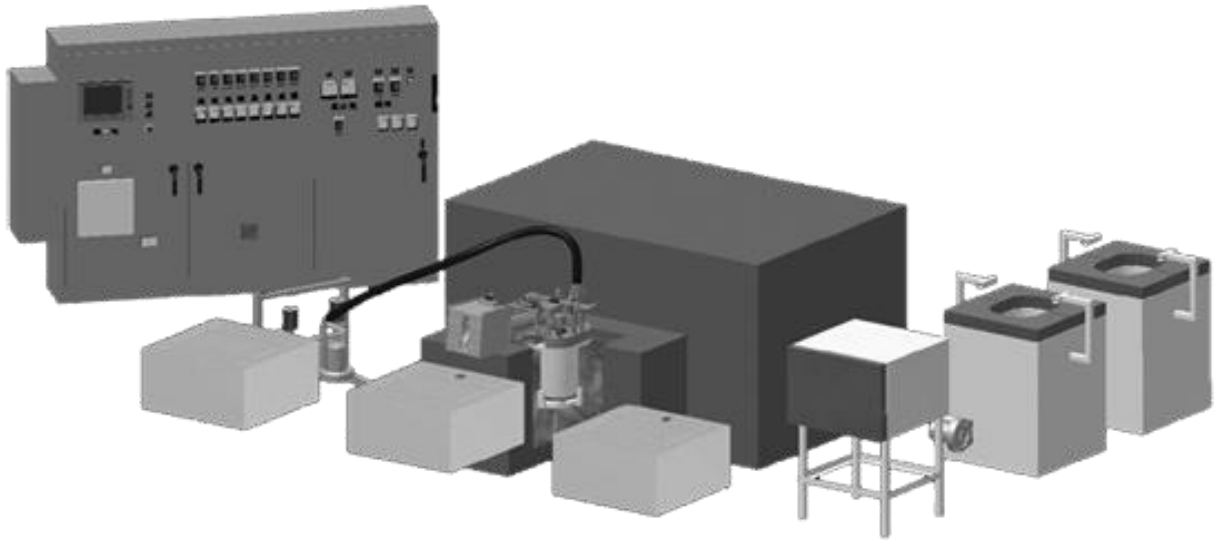
CMI Novacast PG Series Electromagnetic Pump System for Aluminum and Zinc

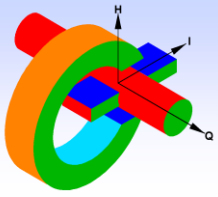


The drawing above shows a typical CMI Novacast electromagnetic pump system for aluminum and zinc. CMI Novacast can engineer a system to meet your specific needs. Components included in a standard PG series system are listed below.

For all other metals, contact CMI Novacast.

Two CMI Novacast PG450 or PG300 Electromagnetic Liquid Metal Pumps

Pump Support (simple, non-motorized) is also included. This device is to be bolted onto or near the existing furnace. It locates the pump in the furnace well. Special motorized version is also available at extra cost.



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CMI Novacast Heated Launder

Launder systems are electrically heated and controlled by thermocouples. All parts that come in contact with the molten metal are made using special silicon-carbide ceramic, which has a long history of providing excellent service. Since the launders are electrically heated, there is very little or no heat loss from the furnace to the mold. This minimizes the need for super-heating of the metal in the furnace, and further improves metal quality and reduces costs.

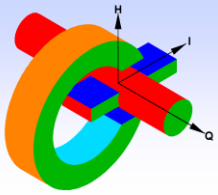
The metal moves up from the pump through a short unheated section and then enters an 85 degree elbow which is connected to a horizontal section. The horizontal section is at a 5 degree incline, which allows the launder to be self-draining when the pump is shut down. The horizontal section is then attached to the mouthpiece.

There are several different mouthpieces available depending on your needs, such as roll over, direct low-pressure, tundish, gravity, or double low-pressure (i.e. two molds in one press). Special mouthpieces can be designed according to your individual needs.

Since the launder carries a large volume of metal every week, it is important to clean it every week. In most cases, a spare is heated one day in advance and put into service, while the other one is cleaned and re-gasketed. The launder transport cart makes this changeover fast and easy.

CMI Novacast heated launders come in two sizes:

45 mm I.D. system has standard horizontal lengths of 580 mm and 1000 mm
60 mm I.D. system has standard horizontal lengths of 667 mm and 1000 mm



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CMI Novacast PG Series Control System

The control system is critical to the proper operation of the pump system. The control system stores all of the operating parameters for each casting job. In some gravity-pour applications, this can amount to many hundreds of "fill profiles." Each fill profile is stored on an industrial PC and is downloaded to the PLC at the beginning of each job run. Programming of fill parameters is performed by an authorized master operator. But any authorized operator can download fill profiles at any time. Typical fill profiles consist of up to 16 segments of specified time of a specified power. As the profile runs, the pump power is varied according to the programmed fill profile. Since the pump has no moving parts, the only inertia in the system is that of the moving metal itself. This means that the pump delivery pressure can be changed almost instantly to meet the requirements of the casting. Numerous safeguards are standard in the control system to meet safety standards throughout the world. Control systems can also be provided with the capability to report to external systems for such things as SPC and other managerial data systems.

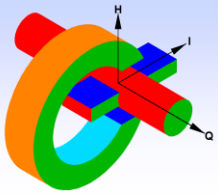
The control panel incorporates controls for automatically compensating for variations in metal level in the holding furnace. This is especially important in gravity casting applications since a very small change in metal level in the launder tube can have a dramatic effect on flow rate. Low-pressure casting is not nearly as sensitive to variations in metal level in the furnace, because the flow rate is not very dependent on how high the metal is in the mold. The control panel also monitors and controls the temperatures in the launder system, and will prohibit operation if the temperature is not within specified limits.

The PG series controls are user-friendly where hands-on command capability is desired. Under rigorous production conditions, a computer or programmable controller can drive the pump. Without operator intervention, complex mold fill parameters, difficult or impossible to execute manually, are easily and uniformly achieved in real-time. To ensure that process commands are accurately met, an optional closed-loop feed-back circuit is available.

The exacting molten metal delivery and tight process control assures maximum casting quality and uniformity, minimal cycle downtime, greatly reduced manpower needs, and fewer scrap castings. The result is significantly improved bottom-line performance.

General Specifications:

Precision pump controls
Launder temperature controls
Pump cooling temperature control



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CMI Novacast Pump Cooling System

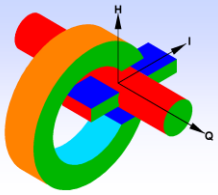
The CMI Novacast electromagnetic liquid metal pump is an electrical device which contains special coils that are designed to operate at temperatures much higher than almost any other coil made today. There are, however, limits as to how hot the coils may operate, and the laminations which make up the pole pieces also have a maximum temperature limit. In order to keep the temperature of these items below their maximum, a special pump cooling system is provided. This system consists of one (or two for redundancy) special blower and a control package. The control package contains the temperature monitoring and control devices to ensure the safety of the pump electricals.

The cooling system also provides self-sealing for small leaks in the pump. As a result of the cooling of the internal areas of the pump, a "freeze-plane" is developed in the ceramic walls of the pump. If a small crack occurs in the ceramic wall, the metal that penetrates that crack will reach a point inside the wall where the metal temperature is below solidus, and the leak is temporarily sealed. As a result of the "self-sealing" of small leaks, the pump life is greatly extended compared to pumps that do not have this freeze-plane feature.

The controls keep the internal pump temperature constant, which minimizes thermal cycling of the ceramics, improving their longevity.

Specifications:

PG-450: 5.5kva max. 380-480V 50/60Hz 3Ph.
PG-300: 2.2kva max. 380-480V 50/60Hz 3Ph.



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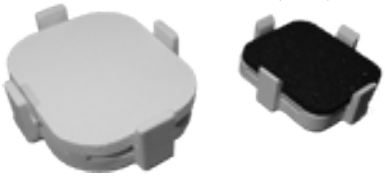
CMI Novacast Pump Preheat Oven

CMI Novacast electromagnetic liquid metal pumps are made of hygroscopic ceramics (they will absorb moisture from the air), therefore it is critical to remove all moisture from the pump and heat the pump to the proper temperature prior to immersion in the molten metal. Failure to fully preheat the pump may result in: thermal shock to the pump, introduction of hydrogen gas into the metal, or freezing of metal inside the pump. The pump preheat oven is designed to raise the pump temperature at a controlled rate, which further enhances the removal of moisture from the pump. Since there are electrical coils inside the pump, it is also required to cool the inside of the pump. The preheat oven incorporates a variable speed cooling blower for this purpose. This cooling blower further aids the removal of moisture and helps to maintain a fixed internal pump temperature. The preheat oven is portable and may be plugged into any standard welding outlet with 3 phase power.

General Specifications:

Power: 0 - 13 kilowatts, 480 volts
Heating: Electrical resistance

CMI Novacast Filter (SiC) and Flotation Disk

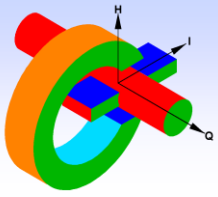


Since the metal inlet on the pumps is on the bottom, it is very easy to apply filtration. The filter of choice is placed on top of the ceramic float. Then the preheated pump is lowered onto the filter and float, forcing both below the bath surface. The buoyancy of the flotation disk forces the filter against the bottom of the pump, and the guides on the float keep the filter and float from sliding out from under the pump. All of the metal entering the pump is filtered, ensuring delivery of the highest quality metal to your castings. Flotation disks and filters need to be preheated before use to remove all moisture.

Metal filtration offers many benefits to the foundry including:

Reduction in oxide inclusions in the casting
Reduced scrap rate
Reduction in finishing tool wear
Improved metal fluidity and castability
Improved surface finish

Expected Life: Nominal of 100,000 pounds of aluminum



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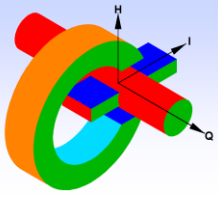
CMI Novacast Filter and Float Preheat Oven

Preheating the metal filter and flotation disk is required before placement into the molten metal. The filter and float preheat oven heats the pair up to bath temperatures to avoid thermal shock and to remove all moisture from the ceramics.

CMI Novacast Pump Cool Down Box

This device is to be used after the pump is removed from the holding furnace. It slows heat loss from the pump, which extends the life of the ceramics.



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