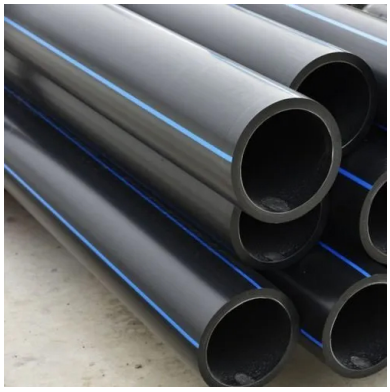
Testing Equipment according to EN 12201 for Polyethylene Water Pipes

Description



Mechanical Tests :

There are mechanical tests and physical tests for polyethylene pipes as per mentioned standard as below

Table 3 — Mechanical characteristics

Characteristics	Requirements	Test parameters		Test method
		Parameters	Value	
Hydrostatic strength at 20 °C	No failure during test period of any test pieces	End caps	Type a)	EN 921
		Conditioning period	As specified in EN 921	
		Number of test pieces[2)]	3	
		Type of test	Water-in-water	
		Test temperature	20 °C	
		Test period	100 h	
		Circumferential (hoop) stress for:		
		PE 40	7,0 MPa	
		PE 63	8,0 MPa	
		PE 80	10,0 MPa	
		PE 100	12,4 MPa	
Hydrostatic strength at 80 °C	No failure during test period of any test pieces	End caps	Type a) [1)]	EN 921
		Conditioning period	As specified in EN 921	
		Number of test pieces[2)]	3	
		Type of test	Water-in-water	
		Test temperature	80 °C	
		Test period	165 h[3)]	
		Circumferential (hoop) stress for:		
		PE 40	2,5 MPa	
		PE 63	3,5,MPa	
		PE 80	4,6 MPa	
		PE 100	5,5 MPa	

(continued)

Table 3 — Mechanical characteristics (concluded)

Characteristics	Requirements	Test Parameters		Test
		Parameters	Value	Method
Hydrostatic strength at 80 °C	No failure during test period of any test pieces	End caps	Type a) [1]	EN 921
		Conditioning period	As specified in EN 921	
		Number of test pieces[2]	3	
		Type of test	Water-in-water	
		Test temperature	80 °C	
		Test period	1000 h	
		Circumferential (hoop) stress for		
		PE 40	2,0 Mpa	
		PE 63	3,2,Mpa	
		PE 80	4,0 Mpa	
		PE 100	5,0 Mpa	

[1] Type b) end caps may be used for batch release tests for diameters ≥ 500 mm.

[2] The number of test pieces given indicate the quantity required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan.(for guidance see ENV 12201-7.

[3] Premature ductile failures are not taken into account. For retest procedure see 7.3.

For above tests that is hydrostatic pressure testing you will need 4 types of equipment:

1- Pressure units (Number of lines are as per customer request and max pressure of testing for PE pipes is less than 80 bar for hydrostatic and burst tests)
2- Hydrostatic hot water bath for 80C tests
3- Hydrostatic cold water bath for 20C tests that need standard bath+chiller unit
4- End caps for PE pipes is A type as per EN 921 (Sizes will be as customer request, for very big sizes also customers can use butt weld end caps for low cost purpose)

Hydrostatic Pressure Test Unit

Water Bath for Hydrostatic Pressure Testing

End Cap for Hydrostatic Pressure Testing

Physical Tests

Table 5 — Physical characteristics

Characteristics	Requirements	Test parameters		Test method
All pipes				
Elongation at break for $e \leq 5$ mm	≥ 350 %	Test piece shape Speed of test Number of test pieces[2)]	Type 2 100 mm/min As specified in ISO 6259	ISO 6259-1:1997 and ISO 6259-3:1997
Elongation at break for $e > 5$ mm ≤ 12 mm	≥ 350 %	Test piece shape Speed of test Number of test pieces[2)]	Type 1[1)] 50 mm/min As specified in ISO 6259	ISO 6259-1:1997 and ISO 6259-3:1997
Elongation at break for e > 12 mm	≥ 350 %	Test piece shape Speed of test Number of test pieces[2)]	Type 1[1)] 25 mm/min As specified in ISO 6259	ISO 6259-1:1997 and ISO 6259-3:1997
		OR		
		Test piece shape Speed of test Number of test pieces[2)]	Type 3[1)] 10 mm/min As specified in ISO 6259	
Melt mass-flow rate MFR for PE 40	Change of MFR by processing ± 20 %[3)]	Load Test temperature Time Number of test pieces[2)]	2,16 kg 190 °C 10 min As specified in EN ISO 1133	EN ISO 1133:1999, condition D
Melt mass-flow rate MFR for PE 63, PE 80, and PE 100	Change of MFR by processing ± 20 %[3)]	Load Test temperature Time Number of test pieces[2)]	5,0 kg 190 °C 10 min As specified in EN ISO 1133	EN ISO 1133:1999, condition T
Oxidation induction time	≥ 20 min	Test temperature Number of test pieces[2,4)]	200 °C [5)] 3	EN 728
Effect on water quality[6)]	National regulations apply			

[1)] Where practical machined type 2 test pieces may be used for pipe wall thicknesses ≤ 25 mm. The test may be terminated when the requirement is met, without continuing until the rupture of the test piece.

[2)] The number of test pieces given indicate the quantity required to establish a value for the characteristic described in the table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan (for guidance see ENV 12201-7).

[3)] Value as measured on the pipe relative to the value measured on the compound used.

[4)] Samples to be taken from the inner wall surface.

[5)] Test may be carried out as an indirect test at 210 °C providing that there is a clear correlation of the results to those at 200 °C, in cases of dispute the reference temperature shall be 200 °C.

[6)] Test methods, parameters and requirements for all properties are under preparation. Until these EN's are published National Regulations apply (see introduction).

1- **Elongation at break** for 3 different thickness ranges will be done by universal tensile tester and 2 types of grips (Wedge grip and grips for type 3 according to ISO 6259). Force capacity of tensile tester will be chosen based on pipe thickness. UT of PE is about 25MPa you based on this and type 3 width of narrow section that is 25mm ,you can calculate max force capacity needed. Suppose that thickness of pipes is 20mm. Then :

20*25*25 [thickness*width of narrow section for type 3*UT of HDPE]= 12500N=1250kgf
Max travel of about 1000mm is enough for HDPE pipes elongation measurement.

2- **Melt mass flow rate** is measured by MFR or MFI tester. for PE, 5kg weight and 190C will be used.

3- **Oxidation induction time** will be measured using OIT-DSC tester. Max temperature of 300C for PE sector is enough. Also no need for complicated functions of DSC tester. only OIT measurement function is enough. You also need Ind and Tin pellet for periodical calibration checkout of machine.

Universal Tensile Tester

Melt Flow Indexer

DSC OIT Tester

Chemical Characteristics

9 Chemical characteristics of pipes in contact with chemicals

If for a particular installation it is necessary to evaluate the chemical resistance of the pipe, then the pipe shall be classified in accordance with ISO 4433-1:1997 and ISO 4433-2:1997.
NOTE: Guidance for the resistance of polyethylene pipes to chemicals is given in ISO/TR 10358.

Performance Tests

10 Performance requirements

When pipes conforming to this standard are assembled to each other or to components conforming to other parts of prEN 12201, the joints shall conform to the requirements of prEN 12201-5.

Category

1. Equipment for Standards