



VACUUM CONVEYORS & BULK MATERIAL HANDLING SYSTEMS

Systems and solutions for the clean, efficient
and secure handling of bulk material



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What is vacuum conveying?

> Transportation of bulk material

Vacuum conveyors are generally used to transport bulk materials. As a general rule, the term 'bulk materials' usually refers to powder and granules, wherein - up to a certain particle size - tablets, pills, capsules, flakes, pellets and even larger pieces are conveyed. Through the use of special vacuum generators which can achieve a high vacuum level, it is also possible to transport liquids and viscous media (for information, refer to the VOLKMANN wet vacuum).

In addition to the particle size of the solids (particle size distribution) the density of the bulk material plays an important role in vacuum conveying. In the extreme case, this can be in the range of approx. 3 lbs/ft³ (e.g., fluidized pyrogenic silica) to approx. 806 lbs/ft³ (e.g. uranium compounds). However, the densities are most frequently in the range of between 6 to 150 lbs/ft³.

VOLKMANN vacuum conveyors are constructed in a modular fashion and as a result, they can be adapted to the individual conveying task so that virtually all types of bulk materials can be conveyed. There are even special solutions for "critical materials", e.g. for wet, oily, adhesive, bridging, hygroscopic, poor-flowing and explosive materials. Even nanoparticles have been successfully transported pneumatically by vacuum.

Advantages

Unlike mechanical conveyors, a vacuum is the only item which is needed in order to move the material. It is possible to eliminate mechanical parts in the product stream. This vacuum technology operates in contrast to mechanical conveyors and offers numerous advantages:

- reliable – no wear and minimal maintenance as a result
- safe – elimination of potential sources of ignition (ATEX)
- throughout the entire process – dust free, gentle dense flow – and plug flow (segregation free)
- hygienic – quick cleaning when changing products
- efficient – simple, compact and light systems, also suited to mobile use

In the conveying of critical bulk solids, there are often high demands in terms of the seal quality of the conveyor systems. In essence, this can be achieved more easily with negative pressure than with positive pressure or mechanical conveyors. As such, vacuum conveying is a particular form of pneumatic conveying. Due to the negative pressure, conveying by vacuum is a mode that

is offered for all materials where escape into the environment should be avoided, whether this is to protect staff or the environment. In this way, vacuum conveying actively contributes toward the goal of achieving "Clean premises". In addition, it helps to avoid the build up of dust and in doing so, it reduces the risk of explosion through suspended particles. As a result of the modular structure, VOLKMANN vacuum conveyors can even be individually adapted for applications under containment conditions (closed systems). WIP (Wetting in place) and CIP (Cleaning in place) are examples for further stages of design.

Performance range

The only criteria that limits the application is the available pressure difference of 1 bar max. (i.e. the difference between the prevailing air pressure and 0 bar absolute) and – from the point of view of safeguarding against explosions – a small conveyor diameter is preferred and with it, the achievable maximum flow rate (depending on the individual case, currently limited to approx. 10 t/h). Conveying distances of up to 260 ft as well as conveying heights of up to 115 ft (and in some cases more). In most applications however, the distances run to 130 ft and heights extend to 65 ft.

- maximum flow rate 10 t/h
- Conveying distances of up to 260 ft
- conveying heights of up to 115 ft
- typical applications, the distances run to 130 ft and heights extend to 65 ft.



What is vacuum conveying?

> Material and application database

Transportation of bulk material

Our database of over 2000 tested materials is constantly growing; however, we recommend that vacuum conveying trials are carried out in order to accurately determine the flow rate. This can be achieved in our laboratory and/or on-site. The number of parameters (specific to the bulk material and installation-related) are so diverse that advanced calculation of the flow rate can only be indicative.

Even chemically identical substances can behave very differently when conveyed as a result of various manufacturing processes. Our wealth of experience and the use of the existing test protocol database allow us to create a feasibility analysis and size up the project in advance, so that budget estimates can be made without delay. We offer project management, technical operations, design, manufacturing, commissioning and service - from one source. Prototypes for experimental purposes can be

implemented at short notice. This summary brochure provides a brief insight into a variety of applications for vacuum conveying technology. On the one hand, there is an almost infinite number of possible combinations of modules (product feeding, conveyor pipe, vacuum pumps, separators, filters, type of aspiration, emptying/discharge) and on the other hand, the applications are extremely varied and diverse. When sizing up the project, our engineers ask specific questions about process peripherals and the procedural workflows. It is only then possible to integrate the conveying task precisely into the production process. New challenges constantly lead to new ideas. As a result of in-house design, development and manufacturing, they can be implemented individually and in a short time. There is something special behind almost every application, from a simple system to the complete custom solution – clearly based on the motto: "ideas ahead".

What can be conveyed?

> Reference products from the fields of chemical, pharmaceutical and food

Chemical

- Additive granules
- Aerosil*
- Activated carbon dust
- Al₂(OH)5C
- Al₂O₃
- Alkylphenol resin
- Aluminum trihydroxide
- Aluminum hydroxide
- Aluminum silicate
- Aminosulfonic acid
- Barium sulfate
- Bentonite
- Bisphenol A
- Fuller's earth
- Boron nitride powder
- Boric acid
- Calcium carbonate
- Calcium phosphate
- Cellulose
- Degalan*
- Dicyandiamide powder
- Iron oxide
- Eudragit
- Ferrocene

Foods

- Alfalfa
- Flavoring powder
- Bread improver
- Bacon strips
- Bentonite
- Blood powder (animal feed)
- Sherbet powder
- Curry powder
- Dextrose
- Pea flour with bacon
- Strawberry crisp
- Ester gum (Harz)
- Fat powder
- Filtracel*
- Fruit jelly granules
- Fruit powder
- Breakfast cereal flakes
- Animal feed

Chemical

- Sodium cyanate
- Sodium metasilicate
- Sodium nitrate
- Neolite
- Neopentyl glycol
- Nitrolon
- Nitrocellulose
- Pancreatin powder
- Pentaerythritol
- Perlite
- Phenolic resin
- Phthalic anhydride
- Polychloroprene chips
- Polyethylene wax
- Polystyrene
- PTFE powder
- Quartz mixtures
- Soot
- Sulfur powder
- Silver oxide
- Silicon carbide
- Silicon dioxide (Aerosil*/HDK* etc.)
- Silicon powder
- Sipernat
- Stearic acid
- Syloid*
- Talc
- Teflon powder
- Titanium dioxide
- Clay
- Clay silicate
- Tricalcium phosphate
- Uranium oxide
- Wax pastilles
- Washing powder beads
- Bismuth
- Tungsten carbide
- Cellulose
- Zeolite
- Zinc oxide
- Zinc stearate

* some names are registered trademarks of the manufacturers

What can be conveyed?

Reference products from the fields of chemical, pharmaceutical and food

- Cherries (preserved)
- Grated coconut
- Coriander
- Herb salt
- Granulated sugar
- Lactose
- Licorice powder
- Skimmed milk powder
- Corn starch
- Maltodextrin
- Almond powder
- Flour
- Mentos*
- Milk powder
- Whey powder
- Nutmeg shell
- Sodium bicarbonate
- Bicarbonate of soda
- Paprika powder
- Peppermint
- Pepper powder
- Horse feed additives
- Chanterelle mushrooms
- Popcorn
- Icing sugar
- Puffed rice
- Rice/Millet
- Reis Krispies
- Beetroot mixture
- Cream fat powder
- Salt
- Snuff
- Chocolate sprinkles
- Smarties / M&Ms
- Breadcrumbs
- Soybean
- Soy flour
- Sorbitol*
- Sauce powder
- Diced bacon
- Spinach-bacon powder
- Trail mix
- Soup powder mixtures
- Sweetener
- Tobacco
- Tea (leaves/bales/cut)
- Pet food
- Tixosil*
- Tricalcium phosphate
- Trigarol*
- Vitamin powder
- Whole egg powder
- Milk chocolate chunks
- White cabbage
- Wheat starch
- Xanthan
- Dark chocolate drops
- Ground cinnamon
- Cellulose
- Sugar
- Broken crackers

Pharmaceutical

- Laxative granules
- Acetylsalicylic acid
- Agiolax*
- API (active pharmaceutical ingredient)
- Ascorbic acid powder
- Barium sulfate powder
- Benzimidazoles
- Blood plasma (frozen)
- Boric acid
- Cellulose powder
- Colistin sulfate
- Curantyl
- Dextrose
- Pills
- Globules
- Glucose
- Urea
- Yeast
- Hormones
- Hypromellose
- Potassium hydrogen carbonate
- Capsules
- Ceramic powder
- Carbon granules
- Kromasil C4*
- Lactose
- Magnesium stearate
- Corn starch
- Mannitol*

- Metamizole (dipyrone)
- Microcrystalline cellulose
- Sodium carbonate
- Sodium citrate
- Pancreatine
- Pantoprazole
- Paracetamol powder
- Pentoxifylline
- Vegetable drugs
- Herbal medicines
- Pirosil
- Posaconazole
- Pyrazole
- SE oxalate
- Silicon dioxide
- Siofor*
- Sorbitol
- Tablets
- Vitamin C powder
- Vivapur*
- Soft gelatine capsules
- API (active pharmaceutical ingredient)
- Xanthan

Plastic powder and granules

- Acrylic powder
- CR rubber granules
- Decorative stones
- Decorative sand
- EPDM granules
- HDPE regrind
- Fiberglass rubber mix
- Rubber granules
- PE-PP rubber
- PE granules and semolina
- Polyacrylic
- Polyamide rods
- Polyethylene resin
- Polypropylene granules
- Polyvinyl chloride
- PS regrind
- PTFE powder*
- PU granules
- PVC powder

Dye and coating powders

- Bayoxide*
- Decorative colouring powder
- Dibromnitroaniline
- Drylac
- Iron oxide
- Epoxy resin
- Colour pigments/inks
- Colour powder
- Fritted glass
- Glass fibers
- Resin splitter
- Glazing powder
- Resin powder
- Ceramic granules
- Magnesium oxide
- Oxazine colourant
- Powder paint
- Resicoat
- Soot
- Styrene/Acrylate polymers
- Teflon powder
- Titanium dioxide
- Toner powder
- Vestosint*
- Water colour

Metal powder

- Aluminum powder
- Boron nitride
- Bronze
- CuF4*
- Rotating dusts
- Stainless steel powder
- Iron powder
- Erbium
- Graphite powder
- Green mixture metal (Cu, Pb, Sb, C, Sn)
- Hart metal dust and granules
- Cobalt powder
- Copper powder
- Magnesium turnings
- Metal powder mixtures
- Nickel-chromium powder
- Palladium ash
- Grinding dust
- Silver powder
- Steel granules
- Strontium ferrite powder
- Tantalum powder
- Tungsten powder
- Tungsten salt
- Zinc powder*

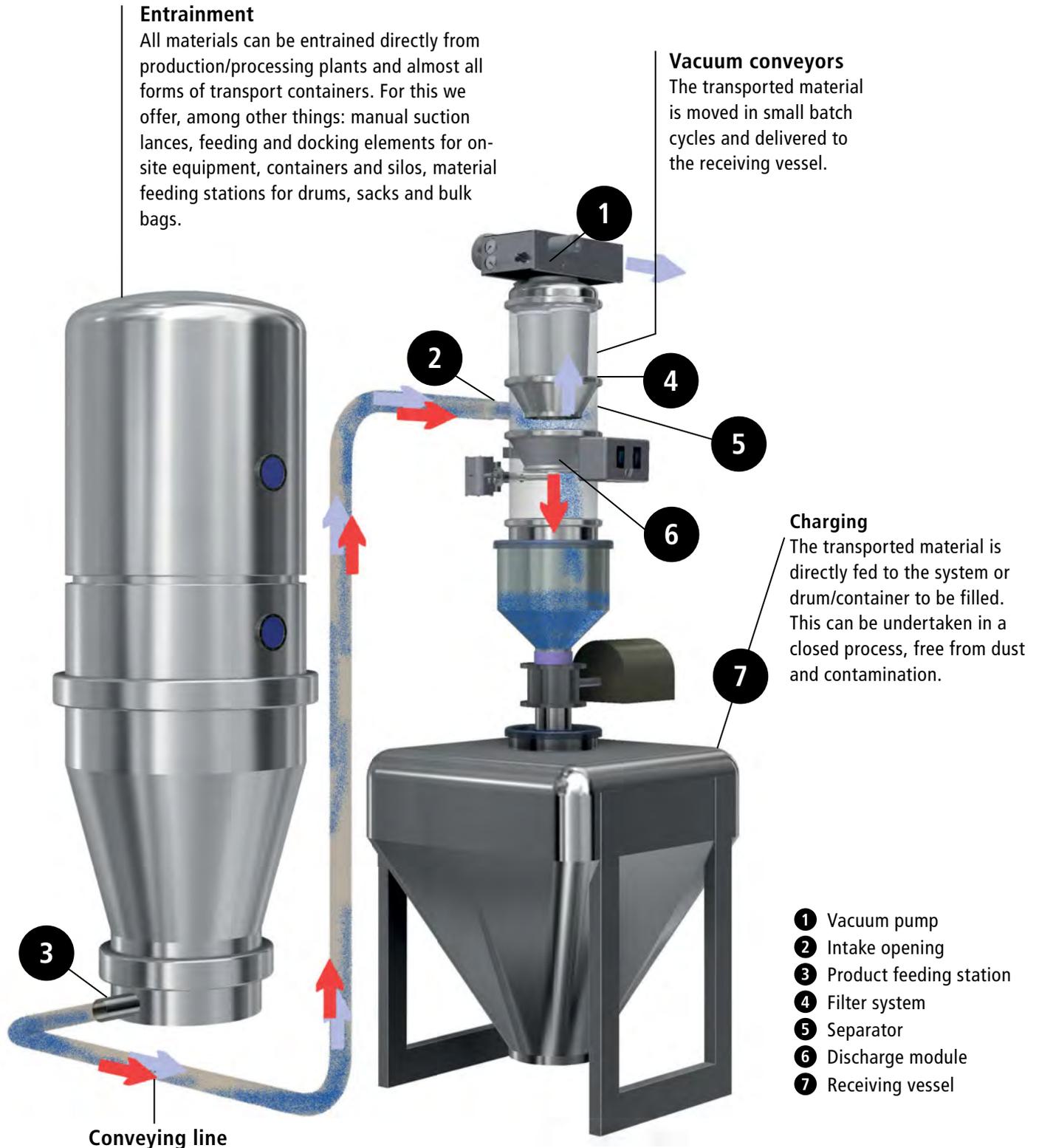
Mass parts and smallparts

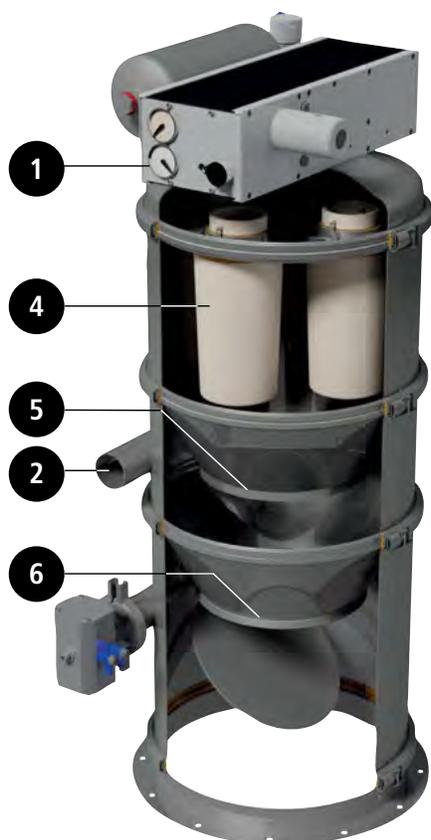
- Activated carbon pellets
- Baypren chips*
- Pills
- Film-coated tablets
- Hollow glassware
- Grass seed
- Infusion plugs
- Wood chips
- Capsules
- Ceramic hollow cylinder
- Infusions cap metal
- Plastic plates
- Copper electrodes
- Button cells (batteries)
- Plastic caps
- Pharmaceutical components
- Salt tablets (for water treatment)
- Stones
- Tablets
- Propellants
- Closure caps
- Soft gelatine capsules*



How vacuum conveyors work

> Entrainment, transporting and feeding – VOLKMANN provides maximum benefit.





Working sequence

Vacuum pump 1 produces negative pressure in the separating container of the vacuum conveyor. Air is sucked through the **intake opening 2** of a **product feeding station 3** and material for transportation is moved. The vacuumed air passes through the **filter system 4** inside the separating container depositing material and it accumulates there. In the case of fine dust, an additional cyclone insert (used in the **separator 5**) allows for higher flow rates due to lower filter surface load. After the separator container is filled, the vacuum pump is switched off. The pressure in the separating container quickly reduces to atmospheric pressure. The valve in the **discharge module 6** opens and the transferred material falls from the vacuum conveyor directly into the **Receiving Vessel 7**. When emptying, the filter is cleaned by a back flow pulse of compressed air. In this case, any filter cake is reliably removed. In the case of heavily 'bridging' or adhesive material, VOLKMANN offers optional piston vibrators and fluidizing units to aid discharge. After emptying is complete, the discharge valve closes and the conveying process begins again.

The advantages of VOLKMANN vacuum conveyor:

- The modular design allows for a high flexibility
- Adaptable for pigments, powders, granules, pellets, tablets, capsules and small parts
- Dustfree conveying in a closed system, Containment is possible
- Small, lightweight, tool-free maintenance high hygiene
- Also suitable for "difficult" bulk materials
- High vacuum: gentle and separation-free transport
- Also suitable for abrasive bulk materials
- Totally pneumatic, free of ignition sources, ATEX certified

VOLKMANN vacuum conveyors in production processes

- **for the chemical industry:** robust and safe
- **for the pharmaceutical industry:** approved construction and the highest level of hygiene
- **for the food industry:** hygienic, inexpensive and gentle
- for the paints and coatings industry: quick cleaning without residue
- For the bulk material-industry: modular and versatile
- For the plant engineering: easy to be integrated
- VOLKMANN vacuum conveyors are at home in all industries
- **Supplied for all relevant ATEX EX-zones**



Specific, accountable and creative The system development process

Consultancy, development, manufacturing and service from one source.

Consultancy

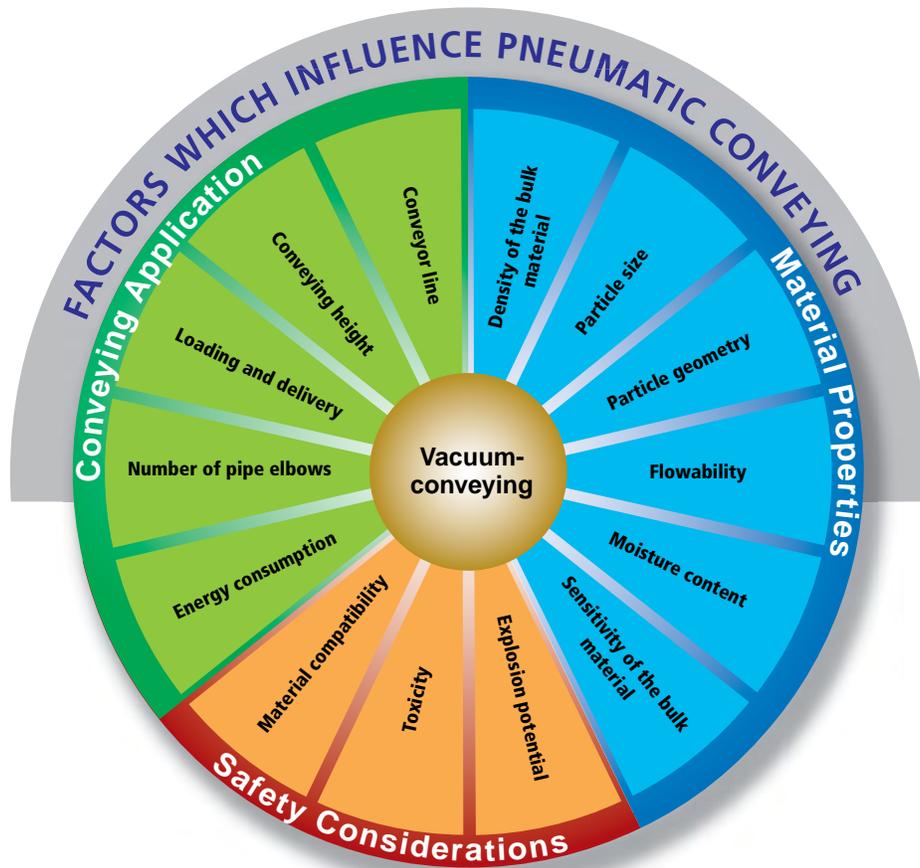
Together with our clients, we work out the demands of the project. We employ highly trained professionals, who are very familiar with the use of conveyor technology, the handling of bulks and the need to guard against explosions, hygiene and automation.

Construction, development, project management

Our project team consisting of construction engineers, technicians, implements the requirements within the current scope. Together with the sales team, we maintain close contact with customers and we only offer our customers those products which are really clean, safe and user-friendly.

How vacuum conveyors work

> Construction of a vacuum conveying system



Design

To design a vacuum conveying system is both easy and difficult at the same time.

To allow a first assessment for the design and construction of the vacuum conveying system we need to consider product characteristics such as bulk density, particle size, flow characteristics and then add the desired transport capacity, conveying distance and heights into the mix.

Selecting a conveying method typically involves considering a wide range of potential issues: Is the product reactive with

oxygen, is it corrosive, is it toxic or harmful to health and are there any environmental considerations to be made. These product aspects are especially important in the initial conveyor design and follow on with other things such as system maintenance. A responsible plant operator will want to ensure a safe conveying system is installed.

You can be assured that with a VOLKMANN design, we carefully consider the welfare of the operators.



components of dishwasher tabs



neoprene chips



toner powder



ceramics abrasive



mushrooms



copper carbonate



nutmeg shell



copper sulphate

➤ Possible conveying conditions in the conveyor line

Essentially, the overall difference in pressure in the conveyor line is a result of the quantity of the conveyed material in the line, its flow properties, the conveyor height (which has to be overcome) and the layout of the feeding station/line design. In addition, the vacuum generator must be able to overcome the overall pressure loss and at the same time, generate the necessary flow speed (air flow based on the conveyor line cross-section) in order to transport the conveyed material. For a stable conveying process, it is important that there is already a sufficient amount of additional diluting air generated in the product at the feeding station and/or the conveyor line. At the same time, the quantity of the added feeding air determines the condition of the conveyed product in the conveyor line. With the correct adjustment of the feeding system, the material can be conveyed very gently. Segregation is avoided, electrostatic charges are reduced and particular effects (such as the formation of 'angel hair' in plastics) are eliminated. Three conveying conditions can be set in the suction line:

Conveying by lean phase

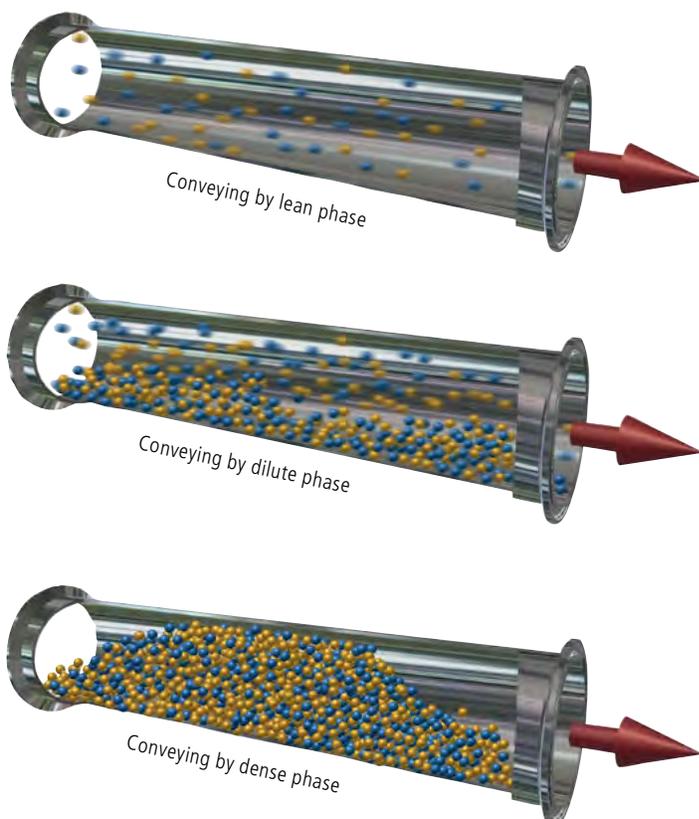
In conveying by lean phase, the speed of suction air w is much higher than the saltation velocity v_S of the individual product particles. It is approximately 3,540 - 6,900 ft/min. The material load on the suction air is quite low. Depending on the characteristic curve of the vacuum generator that is used conveying by lean phase can often achieve maximum flow rates. In the case of sensitive material however, the high speeds can lead to increased particle abrasion, breakage of the particle and wear.

Conveying by dilute phase

In a horizontal conveying pipe, if the air speed w is lowered to below 4,000 ft/min, the conveyed material increasingly falls into the lower half of the tube and it moves through the transport line in waves. The formation of the wave greatly depends on the product. It can form individual plugs or settle so far down the line that again, conditions for conveying by lean phase prevail above it as a result of cross-sectional narrowing of the line and an increase in vacuum air speed. The ratio of the speed of the material v to the speed of air w is less than 0.7. The material load is usually higher than when conveying by lean phase. Conveying by dilute phase is gentle on the product and in terms of the energy that is consumed, the most favorable type of conveying by vacuum.

Conveying by dense phase

If the material load is increased further and the air speed is reduced, individual plugs form in the conveyor line. Along the conveyor line, these fall away and they continually rebuild themselves. As such, even when conveying vertically, the stable transportation well of materials can be realized with an air velocity w that is still well way below the floating speed v_S of the individual grain. The conveying of the plug is particularly gentle for the material. In order for the plug to be conveyed, suitable vacuum pumps must be selected to generate a high negative pressure with a sufficiently high air flow rate in order to prevent any blocking of the suction pipe. The air speed w is between 600 - 2000 ft/min, wherein the ratio of the material speed to the air speed is less than 0.5. The product mass flow rate can be up to one hundred times greater than the air mass flow rate. In terms of the energy that is needed, conveying by plugs is comparable to conveying by lean phase, because the required air flow rate is much smaller, but instead, pressure difference increases in the same proportion.



Volkmann vacuum conveyors

> Individual optimization



Often, the various processes (e.g. chemical engineering) mean that different powders and granules have to be conveyed with one conveyor (e.g. various colour and coating powders in the paint and coatings industry). The vacuum conveyor should then be set up as simply as possible and allow for easy disassembly and cleaning.

At the same time, the selected container material must be resistant to cleaning agents and corrosive chemicals. This is why the tried and tested stainless steel modular design is used. On the one hand, it ensures a quick changeover between product and on the other hand, it fulfills the high requirements of chemical, food and pharmaceutical processes. In addition, single stainless steel modules enable vacuum conveyors to be individually tailored according to the specific task.

VOLKMANN vacuum conveyors – your advantages as a client!

- unparalleled, flexible modular concept
- easy to take apart by hand and clean
- suitable for GMP applications
- superior filter technology
- individual adaptations, specifically tailored to the conveying task
- highly effective vacuum pumps
- no generation of heat
- quiet and extremely reliable operation
- light weight and compact design
- process engineering and support, directly from the manufacturer
- in-house manufacturing in Germany

For reliable conveying, various radial and tangential suction port designs are available.

In particular, small conveyor units can be designed in conjunction with the multi-stage air-powered vacuum pumps. These can be used in a stationary or mobile situation. As high negative pressure may develop in the case of plug conveying, the container system must also be able to withstand the high vacuum levels. The transport capacity is catered for depending on the size of the separator container/filter surface, the vacuum pump, the design of the line and the quantity of feeding air that is added. The conveyed material volume per suction cycle is then more or less constant for the respective system, so that the conveying capacity largely depends on the bulk density of the material and how the feeding of the product is designed.

In such cases, and in cases with adhering/sticky material, the radial suction connection is the better choice, since it does not flow over the larger areas of the separator's interior surface. The material cannot build up on the wall and the mixture remains homogeneous due to turbulence similar to a fluid bed. The filter load is larger with the radial suction inlet requiring compensation, in some cases, by more frequent emptying and cleaning cycles, lowering the suction capacity of the conveyor. The best application oriented configuration of the Vacuum Conveyor and its modules can be found by conveying tests.



Tangential inlet

Radial inlet



In connection with our Multijector vacuum pumps particularly small Vacuum Conveying systems are available, these can be used both stationary or mobile. Since high vacuum levels might occur during plug conveying, our Vacuum Conveyors all are vacuum proof for pressures down to -0.91 bar ($= 9 \text{ m} = 350 \text{ inches water column}$).

In accordance to the size of the Separator Container, its suction inlet, the chosen filter and vacuum pump, a certain transportation capacity is reached. The filling volume per suction cycle is constant, the transportation capacity depends strongly on the bulk density and other properties of the conveyed material, as well as on the feeding situation of the transportation line.

Material flow

> Feeding and delivery systems in a vacuum conveyor

VOLKMANN vacuum conveyors are used throughout industry where critical design makes a difference:

- high levels of hygiene when transporting materials
- easy dismantling and cleaning of all components that come into contact with the product
- high operational safety and reliability
- the avoidance of risks of explosion
- the material quality and consistency of the components that are used



Collection directly from:

- Feeding hoppers
- Bulk bags/FIBCs
- Silos
- Drums
- Sacks
- Sheets
- Belts
- Dryers
- Cutting systems
- Hall floors
- Trays
- Centrifuges

Direct loading of:

- Stirred tanks
- Reactors
- Bottling plants
- Weighing containers
- Sieve machines
- Mixers
- Tablet presses
- Bulk bags
- Bagging systems
- Drums
- Silos
- Preparation containers

Application examples:

> The chemical, food and pharmaceutical industry



Conveying of sugar in food industry.



Vacuum conveyor with a powder lock for conveying pigments in a solvent atmosphere.



Loading a toner filling system.



PPC with a WIP function on a table press.

VOLKMAN vacuum conveyors can be found all

> Focus: Systems and complete solutions for applications involving chemicals,



Two vacuum conveyors for loading loss-in-weight feeders.



Emptying a dryer with a manual suction wand.



Emptying the drum and loading the mixer;
Emptying a fluidized bed dryer and filling the drum.



Vacuum conveyor for conveying pigments in the
manufacturing of paint.

over the world

special materials, pharmaceuticals, food and pigments



Vacuum conveyor for automatically emptying a fluidized bed dryer.
Product is dispensed via an immersion pipe into IBCs.



Conveying of cake/bread mixtures in the food industry.



Vacuum conveyors in an outdoor installation, for charging silos.



Feeding of two different powders (active pharmaceutical ingredients) into a stickpack packaging machine.



Continuous charging of a mixing container and autoclave for manufacturing adhesives.

Vacuum conveyor VS

> The allrounder for the safe and hygienic handling of powder



The VS family of vacuum conveyors

- unique, modular design for a countless number of applications
- small and lightweight
- easy to install and operate
- simple and quick to dismantle without tools
- safe and reliably hygienic to clean

Its modular structure allows for task-specific configuration of the equipment. This also enables complex conveying tasks with difficult products to be reliably conveyed. We are happy to advise you concerning the precise configuration of the conveyor using our extensive product test database and expertise. Through actual trials of the conveyor involving your materials (either in our technical center or on your premises) you will gain confidence in our solution.

Your advantages as a client

- hygienic design of all components
- sophisticated filter technology
- no residuals of the product in the conveyor
- easy material discharge, large discharge valve openings
- flow rates 100 to 20,000 lbs/hr
- pneumatic systems, fail-safe controls
- electric vacuum pumps (optional)
- valves/fittings upon request, to your specifications

According to directive 2014/34/EU (ATEX), all VS conveyors are ATEX certified for assembly in zones 1, 2, 21 and 22. EC type approval certificate number TÜV 02 ATEX 7005 X. Special conditions apply for the safe use of the equipment.

II 1 D c 80°C/II 2 D c 100°C
- /II 2 GD c 100°C (T4)



> Uniquely modular, operationally safe and user-friendly

Separator with a hygienic module system (pat.)

- four sizes: Ø200, Ø250, Ø350, Ø450 mm (Ø8" to Ø18")
- modular segmented structure with a clamp ring system
- light-weight modules, easy to dismantle and clean
- stainless steel 1.4404/1.4435 (AISI 316L), 1.5 mm (0.065") wall thickness
- ground surfaces Ra < 0.8 µm (or electropolished < 0.5 µm)
- coatings, as specified
- silicone seals (FDA), EPDM (FDA) or NBR



QX quick exchange filter system (pat.)

- quick exchange cartridge filter with a secure double seal
- hygienic seal gap between filter and plate
- long lasting sintered PE-HD cartridge filter (5 µm, FDA)
- Teflon-coated star filter cartridge (0.1 µm, FDA)
- stainless steel filter elements
- filter for materials hazardous to health
- filter bag with a Teflon membrane

Automatic filter cleaning

- back blowing air shock systems

Product suction ports

- suction port diameters Ø 25-100 mm (Ø1" to Ø4")
- radial suction module
- tangential suction module with or without a cyclone insert
- component reduced eco-module
- suction port, with an optional clamp connection

Container emptying

- discharge valve openings with a large flap diameter for fast emptying

- active discharge valve with pneumatically actuated flap
- large diameter butterfly valves
- fluidization and piston vibrators for improved material discharge
- individual valves and fittings as specified

Modules for connecting to the process

- flange and cone modules
- storage tanks with liquid flow
- textile socks, immersion pipes
- Individual modules and system integration

Vacuum pumps

- over 50 MULTIJECTOR® types for vacuum conveyors
- multi ejectors made entirely of stainless steel (CIP compatible)
- electric vacuum pumps (please ask)

Controls

- small pneumatic control units
- automatic control units with fill level monitoring
- preparation for PLC control units (on the part of the customer)

Accessories

- suction lances and balancers for manual operation
- product feed hopper
- suction hoses and pipes
- individual wall brackets or special frames
- stationary and mobile fixed height or lifting columns for vacuum conveyors



The patented VS module connection offers a high level of security

- hygienic design
- dust free operation
- assembly/disassembly without tools
- common captive seals
- electrical conductivity via the module joint connection in all operating modes without additional cable earthing

Vacuum conveyor PPC

> The specialist for pharmaceutical applications



The PPC family of vacuum conveyors

This range has been specifically developed by VOLKMANN for applications which, in addition to simply conveying, require maximum quality in terms of surfaces and the features of all parts which come into contact with the product. They are mainly used in the field of the pharmaceutical industry and pigment processing and are characterized by their single-piece construction without additional modules. The structure of the equipment meets the highest hygiene requirements. Nevertheless, without the use of tools, they can be easily disassembled into their individual parts in just a few steps and easily cleaned or sterilized.

The conveyor construction is designed as electrically conductive throughout including the transferred product, it is built to be free of gaps and dead space. Build up of product residuals and pockets of dust/germs are avoided. PPCs empty the transported material via large hygienic butterfly valves.

PPC vacuum conveyors are offered as pre-configured units for the specific task. In addition to various pharmaceutical and/or electrically conductive filter systems (e.g. for explosive applications), they can be supplied with special clamp-connections, coatings and discharge flaps (according to customer requirements). For users in the field of pharmaceutical production, we are able to provide supplementary material/process analyses

and selection procedures and can also prepare the documents which are necessary for a qualification. We also offer special services to support the validation of your production process.

According to directive 2014/34/EU (ATEX), all PPC conveyors are ATEX certified for assembly in zones 1, 2, 21 and 22. EC type approval certificate number TÜV 02 ATEX 7005 X.



Special conditions apply for the safe use of the equipment.

II 1 D c 80°C/II 2 D c 100°C
- /II 2 G c T4



VOLKMANN PPCs are WIP/ CIP compliant

Our PPC vacuum conveyors are designed to be CIP compliant (CIP = Clean in Place). Together with you, we coordinate the scope of the CIP function precisely to your requirements and application.

> Application examples



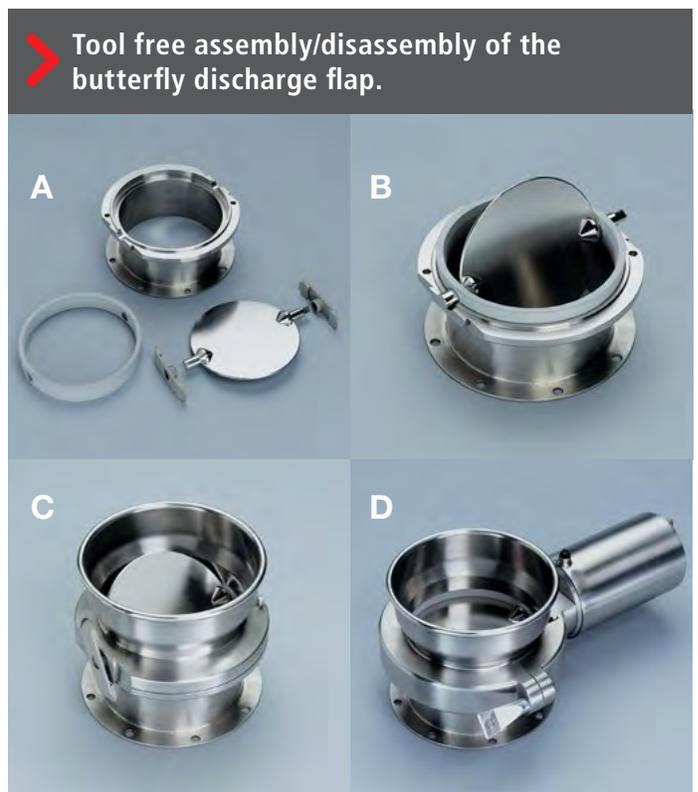
Loading of the mixer using PPC.



PPC (WIP) for charging a tablet press.



PPC on a sieve machine.



Emptying system with the highest hygiene requirements.

Vacuum conveyor INEX

> Vacuum conveyor with an inerting gas function: VOLKMANN INEX



With VOLKMANN INEX vacuum conveyors, material can be simply and safely transported in hazardous processing systems such as stirred tanks and reactors. This enables powder to be transferred in all dust and gas explosion zones.

VOLKMANN INEX vacuum conveyors for applications in explosive areas

- are constructed free of ignition sources
- operate pneumatically without electrics
- are electrically conductive throughout
- small fill volumes
- work with low transport speeds
- do not produce heat
- do not have hot surfaces
- do not have rotating parts
- are easy to control and operate.

Various alternative factors may require the inerting of the conveying process:

A) The product to be conveyed is to be fed into an area which is already inerted, e.g. a hammer mill which works under inert gas conditions.

B) Flammable gases/fluids or solvent-damp powder (hybrid mixes) may be jointly collected and conveyed (e.g. transferred from ATEX zone 1 or 2).

C) The product is to be introduced to ATEX zone 0 or 1 i.e. in a zone in which flammable gases are regularly present.

In case B, the entire conveying process should be carried out inertly as brush discharging are sources of ignition for explosive gases. In cases A and C it is sufficient if the separator container of the vacuum conveyor is inerted before emptying.

All VOLKMANN vacuum conveyors in the following series: 'INEX-VS', 'INEX-PPC' and 'INEX-Pressure rated' are certified according to directive 2014/34/EU (ATEX). EC type approval certificate number TÜV 03 ATEX 7017 X. Special conditions apply for the safe use of the equipment.

- II (1) G D (delivery) /
- II (1) D (2) G (loading) /
- II 2 G D c Tx (Tx in °C).



> Bulk bag unloading stations



Big-Bag discharging station for conveying of various powders (some are abrasive) into a mixer.

Bulk bag unloading station (BBU)

The BBU modular bulk bag unloading station has been optimized for dust-free operation in conjunction with vacuum conveyors. It can be used with almost all materials to be conveyed. In addition, products which do not easily flow can be securely discharged by means of the vibration unit and material massaging elements. In connection with VOLKMANN vacuum conveyors, it is possible to transfer materials in low-dust and low-contamination conditions. The BBU modular bulk bag emptying station is flexible. It can easily be adapted and optimized for the production environment.

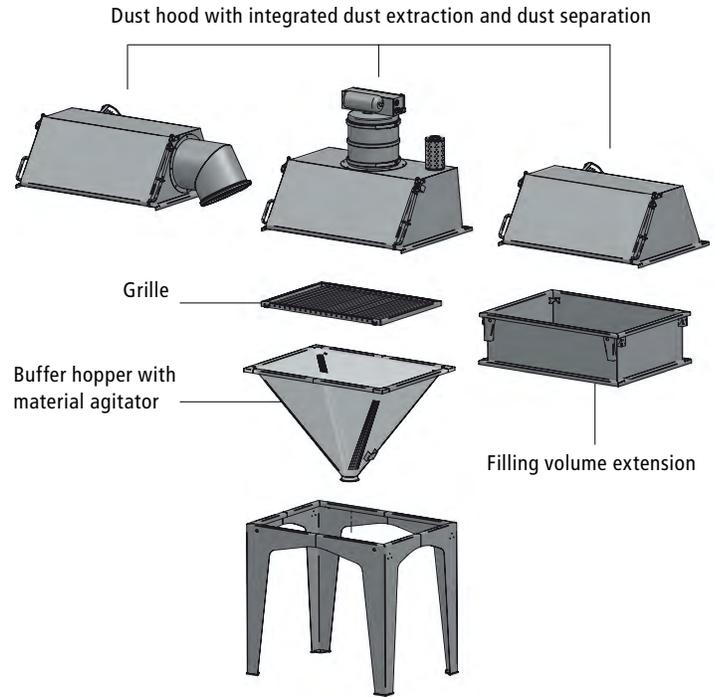
- for bulk bags with a weight up to 2,000 lbs
- fork lift truck loading or using built in hoist
- dust-free docking
- dust collection when exchanging the empty bulk bag
- optional lump breaker
- combined systems are available incl. sack feed
- discharge flow aids

Systems for handling bulk material

> Feeding stations



Modular feeding station RNT 180.



Feeding stations

VOLKMANN offers a comprehensive range of product feeding stations and discharge stations for bulk materials contained in bags. Stations with different holding volumes are available: mini (1 ft³) to maxi (> 16 ft³ buffer). All stations are made in stainless steel by VOLKMANN. Upon request, all product contact parts can also be made from 316L (1.4404) stainless steel.

Individual feeding hopper



Mini product feeding station



Discharge station connected to the clients' process.



Product feeding station with an expansion to the holding volume complete with empty bag disposal port.

Systems for handling bulk material

> Bag feeding stations, lump breakers



Partially-automated sack feeding station featuring contained supply, dust extraction and an empty sack compressor

The full sacks are placed on the belt and by pressing a foot pedal, are transported into the emptying station via the conveyor belt.

The operator pulls the bag into the emptying station, cuts it open empties it and folds up the bag. The emptied bag is then thrown into the empty bag compactor. As the empty bag compactor is filled, the safety door is closed and the empty bag compactor is started.



Containment product feeding stations

High quality powder and toxic dusts require dust-free handling. VOLKMANN's product feeding stations allow materials to be removed from sacks, boxes, PE bags and small packs free from dust and contamination from the environment.



Lump breakers/Disintegrators

What good is a sophisticated delivery system if the flow of materials fails at the point where they are fed? VOLKMANN considers the entire process and also takes care of suitable conditioning of materials at the beginning of the process. Decisions as to whether the material should be fluidized, vibrated, stirred or even first reduced from fist-sized lumps to a transportable grain size are made depending on each individual case.

Systems for handling bulk material

> Lifting columns and mobile frames

Fixed lifting columns and mobile trolleys

Lifting columns allow easy positioning of vacuum conveyors within production processes.

Options and advantages:

- one mobile vacuum conveyor can be used to feed several receiving vessels
- quickly positioned, low manual handling and easier access for cleaning
- controlled pneumatically, electrically or manually
- hygienic pharma designs
- special interfaces and docking solutions are available
- various designs, all manufactured by VOLKMANN

Volkmann lifting columns makes it easier to position the vacuum conveyor above the receiving vessels. Free standing from machinery, the conveyor can be easily connected to a variety of equipment for dust free material transfer. Finally, the conveyor can be dropped down for ease of inspection, maintenance and cleaning without the need for tools.



Fixed lifting/swivel column



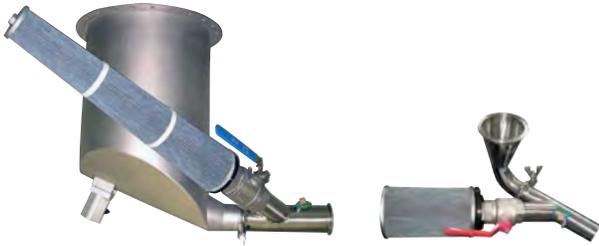
Mobile trolley – height adjustable by pneumatic drive



Platform frame with a parking position for PPC INEX

Accessories for vacuum conveyors

> Feeding elbows, suction lances, product points and suction hoses



Feeding elbows

Feeding elbows with air control valve allow precise volumes of feeding air to be added to the conveying line. The correct adjustment of the air supply valve is determined during the system commissioning. Special designs (e.g. with an inert gas connection) are also available.



Product collection points

VOLKMANN multi collection points systems make it possible for one or more vacuum conveying systems to connect to different collection stations. For example, by means of suction lance, a vacuum conveyor removes the same or different materials from connected silos, bulk bag stations, bag feeding stations or drums. We provide standard equipment for 2-8 transport lines as well as individually coordinated systems according to your specifications.



Line-clearing valve

The Line-clearing valve serves to partially empty the conveying line, specifically for the vertical section. Additional secondary air is fed into the conveying line in order to reduce the product loading and prevents suction line blockage. Alternatively, the line clearing valve can be placed at the beginning of the conveying line to empty the conveying line after each suction cycle.



Suction wands

- are available in different designs and materials:
- hygienic suction wands with a feeding element (POM FDA), stainless steel 316L, Ø 1-4 inch
- double wall suction wands with a feeding element for emptying lined drums and bags. The feeding air can flow to the intake opening through the gap into the double jacket without restrictions, fluidize the material to be collected and be carried away. Special designs are available e.g. with a inert gas connection.



Suction hoses

- Various materials and qualities:
- polyurethane or PVC
- FDA approved material as an standard
- vacuum resistant, lightweight and flexible
- electrically conductive/dissipative embodiments are available for all explosive zones



Suction hoses with moulded couplings

Clamp connections or – if desired – other type of connections can be moulded seamlessly to the suction hose and are specified for hygienic applications. The metal wire spiral of the suction hose will be connected to the metal socket of the coupling to maintain suitability for use with combustible powders acc. to TRBS 2153 (new TRGS 727). In addition, external hose bands/clips and open wire terminals are also avoided when using suction hoses with moulded couplings.

> Pneumatic timer, control units, filters



Pneumatic timer

Our simple pneumatic timers control all VS and PPC vacuum conveyors and are available with plastic or stainless steel housing. All times can be set manually. Can be used in explosive zones.



ET/ET advanced

The electro-pneumatic and intelligent compact control evaluates incoming signals from the fill level sensors as well as a start signal supplied by the customer. All functions can be set via the keypad and the text display.



Electric control units

We manufacture programmable logic controllers (PLC) for our conveyors, emptying and dosing systems in our own control unit workshop.



Filters for vacuum conveyors

We equip our vacuum conveyors with the best available filters for the respective application

- PE-HD filter elements from FDA compliant material with BIA approval (separation rate > 99.99%, for material > 5 µm)
- stainless steel filter cartridges
- star filter cartridges with an electrically conductive polyester fleece and PTFE membrane (FDA compliant, for material > 0.5 µm)
- bag filter with a PTFE membrane

With a high level of reliability and top separation rates, VOLKMANN offers durable filters which can be simply removed and cleaned.

Vacuum pumps



VOLKMANN Multijector®



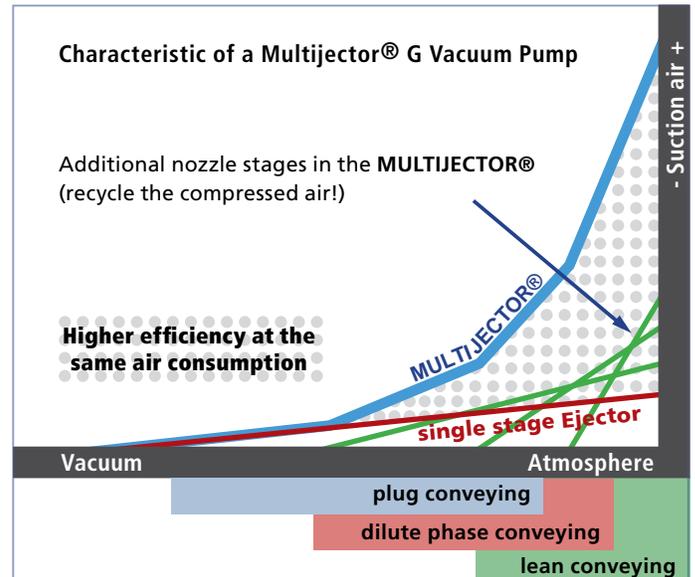
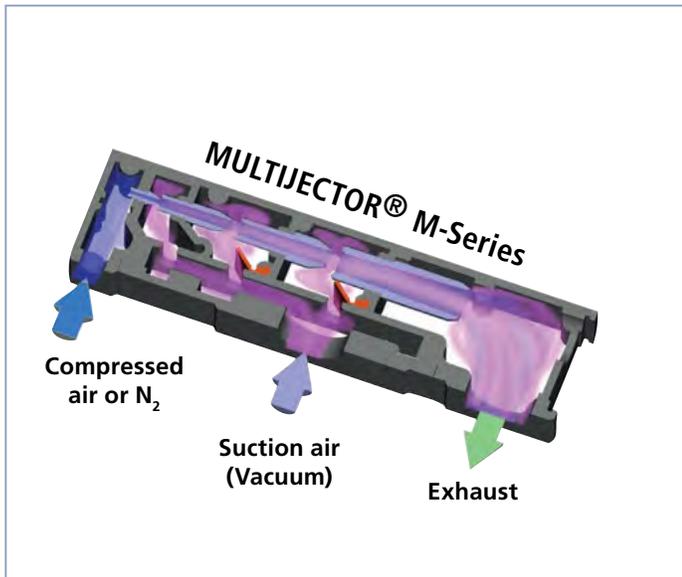
VOLKMANN MULTIJECTOR® Vakuumpumps

For the transport of bulk materials it is necessary to use a vacuum pump with the right characteristics. On the one hand a high volume flow is required for moving the material (conveying

by lean phase). On the other hand a high vacuum is needed for a gentle and separation-free transport of the material (conveying by dense phase). This can be achieved by the multistaged venti systems of the Multijectors.

Advantages of the Multijectors towards electromechanical pumps or blowers

- small size, light weight, quiet, extremely reliable
- oil-free, no rotating parts, maintenance-free
- cyclically operation (energy saving)
- free of ignition sources and not heat regenerated
- high amounts of suction air and up to -910 mbar negative pressure



| Multijector Typ | Operat. pressure (bar) | Vacuum max. (kPa) | Compr. air (NI/min) | Compr. air cons. | Pump width (mm) | Pump weight (kg) | Suction air flow (Norm.Liter/min) at the respective Vacuum level (kPa) | | | | | | | | |
|-----------------|------------------------|-------------------|---------------------|------------------|-----------------|------------------|--|------|------|------|------|------|-----|-----|-----|
| | | | | | | | 0 | -10 | -20 | -30 | -40 | -50 | -60 | -70 | -80 |
| MX360 | 6 | -91 | 372 | | | | 1568 | 931 | 580 | 352 | 180 | 136 | 92 | 56 | 20 |
| | 5 | -85 | 320 | G 1/4" | 156 | 2,5 | 1444 | 779 | 500 | 252 | 184 | 132 | 64 | 24 | 16 |
| | 4 | -63 | 268 | | | | 1302 | 631 | 386 | 216 | 160 | 84 | 20 | | |
| MX540 | 6 | -91 | 558 | | | | 2351 | 1397 | 870 | 528 | 270 | 204 | 138 | 84 | 30 |
| | 5 | -85 | 480 | G 1/4" | 156 | 2,6 | 2166 | 1169 | 750 | 378 | 276 | 198 | 96 | 36 | 24 |
| | 4 | -63 | 402 | | | | 1952 | 946 | 579 | 324 | 240 | 126 | 30 | | |
| G720 | 6 | -91 | 744 | | | | 3350 | 1900 | 1185 | 721 | 359 | 272 | 184 | 107 | 46 |
| | 5 | -85 | 640 | G 1/2" | 127 | 5,7 | 3200 | 1590 | 1016 | 526 | 359 | 270 | 140 | 56 | 39 |
| | 4 | -63 | 536 | | | | 2850 | 1240 | 729 | 451 | 322 | 187 | 47 | | |
| G900 | 6 | -91 | 930 | | | | 4188 | 2375 | 1481 | 901 | 449 | 340 | 230 | 134 | 57 |
| | 5 | -85 | 800 | G 3/4" | 150 | 6,2 | 4000 | 1988 | 1270 | 658 | 449 | 338 | 174 | 70 | 49 |
| | 4 | -63 | 670 | | | | 3563 | 1550 | 911 | 564 | 403 | 234 | 59 | | |
| G1260 | 6 | -91 | 1302 | | | | 5863 | 3325 | 2074 | 1262 | 628 | 476 | 322 | 187 | 80 |
| | 5 | -85 | 1120 | G 3/4" | 195 | 7,3 | 5600 | 2783 | 1778 | 921 | 628 | 473 | 244 | 98 | 68 |
| | 4 | -63 | 938 | | | | 4988 | 2170 | 1276 | 789 | 564 | 327 | 83 | | |
| G1800 | 6 | -91 | 1860 | | | | 8375 | 4750 | 2963 | 1803 | 898 | 680 | 460 | 268 | 114 |
| | 5 | -85 | 1600 | G 3/4" | 262 | 9,0 | 8000 | 3975 | 2540 | 1315 | 898 | 675 | 349 | 140 | 98 |
| | 4 | -63 | 1340 | | | | 7125 | 3100 | 1823 | 1128 | 805 | 468 | 118 | | |
| G2700 | 6 | -91 | 2790 | | | | 12563 | 7125 | 4444 | 2704 | 1346 | 1020 | 690 | 401 | 171 |
| | 5 | -85 | 2400 | G 1" | 375 | 11,7 | 12000 | 5963 | 3810 | 1973 | 1346 | 1013 | 523 | 209 | 146 |
| | 4 | -63 | 2010 | | | | 10688 | 4650 | 2734 | 1691 | 1208 | 701 | 177 | | |

Application Data Form

Please fill in the information and send it to your contact or email to contact@volkmannusa.com.



Customer Information

Contact Name: _____ Email: _____

Company Name: _____ Phone: _____

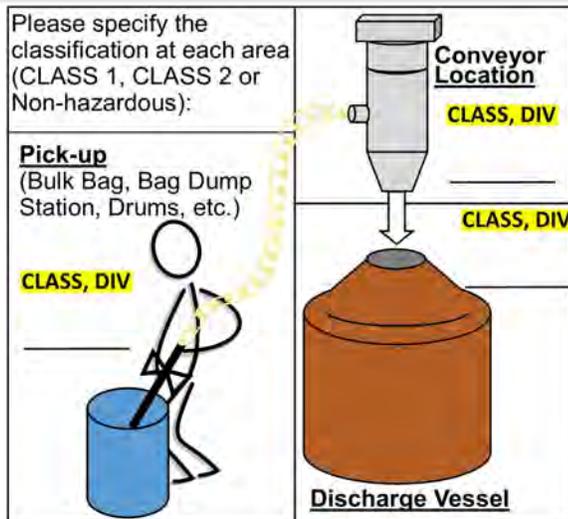
Address: _____ Country: _____

City: _____ State: _____ Zip/PC: _____

Disclosures

Standard Materials of Construction for Product Contact Parts:

- VACUUM RECEIVER: Stainless Steel AISI 316 L
 - SEALS*: Silicone (VMQ) Seals (optional EPDM or Nitrile)
 - HOSE*: Polyurethane (PUR) Hose (optional customer supplied stainless steel tubing)
 - FILTERS*: PTFE (when using TiO7 filters)
- *FDA Approved*



Allowable Installation Areas per ATEX Certification:

- PICKUP: CLASS 2 Only
- CONVEYOR LOCATION: CLASS 1 or 2
- DISCHARGE VESSEL: CLASS 2 (CLASS 1 with INEX Modifications)

Application Information

Conveyance:

Desired transport capacity: _____ lbs/hr kg/hr

Desired control type: Manual On/Off On/Off by Remote Signal from Customer's PLC

How are you currently conveying? _____

Vertical: _____ ft m Horizontal: _____ ft m No. of 90° Bends: _____

Pick-Up: Drums Bag Dump Station Bulk Bag Other, specify: _____

Discharge: Container Blender Buffer Hopper Other, specify: _____

Material:

Common Name: _____ Chemical Designation: _____

Loose Bulk Density: _____ lbs/ft³ g/cc

Characteristics: (check all that apply) free flowing sticky bridges hygroscopic abrasive

Particle size: assume 5 ≤ 500um Other, specify: _____

Is the material combustible or potentially explosive? No Yes, specify MIE: _____ mJ

If you have an SDS, please include a copy with the inquiry form. Hand sketches, photos and/or drawings are welcome.

VACUUM CONVEYORS & BULK MATERIAL HANDLING SYSTEMS

Systems and solutions for the clean, efficient
and secure handling of bulk material



Demonstrations on site, tests, trials in the technical center

Do you want to know more about the possibilities of vacuum conveying? Talk to us about our workshops and seminars that are specially tailored to your industry. We will provide you with the necessary basic principles, show you the incredible range of vacuum conveyors and strive to meet the requirements for your specific applications.

Together we will look for perfect solutions, which will also help to increase product safety and quality, improve the working environment, ensure production processes and save costs.

Seminars and training

Individual seminars, lunch and learn sessions or visits to our facilities in either Bristol, PA or in Germany are available and encouraged. We are happy to teach existing or potential clients about VOLKMANN vacuum conveyors and to share our powder handling experiences first hand. Where product testing is undertaken a written test report and/or a video is supplied with our quotation.



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