

Hydraline





PTFE LINED FLEXIBLE HOSE

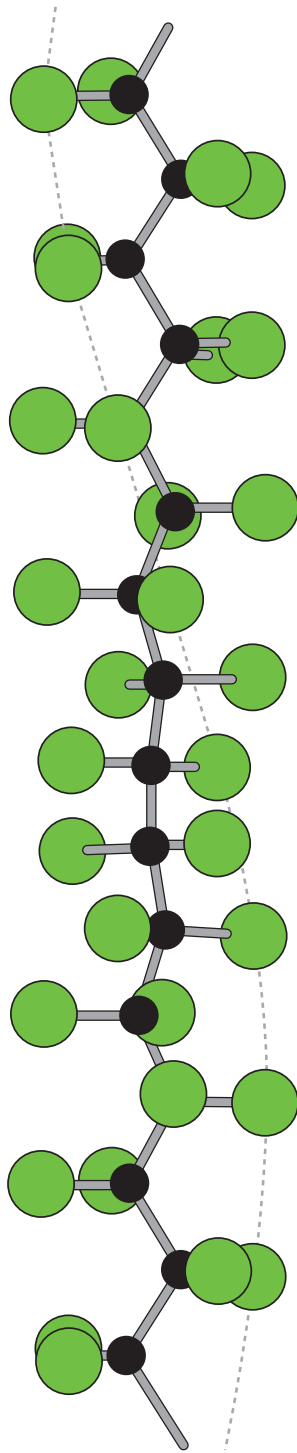
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PTFE - The Optimum Choice For Hydraline Hose Linings

Section from a PTFE Molecule,
16 Angstrom Units long.

 = Fluorine Atom
 = Carbon Atom



PTFE, or Polytetrafluoroethylene, comprises long-chain molecules of carbon atoms, each linked to two fluorine atoms.

The fluorine atoms provide a helical spiral which surrounds the carbon chain and protects it.

It is this structure which creates the unique properties for which PTFE is well-known.

Excellent Chemical Resistance

PTFE is renowned as the most chemically resistant material known. Only a very few, very unusual substances and conditions can affect it, like Fluorine gas at high temperature and pressure and liquid, boiling sodium metal.

PTFE lined hoses can therefore be used for a wider variety of chemicals than any other hose type, making it the ideal choice for very corrosive chemical applications and multi-product applications.

Non-Stick Surface

The use of PTFE as a surface for cookware products has demonstrated to the world how easily cleanable PTFE surfaces are.

This means that PTFE lined hoses can be purged 100% clean more quickly, easily and reliably than any other type of hose.

Excellent Temperature Range

The cookware application also demonstrates another of PTFE's many attributes - temperature resistance. PTFE itself can be used as a hose liner at temperatures from -150°C up to $+260^{\circ}\text{C}$, dependent upon the hose design and the application conditions.

This is the widest temperature range of any rubber or plastic hose lining material.

Hose Design

The only issue with PTFE as a hose lining material is the best way it can be integrated in to the hose design. This is where Aflex Hose have a proven record of success over the last 30 years.

Hydraline

Quality Assurance, Certification and Approvals

BS EN ISO 9001:2000

Aflex products are all manufactured in accordance with BS EN ISO 9001: 2000 Quality Management Systems independently assessed and registered by National Quality Assurance Limited (NQA).

USP Class VI

Natural and Antistatic PTFE Hose Liners, Platinum Cured Silicone Rubber Covers (White and Clear) and EPDM Rubber Cover (Blue) have been tested in accordance with USP protocols and are found to conform to the requirements of USP Class VI Chapter <88>

Natural and Antistatic PTFE Hose Liners, Platinum Cured Silicone Rubber Covers (White and Clear) have also been tested in accordance with USP protocols and are found to conform to the requirements of USP Class VI Chapter <87>, the L929 MEM Elution Test and are considered non-cytotoxic.

FDA

The Materials used to manufacture the natural PTFE Tube liner conforms to FDA 21 CFR 177.1550, and the antistatic PTFE liner conforms to FDA 21 CFR 178.3297.

3-A Sanitary Standards

The PTFE used in the liner is manufactured solely from materials which meet the requirements of the 3-A Sanitary Standards

Pharmaceutical Manufacturers Approvals

Most of the major pharmaceutical manufacturing companies in the world have audited and/or approved Aflex Hose as a Hose Supplier.

CE Marking (Europe only)

Aflex has been assessed by Zurich Risk Services and found to comply with the Pressure Equipment Directive 97/23/EC (European Community) Conformity Assessment Module D1, approved to CE Mark applicable hose products, accompanied by a Hose Usage Data Sheet, and a Declaration of Conformity.

Attestations of Conformity to ATEX Directive 94/9/EC (Potentially Explosive Atmospheres)

Available for hose and assemblies for components used in Gas Zones 1 & 2 and Dust Zones 21 & 22, when applicable.

Material Certification to EN10204

Available for all the hose or hose assembly components.

Certificates of Conformity to EN45014

Are available for all products.

Hose Identification and Testing

All Aflex Hose assemblies are identified with a stainless steel identification tag, ring or ferrule, vibro etched with a unique serial number for traceability, and other relevant information.

Each assembly is pressure tested to 1.5 times maximum working pressure before despatch, and pressure test certificates can be supplied.

HYDRALINE HOSE PRODUCTS

SPECIAL CONDITIONS IN SERVICE

PTFE Hose - Use with Halogens

When PTFE lined hose is used with the halogens Chlorine and Fluorine, or any corrosive halogen compounds which diffuse easily and are gaseous for example phosgene, then trace quantities may diffuse through the PTFE liner to the outside.

Only trace quantities are required, mixed with atmospheric moisture, to create a serious corrosion condition with stainless steel wire braid in particular.

Also, if any Halogen compounds are present in the environment external to the hose (for example, salt in a sea water spray), and if the temperature of the hose exceeds 50°C, there is a serious risk of "Chloride Stress Corrosion" of the stainless steel wire braid on the hose.

For such applications, always use the alternative braid materials, either HB or KYB (for fluorine & chlorine) or PB (for external chlorides).

"Penetrating" Fluids and Gases

Like other plastics and rubbers, in certain special circumstances PTFE is sometimes subject to diffusion through the tube wall, dependant upon the nature of the chemical, and the pressure and temperature of operation.

As mentioned above, Halogens represent a specific problem. Automotive fuels, on the other hand, diffuse much less through PTFE than through other plastics, like nylon.

Some other types of penetrating fluids can also diffuse through PTFE to varying degrees, which may or may not present a problem. Known examples are sulphur trioxide, glacial acetic acid and methyl methacrylate.

Consult with Aflex Hose if these, or any other gases or fluids which are known to be penetrating are to be used.

Gas/Fluid Cycling

There are some applications where the fluid passing through the hose turns into a gas, then back into a fluid, then into a gas etc., in a cyclic sequence.

This is normally associated with changes in temperature and/or pressure.

For complex reasons these conditions are extremely damaging to the hose liner, whatever material it is made from.

For example, hoses are sometimes used to pass steam, water, steam etc into rubber moulding presses, in order to heat the mould, then rapidly cool it before reheating in the next cycle. Hoses of all types fail rapidly in such an application, and PTFE lined hose is no exception.

Consult Aflex Hose for further information if these conditions apply.

CONNECTING ASSEMBLIES FOR USE IN APPLICATIONS

When being connected for use in applications, the end fittings on hose assemblies must be connected to correct mating parts in the correct way, using the correct tools - spanners, clamps, nuts and bolts etc.

The connections must be sufficiently tightened to ensure that the joint is leak-free, but must not be over-tightened as this can damage the sealing surfaces.

In applications involving the transfer through the hose of expensive or dangerous fluids or gases, the connections must be pressure tested first before being put in to service. This should be done with some harmless media, like water or compressed air, to 1 1/2 times the maximum working pressure of the hose assembly, as defined in this brochure.

If in doubt, consult Aflex Hose for advice.

Hydraline PTFE Lined Flexible Hose Products

Introduction

The Hydraline range of hose products includes three product groups, designed for assembly with standard, off-the-shelf hydraulic fittings, using ferrules supplied by Aflex Hose. The actual hose bore sizes are larger than the nominal hose bore sizes, in order to accommodate the actual diameters of the hydraulic inserts, providing an easy fit. Assembly Instructions, and Ferrule Details are given on page 11.

The Hydraline Hose products are designed to be sold either for “Self Assembly” by distributors, or as fully assembled and tested hoses for end use.

Application areas include Automotive and General Industrial, and are further described for the individual products.

The three Product Groups are:

Hydraline SB (pages 4 & 5)

Standard, Smoothbore natural or *antistatic PTFE tube, with a single Stainless Steel (SS) wire braid or double braid (to special order).



Hydraline V (also called 'Visiflon') (pages 6 & 7)

Seamless extruded and convoluted natural or *antistatic PTFE tube, with a Stainless Steel (SS) wire braid, or an orange Polypropylene Braid (to special order).



Hydraline FX (pages 8 & 9)

Our revolutionary new product. A natural or *antistatic PTFE tube with a smooth bore, but externally convoluted. Supplied with a Stainless Steel (SS) wire braid or a Black Polyaramid Fibre braid (AM).

Hydraline FX combines the advantages of Hydraline SB (smoothbore, therefore excellent flow rates) with the advantages of Hydraline V (convoluted, therefore much more flexible, particularly in the bigger bore sizes) in **ONE** product.



***Note:** “Antistatic” refers to a type of PTFE liner which is required in many situations, and is fully described on page 10.

Page 10 also gives the Usage Limitations which refer to particular applications, and must be reviewed.

Note: An alternative PTFE Lined hose product group is also available from Aflex Hose, for assembly with “PTFE tail fittings”, where the actual bore diameters are the same as the Nominal Bore Size. These are called Smoothbore Hose and Visiflon Hose, and are described in another brochure. (Visiflon Hose is actually the same as Hydraline V, and is the only hose which can be assembled with either Hydraulic or PTFE tail fittings).

Hydraline SB - Smooth Bore PTFE Lined Hose

Design & Purpose

Hydraline SB is a smoothbore, medium wall premium grade, seamless extruded PTFE Tube with a Grade 304 Stainless Steel Wire Braid. The choice of the PTFE polymer, together with the extrusion, heat treatment and quality control programmes, is designed to produce the best quality PTFE tube possible, ensuring minimum permeation and maximum flexibility.

This range of Hydraline SB PTFE hose has been developed for general purpose use.

Hydraline SB has a smooth bore, permitting fast, clean fluid flow, but is limited in flexibility and kink resistance, particularly in bore sizes above 1/4". For flexibility Hydraline V is preferred. For flexibility **and** flow, Hydraline FX is preferred.

Hydraline SB is available in the following grade:

Hydraline SB, SS - Natural PTFE Tube, external 304 Stainless Steel Wire Braid.

To special order, Hydraline SB can also be supplied with a Antistatic (AS) grade PTFE liner tube (Hydraline SB, AS, SS), or with a Double Braid of Stainless Steel Wire (Hydraline SB, DB).



Specifications (Hydraline SB, SS Only)

Hose Size (- Size)	Part Number *Natural Grades Only	Actual Bore Size		PTFE Wall Thickness		Outside Diameter		Minimum Bend Radius		*Maximum Working Pressure		Weight/metre		Drum Quantity	
		in	mm	in	mm	in	mm	in	mm	psi	BAR	lbs	kg	ft	mts
3/16 (-4)	70-*400-03-01-02	0.200	5.0	0.030	0.76	0.30	7.65	13/4	45	3300	230	0.17	0.078	4000	1200
1/4 (-5)	70-*400-04-01-02	0.264	6.7	0.030	0.76	0.37	9.30	23/8	60	3000	205	0.24	0.110	2600	800
5/16 (-6)	70-*400-05-01-02	0.335	8.5	0.030	0.76	0.44	11.10	23/4	70	2600	180	0.30	0.136	2000	600
3/8	70-*400-06-01-02	0.394	10.0	0.030	0.76	0.50	12.75	3	80	2600	180	0.36	0.166	1300	400
1/2 (-10)	70-*400-08-01-02	0.536	13.6	0.030	0.76	0.64	16.35	5	130	2000	140	0.46	0.210	720	220
5/8 (-12)	70-*400-10-01-02	0.654	16.6	0.033	0.84	0.77	19.50	61/2	163	1600	110	0.62	0.280	650	200
3/4	70-*400-12-01-02	0.780	19.8	0.040	1.00	0.86	22.50	7	180	1400	95	0.72	0.327	-	-
1	70-*400-16-01-02	1.040	26.4	0.040	1.00	1.19	30.10	9	230	1160	80	1.15	0.524	-	-

*For AS Grades, use 70-410 in place of 70-400-

*Burst Pressure = 4 x Maximum Working Pressure

Hydraline SB - Smooth Bore PTFE Lined Hose (continued)

PROPERTIES

Temperature Rating

The temperature rating is from -70° (-94°F) to +260°C (+500°F), but the Maximum Working Pressure (MWP) must be reduced by 0.5% for each 1°C above 130°C (0.5% for each 1.8°F above 266°F).

Pressure Resistance

The Pressure Ratings are as listed and adjusted for temperature, for the Stainless Steel grades. If higher working pressures are required, a double braid hose can be requested, to special order.

Full Vacuum Resistance

Hydraline SB is not designed for vacuum resistance, and Hydraline FX is more suitable for such applications. The smaller sizes of Hydraline SB may be fully or partly vacuum resistant, dependent upon the application conditions.

Diffusion Resistance

Hydraline SB is not designed for High Pressure Gas applications (above 140 Bar or 2000 psi). A specially processed hose design is required. For advice, consult Aflex Hose.

ASSEMBLY

Assembly of Hydraline SB to standard Hydraulic End Fittings, together with Ferrules supplied by Aflex Hose is straight-forward.

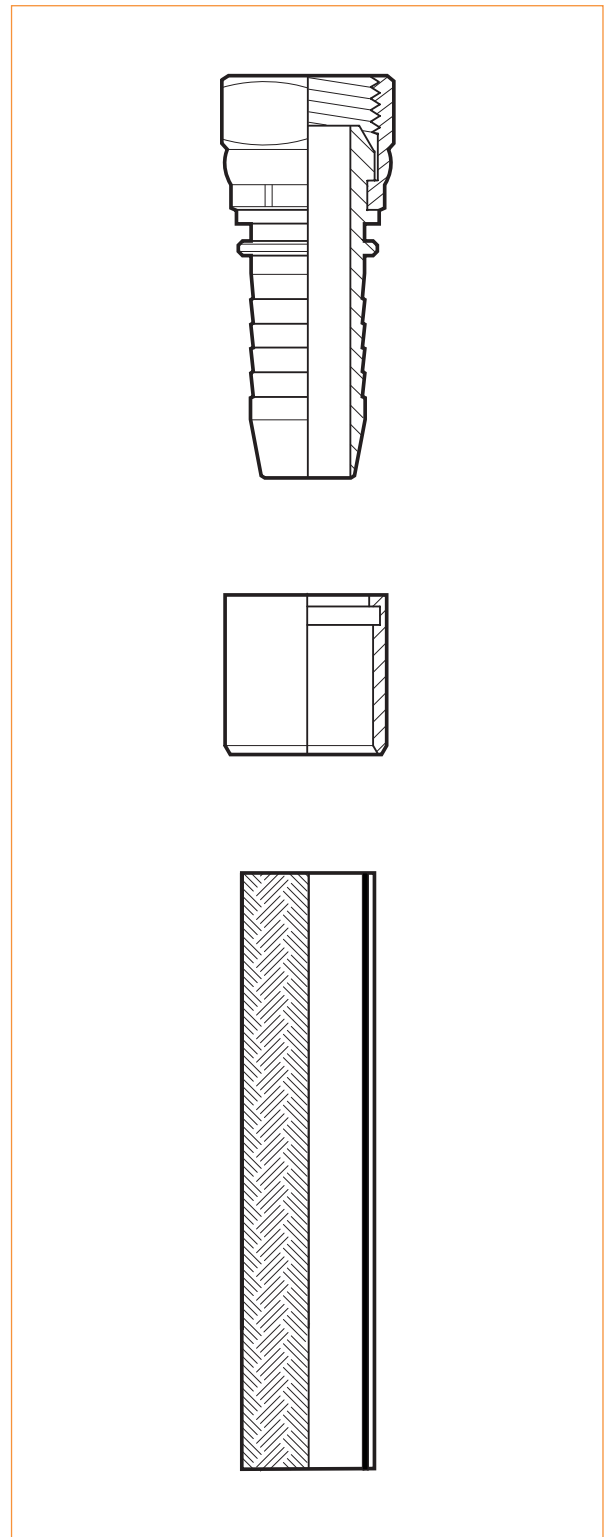
Details concerning Ferrules and Crimp Diameters are available on page 11.

APPLICATIONS

Automotive, motorsport, refrigeration, high pressure steam, and many other industrial applications in general, wherever the excellent chemical resistance and temperature resistance of the hose are required.

CAUTION

Hydraline SB can be "kinked" if care is not taken, particularly sizes 1/2" and above. If this is a problem, use Hydraline FX or Hydraline V.



Hydraline V (also called ‘Visiflon’) - Convolutated PTFE Lined Hose

Design & Purpose

Hydraline V is designed for use in a wide variety of general purpose industrial applications, such as automotive, steam transfer, refrigeration, and many others. Although Hydraline V is also suitable for some light duty process fluid applications, Corroflon or Bioflex (both available from Aflex Hose) is usually preferred due to the thicker PTFE wall and helical reinforcement.

Hydraline V is very flexible and kink resistant, but has a convoluted bore which limits fluid flow rates, and reduces internal “cleanability”.

It also requires de-convolutating before assembly.

Hydraline FX is the preferred alternative which solves these problems without reducing the flexibility too much.

Hydraline V is available in the following grades:

Hydraline V, TO - Natural PTFE Tube Only, no braid.

Hydraline V, AS, - Antistatic Black PTFE Tube Only, no braid.

Hydraline V, SS - Natural PTFE Tube, external 304 Stainless Steel Braid.

Hydraline V, AS, SS - Antistatic PTFE Tube, external 304 Stainless Steel Braid.

To special order, Hydraline V can also be supplied with an orange polypropylene yarn braid (Hydraline V, PB or Hydraline V, AS, PB).

NOTE: Prolonged exposure to sunlight eventually results in UV degradation of PB braid.



Specifications (Hydraline V, SS or V, AS, SS Only)

Hose Size	Part Number *Natural Grades Only	Actual Through Bore		O/D of Braid		PTFE Tube Wall Thickness		Minimum Bend Radius		Maximum Working Pressure		Burst Pressure		Weight/metre		Longest Continuous Length	
		in	mm	in	mm	in	mm	in	mm	psi	Bar	psi	Bar	lbs	kg	ft	mts
3/8	71-*100-06-01-02	1/4	6.30	0.51	13	0.025	0.63	3/4	20	870	60	3500	240	0.29	0.13	130	40
1/2	71-*100-08-01-02	3/8	9.50	0.67	17	0.025	0.63	1	25	680	47	2700	190	0.44	0.20	130	40
5/8	71-*100-10-01-02	1/2	12.70	0.79	20	0.030	0.76	1 1/2	40	580	40	2300	160	0.55	0.25	100	30
3/4	71-*100-12-01-02	5/8	16.00	0.95	24	0.035	0.89	2	50	460	32	1900	130	0.75	0.34	100	30
1	71-*100-16-01-02	7/8	22.20	1.14	29	0.040	1.00	2 1/2	63	380	26	1520	105	1.03	0.47	80	25
1 1/4	71-*100-20-01-02	1 1/8	28.20	1.42	36	0.040	1.00	3	70	360	25	1450	100	1.39	0.63	65	20
1 1/2	71-*100-24-01-02	1 3/8	35.00	1.85	47	0.050	1.25	4 1/2	115	300	20	1230	85	2.00	0.90	33	10
2	71-*100-32-01-02	1 7/8	47.00	2.40	61	0.050	1.25	5	130	220	15	1000	70	2.75	1.25	33	10

* For AS Grades, use 71-110- in place of 71-100-

Hydraline V (also called 'Visiflon') - Convolutated PTFE Lined Hose (continued)

PROPERTIES

Temperature Rating

For Stainless Steel Braided (SS) hose, the temperature rating is from -70° (-94°F) to +260°C (+500°F), but the Maximum Working Pressure (MWP) must be reduced by 1% for each 1°C above 130°C (1% for each 1.8°F above 266°F).

For Polypropylene Braided (PB) hose, the maximum working pressure reduces by 5% for each °C above 80°C (5% for each 1.8°F above 176°F). Maximum Working Temperature = 100°C (212°F).

Pressure Resistance

The Pressure Ratings for SS grades are as listed and adjusted for temperature. Pressure ratings for PB hose grades are 50% of those for SS hose grades. Tube Only (TO) grades can only be used at pressures up to 2 Bar (30 psi).

Vacuum Resistance

SS braided Hydraline V hoses are fully vacuum resistant up to 130°C (266°F).

Flow Rates

Turbulent flow always occurs in hoses with rough or convoluted internal surfaces. This reduces flow rates, and can cause a whistling noise if gases are passed at high flow rates. Use Hydraline FX to solve such problems if necessary.

ASSEMBLY

Hydraline V can be assembled to hydraulic hose fittings in the normal way after the convolutions have been partially flattened out by means of a special tool, called a Visiflon Opening Tool, available from Aflex Hose.

This tool screws in to the convolutions, either manually or mounted on to an electric motor, and then screws out to leave the convolutions flatter, and able to accept the insertion of a hydraulic fitting.

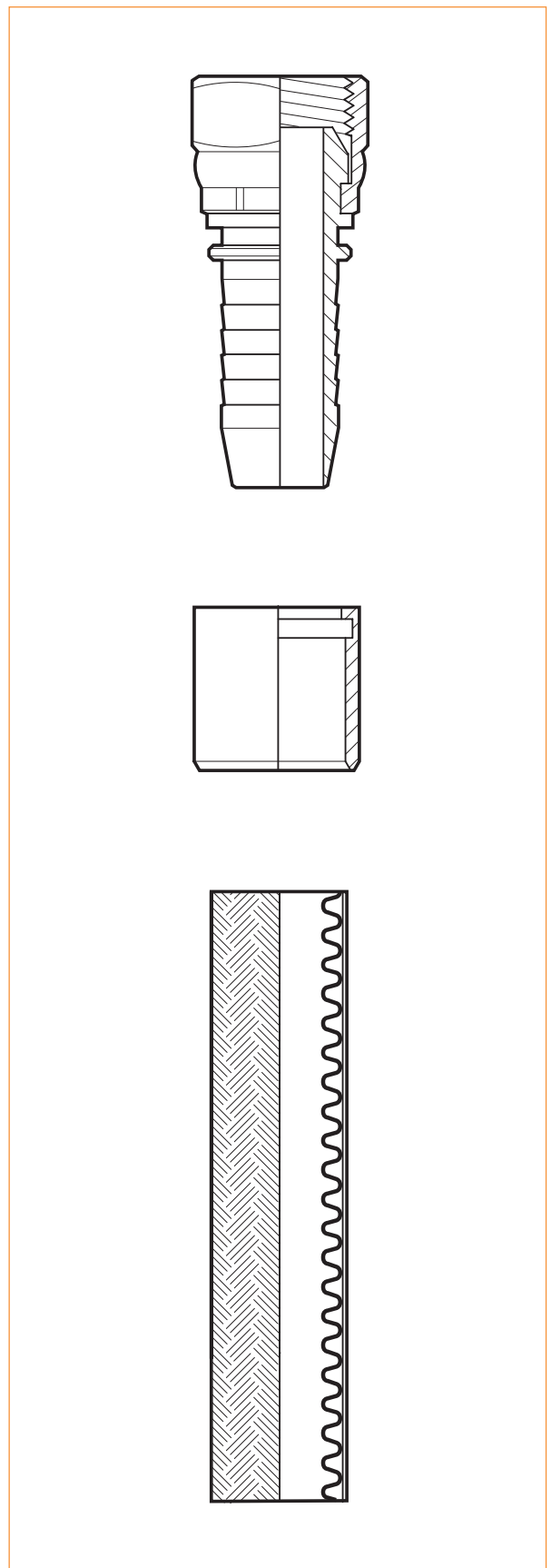
Consult Aflex Hose for further advice concerning Opening Tools.

Details concerning Ferrules and Crimp Diameters for Hydraline V are available on page 11.

APPLICATIONS

- Automotive and General Industrial - where good flexibility is required for larger bore hose applications, (above 1/4" bore size).

- Hydraline FX is preferred to Hydraline V in all applications except those where the superior flexibility and kink resistance of Hydraline V is required.



Hydraline FX - Smooth Bore, Externally Convoluted PTFE Lined Hose

Design & Purpose

Hydraline FX is unlike any other PTFE hose product currently available.

The PTFE liner tube is smooth bore on the inside but convoluted on the outside, to combine the ease of assembly and high flow rates of a smooth bore hose with the flexibility and kink resistance of a convoluted hose in one product!

Hydraline FX is designed to be used in place of Smoothbore Hose when improved flexibility is required, and to replace Convoluted Hose when improved flow characteristics or easier assembly is required.

Hydraline FX is available in the following grades:

Hydraline FX, TO - Natural PTFE Tube Only, no braid.

Hydraline FX, AS, TO - Antistatic Black PTFE Tube Only, no braid.

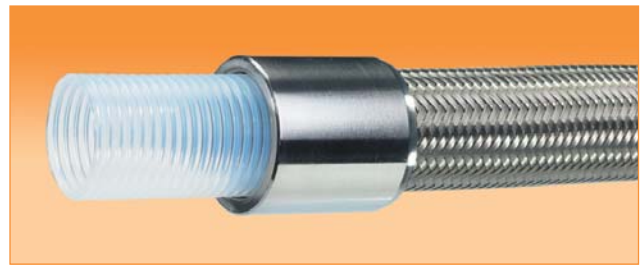
Hydraline FX, SS - Natural PTFE Tube external 304 Stainless Steel Braid.

Hydraline FX, AS, SS - Antistatic Black PTFE Tube, external 304 Stainless Steel Braid.

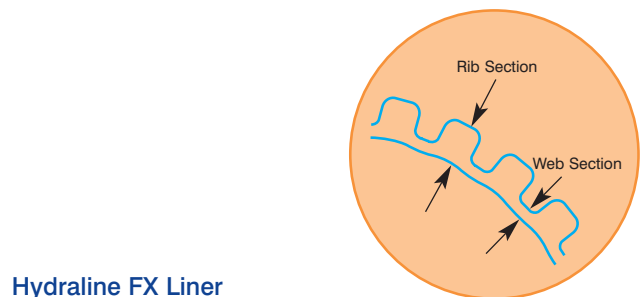
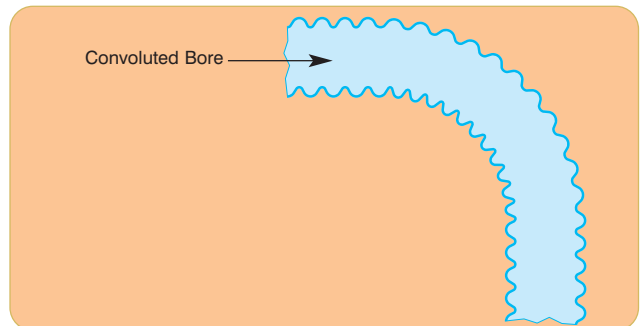
Hydraline FX, AM - Natural PTFE Tube, Polyaramid Fibre Braid.

Hydraline FX, AS, AM - Antistatic Black PTFE Tube, Polyaramid Fibre Braid.

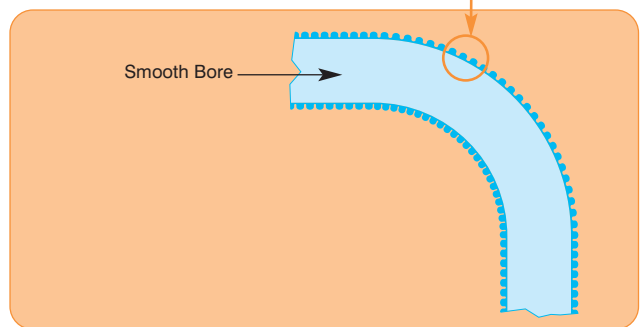
To special order, Hydraline FX can also be supplied with a Polypropylene Braid, or with a Stainless Steel braid with an EPDM or Silicone Rubber Cover, or a PVC, Nylon or other Plastic Cover, printed if required.



Conventional Convoluted PTFE Liner



Hydraline FX Liner



Specifications for Hydraline FX, SS or FX, AS, SS Only (for Hydraline FX, AM and FX, AS, AM, apply the factors shown in Red).

Nominal Hose Size	Part Number *Natural Grade Only (Cancel -02, add -55-01)	Actual Hose Bore Size (Same)		TO (Tube Only) Outside Dia. (Same)		SS Braid Outside Dia (Same)		Minimum Bend Radius (x 2.0)		Maximum Working Pressure (x 0.7)		Burst Pressure (Same)	
		in	mm	in	mm	in	mm	in	mm	psi	BAR	psi	BAR
1/4	92-100-04-01-02	0.270	6.8	0.354	9.00	0.378	9.6	3/4	19	1300	88	8400	580
3/8	92-100-06-01-02	0.394	10.0	0.492	12.50	0.534	13.5	1	25	1200	80	7500	520
1/2	92-100-08-01-02	0.536	13.6	0.640	16.28	0.690	17.5	1 1/4	32	900	60	5500	380
5/8	92-100-10-01-02	0.658	16.7	0.787	20.00	0.843	21.0	2	50	750	50	5200	360
3/4	92-100-12-01-02	0.780	19.8	0.913	23.20	0.948	24.1	2 3/8	60	625	42	5000	350
1	92-100-16-01-02	1.039	26.4	1.193	30.30	1.250	31.3	2 7/8	73	580	40	3800	260

*For AS Grades, use 92-110- in place of 92-100-

Hydraline FX - Smooth Bore, Externally Convoluted PTFE Lined Hose (continued)

PROPERTIES

Temperature Rating

The temperature rating is from -70° (-94°F) to +260°C (500°F), but the Maximum Working Pressure (MWP) must be reduced by 1% for each 1°C above 130°C (1% for each 1.8°F above 266°F).

The maximum working temperature for the Polyaramid Fibre braided hose is +180°C (+356°F).

Pressure Resistance

The maximum working pressures are as listed, up to 130°C (266°F).

The design of a conventional autoconvoluted PTFE hose liner permits internal “pressing out” of the convolutions inside the braid over time, and under temperature and pressure, leading to premature failures. The narrow and highly compressed web sections of Hydraline FX are much more resistant to pressing out, hence a much longer service life under pressure can be achieved.

Tube Only grades can only be used at pressures up to 4 Bar (60 psi) up to 130°C (266°F) and are not fully vacuum resistant.

Full Vacuum Resistance

Stainless Steel braided Hydraline FX hose is fully vacuum resistant up to 130°C (266°F).

Reduced Diffusion Rates

The way the Hydraline FX tube liner is made, by web compression without fracture, surprisingly generates a much improved resistance to gas permeation, compared to any other type of smooth bore or convoluted PTFE hose. Much lower diffusion rates can therefore be achieved.

Excellent Flow Rates

Due to the non-turbulent flow through a smooth bore hose, Hydraline FX flow rates for a given pressure drop and actual bore size are 2 to 3 times higher than for a convoluted PTFE hose. (This applies to the hose itself. If end fittings are applied, however, which introduce a smaller bore at the ends, this multiple is reduced).

The “whistling” noises created by the turbulent flow of gases or steam through convoluted hose are eliminated in Hydraline FX.

Excellent Internal Cleanability

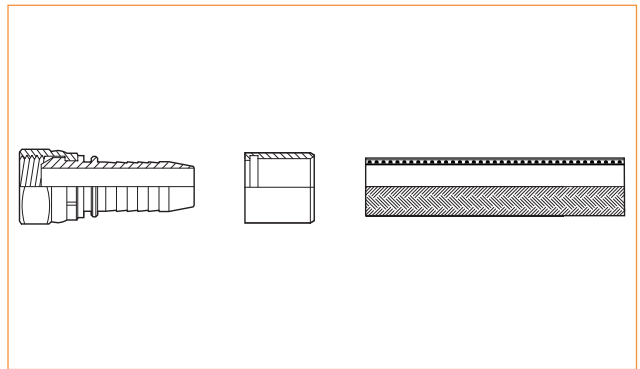
Internal cleanliness and self-drainability are optimised by the smooth bore design. This eliminates ‘pockets’ of fluid trapped in internal convolutions when using convoluted hose.

‘Bridging’ with solid particles is also eliminated.

ASSEMBLY

Easier Assembly

Hydraline FX is very flexible, and is designed to replace conventional flexible tape wrapped convoluted or autoconvoluted PTFE hoses in application where **faster, cleaner fluid flow or ease of assembly** is paramount. SS or MS ferrules and crimp diameters can be supplied to suit any



conventional hydraulic hose tail end fittings.

Problems associated with assembling fittings to convoluted hoses, such as leakages, the need for special or sleeved spigots, the need to de-convolute etc disappear - Hydraline FX is literally as easy to assemble as any smooth bore hose.

Details concerning the Assembly Instructions, also the Ferrules and Crimp Diameters are available on page 11.

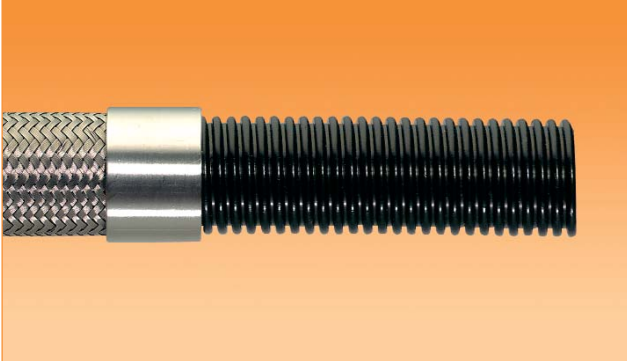
APPLICATIONS

- Automotive and Motorsport - replacing conventional PTFE hoses in ESP systems, fuel systems, braking systems and oil lines.
- Refrigeration : refrigerant feed lines to freezer plates, where the high resistance to permeation, together with the flexibility and chemical resistance, are primary advantages.
- Steam and Gas Lines : where the smooth bore ensures non-turbulent gas flow, leading to noise free operation at higher flow rates, and longer service life.
- Industrial applications in general where the ease of assembly to end fittings together with the higher flow rates, chemical and temperature resistance and resistance to permeation make Hydraline FX the optimum choice.
- Not suitable for use in applications requiring PTFE Lined and Flared End Fittings - for such applications only Bioflex is suitable.

Hydraline FX - The PTFE hose which surpasses all others for ease of assembly and technical advantages.

Antistatic PTFE Linings & Usage Limitations for Hydraline Hoses

ANTISTATIC PTFE LININGS FOR HYDRALINE HOSES



Description

Standard Hydraline Hose linings are made from “Natural”, 100% virgin PTFE, which is translucent white in colour.

Black, antistatic (AS) grade PTFE Linings are, however, an essential requirement in applications where there is the risk of an electrostatic charge build-up on the inside surface of the PTFE tube which may then discharge harmfully, for example, through the PTFE tube wall, to form a leak path.

Media passing through which create such a risk are fluids which have a Conductance of less than 10^{-7} S/m (Siemens per Metre), such as fuels, solvents, freons, and non-polar organics which are being transferred at a medium to high flow velocity.

All twin or multi phase media, and any non-mixing media, such as powder in air, or water droplets in steam, in gases or in oil, also colloidal fluids constitute a particular hazard for static charge generation, and always require grade AS.

If in doubt, consult Aflex Hose.

Design

AS grades of Hydraline Hoses include an anti-static PTFE liner manufactured PTFE, mixed with less than 2.5% Carbon Black material. The carbon is encapsulated by the PTFE, and in normal, non-abrasive applications will not come loose to contaminate any fluid passing through - this is achieved by creating a highly polished inside surface using techniques which are unique to Aflex Hose.

Specifications

The resistance at 500 volts D.C. is measured between the wetted inside surface of the hose liner and an end fitting, and this resistance should not exceed 10^8 ohms. When using an AS hose, at least one end fitting must always be connected to earth.

Stainless Steel wire braided grades of Hydraline AS also meet the requirements of EN12115 which requires that the resistance measured between the end fittings must be less than 10^6 ohms.

USAGE LIMITATIONS FOR HYDRALINE HOSES

Connecting Assemblies For Use In Applications

When being connected for use in applications, the end fittings on hose assemblies must be connected to correct mating parts in the correct way, using the correct tools - spanners, clamps, nuts and bolts etc.

The connections must be sufficiently tightened to ensure that the joint is leak-free, but must not be over-tightened as this can damage the sealing surfaces.

In applications involving the transfer through the hose of expensive or dangerous fluids or gases, the connections must be pressure tested first before being put in to service. This should be done with some harmless media, like water to $1\frac{1}{2}$ times the maximum working pressure of the hose assembly, as defined in this brochure.

If in doubt, consult Aflex Hose for advice.

PTFE Hose - Use with Halogens

When PTFE lined hose is used with the halogens Chlorine and Fluorine, or any corrosive halogen compounds which diffuse easily and are gaseous for example phosgene, then trace quantities may diffuse through the PTFE liner to the outside.

Only trace quantities are required, mixed with atmospheric moisture, to create a serious corrosion condition with stainless steel wire braid in particular.

Also, if any Halogen compounds are present in the environment external to the hose (for example, salt in a sea water spray), and if the temperature of the hose exceeds 50°C (122°F), there is a serious risk of “Chloride Stress Corrosion” of the stainless steel wire braid on the hose.

For such applications, always use the alternative braid materials, either Hastelloy Wire Braid (HB) or PVDF Monofilament Braid (KYB) for fluorine & chlorine, or Polypropylene Braid (PB) for external chlorides, available to special order.

Gas/Fluid Cycling

There are some applications where the fluid passing through the hose turns into a gas, then back into a fluid, then into a gas etc., in a cyclic sequence.

This is normally associated with changes in temperature and/or pressure.

For complex reasons these conditions are extremely damaging to the hose liner, whatever material it is made from.

For example, hoses are sometimes used to pass steam, water, steam etc into rubber moulding presses, in order to heat the mould, then rapidly cool it before reheating in the next cycle. Hoses of all types fail rapidly in such an application, and PTFE lined hose is no exception.

Consult Aflex Hose for further information if these conditions apply.

Assembly Instructions for the Hydraline Range of PTFE Hose

HYDRALINE FX AND HYDRALINE SB

- (1). Cut the hose to the desired length using a cut off machine with a high tensile steel blade, allowing for the length of the end fittings.
- (2). Push the ferrule onto the hose (chamfered end first) and insert the fitting and push into the hose until it meets the collar on the fitting. Align the ferrule over the collar.
- (3). Place the assembly into the swaging machine and swage down the ferrule to the recommended swage dimension as given in Aflex Document AS-42 (below). Check using a vernier or micrometer.

HYDRALINE V (VISIFLON)

- (1). Cut the hose to the desired length using a cut off machine with a high tensile steel blade, allowing for the length of the end fittings.
- (2). Push the ferrules onto the hose (chamfered end first) and push the black de-convoluting tool into the hose turning in a clockwise direction. When the tool is fully inserted give 2 or 3 more turns to complete the process of de-convoluting, then unscrew and remove the tool.
- (3). Insert the fittings. Align the ferrules over the collars.
- (4). Place the assembly into the swaging machine and swage down the ferrule to the recommended swage dimension as given in Aflex Document AS-42 (below). Check the finished swage dimension using a vernier or micrometer.

TESTING

Hydrostatically pressure test all hose assemblies with water to 1.5 times the maximum working pressure as given in this brochure for one minute before supplying for end use.

DOCUMENT AS-42 - FERRULE PART NUMBERS AND SWAGE DIAMETERS

The swage diameters are not listed below, because AS-42 is a Controlled Document.

To find the current swage diameters on the latest Revision of AS-42 **either** consult our website www.aflex-hose.co.uk **or** contact Aflex Hose to request registration, so that Revisions can be issued, now and in future.

Hydraline SB (Smoothbore)

Size in	Ferrule Part Number*
1/4	01-170-04-04-(*03 or 04)
3/8	01-170-06-06-(*03 or 04)
1/2	01-170-08-08-(*03 or 04)
5/8	01-170-10-10-(*03 or 04)
3/4	01-170-12-12-(*03 or 04)
1	01-170-16-16-(*03 or 04)

Hydraline V (Visiflon)

3/8	01-170-06-06-(*03 or 04)
1/2	01-170-08-08-(*03 or 04)
5/8	01-170-10-10-(*03 or 04)
3/4	01-170-12-12-(*03 or 04)
1	01-170-16-16-(*03 or 04)

Hydraline FX

1/4	01-170-04-04-(*03 or 04)
3/8	01-170-06-06-(*03 or 04)
1/2	01-170-08-08-(*03 or 04)
5/8	01-170-10-10-(*03 or 04)
3/4	01-170-12-12-(*03 or 04)
1	01-170-16-16-(*03 or 04)

*Note: Ferrule Part Numbers end in -03 for Stainless Steel (Grade 303 or 304), and -04 for Mild Steel (Zinc Plated).

Hose Length Calculations

Calculating the Hose Length

The formula for calculating the bent section of the hose length around a radius is derived from the basic formula that the circumference of a circle = $2\pi R$, where R = the radius of the circle, and π = a constant, = 3.142.

So, if the hose goes around a 90° bend, which is 1/4 of a full circumference, and the radius of the bend is R, then the length of the hose around the bend is = $1/4 \times 2\pi R$. Or half way round, in a U-shape, = $1/2 \times 2\pi R$.

Note :

In calculating the length of a hose assembly, the (non-flexible) length of the end fittings must be added in, also the length of any straight sections of hose, as in the following example:

Example :

To calculate the length for a 2" bore size hose with flange end fittings, to be fitted in a 90° configuration with one leg 400mm long, the other 600mm long.

$$\begin{aligned} \text{Length of Bent Section (yellow)} &= 1/4 \times 2\pi R \text{ (334)} \\ &= 1/4 \times 2 \times 3.142 \times 334 = \mathbf{525\text{mm}} \end{aligned}$$

$$\begin{aligned} \text{Length of top, Straight Section, including the top end fitting length} &= 600 - 334 = \mathbf{266\text{mm}} \end{aligned}$$

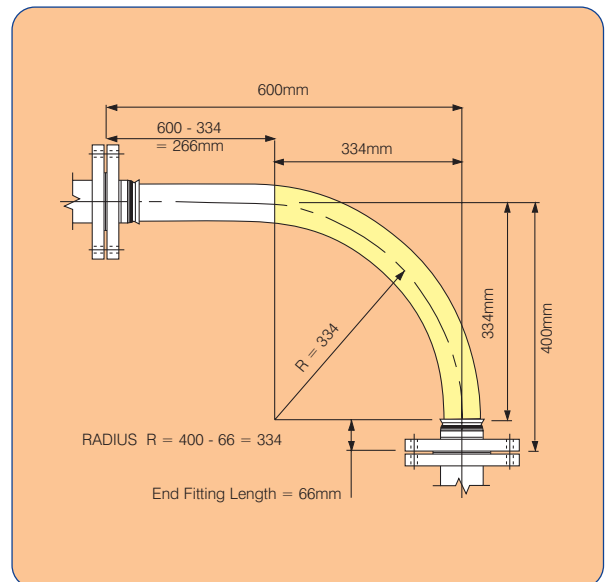
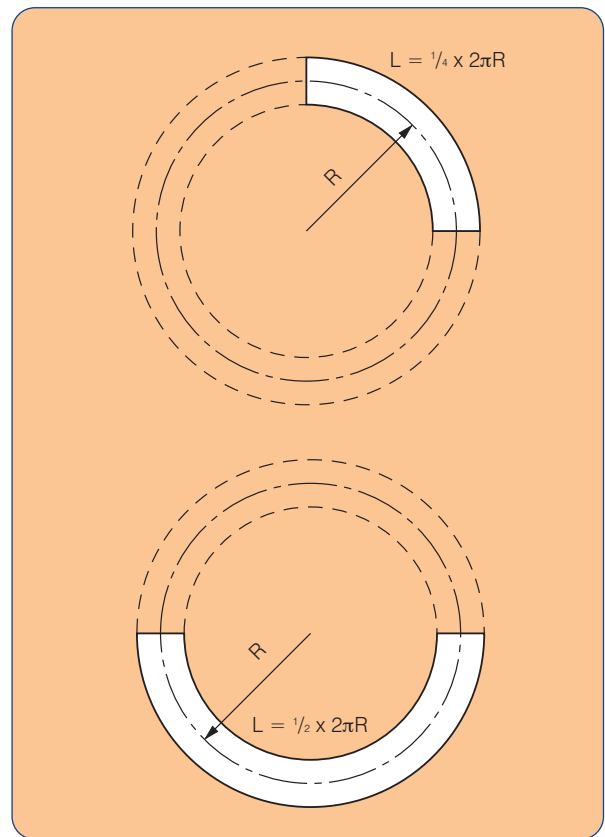
$$\text{Length of bottom end fitting} = \mathbf{66\text{mm}}$$

$$\begin{aligned} \text{Total length of Hose Assembly} \\ &= 525 + 266 + 66 = \mathbf{857\text{mm}} \end{aligned}$$

Things to consider

- A hose will normally take the longest radius available to it to go around a corner, not the MBR! Also - always remember to include the **non-flexible** end fitting lengths.
- In dynamic applications, remember to always calculate the lengths for the most extended configuration during the flexing cycle, not the least extended.
- If the configuration is simply too complex for calculation, then obtain a length of flexible tubing of some kind, mark on paper, or a wall, or floor, or both where the connection points will be relative to each other, scaled down if necessary, then manually run the flexible tubing between them with full radii round bends. Measure the extended length, then scale up if necessary to determine the approximate length of the hose.

If in doubt, consult Aflex Hose.



Conditions of Sale

General

Aflex PTFE hose products have not been designed or tested to be suitable for use in Aerospace or Medical Implantation applications, and such use is therefore strictly prohibited unless written approval from Aflex Hose Ltd has been given.

Similarly, PTFE hose should not be used in any radio active environment as radiation has a detrimental effect on the mechanical and electrical properties of PTFE.

Aflex Hose Ltd will not accept liability for any failures of the Aflex Hose Products which are caused by customers failing to perform their Responsibilities as specified in these Conditions of Sale.

It is the customer's strict Responsibility to review all of the usage limitations given for the hose which he intends to use in an application, to ensure that the application conditions are in compliance with those usage limitations. The usage limitations are specified both on this page, and throughout the relevant sections under "Products and Information" on the Aflex Hose website. Customers must always consult the latest, up to date information, which is available and downloadable from the Aflex website, or request from Aflex Hose Ltd.

It must be accepted, however, that the usage limitations specified elsewhere in the Hose Product Information and on this page are intended as a guide only, since every possible factor in every type of application cannot possibly be covered. It is therefore the Customer's Responsibility to ensure the design suitability and safety of the products in their intended applications, giving particular consideration to the chemical and electrostatic compatibility of the fluids or gases passing through, the possibility of diffusion of fluid or gases through the PTFE hose lining, the possibility of external corrosive conditions, the types and likelihood of excessive mechanical abuse, such as abrasion (internal or external), crushing, excessive flexing or vibrations etc, and any excessive temperature and/or pressure "pulsing" conditions, all of which may cause premature hose failure. It is also the Customer's Responsibility to consider, and take account of the degree of risk involved in any hose failure, including the provision of adequate protection in the event of any risk to employees or the general public. In applications where any type of hose failure would lead to financial losses if the hose is not replaced immediately, it is the Customer's Responsibility to order and hold in stock spare hose(s) accordingly. It is also the Customer's Responsibility to advise Aflex Hose in writing if there are any special requirements for the hose, including cleaning, or drying, or extra testing requirements which are in addition to normal industrial standards.

If the Customer has any doubts concerning these or any other usage limitation or safety parameters, it is the Customer's Responsibility to consult Aflex Hose Ltd, to request a written response to any queries.

It is the Responsibility of the Customer to ensure that if the product is sold on, or passed on, however many times, that all the necessary information including this page and the Aflex Hose website address are also passed on to the final user, together with a specific requirement that the final user must review the usage limitations in terms of his own application.

Hose Service Life

It is not possible to guarantee a minimum service life for any of the Aflex Hose products which can be applicable for every type of application.

(For example, PTFE lined hose has been used in one application where it was cycled with hot steam, then cold water, also flexed every 17 seconds 24 hours per day, and the customer was very satisfied with a service life of 3 weeks before failure. In other light duty applications carrying pharmaceutical products, however, many Corroflon hoses are still performing satisfactorily after 20 years in service).

Service life predictions or guarantees can only be given in cases where all the relevant information concerning the application is given in writing to Aflex Hose, and Aflex Hose subsequently replies in writing prior to the order being placed.

If such a written undertaking is not sought and given, then Aflex Hose cannot be held liable for any hose product failure which the customer considers to be premature, excepting failures which are due to faulty materials or manufacturing defects.

24 Month Warranty

Aflex Hose Ltd warrants its products to be free from faulty materials or manufacturing defects from the date of the initial sale, for 24 months.

Product Failure

In the event of a product failure, Aflex Hose requests that the product should not be cut up or tampered with, but should be de-contaminated and returned to Aflex Hose, plus a decontamination certificate, for examination and analysis of the fault. The customer should also provide full details in writing of the application conditions under which the hose failed, including Pressure, Vacuum, Temperature, Flexing and any cycling of any of these, also the fluid and gases passing through the hose, and the total time that the hose has been in service. The customer may send his own witness to the examination if required. Aflex Hose will provide a full Non Conformance Report for the customer.

If faulty materials or a manufacturing defect in the hose was responsible for the failure to perform then, the maximum liability to be accepted by Aflex Hose would include the invoice value of the failed hose itself, or the invoice value of the whole customer order if appropriate, also any reasonable costs for removal and replacement of the hose, and costs for packing and despatching the failed hose back to Aflex Hose. Aflex Hose Ltd will not accept liability for any other consequential or financial losses, including, but not limited to loss of profits, loss of products or downtime costs.

Untested Hose for Self Assembly by Customers

Aflex Hose sometimes supplies "loose" hose, without end fittings attached to Self Assembly Customers, who will then cut the hose to length and attach end fittings to make up Hose Assemblies.

Self Assembly Customers must then accept the responsibility to carry out pressure testing of 100% of such assemblies to 1 1/2 times the Maximum Working Pressure before supply for end use, to validate both the hose and the end fitting attachment.

Unless the customer requests, and Aflex Hose confirm that their loose hose is pressure tested before supply, such testing is not normally applied by Aflex Hose, because this testing requirement is satisfied by the Self Assembly Customer during his own testing of the finished Hose Assembly.

The Self Assembly Customer must also accept responsibility for determining and approving the Design Suitability of the hose assemblies for their intended use before supply.

This includes determining and requesting or applying any special tests which may be identified as necessary to ensure suitability for the intended use.

Aflex Hose will only accept liability for its hose products which are assembled by customers themselves if all the hose and fitting components were either supplied by Aflex Hose or manufactured in accordance with Aflex Hose drawings, and they were assembled and tested in accordance with Aflex Hose's current Manufacturing and Testing Instructions.

Untested Hose Assemblies

Aflex Hose is sometimes requested by customers to attach non-standard end fittings to hose assemblies which they supply, and in some cases it is not possible to connect these fittings to the pressure test system. In such cases a Concession not to test is obtained from the Customer, and a label is attached to the hose assembly, warning that it requires pressure testing before use.

Force Majeure

Aflex Hose Ltd shall not be liable for any delay or default in performing in accordance with any Customers' order if the delay or default is caused by conditions beyond its control, including, but not limited to wars, insurrections, strikes, natural disasters or performance failures by Carriers, sub-contractors or other third parties outside the control of Aflex Hose Ltd.

Legal System

These Conditions of Sale are subject to English Law.

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