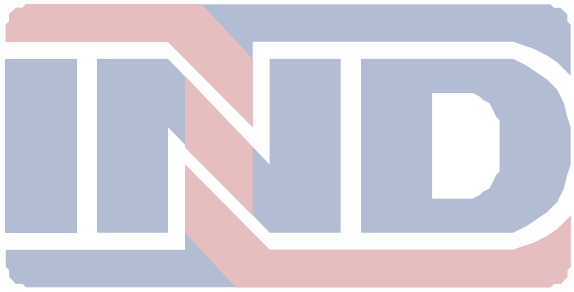
MANUAL

for
Induction
Centrifugal Metal
Casting Machine
ICG-61



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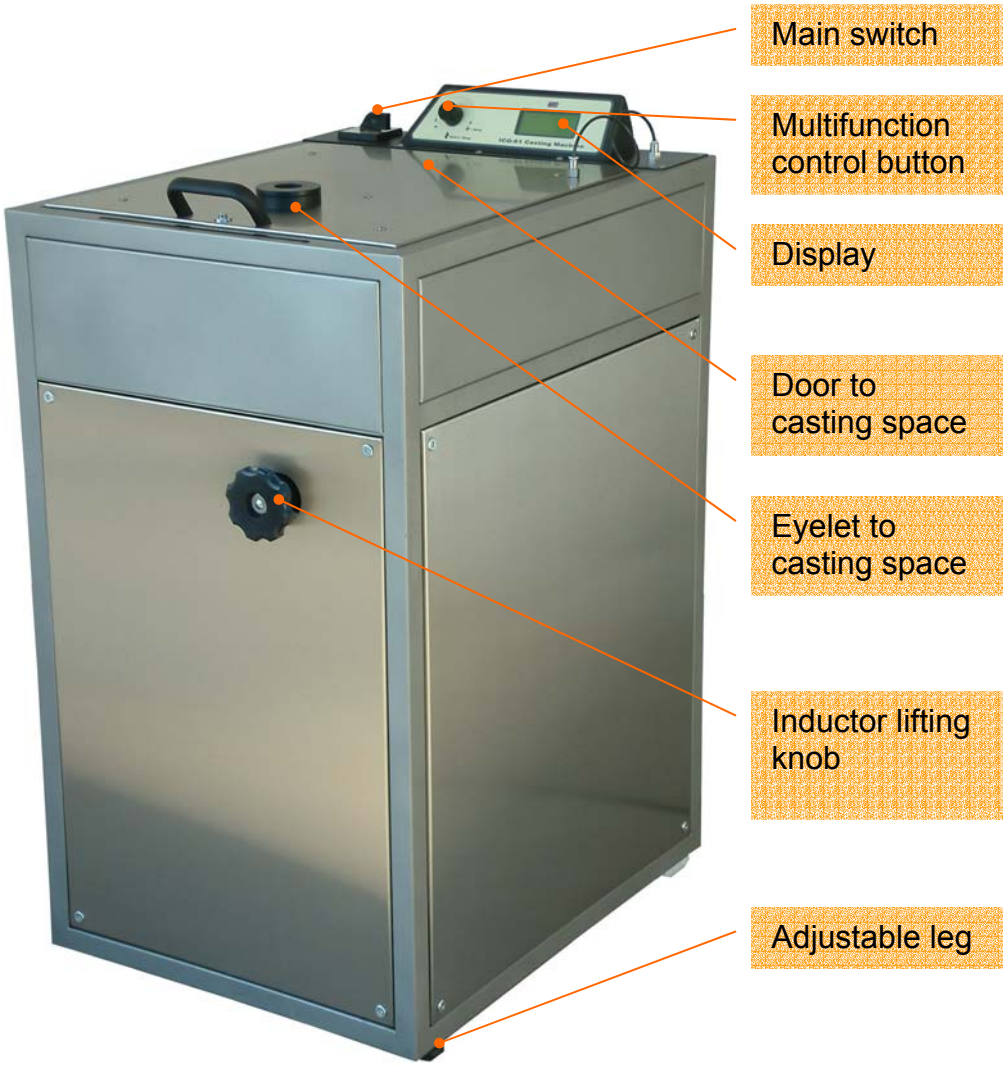
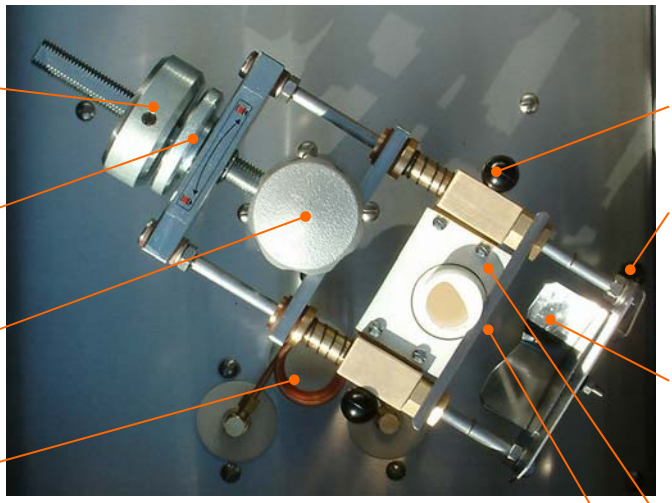
Before installation, setting into operation and use of the induction casting machine ICG-61 read thoroughly this manual, considering especially the chapter of safety technology instructions!

Contents:

1 Parts of equipment



Centrifuge arm and the inductor



Connectors on the back panel

2 Operation of equipment

ⓘ Equipment is suitable for melting and centrifugal casting of metals and alloys. Casting machines ICG are advantageously used in practice of dental mechanics, as well as in technology of precision casting of jewels and individual parts of machines, instruments.

ⓘ By help of casting machines type ICG tasks of laboratory casting can be realized quickly and preciously. Their operation is adapted to the generally propagated means and demands.

ⓘ Casting machines ICG accept the use of crucibles G2 (50 g) or the ones of COWADENTAL (70 g), and their versions with graphite insert. Dimensions of casting machines ICG fit to furniture and devices generally used in laboratories.

ⓘ Not completely introduced, some technology advantages of the equipment

- o great specific power input,
- o mixing of the melted metal under heating, so alloy keeps to be homogenous,
- o contamination of alloy, alteration of its composition and its oxidation take place in a few degree,
- o intensity of heating is controlled optimally by the automatics,
- o thanks to high pressure of casting, moulds of thin dimensions can be made successfully, as well.

3 Installation of the equipment

ⓘ When a question is arisen relative to installation, not detailed in this part, please contact the manufacturer or the service workshop appointed.

3.a Placing the equipment

ⓘ The induction casting machines ICG as laboratory equipment are manufactured in indoor execution, so they shall be installed taking this fact into consideration.

ⓘ Casting machine shall be placed in a dry, dust- and frost-free room, in the vicinity of the heating furnace, in a way that the basic and auxiliary materials needed for casting can be closely stored. Special attention shall be paid that after casting the hot mould or crucible can be placed under safe conditions from the point of view of accidents or property protection.

☞ The inlets of electric supply, protective gas and cooling water shall be mounted and fixed so that they do not disturb the work of operator, and the hot material shall not damage these inlets. The argon gas holder shall be placed in the vicinity of the casting machine.

☞ So that the work would be continued undisturbed, in front of the casting machine a zone of free place of minimum 1,2 m shall be left. The most important condition of the accident-free work performance is that the person performing the operation of casting shall not be anyway hindered. It is very important that the space of centrifuge would be sufficiently illuminated. In case of a sufficient enlightening could be only expected that casting and centrifuge would be adjusted properly, and the casting form would be caught securely.

☞ Casting machine shall be placed on a horizontal and plain surface. The possible loosing shall be entirely eliminated by adjusting the legs of the machine.

☞ Back panel of the casting machine shall be placed in a distance of minimum 10 cm of other surfaces, walls, because of good streaming of the cooling air. When we are to cast many rations serially, directly each after other, casting machine advisable to place in the dominant air stream of the room.

3.b Electric connection of the equipment

ⓘ Electrical connection shall be realized only to mains with grounding.

☞ Connect the equipment to the electric mains. Pay special attention to the intact state of insulation of the wires.

3.c Connecting the equipment to the system of cooling water

☞ Connect cooling water.

ⓘ Because of close repetitions of short time heating procedures and consuming little water, it is advised to solve cooling from the water system. As an average, one casting procedure needs 1 litre of water. When cooling takes place from the water system, even 30 procedures of casting can be made in succession. As to reduce water consumption, casting machine shall be switched off, when takes place no more streaming of cooling water. Without cooling water, machine does not operate.

ⓘ Having a quantity of cooling water less than 0,6 l/min, equipment prohibits casting and on the **display** error message is indicated.

3.d Connecting the argon gas holder

☞ Connect argon gas holder (see para 4.g Changing argon gas holder)

4 Handling of equipment

4.a Switching on the equipment

☞ Turn on the tap of cooling water.

ⓘ WHEN FREE STREAMING OUT OF COOLING WATER IS PARTIALLY OR TOTALLY HINDERED, EQUIPMENT COULD BE DAMAGED.

☞ Open the valve of the argon gas holder.

☞ Turn **main switch** to **1** position.

ⓘ Display indicates menu of pre-heating, while process of pre-heating is performed. Duration of pre-heating makes 10 sec, after this period equipment gets to ready-to-operation status. Casting can be started.

ⓘ On the menu of ready-to-operation state temperature of cooling air, stream volume of cooling water are indicated, and in brackets also a number of self-diagnostics, which shows a code characterizing state of equipment.

4.b Preparation of casting

☞ Open the door of casting space. For this keep pressed the lock button under the handle of the door to space of casting.

☞ Pull out and turn counter-clockwise up to clashing the **button for lifting the inductor**, positioned on the first vertical panel of the casting machine.

ⓘ **Inductor** gets to lower position (when **inductor** is found in this position, naturally this operation is omitted).

☞ Turn the **lever of centrifuge** up to showing to control organs of **holder of casting form**, as to prepare casting procedure comfortably.

☞ Put the crucible to its **holder** directed with its spout to **holder of casting form.**

ⓘ DO NOT USE DAMAGED AND CRACKED CRUCIBLE. Fluid metal pouring out of a cracked crucible can damage the equipment.

ⓘ In certain cases, pre-heating the crucible influences advantageously to its lifetime, while casting itself can be executed more quickly.

☞ By help of **handles** pull the **holder of crucible** against the springs towards the **fixing button**.

ⓘ When normally adjusted, crucible gets to its seat. Let the **holder of crucible** back. Spout of **crucible** is directed to the **holder of casting form**.

☞ Feed into the crucible the quantity of metal needed to casting in a way that metal would fill up the space in the bottom of the crucible.

ⓘ Do not pre-heat casting metal in a heating furnace or casting equipment because this increases oxidation and causes alteration in composition, so metal gets unsuited for casting. In such a way, this operation shall be avoided.

ⓘ Careful placing of the metal pieces can help with quick and undisturbed melting. The metal pieces stacked may cause delay of casting. The melted metal begins to evaporate, while the stacked metal melts.

☞ Take off casting form from the furnace and get it into the **holder of casting form** of the centrifuge. By means of the **lever controlling the height of casting form** adjust the height of position of the form so that its gap of pouring would get positioned against the **spout of the crucible** (in case of a conic gap of pouring against to the lower side of cone).

ⓘ Melted metal should get from crucible to the form in a shortest way and always along solid surfaces, so that melted metal absorbed the possible least gas (which may cause developing of inclusions). In such a way strive to a positioning when metal leaving the spout of crucible gets surface of embedding possibly most quickly.

☞ Then, turning the **milled nut** press the casting form to the plain plate in front of the crucible.

ⓘ When casting form is not fixed sufficiently, it can breake away during certrifugation, making an accident or damage.

☞ Balance the centrifuge. Do it by loosing the **fixing button**, which makes the lever of centrifuge move free, like a lever of a pair of scales.

☞ Adjust the **counterweight** until the balanced state is reached.

☞ Then fix the lever of centrifuge by tightening the **fixing button**.

ⓘ When the lever would not be fixed, it looses during casting procedure, casting can not be realized and the **inductor** can be broken, as well.

☞ Turn the centrifuge until the casting form gets to the control panel, and crucible gets over the **inductor**.

☞ Lift the **inductor** to the crucible by turning clockwise the **button of lifting the inductor** up to it gets to fastened position.

ⓘ Lifting the i**nductor** is allowed only in heating position of the centrifuge. In this position **inductor** is kept in upper state by the fastener on the button.

☞ Close the **door of space of casting**.

4.c Heating of metal

ⓘ Heating should be switched on after in the crucible metal or graphite insert has been placed.

☞ For commencing the heating procedure press the **multifunction control button**.

ⓘ On **display** the menu of heating is indicated. Intensity of heating in %, two characteristic current values of the heating generator (Ia, Ig), temperature of cooling air, stream volume of cooling water and code of self-diagnostics are shown.

ⓘ Commencing the heating procedure, the heat control automatics start, and the inscription AUTO is indicated on the display. Automatics keep power at optimal value, and so ensure metal quality required.

☞ Turning left the **multifunction control button** automatics can be switched off, then the intensity of heating can be manually reduced. Turning the control button right, power is increased. By repeated pression on the **multifunction control button**, heating is switched off.

ⓘ Continuous power control is advantageous especially in case of use of graphite crucible, when melting of precious metals requires special attention.

ⓘ When power is increased up to the operation limit value of the generator, heating cannot be further increased (Ia=600 mA, Ig=180 mA). If a pulse type overload ensued and this cannot be ceased by intensity reduction, heating stops, and an error message is shown; this can be accepted by pressing the button, then heating can be restarted.

ⓘ Heat control automatics can be restarted by stop and repeated restart of heating.

☞ Check streaming of protective gas by the meter of reducer.

ⓘ When gas streams slowly (less than 1 litre/min) and it can not be increased even by the valve, gas is over. Change the gas holder (in such a case also the meter of the holder reads reduction or cease of pressure).

ⓘ Oxidation is considerably reduced by using protective argon gas atmosphere. Protective gas streams to the crucible only on heating. Metal can also be melted without protective gas atmosphere, but with an increased danger of oxidation.

☞ We can inspect the procedure of heating through the **eye of space of casting** supplied with light filter.

ⓘ When during the heat procedure door of space of casting is open, heating stops.

☞ It can be repeatedly switched on after closing the **door of space of casting**, and pressing the **multifunction control button**.

ⓘ After switching on, within 10-20 sec the glowing metal can be inspected.

☞ When local overheating is observed, i.e. contact points of metal pieces brightly glow; reduce heat power until metal softens. After this intensity of heating can be again increased.

ⓘ Dependently on the conditions, quantity, quality of material, size of pieces, metal heats to ready to casting status within 40 - 60 sec.

☞ Would crucible be broken, and melted metal got into the space of casting, switch off heating immediately by pressing the **multifunction control button**, but as to keep streaming of cooling water **main switch** of equipment leave on.

☞ Remove the spread metal from the space of casting.

☞ Check if spread metal has not caused any defects in the **inductor** or its holders. When metal pieces got among the winds or other moving parts, take them off carefully.

ⓘ When quantity of cooling water is not sufficient, on the **display** an error message is shown.

☞ In such a case **inductor** shall be immediately lowered by pulling out and turning the **button of lifting the inductor**.

ⓘ Doing so we can safe the **inductor** remained without cooling, that was softened by the hot crucible.

☞ As to reduce evaporation and oxidation to possible least degree, cast melted metal immediately.

☞ For commencing the casting procedure, pull out the **button of lifting the inductor** and turn it counter-clockwise up to clashing.

☞ When inductor lowers, heating stops, then centrifuge starts operating, and display shows menu of casting. Generally, 8 - 15 sec of centrifugation is sufficient to make cast solid. For materials with lower temperature of melting, keep a longer time of centrifugation. After 20 sec centrifuge stops (display shows counting back).

☞ Centrifuge can be switched off by pressing the **multifunction control button**.

☞ When a trouble is occurred (unusual noise, sounds by broken casting form or parts of crucible), switch off the equipment immediately, by turning **main switch** to **0** position.

4.d Taking off cast

ⓘ After switching off, centrifuge stops decelerated because of its inertia. **The switched off status does not mean that centrifuge has already stopped.**

☞ Open the door of space of casting when centrifuge stopped.

☞ Loosing the **milled nut** casting form gets free and the finished casting may be taken off.

☞ When we cast subsequently the same metal, let crucible on its place.

☞ In case of changing the metal to be cast, lower the **inductor** and take off crucible from its seat with special tongs made for this.

☞ Between castings made serially, do not switch off the **main switch**, but leave equipment ready to operation.

4.e Stopping the equipment

☞ When casting is finished, take off the crucible from its seat.

☞ Turn **main switch** to **0** position.

☞ Turn off tap of cooling water.

☞ Turn off valve of protective gas holder.

☞ Clean up space of casting.

4.f Maintenance

ⓘ Construction and finishing of the ICG type centrifugal metal casting machines ensure trouble free operation and long lifetime. For this aim, the critical parts have been dimensioned for a multiple of normal load of employment. However, for a trouble free operation the systematic cleaning of the casting machine is absolutely necessary. Precise, high quality and form-true casting can only be made with a perfectly cleaned machine.

☞ When cleaning the space of casting, remove the dirt with the help of vacuum cleaner. Dust the outside cover and the control panel. If necessary, wipe with a wet cloth or sponge. Avoid forceful intervention during cleaning.

☞ If a metal piece gets among the turns of the inductor or due to deformation the turns touch each other, the heating power is reduced appreciably or heating stops entirely. The turns of heating coil should be cleaned with a short brush (toothbrush, copper wire brush). Be careful not to deform the coil. The touching turns should be separated one from another with a thin tool, so that their distance should be about ~ 0.7 mm. Do not damage the coil during this.

☞ If the heat resistant eye glass or its light filter (welding glass no. 7) on the door of the space of heating would be damaged or broken, replace it.

☞ Check periodically for undisturbed operation the water cooling and free outflow of water (at least 1 litre/min).

☞ Check periodically state of leads of electrical supply. The hot casting, casting form, crucible or a sharp tool, upon touching the electric leads, may damage their insulation. A damaged electrical lead can cause current shock or accident of mortal danger.

☞ The broken, damaged parts should be replaced immediately.

ⓘ Equipment is not froze-resistant.

☞ Before storing and shipping, water shall be removed from the system of cooling water. For this, disconnect inlet of cooling water. Turn on **main switch** of casting machine connected to main supply, then blow out the water through the inlet of cooling water by compressed air of a pressure of 2,4 bar. Following this, disconnect the equipment from the main supply.

ⓘ IF ANY ABNORMALITY IS OBSERVED, CONTACT THE SERVICE!

4.g Changing the argon gas holder

☞ Do not let the holder get completely empty.

☞ Close the valve of the empty holder.

☞ Open the patent nut of the reducer with a wrench. Dismount reducer from the holder.

☞ Check tightness of reducer, change sealing if required.

☞ Mount the reducer back to the filled holder. Tighten the patent nut with a wrench.

☞ Open the valve of the argon holder and check system for tightness (by leaking control spray).

☞ After change, on the first heating check and readjust the intensity of streaming of argon gas by the stream control valve.

5 General

ⓘ High frequency supply source and auxiliary circuits are dimensioned for continuous operation; however without periodic cooling, the metal parts in the space of casting can be overheated and damaged because of heat effect of casting procedure.

☞ Casting machine needs 20 minutes pause after 30 consequently made procedures of casting.

☞ When door of space of casting is open, space of casting turns cool in a short time. When control organs of the space of casting can be touched by hand, casting may be continued.

☞ Keep the equipment clean, safe it from dust, fluids.

☞ Equipment shall be stored and shipped in its original packaging.

6 Safety technology instructions

ⓘ Safety technology questions and requirements are introduced to the user, by the expert, who performs setting into operation, before handing the equipment over. User signs protocol of this, which takes the part of the protocol of handing over.

ⓘ Casting machine shall be operated according to the operating instructions, and used only for its purpose.

ⓘ Casting machine type ICG can be operated only by trained persons over 18 years. Casting machine can be operated only in its handed over form and status, with intact cover plates, electric wires and control organs. Using the damaged casting machine is not allowed.

ⓘ Because of high temperature during the technology process of casting pay special attention to danger of burning.

- Work with casting machine only when suitable thermo protective accessories are applied.
- Any conversions and modifications of the casting machine are forbidden.
- In the casting machine apply only parts manufactured and approved by the manufacturer.
- Casting machine shall be protected by an inert breaker of 16 A.
- Check periodically grounding of electric supply of the equipment, according to the instructions.
- Casting machine shall be repaired only by qualified experts.

7 Technical parameters

Electrical mains supply:.....230 V±5 % 50 Hz 16 A

Cooling water (10°-25°C): .....max. 1 litre/min. 0.4-4 bar

Protective gas: ..... 2 - 4 litres/min, argon

Characteristics of time of melting: ..... 40 g of cast metal 50 sec.

Maximum quantity of cast metal:..... 50 g or 70 g depending on crucible

Centrifuge revolution: .....400 rpm

Diameter of casting form: .....30 - 90 mm

Length of casting form:.....40 - 83 mm

Dimensions of the casting machine: ..... 560 × 700 mm, height 980 mm

Height necessary for the opening the door of the casting machine:..... 1700 mm

Weight of the machine: .....cca. 120 kg

Finish of the casting machine: Execution of casting machine .....

..... cover and frame of high-allow rust-proof steel

Operating bias temperature: .....+ 15° C - + 35°C

Maximum humidity: .....90 % RH

A G2 type crucible (for 50 g metal) and a COWADENTAL type crucible (for 70 g metal) can be used with the machine.

FOR THE SPECIALIST MAKING THE REPAIR

- Switch off the electric supply, before removing the cover from the equipment.
- Discharge the built in condensers at the adequate place immediately after removing the cover, despite this task is made by the built in resistors after switching off.
- During repair and change of electron tube ground the high frequency cables.