APEX RF MACHINE OPERATOR'S MANUAL – CUSTOMER NAME

Ziel Equipment, Sales and Services, Inc.
2269 Chestnut St. Suite 226
San Francisco, CA 94123

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NONE	NA	Page 1 of 81

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Rev 2	**1/24/2019**	**Updated to Include Data Recording Instruction**	**PY**
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Rev 6	**10/25/2019**	**Added metal detector**	**PY**
Rev 7	**12/19/2019**	**Added fiber optic calibration procedure**	**PY**
Rev 8	**3/31/2020**	**Edit and formatting**	**PY**
Rev 9	**5/26/2020**	**Fiber optic calibration procedure edited**	**PY**
Rev 10	**9/11/2020**	**Added requirements for bag materials**	**NS**

OPERATOR TRAINING COMPLETION RECORD

By my signature below, I hereby acknowledge and agree that (a) I have read and understand the contents of this Operator's Manual, that I have been afforded the opportunity to ask questions and seek clarifications with respect to such contents, and that such questions have been answered and clarifications have been provided to me by Ziel (the "Company"); (b) I agree to comply with, and understand it is my responsibility to abide by, the procedures and other terms contained in this Operator's Manual; (c) I have received adequate training provided by the Company in connection with this Operator's Manual in the use of APEX 7 (the "Equipment"); and (d) I have the requisite qualifications, skills, ability and training necessary to properly and safely handle, operate and otherwise use the Equipment in accordance with such training and this Operator's Manual.

NAME OF OPERATOR	SIGNATURE	DATE

Ziel Equipment, Sales and Service, Inc. **Training Coordinator**	**Signature**	**Date**

Ziel Equipment, Sales and Service, Inc.
2269 Chestnut St. Suite 226
San Francisco, CA 94123

Tel: 1 (888) 612-9895
Website: ziel.com
E-mail: service@ziel.com

MACHINE TYPE **APEX**	SERIAL NO. **XXXX/X**
MODEL **7 kW**	YEAR **XXXX**
MODULE NO. **1/1**	MODULE WEIGHT **1650 kg**
INSTALLED POWER **34 kVA**	VOLTAGE SUPPLY **480/277Y V +/- 5%**
MAXIMUM CURRENT **32 A**	PHASES **3 + EARTH**
SHORT CIRCUIT CURRENT **100 kA**	FREQUENCY **60 Hz +/- 2%**

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1. LEGAL

1.1 Copyright

1.2 Information and safety points

Personnel involved in the use, control, and maintenance of the APEX system must thoroughly read this manual, at least those parts of specific interest.

Throughout this manual, we will draw your attention to key information or safety points that the operator should be aware of when using or maintaining the machine. These safety points will be highlighted in a box, as the following:

TEXT in DOUBLE-FRAMED BOLD ITALICS indicates a PROHIBITION

1.3 Personnel operating RF devices safely

It is important to understand that radio frequency (RF) operates at a very low frequency (27.120 ± 0.163 MHz), which is similar to a mobile phone or a transistor radio (Figure 1.3). Ziel Equipment, is designed to harness and control those gentle waves and apply them to a very specific and regulated cavity in the RF machine.

Additionally, safety measurements have been taken to enclose the process inside the machine. Switches, emergency push buttons, and a light tower notification system are some of the tools built into the APEX to guarantee the safety of the operator. These safety devices shall not be disabled at any time, as all have been thoroughly tested and implemented to ensure the safety.

At the time of manufacturing, an RF Leakage detector is run along all parts of the cavity of the machine to ensure the equipment is compliance with FCC and OSHA.

APEX Machines Comply with:

This APEX machine is in compliance with the following regulations:

- FCC (47 C.F.R. Subpart A §§ 15.5, 15.15, 15.21, 15.33, Subpart C §§ 15.227)
- OSHA (29 CFR § 1910.97) Guideline for Exposure to Non-ionizing Radiation in the Workplace.

What is emitted?

- All APEX equipment have a maximum emission of less than 1mW/ cm^2 at the tunnel apertures.
- This is lower than the 5 mW/cm^2 permissible on microwave units

  It also complies with the following limits, in its working frequency range:
  - **E (Electric field) < 61 V/m**
  - **H (Magnetic Field) < 0.16 A/m**

The Radio Frequency waves emanated by the APEX 7 are **NON-IONIZING** electromagnetic waves. Substances exposed to these waves are not subjected to irradiation. A comparison

of RF waves to other waves and frequencies on the spectrum is illustrated in Figure 1.3.

Every equipment is tested at full power before delivery to the customer.
The equipment remain well below the stated limits in any working condition with the special shielding devices.

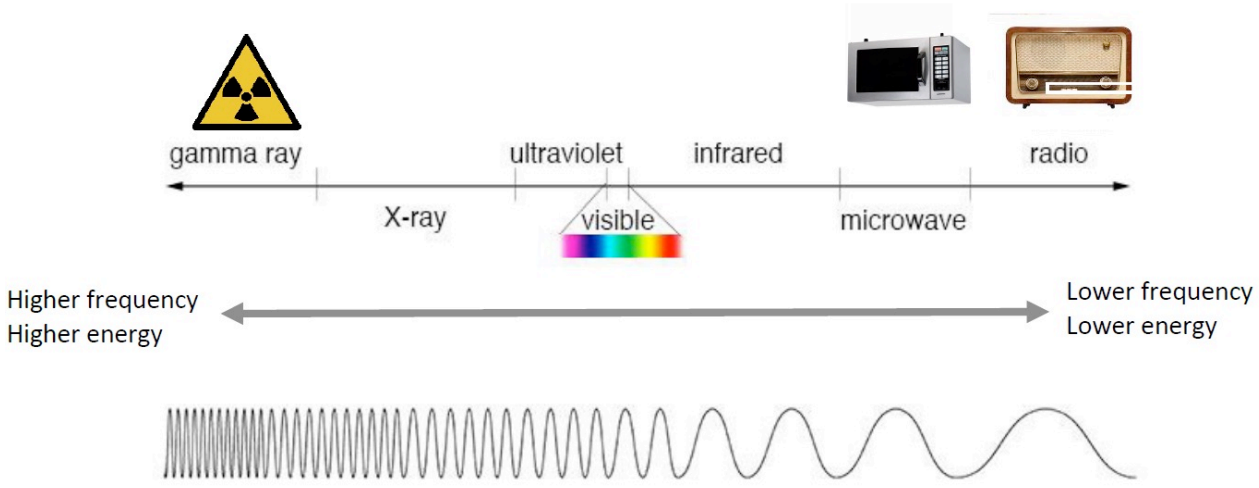


Figure 1.3

2. GENERAL REMARKS

2.1 Introduction

This manual refers to an APEX Radio Frequency system designed and manufactured in compliance with European Norms and Standards for systems constructions and safety (2006/42/CE, 2014/35/EU and 2014/30/EU, EN 12100, EN 60204, EN 61439).

The equipment must be stored and operated in an environment with the following ambient conditions:

Temperature: 15°C ~ 40°C
Relative Humidity: 10% ~ 90% (above dew point)

Personnel involved in installation, use, control, and maintenance of the system must duly read this manual; at least those parts of specific interest.

Keep this manual in a safe place and accessible to anyone operating the system, at any time. If lost or damaged, please contact Ziel Equipment, Sales and Service Inc. immediately in order to obtain a copy.
Ziel Equipment Sales and Services, Inc. and manufacturer decline any responsibility for events generated by failure to read this manual, or non-compliance with its contents.

2.2 Supply limits

Excluded from the supply of Ziel Equipment, Sales and Service, Inc. systems are any civil works in preparing the site, and systems for carrying electrical energy or any other fluids (water, compressed air, steam or overheated water) up to the connection points foreseen on the machine. In this respect, local laws regarding safety standards of civil and industrial systems must be complied with.

Also excluded are works for carrying the air from the outlet mouths of the machines to the outside of the building.

2.3 Technical assistance

Ziel Equipment, Sales and Service, Inc. provides a specialized assistance service for extraordinary maintenance of the systems or their repair.

This service must be requested by email, after duly telephoning the Ziel Equipment, Sales and Service, Inc. Service Department, for each intervention included or excluded from the warranty terms.

Any service not covered by the warranty is completely at Customer's expense, as are any transport costs for the replacement parts, travel, room and board expenses for Ziel Equipment, Sales and Service, Inc. technicians, and will be billed at the foot of the list or personally borne by the same.

2.4 Order of Spare parts

Spare parts for the APEX machine can be ordered from our United States office:

Ziel Equipment, Sales and Service, Inc. **2269 Chestnut St. Suite 226** **San Francisco, CA 94123** **United States of America**	 **Telephone: +1 (888) 612 9895** **Internet: www.zielcannabis.com** **Email: service@zielp.com**

When ordering spare parts please make sure to have the following information available:

- Machine model
- Machine serial number
- Part number and description (If known)
- Quantity required
- Picture of the part

ALWAYS USE GENUINE SPARE PARTS

ALWAYS *use original spare parts supplied by* Ziel Equipment, Sales and Service, Inc. *– do not use parts supplied by any other company.*

Several of the parts listed in the spare parts list are safety related and it is very important that parts with the correct specification are used.

2.5 Glossary

LAYOUT = layout

RF = Radio Frequency

D	Information for the MANAGEMENT
I	Information for the INSTALLERS
M	Information for the MAINTENANCE TECHNICIANS

E	Information for the ELECTRICIANS
O	Information for the OPERATORS
S	Information for Ziel TECHNICIANS

TEXT IN BOLD FONT: indicates an important step

TEXT IN FRAMED BOLD ITALICS: indicates a WARNING

TEXT in DOUBLE-FRAMED BOLD ITALICS indicates a PROHIBITION

3. SAFETY AND ACCIDENT PREVENTION

O E M 3.1 Introduction

APEX 7 RF machines are designed and built to offer the operators maximum safety. However, it is very important to correctly operate the equipment, to avoid the danger caused by mistakes. Anyone operating the equipment must carefully read and follow operator instruction manual.

The operator of this machine must be in good physical and mental health.

Ziel Equipment, Sales and Service, Inc. systems are manufactured to always meet current safety norms in the country where the machine is installed.

O 3.2 Foreseen use (2006/42/CE, EN 12100)

The Ziel Equipment, Sales and Service, Inc. system to which this manual refers to is designed and built for the Radio Frequency thermal treatment of dielectric products.

USE OF THE SYSTEM FOR WORK OTHER THAN THAT STATED ABOVE WITHOUT HAVING CONTACTED* Ziel Equipment, Sales and Service, Inc. *AND HAVING OBTAINED PERMISSION, IS STRICTLY FORBIDDEN.

Any use other than that contemplated by the manufacturer can cause damage to the system, and subsequently to the operator.

The same consequences can also derive from incorrect use of the system due to inadequate training or for other reasons.

M E O **3.3 General safety warnings (EN 12100)**

In order to operate in conditions of maximum safety, it is a very important to carefully follow the instructions and directions indicated in this manual.

During normal operations, follow the rules regarding work positions. In addition, constantly check the material being treated and the location of any tools that might be used for material preparation. Always use personal protective equipment while working with the equipment. Follow instructions carefully in the event of faults or malfunction of the equipment.

Ref. 89/656/EEC
The maintenance staff must be provided with the proper personal protection outfit and must use adequate tools, ladders and any other device required to work in safe conditions. Clothing, gloves and arm guards must be protecting against cuts in compliance with ISO 13999

Foundations are not required. Machine have to be placed on a flat, levelled but anti-slip floor with no obstacles.

THE USE OF THE MACHINE IS STRICTLY PROHIBITED, IF THE SAFETY DEVCIES HAVE BEEN REMOVED, ISOLATED, MODIFIED OR THEIR EFFICIENCY IS REDUCED.

Ziel Equipment, Sales and Service, Inc. maintenance personnel are authorized to check the functionality of the safety devices and to notify the Management (user) of any irregularity detected.

THE INTRODUCTION OF METAL OBJECTS INSIDE TREATMENT CHAMBER IS STRICTLY PROHIBITED.

DO NOT START RADIOFREQUENCY WITH CONDUCTIVE MATERIALS INSIDE TREATMENT CHAMBER.

DO NOT PLACE LIVE ANIMALS OR HUMAN INSIDE TREATMENT CHAMBER

I 3.4 Lighting

The machine is equipped with a lighting system located inside the process chamber. The light will be on when the RF is ON. The electrical cabinet on the RF generator is also equipped with lighting for use when troubleshooting.

The machine must be installed in a suitably lighted room to allow for safe execution of maintenance, repairs and normal operation.

O 3.5 Safety devices on machine

The machine is equipped with safety devices that safeguard the operator. Therefore, if the equipment is used in the conditions described in this chapter, the operator can work without having to use further individual protection systems.

The main **safety devices on the system includes**:

- Main switch circuit, which disconnects the power from mains to the equipment, when any of the doors on the generator cabinet or the electrode chamber are opened.
- Fully automatic protection circuits against overvoltage, discharges in chamber, excessive power output.
- Emergency stop buttons to shut down the entire equipment.
- Filtering and screening devices for reducing the emissions of electromagnetic waves.
- Thermal and magnetic protection on the feed line, the motors and actuators.
- Designated key or tool required for opening any part of the machine.
- Arrangement for fire-extinguishing system. (optional)

O 3.6 Risk or remaining risk zones (2006/42/CE)

The operator must not to wear necklaces or bracelets, and to always close his/her lab coat or apparel when the RF generator is ON.

Note that electromagnetic field can disturb those who uses PACE-MAKER.

O 3.7 Control zones (2006/42/CE, EN 12100)

The designated work positions are shown in Figure 4.2 of Chap. 4, Session [4.2].

Only operate in the designated work zones.

The manufacturer is not responsible for any events caused by absence of the operator from the control panel or load/unload zones.

O 3.8 Periodical checks (2006/42/CE, EN 12100)

All the protection and emergency devices described in 3.5 must be controlled periodically, to ensure functioning correctly. **Every fault detected must be immediately corrected, or reported to** Ziel Equipment, Sales and Service, Inc**. technical assistance. For more information, see Chap.5.**

E M O

3.9 Noise (2006/42/CE)

The noise produced by the equipment is below acoustic pressure of 80 dB (Decible).

> ***Use of individual protection devices (ear protectors, plugs) is not deemed necessary during machine operation.***

To preserve their measured values, perform regular maintenance on moving parts (motors and fans) as these are the main sources of noise.

D

3.10 Reference regulations

For the protection, development and realization of the machine and of this manual, the following regulations and norms were referred to:

3.10.1 *European regulations*

2006/42/CE of the European Parliament and of the Council of 17 May 2006 on machinery and amending Directive 95/16/EC.

2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to Electromagnetic Compatibility.

2014/35/EU of the European Parliament and of the Council of 12 February 2014 on the harmonization of the laws of Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits.

3.10.2 *Harmonized norms*

EN 12100	EN 12198	EN 60204	EN 61439
EN 55011	EN 60519	EN 1672-2	EN 13849-1

D

3.11 Electromagnetic radiation safety notes

The RF equipment can process the designated product using the electromagnetic field created inside its chamber at the I.S.M. frequency of 27.12 MHz. The heat is generated by interaction between the product and electromagnetic field.

The mechanical and electric safety aspects of the equipment are in compliance with the European regulations and the equipment is the CE marked.

The safety of the operators working around the machine is according to the European norm No EN 12198.

The equipment object of this manual, in its working frequency range, complies with the following limits

E (Electric field) < 61 V/m
H (Magnetic Field) < 0.16 A/m

The use of special shielding built-in devices keeps the equipment within limits in any working condition.

According to EN 12198, the equipment is classified as category 1. An equipment in category 1, do not require any additional personal protective equipment to be operated.

Every equipment is fully tested before delivery to the customer.

D 3.12 Fire accident prevention

When applying RF to a product, there is a chance of overheating, scorching and, in extreme cases, burning/fire may happen. It is important to know:

1) Why and how above mentioned incidences may happen
2) How they can be avoided
3) How the RF equipment can be protected in case of such events

1) RF waves generate heat directly inside the materials through oscillation of polar molecules. Different molecules behave differently when exposed to RF waves, i.e. some molecules can be heated easily even by very weak RF fields, while other molecules heat up very slowly, in the same RF field. Mistakes happens when:

- the product is exposed to RF field for too long, so that the product is reaching to very high temperatures;
- two or more products with very different heating properties are inside the RF chamber, so that one of the product could reach high temperatures, while the rest have not been fully processed;
- a piece of conductive metal is inside the product, which can cause local concentration of RF waves, and thus overheating and even arcing;
- a piece of ferrous material is inside the product, which can cause localized heating, and thus overheating and burning;

In the above situations the product or a part of the product may overheat, scorch and even burn. Therefore the product could be damaged. If the damaged product is not removed from the processing chamber or the fire is not extinguished promptly, the damage could extend to the RF equipment.

2) Considering that RF machines are extensively used worldwide for many applications, it is clear that these machines can be used safely and effectively. The above explained dangerous situations should be avoided, by making sure:

- the product input condition is even and constant (especially starting temperature), so that a **uniform / consistent product** is fed to the RF equipment;

- the process time for each different product is calculated and set accordingly, so that over-processing is avoided;
- products with different sizes, properties and composition are fed to the processed separately;
- **No (conductive) metal pieces** inside the processing chamber.

The above are very simple operational rules that can easily be implemented with no difficulty even by relatively unskilled workers.

3) In the rare cases that fire happens, Ziel offer some specific safety features along with the RF equipment.

The **fire protection systems** are described below. On the other hand, specific fire-fighting systems are also provided, with different automation levels.

A. The first protection level consists in the installation of the CO_2 distribution pipe inside the processing chamber. This is supplied by Ziel Equipment, Sales and Service, Inc. free of charge in all newly manufactured machines. The customer has just to connect the CO_2 bottle supply to this pipe, through a manually operated valve. In case of accidents, the operator can activate the valve after shutting down the machine through the emergency stop push button.

B. The second protection level is similar to the above system, but allow the customer to install an electrically controlled CO_2 valve and integrated with additional electrical valves to cut the air flow generated by the exhausters/fans. The whole system is activated, in case of an accident, by a single glass protected push button placed near the control panel. This switch also shut down the entire machine.

C. The third level is the automatic activation of the fire extinguishing system described at the point B, by fire or smoke detection devices. With these devices, the system is fully automatic and does not rely on the operators' presence, thus giving full protection to the machine in all circumstances. This protection level is usually recommended in the case of fully robotised processing lines without operators around.

IF THE MACHINE IS PROPERLY CONNECTED TO AN AUTOMATIC FIRE FIGHTING GAS RELEASE SYSTEM, IN CASE OF FIRE EMERGENCY THE OPERATOR, CAN ACTIVATE THE SYSTEM BY PRESSING ON THE "PRESS GLASS" FIRE SYSTEM BUTTON.

E M O **3.13 Metal detector**

It is necessary to ensure the product entering RF chamber is free of any conductive and ferrous material. A metal detector with the following detection limit should be utilized right before the product enters the RF processing chamber.

Required detection limit for metal detector:

Conductive material 5mm

Ferrous material 1mm

Note: To choose the suitable metal detector for your product, always discuss the product presentation with the metal detector manufacturer.

4. APEX 7 OPERATION MANUAL

M O 4.1 Introduction

Below is a simple explanation of the basics of RF processing: the functional principles of the RF equipment:

– RF Thermal treatment of dielectric products (poor electric conductor) by applying an electromagnetic field generated between the electrodes in the process chamber. Therefore, the RF generator must be ON to obtain the heating;

– Equipment output power depends on the **product quantity under the electrodes: Any variations in the product quantity and nature, can cause rises or falls in the power output, for that reason the generator does not always deliver maximum power, and the power level is not constant. Therefore,** it is very important to minimize the product variation as much as possible and to always follow the same loading procedures;

– Treatment time, must be calibrated according to application and product specification during process setting.

– It is always **risky to leave the machine unsupervised when the product is inside the process chamber and RF generator running. Unsupervised equipment always increase the chance** of overheating and or partially or completely burning of the product.

M | O

4.2 Work position

***During machine operation, work only in the zones indicated in THE WORK POSITIONS* (2006/42/CE, EN 12100)**

During normal operations, follow the rules regarding work positions (See Figure 4.2). In addition, constantly check the material being treated and the location of any tools that might be used for material preparation. Always use personal protective equipment while working with the equipment. Follow instructions carefully in the event of faults or malfunction of the equipment.

Always keep the machine and surrounding work area clean and free of objects or materials that may hinder the movement of personnel in operations of normal use and maintenance, or emergency conditions.

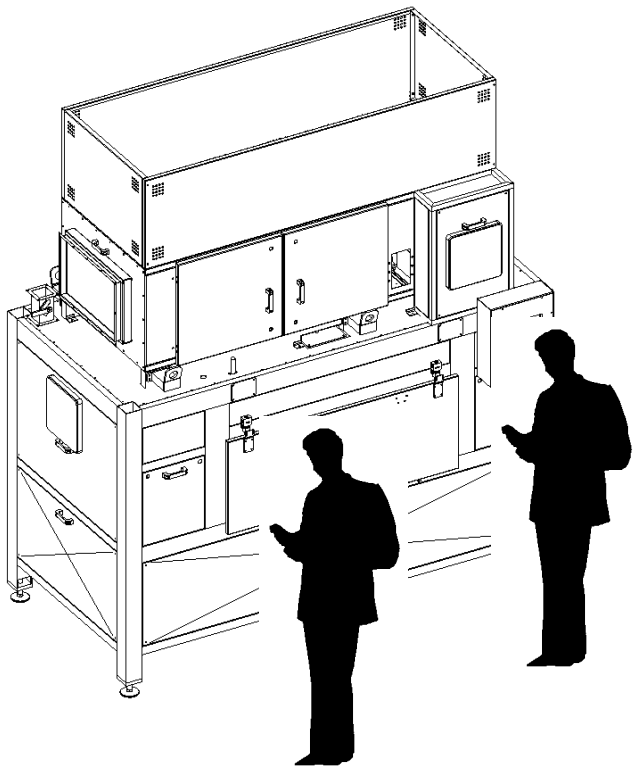
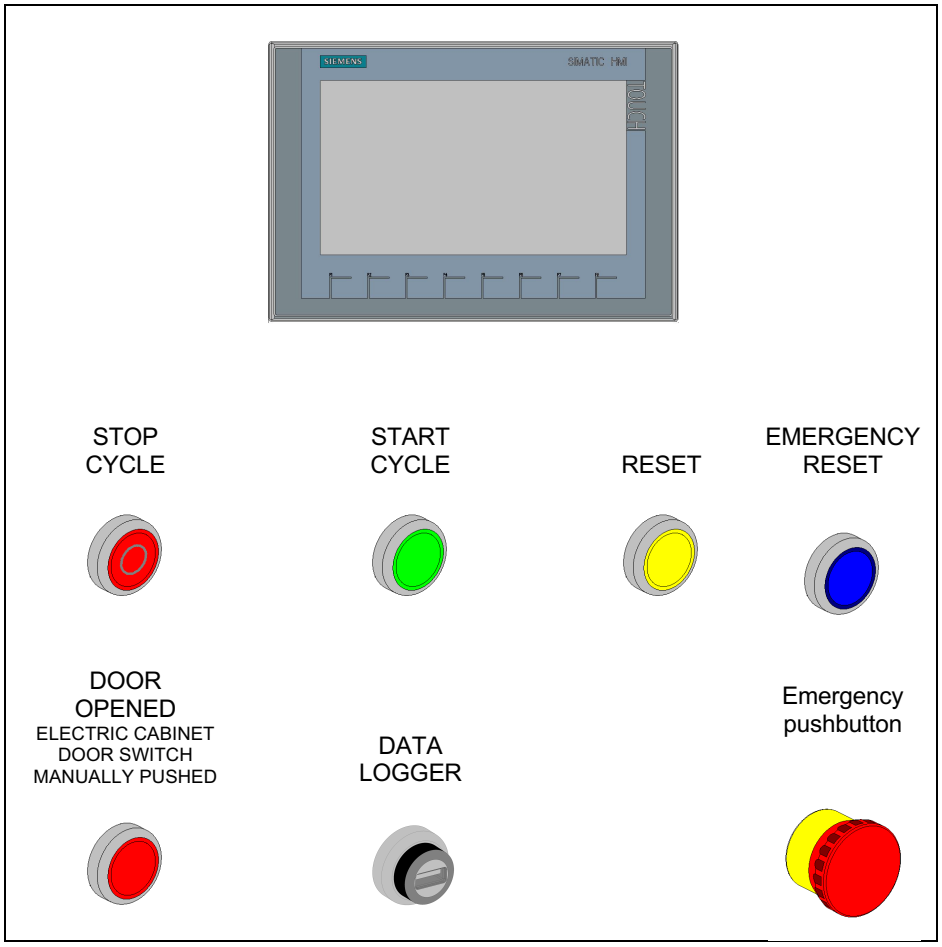


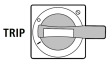
Figure 4.2. WORK POSITIONS

M O **4.3 Control Panel** (2006/42/CE, EN 12100)



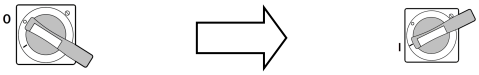
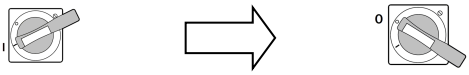
4.3.1 ***Power main switches***


ON position

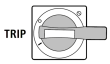


TRIP position

OFF position

From OFF to ON	***From ON to OFF***
	

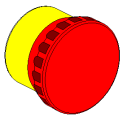
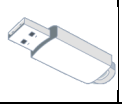
DO NOT TURN ON FROM TRIP POSITION



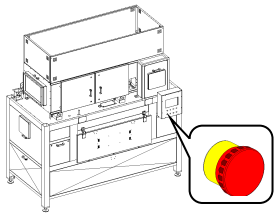
TRIP position

RESET


ON position

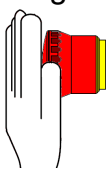
STOP CYCLE  START CYCLE 	Cycle start and stop pushbuttons.
RESET 	Door emergency relay reset Alarms reset pushbutton
EMERGENCY RESET 	Emergency reset push button to restart machine after an emergency system activation
	Emergency pushbutton
DOOR OPENED ELECTRIC CABINET DOOR SWITCH MANUALLY PUSHED 	Red light is on if electric cabinet door is opened and control limit switch is manually pushed to enable machine.
DATA LOGGER  USB FLASH DRIVE 	USB socket is installed. USB flash drive can be inserted to store data using data-logger function on HMI.

4.3.2 ***Emergency pushbutton***



Normal

Push to activate emergency



Pull to enable reset emergency

After EMERGENCY MODE ACTIVATION, it is necessary to CLOSE all the doors before push **EMERGENCY RESET** button. The positions of emergency stop pushbuttons were presented in Enclosure 8.2.

4.3.3 ***Emergency reset pushbutton***

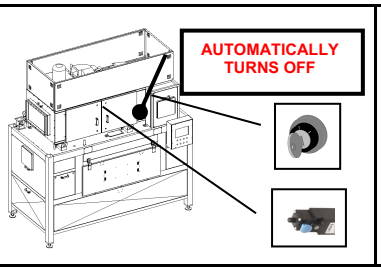
EMERGENCY RESET 	If blue light is ON machine is in EMERGENCY mode Push button to reset EMERGENCY MODE. If blue light is OFF you can turn ON switches.

After EMERGENCY MODE ACTIVATION, it is necessary to CLOSE all the doors before push emergency reset button.

4.3.4 ***Cabinet door opening/ closing procedure***

ELECTRIC CABINET DOOR OPENING INFORMATIONS

If electric cabin door is opened machine automatically turns off in emergency mode.

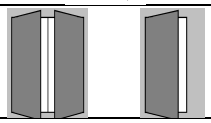
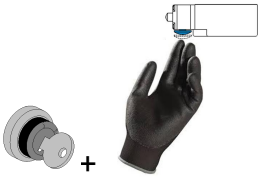


DOOR OPENING OFF ON 

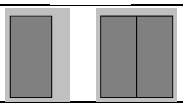
Selector key with automatic return to OFF if released

Door closed position switch. Blue pushbutton onboard to simulate door closed state

DOOR OPENING PROCEDURE WITHOUT STOPPING THE MACHINE

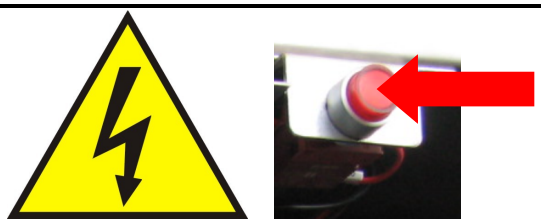
Rotate selector “DOOR OPENING OFF ON” in ON position (keep selector in ON position)	DOOR OPENING **OFF** ON 
Open the door (keeping selector in ON position)	
Push the blue pushbutton on switch (keeping selector in ON position)	
Release selector “DOOR OPENING OFF ON” in OFF position	DOOR OPENING **OFF** ON 

DOOR CLOSING PROCEDURE WITHOUT STOPPING THE MACHINE

Rotate selector “DOOR OPENING OFF ON” in ON position (keep selector in ON position)	DOOR OPENING OFF **ON** 
Close the door (keeping selector in ON position)	
Release selector “DOOR OPENING OFF ON” in OFF position	DOOR OPENING **OFF** ON 

If RF treatment chamber door is opened, RF heating and fans are not energized.

Only with door closed cycles can works

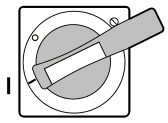
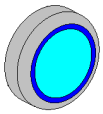
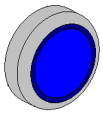


When this light is flashing voltage is present inside electric cabinet

M O **4.4 Work Cycle** (2006/42/CE, EN 12100)

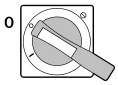
4.4.1 Turning on the equipment

The sequence to turn on the equipment is as following:

Turn "I" main switch 	Turn on machine main supply
Light ON Emergency status  Light OFF Emergency is reset 	Press the button “EMERGENCY RESET” if it is lit on. In case the button blue light does not turn off, check the proper closing of all the machine doors.
RESET 	Press yellow RESET pushbutton: if no alarms are present, you should be ready to run the machine;
	Select the “Processing Page” (see chapter 4.5);
STOP CYCLE  START CYCLE 	Push the green buttons to start the cycle;

4.4.2 ***Turning off the equipment***

The sequence to turn off the equipment is as following:

STOP CYCLE 	The process will stop automatically when the temperature reaches the set limit, or the process time expires. If necessary, the process can be manually stopped by pressing the red “Stop Cycle” button.
Empty the process chamber of all the product.	
Wait about 2 minutes for the remaining humidity to escape the process chamber	
Turn "O" main switch 	Turn off machine main supply

THE INTRODUCTION OF METAL OBJECTS INSIDE TREATMENT CHAMBER IS STRICTLY PROHIBITED.

DO NOT START RADIOFREQUENCY WITH CONDUCTIVE MATERIALS INSIDE TREATMENT CHAMBER

DO NOT INTRODUCE LIVE ANIMALS OR HUMAN INSIDE TREATMENT CHAMBER

4.5 PLC Operations (2006/42/CE, EN 12100)

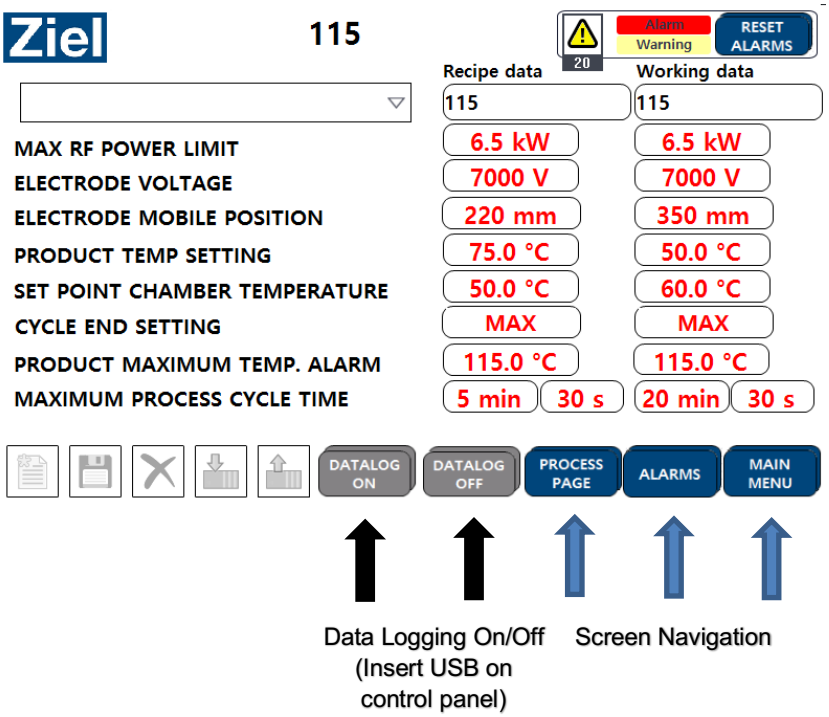
4.5.1 Login

When powered up, the HMI will load the **User Login** screen.

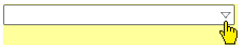
	Press **LOGIN** to enter user credentials. (Credentials will be provided by Ziel during installation)
	Enter credentials based on the user of the machine. (Operator or Supervisor)

4.5.2 ***Recipe Management***

Selecting and creating recipes. Creating recipes is restricted to Supervisor level access.



Saved recipes can be selected from the drop-down box.



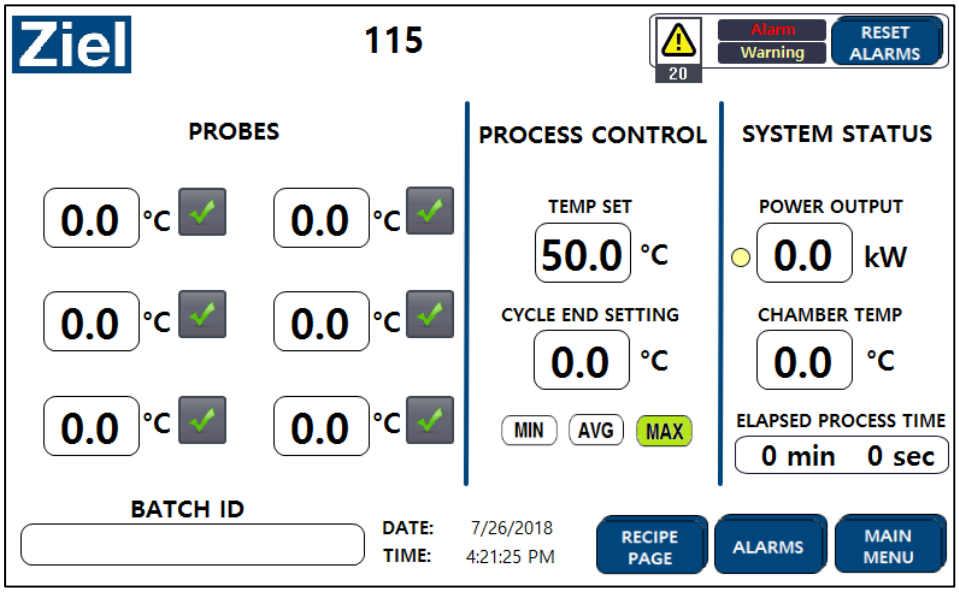
To use the selected recipe, press the **Download Recipe Data** button.

To create a new recipe, press the **New Recipe** button. Enter the parameters under the **Recipe Data** column. After entering the parameters, save the recipe.

To delete a selected recipe, press the **Delete Recipe** button.

- New Recipe 
- Save New Recipe 
- Delete Selected Recipe 
- Download Selected Recipe Data 
- Upload Working Data 

4.5.3 ***Processing Page***



0.0 °C — Live reading of each fiber optic probe. The probe can be bypassed by pressing the green check mark.

TEMP SET 50.0 °C — This displays the temperature at which the process will shutdown, set in the recipe screen.

CYCLE END SETTING 0.0 °C — This displays the selected min, max or avg temperature of the 6 probes, based on the recipe setting.

MIN AVG MAX — Highlights the value that is being displayed in the cycle end setting window. Set in the recipe settings.

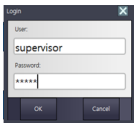
POWER OUTPUT 0.0 kW — Displays the RF power output, kW (killowatts).

CHAMBER TEMP 0.0 °C — Displays the processing chamber air temperature.

ELAPSED PROCESS TIME 0 min 0 sec — Displays the remaining processing time of the maximum set cycle time.

BATCH ID — Data box to enter processor batch ID or product specific data that will be saved in the daga logger.

4.5.4 ***Step by step Operation***

1. Power-up the APEX machine using the primary disconnect on the machine.
2. Place product into the processing chamber. (see 4.5.5)
3. Insert the fiber optic probes.
4. Close the processing chamber door.
5. Reset the emergency safety circuit (Blue Button). 
6. Reset alarms (Yellow Button). 
7. If not done already, log into appropriate user. 

8. Go to the **Recipe Page** and select a recipe. 

9. Check all settings and make sure they are correct and download recipe to PLC. 
10. Make sure the flash drive is in the USB pot for data logging.
11. Press the green **Start Cycle** push button. 
12. Monitor the temperature rise of all fiber optic probes. If a specific probe is not inside the product, that probe can be disabled by unchecking the green check next to the probe reading. 

13. When the process cycle completes, open the process chamber door.
14. Remove the fiber optic probes.
15. Remove product from processing chamber. (see 4.5.5)

4.5.5 Product Loading and Unloading

Material Requirements

Bags:

- FDA approved,
- BPA free,
- 100% Food Grade,
- Nylon material rated to 150C minimum.
- Sample Sites: Buddy Bag Co. True Liberty Bags

Totes:

- Polypropylene totes with lids, FDA approved, 100% Food Grade (supplied with the machine). If a differen

1. Place the product in the nylon bag and tie the bag, or inside the polypropylene tote supplied with the machine.
2. Place the bag(s) or the totes in the RF chamber under the electrode, ensuring all corners of the bag (s)/totes are fully under the electrode.

   Note: Leave one inch space between the edge of the bag and the edge of the electrode. If using the tote, ensure the tote is pushed back to reach to the stoppers in the back of RF chamber and is fully under the electrode.
3. Sanitize the tip of fiber optic probe.
4. Insert the sanitized fiber optic probe inside the product in the bag/tote to monitor the temperature.
5. If using the tote, place the lid on the tote.
6. Close the process chamber door.
7. Select and upload the recipe on HMI.
8. Start the cycle.
9. Once the cycle is finished, first remove the fiber optic probes then remove the bag/tote from the process chamber.
10. Place the bag upside down on the rack to cool at room temperature for one hour. Alternatively place the tote upright on the rack to cool at room temperature for one hour.

4.5.6 *Instruction to Save Process Data*

1. Insert a flash drive (memory stick) in the DATA LOGGER port (USB) located on the control panel of APEX7kW.
2. Before starting the cycle, enter the lot number of the product to be processed on HMI using alphabetic and numerical character.
   Example: 12345 or Lot 25.
3. Start the process by pressing start cycle button on HMI.

Note: As soon as cycle starts, the data will be captured directly on the flash drive. Once the cycle is ended the data log automatically will stop.

4. Enter the lot number for the next batch of product to be processed and start the cycle. The process data will be saved automatically on the flash drive.
5. At the end of the day/shift remove the flash drive from DATA LOGGER port and download the data.

Note: Data is saved on “CSV” format which can be opened on excel file.
The csv file is automatically named by real date and time of the day that the data log has ended.

Example: DATALOG20181112140434
The data log has stopped on November 12, 2018 at 14:04:34 PM.

4.5.7 ***Instruction to Download Data***

1. Open a new workbook on Excel.
2. On data page choose “from text”.
3. Select the file you are planning to download on the flash drive.
4. Text import wizard window will pop up.
5. Make sure the file origin shows: Windows (ANSI). Adjust if needed.
6. Choose “Delimited”, then press “Next”.
7. Choose “semi colon” then press “next”, “next” and “finish”.
8. Import the data in a “new worksheet”.
9. Save the file as excel file on your computer.

4.5.8 ***Trend Page***

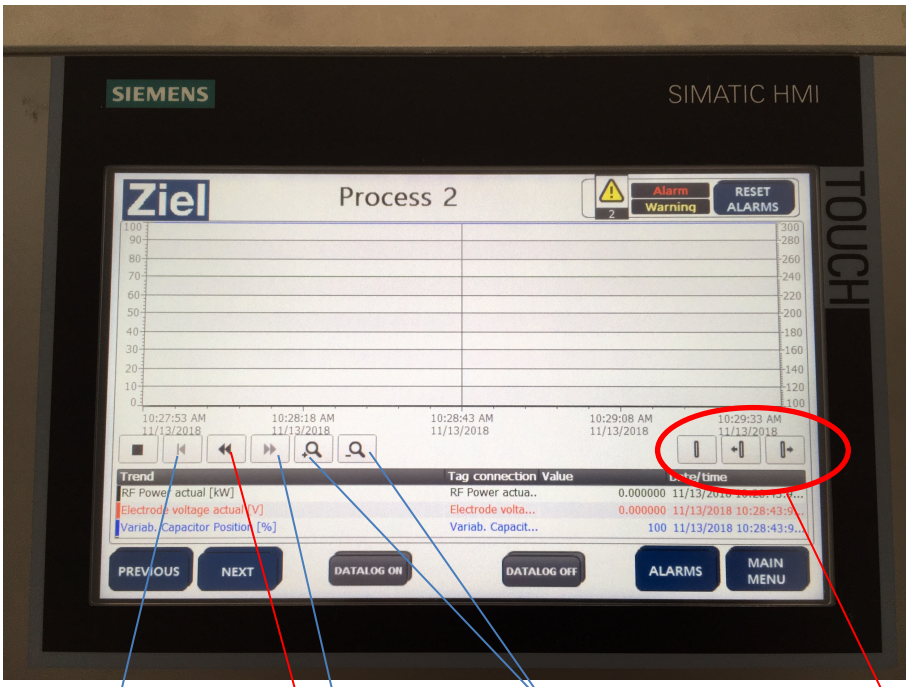
Trend Page has three screens:

Page 1: shows the trends for product temperatures from six fiber optic probes, chamber actual temperature.

Page 2: shows the trends for Process cycle status, Chamber heating status, RF generator status.

Page 3: shows the trends for actual RF power, Actual electrode voltage and variable capacitor position.

The description of soft buttons on Trend page is shown below.



To Zoom in and Zoom out of the trend graph on the screen

To move the indicator column to left and right to read the actual values for specific points on the trend graph.

To fast backward the trend graph to look at data from previous runs

To fast forward the trend graph

To go to the beginning of the Data trend

If “DATALOG ON” is pressed the equipment will save the data on the flash drive continuously. Independent of cycle being ON or OFF.

For example if you require the data between two cycles.

Press “DATALOG Off” to stop recording.

M | O **4.6 Controls and inspections** (2006/42/CE, EN 12100)

During machine operation, the introduction of different type of product will cause variation on the power delivered.

It is advisable to always place two CO_2 fire-extinguishers near the equipment as a precaution.

M | O **4.7 Cleaning** (2006/42/CE, EN 12100)

Cleaning of the machine and keeping it clean is the first requirement for a safe use.

During machine operation, the operator must take care to keep the work and control positions clean. Ensure there are no points of contacts between electrodes and the product by checking inside the RF chamber through window from designated working position.

5. MAINTENANCE

M E I 5.1 Introduction

The information contained in this chapter is fundamental to the correct and safe maintenance of APEX RF Machine.

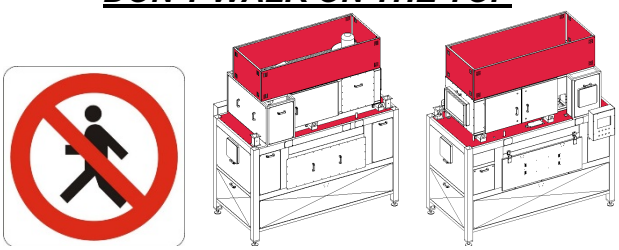
The maintenance technician must duly read all the contents of this chapter

Ref. 89/656/EEC

The maintenance staff must use personal protection equipment and proper tools, ladders or any other device to work in acceptable safe conditions

Clothing, gloves and arm guards must be protecting against cuts in compliance with ISO 13999

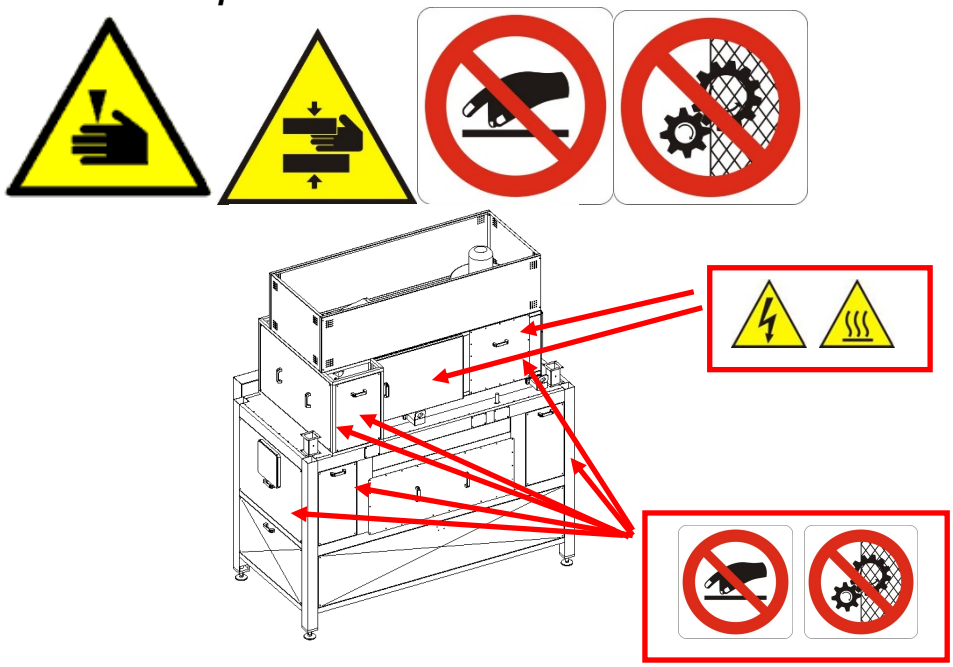
DON'T WALK ON THE TOP

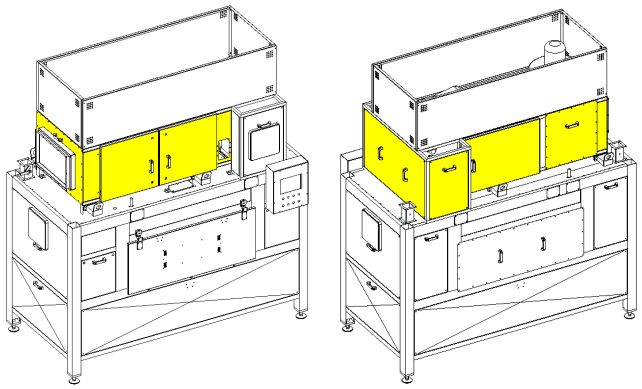


FALL DANGER ***FALL DANGER***

THE USE OF THE MACHINE IS STRICTLY PROHIBITED, IF THE SAFETY DEVCIES HAVE BEEN REMOVED, ISOLATED, MODIFIED OR THEIR EFFICIENCY IS REDUCED.

DANGER ZONES
if machine parts are removed for maintenance



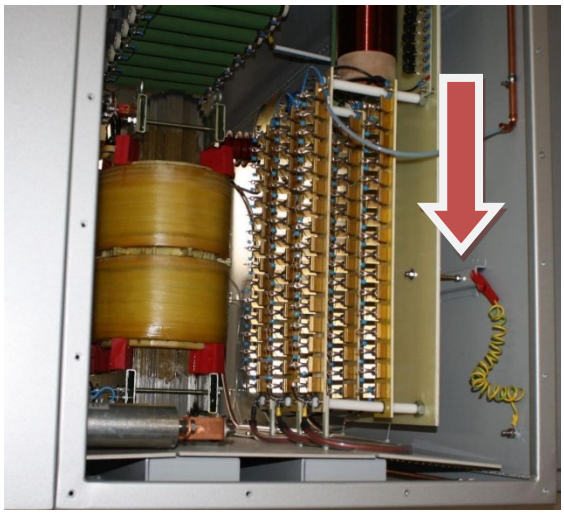


Inside the main transformer cabinet and the generator cabinet, even after having cut off the power, RF filters and capacitors can stay electrically charged for a long time.

DANGER
ELECTRIC SHOCK

Before touching any of the parts in the high voltage cabinet, it is mandatory to attach the prearranged earth connection clip to each of them

CLIPS EXAMPLE IMAGE



The following explanations refer to operations and steps to be carried out for routine, preventive and extraordinary maintenance of the system based on indicated time cycles. Routine and preventive maintenance of the system is done to ensure the equipment is operating in optimal conditions. The extraordinary maintenance is for replacement of broken or worn out parts.

M E I

5.2 Routine Maintenance (2006/42/CE, EN 12100)

Routine maintenances are very simple, but extremely important for correct functioning of the system. They must not be neglected, and must be carried out carefully and regularly.

M E I

5.2.1 *Maintenance of the Mechanical Parts*

Routine mechanical maintenance must be carried out by specialised mechanical personnel.

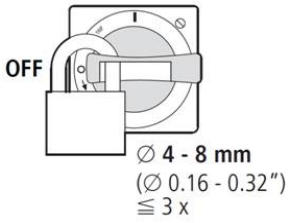
The carrying out of mechanical maintenance with main switches ON is strictly prohibited.

Inside the cabins of transformers, panels, oscillating circuits and the processing cabinet marked by special signs, indicating there are parts, which reach high temperatures during machine operation.

Do not perform any work near these parts until several hours after the machine has been turned off.

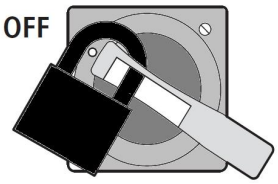
Use heat resistant gloves for all operations carried out inside the processing cabinets, generators and transformer cabins.

During maintenance operations lock in the main switch on off position to prevent unexpected dangerous activations



Even when the main switch is off, voltage is still present on some wires and devices.

EXTERNAL MACHINE SUPPLY LINE SWITCH



locked

To isolate machine from external electrical supply, turn off and lock the external supply main switch

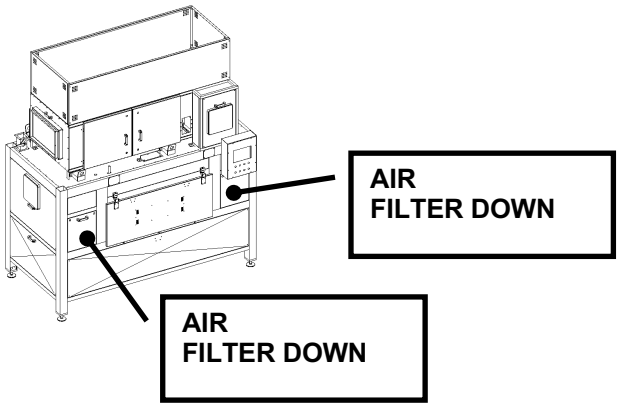
5.2.1.1 ***Daily Maintenance***

- check the process chamber to remove parts of products and evaluate the need of a complete machine cleaning

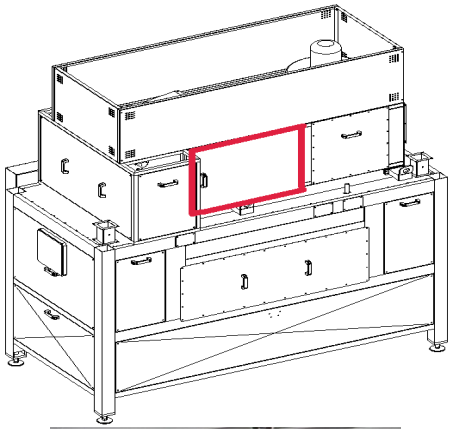
Pay particular attention to the inductances and other details of the material inside the chamber, because they can become very hot after a few minutes running the machine.

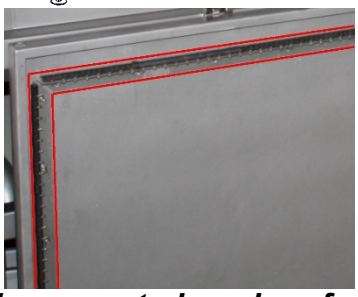
5.2.1.2 ***Weekly Maintenance***

- Clean and replace (if necessary) the FILTERS of fan/aspirators air intakes; use compressed air and/or specific detergents for surfaces of the filters and their stainless steel bases;



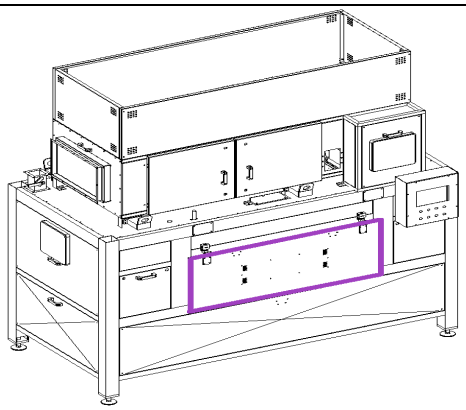
- Check the condition and the proper electrical contact between the door frames and the copper finger strips installed on the respective doors.





Strips mounted on door frame

Spare part roll of strip
Code A3100004



Conductive gasket
Code A22D0050

 ***Box of Rivets*** ***Code A01EJ003***	

Such devices are very important for the stable working of the RF generator and for the shielding action against the electromagnetic waves generated in the machine. If necessary, change the copper finger strips and polish the contact parts of the door frames.

5.2.1.3 ***Maintenance to be carried out every four months***

- Clean off dust and any other impurities, foreign materials from the rotating unit of the product chamber exhausters.

M E I

5.2.2 *Maintenance of the Electrical Parts*

Operations of regular electrical maintenance must be carried out by specialized electrical personnel.

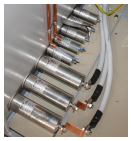
The carrying out of electrical maintenance operations with main switches ON is strictly prohibited.


The parts inside the transformers, panels, oscillating circuits and processing cabinets reach high temperatures during machine operation and marked by caution signs.

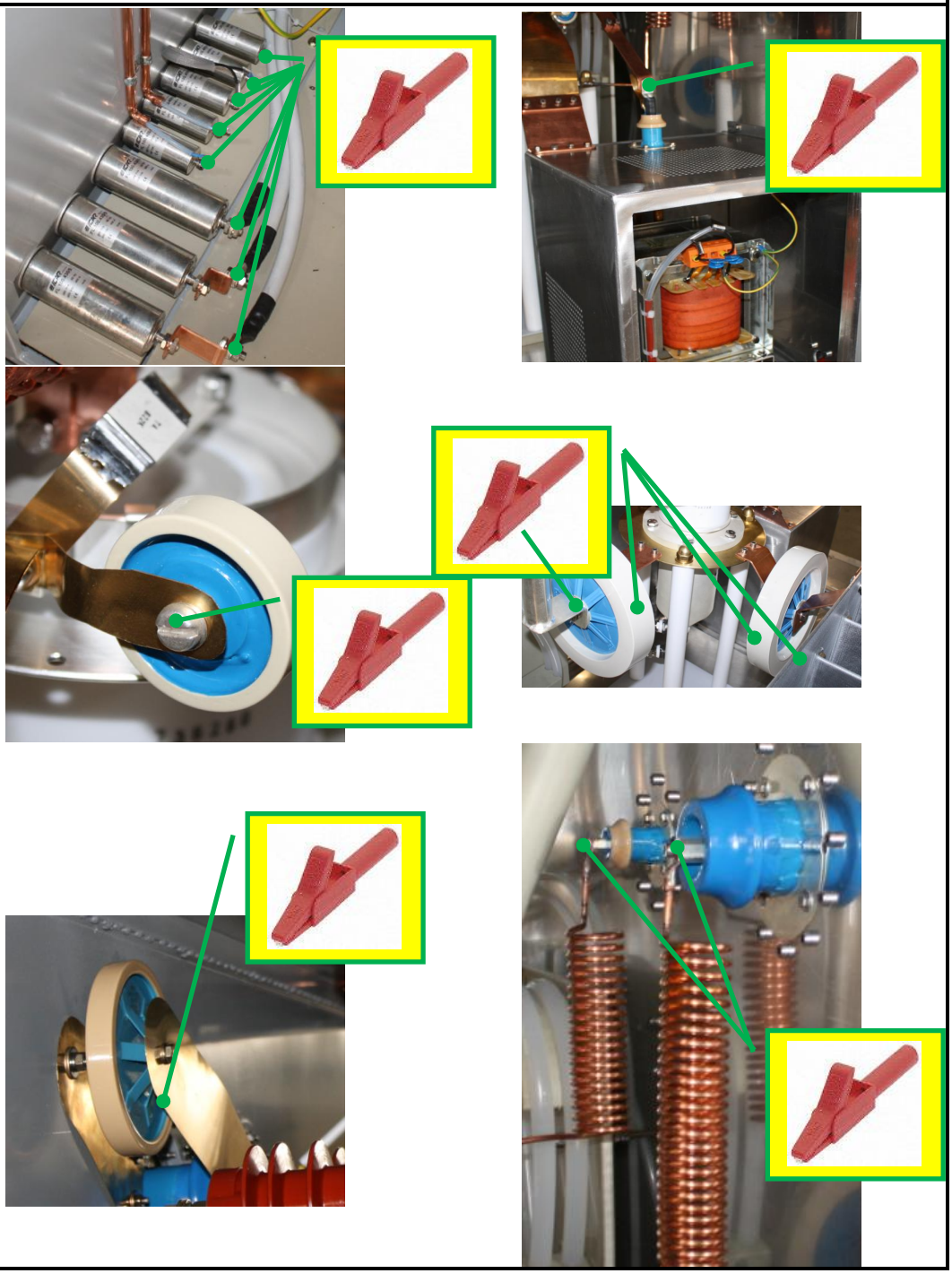
Do not perform any work near the marked parts until several hours after the machine has been turned off.

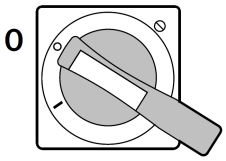
Use heat resistant gloves for all operations carried out inside the processing cabinets, generators and transformer cabinets.



CAPACITORS

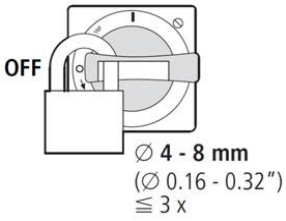




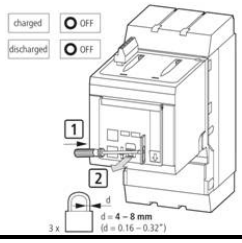
Before carrying out any type of operation disconnect all main switches, and block them in position **O**. This is to prevent other operators from turning ON the power to the generator during maintenance.

During maintenance operations lock in the main switch on off position to prevent unexpected dangerous activations.

manual command on machine
(if remote command not mounted)

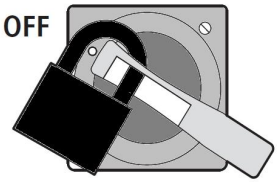


remote operator on machine
(if remote command mounted)



Even when the main switch is off, voltage is still present on some wires and devices

EXTERNAL MACHINE SUPPLY LINE SWITCH

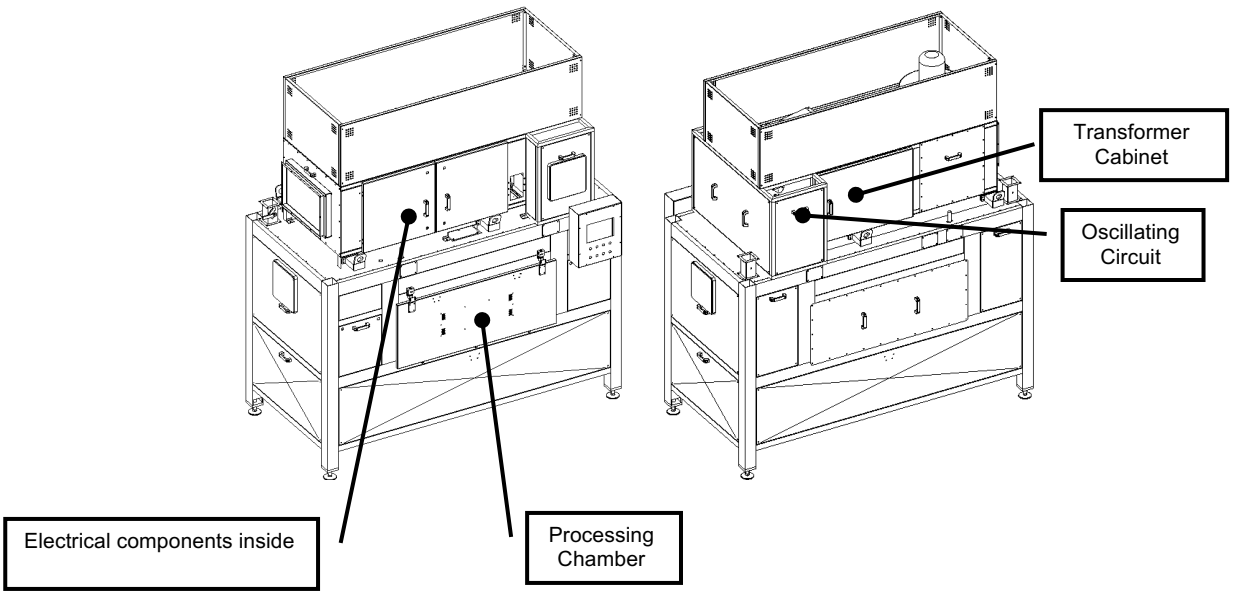


locked

To insulate machine from external electrical supply, turn off and lock the external supply main switch

5.2.2.1 ***Maintenance to be carried out every two months***

- Check the efficiency of electrical contacts inside the panels. Also check the cleanliness of parts under voltage, the fixing of nuts and bolts tightening the contacts, the good state of power and signal wires, general cleanliness inside the panel.
- Check and, if necessary, tighten the nuts and bolts clamping the ends of all wires and electrical components inside the transformer cabinets and oscillating circuits, the state of power wires, the fixing of bolts clamping the inductances and the laminated brass strips. Check and eventually clean where necessary, inside the mentioned cabinets.
- Check, and if necessary, fix the bolts clamping the inductances and those clamping the laminated strips inside the processing cabinet.



M | E | I **5.3 Extraordinary Maintenance** (2006/42/CE, EN 12100)

The most important part of the equipment is the triode.
The triode's life dependents on how hard (hours and power) the equipment is used.

M | E | I **5.4 Lubricants** (2006/42/CE, EN 12100)

All lubricants used in the moving parts should be food grade and complied with the user's SOP.

M | E | I **5.5 Fiber Optic Temperature Sensor Calibration Procedure**

Fiber optic probes come with certificate of calibration from the probe manufacturer. Once the probes are connected to the equipment, the accuracy of their reading have to be verified and adjusted. In addition, the probe calibration has to be verified annually or according to customer requirement.

5.5.1. Required tools:

- Certified calibrated thermometer with temperature range of 0-100°C and increment of ≤0.2 °C.
- Water bath or dry well temperature calibrator.
- Water at room temperature.
- Fiber Optic Calibration Test Report Form.

5.5.2. Procedure:

1. Turn on the main power switch. On the main screen select "PROCESS PAGE".
2. Take one of the six fiber optic temperature sensors and record the serial number and HMI probe number in the Fiber Optic Calibration Test Report Form.
3. Place the certified calibrated thermometer and the fiber optic temperature sensor to be calibrated side by side, in a clean container with boiling water and make sure the tips of certified thermometer and fiber optic sensor are not touching each other or the container walls.

Note: A dry well temperature calibrator can be used alternatively if available. Set the

dry well temperature to desired temperature (100 °C for high temperature calibration and 20°C for room temperature calibration) and wait for the well to reach the set temperature before inserting the temperature probes.

4. Wait for the temperature readings of certified thermometer and fiber optic probe to be stable, then record the temperatures in Table 1 in Fiber Optic Calibration Test Report Form.
5. Do not remove the certified thermometer and fiber optic from the water (or dry well), wait for 20 seconds and record the temperatures in Table 1.
6. Repeat the above step.
7. Remove the fiber optic sensor.
8. Calculate the average temperature for each column.
9. Calculate the correction factor using the following formula:
   (average of fiber optic reading minus average of standard reading = correction factor).

   If the correction factor is +/-1°C, no action is required.

   If the correction factor is between +/- (1 – 4)°C go to step 5 for offset adjustment.

   If the correction factor is greater than +/- 4°C, replace the fiber optic temperature sensor.

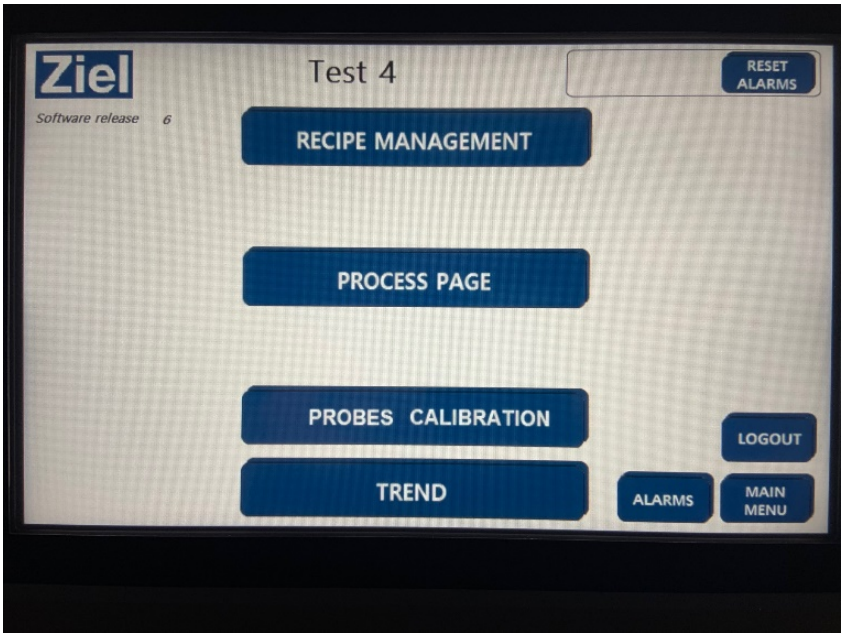


Figure 1. Main page

10. On the main screen select the “PROBES CALIBRATION” (Figure 1).
11. On the PROBES CALIBRATION page, enter the correction factor value in the right hand box corresponding to the probe number. (Figure 2).

    For example:

    If probe 6: correction factor is 2.1, enter 2.1 on the corresponding box.

    If probe 3: correction factor is -0.9, enter -0.9 on the corresponding box.

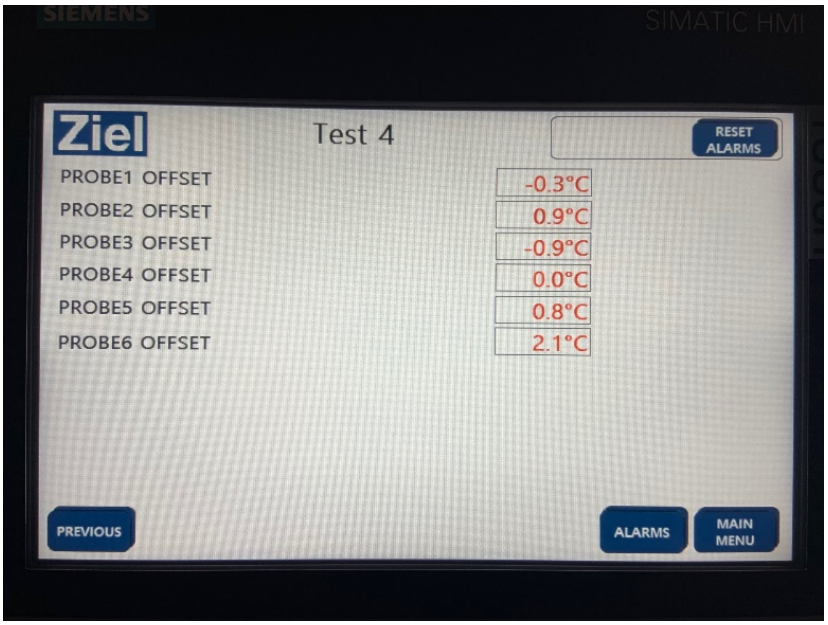


Figure 2. Probes calibration page.

12. Once all the values are entered, repeat the steps 2 - 7 and record the temperature readings in Fiber Optic Calibration Test Report Form **Table 2**.

    The acceptable accuracy deviation is +/-1°C. Any temperature probes that does not meet the criteria after offset adjustment, should be replaced.
13. Repeat step 2-8 with room temperature water or drywell set at 20°C.
14. Calculate the correction factor.

    The acceptable accuracy deviation is +/-1°C.

5.6 Fiber Optic Calibration Test Report Form

Test Date: _____

Equipment model and serial number:

Certified standard thermometer description: _____
Certified standard thermometer calibration due date: _____

Fiber optic temperature sensor serial number: _____
Fiber optic temperature sensor # on HMI: _____

Table 1.

Standard Thermometer (°C)	Fiber Optic (°C)	Correction factor (average 2- average 1)	Offset required Y/N
average1:	average2:		

1 average of three temperature readings for Standard Thermometer.
2 average of three temperature readings for Fiber Optic

If Offset required:
Off set value: _____
Date applied: _____
Verification after Offset date: _____

Table 2.

Standard Thermometer (°C)	Fiber Optic (°C)	Correction Factor (average FO- average ST)	Pass/Fail
average1:	average2:		

Table 3.

Calibration Summary:	
As Found (Check One):	**As Left (Check One):**
☐ Found In Tolerance (Pass)	☐ Left In Tolerance
☐ Found Out of Tolerance (Fail)	☐ Left Out of Tolerance
☐ Found Broken	☐ Left Broken
☐ Could Not Locate	☐ Removed from Service
☐ As Found Data Not Required	

Table 4.

Approval:	
Instrument/System ID/ serial number	
Technician's Signature/Date:	
Engineering / Maintenance Management (or Designee) Signature/Date:	

6. DIAGNOSTICS

6.1 **Control panel alarms** (2006/42/CE, EN 12100)

Every alarm has a simple description to help with troubleshooting from the HMI.

> ***Carry out any maintenance operations following an alarm with machine completely off.***

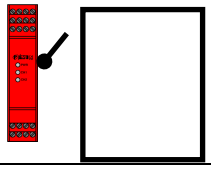
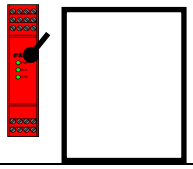
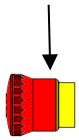
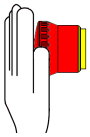
6.2 Troubleshooting main alarms

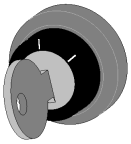
Alarm	Help
O/L Cabin Exhauster Switch (O/L = Over Load)	The magnetic thermal switch of the cabin exhauster is open. Check the running of the motor and its current absorption.
O/L Filament Switch	The magnetic thermal switch of the triode filament supply is open. Verify the continuity between the triode filament connections and the condition of the filament transformer located in the generator box.
O/L Main Transformer Exhauster Or Main Transformer High Temperature	The magnetic thermal switch of the transformer exhauster is open. Check the running of the motor and its current absorption. - The temperature into the main transformer box is too high. Eventually check the running of the transformer exhauster on the top of the machine and the side transformer box air filters.
O/L Triode Exhauster	The magnetic thermal switch of the triode exhauster is open. Check the running of the motor and its current absorption.
Triode Pressure Low	The differential pressure sensor has detected a too low triode air cooling flow. Check the proper running of the triode exhauster motor and its current absorption. Check the condition of the air filters located on the machine. If needed, clean the filters with compressed air.
High RF Power Alarm	The power delivered has exceeded the machine maximum power or an electric arc has happened inside the machine. Activate “kW-“ for a few seconds and start RF again. If the generator stops suddenly, check inside the generator box and look for any black marks on the components caused from high voltage sparks.
High Grid Current	The triode grid current is too high. Activate “kW+” button for a few seconds and start the RF generator. If the alarm is activated again and again, the grid inductor bridge must be moved by 1 cm away from the inductance connection points, then the machine restarted.

Alarm	Help
Low Grid Current	The triode grid current is too low. Try to activate “kW-“ button for a few seconds and start the RF generator. If alarm is activated again and again, the grid inductor bridge must be moved by 1 cm closer from the inductance connection points, then the machine restarted.
Low Electrode Voltage	The machine has detected a too low electrode voltage. Check if the electrode voltage probe is OK. To know if the machine is working OK, check for the neon tubes located inside the RF chamber, are properly lighting when RF is on.
Mob. Elect. limit switch Alarm	The machine has detected both the mobile electrode limit switches pressed. Check the proper working of the mentioned switches and their connection to the electric panel.
Var. Cap. Scan in progress (Not An Alarm)	This is just a warning to advise the Variable Capacitor scan is in progress
Process line consent Alarm (If connected)	The start consent coming from external machines or devices is missing. Verify why this is happening.
O/L Variable. Capacitor. Motor Switch	The magnetic thermal switch of the variable capacitor motor is open. Check the running of the motor and its current absorption.
O/L Mobile Electric Motor Switch	The magnetic thermal switch of the mobile electrode motor is open. Check that no obstacles are stopping the movement of the electrode. Check the running of the motor and its current absorption.
Mobile Electrode moving (Not An Alarm)	This is just a warning to advise the Mobile Electrode is moving
O/L Low Exhaust. /Blowers switch. O/L Final Exhauster Switch.	The magnetic thermal switches of the low exhausters/blowers are open. Check the running of the motors and their current absorption. The magnetic thermal switch of the final exhauster is open. Check the running of the motor and its current absorption.
Air Triode Temperature High	The triode air cooling temperature is too high. Check the proper working of the triode exhauster and filament blower. Check the condition of the air filters located on the machine. If they are dirty, clean the filters with compressed air.

6.3 Emergency stop and safety control relay

6.3.1 *Emergency stop and reset button*

Safety relay 	Safety relay after emergency stop with lights off (machine is **NOT enable** to be turned on) 	Safety relay is NOT in emergency stop with lights on (machine is **enable** to be turned on) 
Emergency stop pushbutton 	Emergency stop Command is not activated in the below position 	**Press** button to active 
Emergency reset 	Blue light ON Safety relay is on emergency stop mode 	**Push** button to reset emergency 

Pull button to enable 	Blue light off means safety relay is reset and machine can be turned on 

6.3.2 *Minimum voltage coil inside main switch*

If the safety relay is active, the lights on it are on and a minimum voltage coil inside main switch is supplied.

If the minimum voltage coil is supplied the switch can be turned ON.

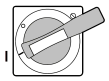
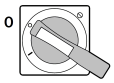
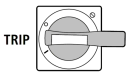
On every emergency stop event, the safety relay goes OFF and cuts off the supply to the minimum voltage coil inside main switch. The main switch cuts off the power supply and goes in to a TRIP position.

Tampering or removing minimum voltage coil from the main switch It is strictly prohibited.
Wrong installation or wrong connection may compromise the safety of the machine.

AFTER EMERGENCY STOP MACHINE MAIN SWITCH GOES TO TRIP POSITION.

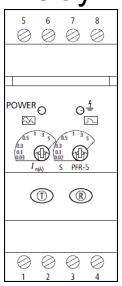
MAIN SWITCH CANNOT MOVE FROM TRIP TO ON POSITION

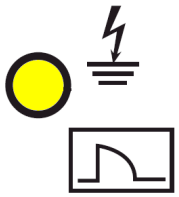
IT IS NECESSARY TO MOVE SWITCH FROM "TRIP-POSITION" TO "OFF-POSITION" BEFORE TRY TO TURN IT ON AGAIN.

ON POWERED	OFF	Trip
		

6.3.4 ***Electric differential protection switch***

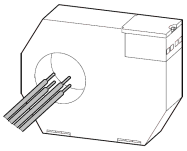
Differential relay





LED blinking = current value lower than set point
– Blinking frequency 2 s = 25 % – 50 %
– Blinking frequency 1 s = 50 % – 75 %
– Blinking frequency 0.5 s = 75 % – < 100 %

Toroid sensor



LED on = activated

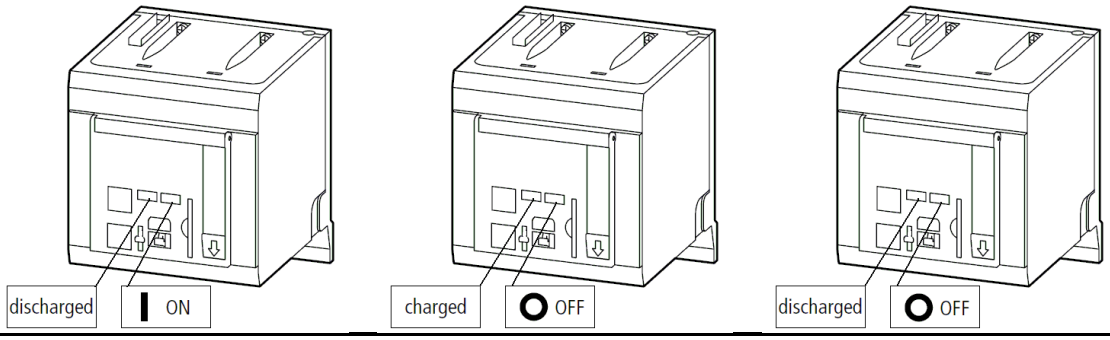
When the differential relay switches, minimum voltage coil inside main switch is out of voltage (not energized) and main switch goes OFF on TRIP position.

After differential switch activation it is necessary to turn off differential switch to restore a normal working condition. After that the machine can be turned on again.

AFTER EMERGENCY STOP MAIN SWITCH GOES ON TRIP POSITION.

AFTER THE TRIP IT IS NECESSARY TO GO TO THE OFF POSITION BEFORE TURNNING THE MACHINE ON AGAIN.

ON ***OFF*** ***TRIP***



7. TECHNICAL DATA (2006/42/CE, EN 12100-2)

7.1 Introduction

The principle of the APEX RF machine is based on the transmission of energy to the molecules of the product being processed under an electromagnetic field. This happens by making the product transit between two electrodes subjected to a voltage of about 5000 Volts, which oscillates at a frequency of 27.120 ± 0.163 Mhz. The electromagnetic field mainly effects on the water, but is also partially absorbed by the product; **therefore, treatment times must be controlled to prevent the overheating the product.**

The values given in section 7.2 & 7.3 are only refer to the RF system which this manual is referred to (Page 4), and cannot be assigned to other systems of the same or other manufacturers.

- Maximum overall dimensions and layout of system;
- Values of power used, evaporative efficiency, maximum dimensions of product being worked;
- Appraisal of environmental impact of system;

A detailed drawing of the layout of the system, with maximum overall dimensions, is given in **Enclosure (8.1)**

M | I

7.2 Specifications

7.2.1 *Electrical Specs*

Feed voltage	480 V ± 5%
Phases	3
Nominal power (Max. output for every module)	7 kW
Installed power for every module	24 kVA
Nominal frequency	60 Hz ± 2 %
N° generators	1
International Protection (IP) for control panel	IP 20
International Protection (IP) for machine	IP 40

7.2.2 *Mechanical Specs*

Electrode height	From 200 to 350 mm
Electrode dimension	1200 x 700 mm

7.2.3 *Load Specs*

Distance from electrode	60 mm

D 7.3 Environmental impact (2006/42/CE)

7.3.1 ***Emissions in the atmosphere***

During RF processing, vapors will be produced and released inside the processing chamber. These vapors will be released to outside environment if an exhaust ducting is connected to the unit.

The content of the vapors can vary depending on the treated product, which for the most part are made up of moist air (water vapor mixed with air).

Therefore we recommend that user carefully review and follow the local laws on emissions, to avoid penalties and production delays.

7.3.2 ***Waste***

In normal operation the machine does not produce industrial wastes of any kind. During maintenance there may be waste lubricants and replaced mechanical parts.

The elimination of these materials is subject to local regulations on the elimination of special, toxic and harmful wastes.

7.3.3 ***Noise***

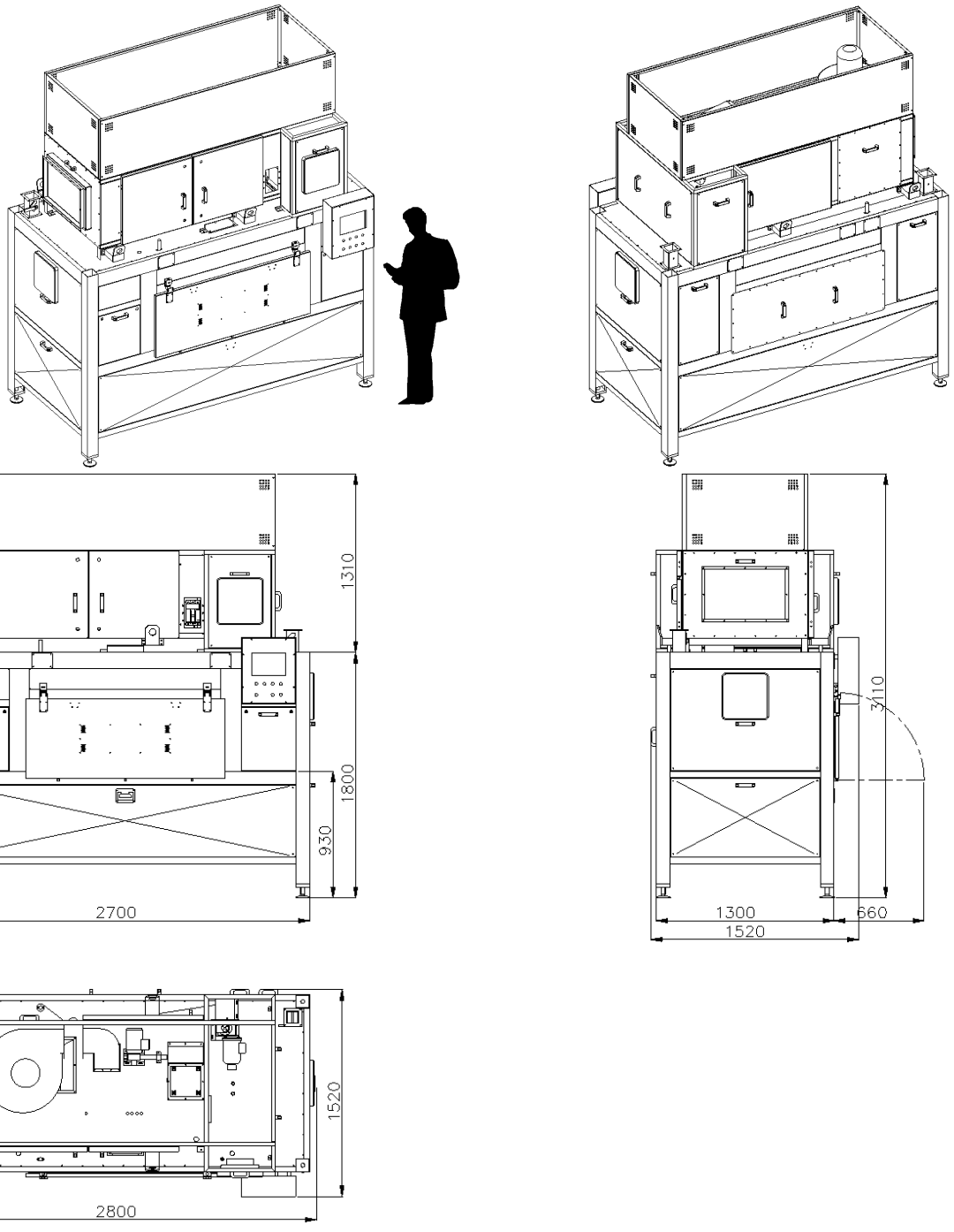
According to measurements carried out during machine testing at Ziel Equipment, Sales and Service, Inc., a continuous acoustical pressure level was determined in the workplaces foreseen by the manufacturer. The data are given in the following table:

POSITION	Leq. dB(A)	Lpeak dB
Work position (Chap. 4.2)	< 80	

According to the values obtained, use of individual protection devices (ear protectors, plugs) during machine operation is not deemed necessary

8. ENCLOSURES

8.1 Layout

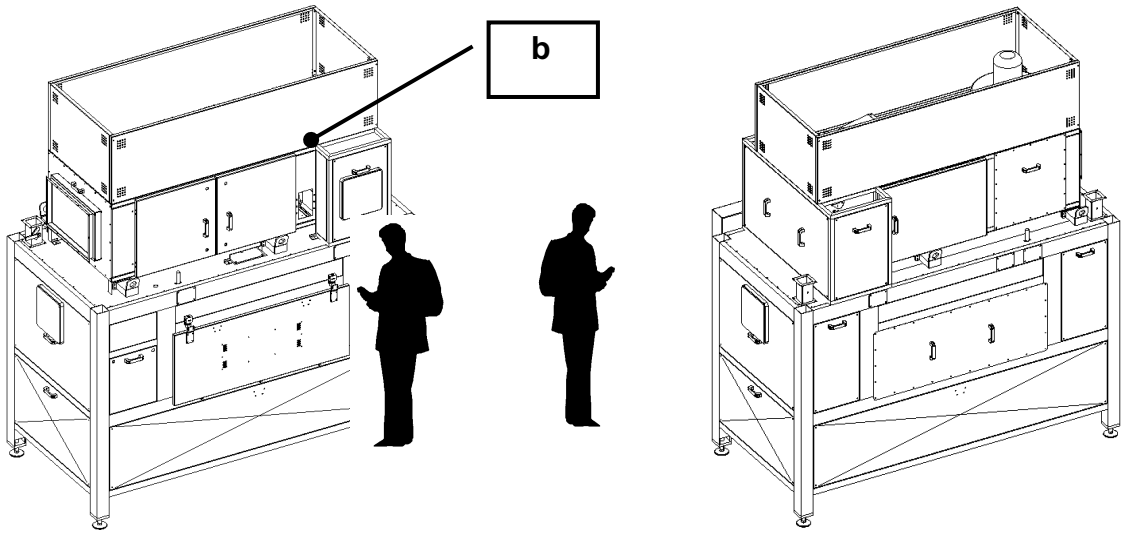


Tolerance ± 50mm

Note: on the top of the machine, 400mm minimum clearance is required for maintenance purpose.

8.2 Utilities

Utilities connections to be provided by the customer



b. power supply for electrical board and generator

cables must stand a continuous current of **40 A**;

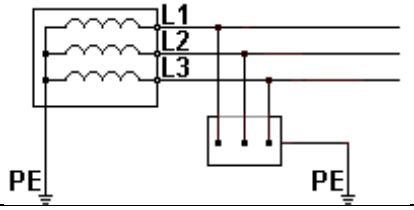
The generator is equipped with a **40A–480V~60Hz** switch (breaking capacity 150kA).

Thermal protection at **40 A** and **magnetic** protection at **320 A**.

Copper or aluminium flexible cables up to 70 mm² (not bigger than 70 mm²) should be used.

The protection of the lines connected to the machine, needs to have breaking current capacity, thermal and magnetic protection higher than the main switch of the machine.

TT electrical distribution system

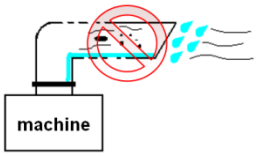
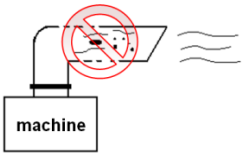
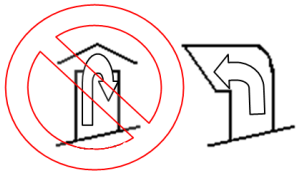
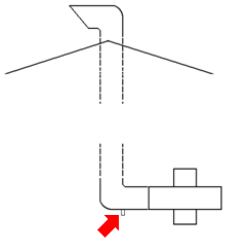


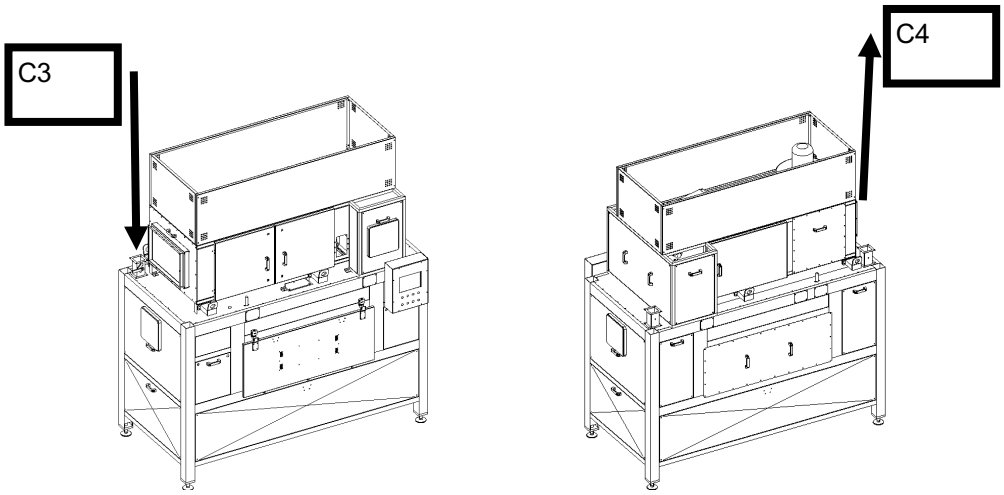
3 phase + earth (no neutral needed).

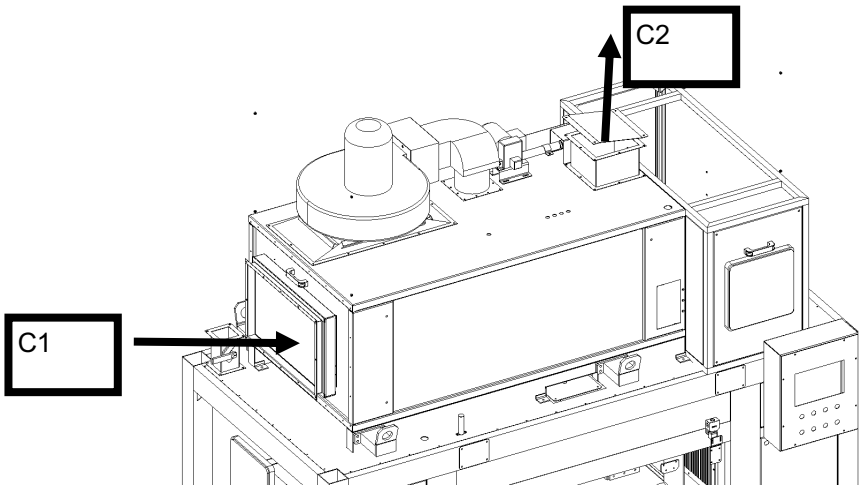
The protective earth is provided by local connection to earth, independent from electrical supply earth

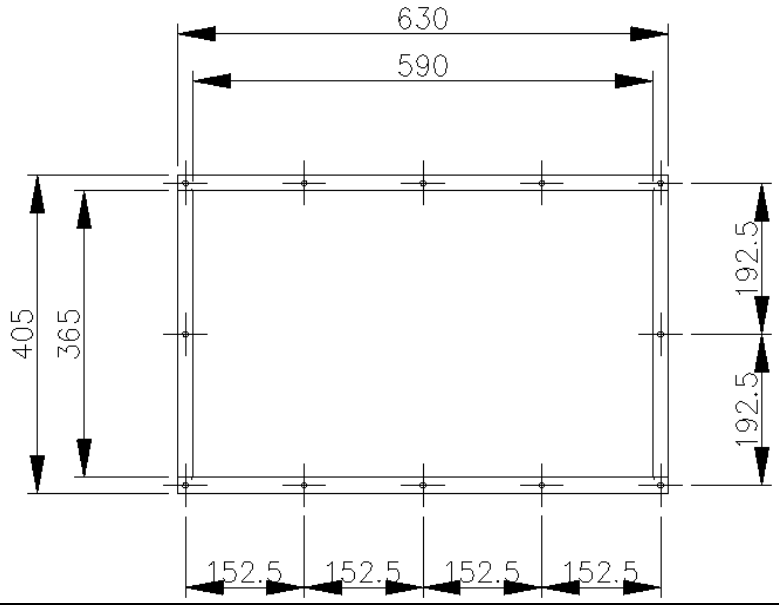
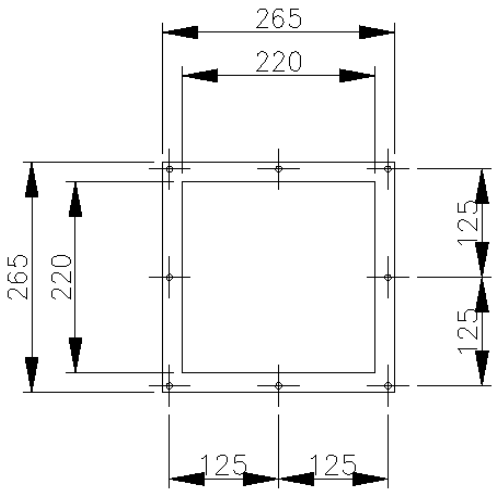
MAIN SWITCH EXAMPLE IMAGES

8.3 Exhaust ducting

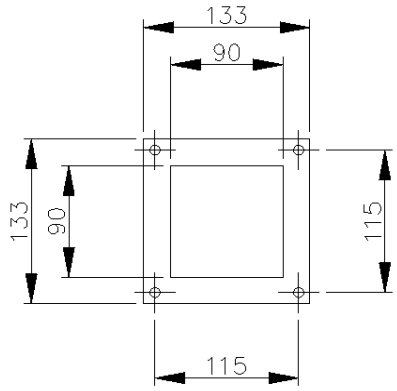
			
do not allow water entry	**do not allow dust entry**	**Duct outlet shape**	**Condensate drain**



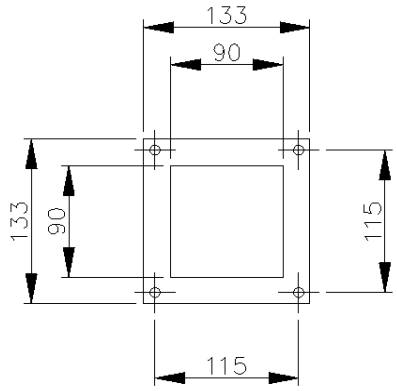


c1 input air, exits to c2 output
c3 input air, exits to c4 output
c1: flow rate typically 22 m³/min 
c2: flow rate typically 22 m³/min 

c3: flow rate typically 1-10 m³/min

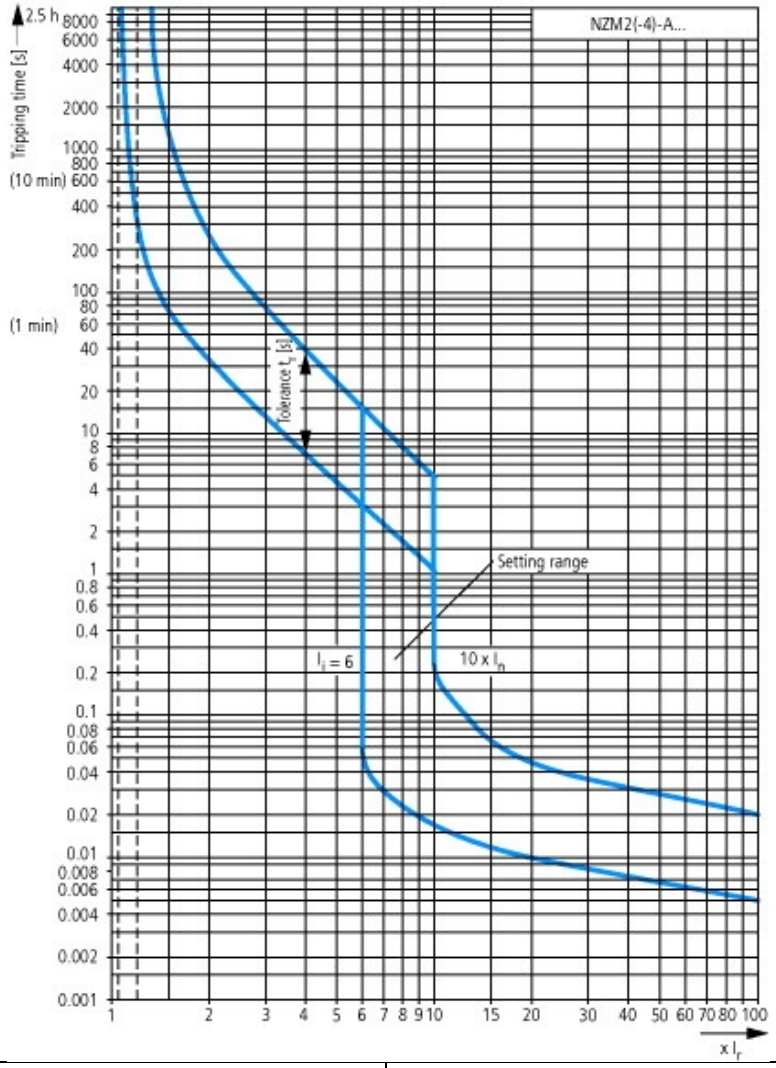


c4: flow rate typically 1-10 m³/min

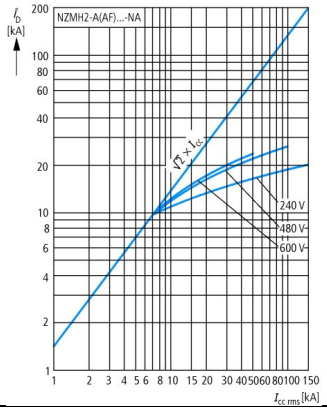


8.4 Main switch intervention graphs

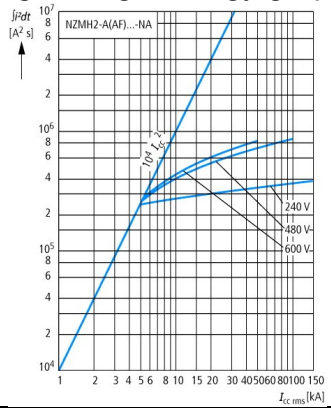
NZMH2-A40 NA	
In= rated current;	**Ir**= thermal protection setting;
Ii= magnetic protection setting;	**Icc**= short circuit current;
Id= passing through current	



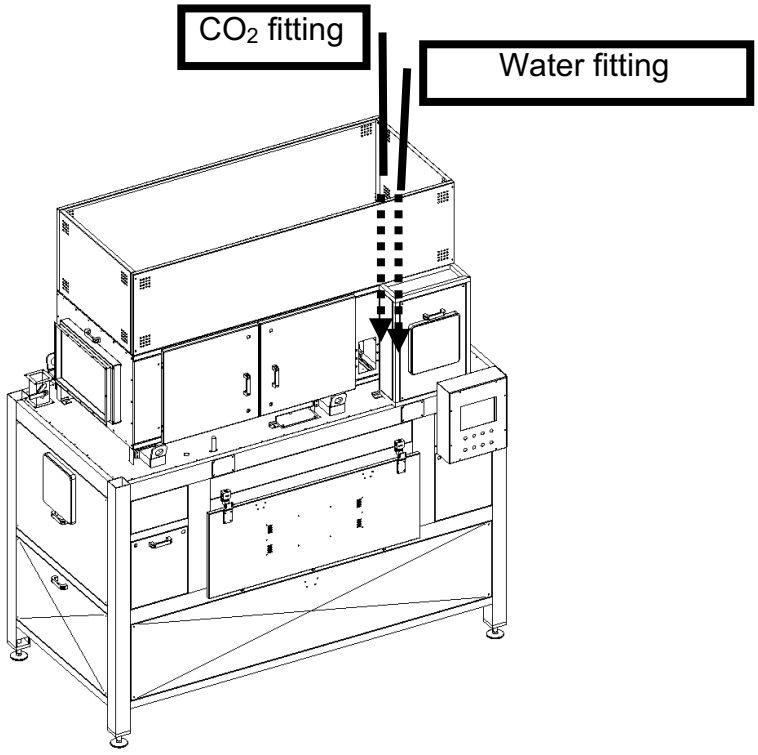
Passing through current graph

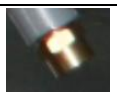


Passing through energy graph (I^2t)



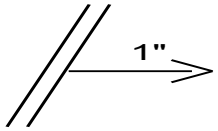
8.5 Eventual fire extinguishing system connection



Pipes with CO_2 bells are installed on the machine	
Pipes with sprayers are installed on the machine	
OTHER DEVICES NECESSARY TO COMPLETE THE FIRE EXTINGUISHING SYSTEM (CO_2 bottles, electric valves, connecting pipes to the machine, etc.) ARE NOT (CANNOT BE) PROVIDED BY Ziel Equipment, Sales and Service, Inc**. Every region and country have different standards for these items**, therefore they can only be sourced locally by the customer.	

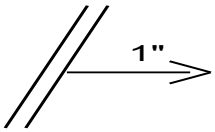
CO_2 extinguishing bottles installation

1” input fitting to be connected to the fire extinguishing system CO_2 bottles.
The bottles need to have 60 bars CO_2 pressure and 30 kg capacity for each module.
In case the CO_2 release is managed through a manual valve or through a solenoid valve controlled by the customer, it is needed to detect the position of the valve with a switch equipped with a number of electrical contacts equal to number of modules of the machine. On the machine electrical services board a terminal block is predisposed for this electrical connection in order to switch off the machine immediately once the CO_2 is released inside the drying chamber.

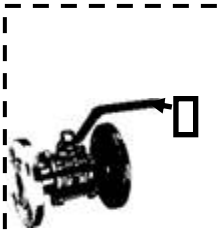


Water input as additional fire extinguishing system

1” input fitting to be connected to the water pipeline.
This water supply has to be managed by a manual valve equipped with a switch that detects its position provided with a number of electrical contacts equal to number of the generators of the machine. On the machine electrical board, a terminal block is predisposed for this electrical connection in order to switch off immediately the machine once water is released inside the drying chamber.



Pressure required 2-4 bar



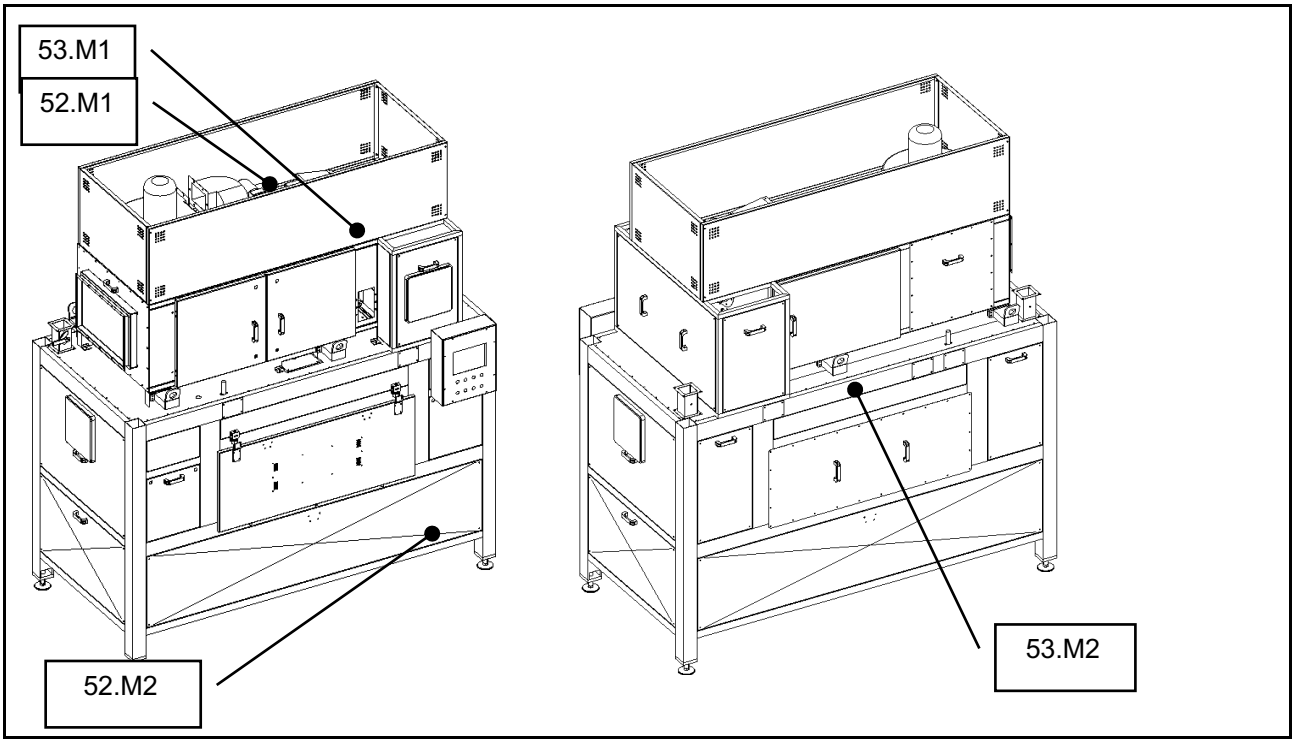
Position switch may be connected to the emergency circuit.
When the valve is closed, the switch is pushed and the contact that is normally open, is closed.
If the valve is opened, the machine goes into emergency mode.

8.6 Electrical voltage supply stabilizer

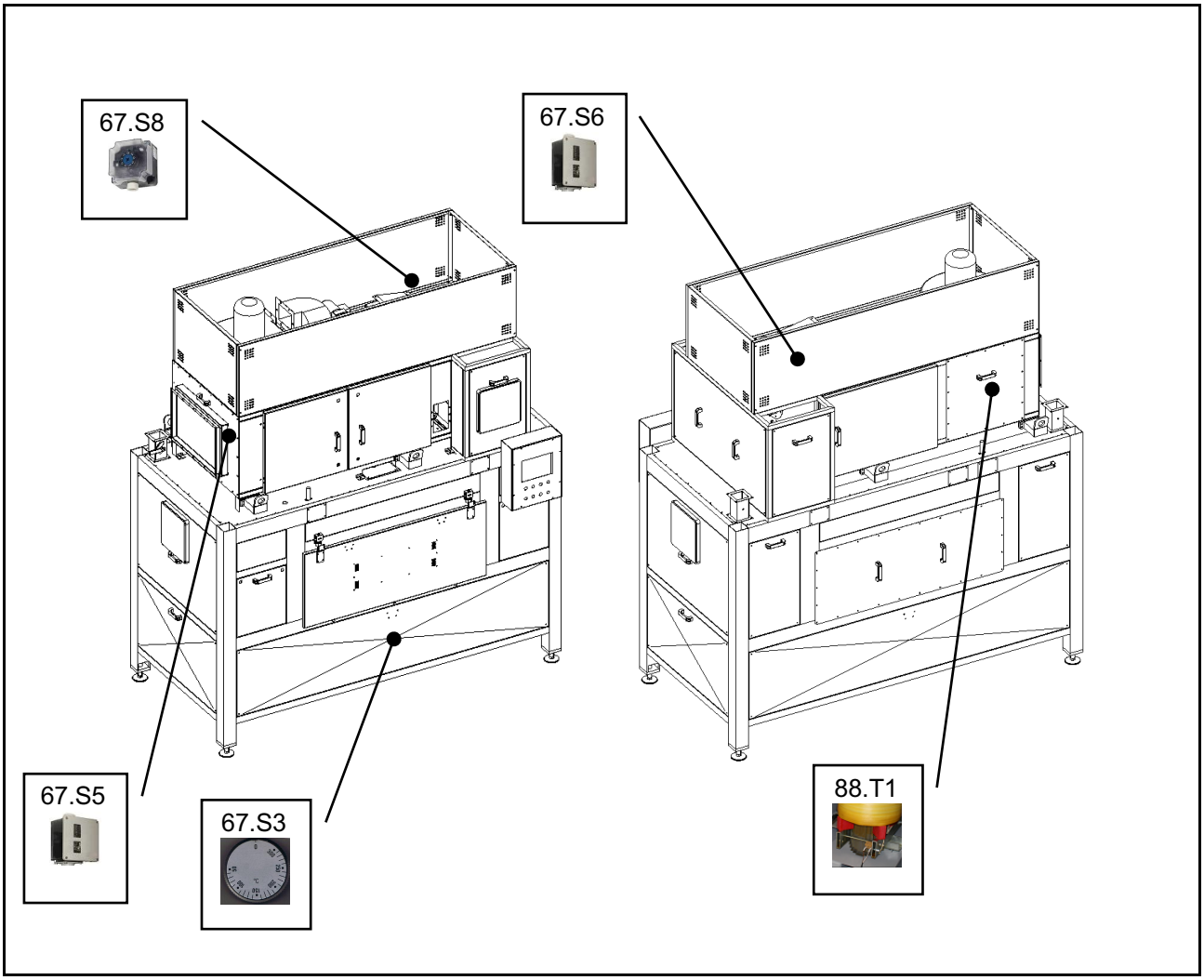
In case the electrical voltage supplied cannot stay within the range of +/- 5%, an electromechanical voltage stabilizer device is needed. The following table will help to choose the suitable voltage stabilizer.

GENERATOR RF POWER	INSTALLED POWER	STABILIZER CAPACITY	OUTPUT VOLTAGE TOLERANCE
7 kW	26 kVA	52 – 60 kVA	+/- 3%

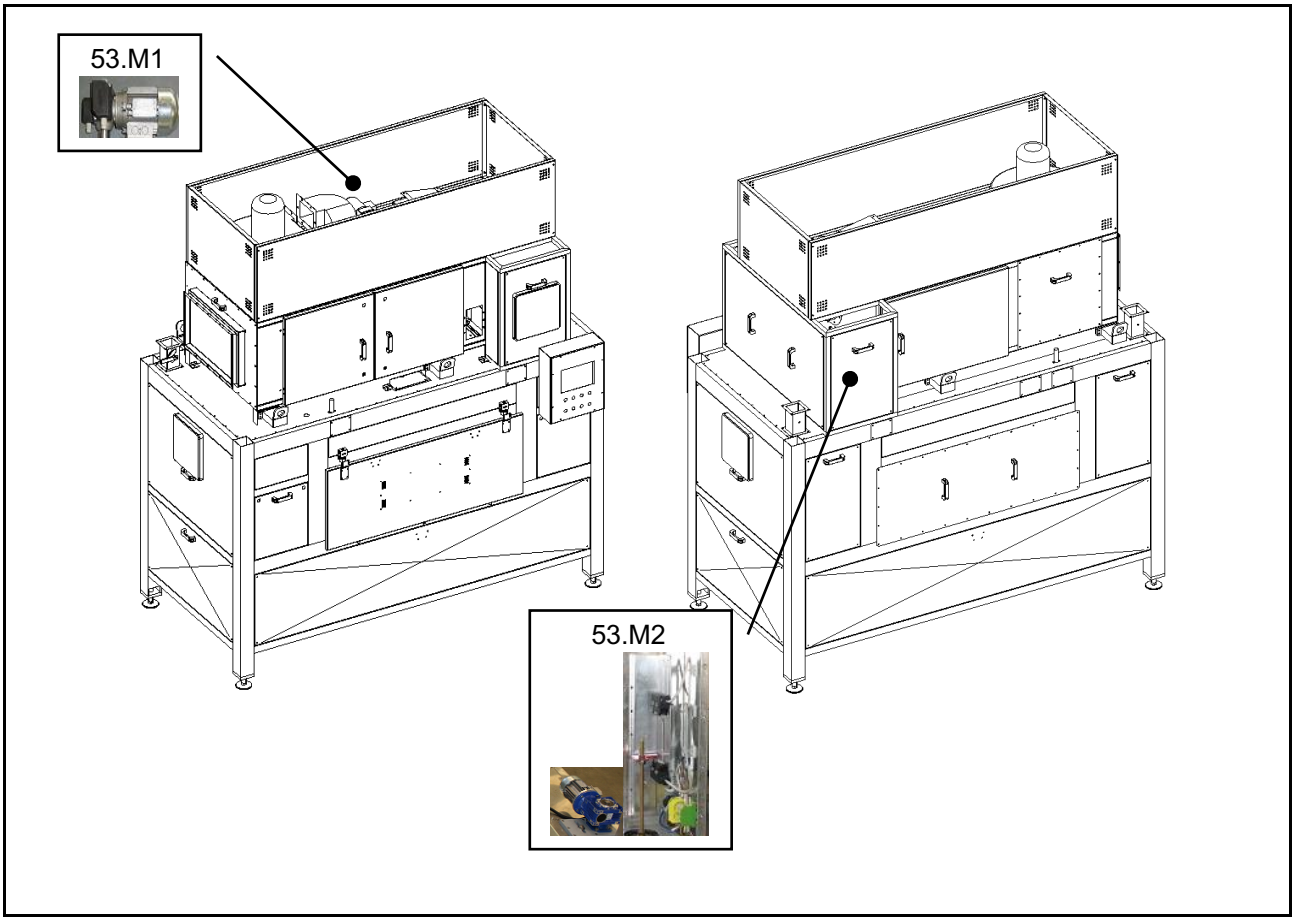
8.7 Motors



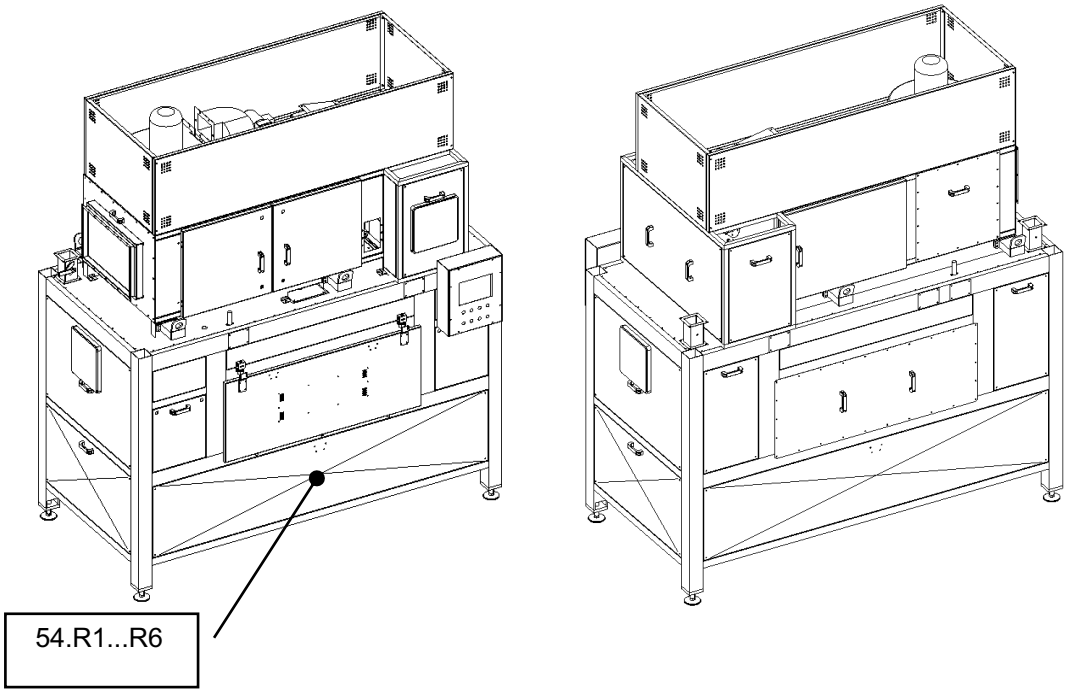
8.8 Pressure switches and temperature switches


67.S8
67.S6
67.S5
67.S3
88.T1

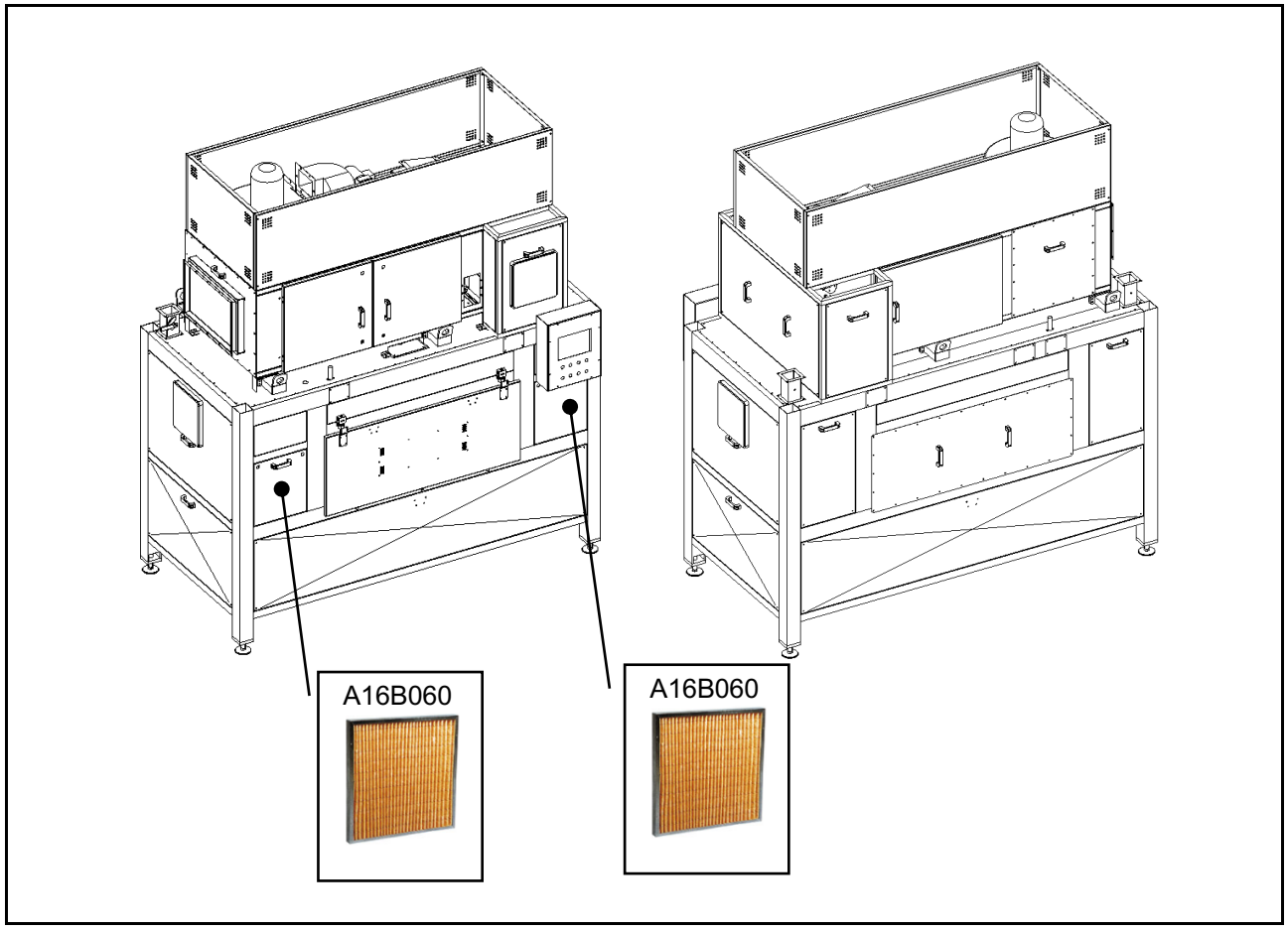
8.9 Encoder



8.10 Heating resistors



8.11 Air Filters



9. NOTES

You can use these pages to write your own notes about the APEX 7 machine.

10. APPIDENIX

APPIDENX I-OPERATOR TRAINING

This is to certify that “The Customer” Operator(s) were trained per this Operator’s Manual on all aspects of safety, operation and maintenance of this APEX system.

Name of Operator	Signature	Date
Name of Operator	Signature	Date
Name of Operator	Signature	Date
Name of Operator	Signature	Date
Ziel Training Coordinator	Signature	Date