

HDPE Water Supply Series

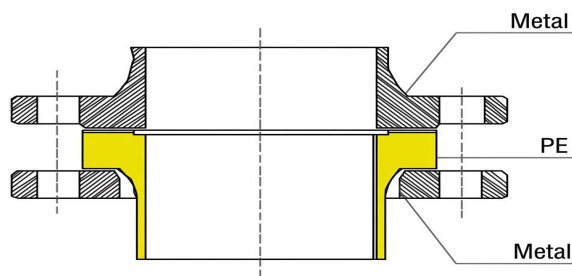
Physical Performance Indicators of Pipes

Item	Indicator
Elongation at Break, %	≥350
Longitudinal Retraction Rate (110°C), %	≤3
Oxidation Induction Time (200°C), min	≥20
80°C Hydrostatic Strength (165h), Hoop Stress (PE80: 4.6MPa; PE100: 5.5MPa)	No Rupture, No Leakage
Weathering Resistance (After pipes cumulatively receive ≥3.5GJ/m ² aging energy) Elongation at Break, %	≥350
Oxidation Induction Time (200°C), min	≥10

Note: Only applicable to blue pipes.

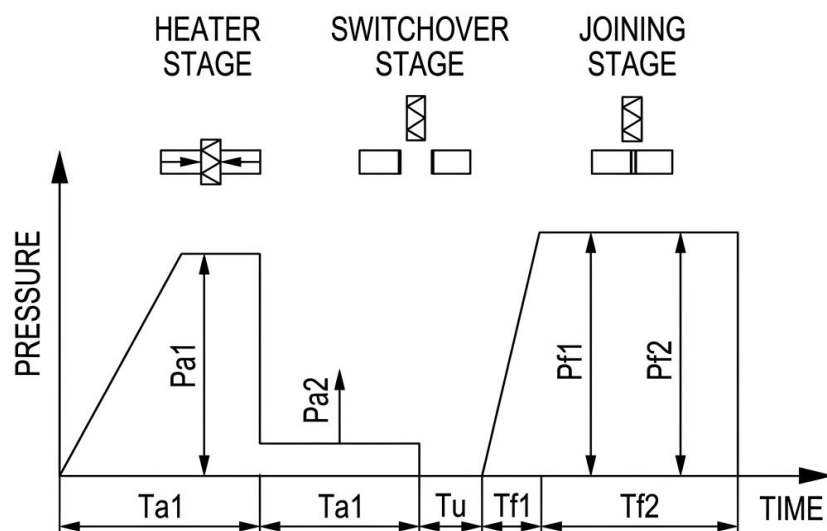
Physical Performance Indicators of Fittings

Item	Requirement	Indicator
Melt Mass-Flow Rate (MFR) for PE63, PE80 and PE100	The variation of MFR is less than ±20% of the material's MFR value	Test Temperature 190°C Load 5kg
Oxidation Induction Time (Thermal Stability)	≥20min	Test Temperature 200°C Number of Samples 3
Fusion Strength of Electrofusion Fittings	Percentage of brittle failure ≤33.3%	Test Temperature 23°C
Fusion Strength of Spigot Fittings - Butt Fusion Fittings	Test until failure; Ductile: Pass Brittle: Fail	Test Temperature 23°C
Impact Strength of Saddle Bypass	No Rupture, No Leakage	Test Temperature (0±2) °C Drop Weight Mass (2500±20) g Drop Height (2000±10) m



Schematic Diagram of Polyethylene Backing Loose Flange Connection

Pipe Connection



- When nominal outer diameter $dn \leq 63\text{mm}$, hot melt socket connection is generally used;
- When nominal outer diameter $dn \geq 75\text{mm}$, hot melt butt connection is used;
- For connection with metal pipes and pipe accessories, methods such as flange connection or transition fitting connection are adopted.

Hot Melt Butt Connection Operating Steps

- Material Preparation: Place the pipe or fitting on a flat surface, put it on the butt fusion machine, leaving 10mm~20mm cutting allowance;
- Clamping: Choose the appropriate slip clamp to clamp the pipe according to the welded pipe and fitting, to prepare for cutting;
- Cutting: Cut the impurities and oxide layer on the end faces of the welded pipe section and fitting to ensure the two butt end faces are flat, smooth, and free of impurities;

- Alignment: The end faces of the two welded pipe sections must be completely aligned, the smaller the misalignment the better, and the misalignment cannot exceed 10% of the wall thickness;
- Heating: The butt connection temperature is generally advisable to be between 210°C~230°C. The heating time of the heating plate varies between winter and summer, and a melt length of 1mm~2mm on both end faces is optimal;
- Switchover: Remove the heating plate, quickly stick the two hot melt end faces together and apply pressure;
- Melt Butt Connection: The butt connection process should always be carried out under melt pressure, and a curl width of 2mm~4mm is advisable;
- Cooling: Keep the butt connection pressure unchanged, let the interface cool slowly;
- Butt Connection Completed: After cooling, release the slips, move away the butt fusion machine, and re-prepare for the next interface connection.

In the figure: Pa1 Heating Pressure; Pa2 Heat Absorption Pressure; Pf1 Fusion Pressure;

Pf2 Cooling Pressure; Ta1 Heating Time; Ta2 Heat Absorption Time;

Tu Switchover Time; Tf1 Pressurization Time; Tf2 Cooling Time.

Hot Melt Butt Connection Process Parameters

Wall Thickness e (mm)	Curl Height during Heating h (mm); Temperature: (210±10) °C; Pressure Pa1: 0.15MPa	Heat Absorption Time Ta2 (s); Ta=10xe; Temperature: (210±10) °C; Heat Absorption Pressure Pa2: 0.02MPa	Maximum Allowed Switchover Time Tu (s)	Pressurization Time Tf1 (s)	Cooling Time of Weld Seam under Pressure Holding State Tf2 (min) Pf1=Pf2=0.15MPa
<5	0.5	45	5	5	6
4.5-7	1.0	45-70	5-6	5-6	6-10
7-12	1.5	70-120	6-8	6-8	10-16
12-19	2.0	120-190	8-10	8-11	16-24
19-26	2.5	190-260	10-12	11-14	24-32
26-37	3.0	260-370	12-16	14-19	32-45
37-50	3.5	370-500	16-20	19-25	45-60

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Precautions

Operators connecting polyethylene water supply pipes should undergo specialized training before taking up the post, and can only perform construction operations after passing the training;

The connection of polyethylene water supply pipes should preferably use pipes and fittings of the same brand and material. The connection between pipes and pipes or pipes and fittings of different brands and materials with similar properties should only be carried out after testing and determining that the connection quality can be guaranteed.

Transportation and Storage

During transportation, the products must not be subjected to violent collisions. Avoid contact with sharp objects to prevent scratches. Keep away from heat sources, oil pollution, and chemically contaminated areas. Products should avoid sun and rain, and keep away from heat sources. Products should be stacked horizontally, and the stacking height should not exceed 1.5m.

Construction Specifications

In the application process of various buried PE pipes, a key factor in whether the pipeline can reach the specified long-term service life is the quality of laying. PE pipes have a variety of unique properties that make laying safer and faster, and correct construction design and installation procedures will allow these superior properties of the pipeline to be exerted to a greater extent.

• Technical Preparation before Construction

Before construction, you should be familiar with and master the construction drawings; prepare corresponding construction equipment;

Conduct on-the-job training for operators, who can only carry out construction after passing the training;

Accept pipes and fittings according to standards.

• Trench Excavation

Trench excavation must be carried out strictly in accordance with the design drawings. PE pipes have good flexibility and light weight, so longer pipelines can be prefabricated on the ground. When terrain conditions permit, ground welding of pipelines can reduce the excavation width of the trench. Excavation of narrow trenches can use excavation equipment such as rotary excavators, plows, or shovels. Generally, the minimum soil cover thickness on the top of buried polyethylene pipes is:

Buried under the carriageway, the burial depth of the pipe top shall not be less than 0.9m;

Buried under the sidewalk or branch pipes shall not be less than 0.75m;

Under the green belt or branch pipes in residential areas shall not be less than 0.6m;

In permafrost or seasonal frozen soil layers, the burial depth of the pipe top should be below the freezing line. In a solid and stable trench bottom, the width of the trench is determined by the operating space required for construction. The size of the space must allow for proper preparation of the trench bottom, backfilling, and compaction of backfill materials, and also take into account the economy of trench excavation costs and the cost of purchasing backfill materials. The width of the trench should generally consider the specifications of the pipeline and the compaction tools used. The table below provides the corresponding minimum width values:

Nominal Pipe Diameter (mm)	Minimum Trench Width (m)
75-400	D+0.3
>400	D+0.5

Generally, when connected on the ground, the trench width is D+0.3m. When installation in the trench or trench backfilling is difficult and cannot meet the backfill soil compactness requirements, the trench width is D+0.5m, and the total width is not less than 0.7m.

In trenches of sandy soil or silt, if it is not easy to make a vertical trench sidewall, a 45° slope or a slope of a material capable of supporting the trench wall can be made. If the trench is wider, the initial backfill material must be compacted to support the weight of the final backfill layer.

• Preparation of PE Trench Bottom

For pressure systems like water supply, sewage, or long-distance transmission pipelines, unless specifically required by the design drawings, the levelness precision requirement for the trench bottom is generally not very high. However, for gravity drainage systems, the slope grade must meet the specified requirements.

If the trench bottom is fairly flat and straight, and there are basically no large stones in the soil, then there is no need for further leveling. Of course, an undisturbed trench bottom layer is better. But if the trench bottom has been disturbed or must be disturbed during excavation, its compactness should at least reach the compactness of the surrounding backfill material. The excavated trench bottom generally needs to be padded and leveled with small stones without sharp edges not exceeding 50mm in diameter mixed with some sandy soil and clay. All sizes of PE pipes can generally adapt to a small amount of local unevenness in the trench bottom, but if the backfill material contains sharp-edged stones or hard shale, it may cause stress concentration areas on the surface of the pipeline, resulting in damage to the pipeline.

For excavation in shale and loose rock soils, to avoid contact with loose rock, a uniform trench bed must be provided for the PE pipeline. The general practice is that the trench bottom should be excavated at least 150mm deeper than the specified grade, and then backfilled to the specified height with appropriate backfill material, and compacted to a compactness of 90% or higher.

For unstable soils with weak supporting strength, such as wet clay or sandy soil, the excavation depth of the trench should be 100-150mm deeper than the specified value. Then use the specified or originally excavated material for backfilling to ensure a uniform support for the PE

pipe. In unstable organic soil, if the groundwater level at the installation site is high enough to submerge the pipeline, additional weight can be added to the pipeline to resist the buoyancy experienced by the pipeline, but this additional design weight should not exceed the supporting strength of the foundation layer.

• Laying of Pipelines in the Trench

Before the pipeline is placed in the trench, it should first be comprehensively inspected. Only when no defects are found is the pipeline allowed to be hoisted or rolled into the trench. Pipelines are usually pre-connected on the ground. Sometimes the pipeline may be pre-connected into many sections about 150m long and stored in a certain place. When it needs to be lowered and connected, it is then transported to the installation site, and these sections are connected using hot melt connection or mechanical connection methods.

Pipes with a nominal diameter of less than 200mm can be manually dragged into the trench; for all large pipes, fittings, valves, fire hydrants, and accessories, appropriate tools should be used to carefully place them in the trench; for hoisting long-distance pipelines, nylon ropes are recommended.

• Final Pipeline Connection and Assembly

The hot melt connection of pipelines in the trench is the same as the hot melt connection method of pipelines on the ground, but it must be ensured that the connected pipelines must be cooled to the ambient temperature of the soil before connection. When PE pipes are connected to metal pipes, water tanks, or water pumps, flange connection is generally used. Between PE pipes, when it is inconvenient to use hot melt connection, flange connection can also be used. During flange connection, the bolts should be pre-tightened evenly, and after 8 hours, tightened again.

• Pressure Testing of PE Pipelines

The PE pipeline system should be subjected to a pressure test before being put into operation. The pressure test includes a strength test and a watertightness test. Water is generally recommended as the test medium for testing.

Strength Test

After discharging the air in the pipeline to be tested, increase the pressure to the required pressure value at a steady pressure rise rate. The pressure gauge should be placed at the lowest point of the pipeline section as much as possible. The pressure test can be carried out before or after the pipeline is backfilled. The pipeline should be covered with soil at regular intervals, especially for snaking pipelines. The pipeline should be fixed in place during the pressure test. Flange connection parts should be exposed for checking for leaks. The test pressure of the pressure test should not exceed 1.5 times the pressure rating of the pipe or the pressure rating of the fitting with the lowest pressure rating in the system. At the beginning, the pressure should be raised to the specified test pressure value and held for a sufficient time to ensure that the pipe fully expands. This process takes 2-3 hours. When the system is stable, the pressure is raised to 1.5 times the working pressure and the pressure is stabilized for 1 hour. Carefully observe the pressure gauge and patrol along the line. If there is no visible leakage or obvious pressure drop during the test, the pipeline passes the pressure test. During the pressure test, the continuous

expansion of the pipe will cause a pressure drop. It is normal for a certain pressure drop to occur during the test, and it cannot be used to prove that the pipeline system must have leaked or been damaged.

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Watertightness Test

PE pipelines are connected by electrofusion, which makes PE pipelines have superior watertight performance compared to traditional pipes. The test pressure of the watertightness test should not exceed 1.15 times the pressure rating of the pipe or the pressure rating of the fitting with the lowest pressure rating in the system. After the pipeline pressure reaches the test pressure, it should be maintained for a certain period to allow the temperature of the test medium in the pipeline to be consistent with the ambient temperature of the pipeline. Wait for the temperature and pressure to stabilize before starting the timing. Generally, the watertightness test should stabilize the pressure for 24 hours. After the test is completed, if there is no obvious leakage or pressure drop, it passes the watertightness test.

• Backfilling and Compaction

In general, the following three types of materials can be used as backfill materials for PE pipelines:

5-40mm angular stones, including a large amount of locally easily available materials, such as coral, crushed slag, crushed stone, and crushed shells;