

<b>BROCHOT</b>	<b>A. M. G.</b>
Order N°: 302 010	Contract: Q2050-SA-010
<b>4 MAGNESIUM CASTING LINES</b>	
<b><u>CHAPTER 1: GENERAL</u></b>	

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**4 MAGNESIUM CASTING LINES****CHAPTER 1: GENERAL****1- SAFETY****1.1 Safety Instructions****1.1.1 Symbols****– Safety at Work**

This symbol marks all information on safety at work where risks to life and limb are entailed.

**– Warning of Electrical Voltage**

Covers such as hoods and caps which are marked with this symbol may only be opened by "skilled or suitable instructed personnel".

**1.1.2 Safety Conscious Operation**

Our machines are constructed according to the state of the art.

In spite of this, dangers may arise due to incorrect use or use for an unintended purpose.

- Read the operating instructions before starting to work.
- Always work in a safety-conscious manner and avoid risks.
- Before starting work, find out where the EMERGENCY STOP facility is (usually in control pendant).
- Report damage and defects to the person responsible immediately. Do not use the machine until the damage has been repaired.
- Do not remove information plate from the machine. Replace illegible or damaged plates.

**4 MAGNESIUM CASTING LINES****CHAPTER 1: GENERAL****1.1.3 Organisational Safety Precautions**

Only direct persons to operate the machine if they have been trained or instructed in its use.



- Observe the legal minimum age!
- At regular intervals, check that work is being carried out in a safety-conscious manner.
- Observe the intervals specified for periodic tests.
- Store the operating instruction within easy reach where the machine is operated

**1.1.4 General regulations**

- Safety regulations and accident prevention regulations.
- National regulations.

**1.1.5 Installation, commissioning, maintenance and repairs**

Erection, commissioning, maintenance and repairs may only be carried out by skilled personnel.



- Use only original spare parts for repairs, otherwise the guarantee will expire.
- Do not carry out any alterations or modifications
- Additional fitments must not prejudice safety.

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## **1.2 Personnel Training**

- Personnel responsible for operating your plant must be informed on matters such as the loading and unloading of the system components; in this respect, the stress should be laid on the following areas:
  - a) Permissible load on each carrying component
  - b) Proper balancing of the products conveyed on their carrier
  - c) Compliance with clearance requirements
  - d) Suspension spacing of the loads, or as the case may be the minimum spacing.
- Personnel must also be forewarned of the hazards involved.

### **1.1.6 Warning for operating personnel**

- Loading and unloading stations must never be obstructed. Only supervisory staff can gain access to them for the performance of their tasks.
- Tampering with mechanical moving parts shall be forbidden
- Personnel shall be familiar with emergency stop devices and safety items, the latter to be kept in good operating conditions at all times
- During a stoppage following actuation of an emergency stop, or by actuation of an overload switch, the apparatus shall be checked prior to start-up.
- Our equipment should never be used for other purposes than those for which it has been intended for and the conveyance of persons is strictly prohibited on them
- Start-up must always be carried out by a responsible Supervisor.
- Working or standing under the loads shall be forbidden. In the event this rule cannot be applied, we suggest that you provide for guarding elements to stop the possible drop of conveyed loads.

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### **1.3 Security on Site**

- Clearly locate the storage area for all the material

Check the correct location of exit points of electric and pneumatic ducting and the water delivery points near the machines.

- The test area must be clearly indicated (mobile gate, white/red striped ribbon)
- All the traffic between storage area and site mounting must be indicated by signs / flashing lights or white/red striped ribbon.
- Any person not involved in the project is not allowed on site without a short training.

### **1.4 Safety Equipment Required**

During the Commissioning you will move or energize some equipment which has not been used before.

You shall be concentrated on your test and be aware of the potential danger.

For these reasons the first safety precaution is to clearly indicate the test area with mobile gates or white/red striped ribbon to forbidden the access to any persons not involved in the test or any person not aware of the danger.

You shall wear:

- Safety glasses
- Thin gloves for mechanical fitter
- Heat insulating gloves (when required)
- Safety helmet
- Protective clothes
- Safety shoes

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## 2- GENERAL DESCRIPTION

### 2.1 Production Cadences

#### Casting Line Train 1 (23 kg Ingots):

- Number of Ingot Moulds: 122
- Spacing of Ingot Moulds: 330 mm.
- Speed of the Chain: 0.887 m / min.  
2.58 Ingots / min.

#### Casting Line Train 2 & 3 (8 – 10 – 12 kg Ingots):

- Number of Ingot Moulds: 135
- Spacing of Ingot Moulds: 220 mm.
- Speed of the Chain:
  - 8 kg Ingots: 1.237 m / min.  
5.62 Ingots / min.
  - 10 kg Ingots: 1.100 m / min.  
5 Ingots / min.
  - 12 kg Ingots: 0.978 m / min.  
4.44 Ingots / min.

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## 2.2 Casting Conveyor

### 2.2.1 Frame

The main frame of the casting conveyor is made of two beams connected by welded crossbars, making an extremely strong structure. Its feet are fitted with rollers, which allow for thermal expansion.

### 2.2.2 Ingot Moulds

The casting conveyor is designed to receive moulds made of nodular cast iron.

- 8, 10 & 12 kg Trapezoidal & Interlocking Ingots will be cast in moulds by setting the filling level of the mould.
- 23 kg Trapezoidal Ingots will be cast in specific moulds.

Each mould is bolted on angles welded on the links of the handling chains. The chains are made of strong links having a high breaking load, and shouldered rollers, which enable expansion without risk of jamming.

The chains run around sprocket wheels. The two head sprockets are keyed onto the driving shaft. The two rear sprockets are keyed onto a shaft, which is set on two stretching bearings with compensation equipment.

### 2.2.3 Driving Equipment

The driving equipment consists in a hollow shaft gearbox connected to the sprocket shaft. The A.C. motor of the gearbox is driven by a variable speed drive. The equipment is designed for a controllable constant speed with minimum mould vibrations that may affect the ingot surface quality.

### 2.2.4 Exhausting (Protect) Hood

The casting conveyor is equipped with a protect hood. The inner hood allows to cover the moulds during ingot solidification and to keep the gas protected area as tight as possible.

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### 2.2.5 Mould Cooling

Mould cooling is performed by spraying cooling water onto the back of the moulds. This is achieved by a set of spraying pipes, easily removable for maintenance purpose. The cooling area is separated from the upper part of the casting conveyor by a sealed plate.

In order to avoid any steam to escape and reach the casting station, this area is connected to the main exhaust system (by others).

The casting conveyor is equipped with a through to collect and evacuate the mould cooling water and with an exhaust hood to evacuate the steam that may be generated. An infrared temperature transmitter is used to regulate the cooling water flow in order to maintain the mould temperature at a pre-determined value (around 130°C).

### 2.2.6 Mould Coating

A spraying system, installed on the lower side of the casting conveyor, allows coating each mould prior to casting. It is fed with a specific liquid mixture at a constant pressure by a re-circulating system.

The coating operation is automatic.

The coating area is separated from the upper part of the casting conveyor by a sealed plate.

### 2.2.7 Mould Preheating

A set of gas burners is provided to preheat the moulds to about 130 °C before starting the casting. An infrared temperature transmitter monitors the mould temperature.

Preheating operation, and any re-heating during casting if necessary, is performed automatically. This device is provided with flame detector and pilot flame controlled by a local cabinet linked to the PLC.



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### 2.3 Casting Station

The casting station consists in a carriage rolling on two rails fitted on the casting conveyor. It is powered by means of rack and pinions, driven by a geared brushless motor.

An encoder is installed on the tail / take-up end of the casting conveyor for synchronisation purpose.

The metal transfer tube rests on a guide support fixed on the carriage fitted with appropriate position adjustments (inclination, "X" and "Y" positions in the mould). A second geared brushless motor drives a cam, which moves the transfer tube support up and down. A pneumatic cylinder is also used to clear the tube out of the mould in case of an emergency.

The two brushless motors are powered by a multi-axis controller allowing:

- Automatic and adjustable combination of vertical and horizontal movements in order to provide smooth and optimised motion of the transfer tube.
- Synchronisation of the pipe motion with the casting conveyor while pouring.

The carriage is also equipped with electrodes for mould filling control.

### 2.4 Ingot Discharge System

An ingot guide, made of a curved frame with free chains, is installed at the end of the casting conveyor, around the moulds, in order to keep the ingots in their moulds once unstuck, until the discharge point.

Each ingot is then taken by two articulated arms, electrically operated, which place them on the transfer conveyor. Two hammers are also provided to facilitate the removal of ingots from the moulds.

### 2.5 Transfer Conveyors

One chain conveyor receives the ingots from Stream 1. Another chain conveyor receives the ingots from Stream 2.

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Each ingot from Stream 2 is then transferred from this conveyor to the cross conveyor (Transversal Transfer Conveyor) by means of a lifting table equipped with free rollers and a pneumatic puller.

At the end of the cross conveyor, the ingot is held by a stopper. It is released towards Stream 1 Transfer Conveyor by means of a driven roller lifting table as soon as the previous ingot from Stream 1 has cleared the transfer area.

## **2.6 Cooling Conveyor**

This conveyor receives the ingots from the Transfer Conveyor Stream 1.

It is provided with chains driven at low speed by a gear reducer powered by means of a variable speed drive.

The ingots travel through a tunnel, where they are sprayed with water, via a set of perforated tanks for cooling the ingots.

At the end of the cooling conveyor, ingots are dried by means of one air ramp.

## **2.7 Casting System**

### **2.7.1 Metal Transfer Pump**

In order to transfer liquid metal from the furnace towards the casting conveyor, a metal transfer pump is required.

It is of centrifugal type, immersed into metal bath. The pump is supplied "ready to run", provided with motor, coupling, base plate for mounting on Settling Furnace roof.

The pump is provided with variable speed drive for flow control.

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### 2.7.2 Metal Transfer Tube

The metal transfer pump supplies the casting station with liquid metal by means of a metal transfer tube.

The tube is basically equipped with a spherical joint matching with the outlet of the pump, and a special valve at the other end, which allows filling the moulds, and closing during tube return movement from one filled mould to the next empty one.

The tube is also insulated to minimise thermal losses and thus avoid metal freezing during operation.

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**3- GENERAL DRAWING**

REFERENCE	DESIGNATION
183 00000 00 0 – 52-M-300	GENERAL ARRANGEMENT