



Hdpe - Pe 100 Pipes For Potable Water System



# HDPE - PE 100 PIPES FOR POTABLE WATER SYSTEM

## PRODUCT IDENTITY

Product Name	DIZAYN HDPE 100 POTABLE WATER NETWORK PIPES
Raw Material	HDPE 100 (=PE 100)
Product Color	Black or Blue
Production Standard	EN 12201-2
Other Standards	ISO 4427,DIN 8074 - EN 12201-2

## PRODUCT SPECIFICATIONS

Production Range	Ø20 - Ø2.500 mm
Pressure Range	PN 4 - PN 32
Production Unit Lengths	Ø20 - Ø90 - [200 meters] Ø110 - Ø2.500 - [11,8 - 12 - 13,5 meters] P.S.: 100,300 and 500 meters pipe length is possible. Please get into contact with project management for special inquiries.

## QUALITY CERTIFICATES OF DIZAYN GROUP



## TECHNICAL SPECIFICATIONS

Polymer Data	PE 100	Unit	Test Method
Density at (23°C)	0.955	g / cm <sup>3</sup>	ISO 1183
Viscosity Number	360	cm <sup>3</sup> / gr	ISO 1628-3
MFR (190° / 5 kg)	0.22	g / 10 dak.	ISO 1133
MFR (190° / 25 kg)	6,6	g / 10	ISO 1133
<b>Mechanical Properties</b>			
Yield Stress	23	Mpa	ISO 527
Elongation at yield	9	%	ISO 527
Tensile Modulus	900	%	ISO 527
<b>Notched Impact strenght</b>			
+ 23 °C	26	kJ / m <sup>2</sup>	ISO 179/1eA
- 23 °C	13	kJ / m <sup>2</sup>	ISO 179/1eA
<b>Other Properties</b>			
Oxidation - Induction time at (210°C)	≥ 20	min	ISO TR 10837
Carbon Black Content	2,3±0,2	%	ISO 6964
Carbon Black Dispersion	≤ 3		ISO CD 11420
MRS minimum Required Strenght	< 10	MPa	ISO TR 9080
Resistance to S.C.P (Slow Crack Propagation) x=4,6 Mpa, 80°C Notched	> 3000	h	EN 33479
Resistance to R.C.P (Rapid Crack) Propagation S4-test 110/10 mm 0°C	< 25	bar	ISO DIS 13477
Elogation at break	< 600	%	EN 638
Linear Thermal Expansion	1.8x10 <sup>-4</sup>	0°C <sup>-1</sup>	ASTM D 696 (20-60°C)
Specific Heat Capacity	1.9	J / g °C	BPCL
<b>Electrical Properties</b>			
Electric Strenght	> 20	kV / mm	BS 27 82: 201 B
Volume resistivity	> 1013	Ωm	BS 27 82: 230A
Surface resistivity	> 1015	Ωm	BS 27 82: 231A
Relative resistivity	2,6	-	BS 2067 (1 to 20 MHZ)
Loss tangent	3x10 <sup>-4</sup>	-	BS 2067

# HDPE - PE 100 PIPES FOR POTABLE WATER SYSTEM

## 1.1 Specifications of Dizayn PE 100 pipes

- Advantage of perfect leak proof, no crack, no break and no deformation under pressure
- Availability of more than one connection method (but welding electrofusion welding, push fit sockets, etc.)
- Availability of connection at a place out of the trench,
- High resistance to chemicals, not affected from corrosion, decaying, and abrasion,
- Advantage of less need of excavation and less need of bringing special filling sand from out of the site,
- Advantage of safe application in irregular surfaces like sea, river, lake, passages and at places where there maybe frequent earth movements,
- Advantage of having perfectly smooth internal surface. Because of this advantage of PE pipes in comparison to the other pipe types, one size smaller PE pipe can make the same work of one size bigger pipe from the other pipe types. This brings considerable savings in the overall cost of the pipe line and the service costs,
- PE pipes require less fittings for connection because they are elastic and in many laces they do not require connection where the other types do. Because PE pipes re bendable with a radius of 20-35 times of its outer diameter. The other pipe types do not have this advantage,
- Advantage of higher durability and advantage of easy installation and transport without material loss,
- Advantage of mobilizability of the PE pipe production facilities. This enables very big savings in transport costs for projects where large diameter pipes are required,
- PE pipes have the advantage of very long service life under severe conditions.
- Minimum guaranteed service life of PE pipes is 50 years and decaying time 1000 years in nature,
- PE pipes are light in weight which enables the installation with high speed at places where the construction season is short,
- PE pipes have very good welding characteristics,
- PE pipes are elastic which a big advantage is during the earthquake or any other earth movements. This characteristics also gives big advantage in transport (coiling up to 90 mm diameter) and in installation costs,
- High impact and breakage resistance,
- Very good adaption to earth movements,
- Very high resistance to direct sun light (UV resistance) for long time. This is supplied by Ultraviolet light resistance agent mixed to the PE raw material,
- Many different pressure resistance options. PE pipes can be produced resistant to 10 different pressure classes from 4 Bars up to 32 Bars.
- There is no need to take protection precautions at the time of installation like cathodic protection.

### 1.1.1 Perfect Leak Proof at Connection Points

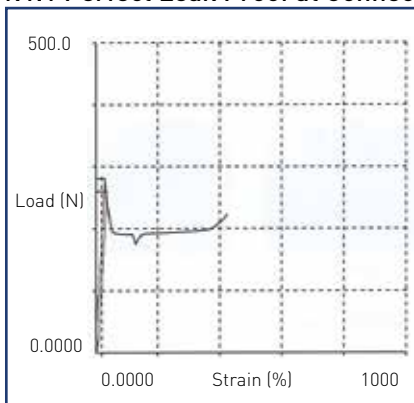


Figure 1.1.1a - Sample with butt welding

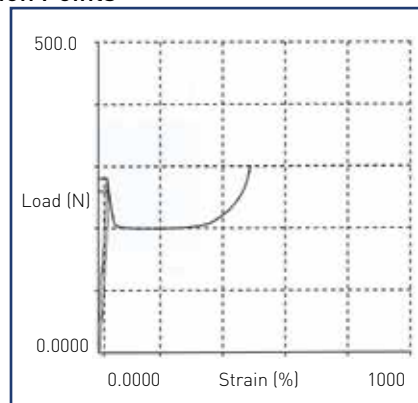


Figure 1.1.1b - Sample without welding (Result of tensile test)

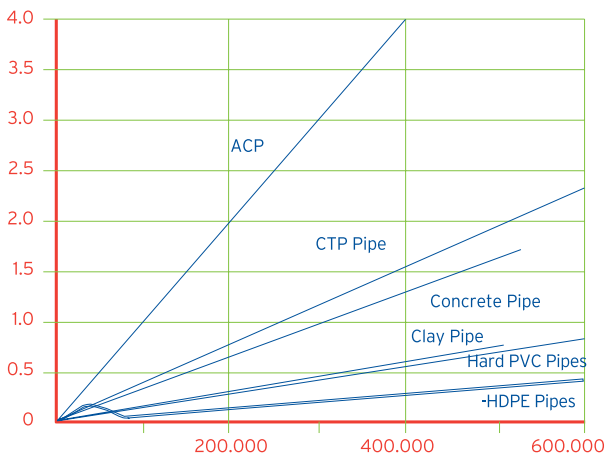
As seen in the test samples, as the result of the tensile test, the energy required for breaking the welded and unwelded pipe area is the same. It means that the butt welded area is also as strong as the pipe itself. (Test sample is shown in picture 1.1.8)

### The Advantage of Butt Welding;

- It does not require special fitting for connection.
- With butt welding, some fittings like bends and T pieces can be produced at the site.
- The butt welding machines are easy to supply in all corners of the World.
- The fittings produced for butt welding have low production costs.
- Butt welding can be applied for all diameters and for all pressure ratings (For best results the minimum wall thickness must be 3 mm.)
- The lips forming inside and outside the pipe increases the welding area's cross-section hence increasing the safety of the welded area.
- Butt welding operation is very easy to learn.

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## 1.1.2 No Abrasion in PE pipes



The curve above proves that HDPE PE 100 pipes have the best abrasion resistance value among the other pipes. For PE, throughout the service life, the abrasion is only 0.09 mm.

The curve above also proves that Asbestos steel pipes and GRP pipes have worse abrasion in comparison to the concrete pipes. Besides their very good abrasion resistance, PE pipes have perfect resistance against the chemicals. These pipes give the best service in all acidic, alkaline and salty solutions.

The resistance of PE pipes to different chemical materials is listed in Table 1.1.2

## 1.1.3 The advantage of less need of bringing special filling sand out of the site, less excavation and less filling sand need.

For laying down the PE pipes, it is enough to leave a small place at each side of the pipe which is enough for the operation of the compaction machine. There is no need to bring sand for bedding. It is enough to prepare the trench bottom surface with an angle of 120 degree. The earth derived from the excavation can be used as filling sand after eliminating the big size stones and sharp object that may damage the pipe. In rocky place, the sharp sides of the rocks are covered by sand in order not to allow it to damage the pipe.

### Advantage

- Since there is no need to bring special filling sand from out of the excavated area, filling sand cost is minimum.
- Since less excavation is done, excavation and filling costs are minimum compared to the other pipe types.



Picture 1.1.2a - A view from sea discharge application of 1600 mm o.d. PN 4 PE pipes in Istanbul.



Picture 1.1.2b - Pipes another view from sea discharge application of 1600 mm o.d.

## 1.1.4 Advantage of PE pipes used in sea, lake and river passes

PE 100 pipes are elastic, not easily breakable, perfectly strong to external loads, perfectly strong to internal pressure and have 1000 years of decaying time in nature. These big advantages make them very suitable to be used in sea discharge, as well as sea, river and lake passes and also taking water to islands. PE 100 pipes are the easiest pipes to be sunk under water either completely or as units of 300-500 meters.

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## 1.1.5 Advantage of adaption to the earth movements, durability and high impact resistance

Below are the statistical values regarding the damage percentages of various pipe types at Kobe/Japan earthquake in 1995. This table tells everything about the superiority of PE pipes to the other pipes at tough conditions.

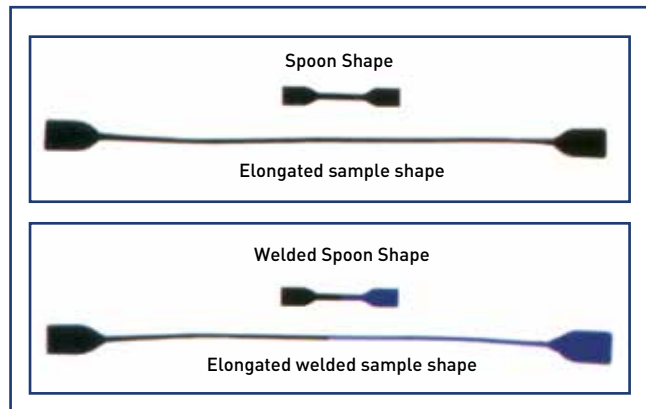
Pipe type	Percentage of damage Piece/km
Ductile cast iron pipe	0.488
Cast iron pipe	1.508
PVC pipe	1.430
Steel Pipe	0.437
Asbestos Steel Pipe	1.782
PE pipe	0 (zero)

Table 1.1.1 - The damage percentages in the potable water lines at Kobe/Japan earthquake.

	Steel pipe	Ductile cast iron pipe	PE pipe
Total length (km)	21,338	12,204	1,458
Number of damage	25,821	630	0
Damage ratio (place/km)	1,21	0,052	0,000

Table 1.1.2 - The damage percentages in the potable water lines at Kobe / Japan earthquake

After the earthquake in Kobe, the use of PE pipe in Japan increased as a boom. As a country in a region of very active seismic zone, the use of PE 100 is increasing as a boom in Turkey.



Picture 1.1.8 - Dizayn PE 100 material in standard test unit elongates 600 % at the pulling test until break.



Picture 1.1.9 - Telescopic storage of PE pipes.

## 1.1.6 PE pipes have perfect resistance to water impact

Velocities	PE 100, DN140, D				PVC mm DN140, D				Steel 5" Dim= 123,4			
	c/g	H	H	H	c/g	H	H	H	c/g	H	H	H
	13,42				38,77							
1		11,34	10	8,65		19,88	10	6,12		22,84	10	-2,84
2		12,68	10	7,31		17,75	10	2,24		35,69	10	-15,69
3		14,03	10	5,74		21,63	10	-1,63		48,53	10	-28,53

Table 1.1.3 - Comprasion of resistances of some pipe types to water impact

Because of perfect surface elasticity coefficient, Dizayn pipes have the lowest affection from water impact when compared to the other pipe types. For this reason, for certain pipe lining projects, one size smaller Dizayn PE 100 pipe can be used for the same work of the other alternative pipes. As it is seen form the table, for a velocity of 3 m/s, the maximum internal pressure stands to be 21.63 Bars for PVC pipes and 48.53 Bars for steel pipes.

PE pipes can be transported as the smaller diameter pipes are inserted into bigger diameter pipes (telescopic transport) enabling big transport cost savings.

Pipe Material	Surface Elasticity Coefficient (K)
Iron and Steel pipe	0,5
Ductile font	1,0
lead pipe	5,0
asbestos concrete pipe	4,4
PVC pipe	33,3
Dizayn PE 100 pipe	377



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### 1.1.7 Advantage of making turns using minimum number of elbows with PE pipes

Because of their perfect elasticity, Dizayn PE 100 pipes can make turns with a Radius of 20-35 times more than their outer diameter.. While the other pipe types can make even 11 and 22 degree turns by using Elbows, Dizayn PE 100 pipes can turn these angles without any elbow or another fitting. This means big material and time saving in the installation. Dizayn PE 100 pipe can even turn 90 degree without elbow with a turning radius which will be calculated with the following formula;

$$R = Dd / 1,12 \text{ (SDR-1)}$$

R: The Radius with which the pipe can bend without breaking.

Dd: Outer Diameter of the pipe

SDR: Standard Dimension Ratio (outer diameter / Wall thickness)



Picture 1.1.10 - Pictures showing bending ability of Dizayn pipes of 1600 mm dia. PN 4 produced for sea discharge project in Buyukcemkece / Istanbul.

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## 1.1.8 Advantage of installation and transportation without any material loss

Because of their perfect impact resistance, Dizayn PE 100 pipes do not break during installation and transportation. This enables having zero material loss during transportation and installation. The pipe pieces remained after installation can be used in production of fittings or installation in another place.

## 1.1.10 Advantage of minimum 50 years service life of PE Pipes

The curve in the figure below shows the change in the physical properties of PE 100 pipes in time. The production design of PE 100 pipes is done for a service life of 50 years. So, the minimum service life of PE 100 pipes is minimum 50 years.

## 1.1.9 Advantage of mobilization of the production installations of PE pipes

By the advantage of easy mobilization of PE pipe production facilities, the production of PE pipes can be done in places near to the installation place enabling big transport cost savings especially for big diameter pipes.



Picture 1.1.12 - A mobile pipe production facility.

The production design of PE 100 pipes is made for a service life of 50 years at 20°C. So, the minimum service life of PE 100 pipes is minimum 50 years (20°C).

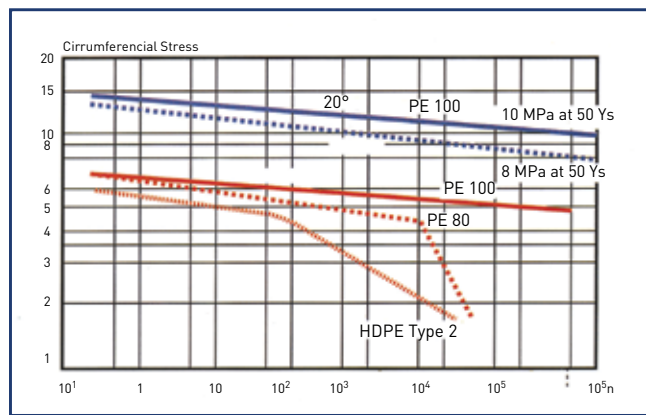


Figure 1.1.3 - The curve of hoop stress against time

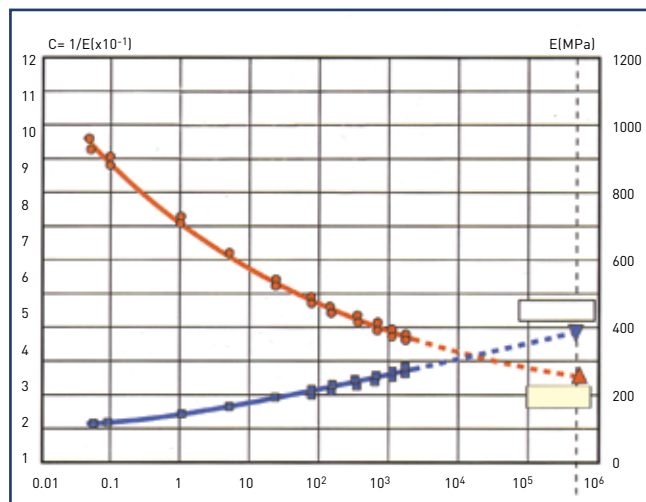


Figure 1.1.4 - The change in the elasticity module of PE pipes in time.

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Table 1.1.3 - Comparison of Dizayn PE Pipes with the other Pipe Types.

FEATURES	PIPE TYPE								EXPLANATION
	DIZAYN PE	PVC	STEEL	DUCTILE FONT	CONCRETE	GRP	ASBESTOS		
Production range (mm)	Ø20 - Ø3600	Ø20 - Ø630	Ø15 - Ø4000	Ø50 - Ø2000	Ø200 - Ø3200	Ø20 - Ø1600	Ø... - Ø1600		
Guaranteed service life (year)	50	0-20	3-15	5-25	0-30	0-50	0-30	For the pipes other than PE 100 pipes, the service life depends on many parameters like quality of the raw material of the pipe, bedding in the trench, etc.	
Feature of breaking	Very Durable	Weak	Durable	Durable	Very Weak	Partially Durable	Very Weak		
Max. Production length	500	6	12	6	4	6-Ara	4		
Standard production length (m)	12	6	6	6	2	6	2		
Strength against corrosion and abrasion	Very Durable	Partially Durable	Very Weak	Very Weak	Partially Durable	Durable	Weak	This evaluation depends on the nature and type of the chemical like SO <sub>2</sub> , Na <sub>2</sub> , Chlorine	
The easiness of producing fittings	Very easy	Very easy	Difficult	Very Difficult	Very Difficult	Very Difficult	Very Difficult		
The easiness of the installation (the easiest : 100 the most difficult : 0)	100	50	25	40	15	45	5		
Superiority from the side of hygiene	Perfect	Doubtful	Doubtful	Doubtful	Doubtful	Good	Troubles		
Surface roughness coefficient ( C )	149	149	120	130	100	145	130	Depend on the quality of the production and raw material	
Variety of fittings and their price	Perfect-Cheap	Perfect-Cheap	Limited-Expensive	Limited-Expensive	Limited-Expensive	Limited-Expensive	Limited-Expensive		
Strength against chemicals	Perfect	Doubtful	Troubles	Doubtful	Doubtful	Good	Doubtful		
Surface elasticity coefficient ( C )	377	33	0.5	1	4.4	>3	-0.5		
Ability for passifying the ram impact	Perfect	Troubles	Troubles	Troubles	Troubles	Troubles	Troubles		
The easiness of making pressure test at site	Perfect	Troubles	Troubles	Troubles	Troubles	Troubles	Troubles	Since the connection of the pipes other than steel and PE pipes is done using o-ring, it is very difficult to have perfect leak proof. It is necessary to take additional precautions for absolute leak proof	
Need of bends at turn points	Very Little	Very much	Very much	Very much	Very much	Very much	Very much	For PE 100 pipes it is possible to make even full round shape with a diameter 25 times of the pipe outer diameter	
Max. instant tes pressure (for PN10)	> 28 bar	> 16 bar	> 40 bar	> 40 bar	> 13 bar	> 18 bar	> 13 bar		
The safety of 1 connection point (max.:100 min.:0)	100	0-50	0-80	0-80	0-30	0-70	0-40	The connections with o-ring always create problems. For PE pipes, since the connection is done by welding, the molecular fusion makes.	
Ability for passifying the ram impact	Perfect	Doubtful	Troubles	Doubtful	Troubles	Doubtful	Troubles		
Needed trench width (as % pipe diameter)	approx. %5-10 wider than the pipe dia	approx. %100 wider than the pipe dia	approx. %200 wider than the pipe dia	approx. %110 wider than the pipe dia	approx. %200 wider than the pipe dia	approx. %200 wider than the pipe dia	approx. %200 wider than the pipe dia	These figures are for pipes with average 400 mm diameter	
Need of bedding around the pipe (max.: 100 min.:0)	10	100	70	60	100	100	100	For PE 100 pipes, if there are not sharp stones which may damage the pipe, there is no need make bedding around the pipe.	



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Table 1.4.4 - HDPE Dizayn PE 100 Pipes dimensions

S <sub>150</sub> =5S; S <sub>150</sub> =27 SDR 41; PN 4		S <sub>150</sub> =9,7; S <sub>150</sub> =5,2 SDR 33; PN 5		S <sub>150</sub> =17; S <sub>150</sub> =9,2 SDR 27,6; PN 6		S <sub>150</sub> =40; S <sub>150</sub> =21,7 SDR 22; PN 8		S <sub>150</sub> =78; S <sub>150</sub> =22,3 SDR 17; PN10		S <sub>150</sub> =160; S <sub>150</sub> =86,7 SDR 13,6; PN12,5		S <sub>150</sub> =320; S <sub>150</sub> =173 SDR16; PN16		S <sub>150</sub> =625; S <sub>150</sub> =339 SDR 9; PN 20		S <sub>150</sub> =1221; S <sub>150</sub> =661 SDR 7,4; PN 25		S <sub>150</sub> =2560; S <sub>150</sub> =133 SDR 6; PN 32		
DN	S	DN	S	DN	S	DN	S	DN	S	DN	S	DN	S	DN	S	DN	S	DN	S	
mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	
75	1,8	0,44	63	2,0	0,42	50	1,8	0,29	40	2,4	0,31	32	3,0	0,29	25	3,0	0,22	20	3,0	0,17
90	2,3	0,68	75	2,3	0,59	63	2,4	0,48	50	3,0	0,47	40	3,7	0,45	32	3,6	0,34	25	3,5	0,25
110	2,7	0,99	90	2,8	0,83	75	2,7	0,65	63	3,8	0,76	50	4,6	0,70	40	4,5	0,53	32	4,4	0,40
125	3,1	1,31	110	3,4	1,24	100	4,0	1,39	90	5,4	1,53	75	6,8	1,54	63	7,1	1,32	50	6,9	0,98
140	3,5	1,63	125	3,9	1,59	125	4,5	1,80	110	6,6	2,28	90	8,2	2,23	75	8,4	1,85	75	10,3	2,20
160	4,0	2,10	140	4,3	1,98	140	5,1	2,26	125	7,4	2,90	110	10,0	3,30	90	10,1	2,66	90	12,3	3,15
180	4,4	2,62	160	4,9	2,55	160	5,8	2,95	140	8,3	3,64	125	12,5	4,27	110	12,3	3,96	110	15,1	4,72
200	4,9	3,21	180	5,5	3,23	180	6,5	3,73	160	9,5	4,75	140	14,0	5,34	125	14,0	5,12	125	17,1	6,08
225	5,5	4,07	200	6,2	4,05	200	7,2	4,60	180	10,7	6,00	160	16,0	7,00	140	15,7	6,43	140	19,2	7,65
250	6,2	5,10	225	6,9	5,01	225	8,2	5,83	200	11,9	7,39	180	20,0	10,90	160	17,9	8,39	160	21,9	9,97
280	6,9	6,28	250	7,7	6,22	250	9,1	7,20	225	13,4	9,38	200	24,0	13,79	180	21,0	10,60	180	24,6	12,60
315	7,7	7,90	280	8,6	7,78	280	10,1	9,03	250	14,8	11,48	225	28,0	17,03	200	22,4	13,12	200	27,4	15,59
355	8,7	10,04	315	9,7	9,85	315	11,4	11,42	280	16,6	14,43	250	35,0	22,28	225	25,2	16,60	225	30,8	19,72
400	9,8	12,71	355	10,9	12,44	355	12,9	14,51	315	18,7	18,27	280	40,0	28,30	250	27,9	20,43	250	34,2	24,33
450	11,0	16,01	400	12,3	15,86	400	14,5	18,42	355	21,1	23,26	315	45,0	35,93	280	31,3	25,66	280	38,3	30,52
500	12,3	19,97	450	13,8	19,93	450	16,3	23,31	400	23,7	29,40	355	50,0	45,48	315	35,2	32,47	315	43,1	38,63
560	13,7	24,82	500	15,3	24,61	500	18,1	28,78	450	26,7	37,26	400	55,0	55,17	355	39,7	41,27	355	48,5	49,01
630	15,4	31,41	560	17,2	30,96	560	20,3	36,10	500	29,7	46,05	450	60,0	60,04	400	44,7	52,36	400	54,7	62,27
710	17,4	39,95	630	19,3	39,03	630	22,8	45,69	550	33,2	57,66	500	66,0	68,04	450	50,3	66,28	450	61,5	78,77
800	19,6	50,62	710	21,8	49,54	710	25,7	58,03	600	37,4	73,07	550	73,5	85,28	500	58,8	81,72	500	67,6	96,37
900	22,0	63,78	800	24,5	62,78	800	29,0	73,68	650	41,2	92,70	600	88,2	108,02	550	62,2	102,11	550	75,7	120,87
1000	24,5	79,02	900	27,6	79,48	900	32,6	93,25	700	47,4	117,61	650	109,9	137,35	600	68,0	129,23	600	85,1	152,88
1200	29,4	113,72	1000	30,6	97,88	1000	36,2	115,12	800	53,3	148,78	700	133,3	174,32	650	70,0	152,88	650	100,0	181,74
1400	34,3	154,72	1200	36,7	140,75	1200	43,5	165,77	900	59,3	183,91	800	155,5	224,59	700	78,8	163,98	700	121,6	200,00
1600	39,2	202,02	1400	42,9	191,94	1400	50,7	225,64	1000	76,2	262,83	900	177,8	275,18	800	100,0	263,74	800	135,1	385,22
			1600	49,0	250,55	1600	58,0	294,71	1200	94,1	467,25	1000	199,9	392,37	900	145,5	335,65	900	194,16	230,92
									1400	117,7	575,18	1200	200,0	469,70	1000	160,0	335,65	1000	246,58	300,99
									1600	160,0	762,26	1400	233,3	534,13	1200	177,8	469,70	1200	312,05	370,89
												1600	266,6	697,70	1400	200,0	469,70	1400	385,22	457,96
															1600	200,0	469,70	1600	500,0	659,36
															1600	233,3	534,13	1600	666,6	897,36
															1600	266,6	697,70	1600	866,6	1171,96

SDR : STANDARD DIMENSION RATIO (= OUTER DIAMETER / WALL THICKNESS)

DN : NOMINAL DIAMETER (OUTER DIAMETER)

S : WALL THICKNESS

SDR24= Ring stiffness daily (24 hours)

SDR150= Ring stiffness for 50 years

Standard Production  
Special Production on Demand

Please demand calculations from our Sales Managers for diameters over 1.600 mm.