TechTips

VOLUME 4

Flexible Duct Connector Tech Tip

What are flexible duct connectors?

A flexible duct connector is an airtight, flexible joint consisting of a fabric that is secured to sheet metal on both sides.

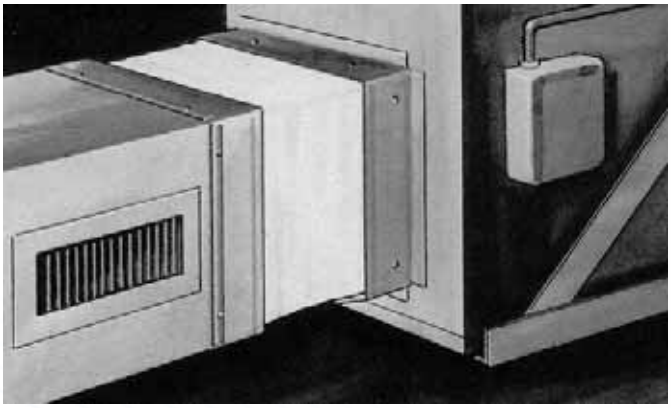
Figure 1

Flexible Duct Connector

Why use flexible duct connectors?

Flexible duct connectors are used as an attachment between the equipment and the ductwork to isolate the vibrations and noises in a duct system. Flexible duct connectors, unlike hard duct, also allow for a slight offset between the equipment and ductwork.

Figure 2



Flexible Duct Connector Installation Example

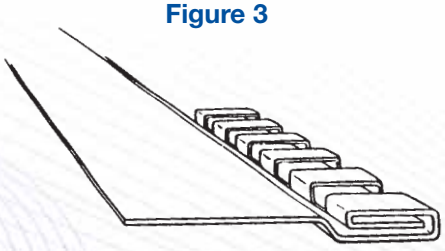
Which market segments use flexible duct connectors?

Flexible duct connectors are manufactured in varying sizes and thickness for use in residential, light commercial, commercial and industrial applications.

Is the fabric-to-metal joining method important?

Absolutely. You want a permanent, airtight joint. The type of joint used will also impact the structural rigidity of the connector. There are many flexible duct connectors available with a wide array of joining methods (see figures below). DynAir uses a double-fold offset seam (figure 3) in all of our flexible duct connector products. This connection style ensures that you will have an airtight seal that cannot be damaged when the connector is fabricated into its final shape. The double-fold offset seam also adds structural stability to the connector, which means that the connector will not fail due to over- or under-pressure issues. DynAir also offers the Fab Guard seam (figure 4) for additional fabric protection.

Figure 3



Carlisle HVAC Double-Fold Offset Seam – fabric is captured twice

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Is the metal used important?

Yes, the metal comprises two-thirds of the flexible duct connector assembly so it is key for a long-lasting connection. The standard metal used in flexible duct connectors is galvanized steel. When looking at galvanized steel, you have to consider the coating thickness and how this impacts the metal's longevity and the installation location. The two most commonly used galvanized steels in HVAC are notated as G60 and G90. The 60 and 90 refer to the total amount of zinc deposited on the surface of the steel; G90 has a thicker coating and therefore will last longer. In indoor applications G60 will have two-thirds the life expectancy of G90, which means that G90's indoor life expectancy is 20 years longer than that of G60. For outdoor applications the full life expectancy drops dramatically but you will still see G90 outlasting G60 (reference). SMACNA (The Sheet Metal and Air Conditioning Contractors' National Association) recommends in the "Duct Construction Standards – Metal and Flexible" standard to use a minimum of G60 for ductwork and connectors. The ASHRAE Handbook—under "HVAC Systems and Equipment", Chapter 16 "Duct Construction"—recommends to a use minimum of G90 for ductwork and connectors. Even though G90 is not required per SMACNA, DynAir understands the need to manufacture a quality product that will last and has standardized G90 for all of our duct connectors.

Will the flexible duct connector impact the airflow through the duct system?

A properly installed flexible duct connector will not impede airflow through the duct system. It is important to size and install the flexible duct connector to fit the distance the fabric will be spanning (see Figure 7). If the fabric is allowed to droop or accordion too much it can impact the airflow through the connector (see figure 8).

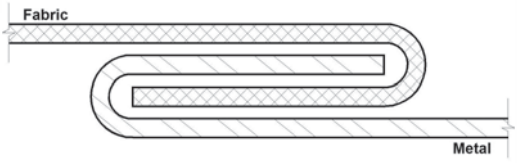
How do I choose the right flexible duct connector?

There are several key factors that will determine which flexible duct connector is right for your job. What pressure will the duct system be running at? Will the equipment be installed within the building envelope or outside of the building? What are the typical minimum and maximum temperatures the ductwork will be exposed to? Will the flexible duct connector be exposed to additional constituents in the airstream (chemicals, etc.)? How large of a distance do you need to span? These are just a few of the important factors to consider. The reference below will give you the information you need to select appropriately.

Figure 4

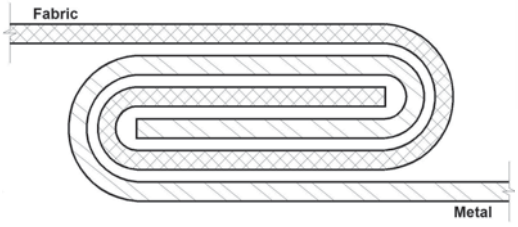
Carlisle HVAC Fab Guard Seam – fabric is centered in the metal joint

Figure 5



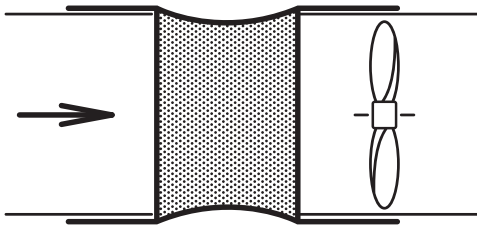
Single Fold Seam – fabric can easily pull out of the connection joint

Figure 6



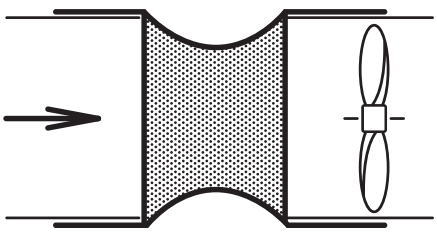
Double Lock Seam – fabric is easily damaged

Figure 7



Proper installation

Figure 8



Improper installation

Fabric Name	Base Fabric	Coating	Weight (oz/yd²)	Tear Resistance (lb/in)		Tensile (lb/in)		Burst Strength (psi)	Minimum	Maximum	Intermittent Max	ASTM E84	Flammability	Connection options	Additional properties
				Warp	Fill	Warp	Fill								
VinylFlex	Woven polyester	Vinyl	14, 16, 20	72	47	234	211	350	0 F	200 F	200 F	15/45	Flame retardent	Dielectrically or thermally weldable, glue, staples	UV resistant, shrink resistant, resists internal and external mildewing
Hypalon	Fiberglass	Hypalon	27	40	40	400	300	400	-50 F	260 F		0/0	Self-extinguishing	Glue, staples	Chemical resistance, higher temp than Vinyl, UV resistance
Silicone	Satin weave fiberglass	Silicone	17.5	60	60	325	250	600	-67 F	500 F	700 F	0/0	Flame retardent	Silicone and staples	Water and oil resistant, high temp,
Neoprene (light)	Fiberglass	Neoprene	15	12.5	11	475	375	200	-40 F	200 F		0/0	Flame resistant	Glue, staples	Waterproof, low temperature resistant
Neoprene (heavy)	Fiberglass	Neoprene	30	25	20	475	375	750	-40 F	200 F	392 F	0/0	Flame resistant	Glue, staples	Waterproof, low temperature resistant

Note: Warp is the longitudinal thread direction in the fabric roll. Fill (also known as weft) is the transverse thread direction in the fabric roll.

How do chemicals and similar items affect the flexible duct connectors?

The chemical resistance chart below will help you to select the appropriate connector fabric for your application.

A = little or no effect **B** = moderate effect **C** = severe effect Blank = no data available

	NEOPRENE	HYPALON	VINYLFLEX	SILICONE
Acetic Acid (30%)	A	A	C	B
Acetone	B	B	C	B
Aluminum Chloride	A	A	A	A
Aluminum Sulfate	A	A	A	A
Ammonia (ANHYD)	A	A	B+	A
Ammonium Hydoxide	A	A	A	A
Ammonium Sulfate	A	A	A	A
Amyl Acetate	C	C	C	C
Barium Sulfide	A	A	A	-
Benzene	C	C	C	C
Black Sulfate Liquor	A	A	A	B
Boric Acid	A	A	A	A
Bromine	C	B	C	C
Butyl Acetate	C	B	C	C
Butyl Alcohol	A	A	C	B
Cadmium Hypochlorite	B	A	B+	-
Carbon Disulfide	C	C	C	-
Carbon Tetrachloride	C	C	C	C
Chlorinated Solvents	C	C	C	C
Chloroform	C	C	C	-
Chlorine Water	C	C	B+	C
Chromic Acid	C	A	A	-
Chromium Plating Solution	-	-	A	-
Citric Acid	A	A	A	A
Copper Chloride	A	A	A	-
Copper Sulfate	A	A	A	-
Cotton Seed Oil	A	A	B+	A
Creosote Oil	B	B	C	-
Cyclohexane	C	C	C	C
Diacetone Alcohol	A	A	C	-
Dowthern (A + E)	B	B	C	B
Disodium Phosphate	-	-	A	-

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	NEOPRENE	HYPALON	VINYLFLEX	SILICONE
Ethyl Acetate	C	C	C	-
Ethylene Dichloride	C	C	C	B
Ethylene Glycol	A	A	C	A
Ferric Chloride (40%)	A	A	A	A
Ferric Sulfate	A	A	A	A
Fluroboric Acid	A	A	A	-
Formaldehyde (40%)	A	A	A	-
Formaldehyde (over 100 F)	C	C	C	-
Formic Acid	A	A	A	-
Gasoline	B	C	C	C
Glucose	A	A	A	A
Glycerine	A	A	C	A
Heptane	A	A	-	-
Hexane	A	A	-	-
Hydrobromic Acid (40%)	A	A	C	-
Hydrochloric Acid (conc)	A	A	C	B
Hydrofluoric Acid (100%)	A	A	B	C
Hydrogen Peroxide	B	A	A	A
Hydrogen Sulfide	A	A	A	-
Isopropyl Ether	C	C	C	-
Kerosene	B	B	C	B
Lactic Acid	A	A	B	-
Linseed Oil	A	A	B	A
Lubricating Oil	B	B	B	B
Magnesium Chloride	A	A	-	B
Magnesium Hydroxide	A	A	-	B
Maleic Aced	B	A	A	A
Methyl Alcohol	A	A	C	B
Methyl Cellosolve	C	C	-	C
Methylene Chloride	C	C	-	C
Mineral Oil	A	A	A	B
Naphtha	B	B	-	A
Naphtalene	C	C	C	C
Nickel Chloride	A	A	A	-
Nickel Sulfate	A	A	A	A
Nitric Acid (40%)	C	A	A	C
Nitrobenzene	C	C	C	C
Oleic Acid	B	B	A	B
Oleum	C	A	C	-
Oxalic	A	A	A	A
Petroleum Oils	B	B	B	B
Phosphoric Acid (85%)	A	A	B	A
Pickling Solution	B	A	A	-
Potassium Chloride	A	A	A	-
Potassium Cyanide	A	A	A	-
Potassium Dichromate	A	A	A	-
Potassium Hydroxide (40%)	A	A	A	A
Potassium Sulfate	A	A	A	-
Propyl Alcohol	A	A	C	B
Skydrol	B	B	C	B+
Skydrol 500	B	B	C	B+
Sodium Chloride	A	A	A	A
Sodium Hydroxide (40%)	A	A	B	A
Sodium Hypochlorite	B	A	B	B
Steam	A	B	B	-
Sulfur Doixide (Liquid)	A	A	B	A
Sulfuric Acid (50%	C	A	A	C
Sulfuric Acid (over 50%)	C	A	C	C
Sulfurous Acid	C	B	C	C
Tannic Acid	A	A	A	-

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	NEOPRENE	HYPALON	VINYLFLEX	SILICONE
Toluene	C	C	C+	C
Trichloroethylene	C	C	C	B+
Turpentine	C	C	C	-
Vinegar	A	A	A	A

Reference: “Effects of Imposing a Universal Requirement of G-60 and/or G-90 Coating For All Components of Ductwork” SMACNA technical paper, Author John H Stratton.

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