



**METAL
IS WHAT
YOU MAKE
OF IT.**



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**Company Name: Esghat Khodro Arta Sanat
Keshavarz Ardabil , Iran**

Sub: Your Requirement of Induction Melting Furnace

Dear Sir,

This is in reference to your discussions with undersigned in connection with your requirement of Medium Frequency Induction Melting Furnace. We really appreciate your interest in Inductotherm Induction Melting Furnace.

As per your discussion, we are pleased to enclose herewith following quotation for your perusal:

➤ **Quotation for One [1] No. 8000 KW/200 Hz VIP POWER TRAK HIGH EFFICIENCY WITH Two [2] Nos. 25000 KG STEEL FRAME FURNACES.**

We are also enclosing herewith technical specification sheet, scope of supply, standard terms & conditions.

Hope our offer is in line with your requirement. If you need any further information/assistance from our side, please feel free to contact undersigned or our **Sr. Manager (International Sales), (Cell # +91-9327578451) or Mr. Tarun Sangal, General Manager (Sales), (Cell # +91-9377673760).**

Thanking you,

Sincerely,

**SUNIL PANDITA
SR. MANAGER (SALES & MARKETING)
Cell # +91-9737377734**

Encl: Quotation consists of price sheet, technical specification, bulletins, international terms & conditions (ITAC-03).

On behalf



QEXP14158 Dated: Jun,06,2023

Esghat Khodro Arta Sanat Keshavarz

GIVING OUR CUSTOMERS THE COMPETITIVE
EDGE SINCE 1953, **UNINTERRUPTED**

TECHNOLOGY

Inductotherm is the world's largest producer of induction melting equipment. We have a full time research and development department. Our company policy ensures that our equipment is continuously up graded as technology changes or new components become available.

The following is summary of features which will be incorporated in any equipment.

Features highlighted in **RED** are unique to Inductotherm.

Features highlighted in **PURPLE** are designed to enhance and improve refractory lining life.

Furnace Design: Inductotherm's heavy steel frame furnace design incorporates the following features:



- 1) This rugged construction enables Inductotherm to build the most rigid furnaces available.
- 2) Inductotherm provides Iron shunts which cover up to 60% of the outside of the coil to ensure adequate control of the magnetic field and direct mechanical support of the coil.
- 3) Inductotherm's coil is manufactured from heavy wall copper tubing to provide strength and large water paths to ensure adequate cooling to the back of the refractory lining.



- 4) Inductotherm has been building high efficiency “studded” coils since the 1960's. Phosphor bronze coil studs are used at all times.



- 5) Coils are manufactured with the minimum of joints and all joints are made using a beveled, sleeved joint that is welded and identified.



- 6) Inductotherm’s coils incorporate low loss stainless steel cooling coils above and below the power coil to ensure adequate cooling to the back of the refractory lining through the full height. Low conductivity stainless steel is used to construct the cooling coils to reduce the amount of energy induced in to cooling section thereby increasing the energy available for melting and reducing the losses to cooling system.



- 7) Spacers placed between the coil turns in 16 positions around the circumference of the coil ensure rigidity of the coil in the vertical and provide a means for the coil to “breathe”. The coils ability to breath ensures the free passage of moisture from the refractory lining during the sinter cycle.

- 8) Inductotherm’s power connect is positioned halfway up the furnace. This eliminates the need for a pit in the foundation behind the furnace, minimizes lead movement and removes the leads from the area directly under the back of the furnace.



- 9) The tilt cylinders are fitted with flow restrictors. If a hydraulic hose or line bursts the furnace will drop at a controlled rate.

- 10) The furnace top and bottom refractories are manufactured as pre cast, pre fired shapes incorporating stainless steel fibers for additional strength and durability in preference to castable refractory applied on site.



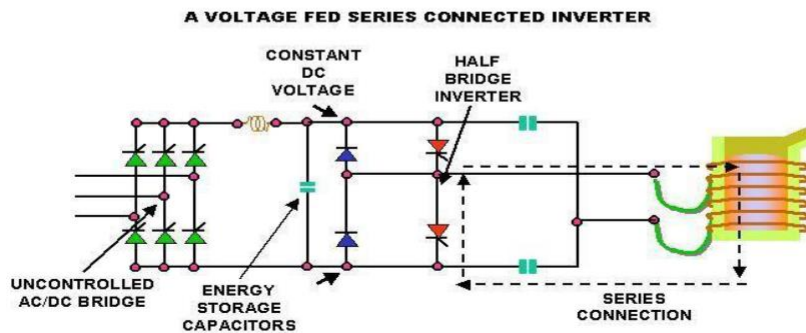
- 11) The furnace weighing system can be included is based on load cells (Optional). To enhance the accuracy and simplify the installation on the foundations Inductotherm supplies the load cells pre mounted in a structural steel frame which is located under the furnace.



- 12) Inductotherm's coils are insulated with a proprietary material called InductoFlex. The use of this material allows Inductotherm to operate with elevated coil voltages. High coil voltages mean lower currents for the same kilowatt draw resulting in lower electrical losses. It also means higher voltages are induced into the charge which enhances the "contact" within the charge.



VIP POWER-TRAK power supply: The VIP Power Trak is based on Inductotherm's time proven voltage fed inverter power circuit. Over 15,500 of these have been supplied worldwide since 1976 and more than 5,000 of these are rated at 5,000 kW or more.



- 1) This Power -Trak operates with an uncontrolled AC/DC rectifier. An uncontrolled AC/DC rectifier ensures that the line power factor $\text{Cos } \emptyset$ will always be between 0.98 and above at ALL levels of power draw.
- 2) The efficiency of the power supply is quoted as 97.5%.
- 3) The SCR's in this system will be operated at 50% of their manufacturer's KVA rating and selected for a thermal junction temperature of 125° maximum.
- 4) The combination of the high power factor and high efficiency ensure Inductotherm's power supplies have the lowest KVA requirement.
- 5) All Inductotherm's power supplies are built into steel enclosures. This ensures all the components, interconnecting cables and bus bars are installed in the factory prior to delivery. This design enables Inductotherm to simplify the installation of the equipment and shorten the onsite installation and commissioning period. This construction ensures the power supply sits on a flat floor and does not require any trenches.
- 6) The nominal operating frequency will be 200 Hz.



MISCELLANEOUS FEATURES:

Inductotherm's designs incorporate a number of features which provide benefits to the customer.

- 1) FOUNDATIONS: All Inductotherm's equipment is design to mount of a flat concrete floor.

The power supply does not require any trenches as all connection are overhead.

An Inductotherm furnace with the power connections in place can fully tilt whilst standing on a flat concrete floor. Unlike our competitors who have the power connection at the bottom rear of the furnace, it does NOT require a pit behind it for the power leads.



- 2) The installation cost is kept to a minimum as each unit is pre wired and pre piped before delivery to site.
- 3) ISO 9001: Inductotherm's equipment is ALL built and tested in the same ISO 9001

SCOPE OF SUPPLY

A. POWER UNIT

I. ELECTRICAL PANEL



1. CABINET

Metal cabinet, duly painted fitted with panel doors which are gasketed and equipped with locks. In addition, micro switches are provided which illuminate a lamp on the monitor board and shut off power to prevent injury to personnel when the lift off panel or doors are opened.

Power connections are easily made through the top and water connections are through the side of the cabinet.

2. RECTIFIER SECTION WITH FILTER

- a) High power SCRs with snubbers for rectification.

This rectifier is designed to minimize line harmonics compared to phase controlled rectifier.

Instantaneous trip circuit facility is provided for the protection of the rectifier.

- b) Fast acting semi-conductor fuses.
c) One No. of Air core encapsulated current limiting reactors.
d) DC capacitors located in capacitor section.

This design of converter and filter section reduces losses compared to iron core current limit reactor(s) and helps to provide constant DC voltage to the voltage fed inverter.

This design helps to achieve the conversion efficiency not less than 96%.



SCOPE OF SUPPLY - PAGE 2

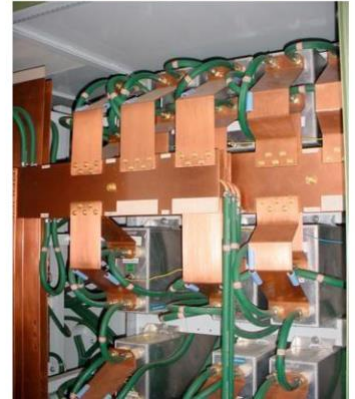
3. INVERTER SECTION

This section contains inverter panel containing high power inverter SCRs with snubbers, anti-parallel diodes and DI/DT reactors. This helps to provide full power throughout the melt cycle.



4. CAPACITOR SECTION

- a) This section contains all the required DC filters and medium frequency AC capacitors.
- b) One pressure switch, installed in each capacitor.
- c) One indicating lamp located on the monitor board to notify the operator when the capacitor pressure switch has been actuated.



5. GROUND/METAL LEAK DETECTOR

One sensing ground/metal leak detector ready to sense and indicate any ground and metal leak. Consisting of indicating lamp, millimeter, probe disconnect switch to disconnect the probe from the power supply.



6. CONTROL AND MONITOR SYSTEM

Enhanced Z-Control Board

Enhanced Z-Control Board (EZCB) is a next step in developing integrated control board with expanded diagnostic. Its design is based on ACCB, ZC-Control Board and Z-Control Board and uses the same principle: controls the delay time between inverter current zero crossing and the next SCR firing pulse depending on the feedback signals. The same new technology from ZDCB and ACCB

is used on the EZCB: one FPGA (Field Programmable Gate Array) combines all-digital, logic and time setting/delay functions which facilitates setup and serviceability, adds more flexibility and functionality, and improves reliability. More diagnostic capabilities with priority decoder based on accumulated knowledge was added to FPGA and its size was doubled. Surface mounted technology (SMT) was used in the design to accommodate 144 pin FPGA IC.



The EZCB was designed as one control board in the unit and incorporates all sensors, actuators, indicators (two digit seven segment display) and firing. The main functions included in EZCB are:

SCOPE OF SUPPLY - PAGE 3

- VIP Control (similar to ZDCB with some modifications)
- Soft Start ACI (similar to ACCB with small modifications)
- Four potential sensors (inverter voltage, DC Bus voltage, capacitor voltage and furnace voltage).
- Diagnostics (status, limit and alarm indicator)
- Inverter SCR Firing Module
- ACI Firing Module
- CLR SCR Firing Module (additional protection from over voltage)
- KWMR
- Lost Phase Detector
- Wrong Phase Rotation Detector
- Short Coil Detector
- Short Secondary Capacitor Detector
- DC Balance Monitor
- AC Current Limit Circuit with two sensing resistors
- Dual Trak Controller
- "Bullet Proof" Function
- MIC (Enhanced IDAIN) Interface
- Test Adaptor Interface

7. INTERNAL CLOSED WATER SYSTEM (INSIDE THE CABINET)

This contains one feed manifold with temperature and pressure switches and one drain manifold with temperature sensors for different paths of cooling system.



II. INTERNAL CLOSED WATER SYSTEM (Outside the cabinet)

This structure contains one plate type water to water heat exchanger, expansion/air separator tank, one mono block non-ferrous pump with starter and one deionizer cartridge for continuous purification of internal water.



SCOPE OF SUPPLY - PAGE 4

III. FURNACE SELECTOR SWITCH ASSEMBLY

Furnace selector switch saves time for selecting the required furnace. For better contact it is made out of silver plated copper blades.



IV. HYDRAULIC POWER UNIT

One hydraulic pumping unit (without oil and starter) to supply pressurized fluid to the tilting cylinders complete with pump, pump motor, fluid reservoir, pressure relief valve, pressure gauge, return line filter and filter air breather cap all mounted on a common base with seamless pipes and fittings.

B. MELTING FURNACE

V. STEEL FRAME FURNACE

Hydraulically tilted steel frame furnace constructed from steel structure to provide higher rigidity and strength. Iron shunts prevent heating of the steel frame from the strong magnetic field; the shunt also holds the coil and prevents the coil from deformation.

The induction coil is placed between the special top refractory block and bottom made out of special refractory clamped by a vertical steel channel.

The coil is made out of electrolytic hollow copper section with top and bottom cooling turns made out of non-magnetic stainless steel. The complete steel frame is pivoted on strong stanchions.

Included in each furnace will be:

1. A set of hydraulic cylinders for the hydraulic tilting of the furnace.
2. Manually operated hydraulic direction control valve for tilting.
3. Leak detector assembly with stainless steel probe wires and hardware.
4. Set of flexible water cooled power leads for connection between the power induction coil and power supply unit. Water cooled leads are with sleeves for protection against metal splash.

