# INDUCTION CASTING MACHINE

# EC-1 / EC-1 Infrared / EC-2

## 🕮 USER MANUAL


dentalfarm
DENTAL EQUIPMENT SINCE 1972

UltraFlex
POWER TECHNOLOGIES

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# TECHNICAL DATA

| SPECIFICATION | DESCRIPTION | | | CONDITION |
|---|---|---|---|---|
| | EC-1 | EC-1 Infr. | EC-2 | |
| Absorbed power (kW, max) | 3.0 kW | | | |
| AC Voltage range | 230 Vac ±10% | | | |
| Line Phases | 1 | | | single phase |
| Line Frequency | 50/60 Hz | | | |
| Input Current maximum | 22 A | | | at 230V -10% |
| Max Melting T° | 2000°C | | | |
| IR Temperature reader | n/a | included | included | |
| Cooling System | Water-Internal | | | |
| Vacuum Pump | n/a | n/a | included | |
| Frequency | 90÷110 kHz | | | |
| Air pressure for coil movement | Min. 4 bar ÷ Max.8 bar | | | |
| Operating temperature | +10°C / +40°C | | | |
| Crucible Capacity (max) | 70g Cr/Co, Ni/Cr | | | |
| Operating material minimum | 7g Cr/Co, Ni/Cr | | | |
| Flask Size mm (max) | D-80, H-75 | | | |
| Admitted cylinders diameter (Flask) | Min. 20 mm – Max. 80 mm | | | whit the suitable spacer available upon request |
| Cylinder length (Flask) | Min. 50 mm – Max. 75 mm | | | whit the suitable spacer available upon request |
| Dimensions LxWxH cm (Inch) | 53 x 65.7 x 105 (20.9” x 25.9” x 41.3”) | | | |
| Weight kg (Lb) | 100 (220.5) | 100 (220.5) | 120 (264.6) | |
| Packaged weight kg (Lb) | 110 (242.5) | 110 (242.5) | 130 (286.6) | |
| Packaged dimensions LxWxH cm (Inch) | 61 x 80 x 122 (24” x 31.5” x 48”) | | | |

# 1. GETTING STARTED GUIDE

## 1.1 SAFETY INSTRUCTION

### 1.1.1 IMPORTANT NOTES

- This operator's manual is addressed to the owner od the casting machine, guiding through the procedure for a correct installation, use and maintenance of the machine.

- The operator's manual contains useful information on the recommended use of the machine according to the project constructive concept and technical features, to provide instructions for the installation, assembly, adjustment and use, personnel training, to direct the maintenance intervention and to supply information on residual risks.

- It also supplies complete information on all models and all additional modules of the EC series casting units; you are therefore advised to refer to all the paragraphs concerning the model(s) of your property.

- For a professional use of the machine, this manual can never replace the operator's specific experience, however it supplies all the information required for a correct installation and it is a useful reminder of the main basic operations.

- This manual is an integral part of the machine and should be ''kept for future reference'' until the final disassembly of the machine. Therefore, its consultation should be allowed near the machine and it should be kept with due care (protected, in a dry place, away from sun rays or atmospheric agents, etc.). In case of loss or damage, you can request a new copy to our dealers, technical service centres or directly apply to Ultraflex Power Technologies or Dentalfarm.

- This manual reflects the state-of-the-art at the moment of the machine commercialisation, and cannot be considered inappropriate only because it has been subsequently amended on the basis of new experiences.

- In this document period "." will be used as a decimal point limiter.

- The manufacturer reserves the right to amend or update his own production and relative manuals, without being obliged to update previous productions, unless in exceptional cases.

- You can obtain further details or updates to this manual from our dealers, technical service centres or directly from Ultraflex Power Technologies and Dentalfarm.

- Any critics or suggestion aimed at improving the machine will be appreciated and can be sent in writing to our office. We will be pleased to read them and send our comments to the persons involved.

### 1.1.2 SAFETY WARNINGS

To guarantee the utmost operating reliability, Ultraflex Power Technologies and Dentalfarm have carried out an accurate selection of materials and components to be used in the machine manufacturing. The machine has undergone regular checks before being delivered. The machine performance over the years also depends on its correct use and on an appropriate preventive maintenance according to the instructions contained in this manual.

All manufacturing elements, connecting components and controls have been designed and produced under the highest safety level allowing to resist abnormal strains or strains higher than those specified in this manual. The materials are of the best quality and their acceptance, storage and use in the workshop are continuously controlled in order to guarantee the absence of damage, wear and tear, faulty operation.

In any event, comply with the following safety procedures:

- **Never use the machine or carry out any intervention on the machine if you have not carefully read and wholly understood this manual in all its parts. In particular, take all the necessary measures listed in section 1 - SAFETY INSTRUCTIONS AND INFORMATION.**

- **It s forbidden to use the machine in conditions or for a use other than that stated in the manual, and Utraflex Power Technologies and Dentalfarm will not be deemed responsible for any failure, fault or accident due to the non observance of this prohibition.**

This manual is made up of three parts:

**SECTION 1:** deals with the SAFETY INSTRUCTIONS AND INFORMATION

**SECTION 2:** illustrates the MACHINE FEATURES - OPERATION - TRANSPORT - AUXILIARY EQUIPMENT ASSEMBLY – EQUIPMENT SHUTDOWN - CIRCUIT DIAGRAMS.

**SECTION 3:** deals with the MAINTENANCE INTERVENTIONS, LUBRICATION and includes the SPARE PARTS LIST AND DESCRIPTION.

**NOTE: IT IS FORBIDDEN TO TAMPER WITH, ALTER OR CHANGE, EVEN PARTIALLY, THE MACHINE OR EQUIPMENT REFERRED TO IN THIS OPERATOR'S MANUAL, AND IN PARTICULAR THE GUARDS FITTED FOR THE PERSONS' SAFETY.**

**IT IS ALSO FORBIDDEN TO OPERATE IN A WAY OTHER THAN THE SPECIFIED WAY, OR TO NEGLECT SAFETY RELATED OPERATIONS.**

Operations, for which the non-observance of the instructions can lead to damages to the machine or other parts related to the machine or to the surrounding environment, will be indicated in the manual by this sign

Operations for which the non-observance of the instructions or the tampering with the equipment parts can lead to injuries to people, will be indicated in the manual by this sign

During the machine operation, the operator is protected by the centrifugation chamber closed lid. The working cycle is allowed only provided the door has been closed and locked. The protection remains locked in firm position until the cycle is over.

| | |
|---|---|
|  | **DURING THE WORKING CYCLE, THE PROTECTION LID SHOULD NOT BE FORCED OPEN. IF, AT THE END OF THE CYCLE, THE LID REMAINS LOCKED, DO NOT FORCE THE OPENING AND CONTACT OUR SERVICE DEPARTMENT.** |

**EMERGENCY LID OPENING**: In case of a black out, to unlock the lid, **see chapter 3.2 ACCIDENT PREVENTION PROTECTIONS.**

| | |
|---|---|
|  | **EMERGENCY LID UNLOCK SHOULD BE USED ONLY IN CASE OF POWER SUPPLY FAILURE, DURING THE CASTING OPERATION.** |

The compartment underneath the centrifugation chamber houses the control and power electric circuits and the arm rotation motor. This compartment is isolated from the operator by fixed bulkheads. The bulkheads are kept in position with screws that can only be removed with special wrenches supplied with the machine.

### 1.1.3 GROUNDING

This product is a Class 1 device which utilizes protective grounding to earth to ensure operator‘s safety.

| | |
|---|---|
|  | **PROTECTIVE EARTHING CONDUCTOR TERMINAL** -This symbol indicates the point on the product where the protective grounding conductor must be attached to. |
|  | **EARTH (GROUND) TERMINAL** -This symbol is used to indicate a point which is connected to the PROTECTIVE EARTHING TERMINAL. The component installer/assembler must ensure that this point is connected to the PROTECTIVE EARTHING TERMINAL. |
|  | **CHASSIS TERMINAL** -This symbol indicates frame (chassis) connection, which is supplied as a point of convenience for performance purposes. This should not be confused with the protective grounding point, and can not be used in place of it. |

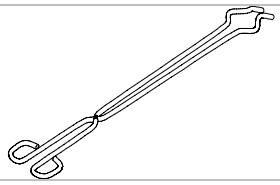
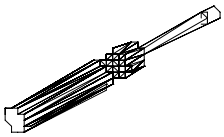
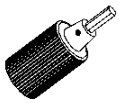
## 1.2 GENERAL INFORMATION

### 1.2.1 RECOMMENDED USE

EC-1, EC-1-IR, EC-1-V and EC-2 are a centrifugal casting unit with medium frequency inductive heating, designed to melt all types of metals. The safety devices fitted on the machine make it safe and reliable in time.

### 1.2.2 SUPPLIED ACCESSORIES

Table 1: ***Accessories EC-1, EC-1-IR, EC-1-V, EC-2***

| | |
|---|---|
| **1 pair of tongs for casting ring and crucible,**<br>Part Number: 4HVM-000-101-00 |  |
| **1 refractory crucible**,<br>Part Number: 2DET-015-000-KB<br>**1 graphite crucible**,<br>Part Number: 2DET-015-000-KC |  |
| **1 blue protection lens,** (already installed)<br>Part Number: 6VMT-000-007-00 |  |
| **1 screwdriver for side panels,**<br>Part Number: 4HVM-000-100-00 |  |
| **1 Tool hexagon S6**,<br>Part Number: 4EAC-000-027-00 |  |
| **4 Adjustable feet, d80, M10x70,**<br>Part Number: 4EAC-000-017-00 (installed) |  |
| **4 Foot mounting bracket,**<br>Part Number: 2DET-015-500-WA (installed) |  |

### 1.2.3 UNAUTHORISED USE

The EC-1, EC-1-IR and EC-2 casting units have NOT been designed for casting alloys that are used for jewellery purpose.
The crucibles from materials others than ceramics or graphite must not to used.
The metal cannot undergo centrifugation casting if the lids are opened.

### 1.2.4 PERSONNEL TRAINING

The EC-1, EC-1-IR and EC-2 casting units have been designed and built for use by qualified personnel with the dental field; these persons are supposed to be perfectly acquainted with the work execution procedures and with the characteristics of the materials to be used.
An accurate reading of this manual and a short training under the supervision of qualified personnel is recommended.

### 1.2.5 SAFETY DEVICES

The machine is supplied complete with the tools required to guarantee the operator's safety:
1. Door locking during rotation.
2. No melting start if water is missing.
3. No melting start if the water temperature is too high.
4. No melting start if the coil does not rise.
5. No coil rises if the pressure is missing.
6. No coil rises if the position of the arm is not aligned with the crucible.
7. Red mushroom emergency stop on yellow background. It should be used:
   7.1. To avoid, as soon as they arise, dangers to people;
   7.2. To reduce, when they arise, damages to the machine or the on-going operation. USE MODERATELY.

### 1.2.6 NOISE LEVEL

The measuring has been taken with the machine in the centrifugation phase, as this is the operation with the highest noise emission.
1. Phonometric measurement in compliance with UNI 9432.
2. Noise meter: Bruel & Kjaer 2218, with wad filter 1613 № 895445.
3. Weighting filter: Curve A.
4. Measuring system: The exposures are calculated starting from noise pressure measures and integrating for the time of exposure.
5. Estimated equivalent continuous noise level A in the working station is $\mathbf{L_{Aeq1}T_p = 68.7}$

### 1.2.7 RESIDUAL DANGER AND EMERGENCY SITUATION

1. **Avoid direct contacts with the melting coil during the heating phase (ELECTRIC HAZARD).**
2. **Avoid introducing metal objects inside the melting coil without the appropriate crucible (ELECTRIC AND THERMAL HAZARD).**
3. **Avoid direct contacts with the mechanical parts situated near the crucible; use supplied tongs and wear suitable gloves to move crucibles and casting rings (THERMAL HAZARD).**
4. **Avoid any type of intervention on the machine before the machine has been disconnected from the electric supply.**

**Note: The above residual dangers are indicated on the machine by specific labels.**

# 2. INFORMATION ON THE MACHINE OPERATION

## 2.1 TECHNICAL DESCRIPTION OF THE MACHINE

The EC-1 melting unit consists of a steel framework supporting the centrifugation tank, and a steel plate panelling closing the machine. On top of the machine, a lid opens in a compasses movement to give access to the working compartment. This lid is fitted with a safety lock.
The melting circuit, based on the current oscillation principle (105 kHz) in such a way as to create an alternate magnetic field, uses the new generation IGBT Transistors technology , which guarantees a better yield of the power circuit, lower consumption and excellent reliability in time.

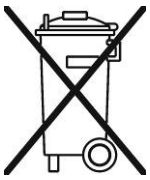
This type of circuit offers two essential advantages:
Low current consumption.
The metal melting takes place from inside towards outside; this allows a more accurate reading and the risk of burning the metal is highly reduced.
Due to the magnetic field, the metal undergoes a continuous mixing, which returns all the alloy components to their position in the initial state; once the melting point is attained, the metal starts ''rising'' and comes off the crucible, thus giving clear evidence of the occured melting.

Last, the machine is fitted with some automatic devices, for an easier work, such as:
Centrifugation time out preset on 40 seconds.
Pneumatic coil rise.

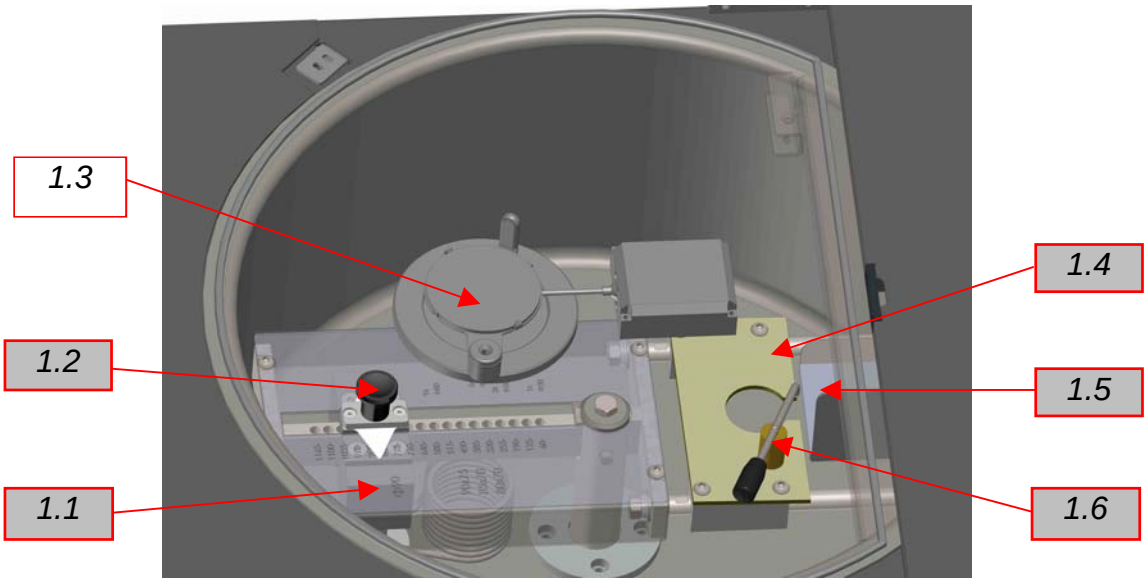
### 2.1.1 TECHNICAL REFERENCE REGULATIONS AND TEST PROCEDURES

This equipment is mass-manifactured by Ultraflex Power Technology, Inc. under the supervision of Dentalfarm, in compliance with technical and safety rules in force, as provided for by the 89/392 EEC Community Directive on machinery. The product is labeled CE and accompanied by a Declaration of Conformity. Careful inspection and full routine testing are carried out singularly on each machine.

According to International regulations, this unit has been classified as AEE (electric and electronic device, whose correct operation depends on electric currents and electromagnetic fields) and as a consequence, at the end of its lifetime, it can not be treated as normal waste material but it must be disposed separately, complying with the Directive 2002/96/CE.



## 2.1.2 IDENTIFICATION OF THE CENTRIFUGATION TANK COMPONENTS



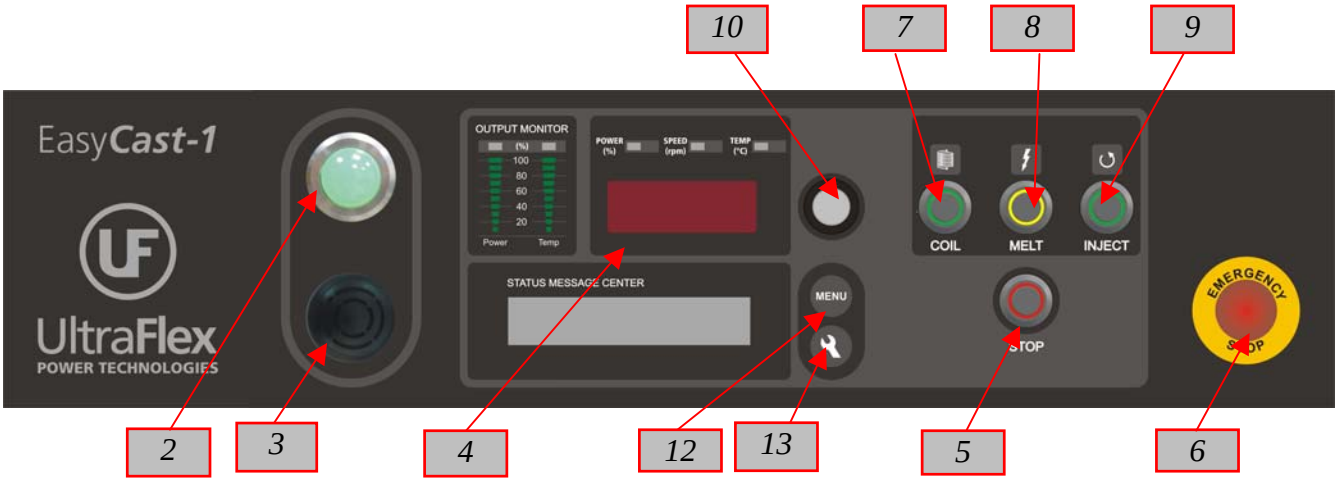

**Centrifugation Tank Components**

| | | | |
|---|---|---|---|
| 1.1 | Counterweight | 1.4 | Crucible support |
| 1.2 | Knob (Indexing plunger) | 1.5 | Support cradle |
| 1.3 | Viewing glass | 1.6 | Crucible lid locking lever |

## 2.2 CONTROLS AND OPERATION

### 2.2.1 FRONT PANEL OVERVIEW

The above drawing illustrates the control section of EC-1, EC-1-IR, EC-1-V and EC-2. Therefore, if the model you have bought is not complete will all the modules, some sections will be missing on your instrument panel.




**Front Panel EC-1, EC-1I**


***Front Panel EC-2***


***Main switch***

Table 2: ***Front panel EC-1, EC-1I, EC-2***

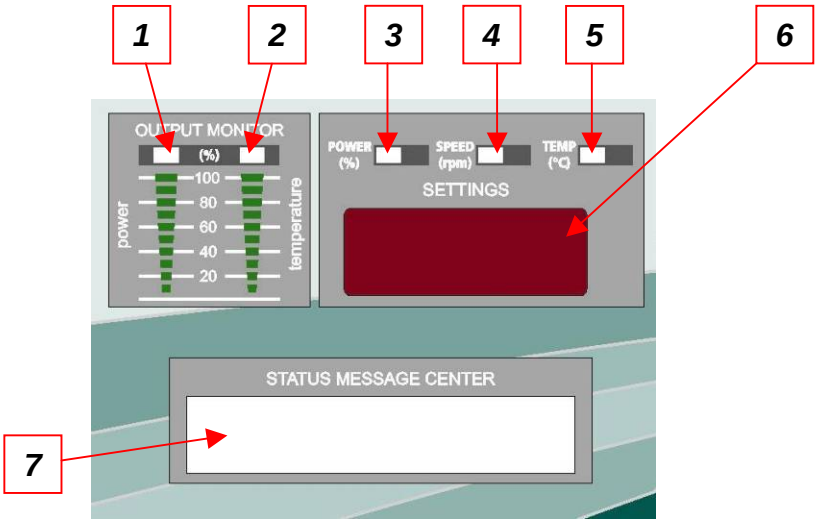
| № | Description |
|---|---|
| 1 | Power On Switch |
| 2 | Green Lamp – Power On Light (electric supply) |
| 3 | Alarm Buzzer |
| 4 | Control Panel |
| 5 | Power generator stop, centrifugation, and coil down button |
| | Lamp lights – Mode “Ready” |
| | Lamp blinks – Alarm |
| 6 | Red mushroom emergency push-button, on yellow background. To be used: 1) to avoid dangers as they arise to the persons; 2) to reduce damages, as they arise, to the machine or on-going operations.<br>USE WITH MODERATION |
| 7 | Induction coil rise and down button |
| 8 | Melting start button |
| 9 | Centrifugal start (Injection) button |
| 10 | Control Knob |
| 11 | Vacuum meter (Pic.3 - only for EC-2) |
| 12 | *for EC-1 and EC-1 Inf. (Pic.2):* “Menu” button button - Shortcut to the Setup Menu when pressed in “Ready” state |
| | *for EC-2, (Pic.3):* Vacuum and release button (for devacuum push and hold button for 3 seconds) |
| 13 | *for EC-1 and EC-1 Inf. (Pic.2):* “Service” button - Shortcut to Service Menu when pressed in “Ready” state |
| | *for EC-2 (Pic.3):* Argon gas button |

### 2.2.2 CONTROL PANEL OVERVIEW

The unit is digitally controlled through a control panel located on the front panel. The control panel utilizes the latest microprocessor technology. The control panel is designed to display essential parameters and alpha-numeric messages providing intuitive and informative visual feedback. The users can also navigate through easy-to-use service, diagnostics and setup menus.

### 2.2.3 INDICATORS

The Control panel has the following indicators:



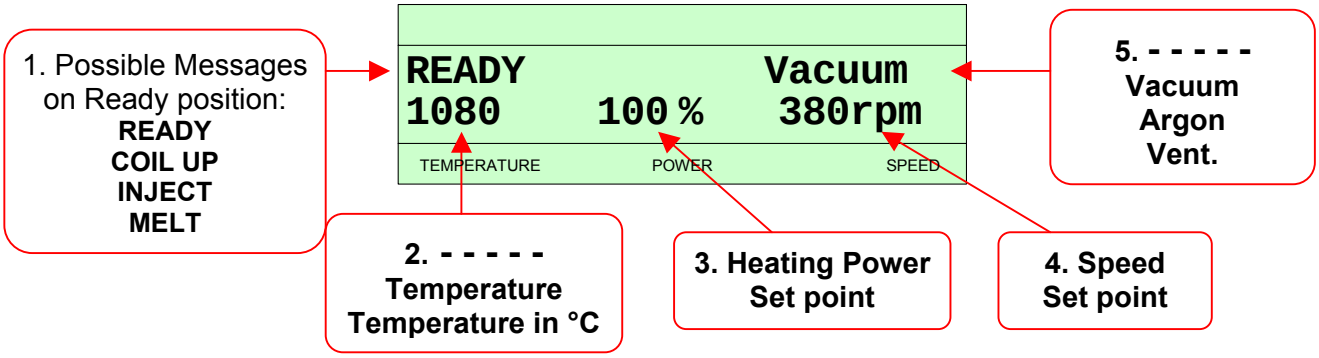

**Control panel**

Table 3: ***Control and indicators Table***

| № | Name/Function | Description | Indicator / Control |
|---|---|---|---|
| 1 | Output Power | BAR-GRAPH: The reading corresponds to the percentage of the measured power. | INDICATOR |
| 2 | Temperature reading | BAR-GRAPH: The reading corresponds to the percentage of the measured temperature. | INDICATOR |
| 3 | Output Power | The set point of Output Power: LED [AMBER] - Illuminated when display(6) is showing the output power | INDICATOR |
| 4 | Speed | Time: LED [AMBER]- Illuminated when display(6) is showing centrifugal speed, [RPM] | INDICATOR |
| 5 | Temp: LED [AMBER] | Temp: LED [AMBER]- Illuminated when display(6) is showing current temperature | INDICATOR |
| 6 | Segment LED indicators showing Output Power, Speed or Temp | Four red 7 segment LED indicators showing Output Power, Centrifugal Speed or Temp depends on items 3, 4 and 5 | INDICATOR |
| 7 | Alphanumeric LCD display | Alphanumeric LCD display (20 characters / 2 rows) for displaying measured parameters, status messages, fault messages and menu screens. | INDICATOR |

## 2.2.4 OUTPUT REGULATION AND STATUS MESSAGES

The following diagram describes a typical LCD display screen with message types and locations on the screen.




**LCD display functions**

Table 4: ***Control Modes and Messages Table***

| № | Name/Function | Description | Indicator / Control |
|---|---|---|---|
| 1 | Status Messages | Shows the current status of the system when in operational mode:<br>READY – When there are no faults and the power supply is ready for use;<br>COIL UP – After pushing button COIL. If there are no faults, coil goes up;<br>MELT – After pushing button MELT. If there are no faults, inverter starts;<br>INJECT – After pushing button INJECT. If there are no faults, coil goes down and centrifugal motor starts. | INDICATOR |
| 2 | *for EC-1*<br>- - - - - -<br>*for EC-1-IR, EC-2:*<br>Regulating Temperature Set point | - - - - - -<br>Temperature. The set point of temperature regulator can be adjusted by rotating the Control Knob while the Amber “Temp °C” LED is illuminated. Temp range – The Temp value can be adjusted from 750° to 2000° in steps of 1°C. | INDICATOR |
| 3 | Current Output Power | The Output power can be adjusted by rotating the Control Knob while the Amber “Output, %” LED is illuminated. Power range – The Power value can be adjusted from 10% to 100% in steps of 1%. | INDICATOR |
| 4 | Speed | The Centrifugal Speed can be adjusted by rotating the Control Knob while the Amber “Speed rpm” LED is illuminated. Speed range – The Speed value can be adjusted from 10 to 500 trn/min in steps of 1 trn. | INDICATOR |

| | | | |
|---|---|---|---|
| 5 | *for EC-1, EC-1-IR:*<br>- - - - - -<br>*for EC-2:*<br>Regulating flow Vacuum, Devacuum or Gas Argon | Vacuum and Gas Argon Control:<br>*for EC-1, EC-1-IR:*<br>Gas Argon and Vacuum Control are not provided.<br>*for EC-2:*<br>VACUUM – After pushing button VACUUM, vacuum pump starts;<br>DEVACUUM – After pushing and hold for 1.5 sec. button VACUUM, the pressure in the chamber was recovering;<br>ARGON – After pushing button ARGON, the chamber starts to be filled with argon gas;<br>TIME OUT VACUUM – Time Out for Vacuum is 1.0 min.;<br>TIME OUT DEVACUUM – Time Out for Devacuum is 10 sec.<br>TIME OUT ARGON – Time Out for gas Argon is 40 sec. | INDICATOR |

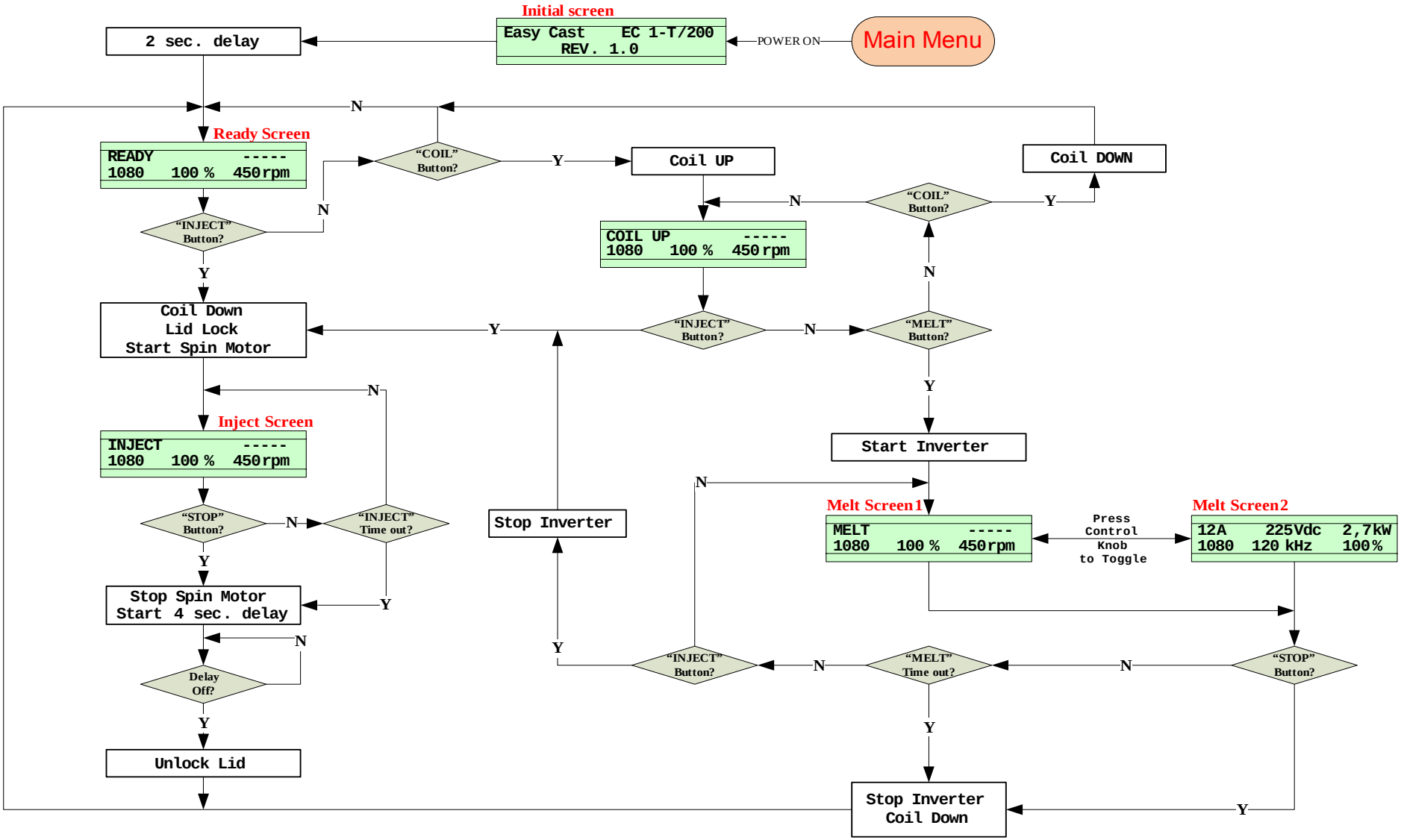
## 2.2.5 MENUS AND NAVIGATION

### 2.2.5.1 General Navigation Rules

Rotate Control Knob Clockwise or Counterclockwise to scroll through the menus, change values or toggles between 2 Melt Screens. Press Control Knob to select menu or accept the changes.
When scrolling through service menus:

- Pushing the Control Knob will select the parameter;
- Selecting the Exit option will return to the previous menu;
- Start and Stop buttons are disabled when in Service menus.

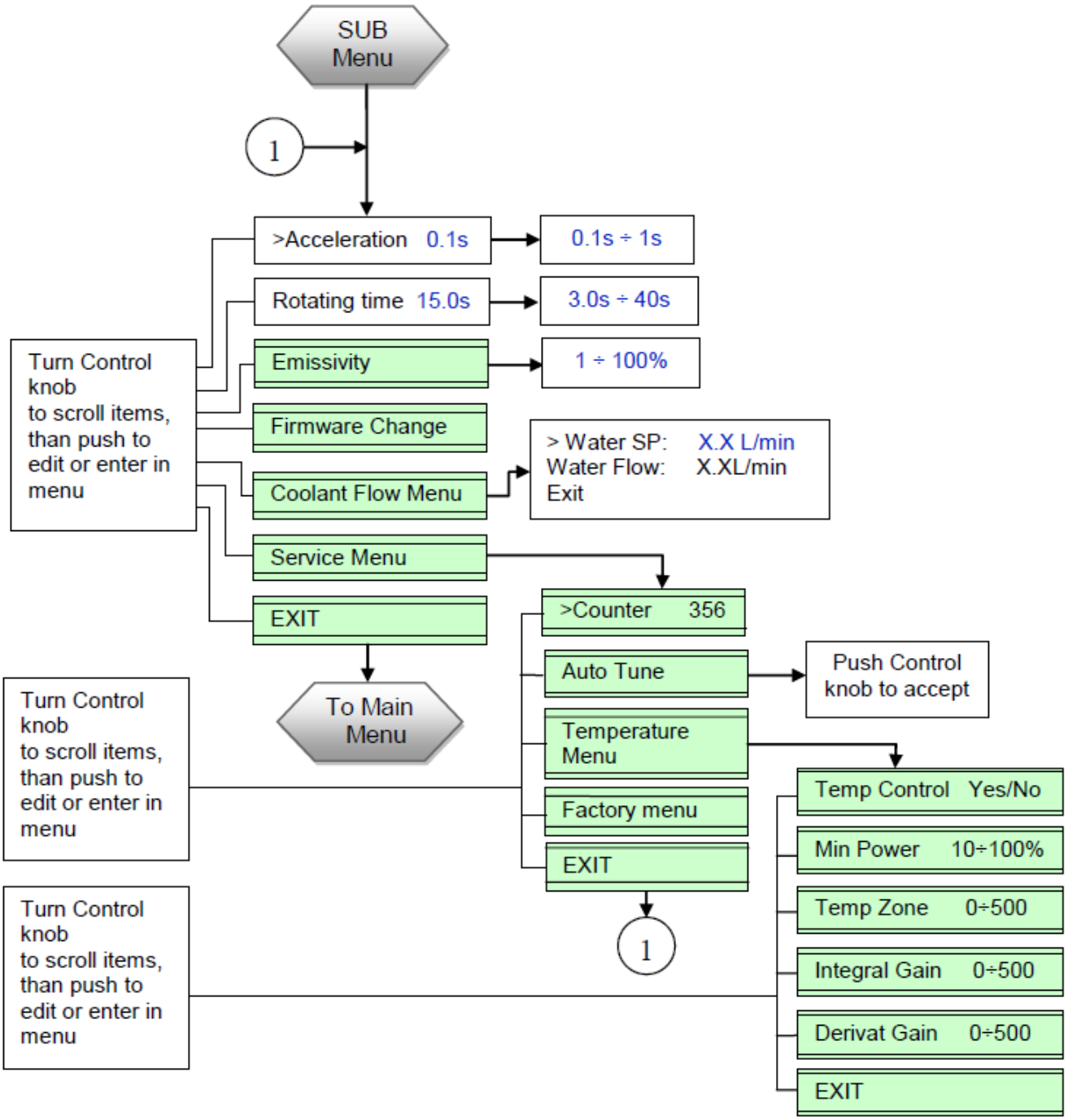
### 2.2.5.2 Main Menu




**Main Menu Flow Chart Diagram**

### 2.2.5.3 SUB Menu

SUB Menu is accessible from Main Menu in “Ready” state, by pressing and holding Control knob for 2 sec. It is shown on Pic. 8. The programmable parameters (in blue) will be highlighted when selected for editing.




**SUB Menu Structure**

### 2.2.5.4 SUB Menu Options

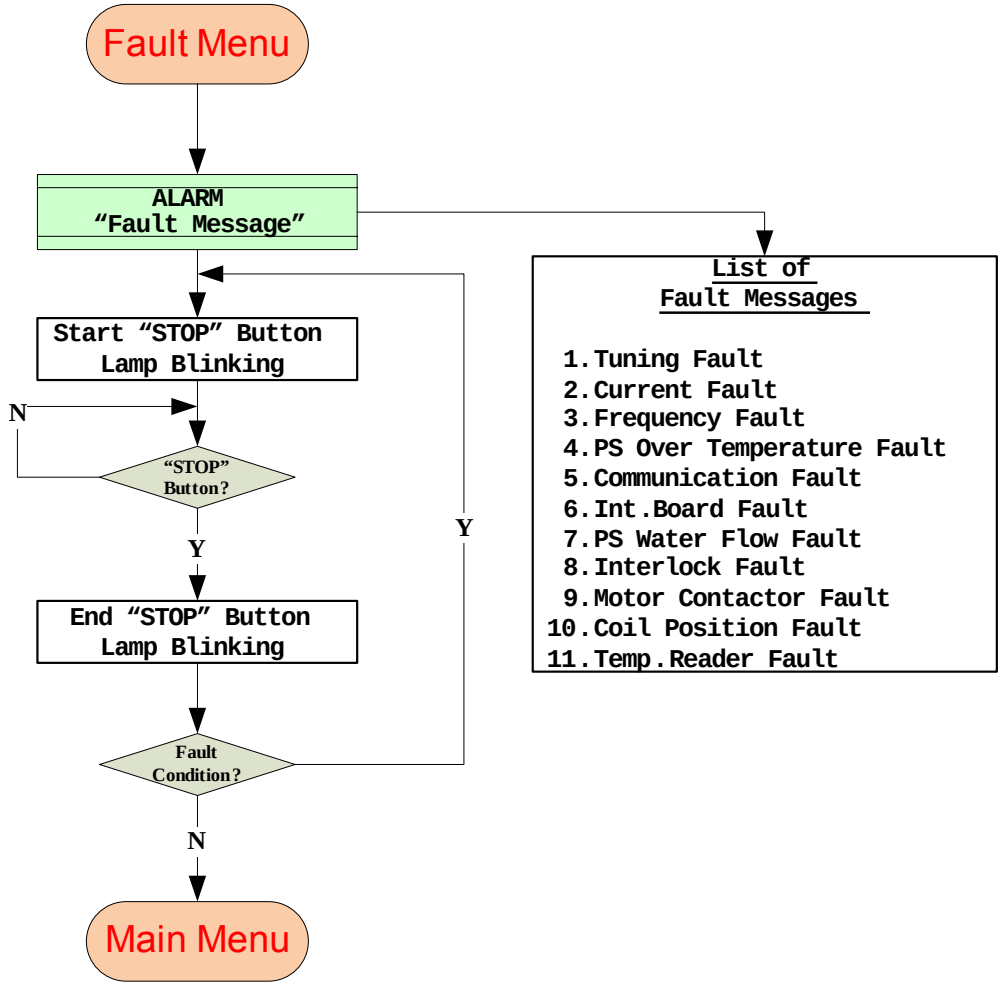
1. **Acceleration –** defines the time for reach the preset RPM.
2. **Rotating Time –** set rotation time for centrifuge in seconds.
3. **Emissivity –** emissivity coefficient for certain alloy.
4. **Firmware Change –** Service menu for updating the software control panel.
5. **Coolant Flow Menu –** show set point of min flow rate of cooling water and current water flow rate.
6. **Service Menu:**
   - **6.1 Counter –** accumulation of casting cycles;
   - **6.2 Auto Tune –** automatically lock the resonant frequency of tank circuit;
   - **6.3 Temperature Menu:**
     - **6.3.1 Temperature Control** – switching on and off temperature regulator, all other parameters are valid if the regulator is switched On and are not valid when it is Off;
     - **6.3.2 Min Power** – minimum permissible power that can be fed to the output;

The parameters 6.3.3, 6.3.4 and 6.3.5 are parameters of PID Control law;

- **6.3.3 Temp Zone** – Zone for proportional part of PID control law of the adjustment;
- **6.3.4 Integral Gain** – integral gain of PID control law;
- **6.3.5 Derivat Gain** – derivat gain of PID control law;
- **6.3.6 EXIT** – returning to SUB Menu.

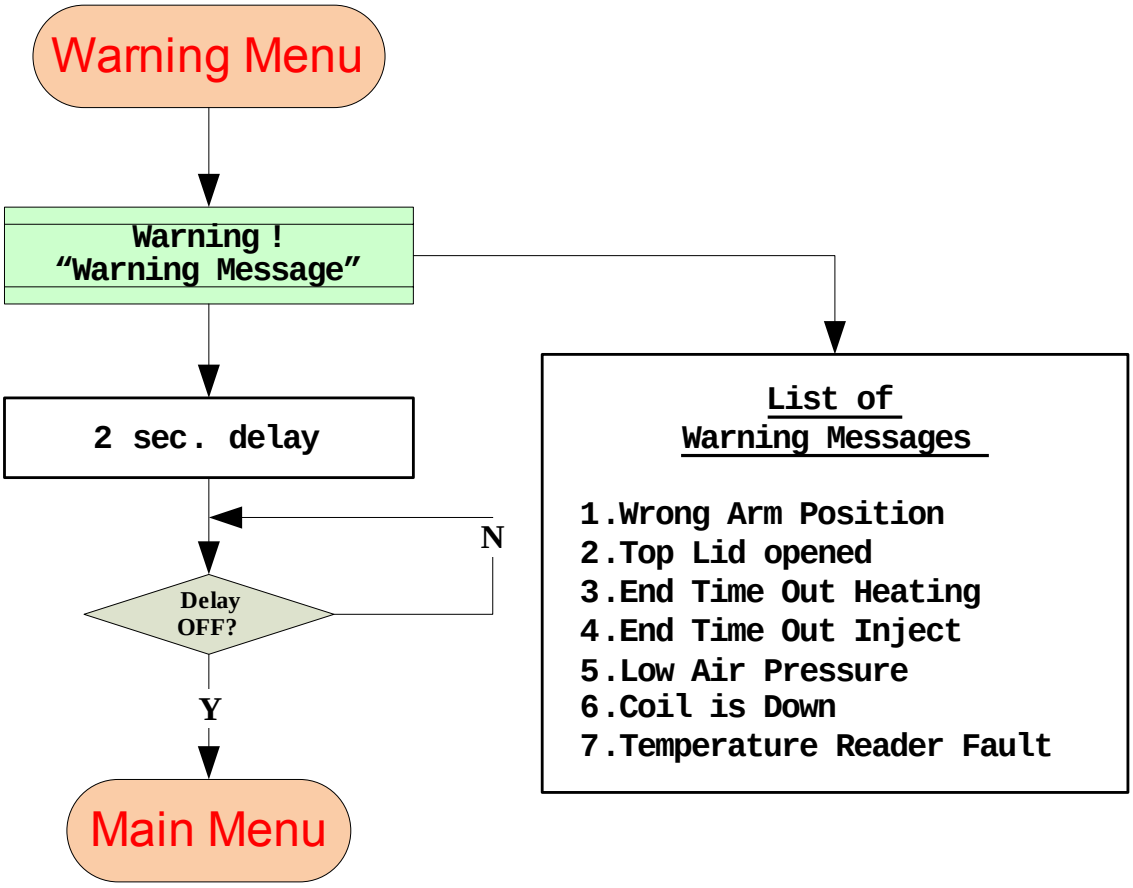
   - **6.4 Factory Menu–** Only for factory staff.
   - **6.5 EXIT –** Returning to Coolant Flow Menu.
7. **EXIT – Exit** – Returning to Main Menu.

Any ERROR message that appears during normal operation of the device is shown in the flowchart in Pic 9.




**Fault Menu Flow chart Diagram**

Any WARNING message that appears during normal operation of the device is shown in the flowchart in Pic.10.




**Warning Menu Flow chart Diagram**

## 2.2.6 TUNING AND TROUBLESHOOTING

### 2.2.6.1 LOAD TUNING GUIDE

Because of fixed tank circuit and load device is factory tuned and does not need additional load tuning.

### 2.2.6.2 ALARMS, FAULTS AND WARNINGS

Table 5: ***Alarms, Warnings (W) and Fault (F) Messages***

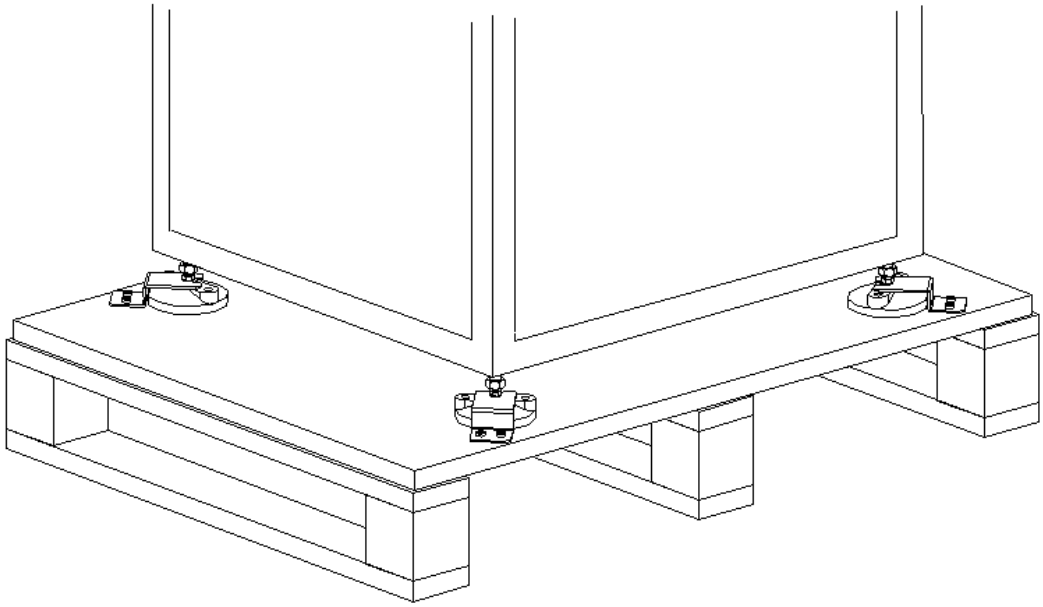
| | | |
|---|---|---|
| Fault Description: **Wrong Arm Position (W) No.1** | | |
| **Condition**<br>Arm is not in zero position | **Cause**<br>You tried to move up the coil, while the arm was not positioned correctly | **Advice**<br>Adjust the arm to zero position |
| Fault Description: **Top Lid Opened (W) No.2** | | |
| **Condition**<br>Top Lid Opened | **Cause**<br>You tried to cast with open lid | **Advice**<br>Close the lid and try again |
| Fault Description: **End Time Out Heating (W) No.13** | | |
| **Condition**<br>Melting has reached 3 minutes | **Cause**<br>Expired time out for melt before manual stop | **Advice**<br>This quantity of metal is not proper /too small or too much |
| Fault Description: **End Time Inject (W) No.4** | | |
| **Condition**<br>Casting has reached 40 seconds | **Cause**<br>Expired time out for casting before manual stop | **Advice**<br>--- |
| Fault Description: **Low Air Pressure (W) No.5** | | |
| **Condition**<br>There pressure is lower 4 bars | **Cause**<br>You tried to move the coil with insufficient air pressure | **Advice**<br>Increase input air pressure |
| Fault Description: **Coil Is Down (W) No.6** | | |
| **Condition**<br>You tried to melt with coil down | **Cause**<br>Pressed MELT button when the coil is down | **Advice**<br>Move up the coil |
| Fault Description: **Phase Fault (F) F01** | | |
| **Condition**<br>Primary U & I out of phase | **Cause**<br>Can't find resonant frequency | **Advice**<br>Check resonant loop parameters and adjust if needed - load coil inductance, tank capacitors values, transformer taps |
| Fault Description: **Current Fault (F) F02** | | |
| **Condition**<br>I primary > I Max | **Cause**<br>Output current exceeds the limit | **Advice**<br>Possible FET/IGBT failure in the Power supply. Contact our Service department |
| Fault Description: **Frequency Fault (F) F03** | | |
| **Condition**<br>F < Fmin<br>or F > Fmax | **Cause**<br>Frequency goes out of the pre-programmed range during Heat On | **Advice**<br>Check resonant loop values, tank capacitors or control board. Check load coil for shorted turns. |
| Fault Description: **Temperature Fault (F) F04** | | |
| **Condition**<br>T°heat sink >50°C | **Cause**<br>The heat sink of the power supply exceeds the max allowed T° | **Advice**<br>Wait until it cools down the cooling water. |

| Fault Description: **Auto Tune Fault (F) F05** | | |
|---|---|---|
| **Condition** | **Cause** | **Advice** |
| Primary U & I out of phase | Can't find resonant frequency | Check resonant loop connections – load coil, tank capacitors. Transformer taps |
| Fault Description: **Interlock Fault (F) F06** | | |
| **Condition** | **Cause** | **Advice** |
| The lock on the lid is not working | Interlock does not execute commands | Check Interlock and Interlock sensor |
| Fault Description: **Communication Fault (F) F09** | | |
| **Condition** | **Cause** | **Advice** |
| Communication Error Between Panel and Control Board | No acknowledgment is received after the last command | Controllare i connettori ed i cavi tra le schede |
| Fault Description: **EU Water Flow Fault (F) F28** | | |
| **Condition** | **Cause** | **Advice** |
| Water Flow < 2 l/min (0.5GPM) | Restricted or no water flow | Check cooling water flow rate. Check hoses and external water filter for blockages. Check flow switch. |
| Fault Description: **Missing Phase (F) F32** | | |
| **Condition** | **Cause** | **Advice** |
| The machine is off | Missing Main Power Supply | Check Main Power Supply cable. |
| Fault Description: **Int. Board Fault (F) F36** | | |
| **Condition** | **Cause** | **Advice** |
| No connection with Interface Board | No acknowledgment is received after the last command | Check cables and RS connectors between boards |
| Fault Description: **Temp. Board Fault (F) F57** | | |
| **Condition** | **Cause** | **Advice** |
| Communication Error Between Panel and Temp. Board | No acknowledgment is received after the last command | Check cables and RS connectors between boards |
| Fault Description: **Motor Contactor (KM2) Fault (F) F67** | | |
| **Condition** | **Cause** | **Advice** |
| Motor Contactor is welded | Contactor damage | Change contactor |
| Fault Description: **Coil Position Fault (F) F68** | | |
| **Condition** | **Cause** | **Advice** |
| Coil is not moving as expected | When the coil does not execute commands | Contact our Service department |

## 2.3 INSTALLATION AND SET-UP

### 2.3.1 UNPACKING THE MACHINE

1. For shipment, the machine is fastened on a wooden pallet by means of brackets, in order to assure a safe transport. Use a Phillips screwdriver to remove screws and release the machine from brackets of the pallet before installing it.



**Brackets**

***CAUTION: use all necessary caution and keep the machine in an upright position.***

2. Check that the machine has not suffered any damage during transport. Should you find damages, report them to the carrier and send a written communication to both the manufacturer and the dealer immediately.
3. Pick up accessories and carefully remove all the packing material.

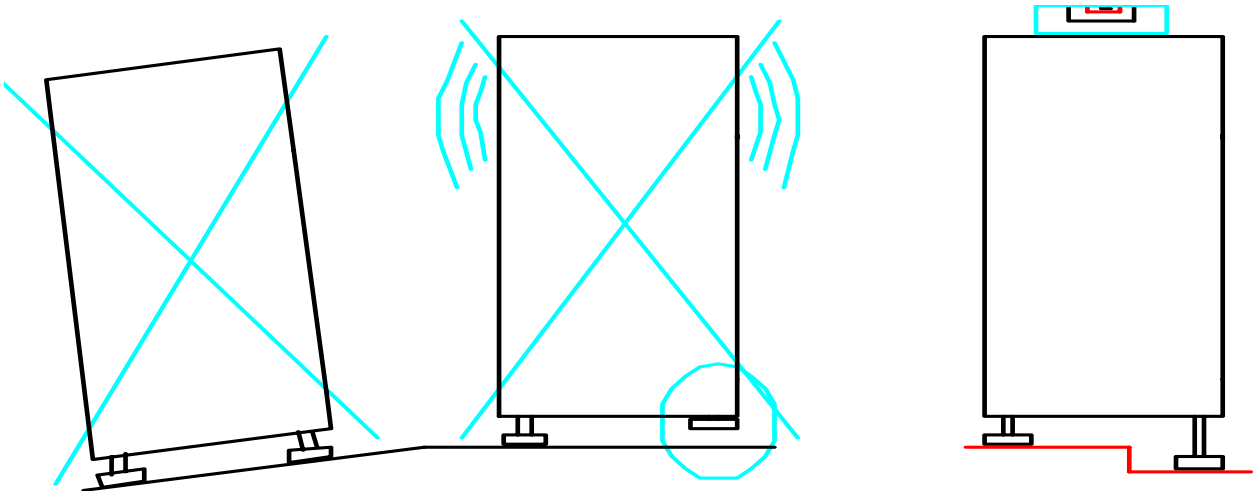
| | |
|---|---|
|  | **WHEN STARTING UP THE MACHINE, THE CENTRIFUGATION CHAMBER MUST BE TOTALLY FREE FROM ACCESSORIES AND PACKING MATE.** |

## 2.3.2 POSITIONING IN THE ROOM

The machine must be installed in a properly ventilated room for a correct fumes and steams exhaust originated during the melting process. In order to reduce possible risks in handling hot materials, it is recommended to install the machine near the heating furnace and the service sink.

1. **PLACE THE MACHINE ON A PERFECTLY FLAT SURFACE.**
2. When the machine is installed, check ***THAT IT IS PERFECTLY STABLE AND HORIZONTAL.***

A total stability is absolutely essential during the centrifugation arm rotation. If necessary, adjust the machine position with the feet supplied with the machine, to adapt it to the floor***. DO NOT INSERT ANY SHIM BETWEEN THE FEET AND THE FLOOR***. With a level gauge, check that the upper surface is perfectly flat.



**Positioning**

## 2.3.3 MAINS CONNECTIONS

Make sure the power supply voltage is the same as the voltage indicated on the identification plate on the machine rear panel. Check that the available power is sufficient (see table: Technical data).

1. **USE AN AC MAINS OUTLET, type 25 A, 250 VAC, SINGLE PHASE**

Using an AC current supply other than the specified supply may damage the machine.

| | |
|---|---|
|  | **Remember the machine must be grounded. Check the efficiency of your electric supply installation.** |

2. Connect the compressed air circuit with the appropriate connection (see Pic. 11). For a proper operation, the pressure should range between 4 and 8 bars.

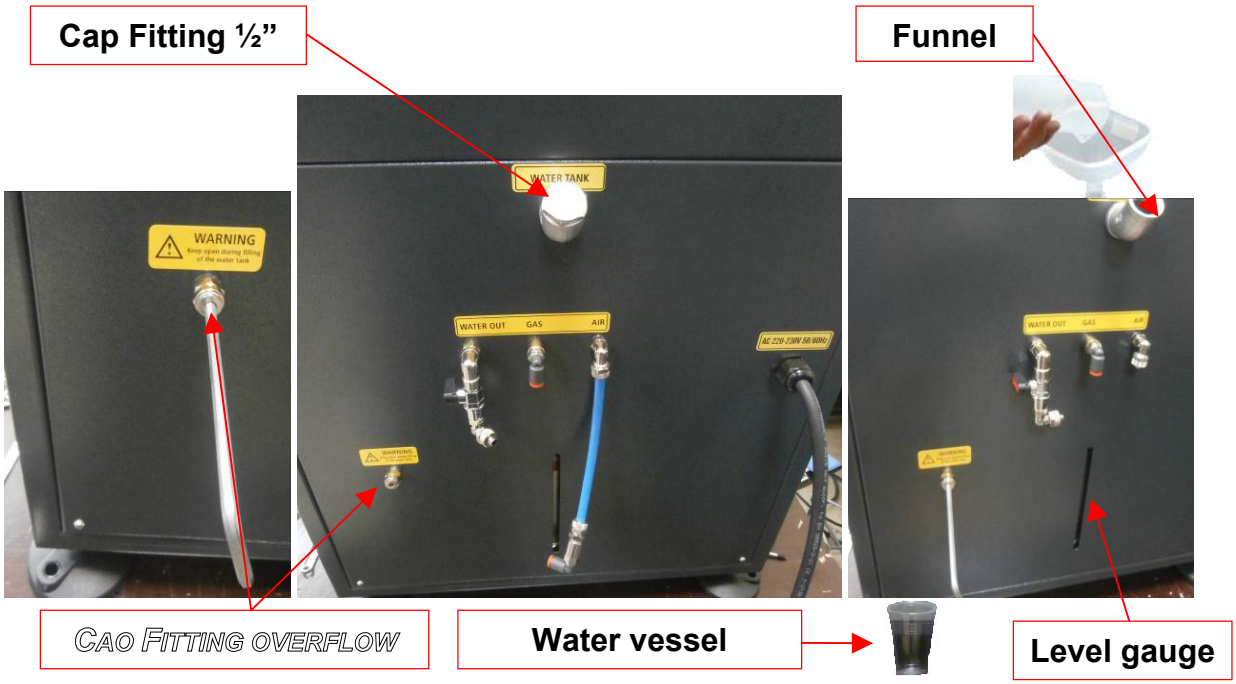
**If the air pressure is being lower, the red light blinks (Pic.2-5) and the LCD-display (Pic.3-10) shows an error: <u>Air pressure fault.</u>**

### 2.3.4 INBUILT COOLING CIRCUIT

The cooling system is built-in. The water level of the tank is indicate by gauge.
In order to fill water tank proceed as follows:
1. Unscrew the cap of the round fitting, marked with “Water In”, located on the rear panel of the machine.
2. Open the “overflow” fitting. Put a water vessel under this fitting – if you fill the tank too much water will start overflowing from there.

***This outlet must be open during filling the water tank!***

3. Start to fill water in the tank using a funnel.
4. Fill in the tank with approximately 18 liters of demineralised water until overflow fitting.
5. Monitor water gauge, located at the bottom of the rear panel!
1.




**Rear Panel**

**ATTENTION!**
**DO NOT FILL THE WATER TANK WITH WATER PRESSURE!**

**A completely full tank allows carrying out about 16 consecutive melting operations (depends on ambient temperature and time for melting).**
**If the laboratory needs to carry out more melting operations, an internal HEAT EXCHANGER can be built.**

6. Check the water level every 12 months.

To empty the cooling circuit, proceed as follows:

1. Connect the L fitting, situated at the rear of the melting machine, marked with ”**WATER OUTLET**” with a suitable hose.
2. Open the Cap and insert the other end of the hose into sewage or a container of about 20 litters.
3. Start the machine with the main switch ON (Pic.2-1); the machine starts draining water.

### 2.3.5 PRELIMINARY CONTROLS

1. Check that the air circuit has been connected (there must be no leaks, bleeds, etc.) and the power supply is on.
2. Check that the centrifugation chamber is free from any accessory.
3. Check that the emergency push-button (Pic.2-6) is disconnected; to unlock the emergency, rotate the push-button in the direction of the arrow.
4. IN CASE OF FAILURE - If a malfunction is observed during the operation, immediately disconnect the machine and check troubleshooting section.
5. EMERGENCY STOP CONTROL - This mushroom type push-button is red on yellow background. It should be used:
    - to avoid danger to operator;
    - to reduce damages to the machine or to on-going operations.

    **USE WITH MODERATION!**

## 2.4 OPERATING INSTRUCTIONS

### 2.4.1 CRUCIBLES

The casting machine EC-1 is supplied with two types of crucibles for testing purposes.

- **DOUBLE COATING CRUCIBLE: CERAMIC + SILICON NITRIDE**

(white with grey inner coating) Dentalfarm item code: **RT100E – pack à 6pcs**.
This kind of crucible can be used to melt all alloys but it is particularly suited for those alloys reaching very high temperatures. We recommend to pre-heat it in the furnace before use in order to avoid coolings and any slags sediment during injection. Its excellent resistance to high temperatures allows for extended use up to 2000°C. The special lining in silicon nitride prevents the melted metal from accumulating between the bottom of the crucible and the injection hole. Available capacity: cm3 13.

- **DOUBLE COATING CRUCIBLE: CERAMIC + GRAPHITE**

(white with black inner wall – fitted with cap) Dentalfarm item code: **RT102E – pack à 6pcs**.
This crucible is suitable for any alloys except for palladium-base alloys which could be contaminated by the graphite layer. No pre-heating is necessary since the graphite itself is a hea-trasmitting conductor. The reduced inner volume allows for small quantities of precious alloys to be melted. Borax vitrification is recommended to stick the graphite powder.
Highest temperature level: 1500°C - Available capacity: cm3 6.

Upon request, additional crucibles are available:

- **CERAMIC CRUCIBLE** Dentalfarm item code: **RT101E – pack à 6pcs**.

The most simple and cheapest crucible of the range, with large capacity and, provided it is duly pre-heated, most widely suited for any melting procedure.
Highest temperature level: 1550°C - Available capacity: cm3 15.

- **DOUBLE COATING CRUCIBLE: CERAMIC + ZIRCONIA**

(white with yellow inner coating) Dentalfarm item code: **RT104E – pack à 6pcs**.
This kind of crucible is best intended for use with all alloys. It is most expensive than the ceramic model but it features a better smooth finishing at the inside which contributes to a smoother metal flow and in addition it is much more resistant (2/3 times more) thus offering a better ratio quality/price/performance. **No pre-heating required**.
Highest temperature level: 1900°C - Available capacity: cm3 15.

- **CRUCIBLE WITH LINING IN SINTERED GRAPHITE**

(Outer ceramic support and black glossy inner coating in vetrified carbon – fitted with cap) Dentalfarm item code: **RT103 – single package**
This crucible is ideally suited for precious and half-precious alloys. It preserves the alloy during melting and it assures a uniform diffusion of the temperature. Thanks to the absence of porosity, any contamination with the alloy is thus prevented. It can stand temperatures up to 2000°C and lifetime is by far longer but price is also higher. Available capacity: cm3 10
**Note:** No differences are evidenced in all ceramic models whereas in order to be assured of longer lifetime for the sintered graphite crucibles, it is most important to let them cool in inert atmosphere (oxygen flowing in the expanded graphite will origin cracks in the crucible).
**Note:** The introduction of pieces which, due to their shape and/or size, risk to get stuck inside the crucible, may cause it to break. During the heating process, these pieces will expand and exert a strong pressure on the crucible walls thus causing them to crack.
**Note:** It is recommended not to let the melted metal too long inside the crucibles since in such a way the critical temperature for the ceramic will be reached, thus originating cracks. During the melting procedure with an induction casting machine, liquefaction must be attained within max 3 minutes otherwise this will be the sign for some inconveniences, therefore immediately stop the unit.

## 2.4.2 CENTRIFUGAL ARM AND CRUCIBLE PREPARATION

Before attempting to melt any type of alloy, refer to the technical data and processing data referred to the metals used, supplied by the alloys manufacturers.
Choose the type of crucible to be used according to the alloys chemical features (see attached table for details).

**Note: Always refer to the indications supplied by the alloy manufacturer.**

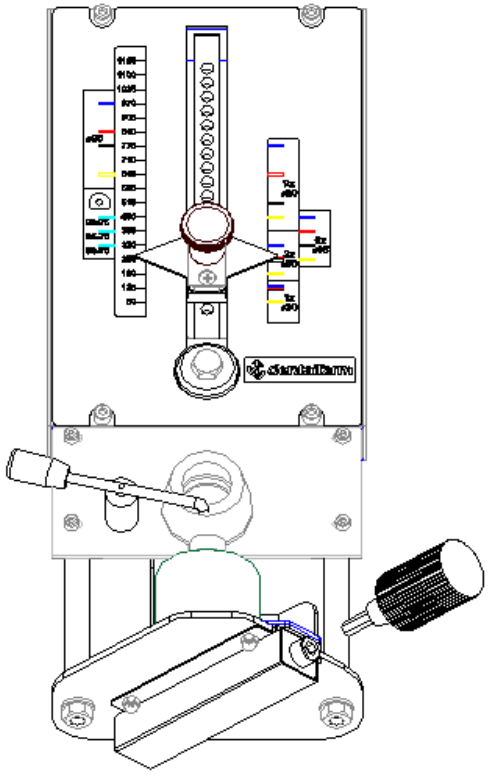
**Use a crucible in good working conditions. If necessary, replace the crucible with a new one to prevent it from breaking, which could damage the melting unit or produce bad melting.**

1. Introduce the metal to be melted into the crucible;
2. Check that the metal reaches the bottom of the crucible and does not remain stuck on the top of the crucible. - Reuse of old alloy: Check with the alloy manufacturer if previously melted metal (in vacuum, argon or atmosphere) can be reused and if a percentage of new metal should be added. If this is possible, it is advised to eliminate all oxide traces (for example through sandblasting), and to cut it in appropriate portions to introduce it inside the crucible in such a way as to achieve the maximum contact between the various metal parts;
3. Prepare the casting ring following the instructions supplied by the coating supplier, depending on the technique used, i.e. free expansion or steel casting ring;

**Choose the casting ring size according to the free expansion technique or the steel casting ring. The size must be suitable for the work to be carried out and to the melting unit casting ring cradles. Place the cradle on the corresponding supports on the centrifugal arm, choosing the most appropriate size according to the casting ring size.**

4. Place the crucible onto its seat with the spout pointing ahead (towards the casting ring melting cone)
5. Use the proper key to shift the trolley in order to reach the position where the caasting ring centre axle matches with the crucible spout
6. Carry out the balancing of the arm

A specific study on this operation has been completed with the aim to facilitate it substantially. The different casting rings prepared according to the most widespread techniques and filled with the most widely used investments have been weighed thus being able to work out a table with full references which can be used by the User when choosing the correct position where the counterweight must be placed to assure the highest stability.
A specific section on the graduated scale corresponds to each size of the most commonly used casting rings (1x = ∅30 / 3x = ∅50 / 6x = ∅65 / 9x = ∅80). In each section of the graduated scale you can find 4 references corresponding to the different weights according to the investment or the technique used.



***Balancing***

| | |
|---|---|
| **yellow** | Free expansion |
| **green** | Plaster investment with metallic casting ring |
| **red** | Framework investment with metallic casting ring |
| **blue** | Phosphate or silicon investment with metallic casting ring |

The mobile counterweight can slide on a track where various position holes have been drilled.
It will be sufficient to lift the knob and direct the pointer onto the casting ring in use.

**NOTE** The distance between the holes is of 8mm, repositioning the mobile counterweight of 1 hole corresponds to an increase in weight of 65 g. For safety reasons, a specific table has been printed, too stating the different weight values according to the selected positions.

**The more accurate balance, the lower will be the machine vibrations.**

The table below shows to operator the acceleration adjustment according to the metal used:

| METAL | ACCELERATION |
|---|---|
| Gold alloys | 0,25...0,5s |
| Palladium alloys, steel | 0,1 …0,25s |

Table 6: ***Acceleration adjustment***

**NOTE: Acceleration should be adjusted according to the weight and type of the material to be centrifuged (specific weight). In general, low accelerations for heavy weights and higher accelerations for lighter weights.**

## 2.4.3 MELTING PREPARATION

**DURING THE MELTING OPERATION, HIGH TEMPERATURES ARE REACHED IN THE CRUCIBLE. HANDLE WITH CARE AND USE APPROPRIATE GLOVES AND TONGS.**

1. Switch on the machine (and prepare it for work) turning the main switch (Pic. 2-1) up.

**The green light “ON” (Pic.2-2) must light up.**

2. Position the centrifuge arm by aligning the crucible axis with that of the heating coil.
3. Press COIL push-button (Pic.2-7). As it rises, it will wind around the crucible. When the correct height is reached, the coil button lamp will turn on and the coil will lock in position for the melting operation.

**If the arm position is not correct, the coil does not rise.**
**If the correct height is not reached for the melting, you must verify the air pressure and check for any objects inside the chamber that may block the rising movement of the heating coil.**

4. Position the crucible holding plate (Pic.1-1.3) to the rotation centre (above the coil).

5. Introduce the material to be melted into the crucible.
6. Introduce the crucible into its housing (Pic.1-1.3).
7. Lock the crucible with the lever (Pic.1-1.5) on the crucible side.

### 2.4.4 MELTING

1. Close the lid.

**During the melting process, a light gas formation is released from the metal mass. This can be dangerous only when the operator performs the melting process, willingly and consciously, with the lid open and directly breathes above the crucible.**

2. If the casting machine has a temperature control, insert the set point
3. Press MELT push-button (Pic.2-8). The yellow light “ON” turns on and, after 1 or 2 seconds, the LED bar (Pic.2-4) shows the absorption; the absorption should be set according to the type and quantity of metal, by rotating the control knob (Pic.2-10) to the right to increase the melting power (and thus the melting speed).
4. While the metal is heating up, open the protection lid and load the flask (which has been heated separately according to the procedures provided by the manufacturer).

**For a direct vision of the melting process, use the anti-UV screen on the lid opening or use appropriate safety goggles.**

Once the metal is melt, the centrifugation process can be carried out (refer to section “CENTRIFUGATION”).

### 2.4.5 VACUUM MELTING (for EC-2 only)

**In vacuum melting, it is recommended to preheat the casting ring in the furnace, at the required temperature, for a longer period of time in comparison to the traditional melting systems.**

1. Arrange the crucible in its support (Pic.1-1.3) with the metal to be melted. Introduce the preheated casting ring and close the protection lid.
2. Press VACUUM push-button (Pic.3-12) to start the air suction process from the centrifugation chamber. Once a negative pressure of – 0.8 bars is reached (see vacuum meter Pic.3-11), the pump can be switched off by pressing again the same push-button (Pic.3-12).
3. Press MELT push-button (Pic.2-8) and proceed as above.

### 2.4.6 INERT GAS INTRODUCTION (for EC-2 with argon option)

**Check that the gas bottle is connected, the valve is open and it is fitted with the appropriate pressure regulator.**

When the protection lid is closed, press VACUUM push-button (Pic.3-3.12) so that the air in the centrifugation chamber is sucked. As soon as the vacuum meter shows a negative pressure of - 0.8 bars (Pic.3-11), the pump can be switched off. Press ARGON push-button (Pic.3-13) to start the gas inlet process, checking the pressure inside the centrifugation chamber. When the vacuum meter (Pic.3-11) shows a pressure close to -0.2 bars interrupt the gas introduction and press the push-button (Pic.2-8) to start the metal heating process.

### 2.4.7 CENTRIFUGATION

1. Make sure that the flask is perfectly positioned. Close protection lid and wait until the metal is completely melted.
2. Press INJECT push-button (Pic.2-9) to start the centrifugation process.
3. When the centrifugation is completed automatically, or if it is stopped with the push-button STOP (Pic.2-5), wait until the safety locking system unlocks the lid. Open the lid and remove the flask with the appropriate tongs.

**For all materials, the centrifuge keeps the preset speed for about 40 seconds then it stops. The lid remains locked for 8 seconds after the centrifugal motor has been stopped.**

# 3. INFORMATION ON MAINTENANCE AND REPAIR

## 3.1 MAINTENANCE

**BEFORE PERFORMING ANY KIND OF MAINTENANCE INTERVENTION, SWITCH OFF THE MACHINE AND DISCONNECT THE POWER SUPPLY.**

Remove all accessories from the centrifugation chamber.
Carefully clean the inside of the centrifugation chamber, removing all coating fragments or metal residues. Clean with the upmost care the PTFE bushing where the coil slides, using the compressed air gun.
Every 6 months, check the cooling water tank and top up the water evaporated during the melting operation, through the filler cap situated at the rear of the machine.

## 3.2 ACCIDENT PREVENTION PROTECTIONS

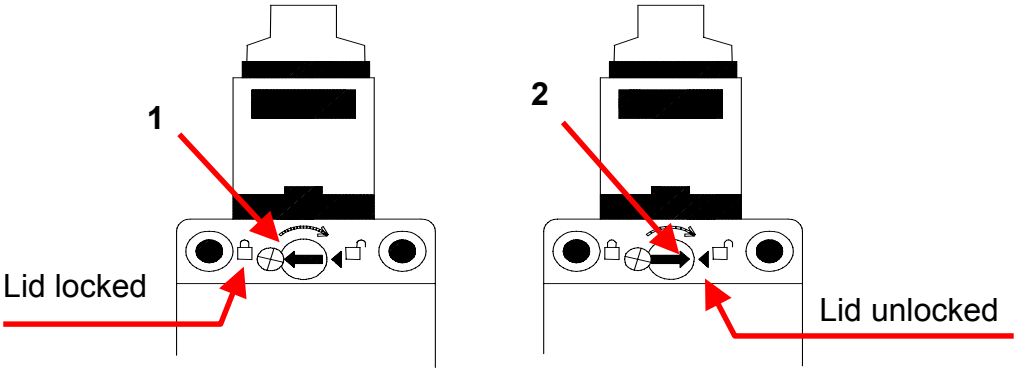
1. During the melting operations, the operator is protected by the centrifugation chamber closing lid. The working cycle is enabled only when the lid is locked. The lid remains locked in closed position until the centrifugation is completed.

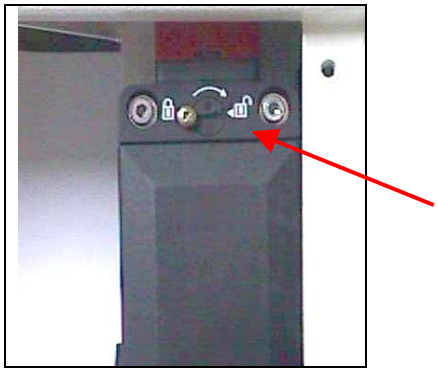
2. The side cover, front cover and rear cover are fitted in position by screws that can be removed with the special screwdriver supplied with the machine.

**DURING THE WORKING CYCLE, DO NOT FORCE THE PROTECTION LID OPENING.**

3. To open the protection lid in case of lack of electric supply, perform the following operations:
   - Remove the left side panel of the machine using the special key supplied with the machine
   - Loosen the crossed screw (1of Pic.12)
   - Turn of 180° the screw (2 of Pic.12) with an appropriate screw driver so that the arrows match each other and unlock the lock.
   - Open the lid
   - Turn of 180° the screw (2 of Pic.12) to bring back into use the safety device
   - Lock it again by tightening the crossed screw.
   - Re-assemble again the side panel.

**EMERGENCY LID UNLOCK SHOULD BE USED ONLY IN CASE OF POWER SUPPLY FAILURE, DURING THE CASTING OPERATION.**



**Safety device to lock the lid.**

**TO PREVENT DAMAGES TO PERSONS, DUE TO HIGH TEMPERATURES AND ELECTRIC SHOCKS, AVOID DIRECT CONTACT WITH THE MELTING COIL DURING THE HEATING PROCESS.**

## 3.3 SERVICE

### 3.3.1 GENERAL

If for some reason the unit fails it is advisable to have the unit be serviced by the manufacturer or its authorized service representative. Should that happen, please contact us immediately (see contact information in Section 3.3.2).

Please have the following information about your unit readily available when calling:

1. Unit Model and Revision (located on the label on the back of the unit).
2. Unit Serial Number (located on the label on the back of the unit).
3. Line Voltage and frequency.
4. Detailed description of the problem including – load, ambient temperature at the time of the failure.
5. Detailed description of the actions taken.
6. Approximate lifetime of service.

If our technical staff is unable to help you over the phone, then a repair authorization number (RA#) will be issued for you. With this number enclosed in you return package you can ship the unit back for repair or request a service engineer to repair the unit on site.

### 3.3.2 SERVICE CONTACT INFORMATION

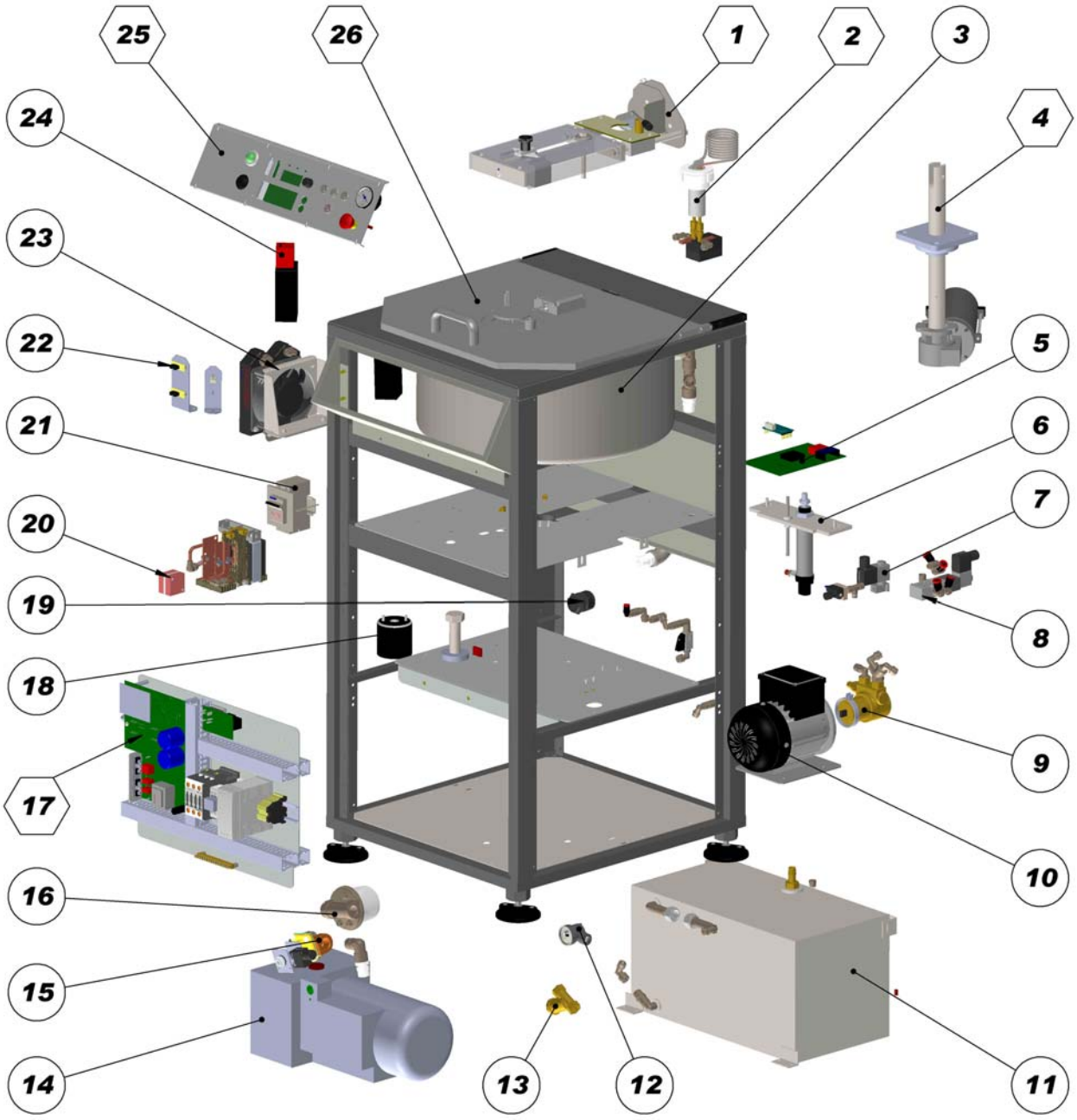
**For technical service questions, please call:**
Italy: +39 011 4346504 – Rest of Europe and Asia: +359 2 480 1900
USA and Canada: +1 631 467 6814
**You may also fax your questions or request:**
Italy: +39 011 4346366 – Rest of Europe and Asia: +359 2 480 1910
USA and Canada: +1 631 980 4065

**Or e-mail us at: support@ultraflexpower.com - info@dentalfarm.it**

**You can also send you request through our www.ultraflexpower.com or www.dentalfarm.it**

**Note: Please, include your contact information so that you can be easily reached if necessary.**

## 3.4 SPARE PARTS LIST

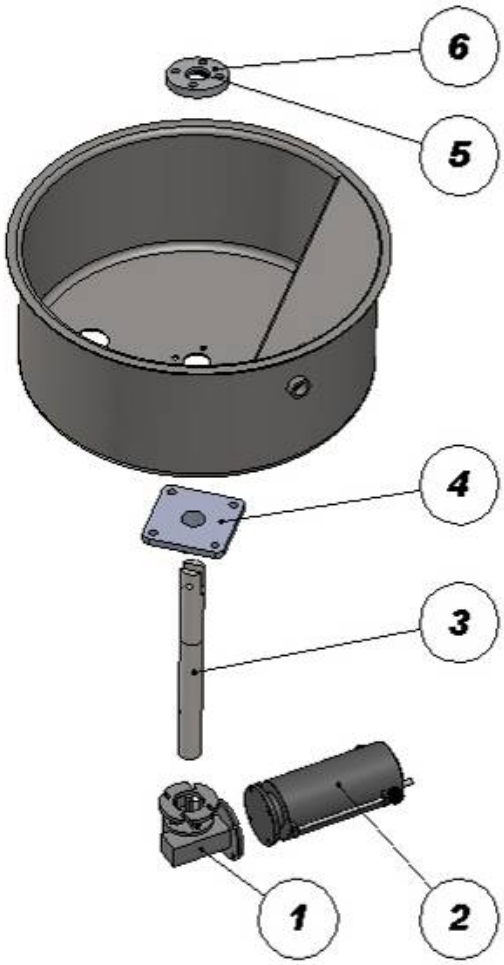



***Spare parts list EC-1, EC-1-IR and EC2***

Table 7: ***Spare parts list EC-1, EC-1-IR and EC-2***

| № | Description | Part Number | | | Qty |
|---|---|---|---|---|---|
| | | EC-1 | EC-1-Inf | EC-2 | |
| 1 | Arm Assembly | 2MAS-015-520-DF, A00-see below | | | 1 |
| 2 | Coil Movement | see below | | | 1 |
| 3 | Chamber | 2MAS-015-500-AA, A00 | | | 1 |
| 4 | Rotation System | see below | | | 1 |
| 5 | Temperature Control Board | N/A | 1MOD-017-710-00, A10 | | 1 |
| | Se 1212 | N/A | 1MOD-017-300-00 | | 1 |
| 6 | Cylinder d 25mm/run 50mm | 9VLM-000-025-00 | | | 1 |
| 7 | Connector for solenoid valve | N/A | | 9VLO-000-127-00 | 0/1 |
| | Bobbin, gas argon, 24Vdc, 10W | N/A | | 9VLM-000-031-00 | 0/1 |
| | Solenoid valve 2/2, 24Vdc,G1/4” | | | | 0/1 |
| 8 | Pressure switch | 9VLM-000-024-00 | | | 1 |
| | Connector for coil | 9VLO-000-151-00 | | | 1 |
| | Bobin, 24Vdc, 3.1W | 9VLO-000-058-00 | | | 1 |
| | Noise Killer | 9VLO-000-152-00 | | | 2 |
| | Solenoid valve 5/2 | 9VLM-000-023-00 | | | 1 |
| 9 | Water Pump | 9VLM-000-018-00 | | | 1 |
| 10 | Motor Water Pump | 5MOT-000-003-00 | | | 1 |
| 11 | Water Tank for EC | 2MAS-015-500-LM, A00 | | | 1 |
| 12 | Flow sensor | 9VLO-000-054-00 | | | 1 |
| 13 | Water filter | 9VLO-000-125-00 | | | 1 |
| 14 | Vacuum Pump | N/A | | 9VLM-000-029-00 | 0/1 |
| 15 | Connector for coil | N/A | | 9VLO-000-175-00 | 0/1 |
| | Bobbin, devacuum valve24Vdc, 8W | N/A | | 9VLM-000-032-00 | 0/1 |
| | Solenoid valve,1/2”,24Vdc, 8W | | | | 0/1 |
| 16 | Air filter for Vacuum pump | N/A | | 9VLM-000-030-00 | 0/1 |
| 17 | Electronic assembly | 2MAS-015-500-II, A10-see below | | | 1 |
| 18 | Inductor, Choke | 5MIT-471-001-00 | | | 1 |
| 19 | Feedthrough, PG 13 | 4KVT-000-026-00 | | | 1 |
| 20 | Capacitor, Film CSP 120 | 3CFM-105-001-01 | | | 1 |
| 21 | Fuse for 2 Fuses | 3FFM-204-003-00 | | | 1 |
| | Decorative Frame for Fuse | 3FFM-000-027-00 | | | 1 |
| 22 | Optic Sensor | 1MOD-015-810-00, A11 | | | 2 |
| 23* | Heat Exchanger | 2MAS-015-500-SA | | | 1 |
| 24 | Safety Switch Pizzato | 3SBM-000-027-00 | | | 1 |
| 25 | Control Panel Plate and CP Folio | 2MAS -015-500-OO, A10 | | 2MAS-015-510-OO, A00 | 1 |
| 26 | Cover Assembly | 1ASM-015-500-CC, A00 | 2MAS-015-510-CC, A00 | | 1 |
| 27* | IR Temperature reader with electronic control | | | TS-04 | 1 |
| 28* | Argon gas dispenser | | | CA-01 | 1 |

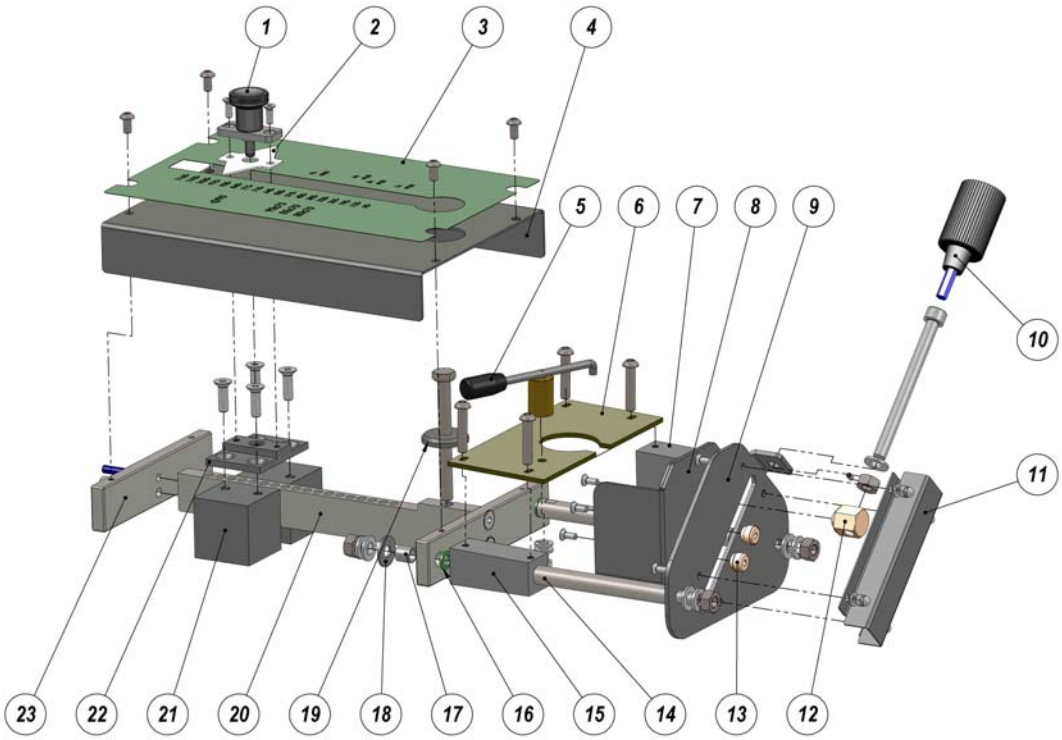
23*, 27*, 28* - Optional Equipment for EC1




***Rotating System***

Table 8: ***Rotating System***

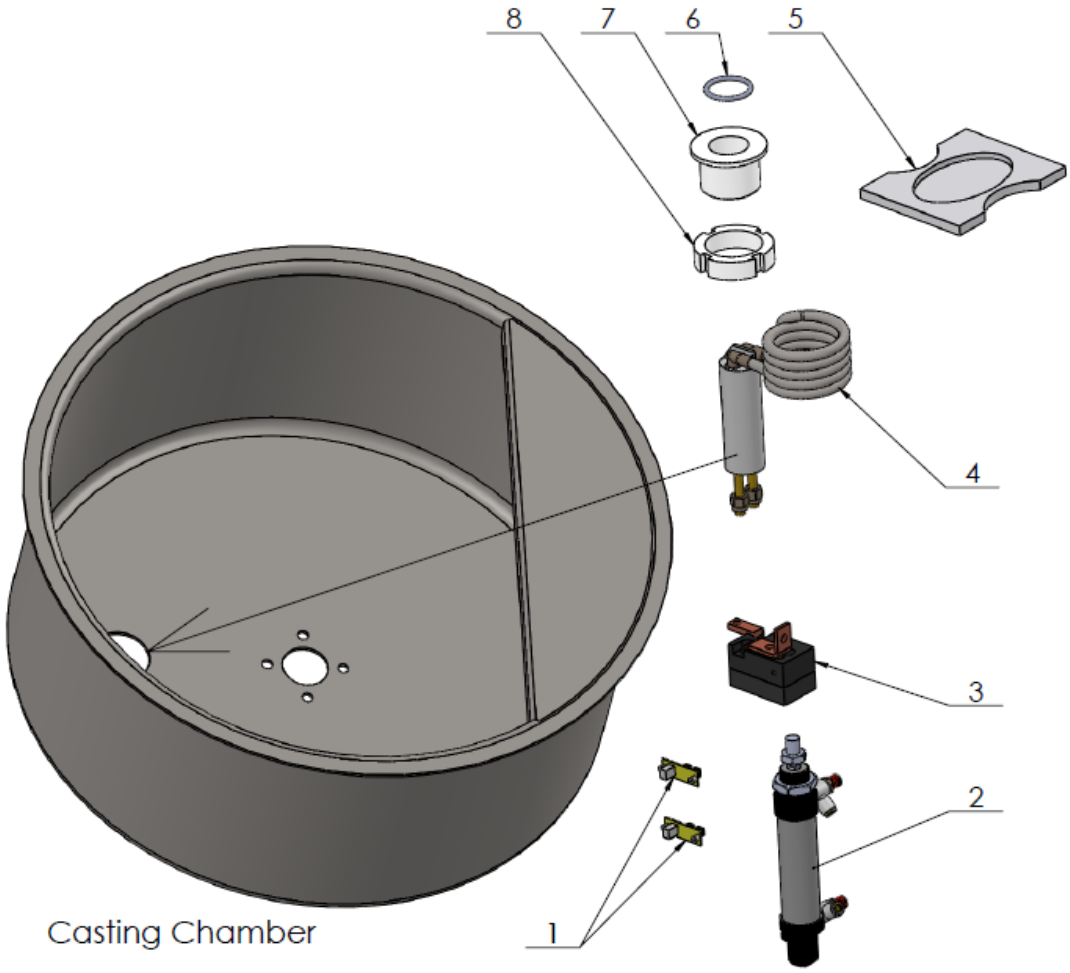
| № | Description Rotate System | Part Number | | | Qty |
|---|---|---|---|---|---|
| | | EC-1 | EC-1-Inf. | EC-2 | |
| 1 | Motor Centrifuging | 5MOT-000-004-00 | | | 1 |
| 2 | Gearbox Reductor | 5MOT-000-005-00 | | | 1 |
| 3 | Metal Shaft | 2DET-015-500-XA, A00 | | | 1 |
| 4 | Radial Bearing | 4HBM-000-004-00 | | | 1 |
| 5 | Holder seal | 2DET-015-200-OM, A00 | | | 1 |
| 6 | Radial Shaft seals 30x40x7 | N/A | | 6VCC-000-115-00 | 1 |




***Centrifugal Arm 2MAS-015-520-DF -A00***

Table 9: ***Centrifugal Arm 2MAS-015-520-DF-A00***

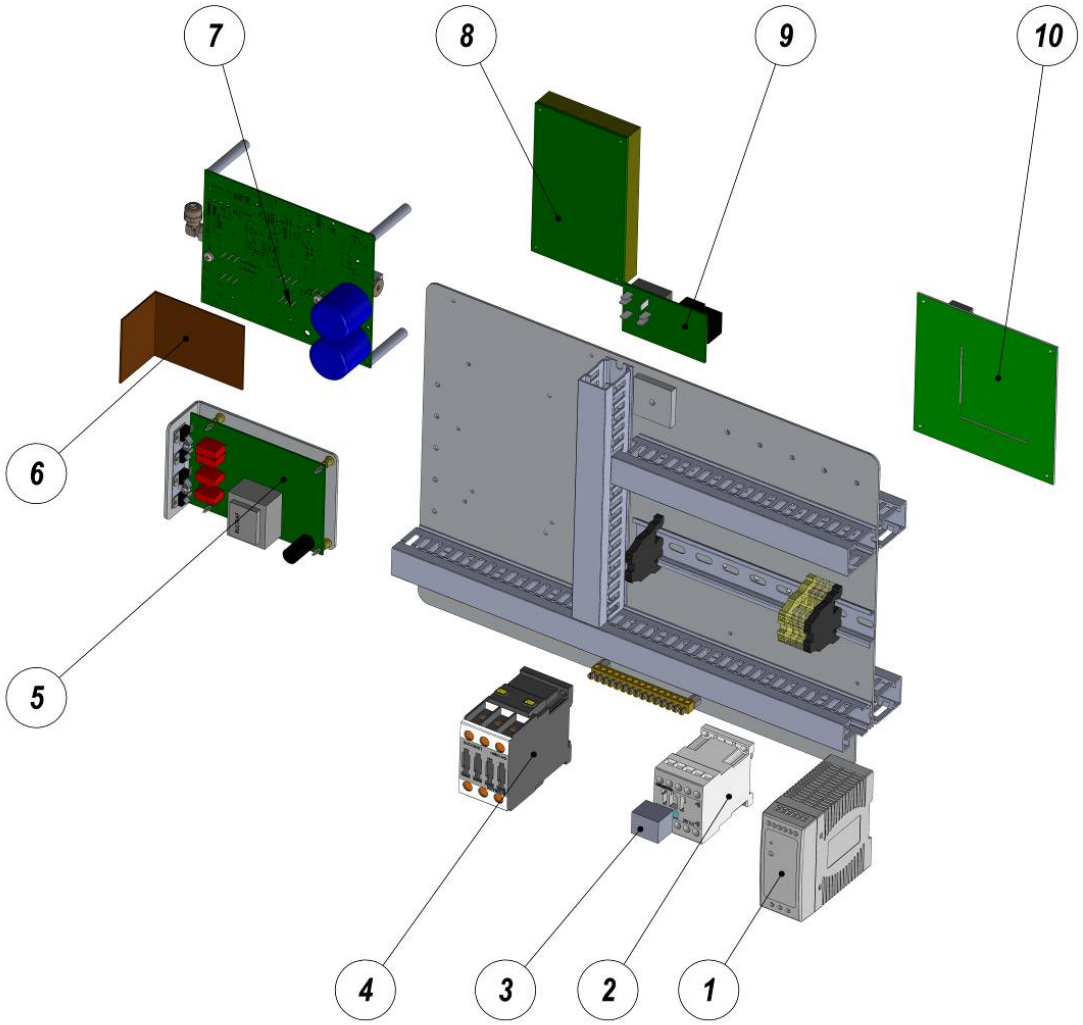
| № | Description Centrifugal Arm | Part Number | Qty |
|---|---|---|---|
| 1 | Counterweight locking knob | 4EAC-000-026-00 | 1 |
| 2 | Pointer | 2DET-015-520-DI, A00 | 1 |
| 3 | Label | 5LBO-015-520-00, A00 | 1 |
| 4 | Closure Plate | 2DET-015-520-DG, A00 | 1 |
| 5 | Crucible locking lever | 2MAS-015-200-AH, A00 | 1 |
| 6 | Crucible holder plate - Cogeterm EC1,2 | 2DET-015-520-DF, A00 | 1 |
| 7 | Arm right trolley slider | 2DET-015-200-NP, A00 | 1 |
| 8 | Support on casting ring holder | 2DET-015-520-DD, A00 | 1 |
| | Casting ring holder | 2DET-015-520-DC, A00 | 1 |
| 9 | Sliding guide | 2DET-015-520-DB, A00 | 1 |
| 10 | Operation key | 4EAC-000-027-00 | 1 |
| 11 | Screw protection Plate | 2DET-015-520-DA, A00 | 1 |
| 12 | Threaded pin | 2DET-015-520-DM, A00 | 1 |
| 13 | Cylindric pin | 2DET-015-520-DL, A00 | 2 |
| 14 | Side arm | 2DET-015-520-DF, A00 | 1 |
| 15 | Arm left trolley slider | 2DET-015-200-NO, A00 | 2 |
| 16 | Small insulating washer | 2DET-015-500-ZE, A00 | 1 |
| 17 | Insulating bush | 2DET-015-500-DZ, A00 | 2 |
| 18 | Big arm washer | 2DET-015-200-PI, A00 | 2 |
| 19 | Arm locking washer | 2DET-015-200-NJ, A00 | 2 |
| 20 | Beam | 2MAS-015-520-DE, A00 | 1 |
| 21 | Mobile counterweight | 2DET-015-520-DK, A00 | 1 |
| 22 | Connection plate | 2DET-015-520-DJ, A00 | 2 |
| 23 | Fix counterweight | 2DET-015-520-DH, A00 | 1 |




***Coil Movement***

Table 10: ***Coil Movement***

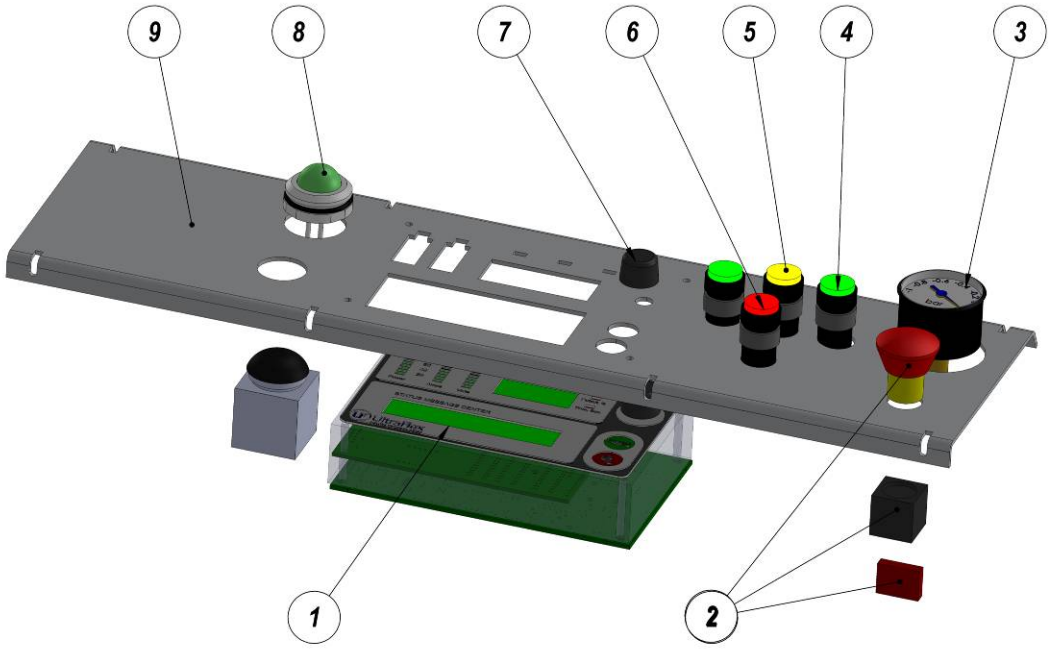
| № | Description Coil Movement | Part Number | Qty |
|---|---|---|---|
| 1 | Optic Sensor | 1MOD-015-810-00, A11 | 2 |
| 2 | Pneumatic Cylinder | 9VLM-000-025-00 | 1 |
| 3 | Holder Coil assembly | 2MAS-015-200-AL, A00 | 1 |
| | | 2DET-015-200-OF, A00 | 1 |
| | | 2DET-015-200-OE, A11 | 1 |
| 4 | EC1/EC2 Inductor | 1ASM-015-501-00, A00 | 1 |
| 5 | Ceramic Base | 2DET-017-100-OU, A00 | 1 |
| 6 | “O”- Ring, 29.75x3.53 | 6VCC-000-082-00 | 1 |
| 7 | Moving Ring Coil | 2DET-015-200-NQ, A10 | 1 |
| 8 | Nut Moving Ring Coil | 2DET-015-200-NR, A00 | 1 |




***Electronic Assembly 2MAS-015-500-II-A1***

Table 11: ***Electronic Assembly2MAS-015-500-II-A1***

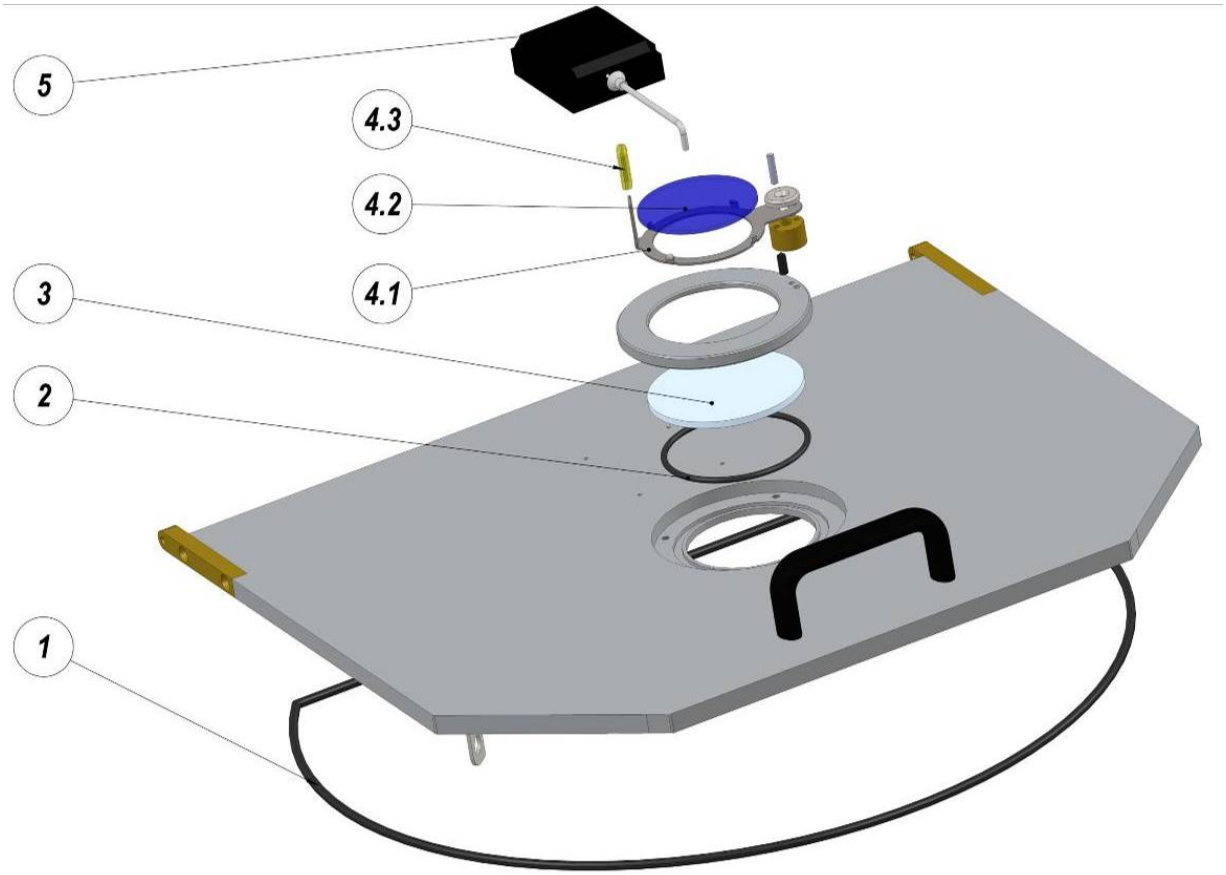
| № | Description Electronic Assembly | Part Number | Qty |
|---|---|---|---|
| 1 | Single Power Supply | 3PSP-000-019-01 | 1 |
| 2 | Contactor 3ph, 24Vdc+NC, 7A/400V | 3FEM-000-010-00 | 1 |
| 3 | Auxiliary Contact | 3FEM-000-019-00 | 1 |
| 4 | Contactor 3ph, 230Vac, 25A/400V | 3FEM-230-001-00 | 1 |
| 5 | Motor Board Assembly | 2MAS-015-550-00, A00 | 1 |
| 6 | Control Board (Inverter) | 1MOD-021-701-00, A11 | 1 |
| 7 | Inverter board | 1MOD-021-220-00, A20 | 1 |
| 8 | Relay Board | 1MOD-017-850-00, A00 | 1 |
| 9 | PCB, JR Power Supply inrush limiter | 1MOD-751-600-00, A00 | 1 |
| 10 | Interface Board | 1MOD-769-102-00, A00 | 1 |




***Control Panel***

Table 12: ***Control Panel***

| № | Description Control Panel | Part Number | | |
|---|---|---|---|---|
| | | EC1 | EC1-Inf. | EC2 |
| | | 2MAS -015-500-OO, A10 | | 2MAS -015-510-OO, A00 |
| 1 | Control Panel, Main Board | 1MOD-782-100-00, A21 | | |
| | Control Panel, LED Board 4digits for Melter | 1MOD-782-111-00, A20 | | |
| | Control Panel, Encoder Board | 1MOD-782-120-00, A10 | | |
| | LCD Display | 3LDT-202-003-00 | | |
| 2 | Push Button, Emergency Stop Red | 3SBM-000-026-00 | | |
| | Holder for 2 contact blocks | 3LEM-000-004-00 | | |
| | Auxiliary contact | 3FEM-000-014-00 | | |
| 3 | Vacuum meter | N/A | | 9VLM-000-027-00 |
| | bracket for vacuum meter | N/A | | 2DET-017-500-PH, B00 |
| 4 | Anti vandal Push Button, green | 3SBM-000-024-00 | | |
| 5 | Anti vandal Push Button, yellow | 3SBM-000-036-00 | | |
| 6 | Anti vandal Push Button, red | 3SBM-000-025-00 | | |
| 7 | Cap, Plastic, push on Knob | 4EAC-000-014-00 | | |
| 8 | LED lamp Board | 1MOD-700-050-00, A00 | | |
| 9 | Front panel plate | 2DET-015-500-OA, A00 | | 2DET-015-510-OA, A00 |
| | Frame for front panel | 2MAS-015-500-EE, A10 | | |
| | Overlay | 3EPN-017-500-00, A10 | | 3EPN-015-510-00, A10 |




***Cover Assembly***

Table 13: ***Cover Assembly***

| № | | Description | Part Nimber | | |
|---|---|---|---|---|---|
| | | | EC1 | EC1-Inf. | EC2 |
| | | | 2MAS-015-500-CC, A00 | | 2MAS-015-510-CC, A00 |
| 1 | | Rubber | N/A | | 6VCC-000-092-00 |
| 2 | | “O”-ring | N/A | | 6VCC-000-081-00 |
| 3 | | Ceramic glass | 2DET-017-500-MT, A00 | | |
| 4 | 4.1 | Filter glass blue | 6VMT-000-007-00 | | |
| | 4.2 | Glass Holder | 2DET-015-200-PB, A00 | | |
| | 4.3 | Plastic Cap | 4EAC-000-019-00 | | |
| 5 | | Fiber Optical Tube | 3SNM-000-012-00, A00 | | |
| | | Preamplifier Box | 2DET-017-500-MC, A00 | | |
| | | Optic Preamplifier Board | 1MOD-017-720-00, A00 | | |

# Appendix A: RECOMMENDED SPARE PARTS KIT

**Table Appendix A:** ***Recommended Spare Parts Kit Table***

| № | Description | Part Number | | | Qty |
|---|---|---|---|---|---|
| | | EC-1 | EC-1-Inf. | EC-2 | |
| 1 | Cogetherm D38 DS | 2DET-015-200-OB, A01 | | | 1 |
| 2 | Motor Board Assembly | 2MAS-015-550-00, A00 | | | 1 |
| 3 | Control Board (Inverter) | 1MOD-021-701-00, A11 | | | 1 |
| 4 | Inverter board | 1MOD-021-220-00, A20 | | | 1 |
| 5 | Flow sensor | 9VLO-000-054-00 | | | 1 |
| 6 | EC1/EC2 Inductor | 1ASM-015-501-00, A00 | | | 1 |
| 7 | Relay Board | 1MOD-017-850-00, A00 | | | 1 |
| 8 | PCB, JR Power Supply inrush limiter | 1MOD-751-600-00, A00 | | | 1 |
| 9 | Safety Switch Pizzato | 3SBM-000-027-00 | | | 1 |
| | Fiber Optical Tube | N/A | 3SNM-000-012-00, A00 | | 0/1 |
| 10 | Preamplifier Box | N/A | 2DET-017-500-MC, A00 | | 0/1 |
| | Optic Preamplifier Board | N/A | 1MOD-017-720-00, A00 | | 0/1 |
| 11 | Optic Sensor | 1MOD-015-810-00, A11 | | | 2 |
| 12 | Ceramic Base | 2DET-017-100-OU, A00 | | | 1 |
| 13 | Rubber lid seal | N/A | | 6VCC-000-092-00 | 0/1 |

## Appendix B: MECHANICAL DIMENSIONS

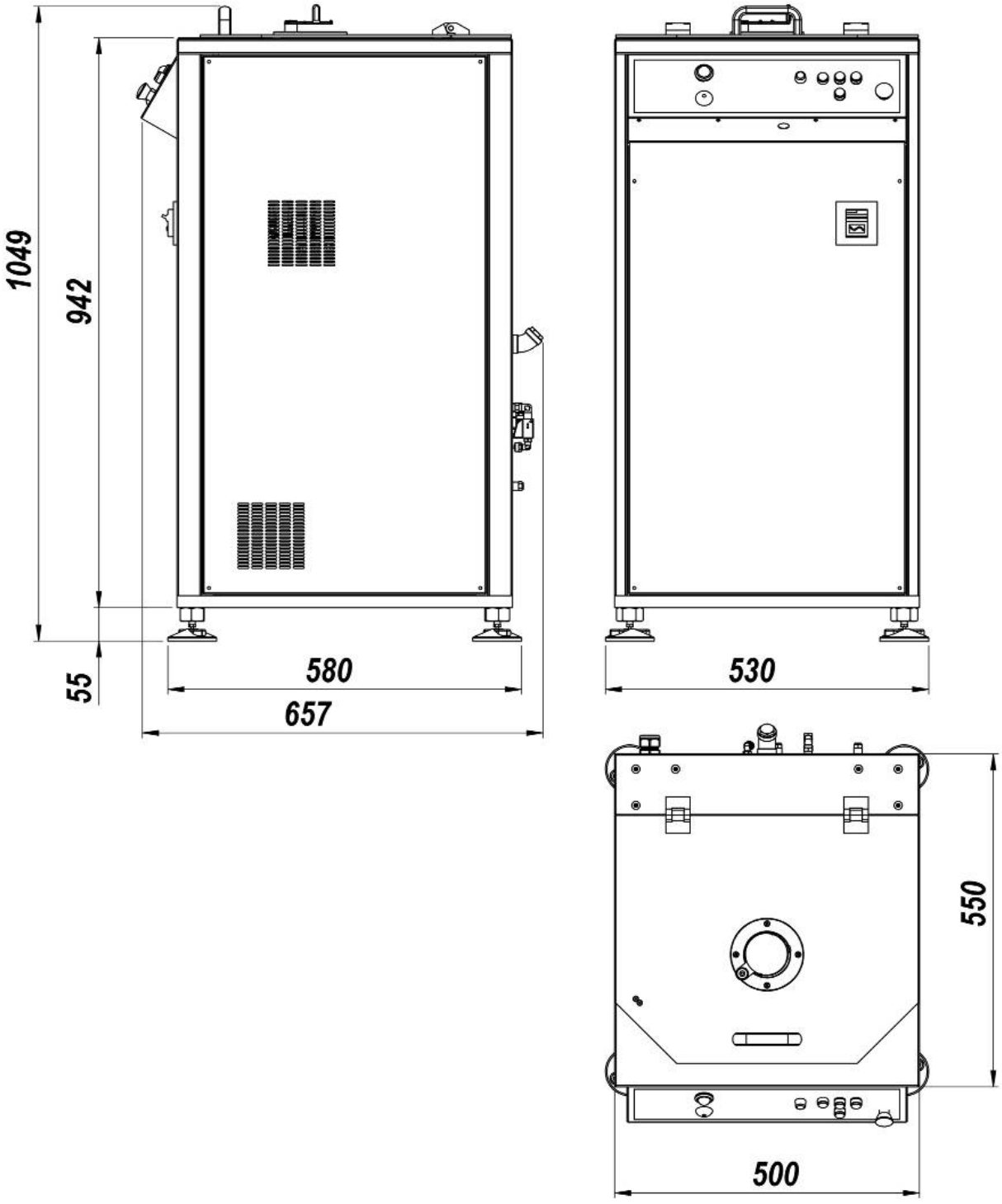



*Fig. App.1* ***Easy Cast EC-1/2 Dimensions (in mm)***

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**Revision Table:**

| № | Ver. | Date | Create/Change by: |
|---|---|---|---|
| 1 | 1.0 | 03.2013 | L. Mihova – M. Bertotti |
| 2 | 1.1 | 04.2013 | L. Mihova – M. Bertotti |
| 3 | 1.2 | 01.2014 | L. Mihova – M. Bertotti |
| 4 | 1.3 | 11.2014 | L. Mihova – M. Bertotti |
| 5 | 2 | 06.2016 | M.Nikolova – M. Bertotti |