



## Assembling module line PTA1

### 1. Soldering:





2. Inserting strings:



3. Glass inlet:





Winders:



Recycle  
Por favor



4. Interconnection:





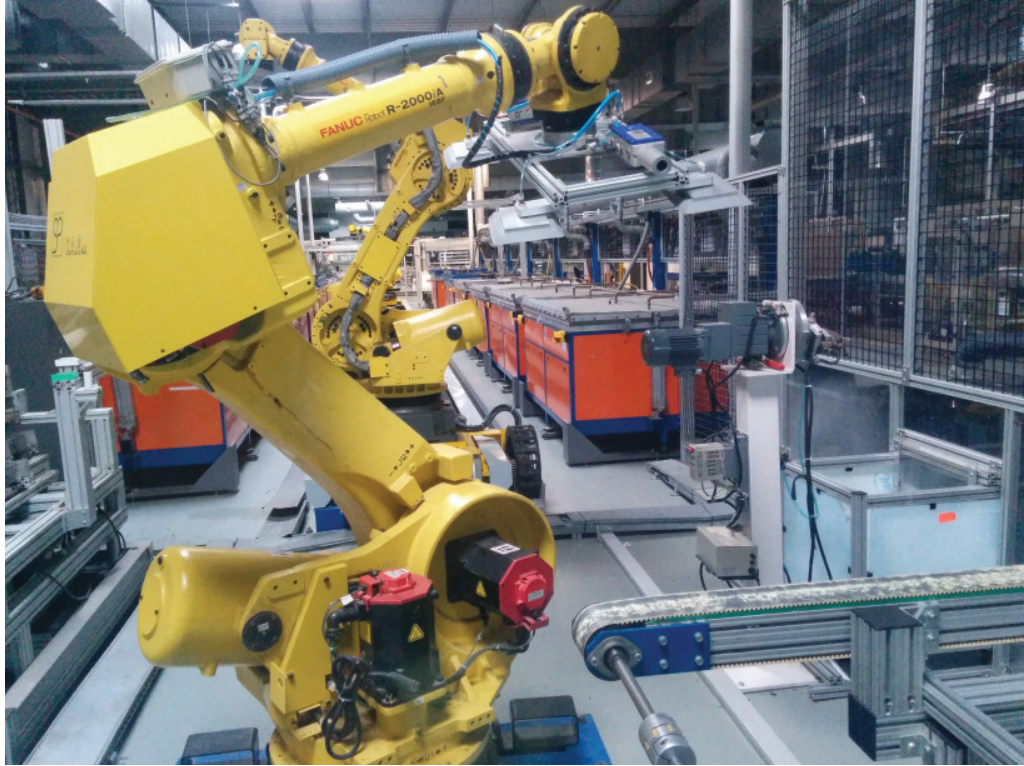
5. Lamination:







6. Automatic deburrie:





7. EOL- End of Line:



8. Adhesive bonding of connection boxes:







9. Frame press:



10. Solar simulator:



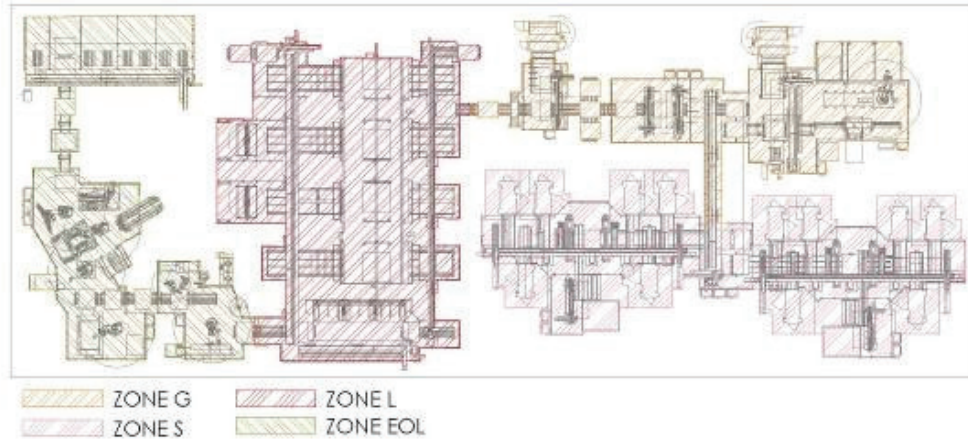


11. Palletizing:



Recycle  
Por favor

## AUTOMATIC MODULE LINE (REIS)



Automatic module line (REIS) is one of the most advanced lines for laminating/framing modules, manpower is only necessary for feeding or inspection issues. This line has four differenced zones: GLASS or “G” which is the glass inlet, SOLDER “S” which is cells inlet and where the strings are performed, LAMINATION “L” where the matrix are laminated and finally END OF LINE “EOL” were the module is measured and framed.



## Glass

This is the beginning of the line, it is the glass, EVA and Tedlar inlet. Tasks in this area are washing glass, EVA, Tedlar and PCB. The interconnection between strings, holes in EVA and Tedlar and serial number labeling is performed in this area too.

The process begins when robot RV60LS picks a glass and introduces it into the washing machine:



Once the glass is clean a robot RL130 places EVA and PCBs on the glass:



The EVA and Tedlar are prepared by REIS robots by two ROBUST winders:



The module is carried to the soldering by a robot RL80 zone and comes back with strings placed on it:



Strings are soldered to the pcbs as well as terminals by four robots RV2016:



Two operators inspect the module:



EVA and Tedlar are placed on the module by a RL130 finishing the sandwich, a hole for the terminals and labeling are performed here:



Recycle  
Por favor

Final check and the module is ready to be laminated or it is extracted of the line if it needs to be repaired:



Modules that need to be repaired are extracted and introduced through this conveyor:



## Soldering

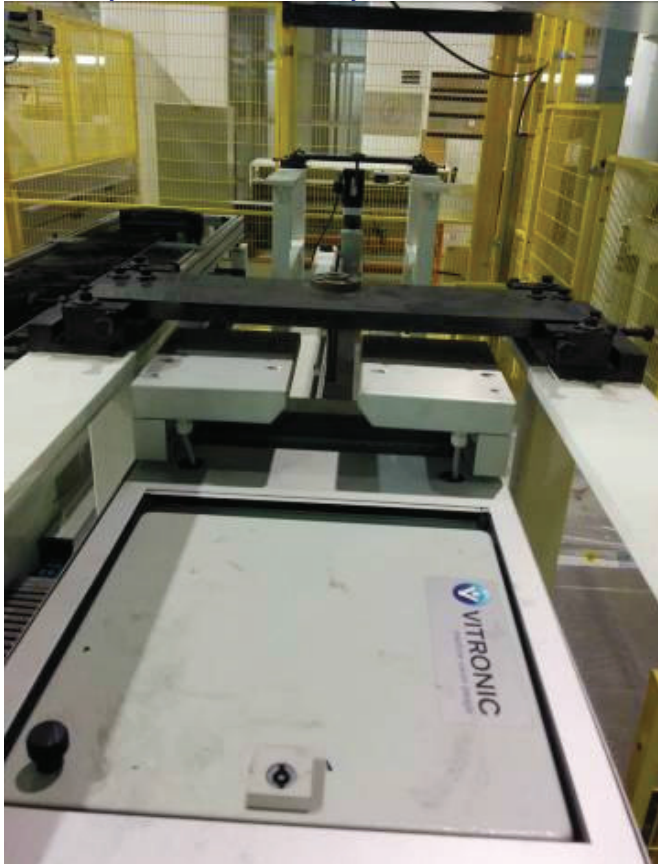
This area is where the tab-wafer soldering is made and the strings are performed. These strings are placed on the glass.

Solder area is composed by six RL50 robots which moves the strings.

Eight soldering machines (five Komax XCELL 3400, two Komax XCELL 3300 and one TopTec) divided in two independent soldering areas are continuously producing strings feeding the line besides a TopTec solder machine is placed out of line:



A vision system manufactured by VITRONIC checks the strings and rejects bad ones:





Two vertical Modula warehouses stores strings, good ones to buffer the system bad ones to be repaired:



Strings can be repaired in this place:



## Lamination

In this area the module is laminated, cooled and inspected before EOL.

Modules are delivered to laminators by a **RL130** robot laminated by four laminators: Two TopTec TM-ISFT-Z00770 and Two Meier ICOLAM 36-21 which are able to laminate up to 3 modules per cycle and per laminator:



On the back of Lamination zone there is a buffer for laminated and not laminated modules configurable by operators with capacity for 60 units. A **RL130** introduces and extras the modules into the warehouse:



After the module is laminated a RL130 places the pieces in two inspection places where modules are inspected and prepared to be framed:



Laminated modules no ok are extracted trough this conveyor:



## End of Line

This is the area where the box is attached; the module is measured, framed and palletized according its measurement.

First step in this zone is to deburrie the module by a **RV60LS**:



After that a robot **RV2016** places the box with a silicon cord on the terminals:



Another robot RV2016 prepares the terminals and solders them to the box:



In this place the solder procedure is inspected and the measurement of the modules is controlled:



A robot picks the module and measures it in one of the two ENDEAS QuickSun 540LA-XL solar simulators by a RV40XL:



After the measuring the edges of the module are covered with neoprene tape by a RV40XL:



Then the module is placed in the press where previously other robot has placed the frames:





And finally corners are crimped to fix the frames by a RV40XL:



These robots RL16 and RV40XL prepare the frames and the corners into the framing table:





A Hi-Pot test can be done if it is required:



In this place the module is inspected before palletizing:



Recycle  
Por favor

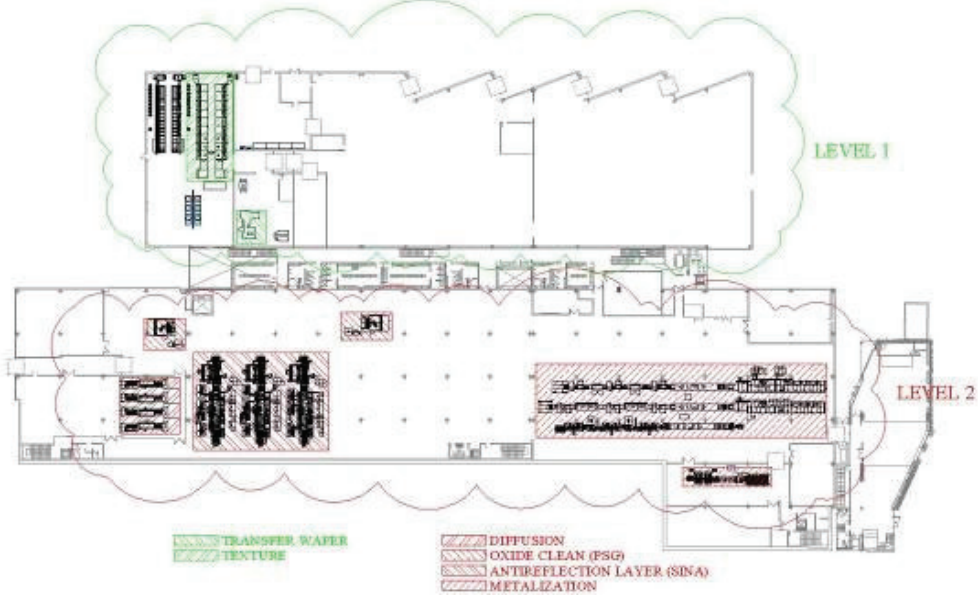
Finally the modules are placed in a pallet according to their classification by a RL130:



Out of the line we have a KomaxSolar X inspect 2800i IR test machine:



### LINE OF CELLS



Semi automatic cells line begins with the inspection of the wafers in a Jonas & Redman. The wafers are then texturized, cleaned and introduced in SEMCO diffusion ovens where are doped with phosphorus. After that wafers are treated with an anti-reflexive layer in a SINA oven. Finally wafers are metalized in two ASYS lines and classified in two Manz laser-classifiers.



## Load Machines

Wafers come in packages and load machines put them into cassettes. There are two load machines: the main machine which is a **Jonas & Redman** loader where wafers are inspected carefully and the **Manz** loader which is a backup machine and it just load the wafers into cassetts:



## Texture lines

There are two **ASTEC (RENA)** alkaline texturing lines model **WTBS BC8** where the wafers obtain the texture, after that wafers are dried in spin-dry machines. These lines are prepared to work with mono-crystalline cells (the rest of the processes can work with both mono and poly):



## PSG

Oxide in wafers is eliminated by immersion in HF, in the **RENA PS-ETCH** machine a **STABULI** robot does this labor:



## Diffusion

In the diffusion ovens wafers are doped with phosphorus. There are four **SEMCO** ovens **DF5200** with 4 tubes each and automatic load:





## AR

Anti-Reflexive layer is applied to the wafers in **SINA** ovens there are three and they are compounded by a **MANZ LOADER**, a **MANZ UNLOADER** and an **ROTH&RAU 16/2007 OVEN**:



## Metallization

Metallization is composed by two **ASYS** lines where different layers are applied to the wafer: Buses frontal, busses back, BSF. Different printers are dried by ovens ending in a firing oven:





It begins with an **ASYS** loader model **ASH** which in fact is a double loader followed by a brake detection:



Front and Busses layers consist in two Serigraphy **ASYS ASP01** and two inspections **ASYS ASH**:



Recycle  
Por favor



BSF layer has **ASYS** broke detection instead inspection:



Recycle  
Por favor



Line 11 has three ovens **NOVASTAR 2000HT** and a firing oven **RTC 1124x** Line 12 has two ovens **ASYS RDS2100** and a firing oven **RTC 1124x**.



**Novastar 2000HT**

**ASYS RDS2100**



**Firing RTC 1124x**



## Laser-Classification

The metallization lines ends in **MANZ Laser-Classification** where edges are cut by a **ROFIN SC/DISC 100ICQ laser**, measured and separated according to their power:

