about: polyethylene

Polyethylene (PE) is a thermoplastic from the polyolefin group of materials. A unique combination of properties including mechanical strength, chemical resistance and thermal stability all combine to make polyethylene a popular piping system material.

Polyethylene has excellent resistance against a variety of chemicals, however strong oxidising acids attack the material. Good chemical resistance is achieved against contact with solvents, such as alcohols, esters and ketones. Consequently, solvent cement welding of PE pipes and fittings is not possible. PE has excellent diffusion resistance, and because of this property, polyethylene has been successfully applied for the safe transportation of gases for many years.

Black coloured PE is stabilised against the effects of UV radiation, and it may therefore safely be used outdoors. The stabilisation also counteracts heat fatigue, increasing the operating life.

There are a number of welding techniques suitable for pressure piping applications. High quality, reliable joints can be achieved using socket fusion jointing, butt fusion welding and electrofusion welding. In addition, PE systems can be joined using flanges, threaded connections and mechanical couplings.

Polyethylene is no longer described by its density (LDPE, MDPE or HDPE), but by its resistance class according to ISO 9080 (PE 63, PE 80 or PE 100). Polyethylene piping systems are available from IPS in metric dimensions according to DIN 8077/8078 and DIN 16962.

PE100-RC - In terms of pressure resistance and processability there is no difference between PE100-RC and PE100.

Properties of Polyethylene (Average values)				
Properties	Standard	Unit	PE 100	PE 100-RC
MRS Classification	ISO 9080	N/mm²	10	10
Specific density at 23°C	ISO 1183	g/cm³	0.96 2)	0.96 2)
Melt flow rate (MFR 190/5)	ISO 1133-1	g/10min	~0.3 1)	~0.3 1)
MFI range	ISO 1133-1		T003	T003
Tensile stress at yield	ISO 527	MPa	≥23	≥23
Elongation at break	ISO 527	%	>350 2)	≥350 2)
Impact strength unnotched (at -30°C)	ISO 179	kj/m²	no break	no break
Impact strength motched (at +23°C)	ISO 179	kj/m²	≥13 3)	≥13 3)
Impact strength notched (at -30°C)	ISO 179	kj/m²	10	10
Young's Modulus	ISO 527	MPa	≥1000	≥1000
Linear coefficient of thermal expansion	DIN 53752	K $^{-1}$ x 10 $^{-4}$	1.8 4)	1.8 4)
Thermal conductivity (at 20°C)	DIN 52612	W / (mxk)	~0.4	~0.4
Surface resistivity	VDE 0303	Ω	>10^{13}	>10^{13}
Colour	-	-	black	black

1) DVS 2207-1 2) EN 12201 3) DVS 2205-1 suppl.1 4) DVS 2210-1

General properties of polyethylene

Polyethylene exhibits thermal stability up to 60°C (short-term 70° for drainage systems). Polyethylene shows excellent impact strength, with impact strength rising with increasing temperature.

Some important advantages of polyethylene are:

- Low specific weight of 0.95g/cm³
- Favourable transportation methods (can be coiled)
- High long term creep resistance
- Very good chemical resistance
- Weathering resistance
- Radiation resistance
- Outstanding weldability
- Excellent abrasion resistance
- Smooth internal surfaces- low friction loss
- Resistant to freezing

Advantages of PE

- High flexibility
- Weldable
- Low weight
- Convenient transportation (e.g. coiled bundles)
- UV resistance (with carbon black)
- Excellent chemical resistance
- Excellent weather-resistance
- Excellent radiation resistance
- Excellent abrasion resistance
- Minimal deposits and no ingrowth possible due to lower friction resistance
- Lower pressure losses in comparison to e.g. metals
- Application at lower temperatures
- Resistant to rodents
- Low microbial growth
- Physiologically safe

Pressure ratings for polyethylene systems

Maximum continuous pressure ratings

Pipes, fittings and valves are designed to operate continuously for 50 years at their maximum rated pressure at 20°C as follows, unless otherwise stated.

The pressure ratings for Polyethylene pipes according to DIN 8074 and Polyethylene fittings according to DIN 16963 are defined by the 'nominal pressure' method, **whereby** pipes, fittings and valves are grouped together according to a single nominal pressure rating. The PN rating is the maximum permitted operational pressure in bars calculated at 20°C, for example PN6 indicates a maximum working pressure of 6 bars. According to this method the pressure ratings of Polyethylene pipes and fittings according to the nominal pressure system is as follows:-

SDR	S Series	PN pressure eating	
		PE 100	PE 100-RC
41	20	4	4
33	16	5	5
26	12.5	6.3	6.3
17	8	10	10
11	5	16	16
9	4	20	20
7.4	3.2	25	25

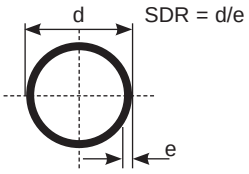
Table shows the comparison of the SDR, S series and PN pressure ratings (valid for 20°C, 50 years durability and C = 1.25 (water)).

Standard Dimensional Ratio (SDR)

Standard Dimensional Ratio (SDR) is used to define thermoplastic pipes in a variety of materials including polypropylene, polyethylene, and PVC-U. Taken from ISO 4065, SDR is described as being 'the ratio of the nominal outside diameter of a pipe to its nominal wall thickness'. To calculate the SDR according to ISO 4065 the following equation can be used:

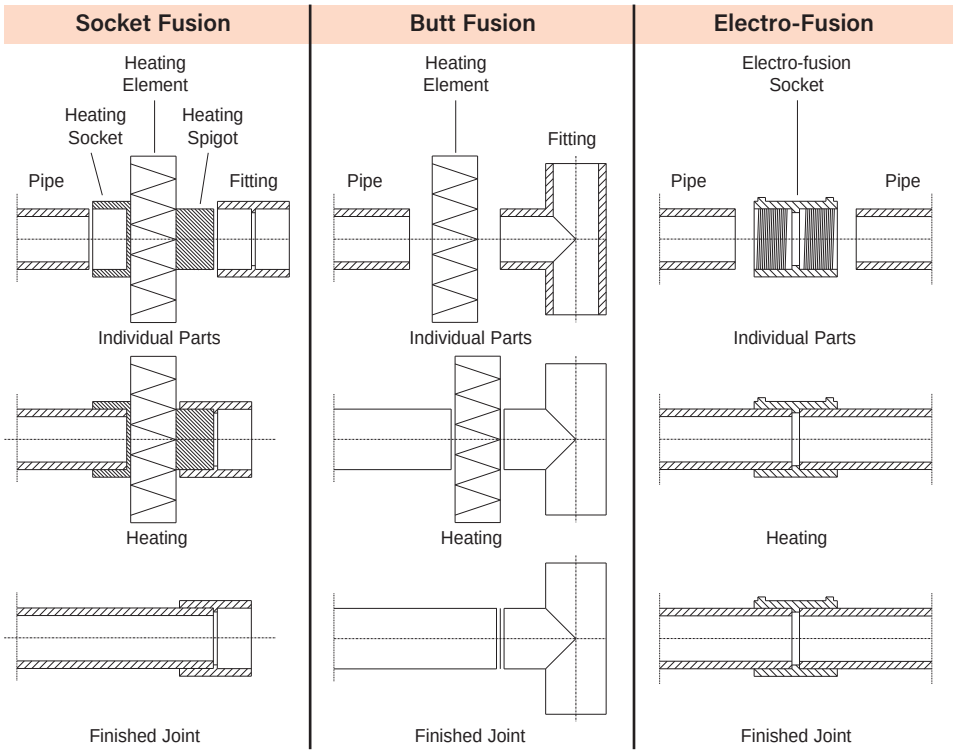
$$SDR = \frac{d}{e}$$

where:
SDR = Value to be calculated
e = Thickness of the pipe wall (mm)
d = Pipe outside diameter (mm)



Jointing Polyethylene Systems

PE pipe to pipe and pipe to fitting joints are easy to make, using socket fusion, butt fusion or electrofusion welds.



Welding equipment is available for sale or hire - see Tools and Installation Equipment.
Detailed installation instructions, as well as free training, is available on request.