UNISTAR
SOLAR RACK SYSTEM

SOLAR PANEL RACKING SYSTEM

Standard: TCVN 6781.2-2017/ IEC 61215.2-2016

FOR SLOPING ROOF

Catalog 2020
Version 2.0

a product of NSCA
MADE IN VIETNAM

STAR ASIA JSC.

Star Asia JSC. (NSCA) is a 15-year experience manufacurer in sheet metal fabrication. The company possesses two factories of 10.000 m^2 located at Hanoi with modern machinery and skillful workforce. "Made in Vietnam" products of Star Asia have been applied and running in hundred major projects in Vietnam and exporting to other market such as The United State, Japan, The Philippines...

Nowadays, Star Asia is improving its facilities to produce better and better products for high performance projects. StarAsia's products are highly appreciated by customers over the country.

Unistar channel is one product of Star Asia and the main material for solar racking system. Also, it is applied in many other supporting structures. Practically, Unistar channel is used as major material for metal walkways on sloping roofs in order to facilitate moving materials, installing solar panel, maintaining and reparing solar systems on those large roofs.

Production process and quality control procedures of Star Asia is complying with the ISO 9001-2015 standard. Solar racking system for slope metal roof (Unistar Solarack) is designed and produced in accordance with the national standard TCVN 6781-2017/IEC 61215-2016.

As a domestic manufactuer, Star Asia is able to satisfy versatilely requirements from local projects, to minimize risks, to save time and to accelerate the progress for projects.

NSCA
MADE IN VIETNAM
ISO
9001:2015

INTRODUCTION

Unistar Solarack System

Unistar Solarack system is developed by Star Asia Jsc. for solar Photovolaic (PV) projects - a trend of sustainable energy that is growing fast in Vietnam. The use of the system is similar to any supporting structure made of metal channels.

- **The production process:** UNISTAR Solarack system is made of high performance extruded aluminum A6061-T6 or metal sheet from Japan and fabricated on full automatic line. Components and brackets of the system are designed, fabricated and tested in accordance with national and international standards and actual application requirements.
- **The materials :** Star Asia Jsc. uses two main material, extruded aluminum profiles grade 6061-T6 and ZAM®, a 3-component alloy coated iron sheet (Zn-Al-Mg) of Nippon Steel Nisshin (Japan). The outstanding characteristic of ZAM® is high anti-corrosion (norminal life-span up to 46 years), this allowed using ZAM® as high performance alternative for aluminum alloy or post hot-dip galvanized channel in solar rack systems. Clamps, brackets of the system are made of extruded aluminum A6061 T6, and fasteners are made of stainless steel.
- **The standards:** in researching, designing, fabricating and testing Star Asia often refers and follows national and international standards such as TCVN 6781-2:2017/IEC 61215-2:2016, AS/NSZ 1170.2, JIS C 8955:2011, ASTM.
- **The uses:** oustanding characteristics of UNISTAR racking system come from the ZAM material. The system has been rationalized to minimized risk in transport and installation and dismantle.
- **The effectiveness:** UNISTAR racking system meets many high-class standards and surpasses other products such as aluminum or zinc-coated channels. UNISTAR racking system is a perfect choice for who care for a reasonable price but long-term solution.

Unistar Solarack meets and is tested in accordance with the TCVN 6781.2-2017/ IEC 61215.2-2016 standard by Vietnam Institute for Building Science and Technology - MINISTRY OF CONSTRUCTION

Quality Control system

Design and test standard

Referred design and test standard

Referred materials standard

Testing unit

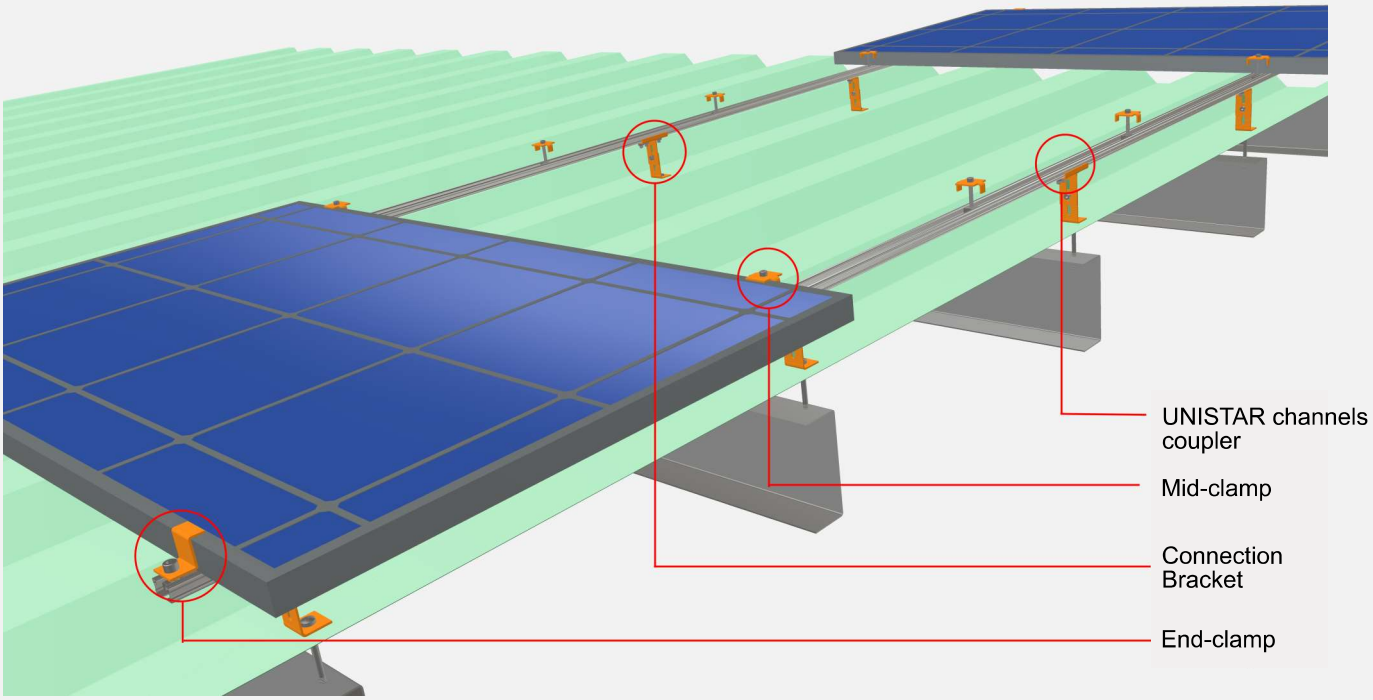
Testing lab.

Testing lab.

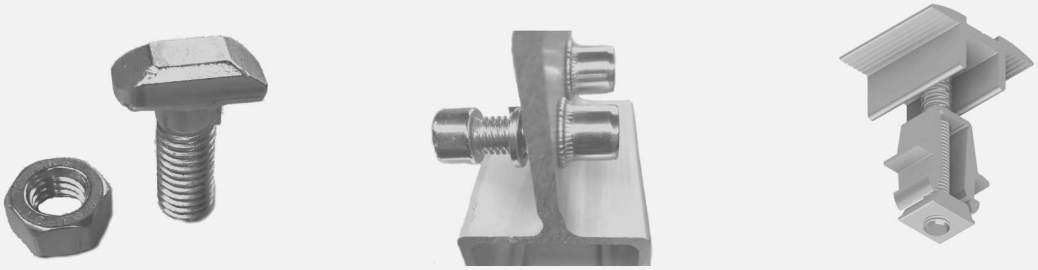
CONSTRUCTION

Unistar Solarack for sloping metal roof

Unistar Solarack is constructed by one of two optional rails - aluminum or steel (U-ALU or U-ZAM system). Both these systems are fabricated and adapted to fit many types of metal sloping roof (corrugated and 'kliplock" iron sheet) by extruded aluminum A6061-T6 clamps and brackets and stainless steel fasteners. Unistar Solarack is very handy for transport, installation and taking to piece.



UNISTAR joining device

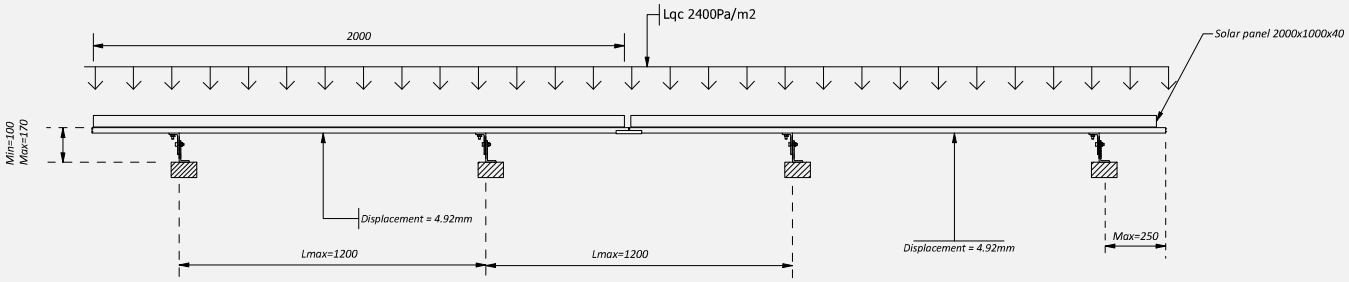


① ② ③

- The frame channels is designed and produced with special details on fully automatic line at Star Asia's factory. The side stiffening ridge and the edge grove of the channel make it much stronger.
- The channel grooves make it grips tightly with the 'spring-nut' and bolt and set conntection points flexibly and firmly as well as ease assemblying and loosing parts.
- Set of clamps and brackets made of aluminum A 6061 T6 and stainless steel, such as (1), (2) and (3) above are designed in accordance with national standards make installation easier and faster.
- Both systems U-ZAM and U-ALU using the same brackets system, those designed and produced exlusively.

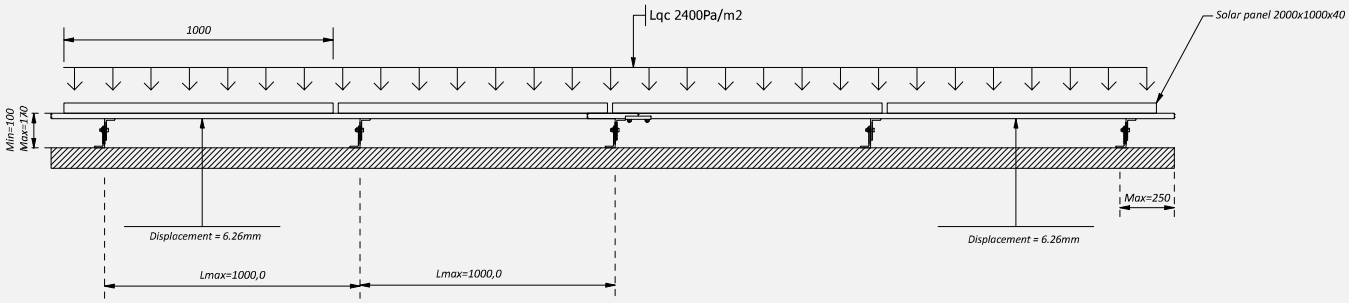
LOADING ARRANGEMENT

Vertical arrangement of PV panels



- Distance between 2 channels: 800 mm
- Distance btw. 2 roof connection brackets: max. 1200 mm
- Designed load: 1600 Pa (160 kg/m2)
- Actual testing load: 2400 Pa (240kg/m2)
- Displacement: 4.92mm
- Von Mises: max. 212.7 Mpa
- Compression strain: 2.48
- Safety factor: 1.5

Horizontal arrangement of PV panels

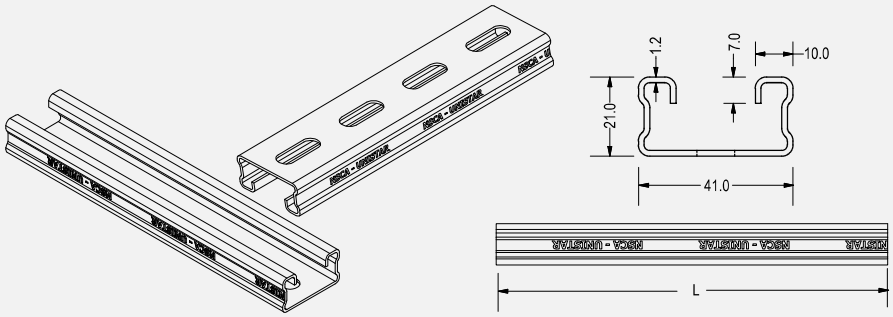


- Distance between 2 channels: 1400 mm
- Distance btw. 2 roof connection brackets: max. 1000 mm
- Designed load: 1600 Pa (160 kg/m2)
- Actual testing load: 2400 Pa (240kg/m2)
- Displacement: 4.92mm
- Von Mises: max. 241.8 Mpa
- Compression strain: 3.18
- Safety factor: 1.5

Test standard : TCVN 6781.2-2017/ IEC 61215.2-2016

UNISTAR RAIL SYSTEM

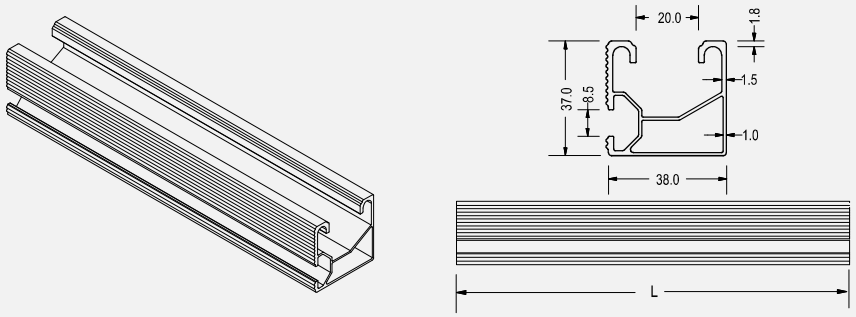
1. U-ZAM channel



Steel channel SZ 4121

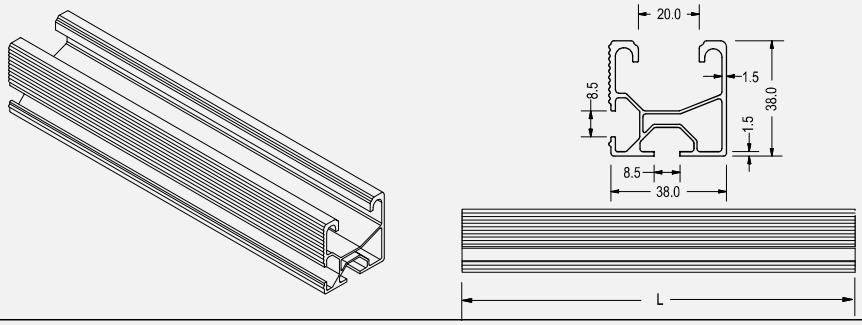
- Material: ZAM K27 metal sheet
- Thickness 1.2mm
- Size: 41 x 21 (mm)
- Slot: 10mm x 30mm
- Slot center dist. : 50mm
- Channel length: 3m & 6m
- Section area: 104 mm²
- **Mass: 0.88kg/m**

2. U-Aluminum channel



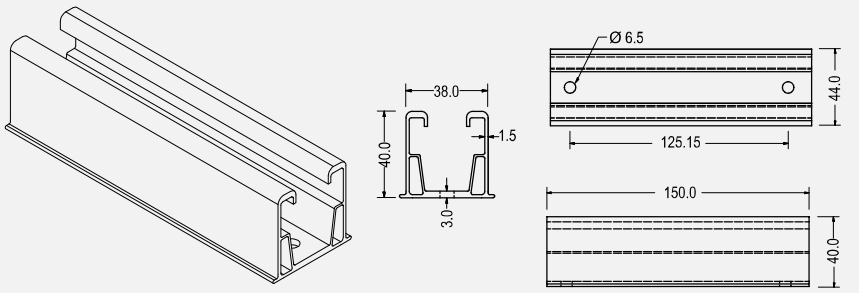
Aluminum channel SN01

- Material: Extruded aluminum A6061-T6
- Thickness 1.0 - 1.8 (mm)
- Size: 38 x 37 (mm)
- PV mounting groove: 20 mm
- Roof mounting groove : 8.5mm
- Channel length: 2.2; 3.2 & 4.2 (m)
- **Mass: 0.65kg/m**



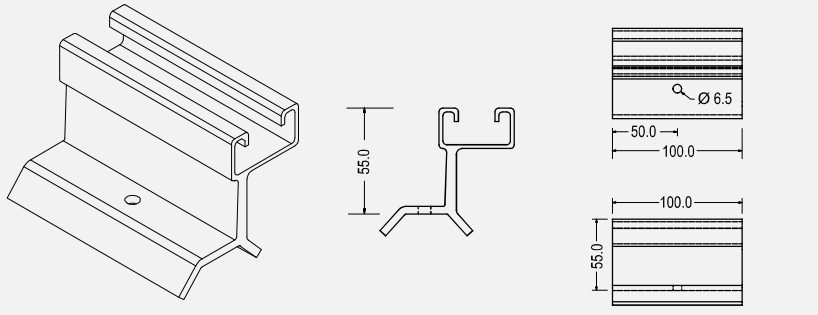
Aluminum channel SN02

- Material: Extruded aluminum A6061-T6
- Thickness 1.5 - 1.8 (mm)
- Size: 38 x 38 (mm)
- PV mounting groove: 20 mm
- Roof mounting groove : 8.5mm
- Channel length: 2.2; 3.2 & 4.2 (m)
- **Mass: 0.79kg/m**



Aluminum "Minirail" SM01

- Material: Extruded aluminum A6061-T6
- Thickness 1.5 - 3.0 (mm)
- Size: 38 x 40 (mm)
- PV mounting groove: 20 mm
- Hole for mounting screw: ø6.5 mm
- Dist. between 2 holes: 125 mm
- Channel length: 150mm



Aluminum "Minirail" SM02

- Material: Extruded aluminum A6061-T6
- Thickness 1.5 - 3.0 (mm)
- Size: 21 x 55 (mm)
- PV mounting groove: 20 mm
- Hole for mounting screw: ø6.5 mm
- Channel length: 100mm

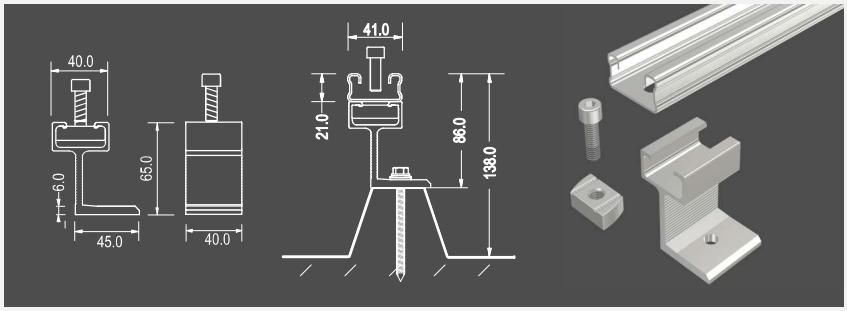
BRACKETS FOR INDUSTRIAL METAL SHEET ROOF

1. Installation for U-ZAM systems

NORMAL PROFILE

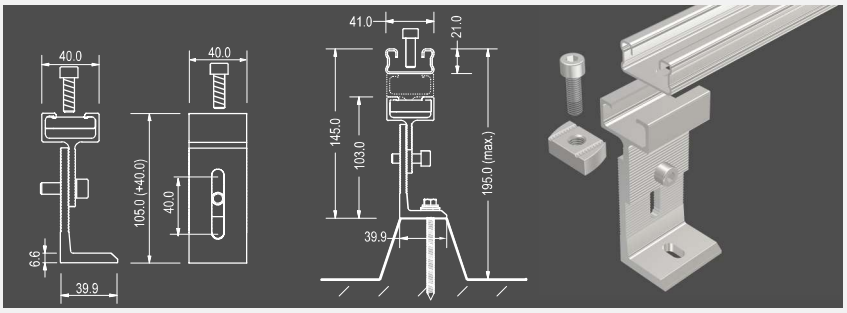
Fixed bracket for U-ZAM channel on normal profile sheet roof (L40)

- Bracket (L foot) made of extruded aluminum A6061 T6, hardness 95HV, thickness 6mm.
- Fastener: connection L foot and roof by 'spring-nut' and inox self-drilling screws.



Adjustable bracket for U-ZAM channel on normal profile sheet roof (L40)

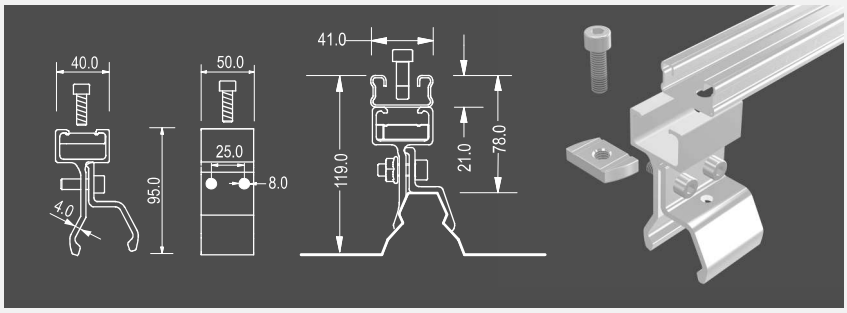
- Two-part (L foot + T foot) bracket made of extruded aluminum A061 T6, hardness 95HV, thickness 6mm
- Fastener: connection 2 parts of the bracket and roof by spring-nut, inox bolt & nut (ISO 4762) and self-drilling screws.



"KLIPLOCK" PROFILE

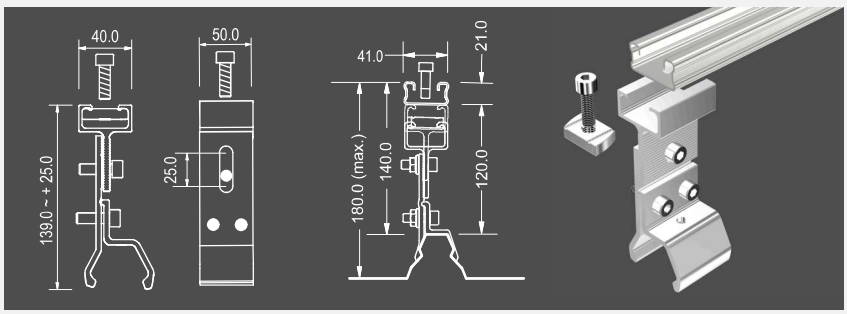
Fixed clamp bracket for U-ZAM channel on 'kliplock' sheet roof (K50)

- Two-part (clamp+T foot) bracket made of extruded aluminum A6061 T6, hardness 95HV
- Fastener: grip parts by spring-nut, inox bolts & nuts.



Adjustable clamp bracket for U-ZAM channel on 'kliplock' roof (K50)

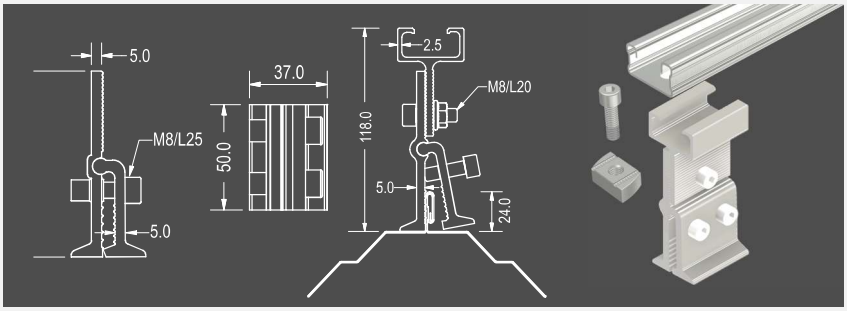
- Two-part (adjustable clamp+T foot) bracket made of extruded aluminum A6061 T6, hardness 95HV
- Fastener: grip parts by spring-nut, inox bolts & nuts and self-drilling screws.



"SEAMLOCK" PROFILE

Adjustable clamp bracket for U-ZAM channel on 'seamlock' roof (K50)

- Three-part adjustable clamp bracket made of extruded aluminum A6061 T6, hardness 95HV
- Fastener: grip parts by spring-nut, inox bolts & nuts and self-drilling screws.



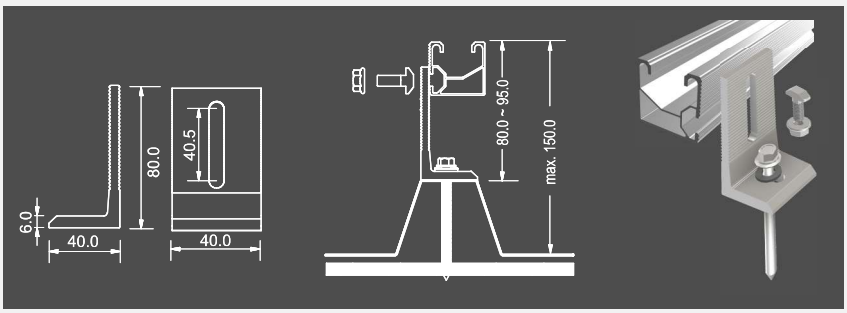
BRACKETS FOR INDUSTRIAL METAL SHEET ROOF

2. Installation for U-Aluminum systems

NORMAL PROFILE

Adjustable bracket for channel on normal profile sheet roof (L40)

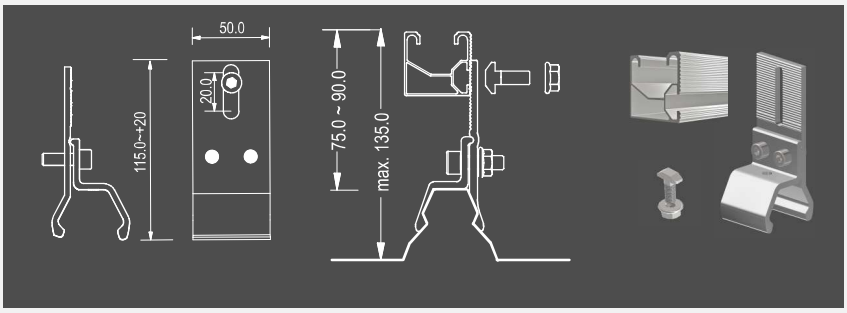
- Bracket (L foot) made of extruded aluminum A6061 T6, hardness 95HV, thickness 6mm.
- Fastener: connection L foot and roof by inox bolt & nuts and self-drilling screws.



"KLIPLOCK" PROFILE

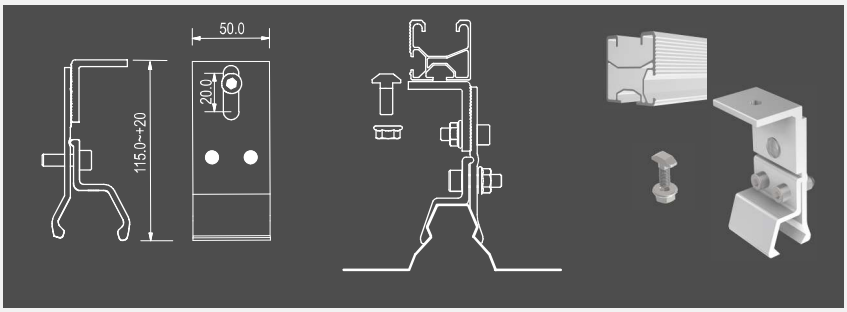
Adjustable bracket for U-Aluminum channel on "kliplock" profile sheet roof (vertical mount) (K50)

- Two-part bracket made of extruded aluminum A061 T6, hardness 95HV
- Fastener: connection 2 parts of the bracket and roof by inox bolt & nut (ISO 4762).



Adjustable bracket for U-Aluminum channel on "kliplock" profile sheet roof (transverse mount) (K50)

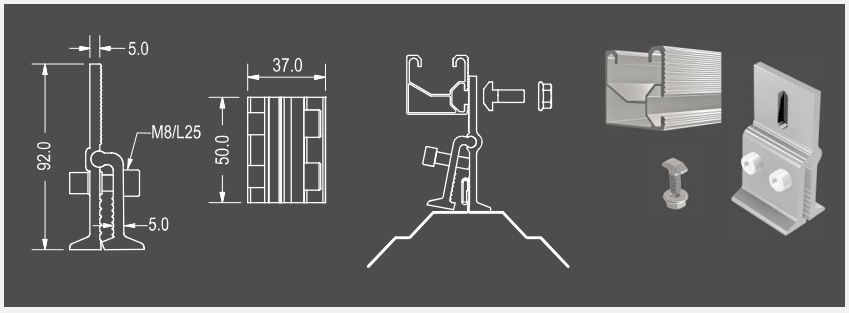
- Two-part bracket made of extruded aluminum A061 T6, hardness 95HV
- Fastener: connection 2 parts of the bracket and roof by inox bolt & nut (ISO 4762).



"SEAMLOCK" PROFILE

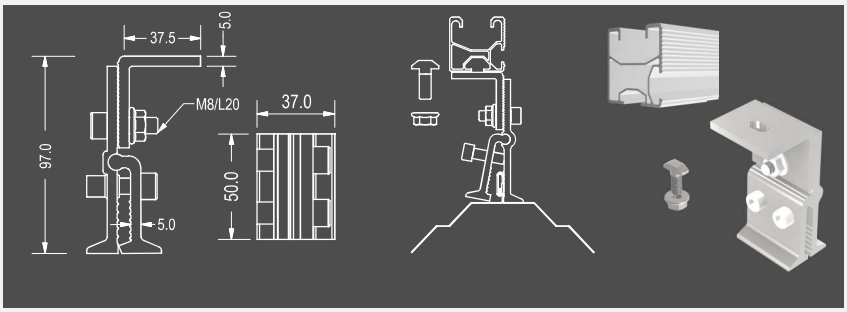
Adjustable bracket for U-Aluminum channel on "seamlock" profile sheet roof (vertical mount) (S50)

- Two-part bracket made of extruded aluminum A061 T6, hardness 95HV
- Fastener: connection 2 parts of the bracket and roof by inox bolt & nut (ISO 4762).



Adjustable bracket for U-Aluminum channel on "seamlock" profile sheet roof (transverse mount) (S50)

- Two-part bracket made of extruded aluminum A061 T6, hardness 95HV
- Fastener: connection 2 parts of the bracket and roof by inox bolt & nut (ISO 4762).

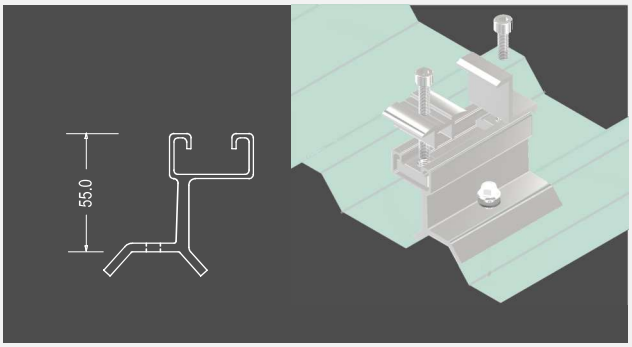


BRACKET FOR SMALL ROOFS

1. Installation with "minirail"

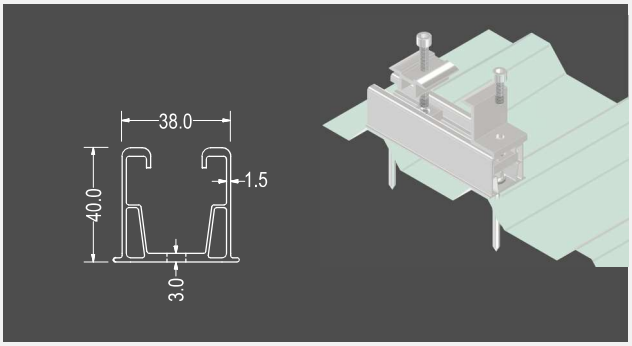
MINIRAIL SM01

- SM01 is the solution for vertical mount of PV
- The rail is made of extruded aluminum profile A6061 T6, hardness 95 HV
- Fastener: inox bolts & nuts and self drilling screws



MINIRAIL SM02

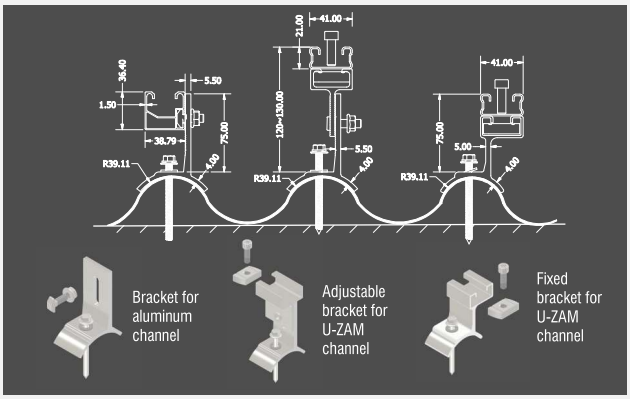
- SM02 is the solution for transverse mount of PV
- The rail is made of extruded aluminum profile A6061 T6, hardness 95 HV
- Fastener: inox bolts & nuts and self drilling screws



2. Installation with bracket

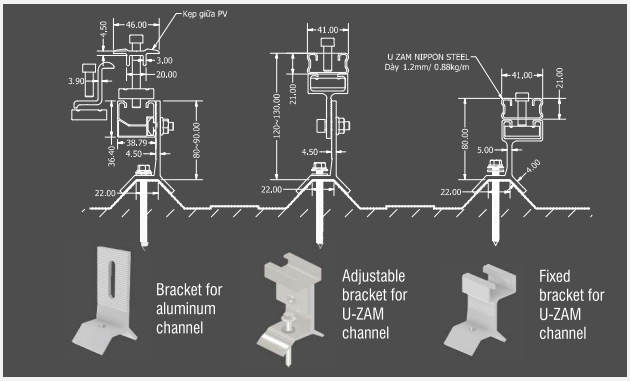
INSTALLATION ON ROUND CORRUGATED ROOF (C16)

- C16 is the solution for mounting PV rail on round corrugated sheet roof.
- The brackets are made of extruded aluminum profile A6061 T6, hardness 95 HV
- Fastener: inox bolts & nuts and self drilling screws



INSTALLATION ONTRAPEZOID PROFILE ROOF (V22)

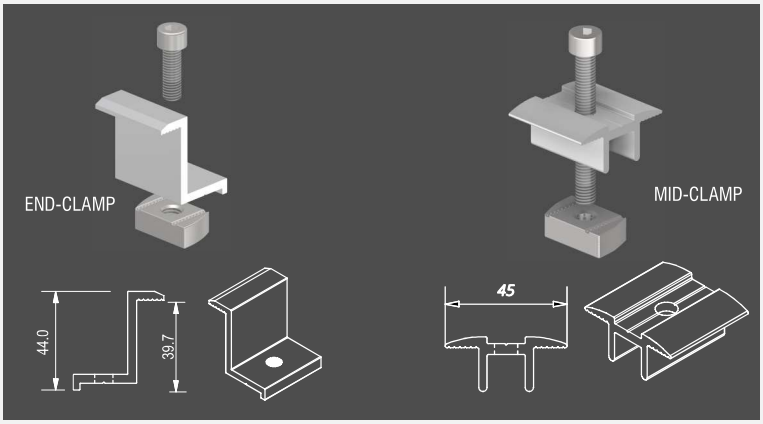
- V22 is the solution for mounting PV rail on trapezoid profile sheet roof.
- The brackets are made of extruded aluminum profile A6061 T6, hardness 95 HV
- Fastener: inox bolts & nuts and self drilling screws



CLAMPS & COUPLERS

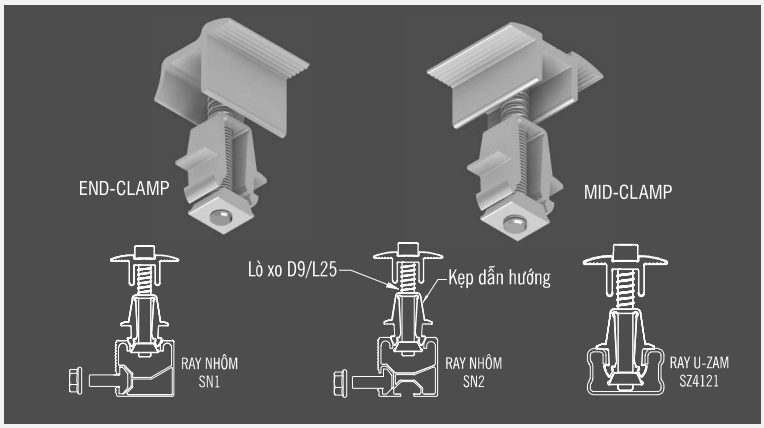
End-clamp and mid-clamp

- Use: to position and fix PV channel.
- These clamps are made of extruded aluminum A6061-T6, thickness 4.0mm.
- These adjustable clamps to exactly position and tighten PV channel by 'spring-nut'.



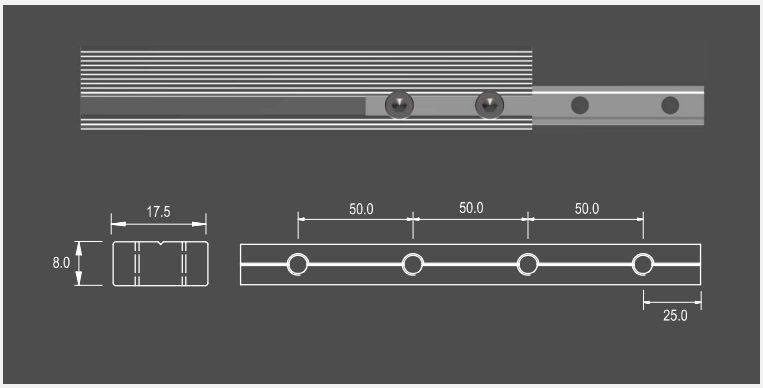
Quick End-clamp and mid-clamp

- Use: to position and fix PV channel.
- These clamps are made of extruded aluminum A6061-T6, thickness 4.0mm.
- These clamps is to fast position and tighten PV channel to rails.



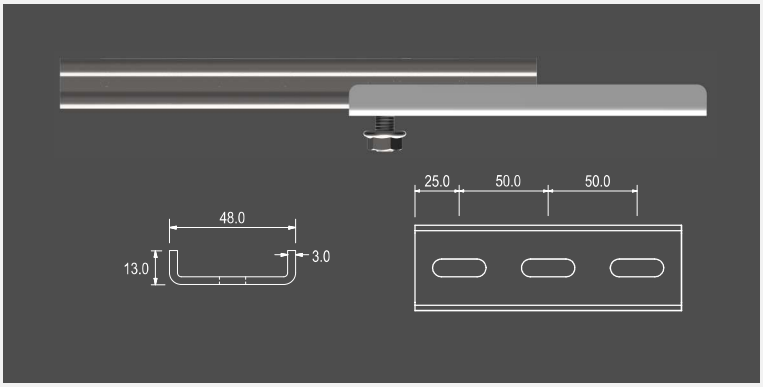
U-Aluminum channel connector (ASP)

- Use: to connect two aluminum channels.
- This connector is made of extruded aluminum A6061-T6.
- Position and tighten by inox bolts.



U-ZAM channel coupler (ZSP)

- Use: to connect two ZAM channels.
- This coupler is made of ZAM K27, 3mm.
- Position and tighten by bolt & nuts.

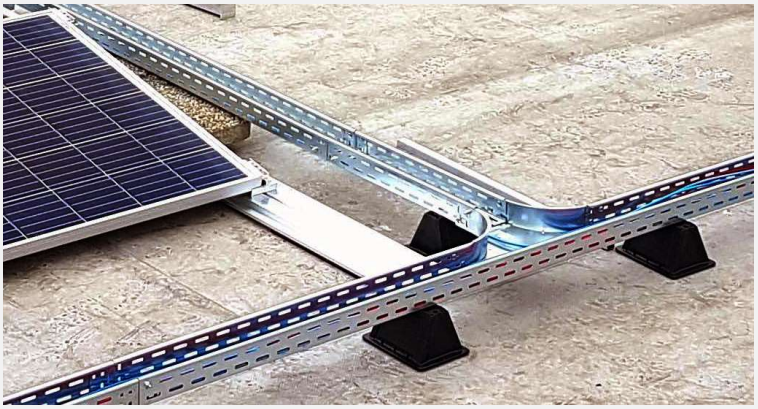


CABLE TRAY: TCVN 10688-2015/IEC 61537-2006

Cable tray & trunking

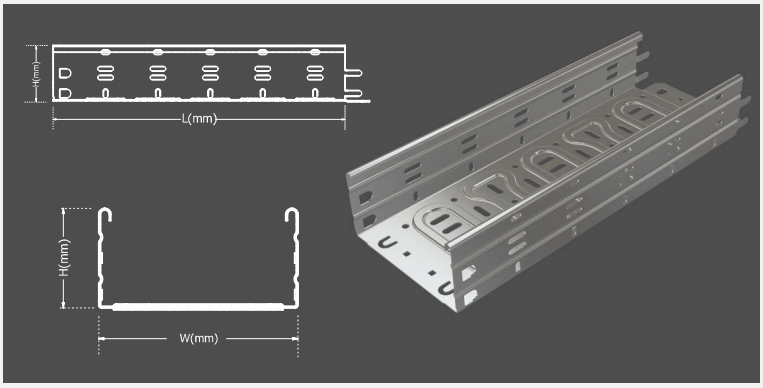
These are additonal components of PV systems. Star Asia Jsc is a cable tray and trunking manufacturer and supplying many projects with various cable management systems.

For PV projects light duty trays and trunkings is applicable. Under Starduct brand, Star Asia's trays and trungkings is in accordance with IEC 61537:2006 standard.



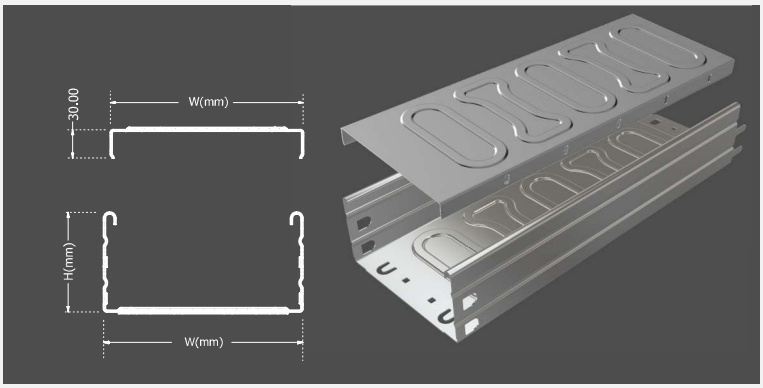
Slotted tray

- Material: ZAM/Galvanized sheet, thickness 0.8mm
- Dimension:
  H = 50 - 200mm
  W = 100 - 600mm
  L = 3000mm
- Finish: ZAM (std.)/galvanizing/ powder coating



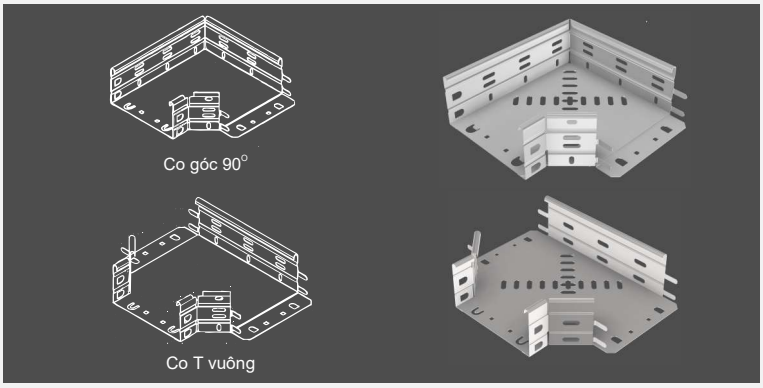
Trunking

- Material: ZAM/Galvanized sheet, thickness 0.8mm
- Dimension:
  H = 50 - 200mm
  W = 100 - 600mm
  L = 3000mm
- Finish: ZAM (std.)/galvanizing/ powder coating (opt.)
- Cover (opt.)



Fittings

- Starduct fittings are full avalable such as elbows 90, 45, 30, Tee, etc.
- Material: ZAM/galvanising 0.8mm,
- Dimension: depending actual app.
- Finish: ZAM(std)/galvanizing/powder coating (opt.)

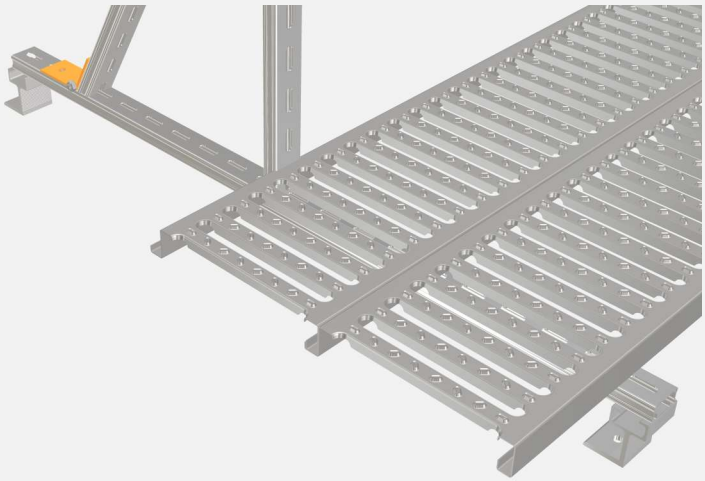


MODULE OF STEEL WALKWAY

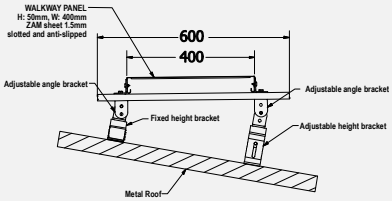
Pre-fabricated MODULE

Unistar walkway for Photovoltaic (PV) system is constructed from prefabricated modules. This makes transport, installation, maintenance and repair PV panels on sloping roofs easier and faster. Also it makes the use more flexible.

Unistar walkway has long life-span to keep safe for service staff and equipments during their woking for many years.



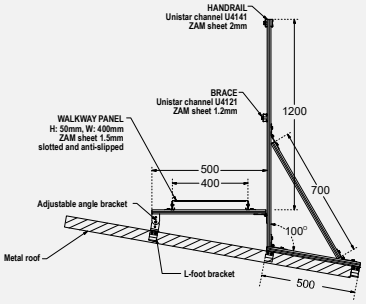
Construction detail



STANDARD MODULE (SWS)

Use: walkways inside slopping metal roofs.

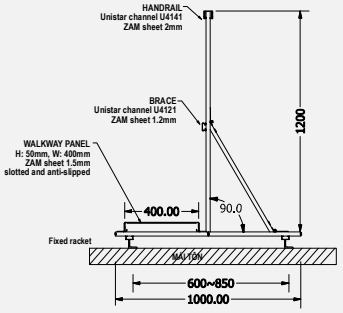
Additonal parts (opt.): bracket for corrugated or 'kliplock', "seamlock' sheets.



STANDARD MODULE (SWR)

Use: walkways on edge slopping metal roofs with handrail

Additonal parts (opt.): bracket for corrugated or 'kliplock', "seamlock' sheets.



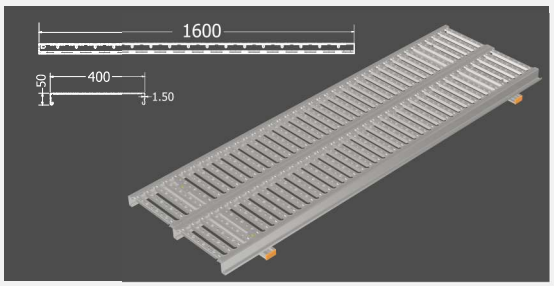
STANDARD MODULE (SWF)

Use: walkways on edge slopping metal roofs with handrail

Additonal parts (opt.): bracket for corrugated or 'kliplock', "seamlock' sheets.

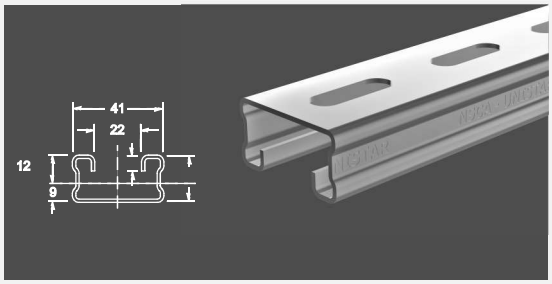
Walkway Panel

- Structure: 400 x 1600mm metal sheet with stiff ridge, slotted for stronger, lighter, anti-slip and drainage .
- Material : ZAM K27 steel sheet 1.5 mm



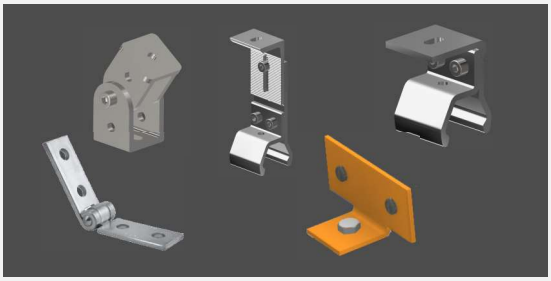
Walkway frame & handrail

- Structure: Unistar ZAM U4121 and U4141 channels
- Material: ZAM K27 1.5mm/2.0mm
- Joining: stainless steel/galvanized nuts & bolts + 'spring-nut' + brackets.



Brackets

- There is available many pre-fabricated brackets of Star Asia for adapting the walkway in many cases of installation or types of roof.

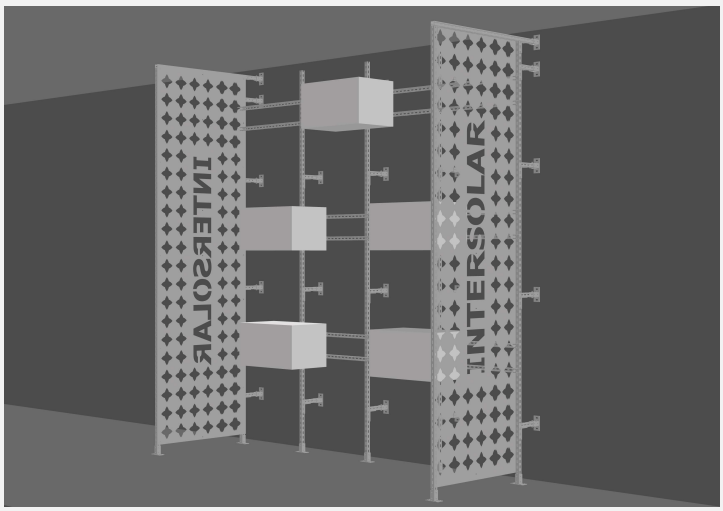


MODULE INVERTER RACK

Pre-fabricated MODULE

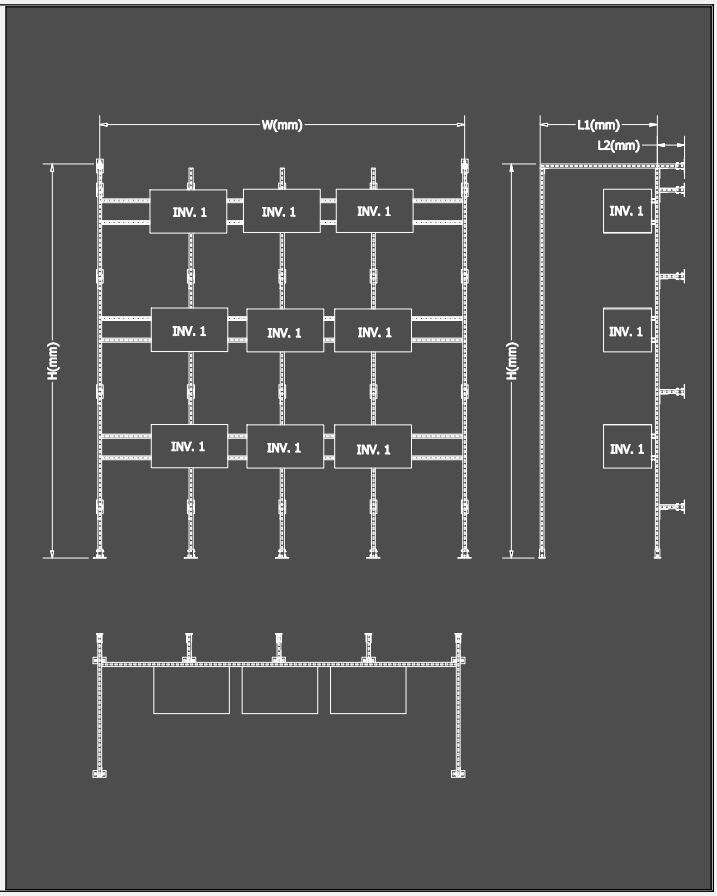
Unistar inverter rack is made from prefabricated modules. This makes the use more flexible.

Unistar inverter rack has long life-span to keep safe for service staff and equipments during their woking for many years.



Standard module

- Width: W (opt.)
- Height: H (opt)
- Depth: L (opt.)
- Wall distance: L2 (opt.)
- Material: U-channel SZ 4141 made from ZAM K27, thickness 2.0mm
- Bracket (opt): 5mm steel plate



MODULE CAT-LADDER

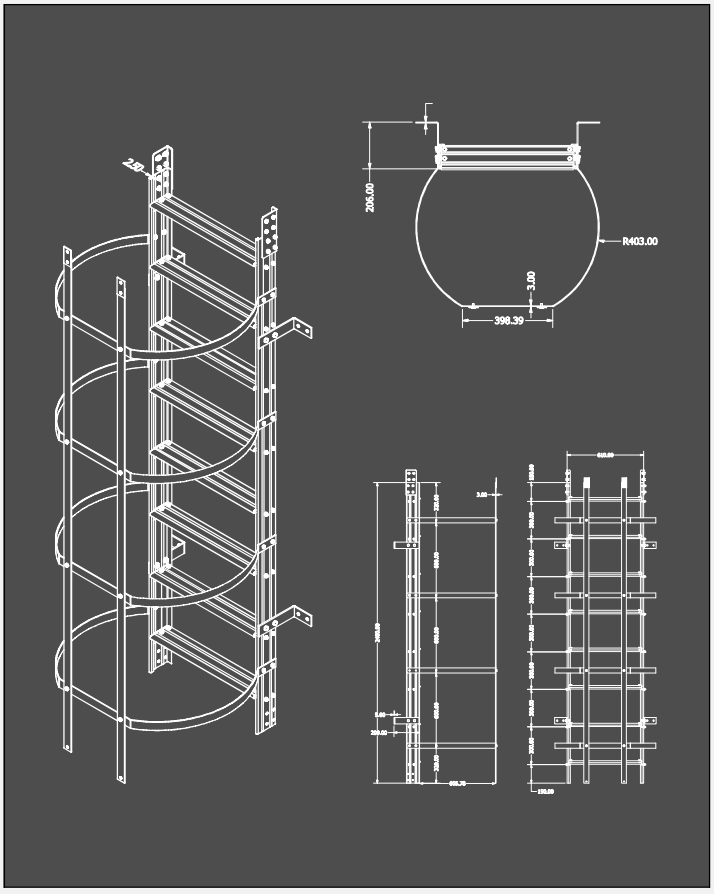
Pre-fabricated MODULE

Unistar cat-ladder is made from prefabricated modules. This makes transport, installation, maintenance and repair PV panels on sloping roofs easier and faster. Also it makes the use more flexible.

Unistar cat-ladder has long life-span to keep safe for service staff and equipments during their woking for many years.

Standard module

- Length: 2.4m
- Width: 600mm
- Rung step: 300mm
- Safety frame: D = 600mm
- Fasteners: bolt M10
- Material: ZAM K27, thickness 2.5mm
- Bracket (opt): 5mm steel plate



COMPARISON
UNISTAR SOLARACK MATERIALS
VS.
TRADITIONAL MATERIALS

ZAM® K27 SHEET
unique material
of UNISTAR Solar Racking system

POWERED BY ZAM®

TECHNICAL COMPARISON

Comparison between Unistar material and others

1. ZAM® sheet

ZAM® is a brand of NIPPON STEEL NISSHIN (Japan) - the enterprise launched it first to the world market in 2000.

Brand ZAM® has been registered as trade mark of NIPPON STEEL NISSHIN.

Life-span comparison: ZAM K27 vs post-fabricated hot-dip gavalnized products

Material	THICKNESS OF COAT (gr/m2/2-side)	WEATHERING SPEED (gr/m2/year)	LIFE-SPAN OF COAT (year)
ZAM K27 coated steel sheet	**270**	**3**	**45(*)**
Post fabricated galvanized product	550	11	25 (*)

(*) ESTIMATION BASED ON SALT SPRAY TEST. Life-span is reduced by 50% at coastal and offshore areas.

2. Aluminum A 6061-T6

A6061-T6 aluminum alloy is a high performance material. A6061-T6 has higher physical properties than the 2 other popular alluminum alloys - A6005-T5 & A6063-T5.

A6063-T6 is often applied for components need tougher and stronger characteristics.

Physical properties comparison: A6061-T6 vs. A6005S-T5 & A6063S-T5

Material	Tensile strength (MPa)	Compression strength (MPa)	Hardness (HV)	Elongation (%)	Anode film thickness (μm)
A6061S-T6	**≥ 265**	**≥ 245**	**≥ 95**	**8**	**8 - 25**
A6005S-T5	≥ 250	≥ 200	≥ 85	8	8 - 25
A6063S-T5	≥ 165	≥ 110	≥ 58	8	8 - 25

WHY ZAM?

The decision to apply ZAM as prior material in solar racking system of Star Asia is not random but rational. It take us a long period of time to make this decision.

After getting basic knowledge, we had done many concerning works such as making sample, testing, consulting from domestic and foreign experts, choosing grade of ZAM material, etc. Our final purpose is to create most suitable products for Vietnamese environment.

Thanks to long time and close relationship with Nippon Steel Nisshin and its partners in Vietnam, Star Asia self-reliantly applies ZAM in our products. In fact, Star Asia have lot experience in producing and utilization ZAM for many products.

Star Asia Jsc. is highly appreciated by Nippon Steel Nisshin and its partners in Vietnam, they are ready to support us in technical issue and to share experience in application ZAM for many industries.

Major reason for Star Asia's research and application of ZAM for solar racking systems coming from a trust that it could bring better benefits for both ouselves and customers in comparison with other domestic and imported products.

POWERED BY ZAM®

ZAM®: basic info.

Unistar Solaracks and its supporting devices are priorly made of special material - ZAM® coating steel sheet from NIPPON STEEL Nisshin (Japan). Thank to this material Unistar Solarack has outstanding characteristics in comparison with normal aluminum alloy or zinc-coated channels.

The most outstanding characteristic of ZAM products is corrosion resistance. Depending on the material grades, working conditions and environments, the life-span of ZAM rack would be up to 45 years.

ZAM® is getting a standard for solar racking system in Japan and some countries. The product has been applied wider and wider from industrial to coastal areas.

K27 is recommeded grade of ZAM® in Vietnam, K27 has been priorly suggested for channels of Unistar Solarack as this would be able to create a high effectiveness solution in term of technique (high performance) and investment (good price).

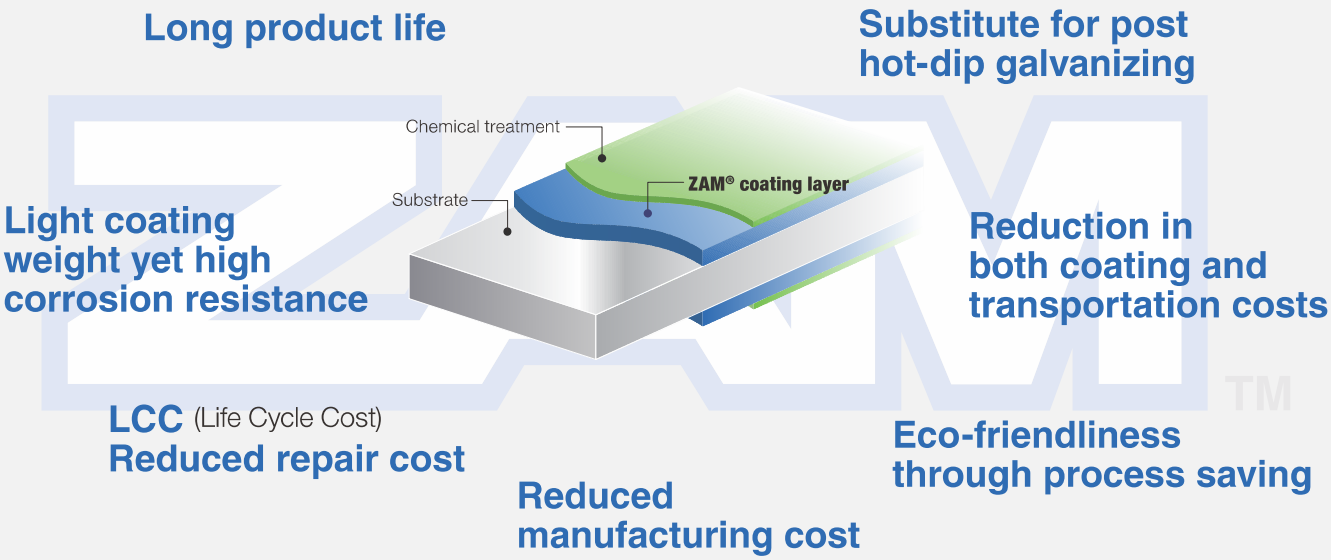
WHAT IS ZAM®?

ZAM is highly corrosion-resistant hot-dip Zinc-Aluminum-Magnesium alloy coate steel sheet that NIPPON STEEL has succeeded in launching on the market for the first time in the world.

Due to the effects of magnesium and aluminum, ZAM has excellent corrosion resistance, scratch resistance as well as formability and can be applied in a wide range of fields.

NIPPON STEEL has provided not only steel products but also various solutions for our customers.

Nippon Steel aim to create new market opportunities along with supply high value-added products, which we have developed with advancing technologies based on worldwide reseach and development.



■ A new hot dip coated steel sheet that has a coating layer of zinc, 6% aluminum, and 3% magnesium.

ZAM: anti-corrosion

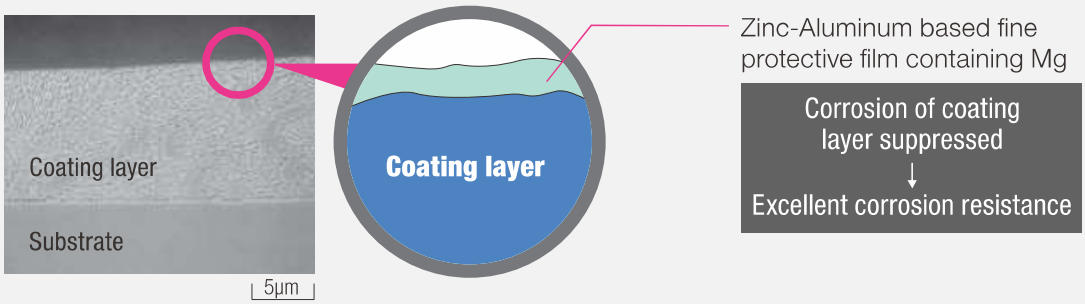
Corrosion resistance mechanism of ZAM

In terms of corrosion resistance, ZAM is 10 to 20 times better than hot-dip zinc-coated steel sheets(*) and 5 to 8 time better than hot-dip zinc-5%aluminum alloy coated steel sheets(*)

(*): Estimated by salt spray test

Mechanism of corrosion resistance on flat section

Al and Mg in the coating layer of ZAM® combine to form a fine, tighly adhered zinc-based protective film on its coating surface as time passes. This protective film suppresses corrosion of the ZAM coating

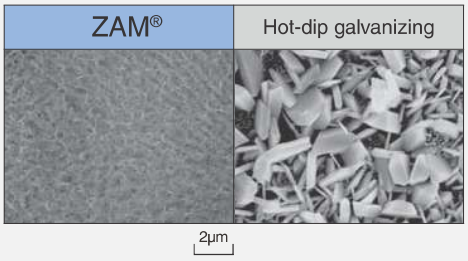


Galvanized coating layer also forms a protective film on the surface. This protective film, however, is not as fine as in ZAM, an less adhesive (see photo at right).

In contrast, the protective film formed on the coating surface of ZAM is excellent in both fineness and adhesion, and consequently it inhibits permeation of corrosion factors, presserving high corrosion resistance over a long period.

Protective film formed on the coating surface after salt spray test (4 hours)

(Thickness: 0.8 mm, coating weight: 90/90 g/m², untreated)

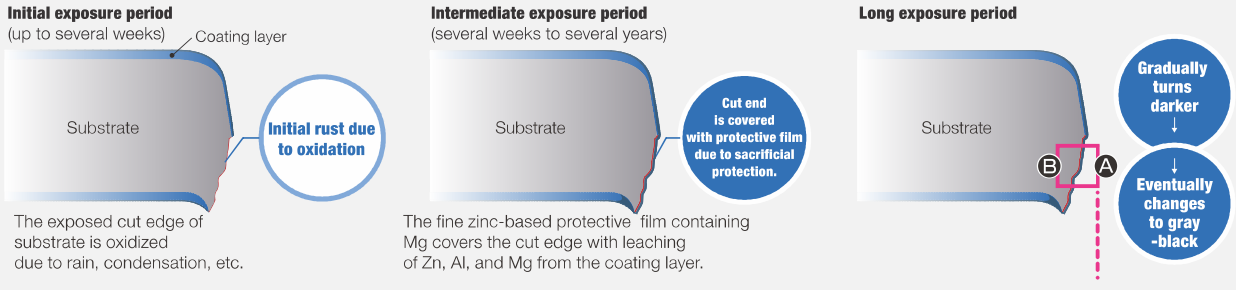


Mechanism of corrosion resistance on cut edge

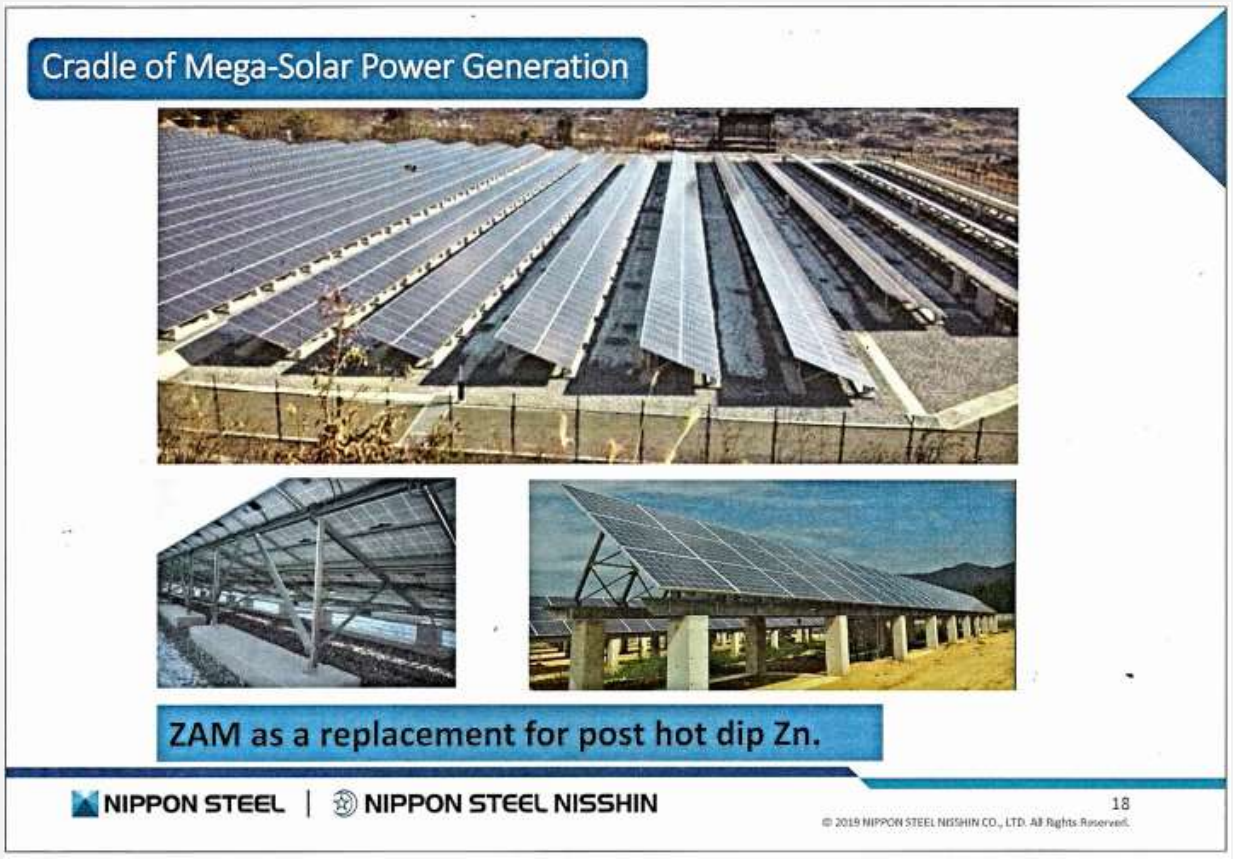
Excellent corrosion resistance is achieved on cut edge parts by covering the ends with a fine zinc-based protective film that contains Al and Mg leaching from the coating layer.

Thickness: 3.2mm, coating weight: 150/150g/m2, post-treatment: chomate 50mg/m2

(Note: the color and the speed of change in color depend on sheet thicknesses and exposure environments (region, installation location, aspects, etc.)



ZAM: actual application



ZAM: actual application

Usage on roof and roof terrace

Hokkaido : 2KW

Nagoya : 10KW

NIPPON STEEL | NIPPON STEEL NISSHIN

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PROJECT USING ZAM ®

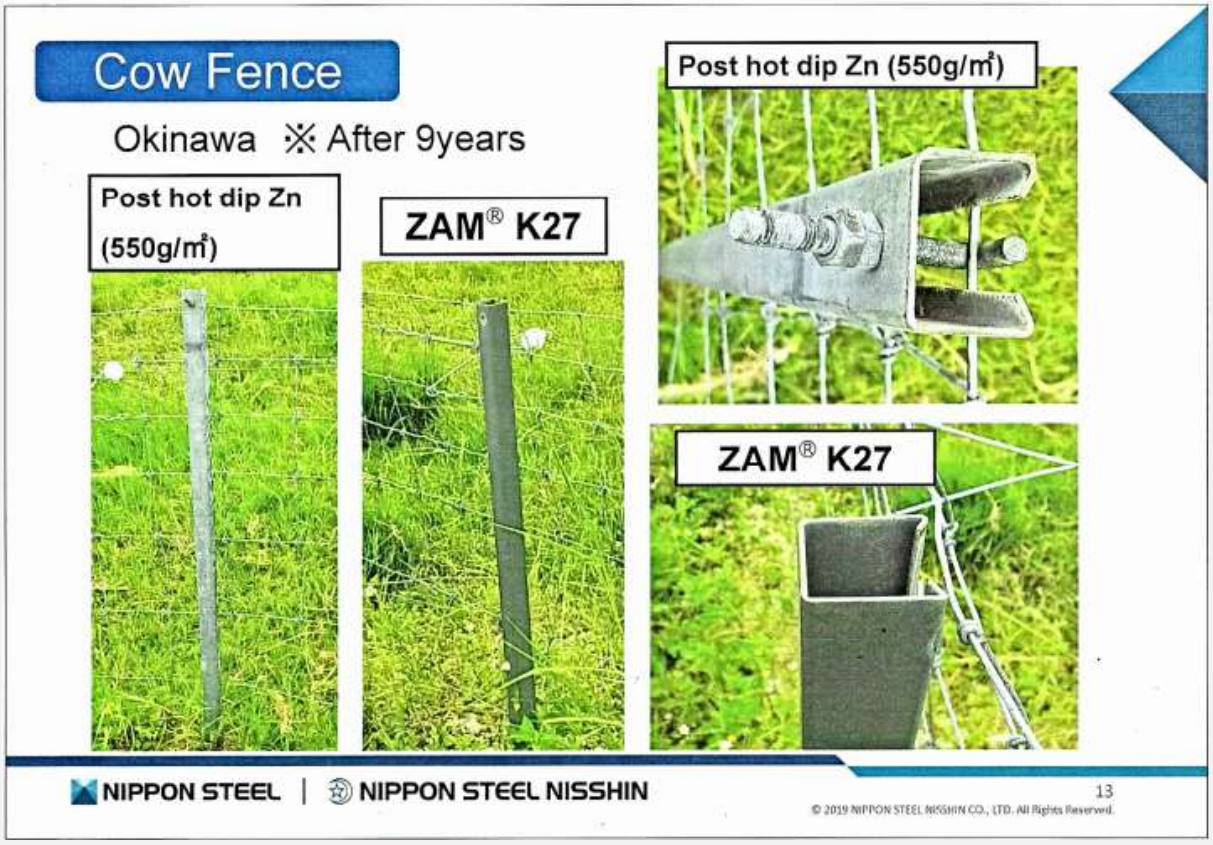
【Energy Absolute, ~Lam Pang, Thailand 126MW April 2014】

5,350ton MSM-HK540-DA K35 t=1.6 2.5mm,3.0mm

NIPPON STEEL | NIPPON STEEL NISSHIN

22

ZAM K27: Test at seaside area



CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh Phúc

BẢN CÔNG BỐ TIÊU CHUẨN CHẤT LƯỢNG

The Declaration of quality standard of product

* * *

Doanh nghiệp: **CÔNG TY CỔ PHẦN ĐẦU TƯ CÔNG NGHỆ NGÔI SAO CHÂU Á (NSCA)**
Manufacturer: ***STAR ASIA JSC. (NSCA)***
Địa chỉ/*Address*: Tầng 3, TTTM Interserco, 17 Phạm Hùng, Nam Từ Liêm, Hà Nội
Điện thoại/*Phone*: 0243 5147999 - Fax: 0243514 7992 - Email: nsca@nsca.vn
Nhà máy: **Nhà máy cơ khí STARDUCT**
Factory: ***STARDUCT Mechanical Factory***
Địa chỉ/*Address*: Lô C3-C4 Cụm Công nghiệp Thị trấn Phùng, Đan Phượng, Hà Nội

CÔNG BỐ
We hereby declare

Tiêu chuẩn số: **24S-SLR/2020**
Standard #: **24S-SLR/2020**
Phù hợp với : TCVN 6781-2017/IEC 61215-2016
***In compliance with*: TCVN 6781-2017/IEC 61215-2016**
Cho sản phẩm: **KHUNG GIÁ ĐỠ PIN NĂNG LƯỢNG MẶT TRỜI**
For the product: ***SOLAR RACKING SYSTEM***
Nhãn hiệu **: UNISTAR SOLARACK**
Brand: ***UNISTAR SOLARACK***
Hình thức công bố : **DOANH NGHIỆP TỰ CÔNG BỐ**
Form of declaration : **SELF DECLARATION**

Doanh nghiệp cam kết sản xuất kinh doanh sản phẩm theo đúng tiêu chuẩn công bố trên
We undertake our product corresponding to the above standard
Hanoi, 20/03/2020

Tổng giám đốc/*General Director*

CÔNG TY CỔ PHẦN NGÔI SAO CHÂU Á

ĐÀO HUY KHÁNH

NSCA
NGÔI SAO CHÂU Á
CÔNG TY CP ĐẦU TƯ CÔNG NGHỆ NGÔI SAO CHÂU Á
Lô C3-C4 Cụm CN thị trấn Phùng, Đan Phượng, Hà Nội
P. 02435147999 - W. nsca.vn - E. nsca@nsca.vn

TIÊU CHUẨN 24S-SLR/2020
CHO SẢN PHẨM HỆ GIÁ ĐỠ PIN MẶT TRỜI ÁP MÁI

THAM CHIẾU

- Tiêu chuẩn tham chiếu: **TCVN 6781-2017/IEC 61215-2016**
- Phương pháp thử nghiệm: **TCVN 6781-2017.2/IEC 61215-2016.2**

TẢI TRỌNG THIẾT KẾ VÀ TẢI TRỌNG THÍ NGHIỆM

- Tải trọng thiết kế: **160kg/m2 (thấp nhất)**
- Tải trọng thí nghiệm: **240 kg/m2 (thấp nhất)**
- Hệ số an toàn: **1.5**

VẬT LIỆU VÀ TUỔI THỌ

- Vật liệu : **(1) Tôn ZAM K27 của Nippon Steel Nissin, Nhật –** dùng cho các thanh U, miếng nối thanh U; **(2) Nhôm đùn A6061-T6** – dùng cho các thanh U nhôm, chân nối (L, T) và miếng kẹp biên, kẹp giữa tấm pin (Z, T); **(3) Inox** – dùng cho bu-lông theo yêu cầu

- Tuổi thọ chống ăn mòn: **25-45 năm** (tùy thuộc vùng/ đặc điểm khu vực lắp đặt – Theo chỉ dẫn của Nippon Steel Nissin Japan)

PHƯƠNG PHÁP GIA CÔNG

- Quy trình nguội trên dây chuyền tự động

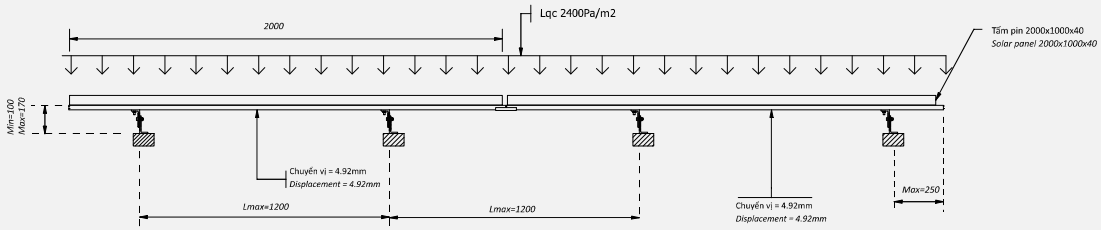
PHƯƠNG PHÁP LIÊN KẾT

- Kết nối bằng kẹp giữ, vít tự khoan, bu-lông, ê-cu và ê-cu “spring nut” (ISO 4762)

TẢI TRỌNG HOẠT ĐỘNG (theo TCVN 6781-2017.2/IEC 61215-2016.2)

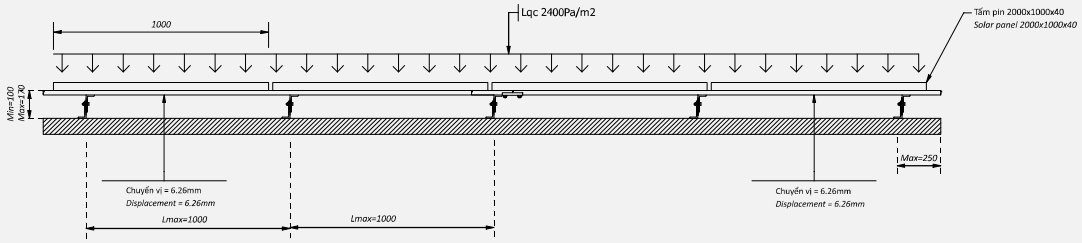
HỆ KHUNG GIÁ ÁP MÁI

BỐ TRÍ TẤM PIN THEO CHIỀU DỌC



- Khoảng cách giữa 2 thanh ray U: 800 mm
- Khoảng các giữa 2 chân nối mái: max. 1200 mm
- Tải trọng thiết kế: 1600 Pa (160 kg/m2)
- Tải thử nghiệm: 2400 Pa (240kg/m2)
- Chuyển vị: 4.92mm
- Hệ số Von Mises: max. 212.7 Mpa
- Biến dạng nén: 2.48
- Hệ số an toàn: 1.5

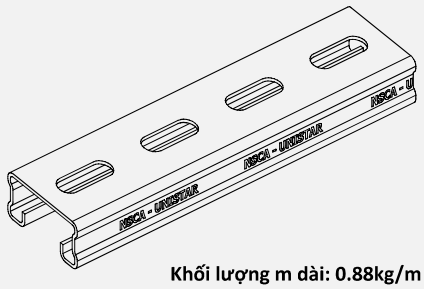
BỐ TRÍ TẤM PIN THEO CHIỀU NGANG

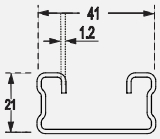


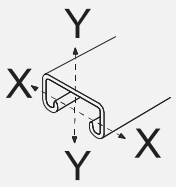
- Khoảng cách giữa 2 ray U: 1400 mm
- Khoảng cách giữa 2 chân nối mái: max. 1000 mm
- Tải trọng thiết kế: 1600 Pa (160 kg/m2)
- Tải trọng thử nghiệm: 2400 Pa (240kg/m2)
- Chuyển vị: 6.26mm
- Hệ số Von Mises: max. 241.8 Mpa
- Biến dạng nén: 3.18
- Hệ số an toàn: 1.5

THANH U-ZAM K27

THANH UNISTAR 4121







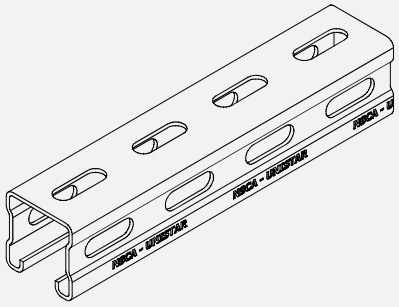
Khối lượng m dài: 0.88kg/m

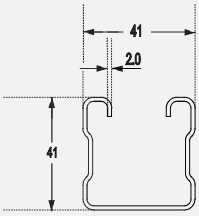
L(mm)	Fmax (kN) F f	fmax (mm)	F(kN)
250	3.43	0.49	14.40
500	1.72	1.96	10.11
750	1.14	4.42	6.40
1000	0.86	7.86	4.00
1250	0.69	12.30	2.82
1500	0.57	17.72	2.16
1750	0.49	24.10	6.47
2002	0.43	31.48	-
2250	0.38	39.83	-
2500	0.35	49.18	-
2750	0.31	59.52	-
3000	0.29	70.63	-

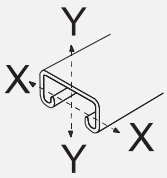
- Vật liệu: tôn ZAM K27- dày 1.2mm
- Tiêu chuẩn vật liệu: BS EN 10025
- Lỗ đột: 10mm x 30mm @ 50mm center
- Chiều dài thanh tiêu chuẩn: 3m & 6m
- Diện tích mặt cắt: 140 mm²

- Mô-men quán tính (chung)
  Ixx = 294,34 kgmm²
  Ixy = -459.00 kgmm²
  Ixz = 0.56 kgmm²
  Iyy = 292.80 kgmm²
  Iyz = 28.48 kgmm²
  Izz = 294,159.97 kgmm²
- Mô-men quán tính (trọng tâm)
  Ixx = 73,767.67 kgmm²
  Ixy = -0.003 kgmm²
  Ixz = 0.505 kgmm²
  Iyy = 291.84 kgmm²
  Iyz = 0.00 kgmm²
  Izz = 73,590.37 kgmm²

THANH UNISTAR 4141







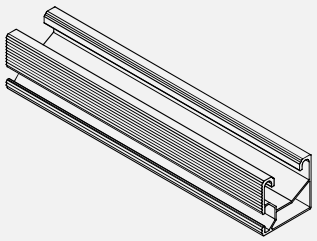
Khối lượng m dài: 1.51kg/m

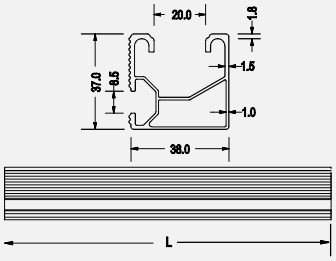
L(mm)	Fmax (kN) F f	fmax (mm)	F(kN)
250	11.08	0.19	34.67
500	6.00	0.82	28.02
750	4.00	1.84	20.89
1000	3.00	3.27	15.03
1250	2.40	5.11	11.09
1500	2.00	7.36	8.72
1750	1.72	10.03	7.18
2002	1.37	7.95	6.47
2250	1.34	16.56	5.23
2500	1.20	20.45	4.57
2750	1.09	24.75	4.03
3000	1.00	29.45	

- Vật liệu: tôn ZAM K27- dày: 2mm
- Tiêu chuẩn vật liệu: BS EN 10025
- Lỗ đột: 10 x 30 mm @ 50mm centers
- Chiều dài thanh tiêu chuẩn: 3m & 6m
- Diện tích mặt cắt: 236 mm²

- Mô men quán tính (chung)
  Ixx = 1489.67kgmm²
  Ixy = -16426.46kgmm²
  Ixz = -0.00kgmm²
  Iyy = 506838.92kgmm²
  Iyz = 0.00kgmm²
  Izz = 507516.71 kgmm²
- Mô men quán tính (trọng tâm)
  Ixx = 778.42kgmm²
  Ixy = 21.54kgmm²
  Ixz = -0.00kgmm²
  Iyy = 126471.70kgmm²
  Iyz = -0.00kgmm²
  Izz = 123438kgmm²

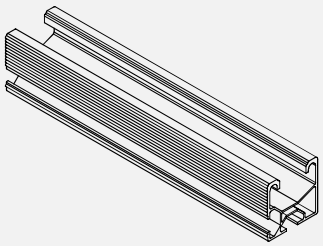
THANH U NHÔM ANODIZED A6061-T6

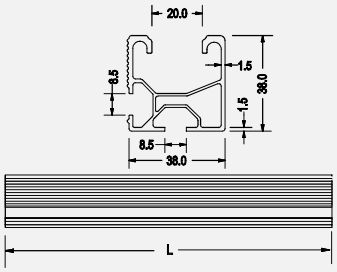




Ray nhôm SN01

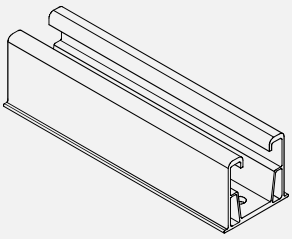
- Vật liệu: nhôm đùn A6061 T6
- Kích thước (WxH): 38 x 37 mm
- Độ dày: 1.0 ~ 1.8 mm
- Khe mặt trên (bắt tấm PV): 20mm
- Khe mặt bên (bắt chân mái): 8.5mm
- Dài thanh tiêu chuẩn: L = 2.2; 3.2 & 4.2m
- **Khối lượng m dài: 0.65kg/m**

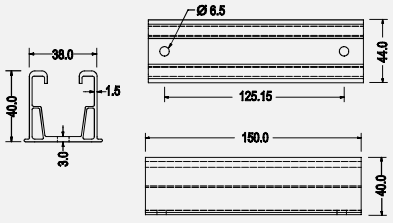




Ray nhôm SN02

- Vật liệu: nhôm đùn A6061 T6
- Kích thước (WxH): 38 x 38 mm
- Độ dày: 1.5 ~ 1.8 mm
- Khe mặt trên (bắt tấm PV): 20mm
- Khe mặt bên (bắt dọc sóng): 8.5mm
- Khe mặt dưới (bắt ngang sóng): 8.5mm
- Dài thanh tiêu chuẩn: L = 2.2; 3.2 & 4.2m
- **Khối lượng m dài: 0.79kg/m**

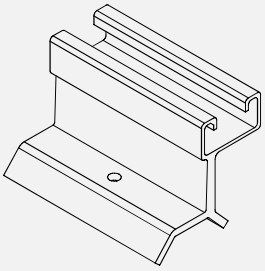


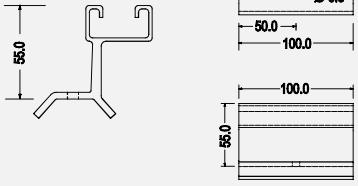


Ray nhôm MINIRAIL SM01

(Bắt ngang sóng trực tiếp lên mái)

- Vật liệu: nhôm đùn A6061 T6
- Kích thước (WxH): 38 x 40 mm
- Độ dày: 1.5 ~ 3.0 mm
- Khe mặt trên (bắt tấm PV): 20mm
- Lỗ bắt vít: Ø6.5mm
- Khoảng cách tâm 2 lỗ: 125mm
- Dài thanh tiêu chuẩn: L = 150mm



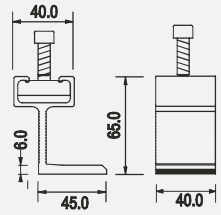
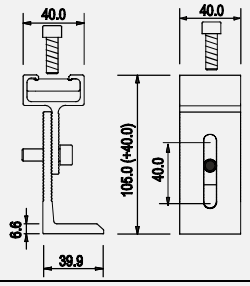
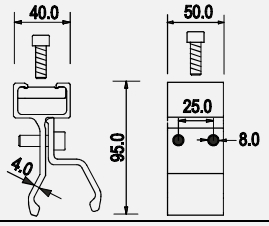
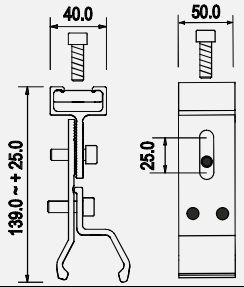
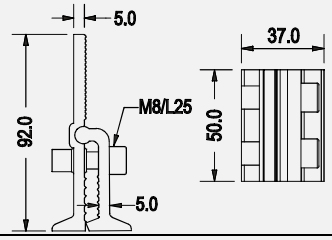
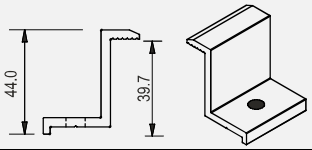
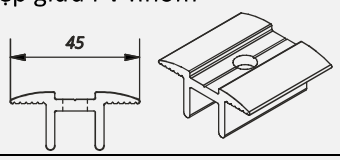


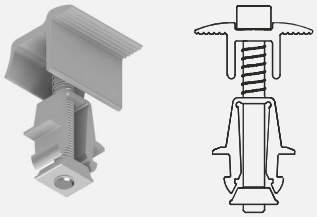
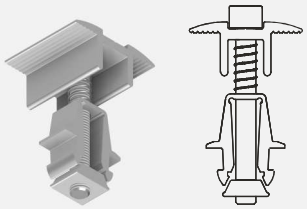
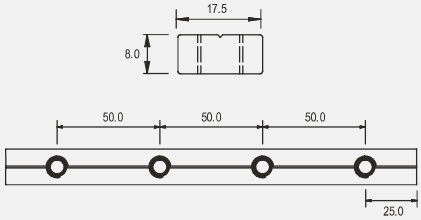
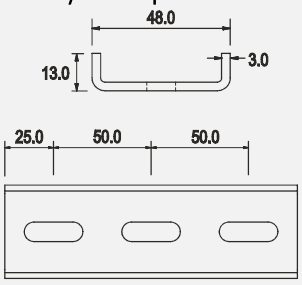
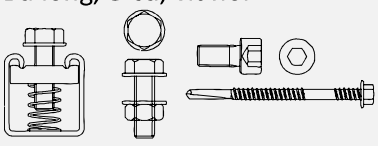
Ray nhôm MINIRAIL SM02

(Bắt dọc sóng trực tiếp lên mái)

- Vật liệu: nhôm đùn A6061 T6
- Kích thước (WxH): 21 x 55 mm
- Độ dày: 1.5 ~ 3.0 mm
- Khe mặt trên (bắt tấm PV): 20mm
- Lỗ bắt vít: Ø6.5mm
- Dài thanh tiêu chuẩn: L = 100mm

CÁC PHỤ KIỆN

Phụ kiện	Mô tả
Chân nhôm L40 	Chân nối mái tôn múi công nghiệp độ cao cố định cho ray đỡ U-ZAM SZ 4121 • Dùng cho lắp ray song song hoặc vuông góc sóng tôn công nghiệp múi vuông bằng ê-cu “spring-nut” • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 3 – 6 mm
Chân nhôm L40 	Chân nối mái tôn múi công nghiệp độ cao tùy chỉnh cao-thấp cho ray đỡ U-ZAM SZ 4121 và ray nhôm • Dùng cho lắp ray song song hoặc vuông góc sóng tôn công nghiệp múi vuông bằng ê-cu “spring-nut” hoặc ốc vít chuyên dụng cho ray nhôm • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 3 – 6mm
Chân nhôm K50 	Chân nối kẹp mái tôn ‘kliplock’ công nghiệp độ cao cố định cho ray đỡ U-ZAM SZ 4121 • Dùng cho lắp ray song song hoặc vuông góc sóng tôn công nghiệp múi vuông bằng ê-cu “spring-nut” • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 4 mm
Chân nhôm K50 	Chân nối kẹp mái tôn ‘kliplock’ công nghiệp độ cao tùy chỉnh cao thấp cho ray đỡ U-ZAM SZ 4121 và ray nhôm • Dùng cho lắp ray song song hoặc vuông góc sóng tôn công nghiệp múi vuông bằng ê-cu “spring-nut” hoặc ốc vít chuyên dụng cho ray nhôm • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 4 mm
Chân nhôm S50 	Chân nối kẹp mái tôn ‘seamlock’ công nghiệp độ cao tùy chỉnh cao thấp cho ray đỡ U-ZAM SZ 4121 và ray nhôm • Dùng cho lắp ray song song hoặc vuông góc sóng tôn công nghiệp múi vuông bằng ê-cu “spring-nut” hoặc ốc vít chuyên dụng cho ray nhôm • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 5 mm
Kẹp biên PV nhôm 	Kẹp biên tấm PV • Dùng để kẹp cố định mép biên ngoài cho tấm pin mặt trời • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 3-4 mm
Kẹp giữa PV nhôm 	Kẹp giữa 2 tấm PV • Dùng để kẹp cố định mép của 2 tấm pin mặt trời cạnh nhau • Vật liệu: Nhôm đùn mác A6061 T6 • Độ dày: 3-4 mm

Kẹp biên PV Nhôm 	Kẹp biên lắp nhanh tấm PV • Dùng để kẹp cố định mép biên ngoài cho tấm pin mặt trời – thi công nhanh • Vật liệu: Nhôm đùn mác A6061 T6, tích hợp lò xo và ốc vít thép không rỉ
Kẹp giữa PV nhôm 	Kẹp giữa lắp nhanh 2 tấm PV • Dùng để kẹp cố định mép của 2 tấm pin mặt trời cạnh nhau – thi công nhanh • Vật liệu: Nhôm đùn mác A6061 T6 tích hợp lò xo và ốc vít thép không rỉ
Cầu nối ray U nhôm 	Cầu nối thanh U nhôm • Dùng để nối 2 thanh u nhôm bằng bu-lông thép không rỉ • Vật liệu: Nhôm đùn mác A6061
Cầu nối ray U thép 	Cầu nối thanh U ZAM • Dùng để kẹp nối 2 thanh U ZAM bằng bu-lông thép không rỉ • Vật liệu: Thép mạ niken dày 3mm
Bu lông, ê-cu, vít nối 	Các loại bu-lông, ê-cu, vít, vòng đệm…nhiều kích cỡ • Dùng cho các kết nối, liên kết trong hệ khung giá • Vật liệu: Thép mạ niken, thép không rỉ • Tiêu chuẩn: ISO 4762

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Số HĐ: 125/2020KNIBS	**PHIẾU KẾT QUẢ THỬ NGHIỆM**	Hà Nội, 08/5/2020 BC.080520-S.14

I. THÔNG TIN

Khách hàng	: **Công ty Cổ phần Đầu tư Công nghệ Ngôi sao Châu Á**
Công trình	: **Kiểm tra chất lượng sản phẩm của khách hàng**
Mẫu thử nghiệm	: **Hệ đỡ pin áp mái Unistar Solar**
Chỉ tiêu thử nghiệm	: **Thử tải cơ tĩnh**
Địa điểm thử nghiệm	: **Viện KHCN XD, số 81 Trần Cung Cầu Giấy, Hà Nội**

II. KẾT QUẢ

Ngày nhận mẫu : **20/04/2020** Phương pháp thử : **TCVN 6781-2: 2017**
Ngày thử nghiệm : **23/04/2020** Thiết bị thử : **Hệ thống kích thủy lực 300 kN, bộ đo chuyển vị điện tử, lực kế điện tử**

2.1 Kích thước mẫu thử và tải trọng thử

Kích thước diện truyền tải			Áp lực thiết kế *(Pa)*	Hệ số thử vượt tải, γ_m	Áp lực thử lớn nhất *(Pa)*	Tổng tải trọng thử *(N)*	
						P^+, P^-	$1.5P^+$, $1.5P^-$
Chiều dài *(m)*	Chiều rộng *(m)*	Diện tích *(m^2)*	1600	1.5	2400	12800	19200
4.0	2.00	8.0					

2.2 Kết quả thử tải cơ tĩnh

STT	Ký hiệu đồng hồ đo chuyển vị	Chuyển vị lớn nhất các vị trí đo tại lực thí nghiệm 12800 N tương đương áp lực 1600 Pa (mm)		Nhận xét
		Tải trọng P^+	Tải trọng P^-	
1	V1 Tại vị trí gối	1,25	0,75	- Sau khi gia tải đủ 03 chu kỳ gia tải với tải trọng thử lớn nhất là 19200 N tương đương áp lực 2400 Pa, mẫu không có hiện tượng phá hoại;
2	V2 Giữa nhịp 1.0 mm	7,68	3,76	
3	V3 Tại vị trí gối	1,86	0,68	
4	V4 Giữa nhịp 1.0 mm	8,20	3,85	
5	V3 Tại vị trí gối	1,75	0,84	
Ghi chú: Xem sơ đồ tải trọng và hình ảnh thí nghiệm trong trang sau				

Nhận xét: Hệ đỡ pin áp mái Unistar Solar đã thử nghiệm đảm bảo khả năng chịu tải trọng thiết kế 1600 Pa với hệ số thử vượt tải γ_m = 1,5 theo tiêu chuẩn TCVN 6781-2:2017.

Chủ đầu tư	**Người thử nghiệm**	**LAS-XD01** Phòng TNCT	**Viện Chuyên ngành Kết cấu Công trình Xây dựng** *(IBS)*
TVGS			
Khách hàng	**ThS.Đỗ Trần Hùng**	Phó trưởng LAS-XD01 **ThS. Ngô Mạnh Toàn**	Phó Giám đốc **TS. Đỗ Tiến Thịnh**

1.Phiếu kết quả này chỉ có giá trị đối với mẫu thử do khách hàng đưa tới *(This test report is valid only for samples provided by the Client)*
2.Không được sao chép kết quả này nếu không được sự đồng ý của IBS *(This test report shall not be reproduced without the written approval of IBS)*

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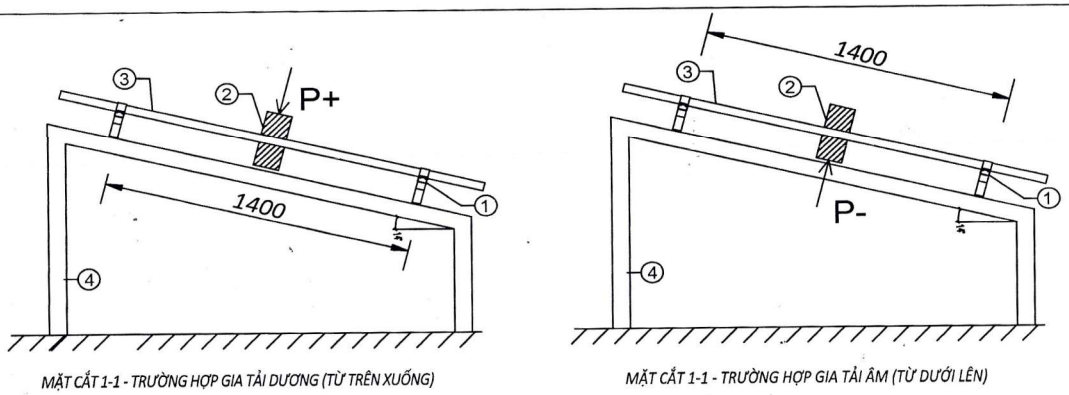
Sơ đồ tải trọng

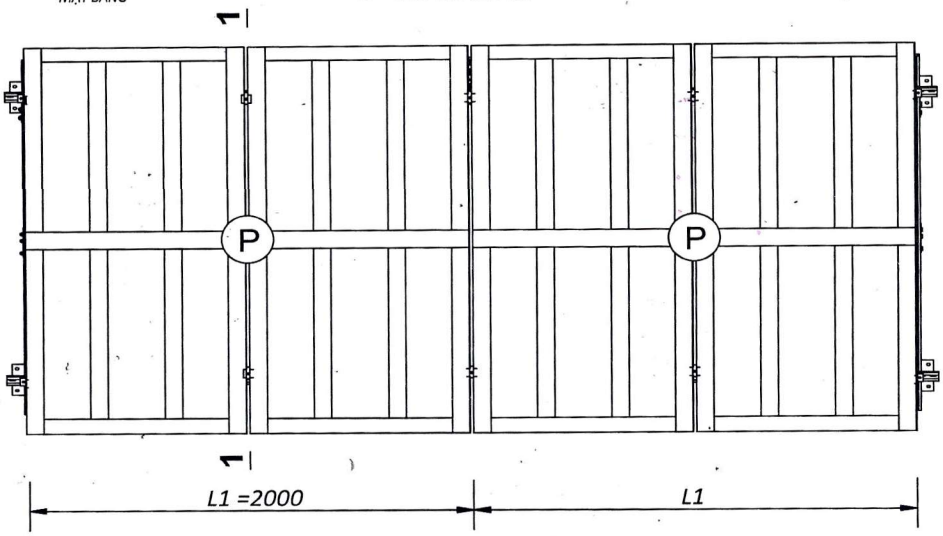


MẶT CẮT 1-1 - TRƯỜNG HỢP GIA TẢI DƯƠNG (TỪ TRÊN XUỐNG)

MẶT CẮT 1-1 - TRƯỜNG HỢP GIA TẢI ÂM (TỪ DƯỚI LÊN)

GHI CHÚ:
1– MẪU THÍ NGHIỆM
2– DẦM TRUYỀN TẢI
3– KHUNG TRUYỀN TẢI
4– KHUNG ĐỠ GIẢ HỆ MÁI

MẶT BẰNG



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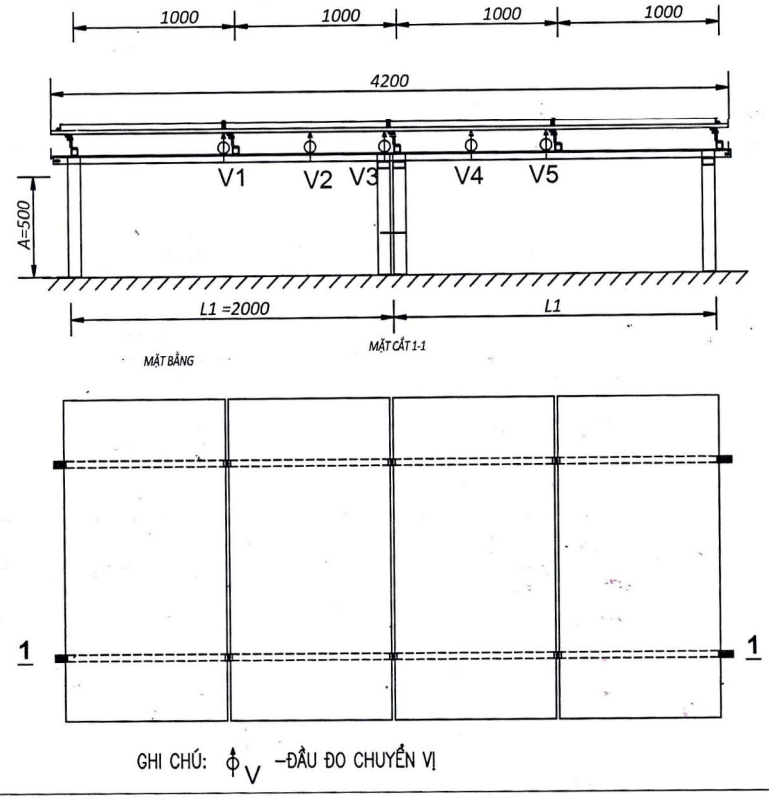
Sơ đồ lắp thiết bị đo chuyển vị



GHI CHÚ: ϕ_V –ĐẦU ĐO CHUYỂN VỊ

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Hình ảnh thử nghiệm / *Image of test*

UNISTAR

SOLAR RACK SYSTEM

Nhà sản xuất và cung cấp : CÔNG TY NGÔI SAO CHÂU Á

Văn phòng và Nhà máy tại Hà nội

Lô C3/C4 - Cụm công nghiệp thị trấn Phùng - Đan Phượng - Hà Nội

Điện thoại: +84 (24) 35 14 79 99 - Email: baogia@nsca.vn