



Ersa Application Centre and AVLE Course Venues – Experience and training ideally combined

Staff qualification – perfectly tailored to your team

AVLE soldering courses at the highest level

We live in a world marked by globalisation and free trade which is increasingly dictated by digitalisation – both in our private lives and at professional level. Workplaces which have grown over years are being replaced by modern technology; in other areas, digitalisation results in new jobs. The associated structural change has already begun and is exhibiting an extraor-

dinarily fast pace. If we look at the future aspects of the “Internet of Things”, we quickly perceive the enormous potential and the demand for electronic components to achieve comprehensive connectivity. The range is wide, extending from mobile appliances to smart fridges, fully-automated industrial manufacturing processes and autonomous vehicles.

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All the necessary electronic components have to be produced by specific manufacturers. While digitalisation is also advancing in manufacturing, the demand for skilled employees is still huge. The complex correlations in the electronic components manufacturing chain can be ideally mastered using smart production equipment. Soldering processes, in particular, represent an elementary core process impacting directly on the reliability and service life of the final product. On the one hand, soldering processes depend on the quality of the printed circuit boards and components. On the other hand, they require specific expertise in the parameterising of the soldering systems. Despite automation, the decision or intervention of a competently-trained skilled worker is still often called for. This is the point at which the AVLE concept comes in.

THE SOLDERING TECHNOLOGY ELECTRONICS TRAINING ASSOCIATION (AVLE)

The objective of AVLE is the nationwide standardised, close-to-practice and certified training of employees in the field of industrial soldering technology. As commercial soldering training is only received by those in micro-technologist apprenticeships, dedicated companies have come together to overcome this deficit. The founding members are the companies Hannusch Industrieelektronik (Laichingen), Rafi (Ravensburg), Zollner Elektronik AG (Zandt) and Ersa (Wertheim). All the above companies are characterised by a high degree of practical orientation, being constantly confronted with the challenges of modern component manufacturing. It is also this practical orientation which guarantees that the training courses are up-to-date.

New component forms and their specific characteristics in processing can therefore be quickly identified and incorporated into the training. Regular

meetings of the association partners ensure the exchange of technical ideas and the incorporation of customer feedback. Given this close cooperation, the AVLE more than lives up to the claim "Drawn from practice – for practice". Cooperation with the Electronic Design Specialist Association (Berlin) and the Fraunhofer Institute for Silicon Technology ISIT in Itzehoe as scientific partners rounds off the spectrum of these training courses.

AVLE TRAINING CONCEPT

The standards for instructors, content and course venues, as well as for the examination and examiners, were developed jointly by the association partners and summarised in binding guidelines. Compiling the training documents was what took most time. In order to be able to respond to customer requirements with the greatest flexibility, the entire AVLE training concept has a modular structure. In addition, a differentiation is made between manual soldering and automated mass soldering.

At present, the AVLE training concept comprises eight training modules, with four modules each available for manual and mechanical soldering. Each module is structured into a theoretical and a practical section. Where possible, the theoretical knowledge imparted is demonstrated and expanded upon in the practical section which follows immediately. Each module ends with a theoretical examination which tests the participant's knowledge in multiple-choice form.

Modules 1–3 on manual soldering also involve a practical examination in which participants must demonstrate the skills they have acquired by making a test sub-assembly. The soldering joints on the test boards are evaluated in accordance with the most recent version of the IPC-A-610 which is valid worldwide. Having passed the examinations, each participant receives a qualificati-



Ersa Application Centre,
ideal for high-level training



on certificate and the “AVLE Soldering Licence”, a small personalised document recording all the modules which have been passed and identifying the holder as a soldering specialist. The validity of the certificate for the mechanical soldering module is unlimited; in the area of manual soldering and rework, the certificate is valid for three years. Once the validity for the respective module has expired, recertification is required. Modules 1–4 build on one another and attending these modules one after the other is recommended. While entry at a higher level is possible, experience shows that lateral entrants often demonstrate deficits in the fundamentals of soldering.

THE MODULES OF THE AVLE TRAINING CONCEPT

The content of Modules 1–4 are based on the AVLE1510 guidelines, Modules 5–8 on AVLE1511. Participants can select the order in which they complete the individual modules for themselves. With the exception of Module 1, two days each are set for Modules 2–8, including the examination. Module 1 extends over three days.

MODULE 1 FUNDAMENTALS AND THT BASIC TRAINING

The first and most important module in the training of soldering specialists covers all the major fundamentals of soldering in electronics, and cements this knowledge with soldering and desoldering of wired components on printed circuit boards.

Participants learn the correlations between printed circuit board, components and soldering process, thus acquiring a soundly-based knowledge of the process and the process windows in hand soldering using the soldering iron. In addition, Module 1 teaches the necessary basic knowledge for participation in the subsequent modules 2–4.

MODULE 2 SMT BASIC TRAINING

The second module expands on the basic knowledge acquired in Module 1 to include the fundamentals of hand soldering surface-mounted components (SMD) on printed circuit boards. Participants learn the correlations between

printed circuit board, components and soldering process and thus acquire a soundly-based knowledge of the process and the process windows with hand-guided soldering and desoldering of simple SMDs. The maximum size of chip components is 0603, the spacing for SO and SOT components with gull-wing connections is >0.8 mm. Module 2 provides the necessary basic knowledge for Modules 3 and 4.

MODULE 3 SMT ADVANCED TRAINING

The third module is based on the basic SMT knowledge acquired in Module 2 and covers the special requirements in hand-guided soldering and desoldering of very small chip components up to size 01005 and multi-pole fine pitch SMDs up to spacing of 0.4 mm on printed circuit boards with the aid of stereo microscopes.

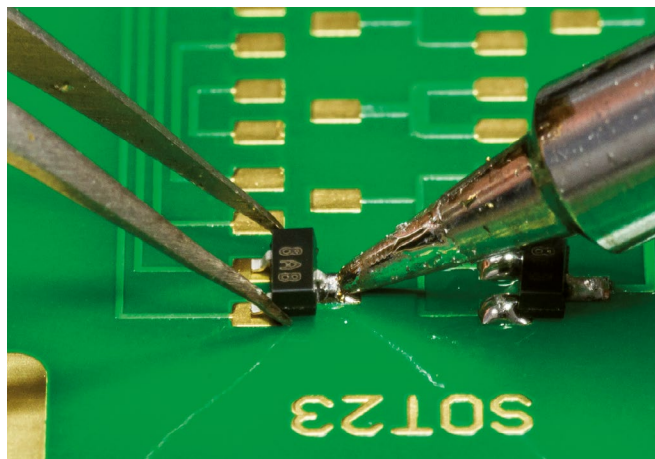
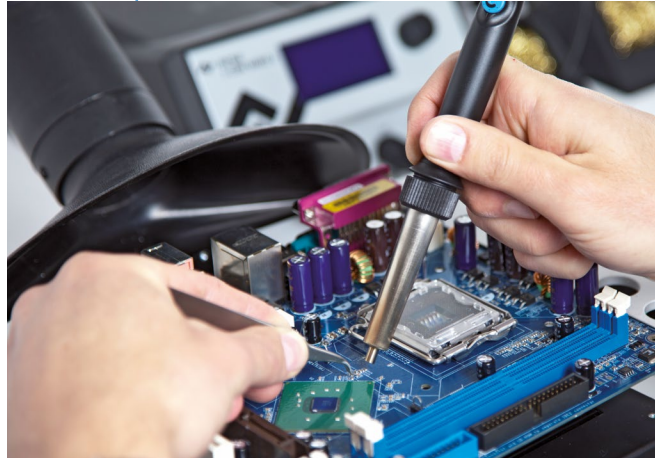
MODULE 4 REWORKING COMPLEX COMPONENTS

The fourth module offers special instruction on the reworking of complex SMT components on electronic sub-assemblies using rework systems.

Participants learn the specific desoldering of defective components and the subsequent replacement with a new component in the same spot on the printed circuit board. The focus in these mechanical processes is on thermal profiling in the component to be replaced when desoldering and soldering, and the thermal resistance of components in the immediate vicinity.

The module teaches methods of soldering and desoldering BGA, QFP and QFN components through practical demonstrations on test printed circuit boards or components which participants bring along from their own workplaces.

Hand soldering with hot-air iron.



Hand soldering of a SOT23 with direct-contact heat.

MODULE 5 WAVE SOLDERING

Module 5 provides a holistic overview of the factors dictating the quality and the system engineering for wave soldering. The interaction between printed circuit board, components and the process parameters of the wave soldering systems are examined in detail, leading to a carefully-targeted approach in creating soldering programmes. Process monitoring, measures against soldering errors and the necessary maintenance of wave soldering systems to ensure process stability are also components of this module.

MODULE 6 SELECTIVE SOLDERING

Module 6 is taught in conjunction with Module 5, as the technical fundamentals of both processes are almost identical. In addition, this module deals with the specific features of selective soldering processes as compared to manual soldering processes and wave soldering. The primary focus is on the soldering processes with mini and multi waves, although other processes are also considered.

MODULE 7 REFLOW SOLDERING

Module 7 deals with the standard soldering process in today's SMT production – reflow soldering. The material under consideration is convection-reflow soldering and related processes. Participants become familiar with different temperature profiles and the conditions for their creation. The measurement of temperature-time processes is also a component of the training, as are soldering errors and their possible causes.

MODULE 8 SOLDERING PASTE PRINTING

Module 8 is taught in conjunction with Module 7. Soldering paste printing is a process of central significance in SMT. To a great degree, the quality of the SMT soldering joints is dependent on the quality of the soldering paste printing. The influence of the factors, soldering paste, template design and printing parameters on the printing result are explained in theory and demonstrated on real printed circuit boards in the practical session.

CONCLUSION

The Soldering Technology Electronics Training Association (AVLE) offers a unique concept for training skilled employees in industrial soldering. With its modular and logical structure, the AVLE training concept provides customers a broad base for practice-related staff training. The broad spectrum of established, industrial soldering processes in electronics manufacturing is covered completely in the training in Modules 1–8, leaving nothing to be desired. Over 1,000 course participants trained by the four association partners in the past four years provide impressive testimony to the fact that the AVLE training concept meets customer needs and requirements in every respect. Highly-qualified, motivated instructors, firmly grounded in practice and with CIT/CIS qualifications pursuant to IPC-A-610 and IPC-7711/7721, run the training courses in small groups in the course venues or at the customer's own site. This ensures that participants are individually supervised.

Ersa, as a founding member of AVLE, offers all AVLE modules in close contact with its own customer application centre. The professionally-equipped course venues offer individual workplaces, fitted out with the most widely-used hand-soldering equipment, fume extraction and stereo microscopes. The consistently state-of-the-art machinery in the Application Centre guarantees effective training at the highest level. Investment in the training of skilled employees in one's own company makes a major contribution to honing the competitive edge and increasing quality in production. Fault-free soldering saves on high costs and at the same time ensures the quality and reliability of the electronic components produced. A wealth of good reasons for firms involved in electronics manufacturing to further qualify their employees by availing of the modular AVLE training options. ■

Further information
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