DO YOU <u>REALLY</u> WANT ISO 9000 PROCESS CONTROL?

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		GOOD	BAD
1. Wave solder machine temperature	= 240°- 250° C		✓
2. Reflow solder oven temperature	= 225°- 235° C	✓	
3. Hand soldering iron temperature	= 350°- 400° C		✓

Soldering is a science. ISO 9000 process control in <u>all</u> soldering operations is a requirement.

<u>Soldering Process</u> = Bring copper (Cu) land and copper (Cu) lead and solder (SnPb) up to 220° for 2 sec. This produces a chemical diffusion reaction between Cu and Sn which makes approx. 0,5µ of the intermetallic bonding material: Cu3Sn / Cu6Sn5, and provides for the maximum mechanical strength of the solder joint.

The Coefficient of Thermal Expansion (CTE) mismatch existing in the various materials, i.e. the land, the lead, the component body, and the substrate, causes a shearing stress during thermal cycling. The intermetallic material allows for plastic deformation or flex in a solid state, thereby, compensating for the CTE mismatch. Without this material or bond, <u>NO</u> joint has been made (See Fig. 1).

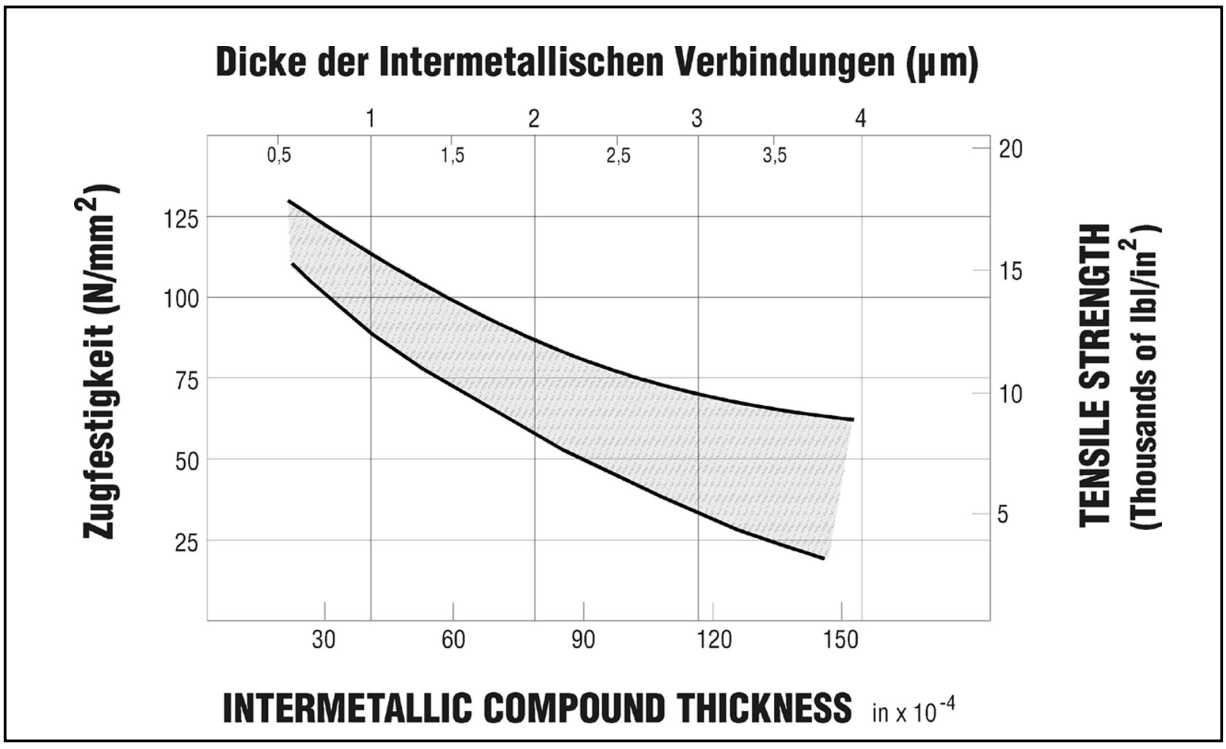

Fig. 1: Tensile strength and intermetallic compound thickness

With less than 0,5µ of intermetallic, we have no tensile strength and therefore a bad or "cold" solder joint. A "cold" solder joint is a joint that melted (i.e. above 183°C) but did not reach 220°C in order to allow the chemical diffussion reaction to take place between the Cu and Sn. With the minimum acceptable amount of intermetallic, 0.5µ , which is produced at 220°C for 2 sec., we have maximum tensile strength and therefore maximum solder joint quality as clearly seen in diagram 1. At higher soldering temperatures the chemical diffussion reaction rate is higher which produces more intermetallic material. The solder joint becomes brittle and porous and has a great decrease in tensile strength!

Process control in a soldering process means always controlling the temperature and time profile (220°C for 2 sec.) to produce the best solder joint quality with maximum mechanical strength. Soldering temperatures which are too low or too high are dangerous and not in accordance with ISO 9000.

The following diagram shows a typical hand soldering process. With a standard iron, the set temperature at which the iron idles is and must be high (375°C-400°C) due to its construction which is limiting. The first joint made when the iron is taken out of its holder is very hot and produced very fast. The following joint, however, has a lower temperature because the tip is no longer as hot because it lost heat into the first joint. This decrease in joint temperature and increase in the dwell time continues until the operator stops the hand soldering process and waits for the iron to get back up to maximum set temperature, and then the process continues. (See Fig. 2).

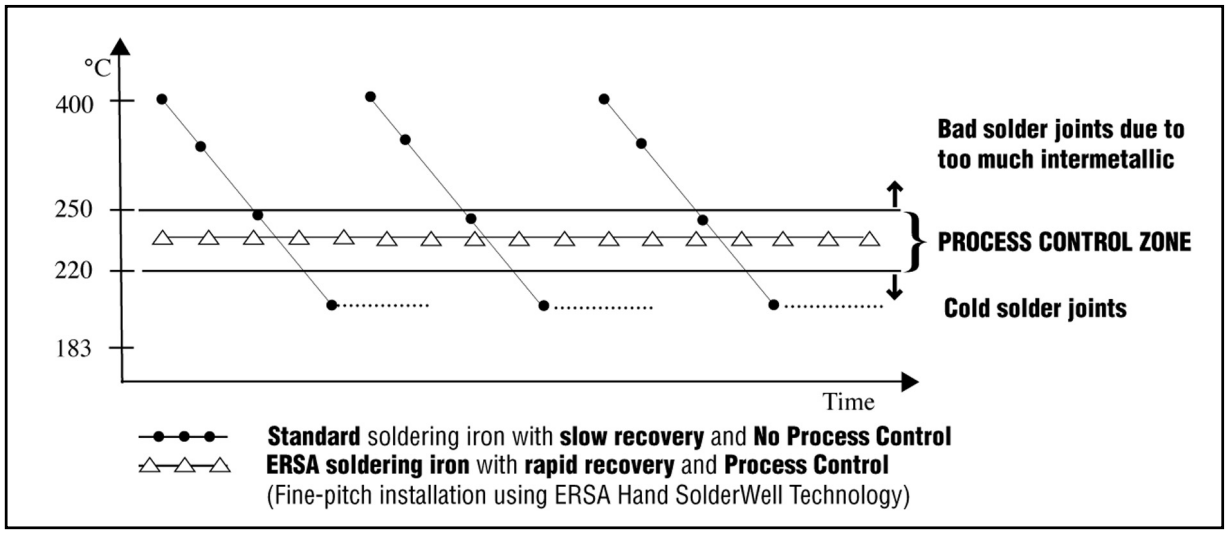

Fig. 2: Typical hand soldering process with different heating and control systems

As the diagram shows, some joints are made too hot, some are in the safe zone (i.e. 220°C-250°C), and some are made too cold. In a machine production process the temperature profile on the PCB is controlled precisely and monitored by a computer. In hand soldering operations, however, the operator is incapable of seeing the difference between molten solder at 190°C (cold) or molten solder at 220°C (ideal)or molten solder at 350°C (too high). If the soldering iron is not designed to operate safely and rapidly in the process control zone (220-250°C) than the soldering quality is left up to chance. This type of "soldering by chance" offers NO Process Control, is contrary to ISO 9000, and has a negative effect on productivty.

The ERSA Power and Control technology delivers Process Control in hand soldering operations at your fingertips by offering:

1. **Exact temperature control**
2. **Maximum power**
3. **System efficiency**
4. **Repeatable soldering results**
5. **Calibration capability**
6. **Ergonomic design**

The following diagram (See Fig. 3) illustrates a design comparison of the different heating and control systems. For a more complete understanding of the 6-point analyses of a closed-loop temperature controlled soldering iron, please refer to pages 6 and 7 in the **ERSA NEW DIMENSION Catalogue** or the technical article **"Power and Control from within - the winning combination"**. A properly engineered iron will allow an operator to produce repeatable soldering results in the Process Control Zone independent of the thermal mass of the PCB. The ERSA SolderWell Technology using the ERSA TechWell tip allows an opperator to solder an SMT finepitch component with 235°C in seconds even on heavy mass boards. The revolutionary ERSA PLCC-Blade allows operators to solder in the largest PLCC´s with 250°C in seconds. **Quality is being increased while at the same time greatly increasing productivity and decreasing working costs.**

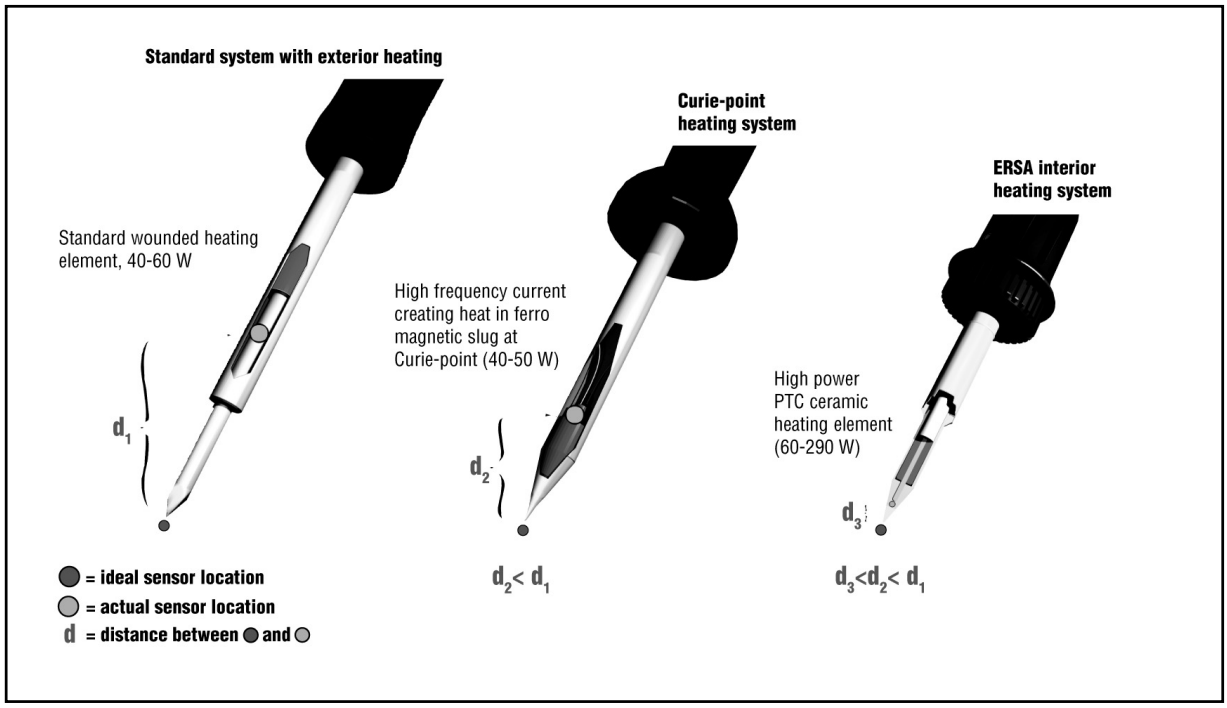

Fig. 3: Comparison of the different heating and control systems

For maximum safety and accountability, the Power and Control technology takes Process Control in hand soldering to the highest level. The revolutionary **ERSA MICRO-CON 60iA** with its **Process Control Software** for the first time in the history of hand soldering, monitors and documents temperature profiles at the solder tip (i.e. in the joint) in real time. The software´s **two-way, interactive capibility**, not only notifies the supervisor that an iron has gone out of the Process Control Zone, but also allows the supervisor to change the stations on line! With a single click of the mouse, the desired temperature settings and other parameters can be down-loaded to all soldering stations connected to the **ERSA CIA 32** computer interface. Additionally, the temperature profiles of all MICRO-CON soldering stations connected are continually stored for ISO 9000 document requirements (See Fig. 4).

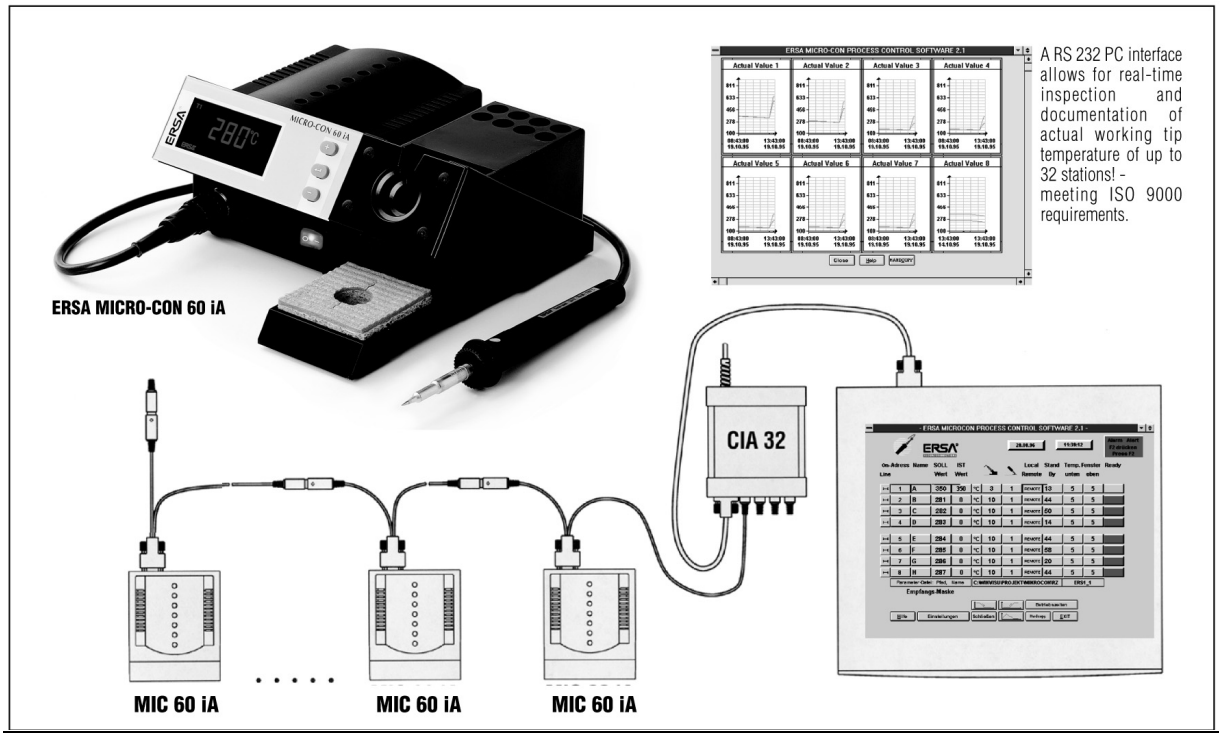

Fig. 4: ERSA Process control software with MICRO-CON 60 iA