

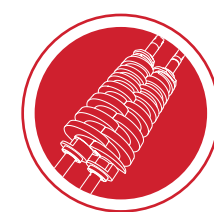
INNOVATIVE VACUUM SOLUTIONS FOR STEEL DEGASSING



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.

We believe in delivering results that bring value to our customers by using our breadth of industry experience to identify and apply solutions. 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.



MECHANICAL VACUUM SYSTEMS FOR STEEL DEGASSING

Edwards leads the way in vacuum for secondary metallurgy by a considerable margin. Our market position is built on our understanding of customers processes and our expertise in providing vacuum solutions for VD, VOD and RH processes.

Edwards has the largest installed base of dry pumps in the global steel industry, including the world's first mechanical vacuum pumping system for RH, in China. Used for degassing 230-tonne batches of liquid steel, the system has a pumping capacity of 1,000,000 m³/hr at 0.67 mbar and has now refined more than 15 million tons of steel during 10 years of operation.

Edwards pumps can be easily integrated into existing systems, with as much or as little technical support as you need. Edwards can take care of the commissioning and start-up phase onsite. We can assist with integration of controls into the customer's device management system, fine-tuned to the particular process. We also offer a comprehensive range of options for after sales service, maintenance and repair.

We don't just supply vacuum pumps. We provide solutions, and the system that's right for you.

Edwards Steel Degassing Module (ESDM)





EDWARDS LEADS THE WAY

Which vacuum technology do you choose when you are building a new steel degasser or upgrading an existing system?

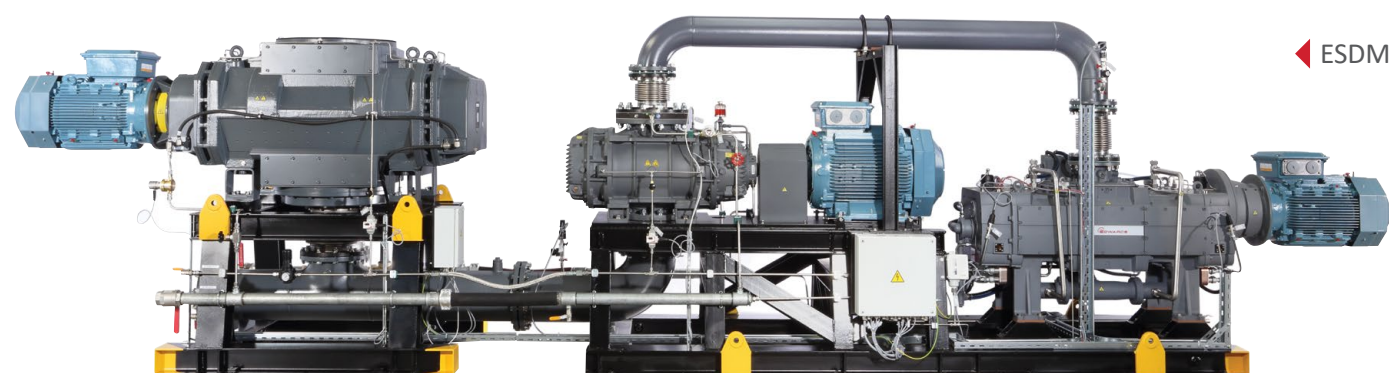
Dry mechanical pumps or steam ejectors? It is a key decision.

For VD, VOD and RH processes, the smart money is on dry technology. Increasingly, mechanical dry pumps are replacing traditional steam ejectors as the vacuum technology of choice for new installations, and the trend is accelerating. It is not hard to see why.

Lower running costs and improved productivity are just two of the reasons. Dry pumps have been proven to reduce energy costs by as much as 97% compared to steam ejectors. High reliability and dependable performance are also key factors, given the exceptional demands that secondary metallurgy processes can make on vacuum equipment. Higher pumping speeds, lower ultimate vacuum, minimal maintenance and lower environmental impact all lend further weight to the case for mechanical dry pumps.



MAXX Systems ▶

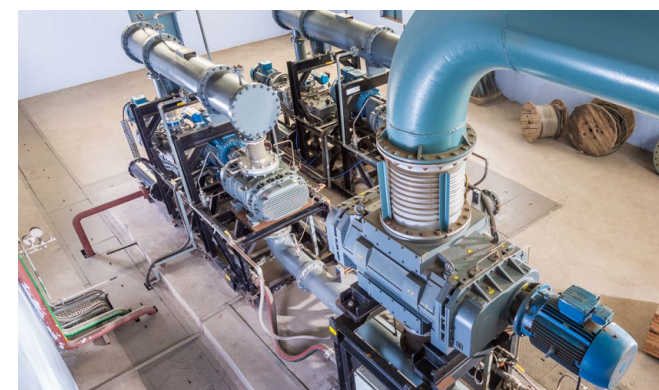


◀ ESDM

■ VD AND VOD PROCESSES

Processes in the growing secondary metallurgy sector depend on several vacuum-based treatments: Vacuum Degassing (VD) for alloy steels; Vacuum Oxygen Decarburising (VOD) for stainless steels; and combinations of both treatments, for example Vacuum Degassing Oxygen Blowing (VDOB) and Vacuum Carbon Decarburising (VCD), for low and ultra-low carbon steels. These processes operate at varying vacuum levels, with different process gas loads, and in differing types of vacuum vessels, including tank, lid, ladle to ladle, stream and design options. Edwards vacuum systems have been successfully applied to all of these secondary metallurgy processes at production facilities around the world. Modular system design enables degassing and decarburising melt sizes up to 200 tonnes or more in electric steel making facilities (mini-mills).

There are different types of vacuum systems available: The Edwards MAXX Systems are tailored for the requirements in smaller refining stations as for applications in foundries. The compact design with smaller pumps equipped with on-board control allows systems with small footprint, easy upscaling options and high redundancy. For all ladle sizes up to more than 200 tonnes the high capacity Edwards Steel Degassing modules ESDM have proven reliability, with more than 400 units installed since 1986. The modular concept can be easily tailored to all heat sizes by using multiple units in parallel. With the ESDM variant FLEXX, the number of pumps per stage can be adjusted to very special process requirements, for example evacuating large volumes or high gas loads during oxygen blow for VOD.

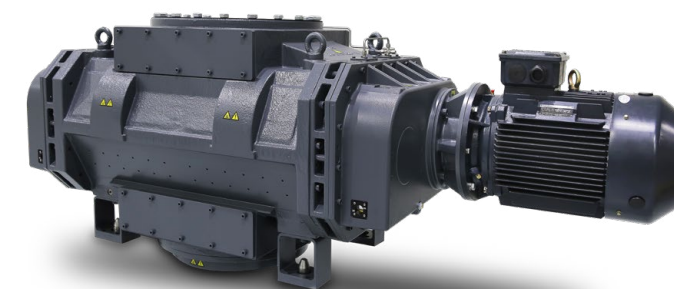


▶ Steel degassing installation FLEXX for VOD

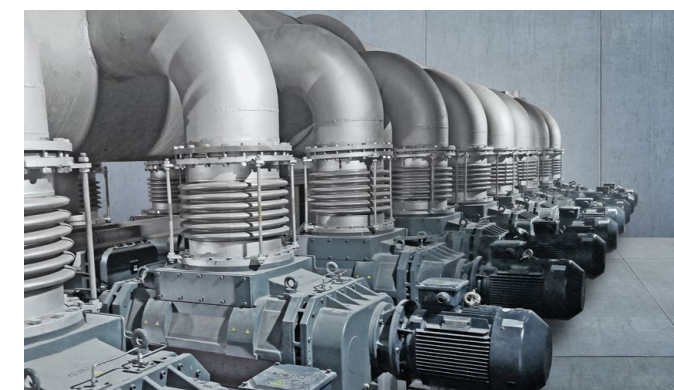
■ RH PROCESSES

In large integrated steelmaking facilities, typically equipped with basic oxygen converters, secondary metallurgical processing is carried out mainly in Ruhrstahl Heraeus (RH) systems.

These facilities process steels in ladle sizes of over 400 tonnes and require much larger pumping capacities – up to 1,000,000 m³/hr or more. Until a few years ago, RH plants were considered too large for dry mechanical pumping systems. But technological advances and successful installations mean that the huge potential for dry pump technology in this process is now being recognised. Edwards has supplied multiple RH systems starting from a 3-stage system and currently with 4-stage tailored systems. Whether you are planning a new installation at a greenfield site or upgrading/replacing an existing installation, Edwards is your vacuum partner of choice.

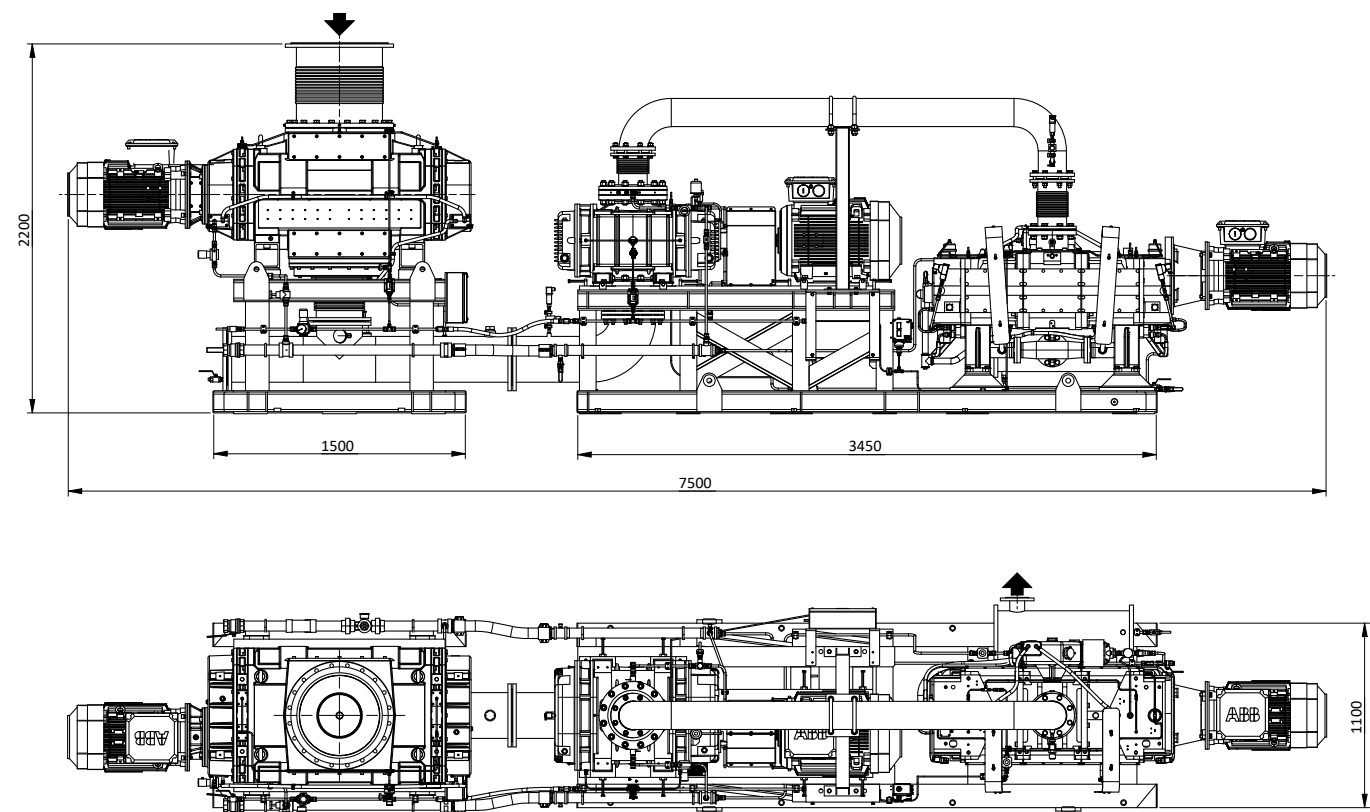


▶ GMB40K large capacity booster pump

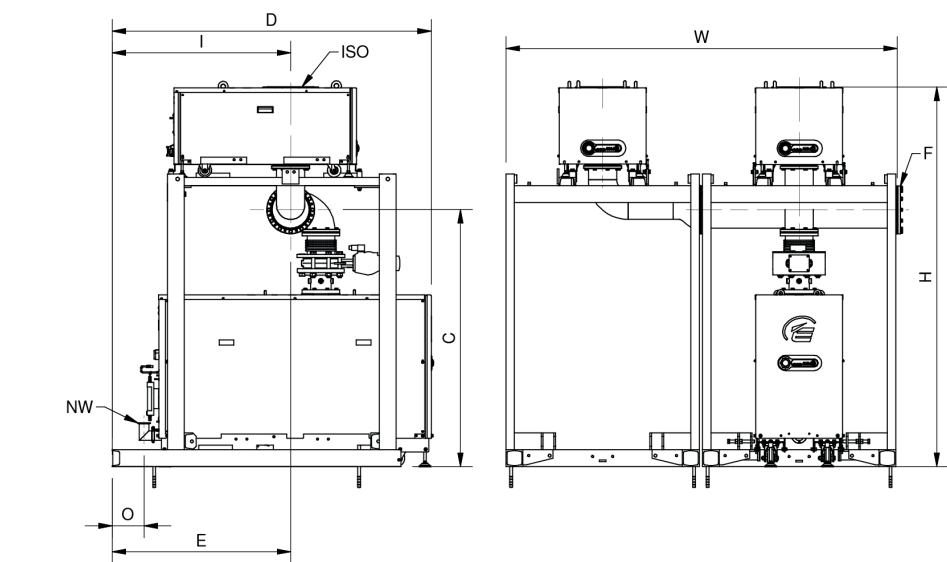


▶ First stage GMB40K installation for RH

DIMENSIONS



Note: This is an example of a typical steel degassing module system for VD applications. Edwards systems can be adapted for individual customer requirements.



OPERATING COSTS

Operating costs	Steam ejectors	Dry running pumps including filter
	€/tonne	€/tonne
Energy and fluids	1,6041667	0,0282000
Maintenance	0,5694556	0,0042014
Spares	0,0100000	0,0300000
Total Cost	2,1836222	0,0624014
Saving	0%	97%

On a typical VD plant processing 300,000 tonnes of steel per year, the operating costs of a modular dry pump system can be less than 10% of the equivalent steam ejector system.

SERVICE AND SUPPORT



Our expertise is in vacuum technology. We have been in the business since 1919 and our knowledge runs deep. We design, develop and manufacture vacuum equipment to the highest standards.

But it's not just the technology. With a global installed base of 750,000 pumps, we understand how vacuum pumps and systems perform in real life. We know how to get the best from our products, whatever the application. We know how to look after them. That's why a large section of our expert workforce is dedicated to service and support.

Our service solutions include; on-site service, repairs and exchange, and quality spares. All built on our world-class technical know-how and backed by our sophisticated logistics and supply chain infrastructure.



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