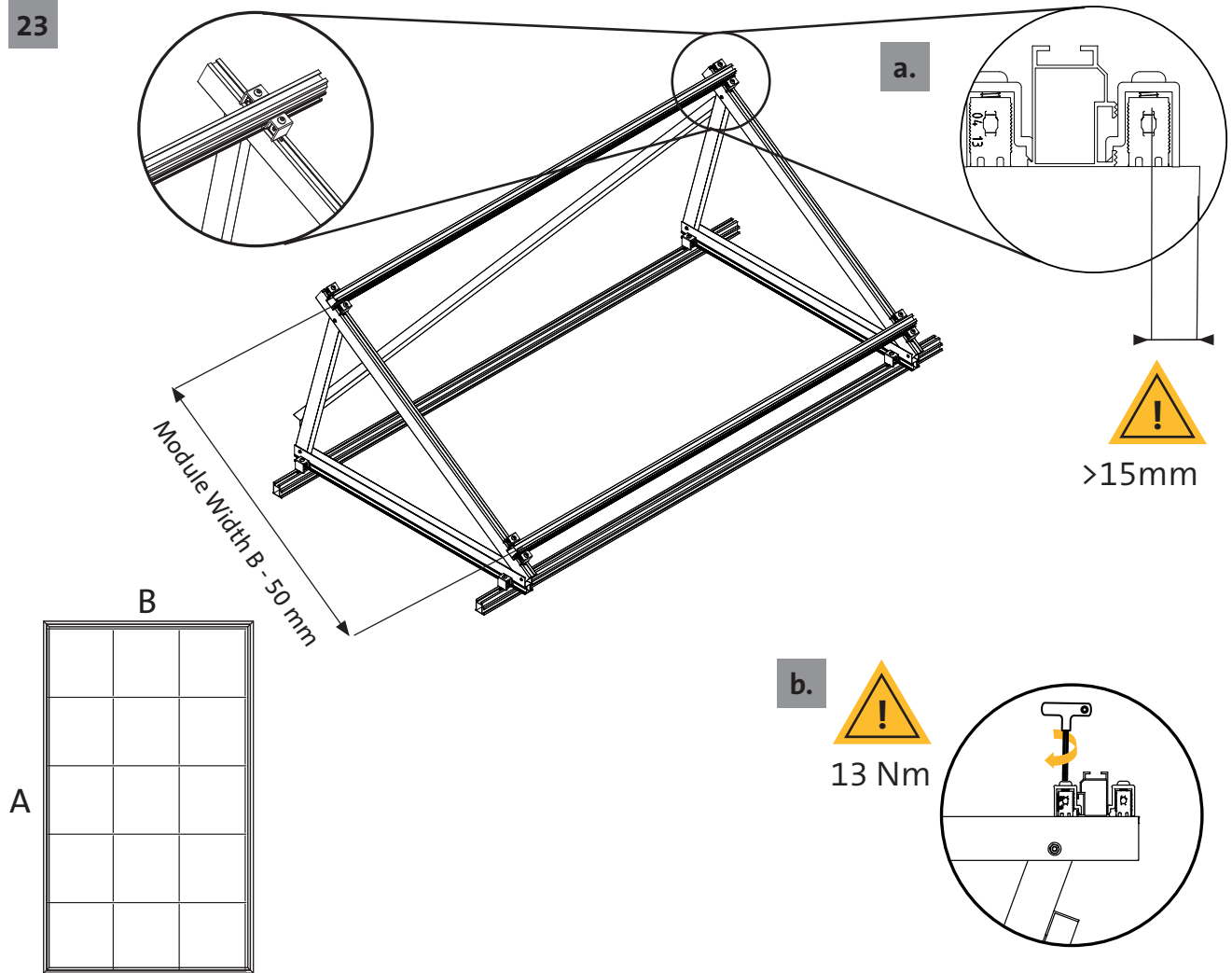
21



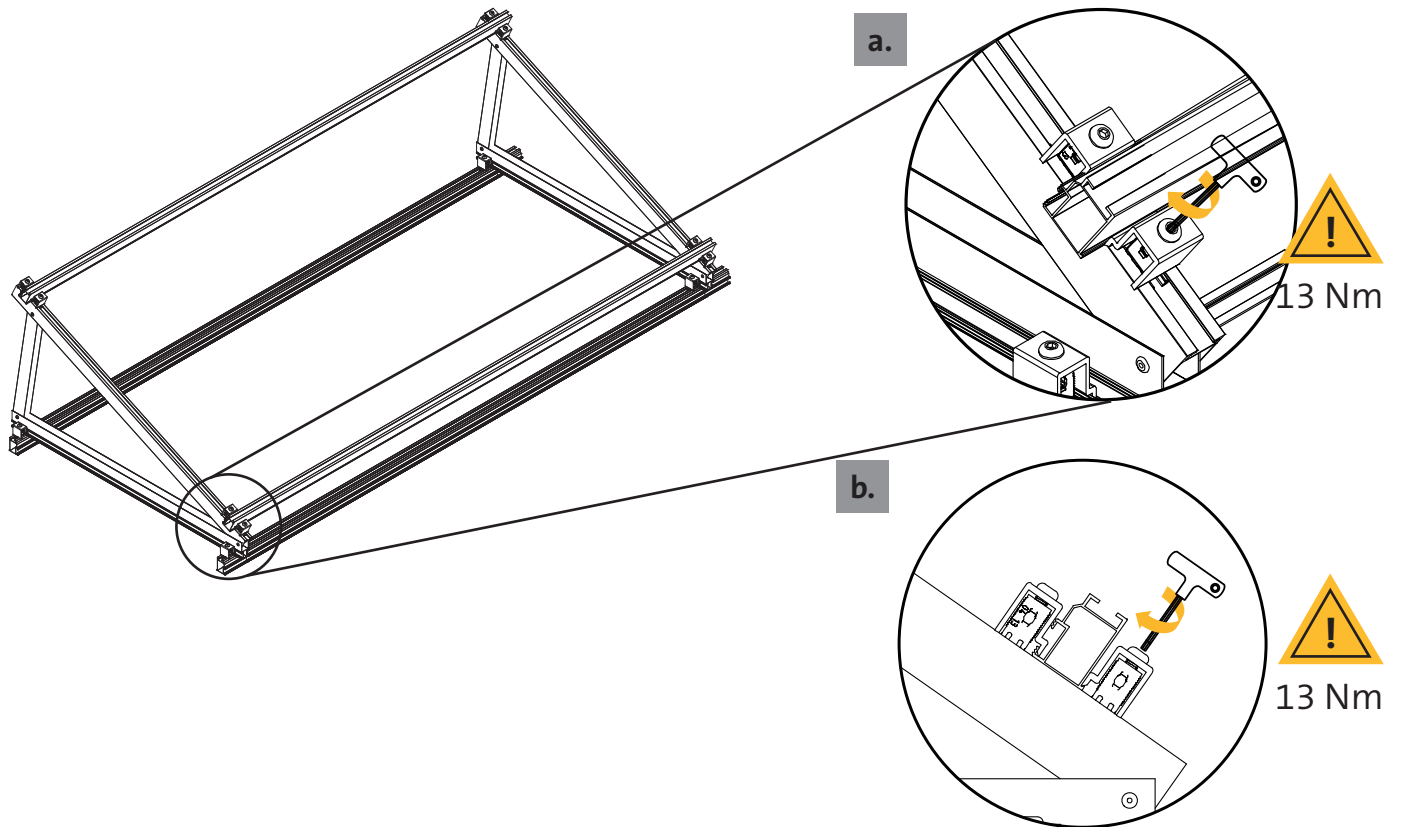
22.



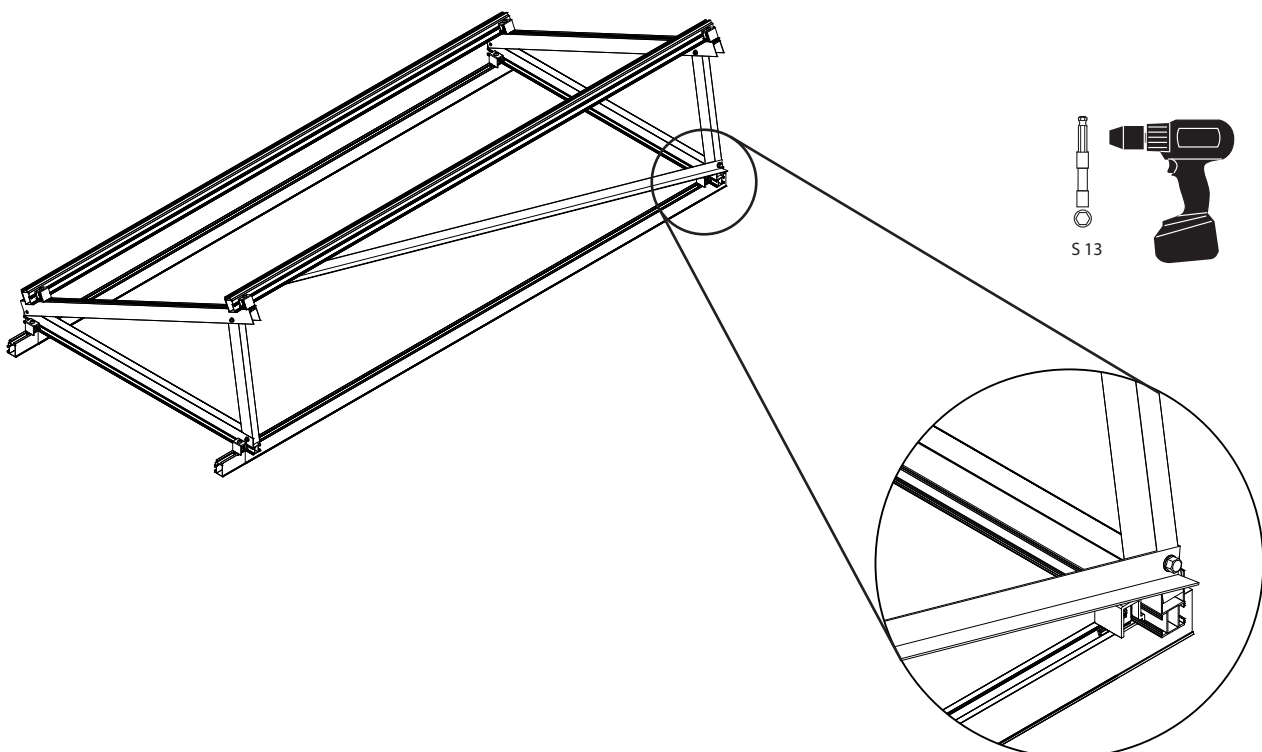
23

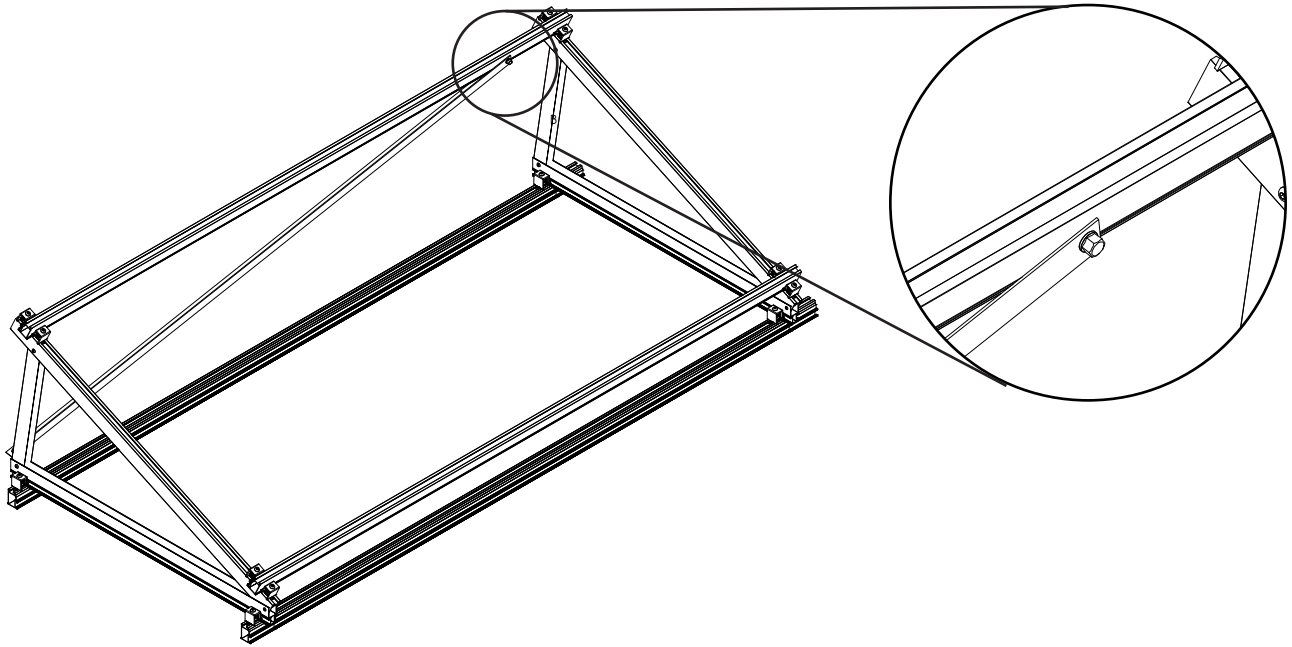


21.

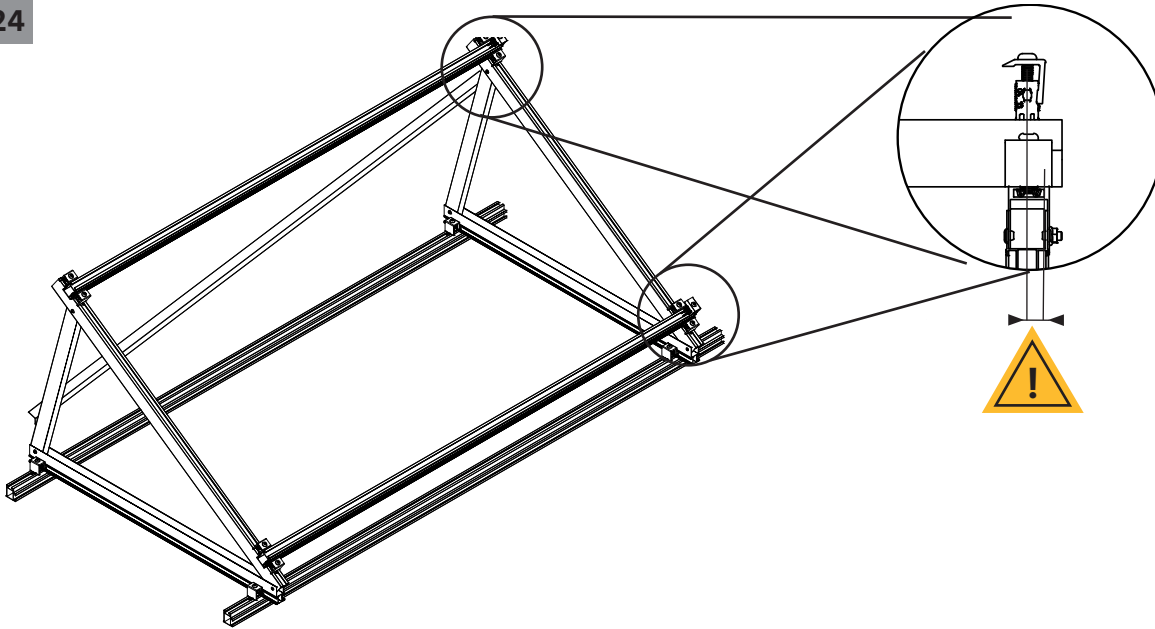


22.

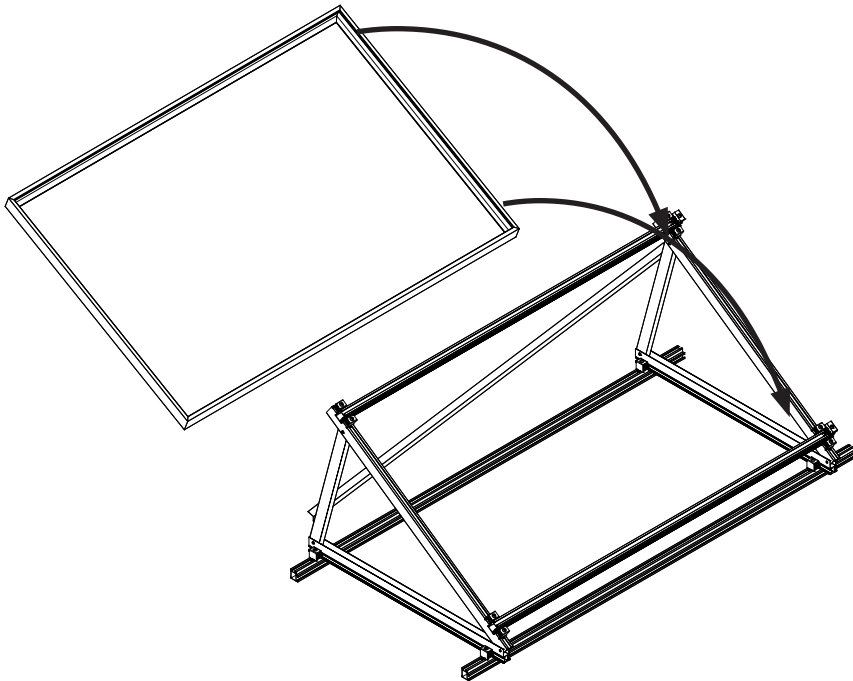




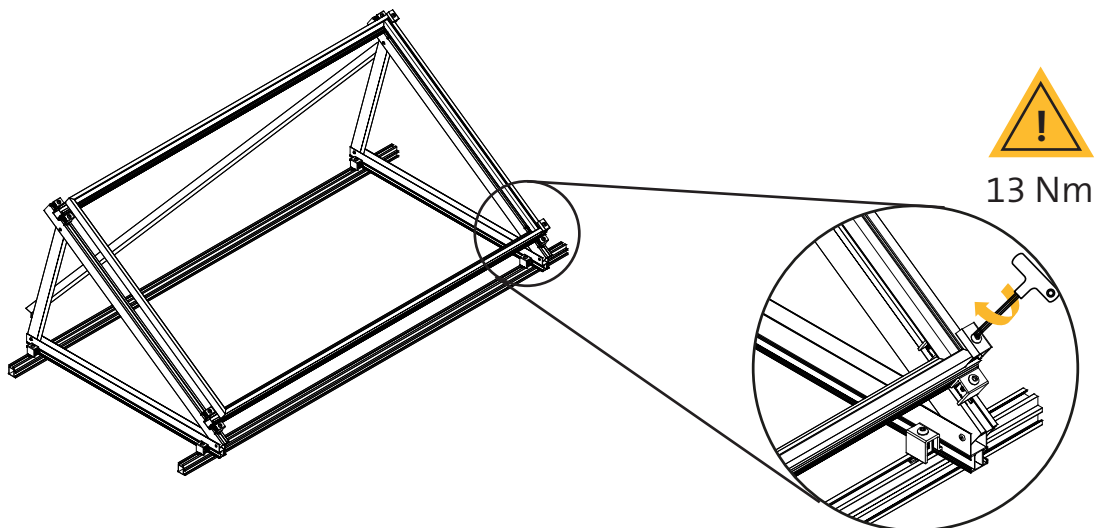
24



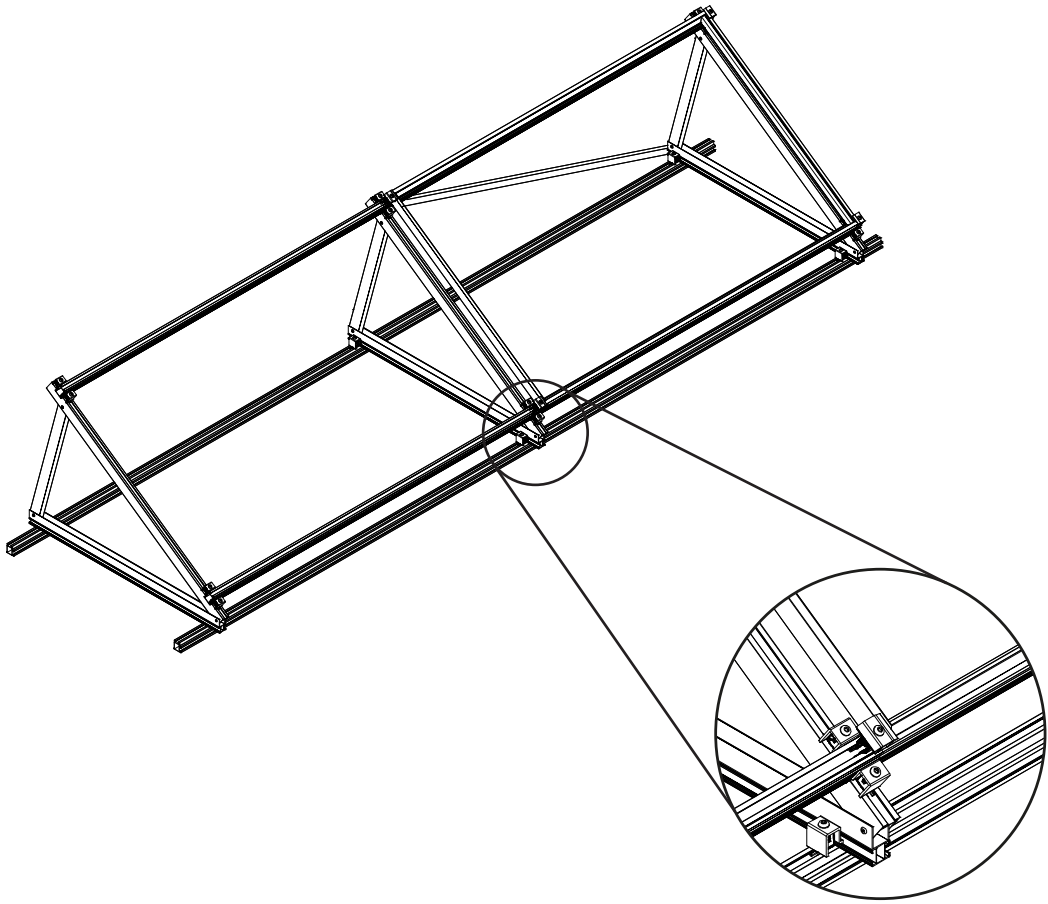
25.



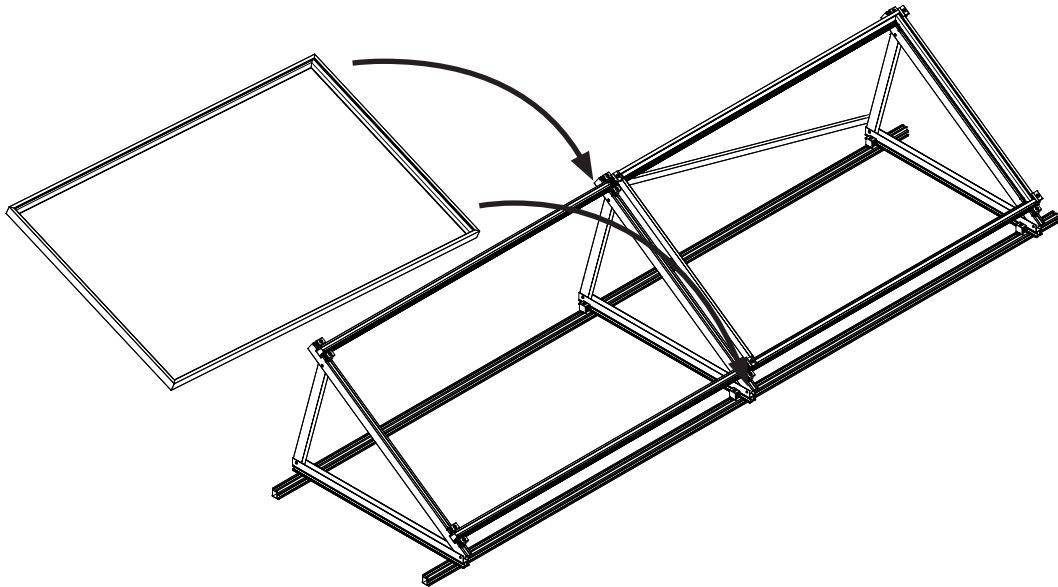
26.



27.

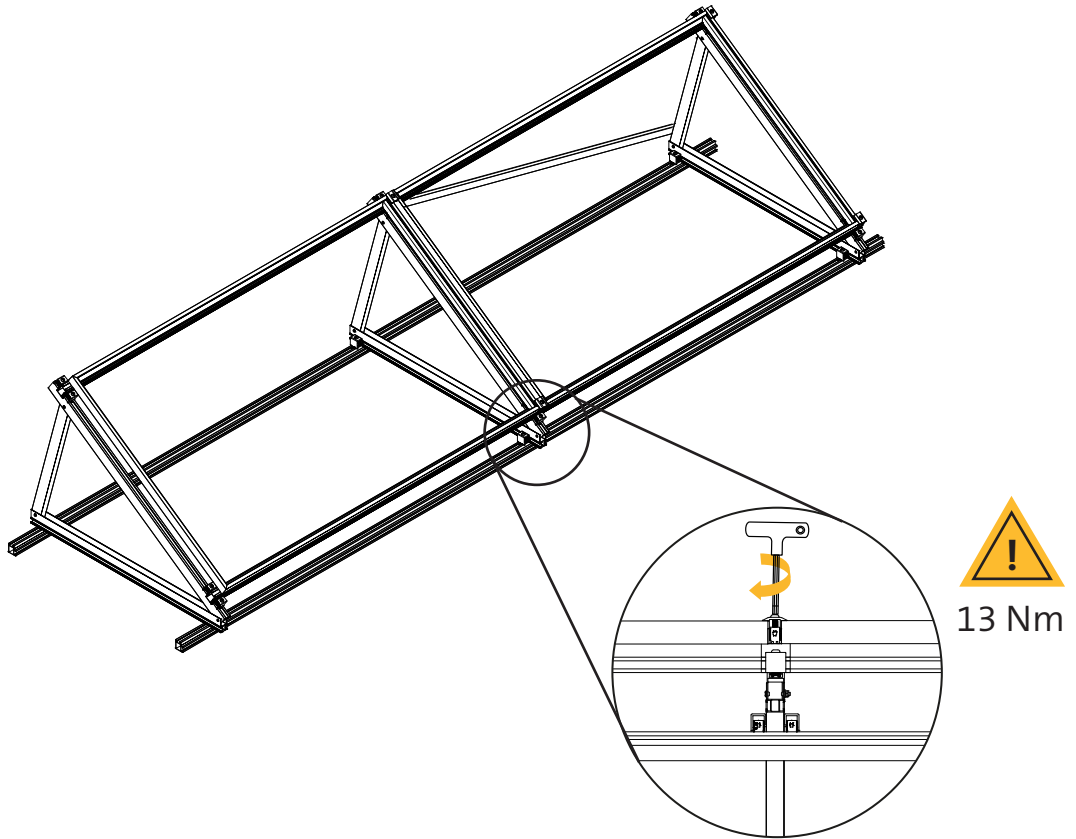


28.

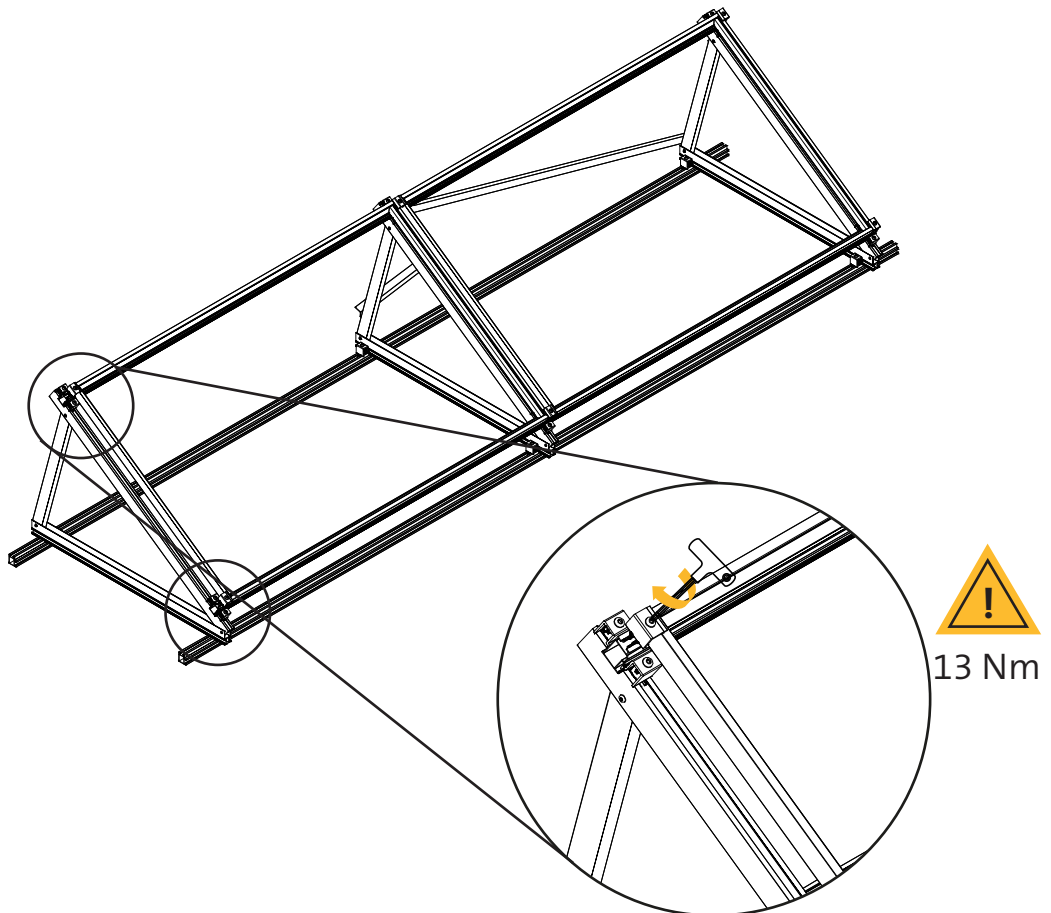




29.



30.



Renusol Europe GmbH  
Piccoloministrasse 2  
51063 Cologne  
Germany  
Telephone: +49 221 788707-0  
Fax: +49 221 788707-99  
Email: [info@renusol.com](mailto:info@renusol.com)  
[www.renusol.com](http://www.renusol.com)

Sales department  
Telephone: +49 221 788707-19  
Fax: +49 221 788707-97  
Email: [sales-support@renusol.com](mailto:sales-support@renusol.com)

Application technicians  
Telephone: +49 221 788707-29  
Fax: +49 221 788707-98  
Email: [technical-support@renusol.com](mailto:technical-support@renusol.com)

DE | Abbildungen und Texte entsprechen dem aktuellen technischen Stand bei Drucklegung, Änderungen vorbehalten.

GB | The images and texts in these instructions relate to the latest technology at the time of printing, subject to modifications.

FR | Les illustrations et textes sont conformes à l'état de la technique au moment de mise sous presse. Sous toutes réserves de modifications.

IT | Figure e testi corrispondono allo stato più attuale della tecnica al momento dell'ordine di stampa. Con riserva di modifiche.

ES | Las imágenes y los textos se corresponden al estado actual de la técnica en el momento de la impresión, reservado el derecho a las modificaciones.

PT | As imagens e os textos nestas instruções relacionam-se à última tecnologia no momento da impressão, sujeita a modificações.