New Products

Lead-Free Reflow Oven with Nitrogen Atmosphere for Medium-Sized Printed Circuit Boards "Salamander XNZ-725"

In the past two or three years, despite the fact that the lead-free mounting technology just began to be applied to mass production of commonplace electronic products, there is an urgent need for this technology to deal with printed circuit boards (PCBs) having a high difficulty level such as for automobiles and network servers where extremely high-reliability is required. This is presumably because the WEEE Directive and the RoHS Directive are scheduled to come into force soon.

Because its liquidus line is higher than that of the tin-lead eutectic solder by 30~40°C, the lead-free solder of tin-silver alloys, which is becoming the worldwide standard, tends to have such problems as increasing temperature differences in component joints, insufficient solder wettability and inadequate heat resistance of components, thus lowering the soldering yields.

Furukawa Electric has been supplying, after the company addressed the above-mentioned problems to devise appropriate countermeasures, the Salamander XNK series of lead-free reflow ovens for large-sized PCBs to the global market with a focus on the domestic as well as Asian markets, thereby making a major contribution to eliminating Pb solders.

Recently, Furukawa Electric has developed the XNZ-725 model (Figure 1), an extension of the XNK series, for exclusive use for medium-sized PCBs. This is a modified model, intended for universal use, of a high-performance model that was developed for automotive applications. Main features of the machine will be presented below.

1. IMPROVED BASIC HEATING PERFORMANCE

To decrease the temperature difference in the components joints, it is required to increase the heat transfer rate using hot air. While heat transfer rate can be increased by raising the wind speed of hot air, this will cause the displacement or shifting of components, so that improving the heating performance by means of wind velocity alone is restricted to a certain extent. Conventional Salamander ovens have adopted a nozzle flow system which can, while suppressing the horizontal wind speed that causes the displacement of components, increase the heat transfer rate. In the XNZ-725 model, the nozzle flow system, inherited from the conventional model, has been improved by alternating the suction and blow nozzles in a matrix configuration as shown in Figure 2, thereby increasing the total output area of the blow nozzles. This has brought about an improvement in the uniformity of temperature, and the basic heating performance has been upgraded by about 30 %. Moreover, the improved heating performance enabled to manufacture various PCBs using the same setting for soldering temperature, so that a considerable reduction in the setup time has been achieved.

Figure 1 Appearance of Salamander XNZ-725PT.

2. INCLUSION OF FORCED COOLING MECHANISM AS STANDARD EQUIPMENT

The two-stage cooling mechanism of the XNZ-725 using water is included as standard equipment in consideration of the heat resistance of sensitive components and operator's comfort. This enables cooling of the surface temperature of a 1.6-mm thick glass-epoxy PCB down to 100°C or lower at the reflow oven exit, realizing a cooling gradient of 4°C/sec at the maximum. See Figure 3.

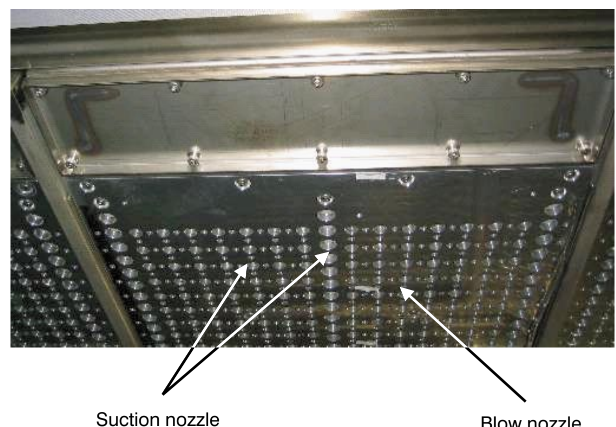

Figure 2 Appearance of hot-air nozzle panel. The blow and suction nozzles are alternately arrayed.

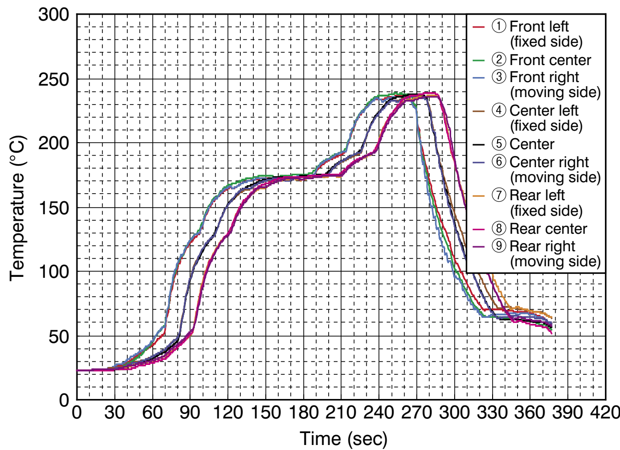

Figure 3 Example of temperature profile measurements.

3. FLUX COLLECTION

A new flux collection system of centralized configuration has been adopted to prevent deposition of flux fumes evaporated from the PCBs. Ease of maintenance has been greatly improved due to the new system whereby flux collection at the entry and exit is enhanced thus reducing the intermediate collection spots.

4. IMPROVED EASE OF OPERATION

A high-performance microcomputer with a touch panel has been employed to ensure ease of operation as good as or better than that of personal computers, while achieving upgraded reliability without using a HDD. See Figure 4.

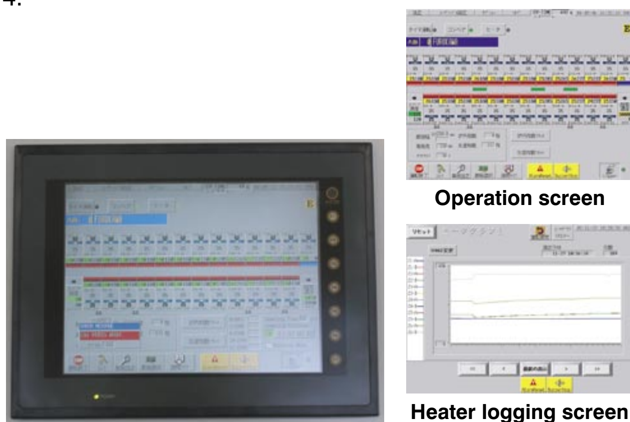

Figure 4 Operation panel.

5. COMPACT DESIGN

In line with the general movement of mounting systems toward medium-sized PCBs, the XNZ-725 specializes in this size, and succeeded in the footprint reduction while achieving performance improvements above mentioned. The total length of the oven is about 5 m, i.e. 20~100 cm shorter than conventional ovens of the XNK-series.

6. ZONE COFIGURATION

Figure 5 shows the zone configuration of the XNZ-725 consisting of seven heating zones and two cooling zones in addition to a flux collection system installed at the entry and exit.

7. SPECIFICATION

Table 1 shows the specifications of the XNZ-725.

Table 1 Outline specifications

Outer dimensions	Length	5070 mm
	Width	1300 mm
	Height	1400 mm
Maximum PCB width		250 mm
Top and bottom clearance		Top: 15 mm, Bottom: 15 mm (standard)
Number of zones	Heating	7
	Cooling	2
Power supply		AC 200 V, 3 phase
Power consumption		52 kVA max. including chiller
Weight		2,200 kg

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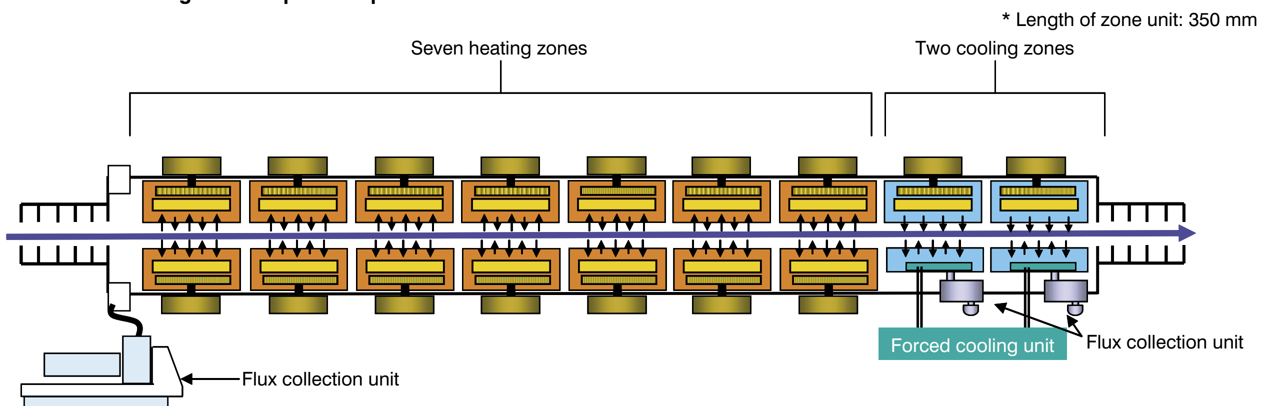

Figure 5 Zone configuration.