



VACUUM CONVEYORS

& BULK MATERIAL HANDLING SYSTEMS

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



TABLE OF CONTENTS	
What is vacuum conveying?	3 - 4
What can be conveyed? (References)	4 - 5
How vacuum conveyors work	6 - 9
VOLKMANN vacuum conveyors / Material flow	10 - 12
Application examples	13 - 15
VOLKMANN vacuum conveyor VS	16 - 17
VOLKMANN vacuum conveyor PPC	18 - 19
VOLKMANN INEX vacuum conveyor (nitrogen inert)	20
Systems for handling bulk material	21 - 31
Accessories for vacuum conveyor	32 - 33
Vacuum pumps	34

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

Lamp black (*Printex 80)

- Glizonite
- Urea
- HDK*
- Hexamethylenetetramine
- Hostanox*
- Ion exchanger resin
- Isophthalic acid
- Potassium carbonate (pot ash)
- Kaoline
- Catalyst powder
- Diatomite
- Silicon dioxide
- Carbon fibers
- Rosin resin
- Chalk
- Copper chloride
- Lithium carbonate
- Calcium hydroxide
- Magnesium hydroxide
- Methyl cellulose
- Micro silica
- Sodium azide
- Sodium bisulfate
- Sodium carbonate

Sodium cyanate

- Sodium metasilicate
- Sodium nitrate
- Nealite
- 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

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

Cookies (extruded)

- Gelatine powder
- Spice blends
- Cloves
- Glucose
- Gum arabic powder
- Decorating sugar
- Chicken thighs
- Hemp
- Yeast extract
- Millet
- Dog food rings
- Ginger
- Ground coffee and beans
- Freeze dried coffee
- Cocoa
- Calcium stearate
- Potato starch
- Cheese powder

* 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
Triglarol*
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

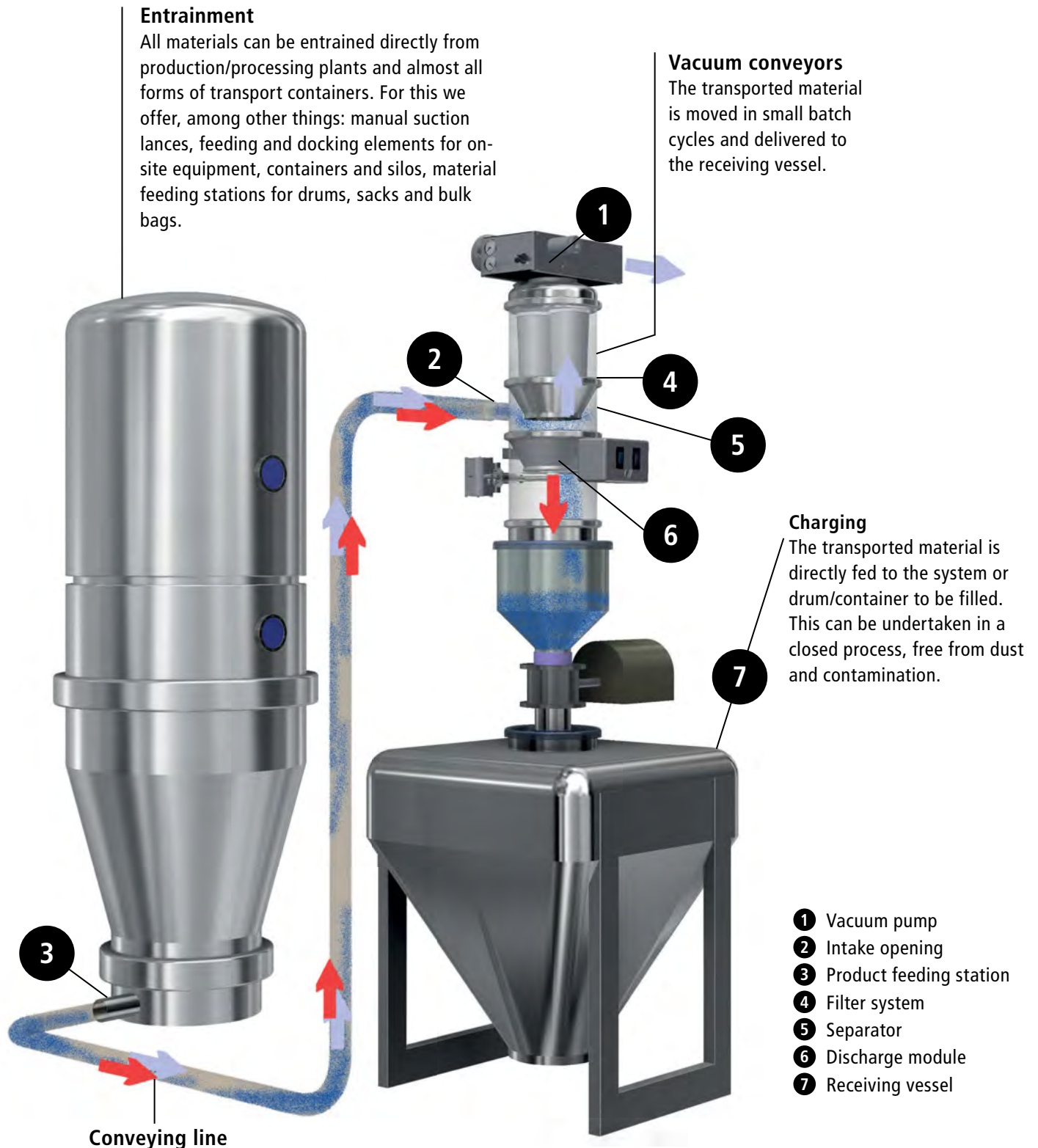
Aluminum powder
Boron nitride
Bronze
CuF4*
Rotating dusts
Stainless steel powder
Iron powder
Erbium
Graphite powder
Green mixture metal (Cu, Pb, Sb, C, Sn)
Hart metal dust and granules
Cobalt powder
Copper powder
Magnesium turnings
Metal powder mixtures
Nickel-chromium powder
Palladium ash
Grinding dust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

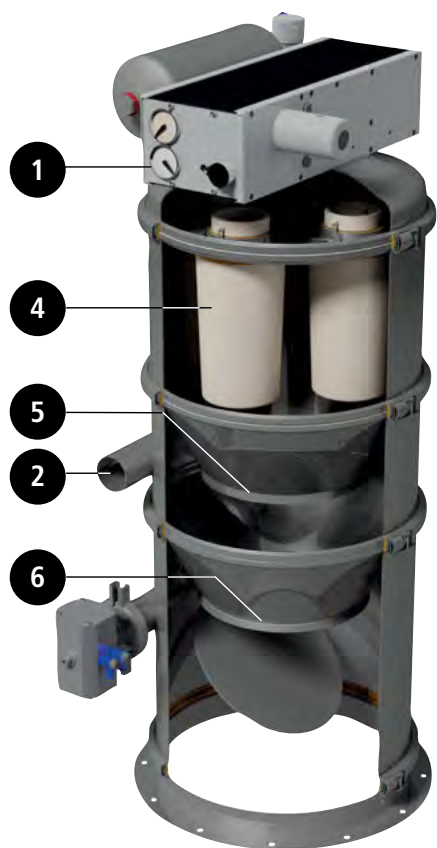
Mass parts and small parts

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

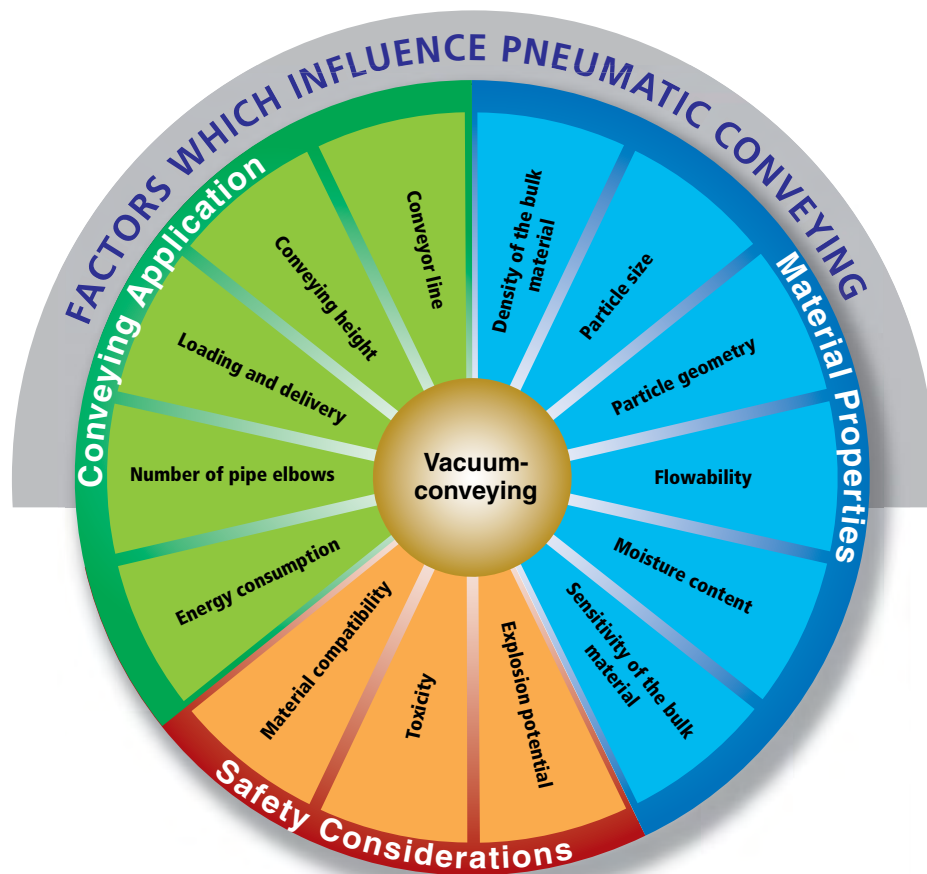
Together with our clients, we work out the demands of the project. We employ highly trained professionals, who are very familiar with the use of conveyor technology, the handling of bulks and the need to guard against explosions, hygiene and automation.

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

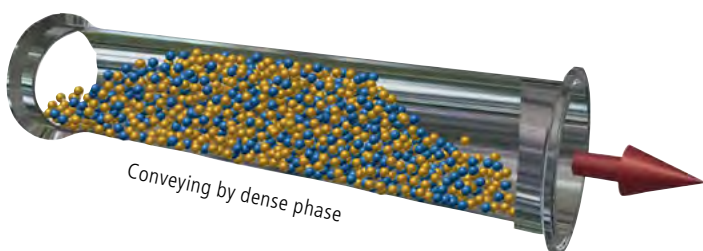
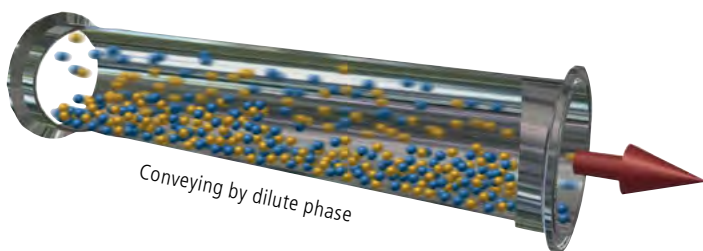
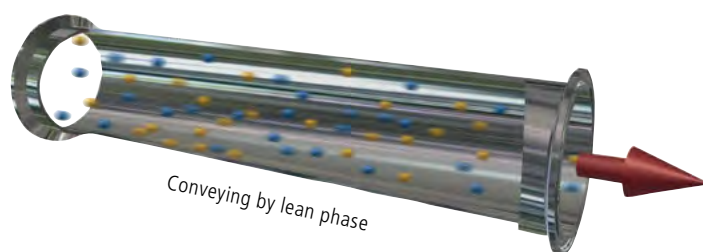
In conveying by lean phase, the speed of suction air w is much higher than the saltation velocity v_s of the individual product particles. It is approximately 3,540 - 6,900 ft/min. The material load on the suction air is quite low. Depending on the characteristic curve of the vacuum generator that is 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 m = 350 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

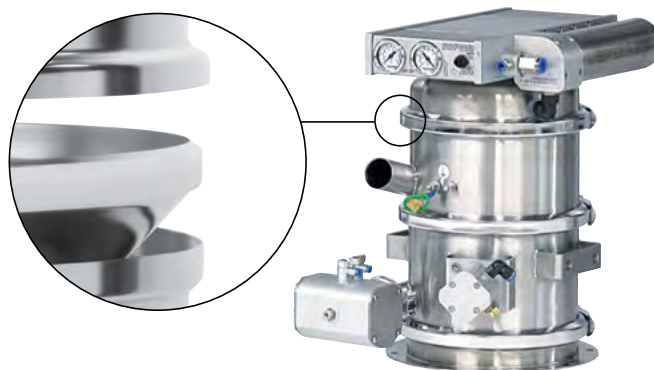
- over 50 MULTIJECTOR® types for vacuum conveyors
- multi ejectors made entirely of stainless steel (CIP compatible)
- electric vacuum pumps (please ask)

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.

> Tool free assembly/disassembly of the butterfly discharge flap.



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/liquids 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).



Systems for handling bulk material

> 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.

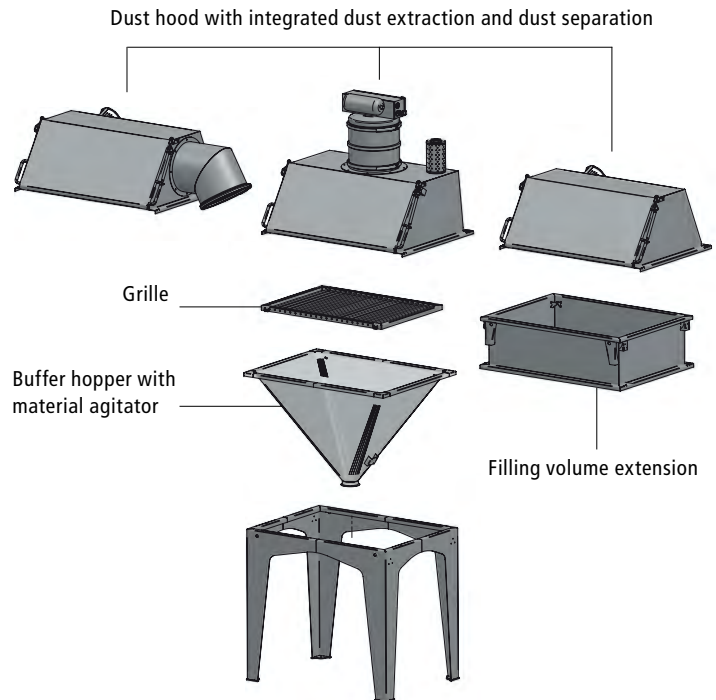
- for bulk bags with a weight up to 2,000 lbs
- fork lift truck loading or using built in hoist
- dust-free docking
- dust collection when exchanging the empty bulk bag
- optional lump breaker
- combined systems are available incl. sack feed
- discharge flow aids

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

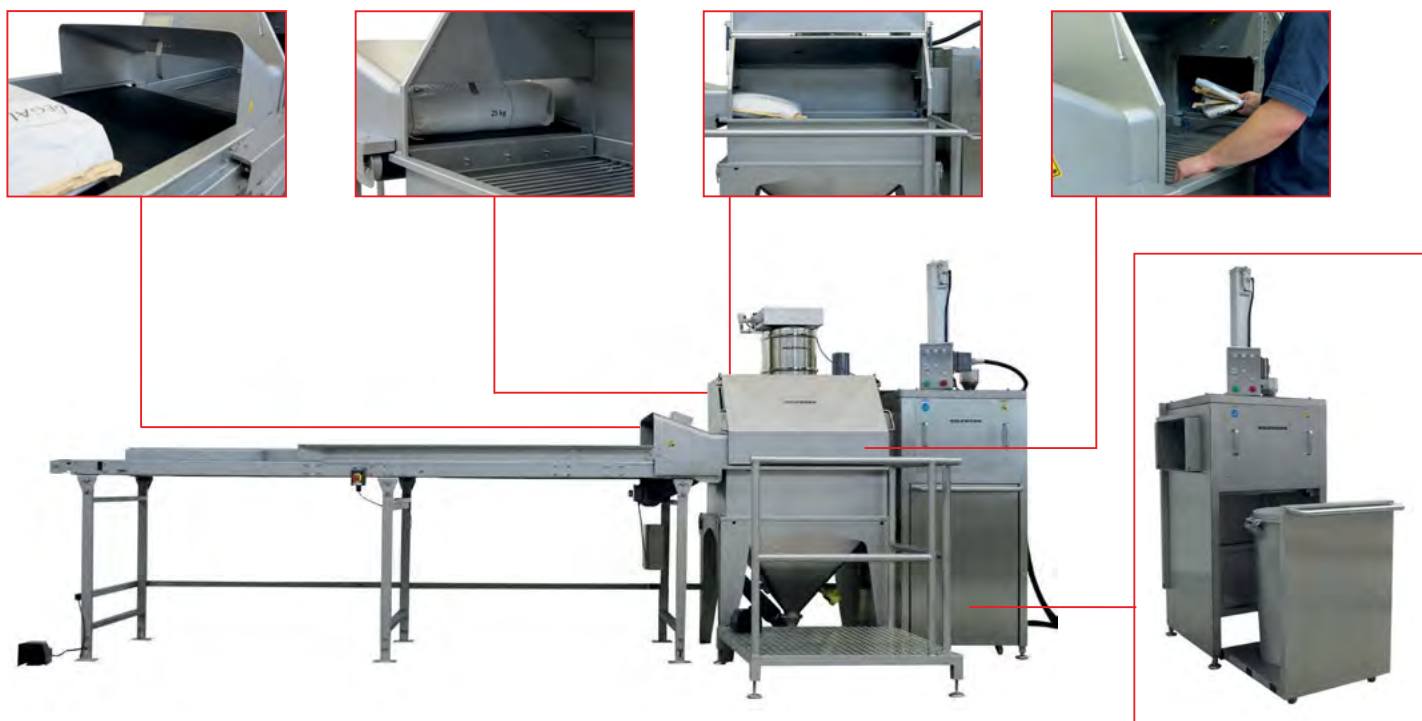


Discharge station connected to the clients' process.



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

➤ 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

> Powder locks, double flap locks, pressure resistant and shock resistant vacuum conveyors



Double flap locks

Powder locks and/or double flap locks ensure that when filling containers, there is no direct contact between the container interiors of the unit to be charged and the surrounding environment. They also prevent hazardous substances from escaping.

VOLKMANN powder locks can be easily inerted so that no unwanted atmosphere (oxygen) passes from the lock into the receiving vessel. Through the lock, it is also possible to avoid carrying unwanted receiving vessel gases back through to the conveying process.

The special feature of VOLKMANN powder locks is the ability for it to couple directly to a standard conveyor.



Pressure resistant and shock resistant vacuum conveyors

If bulk material needs to be delivered directly into reactors and stirred tanks (which may be under pressure) the separating container of the conveyor should be designed as a pressure vessel (permissible pressure range -1 to +6 bar or -1 to +10 bar, various embodiments are available in accordance with the Pressure Equipment Directive). Similarly, specific safety requirements on the part of the client, or the concept for protecting against an explosion (as selected by the operator) may make the pressure-resistant and/or shock resistant construction of the vacuum conveyor system mandatory.

Pressure-resistant vacuum conveyors from VOLKMANN will comply with customized, safety requirements in every respect. They provide safety when handling bulk material.

> Coatings



PPC containers which have a bonded ETFE coated liner , are exceptionally resistant to chemicals and are FDA approved.

Coatings

Cream fat powder with 70% fat, baked iron oxide, moist activated carbon coke - there are numerous examples of adherent and adhesive powder and bulk solids. A wide variety of conveyor coatings are used in order to transport these in a stable and secure way. For a clean separation (to avoid cross-contamination) and low residue, it is possible to change both the conveying method and liner materials.

For example, special coatings (e.g. Halar®) are used in corrosive environments. An inner coating protects the vacuum conveyor when corrosive powders are transported. If the atmosphere outside is also corrosive, the conveyor is also coated on the outside. Even the vacuum generator is available in an acid-resistant material.

In certain industries, certain material specifications have to be adhered to (even in non product contact parts). At VOLKMANN, our in house production ensures alternative materials can also be supplied (e.g. equipment that is completely copper-free).



PPC container with an outer coating.

Systems for handling bulk material

> Conweigh weighing and dosage systems, dosing powder locks



Weighing and dosing systems

VOLKMANN weighing and dosing conveyor systems are set up on the basis of the VS and PPC vacuum conveyors (with all their possibilities) and work gravimetrically. Special designs ensure the vacuum conveyor is isolated from external forces. Weighing occurs throughout the entire conveying cycle to accurately establish the precise weight of the material in the separator.

The target amount of material to be conveyed can be entered into the control unit via a touch screen display. Product collection is also possible from various discharge stations and this can be integrated into the control unit. In addition, 'recipes' can be created automatically with CONWEIGH.

The combined transfer-dosing system can be typically used with batch weights of over 4 lbs wherein materials (as is usual with vacuum conveyors) are delivered intermittently. The maximum quantity depends on the conveying capacity of the system. In the case of CONWEIGH, this is up to 4 t/hr. Depending on the design of the system, it can achieve an accuracy of 99 to 99.7% of the displayed value.

The design allows for simply and quick disassembly and cleaning of the VS and PPC conveyors. Alternative dosing systems, e.g. differential dosing scales and other continuous dosing systems are also available in a package (when ordering a complete solution).



PPC 350VS with rotary valve dosing active substances.

Rotary feeders

VOLKMANN dosing feeders are characterized by their hygienic design, the fact they are easy to disassemble and clean, as well as their safety when operated. They are designed and manufactured by VOLKMANN.

- available in a 4 and 6 inch connection diameter
- various rotors are available
- optional bearing clearance purging by air
- the drive can easily be removed for cleaning/servicing
- product product contact parts in AISI 316L stainless steel
- ATEX approved design max. zone within the valve 20 or 2; outside of the valve 21 or 1)
- type approval certificate number BVS 08 ATEX H 006 X
- II 3/2G c T3; II 1/2D c 135°C
- individual tailoring is possible, e.g. clamp connections,
- special flange, rotor variants, special materials



Systems for handling bulk material

> Tablet conveyor



Loading a tablet packaging machine.



Product collection with a lance.



Film-coated tablets, coated and uncoated tablets, pills, capsules, oblongs (some of which feature a breaking notch).

Tablet conveyor

Whenever tablets have to be moved, other operational aspects have to be considered. Frequently, faults that may not be visible to the naked eye such as mechanical damage, broken edges, scratches, abrasions, discoloration (gray streaks), etc. to the tablet should be avoided. Tablet conveyors from VOLKMANN offer damage free transportation for a variety of sensitive tablets. They collect the tablets, e.g. from transport containers or directly from the tablet press and load dust-free containers, bottling or packaging systems. They are easy to install and offer reliable feeding, even with low ceiling heights.

VOLKMANN tablet conveyors have wear-free contact surfaces (either made from stainless steel, glass or special FDA-approved shock-absorbing coatings). Special gap-free and shock-minimizing hose systems act as transport lines. Tablets find their way into the separator via an inlet speed reducer and collect in the conveyor body. The suction air is directed to a second stage dust collection module and dust is held here-without being returned to the tablets. The vacuum pump switches off once the primary separator is full. The tablets are discharged directly into a blister packaging machine and/or into an intermediary buffer hopper.

The design of the tablet conveyor is determined by the application, the required conveying capacity and, above all, the tablet itself which is to be conveyed and the type of product feed/delivery. Clients do not only receive individually adapted conveyor systems from us, but also complete system solutions, e.g. for conveying and dosing their raw materials. Why not get in touch with us and take advantage of our many years of experience in the business of handling bulk materials for chemical, food and pharmaceutical industries.

Transparent vacuum conveyor system with a glass container.



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



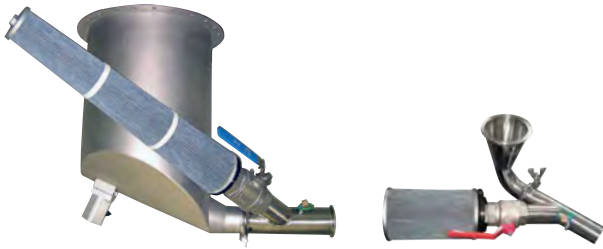
Mobile trolley – height adjustable by pneumatic drive



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®



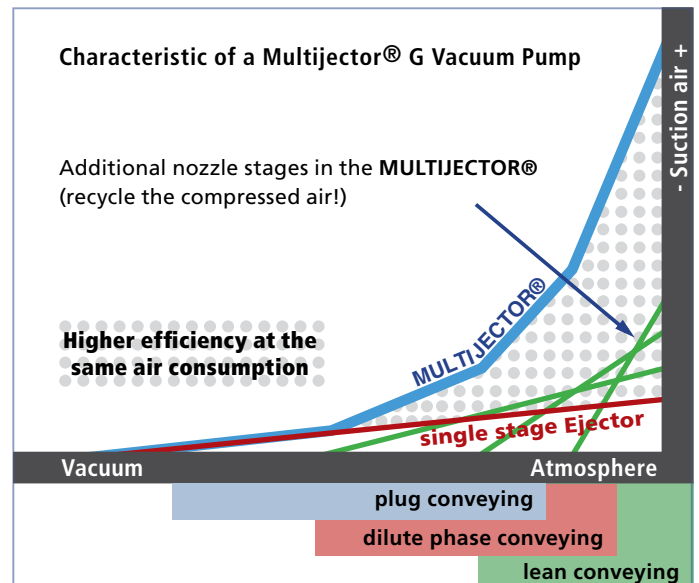
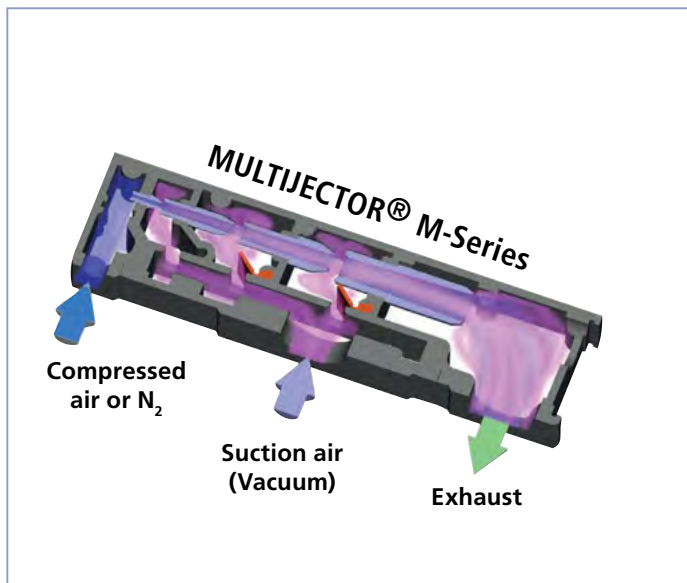
VOLKMANN MULTIJECTOR® Vakuum pumps

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		

Inquiry Form

Please fill in the information available and send it to your contact or

Email: sales@VolkmannUSA.com or Fax it to 609-265-0110



1. Customer information

Company: _____ Contact person: _____ Email: _____ Department: _____
Phone: _____ Address: _____ Country/ZIP Code/Place: _____ Fax: _____

2. Conveying task

Conveying height ↑ : _____ ft Total Conveying Distance ↗ : _____ ft

No. of Bends: _____ x 90° Desired transporting capacity: _____ lbs/h

Product charging location: _____

(e.g. suction from hoppers, bins, sack unloading stations (rip & tip), bulk bags, big bags, dryers, mixers, sieves, etc.)

Product discharging location: _____

(e.g. tablet press, blender, filling machine, IBC, drums, reactor, buffer hopper, container etc.)

Additional Information:

(Please give more precise statements about conditions such as pressures, temperatures, ascending steams, solvents etc. if applicable.) _____

2.1. Ex-zones according to 2014/34/EU (ATEX) directive

Will the unit be used in EX-Area? ☐ No, please continue with 2.2 ☐ Yes, please specify: _____
Suction location: Class level _____ Installation location: Class level _____ Charging into location: Class level _____

2.2. Is the material combustible or potential for a dust explosive?

☐ No ☐ Yes, the Minimum Ignition Energy (MIE) is _____ Millijoule (mJ)

3. Material definition of the product to be conveyed

Trade name: _____ Chemical designation: _____ Manufacturer: _____

Particle size min. _____ max. _____ (please state in µm ☐ or inches ☐):

Bulk density: _____ lbs/ft³ Density (basic materials): _____ lbs/ft³ Max. humidity content: _____ %

Particle description: _____ Particle geometry: _____

Flowing characteristics (estimation):

☐ good flowing ☐ sticky ☐ bridging

Is the material hygroscopic (does it absorb humidity)?

☐ no ☐ yes

Is the material scouring/wearing?

☐ no ☐ yes

Is the material sensitive to mechanical loads?

☐ no ☐ yes

4. Material requirements of the Conveying System

Which of these materials are **NOT** allowed to be used for product contacting parts of the conveying System?

☐ Stainless Steel AISI 316 L/1.4435-1.4404 ☐ Nickel-plated brass (MSV) ☐ Nitrile (NBR)
☐ Silicone (VMQ) ☐ Ethylene-Propylene-Dien-Rubber (EPDM)
☐ Polyethylene (PEHD) ☐ Polyurethane (PUR)
☐ Others: _____

Which materials are **NOT** allowed to be used **outside** the product contacting area of the Conveyor?

Do you have special wishes which materials should be used for the product contacting area of the Conveyor?

☐ no ☐ yes:

Separator Container: _____ Gaskets: _____ Others: _____

Are any special certificates necessary for the product contacting parts? ☐ no ☐ yes: _____

Operative area of the unit (eventually tendency): ☐ Chemical ☐ Pharmaceutical ☐ Food ☐ Industry ☐ Others: _____

5. Information with regard to health risks, industrial safety and environmental protection (Please enclose MSDS)

Is the material poisonous/toxic? ☐ no ☐ yes

Is the material corrosive/caustic? ☐ no ☐ yes

Does skin contact has to be avoided? ☐ no ☐ yes

Does the material cause allergic reactions? ☐ no ☐ yes

Is the material harmful to the environment? ☐ no ☐ yes

Is the material hazardous for water? ☐ no ☐ yes

6. Additional Comments

Important: If you send any sample material for testing, we need up front the health & safety data sheet (MSDS) and -if ok- following the material packed in a reusable packaging with return note. All samples, containers etc. will be sent back to the sender after the trials. The freight charges will be invoiced to the sender. For Big-Bag unloading trials please add one empty Big-Bag.

This inquiry form was filled-in on _____ by _____

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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