SPI-ASSEMBLER™ 5000

Automated Solar Cell Assembly

The SPI-ASSEMBLER™ 5000 is an automated production machine which interconnects solar cells by soldering flat metal leads, or tabs, to cell contacts. The machine processes solar cells at a nominal throughput of 500 cells per hour, resulting in substantial cost savings in high volume production through improved yield and reduced labor.

Solar cells are unloaded from stacks and edge-aligned with a mechanical aligner. Tab material is fed from spools, coated with flux, cut to length, and provided with a stress-relief bend. Tabs and cells are aligned for soldering.

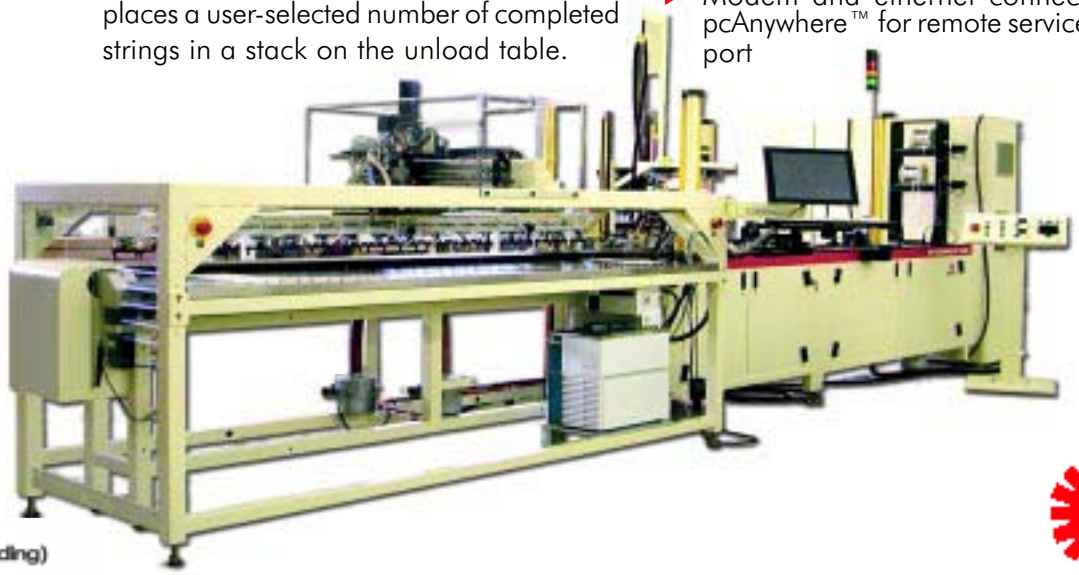
High-intensity lamps in the solder head assembly provide radiant thermal energy to the cells and tabs. Cells are preheated to minimize thermal stress and improve yield. Both front and back cell contacts are soldered in a single heating step.

A variety of solar cell sizes and shapes can be processed. The number of cells per string, the cell spacing, the ribbon length, the stress bend location, and the soldering parameters are software programmable.

A two-axis robotic string unloader places a user-selected number of completed strings in a stack on the unload table.

Features and Benefits

- Automated and programmable assembly results in reproducible, high quality soldered cell strings
- Mechanical snugging system provides cell alignment
- High-intensity light soldering with preheating for improved throughput and yield
  - *Rapid soldering process*
  - *Minimum mechanical force on cell*
  - *Low thermal stress*
  - *Hinged bracket for easy servicing of lamp assembly*
- Software selectable module design
  - *Tab length and stress-relief bend location*
  - *Number of cells per string*
  - *Cell spacing*
  - *Soldering parameters*
- Adaptable to a wide range of cell and tab designs
- Computer controlled with a graphical user interface software package
- Touch screen for easy cycle programming and process monitoring
- Modem and ethernet connections and pcAnywhere™ for remote service and support



SPI-ASSEMBLER™ 5000

CE (Pending)

CERTIFIED BY STR-R ISO 9001:2000 REGISTERED COMPANY ANSI-RAB QMS ACCREDITED

spire Solar

Spire Corporation/One Patriots Park/Bedford, MA 01730-2396/USA/TEL 800-510-4815/781-275-6000/FAX 781-275-7470/EMAIL pvsales@spirecorp.com/WEB www.spiresolar.com

SPI-ASSEMBLER™ 5000 Specifications

1. Solar Cell Geometry ..... *square, rectangular, pseudo-square or round with flats. Completely round requires vision system for alignment.*

2. Maximum Cell Dimensions ..... *20 cm x 20 cm (8 in. x 8 in.)*

3. Number of Interconnect Ribbons *2*

4. Maximum String Length..... *200 cm (78.7 in.)*

5. Nominal Throughput ..... *500 cells/hour*

6. Equipment Dimensions: *(excluding computer system and console)*
   Length ..... *587 cm (231 in)*
   Width ..... *213 cm (84 in)*
   Height ..... *244 cm (96 in)*

7. Equipment Weight (Approx. Net) ..... *1500 kg (3300 lbs)*

8. Facility Requirements:
   Electricity .....200-240 VAC, 50A, 50/60 Hz Three Phase
   Compressed Air:
   Pressure..... *550-700 kPa (80-100 psi)*
   Flow ..... *170 l/min. (6 scfm)*

Options

- String I-V Test - *A pulsed xenon lamp illuminates the cell string (up to 20 cm x 200 cm), an I-V curve is measured, and the string is placed either in a reject bin or in a proper location for a module, based on user selected criteria.*
- Vision System for Cell Alignment - *Vision system with CCD camera, electronics, and software provides alignment of cells to tabs using cell pattern information. The system checks for non-conforming cells and automatically rejects any cells with chips or cells that cannot be aligned. Allows round cells to be processed.*
- 3rd Ribbon Path - *A third interconnect ribbon is dispensed, fluxed, formed, cut and placed, and a third solder lamp is provided.*
- Module Layup - *Automatically aligns and places each string in position for module assembly. The number of strings per module and the string orientation in the module are software programmable.*
- Tooling - *Tooling for additional cell sizes and ribbon spacings*
- Three-Phase Transformer - *Allows operation at voltages other than the standard 200-240 VAC range*

For additional information or design and application assistance, please call, fax or email us at the numbers below.

Spire Corporation/One Patriots Park/Bedford, MA 01730-2396/USA/TEL 800-510-4815/781-275-6000/FAX 781-275-7470/EMAIL pvsales@spirecorp.com/WEB www.spiresolar.com