User report | Best practice

The soldering module of the SMARTFLOW 2020 is equipped with nitrogen heating and supplies additional energy during soldering of the mass connections.

ifm ecomatic gmbh & Ersa

Convincing high-tech for heavy-duty and more!

Ever since it was founded in 1969, ifm has been developing, producing and distributing sensors, control units and industrial automation systems. The ifm group now has more than 70 branches and 6,700 employees around the world, 4,500 of these in Germany. Yet ifm has still remained a family-run company, or even a double one in metaphorical terms: the company's DNA has always had two strands – sales in Essen, development and production not far from Lake Constance. Just recently, one of the subsidiary companies, ifm ecomatic gmbh in Kressbronn, installed an Ersa SMARTFLOW 2020.

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Summer time is the time for mowing grass and bringing in the hay. The air is heavy with the tangy smell and many children's eyes light up when a tractor or mower or bale trailer drive past. Who wouldn't like to take a ride? What only a few people realise is that in many cases, control units from ifm are doing important work under the hood. As well as in tractors, ifm devices can mainly be found in construction machinery or municipal vehicles. But ifm products are also used in industrial production or in control units for hygiene-sensitive areas of the pharmaceutical and food industries too. Currently being managed by the second generation, the family-run ifm group is one of the global leaders in the sensors business, and develops, produces and distributes sensors, control units and industrial automation systems all over the world. Alongside relevant standard solutions, the comprehensive ifm product portfolio takes the special requirements of individual branches into account – as well as position and process sensors, the range also includes sensors for motion control and security technology. In addition, ifm supplies products for industrial image processing and communication as well as identification systems and systems for mobile work machines; software solutions for process digitisation round off the range.

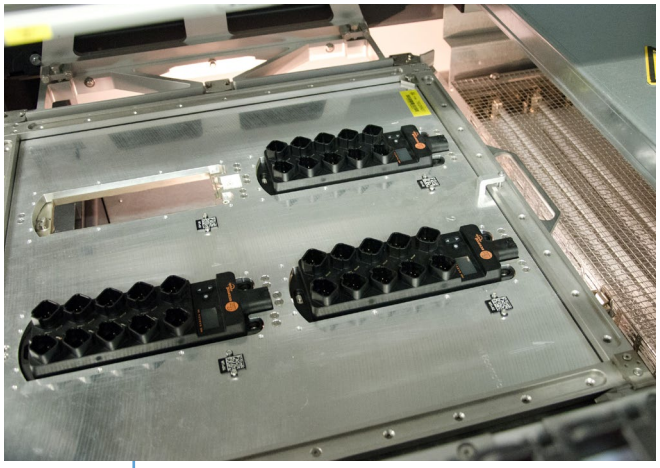
Ersa and ifm – two partners who understand each other. Ersa Area Sales Manager Mark Birl (left) and ifm production scheduler Jürgen Rietzler.

Ersa SMARTFLOW 2020 with customer-specific connection to the MES system.

PERFECTLY COMPLEMENTARY LOCATIONS

ifm development and production are settled in the Lake Constance region around Kressbronn and Tettnang – in an area of Germany renowned for producing a lot of inventors. In contrast, the sales centre is in Essen. Both locations complement each other perfectly: Swabian inventors on the one hand and the Ruhr region as the largest industrial metropolitan area in Europe on the other. Despite continued growth, ifm has stuck to the virtues of its founding years: the flexibility and individuality of a small enterprise and the quality and professionalism of a group. Quality is very important at ifm and a term far exceeding the actual product. All the processes are focused on customer service and product quality. ifm feels closely connected to the "Made in Germany" philosophy – 70 percent of the products are developed and manufactured in Germany. "One of the first questions in the development process is: What does the product design have to be to make an optimum and problem-free manufacturing process possible?" says Jürgen Rietzler, production scheduler at the ifm subsidiary ifm ecomatic gmbh in Kressbronn. For this reason, ifm production is closely involved in product development right from the start in order to avoid manufacturing problems later on. "This is also the reason we cooperate very closely with the suppliers of our production machines," Mr. Rietzler explains.

The SMARTFLOW pre-heater with infrared lamp segments.



Up to 4 ioControl modules can be processed simultaneously. Empty nests are identified through the code on the product carrier, preventing them being processed.

CYCLE TIME < 90 S PER ASSEMBLY

The new ioControl range, which is also used in agricultural mowers, presented a special challenge. Pins are stitched into the module in the injection moulding phase. This means soldering must take place during final assembly since the PCB is already installed in the housing. For this reason, ifm ecomatic Kressbronn decided to invest in its own soldering line, although electronics production and thus the soldering processes are now centralised in Tettnang. A manufacturing cell for the exclusive production of these modules was planned for the soldering process. Requirements made on the soldering line included a small footprint and, above all, connection to the MES system and a specified cycle time of less than 90 seconds per assembly. The sourcing process for the production lines for the new manufacturing cell was based on these requirements. "Several suppliers followed our invitation for tenders of course. Following initial talks, the visit to Ersa in Wertheim was the key moment for us," Jürgen Rietzler recalls. "Ersa's professional approach and presentation of the project implementation was a good match for ifm." In addition, the features of the SMARTFLOW 20/20 selective soldering line corresponded to a major extent with ifm's concept: "The machine and configuration offered fitted the bill very well. A few minor alterations were necessary, these mainly concerned the software," explains Jürgen Rietzler.

SMARTFOW 2020: DESIGNED FOR CELL MANUFACTURING

The compact Ersa line with manual loading and unloading of the assemblies has been designed for cell manufacturing solutions. At the same time, it is the Ersa entry-level model for selective soldering and ideal for small quantities and a high product mix. The compact solution from Ersa benefits from the technology used in the larger versions – fluxing, pre-heating and soldering take place in sequence. A drop-jet fluxer is used in the fluxing module, the fluxing agent is applied precisely in the form of drops onto the soldering spots to be fluxed. The quantity of fluxing agent droplet dispensed per minute is entered via the machine software ERSASOFT 5. Fluxing agent application can be controlled exactly with a constant droplet size, enhancing the cleanness of the assembly.

The full-surface pre-heating with IR lamps can be segmented according to heat requirements and assembly size. Furthermore, temperature curves can be saved in the individual soldering programs. In addition to the heating from below, the SMARTFLOW can be supplemented by heating from above for

increased heat requirements for extremely demanding assemblies such as multi-layer or heavy-mass versions. All these components guarantee effective and reproducible through heating of the assembly and thus guarantee a high quality of the soldering spots.

INTEGRATED HEATER IN NITROGEN GASSING

Increased thermal requirements had to be covered for the production of the new ioControl series from ifm as well. The special challenge in this case is the fact that the board is already installed in the housing and are thus covered from above when the modules reach the production step. This prevents thermal energy being supplied to the soldering spot by a heater above the line. In order to ensure sufficient thermal energy supply to the high-mass component connections, a heater was integrated in the nitrogen gassing unit to support the soldering process. The warm nitrogen exits the gassing ring, flushes the soldering nozzle and flows to the spot to be soldered. This specifically heats the soldering spot and achieves reliable capillary fill because the solder no longer hardens prematurely at the connector socket. The result is secure and long-lasting solder connections.

Like the VERSAFLOW systems, the SMARTFLOW is also equipped with a low-maintenance and wear-free solder pot with an electromagnetic solder pump. The level of solder in the pot is monitored automatically and kept constant thanks to automatic soldering wire feed. If the level of solder in the pot drops to below the minimum, a sensor feeds additional nitrogen to the pot. An integrated flow sensor registers the addition of nitrogen and triggers the supply of soldering wire in the required quantity.

CONNECTION TO MES AND TRACE SYSTEM

Simple and intuitive operation is guaranteed by the tried-and-trusted operator software ERSASOFT 5 with a modern visualisation and operator-oriented structure. The integrated program editor CAD Assistant permits the soldering program to be created both directly at the machine and offline in the office, for example. Programming is done on the basis of CAD data or PCB scans. Fluxing agent application and soldering can be entered easily and quickly with parameters. An auto-routing function, collision protection and plausibility check guarantee optimum travel paths and process workflows in the SMARTFLOW. Process monitoring is also a central part of the operator software. Many relevant process parameters are monitored in cycles and logged. Thanks

View of equipped product carriers in the SMARTFLOW process chamber.

Ersa Area Sales Manager Mark Birl talking to ifm production scheduler Jürgen Rietzler.

to modern PIP technology ("picture in picture"), the soldering parameters and a live process image of the soldering wave are available next to one another at a glance for optimum checks during individual soldering processes or set-up. "One of the key requirements in this machine project was connection of the soldering line to the MES system at ifm. These were implemented as a customer-specific solution and the ERSASOFT was customised accordingly," explains Ersa Area Sales Manager Mark Birl. Program changeover by scanning the order papers was one of the points that had to be dealt with. Since all modules in the ioControl series are being produced in this one manufacturing cell, program changeover has to be quick and easy. This is guaranteed by the employees at the manufacturing cell scanning the order papers when the assemblies arrive at the machine with the order papers. The respective soldering program is started automatically by the soldering system on the basis of this scan.

The second point was the connection of the SMARTFLOW to the trace system to guarantee traceability of every single product – a central issue in the quality assurance chain at ifm. A product carrier with four separately coded nests is used. Before employees at the manufacturing cell packs the ioControl modules to be soldered into the product carrier at the SMARTFLOW, they scan the respective bar code on the assembly first. The matching process parameters such as pre-heating temperature, fluxing agent application, solder temperature and processing time are saved in the soldering log for this bar code. Then the soldering log is transmitted to the MES system to guarantee the traceability of every assembly and prevent faulty or non-soldered assemblies progressing to the next process step. Each of the nests on the product carriers themselves also has a code.

If one of the nests remains empty because there are only another three modules to be soldered at the end of a batch, for example, the operator scans the code next to the empty nest on the product carrier. Through this, the soldering system receives the information that this nest is empty and does not have to be processed.

SUITABLE PACKAGE: PROCESS CONSULTATION, SOLDERING SYSTEM, AFTER SALES SUPPORT

Benefits for ifm do not stop at Ersa machine know-how, they also encompass the enormous range of experience with the soldering process in general. "Our quality policy and company philosophy include close coordination with the line supplier. The best manufacturing processes with the best equipment will not work if the product has not been fine-tuned properly," says Jürgen Rietzler, spelling out the key to good manufacturing.

This is why Ersa was involved in product development and provided layout advice. The design of the PCB and pins was adapted in such a way that the soldering process step could take place ideally and smoothly within the required cycle time. To achieve this, extensive use was made of the opportunity to carry out soldering trials at the Ersa application and demonstration centre. Nozzle size, travel paths and the number of assemblies on the product carrier were adapted in such a way that products with top soldering quality leave the ifm plant in Kressbronn.

"Ersa's professional approach and know-how had us convinced. They are endorsed by defined processes, response times are short and the Ersa employees are passionate about their work," is the positive conclusion drawn by Jürgen Rietzler. "And if the chemistry between the two companies is right on top of all that, doing business is a real pleasure," adds Mark Birl. Next time you see an excavator, construction vehicle or tractor driving past, always remember that ifm sensors are probably involved there somewhere. Ersa is very happy to support ifm so that things go like clockwork thanks to the sensor system. ■

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