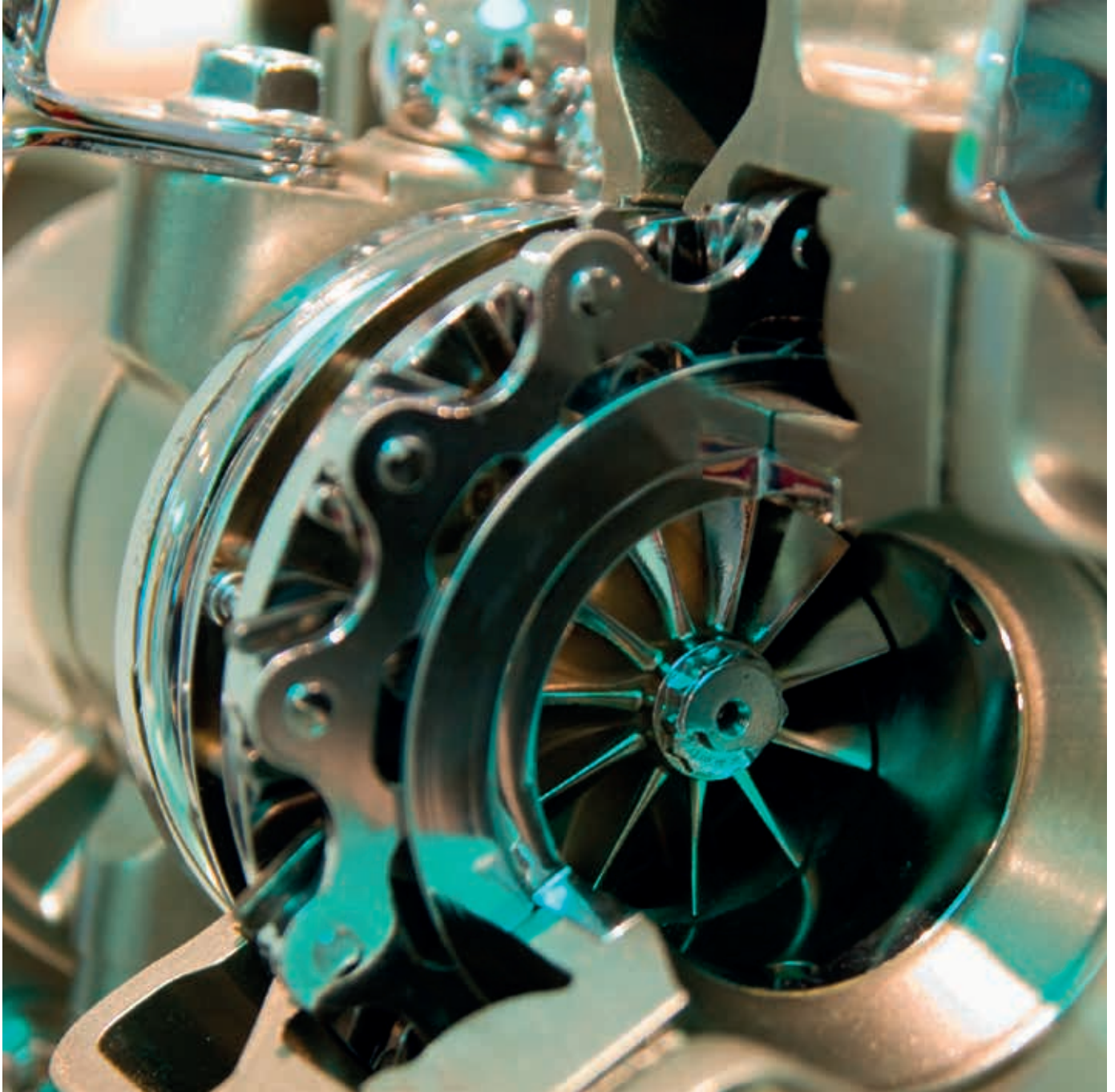


# VACUUM SOLUTIONS FOR METALLURGY

The logo for EDWARDS, featuring a stylized red and black circular emblem to the left of the word "EDWARDS" in a bold, red, italicized sans-serif font.

**EDWARDS**





## EDWARDS THE PARTNER OF CHOICE

**Edwards is a world leader in the design, technology and manufacture of vacuum pumps with over 95 years' history and more than 75 years' manufacturing experience.**

Edwards believes in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions to your problems. Using the most innovative and up-to-date modelling techniques, we can optimise the pumping configuration for customers to provide a system design giving the maximum performance in the most reliable and cost-effective way. Metallurgy

# MAXIMISE YOUR PRODUCTIVITY AND PERFORMANCE

Vacuum metallurgy encompasses a wide range of processes, from the treatment of liquid metallic materials to the heat treatment of metallic solids. These processes include alloying - the preparation of a metallic solid solution, casting - where the liquid alloy solidifies in the desired shape; and the heat treatment of the solid-shaped piece to alter the physical and sometimes chemical properties of the material.

With our broad product portfolio, application expertise and advanced pumping modelling techniques, we are able to suggest the right solution for your metallurgical processes.

## Alloying and casting

Melting, refining and casting processes involve vacuum pumps handling large amounts of dust and debris. We know that selecting the right pumping mechanism is a critical decision where high reliability is essential, while also maintaining a low cost of ownership. Our engineers will help you select the best system to cope with the challenges of your process.

### **High reliability**

Robust technologies to cope up with harsh process challenges

### **Variety of offering to suit your investment**

Choice of dry and oil sealed pumps

### **Increased productivity**

Low maintenance and high uptime solutions

## Heat treatment

We are at the forefront of vacuum for all heat treatment applications. We can provide you with high quality, reliable and cost-effective vacuum solutions with reduced environmental impact. Our experts can select the best option for your process, whether oil sealed or dry pumping technology.

### **Value for investment**

Cost-effective single stage oil sealed pumps and rotary piston pumps

### **Better end product quality**

Specialised solutions for oil-free clean vacuum

### **Single source partner**

Packaged offerings including high vacuum secondary pumps

# APPLICATION MATRIX

Metallurgy  
Application v Edwards Technology Matrix  
**Mid-Range Dry Pumps are available for small scale or pilot processes**

APPLICATIONS						
Sintering	MIM Metal Injection Moulding	PIC Precision Investment Casting	ESR Electroslag Remelting	VIM Vacuum Induction Melting	VAR Vacuum Arc Refining	Steel Degassing
Casting			Alloying			

PUMPING TECHNOLOGY	Vapour Booster					●	●
	HT Diffusion Pump	○		○			
	GXS Dry Pumps & MAXX Systems	●	●	●	●	●	●
	Microvac Piston Pumps & Booster Combinations	○	○	○	○	○	○

● Recommended Technology

○ Conventional Technology

Heat Treatment  
Application v Edwards Technology Matrix  
**Mid-Range Dry Pumps are available for small scale or pilot processes**

APPLICATIONS											
Annealing	Tempering	Quenching	VB Vacuum Brazing	Plasma Welding	EBW E-Beam Welding	PN Plasma Nitriding	Nitro Carburising	LPN Low Pressure Nitriding	LPC Low Pressure Carburising (Acetylene)	LPC Low Pressure Carburising (Propane)	CVI Carbon Vapour Impregnation
Heat Treatment			Assembling			Reactive					

PUMPING TECHNOLOGY	STP Turbomolecular	●	●	●	●	●	●					
	HT Diffusion Pump	○	○	○	○	○	○					
	GXS Dry Pumps & MAXX Systems				●	●	●	●	●	○	●	
	Microvac Piston Pumps & Booster Combinations	○	○	○	○	○	○	○	○	○	●	○
	ES Single Stage & EH Booster Combinations	●	●	●								

● Recommended Technology

○ Conventional Technology

# PRODUCTS

We have a broad portfolio of products and can provide a solution based on the process need. Dry pumping is the optimum solution for harsh and challenging processes or where the cleanliness of final product is essential. It is also environmentally friendly as it eliminates handling and disposal of contaminated oil.

Our intelligent dry pumps also feature a fully enabled on-board control system delivering unmatched benefits for the metallurgical processes.

## **Reduced installation costs**

Easy integration with other systems with intelligent controls

## **Safe operation, consistent output**

Automated control of your process

## **Peace of mind**

Remotely monitor your process (smart communications via ethernet, profibus or hard-wired interfaces)

## **Energy saving**

“Green mode” with reduced power consumption during idle periods

We also have a range of conventional pumping technologies consisting of piston pumps, oil sealed rotary vane pumps and diffusion pumps. These have been used in the metallurgical process over the years providing consistent performance.

## GXS dry screw pump range

The GXS range featuring intelligent on-board control has been developed using variable pitch tapered-screw technology for exceptional performance and reliability in the harshest processes. GXS pumps can be readily systemised using a range of pre-engineered accessories to meet a variety of application needs. Pumping speeds of up to 3,450 m<sup>3</sup>h<sup>-1</sup> can be achieved in combinations with GMB vacuum boosters.



### **Increased productivity**

Faster process and longer intervals between service

### **Improved product quality**

Better ultimate vacuum

### **Highly reliable**

Ability to handle harsh processes

### **Small carbon footprint**

Low power and utilities usage

# PRODUCTS

## MAXX systems range

For high capacity applications such as Vacuum Induction Melting and Vacuum Arc Refining, the GXS pump range is complemented with a new generation of pXH mechanical boosters for an integrated flexible modular skid design. pXH booster pumps are provided with high efficiency motors and inverter drives that integrate directly into the GXS pump control system with a single connection.

Two sizes are available:

- pXH4500 (displacement 6,766 m<sup>3</sup>h<sup>-1</sup>)
- pXH6000 (displacement 8,358 m<sup>3</sup>h<sup>-1</sup>)



### **Flexible**

Integrated modular skid design

### **Optimise the configuration**

for your process

### **Easy to upgrade**

whenever you need more capacity

## Stokes Microvac rotary piston pumps

Stokes Microvac rotary piston pumps have a large installed base in the metallurgy market. They can be packaged with Edwards EH or Stokes 6" Series mechanical boosters to provide pumping packages with capacities up to 6,630 m<sup>3</sup>h<sup>-1</sup>.



### **Proven reliability**

over 80 years of time tested proven performance

### **Value for investment**

low rotational speed enables longest pump life cycle

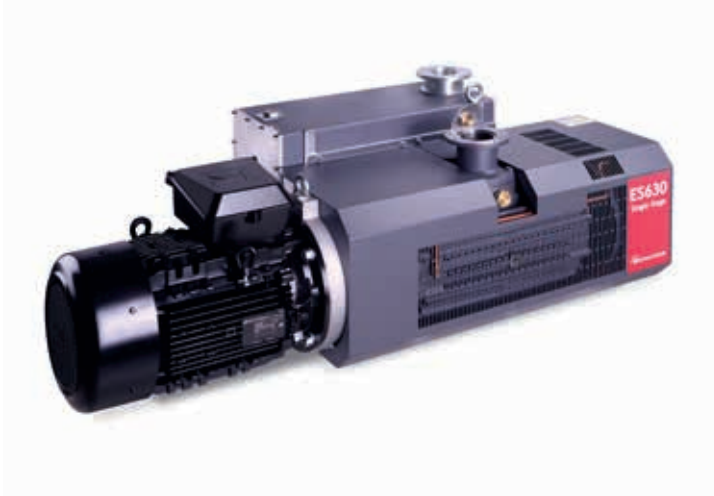
### **Easy on-site maintenance**

robust simple mechanism for high reliability and ease of rebuild

# PRODUCTS

## ES single stage rotary vane pumps

The ES range features class leading ultimate vacuum level and extended operating pressure range. The ES range, available in sizes from 65 to 630 m<sup>3</sup>h<sup>-1</sup> and in systems with EH mechanical booster pumps, is the recommended cost-effective technology for heat treatment applications.



### **Improved product quality**

stable vacuum performance

### **Ease of integration**

in-built ISO and BSP connections

### **Easy to maintain**

easy oil and filter changes

## The EH range

Engineered for high vacuum performance the EH range of mechanical boosters (from 250 to 4,200 m<sup>3</sup>h<sup>-1</sup> displacement) with their unique hydrokinetic drive allows for continuous operation from atmosphere to ultimate vacuum, giving faster pump down time.



### **Peace of mind**

industry proven with large installed base

### **Increased productivity**

faster pump down time

### **Robust operation even for harsh duties**

proven shaft seal design to protect pumping mechanism and gearbox from cross-contamination

### **Simple installation**

no need for pressure switches, bypass lines or variable frequency drives

# PRODUCTS

## Stokes 6" series

Available in sizes from 1,040 to 6,630 m<sup>3</sup>h<sup>-1</sup> displacement, the Stokes 6" Series features a rugged design for robust and reliable operation. A bypass version is available in the 615 series (61B). The bypass valve limits the maximum differential pressure enabling the booster to start from atmospheric pressure.



### **Peace of mind**

industry proven with large installed base

### **Configured for your needs**

direct drive 1,800-3,600 rpm, vertical or horizontal flow orientation with bypass version available

### **Reliability in all metallurgical applications**

large diameter shafts, ring feeder keyless gear locking system and dynamically balanced impellers

## STP Maglev

In metallurgical processes, turbomolecular pumps are becoming increasingly important as an alternative to oil based diffusion vacuum pumps for better quality end products and reduced power consumption.

Our STP magnetically levitated turbomolecular and compound molecular pumps are available in a range up to 4,500 ls<sup>-1</sup> and offer a multi axis magnetic bearing system. The rotor is entirely suspended by magnetic bearings so all contact between the rotor and the rest of the pump is eliminated.



### **Increased productivity**

quicker pump down to base pressure

### **Compact size – saves space**

and makes for easy installation

### **Low cost of ownership**

low power and utilities consumption

### **Maintenance free**

economical



# PRODUCTS

## Diffusion pumps and vapour boosters

Our industrial, high throughput diffusion pumps and vapour booster pumps, with the very comprehensive range of sizes up to 15,000 ls<sup>-1</sup>, are ideal for applications in the vacuum metallurgical processes.



### **Increased productivity**

high throughput pumping

### **Stable performance**

high backing line pressure

### **Better end-product quality**

low oil back streaming

### **Clean process**

stainless steel body

## Measurement and control

Edwards offers a wide choice of vacuum measurement and control products – from dial gauges to microprocessor based gauge controllers. Within each product range, there is a family of models designed to meet the widest user specification.

## Valves for vacuum systems

Edwards applies the same energy and commitment to its valves. The result is an extensive range of valves, with a choice of actuation methods, materials and size. Materials of construction have been uncompromisingly selected for performance in high vacuum.

## Fittings and flanges

Edwards vacuum fittings are designed to be leak-tight in vacuum applications. However, they are not intended to provide full structural support. When designing vacuum systems, it is essential that consideration be given to the static and dynamic loads imposed on each connection. If necessary, additional mechanical support should be provided.

# PUMP COMBINATIONS

Edwards' comprehensive range of pumps forms the basis for the manufacture of factory tested combination systems, with displacements from 310 m<sup>3</sup>h<sup>-1</sup> to 30,000 m<sup>3</sup>h<sup>-1</sup> /180 ft<sup>3</sup>min<sup>-1</sup> to 17,700 ft<sup>3</sup>min<sup>-1</sup>. With a wide and robust range of accessories to choose from, the pumping system can be optimised for your application. Our systemisation service offers fully factory tested combinations with appropriate accessories.

Dry Pumps & Booster combinations							
	GMB 1750	GMB2600	GMB4200	pXH4500	pXH6000	2xpXH4500	2xpXH6000
GXS160	●						
GXS250		●					
2xGSX250				●	●		
GXS450		●	●	●	●		
2xGXS450				●	●		
GXS750		●	●	●	●	●	
2 x GXS750				●	●		
GXS250/2600				●			
2xGXS250/2600					●		
GXS450/2600				●	●	●	
2xGXS450/2600					●		
GXS450/4200					●	●	●
GXS750/2600				●	●	●	●
2xGXS750/2600					●		
GXS750/4200				●	●	●	●

Oil Sealed Pumps & Booster combinations									
	EH250	EH500	EH1200	EH2600	EH4200	607	615	61B	622
ES100	●	●							
ES200		●	●						
ES300		●	●	●	●				
ES630			●	●	●				
212J	●	●	●			●	●	●	
412J		●	●	●	●	●	●	●	●

# SERVICE AND SUPPORT

Your business success depends on maximum equipment uptime and minimum total cost of ownership, and we constantly strive to support those objectives. As a global leader in vacuum technology and processes, we understand how vacuum pumps and systems perform in real life. Our wide portfolio of services is designed with you in mind: to help keep your processes and equipment running in the most economical and environmentally efficient manner.

Services include:

- Overhaul and repair using genuine Edwards OEM parts
- OEM spares and kits available for immediate despatch
- ReManufactured products available for cost-effective expansion and backups
- Global network of expert field service engineers available to respond quickly to unexpected equipment failures
- Extended warranty, to help manage the cost of the unexpected

Our Expert Advantage Service Plans provide you with the on-going support necessary to continuously improve your operational efficiency and meet your business objectives. As service offerings may vary slightly from product to product, please contact your Edwards representative to discuss your specific requirements.





## GLOBAL CONTACTS

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