Material Conveying Vacuum Pumps

DF Series

The DF Series of high flow material conveying vacuum pumps provide a simple, reliable and cost effective method of in-line transfer of bulk materials, complex shapes, individual objects, selvedge.

The DF pump's unique capability to create instantaneous vacuum flow and high air velocity, combined with its straight-through, smooth bore design allows material to pass directly through the pump at high speeds without interference or clogging.

Simply regulate the input pressure to adjust and control the transfer speed. For maximum efficiency, the compact design allows close placement to the work area.

DF Series material conveying pumps are made of anodized aluminum and available in 17 standard models with inside diameters from 1/8" [6mm] to 4" [100mm].

Features/Benefits

- **Application versatility**
- **Efficient – instant on and off, low operating costs**
- **Fast response – installs close to vacuum point**
- **Easy to install – simply connect tubing to the vacuum and exhaust ports, and supply compressed air**
- **Safe operation – no electricity needed at the pump**
- **Reliable – trouble-free operation:**
  - **~ Straight-through design, non-clogging**
  - **~ No moving parts to wear or clog**
  - **~ No flap valves to stick open**
  - **~ No maintenance**
  - **~ No downtime**

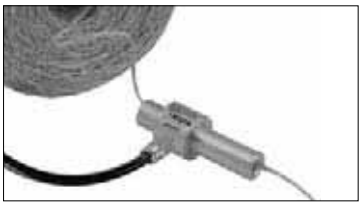
Pump Options:

- Internal and external threaded exhaust and/or vacuum ports
- G port threads for metric machines – an "I" prefix designates products with metric threads
- Teflon™ or hardcoat anodizing
- For chemical compatibility, heat and environmental requirements, food and medical applications, custom materials, special coatings and modified threads are available.

Applications:

Bulk Materials:
- Granulated Plastics
- Seasonings
- Dry Powders
- Ball Bearings
- Paper Strips
- Wood Chips
- Molded Items
- Game Pieces
- Food Products
- Pharmaceutical Products
- Chip Removal in Machining Operations
- Caustic or Hazardous Materials

Individual Objects:
- Pens And Pen Caps
- Bottle Caps
- Pills, Tablets
- Electronic Components
- Springs
- Packaged Products
- Spark Plugs
- Needles
- Screwdrivers
- Bearings
- Engine Valves
- Golf Balls



Trim, Selvedge and Fiber Collection:
- Transfer Selvedge from Trimming Operations
- Wind, Unwind, Manage Continuous Strips
- Waste Removal for Manual and Automatic Operations
- Drying
- Assists Central Collection Systems

Vaccon Fun Fact: **Our first product developed was a vacuum conveying product, thus our name *VAC*uum *CON*veying**

Eliminate the Guesswork: Contact Us!

Vacuum technology isn't an exact science. To ensure proper product selection, Vaccon offers free application engineering assistance, a 30 Day Test & Evaluation Program or you can send sample products to our in-house test facility and we will test and size a pump for you.

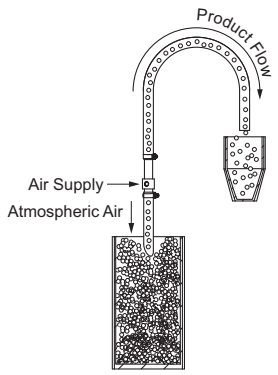
To download a complete set of drawings in 13 different CAD formats, please visit our website at **www.vaccon.com**

For more information or technical assistance, please call **508-359-7200** or **800-848-8788** or email **engineering@vaccon.com**

General Application Information

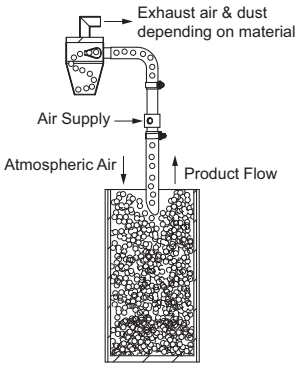
Sizing the correct DF material transfer pump is based on the material density, particle size, transfer rate required (kg/min), elevation and length of transfer line. For application assistance, please contact Vaccon Technical Support. In many cases, customers send product to Vaccon to test at our in-house test facility. Ask about our 30-Day Test & Evaluation policy.

Transfering Bulk Materials:



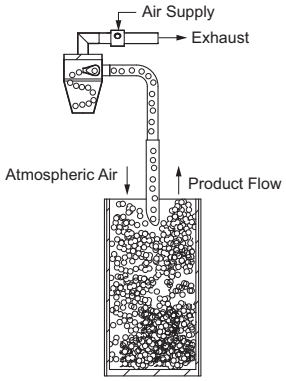
Basic Hopper

Place pump about 1/3 the overall distance from the suction. Allow the compressed air powering the pump to assist in pushing the material to the collection hopper.



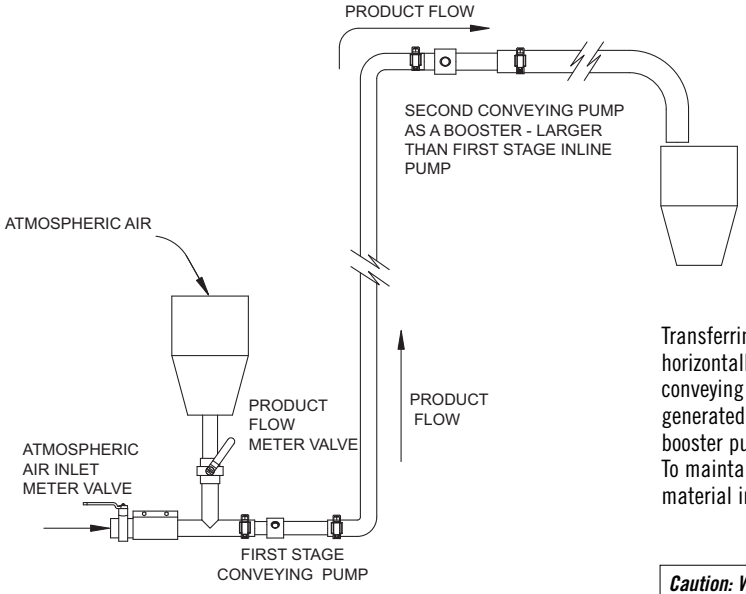
Hopper Inlet

Induced atmospheric air, compressed air and the material being transferred enter the collection hopper, where the material falls by gravity. The air vents out the top of the hopper. To capture lighter-than-air materials, connect a filter or dust collector to the hopper outlet.



Hopper Outlet

The DF pump creates a vacuum in the collection hopper causing the material to flow up the conveyor tube into the collection hopper. Compressed air doesn't mix with the material, helping to prevent a cloud from forming when transferring fine, light powders. Material entering the hopper falls to the bottom faster due to the vacuum in the collection hopper. To reduce noise, add an optional silencer to the DF pump exhaust.

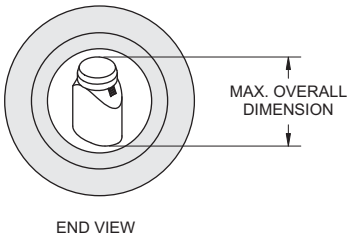


Hopper to Hopper Butterfly Extended Distance

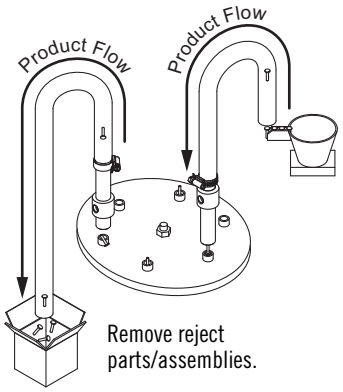
Transferring bulk and individual items vertically and horizontally over long distances may require a second conveying pump as a booster pump. To accept the flow generated by the first pump and to add power, add a booster pump that is larger than the first-stage pump. To maintain the proper balance between air intake and material intake use a valve to meter both.

Caution: When conveying materials through plastic transfer lines, you must ground the transfer line to dissipate the static charge that develops from the friction of the air and material flowing over the transfer line surface.

Transferring Complex Shapes & Individual Objects:

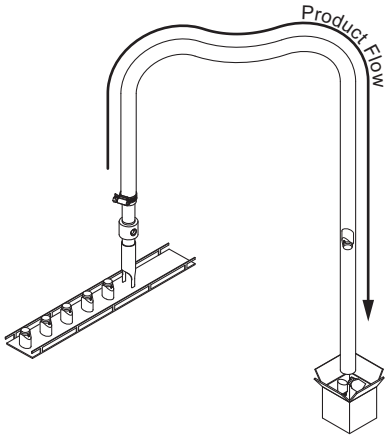


To size a DF pump for transferring individual items, choose the pump with an inside diameter just slightly larger than the largest dimension of the object.

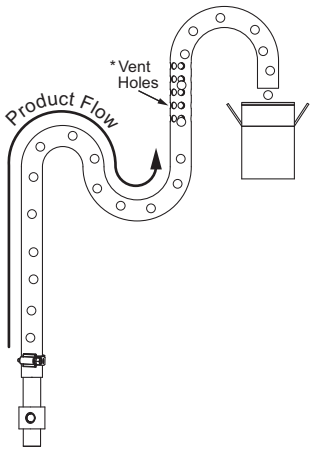


Load parts for assembly from a vibratory bowl feeder.

Remove reject parts/assemblies.



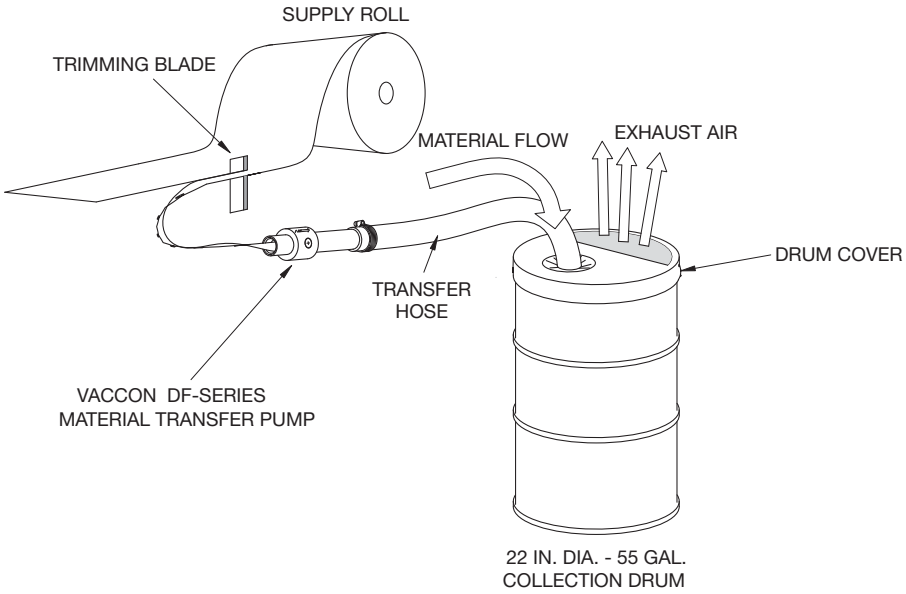
Remove non-conforming parts from conveyor line.



Design Tip: To prevent damage or to match the assembly speed, decrease the transfer speed by introducing a vertical bend into the tube, allowing gravity to work against the direction of travel.

* To reduce transfer speed further, add holes in the tube to allow the air to vent.

Trim, Selvedge and Fiber Collection:

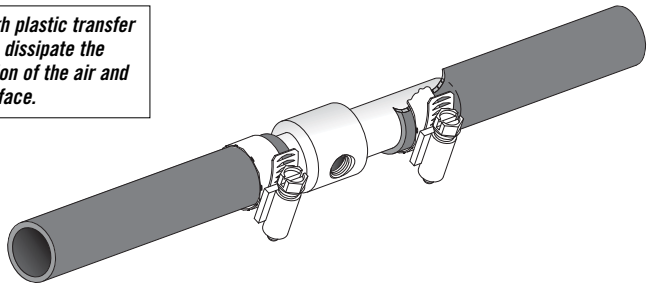


Installation Options:

For simple applications, place the DF pump in the transfer line, slip the transfer hose over the outside diameter of the pump and secured in place with a hose clamp.

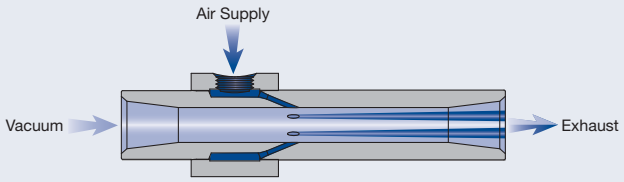
When this type of installation is not desired or appropriate for the application, Vaccon offers the option of adding threads to the O.D. and the I.D. Please see page 231 for optional vacuum & exhaust port threads.

Caution: When conveying materials through plastic transfer lines, you must ground the transfer line to dissipate the static charge that develops from the friction of the air and material flowing over the transfer line surface.



Principles of Operation:

Compressed air is fed into an exterior annular ring that has a number of orifices leading into the main tube of a transducer. As the compressed air exits from the orifices, its velocity increases to supersonic speed. The air forced into the center of the tube rotates with a twisting motion similar to a worm screw. This cyclonic flow creates a powerful vacuum capable of drawing materials into and through the transducer. As a vacuum source, the DF Series are capable of rapid evacuation of a large volume of air to a low vacuum level.

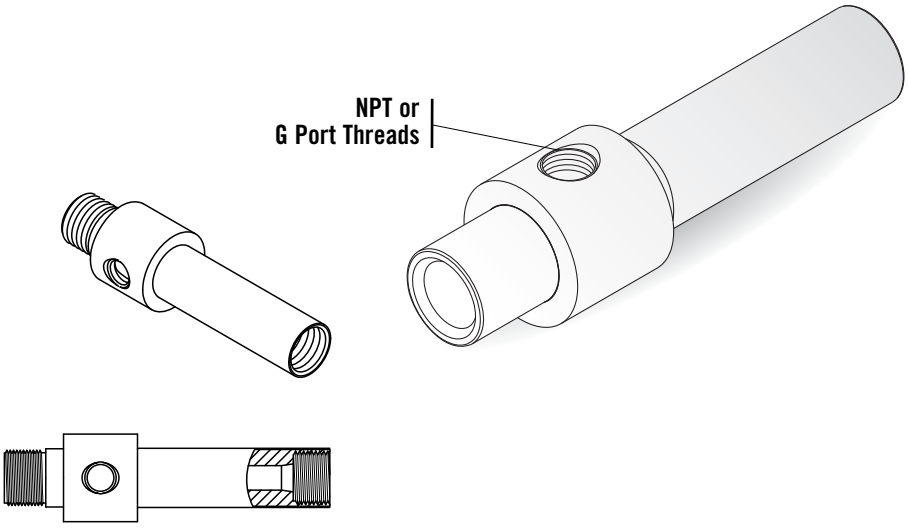


DF Series Material Conveying Pumps Standard Specifications:

Body Material:	Anodized Aluminum
Medium:	Filtered (50 Micron) unlubricated, non-corrosive, dry gases
Operating Temperature:	-100°~ 400° F [-73°~204°C]
Operating Pressure:	Input pressure of 40 PSI or less is sufficient to move most bulk materials and individual objects
Supply Pressure:	Regulate the supply pressure to develop the necessary transfer speed for your application

DF Series Configurations and Options:

All Vaccon pumps offer a variety of options and accessories to meet your specific requirements. Please configure your pump from the options listed below.



Optional Threaded Ports:
Optional internal or external threaded vacuum and/or exhaust ports.

On-line Configurator and CAD Drawings @ www.vaccon.com

New powerful design tool saves you time by configuring the pump you need on-line. When complete, simply download the CAD drawing in any one of 13 different CAD formats and insert it right into your design.

Get the pump you need, in the format you like!

How to Specify:

DF 5-6 - TV50/TE50 - 304

Standard (Non-Threaded) DF Series				Optional Threaded Ends			
		Recommended					
P/N NPT	P/N G Port	Air Supply Line	Transfer Hose	Internal Vacuum Port	Internal Exhaust Port	External Vacuum Port	External Exhaust Port
DF 1-3	I-DF 1-3	1/4	3/4" I.D.	TV-25	TE-25	MTV-38	MTE-38
DF 2-3	I-DF 2-3	1/4	3/4" I.D.	TV-25	TE-25	MTV-38	MTE-38
DF 3-3	I-DF 3-3	1/4	3/4" I.D.	TV-25	TE-25	MTV-38	MTE-38
DF 3-6	I-DF 3-6	3/8	3/4" I.D.	TV-25	TE-25	MTV-38	MTE-38
DF 5-3	I-DF 5-3	3/8	1" I.D.	TV-50	TE-50	MTV-50	MTE-50
DF 5-6	I-DF 5-6	3/8	1" I.D.	TV-50	TE-50	MTV-50	MTE-50
DF 7-3	I-DF 7-3	1/2	1 1/4" I.D.	TV-75	TE-75	MTV-100	MTE-100
DF 7-6	I-DF 7-6	1/2	1 1/4" I.D.	TV-75	TE-75	MTV-100	MTE-100
DF 10-3	I-DF 10-3	1/2	1 1/2" I.D.	TV-100	TE-100	MTV-100	MTE-100
DF 10-6	I-DF 10-6	1/2	1 1/2" I.D.	TV-100	TE-100	MTV-100	MTE-100
DF 12-3	I-DF 12-3	1/2	1 3/4" I.D.	N/A	N/A	N/A	N/A
DF 12-6	I-DF 12-6	1/2	1 3/4" I.D.	N/A	N/A	N/A	N/A
DF 15-3	I-DF 15-3	1/2	2" I.D.	TV-125	TE-125	MTV-125	MTE-125
DF 15-6	I-DF 15-6	1/2	2" I.D.	TV-125	TE-125	MTV-125	MTE-125
DF 20-3	I-DF 20-3	1/2	2 1/2" I.D.	TV-200	TE-200	MTV-200	MTE-200
DF 20-6	I-DF 20-6	1/2	2 1/2" I.D.	TV-200	TE-200	MTV-200	MTE-200
DF 30-6	I-DF 30-6	3/4	3 1/2" I.D.	N/A	N/A	N/A	N/A
DF 40-12	I-DF 40-12	3/4	5" I.D.	N/A	N/A	N/A	N/A

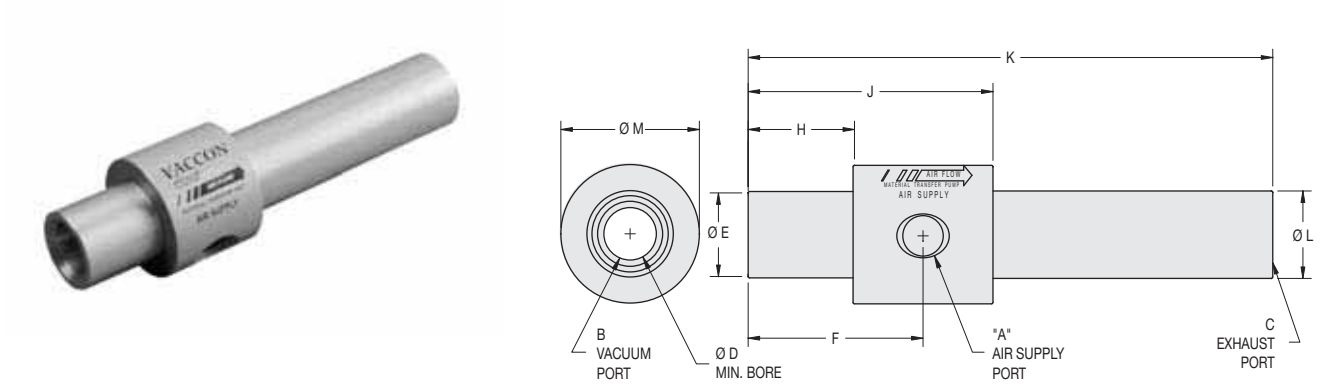
P/N	Material
	Anodized Aluminum
303*	Stainless Steel
304	Stainless Steel
316	Stainless Steel
316L	Low Carbon Stainless
PVC	PVC
PEEK	PEEK
TEF	Teflon®
DEL	Delrin®

*303 Stainless Steel only available for DF 1-3, 2-3, 3-3, and 3-6. Not available in larger size pumps.

For complete Performance Data, see page 227.

Please note: Male and female threads can be ordered on different ends of the same pump. i.e. DF 5-6-TV50/MTE50
Please note: Custom materials are not stock items. Consult factory for availablity.
Please note: Special anodizing available. i.e. Teflon™ hardcoat, hard anodize, etc. Consult factory.

Standard Material Conveying Pump: DF Series (DF 7-6 shown is representative sample of all DF's)



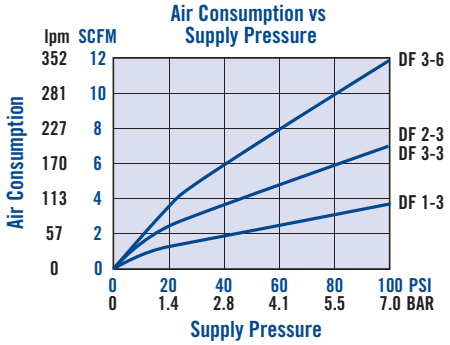
Model #	DF Series – Imperial Dimensions (in.)													
	A	B Optional Male Vacuum Thread	C Optional Male Exhaust Thread	B Optional Female Vacuum Thread	C Optional Female Exhaust Thread	D Minimum Bore	E	F	H	J	K	L	M	Weight
DF 1-3	1/8 NPT F	3/8" NPT	3/8" NPT	1/4" NPT	1/4" NPT	0.15	0.73	1.25	0.75	1.75	3.50	0.74	1.24	3.4 oz
DF 2-3	1/8 NPT F	3/8" NPT	3/8" NPT	1/4" NPT	1/4" NPT	0.25	0.73	1.25	0.75	1.75	3.50	0.74	1.24	3.2 oz
DF 3-3, 6	1/8 NPT F	3/8" NPT	3/8" NPT	1/4" NPT	1/4" NPT	0.38	0.73	1.25	0.75	1.75	3.50	0.74	1.24	2.8 oz
DF 5-3, 6	1/4 NPT F	1/2" NPT	1/2" NPT	1/2" NPT	1/2" NPT	0.50	0.99	1.62	1.00	2.25	5.50	1.00	1.48	6.2 oz
DF 7-3, 6	3/8 NPT F	1" NPT	1" NPT	3/4" NPT	3/4" NPT	0.75	1.24	2.50	1.50	3.50	7.50	1.25	1.98	13.4 oz
DF 10-3, 6	3/8 NPT F	1" NPT	1" NPT	1" NPT	1" NPT	1.00	1.46	2.50	1.50	3.50	7.50	1.48	2.23	1 lb 5 oz
DF 12-3, 6	3/8 NPT F	*	*	*	*	1.25	1.71	2.50	1.50	3.50	7.50	1.73	2.47	1 lb 3 oz
DF 15-3, 6	3/8 NPT F	1 1/4" NPT	1 1/4" NPT	1 1/4" NPT	1 1/4" NPT	1.50	1.96	2.50	1.50	3.50	7.50	1.98	2.73	1 lb 5 oz
DF 20-3, 6	3/8 NPT F	2" NPT	2" NPT	2" NPT	2" NPT	2.00	2.46	2.50	1.50	3.50	7.50	2.48	3.23	1 lb 9 oz
DF 30-6	1/2 NPT F	N/A	N/A	N/A	N/A	3.00	3.46	2.50	1.50	3.50	8.50	3.48	4.47	3 lbs 6 oz
DF 40-12	3/4 NPT F	N/A	N/A	N/A	N/A	4.00	4.89	3.25	2.00	4.50	9.50	4.95	5.58	6 lbs 11 oz

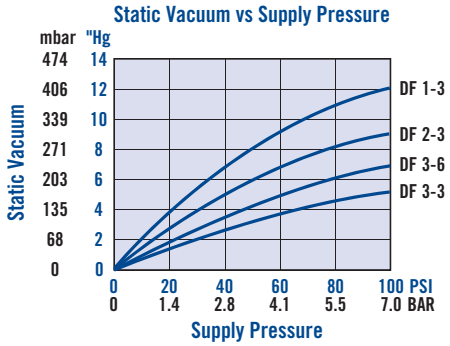
Model #	DF Series – Metric Dimensions (mm.)													
	A	B Optional Male Vacuum Thread	C Optional Male Exhaust Thread	B Optional Female Vacuum Thread	C Optional Female Exhaust Thread	D Minimum Bore	E	F	H	J	K	L	M	Weight
I-DF 1-3	G 1/8	G 3/8	G 3/8	G 1/4	G 1/4	3.8	18.4	31.8	19.1	44.5	88.9	18.8	31.5	96g
I-DF 2-3	G 1/8	G 3/8	G 3/8	G 1/4	G 1/4	6.4	18.4	31.8	19.1	44.5	88.9	18.8	31.5	91g
I-DF 3-3, 6	G 1/8	G 3/8	G 3/8	G 1/4	G 1/4	9.7	18.4	31.8	19.1	44.5	88.9	18.8	31.5	79g
I-DF 5-3, 6	G 1/4	G 1/2	G 1/2	G 1/2	G 1/2	12.7	25.0	41.1	25.4	57.2	139.7	25.4	37.6	176g
I-DF 7-3, 6	G 3/8	G 1	G 1	G 3/4	G 3/4	19.1	31.4	63.5	38.1	88.9	190.5	31.8	50.3	380g
I-DF 10-3, 6	G 3/8	G 1	G 1	G 1	G 1	25.4	37.1	63.5	38.1	88.9	190.5	37.6	56.6	468g
I-DF 12-3, 6	G 3/8	*	*	*	*	31.8	43.4	63.5	38.1	88.9	190.5	43.9	62.7	541g
I-DF 15-3, 6	G 3/8	G 1 1/4	G 1 1/4	G 1 1/4	G 1 1/4	38.1	49.8	63.5	38.1	88.9	190.5	50.3	69.3	607g
I-DF 20-3, 6	G 3/8	G 2	G 2	G 2	G 2	50.8	62.5	63.5	38.1	88.9	190.5	63.0	82.0	777g
I-DF 30-6	G 1/2	N/A	N/A	N/A	N/A	76.2	87.9	63.5	38.1	88.9	215.9	88.4	113.5	1.4kgs
I-DF 40-12	G 3/4	N/A	N/A	N/A	N/A	101.6	124.2	82.6	50.8	114.3	241.3	125.7	148.6	3kgs

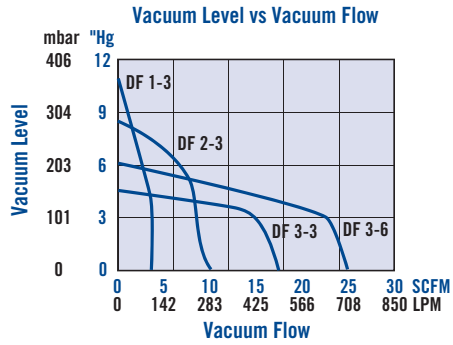
*__Note:__ Consult Factory.

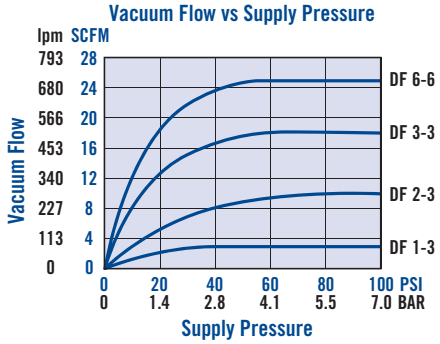
DF Material Conveying Pumps – Performance Graphs

DF 1-3, DF 2-3, DF 3-3, DF 3-6

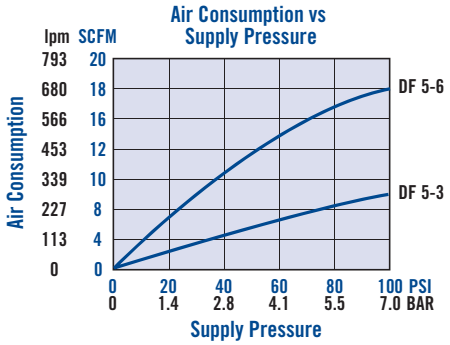


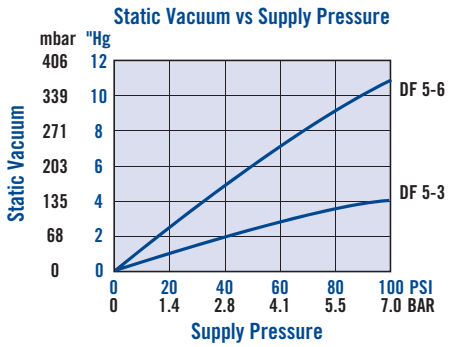


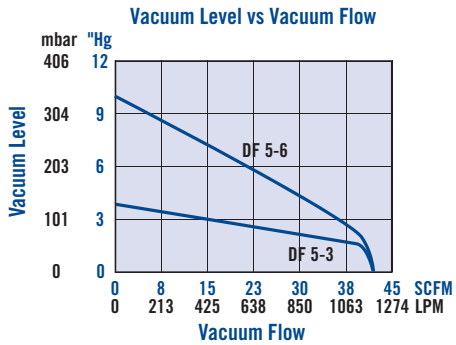


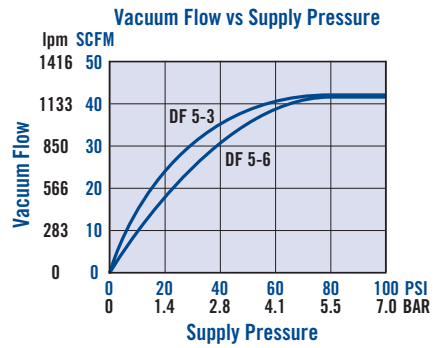


DF 5-3, DF 5-6



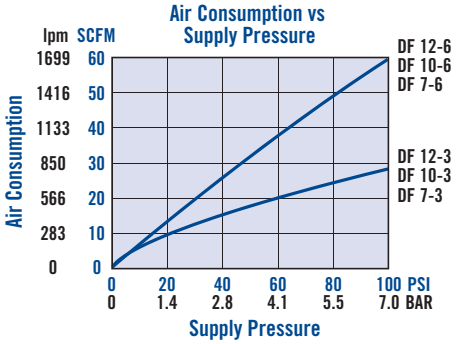


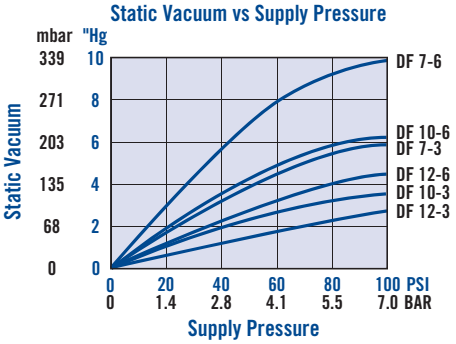


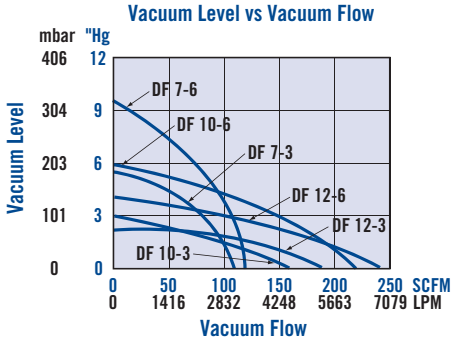


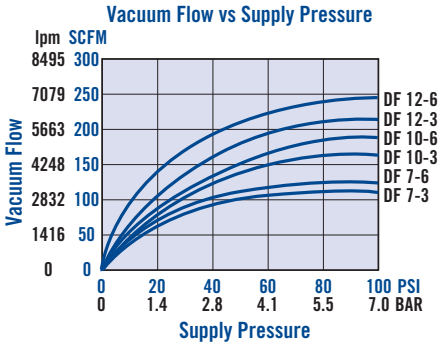
Operating Note: Above 40 PSI, the increased energy consumed through rising air consumption is converted into increased vacuum level while vacuum flow stays constant. It is the vacuum flow that provides the motive force for the materials to be transferred. Higher vacuum levels are useful when lifting high molecular weight bulk materials and heavy individual objects long distances vertically.

DF 7-3, DF 7-6, DF 10-3, DF 10-6, DF 12-3, DF 12-6

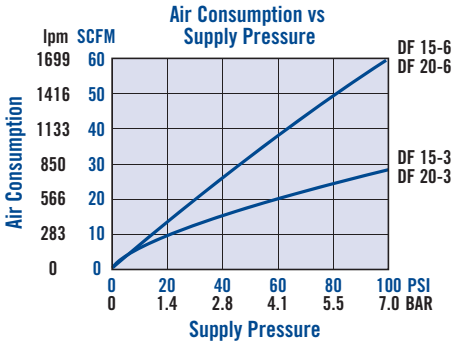


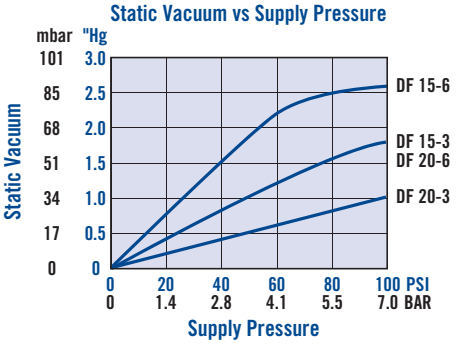


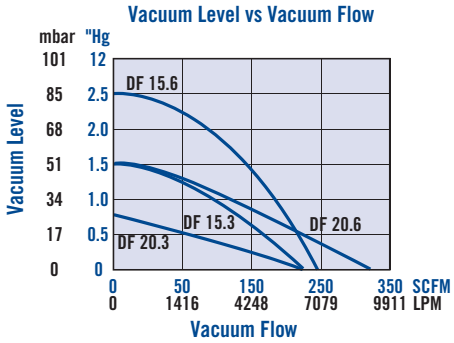


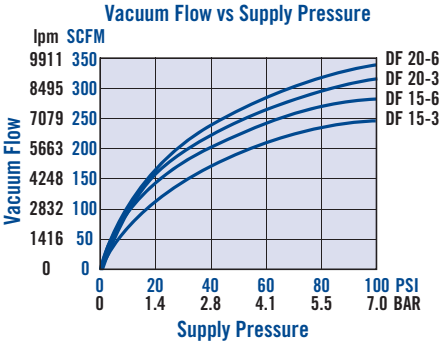


DF 15-3, DF 15-6, DF 20-3, DF 20-6



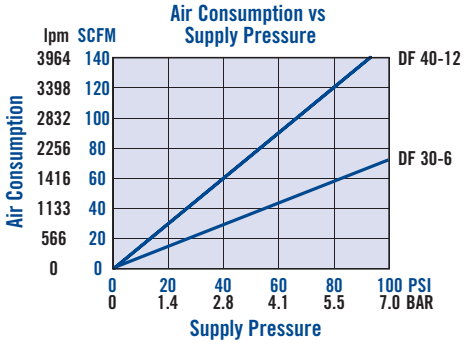


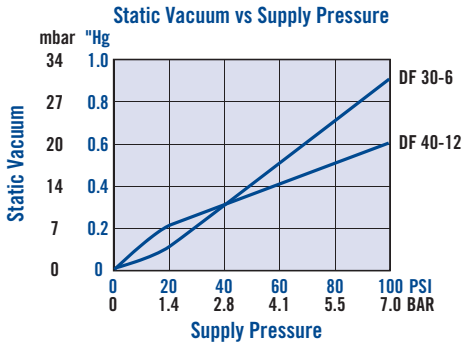


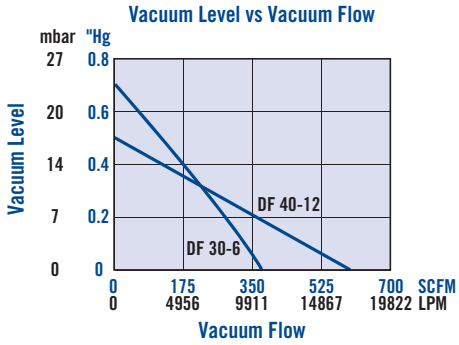


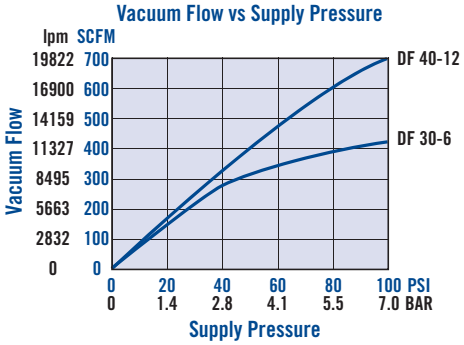
Operating Note: Above 40 PSI, the increased energy consumed through rising air consumption is converted into increased vacuum level while vacuum flow stays constant. It is the vacuum flow that provides the motive force for the materials to be transferred. Higher vacuum levels are useful when lifting high molecular weight bulk materials and heavy individual objects long distances vertically.

DF 30-6, DF 40-12









Operating Note: Above 40 PSI, the increased energy consumed through rising air consumption is converted into increased vacuum level while vacuum flow stays constant. It is the vacuum flow that provides the motive force for the materials to be transferred. Higher vacuum levels are useful when lifting high molecular weight bulk materials and heavy individual objects long distances vertically.

Custom Material Conveying Pumps – DF Series

Ideal for OEM engineers and designers

Creative Engineering • Precision Manufacturing • Extensive Application Experience

When off the shelf doesn't work, Vaccon's engineering expertise and manufacturing capabilities can provide custom solutions to your specifications.

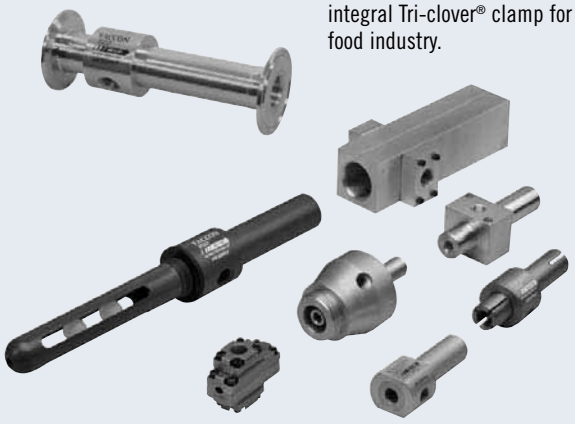
Whether it's as simple as modifying a standard product, or more complex requiring new products with specific features, or special materials, Vaccon has the solution.

Vaccon customizes more DF pumps than any other product line.

Custom Materials:

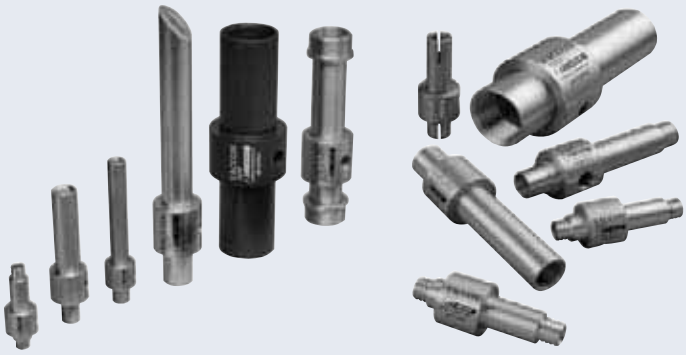
When transferring highly abrasive, caustic or food grade materials, Vaccon offers the DF Series material conveying pumps in several grades of stainless steel – 303, 304, 316, 316L, Delrin®, Teflon®, PVC, PEEK, as well as hardcoat and Teflon® coated anodizing.

Custom Shapes and Sizes:



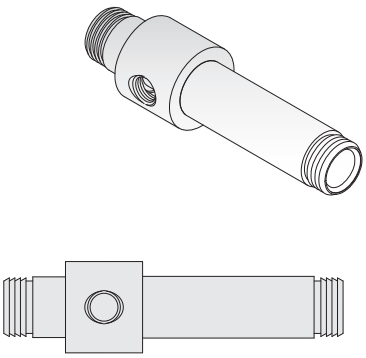
Custom stainless steel DF with integral Tri-clover® clamp for food industry.

Custom End Configurations/Connections:

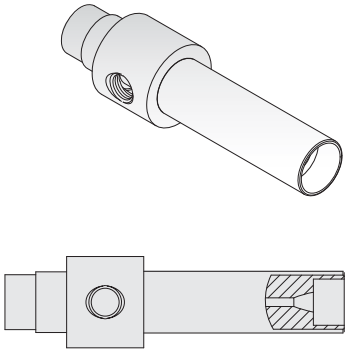


When size, shape, material and performance matter, it's Vaccon Vacuum Pumps.

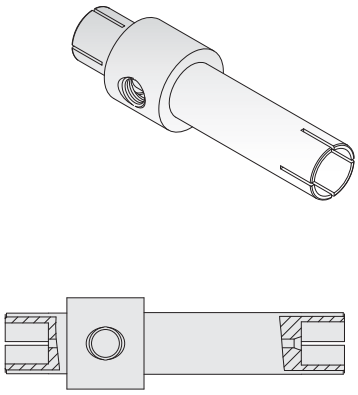
DF Custom End Connections



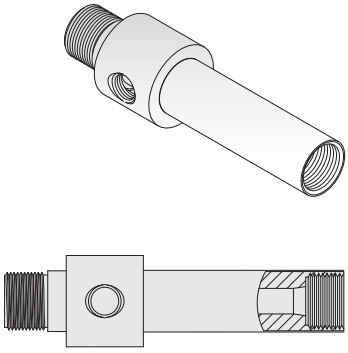
Barbs grip securely on flexible tubing, no clamps required



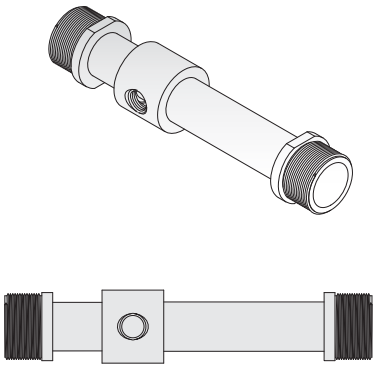
Combined turned OD with counter bored ID to match customer design



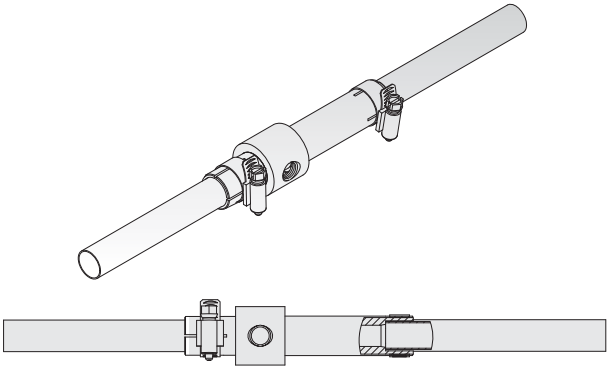
Slotted: Counter bored to match transfer tube for smooth transition



Optional OD and ID threads. See tables on Page 226

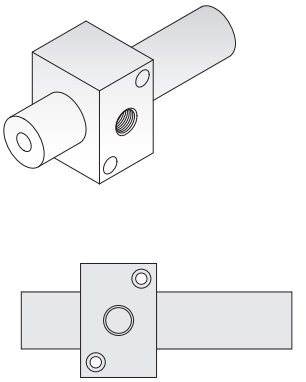


Threaded Adapter: Oversized threads available

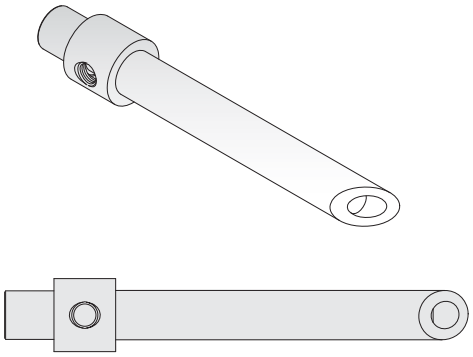


Slotted with screw clamp for clamping OD of transfer tube

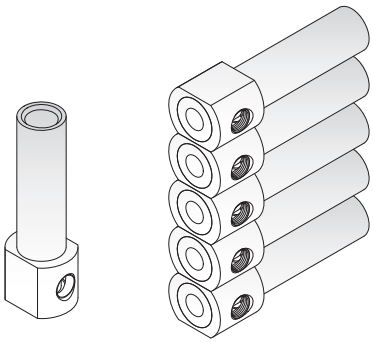
DF Pumps – Custom Shaped



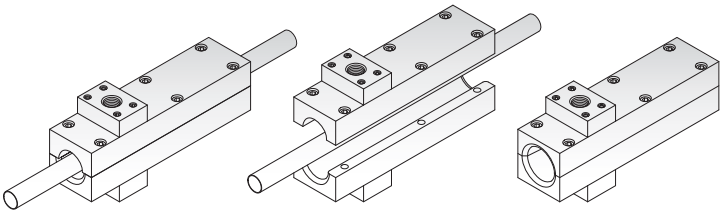
Square collar aids in mounting



Extended length with angle for stuffing stuffed animals



DF notched multi-pump – close centers designed for picking and placing compression springs



DFR – split design surrounds continuous fibers, wires, tubing etc., for drying and cooling