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the modula wave®

the wave soldering system
for the finest electronics

green soldering systems

the modula wave® – flexibility included

Kirsten, Switzerland's lead-free pioneer, has provided reliable solder joints for 30 years – with innovative solutions for the cost-effective and simultaneously environmentally friendly handling of increasingly small components and circuit boards.

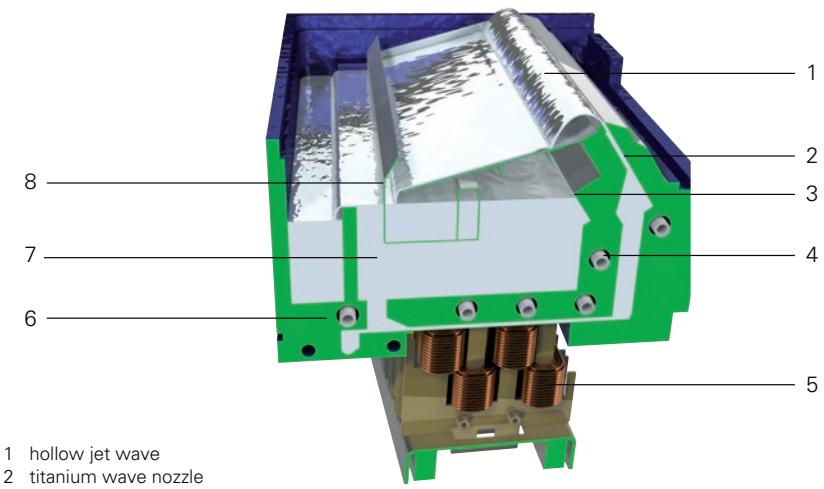
The launch of the Kirsten **jet wave** was followed by a long wait for a far-reaching innovation. Now it is here. Kirsten confirms its status as a pioneer with the first truly modularly designed wave soldering system, **the modula wave®**.

The most conspicuous features of the new system generation include the first-ever entirely horizontal arrangement of the individual modules. This doesn't just make the whole thing more elegant, the absolutely horizontal feed direction also means an increase in precision.

A further advantage lies in the continuously modular design of the system. Amongst other advantages, it is possible to start with an entry configuration which is adapted to meet individual needs and investment capacities. Kirsten's new generation of systems also offers the option of soldering with leaded and lead-free solder on the same machine.

sustainable advantages

Technology is advancing rapidly. More and more products with increasingly shorter life cycles are a result of this. At the same time, environmental compatibility must be taken increasingly into account; this is valid also for soldering technology.



1 hollow jet wave
2 titanium wave nozzle
3 deflection sheet
4 heating rods
5 linear motor
6 solder pot (enamelled)
7 solder
8 solder runback

With its universally patented electromagnetic soldering pump, the Kirsten Soldering Company has created an essential pre-requisite for a high-quality and energy-saving soldering system.

The pump, which operates according to the rotor/stator principle, does not contain a single moving part. In this way, the whole soldering pot construction can be kept to a very compact size. Therefore, the Kirsten soldering pump has a considerably smaller tin bath volume than conventional wave soldering machines, which means considerable less tin costs.

This means substantially lower energy consumption. A considerably shorter wetting time for the individual soldering joints is yet another great advantage.

visko user interface

Via **visko** all process-parameters can be set individually and they are monitored constantly in real time and adapted with intelligent selfregulation.

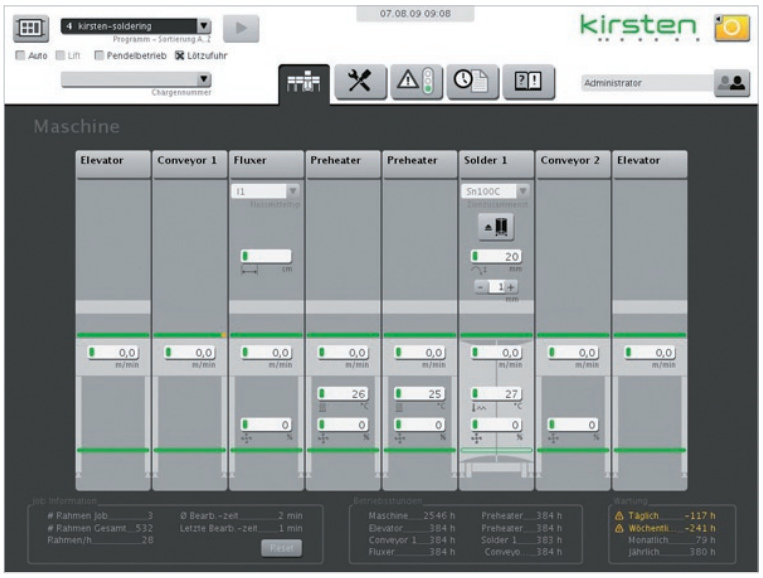
to provide total process setting and control

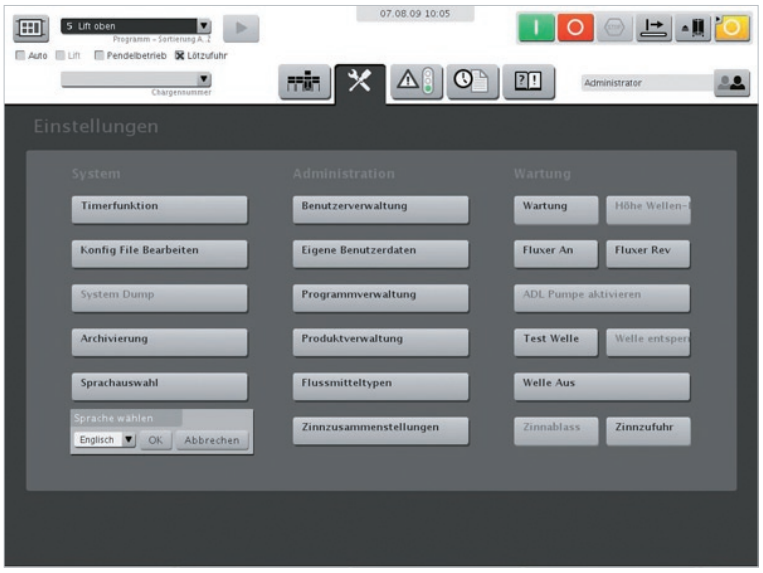
The set up and control management across the whole system represents a substantial innovation. A logical, graphical menu is available to the user via a touch screen.

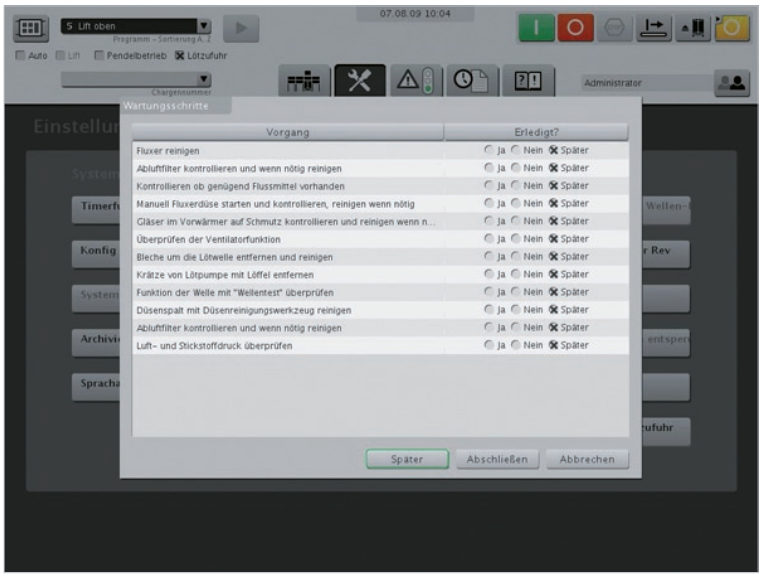
All the information regarding the current status in the individual modules is displayed in real time and can be called up from a log file at any time. All of the maintenance steps which have to be carried out at regular intervals are displayed to the user, in this way a high degree of up time is guaranteed.

The operator uses the **visko** to manage the passage of products and monitor if the machine senses any deviations of the process window from the set programme.

Each module of **the modula wave®** contains a CAN (Controlled Area Network) control system so that each module only gets information relative to its particular activity. It also instructs the visualisation and control unit **visko**, when it has completed its tasks.







options

The basic, minimum configuration of **the modula wave®** will work well in many companies. However, there are a number of companies that need larger systems and different types of control. For these users there are many options that can be configured into the machine either as initial purchase, or as modular add-ons that can be fitted once the original system has been installed. Besides, up-grade and down-grade of this modular system are manageable absolutely without problem.

additional preheat modules
Any number of additional preheat modules can be added to the first if the products require a large thermal soak.

additional solder modules
If more than one solder type is needed, **the modula wave®** can be supplied as original, or as a retrofit, with one or more extra solder modules. These can be interchanged within minutes.

bar-code or RFID transponder reader
This allows the programmes to be loaded and changed fully automatically. It resides in front of the fluxer module and loads each module with its specific programme.

more options:

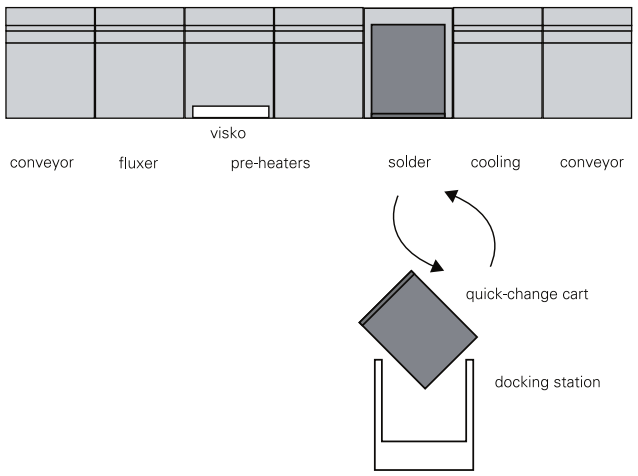
- docking station
- automatic solder replenishment system
- cooling module
- soldering frames with customized applications
- lift and lowering device for soldering frames
- return-conveyors below
- transport modules back and forth

solder modules

There is a worldwide demand for high-quality soldering results as well as for the use of leaded and lead-free solder in a single system.

fixed solder module

A fixed soldering module is available in an affordable entry-level system: the starter point. Unlike the solder module with the cart the fixed solder module has no quick-change mechanism for the solder pot. The most important process-related solder wave settings can be made either manually or via program control, depending on the specification. The installation of two modules in a row enables the simultaneous handling of two solder pots with differing melting points, such as leaded and lead-free solder, in a single production line, making it ideal for high-mix production.



solder module with quick-change cart

This solder module provides the option of changing the type of solder quickly through the use of an extendable cart. The carts are on castors and can be easily exchanged by a single person.

A second cart can be kept at the required operating temperature in a docking station. An advantage of this system is that service and inspection work can be carried out on the solder pot away from the in-line production without having to interrupt operation.

the modula wave® - the key benefits at a glance

energy-friendly / low operating costs

Kirsten machines are optimised in terms of energy consumption, to reduce operational costs.

short warm-up time

Kirsten machines heat up and are ready for operation within one hour.

compact design / minimum area costs per m²

Even for high volume a considerably smaller space requirement is necessary compared to conventional wave soldering systems due to the compact design.

fastest soldering wave - best soldered joints

Suitable for high density close pitch with less shadow formation and minimal risk of short circuits, due to the Bernoulli Effect.

shortest wetting time

Low thermal stress of the components due to high flow speed of the hollow wave, with intensive and short-term heat transfer.

revolutionary linear motor – soldering pump

The soldering pump, with no moving, mechanical parts, is long lasting with minimal maintenance.

short changeover time

Thanks to the possibility of maintaining a second, independent soldering module in a docking station, a solder change over is possible within a short time.

process dwell steps are infinitely variable

The transportation speed can be individually regulated for each process step in each module.

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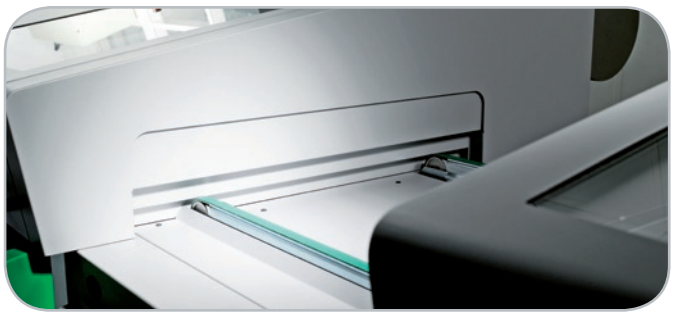
reddot design award
honourable mention 2009



the modula wave®

solder bath covering

There are two methods of protecting the molten solder from oxidation while it is in the solder pot.

K-IN$_2$ERTWAVE™ solder bath covering

The electromagnetic wave solder pump with integral nitrogen inertisation.

The patented K-IN$_2$ERTWAVE™ system was developed jointly by Kirsten Soldering AG and Air Liquide. This system is particularly suited to the use of Pb-free solders in all volume situations.

Covering the molten solder and also the solder wave with inert Nitrogen is an efficient and cost-effective method of reducing scrap and maintaining solder joint quality.

Anti-Dross-Liquid (ADL) solder bath covering

Molten solder that is exposed to an oxidising atmosphere, either while at rest in the solder pot or while being pumped into a solder wave, needs protection to avoid excess dross and a low-viscosity liquid that lies on top of the molten solder in the solder pot provides that protection.

The liquid is preheated and pumped into the wave in such a way that it is guaranteed that all circuit boards to be processed do not come into contact with the liquid whilst maintaining joint quality.

conveyor systems for high volume

Two different conveyor systems are available so as to meet all of the customer's requirements: a soldering frame conveyor system or a bushing chain finger conveyor. The respective transport units are built into the modules and enable differing speeds in each individual module.

The products are forcibly guided and cannot slip out of position. The intelligent **visko** system software dynamically controls the soldering frame or print separation based on the process parameters set, such as conveyor speeds, thus optimising output.

soldering frame conveyor with belt drive

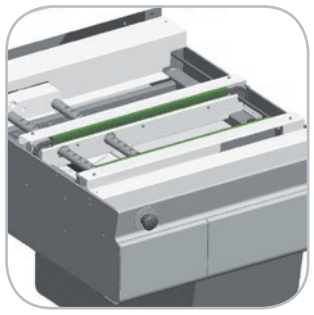
Each module is equipped with a belt drive which can be actuated separately.

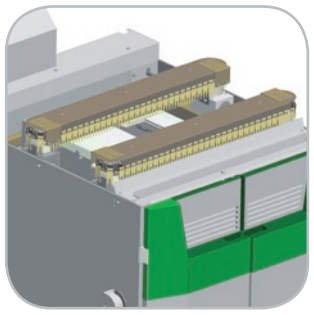
bushing chain – finger conveyor

This conveyor system consists of two complementary systems. A finger conveyor is used in the solder module on account of the special requirements. Individual titanium fingers attached to a chain hold the circuit board or circuit board holder firmly and convey it over the solder wave. A bushing chain conveyor system is used in all of the other modules.

It consists of two chains running parallel to one another with elongated bolts which serve as a handling system. In all modules the track width is actuated using an electrically controlled threaded spindle unit and is set to the desired width using **visko**.

conveyor with belt drive


bushing chain conveyor


finger conveyor solder module

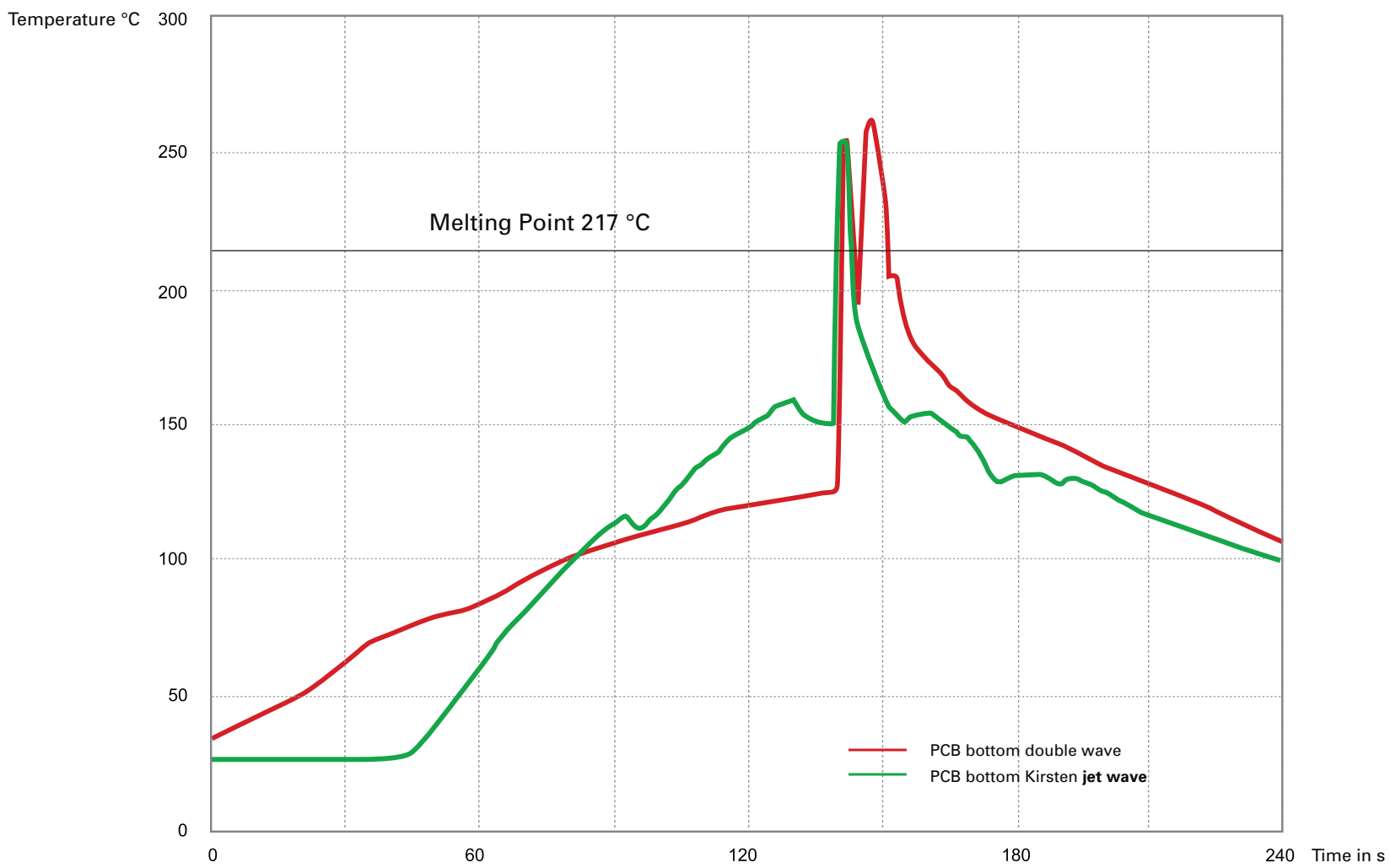
lean and clean - lowest thermal stress included

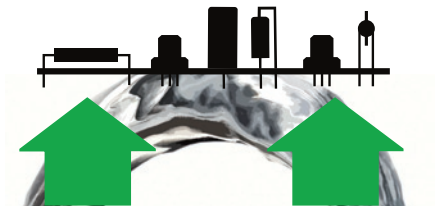
Preheating is achieved, for example, by running a background convection air system to provide constant background heat to start the thermal build-up in the PCB assembly. Extra heat is applied by peak emission IR quartz heaters to quickly build up underside heating.

Both are controllable by **visko** so that a three-preheat machine can be programmed to use only convected air in preheat 1 but progressively apply IR in preheats 2 and 3 if that is what the product needs.

The product receives optimum heat but at the minimum energy consumption possible. In comparison with a double wave there is only one temperature peack with a controllable wetting time. The risk of no existence of fluxer at the second peack is not existing. Also the thermal stress for mounted components is minimal.

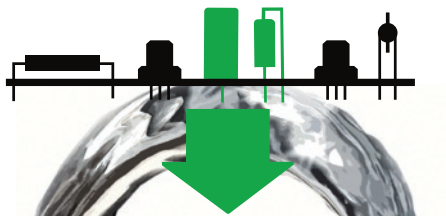
The programme is set up to offer the optimum facilities to the PCB being soldered. It ensures that all the flux is used without leaving excess to be cleaned off later but it also does not burn it all prematurely so that there is no chance for oxidation to take place again on any of the solder pads.





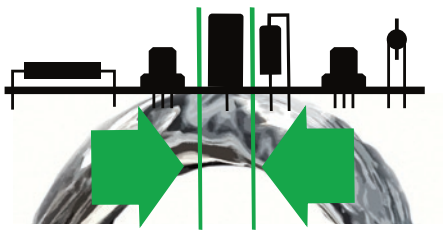
Kirsten hollow jet wave

Large boards tend to warp during soldering. The **jet wave** compensates automatically differences in height, thus eliminating unsoldered zones. The **jet wave** is flexible and adapts itself to the lower surface of the PCB. Easy adjustment of wave height.



pulling-down effect

The **jet wave** is projected to the lower surface of the PCB, where it clings and pulls the PCB and the components down by its weight and due to the Bernoulli effect. With the **jet wave**, holding down- clamps are unnecessary.



low heat load

Heat exposure over the **jet wave** is minimal, as the contact zone of the PCB over the **jet wave** is short (min. wetting time). The contact width of the wave is self-adjusting to conductor surface. The wave maintains the necessary contact time on small and large tracks automatically.

jet wave compared to solid/double waves provides 8 times more heat transfer at only 20% heat load.

bernoulli effect

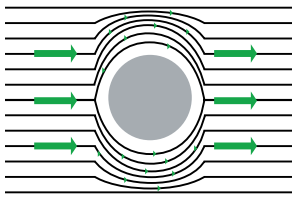
The single, Kirsten hollow **jet wave** was selected because of its ability to provide hold-down forces and its ability to force molten solder on to every wettable surface.

The Italian physicist, Bernoulli, gave his name to the effect of flow rates of incompressible materials creating differing pressures on either side of the flow. In the case of Kirsten's hollow **jet wave**, the atmospheric pressure above the wave is greater than the atmospheric pressure underneath. This results in a gentle, but consistent pressure on the components on the top side of the PCB so that they stay in position and do not rise up as is usually the case with other systems using Wörthmann or double wave.

The high flow rate of around 0.8 metres per second contributes to the special quality of the connections; it produces an optimal circulation and therefore a perfect covering of the wettable solder surfaces.

flow physics around a SMD

The high-speed **jet wave** also creates a mechanical scrubbing effect, ensuring that the solderable surfaces remain de-oxidised following the flux activity.



- No bridging
- No shadow effects
- No additional or special wave
- Perfectly soldered SMD´s

fine pitch and fine line technology

The Kirsten **jet wave** is especially suited to solder fine line PCBs.Track width of 0,1 mm (4 MIL.) and gaps of 0,2 mm (8 MIL.) present no problem. Fine pitch down to 0,4 mm (16 MIL.).

The limit of miniaturisation is given by the etching technology and not by the wave.

principle of the hollow wave

Technical Data

Model	the modula wave®
Soldering width	360 mm
Pre-heater length	1 x 650 mm (standard) 2 x 650 mm (option) 3 x 650 mm (option)
Max. throughput height	120 mm
Solder angle	0°
Throughput speed (solderi	0,1 - 6 m/min
Max. PCB dimensions	~320 mm x 490 mm
Production capacity	min. 140 frames/hour (4 PCB's 100x160mm/frame; soldering speed 0,9m/min; 2 Pre-heater)
Solder wave height	5 - 30 mm, adjustable in 0,5mm steps
Wave speed	approx. 0,8 m/s
Solder pump capacity	approx. 280 kg/min
Solder bath content	approx. 60 kg
Max. solder temperature	290 °C
Heat up time	approx. 65 minutes
Solder bath covering system	nitrogen N_2 or alternatively liquid medium (ADL)
Covering medium content	approx. 40 Liter
Usage of nitrogen N_2	approx. 15 m^3/h
Requested air exhaust of	approx. 2200 m^3/h (incl. Fluxer) (measured at exhaust exit of machine)
Requested air exhaust of fluxer	approx. 1100 m^3/h
Exhaust pipe - Ø machine	1x250 mm
Electricity supply ✳	3Phase (5 wire, 3L, N & E), 230/400 Volts +/-10%, 50/60 Hz
Main fuse	external 63A fuse necessary
Hook up methode ✳	max. 3 x 52 A (with 3 Pre-heater)
Requested power capacity	18 kW (with 1 Pre-heater)
Requested power capacity	27 kW (with 2 Pre-heater)
Requested power capacity	36 kW (with 3 Pre-heater)
Power consumption in stan	approx. 4 kW
Requested compressed air	4 - 6 bar; approx. 0,1 m^3/min.
Length of machine	3250 mm (one Pre-heater included) + 650mm per additional Pre-heater
Width of machine	1100 mm (+ 300 mm for Kirsten exhaust pipe connection)
Height of machine	1450 mm
Max height with open cover	2010 mm
Height of transport	1110 mm
Operating Temperature	15°C - 30°C (59°F - 86°F)
Max. weight incl. solder	approximately 800 kg for standard configuration

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