

# UPSOLAR PV MODULES – PACKING SOLUTIONS

## 1. PV Module Standard Dimensions

| Type            | Mono 72 cells<br>(5 inches) | Mono 60 cells<br>(6 inches) | Poly 54 cells | Poly 60 cells | Poly 72 cells |
|-----------------|-----------------------------|-----------------------------|---------------|---------------|---------------|
| Dimensions (mm) | 1580×808×35                 | 1640×992×35                 | 1482×992×35   | 1640×992×35   | 1956×992×40   |

## 2. Packing Quantity

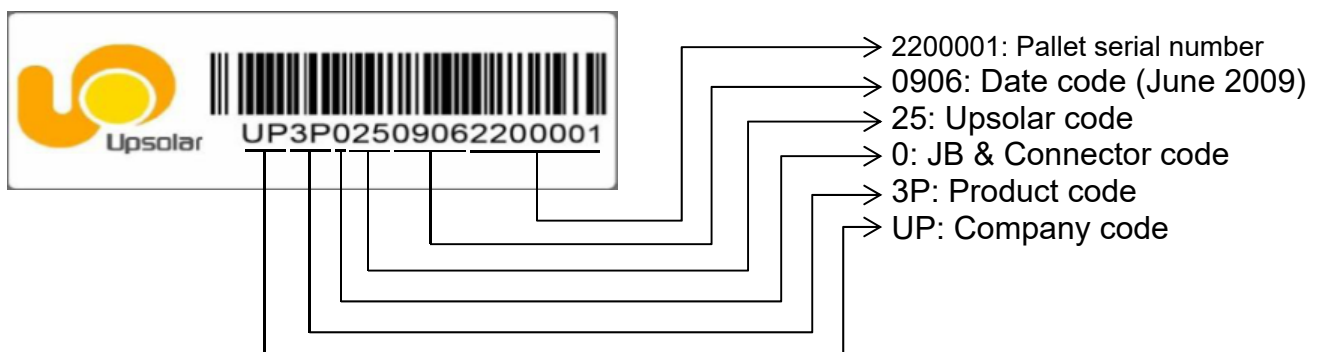
| Type                            | Mono 72 cells<br>(5 inches) |      | Mono 60 cells<br>(6 inches) |      |          | Poly 60 cells |      |          | Poly 72 cells |      |          |
|---------------------------------|-----------------------------|------|-----------------------------|------|----------|---------------|------|----------|---------------|------|----------|
|                                 | 20GP                        | 40GP | 20GP                        | 40HQ |          | 20GP          | 40HQ |          | 20GP          | 40HQ |          |
| Pcs / pallet                    | 30                          |      | 30/22                       | 30   | 30(+5)   | 30/22         | 30   | 30(+5)   | 26/20         | 26   | 26(+4)   |
| Pallet Gross Weight (kg)        | 410                         |      | 600/440                     | 600  | 600(700) | 600/440       | 600  | 600(700) | 730/560       | 730  | 730(810) |
| Volume/pallet (m <sup>3</sup> ) | 1.75                        |      | 2.2                         |      | 2.2(2.6) | 2.2           |      | 2.2(2.6) | 2.6           |      | 2.6(3.0) |
| Pallets / container             | 12                          | 28   | 6+6                         | 28   | 28       | 6+6           | 28   | 28       | 5+5           | 22   | 22       |
| Pcs / container                 | 360                         | 840  | 312                         | 840  | 910      | 312           | 840  | 910      | 230           | 572  | 616      |

## 3. Wooden Pallet Dimensions

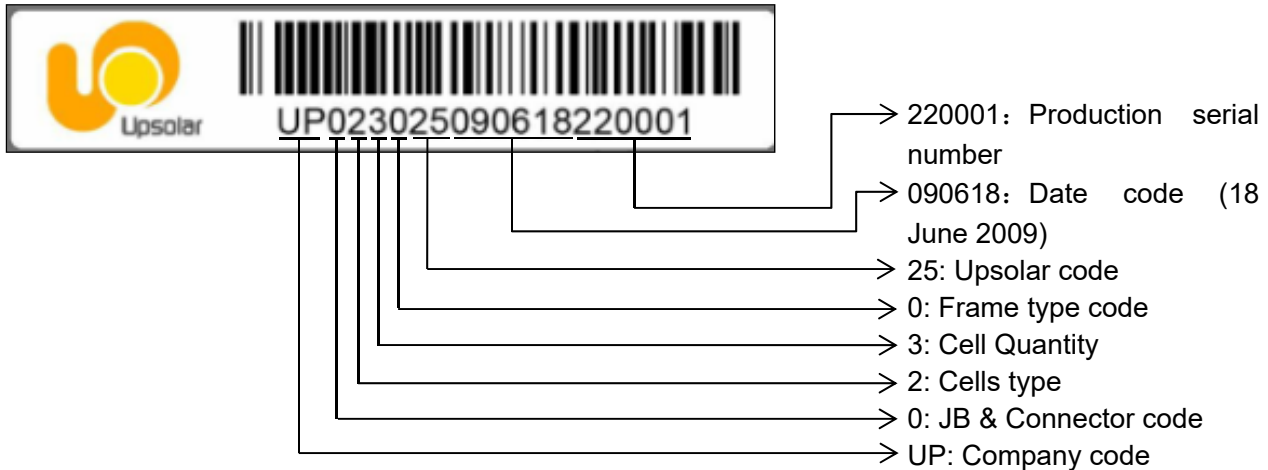
| Type                   | Mono 72 cells<br>(5 inches) | Mono 60 cells<br>(6 inches) |               | Poly 60 cells |               | Poly 72 cells |
|------------------------|-----------------------------|-----------------------------|---------------|---------------|---------------|---------------|
|                        | 840pcs                      | 840pcs                      | 616pcs        | 840pcs        | 616pcs        | 840pcs        |
| Pallet Dimensions (mm) | 1620×1130×120               | 1680×1130×120               | 1690×1045×125 | 1680×1130×120 | 1690×1045×125 | 2000×1130×120 |

## 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.

| Current class                                | Alpha ( $\alpha$ )  | Beta ( $\beta$ )  | Gamma ( $\gamma$ )  | Delta ( $\delta$ )  | Epsilon ( $\epsilon$ )  |
|--|---|---|---|---|---|
| Label  |  |  |  |  |  |
| Ref. UP-MXXXM Monocrystalline (5-inch cells) | $I\alpha < 5.45A$   | $5.45A \leq I\beta < 5.55A$   | $5.55A \leq I\gamma < 5.65A$  | $5.65A \leq I\delta < 5.75A$  | $I\epsilon \geq 5.75A$  |

|   |                      |                                |                                 |                                 |                              |
|---|----------------------|--------------------------------|---------------------------------|---------------------------------|------------------------------|
| <b>Ref. UP-MXXXM<br/>Monocrystalline<br/>(6-inch cells)</b> | $I_{\alpha} < 8.75A$ | $8.75A \leq I_{\beta} < 8.85A$ | $8.85A \leq I_{\gamma} < 8.95A$ | $8.95A \leq I_{\delta} < 9.05A$ | $I_{\varepsilon} \geq 9.05A$ |
| <b>Ref. UP-MXXXP<br/>Polycrystalline</b>                    | $I_{\alpha} < 8.45A$ | $8.45A \leq I_{\beta} < 8.55A$ | $8.55A \leq I_{\gamma} < 8.65A$ | $8.65A \leq I_{\delta} < 8.75A$ | $I_{\varepsilon} \geq 8.75A$ |

### 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 will only content modules of the same current class as a default, while one pallet can be mixed with different current classes in one container.
- 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.: OOLU7462055 |     |          |                    | Lead sealing No.: ALD9515 |        |        |        |        |       |            |                |
|----------------------------|-----|----------|--------------------|---------------------------|--------|--------|--------|--------|-------|------------|----------------|
| Pallet No.                 | No. | Type     | Serial No.         | Pm(W)                     | Voc(V) | Isc(A) | Vpm(V) | Ipm(A) | FF    | Date       | Grade          |
| UP4M028090300407           | 1   | UP-M185M | UP0120281008220080 | 186.7                     | 45.47  | 5.605  | 35.69  | 5.233  | 0.733 | 24-08-2010 | I <sub>γ</sub> |
|                            | ... | ...      | ...                | ...                       | ...    | ...    | ...    | ...    | ...   | ...        | ...            |
|                            | 23  | UP-M185M | UP0120281008220083 | 187.8                     | 45.47  | 5.615  | 35.83  | 5.242  | 0.734 | 24-08-2010 | I <sub>γ</sub> |

## 7. Upsolar Packing Process



Each finished pallet is wrapped in plastic film to ensure the pallet integrity



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

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Step five: Loading into container and fixing with PE belt