Compact, rugged and easy to put into operation, at the same time quick, reliable and low-priced – that is how code reading systems have to be, even more so if they are installed in larger numbers. As is the case in vast solar module factories, where often up to 100 code readers guide the modules on their way through the various processing stations. For this purpose, one of the world’s leading plant manufacturers relies on an integrated, PROFINET-based solution from a single source.

The production of solar modules is a business characterized by fierce international competition. And thus also by highly automated, complex production processes with little operator intervention. Even after modules are manually discharged and then reintroduced into the production flow, the various processing stations have to “know” which module in what condition is arriving at the station and which processing steps are pending. That is, the modules need to be tracked & traced without interruption from the beginning to the end of the production and be clearly identifiable by the controllers at any point and at all times.

A tried and tested method for accomplishing this employs barcodes and data matrix codes (DMC), which are placed directly onto, below or also into the glass substrate, or printed on labels and applied. Such a code makes each module unique and therefore identifiable and traceable. However, the quality of the code reading systems used affects the process reliability and consequently also the productivity and output. Thanks to the reliable reading rate even in the most demanding environments, Reis Robotics based in Obernburg am Main (Germany) – according to the company, the worldwide leader in system solutions for the solar module production – universally relies on SIMATIC code reading systems by Siemens from the product spectrum of industrial identification systems.
Compact, cost-effective Standard

For a majority of the applications in the photovoltaics industry as well as in automobile manufacturing, the company employs the stationary code reading system SIMATIC MV420 in the low-priced basic version “SR-B” (with a standard resolution of either 640 x 480 or 752 x 480 pixels). The especially compact device with integrated optics and illumination is predestined for reading distances in the near to medium range from approximately 15 to 220 mm. The MV420 reads all current 1D/2D codes, also DMCs, largely independent of the printing technology and carrier medium used. The extremely rugged reading device with IP67 degree of protection has demonstrated its ability to read even from difficult surfaces – such as reflecting, structured glass surfaces of solar modules or metal surfaces of cast parts with dot-peened direct part markings (DPM). Typical fields include product tracking & tracing and process control applications in the automobile, packaging, pharmaceutical, tobacco, cosmetics, electronics as well as food & beverage industries. Furthermore, the MV420 is used in logistics and distribution for tracking & tracing shipments.

The basic version possesses a reading performance of up to 40 codes per second, can store up to five code types and can perform an analysis using a standard decoding algorithm. The performance version (SR-P) manages up to 70 readings of up to 50 codes simultaneously per second, can also operate without an external trigger and offers expanded analysis options.

Easy Connection and Communication

Next to the competitive costs, the PROFINET functionality of the reader was another decisive argument for the plant manufacturer: In widespread production systems with several hundred participants, it greatly simplifies the communication between the plant sections. From the connection and commissioning to the core functions of a quick, failsafe reading and data transfer to the error diagnosis and maintenance. The MV420 can be connected to the higher-level SIMATIC world either via a connection module ASM456 (PROFIBUS), a serial RS232 interface, a communication module RF180C (PROFINET IO) or directly through PROFINET. Reis Robotics prefers the last named version, because it allows all parameters to be exchanged without additional hardware and programming effort over the standard communication block FB79. “A clear and unique advantage of the integrated Siemens solution,” speaks Uwe Eich from experience, manager of the control engineering department at Reis Robotics. “The block supplies all parameters of the reader, from the axis and angle positions to all optical data (exposure, brightness, etc.) to the type of code. If needed, this data could be used to do much more – such as automatically correcting the placement of a robot gripper.”

With PROFINET, there are virtually no limitations with regard to number of participants, route length and transmission speed. The code reading systems integrate seamlessly into the consistent automation concept by Reis Robotics, which it has implemented several times in the largest and most efficient solar module production plants of the world. Standard components utilized in large quantities include rugged, modular embedded controllers SIMATIC S7-mEC and in some cases up to 700 decentralized compact inverters SINAMICS G120D by Siemens, both in the PROFINET-enabled, failsafe version.

Very easy Commissioning and Diagnosis via Web Browser

The stationary code readers are commissioned and configured via a convenient web-based user interface in the Internet Explorer. After assigning a valid IP address (in the primary setup tool) and entering it in the web browser, immediate access to all setting options is gained, the reader can be adjusted to the specific conditions by means of a live image, and – last but not least – the analysis can be started. The web-based approach offers versatile operating and monitoring functions while in the normal analysis mode, and is also advantageous during possible malfunctions to quickly localize and correct errors.

“An advantage not to be underestimated in the usually very large solar module factories is the option where – if needed – all code readers of a PROFINET segment can also be diagnosed via a Windows-based SIMATIC HMI device,” states Uwe Eich. For this, only the IP address of the reader must be known and, of course, access to the network be possible and authorized. This sometimes saves a lot of back and forth.
Beyond the integrated visualization options, OEMs, system integrators or users can also create a specific user interface on the basis of the standard visualization systems SIMATIC WinCC flexible and WinCC.

**Exhausting all Possibilities**

In the meantime, Reis Robotics has also found a way to connect the code readers to its own robot controls so that more simple applications can be cost-effectively set up without additional PLC or peripherals.

In more demanding applications, too, such as the quick reading of multiple codes as they pass by or reading from a greater distance, Reis Robotics counts on code reading systems by Siemens. For instance, the systems MV420 SR-P (Performance) and MV440 have already proven themselves in various implementations and applications in the company.

The wide range of lenses and various illumination systems allowed the code readers to be optimally matched to the respective application. For that, the product spectrum offers scalable and economical solutions.

On request, the application consulting provides preliminary support during the selection and optimization of the best combination for the specific reading task.