USER MANUAL

Lead-free Reflow Oven
LPKF ProtoFlow® S

LPKF
Laser & Electronics

1 INTRODUCTION

Company name: LPKF Laser & Elektronika d.o.o.
Abbreviated name: LPKF d.o.o.
Address: Polica 33
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Internet: www.lpkf.si

E-mail: support@lpkf.si, sales@lpkf.si

Trade-mark: LPKF
Laser & Electronics

1.1 ProtoFlow S

The ProtoFlow S is a powerful convection oven for lead-free reflow soldering. Many pre-programmed process profiles can be easily selected via a LCD display and simple keyboard. All profile parameters, such as temperature and process duration, can be programmed individually for separate preheating and reflow phases. Profiles are easily defined by user names. A single or multiple PCB's up to a maximum working surface of 200x160 mm can be easily inserted.

The multiprocessor controller, combined with 3 sensors and 3 separate heating groups, provides even heat distribution over the whole area of the PCB. Several freely programmable steps between preheating and the final reflow enable the processing of almost all reflow profiles up to 320 °C. In addition, via an USB communication port, a profile recorder (up to four optional additional sensors) enables the monitoring and recording of temperatures on the PCB or on individual components. This same USB connection provides a user-friendly way of setting up and profile-programming the process via a PC.

1.2 Warnings

Note: Data can be altered without prior notice.

Original Instructions

LPKF is not liable for any damage occurring due to improper use of these instructions.

The owner of the LPKF device is obligated to:

- Ensure that the device is used only for its intended purpose.
- Ensure that the device is used only under the specified operating conditions.
- Regularly check safety, and control devices.
- Ensure that only authorised and qualified personnel operate the device.
- Ensure that all operators of the device have ready access to these instructions.
- Ensure that the device always has safety labels in place.

Before opening the packaging, check the »shock sensor« located on the outside of the box. If the indicator is coloured bright red, DO NOT OPEN THE PACKAGING, but immediately inform your transport agent!

Remove the packaging and check the general state of the equipment, and check the contents against the enclosed packing list.

In the event of any damage immediately inform the transport agent!

Before starting-up the device, remove all packaging, which served as protection of the device during transport, otherwise severe damage could be caused to the device!

Please note: unauthorised repairs or modifications to the equipment will void the warranty!

In case of problems with the machine, please immediately contact us, giving the serial number of the machine!

Telephone:	+ 386 (0) 592 08 800
Fax:	+ 386 (0) 592 08 820
E-mail:	support@lpkf.si sales@lpkf.si

2 CONTENTS

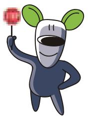
2.1 Symbols etc. used in this manual

Text in *italics* emphasises the importance of the information.

Symbols that you will notice in some chapters have the following meaning:

Danger!
The symbol is used to highlight danger to life or health.

Caution!
The symbol warns of circumstances that could threaten the safety and health of the device operator or cause a serious device defect.



Good advice and instruction
“Rapido” warns us of possible faults, and recommends simple and effective solutions.

2.1.1 Registered trademarks

The LPKF logo and all LPKF product brand names are registered trademarks of LPKF Laser & Electronics AG and LPKF Laser & Elektronika d.o.o.

Microsoft and Windows are worldwide registered trademarks of the Microsoft Corporation.

All other trademarks are property of their respective owners.

3 BASIC DATA

3.1 Name and address of the manufacturer

Company name:	LPKF Laser & Elektronika d.o.o.
Abbreviated name:	LPKF d.o.o.
Address:	Polica 33 SI-4202 Naklo Slovenia
Telephone:	+ 386 (0) 592 08 800
Fax	+ 386 (0) 592 08 820
Internet:	www.lpkf.si
E-mail:	support@lpkf.si, sales@lpkf.si
Trade-mark:	LPKF Laser & Electronics

3.2 Relevant model

ProtoFlow S

3.3 Intended use

LPKF ProtoFlow S is a convectional oven for rapid prototyping intended for:

- lead-free reflow soldering
- curing adhesives
- hardening through-plating pastes
- hardening solder-resist masks
- drying components

3.4 Technical data

Max. size of PCB	230 x 305 mm (9” x 12”)
Max. preheating temperature, time	220 ºC, 999 s
Max. reflow temperature, time	320 ºC, 600 s
Long thermal treatment temperature, time	220 ºC, 64 h
Temperature stabilization time	< 5 min
PCB cooling	Double, speed adjustable bottom-mounted fans
Power supply	single phase 220-240 V, 50-60 Hz, 16 A
Max. power consumption	3500 W
Dimensions (W x H x D)	647 x 315 x 450 mm (25.5” x 12.4” x 17.7”)
Weight	22 kg (48.5 lbs)
PC requirements	Microsoft Windows 2000, XP, Vista Microsoft Office 2000, 2003, 2007 USB 1.1 or 2.0
Ambient conditions	Temperature: 15-30 ºC (59-95 ºF) Relative humidity: 30-80 %

3.5 Noise level/vibration/emission of hazardous chemicals

The noise and vibration levels of the device during operation are not harmful to health.

Noise level: 55 dB(A)

Soldering pastes can contain hazardous chemicals.

Verify data on the type of the substance and dangerous characteristics of the substance on the packaging or on the safety data sheet.

Soldering paste can contain lead!
Please ensure that the prescribed safety measures, stated in the paste manufacturer’s instructions, are observed. Any advice concerning personal protective equipment should also be followed!

4 SAFETY NOTES

⚠ Before using the device, carefully read this chapter on health and safety. Familiarise yourself with potential risks and prescribed safety precautions.

4.1 General

1. The device must be installed in accordance with the installation instructions.
2. The device should only be used for its designated purpose.
3. A suitable working environment must be ensured.
4. The device may only be operated by qualified personnel.
5. Servicing can only be performed by authorised and qualified personnel.
6. Ready access to the “User Manual” must be provided to all device operators.

4.2 Hazards

⚠	**BURNS**	There is a risk of burns, if the PCB securing aluminium laths are touched. Supplied protective gloves enable brief touching of hot surfaces only! Attention! If the device is turned off, the cooling fans do not operate, and the machine surface can get sufficiently hot to cause burns, if touched.
⚠	**MECHANICAL HAZARDS**	When the drawer is closing, hands should be kept well clear to avoid entrapment and serious injury. Closing or opening the drawer is always preceded by a warning sound.
⚠	**ELECTRICAL HAZARDS**	Direct contact with a damaged electrical component, or intervention into a dangerous area when the device is connected to the mains supply, can result in injury.
⚠	**CHEMICAL HAZARDS**	Soldering pastes can contain substances that are hazardous to health. Hazardous vapours could spread into the work space when the drawer is opening (process of cooling).
⚠	**SENSOR STRESS**	In the event of unsuitable general lighting of the area the operator can experience an increase of sensor stress.
⚠	**MANUAL HANDLING**	The weight of the device is 22 kg / 48.5 lbs. Unless handled correctly spinal injuries can occur.

4.3 Safety measures

Before operating the device, a full visual inspection should be carried out. Special attention must be paid to the state of the electrical installation (i.e. power cord). In the event of any defects or malfunctions work may not begin before removing all faults!

It is of vital importance that the area around the device is maintained clean and tidy. A disorganised work-place can cause occupational injuries (e.g. a person can fall, slip or incur an injury).

Please ensure that the environment in which the equipment is going to be used conforms to that specified in this document. It is particularly important that there is no contact with water in any of its forms. Furthermore, the device may not be operated or stored in humid conditions!

It is necessary that electrical equipment, i.e. cables and connections, is inspected regularly. The electrical equipment may only be maintained by an authorised, qualified electrician.

Cleaning and maintenance should only be carried out when the power switch is turned off, and measures have been taken to avoid accidental starting of the device.

While working with the device, complete attention of the operator is required. A person who is feeling unwell or is having difficulties concentrating should not operate the device!

Only equipment, which has been approved by LPKF, can be used in conjunction with the device. The use of unsuitable equipment could endanger the operator!

Repairs can only be carried out by authorised service personnel. The service personnel should ensure that the safety of the equipment is not compromised by the repair.

The storing or consuming of food and beverages in the work area is forbidden!

Smoking is forbidden!

When using hazardous substances, safety data sheet instructions and advice should be followed!

After completing work, the device should be turned off and cleaned.

Prescribed personal protective equipment: protective gloves (enclosed).

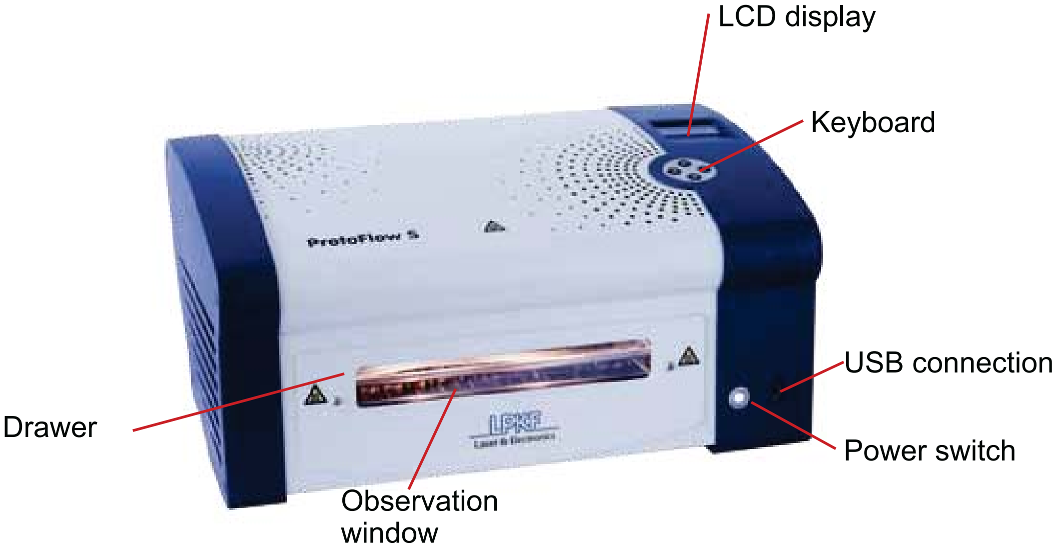
4.4 Procedures in the event of injury or other emergencies.

Emergency disconnection is possible by turning off the power switch.

In the event of a work-related injury, stop the device immediately, and if necessary seek professional medical assistance.

5 DEVICE DESCRIPTION

5.1 Basic parts



5.1.1 Power switch

The power switch is located in the lower right hand corner of the front panel of the machine.

The power switch is illuminated when the power is on.

5.1.2 USB connection

A USB connection port type A is placed near the power switch.

USB communication supports both USB 1.1 and 2.0 versions.

5.1.3 LCD display

Menu selection from the four-line LCD using the keyboard is logical, i.e. the direction arrows move the selection on the LCD in the appropriate direction.

The menu choices available include operating methods, and parameter adjustments.

The keys are slightly proud of the surface and have a spring click, which enables touch control.

5.1.4 Chamber

The heating of the chamber is done by 6 tube heaters with a combined power of 3200 W.

5.1.5 Motorized drawer

The aluminium laths slide easily on two rods, which makes it very easy to adapt to various sizes of PCB's, up to a maximum of 230 × 305 mm (9˝ × 12˝).

Drawer opening and closing is preceded by a warning sound, and a display message.

Two adjustable fans are mounted on the bottom of the drawer. The cooling speed is adjustable, 0-100% in 10% steps.

⚠ When the oven is turned ON and the drawer is opened for the first time, it will go out further than usually. The reason for this is its automatic function for drawer alignment. After that, the drawer opens normally.

An observation window and internal illumination enable the process to be viewed at any time.

5.1.6 Monitoring

The integrated thermal sensors ensure excellent optimization of the reflow process.

As an extra option, Profile recorder module can be integrated with the drawer to measure the temperatures on the PCB's or particular electronic components.

A USB communication port enables data transfer to a PC for analyzing and editing process data.

5.1.7 Software

The LPKF FlowShow software is an excellent accessory, which simplifies the handling of ProtoFlow S.

FlowShow for LPKF ProtoFlow oven (v2.00)

OVEN: LEFT 169 °C, RIGHT 168,5 °C, CENTER 171 °C

RECORDER: A 0 °C, B 0 °C, C 0 °C, D 0 °C

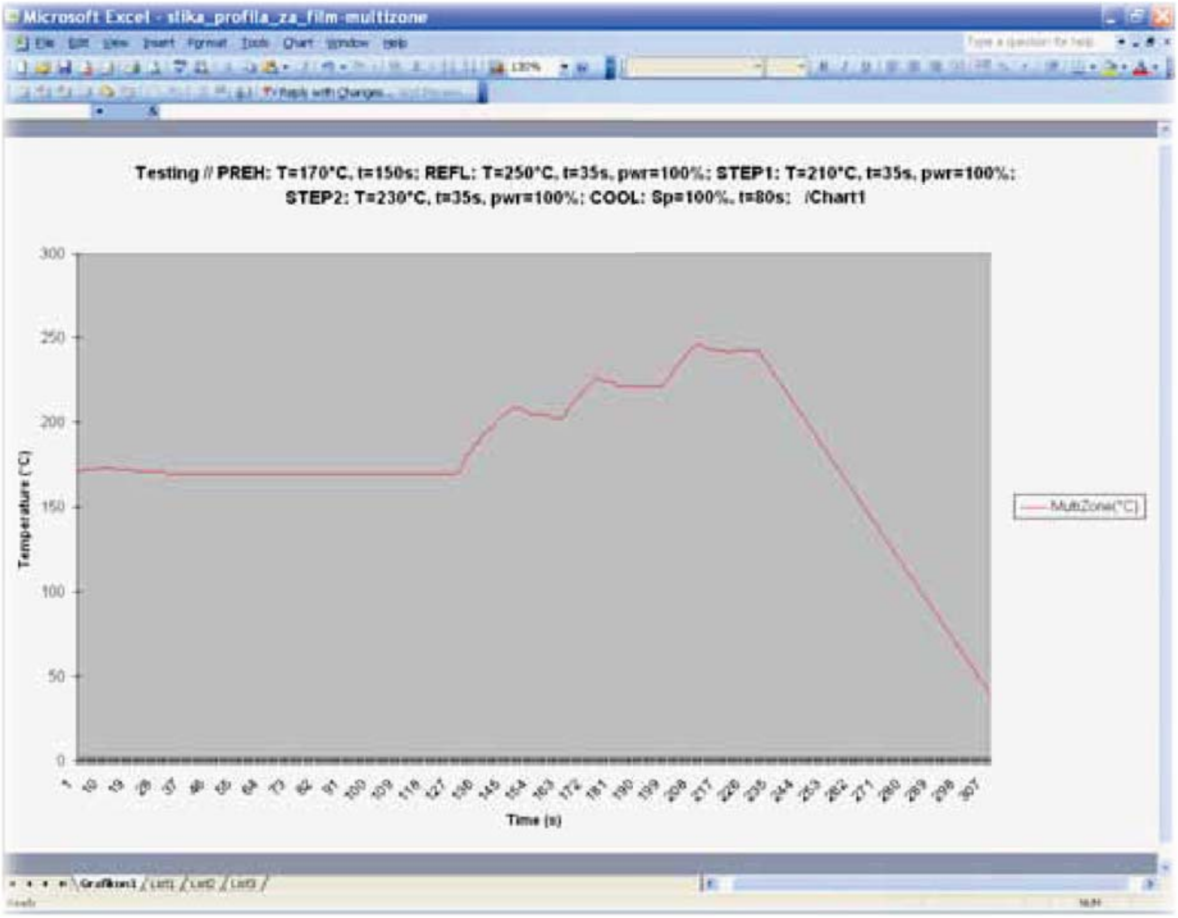
Oven time: 119 sec

Short name: LF-SMALL

Extra info: FR4,1.5mm

Measurement description: ProtoFlow test

Reports: PREHEAT



Microsoft Excel - slika_profila_za_film-multizone

Testing // PREH: T=170°C, t=150s; REFL: T=250°C, t=35s, pwr=100%; STEP1: T=210°C, t=35s, pwr=100%; STEP2: T=230°C, t=35s, pwr=100%; COOL: Sp=100%, t=80s; /Chart1

6 INSTALLATION

6.1 Opening the packaging

Before opening the packaging, check the »shock sensor« located on the outside of the cardboard box. If the indicator is coloured bright red, DO NOT OPEN THE PACKAGING, but immediately inform your transport agent!

Find the serial number on the front side of the cardboard box.

Cut the plastic strips and remove cover of the cardboard packaging.

Take out the items enclosed with the oven (User Manual, packing list, test report, accessories, special orders...).

Remove the top foam inserts.

Pull the cardboard and foam inserts over the machine, and set it down.

Take the oven out of the packaging and remove the plastic bag.

After removing the packaging, inspect the general state of the device and equipment, and check the content in accordance with the enclosed packaging certificate. In the event of damage immediately inform the transport agent.

⚠ Before starting-up the device for the first time, it is necessary to allow the device to acclimatize. Leave the unconnected device in the working area for such a period that the device adjusts to the temperature conditions in the room.

6.2 Installation

The oven must be placed on a flat surface of 800 × 550 mm / 31.5” x 21.2”.

There must be at least 450 × 450 mm / 17.8” x 17.8” free space in front of the oven for opening the drawer.

⚠ Before starting-up the device for the first time, it is necessary to allow the device to acclimatize. Leave the unconnected device in the working area for such a period that the device adjusts to the temperature conditions in the room.

⚠ Do not block in any way the space under the oven, as air flow from the bottom fans could be restricted.

Electric power supply (requirements):
220-240 V / 50-60 Hz

Main fuse specifications:
T 16 A, 250 V

⚠ Connect the power cord to a grounded network socket only!

⚠ In case data are lost with the first start-up of the oven (names of the profiles are not readable), factory profiles and settings must be reloaded (**SETTINGS → FACTORY PR**).
After data reloading, the oven has to be turned off and turned on to accept the settings.

P	R	O	F	I	L	E				▲								0	5
				▶											◀				
E	S	C															E	N	T
										▼									

7 INSTRUCTIONS FOR USE

All software/menu functions refer to firmware version 2.0
To verify your current firmware version restart ProtoFlow S and check the screen message on the display.

7.1 Fixing of printed circuit boards

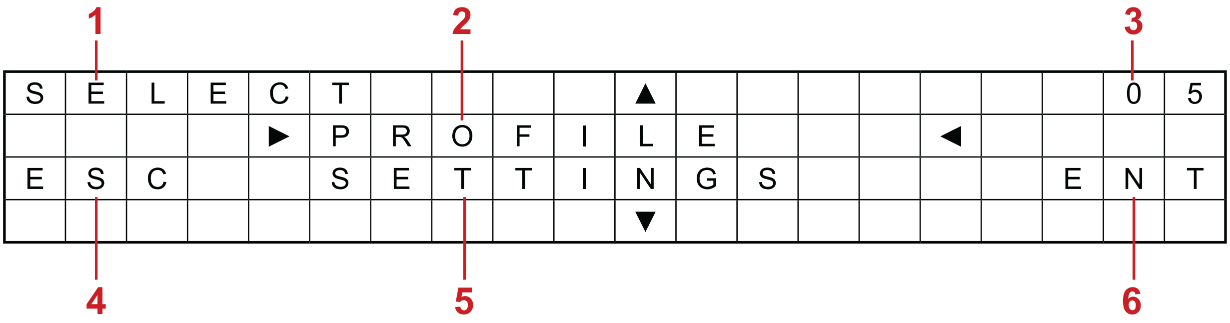
Mounting of PCB’s up to the size of 230 × 305 mm (9¨ × 12¨) is possible. The three securing strips slide easily onto carriers.

Aluminium laths can be hot - when sliding the laths, always use protective gloves (enclosed).

We recommend that you make adjustments of the aluminium laths before starting the process. After the warm-up phase, the laths can get hot.

7.2 Menus

7.2.1 General description

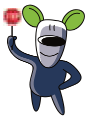


S	E	L	E	C	T					▲								0	5
				►	P	R	O	F	I	L	E				◄				
E	S	C			S	E	T	T	I	N	G	S					E	N	T
										▼									

1	Current menu	4	Return to previous menu
2	Current selection of the menu	5	Next selection of current menu
3	Current profile’s number	6	Enter (confirm)

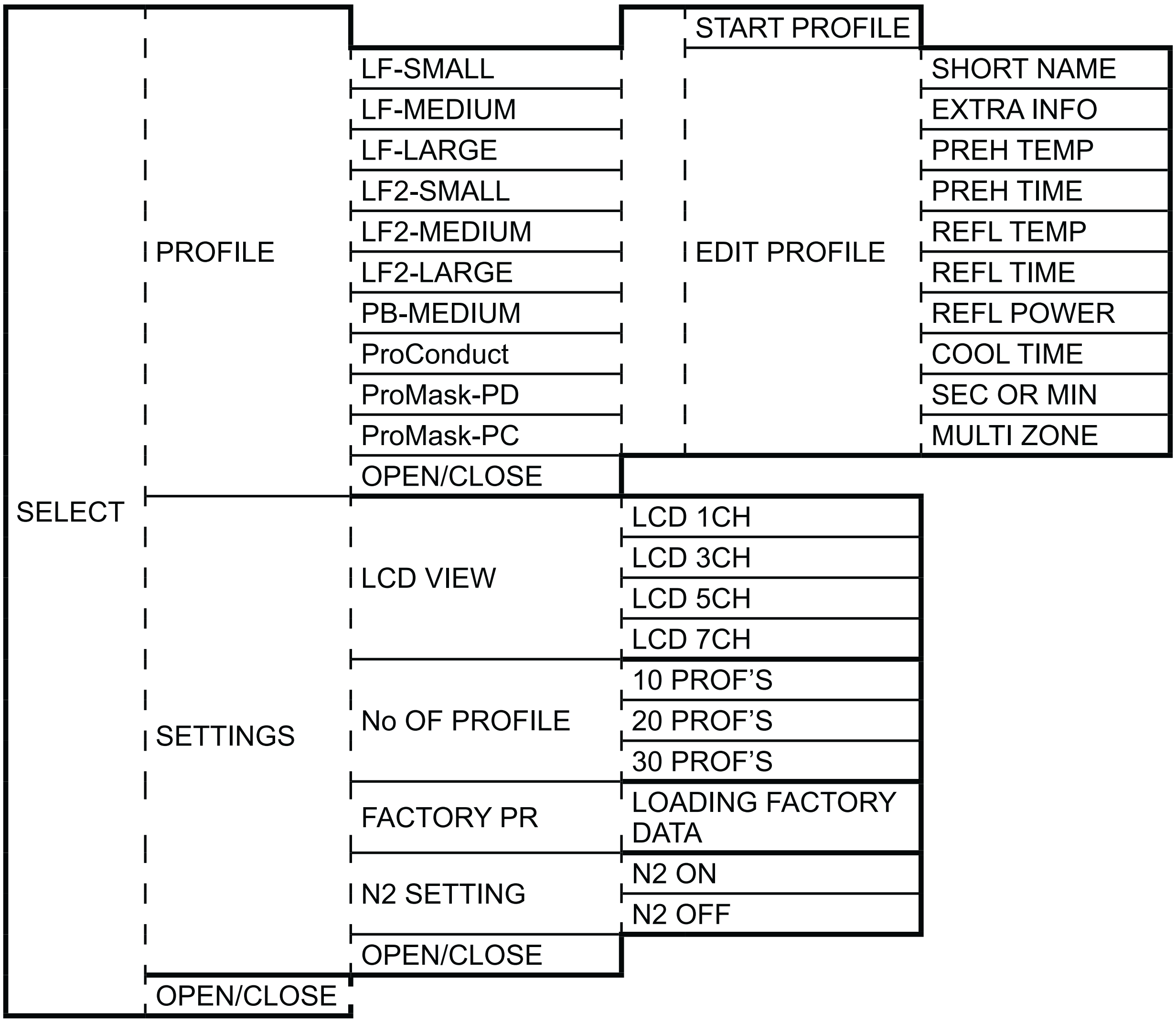
Moving between menus is done by pushing the buttons on the keyboard:

▲	UP
▼	DOWN
◄	ESCAPE
►	ENTER



A quick way to open or close the drawer is by selecting »**OPEN/CLOSE**« function. Easy access by pressing the “up button - ▲” when basic menu is preselected. (see next page).

7.2.2 Options



PROFILE:

»**SHORT NAME**« ⇨	name of profile (10 characters)
»**EXTRA INFO**« ⇨	additional description of profile (10 characters)
»**PREH TEMP**« ⇨	preheat temperature (ºC), from 50 ºC to max. 220 ºC Note: in the second mode, the temperature is always lower than the temperature of the next phase.
»**PREH TIME**« ⇨	preheating time (sec or min), max. 999 s or 999 min
»**REFL TEMP**« ⇨	reflow temperature (ºC), from 50 ºC to max. 320 ºC in minute mode, max. 220 ºC in second mode, max. 320 ºC Note: in the second mode, the temperature must be always higher than the preheat temperature

»**REFL TIME**« ⇨	reflow time (sec. or min.), max. 600 s or 999 min Note: when the "MultiZone" (S1&REFL, S1&S2&REFL) option is switched on the time of all phases together max. 600 s
»**REFL PWR**« ⇨	reflow power, engagement of the power of heaters (center 50%, 50% power, 75% power, 100% power)
»**COOL SPEED**« ⇨	speed of cooling PCB (0-100%, step 10%)
»**COOL TIME**« ⇨	time of cooling PCB (sec or min), max. 999 s or 999 min
»**SEC OR MIN**« ⇨	time unit (sec or min)
»**MULTIZONE**« ⇨	setting the number of the reflow processes: "**ONLY REFL**" - only reflow "**STEP1&REFL**" - step1 and reflow (reflow follows step1) "**S1&S2&REFL**" - step1, step2 and reflow (reflow follows step2 and step1)

Description of MultiZone function:

Settings:
The reflow process parameters of each multizone step are always displayed one zone at a time.

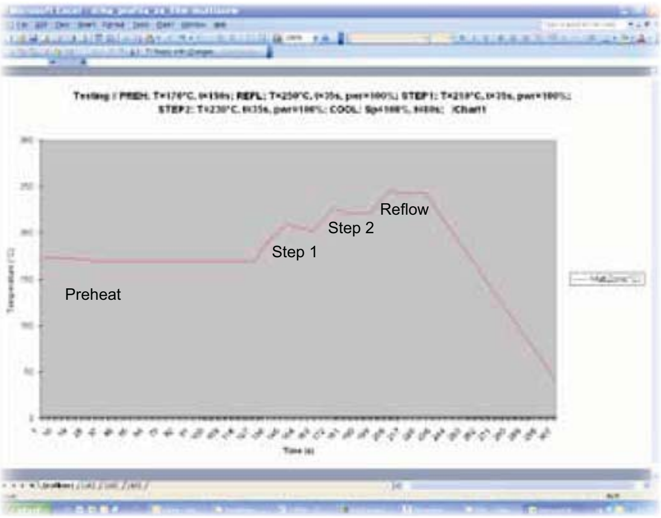
Multizone option "**ONLY REFL**" displays the reflow parameters of the REFLOW phase.

Multizone option "**STEP1& REFL**" displays the reflow parameters of the STEP1 reflow phase.

Multizone option "**S1&S2&REFL**" displays the reflow parameters of the STEP2 reflow phase.

Setting of the MultiZone parameters (for all three phases):

1. Change the MultiZone option to "**ONLY REFL**"
2. Set the PREHEAT, REFLOW and COOLDOWN parameters
3. Change the MultiZone option to "**STEP1&REFL**"
4. Set the STEP1 reflow parameters
5. Change the MultiZone option to "**S1&S2&REFL**"
6. Set the STEP2 reflow parameters
7. Start the changed profile



The MultiZone function enables repeating max. three reflow processes. The first reflow process is labelled “STEP1”, the second “STEP2” and the last reflow process is “REFLOW”.

The MultiZone function is intended for advanced users, dealing with the most demanding reflow processes.

Almost all reflow processes can be done with the “MultiZone” function disabled.

Every MultiZone step (reflow) consists of the same reflow parameters:

- reflow (step) temperature: max. 320 ºC (in sec. mode), max. 220 ºC (in min. mode)
- reflow (step) time: 0 - 600 s; 0 - 999 min
- reflow (step) power: center 50%, 50% power, 75% power, 100% power

The MultiZone option is also useful with temperature processes which require up to four temperature steps.

To achieve the maximum process time in the minute mode (64 h) it is necessary to change the MultiZone option to “**S1&S2&REFL”** (999 min + 999 min + 999 min).

SETTING:

»**LCD VIEW**« ⇨	setting the number of visible channels (1, 3, 5, 7)
»**No. OF PROFILE**« ⇨	setting the number of profiles (10, 20, 30) showed on the LCD (the number of current profile is visible in the right top corner)
»**FACTORY PR**« ⇨	loading of factory pre-programmed profiles and settings Note: The parameters of the pre-programmed profiles have been chosen based on tests, made with the Alpha® OM-338-T lead-free soldering paste.
»**N2 SETTING**« ⇨	»**N2 ON**« - checking of N2 flow ON »**N2 OFF**« - checking of N2 flow OFF »**N2 CHECK**« - current value of N2 flow (l / h)

Notes:

When the oven is used for the ProMask procedure, first start the “**ProMask-PD”** (pre-dry) and then continue with the “**ProMask-PC”** (post-cure).

The names of the pre-programmed profiles have been created in the following procedure, for example:

Short name: LF-SMALL

Extra info: FR4, 1.5 mm

“LF” - lead free, defines the optimized temperature for preheat and reflow phases with the lead free soldering paste

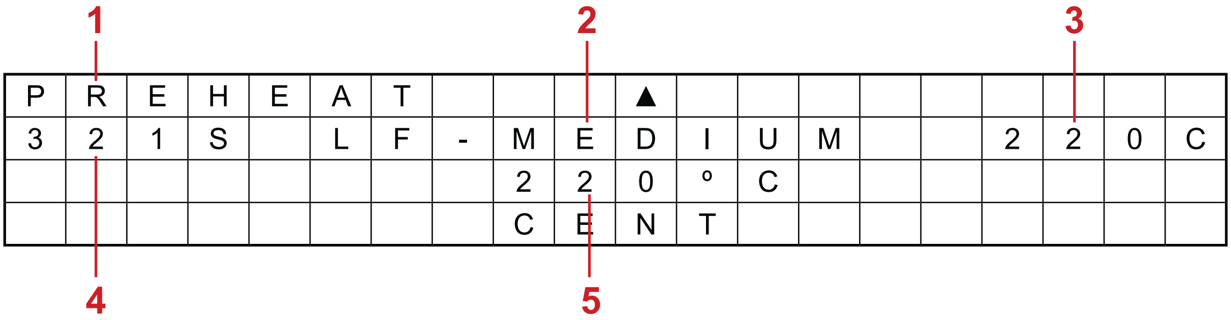
“SMALL” - defines the size of the PCB, ex. “small” - up to 80 × 50 mm / 3.2” x 2.0”
“medium” - up to 100 × 160 mm / 3.9” x 6.3”
“large” - above 100 × 160 mm / 3.9” x 6.3”

“FR4”- defines the selected material of the PCB

“1.5mm” - defines the thickness of the PCB

7.2.3 Display view

*Option “***LCD 1CH***” (current temperature in the CENTRE of the chamber)*



P	R	E	H	E	A	T				▲									
3	2	1	S		L	F	-	M	E	D	I	U	M			2	2	0	C
								2	2	0	º	C							
								C	E	N	T								

1 → Current phase

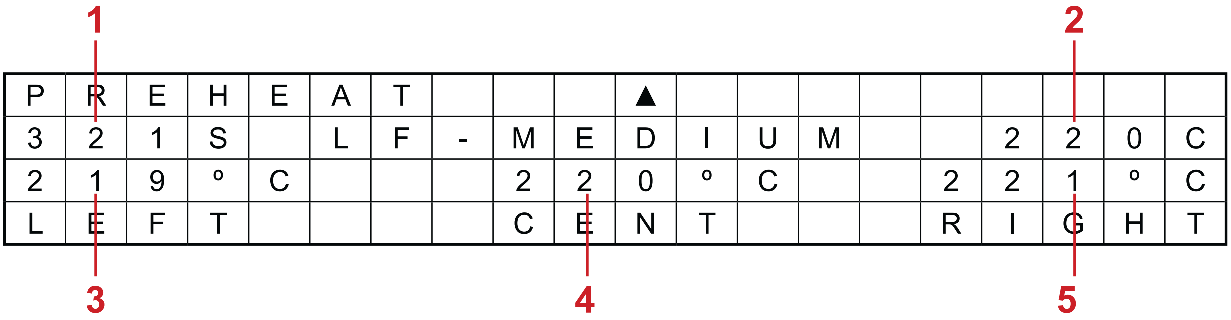
2 → Name of profile

3 → Set temperature

4 → Remaining time for current phase

5 → Current air temperature (in the centre of the chamber)

*Option “***LCD 3CH***” (current LEFT, RIGHT and CENTRE temperature of the chamber)*



P	R	E	H	E	A	T				▲									
3	2	1	S		L	F	-	M	E	D	I	U	M			2	2	0	C
2	1	9	º	C				2	2	0	º	C			2	2	1	º	C
L	E	F	T					C	E	N	T				R	I	G	H	T

1 → Remaining time for current phase

2 → Set temperature

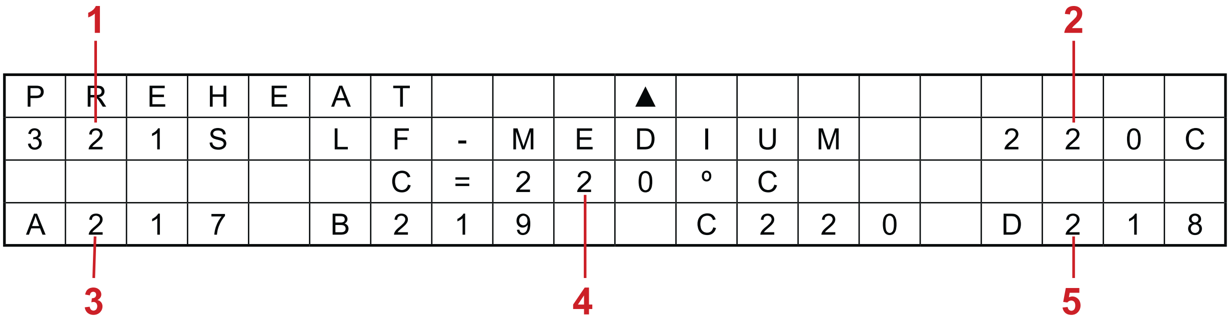
3 → Left current temperature

4 → Centre current temperature

5 → Right current temperature

Only available when optional extra sensors are assembled.

*Option "***LCD 5CH***" (current CENTRE temperature in the chamber and profile recorder sensors - extra option)*



P	R	E	H	E	A	T				▲									
3	2	1	S		L	F	-	M	E	D	I	U	M			2	2	0	C
						C	=	2	2	0	º	C							
A	2	1	7		B	2	1	9			C	2	2	0		D	2	1	8

1 → Remaining time for current phase

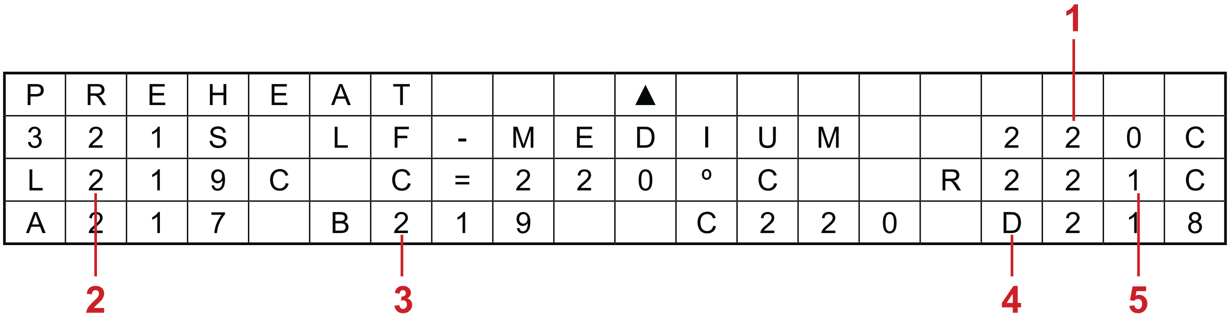
2 → Set temperature

3 → Current temperature of sensor A

4 → Current air temperature (in the centre of the chamber)

5 → Current temperature of sensor option

"***LCD 7CH***" (current LEFT, RIGHT and CENTRE temperature, and profile recorder sensors - optional)



P	R	E	H	E	A	T				▲									
3	2	1	S		L	F	-	M	E	D	I	U	M			2	2	0	C
L	2	1	9	C		C	=	2	2	0	º	C			R	2	2	1	C
A	2	1	7		B	2	1	9			C	2	2	0		D	2	1	8

1 → Set temperature

2 → Current air temperature (on the left side of the chamber)

3 → Current temperature of sensor B

4 → Current temperature of sensor D

5 → Current air temperature (on the right side of the chamber)

7.3 Reflow process

Typical reflow process procedure:

- Turn on the oven
- Open the drawer
- Adjust the PCB holder to the PCB dimensions
- Close the drawer
- Adjust the profile parameters
- Start the process
- Insert the PCB (after the warm up phase is done)
- Remove the PCB (after the cool down phase is done)

To find details, please continue reading.

7.3.1 Select profile

1. Select “PROFILE” in the main menu:

S	E	L	E	C	T					▲								0	1
				►	P	R	O	F	I	L	E				◄				
E	S	C			S	E	T	T	I	N	G	S					E	N	T
										▼									

2. Select the suitable profile from the base of profiles:

P	R	O	F	I	L	E				▲								0	1
				►	L	F	-	S	M	A	L	L			◄				
E	S	C			L	F	-	M	E	D	I	U	M				E	N	T
										▼									

3. Select “EDIT PROFILE” to adjust parameters … or start the selected profile (see step 5):

L	F	-	S	M	A	L	L			▲								0	1
				►	E	D	I	T			P	R			◄				
E	S	C			S	T	A	R	T		P	R					E	N	T
										▼									

4. Adjust parameters, for example, “PREHEAT TEMPERATURE”:

P	R	E	H	E	A	T				▲								0	1
				►	1	7	0		º	C					◄				
E	S	C			S	C	R	O	L	L	&	E	N	T			E	N	T
										▼									

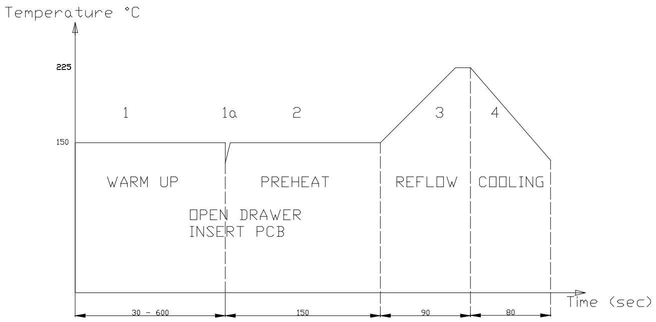
The current character of the parameter value is blinking when it is activated. Press the UP button to increase, and DOWN button to decrease the value. Confirm with ENTER.

P	R	E	H	E	A	T				▲								0	1
				►	1	7	5		º	C					◄				
E	S	C			S	C	R	O	L	L	&	E	N	T			E	N	T
										▼									

7.3.2 Start profile

5. Starting the chosen profile (“**START PROFILE**”):

L	F	-	S	M	A	L	L			▲								0	1
				▶	S	T	A	R	T		P	R			◀				
E	S	C			E	D	I	T			P	R					E	N	T
										▼									



6. WARM-UP PHASE

In the warm-up phase, the chamber is heated to the temperature suitable for inserting the PCB.

W	A	R	M	U	P					▲									
0	6	0	S		L	F	-	S	M	A	L	L				1	7	0	C
						C	=	1	5	6	º	C							
A	1	5	6		B	1	5	7			C	1	5	8		D	1	5	5

When the temperature of the chamber reaches the set value the oven gives emits a sound signal and displays the message on the LCD, press ENTER to open the drawer and prepare the PCB for inserting.

W	A	R	M	U	P		D	O	N	E									
					P	R	E	S	S		E	N	T	&					
					I	N	S	E	R	T		P	C	B			E	N	T

Opening the drawer

						W	A	R	N	I	N	G	!						
			D	R	A	W	E	R		O	P	E	N	I	N	G			

7. PREHEAT PHASE

Insert the PCB and close the drawer by pressing ENTER to start the preheat phase.

P	R	E	H	E	A	T													
					I	N	S	E	R	T		P	C	B					
					&	P	R	E	S	S		E	N	T			E	N	T

⚠ When the drawer is closing, hands should be kept well clear to avoid injury.

						W	A	R	N	I	N	G	!						
			D	R	A	W	E	R		C	L	O	S	I	N	G			

The preheating phase starts automatically when the drawer is closed:

P	R	E	H	E	A	T				▲									
1	3	5	S		L	F	-	S	M	A	L	L				1	7	0	C
						C	=	1	7	0	°	C							
A	1	6	9		B	1	6	8			C	1	6	7		D	1	7	0

8. REFLOW

The reflow phase starts automatically after the preheat phase is done. The oven emits a sound signal when starting the next phase.

R	E	F	L	O	W					▲									
0	4	7	S		L	F	-	S	M	A	L	L				2	5	0	C
						C	=	2	3	5	°	C							
A	2	3	7		B	2	3	4			C	2	3	6		D	2	3	9

9. COOL DOWN

After the reflow phase, the drawer opens automatically. During opening, the oven emits a sound signal and displays a message on the LCD

						W	A	R	N	I	N	G	!						
			D	R	A	W	E	R		O	P	E	N	I	N	G			

Bottom mounted fans begin the cool down phase.

C	O	O	L	D	W	N				▲									
0	7	2	S		L	F	-	S	M	A	L	L				0	8	0	%
						C	=	1	2	0	º	C							
A	0	8	8		B	0	9	0			C	0	8	9		D	0	9	0

10. The end of the reflow process:

After the oven has emitted a sound signal and displayed a message on the LCD, remove the PCB and press ENTER to start a new profile.

P	C	B		D	O	N	E												
					R	E	M	O	V	E		P	C	B					
					&	P	R	E	S	S		E	N	T			E	N	T

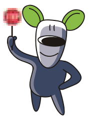
When the drawer is closing, hands should be kept well clear to avoid injury.

						W	A	R	N	I	N	G	!						
			D	R	A	W	E	R		C	L	O	S	I	N	G			

Return to start menu.

L	F	-	S	M	A	L	L			▲								0	1
				►	S	T	A	R	T		P	R			◄				
E	S	C			E	D	I	T			P	R					E	N	T
										▼									

7.3.3 Correction of time settings during the process



The current phase or process can be cancelled, skipped to the next phase or the times for the appropriate phase (preheat, reflow and cool down) can be increased by 5 seconds throughout the process.

P	R	E	H	E	A	T				▲									
1	3	5	S		L	F	-	S	M	A	L	L				1	7	0	C
								1	7	0	º	C							
								C	E	N	T								

(press ▲ - up arrow - during the process)

R	U	N	N	I	N	G				▲									
				►	N	E	X	T		P	H	A	S	E	◄				
E	S	C			+	5		S	E	C	O	N	D	S			E	N	T

(confirm function “**NEXT PHASE**” with ENTER or

press ▲ - up arrow - again to select the cancellation of the current profile)

R	U	N	N	I	N	G				▲									
				►	C	A	N	C	E	L		A	L	L	◄				
E	S	C			N	E	X	T		P	H	A	S	E			E	N	T

(confirm function “**CANCEL**” with ENTER or

press ▲ - up arrow - again to select the increase of the current time by 5 s)

R	U	N	N	I	N	G				▲									
				►	+	5		S	E	C	O	N	D	S	◄				
E	S	C			C	A	N	C	E	L		A	L	L			E	N	T

(confirm function “**+5 SECONDS**” with ENTER or

press ▲ - up arrow - again to go back to the process view)

Entering the sub-menu during the process will not stop the temperature control of the current phase.

7.4 LPKF FlowShow (Option with USB connection)

⚠ *The LPKF FlowShow program works as a macro in the Microsoft Excel program. The recommended version to use with LPKF FlowShow is Microsoft Excel 2003. LPKF FlowShow can be used in Microsoft Excel 2007, too, but due to a bug in Microsoft Excel 2007 confirmed by Microsoft, it is not able to refresh the chart in real-time, and draws it at the end of the process instead. It is expected that the bug is eliminated with the next Service pack for Microsoft Excel 2007.*

7.4.1 General

LPKF FlowShow enables temperature logging of the current profile (chart and data), upgrades of the oven profiles from an Excel data base, and upgrades of the LPKF ProtoFlow firmware.

Note:
The LPKF FlowShow PC software is not necessary for normal use of LPKF ProtoFlow ovens. LPKF FlowShow represents an additional tool for temperature acquisition and upgrades of profiles. Therefore, a PC connection is not required.

If you do not use the FlowShow option, please skip this section.

⚠ FlowShow runs as a macro in Microsoft Excel. During the operation of FlowShow, it is not possible to use any other Excel documents or functions.

Creating a shortcut to FlowShow.xls:

It is necessary to create a shortcut to replace the existing icon with the LPKF icon.

- find the folder with **FlowShow.xls**
- right-click the file, choose **Send to** → **Desktop (Create Shortcut)**
- Show Desktop (switch to the desktop view)
- right-click the icon (**Shortcut to FlowShow.xls)** → **Rename** to **FlowShow.xls**
- right-click the icon (**FlowShow.xls**) → **Properties** → **Change Icon** → **Browse** → select **FlowShow.ico** → **OK** → **Apply** → **OK**

7.4.2 ProtoFlow USB driver installation instructions

1.

Connect the PC and ProtoFlow with the USB cable supplied (2 x type A female).

- Turn ON the oven.
- The PC should announce **Found new hardware - ProtoFlow USB support.**

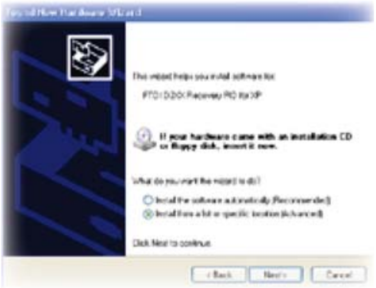
Found New Hardware
ProtoFlow USB support

2.

Wait until the next page appears (select **No, not this time** and confirm with **Next**).

3.

Select **Install from a list or specific location** and confirm with **Next.**



4.

Select **Install from a list or specific location** and confirm with **Next.**

5.

Specify the path to the installation directory and confirm with **Next.**

The following page is shown for a moment (wait).

6.

Select **Continue Anyway,** when the following page appears.

Hardware Installation

The software you are installing for this hardware:

FTDI D2XX Recovery PID for XP

has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.

7.

Installation in process should be followed by the next page.

8.

In case the path to the **.SYS** file is not correct, change the path and confirm.

Files Needed

The file 'FTD2XX.sys' on FTDI FTD2XX Drivers Disk is needed.

Type the path where the file is located, and then click OK.

Copy files from:

c:\ProtoFlow\Drivers

9.

Wait until the following page appears and confirm with **Finish**. Done.

Completing the Found New Hardware Wizard

7.4.3 Starting the program

1.

Run **FlowShow.xls**

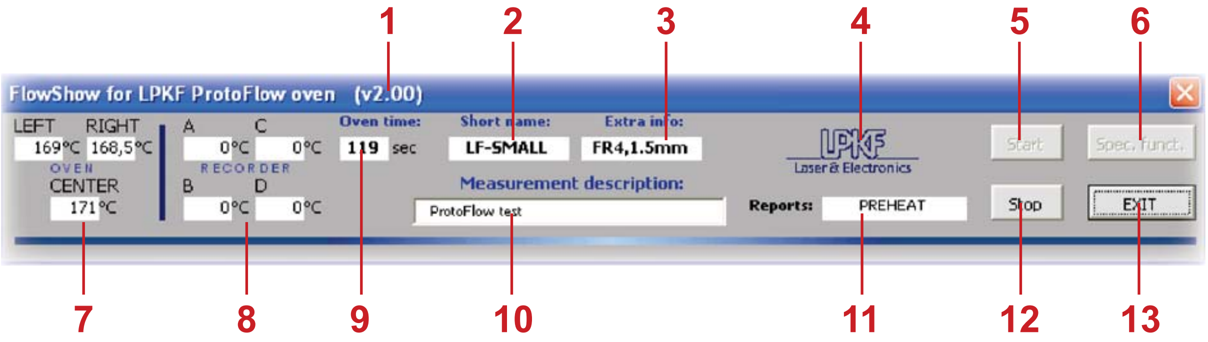
2.

Enable the macros (normal level of protection):
If the level of macro protection is too high, please do the following:

- In the Toolbar, select **Tools** → **Macro** → **Security** → **Medium level** → **OK**
- Close FlowShow and open it again.

3.

Click the button to start the program



LEFT 169°C RIGHT 168,5°C
CENTER 171°C
A 0°C C 0°C
B 0°C D 0°C
Oven time: 119 sec
Short name: LF-SMALL
Extra info: FR4,1,5mm
Measurement description: ProtoFlow test
Reports: PREHEAT

1	Version of software	8	Profile recorder sensors, mounted on PCB (double click to change name, max. 6 characters)
2	Short name of current profile	9	Time out of current phase
3	Additional information about current profile	10	Description of current measurement (defined by user, e.g. serial number of device)
4	Link to LPKF official home page (www.lpkf.com)	11	Current phase
5	Start acquisition	12	Stop acquisition
6	Link to profile data base and firmware upgrade	13	Exit FlowShow
7	Integrated temperature sensor in oven chamber (name can not be changed)		

7.4.4 Adjustments of program

Change the names of A, B, C and D sensors (additional sensors) →

Double click on the name of the chosen sensor, write a new name (max. 6 characters) confirm with ENTER.

Add an extra description to the current measurement →

Click the field and write a new description, confirm with ENTER.
For example operator’s name and serial number of electronics.

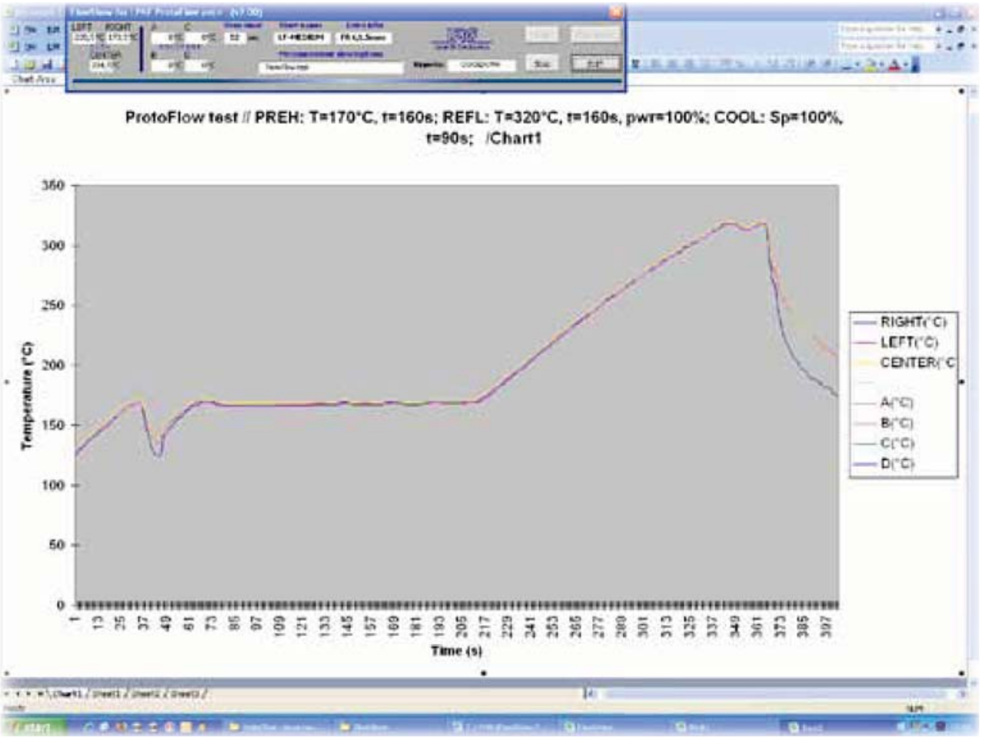
Start temperature acquisition (see 7.3.1 – Select profile) →

⚠ To start temperature acquisition, it is necessary to start the oven’s profile first, after that temperature acquisition can be started within all phases. The WARMUP phase is not so important for monitoring, therefore we suggest temperature acquisition is started at the beginning of the PREHEAT phase.
After the COOLDOWN phase, acquisition is automatically stopped.

Click the START button. Data are automatically inserted in the chart description, temperatures are refreshed every second.

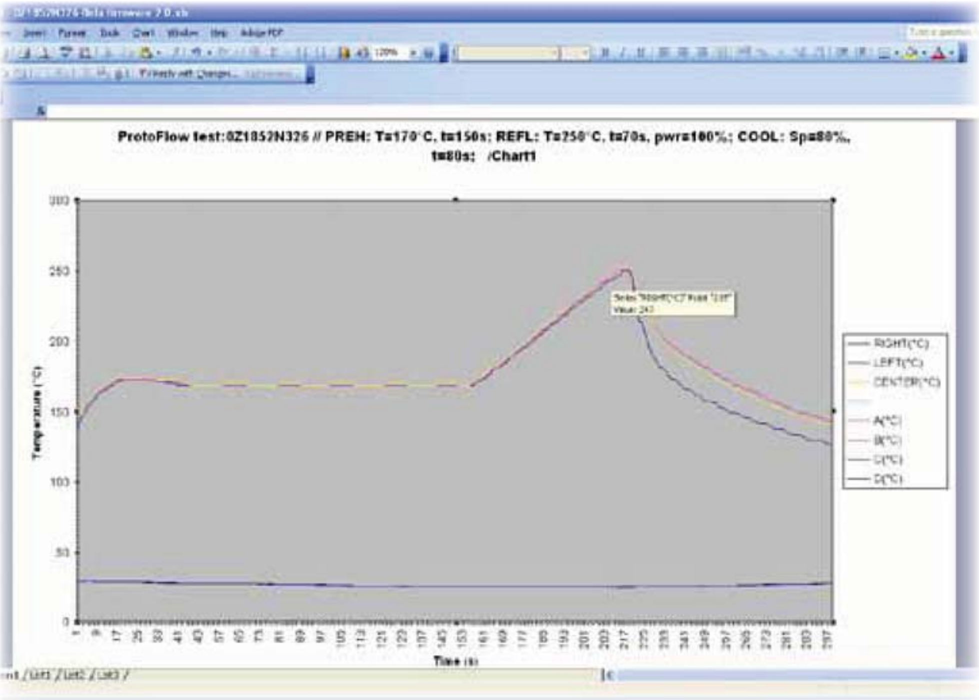
Every 500 seconds, a new chart is created, named “CHART 2, 3, …”. All created workbooks with charts can be saved after temperature acquisition by normal procedure of saving a file.

The names of the sensors and descriptions of measurements are written in the sheet named “Last saved data (don’t change!)”. They can be saved by confirming “YES” in the question window when closing the programme.



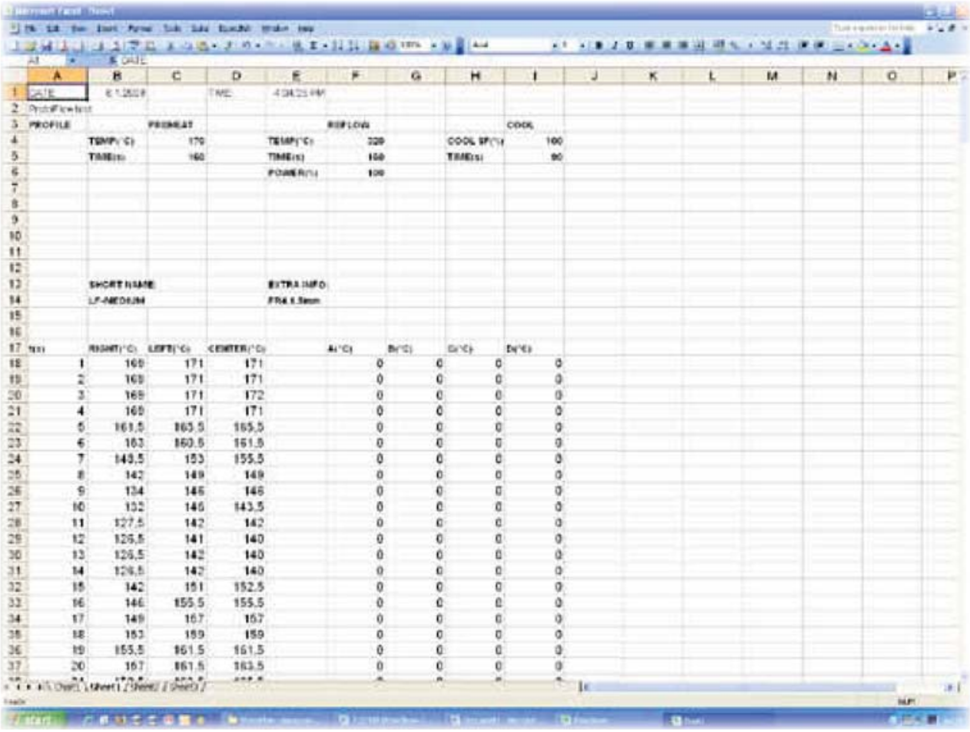
Stop temperature acquisition → click the STOP button, the chart is finished.

To exit the programme or to see logged temperatures & chart → click the EXIT button.



ProtoFlow test:0Z1852N326 // PREH: T=170°C, t=150s; REFL: T=250°C, t=70s, pwr=100%; COOL: Sp=80%, t=80s; /Chart1

To analyse the current temperatures and times of the created chart it is not necessary to switch to the DATA sheet. Simply move the mouse cursor to the desired position on the chart, the values are displayed after a small delay. Values stand for temperatures (°C), points stand for time (s).



A1 DATE

	A	B	C	D	E	F	G	H	I
1	DATE	6.1.2009		TIME	4:34:23 PM				
2	ProtoFlowtest								
3	PROFILE		PREHEAT			REFLOW			COOL
4		TEMP(°C)	170		TEMP(°C)	220		COOL SP(°C)	100
5		TIME(s)	160		TIME(s)	150		TIME(s)	90
6					POWER(%)	100			
7									
8									
9									
10									
11									
12									
13		SHORT NAME			EXTRA INFO:				
14		LF-MEDIUM			FR4 1.5mm				
15									
16									
17	t(s)	RIGHT(°C)	LEFT(°C)	CENTER(°C)		A(°C)	B(°C)	C(°C)	D(°C)
18	1	169	171	171		0	0	0	0
19	2	169	171	171		0	0	0	0
20	3	169	171	172		0	0	0	0
21	4	169	171	171		0	0	0	0
22	5	161.5	163.5	165.5		0	0	0	0
23	6	163	160.5	161.5		0	0	0	0
24	7	148.5	153	155.5		0	0	0	0
25	8	142	149	149		0	0	0	0
26	9	134	146	146		0	0	0	0
27	10	132	146	143.5		0	0	0	0
28	11	127.5	142	142		0	0	0	0
29	12	126.5	141	140		0	0	0	0
30	13	126.5	142	140		0	0	0	0
31	14	126.5	142	140		0	0	0	0
32	15	142	151	152.5		0	0	0	0
33	16	146	155.5	155.5		0	0	0	0
34	17	149	157	157		0	0	0	0
35	18	153	159	159		0	0	0	0
36	19	155.5	161.5	161.5		0	0	0	0
37	20	157	161.5	163.5		0	0	0	0

To see the logged data or the chart → switch between sheets.

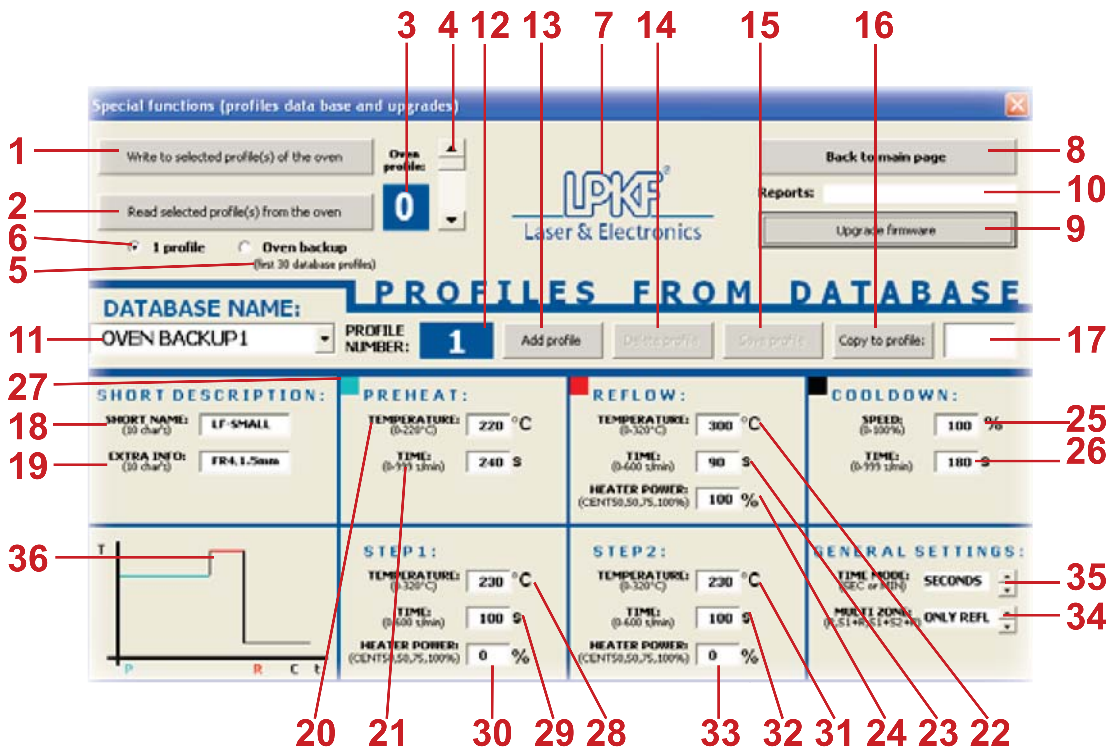
Enter the profile and firmware upgrades → click the “SPEC. FUNCT.” button.

Check reports of measurements → check the “REPORTS” field (current phase, communication errors, function errors, etc.).

⚠ Oven parameters are automatically refreshed with the start of measurement (click the START button).

⚠ *Error13*
When the Error 13 (Type mismatch) occurs in the LPKF FlowShow PC software, reload of factory settings is necessary. To make this, select “**SETTINGS - FACTORY PR**.” function in basic menu.

7.4.5 Upgrading profiles



Special functions (profiles data base and upgrades)

Oven profile: 0

◉ 1 profile ○ Oven backup (first 30 database profiles)

Reports:

DATABASE NAME: OVEN BACKUP 1

PROFILE NUMBER: 1

SHORT DESCRIPTION:
SHORT NAME: (10 char's) LF-SMALL
EXTRA INFO: (10 char's) FR4, 1.5mm

PREHEAT:
TEMPERATURE: (0-220°C) 220 °C
TIME: (0-999 s/min) 240 S

REFLOW:
TEMPERATURE: (0-320°C) 300 °C
TIME: (0-600 s/min) 90 S
HEATER POWER: (CENT50,50,75,100%) 100 %

COOLDOWN:
SPEED: (0-100%) 100 %
TIME: (0-999 s/min) 180 S

STEP1:
TEMPERATURE: (0-320°C) 230 °C
TIME: (0-600 s/min) 100 S
HEATER POWER: (CENT50,50,75,100%) 0 %

STEP2:
TEMPERATURE: (0-320°C) 230 °C
TIME: (0-600 s/min) 100 S
HEATER POWER: (CENT50,50,75,100%) 0 %

GENERAL SETTINGS:
TIME MODE: (SEC or MIN) SECONDS
MULTI ZONE: (R,S1+R,S1+S2+R) ONLY REFL

The lower half of the window is the profiles data base.

All parameters of the selected profile are shown in the fields below.

Values of a parameter can easily be changed by typing new data.

1	Sends the selected profile(s) to the oven.	2	Reads the selected profile(s) from the oven.
3	The oven's profile number (writes to this profile on the oven, reads from this profile of the oven).	4	Scrollbar to change the current profile number of the oven.
5	Option to program (read) all 30 profiles of the oven. It takes the first 30 profiles from the database (oven backup 1 – backup 30).	6	Option to program (read) one profile of the oven. The oven profile (3) number defines the location of the profile on the oven.
7	Logo with shortcut to corporate official web page.	8	Exit the database of profiles (opens the temperature recording menu).
9	Opens the menu, which enables upgrades of firmware.	10	Report window (messages errors, communication problems, successful procedures).
11	The name of the current profile in the database.	12	Database of the current number of the selected database profile.
13	Adds a profile at the end of the database (copies the data currently seen in the fields).	14	Deletes the selected profile (moves the profiles below 1 step up to fill the gap).
15	Saves the data currently seen in the fields to the selected profile.	16	Copies the data currently seen in the fields to the selected profile (number).
17	Number, which defines where to copy the profile. To (0-999).	18	Short name of the current profile (the same as on the oven, 10 characters)
19	Extra info of the current profile (the same as on the oven, 10 characters).	20	The current temperature of the preheat phase.
21	The current time of the preheat phase.	22	The current temperature of the reflow phase.
23	The current time of the reflow phase.	24	The current heater power (25, 50, 75 or 100%) of the reflow phase.
25	The current time of the cool-down phase.	26	The current power of the cool-down phase.
27	The colour of the phase (the same as the colour of the line in the chart).	28	Value of the current step 1 temperature.
29	The value of the current step 1 time.	30	The value of the current step 1 heater power.
31	The value of the current step 2 temperature.	32	The value of the current step 2 time.
33	The value of the current step 2 heater power.	34	Time mode selection.
35	Multi zone selection.	36	Chart, to show the temperature and time between the different phases (colours indicate each phase) – the same as the name of the phase, reflow is red.

The “**Write to selected profile(s) of the oven**” command button sends the current data base profile to the selected (oven profile field) profile of the oven when the “1 profile” option is enabled. When the “**Oven backup**” option is enabled it sends the first 30 profiles from the data base to the oven.

The “Read selected profile(s) from the oven” command button reads the parameters of the selected profile of the oven when “1 profile” option is enabled.
When the “Oven backup” option is enabled all 30 profiles of the oven are saved to the first 30 positions of the data base (and cannot be changed, just sent).

⚠ Profiles can only be upgraded in the SELECT menu of the oven. The oven software automatically jumps to the select menu (except during the running process).

⚠ *WARNING!*
Never write the selected profile(s) to the oven during the process. It can cause serious malfunctions of the oven.

Notes:
The maximum number of profiles in the data base is limited to 999.

The first 30 profiles are oven backup (named Oven backup1, 2, 3, …, 30).

It is not possible to rearrange them.

7.5 Firmware upgrade

ProtoFlow firmware upgrade procedure:

- Turn OFF the oven.
- Select the firmware to be upgraded with option buttons below.
- Turn ON the oven and press **DOWN** button within 1 second.
- LCD should display "OK" text.
- Click the button below (Upgrade ProtoFlow) and select the file.
- Wait approx. 10 minutes untill the main menu displays. Done.

Select upgrade:
● MAIN PROGRAM
○ HEATING CONTROL

It is important to select the right version of firmware to be upgraded.

You can recognize the right version to be selected from the name of the file, for example: “ProtoFlow main program V2.0.hex” defines software for the main program.

Password for software upgrade: *LPKF*

7.6 N2 Module (Option)

7.6.1 General

A nitrogen atmosphere significantly decreases oxidation during the process and ensures superior soldered joints.

The benefits of soldering in a nitrogen atmosphere:

- Lower porosity
- Almost 100 % prevention of stains on the PCB
- Higher surface tension
- Better quality of the PCB

7.6.2 N2 connection

Before connecting the nitrogen supply, read the instruction from your gas supplier (safety data sheet).

1. Connect the N2 hose (6mm diameter) to the inlet port at the back of the device.
2. Open the main valve on the tank regulator or pipeline.
3. Adjust the pressure to 7 bar.
4. Check the value of N2 flow → chapter 7.6.3
5. Adjust the reference value of N2 flow → chapter 7.6.3

7.6.3 Starting the process with a nitrogen atmosphere

1.

Turn ON the oven and go to the “**Settings**” menu:

SETTINGS → N2 SETTING → N2 CHECK

“**N2 CHECK**” is a function which displays the current value of N2 flow (l/h) with a 2 s refresh rate.

To set the desired N2 flow, rotate the “N2 flow regulator”.

1.

Set the reference level of N2 flow.

If the flow is too low/high at the beginning of every phase of the process, the oven LCD display shows a message, and there is an audible warning. The process, however will continue unless the operator interrupts it.

SETTINGS → N2 SETTING → N2 ON (Confirm with ENTER!)

N	2		S	E	T	T				▲								0	1
				▶	N	2		O	N						◀				
E	S	C			N	2		O	F	F							E	N	T
										▼									

Set the reference value and confirm with ENTER!

N	2		O	N						▲								0	1
				▶	3	0	0		l	/	h				◀				
E	S	C			S	C	R	O	L	L	&	E	N	T			E	N	T
										▼									

DISABLE the N2 flow check with the "**N2 OFF**" function:

SETTINGS → N2 SETTING → N2 OFF

The integrated electro-magnetic valve opens the flow automatically with the WARMUP phase and closes it with the end of the REFLOW phase.

The current flow value of nitrogen during the process is shown in the upper right corner.

P	R	E	H	E	A	T				▲				3	0	0	l	/	h
1	3	5	S		L	F	-	S	M	A	L	L				1	7	0	C
								1	7	0	º	C							
								C	E	N	T								

The current value of N2 flow is too low:

		N	2		F	L	O	W		T	O	O		L	O	W	!		

The current value of N2 flow is too high:

		N	2		F	L	O	W		T	O	O		H	I	G	H	!	

LPKF Laser & Electronics recommends MESSER gases.

7.7 Profile recorder

7.7.1 General

The Profile recorder module contains four K-type thermocouple sensors and measuring electronics, and is situated at the front of the drawer (see picture).

It is intended to measure the temperatures of PCB's in user-defined positions (i.e. PCB temperature, component surface temperature).

The measured temperatures can be shown directly on the oven's LCD and also on a PC with the LPKF FlowShow software (USB communication required).

The profile recorder module can be integrated into the oven when it is ordered directly with ProtoFlow S, or simply added later when it is delivered separately as extra optional equipment.

Choose the number of sensors to be displayed on the LCD:

SETTINGS → LCD VIEW →

LCD 1CH (current center temperature of the chamber)

LCD 3CH (current left, right and center temperatures of the chamber)

LCD 5CH (current center temperature and the temperatures of four additional sensors)

LCD 7CH (current left, right and center temperatures of the chamber and temperatures of the four additional sensors)

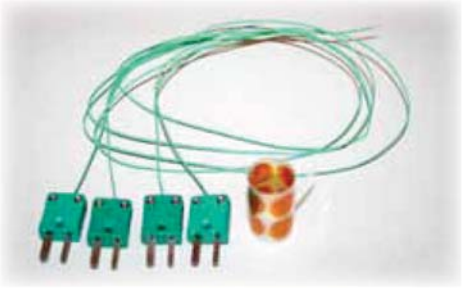
If an additional sensor is not connected, the oven displays the following warning:

				V	E	R	S	I	O	N		2	.	0					
N	O		P	R	O	F	I	L	E		R	E	C	O	R	D	E	R	

When LCD 5CH or LCD 7CH are selected and an additional sensor is not connected, the oven displays the following warning:

N	O		P	R	O	F	I	L	E		R	E	C	O	R	D	E	R	
				C	H	E	C	K		M	A	N	U	A	L				

7.7.2 Connection



For connection, use the enclosed accessories (only if extra sensors are ordered):

- Additional sensors (K type thermocouple wires)
- High temperature resistant adhesive dots

1. Connect the additional thermocouple sensors to the connectors in the drawer
2. Start the selected profile
3. After the “Warmup” phase, insert the PCB and place the additional sensors on the PCB or specific component. Fix the sensors with the enclosed adhesive dots.

The LPKF FlowShow software enables temperature logging of the current profile with the integrated sensor and optional additional sensors (A, B, C, D)

The procedure:

Start LPKF FlowShow (see chapter 7.4) and:

- Change the names of A, B, C, D temperature sensors (additional sensors)→

Double click the name of the chosen sensor, write a new name, confirm with ENTER.

- Add an extra description to the current measurement →

Click the field and write a new description, confirm with ENTER.

8 MAINTENANCE

8.1 Cleaning

The surface of the oven can be easily cleaned with a soft cloth, soaked in a mild detergent solution.

⚠ Before cleaning, make sure the device is disconnected from the mains!

8.2 Replacing the main fuse

1. Disconnect the oven from the mains.
2. Unscrew the fuse cover.
3. Insert the new glass fuse (**ATTENTION, USE T 16 A, 250 V FUSE ONLY!**)
4. Screw the fuse cover back on.

9 TROUBLESHOOTING

Before any intervention in the device, first disconnect the device from the mains power system.

In some cases you can correct a fault in device operation yourself following the guidelines stated below. In the event that you do not succeed do not continue with any repairs, but immediately contact an authorised serviceman/distributor of LPKF devices.

Fault/Defect	Cause	Procedure
Oven does not turn on.	No power supply.	Check the mains voltage in the socket Check the main fuse Check the power cord
	Main fuse (T 16 A, 250 V) has blown.	Disconnect the oven from the main supply Replace the fuse on the rear panel Turn on the oven
Temperature is not rising.	One heating group is damaged or it may be disconnected. The drawer is not completely closed.	Check the connection of the heaters Check the drawer for any obstacles
Error message on LCD: DRAWER BLOCKED! CHECK MANUAL	Something is blocking the drawer.	Check if any obstacle blocks the drawer. Restart the oven.
USB communication loss during data transfer.	Power supply voltage swings caused by other high powered machines (compressors, etc.).	Disconnect the USB cable Exit the FlowShow software Reconnect the USB cable Start the FlowShow software Start the desired FlowShow function ADVICE: Try to avoid the use of high powered machines during USB acquisition.
Profile data has been lost.	Interference on the power supply voltage.	Reload factory default profile (SETTINGS - FACTORY PR.)
Error 13 (type mismatch) occurs in the LPKF FlowShow PC software	Unreadable string in the Microsoft Excel program.	Reload the factory default profile (SETTINGS - FACTORY PR.)
Program navigation malfunction.		Contact LPKF technical support.

10 APPENDICES

10.1 Scope of delivery

Oven ProtoFlow S

USB cable

Protective gloves

Fuse, T 16 A, 250 V

ProtoFlow S User manual

ProtoFlow CD

10.2 Technical Datasheet

Alpha OM-338-T Lead free Solder Paste (see the attachment on the next pages)

ALPHA

TECHNICAL BULLETIN

SM871-8

ALPHA® OM-338-T

ULTRA FINE FEATURE LEAD-FREE SOLDER PASTE

DESCRIPTION

ALPHA OM-338-T is a lead-free, no-clean solder paste designed for a broad range of applications. **ALPHA OM-338-T's** broad processing window is designed to minimize transition concerns from tin/lead to lead free solder paste. This material is engineered to deliver the comparable performance to a tin lead process.* **ALPHA OM-338-T** yields excellent print capability performance across various board designs and, particularly, with ultra fine feature repeatability (11 mil Squares) and high throughput applications.

Outstanding reflow process window delivers good soldering on CuOSP with excellent coalescence on a broad range of deposit sizes, excellent random solder ball resistance and mid-chip solder ball performance. **ALPHA OM-338-T** is formulated to deliver exceptional visual joint cosmetics. Additionally, **ALPHA OM-338-T's** capability of IPC Class III for voiding and ROL0 IPC classifications ensures maximum long-term product reliability.

ALPHA OM-338-T is also known as ALPHA OM-338 with M13 viscosity.

**Although the appearance of these lead-free alloys will be different to that of tin-lead, the mechanical reliability is equal to or greater than with that of tin-lead or tin-lead-silver.*

FEATURES & BENEFITS

- Maximizes reflow yield for lead-free processing, allowing full alloy coalescence at circular dimensions as small as 0.25mm (0.010") with 0.100mm (4mil) stencil thickness.
- Excellent print consistency with high process capability index across all board designs.
- Print speeds of up to 200mm/sec (8"/sec), enabling a fast print cycle time and a high throughput.
- Wide reflow profile window with good solderability on various board / component finishes.
- Excellent solder and flux cosmetics after reflow soldering
- Reduction in random solderballing levels, minimizing rework and increasing first time yield
- Meets highest IPC 7095 voiding performance classification of Class III.
- Excellent reliability properties, halide-free material
- Compatible with either nitrogen or air reflow

PRODUCT INFORMATION

Alloys: SAC305 (96.5%Sn/3.0%Ag/0.5%Cu)
SAC387 (95.5%Sn/3.8%Ag/0.7%Cu)
SAC396 (95.5%Sn/3.9%Ag/0.6%Cu)
SAC405 (95.5%Sn/4.0%Ag/0.5%Cu)
e1 alloys per JESD97 Classification
For other alloys, contact your local Cookson Electronics Sales Office.
Powder Size: Type 3, (25-45µm per IPC J-STD-005) Available in Type 4 by Special Request. All data below was developed using Type 3 powder.
Residues: Approximately 5% by (w/w)
Packaging Sizes: 500 gram jars, 6" & 12" cartridges, and 10cc and 30cc dispense syringes.
Flux Gel: OM-338 Flux Gel is available in 10cc and 30cc syringes for rework applications.
Lead Free: Complies with RoHS Directive 2002/95/EC.

5-30-08

APPLICATION

Formulated for both standard and fine pitch stencil printing, at print speeds of between 25mm/sec (1"/sec) and 200mm/sec (8"/sec), with stencil thickness of 0.100mm (0.004") to 0.150mm (0.006"), particularly when used in conjunction with ALPHA® Stencils. Blade pressures should be 0.16-0.34 kg/cm of blade (0.9 -2lbs/inch), depending upon the print speed. The higher the print speed employed, the higher the blade pressure that is required. The reflow process window will give high soldering yield with good cosmetics and minimized rework.

SAFETY

While the **ALPHA OM-338-T** flux system is not considered toxic, its use in typical reflow will generate a small amount of reaction and decomposition vapors. These vapors should be adequately exhausted from the work area. Consult the MSDS for additional safety information.

STORAGE

ALPHA OM-338-T should be stored in a refrigerator upon receipt at 0 to 10°C (32-50°F). **ALPHA OM-338-T** should be permitted to reach room temperature before unsealing its package prior to use (see handling procedures on page 2). This will prevent moisture condensation build up in the solder paste.

ALPHA OM-338-T TECHNICAL DATA

CATEGORY	RESULTS	PROCEDURES/REMARKS
CHEMICAL PROPERTIES		
Activity Level	ROL-0 = J-STD Classification	IPC J-STD-004
Halide Content	Halide free (by titration). Passes Ag Chromate Test	IPC J-STD-004
Copper Mirror Test	**Pass**	IPC J-STD-004
Copper Corrosion Test	**Pass**, (No evidence of Corrosion)	IPC J-STD-004
ELECTRICAL PROPERTIES		
SIR (IPC 7 days @ 85° C/85% RH)	**Pass**, > 1.9 x 10^{10} ohms	IPC J-STD-004 {Pass ≥ 1 x 10^{8} ohm min}
SIR (Bellcore 96 hours @ 35°C/85%RH)	**Pass**, 8.3 x 10^{12} ohms	Bellcore GR78-CORE {Pass ≥ 1 x 10^{11} ohm min}
Electromigration (Bellcore 96 hours @ 65°C/85%RH 10V 500 hours)	**Pass**, Initial= 5.3 x 10^{10} ohms Final= 1.5 x 10^{11} ohms	Bellcore GR78-CORE {Pass=final > initial/10)
PHYSICAL PROPERTIES		Using 88.5% Metal, Type #3 Powder.
Color	Clear, Colorless Flux Residue	SAC 305, 405 alloy
Tack Force vs. Humidity (t=8 hours)	**Pass** -Change of <1 g/mm^2 over 24 hours at 25% and 75 % Relative Humidity	IPC J-STD-005
	Pass -Change of <10% when stored at 25±2°C and 50±10% relative humidity.	JIS Z3284 Annex 9
Viscosity	OM-338-T: 88.5% metal load designated M13 for printing. OM-338: 83.3% metal load designated M04 for dispensing.	Malcom Spiral Viscometer; J-STD-005
Solderball	**Acceptable** (SAC 305 and SAC405 alloys)	IPC J-STD-005
	Pass Class 2, 1 hour and 72 hour	DIN Standard 32 513, 4.4
Stencil Life	> 8 hours	@ 50%RH, 23°C (74°F)
Spread	**Pass**	JIS-Z-3197: 1999 8.3.1.1
Flux Tackiness Test	**Pass**	DIN 32513 Talc Test
Slump	**Pass**	IPC J-STD-005 (10 min 150°C)
	Pass	DIN Standard 32 513, 5.3
	Pass	JIS-Z-3284-1994 Annex 8

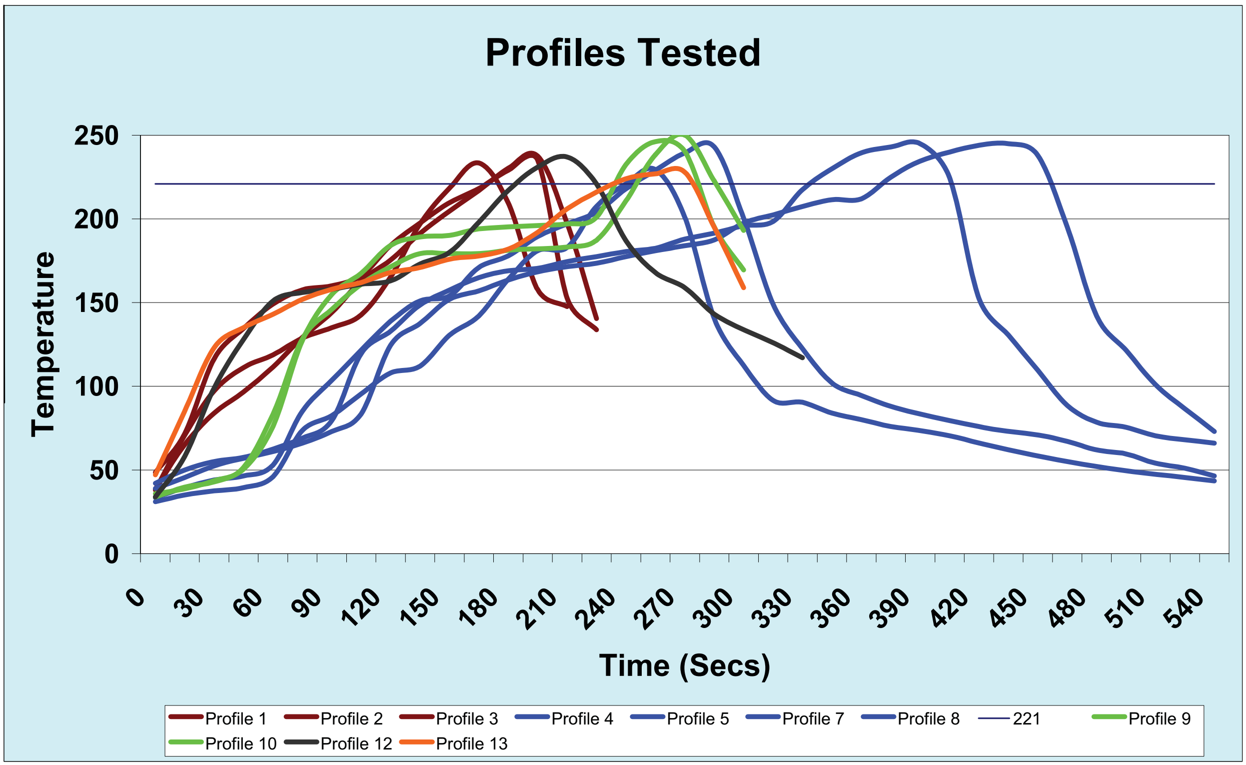
Cookson Electronics ASSEMBLY MATERIALS

ALPHA OM-338-T Processing Guidelines

STORAGE-HANDLING	PRINTING	REFLOW (See Figure #1)	CLEANING
•Refrigerate to guarantee stability @ 0-10°C (32-50°F) •Shelf life of refrigerated paste is six months. •Paste can be stored for 2 weeks at room temperatures up to 25°C (77°F) prior to use. •When refrigerated, warm-up of paste container to room temperature for up to 4 hours. Paste must be ≥19°C (66°F) before processing. Verify paste temperature with a thermometer to ensure paste is at 19°C (66°F) or greater before setup. Printing can be performed at temperatures up to 29°C (84°F). •Do not remove worked paste from stencil and mix with unused paste in jar. This will alter rheology of unused paste. •These are starting recommendations and all process settings should be reviewed independently.	STENCIL: Recommend Cookson Electronics ALPHA CUT or ALPHA FORM stencils @ 0.100mm - 0.150 mm (4-6 mil) thick for 0.4 - 0.5 mm (0.016" or 0.020") pitch. Stencil design is subject to many process variables. Contact your local Cookson Electronics stencil site for advice. SQUEEGEE: Metal (recommended) PRESSURE: 0.16-0.34 kg/cm of squeegee length (0.9-2.0 lbs./inch). SPEED: 25 to 200mm per second (1 to 8 inches per second). SEPARATION SPEED: Disable slow snap off for fast PCB release PASTE ROLL: 1.5-2.0 cm diameter and make additions when roll reaches 1-cm (0.4") diameter (min). Max roll size will depend upon blade. PRINT PUMP HEAD: Passes MPM 2000 print compaction and DEK ProFlow™ testing.	ATMOSPHERE: Clean-dry air or nitrogen atmosphere. PROFILE (SAC Alloys): A straight ramp profile @ 0.8°C to 1.7°C per second ramp rate is recommended (TAL 35 - 90 sec and peak 232-250°C). (1) Higher density assemblies may require preheating with within the profile and may be accomplished as follows: - From 40°C to Liquidus: Between 2min 30 sec. and 4 min. (optimum(2) is 3 min.) - From 170°C to Liquidus: Between 45 sec. and 75 sec. (optimum(2) is 1 min.) - From 130°C to Liquidus: Between 1min. 20 sec. and 2 min. 15 sec. (optimum(2) is 1min. 30 sec.) - Time above liquidus: Between 30 sec. and 90 sec. (optimum(2) is 45 sec. to 70 sec.) Note 1: Refer to component and board supplier data for thermal properties at elevated temperatures. Lower peak temperatures require longer TAL for improved joint cosmetics. Note 2: OM-338 is designed to work under a wide range of reflow profiles in order to find the optimum profile for your process. This can be achieved by balancing: (1) Minimum Delta T's (depending on board mass and thermal oven characteristics) (2) Maximum Reflow Yield (includes voiding, cosmetics, solder balling, etc.) (3) Minimum Stress and Overheat for Components and Boards (refer to suppliers' guidelines and specifications. Contact your local Cookson Electronics Application Engineer for further details.	ALPHA OM-338-T residue is designed to remain on the board after reflow. If reflowed residue cleaning is required, ALPHA BC-2200 aqueous cleaner is recommended. For solvent cleaning, agitation for 5 min in the following cleaners is recommended: - ALPHA SM-110E - Bioact™ SC-10E - Kyzen Micronox MX2501 Misprints and stencil cleaning may be done with ALPHA SM-110E, ALPHA SM-440, ALPHA BC-2200 and Bioact™ SC-10E cleaners.

Bioact™ and Hydrex™ are registered trademarks of Petroferm, Inc.

Figure #1 – Reflow Envelope



LPKF
Laser & Elektronika

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E-mail: info@lpkf.si, Web: www.lpkf.si
VAT Reg. No.: SI14682931

DECLARATION OF CONFORMITY

according to Machinery Directive (MD), (2006/42/EC)

We hereby confirm that the machine:

LPKF ProtoFlow S,

a drawer type microprocessor controlled programmable table top reflow oven for SMT soldering and similar temperature treatments,

is a machine according to the EU Machinery Directive (MD), (2006/42/EC).

The LPKF ProtoFlow S also complies with the requirements of the following EC directives:

- Low Voltage Directive (LVD), (2006/95/EC)
- Electro – Magnetic Compatibility Directive (EMC), (2004/108/EC)

and standards:

EN 12100
EN 563
EN 614
EN 60204

CE approval symbol is atached to the machines in accordance with Machinery Directive.

Manufactured by: LPKF Laser & Elektronika d.o.o.
Polica 33
4202 Naklo
Slovenia

Naklo, 20.8.2009

(Mr.Tomaž Žepič, Managing Director)

Further details and safety precautions of the device can be obtained from the Users manual.

Registracija / Registration:
Predsednik NS / President of SB: Bernd Hildebrandt ◆ ID DDV / VAT No.: SI14682931
Osnovni kapital / Capital Fund: 52.162,00 EUR ◆ Matična št. / Registry No.: 5711096
Okrožno sodišče Kranj, št. vl. / District Court Kranj, Reg. No.: 1/04293/00

Banke / Banks:
SKB banka d.d. IBAN: SI56031381000489121
Nova Ljubljanska banka d.d. IBAN: SI56020680017951436
Gorenjska banka d.d. IBAN: SI56070000000009984

ISO 9001