



LPKF ZeIFlow RO4(/N2)

Manual

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1. Introduction

Reflow soldering is a part of surface mount technology (SMT). Basics steps are applying of solder paste, placing of surface mount designed (SMD) components and reflow soldering.

LPKF ZeiFlow reflow oven is designed for laboratory or small workshop use for SMT reflow, curing adhesives, hardening through-plating pastes and hybrids as well as other thermal processes. Thermal process is set only with minimal parameters as are temperature and time for preheat and reflow phases and whole process can be observed through glass window therefore specific knowledge of reflow process is not necessary.

To enable successful warranty claims, if necessary, it is absolutely necessary to read this manual carefully before using the device for the first time, and to follow the instructions exactly!

If you have any additional questions to your equipment, please don't hesitate to contact us:

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2. Technical characteristics of the LPKF Reflow oven RO4

Power connection:	220-230V / 50-60Hz single phase
Power consumption max.	3500W
Maximum circuit board size:	280 x 350mm; 11" x 14"
Soldering temperature	max 270°C
Temperature stabilisation	5min
PCB cooling	bottom-mounted fan
Dimensions (w x h x d)	500mm x 450mm x 370mm; 20" x 18" x 15"
Weight	20kg ; 42lb
Ambient conditions:	Temperature: 5 – 35°C
	Humidity: 30 - 95%
	Altitude: below 1000m above mean sea level
Nitrogen consumption:	10 SCFH* = 0,283 m ³ / hour

* SCFH: S = measuring at room temperature under ambient atmosphere; CFH = cubic feet per hour

	Reflow (sec)	Dry (min)
PREHEAT time:	1 - 1800	1 - 1440
PREHEAT temp:	50 - 220°C	50 - 220°C

REFLOW time:	0 – 600	-----
REFLOW temp:	75-270°C	-----

HEATUP time:	approx. 5 minutes
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3. General information

Caution:

- The original packing should be opened on marked places only by screwdriver otherwise warranty claim will not be considered.
- If any transport damage is discovered, the forwarding agent is to be notified immediately.
- Please inspect ZeiFlow device for completeness immediately after unpacking it on hand of the packing list. Also inspect it for transport damage.

Attention:

- Don't inhale the soldering steams. Avoidance contact with your skin. Read the information and the attentions of the manufacturer of the solder paste. Solder pastes are leaded.
- Use only genuine spare parts. If non genuine spare parts are used we cannot guarantee warranty claims.

NOTICE:

This instruction manual was prepared for different models. Therefore is possible that some of the functions your appliance doesn't have.

In case of any claim please make sure that you send the equipment back in the original package.

Warranty for the oven is 12 months in case oven is used in accordance to this manual and is not anyhow modified by customer or other not autorised person.

WARNING

NEVER SWITCH OFF HOT OVEN!

When hot oven is switched-off some heat of inner chamber will pass over also to outer casing.

This might cause overheating of the oven increase the risk of fire and burns!

Oven is designed to automatically cool down and switch off. In case you are forced to switch-off hot oven or in case of electric power back out open the drawer!

During reflow process oven heats up to relatively high temperature. After the cycle oven cools down again to the preheating temperature. If new cycle is not started within 15minutes, oven is going to cool down and automatically switch-off when temperature falls below 40 degrees Celsius.

After last cycle, reset the oven and cooling will be started automatically. Slightly open the drawer (cca. 5cm / 2") to speed up cooling procedure.

3.1. Safety precautions

1. In order to be able to guarantee the safe operation of the system the user must have read this manual, before first use.
2. Never reach into the device during operation.
3. If you modify equipment yourself, the equipment's safety can no longer be guaranteed and no guarantee claims can be accepted!
4. When using chemicals please take note of the safety notes on the containers or separate security sheets delivered with them!
5. Keep the workplace tidy.
6. The device must work in a dry place
7. The equipment is designed for room operation only.

3.2. Unpacking and setting up the Reflow oven

Please check before unpacking the system if any transportation damage is visible on the outside of the packing. If any damage is visible, please inform immediately your forwarding agent.

Unpack LPKF ZelFlow carefully not to cause any damage on the device which is delivered according to your ordered specifications. Remove the fixation of the device.

Compare the power supply characteristics with your mains network before operating.

The oven is to be installed on a heat resistant floor/background. To power oven, fit main plug of minimum 16 Amp.

3.3. N2 connection

To connect gas you have to lead the instructions from your gas supplier.

Inlet piping run: it is good practice to approach the flowmeter inlet with as few elbows and restrictions as possible. In every case the inlet piping should be at least as large as the connection to the flowmeter i.e. 1/8" pipe size. Pipe type material and connector must be proper to provide gases under high pressures i.e. 16 bar.

Unwind the plug 1/8" and tighten inlet piping with 1/8" threaded connector. Open the main valve on your tank regulator or on your pipeline. Adjust the pressure on 2 bar and open the valve at the beginning of your connection for flowmeter. Connection is now ready for operation; after use you have to close both valves.

4. Switching on and settings

ZelFlow RO4 is combined hot air/quartz top bench reflow oven for laboratory - prototyping and small batch use. You can open the drawer of the oven. For bigger objects you can open the upper part of the oven and put it into the oven. The temperature in the oven must be below 40°C, otherwise the opening is not possible.

For easier usage and handling has the oven 10 different stored profiles for later use. The start and end of all process are indicated both visually and acoustically. The oven has automatic switch off function after 15 minutes.

Temperatures and times can be set with the switches 2, 3, 4, 5 at the front panel.



1

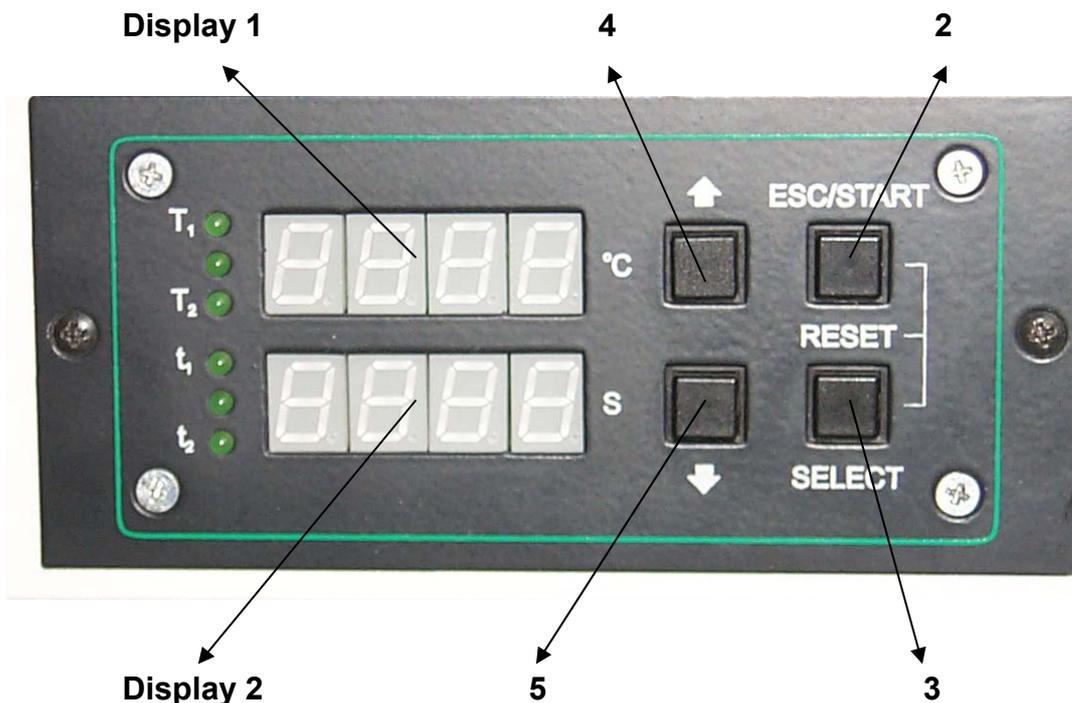
4.1. Starting the process

1. When power switch 1 is switched to on. The last used program is stored in the memory and can be started with pressing the switch 2 (START/ESC) for 1second.
2. Within 10seconds after switching the oven on or reset (pressing switches 2 (START/ESC) and 3 (SEL) for 0,5second) is possible to open the upper part of the oven by pressing switch 3 (temperature in the oven must be less than 40°C). Otherwise program continues with step 3.
3. The last used program is loaded in the memory. (for example display1 shows : rdY and display 2 shows: Pr 8 in case the last used program was 8). By pressing switch 2 (START/ESC) you can start the program.
4. Stabilisation process for the oven is starting. It lasts approximately 5 minutes. When oven is switch on from room temperature (cold oven) is recommended to make on soldering process without PCB inside to warm up oven to working parameters.
5. When the oven is ready for starting the process Display 1 is changing from rdY to Ins and Display 2 changes from: 4PCB and PCB and additional acoustic signal.
6. Soldering process is started by opening the drawer and placing assembled PCB in the drawer. This should preferable be done within 15 minutes. If the drawer is not closed within 15 minutes, the oven will switch off automatically!
7. Temperature and time during the reflow period can be read from the Display 1 and 2
8. After completion of the reflow phase, the oven will emit an acoustic signal indicating that the drawer is to be opened. The drawer should remain open to cool down PCB and oven. Remove PCB from the drawer. If the drawer is closed during cooling period , the display will indicate that the drawer should remain open.

Typical setting for temperature profile are between 140°C -170°C for preheating and from 215°C -230°C for reflow and time from 90s to 180s for preheating and from 30s to 50s for reflow. Time for reflow includes also raising of temperature from preheating phase. Necessary time for reflow at desired end temperature is only few seconds.

4.2. Starting the process under nitrogen atmosphere

1. When power switch 1 is switched on the last used program is stored in the memory and start the program with pressing the switch 2 (START/ESC) for 1second. Open both valves on your gas piping.
2. To start the process, open the control valve on flowmeter slowly to avoid possible damage. Rate of flow is read at the point of maximum width of indicator float. Control valve is turned clockwise to reduce flow, counter clockwise to increase flow. Adjust the flow on 10 SCFH.
3. Scale on flowmeter is in SCFH: S = measuring at room temperature under ambient atmosphere; CFH = cubic feet per hour; 10 SCFH=0,283 cubic m per hour.
4. During the stabilisation process the atmosphere becomes neutral – with less volume of Oxygen than Nitrogen.
5. When the oven is ready for starting the soldering process increase the gas flow to 15-20 SCFH (when you will open the drawer the internal atmosphere would be polluted with Oxygen).
6. During the preheating the dezoxydation process is more efficient especially for high professional pcb. Also wetting process is better during reflow phase especially with lead free solders.
7. After completion of reflow phase close the control valve on flowmeter and open the drawer to start cooling the PCB. When finished close the drawer and adjust the flow again on 10 SCFH if you want to continue with soldering otherwise close both valves on your piping.



4.3. Pre-setting and changing the stored profiles

1. When power switch 1 is switched to on. The last used program is stored in the memory and can be started with pressing the switch 2 (START/ESC) for 1second.
2. Within 10seconds after switching the oven on or reset (pressing switches 2 (START/ESC) and 3 (SEL) for 0,5second) the oven is possible to open the upper part of the oven by pressing switch 3 (temperature in the oven must be less than 40°C). Otherwise program continues with step 3.
3. The last used program is loaded in the memory. (for example display1 shows : rdY and display 2 shows: Pr 8 in case the last used program was 8). By pressing switch 2 (START/ESC) you can start the program.
4. In case we want to select other stored profile we have to press switch 4 (↑) or 5 (↓).
5. In case we want to change or compare stored parameters press switch 3 (SEL) before starting the program. By pressing switches 4 (↑) or 5 (↓) we are changing parameters either positively or negatively:
 - Minute or seconds mode: Display 1 shows: °C; Display 2 shows: SEC or IIN. The whole program will operate in the selected time mode. Press switch 3 (SEL);
 - T1 (preheating temperature); Press switch 3 (SEL)
 - t1 (preheating time); Press switch 3 (SEL)
 - T2 (reflow temperature); Press switch 3 (SEL)
 - t2 (reflow time); Press switch 3 (SEL)
 - Working of the bottom fan: Display 1 shows: COOL; Display 2 shows value between 0 and 8 (speed of the bottom cooling fan: 0 means the fan is not working; 8: maximum speed of the fan); Press switch 3 (SEL)
 - Cooling time for the PCB: Display 1 shows: COOL; Display 2 shows value in the selected time mode (1 and up to 1800sec or 180min); Press switch 3 (SEL)

6. The last step is storing the new values or giving up the changed parameters. On Display 1 is sign : Stor and on Display 2 the program were we can store the program Pr8. By pressing switches 4 (↑) or 5 (↓) we can select the program were we want to store the program. If we want to store the new parameters press the switch 3 (SEL), by pressing the switch 2 (START/ESC) we will keep the old parameters.
7. Predefined profiles: they can be overwritten by user. In case, that factory predefined profiles are requested again can be called back through SET function – see chapter 5 under improvements.

prg.No.	Mode	Preheat Temp	Preheat Time	Reflow Temp	Reflow Time	Cooling Time	Cooling Speed
0	Sec	150	150	225	90	80	6
1	Sec	160	140	230	100	90	8
2	Sec	170	140	235	100	100	8
3	Sec	180	150	260	100	100	8
4	Sec	190	150	265	100	100	8
5	Sec	200	160	270	110	100	8
6	Sec	210	160	270	110	100	8
9	Min	160	90min	0	0	20min	6

Programs 4-6 are for lead-free soldering with melting point 217-219degC.

5. Firmware changes at new release 2.00

New SW release RO4 v2.00 is replacement for RO4 v1.03 for ovens without custom designed changes. All ovens, delivered from Nov.20, 2003 will be set up with new firmware.

Eliminated bugs:

- After REFLOW phase when first beeping period is turned ON and OPEN DOOR is on display, display doesn't show the COOL PCB time, if door is opened, but it shows it, if you open the door AFTER first beeping period
- If the door is opened during PREHEAT and REFLOW phases, and remains opened over the phase timeout, display is cleared when the door is closed. The ZelFlow RO4 is blocked until reset is pressed. There was also a problem with time countdown when the door was closed.
- More secure enter into SET mode. To enter into SET mode, where factory profiles can be loaded, it is necessary to press ESCAPE/START button meanwhile the version text is shown on display. To load factory profiles SELECT button must be pressed (in earlier version START button), START button is used to exit SET mode and to continue loading previously ran program. So it is almost impossible to upload factory profiles over user-redefined profiles if enter to the SET mode is done by accident.

Improvements:

- New, faster and more accurate STABILIZATION. Maximum stabilization time for high temperatures is now under 10 minutes for first cycle. When oven is warmed up, stabilization lasts only few seconds.
- More secure enter into SET mode. To enter into SET mode, where factory profiles can be loaded, it is necessary to press ESCAPE/START button meanwhile the version text is shown on display. To load factory profiles SELECT button must be pressed (in

earlier version START button), START button is used to exit SET mode and to continue loading previously ran program. So it is almost impossible to upload factory profiles over user-set profiles if enter to the SET mode is done by accident.

Resetting user memory and all memory is now done by choosing

- rst1 (ALL MEMORY) or
- rst2(USER MEMORY) with up and down buttons.

To reset selected memory, SELECT must be pressed.

New, predefined factory profiles have been saved. They are saved on program 0, 1, 2, 3, 4, 5, and 6. Programs from 3 to 6 are saved for lead-free solder paste reflow. Programs can be overwritten by user at any time.

EasySolder profile is still on program 9.

6. Trouble shooting guide

A great deal of care was taken when manufacturing and assembling your appliance. Nevertheless, it is possible that faults may occur during start up or at a later stage. These are often caused by transportation.

In the event of a fault, please proceed as follows:

No power:

- Check your power supply
- Check the fuses which are located in the power supply at the back of device.

RO4 Error Definitions

Error nr.XX	Description	Possible solutions
1	Temperature too high to release cover	Cool down oven, then try again
2	Temperature out of allowed range	Cool down oven, then run check out
3	Time constant passed	Time constant for specific task passed. Check heater function, if necessary change time constant
10	DC 24V missing	Power supply failure
11	KeyBoard read failure	Error might happen on POWER ON, when software initializes keyboard, and one of buttons is pressed. Restart the oven and wait a little more with pressing buttons.
12	Temperature sensor failure	
13	Heater failure	
14	Quartz failure	
20	Password Error	

7. Display Messages

	RO4 Display messages:	
LOAD	"LOAD"	Loading profile
Stor	"Stor"	Store profile?
CLS door	"CLS DOOR"	Close drawer(door)
Err	"Err XX"	Error nr.XX (look Error definitions)
rSt	"rSt"	reset
HEAT	"HEAT"	heating to previously set preheat temperature
StAb	"StAb"	stabilization
oPEn door	"oPEn door"	open drawer(door)
oPEn	"oPEn"	open bench top
COOL	"COOL"	oven is cooling down

COOL SP	"COOL SP"	speed of cooling fan
Auto OFF	"Auto" "OFF"	oven has been automatically turned off after preset time
Ins PCb	"Ins" "PCb"	insert pcb
SET	"Set"	enter to SET menu?
done rSt	"done" "rSt"	reset or factory profiles has been loaded

8. Maintenance

With proper using of Nitrogen gas there is no pollution in the system. A nylon insert is provided in the threaded section of the valve stem to give a firm touch to the valve to prevent change of setting due to vibration. Do not unscrew or withdraw valve stem beyond the threaded section except for maintenance. The only maintenance normally required is occasional cleaning to assure reliable operation and good float visibility on flowmeter.