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Our Ref: 2830/K.Z

1 December 2016

Xiamen Hopergy Photovoltaic Technology Co. Ltd.
No.630, Tonghong Road
Tongan District, Xiamen 361100
China

PV Array Frame Engineering Certification

Installation of Hopergy Adjustable Tilt Leg Roof Mount Solar System on KlipLok 700 with HOP-SLR02 Rails

Gamcorp (Melbourne) Pty Ltd, being Structural Engineers within the meaning of Australian and New Zealand Building Regulations, have carried out a structural design check of Hopergy Adjustable Tilt Leg Roof Mount Solar System installation on KlipLok 700 roof within Australia and New Zealand. The design check has been based on the information and test report provided by Hopergy Australia (IMSOLAR).

We find the Installation of Hopergy Adjustable Tilt Leg Roof Mount Solar System on KlipLok 700 for Australian and New Zealand use to be structurally sufficient based on the following conditions:

- Wind loads to AS/NZ1170.2:2011 Admt 3:2013
- Wind region A, B, C, D, W
- Wind terrain category 2 & 3
- Wind average recurrence interval of 500 years
- Maximum building height 20m
- The PV panel dimensions to be 1670mm x 1000mm
- Maximum weight of the PV panel and array frame to be 15 kg/m^2
- Rails to be HOP-SLR02
- The roof interface to be HOP-KLK700 as per test report 2016111201
- The assessment of the rail is based on a deflection limit of 20mm specified by Hopergy Australia (IMSOLAR) as per the test report provided
- The roof interface to be Hopergy adjustable tilt leg as per drawing HOP-ARL01-15/30/60 and front leg as per drawing HOP-FB002-30
- The assessment is based on an assumption that the front leg and tilt leg meet the industrial standard requirements
- Each PV panel to be installed using 2 rails minimum in all circumstances
- Installation of PV array to be done in accordance with the PV installation manual
- The certification **excludes** assessment of roof structure and PV panels

Refer to attached summary table for interface spacing

ISO 9001:2008 Registered Firm
Certificate No: AU1222

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NOTES:

- **The recommended spacing nominated in this certification is based on the capacity of the array frame, not the roof structure and PV panel. It is the responsibility of the installer to adopt the most critical spacing.**

- **If any of the above conditions cannot be met, the structural engineer must be notified immediately.**

Construction is to be carried out strictly in accordance with the manufacturers instructions. This work was designed in accordance with the provisions of Australian and New Zealand Building Regulations and in accordance with sound, widely accepted engineering principles.

Yours faithfully,
Gamcorp (Melbourne) Pty Ltd

Martin Gamble
Managing Director
MAICD

Mudi Ariyarathna
B.Eng(Civil)(Hons)Monash, M.Eng&Mgt, MIEAust, CPEng, NPER, RBP EC-39699, RPEQ- 15899

ISO 9001:2008 Registered Firm
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Structural Design Documentation

KlipLok 700 Tilt Leg PV Racking System
Interface Spacing Table
According to AS/NZS 1170.2-2011 Amdt 3-2013
with HOP-SLR02 Rails
within Australia and New Zealand

Terrain Category 2 & 3

For: Xiamen Hopergy Photovoltaic Technology Co. Ltd.

Job Number: 2830
Date: 1 December 2016

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ISO 9001:2008 Registered Firm
Certificate No: AU1222

Job No: **2830**

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.**

Project: **Adjustable Tilt Leg Interface Spacing Table for KlipLok 700**

Address: **within Australia and New Zealand**

Australian and New Zealand Standards

AS/NZS 1170. 2011 – Structural Design Actions
Part 0 – General Principles
Part 1 – Permanent imposed and other actions
Part 2 – Wind Actions
AS/NZS 1252 – High Strength Structural Bolting
AS 4055 – Wind Loads for Housing
AS/NZS 1664 – Aluminium Structures
AS 4100 – Steel Structures
AS/NZS 4600 – Cold-Formed Steel Structures

Wind Terrain Category: WTC 2 & 3

Designed: **K.Z**

Date: **Dec-16**

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Relationships built on trust

Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2830**
Project: **Adjustable Tilt Leg Interface Spacing Table for KlipLok 700** Date: **Dec-16**
Address: **within Australia and New Zealand**
Designed: **K.Z** Checked: **M.A**

Adjustable Tilt Leg Interface Spacing Table for KlipLok 700

Type of Rail: HOP-SLR02
Type of Interface: Adjustable Tilt Leg with HOP-KLK700
Solar Panel Dimension: 1.67m x 1m
Terrain category: 2

Tilt Angle from Horizontal: 10°<Φ≤15°
Roof Angle – : ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	982	1504	1785	2009	808	1232	1671	1900	731	1112	1506	1847	689	1049	1419	1817
B	603	916	1237	1821	497	754	1015	1556	450	682	917	1403	425	643	865	1322
C	405	612	823	1256	334	505	678	1031	303	457	613	932	286	432	579	879
D	249	376	504	764	206	311	416	629	187	281	377	569	177	266	356	538
W	758	1155	1565	1839	624	949	1282	1744	565	857	1157	1697	533	809	1091	1671

Tilt Angle from Horizontal: 15°<Φ<30°
Roof Angle – : ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	536	813	1096	1683	442	670	901	1377	401	606	814	1242	378	572	768	1171
B	331	501	672	1022	274	413	554	840	248	374	501	760	234	353	473	717
C	223	336	451	682	185	278	372	562	167	252	337	509	158	238	318	480
D	138	208	277	419	114	172	229	346	103	156	208	313	98	147	196	296
W	415	628	845	1290	343	518	696	1059	311	469	629	956	293	443	594	902

Tilt Angle from Horizontal: Φ = 30°
Roof Angle – : ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	437	661	890	1360	361	545	732	1115	327	493	662	1007	309	466	625	950
B	270	408	547	830	224	337	451	683	203	305	409	618	191	288	386	583
C	182	275	367	555	151	227	303	458	137	206	275	415	129	194	260	392
D	113	170	227	341	93	140	187	282	85	127	170	256	80	120	160	241
W	339	512	687	1046	280	422	566	859	254	382	513	777	240	361	484	733

Adjustable Tilt Leg Interface Spacing Table for KlipLok 700

Type of Rail HOP-SLR02
Type of Interface Adjustable Tilt Leg with HOP-KLK700
Solar Panel Dimension 1.67m x 1m
Terrain category 2

Tilt Angle from Horizontal 30°＜Φ≤45°
Roof Angle – ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**
A	**342**	**517**	**694**	**1056**	**283**	**426**	**572**	**868**	**256**	**386**	**517**	**784**	**242**	**365**	**488**	**740**
B	**212**	**319**	**428**	**647**	**175**	**264**	**353**	**534**	**159**	**239**	**320**	**483**	**150**	**226**	**302**	**456**
C	**143**	**215**	**288**	**434**	**118**	**178**	**238**	**358**	**107**	**161**	**216**	**325**	**101**	**152**	**204**	**307**
D	**89**	**133**	**178**	**267**	**73**	**110**	**147**	**221**	**66**	**100**	**133**	**200**	**63**	**94**	**126**	**189**
W	**265**	**400**	**537**	**814**	**219**	**331**	**443**	**670**	**199**	**299**	**401**	**606**	**188**	**283**	**379**	**572**

Tilt Angle from Horizontal 20°＜Φ≤45°
Roof Angle – 11° - 20°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**
A	**418**	**632**	**850**	**1297**	**345**	**521**	**700**	**1065**	**312**	**472**	**633**	**962**	**295**	**445**	**597**	**907**
B	**259**	**390**	**523**	**793**	**214**	**322**	**431**	**653**	**194**	**292**	**391**	**591**	**183**	**276**	**369**	**557**
C	**174**	**262**	**351**	**531**	**144**	**217**	**290**	**438**	**131**	**197**	**263**	**396**	**124**	**186**	**248**	**374**
D	**108**	**162**	**217**	**326**	**89**	**134**	**179**	**270**	**81**	**122**	**162**	**244**	**76**	**115**	**153**	**231**
W	**324**	**489**	**657**	**998**	**268**	**404**	**541**	**821**	**242**	**366**	**490**	**742**	**229**	**345**	**462**	**700**

Tilt Angle from Horizontal 30°＜Φ≤45°
Roof Angle – 21° - 30°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**
A	**694**	**1056**	**1428**	**1820**	**572**	**868**	**1171**	**1726**	**517**	**784**	**1057**	**1621**	**488**	**740**	**997**	**1527**
B	**428**	**647**	**871**	**1330**	**353**	**534**	**717**	**1091**	**320**	**483**	**648**	**986**	**302**	**456**	**612**	**930**
C	**288**	**434**	**582**	**884**	**238**	**358**	**480**	**728**	**216**	**325**	**435**	**658**	**204**	**307**	**411**	**621**
D	**178**	**267**	**358**	**541**	**147**	**221**	**296**	**446**	**133**	**200**	**268**	**404**	**126**	**189**	**253**	**382**
W	**537**	**814**	**1098**	**1674**	**443**	**670**	**902**	**1378**	**401**	**606**	**815**	**1244**	**379**	**572**	**769**	**1172**

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Client: **Xiamen Hopergy Photovoltaic Technology Co. Ltd.** Job: **2830**
Project: **Adjustable Tilt Leg Interface Spacing Table for KlipLok 700** Date: **Dec-16**
Address: **within Australia and New Zealand**
Designed: **K.Z** Checked: **M.A**

Adjustable Tilt Leg Interface Spacing Table for KlipLok 700

Type of Rail: HOP-SLR02
Type of Interface: Adjustable Tilt Leg with HOP-KLK700
Solar Panel Dimension: 1.67m x 1m
Terrain category: 3

Tilt Angle from Horizontal: 10°<Φ≤15°
Roof Angle – : ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	1191	1734	1882	2126	1191	1734	1882	2126	1029	1577	1808	2036	918	1404	1753	1970
B	729	1110	1502	2004	729	1110	1502	2004	631	959	1296	1863	564	856	1155	1761
C	488	740	996	1526	488	740	996	1526	424	641	862	1316	379	573	770	1173
D	300	454	608	924	300	454	608	924	261	393	527	800	234	352	472	715
W	917	1402	1728	1940	917	1402	1728	1940	794	1210	1641	1863	709	1079	1461	1805

Tilt Angle from Horizontal: 15°<Φ<30°
Roof Angle – : ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	647	984	1330	1786	647	984	1330	1786	561	851	1149	1717	502	761	1025	1570
B	399	604	812	1239	399	604	812	1239	347	524	703	1071	310	468	629	955
C	269	405	544	825	269	405	544	825	233	352	471	714	209	315	422	638
D	166	250	334	505	166	250	334	505	144	217	290	438	129	194	260	392
W	501	759	1023	1568	501	759	1023	1568	435	658	885	1352	389	588	790	1205

Tilt Angle from Horizontal: Φ = 30°
Roof Angle – : ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal	Corner	Edge	Intermediate	Internal
A	527	799	1078	1653	527	799	1078	1653	457	692	932	1425	409	619	832	1270
B	326	492	661	1005	326	492	661	1005	283	427	573	869	253	382	512	776
C	220	331	443	671	220	331	443	671	191	287	384	581	171	257	344	520
D	136	204	273	412	136	204	273	412	118	177	237	357	106	159	212	320
W	408	618	831	1268	408	618	831	1268	354	536	719	1095	317	479	643	977

Adjustable Tilt Leg Interface Spacing Table for KlipLok 700

Type of Rail HOP-SLR02
Type of Interface Adjustable Tilt Leg with HOP-KLK700
Solar Panel Dimension 1.67m x 1m
Terrain category **3**

Tilt Angle from Horizontal 30°＜Φ≤45°
Roof Angle – ≤10°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**
A	**412**	**624**	**839**	**1280**	**412**	**624**	**839**	**1280**	**358**	**541**	**726**	**1106**	**320**	**484**	**649**	**987**
B	**255**	**385**	**516**	**782**	**255**	**385**	**516**	**782**	**222**	**334**	**448**	**678**	**199**	**299**	**400**	**606**
C	**172**	**259**	**347**	**524**	**172**	**259**	**347**	**524**	**150**	**225**	**301**	**454**	**134**	**202**	**269**	**406**
D	**106**	**160**	**214**	**322**	**106**	**160**	**214**	**322**	**93**	**139**	**186**	**280**	**83**	**125**	**166**	**250**
W	**320**	**483**	**648**	**985**	**320**	**483**	**648**	**985**	**278**	**419**	**562**	**852**	**249**	**375**	**502**	**761**

Tilt Angle from Horizontal 20°＜Φ≤45°
Roof Angle – 11° - 20°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**
A	**647**	**984**	**1330**	**1576**	**647**	**984**	**1330**	**1576**	**561**	**851**	**1149**	**1360**	**502**	**761**	**1025**	**1212**
B	**399**	**604**	**812**	**959**	**399**	**604**	**812**	**959**	**347**	**524**	**703**	**830**	**310**	**468**	**629**	**741**
C	**269**	**405**	**544**	**641**	**269**	**405**	**544**	**641**	**233**	**352**	**471**	**555**	**209**	**315**	**422**	**497**
D	**166**	**250**	**334**	**393**	**166**	**250**	**334**	**393**	**144**	**217**	**290**	**341**	**129**	**194**	**260**	**306**
W	**501**	**759**	**1023**	**1210**	**501**	**759**	**1023**	**1210**	**435**	**658**	**885**	**1046**	**389**	**588**	**790**	**933**

Tilt Angle from Horizontal 30°＜Φ≤45°
Roof Angle – 21° - 30°

Wind Region	Building Height – H (m)															
	H≤5				5<H≤10				10<H≤15				15<H≤20			
	Corner	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**	**Corner**	**Edge**	**Interm ediate**	**Internal**
A	**1191**	**1734**	**1882**	**1920**	**1191**	**1734**	**1882**	**1920**	**1029**	**1577**	**1808**	**1844**	**918**	**1404**	**1753**	**1787**
B	**729**	**1110**	**1502**	**1617**	**729**	**1110**	**1502**	**1617**	**631**	**959**	**1296**	**1394**	**564**	**856**	**1155**	**1242**
C	**488**	**740**	**996**	**1071**	**488**	**740**	**996**	**1071**	**424**	**641**	**862**	**926**	**379**	**573**	**770**	**827**
D	**300**	**454**	**608**	**653**	**300**	**454**	**608**	**653**	**261**	**393**	**527**	**566**	**234**	**352**	**472**	**506**
W	**917**	**1402**	**1728**	**1761**	**917**	**1402**	**1728**	**1761**	**794**	**1210**	**1641**	**1694**	**709**	**1079**	**1461**	**1572**

General Notes

Note 1 Following components are satisfied to use according to AS/NZS 1170.2 - 2011 Amdt 3 - 2013

Components	Part Number	Description
HOP-SLR02 Rail	1.01.SSR02.00000-00	HOP-SLR02 Rail
HOP-KLK700 Clamp		as per test 2016111201

Note 2 Refer Figure 5.3 of AS/NZS 1170.2:2011 for definition of roof zones

Note 3 Terrain Category 2 (TC2) refers to open terrain, including grassland, with well-scattered obstructions having heights generally from 1.5 m to 5 m, with no more than two obstruction per obstructions per hectare.

Terrain Category 3 (TC3) refers to numerous closely spaced obstructions having heights generally from 3m to 10m. For example, suburban housing or light industrial estates. Refer clause 4.2.1 of AS/NZS 1170.2-2011 Amdt 3-2013 for definition of Terrain Category 3.