Gas Industry Standard

GIS/PL2-7:2013

Specification for

Polyethylene pipes and fittings for natural gas and suitable manufactured gas

Part 7: Squeeze-off tools and equipment

Cadent
Your Gas Network

Northern Gas Networks

SGN
Your gas. Our network.

WALES&WEST UTILITIES

Contents

Foreword

Gas Industry Standards (GIS) are revised, when necessary, by the issue of new editions. Users should ensure that they are in possession of the latest edition. Contractors and other users external to Gas Transporters should direct their requests for copies of a GIS to the department or group responsible for the initial issue of their contract documentation.

Comments and queries regarding the technical content of this document should be directed in the first instance to the contract department of the Gas Transporter responsible for the initial issue of their contract documentation.

This standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with this engineering document does not confer immunity from prosecution for breach of statutory or other legal obligations.

Relationship with other publications

GIS/PL2 *Polyethylene pipes and fittings for natural gas and suitable manufactured gas* consists of the following parts:

Part 1: General and polyethylene compounds for use in polyethylene pipes and fittings.

Part 2: Pipes for use at pressures up to 5.5 bar.

Part 3: Butt fusion machines and ancillary equipment.

Part 4: Fusion fittings with integral heating element(s).

Part 5: Electrofusion ancillary tooling.

Part 6: Spigot end fittings for electrofusion and/or butt fusion purposes.

Part 7: Squeeze-off tools and equipment.

Part 8: Pipes for use at pressures up to 7 bar.

Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:

can indicates a physical possibility;

may indicates an option that is not mandatory;

shall indicates a GIS requirement;

should indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

Disclaimer

This engineering document is provided for use by Gas Transporters and such of their contractors as are obliged by the terms of their contracts to comply with this engineering document. Where this engineering document is used by any other party, it is the responsibility of that party to ensure that the engineering document is correctly applied.

Brief history

First published as GBE/PL2: Part 7	April 1992
Amendment No. 1 published	May 1994
Editorial update to reflect demerger November 2000	June 2001
Revision published as T/SP/PL2: Part 7 to reflect availability of 500mm equipment for MDPE	July 2004
Revision	December 2005
Edited by BSI in accordance with BS 0-3:1997	August 2006
Reviewed on behalf of the Gas Distribution Networks' Technical Standard Forum by BSI	September 2013
Reviewed by TSF	June 2018

1 Scope

This part of GIS/PL2 specifies requirements for squeeze-off tools and equipment used in the maintenance of polyethylene systems constructed from pipe of nominal size 16 mm to 630 mm inclusive and conforming to GIS/PL2-2. This includes peelable pipes (where the skin is taken off before squeeze-off). It applies to tools and equipment suitable for use with close-fit insertion size pipe and imperial size pipe.

This standard does not apply to squeeze-off tools and equipment to be used on pipe conforming to GIS/PL2-8.

It is not the intention of this standard to establish interchangeability between component parts of differing types of squeeze-off tools.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Formal standards

BS EN 60947-1, *Specification for low-voltage switchgear and controlgear — Part 1: General rules.*

BS EN ISO 3452-1, *Non-destructive testing. Penetrant testing. General principles.*

BS EN ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids. Determination of the resistance to internal pressure. General method*

BS EN ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids. Determination of the resistance to internal pressure. Preparation of pipe test pieces*

BS EN ISO 1167-3, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids. Determination of the resistance to internal pressure. Preparation of components*

BS EN ISO 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids. Determination of the resistance to internal pressure. Preparation of assemblies*

Gas Industry Standards

GIS/PL2-2, *Specification for polyethylene pipes and fittings for natural gas and suitable manufactured gas — Part 2: Pipes for use at pressures up to 5.5 bar*.

GIS/PL2-5, *Specification for polyethylene pipes and fittings for natural gas and suitable manufactured gas — Part 5: Electrofusion ancillary tooling.*

3 Terms and definitions

For the purposes of standard following terms and definitions apply.

3.1
Geometrical definitions

3.1.1
nominal size (DN)
numerical designation of the size of a component, other than a component designated by

thread size, which is a convenient round number, approximately equal to the manufacturing dimension in millimetres (mm)

3.1.2
nominal size (DN/OD)
nominal size, related to the outside diameter

3.1.3
nominal outside diameter, d_n
specified outside diameter, in millimetres, assigned to a nominal size DN/OD

3.1.4
mean outside diameter, d_{em}
value of the measurement of the outer circumference of the pipe or spigot end of a fitting in any cross-section divided by π (= 3.142), rounded to the next greater 0.1 mm

3.1.5
nominal wall thickness, e_n
numerical designation of the wall thickness of a component, which is a convenient round number, approximately equal to the manufacturing dimension in millimetres (mm)

NOTE For thermoplastics components, the value of the nominal wall thickness, e_n, is identical to the specified minimum wall thickness, e_{min}.

3.1.6
tolerance
permitted variation of the specified value of a quantity, expressed as the difference between the permitted maximum and the permitted minimum value

3.1.7
standard dimension ratio (SDR)
numerical designation of a pipe series, which is a convenient round number, approximately equal to the dimension ratio of the nominal outside diameter, d_n, and the nominal wall thickness, e_n

3.2 Material definitions

3.2.1
peelable pipe
pipe made with polyethylene (PE100) core material over which is an outer skin, which is removed locally with the aid of simple tools, prior to fusion jointing

NOTE The skin allows protection of the core pipe during installation, but does not contribute to the specified wall thickness or to the mechanical strength of the pipe. The skin carries all marking and colour identification of the pipe.

3.2.2
core pipe
polyethylene pipe without skin

NOTE The core pipe meets all the dimensional requirements of GIS/PL2-2 with the exception of colour.

3.2.3
coiled pipe
pipe coiled in a multilayer configuration with the layers strapped together to provide a stable and self-supporting unit

3.3
squeeze-off

method of flow stopping, by constricting the flow area of a pipe by squeezing it between clamp bars, used when making mains extensions and repairs to polyethylene pipe systems

3.4
squeeze off equipment
complete assembly required to carry out a flow stopping operation using hydraulic equipment (manual or powered), including hydraulic rams, hoses, locking pins and handling equipment

3.5
squeeze-off tool
complete assembly required to carry out a flow stopping operation manually, including hydraulic rams, hoses, locking pins and handling equipment

3.6
maximum operating pressure (MOP)
maximum effective pressure of the fluid in the piping system, expressed in bar, which is allowed in continuous use

NOTE It takes into account the physical and the mechanical characteristics of the components of a piping system.

3.7 Symbols

A, cross-sectional area of the hydraulic cylinder or the total cross-sectional area if more than one cylinder,

d_{em} mean outside diameter

d_n nominal outside diameter

e_n nominal wall thickness

L compressive load to squeeze-off the largest pipe and thickest wall at −5°C

P hydraulic pressure required to squeeze-off the largest pipe and thickest wall at −5°C

t time to displace 1 litre of water

Q air/nitrogen leakage flow rate, in m^3/h

3.8 Abbreviations

DN nominal size

DN/OD nominal size outside diameter related

MOP maximum operating pressure

4 General

4.1 Squeeze-off tools and equipment shall be designed to satisfactorily squeeze-off pipes in all materials and wall thicknesses conforming to GIS/PL2-2 within an operating temperature range of −5 °C to 30 °C. Machines shall be sufficiently robust to withstand normal field usage without deterioration of performance.

NOTE 1 The squeeze-off tools and equipment, in particular, shafts, fastenings and stops, should be constructed from corrosion resistant materials, or be otherwise suitably protected.

NOTE 2 Where possible machine sizes should be combined as follows:

a) 16 mm to 75 mm inclusive;

b) above 75 mm to 180 mm inclusive;

c) above 180 mm to 355 mm inclusive;

d) above 355 mm to 630 mm inclusive.

4.2 For manually operated hydraulic tools, the handle shall operate along the line of the pipe.

4.3 Electrically operated or powered components of machines shall be suitable for use with a nominal −55 V/0 V/+55 V ± 10 % ac power supply which incorporates current overload, earth leakage protection and mid-point earthing. Electrical equipment shall be protected to conform to the degree of protection specified in IP44 of BS EN 60947-1.

4.4 Equipment shall be capable of being installed and operated in trench conditions by not more than two persons.

4.5 Squeeze-off shall be limited by a positive mechanical “stop”. The stop shall clearly indicate the pipe diameter and SDR class for which it is suitable, and shall be capable of being interchanged or reset for the specified size ranges. For selected pipe diameters up to and including 180 mm, the stop shall be dual-marked to cover equivalent metric and imperial sized pipe, see Table 1.

4.6 When operation is by any means other than mechanical (e.g. manual or powered hydraulic), the squeeze-off tool shall be capable of being locked mechanically in the loaded position when squeeze-off is fully applied.

4.7 Hydraulic systems shall be designed to avoid exceeding their rated working pressure (or the structural strength of the machine) by restricting the hydraulic pressure to 1.2 times the pressure (*P*) required to squeeze-off the largest pipe and thickest wall for which the equipment is designed, at the minimum operating temperature of −5 °C. The test method for determining the maximum pressure (*P*) shall be in accordance with **A.4**.

Table 1 — Minimum squeeze-off bar separation

Pipe diameter mm	**PE80 pipes**			
	Minimum squeeze-off bar separation mm			
	SDR11	**SDR17.6**	**SDR21**	**SDR26**
16 [a]	3.5	—	—	—
20 [a], ½ in	3.5 [b]	—	—	—
25, ¾ in	4.0 [b]	—	—	—
32, 1 in	5.0 [b]	—	—	—
40	5.9	—	—	—
50	7.4	4.6	—	—
55	8.2	—	—	—
63, 2 in	9.3 [b]	5.8	4.8	—
75	10.9	6.9	—	—
90, 3 in	12.9 [b]	8.3	6.9	—
110	16.0	10.1	8.3	—
125, 4 in	17.8 [b]	11.4	9.6	—
140	20.3	12.8	—	8.6
160	—	14.6	12.2	9.9
180, 6 in	26.2	16.0 [b]	13.8	11.2
200	29.1	18.2	15.2	12.3
213	—	—	—	13.1
225	—	—	17.1	13.8
250	36.3	22.7	19.0	15.4
268	—	—	—	18.5
280	45.7	28.6	—	19.3
315	51.5	32.2	27.0	21.8
355	58.1	36.4	30.4	—
400	65.5	41.0	34.2	—
450	73.6	46.1	38.5	—
469	—	—	40.1	—
500	81.9	51.1	42.8	—
560	91.6	57.4	48.1	—
630	103.1	64.4	54.0	—

[a] Fitting sizes 16 mm and 20 mm use pipe of SDR7 and SDR9 respectively due to minimum wall thicknesses.

[b] Dual marked metric/imperial stops. Tolerances $^{+0.1}_{-0.0}$ mm.

NOTE 1 For pipe diameters of 250 mm and below the minimum squeeze bar separation should be equal to 80 % of double the minimum pipe wall thickness.

NOTE 2 For pipe diameters of above 250 mm the minimum squeeze bar separation is equal to 90 % of double the minimum pipe wall thickness.

NOTE 3 For pipe diameters 90 mm and 125 mm SDR17.6, the next suitable lower stop for SDR11 pipe may be used, i.e. 63 mm/SDR11 stop for 90 mm/SDR17.6 pipe and 90 mm/SDR11 stop for 125 mm/SDR17.6 pipe.

5 Performance

5.1 For considerations of strength and reliability, all squeeze-off tools and equipment shall be capable of squeezing-off the largest pipe and thickest wall for which the tooling and equipment is designed, at the minimum operating temperature of −5°C.

5.2 Non-hydraulic squeeze-off tools shall be designed to have sufficient strength for long-term use. When non-hydraulic squeeze-off tools are tested in accordance with Annex A there shall be no evidence of deterioration, permanent deformation of critical operating members, or cracking of structural welds, see **6.2.2**.

5.3 Hydraulic squeeze-off equipment shall have a design factor of at least 1.5 on the load required to squeeze-off at −5°C of the largest pipe and thickest wall for which it is designed to be used. When hydraulic equipment is tested in accordance with Annex A, there shall be no evidence of deterioration, permanent deformation of critical operating members, or cracking of structural welds, see **6.2.2**.

5.4 For squeeze-off of polyethylene pipe diameters up to and including 250 mm, the tool design shall ensure that, in order not to damage the pipe**,** the minimum squeeze-off bar separation for a given pipe diameter shall be in accordance with Table 1.

5.5 Dual-marked metric/imperial stops shall be designed such that the final distance between the squeeze-off bars conforms to Table 1.

5.6 For squeeze-off tools and equipment above 250 mm diameter pipe, the final distance between the squeeze-off bars shall be in accordance with Table 1.

5.7 For pipe diameters of 355 mm and below, the air/nitrogen flow rate through a fully squeezed-off pipe shall not exceed 0.1 m^3/h under the conditions specified in Table 2 when tested in accordance with Annex B. Compliance with this requirement shall be demonstrated as part of the type testing programme in accordance with **6.2.3**.

NOTE For pipe diameters of 400 mm and above, the air/nitrogen flow rate through a fully squeezed-off pipe should not exceed 0.1 m^3/h under the conditions specified in Table 2 when tested in accordance with Annex B.

5.8 The squeeze-off tools and equipment shall not damage the polyethylene pipe and affect its long-term strength. When tested in accordance with Annex C there shall be no pipe failure or damage to the pipe bore at squeeze-off pinch points.

Table 2 — Leakage flow rate test conditions

Upstream pressure of squeeze-off mbar	**Pipe diameter** mm	**Maximum allowable leakage rate** m^3/h
75	All pipe diameters and SDRs	0.1
2	Up to and including 63 mm	0.1

6 Type testing

6.1 General

A type testing programme in accordance with **6.2** shall be carried out on each size of each design of squeeze-off tool or equipment.

NOTE Users of this standard are advised to consider the desirability of third-party certification of product conformity with this standard or testing by an independent laboratory accredited to BS EN ISO/IEC 17025.

6.2 Test requirements

6.2.1 The squeeze-off tool and equipment "stops" shall conform to **4.5**, **4.6**, **4.7**, **5.4**, **5.5** and **5.6**.

6.2.2 Following testing in accordance with **5.2** (tools: non-hydraulic), **5.3** (equipment: hydraulic) and Annex A, the tooling and equipment shall be examined for evidence of deterioration by penetrant testing in accordance with BS EN ISO 3452-1. Tools and equipment exhibiting permanent deformation of critical operating members, or cracking of structural welds shall be rejected.

6.2.3 The effectiveness of the squeeze-off tool and equipment against let-by leakage shall be demonstrated by testing two polyethylene pipes conforming to GIS/PL2-2 in accordance with **5.7** and Annex B. One of the pipes to be tested shall be the smallest diameter with the thinnest wall within the machine's range, and the other pipe shall be the largest diameter with the thickest wall.

The measured gas flow rate for pipe diameters up to and including 355 mm shall conform to **5.7**.

6.2.4 The effect of the squeeze-off tool and equipment on the long-term strength and stress crack resistance of the pipe shall be demonstrated by testing two polyethylene pipes conforming to GIS/PL2-2, conditioned at −5 °C, in accordance with Annex C. One of the pipes to be tested shall be the smallest diameter with the thinnest wall within the machine's range, and the other pipe shall be the largest diameter with the thickest wall.

7 Marking

Squeeze-off tools and equipment conforming to GIS/PL2-7 shall be permanently marked. The marking shall be applied to all major structural components so as not to damage the squeeze-off tool and equipment, and shall contain the following information:

a) the number and date of this standard, i.e. GIS/PL2-7:2013 [1)];

b) the name or trademark of the manufacturer or their appointed agent;

c) the manufacturer's contact details for pipe diameters of above 180 mm;

d) model;

e) serial number for hydraulically operated equipment;

f) pipe diameter range and SDR for which it is suitable;

g) total weight of the assembly, or the weight of each section in a modular design, if any section exceeds 10 kg or more.

h) where authorized, the product conformity mark of a third party certification body, e.g. BSI Kitemark.

NOTE Attention is drawn to the advantages of using third party certification of conformance to a standard.

[1)] Marking GIS/PL2-7:2013 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

8 Packaging

Squeeze-off tooling and equipment shall be suitably packaged so that it does not deteriorate during transit or storage. The package shall contain the operating, safety and maintenance instructions.

Annex A (normative)
Strength and safety test

A.1 Principle

The ability of the squeeze-off equipment and tools to withstand repeated squeeze-off of the largest pipe and thickest wall for which the equipment is designed, when the pipe is at the minimum operating temperature of −5 °C, is determined.

A.2 Apparatus

A.2.1 *Squeeze-off tool or equipment*, test product.

A.2.2 *Polyethylene pipes*, conforming to GIS/PL2-2 for largest pipe and thickest wall for which the squeeze-off tool or equipment is designed.

A.2.3 *Hydraulic pressure gauge*, accuracy ±2 %, connected to the hydraulic squeeze-off equipment to measure the pressure and calculate the compressive load.

A.2.4 *Refrigeration unit*, maintained at −5 °C ± 2 °C.

A.3 Procedure A (non-hydraulic tools)

A.3.1 Select the largest pipe and thickest wall within the size range of the tool and condition the polyethylene pipe at −5 °C ± 2 °C for 12 h.

A.3.2 With the conditioned polyethylene pipe inserted in the tool, and the correct stop setting used, squeeze-off the pipe whilst maintaining the pipe temperature at −5 °C ± 2 °C.

A.3.3 After 2 min, remove the squeeze-off.

A.3.4 Repeat **A.3.2** and **A.3.3** fifty times. Maintain the pipe temperature at −5 °C ± 2 °C. Move the squeeze-off position by a minimum of one pipe diameter ($1d_n$) after each cycle.

A.3.5 After completion of these tests, the tool shall be examined for evidence of deterioration, permanent deformation of critical operating members, or cracking of structural welds detected by penetrant flaw detection in accordance with BS EN ISO 3452-1.

A.4 Procedure B (hydraulic equipment)

A.4.1 Select the largest pipe and thickest wall within the size range of the equipment and condition the polyethylene pipe at −5 °C ± 2 °C for 12 h.

A.4.2 Measure the pressure (P) required to squeeze-off the conditioned pipe to the correct stop setting. The compressive load, L, shall be calculated from the hydraulic pressure, P (see **A.5**).

A.4.3 With a pipe of largest diameter and thickest wall inserted in the equipment, and the correct stop setting used, apply a load of $1.5 \times L$ to the squeeze-off equipment. Pipe and equipment shall be at 23 °C ± 3 °C.

NOTE It may be necessary to temporarily deactivate the maximum hydraulic pressure limitation device.

A.4.4 Lock-off machine and remove the load; leave for 2 min.

A.4.5 Repeat A.4.3 and A.4.4 fifty times.

NOTE It is not necessary to reposition or rotate the pipe during the fifty load cycles.

A.4.6 After completion of these tests, the equipment shall be examined for evidence of deterioration, permanent deformation of critical operating members, or cracking of structural welds detected by penetrant flaw detection in accordance with BS EN ISO 3452-1.

NOTE Following examination, reset and check that the hydraulic pressure limitation device is set again to 1.2 × *L*.

A.5 Calculation (hydraulic equipment only)

The compressive load to squeeze-off the largest pipe and thickest wall at −5 °C shall be calculated as follows:

$L = P\,A/10^4$

where:

L is the compressive load to squeeze-off the largest pipe and thickest wall at −5 °C, in kN.

P is the hydraulic pressure required to squeeze-off the largest pipe and thickest wall at −5°C, in bar.

A is the cross-sectional area of the hydraulic cylinder or the total cross-sectional area if more than one cylinder, in mm^2.

A.6 Expression of results

For test procedure A, any evidence of deterioration, deformation or cracking shall be recorded and reported.

For test procedure B, the following shall be recorded and reported:

a) the hydraulic pressure, *P*;

b) the total cross-sectional area of the hydraulic cylinder(s);

c) calculate and record the load, *L*;

d) any evidence of deterioration, deformation or cracking.

A.7 Test report

The test report shall include the following information: -

a) reference to this standard and test method, i.e. GIS/PL2-7:2013;

b) manufacturer, model;

c) serial number of squeeze-off equipment;

d) polyethylene pipe diameter and SDR;

e) hydraulic pressure, *P* and calculated load, *L*, if applicable;

f) any evidence of deterioration, permanent deformation of critical operating members or cracking of structural welds detected by penetrant flaw detection;

g) any unusual factors which may have affected the results.

Annex B (normative)
Squeeze-off leakage test

B.1 Principle

The degree of leakage past the squeeze-off position is determined by squeezing-off the polyethylene pipe and measuring the leakage rate.

NOTE Air or nitrogen is used rather than natural gas for reasons of safety. The differences in leakage rate will be insignificant.

B.2 Apparatus

NOTE A typical layout for the test rig is shown in Figure B.1.

B.2.1 *Squeeze-off tool or equipment*, test product.

B.2.2 *Polyethylene pipes*, conforming to GIS/PL2-2.

B.2.3 *Measuring flask*, 1 litre or other suitable flask size.

B.2.4 *Water tank*, to suit the size of the measuring flask.

B.2.5 *Timer*, with an accuracy of ±0.1 %.

B.2.6 *Pressure gauge*, with an accuracy of ±2 %.

B.2.7 *Air/nitrogen supply*, above 2 bar.

B.2.8 *Pressure regulator*, capable of maintaining an outlet pressure of 75 mbar ± 1 mbar, or 2.00 ± 0.05 bar, as appropriate.

B.3 Test procedure

B.3.1 Condition the polyethylene pipe at 23 °C ± 3 °C for 12 h.

B.3.2 Squeeze-off the conditioned polyethylene pipe to the appropriate stop setting.

B.3.3 Adjust the air/nitrogen pressure regulator to give the appropriate outlet pressure specified in Table 2.

Place the flexible hose in the inverted measuring flask and record the time, in s, to displace 1 litre of water.

NOTE Alternative flask sizes may be used to suit the actual leakage rate.

B.4 Calculation

The air/nitrogen leakage flow rate (Q) shall be calculated from the following equation:

$$Q = \frac{3.6}{t} \quad \mathrm{m^3/h}$$

where:

Q is the air/nitrogen leakage flow rate, in m^3/h;

t is the time to displace 1 litre of water, in s.

B.5 Expression of results

The following shall be recorded and reported:

a) the time to displace 1 litre of water, in s;

b) the air/nitrogen leakage rate, Q in m^3/h.

B.6 Test report

The test report shall include the following information:

a) reference to this standard and test method, i.e. GIS/PL2-7:2013;

b) manufacturer, model;

c) serial number of squeeze-off equipment;

d) polyethylene pipe diameter and SDR;

e) the time to displace 1 litre of water, in s;

f) the air/nitrogen leakage rate, Q in m^3/h;

g) any unusual factors which may have affected the results.

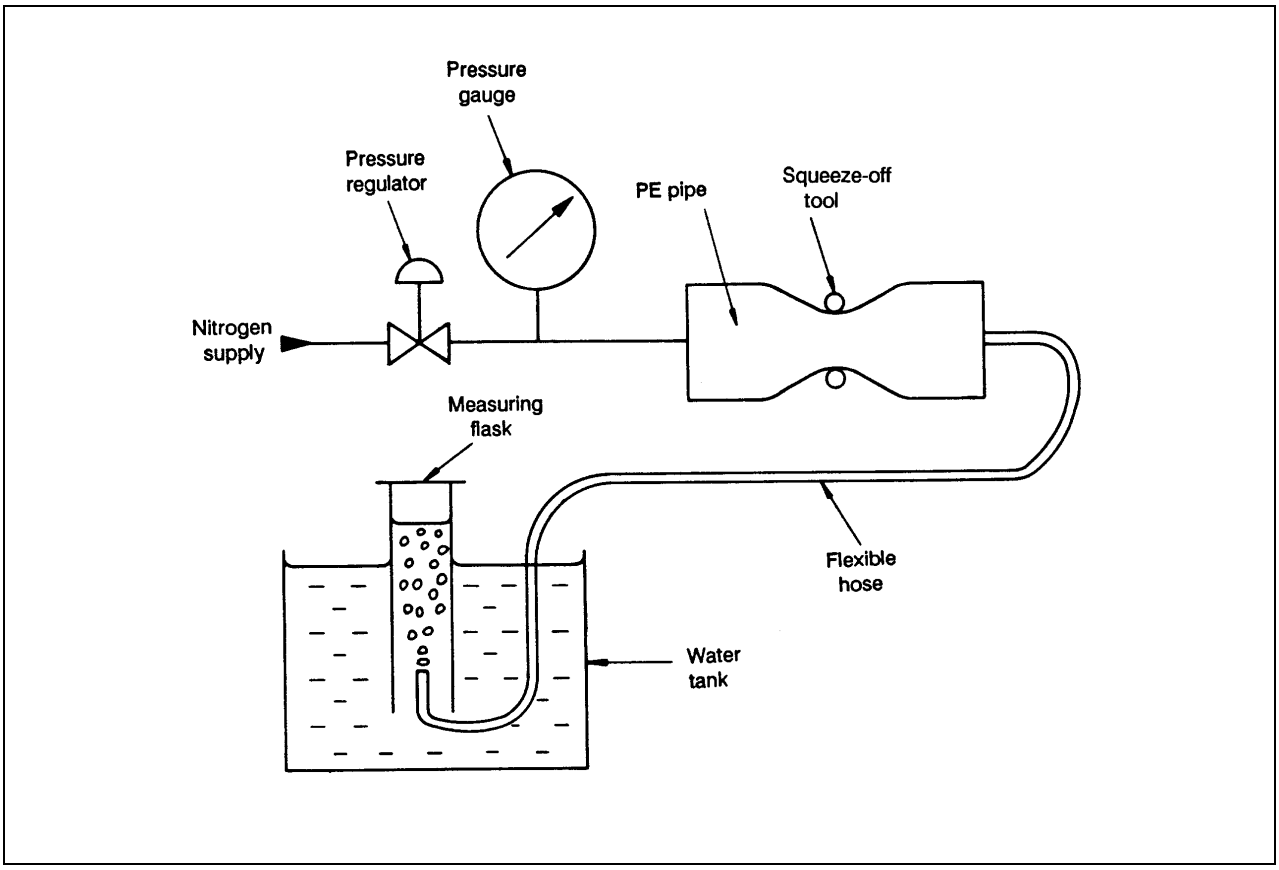

Figure B.1 — Typical layout for squeeze-off leakage test rig

Annex C (normative) Pipe damage test

C.1 Principle

The ability of the pipe to withstand deformation by the squeeze-off tool is determined.

NOTE The damage is greatest in the bore of the pipe at the pinch points, where creasing, stress whitening or even cracking may occur.

C.2 Apparatus

C.2.1 *Squeeze-off tool or equipment*, test product.

C.2.2 *Polyethylene pipe*, smallest diameter with the thinnest wall within the machine's range.

C.2.3 *Polyethylene pipe*, largest diameter with the thickest wall within the machine's range.

C.2.4 *Refrigeration unit*, at −5 °C ± 1.5 °C.

C.2.5 *Water baths*, at 80 °C ± 1 °C in which to immerse the pipe samples.

C.2.6 *Hydrostatic pressure control equipment*, to BS EN 921.

C.2.7 *Endoscope*, to examine pipe bore without sectioning, if available.

C.3 Procedure

C.3.1 Assemble the polyethylene pipe samples according to BS EN 921 using sample type a.

C.3.2 Condition the polyethylene pipe samples at −5 °C ± 1.5 °C for a minimum period of 12 h. The length of the pipe samples shall be in accordance with BS EN 921, except the free length (l_0) of each test piece between the end caps which also shall be at least three times the outside diameter for pipe diameters above 315 mm.

C.3.3 Squeeze-off the pipe at −5 °C ± 1.5 °C, using the appropriate stop setting.

C.3.4 Hold the squeeze-off for a period of 24 h and maintain temperature of −5 °C ± 1.5 °C.

C.3.5 Release the squeeze-off and at ambient temperature re-round the squeeze-off position for 1 h using electrofusion tooling in accordance with GIS/PL2-5.

C.3.6 Examine the pipe bore for damage using an endoscope or repeat the test (**C.3.2** to **C.3.5**) on another pipe sample and longitudinally section it to examine the bore.

C.3.7 Hydrostatic pressure test the samples at 80 °C ± 1 °C at a hoop stress of 4 MPa for a minimum of 1000 h, in accordance with BS EN 921.

C.4 Expression of results

The following shall be recorded and reported:

a) pipe failure time or run-out time;

b) report on any damage to the pipe bore at squeeze-off pinch points.

C.5 Test report

The test report shall include the following information:

a) reference to this standard and test method, i.e. GIS/PL2-7:2013;

b) manufacturer, model;

c) serial number of squeeze-off equipment;

d) polyethylene pipe diameter and SDR;

e) the pipe failure time or run-out time;

f) report on any damage to the pipe bore at squeeze-off pinch points;

g) any unusual factors which may have affected the results.

Bibliography

Formal standards

BS EN ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories.*

Gas Industry Standards

GIS/PL2-8:2006, *Polyethylene pipes and fittings for natural gas and suitable manufactured gas — Part 8: Pipes for use at pressures up to 7 bar.*