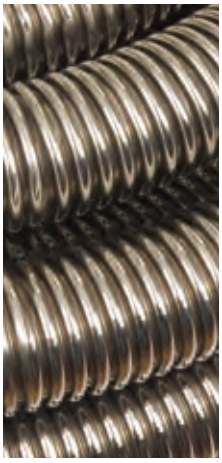
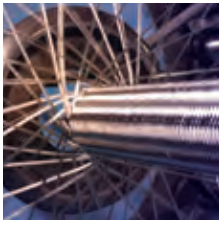
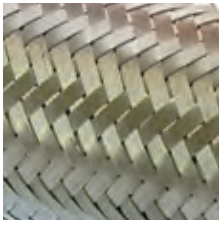
AYVAZ

FLEXIBLE METAL HOSES

Handbook

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BUSINESS DIVISION AND PRODUCTION

Ayvaz deals with the development and production of high quality products for HVAC industry, gas and steam supply applications, power and electricity generation sectors and many others for over six decades.

Our production experience in manufacturing the special designed products and the success in providing the technical support and infrastructure for all sized projects are our biggest strengths.

From the first day of establishment we have been aiming to manufacture and supply superior quality products which provide value added performance to our customers. We will keep producing with focused quality control, comprehensive training programs and innovative technology.

We are dedicated to a professional sales force with technical support and continuous improvement of our people, products and service.

Challenge of doing extraordinary works with the respect to the human and nature is the main purpose of our organization.

METAL HOSE PRODUCTION

Ayvaz is the first flexible metal hose manufacturer of Turkey and one of the biggest ones in Europe. The company has started flexible metal hose production in 1984 and been developing the product range and the types of hoses for all industrial requirements since then.

We keep up with the state of art technology production techniques and train our employees as to use and control these techniques individually.

CAPACITY

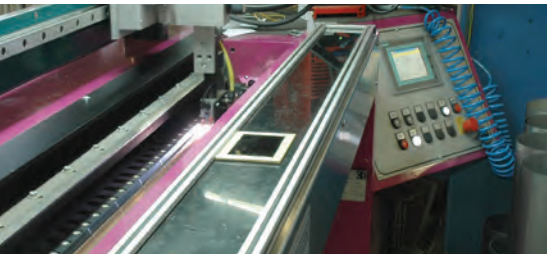
• Ayvaz increases its production capacity from the first day of establishment. We are currently operating our main production in our Hadimkoy factory which is located in the land of 7500 m^2 and 32000 m^2 closed area and designed according to the latest technological developments.

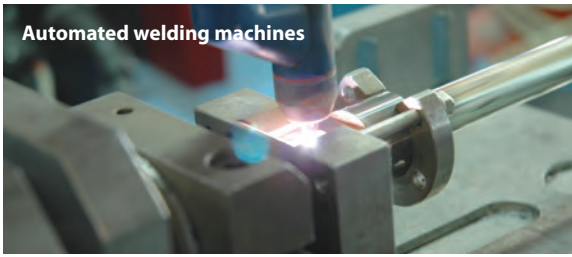
• We are also expanding our production abroad in parallel with this, we opened new production plants in Russia and Bulgaria, we aim to reach our clients faster and provide better services in different areas.

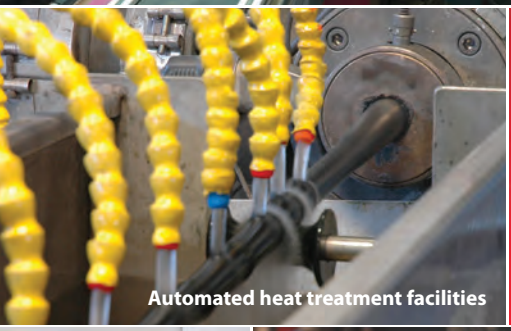
• We are able to produce flexible metal hoses at the sizes from DN6 up to DN300.

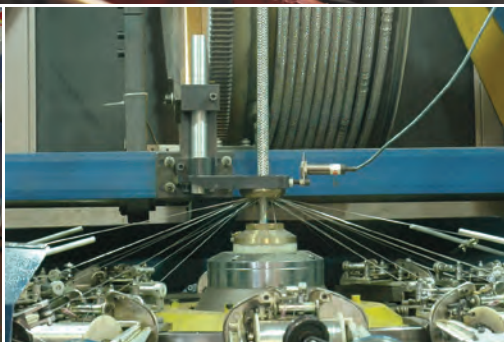
EQUIPMENT

Ayvaz uses modern production techniques and equipment in order to maintain high quality production.



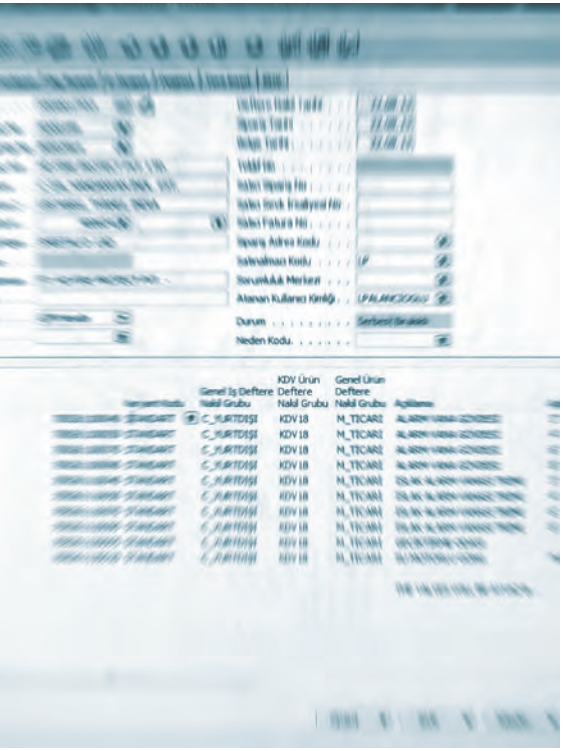






SOFTWARE

We believe the success comes with correct resource planning and operate our ERP with Microsoft Navision. We monitor our production with SCADA and operate controlling and planning activities accordingly.



EXPERIENCE

Ayvaz is celebrating its 65th establishment anniversary this year. The company holds the production experience of different type and designed products for over six decades.

We provide engineering activities from product specification to project estimation and work on to provide the most specific solution for each case.

QUALITY MANAGEMENT SYSTEM

We constantly work on developing our quality management techniques that are used to communicate to employees what is required to produce the desired quality of products and services and to influence employee actions to complete tasks according to the quality specifications.

We see the product quality is the key factor of our company's success. Ayvaz's quality management system allows us to keep up with and meet current quality levels, meet the consumer's requirement for quality, retain employees through competitive compensation programs, and keep up with the latest technology.

• AYVAZ's Quality Management System based on the internationally recognized ISO 9001:2008 standard and certificated by TÜV.

• AYVAZ is continually monitoring global development of technology and learning about areas of activity.

• AYVAZ is educating, training, choosing and motivating workers capable of flawless performance and constantly improving work processes.

• AYVAZ is working in compliance with adopted standards and specifications and any regulatory requirements.

• AYVAZ is permanently monitoring and improving the quality management system.

OUR VISION

• AYVAZ's priority is to provide the best quality products for both domestic and international markets.

• World class production and providing before and after sales services with highly experienced personnel.

• Another objective of the company, and the responsibility of each employee, is to continually exceed industry standards for Health, Safety, Environment and Quality and to continually improve Efficiency and Profitability.

OUR MISSION

• Promoting creativity, flexibility and innovation

• Satisfying and exceeding our client's requirements, demands and expectations

• Keep growing our international activities and meet the demands of the Turkish market

• Aiming continual improvements in Health, Safety, Environment and Quality

• Employing highly trained, experienced and motivated employees

• Working for improvements in efficiency and profitability

HUMAN RESOURCES

• AYVAZ employs over 600 employees.

• Workforce and know-how present key values to our business success

• Care for employees and their development is our continuous strategic priority.

• We continuously invest in the education and training of our employees.

• We develop and promote good team relations and efficient communication among employees.

• We promote acknowledgements and awards for employee commitment and achievements

CUSTOMER RELATIONS

Communication:

• Pre-sales operations enable our sales team to identify and analyse customer needs and problems. We very much value gathering the feedbacks and suggestions of the customers in order to develop ourselves and our communication skills.

Engineering:

• The data gathered from the customers by the sales team is analysed carefully by our expert engineering team.

• We provide engineering activities from product specification to project estimation and work on to provide the most specific solution for each case.

Consulting:

• We delightfully share our expertise with the potential clients who experience problems caused by wrong product selection, improper working conditions etc… with the products that are not even manufactured by our brand.

BUSINESS DIVISION WHOLE SALE AND RETAIL SERVICES

The main business activity of Ayvaz's whole sale is providing products for large scale projects and customized goods for business partners. Retail sale of core products is fulfilled by 10 domestic sales offices and over 250 distributors globally

AYVAZ ACTIVITIES

• Apart from being the biggest manufacturer of its sector in Turkey. Ayvaz operates exportation to 83 countries all around the world.

• Ayvaz has five international sales offices located in Italy, Russia, Ukraine, Bulgaria and Saudi Arabia.

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PRODUCT APPROVALS AND CERTIFICATES

GENERAL APPROVALS

TÜV	Quality Managemet system to DIN ISO 9001:2008	
CE	Production in accordance with EU legislations	
OHSAS	18001 Occupational Health & Safety Management System	

GAS/WATER

DVGW	German Association of Gas and Water	Germany
ÖVGW	Austrian Association for Gas and Water	Austria
SVGW	Swiss Association for Gas and Water	Switzerland
AFNOR	French Gas Association for Standardization	France
IMQ	Italian Quality and Safety Association	Italy
GOST-R	All-Union State Standard	Russia
AENOR	Spanish Association for Standardization and Certification	Spain
GASTEC (KIWA)		Holland
AGA	The Australian Gas Association	Australia
KVBG	Belgium Natural Gas Association	Belgium
GL	Germanischer Lloyd	UK

FIRE PROTECTION

FM	FM Global	USA
VdS	Association of proper insurer	Germany

SHIPPING

BV	Bureau Veritas	France
RINA	Italian Naval Register	Italy
LLOYD'S REGISTER	Lloyd's Register	UK

SYMBOLS FOR PRODUCT FEATURES AND QUICK SELECTION


Gas Hoses


Water Hoses


Solar Thermal Application Hoses


Industrial Hoses


Sprinkler Hoses


Suitable For Combi Boilers


Suitable For Cookers


Suitable For Natural Gas Meters

Threaded Connection


Suitable For Gaseous Media


Seismic Protection Joint


Suitable For Oils


Suitable For Water Heaters

Flange Standards

Flange Standards


Standard Corrugation


Open Pitched Corrugation


Semi-Closed Pitched Corrugation


Closed Pitched Corrugation


Heavy Version


Suitable For Hot Water


Suitable For Drinking Water

Max. Operating Pressure

Max. Operating Temperature


Suitable For Washing Machines


Suitable For Sanitary Applications

AYVAZ

THE QR CODES IN THE BOOK

THE QR CODES

New generation barcoding system called Quick Response Code (QR Code) is the **easiest way to reach** the most detailed information of our products.

We have prepared unique QR codes for each product in "The White Book". All you need to do is to let your mobile device read the code.

For more information:

ayvaz.com/qrcode

AEQ MEMBERSHIP OF AYVAZ

The quality of Ayvaz production has been approved by the most respected European association of Expansion Joint and Flexible Metal Hose manufacturers (AEQ). This membership represents the ability of Ayvaz to use its knowledge and experience to manufacture reliable products guarantee the health and safety of the users.

As the only Turkish member of the association, Ayvaz starts representing Turkey in AEQ which has 19 members from Europe.

What is Euro-Qualiflex (AEQ)

AEQ is the association which was established by the leader manufacturers of Expansion Joints and flexible metal hoses in France in 1956. The main purpose of the association is improving the quality and the reliability standards of related products. AEQ had studied on European Standards (CEN and ISO) between 1981 and 1997 and started issuing official requests on the high quality and approved products to enter the market between 1997 and 2007.

Euro-qualiflex has currently 19 members and Ayvaz is the only Turkish member of the association. Each year the association organizes an assembly in one of the member countries for a week and review the problems of the sector also discuss the international standards and unfair competition in manufacturing.

AYVAZ

FLEXIBLE METAL HOSES

CHAPTER I

FLEXIBLE METAL HOSE

CHAPTER I

FLEXIBLE METAL HOSE

First flexible metal hose designed to be used in industrial applications; was produced in 1885 and the flexible metal hose technology has taken today's shape by developing since that date. At present, the modern industries' high demand for pipelines to transport heating and cooling fluids can't be met without using flexible metal hoses.

We can count the automotive, heating, air conditioning, chemical and petrochemical processing, steel manufacturing industries as the most frequently usage areas of flexible metal hoses. In principal we can classify the metal hoses into two groups as, corrugated hoses and strip wound hoses. Corrugated metal hoses are more preferred in industrial applications.

Design and Function of Corrugated Hoses

Corrugated metal hose production is based on forming the seamless or longitudinally welded pipes by using special mechanical and hydraulic tools. With their flexible structure, corrugated hoses provide the systems an absolute leak-proof character. Corrugated hoses can also fulfil the task of carrying the fluids and gases at the pressured and vacuum systems, as a result of that they are named pressure hoses as well.

Corrugated hoses can be used as the movement, vibration and thermal expansion absorbing flexible connection elements with their low costs as well as the feeding purposes. Flexibility and the pressure resistance of the corrugated hoses are related to the shape and spring ability of corrugations.

Corrugated hoses can be manufactured in two main types through their corrugation shapes; these are annular and helical corrugated hoses. Due to their structure which enables different type of connections also easy manufacturing and application capabilities, annular corrugated hoses are the most preferred hose types in industry. In this respect, annular corrugated hoses cover the main part of Ayvaz flexible metal hose production.

The annular corrugation arises from a multitude of individual and parallel corrugations. The main plane of these types of hoses is perpendicular to the axis of hose. Helical hoses can be stated as a single right-handed corrugation which goes through the whole length of the hose.

The Advantages of Annular Corrugated Hoses Against Helical Corrugated Hoses

1.In case, they have been assembled properly, they resist well against the twisting tension arises of the sudden pressure increases.

2.Because of the profile shape, annular corrugated hoses provide a smooth connection structure at both ends; this increases the reliability of the hose in both manners of manufacturing and applicability.

Annular Corrugated Hoses

The flexibility of the corrugated hoses consists of the basic structure of the corrugation. While the hose expands, the corrugations are extended on the exterior side of the bend and compressed internally. The flexibility and the pressure resistance of the hoses can be improved by selecting appropriate profile shape of the corrugations. Larger profile with the short corrugation distance means high flexibility and low pressure resistance.

As a result of that in most applications, the hoses with medium bending behaviour are chosen. Medium bending behaviour is possible by using flat profiles which also provide an economical benefit, because of reducing the amount of the material used.

Pressure resistance and flexibility can also be adjusted by changing the wall thickness of the corrugations. Reducing the wall thickness makes the hoses more flexible but decreases the pressure resistance. Instead of increasing the wall thickness, improving the pressure resistance of the hoses can be done by using single or double layered braiding.

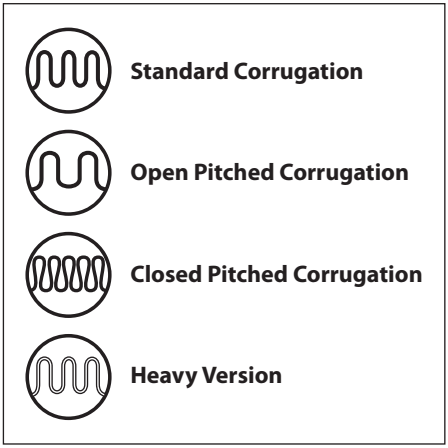
Hose braiding is tightening to the connection elements at both ends to compensate the longitudinal force which is the result of internal pressure.

The flexibility of the braiding is also affective on the movement capacity of the hose.

Braiding is made by crossing right and left handed wire coils through over and under each other. Additionally, hose braiding helps to protect the hose from external damages with absorbing the external tensions.

Hose corrugations and the braiding wires are generally made by the same material. But in some cases in order to protect the hose from corrosion, different materials may be used as well.

We can classify the hose types produced by Ayvaz in four groups according to their corrugation types.



Spiral Corrugated Metal Hoses

Beside of the parallel corrugated metal hoses, spiral corrugated metal hoses have also been designed for the use for industrial applications. Spiral corrugated hoses are used in more likely the special applications where the parallel corrugated hoses cannot meet the certain resistance and performance requirements.

Spiral corrugation structure is consisted by one single corrugation which rises on the right hand side and goes through the whole hose length.

Design Parameters of Flexible Metal Hoses (DIN EN ISO 10380)

Before passing on to examine each hose type, please remember that the pressure resistance increases as the rise of the wall thickness and length of the corrugations in contrast, flexibility falls with the rise of these two parameters.

Each type of hose produced by Ayvaz is given with the relevant product table. Some values given in these tables can be identified as follows.

Operation Pressure: The operation pressure given for the stainless steel in the tables expresses two different pressure values.

1. Permissible Operation Pressure: It is accepted as the pressure value at 20 °C and static loading circumstances with no movement. Safety factor of bursting is 3.

2. Nominal Pressure: It is defined as the maximum permissible pressure value according to DIN 10380. The maximum permissible pressure should meet the safety factor of 4 against bursting and average flexibility of 10.000 load cycles in U-bend.

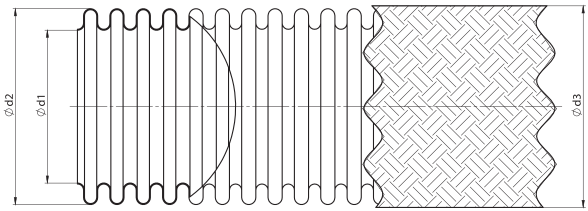
Following data for the correct design of the hoses are required;

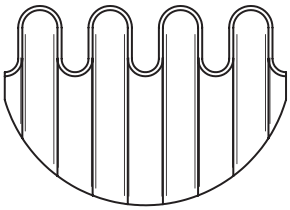
- Nominal Diameter (DN)
- Bending shape
- Minimum and maximum operating pressure
- Temperature range
- Materials

Following additional information help to increase the design quality accordingly;

- Transported fluid
- Maximum permissible pressure
- Maximum permissible temperature
- Length of the hose
- Flow rate
- Fluid movement and vibration type

Standard Corrugated Flexible Metal Hose (701.110,120,130)





Versions
- DN 6-100 (701.110) 701.111 (with braiding)
- DN 125-300 (701.120) 701.121 (with braiding)
- Contact our sales team for the availability of 701.130 hose

Structure
Annularly corrugated flexible metal hoses can be produced from longitunally welded tubes with or without braiding.

Standards
All the flexible metal hoses are tested in accordance with DIN EN ISO 10380 *(See Page 26)*

Hose Material
Stainless steel AISI 316L, DIN 1.4404

Braiding Material
Stainless austenitic steel AISI 304, DIN 1.4301

Temperature Range
Between -270 °C and 600 °C (only for the hose)

Compatible Fittings Types
- Flanges
- Welding ends
- Threaded connections
- Customized connections

Production Lengths

Coil	
DN 6-25	50m
DN 25-50	100m
DN 50-150	10m

Bobbin	
DN 12	1000m
DN 16	700m
DN 20	450m
DN 25	350m

* Please contact the sales team for bigger diameters.

OPERATING PRESSURE

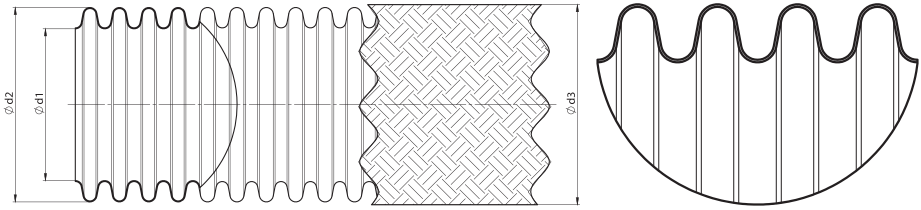
Following tables illustrate the technical specifications of Ayvaz Standard corrugated metal hoses. Two different pressure values are given for the products. First pressure value shows the maximum operating pressure at 20°C and the safety factor to be 3. Other value defines the nominal pressure value according to DIN EN ISO 10380 standard as the safety factor to be 4.

AYVAZ STANDARD CORRUGATED METAL HOSE (701.110 / 701.111)								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
6	701.110	6,3	9,9	0,2	15	80	25	25
	701.111		11		25		100	150
8	701.110	7,7	11,3	0,2	16	120	20	20
	701.111		12,3		32		180	100
10	701.110	10,1	14,4	0,2	18	130	16	16
	701.111		15,5		38		140	100
12	701.110	12,2	16,2	0,2	20	140	12	10
	701.111		17,5		45		85	65
16	701.110	15,6	20,8	0,2	28	160	8	6
	701.111		22,1		58		90	65
20	701.110	18,8	24,9	0,2	32	170	5	4
	701.111		26,2		70		55	40
25	701.110	24,6	31,3	0,2	40	190	4	4
	701.111		32,7		85		55	50
32	701.110	33,7	41,1	0,3	50	260	3	2,5
	701.111		42,8		105		35	25
40	701.110	40,8	49,8	0,3	60	300	2,5	2,5
	701.111		51,2		130		50	40
50	701.110	51,5	60,4	0,3	70	320	1,5	0,5
	701.111		62,7		160		40	25
65	701.110	66,1	78,2	1	115	460	1	0,5
	701.111		81,5		200		32	25
80	701.110	80,7	94,8	1	130	660	2	0,5
	701.111		98		240		30	16
100	701.110	99,5	115,4	1	160	750	1,5	0,5
	701.111		118,8		290		25	10

AYVAZ STANDARD CORRUGATED METAL HOSE (701.120 / 701.121)								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
6	701.120	6,2	9,6	0,3	15	85	25	25
	701.121		10,5		15		120	150
8	701.120	8,2	12,1	0,3	16	125	20	20
	701.121		13		32		95	100
10	701.120	10,3	14,3	0,3	18	140	16	16
	701.121		15,5		38		85	100
12	701.120	12,2	16,7	0,3	20	140	12	10
	701.121		17,8		45		75	65
16	701.120	16,2	21,6	0,3	28	160	8	6
	701.121		23		58		80	65
20	701.120	20,2	26,8	0,3	32	170	5	4
	701.121		28,3		70		64	40
25	701.120	25,4	32,2	0,4	40	190	4	4
	701.121		33,5		85		50	50
32	701.120	34,3	41,1	0,4	50	260	3	2,5
	701.121		42,8		105		40	25
40	701.120	40,1	49,5	0,4	60	300	2,5	2,5
	701.121		51,2		130		35	40
50	701.120	50,3	60,3	0,5	70	320	1,5	0,5
	701.121		62		160		30	25
65	701.120	65,4	80,5	1	115	410	1	0,5
	701.121		84		180		24	25
80	701.120	80,3	94,5	1	130	450	2	0,5
	701.121		98		200		18	16
100	701.120	100,8	118	1	160	560	1,5	0,5
	701.121		121,5		290		16	10
125	701.120	124,7	150,5	1	325	710	0,8	0,5
	701.121		154,5				14	6
150	701.120	150,5	179,7	1	380	815	0,5	0,5
	701.121		183,7				10	6
200	701.120	196,5	228,7	1	500	1015	0,25	-
	701.121		232,7				8	-
250	701.120	250,4	278	1	620	1270	0,25	-
	701.121		282				7,5	-
300	701.120	300,2	336	1	725	1525	0,25	-
	701.121		340				6	-

AYVAZ STANDARD CORRUGATED METAL HOSE (701.130 / 701.131)								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
6	701.130	6,4	9,5	0,2	15	80	25	25
	701.131		10,6		25		200	150
8	701.130	8,1	12,1	0,2	16	120	20	20
	701.131		13,5		32		180	100
10	701.130	10,4	14,1	0,2	18	130	16	160
	701.131		15,5		38		140	100
12	701.130	12,4	16,6	0,2	20	140	12	10
	701.131		18		45		85	65
16	701.130	16	21,5	0,2	28	160	8	6
	701.131		23,1		58		90	65
20	701.130	19,9	26,4	0,3	32	170	5	4
	701.131		28		70		55	40
25	701.130	25,2	31,9	0,3	40	190	4	4
	701.131		33,9		85		55	50
32	701.130	34,5	40,7	0,3	50	260	3	2,5
	701.131		42,7		105		35	25
40	701.130	40,4	49,4	0,3	60	300	2,5	2,5
	701.131		51,7		130		50	4
50	701.130	50,6	59,9	0,4	70	320	1,5	0,5
	701.131		62,2		160		40	25
65	701.130	65,1	77,6	0,4	115	460	1	0,5
	701.131		80,8		200		32	25
80	701.130	79,9	94,3	0,5	130	660	2	0,5
	701.131		97,5		240		30	16
100	701.130	100,5	115,7	0,5	160	750	1,5	0,5
	701.131		118,9		290		25	10
125	701.130	125,8	144,4	0,6	350	1000	0,8	0,5
	701.131		147,6				20	6
150	701.130	150,8	169,6	1,4	400	1250	0,5	0,5
	701.131		172,8				16	6

Open Pitch Corrugated Flexible Metal Hose (701.140,701.150)



Versions
- DN 12-32 (701.140)
- DN 40-100 (701.150)
- Contact our sales team for the availability of 701.150 hose

Structure
Annularly corrugated flexible metal hoses can be produced from longitunally welded tubes with or without braiding.

Standards
All the flexible metal hoses are tested in accordance with DIN EN ISO 10380 *(See Page 26)*

Hose Material
Stainless steel AISI 316L, DIN 1.4404

Braiding Material
Stainless austenitic steel AISI 304, DIN 1.4301

Temperature Range
Between -270 °C and 600 °C (only for the hose)

Compatible Fittings Types
- Flanges
- Welding ends
- Threaded connections
- Customized connections

Production Lengths

Coil	
DN 6-25	50m
DN 25-50	100m
DN 50-150	10m

Bobbin	
DN 12	1000m
DN 16	700m
DN 20	450m
DN 25	350m

* Please contact the sales team for bigger diameters.

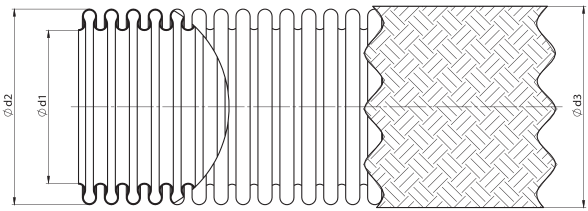
OPERATING PRESSURE

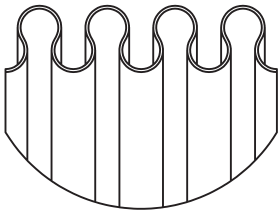
Following tables illustrate the technical specifications of Ayvaz's open pitch corrugated metal hoses. Two different pressure values are given for the products. First pressure value shows the maximum operating pressure at 20°C and the safety factor to be 3. Other value defines the nominal pressure value according to DIN EN ISO 10380 standard as the safety factor to be 4.

AYVAZ OPEN PITCH CORRUGATED METAL HOSE (701.140)								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
12	701.140	11,85	15,85	0,2	20	165	21	16
16	701.140	16,5	21,35	0,2	25	195	13	10
20	701.140	21	26,6	0,2	30	225	13	10
25	701.140	25,3	31,7	0,3	35	260	8	6
32	701.140	32,4	39,9	0,3	40	300	5	4

AYVAZ OPEN PITCH CORRUGATED METAL HOSE (701.150)								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
6	701.150	6,6	9,2	0,3	11	110	65	65
	701.151		10,9		25		175	100
8	701.150	8,2	11,7	0,3	15	130	35	25
	701.151		13,7		32		150	65
10	701.150	10,6	13,8	0,3	18	150	16	16
	701.151		15,8		38		120	65
12	701.150	12,3	16,3	0,2	20	165	18	16
	701.151		18,2		45		80	65
16	701.150	16,6	21,1	0,3	25	195	13	10
	701.151		23,3		58		80	65
20	701.150	20,4	26,3	0,3	30	225	20	20
	701.151		28,4		70		55	40
25	701.150	25,1	31,3	0,4	35	260	14	16
	701.151		34,1		85		60	50
32	701.150	34,1	40,5	0,5	40	300	2,5	2,5
	701.151		43,5		105		35	25
40	701.150	40	49	0,5	50	340	3	2,5
	701.151		52		130		50	40
50	701.150	50,3	59,7	0,5	60	390	2,5	2,5
	701.151		63		160		35	25
65	701.150	65,3	77,3	0,4	75	460	4	4
	701.151		81,3		200		35	25
80	701.150	80,1	93,7	0,5	90	660	4	4
	701.151		97,9		240		40	20
100	701.150	101	114,4	0,6	110	750	3	2,5
	701.151		118,8		290		20	16

Closed Pitch Corrugated Highly Flexible Metal Hose





Versions
• 701.161 with single braiding
• Contact our sales team for the availability of 701.160 hose

Annularly corrugated flexible metal hoses can be produced from longitunally welded tubes with or without braiding.

Standards
All the flexible metal hoses are tested in accordance with DIN EN ISO 10380 *(See Page 26)*

Hose Material
Stainless steel AISI 316L, DIN 1.4404

Braiding Material
Stainless austenitic steel AISI 304, DIN 1.4301

Temperature Range
Between -270 °C and 600 °C (only for the hose)

Compatible Fittings Types
• Flanges
• Welding ends
• Threaded connections
• Customized connections

Production Lengths

Coil	
DN 6-25	50m
DN 25-50	100m
DN 50-150	10m

Bobbin	
DN 12	1000m
DN 16	700m
DN 20	450m
DN 25	350m

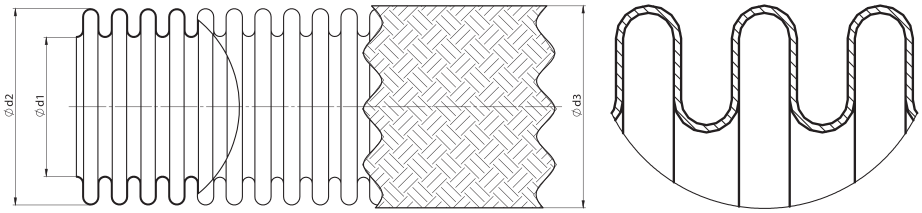
* Please contact the sales team for bigger diameters.

OPERATING PRESSURE

Following tables illustrate the technical specifications of Ayvaz's closed pitch corrugated metal hoses. Two different pressure values are given for the products. First pressure value shows the maximum operating pressure at 20°C and the safety factor to be 3. Other value defines the nominal pressure value according to DIN EN ISO 10380 standard as the safety factor to be 4.

AYVAZ CLOSED PITCH CORRUGATED METAL HOSE (701.160 / 701.161)								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
6	701.160	6,3	9,7	0,2	20	70	20	20
	701.161		11,2		25		140	100
8	701.160	8,1	12,3	0,2	20	70	20	20
	701.161		14,1		25		140	100
10	701.160	10,3	14,2	0,2	30	90	10	10
	701.161		16		35		120	65
12	701.160	122,3	16,9	0,2	35	100	8	6
	701.161		18,7		40		90	50
16	701.160	16,4	21,8	0,2	40	110	6	6
	701.161		23,8		50		65	50
20	701.160	20,5	26,5	0,3	50	130	4	4
	701.161		28,7		55		40	40
25	701.160	24,8	31,9	0,3	60	150	5	4
	701.161		34,5		65		55	40
32	701.160	33,9	40,7	0,3	70	200	2,5	2,5
	701.161		43,3		75		55	20
40	701.160	40,2	49,4	0,4	80	210	2	0,5
	701.161		52,5		90		40	20
50	701.160	50,5	60	0,5	100	240	1	0,5
	701.161		63,3		110		30	16
65	701.160	64,7	77,7	0,5	145	280	1	0,5
	701.161		81,9		200		25	10
80	701.160	80,5	94,5	0,5	200	400	1,5	0,5
	701.161		98,7		240		25	10
100	701.160	98,8	116,2	0,6	240	500	1	5
	701.161		120,6		290		20	6

Heavy Version Flexible Metal Hose (701.170)



Versions
• 701.171 with single braiding
• Contact our sales team for the availability of 701.170 hose

Structure
Annularly corrugated flexible metal hoses can be produced from longitunally welded tubes with or without braiding.

Standards
All the flexible metal hoses are tested in accordance with DIN EN ISO 10380 *(See Page 26)*

Hose Material
Stainless steel AISI 316L, DIN 1.4404

Braiding Material
Stainless austenitic steel AISI 304, DIN 1.4301

Temperature Range
Between -270 °C and 600 °C (only for the hose)

Compatible Fittings Types
• Flanges
• Welding ends
• Threaded connections
• Customized connections

Production Lengths

Coil	
DN 6-25	50m
DN 25-50	100m
DN 50-150	10m

Bobbin	
DN 12	1000m
DN 16	700m
DN 20	450m
DN 25	350m

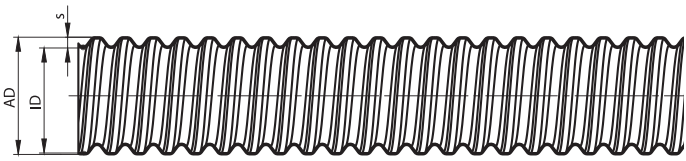
* Please contact the sales team for bigger diameters.

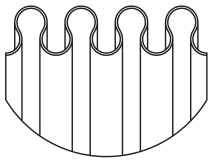
OPERATING PRESSURE

Following tables illustrate the technical specifications of Ayvaz's heavy version metal hoses. Two different pressure values are given for the products. First pressure value shows the maximum operating pressure at 20°C and the safety factor to be 3. Other value defines the nominal pressure value according to DIN EN ISO 10380 standard as the safety factor to be 4.

AYVAZ HEAVY VERSION METAL HOSE 701.170 / 701.171								
DN	Model	Internal Dia.	External Dia.	Tol.	Min. Bending Radius	Nominal Bending Radius	Max. Operating Pressure at 20°C Safety Factor: 3	Nominal Operating Pressure DIN EN ISO 10380 Safety Factor: 4
		mm	mm	mm	rmin mm	rn mm	P1 bar	PN
6	701.170	6,4	10	0,2	15	110	50	50
	701.171		11,8		25		315	200
8	701.170	8,2	12,7	0,2	20	130	50	50
	701.171		14,7		32		250	200
10	701.170	10,3	15,6	0,3	25	150	35	25
	701.171		17,8		38		200	150
12	701.170	11,8	18,4	0,3	30	165	32	25
	701.171		20,6		45		185	100
16	701.170	16,4	23,5	0,3	40	195	20	20
	701.171		26,1		58		190	150
20	701.170	19,9	28,9	0,3	45	285	8	6
	701.171		32,5		70		125	65
25	701.170	25,5	33,9	0,3	50	325	6	6
	701.171		36,5		85		80	50
32	701.170	33,4	42,4	0,3	60	380	4	4
	701.171		45,3		105		85	65
40	701.170	40,4	54,6	0,4	75	430	2,5	2,5
	701.171		57,7		130		50	40
50	701.170	50,2	64,6	0,4	90	490	3	2,5
	701.171		68,6		160		65	50
65	701.170	65,2	80,6	0,4	110	580	2	0,5
	701.171		54,6		200		40	25
80	701.170	79,3	97,8	0,5	135	800	1,5	0,5
	701.171		102		240		40	16
100	701.170	99,3	117,3	0,5	160	1000	1,5	0,5
	701.171		121,5		290		35	10

Spiral Corrugated Flexible Metal Hose (701.180)





• Contact our sales team for the availability of 701.180 hose

Structure
Spirally corrugated flexible metal hoses can be produced from longitunally welded tubes without braiding.

Standards
All the flexible metal hoses are tested in accordance with DIN EN ISO 10380 *(See Page 26)*

Hose Material
Stainless steel AISI 316L, DIN 1.4404

Braiding Material
Stainless austenitic steel AISI 304, DIN 1.4301

Temperature Range
Between -270 °C and 600 °C (only for the hose)

Compatible Fittings Types
• Flanges
• Welding ends
• Threaded connections
• Customized connections

Production Lengths

Coil	
DN 6-25	50m
DN 25-50	100m
DN 50-150	10m

Bobbin	
DN 12	1000m
DN 16	700m
DN 20	450m
DN 25	350m

* Please contact the sales team for bigger diameters.

AYVAZ SPIRAL CORRUGATED METAL HOSE (701.180)						
DN	Model	Internal Diameter	External Diameter	Tolerance	Min. Bending Radius	Nominal Bending Radius
		mm	mm	mm	rmin mm	rn mm
15	701.180	15,8	20,2	0,2	0,18	0,4
20	701.180	21,8	25,7	0,3	0,2	0,4
25	701.180	29,8	34,2	0,3	0,2	0,4
32	701.180	38,6	44,1	0,4	0,25	0,5
40	701.180	48,2	54,8	0,5	0,3	0,6
50	701.180	59,7	66,3	0,5	0,4	0,8
65	701.180	82,7	94,4	0,8	0,7	1,4
80	701.180	97,7	109,5	0,8	0,8	1,6
100	701.180	126,7	143,2	0,9	0,9	1,8

AYVAZ

FLEXIBLE METAL HOSES

CHAPTER II

STANDARDS AND NORMS

CHAPTER II

STANDARDS AND NORMS

As being the leader of installation sector, Ayvaz operates its manufacturing complying the standards that recognized by the most important national and international bodies and industrial associations. This philosophy brings benefit to the users as well as helps to improve general quality and harmony at flexible metal hose applications.

We take the most important standard, DIN EN ISO 10380 (corrugated metal hoses and hose assemblies) as principal to ourselves.

DIN EN ISO 10380

Currently, the most important standard for corrugated metal hoses is DIN EN ISO 10380. This standard came on power on October 2003 and is very important for being the first standard in the respect of bringing enforcements about flexible metal hose designs, manufacturing and testimology subjects all around the world.

By this standard to come on power, the safety factor for bursting pressure was increased to 4 from 3 in Europe. Nominal pressure values were also reviewed again.

All the annularly corrugated metal hoses produced in Ayvaz manufacturing plants are tested according to this standard and technical specifications are also set through it.

Increasing the safety factor against bursting and reviewing new pressure levels mean to reduce the nominal and operating pressure values of the metal hose applications in a remarkable manner. In this respect, Ayvaz's flexible metal hoses offer maximum safety and compatibility to the users by following the recent technical developments.

DESING AND SERVICE LIFE

The first of two criteria that DIN EN ISO 10380 has stipulated in the static design of flexible metal hose applications is bursting pressure and the other one is the plastic forming characteristics under pressure.

These two criteria specify the strength of the metal hose, hose braiding, fittings and connection types.

This standard determines the nominal diameter, service life of the hose regarding the shape that it takes at the applications and the minimum loading capacity relating the braiding type.

The effective factors on service life:

- Operating Pressure
- Operating Temperature
- The shape that the hose takes at the application
- Correct storage, transport and handling
- Resistance against the corrosion in the pipeline and external effects likewise sea water.
- Dynamic tensions arise from movement, vibration, pressure changes and other effects
- Flow conditions and rate

The issues about service life are generally related to braided hose applications. The structure of connection style which tights the hose to the fittings and the friction between the hose and braiding are very effective on the service life. However, it is only possible to estimate these effects approximately by using very complicated calculation methods.

With the purpose of to share our technical expertise with our customers in every stages of before and after sales, we collect all the information about the exact conditions of where our hoses are to be used. This investigation enables us to predict service life of the hose and prevent potential hazards.

DYNAMIC PRESSURE REDUCING FACTORS

In order to take the dynamic tensions into account for metal hose applications, a reducing factor is applied on the system pressure.

Our tests and the condition changes during these test indicated that a reducing factor covering dynamic tensions arise from the system movements should be used in the hose application calculations.

By applying a reducing factor, it is aimed to pro-

vide maximum service life against the dynamic tensions relating the thermal expansions and vibration.

In addition, the special purpose products that used in the systems where irregular movements , sudden pressure rises and falls and unavoidable vibration are expected can be designed and manufactured with the help of the experience we gained in years.

Pressure Reducing Factors When Operating Temperature Increases

In flexible metal hose assemblies, standard pressure values are accepted for the conditions at 20 °C temperature. The operating temperature is affective on design pressure of the assembly.

Reductions of the pressure resistance of the used materials must be count into account during the design. The pressure reducing factors for the most important materials is given in chapter V.

In the calculation of design of the assemblies, the lowest value of both hose and braiding should be used at all times. The maximum permissible operating temperature should never been exceeded without being related to the type of the connection material.

Testing The Corrugated Hose Assemblies

As a part of the quality principal of Ayvaz Production, We apply the tests of pressure and leakage to all corrugated hose assemblies manufactured in our plants. The cold pressure calculation is based on the operating pressure at 20 °C and the pressure reducing factors at operating temperatures.

Metal hose assemblies shall be representative of production and made in accordance with the requirements of EN ISO 10380. We perform following test sequence for our corrugated hose samples accordingly.

Leak tightness: We use the bubble test method, a hydraulic pressure test is applied under a combined test pressure of test pressure and nominal diameter. By that water using test, we test the leak tightness of our hose assemblies.

Pressure resistance: Corrugated metal hoses, braided or unbraided, and corrugated metal hose assemblies shall be capable of withstanding the test pressure without any deformation, leakage or other mode of failure. The hose assemblies which are manufactured according to EN ISO 10380 regulations are tested under 1.5 times of the cold pressure.

Elongation: The permanent elongation of a metal hose assembly subjected to its test pressure shall, after release of the pressure, not exceed 1 % of its initial length. We Fix the hose sample at one end, then hydraulically pressurize it to 1,5 times its maximum allowable pressure and hold for 1 min.

Electric conductivity: A corrugated metal hose shall be electrically conductive. The electric resistance of a corrugated metal hose shall not exceed 1 Ω/m.

Burst pressure: The burst pressure of a corrugated metal hose assembly shall not be less than four times the maximum allowable pressure at room temperature. We close the test sample by appropriate fittings and fix it at one end, lying horizontally on a surface. It shall be hydraulically pressurized to 1,5 times its allowable pressure and such pressure held for 1 min.

The pressure shall then be increased gradually with a minimum of 10 increments to four times its maximum allowable pressure and the pressure held at this level for 1 min. At this pressure level, the assembly shall not fail by visible leakage or rupture of any of the components.

Pliability: A corrugated metal hose shall be capable of being bent 10 times to a small radius in accordance with the bending radius indicated by EN ISO 10380 for each diameter without leakage.

Fatigue: The performance of our products is tested by representative cycle tests according to the norm requirements depending on the performance level.

Safety: Ayvaz flexible metal hose assemblies are

high quality products that are manufactured by the highest technology of equipment. Although, the quality of our products, it is essential to choose the most appropriate hose design and correct assembly technique in order to get maximum efficiency and service life from hose assemblies.

Some of the most important safety advises are given below.

Design and Service Life

In some cases, hose assemblies must only be used under the application conditions which are stated by the manufacturer. In such cases, the service life of the hose assemblies is directly related to the operating conditions.

The Choice of Correct Hose Length

There must be no movement or bending tension on the hose applications. The neutral areas around the hose ends must definitely be measured. These measurements might be used in the calculations if it is necessary.

Effect of Temperature

The standard operating pressure that is used in hose calculations is the pressure value at 20 °C. For increased temperatures, operating pressure and service life are expected to be decreased. Temperature reducing factors should be taken into account while calculating the operating pressure.

Material and Corrosion

All the materials used in hose assemblies must be checked from the resistance tables that are shaped according to the industrial literature. On the other hand, the fluid type transported by the hose assembly and the resistance caused by the external effects must also be considered in order to provide the maximum service life for the hose applications.

In addition, all the insulation materials that could trigger the corrosion must be fixed, especially there should be no residue permitted through the braiding. Because of the structure of the hose, it is very hard to annihilate these residues which may cause corrosion.

Apart from all these advices, every hose assemblies have a visible defect must be taken off immediately and replaced with a new one. Especially in the areas where the human health and safety is subject, it is essential to keep up with the advised points explained above.

OTHER STANDARDS THAT WE COMPLY

EN 14800:2007 Corrugated safety metal hose assemblies for the connection domestic appliance using gaseous fuels

The objective of this European Standard is to achieve safe operation of corrugated metal gas hose assemblies by specifying the requirements of performance, materials and test methods.

These assemblies are designed for the use with fixed applications; they may also be used for the connection of movable applications.

This European Standard is based on a balance of requirements given by the major national European Gas Authorities for corrugated metal hose assemblies for the connection of domestic gas appliances.

It reflects the recognised practise and technology of products approved today as well as the present culture of usage by the consumer.

EN 14800 standard specifies the requirements of

performance, the material and the test methods of corrugated safety metal gas hose assemblies for the connection of domestic appliances, in order to achieve save operation.

The corrugated metal gas hose assemblies according to EN 14800 are suitable for the connection of domestic appliances inside or outside a dwelling, using gas at a pressure lower than 0,5 bar.

EN 15266 Stainless steel pliable corrugated tubing kits in buildings for gas with an operating pressure up to 0,5 bar

This European Standard specifies the requirements for material, design, manufacture, testing, marking and documentation of stainless steel pliable corrugated gas tubing kits for buildings with a maximum operating pressure (MOP) less than or equal to 0,5 bar and a nominal size range from DN 10 to DN 50. EN 15266 applies to stainless steel pliable corrugated gas tubing kits used for 1st, 2nd and 3rd family gases in residential, commercial and industrial gas installations.

UNI 11353 Italian Standard for Stainless steel corrugated flexible safety hose assemblies for the connection of gas appliances for domestic and similar uses

The standard establishes the design requirements, dimensional requirements and test methods of stainless steel flexible tubes. It applies to flexible pipes destined to the connection of appliances for household and similar, fed with fuel gas belonging to I, II and III family, in accordance with UNI EN 437, with a working pressure not exceeding 0.5 bar. These tubes can be installed both in indoor and outdoor applications, in the temperature range (-20 ° C to 120 ° C).

UNE 60713/1:2007 Spanish Standard for Stainless steel corrugated flexible safety hose assemblies for the connection of gas appliances for domestic and similar uses

The standard establishes the design requirements, dimensional requirements and test methods of stainless steel flexible tubes.

It applies to flexible pipes destined to the connection of appliances for household and similar, fed with fuel gas belonging to I, II and III family, in accordance with UNE 60002, with a working pressure not exceeding 0.4 bar and maximum length up to 2 meters.

BS 669/1:1989 British Standard for flexible hoses, end fittings and sockets for gas burning appliances

BS 669 specifies type test requirements for strip-wound metallic flexible hoses, covers, end fittings and sockets for use with domestic cookers and appliances burning 1st and 2nd family gases at a nominal inlet pressure of 20 mbar.

T/SP/PRS/6 Specifications for Meter Connectors issued by National Grid Gas (England)

T/SP/PRS/6 specifies the product requirements for stainless steel flexible meter connection hoses purchased by National Grid Gas.

Meter connectors covered by T/SP/PRS/6 have nominal bores of corrugated hose of 20,25,50,80 or 100mm and are suitable for use with 1st,2nd and 3rd family gases.

FM, Class Number 1637 Approval Standard for flexible sprinkler hose with threaded end fittings

This standard encompasses the design and performance requirements for flexible sprinkler hose with threaded end fittings for their intended application of connecting the sprinklers in a cleanroom, commercial suspended ceiling, or duct to the sprinkler piping.

A commercial suspended ceiling is a type of ceiling used predominately in Light Hazard Occupancies. It is also used less frequently in ordinary hazard occupancies. A typical suspended ceiling system is a "T Bar Grid". In a T- Bar Grid ceiling, a metal component with an inverted "T" cross-section is used to secure and support acoustical lay-in panels.

VDS 2343, Procedure for the testing, approval certification and conformity assessment of products and systems for fire protection and security technologies

The services are mainly offered for devices, component and systems for fire protection and security technologies. In particular cases, however, they may also be used for other products.

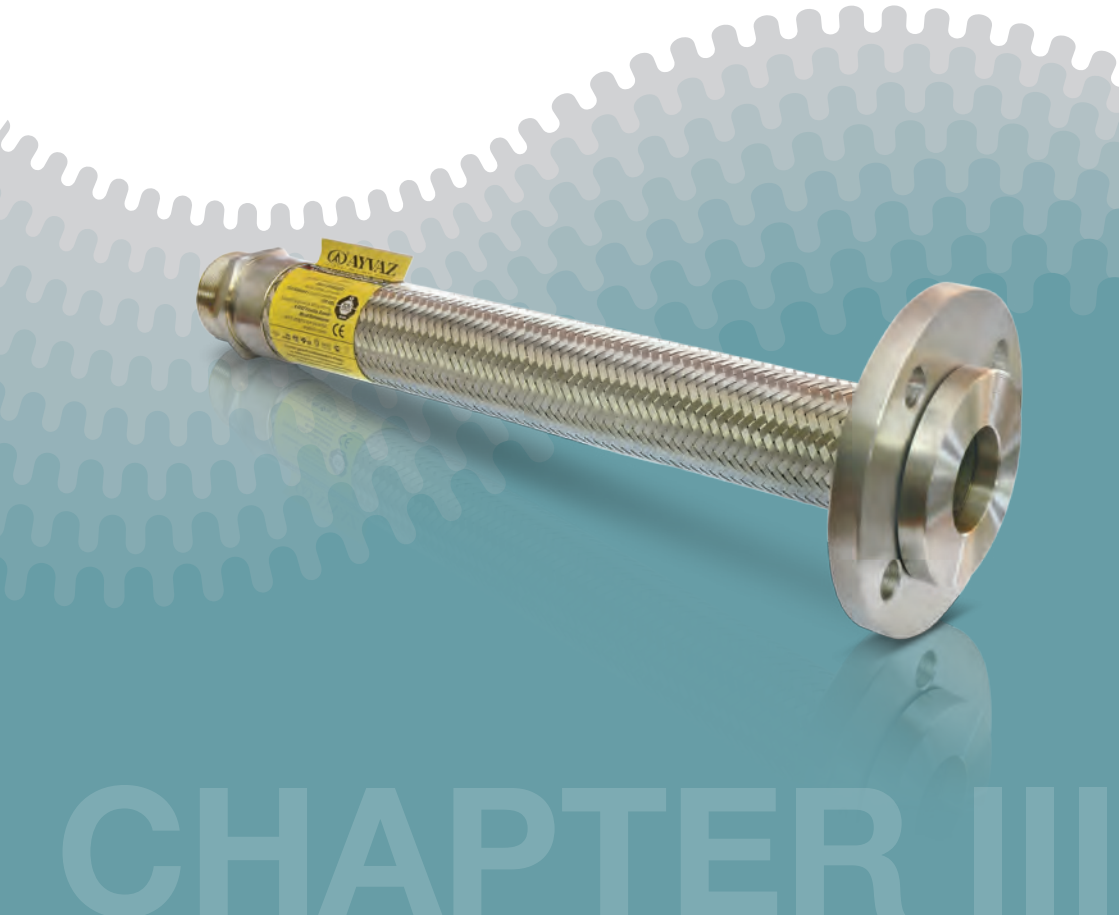
OHSAS 18001 Occupational Health & Safety Management System

AYVAZ

FLEXIBLE METAL HOSES

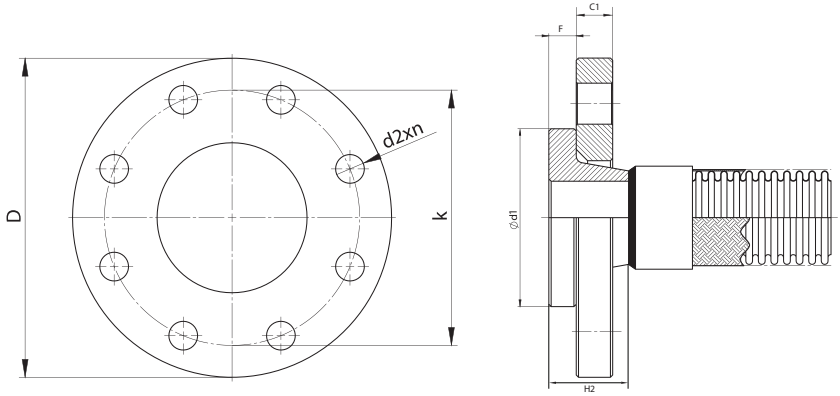
CHAPTER III

INDUSTRIAL METAL HOSE CONNECTIONS



CHAPTER III

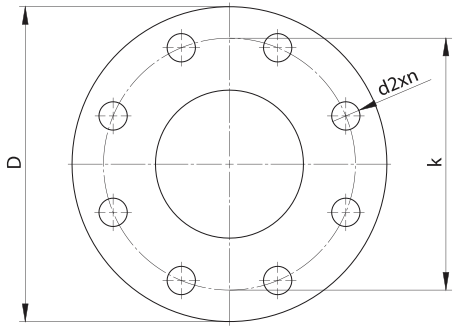
1. FLOATING FLANGE - WELDING COLLAR
DIN EN 1092/1

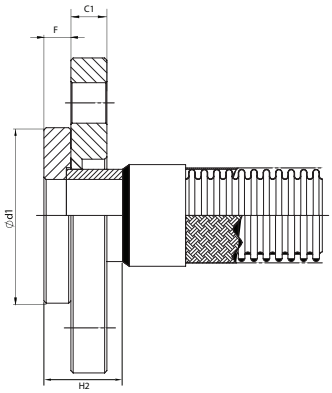


	CONNECTION FEATURES				
	Material		Maximum Operating Temperature °C	Maximum Operating Pressure (PN)	Product Code
Material Code	Welding Collar	Flange			
11	Carbon Steel	Ni Coated Carbon Steel	480	6 10 16 25 40	F111
12	Carbon Steel	Stainless Steel	480		F112
21	Stainless Steel	Carbon Steel	550		F121
22	Stainless Steel	Stainless Steel	550		F122

DIN EN 1092/1 (PN 10/16)									DIN EN 1092/1 (PN 25/40)								
DN	PN	C1	F	H2	Ød1	ØD	Øk	Ødxn	DN	PN	C1	F	H2	Ød1	ØD	Øk	Ødxn
10	10/16	14	12	35	40	90	60	Ø14x4	10	25/40	14	12	35	40	90	60	Ø14x4
15	10/16	14	12	38	45	95	65	Ø14x4	15	25/40	14	12	38	45	95	65	Ø14x4
20	10/16	16	14	40	58	105	75	Ø14x4	20	25/40	16	14	40	58	105	75	Ø14x4
25	10/16	16	14	40	65	115	85	Ø14x4	25	25/40	16	14	40	68	115	85	Ø14x4
32	10/16	18	14	42	78	140	100	Ø18x4	32	25/40	18	14	42	78	140	100	Ø18x4
40	10/16	18	14	45	88	150	110	Ø18x4	40	25/40	18	14	45	88	150	110	Ø18x4
50	10/16	20	16	45	102	165	125	Ø18x4	50	25/40	20	16	48	102	165	125	Ø18x4
65	10/16	20	16	45	122	185	145	Ø18X8	65	25/40	22	16	52	122	185	145	Ø18X8
80	10/16	20	16	50	138	200	160	Ø18X8	80	25/40	24	18	58	138	200	160	Ø18X8
100	10/16	22	18	52	158	220	180	Ø18X8	100	25/40	26	20	65	162	235	190	Ø22X8
125	10/16	22	18	55	188	250	210	Ø18X8	125	25/40	28	22	68	188	270	220	Ø26X8
150	10/16	24	20	55	212	285	240	Ø22X8	150	25/40	30	24	75	218	300	250	Ø26X8
200	16	26	20	62	268	340	295	Ø22X12	200	25	32	26	80	278	360	310	Ø26X12
250	16	29	22	70	320	405	355	Ø26X12	250	25	35	26	88	335	425	370	Ø30X12
300	16	32	24	78	378	460	410	Ø26X12	300	25	38	28	92	395	485	430	Ø30X16

2. FLOATING FLANGE - COLLAR PIPE
DIN EN 1092/1

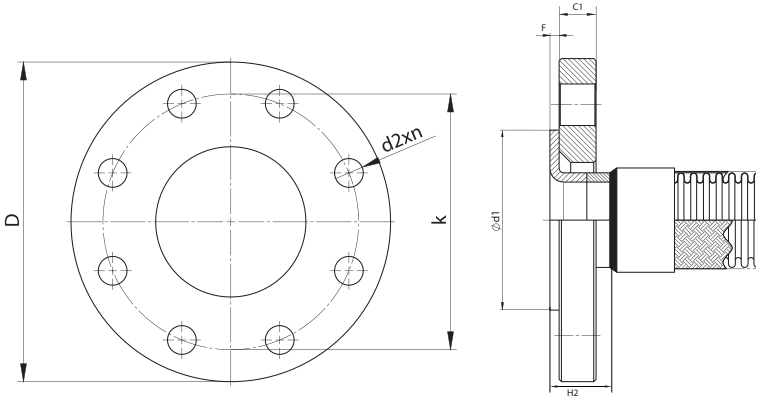




	CONNECTION FEATURES				
	Material		Maximum Operating Temperature °C	Maximum Operating Pressure (PN)	Product Code
Material Code	Welding Collar	Flange			
11	Carbon Steel	Ni Coated Carbon Steel	480	6 10 16 25 40	F211
12	Carbon Steel	Stainless Steel	480		F212
21	Stainless Steel	Carbon Steel	550		F221
22	Stainless Steel	Stainless Steel	550		F222

DIN EN 1092/1 (PN 10/16)									DIN EN 1092/1 (PN 25/40)								
DN	PN	C1	F	H2	Ød1	ØD	Øk	Ødxn	DN	PN	C1	F	H2	Ød1	ØD	Øk	Ødxn
10	10/16	14	12	35	40	90	60	Ø14x4	10	25/40	14	12	35	40	90	60	Ø14x4
15	10/16	14	12	38	45	95	65	Ø14x4	15	25/40	14	12	38	45	95	65	Ø14x4
20	10/16	16	14	40	58	105	75	Ø14x4	20	25/40	16	14	40	58	105	75	Ø14x4
25	10/16	16	14	40	65	115	85	Ø14x4	25	25/40	16	14	40	68	115	85	Ø14x4
32	10/16	18	14	42	78	140	100	Ø18x4	32	25/40	18	14	42	78	140	100	Ø18x4
40	10/16	18	14	45	88	150	110	Ø18x4	40	25/40	18	14	45	88	150	110	Ø18x4
50	10/16	20	16	45	102	165	125	Ø18x4	50	25/40	20	16	48	102	165	125	Ø18x4
65	10/16	20	16	45	122	185	145	Ø18X8	65	25/40	22	16	52	122	185	145	Ø18X8
80	10/16	20	16	50	138	200	160	Ø18X8	80	25/40	24	18	58	138	200	160	Ø18X8
100	10/16	22	18	52	158	220	180	Ø18X8	100	25/40	26	20	65	162	235	190	Ø22X8
125	10/16	22	18	55	188	250	210	Ø18X8	125	25/40	28	22	68	188	270	220	Ø26X8
150	10/16	24	20	55	212	285	240	Ø22X8	150	25/40	30	24	75	218	300	250	Ø26X8
200	16	26	20	62	268	340	295	Ø22X12	200	25	32	26	80	278	360	310	Ø26X12
250	16	29	22	70	320	405	355	Ø26X12	250	25	35	26	88	335	425	370	Ø30X12
300	16	32	24	78	378	460	410	Ø26X12	300	25	38	28	92	395	485	430	Ø30X16

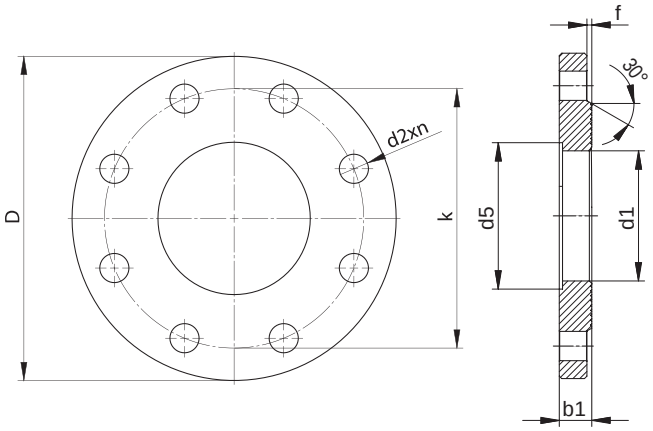
3. FLOATING FLANGE - WELDING RIM
DIN EN 1092/1



	CONNECTION FEATURES				
	Material		Maximum Operating Temperature °C	Maximum Operating Pressure (PN)	Product Code
Material Code	Welding Collar	Flange			
11	Carbon Steel	Carbon Steel	480	10	F311
12	Carbon Steel	Stainless Steel	480	16	F312
22	Stainless Steel	Stainless Steel	550	25 40	F322

DIN EN 1092/1 (PN 10/16)									DIN EN 1092/1 (PN 25/40)							
DN	PN	C1	F	H2	Ød1	ØD	Øk	Ødxn	DN	PN	C1	F	H2	Ød1	ØD	Øk	Ødxn
10	10/16	14	5	35	40	90	60	Ø14x4	10	25/40	14	5	35	40	90	60	Ø14x4
15	10/16	14	5	38	45	95	65	Ø14x4	15	25/40	14	5	38	45	95	65	Ø14x4
20	10/16	16	6	40	58	105	75	Ø14x4	20	25/40	16	6	40	58	105	75	Ø14x4
25	10/16	16	7	40	65	115	85	Ø14x4	25	25/40	16	7	40	68	115	85	Ø14x4
32	10/16	18	8	42	78	140	100	Ø18x4	32	25/40	18	8	42	78	140	100	Ø18x4
40	10/16	18	8	45	88	150	110	Ø18x4	40	25/40	18	8	45	88	150	110	Ø18x4
50	10/16	20	8	45	102	165	125	Ø18x4	50	25/40	20	10	48	102	165	125	Ø18x4
65	10/16	20	8	45	122	185	145	Ø18X8	65	25/40	22	11	52	122	185	145	Ø18X8
80	10/16	20	10	50	138	200	160	Ø18X8	80	25/40	24	12	58	138	200	160	Ø18X8
100	10/16	22	10	52	158	220	180	Ø18X8	100	25/40	26	14	65	162	235	190	Ø22X8
125	10/16	22	10	55	188	250	210	Ø18X8	125	25/40	28	16	68	188	270	220	Ø26X8
150	10/16	24	10	55	212	285	240	Ø22X8	150	25/40	30	18	75	218	300	250	Ø26X8
200	16	26	11	62	268	340	295	Ø22X12	200	25	32	18	80	278	360	310	Ø26X12
250	16	29	12	70	320	405	355	Ø26X12	250	25	35	18	88	335	425	370	Ø30X12
300	16	32	14	78	378	460	410	Ø26X12	300	25	38	20	92	395	485	430	Ø30X16

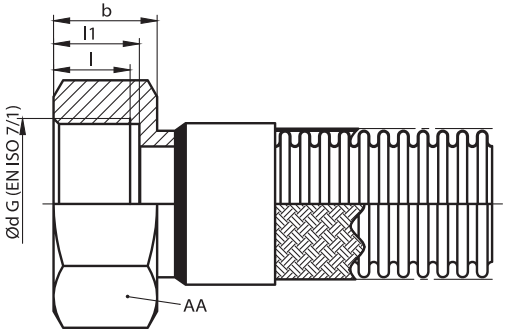
4. FIXED FLANGE
DIN EN 1092/1



	CONNECTION FEATURES				
	Material		Maximum Operating Temperature °C	Maximum Operating Pressure (PN)	Product Code
Material Code	Welding Collar	Flange			
11	Carbon Steel	Carbon Steel	480	10 16 25 40	F411
12	Carbon Steel	Stainless Steel	480		F412
22	Stainless Steel	Stainless Steel	550		F422

DIN EN 1092/1 (PN 10/16)									DIN EN 1092/1 (PN 25/40)								
DN	PN	b1	f	Ød1	Ød5	ØD	Øk	Ødxn	DN	PN	b1	f	Ød1	Ød5	ØD	Øk	Ødxn
10	10/16	14	2	10	18	90	60	Ø14x4	10	25/40	14	5	10	18	90	60	Ø14x4
15	10/16	14	2	15	22	95	65	Ø14x4	15	25/40	14	5	15	22	95	65	Ø14x4
20	10/16	16	2	20	26	105	75	Ø14x4	20	25/40	16	6	20	26	105	75	Ø14x4
25	10/16	16	2	25	32,5	115	85	Ø14x4	25	25/40	16	7	25	32,5	115	85	Ø14x4
32	10/16	18	2	32	42,5	140	100	Ø18x4	32	25/40	18	8	32	42,5	140	100	Ø18x4
40	10/16	18	3	40	51,5	150	110	Ø18x4	40	25/40	18	8	40	51,5	150	110	Ø18x4
50	10/16	18	3	50	62,5	165	125	Ø18x4	50	25/40	18	10	50	62,5	165	125	Ø18x4
65	10/16	18	3	65	77	185	145	Ø18X8	65	25/40	18	11	65	77	185	145	Ø18X8
80	10/16	20	3	80	90	200	160	Ø18X8	80	25/40	20	12	80	90	200	160	Ø18X8
100	10/16	22	3	100	115,5	220	180	Ø18X8	100	25/40	26	14	100	115,5	235	190	Ø22X8
125	10/16	22	3	125	141	250	210	Ø18X8	125	25/40	28	16	125	141	270	220	Ø26X8
150	10/16	24	3	150	169,5	285	240	Ø22X8	150	25/40	30	18	150	169,5	300	250	Ø26X8
200	16	24	3	200	220	340	295	Ø22X12	200	25	32	18	200	220	360	310	Ø26X12
250	16	26	3	250	274	405	355	Ø26X12	250	25	35	18	250	274	425	370	Ø30X12
300	16	32	4	300	325	460	410	Ø26X12	300	25	38	20	300	325	485	430	Ø30X16

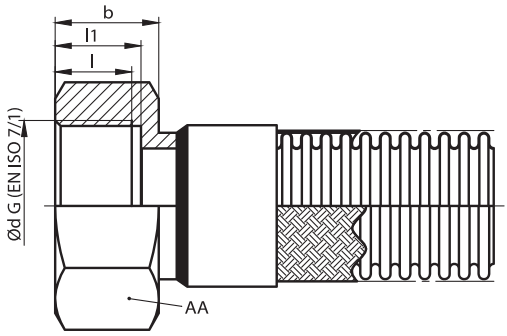
5. FIXED THREADED CONNECTION
HEXAGON SOCKET, WHITWORTH PIPE THREAD (EN ISO 7/1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	M111
22	Stainless Steel	550	M122

DIMENSIONS						
Ød	l	l1	b	AA	PN	
					Non-Braided	Braided
G 1/4"	8	10	12	17	16	200
G 3/8"	8	10	12,5	19		
G 1/4"	8	10	12	17	16	200
G 3/8"	8	10	12,5	19		
G 3/8"	8	10	12,5	19	12	180
G 1/2"	11	13	15,5	24	9	140
G 3/4"	11,5	13,5	16,5	30		
G 1/2"	11	13	15,5	24	7	95
G 3/4"	11,5	13,5	16,5	30		
G 1"	13,5	15,5	18,5	36		
G 3/4"	11,5	13,5	16,5	30	4	90
G 1"	13,5	15,5	18,5	36		
G 1 1/4"	14,5	16,5	20,5	46		
G 1"	13,5	15,5	18,5	36	3,5	60
G 1 1/4"	14,5	16,5	20,5	46		
G 1 1/2"	14,5	16,5	20,5	55		
G 1 1/4"	19,5	21,5	26,5	50	3	55
G 1 1/2"	19,5	21,5	26,5	60		
G 2"	20	22	34	70		
G 1 1/2"	14,5	16,5	20,5	55	2,5	50
G 2"	15	17	21	65		
G 2"	15	17	21	65	2,5	40

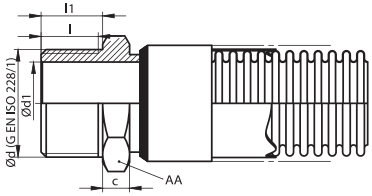
6.FIXED THREADED CONNECTION
HEXAGON SOCKET
Tapered Internal Thread Rc(EN ISO 7/1) ve Cylindrical Internal Thread Rp(EN ISO 7/1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	M211
22	Stainless Steel	550	M222

DIMENSIONS						
Ød	l	l1	b	AA	PN	
					Non-Braided	Braided
G 1/4"	8	10	12	17	16	200
G 3/8"	8	10	12,5	19		
G 1/4"	8	10	12	17	16	200
G 3/8"	8	10	12,5	19		
G 3/8"	8	10	12,5	19	12	180
G 1/2"	11	13	15,5	24	9	140
G 3/4"	11,5	13,5	16,5	30		
G 1/2"	11	13	15,5	24	7	95
G 3/4"	11,5	13,5	16,5	30		
G 1"	13,5	15,5	18,5	36		
G 3/4"	11,5	13,5	16,5	30	4	90
G 1"	13,5	15,5	18,5	36		
G 1 1/4"	14,5	16,5	20,5	46		
G 1"	13,5	15,5	18,5	36	3,5	60
G 1 1/4"	14,5	16,5	20,5	46		
G 1 1/2"	14,5	16,5	20,5	55		
G 1 1/4"	19,5	21,5	26,5	50	3	55
G 1 1/2"	19,5	21,5	26,5	60		
G 2"	20	22	34	70		
G 1 1/2"	14,5	16,5	20,5	55	2,5	50
G 2"	15	17	21	65		
G 2"	15	17	21	65	2,5	40

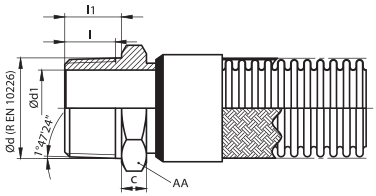
7. FIXED, EXTERNAL THREADED CONNECTION
Hexagon Nipple, Whitworth Threaded (G EN ISO 228/1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	N111
22	Stainless Steel	550	N122

DIMENSIONS								
DN	Ød	Ød1	l	l1	c	AA	PN	
							Non-Braided	Braided
6	G 1/4"	6,2	8	10	4,5	15	16	200
8		8,2					16	200
10					5	17	12	180
12						19	9	140
6	G 3/8"	6,2	8	10	5	17	16	200
8		8,2					16	200
10		10,2					12	180
12		12,2				19	9	140
10	G 1/2"	10,2	10,5	12,5	5,5	22	12	180
12		12,2					9	140
16		15,2					7	95
20					6	27	4	90
12	G 3/4"	12,2	11	13	6	27	9	140
16		15,2					7	95
20		19,5					4	90
25						32	3,5	60
16	G 1"	15,2	13	15	6,5	36	7	95
20		19,5					4	90
25		25,2					3,5	60
32					8	46	3	55
20	G 1 1/4"	19,5	14	16	8	46	4	90
25		25,2					3,5	60
32		32,2					3	55
40					9	55	2,5	50
25	G 1/2"	25,2	14	16	8	50	3,5	60
32		32,2					3	55
40		40,2			9	55	2,5	50
50						65	2,5	40
32	G 2"	32,2	14	16	9	60	3	55
40		40,2					2,5	50
50		50,2				65	2,5	40

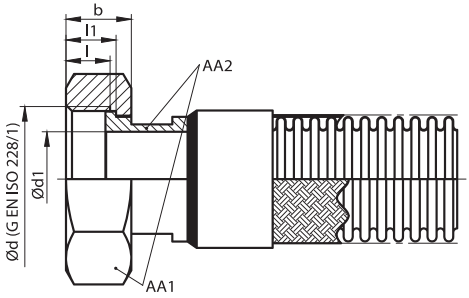
8.FIXED EXTERNAL THREADED CONNECTION
Hexagon Nipple, Whitworth Threaded (R EN ISO 10226)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	N211
22	Stainless Steel	550	N222

DIMENSIONS								
DN	Ød	Ød1	I	I1	c	AA	PN	
							Non-Braided	Braided
6	G 1/4"	6,2	11	13	4,5	15	16	200
8		8,2					16	200
10					5	17	12	180
12						19	9	140
6	G 3/8"	6,2	11,4	13,5	5	17	16	200
8		8,2					16	200
10		10,2					12	180
12		12,2				19	9	140
10	G 1/2"	10,2	15	17	5,5	22	12	180
12		12,2					9	140
16		15,2					7	95
20					6	27	4	90
12	G 3/4"	12,2	16,3	19	6	27	9	140
16		15,2					7	95
20		19,5					4	90
25						32	3,5	60
16	G 1"	15,2	19,1	21	6,5	36	7	95
20		19,5					4	90
25		25,2					3,5	60
32					8	46	3	55
20	G 1 1/4"	19,5	21,4	24	8	46	4	90
25		25,2					3,5	60
32		32,2					3	55
40					9	55	2,5	50
25	G 1/2"	25,2	21,4	24	8	50	3,5	60
32		32,2					3	55
40		40,2			9	55	2,5	50
50						65	2,5	40
32	G 2"	32,2	23,4	26	9	60	3	55
40		40,2					2,5	50
50		50,2				65	2,5	40

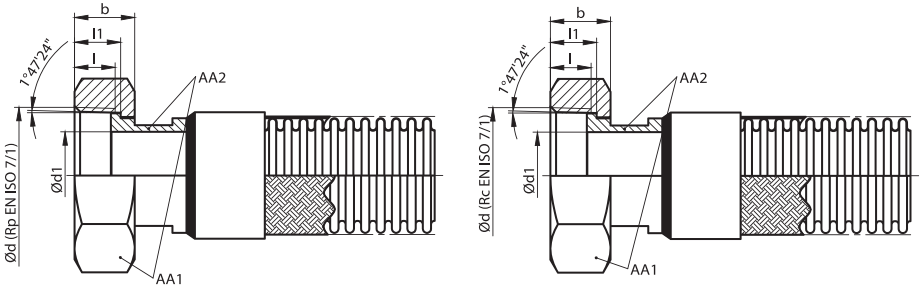
9.SWIEVELLING RACCORD CONNECTION
Collar Pipe, Hexagon Socket
Flat Sealing, Whitworth Thread (EN ISO 228/1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	R111
22	Stainless Steel	550	R122

DIMENSIONS								
PN	DN	Ød	Ød1	l	l1	b	AA1	AA2
PN 25	6	G 1/4"	6,2	8	10	12	12	8
	8							
	6	G 3/8"	6,2	8	10	12,5	19	10
	8		8,2					
	10							
	10	G 1/2"	10,2	11	13	15,5	24	15
	12		12,2					14
	16							
	12	G 3/4"	12,2	11,5	13,5	16,5	30	19
	16		15,2					
	20		18,2					20
	16	G 1"	15,2	13,5	15,5	18,5	36	23
	20		19,5					
	25		23,2					26
	20	G 1 1/4"	20,2	14,5	16,5	20,5	46	30
	25		25,2					
	32							
	25	G 1 1/2"	25,2	14,5	16,5	20,5	55	36
	32		31,2					
	40							
	32	G 2"	32,2	15	17	21	65	46
	40		40,2					
	50							

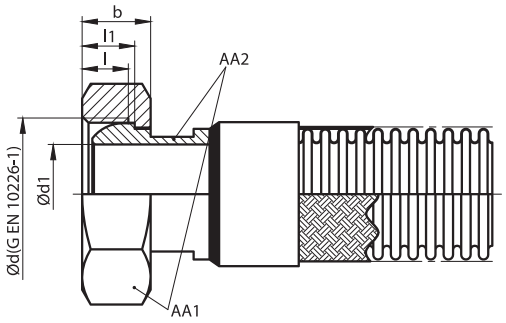
10.SWIEVELLING RACCORD CONNECTION
Collar Pipe, Hexagon Socket
Tapered Internal Thread Rc (EN ISO 7/1) or Cylindrical Internal Thread Rp (EN ISO 7/1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	R211
22	Stainless Steel	550	R222

DIMENSIONS								
PN	DN	Ød	Ød1	l	l1	b	AA1	AA2
PN 25	6	G 1/4"	6,2	8	10	12	12	8
	8							
	6	G 3/8"	6,2	8	10	12,5	19	10
	8		8,2					
	10							
	10	G 1/2"	10,2	11	13	15,5	24	15
	12		12,2					14
	16							
	12	G 3/4"	12,2	11,5	13,5	16,5	30	19
	16		15,2					
	20		18,2					20
	16	G 1"	15,2	13,5	15,5	18,5	36	23
	20		19,5					
	25		23,2					26
	20	G 1 1/4"	20,2	14,5	16,5	20,5	46	30
	25		25,2					
	32							
	25	G 1 1/2"	25,2	14,5	16,5	20,5	55	36
	32		31,2					
	40							
	32	G 2"	32,2	15	17	21	65	46
	40		40,2					
	50							

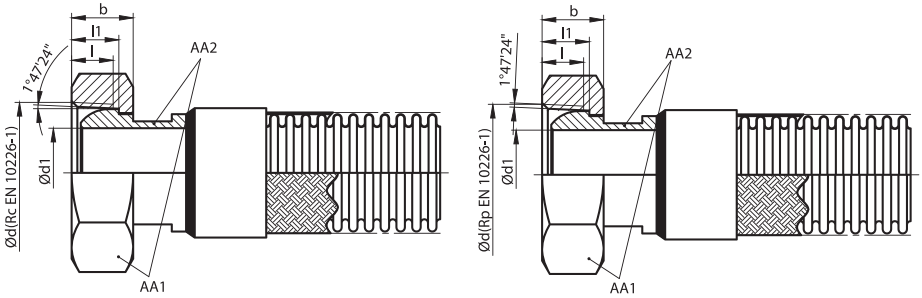
11. SWIEVELLING RACCORD CONNECTION
Spherical Sleeve, Hezagon Socket
Whitworth Thread (EN 10226-1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	R311
22	Stainless Steel	550	R322

DIMENSIONS								
PN	DN	Ød	Ød1	l	l1	b	AA1	AA2
PN 25	6	G 1/4"	6,2	8	10	12	17	8
	8							
	6	G 3/8"	6,2	8	10	12,5	19	10
	8		8,2					
	10							
	10	G 1/2"	10,2	11	13	15,5	24	15
	12		12,2					14
	16							
	12	G 3/4"	12,2	11,5	13,5	16,5	30	19
	16		15,2					
	20		18,2					20
	16	G 1"	15,2	13,5	15,5	18,5	36	23
	20		19,5					
	25		23,2					26
	20	G 1 1/4"	20,2	14,5	16,5	20,5	46	30
	25		25,2					
	32							
	25	G 1 1/2"	25,2	14,5	16,5	20,5	55	36
	32		31,2					
	40							
	32	G 2"	32,2	15	17	21	65	46
	40		40,2					
	50							

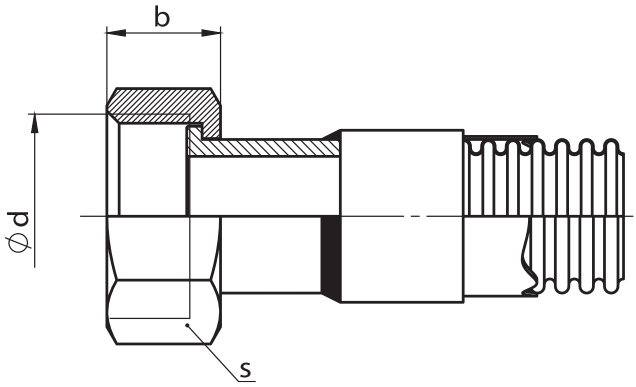
12.SWIEVELLING RACCORD CONNECTION
Spherical Sleeve, Hezagon Socket
Tapered Internal Thread Rc (EN 10226-1) or Cylindrical Internal Thread Rp(EN 10226-1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	R411
22	Stainless Steel	550	R422

DIMENSIONS								
PN	DN	Ød	Ød1	l	l1	b	AA1	AA2
PN 25	6	Rc 1/4"-Rp 1/4"	6,2	8	10	12	17	8
	8							
	6	Rc 3/8"-Rp 3/8"	6,2	8	10	12,5	19	10
	8		8,2					
	10							
	10	Rc 1/2"-Rp 1/2"	10,2	11	13	15,5	15	14
	12		12,2					14
	16							
	12	Rc 3/4"-Rp 3/4"	12,2	11,5	13,5	16,5	30	19
	16		15,2					
	20		18,2					20
	16	Rc 1"-Rp 1"	15,2	19,5	21	24	36	23
	20		19,5					
	25		23,2					26
	20	Rc 1 1/4"-Rp 1 1/4"	20,2	21,4	24	28	46	30
	25		25,2					
	32							
	25	Rc 1 1/2"-Rp 1 1/2"	25,2	21,4	24	28	55	36
	32		31,2					
	40							
	32	Rc 2"-Rp 2"	32,2	23,4	26	30	65	46
	40		40,2					
	50							

13. SWIEVELLING RACCORD CONNECTION
Collar Pipe, Flat Sealing
Metric Thread (DIN 3870)



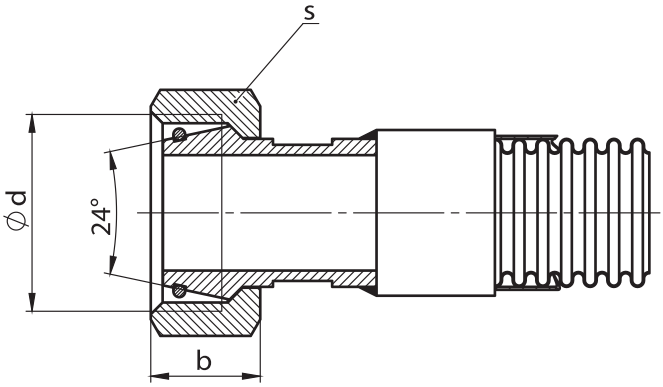
Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	R511
22	Stainless Steel	550	R522

High Pressure Class	Series S
Low Pressure Class	Series L

DIMENSIONS					
Serie	PN	DN	Ød	s	b
S	315	6	M14x1,5	17	14,5
		8	M16x1,5	19	15,5
		10	M18x1,5	22	
		12	M22x1,5	27	17
		16	M26x1,5	32	18
	160	20	M30x2	36	20
		25	M36x2	41	21
		32	M45x2	50	24
		40	M52x2	60	32,5

DIMENSIONS					
Serie	PN	DN	Ød	s	b
L	630	6	M14x1,5	17	16,5
		8	M16x1,5	19	
		10	M18x1,5	22	17,5
			M20x1,5	24	
		12	M22x1,5	27	20,5
	400	16	M24x1,5	30	
		20	M30x2	36	24
		25	M36x2	46	27
		32	M42x2	50	29
	315	40	M52x2	60	32,5

14. SWIEVELLING RACCORD CONNECTION
24° Conical Sleeve with O-ring
Union Nut, DIN ISO 12151-2



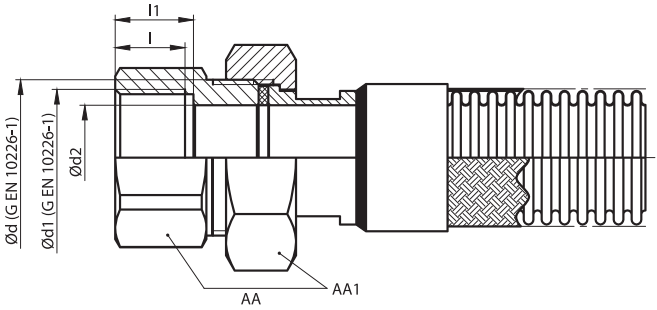
Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	R611
22	Stainless Steel	550	R622

High Pressure Class	Series S
Low Pressure Class	Series L

DIMENSIONS					
Serie	PN	DN	Ød	s	b
L	315	6	M14x1,5	17	14,5
		8	M16x1,5	19	15,5
		10	M18x1,5	22	
		12	M22x1,5	27	17
		16	M26x1,5	32	18
	160	20	M30x2	36	20
		25	M36x2	41	21
		32	M45x2	50	24
		40	M52x2	60	32,5

DIMENSIONS					
Serie	PN	DN	Ød	s	b
S	630	6	M14x1,5	17	16,5
		8	M16x1,5	19	
		10	M18x1,5	22	17,5
			M20x1,5	24	
		12	M22x1,5	27	20,5
	400	16	M24x1,5	30	
		20	M30x2	36	24
		25	M36x2	46	27
		32	M42x2	50	29
	315	40	M52x2	60	32,5

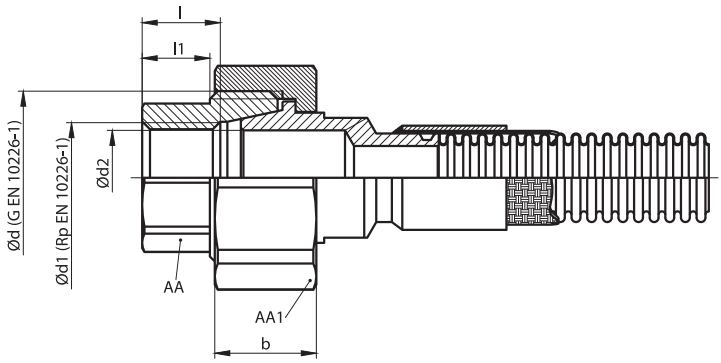
15. INTERNAL THREADED FITTING
Hexagon Socket, Flat Sealing, Whitworth Thread (EN 10226-1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	TR111
22	Stainless Steel	550	TR122

DIMENSIONS								
PN	DN	Ød	Ød1	Ød2	AA	AA1	I	I1
PN 35 PN 40 PN 50 PN 65	10	G 1/2"	G 3/8"	12,2	22	24	8	10
	12	G 3/4"	G 1/2"	15,2	27	30	11	13
	16							
	20	G 1"	G 3/4"	20,2	36	36	11,5	13,5
	25	G 1 1/4"	G 1"	25,5	46	46	13,5	15,5
	32	G1 1/2"	G 1 1/4"	32,2	50	55	14,5	16,5
	40	G 2"	G 1 1/2"	40,2	60	65	14,5	16,5
PN 35 PN 40 PN 50 PN 65	10	G 1/2"	Rc 3/8"	12,2	22	24	11,4	13,5
	12	G 3/4"	Rc 1/2"	15,2	27	30	15	17
	16							
	20	G 1"	Rc 3/4"	20,2	36	36	16,3	19
	25	G 1 1/4"	Rc 1"	25,2	46	46	19,1	21
	32	G 1 1/2"	Rc 1 1/4"	32,2	50	55	21,4	24
PN 30 PN 40 PN 50 PN 65	40	G 2"	Rc 1 1/2"	40,2	60	65	21,4	24

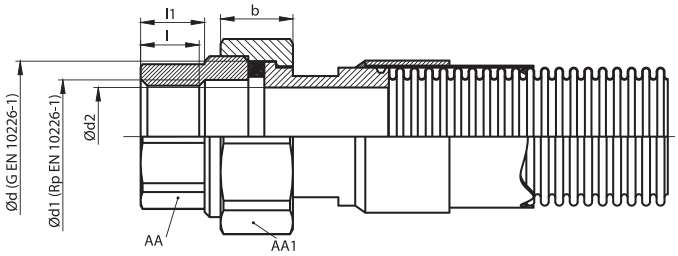
16. INTERNAL THREADED FITTING
Octagonal Socket, Tapered Internal Thread EN 10226-1, Conical Sealing



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	TR211
22	Stainless Steel	550	TR222

DIMENSIONS								
PN	DN	Ød	Ød1	Ød2	AA	AA1	l	l1
PN 100	6	G 1/2"	Rp 1/4"	11,2	17	27	11	12
	8							
	10							
	12							
	10	G 3/4"	Rp 3/8"	14,2	22	32	11,4	12
	12							
	16							
	12	G 1"	Rp 1/2"	18,2	27	41	15	13
	16							
	20							
	16	G 1 1/4"	Rp 3/4"	22,2	32	50	16,3	15
	20							
	25							
	20	G 1 1/2"	Rp 1"	29,2	41	55	19,1	19
	25							
	32							
PN 63	25	G 2"	Rp 1 1/4"	38,2	50	70	21,4	214
	32							
	40							
	32	G 1 1/4"	Rp 1 1/2"	40,2	55	75	21,4	23
	40							
	40	G 2 1/2"	Rp 2"	50,2	68	90	23,4	25
	50							

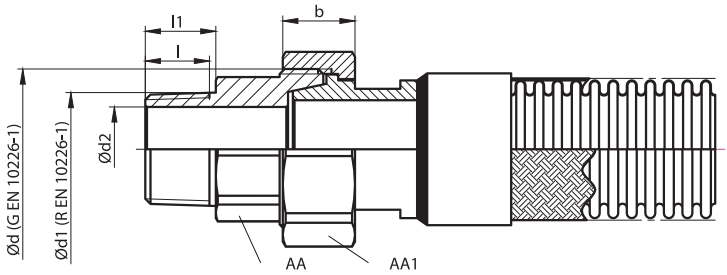
17.INTERNAL THREADED FITTING
Octagon Socket, Internal Thread EN 10226-1, Flat Sealing



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	TR311
22	Stainless Steel	550	TR322

DIMENSIONS									
PN	DN	Ød	Ød1	Ød2	AA	AA1	b	l	l1
PN 35 PN 40 PN 50 PN 65	12	G 1/2"	Rp 1/4"	11,2	17	27	16,5	11	12
	16	G 3/4"	Rp 3/8"	12,2	22	32	17,5	11,4	12
	20	G 1"	Rp 1/2"	18,	27	41	19,5	15	13
	25	G 1 1/4"	Rp 3/4"	22,2	32	50	21,5	16,3	15
	32	G 1 1/2"	Rp 1"	29,2	41	55	21,5	19,1	19
	40	G 2"	Rp 1 1/4"	38,2	50	70	22	21,4	21

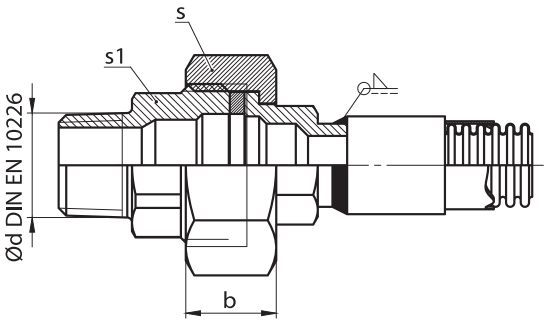
18.EXTERNAL THREADED FITTING
Flat Sealing, Whitworth Thread (EN 10226-1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	TR411
22	Stainless Steel	550	TR422

DIMENSIONS									
PN	DN	Ød	Ød1	Ød2	AA	AA1	b	l	l1
PN 100	6	G 1/2"	R 1/4" G 1/4"	8,2	17	27	16,5	11	13
	8								
	10								
	12								
	10	G 3/4"	R 3/8" G 3/8"	12,2	22	32	17,5	11,4	13,5
	12								
	16								
	12	G 1"	R 1/2" G 1/2"	15,2	27	41	19,5	15	17
	16								
	20								
	16	G 1 1/4"	R 3/4" G 3/4"	20,2	32	50	21,5	16,3	19
	20								
	25								
	20	G 1 1/2"	R 1" G 1"	25,2	41	55	21,5	19,1	21
	25								
	32								
PN 63	25	G 2"	R 1 1/4" G 1 1/4"	32,2	50	70	22	21,4	24
	32								
	40								
	32	G 1 1/4"	R 1/2" G 1/2"	40,2	55	75	23	21,4	24
	40								
	40	G 2 1/2"	R 2" G 2"	50,2	68	90	23	23,4	26
	50								

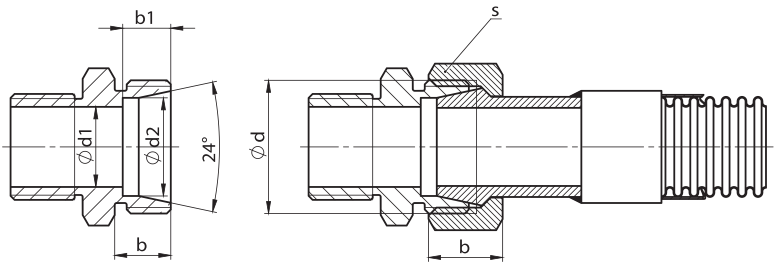
19.EXTERNAL THREADED FITTING
Flat Sealing, Whitworth Thread (EN 10226-1)



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	TR511
22	Stainless Steel	550	TR522

DIMENSIONS				
DN	Ød	s	s1	b
12	R 1/2"	42	26	22
16				
20	R 3/4"	50	31	
25	R 1"	55	38	24
32	R 1 1/4"	68	48	27
40	R 1 1/2"	75	54	32
50	R 2"	90	65	30

20.WELDED END, MALE CONNECTION
24° Cone angle, Conically Sealing
Metric Thread (DIN 3870)



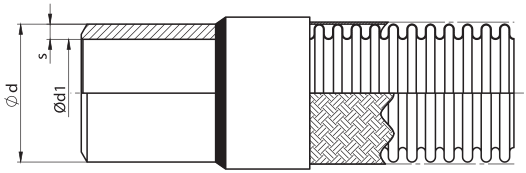
Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	N311
22	Stainless Steel	550	N322

High Pressure Class	Series S
Low Pressure Class	Series L

DIMENSIONS								
Serie	PN	DN	Ød	Ød1	Ød2	s	b	b1
L	100	6	M14x1,5	6	8	17	10	7
		8	M16x1,5	8	10	19	11	
		10	M18x1,5	10	12	22		
		12	M22x1,5	12	15	27	12	7,5
		16	M26x1,5	15	18	32		
		20	M30x2	19	22	36	14	
		25	M36x2	24	28	41		
	63	32	M45x2	30	35	50	16	10,5
		40	M52x2	36	42	60		11

DIMENSIONS								
Serie	PN	DN	Ød	Ød1	Ød2	s	b	b1
S	100	6	M18x1,5	7	10	22	12	7,5
		8	M20x1,5	8	12	24		
		10	M22x1,5	10	14	27	14	8
		12	M24x1,5	12	16	30		8,5
		16	M30x2	16	20	36	16	10,5
		20	M36x2	20	25	46	18	12
		25	M42x2	25	30	50	20	13,5
	63	32	M52x2	32	38	60	22	16

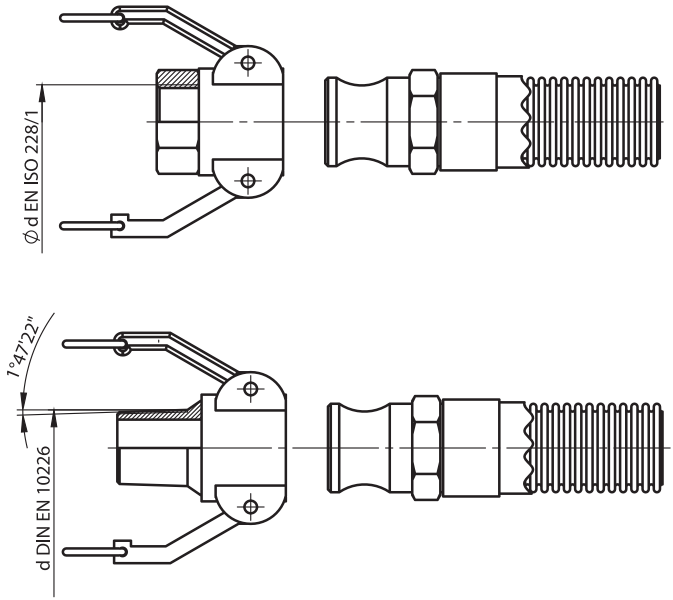
21.PIPE FITTING
WELDED END



Material Code	Material	Maximum Operating Temperature °C	Product Code
11	Carbon Steel	300	KB111
22	Stainless Steel	550	KB122
33	Copper		KB133

DIMENSIONS				
DN	Ød	s	s1	b
12	R 1/2"	42	26	22
16				
20	R 3/4"	50	31	
25	R 1"	55	38	24
32	R 1 1/4"	68	48	27
40	R 1 1/2"	75	54	32
50	R 2"	90	65	30

22.QUICK COUPLINGS
Stainless Steel lever coupling
Internally whitworth thread ISO 228/1 or externally whitworth threaded DIN 2999 (ISO 7/1)



Material		Operating Pressure (bar)	Operating Tempereture (°C)	Product Code
Quick Coupling	Carbon Steel			
Stainless Steel	NBR Viton	10 bar	65 °C	QC122

DIMENSIONS	
DN	Ød
20	3/4"
25	1"
32	1 1/4"
40	1 1/2"
50	2"
65	2 1/2"
80	3"
100	4"

ORDERING INFORMATION

Ayvaz's braided and non braided industrial hoses and fittings can be ordered individually with the give codes in the following form.

Hose Code
First three digits represent Ayvaz metal hose (701)
Following three digits represent the corrugation type and braiding
Last three digits reprsent the hose diameter

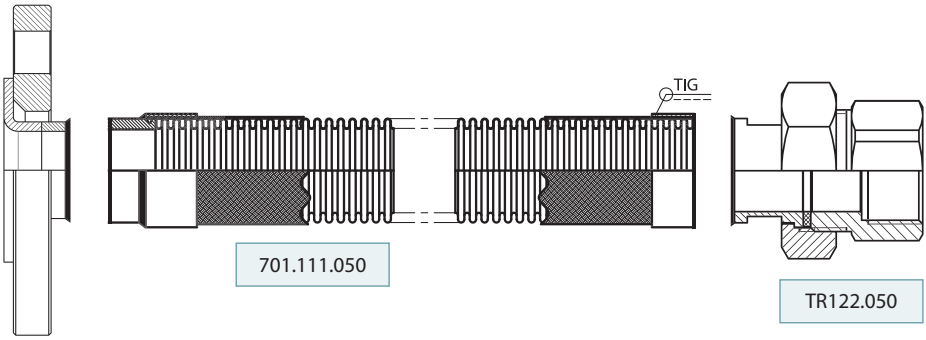
Example: **701.111.025** (Ayvaz's standard corrugated single braided DN 25 metal hose)

Fittings Code
Beginning one or two letters and following digit represent the fitting's type
Following two digits represent the material
Last three digits represent the fitting's diameter

Example: **F212.032**
(Floating flange with carbon steel welding collar and stainless steel flange, DN 32 diameter)

Ayvaz's braided and non braided industrial hoses with fittings can be ordered with the following table

Hose	701.111.050
Fitting 1	F322.050
Fitting 2	TR122.050



Ayvaz's standard corrugated single braided DN 50 industrial metal hose with
One side floating flange with stainless steel welding rim and flange
Other side with internal threaded fitting with Hexagon Socket, Flat Sealing, Whitworth Thread (EN 10226-1)

AYVAZ

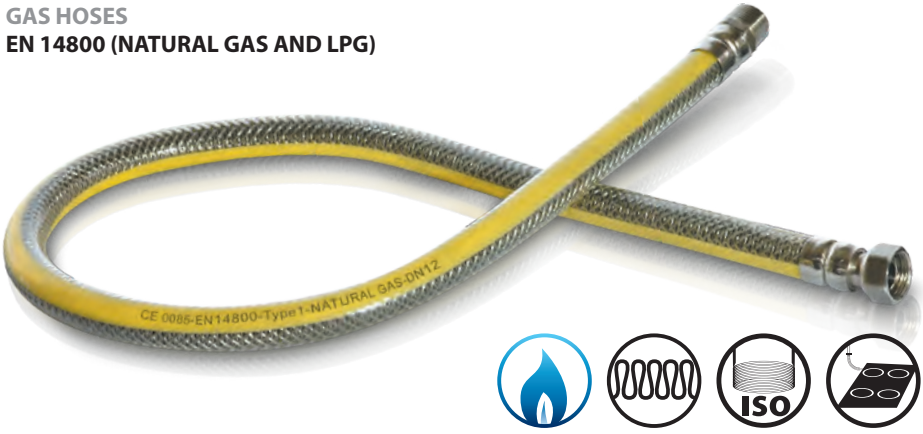
FLEXIBLE METAL HOSES

CHAPTER IV

STANDARD PRODUCT RANGE

CHAPTER IV

GAS HOSES
EN 14800 (NATURAL GAS AND LPG)



Standard: European Norm DIN EN 14800 represents high safety standards for corrugated metal gas hoses used in domestic appliances intended for use by individual householder inside or outside dwelling throughout Europe. This norm aims to improve the performance of the corrugated hose assemblies by defining certain materials for components and test methods, in order to achieve save operation for Natural gas and LPG connections. *(See Page 28)*

Design: Ayvaz DIN EN 14800 flexible metal hoses have a three layered structure which is consisted of, highly flexible corrugated stainless steel hose, stainless steel braiding and external PVC cover.

Hose: Stainless steel (AISI 316L) is used to make sure safe gas distribution by providing a higly flexible structure which is remarkably resistant to corrosion. *(See Page 14)*

Braiding: Stainless Steel (AISI 304) braiding is the second layer which is responsible to prevent overloads and protect the assembly from mechanical damages.

PVC Cover: Transparent PVC cover aims to protect the hose from the environmental and other outside influences likewise aggressive household cleaners.

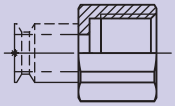
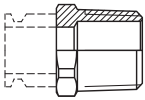
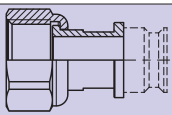
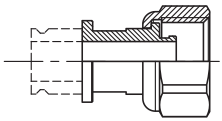
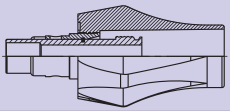
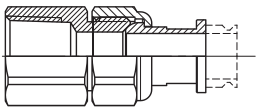
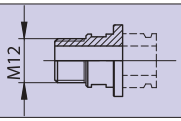
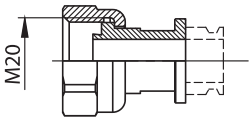
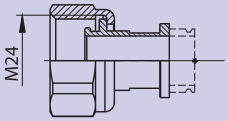
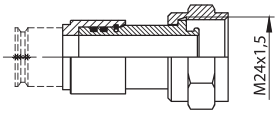
Marking: Ayvaz EN 14800, cooker and oven gas connection hoses are marked as follows;
• Manufacturer's ID and logo • EN 14800 marking, • Diameter and Length • CE certificate number • Type number

Packaging: Hoses are packed individually in transparent plastic bags with complete installation and using instruction card.

Scan this QR Code

NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
12	1/2"x1/2"	500
		750
		1000
		1250
		1500
		2000

Special lengths for specific purposes may be available on request.

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Fixed Nut EN ISO 228/1 thread	Stainless Steel AISI 304 (1.4301)	12	1/2"
2		Male Connection EN ISO 7/1 thread	Stainless Steel AISI 304 (1.4301)	12	1/2"
3		Swivel Nut EN ISO 228/1 thread	Stainless Steel AISI 304 (1.4301)	12	1/2"
4		Swivel Female Connection EN ISO 228/1 thread	Stainless Steel AISI 304 (1.4301)	12	1/2"
5		Socket Bayonette Connection	Stainless Steel AISI 304 (1.4301)	12	1/2"
6		Swivel Female Adapter EN ISO 228/1 thread	Stainless Steel AISI 304 (1.4301)	12	1/2"
7		Male Connection Metric thread	Stainless Steel AISI 304 (1.4301)	12	M 12
8		Swivel Female Connection Metric thread	Stainless Steel AISI 304 (1.4301)	12	M 20
9		Swivel Female Connection Metric thread	Stainless Steel AISI 304 (1.4301)	12	M 24
10		Swivel Female Connection Metric thread	Stainless Steel AISI 304 (1.4301)	12	M 24

GAS HOSES

MIGFLEX (MIG GAS) EXTENSIBLE GAS HOSES (UNI 11353)

Scan this QR Code

With their closed pitch corrugated structure, mig-gas hoses provide a highly flexible and extensible connection for all kitchen appliances. It can be manufactured with or without polyolefin based cover.

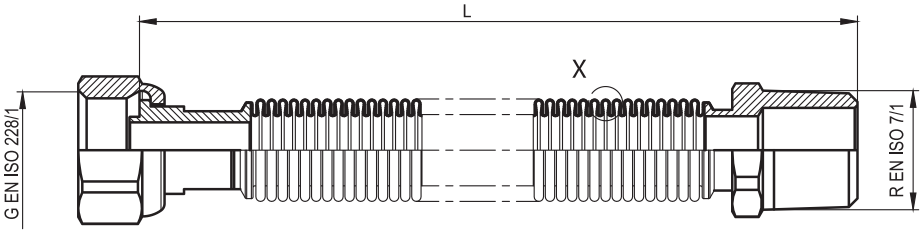
Mig-flex hoses are exposed to special heat treatment. This application increases the flexibility and the corrosition resistance of hoses while reducing the spring rate accordingly. **Heat treatment helps hose to save the form and the shape given.**

Standard: UNI 11353 *(See Page 29)*

Application Areas
- Domestic gas connections
- Kitchen appliances
- Combi Boilers and water heaters
- Cookers and grills

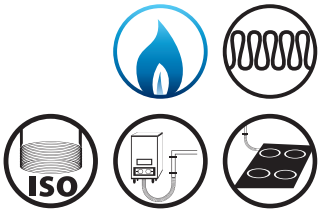
Design

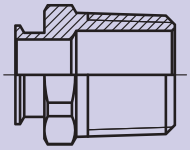
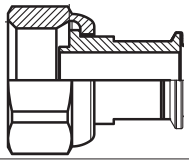
Hose	Closed pitch corrugated, stainless steel (AISI 316L) extensible metal hose
Cover	Polyolefin Cover in yellow or coverless
Gasket	NBR/Aluminium



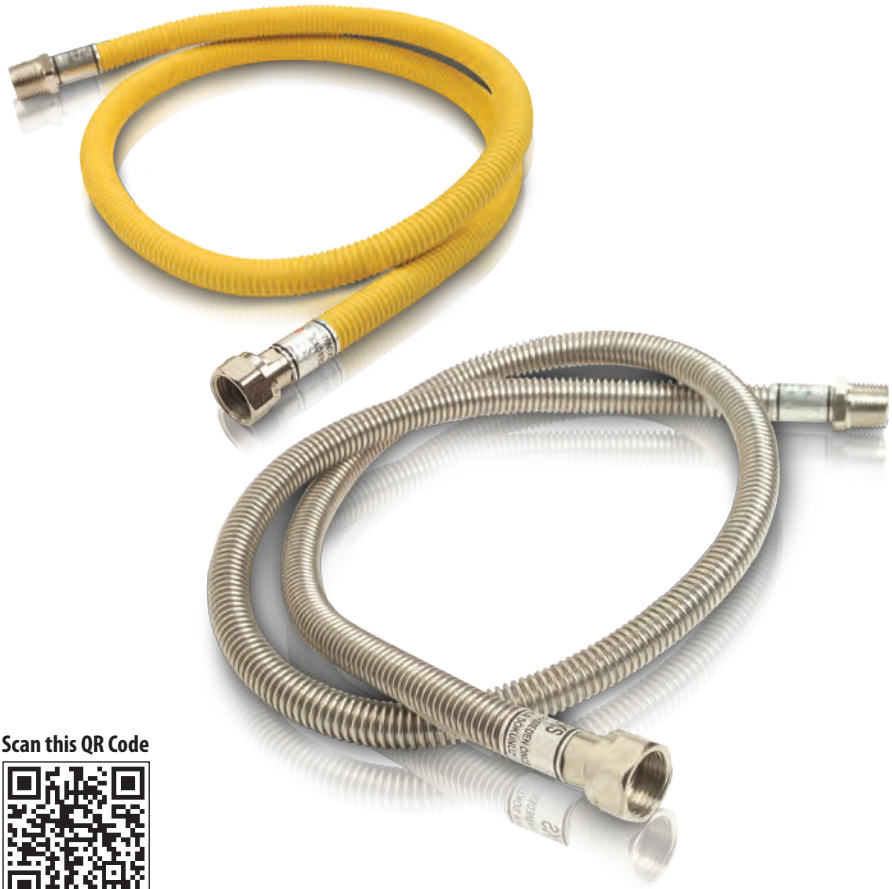
NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
12	1/2"x1/2" 1/2"x3/4"	90x140 130x220 220x420 300x600
20	3/4"x3/4"	90x140 130x220 220x420 300x600 500x1000 750x1500 1000x2000
25	1"x1"	

Special lengths for specific purposes may be available on request.



CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 7/1 thread	Stainless Steel AISI 304 (1.4301)	12 20 25	1/2" 3/4" 1"
2		Swivel Female Connection EN ISO 228/1 thread	Inner Part and Nut Stainless Steel AISI 304 (1.4301)	12 20 25	1/2" 3/4" 1"

GAS HOSES
EKO-FLEX



Scan this QR Code

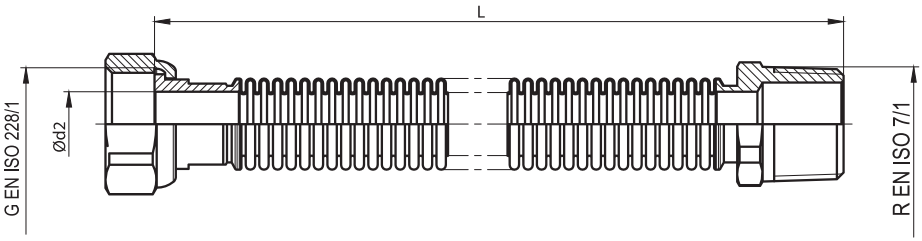
Ayvaz's Ocakflex hose provides an easy and low cost installation for cookers and ovens with its flexible body and screwed fittings. By its highly flexible structure, Ocakflex hose can be formed easily to offer connections even the working distance is too low.

Ayvaz's Ocakflex Hose prevents the problems caused by rigid connections. It can be manufactured with or without yellow polyolefin cover and offer long service life with its reliable design.

Application Areas
- Natural gas applications
- Kitchen Appliances
- Cookers and grills

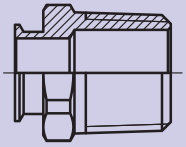
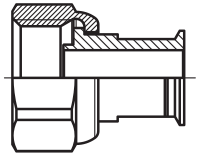
Design

Hose	Standard corrugated, stainless steel (AISI 316L) metal hose *(See page 14)*
Cover	Polyolefin Cover in yellow or coverless



NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
12	1/2"x1/2" 1/2"x3/4"	300 all sizes are available between 5000
16	3/4"x3/4"	
20	1"x1"	

Special lengths for specific purposes may be available on request.

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 7/1 thread	Ni Coated Carbon Steel St. 37.2	12 16 20	1/2" 3/4" 1"
2		Swivel Female Connection EN ISO 228/1 thread	Ni Coated Carbon Steel St. 37.2	12 16 20	1/2" 3/4" 1"

GAS HOSES
BURN-FLEX

Scan this QR Code

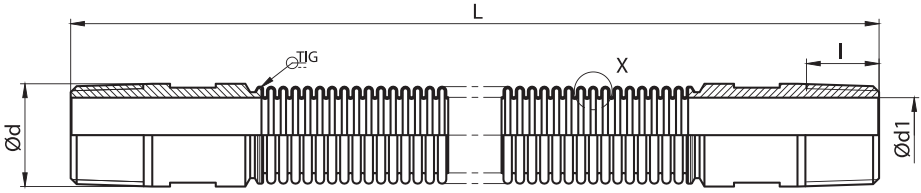
Ayvaz's Burnflex hose provides an easy and low cost installation to gas burners with its flexible body and screwed fittings. By its highly flexible structure, Burnflex hose can be formed easily to offer connections even the working distance is so low.

Ayvaz's Burnflex Hose prevents the problems caused by rigid connections. It can be manufactured with or without special PVC cover and offer long service life with its reliable design.

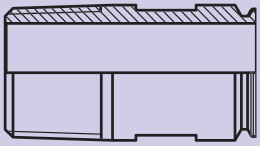
Application Areas
- Gas burners and heaters
- Natural gas applications

Design

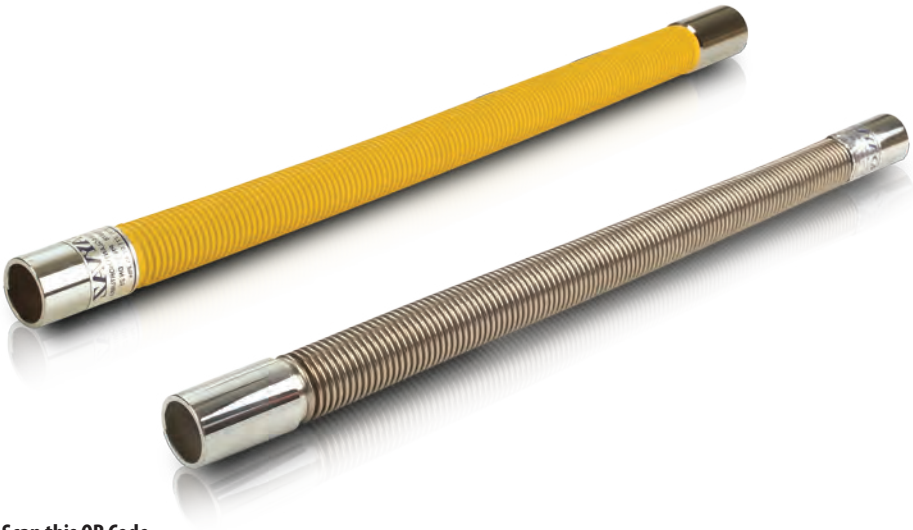
Hose	Semi closed pitch corrugated, stainless steel (AISI 316L) metal hose
Cover	Polyolefin Cover in yellow or coverless



NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
12	1/2″	145
16	3/4″	150
25	1″	165
32	1 1/4″	165
40	1 1/2″	210
50	2″	230

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		External Threaded Pipe EN ISO 7/1	Ni Coated Carbon Steel St. 37.2 Stainless Steel	12 16 25 32 40 50	1/2" 3/4" 1" 1 1/4" 1 1/2" 2

GAS HOSES
DILATATION HOSE



Scan this QR Code

Ayvaz's dilatation hoses are used at dilatation transition points in the buildings. Ayvaz's dilatation hose absorbs all of the deflection, and protects system with its flexible design.

Ayvaz's dilatation hose prevents the problems likewise cracking and crushing caused by rigid connections. Dilatation hoses may be produced with or without protective cover.

Advantages of Dilatation Hose

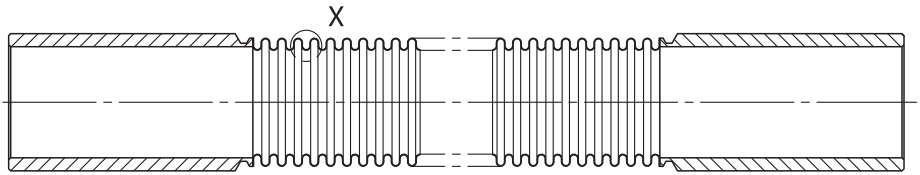
Easy installation with its flexible body and screwed fittings
Low installation cost
Easy and quick installation
Long working life
Low vibration transfer

Application Areas

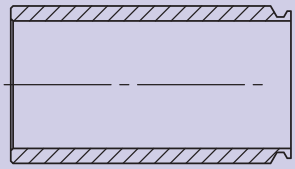
- Seismic security areas
- Dilatation points
- Fire protection lines
- Industrial applications

Design

Hose	Standard corrugated metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L
Cover	Poly-Olefin Cover in Yellow or Coverless



HOSE DIMENSIONS	DN	LENGTH (mm)
	12	500
	20	550
	25	600
	32	650
	40	750
	50	850

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Welded End	NiCr Coated Carbon Steel St.37.2 Stainless Steel (Optional)	12 16 20 25 32 40 50	3/8" 1/2" 3/4" 1" 1 ¼" 1 ½" 2"

GAS HOSES
INDOOR-FLEX (EN ISO 15266)

INDOOR FLEX

DVGW
Complying with
EN 15266:2007

Scan this QR Code

Ayvaz's Indoor-flex domestic natural gas connection system is certified as to conform the EN 15266 European Standard which specifies the requirements for material, design, manufacture, testing, marking and documentation of stainless steel pliable corrugated gas tubing kits for buildings with a maximum operating pressure (MOP) less than or equal to 0,5 bar and a nominal size range from DN 10 to DN 50.

The aim of the standard (EN 15266) is to improve the safety level of domestic natural gas connections in the buildings and to provide countless benefits for both users and installers.

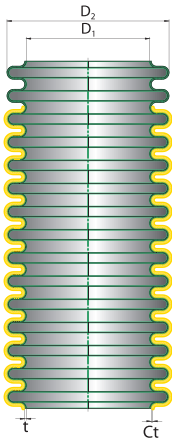
Standard: European Norm DIN EN 15266.
(See page 29)

Application Areas
- Ayvaz's Indoor-flex hoses can be used for the main gas lines of;
- Fixed appliances such as furnaces, stoves, and gas burning fireplaces
- Cookers, grills, patio heaters, fire pits
- Combi-boilers and water heaters

Design

Hose	Parrallel corrugated, stainless steel (AISI 316L) metal hose
Cover	Soft PVC cover in Yellow

AYVAZ INDOOR-FLEX STAINLESS STEEL AISI 316L, YELLOW PVC COATED									
DN	Internal Diam. (D_1)	External Diam. (D_2)	Wall Thick-ness (t)	Coating Thickness (Ct)	Tolerance (±)	Minimum Bending Radius	Nominal Bending Radius	Surface Area	Internal Volume
						rmin	rn		
	mm	mm	mm	mm	mm	mm	mm	m^2/m	l/m
12	12,1	16,3	0,2	1,15	±0,2	20	140	0,083	0,163
16	16,3	21,4	0,2	1,15	±0,2	28	160	0,112	0,254
20	18,7	24,8	0,2	1,5	±0,3	32	170	0,13	0,364
25	24,6	31,3	0,2	1,5	±0,3	40	190	0,204	0,604

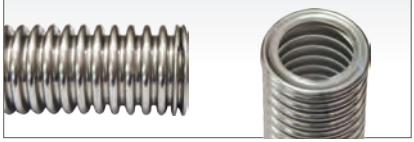


PREPARING PROPER GASKET SURFACE

Providing the required tightness is crucial for corrugated pipe connections. In order to grant leak-proof connection, a smooth, flat and well pressed gasket surface should be prepared. Besides of automated flanging tools Ayvaz offers manual gasket surface preparing tool to the installers. This manual system is very easy to use and carry to the all places where the workers can handle easily.

At the end of the gasket surface preparing, the installers must make sure to get a completely flat and circular surface without burr.

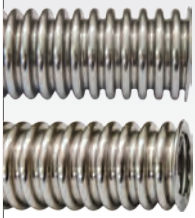
1. Not plane flange



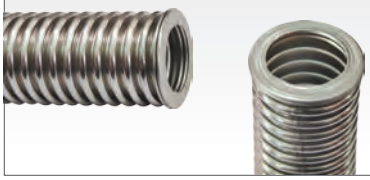
3. Incorrect cutting

2. Not properly compressed corrugations

4. Flange with the template used at the not correct side



5. Example of correct flange



GAS HOSES
INDOOR-FLEX

Thanks to its flexible corrugated structure, indoor-flex domestic natural gas hose can easily be adopted the direction changes through the connection line with requiring no additional fittings (elbows, etc).

Nominal Dimension (DN)	Min. Bending Radius (R min) mm
12	20
16	28
20	32
25	40
32	50

The hose can easily be bent in the limits of bending radius characteristics, but must not be exposed repeated bending.

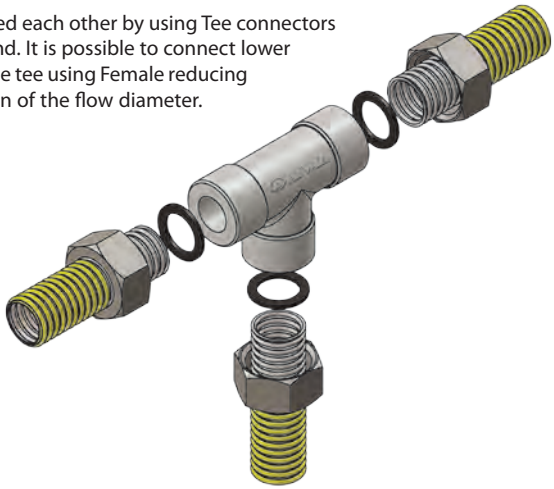
Connection Types:

1. Connection through Male simple screw:

The picture below illustrates the connection of two indoor-flex hoses through an M/M adapter with double ISO 228G thread and plane end. Sealing is provided by NBR gaskets.

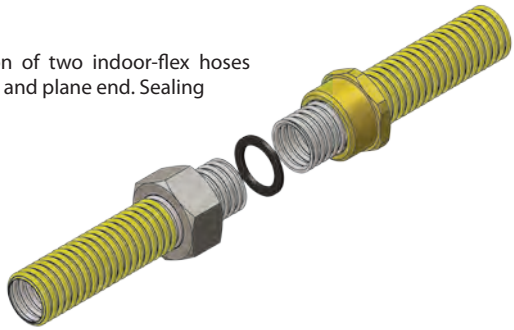
2. Connection through Tee connector:

Three indoor-flex hoses may be connected each other by using Tee connectors with ISO 228 G male thread and plane end. It is possible to connect lower diameter hoses to one or more ends of the tee using Female reducing nuts with ISO 228G thread with reduction of the flow diameter. Sealing is provided by NBR gasket.



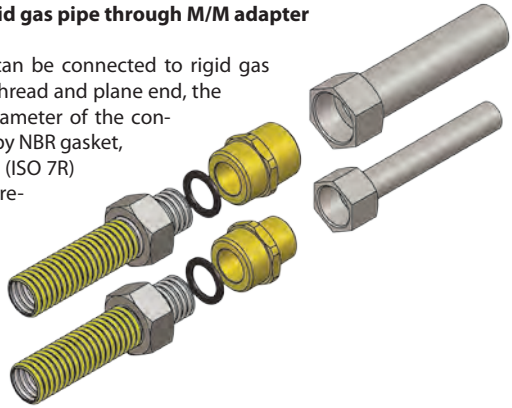
3. Connection through Nipple adapter:

The picture below illustrates the connection of two indoor-flex hoses through an Male nipple with ISO 228G thread and plane end. Sealing is provided by NBR gasket.



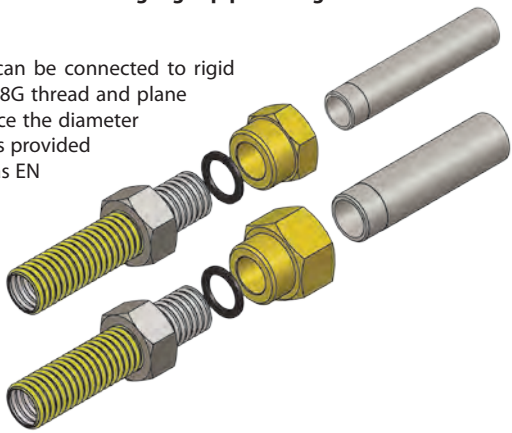
4. Connection between Indoor-flex and rigid gas pipe through M/M adapter

Indoor-flex domestic gas distribution hose can be connected to rigid gas pipes through M/M adapters with ISO 228G thread and plane end, the connection adapters may also reduce the diameter of the connection. Sealing on the hose side is provided by NBR gasket, pipe side of the male adapter has EN 10226 R (ISO 7R) or ISO 228G male taper thread, no gasket is required for sealing on this side.



5. Connection between Indoor-flex and Male threaded rigid gas pipe through M/F Nipple

Indoor-flex domestic gas distribution hose can be connected to rigid gas pipes through M/F adapters with ISO 228G thread and plane end, the connection adapters may also reduce the diameter of the connection. Sealing on the hose side is provided by NBR gasket, female side of the adapter has EN 10226 R (ISO 7Rp) female thread, no gasket is required for sealing on this side.



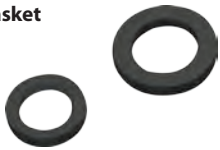
Nut

Description	Material	Size
Nut	Nickel Coated Brass	1/2"
		3/4"
		1"
		1¼"

Clamping Washers

Description	Material	Size
Clamping Washer	AISI 304	1/2"
		3/4"
		1"
		1¼"

Gasket



Description	Material	Size
Gasket	NBR	1/2"
		3/4"
		1"
		1¼"

Ball Valve

Description	Material	Size
Ball Valve	Nickel Coated Brass	1/2"
		3/4"
		1"
		1¼"

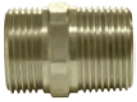
Crushing Tool

Description	Material	Size
Piston	Ni Coated Carbon Steel	
Crushing Tool	Ni Coated Carbon Steel	For DN12-DN16 Hose
		For DN20-DN25 Hose

Nipple Adapters (MxM)

Description	Material	Size
Adaptor Male (MxM)	Nickel Coated Brass	G 1/2"
		G 3/4"
		G 1"
		G 1¼"

Nipple Adapter (MxM)

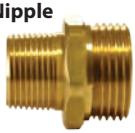


Description	Material	Size
Adaptor Male (MxM)	Nickel Coated Brass	G 1/2" x R 1/2"
		G 3/4" x R 3/4"
		G 1" x R 1"
		G 1¼" x R 1¼"

Plane End Adaptor (MxF)

Description	Material	Size
Plane End Adaptor (MxF)	Nickel Coated Brass	G 1/2" x R 1/2"
		G 3/4" x R 3/4"
		G 1" x R 1"
		G 1¼" x R 1¼"

Reduced Nipple (M-M)



Description	Material	Size
Reduced Nipple (M-M)	Brass	R 1/2" x G 3/4"
		R 3/4" x G 1"
		R 1" x G 1¼"

Nipple Adapter

Description	Material	Size
Nipple Adapter	Brass	G 1/2"XDN12
		G 3/4"XDN16
		G 1"XDN20
		G 1¼"XDN25

Tee

Description	Material	Size
Tee	Ni Coated Carbon Steel	1/2" x 1/2" x 1/2"
		1/2" x 1/2" x 3/4"
		3/4" x 3/4" x 1/2"
		3/4" x 1/2" x 3/4"
		3/4" x 3/4" x 3/4"
		1" x 1" x 1"

Cutting Tool

Description	Material	Size
Cutting Tool	For DN12, DN16 and DN20 Hose	1/2" & 3/4" & 1"
Cutting Tool	DN25 Hose	1¼"

Pipe Clips

Description	Material	Size
Pipe Clips	Rubber Coated Metal	DN12 (1/2")
		DN16 (3/4")
		DN20 (1")
		DN25 (1¼")

Heat Shrink Tube

Description	Material	Size
Shrink Tube	Polyolefin Tube Yellow	DN12
		DN16
		DN20
		DN25

GAS HOSES
COUNTER-FLEX (PRS 6/E)

Scan this QR Code

Ayvaz's Counter-flex hose provides an easy and low cost installation to the natural gas counters with its flexible body and screwed fittings. By its highly flexible structure, the hose can be formed easily to offer connections even the working distance is so low.

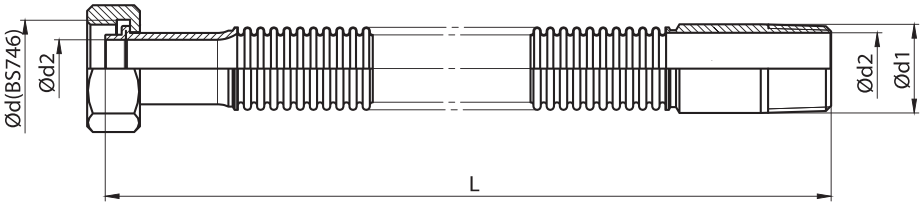
Ayvaz's Counter-flex Hose can be manufactured in both UNI-EN and PRS 6/E standards. Counter-flex hose prevents the problems caused by rigid connections. It can be manufactured with or without special polyolefin cover and offer long service life with its reliable design.

Standard: PRS 6/E *(See Page 30)*

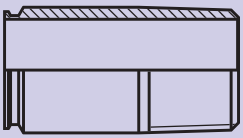
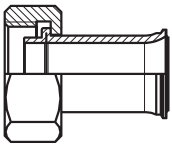
Application Areas
- Natural gas applications
- Natural gas meters and counters
- Building installations

Design

Hose	Standard corrugated metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L



NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
20	3/4"x3/4"	242
25	1"x1"	250 330 400

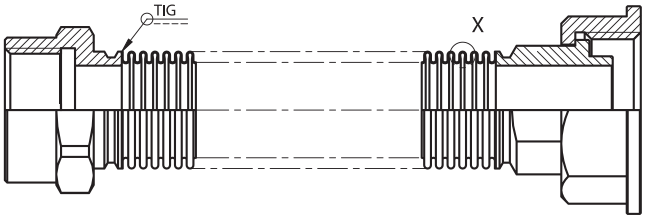
CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		External Threaded Pipe EN ISO 10226	Carbon Steel St. 37.2	20 25	3/4" 1"
2		Swivel Nut Female Connection BS 746 thread	Internal Part: Carbon Steel Nut: Brass	20 25	3/4" 1"

GAS HOSES
COUNTER-FLEX

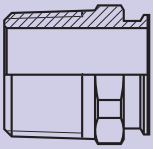
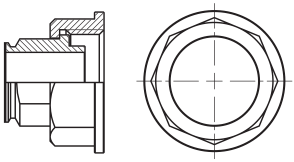
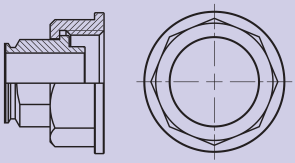
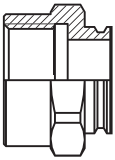
Design

Hose	Standard/Closed pitch corrugated extensible metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L

Scan this QR Code



NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
20	3/4"x3/4"	150
25	3/4"x1" 1"x1"	170 130x220
32	1"x1 1/4"	220x420 300x600

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 7/1 thread	CrNi Coated Carbon Steel St. 37.2 Stainless Steel Optional)	20 25 32	3/4" 1" 11/4"
2		Swivel Female Connection EN ISO 228/1 thread	Internal Part: Ni Coated Carbon Steel St. 37.2 Nut: Ni Coated Brass	20 25 32	3/4" 1" 11/4"
3		Swivel Female Connection EN ISO 228/1 thread	Internal Part: Stainless Steel Nut: Brass	20 25 32	3/4" 1" 11/4"
4		Female Connection EN ISO 228/1 thread	Ni Coated Carbon Steel St. 37.2 or Stainless Steel	20 25 32	3/4" 1" 11/4"

GAS HOSES
SERVICE FLEX (NATURAL GAS)

Scan this QR Code

Service-flex provides solution for the natural gas connections between the main gas line and the building entrances.

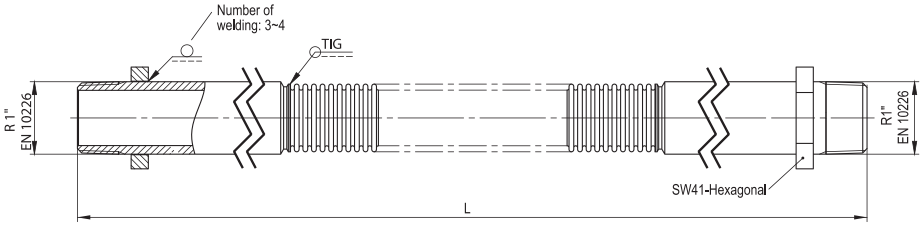
The hose is designed with the required resistance for undersoil applications before the buildings and for the service access points through outher walls.

Service-flex main natural gas application hoses may be used for single houses as well as big buildings with several flats.

Application Areas
- Under-soil natural gas connections from the main street lines to the buildings
- Service-access point connections

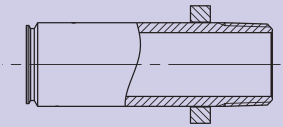
Design
Ayvaz Service-flex metal hoses have a double layered structure which is consisted of annularly corrugated stainless steel hose and external PE cover.

Hose: Standard corrugated, stainless steel (AISI 316L) metal hose *(See page 14)*
Cover: Special Polyethylene band.



NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
25	1"x1"	170 available in between 5000
32	1 1/4" x 1 1/4"	
50	2"x2"	

Special lengths for specific purposes may be available on request.

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 10226 thread	Carbon Steel St. 37.2	25 32 50	1" 1 1/4" 2"

WATER & HVAC HOSES

In present day, using flexible metal hose assemblies instead of rigid pipe connections in hot and cold water carrying pipelines is increasing each day passing. Hose assemblies are especially preferred, because they are very useful to prevent extra welding and handling costs.

Main usage areas are combi boilers, radiators, washing machines, air conditioning systems, solar power collectors as well as kitchen and bathroom water connections.

Some of other advantages that the water hose assemblies provide in these areas as follows;

- To prevent the assemblage faults
- To balance the thermal expansions
- To prevent the noise and vibrations

That is because, the efficiency and service life of hose assemblies are subject to the structure of the hose and material selection, our hoses offer the following features as standard in order to meet the needs in every kind of specific application.

- Long service life
- High corrosion resistance
- High temperature resistance

SU-FLEX

Su-flex assemblies provide non-welded structure that makes the su-flex hose very resistant against corrosion.

Features

- The stainless steel structure of Su-Flex is the guarantee of its long service life.
- Besides of very decorative appearance, the flexible corrugations of the hose do not cause any reduction in cross-section when forming bends.
- It provides the most appropriate working conditions by enabling the flow in maximum levels.
- It can be used in all hot and cold water applications.
- Easy and quick assemblage provides a benefit on handling and time. If it is necessary, different type of connections may be possible by applying nipple adapters to the female ends of the hose.

Application Areas

Sanitary Radiator connections
Combi boilers, water heater connections Burner connections
Washing machine connections Fan - coil connections
Tank and storage connections Solar systems
Expansion tank connections Decorative piping system

Design

Hose: Standard corrugated, stainless steel (AISI 316L) metal hose *(See page 14)*

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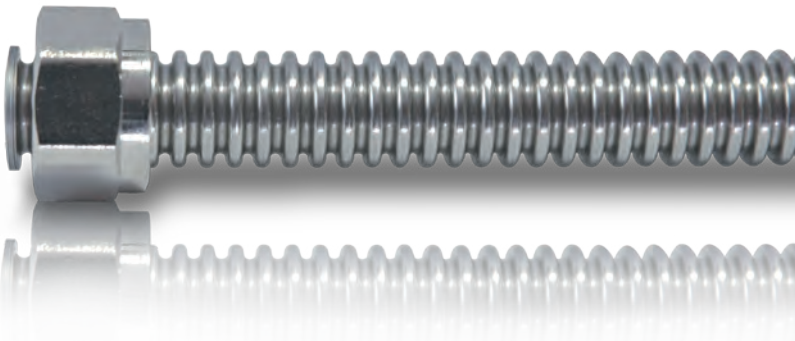
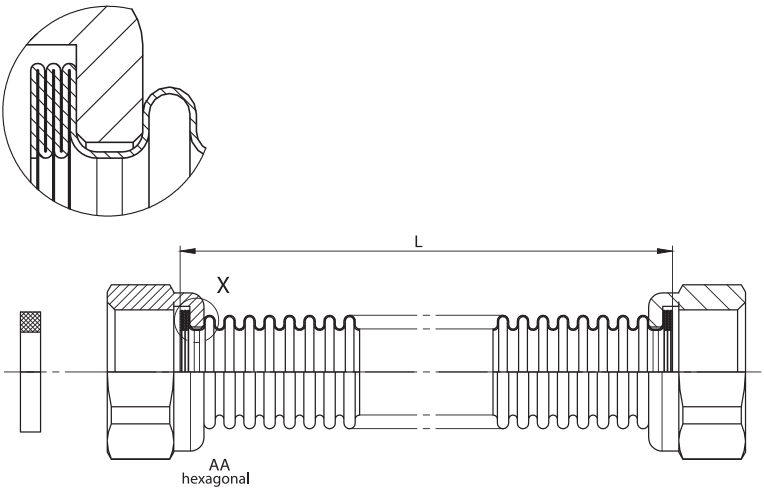
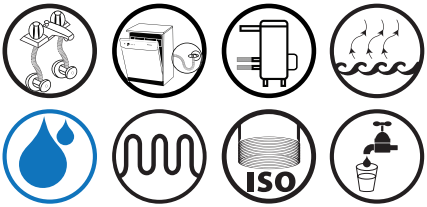
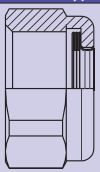
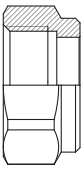




NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
12	1/2"	200 up to 5000
16	3/4"	



CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Swivel Female Connection EN ISO 228/1 thread	Ni Coated Brass	12 16	1/2" 3/4"
2		Kes-Tak Swivel Nut *(See Page 86)* EN ISO 228/1 thread	Ni Coated Brass	12 16	1/2" 3/4"

WATER & HVAC HOSES
MIX-FLEX

Mix-flex water connection hose is a highly flexible structured hose assembly which provides, time and cost saving conection features with its quick connection fittings.

Ayvaz's Aquaflex hose prevents the problems caused by rigid connections. In short distances there is no need to use elbows, sleeves or other similar equipment. The users are able to reduce on assembly time and effort using easy forming aquaflex hose assemblies.

Mix-flex is designed for especially mixes taps for all sanitary applications, baths and kitchens, The hose set is provided as twin pack for hot and cold water connections marked with red and yellow strips around the hose necks.

Application Areas
- Kitchen Faucet connections
- Bathroom Mixer tap connections
- Domestic Water connections
- Sanitary

Design

Hose	Standard pitch corrugated, stainless Steel (AISI 316L) metal hose *(See page 14)*
Cover	Normally coverless, polyolefin cover in customized colours is optional
Gasket	Klingerit or NBR

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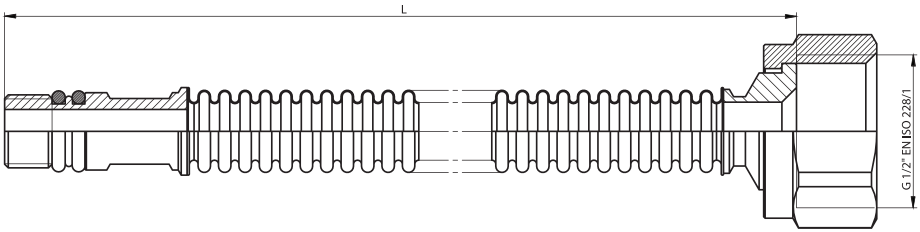
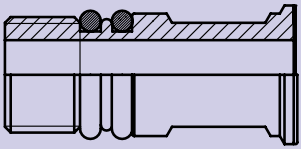
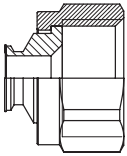
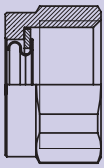


NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
8	M10x1 x 3/8" M10x1 x 1/2"	300 all sizes are available in between 1000

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection M10x1 thread"	Stainless Steel O-rings in NBR	8	
2		Swivel Female Connection EN ISO 228/1 thread	Internal Part Stainless steel Nut Ni coated Brass	8	1/2"
		Kes-Tak Female Connection (page) EN ISO 228/1 thread	Nut, Ni coated Brass MS58 Washer, Stainless steel"	8	3/8"

WATER & HVAC HOSES
AQUAFLEX (MIG SU) EXTENSIBLE HVAC HOSES

Aquaflex water connection hose is a highly flexible structured, time and cost saving hose assembly which is highly resistant against pressure and temperature. Ayvaz's Aquaflex hose prevents the problems caused by rigid connections. In short distances there is no need to use elbows, sleeves or other similar equipment. The users are able to reduce on assembly time and effort using easy forming aquaflex hose assemblies.

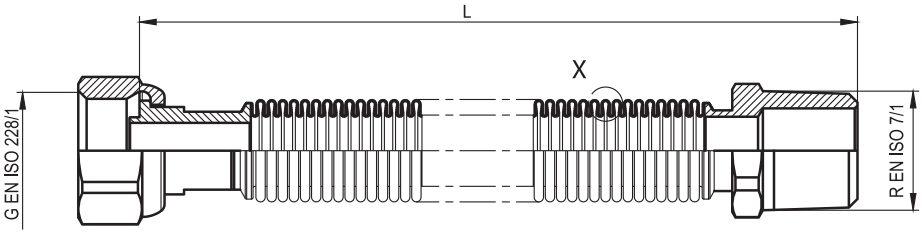
Because of the hose's flexible design, corrugations are able to make expansion and compress movements and this provide a non-calcified structure. This non-calcified structure enables the hose to work in a long service life. Aqua-flex hoses are exposed to special heat treatment. This application increases the flexibility and the corrosition resistance of hoses while reducing the spring rate accordingly. **Heat treatment helps hose to save the form and the shape given.**

Application Areas
- Sanitary
- Radiator connections
- Combi boilers, water heater connections
- Burner connections
- Washing machine connections
- Fan - coil connections
- Tank and storage connections
- Solar systems
- Expansion tank connections
- Decorative piping system

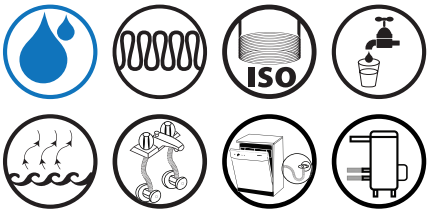
Design

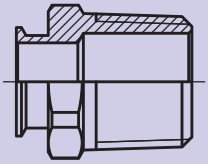
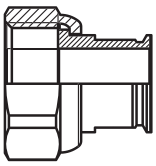
Hose	Closed pitch corrugated, stainless steel (AISI 316L) extensible metal hose
Cover	Polyolefin Cover in white or coverless
Gasket	Klingerit

Scan this QR Code



NOMINAL DIMENSIONS		
DN	Connection	Length (mm)
12	1/2"x1/2" 1/2"x3/4"	90X140 130X220 220X420 300X600 500X1000 750X1500 1000X2000
20	3/4"x3/4"	
32	1"x1"	



CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 7/1 thread	Stainless Steel AISI 304 (1.4301)	12 20 25	1/2" 3/4" 1"
2		Swivel Female Connection EN ISO 228/1 thread	Internal Part: Stainless Steel AISI 304 (1.4301) Nut: Ni Coated Brass	12 20 25	1/2" 3/4" 1"

WATER & HVAC HOSES
FAN-COIL HOSE

Ayvaz's fan-coil connection hose is a highly flexible structured, time and cost saving hose assembly which is highly resistant against pressure and temperature. It may be produced with or without insulation. The rubber insulation prevents sweating may be exist in the heating and cooling systems.

Insulated Fan-coil connection hose brings meaningful solutions for the difficulties of rigid connections.

The special welding process prevents the potential corrosion caused by the moisture around the connection points. The insulation and the welding protection cover applied on the insulation help to sort problems may be caused by wrong earthling.

The flexible design of the hose enables the connection between collectors and the pump with using no additional fittings (elbows etc.). This reduces the time spent on assemblies and the cost as well.

Ayvaz's Fan-coil hose which has a great service life provides easy, quick and safe connections and prevents the vibration and noise by its flexible structure.

Application Areas

- Heating, Air Conditioning and ventilization applications
- Combi and fan heating connections
- Water Heaters
- Radiator Connections

Design

Hose	Standard corrugated metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L
Braiding Material	Stainless Steel AISI 304 Non-braided version is also available
Insulation Material	Rubber based special insulation (9-13 mm) Cryogel X201 (Aspen Aerogels) (5-10 mm)

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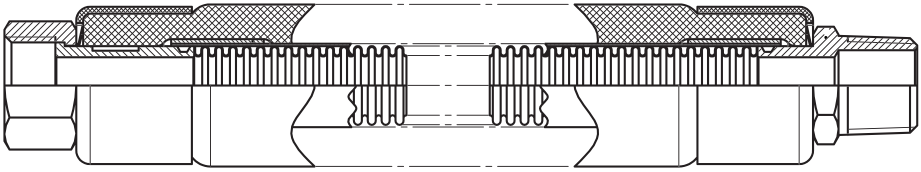
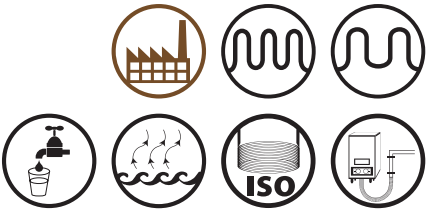
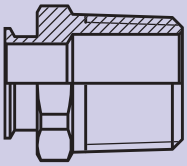
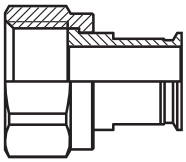
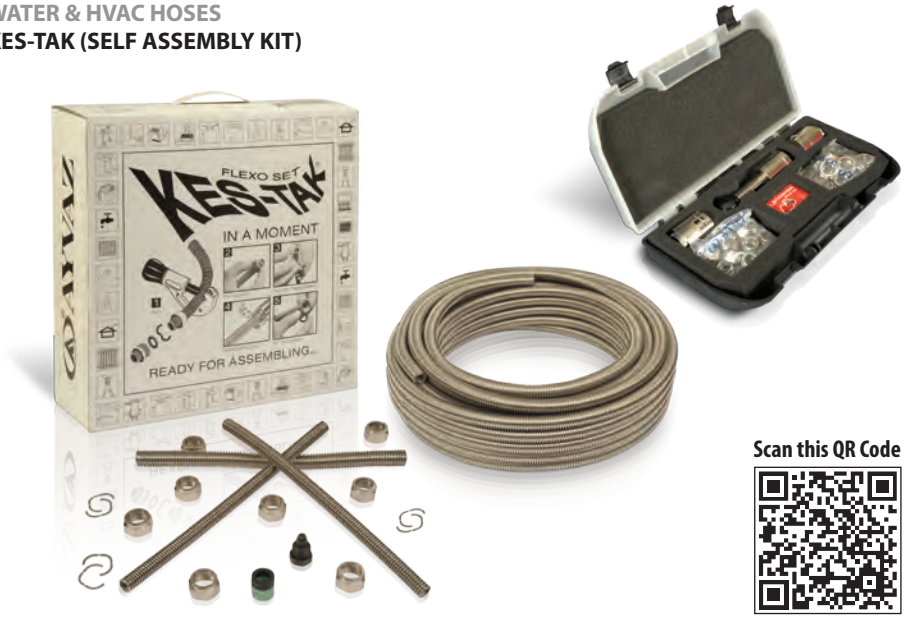


HOSE DIMENSIONS	DN	CONNECTION	LENGTH (mm)
	12	1/2"x1/2" 1/2"x3/4"	200 all sizes are available in between 2000
	16	3/4"x3/4"	



CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 7/1 thread	Ni Coated Carbon Steel St.37.2	12 16	1/2" 3/4"
2		Swivel Female Connection EN ISO 228/1 thread	Ni Coated Carbon Steel St.37.2	12 16	1/2" 3/4"

WATER & HVAC HOSES
KES-TAK (SELF ASSEMBLY KIT)



Scan this QR Code

Ayvaz' s individual water installation set which is called KES-TAK in meaning cut to size and install is the latest technology for domestic water piping systems. The set reduces the workman time accordingly the cost which saving time is money now. For rigid piping the lengths shall be very precise and the installers need a preparation for each straight line and precise calculation for number of fittings plus threaded end preparation of piping etc.

But with KES-TAK you do not need any preparation and/or pre-calculation and/or extra fittings. All the installer needs to do is to take the hose from the box and cut the hose in required length and put the fittings finally mount the system in 5 steps and within a-few minutes. Ayvaz's Kes-Tak set provides great save of time plus money and makes installation as easy as that everybody can do it himself.

The Main Advantages of KES-TAK Set

• No Reducing in Cross Sections Occur: No reducing in cross sections occur in any bending direction. It provides a full flow capacity and absorb the vibration and the noise.

• A Hygienic Connection: Stainless steel corrugated hose is also non-calcified and stay shiny and hygienic during it whole service life. Because of non-welded connection design, it is well resistant to corrosion.

• Saves on Time and Handling: Easy, quick and safe assemblage reduces the cost of handling and the application time.

• A Decorative Application: With its stainless steel, dirt-proof and shiny body, it is always a decorative application in especially visible water connection assemblies.

Application Areas

• Domestic water lines
• Water meters
• Fan-coil connections
• Combi boilers
• Water heaters
• Radiators
• Sanitary applications
• Mobile and under heating systems
• Solar power collectors

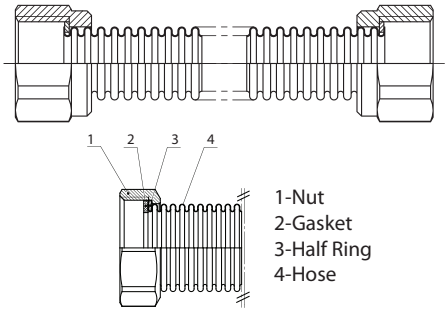
KES-TAK BOX DETAILS								
Hose Dia.	Fittings Dia.	Hose Length (m)	Gasket Qtty	Internal Dia.	External Dia.	Tolerance (±)	Operating Pressure DIN EN ISO 10380	Bursting Pressure DIN EN ISO 10380
DN8	3/8″	25	10	7,7	11,2	0,2	20 bar	80 bar
DN12	1/2″	25	10	12,2	16,2	0,2	10 bar	40 bar
DN16	3/4″	15	10	15,6	20,8	0,2	6 bar	24 bar
DN20	1″	10	10	18,8	24,9	0,2	4 bar	16 bar
DN25	1 1/4″	Please contact our Sales Team						
DN32	1 1/2″							
DN40	2″							

WATER & HVAC HOSES
KES-TAK (SELF ASSEMBLY KIT)

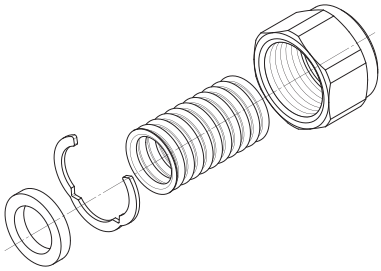
Design

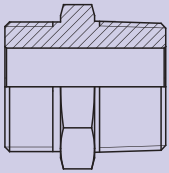
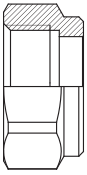
Hose : Standard corrugated, stainless steel (AISI 316L) metal hose

Gasket : Klingerit with no asbestos



1-Nut
2-Gasket
3-Half Ring
4-Hose



CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Adapter Nipple EN ISO 7/1 x EN ISO 228/1 thread	Ni Coated Brass	10 12 16 20 25 32 40	3/8" 1/2" 3/4" 1" 1 ¼" 1 ½" 2"
2		Swivel Nut EN ISO 228/1 thread	Ni Coated Brass	10 12 16 20 25 32 40	3/8" 1/2" 3/4" 1" 1 ¼" 1 ½" 2"

WATER & HVAC HOSES
TRACE FLEX (HEAT TRACING HOSE)

It is essential to keep the temperature of the special fluids transported in very long pipelines at certain temperature levels, especially in chemical and petro-chemical processing plants and refineries.

Heat tracing systems are specially designed and developed to protect the industrial plants and the fluids flow through the pipelines against the temperature losses and even the freezing, depending on the external temperatures. By heat tracing, it is possible to maintain the right viscosity and to prevent the unrequired flow resistances.

The success of the heat tracing is highly dependent on the heat transfer from the tracing line to the main pipeline in a limited time. Accordingly, using metal hoses with low wall thickness and high effective surface which is provided by the corrugated structure, in heat tracing increases the success and the reliability of the system.

Meanwhile, the flexibility of the metal hose assemblies and the installation features with no need for additional fittings or connection parts in the direction chances make the assembly easier and reduce the labouring and installation costs remarkably.

Application Areas

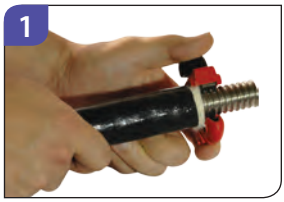
- Refineries
- Chemical Processing Plants
- Petro-Chemical Industries
- Pharmaceutical industry

Design

Hose	Standard or open pitch corrugated metal hose *(See page 14/18)*
Hose Material	Stainless Steel AISI 316L
Cover	Seperable UV resistant cover
Cover Color	Black, white, red, grey
Sensor Cable	Silicone Cable
Insulation Material	Pyrogel XT (Aerogels insulation)
Insulation Thickness	5 mm / 10 mm

TRACEFLEX CONNECTION TYPES

KES-TAK *(See Page 86)*



Cut the insulated tracing hose to the size and remove approximately 3 cm of the insulation from the hose end

Slide the nut over the hose

Depress the first corrugation of the hose onto the nut by the piston

Fit the clamping washer around the first corrugation

Fit the gasket (NBR or Teflon) and complete the assembly

QUICK CONNECTION SET *(See Page 86)*

Quick set is an easy metal-metal connection system for both, insulated and non-insulated Traceflex heat tracing hoses without gasket which provides perfect sealing. Quick connection system is based on just cutting the hose to the size and fitting required connection, so it saves on the installation time and the labouring costs.

FEEDING LINE CONNECTION

Remove approximately 3cm of the insulation from the hose end

Slide the nut over the hose and fit the half rings

Fit the required fitting

Wrap up the fittings and the hose neck with the self-adhesive tape

Remove approximately 3cm of the insulation from the hose end

Fit the intermediate fitting

Cover up the intermediate connection with the appropriate insulation

Wrap the rubber tape around the connection as it overlaps the assembly on both sides

AYVAZ SOLAR THERMAL APPLICATION HOSES AND CONNECTIONS

Ayvaz offers a complete set to connect all mechanic components of solar systems to each other and the rest of the system.

Ayvaz continues working to produce highly efficienct connections for solar systems and to provide solutions for the problems that the workers face during the installation in order to save time and money.

Ayvaz's Solar Connection Range:

Pre-insulated flexible metal hoses between collectors and heating tank or solar boiler

Boilerflex: Flexible metal hose designs applied into the water heating tanks or heat exchangers

Pan-flex:Quick connection parts between the solar collectors

AYVAZ'S SOLAR CONNECTION RANGE

EZ-FLEX NANOFLEX	BOILERFLEX	PAN-FLEX
		
Pre-insulated flexible metal hoses between solar panels and heating tank.	Flexible metal hose, coil designs for water heating tanks or heat exchangers.	Flexible connection parts between solar panels.

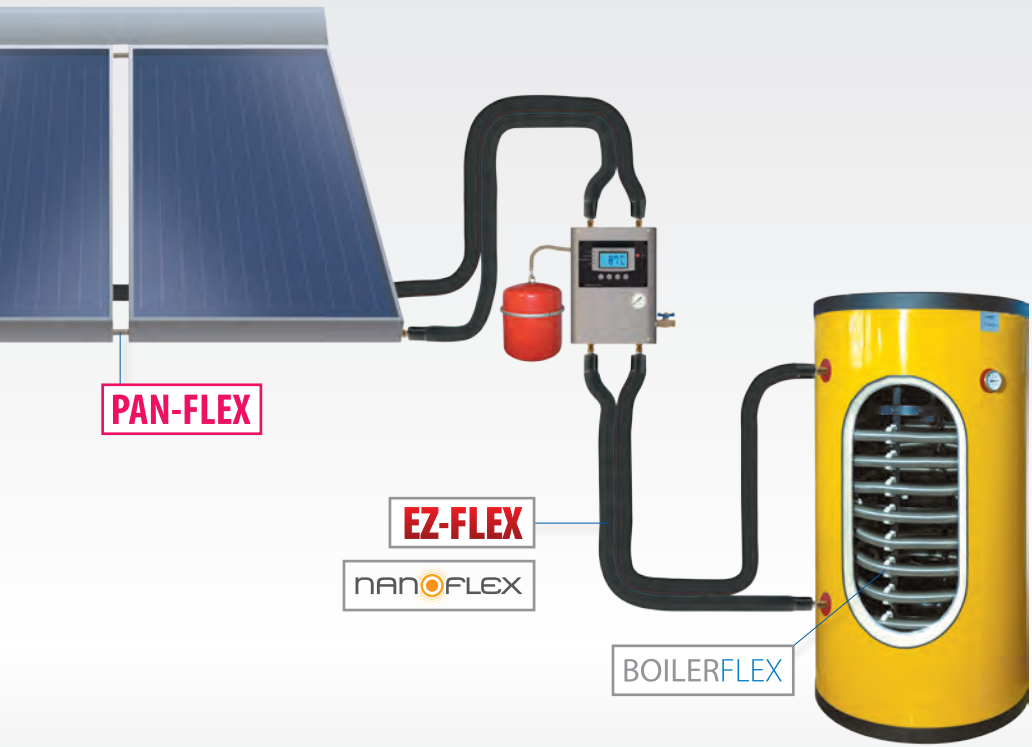
Ayvaz's Pre-insulated Solar Connection Hoses

Flexible metal hoses manufactured from stainless steel AISI 316L, material that are used to transport the hot and cold water between solar thermal panels and hot water storage tank.

Advantages of Pre-insulated Solar Hoses

- Continuous runs allow for bending around corners and obstacles.
- Minimum energy loss through low thermal conductivity coefficient and high thermal resistance value.
- Pre-insulated metal solar hoses make the installation easier and quicker, especially where the installation space is limited and causes difficulties for the workers such as roofs and attics.
- Easy installation saves on time and the labouring costs accordingly.

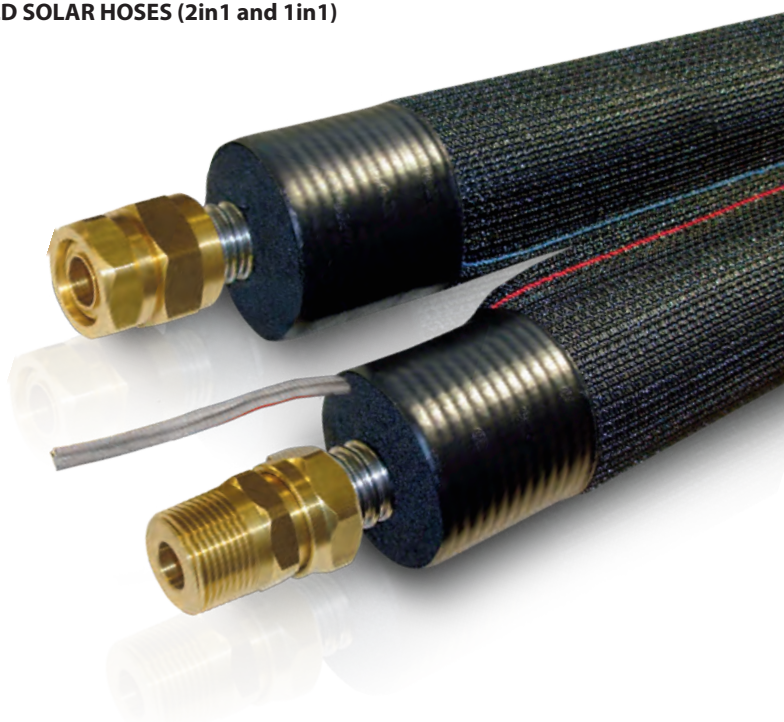
SOLAR CONNECTION SYSTEMS



SOLAR THERMAL APPLICATION HOSES

EZ-FLEX PRE-INSULATED SOLAR HOSES (2in1 and 1in1)

EZ-FLEX



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Advantages

• UV resistant polyamide braiding prevents the negative effects of the sun and protects the hose and the insulation against mechanical damages.

• Identification marks (red and blue strips) to distinguish supply and return lines.

• Easy to bend and separate with using no additional tools.

• Highly resistant to the birds and other external effects.

• Thermal conductivity coefficient λ (0°C) 0,036 W/m.K

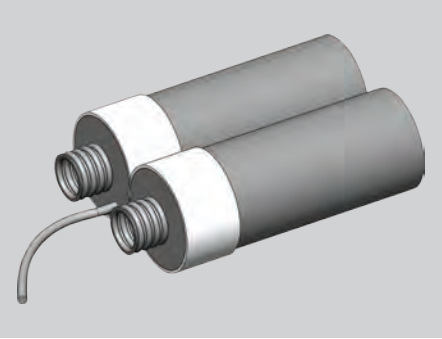
• Closed cell elastomeric rubber insulation minimizes thermal loses and suitable to be applied up to 150 °C (Peak temperature 175 °C)

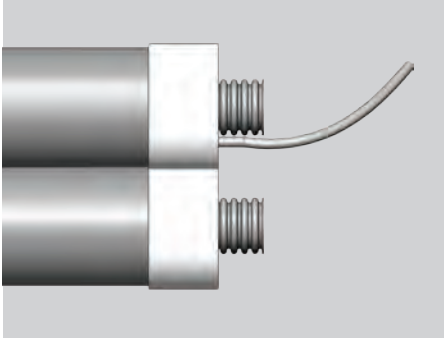
Design

Hose	Standard or open pitch corrugated metal hose *(See page 14/18)*
Hose Material	Stainless Steel AISI 316L
Braiding Material	Separable Polyamide braiding or non braiding
Sensor Cable	Silicone Cable
Insulation Material	EPDM, Rubber based insulation
Insulation Thickness	9mm/13mm/19mm

Connections

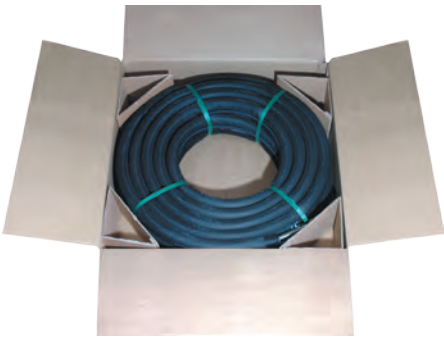
See page 86 and 103 for details (Kes-Tak Connection set & Push-fit Connection set)





Packaging

Ayvaz's pre-insulated EZ-flex solar hoses are provided as the coils and bobbins in the lenghts as shown in the following tables.



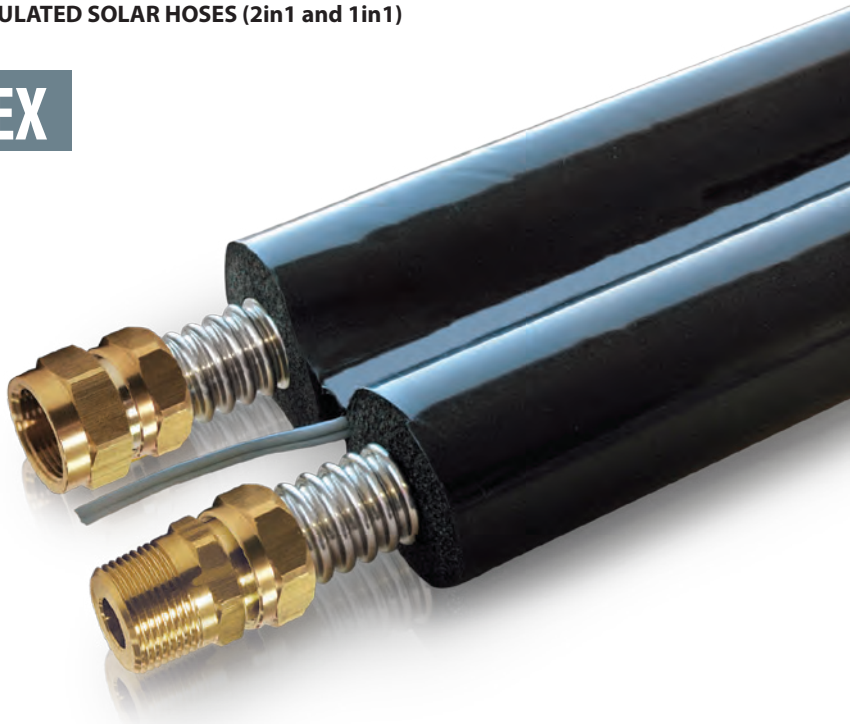
BOBBIN				
Diameter (DN)	DN12	DN16	DN20	DN25
Max. Length (m)	150	150	125	100

COIL				
Diameter (DN)	DN12	DN16	DN20	DN25
Max. Length (m)	10-50	10-50	10-50	10-50

SOLAR THERMAL APPLICATION HOSES

EF-FLEX PRE-INSULATED SOLAR HOSES (2in1 and 1in1)

EF-FLEX



Scan this QR Code

Advantages

• UV resistant polyamide foil prevents the negative effects of the sun and protects the hose and the insulation against mechanical damages.

• Easy to bend and separate with using no additional tools.

• Low thermal conductivity coefficient [λ (0 °C) 0,036 W/m.K] helps to minimize thermal loses and provides high efficiency.

• Elastomeric rubber insulation is suitable to be applied up to 150 °C (Peak temperature 175 °C.

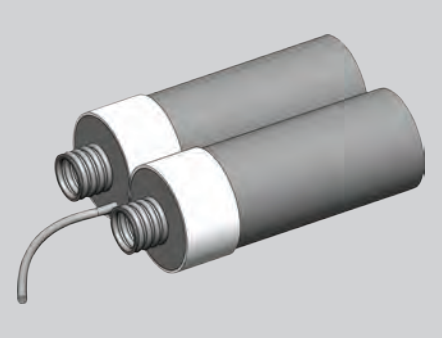
• UV resistant foil protects hose and insulation by preventing negative effects of the sun. Highly resistant to the birds and other external effects.

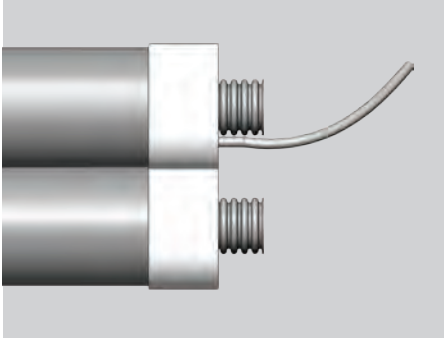
Design

Hose	Standard or open pitch corrugated metal hose *(See page 14/18)*
Hose Material	Stainless Steel AISI 316L
Foil Material	Separable Polyamide Foil
Sensor Cable	Silicone Cable
Insulation Material	EPDM, Rubber based insulation
Insulation Thickness	9mm/13mm/19mm

Connections

See page 86 and 103 for details (Kes-Tak Connection set & Push-fit Connection set)





Packaging

Ayvaz's pre-insulated EF-flex solar hoses are provided as the coils and bobbins in the lenghts as shown in the following tables.

BOBBIN				
Diameter (DN)	DN12	DN16	DN20	DN25
Max. Length (m)	150	150	125	100

COIL				
Diameter (DN)	DN12	DN16	DN20	DN25
Max. Length (m)	10-50	10-50	10-50	10-50

SOLAR THERMAL APPLICATION HOSES
NANO-FLEX - NANO INSULATED SOLAR HOSE

NANOFLEX

Scan this QR Code

Advantages

• Nano-flex is produced with one of the world's lightest insulation materials, developed by Aspen Aerogels.

• Hi-tech insulation with low thermal conductivity (0.015 W/mK at 0 °C) is suitable for a wide temperature range, from -40 °C up to +650 °C.

• Low thickness of the insulation material (5 mm) reduces the external diameter of the hose and provides a relief on the transportation and the logistics area up to 66%.

• Easily separable compact design requires no additional pipe support during the installation. This shortens the installation time and makes it quicker and easier.

• The UV cover that is applied on the insulation, prevents the negative effects of the sun and protects the hose against birds and other hazardous species.

Design

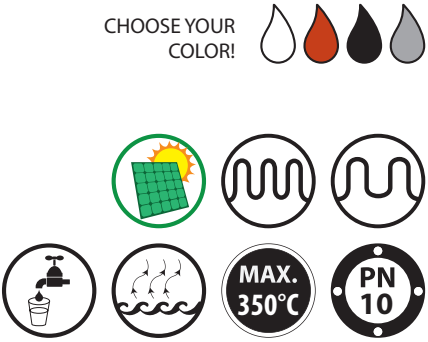
Hose	Standard or openpitch corrugated metal hose *(See Page 14/18)*
Hose Material	Stainless Steel AISI 316L
Cover	Seperable UV resistant cover
Cover Color	Black, white, red, grey
Sensor Cable	Silicone Cable
Insulation Material	Pyrogel XT, Cryogel X201 (Aspen Aerogels insulation)
Insulation Thickness	5mm-10mm (Optional)

Connections

See page 86 and 103 for details (Kes-Tak Connection set & Push-fit Connection set)

Packaging

Ayvaz's Nano-flex solar hoses are provided as the coils and bobbins in the lenghts as shown in the following tables.



BOBBIN				
Diameter (DN)	DN12	DN16	DN20	DN25
Max. Length (m)	150	150	125	100

COIL				
Diameter (DN)	DN12	DN16	DN20	DN25
Max. Length (m)	10-50	10-50	10-50	10-50

"QUICK SET" FITTINGS SYSTEM FOR INSULATED SOLAR HOSES WITHOUT GASKET

PRODUCT FEATURES

Fittings Material MS 58 Brass

Male	
Hose Dia.	Con. Size
DN12 x 1/2"	
DN12 x 3/4"	
DN16 x 1/2"	
DN16 x 3/4"	
DN16 x 1"	
DN20 x 3/4"	
DN20 x 1"	
DN25 x 1"	
DN25 x 11/4"	

Female	
Hose Dia.	Con. Size
DN12 x 1/2"	
DN12 x 3/4"	
DN16 x 1/2"	
DN16 x 3/4"	
DN16 x 1"	
DN20 x 3/4"	
DN20 x 1"	
DN25 x 1"	
DN25 x 11/4"	

Adapter	
Hose Dia.	Con. Size
DN12 x DN12	
DN16 x DN16	
DN20 x DN20	
DN25 x DN25	

Welded End	
Hose Dia.	Con. Size
DN12 x 15 mm	
DN16 x 15 mm	
DN16 x 18 mm	
DN16 x 22 mm	
DN20 x 18 mm	
DN20 x 22 mm	
DN25 x 22 mm	

Ermeto Nut	
Hose Dia.	Con. Size
DN12 x 15 mm	
DN12 x 18 mm	
DN12 x 22 mm	
DN16 x 15 mm	
DN16 x 18 mm	
DN16 x 22 mm	
DN20 x 18 mm	
DN20 x 20 mm	
DN20 x 22 mm	
DN25 x 18 mm	
DN25 x 22 mm	

SOLAR THERMAL APPLICATION HOSES
PAN-FLEX

PAN-FLEX

Pan-flex solar collector connectors are used to connect the solar collectors that are located very closely to each other. These highly flexible metal connectors enable installers to complete collector connections safely and reliably in a very short time.

Types:

- Threaded Connectors
(Male-Male, Female-Female, Female-Male)
- Welded End Connectors
- Push-in Connectors
- Press Type Connectors

Advantages:

- Highly reliable, leak-proof connection.
- Easy and quick connection saves on time and labouring costs.
- Long service life, no maintenance required.

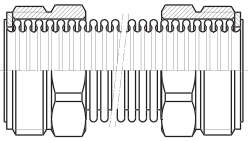
Design:

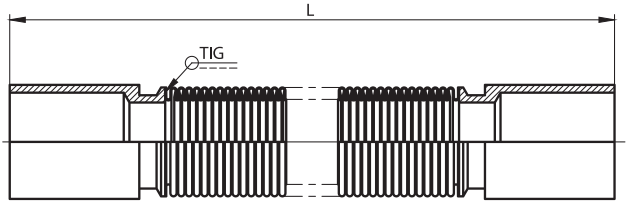
Hose	Semi-Closed corrugated highly flexible metal hose
Hose Material	Stainless Steel AISI 316L

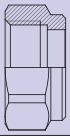
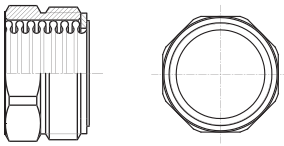
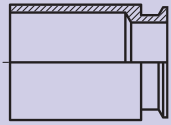
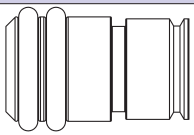
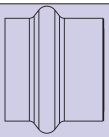
Scan this QR Code

Nominal Dimensions:

HOSE DIMENSIONS	DN	CONNECTION	LENGTH (mm)	
			MM/FF	PP/Press/Push in
	12	1/2"x1/2"	50 100	100
	16	3/4"x3/4"		
	20	1"x1"		

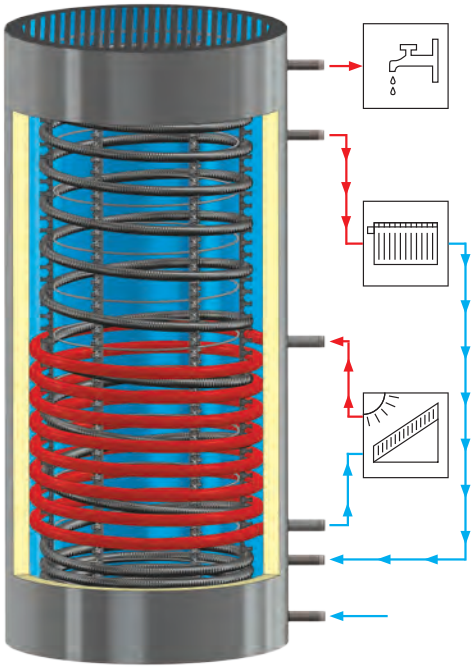




CONNECTIONS					
No	Type of Connection		Material	Hose (DN)	Connection
1		Swivel Nut EN 10226/1 thread	Ni Coated Brass	12 16 20	1/2" 3/4" 1"
3		Male Connection Octagonal Nipple EN 10226/1 thread	Brass MS 58	12 16 20	3/4"
4		Welded End	Carbon Steel Stainless Steel	12 16 20	Ø15 Ø18 Ø22 Ø28
5		Push Connector	Stainless Steel	12 16 20	Ø18 Ø22
6		Press Type	Carbon Steel Stainless Steel	12 16 20	Ø15 Ø18 Ø22 Ø28

SOLAR THERMAL APPLICATION HOSES
BOILER-FLEX

BOILERFLEX



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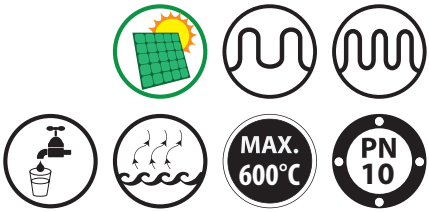


In all solar heating systems, there is a horizontal heating tank combined with the collector or an independent vertical solar heating boiler where the heating and domestic water is heated.

The water which keeps circling between the collectors and the heating tank transfers its temperature to the system in these places and provides the required heating.

Ayvaz is able to provide the most appropriate boiler-flex application from the cage coiling to the selection of correct fittings type and length to the tank and boiler manufacturers. Please apply our the sales team for your special Boiler-flex designs.

Boiler-flex applications prevent numerous problems that the tank or boiler manufacturers face, because of the use of rigid pipes in their production.

Advantages

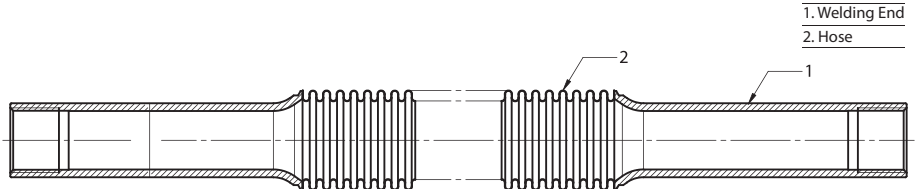
• Parallel corrugated structure of the hose provides almost doubled surface area in comparison with rigid pipe applications. Greater surface area means better heat transfer capacity and higher efficiency. Spiral corrugation is also available.

• Boiler-flex systems are economical, energy saving applications.

• Hose corrugations keep moving as a result of constant thermal expansion and compression, this movement prevents the lime and residue formation on the hose surface and provides longer service life.

• Stainless steel (AISI 316L) hose is suitable for drinking water application and highly resistant to corrosion.

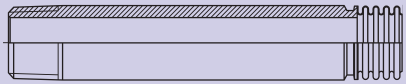
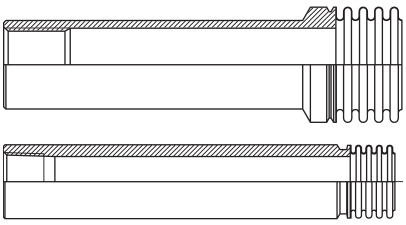
• With the help of flexibility and low bending radius, the hose can be formed in any form required for various applications.



DN	Ød Internal Diameter (mm)	ØD External Diameter (mm)	Tolerance ± mm	Wall Thickness (mm)	Bending Radius		PN bar	Surface Area	Internal Volume
					rmin (mm)	rn (mm)			
16	16,6	21,3	0,2	0,18	25	195	0-10	0,086 m2	0,274 dm^3
20	20,9	26,4	0,2	0,18	30	225		0,112 m2	0,442 dm^3
25	25,2	31,7	0,2	0,2	35	260	0-8	0,148 m2	0,639 dm^3
25	24,5	31,25	0,2	0,3	35	260		0,147 m2	0,,598 dm^3
32	32,3	39,8	0,3	0,3	40	300	0-6	0,192 m2	1,018 dm^3
40	40,8	49,8	0,4	0,4	58	290		0,241 m2	1,575 dm^3
50	50,8	61,2	0,4	0,5	68	300		0,319 m2	2,421 dm^3

CONNECTIONS

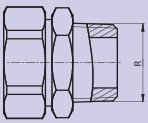
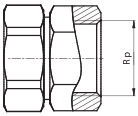
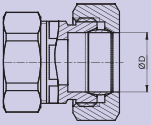
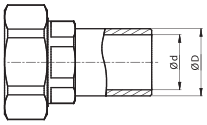
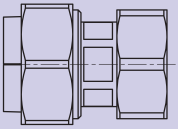
Various types of connections are available upon request.

CONNECTIONS						
No	Type of Connection		Material	DN	inch	Length (mm)
1		External Threaded Pipe DIN EN 10226/1 thread	Stainless Steel	16 20 25	1/2" 3/4" 1"	100
				32 40 50	1 ¼″ 1 ½″ 2″	150
2		Internal Threaded Pipe DIN EN 10226/1 thread	Stainless Steel	16 20 25	3/8" 1/2" 3/4"	100
				32	1″	150
				40	1″ 1 ¼″	
				50	1 ½″ 2″	

"QUICK SET" FITTINGS SYSTEM FOR PRE-INSULATED HOSES WITHOUT GASKET

Ayvaz quick connection set is the new generation push-fit system that reduces the time spent on preparation and installation. It is possible to fit the required connection and complete the assembly within minutes. With push-fit connection set, preparation of the connection end could be completed in three easy steps.

Cut the hose | Push the fitting | Squeeze the fitting

CONNECTIONS				
No	Type of Connection		Material	Size
1		Male Connection EN ISO 7/1 thread	MS 58 Brass	DN12x1/2" DN12x3/4" DN16x1/2" DN16x3/4" DN16x1" DN20x3/4" DN20x1" DN25x1" DN25x1¼"
2		Female Connection EN ISO 7/1 thread	MS 58 Brass	DN12x1/2" DN12x3/4" DN16x1/2" DN16x3/4" DN16x1" DN20x3/4" DN20x1" DN25x1" DN25x1¼"
3		Adapter Connection Pipe End	MS 58 Brass	DN12xDN12 DN16xDN16 DN20xDN20 DN25xDN25
4		Welded End Connection Pipe End	MS 58 Brass	DN12x15mm DN16x15mm DN16x18mm DN16x22mm DN20x18mm DN20x22mm DN25x22mm
5		Ermeto Nut Connection Pipe End	MS 58 Brass	DN12x15mm DN12x18mm DN12x22mm DN16x15mm DN16x18mm DN16x22mm DN20x18mm DN20x20mm DN20x22mm DN25x18mm DN25x22mm

INDUSTRIAL HOSES

INDUSTRIAL BRAIDED HOSES WITH INSTALLATION FITTINGS (acc. DIN 3384 with DVGW approval)

Scan this QR Code

Advantages

- Annularly corrugated structure prevents lime formation.
- Stainless steel hose and braiding have long service life.
- Easy installation and saving on labour costs.
- No reduction of cross section.
- Well resistant against high pressure.
- Non welded installation is suitable for hazardous areas.

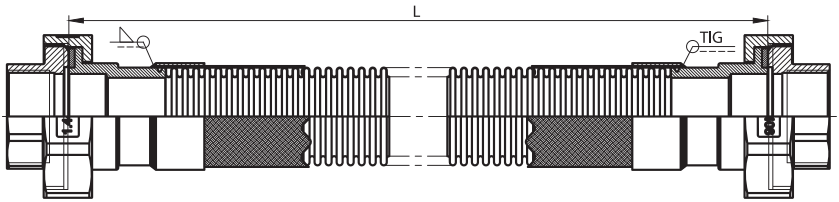
Application Areas

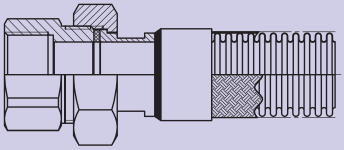
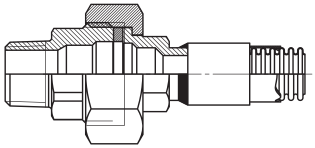
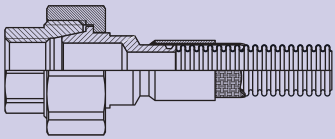
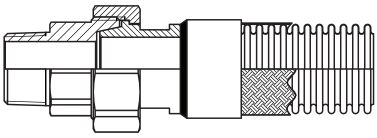
- Gas connections
- Heating, Ventilation and air conditioning
- Heating of manufacturing lines.
- Pipeline bridges.
- Heating of pressured vessels and tanks.
- Cooling systems and transporting relevant fluids

Design

Hose	Standard corrugated metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L
Braiding Material	Stainless Steel AISI 304L

	HOSE DIMENSIONS	
	DN	Connection
Threaded	DN10	3/8" x 3/8"
	DN16	1/2" x 1/2"
	DN20	3/4" x 3/4"
	DN25	1" x 1"
	DN32	1 1/4" x 1 1/4"
	DN40	1 1/2" x 1 1/2"
	DN50	2" x 2"
Flanged	DN65	DN65
	DN80	DN80
	DN100	DN100

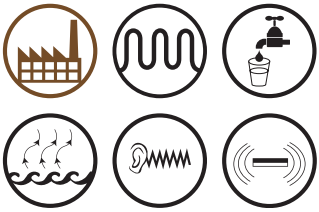


CONNECTIONS					
No	Type of Connection		Material	Size	
1		Internal threaded Female connection EN ISO 10226/1 Flat sealing	Stainless Steel	DN10x3/8" DN16x1/2" DN20x3/4" DN25x1"	DN32x1 ¼" DN40x1 ½" DN50x2"
2		External threaded Male connection EN ISO 7/1 Flat sealing	Stainless Steel	DN10x3/8" DN16x1/2" DN20x3/4" DN25x1"	DN32x1 ¼" DN40x1 ½" DN50x2"
3		Internal threaded Female connection EN ISO 10226/1 Conical sealing	Stainless Steel	DN10x3/8" DN16x1/2" DN20x3/4" DN25x1"	DN32x1 ¼" DN40x1 ½" DN50x2"
4		External threaded Male connection EN ISO 7/1 Conical sealing	Stainless Steel	DN10x3/8" DN16x1/2" DN20x3/4" DN25x1"	DN32x1 ¼" DN40x1 ½" DN50x2"

INDUSTRIAL HOSES

VIBRATION ABSORBER

Scan this QR Code



Ayvaz's vibration absorber hoses are assembled using annularly corrugated stainless steel hoses and high strength stainless steel braiding. They are designed for optimum performance in vibration applications and to reduce vibration in mechanical piping systems.

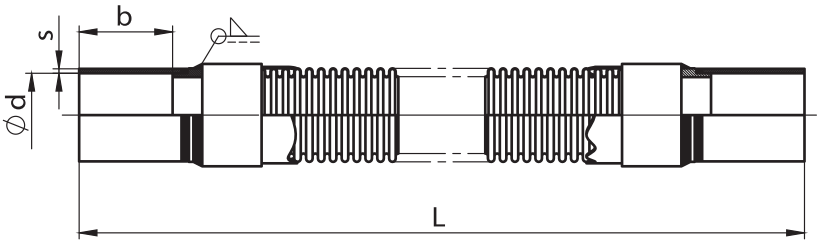
Vibration absorbers are constructed with a corrugated inner hose and braided cover that helps increasing the pressure resistance rating and provides end limitations that annihilate the need for additional control assemblies

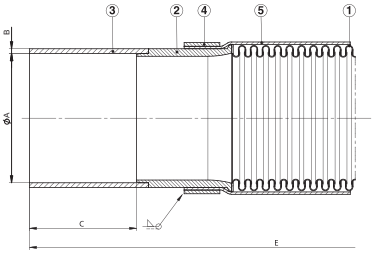
Application Areas

Vibration absorption of rotating elements
Pressured systems
Pumps, motors, machines, compressors
Gas and water Supply

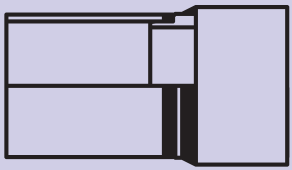
Design

Hose	Standard corrugated metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L
Braiding Material	Stainless Steel AISI 304





Metric DN	inches	ØA mm	tol mm	B mm	C mm	E mm	tol mm
6	1/4	6,6	±0,2	1	20	230	±5
8	-	8,2	±0,2	1	20	230	±5
-	3/8	9,7	-0,1+0,3	1	20	230	±5
10	-	10,2	-0,1+0,3	1	20	230	±5
12	-	12,2	-0,1+0,3	1	20	230	±5
-	1/2	12,9	-0,1+0,3	1	20	230	±5
15	-	15,2	-0,1+0,3	1	20	255	±5
16	5/8	16,2	-0,1+0,3	1	20	255	±5
18	-	18,2	-0,1+0,3	1	20	255	±5
-	3/4	19,3	-0,1+0,3	1	25	255	±5
22	7/8	22,4	-0,2+0,3	1,5	25	290	±5
28	11/8	28,9	-0,2+0,3	1,5	25	330	±5
35	13/8	35,3	-0,2+0,3	2	30	375	±10
42	15/8	42,3	-0,2+0,3	2,5	35	430	±10
54	21/8	54,3	-0,2+0,3	2	45	510	±10

CONNECTIONS				
No	Type of Connection		Material	inch
1		Welded End	Copper	3/8"-2 1/8"

FIRE PROTECTION HOSES
SPRINKLER HOSES

Scan this QR Code

VdS FM APPROVED

Sprinkler systems are used for fire protection purposes which switch on automatically as soon as a fire starts up and splash water on to the flames to extinguish the fire. These systems are located very close to the roof and collect water by the connected pipelines. Sprinkler systems are especially preferred in the big buildings open to the public where the access is difficult and with heavy fire interference.

Sprinkler hose and joint set are connection devices of the sprinkler systems. Flexible feature and structure of the sprinkler hose and joint set provide the durability properly against any kind of seismic movements and also minimize the handling time expenditure.

MATERIAL LIST		
Part Number	Part Name	Material
1	Assembly Bar	Galvanized coated St 37.2
2	Fixing Bolt	Carbon Steel 8.8
3	Kit Fixing Part	Galvanized coated St 37.2
4	Sprinkler Hose	Stainless Steel
5	Hose Fixing Part	Galvanized coated St 37.2

Standard

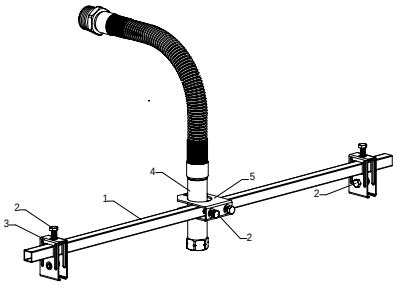
FM, VdS *(See page 30)*

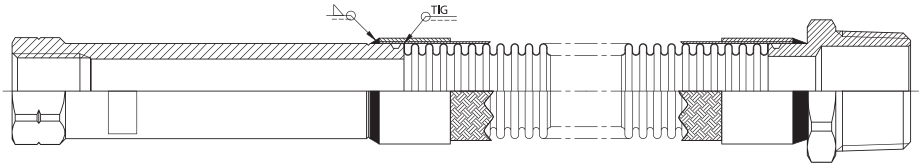
Application Areas

Publicly accessible places likewise; hotels, theatres, cinemas, hospitals, schools, residences, offices, business and shopping centres, governmental buildings, trade centres.

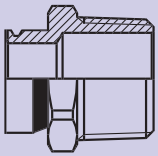
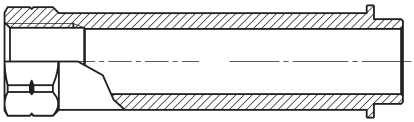
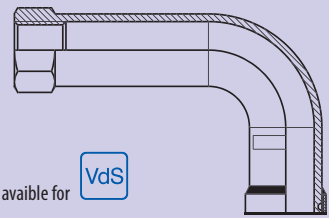
Design

Hose	Standard corrugated metal hose *(See page 14)*
Hose Material	Stainless Steel AISI 316L
Braiding Material	Stainless Steel AISI 304
Min. Bending Radius	200mm

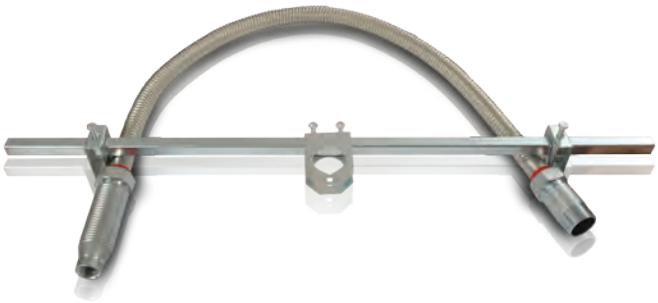




HOSE DIMENSIONS (FM and VdS Approved)			
DN	CONNECTION		LENGTH (mm)
	Main Pipeline	Sprinkler	
20	DN20 (3/4") x 1/2" DN20 (1") x 1/2"		500 700 1000 1200 1500 2000
25	DN25 (1") x 1/2"		

CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Male Connection EN ISO 7/1 thread	Carbon Steel Stainless Steel (opt.)	25	3/4" 1"
2		Female Connection EN ISO 7/1 thread	Carbon Steel Stainless Steel (opt.)	20 25	1/2"
3	 Only avaible for VdS	Elbow Sprinkler Connection EN ISO 7/1 thread	Carbon Steel Stainless Steel (opt.)	20 25	1/2"

FIRE PROTECTION HOSES
SPRINKLER HOSES (UL Type)



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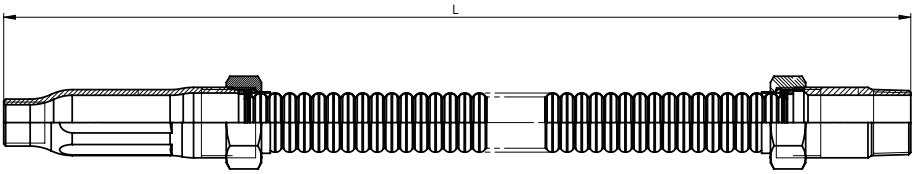
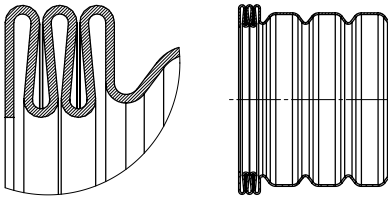
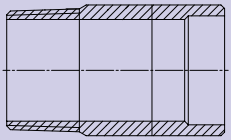
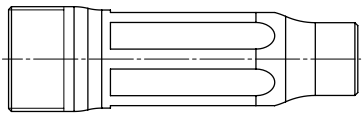
SPRINKLER HOSES (UL Type)

Hose	Open pitch corrugated metal hose
Hose Material	Stainless Steel AISI 316L
Min. Bending Radius	200mm

HOSE DIMENSIONS (UL Type)			
DN	CONNECTION		LENGTH (mm)
	Main Pipeline	Sprinkler	
25	DN25 (1") x 1/2"		500 700 1000 1200 1500 2000





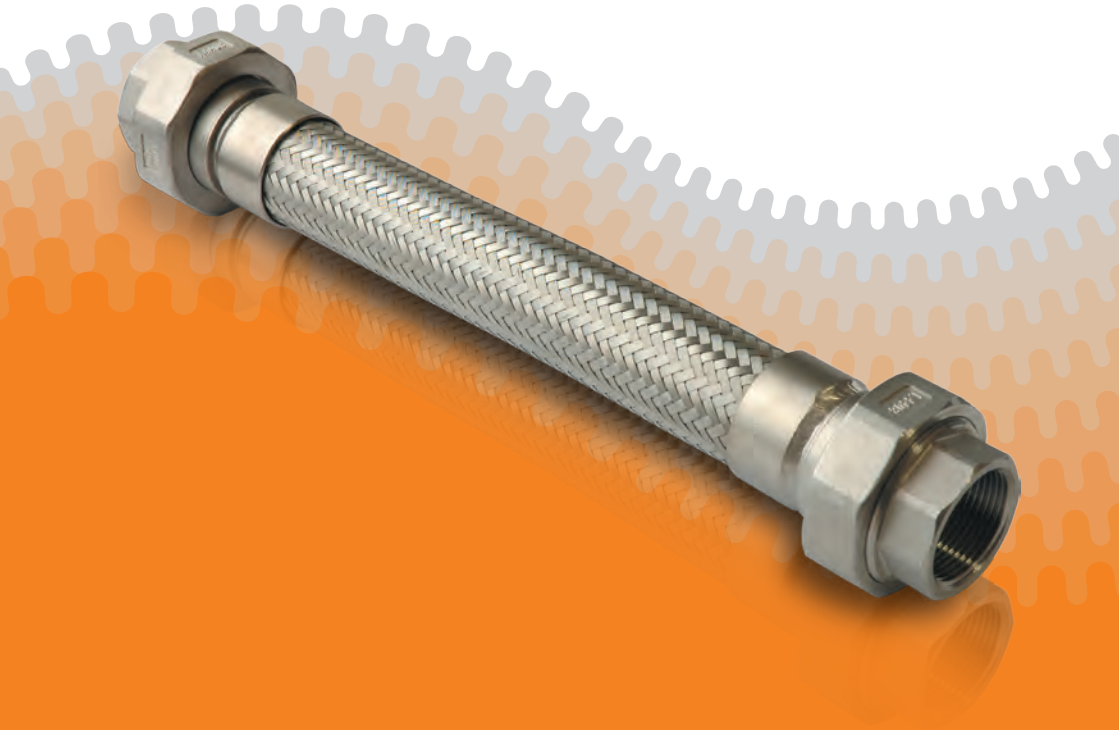
CONNECTIONS					
No	Type of Connection		Material	DN	inch
1		Adapter Nipple Connection EN ISO 7/1 thread	Galvanized coated Carbon SteelSt 37.2 Stainless Steel (opt.)	25	1"
2		Sprinkler Connection EN ISO 7/1 thread	Galvanized coated Carbon SteelSt 37.2 Stainless Steel (opt.)	25	1/2"

AYVAZ

FLEXIBLE METAL HOSES

CHAPTER V

MATERIAL CHOICE AND INSTALLATION



CHAPTER V

MATERIAL CHOICE AND INSTALLATION

Material Choice

Material choice is a key factor which is very effective on the success of the hose applications. As a flexible connection and transportation element, the metal hose must be designed to cover all the temporary shape changes and expansions while it prevents the corrosion that may occur in the systems.

If you consider that the wall thickness of the hose is lower than rigid pipes, you can understand the importance of the correct design of the hose.

Some of the features that we expect from the materials used in metal hose production are given below;

- They must be well resistant to corrosion
- The physical conditions must be high level
- Must resist against high temperatures
- Must have a good cold operating capability
- Must be functional

It is almost impossible to find a material which has got all these features at the same time. But with the experience of more than six decades in industrial manufacturing, we use materials that contain the most of those features in order to produce best metal hoses possible.

In addition, in cases that the extremely anti-corrosive materials are required, we are able to re-design our manufacturing and provide hoses made by any specific material.

We show ultimate attention when choosing the most appropriate material and request the DECHEMA material reports from the manufacturers of ferritic and steel materials.

All the materials used in hose manufacturing are formed by cold forming methods, this prevents the negative effects of heat treatment in the structure of the material. All the material combinations and the welding process between the fittings and hose are done with great care.

Choosing The Appropriate Length

Annularly corrugated hoses are measured as straight position and under atmosphere pressure. The nominal length of the hose is the total length of the hose and the fittings connected to the both ends of hose. As long as no other deviation factors are given, the following deviations are used in standard hose applications.

Nominal Length	0-499m	500-999m	over 100m
Deviation	+10mm	+15mm	+1.5 %
	-5mm	-10mm	-1.0%

Pressure Reducing Factors at Increased Temperatures

At increased temperatures, pressure reducing factors should be applied in order to get the closest values for the hose materials.

Metal hose assemblies are designed according to AD standard which is accepted for the elements exposed to pressure. A pressure reducing factor is required for these elements and this factor is reflected as the fall of the resistance value of thermal intention for the increased temperatures.

Thermal resistance parameter of the materials which are not stated in AD standard are given in the manufacturer's certificates, these certificates are arranged according to the material tests.

The table shown below illustrates the pressure reducing factors for the most frequently used materials at certain temperatures.

Reduction Factor (kt) at Increased Temperatures				
Temp. °C	Stainless Steel			
	DIN 17441			DIN 17440
	1.4541	1.4571	1.4404 1.4435	1.4301
20	1.00	1.00	1.00	1.00
50	0.92	0.94	0.89	0.92
100	0.86	0.87	0.80	0.83
150	0.83	0.84	0.75	0.75
200	0.79	0.80	0.69	0.68
250	0.74	0.75	0.65	0.63
300	0.71	0.72	0.62	0.59
350	0.68	0.69	0.60	0.56
400	0.67	0.68	0.58	0.54
450	0.66	0.67	0.56	0.53
500	0.65	0.66	0.55	0.52
550	0.56	0.58	0.47	0.52

Calculation of the Maximum Operating Pressure

p = pop x kt

p : Maximum operating pressure
pop : Operating pressure at 20 °C
kt : Reducing factor related with temperature

Example

Calculation of the maximum operating pressure for Ayvaz's annularly open pitch corrugated DN 20 hose at 200 °C.

pop =10 bar *(See page 18)*
kt = 0.68 (kt table)

p = pop x kt

p = 10 x 0.68 = 6.8 bar

Pressure Loss

Flexible metal hoses are used for transporting the materials form different consistencies, as a result of that the possible pressure losses in the hose lines are very influential on the design and measuring the hose lines.

Under similar flow conditions and operating temperatures, the pressure loss in the hose assemblies may be higher than rigid pipelines. This situation may be variable according to the hose profile and flow characteristics.

Roughly, we can say that the pressure loss of the annularly corrugated hoses around the turbulence areas is 150% higher than rigid stainless steel pipes. The pressure loss of a rigid pipe can only be levelled by increasing the diameter of the hose by 18%.

On the other hand, the pressure loss of the annularly corrugated hoses around high velocity areas may be 400% higher than rigid pipes, in this case the diameter of the hose should be increased by 40% to level the pressure loss.

PRESSURE LOSES FOR AYVAZ FLEXIBLE METAL HOSES

The diagrams shown below illustrate pressure loses of Ayvaz's flexible metal hoses at various diameters per meter. These diagrams are shaped as the results of tests applied in the straight position and with air and water at 20 °C and different flow rates.

Pressure loss: ΔP (Pa)
Flow rate: Q (lt/sc)

Diagram of the pressure drop (Pa) of per meter, through the change of flow rate

Straight Pipe-Test with water

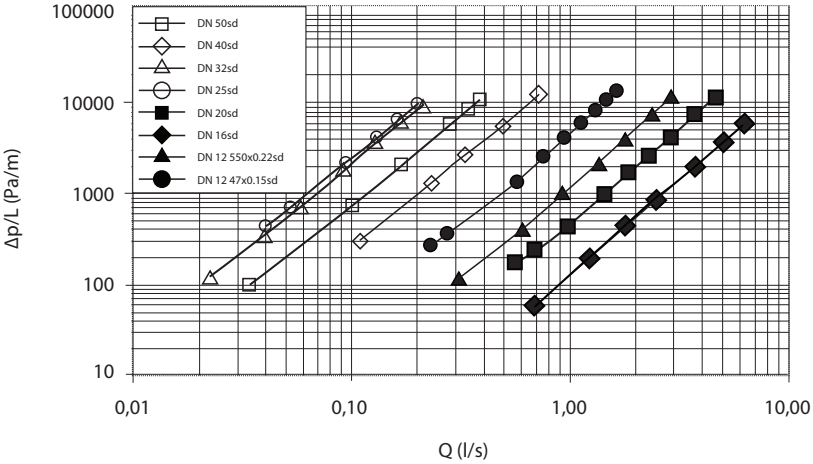
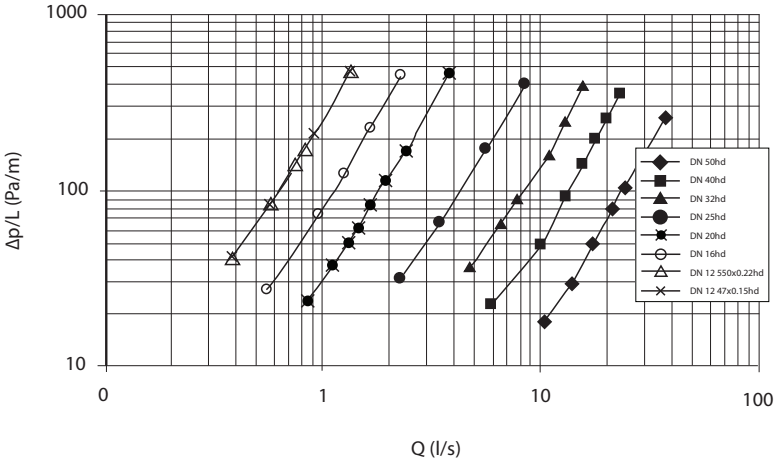


Diagram of the pressure drop (Pa) of per meter, through the change of flow rate

Straight Pipe-Test with air



Pressure Loses of the hoses at minimum bending radius

The diagrams shown blow illustrate pressure loses of Ayvaz's flexible metal hoses which are bent as 90°elbows. These diagrams are shaped as the results of tests applied with air and water at 20 °C and different flow rates.

Diagram of the pressure drop (Pa) of per meter, through the change of flow rate

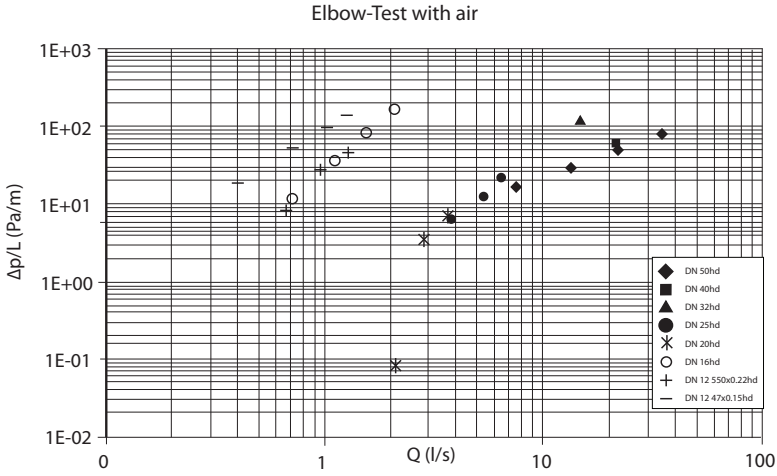
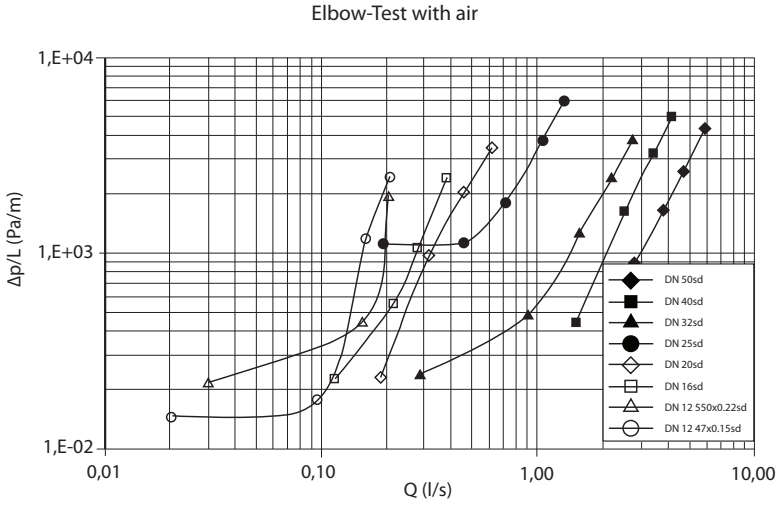


Diagram of the pressure drop (Pa) of per meter, through the change of flow rate



Change of the constant pressure loss according to the Reynold Number

Constant pressure loss is expressed with the friction coefficient (λ). The friction coefficient is calculated as shown below accordingly.

$$\lambda = \frac{\Delta P/(\rho g)}{V^2/(2g)}$$

In the formula;

- ΔP = Pressure drop between the hose ends
- P = Volume of the flow (kg/m^3)
- V = Velocity of the flow (m/sn)
- g = Acceleration of gravity (m/sn^2)

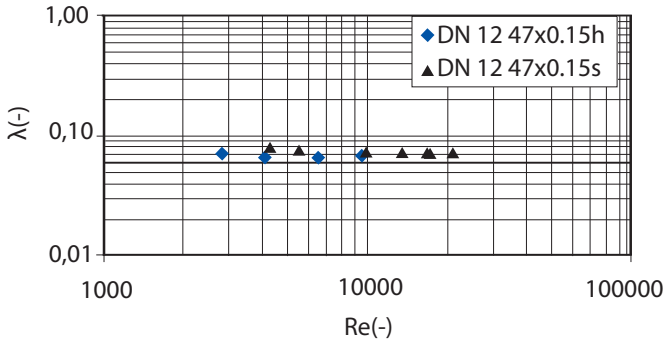
The Reynolds number to be used in the calculations is held by the following formula.

Reynolds Number. Re=VD/ν

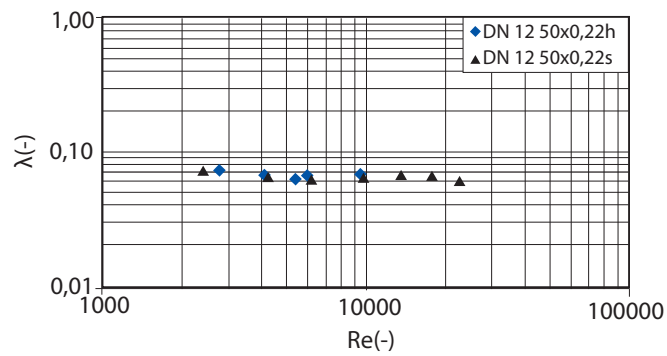
- D = Nominal diameter of the hose
- ν = Kinematic viscosity of the fluid (m^2/sn)

The constant loss coefficients are illustrated by the diagrams shown below at different diamters according to λ-Re changes.

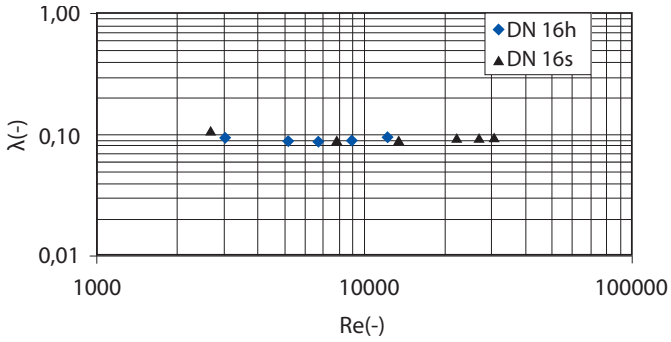
DN 12 (Constant pressure drop coefficient)



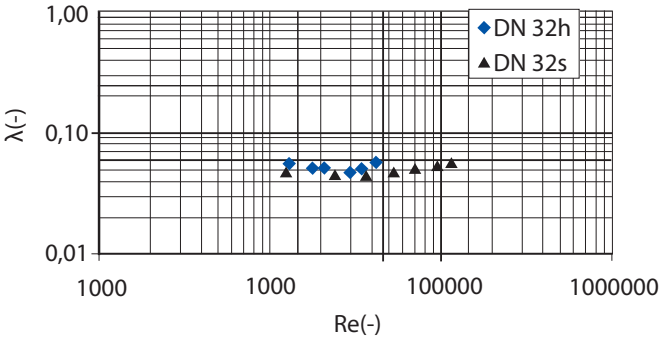
DN 12 (Constant pressure drop coefficient)



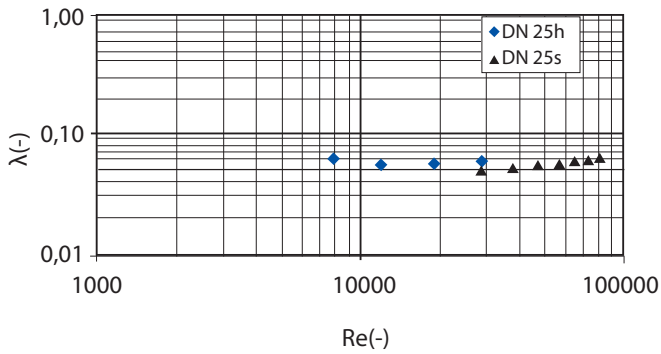
DN 16 (Constant pressure drop coefficient)



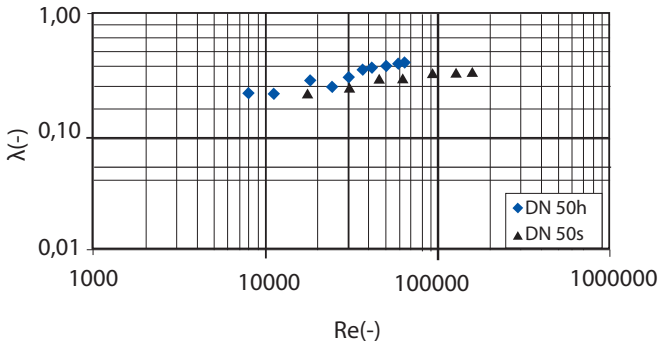
DN 32 (Constant pressure drop coefficient)



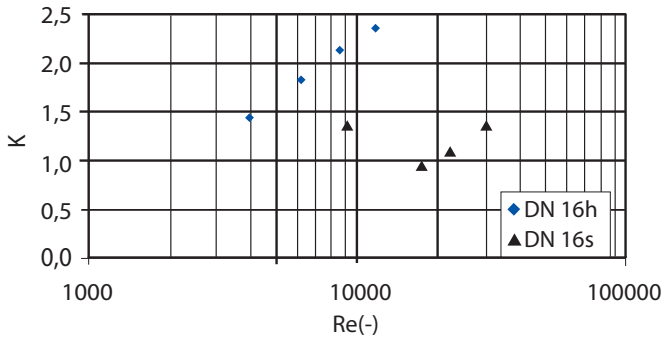
DN 25 (Constant pressure drop coefficient)



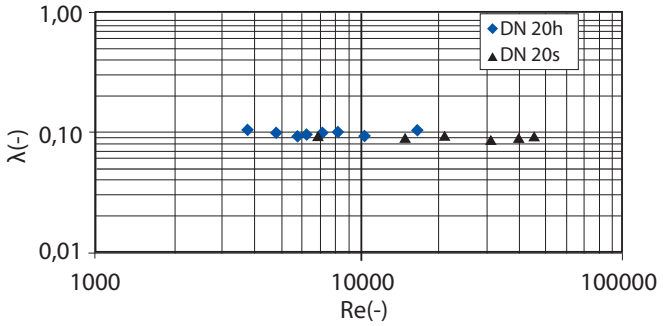
DN 50 (Constant pressure drop coefficient)



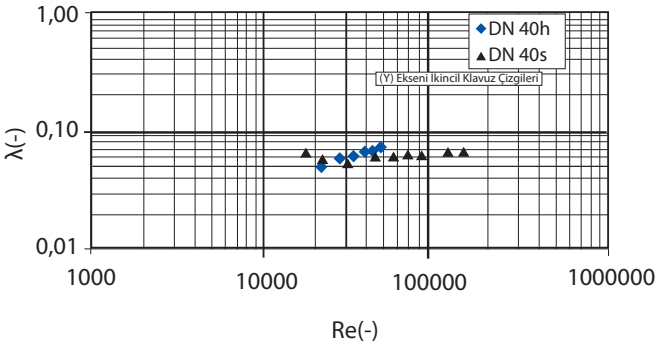
DN 16 (Constant pressure drop coefficient)



DN 20 (Constant pressure drop coefficient)



DN 40 (Elbow pressure drop coefficient)



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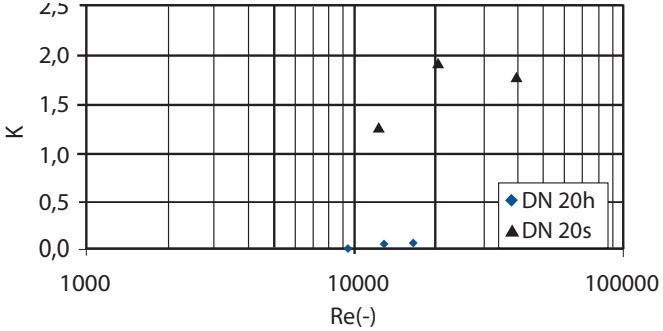

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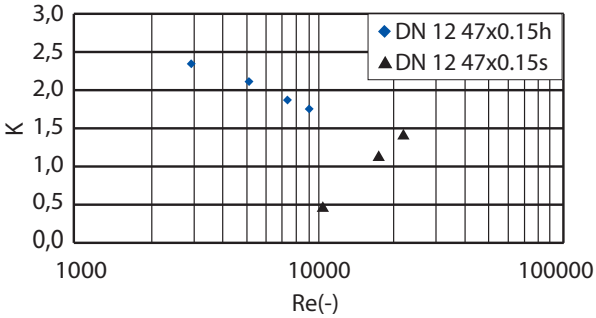

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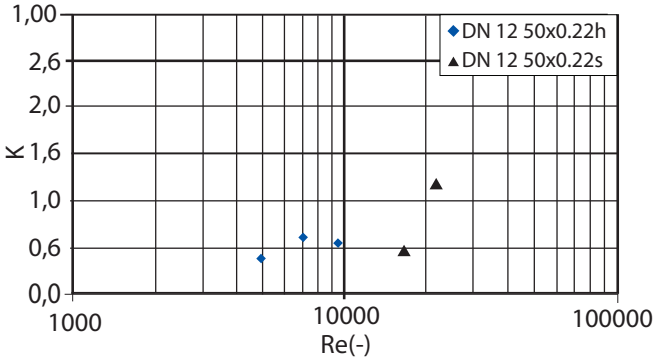

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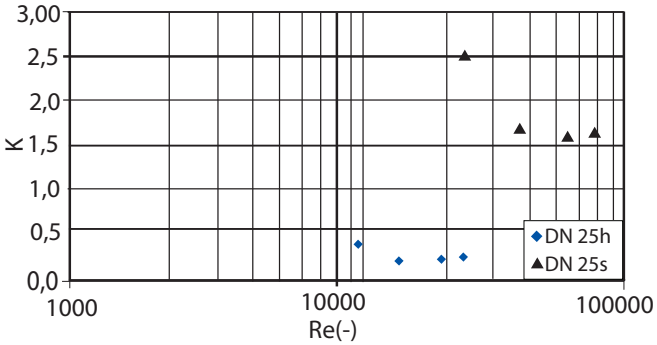

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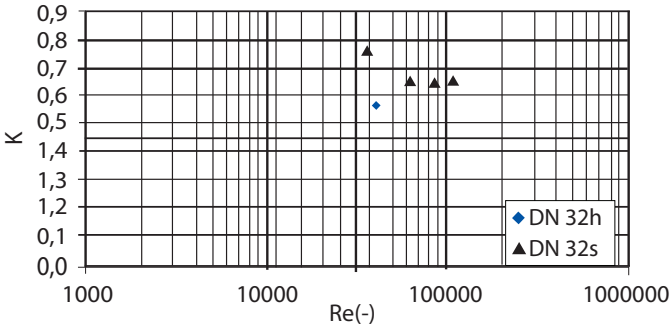

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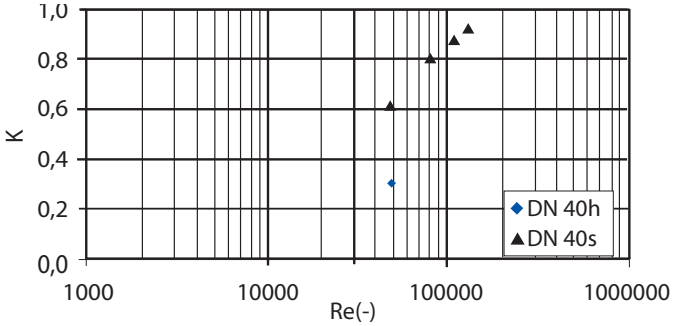
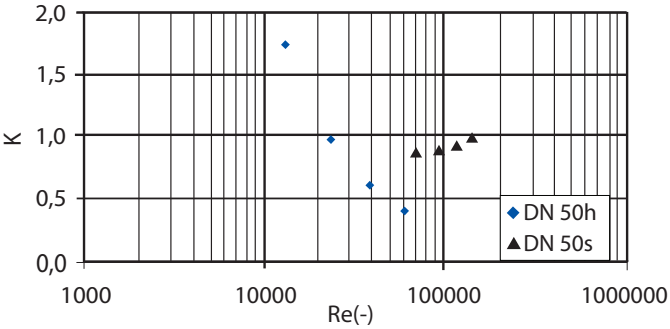


DN 50 (Elbow pressure drop coefficient)



Absorption of Hose Movements

In hose assemblies, hoses are generally assembled in 180° arcs (U bend) in order to absorb the movement between two ends of the hose assembly. In the hose assemblies which are applied in U shaped bends, two types of movements (vertical and horizontal) may occur. This means, the hose can be assembled as vertically and horizontally according to the application conditions.

Vertical applications of hose assemblies are always preferred whenever it is possible, that is because, for horizontal applications, additional support mechanisms may be required to prevent the deflections in the shape of the assemblies.

The main influential factors on the Hose efficiency and the service life are explained below.

1. Detection of the Nominal Length:

• The most appropriate assembly shape is detected.
• The nominal length is calculated by the formulas.
• The sufficient length of the hose is selected allowance for to divert the dynamic and twisting torsions behind the fitting connections at both neutral ends of the hose.

The optimum use of the hose line, the fixed end of the hose should be remained in the centre of the hose movement.

2. The Assemblage Distance:

• The installation distance must be twice of the 180° bend distance.
• This rate is quite influential on the service life of the hose assembly. If the bending radius drops below the permissible value, the number of the loading points increases and the service life is affected in a negative manner.
• Permissible bending radius is dependent on pressure and required number of loading points.

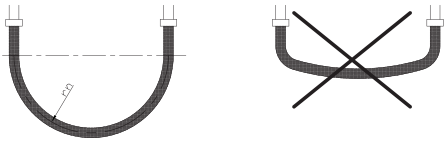
3. The Assembly:

• The hose line should be installed without exposed to twisting.
• No torsion stress must occur neither during the assembly, nor the operating. Otherwise, the service life of the hose falls.
• Both ends of the hose and the movement must be on the same plate.
• Only one end of the hose must be tightened first to be assured that no twisting on the hose assembly occurs. Afterwards, the hose must complete its movement for couple time while it is in neutral position under no torsions.

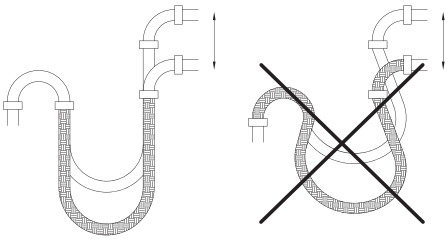
• Finally the other end of the hose must be connected.

Some Examples For Proper Hose Assemblies

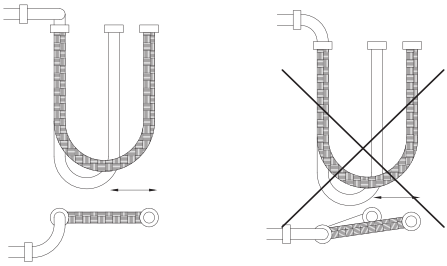
The hose must be installed in an arc of 180°. The nominal hose length and installation distance are calculated in a relation with bending radius.



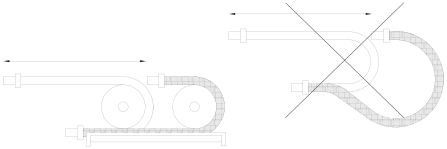
Non-permissible deflections caused by the rigid pipepieces behind the hose connections must be avoided. Minimum bending radius should be detected.



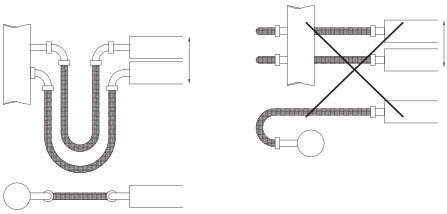
The direction of the hose movement and hose axis should be on the same plate. This prevents the dangerous torsion stress.



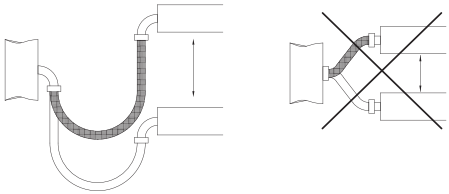
The hose line should be protected from the deflections and sharp strains caused by the support points behind the connection fittings of the both ends of the hose. In such cases, using a bobbin or guiding chain may be useful.



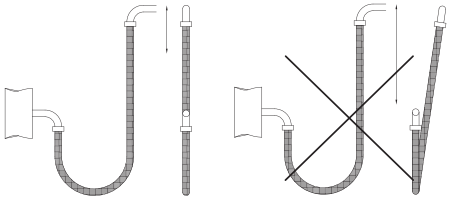
Connection arcs or elbows made by rigid pipe pieces may prevent the bending stress and torsions.



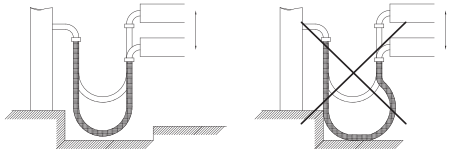
Connection arcs or elbows made by rigid pipe pieces may prevent the sinuous bending stress and extreme torsions.



Hose bend and the direction of the movement must be on the plate, this way the torsion can be prevented to reach dangerous levels.



Hose must be hanging freely and it should be installed as it does not contact anywhere even at the maximum expansion situation.

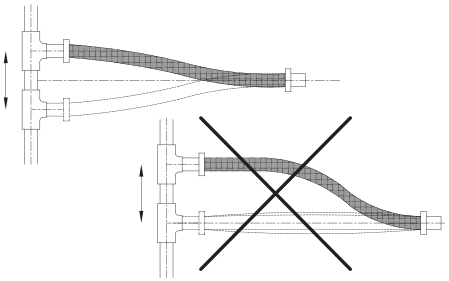


Calculation of the Hose Installed in 90 °C Bend.

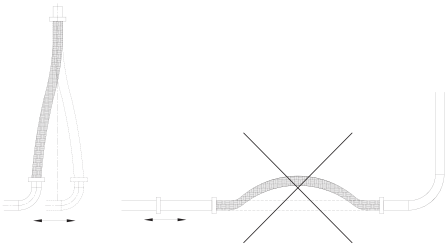
Hose assemblies installed in a bend of 90° can absorb the thermal changes in two directions as vertically and horizontally. In order to avoid the dangerous torsion effects, the hose bend and the expansion must be kept on the same plate. In abroad words, the hose guides which keep the hose in axial expansion direction and prevent the lateral deviations are suggested.

In cases that, the dual expansions in two directions to be absorbed, the hose guides must be located right behind the connections on hose ends, it is aimed to divert the expansions diagonally to each other.

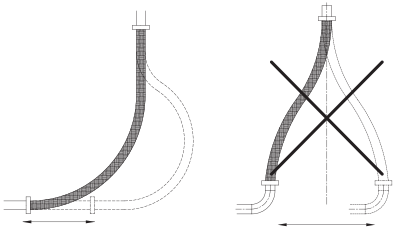
1. To absorb the lateral expansions, the hose must be assembled with the right angle to the expansion direction. In such applications, hose assembly must be preloaded by half of the estimated expansion in order to make full use of lateral movement scope of the application.



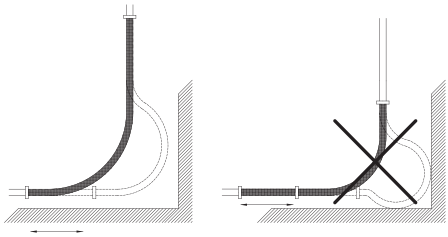
2. In order to absorb little expansions, the suggested shape of the lateral assembly is as in the picture. The hose must be protected from the expansions and compressions during the installation.



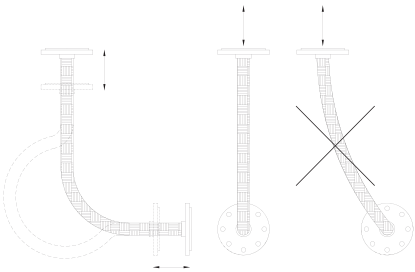
3. In cases that the larger expansions are required to be absorbed, the hose is suggested to be installed in a bend of 90°. The lateral installation is no longer effective in those cases.



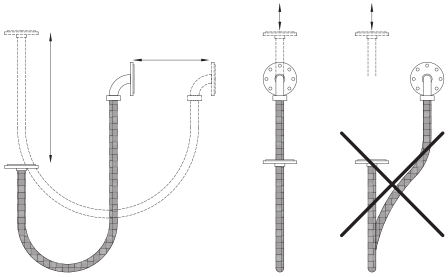
4. For absorption the possible expansions occurred in hose assemblies effectively, the distance between the legs of the hose which is installed in a bend of 90° and the installation angle must the calculated carefully. The nominal length of the hose and the distance between the fixed ends of the hose assembly is calculated by the formulas given before.



5. In order to absorb the expansions in two directions, the hose installation must be done in a bend of 90 ° with the right length and the appropriate distance between the legs of the hose assembly. That helps the hose to make its movement in both directions easily.

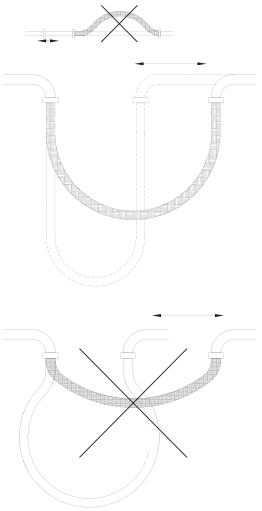


6. Expansion direction and the bent part of the hose assembly must be kept on the same plate. Lateral deflection occurs in the hose applications must be prevented by using proper hose guides. In the meanwhile, using pipe guides would protect the hose against the damages caused by the torsions.



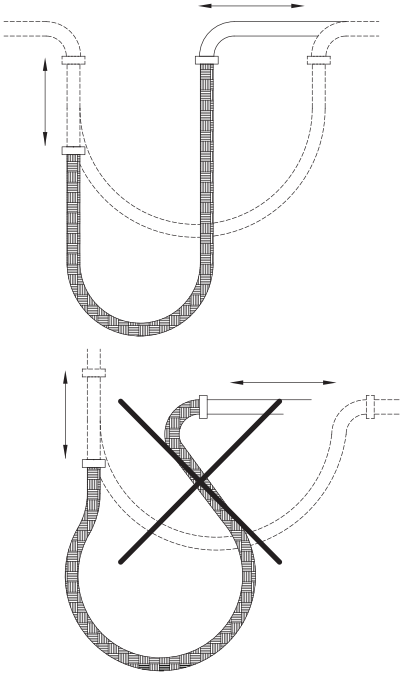
7. It is suggested to install the hose in a bend of 180° to absorb the larger amount of axial expansions that may occur in very long straight pipelines. The hose assembly must be protected from the expansions and the compressions during installation.

8. The required installation distance for the hose assembly and the nominal length of the hose must be calculated properly and the hose must be installed in a bend of 180° in order to absorb the single direction expansions.



9. For absorption of the dual expansions in two directions, the hose must be installed in a bend of 180° with the right nominal length and effective installation distance.

10. By using rigid elbows, unwanted bends which is caused by the connection fittings can be prevented in hose assemblies.



Absorption of Vibration

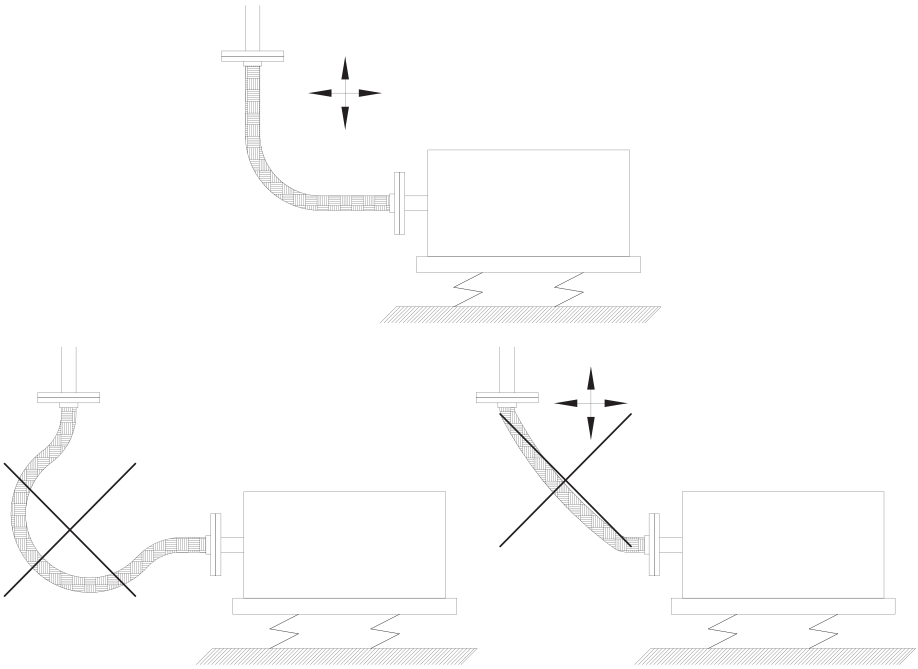
The vibration that occurs in the mechanical systems, swinging and the noise are very inconvenient. They also cause an unignorable amount of material fatigue on the parts that exposed to them. The fixed pipe connections used in mechanical equipment may become very risky areas because of the vibration that occurs around those areas.

Ayvaz's Flexible Metal hoses provide many benefits to the installers in order to maintain system security by assuring the absorption of vibration in mechanical systems.

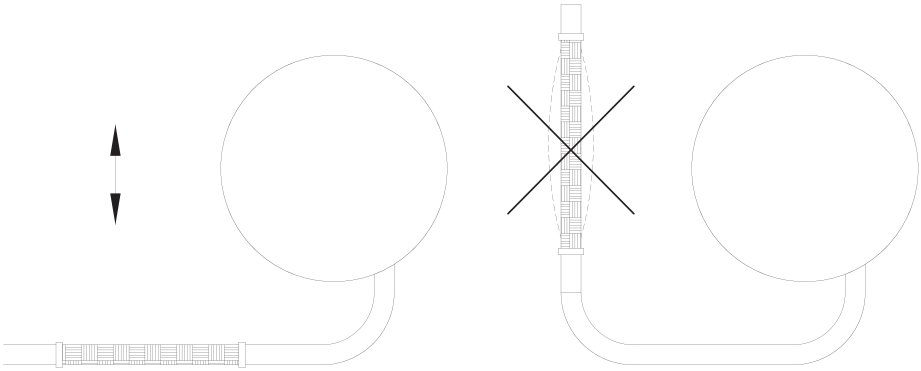
Annularly corrugated metal hoses are selecting according to the system pressure, temperature and the direction of the vibration and are used in the connections of the tools that cause a high level of vibration likewise pumps, compressors, engines.

Hose assembly must be installed to the machine that is the source of high vibration as close as possible. The movement which is the result of the vibration and the bend of the hose must be on the same plate as in the shape that prevents the torsion tension. After completing the hose assembly, hose must be fixed from one end.

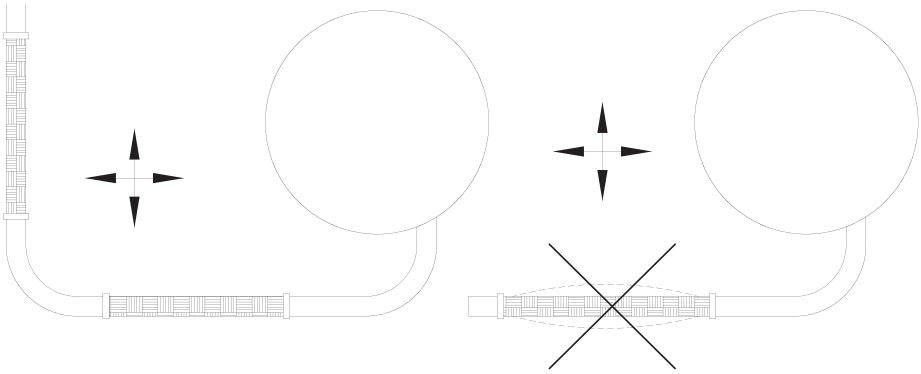
1. Hose assembly must be installed in a bend of 90° and close enough to the machine exit in the permissible bending radius limits by proper hose connections. Nominal length of the hose must be indicated carefully and the hose must be protected from extreme bending and damages.



2. Hose assembly must be installed with the right angle to the direction of the vibration.



3. In cases that the two or three dimensional movements must be absorbed, hoses must be installed with the 90° to each other.



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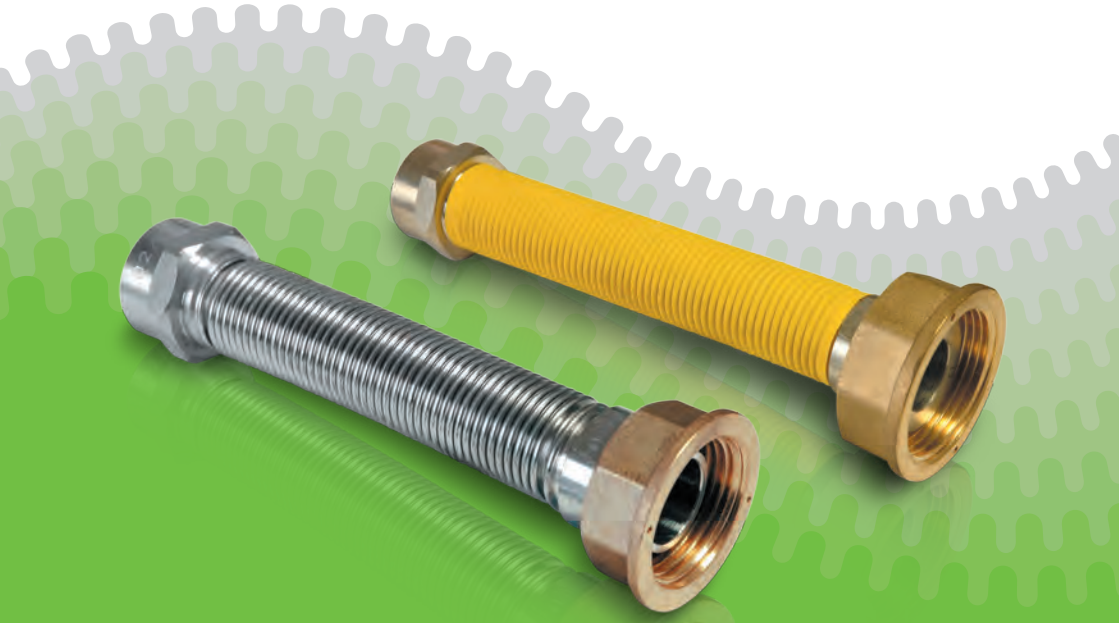
FLEXIBLE METAL HOSES

CHAPTER VI

CORROSION



CHAPTER VI

CORROSION

TYPES OF CORROSION

According to the explanation of DIN 50900 (DIN EN ISO 8044), corrosion is the reaction of the metallic materials with their environment that causes serious changes and damages in the structure of the materials. In most cases, corrosion takes an electro-chemical shape, as a result of that many different types of corrosion may occur.

The most important corrosion types for ferritic and non-ferritic materials are explained as follows.

Equal Surface Corrosion

The complete surface of the material is effected from this kind of corrosion. The loss from the weight of the material can be specified with g/m^2h and the fall of the wall thickness with mm/year. This kind of corrosion can be seen in normal steels and includes rusting as well. Equal surface corrosion can affect the stainless steels under only very inconvenient conditions. Other abrasive corrosion types may be caused by the liquids such as acids, bases and salt solutions.

During the design of the components that are subject to corrosion, the tolerances for wall thickness of the flexible pipe and hose assemblies with tin walled products can't be used. This situation is influential on the selection of materials. The resistance of the materials against equal surface corrosion is dependent on the quality of surface.

Pitting Corrosion

The corrosion which is restricted locally can consist under some certain conditions. This type of local corrosion is named after its appearance. Especially in the cases that chlorine and iodine ions present in hydrous solutions, pitting corrosion arises from the effects of these ions.

Unlike the equal surface corrosion, this kind of corrosion can't be calculated and it is only kept under control by choosing the best possible material. The resistance of the stainless steel materials against the pitting corrosion increases in line with the amount of molybdenum content in the chemical formula of the material.

The resistance of the materials against pitting corrosion can be compared with the cumulated reaction values (WS=Cr+3.3:Mo); the higher reaction value means the higher resistance.

Intercrystalline Corrosion

Intercyristalline corrosion is local corrosion type which effect the grain boundries of materials first. This kind of corrosion is caused by the deflection around the grain boundries that reduces the resistance of the materials.

Intercrystalline corrosion may grow up till the grain composition is dissolved.

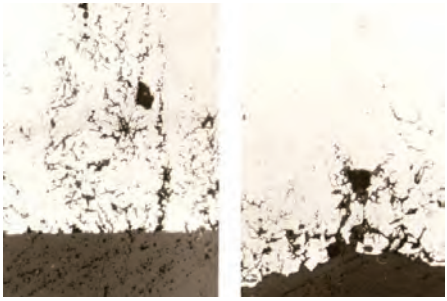
This deflection movement is dependent on the time and temperature for CrNi coated steels. In cases that the critical temperature is between 550 and 650 °C, the time needed to be spent for the deflection to begin is the subject of the type of the steel. For example while welding the materials that have a high thermal capacity and wall

thickness, this situation must be considered. The changes in the material structure dependent on this deflection can be turned around by thermal treatments to be applied to the materials (1000-1050 °C).

This type of corrosion can be reduced by using balancing materials such as low carbon content stainless steel or titanium or niobium.

The intention of intercrstalline corrosion of the materials can be indicated by standard tests (DIN EN ISO 3651-2)

During our ordering process and inspections we request the test results of the materials which proof the eligibility of the material to the standards and resistance against intercrystalline corrosion from the manufacturers.



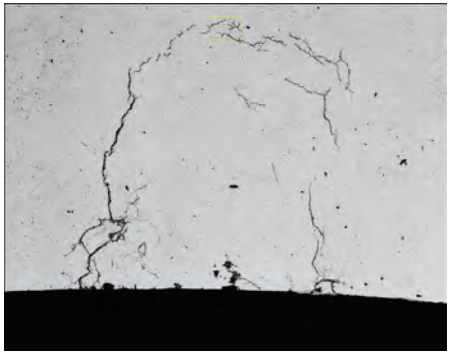
Stress Corrosion Cracking

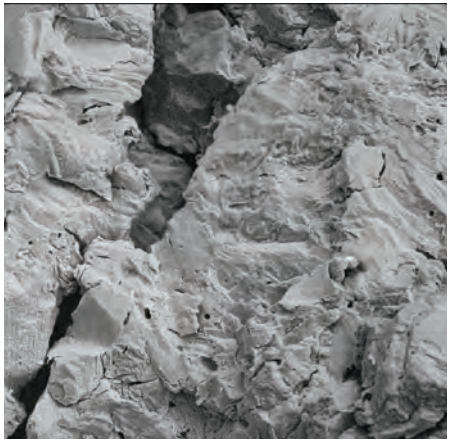
This type of corrosion is generally seen in the austenitic materials that exposed to the corrosive effects and internal or external tensile stress. The most important reason of this type of corrosion is the alkaline solutions that content chlorine. The shape of the crack can be transcrystalline as in the figure 4 as well as intercrystalline as in the figure 5. Transcrystalline cracks may only occur at tempeartures higher than 50 °C, on the other hand intercrystalline cracks can be seen at temperature as low as room temperature in especially austenitic materials.

At elevated temperatures, stress corrosion cracking may be sourced by very little chlorine and lye concentrations. From that point the corrosive effect will always lead to the transcrystalline form of corrosion.

The stress corrosion cracking takes similar shape in the non-ferritic materials as in the austenitic metals. Intercrystaline corrosion cracking may cause the similar damages at higher temperatures than 400°C in high concentrated nickel and nickel alloys as at higher temperatures than 250°C in steam solutions content hydrogen sulphur.

In order to detect and prevent this type of corrosion, it is required to have detailed information about the operation conditions and to make the selection carefully on the basis of expert knowledge.





Crevice Corrosion

Crevice corrosion is a corrosion type which is located in crevices that are caused by the design of the deflections. This kind of corrosion is the result of the lack of oxygen in the crevices. Oxygen has a protective effect on passive layer of the passive materials.

Because of the risk of crevice corrosion, it is required to avoid the designs that contain crevices and makes the deflections possible. The resistance of the high-alloy steels and nickel containing materials against this type of corrosion is dependent on the molybdenum amount in the chemical structure of the material.

As in the pitting corrosion, the cumulative reaction values can be used in order to investigate the resistance of the materials against crevice corrosition.

Contact Corrosion

Contact corrosion is an expression that is used to define the corrosion which is caused by the combination of different materials.

The effect which is named as "practical galvanic potentials" and is used to express the contact corrosion risk in seawater . The materials located close to each other in the diagram are mutually compatible materials. Anodic metal corrodes increases in line with the distance between two materials.

The active or passive characteristics of the materials must be considered carefully for possible contact conditions.

For example; the corrosion products, deflections or the mechanical damages on the surface are likely to activate the corrosion risk of a CrNi Steel. This may cause a potential difference between the active and passive surfaces of the materials and the corrosion in cases if an additional electrolyte exists.

Dezincing

Dezincing is a type of corrosion that is seen in copper-zinc alloys which contain more than 20% zinc in compositions. During the corrosion activity, copper is generally separated from zinc by taking a spongy form.

Zinc may stay either in the solution or above the corrosion level as in the basic salt form. Dezincing may happen on the surface or may be restricted locally as well as it may happen in far deep from the surface.

We can count the tick layers consisted from the corrosion products, water or the lime deposits that are the results of other extraneous matters on the material surfaces as the accelerating factors of dezincing corrosion.

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APPENDIX

APPENDIX

Chemical Resistance

Material	Density g. kg/dm³	Specific Heat cp kJ/(kg.K)	Melting Point °C	Melting Heat kJ/kg	Boiling Point °C	Boiling Heat kJ/kg
SOLID MATERIALS						
Gold	19.32	0.130	1063	67.0	2700	1758
Aluminium	2.70	0.921	660	355.0	2270	11723
Antimony	6.69	0.209	630.5	167.5	1635	1256
Copper	8.96	0.385	1083	209.3	2330	4647
Bismuth	9.80	0.126	271	54.4	1560	837
Mercury	13.55	0.138	-38.9	11.7	357	301
Zinc	7.14	0.385	419.4	112.2	907	1800
Ferrit (Pure)	7.87	0.465	1530	272.1	2500	6364
Silver	10.45	0.234	960.8	104.7	1950	2177
Iridium	22.42	0.134	2600	117.2	-	3894
Tin	7.28	0.226	231.9	58.6	2300	2596
Chrome	7.19	0.506	1890	293.1	2642	6155
Lead	11.34	0.130	327.3	23.9	1730	921
Sulphur	2.07	0.720	112.8	39.4	444.6	293
Magnesium	1.74	1.034	650	209.3	1100	5652
Manganese	7.3	0.507	1250	251.2	2100	4187
Molybdenum	10.2	0.271	2625	-	3560	7118
Nickel	8.90	0.444	1455	293.1	3000	6197
Platinum	21.45	0.134	1773	113.0	3804	2512
Titanium	4.54	0.471	1800	-	3000	-
Tungsten	19.3	0.134	3380	251.2	6000	4815
LIQUID MATERIALS						
Acetone	0.79	2.160	-94.3	96.3	56.1	523.4
Benzol	0.88	1.738	5.5	127.3	80.1	395.7
Sea water	1.03		-2.0		100.5	
Ethyl alcohol	0.79	2.470	-114.5	104.7	78.3	841.6
Etilether	0.71	2.328	-116.3	100.5	34.5	360.1
Glycerin	1.26	2.428	18.0	200.5	290.0	854.1
Methylalcohol	0.79	2.470	-98.0	100.5	64.5	1101.1
N-Hexane	0.66	1.884	-95.3	146.4	68.7	330.8
NHektan	0.68	2.219	-90.6	141.5	98.4	318.2
Water	1.00	4.183	0.0	332.4	100.0	2257.1
Turpentine oil	0.87	1.800	-10.0	116.0	160.0	293.1
Food Salt Sol.	1.19	3.266	-18.0		108.0	
GASES	kg./m³	kJ /(m³K)				
Ammonia	0.771	2.060	-77.7	332.0	-33.4	1371
Argon	1.784	0.523	-189.4	29.3	-185.9	163
Nitrogen	1.250	1.043	-210.0	25.5	-195.8	198
Ethylene	1.261	1.465	-169.5	104.3	-103.9	523
Air	1.293	1.001	-	-	-194.0	197
Helium	0.178	5.234	-	37.7	-268.9	21
Hydrogen	0.90	14.235	-259.2	58.2	-252.8	454
Carbon dioxide	1.977	0.825	-56.6	180.9	-78.5	576
Carbon Monoxide	1.250	1.051	-205.1	30.1	-191.5	216
Sulphure dioxide	2.926	0.632	-75.5	115.9	-10.2	390
Methane	0.717	2.177	-182.5	58.6	-161.5	548
oxygen	1.429	0.913	-218.8	13.8	-183.0	214

Chemical Resistance

Meanings of Abbreviations

Assesment	Corrosion Behaviour	Suitability
1	Resistant	Suitable
2	Risk of Corrosion	Restricted Suitability
3	Not Resistant	Unsuitable

Chemical Composion	Temperature °C	304, 321	304L, 316L	Carbon Steel	Brass	Bronze	Monel
Ethyl alcohol	Boiling and 20 °C	1	1	1	1	1	1
Methyl alcohol	20 °C - 65 °C	1	1	1	1	1	1
Aluminum, molten	760 °C	3	3	3	3	3	3
Aluminium Acetate, Saturated Aluminum Sulphate 5%	20 °C - Boiling	1	1	3	3	3	1
Aluminum Fluoride	at 20 °C	3	3	3	3	3	2
Aluminium Hydroxide	at 20 °C	1	1	1	1	1	1
Aluminium Sulphate 5%	65 °C	1	1	3	3	3	1
10%	at 20 °C	1	1	3	3	3	1
Saturated	at 20 °C	1	1	3	3	3	1
Aluminum-Potassium-Sulfate 2-10%	at 20 °C	1	1	3	2	2	2
10%	Boiling	2	1	3	3	3	2
Saturated	Boiling	3	2	3	3	3	2
Ammonia							
All concentrations	at 20 °C	1	1	1	1	1	1
Gas	Hot	3	3	3	3	3	
Ammonia, liquid	at 20 °C	1	1	3	3	3	3
Ammonium Bicarbonate	at 20 °C	1	1	3	3	3	2
Ammonium Bromide	at 20 °C	2	1	3	3	3	2
Ammonium Carbonate 1-5%	at 20 °C	1	1	1	3	3	3
Ammonium chloride 1%	at 20 °C	1	1	2	3	3	1
10%	Boiling	1	1		3	3	2
28%	Boiling	2	1		3	3	2
50&	Boiling	2	1		3	3	2
Ammonium Hydroxide							
All concentrations	at 20 °C	1	1	2	3	3	3
Ammonium monophosphate	at 20 °C	1	1	2	3	3	2
Ammonium nitrate							
All Concentration	at 20 °C	1	1	3	3	2	
Ammonium oxalate 5%	at 20 °C	1	1	2	3	3	
Ammonium Perchlorate 10%	Boiling	1	1	2	3	3	
Ammonium Persulphat5%		1	1	2	3	3	
Ammonium Phosphate	at 20 °C	1	1		3	3	3
Ammonium sulphate 5%	at 20 °C	1	1	2	3	3	3
10% - Saturated	Boiling	2	1	3	3	3	2
Ammonium sulfide	20 °C - Boiling	1	1	3	3	3	3
Amyl Acetate Concentration	at 20 °C	1	1	2	1	1	1
Amyl Chloride	at 20 °C	1	1	3	2	2	2
Aniline 3%	at 20 °C	1	1	2	3	3	2

Chemical Composion	Temperature °C	304, 321	304L, 316L	Carbon Steel	Brass	Bronze	Monel
Crude Concentrate	at 20 °C	1	1	1	3	3	2
Aniline hydrochloride	at 20 °C	3	3		3	3	3
Antimony trichloride	at 20 °C	3	3	3	3	3	3
Acetic Acid 50%	at 20 °C	1	1	3	3	3	3
50-80%	Boiling	3	2	3	3	3	3
80%	at 20 °C	1	1	3	3	3	1
100%	at 20 °C	1	1	3	3	3	1
100%	Boiling	3	2	3	3	3	2
10 atü 100%	200 °C	3	3	3	3	3	2
Acetic Anhydride	at 20 °C	1	1	3	3	3	2
	Boiling	1	1	3	3	3	2
Acetic acid vapor							
30°	Hot	3	2	3	3	3	3
100°	Hot	3	3	3	3	3	2
Acetone	Boiling	1	1	3	1	1	1
Acetyl chloride	Cold	2	2	3	2	2	1
	Boiling	2	2	3	2	2	3
Concentrated Acetylene	at 20 °C	1	1	1	3	3	1
Commercial purity	at 20 °C	1	1	1	3	3	1
Acid-salt mixture							
10% H2So4 and							
10% CuSo4 5H20	Boiling	1	1	3	3	3	3
10% H2So4 and							
2% FeSo4. 7H20	Boiling	1	1	3	3	3	3
Copper acetate (saturated sol.)		1	1	3			2
Copper Carbonate (Doşmuş sol)							
50% NHwas dissolved in oH		1	1		3	3	
Copper chloride 1%	at 20 °C	2	1	3	3	3	3
1%	70 °C	3	3	3	3	3	3
Mixed with air at 1%	at 20 °C	2	1	3	3	3	3
5%	at 20 °C	3	2	3	3	3	3
with 5% air	at 20 °C	3	3	3	3	3	3
Copper cyanide (Sat.sol)	Boiling	1	1		3	3	2
Copper Nitrate							
Mixed with air at 1%	at 20 °C	1	1	3	3	3	3
Mixed with air at 5%	at 20 °C	1	1	3	3	3	3
50% water solution	Hot	1	3	3	2	2	3
Copper sulphate							
5% mixed	at 20 °C	1	1	3	2	2	3
Saturated Solution	Boiling	1	1	3	2	2	3
Barium Carbonate	at 20 °C	1	1	2	1	1	2
5% barium chloride-saturated	at 20 °C	1	1	3	2	2	2
Barium Hidroaksit, solution	Hot	1	1	2	1	1	2
Barium Nitrate Solution	Hot	1	1	2			
Barium Sulphat	at 20 °C	1	1		1	1	2
Barium Sulfide, Saturated	at 20 °C	1	1	3	3	3	

Chemical Composion	Temperature °C	304, 321	304L, 316L	Carbon Steel	Brass	Bronze	Monel
Benzene (benzol) Hot	at 20 °C	1	1	2	1	1	2
Benzoic Acid	at 20 °C	1	1	1	1	1	
Benzin	at 20 °C	1	1	2	1	1	1
Borax 5%	Hot	1	1	2	1	1	2
Boraxic Acid 5%	Hot or Cold	1	1				
Boric Acid							
5% solution Hot	at 20 °C	1	1	3	1	1	2
5% solution	Boiling	1	1	3	2	1	2
Saturated Solution	at 20 °C	1	1	3	3	2	2
Saturated Solution	Boiling	1	1	3	3	3	2
Bromine	at 20 °C	3	3	3	3	3	3
Steam		1	1	3	2	1	1
Butyl Acetate		1	1	2			2
Butyric Acid 5%	20 °C -65 °C	1	1	3	2	2	2
Solution	Boiling	1	1	3	3	3	2
Zinc	Molten	3	3	3	3	3	3
Zinc chloride	at 20 °C	1	1	3	3	3	2
	Boiling	2	2	3	3	3	2
Zinc Cyanide	at 20 °C	1	1	3			
Zinc nitrate		1	1	3			
Zinc Sulphat	20 °C, Boiling	1	1	3	3	2	2
Iron Hydroxide	at 20 °C	1	1	3			
Iron Nitrate	at 20 °C	1	1	3	3	3	3
Iron Sulphat	at 20 °C	1	1	3	3	3	3
Sea water	at 20 °C	1	1	3	2	2	1
Sewage		1	1		1	1	1
Dichloroethane	Boiling	1	1	3	3	3	2
Dinitrochlorobenzene	at 20 °C	1	1	3			
Apple juice	at 20 °C	1	1	2	1	1	1
Broth	Cold	1	1	3			2
Ether	at 20 °C	1	1	2	1	1	2
Ethyl Acetate	at 20 °C	1	1	2	1	1	2
Ethyl Chloride	at 20 °C	1	1	2	2	2	1
Ethylene chloride	at 20 °C	1	1	2	2	2	1
Ethylene Glycol	at 20 °C	1	1	2	1	1	1
Ferricloride							
1% solution	at 20 °C	2	1	3	3	3	3
1% solution	Boiling	3	3	3	3	3	3
5% solution	20th	3	3	3	3	3	3
Ferrocloride	20th	3	1	3	2	2	
Flor (Gas)	at 20 °C	3	3	3	3	3	3
Formaldehyde		1	1	2	1	1	1
Formic acid	20 °C -65 °C	2	1	3	2	2	2
Phosphoric Acid 1%	at 20 °C	1	1	3	3	3	2
1%	Boiling	1	1	3	3	3	2
1% -3 atm.	140 °C	1	1	3	3	3	2
5%	at 20 °C	1	1	3	3	3	2
Phosphoric Acid 10%	at 20 °C	3	1	3	3	3	2
10-50%	Boiling	1	1	3	3	3	3
80%	at 20 °C	3	3	3	3	3	2
80%	110 °C	3	3	3	3	3	3
85%	Boiling	3	3	3	3	3	3

Chemical Composion	Temperature °C	304, 321	304L, 316L	Carbon Steel	Brass	Bronze	Monel
Fuel-oil	Hot	1	1	2	1	1	2
Sulphuric Acid		3	2		3	3	2
Gallic acid	20 °C -100 °C	1	1	3			2
Glycerin		1	1	2	1	1	1
Silver Bromide		2	1	3	3	3	
Silver Chloride		3	3	3	3	3	3
Silver Nitrate		1	1	3	3	3	3
Hydrochloric acid	20 °C	3	3	3	3	3	3
Hydrofluoric Acid	20 °C	3	3	3	3	3	1
Hidroflosilisik Acid	20 °C	3	3	3	2	2	2
Hydrogen peroxide	20 °C	2	1	3	3	3	2
Hydrogen Sulphide	20 °C	2	1	2	1	1	3
Hypo-		1	1				
Lodine	20 °C	3	3	3	3	3	3
Lodoform	20 °C	1	1	3			2
Gelatin		1	1	3	1	1	1
Coffee	Boiling	1	3	1	1	1	1
Tin	molten	3	3	3	3	3	
Tin Chloride Solution	20 °C-Boiling	3	3	3	3	3	3
Calcium Carbonate	at 20 °C	1	1	1			1
Calcium Chlorate							
Dilute Solution	at 20 °C	1	1	2			2
Calcium Chloride							
Any solution	at 20 °C	2	1	3	2	2	3
Calcium Clorohypocloride							
(Bleaching powder) 1%	at 20 °C	3	3	3	2	2	3
5%	at 20 °C	3	3	3	2	2	3
Calcium Hypochloride 2%	at 20 °C	2	1	3	2	2	3
Calcium Sulfate, Saturated	at 20 °C	1	1	3	1	1	2
Carbonlik acid, Saturated, sol.	at 20 °C	1	1	3	3	1	3
Carboxylic acid	20 °C-Boiling	1	1	3	2	2	1
Carbonated water		1	1	3	2	2	3
Carbonbisulphite	at 20 °C	1	1	2	1	2	2
The carbon monoxide gas	760 °C -870 °C	1	1	1	3	3	1
Carbon tetrachloride	at 20 °C	1	1	2	1	1	1
Dry	Boiling	1	1	2	1	1	2
Commercial + 1% Water		3	3	3	2	2	2
Carnallite (KCl-MgCl2 6H2o)	Boiling	3	1				
Tar		1	1	2	1	1	2
Creosote	Hot	1	1	2	1	1	2
Tar	Hot	1	1	2	2	2	2
Kerosene	20 °C	1	1	2	1	1	2
Ketchup	20 °C -65 °C	1	1	3			2
Quinine Bisulphate		2	1	3			
Quinine Sulphate		1	1	3	2	2	2
Cola Syrup (pure)	20 °C	1	1	3			2
Clorasedic Acid	20 °C	3	3	3	3	2	2
Clorbenzol Sol.Pure.Dry	20 °C	1	1	2	2	2	2
Chloric acid	20 °C	3	3	3	3	3	3
Chlorine gas (dry)	20 °C	3	2	2	1	1	2
(Moist)	20 °C	3	3	3	3	3	3
Chlorinated water, saturated		3	2	3			2
Chloroform	20 °C	1	1	1	1	1	1

Chemical Composion	Temperature °C	304, 321	304L, 316L	Carbon Steel	Brass	Bronze	Monel
Chromic Acid 5%	20 °C	1	1	3	3	3	3
10%	20 °C	3	2	3	3	3	3
Commercial 50%	20 °C	3	3	3	3	3	3
Commercial 50%	Boiling	3	3	3	3	3	3
Chrome Plating Bath	20 °C	1	1	2			3
Sulphure, moist	20 °C	2	1	3	3	3	2
Molten	130 °C	1	1	3	3	3	1
Molten	445 °C	3	3	3	3	3	3
Sulfur Chloride		3	3	3	1	1	2
Sulfur Diosit, moist	20 °C	2	1	3	2	2	3
	300 °C	1	1	3	1	1	2
Lactic acid 1%	20 °C	1	1	3	2	2	2
1%	Boiling	1	1	3	3	3	2
5%	at 20 °C	1	1	3	2	2	2
5%	65 °C - Boiling	2	1	3	3	3	2
10%	at 20 °C	2	1	3	2	2	2
10%	65 °C - Boiling	3	2	3	3	3	2
Concentrated	at 20 °C	2	1	3	2	2	2
Concentrated	Boiling	3	3	3	3	3	3
Concentration smoky.	20 °C - 45 °C	1	1	3	3	3	3
Concentration smoky.	Boiling	3	3	3	3	3	3
Magnesium Sulphat		1	1	3	1	1	2
Yeast		1	1		3	3	1
Fruit Juices	at 20 °C	1	1	3	2	2	2
Ink	at 20 °C	2	1	3	3	3	1
Starch Solution		1	1				2
oxalic Acid 5-10%	20 °C - Boiling	1	1	3	3	2	2
10%	Boiling	3	3	3	3	2	2
25-50%	Boiling	3	3	3	3	2	1
oleic Acid	20 °C -200 °C	1	1	2	2	2	2
Paraffin		1	1	2	1	1	1
oil - Ether		1	1	2			2
Pitric Acid	at 20 °C	1	1	3	3	3	3
Potassium Bichromate 25%	at 20 °C	1	1		3	3	2
25%	Boiling	1	1		3	3	2
Potassium Bromide	at 20 °C	2	1	3	2	2	2
Potassium Carbonate 1%	at 20 °C	1	1	2	2	2	1
Potassium Chlorate	Boiling	1	1	2	3	3	3
Potassium chloride 1%	at 20 °C	1	1	3	3	2	1
5%	at 20 °C	1	1	3	3	2	1
Potassium Chromium Sulphate	at 20 °C	1	1	3	3	2	
Potassium Cyanide	at 20 °C	1	1	2	3	3	2
Potassium ferricyanide	at 20 °C	1	1	3			2
5% Potassium Hydroxide	at 20 °C	1	1	2	3	2	1
Potassium Hypochlorite	at 20 °C	2	2	3	3	3	3
1-50% Potassium Nitrate	at 20 °C	1	1	3	2	2	1
50%	Boiling	1	1	3			1
Molten	550 °C	1	1	3			
Potassium oxalat		1	1				
Potassium Permanganate 5%	20 °C	1	1	2			3
Potassium Sulphate		1	1	2	2	1	2
Potassium Sulphite		1	1	3			
Pirogallik Acid		1	1	2			

Chemical Composion	Temperature °C	304, 321	304L, 316L	Carbon Steel	Brass	Bronze	Monel
Soap	20 °C	1	1	2	1	1	1
Vegetable Juice		1	1	2	3	2	2
Cellulose		1	1				1
Liquid Adhesive	20 °C	1	1	1	2	2	2
Acid Solution	20 °C -60 °C	2	1	2	3	3	2
Vinegar	20 °C	1	1	3	3	2	3
Citric acid	20 °C -65 °C	1	1	3	2	1	2
15%	20 °C	1	1	3	3	2	2
15%-concentration	Boiling	2	1	3	3	2	3
Acid Cyanide	20 °C	1	1	3	3	3	2
Cyanide Gas	20 °C	1	1				
Sodium Acetate		1	1	3			2
Sodium bicarbonate	20 °C -65 °C	1	1	3	2	2	1
Sodium bisulphate	20 °C	1	1	3	3	2	2
Saturated Solution	20 °C	3	3	3	3	2	2
Sodium Carbonate 5%	20 °C -65 °C	1	1	2	2	2	1
5-50%	Boiling	1	1	2	2	2	1
Molten	900 °C	3	3	3	3	3	1
Sodium Chlorite	20 °C-Boiling	2	1	3	3	2	1
Sodium Cyanide	at 20 °C	1	1	2	3	3	
Sodium Fluoride	at 20 °C	2	1	3	1	1	1
Sodium Hypochloride		2	1	3	3	2	3
Sodium Hyposulphite	at 20 °C	1	1	3			1
Sodium Nitrate	Molten	1	1	2	1	1	2
Sodium perchlorate	20 °C-Boiling	1	1				
Sodium Phosphate	at 20 °C	1	1	2	2	2	2
Sodium Suphate	at 20 °C	1	1	3	1	1	1
Sodium Sulphide		2	1	3	3	3	2
Sodium Sulphide	20 °C -65 °C	1	1	3	3	2	2
Sodium Triosulphate	20 °C-Boiling	1	1	3	3	3	2
Stearic Acid	at 20 °C	1	1				
Strontium Hydroxide		1	1	3			2
Strontium Nitrate Solution		1	1	2	1	1	1
Water		3	2	3	3	2	3
5-10% sulphuric acid	at 20 °C	3	3	3	3	3	3
5-10%	Boiling	3	3	3	3	3	3
50%	at 20 °C	3	3	3	3	3	3
50%	Boiling	3	3	3	3	3	3
Concentrated	at 20 °C	1	1	3	3	2	3
Concentrated	Boiling	3	3	3	3	2	3
Concentrated	150 °C	3	3	3	3	1	3
Smoky	at 20 °C	3	2	3	3	2	3
Wine		1	1	3	3	3	2
Tenenli Acid	at 20 °C	1	1	3	2	3	1
	65 °C	1	1		2	1	3
Tartaric acid	20 °C - Boiling	2	1	3	2	1	2
Trichloroacetic acid	20 °C	3	3	3	3	2	3
Trichloroethylene	20 °C	1	1	3	1	1	1
Varnish	20 °C	1	1	2	1	1	1
Whiskey		1	1	3	2	1	1
Whole Milk	20 °C	1	1	3	3	3	2
oils, crude		1	1		2	2	1
oils, mineral, vegetable		1	1		2	2	1

t	p	v'	v''	h'	h''	r	s'	s''
°C	bar	dm^3/kg	m^3/kg	kJ/kg		kJ/kg	kJ/kg	
0	0.006108	1.0002	206.3	-0.04	2501.6	2501.6	-0.0002	9.1577
2	0.007055	1.0001	179.9	8.39	2505.2	2469.8	0.0306	9.1047
4	0.008129	1.0000	157.3	16.80	2508.9	2492.1	0.0611	9.0526
6	0.009345	1.0000	137.8	25.21	2512.6	2487.4	0.0913	9.0015
8	0.10720	1.0001	121.0	33.60	2516.2	2482.6	0.1213	8.9513
10	0.12270	1.0003	106.4	41.99	2519.9	2477.9	0.1510	8.9020
12	0.014014	1.0004	93.84	50.38	2523.6	2473.2	0.1805	8.8536
14	0.015973	1.0007	82.90	58.75	2527.2	2468.5	0.2098	8.8060
16	0.018168	1.0010	73.98	67.13	2530.9	2463.8	0.2388	8.7593
18	0.02062	1.0013	65.09	75.50	2434.5	2459.0	0.2677	8.7135
20	0.02337	1.0017	57.84	83.86	2538.2	2454.3	0.2963	8.6684
22	0.02642	1.0022	51.49	92.23	2541.8	2449.6	0.3247	8.6241
24	0.02982	1.0026	45.93	100.59	2545.5	2444.9	0.3530	8.5806
26	0.03360	1.0032	41.03	108.95	2549.1	2440.2	0.3810	8.5379
28	0.03778	1.0037	36.73	117.31	2552.7	2435.4	0.4088	8.4959
30	0.04241	1.0043	32.93	125.66	2556.4	2430.7	0.4365	8.4546
32	0.04753	1.0049	29.57	134.02	2560.0	2425.9	0.4640	8.4140
34	0.05318	1.0056	26.60	142.38	2563.6	2421.2	0.4913	8.3740
36	0.05940	1.0063	23.97	150.74	2567.2	2416.4	0.5184	8.3348
38	0.06624	1.0070	21.63	159.09	2570.8	2411.7	0.5453	8.2962
40	0.07375	1.0078	19.55	167.45	2574.4	2406.9	0.5721	8.2583
42	0.08198	1.0086	17.69	175.81	2577.9	2402.1	0.5987	8.2209
44	0.09100	1.0094	16.04	184.17	2581.5	2397.3	0.6252	8.1842
46	0.100866	1.0103	14.56	192.53	2585.1	2392.5	0.6514	8.1481
48	0.11162	1.0112	13.23	200.89	2588.6	2387.7	0.6776	8.1842
50	0.12335	1.0121	12.05	209.26	2592.2	2382.9	0.7035	8.0776
52	0.13613	1.0131	10.98	217.62	2595.7	2378.1	0.7293	8.0432
54	0.15002	1.0140	10.02	225.98	2599.2	2372.2	0.7550	8.0093
56	0.16511	1.0150	9.159	234.35	2602.7	2368.4	0.7804	7.9759
58	0.18147	1.0161	8.381	242.72	2606.2	2363.5	0.8058	7.9431
60	0.19920	1.0171	7.679	251.09	2609.7	2358.6	0.8310	7.9108
62	0.2184	1.0182	7.044	259.46	2613.2	2353.7	0.8560	7.8790
64	0.2391	1.0193	6.948	267.84	2616.9	2348.8	0.8809	7.8477
66	0.2615	1.0205	5.476	276.21	2620.1	2343.9	0.9057	7.8168
68	0.2856	1.0217	5.046	284.59	2623.5	2338.9	0.9303	7.7864
70	0.3116	1.0228	4.656	292.97	2626.9	2334.0	0.9548	7.7565
72	0.3396	1.0241	4.300	301.35	2630.3	2329.0	0.9792	7.7270
74	0.3696	1.0253	3.976	309.74	2633.7	2324.0	1.0034	7.6979
76	0.4019	1.0266	3.680	318.13	2637.1	2318.9	1.0275	7.6693
78	0.4365	1.0279	3.409	326.52	2640.4	2313.9	1.0514	7.6410
80	0.4736	1.0292	3.162	334.92	2643.8	2308.8	1.0753	7.6132
82	0.5133	1.0305	2.162	343.31	2647.1	2303.8	1.0990	7.5858
84	0.5557	1.0319	2.935	351.71	2650.4	2298.7	1.1225	7.5588
86	0.6011	1.0333	2.927	360.12	2653.6	2293.5	1.1460	7.5321
88	0.6495	1.0347	2.536	368.53	2656.9	2288.4	1.1693	7.5058
90	0.7011	1.0361	2.361	376.94	2660.1	2283.2	1.1925	7.4799
92	0.7561	1.0376	2.200	385.36	2663.4	2278.0	1.2156	7.4543
94	0.8146	1.0391	2.052	393.78	2666.6	2272.8	1.2386	7.4291
96	0.8769	1.0406	1.915	402.20	2669.7	2267.5	1.2615	7.4042
98	0.9430	1.0421	1.789	410.63	2672.9	2262.2	1.2842	7.3796

t °C	p bar	v' dm^3/kg	v'' m^3/kg	h' kJ/kg	h'' kJ/kg	r kJ/kg	s' kJ/kg	s'' kJ/kg
100	1.0133	1.0437	1.673	419.06	419.06	2258.9	1.3069	7.3554
105	1.2080	1.0477	1.419	440.17	440.17	2243.6	1.3630	7.2962
110	1.4327	1.0519	1.210	461.32	461.32	2230.0	1.4185	7.2388
115	1.6909	1.0562	1.036	482.50	482.50	2216.2	1.4733	7.1832
120	1.9854	1.0606	0.8915	503.72	503.72	2202.2	1.5276	7.1293
125	2.3210	1.0652	0.7702	524.99	524.99	2188.0	1.5276	7.0769
130	2.7013	1.0700	0.6681	546.31	546.31	2173.6	1.5813	7.0261
135	3.131	1.0750	0.5818	567.68	567.68	2158.9	1.6344	6.9766
140	3.614	1.0801	0.5085	589.10	589.10	2144.0	1.6869	6.9284
145	4.155	1.0853	0.4460	610.60	610.60	2128.0	1.7390	6.8815
150	4.760	1.0908	0.3924	632.15	632.15	2113.2	1.7906	6.8358
155	5.433	1.0964	0.3464	653.78	653.78	2097.4	1.8416	6.7911
160	6.181	1.1022	0.3068	675.47	675.47	2081.3	1.8923	6.7475
165	7.008	1.1082	0.2724	697.25	697.25	2064.8	1.9425	6.7048
170	7.920	1.1145	0.2165	719.12	719.12	2047.9	1.9923	6.6630
175	8.924	1.1209	0.1938	741.07	741.07	2030.7	2.0416	6.6221
180	10.027	1.1275	0.1739	763.12	762.12	2013.1	2.0906	6.5819
185	11.233	1.1344	0.1563	785.26	785.26	1995.2	2.1393	6.5424
190	12.551	1.1415	0.1408	807.52	807.52	1976.7	2.1876	6.5036
195	13.987	1.1589	0.1272	829.88	829.88	1957.9	2.2356	6.4654
200	15.549	1.1565	0.1150	852.37	852.37	1938.6	2.2833	6.4278
205	17.243	1.1644	0.1042	874.99	874.99	1918.8	2.3307	6.3906
210	19.077	1.1726	0.0946	897.74	897.74	1898.5	2.3778	6.3539
215	21.060	1.1811	0.0860	920.63	920.63	1877.6	2.4247	6.3176
220	23.198	1.1900	0.0784	943.67	943.67	1856.2	2.4713	6.2817
225	25.501	1.1992	0.0715	966.89	966.89	1834.3	2.5178	6.2461
230	27.976	1.2087	0.0653	990.26	990.26	1811.7	2.5641	6.2107
235	30.632	1.2187	0.0597	1013.8	1013.8	1788.5	2.6102	6.1756
240	33.478	1.2291	0.0546	1097.6	1037.6	1764.6	2.6562	6.1408
245	36.523	1.2399	0.0500	1061.6	1061.6	1740.0	7020	6.1057
250	39.776	1.2513	0.0459	1085.8	1085.8	1714.6	2.7478	6.0709
255	43.246	1.2632	0.0421	1110.2	1110.2	1688.5	2.7935	6.0359
260	46.943	1.2756	0.0387	1134.9	1134.9	1661.5	2.8392	6.0010
265	50.877	1.2887	0.0356	1159.2	1159.9	1633.6	2.8848	59658
270	55.058	1.3025	0.0327	1185.2	1185.2	1604.6	2.9306	5.9304
275	59.496	1.3170	0.0301	1210.9	1210.9	1574.7	2.9763	5.8947
280	64.202	1.3324	0.0277	1236.8	1236.8	1543.6	3.0223	5.8586
285	69.186	1.3487	0.0255	1263.2	1263.2	1511.3	3.0683	5.8220
290	74.037	1.3659	0.0235	1290.0	1290.0	1477.6	3.1146	5.7848
295	80.037	1.3844	0.0217	1317.3	1317.3	1442.6	3.1611	5.7469
300	85.927	1.4041	0.0183	1345.0	1345.0	1406.0	3.2079	5.7069
310	98.700	1.4480	0.0155	1402.4	1402.4	1327.6	3.2512	5.7081
320	112.89	1.4995	0.0130	1462.6	1462.6	1241.1	3.4500	5.6278
330	128.63	1.5615	0.0130	1526.6	1526.5	1143.6	3.5528	5.4490
340	146.05	1.6387	0.0108	1595.5	1595.5	1030.7	3.6616	5.3427
350	165.35	1.7411	0.0088	1671.9	1671.9	895.7	3.7800	5.2177
360	186.75	1.8959	0.0069	1764.2	1764.2	721.3	3.9210	5.0600
370	210.54	2.2136	0.0050	1890.2	1890.2	452.6	4.1108	4.8144
374.15	221.20	3.17	0.0032	2107.4	2107.4	0.0	4.4429	4.4429

t = temperature v = specific volume of fluid h ' = liquid enthalpy r = the heat of vaporization s' = liquid entropy
p = pressure v'' = specific volume of steam h'' = gas enthalpy s'' = gas entropy

t °C	p bar	v' dm³/kg	v'' m³/kg	h' kJ/kg	h'' kJ/kg	r kJ/kg	s' kJ/kg	s'' kJ/kg
0.010	6.9808	1.0001	129.20	29.34	2514.4	2485.0	0.1060	8.9767
0.015	13.036	1.0006	87.98	54.71	2525.5	2470.7	0.1957	8.8288
0.020	17.513	1.0012	67.01	73.46	2533.6	2460.2	0.2607	8.7246
0.025	21.096	1.0020	54.26	88.45	2540.2	2451.7	0.3119	8.6440
0.030	24.100	1.0027	45.67	101.00	2545.6	2444.6	0.3544	8.5785
0.035	26.694	1.0033	39.48	111.85	2550.4	2438.5	0.3907	8.5232
0.040	28.983	1.0040	34.80	121.41	2554.5	2433.1	0.4225	8.4755
0.045	31.035	1.0046	31.14	129.99	2558.2	2428.2	0.4507	8.4335
0.050	32.898	1.0052	28.19	137.77	2561.6	2423.8	0.4763	8.3960
0.055	34.605	1.0058	25.77	144.91	2564.7	2419.8	0.4995	8.3621
0.060	36.183	1.0064	23.74	151.50	2567.5	2416.0	0.5209	8.3312
0.065	37.651	1.0069	22.02	157.64	2570.2	2412.5	0.5407	8.3029
0.070	39.025	1.0074	20.53	163.38	2572.6	2409.2	0.5591	8.2767
0.075	40.316	1.0079	19.24	168.77	2574.9	2406.2	0.5763	8.2523
0.080	41.534	1.0084	18.10	173.86	2577.4	2403.2	0.5925	8.2296
0.085	42.689	1.0089	17.10	178.69	2579.2	2400.5	0.6079	8.2082
0.090	43.787	1.0094	16.20	183.28	2581.1	2397.9	0.6224	8.1881
0.095	44.833	1.0098	15.40	187.65	2583.0	2395.3	0.6361	8.1691
0.10	45.833	1.0102	14.67	191.83	2584.8	2392.9	0.6493	8.1511
0.12	49.446	1.0119	12.36	206.94	2591.2	2384.3	0.6963	8.0872
0.14	52.574	1.0133	10.69	220.02	2596.7	2376.7	0.7367	8.0334
0.16	55.341	1.0147	9.433	231.59	2601.6	2370.0	0.7721	7.9869
0.18	57.826	1.0160	8.445	241.99	2605.9	2363.9	0.8036	7.9460
0.20	60.086	1.0172	7.650	251.45	2609.9	2358.4	0.8321	7.9094
0.25	64.992	1.0199	6.204	271.99	2618.3	2346.4	0.8932	7.8323
0.30	69.124	1.0223	5.229	289.30	2625.4	2336.1	0.9441	7.7695
0.40	75.886	1.0265	3.993	317.65	2636.9	2319.2	1.0261	7.6709
0.45	78.743	1.0284	3.576	329.64	2641.7	2312.0	1.0603	7.6307
0.50	81.345	1.0301	3.240	340.56	2646.0	2205.4	1.0912	7.5947
0.55	83.737	1.0317	2.964	350.61	2649.9	2299.3	1.1194	7.5623
0.60	85.954	1.0333	2.732	359.93	2653.6	2293.6	1.1454	7.5327
0.65	88.021	1.0347	2.535	368.62	2656.9	2288.3	1.1696	7.5055
0.70	89.959	1.0361	2.365	376.77	2660.1	2283.3	1.1921	7.4804
0.75	91.785	1.0375	2.217	384.45	2663.0	2278.6	1.2131	7.4570
0.80	93.512	1.0387	2.087	391.72	2665.8	2274.0	1.2330	7.4352
0.85	95.152	1.0400	1.972	398.63	2668.4	2269.8	1.2518	7.4147
0.90	96.713	1.0412	1.869	405.21	2670.9	2265.6	1.2696	7.3954
1.0	99.632	1.0434	1.694	417.51	2675.4	2257.9	1.3027	7.3598
1.5	111.37	1.0530	1.159	467.13	2693.4	2226.2	1.4336	7.2234
2.0	120.23	1.0608	0.8854	504.70	2706.3	2201.6	1.5301	7.1268
2.5	127.43	1.06675	0.7184	535.34	2716.4	2181.0	1.6071	7.0520
3.0	133.54	1.0735	0.6056	561.43	2724.7	2163.2	1.6716	6.9909
3.5	138.87	1.0789	0.5240	584.27	2731.6	2147.4	1.7273	6.9392
4.0	143.62	1.0839	0.4622	604.67	2737.6	2133.0	1.7764	6.8943
4.5	147.92	1.0885	0.4138	623.16	2742.9	2119.7	1.8204	6.8547
5.0	151.84	1.0928	0.3747	640.12	2747.5	2107.4	1.8604	6.8192
6.0	158.84	1.1009	0.3155	670.42	2755.5	2085.0	1.9308	6.7575
7.0	164.96	1.1082	0.2727	697.06	2762.0	2064.9	1.9918	6.7052
8.0	170.41	1.1150	0.2403	720.94	2767.5	2046.5	2.0457	6.6596
9.0	175.36	1.1213	0.2148	742.64	2772.1	2029.5	2.0941	6.6192
10.0	179.88	1.1274	0.1943	762.61	2776.2	2013.6	2.1382	6.5828

t °C	p bar	v' dm³/kg	v'' m³/kg	h' kJ/kg	h'' kJ/kg	r kJ/kg	s' kJ/kg	s'' kJ/kg
11	184.07	1.1331	0.1774	781.13	2779.7	1998.5	2.1786	6.5497
12	187.96	1.1386	0.1632	798.43	2782.7	1984.3	2.2161	6.5194
13	191.61	1.1438	0.1511	814.70	2785.4	1970.7	2.2510	6.4913
14	195.04	1.1489	0.1407	830.08	2787.8	1957.7	2.2837	6.4651
15	198.29	1.1539	0.1317	844.67	2789.9	1945.2	2.3145	6.4406
16	201.37	1.1586	0.1237	858.56	2731.7	1933.2	2.3436	6.4175
17	204.31	1.1633	0.1166	871.84	2739.4	1921.5	2.3713	6.3957
18	207.11	1.1678	0.1103	884.58	2794.8	1910.3	2.3976	6.3751
19	209.80	1.1723	0.1047	896.81	2796.1	1899.3	2.4228	6.3554
20	212.37	1.1766	0.09954	908.59	2791.2	1888.6	2.4469	6.3367
21	214.85	1.1809	0.09489	919.96	2798.2	1878.2	2.4700	6.3187
22	217.24	1.1850	0.09065	930.95	2799.1	1868.1	2.4922	6.3015
23	219.55	1.1892	0.08677	941.60	2799.8	1858.2	2.5136	6.2849
24	221.78	1.1932	0.08320	651.93	2800.4	1848.5	2.5343	6.2690
25	223.94	1.1972	0.07991	961.96	2800.9	1839.0	2.5543	6.2536
26	226.04	1.2011	0.07686	971.72	2801.4	1829.6	2.5736	6.2387
28	230.05	1.2088	0.07139	990.48	2802.0	1811.5	2.6106	6.2104
29	233.84	1.2163	0.06663	1008.4	2802.3	1793.9	2.6455	6.1837
30	237.45	1.2237	0.06244	1025.4	2802.3	1776.9	2.6786	6.1585
32	240.88	1.2310	0.05873	1041.8	2802.1	1760.3	2.7101	6.1344
34	244.16	1.2381	0.05541	1057.6	2802.7	1744.2	2.7401	6.11115
36	247.31	1.2451	0.05244	1072.7	2801.1	1728.4	2.7689	6.0896
38	250.33	1.2521	0.04975	1087.4	2800.3	1712.9	2.7965	6.0685
40	257.41	1.2691	0.04404	1122.1	2797.7	1675.6	2.8612	6.0191
45	263.91	1.2858	0.03943	1154.5	2794.2	1639.7	2.9206	5.9735
50	269.93	1.3023	0.035.63	1184.9	2789.9	1605.0	2.9757	5.9309
55	275.55	1.3187	0.032.44	1213.7	2785.0	1571.3	2.0273	5.8908
60	280.82	1.3350	0.02972	1241.1	2779.5	1538.4	3.0759	5.8527
65	285.79	1.3513	0.02737	1267.4	2773.5	1506.0	3.1219	5.8162
70	290.50	1.3677	0.02533	1292.7	2766.9	1474.2	3.1657	5.7811
75	294.97	1.3842	0.02353	1317.1	2759.9	14422.8	3.2076	5.7471
80	299.23	1.4009	0.02193	1340.7	2752.5	1411.7	3.2479	5.7141
85	303.31	1.4179	0.02050	1363.7	2744.6	1380.9	3.2867	5.6820
90	307.21	1.4351	0.01921	1386.1	2736.4	1350.2	3.3242	5.6506
95	310.96	1.4526	0.01804	1408.0	2727.7	1319.7	3.3605	5.6198
100	318.05	1.4887	0.01601	1450.6	2709.3	1258.7	3.4304	5.5595
110	324.65	1.5268	0.01428	1491.8	2689.2	1197.4	3.4972	5.5002
120	330.83	1.5672	0.01280	1532.0	2667.0	1135.0	3.5616	5.4408
130	336.64	1.6106	0.01150	1571.6	2642.4	1070.7	3.6242	5.3803
140	342.13	1.6579	0.01034	1611.0	2615.0	1004.0	3.6859	5.3178
150	347.33	1.7103	0.009308	1650.5	2584.9	934.3	3.7471	5.2531
160	352.26	1.7696	0.008371	1691.7	2551.6	859.9	3.8107	5.1855
170	356.96	1.8399	0.007498	1734.8	2513.9	779.1	3.8765	4.1128
180	361.43	1.9260	0.006678	1778.7	2470.6	692.0	3.9429	4.0332
190	365.70	2.0370	0.005877	1826.5	2418.4	591.9	4.0149	4.9412
200	369.78	2.2015	0.005023	1886.3	2347.6	461.3	4.1048	4.8223
210	373.69	2.6714	0.003728	2011.1	2195.6	184.5	4.2947	4.5799
220	374.15	3.17	0.00317	2107.4	2107.4	0	4.4429	4.4429
221.2								

Pipe Dimensions and Weights

Note: °C. = 5/9 (°F.-32); °F. = 9/5 °C.+32

Nominal Dia. Outer Dia. mm - inch		Type and Schedule Number			Wall Thickness mm - inch		Cross Section Area cm^2	Moment of Inertia cm^4 - $inch^4$		Cross Area Module cm^3 - $inch^3$		Pipe Weight kg/m lb./ft.		Water Weight kg/m lb./ft.	
15	1/2″	Std.	40	40S	2.769	0.109	1.96	0.7078	0.0171	0.6639	0.0407	1.265	0.851	0.196	0.132
21.336	0.840	XS	80	80S	3.734	0.147	1.51	0.8325	0.0201	0.7809	0.0478	1.618	1.09	0.151	0.101
			160		4.750	0.187	1.10	0.9191	0.0221	0.8621	0.0527	1.949	1.30	0.110	0.074
		XXS			7.468	0.294	0.32	1.0043	0.243	0.9421	0.0577	2.551	1.72	0.032	0.022
20	3/4″	Std.	40	40S	2.870	0.113	3.44	1.5385	0.0370	1.1541	0.0706	1.682	1.13	0.344	0.231
26.670	1.050	XS	80	80S	3.912	0.154	2.79	1.8602	0.0448	1.3954	0.0853	2.192	1.47	0.279	0.187
			160		5.537	0.218	1.91	2.1921	0.0527	1.6444	0.100	2.887	1.94	0.191	0.128
		XXS			7.823	0.308	0.95	2.4059	0.0579	1.8048	0.110	3.631	2.44	0.095	0.064
25	1″	Std.	40	40S	3.378	0.133	5.59	3.0274	0.0874	2.1600	0.133	2.494	1.68	0.559	0.374
33.401	1.315	XS	80	80S	4.547	0.179	4.04	4.3894	0.106	2.6284	0.161	3.229	2.17	0.404	0.311
			160		6.350	0.250	3.36	5.2049	0.125	3.1167	0.190	4.233	2.84	0.336	0.226
		XXS			9.093	0.358	1.81	5.8424	0.141	3.4984	0.214	5.446	3.66	0.181	0.122
32	1 1/4″	Std.	40	40S	3.556	0.140	9.64	8.0872	0.195	3.8364	0.235	3.378	2.27	0.964	0.65
42.164	1.660	XS	80	80S	4.851	0.191	8.27	10.0535	0.242	4.7691	0.291	4.460	3.00	0.827	0.56
			160		6.350	0.250	6.81	11.8048	0.284	5.6000	0.342	5.604	3.76	0.681	0.46
		XXS			9.703	0.382	3.06	14.1836	0.341	6.7285	0.411	7.760	5.22	0.306	0.27
40	1 1/2	Std.	40	40S	3.683	0.145	13.13	12.8837	0.310	5.3392	0.326	4.043	2.72	1.313	0.88
48.260	1.900	XS	80	80S	5.080	0.200	11.39	16.2745	0.391	6.7445	0.412	5.406	3.63	1.139	0.77
			160		7.137	0.281	9.07	20.0562	0.483	8.3117	0.508	7.228	4.87	0.907	0.61
		XXS			10.160	0.400	6.12	23.6220	0.568	9.7893	0.598	9.541	6.41	0.612	0.41
50	2″	Std.	40	40S	3.912	0.154	21.63	27.679	0.666	9.177	0.561	5.43	3.65	2.163	1.45
60.325	2.375	XS	80	80S	5.537	0.218	19.04	36.063	0.868	11.957	0.731	7.46	5.02	1.904	1.28
			160		8.730	0.343	14.42	48.395	1.16	16.046	0.979	11.10	7.45	1.442	0.97
		XXS			11.074	0.436	11.44	54.526	1.31	18.078	1.10	13.44	9.03	1.144	0.77
65	2 1/2″	Std.	40	40S	5.156	0.203	30.88	63.559	1.53	17.408	1.06	8.61	5.79	3.0888	2.08
73.025	2.875	XS	80	80S	7.010	0.276	27.32	80.030	1.93	21.920	1.34	11.40	7.66	2.732	1.84
			160		9.525	0.375	22.84	97.825	2.35	26.794	1.64	14.90	10.0	2.284	1.54
		XXS			14.021	0.552	15.89	119.398	2.87	32.702	2.00	20.38	13.7	1.589	1.07
80	3″	Std.	40	40S	5.186	0.216	47.68	125.400	3.02	28.211	1.72	11.26	7.58	4.768	3.20
88.900	3.500	XS	80	80S	7.020	0.300	42.59	161.012	3.90	36.448	2.23	15.26	10.3	4.259	2.86
			160		11.120	0.438	34.88	209.573	5.04	47.148	2.88	21.28	14.3	3.488	2.34
		XXS			15.240	0.600	26.79	249.300	5.99	56.085	3.43	27.67	18.6	2.679	1.80
100	4″	Std.	40	40S	6.010	0.237	82.12	300.480	7.23	52.577	3.21	16.04	10.8	8.212	5.51
114.300	4.500	XS	80	80S	8.550	0.337	74.16	399.460	9.61	69.896	4.27	22.28	15.3	7.416	4.98
			120		11.120	0.438	66.52	485.000	11.7	84.804	5.18	28.28	19.0	6.652	4.47
			160		13.487	0.531	59.88	551.900	13.3	96.570	5.90	33.49	22.5	5.988	4.02
		XXS			17.110	0.674	50.34	635.63	15.3	112.213	6.79	40.98	27.5	5.034	3.38
125	5″	Std.	40	40S	6.553	0.258	129.01	630.50	15.2	89.240	5.45	21.75	14.6	12.901	8.66
141.300	5.563	XS	80	80S	9.525	0.375	117.33	859.50	20.7	121.650	7.43	20.92	20.8	11.733	7.88
			120		12.700	0.500	105.44	1070.50	25.7	151.640	9.25	40.25	27.0	10.554	7.09
			160		15.875	0.625	94.46	1245.20	30.0	186.240	10.8	48.87	33.0	9.446	6.33
		XXS			19.050	0.750	83.60	1399.26	33.6	208.050	12.1	57.40	38.6	8.360	5.62

Pipe Dimensions and Weights

Note: °C. = 5/9 (°F.-32); °F. = 9/5 °C.+32

Nominal Dia. Outer Dia. mm - inch		Type and Schedule Number			Wall Thickness mm - inch		Cross Section Area cm^2	Moment of Inertia cm^4 - $inch^4$		Cross Area Module cm^3 - $inch^3$		Pipe Weight kg/m lb./ft.		Water Weight kg/m lb./ft.	
150	6″	Std.	40	40S	7.112	0.280	186.20	1170.30	28.1	149.100	8.50	28.24	19.0	18.620	12.5
			80	80S	10.973	0.432	168.06	1683.60	40.5	210.110	12.1	42.53	28.6	16.806	11.3
168.275	6.625		120		14.275	0.562	153.24	2062.70	49.6	255.180	15.0	54.16	36.4	15.324	10.3
			160		18.260	0.718	136.24	24.54.70	59.0	281.770	17.8	67.51	45.3	13.624	9.16
		XXS			21.946	0.864	121.44	2758.30	66.3	337.860	20.0	79.12	53.2	12.144	8.14
200	8″		20		6.350	0.250	333.9	2400.8	57.7	219.19	13.4	33.29	22.4	33.390	22.5
			30		7.036	0.277	329.8	2633.0	63.4	240.39	14.7	36.74	24.7	32.980	22.2
		Std.	40	40S	8.179	0.322	322.5	3012.1	72.5	275.00	16.8	42.66	28.6	32.250	21.7
			60		10.312	0.406	309.1	3690.0	88.3	356.89	20.6	53.05	35.6	30.910	20.8
219.075	8.625	XS	80	80S	12.700	0.500	294.4	4397.0	106	401.44	24.5	64.59	43.4	29.440	19.8
			100		15.080	0.593	280.1	5050.9	154	461.14	28.1	75.82	50.9	28.010	18.8
			120		18.260	0.718	261.5	5850.7	141	534.16	32.6	90.37	60.6	26.150	17.6
			140		20.625	0.812	248.2	6392.6	154	583.63	35.6	100.85	67.8	24.820	16.7
		XXS			22.225	0.875	239.3	6736.3	162	615.01	37.6	107.80	72.4	23.930	16.1
			160		23.012	0.906	235.0	6899.1	166	629.88	38.5	111.19	74.7	23.500	15.8
250	10″		20		6.350	0.250	532.0	4730.2	114	346.48	21.2	41.74	28.0	53.200	35.7
			30		7.798	0.307	520.3	5711.0	138	418.30	25.6	50.93	34.2	52.030	34.9
		Std.	40	40S	9.271	0.365	508.4	6685.4	161	489.70	29.9	60.27	40.5	50.840	34.1
		XS	60		12.700	0.500	484.7	8558.8	212	626.92	39.4	78.86	54.7	48.470	32.3
273.050	10.750		80	80S	15.080	0.593	463.0	10194.8	245	746.78	45.5	95.88	64.3	46.300	31.1
			100		18.260	0.718	439.1	11914.1	286	872.69	53.2	114.67	76.9	43.910	29.5
			120		21.430	0.843	415.9	13495.3	324	988.52	60.3	132.90	89.2	41.590	27.9
			140		25.400	1.000	387.7	15299.6	368	1120.68	68.4	155.04	104	38.770	26.0
			160		28.575	1.125	365.9	16608.0	399	1216.52	74.3	172.16	116	36.590	24.6
300	12″		20		6.350	0.250	759.9	7979.5	192	492.80	30.0	49.69	33.4	75.990	51.1
			30		8.382	0.330	740.2	10342.8	249	638.14	39.0	65.16	43.8	74.020	49.7
		Std.		40S	9.525	0.375	729.2	11614.2	279	717.28	43.8	73.75	49.6	72.920	49.0
			40		10.312	0.406	721.7	124.85.4	300	771.08	47.1	79.67	53.5	72.170	48.5
		XS		80S	12.700	0.500	699.1	150.39.5	362	928.82	56.7	97.40	65.4	69.910	47.0
323.850	12.750		60		14.275	0.562	684.5	16651.8	401	1028.39	62.8	108.88	73.2	68.450	46.0
			80		17.470	0.687	655.1	19782.4	475	1221.73	74.5	131.90	88.5	65.510	44.0
			100		21..430	0.843	619.7	23378.9	562	1443.85	88.1	159.74	107	61.970	41.6
			120		25.400	1.000	585.2	26691.8	642	1648.45	101	186.80	125	58.520	39.3
			140		28.575	1.125	558.3	29137.6	701	1799.50	110	207.93	140	55.830	37.5
			160		33.325	1.312	519.2	32486.8	781	2006.53	123	238.60	160	51.920	34.9

Pipe Dimensions and Weights

Note: °C. = 5/9 (°F.-32); °F. = 9/5 °C.+32

Nominal Dia. Outer Dia. mm - inch		Type and Schedule Number		Wall Thickness mm - inch		Cross Section Area cm^2	Moment of Inertia cm^4 - $inch^4$		Cross Area Module cm^3 - $inch^3$		Pipe Weight kg/m lb./ft.		Water Weight kg/m lb./ft.	
350	14"		10	6.350	0.250	923.0	11006	255	619.06	36.5	54.6	36.7	92.300	62.0
355.600	14.00		20	7.925	0.312	906.0	13006	315	736.04	45.0	67.9	45.7	90.600	60.6
		Std.	30	9.525	0.675	889.0	15515	373	872.62	53.3	81.2	54.6	88.900	59.7
			40	11.100	0.438	872.5	17831	429	1002.09	61.4	94.2	63.4	87.250	58.6
		XS		12.700	0.500	855.9	20125	484	1131.00	69.1	107.3	72.1	85.590	57.5
			60	15.062	0.593	831.5	23456	562	1319.27	80.3	126.4	84.9	83.150	55.9
			80	19.050	0.750	791.3	28593	687	1608.20	98.2	158.0	106	79.130	53.1
			100	23.800	0.937	744.6	34298	825	1929.03	118	194.6	131	74.460	50.0
			120	27.787	1.093	706.5	38699	930	2178.55	133	224.5	151	70.650	47.5
			140	31.750	1.250	669.7	42733	1030	2403.45	147	253.4	170	66.970	45.0
			180	35.712	1.406	533.8	46461	1120	2613.13	160	281.6	189	63.380	42.6
400	16"		10	6.350	0.250	1216.7	15961	384	785.4	48.0	62.6	42.1	121.870	81.7
406.400	16.00		20	7.925	0.312	1197.4	19676	474	968.3	59.3	77.7	52.3	119.740	80.5
		Std.	30	9.525	0.375	1177.7	23372	562	1150.1	70.3	93.1	62.6	117.770	79.7
			40	12.700	0.500	1139.5	30450	732	1498.5	91.5	123.2	82.8	113.950	73.5
		XS	60	16.662	0.656	1092.6	38782	933	1908.5	117	160.0	108	109.260	73.4
			80	21.430	0.843	1037.4	48137	1150	2368.9	145	203.3	136	130.740	69.7
			100	26.187	1.031	983.9	56750	1370	2792.8	171	245.3	165	98.390	66.14
			120	30.960	1.218	931.5	64744	1560	3186.2	195	286.5	192	93.150	62.6
			140	36.520	1.438	872.3	73243	1760	3604.4	220	332.9	224	87.230	58.6
			160	40.480	1.593	631.4	78799	1890	3877.9	237	365.1	245	63.140	55.9
450	18"		10	6.350	0.250	1551.0	22845	549	999.3	61.0	70.5	47.4	155.1	104
457.200	18.000	Std.	20	7.925	0.312	1529.1	20200	679	1233.5	75.5	87.7	59.0	152.9	103
		XS		9.525	0.375	1507.0	33541	807	1467.2	89.6	105.0	70.6	150.7	101.4
			30	11.120	0.438	1485.1	38766	932	1695.8	104	122.2	82.2	148.5	99.7
				12.700	0.500	1403.6	43814	1050	1916.6	117	139.1	93.5	140.4	98.9
			40	14.270	0.562	1442.4	40716	1170	2131.0	130	155.7	105	144.2	96.9
			60	19.050	0.750	1378.8	63012	1520	2756.4	168	205.7	136	137.9	92.6
			80	23.850	0.937	1316.7	86330	1830	3339.0	204	254.4	171	131.7	88.5
			100	29.362	1.156	1246.4	90573	2180	3966.4	242	309.6	208	127.7	83.7
			120	34.920	1.375	1177.8	103914	2500	4545.6	278	363.4	244	117.8	79.1
			140	39.675	1.562	1129.8	114358	2750	5902.5	306	408.2	274	113.0	75.3
			160	44.230	1.781	1055.4	125622	3020	5495.2	336	459.2	309	150.5	70.9

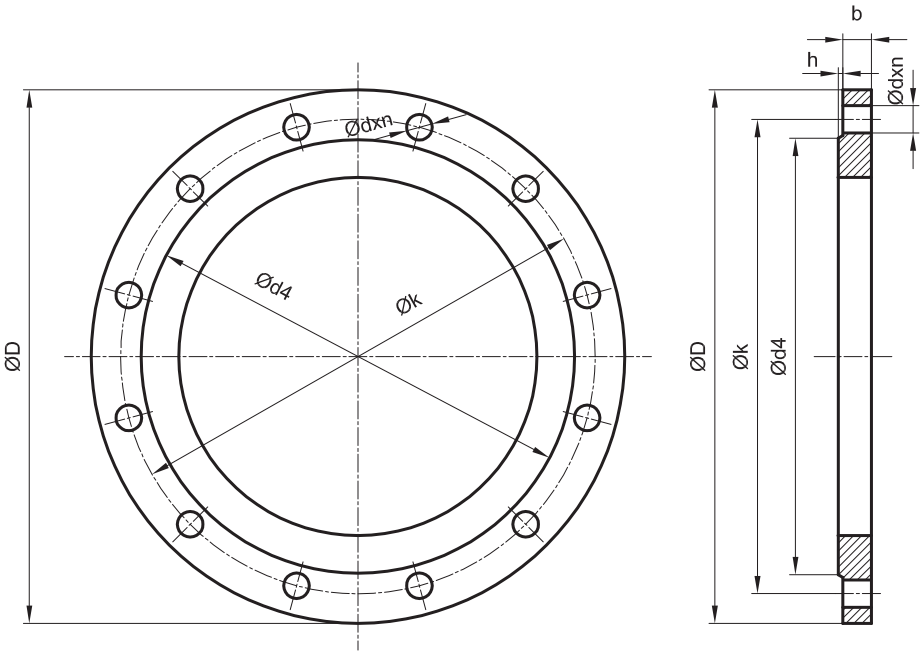
Pipe Dimensions and Weights

Note: °C. = 5/9 (°F.-32); °F. = 9/5 °C.+32

Nominal Dia. Outer Dia. mm - inch		Type and Schedule Number		Wall Thickness mm - inch		Cross Section Area cm^2	Moment of Inertia cm^4 - $inch^4$		Cross Area Module cm^3 - $inch^3$		Pipe Weight kg/m lb./ft.		Water Weight kg/m lb./ft.	
500 508.000	20" 20.000		10	0.350	0.250	1925	32469	757	1238.9	75.7	78.5	52.7	192.5	129
		Std.	20	9.525	0.375	1876	46300	1110	1822.8	111	116.9	78.6	187.6	126
		XS	30	12.700	0.500	1828	60844	1460	2595.4	146	155.3	104	182.8	123
			40	15.080	0.593	1792	70954	1700	2793.4	170	182.0	123	179.2	120
			60	20.625	0.812	1710	93688	2260	3695.5	226	247.7	166	171.0	115
			80	26.187	1.031	1629	115277	2770	4538.4	277	310.9	209	162.9	109
			100	32.537	1.281	1540	137866	3320	5428.5	323	362.0	256	154.0	103
			120	38.100	1.500	1463	158180	3760	6148.6	376	441.2	296	146.3	98.3
			140	44.450	1.750	1378	175353	4220	6904.6	422	507.8	341	137.8	92.6
			160	50.010	1.968	1306	190814	4590	7512.3	459	564.5	379	130.6	87.8
600 609.600	24" 24.000		10	6.350	0.250	2796	54720	1320	1795.2	110	94.4	63.4	279.6	188
		Std.	20	9.525	0.375	2736	81409	1940	2670.8	162	141.9	94.6	273.6	184
		XS		12.700	0.500	2679	106057	2550	6479.5	213	186.8	125	267.9	180
			30	14.275	0.562	2650	118245	2840	3879.4	237	209.4	141	265.0	178
			40	17.470	0.587	2592	142482	3420	4674.6	285	254.9	171	259.2	174
			60	24.610	0.968	2465	193715	4650	6355.4	388	354.8	238	246.5	166
			80	30.960	1.218	2354	236108	5670	7746.2	473	441.5	296	235.4	158
			100	38.880	1.531	2221	284586	6850	9336.8	571	548.0	367	222.1	149
			120	46.020	1.812	2102	325490	7820	10678.8	652	639.2	429	210.2	141
			140	52.375	2.062	2000	358793	8630	11771.4	719	719.3	483	200.0	134
			160	59.530	2.343	1888	393448	9460	12900.3	799	807.1	542	188.8	127
750 762.00	30" 30.000		10	7.92	0.312	4370	132984	3210	3490.3	214	147.45	98.9	437.0	294
		Std.		9.52	0.375	4333	158910	3830	4170.8	255	176.57	119	433.3	291
			20	12.70	0.500	4259	209766	5040	5505.6	336	234.44	157	425.9	286
			30	15.88	0.625	4185	259313	6220	6806.1	415	291.11	196	418.5	281

Flange Table

ANSI



ANSI 150

h = 1/16 (1.6 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	3 1/2	88.9	1 3/8	34.9	2 3/8	60.3	3/8	9.5	5/8	15.9	4	1/2 1/2
3/4	3 7/8	98.4	1 11/16	42.9	2 3/4	69.9	3/8	9.5	5/8	15.9	4	1/2
1	4 1/4	108.0	2	50.8	3 1/8	79.4	3/8	9.5	5/8	15.9	4	1/2
1 1/4	4 5/8	117.5	2 1/2	63.5	3 1/2	88.9	7/16	11.1	5/8	15.9	4	1/2
1 1/2	5	127.0	2 7/8	73.0	3 7/8	98.4	1/2	12.7	5/8	15.9	4	5/8
2	6	152.4	3 5/8	92.1	4 3/4	120.7	9/16	14.3	3/4	19.1	4	5/8
2 1/2	7	177.8	4 1/8	104.8	5 1/2	139.7	5/8	15.9	3/4	19.1	4	5/8
3	7 1/2	190.5	5	127.0	6	152.4	11/16	17.5	3/4	19.1	4	5/8
3 1/2	8 1/2	215.9	5 1/2	139.7	7	177.8	3/4	19.1	3/4	19.1	8	5/8
4	9	228.6	6 3/16	157.2	7 1/2	190.5	7/8	22.2	3/4	19.1	8	3/4
5	10	254.0	7 5/16	185.7	8 1/2	215.9	7/8	22.2	7/8	22.2	8	./4
6	11	279.4	8 1/2	215.9	9 1/2	241.3	15/16	23.8	7/8	22.2	8	3/4
8	13 1/2	342.9	10 5/8	269.9	11 3/4	298.5	1 1/16	27.0	7/8	22.2	8	7/8
10	16	406.4	12 3/4	323.9	14 1/4	362.0	1 1/8	28.6	1	25.4	12	7/8
12	19	482.6	15	381.0	17	431.8	1 3/16	30.2	1	25.4	12	1
14	21	533.4	16 1/4	412.8	18 3/4	476.3	1 5/16	33.3	1 1/8	28.6	12	1
16	23 1/2	596.9	18 1/2	469.9	21 1/4	539.8	1 3/8	34.9	1 1/8	28.6	16	1 1/8
18	25	635.0	21	533.4	22 3/4	577.9	1 1/2	38.1	1 1/4	31.8	16	1 1/8
20	27 1/2	698.5	23	584.2	25	635.0	1 5/8	41.3	1 1/4	31.8	20	1 1/8
24	32	812.0	27 1/4	692.2	29	749.3	1 13/16	46.0	1 3/8	34.9	20	1 1/4

ANSI 300 lb

h = 1/16" (1.6 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	3 3/4	95.3	1 3/8	34.9	2 5/8	66.7	1/2	12.7	5/8	15.9	4	1/2
3/4	4 5/8	117.5	1 11/16	42.9	3 1/4	82.6	9/16	14.3	3/4	19.1	4	5/8
1	4 7/8	123.8	2	50.8	3 1/2	88.9	5/8	15.9	3/4	19.1	4	5/8
1 1/4	5 1/4	133.4	2 1/2	63.5	3 7/8	98.4	11/16	17.5	3/4	19.1	4	5/8
1 1/2	6 1/8	155.6	2 7/8	73.0	4 1/2	114.3	3/4	19.1	7/8	22.2	4	3/4
2	6 1/2	165.1	3 5/8	92.1	5	127.0	13/16	20.6	3/4	19.1	8	5/8
2 1/2	7 1/2	190.5	4 1/8	104.8	5 7/8	149.2	15/16	23.6	7/8	22.2	8	3/4
3	8 1/4	209.6	5	127.0	6 5/8	168.3	1 1/16	27.0	7/8	22.2	8	3/4
3 1/2	9	228.6	5 1/2	139.7	7 1/4	184.2	1 1/8	28.6	7/8	22.2	8	3/4
4	10	254.0	6 3/16	157.2	7 7/8	200.0	1 3/16	30.2	7/8	22.2	8	3/4
5	11	279.4	7 5/16	185.7	9 1/4	235.0	1 5/16	33.3	7/8	22.2	8	3/4
6	12 1/2	317.5	8 1/2	215.98	10 5/8	269.9	1 3/8	34.9	7/8	22.2	12	3/4
8	15	381.0	10 5/8	269.9	13	330.2	1 9/16	39.7	1	25.4	12	7/8
10	17 1/2	444.5	12 3/4	323.9	15 1/4	387.4	1 13/16	46.0	1 1/8	28.6	16	1
12	20 1/2	520.7	15	381.0	17 3/4	450.9	1 15/16	49.2	1 1/4	31.8	16	1 1/8
14	23	584.2	16 1/4	412.8	20 1/4	514.4	2 1/16	52.4	1 1/4	31.8	20	1 1/8
16	25 1/2	647.7	18 1/2	469.9	22 1/2	571.5	2 3/16	55.6	1 3/8	34.9	20	1 1/4
18	28	711.2	21	533.4	24 3/4	628.7	2 5/16	58.7	1 3/8	34.9	24	1 1/4
20	30 1/2	774.7	23	584.2	27	685.8	2 7/16	61.9	1 3/8	34.9	24	1 1/4
24	36	914.4	27 1/4	692.2	32	812.8	2 11/16	68.3	1 5/8	41.3	24	1 1/2

ANSI 400 lb

h = 1/4" (6.4 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	3 3/4	95.3	1 3/8	34.9	2 5/8	66.7	9/16	14.3	5/8	15.9	4	1/2
3/4	4 5/8	117.5	1 11/18	42.9	3 1/4	82.6	5/8	15.9	3/4	19.1	4	5/8
1	4 7/8	123.8	2	50.8	3 1/2	88.9	11/16	17.5	3/4	19.1	4	5/8
1 1/4	5 1/4	133.4	2 1/2	63.5	3 7/8	98.4	13/16	20.6	3/4	19.1	4	5/8
1 1/2	6 1/8	155.6	2 7/8	73.0	4 1/2	114.3	7/8	22.2	7/8	22.2	8	3/4
2	6 1/2	165.1	3 5/8	92.1	5	127.0	1	25.4	3/4	19.1	8	5/8
2 1/2	7 1/2	190.5	4 1/8	104.8	5 7/8	149.2	1 1/8	28.6	7/8	22.2	8	3/4
3	8 1/4	209.6	5	127.0	6 5/8	168.3	1 1/4	31.8	7/8	22.2	8	3/4
3 1/2	9	228.6	5 1/2	139.7	7 1/4	184.2	1 3/8	34.9	1	25.4	8	7/8
4	10	254.0	6 3/16	157.2	7 7/8	200.0	1 3/8	34.9	1	25.4	8	7/8
5	11	279.4	7 5/16	185.7	9 1/4	235.0	1 1/2	38.1	1	25.4	8	7/8
6	12 1/2	317.5	8 1/2	215.9	10 5/8	269.9	1 5/8	41.1	1	25.4	12	7/8
8	15	381.0	10 5/8	269.9	13	330.2	1 7/8	47.6	1 1/8	28.6	12	1
10	17 1/2	444.5	12 3/4	323.9	15 1/4	387.4	2 1/8	54.0	1 1/4	31.8	16	1 1/8
12	20 1/2	520.7	15	381.0	17 3/4	450.9	2 1/4	57.2	1 3/8	34.9	16	1 1/4
14	23	584.2	16 1/4	412.8	20 1/4	514.4	2 3/8	60.3	1 3/8	34.9	20	1 1/4
16	25 1/2	647.7	18 1/2	469.9	22 1/2	571.5	2 1/2	63.5	1 1/2	38.1	20	1 3/8
18	28	711.2	21	533.4	24 3/4	628.7	2 5/8	66.7	1 1/2	38.1	24	1 3/8
20	30 1/2	774.7	23	584.2	27	685.2	2 3/4	69.9	1 5/8	41.3	24	1 1/2
24	36	914.4	27 1/4	692.2	32	812.8	3	76.2	1 7/8	47.6	24	1 3/4

ANSI 600 lb

h = 1/4" (6.4 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	3 3/4	95.3	1 3/8	34.9	2 5/8	66.7	9/16	14.3	5/8	15.9	4	1/2
3/4	4 5/8	117.5	1 11/18	42.9	3 1/4	82.6	5/8	15.9	3/4	19.1	4	5/8
1	4 7/8	123.8	2	50.8	3 1/2	88.9	11/16	17.5	3/4	19.1	4	5/8
1 1/4	5 1/4	133.4	2 1/2	63.5	3 7/8	98.4	13/16	20.6	3/4	19.14	4	5/8
1 1/2	6 1/8	155.6	2 7/8	73.0	4 1/2	114.3	7/8	22.2	7/8	22.2	4	3/4
2	6 1/2	165.1	3 5/8	92.1	5	127.0	1	25.4	3/4	19.1	8	5/8
2 1/2	7 1/2	190.5	4 1/8	104.8	5 7/8	149.2	1 1/8	28.6	7/8	22.2	8	3/4
3	8 1/4	209.6	5	127.0	6 5/8	168.3	1 1/4	31.8	7/8	22.2	8	3/4
3 1/2	9	228.6	5 1/2	139.7	7 1/4	184.2	1 3/8	34.9	1	25.4	8	7/8
4	10 3/4	273.1	6 3/16	157.2	8 1/2	215.9	1 1/2	38.1	1	25.4	8	7/8
5	13	330.2	7 5/16	185.7	10 1/2	266.7	1 3/4	44.5	1 1/8	28.6	8	1
6	14	355.6	8 1/2	215.9	11 1/2	292.1	1 7/8	47.6	1 1/8	28.6	12	1
8	16 1/2	419.1	10 5/8	269.9	13 3/4	349.3	2 3/16	55.6	1 1/4	31.8	12	1 1/8
10	20	508.0	12 3/4	323.9	17	431.8	2 1/2	63.5	1 3/8	34.9	16	1 1/4
12	22	558.8	15	381.0	19 1/4	489.0	2 5/8	66.7	1 3/8	34.9	20	1 1/4
14	23 3/4	603.3	16 1/4	412.8	20 3/4	527.1	2 3/4	69.9	1 1/2	38.1	20	1 3/8
16	27	685.8	18 1/2	469.9	23 3/4	603.3	3	76.2	1 5/8	41.3	20	1 1/2
18	29 1/4	743.0	21	533.4	25 3/4	654.1	3 1/4	82.6	1 3/4	44.5	20	1 5/8
20	32	812.8	23	584.4	28 1/2	723.9	3 1/2	88.9	1 3/4	44.5	24	1 5/8
24	37	938.8	27 1/4	692.2	33	832.2	4	101.6	2	50.8	24	1 7/8

ANSI 900 lb

h = 1/4" (6.4 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	4 3/4	120.7	1 3/8	34.9	3 1/4	82.6	7/8	22.2	7/8	22.2	4	3/4
3/4	5 1/8	130.2	1 11/16	42.9	3 1/2	88.9	1	25.4	7/8	22.2	4	3/4
1	5 7/8	149.2	2	50.8	4	101.6	1 1/8	28.6	1	25.4	4	7/8
1 1/4	6 1/4	158.8	2 1/2	63.5	4 3/8	111.1	1 1/8	28.6	1	25.4	4	7/8
1 1/2	7	177.8	2 7/8	73.0	4 7/8	123.8	1 1/4	31.8	1 1/8	28.6	4	1
2	8 1/2	215.9	3 5/8	92.1	6 1/2	165.1	1 1/2	38.1	1	25.4	8	7/8
2 1/2	9 5/8	244.5	4 1/8	104.8	7 1/2	190.5	1 5/8	41.3	1 1/8	28.6	8	1
3	9 1/2	241.3	5	127.0	7 1/2	190.5	1 1/2	38.1	1	25.4	8	7/8
4	11 1/2	292.1	6 3/16	157.2	9 1/4	235.0	1 3/4	44.5	1 1/4	31.8	8	1 1/8
5	13 3/4	349.3	7 5/16	185.7	11	279.4	2	50.8	1 3/8	34.9	8	1 1/4
6	15	381.0	8 1/2	215.9	12 1/2	317.5	2 3/16	55.6	1 1/4	31.8	12	1 1/8
8	18 1/2	469.9	10 5/8	269.9	15 1/2	393.7	2 1/2	63.5	1 1/2	38.1	12	1 3/4
10	21 1/2	546.1	12 3/4	323.9	18 1/2	469.9	2 3/4	69.9	1 1/2	38.1	16	1 3/8
12	24	609.6	15	381.0	21	533.4	3 1/8	79.4	1 1/2	38.1	20	1 3/8
14	25 1/4	641.4	16 1/4	412.8	22	558.8	3 3/8	85.7	1 5/8	41.3	20	1 1/2
16	27 3/4	704.9	18 1/2	469.9	24 1/4	616.0	3 1/2	88.9	1 3/4	44.5	20	1 5/8
18	31	787.4	21	533.4	27	685.8	4	101.6	2	50.8	20	1 7/8
20	33 3/4	857.3	23	584.2	29 1/2	749.3	4 1/4	108.0	2 1/8	54.0	20	2
24	41	1041.4	27 1/4	692.2	35 1/2	901.7	5 1/2	139.7	2 5/8	66.7	20	2 1/2

ANSI1500 lb

h = 1/4" (6.4 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	4 3/4	120.7	1 3/4	34.9	3 1/4	82.6	7/8	22.2	7/8	22.2	4	3/4
3/4	5 1/8	130.2	1 11/16	42.9	3 1/2	88.9	1	25.4	7/8	22.2	4	3/4
1	5 7/8	149.2	2	50.8	4	101.6	1 1/8	28.6	1	25.4	4	7/8
1 1/4	6 1/4	158.8	2 1/2	63.5	4 3/8	111.1	1 1/8	28.6	1	25.4	4	7/8
1 1/2	7	177.8	2 7/8	73.0	4 7/8	123.8	1 1/4	31.8	1 1/8	28.6	4	1
2	8 1/2	215.9	3 5/8	92.1	6 1/2	165.1	1 1/2	38.1	1	25.4	8	7/8
2 1/2	9 5/8	244.5	4 1/8	104.8	7 1/2	190.5	1 5/8	41.3	1/8	28.6	8	1
3	10 1/2	266.7	5	127.0	8	203.2	1 7/8	47.6	1 1/4	31.8	8	1 1/8
4	12 1/4	311.2	6 3/16	157.2	9 1/2	241.3	2 1/8	54.0	1 3/8	34.9	8	1 1/4
5	14 3/4	374.7	7 5/16	185.7	11 1/2	292.1	2 7/8	73.0	1 5/8	41.3	8	1 1/2
6	15 1/2	393.7	8 1/2	215.9	12 1/2	317.5	3 1/4	82.6	1 1/2	38.1	12	1 3/8
2	19	482.6	10 5/8	269.9	15 1/2	393.7	3 5/8	92.1	1 3/4	44.5	12	1 5/8
10	23	584.2	12 3/4	323.9	19	482.6	4 1/4	108.0	2	50.8	12	1 7/8
12	26 1/2	673.1	15	381.0	22 1/2	571.5	4 7/8	123.8	2 1/8	54.0	16	2
14	29 1/2	749.3	16 1/4	412.8	25	635.0	5 1/4	133.4	2 3/8	60.3	16	2 1/4
16	32 1/2	825.5	18 1/2	469.9	27 3/4	704.9	5 3/4	146.1	2 5/8	66.7	16	2 1/2
18	36	914.4	21	533.4	30 1/2	774.7	6 3/8	161.9	2 7/8	73.0	16	2 3/4
20	38 3/4	984.3	23	584.2	32 3/4	831.9	7	177.8	3 1/8	79.4	16	3
24	46	1168.4	27 1/4	692.2	39	990.6	8	203.2	3 5/8	92.1	16	3 1/2

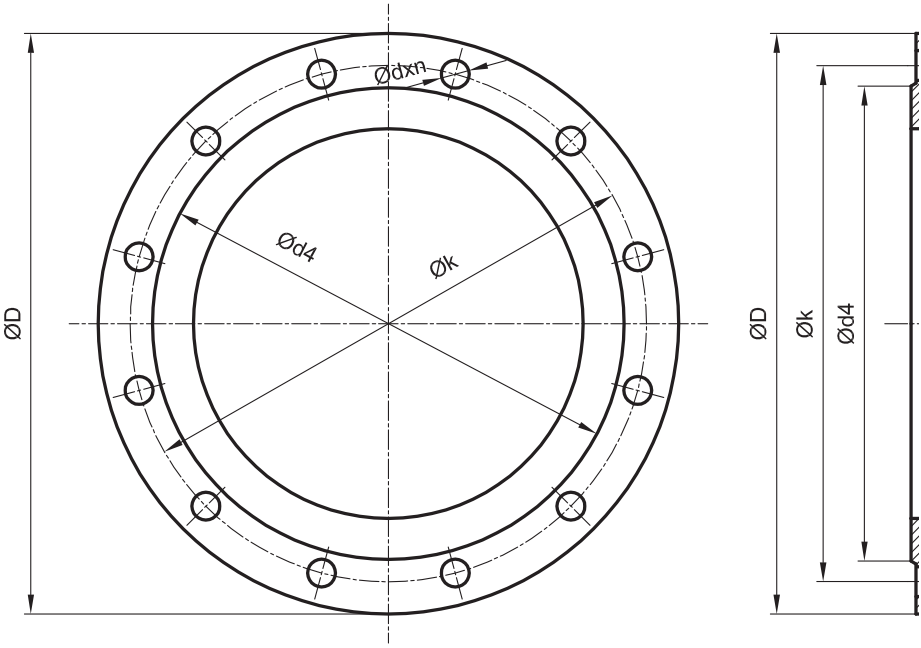
ANSI 2500 lb

h = 1/4" (6.4 mm)

Nominal Dia (inch)	ØD		Ød4		Øk		b		Ød		n	w
	in	mm	in	mm	in	mm	in	mm	in	mm		
1/2	5 1/4	133.4	1 3/8	34.9	3 1/2	88.9	1 3/16	30.2	7/8	22.2	4	3/4
3/4	5 1/2	139.7	1 11 /16	42.9	3 3/4	95.3	1 1/4	31.8	7/8	22.2	4	3/4
1	6 1/4	158.8	2	50.8	4 1/4	108.0	1 3/8	34.9	1	25.4	4	7/8
1 1/4	7 1/4	184.2	2 1/2	63.5	5 1/8	130.2	1 1/2	38.1	1 1/8	28.6	4	1
1 1/2	8	203.2	2 7/8	73.0	5 3/4	146.1	1 3/4	44.5	1 1/4	31.8	4	1 1/8
2	9 1/4	235.0	3 5/8	92.1	6 3/4	171.5	2	50.8	1 1/8	28.6	8	1
2 1/2	10 1/2	266.7	4 1/8	104.8	7 3/4	196.9	2 1/4	57.2	1 1/4	31.8	8	1 1/8
3	12	304.8	5	127.0	9	228.6	2 5/8	66.7	1 3/8	34.9	8	1 1/4
4	14	355.6	6 3/16	157.2	10 3/4	273.1	3	76.2	1 5/8	41.3	8	1 1/2
5	16 1/2	419.1	7 5/16	185.7	12 3/4	323.9	3 5/8	92.1	1 7/8	47.4	8	1 3/4
6	19	482.6	8 1/2	215.9	1 4 1/2	368.3	4 1/4	108.0	2 1/8	54.0	8	2
8	21 3/4	552.5	10 5/8	269.9	17 1/4	438.2	5	127.0	2 1/8	54.0	12	2
10	26 1/2	673.1	12 3/4	323.9	21 1/4	539.8	6 1/2	165.1	2 5/8	66.7	12	2 1/2
12	30	762.0	15	381.0	24 3/8	619.2	7 1/4	184.2	2 7/8	73.0	12	2 3/4

Flange Table

DIN



DIN 2501

1 ve 2.5 atü All dimensions given (mm)

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6	65	25	40	4	M10	11
8	70	30	45	4	M10	11
10	75	35	50	4	M10	11
15	80	40	55	4	M10	11
20	90	50	65	4	M10	11
25	100	60	75	4	M10	11
32	120	70	90	4	M12	14
40	130	80	100	4	M12	14
50	140	90	110	4	M12	14
65	160	110	130	4	M12	14
80	190	128	150	4	M12	18
100	210	148	170	4	M16	18
125	240	178	200	8	M16	18
150	265	202	225	8	M16	18
200	320	258	280	8	M16	18
250	375	312	335	12	M16	18
300	440	365	395	12	M20	22
350	490	415	445	12	M20	22
400	540	465	495	16	M20	22
450	595	520	550	16	M20	22
500	645	570	600	20	M20	22
600	755	670	705	20	M24	26
700	860	775	810	24	M24	26
800	975	880	920	24	M27	30
900	1075	980	1020	24	M27	30
1000	1175	1080	1120	28	M27	30
1200	1375	1280	1320	32	M27	30
1400	1575	1480	1520	36	M27	30
1600	1790	1690	1730	40	M27	30
1800	1990	1890	1930	44	M27	30
2000	2190	2090	2130	48	M27	30
2200	2405	2295	2340	52	M30	33
2400	2605	2495	2540	56	M30	33
2600	2805	2695	2740	60	M30	33
2800	3030	2910	2960	64	M33	36
3000	3230	3110	3160	68	M33	36
3200	3430	3310	3360	72	M33	36
3400	3630	3510	3560	76	M33	36
3600	3840	3720	3770	80	M33	36
3800	4045	3920	3970	80	M36	39
4000	4245	4120	4170	84	M36	39

DIN 2501

6 atü All dimensions given (mm)

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6	65	25	40	4	M10	11
8	70	30	45	4	M10	11
10	75	35	50	4	M10	11
15	80	40	55	4	M10	11
20	90	50	65	4	M10	11
25	100	60	75	4	M10	11
32	120	70	90	4	M12	14
40	130	80	100	4	M12	14
50	140	90	110	4	M12	14
65	160	110	130	4	M12	14
80	190	128	150	4	M16	18
100	210	148	170	4	M16	18
125	140	178	200	8	M16	18
150	165	202	225	8	M16	18
20	320	258	280	8	M16	18
250	375	312	335	12	M16	18
300	440	365	395	12	M20	22
350	490	415	445	12	M20	22
400	540	465	495	16	M20	22
450	595	520	550	16	M20	22
500	645	570	600	20	M20	22
600	755	670	705	20	M24	26
700	860	775	810	24	M24	26
800	975	880	920	24	M27	30
900	1075	980	1020	24	M27	30
1000	1175	1080	1120	28	M27	30
1200	1405	1295	1340	32	M30	33
1400	1630	1510	1560	36	M33	36
1600	1830	1710	1760	40	M33	36
1800	2045	1920	1970	44	M36	39
2000	2265	2115	2180	48	M39	42
2200	2475	2335	2390	52	M39	42
2400	2685	2545	2600	56	M39	42
2600	2905	2750	2810	60	M45	48
2800	3115	2960	3020	64	M45	48
3000	3315	3160	3220	68	M45	48
3200	3525	3370	3430	72	M45	48
3400	3725	3580	3640	76	M45	48
3600	3970	3790	3860	80	M52	56

DIN 2501

10 atü

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6	75	32	50	4	M10	11
8	80	38	55	4	M10	11
10	90	40	60	4	M12	14
15	95	45	65	4	M12	14
20	105	58	75	4	M12	14
25	115	68	85	4	M12	14
32	140	78	100	4	M16	18
40	150	88	110	4	M16	18
50	165	102	125	4	M16	18
65	185	122	145	4	M16	18
80	200	138	160	8	M16	18
100	220	158	180	8	M16	18
125	250	188	210	8	M16	18
150	285	212	240	8	M20	22
175	315	242	270	8	M20	22
200	340	268	295	8	M20	22
250	395	320	350	12	M20	22
300	445	370	400	12	M20	22
350	505	430	460	16	M20	22
400	565	482	515	16	M24	26
450	615	532	585	20	M24	26
500	675	585	620	20	M24	26
600	780	685	725	20	M27	30
700	895	800	840	24	M27	30
800	1015	905	950	24	M30	33
900	1115	1005	1050	28	M30	33
1000	1230	1110	1160	28	M33	36
1200	1455	1330	1380	32	M36	39
1400	1675	1535	1590	36	M39	42
1600	1915	1760	1820	40	M45	48
1800	2115	1960	2020	44	M45	48
2000	2325	2170	2230	42	M45	48
2200	2550	2370	2440	52	M52	56
2400	2760	2570	2650	56	M52	56
2600	2960	2780	2850	60	M52	56
2800	3180	3000	3070	64	M52	56
3000	3405	3210	3290	68	M56	62

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16 atü

All dimensions given (mm)

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6	75	32	50	4	M10	11
8	80	38	55	4	M10	11
10	90	40	60	4	M12	14
15	95	45	65	4	M12	14
20	105	58	75	4	M12	14
25	115	68	85	4	M12	14
32	140	78	100	4	M16	18
40	150	88	110	4	M16	18
50	165	102	125	4	M16	18
65	185	122	145	4	M16	18
80	200	138	160	8	M16	18
100	220	158	180	8	M16	18
125	250	188	210	8	M16	18
150	285	212	240	8	M20	22
175	315	242	270	8	M20	22
200	340	268	295	12	M20	22
250	405	320	355	12	M24	26
300	460	378	410	12	M24	26
350	520	438	470	16	M24	26
400	580	490	525	16	M27	30
450	640	550	585	20	M27	30
500	715	610	650	20	M30	33
600	840	725	770	20	M33	36
700	910	795	840	24	M33	36
800	1025	900	950	24	M36	39
900	1125	1000	1050	28	M36	39
1000	1255	1115	1170	28	M39	42
1200	1485	1330	1390	32	M45	48
1400	1685	1530	1590	36	M56	48
1600	1930	1750	1820	40	M52	56
1800	2130	1950	2020	44	M52	56
2000	2345	2150	2230	48	M56	62
2200	2555	2360	2440	52	M56	62

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25 atü

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6	75	32	50	4	M10	11
8	80	38	55	4	M10	11
10	90	40	60	4	M12	14
15	95	45	65	4	M12	14
20	105	58	75	4	M12	14
25	115	68	85	4	M12	14
32	140	78	100	4	M16	18
40	150	88	110	4	M16	18
50	165	102	125	4	M16	18
65	185	122	145	8	M16	18
80	200	138	160	8	M16	18
100	235	162	190	8	M20	22
125	270	188	220	8	M24	26
150	300	218	250	8	M24	26
175	330	248	280	12	M24	26
200	360	278	310	12	M24	26
250	425	335	370	12	M27	30
300	485	395	430	16	M27	30
350	555	450	490	16	M30	33
400	620	505	550	16	M33	36
500	730	615	660	20	M33	36
600	845	720	770	20	M36	39
700	960	820	875	24	M39	42
800	1085	930	990	24	M45	48
900	1185	1030	1090	28	M45	48
1000	1320	1140	1210	28	M52	56
1200	1530	1350	1420	32	M52	56
1400	1755	1560	1640	36	M56	62
1600	1975	1780	1860	40	M56	62
1800	2195	1985	2070	44	M64	70
2000	2425	2210	2300	48	M64	70

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40 atü

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6	75	32	50	4	M10	11
8	80	38	55	4	M10	11
10	90	40	60	4	M12	14
15	95	45	65	4	M12	14
20	105	58	75	4	M12	14
25	115	68	85	4	M12	14
32	140	78	100	4	M16	18
40	150	88	110	4	M16	18
50	165	102	125	4	M16	18
65	185	122	145	8	M16	18
80	200	138	160	8	M16	18
100	235	162	190	8	M20	22
125	270	188	220	8	M24	26
150	300	218	250	8	M24	26
175	350	248	295	12	M27	30
200	375	285	320	12	M27	30
250	450	345	385	12	M30	33
300	515	410	450	16	M30	33
350	580	465	510	16	M33	36
400	660	535	585	16	M36	39
450	685	560	610	20	M36	39
500	755	615	670	20	M39	42
600	890	735	795	20	M45	48
700	995	740	900	24	M45	48
800	1140	960	1030	24	M52	56
900	1250	1070	1140	28	M52	56
1000	1360	1180	1250	28	M52	56
1200	1575	1380	1460	32	M56	62
1400	1795	1600	1680	36	M56	62
1600	2025	1815	1900	40	M64	70

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64 atü

Nominal Ø	ØD	Ød4	Øk	n	w	Ød
6						
8						
10	100	40	70	4	M12	14
15	105	45	75	4	M12	14
20						
25	140	68	100	4	M16	18
32						
40	170	88	125	4	M20	22
50	180	102	135	4	M20	22
65	205	122	160	8	M20	22
80	215	138	170	8	M20	22
100	250	162	200	8	M24	26
125	295	188	240	8	M27	30
150	345	218	280	8	M30	33
175	375	260	310	12	M30	33
200	415	285	345	12	M33	36
250	170	345	400	12	M33	36
300	530	410	460	16	M33	36
350	600	465	525	16	M36	39
400	670	535	585	16	M39	42
500	800	615	705	20	M45	48
600	930	735	820	20	M52	56
700	1045	840	935	24	M52	56
800	1165	960	1050	24	M56	62
900	1285	1070	1170	28	M56	62
1000	1415	1180	1290	28	M64	70
1200	1665	1380	1530	32	M72	78