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**Glass-reinforced thermosetting plastics  
(GRP) pipes and fittings — Test methods  
to prove the design of bolted flange joints**

*Tubes et raccords en plastiques thermodurcissables renforcés de verre  
(PRV) — Méthodes d'essai pour confirmer la conception des  
assemblages à brides boulonnées*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8483 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 6, *Reinforced plastics pipes and fittings for all applications*.

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## Introduction

In a pipework system, pipes and fittings of different nominal pressures and stiffness may be used.

A joint may be made between pipes and/or fittings and should be designed such that its performance is equal to or better than the requirements of the pipeline, but not necessarily of the components being joined.

The requirements for the assembly of the joint are not included in this standard, but they should be in accordance with the manufacturer's recommendations.

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# Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods to prove the design of bolted flange joints

## 1 Scope

This International Standard specifies methods of test for bolted flange joints for plastics piping systems made of glass-reinforced thermosetting plastics (GRP). This standard is only applicable to the joint, and covers methods of test to prove its design. It assumes that the joint either is or is not intended to be subject to the effects of hydrostatic end thrust.

These test procedures are applicable to joints between pipes and fittings of all nominal sizes. The tests are applicable for evaluating joints intended for applications conveying liquids at temperatures specified in the referring specifications.

## 2 Principle

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A joint is subjected to a specified internal pressure and, if appropriate for the joint design, the consequent hydrostatic end thrust. The procedure includes prolonged static tests at elevated pressures and cyclic testing.

A method is also included to test the resistance of the joint to an internal negative pressure. This also simulates an external positive pressure.

NOTE 1 The only reason for testing the resistance to external pressure differential is to ensure adequate safety against infiltration of pollutants through the joint into the fluid carried in the piping system. Under these test conditions, pipes with low stiffness may require support to prevent buckling.

At the end of each of the tests the joint is inspected for signs of leakage and damage and, unless otherwise specified, if either has occurred then the joint has failed.

If the joint is to be used in systems where the maximum operating temperature is higher than the value given in the referring specification, the test conditions can be modified accordingly.

NOTE 2 It is assumed that the following test parameters are set by the standard making reference to this standard:

- a) length,  $L$ , of the assembled test piece (see 4.1);
- b) number of test pieces to be used (see 4.2);
- c) if applicable, conditioning other than as given in Clause 5;
- d) test temperature and its permissible deviations (see Clause 6);
- e) nominal pressure relevant to the joint under test (see 4.1 and Clause 7);
- f) if applicable, any criteria indicative of damage to the joint components [see Clause 7 and item j) of Clause 8];
- g) whether the joint is or is not to be tested with end loads;

- h) whether GRP to GRP or GRP to metal flange tests are to be performed (see Clause 4);
- i) acceptable increase in pressure over 1 h for negative pressure test (see 7.2).

### 3 Apparatus

#### 3.1 End-sealing devices

The end-sealing devices shall be of a size and type appropriate to the joint system under test and shall conform to 3.1.1 or 3.1.2 as applicable.

##### 3.1.1 Capable of applying the end loads

If the joint is to be tested with an end load [see item g) of Note 2 to Clause 2] then the end-sealing devices shall be anchored to the pipes to transmit the end thrust loads.

##### 3.1.2 Not capable of applying the end loads

If the joint is to be tested without the end load [see item g) of Note 2 to Clause 2] then the end-sealing devices shall not be anchored to the pipes (see 7.6).

#### 3.2 Supports

**3.2.1 End thrust supports**, if required, comprising part of the rig, which shall be capable of supporting the end thrust induced by the internal pressure, but which shall not otherwise support the joint.

**3.2.2 Special supports**, if necessary, to prevent buckling of the pipe barrel during external pressure differential (see 7.2) testing.

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#### 3.3 Source of hydrostatic pressure

A source of hydrostatic pressure capable of meeting the needs of the test.

#### 3.4 Means of measuring the gauge pressure

A means of measuring the gauge pressure at the top of the pipe to an accuracy within  $\pm 1\%$  and checking conformity to the specified pressures (see 7.2 to 7.4).

#### 3.5 Vacuum pump or equivalent

A vacuum pump or equivalent capable of applying the required negative gauge pressure (see 7.2).

#### 3.6 Bolt torque test apparatus

The bolt torque test apparatus shall incorporate the following items:

- a) a flat-faced metallic flange of the same mating dimensions as the GRP flange;
- b) a calibrated wrench with means of measuring the torque applied;
- c) bolts, nuts and washers for assembling the metallic flange to the flange under test.



## 4 Test pieces

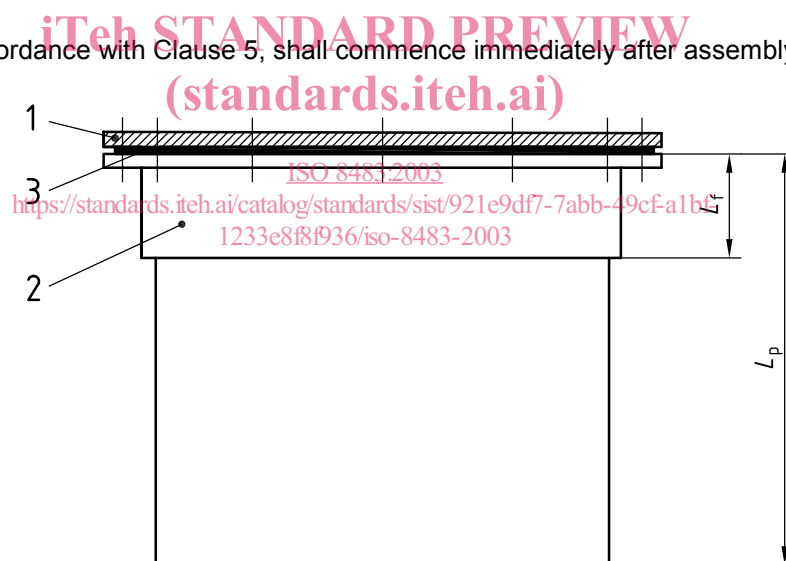
### 4.1 Test arrangement

When testing in accordance with 7.2 to 7.4 and 7.6 the test arrangement shall be one of those shown in Figure 2a). When testing in accordance with 7.8 the test arrangement shall be one of those shown in Figure 2b). It should be noted that there are two different joint conditions shown, namely metallic flange to GRP flange and GRP flange to GRP flange. These two conditions will not necessarily give the same results due to different stresses and strains being induced. The referring specification shall state which condition is to be used. For the test detailed in 7.5 the arrangement shall be as shown in Figure 3. See Annex A for details on determining the maximum deflection,  $\Delta$  (see item 6 in Figure 3), at mid-span and the magnitude of the additional force,  $F$  (see Annex A). In all these arrangements a joint of the same size and design shall be used. The same test piece may be used for more than one test procedure providing it is undamaged and of sufficient size to enable the test conditions to be achieved.

The test piece shall comprise an assembly of one or two pieces of pipe of the same size and pressure class as the joint being tested, and the joint to be tested. The total effective length,  $L$ , of the assembly shall be not less than that specified in the referring specification and shall allow, if required, the joint under test to be located in the middle of the test arrangement. For the test detailed in 7.5 the length,  $L$ , of the assembly shall be not greater than 8 m and the joint under test shall be located in the middle of the test arrangement.

The joint shall be assembled in accordance with the manufacturer's recommendations, including gasket type (inside bolt circle or full face), gasket material, bolt and nut lubrication and, if applicable, the requirements of the referring specification.

Conditioning, in accordance with Clause 5, shall commence immediately after assembly of a test joint.



#### Key

- |   |                              |       |                  |
|---|------------------------------|-------|------------------|
| 1 | metal blank flange           | $L_f$ | length of flange |
| 2 | GRP flange and over-wrapping | $L_p$ | length of pipe   |
| 3 | gasket                       |       |                  |

Figure 1 — Typical test arrangement for tests detailed in 7.7