ESSEMTEC ®

CONVECTION/IR CONVEYOR REFLOW-OVEN

RO260
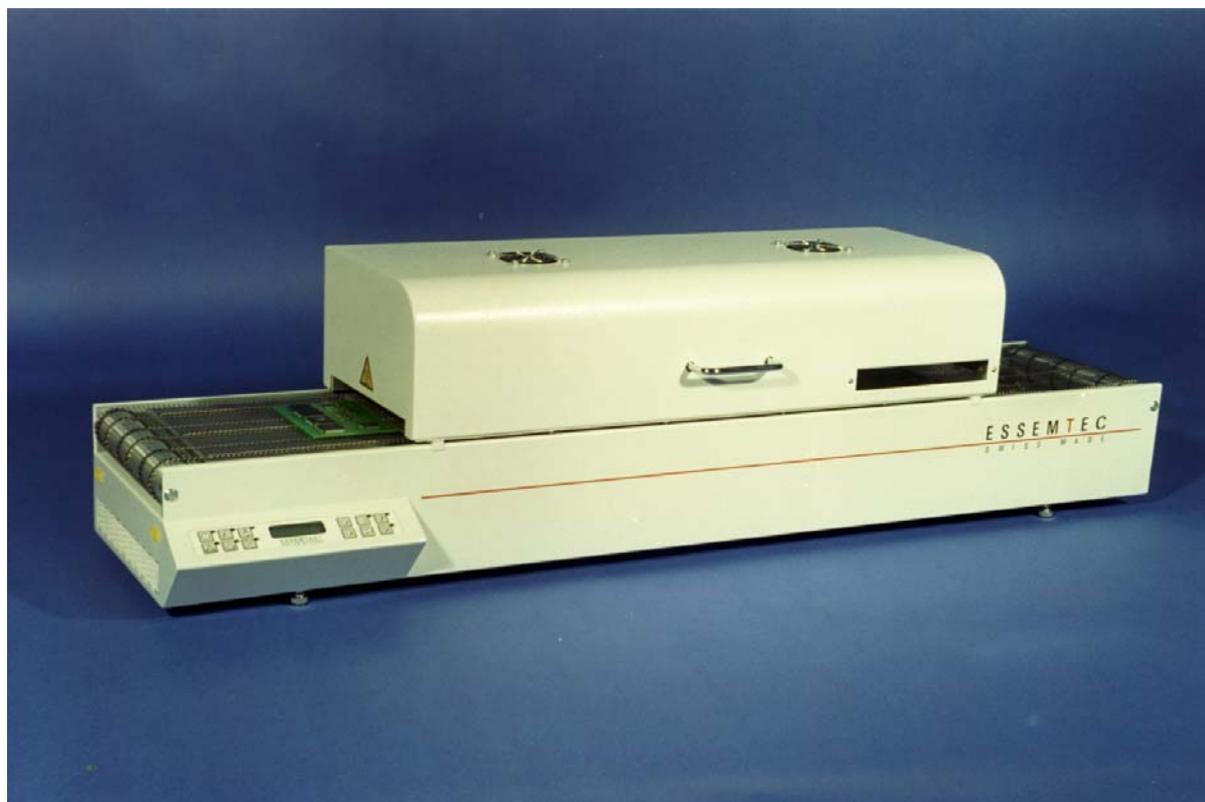
User Manual

Article No.:	RO260BA1.2E
Version:	1.2
Date:	January 2003

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You have opted for an ESSEMTEC REFLOW-SYSTEMS reflow oven. We thank you for this decision and congratulate to it.

Your device was manufactured according highest quality standards and was tested thouroughly before shipment. It is very easy in operation, nevertheless we suggest to read this manual before operating the machine. If you have any additional questions to your equipment, please don't hesitate to contact:

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or your nearest ESSEMTEC distributor:

For product information on batch or bigger reflow systems, screen-/stencilprinters, dispensing systems, manual/semiautomatic and automatic pick and place, repairing and optical inspection please contact us.

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PRODUCTION EQUIPMENT FOR ELECTRONICS

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1. INTRODUCTION

The RO260 was developed for small to midsize productions runs and prototypes.

Six seperately programmable heating zones and an additional cooling zone provide possibilities of specifying ideal temperature profiles. The combination of Infrared and hot air convection enables soldering of even complex PCB's, as the convection heating ensures a heat transfer over the whole PCB area. Also curing jobs can be solved by the RO260.

This manual shows how to install and run the oven. Additionally it provides hints and tips for optimized soldering. For any questions to this manual or the system, please contact your nearest ESSEMTEC representative or directly us.

2. INSTALLATION

2.1 UNPACKING / INSTALLATION

Please check before unpacking the system if any transportation damage is visible on the outside of the packaging. If any damage is visible, please inform immediately your freight forwarder.

Your system is delivered according your ordered specification. Basically the delivery consists of:

- Base system equipped with integrated options as per order, power cord, manual
- 2 pieces flying thermocouples (if ordered)
- software disk with manual and interface cable (if ordered)

Put your oven on a horizontal adjusted, stable, heatresistent table. The system is equiped with adjustable feets. Adjust if necessary by opening the counter screws first, adjust the feets on the correct height so the system is levelled and tighten the counterscrews.

⚠ WARNING:	The system can get hot at the outside. Place it therefore only on a heatresistent table. The device has an integrated housing cooling. Please make sure that this cooling can work properly by respecting the following minimum dimensions around the oven.

min. 200mm

min. 250mm
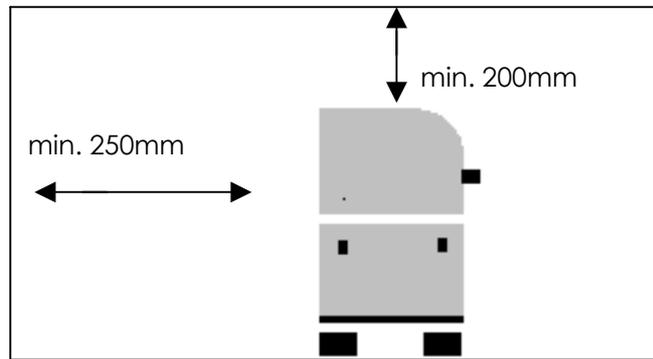
On top of the housing is an integrated fan. It is used for cooling the housing and enables convection heating. Never block this fan by putting something on top or by not respecting the minimum distance. Level the oven on the floor by using the integrated feets.

2.2   CONNECTIONS

The only connection the system needs is a power supply. Included in the delivery is a power cord, please attach your local connector (if not already mounted). Plug in the powercord on the backside of the machine.

⚠ WARNING:	Before connecting the oven to the power, check if your supplied voltage fits the on the machine plate of the oven indicated power. Please make sure the device is switched off before connecting it to the power supply.

Optionally available is a PC control for the RO260. The RS-232 port is located on the backside of the oven. Plug in the delivered interface cable and connect it with a serial port of your PC. Additional informations about this option are available in the user manual "ESSEMTEC REFLOW-SYSTEMS SOFTWARE".

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2.3 GENERAL RISK ADVICES

⚠️ **WARNING:** The conveyor passes a heating zone which can get hot up to 400° C ! Never touch during the operation into the housing or onto the heating plate, in the event of injuries, please look for medical assistance.

Do not touch the conveyor during operations, you might get injured.

The integrated window is for supervise the soldering process. It is located in the most heated area of the oven. Although special thermoglass is used the window can get hot up to 100°C at the outside. Therefore do not touch the window during operation.

As long as the oven is heated up (acoustical signal and blinking or stable LED with temperature indication on the display) the upper housing may not be opened. Please remember, the inside of the oven can be up to 400°C!

For servicing, use only original spare parts mounted by trained service personal. Please make sure before opening the housing, the power supply connector is pulled out and the oven is completely cooled down.

3. HINTS AND TIPS

3.1 REFLOW-SOLDERING

The process of reflow soldering is the same for all sizes of production runs. If you produce thousand of PCB's per day or only a few the principle remains the same. Basically one differ between a preheat, a reflow- and a cooling zone. Depending the production through put, various steps-between can also be found. The length of an oven defines besides the quantity of seperately adjustable zones, basically the through put of the machine. The longer the zones are, the faster the conveyor can pass through the zones.

On all available ovens (except on vapour phase oven) the heating zones can be regulated. On all ovens the set temperature values are not reflecting the actual temperature on the PCB. These temperature differences are influenced by the heating source, the construction of the oven, the PCB material and size, layout and thickness and the type and colour fo the components. This prevents defining of standard parameters. Practically most of the user defines a few different parameter sets which can then be used for the most common applications.

This results that the set temperatures on a oven must be above the actual solder temperatures (i.e. 183°C). For defining these set temperature values experience and testing is required. To help the operator of an oven to find the correct set temperatures two flying thermocouple sensor are optional available. These sensors can be attached on the PCB to measure the actual temperatures directly on the solderjoints.

The process of soldering shall contain the following steps which can be defined with the various zones. I.e. a standard soldercream should be slowly heated up from roomtemperature to set the solvents free, then the temperature should rise and stabilize on around 130° to 160°C to activate the flux. With a reflow temperature of around 215°-225° the effective soldering is done. After the reflow temperature a relative fast temperatre decline is required.
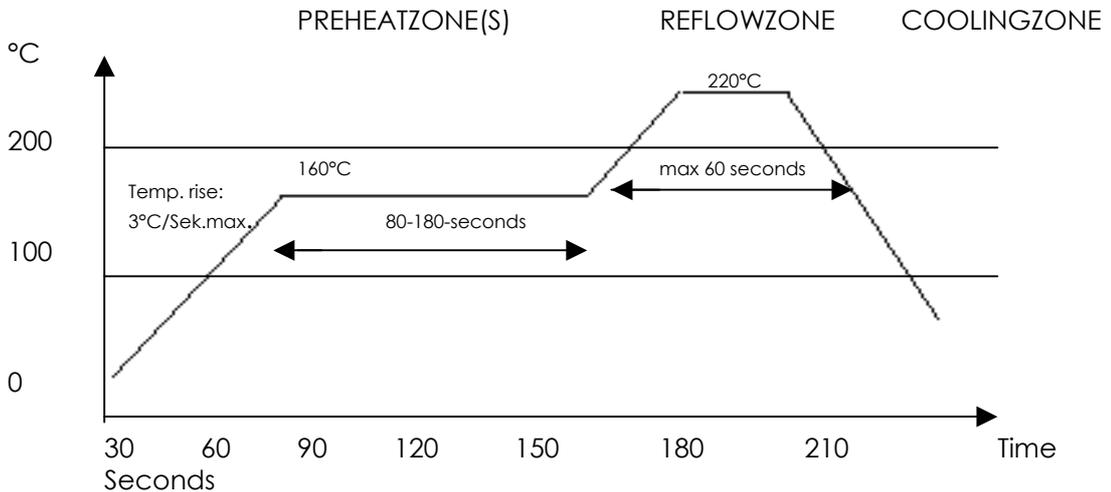

3.2 CURING ADHESIVES

With the RO260 also curing adhesive tasks can be done: instead of a soldering profil as shown in 3.1, a plateau profile is set.
The schematics below shows a typical curing profile.

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3.3 RO260 OVERVIEW

Loading zone   P1   P2   R1   Cooling / unloading
Prereat 1   Soak   Reflow

Infrared-Emitters

Keyboard + Display   Hotplates
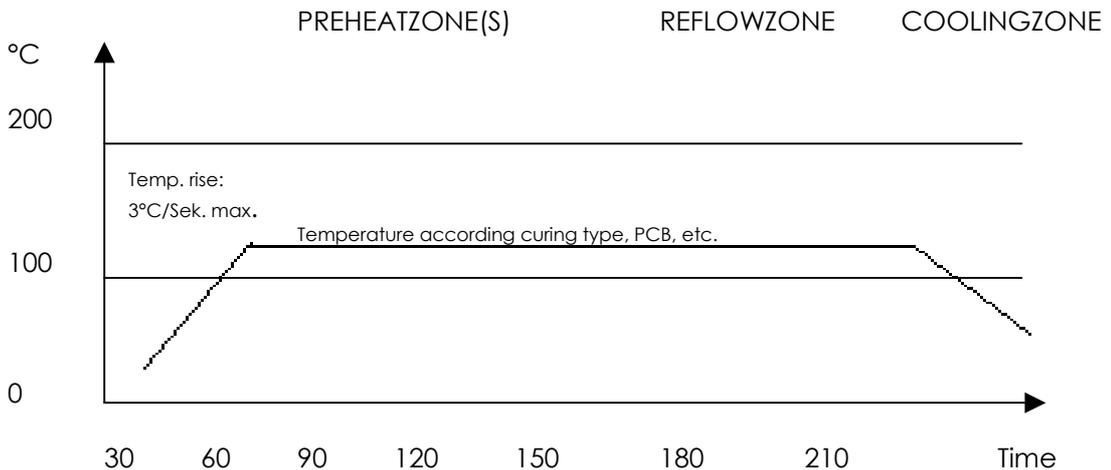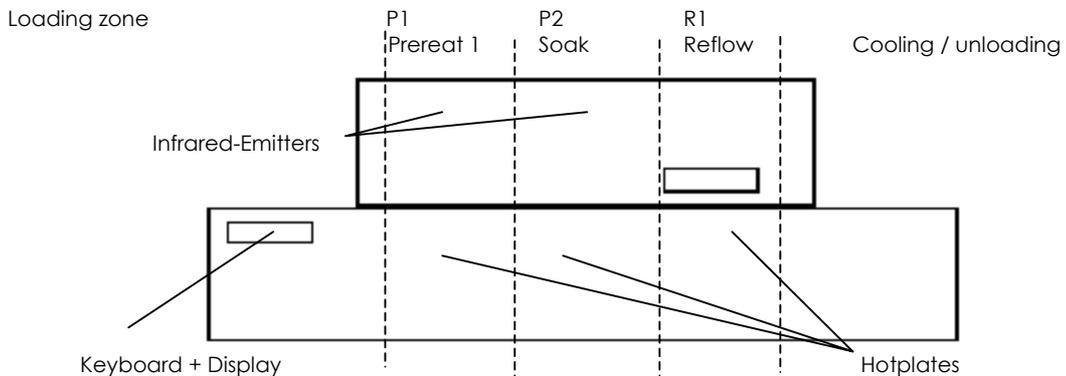
3.4 FUME EXTRACTION

The oven has to be placed in area where the fume can be absorbed. For attaching a fume extraction the oven can be placed under a suction hood. It can not be connected directly to a fume extraction system due to constructional design.

4. OPERATION

4.1 KEYBOARD

The RO260 reflow system is equipped with a microprocessor control which is built in the housing. An easy to use keyboard allows to select all functions directly.

1   On / Off (STANDBY)
2   Select existing programs
3   display temperature values of thermocouples (Option)
4   store free definable programs (M1-M8)
5   display set / real temperature values
6   display conveyor speed
7   scroll up in menu function / increase values in programming
8   scroll down in menu function / decrease values in programming
9   Menu functions (counter, languages, Celsius/Fahrenheit)
10   Enter-key
11   without function on model RO260
12   stop conveyor during soldering

DISPLAY:

Program number

P1	P2	R1	
210°	120°	125°	09
120°	310°	230°	09
P2	R1	B2	

4.2   ON /OFF

First, the system has to be switched on on the mainswitch which is located at the backside of the housing.

Switching ON brings the oven into a standby mode. A red LED on the key shows that it is in the standby mode. Pressing this key activates the oven, on the display a message "Oven 6 zones" and the actual version of the control system. Heating and conveyor are not yet started as first the appropriate programm has to be selected.

4.3   SELECT AN EXISTING PROGRAM

In the system are already 50 complete parameter sets for the most common applications stored. They contain set temperature values for the three heating zones and the related conveyor speed. Additionally 8 programms are free definable by the customer (see chapter 4.4 "program a free definable parameter set")

In the attachement to this manual is a list included with all 50 integrated programms with the appropiate program number.

M1-M8	free definable parameter sets
09-48	stored parameter sets for soldering tasks
49-58	stored parameter sets for curing adhesives

To select one of these programes, do the following:

Action: =>   press key

the display shows:

```
                           – –
      Program           M1
```

=>   by pressing key ⬆ and ⬇ the desired program can be selected

=>   by pressing key ⬅ the selected program is started

the display shows:
```
210°    120°    125°    09      blinking
120     310s    230°    09
```

The blinking program number and the LED on the key are indicating that the oven is heating up to the set temperature values. Alternated the set and the reached temperature values are shown on the display.

```
076°    094°    125°    – –
090°    096°    102°    09
```

=>   if by mistake a wrong program number was selected, the correct program number can be selected by pressing keys or ⬇   ⬆

=> the display shows:

123°	149°	171°	09
115°	130°	180°	35

— actual running program
— new selection

=> confirm the selection by pressing key

When the oven reached and stablized the set temperature values, the systems confirms the readiness by an acoustical signal (can be switched off if desired). Additionally the LED on the key stops blinking.

The display shows now the actual regulation and surveillance of the set temperature values. The microprocessor controls this regulation and adjusts where necessary automatically the temperatures.

4.4 PROGRAM A FREE DEFINABLE PARAMETER SET

Up to 8 free definable parameter sets can be directly stored in the system. All 8 programs can be selected in the same manner as the fix integrated programs.

Action: => activate the programming modus by pressing key

the display shows:

	– –
Memory	M1

=> with keys and a program number under which the program shall be saved can be selected (M1-M8)

=> confirm the selection by pressing key

the display shows:

(000)000°	000°	– –
000°000°	000°	M1

=> with keys and the value for the first heating zone inside the ( ) can be changed.

=> to confirm a selected value, press to go to the next zone

=> after given all temperature values for the three heating zones, the control automatically displays the conveyor speed.

the display shows:

Advance	
(270) mm/min.	M4

=> with keys [↑] and [↓] the value in the ( ) can be changed.

=> confirming with key [↵] stores all given parameters under the select program number (i.E.M4)

The new program can now be selected for running as described in chapter 4.3 " select an exiting program"

4.5 MODIFY A FREE DEFINABLE PARAMETER SET

All free definable programs (M1-M8) can be changed. All other programs (09-58) can not be changed as they are fixed programed within the memory of the system.

Action: => activate the programming modus by pressing key

the display shows
```
                    – –
Memory       M1
```

=> with keys [↑] and [↓] the program number can be selected which has to be modified

=> confirm the selection by pressing key [↵]

the display shows:
```
(225) 130°  120°        – –
130° 310°  240°         M4
```

=> with keys [↑] and [↓] the values in the ( ) can be changed

=> after modification press key [↵] for going to the next value

=> After modifying all three temperature values, the selection goes directly in the programming mode for the conveyor speed

the display shows:
```
Advance              – –
(270)° mm/min.    M4
```

=> with keys [↑] and [↓] the values in the ( ) can be changed

=> confirming with key [↵] stores all given parameters under the select program number (i.E.M4)

TIP: If only the conveyor seed has to be modified, press simply after activation of the programming modus the program number key

The modified program can now be selected as described in chapter 4.3 " select an existing program"

4.6 DISPLAY SET VALUES

Set temperature values and conveyor speed can be displayed at any time to verify the values.

Depending the actual operation mode the display of these values is automatically activated by the system. A LED on the keys shows if the display mode is active. If not automatically displayed the values can be displayed by pressing the following keys.

Action: => pressing key activates display mode for settemperatures.

=> pressing key activates display mode for set conveyor speed.

Within the display mode, no values can be changed. When the display mode is activated directly by the system (during programming) the values can be changed as described in chapters 4.4 and 4.5.

4.7 STOP CONVEYOR FOR COMPLEXE SOLDERING JOBS

For soldering single, prototyp PCB's a stop function is included. For prototopying no samples can be run to establish a profile. Working with the conveyor stop function allows to solder a single PCB by the first run. Choose the recommended program from the list on page 17 and try to solder the PCB with this profile. Using the conveyor stop function allows to keep the PCB within the reflow zone for a longer periode than programed.

Action: => As soon as the PCB reaches the reflow zone the key can be pressed. The conveyor stops

=> Through the integrated window the reflow process can now be supervised. As soon the soldering is done, press the same key again and the conveyor starts running again and transports the PCB to the cooling zone.

TIP: When soldering with the bandstop function, please make sure no other PCB is in the Preheat zone of the oven to prevent any damages on this second PCB.

Stop and go function can be programed with the optional available ESSEMTEC REFLOW SYSTEMS SOFTWARE and PCB counting function. Please contact your nearest representative of directly ESSEMTEC for further informations.

4.8 TEMPERATURE MEASUREMENTS WITH FLYING THERMOCOUPLES

To measure temperatures directly at the solderjoints on the PCB two optional flying thermocouples are available. This option is mainly used for the first defining of exact parameter sets for serial production. Additionally used are the thermocouples for periodical protocolling purposes.

The two thermocouples have to be plugged in on the connectors on the left side of the machine. The system recognises automatically that these sensors are plugged in and starts to registers continously the measured temperatures. The ends of the thermocouples are attached directly onto the PCB on two critical points (i.e. on the solderjoints of big components which absorb a lot of heat).

The easiest way of attaching is temperature resistant tape. During the whole soldering process the thermocouples travel now with the PCB through the heating chambers and register the effective values which are on the PCB surface. Registered values can be readed directly on the display or profiled within the optional software.

To display the measured values, select this option on the keyboard as follows:

Action: =>   press key

the display shows:

S1	S2	– –	S1 = Thermocouple 1
033°	035°	M1	S2 = Thermocouple 2

=>   pressing of any other key switches off the display of the measured temperatures. Anyway the measurement is steadily taking place in the background. Pressing the key again displays the actual values.

The optional available software allows to establish complete temperature profiles which can be stored and printed out for documentation reasons (i.e. quality control).

4.9 TOOLS MENU

An additional menu with helping tools is integrated in the RO260. Selections for user languages, Celsius or Fahrenheit, acoustical signals, PCB counting functions, etc. can be done within.

Action: =>   press key   for selecting menu functions

the display shows:

Menu	M4
Counter	00000

This function is used for counting PCB `s which were soldered in a production run. An optical sensor (optional) is for this purposes attached to the oven. The counter can be set manually to a value from which he starts counting.

=> press key

the display shows:

```
Menu            M4
Counter     >00000
```

Adjust with keys   and   the desired value / confirm it with

=> pressing keys   and   to scroll the menu. Pressing scroll up the display shows

```
Menu            M4
Reset        00050
```

press key   for setting the counter back to 0

=> press another time key   the language of the display can be selected. Three languages are integrated in the base system (English, German, French). With the scroll key the language can be selected.

press key   for selecting the appropriate language.

=> Another pressing of key   brings function for temperature indication. Temperature values can be display in °Celsius or °Fahrenheit.

press key   for selecting the appropriate temperature indication.

=> another pressing of key   brings function for acoustical signal. This signal can be switched off if requested.

the display shows:

```
Menu            M4
Stop signal    Yes
```

press key   . By pressing keys   or   the signal can be switched off (NO) or on (YES). Confirm the appropriate selection by pressing key.

Within the menu function scrolling can also be made by key   . The sequence is then made in the other direction. Pressing any other key leaves the menu function.

5. MAINTENANCE ADVICES

5.1 GENERAL

The RO260 was designed for an almost maintenance free operation. No parts must be greased to specially treated. Through to steady heating up and cooling down the system, it might be that sometimes some screws have to be retightend.

⚠️ **WARNING:**   Please make sure that before doing any maintenance the power supply has to be disconnected.

5.2 SPARES

Spares are available from your nearest ESSEMTEC representative. Only original spare parts have to be inserted and should be integrated only by authorized and educated personal.

Please find on the next page an overview of the available parts and wiring and connection diagramms.

5.3 SPARE PARTS LIST

Order number	Description
260E02	Motor for conveyor
260E04	Hotplate 850W complete
260E05	Cooling zone fan
260E06	Thermoglas for Window
260E07	Convection fan (mounted in upper housing)
260EP1	Infrared emitter Preheat zone 245mm length / 150 Watts without sensor
260EP1S	Infrared emitter Preheat zone 245mm length / 150 Watts With sensor
260EP2	Infrared emitter Preheat zone 245mm length / 150 Watts without sensor
260EP2S	Infrared emitter Reflow zone 245mm length / 150 Watts With sensor
260ER1	Infrared ermitter Reflow zone 245mm length / 250 Watts without sensor
260ER2	Infrared ermitter Preheat zone 245mm length / 25o Watts With sensor
260E12	Bulb for illumination of reflow zone
260E13	Microprocessor control complete
260E14	Keyboard with integrated display
260E15	Relais
260E16	Flying thermocouple
260E18	Temperature restistant main cable
260E19	Thermocouple cable for cabling of emitter sensors

6. TESTING OF FLYING THERMOCOUPLE OPTION

When during measuring temperatures with flying thermocouples no values are indicated, the following test can be effected to verify if the thermocouple itself or the control electronic is not working. Attach for this purpose on the connector on the left side of the machine a small piece of wire as a connector. On the display the roomtemperature should be now displayed. If yes the flying thermocouple has to be exchanged.

7. EXCHANGE OF INFRARED EMITTERS

Open the upper housing and unscrew the inner hood. The complete innerhood can be taken out and enables to exchange the emitters very easy. The emitters are attached with clamps. For cabling see attached diagramm.
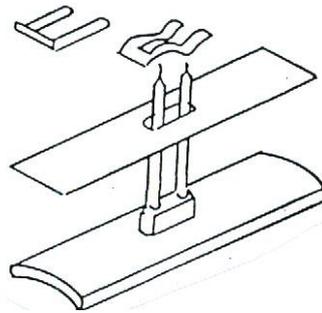
	It is necessary to use special thermo resistant cables. Exchange with other then original cables may result in damages of the whole system and can endanger the operator.
⚠ **WARNING:**	

8. OVERVIEW FIXED PROGRAMED PARAMETER SETS

The following parameter sets are a proposal for soldering and curing. Depending the actual PCB type, material, components and density others than the recommended profiles have to be choosen. ESSEMTEC can't take any responsibility for using a suggested parameter set.

Overview of the zones at the display

_____>
Direction of PCB through
the oven

V1	V3	R5
V2	V4	R6

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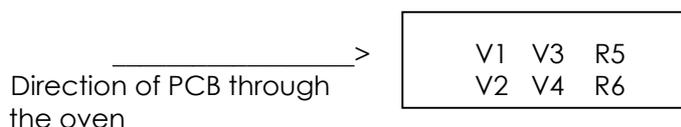
PROGRAMED SETS DISPLAYED IN ° CELSIUS

	(Zone 1)		(Zone 2)		(Zone 3)		
Program number	Preheat1 Top V1	Preheat 2 Bottom V2	Preheat Bottom V3	Preheat Bottom V4	Reflow Top R5	Reflow Bottom R6	Conveyor speed	Component density

ONE SIDE SOLDERED PCB'S

1)   PCB AREEA/SIZE: 0-5000 mm²   PCB THICKNESS: 0,8-1,2 mm

Program number	V1	V2	V3	V4	R5	R6	Conveyor speed	Component density
09	210	170	120	125	310	230	265	few
10	210	170	120	125	310	230	250	average
11	215	175	125	130	320	240	220	dense or with PLCC's

2)   PCB AREEA/SIZE: 0-5000 mm²   PCB THICKNESS: 1.3-1,6 mm

Program number	V1	V2	V3	V4	R5	R6	Conveyor speed	Component density
12	215	175	125	130	320	240	255	few
13	215	175	125	130	330	250	230	average
14	220	180	130	135	345	270	200	dense or with PLCC's

3)   PCB AREA/SIZE: 5000-10000 mm²   PCB THICKNESS: 0.8-1.2 mm

Program number	V1	V2	V3	V4	R5	R6	Conveyor speed	Component density
15	210	170	125	130	320	240	265	few
16	210	170	125	130	320	240	250	average
17	215	175	125	130	325	250	220	dense or with PLCC's

4)   PCB AREA/SIZE: 5000-10000 mm²   PCB THICKNESS: 1.3-1,6 mm

Program number	V1	V2	V3	V4	R5	R6	Conveyor speed	Component density
18	220	180	130	135	330	250	240	few
19	220	180	130	135	340	260	220	average
20	225	185	130	135	350	270	200	dense or with PLCC's

5)   PCB AREA/SIZE: 1000-15000 mm²   PCB THICKNESS: 0.8-1,2 mm

Program number	V1	V2	V3	V4	R5	R6	Conveyor speed	Component density
21	210	170	125	130	325	245	265	few
22	210	170	125	130	325	245	250	average
23	215	175	125	130	330	250	220	dense or with PLCC's

6)   PCB AREA/SIZE: 1000-15000 mm²   PCB THICKNESS: 1.3-1,6 mm

Program number	V1	V2	V3	V4	R5	R6	Conveyor speed	Component density
24	220	180	130	135	340	260	240	few
25	220	180	130	135	350	265	220	average
26	225	185	130	135	360	270	200	dense or with PLCC's

| 7) | PCB AREA/SIZE: | 15000-20000 mm² | PCB THICKNESS: 0.8-1,2 mm |

27	210	170	125	130	330	245	265	few
28	210	170	125	130	330	245	245	average
29	215	175	130	135	335	255	220	dense or with PLCC's

| 8) | PCB AREA/SIZE: | 15000-20000 mm² | PCB THICKNESS: 1.3-1,6 mm |

30	220	180	130	135	345	265	240	few
31	220	180	130	135	345	265	230	average
32	225	185	130	135	360	270	190	dense or with

| 9) | PCB AREA/SIZE: | 20000-250000 mm² | PCB THICKNESS: 0.8-1,2 mm |

33	210	170	125	130	335	245	245	few
34	210	170	125	130	335	245	235	average
35	215	175	130	135	335	260	220	dense or with PLCC's

| 10) | PCB AREA/SIZE: | 20000-250000 mm² | PCB THICKNESS: 1.3-1,6 mm |

36	220	180	130	135	340	260	230	few
37	220	180	130	135	345	260	210	average
38	225	185	130	135	360	270	180	dense or with PLCC's

DOUBLESIDED SOLDERING (SOLDERING 2ND SIDE)

Depending PCB and component types it is important the the sidebelow (with aleady soldered components) is not getting too hot. RO260 provides no cooling from below within the solder zone. As a result the heating plate within the solder zone is heated up by the emitters on top. TIP: For small series start immediately with soldering when the two upperzones (preheat and reflow zone above) have reached their temperatures. If problems occur it is recommended to glue the components which are underside before soldering.

CURING OF ADHESIVES

49	190	180	150	150	145	145	210	apply
50	200	190	160	160	155	155	210	according to
51	210	200	170	170	165	165	210	instructions of
52	220	210	180	180	175	175	210	adhesive
53	230	220	190	190	185	185	210	supplier
54	240	230	200	200	195	195	210	
55	250	240	210	200	205	205	210	
56	255	245	215	215	210	210	210	
57	260	250	220	220	215	215	210	
58	270	260	230	230	225	225	210	

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CE-DECLARATION OF CONFORMITY

Machine SR: **98/37/CE**
Directions of low voltage: **73/23/EWG**
Directions of electro magnetic compatibility: **89/336/EWG**

Manufacturer	**ESSEMTEC AG**
Adress of Manufacturer	ESSEMTEC AG Mosenstrasse 20 CH – 6287 Aesch LU Switzerland

We herewith declare, that the mentioned machines are in conformity with the above stated standards and healthy and safety rules of the CE directives.
If there are any changes on the machine as also on their options by the user/customer, this declaration will expire immediately.

Typ:	IR/Convection Reflow-Oven
	RO260
Serial number:	_____
Date of manufacture:	_____

Applied/used harmonised european norms:

DIN EN 292-1, 292-2, 294, 954-1,
EN50081-1, EN50082-1, EN61000-3-2,
EN62000-4-2, EN61000-4-2, EN60204

ESSEMTEC AG

Martin A. Ziehbrunner
Director

Aesch, _____