

Case	Delta Industrial Automation Products - on Auto Layup Station of Solar Panel Wafer				
Issued By	Solution Center	Date	November, 2012	Page	3
Applicable To	PLC AH500 \ ASDA-A2 F \ DMV				
Keyword	Automation Controller, Solar Energy				

Introduction

As the world's energy crisis has worsened in recent years, the dramatic global rise in oil prices has inspired many countries to develop alternative renewable energy resources. Solar energy is a widely used alternative energy source because it is both "renewable and sustainable". To convert solar energy into electricity, wafers are required. Normally, at least 60 to 72 wafers are needed to produce a solar panel, depending on the panel size. Wafer materials are very fragile and brittle, and any rupture of the wafers on the panel will affect their efficiency for power generation. This is why the module line process is very important to the entire solar panel production. The main purpose of the module line process is to completely arrange the wafers on the tempered glass and coat them with a multilayered buffer material. After the coating process, the wafers undergo high temperatures, high pressure, and manual assembly of the aluminum extrusion frame to finally form a solar panel.

Equipment

During solar module production, the wafer Auto-Layup station evenly aligns the wafers on the tempered glass after the wafer finishes its stringer serial welding process.

During the Auto-Layup manufacturing process, each string of wafers is arranged to be evenly placed on the tempered glass as a precise $\pm 0.2\text{mm}$ interval for each string's X/Y is required. As each string of wafers is placed on the tempered glass, it must go through a visual system to correct its position for best space utilization. (See Figure 1)

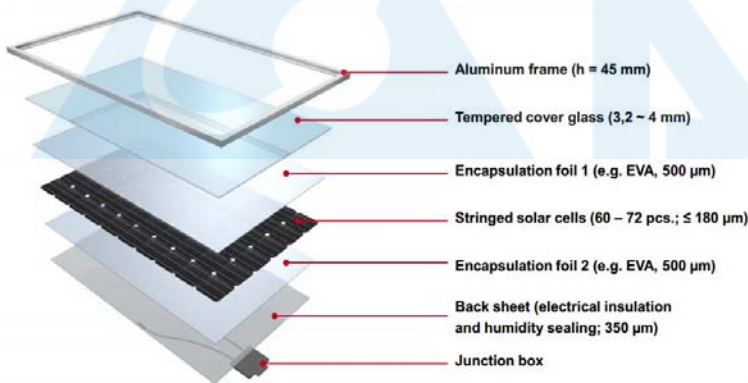


Figure 2: Solar Panel

Solar Power Modules



Figure 1: Production of

The main mechanisms of the equipment is composed of an X, Z, Q axes load/unload robot arm and a Y-axis conveyor belt with vision image correction system. The tempered glass from the previous production stage flows into the machine for mechanical structure alignment via the Y-axis conveyor. After the alignment, the three-way load and unload arm will pick up the string of wafers with its vacuum function and the wafers will go through a visual imaging system that calculates the difference of each string's alignment position. This difference is compensated for the coordinates of X, Z and Q of the load and unload robot arm and the number of wafers placed on each solar panel can be defined by users.

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Figure 3:

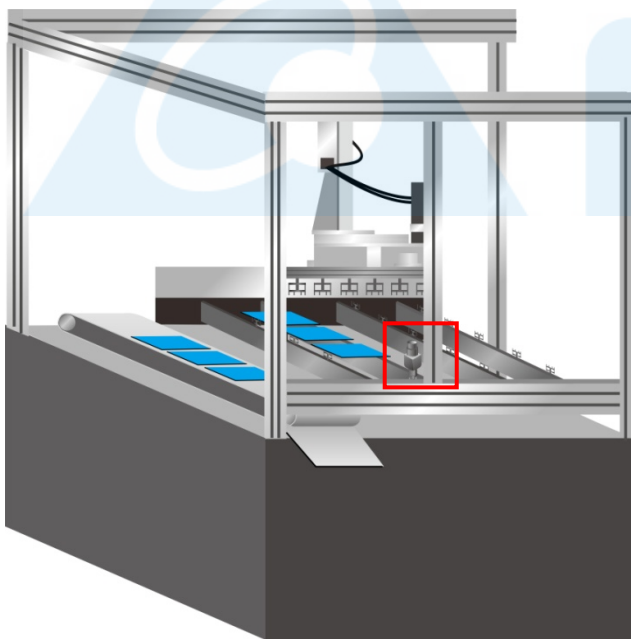
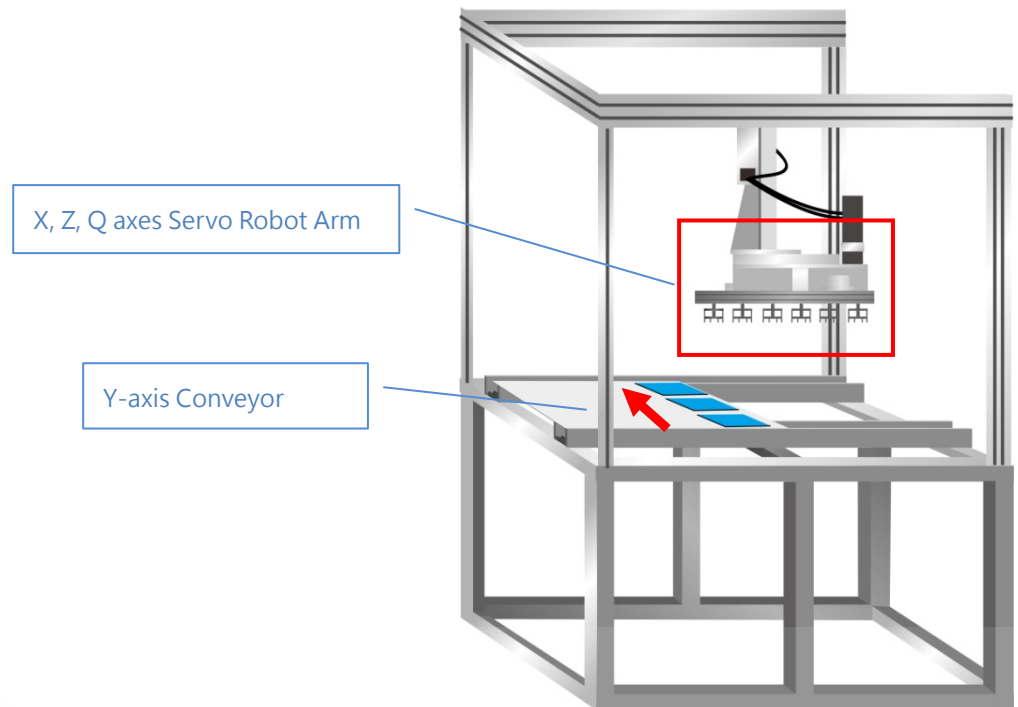


Figure 4: Delta Machine Vision (DMV) System

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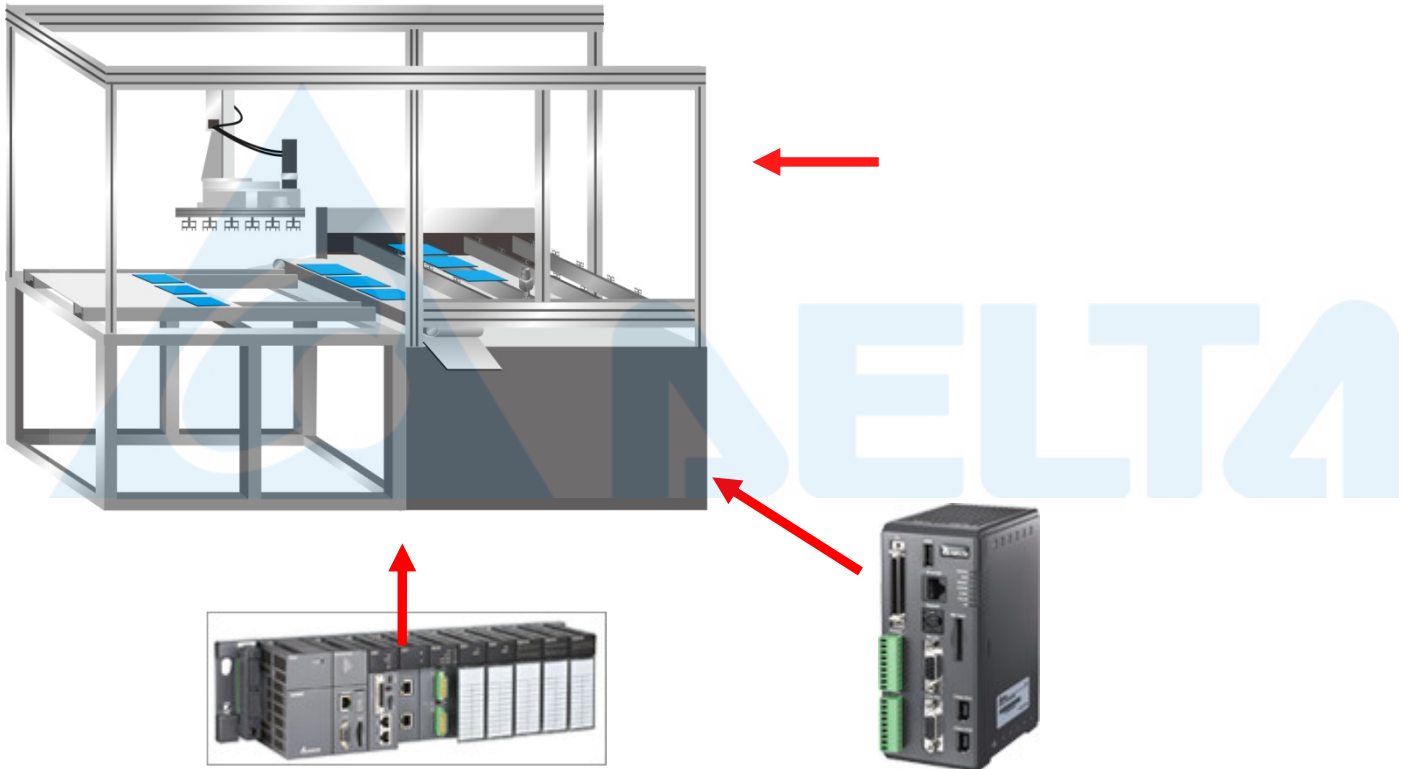
Delta Industrial Automation Product Applications

PLC: Delta's midrange AH-500 Series Programmable Logic Controller (PLC) provides high-speed and multi-axis servo motor control for Module In-Line production (With the aid of Delta's DMCNET communication, the Delta servo system can support up to 12-axes motion control with the fastest speed of 1M PPS for a single axis.) It also supports diverse communication protocols of the different production stages and CIM information flow communication (DeviceNet connection, Ethernet TCP / IP, RS485/422 mode), modular function card selection and remote I / O control.

Visual: The Delta Machine Vision (DMV) system can provide alignment correction for the Auto-Layup process through RS232 or Ethernet interface with the integration of the AH500 Series PLC, which can instantly transmit the amended compensation values to the AH500 Series to control the servo system and instantly correct the string arrangement position of the wafers via real time communication.

Servo: Delta communication type ASDA-A2-F Servo System can control up to 12 axes by functioning with the AH500 Series' 20MC module via DMCNET communication, which provides the advantage of faster wiring using a network connection.

Figure 5: Auto Layup Station of Solar Panel Wafer



For more information on Delta's industrial automation products, please visit our website at: www.delta.com.tw/ia.

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