

Indutherm MU200 to MU 1200 Instruction Manual



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1. Introduction

1.1. General description of the MU melting machines

With this melting machine, the melting charge is heated up by induction.

The special advantage of inductive heating is that the melting temperature is reached rapidly, because the heat is directly generated in the metal and in the crucible. During the melting process, the metal is thoroughly mixed by means of a magnetic field, ensuring a homogenous mixing even when using new alloys.

Installing the thermocouple in the crucible bottom allows an exact temperature measuring and also the output of the unit is controlled in such a way that the set temperature remains constant.

1.2. Machine components

The machine consists of separate units built into one casing:

- 1. Inside the casing, the following components are installed:
 - mains supply and mains fuses (automatic cut-out)
 - microprocessor controlled induction generator F-type
 - medium frequency transformer
 - oscillation circuit capacities
- 2. The front panel consists of:
 - operating panel for control of melting cycles
- 3. The ca sting unit consists of:
 - inductor, crucible, insulation parts, thermocouple

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Technical data 1.3.

	MU200	MU200
	single phase	three phase
Crucible volume	155cm ³	
Useable capacity	75% of maximum volume	
Crucible temperature	max. 1200 °C	max. 1400 °C
Melting performance	3,5 kW	6,0 kW
Mains supply	1x230V / 20A	3 * 400 V/16A, 50 or 60 Hz
Cooling water supply	2.5 - 6 bar/at least 200 l/h	
Cooling water recoil	without pressure	
Cooling water entry temperature	15 – 25°C	
Room temperature	10 – 35°C	
Relative atmospheric humidity	20 – 80%	
Weight	approx. 58 kg	
Dimensions (width * depth * height)	500 mm * 500 mm * 900 n	nm

	MU 400	MU	700 ML	J 900 MU1	
Crucible volume	400 cm ³ ~6 kg/Au	700 cm ³ ~9 kg/Au	900 cm ³ ~ 13 kg/Aι	1200 cm ³ ı ~18 kg/Au	
Useable capacity	75% of maxi	75% of maximum volume			
Crucible temperature	max. 1500 °	max. 1500 °C with type S thermocouple			
Melting performance	10 kW	12 kW	15 kW	15 kW	
Mains supply	3 * 400 V/25 A, 50 or 60 Hz				
Cooling water supply	2.5 - 6 bar/at least 200 l/h				
Cooling water recoil	without pressure				
Cooling water entry temperature	15 – 25°C				
Room temperature	10 – 35°C				
Relative atmospheric humidity	20 - 80%				
Weight	approx. 58 kg				
Dimensions (width * depth * height)	500 mm * 500 mm * 900 mm				

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1.4. General information

Safety information

In order to ensure a constant, ideal performance of the machine and to ensure safe working conditions, the user is to observe the following safety measures:

- The complete electrical wiring is to be performed only by gualified and specially trained personnel.
- Check the machine and the supply devices regularly on possible damages. ٠
- When opening cabinet/casings or when removing parts (exception: when this is possible ٠ by hand), certain parts under electric power can cause danger. If opening up the machine is necessary (before maintenance, change of machine settings, repair or exchange of parts) the machine must be cut off the mains voltage. If working on the opened machine is inevitable, only qualified trained personnel aware of the danger caused hereby and aware of the relevant regulations may be instructed to do this work.
- Capacitors in the machine can still be charged even when the machine's mains supply is ٠ switched off.
- When it seems that the machine can no longer be worked safely it has to be taken out of production and secured against further unintentional use. The following incidents indicate that safe working is no longer possible:
 - the machine is visibly damaged
 - the machine does not function
 - uncommonly heavy wear from transportation
- The safety valves placed inside the machine casing may not be removed, closed or altered ٠ in any way.
- As melted metal is processed with this machine (= temperatures up to 1500 °C), the utmost care and attention has to be applied when working with the Machine. The following necessary safety clothing is principally to be worn:
 - fireproof clothes
 - fireproof closed shoes
 - fireproof gloves
 - safety goggles
- Special caution is essential when working with graphite crucibles and graphite dies ٠ because these are only visibly hot at temperatures above 500°C!
- In commercial enterprises the regulations for the prevention of accidents of the relevant ٠ authority for electrical machinery are to be followed.
- People with pacemakers must not be near the machine while it is running.
- A trained responsible personnel is to supervise work with this machine. ٠

Use as determined/liability

This casting machine is designed and manufactured to comply with the latest technical knowledge and according to approved safety regulations. When not putting into operation correctly or not using the machine as determined, however, danger and damages may occur. Therefore we suggest reading carefully and completely this manual before putting the machine into operation and to follow the instructions given therein:

- This machine is only to be used for melting and casting of precious metals normally used for the production of jewellery.
- This machine may only be connected as mentioned in this manual. The mains supply as well as in- and outgoing pressures are to be provided as stated on the machine label.
- This machine was designed for use in closed spaces (indoors) and may only be used for the above-mentioned purpose.
- Only original INDUTHERM consumable and spare parts are to be used.
- The machine may not be modified in any way. Technical changes may only be effected with INDUTHERM GmbH's prior written permission.
- Damages caused by disregard or false interpretation of the contents of this instruction manual result in an immediate expiration of the machine guarantee.
- This instruction manual is conform to the latest technical condition of the machine when printed. Technical changes and fittings subject to change.
- INDUTHERM GmbH cannot and will not take responsibility for any damages resulting of the above mentioned.
- This instruction manual may not even partially be reproduced (photocopy, micro film, computer processing etc.) without prior written permission of INDUTHERM GmbH.

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2. Putting into operation

On delivery, immediately check if the machine is complete and if there are any transportation damages. In the case of damages, please contact at once supplier or forwarding agent.

2.1. Set-up directions

The machine should be placed on clean and dry ground. The ground should be even, solid and level. The rear side of the machine must remain freely accessible to ensure sufficient circulation of cooling air. The cooling air temperature must not exceed 35°C and must not be contaminated. Only after all supply and connecting systems have been connected, the machine may be put into operation.

2.2. Mains supply

Only trained personnel may connect the machine. Please pay attention to the nominal voltage and frequency stated on the machine label. The 3-phase current may differ +/- 10% (maximum) from the nominal value. The mains supply must at least be furnished with 20 A and maximum with 32 A delay-action fuses (at 3* 400 V AC). The machine is equipped with a 32 A-Ceekon-connector when leaving INDUTHERM. All 5 lines (L1, L2, L3, N, PE) must be connected correctly.

2.3. Cooling water

Use two hoses with an inner ø of 8 mm for the cooling water. The water entry pressure must be at least 2.5 bar and must not be more than 6 bar. The water drainage must be <u>without</u> <u>pressure</u>. The water entry temperature must be above 15°C and must not exceed 25°C. The concentration of lime in the water must not be more than 60 mg CaO/I. The cooling water must not be contaminated.

Caution: As long as the crucible temperature is above 100°C, the cooling water supply must be open; otherwise the inductor insulation could be destroyed. In case the cooling water supply stops while there is still a hot crucible inside the machine, the crucible must be removed once.

2.4. RS232 connector

At this connector our modem article no. 71000320 or the serial cable article no. 50500060 can be connected

3. Operation

3.1. Operating elements



- Temperature:

Normally, the actual crucible temperature is indicated here. When pressing the buttons "+" or "--" the indication changes to the set-point value (nominal value) for at least 5 seconds. An active set-point value is indicated through an illuminated red decimal point. The set-point value can be altered with the buttons "+" or "-".

- Water:

This signal lamp illuminates when the water entry pressure is more than 2 bar. If the water pressure is too low, the signal light extinguishes and the generator is stopped after some seconds. The display shows error and there is an acoustic error signal.

- Program:

It is possible to store up to 20 temperature values (0-19). To store a new value:

1. Select a program number (0-19) with the pushbuttons '+' or '-' (field Program).

2. Adjust the temperature value with the pushbuttons '+' or '-' (field Crucible Temperature).

3. Press the pushbuttons '+' **and** '-' (field Program) simultaneously at least 1 second. Now the new temperature value is stored.

Power:

-

-Button Start / Stop:

The generator is turned on/turned off with this buttons. The turned on generator regulates principally to the adjusted nominal temperature (see Crucible-Temperature).

-Button + / -:

The maximum generator power is selected with this buttons

At the side of the operating panel:

Mains Switch:

The machine is switched on/off by turning the mains switch.

3.2. Casting

Before starting check crucible and crucible insulation for dirt residues/possible damages. It is recommended to use a **vacuum cleaner** for the entire inductor.

A suggestion for a general casting process:

- 1. Open cooling water supply.
- 2. Switch on melting machine.
- 3. Set the desired melting temperature on the digital temperature controller and start generator (button 'Start').
- 4. Wait until material is molten.
- 5. Turn generator off (Button 'Stop') an remove crucible with the help of tongs.
- Comment: All these steps you can see in our official customer CD article no. 81100010. There you can see all steps in a video.

4. Service

4.1. <u>Trouble shooting</u>

Only trained personnel should open the machine.

The machine cannot be turned on:

- when there is no mains supply

The heating cannot be turned on:

- when there is no cooling water supply, error code "E012"
- when thermocouple is not in place or defective, indication crucible temperature "OFbE"
- when generator is running hot (error code "E021"
- other error, error code "Exxx"

Incorrect temperature indication:

- thermocouple is not programmed correctly, see appendix

Low generator output:

- nominal value of temperature control too low

Other error codes: see appendix

4.2. Maintenance

A routine check/regular cleaning of the following is necessary: (Caution: disconnect the machine first!):

Daily (before casting):

1. Remove thermocouple, crucible and insulation materials, carefully clean inductor housing with a vacuum cleaner. Before reinstalling the above parts, check those and replace if necessary.

Annually:

Depending on the water quality, the cooling system should be cleaned with 25% citric acid. The cooling system should be treated with this acid for approx. 1 hour. Then clean the system thoroughly with pure water and check on eventual leakages.

- 1. Tighten all electric wirings, especially those for power current.
- 2. Tighten all connections of water-cooling.

5. Connection diagram

5.1. MU200 single phase



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5.2. MU200- MU1200 three phase



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6.1. Assembly drawing MU-series

