

“Plug and Play”

Small and excellent, the ideal System for low volume and /or small production departments

Simple and smart selective soldering - Ersa SMARTFLOW2020

Already in 1921 in Berlin Ernst Sachs, the founder of Ersa, revolutionized with this motto the market, setting a new standard at that time with the first electrically heated solder iron. Today, almost 100 years later, Ersa GmbH once again sets

new standards, this time in the selective soldering technology. The Smartflow 2020 – low cost, simple to operate, highest level of quality both in design and in process, in all respects the ideal entrance into the selective soldering technology.

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Connect, switch on, and solder – Ersa reinvented selective soldering with the SMARTFLOW 2020

It was 20 years ago that the first selective soldering system was being developed by Ersa. The steady developmental trend towards the surface mount technology, while at the same time maintaining the use of through-hole components, has been the driving force behind the introduction of the selective soldering process into modern electronic manufacturing environments. Selective soldering processes today are basic elements of electronic manufacturing, whose absence from the production floor can no longer be imagined.

As a result of this wide usage and its general acceptance, the demand for stable and verifiable soldering processes has reached those applications which are, for example because of low production volumes, still being soldered by hand. Another reason for maintaining the manual soldering process is quite often the barrier of the investment required. Especially for smaller corporations processing a high product mix at low volumes, the economic viability of the investment has top priority. Yet, and aside from all the hurdles presented by the size of the investment, it is the rising demands on the quality of the board assemblies processed, which, more or less, forces manufacturers to reconsider their manufacturing methods and include a selective soldering process.

Especially large, exotic through-hole components such as connectors, electrolytic capacitors, relays or chokes and coils, which are very difficult to solder manually because of their large heat absorption capacity, call for cost effective solutions being available on the equipment market. With this situation in mind, the Smartflow 2020 was

developed by Ersa. Its objectives were defined as requiring a lower investment, being of simple and intuitive operation and offering a process quality similar to that provided by the high end systems of the Versaflow family. The result of this development now allows users to cost-effectively enter into the world of automated selective soldering at the highest quality level.

THE CONCEPT

The Smartflow 2020 puts selective soldering on a new basis, and it is proof that the demands for low-cost design while at the same time satisfying the highest quality demands can be combined and actually realized. The Smartflow 2020 is small but powerful - the ideal, flexible system for small batch sizes and/or small manufacturers.

The system is designed as a self-contained work station soldering system with manual loading and unloading of the board assemblies, where fluxing, preheating and soldering takes place sequentially.

“Plug and Play” – applying this concept is a novel means to put the user in the position to bring into production and to operate the system without prior training. Just as it was, way back, with the first soldering iron, with the Smartflow 2020 this method of the simplest operation has been brought back to life. Provided that a basic knowledge of the process is present, the operator is completely guided through the process by the software and is enabled to generate solder programs and to solder board assemblies.

Ersa SMARTFLOW 2020 – the plug-and-play selective soldering system. Compact design and uncompromising technology. The ideal entrance into the selective soldering technology



The compact system can handle boards with a maximum size of 508 x 508 mm (20" x 20"), and is available with optional full-area lower and upper preheaters. All this, while not requiring more floor space than a standard hand-soldering work station. Implementing this design guideline was achieved by the spatial division of the motion kinematics. The board assembly moves on a y-axis, solder bath and the fluxer head on the x- and z axis. When selecting this motion kinematics, the relationship of maximum board size and floor space of the system required is the most favorable, thereby allowing for the compactness of the system.

High quality: On account of the proven technology applied, no compromises have to be made when it comes to the high demands placed on quality. To eliminate any risk, the same field proven functional units installed in the other models of the Versaflow family are being used in the fluxing, preheating and soldering sections. This standardization simplifies not only the stocking of spare parts, but a far greater advantage lies in the comparability of the processes and the thereby associated compatibility of the solder programs across the complete range of selective soldering systems from Ersa.

The simple operation is ensured by the operating software Ersasoft 5, a completely new platform. This new version of the operating software convinces, aside from its modern visualization, through its user oriented structure. To program the different solder programs for board assemblies, the programming software Ersa CAD 3 is optionally available. It allows to generate programs

directly at the system or alternatively, off line at the office desk. Process monitoring is a central part of the operating software. Many relevant process parameters are cyclically monitored and their data are being stored. With modern PIP technology (Picture in Picture) the soldering parameters and a life view of the solder nozzle and the wave can be displayed simultaneously on the monitor. This ensures optimal control of each individual soldering process during production or during setup. Handling of the board assemblies generally takes place with board carriers (pallets). The carrier stuffed with an assembly is placed on a push-type conveyor. If the system is ready to operate, the entry gate opens and the carrier is manually pushed into the staging area of the y-axis. After triggering the start button, the carrier is locked up on the axis, the entry gate closes and processing of the assembly will start. Once the process is completed, the soldered board assembly is transferred, still in its carrier, to its starting location to be manually removed from the system.

The low maintenance requirement of the Smartflow 2020 is due to the general use of high quality components and materials, which conform to all current and high industrial standards. Those system aggregates that do need maintenance are all easily accessible through widely opening doors, clearly displaying all relevant areas of the system. All service work required can comfortably be performed from one side of the system. This substantially reduces the time it takes to perform the maintenance work, therefore raising the uptime of the system. Attention was also paid to provide easy access to the soldering aggregate:



Digital process camera to visualize the soldering process

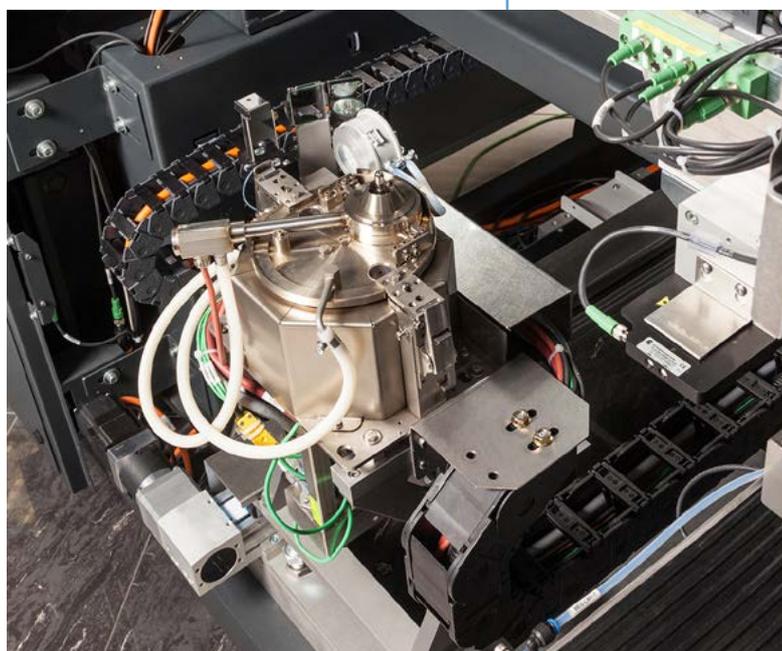
it moves to a front position to comfortably allow the operator or the maintenance staff to perform the service work, so that even with the obligatory protective clothing it is a simple task. The solder bath itself is equipped with a maintenance free inductive solder pump, which does not contain any movable parts.

The versatility of selective soldering systems rests on the numerous options available for installation. Starting with the flux deposition – the accuracy of the spray jet position in the x- and in the y-direction can be monitored with sensors. In the preheating area, the assemblies can be preheated both from the bottom and from the top. The heating modules are equipped with short-wave IR emitters, whose function can be individually monitored. The output of the emitters can be individually controlled in a number of time slots, so that targeted temperature/time sequences can be programmed. The emitters are pooled in groups, and they can be programmed in groups, depending on the length of the board assembly. With an eye on the energy efficiency of the system, only as many emitters need to be activated as are required to adequately preheat the assembly.

To ensure stable conditions in the solder aggregate, a solder wire feeder for the solder bath is available. If the solder level in the bath drops below a defined level, solder wire will automatically be fed from a role into the bath, until the correct level has been reached again. The solder wave height is also cyclically monitored via sensors, and if a deviation is detected, it will be corrected through the solder pump offset.

All these equipment features ensure a high equipment uptime, high throughput and a high degree of process monitoring and process stability.

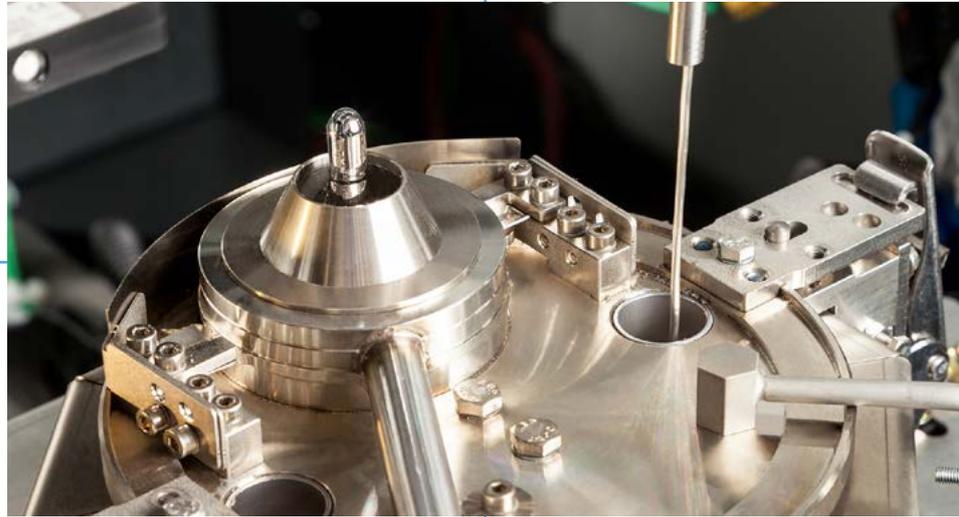
Easy access to soldering unit for maintenance



DETAILS OF THE SELECTIVE SOLDERING SYSTEM

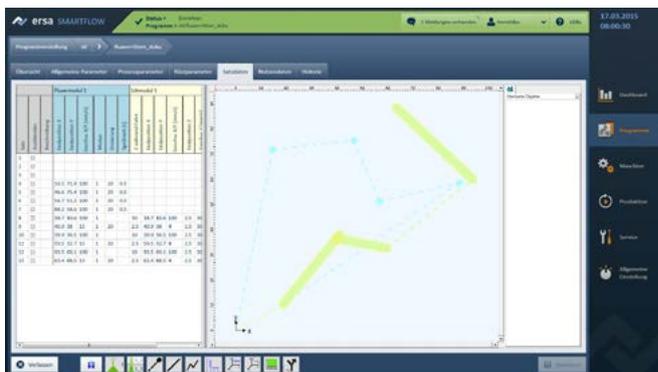
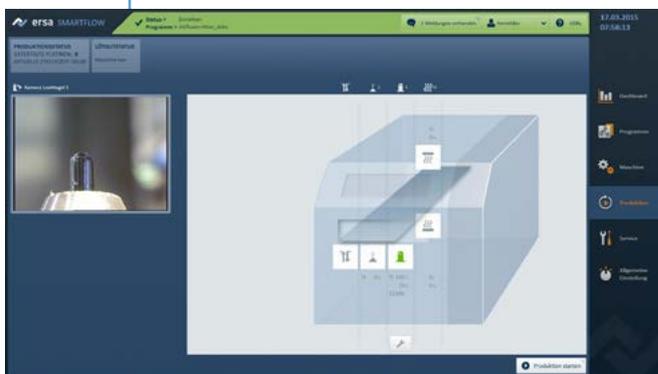
The system is designed as a compact stand-alone soldering system with manual loading and unloading of the board assemblies. Assemblies are generally handled in board carriers. The soldering system is divided in two areas, the process area, where the board is being processed, and the area to load and unload the assemblies. Both areas are separated from each other by a safety lock, which only opens when the system is in a safe state and the safety regulations for equipment with movable components to protect the operators are being met.

Automatic solder wire feeder



The board carrier is being placed on a passive roller-push type conveyor. The solder program is being activated either manually on the system PC or via an optional hand scanner reading a bar- or data matrix code on the board assembly. After reaching the operational readiness, the safety lock opens and the board carrier can be manually pushed into the system. Following this, the start button is triggered or, alternatively, an optional foot switch is depressed, the safety lock closes and processing of the assembly will start.

User interface of the Ersa 3D CAD programming assistant



User interface with PIP technology – intuitive and comfortable for the user

The assembly moves in the locked carrier on the y-axis. Below the assembly, the soldering aggregate and the fluxer are being moved on the x- and z-axis. The complete assembly with a maximum board size of 508 x 508 mm can be processed with this setup. On account of the division of the motion axes, the footprint of the Smartflow 2020 is kept to a minimum, while still offering the same flexibility as the selective soldering systems of the Versaflow range.

The selective soldering process starts with the deposition of the flux medium. In the selective soldering process, this deposition has to be of high accuracy, since areas which are not wetted by the wave during actual soldering should not come in contact with flux. Only then is the cleanliness of the assembly after soldering sufficiently ensured. This demand can only be met by the most modern drop-jet flux heads. The distinctive feature of these flux heads lies in the fact that the flux is not atomized, but that it is sprayed in the form of small droplets, similar as in an ink-jet printer, on to the board surface. It is irrelevant whether an individual dot or a line is to be fluxed, as these instructions, as well as the amount of flux deposited, are laid down individually for each solder joint in the solder program.

After the completion of the flux deposition, the board assembly is carried on the y-axis into the preheat module. Standard preheating is from the bottom, and, if called for, optionally from the top, with short wave IR emitters. The software permits programming a temperature/time sequence in up to four time windows.



Manual loading of the SMARTFLOW 2020 with a board carrier

This allows that the preheat requirement can be adapted precisely to the demand of a specific board assembly. Whether the preheating feature is utilized is at the discretion of the user. Fully optioning the preheat module enables the user to gently and effectively preheat even complex and heavy multi-layer boards. Upon completion of the preheating cycle, the soldering process commences.

The heart of the soldering aggregate is the mini-wave solder bath, as it is being used in all selective soldering systems from Ersa. The proven design of this bath allows for the use of all commonly used tin based solders. In addition, it features a maintenance free inductive solder pump, which, since there are no moving mechanical components present, substantially reduces the amount of maintenance required. The protection of the solder bath surface with a nitrogen cover reduces the incidence of oxidization of the solder down to a minimum, so that, for example, the solder bath needs to be maintained in single operation only once per week.

The standard mini-wave solder nozzles generally have a wettable surface. This wettable surface provides, during the snap-off of the solder from the joint just made, an additional downward force vector, thereby adding a large advantage to the process. A further advantage is the unidirectional solder flow, which means that there is no preferred direction for soldering. Even for square soldering applications, such as a PGA socket, is it sufficient to program the four corner points of the component, so that the axis system changes its motion direction.

The solder flow automatically follows the motion, and it is not necessary to rotate either the nozzle or the board assembly. Mini-wave solder nozzles are available in different sizes, with the outside dimension starting at 4, 5 mm and reaching up to 34 mm. Custom dimensions are available on request.

Aside from the mini-wave, two further solder wave options are available. Mini-Vario waves, as well as Mini-Dip waves, are two interesting alternatives which expand the field of application of the system. With the Mini-Vario wave strips with a width of 68 mm can be soldered on the assemblies. This technology allows to "wave solder" small boards or specific areas on larger boards. The Mini-Dip option is a small, product-specific solder nozzle plate, covering an area of maximum 80 x 80 mm. With this nozzle, all joints on an assembly that are to be selectively soldered are soldered in one cycle. The advantage of this option rests in the short cycle times that can be achieved. The complete processing of the assembly, starting with fluxing and ending with soldering, takes place in a closed process environment. This ensures a high degree of thermal stability.

To operate the system, the operator interacts with a touch screen monitor, which is connected to a PC. The PC again communicates via an interface with a micro-processor, on which the actual software for operating the system runs. The primary function of the PC is to serve as an HMI (Human-Machine Interface), but at the same time it serves as mass storage location for solder programs, as well as for production- and traceability data.

Board assembly in the preheating position with upper and lower preheat



Generating a solder program principally replicates the programming of the motions of the axes to process the assemblies. This can be performed directly at the soldering system, or, very comfortably, at another PC-work station. For this off-line programming feature, the Ersa CAD Assistant 3 is optionally available. Base for this graphical programming interface is the CAD data of the board assembly or, alternatively, a scanned picture of the assembly which will be calibrated accordingly. The motion sequence, that is, the components to be soldered and their connections to each other are drawn into the image by a number of different tools. Available are points and tracks, whereby the data for fluxing and soldering are lying on different levels, since their movements frequently differ from each other. The system can be integrated into existing MES/ERP systems through the network interface, which is provided as a standard feature. This opens up the possibilities for remote maintenance, for the provision of traceability data as well the ability to lock-in the process.

THE TARGET – STANDARDIZATION OF PROCESSES

It can be observed in the EMS industrial sector, that the diversity in the design of the boards and in the connection technology is both continuously increasing and getting more demanding.

And with the issue of product liability looming in the background, the customers of the EMS corporations are starting to increasingly demand qualified processes, so that the production of electronic assemblies takes place within clearly defined process windows.

In order to accommodate these demands, the manufacturers of electronic assemblies are striving to always apply safe, stable and reproducible processes, and to be able to monitor these permanently. Under this aspect, many soldering processes had to be eliminated right from the outset, and reflow-, wave- and selective soldering using mini-waves have firmly established themselves on the market.

Manual soldering processes are very diverse and flexible, yet their execution is depending on the subjective ability and observations of the user. To eliminate this uncertainty impacting on the product quality, these processes are being used less and less in industrial manufacturing.

With the Smartflow 2020, users have been given the possibility to enter into the technology of selective soldering with a manageable investment. With it, they can process even small production volumes of demanding board assemblies on a raised quality level, and present to their customers the requested proofs of the process parameters.



*Mini-wave solder unit
with maintenance free
solder pump*

SUMMARY

With the Smartflow 2020 users have available at their disposal a modern selective soldering system, qualitatively meeting the highest industrial standards at a low investment. Despite its compact design, it is possible to process boards of a size of 508 x 508 cm (20" x 20"). For fluxing, preheating and soldering proven technology is provided, which fulfills the highest demands, even that of operating three-shifts a day, 7 days a week. With the options available, the system can be tuned to the individual needs of the user.

The innovative design of the system and the low maintenance requirement, combined with the excellent accessibility to the functional modules, ensure a high uptime of the system. The extremely low consumption of nitrogen, flux, solder and electrical power allow for a very economic operation at low operating costs. The modern control technology allows simple operation, networking the system to MES/ERP architectures, off-line programming as well as the possibility for remote maintenance.

Featuring all these advantages, this soldering system is a safe investment in the future of any electronic manufacturing plant, since it delivers the quality which one can expect from the market leader Ersa, who has more than 1500 selective soldering systems installed world-wide. ■



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