

UPSOLAR PV MODULES – PACKING SOLUTIONS

1. PV Module Standard Dimensions

Type	Mono 60 cells (6 inches)	Mono 60 cells (6 inches)	Mono 72 cells (6 inches)
Dimensions (mm)	1640×992×35 1650×992×35	1640×992×30 1650×992×30	1956×992×35
Type	Mono square 60 cells (158.75×158.75)	Mono square 72 cells (158.75×158.75)	Mono half-cut 120 cells (158.75×79.375)
Dimensions (mm)	1665×1002×35	1979×1002×35	1684×1002×35
Type	Mono half-cut 144 cells (158.75×79.375)	Mono half-cut bifacial 120 cells (158.75×79.375) (Glass-glass)	Mono half-cut bifacial 144 cells (158.75×79.375) (Glass-glass)
Dimensions (mm)	2008×1002×35	1704×1008×35	2031×1008×35
Type	Mono half-cut 120 cells (166×83)	Mono half-cut 144 cells (166×83)	Mono half-cut bifacial 120 cells (166×83) (Glass-glass)
Dimensions (mm)	1755×1038×35	2094×1038×35	1755×1038×35
Type	Mono half-cut bifacial 144 cells (166×83) (Glass-glass)	Mono half-cut 120 cells (182×91)	Mono half-cut 144 cells (182×91)
Dimensions (mm)	2094×1038×35	1908×1134×35	2278×1134×35
Type	Mono half-cut 156 cells (182×91)	Mono half-cut bifacial 144 cells (182×91) (Glass-glass)	Mono half-cut bifacial 156 cells (182×91) (Glass-glass)
Dimensions (mm)	2465×1134×35	2278×1134×35	2465×1134×35
Type	Poly 36 cells (9×4)	Poly 60 cells	Poly 60 cells
Dimensions (mm)	1478×670×35	1640×992×35 1650×992×35	1640×992×30 1650×992×30
Type	Poly 72 cells	Poly half-cut 120 cells	Poly half-cut 144 cells
Dimensions (mm)	1956×992×35	1675×992×35	2000×992×35

2. Packing Quantity

Type	Mono 60 cells (6 inches) 1640×992×35 1650×992×35		Mono 60 cells (6 inches) 1640×992×30 1650×992×30		Mono 72 cells (6 inches) 1956×992×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/24	31/37	36/25	36/42	31/24	31/37
Pallet Gross Weight (kg)	610/490	610/725	705/510	705/820	725/580	725/865
Volume / pallet (m ³)	2.2/1.9	2.2/2.6	2.2/1.7	2.2/2.6	2.6/2.2	2.6/3.1
Pallets / container	6+6	14+14	6+6	14+14	5+5	12+12
Pcs / container	330	952	366	1092	275	816

Type	Mono square 60 cells (158.75×158.75) 1665×1002×35		Mono square 72 cells (158.75×158.75) 1979×1002×35		Mono half-cut 120 cells (158.75×79.375) 1684×1002×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/24	31/37	31/24	31/37	31/24	31/37
Pallet Gross Weight (kg)	625/500	625/745	725/580	725/865	625/500	625/745
Volume / pallet (m ³)	2.2/1.9	2.2/2.7	2.6/2.2	2.6/3.2	2.3/1.9	2.3/2.7
Pallets / container	6+6	14+14	5+5	11+11	6+6	14+14
Pcs / container	330	952	275	748	330	952

Type	Mono half-cut 144 cells (158.75×79.375) 2008×1002×35		Bifacial Mono half-cut 120 cells (158.75×79.375)(Glass-glass) 1704×1008×35		Bifacial Mono half-cut 144 cells (158.75×79.375) (Glass-glass) 2031×1008×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/24	31/37	31/24	31/37	31/24	31/37
Pallet Gross Weight (kg)	740/595	740/880	720/575	720/860	850/680	850/1010
Volume / pallet (m ³)	2.7/2.3	2.7/3.2	2.3/1.9	2.3/2.8	2.7/2.3	2.7/3.3
Pallets / container	5+5	11+11	6+6	13+13	5+5	11+11
Pcs / container	275	748	330	884	275	748

Type	Mono half-cut 120 cells (166×83) 1755×1038×35		Mono half-cut 144 cells (166×83) 2094×1038×35		Mono half-cut bifacial 120 cells (166×83) (Glass-glass) 1755×1038×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/20	31/35	31/20	31/35	31/20	31/35
Pallet Gross Weight (kg)	675/465	675/765	790/540	790/890	755/515	755/850
Volume / pallet (m ³)	2.4/1.7	2.4/2.8	2.9/2.0	2.9/3.3	2.4/1.7	2.4/2.8
Pallets / container	6+6	13+13	5+5	11+11	6+6	13+13
Pcs / container	306	858	255	726	306	858

Type	Mono half-cut bifacial 144 cells (166×83) (Glass-glass) 2094×1038×35		Mono half-cut 120 cells (182×91) 1908×1134×35		Mono half-cut 144 cells (182×91) 2278×1134×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/20	31/35	31/20	31	31/20	31
Pallet Gross Weight (kg)	900/610	900/1015	770/525	770	935/630	935
Volume / pallet (m ³)	2.9/2.0	2.9/3.3	2.8/2.1	2.8	3.4/2.5	3.4
Pallets / container	5+5	11+11	6+6	24	5+5	20
Pcs / container	255	726	306	744	255	620

Type	Mono half-cut 156 cells (182×91) 2465×1134×35		Mono half-cut bifacial 144 cells (182×91) (Glass-glass) 2278×1134×35		Mono half-cut bifacial 156 cells (182×91) (Glass-glass) 2465×1134×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/20	31	31/20	31	31/20	31
Pallet Gross Weight (kg)	1015/685	1015	1025/690	1025	1105/745	1105
Volume / pallet (m ³)	3.7/2.7	3.7	3.4/2.5	3.4	3.7/2.7	3.7
Pallets / container	4+4	18	5+5	20	4+4	18
Pcs / container	204	558	255	620	204	558

Type	Poly 36 cells (9×4) 1478×670×35		Poly 60 cells 1640×992×35 1650×992×35		Poly 60 cells 1640×992×30 1650×992×30	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/43	31	31/24	31/37	36/25	36/42
Pallet Gross Weight (kg)	340/470	340	610/490	610/725	705/510	705/820
Volume / pallet (m ³)	1.4/2.2	1.4	2.2/1.9	2.2/2.6	2.2/1.7	2.2/2.6
Pallets / container	7+7	45	6+6	14+14	6+6	14+14
Pcs / container	518	1395	330	952	366	1092

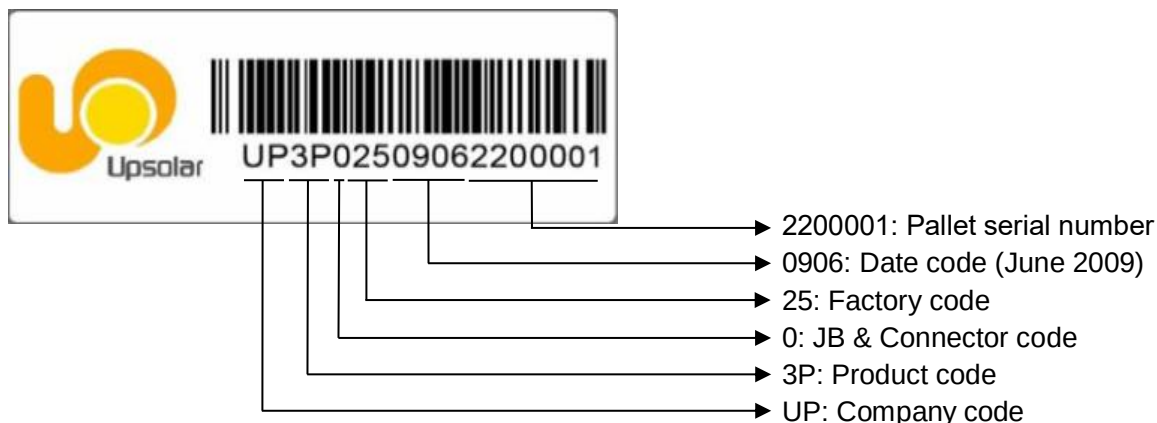
Type	Poly 72 cells 1956×992×35		Poly half-cut 120 cells 1675×992×35		Poly half-cut 144 cells 2000×992×35	
Container	20GP	40HQ	20GP	40HQ	20GP	40HQ
Pcs / pallet	31/24	31/37	31/24	31/37	31/24	31/37
Pallet Gross Weight (kg)	725/580	725/865	625/500	625/745	725/580	725/865
Volume / pallet (m ³)	2.6/2.2	2.6/3.1	2.2/1.9	2.2/2.7	2.6/2.2	2.6/3.2
Pallets / container	5+5	12+12	6+6	14+14	5+5	11+11
Pcs / container	275	816	330	952	275	748

3. Wooden Pallet Dimensions

Type	Mono 60 cells (6 inches)	Mono 72 cells (6 inches)	Mono square 60 cells (158.75×158.75)
Pallet Dimensions (mm)	1670×1145×120	1980×1145×120	1700×1145×120
Type	Mono square 72 cells (158.75×158.75)	Mono half-cut 120 cells (158.75×79.375)	Mono half-cut 144 cells (158.75×79.375)
Pallet Dimensions (mm)	2010×1145×120	1700×1145×120	2030×1145×120
Type	Bifacial Mono half-cut 120 cells (158.75×79.375) (Glass-glass)	Bifacial Mono half-cut 144 cells (158.75×79.375) (Glass-glass)	Mono half-cut 120 cells (166×83)
Pallet Dimensions (mm)	1730×1145×120	2060×1145×120	1780×1145×120
Type	Mono half-cut 144 cells (166×83)	Mono half-cut bifacial 120 cells (166×83) (Glass-glass)	Mono half-cut bifacial 144 cells (166×83) (Glass-glass)
Pallet Dimensions (mm)	2120×1145×120	1780×1145×120	2120×1145×120
Type	Mono half-cut 120 cells (182×91)	Mono half-cut 144 cells (182×91)	Mono half-cut 156 cells (182×91)
Pallet Dimensions (mm)	1940×1145×120	2300×1145×120	2500×1145×120
Type	Mono half-cut bifacial 144 cells (182×91) (Glass-glass)	Mono half-cut bifacial 156 cells (182×91) (Glass-glass)	Poly 36 cells (9×4)
Pallet Dimensions (mm)	2300×1145×120	2500×1145×120	1510×1145×120
Type	Poly 60 cells	Poly 72 cells	Poly half-cut 120 cells
Pallet Dimensions (mm)	1670×1145×120	1980×1145×120	1700×1145×120
Type	Poly half-cut 144 cells		
Pallet Dimensions (mm)	2030×1145×120		

4. Pallet and Module Serial Number Signification

➤ Example: Pallet bar code



➤ Example: Module bar code



Remark 1: Pallet number and module serial numbers are inserted inside a water-proof bag attached on one side of the carton in order to make warehouse management more efficient on customer site.

Remark 2: Module serial numbers are encapsulated at the top left corner of each module.

5. Upsolar Current Classification for PV modules

A- Purpose:

When several modules are installed on one string (=series connection), the modules with the lowest current at maximum power (I_{mp}) will penalize the electricity production of the full string. This phenomenon is called performance loss due to current mismatch.

To limit this effect, it is important to verify that all the modules that will be connected on one string are showing similar maximum power current. UPSOLAR proposes this service by sorting every module during the flash test to avoid complications to the customer during his PV system installation.

B- Classification:

5 current classes have been defined (alpha, beta, gamma, delta and epsilon). The ranges of current for each class are given in the table here-under for the 2 main product families identified in UPSOLAR catalogue: monocrystalline and polycrystalline.

Module type	Alpha (α)	Beta (β)	Gamma (γ)	Delta (δ)	Epsilon (ϵ)
Label					
Ref. UP-MXXXM Monocrystalline(6")	$I_{\alpha} < 9.3 \text{ A}$	$9.3 \text{ A} \leq I_{\beta} < 9.4 \text{ A}$	$9.4 \text{ A} \leq I_{\gamma} < 9.5 \text{ A}$	$9.5 \text{ A} \leq I_{\delta} < 9.6 \text{ A}$	$I_{\epsilon} \geq 9.6 \text{ A}$
Ref. UP-MXXXM&H Monocrystalline(158.75)	$I_{\alpha} < 9.7 \text{ A}$	$9.7 \text{ A} \leq I_{\beta} < 9.8 \text{ A}$	$9.8 \text{ A} \leq I_{\gamma} < 9.9 \text{ A}$	$9.9 \text{ A} \leq I_{\delta} < 10.0 \text{ A}$	$I_{\epsilon} \geq 10.0 \text{ A}$
Ref. UP-M(G)XXXM&H Monocrystalline(166)	$I_{\alpha} < 10.7 \text{ A}$	$10.7 \text{ A} \leq I_{\beta} < 10.8 \text{ A}$	$10.8 \text{ A} \leq I_{\gamma} < 10.9 \text{ A}$	$10.9 \text{ A} \leq I_{\delta} < 11.0 \text{ A}$	$I_{\epsilon} \geq 11.0 \text{ A}$
Ref. UP-M(B)XXXM&H Monocrystalline(182)	$I_{\alpha} < 13.1 \text{ A}$	$13.1 \text{ A} \leq I_{\beta} < 13.2 \text{ A}$	$13.2 \text{ A} \leq I_{\gamma} < 13.3 \text{ A}$	$13.3 \text{ A} \leq I_{\delta} < 13.4 \text{ A}$	$I_{\epsilon} \geq 13.4 \text{ A}$
Ref. UP-MXXXP&H Polycrystalline	$I_{\alpha} < 9.0 \text{ A}$	$9.0 \text{ A} \leq I_{\beta} < 9.1 \text{ A}$	$9.1 \text{ A} \leq I_{\gamma} < 9.2 \text{ A}$	$9.2 \text{ A} \leq I_{\delta} < 9.3 \text{ A}$	$I_{\epsilon} \geq 9.3 \text{ A}$

C- Integration into the Manufacturing Process:

During the flash test in the factory, the modules are first sorted per power by excluding from the lot the ones for which the maximum power value is not included in the range of $\pm 3\%$ of the nominal power. Modules are then sorted per current according to the I-V curve values given by the same flash test.

- One pallet only contains modules of the same current class.
- A label indicating the current class is stuck on each module frame (see label format here-above)

N.B: The values given in this document are defined as standard and are subject to change in the future, due to continuous technology improvement.

6. Flash Reports

A flash report is available for each container shipped. It contains the following information: container number, lead sealing number, pallet code, module type, module serial numbers, electrical parameters, flash test date and current classification.

Container No.: TEMU6697048				Lead sealing No.: SITE238296								
Pallet No.	No.	Type	Serial No.	Pm(W)	Voc(V)	Isc(A)	Vpm(V)	Ipm(A)	FF	Date	Time	Grade
UPXM02519029200019	1	UP-M300M	UP034525190220920711	301.1	39.22	9.941	33.40	9.016	0.772	2019/2/21	11:54 PM	Iα
	2	UP-M300M	UP034525190220920719	301.4	39.26	9.955	33.38	9.030	0.771	2019/2/21	11:53 PM	Iα
	3	UP-M300M	UP034525190220920895	301.7	39.17	9.948	33.39	9.037	0.774	2019/2/21	11:53 PM	Iα
	...	...	...	...	...	...	...	...	...	...	...	...
	30	UP-M300M	UP034525190220920735	302.0	39.26	9.921	33.44	9.032	0.775	2019/2/21	11:39 PM	Iα

7. Upsolar Packing Process



Step one: Four paper corners are fixed to each frame to avoid any contact.



Step two: Twenty-six modules are vertically placed into the carton for each pallet.



Step three: Stack additional carton onto the top of pallet.



Step four: Each finished pallet is wrapped in plastic film to ensure pallet integrity.



Step five: Loading into container and fixing with PE belt.

