

1 DESCRIPTION OF EQUIPMENT

1.1 Suppliers Details

The equipment is supplied by :-

Name: Furnace Engineering Pty. Ltd.
Address: 50 Howleys Road, Notting Hill. Vic. 3168 Australia
Phone: 61-3-95442922
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1.2 Order and Contract Number

Contract Number: B2003
Order Number: 111532

1.3 Date of Order

26th September, 2002

1.4 Date of Equipment Manufacture

July, 2003

1.5 Date of Commissioning

To be advised.

1.6 Suppliers Equipment Model Number

Westomat Model 1200 S VPC

1.7 Suppliers Warranty Policy

Warranty

Please refer to our General Conditions of Sale.

1.8 Product Quality Approval

The equipment has been manufactured under a quality system certified as complying with ISO 9001 by an accredited certification body.

Industry's most demanding quality certification, ISO 9001 confirms that our quality management system is performing to the highest standards, this assures that the product is fit for purpose.

Operating and Maintenance Instructions - B2003
Castalloy Manufacturing Pty. Ltd. – Travelling Westomat Dosing Furnace
Model - 2300 S VPC

1.9 Technical Data

Furnace Model :	2300S VPC
Total Aluminium Capacity :	2300 kg aluminium
Useable Aluminium Capacity :	/ 800 kg aluminium
Maximum Casting Weight with	28 kg
Dosing Control :	Electronic Micro Processor
Aluminium Level Indication :	Light Array
Variable Dosing (Fast-Slow-Fast) :	Included
Connected Power :	36 kW
Connected Voltage : Mains	415 Volts, 3 phase, 50 Hz
Control Circuit :	240 Volts, 1 phase, 50 Hz and 24 Volts DC
Connected Air Supply :	600 kPa; \pm 20 kPa dry air
Travelling Base Frame :	Included
Hydraulic Tilting Table (Tilt Only)	Included
Hydraulic Components : -	
Cylinder c/w Counter Balance Valve :	Included
Joystick Control :	Included
Interconnecting Plumbing for above :	Included
Hydraulic Power Unit :	Included in travelling base frame

1.10 Technical Description

The dosing plant for aluminium, type **WESTOMAT**, is a holding furnace without crucible with electric resistance heating and an electronic dosing system in one unit.

The electronic system (**VPC**) specifically developed for the **WESTOMAT** and gravity casting regulates plus controls the dosing system.

Automation in modern foundries and the requirements of foundry technology call for the utilization of this equipment in gravity casting (sand and permanent mold casting).

These **WESTOMAT** plants have proven successful for many years in the manufacture of the most complicated cast pieces with highest quality requirements.

The main features are listed below:

- Dosing regulation via data memorized by VPC-Control
- Automatic dosing of up to 13 different dosing weights in repeatable cycles,
- Depending on the gating technique of any single mold the casting quantity can be dosed in up to three different casting velocities that can be adjusted variably (for example fast/slow/fast),
- Quick casting sequences by self-optimised parallel working of the control systems-**WESTOMAT**/casting unit,
- High dosing precision of up to +/- 2% weight tolerance,
- High casting quality by virtually oxide-free metal transport as well as temperature stability of the melt; no degradation of the alloy quality due to the furnace lining,
- Clean working environment with a high degree of safety,
- Economic holding of the melt,
- During the filling of the furnace dosing operation is possible, here eventual deviations from the normal dosing accuracy may come up,
- High operational reliability with little maintenance work,
- Easy exchange of the alloy,
- Long service life and few spare parts required,
- Compact design and small space requirement.

DOSING SYSTEM

The dosing system, type **WESTOMAT**, consists of two components:

- The holding furnace with the integrated rising tube and mounted equipment group for dosing operation wired ready for connection.

Shortest pouring cycles can be reached by application of best possible size of riser tube. In relation to the smallest dosing quantities the following riser tubes (inside dia./bore) are available:

- Ø 40/12 mm from 0,2 kg
- Ø 40/16 mm from 0,4 kg
- Ø 50/18 mm from 1,2 kg)

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- Ø 65/21 mm from 1,5 kg) not for WESTOMAT
- Ø 80/24 mm from 3,5 kg) 45 S
- Ø 80/28 mm from 6,0 kg)
- Ø 100/35 mm from 10,0 kg)

The installation design (positioning) of the rising tube which protrudes deep into the melt prevents unintentional flowing out of the melt even when replacing the rising tube.

Depending on the size of the **WESTOMAT**, an additional steel compensation container is required as furnace chamber volume expansion for dosing weights above 20 kg. It is generally mounted on the furnace.

The dosing control described as follows:

Measurement, switch and control mechanism

The complete **WESTOMAT** control unit:

- Dosing regulation – VPC Control
- Temperature Control
- and the signal interface to the casting unit

are installed in a standard cabinet (protective type IP 54 - RAL 7032/standard) and wired on a connector (with the exception of the heating wires).

The design of the unit corresponds to the German VDE and UV regulations as well as to general technical regulations.

The control unit (VPC-Control), measuring instruments, operator elements and signal lamps are installed in the switch cabinet door.

The control panel also includes:

EMERGENCY-OFF WESTOMAT, dosing operation ON, dosing operation OFF, dosing MANUALLY, acknowledge disturbance, switch-off horn

and signal lamps:

operation readiness, dosing, disturbance
can be supplied on request - refer to options

Recommendation:

For ambient temperatures indoors reaching an average of more than +40°C resp. +35°C within 24 h, we recommend the use of a switch cabinet cooling appliance.

Dosing Control

Dosing device with control type STRIKO VPC

The freely programmable control system with its modular design ensures maximum flexibility. This refers to the operation of the furnace as well as to the data communication with the corresponding die casting machines.

The caster does not come into contact with the extensive and complicated calculations and controls.

The control elements are reduced to the absolute essential items and were simplified on purpose.

There is no separate time setting.

The control automatically makes all settings and continuously optimises them. By this the duration of a dosing cycle is considerably reduced. Even small deviations from the set dosing weight are recognised and eliminated.

Inputs, e.g. casting weights, are made with the operator's keyboard in connection with the clear-text display in the dialogue mode.

The weight to be dosed is entered in grams (adjusting aid).

There may be slight differences between the entered weight and the dosed weight because of the manufacturing tolerances of the riser tubes and varying wear and tear of the scanning electrode. Once the dosing weight has been adjusted, no readjustment is required.

Due to the furnace pressure control system the leakage losses are continuously recorded and evaluated. The system permits differing leakage losses without changing the dosing weight.

Additionally the working hours, the number of shots, furnace contents, set and actual temperature of the melting bath, set dosing weight and fault messages are displayed.

The hardware of the switch cabinet is divided into components and has modular form. Components can be replaced easily and quickly. The use of relays was reduced to the most necessary.

Inclusive Top-Stop-Position

STRIKO have developed the metal dosing via TOP-STOP-POSITION where for each dosing cycle the metal level rests approximately 30 mm below the metal outlet and waits for the signal from the die casting machine to receive metal.

Immediately after the release signal the metal flow is started. Varying dosing times e.g. from older die casting machines or from complex expensive manufacturing cells are compensated by the system without time loss.

Inclusive Time Optimisation

A built-in time optimisation registers all times and adjusts to the shortest dosing time. Time adjustment between dosing furnace and die casting machine is no longer necessary, even when the die is being changed. Besides the input of the dosing weight no other adjustments are necessary to achieve the optimal dosing cycle. This improves the working conditions of the operating personnel considerably.

PneuCo

Metal bath level detecting system type PneuCo. The pneumatically operated scanning electrode can be replaced by a non-contact metal bath level detecting system, type PneuCo. The PneuCo system has no movable components and is therefore maintenance free and resistant to wear and tear. The metal level in the riser tube is always recognised at the same point. This guarantees that also after cleaning of the riser tube, the dosing weight does not have to be readjusted. Because the scanning electrode is no longer required, the cleaning of the launder and the riser tube is simplified. By using the PneuCo system the failure liability in this area is considerably lowered.

The Westomat VPC-Control simultaneously controls, regulates, measures and monitors the following functions:

- Dosing regulation of any single casting weight of up to three casting velocities
- Dosing regulation for up to 13 different casting programs (casting weights) in repeatable cycles
- Safety precautions (concerning soft and hardware)
- Disturbance signals
- Interface configuration
- Furnace filling level
- Display-assisted control keyboard
- Printer operation
- Commissioning program
- Data protection
- Memory handling of dosing menus
- Soft and hardware
- Too low / too high temperature of melt - monitoring

Concerning sand mold units, identical parts are cast in series. For this kind of operation, e.g. the quantity needed per day or shift can be programmed (with voltage failure protection), and the dosing weight can be chosen either manually or automatically via signal interface.

All dosing menus programmed are protected against voltage failure and can, if required, either be assigned to the dosing operation, or corrected or deleted.

Signal Interface and Dosing Operation

Owing to the constructive and technical complexity of gravity casting units, it is virtually

impossible to standardize the signal interface technique. The cycle synchronization can only be precisely determined after all relevant requirements of the interdependent units have been determined. Therefore, the cost of the signal interface control can only be fixed afterwards and, for that reason, can only be given after the offer has already been made.

The correct functioning of the signal exchange is a prerequisite for optimum control and operation.

For automatic operation, the dosing process is started with a signal of the casting unit. Thereby the parallel working of the **WESTOMAT** is self-optimised in such a manner that the aluminium only flows into the mold which is ready for casting.

Dosing by hand has to be started manually and carried out when mold is ready for casting.

Disturbance signals are given visually and acoustically plus via text display.

Filling Level Indicator

The filling level of the furnace is displayed through a clearly visible lamp column.

Control structure of the VPC-CONTROL

Control panel pushbuttons, lamp indicators and process visualization elements are integrated into the front panel of the VPC-Control.

A graphical display interface guarantees an easy handling of the dosing control.

All data entered and set up are memorized and cannot be lost (voltage failure protection).

Software and Hardware

Both soft and hardware have been developed by STRIKOWESTOFEN Limited. The operational liability, the safety and easy handling of the **WESTOMAT** require sophisticated control electronics.

In addition to the control of the dosing process, the software also fulfils the following functions:

- Measuring functions
- Digital control functions
- Processing of parallel programs
- Processing of a signal interface program on a casting unit
- Process visualization (text display and process LEDs)

The hardware is in modules and can be easily installed.

The complexity of the objectives concerning the product (dosing unit for liquid aluminium), the price/efficiency aspect and annual production amount clearly favour the individual solution offered by STRIKOWESTOFEN.

Too High/Low Temperature of Melt - Monitoring

This monitoring serves quality assurance when manufacturing cast parts with higher quality requirements. The digital controller with signal transmitter signals the too low or too high temperature. Dosing operation is automatically interrupted if the melt temperature is too low or too high.

In addition, an external remote signalisation (e.g. 24 V DC) can be switched on.

Holding Furnace

In the area of the melt, the inner furnace chamber is lined with a refractory ceramic mix which is resistant to aluminium and neutral to different coating additions. The sodium content of the melt is only important for the choice of the rising tube quality:

- Aluminium Titanate for sodium-free melts,
- Carbone Silicide for sodium-content melts.

The lining qualities for these melts will be determined by the customer.

The capacity of the furnaces ranges from 450 to 4100 kg - refer to brochure. In general, the remaining melt is deducted from the operational volume. In case of alloys with volatile coating additions, the residual melt can be reduced to a reasonable degree by using a special type of furnace bottom.

Thanks to the premium-grade refractories and their high-quality treatment, a service life of up to ten years and more can be achieved.

Deviations from this can take place during melt treatment (for example with sodium) of very high throughputs.

Drying of Furnace

A special drying procedure in our plant guarantees that the furnace will be delivered without any residual moisture. This procedure also prevents water absorption of the alloy by way of the refractory lining.

Before commissioning, the units are heated up to operation temperature over a period of time.

If the furnaces are stored somewhere during transport, it must be in dry and frost-protected facilities.

Heating and Temperature Control

The resistance heating of the furnace consists of three SiC-heating elements which are installed in the roof area and individually connected to the three-phase low consumption SCR.

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Depending on the temperature of the melt, the heating performance - full load, partial load, off - is switched via a digital controller. A second thermocouple is installed in the furnace chamber and connected to this controller. It is part of the standard equipment and effects the safety switching-off of the heating.

For holding operation, the partial load is best in order to maintain a high degree of temperature stability of the melt.

If required - e.g. if the melt has been filled in too cold - the aluminium can be heated up by switching to full load. The aluminium which, in case of prolonged voltage failure often solidifies in the furnace, can also be remelted by switching to full load.

The service life of the heating elements ranges from one to several years. The elements can also be replaced individually in case of failure.

Further modification of the melt in the furnace chamber reduces the service life of the heating elements.

Refill Device

Even during dosing operation, the **WESTOMAT** is charged with liquid aluminium by way of the filling funnel attached to the furnace and a filling tube extending into the melt.

The oxides forming during the refilling of aluminium cannot enter the melt. They are trapped in the filling funnel and removed from there by the operator.

Casting Trough

In general, a short, light sheet-metal trough without additional heating is required which is hung between the rising tube and the filling chamber. This neither leads to a considerable temperature drop nor requires any special maintenance.

Depending on the objective, the casting trough can – (as an option) - be supplied as:

- Horizontal swivelling construction - for dosing in several ingot moulds,
- vertical swivelling construction - for technical reasons,
- and for above constructions with additional heating etc.

Lower Frame

The working height of the **WESTOMAT** is adapted at a height of 400 mm to the fill-in height of the filling chamber without any steps.

For casting units having a constant fill-in height it will be possible to supply a stationary (at one height), hydraulically tiltable frame.

In order to empty the furnace all lower frames can be tilted hydraulically.
For technical reasons a **WESTOMAT** can only be mounted on a lower frame which can be automatically moved or turned cross- and lengthwise - e.g. for dosing into several unmovable molds.

Cleaning and Emptying

Depending on the metal throughput, the alloy quality and holding temperature, the walls which can be easily reached through the cleaning door, are to be cleaned regularly. If necessary, the furnace needs to be emptied.

For cleaning purposes or in case of alloy change the furnace can be tilted and entirely emptied.

For security reasons the opening of the cleaning door is locked mechanically and electrically. If the furnace is overcharged the unlocking mechanism is automatically blocked.

Travelling Base Frame

As the Westomat is required to pour aluminium into up to 4 molds it will be mounted on a travelling base.

This base consists of the following:

- Furnace tilting frame.
- Travelling shuttle.
- Variable speed drive.
- Control system.

Furnace tilting frame.

As previously described, the furnace will be set at a fixed height as determined by the molds.

This frame can be tilted for furnace cleaning or alloy changes.

Travelling shuttle.

The furnace tilting frame is fixed to a travelling shuttle.

The purpose of the shuttle is to transport the Westomat between the molds for pouring.

Travel is achieved by one driven axle and one free axle.

Rails are permanently fixed for the shuttle to travel.

Safety barriers are fitted to both sides of the shuttle and will stop the Westomat travel if an obstruction is detected.

Variable speed drive

The shuttle is driven by a variable speed brake motor and gear box.

This enables the Westomat to ramp to a preset speed from a complete pour and travel to the next casting station. As the Westomat approaches the next station, it will ramp to a slow speed before stopping.

Control system

A PLC control will interface with each of the casting machines and via a pre-determined sequence (e.g. 1, 2, 3, 4, 1, 2) safely transport the Westomat to the next casting machine and initiate pouring.

In the event the next casting machine was not ready for casting, the Westomat would continue to travel through the sequence.

Limit switches enable the PLC to recognise the approach casting station, at what point the Westomat should slow and stop.

An operator push button will also interrupt the Westomat travel at a preset location to allow filling of aluminium or cleaning to be carried out.

2 INSTALLATION AND COMMISSIONING INSTRUCTIONS

Remove all packing materials or devices and inspect unit for damage.

Set unit in position. Make sure unit is level and plumb to assure best heat distribution and proper operation of all mechanical components.

Connect electricity service directly to terminal points, with all required grounding or safety equipment, and in compliance with applicable codes, regulations and accepted safe practices and ensure compliance with EPA regulations for work site ventilation and exhaust discharge to atmosphere.

PLEASE REFER TO THE INSTALLATION CHECKLIST ON PAGE 15.

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EQUIPMENT INSTALLATION CHECKLIST

INSTALLATION						
Maximum Equipment Dimensions	As per Furnace Engineering Pty. Ltd. G. A. Drawing No. B2003/004					
Maximum Weight	11300 approx.	Kg				
Lifting Equipment Required	Crane					
Special Foundations Required	Rails as per Furnace Engineering Pty. Ltd. supplied					
SERVICES						
Electricity						
Voltage	415 Volts, 3 phase plus neutral at 50 Hz					
Maximum Current	130 Amps from 3 phases					
Fuel Type						
Maximum Flow Rate						
Calorific value	N/A	35 MJ/m ³ nett				
Supply pressure	N/A	7 kPa				
OPSO required	N/A					
Water						
Maximum Flow Rate	N/A	litres/min				
Pressure	N/A	kPa				
Compressed Air						
Maximum Flow Rate	185m ³ / max					
Pressure	6 - 10 Bar - Constant within 0 - 2 Bar					
FLUES	N/A					
Material						
Size						
Special Requirements						
OTHER	N/A					