

# Specifying flanged joints for polyethylene pressure piping systems

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## Background

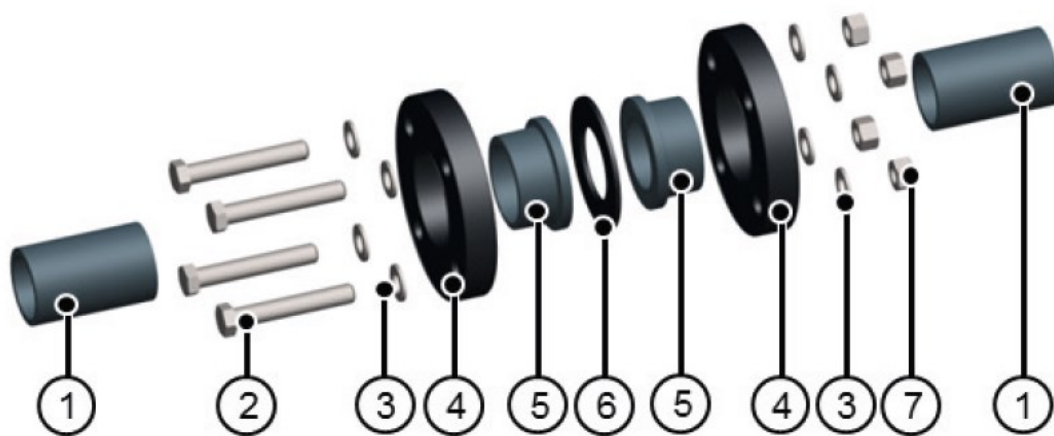
In polyethylene (PE) pressure pipe systems, flanged joints can be used to connect a PE pipe or PE barrier pipe to metal components, such as valves and fittings, and to metal pipes. A properly designed, specified and assembled flange connection offers a fully end-load resistant and leaktight joint.

Note: Flanged connections are not normally recommended for connecting PE pipes to each other or PE pipes to PE components, as there are better solutions. The BPF Pipes Group’s publication *Joining of polyethylene pipes for below ground gas applications* and *Joining of polyethylene pipes for below ground water applications* provides information on these options.

The connection between the PE pipe and the flanged fitting is normally made by welding a PE stub onto the PE pipe (known as a pup pipe or “pupped”) and assembled with a backing ring, a flange gasket, the metallic flange face of the valve and bolts and nuts with washers on both sides to keep the components together and tight.

Alternatively, a one-piece stub flange can be supplied with a long spigot. A pupped flange or a one-piece stub flange can be connected to a PE pipe or PE barrier pipe by butt fusion or using a mechanical or electrofusion fitting.

### Components of a complete polyethylene stub flange assembly for connection to a PE pipe



- KEY:
- (1) Pipe
  - (2, 3, 7) Bolt set
  - (4) Backing ring
  - (5) PE stub
  - (6) Gasket / flange seal

## Procurement of PE stub assembly components

Members of the BPF Pipes Group supply complete PE stub flange assemblies comprising PE stub fitting with the backing ring, flange gasket, and the bolt set to the relevant standard. For water supply and for drains and sewers under pressure, the standard is BS EN 12201: Part 3; for gas supply BS EN 1555: Part 3 or GIS PL2: Part 6.

A PE stub flange is designed such that it is compatible with metal flanges whose dimensions and tolerances are in accordance with BS EN 1092-1 (steel) or BS EN 1092-2 (cast iron). Key dimensions include the number and diameter of bolt holes, spacing between bolt holes, the diameter of the backing ring and the thickness of the backing ring (which determines pressure rating).

## Product assessment

Members of the BPF Pipes Group undertake fitness for purpose testing of a complete assembly to the relevant standard. For water supply and for drains and sewers under pressure, the standard is BS EN 12201: Part 5; for gas supply BS EN 1555: Part 5 or GIS PL2: Part 6.

This ensures that the selected components work effectively together to provide a reliable and leaktight flange assembly. Testing includes for example, tensile strength and ductility of the welded joint, leaktightness under internal and external pressures, leaktightness when the assembly is subjected to bending and resistance to pull out under the constant longitudinal forces generated by internal pressures.

Note: Advice on this topic can be found in the BPF Pipes Group's guidance *Dealing with longitudinal forces in a polyethylene pipe under pressure*.

Typically when testing the complete PE stub flange assembly in the laboratory, it is connected to a metallic flange face or a blank plate. **The pipe manufacturer's recommended installation instructions for the PE stub flange assembly including values for bolt torque are based on this testing.**

It is important when specifying a PE stub assembly that performance to these standards (i.e. BS EN 12201: Part 5; BS EN 1555: Part 5 or GIS PL2: Part 6) is demonstrated.

**The British Plastics Federation (BPF) Pipes Group and its members strongly advise that product performance is verified by a third-party certification scheme (for example, the BSI Kitemark or equivalent).**

**WARNING:** Where components are purchased separately, there will have been no testing of the complete assembly by a manufacturer. The purchaser would need to undertake their own performance assessment and establish values for bolt torque to deliver a leaktight joint. Tests in the standards above could be used for this purpose.

## Advice from pipe manufacturers

1. Purchase a complete flange kit from one manufacturer—this includes PE stub flange, backing ring, gasket, and bolt set
2. For gas, purchase flange kit to BS EN 1555: Part 3 or GIS PL2-6 which has been assessed to GIS PL2-6 or BS EN 1555: Part 5.
3. For water and for drains and sewers under pressure, purchase flange kit to BS EN 12201: Part 3 which has been assessed to BS EN 12201: Part 5.
4. Specify the Design Pressure (DP) of the pipeline, the PE pipe (material, SDR, PN), and the dimensions of the metallic flange.

## References

GIS PL2-6: Specification for Polyethylene pipes and fittings for natural gas and suitable manufactured gas. Part 6: Spigot end fittings for electrofusion and/or butt fusion purposes

BS EN 12201-3: Plastics piping systems for water supply, and for drains and sewers under pressure — Polyethylene (PE). Part 3: Fittings

BS EN 12201-5: Plastics piping systems for water supply, and for drains and sewers under pressure — Polyethylene (PE). Part 5: Fitness for purpose

BS EN 1555-3: Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 3: Fittings

BS EN 1555-5: Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Part 5: Fitness for purpose

*Joining of polyethylene pipes for below ground gas applications and Joining of polyethylene pipes for below ground water applications.* BPF Pipes Group.

*Dealing with longitudinal forces in a polyethylene pipe under pressure.* BPF Pipes Group.

BPF Pipes Group guidance is available from <https://bpfpipesgroup.com/technical-information/specification-guidance/> and <https://www.bpfpipesgroup.com/technical-information/technical-guidance/>