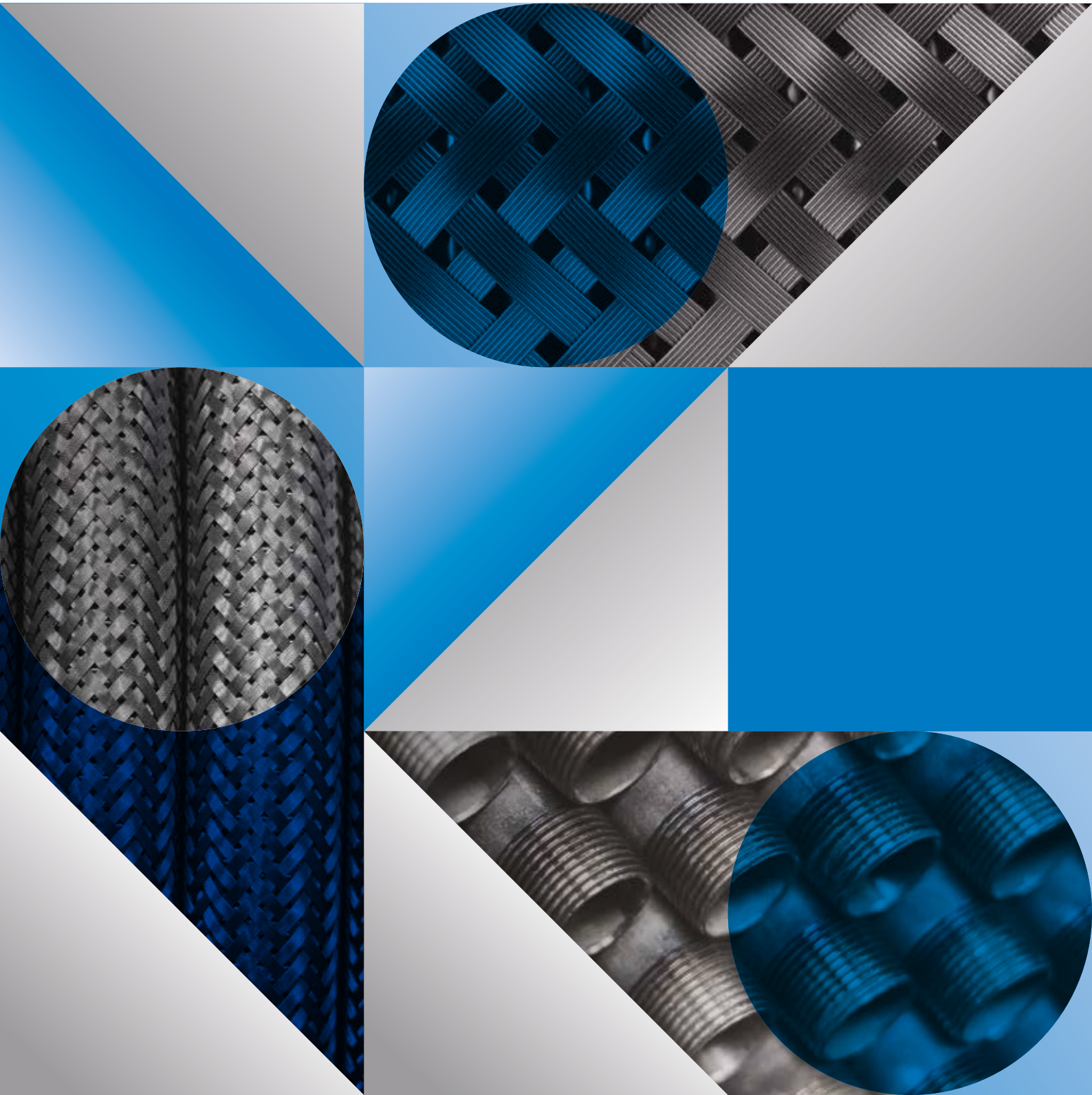
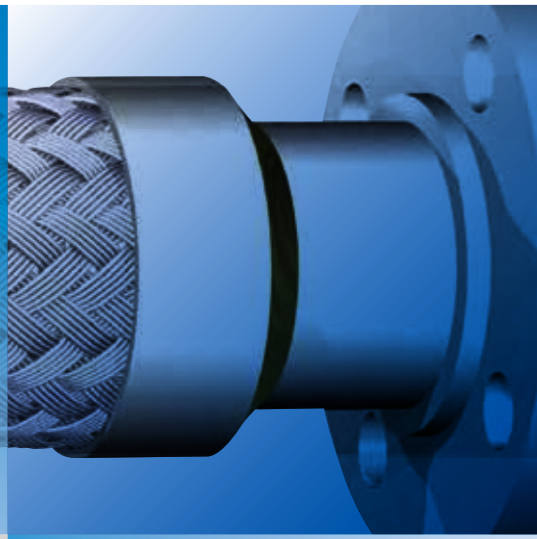
Amnitec

Flexible Metalic Hose Braid & Assemblies





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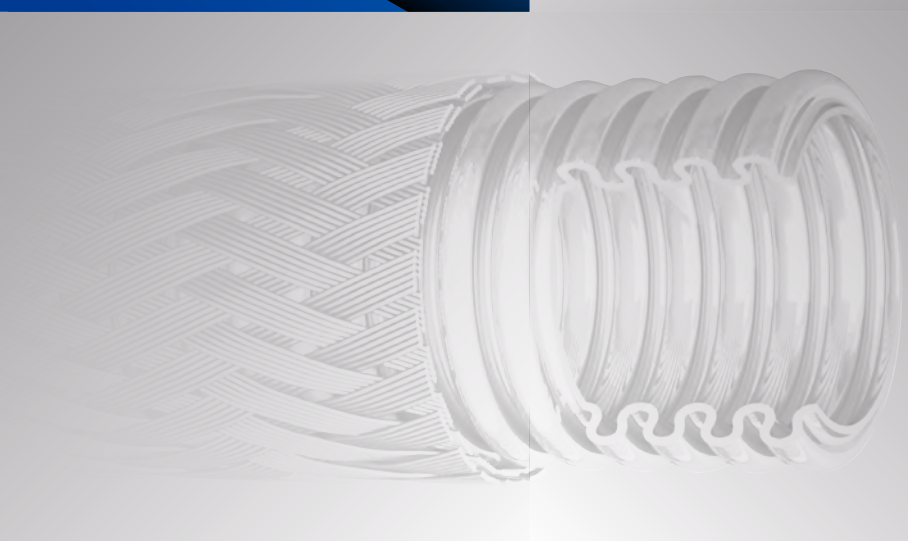


STAMPED Design and Application Guide

The selection of the correct metal hose is critical to ensure optimum field performance. To accomplish this, there are a number of important application requirements to consider.

The guide below will help the specifier to identify the requirements and design the most effective product.

The word STAMPED is a useful acronym checklist to refer to when specifying a hose.

Note: This guide is to assist you in the selection and application of flexible metal hose for your particular requirements.

The information and data contained within is the result of years of experience and research in flexible metal hose. All information and data contained herein is subject to change (without notice) at any time.

As we do not supervise or control the installation and use of our products, we cannot be responsible for their performance or for the improper application and usage of the data.

If you need help specifying a hose, or require a bespoke solution, contact us on **+44 (0)1685 385641**.

S	T	A	M	P	E	D
SIZE	**TEMPERATURE**	**ALLOY**	**MOTION**	**PRESSURE**	**ENDS**	**DISTANCE**
Inside diameter (I.D.), outside diameter (O.D.).	Temperature of material being conveyed (high, low, ambient), of outside environment (high, low, ambient), intermittent or constant.	Service temperature range, strength, corrosion resistance, chemical compatibility.	Static (one time routing) or dynamic motion (flexing and cycling), vibration, minimum bend radius.	Maximum working pressure, safety factor and burst pressure, flow rate, impulse or pressure surges.	Male or female, fitting type and material, swivel or non-swivel, orientations and alignment.	Hose length (overall, live length, seat to seat), tolerances.

SIZE SELECTION FACTORS

HOSE DIAMETER

Inner diameter refers to the free cross-section of the hose and is also known as nominal diameter. It indicates the approximated inside diameter and guarantees that parts with the same nominal diameter will fit together. The outside diameter refers to the external diameter of metal hose, measured from the top of the corrugation (or braiding/other outside protection).

FLOW VELOCITY

Where flow velocity exceeds 30 m/sec gas or 15 m/sec liquid, in unbraided hose, or 45 m/sec gas or 22 m/sec liquid, in braided hose, a flexible metal liner of fully interlocked hose should be used. When the hose is installed in a bent condition, these flow values should be reduced by 50% for a 90° bend, 25% for a 45° bend, and so on, proportional to the angle of bend.

In cases where velocity exceeds the above values, the next larger size corrugated hose should be used with the flexible interlock liner size equivalent to the mating pipe size.

PRESSURE DROP

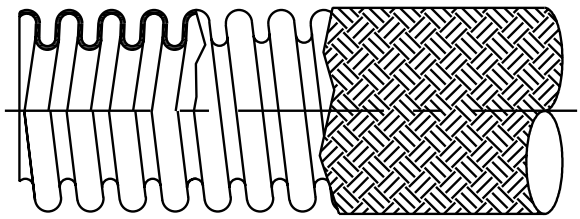
Where the amount of pressure drop through longer lengths of hose is a significant factor, a larger diameter hose may be required. As a broad rule of thumb, pressure drop through a corrugated metal hose is approximately three times that in comparably sized standard steel pipe.

For more accurate calculations of pressure drop, contact us on **+44 (0)1685 385641**.

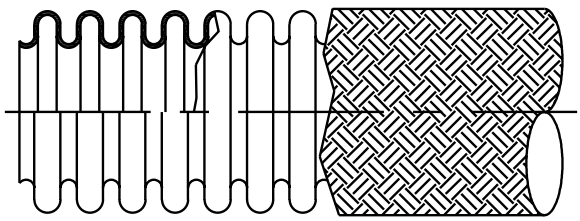
CORRUGATION PROFILE

Annular profile: Independent corrugations, straight and parallel.
Helical profile: One continuous corrugation that spirals around the hose.

HELICAL HOSE CONSTRUCTION IN PROFILE W/SINGLE LAYER OF BRAID



HELICAL HOSE CONSTRUCTION IN PROFILE W/SINGLE LAYER OF BRAID



TEMPERATURE SELECTION FACTORS

MAXIMUM SERVICE TEMPERATURES OF MATERIALS

Alloy	Max Temp °F	Max Temp °C
Hastelloy® C276	2000	1093
Inconel®625	1800	982
AISI Stainless Steel Type:	50	200
321	1500	815
316 ELC	1500	815
304L	1500	815
304	850	454
302	850	454
Mild Steel	850	454
Malleable Iron	800	427
Monel®	800	427
Bronze	450	232
Brass	450	232
Copper	400	204
Brazing (RCuZn-c or BCuP-2) Bronze Hose	450	232
Silver Brazing (AWS-Bag-2)	600	315
Aluminum 52S-0 (5052-0)	600	315
Galvanizing	450	232
Soft Solder		
(Pb: 60, Sn:40)	250	121
(PB: 95, Sn: 5)	350	177
Silicone Coated Fiberglass	600	315
Aluminized Fiberglass	1000	538

MAXIMUM SERVICE TEMPERATURES OF MATERIALS

Operating temperature at which the material will operate effectively, which varies based on the application. Outside this range of safe operating temperatures, the hose and braid may fail.

TEMPERATURE DERATING

	Temp °C	20	50	100	150	200	250	300	350	400	450	500	550	600	650
Material	304 SS	1	0.88	0.73	0.66	0.60	0.56	0.52	0.50	0.48	0.47	0.46	0.42	-	-
	321 SS	1	0.92	0.83	0.78	0.74	0.71	0.67	0.64	0.62	0.61	0.60	0.59	-	-
	316 SS	1	0.88	0.74	0.67	0.62	0.58	0.54	0.52	0.50	0.48	0.47	0.47	-	-
	Alloy C276	1	0.97	0.92	0.88	0.83	0.79	0.74	0.72	0.70	-	-	-	-	-
	Alloy 400	1	0.94	0.86	0.81	0.77	0.75	0.74	0.74	0.74	0.73	-	-	-	-
	Alloy 625	1	0.95	0.88	0.84	0.80	0.78	0.75	0.73	0.70	0.68	0.65	0.64	0.63	0.50
	Alloy 825	1	0.95	0.89	0.83	0.77	0.75	0.74	0.72	0.70	0.68	0.67	0.66	-	-

TEMPERATURE DERATING

For operating temperatures in excess of 70°F (21°C), the tabulated pressures must be decreased in accordance with the 'conversion factors' listed in the table below. Since the pressure ratings are based on annealed material properties, no reduction in pressure rating is necessary for fitting attachment by TIG welding, brazing, or soft solder.

ALLOY SELECTION FACTORS

300 SERIES STAINLESS STEEL (AUSTENITIC)

The general grouping of the austenitic stainless steels is: 302, 303, 304, 304L, 316, 316L, 316Ti, 321, 347 etc.

304 STAINLESS STEEL UNS S30400/EN 1.4301

304 is the most commonly used stainless in the world, often referred to as 18/8. It is weldable, machinable with the right techniques and has good corrosion resistance.

304L STAINLESS STEEL UNS S30403 / EN 1.4307

304L has reduced or low carbon to eliminate carbide precipitation due to welding so the alloy can be used in the 'as welded' condition even in severe corrosive conditions.

316 STAINLESS STEEL UNS S31600 / EN 1.4401

316 stainless steel is 18/8 with the inclusion of molybdenum (Mo) in the alloy to give better overall corrosion resistant properties than grade 304, particularly higher resistance to pitting and crevice corrosion in chloride environments.

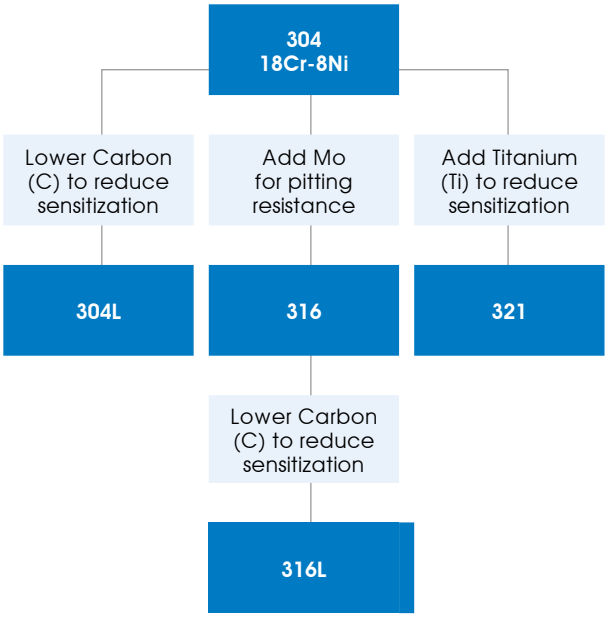
316L STAINLESS STEEL UNS S31603 / EN 1.4404

316L has reduced or low carbon to eliminate carbide precipitation and offers higher creep, stress to rupture and tensile strength at elevated temperatures.

321 STAINLESS STEEL UNS S32100 / EN 1.4541

Type 321 is an austenitic chrome nickel steel stabilized with titanium. This material has similar properties to alloy 304, but its titanium content limits carbide precipitation, improving high temperature performance.

This grade is recommended for parts fabricated by welding which cannot be subsequently annealed.



Need to know performance against a specific chemical?

See our corrosion charts on the following pages or contact our technical sales team on **+44 (0)1685 385641.**

BRONZE®

Alloy consisting of primarily copper (Cu) and around 12% tin (Sn) alloy.

MONEL® 400. UNS N04400 / EN 2.4360

A high nickel-copper alloy which offers superior strength and corrosion resistance with a wide range of media including seawater and chlorine.

INCONEL® 625. UNS N06625 / EN 2.4856

A nickel-chromium-molybdenum super alloy with an addition of niobium that acts with the molybdenum to stiffen the alloy matrix and provides ultra-high strength without the need for heat treatment. This material provides superior resistance to pitting and crevice corrosion.

HASTELLOY® C-276. UNS N10276 / EN 2.4819

A nickel-chromium-molybdenum super alloy with the addition of tungsten designed to have excellent corrosion resistance for severe environments. Especially resistant to pitting and crevice corrosion. Resistant to the formation of grain boundary precipitants in the heat affected zone, making is suitable for most chemical process applications in an as-welded condition.

CHEMICAL RESISTANCE TABLES

These charts contain recommendations based on published corrosion data for valid laboratory or field tests. This data should be used only as a guide and is not a guarantee of actual service performance. It is recommended that users test the combination before connecting the product to any application.

For additional information please contact our technical sales team on **+44 (0)1685 385641**

NACE MR0175-2009/ISO 15156-2009 COMPLIANCE

Materials Amnitec specifies and uses in the manufacturing of hose and braid are compliant to NACE MR0175-2009/ISO 15156-2009 for use in sour environments as defined.

Austenitic stainless steels of the grades listed below meet the requirements of NACE MR0175-2009/ISO 15156-2009 Section A.2.1 for use in sour environments as defined by tables A.2 through A.7.

- 304 (UNS S30400)
- 304L (UNS S30403)
- 316 (UNS S31600)
- 316L (UNS S31603)
- 321 (UNS S32100)

High alloy austenitic stainless steels of the grades listed below meet the requirements of NACE MR0175-2009/ISO 15156-2009 section A.3.1 and table A.8 material type 3a for use in sour environments as defined by tables A.8 through A.11.

- Inconel® 600 (UNS N06600)
- Inconel® 625 (UNS N06625)

Did you know?

When NASA/Boeing needed a flexible high pressure connector on a tight schedule, our team developed a very flexible hose at high pressure to meet NASA's standards.

It is now in use on the International Space Station and enables the ISS to process its own gases. Our hose also serves as a lifeline for astronauts. This problem had never been solved before.

FLUID/SERVICE CONDITION	304SS	316SS	321SS	ALLOY 400	CARBON STEEL
Acetic acid 5% to 20% agitated or aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Acetic acid 50%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Acetic acid 50% to 80%, boiling	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Acetic acid 80%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Acetic acid 100%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Acetic acid 100%, boiling	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Acetic anhydride	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Acetone, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Acetyl chloride, boiling	Partially Resistant	Partially Resistant	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Acetylene concentrated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Acetylene commercially pure	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Acid salt mixture	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Air	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Aluminium acetate, saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Aluminium chloride 10%, quiescent	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Aluminium chloride 25%, quiescent	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Aluminium hydroxide, saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Aluminium sulfate 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Aluminium sulfate 10%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Aluminium sulfate 10%, boiling	Partially Resistant	RECOMMENDED	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Aluminium sulfate saturated, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Aluminium sulfate saturated, boiling	Partially Resistant	RECOMMENDED	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Aluminium potassium sulfate (alum) 2% to 1%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Aluminium potassium sulfate (alum) 10%, boiling	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Aluminium potassium sulfate (alum) saturated	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Ammonia (anhydrous) All concentrations	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Ammonia (anhydrous) hot gas	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Ammonia liquor 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED

FLUID/SERVICE CONDITION	304SS	316SS	321SS	ALLOY 400	CARBON STEEL
Ammonia liquor boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Ammonium bromide	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Ammonium carbonate, 1 % and 5 %	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	RECOMMENDED
Ammonium chloride 1%	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Ammonium chloride 10%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Ammonium chloride 28%	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Ammonium chloride 50%	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Ammonium dihydrogen orthophosphate (Ammonium phosphate), 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Ammonium hydrogen carbonate (Ammonium bicarbonate), hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Ammonium monophosphate	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Ammonium oxalate, 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Ammonium perchlorate, 10%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Ammonium peroxodisulfate (Ammonium persulfate), 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Ammonium solution (Ammonium hydroxide) all concentrations	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Ammonium sulfate 1%, aerated or agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Ammonium sulfate 5%, aerated and agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Ammonium sulfate 10%, saturated	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Ammonium sulfite, 20 oc, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Amyl acetate, concentrate	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Amyl chloride	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Aniline 3%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Aniline concentrated crude	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	RECOMMENDED
Argon (refrigerated liquid)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Barium carbonate	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Barium chloride, 5%, saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Barium hydroxide, aqueous solution, hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Barium nitrate, aqueous solution, hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Barium sulfate (Barytes-blanc fixe)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Barium sulfide, saturated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Benzene (Benzol) 20°C or hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Benzoic acid	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	RECOMMENDED
Bitumen	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Butane -50°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Butane 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Butyl acid 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Butyl acid aqueous solution, dilution of 0.964 g/l	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Calcium carbonate	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Calcium chlorate, dilute solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Calcium chlorite, dilute or concentrate solution	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Calcium hypochlorite, 2 %	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Calcium hydroxide, 10 % to 20 %	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Calcium sulfate, saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Carbonated water	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Carbonic acid, saturated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Carbon dioxide Dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Carbon dioxide moist	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Carbon disulfide (Carbon bisulfide)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Carbon tetrachloride CP	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Carbon tetrachloride dry CP	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Carbon tetrachloride commercial + 1 % water	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Cellulose	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Chloracetic acid	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Chlorbenzol, concentrated, pure, dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Chlorine gas dry	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	Partially Resistant
Chlorine gas moist	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Chlorinated water, saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Chloroform	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Chromium (VI) oxide (Chromic acid) 5% CP	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Chromium (VI) oxide (Chromic acid) 10%	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Chromium plating bath	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant

FLEXIBLE METALLIC HOSE, BRAID AND ASSEMBLIES

FLUID/SERVICE CONDITION	304SS	316SS	321SS	ALLOY 400	CARBON STEEL
l-chloro-2,4-dinitrobenzene (Dinitrochlorobenzene) melted and solidified	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Chloroethane (Ethyl chloride)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Citric acid 5%, still	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Citric acid 15%, still, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Citric acid 15% boiling	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Copper (II) acetate, saturated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Copper (III) carbonate, saturated solution in 50% NH4OH	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Copper (II) cyanide, saturated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Copper (II) nitrate 1% still, agitated and aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Copper (II) nitrate 5% still, agitated and aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Copper (II) nitrate 50% aqueous solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Copper (II) sulfate 5% agitated still or aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Copper (II) sulfate saturated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Creosote (coal tar)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	RECOMMENDED
Creosote oil	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Cyanogen gas	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Developing solutions	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
1,2-Dichloroethylene (Dichloroethane) dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Diethyl ether (Ether)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	RECOMMENDED
Disodium tetraborate (Borax), 5 %	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	RECOMMENDED
Distillery wort	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Dyewood liquor	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Ethanediol (Ethylene glycol)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Ethanol (Ethyl alcohol) 20 oc and boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Ethyl acetate, concentrated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	RECOMMENDED
Ethylene chloride	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Fluorine (gas) moist	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Fluorosilicic (Hydrofluosilicid acid)	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	Partially Resistant
Formaldehyde, 40 % solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED
Formic acid 5%, still, 20°C	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Formic acid 5%, still, 66°C	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Fuel oil	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Fuel oil containing sulfuric acid	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
2-Furaldehyde (Furfural)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Gelatin	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Glue dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	RECOMMENDED
Glue solution, acid	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	Partially Resistant
Glycerol (Glycerine)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Hydrochloric acid, all concentrations	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Hydrocyanic acid	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Hydrofluoric acid	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Hydrogen peroxide 20°C	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Hydrogen peroxide boiling	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Hydrogen sulfide dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Hydrogen sulfide wet	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Ink	Partially Resistant	RECOMMENDED	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Iodoform	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Iron (II) chloride (Ferrous chloride) saturated solution	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) chloride (Ferric chloride) 1% solution, 20°C	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) chloride (Ferric chloride) 1% solution, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) chloride (Ferric chloride) 5% solution agitated, aerated	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (II) hydroxide (Ferric hydroxide) (hydrated iron oxide)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Iron (III) nitrate (Ferric nitrate) 1% to 5% quiescent or agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) nitrate (Ferric nitrate) 1% to 5% aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (II) sulfate (Ferrous sulfate) dilute solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) sulfate (Ferric sulfate) 1% to 5% quiescent or agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) sulfate (Ferric sulfate) 1% to 5% aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Iron (III) sulfate (Ferric sulfate) 10%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Kerosene	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Lactic acid 1%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED

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Lactic acid 1%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Lactic acid 5%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Lactic acid 5%, boiling	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Lactic acid 10%, 20°C	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Lactic acid 10%, boiling	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Lactic acid concentrated, 20°C	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Lactic acid concentrated, boiling	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Lead diacetate (Lead acetate) 5 %	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Linseed oil	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Magnesium chloride 1% quiescent, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Magnesium chloride 1% quiescent, hot	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Magnesium chloride 5% quiescent, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Magnesium chloride 5% quiescent, hot	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Magnesium sulfate	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Malice acid	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Mash	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Mercury	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	RECOMMENDED
Methane (refrigerated liquid)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Methanol (Methyl alcohol) boiling	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Mixed acids, 53% H2SO4 + 45% HNO3	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Molasses	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Mustard	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Naphtha crude	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Naphtha pure	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Naphthalene sulfonic acid	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Nickel chloride solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Nickel sulfate	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Nitre cake	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Nitric acid 5%, 50%, 70%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Nitric acid 65%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Nitric acid 65%, boiling	Partially Resistant	Partially Resistant	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Nitric acid concentrated, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Nitric acid concentrated, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Nitric acid fuming concentrated, 43°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Nitric acid fuming concentrated, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Nitrogen (refrigerated liquid)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Nitrous acid, 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Oils, crude	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Oils, vegetable, mineral	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Oleic acid	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Orthoboric acid (Boric acid) 5% solution, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthoboric acid (Boric acid) 5% solution, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthoboric acid (Boric acid) saturated solution, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthoboric acid (Boric acid) saturated solution, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 1%, 20°	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 1%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 1% 3, 1 bar, 140°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 5% quiescent, or agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 5% aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 10% quiescent	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 10% agitated or aerated	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 10%, 50%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 80%, 20°C	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 80%, 110°C	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Orthophosphoric acid (Phosphoric acid) 85%, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Oxalic acid 5%, 10% 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Oxalic acid 10%, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Oxalic acid 25%, 50%, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Oxygen (refrigerated liquid)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Paraffin, hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant

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Petrol	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Petroleum ether	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Phenol	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Picric acid	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Potassium bromide	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Potassium carbonate 1%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Potassium carbonate Hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Potassium chlorate saturated at 100 C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Potassium chloride 1% quiescent	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium chloride 1% agitated or aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium chloride 5% quiescent	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium chloride 5% agitated or aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium chloride 5%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium chromium sulfate 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Potassium chromium sulfate dilution of 1.6 g/L	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Potassium cyanide	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Potassium dichromate (Potassium bichromate) 25%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Potassium dichromate (Potassium bichromate) 25%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Potassium hexacyanoferrate (III) (Potassium ferricyanide) 5%, 25%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Potassium hexacyanoferrate (III) (Potassium ferricyanide) 25 %, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Potassium hexacyanoferrate (II) (Potassium ferrocyanide) 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Potassium hydrogen oxalate (Potassium oxalate) 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Potassium hydrogen oxalate (Potassium oxalate) 27%	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Potassium hydrogen oxalate (Potassium oxalate) 50%	Partially Resistant	RECOMMENDED	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Potassium hypochlorite	Partially Resistant	Partially Resistant	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Potassium nitrate 1%, 5% still or agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium nitrate 1%, 5% aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium nitrate 50%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium nitrate 50%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Potassium nitrate molten	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Potassium permanganate, 5 %	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Potassium sulfate 1%, 5% still or agitated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Potassium sulfate 1%, 5% aerated, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Potassium sulfate hot	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Potassium sulfite (salt)	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Propane -50°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Propane 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Pyrogallol (Pyrogallic acid)	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Quinine bisulfate, dry	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Quinine sulfate, dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Resin	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sea water	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Silver bromide	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Silver nitrate	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Soap	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Sodium acetate, moist	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sodium carbonate 5%, 66°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Sodium carbonate 5%, 50%, boiling	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Sodium carbonate molten	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium chloride 5% still	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium chloride 20% aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium chloride saturated, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium chloride saturated, boiling	Partially Resistant	RECOMMENDED	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Sodium cyanide	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Sodium fluoride, 5% solution	Partially Resistant	RECOMMENDED	Partially Resistant	RECOMMENDED	NOT RECOMMENDED
Sodium hydrogen carbonate (Sodium bicarbonate) all concentrations, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium hydrogen carbonate (Sodium bicarbonate) 5% still, 66°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium hydrogen sulfate (Sodium bisulfate) solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED

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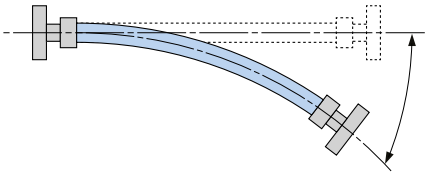
Sodium hydrogen sulfate (Sodium bisulfate) saturated solution	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sodium hydroxide	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Sodium hypochlorite	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sodium nitrate	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Sodium perchlorate, 10%	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sodium phosphate	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Sodium sulfate 5% still	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium sulfate all concentrations	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium sulfate disodium sulfide, saturated	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Sodium sulfite 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sodium sulfite 10%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sodium thiosulfate saturated solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sodium thiosulfate acid fixing bath (hypo)	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sodium thiosulfate 25% solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sodium thiosulfite (Sodium hyposulfite)	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Steam	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Stearic acid	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Starch, aqueous solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Strontium hydroxide	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Strontium nitrate solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sulfur moist	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Sulfur molten	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Sulfur chloride, dry	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sulfur dioxide gas moist	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Sulfur dioxide gas dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Sulfuric acid 5%, 10%	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfuric acid 50%	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfuric acid concentrated, 20°	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfuric acid concentrated, boiling	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfurous acid saturated	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfurous acid saturated, 4 bar pressure	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfurous acid saturated, 8 bar pressure	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Sulfurous acid 10 bar pressure	NOT RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Tannic acid 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Tannic acid 66°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Tanning liquor	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Tar	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	Partially Resistant
Tartaric acid 10%, 20°C	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Tartaric acid 10%, 50%, boiling	Partially Resistant	RECOMMENDED	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Tin (IV) chloride (Stannic chloride solution) (dilution of 1.21 g/l)	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Tin (II) chloride (Stannous chloride) saturated	NOT RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Trichloroacetic acid	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Trichloroethylene dry	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Trichloroethylene moist	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
3,4,5-Trihydroxybenzoic acid (Gallic acid) 5%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
3,4,5-Trihydroxybenzoic acid (Gallic acid) saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Varnish	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Vegetable juices	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	Partially Resistant
Vinegar fumes	Partially Resistant	RECOMMENDED	Partially Resistant	NOT RECOMMENDED	NOT RECOMMENDED
Vinegar, still, agitated or aerated	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Water, potable	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant
Whisky	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Wine, all phases of processing and storing	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Yeast	RECOMMENDED	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED
Zinc chloride 5% still	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Zinc chloride 20°C boiling	Partially Resistant	Partially Resistant	Partially Resistant	Partially Resistant	NOT RECOMMENDED
Zinc cyanide, moist	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Zinc nitrate, solution	RECOMMENDED	RECOMMENDED	RECOMMENDED	NOT RECOMMENDED	NOT RECOMMENDED
Zinc sulfate 4%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Zinc sulfate 25%	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED
Zinc sulfate saturated	RECOMMENDED	RECOMMENDED	RECOMMENDED	Partially Resistant	NOT RECOMMENDED

MOTION SELECTION FACTORS

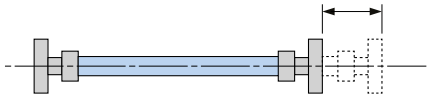
MOTION TYPES

Most industrial applications can be reduced to one of five classes of motion: **angular, axial, offset, radial or random.**



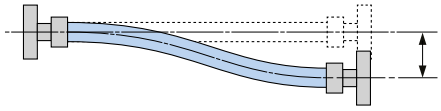
ANGULAR

Motion that occurs when one end of a hose assembly is deflected in a simple bend with the ends not remaining parallel. Angular motion may be incorporated into an installation to accommodate misalignment and vibration only but must not be used to accommodate expansion that would result in unloading the braid.



AXIAL

This type of motion occurs when one end of a hose assembly is deflected along its longitudinal axis. Axial motion is applicable to annular corrugated, unbraided flexible hose only. Neither helical hose nor braided hose should be used in axial motion applications.



OFFSET

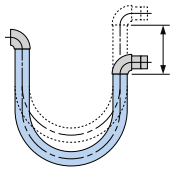
Motion that occurs when one end of the hose assembly is deflected in a plane perpendicular to the longitudinal axis with the end remaining parallel. Offset is measured in inches of displacement of the free end centreline from the fixed end centreline. In offset motion applications, the offset should never be greater than one fourth (25%) of the minimum centreline bend radius.

RADIAL

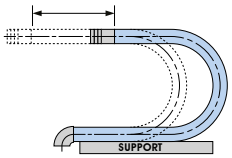
This type of motion occurs when the centreline of a hose assembly is bent in a circular arc. In industrial applications, radial motion is most commonly found in travelling loops.

CLASS "A" TRAVELING LOOPS

For maximum vertical travel

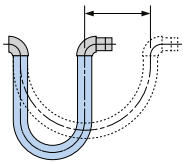


For maximum horizontal travel

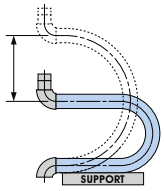


CLASS "B" TRAVELING LOOPS

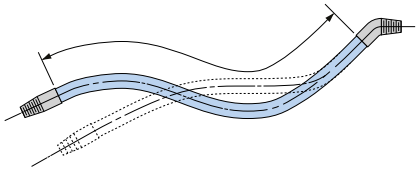
For Short Horizontal Travel



For Short Vertical Travel



RANDOM



Non-predictable motion that occurs from manual handling of an assembly. Loading and unloading hose would generally fall into this category. Abusive handling of hose is an important factor
to consider in applications involving random motions. The use of an interlocked (RT-6) guard over the corrugated hose is recommended to protect the hose assembly from rough handling and'over-bending' adjacent to the fittings.

MOTION FREQUENCY

The frequency of a particular class of motion to which a flexible metal hose may be subjected by repeated flexing or bending.
The frequency of motion may be divided into three basic categories: **vibration, dynamic, and continuous**.

The minimum live length required for these motion categories may be selected as follows:

VIBRATION

For the normal vibration encountered in industrial applications, such as pump and compressor discharge lines and engine exhaust installations, the hose live lengths should be taken from the minimum live length for vibration column on technical data pages.

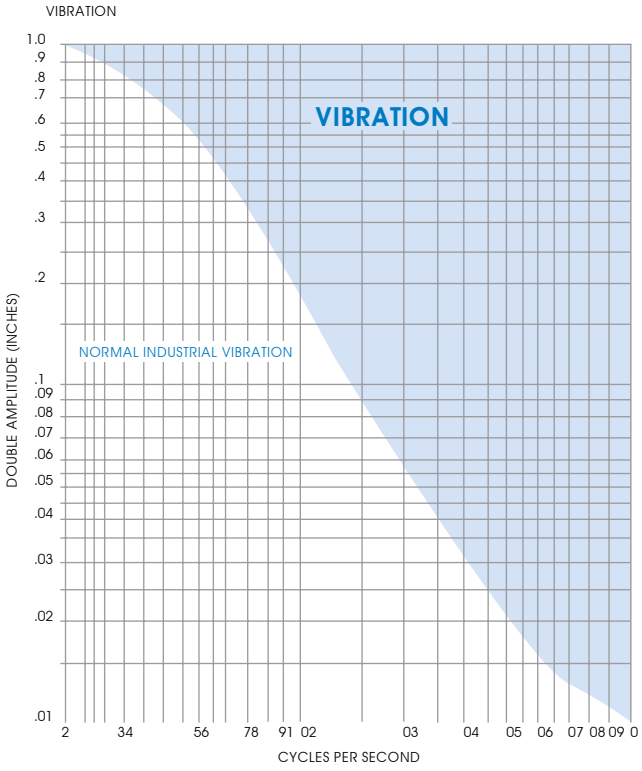
Normal vibration is shown as the unshaded area of the chart below. If the expected combination of double amplitude, (total motion excursion), and frequency falls into the shaded area, contact us for more information.

DYNAMIC MOTION

Motion that occurs on a regular or irregular basis normally the result of thermal expansion and contraction or other non-continuous actions. The dynamic flexing bend radius shown on hose technical data pages shall be used in the formulas for angular, radial and offset motion when determining hose live length for dynamic motion.

CONTINUOUS MOTION

Motion that occurs on a regular cyclic basis normally at a slow rate and constant travel for continuous lateral offset motion, double the minimum centreline bend radius for dynamic flexing shown on hose technical data pages.



Note: This information should be used as a guide only.
We cannot predict every variable which might be encountered in every application nor any misapplication, mechanical damage, and/or any uncontrollable situation.

CAUTION

Avoid hose resonance.
If resonance is anticipated, consult the Amnitec technical team on **+44 (0)1685 385641**.

STATIC BEND

The minimum centreline bend radius to which a flexible metal hose may be bent for installation. No further motion is to be imposed other than normal vibrattion.

CYCLE LIFE

The cycle life expectancy of a metal hose is affected by various factors such as: operating pressure, operating temperature, materials, bend radius, (the movement per corrugation due to the flexure), and thickness of the corrugation. Change in any one of these factors will result in a change in the cycle life of a metal hose assembly.

The cycle life of a metal hose assembly is proportional to the sum of the pressure stress range and deflection stress range. The life expectancy can be defined as the total number of competed cycles which can be expected from the metal hose assembly based on S/N curves and data tabulated from tests performed under simulated operating conditions.

A cycle is defined as one complete movement from the initial position in the system to some operating point and returning to the original position.

PRESSURE SELECTION FACTORS

PRESSURE RATINGS

Amnitec pressure ratings are in accordance with industry-wide good practice and are consistent with the requirements of:

- USA Standard Code for Pressure Piping and the ASME Boiler and Pressure Vessel Code, Sec. VIII.
- Pressure Equipment Directive (PED) 2014/68/EU Module H

MAXIMUM WORKING PRESSURE

Maximum operating pressure to which the hose should be subjected. It is established at 25% of the nominal design burst pressure. The hose may be deflected within the specified bend radius range.

MAXIMUM PROOF PRESSURE

Maximum test pressure to which the hose should be subject. It is established at 150% of the maximum working pressure with the hose installed straight. No harmful deformation shall occur.

Hydrostatic field tests of hose assemblies installed in varying degrees of radial bend or parallel offset should be limited to 120% of the maximum rated working pressure at 20°C or 150% of the actual operating pressure, whichever is lower.

NOMINAL DESIGN BURST PRESSURE

The pressure at which the hose can be expected to rupture, based on the minimum annealed ultimate tensile strength of the braid wire and corrugated hose alloys at 20°C and the hose installed straight.

PULSATING OR SHOCK PRESSURES

When pulsating, surge or shock pressures exists, such as due to fast closing valves, the peak pressure shall not exceed 50% of the maximum working pressure. Installation shall be such that there is no initial slack in the braid when the pressure pulse, surge or shock occurs.

PRESSURE RELATIVE TO UNBRAIDED HOSE

At maximum working pressure, 1 to 2½% elastic elongation will occur in unbraided hose assemblies. To avoid squirm, unbraided hose should be unrestrained at one end or installed in such a manner as to allow free axial expansion due to pressure, as in a 180° loop.

PRESSURE RELATIVE TO BRAIDED HOSE

Whenever appreciable internal pressure is applied to a corrugated metal hose, it will elongate unless restrained. Generally, this restraint is provided by a wire braid sheath over the hose. The braid has little effect on bending or flexibility of the hose. However, in extremely short lengths of braided and pressurized hose, additional bending forces are required because of braid friction.

Where the strength of the braid sheath is the limiting factor, additional working pressure may be gained by using a heavier, rather than standard, single braid, or two or more braids. However, when the hoop rupture strength of the corrugated hose is the limiting factor, no additional pressure resistance is gained with additional braids.

Need help determining the right braid/hose design for maximum pressure ratings at lowest total cost for an application? Contact us on **+44 (0)1685 385641.**

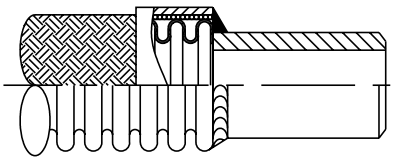
Did you know?

When a renowned international manufacturer of industrial electrical carbon products faced a challenge, Amnitec was able to offer a solution. Engineers needed to move very hot air at very high pressure and with high volumetric flow; a demanding combination. Our ultra-high pressure RF67 hose was comfortably able to handle the high pressure and temperature encountered. A bespoke manifold set including multiple hose lines, meant that smaller diameter, more flexible hose lines could be employed to accommodate the large vertical and horizontal movement of an autoclave cover. Problem solved.

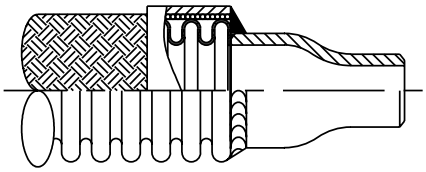
END SELECTION FACTORS

Welded pipe end with 371/2 degree bevel	
Size Availability	1/8" diameter to 12" diameter
Material Availability	Carbon steel, 304 stainless steel, 304L stainless steel, 321 stainless steel, 3 16 stainless steel, 316L stainless steel
Schedule Availability	5, 10, 40, 80, 160, XX

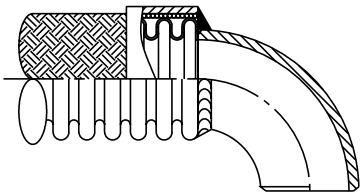
PIPE END



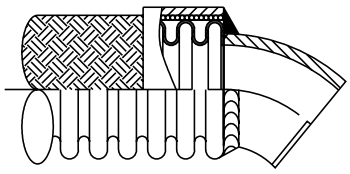
CONCENTRIC REDUCER



LONG RADIUS 90° ELBOW



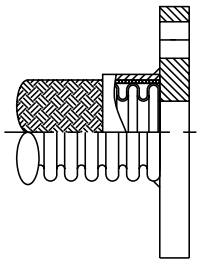
LONG/SHORT RADIUS 45° ELBOWS



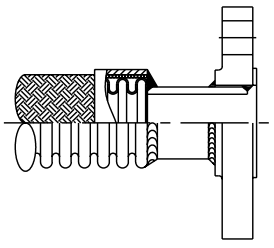
FLANGED ENDS

Size Availability	1/2" diameter to 12" diameter
Material Availability	Carbon steel, 304 stainless steel, 304L stainless steel, 321 stainless steel, 316 stainless steel, 316L stainless steel
Schedule Availability	5, 10, 40, 80, 160, XX
ANSI class ratings	150, 300, 600, 900, 1500, 2500
EN 1092-1 ratings:	PN 6, 10, 16, 25, 40, 63, 100, 160, 250, 320, 400

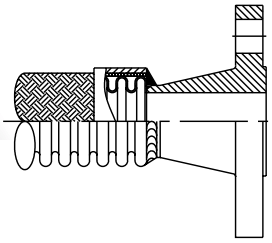
WELD PLATE



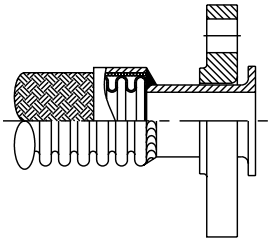
RAISED FACE SLIP-ON (RFSO)



RAISED FACE WELDNECK



FLOATING LAP JOINT W/STUB END

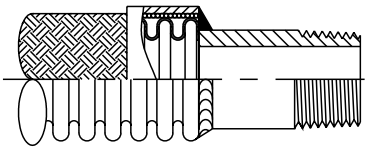


Note: Not all sizes and schedules are available in combination – call **+44 (0)1685 385641** for more information.

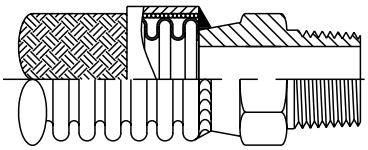
THREADED ENDS

Size Availability	1/4" diameter to 12" diameter
Material Availability	Carbon steel, 304 stainless steel, 304L stainless steel, 321 stainless steel, 316 stainless steel, 316L stainless steel
Schedule Availability	5, 10, 40, 80, 160, XX

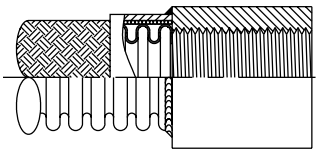
NPT/BSPT/BSPP MALE NIPPLE



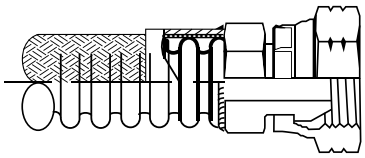
NPT/BSPT/BSPP MALE



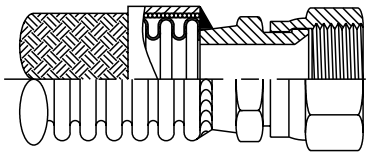
FEMALE NPT/BSPT HALF COUPLING



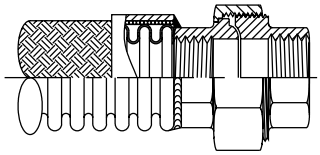
BSPP SWIVEL



JIC SWIVEL FEMALE



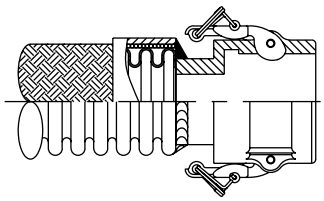
WELDED FEMALE UNION



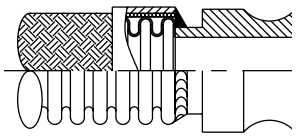
QUICK DISCONNECTS

Size Availability	1/2" diameter to 8" diameter
Material Availability	Carbon steel, 316 stainless steel, Hastelloy®, aluminium

FEMALE PART "D" COUPLER

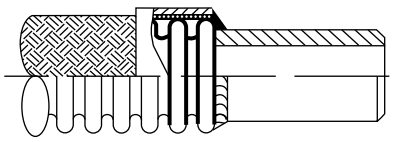


MALE PART "A" CAMLOCK



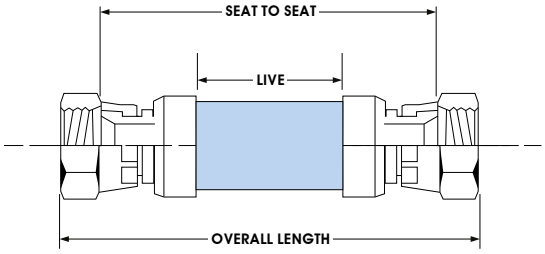
TUBE ENDS

Size Availability	1/4" diameter to 4" diameter
Material Availability	Carbon steel, 304 stainless steel, 304L stainless steel, 321 stainless steel, 316 stainless steel, 316L stainless steel, copper



DISTANCE SELECTION FACTORS (LIVE LENGTH AND OVERALL LENGTH)

After the hose is selected for the application, the live length and overall length of the assembly must be determined to complete the design. The live length is the flexible portion of an assembly and can be determined for the class of motion from the diagrams and for vibration. After the live length has been determined, the overall length is calculated by adding the dimensions for the end fittings. Refer to factory for fitting lengths as standard and special lengths can be offered.



LIVE LENGTH OF HOSE IN OFFSET

Centre Line Radius (mm)	Maximum Distance from Centreline (mm)													
	3	**6**	**10**	**12**	**20**	**25**	**40**	**50**	**75**	**100**	**125**	**150**	**200**	**250**
50	32	44	57	64	83	95	108	133	171	203	235	267	298	381
100	44	64	76	89	114	127	159	184	229	273	305	343	406	470
150	57	83	95	108	133	159	191	222	273	324	362	406	483	546
200	64	89	6	127	152	178	222	254	318	368	413	457	540	616
250	70	102	121	140	171	203	248	286	349	406	457	508	597	673
300	76	108	133	152	13	216	267	311	381	445	495	546	648	730
350	83	121	146	165	203	235	286	337	413	476	533	597	184	781
400	89	127	152	178	216	254	311	356	438	508	572	635	737	832
450	95	133	165	191	229	267	330	381	464	540	610	660	13	864
500	102	13	171	197	241	279	343	146	489	572	635	699	819	921
625	114	159	191	222	273	311	381	445	546	635	711	775	908	1,016
750	121	171	210	241	298	343	419	483	597	692	775	851	991	1,111
875	133	184	229	260	318	368	457	527	667	749	832	914	1,067	1,194
1,000	140	197	241	279	343	394	483	559	686	819	889	978	1,137	1,270
1,125	152	210	254	298	362	419	527	597	718	845	940	1,041	1,207	1,346
1,250	159	222	273	311	381	445	540	622	762	889	991	1,092	1,270	1,422
1,500	171	241	298	343	419	483	591	686	838	972	1,092	1,194	1,378	1,549
1,750	184	260	324	375	451	521	641	737	902	1,054	1,168	1,295	1,492	1,670
2,000	197	279	343	394	483	559	686	787	965	1,118	1,257	1,372	1,594	1,778
2,250	210	44	1,048	419	514	597	724	838	1,029	1,187	1,321	1,454	1,683	1,886
2,500	222	311	1,143	445	540	622	762	889	1,080	1,257	1,397	1,537	1,772	2,000
2,750	235	76	400	476	572	654	806	927	1,137	1,308	1,473	1,607	1,861	2,083
3,000	241	343	419	483	591	686	838	972	1,187	1,372	1,537	1,676	1,943	2,172
3,250	254	356	438	508	616	711	883	1,010	1,232	1,422	1,594	1,746	2,019	2,261

The values shown above are minimum live lengths for most centerline bend radii and total offset travel combinations. If the exact radius or travel are not shown on the chart, then the next larger value may be used or use the lateral offset formula. The values as shown in the shaded portion are applicable to static bends only. The offset motion should never be greater than 1/4 (25%) of the centerline bend radius.

ENGINEERING DESIGN SERVICES

In addition to our own products and solutions, we also offer development services, from the early phases of developing concepts and prototypes, through to technical engineering and calculations, we offer support throughout the entire development process.

As an engineering partner we have extensive experience in solving demanding tasks in such a way that the results become an optimal part of the overall system and function reliably

CALCULATIONS

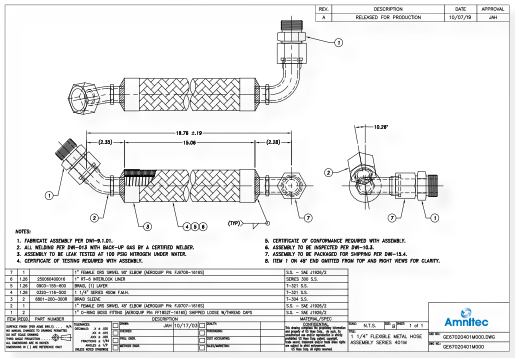
We can calculate and determine requirements for severe applications such as high pressure, high temperature, vibration and corrosive environments.

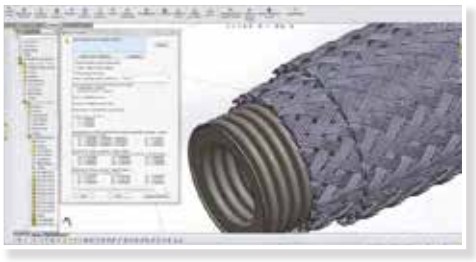
DRAWINGS

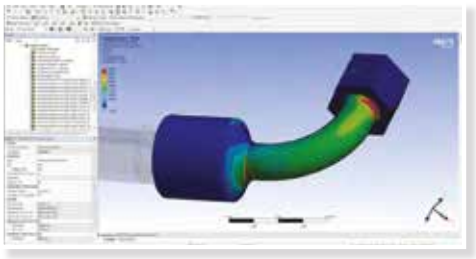
We are able to provide advanced CAD component and assembly drawings

3D MODELS/FINITE ELEMENT ANALYSIS

We are able to provide advanced 3D CAD component and assembly drawings and apply advance analysis techniques.







SPECIAL ASSEMBLIES

In addition to our standard product lines, we offer a wide array of specialty assemblies to satisfy some of the most demanding applications.

VACUUM/STEAM JACKETED

Jacketed assemblies are multi-layer assemblies with an inner hose bore surrounded by a secondary layer providing an atmospheric 'jacket' around the inner hose. This jacket allows for a heating, cooling or a vacuum thermal barrier to be applied to the media inside the assembly without contamination or mixing of media.

COAL INJECTION

Eliminate problems with our coal injection assembly designed for both pulverized injection and/or heavy duty coal injection application. Features include:

1. Non-flammable, all metal construction.
2. Designed to withstand erosion from coal abrasion.
3. Engineered to significantly reduce pressure drop.
4. Factory-built by ASME certified welders in an ISO 9001 certified facility.
5. Engineered to increase performance life.
6. Quick disconnect fittings for rapid change over to alternate hydrocarbons.

Our coal injection assembly solves problems such as:

1. Rubber hose catching on fire.
2. Hose failure from erosion due to abrasive action of coal.
3. Clogging of hose from restrictions in hose diameter.
4. Short life span with frequent replacements.
5. Unreliable attachment of fittings to hose.
6. A need for quick disconnect fittings to switch to an alternate fuel such as natural gas or oil.

METAL PTFE LINED (MTLC)

MTLC is a high quality engineered flexible metal braided hose with a smooth inner liner of extruded PTFE. The assembly is reinforced with a layer of stainless steel braid. A smooth liner of PTFE is locked in place and flared over the flange faces. The PTFE liner is stationary and will not move once locked into position. Special vent holes in the ends prevent gas build-up between the layers.

OXYGEN LANCE

Amnitec has been manufacturing and supplying metal corrugated stainless steel hose for handling oxygen for decades. Our all metal construction is safe, non-combustible, absolutely pressure and vacuum tight and wear resistant. Our lance assemblies are a practical response

to the many uncertainties of rubber or packed interlock lance hoses.

Ten good reasons to specify an Amnitec stainless steel lance hose:

1. 100% metal which withstands temperatures up to 1500°F without deterioration.
2. Metallic construction with superior fire, flame, and char-proof characteristics. Will not catastrophically fail in a major fire.
3. Complete oxygen compatibility to assure flow of pure oxygen.
4. Zero leakage - saves oxygen, helps assure steel uniformity and adds an extra safety dimension.
5. Fittings welded to the hose for optimum protection against breakage.
6. More flexible than rubber, offering a longer cycle life.
7. Weighs less than rubber for easier handling and installation.
8. Double braiding, double hose layer for optimum operation, safety, and performance.
9. Doesn't flatten in bending for a more uniform oxygen flow.
10. No age hardening, so no shelf-life limitations.

Need a bespoke solution? Let our engineering department design a custom hose for your application.

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Call **+44 (0)1685 385641** to discuss your requirements.

METAL HOSE STANDARD PRODUCT LINES

ANNULAR HOSE CONSTRUCTION

One braid shown

MEDIUM PRESSURE

UFBX series	Standard pressure annular hose series suitable for full vacuum up to 220 bar, depending on size and braid construction. The UFBX product line is comprised of 321 stainless steel or 316L stainless steel for temperature service from cryogenic service up to 550°C. Sizes range between 1/4" (4mm) up to 12" (300mm) nominal diameter and is available as an unbraided (UFBX0) hose or as a direct braided single (UFBX1) or double (UFBX2) layer hose. Versions available certified to ISO 10380.

HIGH PRESSURE HOSES

UFC series	High pressure super flexible annular hose series suitable for full vacuum up to 305 bar, depending on size and braid construction. The UFC product line is comprised of 321 stainless steel or 316L stainless steel for temperature service from cryogenic service up to (550°C). Sizes range between 1/4" (4mm) up to 4" (100mm) nominal diameter and is available as an unbraided (UFC0) hose or as a direct braided single (UFC1) or double (UFC2) layer hose.
400X series	High pressure annular hose series suitable for full vacuum up to 365 bar, depending on size and braid construction. The 400x product line is comprised of heavy weight 316L stainless steel for temperature service from cryogenic service up to 550°C). Sizes range between 1/4" (4mm) up to 4" (100mm) nominal diameter and is available as a direct braided double (402X), triple (403X) or quad (404X) layered hose.

ULTRA-HIGH PRESSURE HOSES

RF67 series	Ultra-high pressure helical hose series suitable for full vacuum up to 12000 827 bar, depending on size and braid construction. The RF67 product line is comprised of heavy weight seamless 321 stainless steel for temperature service from cryogenic service up to 550°C. Sizes range between 1/4" (4mm) up to 3" (80mm) nominal diameter and is a multiple braided triple layered hose.

SPECIAL ALLOY HOSES

A400 series	Standard pressure annular exotic hose series suitable for full vacuum up to 208 bar, depending on size and braid construction. The A400 product line is comprised of Monel® 400 alloy for temperature service from cryogenic service up to 425°C. Sizes range between 1/4" (4mm) up to 2" (50mm) nominal diameter and is available as an unbraided (A400) hose or as a direct braided single (A400-1) or double (A400-2) layer hose.
A625 series	Standard pressure annular exotic hose series suitable for full vacuum up to 183 bar, depending on size and braid construction. The A625 product line is comprised of Inconel® 625 alloy for temperature service from cryogenic service up to 982°C. Sizes range between 1/4" (4mm) up to 12" (300mm) nominal diameter and is available as an unbraided (A625) hose or as a direct braided single (A625-1) or double (A625-2) layer hose.
A276 series	Standard pressure annular exotic hose series suitable for full vacuum up to 106 bar, depending on size and braid construction. The A276 product line is comprised of Hastelloy® C276 alloy for temperature service from cryogenic service up to 815°C. Sizes range between 1/4" (4mm) up to 12" (300mm) Maximum pressure depending on size and braid configuration

MEDIUM PRESSURE HOSE UFBX 321

- Hose manufactured in 321 stainless steel
- Braid manufactured in 304
- Directly braided on reels – up to 80mm (3")
- UFBX0 = Unbraided hose, UFBX1 = Single braid layer, UFBX2 = Double braid layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	UFBX0	10	16	110	10	145	15	218	0.09
		UFBX1	11.4	25		167	2422	251	3633	0.17
		UFBX2	12.8			220	3191	330	4786	0.25
8	5/16"	UFBX0	12	20	130	10	145	15	218	0.13
		UFBX1	13.4	32		136	1973	204	2959	0.23
		UFBX2	14.7			210	3046	315	4569	0.33
10	3/8"	UFBX0	14.9	22	150	5.5	80	8	120	0.17
		UFBX1	16.3	38		100	1450	150	2176	0.28
		UFBX2	17.6			178	2582	267	3873	0.39
12	1/2"	UFBX0	19.3	24	165	5.5	80	8	120	0.17
		UFBX1	20.7	45		74	1073	111	1610	0.36
		UFBX2	22.4			103	1494	155	2241	0.53
15	5/8"	UFBX0	22	28	195	5	73	8	109	0.28
		UFBX1	23.3	50		70	1015	105	1523	0.45
		UFBX2	24.6			125	1813	188	2719	0.62
20	3/4"	UFBX0	25.8	30	200	4.1	59	6	89	0.3
		UFBX1	27.4	70		65	943	98	1414	0.55
		UFBX2	29			86	1247	129	1871	0.8
25	1"	UFBX0	33.7	44	200	4.1	59	6	89	0.32
		UFBX1	35.8	85		50	725	75	1088	0.7
		UFBX2	37.9			76	1102	114	1653	1.08
32	1 1/4"	UFBX0	41.1	55	250	3.4	49	5	74	0.4
		UFBX1	43.2	105		39	566	59	848	0.86
		UFBX2	45.3			57	827	86	1240	1.32
40	1 1/2"	UFBX0	47.9	70	250	2.4	35	4	52	0.67
		UFBX1	50	127		35	508	53	761	1.18
		UFBX2	52.2			55	798	83	1197	1.69
50	2"	UFBX0	62.1	90	350	1	15	2	22	0.82
		UFBX1	64.2	160		30	435	45	653	1.52
		UFBX2	66.3			44	638	66	957	2.22
65	2 1/2"	UFBX0	76.5	110	410	1	15	2	22	1.9
		UFBX1	78.6	200		26	377	39	566	2.8
		UFBX2	80.7			46	667	69	1001	3.7
80	3"	UFBX0	89.8	130	450	1	15	2	22	2.3
		UFBX1	91.9	230		22	319	33	479	3.4
		UFBX2	94.1			40	580	60	870	4.5
100	4"	UFBX0	127	200	560	0.69	10	1	15	3
		UFBX1	129	230		21.5	312	32	468	4.9
		UFBX2	132			34	490	51	735	6.8
125	5"	UFBX0	149	343	711	0.21	3	0.3	4	3.38
		UFBX1	151	343		20	290	30	435	5.32
		UFBX2	154			30	435	45	650	7.89
150	6"	UFBX0	178	406	864	0.21	3	0.3	4	5.26
		UFBX1	180	406		14.5	210	21.7	315	7.78
		UFBX2	183			21.4	310	32.1	465	10.3
200	8"	UFBX0	230	508	1067	0.14	2	0.21	3	6.84
		UFBX1	233	508		15.2	220	22.8	330	11.79
		UFBX2	235			23.4	340	35.2	510	16.74
250	10"	UFBX0	284	864	1753	0.14	2	0.21	3	8.84
		UFBX1	287	864		12.8	185	19	275	15.36
		UFBX2	290			22.8	330	34.1	495	21.87
300	12"	UFBX0	337	940	1880	0.14	2	0.21	3	10.55
		UFBX1	339	940		12.07	175	18	260	20.29
		UFBX2	343			2.17	315	32	470	30.04

MEDIUM PRESSURE HOSE UFBX 316

- Hose manufactured in 316 stainless steel
- Braid manufactured in 304 and 316 stainless steel
- Directly braided on reels – up to 80mm (3")
- UFBX0 = Unbraided hose, UFBX1 = Single braid layer, UFBX2 = Double braid layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	UFBX0	10	16	110	10	145	15	218	0.9
		UFBX1	11.4	25		167	2422	251	3633	0.17
		UFBX2	12.8			220	3191	330	4786	0.25
8	5/16"	UFBX0	12	20	130	10	145	15	218	0.13
		UFBX1	13.4	32		136	1973	204	2959	0.23
		UFBX2	14.7			210	3046	315	4569	0.33
10	3/8"	UFBX0	14.9	22	150	5.5	80	8	120	0.17
		UFBX1	16.3	38		100	1450	150	2176	0.28
		UFBX2	17.6			178	2582	267	3873	0.39
12	1/2"	UFBX0	19.3	24	165	5.5	80	8	120	0.17
		UFBX1	20.7	45		74	1073	111	1610	0.36
		UFBX2	22.4			103	1494	155	2241	0.53
15	5/8"	UFBX0	22	28	195	5	73	8	109	0.28
		UFBX1	23.3	50		70	1015	105	1523	0.45
		UFBX2	24.6			125	1813	188	2719	0.62
20	3/4"	UFBX0	25.8	30	200	4.1	59	6	89	0.3
		UFBX1	27.4	70		65	943	98	1414	0.55
		UFBX2	29			86	1247	129	1871	0.8
25	1"	UFBX0	33.7	44	200	4.1	59	6	89	0.32
		UFBX1	35.8	85		50	725	75	1088	0.7
		UFBX2	37.9			76	1102	114	1653	1.08
32	1 1/4"	UFBX0	41.1	55	250	3.4	49	5	74	0.4
		UFBX1	43.2	105		39	566	59	848	0.86
		UFBX2	45.3			57	827	86	1240	1.32
40	1 1/2"	UFBX0	47.9	70	250	2.4	35	4	52	0.67
		UFBX1	50	127		35	508	53	761	1.18
		UFBX2	52.2			55	798	83	1197	1.69
50	2"	UFBX0	62.1	90	350	1	15	2	22	0.82
		UFBX1	64.2	160		30	435	45	653	1.52
		UFBX2	66.3			44	638	66	957	2.22
65	2 1/2"	UFBX0	76.5	110	410	1	15	2	22	1.9
		UFBX1	78.6	200		26	377	39	566	2.8
		UFBX2	80.7			46	667	69	1001	3.7
80	3"	UFBX0	89.8	130	450	1	15	2	22	2.3
		UFBX1	91.9	230		22	319	33	479	3.4
		UFBX2	94.1			40	580	60	870	4.5
100	4"	UFBX0	127	200	560	0.69	10	1	15	3
		UFBX1	129	230		21.5	312	32	468	4.9
		UFBX2	132			34	490	51	735	6.8
125	5"	UFBX0	149	343	711	0.21	3	0.3	4	3.38
		UFBX1	151	343		20	290	30	435	5.32
		UFBX2	154			30	435	45	650	7.89
150	6"	UFBX0	178	406	864	0.21	3	0.3	4	5.26
		UFBX1	180	406		14.5	210	21.7	315	7.78
		UFBX2	183			21.4	310	32.1	465	10.3
200	8"	UFBX0	230	508	1067	0.14	2	0.21	3	6.84
		UFBX1	233	508		15.2	220	22.8	330	11.79
		UFBX2	235			23.4	340	35.2	510	16.74
250	10"	UFBX0	284	864	1753	0.14	2	0.21	3	8.84
		UFBX1	287	864		12.8	185	19	275	15.36
		UFBX2	290			22.8	330	34.1	495	21.87
300	12"	UFBX0	337	940	1880	0.14	2	0.21	3	10.55
		UFBX1	339	940		12.07	175	18	260	20.29
		UFBX2	343			2.17	315	32	470	30.04

HIGH PRESSURE HOSE UFC 321

- Hose manufactured in 321 stainless steel (high flexibility)
- Braid manufactured in 304 stainless steel
- UFC0 = Unbraided hose, UFC1 = Single braid layer, UFC2 = Double braid Layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	UFC0	13	16	100	10	145	15	218	0.2
		UFC1	14.5	25		171	2480	257	3720	0.31
		UFC2	15.9			305	4424	458	6635	0.42
10	3/8"	UFC0	17.8	22	150	5.5	145	8.3	120	0.29
		UFC1	19.3	40		151	2480	227	3285	0.48
		UFC2	20.7			260	4420	390	5656	0.67
12	1/2"	UFC0	21.8	24	150	5.5	80	8.3	120	0.35
		UFC1	23.3	50		114	2190	171	2480	0.58
		UFC2	24.7			205	3771	308	4460	0.81
20	3/4"	UFC0	28	30	200	4.1	80	6.2	89	0.48
		UFC1	30.2	70		90.8	1653	136.2	3263	1.24
		UFC2	32.3			150	2973	225	3263	1.24
25	1"	UFC0	35	44	200	4.1	59	6.2	89	0.64
		UFC1	37.2	90		79.4	1317	119	1727	1.13
		UFC2	39.3			120	2176	180	2611	1.62
32	1 1/4"	UFC0	46.5	55	250	3.2	59	4.8	70	1.1
		UFC1	48.6	108		59	1152	89	1284	1.76
		UFC2	50.7			89	1740	134	936	2.42
40	1 1/2"	UFC0	54.5	70	250	2.4	46	3.6	52	1.25
		UFC1	56.7	127		46	856	69	1001	1.99
		UFC2	58.8			71	1291	107	1545	2.73
50	2"	UFC0	65.7	90	350	1	35	1.5	22	1.37
		UFC1	68.4	175		40.2	667	60.3	875	2.36
		UFC2	70.9			50	1030	75	1088	3.35
65	2 1/2"	UFC0	85.5	110	410	1	15	1.5	22	2
		UFC1	88.2	200		33.5	583	50.3	729	3.3
		UFC2	90.7			50	725	75	1088	4.6
80	3"	UFC0	97.7	130	450	1	15	1.5	22	2.5
		UFC1	100	200		28.1	486	42.2	611	4
		UFC2	103			50	725	75	1088	5.5
100	4"	UFC0	127	200	560	0.7	10	1.1	15	3
		UFC1	129	230		21.5	312	32.3	468	4.9
		UFC2	132			34	493	51	740	6.8
125	5"	UFC0	151	279	711	0.19	3	0.3	4	4.77
		UFC1	153	279		14.5	210	21.8	315	6.67
		UFC2	156			26	277	39	566	8.57
150	6"	UFC0	180	419	838	0.24	4	0.4	5	6.65
		UFC1	182	419		16.55	240	24.8	360	9.35
		UFC2	185			19.7	285	29.5	428	12.05
200	8"	UFC0	234	546	1092	0.2	3	0.3	4	8.72
		UFC1	236	546		15	217	22.5	326	14
		UFC2	239			18.6	270	27.9	405	19.27
250	10"	UFC0	284	686	1372	0.15	2	0.2	3	13.66
		UFC1	289	686		14.5	210	21.8	315	20.17
		UFC2	294			35.9	375	38.79	563	26.69
300	12"	UFC0	337	813	1626	0.12	2	0.2	3.16	16.29
		UFC1	343	813		13.8	200	20.7	300	25.24
		UFC2	349			24.8	360	37.2	540	34.2

HIGH PRESSURE HOSE UFC 316

- Hose manufactured in 316 stainless steel (high flexibility)
- Braid manufactured in 304 and 316 stainless steel
- UFC0 = Unbraided Hose, UFC1 = Single Braid layer, UFC2 = Double Braid Layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	UFC0	13	16	110	10	145	15	218	0.2
		UFC1	14.5	25		171	2480	257	3720	0.31
		UFC2	15.9			305	4424	458	6635	0.42
10	3/8"	UFC0	17.8	22	150	5.5	145	8.3	120	0.29
		UFC1	19.3	40		151	2480	227	3285	0.48
		UFC2	20.7			260	4420	390	5656	0.67
12	1/2"	UFC0	21.8	24	150	5.5	80	8.3	120	0.35
		UFC1	23.3	50		114	2190	171	2480	0.58
		UFC2	24.7			205	3771	308	4460	0.81
20	3/4"	UFC0	28	30	200	4.1	80	6.2	89	0.48
		UFC1	30.2	70		90.8	1653	136.2	1973	1.24
		UFC2	32.3			150	2973	225	3264	1.24
25	1"	UFC0	35	44	200	4.1	59	6.2	89	0.64
		UFC1	37.2	90		79.4	1317	119	1727	1.13
		UFC2	39.3			120	2176	180	2611	1.62
32	1 1/4"	UFC0	46.5	55	250	3.2	59	4.8	70	1.1
		UFC1	48.6	108		59	1152	89	1284	1.76
		UFC2	50.7			89	1740	134	1936	2.24
40	1 1/2"	UFC0	54.5	70	250	2.4	46	3.6	52	1.25
		UFC1	56.7	127		46	856	69	1001	1.99
		UFC2	58.8			71	1291	107	1545	2.73
50	2"	UFC0	65.7	90	350	1	35	1.5	22	1.37
		UFC1	68.4	175		40.2	667	60.3	875	2.36
		UFC2	70.9			50	1030	75	1088	3.35
65	2 1/2"	UFC0	85.5	110	410	1	15	1.5	22	2
		UFC1	88.2	200		33.5	583	50.3	729	3.3
		UFC2	90.7			50	725	75	1088	4.6
80	3"	UFC0	97.7	130	450	1	15	1.5	22	2.5
		UFC1	100	200		28.1	486	42.2	611	4
		UFC2	103			0	725	75	1088	5.5
100	4"	UFC0	127	200	560	0.7	10	1.1	15	3
		UFC1	129	230		21.5	312	32.3	468	4.9
		UFC2	132			34	493	51	740	6.8
125	5"	UFC0	151	279	711	0.19	3	0.3	4	4.77
		UFC1	153	279		14.5	350	6.2	524	6.67
		UFC2	156			26	385	39.8	578	8.57
150	6"	UFC0	180	419	838	0.24	4	0.4	5	6.65
		UFC1	182	419		16.55	240	24.8	359	9.35
		UFC2	185			19.7	285	29.5	644	12.05
200	8"	UFC0	234	546	1092	0.2	3	0.3	4	8.72
		UFC1	236	546		15	217	22.5	410	14
		UFC2	239			18.6	270	27.0	525	19.27
250	10"	UFC0	284	686	1372	0.15	2	0.2	3	13.66
		UFC1	289	686		14.5	210	21.8	375	20.17
		UFC2	294			25.9	375	38.79	563	26.69
300	12"	UFC0	337	813	1626	0.12	2	0.2	3	14.81
		UFC1	343	813		13.8	200	20.7	270	24
		UFC2	349			24.8	360	37.2	480	34.2

SUPER HIGH PRESSURE HOSE

- **402X** Hose manufactured in 316L SS with 321 SS braids
- **403XM** Hose manufactured in 321L SS with 321 SS braid
- **403XM-I** Hose manufactured in Inconel® 625 with 321 SS braid
- **404XM** Hose manufactured in 321L SS with 321 SS braids

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	402X	16	51	210	365	5300	548	7950	0.58
10	3/8"	402X	20.6	64	230	269	3900	404	5850	0.79
12	1/2"	402X	26.7	77	267	248	3600	372	5400	1.12
20	3/4"	402X	36.3	102	325	245	3550	368	5325	2.43
25	1"	402X	44.5	134	381	193	2800	290	4200	3.08
32	1 1/4"	402X	52.8	166	440	171	2480	257	3720	4.27
40	1 1/2"	402X	61.2	205	496	152	2200	228	3300	5.39
50	2"	402X	77.5	295	610	115	1675	173	2512	6.90
80	3"	403XM	100	635	2185	83	1200	124	1800	8.15
80	3"	403XM-I	101.4	635	2185	124	1800	186	2700	10.25
100	4"	404XM	132	839	2896	83	1200	124	1800	13.69

ULTRA HIGH PRESSURE HOSE

- **RF67** Hose manufactured in 321L stainless steel (helical corrugation)
- Multiple braids manufactured in 300 series stainless steel

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	RF67	17.3	64	292	827	12,000	1,240	18,000	0.92
10	3/8"	RF67	22.9	95	381	620	9,000	930	13,500	1.45
12	1/2"	RF67	26.4	115	420	586	8,500	879	12,750	2.00
20	3/4"	RF67	38.6	165	775	469	6,800	704	10,200	3.81
25	1"	RF67	49.0	230	890	431	6,250	646	9,375	5.50
32	1 1/4"	RF67	54.6	254	965	379	5,500	568	8,250	7.57
40	1 1/2"	RF67	64.5	305	1042	359	5,200	538	7,800	9.88
50	2"	RF67	77.2	380	1220	300	4,350	450	6,525	12.02
80	3"	RF67	88.9	635	1650	207	3,000	311	4,500	22.07

FLEXIBLE METALLIC HOSE, BRAID AND ASSEMBLIES

MONEL 400 HOSE

- Hose manufactured in Monel® 400 Alloy
- Braid manufactured in 304 and 316 stainless steels and Monel®
- 500 = Unbraided hose, 501 = Single braid layer, 502 = Double braid layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	500	12.5	25	140	12.4	180	18.6	270	0.24
		501	14			155.2	2250	232.8	3375	0.34
		502	15.5			208.6	3025	312.8	4535	0.46
10	3/8"	500	16.8	38	153	9.7	140	14.5	210	0.36
		501	18.5			108.6	1575	162.8	2360	0.51
		502	20.1			141.4	2050	212.1	3075	0.66
12	1/2"	500	21.3	50	178	8.3	120	12.4	180	0.6
		501	22.9			57.6	835	86.2	1250	0.76
		502	24.4			103.4	1500	155.2	2250	0.95
20	3/4"	500	30.7	70	216	6.2	90	9.3	135	1.18
		501	32.3			41.4	600	62.1	900	1.43
		502	33.8			74.5	1080	111.7	1620	1.71
25	1"	500	38.9	90	254	3.9	56	5.9	85	1.52
		501	40.4			29	420	43.4	630	1.82
		502	41.9			52.1	755	77.9	1130	2.15
32	1 1/4"	500	47.2	110	293	3.7	53	5.5	80	2.4
		501	48.8			21.7	315	29	420	2.74
		502	50.3			39.3	570	59	855	3.1
40	1 1/2"	500	55.6	127	331	2.6	37	3.8	55	2.94
		501	57.7			34.6	502	51.9	753	3.8
		502	60.7			62.2	902	93.3	1353	4.71
50	2"	500	71.9	175	407	1.4	20	2.1	30	3.92
		501	74.4			28.6	415	42.8	620	5.02
		502	77			51.4	745	70	1015	6.13
80	3"	500	90.7	200	534	0.3	4	0.4	6	2.52
		501	93.2			15.5	225	23.1	335	3.73
		502	95.8			29.3	425	43.8	635	4.95

INCONEL® 625 HOSE

- Hose manufactured in Inconel® 625 alloy
- Braid manufactured in 304 and 316 stainless steels
- INC00 = Unbraided hose, INC01 = Single braid layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
6	1/4"	INC00	12.5	23	127	15.7	228	23.6	342	0.16
		INC01	14			183	2660	275	3990	0.27
10	3/8"	INC00	16.8	29	140	10.3	150	15.5	225	0.22
		INC01	18.5			111	1610	167	2415	0.34
12	1/2"	INC00	21.3	39	153	5.4	79	8	119	0.31
		INC01	22.9			90.3	1310	135	1965	0.48
20	3/4"	INC00	30.7	54	203	2.2	32	3.3	48	0.51
		INC01	32.3			63.1	915	94.6	1373	0.75
25	1"	INC00	38.9	70	230	2.6	38	3.9	57	0.88
		INC01	40.4			44.5	645	67	968	1.16
32	1 1/4"	INC00	47.2	83	270	1.5	22	2.3	33	1.16
		INC01	48.8			37.6	545	56	818	1.52
40	1 1/2"	INC00	55.6	96	305	1.8	26	2.7	39	1.39
		INC01	57.7			38.6	560	57.9	840	1.89
50	2"	INC00	69.1	127	381	1	14	1.5	21	1.83
		INC01	71.1			31.7	460	47.6	675	2.5
80	3"	INC00	90.7	210	432	0.3	5	0.45	8	1.59
		INC01	93.7			30.3	440	45.4	660	2.88
100	4"	INC00	120	280	690	0.1	4	0.2	6	3.83
		INC01	123			18.6	270	27.9	405	5.26

HASTELLOY® C276 HOSE

- Hose manufactured in Hastelloy® C276 alloy
- Braid manufactured in 304 and 316 stainless steels
- HAS00 = Unbraided hose, HAS01 = Single braid layer

Nominal Bore		Hose Type	Hose O/D	Min Bend Radius		Maximum Pressure				Weight
				Static	Dynamic	Working		Test		
mm	in		mm	mm	mm	Bar	PSI	Bar	PSI	Kg / m
12	1/2"	HAS00	21.3	40	155	5.5	80	8.3	120	0.46
		HAS01	22.9			107	1550	161	2325	0.63
20	3/4"	HAS00	30.7	55	205	4.8	70	7.2	105	1.80
		HAS01	32.3			63.1	915	94.6	1370	1.89
25	1"	HAS00	38.9	70	230	3	43	4.5	65	2.28
		HAS01	40.4			44.5	645	67	965	2.37
32	1 1/4"	HAS00	47.2	83	270	2	29	3	42	2.77
		HAS01	48.8			39.7	575	60.5	860	2.86
40	1 1/2"	HAS00	55.6	96	305	2.1	31	3.2	47	3.26
		HAS01	57.7			40.3	585	60.5	875	2.94
50	2"	HAS00	71.9	127	385	1.2	17	1.8	26	3.10
		HAS01	73.9			32.4	470	48.6	705	4.33

STRIPWOUND HOSE

Amnitec manufacture a comprehensive range of polygonal and round section double overlap Stripwound hose, available with or without packing. The product is available in Stainless or Galvanised steel, depending on temperature, corrosion resistance, service life and cost factors. Our Polylock and Interlock designs are manufactured in accordance with BS EN ISO 15465:2004, and will accept axial and bending movement. They are typically used in exhaust applications, for cable armouring and conduit, and for the transfer of granular materials such as grain, flour and ash. As a pressure house, common applications include tar and bitumen transfer. Common bore sizes are available on request.

Did you know?

A company, operating within the marine sector, needed a subsea hose able to operate under great external pressure to transport supersaturated sodium chloride – something stainless steel could not handle.

With no manufactured solution available, we developed a stripwound liner in Inconel®. The result; a high-performance hose that is still a unique solution for undersea transport.

METAL ASSEMBLY APPLICATIONS

Metal assembly armour guard, flow liner and bend restrictors

SIZE RANGE

5/16" to 12" I.D. (8mm - 300mm) inclusive.
Larger sizes may be available - please contact us for more information.

METALS

Stainless steel, galvanized steel and bronze.

METAL THICKNESS

0.254mm - 0.305mm

TEMPERATURE RATINGS

Galvanized steel: Up to 200°C 304 stainless steel: Up to 454°C

RIGID VS FLOPPY

Rigid guard has a tighter profile to provide additional support in application where protection, bend restrictions or high flow rates are critical. Floppy guards profile allows free movement of the hose assembly while providing protection to the hose and braid.

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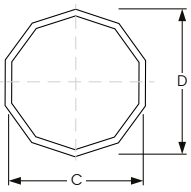
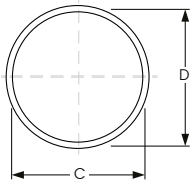


POLYLOCK POLYGONAL CROSS SECTION

A polygonal profile provides better size stability when cut, especially on short lengths, due to the liner surfaces and bends locking together.

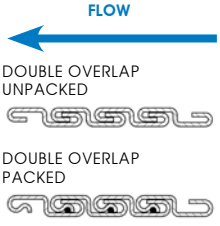
INTERLOCK ROUNDED CROSS SECTION

Round profile is the most common guard used and provide excellent overall performance. The round profile can allow for minor adjustments in diameter by tightening or loosening the guard.



PXPM LINED/ SMOOTHBORE CROSS SECTION

This profile provides a smoother bore to the hose for higher velocity flow rates. Flow must be proper direction for maximum efficiency.



UNPACKED VS PACKED

Packing can be applied into the profile to provide a tighter seal against media escape in certain applications. This is done in rigid profiles and a variety of packing options are available.

POLYLOCK HOSE

Bore Size		Amnitec Ref	Material	OD Ref (mm)	Bend Radius (mm)	Weight (Kg/m)	Max Length (m)
in	mm						
1 1/4"	31.8	SP0318ALNNM	304SS	35	160	0.7	20
		SP0318CFNNM	Galv Stl	36	230	0.9	
1 1/2"	38.1	SP0381ALNNM	304SS	42	180	0.8	20
		SP0381CFNNM	Galv Stl	43	245	1	
2"	50.8	SP0508ALNNM	304SS	55	225	1.1	20
		SP0508CFNNM	Galv Stl	56	280	1.4	
2 1/2"	63.5	SP0635ALNNM	304SS	67	305	1.4	20
		SP0635CFNNM	Galv Stl	68	355	1.8	
3"	76.2	SP0762ALNNM	304SS	80	350	1.6	20
		SP0762CGNNM	Galv Stl	81	410	2.8	
4"	101.6	SP1016ALNNM	304SS	107	490	2.3	15
		SP1016CGNNM	Galv Stl	108	540	3.6	
5"	127	SP1270ALNNM	304SS	132	600	3.1	10
		SP1270CGNNM	Galv Stl	133	680	4.5	
6"	152.4	SP1524ALNNM	304SS	157	700	3.3	10
		SP1524CGNNM	Galv Stl	158	790	5.4	
8"	203.2	SP2032ALNNM	304SS	207	1000	6.5	10
		SP2032CGNNM	Galv Stl	208	1100	7.2	

INTERLOCK HOSE

Bore Size		Amnitec Ref	Material	OD Ref (mm)	Bend Radius (mm)	Weight (Kg/m)	Max Length (m)
in	mm						
1"	25.4	SI0254ALNNM	304SS	29.2	165	0.64	20
		SI0254CGNMM	Galv Stl	30.2	165	1.00	
1 1/4"	31.8	SI0318ALNNM	304SS	35.7	185	0.80	20
		SI0318CGNNM	Galv Stl	36.6	185	1.13	
1 1/2"	38.1	SI0381ALNNM	304SS	42.2	190	0.93	20
		SI0381CGNNM	Galv Stl	42.9	190	1.30	
2"	50.8	SI0508ALNNM	304SS	55.1	300	1.30	20
		SI0508CGNNM	Galv Stl	55.6	300	1.60	
2 1/2"	63.5	SI0635ALNNM	304SS	67.4	330	1.53	20
		SI0635CGNNM	Galv Stl	68.3	315	2.10	
3"	76.2	SI0762ALNNM	304SS	80.3	375	1.76	20
		SI0762CGNNM	Galv Stl	81.0	365	2.33	
4"	101.6	SI1016ALNNM	304SS	105.8	470	2.28	15
		SI1016CGNNM	Galv Stl	106.4	460	3.06	
5"	127.0	SI1270ALNNM	304SS	131.4	555	2.86	10
		SI1270CGNNM	Galv Stl	131.3	565	3.91	
6"	152.4	SI1524ALNNM	304SS	156.5	640	3.45	10
		SI1524CGNNM	Galv Stl	157.0	640	6.26	
8"	203.2	SI2032ALNNM	304SS	211.1	965	8.11	10
		SI2032CGNNM	Galv Stl	212.0	940	10.26	
10"	245.0	SI2540ALNNM	304SS	261.9	1140	10.20	5
		SI2540CGNNM	Galv Stl	262.7	1155	13.27	
12"	304.8	SI3048ALNNM	304SS	312.7	1345	12.30	5
		SI3048CGNNM	Galv Stl	313.5	1360	15.94	

PXPM® (LINED)

Nominal I.D.		Nominal O.D.		Minimum Inside Bend Diameter		Weight Per	
in	mm	in	mm	in	mm	lb/ft	kg/m
3	76.2	3.19	81.0	16.1	410	1.95	2.90
4	101.6	4.25	108.0	21.3	540	2.49	3.70
5	127.0	5.24	133.0	27.6	700	3.12	4.65
6	152.4	0.06	1.6	31.5	800	3.76	5.60

ASSEMBLY CUSTOMISATION

We can modify assemblies to ensure they meet the most demanding of applications or requirements.

ASSEMBLY PROTECTION

Interlock hose	A stripwound hose made of a helical profile of interlocked strip. This hose can be used as: • Outer protective guard over the hose assembly to protect against physical damage to hose and braid layers. • Inner protective liner to protect hose from abrasive media or provide a smother bore for increased media flow rates. • Bend restrictor at assembly ends to provide support and prevent over bending.
Rope lagging	A helical wrapping of rope around the outside of the hose with a closed pitch to protect the hose and braid from physical damage and insulation on cryogenic applications. Rope materials and diameter can be varied to requirements.
Spring guard	A helical wrapping wire around hose assembly to provide support and if attached to fittings can provide 'whip' protection in case of rupture.
Silicone fire sleeve	Silicon impregnated fibreglass sleeve to provide protection to hose and braid from high heat and environmental conditions.
Heat shrink covering	Heat shrink tubing placed over hose and shrunk tight against assembly to provide protection from minor environmental conditions. Materials and colours can be varied to meet desired performance and aesthetics.

ASSEMBLY IDENTIFICATION

We offer a variety of identification options including customer logo branding, serialization, operation limits and date stamping.

We also offer:

- Laser printed/etched stainless steel tags, aluminium tags, or braid bands.
- Dot peened stainless steel and aluminium tags.
- Custom printed heat shrink bands in a variety of colours and lengths.

CLEANING

Cleaning options are available for assemblies that need to meet CGA requirements for industrial oxygen and gas services. This allows for use in critical services such as oxygen service and contamination sensitive applications.

Precision cleaning services are also available for aerospace and other mission critical applications.

LEAK AND PROOF TESTING

To ensure our assemblies meet critical applications requirements, we 100% test all of our assemblies. We offer a wide variety of testing services, including:

- Pneumatic bubble testing with compressed air, nitrogen or helium.
- Hydrostatic proof testing to 1.5x working pressure with reverse osmosis water or deionised water upon request.
- Helium mass spectrometer leak detection.

NON-DESTRUCTIVE TESTING (NDT)

A variety of non-destructive testing options are available and follow American Society for Non-destructive Testing (ASNT) recommended practice SNT-TC-1A:

- Dye penetrant testing (visible and fluorescent)
- X-ray Fluorescence Positive Material Identification (XFR PMI)
- Radiographic examination (x-ray)

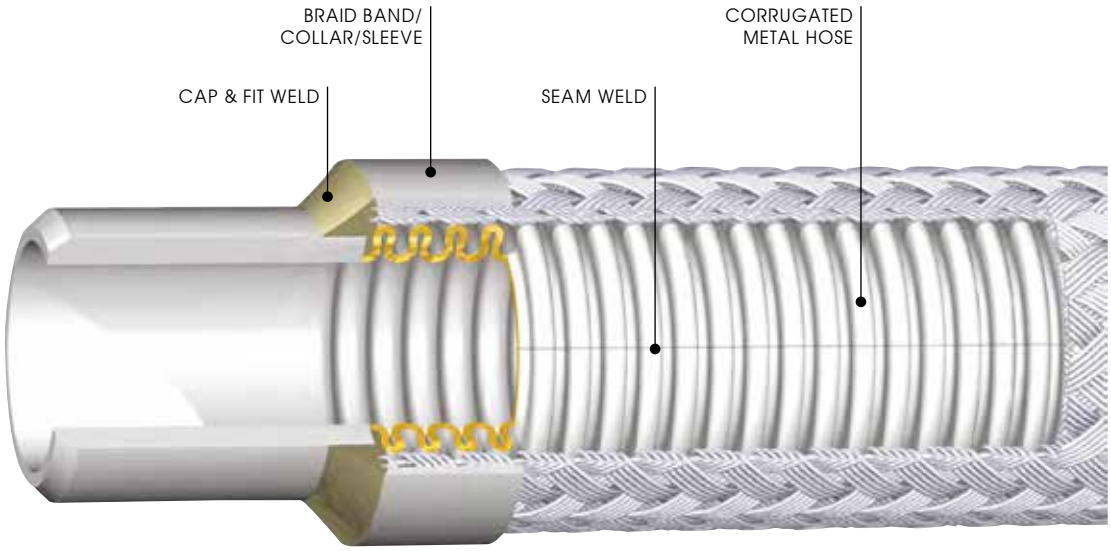
CERTIFICATION

Certification records can be produced for all testing performed, including:

- Certificated of Conformance (CoC)
- Certificates of Testing (CoT)
- Certificates of Testing w/ Chart Recorded Data (CoT)
- EN10204 3.1 Material Certificates
- Manufacturing Data Records (MDR Books)
- Inspection and Testing Control Plans (ITPs)

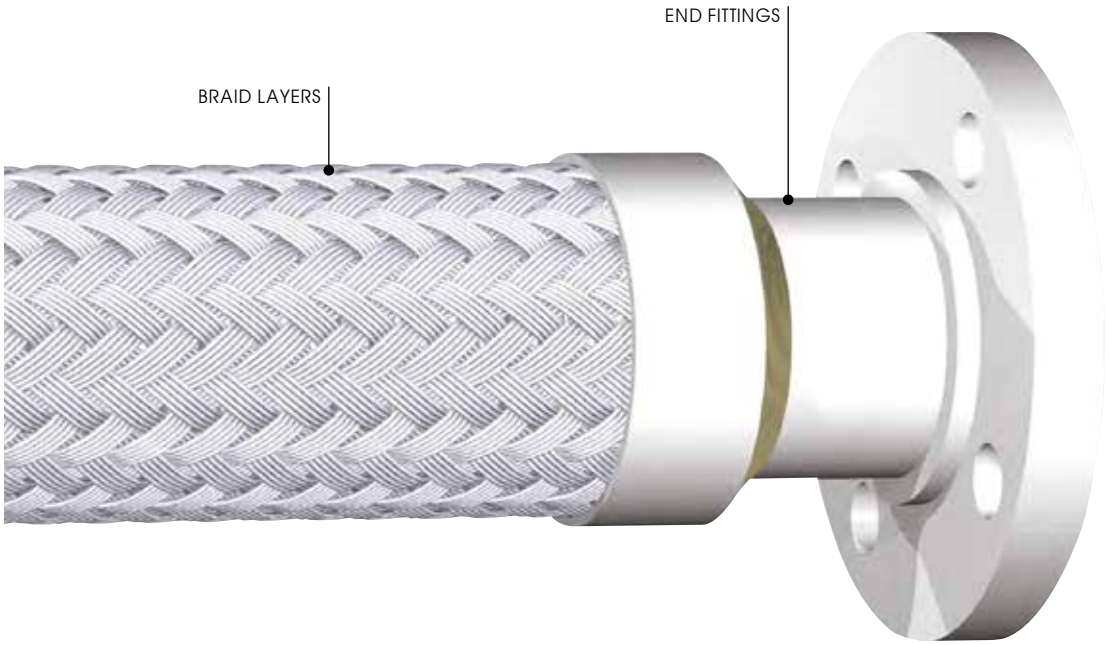
ASSEMBLY SCHEMATIC

BASIC METALLIC ASSEMBLY



END PREPARATION

Corrugation root cut	Standard end preparation providing wider cap weld for fitting attachment.
Corrugation crest cut	Special end preparation providing smoother assembly bore.



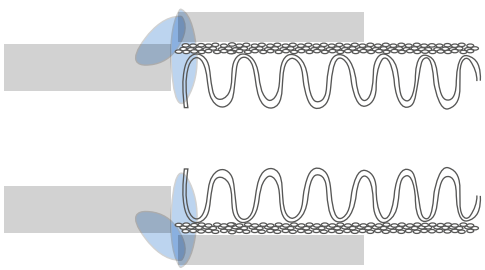
GTAW/TIG WELDED ENDS

Method 1: Direct fitting attachment

Welding procedures as required

ASME Boiler & Pressure Vessel Code Section IX

AWS D17.1 EN 9606



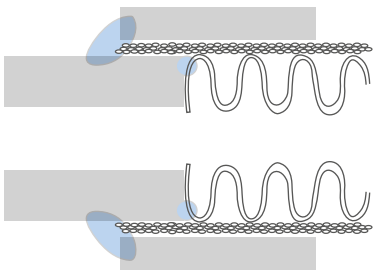
GTAW/TIG WELDED ENDS

Method 2: Braid over/ neck down

Welding procedures as required

ASME Boiler & Pressure Vessel Code Section IX

AWS D17.1 EN 9606



INSTALLATION GUIDE

To obtain maximum service life from metal hose, two IMPORTANT installation rules should be adhered to:

1. DO NOT TORQUE

A hose is subject to torque by:

Twisting during installation. To minimize possible torque damage to a hose, a union or floating flange should be used at one end of the hose assembly.

Where flanges are used, the fixed flange end should be bolted into place before the floating flange end. Where a threaded nipple and a union are used, the nipple end should be threaded into place and then the union tightened using two wrenches.

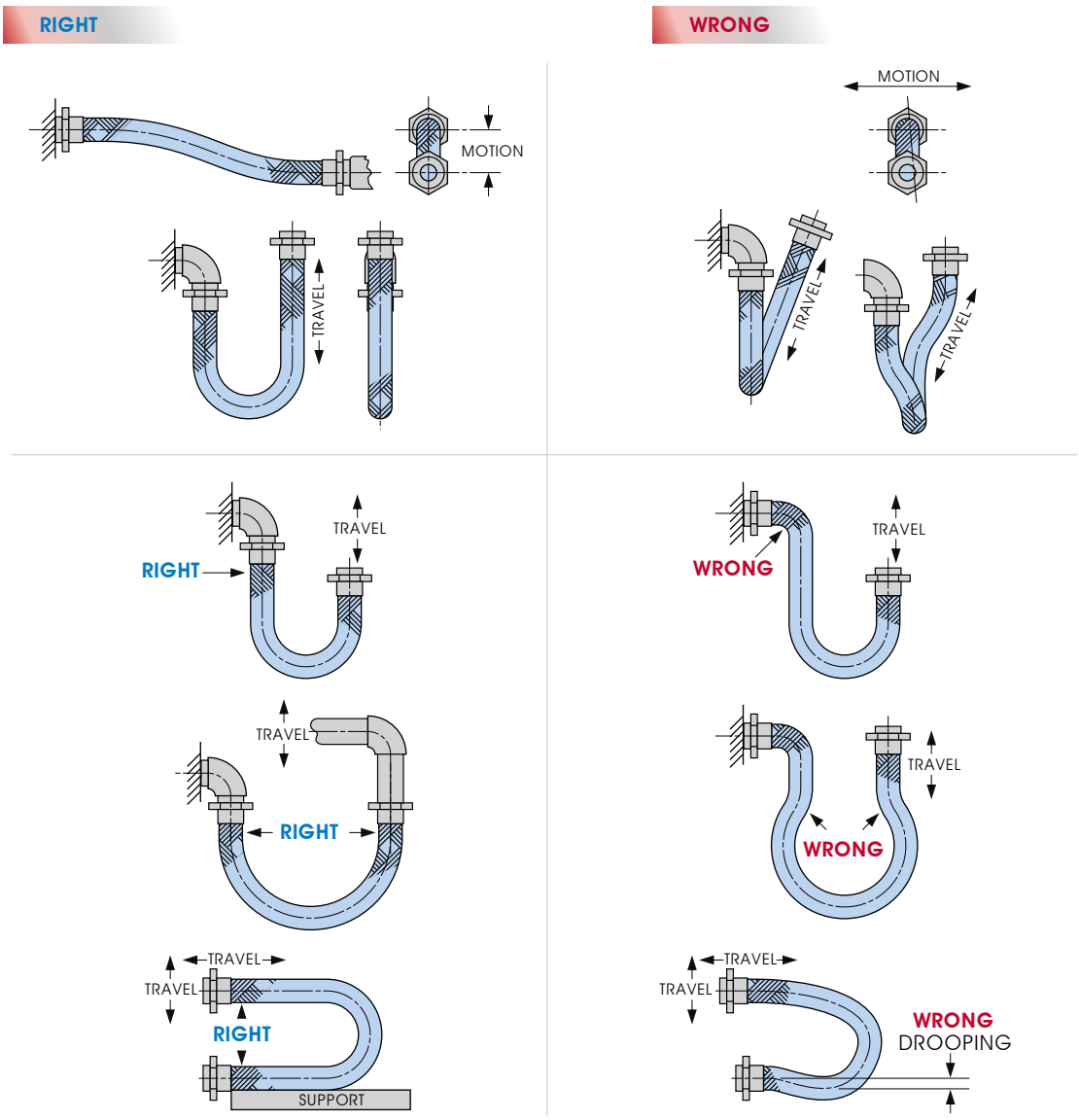
Twisting on fixture: always install the hose so that flexing takes place in one plane only, and in the plane of bending.

2. AVOID SHARP BENDS

There are many ways a hose can be subjected to recurring sharp bends as a result of improper installation. A few examples are illustrated below.

The minimum centreline bend radius for dynamic flexing should never be less than the values specified in the hose data table.

Should piping restrictions make it impractical to install hose in the proper manner, the use of interlocked hose guard will limit the hose bending to a suitable radius, thus prolonging the life of the corrugated hose.



PIPE ANCHORING AND GUIDING

A piping system which utilizes flexible metal hose to absorb pipe movement, must be properly anchored and guided to assure correct functioning and maximum service life.

The basic principles to be observed are:

1. Pipe motion The direction of pipe motion must be perpendicular to the centreline (axis) of the hose.

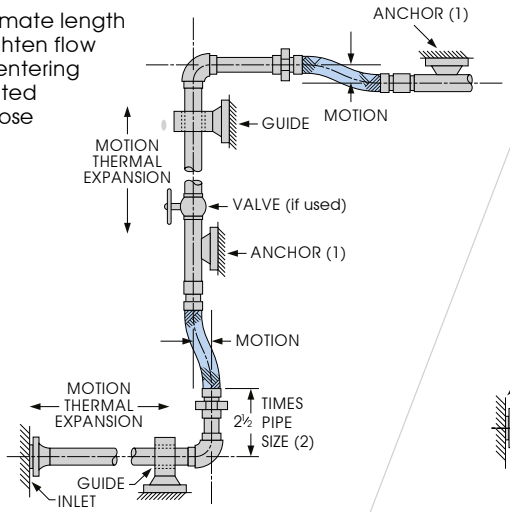
2. Anchoring The pipe must be anchored at each change of direction where a flexible metal hose is employed, to prevent torsional stress.

Typical examples of correct and incorrect guiding are shown below.

RIGHT

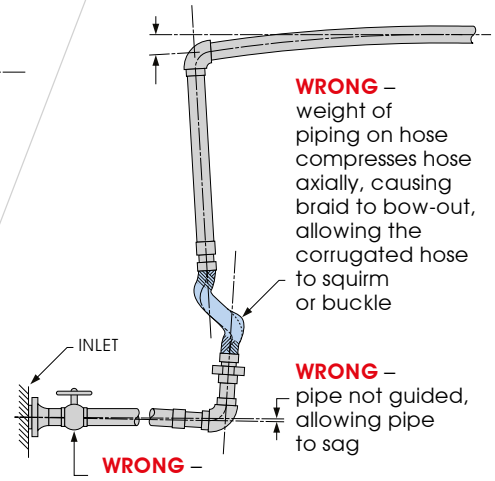
1. Anchors are to be used at the end of hose opposite from the source of motion.

2. Approximate length to straighten flow before entering corrugated metal hose



WRONG

WRONG –
pipe not guided or suppoted, allowing pipe to sag

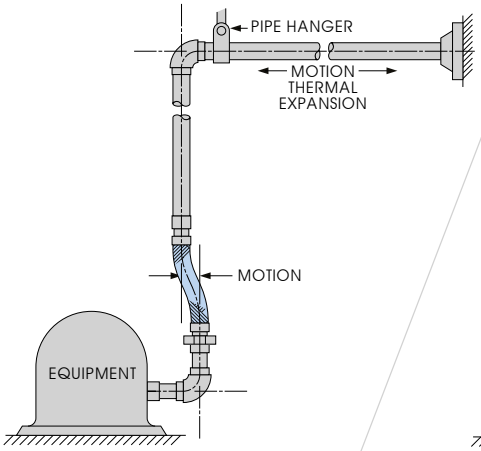


WRONG –
weight of piping on hose compresses hose axially, causing braid to bow-out, allowing the corrugated hose to squirm or buckle

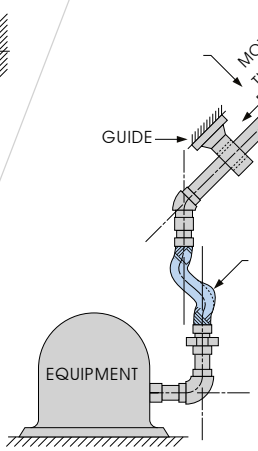
WRONG –
pipe not guided, allowing pipe to sag

WRONG –
if valve between equipment and hose is quick-acting type

1. Direction of motion must be applied perpendicularto hose centerline (axis)



WRONG –
direction of motion not perpendicular to hose centerline (axis)



WRONG –
braid on hose bowed-out due to axial compression component of applied motion resulting in relaxing of braid tension, thus permitting the corrugated hose to buckle.

HANDLING GUIDE

HOSE STORAGE

- Hoses should be stored in a straight line, raised off the ground on firm level supports or storage racks, preferably in a cool area.
- Hoses should be drained and dry before moving into storage. Flange covers or caps should be placed on threads to prevent ingress of foreign objects or debris into the bore of the hose.

BASIC ASSEMBLY HANDLING AND INSTALLATION

- When handling our products, particularly where end fittings are not fitted, there is a possibility of laceration to the skin due to protruding wires and skin contamination may occur. Care should also be exercised when handling the products if they are coiled up, as injury may occur when removing packaging straps due to the tension in the product being released.
- It is advisable that protective gloves and/or safety glasses should be worn when handling the products.
- Hoses should not be dragged on the floor or along any object that may snag, wear, cut or damage the braid covering in any way.
- Do not stand on, drive over, or place objects on the hose that may dent or deform the convolutions in any way.
- Hose is not designed or meant to act as a hanger or support for any other components.
- Always follow industry recommended practices for handling and installing hose assemblies and fittings.
- When tightening tapered threaded ends, such as BSP taper or NPT fittings, use a quality pipe thread sealing compound or tape and tighten the male fittings 2 to 2½ full turns past the hand tight position. If leakage is observed, tighten further in small increments.

Note: Over tightening can cause the pipe fitting to deform and damage the components.

- When tightening couplings, tighten to the recommended torque values as stated by the coupling style. Tighten by bringing the sealing faces together and turning the nut only. Do not allow the sealing surfaces to rotate against each another; they could gall and scratch,preventing a proper seal.
- When welding pipe ends, care must be taken to prevent excessive heat being placed in the fitting to hose weld. Under no circumstances should the fitting to hose weld be re-melted or have any welding performed to it.
- **NEVER** wrench on the hose or the collars of a hose assembly.
- Install hose assembly so there is no live length contact with foreign objects, framing, piping or any other component that could rub against and wear the braid during normal operational vibration.
- Never axially compress a braided metal hose assembly to facilitate installation.

CLEANING

- Hoses should be cleaned after use and before prolonged storage or testing.
- Before commencing any cleaning operation, the user must be satisfied that the cleaning method proposed is safe and will not result in any dangerous reactions with the chemical residues left in the hose.
- Flushing out is enough in many circumstances using a variety of fluids, e.g. clean water, hot water detergents, common solvents at ambient temperature.
- Loose steam or compressed air may be used but the hose must be open ended and the maximum working pressure must not be exceeded.

OXYGEN AND CLEANED ASSEMBLIES

- Should remain bagged or suitably protected until installation.
- Installation should be performed using only lubricants, thread sealing compounds and gaskets specifically designed for oxygen service or are compatible with the application and media

INSPECTION GUIDE

PERIODIC INSPECTION OF HOSE ASSEMBLIES

- A hose inspection program can reduce equipment downtime and maintain peak operating performance. Inspection should be done on a regular basis with frequency based on prior history of the equipment, a set maintenance programme, and the severity of the application.

Always use appropriate safety considerations when performing inspection of hose assemblies to avoid personal injury. Be aware of the potentially hazardous area surrounding the hose assembly.

Inspected hose and fittings for the following conditions:

- Broken or corroded wires.
- Physical damage to hose and braid.
- Leakage in the hose or at the end fittings.
- Cracked, damaged, or corroded hose and/or fittings.
- Abrasion along length due to contact with other surfaces.

If any of the above conditions exist, the hose assembly should be replaced immediately.

If the hose can be removed from the system, additional steps can be taken to ensure a properly maintained assembly. Before performing any inner bore inspection and maintenance, be aware of the possible presence of media left in the hose bore and corrugations, even after cleaning

with a compatible cleaning media.

Inspected hose bore and fittings for the following conditions:

- Obstructions.
- Physical damage to hose bore.
- Corrosion to hose or fittings.

RETESTING OF HOSE ASSEMBLIES

- Drain and thoroughly clean hose.
- Carry out visual inspection - only pressure hoses assemblies which have passed a visual inspection without any of the conditions as stated above.
- Retesting of the hose should be done periodically based on risk potential. Hydrostatic testing should be performed according to the maximum test pressure of the hose or 1.5x the working pressure.
- **Do NOT** exceed the maximum test pressure of the end fittings that have been used on the hose assembly.
- Consult Amnitec for any assistance in determining proper test pressures and methods.

REMOVAL FROM SERVICE

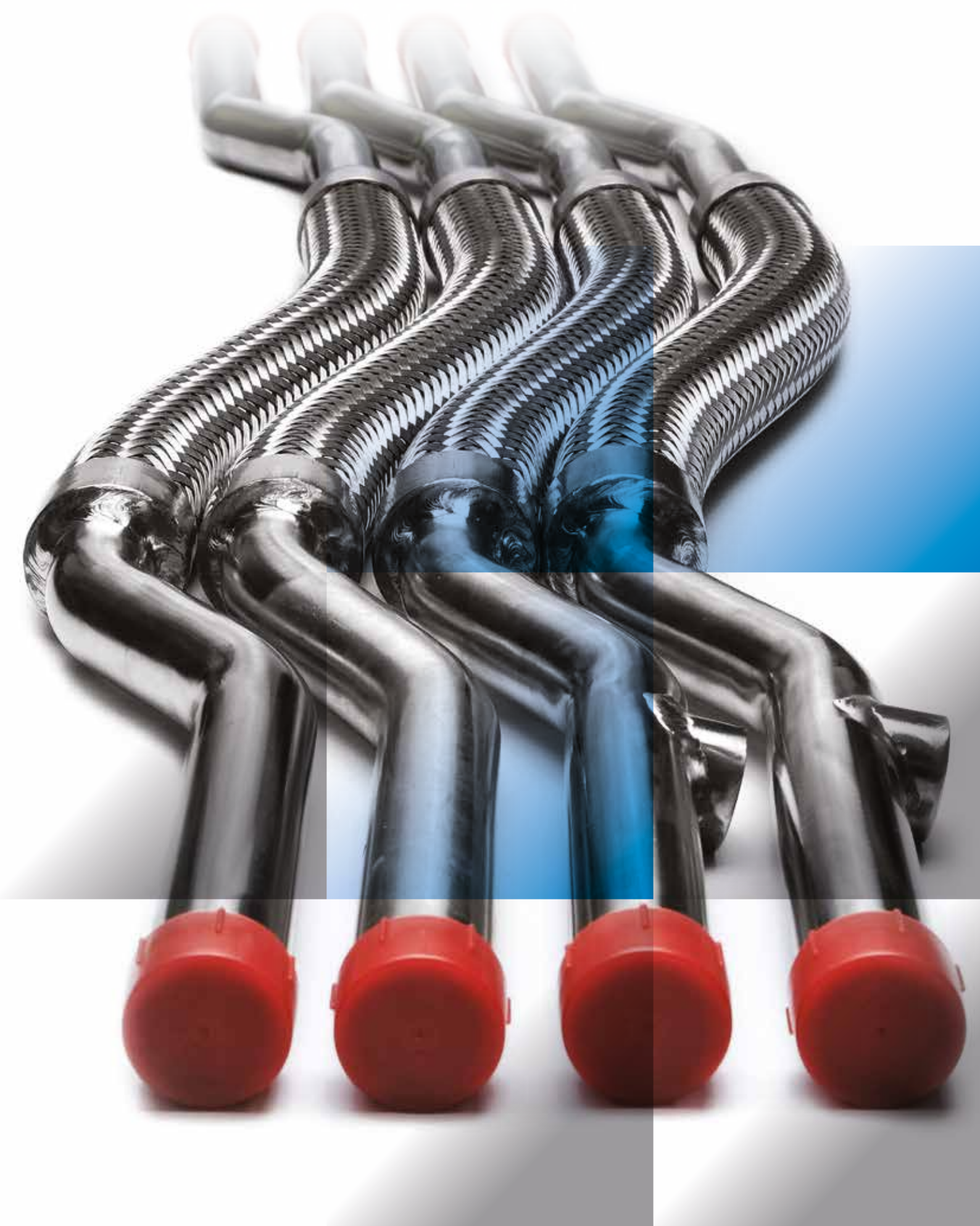
- Any hose which exhibits any of the above characteristics should be removed from service immediately. Amnitec may be consulted to:
- Review a hose's suitability for service.
- Perform testing to verify integrity and performance.
- Provide repair (if possible).
- Obtain replacement. ide

BESPOKE SOLUTIONS

While our range of standard hose and assemblies are the perfect choice for a wide range of applications, there are times when a bespoke solution is required. Utilising our many years of experience, high-performance manufacturing facilities and in-house expertise, we work with our customers to create bespoke solutions that solve problems and enhance performance.

Our best practice manufacturing techniques ensure that every product we design and manufacture is done to the highest of quality standards, using the best materials.

It is through this continued commitment to quality, innovation and 'getting it right first time', that we have built long term relationships with our customers, many of which rely on us to not only supply outstanding products, but to provide solutions.



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