

VACUUM SOLUTIONS FOR METALLURGY

 **EDWARDS**





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

EDWARDS THE PARTNER OF CHOICE

Edwards is a world leader in the design, technology and manufacture of vacuum pumps for industrial applications with over 100 years' history and more than 80 years' manufacturing experience. We offer the broadest range of both dry and oil sealed technologies which help to make manufacturing cleaner, smarter, more economical and environmentally friendly. From coating to drying, metallurgy to lithiumion battery manufacturing we have a solution to meet your application needs.

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.

APPLICATION MATRIX

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

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

| PUMPING TECHNOLOGY | Vapour Booster | | X | X | | | | |
|--------------------|--|---|---|---|---|---|---|---|
| | nHT Diffusion Pump | | | | | | y | y |
| | GXS Dry Pumps & Maxx Systems | X | X | X | X | X | X | X |
| | EDS Dry Pump | X | X | X | X | X | X | X |
| | Microvac Piston Pumps & Booster Combinations | y | y | y | | y | y | y |

X Recommended Technology

y 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 | Vacuum Brazing (VB) | Plasma Welding | E-beam Welding (EBW) | Plasma Nitriding (PN) | Nitro Carburising | Low Pressure Nitriding (LPN) | Low Pressure Carburising (LPC) (Acetylene) | Low Pressure Carburising (LPC)(Propane) | Carbon Vapour Impregnation (CVI) |
| Heat Treatment | | | Assembling | | | Reactive | | | | | |

| PUMPING TECHNOLOGY | STP Turbomolecular | X | X | X | X | X | X | | | | | |
|--------------------|--|---|---|---|---|---|---|---|---|---|---|---|
| | nHT Diffusion Pump | y | y | y | y | y | y | | | | | |
| | GXS Dry Pumps & MAXX Systems | | | | X | X | X | X | X | X | X | |
| | EDS Dry Pump | | | | X | X | X | X | X | X | X | |
| | Microvac Piston Pumps & Booster Combinations | y | y | y | y | y | y | y | y | y | X | y |
| | nES Single Stage & EH Booster Combinations | X | X | X | | | | | | | | |

X Recommended Technology

y 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 m³h⁻¹ 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

EDS dry screw pumps

Edwards’ new range of EDS dry screw pumps features an innovative design, which creates a new benchmark in the screw pump market. An intricate piece of engineering, built to the exacting standards and quality demanded by our customers, the new dry screw pump provides you with a trouble-free and cost-effective solution to meet your needs.



Trouble free peace of mind

Ease of installation, systemisation, support and service

Quick pumpdown times

Higher roughing speeds get the job done quicker

Innovative and sturdy screw design

Plug and Play system with tapered variable pitch dry screws

Safe and compliant

Certified for global explosion standards and is easily configured for hazardous area installations

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 m³h⁻¹)
- pXH6000 (displacement 8,358 m³h⁻¹)



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 m³h⁻¹.



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

Next generation single stage rotary vane pumps

The Edwards nES single stage series represents the next advancement in oil sealed rotary vane vacuum pumps for use in a wide of range industries and applications. Offering high reliability, low life cycle cost and proven performance, the nES series provides an ideal solution to suit a broad range of requirements.



Advantages

- High pumping speed at low pressure
- Stable vacuum performance with no pressure fluctuation
- Good condensable vapour handling capability with gas ballast
- Optimised oil return system and integrated exhaust mist filter
- Low noise and vibration
- Efficient cooled motor
- High reliability through proven technology
- Compact design
- Low and easy maintenance - therefore high productivity

The EH range

Engineered for high vacuum performance the EH range of mechanical boosters (from 250 to 4,200 m³h⁻¹ 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

Stokes 6" series

Available in sizes from 1,040 to 6,630 m³h⁻¹ 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⁻¹ 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

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⁻¹, are ideal for applications in the vacuum metallurgical processes.



Increased productivity

High throughput pumping performance

- Energy efficiency
- Low cost of ownership
- High system uptime
- Simple to operate
- Low and simple maintenance
- Control capability via Energy Efficiency
- Controller (optional accessory)

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 m³h⁻¹ to 30,000 m³h⁻¹ /180 ft³min⁻¹ to 17,700 ft³min⁻¹. 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 |
|--------|-------|-------|--------|--------|--------|-----|-----|-----|-----|
| nES100 | • | • | | | | | | | |
| nES200 | | • | • | | | | | | |
| nES300 | | • | • | • | • | | | | |
| nES630 | | | • | • | • | | | | |
| 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
- Re-manufactured 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.





Publication Number: 3602 504 9 01
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