

HIGH PERFORMANCE TABBER & STRINGER

TS SERIES



TS1200

MONDRAGON ASSEMBLY



Our Advantages

Mondragon Assembly, a company of Mondragon Corporation



More information in: www.mondragon-corporation.com

The belonging to the Mondragon Corporation brings to Mondragon Assembly the necessary solidity to assure an effective long term partnership with its clients.

Today Mondragon is the seventh largest business group in Spain and it is distributed in four big areas:

- Financial, with its own bank and insurance company;
- Industrial, with companies manufacturing a wide variety of products, from machine tools to consumer goods, from white goods to buildings;
- Retail: One of the biggest supermarket and hypermarket chains in Spain;
- Knowledge: with the Mondragon University and the R&D centres which play a key role on the development of the companies within the Corporation.

Mondragon Assembly, the Group

Mondragon Assembly is an International Group of companies that offers solutions for high level of automation and assembly processes.

The company started the activity in the Solar Sector in year 2000, applying the different technologies already known in other sectors such as automotive, electrical, medical, cosmetics and developing new applications specifically in this sector.

Some of the aspects we could pinpoint are:

Experience in the field

With over 30 years experience in process automation and a background of almost 10 years providing assembly technologies for the PV Module Industry, we have a wide portfolio of customers worldwide.

Proximity and Flexibility

With subsidiaries in Europe (Germany, France, Spain) and Mexico and commercial partners in China, India, Taiwan and USA, we are able to adapt your requirements into our equipment-solution.

Know-how

Mondragon Assembly keeps the position of a pioneer in the development and evolution of applications with new technologies for automation (robots, artificial vision, linear motors, soldering,...) The new working lines are focussed on laser scribing and ink-jet high precision solutions for future PV applications.

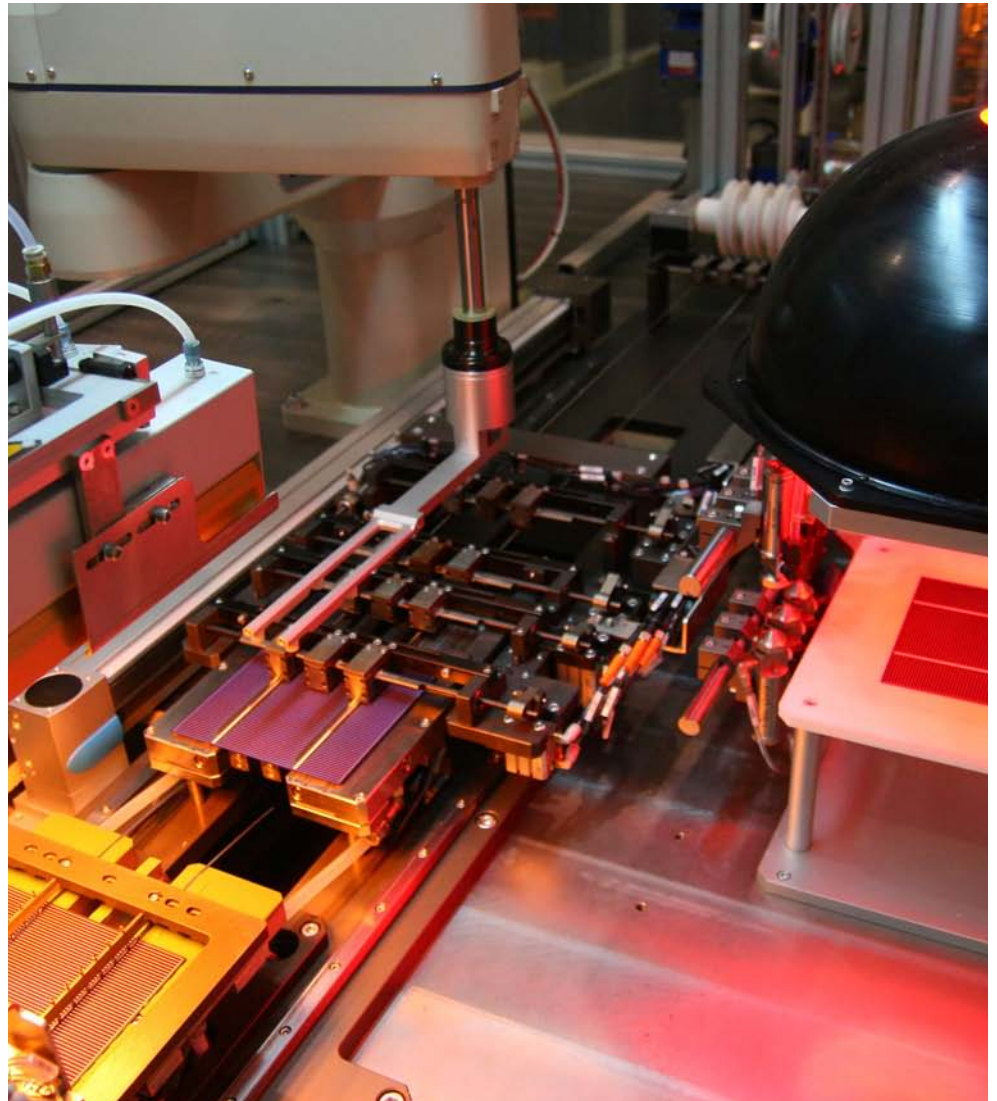




Mondragon Assembly's Tabber Stringers ensure optimal soldering between the cells and the ribbons to allow the electricity to flow between them and ensure the module's quality and longevity.

Our Tabber & Stringer offers a combined process to solder the front and back of the cell, based on infra-red technology and adopts all the valid technological breakthroughs to minimize breaking cells.

The TS series have two different ranges of models: High performance models for those seeking for a state of the art equipment with all the technical and technological improvements and an entry level model for those seeking for simplicity and cost-effectiveness.



The machine has been designed to ensure an optimal soldering quality:

- The internally developed Infra Red lamp and control system allows an accurate temperature control on the cell and an homogeneous heating of it.

The whole machine has been developed to minimise breakage:

- The contactless fluxing system, the cell alignment by vision, the handling by robot allows a very low mechanical stress on cells.

- The completely parametrable soldering process allows a non aggressive soldering, minimising thus the thermal stress on the cells.

The optimal final geometry of string and module is ensured by the use of a high performance tab handling system, powerful vision and robot, vacuum integrated walking beam and servo driven gantry system.

All these features are integrated in a user friendly and easy to maintain machine. Maintenance operations are simple, fast and easy and can be made by operators. The changeover time for ribbon change, cell type (5"/6" or 2/3BB) change or string model change is minimal.

Specifications

Tabber & Stringer

Model	TS 600 LT	TS 600	TS 1200
Cell parameters			
Cell dimension range (")		5" - 6"	
Cell thickness range (mm)		0.16 - 0.3	
Cell geometry		all	
Tab			
Number of tabs per cell (2/3)		2 or 3	
Minimum distance between tabs		For 2 busbar cells: 56 mm - for 3 busbar cells 29 mm	
Maximum distance between external tabs		110 mm	
Tab soldering process		Line	
String			
Max. string length		1950	
Nominal distance between cells		> 2 mm	
Tabbing & Stringing			
Cell aligning system	Mechanical	Vision	
Tabbing & Stringing process		One step	
Flux dispensing system		Spray	
Soldering process		Focused IR lamp	
Z- Shape	●	●	●
Cell transport system			
Tabbing	Manipulator	Scara Robot	
Stringing		Walking beam	
Cell loading/unloading			
Max. number of cells per stack		250	
Cell loading	Automatic (2 stacks)	Automatic (5 stacks)	Automatic (10 stacks)
Performance features			
Maximal throughput		700	1200
Nominal throughput		640	1125
Average cell breakage ratio		< 0,3%	
Air supply			
Compressed air pressure		600 Mpa	
Compressed air flow		650 NI/min	1500 NI/min
Power supply type			
Maximal Power	15 kW	27 kW	49 kW
Utilities		380 V, 50/60 Hz	
Power consumption	6 kWh/h	8 kWh/h	15 kWh/h
System size			
Weight	2500 Kg	3000 Kg	5000 Kg
Size for transport (length x width x height)	5600 x 1700 x 2100	5600 x 1950 x 2650	5600 x 2560 x 2650
System control + Software			
PLC		Beckhoff	
Remote connection	●	●	●
Others			
Calibration tools	●	●	●
Colour		Ral 9010, Ral 3002 & Ral 7025	



Lay Up

Model	Lay Up on tray	Lay Up on glass	Lay Up on glass with string check
Compatible machines			
TS 600 LT	●	●	—
TS 600	●	●	—
TS 1200	—	●	●
TS 2400 HP	—	—	●
Module			
Maximal module size (length x width)	—	2000 x 1100	
Minimal module size	—	1200 x 300	
Features			
String unloading	Mechanical (X-Z)	Electrical (X-Z-Turn)	
String check by vision system	—	—	●
String check by EL system	—	—	●
String positioning accuracy	—	< 0,3 mm	
Module assembly			
Incoming conveyor glass (buffer 2 glasses)	—	●	●
Outgoing conveyor glass (buffer 1 glass)	—	●	●
Check EVA	—	●	●



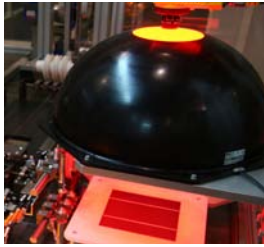
TS600

●	Included
●	Optional

Geometry	Max	Min	Tol
Distance among cells (mm)	200	2	+/- 0,2
String length (mm)	1950	1 cell	+/- 1
Tab	Max	Min	Tol
Tab + length (trailing tab) (mm)	250	7	+/- 0,2
Tab - length (leading tab) (mm)	25	10	+/- 0,2
Tab to cell edge front (mm)	4	2	+/- 0,2
Tab to cell edge back (mm)	10	2	+/- 0,2
Front tab lateral deviation (mm)			+/- 0,3
Front tab rotation deviation (°)			+/- 0,5°
Back tab lateral deviation (mm)			+/- 1
Back tab rotation deviation (°)			+/- 1°
Flux dosing spray	Max	Min	Tol
Width (mm)	8	4	+/- 1,2

Main Features

Minimal mechanical stress



Vision System

- Thanks to the powerful vision system any of the standard cell shapes can be used in the machine.
- The high resolution camera allows the inspection of chips, cracks, grid patterns, cosmetic defects...
- The user can choose the alignment of the cell by its contour, grid pattern...



Contactless Fluxing System

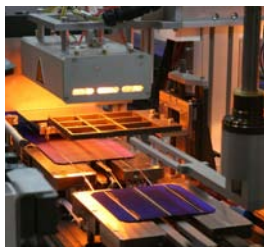
- Allows a very precise dosing of the flux. A minimal quantity is dosed by the spray system reducing cleaning time.
- The length of the dosed flux can be adjusted and thus the length of the soldered ribbon, minimizing the stress on the string while further manipulations are done.



Robot System

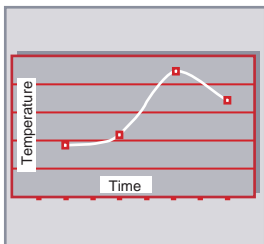
- Cells are handled by means of tool with vacuum pads.
- The smooth handling of the cell allows to minimize the breakage rate.

Soldering quality and minimal thermal stress



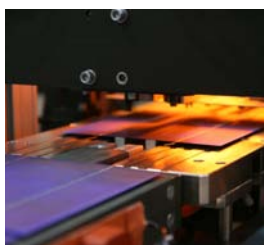
Infrared Soldering System

- The use of an internally developed infrared lamp allows an homogenous heating of the cell, minimizing thermal gradient within the cell.
- The design of the lamp allows the use of 5/6" cells and 2/3 bus cells without any change on the lamp.
- The intelligent control is able to adapt the soldering cycle to the thickness variations of cells within the same batch.



Absolut Control of the Soldering Process

- Thanks to the parameterized soldering process the perfect soldering quality can be achieved.
- With the adjustment of parameters such as: Maximum temperature on cell, cooling temperature, heating power,... a uniform and continuous soldering can be achieved with minimal crystal damage.



Three Step Soldering Process

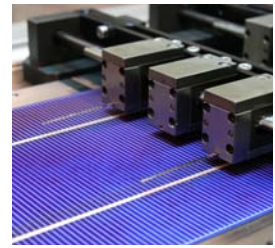
- The cell is heated and cooled in a smooth and controlled way by the use of preheating, soldering and cooling zones.
- The single zone preheating, and the 3 zone cooling allows a smooth ramp up and down in temperature avoiding any abrupt temperature change in the cell and thus minimising breakages.

String and module geometry

Tab Handling

The tab handling is done by means of clamps and scissors. Main advantages are:

- The tab is always held by clamps or steppers ensuring a very accurate positioning and alignment of the tab and thus the string.
- The tab anticamber system ensures the correct stretching of the tabs and thus lets a very precise linearity of the tab.



Z-Shape

- With the "z-shape" feature Mondragon Assembly's TS can perform a deformation on the tab to minimize the mechanical stress in the cell edges on the string.
- The intelligent tab end control allows the independent adjustment of leading and trailing tab length depending on string position on glass, avoiding any further rework on the panel and reducing defective modules.



Lay-up

- With the integrated lay-up system a single manipulation is enough to place the string in its final position on the glass. There is no need to further manipulation, nor manual nor automatic. Less manipulation, less breakage.
- The accuracy and repeatability of the lay-up system is ensured by the use of servo controlled gantry systems.



Flexibility, maintainability and user-friendliness

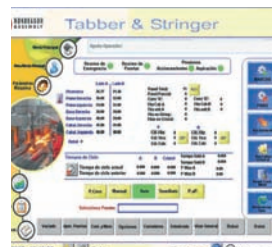
Flexibility on String and Module Geometry

- The machine is able to manufacture an infinity of different strings or module types: values of leading and trailing tab, distance between cells, number of cells per string... can easily be configured by means of the user friendly touch screen.



Multiple Recipe Storage

- The machine can store more than 100 independent recipes for soldering parameters, glass or string geometry, vision control adjustment, ribbon parameters...
- This makes the machine able to process different types of cells, ribbons, module sizes... in an easy way, reducing changeover time from reference to reference.



Maintainability

- Thanks to the simple design of the soldering station, maintenance operations are minimal, fast and easy to do.
- Productivity is enhanced due to the specifically designed simple parts, clean elements and ergonomic accesses.



Mondragon Assembly is part of the Mondragon Corporation, the management structure of which is divided into four large Groups: Financial, Industrial, Retail and Knowledge. Each Group operates independently within the framework of a common strategy.

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