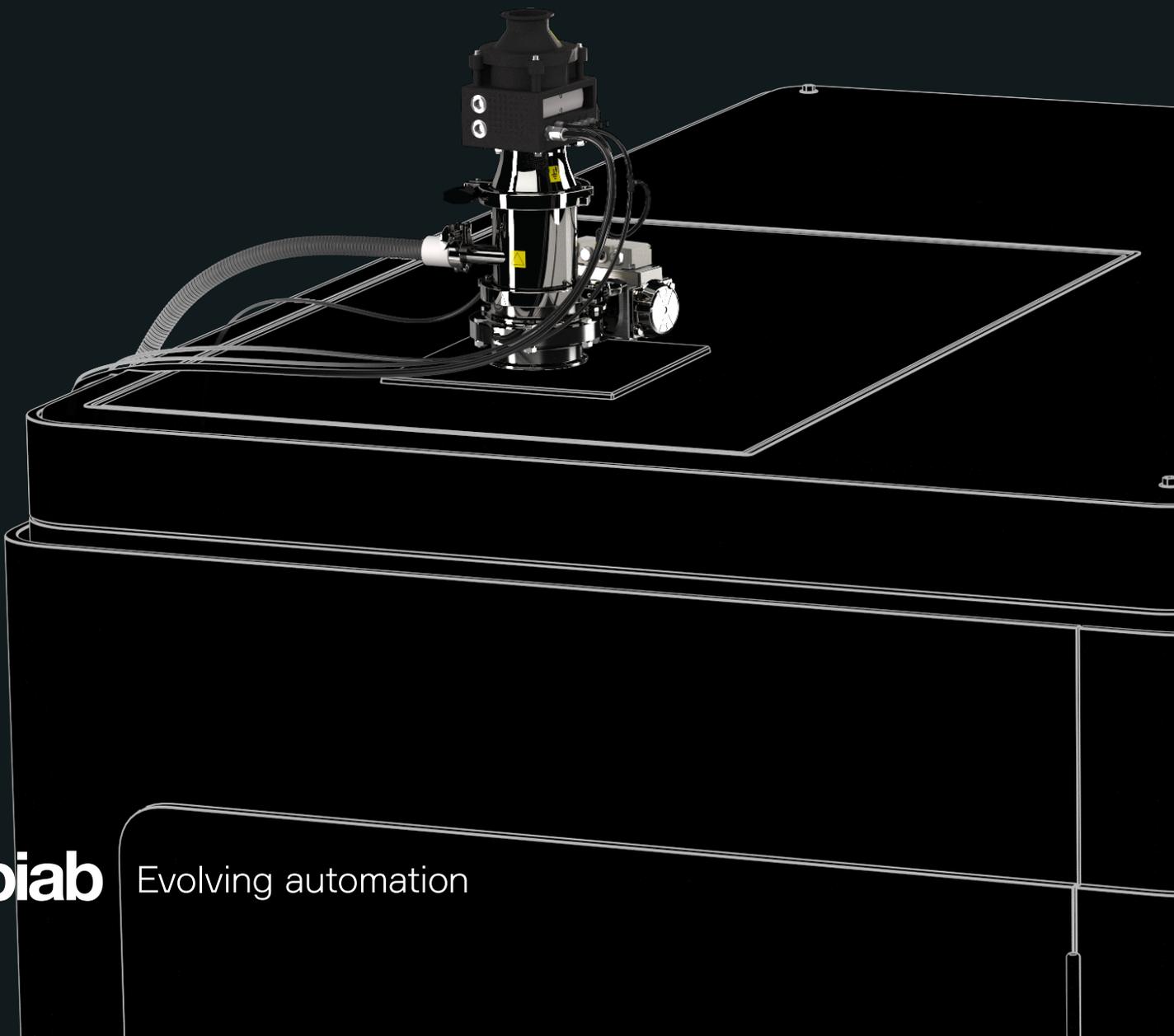


piFLOW®

Powder management for additive manufacturing powered by vacuum technology



Evolving automation





Safe and clean powder handling

With the high growth rates and increasing capabilities in the additive manufacturing industry, automating powder handling is key to establishing the technology as a standard production process. And while it sets standards in the realization of products, many process steps are still manual. That includes, in particular, the loading of the 3D printer or intermediate vessels with the corresponding metal powder. An ergonomic workplace design is needed to prevent back pain from employees handling the weight of the containers and reduce exposure to the particulate matter itself. The use of vacuum conveying technology can help to protect people, the product, and the environment.

Vacuum conveying is a hygienic, safe and ergonomic solution to transfer bulk powders, granules and small parts. Piab has been offering a wide range of such solutions in the pharmaceutical, chemical, and food industries for the past 40 years. Accordingly, we developed the piFLOW® vacuum conveyor series as a closed system to solve the powder conveying problem.

Conveying metal powders poses specific challenges such as the high bulk density, requiring significantly more powerful vacuum systems to keep the metal powder moving. Piab has conducted in-house tests with various metals and alloys to be a reliable partner to the additive manufacturing industry. Testing proved that our vacuum conveyors could convey powder with a bulk density of 8kg/litre [500 lbs/ft³] with an impressive throughput.

By working with a wide variety of additive manufacturing technologies like Powder Bed Fusion, including Binder Jetting and Laser Sintering, Piab offers the highest possible flexibility in integrating automated vacuum conveying solutions in any powder-based production process. Our technology is printer-agnostic and useable in numerous applications.

No matter the scale, Piab offers future proof solutions for the additive manufacturing industry by accelerating the industrialization of the manufacturing process. We are continuously developing our offering to cater for the needs of our partners.

Based on our long-term experience we offer our customers a 5-year warranty on the main parts of our vacuum conveyors.

Applications

Operators usually feed the printer, sieves, or hoppers manually. Therefore the process becomes heavily dependent on manual work and exposes the employee to hazardous metal dust and heavy lifts. Moreover, it is hard to ensure that all metal powders are picked up from the barrel/container, resulting in powder loss, causing an expensive process scrap. Automation of the process provides higher productivity, employer safety, and an ergonomic working environment.

(A) Filling 3D printer with metal powder

In this step, Piab Vacuum Conveyors pick up the virgin or reclaimed metal powder directly from a sieve/metal barrel or hopper and feed the printer. Pick-up can also happen straightaway from the overflow bin.

(B) Sieve or hopper filling with metal powder

Piab Vacuum Conveyors can effectively feed the sieve or hopper directly from the original manufacturer barrel/container if pre-screening is needed or reclaim metal powder from the overflow bin of the 3D printer.

Conveyors can be integrated into portable sieving solutions because of their easy assembly and lightweight, which allows

the use of the same conveyor and sieve solution for printers.

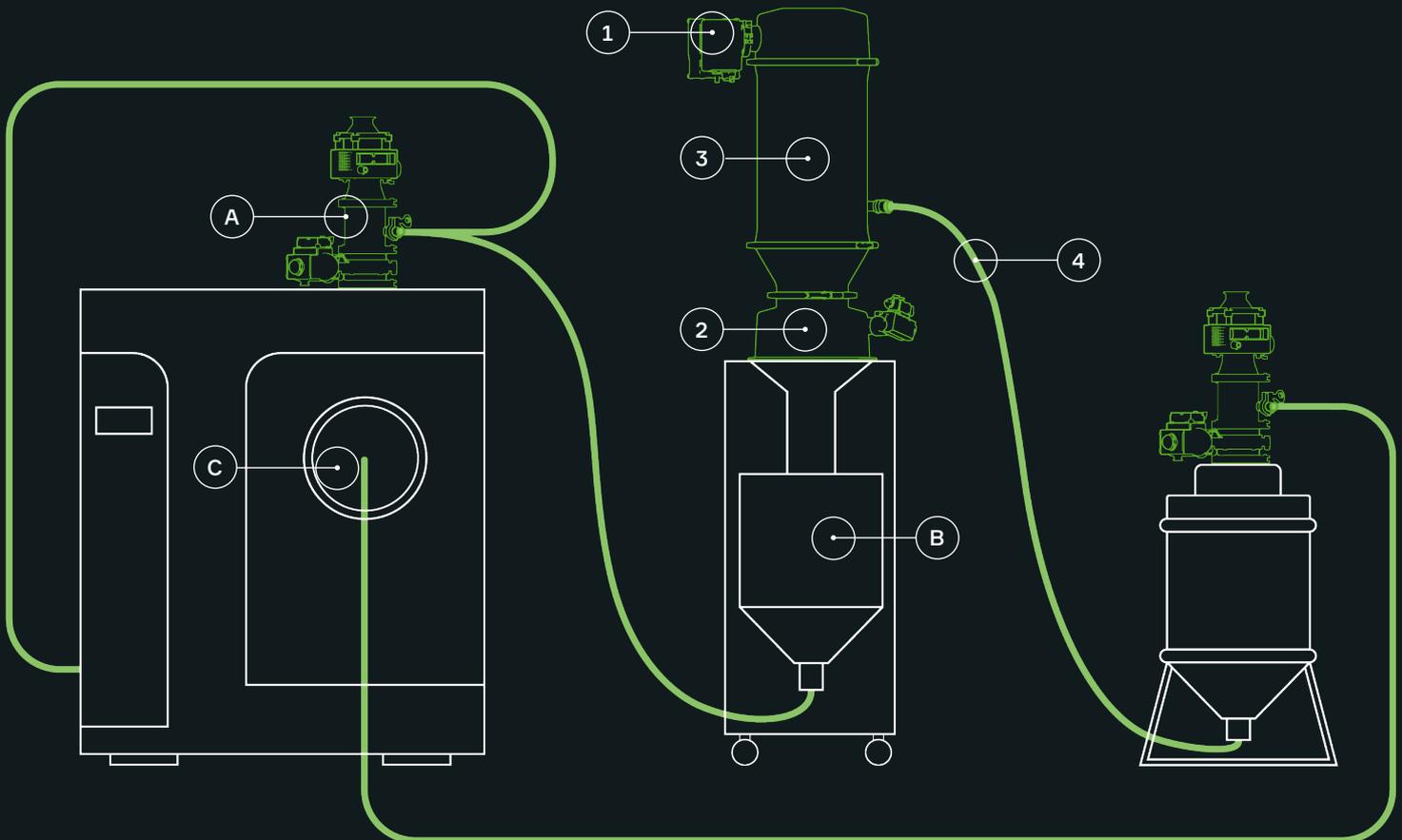
(C) Reclaiming metal powder from the printer

Metal powders are both expensive and hazardous, so the proper reclaim from the printer is crucial. Piab's piFLOW® vacuum conveyors can transport metal powders from the printer to the sieve or the original manufacturer barrel/container via an enclosed system to increase productivity and ensure employee safety. It is possible to reclaim metal powder from the overflow bin and the building plate directly from the printer or with the help of a Piab Feed pipe.

Principles of vacuum conveying

Piab vacuum conveyors transfer bulk powders with negative pressure from a feeding point to a receiving vessel.

The vacuum conveyor works in cycles. In the beginning, the Pump unit (1) generates a vacuum, and the Bottom valve (2) closes – the vacuum in the Conveyor body (3), and the Piping (4) increases. The pressure differentiate carries the product from the feeding point towards the Conveyor body.





The filter protects the Pump and the surrounding area from dust during the conveying process, and compressed air fills the Air shock tank.

Then the Conveyor body fills up with the powder, the (2) Bottom valve opens, discharging the powder into the 3D printer, sieve, hopper, or any other equipment. At the same time, the Air shock activates, and the compressed air cleans the filter from dust and small particles.

When the Pump starts again, this process is repeated, and a new cycle begins. A pneumatic or electric control system controls the suction time and emptying times.

Scalability with modularity

Piab has some of the most knowledgeable application engineers for Vacuum Conveying Technology globally, running 11 test labs in 4 continents. We find a way for the best possible solution at any scale.





Do you want to know more?

Take a look at the online product page: www.piab.com/industries/additive-manufacturing/

Ideal vacuum conveyors for additive manufacturing

With our extensive experience in material handling, Piab's vacuum conveyors have been an efficient solution for the additive manufacturing process for a long time. Still, the evolution of our product range allows a higher level of customization.

Depending on the product and conveying requirements, Piab has developed three different product configurations specifically for additive manufacturing manufacturers, OEMs,

powder producers, and suppliers. With these products, you can connect the dots in the additive manufacturing production line!

Piab's premium conveyors are designed with a Stainless-Steel body (ASTM 316L) and are equipped with Piab's proprietary and highly efficient COAX® vacuum technology. They are ATEX Dust and Gas certified and have an integrated automatic filter cleaning.



	piFLOW®p	piFLOW®am
Primary applications	<p>A versatile, premium device used in a wide range of industries.</p> <p>Equipped with a quick release system, it is easy to be sanitized.</p> <p>It comes with a variety of accessories and possible configurations to meet specific conveying needs.</p> <p>Conveys metal powders to sieves, hoppers, or any other intermediate vessels.</p>	<p>Compact and powerful, designed to fit space limitations with extremely small footprint. Features a butterfly valve which is not sensitive to pressure fluctuations.</p> <p>Conveying the powder directly to the 3D printer or collecting the powder from the overflow bin.</p>
Capacity	14 tons/hrs / 30,000 lbs/hrs	300 kg/hrs / 660 lbs/hrs for stainless steel
Available batch sizes	2 - 56 litre / 0,07 – 2 ft³	0.5 litre / 0.02 ft³
Certifications	EC, FDA, USDA*, ATEX	ATEX**
Main material	ASTM 316L	ASTM 316L
Surface finish	Ra < 0.6	General surface: Ra < 1.6 Product contact surface: Ra < 0.8
Height	643 mm (25.3 inch)***	422 mm (16.6 inch)

* All conveyor parts which are in contact with the conveyed material fulfill the requirements of the FDA, and the conveyor is designed according to the USDA dairy guidelines.

** ATEX dust and gas certification process ongoing. *** Applicable for the piFLOW®p with 3 litre batch size. Piab's experts can configure a customized solution to meet specific needs.

650
employees

25
sales offices

900
partners globally

 Manufacturing facilities

 Headquarter in Sweden

 Regional assembly & distribution centers

Piab at a glance, your strong and reliable partner

Piab continues to evolve automation through advanced gripping, lifting, and moving solutions and has done so since 1951. We believe in an automated world, where no resources are wasted and no humans are injured. With annual sales of ~1.5 billion SEK, 650 employees, and a global presence in more than 100 countries, we help our customers improve their operations for the better daily. Since 2018, Piab has been a part of Patricia Industries, part of Investor AB.

Vacuum Conveying is a significant division within Piab that focuses exclusively on the transport and movement of powders and bulk materials, handling sensitive powders and granules for the pharmaceutical, food, and chemical industries, as well as increasingly for additive manufacturing.

With an Application and Customization Centre in the US, Germany, Singapore, and our headquarters in Sweden, we offer individual support and tests for your specific material to assist you in configuring the most optimal solution for your process. Additionally, our offices in France, Poland, Spain, the UK, Brazil, and China offer test facilities for a broad range of Piab's vacuum conveying solutions. They are ready to help you with their extensive experience and know-how.

Share your powder management challenge with us!

Evolving around the world

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