

# USER MANUAL

## Lead-free Reflow Oven LPKF ProtoFlow® S





## 1 INTRODUCTION

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](http://www.lpkf.si)

E-mail: [support@lpkf.si](mailto:support@lpkf.si), [sales@lpkf.si](mailto:sales@lpkf.si)

Trade-mark:



### 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 230 x 305 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.

Version with nitrogen connection allows soldering in inert gases atmosphere, which enlarges the soldering quality.

## 1.2 Warnings

Copyright© 2010-2013 LPKF d.o.o.

Copying and distributing these instructions in their entirety or in part is only permitted by LPKF approval in writing.

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!

### **Privacy disclaimer upon registration:**

Your personal data will be exclusively used for communication with you related to your use of the LPKF ProtoFlow S/E according to your indicated preferences. You might be contacted from our marketing department with product survey and in such case, you would have chance to unsubscribe from our further mailings. Collected data will not be sold or passed to 3rd parties. Upon written request, LPKF or its retailers will inform you by letter, what personal data is stored by us as defined by local law. If such data is incorrect, we will correct that information at your request. Please refer to local Brand site services for further instructions.

Telephone: + 386 (0) 592 08 800

Fax: + 386 (0) 592 08 820

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

## 2 CONTENTS

1	INTRODUCTION	3
1.1	ProtoFlow S	3
1.2	Warnings	4
2	CONTENTS	5
2.1	Symbols etc. used in this manual	7
2.1.1	Registered trademarks	
3	BASIC DATA	8
3.1	Name and address of the manufacturer	8
3.2	Relevant model	8
3.3	Intended use	8
3.4	Technical data	8
3.5	Noise level/vibration/emission of hazardous chemicals	9
4	SAFETY NOTES	10
4.1	General	10
4.2	Hazards	10
4.3	Safety measures	11
4.4	Procedures in the event of injury or other emergencies.	12
5	DEVICE DESCRIPTION	13
5.1	Basic parts	13
5.1.1	Power switch	
5.1.2	USB connection	
5.1.3	LCD display	
5.1.4	Chamber	
5.1.5	Motorized drawer	
5.1.6	Monitoring	
5.1.7	Software	
6	INSTALLATION	16
6.1	Opening the packaging	16
6.2	Installation	18
7	INSTRUCTIONS FOR USE	19
7.1	Fixing of printed circuit boards	19
7.2	Menus	20
7.2.1	General description	
7.2.2	Options	
7.2.3	Display view	
7.3	Reflow process	27
7.3.1	Select profile	
7.3.2	Start profile	
7.3.3	Correction of time settings during the process	
7.4	LPKF FlowShow SE	33
7.4.1	General	
7.4.2	Starting the program	
7.4.3	Tab 1 - Profile recording	
7.4.4	Tab 2 - Profile programming	
7.4.5	Tab 3 - Admin	

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7.5	N2 Module (Option)	42
	7.5.1 General	
	7.5.2 Description	
	7.5.3 N2 connection	
	7.5.4 Starting the process with a nitrogen atmosphere	
7.6	Profile recorder	46
	7.6.1 General	
	7.6.2 Connection	
8	MAINTENANCE	48
8.1	Cleaning	48
8.2	Replacing the main fuse	48
9	TROUBLESHOOTING	49
10	APPENDICES	50
10.1	Scope of delivery	50
10.2	Technical Datasheet	50
10.3	Declaration of conformity	54

## 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  
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Trade-mark:



#### 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 °C, 999 s
Max. reflow temperature, time	320 °C, 600 s
Long thermal treatment temperature, time	220 °C, 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	<i>Hardware:</i> Pentium 1 GHz, 512 MB RAM, 10MB free disk space, 1024x768 video resolution graphic card, CD-ROM or DVD, USB 1.1, 2.0 or 3.0 <i>Software:</i> Windows XP Professional SP3, Windows Vista, Windows 7 or Windows 8 and .NET Framework 4.0



Ambient conditions	Temperature: 15-30 °C (59-95 °F) Relative humidity: 30-80 %
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### 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

	<b>BURNS</b>	<p>There is a risk of burns, if the PCB securing aluminium laths are touched. Supplied protective gloves enable brief touching of hot surfaces only!</p> <p>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.</p>
	<b>MECHANICAL HAZARDS</b>	<p>When the drawer is closing, hands should be kept well clear to avoid entrapment and serious injury.</p> <p>Closing or opening the drawer is always preceded by a warning sound.</p>
	<b>ELECTRICAL HAZARDS</b>	<p>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.</p>
	<b>CHEMICAL HAZARDS</b>	<p>Soldering pastes can contain substances that are hazardous to health.</p> <p>Hazardous vapours could spread into the work space when the drawer is opening (process of cooling).</p>
	<b>SENSOR STRESS</b>	<p>In the event of unsuitable general lighting of the area the operator can experience an increase of sensor stress.</p>
	<b>MANUAL HANDLING</b>	<p>The weight of the device is 22 kg / 48.5 lbs. Unless handled correctly spinal injuries can occur.</p>

### 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).



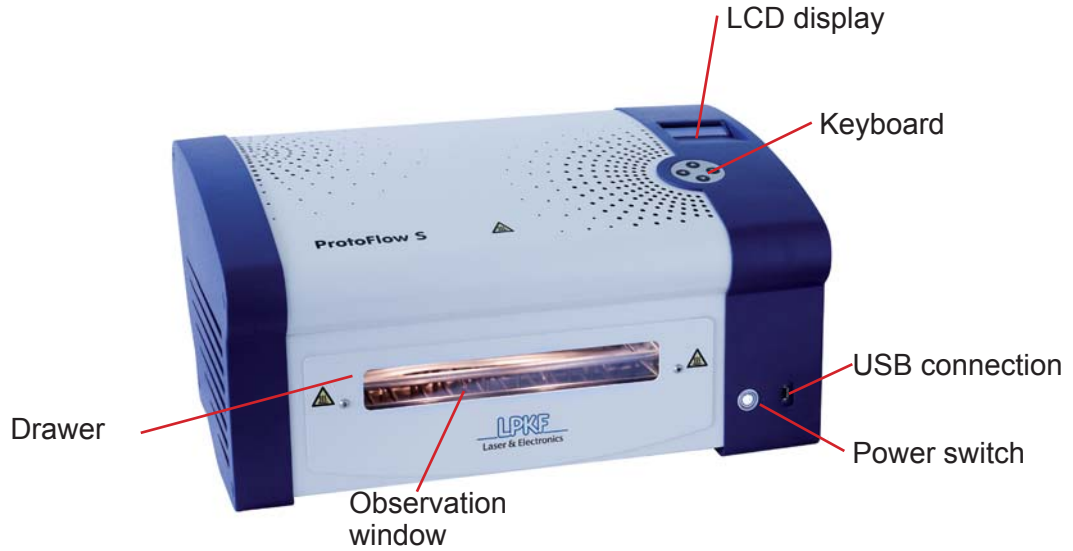
#### **4.4 Procedures in the event of injury or other emergencies.**

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.

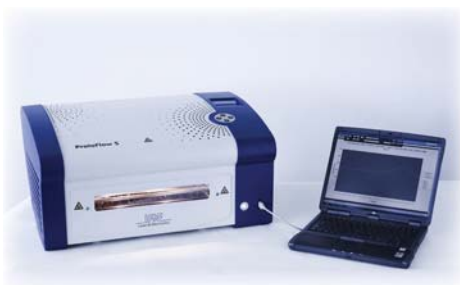
The power switch is illuminated when the power is on.

#### 5.1.2 USB connection



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

USB communication supports all USB 1.1, 2.0 and 3.0 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



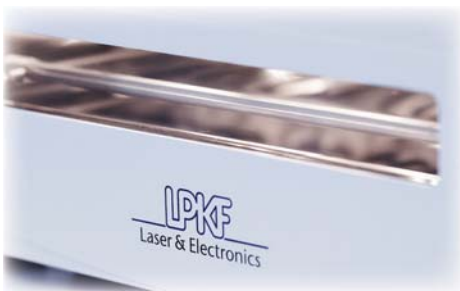
The aluminium laths slide easily on two rods, which makes it very easy to adapt to various sizes of PCB's, up to a maximum of 230 x 305 mm (9" x 12").

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 SE software is an excellent accessory, which simplifies the handling of ProtoFlow S.



## 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 x 550 mm / 31.5" x 21.2".

There must be at least 450 x 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 3.10*

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 x 305 mm (9" x 12") is possible. The three securing strips slide easily onto carriers.



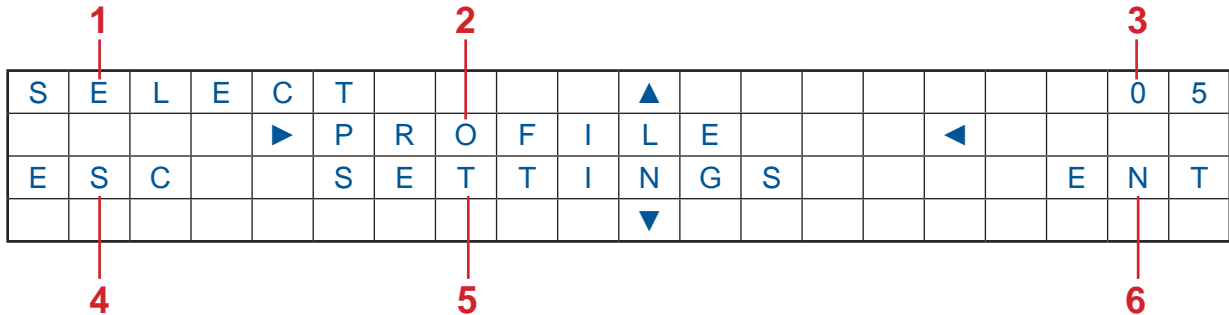
Aluminium laths can be hot - when sliding the laths, always use protective gloves (enclosed).



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



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	LF-SMALL	EDIT PROFILE	START PROFILE	SHORT NAME	
	LF-MEDIUM		EXTRA INFO		
	LF-LARGE		PREH TEMP		
	LF2-SMALL		PREH TIME		
	LF2-MEDIUM		REFL TEMP		
	LF2-LARGE		REFL TIME		
	PB-MEDIUM		REFL POWER		
	ProConduct		COOL TIME		
	ProMask-PD		SEC OR MIN		
	ProMask-PC		MULTI ZONE		
	OPEN/CLOSE				
	SETTINGS		LCD VIEW	LCD 1CH	
				LCD 3CH	
				LCD 5CH	
		LCD 7CH			
No OF PROFILE		10 PROF'S			
		20 PROF'S			
		30 PROF'S			
FACTORY PR		LOADING FACTORY DATA			
N2 SETTING		N2 ON			
		N2 OFF			
OPEN/CLOSE					
SELECT					

### PROFILE:

- »**SHORT NAME**« ⇨ name of profile (10 characters)
- »**EXTRA INFO**« ⇨ additional description of profile (10 characters)
- »**PREH TEMP**« ⇨ preheat temperature (°C), from 50 °C to max. 220 °C  
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 (°C), from 50 °C to max. 320 °C  
in minute mode, max. 220 °C  
in second mode, max. 320 °C  
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.

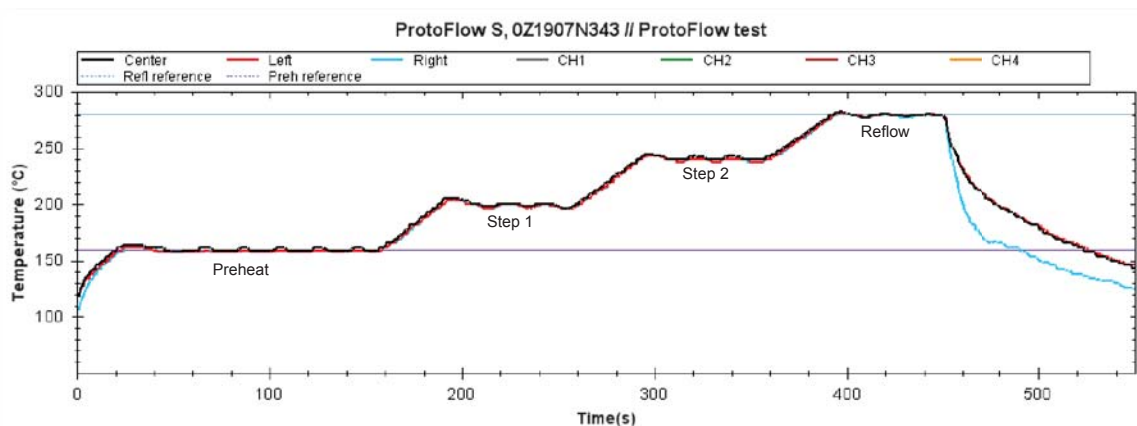
Multizone option "**ONLY REFL**" displays the reflow parameters of the REFLOW phase.

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 °C (in sec. mode), max. 220 °C (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	°	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	°	C				2	2	0	°	C			2	2	1	°	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	°	C							
A	2	1	7		B	2	1	9			C	2	2	0		D	2	1	8

Red arrows point to the following values in the table:

- 1: 3 (top-left)
- 2: 2 (top-right)
- 3: 2 (bottom-left)
- 4: 2 (bottom-middle)
- 5: 2 (bottom-right)

- 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	°	C		R	2	2	1	C	
A	2	1	7		B	2	1	9			C	2	2	0		D	2	1	8

Red arrows point to the following values in the table:

- 1: 2 (top-right)
- 2: 2 (bottom-left)
- 3: 2 (bottom-middle)
- 4: 2 (bottom-right)
- 5: 1 (bottom-right)

- 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		°	C				◀						
E	S	C			S	C	R	O	L	L	&	E	N	T				E	N	T
										▼										

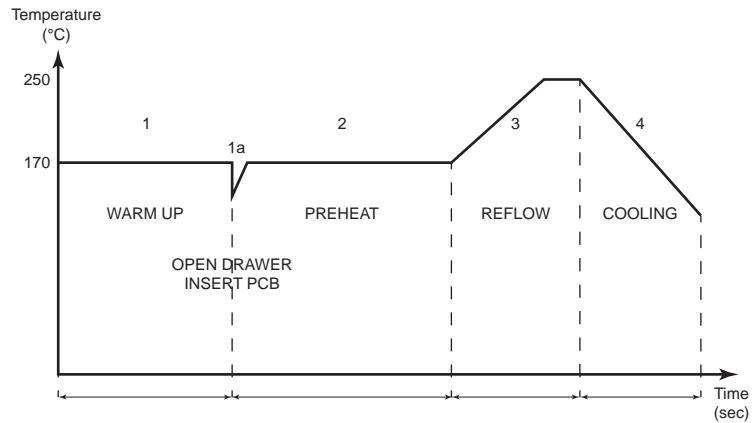
The current character of the parameter value is blinking when it is activated. Press the UP button to increase, and DOWN button to decrease the value. Confirm with ENTER.

P	R	E	H	E	A	T				▲								0	1	
				▶	1	7	5		°	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	°	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	°	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	°	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 SE

### 7.4.1 General

LPKF FlowShow SE enables temperature logging of the current profile (chart and data), programming of oven profiles from the saved database, and upgrades of the ProtoFlow firmware.

*Note:*

FlowShow SE software is not required for general use of ProtoFlow. FlowShow SE represents an additional tool for temperature acquisition and more convenient profile programming. Therefore, connection to a PC is not required.

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



Detailed instructions of FlowShow SE, including installing procedure and detailed descriptions of all functions can be found in FlowShow SE User Manual.

### 7.4.2 Starting the program

Go to **Start** → **All Programs** → **LPKF Laser & Electronics** → **FlowShow SE** and click the **FlowShow SE** icon or click the icon on the desktop.

#### LANGUAGE SETTINGS

Program FlowShow SE is a multilingual program.

Default language is **English**.

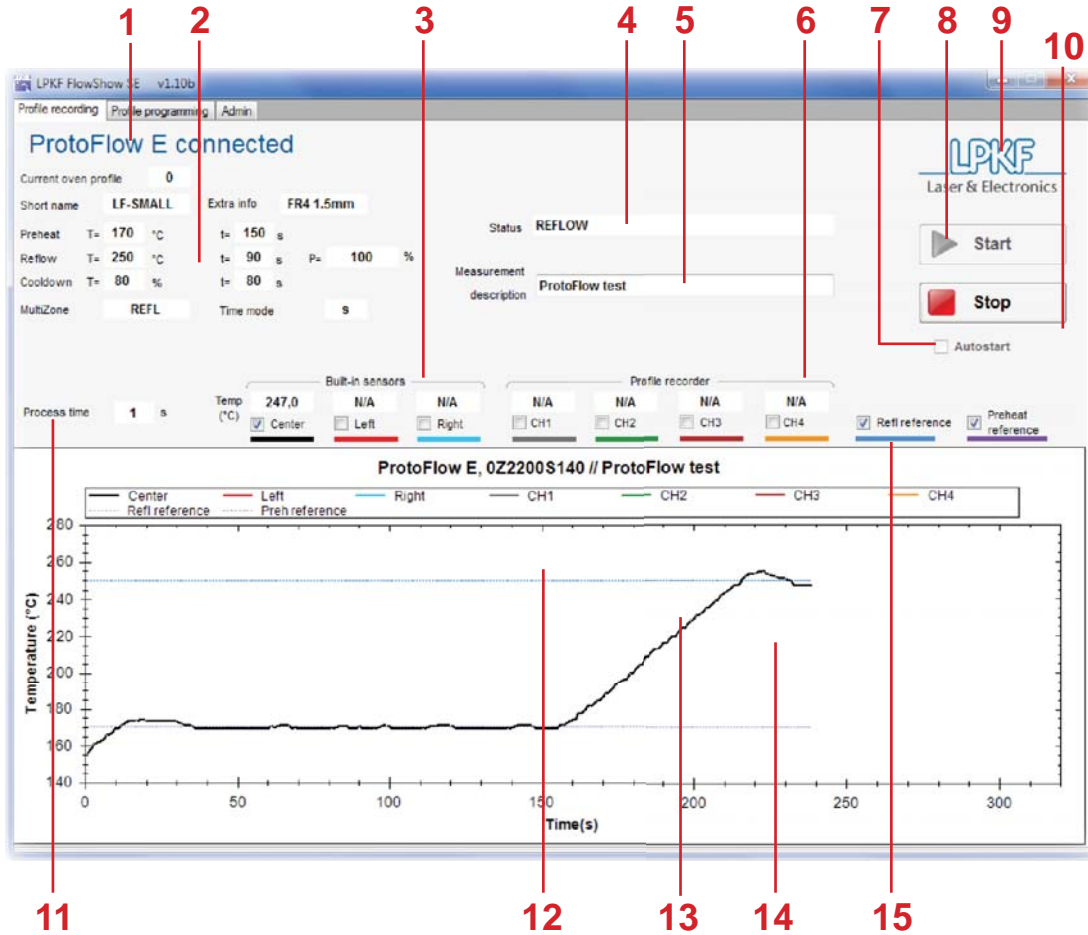
This setting can be changed at any time using Language function from **Admin tab**.



If your language is not on the list, you can select “custom” language. Please ask your local distributor for details.

### 7.4.3 Tab 1 - Profile recording

Profile recording is a screen where the entire current process in the oven can be followed. The current profile setting, current status of the oven, start and stop of the recording, following temperatures of built-in and additional sensors, displaying profile in the graph and exporting the data recorded can be seen on this screen.



1	Device connection status	2	Current profile parameters
3	Built-in sensor temperatures	4	Oven status messages
5	Description of current measurement (used in chart export)	6	Temperatures of additional freely mounted sensors - Profile recorder (option) (N/A when Profile recorder is not available)
7	Check box for automatic start of the oven or recording	8	Start profile recording and oven
9	LPKF home page (click to open)	10	Stop profile recording
11	Remaining time until the end of the current phase	12	Reflow temperature reference
13	Real-time oven temperatures	14	Preheat temperature reference
15	Show/Hide reference line		

No.	Description
1	Connected; oven is successfully connected with PC Not connected; <ul style="list-style-type: none"> <li>oven is not switched ON</li> <li>USB cable is not connected to oven/PC</li> <li>USB driver on the PC is not correct</li> </ul>
2	Profile parameters from the oven. When the oven is connected, the current oven profile parameters are automatically downloaded.
3	Display of the current temperatures of the built-in sensors.
4	Different status messages are shown: <ul style="list-style-type: none"> <li>WARMUP, PREHEAT, STEP1, STEP2, REFLOW, COOLDOWN, RECORDING FINISHED, START THE OVEN'S PROFILE OR ENABLE AUTOSTART FIRST; oven profile phases and recording status</li> <li>Warnings related to device connection failure</li> </ul>
5	Free entry text. Default text is "ProtoFlow test".
6	Display of the current temperatures at freely mounted additional sensors from Profile recorder (option). N/A means that the oven is not equipped with a Profile recorder.
7	Check the box to start the oven automatically by pressing the START button or start the profile recording automatically when the process is started on the oven. This function requires registration.
8	Manual Start of profile recording and automatic start of the oven if Autostart box is selected.
9	Link to the LPKF web site.
10	Manual Stop of the profile recording. <i>This function does not stop the oven's current profile, it has to be stopped manually.</i>
11	Remaining time until the end of the current phase.
12	Reference line of the Reflow temperature.
13	Real time temperature chart of selected sensors. Separate lines can be hidden/shown.
14	Reference line of the Preheat temperature
15	Check box to show/hide the display of reference lines

## START

To start the profile recording, first start the process on the oven and press the Start button in FlowShow SE.

Optionally, when FlowShow SE has been registered, Autostart of recording can be enabled.

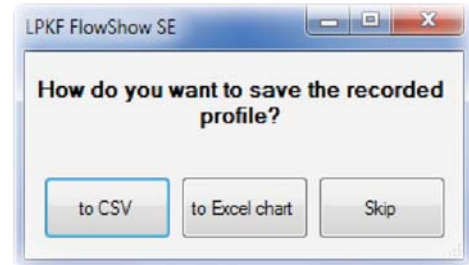


Autostart enables an automatic start of profile recording, when the profile on the oven has been started, or an automatic start of the current profile on the oven when the Start button in FlowShow SE has been pressed.

## STOP

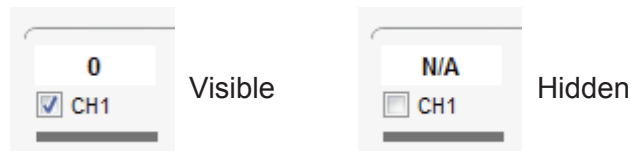
Recording can be stopped automatically when the cooldown phase is finished, or stop it manually by pressing the Stop button.

After stop, FlowShow SE offers to save the recorded data: export it to CSV, draw an Excel chart or skip exporting. When recording is not stopped manually, the export option is offered at the end of the recording.



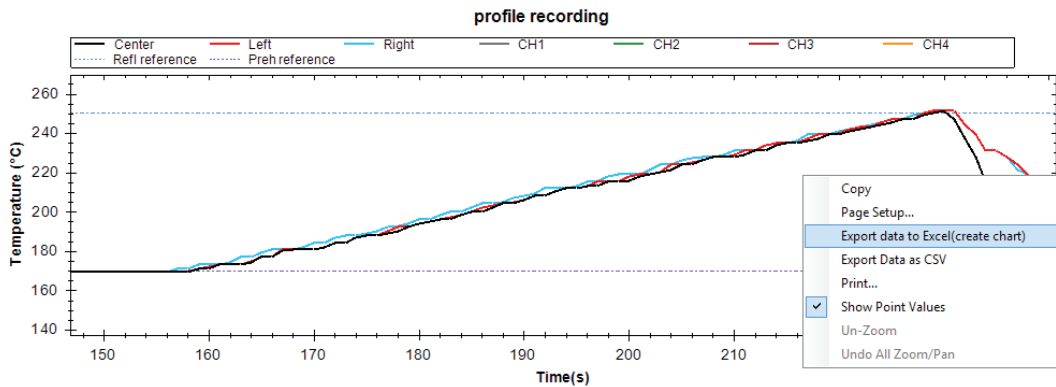
## CHART VIEW

A different view of the chart is possible. To switch on/off the display of separate sensors and reference temperatures, alternation of the check boxes beside the names is required.

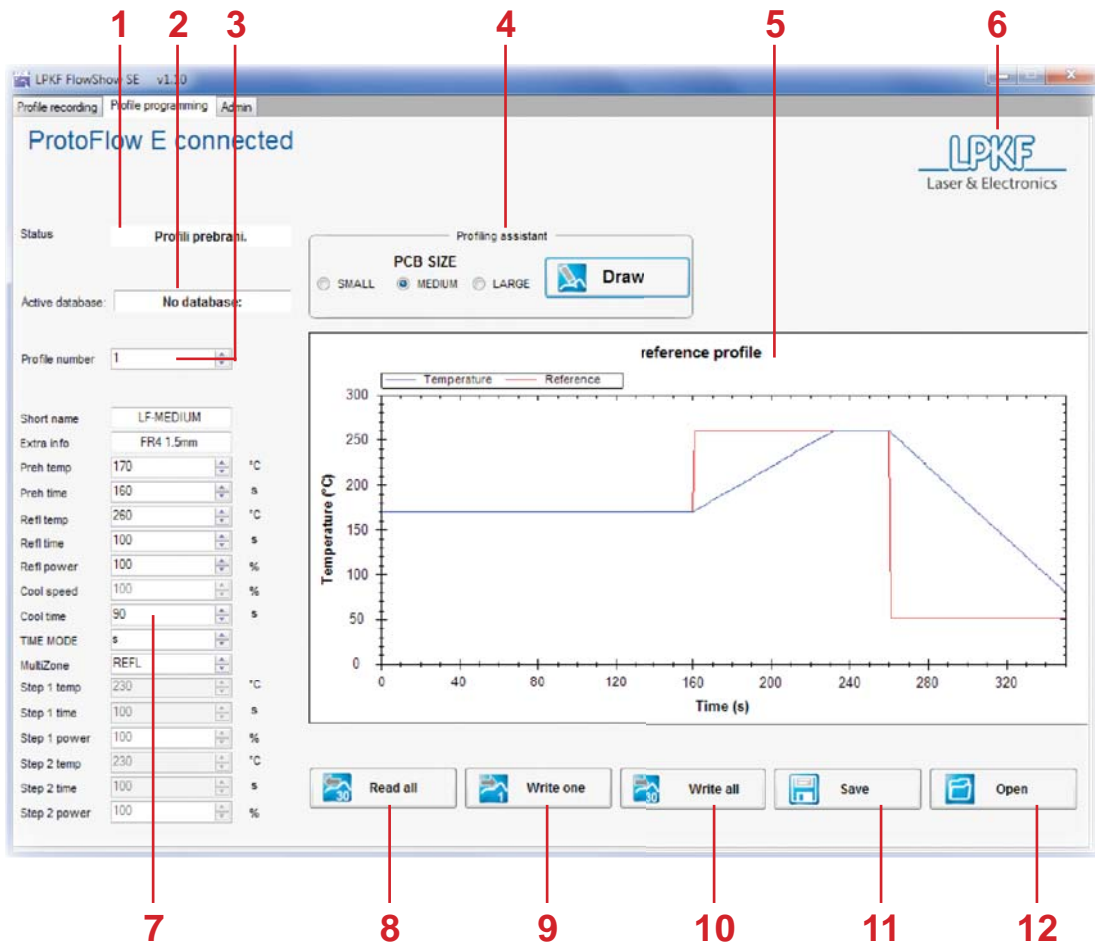


## CHART HANDLING

When a profile has been recorded, the chart can be window-zoomed, exported as CSV, XLS chart, BMP image, or printed. The special functions are available by right-clicking the mouse.



7.4.4 Tab 2 - Profile programming



1	Oven status messages	2	Name of the latest read/loaded database
3	Profile number from oven profile number	4	Profiling assistant
5	Theoretical profile created from parameters entered	6	LPKF home page
7	Profile parameters	8	Read entire database from oven
9	Write selected profile to oven	10	Write entire database to oven
11	Save current read/loaded database	12	Open saved database

No.	Description
1	The current status of the oven is shown.
2	The name of latest read/loaded database is shown. Possible status: database from oven, database from disk...
3	The number of oven profile parameters that can be shown and modified in profile parameters table. The number of profile can be selected by scrolling the menu. A maximum 30 profiles can be stored in the oven database.
4	Profiling assistant is a useful tool for optimizing profile parameters (see explanation below)
5	A theoretical profile created from the profile parameters entered (reference) and temp/time profile expected (temperature) in the oven regarding the ramp rate.
6	Automatic connection to the LPKF web site
7	Profile parameters, which can be modified. The set parameters are shown as reference in the "reference profile" chart. Adjusting of parameters is necessary to obtain the correct profile (see explanation below).
8	All 30 profiles can be transferred from the currently connected oven. The current oven profile is also updated in the Profile recording tab.
9	Write the currently shown profile in the database to the selected profile in the oven. The profile will be set as the current profile of the oven.
10	All 30 profiles in the selected database can be written back to the oven.
11	Save all 30 database profiles to a selected file location on computer (.fsp extension).
12	Open the database from the selected location in the computer (.fsp extension).

## PROFILING ASSISTANT

Profiling assistant is a useful tool for profile parameter optimization, before the profile is sent to the oven and tested.

Profile assistant calculates the set parameters and oven specific ramp rate. The calculation, a theoretical profile for selected PCB, is shown in the chart as "temperature". Calculation uses the default ramp rate.

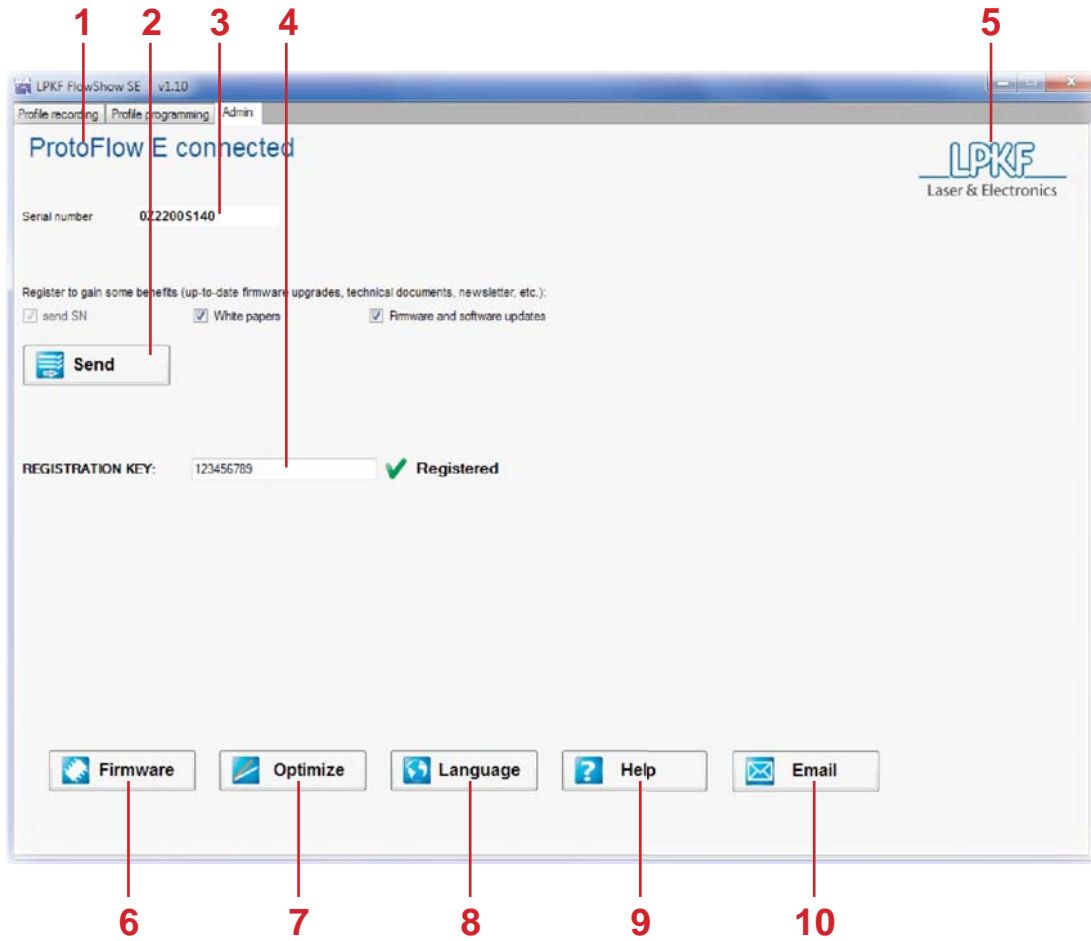
## PROFILE PARAMETERS

Profile parameters can be inserted/modified with the same restrictions as on the oven, and must be identical. All parameters except Short name and Extra info can be modified by using the scroll menu, or can be written. The set parameters are shown in the "reference profile" chart as "reference".

## READ, WRITE, SAVE, OPEN

The read, write, save, open functions allow oven profiles to be sent to the FlowShow SE program, after modification they can be sent back to the oven, stored in the computer and opened again at any time.

7.4.5 Tab 3 - Admin

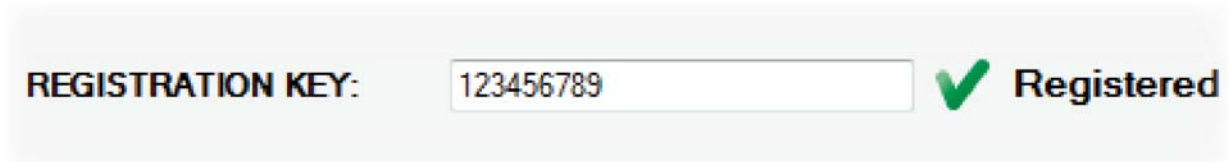


1	Device connection status	2	Send serial number of oven and other details to LPKF for registration
3	Serial number of currently connected oven	4	Registration key field
5	LPKF home page	6	Upload firmware to oven
7	Optimize reflow ramp-up rate (requires registration)	8	Change UI language
9	Open user manual	10	Send email to LPKF support

No.	Description
1	The current status of the oven is shown.
2	Default email client creates a new email which contains the registration data. The registration field allows the user to send the registration request by email. They can select options they should receive after registration. The serial number and sender e-mail are generated automatically.
3	The serial number of the currently connected oven.
4	The registration key field allows insertion of the registration key or licence number, which is sent to the sender by LPKF. The registration key or the licence number brings some additional benefits. (for more details see the Registration & Licence paragraph)
5	Automatic connection to the LPKF web site.
6	The button allows the user to upgrade the firmware on the oven.
7	OPTIMIZE button automatically starts the OPTIMIZE oven profile and measures the ramps in the reflow phase. The measured data is used to calculate ramps in PROFILE ASSISTANT chart drawing.
8	Change the user interface language. Select desired language from the drop-down menu.
9	The HELP button opens the User manual in pdf format. A PDF reader is required.
10	Send email to LPKF support team

## REGISTRATION

Registration brings some benefits, like autostart, ramp optimization, whitepapers and firmware updates.



### NOTE:

Registration & licence free 30 days trial is available. To activate, type TRIAL in registration field.

## FIRMWARE UPDATE

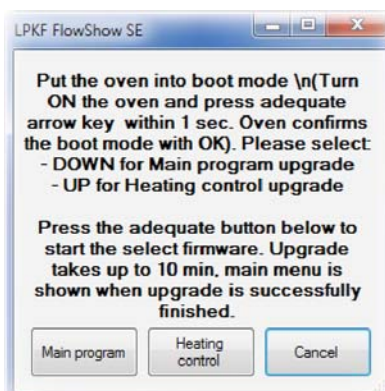
Firmware updating will bring improvements or new features into the oven.

To upgrade the firmware, follow the procedure described in FlowShow SE User Manual.



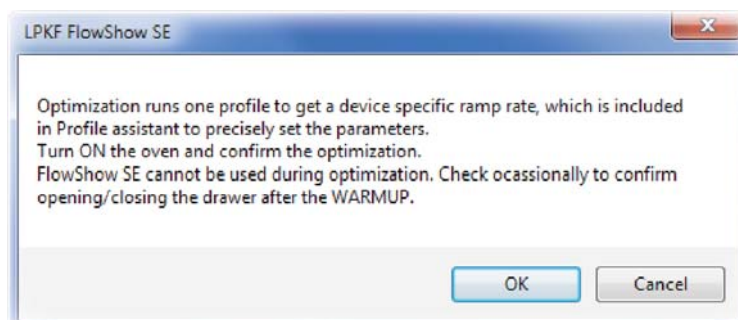
Before the firmware update make sure you read and understand FlowShow SE User Manual.





## OPTIMIZE

Optimization runs one profile to measure a specific ramp-up rate on the connected oven. Profile assistant includes the measured ramp-up rate when calculating profiles and helps you to precisely set profile parameters.



## LANGUAGE

Language of the user interface can be changed at any time using Language option. Select the desired language from the dropdown menu and confirm with OK.

## HELP

The FlowShow SE program is supported by help files. Help files bring you:

- Opening of user manuals
- “How to” documents
- Different whitepapers with new information about FlowShow SE, processes, ovens, other devices.

Click the button to open the default folder with the user manual, whitepapers, and select the appropriate manual.

## EMAIL

For any complains, problems, questions, suggestions, an email in the default email client can be created. The LPKF Slovenia support team will be automatically contacted.

## 7.5 N2 Module (Option)

### 7.5.1 General

N2 module is an additional unit mounted into LPKF ProtoFlow S N2 reflow oven, which enables the supply of inert gases in the soldering chamber during the soldering process. By injecting inert gases, especially nitrogen as the most common used gas in SMT, significantly decreases oxidation during the process and ensures superior soldered joints.

The benefits of soldering in a nitrogen atmosphere:

- Reduction in Soldering Defects
- Improvement of First Pass Soldering Yields
- Reduction in Labor Costs and Increase in Production Rates
- Elimination of Metal Surface Oxidation
- Increase in Solder Joint Strength
- Implementation of Low Residue, No-Clean Soldering
- Expansion of Process Window

### 7.5.2 Description

N2 module ensures connection and regulation of nitrogen. It consists of inlet port for 6 mm hose, electromagnetic valve, flow regulator and electronic board which function is measuring of gas flow and controlling the valve. Input pressure rate is in range between 2.5 and 8 bar (36,3 – 116 PSI), measure of flow rate is in range 0 -730 l/h ( 0 – 26 SCFH).

### 7.5.3 N2 connection



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

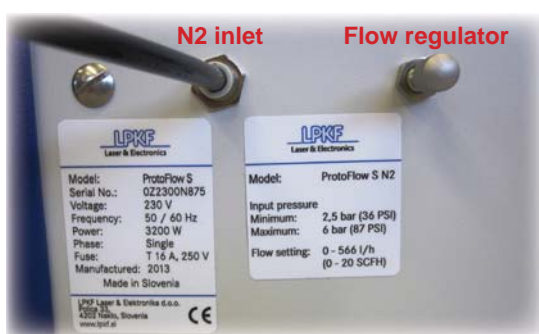


Figure 1: N2 inlet

1. Connect the 6 mm diameter pneumatic hose to the inlet port at the back of the device (figure 1).
2. Open the main valve on the tank regulator or pipeline (figure 2).
3. Adjust the pressure to range between 2.5 and 6 bar (36,3 – 87 PSI).



The oven is not equipped with a pressure regulator. Using the pressure regulator on the tank or on the pipeline outlet is mandatory.

4. Check the value of N2 flow → chapter 7.5.4., point 1
5. Adjust the reference value of N2 flow → chapter 7.5.4., point 1

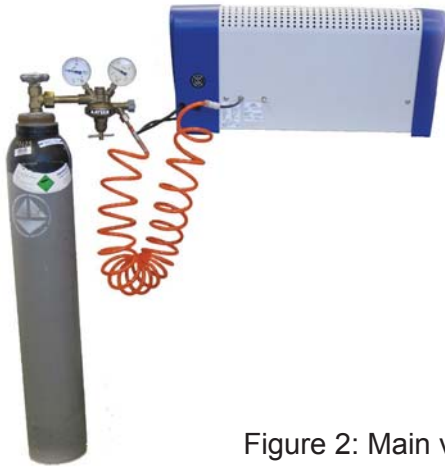


Figure 2: Main valve

#### 7.5.4 Starting the process with a nitrogen atmosphere

##### 1. Checking and setting the flow

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

Turn ON the oven and from the main menu select:

**SETTINGS → N2 SETTING → N2 CHECK**

Wait for a moment and LCD will display the current value of N2 flow in l/h.

To set the desired N2 flow, rotate the “N2 flow regulator” located on the back side of the oven. Showed value of flow is in range from 0 to 730 l/h (0 – 26 SCFH)



Recommended value is in range between 200 and 510 l/h (7 - 18 SCFH).



Showed values of N2 flow under 200 l/h (7 SCFH) and over 510 l/h (18 SCFH) are blinking.

Press ENTER to exit.

##### 2. Activation of N2 flow

Set the reference level of N2 flow.

Activation of N2 flow is preparing the N2 module to be used during the soldering process. Switching on provides that the integrated electromagnetic valve opens the flow automatically with the WARMUP phase and close it with the end of the REFLOW phase. The setting of reference level of flow ensures control of the adequate flow and notice in case of deviations.

To activate the N2 flow please select:

**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
									▼									

Adjust the reference value to the set value in N2 CHECK function and confirm with ENTER!

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



Recommended value is in range between 200 l/h (7 SCFH) and 510 l/h (18 SCFH). The other values could be set also.



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

Go back to the main menu and start the soldering profile.

Select adequate profile and start the process.

**PROFILE → LF-SMALL → START**

Further information on how to start/edit profiles can be found in chapter 7.3.

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	I	/	h
1	3	5	S		L	F	-	S	M	A	L	L			1	7	0	C
								1	7	0	°	C						
								C	E	N	T							



Incorrect value of current flow blinks.

The flow could be readjusted any time during the process by rotating the Flow regulator located on the rear side of the oven.



If the deviation of the flow is too low/high from the reference level set in N2 ON, the oven LCD shows a message, and there is an audible warning at the beginning of every phase of the process. The process, however will continue unless the operator interrupts it.

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	!		

**3. Disable the N2 flow function**

The use of an inert gas can be terminated by selecting the N2 OFF function

From the main menu select:

**SETTINGS → N2 SETTING → N2 OFF**

The function will disable N2 module and whole its functions. The oven can be further used for all temperature treatments without inert gases.



LPKF Laser & Electronics recommends **MESSER**  gases.

## 7.6 Profile recorder

### 7.6.1 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)

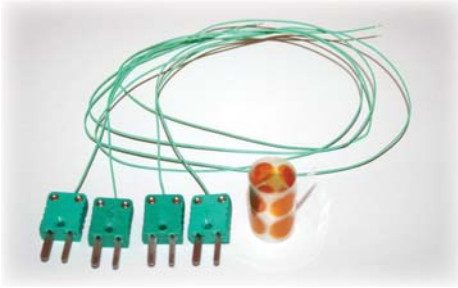
If an additional sensor is not connected, the oven displays the following warning:

				V	E	R	S	I	O	N		3	.	1	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:

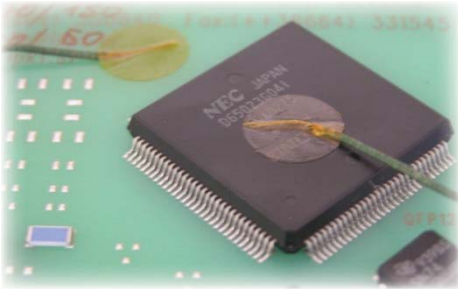
N	O			P	R	O	F	I	L	E		R	E	C	O	R	D	E	R			
				C	H	E	C	K			M	A	N	U	A	L						

## 7.6.2 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



**WARNING**  
**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

FlowShow SE User manual

### 10.2 Technical Datasheet

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

# ALPHA<sup>®</sup> OM-338-CSP

## ULTRA FINE FEATURE LEAD-FREE SOLDER PASTE

### DESCRIPTION

**ALPHA OM-338-CSP** is a lead-free, no-clean solder paste designed for a broad range of applications. **ALPHA OM-338-CSP'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-CSP** yields excellent print capability performance across various board designs and, particularly, with ultra fine feature repeatability and high "through-put" 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-CSP** is formulated to deliver excellent visual joint cosmetics. Additionally, **ALPHA OM-338-CSP's** capability of IPC Class III for voiding and ROL0 IPC classifications ensures maximum long-term product reliability.

*\*Although the appearance of these lead-free alloys will be different to that of tin-lead, with mechanical reliability 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 0.24mm (0.096") with 0.100mm (4mil) stencil thickness.
- Excellent print consistency with high process capability index across all board designs.
- Print speeds of up to 150mm/sec (6"/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

<u>Alloys:</u>	SAC305 (96.5%Sn/3.0%Ag/0.5%Cu) e1 alloys per JESD97 Classification For other alloys, contact your local Cookson Electronics Sales Office.
<u>Powder Size:</u>	Type 4.5
<u>Residues:</u>	Approximately 5% by (w/w)
<u>Packaging Sizes:</u>	500 gram jars, 6"
<u>Lead Free:</u>	Complies with RoHS Directive 2002/95/EC.

### APPLICATION

Formulated for both standard and fine pitch stencil printing, at print speeds of between 25mm/sec (1"/sec) and 150mm/sec (6"/sec), with stencil thickness of 0.100mm (0.004") to 0.150mm (0.006"), particularly when used in conjunction with ALPHA<sup>®</sup> 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.

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8-10-09





**SAFETY**

While the **ALPHA OM-338-CSP** 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-CSP** should be stored in a refrigerator upon receipt at 0 to 10°C (32-50°F). **ALPHA OM-338-CSP** 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-CSP TECHNICAL DATA		
CATEGORY	RESULTS	PROCEDURES/REMARKS
<b>CHEMICAL PROPERTIES</b>		
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	<b>Pass</b>	IPC J-STD-004
Copper Corrosion Test	<b>Pass</b> , (No evidence of Corrosion)	IPC J-STD-004
<b>ELECTRICAL PROPERTIES</b>		
SIR (IPC 7 days @ 85° C/85% RH)	<b>Pass</b> , > 1.9 x 10 <sup>10</sup> ohms	IPC J-STD-004 {Pass ≥ 1 x 10 <sup>9</sup> ohm min}
SIR (Bellcore 96 hours @ 35°C/85%RH)	<b>Pass</b> , 8.3 x 10 <sup>12</sup> ohms	Bellcore GR78-CORE {Pass ≥ 1 x 10 <sup>11</sup> ohm min}
Electromigration (Bellcore 96 hours @ 65°C/85%RH 10V 500 hours)	<b>Pass</b> , Initial= 5.3 x 10 <sup>10</sup> ohms Final= 1.5 x 10 <sup>11</sup> ohms	Bellcore GR78-CORE {Pass=final > initial/10}
<b>PHYSICAL PROPERTIES</b>		
Color	Clear, Colorless Flux Residue	SAC 305, 405 alloy
Tack Force vs. Humidity (t=8 hours)	<b>Pass</b> -Change of <1 g/mm <sup>2</sup> over 24 hours at 25% and 75 % Relative Humidity	IPC J-STD-005
	<b>Pass</b> -Change of <10% when stored at 25±2°C and 50±10% relative humidity.	JIS Z3284 Annex 9
Viscosity	OM-338-CSP: 88.3% metal load designated M14 for printing.	Malcom Spiral Viscometer; J-STD-005
Solderball	<b>Acceptable</b> (SAC 305 and SAC405 alloys)	IPC J-STD-005
	<b>Pass</b> Class 2, 1 hour and 72 hour	DIN Standard 32 513, 4.4
Stencil Life	> 8 hours	@ 50%RH, 23°C (74°F)
Spread	<b>Pass</b>	JIS-Z-3197: 1999 8.3.1.1
Flux Tackiness Test	<b>Pass</b>	DIN 32513 Talc Test
Slump	<b>Pass</b>	IPC J-STD-005 (10 min 150°C)
	<b>Pass</b>	DIN Standard 32 513, 5.3
	<b>Pass</b>	JIS-Z-3284-1994 Annex 8

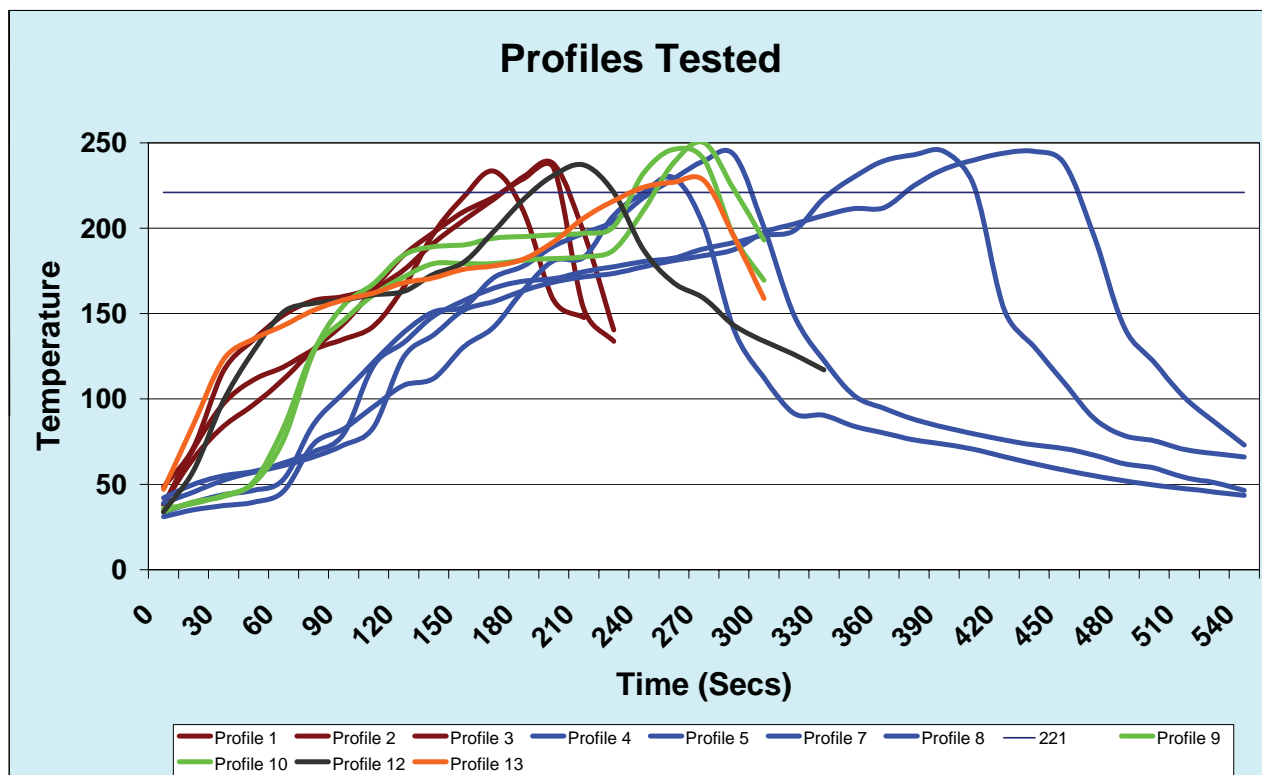
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Rev. 8-10-09



ALPHA OM-338-CSP Processing Guidelines			
STORAGE-HANDLING	PRINTING	REFLOW (See Figure #1)	CLEANING
<ul style="list-style-type: none"> <li>Refrigerate to guarantee stability @ 0-10°C (32-50°F)</li> <li>Shelf life of refrigerated paste is six months.</li> <li>Paste can be stored for 2 weeks at room temperatures up to 25°C (77°F) prior to use.</li> <li>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).</li> <li>Do not remove worked paste from stencil and mix with unused paste in jar. This will alter rheology of unused paste.</li> <li>These are starting recommendations and all process settings should be reviewed independently.</li> </ul>	<p><b>STENCIL:</b> 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.</p> <p><b>SQUEEGEE:</b> Metal (recommended)</p> <p><b>PRESSURE:</b> 0.16-0.34 kg/cm of squeegee length (0.9-2.0 lbs./inch).</p> <p><b>SPEED:</b> 25 to 200mm per second (1 to 8 inches per second).</p> <p><b>PASTE ROLL:</b> 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 "Exceeding the maximum diameter may cause curtaining (sticking to the squeegee when it is lifted from the stencil)."</p>	<p><b>ATMOSPHERE:</b> Clean-dry air or nitrogen atmosphere.</p> <p><b>PROFILE (SAC Alloys):</b> 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)<sup>1</sup>. Higher density assemblies may require preheating within the profile and may be accomplished as follows:</p> <ul style="list-style-type: none"> <li>Ramp @ 0.8-1.7°C/sec. to 135-160°C.</li> <li>Ramp from 130°C to liquidus over 60-90 seconds.</li> <li>Ramp from 150°C to liquidus over 30-60 seconds.</li> <li>Time above liquidus = 35-90 seconds</li> <li>Ramp down to R.T. @ 3 to 7°C per second (fast ramp down is recommended)</li> </ul> <p>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.</p>	<p>ALPHA OM-338-CSP 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:</p> <ul style="list-style-type: none"> <li>ALPHA SM-110E</li> <li>Bioact™ SC-10E</li> <li>Kyzen Micronox MX2501</li> </ul> <p>Misprints and stencil cleaning may be done with ALPHA SM-110E, ALPHA SM-440, ALPHA BC-2200 and Bioact™ SC-10E cleaners.</p>

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

Figure #1 – Reflow Envelope



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**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 attached 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: SI5607000000009984



**NOTES:**