



## Transoil Composite Hose

### Description

Composite hose made from polypropylene fabrics and films with an abrasion resistant PVC coated fabric cover. Inner and outer wires are galvanised mild steel.

### Colour code

Blue outer cover with Red or marked white stripe.

### Principal applications

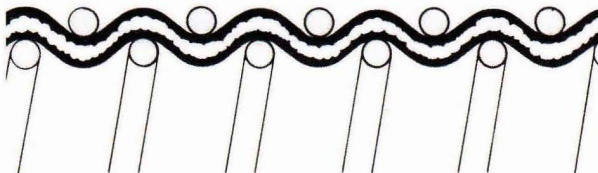
Transoil is especially suitable for the suction and discharge transfer of petroleum products in in-plant applications. It is an excellent hose for conveying tallow and high aromatic hydrocarbons.

### Manufacture

Complies with EN 13765 Type 2 and AS 2117 Type 3 Grade 1 & 2.

### Temperature

Depending on the conveyant -30°C to +80°C.



specifications					
nominal bore	outside dia	bend radius	pressure nominal		weight per metre
mm	mm	mm	psi	bars	kg / M
25	38	90	150	10	1.00
38	52	120	150	10	1.60
50	64	150	150	10	2.00
65	80	180	150	10	2.70
75	92	250	150	10	3.20
100	115	350	150	10	6.00
150	170	480	150	10	9.00
200	230	600	150	10	13.00

*All pressures are based on a safety factor of 4:1*

## Transdock Composite Hose

### Description

Composite hose made from heavy duty polypropylene fabrics and films with a double layer of abrasion resistant PVC coated fabric cover. Inner and outer wires are galvanised mild steel.

### Colour code

Royal Blue outer cover with marked white stripe.

### Principal applications

Transdock is suitable for the heavy duty suction and discharge transfer of petroleum products in road and rail tanker, dockside and ship to shore applications.

### Manufacture

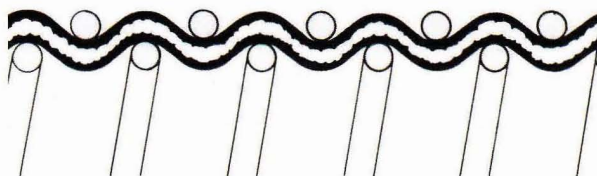
Complies with EN 13765 Type 3 (100-200mm), Type 2 (250mm), and AS 2117 Type 2 Grade 1 & 2. A Group 1 hose where electrical continuity is maintained by both hose wires being securely connected to the fittings.

### Assemblies

All dock hose assemblies are supplied with factory fitted externally swaged end connections.

### Temperature

Depending on the conveyant -30°C to +80°C.



specifications					
nominal bore	outside dia	bend radius	pressure nominal		weight per metre
mm	mm	mm	psi	bars	kg / M
100	120	430	200	14	7.50
150	175	550	200	14	11.00
200	240	750	200	14	16.00
250	295	1000	150	10	22.00

*All pressures are based on a safety factor of 4:1*

# Transchem Composite Hose

## Description

Composite hose made from polypropylene fabrics and films with an abrasion resistant PVC coated fabric cover. The hose has an inner wire of stainless steel 316 and is lined with layers of PTFE film. The outer wire is galvanised mild steel.

## Classification

Chemical Group 3 Hose.

## Colour code

Red outer cover with white stripe.

## Principal applications

Solfon is suitable for the transfer of the most aggressive chemicals and searching solvents.

The PTFE liner has a low co-efficient of friction making the hose also suitable for the conveyance of high viscosity products such as paint.

Electrical continuity is maintained by the hose wires being securely connected to the fittings.

## Special applications

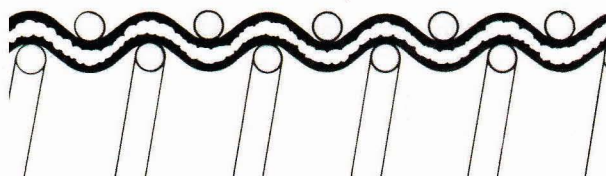
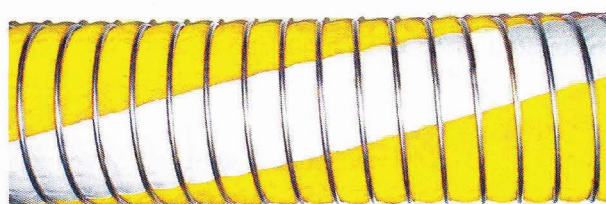
Solfon can be supplied with a stainless steel 316 outer wire for applications involving corrosive atmospheres and splash. This hose is called Solfon-S.

## Manufacture

Complies with EN 13765 Type 2.

## Temperature

Depending on the conveyant -30°C to +80°C.



## specifications

nominal bore mm	outside dia mm	bend radius mm	pressure nominal psi bars	weight per metre kg / M
25	38	90	150 10	0.90
38	52	120	150 10	1.60
50	64	150	150 10	1.80
65	80	180	150 10	2.50
75	92	210	150 10	2.90
100	120	340	150 10	5.30
150	170	480	150 10	8.20
200	230	600	150 10	11.60

All pressures are based on a safety factor of 4:1

# Transgas Composite Hose

## Description

Composite hose made from polyester and polyamide fabrics and films. Inner and outer wires are stainless steel 316.

## Colour code

White outer cover with green stripe.

## Principal applications

Transgas hose is in general suitable for liquid petroleum gas (LPG) handling. To transport LPGs, it is standard practice to liquefy them either by refrigeration down to -50C, or by pressurisation at approximately 20 Bar pressure at ambient temperature.

Suitable for the transfer of cryogenic conveyants down to - 50C and can be used for with other conveyants as listed under Group 4,5 and 7 of the Resistance Chart.

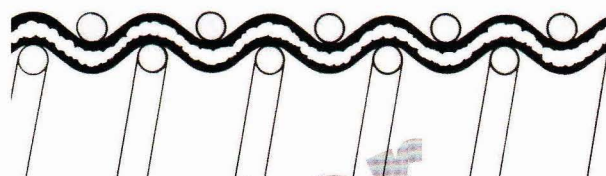
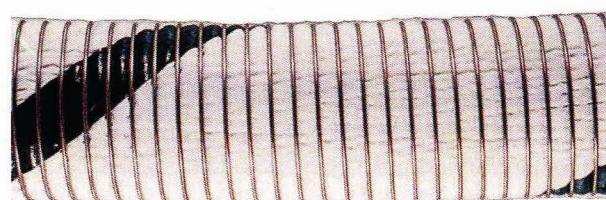
## Manufacture

Complies with AS 1869 Class E (25-100mm) and EN 13766 Class A Type 1 (25-100mm).

Note : the 150 and 200mm hoses have a lower pressure rating than the above Standards and due care must be taken in their selection.

## Temperature

Temperature range from -50°C to +80°C with limitations on working pressure over 50°C.



## specifications

nominal bore mm	outside dia mm	bend radius mm	pressure nominal psi bars
25	38	100	380 26
38	50	150	380 26
50	65	165	380 26
65	80	190	380 26
75	93	230	380 26
100	120	350	380 26
150	174	460	150 10
200	230	600	150 10

All pressures are based on a safety factor of 4:1



## Bituflex Composite Hose

### Description

Composite hose made from polyester and polyamide fabrics and films. Inner and outer wires are galvanised mild steel.

### Colour code

White outer fabric cover with word 'Bituflex' stencilled.

### Manufacture

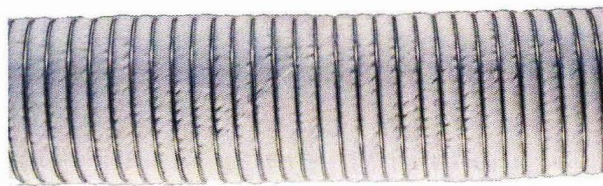
Bituflex is suitable for temperatures to +150°C continuous and to +180°C in surges, however, pressure ratings should be reduced by 50% when temperatures exceed 100°C.

### Principal applications

Ideal for the transfer of most hot fluids at elevated temperatures.

### Safety note

Bitumen is generally handled at elevated temperatures. Medical specialists advise that burns from bitumen usually affect the full thickness of skin, generally requiring a skin graft. Use of suitable personal protective equipment is strongly recommended.



### specifications

nominal bore mm	outside dia mm	bend radius mm	pressure nominal psi	bars
25	38	130	150	10
38	50	160	150	10
50	65	210	150	10
65	75	270	150	10
75	90	300	150	10
100	120	400	150	10

*All pressures are based on a safety factor of 4:1*

## Transchem Composite Hose

### Description

Composite hose made from heavy duty polypropylene fabrics and films with a double layer of abrasion resistant PVC coated fabric cover.

The standard manufacture is with SS316 inner and outer wires.

Alternative options are with SS316 inner wire and galvanised steel outer wire, or polypropylene coated steel inner wire with galvanised or SS316 outer wire.

This hose is also available lined with layers of PTFE film.

### Principal applications

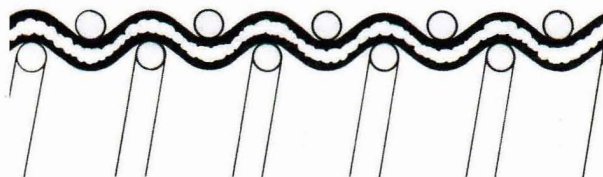
Chemdock is suitable for heavy duty suction and discharge of bulk chemicals in road and rail tanker, dockside and ship to shore applications.

### Manufacture

Complies with EN 13765 Type 3 (100-200mm) Type 2 (250mm) and AS 2117 Type 2 Grade 1 and 2 Electrical continuity is maintained by both hose wires being securely connected to the fittings.

### Temperature

Depending on the conveyant -30°C to +80°C.



### specifications

nominal bore mm	outside dia mm	bend radius mm	pressure nominal psi	bars	weight per metre kg / M
100	120	430	200	14	7.50
150	175	550	200	14	11.00
200	240	750	200	14	16.00
250	295	1000	150	10	22.00

*All pressures are based on a safety factor of 4:1*

### Product codes

CD_ _ _	SS316 inner and outer wire
CDG_ _ _	SS316 inner and galvanised steel outer wire
CDP_ _ _	Polypropylene coated steel inner wire and SS316 outer wire
CDPG_ _ _	Polypropylene coated inner wire and galvanised steel outer wire
CDE_ _ _	PTFE lined with SS316 inner and outer wire

## **Smooth Bore Petroleum Dock**



Application : For the transfer of petroleum based products of up to 50% aromatic content between docks and ships under all type of service conditions.

Tube : Black smooth nitrile rubber

Cover : Smooth synthetic rubber, resistant to oil, abrasion, ozone and weathering.

Temperature : -31°C + 93°C

End fittings : Coupled with standard build-in nipple / flanges. swage nipples are offered Up to 10". hose assembly is electrically continuous unless otherwise specified by customer.

## **Material Handling, Slurry and Dredge Rubber Hose**

Application : For dual delivery and suction of abrasive slurry materials particularly in mining applications or processing plants.

Tube : Natural rubber – Super abrasion resistant (S.A.R)

Reinforcement : High tensile synthetic, incorporating a steel wire helix

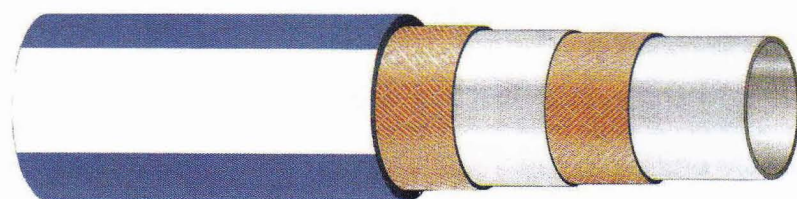
Cover : Black, Natural rubber, Super abrasion resistant (S.A.R) and UV resistant

Temperature : -35°C and +75°C (-31°F and 167°F).

Size : Internal diameters in excess of 1M and lengths to 12M



## **Food Grade Suction & Delivery Heavy Duty Smooth Bore Rubber Hose 15 BAR**



### **Applications :**

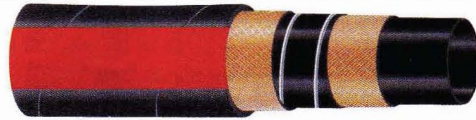
- Designed for loading & unloading of Food Grade products between Dock and Ship application

### **Construction :**

- Tube : Food Grade rubber for aqueous and Fatty foods content
- Cover : Food Grade rubber blends for abrasion, ozone and weather resistance
- Reinforcement : Multiply heavy duty synthetic tire cord supported with wire helix
- Safety Factor : 1:3
- Temperatures : -40°C to + 100°C
- Electrically : Continuous, Discontinuous on customer requirement
- Approval : EN1765 Food Grade US FDA CFR 177.2600



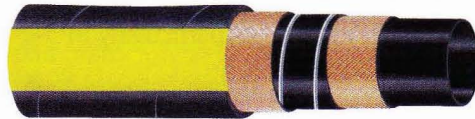
## **Oil Suction & Discharge Rubber Hose**



### **Hose specifications**

<b>Inner tube</b>	Seamless oil resistant nitrile rubber.
<b>Outer cover</b>	Weather and abrasion resistant neoprene rubber.
<b>Reinforcement</b>	Multi layers of close mesh textile cords with embedded steel wire helix.
<b>Temperature</b>	Maximum operating temperature 90°C.
<b>Safety factor</b>	3 : 1
<b>Color</b>	Black hose with maroon stripe and black letters.
<b>Application</b>	Medium duty fuel oil transfer for plant or dock side and can be used with many other mediums (please consult us for advice or you may request for chemical chart).
<b>End fittings</b>	Flange, camlock, bauer couplings, threaded, victaulic pipe end, etc.

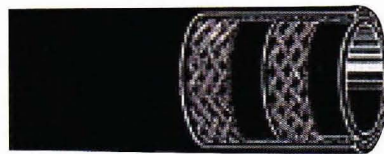
## **Water Suction & Discharge Rubber Hose**



### **Hose specifications**

<b>Inner tube</b>	Smooth bore SBR rubber.
<b>Outer cover</b>	SBR rubber.
<b>Reinforcement</b>	High tensile wire and 2 plies of textile cords.
<b>Temperature</b>	Maximum working temperature 85°C.
<b>Safety factor</b>	3 : 1
<b>Color</b>	Standard production is YELLOW.in black with green stripe and black lettering.
<b>Application</b>	Most commonly used by plants and factories as a general transfer hose for pump suction or delivery and gravity drop.

## **Black Rubber Air Hose**

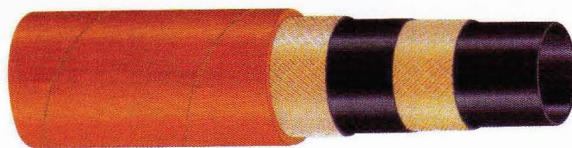


### **Technical Specifications:**

<b>Inner Tube</b>	SBR Compound
<b>Reinforcement</b>	2 layers of high density synthetic yarn
<b>Outer Cover</b>	Smooth black SBR compound weather and abrasion resistant
<b>Temperature</b>	Maximum recommended working temperature 95 degree Celcius
<b>Safety Factor</b>	3:1
<b>Application</b>	Compress air/water for offshore platforms, refineries, depots, ship building, steel production and general industries, mining, quarries, civil works, agricultural, etc

SBR (Styrene Butadiene is not recommended for oil based products)

## **Red General Purpose Hose**



### **Technical Specifications:**

<b>Inner Tube</b>	Smooth bore oil resistant nitrile rubber
<b>Reinforcement</b>	High tensile textile yarns in 2 or 4 layers
<b>Outer Cover</b>	Red smooth neoprene rubber, highly resistant to ozone/weather, oil and abrasion
<b>Temperature</b>	Maximum recommended working temperature 95 degree Celcius
<b>Safety Factor</b>	3:1
<b>Application</b>	General utility hose for oil, water, air, gases, kerosene, salt solution and return line for offshore platforms, refineries, depots, ship building, steel production and general industries

## **Tuchem EPDM**



Suction and delivery hose for chemical products, designed according to EN 12115 standards.

### **Construction**

<b>Tube</b>	EPDM, black, conductive
<b>Reinf.</b>	textile plies, a/s copper wire to discharge static electricity, steel wire helices
<b>Cover</b>	smooth EPDM, black, conductive, ageing and ozone resistant, cloth finish
<b>Marking</b>	lilac tape TUDERTECHNICA TUCHEM EPDM



embossed according to norm EN 12115

TUDERTECHNICA TUCHEM EPDM EN12115 DN SD PN 16  $\Omega$  Q/Y

### **Technical characteristics**

<b>Temperature range</b>	-40°C / +120°C
<b>Vacuum</b>	0,8 bar
<b>Electrical properties</b>	type $\Omega$ according to norm EN 12115 ( $R < 10^6 \Omega$ )
<b>Norm</b>	EN12115, Trbf 131/2

## **Plicord® 250 Steam**



### **Application:**

A rugged construction used for all-around steam service in chemical plants, refineries, shipyards and demanding industrial service. It is recommended for cleaning, thawing, blowout service, steam pumps, hoists and other applications involving steam.

**Construction:** Tube: Black Versigard® synthetic rubber

Cover: Black Versigard® synthetic rubber, also available in red cover with yellow brand for color coding (wrapped impression)

Reinforcement: Spiral plied steel wire

Temperature: 0°F to 406°F (-40°C to 208)

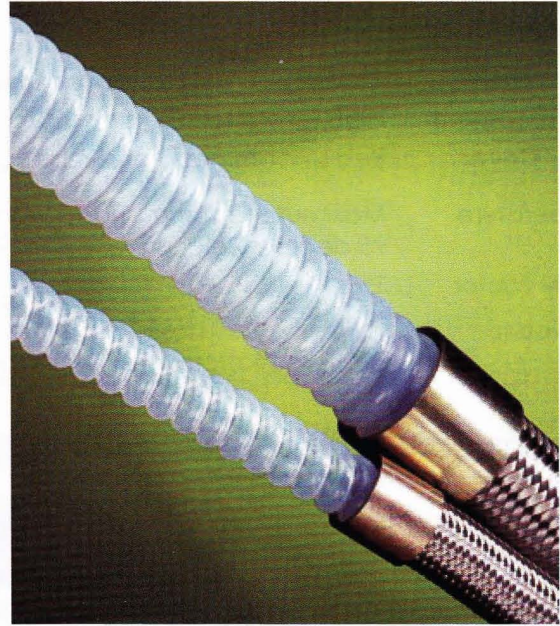


# TEFLON® HOSE

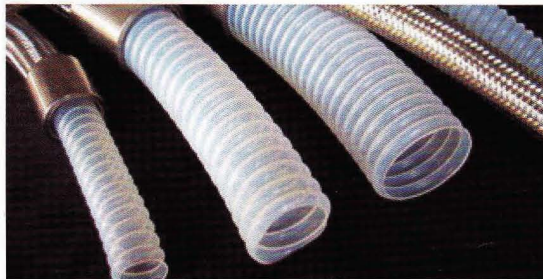
## Easyflex Convoluted Hose

### EASYFLEX Convoluted hose

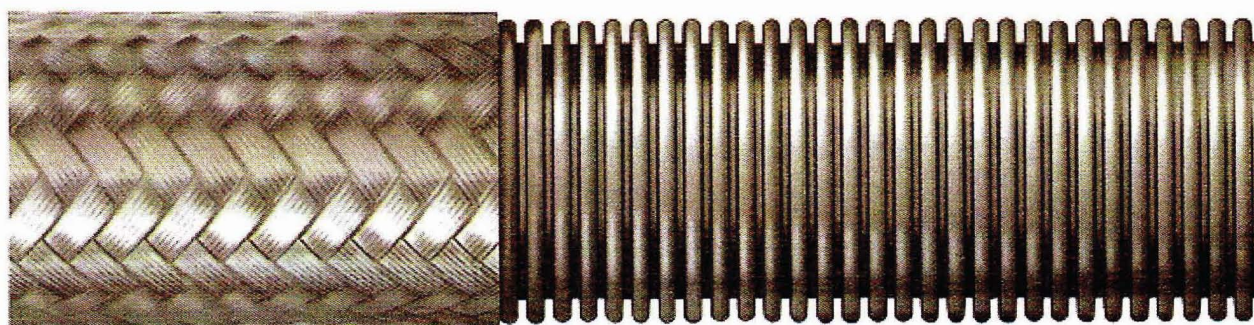
Easyflex was developed to simplify the assembly of convoluted TEFLON® hose using standard hydraulic fitting. The tube is manufactured in a seamless, extruded convoluted TEFLON®. This process allows the manufacture of maximum lengths of 60 meters and gives control over Product quality.



Part Number	Size/Description	Internal Diameter				Wall		Outside Diameter				Minimum		Maximum*		Minimum*	
		Minimum		Maximum		Thickness		Minimum		Maximum		Bend Radius		Working Pressure		Burst Pressure	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	bar	psi	bar	psi
8004	1/4" EASY FLEX(1WB)	6.73	0.265	7.49	0.295	0.76	0.030	11.94	0.470	12.70	0.500	17.8	0.700	172	2500	517	7500
8006	3/8"	9.14	0.360	9.91	0.390	0.76	0.030	14.73	0.580	15.75	0.620	20.3	0.800	138	2000	414	6000
8008	1/2"	12.45	0.490	13.21	0.520	0.89	0.035	18.29	0.720	19.30	0.760	25.4	1.000	103	1500	310	4500
8010	5/8"	15.37	0.605	16.38	0.645	0.89	0.035	21.59	0.850	22.61	0.890	50.8	2.000	83	1200	248	3600
8012	3/4"	18.54	0.730	19.56	0.770	0.89	0.035	24.00	0.945	25.27	0.995	63.5	2.500	69	1000	207	3000
8014	7/8"	21.84	0.860	22.86	0.900	0.89	0.035	27.94	1.100	29.46	1.160	76.2	3.000	57	830	172	2500
8016	1"	24.89	0.980	26.16	1.030	1.02	0.040	32.13	1.265	33.66	1.325	88.9	3.500	46	667	138	2000
8020	1 1/4"	31.00	1.220	33.00	1.299	1.02	0.040	39.00	1.535	42.00	1.654	88.9	3.500	34	500	103	1500
8024	1 1/2"	37.50	1.476	40.50	1.594	1.02	0.040	46.99	1.850	49.20	1.937	152.4	6.000	30	435	90	1300
8032	2"	48.00	1.890	52.00	2.047	1.09	0.043	58.67	2.310	59.70	2.350	190.5	7.500	23	329	69	1000



## PRODUCT SPECIFICATIONS



### STAINLESS STEEL HOSE AND BRAID SPECIFICATIONS

NOMINAL I.D. mm	MINIMUM BEND RADIUS		WITHOUT BRAIDS		SINGLE BRAID		DOUBLE BRAID	
	Static mm	Flexing mm	Max. Working Pressure Kg / cm <sup>2</sup>	Test Pressure Kg / cm <sup>2</sup>	Max. Working Pressure Kg / cm <sup>2</sup>	Test Pressure Kg / cm <sup>2</sup>	Max. Wprking Pressure Kg / cm <sup>2</sup>	Test Pressure Kg / cm <sup>2</sup>
8	25	100	4.0	6.0	100	150.0	160.0	240.0
10	40	150	4.0	6.0	90	135.0	144.0	216.0
12	50	200	3.0	4.5	80	120.0	128.0	192.0
20	70	200	2.0	3.0	64	96.0	102.0	153.0
25	90	200	2.0	3.0	50	75.0	80.0	120.0
32	110	250	1.5	2.3	40	60.0	64.0	96.0
40	130	300	1.5	2.3	30	45.0	48.0	72.0
50	175	350	1.0	1.5	28	42.0	44.0	66.0
65	200	410	1.0	1.5	24	36.0	38.0	57.0
75	205	450	1.0	1.5	18	27.0	28.0	42.0
100	230	560	0.8	1.2	16	24.0	26.0	39.0
125	280	660	0.6	0.9	12	18.0	20.0	30.0
150	320	815	0.6	0.9	10	15.0	16.0	24.0
200	435	1015	0.5	0.75	8	12.0	12.0	18.0

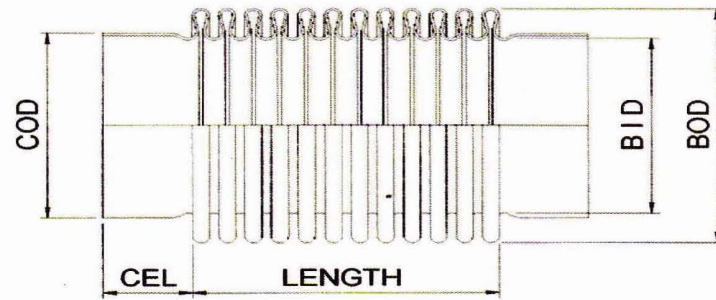
#### Note:

- ✓ The above values are applicable for Toyoflex Braid Hoses & assemblies.
- ✓ The Burst pressure is 4 times the maximum working pressure.
- ✓ The above mentioned values are for our standard range of hoses tested at 21 Deg. C.
- ✓ We can also supply hoses with lesser bend radius / higher pressure rating on request.
- ✓ Stainless Steel refers to SS 304, 316, 316L and 321.



LIGHT WAY METALS

## Metallic Bellows



JOIN FORCE BELLOWS

## SPECIFICATION

NOMINAL BORE		PLY	DIMENSIONS				MAX. WORKING PRESSURE		LENGTH			TOTAL MOVEMENT	
			BOD	BID	COD	CEL			NEUTRAL	COMPRESSED	EXTENDED	AXIAL	LATERAL
inch	mm	No.	mm	mm	mm	mm	bar	psi	mm	mm	mm	mm	mm
1/2"	15	1	25.4	17.0	17.7	15	25	363	90	70	95	25	15
									180	140	190	45	60
									270	210	285	75	140
3/4"	20	1	32.7	22.2	23.1	15	25	363	90	70	95	25	12
									180	140	190	45	50
									270	210	285	75	110
1"	25	1	39.0	26.9	28.0	15	25	363	90	70	95	25	10
									180	140	190	45	40
									270	210	285	75	90
1-1/4"	32	1	48.0	34.0	35.0	15	10	145	90	70	95	25	10
									180	140	190	50	39
									270	210	285	75	90
1-1/2"	40	2	48.0	35.8	37.0	20	25	363	90	70	95	25	11
									180	140	190	50	44
									270	210	285	75	100
1-1/2"	40	1	58.5	43.8	45.0	20	10	145	90	70	95	25	8
									180	140	190	50	32
									270	210	285	75	73
2"	50	2	58.0	43.4	45.0	20	25	363	90	70	95	25	9
									180	140	190	50	36
									270	210	285	75	80
2-1/2"	65	1	73.0	55.4	57.0	20	10	145	90	70	95	25	7
									180	140	190	50	29
									270	210	285	75	66
2-1/2"	65	2	74.5	55.2	56.2	20	25	363	90	70	95	25	7
									180	140	190	50	29
									270	210	285	75	65
3"	80	1	90.0	69.0	71.0	20	10	145	90	70	95	25	5
									180	140	190	50	21
									270	210	285	75	47
3"	80	2	90.0	68.2	71.0	20	25	363	90	70	95	25	5
									180	140	190	50	20
									270	210	285	75	47
3"	80	1	104.0	82.0	84.0	20	10	145	90	70	95	25	4
									180	140	190	50	18
									270	210	285	75	42
4"	100	2	104.5	80.8	84.0	20	25	363	90	70	95	25	4
									180	140	190	50	19
									270	210	285	75	44
4"	100	1	131.0	104.7	107.0	20	10	145	90	70	95	25	4
									180	140	190	50	17
									270	210	285	75	38
5"	125	2	128.3	103.7	107.0	20	25	363	90	70	95	25	3
									180	140	190	50	14
									270	210	285	75	32
5"	125	1	158.0	130.0	134.2	20	10	145	90	70	95	25	3
									180	140	190	50	12
									270	210	285	75	27
6"	150	2	161.0	130.7	134.2	20	25	363	90	70	95	25	3
									180	140	190	50	12
									270	210	285	75	27
6"	150	1	192.0	160.0	163.2	20	10	145	90	70	95	25	2.5
									180	140	190	50	11
									270	210	285	75	24
8"	200	2	190.0	159.0	163.2	20	25	363	90	70	95	25	2.4
									180	140	190	50	9
									270	210	285	75	22
8"	200	1	252.0	215.0	218.0	20	10	145	90	70	95	25	2.1
									180	140	190	50	8
									270	210	285	75	18
8"	200	2	250.0	214.0	218.0	20	16	232	90	70	95	25	2.3
									180	140	190	50	9
									270	210	285	75	20
8"	200	3	250.0	213.0	218.0	20	25	363	90	70	95	25	2.3
									180	140	190	50	9
									270	210	285	75	20

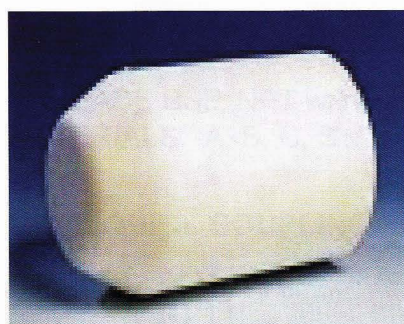
# PIGGING EQUIPMENT

## FOAM PIGS



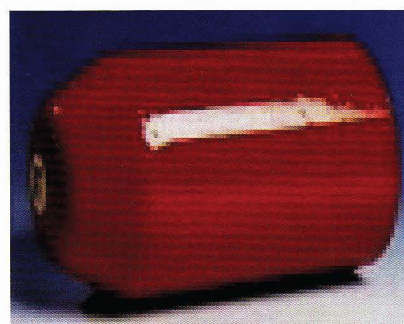
### \* PU-LD-FP LOW DENSITY PLAIN FOAM PIG

The soft foam pig is mostly used for frequent wiping or for air drying after hydrostatic testing. The soft foam pig has excellent water-absorption properties and is provided with a strong polyurethane back-seal in natural color. The soft foam pig will traverse diameter reductions up to 50%



### \* PU-LD-FP LOW DENSITY PLAIN FOAM PIG

The medium density bare foam pig is mostly used for regular on-stream wiping, as well as dewatering of pipelines. The medium density foam pig shows excellent flexibility and is provided with a strong polyurethane back-seal in blue color. The medium density foam pig will traverse diameter reductions up to 20%



### \* PU-MD-CC MEDIUM DENSITY LONG-RUN FOAM PIG

The long run foam pig is completely covered with low wear polyurethane elastomer coating. It is used both for pipeline cleaning as well as for hydrostatic testing. The medium density long run for pig will traverse diameter reductions up to 10%

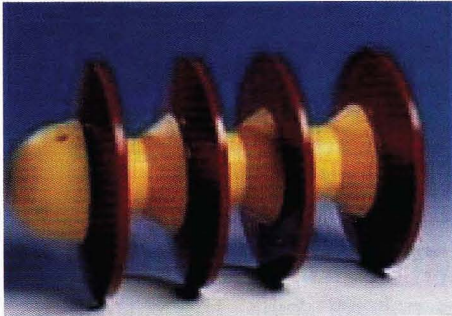


### \* PU-MD-CC MEDIUM DENSITY CRISS-CROSS FOAM PIG

The criss cross foam pig is provided with a criss-cross pattern of tough, low-wear polyurethane scarping bands. These bands generate effective pipe wall cleaning. Both the nose and back are coated as well with blue colored elastomer, which makes the pig appropriate for removal of debris.

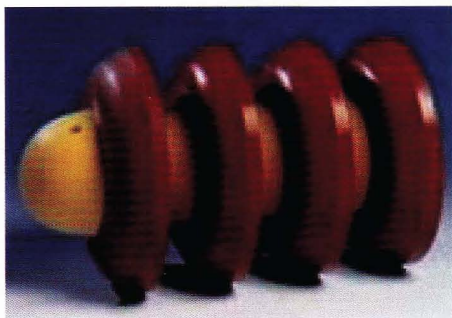
## **PIGGING EQUIPMENT**

### **FLEXI PIGS**



#### **FLEXIBLE BIDIRECTIONAL PIGS**

The Flexi-Bi-Directional-Pig is equipped with polyurethane discs that guarantee optimal operation in either flow direction. Moreover also the Flexi-Bi-Directional-Pig can be provided with circular cleaning brushes.



#### **FLEXIBLE BATCHING PIGS**

The Flexi-Separation-Pig is furnished with three or four cups and used for batching and cleaning jobs. Moreover also the Flexi-Separation-Pig can be provided with circular cleaning brushes.

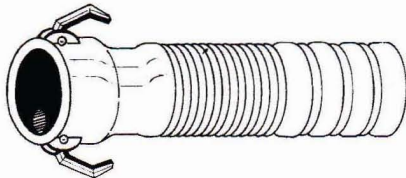


#### **FLEXIBLE GAUGING PIGS**

The Flexi-Gauging-Pig is provided with a gauging plate and driven by two or three cups or discs. It is used to register obstacle and indents, to check the free passage of a pipeline.

# Typical end Connections Composite Hose Assemblies

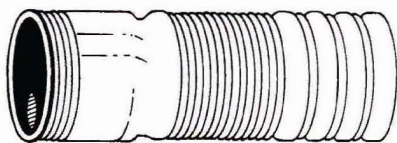
## TYPICAL WIRE WHIPPED ATTACHMENT



### materials codes

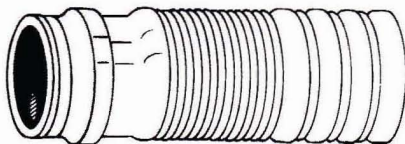
A - aluminium B - bronze C - carbon steel P - polypropylene S - stainless steel 316

## THREADED PIPE



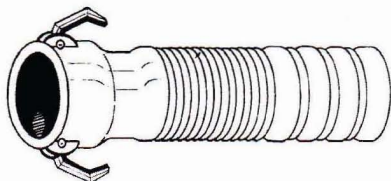
THREADS BSP, NPT with HEX NIPPLE  
MATERIALS - A, B, C, S

## MALE QUICK COUPLING



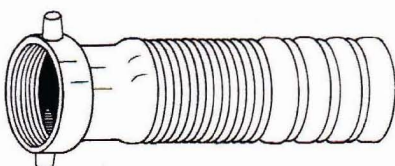
MATERIALS - A, B, P, S

## FEMALE QUICK COUPLING



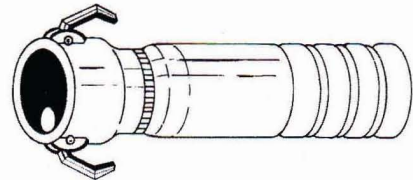
AVAILABLE IN STRAIGHT & BENT STYLES  
MATERIALS - A, B, P, S

## LOOSE SWIVEL

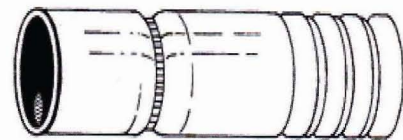


STYLE - WITH LUGS OR HEX THREADS BSP  
MATERIALS - A, B, C, S

## TYPICAL SWAGED ATTACHMENT

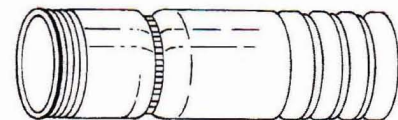


## LIFESAVER - PIPE END SCH 40



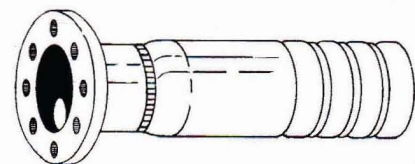
MATERIALS - C, S

## HEX NIPPLE



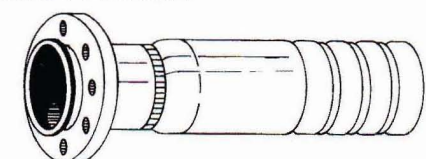
THREADS BSP, NPT  
MATERIALS - C, S

## FIXED FLANGE



STANDARDS BST, ANSI, DIN, JIS, NTT  
MATERIALS - C, S

## FLOATING FLANGE



STANDARDS BST, ANSI, DIN, JIS, NTT  
MATERIALS - C, S