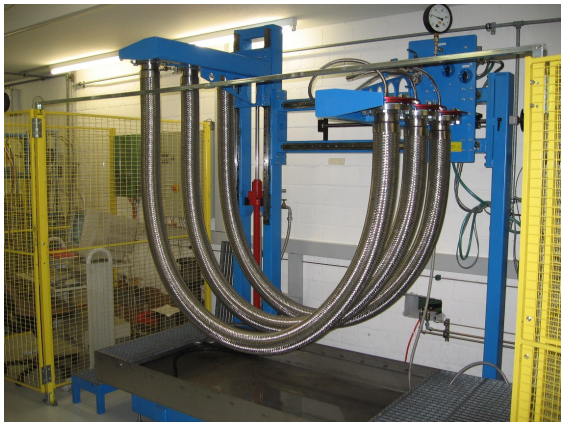


BOA Technical Information
Metal hoses and Metal hose assemblies

EXECUTION:
Materials of corrugated hoses

High quality chrome-nickel steel	1.4541 (equivalent to AISI 321)
	1.4571 (equivalent to AISI 316 Ti)
	1.4404 (equivalent to AISI 316 L)

Special materials on demand

Braid
Provided with a steel wire braid, the pressure resistance can be increased by different degrees (type A, B or C). A mechanical joint is realized between the two end fittings, blocking the uncontrolled elongation of the metal hose assembly under pressure forces. These braids are made of high quality chrome-nickel steel 1.4301 (equivalent to AISI 304).

As a mechanical protection in heavy duty conditions, the metal hose assembly may be additionally equipped with a wire spiral and/or a protecting hose. Provided at both ends with spirals against buckling, the bend stress may be further reduced.

Length tolerances
The tolerance of the overall length of a metal hose assembly ranges between –1% and +3%.

Insulation
On demand

NOTIONS/ DEFINITIONS:
Metal hose
Bulk product without fittings, raw material (half-finished product) for assembly.

Assembly
Equipment of metal hoses with fittings by welding, soldering, brazing or pressing and any preparatory operations and finishing.

Metal hose assembly
Completely assembled metal hose, with or without braid, equipped with fittings and tested.

Nominal pressure PN
Permissible design pressure at ambient temperature ϑ = 20°C without dynamic strain.

Max. permissible operating pressure
The permissible operating pressure $p_{max, zul}$ is calculated as follows, considering all environmental conditions:

$$p_{max, zul} = PN \cdot k_t \cdot k_d$$

PN: theoretic maximum operating pressure according to specification tables
k_t: temperature reduction factor
k_d: dynamic reduction factor

Temperature reduction factor k_t
Reduction factors for materials and/or temperatures according to ISO standard 10380 V2012. If the corrugated hose and the braid are not made of the same material, the lowest value must be taken.

To be continued on the next page

Temperature reduction factor k_t		Operating temperature [°C]													
		-200	20	50	100	150	200	250	300	350	400	450	500	550	600
Material	1.4571	1	1	0.90	0.81	0.76	0.72	0.69	0.65	0.63	0.61	0.59	0.59	0.58	A
	1.4541	1	1	0.92	0.83	0.78	0.74	0.7	0.67	0.64	0.62	0.61	0.60	0.59	A
	1.4404	1	1	0.88	0.74	0.67	0.62	0.58	0.54	0.52	0.50	0.48	0.47	0.47	A
	1.4301	1	1	0.88	0.73	0.66	0.60	0.56	0.52	0.50	0.48	0.47	0.46	0.42	A

A = necessary to check with the manufacturer

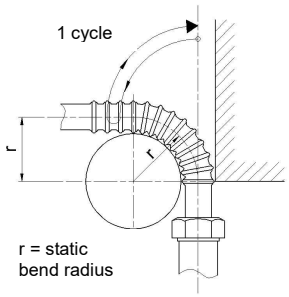
Dynamic reduction factor k_d
Reduction factors for different types of application.

Dynamic reduction factor k_d		Movement		
		no vibrations; feeble, slow	vibrations; frequent, constant	strong vibrations; heavy service
Flow	static or slow and constant	1	0.8	0.4
	pulsating and variable	0.8	0.63	0.32
	rhythmic and water hammers	0.32	0.2	on demand

Bend radius
Radius measured at the longitudinal axis of the metal hose. The ISO standard distinguishes between static bend radius – for single movement (bend test) – and dynamic bend radius – for frequent movement cycles and/or pressure impulses (fatigue test). Falling below the minimum bend radius shortens the life time of the metal hose assembly.

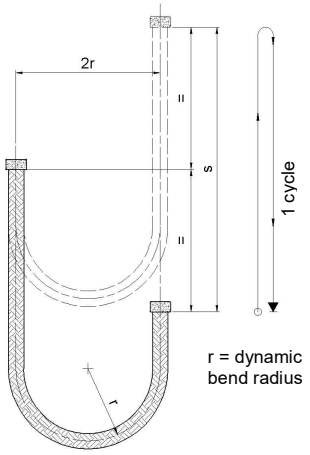
Life time
The term life time defines the number of cycles realized until shows a leakage occurs, the hose changes considerably its external aspect, or a reduction of >50% of the intended bend radius occurs.

Pressure loss
Due to the corrugated profile, metal hose assemblies have a higher flow resistance than smooth pipework. Nominal size, medium and flow rate play an important part. At short hose assemblies that pressure loss may be ignored, at longer units however it should be taken into consideration.



Design and type approval according to ISO standard 10380
Burst pressure test
Test with water at ambient temperature. A straight hose sample with a length of 10 times the nominal size – but not shorter than 500 mm, shall be tested hydraulically until a leakage occurs. The so established burst pressure must not be less than 4 times the permissible nominal pressure PN mentioned in the table.

Bend test
Pressure-less test according to the drawing in the margin. The hose sample is to be bend around a template having a diameter defined by the static bend radius. The test consists in 10 cycles (back and forth). Movement frequency: 5 - 25 cycles per minute.



Fatigue test (U-bend)
Test with water at ambient temperature. Test pressure according to table (nominal pressure PN). Movement cycle according to the drawing in the margin. The distance between the axis is 2 times the dynamic bend radius according to table. Movement s: 8 times nominal size DN or at least 250 mm. Movement frequency: 5 - 30 cycles per minute.
Testing period: 10'000 cycles (back and forth movement) – test interruption at leakage or reduction of the bend radius >50%.

Subject to change
15-07