RO-06 Plus

Convection Reflow Oven

Installation / Operating / Maintenance Manual

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Copyright

The RO-06 Plus works as is. Screenshots and description cover the actual behavior as far as possible. The content of this manual does not give any claim to software performance or implemented software features.

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Imprint

RO-06 Plus Installation / Operating / Maintenance Manual

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Contents

4000013/01 / March 04, 2014

4000013/01 / March 04, 2014

About this Manual

Purpose

This Installation / Operating / Maintenance Manual contains essential information (where applicable) concerning:

- the safe and efficient unpacking of theRO-06 Plus
- the safe and efficient installation, movement and storage of the RO-06 Plus
- the necessary technical data for installation, production run and service
- the safe and efficient operating of the RO-06 Plus equipment
- the safe and efficient performance of preventive maintenance tasks on the RO-06 Plus
- the safe and efficient calibration of the RO-06 Plus

The knowledge of and adherence to the safety regulations and the compliance with additional warning instructions described in this Installation / Operating / Maintenance Manual is a basic precondition for a safe and error free work with or at the RO-06 Plus.

This Installation / Operating / Maintenance Manual and especially the safety regulations have to be observed by all persons who work with or at the RO-06 Plus. Additionally, all local safety and environmental regulations have to be observed.

How to Use

In general, this Installation / Operating / Maintenance Manual should be used in conjunction with all other relevant documentation provided with the machine.

Manual used as Reference Book

This Installation / Operating / Maintenance Manual can be used as reference book for working with the equipment. All equipment users can follow the task description steps easy and fast. Essemtec suggests to acquire application knowledge in training courses.

Manual used as Training Information

This Installation / Operating / Maintenance Manual is structured according to the method of Performance Based Equipment Training (PBET). Therefore it can be used as training information to pursue tasks step by step. It will be used in Essemtec training courses.

Pictograms and their Meanings

Pictograms are used in this Manual in order to support the understanding of the text and to increase the efficiency of the practical work. In line with text no pictograms are used.

Menu

Meaning of pictogram: "select the menu:…". The corresponding menu with sub-menu is written next to the pictogram in a hierarchical form.

Example:

System
Calibration
XY gantry

Soft Key

Meaning of pictogram: "click the soft key ...". The corresponding soft key is written next to the pictogram in bold italic font.

Example:

Calibrate all

Tool

Meaning of pictogram: a tool is required to carry out a step in a procedure. The pictogram is placed next to the corresponding instruction.

Example:

Tighten the fixation screw.

Check

Meaning of pictogram: a selection has to be done (check boxes). The pictogram is placed next to the corresponding instruction.

Example:

Setup check

Hint / Notification

Meaning of pictogram: a pop up window giving a hint or a warning. The text of the pop up window is written next to the pictogram in a non proportional font.

Example:

```
Make sure that all boards are removed before continuing calibration
```

4000013/01 / March 04, 2014

Text Box

Meaning of pictogram: a value (alphanumeric) has to be entered by means of the softkeyboard, after clicking the text box (usually a parameter). The pictogram is placed next to the corresponding parameter name.

Example:

Barcode, enter the paste name.

Drop Down List

Meaning of pictogram: one of the presented items on the drop down list has to be selected, after clicking the box (usually a parameter). The pictogram is placed next to the corresponding parameter name.

Example:

Temperature Unit, select the desired unit for the temperature.

Text Conventions and their Meanings

Various text styles are used in this Installation / Operating / Maintenance Manual manual in order to support the readability of the text or to emphasize the meaning of text segments.

Meaning	Description / Text Style	Example
Parameters and actual Values	Machine parameters and actual values are visualized by bold characters and in the same spelling as in the menu. Also the state of the parameter is written in the same way.	Set the parameter **Board constant** to **100** **Speed 150 [mm/min]**
Soft Key	Context sensitive function keys are written in italic and bold. Normally they are shown together with the respective pictogram.	Press ***New*** to create a new profile
Menu Key	Starts a submenu. Same style as the Soft Keys.	***Options***
Check Boxes	Are located anywhere on a screen. They have same style as Soft Keys.	Select ***thermo 1***
Menu Tree	In a text flow the hierarchy of a menu is visu-alized by using hyphens and bold characters.	**Options - User management**
Screen	Screens are written in bold using capital and small letters.	... on **Paste editor** screen
Cross Reference	Written in blue italic.	*see page x*
Notification Error Warning	Appearing in a pop up window providing tips, instructions and messages. They are written in a non proportional font.	The following warning appears: `Temperature too high`
Note	If a certain subject must be emphasized it is written as a note.	**Note:** Adjust the guide pins symmetrically

History

Index	Release Date	Changes
01	March 04, 2014	First release of new manual type.

4000013/01 / March 04, 2014

1 Safety

1.1 Introduction

1.1.1 Compulsory Reading

This Chapter is compulsory reading matter for anyone working with or at the RO-06 Plus. Essemtec AG declines all responsibility for personal injuries or material damages occurring as a result of non-observance of this chapter's instructions and warnings.

1.2 Use of the Equipment

1.2.1 Intended Use

This ESSEMTEC RO-06 Plus oven system is purpose-built for the following operations:

- soldering of SMD PCBs
- curing of adhesives/glue in today's electronic productions

Operations other than the intended use are not permitted. ESSEMTEC assumes no responsibility for any damages caused by using this machine for other purposes.

In case of any safety-relevant alteration of the equipment or its behaviour, the equipment must be taken out of service immediately and the defect has to be reported to the responsible department or person.

1.2.2 Prohibited Use

It is prohibited to use this ESSEMTEC RO-06 Plus oven system for any Volatile Organic Compound (VOC) .

A VOC is any organic compound having an initial boiling point less than or equal to 250 °C. Many VOCs are dangerous to human health or cause harm to the environment.

Due to the low boiling point, the VOC can outgas which can result in an explosion within the oven.

4000013/01 / March 04, 2014

1.2.3 Modifications

It is forbidden to make any software, hardware or mechanical modifications or extensions to the RO-06 Plus. All modifications require the written consent of the equipment's manufacturer.

1.3 Personnel Requirements

Any incorrect use of the RO-06 Plus, its modules or options can cause severe injury. Therefore only authorized personnel is permitted to work with or at the RO-06 Plus equipment.

1.3.1 Management Responsibilities

The management has to take care, that

- personnel working with or at the RO-06 Plus equipment is well trained in safety aspects and accident prevention and adhere to safety regulations.
- the user documentation (machine manuals) is available at all times.
- personnel in training or working under instruction has to be supervised continuously by authorized personnel.
- no unauthorized personnel can gain access to RO-06 Plus equipment.
- no items of the safety system is removed from RO-06 Plus equipment.
- bypassing safety elements is strictly prohibited.
- the RO-06 Plus equipment is only used in perfect condition and is maintained correctly and safely.
- all safety relevant material is kept in top condition.
- the work habits of the personnel have to be checked on a regular basis regarding awareness of security and danger.
- tools and methods for fire-fighting have to be provided and published as well as the location of fire-extinguisher and fire alarms.
- necessary protective equipment (goggles, protective gloves, etc.) is available for the staff.

1.3.2 Equipment Operating - Personnel Profile

Operating the RO-06 Plus, its modules or options may only be performed by qualified personnel. Depending on the training completed the user may be certified as level 1 operating personnel (standard user) or as level 2 operating personnel (advanced user).

Function of the Level 1 Operating Personnel

- starting/stopping/aborting production
- loading and unloading production material
- cleaning the machine

4000013/01 / March 04, 2014

Function of the Level 2 Operating Personnel

- setting-up production
- adjusting processes
- teaching material
- maintenance

Level 2 operating personnel is authorized to operate the equipment also in special operating mode as mentioned above. This special operating mode requires appropriate training.

Duties and Responsibilities of all Operating Personnel

- Handles production material in a correct manner.
- Interprets operating information correctly.
- Knows how to interpret material safety data sheets (MSDS).
- Interprets hints and errors and takes correct action.
- Follows approved technical methods in the operating of the RO-06 Plus, modules or options of it.
- Participates in regular trainings to maintain the required level of knowledge related to operate equipment and trains subordinate personnel as required.
- Wears and uses protective equipment (goggles, protective gloves, etc.) when working with aggressive substances or hot parts and material.

1.3.3 Installation / Movement / Storage - Personnel Profile

The installation, movement and storage of the RO-06 Plus, its modules or options may only be performed by qualified technical personnel who fulfill the following requirements.

Function

Responsible for unpacking, installing, setting-up, moving, packing, shipping and storing the RO-06 Plus equipment, its modules or options.

Duties and Responsibilities

- Plans the installation and movement sequence in a safe manner.
- Handles raw materials and supplies in a correct and safe manner.
- Interprets installation information correctly.
- Knows how to interpret material safety data sheets (MSDS).
- Follows approved technical methods in the installation, movement, shipment and storage of the RO-06 Plus, modules or options of it.
- Interprets hints and errors and takes correct action.
- Participates in regular training to maintain the required level of knowledge related to installing, moving, shipping and storing equipment and trains subordinate personnel as required.
- Wears and uses protective equipment (goggles, protective gloves, etc.) when working with aggressive substances or hot parts and material.

4000013/01 / March 04, 2014

1.3.4 Maintenance (Preventive and Corrective) - Personnel Profile

The maintenance tasks on the RO-06 Plus, its modules or options may only be performed by authorized maintenance personnel who fulfill the following requirements.

Function

It is responsible for regular checks of the machine, for cleaning and lubrication, for regular adjustments as well as for removal and replacement of faulty assemblies.

Duties and Responsibilities

- Handles material and chemicals in a correct and safe manner.
- Knows how to interpret material safety data sheets (MSDS).
- Interprets the maintenance information correctly.
- Interprets hints and errors and takes correct action.
- Follows approved technical methods for maintaining the RO-06 Plus, modules or options of it.
- Participates in regular trainings to maintain the required level of knowledge related to maintain and service the equipment and trains subordinate personnel as required.
- Wears and uses protective equipment (goggles, protective gloves, etc.) when working with aggressive substances or hot parts and material.

1.3.5 Conformation Statement

All persons who are assigned to work with or at the RO-06 Plus have to agree to the following statements before they start working with the RO-06 Plus for the first time. They must commit themselves with their signature:

- I agree to observe the regulations regarding safety of work and accident prevention.
- I confirm that I have read and understood the chapter on safety regulations in this manual as well as the warning paragraphs.

4000013/01 / March 04, 2014

1.4 Safety Information in User Documentation

This section describes the safety information used in product manuals, instructions and other collateral information materials of the RO-06 Plus machine.

1.4.1 Signal Words

Throughout all manuals and other collateral information materials, attention is drawn to safety issues by using the following signal words:

DANGER **WARNING** **CAUTION** **NOTICE**

Signal words are selected based on the degree or level of hazard seriousness, in particular, the probability and severity of harm associated with not following the safety message.

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is limited to the most extreme situations.

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

Indicates a situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Indicates a situation which, if not avoided, may result in equipment or material damage.

1.4.2 Safety Alert Symbol

The safety alert symbol is used to refer to safety messages indicating a potential personal injury hazard. Example:

Read the Safety chapter before executing the following task.

4000013/01 / March 04, 2014

1.5 Safety Labels Attached to System

Personnel must be familiar with all the warning symbols and decals fitted to the equipment. Failure to recognize a warning and understand the associated safety instructions may result in injury or death.

Note: Check periodically the existence of safety labels on the equipment. Replace damaged or missing labels immediately.

1.5.1 Meaning of the Safety Labels

The following symbols and decals are used on the machine:

	Moving Parts, Keep Hands Out Indicates that moving parts in this area can cause serious injury. Always stop the machine prior to removing parts and/or performing adjustments.
	Electrical Hazards / Hazardous Voltage Indicates an electrical hazard. Contact may cause electric shock or burn. The machine must be switched off before removing any cover with this decal on it.
	CE mark for RO-06 Plus The CE marking is a key indicator of a product's compliance with EU legislation. Electrical Plate for RO-06 Plus The electrical plate states details of the power supply unit such as the supply voltage and the necessary fuse protection (power mains) for the RO-06 Plus.
	Hot Surface Indicates machine parts that reach high temperatures. Coming into contact with these components may result in serious burns. Avoid contact with hot machine components and wear protective gloves.

4000013/01 / March 04, 2014

1.5.2 Danger Zones and Location of Safety Labels

The danger zones are marked with safety labels on the machine.

Electrical and Electronic Zones

Hazardous voltage. Contact will cause electric shock, burn or death.

The machine must be disconnected from the main electrical power supply before removing the covers of the electrical and electronic unit.

Check that the safety labels indicating 'HAZARDOUS VOLTAGE' are properly in place (see pictures):

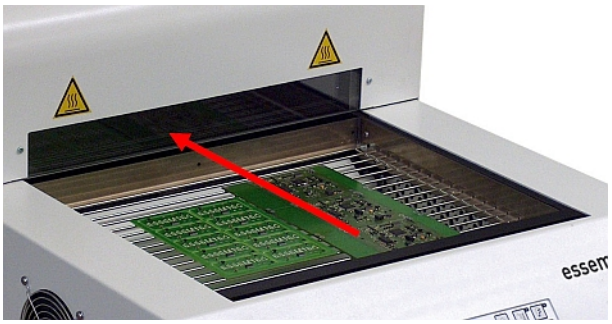
- Front, below the drawer.

Bruising Zones

The conveyor driving motor can start unexpectedly.

Avoid any contact with rotating machine elements. Take the necessary caution to prevent long hair or jewelry from getting caught in the oven (wear a hairnet). Never grasp with your hands or fingers on the moving pin conveyor (danger of violent pressure to hands and fingers).

There are no safety labels attached. During the regular use of the oven and the adherence to the directions, the probability of occurrence of an injury is very low.



4000013/01 / March 04, 2014

Hot Surface Zones

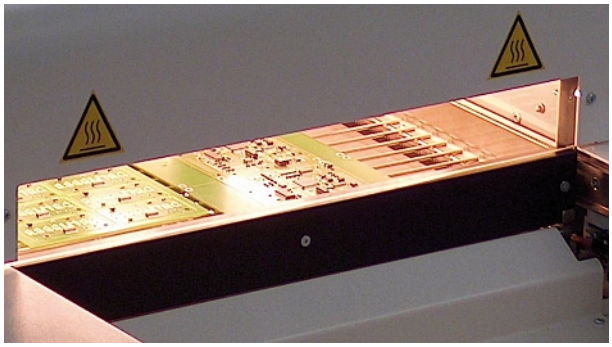
The oven can reach temperatures of up to 300°C.

The high temperature can cause severe burns. Keep hands and other parts of the body away from the hot surfaces. Never grasp with your hands or fingers on the moving conveyor (danger of being burnt). The conveyor itself will become very hot, because it is passing through the heating chambers.

For servicing, switch off the heating and allow the oven to cool before any handling on and around this unit.

Check that the safety labels indicating 'HOT SURFACE' are properly in place (see pictures). A total of 3 labels are attached:

- Drawer infeed
- Fan of heating chamber



4000013/01 / March 04, 2014

1.6 Safety Concept

1.6.1 Conceptual Safety Measures

Construction	The equipment is constructed and designed according to the current state of technology and the confirmed legal safety rules. Refer to the CE Declaration of Conformity on page *1-14* to see the standards and regulations which are adhered to for maximum safety.
Safety devices and elements	Mechanical elements, hardware and software to avoid hazards.
Temperature control	If the safety temperature limit is reached (standard setting = 310°C) the whole system will be switched off.
Information in manuals and on the equipment	Hazards that could not be eliminated by construction or by safety elements are indicated in manuals and on the equipment. DANGER / WARNING / CAUTION / NOTICE

1.6.2 Shutdown Appliances

Regular Shutdown

Softkey  to switch off the system.

The system stops the heating while still leaving the fans and conveyor on. The display shows the currently hottest zone. The system now automatically cools down until the zones have reached 80°C (due to the excellent thermal insulation, cooling down can take 4 hours).

Then the fans and the conveyor stop, and the machine goes automatically into the stand-by mode.

Turn the main power switch to **0** (OFF).

This shutdown procedure will completely switch off the equipment. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.

Main Switch

Turning the main switch to **0** (OFF) will completely switch off the equipment. Fan drives do not have a mechanical break, which means they go to a freewheeling operation until they stop independently.

Electrical power supplies are switched off. Power between inlet and main switch is still alive.

NOTICE

In case of necessity to completely switch off the oven before the temperature of 70°C is reached, it is recommended to open the hood and to let the oven cool down to a maximum of 120°C before the main switch is turned. Switching the oven completely off before this temperature is reached can influence the lifetime of the fans and of other relevant machine parts. That usually means, components of the oven will being damaged because of the high temperature.

Emergency Stop Button

There is no emergency stop button on the machine. The drawer movement is very slow and it has not enough force to cause serious damage. At an emergency it can be easily stopped by hand.

1.6.3 Covers

The covers prevent from accidentally contact of hot surfaces, moving parts and of course to have a controlled heating chamber. During production all the covers have to be closed.

4000013/01 / March 04, 2014

1.7 Specific Warnings

Specific warnings are included throughout the manual in the relevant procedures. As a general warning the following areas of the equipment present a particular hazard during installation, set-up, operation and maintenance.

1.7.1 Electrical Hazard

The system operates with 230 V power supply. Specific warnings are included throughout the manual in the relevant procedures. As a general warning the following precaution must always be applied.

⚠ DANGER

The system must be disconnected from the mains electrical power supply when a high voltage label is encountered during installation, maintenance or setup.

Hazards or unsafe practices could result in severe personal injury or death.

Only qualified personnel is allowed to carry out any work on the system's power.

Never touch any component behind a cover or door where a high voltage label is located before the machine is disconnected from the main electrical power supply and locked against re-connecting.

1.7.2 Heat Hazard / High Temperatures

⚠ WARNING

The oven can reach temperatures of up to 300°C. Therefore please use it with the necessary caution. Due to the nature of the metal, the inner housings remain very hot, even when the heating is automatically switched off.

Please always wear heat-resistant gloves, whenever an access into the oven has to be made.

Do not grasp through the openings at the infeed and outfeed section of the oven. Bear in mind that the machine parts at the infeed and outfeed section are very hot. The process area of the oven should be opened only when the system has cooled down. When opening the system in heated condition, all works within the system must only be done with utmost caution.

High temperatures can ignite chemical substances. Avoid any contact of chemical substances with hot surfaces

1.7.3 Chemical Hazard

Some substances used during operation or maintenance (adhesives, cleaning agents, lubricants etc.) may cause health hazards when used without protection. Some substances may ignite when coming in to contact with hot surfaces.

WARNING

Consult and obey the Material Safety data Sheet (MSDS) of the corresponding material and use protective equipment if necessary.

Avoid any contact of chemical substances with hot surfaces.

1.7.4 Fume Hazard

During the soldering process, flux and other vapor is formed.

WARNING

Only operate the system with connected and running fume exhausting unit. When operating the system without fume exhausting unit, fume can leak at the infeed and outfeed section which can result in personal injury.

1.7.5 Material Handling

CAUTION

The Printed Circuit Boards (PCB) can have sharp edges. Handling these objects can cause cuts on hands and clothing. Handle all material with care.

1.7.6 Moving Parts

CAUTION

Keep hands and loose clothing away from all moving parts.

Conveyor

The conveyor may move unexpectedly. Keep hands and loose clothing clear of the conveyor. Avoid jewelry or long hair getting caught.

1.7.7 Electrostatic Discharge (ESD)

Precautions against ESD must be taken to prevent damage to the particular equipment or devices or production material.

NOTICE

Ensure that the operating environment is protected against ESD. Do not touch electronic circuits whilst unpacking. Always use a grounded wrist strap whilst handling electronic circuits.

4000013/01 / March 04, 2014

1.8 A place for the Manual

The owner of the equipment is responsible for ensuring that this Installation / Operating / Maintenance Manual is available all the time. As a general rule it is kept close to the equipment, visible and easily accessible.

1.9 CE-Declaration of Conformity

Manufacturer	**ESSEMTEC AG**
Address of Manufacturer	ESSEMTEC AG Mosenstrasse 20 CH – 6287 Aesch LU Switzerland
Authorized Person for Documentation	Armin Mueller, ESSEMTEC AG, CH-6287 Aesch LU

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

Product name/Type:	Reflow Oven / RO06 Plus
Version	EU ☐ US ☐
Serial number:	
Date of manufacture:	
Directive of Machinery: Directives of low voltages: Electromagnetic Compatibility:	2006/42/CE 2006/95/CE 2004/108/CE
Safety of Machinery Safety of Machinery – General design principles Safety of machinery – Safety Distances	EN ISO 12100:2011-03 EN ISO 13849-1:2006 EN ISO 13857:2008
Electrical equipment of machines	EN 60204-1: 2006
Immunity Standard	EN61000-6-3:2007 EN61000-3-2:2006 EN55022:2008 EN61000-6-1:2007 EN61000-4-2:2009 EN61000-4-4:2012

ESSEMTEC AG

Date of first issue
Aesch, January 03, 2014

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Managing Director
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4000013/01 / March 04, 2014

2 Equipment Overview

2.1 Function of Equipment

RO-06

The oven is equipped with one heating and one cooling zone. The heating zone is equipped with a high-volume hot-air system producing a vertical laminar air flow. This is the physically ideal air flow for ensuring a high heat transfer, yet without the risk of shifting the position of small components. The recirculation air fans and the plated heating rods are located underneath the heating chamber; they blow the heated air towards the upper part of the heating chamber, passing through lateral channels. There, the air is straightened and conveyed, vertically and from above, to the process chamber. Additionally, four quartz emitters ensure a precise temperature profile and fast ramping up for solder peaks.

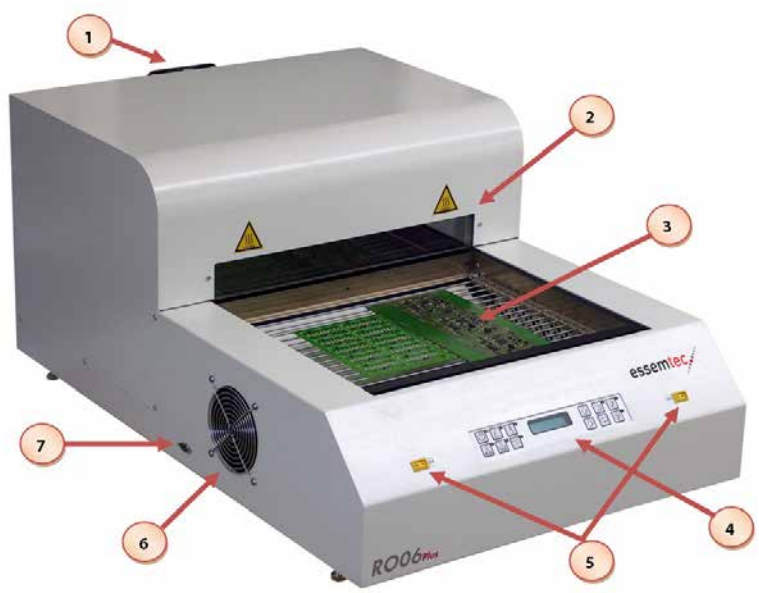
The heating zone combines all important soldering processes in one chamber:

Heating zone:	Activation zone (starts to activate the flux and preheats the board). Soaking zone (starts to activate the flux and preheats the board additionally). Soldering zone / double heating chamber (top and bottom).

4000013/01 / March 04, 2014

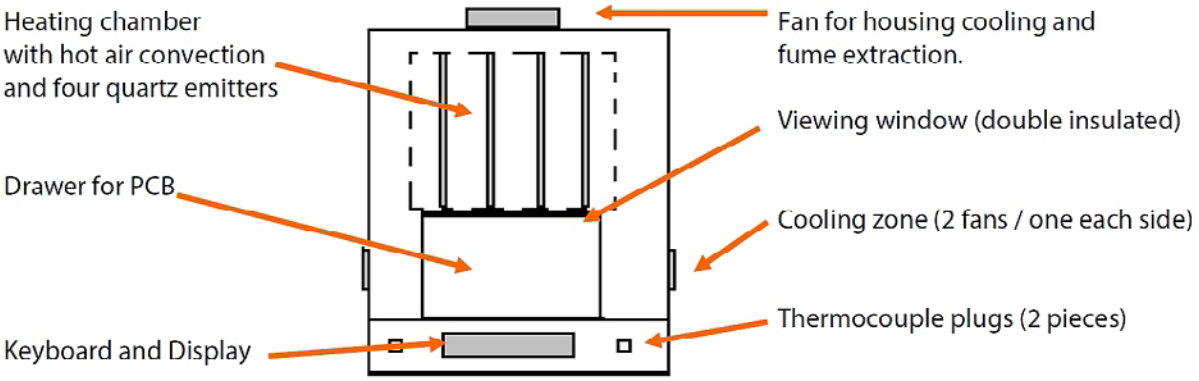
2.2 Overview

Front View



1	Fan for housing, cooling and fume extraction	5	Plugs for thermocouples
2	Heating Chamber with viewing window	6	Fans for the cooling zone
3	Cooling Zone and PCB drawer	7	RS232 connection for RO-SOFT
4	Display and keyboard for controlling and programming		

Top View



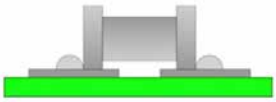
4000013/01 / March 04, 2014

2.3 Equipment Application, Purpose

The RO-06 Plus equipment with all its components is designed to fulfill the requirements of a SMT (Surface Mount Technology) production. The RO-06 Plus Reflow Oven is a state-of-the-art and flexible system for soldering of PCBs (Printed Circuit Boards) as well as for curing applications in electronic packaging.

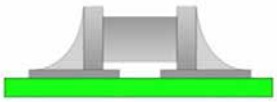
Use only materials especially designed for the surface mount or electronic packaging technology. Other materials might have hidden hazards or could damage equipment components. In any case, take notice of the Material Safety Data Sheet (MSDS) of the appropriate material.

2.3.1 Typical Application of a RO-06 Plus



SMD assembled circuit board with various components on solder paste

RO-06 Plus reflow oven



Soldered circuit board

2.4 Human Machine Interface HMI

This chapter describes the interface components between operator and machine, the human machine interface. This includes information on the:

- Switches
- Keypad and Display

2.4.1 Switches

Main Power Switch

The main power switch is used to switch on or off the equipment.

Turning the main power switch to **I** (ON) position will start the equipment.

Turning the main power switch to **0** (OFF) position will switch off the oven.

NOTICE

Switching off the equipment without waiting the cooling down phase can influence the lifetime of the fans and of other relevant machine parts. That usually means, components of the oven will be damaged because of the high temperature. Follow the regular shutdown procedure for a safe switch off.

Emergency Stop Button

There is no emergency stop button on the machine. The drawer movement is very slow and it has not enough force to cause serious damage. At an emergency it can be easily stopped by hand.

2.4.2 Keypad

Overview

The RO-06 Plus is equipped with a microprocessor control system which is located at the front of the machine. An easy to operate membrane keypad allows to access all available functions.

Key Functions

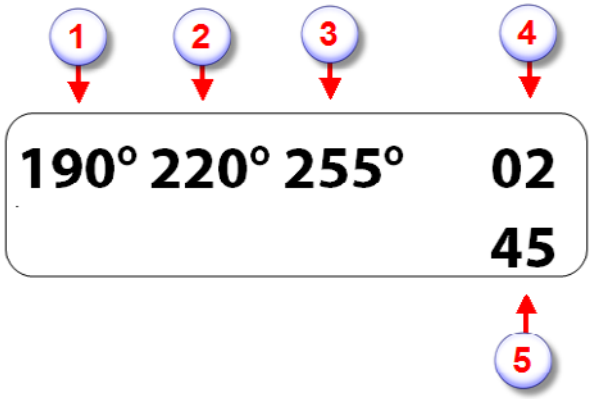
- ON / OFF. (Stand-by).
- Select an existing program.
- Displays the temperature values of the external Thermocouples (option).
- Programming of free definable parameter set (1-9).
- Displays the set temperature / real temperature.
- Displays the conveyor speed.
- Scroll up within menus / set values higher.
- Scroll down within menus / set values lower.
- Menu for additional functions (counter, SMEMA, language, temperature unit, etc.).
- Enter.
- Maximum conveyor speed (board eject).
- Move drawer in/out without stopping the heating.

4000013/01 / March 04, 2014

2.4.3 Display

Overview

- (1) Base temperature, set/real value
- (2) Preheat/Soak temperature, set/real value
- (3) Reflow temperature, set/real value
- (4) Active program
- (5) New select program



2.5 Module Description / Terms / Definitions

2.5.1 Covers

Overview

The RO-06 Plus has a complete enclosure of the heating chamber (1). To open the heating chamber for maintenance purposes, the cover has to be removed.

2.5.2 Heating / Cooling Zone

Heating zone and cooling zone

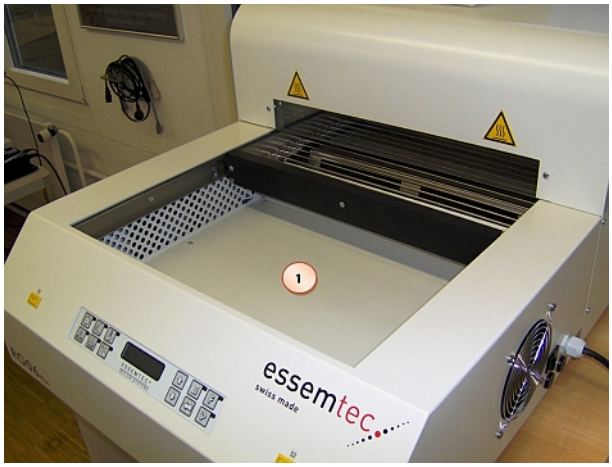
The RO-06 Plus has only one heating chamber. The cooling zone is located outside of the oven and is similar to the default position of the drawer. The first part of cooling the PCB is executed in the heating zone itself. The heating elements stop and the temperature will decrease. After a preset temperature the drawer will drive out into the cooling zone for a rapid cooling.

2.5.3 Electrical and Electronic Unit

Overview

The Electronic Unit is located behind the cover below the drawer (1).

The Electronic Unit controls the functions of the oven.

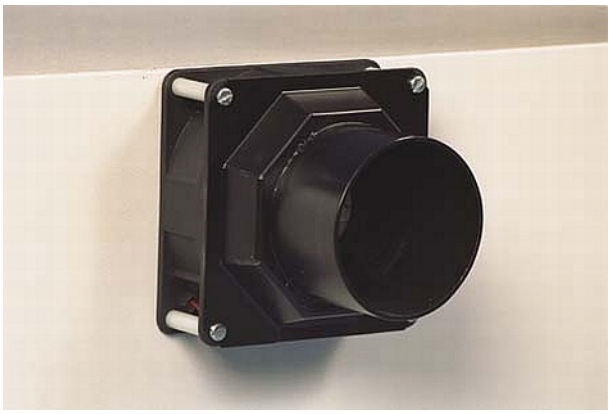


4000013/01 / March 04, 2014

2.5.4 Exhaust Ventilator (Option)

Overview

The exhaust option consists of the exhaust connector. The oven will be delivered with this part already mounted on the machine.



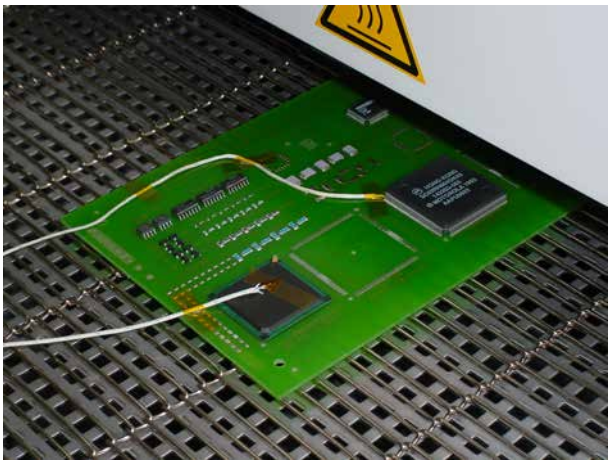
2.5.5 Thermocouple (Option, flying thermocouple)

Overview

In order to ascertain the temperature effectively prevailing on the PCB (directly at the soldering points), it is possible, as an option, to connect two thermocouples at the reflow oven. This option is mainly used for the first establishing of required parameters for a PCB series and for periodically checking the temperatures.

By means of the optional software RO-SOFT or RO-CONTROL, these values are displayed on a graphical base on the PC.

Fasten the peaks of the sensors on the board, using heat-resistant adhesive tape. Make sure that the sensor peak has contact with the board, because only in this way the surface temperature can be measured correctly.

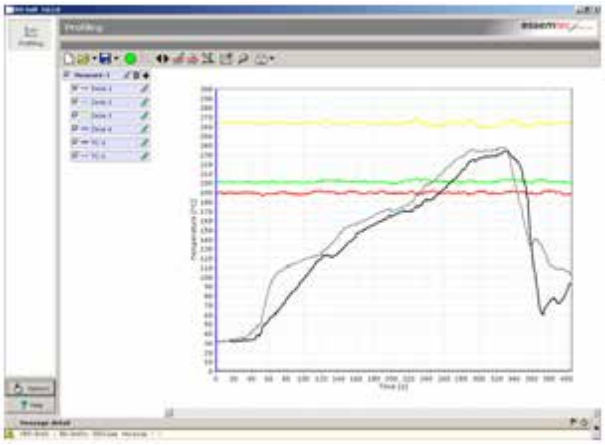


2.5.6 Software / Hardware Modules (Option)

RO-Soft

This is the registration software for the oven RO-06 Plus. With this software, board measurements can be registered and managed. The display shows the temperatures of the 3 zones and, if ordered, of the 2 thermocouples.

The graphic result can be edited by means of several functions (thermocouples are required).



2.6 Machine Identification

Identification Plate

The identification plate is located on the left side of the machine.

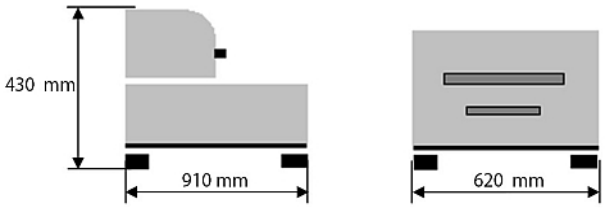
4000013/01 / March 04, 2014

3 Technical Data

3.1 Machine Dimensions

Overall Dimension of Basic Machine

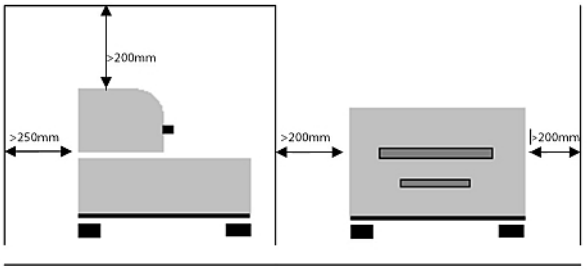
Overall dimensions
Length (L) / Width (W) / Height (H):
620 x 910 x 430 mm (24.4 x 35.8 x 16.9 in)
The height can slightly vary depending on feet adjustment.



3.2 Required Space

Space around the oven

To ensure the oven does not overheat, a minimum clearance around the equipment is required.



3.3 Machine Weight / Packaging / Transport

Note: The weight, packaging and transport facilities depend very much on the configuration. Please refer to the RO-06 Plus 'Specifications' manual for details.

3.4 Center of Gravity

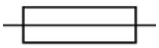
Location of Center of Gravity

The center of gravity is located roughly in the center point of the equipment. For the boxed machine the center of gravity is roughly in the center point of the outer packing.

Note: Depending on the machine configuration and installed options, the center of gravity may move slightly.

3.5 Required Supplies / Consumption

Electrical Power

Power Grid (Voltage):	1 x 208 - 240 V ±10% For other voltages please contact Essemtec AG
	16 A per phase
Frequency:	50 Hz
Power Consumption (heating up):	11.6 kW (approx. 15 to 30 min)
Power Consumption (operation):	typ. 5.8 kW

3.6 Connection of Supplies / Network

Electrical Power

Main connection:	TN-S
Plug:	Delivered with EURO connector type 32A 6 (CEE type 230) Alternative a local five-pole male plug has to be assembled on-site.

4000013/01 / March 04, 2014

3.7 Chemicals

In order to maintain the machine, a few chemicals such as cleaning agents and lubricants are required.

Refer to the chapter Material Safety Data Sheet (MSDS) in this manual for all material safety sheets. For chemical production materials such as solder paste etc, refer to the MSDS of the corresponding supplier.

3.8 Environment

Noise

Noise emission level (without fume exhausting unit): (according ISO 11202)	LpA <70 dB (A)

Operating Environment

Temperature:	10 ... 30°C
Relative humidity:	20 ... 80%
Electrostatic discharge:	The machine has to be protected against electrostatic discharge (ESD)

4 Oven Unpacking

WARNING

Pay attention to the center of gravity. The equipment can be sensitive to tipping over. This can result in serious injury and material damage. Only authorized and qualified personnel are allowed to lift and move the equipment with maximum care. The equipment must not be lifted too high above the floor.

The equipment is heavy, pay attention to fingers and other bodily parts during moving!

NOTICE

The equipment is sensitive to sudden temperature changes and condensation.

Condensation may damage the equipment.

Store the equipment at room temperature for at least 24 hours before opening and removing the packaging material.

Note: For shipment, the machine is protected by a wooden crate, packaging material and transport locks.
Do not discard any packaging material or transport locks (except cable ties) while unpacking the equipment, it will be used for later movement or shipment.

Before lifting the equipment from the pallet, move it as close as possible to the final working position.

Before starting equipment unpacking, make sure the required tools are available as stated below:

- fork lift (max. load depends on configuration, refer to the 'Specification' manual to determine the load)
- set of Torx driver bits
- set of Phillips driver bits
- open-ended wrench (13 mm)
- knife

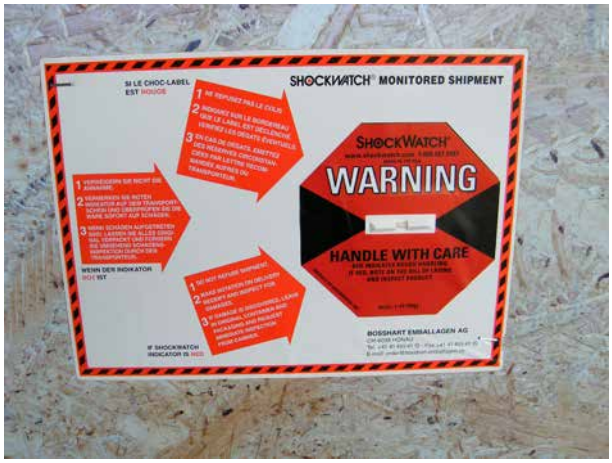
Check the Tilt Indicator and for Transportation Damages

Check the ShockWatch indicator attached on the crate.

Check for any transportation damages, visible on the outside of the transport packaging.

If it indicates a tumble, or any damage is visible, notify the manufacturer, your supplier, the forwarder and the insurance company immediately.

In case of no indication, continue the unpacking steps.



Take out Shipping Documents

Remove all the shipping documents (delivery note) for later checking of delivery.

Open the wooden crate

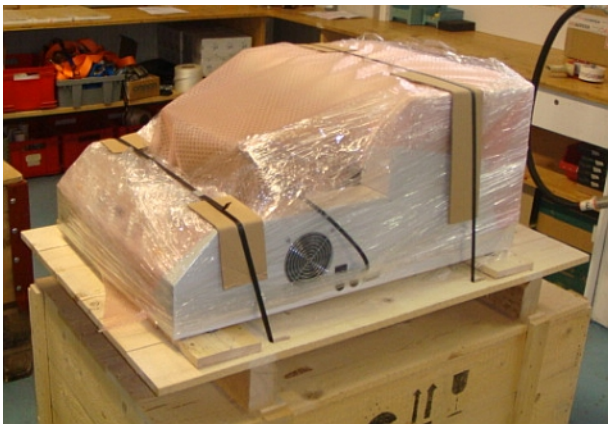
Unscrew and remove all the wood screws.

Carefully remove the cover. Pay attention not to get wooden splinters in hand and fingers.

4000013/01 / March 04, 2014

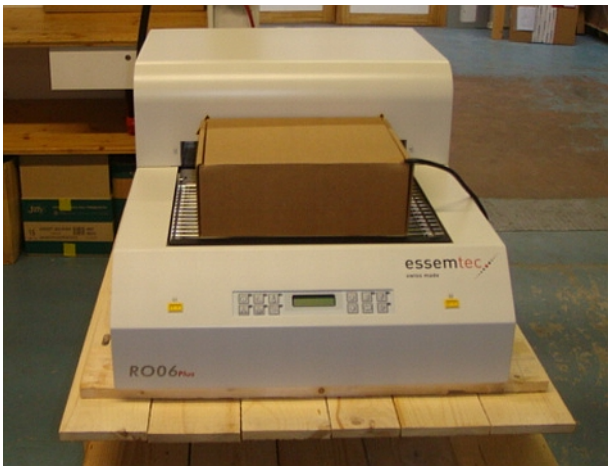
Loosen and remove Straps

Remove both straps, fixing the oven on the pallet.



Remove the wrapping foil

Remove completely the wrapping foil.



Check Delivery

Check the delivery for completeness using the delivery note.

Visually check all items for damage.

Remove Equipment from Pallet

With the oven still on the pallet, use the fork lift to carry the pallet beside the final work place.

Remove Protection Material

Remove all the remaining protection material like foamed plastic, tapes, plastic foils, cardboard etc.

Install the Machine

Continue with the oven installation.

4000013/01 / March 04, 2014

5 Oven Installation

5.1 Tools and Material Required

Before starting machine installation, make sure the required tools and material are available as stated below:

- Side cutter
- One or two spirit levels
- Set of Allen keys
- Set of wrenches
- Tape measure
- Open-ended wrench (24 mm)

5.2 Moving to Work Position

WARNING

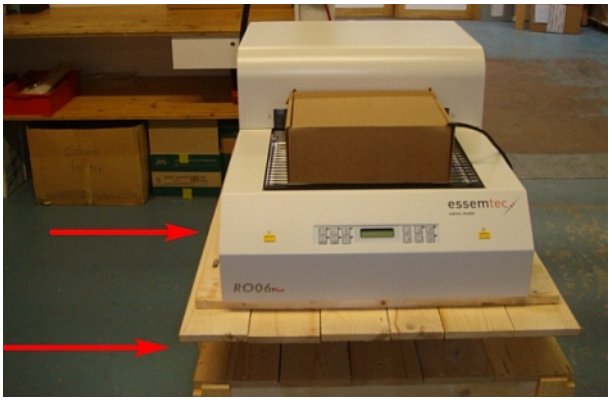
Pay attention to the center of gravity. The equipment can be sensitive to tipping over. Wrong handling during movement can result in serious injury or material damage. Only authorized and qualified personnel is allowed to move the equipment with maximum care. The equipment is very heavy, pay attention to fingers and other bodily parts during moving!

Move the equipment to desired Position

If the oven is still on the pallet, use the fork lift to carry the pallet beside the final work position.

If the oven is already on a table or stand, carefully lift the oven on the fork lift. Now it can be moved to the desired position.

During moving or any handling of the equipment, do not push the equipment over the surface as it could cause damage to the feet or the feet fitting. Lift it up first and then move it.



5.3 Parking the equipment

Park the equipment

Bring the equipment to its final work position.

Check the necessary clearance around the equipment with a tape measure (see 'Required Space' on page *3-1*).

Make sure that the fume exhaust hoods, if existing, are on the correct position matching for the installation of the exhaust system.

Level the equipment

Take two or three spirit levels and place it on meaningful spots on the oven.

Adjust the feet by means of the open-ended wrench until the machine is leveled in X and Y.

Tighten the counternuts on the machine feet.

5.4 Examination

Safety Labels

- Check that all safety labels are in place.
- Check that all safety labels are in perfect condition.
- Replace missing and damaged safety labels immediately. For ordering safety labels please refer to the spareparts catalog.

For the location of the safety labels, refer to the Safety Chapter on page *1-6*.

Covers

- Check that all covers are securely in place.
- Check that all covers are in perfect condition.

5.5 Connecting Fume Exhaust System

Please take care that the following specifications are respected:

Diameter of exhaust hoods:	80 mm

4000013/01 / March 04, 2014

The connecting hose must be provided with a mechanically adjustable throttle valve, located directly after the suction socket, in order to avoid important heat loss and/or temperature fluctuations in case of a too high performance of the building-related exhaust system.

CAUTION

During the soldering process, flux and other vapor is formed which can be a human health risk.

The exhaust air must not be conveyed into the production room or other rooms. The locally applicable legal prescriptions regarding environmental protection must absolutely be respected. If necessary, adequate filter systems are to be integrated into the exhaust air zones or its outlets.

Direct Connection to Exhaust Air System

Connect the exhaust air system to the suction sockets of the machine by means of a hose which must be flexible (for opening the hood) and heat-resistant (resistance up to at least 100°C).

5.6 Connecting Sources

Connect Electrical Power

Check for correct voltage (see identification plate on page *2-8*).

Plug in the machine to the local supply.

In case of different connector system, entrust an authorized electrician with the correct connecting of the oven. ESSEMTEC AG refuses any liability if the oven is connected in an incorrect way.

5.7 Storing

Material

Store all packaging material and transport locks for later use.

5.8 Initial Operation

Note: The initial operation should be done by an Essemtec Service Technician or by authorised personnel trained by Essemtec.

Check all Connections

Check if all connections are mechanically secured:

- Electric power
- Fume exhaust

Check for proper Cable Routing

Check if all cables are properly routed. No risk of stumbling.

- Electric power cable

Check Heating/Cooling Zones

Check if all the heating zones and the cooling zone are working.

4000013/01 / March 04, 2014

6 Oven movement within plant

6.1 Tools and Material Required

Before starting the movement, make sure the required tools and material are available as stated below:

- fork lift (max. load depends on configuration, refer to the 'Specification' manual to determine the load)
- side cutter
- one or two spirit levels
- Set of Allen keys
- Set of wrenches
- tape measure
- open-ended wrench (24 mm)

6.2 Switching off / Disconnecting the oven

6.2.1 Regular Shut down

Shutting Down the Equipment

Softkey

to switch off the system.

The system stops the heating while still leaving the fans and conveyor on. The display shows the currently hottest zone. The system now automatically cools down until the zones have reached 80°C (due to the excellent thermal insulation, cooling down can take 4 hours).

Then the fans and the conveyor stop, and the machine goes automatically into the stand-by mode.

Turn the main power switch to **0** (OFF).

This shutdown procedure will completely switch off the equipment. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.

6.2.2 Disconnecting the Oven

Electrical Power / Network Connection

Disconnect the main power cable from the local supply.

4000013/01 / March 04, 2014

6.3 Disconnecting Fume Exhaust System

Disconnect Exhaust Air System

Disconnect the exhaust air system from the suction socket of the exhaust option.

6.4 Moving to New Position

WARNING

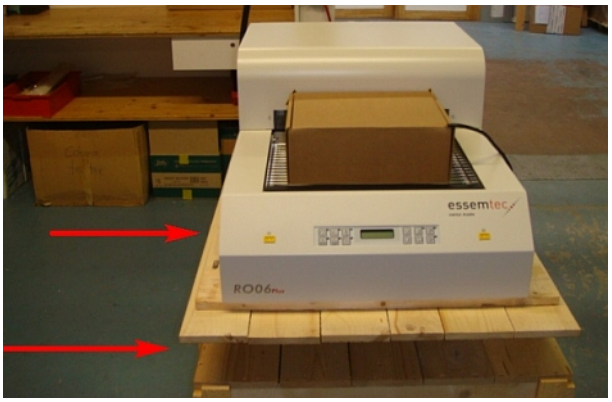
Pay attention to the center of gravity. The equipment can be sensitive to tipping over. Wrong handling during movement can result in serious injury or material damage. Only authorized and qualified personnel is allowed to move the equipment with maximum care. The equipment is very heavy, pay attention to fingers and other bodily parts during moving!

Move the equipment to desired Position

If the oven is still on the pallet, use the fork lift to carry the pallet beside the final work position.

If the oven is already on a table or stand, carefully lift the oven on the fork lift. Now it can be moved to the desired position.

During moving or any handling of the equipment, do not push the equipment over the surface as it could cause damage to the feet or the feet fitting. Lift it up first and then move it.



6.5 Parking the equipment

Park the equipment

Bring the equipment to its final work position.

Check the necessary clearance around the equipment with a tape measure (see 'Required Space' on page *3-1*).

Make sure that the fume exhaust hoods, if existing, are on the correct position matching for the installation of the exhaust system.

Level the equipment

Take two or three spirit levels and place it on meaningful spots on the oven.

Adjust the feet by means of the open-ended wrench until the machine is leveled in X and Y.

Tighten the counternuts on the machine feet.

6.6 Connecting Fume Exhaust System

Please take care that the following specifications are respected:

Diameter of exhaust hoods:	80 mm

The connecting hose must be provided with a mechanically adjustable throttle valve, located directly after the suction socket, in order to avoid important heat loss and/or temperature fluctuations in case of a too high performance of the building-related exhaust system.

CAUTION

During the soldering process, flux and other vapor is formed which can be a human health risk.

The exhaust air must not be conveyed into the production room or other rooms. The locally applicable legal prescriptions regarding environmental protection must absolutely be respected. If necessary, adequate filter systems are to be integrated into the exhaust air zones or its outlets.

4000013/01 / March 04, 2014

Direct Connection to Exhaust Air System

Connect the exhaust air system to the suction sockets of the machine by means of a hose which must be flexible (for opening the hood) and heat-resistant (resistance up to at least 100°C).

6.7 Connecting Sources

Connect Electrical Power

Check for correct voltage (see identification plate on page *2-8*).

Plug in the machine to the local supply.

In case of different connector system, entrust an authorized electrician with the correct connecting of the oven. ESSEMTEC AG refuses any liability if the oven is connected in an incorrect way.

7 Shipment of the oven

7.1 Tools and Material Required

Before starting machine uninstallation, make sure the required tools and material are available as stated below:

- Shock Watch
- Shipping documents
- Wooden crate
- Wrapping foil
- tape measure
- Straps
- woodscrews and drilling machine

7.2 Switching off / Disconnecting the oven

7.2.1 Regular Shut down

Shutting Down the Equipment

Softkey  to switch off the system.

The system stops the heating while still leaving the fans and conveyor on. The display shows the currently hottest zone. The system now automatically cools down until the zones have reached 80°C (due to the excellent thermal insulation, cooling down can take 4 hours).

Then the fans and the conveyor stop, and the machine goes automatically into the stand-by mode.

Turn the main power switch to **0** (OFF).

This shutdown procedure will completely switch off the equipment. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.

7.2.2 Disconnecting the Oven

Electrical Power / Network Connection

Disconnect the main power cable from the local supply.

7.3 Disconnecting Fume Exhaust System

Disconnect Exhaust Air System

Disconnect the exhaust air system from the suction socket of the exhaust option.

7.4 Attachment of Protection Material

Protect Cables

Wrap all the cables with adequate packaging material and/or fix them with a cable tie on a suitable place.

Fix loose parts

Fix all loose parts with cable ties and/or wrap it with adequate packaging material.

4000013/01 / March 04, 2014

7.5 Moving to Packing Position

WARNING

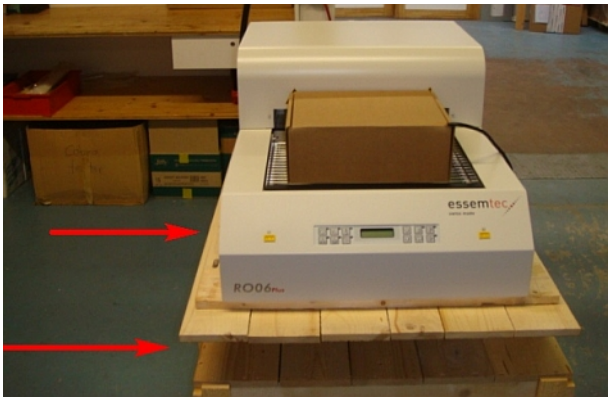
Pay attention to the center of gravity. The equipment can be sensitive to tipping over. Wrong handling during movement can result in serious injury or material damage. Only authorized and qualified personnel is allowed to move the equipment with maximum care. The equipment is very heavy, pay attention to fingers and other bodily parts during moving!

Move the equipment to desired Position

If the oven is still on the pallet, use the fork lift to carry the pallet beside the final work position.

If the oven is already on a table or stand, carefully lift the oven on the fork lift. Now it can be moved to the desired position.

During moving or any handling of the equipment, do not push the equipment over the surface as it could cause damage to the feet or the feet fitting. Lift it up first and then move it.



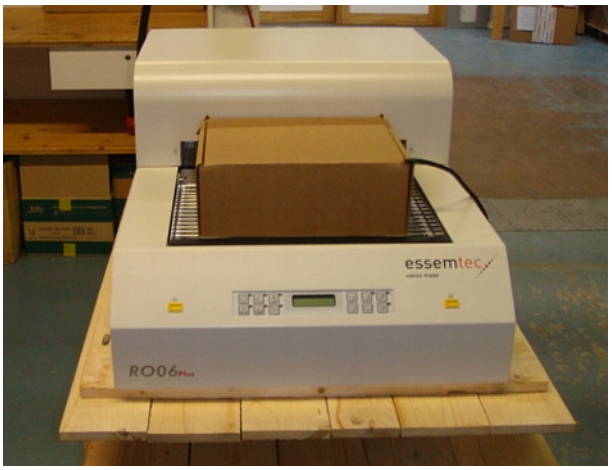
7.6 Equipment Packing

Place Equipment on the Pallet

With the fork lift bring the oven beside the pallet. If possible at the same height.

By hand, carefully lift the oven onto the pallet in a centered position.

Inside suitable packing, stow additional parts on top of the drawer.

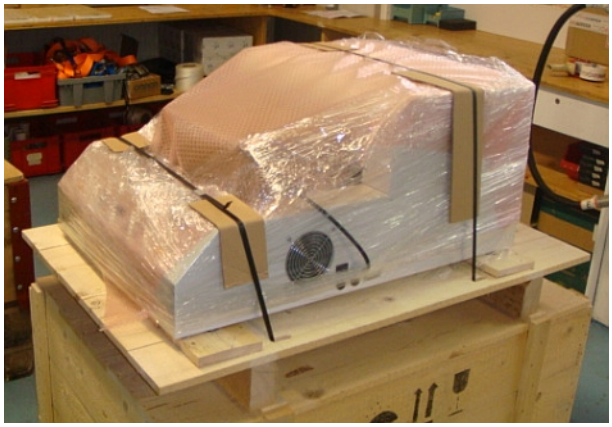


Wrap the Equipment and bring on Straps

Place bubble wrap on edges and wrap the whole equipment with plastic foil.

Bring on cardboard on the edges of the oven where the straps will press.

Tighten the straps to fix the oven on the pallet.



Close the wooden crate

Bring on the cover of the wooden crate.

Screw in the wood screws to fix the cover and the side walls of the wooden crate.

Make ready for Shipment

Attach a 'ShockWatch', 'TipnTell' or similar shock indicator to the wooden crate.

Attach the shipping documents to the wooden crate.

Attach the unpacking instructions to the wooden crate.

7.7 Truck Loading

Load Machine on the Truck

Use a fork lift to place the machine on the truck.

Note: The distance between the two forks should be as wide as possible to avoid tipping.

8 Disposal

The RO-06 Plus has been designed for a long product life-time. Nevertheless the machine must be disposed some time.

Disposal may be subject of national, state, or local laws and regulations.

For disposal of chemicals please follow the instructions on the Material Safety Data Sheets (MSDS).

9 Setting up the Oven

CAUTION

For better visibility of subjacent functions, covers have been removed or opened before taking pictures. In standard operating mode all covers have to be in place at any time.

9.1 Set up and personalize the oven

The following settings have to be done:

- **Sound** (Audible Signal)
  Set to NO, all acoustical sounds are switched off.
- **Temperature Unit**
  The temperature can be displayed either in °Celsius or °Fahrenheit.
- **Language**
  The desired language can be selected.
- **Serial Number of Electronics**
  This is a purely display function, no entering possible. The serial number of the electronics is shown.
- **Use Time**
  This function counts the operating hours of the oven. The stand-by time (heating and fans not in operation) is *not* taken into account. After 2000 hours of operation, a warning message is displayed, indicating a maintenance interval, performed by a technician.

4000013/01 / March 04, 2014

10 Operating of the Oven

10.1 Power up the Oven

Read the Safety chapter in this manual before powering up the machine.

Checks

Check for proper connection of the electricity and the LAN cable (if used).

Make sure all covers are closed.
And that the drawer is outside.

4000013/01 / March 04, 2014

Startup

Turn on the main power switch to **I** (ON)

The indicator light on the membrane keypad is lit on and the system is now in the standby mode.

Softkey to switch the oven from the standby mode to the operation mode.

The display shows the message 'Oven 2 Zones' as well as the internal software version.

The conveyor, the heating and the fans are not yet started, as no program is selected so far. The equipment is now ready for loading a program and running the production.

10.2 Stop and Shut Down the Oven

10.2.1 Regular Shut down

Shutting Down the Equipment

Softkey to switch off the system.

The system stops the heating while still leaving the fans and conveyor on. The display shows the currently hottest zone. The system now automatically cools down until the zones have reached 80°C (due to the excellent thermal insulation, cooling down can take 4 hours).

Then the fans and the conveyor stop, and the machine goes automatically into the stand-by mode.

Turn the main power switch to **0** (OFF).

This shutdown procedure will completely switch off the equipment. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.

4000013/01 / March 04, 2014

10.2.2 Power Loss

Power Failure

NOTICE

In case of a power failure, the equipment cannot cool down monitored and by means of the fans. This can influence the lifetime of the fans and of other relevant machine parts. That usually means, components of the oven will being damaged because of the high temperature.

Power up the equipment immediately according to the procedure on page as soon as power is available again.

Softkey  to unload all the boards which have been caught during power failure.

All these PCBs must be analyzed extensively. In the worst case they can be damaged.

10.2.3 Unordered Stops

Cause of unordered stop

This may happen for a number of reasons, e.g. due to wrong fan speed, wrong temperature etc. Whatever the reason for the stop is, an error message, warning or notification will always be displayed showing the cause of the stop.

Problem Solving

The action to solve a problem depends on the cause of the stop. If the problem is more serious an error message or warning will be displayed giving detailed information for troubleshooting.

For details in problem solving, refer to chapter 'Error Diagnostic' on page *13-1*.

10.3 Create a Program

A program contains the different temperature values for each heating zone and the time for which this temperature is hold on. This combination results in a soldering or curing profile.

Prerequisites

- The equipment is installed completely, according to chapter 'Oven Installation'.
- The equipment is powered up and started according to the chapter 'Power up the oven' on page *10-1*.

10.3.1 Standard Programs / Profiles

Overview

For the most usual applications, 20 programs are already defined. Additionally, 15 programs can be freely defined and saved.

- 01 - 15 freely definable programs
- 16 - 25 predefined programs for soldering profiles
- 26 - 35 predefined programs for glue curing applications

Note: The predefined profiles are recommendations only. Due to the nature of PCBs, densities, used soldering pastes, the ideal profiles can differ. Necessary tests must be done to find the correct profile for each process.

4000013/01 / March 04, 2014

Standard Pastes

Prog #	Base Temp [°C]	Preheat/Soak Temp [°C]	Preheat/Soak Time [s]	Reflow Temp [°C]	Reflow Time [s]	Cooling Temp [°C]
21	120	140	100	170	15	140
22	120	140	100	180	15	140
23	140	190	20	220	5	200
24	140	190	25	220	8	200
25	150	190	20	220	5	190
26	150	190	20	225	5	190
27	140	200	15	220	5	200
28	140	200	20	220	8	190
29	180	190	10	220	5	170
30	180	190	20	220	5	170

Note: If the oven is set to °Fahrenheit (°F), the indicated temperatures are automatically switched to Fahrenheit.

SMD Glue

Prog #	Base Temp [°C]	Preheat/Soak Temp [°C]	Preheat/Soak Time [s]	Reflow Temp [°C]	Reflow Time [s]	Cooling Temp [°C]
21	70	95	30	85	90	75
22	70	95	30	90	90	75
23	75	105	30	95	90	85
24	75	105	30	100	90	85
25	80	115	25	105	95	90
26	85	125	20	112	100	100
27	90	135	10	125	100	105
28	95	145	10	130	100	110
29	100	145	10	140	100	115
30	105	155	10	150	100	120

Note: If the oven is set to °Fahrenheit (°F), the indicated temperatures are automatically switched to Fahrenheit.

10.3.2 Rules to set up a Soldering Profile

Basic Rules

When establishing a soldering profile, the following basic rules are generally to be respected:

- The melting point of the solder must be reliably reached.
- The thermal impact for the components is to be kept as low as possible.
- By selecting temperatures and conveyor speed and by considering the complexity of the PCB and the density of placed components, an optimum soldering profile can be created.

Oven Characteristics

The Essemtec oven equipment, ensures that the zone temperature is almost identical with the temperature at the soldering point. Thanks to the particular functional principle, a homogeneous temperature with a low delta T between the single components is ensured at any spot. By selecting temperatures and heating durations and by considering the complexity of the PCB and the density of placed components, an optimum soldering profile can be created.

Preheat Settings

The temperatures in the preheating zones are set to values between 120 and 200°C, according to the applied paste. During this preheating phase, all volatile ingredients of the paste will evaporate, and the efficacious components of the flux will deploy their maximum activity. In particular, the heating-up speed must not be too high, in order to avoid splashes and the formation of solder balls. Apart from this, in the preheating zones a uniform heating-through of the basic materials and of the soldering points needs to be achieved, until shortly before the soldering zone.

Peak Zone Settings

For the peak zone, the energy amount must be selected in such a way that the melting temperature of the solder (see data report of the solder used) can be safely reached. For the usual solders containing lead it is desirable to have temperatures of between approx. 205 and 215°C (melting point 183°C), for lead free solder between 235 and 245°C (melting point at 221°C), at the coldest point of the PCB.

Conclusion

Provided that the same soldering paste is used, one program setting can be applied as for almost all further reflow soldering. According to the results, individual optimization measures can be taken. Practically the same is also valid for the curing of glue by means of the pass-through method.

Actions in case of unsuccessful or incomplete soldering

If the soldering process is unsuccessful or incomplete even though the zone temperatures are within the melting range of the soldering paste, in a first attempt it will be useful to reduce the conveyor speed. Increasing the temperature within the peak zone should be considered very

4000013/01 / March 04, 2014

carefully and critically, because of the probability of damaging those electronic components which need a lower energy amount for heating up. Another attempt would be to increase the temperature within the zone located before the peak zone, in order to reduce the energy amount to be fed to the peak zone.

In any case, when making a new attempt with the same and meanwhile cooled down PCB, the non-soldered points need to be lubricated with flux.

To identify the actual effects of the preset machine parameters on the PCB, it would be useful to perform a temperature measuring at the soldering joint during the soldering process, by means of the optionally available thermocouple set. This measuring should preferably be done both at the coldest and at the hottest point of the board, i. e. at the soldering joint of the smallest and the biggest component.

10.3.3 Create a Program

Choose program place and create program

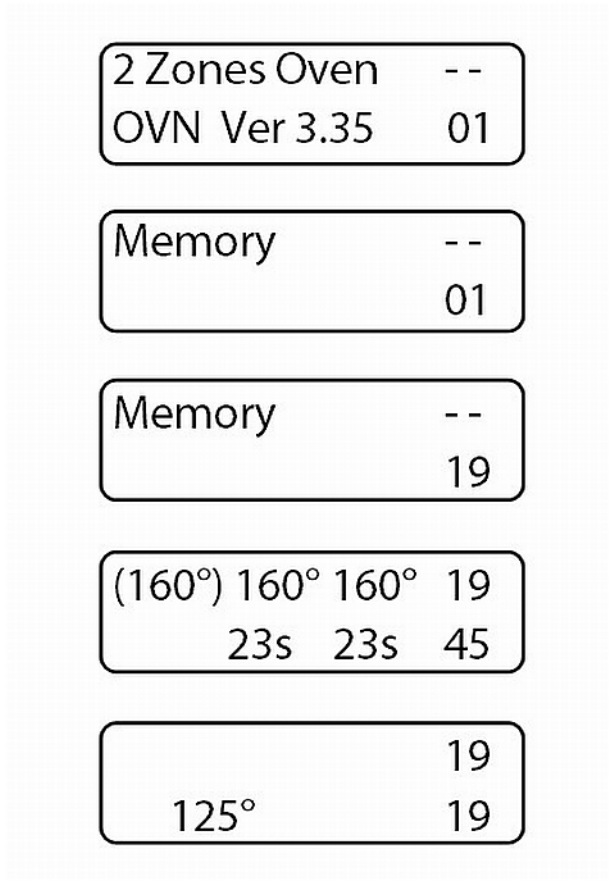
Softkey  to open the memory function.

Softkey  or  to select the desired program number.

Softkey  to confirm the program choice.

Now the appropriate value in the bracket can be set by using the UP/DOWN key. Pressing the key continuously increments or decrements the value by 10 or 100.

Softkey  to confirm each value. Press this key again at the end of all entries to confirm the whole parameter set.



10.4 Operate the Production

Prerequisites

- The equipment is installed completely, according to chapter 'Oven Installation'.
- The desired Program is created.
- The equipment is powered up and started according to the chapter 'Power up the oven' on page *10-1*.
- The equipment is set up and personalized correctly, according to the chapter 'Setting up the Oven' on page *9-1*.

CAUTION

Avoid any contact with rotating machine elements. Take the necessary caution to prevent long hair or jewelry from getting caught in the oven (wear a hairnet). Never grasp with your hands or fingers on the moving conveyor (danger of violent pressure to hands and fingers and danger of being burnt).

10.4.1 Load an existing Program

Choose and load the program

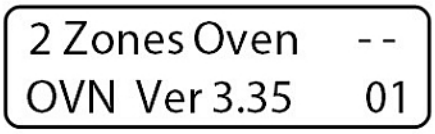
Softkey  for choosing either a standard or a self created program.

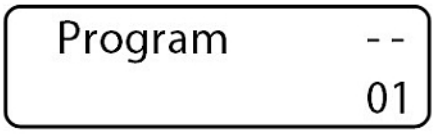
Softkey  or  to scroll through the programs.

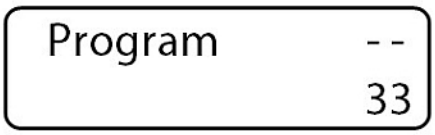
Softkey  to select the desired program.

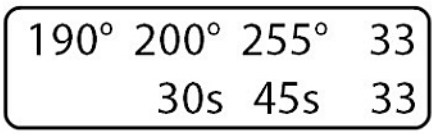
The blinking program number and the blinking LED on the key indicate that the oven is heating up to the nominal temperature values given by the program. The display shows the nominal and the reached temperature values alternatively.

The oven is ready for production as soon as the LED on the key is illuminated permanently and an acoustic signal becomes audible.









4000013/01 / March 04, 2014

10.4.2 Run the Production

Start Production

In case of a manual system, wait until the temperatures are in the correct range and all conditions are ok.

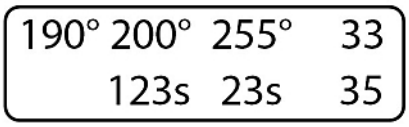
The LED of the key  , on the keypad, indicates the readiness of the system. A blinking LED indicates, the system is heating up (cooling down) and is not ready. If the LED is continuously on, the system is ready to run the production.

10.4.3 Change a running Program

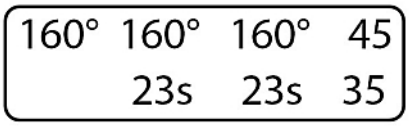
Choose and load the program

The program can be changed 'on the fly', during production.

Softkey  or  to scroll through the programs (the program number of the new program is shown on the second row on the display).



Softkey  to select and start the new program.



The blinking program number and the blinking LED on the key indicate that the oven is heating up or cooling down to the nominal temperature values given by the new program. The display shows the nominal and the reached temperature values alternatively.

The oven is ready for production as soon as the LED on the key is illuminated permanently and an acoustic signal becomes audible.

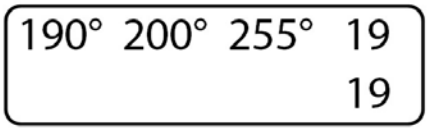
10.4.4 Display the Settings

Depending on the running status of the oven, the values are displayed directly. A red LED indicates that the display function is active.

These are purely display functions, no changes are possible.

Display soldering and cooling temperature

Softkey  to show the soldering temperatures. The set temperature value and the real temperature are showed alternatively.



Softkey  to show the current cooling temperature.

10.4.5 Stop the Production

Stop at any time

Wait until the soldering process is over and the drawer is outside of the oven.

Do a regular shutdown according the description on page *14-2*.

4000013/01 / March 04, 2014

10.4.6 Measuring Temperature with external Thermocouples

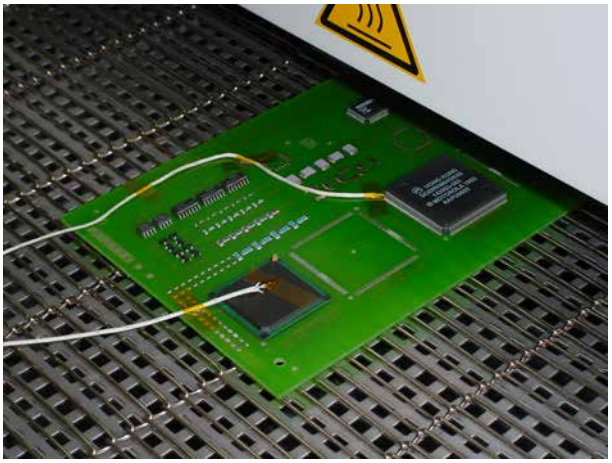
In order to ascertain the temperature effectively prevailing on the PCB (directly at the soldering points), it is possible, as an option, to connect two thermocouples at the reflow oven. This option is mainly used for the first establishing of required parameters for a PCB series and for periodically checking the temperatures.

The thermocouples are to be inserted into the two yellow bushings located on the left side (entry side). The oven automatically registers that the sensors are put up and takes the measured values into account.

The extremities of the thermocouples must be fixed at two points, directly on the PCB (e.g. by means of a heat-resistant adhesive tape [Capton]). During the soldering process, the thermocouples, together with the material to be soldered, pass through the oven and register the temperatures prevailing directly on the PCB surfaces. For measuring the effective surface temperature, it is necessary to cover the peak of the sensor with adhesive tape (Capton), ensuring that the peak bears firmly on the PCB surface, without being lifted up (which would expose the peak to the air flow). In this way, a constant measuring of the temperature can be achieved, without any influence by air flows within the oven. This prevents wrong measurements. Make also sure that the peak of the sensor does not have any contact with metallic conveyor elements and therefore with the grounding (also avoid through-connections within the PCB), since this would result in wrong measurements and undefined temperature values.

Place Thermocouples on PCB

Fix the Thermocouples on the PCB by means of a heat-resistant adhesive tape, according to the description above.



Plug in the Thermocouples

Plug in the Thermocouples into the yellow bushings (see picture)

View the current temperature

Note: RO-SOFT :
The RO-Soft software, available as an option, allows establishing a profile registration directly from the measured data, which can be printed out and graphically edited, for protocol purposes. Please refer to the RO-Soft manual.

If no additional software is installed or used, do the following step to display the current temperature:

Softkey

to show the current temperature of each thermocouple element.

S1	S2	17
167°	168°	17

4000013/01 / March 04, 2014

11 Preventive Maintenance

11.1 Introduction

The RO-06 Plus requires little maintenance but as with any machine correct and regular preventive maintenance will optimize efficiency and help to reduce downtime during production.

Should an assembly or sub-assembly require removal and/or replacement, it is important that the correct procedures, as detailed in the Corrective Maintenance Chapters, are followed. After removal and/or replacement procedures it might be necessary to re-calibrate the equipment.

⚠ CAUTION

For better visibility of subjacent functions, covers have been removed or opened before taking pictures. In standard operating mode all covers have to be in place at any time.

11.2 Preventive Maintenance Schedule

Note: After 2000 hours of operation, a warning message is displayed, requesting to do preventing maintenance, performed by a service technician. This request relates mainly to the Fan Service.

Module	Task / Condition	*Interval	**Effort [min]
Resin Residues	Eliminate the residues completely by means of a towel soaked with alcohol or methylated spirit.	Weekly	15

The time calculation is based on a medium degree of contamination. Depending on the contamination, the maintenance can take less/more time.

12 Calibration of the Oven

With the calibration of the equipment RO-06 Plus, any differences toward a 'normal machine' for instance caused by mechanical and other tolerances are compensated. Thereby the use of programs is guaranteed. That means using the same program, all machines have the same behavior.

12.1 Introduction

The calibration has to be done at minimum on a yearly base or according to the operating rules of the company.

Before starting the calibration, read carefully the Specific Warnings in the safety chapter on page *1-11*.

12.2 Calibration Tasks

12.2.1 Tools, Material and Scheduling

The following resources have to be provided:

Required Tools / Auxiliary Material / Spare parts

Tools:	Flying thermocouples Device for temperature measuring Small slotted screwdriver (0 or 00)
Auxiliary Material:	none
Spare parts:	none

Time needed

For the preparation the oven has to be cooled down. However, for the test it has to heat up. If you include the time for cooling down after calibration, it will take around 200 minutes.

12.2.2 Prerequisites

For a safe and efficient calibration, the following prerequisites have to be fulfilled:

Equipment loading:	· Production Material unloaded (oven empty)
Equipment operating condition:	· cooled down
Main electrical power:	· connected
Compressed air:	· connected
Equipment location:	· at working position

Cooling down the oven takes a long time. Schedule at least 120 minutes to fulfill these prerequisites.

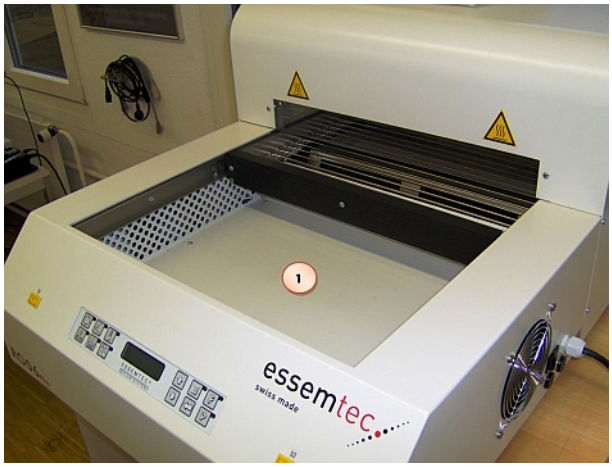
Preparation of the oven and location of the mainboard

If not already done, let the oven cool down.

Turn on the oven and press  to drive the drawer into the oven.

Cut the main power by just pull out the mains cable connection. Now it is save to remove the cover (1) for gaining access to the mainboard.

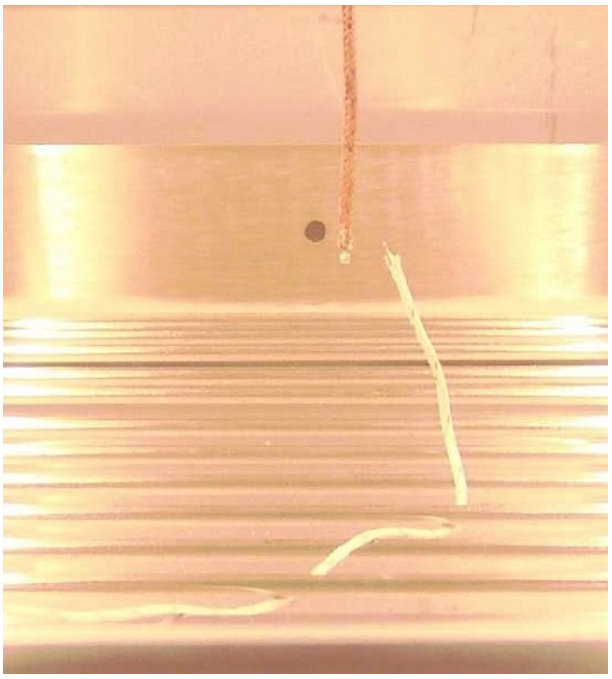
Plug in the mains cable and restart the oven.



12.2.3 Zone Temperature Alignment

Zone temperature measuring

Press  to drive the drawer out. Fit the external temperature sensor about to the center of the drawer that the point will be near the position of the internal temperature sensor. It might be necessary to verify and adjust this position a few times by driving the drawer in and out of the oven.

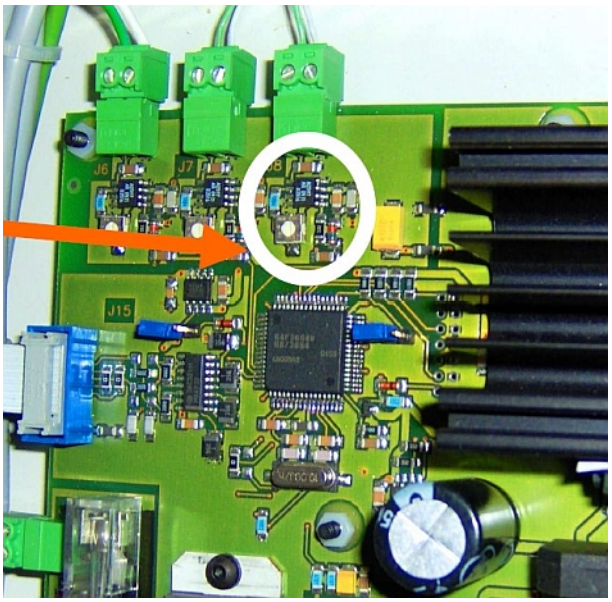


Setup calibration program

Turn on the oven and program all zones up to 150°C.

Assignment of potentiometers

In the picture the potentiometer for the heating zone is shown.



Adjustment

Calibrate the zones with adjusting the potentiometer on the mainboard. The temperature measuring instrument has to show 150°C.

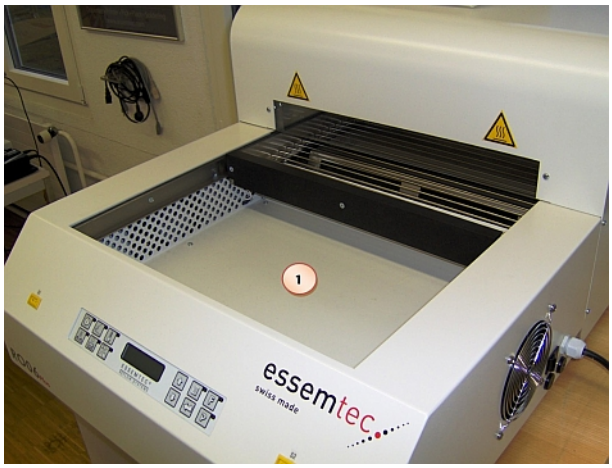
Changes on the potentiometer need approximately 10 minutes to evenly affect the heating chamber.

Changes on the potentiometer need approximately 10 minutes to evenly affect the heating chamber.

Rebuild the oven

Safely shut down the oven until it is cooled down to cut the main power.

Cut the main power by just pull out the mains cable connection. Now it is save to attach the cover (1) back to the oven.

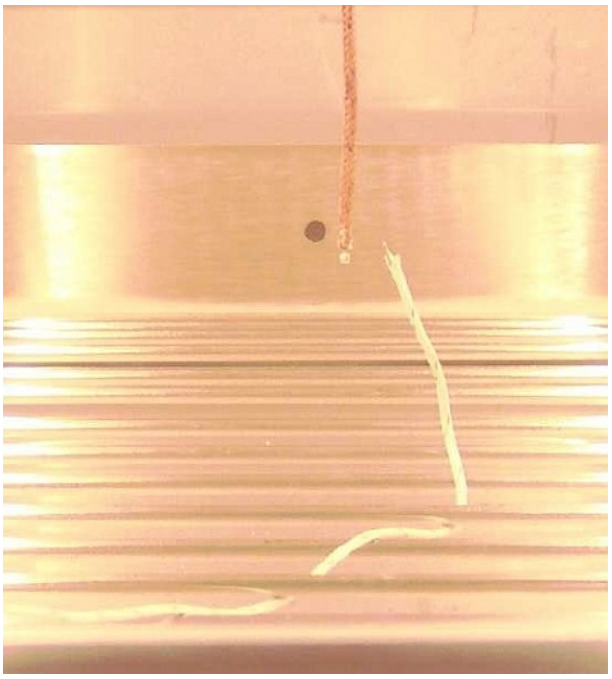


4000013/01 / March 04, 2014

12.2.4 External Thermocouple Alignment

Thermocouple temperature measuring

Press  to drive the drawer out. Fit the external temperature sensor together (!) with the thermocouple sensor about to the center of the drawer that the point will be near the position of the internal temperature sensor. It might be necessary to verify and adjust this position a few times by driving the drawer in and out of the oven.

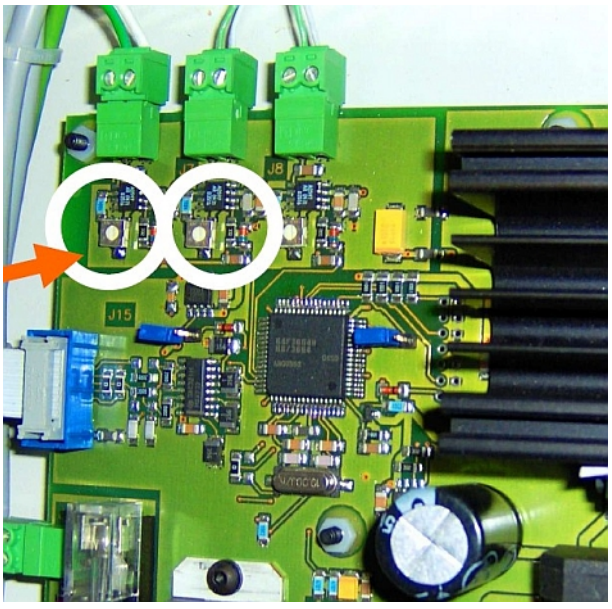


Setup calibration program

Turn on the oven and program all zones up to 150°C.

Assignment of potentiometers

In the picture the potentiometers for both thermocouples are shown.

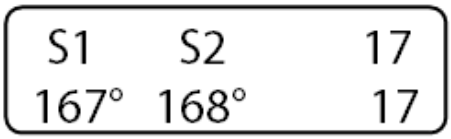


Adjustment of the thermocouples

Softkey

Press the thermocouple button next to the display. The temperatures of both thermocouples are now displayed.

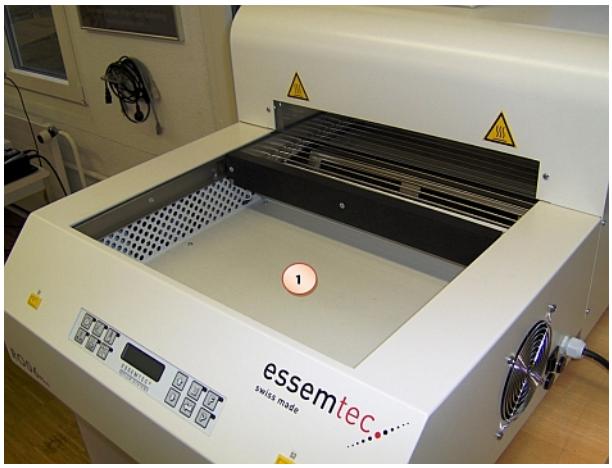
Compare the value on the measurement device to the displayed temperature and adjust the corresponding potentiometer until all temperatures are equivalent.



Rebuild the oven

Safely shut down the oven until it is cooled down to cut the main power.

Cut the main power by just pull out the mains cable connection. Now it is save to attach the cover (1) back to the oven.



4000013/01 / March 04, 2014

13 Error Diagnostic

Diagnostics must exclusively be performed by qualified personnel.

13.1 Error Descriptions

The equipment does not work though it is connected to the power supply

- Current entry ensured and main switch on?
- Overheating of the machine (operation without exhaust air extraction)?

A heating zone does not or not correctly work (cannot be stabilized)

- Check the circuit breakers.
- The plated heating rod is defective.
- Check the triggering LED on the electronics.

The defined temperature value of a heating zone is considerably exceeded

- If the temperature difference of adjoining heating zones is too important, the heat of the higher set zone can influence the regulation of the neighboring zone in such a way that the set temperature cannot be reached. The consequence can be that the readiness for operation (blinking LED on the keyboard) is not attained . Therefore, in order to obtain the readiness for operation, either the set temperature of the lower set zone must be increased accordingly, or the temperature of the higher set zone is to be slightly adapted. After a correction by lowering the temperature, the heating zones need to be optimally stabilized again.
  For this, the best way is to shortly shift the oven to stand-by operation or to select an empty program place (e.g. 19) where all three heating zones are set to 20°C. Start this program. Wait until the oven temperature is distinctly lower than the set temperature of the preceding program, and then start again the desired (maybe modified) program. Now the oven is able to stabilize again according to the lower temperature level. Normally this happens within a few minutes.
- Another cause can be a too high or a too low exhaust air performance. For the optimum separation of the zones, the exhaust air volume of 500 m^3 /h, as mentioned in the specifications, must be guaranteed. For this, it is recommendable to boost the exhaust performance while observing the temperature display. If the temperature clearly increases, the performance is below 500 m^3/h; if it decreases further, the performance is distinctly above 800 m^3/h

The external thermocouples do not display any value

- When there is no temperature display of the thermocouples, their function can be tested in this way: Bypass the connector by means of a small piece of wire. The display must now show the approximate room temperature. If this is the case, the thermocouples are defective and need to be replaced.

13.2 Error Messages / Reports

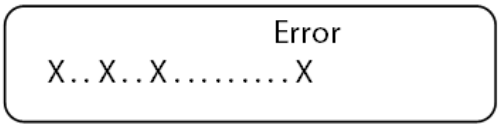
The oven is provided with an internal error diagnose system. Certain functions are permanently retrieved, and in case of an error message, a safety shut-down is triggered. After this, the error/fault must first be eliminated, before the oven can be enabled again. At any rate, in such a case please contact our ESSEMTEC Support Team, in order to agree how to proceed further. To simplify the diagnostics, please transmit the following error reports:

Error Codes

16 error codes are possible.

See the table below for the meanings of the "X".

The error code (X) may be displayed individually or in combination. Some of the error codes are displayed together with an additional message.



1	Motor encoder does not send return signals
2	ADC current measurement from the exhaust does not send return signals
3	LED driver has no feedback signal
4	LCD driver or LED driver 2 has no feedback signal
5	Driver output 24 V has no feedback signal
6	24 V input has no feedback signal
7	SMEMA I/Os has no feedback signal
8	Keyboard has no feedback signal
9	Supply (power command) has no feedback signal
10	Memory EEPROM has no feedback signal
11	Motor blocked
12	Overheating
13	not used
14	not used
15	not used
16	not used

4000013/01 / March 04, 2014

14 Firmware Upgrade

The firmware upgrade (Flash EPROM programming) must exclusively be performed by qualified personnel.

Note: If using RO-Control, the Flash EPROM can be programmed by means of the built in PC. If not using RO-Control (no built in PC), a separate PC or Notebook has to be provided.

14.1 Preparation

14.1.1 Software Installation

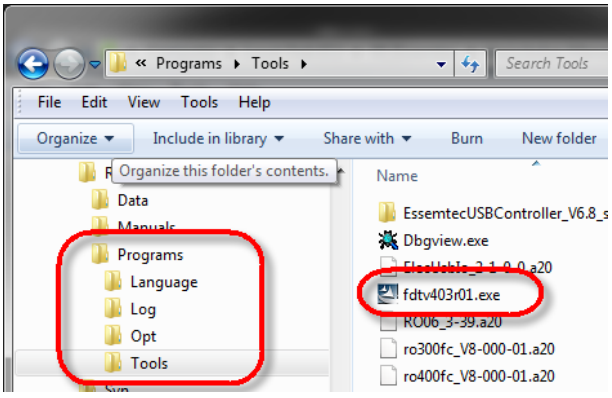
Installing Flash EPROM Programming Software

In case of a machine built in computer (using RO-Control), use the Windows explorer to find the installer for the flash programming software under:

YourPath\...\Programs\Tools (see picture)

Softkey

Double click on **fdtv403r01.exe** to install the programming software on the built in PC.



If there is no machine built in computer or the installer cannot be found, download the 'Flash Development Toolkit' to an external PC or the machine built in computer from:

Homepage:	*www.mydrive.ch***Fehler! Es wurde kein Textmarkenname vergeben.**
User:	oven
Password:	essemtec

During the installation, choose your language and further on use all default values.

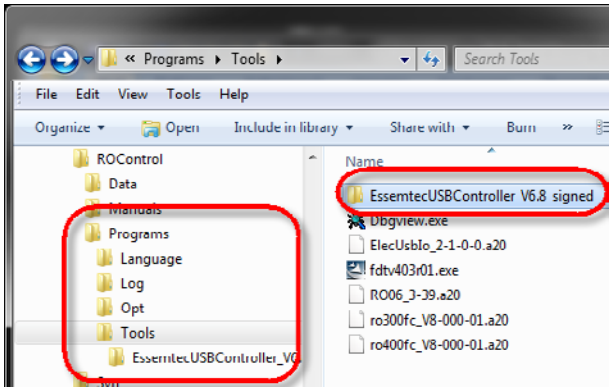
Installing Device Drivers

For the communication between PC and the oven electronic, either a RS232 or an USB connection can be used. If using the USB connection, the proper driver has to be installed.

In case of a machine built in computer (using RO-Control), use the Windows explorer to find the device driver under:

YourPath\...\Programs\Tools (see picture).

Check if the device driver on folder **EssemtecUSBController_V6.8_signed** is available.



If there is no machine built in computer or the device driver cannot be found, download it to an external PC or the machine built in computer from:

Homepage:	*www.mydrive.ch***Fehler! Es wurde kein Textmarkenname vergeben.**
User:	oven
Password:	essemtec

14.1.2 Regular Shut down

Shutting Down the Equipment

Softkey

to switch off the system.

The system stops the heating while still leaving the fans and conveyor on. The display shows the currently hottest zone. The system now automatically cools down until the zones have reached 80°C (due to the excellent thermal insulation, cooling down can take 4 hours).

Then the fans and the conveyor stop, and the machine goes automatically into the stand-by mode.

Turn the main power switch to **0** (OFF).

This shutdown procedure will completely switch off the equipment. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.

14.1.3 Oven Preparation

Note: Before doing the preparation, the oven has to be shut down completely.

Open machine cover

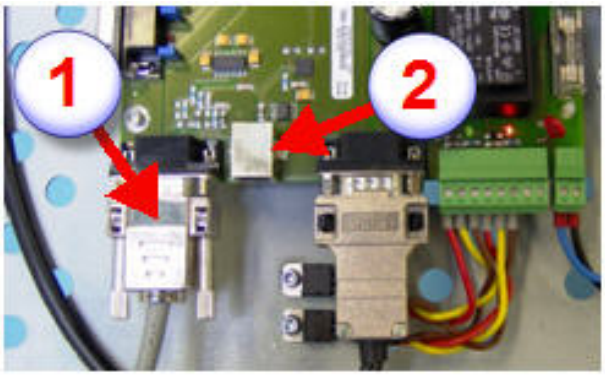
Open the appropriate cover to have access to the oven electronic (see picture).

Connect Programming PC

The connection between PC and oven electronic can be done via RS232 or USB interface.

If RO-Control is used, the PC is already connected by using the RS232 interface (1).

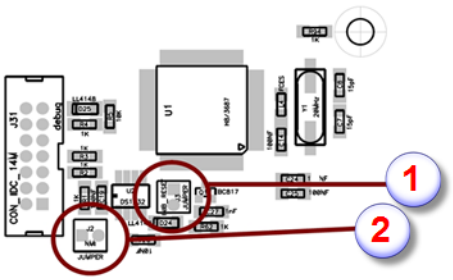
If not using RO-Control (no built in PC), connect the separate PC to the electronic board, using a RS232 cable (1) or a USB cable (2).



Find and set Jumper on Electronic Board

There are two jumpers to set on the electronic board. Close both of them.

- Reset jumper (1)
- Programming jumper (2)



14.1.4 Communication Setup

Switch on Oven and PC

Power up the oven according to the instruction on page *10-1*.

Switch on and boot the PC (if not machine built in).

Setting up RS232 Connection

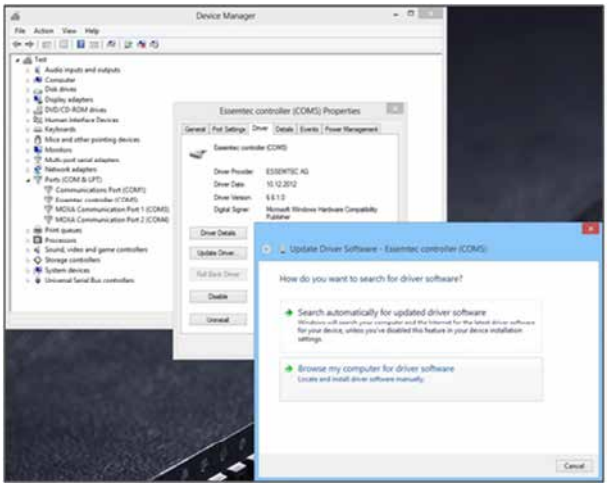
Note: If the connection between PC and oven electronic is done by using the USB interface, skip this step.

The easiest way is to use the COM 1 connection of the computer. Otherwise be aware that you have to choose the correct COM port.

Setting up USB Connection

Note: If the connection between PC and oven electronic is done by using the RS232 interface or if the software RO-Control is used, skip this step.

- Open the 'Device Manager' on the PC.
- Search the new device named 'Essemtec Controller'.
- Open the Properties of the 'Essemtec Controller'.
- Select 'Update Driver' and let the computer browse for driver software (the computer will choose the correct driver files itself).
- Write down the number of the COM which has been assigned during driver installation (e.g. COM5). This COM number will be used later.



4000013/01 / March 04, 2014

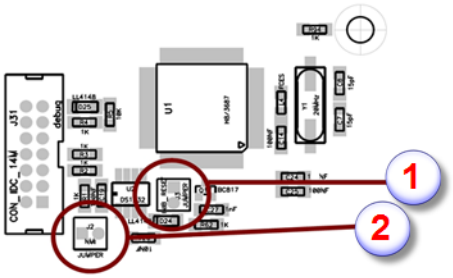
14.2 Programming

14.2.1 Firmware Programming

Open Reset Jumper

Open the Reset jumper (1) when the oven is switched on.

In the first line the oven display shows bars. The oven is now ready to receive a new firmware.

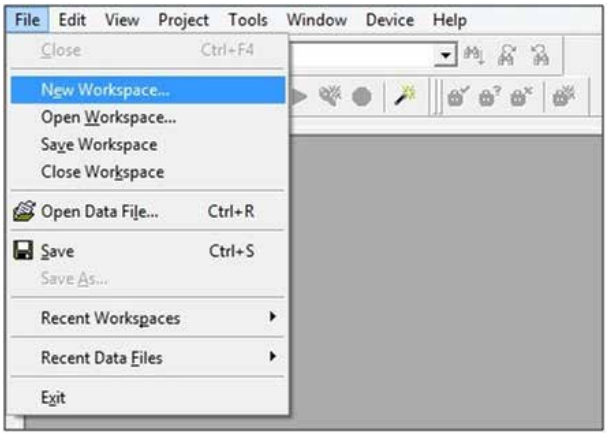


Launch Flash Development Toolkit

Select Windows Programs

Softkey ***Flash Development Toolkit 4.03*** to launch the tool kit (not the basic version).

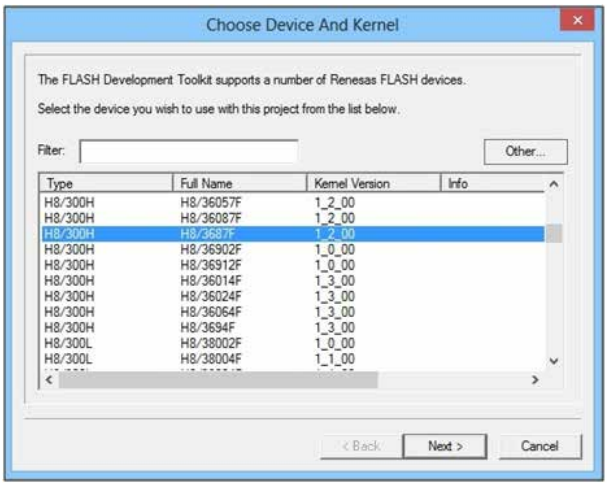
Create a new workspace using any name for it.



Select the correct Kernel:

H8/3687F for RO300FC / RO400FC

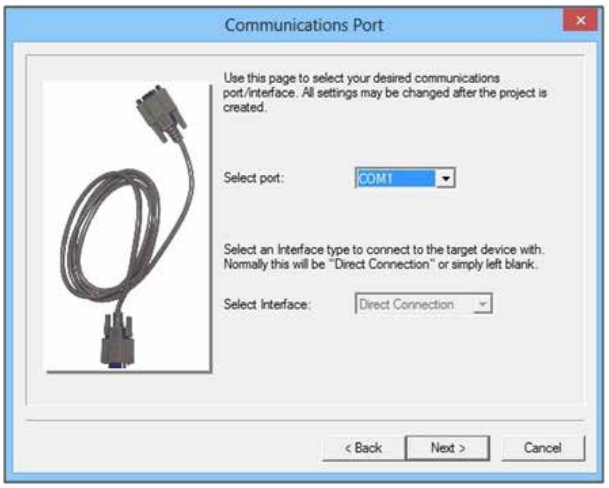
H8/3664F for RO06



Choose the communication port used

- COM1 if using RS232 interface for communication
- COMn if using USB. For 'n' take the number which was assigned during installation of the device driver (e.g. COM5).

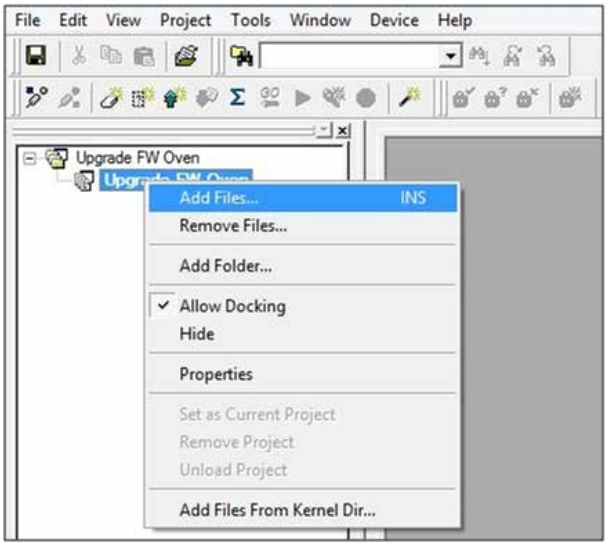
For all the next setup pages use the default values.



Import the newest Firmware

Softkey Right click on the project name.

Softkey ***Add Files***.

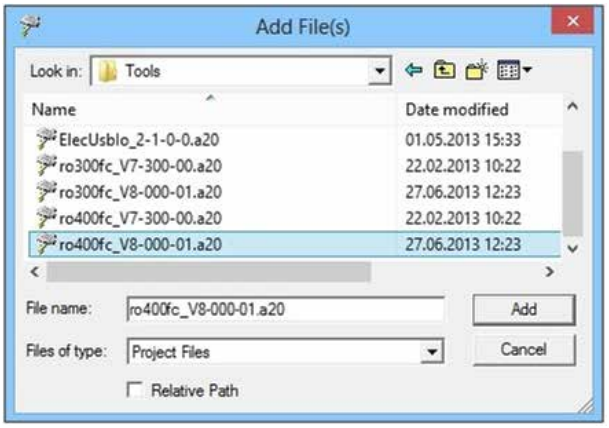


Choose newest Firmware

The newest firmware can be found in the directory:

YourPath\...\Programs\Tools (see picture).

Softkey ***Add*** to import the newest firmware.



4000013/01 / March 04, 2014

Burn the newest Firmware

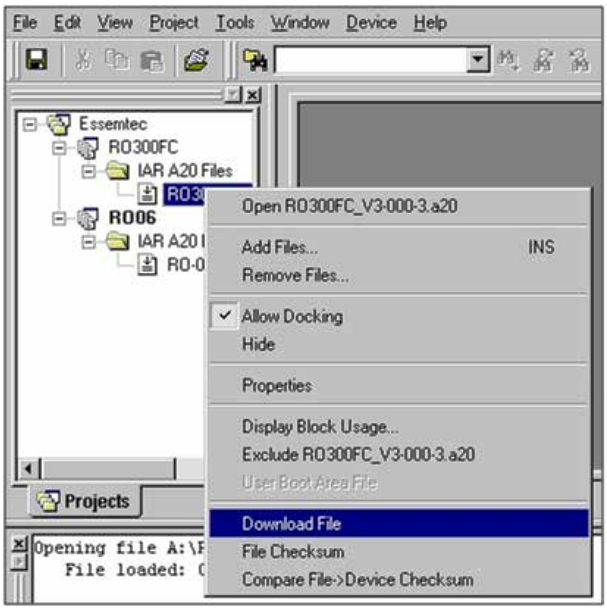
Softkey Right click on the firmware file in the project root.

Softkey ***Download File***.

Wait 1-2 minutes until the firmware is completely downloaded and at the bottom of the window is displayed:

' Image successfully written to device'.

Exit the flash development toolkit.



Shut Down the Oven

Softkey  to switch off the system.

The system stops the heating while still leaving the fans and conveyor on. The display shows the currently hottest zone. The system now automatically cools down until the zones have reached 80°C (due to the excellent thermal insulation, cooling down can take 4 hours).

Then the fans and the conveyor stop, and the machine goes automatically into the stand-by mode.

Turn the main power switch to **0** (OFF).

This shutdown procedure will completely switch off the equipment. The main switch will switch off the electrical power supplies. Power between inlet and main switch is still alive.

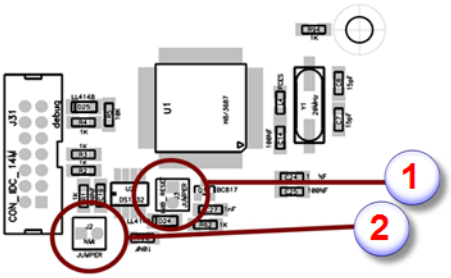
14.3 Initialization

14.3.1 Oven Initialization and Finalization

Set Jumpers back for Operating Mode

For the operating mode, set the two jumpers as follows:

- Reset jumper (1): CLOSED
- Programming jumper (2): OPEN



Switch on the Oven

Power up the oven according to the instruction on page *10-1*.

Check Firmware Version

Softkey

to display the firmware version.

Finalize Firmware Upgrade

If the firmware version is ok, finalize the upgrade doing the following:

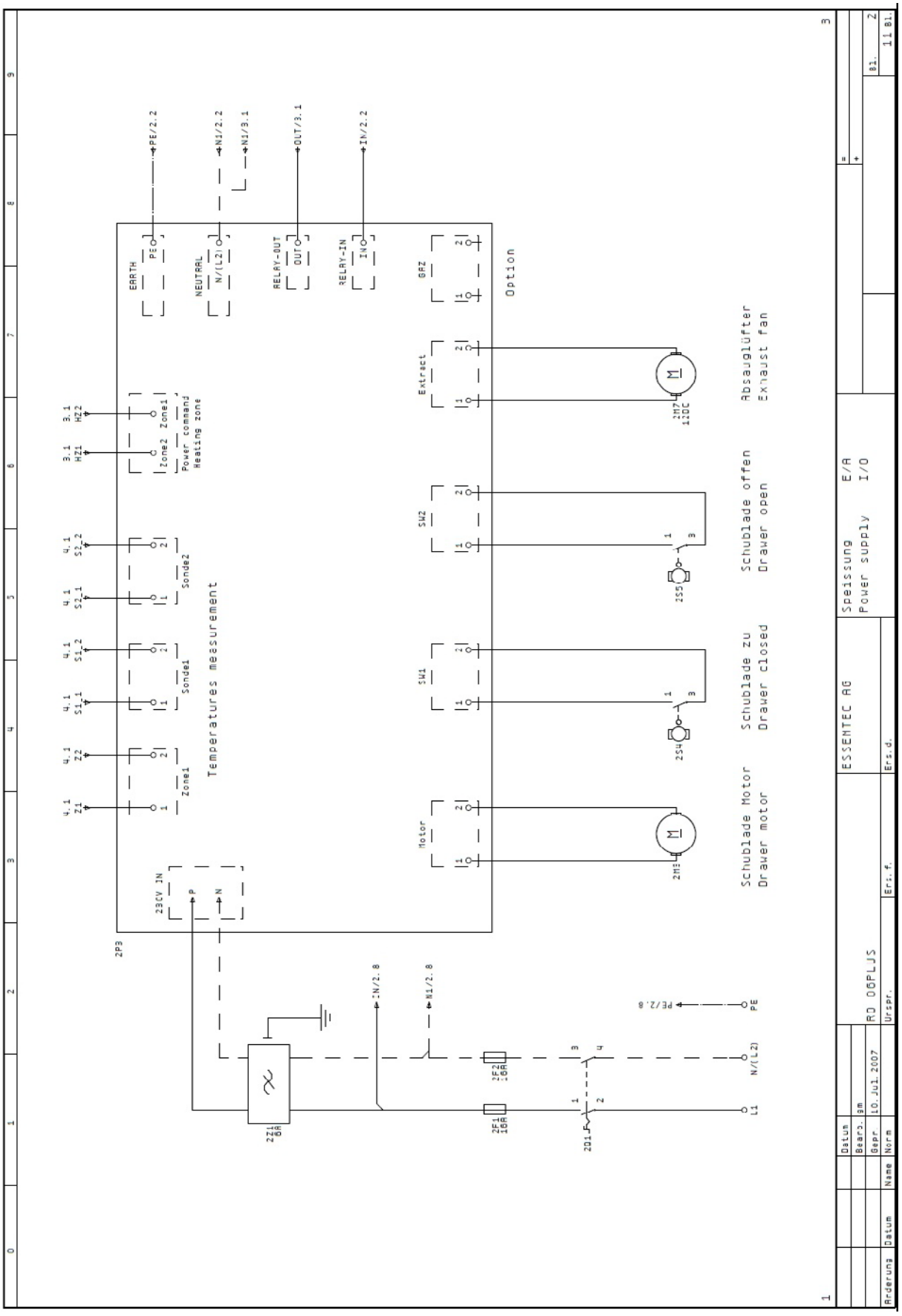
- Shut down the oven again.
- Unplug external PC (if applicable).
- Close and fix the machine cover.

The oven is now ready for production, using the most recent firmware version.

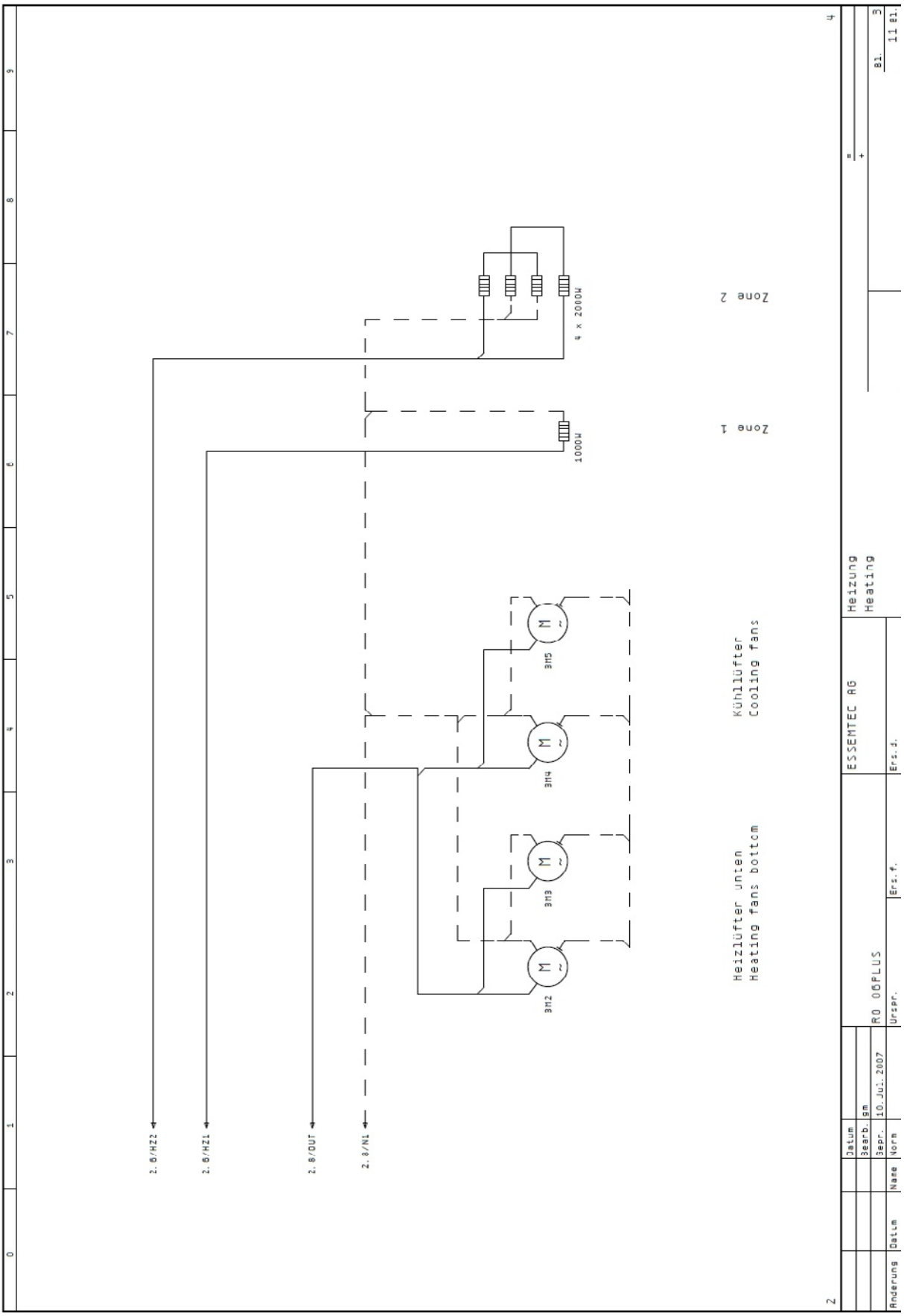
4000013/01 / March 04, 2014

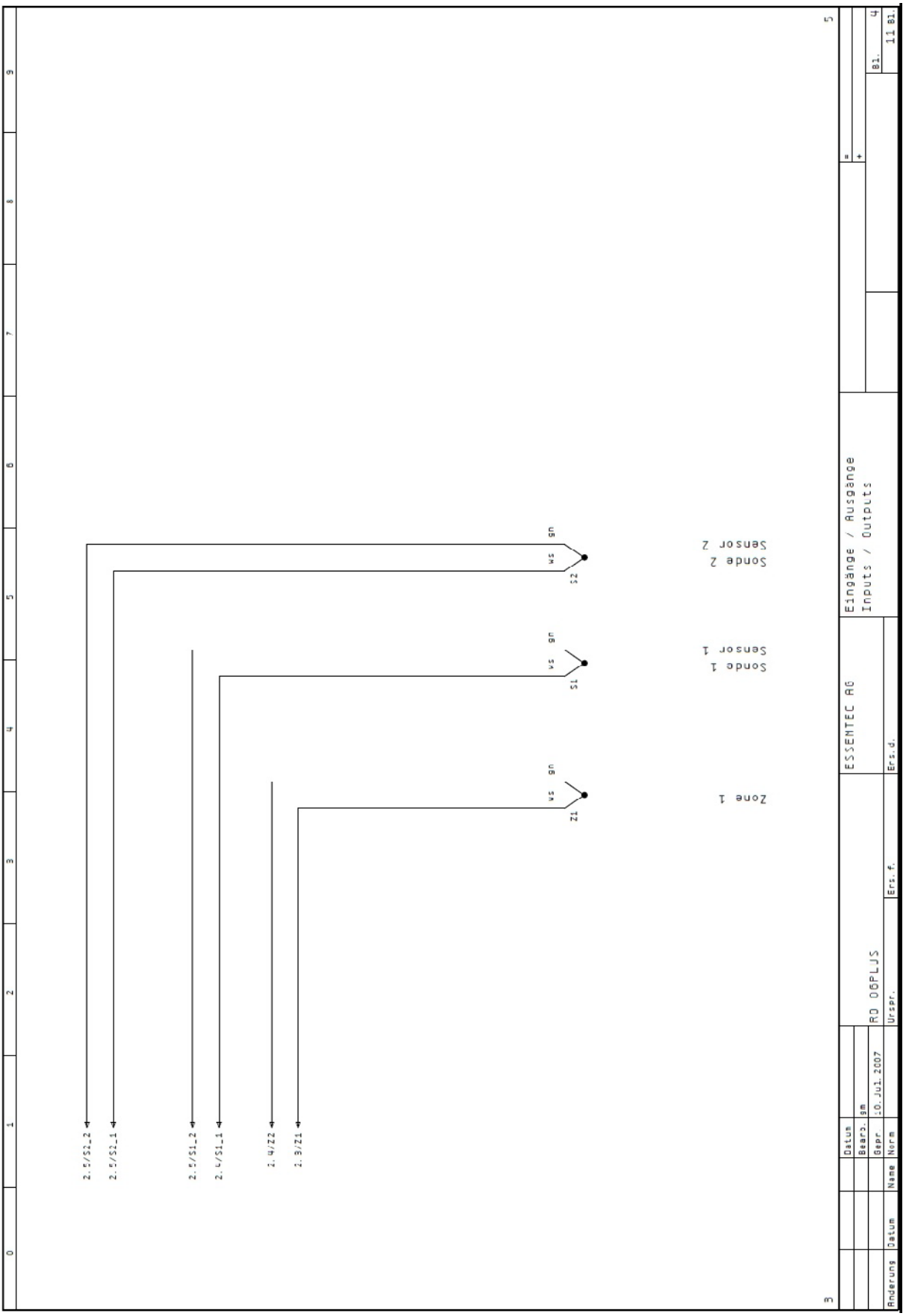
15 Schematics

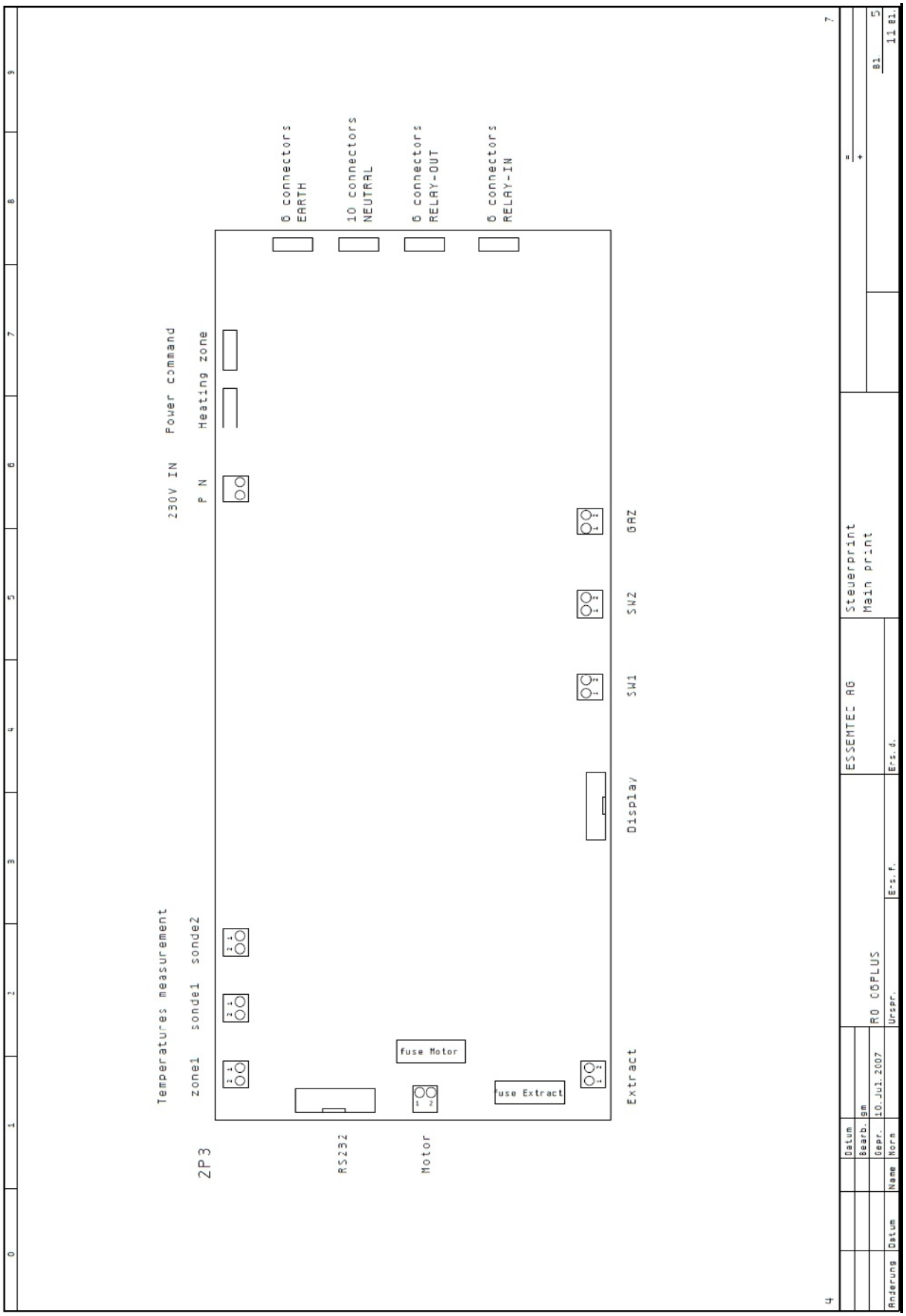
15.1 RO-06 Default machine type

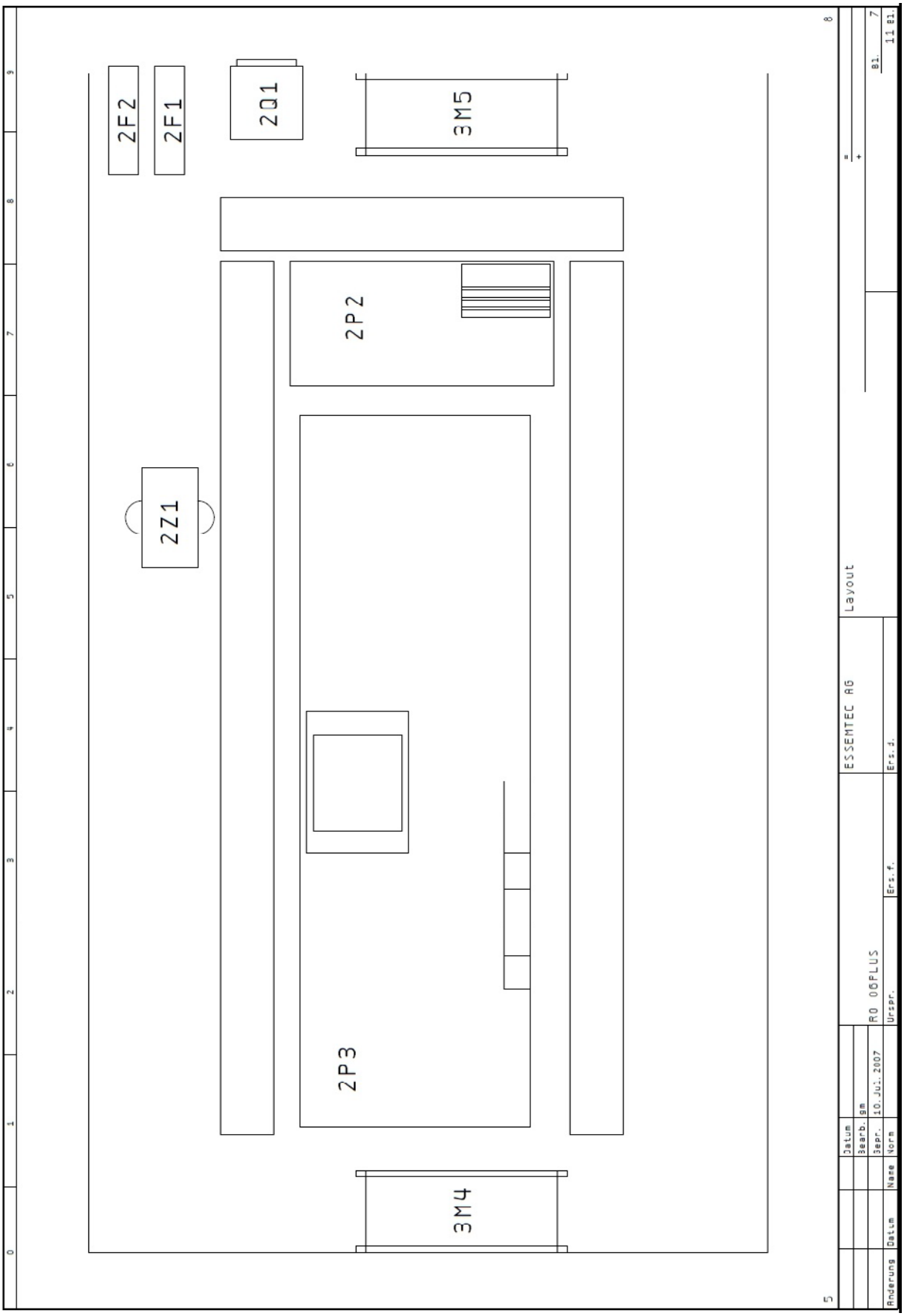


4000013/01 / March 04, 2014


Zone 2
4 x 2000W
Zone 1
1000W
Heizlüfter unten
Heating fans bottom
Kühllüfter
Cooling fans
3M5
3M4
3M3
3M2
2.6/HZ2
2.6/HZ1
2.8/OUT
2.8/N1
ESSEMTEC AG
Heizung
Heating
RO 06PLUS


Eingänge / Ausgänge
Inputs / Outputs
ESSENTEC AG
RD 06PLJS
Sonde 2
Sensor 2
Sonde 1
Sensor 1
Zone 1
2.5/S2_2
2.5/S2_1
2.5/S1_2
2.4/S1_1
2.4/Z2
2.3/Z1


6 connectors
EARTH
10 connectors
NEUTRAL
6 connectors
RELAY-OUT
6 connectors
RELAY-IN
230V IN
Power command
P N
Heating zone
Temperatures measurement
zone1
sonde1
sonde2
2P3
RS232
Motor
fuse Motor
fuse Extract
Display
SW1
SW2
GAZ
Extract
ESSEMTEC AG
Steuerprint
Main print
RO CØPLUS


2F2
2F1
2Q1
3M5
2P2
2Z1
2P3
3M4
ESSEMTEC AG
Layout
RO 06PLUS
Datum
Bearb. gm
10.Jul.2007
Änderung
Datum
Name
Norm