



The Solution  
**alp**

# **VIDP**

**Vacuum Induction Degassing and Pouring Furnaces**

**The Concept of Success in  
Vacuum Induction Furnace Technology**

# VIDP – The Systems Concept

## Equipment Advantages

### Small Furnace Volume

- Reduced desorption surfaces
- Small vacuum pumping system
- Optimum control of the furnace atmosphere
- Low inert gas consumption

### High Flexibility

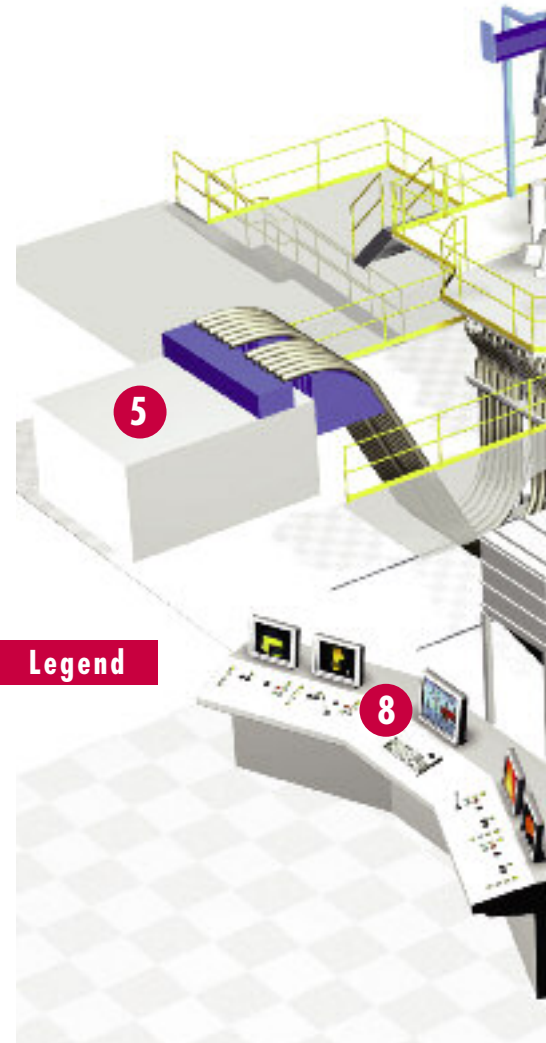
- Through a range of interchangeable lower furnace bodies
- Variable pouring technologies (Ingot Casting, Horizontal Continuous Casting, Powder Production)
- Unit can be modularly expanded
- Connection to multiple casting chambers

### Easily Maintainable

- Power cables and hydraulic lines are outside the melting chamber – leaks do not affect the vacuum
- Simple maintenance of the vacuum pumps through effective filter system, smaller vacuum pumping system
- Tried and tested components, preventative fault diagnostics

### Reliable crucible status monitoring

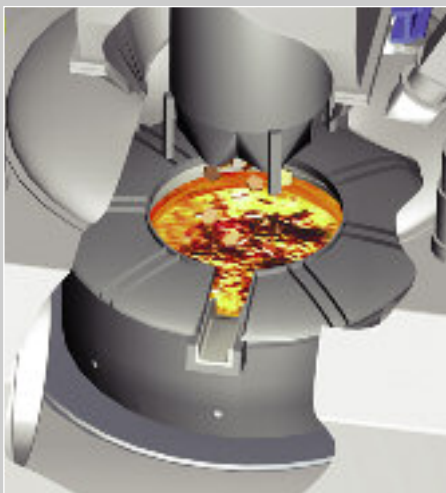
- Increased operational reliability
- Optimisation of the crucible life



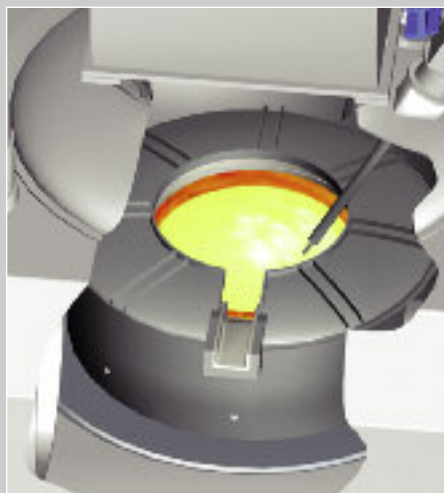
## Legend

- 1 VIDP melting chamber
- 2 Mold chamber
- 3 Bulk charger
- 4 Launder lock
- 5 Melting power supply
- 6 Vacuum pumping system
- 7 Temperature measurement / sample taking
- 8 Central control desk

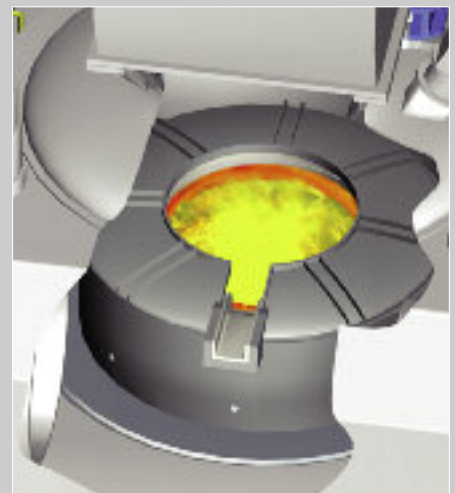
## Vacuum charging

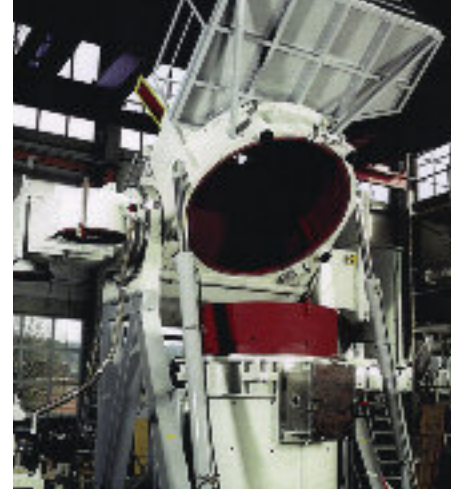
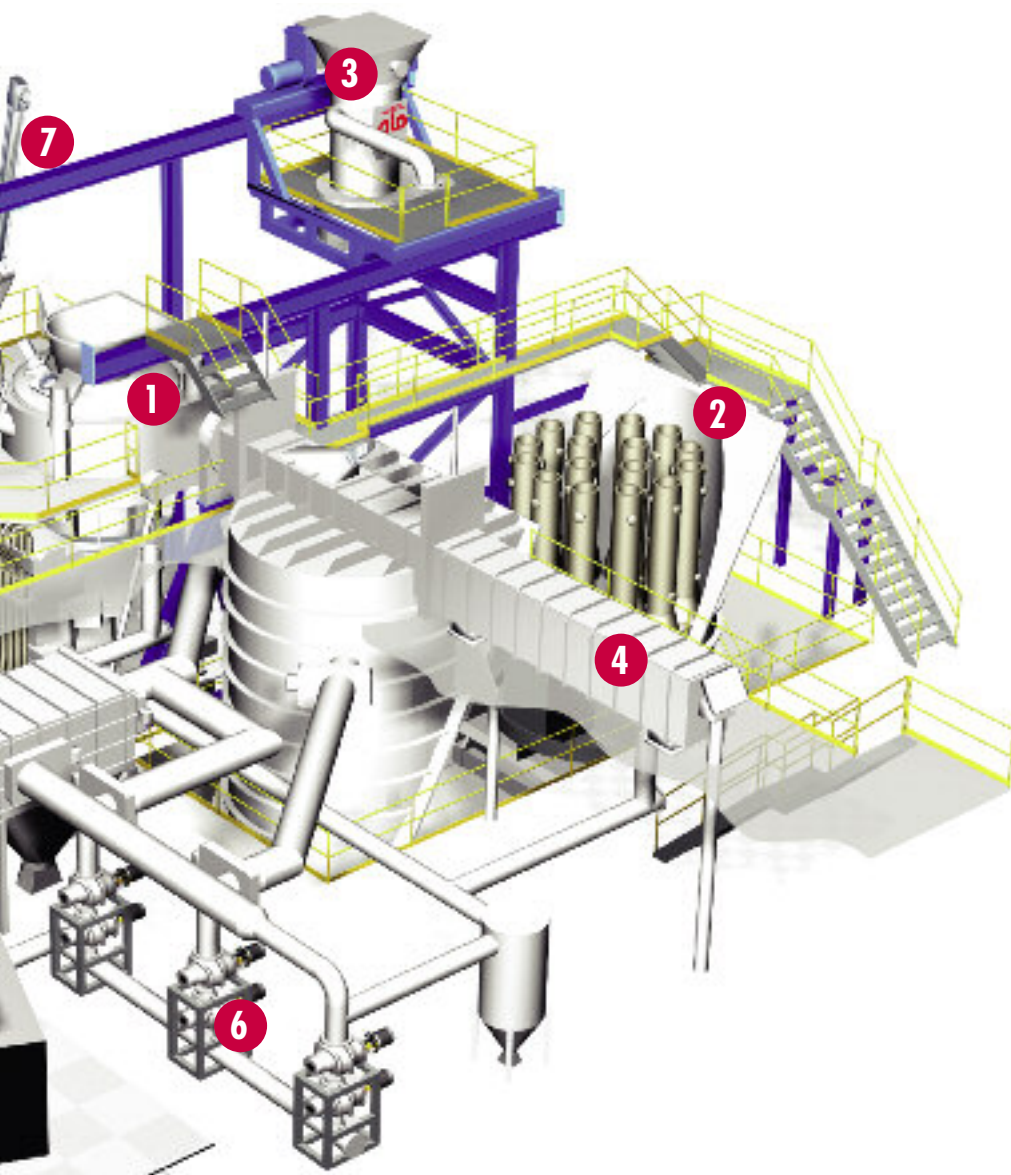


## Temperature measurement – Sample taking



## Degassing – Homogenizing

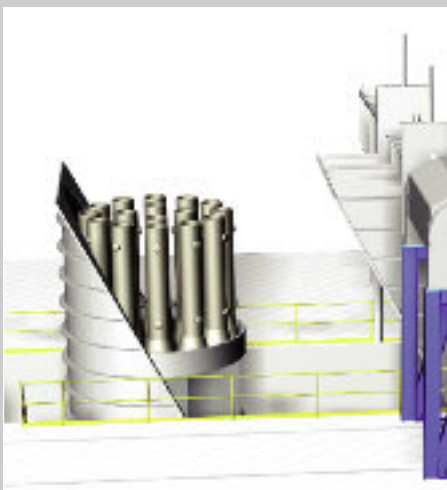




#### Fast Furnace Change

- < 1 hour with hot crucible
- High operating availability
- Increased productivity by up to 25 %
- Rapid alloy change
- Separate crucible break out and relining stations

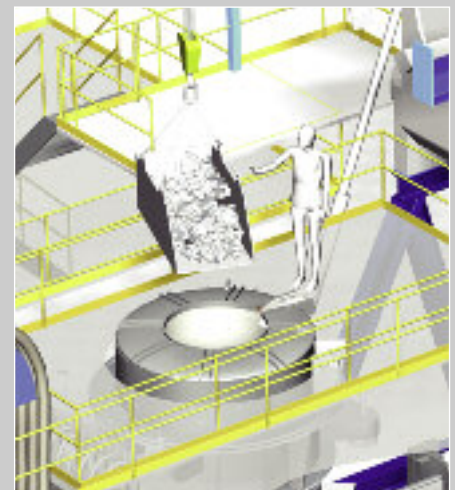
#### Mold loading



#### Tapping



#### Open charging / Crucible cleaning



# VIDP: Higher Quality, Flexibility and P

## Applications

- Charging, melting, degassing, distilling, alloying, homogenizing and pouring of specialty alloys under vacuum or protective gas for applications in
  - Aerospace
  - Medical equipment
  - Tool making
  - Chemical engineering
  - Power generation equipment
  - Electronics
- Primary melter for ESR, VAR, precision casting and powder metallurgy feedstock
- Production of rolling and forging ingots, remelting electrodes, barsticks and molten metal for continuous casting and precision casting

## Materials

- Superalloys
- Nickel-base alloys
- Cobalt-base alloys
- Tool steels
- Stainless steels
- Amorphous alloys
- Magnetic materials
- High purity or reactive Copper and Aluminum alloys



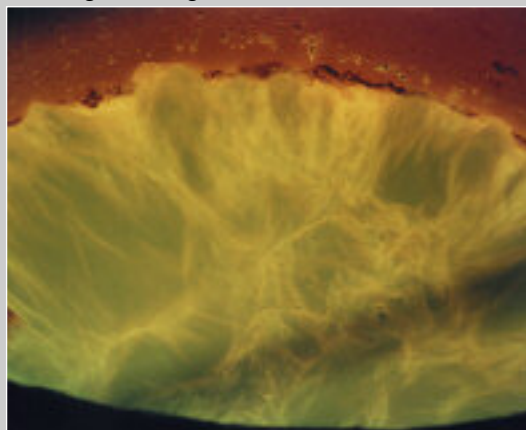
**Exact meeting of alloy specs • Highest material**

### Charging, alloying, temperature measurement and sample taking



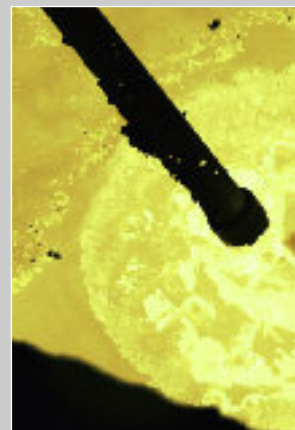
The VIDP furnace can be charged liquid in open air or under vacuum through a mobile bulk charger lock

### Degassing and Refining/Homogenizing



3 phase electro-magnetic stirring for controlled bath movement with low power input during refining phase, gas purging with porous plug in crucible bottom

### Temperature measurement and sample taking



Temperature measurement and sample taking either a small vacuum lock lance

# Productivity



**16 ton VIDP system**  
Böhler Edelstahl  
Kapfenberg, Austria

Vacuum crucible preheat station



## Metallurgy

- Attainment of precision analyses
- Removal of gasses (such as O, H, N), metallic impurities and harmful trace elements
- Fine decarburization down to ELC qualities
- Distilling off unwanted elements
- Prevention of oxidation losses and avoidance of Oxide and Nitride formation
- Decanting of slag inclusions
- Homogenization of the melt
- Treatment of the melt with reactive gasses

**High cleanliness • Versatile pouring possibilities • Rapid product change**

### Sampling



Sample taking are possible through the bulk charger or through the bulk charger

### Casting



Controlled tilting of the entire furnace housing for tapping the melt into the transfer launder

### Maintenance



Quick changing of the furnace body and quick crucible cleaning for an alloy change as well as effective loading/packing of the crucible

# The VIDP-Process Advantages

## Vacuum- (pressure $< 10^{-3}$ mbar) or protective gas operation possible

- The entire melt chamber can be permanently left under a controlled atmosphere during a melting campaign lasting several days

## All important secondary metallurgical treatment steps take place in a vessel equipped with appropriate vacuum locks

- All necessary process steps such as charging, deslagging, temperature measurement, sample taking and alloying are possible without interrupting the vacuum

## Small furnace volume (1:10 compared to chamber type furnaces) and small internal furnace surfaces

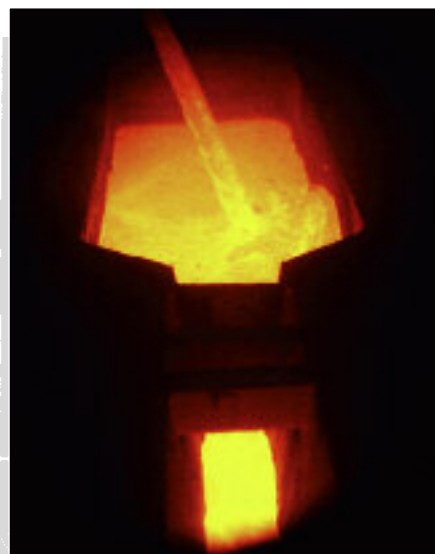
- Lowest desorption surfaces and low gas emission
- Only a small vacuum pumping system required
- Easy cleaning
- Large melt surface and better relationship for boundary dependant reactions and thus high degassing rates
- High crucible freeboard
- Safety with foaming melts or delay in boiling

## Electromagnetic stirring

- Optimum degassing of the melt without energy input and overheating
- Good homogenization and rapid mixing in of reactive alloying elements
- Exact setting of melt temperature
- Decanting of inclusions



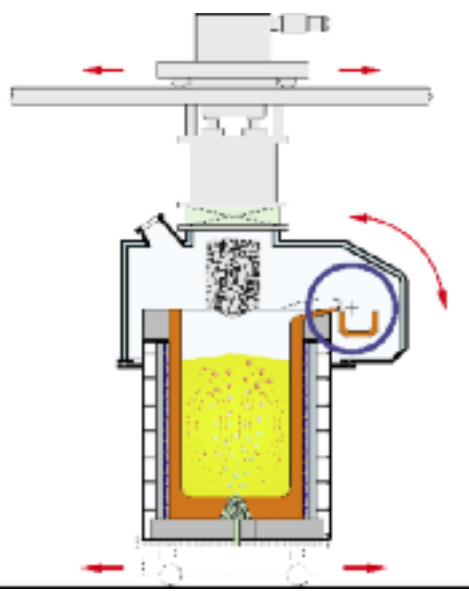
Effective degassing/Distillation



Pouring into the transfer launder



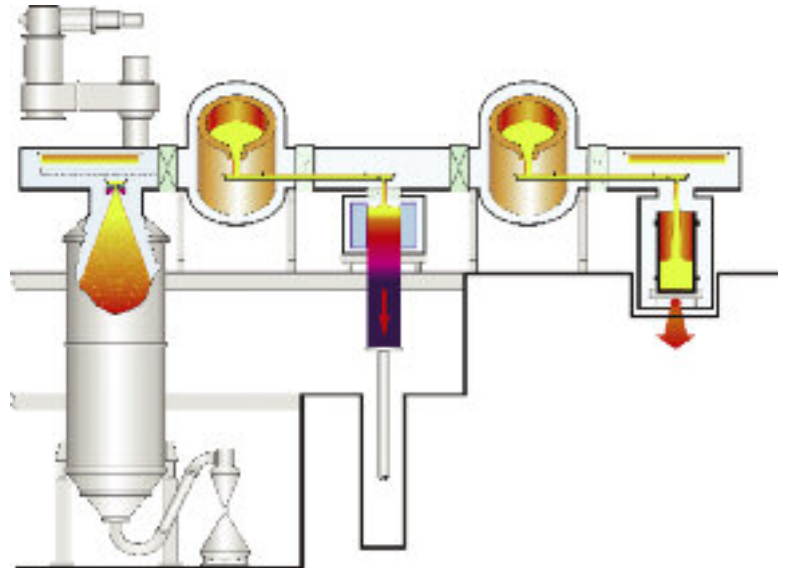
Tundish box with slag weir



## The VIDP-Casting Options

Maximum flexibility with the choice of process and pouring options such as

- Removable casting chamber for small or medium sizes
- Fixed casting chamber for large forging ingots and remelt electrodes
- Tundish chamber with horizontal and vertical continuous casting
- Atomization system for production of powders and/or spray casting

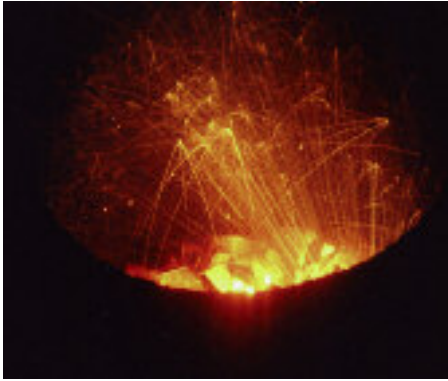


## The VIDP-Process Control

- Process data collection and documentation with link to a host computer facilitates reproducible quality settings
- Safe, simple operation thanks to automated sequencing procedure
- Automatic crucible monitoring for increased process safety
- Automatic suction capacity measurement and leak rate detection



# VIDP 400 (1-3 tons)



## Key technical data

- Charge capacity 2 tons
- Production of Fe/Ni/Rare Earth based Hydrogen storage alloys
- Pouring of ingots and plates
- Melting power 810 kW
- Operating pressure  $10^{-2}$  mbar

VIDP 400, Treibacher Auermet, Ravne, Slovenia

View with open casting chamber



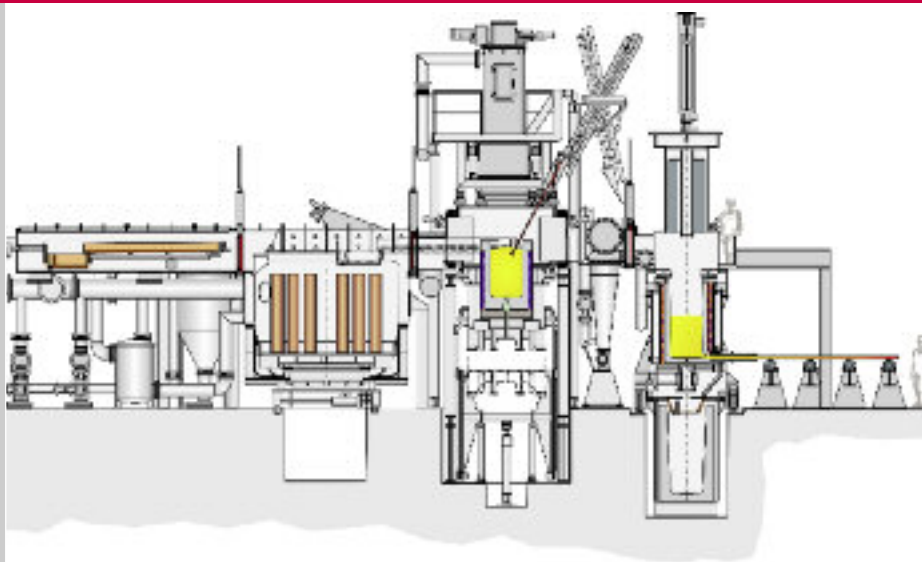
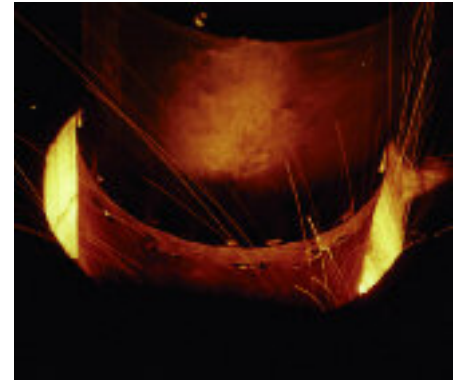
# VIDP 1000 (4-8 tons)



VIDP 1000, Ross & Catherall, Sheffield, U. K.

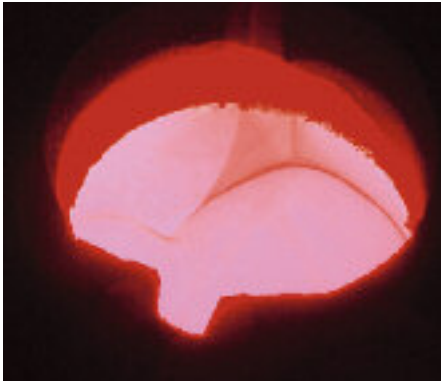
## Key technical data

- Charge capacity 8 tons
- Production of Ni/Co base alloys
- Pouring of small ingots (Barsticks) and provision of molten metal for horizontal continuous casting system
- Melting power 2,000 kW
- Operating pressure  $10^{-3}$  mbar



VIDP systems with Ingot casting and horizontal continuous casting

# VIDP 2000 (9-18 tons)



## Key technical data

- Charge capacity 16 tons
- Production of Special Steels and Ni/Co base alloys
- Pouring of large forging ingots and remelt electrodes
- Melting power 3,500 kW
- Operating pressure  $10^{-2}$  mbar

VIDP 2000, Böhler Edelstahl, Kapfenberg, Austria



Melting chamber in pouring position

# VIDP 3000 (19-30 tons)



## Key technical data

- Charge capacity 22 tons
- Production of Special Steels and Ni/Co base alloys
- Pouring of large forging ingots and remelt electrodes
- Melting power 5,000 kW
- Operating pressure  $10^{-2}$  mbar

VIDP 3000, Carpenter Technology, Reading, PA, USA



Control center (tilted position for tapping in the background)

# Technical Data

Characteristic	Units	VIDP 400	VIDP 1000	VIDP 2000	VIDP 3000
<b>Crucible size</b> Capacity (based on Ni)	(metric tons)	1 - 3	4 - 8	9 - 18	19 - 30
<b>Typical cycle times</b>					
Ni-Co base alloy	(h)	6 - 8	6 - 8	6 - 8	6 - 8
Fe base alloys/ Special steels	(h)	3 - 6	3 - 6	3 - 6	3 - 6
<b>Furnace changeover times</b>	(h)	< 1	< 1	< 1	< 1
<b>Operating pressure</b>					
With mechanical pump set	(mbar)	10 <sup>-1</sup> - 10 <sup>-2</sup>	10 <sup>-1</sup> - 10 <sup>-2</sup>	10 <sup>-1</sup> - 10 <sup>-2</sup>	10 <sup>-1</sup> - 10 <sup>-2</sup>
With oil booster pump set	(mbar)	10 <sup>-2</sup> - 10 <sup>-3</sup>	10 <sup>-2</sup> - 10 <sup>-3</sup>	10 <sup>-2</sup> - 10 <sup>-3</sup>	10 <sup>-2</sup> - 10 <sup>-3</sup>
<b>Electrical layout</b>					
Output melting power supply	(kW)	600 - 1,500	1,500 - 2,500	2,500 - 3,500	3,500 - 5,000
Connected power vacuum pump set and auxiliary equipment (depends on scope of supply)	(kVA)	ca. 150	ca. 250	ca. 300	ca. 350
<b>Cooling water</b>					
Total consumption ( $\Delta t=10\text{ }^{\circ}\text{C}$ )	(m <sup>3</sup> x h <sup>-1</sup> )	ca. 100	ca.150	ca. 200	ca. 250
<b>Floor area</b> Length (L) x Width (W)	L x B (m)	10 x 10	12 x 10	14 x 14	25 x 16
Height	(m)	8.5	9.5	10	12
<b>Recommended</b>					
Crane capacity	(metric tons)	20	30	50	70



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