

Al-Amal Company For Plastic Pipes & Fittings (AL-SHARIF)



High Density Polyethylene (PE 100)

Pressure
Irrigation
Chemical Industrial
Underground drainage



Introduction

AL-AMAL Company for plastic pipes and fittings (AL-SHARIF) was formed in 1995 with the aim of developing a professional UPVC/CPVC/HDPE/PP-R/PP-B/H Pipes and fitting industry.

Since the company has bought AL-AMAL's plastic pipes factories with their well known and trusted brand name and sign, AL-AMAL Co. is considered one of the largest leading companies in the plastic pipes and fittings field in the Middle East.

Since its foundation, AL-AMAL has a steady growth with high quality standards to fulfill the requirements of its customers especially for UPVC/CPVC/HDPE/PP-R/PP-B/H Pipes with more than 42000 tons per year, fittings with more than 8000 tons per year, and it already started in 1st. September 2008 production of PP-R with capacity more than 6000 tons pipes per year and 1200 tons of fittings per year, AL-AMAL's pipes and fittings are produced according to DIN,BS,ASTM,ISO and Egyptian standards demand.

There is also the facility of manufacturing products with special specifications according to customer requirements.

As AL-AMAL's target is to become the major producer in the field of plastic pipes and fittings, a strategic program has been carried out to improve the quality standards and increase the quality and variation of production by having its plant in the 10th of Ramadan City, equipped with new injection molding machines and new molds with advanced automated tooling and up-to date know how which permit high capacity of pipes and fittings with exceptionally high consistency in terms of dimensional accuracy, mechanical strength and surface finish.

AL-AMAL UPVC/CPVC/HDPE/PP-R/PP-B/H Pipes (AL-SHARIF) are well accepted any widely used in domestic water system, warming, cooling, and all types of industrial process pipe works, water distribution and water treatment as well as irrigation systems.

A new range for the production of all systems required for AL-AMAL's customers has been taken into consideration in its near expanding plans.

The most highly advantage is the well equipped laboratory which is established according to the best international standards to control raw materials, final products and also for the researches which is one of the important targets of AL-AMAL to update and develop its products.

Customers can depends completely on AL-AMAL and consider it their partner in the business.

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Manufacturing Standards

AL-SHARIF PE 100 pipes and fittings are manufactured according to the standard specification as follows:

	Dimensions, general quality requirements and tests
Pipe	
PE 100 pressure pipes	DIN 8074/8075
PE 100 waste-water pressure pipes	DIN 8074/8075
PE 100 drinking water pipes	DIN 8074/8075
Fittings	
PE 100 injection-molded fittings for drinking water	DIN 16963
PE 100 fittings for sewers and waste water pipes	DIN 16963

And we can produce according to any standard required from the client.

Marking of Pipes:

1. AL AMAL () ALSHARIF
2. Type of Material (PE 100)
3. Production standard
4. Dimension of the pipe (OD x Thickness)
5. Class of the pipe (PN and S)
6. Machine Name
7. Date and time of production

Marking of Fittings:

1. AL AMAL () ALSHARIF
2. Nominal diameter of fittings
3. Type of material (PE 100)
4. Class of fitting

Quality

This is reflected in national and international certificates ,but above all in the satisfaction of ALAMAL-clients, installers and planners the following laws, decrease, guidelines and standards have to be considered on planning and designing ALAMAL for potable water and heating installations, Cables, Drainage sewage and well pipe systems.

System specific standards:

General quality requirements, dimensions according to:

DIN ,ISO ,EN ,ASTM ,BS ,ES standard for all products **UPVC , CPVC , PP-R , PP-H/B** and **HDPE**.

System control

The production of a quality controlled pipe systems demands the supervision, regulation and control of all work operations. All results and processes have to be documented.

This requires

- ✓ Test and acceptance of incoming goods
- ✓ Process control
- ✓ In-process inspection and test
- ✓ Final inspection and test

Relevant regulations for the quality assurance of all pipes systems are:

ISO- guidelines
ISO 9001/2008
ISO 14001/2004
OHSAS 18001/2007

These standards and guidelines detail the minimum requirements for internal control.

Conformance to the standards is verified by independent institutes in form of internal audits and laboratory tests.

ALAMAL has many years of experience in extrusion and injection molding and is the market leader and pioneer in the manufacturing of **UPVC, CPVC, PP-R, PP-H/B** and **HDPE** pipe systems.

This experience is reflected in internal quality standards and laid down procedures, which are taken strongest note of and are documented by the constant quality of our products.

Internal control

Trained and qualified employees and a modern equipped laboratory ensure that all tests are carried out and regulations are complied with in accordance with the quality control policy, which includes

- ✓ Control of inspection, measuring and test equipment
- ✓ Process and production control
- ✓ receiving inspection test
- ✓ In-process inspection
- ✓ Final inspection

All internal quality controls are documented and recorded in according to the quality control policy.

Process control

AL-AMAL quality control team has supervision of all machines. They inspect all finish products (systemized sampling) all over the day and at the storage too.

They have high experience and training at the quality measurements of the material and finished products.

In-process inspection and test the quality plan requires that tests and inspections are carried out before and during production. At the start of production all quality relevant data are checked by the quality assurance department. Preproduction samples are tested by the laboratory technicians for

- ✓ Surface finish
- ✓ Dimensional accuracy of the test samples
- ✓ Data from extrusion and injection molding machines

The goods will be released for production only if optimal test results are achieved. These tests are carried out at the beginning of each production series to ensure perfect system quality.

Final inspection and test

The quality plan requires that inspections and tests are carried out on all finished products. The results are documented in test reports. Finished products are only released to stock when all tests and inspections conform to the prescribed procedures and specifications.

The final inspection and test includes time lapse test procedures. This enables statements regarding the usability of the products in their later field of application.

These tests are the method for quality assurance during production and for design tests. This is to discover and remove production weaknesses. The results document the system quality and optimize the manufacturing processes.

The final inspection and test covers a lot of test explaining in detail.

ALAMAL laboratory: testing of raw materials and final product, with most modern laboratory equipment (made in Germany) built in a huge area.

AL-AMAL laboratory team is about 50 clever, qualified and trained technicians.

Measurement equipment

- 1- Digital Caliper device
- 2- Circumference
- 3- Micrometer
- 4- Meter
- 5- Gauges for GO and NO GO
- 6- Thread Gauges for Brass
- 7- Gauges for Rubber

Laboratory equipment's for the Granular and Powder materials

1- Melt flow Tester (ISO 1133)

Measurement of the melt flow index

2- Sieve analysis test (ES 1992-4)

Measurement of the particle size of the powder

3- Flow test (ES 1991)

Measurement of the flow of material in the feeder of the machine

4- Heat stability test (ES 1991)

Measurement of the heat stability of the material

5- Bulk density (ES 1991)

Measurement the density of the powder

6- K-value (ES 1991)

Measurement the K-value of the resins

1. Falling Impact Test

According to (ES 848 – ISO 4422 – ISO 15877 – ASTM D1785 – ASTM D2241)

These depend on the diameter of the pipe at which we fall a certain mass in the pipe from 2 meter height at room temperature according to standard

2. Pendulum Impact Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080)

That tests according to DIN and ES standard that measure notched charpy impact strength of the pipe

3. VST Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080 – ISO 4422)

That measures the softening temperature of the product (Pipes or Fittings)

4. Chemicals Effect Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080)

That measures the effect of the solvent as Acetone and Methylene chloride

5. Hydrostatic Pressure Test

According to (ES 848 – ISO 4422 – ISO 15877 – ASTM D1785 – ASTM D2241 – DIN 8061 – DIN 8074 – DIN 8075 – DIN 8080)

Measurement of the Internal Hydrostatic pressure of the pipes and fittings

6. Burst Pressure Test

According to (ASTM D1785 – ASTM D2241 – ASTM F441 – ASTM F439)

Measurement of the Burst pressure of the pipes and the fittings

7. Oven (Heat reversion) Test

According to (ES 848 – ES 5232 – DIN 8061 – DIN 8080 – DIN 8075)

Measurement the effect of the high temperature in the products

8. Tensile Tester

According to (ES 5232 – ASTM 681 – ISO 37)

Measurement of the tensile strength of the products (Pipes, Fittings and gaskets)

9. Compression Tester

According to (BS EN ISO 9969 – EN 1401 – ES 1717 – ISO 4435)

Measurement the stiffness of the pipe

10. Hardness Tester

According to (ISO 48 – DIN 681-1/2 – DIN 53505 – ASTM D 2240)

11. Thermocycling Tester

According to (ISO 10508)

Those test a net of the product (pipes and fittings) at different temperature and certain internal pressure for long time

The customer can be assured of the highest quality of the products.

External supervision consists of tests of a defined scope and in defined intervals. The respective supervising institutions appoint authorized test organizations to carry out these tests.

The external supervision includes external tests of the products and:-

- a) Internal audit of AL-AMAL's quality assurance system and test procedures.
- b) Calibration of the test equipment.
- c) Hygienic and toxicity tests.

The results of the supervisory visits as well as external tests made on pipe and fitting samples are confirmed to ALAMAL in test certificates.

In Egypt, the external supervision of the AL-AMAL pipe system is carried out by the Storage / packing / dispatch upon successful release the products are stored in suitable warehouses.

Internal instructions control the method of packing, storage and dispatch of the products. The warehouse staff is responsible for control of the stored product.

Polyethylene (PE)

General Information

Polymers which consist only of carbon and hydrogen (hydrocarbons) are called polyolefin.

Polyethylene (PE) belongs to this group. It is a semi-crystalline thermoplastic. Polyethylene is the best known standard polymer. The chemical formula is: $(CH_2-CH_2)_n$. It is an environmentally friendly hydrocarbon product so that it's the most common plastic.

PE is considered a non-polar material, meaning it does not dissolve in common solvents and hardly swells. As a result, PE pipes cannot be solvent cemented. The appropriate joining method for this material is heat fusion.

HDPE: High Density Polyethylene (PE 100)

DESCRIPTION

- PE 100 is a black high density polyethylene designed for water pressure pipes, irrigation, chemical industrial and underground drainage.
- PE 100 contains minimum 2% of well dispersed, fine particle size Carbon Black and stabilizers to ensure excellent weathering resistance and long-term stability.
- PE 100 shows excellent resistance to rapid crack propagation and slow crack growth, both being important parameters for pressure pipe design.
- PE 100 can easily be welded by butt fusion, using standard HDPE parameters or by electrofusion.
- PE 100 raw material has the highest performance of all HDPE material (PE 63 and PE 80)

Material Properties (PE100)

Material Data

The following table lists typical physical properties of Polyethylene thermoplastic materials. Variations may exist depending on specific compounds and product.

PHYSICAL PROPERTIES		Typical Value	Unit	Test Method
Density	(Base resin)	949	Kg/m ³	ISO 1183/ISO 1872-2B
Density	(Compound)	959	Kg/m ³	ISO 1183/ISO 1872-2B
Melt Flow Rate	(190°C/2.16kg)	<0.1	g/10min	ISO 1133
Melt Flow Rate	(190°C/5.0kg)	0.25	g/10min	ISO 1133
Tensile Stress at Yield	50mm/min	25	Mpa	ISO 527-2
Elongation at Break		>600	%	ISO 527-2
Charpy impact, notched	(0°C)	16	KJ/m ²	ISO 179/1eA
Hardness, Shore D		60	-	ISO 868
Carbon Black Content		≥2	%	ASTM D 1603
Brittleness Temperature		<-70	°C	ASTM D 746
ESCR	(10% Igepal), F ₅₀	>10000	h	ASTM D 1693-A
Thermal Stability	(210°C)	>15	min	EN 728

The Advantages of PE 100

High Impact Strength:

The high impact strength of PE 100 pipes compared with other materials ensures a greater resistance to the rigours of pipe laying conditions.

Damage Resistance:

PE 100 has low notch sensitivity, providing a high level of resistance to the effect of external damage, especially important for pipe bursting operations and others where likelihood such damage.

Ease of Installation:

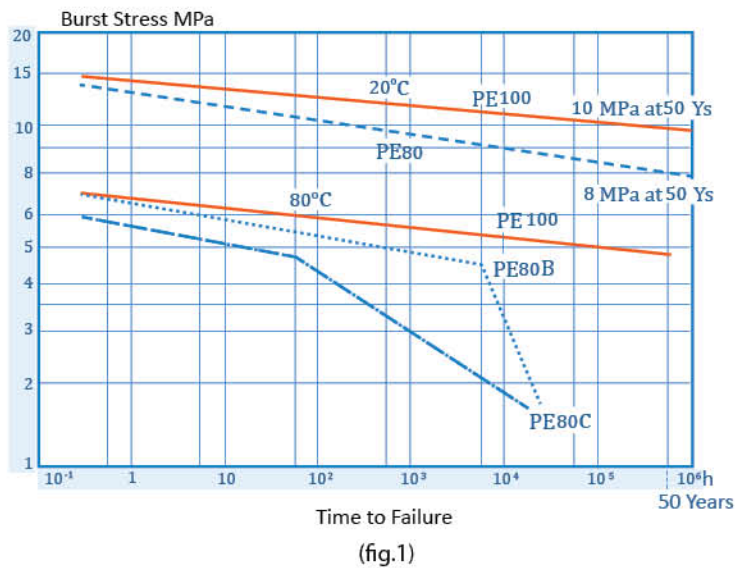
PE 100 pipes are easy to install with their light weight and long lengths. PE coiled pipes are widely used in applications such as stock watering, irrigation systems, communications, gas, and reticulated water mains due to rapid installation and the ease and less frequent joining.

High Flow Capacity:

HDPE pipes have lower friction factors than the most non-plastic materials. The surface energy characteristics of PE 100 ensure that material deposition is inhibited and the smooth bore characteristic is maintained over the working life of pipe line.

Long life:

PE 100 pipes have a proven high reliability record across a wide range of industries and applications, now approaching a period of 50 years. PE 100 also provides alone maintenance free lifetime with low whole life costs, compared to many other materials. (fig.1)



Trenchless Construction:

PE 100 pipes offer many advantages in slip lining, pipe bursting, directional drilling and microtunneling including features such as long lengths, corrosion resistance, light weight and ease of installation with minimum disruption.

Allowable working pressure for pipes made from PE 100, conveying water, with a safety factor of 1.25

Tem- pera- ture, in °C	Years of service	Pipes series														
		25	20	16	12.5	10.5	10	8.3	8	6.3	5	4	3.2	2.5	2	
		Standard dimension (SDR)														
51	41	33	26	22	21	17.6	17	13.6	11	9	7.4	6	5			
Allowable working pressure																
10	5	4.0	5.0	6.3	7.9	9.4	10.1	12.1	12.6	15.7	20.2	25.2	31.5	40.4	50.5	
	10	3.9	4.9	6.2	7.8	9.3	9.9	11.9	12.4	15.5	19.8	24.8	31.0	39.7	49.6	
	25	3.8	4.8	6.0	7.6	9.0	9.6	11.6	12.1	15.1	19.3	24.2	30.2	38.7	48.4	
	50	3.8	4.7	5.9	7.5	8.9	9.5	11.4	11.9	14.8	19.0	23.8	29.7	38.0	47.6	
	100	3.7	4.6	5.8	7.3	8.7	9.3	11.2	11.6	14.6	18.7	23.3	29.2	37.4	46.7	
20	5	3.3	4.2	5.3	6.6	7.9	8.4	10.2	10.6	13.2	16.9	21.2	26.5	33.9	42.4	
	10	3.3	4.1	5.2	6.5	7.8	8.3	10.0	10.4	13.0	16.6	20.8	26.0	33.3	41.6	
	25	3.2	4.0	5.0	6.4	7.6	8.1	9.8	10.1	12.7	16.2	20.3	25.4	32.5	40.7	
	50	3.2	4.0	5.0	6.3	7.5	8.0	9.6	10.0	12.5	16.0	20.0	25.0	32.0	40.0	
	100	3.1	3.9	4.9	6.1	7.3	7.8	9.4	9.8	12.2	15.7	19.6	24.5	31.4	39.2	
30	5	2.8	3.6	4.5	5.6	6.7	7.2	8.6	9.0	11.2	14.4	18.0	22.5	28.8	36.0	
	10	2.8	3.5	4.4	5.5	6.6	7.0	8.5	8.8	11.0	14.1	17.7	22.1	28.3	35.4	
	25	2.7	3.4	4.3	5.4	6.4	6.9	8.3	8.6	10.8	13.8	17.2	21.6	27.6	34.5	
	50	2.7	3.3	4.2	5.3	6.3	6.7	8.1	8.4	10.6	13.5	16.9	21.2	27.1	33.9	
	100	2.4	3.0	3.8	4.8	5.8	6.1	7.4	7.7	9.6	12.3	15.4	19.3	24.7	30.9	
40	10	2.4	3.0	3.8	4.7	5.7	6.0	7.3	7.6	9.5	12.1	15.2	19.0	24.3	30.4	
	25	2.3	2.9	3.7	4.6	5.5	5.9	7.1	7.4	9.2	11.8	14.8	18.5	23.7	29.7	
	50	2.3	2.9	3.6	4.5	5.4	5.8	7.0	7.2	9.1	11.6	14.5	18.2	23.3	29.1	
	100	2.1	2.6	3.3	4.2	5.0	5.3	6.4	6.7	8.3	10.7	13.4	16.7	21.4	26.8	
	10	2.0	2.6	3.2	4.0	4.8	5.2	6.2	6.5	8.1	10.4	13.0	16.2	20.3	26.0	
50	15	1.9	2.3	2.9	3.7	4.4	4.7	6.7	6.7	7.4	9.5	11.8	14.8	19.0	23.7	
	5	1.5	1.9	2.4	3.0	3.6	3.8	4.6	4.8	6.0	7.7	9.7	12.1	15.5	19.4	
	2	1.2	1.5	1.9	2.4	2.9	3.1	3.7	3.9	4.9	6.2	7.8	9.8	12.5	15.7	

Allowable working pressure for pipes made from PE 100, conveying water, with a safety factor of 1.6

Tem- pera- ture, in °C	Years of service	Pipes series														
		25	20	16	12.5	10.5	10	8.3	8	6.3	5	4	3.2	2.5	2	
		Standard dimension (SDR)														
	51	41	33	26	22	21	17.6	17	13.6	11	9	7.4	6	5		
Allowable working pressure																
10	5	3.1	3.9	4.9	6.3	7.5	7.8	9.5	9.8	12.5	15.7	19.7	24.2	31.5	39.4	
	10	3.1	3.8	4.8	6.2	7.3	7.7	9.3	9.6	12.3	15.5	19.3	23.8	31.0	38.7	
	25	3.0	3.8	4.7	6.0	7.2	7.5	9.1	9.4	12.0	15.1	18.9	23.3	30.2	37.8	
	50	2.9	3.7	4.6	5.9	7.0	7.4	8.9	9.3	11.8	14.8	18.6	22.8	29.7	37.2	
	100	2.9	3.6	4.5	5.8	6.9	7.3	8.8	9.1	11.6	14.6	18.2	22.4	29.2	36.5	
20	5	2.6	3.3	4.1	5.3	6.3	6.6	7.9	8.2	10.5	13.2	16.5	20.4	26.5	33.1	
	10	2.6	3.2	4.0	5.2	6.2	6.5	7.8	8.1	10.3	13.0	16.2	20.0	26.0	32.5	
	25	2.5	3.1	3.9	5.0	6.0	6.3	7.6	7.9	10.0	12.7	15.9	19.5	25.4	31.8	
	50	2.5	3.1	3.9	5.0	5.9	6.2	7.5	7.8	9.9	12.5	15.6	19.2	25.0	31.2	
	100	2.4	3.0	3.8	4.9	5.8	6.1	7.3	7.6	9.7	12.2	15.3	18.8	24.5	30.6	
30	5	2.2	2.8	3.5	4.5	5.3	5.6	6.7	7.0	8.9	11.2	14.0	17.3	22.5	28.1	
	10	2.2	2.7	3.4	4.4	5.2	5.5	6.6	6.9	8.7	11.0	13.8	17.0	22.1	27.6	
	25	2.1	2.7	3.3	4.3	5.1	5.4	6.5	6.7	8.5	10.8	13.5	16.6	21.6	27.0	
	50	2.1	2.6	3.3	4.2	5.0	5.3	6.3	6.6	8.4	10.6	13.2	16.3	21.2	26.5	
	100	2.0	2.5	3.2	4.1	4.9	5.2	6.2	6.5	8.3	10.5	13.1	16.2	21.1	26.4	
40	5	1.9	2.4	3.0	3.8	4.6	4.8	5.8	6.0	7.6	9.6	12.0	14.8	19.3	24.1	
	10	1.9	2.3	2.9	3.8	4.5	4.7	5.7	5.9	7.5	9.5	11.8	14.6	19.0	23.7	
	25	1.8	2.3	2.9	3.7	4.4	4.6	5.5	5.8	7.3	9.2	11.6	14.2	18.5	23.2	
	50	1.8	2.2	2.8	3.6	4.3	4.5	5.4	5.6	7.2	9.1	11.3	14.0	18.2	22.7	
	100	1.7	2.1	2.7	3.5	4.2	4.4	5.3	5.5	7.1	9.0	11.2	13.9	18.1	22.6	
50	5	1.6	2.0	2.6	3.3	3.9	4.1	5.0	5.2	6.6	8.3	10.4	12.8	16.7	20.9	
	10	1.6	2.0	2.5	3.2	3.8	4.0	4.8	5.0	6.4	8.1	10.1	11.4	16.2	20.3	
	25	1.5	1.9	2.4	3.1	3.7	3.9	4.7	4.9	6.3	8.0	10.0	12.4	16.1	20.2	
	50	1.5	1.9	2.4	3.1	3.7	3.9	4.7	4.9	6.3	8.0	10.0	12.4	16.1	20.2	
	100	1.4	1.8	2.3	2.9	3.5	3.7	4.4	4.6	5.8	7.4	9.2	11.4	14.8	18.5	
60	5	1.2	1.5	1.9	2.4	2.8	3.0	3.6	3.8	4.8	6.0	7.6	9.3	12.1	15.2	
70	2	0.9	1.2	1.5	1.9	2.3	2.4	2.9	3.0	3.8	4.8	6.1	7.5	9.8	12.2	

Allowable working pressure for pipes made from PE 100, conveying water, with a safety factor of 2.0

Tem- pera- ture, in °C	Years of service	Pipes series														
		Standard dimension (SDR)														
		25	20	16	12.5	10.5	10	8.3	8	6.3	5	4	3.2	2.5	2	
	51	41	33	26	22	21	17.6	17	13.6	11	9	7.4	6	5		
	Allowable working pressure															
10	5	2.5	3.1	3.9	5.0	6.0	6.3	7.6	7.8	10.0	12.6	15.7	19.4	25.2	31.5	
	10	2.4	3.1	3.8	4.9	5.9	6.2	7.4	7.7	9.8	12.4	15.5	19.0	24.8	31.0	
	25	2.4	3.0	3.7	4.8	5.7	6.0	7.3	7.5	9.6	12.1	15.1	18.6	24.2	30.2	
	50	2.3	2.9	3.7	4.7	5.6	5.9	7.1	7.4	9.4	11.9	14.8	18.3	23.8	29.7	
	100	2.3	2.9	3.6	4.6	5.5	5.8	7.0	7.3	9.2	11.6	14.6	17.9	23.3	29.2	
20	5	2.1	2.6	3.3	4.2	5.0	5.3	6.3	6.6	8.4	10.6	13.2	16.3	21.2	26.5	
	10	2.0	2.6	3.2	4.1	4.9	5.2	6.2	6.5	8.2	10.4	13.0	16.0	20.8	26.0	
	25	2.0	2.5	3.1	4.0	4.8	5.0	6.1	6.3	8.0	10.1	12.7	15.6	20.3	25.4	
	50	2.0	2.5	3.1	4.0	4.7	5.0	6.0	6.2	7.9	10.0	12.5	15.3	20.0	25.0	
	100	1.9	2.4	3.0	3.9	4.6	4.9	5.9	6.1	7.7	9.8	12.2	15.1	19.6	24.5	
30	5	1.8	2.2	2.8	3.6	4.2	4.5	5.4	5.6	7.1	9.0	11.2	13.8	18.0	22.5	
	10	1.7	2.2	2.7	3.5	4.2	4.4	5.3	5.5	7.0	8.8	11.0	13.6	17.7	22.1	
	25	1.7	2.1	2.7	3.4	4.1	4.3	5.2	5.4	6.8	8.6	10.8	13.6	17.2	21.6	
	50	1.6	2.1	2.6	3.3	4.0	4.2	5.1	5.3	6.7	8.4	10.6	13.0	16.9	21.2	
	100	1.5	1.9	2.4	3.0	3.6	3.8	4.6	4.8	6.1	7.7	9.6	11.9	15.4	19.3	
40	5	1.5	1.9	2.3	3.0	3.6	3.8	4.5	4.7	6.0	7.6	9.5	11.6	15.2	19.0	
	10	1.5	1.9	2.3	3.0	3.6	3.8	4.5	4.7	6.0	7.6	9.5	11.6	15.2	19.0	
	25	1.4	1.8	2.3	2.9	3.5	3.7	4.4	4.6	5.8	7.4	9.2	11.4	14.8	18.5	
	50	1.4	1.8	2.2	2.9	3.4	3.6	4.3	4.5	5.7	7.2	9.1	11.2	14.5	18.2	
	100	1.3	1.6	2.0	2.6	3.1	3.3	4.0	4.1	5.3	6.7	8.3	10.3	13.4	16.7	
50	5	1.3	1.6	2.0	2.6	3.0	3.2	3.9	3.0	5.1	6.5	8.1	10.0	13.0	16.2	
	10	1.3	1.6	2.0	2.6	3.0	3.2	3.9	3.0	5.1	6.5	8.1	10.0	13.0	16.2	
	25	1.1	1.4	1.8	2.3	2.8	2.9	3.5	3.7	4.7	5.9	7.4	9.1	11.8	14.8	
	50	0.9	1.2	1.5	1.9	2.3	2.4	2.9	3.0	3.8	4.8	6.0	7.4	9.7	12.1	
	100	0.7	0.9	1.2	1.5	1.8	1.9	2.3	2.4	3.1	3.9	4.9	6.0	7.9	9.8	

Mechanical Properties

Modern PE100 grades show a bimodal molecular weight distribution, i.e.: they consist of two different kinds of molecular chains (short and long). These polyethylenes combine a high tensile strength with a high resistance against fast and slow crack propagation.

PE also shows a very high impact resistance throughout its entire temperature range.

Creep under internal pressure

One of the most important methods of verifying the service life of PE pipes are to determine creep under internal pressure, also referred to simply as "creep".

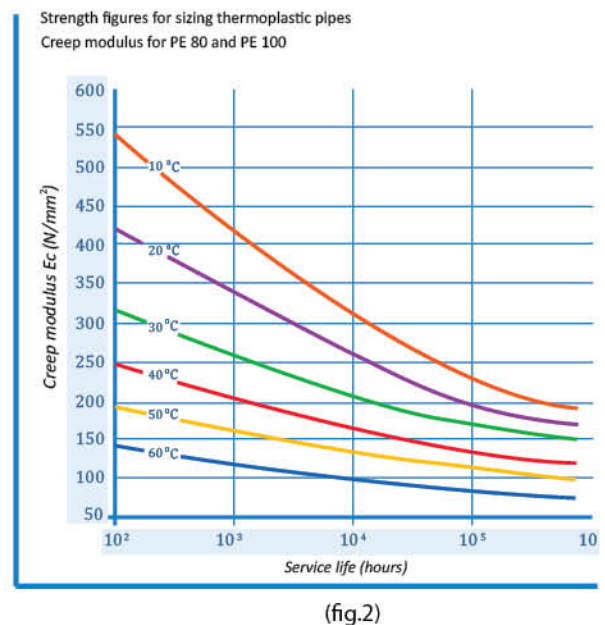
Even after 100 years of a continuous service temperature of 20 °C no thermo oxidative processes will occur in PE 80 or PE 100 pipes (see chart). The tests conducted within this area provide comparative data used for the purpose of design/sizing pipes to be exposed to sustained loading (up to 100 years).

Time-dependent modulus of elasticity (creep modulus)

Data relating to the modulus of elasticity is essential when it comes to performing stability analyses, e.g.

in the case of buried pipes exposed to soil loads, live loads or groundwater. In the case of pipes made of thermoplastic materials, the time-dependent modulus of elasticity is of particular importance. Scientific tests and practical experience have provided long-term dimensional parameters,

ensuring that the design of the piping system is technically sound and suitable for sustained operation. (fig.2)

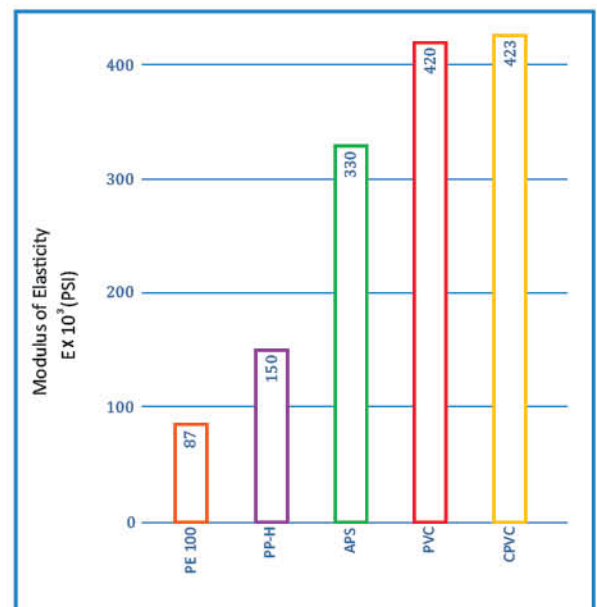


(fig.2)

Expansion/Contraction

Allowing for Length Changes in PE Pipelines

Variations in temperature cause greater length changes in thermoplastic materials than in metals. In the case of above ground, wall or duct mounted pipe work, particularly where subjected to varying working temperatures, it is necessary to make suitable provision for length changes in order to prevent additional stresses. (fig.3)



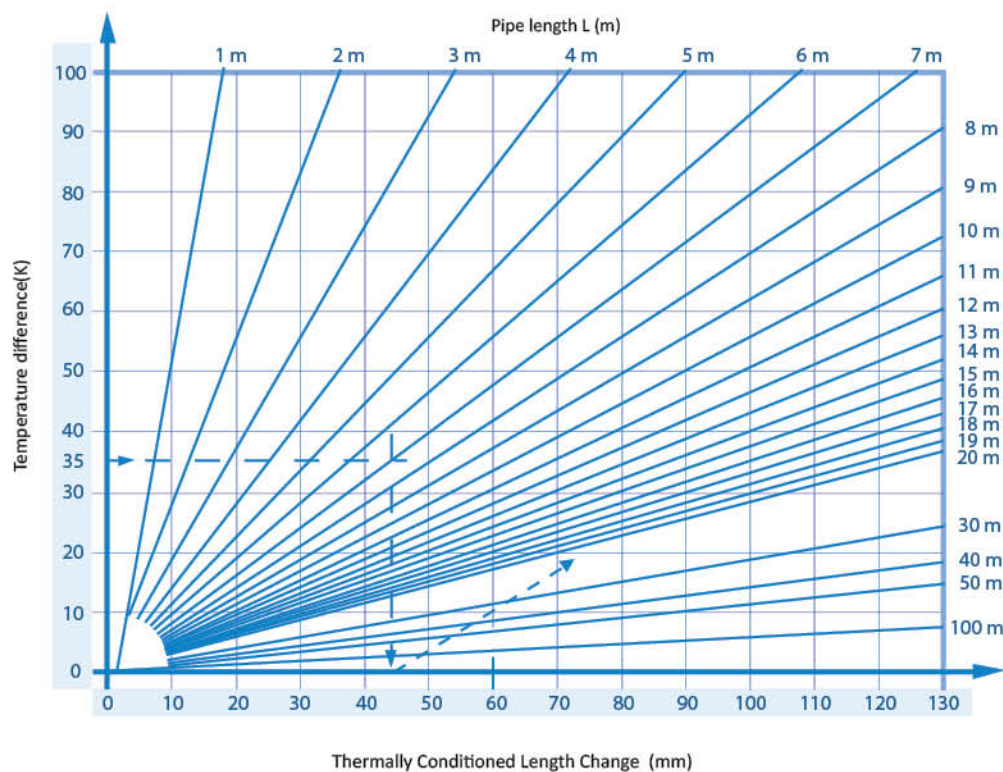
(fig.3)

Polyethylene pipes can be used at temperatures ranging from -50°C to 60°C .

The thermal conductivity of PE100 is $0.4 \text{ W/m}^{\circ}\text{K}$. Because of its inherent insulating properties, a PE piping system is notably more economical due to not requiring secondary insulation when compared to a system made of metals such as Stainless Steel and Copper.

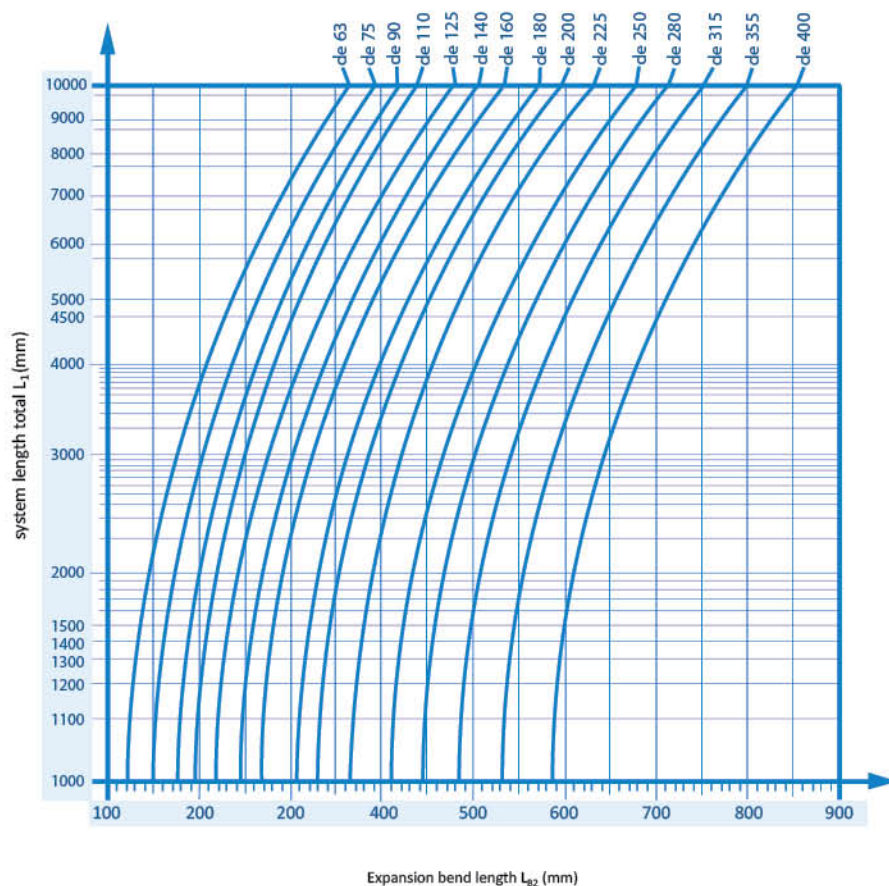
Expansion and contraction of AL-SHARIF pipes occurs with changes in the pipe material service temperature. This is in common with all pipe material and in order to determine the actual amount of expansion or contraction, the actual temperature change, and the degree of restraint of the installed pipeline need to be known. For design purposes, an average value of $2.0 \times 10^{-4}/^{\circ}\text{C}$ for AL-SHARIF PE pipes may be used.

The relationship between temperature change and length change for different materials. Where pipes are buried, the changes in temperature are small and slow acting, and the amount of expansion/contraction of the pipe is relatively small. In addition, the frictional support of the backfill against the outside of the pipe restrains the movement and any thermal effects are translated into stress in the wall of the pipe. Accordingly, in buried pipelines the main consideration of thermal movement is during installation in high ambient temperatures. Above ground PE pipes require no expansion/contraction considerations for free ended pipe or where lateral movement is of no concern on site. Alternatively, pipes may be anchored at intervals to allow lateral movement to be spread evenly along the length of the pipeline.

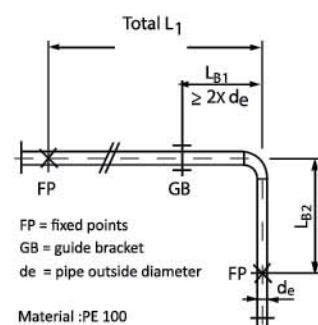


(fig.4)

L-Expansion bends

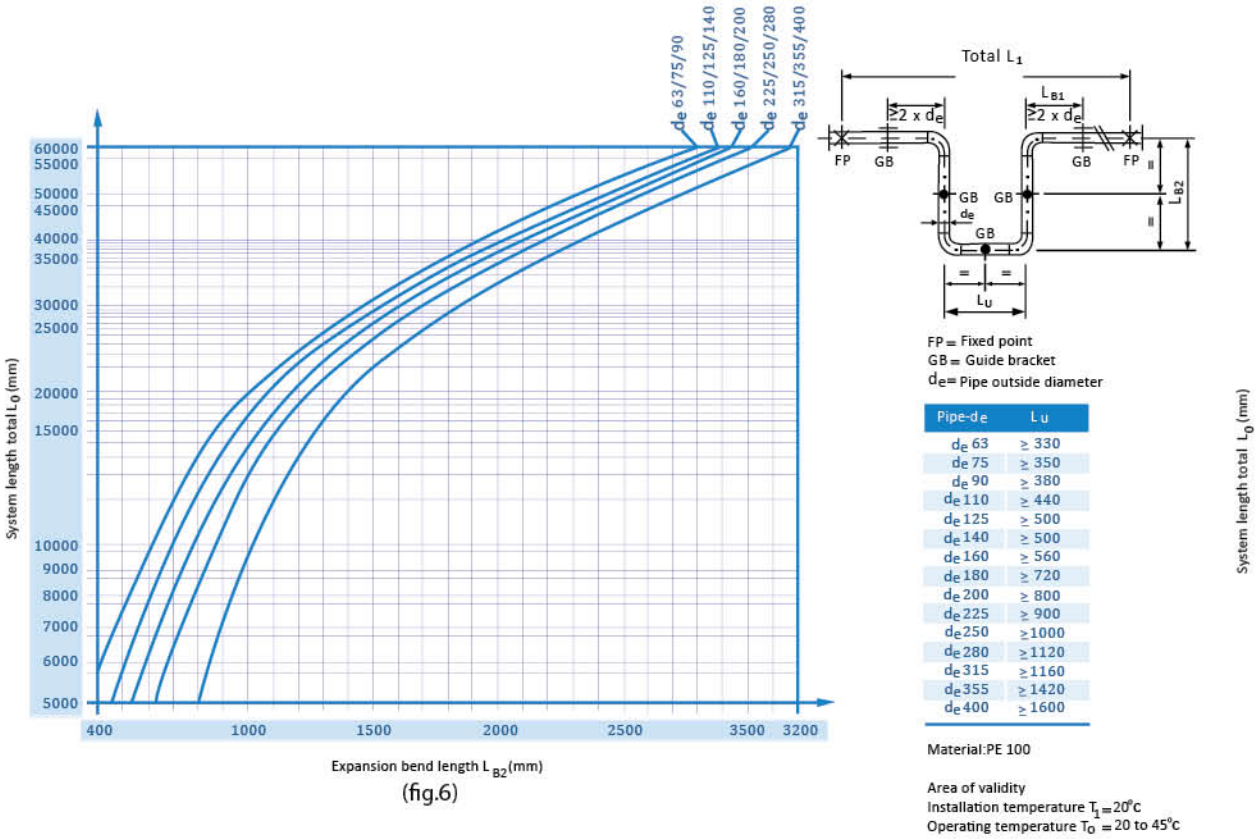


(fig.5)

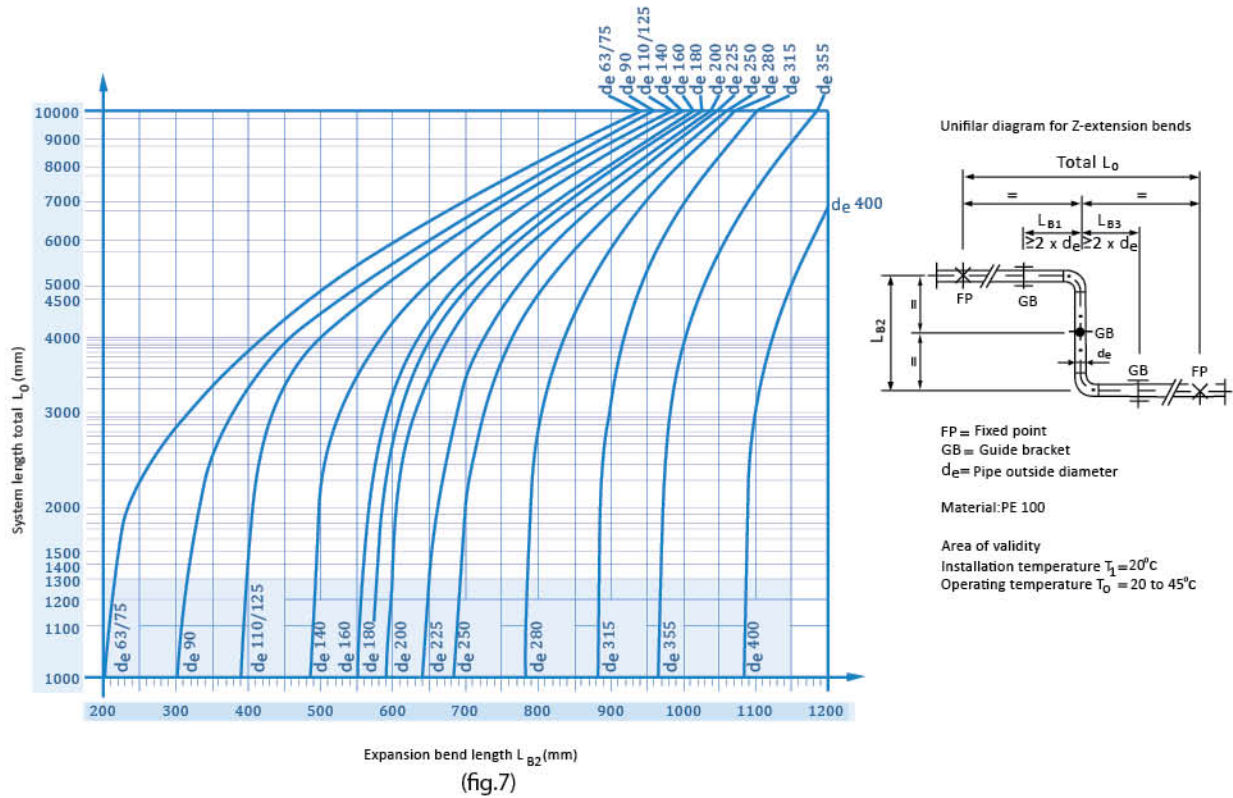


Area of validity:
Installation temperature $T_i = 20^\circ\text{C}$
Operating temperature T_o = up to 30°C
SDR 17/11

U-Expansion bends



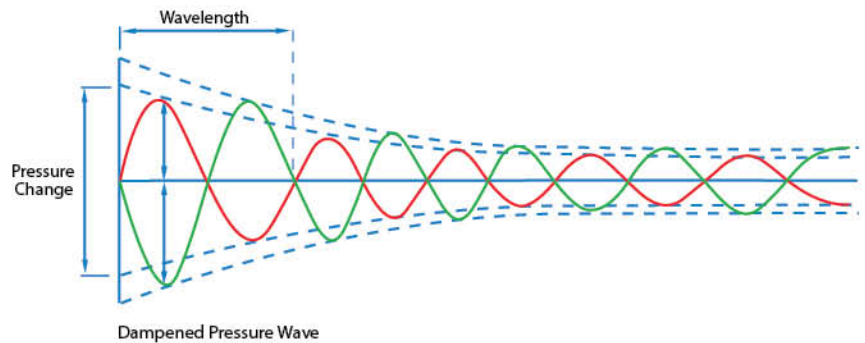
Z-Expansion bends



Surge Pressure (Water Hammer)

Surge pressure, or water hammer, is a term used to describe dynamic surges caused by pressure changes in a piping system. They occur whenever there is a deviation from the steady state, i.e.; when the velocity of the fluid is increased or decreased, and may be transient or oscillating. Waves of positive or negative pressure may be generated by any of the following:

- Opening or closing of a valve
- Pump startup or shutdown
- Change in pump or turbine speed
- Wave action in a feed tank
- Entrapped air



The pressure waves travel along at speeds limited by the speed of sound in the medium, causing the pipe to expand and contract. The energy carried by the wave is dissipated and the waves are progressively damped.

The pressure excess to water hammer must be considered in addition to the hydrostatic load, and this total pressure must be sustainable by the piping system. In the case of oscillatory surge pressures, extreme caution is needed as surging at the harmonic frequency of the system could lead to catastrophic damage.

Chemical, Weathering, and Abrasion Resistance

Due to its non-polar nature as a hydrocarbon of high molecular weight, polyethylene shows a high resistance against chemical attack. PE is resistant to acids, alkaline solutions, solvents, alcohol and water. Fat and oil swell PE slightly. PE is not resistant against oxidizing acids, ketones, aromatic hydrocarbons and chlorinated hydrocarbons.

Experience has shown that PE offers considerable advantages over metal and other plastics, such as, low temperature applications and excellent resistance against abrasion. As a result, PE piping systems are used in numerous applications for transporting brine solutions, dissolved solids and slurries.

Chemical resistance Chart

AL-SHARIF PE 100 pipes and fittings are resistance to corrosion by chemicals conform to (ISO-TR 10358) For different chemicals contact our factories.

Transportation, Packaging, Handling and Storage of PE100 Pipes and Fittings

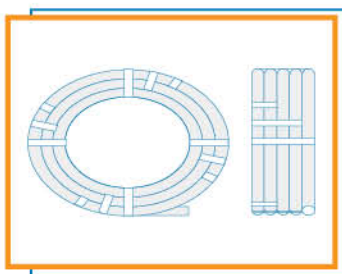
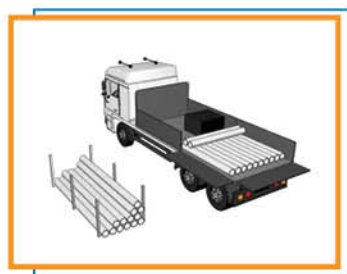
Pipes

On trucks the 6m or longer pipes must be fully supported on the loading area. Avoid loading at the same time with sharp objects. Pipes should not be thrown or dragged along the ground.

Pipes should be given adequate support at all times. Pipes should not be stacked in large piles, especially in warm temperature conditions as the lower layers may distort, resulting in difficulties in jointing and pipe alignment. Any pipe with ends prepared for jointing (sockets and spigot joints, A joints, etc.) should be stacked in layers with sockets placed at alternate ends of the stacks and with the sockets protruding to avoid unstable stacks and the possibility of imparting a permanent set to the pipes.

For long-term storage, pipe racks should provide continuous support, but if this isn't possible timber of at least 3 in. (75mm) bearing width at spacing no greater than 3 ft. (915mm) centers for pipe sizes 160mm and above, should be placed beneath the pipes and at 6 ft. (1.8m) centers at the side, if the stacks are rectangular. These spacing apply to pipe size 160mm and above. Closer support will be required for size below 160mm in such pipe racks. Pipes may be stored not more than seven layers, or 6 ft. (1.8m) height, whichever is the lesser. But if different classes of pipe are kept in the same racks, than the thickness classes of the largest diameter must always be placed at bottom.

When loading pipes on to vehicles, care must be taken to avoid their coming into contact with any sharp corners such as cope irons, loose nail-heads, etc. as pipes may be damaged by being rubbed against these during transit. Whilst in transit pipes shall be well secured over their entire length and not allowed to project unsecured over the tailboard of the lorry pipes may off-loaded from lorries by rolling them gently down timbers, care being taken to ensure that pipes don't fall one upon another, nor on to any hard or uneven surfaces.



Applications of PE 100 Pipes

Water Networks:

AL-AMAL HDPE (PE100) pipes are used for potable water network which is not affecting the water properties or validity, as it's chemically inert. In addition, the networks are totally safe and very secure from any leakage problems resulted from water hammering due to the joining methods using butt welding and its high flexibility.

The smooth surface which prevents any kind of bacteria to accumulate makes the pipes is the most suitable choice when dealing with potable water.

Sanitary and industrial drainage:

AL-AMAL HDPE pipes are used for both sanitary and industrial drainage due to their excellent chemical resistance for (Acids, Alkaline, Salts ...etc) and their non-penetration nature, besides the network leakage free.

Irrigation system:

Due to flexibility, AL-AMAL HDPE pipes have high resistance for environmental conditions, especially ultraviolet rays. Same as PE pipes. One considered the optimum choice for irrigation networks by using it up ground and underground.

Other uses:

Siphons under canals, railway lines & aircraft runways where the pipes are installed by directional drilling, Cables ducts and water injection system of oil wells.

Joining Methods of High Density Polyethylene Pipe Systems PE 100

Butt Fusion:

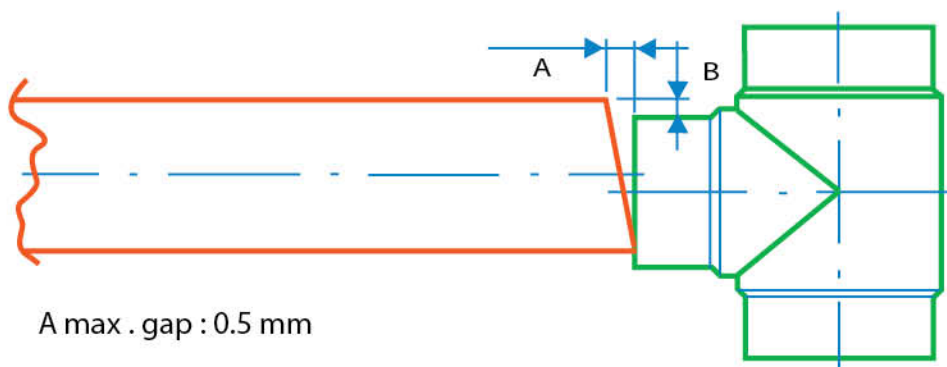
In butt fusion the pipe ends to be joined are brought together in a dedicated butt fusion machine. The end faces are squared up by planing with a mechanical trimmer then heated with thermostatically controlled non-stick heater plate. When molten, the faces are pushed together and allowed to cool.

This method is carried out as follows:

- Clamp the pipes in the clamping devices if necessary use pipe supports so the pipes remain axially.
- Clean the outside and inside surfaces by dry cloth.
- Cover the free ends of the pipes to prevent cooling of the plate by internal draughts.



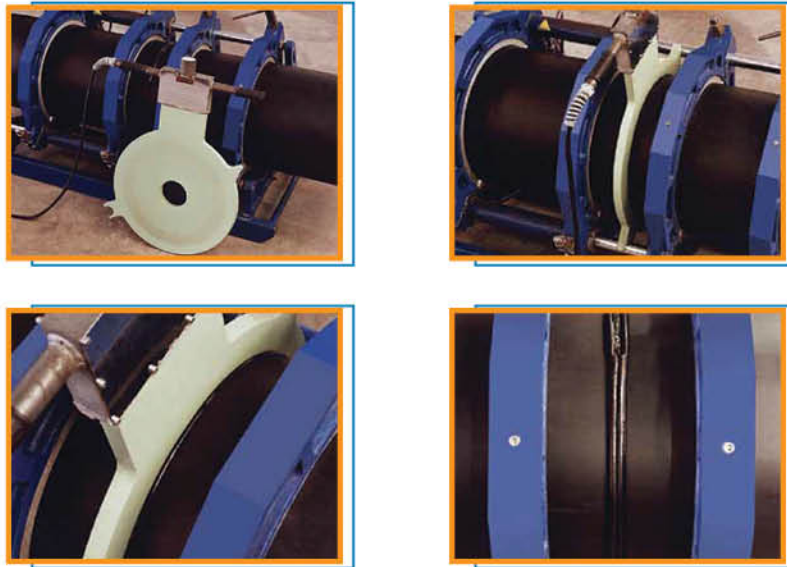
- Switch on the trimming tool and bring the clamps slowly together so that the pipe ends are moved against the trimming tool until continuous shavings are cut from each surface.
- Remove the trimming tool taking care
Do not touch the trimmed ends with your hands.
- Match the end of both pipes, the gap between the pipes may not exceed 0.5mm at the same time check the wall offset of the pipes, the wall offset may only be a maximum of 10% of the pipe wall thickness.



A max . gap : 0.5 mm

B max . displacement : 10% of wall thickness

- Insert the heater between the two ends of pipes (temperature 210°C) and make sure the pipes are in contact with the heating element then increase pressure to the equalization pressure.
- Wait till the bead height reaches the value given in the fusion tables.
- Release the pressure; leave the pipe at the necessary time according to the welding table provided with the machine



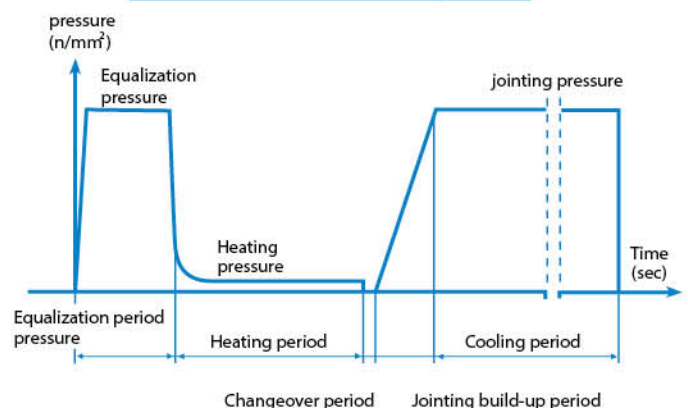
- Remove the heater and join the surfaces together then increase the pressure up to the value in the fusion tables.
- Cooling time begins, after that release the pipes from machine clamps.

The rules for butt-fusion

NEVER

- Attempt to weld together pipes of different SDR (wall thickness).
- Touch trimmed pipe ends.
- Leave trimming swarf inside pipe or on welding machine.
- Allow equipment to get wet or dusty.
- Use non-approved machinery.
- Remove a weld from the machine before cooling time has elapsed.
- Allow untrained personnel to use welding equipment.
- Cut corners in any part of the welding procedure.
- Weld pipes of different material on-site.
- Use a generator of inadequate capacity.

Pressure/ Time Diagram



Outside diameter	SDR	Wall Thickness (min)	Bead up interface stress	Initial bead size (approx)	Soak time	Min soak interface stress	Max plate removal time	Fusion and cooling interface stress	Cooling time in clamps	Cooling time out of clamps	Cooling time for coiled pipe in clamps	Typical final overall bead width	
												min mm	max mm
90	26	3.5	0.15	2	95	0	10	0.15	10	5	15	8	15
90	17.6	5.1	0.15	2	110	0	10	0.15	10	5	15	8	15
90	11	8.2	0.15	2	140	0	10	0.15	10	5	15	9	16
110	26	4.2	0.15	2	100	0	10	0.15	10	5	15	8	15
110	17.6	6.3	0.15	2	125	0	10	0.15	10	5	15	9	16
110	11	10	0.15	2	160	0	10	0.15	10	5	15	10	17
125	26	4.8	0.15	2	110	0	10	0.15	10	5	15	8	15
125	17.6	7.1	0.15	2	130	0	10	0.15	10	5	15	9	16
125	11	11.4	0.15	2	175	0	10	0.15	10	5	15	10	17
160	26	6.2	0.15	2	120	0	10	0.15	10	5	15	9	16
160	17.6	9.1	0.15	2	150	0	10	0.15	10	5	15	9	16
160	11	14.6	0.15	2	205	0	10	0.15	10	5	15	11	18
180	26	6.9	0.15	2	130	0	10	0.15	10	5	15	9	16
180	17.6	10.2	0.15	2	160	0	10	0.15	10	5	15	10	17
180	11	16.4	0.15	2	225	0	10	0.15	10	5	15	11	18
225	26	8.6	0.15	2	145	0	10	0.15	10	5		9	16
225	17.6	12.8	9.8	2	190	0	10	0.15	10	5		10	17
225	11	20.5	0.15	2	265	0	10	0.15	10	5		12	19
250	26	9.6	0.15	2	155	0	10	0.15	10	5		9	16
250	17.6	14.2	0.15	2	200	0	10	0.15	10	5		10	17
280	26	10.7	0.15	3	170	0	10	0.15	10	5		13	22
280	17.6	15.9	0.15	3	220	0	10	0.15	10	5		14	23
315	26	12.1	0.15	3	180	0	10	0.15	10	5		13	22
315	17.6	17.9	0.15	3	240	0	10	0.15	10	5		14	23
	Tolerance		±0.02		±3			±0.02					

Table 1 — Single pressure butt-fusion jointing conditions for PE 63, PE 80 and PE 100
Heater Plate Surface Temperature: 195 °C to 200 °C

Outside diameter	SDR	Wall Thickness (mm)	Bead up interface stress (Mpa)	Initial bead size (approx) (mm)	Soak time (sec)	Min soak interface stress (Mpa)	Max plate removal time (sec)	Fusion interface stress (after 10 sec) (Mpa)	Cooling interface stress (after 10 sec) (min)	Cooling time in clamps (min)	Cooling time out of clamps (min)	Typical final overall bead width	
												min mm	max mm
250	11	22.7	0.15	2	285	0	10	0.15	0.025	15	7.5	15	24
280	11	25.4	0.15	3	315	0	10	0.15	0.025	15	7.5	16	25
315	11	28.6	0.15	3	345	0	10	0.15	0.025	15	7.5	17	26
355	26	13.6	0.15	3	195	0	10	0.15	0.025	10	5	13	22
355	17.6	20.1	0.15	3	260	0	10	0.15	0.025	15	7.5	15	24
355	11	32.3	0.15	3	385	0	10	0.15	0.025	15	7.5	18	27
400	26	15.3	0.15	3	215	0	10	0.15	0.025	10	5	14	23
400	17.6	22.7	0.15	3	285	0	10	0.15	0.025	15	7.5	15	24
400	11	36.4	0.15	3	425	0	10	0.15	0.025	20	10	18	27
450	26	17.2	0.15	3	235	0	10	0.15	0.025	10	5	14	23
450	17.6	25.6	0.15	3	315	0	10	0.15	0.025	15	7.5	16	25
450	11	41	0.15	3	470	0	10	0.15	0.025	20	10	19	28
500	26	19.1	0.15	3	250	0	10	0.15	0.025	10	5	15	24
500	17.6	28.3	0.15	3	345	0	10	0.15	0.025	15	7.5	16	25
500	11	45.5	0.15	3	515	0	10	0.15	0.025	20	10	20	29
560	26	21.4	0.15	3	275	0	10	0.15	0.025	15	7.5	15	24
560	17.6	31.7	0.15	3	380	0	10	0.15	0.025	15	7.5	17	26
560	11	50.8	0.15	3	570	0	10	0.15	0.025	20	10	22	31
630	26	24.1	0.15	3	300	0	10	0.15	0.025	15	7.5	16	25
630	17.6	35.7	0.15	3	420	0	10	0.15	0.025	15	7.5	18	27
630	11	57.2	0.15	3	635	0	10	0.15	0.025	25	12.5	23	32
710	26	27.2	0.15	3	335	0	10	0.15	0.025	15	7.5	16	25
710	17.6	40.2	0.15	3	465	0	10	0.15	0.025	20	10	19	28
800	26	30.6	0.15	3	370	0	10	0.15	0.025	15	7.5	17	26
800	17.6	45.3	0.15	3	515	0	10	0.15	0.025	20	10	20	29
900	26	34.6	0.15	3	405	0	10	0.15	0.025	20	10	18	27
900	17.6	50.9	0.15	3	570	0	10	0.15	0.025	20	10	22	31
1000	26	38.4	0.15	3	445	0	10	0.15	0.025	20	10	19	28
1000	17.6	56.6	0.15	3	630	0	10	0.15	0.025	25	12.5	23	32
	Tolerance		±0.02		±3			±0.02	±0.01				

Table 2 — Dual pressure butt-fusion jointing conditions for PE 63, PE 80 and PE 100
Heater Plate Surface Temperature: 195 °C to 200 °C

All jointing pressure must be calculated by using the effective ram area of the machine in relation to the cross sectional area of the pipe wall. Effective ram area should be marked on each model

Pipe lying in an open trench

- Applicable standards are EN 805 (water pipe), EN 1610 (waste water and sewer pipe)

Bedding and backfilling

- Based on the proof of resistance to slow crack growth (tested by an independent, Multilayer PE 100 pipes made of PE 100 are suitable for lying without sand bedding. Thus, additional work in order to replace the excavated material with a sand bed in accordance with EN 805 (transport, disposal) is not necessary. The pipe properties are such that no restriction of the grain size of the bedding and backfilling materials is necessary.

Trenchless laying of pipes

- PE 100 pipes suitable for alternative - trenchless laying.
- Ploughing
- Milling
- Alternative installation methods are chosen because they are time and cost-saving. In the last few years various installation technologies become the state-of-the-art due to their economic advantages:
- Minimal adverse effect on developed and paved surfaces.
- Use of existing pipeline routes.
- Minor inconvenience for residents.
- Shorter construction time.
- Lower civil engineering and re-cultivation costs.
- Installation possible under rivers, lakes or traffic routes.
- Reduction in CO₂ emissions, as no vehicles is needed for transport of road surface materials, excavation work, etc.
- Avoidance of traffic rerouting and congestion.

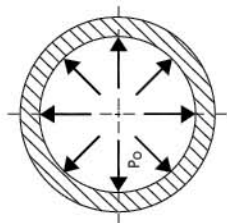
Ploughing

- Ploughing is the fast and possibly most cost-effective method of laying new plastic pipes. The technique used has a minimal impact on the subsoil and is therefore considered to be environmentally friendly. A winch is used to pull a plough blade and pipe-laying unit through the ground. Once the pipe has been installed, the furrow (trench) is automatically closed as the plough blade advances. This method is also.
- Suitable for the parallel installation of several pipelines. As the soil initially displaced by the plough is reused without any further processing, the pipes deployed have to be highly resistant to point, i.e. concentrated, loads. Owing to their high stress crack Wresistance, PE 100 pipes are particularly durable.

Milling

This laying method is usually applied in rural areas and outside of traffic zones. With the milling technique, a suitable machine is used to cut a pipe trench into the soil, and the PE 100 pipes is simultaneously placed on the trench bottom by means of a so-called installation box. As the trench is in most cases not walk able, this box serves as a trench support in the installation of the pipeline. Once the pipe has been laid, the trench is mechanically backfilled and compacted with the previously milled-out material, i.e. no sand bed is needed.





P_0 = interval overpressure

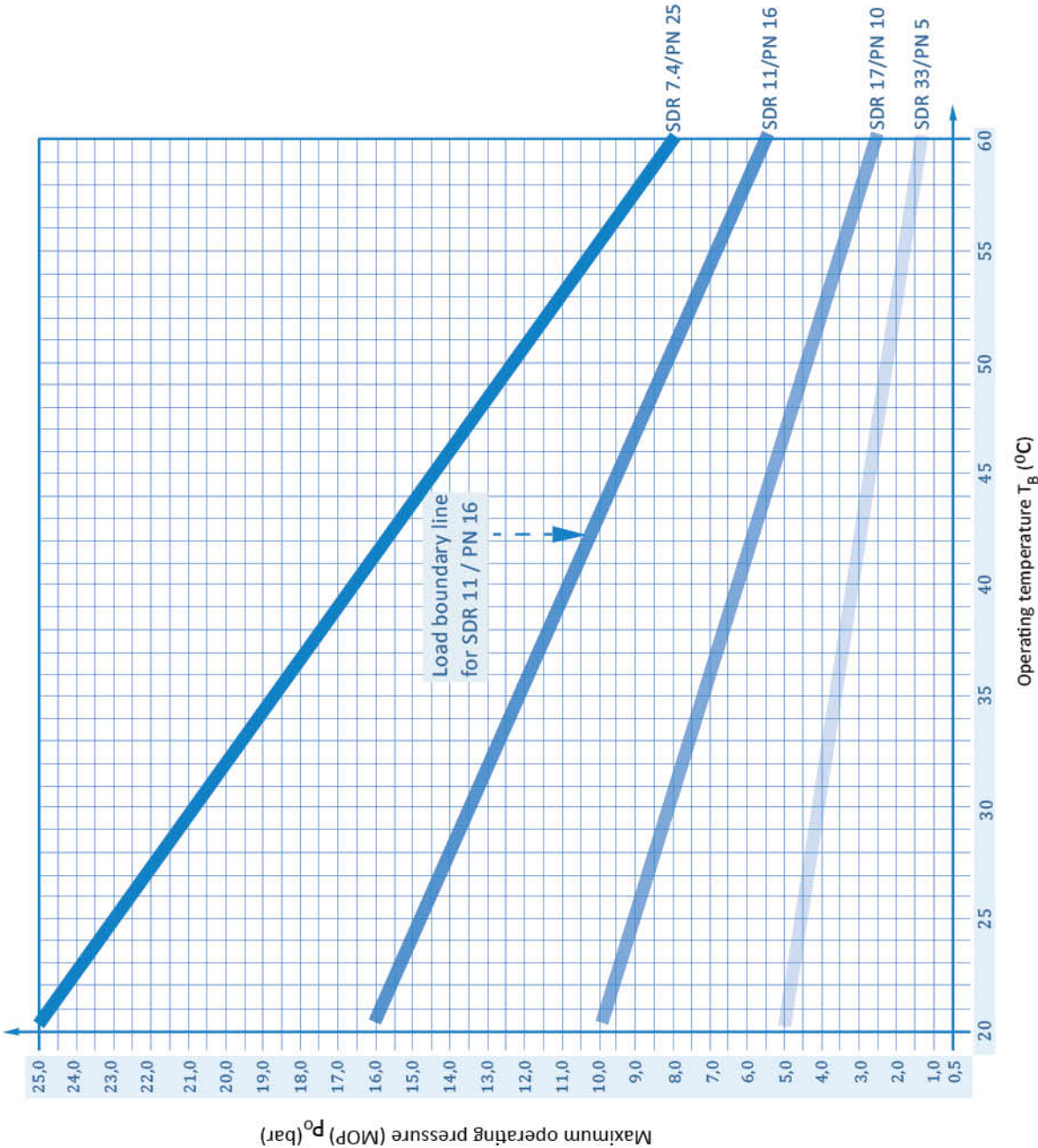
Area of validity:

- Service life $t_{10} = 25a$
- Flow medium: water and other flow media with $A_2 = 1.0$
- Pipes with connections according to Practice

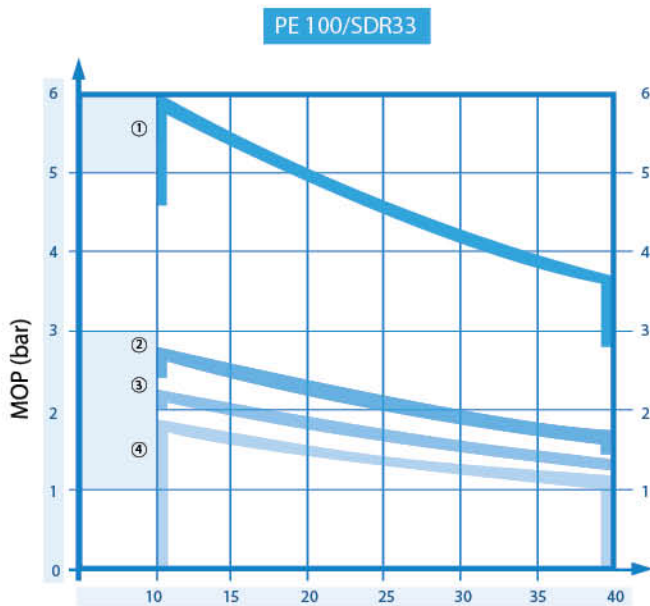
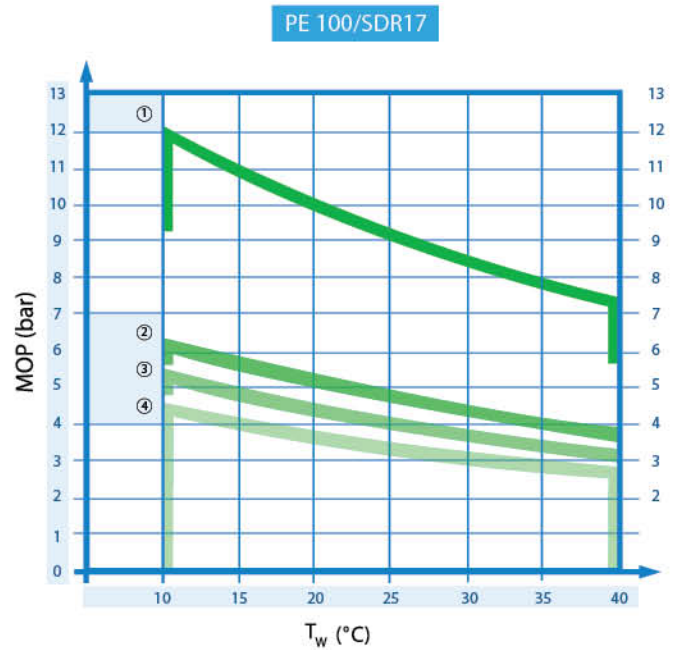
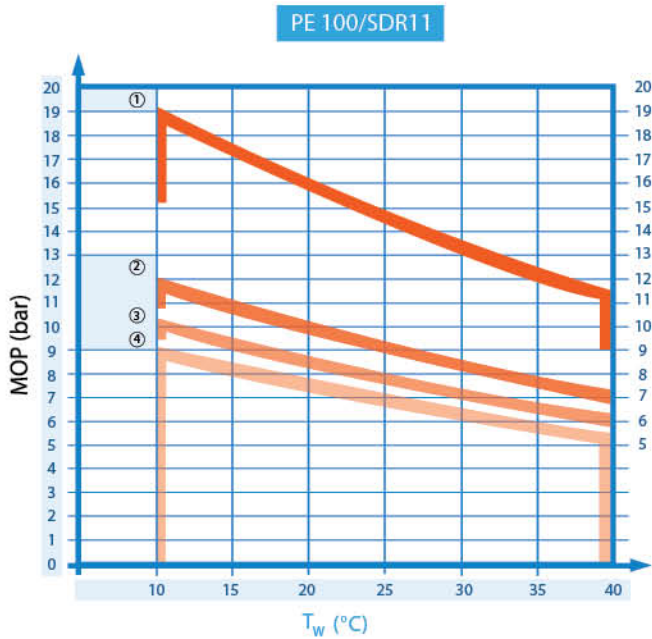
SL	Joining factor $f_s = 0.8$
EL	
ML	

- Safety factor $FS = 1.25$

(valid for the entire pipe system, consisting of pipe and moulded fittings)



Maximum Operation Pressure for PE 100 Pipes and Fittings

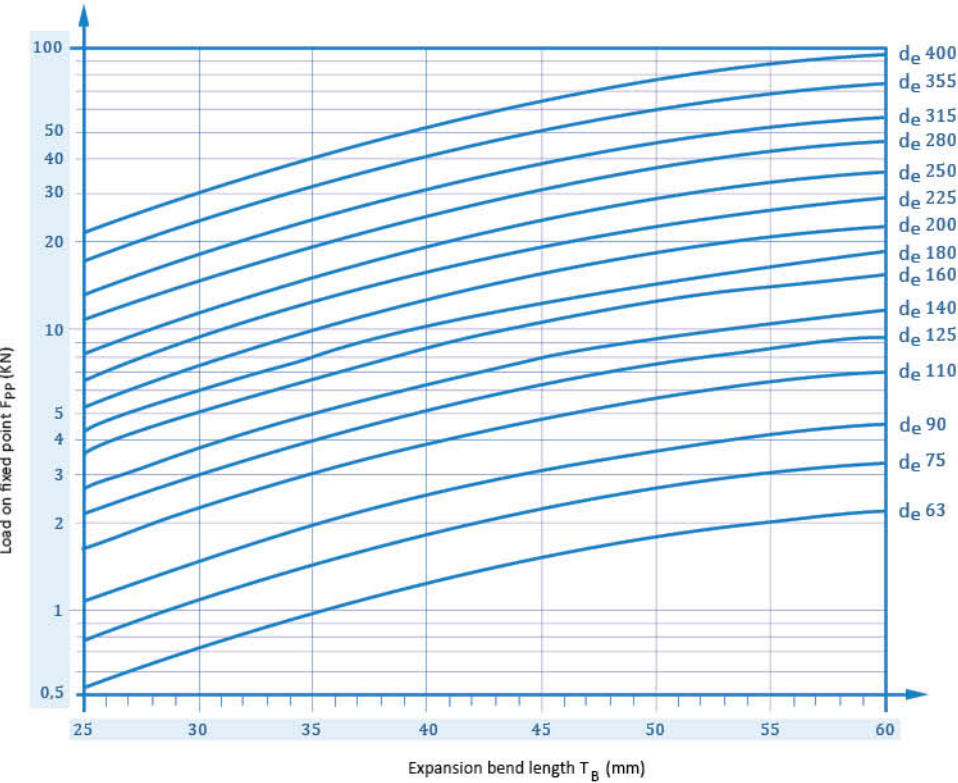


The indicated values don't apply to pipes exposed to UV radiation. maximum operating pressure of <1 are not included in the tables. for siphonic roof drainage and soil & waste systems, see the technical manual and pricelist for akatherm specialist drainage systems.

- ① = pipe, injection fittings, seamless bends and welded bends=30°
- ② = welded bends >30°-90° , tees 90° welded
- ③ = welded 60° tees
- ④ = welded 45° tees

SF = safety factor 1.25
 t_{ld} = lifespan 25a
MOP = internal pressure
 T_w (°C) = pipe wall temperature

Forces at fixed points in axial constricted PE100 pipe systems

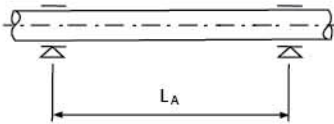
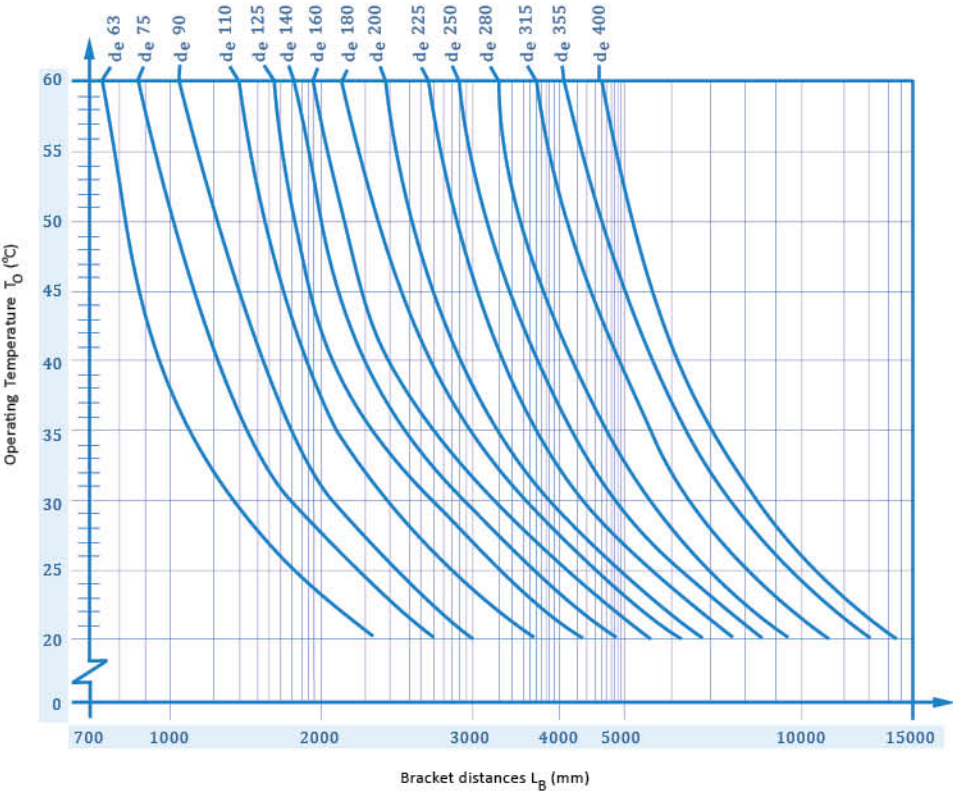


Conversion factor f_1 :

PE 100	
SDR 17	SDR 11
PN 10	PN 16
0.65	1.00

Area of validity
Installation temperature $T_H = 20^\circ\text{C}$
Operating temperature $T_O = 20$ to 45°C

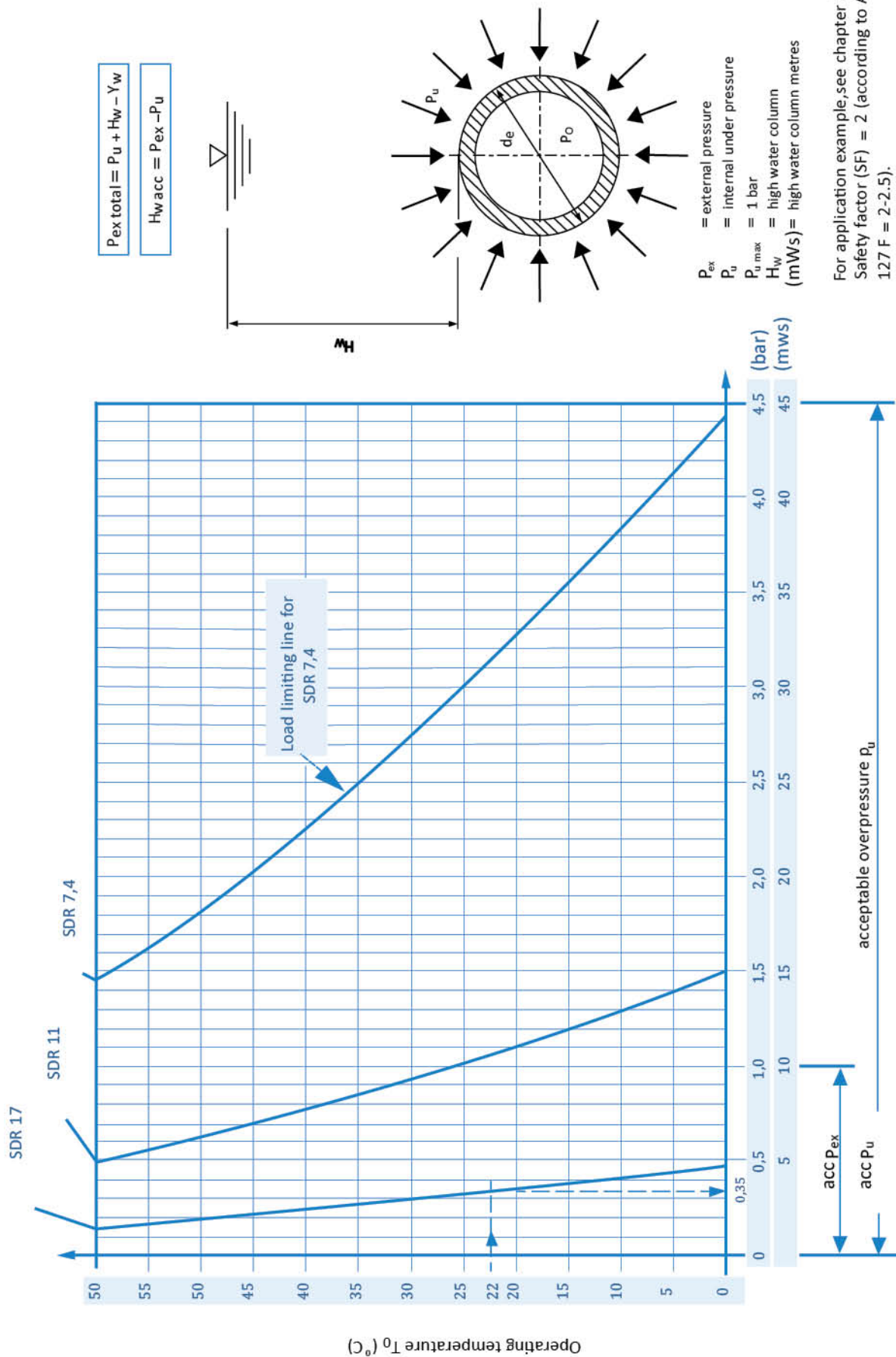
Bracket distances in axial constricted PE100 pipe systems



Conversion factor f_1 :

PE 100	
SDR 17	SDR 11
PN 10	PN 6
0.95	1.00

Area of validity
Installation temperature $T_H = 15$ to 20°C
Operating temperature $T_O = 25$ years



For application example, see chapter 6.4.3.
Safety factor (SF) = 2 (according to ATV A 127 F = 2-2.5).
For detailed indications (roundness, load on brackets and average load), individual analy-

CAUTION



PE 100 plastic piping systems will give excellent, maintenance free performance over many years use when the applications and system designs are correct for the product and installation is properly done.

It's most important to know the physical properties and limitations of PE plastic pipes when selecting the system for their use. These points should be taken into consideration in order to avoid problems caused by misapplication or poor installation.

Impact resistance is lower than for metals therefore plastic pipes must be protected from contact with hard and pointed objects.

Expansion and contraction is greater than for metals. This can cause breaks and leaking joints if system design is not flexible to allow for movement.

Temperature pressure relationship has to be taken into consideration. The pressure rating (tensile strength) of PE 100 decreases as temperature increases.

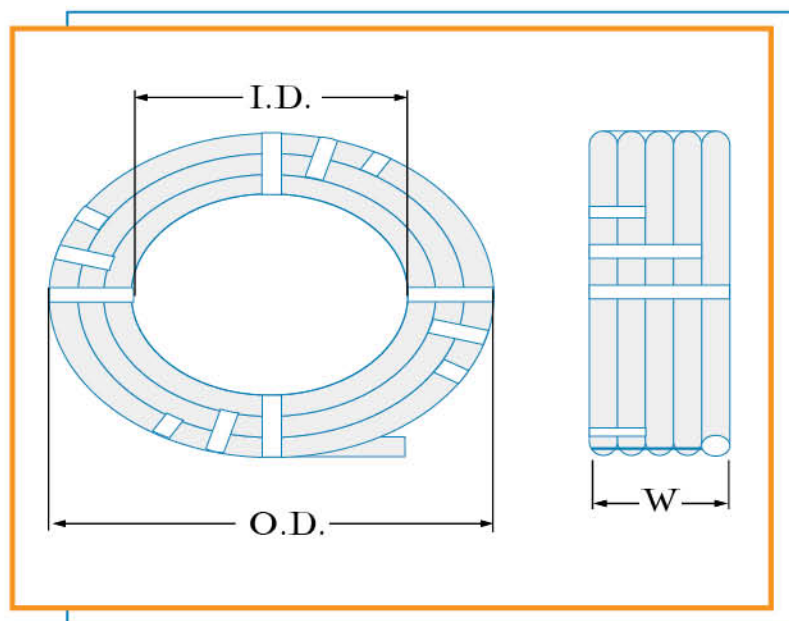
Extremes of heat and cold can cause failure. Allowing liquids to freeze inside of PE can cause the pipe and / or the fittings to crack. Heat beyond design limits can cause failures as well.

Certain chemicals, especially petroleum distillates and derivatives, can cause failure. Every chemical should be verified and approved in the manufacturer's chemical resistance chart.

In every case installation procedures should be carefully read followed. It's very important to know the reputation and abilities of your installation crew or contractor. Professional engineering design of the system and close supervision of the assembly-installation procedures are recommended. Any questions concerning the application or installation of PE piping products should be directed to the supplier, manufacturer or consultant.

PIPES DIMENSIONS

Coil Dimensions						
I.D.		O.D.		Width (W)		
mm		mm	mm	mm	mm	mm
Coil Length - meters						
O.D. mm	SDR's	50/100m	50m	100m	50m	100m
16	7.4/9/11	600	n/a	860	n/a	180
20	7.4/9/11/13.6	600	n/a	860	n/a	180
25	7.4/9/11/13.6/17	600	n/a	890	n/a	200
32	7.4/9/11/13.6/17	700	n/a	1090	n/a	220
40	7.4/9/11/13.6/17/26	700	n/a	1090	n/a	220
50	7.4/9/11/13.6/17/26	1300	1410	1560	150	220
63	7.4/9/11/13.6/17/26	1300	1780	1960	190	280
75	7.4/9/11/13.6/17	1300	1780	1960	190	280
90	7.4/9/11	2500	3100	3300	270	360
90	13.6/17/21	1800	2360	2540	360	450
110	7.4/9/11	2500	3160	n/a	330	n/a
110	13.6/17/21	2500	2860	n/a	400	n/a



Pipe Series																												
Standard dimension ratio (SDR)																												
S 25	S 20	S 16	S 12.5	S 10.5	S 10	S 8.3	S 8	S 6.3	S 5	S 4	S 3.2	S 2.5	S 2															
SDR 41														SDR 33														
51	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	SDR 26	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	S	Mass, kg/m	SDR 5			
16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
75	1.8	0.436	1.9	0.457	2.3	0.551	2.9	0.675	3.5	0.807	3.6	0.828	4.3	0.976	4.5	1.02	5.6	1.24	6.8	1.47	8.4	1.76	10.3	2.09	12.5	2.44	15.1	2.82
90	1.8	0.525	2.2	0.643	2.8	0.791	3.5	0.978	4.1	1.14	4.3	1.18	5.1	1.39	5.4	1.46	6.7	1.77	8.2	2.12	10.1	2.54	12.3	3.00	15.0	3.51	18.1	4.05
110	2.2	0.786	2.7	0.943	3.4	1.17	4.2	1.43	5.0	1.67	5.3	1.77	6.3	2.08	6.6	2.17	8.1	2.62	10.0	3.14	12.3	3.78	15.1	4.49	18.3	5.24	22.1	6.04
125	2.5	1.00	3.1	1.23	3.9	1.51	4.8	1.84	5.7	2.16	6.0	2.27	7.1	2.66	7.4	2.76	9.2	3.37	11.4	4.08	14.0	4.87	17.1	5.77	20.8	6.75	25.1	7.79
140	2.8	1.25	3.5	1.54	4.3	1.88	5.4	2.32	6.4	2.72	6.7	2.83	8.0	3.34	8.3	3.46	10.3	4.22	12.7	5.08	15.7	6.11	19.2	7.25	23.3	8.47	28.1	9.76
160	3.2	1.63	4.0	2.00	4.9	2.42	6.2	3.04	7.3	3.54	7.7	3.72	9.1	4.35	9.5	4.52	11.8	5.50	14.6	6.67	17.9	7.96	21.9	9.44	26.6	11.0	32.1	12.7
180	3.6	2.05	4.4	2.49	5.5	3.07	6.9	3.79	8.2	4.47	8.6	4.67	10.2	5.48	10.7	5.71	13.3	6.98	16.4	8.42	20.1	10.1	24.6	11.9	29.9	14.0	36.1	16.1
200	3.9	2.46	4.9	3.05	6.2	3.84	7.7	4.69	9.1	5.51	9.6	5.78	11.4	6.79	11.9	7.05	14.7	8.56	18.2	10.4	22.4	12.42	27.4	14.8	33.2	17.2	40.1	19.9
225	4.4	3.12	5.5	3.86	6.9	4.77	8.6	5.89	10.3	7.00	10.8	7.3	12.8	8.55	13.4	8.93	16.6	10.9	20.5	13.1	25.2	15.8	30.8	18.6	37.4	21.8	45.1	25.2
250	4.9	3.83	6.2	4.83	7.7	5.92	9.6	7.30	11.4	8.59	11.9	8.93	14.2	10.6	14.8	11.0	18.4	13.4	22.7	16.2	27.9	19.4	34.2	23.0	41.6	27.0	50.1	31.1
280	5.5	4.83	6.9	5.98	8.6	7.40	10.7	9.10	12.8	10.8	13.4	11.3	15.9	13.2	16.6	13.7	20.6	16.8	25.4	20.3	31.3	24.3	38.3	28.9	46.5	33.8	56.2	39.0
315	6.2	6.12	7.7	7.52	9.7	9.37	12.1	11.6	14.4	13.6	15.0	14.2	17.9	16.7	18.7	17.4	23.2	21.2	28.6	25.6	35.2	30.8	43.1	36.5	52.3	42.7	63.2	49.3
355	7.0	7.73	8.7	9.55	10.9	11.8	13.6	14.6	16.2	17.3	16.9	18.0	20.1	21.2	21.1	22.1	26.1	26.9	32.2	32.5	39.7	39.1	48.5	46.3	59.0	54.3	-	-
400	7.9	9.82	9.8	12.1	12.3	15.1	15.3	18.6	18.2	21.9	19.1	22.9	22.7	26.9	23.7	28.0	29.4	34.1	36.3	41.3	44.7	49.6	54.7	58.8	66.5	68.9	-	-
450	8.8	12.3	11.0	15.3	13.8	19.0	17.2	23.5	20.5	27.7	21.5	28.9	25.5	34.0	26.7	35.4	33.1	43.2	40.9	52.3	50.3	62.7	61.5	74.4	-	-	-	-
500	9.8	15.2	12.3	19.0	15.3	23.4	19.1	28.9	22.8	34.2	23.9	35.7	28.4	42.0	29.7	43.8	36.8	53.3	45.4	64.5	55.8	77.3	68.3	91.8	-	-	-	-
560	11.0	19.1	13.7	23.6	17.2	29.4	21.4	36.2	25.5	42.8	26.7	44.7	31.7	52.5	33.2	54.8	41.2	66.9	50.8	80.8	62.5	97.0	-	-	-	-	-	-
630	12.3	24.0	15.4	29.9	19.3	37.1	24.1	45.9	28.7	54.1	30.0	56.4	35.7	66.5	37.4	69.4	46.3	84.6	57.2	102	-	-	-	-	-	-	-	-
710	13.9	30.5	17.4	38.0	21.8	47.2	27.2	58.4	32.3	68.7	33.9	71.8	40.2	84.4	42.1	88.1	52.2	107	64.5	130	-	-	-	-	-	-	-	-
800	15.7	38.8	19.6	48.1	24.5	59.7	30.6	73.9	36.4	87.2	38.1	91.1	45.3	107	47.4	112	58.8	136	-	-	-	-	-	-	-	-	-	-
900	17.6	48.9	22.0	60.9	27.6	75.6	34.4	93.4	41.0	110	42.9	115	51.0	136	53.3	141	66.1	172	-	-	-	-	-	-	-	-	-	-
1000	19.6	60.5	24.5	75.2	30.6	93.1	38.2	115	45.5	136	47.7	142	56.7	167	59.3	175	-	-	-	-	-	-	-	-	-	-	-	-

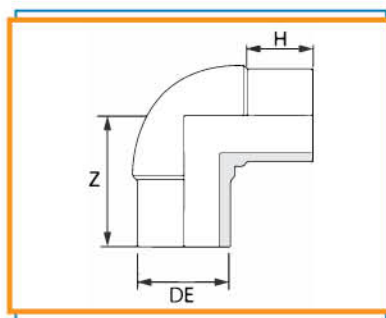
Pipe Series														
SDR 41		SDR 33	SDR 26	SDR 21	SDR 17	SDR 13.6	SDR 11	SDR 9	SDR 7.4	SDR 6				
S 20		S 16	S 12.5	S 10	S 8	S 6.3	S 5	S 4	S 3.2	S 2.5				
Nominal Pressure (PN) ^a bar														
PE63	PN 2.5	PN 3.2	PN 4	PN 5	-	PN 8	PN 10	-	-	-				
PE80	PN 3.2	PN 4	PN 5	PN 6 ^d	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25				
PE100	PN 4	PN 5	PN 6 ^c	PN 8	PN 10	PN 12.5	PN 16	PN 20	PN 25	-				
Wall Thicknesses ^b mm														
Nominal size	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}	e _{min}	e _{max}
16	-	-	-	-	-	-	-	-	2.0 ^c	2.3 ^c	2.3	2.7	3.0	3.4
20	-	-	-	-	-	-	2.0 ^c	2.3	2.3 ^c	2.7	3.0	3.4	3.4	3.9
25	-	-	-	-	-	-	2.0 ^c	2.3	2.3 ^c	2.7	3.0	3.4	4.0	4.8
32	-	-	-	-	2.0 ^c	2.3	2.4	2.8	3.0	3.4	3.6	4.1	5.0	6.1
40	-	-	-	-	2.0 ^c	2.3	2.4	2.8	3.0	3.5	3.7	4.2	5.1	6.2
50	-	-	2.0	2.3	2.4	2.8	3.0	3.4	3.7	4.2	4.6	5.2	6.3	7.7
63	-	-	2.5	2.9	3.0	3.4	3.8	4.3	4.7	5.3	5.8	6.5	8.0	9.6
75	-	-	2.9	3.3	3.6	4.1	4.5	5.1	5.6	6.3	6.8	7.6	9.4	11.5
90	-	-	3.5	4.0	4.3	4.9	5.4	6.1	6.7	7.5	8.2	9.2	11.3	13.7
110	-	-	4.2	4.8	5.3	6.0	6.6	7.4	8.1	9.1	10.0	11.1	13.7	16.8
125	-	-	4.8	5.4	6.0	6.7	7.4	8.3	9.2	10.3	11.4	12.7	15.6	19.0
140	-	-	5.4	6.1	6.7	7.5	8.3	9.3	10.3	11.5	12.7	14.1	17.4	21.3
160	-	-	6.2	7.0	7.7	8.6	9.5	10.6	11.8	13.1	14.6	16.2	19.8	24.2
180	-	-	6.9	7.7	8.6	9.6	10.7	11.9	13.3	14.8	16.4	18.2	22.3	27.2
200	-	-	7.7	8.6	9.6	10.7	11.9	13.2	14.7	16.3	18.2	20.2	24.8	30.3
225	-	-	8.6	9.6	10.8	12.0	13.4	14.9	16.6	18.4	20.5	22.7	27.9	34.0

NOTE 1 bar = 0.1 MPa = 105 Pa; 1 MPa = 1 N/mm²

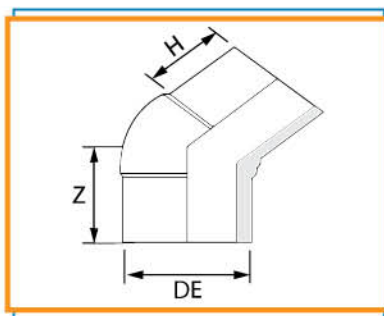
- a** PN values are based on $C = 1.25$
- b** Tolerances in accordance with ISO 11922-1:1997, grade V, calculated from $(0.1e_{\min} + 0.1)$ mm rounded up to the next 0.1 mm. For certain applications for $e > 30$ mm. ISO 11922-1:1997, grade T, tolerances may be used calculated from $0.15 e_{\min}$ rounded up to the next 0.1 mm.
- c** The calculated value of e_{\min} according to ISO 4065 is rounded up to the nearest value of either 2.0, 2.3 or 3.0. This is to satisfy certain national requirements. For practical reasons.
- a** wall thickness of 3.0 mm is recommended for electrofusion jointing and lining applications.
- d** Actual calculated values are 6.4 bar for PE 100 and 6.3 bar for PE 80.

PE 100 Butt Welding Fittings

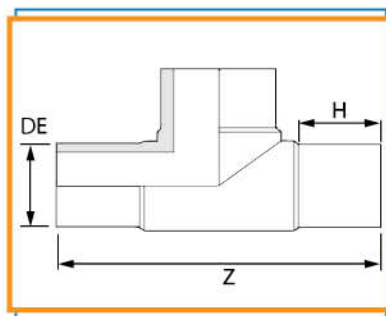
Elbow 90° "PN 16 SDR 11"



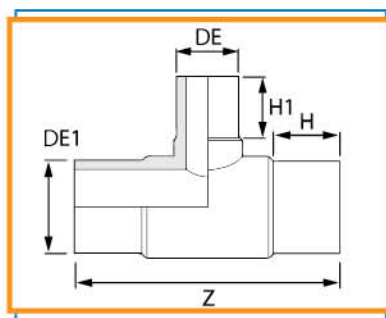
DE	H	Z
25	47	67
32	50	72
40	56	85
50	57	88
63	58	108
75	73	127
90	82	154
110	91	153
125	91	172
140	97	182
160	104	215
180	106	228
200	117	246
225	119	282
250	130	320
280	124	348
315	151	358



DE	H	Z
32	50	70
40	58	78
50	59	84
63	69	90
75	73	100
90	83	109
110	93	127
125	94	159
140	98	165
160	107	175
180	108	173
200	115	180
225	121	193
250	133	206
280	140	246
315	152	258



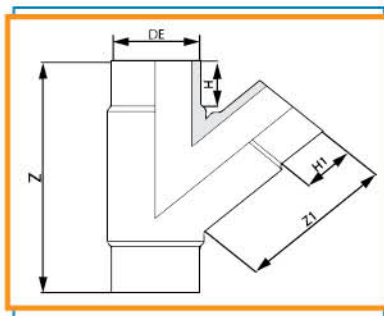
DE	H	Z
25	45	139
32	50	147
40	55	171
50	57	179
63	68	229
75	73	257
90	82	303
110	92	338
125	94	355
140	96	388
160	104	423
180	107	450
200	117	500
225	120	538
250	132	597
280	140	653
315	152	703



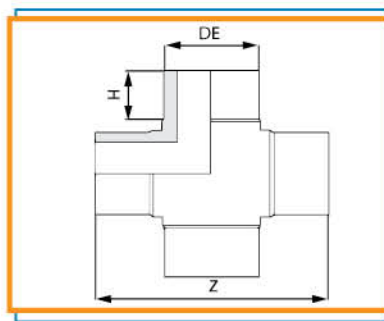
DE 1	DE	H	H1	Z
90	50	82	58	305
90	63	82	70	305
110	50	90	58	337
110	63	90	70	337
110	90	90	83	337
125	63	90	70	356
125	90	90	83	356
140	63	96	72	390
140	90	96	83	390
160	63	104	72	424
160	90	104	84	424
160	110	104	92	424
160	125	104	94	424
180	63	106	68	450
180	90	106	84	450
180	125	106	92	450
200	63	116	83	500
200	90	116	85	500
200	110	116	93	500
200	160	116	105	500
225	93	120	83	538
225	125	120	93	538
225	160	120	106	538
225	180	120	108	538
250	110	130	92	598
250	160	130	108	598
250	180	130	105	598
315	90	150	83	700
315	110	150	93	700

DE 1	DE	H	H1	Z
315	160	150	106	700
315	180	150	107	700
315	200	150	118	700
315	225	150	123	700

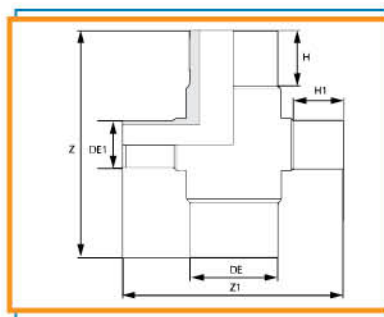
Tee 45° "PN 16 SDR 11"



DE	Z1	H1	H	Z
63	207	68	68	322
90	238	80	80	385
110	276	92	92	438
125	295	120	90	455
160	330	104	104	534

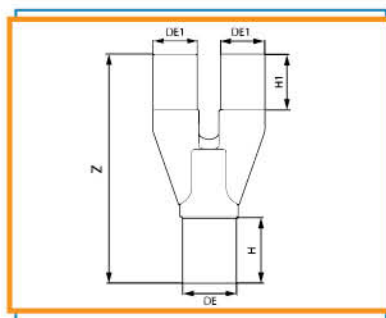


DE	H	Z
63	68	229
75	73	257
90	82	303
110	92	338
125	90	355
140	96	388
160	104	423



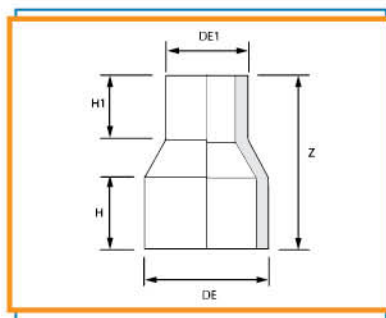
DE	DE1	H	H1	Z	Z1
110	63	92	70	338	298
110	90	92	83	338	326
125	90	92	83	357	343
140	90	96	83	390	364
160	90	104	93	423	403

Y Tee "PN 16 SDR 11"



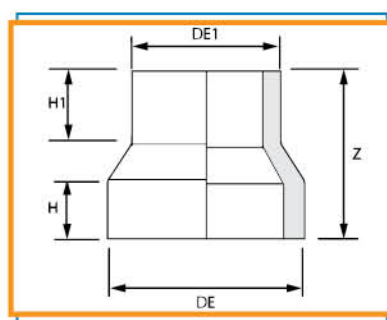
DE	DE1	H	H1	Z
32	25	44	41	156
40	32	50	44	165
50	40	55	50	175

Reducer "PN 16 SDR 11"

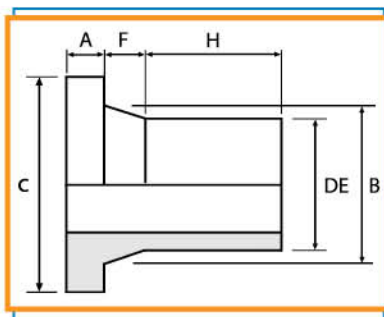


DE	DE 1	H	H1	Z
32	25	44	42	91
40	25	50	42	100
40	32	53	59	112
50	25	54	43	113
50	32	56	48	116
50	40	55	51	111
63	25	66	45	136
63	32	67	58	134
63	40	64	53	131
63	50	65	56	128
75	32	74	50	146
75	40	74	51	142
75	50	74	57	143
75	63	73	67	147

DE 1	DE	H	H1	Z
90	50	83	52	158
90	63	84	66	168
90	75	84	74	168
110	50	90	57	180
110	63	90	68	183
110	75	90	75	182
110	90	90	80	194
125	63	90	68	190
125	75	90	75	190
125	90	90	80	189
125	110	90	90	188
140	90	96	82	205
140	110	96	91	205
140	125	96	94	197
160	90	105	84	226
160	110	105	93	224
160	125	105	93	217
160	140	105	97	214
180	110	105	83	240
180	125	105	88	236
180	140	105	92	216
180	160	105	99	216
200	140	112	95	240
200	160	112	99	234
200	180	136	130	278
225	160	120	105	262
225	180	120	118	269
225	200	120	114	258
250	180	130	119	293
250	200	130	114	273
315	225	152	130	327
315	250	152	147	342

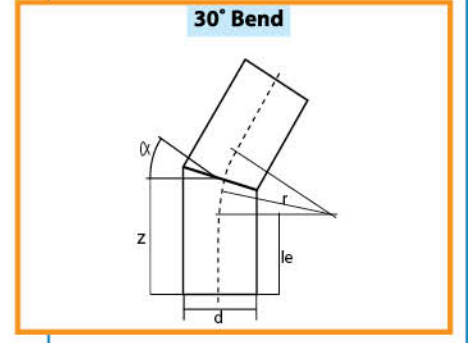
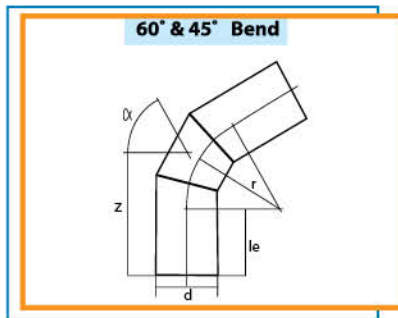
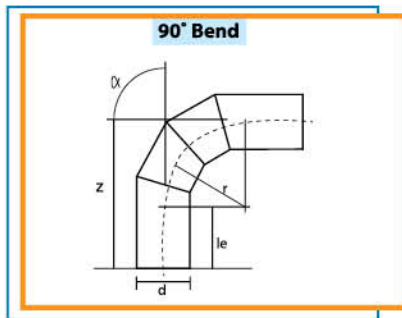


DE	DE1	H	H1	Z
250	180	64	51	158
250	200	60	58	147
250	225	49	70	145
280	200	85	35	145
280	225	65	50	150
280	250	70	55	145
315	225	68	41	137
315	250	48	31	133
315	280	48	43	139
355	250	50	36	134
355	280	48	61	130
355	315	53	68	134
400	280	40	50	130
400	315	49	41	128
400	355	54	64	132
450	315	73	37	145
450	355	40	50	130
450	400	43	70	145
500	355	40	45	130
500	400	91	50	160
500	450	97	45	159
560	400	71	40	155
560	450	40	45	130
560	500	40	45	130
630	450	80	40	150
630	500	40	45	130
630	560	83	43	156



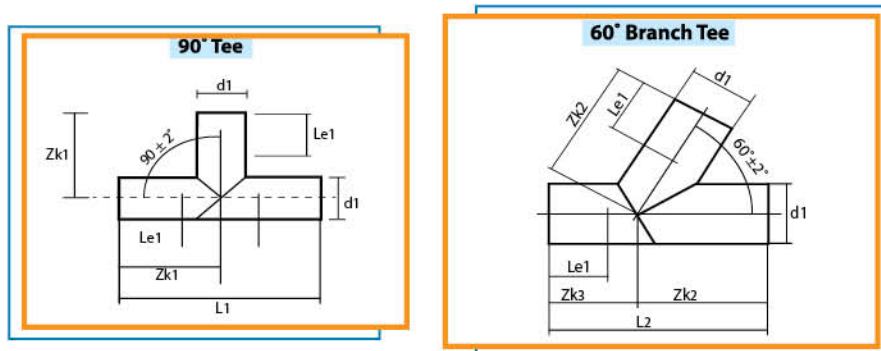
DE	H	F	B	C	A
25	46	13	33	58	10
32	56	13	40	68	11
40	57	15	50	78	12
50	57	15	61	88	13
63	63	20	75	102	16
75	73	20	89	122	18
90	82	20	105	138	19
110	91	25	125	158	19
125	101	20	132	158	26
140	102	28	155	188	26
160	106	28	175	212	26
180	108	30	180	212	31
200	119	40	232	268	33
225	120	30	235	268	33
250	130	40	285	320	35
280	140	30	291	320	36
315	150	40	335	370	36
355	165	40	373	430	40
400	180	45	427	482	45

AL-SHARIF Fabricated Fittings



d	l _e	r ¹⁾	α $\pm 2^\circ$			
			90°	60°	45°	30°
			Z _{min}	Z _{min}	Z _{min}	Z _{min}
110	150	165	315	245	218	194
125		188	338	258	228	200
140		210	360	271	237	206
160		240	390	288	249	214
180		270	420	305	262	222
200		300	450	323	274	230
225		338	488	345	290	241
250	250	375	625	466	412	350
280		420	670	492	424	362
315	300	473	773	576	498	428
355		533	833	608	520	443
400		600	900	646	548	461
450		675	975	689	580	481
500	350	750	1100	783	665	551
560		840	1190	835	698	575
630		945	1295	896	741	603
710		1065	1415	865	792	636
800		1200	1550	1043	847	672
900	400	1350	1750	1179	960	762
1000		1500	1900	1266	1022	802

¹⁾ r = 1.5 d



d_1	l_{e1}	Tee		60° Branch		
		l_1	Z_{k1} min	l_2	Z_{k2} min	Z_{k3} min
110	150	410	205	500	325	175
125		430	215	545	355	190
140		440	220	581	375	206
160		460	230	642	412	230
180		480	240	700	450	250
200		500	250	759	487	272
225		530	265	830	530	300
250	250	750	375	905	580	325
280		780	390	995	630	365
315	300	920	460	1090	690	400
355		960	480	1155	730	425
400		1000	500	1250	800	450
450		1050	525	1325	850	475
500	350	1200	600	1400	900	500
560		1260	630	1480	950	530
630		1330	665	1545	1000	545
710		1410	705	1670	1090	580
800		1500	750	1810	1180	630
900	400	1700	850	1990	1320	670
1000		1800	900	2070	1360	710
1200		2000	1000	2400	1540	860

The background is a solid dark blue. On the left side, there are several concentric circular arcs in a lighter blue shade. A diagonal line, colored orange, extends from the top right towards the center, passing behind the text. The word "CERTIFICATES" is written in a white, bold, serif font, slanted upwards from left to right, positioned over the diagonal line and the circular arcs.

CERTIFICATES

Registration Certificate

*This is to certify that
the Environmental Management Systems of*

**AL-AMAL COMPANY FOR PLASTIC PIPES AND
FITTINGS (AL-SHARIF)**

*have been assessed by AJA Registrars and registered
against the requirements of*

BS EN ISO 14001:2004

Certificate No. : **AJA10/AN/1453**

Date of Original Registration : **05/07/2010**

Date of Expiry : **04/07/2013**

Date of Re-Registration : **N/A**



Raymond Hinton *Timothy Dixon*
Joint Chief Executives, AJA Registrars



This Certificate has been issued by AJA Registrars Limited, Unit 6, Gordano Court, Gordano Gate Business Park, Serbert Close, Portishead, Bristol UK BS20 7FS

This certificate is issued in respect of the locations & scope of registration detailed in the Associated Registration Schedule.
This certificate is the property of AJA Registrars and must be returned on request.

Registration Certificate

*This is to certify that
The Occupational Health & Safety Management Systems of*

**AL-AMAL COMPANY FOR PLASTIC PIPES
AND FITTINGS (AL-SHARIF)**

*have been assessed by AJA Registrars and registered
against the requirements of*

OHSAS 18001:2007

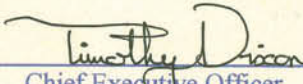
Certificate No: AP/EG/10/HS/472

Date of Original Registration: 23:06:10

Date of Expiry: 22:06:13

Date of Re-Registration: N/A




Chief Executive Officer



Registration Certificate

*This is to certify that
the Management Systems of*

**AL-AMAL COMPANY FOR PLASTIC
PIPES AND FITTINGS (AL-SHARIF)**

*have been assessed by AJA Registrars and registered
against the requirements of*

ISO 9001:2008

Certificate No. : **AJA01/3823**

Date of Original Registration : **01/10/2001**

Expiry Date : **03/01/2016**

Date of Re-Registration : **03/01/2013**



0059



Raymond Winter Timothy Dixon
Joint Chief Executives, AJA Registrars



*This certificate is issued in respect of the locations & scope of registration detailed in the Associated Registration Schedule.
This certificate has been issued by AJA Registrars Limited Unit 6 Gordano Court Gordano Gate Business Park Serbert Close Portishead Bristol UK BS20 7FS*

Notes



Notes



Notes





الهيئة القومية
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