



Reference

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SIMATIC Ident

Correctly into the Right Channels

Compact and cost-effective RFID Technology employed in the Assembly and Testing of Channel-Track Electrical Outlets

A considerably greater reading distance, compact readers, and more cost-effective mobile data storage media were compelling arguments for a leading manufacturer of electrical installation equipment to employ a new RFID system for the first time. The manufacturer thus very economically ensures the necessary flexibility and process reliability for the largely automated assembly and testing of various channel-track power sockets.

Following the acquisition of the Berker GmbH & Co. KG, the globally operating Hager Group (see box) has consolidated its expanded product spectrum and in part re-released it. This also applies to the established series of channel-track power sockets – the Hager “Tehalit C-Profile”. It was redesigned and its production relocated to Berker in Wenden-Ottfingen (Sauerland region, Germany). The assembly and testing also was to be matched to the projected annual quantity (of 500,000 units in about 80 variants). The technically and economically best solution for this was determined to be an automated process with manual insertion and joining of the individual parts. Hager MD, the “Machinery Department” of the group (see box) headquartered in Oberrnai (Alsace region, France), was tasked with the development and implementation. In close coordination with their German colleagues, the French put into practice a modular assembly and testing line – named Ecoline, the most comprehensive one to date for Berker. The various process steps are flexibly controlled with the aid of proven control and RFID technology from Siemens.

Modular with PROFIBUS

A challenge of the project was to set up the line in two stages.

While all necessary testing steps (operation of the child safety device, electrical test, etc.) had been defined at the project start, not all product variants and properties were known in detail at that time – and consequently not all requirements regarding the assembly. For instance, the sockets were initially still assembled by hand, while the automated assembly stations were gradually developed and integrated into the line. Facilitating this approach is the modular machine construction in the form of so-called cubes, which could be linked together very easily via PROFIBUS. At first, the control program was divided between two controllers; later on, it was transferred to a joint, failsafe CPU of the type SIMATIC S7-300F.

The line implemented in the end is comprised of separate stations for the assembly and testing of approximately 80 product variants, including double- and triple-receptacle models with or without switch, filter module, surge protection, etc. Depending on the model, a socket passes through fewer or more stations of the line.



From Hager MD (Machinery Department) for Berker implemented, largely automated assembly and testing line Ecoline for channel-track sockets.

Always up-to-date on the Processes with RFID

“It was clear early on that the sequence of individual assembly and testing steps were to be coordinated and controlled with the aid of RFID technology, and that as simply, reliably, and cost-effectively as possible,” states Fabrice Klein, head of the electrical engineering and automation division at Hager MD. “Within the company group, we do not enjoy any special status. We compete against external machine builders, and just like them, we have to weigh the costs and benefits in all plant sections.”

Fabrice Klein turned to the Siemens branch in Strasbourg, which – with the support of RFID specialists from the head office in Nuremberg – tested different setups. The requirements with regard to a reliable reading operation were best met by the new RFID system SIMATIC RF200 and its high frequency (HF) readers RF240R. A major advantage of this entry-level RFID system is its considerably greater reading distance of up to 65 millimeters compared to four millimeters with the previously used model. While certain cases with the old system required two to three data storage media to be affixed at the sides of the workpiece carrier to ensure a reliable reading in any rotational position, the permissible tolerances with the new system are far greater, which gives much more installation leeway.

In the application described, the workpiece carriers are heavy and sturdy enough to be transported reliably and accurately on top of two narrow belts. Trials have also shown that the new system can actually read through a full-width conveyor belt. In the case of lighter workpiece carriers, the slippage can be reduced. Also, a full-width conveyor belt offers additional mechanical protection for the RFID readers. Up to 25 workpiece carriers can be in circulation simultaneously. They are clearly encoded and identified by means of the proven mobile data storage media MDS D160 from the Siemens Moby D portfolio. The equally simple and rugged data storage “tags” are maintenance-free and at the same time significantly less costly than the ones used until now.

“Apart from that, an electronic encoding is generally much more simple and flexible than a purely mechanical one – while also providing greater process reliability”, says Fabrice Klein. The mobile data storage tags were countersunk with appropriate spacers at the bottom center of the workpiece carriers. They are thus protected and can be reliably read independent of the position.

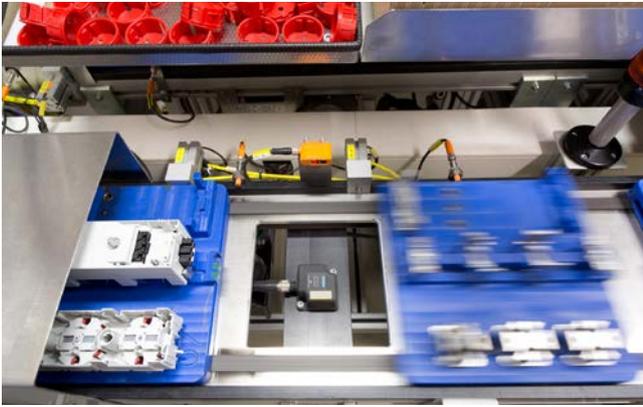
Along the line, ten readers of the type SIMATIC RF240R with integrated antenna are installed. With dimensions of 50 x 50 x 30 mm, the readers are very compact, and their protection rating of IP67 enables a simple, direct installation at transport routes and assembly lines. The read-only devices meet the specifications of the open standard ISO 15693 and operate with all compliant tags at a frequency of 13.56 MHz. Before every assembly and testing station, the workpiece carrier number is read (while stationary) and the next process step requested from a data block in the PLC, which is acknowledged as completed upon successful execution. The controller is thus always up-to-date on the process and recognizes the current processing status even after a manual removal and reinsertion of a workpiece carrier. Workpiece carriers reinserted at the wrong place are simply passed through until reaching the next, not yet completed station.

Extremely easy PLC Connection

The link to the control level is comprised of interface modules ASM 456, which each connect two readers with the line controller via PROFIBUS. Like the readers of the more powerful systems, the SIMATIC RF200 readers also can be easily integrated into the control software and conveniently diagnosed centrally via ready-made function blocks. The diagnostic capability contributes to keeping possible downtimes short and the productivity at a high level.



Mobile data storage tags MDS D160 – countersunk with spacers into the workpiece carriers – enable an easy and clear assignment as well as tracking & tracing of assembly and testing steps.



Compact, reliable, and cost-effective: RFID readers SIMATIC RF240R integrated directly into the transport route.



Via interface modules Moby ASM 456 and PROFIBUS, the SIMATIC readers RF240R are connected to the failsafe line controller SIMATIC S7-300F.

The failsafe CPU SIMATIC S7-317F-2 DP chosen for this application handles and integrates process-relevant as well as safety-related signals (from safety doors, emergency stop pushbuttons, the compressed air monitoring, etc.), the latter via the ProfiSAFE profile and PROFIBUS. The controller communicates via Ethernet and OPC (OLE for Process Control) with the higher-level SAP system, and continuously supplies data for monitoring and reporting purposes, e.g., current quantities or data to determine key performance indicators (KPIs). A laser marking system at the packaging station is also connected via Ethernet. For the visualization of status and error messages, graphics-capable multi-panels SIMATIC MP177 are installed at key points.

Reliable – and more productive than planned

Uwe Richter, head of control engineering at Berker: "The production line Ecoline has been running reliably and trouble-free to our complete satisfaction for more than a year now. We were also able to increase the originally specified cycle rate of five power sockets per minute to almost seven. And we could add additional automated stations to the line at any time." As expected, the new to Berker SIMATIC RF200 RFID system is performing its tasks reliably without malfunctions – and thus is now the first choice for an extensive follow-up project by the electrical installation equipment manufacturer.

Electrical Installations for the World Market

The Hager Group is a leading provider of solutions and services for electrical installations in residential, industrial, and commercial properties. Hager's product and service portfolio ranges from energy distribution to cable routing to intelligent building control and safety engineering. The Hager Group is comprised of Berker – a leading provider of high-quality electrical installation equipment ranging from switches to intelligent building management systems, and the firms Daitem and Diagrall as well as Efen and Elcom. The Hager Group was founded in 1955 and to date remains an independent, owner-managed family business based in Blieskastel, Germany. Today, the Hager Group is active worldwide and employs about 11,400 people at 22 locations.

From the Group for the Group

Hager MD, based in Obernai, France, is the machine builder within the globally operating Hager Group. Core competencies include the development, manufacturing, assembly, commissioning, and maintenance of customized process, assembly, and testing systems for the various products and for all production plants of the group. A decisive advantage over external competitors is the specific product and process expertise that has been gained over the decades.

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