TMS

Stainless steel hoses

QUALITY
SOLUTIONS

TMS

1. GOODALL® METALVISOR® INCREASED SAFETY, HIGHER FLEXIBILITY

Knows how important the right metal hose is for you.
Hose prevents leaks and guarantees less downtime and maintenance.

We have designed the best possible hose and the ideal coupling system. We developed new and efficient assembly techniques and welding procedures to avoid gaps and burrs improve the flow of the hose, and avoid corrosion.

The result is higher quality and highly reliable metal hose assemblies.
This complete system will increase safety and improve your productivity and efficiency.

TMS offers you:

- No leaks
- Less downtime
- Increased safety
- Superior flexibility
- User-friendly, ergonomic

2. YOUR BENEFITS

COST SAVING

EXTENDED LIFETIME: LESS DOWNTIME, MORE UPTIME

- High quality and thick stainless steel strip used for the corrugated tube
- Extreme high coverage of the stainless steel braid
- Innovative single pass welding procedure avoiding corrosion at the welds

NO LEAKS AND NO LOSS OF PRODUCT

- Fitting assortment designed for the hose
- Special assembly and welding procedures
- Single-pass weld to avoid gaps and burrs between the hose end and the fitting

SAFETY

MECHANICAL STRENGTH

- High working pressures
- High braid coverage

PARAMETERS

- Designed according ISO10380:2012 and BS 6501-1: 2004
- ASME IX and ISO 15614-1:2004: welding procedures qualification certification

FULL TRACEABILITY

- Material certificates for hose and braid available for each hose

ERGONOMIC

- The design of the corrugation and braid of the hose allow for greater flexibility and ease of use

WELDING PROCEDURES

- Innovative single-pass welding procedures to weld the fittings on the corrugated hose, decreasing the risk of corrosion and leaks enormously

SUSTAINABILITY

NO LEAKS

- A perfectly designed assortment of metal hose and fittings and innovative single-pass welding procedures guarantees no leaks at the weld and thus no contamination and pollution of the environment.

IMPROVE YOUR WASTE MANAGEMENT

- GOODALL® MetalVisor® hose assemblies are 100% made out of stainless steel or mild steel. Separate waste collection allows you to recycle 100%.

3. Quality

QUALITY SOLUTION

Hoses stand up to the toughest jobs, outlasting competitive products for a lower lifetime cost.

Hoses are the result of continuous improvement and attention to detail.

Superior engineering, meticulous manufacturing and advanced technology.

We bring innovative solutions to the table that result in a longer life. Wherever pressure-tight and safe transport of dangerous media is essential or a high vacuum must be maintained, solutions are required.

RELIABLE CONCEPT: MAXIMUM SAFETY

The applications are always critical: high pressure steam, extreme hot or cold fluids, gasses or vapor, high corrosive chemicals, explosion-sensitive chemicals, extreme environments, etc...

To ensure its customer's peace of mind, created the most reliable metal hose concept ever.

Each hose assembly is produced according certified assembly and welding procedures.

Convoluted metal hoses are used in many industries:


Chemical industry


Petrochemical industry


Steel industry


Pulp and paper industry


Waste water treatment


Food and pharma industry

4. QUALITY MANAGEMENT

LABORATORY

There are various standards that essentially describe the performance and technical specifications of metal hoses. Beside the continuity in performance, there is also the need to stipulate a number of additional characteristics that are relevant during hose production.

Created a Quality Assurance Plan for metal hoses using industry norms for metal hose production as a baseline.
Additional tests and controls are put in place on raw material certificates, production quality control, and welding procedures.

During the production process, all technical specifications of the stainless strip, stainless steel wire braid, couplings, braid collars, etc. are verified on dimensional, mechanical and chemical characteristics.

On demand, TMS can deliver all material and test certificates for each component.

PRODUCT APPROVAL

As an ISO9001 (2008) certified manufacturer, we are focused on meeting customer expectations and delivering customer satisfaction by implementing a strict Quality Management System. Our Quality Management System consists of registered check-ups after every step of the production process exceeding the requirements for the ISO9001 certification.

This guarantees control over used materials, production processes, capability of the workforces and periodical recalibrating of all test and measuring equipment.
This ensures we continuously identify and implement improvements regarding production processes and quality control.
In this way, we assure meticulous manufacturing and consistent product quality.

The hose is produced and tested according the ISO10380:2012 and BS 6501-1: 2004 standards. All necessary type tests are performed:

INTEGRITY
All hoses and assemblies are tested for structural integrity by qualified and reliable test personnel.

PRESSURE RESISTANCE
During the leak tightness test, the hoses are checked for any deformation or any other method of failure.

ELONGATION UNDER PRESSURE
The permanent elongation of the test assembly put under pressure shall, after release of the pressure, not exceed 1% of its initial length.

ELECTRIC CONDUCTIVITY
The electric resistance of the hose assembly shall not exceed 1 Ω/m.

BURST PRESSURE
During the burst pressure test, the hoses are checked for any deformation or any other method of failure.

PLIABILITY
The hoses shall be bent 10 times to a small radius, in accordance with the standard, without showing leakage after the test. (=static bend radius)

FATIGUE
The hoses shall have an average life of 10,000 cycles during a dynamic U-bent test, in accordance with the requirements of a standard-cycle-life hose.

In this way, we prove that the full range of our products live up to the mentioned standards. During production, all different components are periodically tested so that we can guarantee the continuity of the quality of our products.

5. STANDARDS

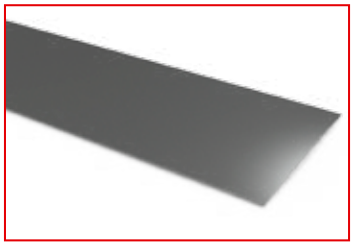
BASICS

Metal hoses can be used for different applications where rubber and synthetic hoses are not suitable by themselves. In combination with each other or not, they can be used in following situations:

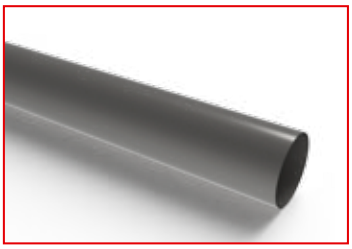
- High temperatures (550°C / 1022°F max)
- Low temperatures
- High pressure
- Vacuum-filled spaces
- Universal chemical resistance
- Vibration
- Non-gas permeable

The ideal flexible connection or transport hose for acids, bases, aromatic hydrocarbon, steam (even overheated), etc.

The manufacturing process of corrugated metal hose starts with a high-grade stainless steel strip that is rolled, while the edges are welded together to form a thin-walled, gas-tight tube.



High quality steel strip



Rolled to form a tube

After the tube has been welded, corrugations are formed into the tube to make it flexible

To withstand pressure, the corrugated tube is equipped with one-layer braiding - or even two layers to achieve even greater working pressure.
The braiding is made out of stainless steel wire and is machine braided over the corrugated tube.
The braid fits tightly against the tube.
Due to its inherent flexibility, the braid moulds itself perfectly to the movement of the hose.

It is very important to have a high percentage of braid covering the hose. Our braid is engineered to maintain the balance between braid strenght and hose flexibility.
Our design does not sacrifice the strenght of our hose to meet the flexibility the customer's needs.

STANDARDS

As part of the optimization of the stainless steel hose, three characteristics make the perfect symbiosis between flexibility, resistance to pressure, and life-cycle. We elaborate this to fulfill at least ISO10380:2012: "Pipework - corrugated metal hoses and hose assemblies."

Hoses have been tested according to ISO10380:2012. For that reason, we can safely state that the stainless steel hoses surpass the ISO 10380:2012 norms.

*The international standard ISO10380:2012 has also been approved by CEN as EN ISO10380:2012 without any modifications.

DESIGN AND SERVICE LIFE CALCULATIONS

There are some factors affecting the service life of metal hoses:

- Operating pressure
- Operating temperature
- Dynamic stresses caused by movement, torsion, or vibration
- Velocity
- Fatigue
- External influences
- Corrosion
- Installation

For more information, refer to Chapter 10 of this documentation: Technical information.

WELDING PROCEDURES

The stainless steel hoses are always ordered according to our approved and permanent welding procedure. These welding procedures are certified by an accredited body. For welded tube and pipe, we follow the standard of ISO 15614-1. We ensure that our welders achieve qualifications in accordance with ISO 9606-1 and ASME IX.

The welds can be further subjected to various other forms of testing, ranging from visual to radiographic examinations. Destructive testing is also available upon request.

SINGLE PASS WELDING

Innovative single pass welding procedures of the fittings eliminate the risk of corrosion and improve the strength of the weld connection.

Our newly developed weld technology is based on 5 points:

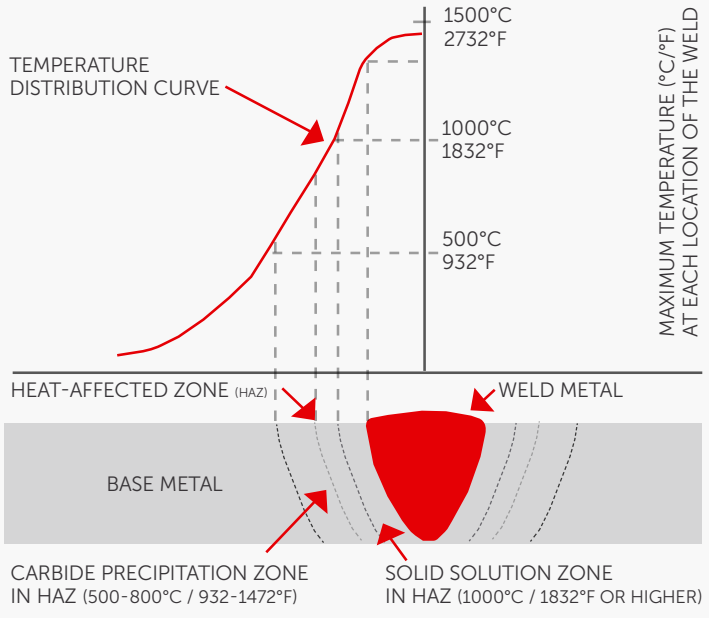
1. Innovative welding procedures limit the maximum amperage during welding and thus keep the heat input as low as possible to avoid 'sensitization';
2. Minimum travel speed to optimize the molten weld pool;
3. Standard end fittings made of materials with extremely low carbon content (316L);
4. The single pass weld only heats up the material once which improves the stability of the microstructure of the heat affected zone (HAZ);
5. Special filler metal with a high percentage of alloy to compensate and restore the loss by heat input.

SENSITIZATION

Stainless Steel 316L is made of iron, carbon, nitrogen, nickel, molybdenum, manganese, silicon, phosphorus, sulfur, and chromium. Chromium is the key element that makes stainless steel rust-resistant.

When the surface of normal steel is exposed to oxygen, it usually forms ferric oxide (Fe^2O^3) , which has the well-known red rust color. When stainless steel is exposed to oxygen, chromium oxide is created on the surface of the steel because chromium has a very strong affinity for oxygen. The chromium oxide is a very thin layer which does not spall off, and it prevents further oxidation of the stainless steel. Even if stainless steel is scratched and the chromium oxide layer is removed, a new chromium oxide layer will form and protect the rest of the stainless steel beneath it. As long as there is sufficient chromium present, the chromium oxide layer will continue to protect the stainless steel and prevent it from rusting.

Chromium protects stainless steel if the concentration is in excess of 12%. A common form of rusting in stainless steel is after the stainless steel has been exposed to very high temperatures, often in the 750-1550°F range (400-850°C). This type of corrosion is often seen in welding applications in which stainless is heated and then cooled. If this happens, "sensitization" can occur, which is where the carbon and the chromium bond together in the stainless steel and form carbides. These carbides situate themselves at the stainless steel grain boundaries, and the grain boundaries become deficient of chromium. With lower chromium concentrations at the grain boundaries, the chromium oxide protective layer can become discontinuous and rusting becomes possible. "Sensitization" will ruin stainless steel forever.



TESTING AND CERTIFICATION

PNEUMATIC TEST

After a visual test, the hose assembly shall be subjected to a pneumatic test. Using air, the assembly is immersed in a bath of water for a sufficient length of time to permit visual examination of all fabricated joints. Any evidence of leakage or permanent deformation can cause a rejection.

HYDROSTATIC TEST

Unless otherwise stated by the customer the test medium shall be water. The hydrostatic test not only checks for leakage, it confirms the assembly's structural integrity. The assembly shall be pressurized with water to the maximum test pressure of the assembly maintained for a sufficient length of time to permit a visual examination. The test pressure shall be 1.5 times the working pressure of the assembly. To guard against corrosion, deionized water is used.

ADDITIONAL LEAKAGE TESTS

Other testing methods are available per customer testing specifications.
These include Dye Penetrant leak testing, radiographic testing, or ultrasonic testing.

6. CORRUGATED METAL HOSES

HOSE ASSORTMENT

Hoses represent a new generation of metal hose and fitting products. The wall thickness and the consistency of the strip, geometric dimensions, and uniformity of the corrugations and pitch result in a high flexibility and strength of the corrugated tube. Hoses have a very high braid coverage, which is designed for higher working pressures and to protect the corrugated tube.
Recognizable: You can recognize the hose by the dark blue spiral cluster of wires in the braid.

TMS offers 2 series of corrugated metal hoses:

SERIES 4

Series 4 is our standard hose that is manufactured and tested according the requirements of the international standard ISO 10380:2012.

CONSTRUCTION OF THE TUBE
Annular corrugations; special narrow pitch

HOSE MATERIAL
standard SS321 L (w.nr. 1.4404)
(other material on request)

BRAID MATERIAL
standard SS 304 (w.nr. 1.4301)

HOSE SIZES
¼" to 12"

SERIES 8

Series 8 is our high pressure hose that is manufactured and tested according the requirements of the international standard ISO 10380:2012.

CONSTRUCTION OF THE TUBE
Annular corrugations; special medium pitch

HOSE MATERIAL
standard SS 316L (w.nr. 1.4404)
(other material on request)

BRAID MATERIAL
standard SS 304 (w.nr. 1.4301)

HOSE SIZES
¾" to 12"

SERIES 4

SPECIFICATIONS

- Annularly corrugated metal hose with one or two braids
- Medium wall thickness strip
- Proprietary technology for special and narrow geometrics of the convolutions
- Excellent life cycle
- Minimum effort to bend or flex
- Very good pressure resistance

Explanation of the available series 4 hose types:

SERIES 4-BR-MT-XXX

BR = number of braids:

00: Unbraided
01: Single braid
02: Double braid

MT = material corrugated tube and braid:

GM: AISI 321 (w.nr. 1.4541) tube and AISI 304 (w.nr. 1.4301) braid
GC: AISI 316L (w.nr. 1.4404) tube and AISI 304 (w.nr. 1.4301) braid

XXX = nominal bore size of the hose

Example: 1" stainless steel 316L hose with a single 304 braid: **type 4-01-GC-025**

SERIES 8

SPECIFICATIONS

- Annularly corrugated metal hose with one or two braids
- Heavy wall thickness strip
- Proprietary technology for special and medium geometrics of the convolutions
- Excellent life cycle
- Very high pressure resistance

Explanation of the available series 8 hose types:

SERIES 8-BR-MT-XXX

NB = number of braids:

00: Unbraided
01: Single braid
02: Double braid

MT = material corrugated tube and braid:

GM: AISI 321 (w.nr. 1.4541) tube and AISI 304 (w.nr. 1.4301) braid
GC: AISI 316L (w.nr. 1.4404) tube and AISI 304 (w.nr. 1.4301) braid

XXX = nominal bore size of the hose

Example: stainless steel 316L hose with a double 304 braid: **type 8-02-GC-080**

SERIES 4

According to ISO 10380:2012

CONSTRUCTION

Annular corrugations; special narrow pitch

BELLOW AISI 321 (w.nr. 1.4541) or 316L (W.NR.1.4404)

MATERIAL BRAID

AISI SS 304 (w.nr. 1.4301)

SERIES 4

TYPE	NOMINAL BORE		BRAIDS	INSIDE DIAMETER(D1)		OUTSIDE DIAMETER(d3)		BEND RADIUS MM / INCH				WORKING PRESSURE		BURST PRESSURE		WEIGHT	
	mm	inch	#	mm	inch	mm	inch	static		dynamic		bar	psi	bar	psi	kg/m	lb/ft
4 - 00 - GM - 006			0			9.6	0.38	20	0.79	N/A	N/A	10	145	40	580	0.08	0.05
4 - 01 - GM - 006	DN06	1/4"	1	6.1	0.24	11.0	0.43	25	0.98	105	4.13	150	2177	600	8706	0.19	0.12
4 - 02 - GM - 006			2			12.5	0.49	25	0.98	110	4.33	225	3265	900	13059	0.31	0.21
4 - 00 - GM - 008			0			12.1	0.48	30	1.18	N/A	N/A	10	145	40	580	0.09	0.06
4 - 01 - GM - 008	DN08	5/16"	1	8.2	0.32	13.5	0.53	32	1.26	125	4.92	135	1959	540	7835	0.22	0.15
4 - 02 - GM - 008			2			15.0	0.59	32	1.26	130	5.12	203	2938	810	11753	0.38	0.26
4 - 00 - GM - 010			0			14.3	0.56	32	1.26	N/A	N/A	8	116	32	464	0.11	0.08
4 - 01 - GM - 010	DN10	3/8"	1	10.1	0.40	15.6	0.61	38	1.50	140	5.51	80	1161	320	4643	0.25	0.17
4 - 02 - GM - 010			2			17.2	0.68	38	1.50	150	5.91	120	1741	480	6965	0.41	0.27
4 - 00 - GM - 012			0			16.7	0.66	40	1.57	N/A	N/A	8	116	32	464	0.12	0.08
4 - 01 - GM - 012	DN12	1/2"	1	12.2	0.48	18.1	0.71	45	1.77	140	5.51	80	1161	320	4643	0.30	0.20
4 - 02 - GM - 012			2			20.0	0.79	45	1.77	165	6.50	120	1741	480	6965	0.44	0.29
4 - 00 - GM - 016			0			21.6	0.85	50	1.97	N/A	N/A	8	116	32	464	0.20	0.13
4 - 01 - GM - 016	DN16	5/8"	1	16.2	0.64	23.0	0.91	58	2.28	160	6.30	70	1016	280	4063	0.42	0.28
4 - 02 - GM - 016			2			24.5	0.96	58	2.28	195	7.68	105	1524	420	6094	0.66	0.44
4 - 00 - GM - 020			0			26.8	1.06	70	2.76	N/A	N/A	6	87	24	348	0.25	0.17
4 - 01 - GM - 020	DN20	3/4"	1	20.3	0.80	28.2	1.11	70	2.76	170	6.69	64	929	256	3715	0.54	0.36
4 - 02 - GM - 020			2			29.7	1.17	70	2.76	225	8.86	96	1393	384	5572	0.86	0.58
4 - 00 - GM - 025			0			32.2	1.27	80	3.15	N/A	N/A	6	87	24	348	0.35	0.24
4 - 01 - GM - 025	DN25	1"	1	25.4	1.00	33.7	1.33	85	3.35	190	7.48	50	726	200	2902	0.69	0.46
4 - 02 - GM - 025			2			35.5	1.40	85	3.35	260	10.24	75	1088	300	4353	1.05	0.71
4 - 00 - GM - 032			0			41.1	1.62	100	3.94	N/A	N/A	3	44	12	174	0.56	0.37
4 - 01 - GM - 032	DN32	1.1/4"	1	34.3	1.35	43.0	1.69	105	4.13	260	10.24	44	638	176	2554	1.17	0.79
4 - 02 - GM - 032			2			45.0	1.77	105	4.13	300	11.81	66	958	264	3831	1.80	1.21
4 - 00 - GM - 040			0			49.5	1.95	120	4.72	N/A	N/A	1	15	4	58	0.68	0.46
4 - 01 - GM - 040	DN40	1.1/2"	1	40	1.57	51.5	2.03	130	5.12	300	11.81	40	580	160	2322	1.33	0.89
4 - 02 - GM - 040			2			53.3	2.10	130	5.12	340	13.39	60	871	240	3482	2.02	1.36
4 - 00 - GM - 050			0			60.3	2.37	140	5.51	N/A	N/A	1	15	4	58	1.00	0.67
4 - 01 - GM - 050	DN50	2"	1	50.2	1.98	62.0	2.44	160	6.30	320	12.60	35	508	140	2031	1.80	1.21
4 - 02 - GM - 050			2			64.0	2.52	162	6.38	390	15.35	53	762	210	3047	2.65	1.78
4 - 00 - GM - 065			0			80.8	3.18	150	5.91	N/A	N/A	0.3	4	1.2	17	1.09	0.73
4 - 01 - GM - 065	DN65	2.1/2"	1	65.4	2.57	83.0	3.27	200	7.87	410	16.14	24	348	96	1393	2.64	1.77
4 - 02 - GM - 065			2			85.5	3.37	200	7.87	460	18.11	36	522	144	2089	4.26	2.86
4 - 00 - GM - 080			0			95.0	3.74	180	7.09	N/A	N/A	0.3	4	1.2	17	1.23	0.82
4 - 01 - GM - 080	DN80	3"	1	80.5	3.17	97.4	3.83	240	9.45	450	17.72	20	290	80	1161	2.83	1.90
4 - 02 - GM - 080			2			100.0	3.94	240	9.45	660	25.98	30	435	120	1741	4.53	3.04
4 - 00 - GM - 100			0			117.0	4.61	280	11.02	N/A	N/A	0.3	4	1.2	17	1.88	1.26
4 - 01 - GM - 100	DN100	4"	1	100	3.94	119.4	4.70	290	11.42	560	22.05	18	261	72	1045	3.80	2.55
4 - 02 - GM - 100			2			122.0	4.80	290	11.42	750	29.53	27	392	108	1567	5.78	3.88
4 - 00 - GM - 125			0			150.0	5.91	280	11.02	N/A	N/A	0.2	3	0.8	12	2.66	1.79
4 - 01 - GM - 125	DN125	5"	1	125	4.92	152.6	6.01	290	11.42	711	27.99	14	203	56	813	5.33	3.58
4 - 02 - GM - 125			2			155.4	6.12	327	12.87	712	28.03	21	305	84	1219	8.08	5.43
4 - 00 - GM - 150			0			175.0	6.89	360	14.17	N/A	N/A	0.2	3	0.8	12	3.22	2.16
4 - 01 - GM - 150	DN150	6"	1	150	5.91	178.0	7.01	400	15.75	815	32.09	13	181	50	726	6.77	4.55
4 - 02 - GM - 150			2			181.2	7.13	400	15.75	1250	49.21	19	272	75	1088	10.44	7.02
4 - 00 - GM - 200			0			225.0	8.86	500	19.69	N/A	N/A	0.2	3	0.8	12	5.15	3.46
4 - 01 - GM - 200	DN200	8"	1	197	7.76	228.0	8.98	520	20.47	1015	39.96	10	145	40	580	9.76	6.56
4 - 02 - GM - 200			2			231.2	9.10	520	20.47	1600	62.99	15	218	60	871	14.50	9.74

a. Pressures listed are designed for welding as the method of attachment. Other methods will result in different pressures. Contact for details.

b. The test pressure is 1.5x the maximum working pressure.

c. All data at 68°F / 20°C.

7. FITTING ASSORTMENT

FITTING ASSORTMENT

A multitude of different end connections and fittings can be attached to metal hoses.

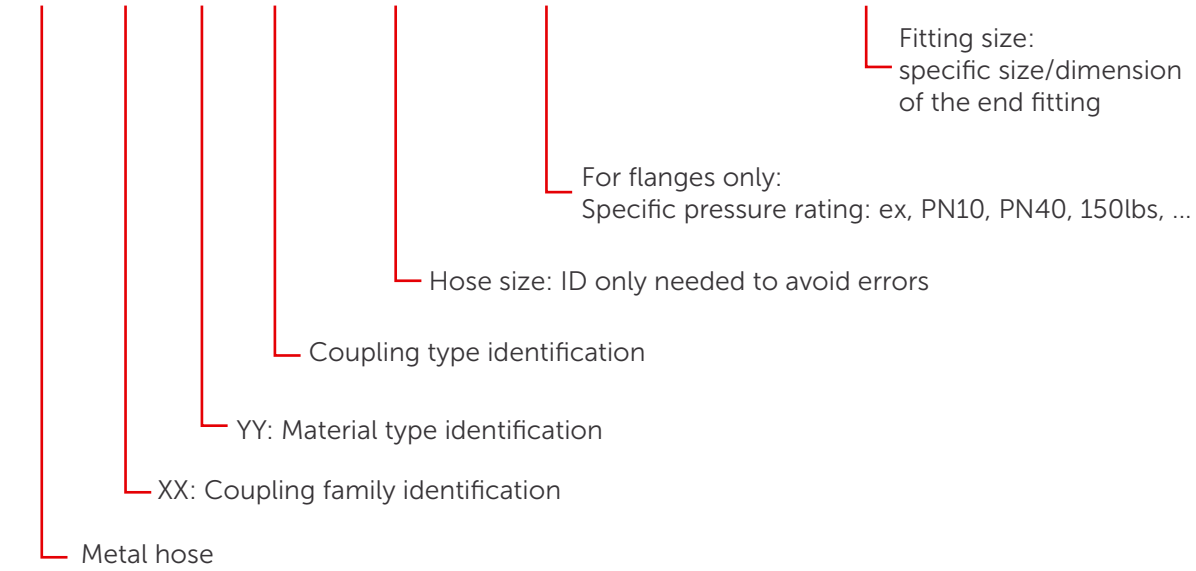
In theory, any fitting that is made from a weldable material can be welded on the hose end.

To ensure the best weld connections to perform best in extreme application conditions,
Has developed specially-designed weld fittings and specialized welding and
fabrication procedures.

Please ensure that the right fitting is determined at each hose end and that the fittings are chemically appropriate and compatible to withstand the operating pressure and temperature of the application.

BUILD-UP TYPE END FITTING

GMV - XX - YY - ZZ (-HOSE SIZE) - PRESSURE RATING - END FITTING SIZE



Coupling Family (XX)	Identification
Male thread	M
Female thread	F
Union (3-piece) male thread	UM
Union (3-piece) female thread	UF
Fixed flange	FF
Swivel flange	LF
Pipe-end / weld-end	W
Cam & Groove Quick coupling	CG
Guillemin Quick coupling	GU
Storz Quick coupling	STORZ
Tri-clamp	TRI

Material type (YY)	Identification
Carbon steel	A
ST.ST. AISI 304	B
ST.ST. AISI 316L machined	C
ST.ST. AISI 316 casted	D
Brass	E
Bronze	K

Type		Coupling type identification (ZZ)	Identification
Threaded	BSPT	ISO 7/1 - EN10226	B01
Threaded	BSPT	ISO 7/1 - EN10226 - pipe nipple	B05
Threaded	BSP 60°	ISO 228/1 with 60° cone	B10
Threaded	BSP 60°	ISO 228/1 with 60° cone - bonded seal comp. - DIN 3852	B15
Threaded	BSP	ISO 228/1 - pipe nipple	B20
Threaded	BSP	ISO 228/1 - flat sealing	B25
Threaded	NPT	ANSI B1.20.1	N01
Threaded	NPT	ANSI B1.20.1 - pipe nipple	N20
Threaded	DIN405	DIN405 (DIN11851)	F01
Threaded	JIC	SAE J514	J01
Threaded	Metric	ISO 8434/1 - light version	ML01
Threaded	Metric	ISO 8434/1 - heavy version	MS01
Flanged	Fixed flange	EN 1092-01/type 01 - plate flange	EN01
Flanged	Fixed flange	EN 1092-01/type 11 - weld neck	EN11
Flanged	Fixed flange	ANSI B16.5 - slip-on	ANSI01
Flanged	Fixed flange	ANSI B16.5 - weld neck	ANSI11
Flanged	Swivel flange	EN1092-01/type 02-plate flange - weld-on collar type 32	EN32
Flanged	Swivel flange	EN1092-01/type 02-pressed collar type 37	EN37
Flanged	Swivel flange	EN1092-01/type 04-weld neck collar type 34	EN34
Flanged	Swivel flange	ANSI B16.5 - lap joint	ANSI53
Pipe end		ISO, METRIC, DIN, ANSI, ...	W01
Quick coupling		Cam & Groove adaptor	AW
Quick coupling		Cam & Groove coupler	DW
Quick coupling		Guillemin with locking ring	WL

8. HOSE ACCESSORIES

SPRING GUARD PROTECTION SPIRAL

TYPE
The spring guard spiral hose protection is available to protect the braid against abrasion.

MATERIAL WIRE
SS AISI 302 (w.nr. 1.4319) or galvanized steel

ANTI-KINK PROTECTION SPIRAL

TYPE
The anti-kink protection spiral placed at the end of the hose prevents kinking of the hose just after the braid collar.

MATERIAL WIRE
SS AISI 302 (w.nr. 1.4319) or galvanized steel

HOSE BUMPER

TYPE
Nylon shells are placed around the hose to prevent damage to the braid and to make the hose slide more easily on the ground.

MATERIAL BUMPER
HDPE (High Density Polyethylene)

ANTI-KINK ARMOUR GUARD CASING

TYPE
The anti-kink armor guard casing protects the hose from being crushed and kinked during process motion. The armour guard casing is made of double interlocked hose and has a high tensile strength for crush resistance.

MATERIAL CASING
SS AISI 304 (w.nr. 1.4301)

PYRO-GARD®

TYPE
- The Pyro-Gard sleeve protects your hose assembly from damage due to high heat. It withstands exposure to a constant temperature of up to 260°C/500°F.
- Metal hoses protected with the Pyro-Gard sleeve can also withstand damage from occasional flame as well as splashes from material being melted up to 1200°C/2200°F during the production process.
- The Pyro-Gard sleeve also insulates against energy loss and offers protection from exposure injuries, such as heat or flame-related blisters and burns.

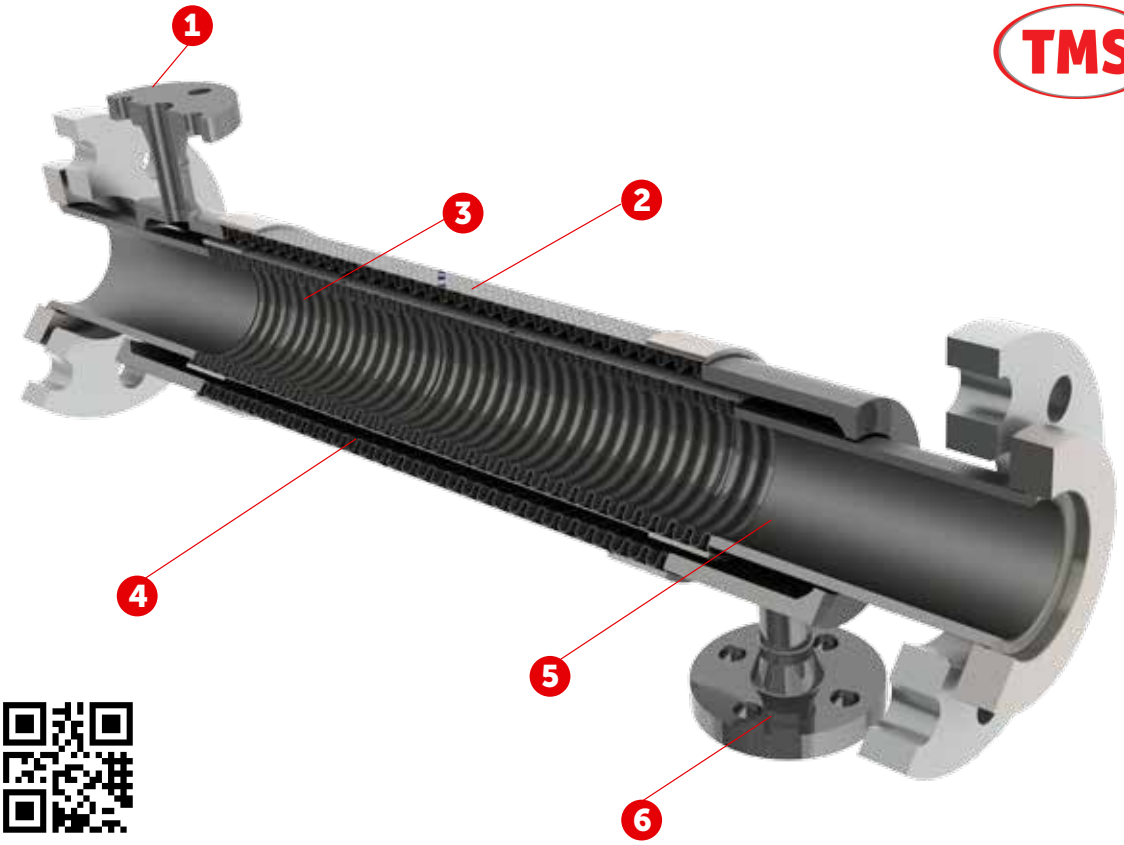
MATERIAL PYRO-GARD®
Knitted fiberglass core, silicone coated

9. SPECIAL HOSE DESIGNS

JACKETED ASSEMBLY

CONSTRUCTION

Jacketed hose assemblies are made up of two flexible hoses: one inside another. An inner media conveying hose is enclosed by a larger diameter hose. The two hoses are joined at each end by specially-designed fittings to prevent media pathway between the two hoses.



1. Outer hose inlet port
2. Outer hose
3. Inner corrugated metal hose product line
4. Jacked chamber
5. Special-designed end caps
6. Outer hose outlet port

JACKETED ASSEMBLY

APPLICATIONS

Jacketed hose assemblies are primarily used for three specific application:

- Cryogenic applications because of their insulation properties: a vacuum can be pulled on the jacket hose to insulate cryogenic liquid being conveyed in the inner media hose.
- Critical applications: when containment of the media conveyed in case of rupture is very critical, a jacketed hose can be a safe solution.
- Conveying viscous material through a hose: when the inner media must be kept at an elevated temperature to keep a viscous material in the inner hose hot and easily conveyed. The jacked hose can be heated with hot water, steam, hot thermic oil, or other products.

APPLICATIONS USED

- Tanker or rail car unloading
- Asphalt/hot mix plants
- Food/Beverage industries
- Cosmetic manufactures
- Chemical/pharmaceutical use

IDEAL FOR

- Pipe system misalignment
- Vibration isolation
- Thermal growth compensation
- Increase flow of viscous media
- Media safety containment

DOGLEGS

CONSTRUCTION

Dogleg hose assemblies are made up of two lengths of flexible hoses connected to one 90° elbow to permit movement in multiple planes and absorb vibrations.

1. Dogleg
2. Vibration source (pump, compressor, ...)
3. Fixed point
4. Rigid piping system

DOGLEGS

APPLICATIONS

Vibrations and the resulting noise is not only disturbing for the immediate area but can also cause fatigue. This can lead to failure and damage to machines, pipe ruptures, leaks, etc. One of the applications of stainless steel hoses is to eliminate vibrations. If vibrations occur only in one plane (AA), it can be sufficient to use a single metal hose. The minimum active hose length can be determined as described in "lateral movement" (see Chapter 10 Page 76).
If, however, the vibrations occur in more than one planes (ex. A-A + B-B), a dogleg should be installed. The minimum active hose length can be found from table below.
Attention: the dogleg must be installed torsion-free, and the piping system just after the dogleg must be attached properly.

MINIMUM ACTIVE HOSE LENGTH OF A DOGLEG FOR SPECIFIC MOVEMENTS IN ALL PANES (+/- MM)

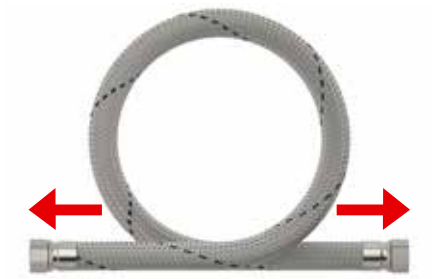
HOSE ID	10	25	50	75	100	125	150
1/4"	80	120	170	210	270	270	300
5/16"	85	130	180	225	260	290	315
3/8"	90	140	195	240	275	310	330
1/2"	95	150	210	260	300	330	365
5/8"	105	160	230	280	325	360	400
3/4"	115	175	250	305	335	400	435
1"	120	190	270	330	380	430	470
1 1/4"	130	205	290	350	410	460	500
1 1/2"	140	220	325	380	440	500	540
2"	150	240	340	410	475	530	580
2 1/2"	165	265	370	450	530	590	645
3"	180	290	400	495	570	540	700
4"	195	325	435	540	620	700	760
5"	270	425	510	730	840	940	1040
6"	290	425	640	790	900	1020	1120
8"	325	510	720	890	1050	1150	1260

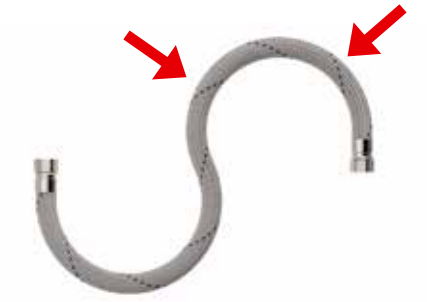
MINIMUM ACTIVE HOSE LENGTH OF A DOGLEG FOR SPECIFIC MOVEMENTS IN ALL PANES (+/- INCH)

HOSE ID	0,40	1,0	2,0	3,0	4,0	5,0	6,0
1/4"	3.15	4.72	6.69	8.27	10.63	10.63	11.81
5/16"	3.35	5.12	7.09	8.86	10.24	11.42	12.40
3/8"	3.54	5.51	7.68	9.45	10.83	12.20	12.99
1/2"	3.74	5.91	8.27	10.24	11.81	12.99	14.37
5/8"	4.13	6.30	9.06	11.02	12.80	14.17	15.75
3/4"	4.53	6.89	9.84	12.01	13.19	15.75	17.13
1"	4.72	7.48	10.63	12.99	14.96	16.93	18.50
1 1/4"	5.12	8.07	11.42	13.78	16.14	18.11	19.69
1 1/2"	5.51	8.66	12.80	14.96	17.32	19.69	21.26
2"	5.91	9.45	13.39	16.14	18.70	20.87	22.83
2 1/2"	6.50	10.43	14.57	17.72	20.87	23.23	25.39
3"	7.09	11.42	15.75	19.49	22.44	21.26	27.56
4"	7.68	12.80	17.13	21.26	24.41	27.56	29.92
5"	10.63	16.73	20.08	28.74	33.07	37.01	40.94
6"	11.42	16.73	25.20	31.10	35.43	40.16	44.09
8"	12.80	20.08	28.35	35.04	41.34	45.28	49.61

10. TECHNICAL INFORMATION

INSTALLATION INSTRUCTIONS: DO'S AND DON'TS

DO	DON'T
	
	
	
	

DO	DON'T
	
	
	
	

DO	DON'T
	
	
	
	

INFLUENCE OF THE SERVICE CONDITIONS ON THE METAL HOSE DESIGN FOR DYNAMIC LOAD AND DERATING FACTORS FOR ELEVATED TEMPERATURES

The working pressure and bending radius stated in the technical tables of the metal hoses. Series 4 and 8 can only be used as a guideline. The data on page 16 for Series 4 and page 17 for Series 8 is valid for predominantly static working pressures and stress and at room temperature (68°F/20°C).
The pressure values provide a minimum of four times the safety factor to the burst pressure.
The determination of the test pressure value is carried out according to the ISO 10380:2012 norm at 1.5x the maximum working pressure, unless the end-user specifies a higher pressure for testing.
Specific service conditions (i.e. pulsating and discontinuous demand, type and frequency of motion, higher working temperature, etc.) will influence the hose material and technical data.
These influences have to be taken into account to correct the maximum allowable working pressures and bending radius. Following formulas, the tables and diagrams must be applied.

Maximum allowed working pressure

$$P_{max} = P_{tab} \cdot f_t \cdot f_{dyn}$$

P_{max} = Maximum allowed working pressure
P_{tab} = Working pressure according to the table
f_t = Derating factor for increased temperature (table 1)
f_{dyn} = Corrective factor for dynamic load (table 2)

Minimum allowed bending radius for dynamic load:

$$R_{dyn} = \frac{R_b}{2{,}98} \left(1{,}09 \cdot f_t \cdot f_{dyn} + \frac{1}{f_t} + \frac{1}{f_{dyn}} \right)$$

R_{dyn} = Minimum allowed bending radius for dynamic load
R_b = Bend radius according to table
f_t = Derating factor for increased temperature (table 1)
f_{dyn} = Corrective factor for dynamic load (table 2)

TABLE 1. DERATING FACTORS AND LIMITING TEMPERATURES

		°F	68	122	212	302	392	482	572	662	752	842	932	1022
		°C	20	50	100	150	200	250	300	350	400	450	500	550
AISI	**EN**	**TYPE**												
AISI 304	W.Nr. 1.4301	X5CrNi18-10	1.00	0.88	0.73	0.66	0.60	0.56	0.52	0.50	0.48	0.47	0.46	0.42
AISI 321	W.Nr. 1.4541	X6CrNiTi18-10	1.00	0.92	0.83	0.78	0.74	0.71	0.67	0.64	0.62	0.61	0.60	0.59
AIS 316L	W.Nr. 1.4404	X2CrNiMo17-12-2	1.00	0.88	0.74	0.67	0.62	0.58	0.54	0.52	0.50	0.48	0.47	0.47

TABLE 2. CORRECTIVE FACTOR FOR DYNAMIC LOAD

MOTION / FLOW	WITHOUT VIBRATION, STATIC OR SLOW MOTION	LOW VIBRATION, FREQUENT UNIFORM MOTION	STRONG VIBRATION, RHYTHMICAL ONGOING MOTION
STATIONARY OR SLOW UNIFORM FLOW	1.00	0.80	0.40
PULSATING AND SWELLING FLOW	0.80	0.64	0.32
RHYTMIC SHOCK AND DISCOUNTINIOUS FLOW	0.40	0.32	0.16

Calculation example

A metal hose, DN50 – 2" Series 4 (single braid) is installed in an installation at a temperature of 200°C / 392°F.
The stainless steel material of the corrugated tube is made out of AISI 316L (W.Nr. 1.4404) with a single AISI 304 (W.Nr. 1.4301) braid.
In this application, the hose is exposed to low vibrations and frequent uniform motions with a stationary uniform flow.

P_{tab} = 508 psi (35 bar)
f_t = 0.60
R_b = 12.6 inch (320 mm)
f_{dyn} = 0.80

The maximum allowed working pressure (P_{max}) is :

P_{max} = 508 . 0,60 . 0,8
P_{max} = 244 psi (17 bar)

The minimum allowed bending radius for dynamic load is:

$$R_{dyn} = \frac{12.6}{2.98}(1.09 + 0.60 \cdot 0.80 + \frac{1}{0.60} + \frac{1}{0.80})$$

R_{dyn} = 19 inch (483 mm)

IMPORTANT POINTS TO WATCH

Four fundamental points are important when installing a metal hose assembly:

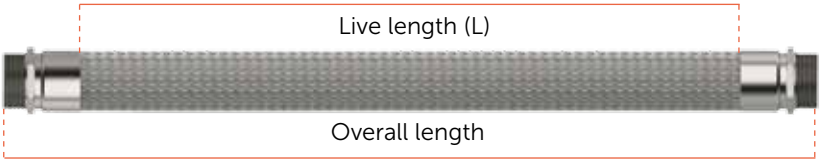
1. Always avoid bending the hose just after the coupling
2. Install the hose torsion free
3. Limit the bending motion of the hose to a single dimensional plane
4. Do not overbend or compress the hose assembly

LENGTH CALCULATIONS METAL HOSE

Effective length (live length)
The effective hose length of a metal hose assembly is the amount of flexible hose.
Actually, it is the part of hose between the braid collars. The effective hose length calculations can be found on the following pages for different movements and built-in situations.

Overall hose length (total length)
The overall hose length is equal to the effective hose length plus the lengths of the braid collars and fittings. When adding the fitting lengths, please refer to the datasheets of the fittings.

Depending on the movement, following formulas are to be used to calculate the effective hose length (L).



ANGULAR MOVEMENTS

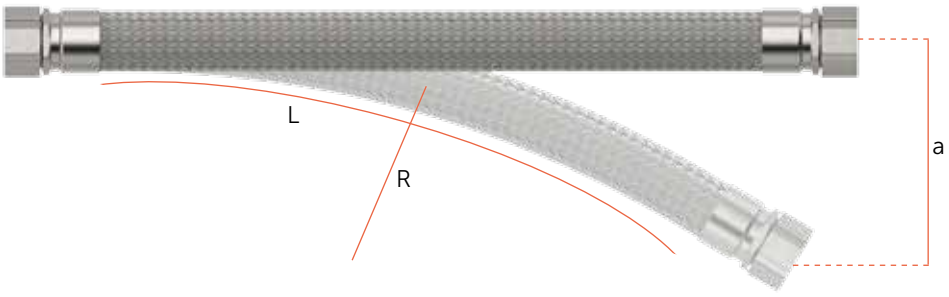
These displacements occur when forming a bend in the hose. There are applications such as flexible connections between installation and machine to compensate alignment differences and vibrations.

$$L = \frac{\pi \, Ra}{180}$$

R = Radius of curvature (mm)

a = Bending angle (°)

π = 3,1416



LATERAL MOVEMENTS

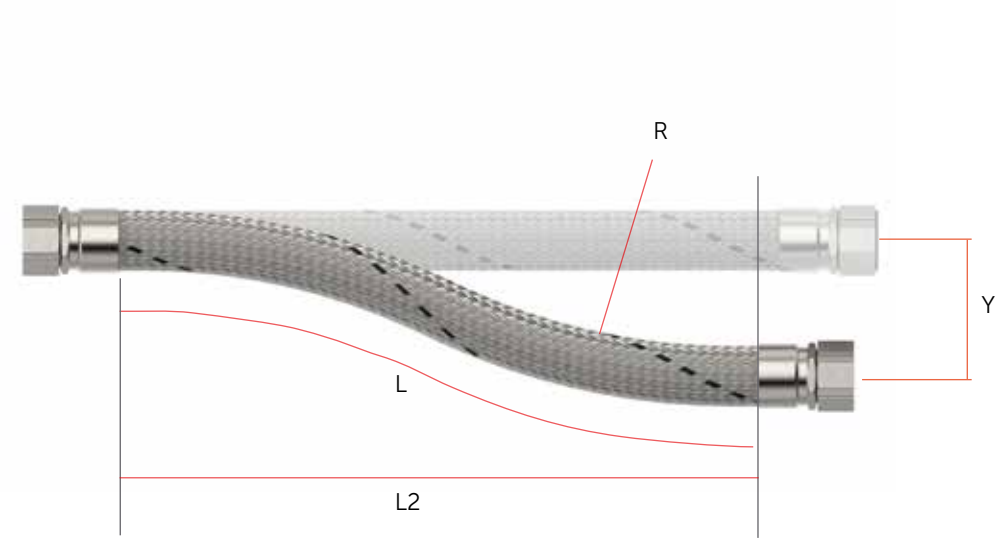
One end of the hose moves parallel relative to each other. The lateral movement (Y) cannot exceed 1/4 of the minimum bend radius. This construction is often used to absorb sagging, to correct misalignment of pipes, etc.

Effective hose length: $\sqrt{L = 6YR + Y2}$

Projected live hose length: $\sqrt{L2 = L2 - Y2}$

R: Bending radius of the hose

Y: Total lateral movement



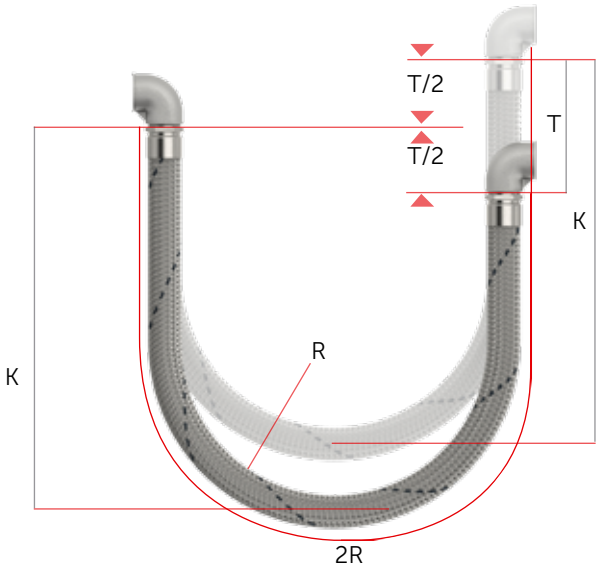
RADIAL MOVEMENTS

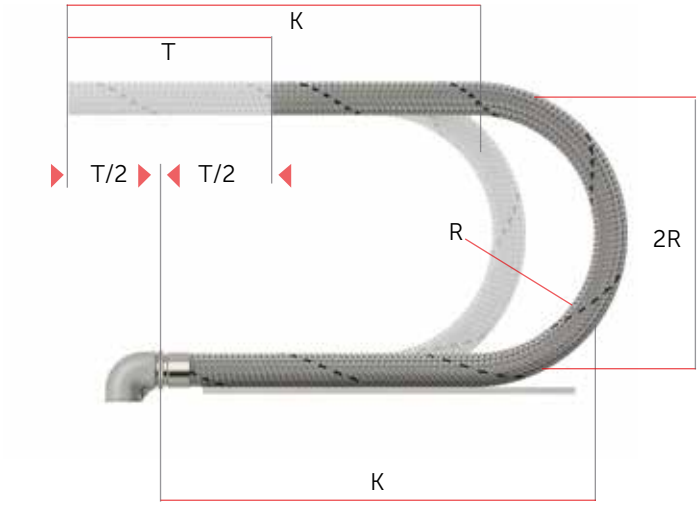
This construction is often used to absorb important axial or lateral displacements in pipelines.

Effective length of the hose: L= 4R + T/2

R: Bending radius of the hose

T: Total radial movement

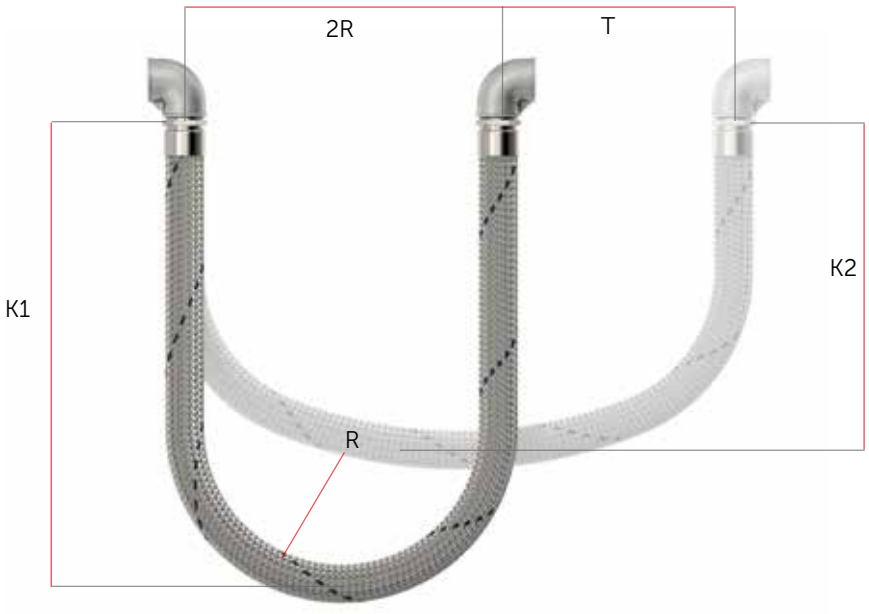




AXIAL MOVEMENTS

This configuration offers an ideal solution when important axial movements must be absorbed.

Effective length of the hose:	L= 4R + 1.57 T
U-Length K1:	K1 = 1.43 R + T/2
U-Length K2:	K2 = 1.43 + T/2
R:	Bending radius of the hose
T:	Total axial movement



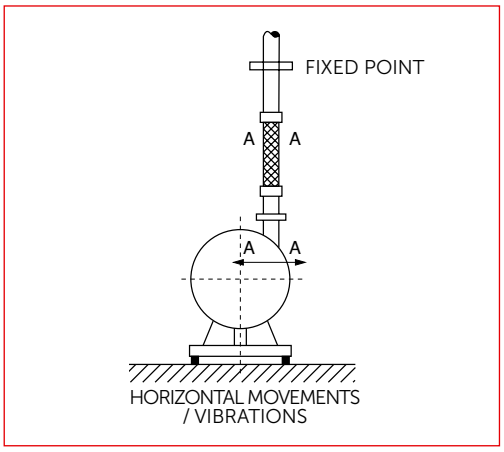
VIBRATION

An important application for metal hoses is the absorption of vibrations.

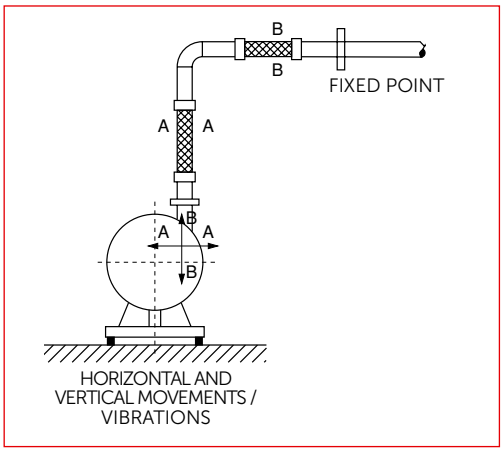
Vibrations can be very harmful for the assembly because it may cause high fatigue stress to the metal hose, leading the development of cracks and premature failure of the assembly. Therefore, to decrease the harmful effects of vibrations, it is important during assembly fabrication to take into consideration factors such as effective minimal length of the assembly, operating pressure, and the derating factors for a type of vibration or dynamic stress.

If vibrations are present, it is especially important to follow TMS Assembly Instalation and Handling Precautions.

It is important to calculate the proper length of the assembly, keeping in mind that there are some requirements as to the "Minimum Live Length" of the assembly used in the application involving vibration. These requirements are found in the table on page 67.

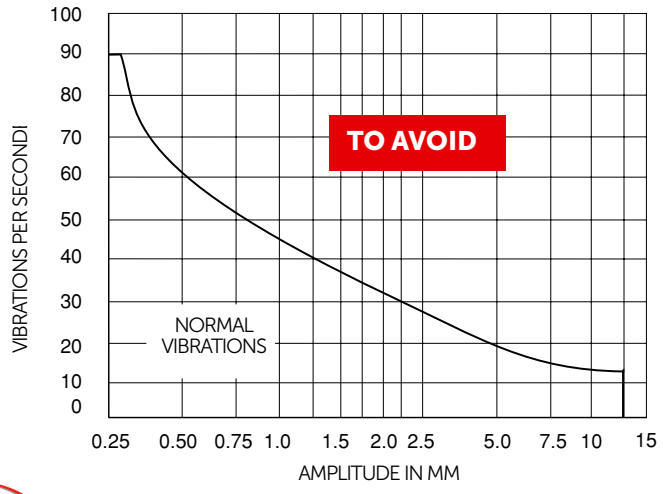


The assembly of one stainless steel hose is sufficient if the vibrations occur only horizontally (A-A).



If vibration also vertically occurs (B-B), two stainless steel hoses are assembled perpendicular to each other. Such type of construction is called "dog-leg".

To avoid transmission of the vibrations in the pipework, a fixed point has to be present at the end of the hose.
The table below indicates the values of the metal hoses vibrations used for industrial applications, from which the intensity may not surpass the values mentioned on the graph line.



ASSEMBLY INSTALLATION - HANDLING PRECAUTIONS

Stainless steel corrugated metal hoses are engineered to provide maximum service life when properly installed. Improper installation, incorrect flexing, or careless handling in an application will reduce the effective service life of the hose and cause premature failure of an assembly. The following assembly installation and handling precautions should be observed to achieve optimum performance.

AVOID TORQUE

Do not twist the hose assembly during installation when aligning the bolt holes in a flange or in making up pipe threads. It is recommended that two wrenches be used in making a union or female nut connection: one wrench to prevent the hose from twisting and the other to tighten the coupling.

IN-PLANE LATERAL OFFSET INSTALLATION

To prevent out-of-plane flexing in an installation, always install the hose so that the flexing takes place in only one plane. This plane must be the plane in which the bending occurs.

AVOID OVER BENDING

The repetitive bending of a hose to a radius smaller than the radius listed in the specification tables for corrugated hose will result in premature hose failure. Always provide sufficient length to prevent over bending and to eliminate strain on the hose.

AVOID SHARP BENDS

Utilize sound geometric configurations that avoid sharp bends, especially near the end fittings of the assembly.

PROVIDE SUPPORT

When installing the assembly in a horizontal loop, provide support to prevent the hose from sagging.

DO NOT EXTEND OR COMPRESS AXIALLY

A piping system that utilizes metal hose to absorb movement must be properly anchored and/or guided. Always support the piping to prevent excessive weight from compressing the hose and relaxing the braid tension.

HANDLE WITH CARE

Avoid careless handling of the hose assembly. Always lift or carry metal hoses to prevent abrasion damage, particularly to braided corrugated hose. Store metal hose assemblies away from areas where it can be subjected to spills, corrosive fumes or sprays, weld splatter, etc.

11. RESISTANCE TABLE

For selection of suitable hose and fitting material, you may refer this table for guidelines that are accurate; however, because of variables beyond our control, no guarantee of service generally can be given.

Rating Code:
A - Suitable
B - Limited service
C - Not suitable
D - No information

Service life is subject to the following notes:
1. Susceptible to intergranular corrosion.
2. May cause explosive reaction.
3. Susceptible to stress, corrosion, or cracking.
4. Susceptible to pitting-type corrosion.
5. Discoloration.

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Acetaldehyde	B	A	A
Acetanilide	B	B	B
Acaticacid	C	B[1]	A[1]
Acetic acid, glacial	D	B	B
Acetic acid 30%	C	B	B
Acetic anhydride	C	B	B
Acetone	C	B	B
Acetophenone	A	B	B
Acetyl chloride	C	B	B
Acetylene	A	A	A
Acrylates	B	B	B
Aclylic acid	C	B	B
Aclylonitrille	A	A	A
Alcohols	A	A	A
Alum	C	B	B
Alum acetate	D	A	A
Alumina	A	A	A
Aluminium acetate	C	B	B
Aluminium bromide	C	B	B
Aluminium chloride dry	B	A	A
Aluminium chloride-moist	C[3]	C[3,4]	C[3]
Aluminium fluoride	B	C	C
Aluminium hydroxide	B	A	A
Aluminium nitrate	C	A	A
Aluminium sails	D	B	B
Aluminium sulphate	C	B[1,3]	A[3]
Ammonia-dry	A[3]	A	A
Ammonia-moist	C	A	A
Ammonium acetate	A	A	A
Ammonium bicarbonate (hot)	D	A	A
Ammonium bromide	C	C[4]	C[4]
Ammonium carbonate	A	A	A
Ammonium chloride-dry	B	A	A
Ammonium chloride-moist	C	C[3,4]	C[3]
Ammonium hydroxide	B	A	A
Ammonium meta phosphate	A	A	A
Ammonium nitrate	C[3]	A	A
Ammonium nitrite	D	A	A
Ammonium perchlorete (10%)	D	A	A
Ammonium persulphate	D	A	A
Ammonium phosphate	C	B	A
Ammonium sulphate	C	C[1]	B
Ammonium Thiocyanate	A	A	A
Amyl acetate	A	A	A
Amyl alcohol	A	A	A
Amyl chloride-dry	B	A	A
Amyl chloride-moist	C	C[3,4]	C[3]
Amyl chloronaphthalane	D	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Butadlene	A	A	A
Butane	A	A	A
Butanol (Butyl alcohol)	A[1]	A	A
Butyl acetate	B	A	A
Butyl amine	A	A	A
Butyl carbitol	A	A	A
Butyl phenols	B[3]	B	B
Butyl mercaptan	D	A	A
Butyl stearate	A	A	A
Butyaldehyde	D	D	D
Butylamine	A	A	A
Butyric acid	C	B	B
Cadmium chloride-moist	C	C[3,4]	C[3]
Calcium chloride-dry	A	A	A
Cadmium sulphate	B	A	A
Calcium acetate	A	A	A
Calcium bisulphita	B	B1	B
Calcium bromide	C	C3	C3
Calcium carbonate	A	A	A
Calcium chlorate	D	B	A
Calcium chloride-moist	C	C[3,4]	C[3]
Calcium chloride-dry	A	A	A
Calcium chloro hypochlorite	C	B	B
Calcium fluride	C	C	C
Calcium hydrochlorite	D	C	B
Calcium hydroxide	C	B	B
Calcium hypochlorite-moist	C	C[3,4]	C[3,4]
Calcium hypochlorite-dry	B	A	A
Calcium nitrate	C[1]	B[1]	B
Calcium oxide	A	A	A
Calcium silicate	A	A	A
Calcium sulphate	A	A	A
Calcium sulphide	A	A	A
Camphor	D	A	A
Cane sugar syrups	B	A	A
Carbolic acid (phenol)	C	B	A
Carbon dioxide-dry	A	A	A
Carbon dioxide-moist	C	A	A
Carbonate deverages	C	A	A
Carbonated water	C	A	A
Carbon disulphide	B	B	B
Carbon tetrachloride-dry	B	A	A
Carbon tetrachloride-moist	C	C[3,4]	C[4]
Carbon monoxide	A	A	A
carbonic acid	D	A	A
Castoroil	A	A	A
Caustic soda	B	A	A
Cellosolve acetate	A	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Cellesolve butyl	A	A	A
Cellulube	A	A	A
Chlorine-dry	B	A	A
Chlorine-moist	C	C[3.4]	C[3]
Chlorine trifluoride	C	D	D
Chloroacetlc acid	C	C[3.4]	C[3]
Chloric acid	C	C3	C[3]
Chlorinated water (saturated)	B	D	D
Chlorine dioxide-dry	B	A	A
Chlorin Dioxide-moist	C	C[3.4]	C[3]
Chlorobenzene	A	A	A
Chlorobromo methane	A	A	A
Chloronaphthalene	A	A	A
Chloro sulphonic acid dilute	C	A	A
Chloro toluene	A	A	A
Chloroform-dry	A	A	A
Chloroform-moist	C	C[3.4]	C[3]
Chromic acid	C	C[1.4]	B
Chromic fluorides	C	C	C
Chromic hydroxide	B	B	B
Chromium sulphate	C	B	B
Cider	C	A	A
Citric acid	C	B	B
Cod liver oil	A	A	A
Coffee	C	A	A
Coke oven gas	A	A	A
Copper acetate	D	A	A
Copper chloride-dry	B	A	A
Copper chloride-moist	C	C[3.4]	C[3]
Copper cyanide	D	A	A
Copper nitrate	C	A	A
Copper sulphate	C	B[1]	B
Corn oil	A	A	A
Corn syrup	A	A	A
Cottonseed oil	A	A	A
Creosole	A	A	A
Cresote	B	A	A
Crude oil	C	C[1]	B
Crude wax	A	A	A
Cutting oil	A	A	A
Cyanogen gas	D	A	A
Cyclohexane	B	B	B
Cyclohexanone	D	A	A
Cymene	D	D	D
DDT	C	A	A
Decalin	D	D	D
Denatured alcohol	A	A	A
Diancetone	A	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Diacetone alcohol	A	A	A
Dibenzyl Ether	A	A	A
Dibutyl Ether	A	A	A
Dibutyl pthalate	A	A	A
Dibutyl sebacate	D	D	D
Dichlorobenzene	D	A	A
Dlchloroethane-dry	A	A	A
Dichloroethane-moist	C	C[4]	C[4]
Dichloroethylene-dry	B	A	A
Dichloroethlylene-moisl	C	C[4]	C[4]
Dichlorophenol	C	B[3]	B[3]
Diesel oil	A	A	A
Dirthylamine	C	D	B
Diethyl Ether	A	A	A
Diethylene glycol	A	A	A
Diethylene phthalate	D	A	A
Diethyl sebacate	D	A	A
Di-iso butylene	D	A	A
Di-iso proply keton	D	A	A
Dimethyl anline	D	D	D
Dimethyl Formamide	A	A	A
Dimethyl phthalate	D	D	D
Disocyanate	B	A	A
Dimethyl sulphate	B	B	B
Dioctyl phthalate	A	A	A
Dioxane	A	A	A
Dipantane	A	A	A
Ephichorohydrin-dry	C[4]	A	A
Epichlorohydrib-moist	C[4]	C[3,4]	C3
Epsom Salt (mg sulphate)	D	A	A
Ethane	A	A	A
Ethanol	C	A	A
Ethanol Amine	A	A	A
Ethers	A	A	A
Ethyl acetate	A	A	A
Ethyl aceto acetate	A	A	A
Ethyl Acrulate	A	A	A
Ethylene	A	A	A
Ethyl Cellulose	A	A	A
Ethyl benzene	B	B[3]	B
Ethyl chloride-dry	A	A	A
Ethyl chloride-moist	C	C[3,4]	C[3]
Ethyl ethers	B	A	A
Ethyl micaptan	B	D	D
Ethyl pento chlorobenzene	B	A	A
Ethyl silicate	A	A	A
Ethylene	A	A	A
Ethylene Chloride	A	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Ethylene chlorohydrin-dry	B	A	A
Ethylene chlorohydrin-moist	C	C[4]	C[4]
Ethylene diamine	B	B	B
Ethylene glycol	A	A	A
Ethylene oxide	B	A	A
Fatty acids	C	B[1,4]	A
Ferric chloride-dry	B	A	A
Ferric Chloride-moist	C	C[1,2,4]	C[3,4]
Ferric hydroxide	D	A	A
Ferric nitrate	C	B	B
Ferric sulphate	C	B[1]	A
Ferrous chloride-dry	B	A	A
Ferrous chloride-moist	C	C[3,4]	C[3]
Ferrous nitrate	D	A	A
Ferrous sulphate	C	B[4]	B
Fluoroboric acid	D	A	A
Fluorine-dry	A	A	A
Fluorine-moist	C	C	C
Formaldehyde	B[4]	B	B
Formic acid	C	B	A
Freon	C	A	A
Fruit Juices	C	A	A
Fuel oil	C	A	A
Fumaric acid	D	A	A
Furan Furfuran	A	A	A
Furfural	B	A	A
Gallic acid	C	A	A
Gasoline	B	A	A
Gelatine	C	A	A
Glauber's Salt	A	A	A
Glucose	B	A	A
Glue	C	A	A
Glutamic acid	C	B[3,4]	B[3,4]
Glycerin (glycerol)	B[3]	A	A
Glycols	A	A	A
Green sulphate liquor	A	A	A
Heptane	A	A	A
Hexachloroethane-dry	B	A	A
Hexachlorethane-moist	C	C[4]	C[4]
Hexal dehye	A	A	A
Hexane	A	A	A
Hexene	A	A	A
Hexyl alcohol	A	A	A
Hydraulic oil	A	A	A
Hydrazine	C	A	A
Hydrobromic acid	C	C[4]	C
Hydrocarbon acid	C	A	A
Hydrocarbons, pure	A	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Hydrochloric acid	C	C[4]	C[4]
Hydrocyanic acid	C[3]	C[1.4]	C[3]
Hydrofluoric acid	C	C[1.3]	C
Hydrofluorsilicic acid	C	C	C
Hydrogen	B	A	A
Hydrogen chloride-dry	B	A	A
Hydrogen chloride-moist	C	C[4]	C[4]
Hydrogen peroxide	C	B	B
Hydrogen sulfide-dry	B	A	A
Hydrogen sulfide-moist	C[2]	B[4]	A
Hydroquinone	B[4]	B	B
Hypo	D	A	A
Imol	A	A	A
Ink	D	B	A
Iodine	D	C	D
Isobutyl Alcohol	A	A	A
Iso octane	A	A	A
Isopropyl acetate	A	A	A
Isopropyl alcohol	A	A	A
Isopropyl ether	A	A	A
Kerosene	B	A	A
Ketchup	D	A	A
Ketones	D	A	A
Lacquers	A	A	A
Lacquer solvents	A	A	A
Lactic acid	C	B[1.4]	B[1]
Lard	A	A	A
Lead molten	C	B	A
Lead acetate	B	A	A
Lead nitrate	A	A	A
Lime	B	A	A
Lime Bleach	C	B	A
Lime-sulphur	C	B	B
Linoleic acid	D	D	D
Linseed ail	B	A	A
Lithium chloride-dry	B	A	A
Lithium chloride-moist	B	C[3.4]	C[3]
Lithium hydroxide	B	B	B
Lubricating oil	A	A	A
Magnesium chloride-dry	B	A	A
Magnesium chlorlde-moist	C	C[3.4]	C[3]
Magnesium hydroxide	A	A	A
Magnesium sulphate	B	B	A
Maleic acid	B	B[1]	A
Mayonnaise	D	A	A
Mercuric chloride-dry	B	A	A
Mercuric chloride-moist	C	C[3.4]	C[3]
Marcurous nitrate	B	B	B

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Mercury	B	B	B
Mesityl oxide	A	A	A
Methane	A	A	A
Methyl acetate	A	A	A
Methyl acrylate	D	A	A
Methyl alcohol	A	A	A
Melhyl bromide	A	A	A
Methyl butyl ketone	A	A	A
Methyl chloride-dry	A	A	A
Methyl chloride-moist	C	C[3,4]	C[3]
Methylene chloride	A	A	A
Melhyl ethyl ketone	B	B	B
Methyl formate	A	A	A
Methyl isobutyn ketone	A	A	A
Methyl methacrylate	A	A	A
Methyl salicylate	A	A	A
Milk	C	A	A
Mineral water	C	B	B
Mono chloro benzene	A	A	A
Mono ethanolamine	A	A	A
Morpholine	D	A	A
Naphtha	B	A	A
Naphthalene	A	A	A
Naphthenic acid	D	B	A
Natural gas	A	A	A
Nickle acetate	A	A	A
Nlckle chloride-dry	B	A	A
Nickle chloride-moist	C	C[3,4]	C[3]
Niter cake	C	B	A
Nitric acid	C	B	B
Nitroluene	B	B	B
Nitrogen	A	A	A
Nitrogen tetroxide	D	D	B
Nitro benzene	A	A	A
Nitro ethane	A	A	A
N-octane	A	A	A
Octyl alcohol	A	A	A
Oils crude	A	A	A
Oils Vegetables	A	A	A
Oils minerals	A	A	A
Olelc Acid	C	B[4]	B
Oleum (fuming H^2SO^4)	B[3]	B	B
Oleum spirits	C	D	D
Olive oil	B	B	A
Oxalic Acid	C	C[1]	B[1]
Oxygen	A	A	A
Ozone	A	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Paint	D	A	A
Palmitic acid	C	A	A
Parafin	B	A	A
Paregoric compound	C	A	A
Peanutoil	A	A	A
Pentane	B	B	B
Perchloric acid	D	B	A
Perchlore ethylene	A	A	A
Petroleum	A	A	A
Petroleum ether	D	A	A
Phenol (carbolic acid)	C	B	A
Phorone	A	A	A
Phosphate esters	A	A	A
Phosphoric acid	C	C[1]	B[1]
Phthalic acid	C	B[1]	B
Pitric acid	C	B	B
Pinene	A	A	A
Pine oil	A	A	A
Plating solution Chrome	D	C	C
Potassium acetate	D	A	A
Potassium bichromate	B	A	A
Potassium bromide	C	C	C
Potassium carbonate	B	A	A
Potassium chloride-dry	A	A	A
Potassium chloride-moist	C	C[3,4]	C[3]
Potassium chromate	C	B	B
Potassium cyanide	B	B	B
Potassium dichromate	C	A	A
Potassium ferricyanide	C	A	A
Potassium fluoride	C	C	C
Potassium hydroxide	B[3]	B[3]	A
Potassium iodide	B	A	A
Potassium nitrate	B	B	A
Potassium permanganate	B	B	B
Potassium sulphate	C	B	B
Progallic acid	B	A	A
Propane	A	A	A
Propyl acetate	A	A	A
Propyl alcohol	A	A	A
Propylene	A	A	A
Propylene oxide	C	A	A
Propylene dichloride-dry	B	A	A
Propylene dichloride-moist	C	C[4]	C[4]
Pyridine	B[5]	B	B
Pyrrolidine	B	B	A
Quinine	C	B	B
Quinine sulphate-dry	C	A	A
Rosin	C[5]	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Red Oil	B	B	A
Salicylic acid	D	A	A
Sauerkraut Brine	D	C	A
Sea water	C	A	A
Sewage	B	A	A
Silicon greases	A	A	A
Silicon oils	A	A	A
Silver salts	C	B	B
Sliver nitrate	C3	B	A
Skydrol 500 & 7000	A	A	A
Soap solutions	B	A	A
Sodium	A	A	A
Sodium acatate	B	B4	B
Sodium bicarbonate	C	A	A
Sodium bisulphate	C	B1.4	A
Sodium bisulphite	C	B	B
Sodium borate	A	A	A
Sodium bromide	B	C	C
Sodium carbonate	B	A	A
Sodium chlorate-dry	A	A	A
Sodium chlorate-moist	C	C3.4	C3
Sodium chloride-dry	B	A	A
Sodium chloride-moist	C	C3.4	C3
Sodium chromate	B	A	A
Sodium Citrate	B	B	B
Sodium cyanide	B	B	B
Sodium dichromate	C	A	A
Sodium fluoride	B	C4	C
Sodium hydroxide	B3	B3	B3
Sodium hypochlorite-dry	B	A	A
Sodium hypochlorite-most	C	C1.4	C4
Sodium melaphosphate	C	A	A
Sodium metasilicate	B	A	A
Sodium nitrate	B3	A	A
Sodium nitrite	B	B	B
Sodium perborate	C	A	A
Sodium peroxide	C	A	A
Sodium phosphate	C	A	A
Sodium silicate	B	A	A
Sodium sulphate	B	B3	B
Sodium sulphide	C	B4	B
Sodium sulphite	C	B	B
Sodium thiosulphate	C	B	B
Soybean oil	A	A	A
Stannic chloride-dry	B	A	A
Stannic chloride-moist	C	C3.4	C3
Stannous chloride-dry	B	A	A
Stannous chloride-moist	C	C3.4	C3

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Starch, Aqua Solution	A	A	A
Steam	C	A	A
Stearic acid	C[4]	B	B
Stoddard solvent	B	A	A
Strontium nitrate	C	B	B
Styrene	B	D	B
Sulphate black liquor	B	B	B
Sulphate grean liquor	B	B[3]	B
Sugar solutions	B	A	A
Sucrose solution	A	A	A
Sulphur-dry	B	A	A
Sulphur- molten	C	C	B
Sulphur chloride-dry	C	A	A
Sulphur chloride-moist	C	C[3.4]	C[3]
Sulphur dioxide-dry	C	C1	B
Sulphur dioxide-moist	C	C1	B
Sulphur trioxide-dry	C	A	A
Sulphuric acid, 95% - 100%	B	A	A
Sulphuric acid, 80%-95%	C	B	B
Sulphuric acid, 40%-80%	C	C[1]	C[1]
Sulphuric acid, 40%	C	C[1]	C[1]
Sulfurous acid	C	C[1.4]	C[1.4]
Tail Oil	B	B	B
Tannic acid	C[5]	B	B
Tar	B	A	A
Tar bituminous	A	A	A
Tartaric acid	C	B	B
Terpineol	D	D	D
Tatraphosphoric acid	C	B	B
Tin molten	B	B	B
Titanum Tetra chloride	A	B	B
Toluene	B	A	A
Tolune Dijsocyanate	D	D	D
Transformer oil	A	A	A
Transmission fluidtype	A	A	A
Tributoxyethyl phosphate	A	D	D
Tributyl phosphate	A	D	D
Trichloro acetic acid	C	C[3.4]	C[4]
Trichloroethane-dry	A	A	A
Trichloroethane-moist	C	C[4]	C[4]
Trichloroethylene-dry	A	A	A
Trichloroethylene-moist	C	C[4]	C[4]
Tricresyl phosphate	A	D	B
Tung oil	A	A	A
Turpentine	B	A	A
Uric acid	B	A	A
Varnish	B	A	A
Vegetable juices	C	A	A

	CARBON STEEL	STAINLESS STEEL 321	STAINLESS STEEL 316
Vegetable oil	A	A	A
Versilube	A	A	A
Vinegar	C	A	A
Vinyl chloride	B	A	A
Water, potable	C	A	A
Whisky	C	B	A
Wine	C	B	A
Wood pulp	A	A	A
Wort	A	A	A
Xylene	B	B	B
Yeast	A	A	A
Zinc acetate	A	A	A
Zinc chloride-dry	A	A	A
Zinc chloride-moist	C	C[3,4]	C[3]
Zinc molten	C	C	C
Zinc sulphate	C	B	A

REQUEST FORM / SPECIFICATION SHEET

Please provide the following information.
We mention the assumptions that will be made if an answer is not given.

Customer: .....

Contact: ..... Date: .....

Phone: ..... E-mail: .....

APPLICATION INFORMATION

Media: .....
(WE ASSUME THAT THE MEDIA IS COMPATIBLE WITH THE MATERIALS.)

Temperature media:	Min. ..... °C/°F*	Max. ..... °C/°F*	ASSUMPTION IS 70°F/20°C FOR BOTH MEDIA AND ENVIRONMENT
Temperature environment:	Min. ..... °C/°F*	Max. ..... °C/°F*	

Working pressure: ..... bar/psi*

Max. Velocity: ..... m/sec ft/sec*
(WE ASSUME VELOCITY IS TOO SLOW TO AFFECT HOSE PERFORMANCE)

Flow:	Slow / Pulsating / Shock**	ASSUMPTION IS SLOW FLOW
Type of motion:	Static / Frequent Uniform motion / Strong vibrations**	ASSUMPTION IS STATIC

HOSE SPECIFICATION

Quantity: .....

Diameter hose: ..... DN/Inch*

Overall hose length: ..... mm/inch*

END FITTING N° 1

Type: .....

Size: .....

Material: .....

END FITTING N° 2

Type: .....

Size: .....

Material: .....

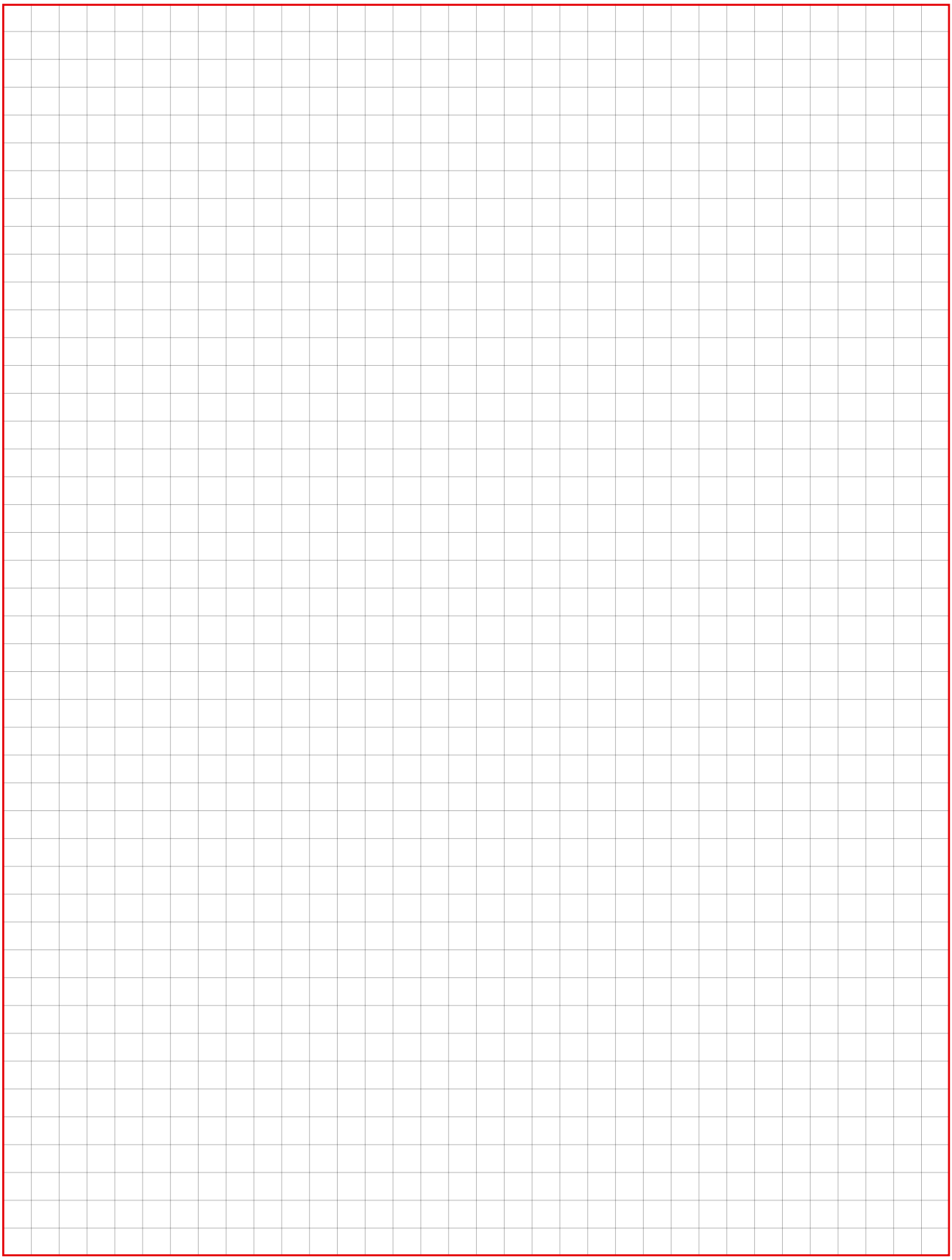
Accessories: .....

* Kindly specify the unit of measure.

** Please specify one

APPLICATION DRAWING

Please sketch the installation and all motions of the hose during application.



Quality, safety, and durability

TMS has been producing industrial hoses and couplings for more than 10 years. Throughout the years, we have built a name and a reputation in Baltics, and we have recently become active in the European market.
Providing **superior quality products** and **continually investing** in new, innovative and market-oriented hose solutions gives us the strength behind our name and is the result of the trust our customers rely on.

Each industrial hose and coupling that carries the TMS logo guarantees **superior quality**. All hose connections have been thoroughly tested in our hose labs and in practice. Our **R & D departments** develop the necessary assembly techniques that are described in detail in work instructions. Our distributors follow our instructions thoroughly to assure the safety of your employees and the environment.

TMS is very involved and committed to **environmental sustainability**.
The improvement of the durability through ecological and sustainable production, developing hoses and couplings with a longer service life (less waste!) and the support to our customers in reducing their TCO (Total Cost of Ownership) contribute to this.

Intelligent hose technology

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