



# SOLARPREP™

Dispensing Automation for  
Renewable Energy



## 4 Photovoltaic

### Mono Crystalline Photovoltaic Solar Panel Assembly

Post lamination fully integrated crystalline PV factory assembly system.

Semi-automatic assembly solution including automatic frame assembly, junction box installation, potting and bonding, stringers soldering and sealing.

## 6 Modular Solar Panel Assembly

Modular single & multi-stage robotics and dispensing system including conveyor connectivity.

Bead laying for stringers.

Potting and sealing junction boxes.

Edge frame and frameless sealing.

## 10 CPV Concentrated Photovoltaic Solar Power Assembly

Technology for concentrating solar energy to a single Si component receiver via prism lens.

Micro component mix-on-the-fly bead sealing and bonding of component package.

Prism bonding of lens.

Robot assembly.

Automated production systems.

Specialized handling.

## 11 CST Concentrated Solar Thermal

Concentrated solar thermal (CST) systems use lenses, parabolic mirrors or linear reflectors to focus a large area of sunlight onto a small area.

Two part adhesive mixing and dispensing equipment.

Hot melt bonding and sealing systems.

Mirror bonding to frame.

Robot assembly.

## 12 Thin Film Cell Production

Thin film processes use a number of techniques, Fisnar provides dispensing systems for use in the final assembly of sealing and bonding.

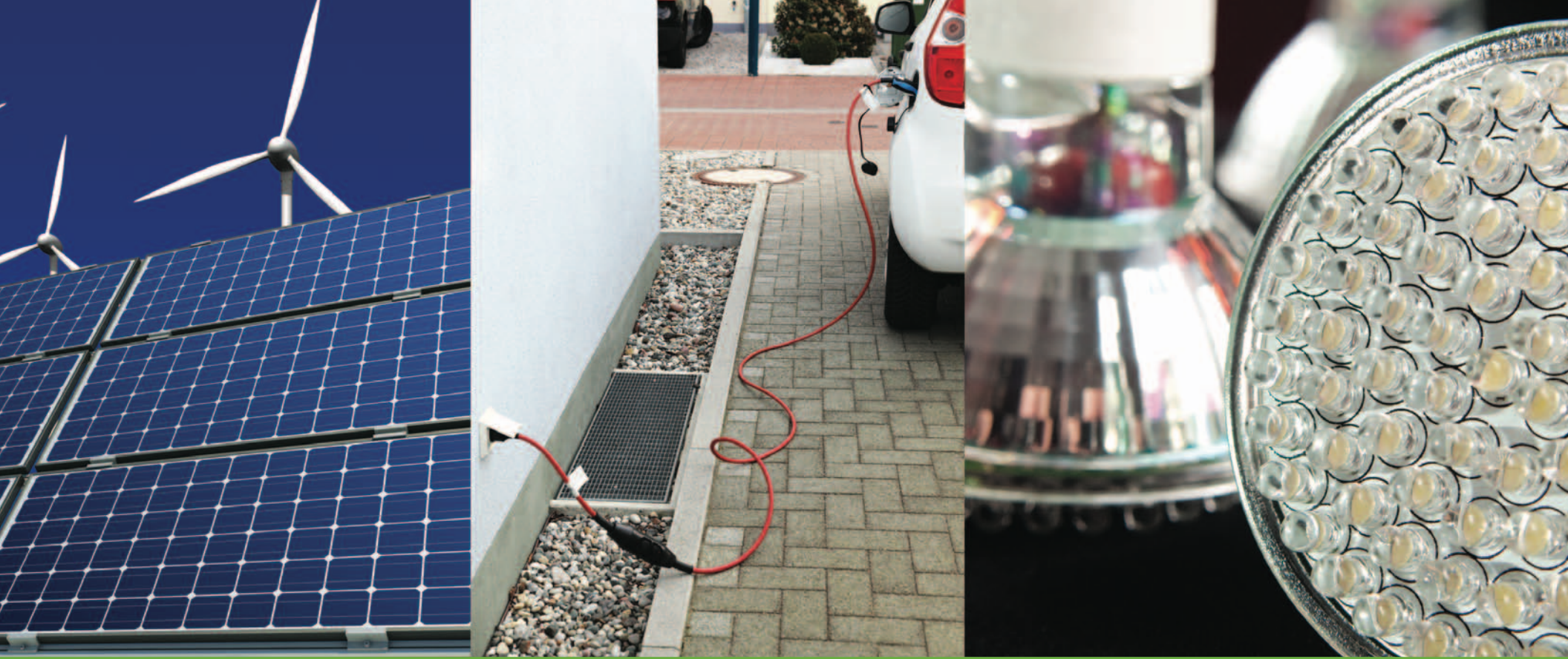
Bead laying.

Potting and sealing junction boxes.

Edge frame and frameless sealing.







## 13 Wind Power Turbine Blade Assembly

- Lamination fiberglass hot melt process equipment.
- Resin casting low pressure meter & mix systems for vacuum processes.
- Single and two part sealing process equipment.
- Potting and silicone sealing of junctions & fixings.
- Turbine environmental sealing and component encapsulation.

## 14 Electric Vehicles (EV) Lithium ion Battery Production

- High pressure meter & mixing systems for sealing battery units.
- Resin casting low pressure meter & mixing systems for encapsulating.
- Modular and in-line robot assembly dispensing systems.
- Interconnection assembly.

## 15 Light Emitting Diodes (LED) Assembly & Packaging

- High pressure severe-duty meter & mixing systems for assembling components.
- Resin casting low pressure meter & mixing systems for encapsulating.
- Modular and in-line robot assembly dispensing systems.
- Micro mix-on-the-fly two part conductive material dispensing.

# Photovoltaic - Crystalline Assembly

## Integrated Production Line for Panel & Frame Assembly



### Model AL944M

The AL944M is a semi-automatic panel production line requiring a maximum of 4 line operators. The line can be configured to suit the needs of the manufacturer. It starts with accepting the laminated photovoltaic glass ready for the assembly of components and finishes with a framed panel. The potential completed manufacturing cycle time is one panel every 60 - 90 seconds.

The following are the transported stages of manufacture. These components are modular and are available separately to accommodate production requirements:

1. Conveyor loading.
2. Trimming panel sides.
3. Attach junction box (JB) assembly.
4. Solder JB connections.
5. Inspection of JB solder connections.
6. Optional - Electrical Test & QC of JB.
7. Potting and sealing of JB.
8. Sealing both sides of panel.
9. Oven air cure sides at 60°C.
10. Automatic frame handling, adhesive conditioning and attach.
11. Conveyor unloading.

Model	In-line System Modules
AL944M	Fully Integrated Assembly System
AL943M	Junction Box Assembly Module
AL942M	Frame Assembly Module
AL941M	Dual Side Panel Sealing Module
AL940M	Junction Box Vision Inspection Module
AL939M	Junction Box & Panel Electrical Test Module
AL938M	Transport Conveyor Module

### Summary Specification - AL944M

Total floor area:	17.81 x 14.61 x 3.82 (meters)
Loading & unloading:	Roller conveyor system
Junction box dispenser:	3-axes servo motor robot
Dual seal dispenser:	4-axes servo motor robot - dual valve
Oven:	Max temp 80°C - Operate 60°C - 70°C internal size 4950 x 3500 x 2500
Short & long frame attach:	Loader - diverter - dispense - transfer - press
Trimming:	Manual - system presentation - 4 sides
Power:	AC220V 50/60 Hz - solenoid valves DC24V Servo motor AC220V 50/60 Hz
Weight:	23 tons total all modules

#### 1. Loading from Previous Process

Automatic loading transport stage - custom to suit panel size.

#### 2. Manual Trimming Stage

Removes burrs and excess - ensure even edge for processing.

#### 3. Junction Box Installation

Robot dispenses a bead of glue on the junction box and cable form assembly - the prepared part is then placed on the glass panel by the operator, or optional pick & place robot.

#### 4. Robot Solder Station

Solders cable form connections to junction box.

#### 5. Inspection

Checks for correctly soldered connections. Failed inspection of soldered connections routed to reject stacker

#### 6. Optional Test Current & QC Stage

Test electrical integrity of junction box and panel.

#### 7. Junction Box Potting

Robot automatically dispenses potting compound.

#### 8. Top & Bottom Edge Sealing

A robot & valve provide a low profile ribbon of silicone sealant to encapsulate the top, bottom and edge of all four sides of the glass panel.

#### 9. Air-Drying Oven Cure

Edge sealant cured at 60°C - 70°C. A 20 stack step-through elevator air-dry and cooling system ensures constant production throughput.

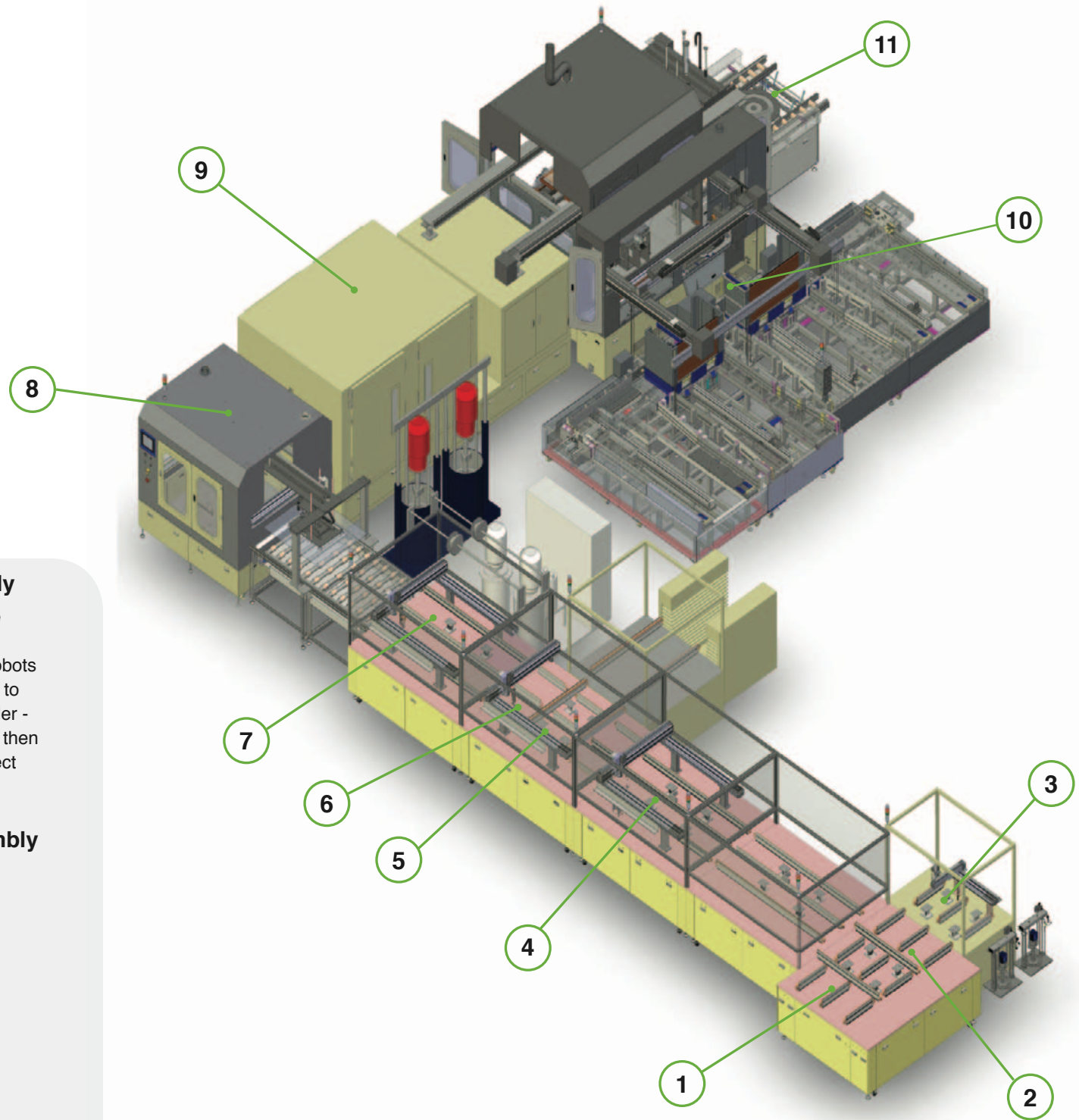


### 10. Frame Pick & Place Assembly

After curing the panel is transported to the framing module - a centering robot aligns each panel by an air cushion. Transport robots select frames in pairs, adhesive is applied to the frames and placed in an auto-assembler - long frames installed and press fitted first, then the short frames are auto aligned for perfect registration.

### 11. Unloading Completed Assembly

Automatic unloading transport stage with optional stacker.



# Photovoltaic - Crystalline Assembly



## 6 Steps to Photovoltaic Modular Fabrication

A flexible and cost effective strategy of automating solar assembly is to install modular function modules for handling and dispensing the potting and sealing materials required in panel assembly. Equipment can be repurposed and upgraded as required to suit changes in design and volume.

We have listed recommendations of Fisnar robotic and dispensing equipment to match the component job functions. Details on these recommendations can be found online at [www.fisnar.com](http://www.fisnar.com) or in selected brochures by calling 973-646-5044 for your free copies.

## Step 1 - Junction Box Assembly

### Module Assembly - Junction Box Assembly

Bonding, form-in-place gaskets, soldering, potting and sealing. Cable forms also applicable to this step.

#### Gantry & Cantilever Robots

Suitable for in-line conveyor transported panel applications or off-line modular concepts. Heavier loads may be mounted and larger working sizes are available from 300 x 300mm up to and greater than 4000 x 2000mm.

#### Desktop Dispensing Robots

Fisnar economic desktop robots provide an off-line flexible method of volume production performing a single task, such as dispensing a liquid gasket. Available in 3, 4 and 5 axes with a choice of servo or stepping motor drive arrangements. Working sizes from 200 x 200mm to 500 x 500mm.

#### Single Part Fluid Dispensing Equipment

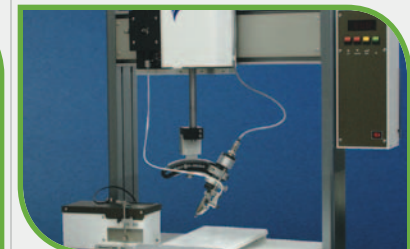
A wide selection of dispensing valves and feed systems is available for dispensing form-in-place gaskets, bonding and sealing applications using single part fluids.

#### Two-Part Pre-Mixed or Meter & Mix Equipment

Two-part materials are specified for durability and dielectric properties - they often contain fillers to alter their characteristics. Fisnar supplies a wide range of Meter & Mix equipment that can be interfaced to in-line or off-line dispensing robots or used manually where required. Visit [www.fisnar.com](http://www.fisnar.com) to complete a meter-mix questionnaire, select submit and a Fisnar engineer will respond to your request.

#### Soldering Robot

In-line soldering robot module for panel transport system. Solders cable form connections to junction box prior to testing and potting.





# Photovoltaic - Crystalline Assembly

## Step 2 - Conductive Stringer Panel Connections

### Module Assembly - Conductive Stringer Panel Connections

Bonding rigid or flexible circuits, form-in-place conductive formulations, soldering, dispensing conductive adhesives, potting, sealing and UV cure.



### Two-Part Pre-Mixed or Meter & Mix Equipment

For potting after soldering or casting two-part materials. These two-part materials are specified for durability and dielectric properties - they often contain fillers to alter their characteristics.

Mix-On-The-Fly waste saving technology can be offered for continuous fine bead dispensing of conductive material without the inconvenience of pre-mixed and frozen low volume syringes or cartridges.

Visit [fisnar.com](http://fisnar.com) to complete a meter-mix questionnaire and a Fisnar engineer will respond to your request.



### Gantry & Cantilever Robots

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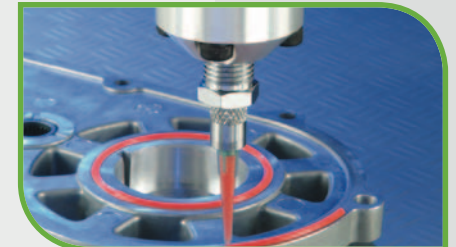
### Soldering Robot

In-line soldering robot module for panel transport system. Solders stringer connections on flexible or rigid circuitry.



### Single Part Fluid Dispensing Equipment

A selection of dispensing valves and feed systems is available for dispensing form-in-place conductive stringers, bonding and sealing with single part fluids. Rotary valves are used for solder paste and heavily filled adhesives.



# Photovoltaic - Crystalline Assembly

## Step 3 - Panel Edge Sealing

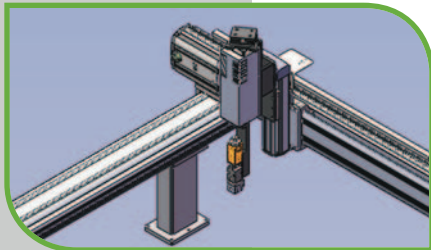
### Module Assembly - Panel Edge Sealing

Sealing the side edges on a glass panel prior to cure & framing.



### 4 Axis Gantry or Cantilever Robot

Suitable for conveyor transported panel applications. The robot will guide a double sided dispensing valve around each side of a glass panel after Steps 1 & 2. Panels sizes of up to 4 meters by 2 meters can be accommodated.



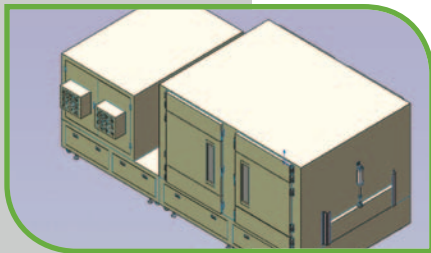
### Double Sided Dispensing Valve for Single Part Fluid:

The valve provides a low profile ribbon of silicone type fluid to encapsulate the top, bottom and the edge of all four sides of the glass panel. The sealant is then cured in Step 4.

## Step 4 - Cure Aging

### Module Assembly - Cure Aging

An aging and cooling process for curing the sealant applied in Step 3.



### Oven

Ovens are available to suit the panel size. The number of panels that can be processed is dependant upon the number of stacks in the oven elevator transport system.

Panels are delivered to the oven from the sealing station in Step 3 via a conveyor transporter. The panel enters an index stacker and is elevated so that the oven is ready for the next panel. The elevator ascends and descends the panel during the cure cycle. A robot within the oven transfers the cured panel at the bottom of the cycle to the secondary cooling elevator where it ascends to the oven exit transport.

The maximum temperature of the oven is 80°C and the normal cure temperature is 60°C to 70°C.

Once cured the stack moves to the cooling stage. Cooling temperature is 25°C to 28°C for 70 seconds.





# Photovoltaic - Crystalline Assembly

## Step 5 - Framing Station

### Module Assembly - Framing Station

Automatic assembly of four frames.

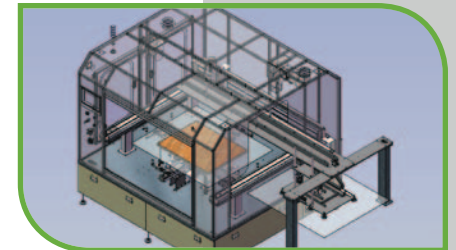
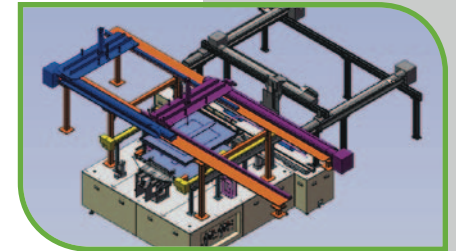
#### Frame Cassette

Panels are transported to a framing station by conveyor. Once in position within the frame module, an air cushion suspends the panel for auto-alignment. Sensors locate and align the edges of the panel.

Magazines are pre-filled with long and short frames. Operators load the magazines onto carrier rails. Each magazine is captured and pulled into location automatically. Dampeners ensure a smooth homing position, the system ejects the magazine in the same manner. A counter signals when a change of magazine is necessary.

#### Dispensing and Press Fitting

Frames are selected from the magazine by a vacuum gripper on a transfer robot and taken in pairs to a dispensing station where adhesive is applied in line. After dispensing, the frames are transferred to the press station by the transfer robot. In the first stage of assembly, the long frames are press fitted. The second stage assembles the short frames, which are first aligned by a key sensor and pressed home for a perfect four-frame seal. An air blower feature in the vacuum gripper ensures a clean release.



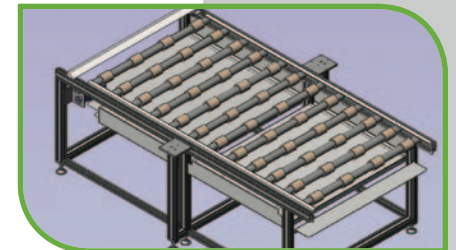
## Step 6 - Panel Transport Conveyors

### Module Assembly - Panel Transport Conveyors

Transport conveyors are available for each module solution, including sensors and I/O configurations.

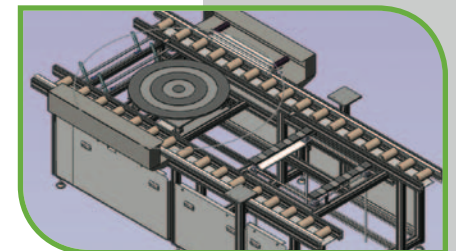
#### Loading

A loading conveyor transporter could interface to a glass panel production line or be the entry point for each module. Loading transporters are available as auto-loading devices from stacked panels.



#### Unloading

Similar to loading transporters, unloading transporters may be simple roller conveyors ending in a stop or auto-unloading and stacking to mobile trolleys.



# Concentrated Photovoltaic Solar Power (CPV)



## CPV Introduction

Concentrated photovoltaic (CPV) is a highly efficient technology for converting solar energy into electricity by concentrating sunlight up to 650 times onto high performance solar cells. The resultant increase in generated electricity can be maximized further by the use of sun tracking systems controlling the CPV panels. Common efficiency is greater than 25% a higher efficiency in comparison to SiPV production, while reducing silicon usage by up to 50%. CPV is suitable for areas of constant daily sunshine.

## CPV Production

Fisnar can supply production dispensing equipment and technology based systems to produce the fine bead form-in-place gaskets and thermal compounds required for heat sinks that are necessary to prevent thermal destruction and to manage temperature related performance losses.

## Two-Part Pre-Mixed or Meter & Mix Equipment

Mix-On-The-Fly waste saving technology can be offered for continuous fine bead dispensing of conductive material without the inconvenience of pre-mixed and frozen low volume syringes or cartridges.

Visit [www.fisnar.com](http://www.fisnar.com) to complete a meter-mix questionnaire, select submit and a Fisnar engineer will respond to your request.



## Gantry & Cantilever Robots

Suitable for in-line conveyor transported panel applications or off-line modular concepts. Heavier loads may be mounted and larger working sizes are available from 300 x 300mm up to and greater than 4000 x 2000mm.



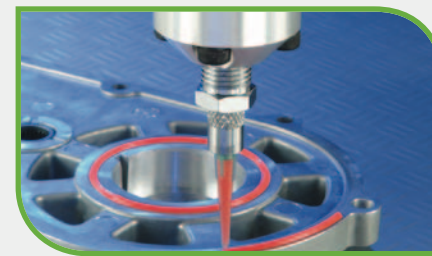
## Desktop Dispensing Robots

Fisnar desktop robots provide an off-line flexible method of volume production performing a single task, such as dispensing a liquid gasket. Available in 3, 4 and 5 axes with a choice of servo or stepping motor drive arrangements. Working sizes from 200 x 200mm to 500 x 500mm.



## Single Part Fluid Dispensing Equipment

A wide selection of dispensing valves and feed systems are available for dispensing form-in-place gaskets, bonding, soldering, fluxing and sealing applications using single part fluids.





# Concentrated Solar Thermal (CST)

## CST Introduction

Also known as CSP (Concentrated Solar Power), technology that concentrates a large area of sunlight onto a small area using lenses, parabolic mirrors or solar towers. Used primarily in utility scale solar farms, electric power is produced when the concentrated light is converted to heat which drives a turbine connected to an electrical power generator. This technology is not to be confused with CPV, which uses photovoltaics to convert solar energy directly into electricity.

## CST Production

The technology uses traditional dispensing production equipment and weather resistant materials to manufacture the sophisticated mechanics and electronic motor assemblies required for optimized tracking.



## Two-Part Pre-Mixed or Meter & Mix Equipment

For potting after soldering or casting two-part materials. These two-part materials are often specified for durability and dielectric properties - they often contain fillers to alter their characteristics.

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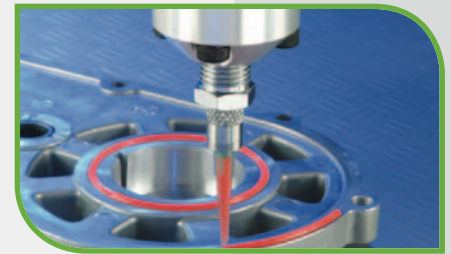
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# Photovoltaic Thin Film Assembly



## Thin Film Manufacture

As its name implies, thin film manufacture involves a deposition process, usually chemical vapor, sputtering or more recently, roller printing. These processes deposit several layers of photovoltaic material such as cigs composite onto a flexible substrate. Unlike a rigid mono crystalline structure nanoparticle amorphous silicone is used in the process. Products can be supplied as ruggedized framed panels similar to crystalline structures or as BIPV, (Building Integrated Photovoltaics) which require no framing. However the same principles for electrical connection, inversion and electricity storage, apply equally to thin film as they do to mono crystalline installations.

## Dispensing Equipment

Whereas mono crystalline rigid panels by nature employ a wide range of dispensing requirements to support the technology, thin film substrates may include similar final product assembly or require significantly less assembly equipment depending upon the final product configuration and application.

Fisnar products can be selected for whatever components require an adhesive, sealant, encapsulate or gasket dispensing solution in a thin film assembly arena.

## Two-Part Pre-Mixed or Meter & Mix Equipment

Two-part materials are specified for durability and dielectric properties - they often contain fillers to alter their characteristics.

Fisnar supplies a wide range of Meter & Mix equipment that can be interfaced to in-line or off-line dispensing robots or used manually where required.

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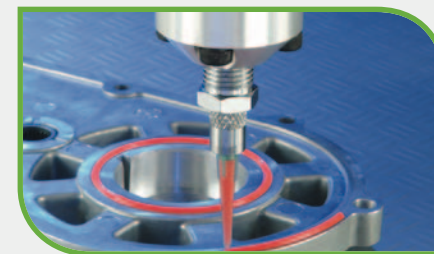
## Desktop Robots

Junction boxes can be prepared for assembly by using a desktop robot, which will provide an off-line flexible method of volume production performing a single task, such as dispensing a liquid gasket or potting a prefabricated assembly. Available in 3, 4 and 5 axes with a choice of servo or stepping motor drive arrangements. Working sizes from 200 x 200mm to 500 x 500mm.



## Single Part Fluid Dispensing Equipment

A wide selection of dispensing valves and feed systems are available for dispensing form-in-place gaskets, bonding, soldering, fluxing and sealing applications using single part fluids.





# Wind Power Wind Turbine Energy

## Wind Turbine Energy

Wind power technology has accelerated over the last few years with efficient direct drive generators, providing longer life and requiring less maintenance, while significantly increasing output. Off shore and land based wind farms are being coordinated in most countries with smart grid control to ensure a continuous and regulated supply.

Blade technology has progressed with improved dynamic designs, which are lighter and more robust. Fisnar is pleased to supply lamination and fiberglass preparation equipment for this critical component in a turbine's efficiency.

## Blade Manufacture

Two-part resins are used in lamination, the process necessitates a vacuum to draw the pre-mixed material through fiberglass layers held in place by a form mold. There are a number of processes in preparing the material for the form and injecting the mixed resin.

## Two-Part Resin Casting Meter & Mix Equipment

Highly accurate, technically advanced and versatile low pressure meter mix systems from Fisnar are designed for high output with a choice of either fixed or variable ratio metering.

Machine versions offer programmable flow rate and dispense volume settings, while the variable ratio option also incorporates programmable mix ratio adjustment. An on-board HMI touch screen provides close loop monitoring.

### Features

- Low pressure
- Volumetric dispensing up to 8000 cps
- High output up to 6 liters a minute
- HMI touch screen close loop monitoring
- Precision long life gear pumps
- Digital programmable flow rate and volume setting
- Variable ratio machine enables programmable ratio
- Single phase
- Mobile trolley mounted
- Ideal for assembly lines
- Disposable static-mixer dispensing

Visit [www.fisnar.com](http://www.fisnar.com) to complete a meter-mix questionnaire, select submit and a Fisnar engineer will respond to your request.



## Hot Melt Equipment

THERMADOSE® Positive-displacement, all-electric Hot Melt systems are designed to provide the ultimate in temperature controlled thermoplastic delivery and dispensing for industrial applications using pressure sensitive adhesives, contact adhesives, waxes and sealants. There are two ranges of equipment: Tank controllers and pail-handling machines.

### Features

- Gear-pump for consistent, pulse-free dispensing
- Reduced material degradation
- Over-temperature safety protection
- Optimum production output
- Fully automatic

### Sample forms

- Bead or gasket dispense - precision-nozzle
- Shot or fill dispense - precision-nozzle
- Swirl for larger surface cover - swirl-nozzle
- Spray coating - spray-gun

THERMADOSE® recommendations can be found online at [www.fisnar.com](http://www.fisnar.com) or in our brochure by calling 973-646-5044 for your free copy.



# Electric Vehicles (EV)



## Electric Vehicles Manufacture

An informed prediction is that all cars will be electric by 2030. Driving factors are not only energy saved and a potential reduction in the cost of fuel and build but also the eventual general performance in acceleration, efficiency, quiet running and less costly maintenance.

The key component that will make an EV an economic and technically viable alternative is its battery source and the number of miles between charging. It's now feasible to run fleets of vehicles on regular routes and for practical local urban commuting. A typical EV travels 285 miles on a single charge.

Lithium-ion is the current battery technology. Production has increased to meet a high demand from several automotive manufacturers racing to enter the market.

Fisnar commenced supplying two-part meter mix equipment and single part silicone dispensing systems in 2008 and has since installed several automated and manually operated systems for lithium battery production.

### Two-Part Pre-Mixed or Meter & Mix Equipment

Two-part materials are specified for durability and dielectric properties - they often contain fillers to alter their characteristics.

Fisnar supplies a wide range of Meter & Mix equipment that can be interfaced to in-line or off-line dispensing robots or used manually where required.

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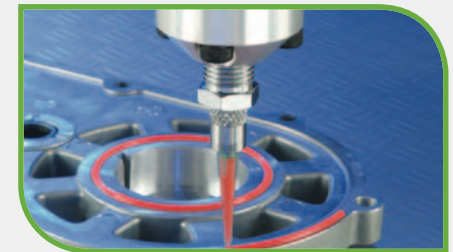
### Desktop Dispensing Robots

Desktop robots provide an off-line flexible method of volume production of battery cells, such as dispensing a liquid gasket or potting a prefabricated assembly. Available in 3, 4 and 5 axes with a choice of servo or stepping motor drive arrangements. Working sizes from 200 x 200mm to 500 x 500mm.



### Single Part Fluid Dispensing Equipment

A wide selection of dispensing valves and feed systems are available for dispensing form-in-place gaskets, bonding, soldering, fluxing and sealing applications using single part fluids.





# Light Emitting Diodes (LED)

## Assembly & Packaging

LED's are a cool light technology. LED's are brighter, last longer and provide more lumina-tion per watt than a candescent bulb, resulting in less power usage.

LED technology efficiency and light output has been said to double every 36 months, which is similar to Moors Law. At this rate we can expect LED's to replace incandescents in a fairly short period.

LED's are not only used for domestic and commercial lighting, they are commonly used in an exposed environment, such as, aviation, automotive, traffic and navigation - all these areas require weather proofing using compositions such as, adhesives, sealants, encapsu-lates and coatings.

Fisnar dispensing products and systems are routinely employed in the application of these materials.

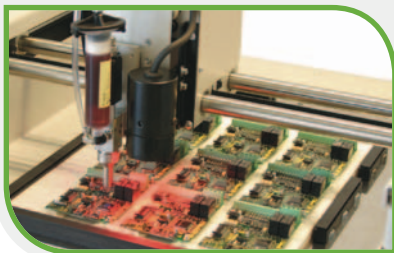


## Conformal Coating Equipment

Urethane & Silicone coating machines for selective or total coat applications. Systems feature unique programming and patented designed spray heads.

Dispense coordinates are automati-cally optimized to reduce program-ming time. The routing of the dispense head can be simulated with an on screen graphical plot function of the software.

Also available are CAD conversion utilities, which can reduce program-ming time to minutes.



## Two-Part Pre-Mixed or Meter & Mix Equipment

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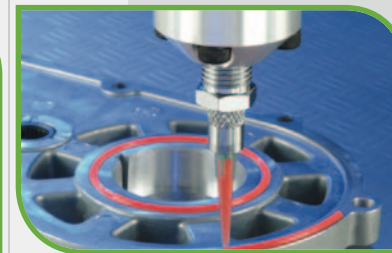
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## Single Part Fluid Dispensing Equipment

A wide selection of dispensing valves and feed systems are avail-able for dispensing form-in-place gaskets, bonding, soldering, fluxing and sealing applications using single part fluids.



Because some factors that can affect the use and performance of our products are uniquely within your knowledge and product use. However, Fisnar cannot know all of the factors and conditions associated with your intended use of products suggested by Fisnar. You must verify any advice, suggestions, recommendations or statements by Fisnar to you, including those related to product selection, use and/or application; and you must test the product in your particular application to insure its efficacy, performance and safety. FISNAR IS NOT RESPONSIBLE FOR ANY PRODUCT FAILURE, PERSONAL INJURY OR PROPERTY DAMAGE (INCLUDING ANY INCIDENTAL, CONSEQUENTIAL, INDIRECT OR SPECIAL DAMAGES) THAT RELATE TO ADVICE, SUGGESTIONS, RECOMMENDATIONS OR STATEMENTS BY FISNAR.

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# SOLARPREP™



15 Corporate Drive, Suite E - Wayne - NJ 07470  
Tel: (973) 646-5044 E-mail: [info@fisnar.com](mailto:info@fisnar.com)  
[www.fisnar.com](http://www.fisnar.com)