BRITISH STANDARD

BS EN
751-2 : 1997

Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water

Part 2. Non-hardening jointing compounds

The European Standard EN 751-2 : 1996 has the status of a British Standard

ICS 91.140.40; 91.140.60

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PSE/2, Jointing materials and compounds, upon which the following bodies were represented:

Asbestos Information Centre Ltd.
British Adhesives and Sealants Association
British Compressed Gases Association
British Hydromechanics Research Group
Chartered Institution of Water and Environmental Management
Energy Industries Council
Industrial Water Society
LP Gas Association
Water Services Association of England and Wales

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Contents

National foreword

This Part of BS EN 751 has been prepared by Technical Committee PSE/2, and is the English language version of EN 751-2 : 1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds*, published by the European Committee for Standardization (CEN). It supersedes BS 6956 : Part 6 : 1992 which is withdrawn.

Cross-references

International Standards	Corresponding British Standard
ISO 7-1	BS 21 *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions)*
EN ISO 2160	BS EN ISO 2160 *Petroleum products. Corrosiveness to copper. Copper strip test*
EN 437	BS EN 437 *Specification for test gases, test pressures and categories of appliance, for gas appliances*
EN 10242	BS EN 10242 *Threaded pipe fittings in malleable cast iron*

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 8, an inside back cover and a back cover.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 751-2

December 1996

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Descriptors: Pipe fittings, gas pipes, water pipes, hot water, threaded fittings, sealing materials, classifications, specifications, tests, effectiveness, marking

English version

Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water — Part 2: Non-hardening jointing compounds

Matériaux d'étanchéité pour raccords filetés en contact des gaz de la 1ère, 2ème et 3ème famille et de l'eau chaude — Partie 2: Composition d'étanchéité non durcissante

Dichtmittel für Gewindeverbindungen in Kontakt mit Gasen der 1., 2. und 3. Familie und Heißwasser — Teil 2: Nichtaushärtende Dichtmittel

This European Standard was approved by CEN on 1996-11-24. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 108, Sealing materials and lubricants for gas appliances and gas equipment, the secretariat of which is held by NNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 1997, and conflicting national standards shall be withdrawn at the latest by June 1997.

This European Standard consists of the following Parts:

– Part 1: *Anaerobic jointing compounds*

– Part 2: *Non-hardening jointing compounds*

– Part 3: *Unsintered PTFE tapes*

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Contents

Introduction

This European Standard specifies requirements and test methods for non-hardening sealing materials (jointing compounds) for metallic threaded joints. These jointing compounds applied as liquid, gel, paste or tape of non-woven synthetic fibres impregnated with jointing compound paste do at the most only partly harden or cure. This enables the threaded joint to be easily dismantled with commercial tools at ambient temperatures without damage of the threads.

There are three classes of jointing compounds defined by their properties and application range. Class A jointing compounds are suitable for normal installation purposes for 1st, 2nd and 3rd family gases and heating systems. Class B jointing compounds are normally used in gas appliances and their auxiliary equipment, whereas Class C jointing compounds are for use in LPG storage application. Jointing compounds may be suitable for one or more classes.

A universally applicable jointing compound may be used for all gas, potable water, and hot water installation.

In respect of potential adverse effects of the jointing compounds covered by this European Standard on the quality of water intended for human consumption this Standard provides no information as to whether the jointing compounds may be used without restriction in any of the Member States of the EU or EFTA. The use and characteristics of the jointing compounds should comply with current regulations, where they exist, depending on the acceptance of verifiable European criteria.

Since the application techniques, sometimes due to different pressure limits and safety requirements, differ from country to country, it is difficult to harmonize the existing national standards and approval requirements for Class A jointing compounds. One particular point relates to the use of sealant supporting bases (e.g. hemp, flax or synthetic fibres). Whilst these should not be used to fill large gaps between badly fitting threads, in some countries they may be used to ensure that the jointing compound remains in its position on the male thread and is not stripped off during assembly of the joint. It will be up to the manufacturer's handling instructions (and the country of use) whether jointing compounds of Class A will be applied with or without such sealant supporting bases. Supporting bases are not used with Classes B and C jointing compounds.

The adjustment of prefabricated parts of an installation requires sometimes the assembled taper/parallel threaded joints to be turned back up to an angle of 45°. To ensure that jointing compounds fulfil this requirement in countries where such handling techniques are used, an additional requirement concerning the turn back test has been included. Such jointing compounds are additionally designated with 'Rp'.

1 Scope

This European Standard specifies requirements and test methods for non-hardening sealing materials (hereafter referred to as jointing compounds) suitable for sealing threaded metallic joints such as those specified in ISO 7-1. These jointing compounds are for use in contact with 1st family gases (town gas), 2nd family gases (natural gas) and 3rd family gases (liquefied petroleum gases (LPG) not including LPG in the liquid form) and hot water of heating systems (Class A), in gas appliances and their auxiliary equipment (Class B) as well as in LPG storage (Class C) according to table 1.

Anaerobic jointing compounds are covered by EN 751-1, non-hardening sealing materials in the form of PTFE-tapes are covered by EN 751-3.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 7-1	*Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*
ISO 228-1	*Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*
EN ISO 2160	*Petroleum products — Corrosiveness to copper — Copper strip test* (ISO 2160 : 1985, including Corrigendum 1 : 1993)
EN 437	*Test gases — Test pressures — Appliance categories*
EN 10242	*Threaded pipe fittings in malleable cast iron*
prEN 10255	*Carbon steel tubes suitable for welding or threading*
prEN 12164	*Copper and copper alloys — Rod for free machining purposes*

3 Definitions

For the purposes of this European Standard the following definitions apply:

3.1 non-hardening jointing compound (referred to hereafter as jointing compound)

Sealing material applied as liquid, gel, paste (normally without the addition of sealant supporting bases) or as tape of non-woven synthetic fibres impregnated with jointing compound to the threads.

3.2 sealant supporting bases

Materials (e.g. hemp, flax or synthetic fibres) which may be used in some countries to support jointing compound in large threaded joints and ensure that the jointing compound remains in its position on the male thread and is not stripped off during assembly of the joint.

3.3 gas family

For further information on types of gases see EN 437.

3.4 batch

Any quantity of jointing compound manufactured in a single mix at one time.

4 Classification of jointing compounds

There are three classes of jointing compounds defined by their properties and application range according to table 1. Jointing compounds may be suitable for one or more classes. The class(es) shall be indicated by the manufacturer.

5 Requirements

5.1 Requirements to be met by the jointing compound as received

5.1.1 ***General***

The jointing compound shall be homogeneous and free of lumps when tested in accordance with **7.1.1.1**. The solids used in its manufacture shall be thoroughly ground.

Tapes of non-woven synthetic fibres shall be evenly impregnated or coated with jointing compound paste, the mass per area of which when tested in accordance with **7.1.2** of which shall not be lower than 90 % of the value declared by the manufacturer.

The jointing compound shall have good wetting properties necessary for adhesion to metallic surfaces when tested in accordance with **7.2.1.1**.

5.1.2 ***Corrosive properties***

The jointing compound shall not cause corrosion of aluminium, brass, copper, low carbon steel or zinc surfaces when tested in accordance with **7.1.2**. The appearance of copper and brass test strips shall give a classification 3 or less in accordance with EN ISO 2160.

5.1.3 ***Storage properties***

The storage life of the jointing compound shall be at least two years in its original unopened container when stored at a temperature less than 25 °C, indicated and declared by the manufacturer.

5.2 Requirements to be met by the jointing compound after assembly

5.2.1 ***Sealing properties***

When tested in accordance with the methods described in **7.2.1** the jointing compound shall not disintegrate or flow out of the joint and shall not permit any leakage when each test assembly is tested in accordance with **7.2.1.2** to **7.2.1.7** in sequence.

5.2.1.1 *Soundness*

When pressurized, within 1 h after preparation all the joints in the test assemblies shall not leak when tested in accordance with **7.2.1.2**.

5.2.1.2 *Soundness after adjustment* (additional requirement for Class ARp only)

After adjusting the test assemblies in accordance with **7.2.1.3** the joints of these test assemblies shall not leak, when tested in accordance with **7.2.1.2**.

NOTE. This additional requirement is only valid for countries in which a limited turning back of prefabricated taper/parallel (R/Rp) threaded joints is permitted. Jointing compounds fulfilling this requirement should additionally be marked with Rp.

5.2.1.3 *Resistance to gas condensates*

The sealing properties of the jointing compound shall not be impaired by liquid hydrocarbon gas condensate when tested in accordance with **7.2.1.4**.

5.2.1.4 *Resistance to hot water*

The sealing properties of the jointing compound shall not be impaired by hot water when tested in accordance with **7.2.1.5**.

Table 1. Classification of jointing compounds

Class	Fluid	Temperature range °C	Pressure limit bar	Typical application
A, Arp[1)]	1st, 2nd, 3rd[2)] family gases hot water	−20 to 70 up to 130	5 7	installation heating systems
B	1st, 2nd, 3rd[2)] family gases	−20 to 125	0,2	gas appliances
C	3rd family gases	−20 to 70	20	LPG storage

[1)] Jointing compounds of Class A where limited turning back of taper/parallel (R/Rp) threaded joints is permitted, are additionally marked with Rp.

[2)] Not including LPG in the liquid phase.

5.2.1.5 *Resistance to temperature cycling*

The sealing properties of the jointing compound shall not be impaired by the temperature cycling test in accordance with **7.2.1.6**.

5.2.1.6 *Resistance to vibration*

The sealing properties of the jointing compound shall not be impaired by vibration when tested in accordance with **7.2.1.7**.

5.2.2 ***Compatibility with foam forming leak testers***

The jointing compound shall not destroy the film of aqueous leak test fluid within 1 min when tested in accordance with **7.2.2**.

5.2.3 ***Hardening and dismantling***

After all tests the screwed joints shall be dismantled with commercial tools without heating. There shall be no damage or corrosion of the threads after dismantling in accordance with **7.2.3**. The jointing compound between the threads shall not form a loose powder.

5.3 Re-test

If more than one joint in all test assemblies should fail throughout the tests specified in **7.2.1.2** to **7.2.1.7** no re-test shall be permitted. Should only one joint fail to comply with the requirements of any test, two further test assemblies shall be prepared using jointing compound from the same batch and each of them shall comply with the requirements of all tests. If any of the joints in the re-tested assemblies fails then it shall be deemed that the whole batch has failed.

6 Test material and documentation

6.1 Test material

The manufacturer shall submit sufficient quantities of the jointing compound from a single batch or 20 spools of impregnated tapes in original packing to the test laboratory.

6.2 Test documentation

The following documents shall be submitted to the test laboratory:

a) description of the jointing compound including classification according to table 1 and the amount of impregnation of non-woven tapes of synthetic fibres (mass per area);

b) application and handling instructions including a note relating to permissible adjustment in accordance with **5.2.1.2**;

c) declaration that storage requirements conform to **5.1.3** are met;

d) declaration that any solvent used in the formulation of the jointing compound has a flash point higher than 21 °C (this could be in the form of a data sheet for the jointing compound);

e) appropriate health and safety data sheet.

7 Test methods

7.1 Test methods for jointing compounds as received

7.1.1 ***Test of general requirements***

7.1.1.1 *Test of visual quality*

Approximately 1 g jointing compound is spread with a spatula in a thin film on a glass plate and estimated for homogeneity, consistency, lumps or other deleterious material.

7.1.1.2 *Test for impregnation of non-woven tapes*

The impregnation of non-woven tapes of synthetic fibres is determined by cutting 3 pieces (200 cm long) from 3 spools. Measure the length of the pieces to an accuracy of ± 5 mm, the width to an accuracy of 0,1 mm, and their mass to an accuracy of 0,1 mg. Place each piece in a 500 ml boiling flask with conical ground glass joint equipped with a reflux condenser and a magnetic stirrer. After adding 300 ml of acetone, heat under reflux for $(3 \pm 0{,}5)$ h. During the extraction, the contents of the flask are stirred or agitated ultrasonically to remove the fillers of the jointing compound from the tape. After cooling below the boiling point of the solvent the tape sample is removed from the flask, first dried for 15 min in a fume cupboard and afterwards for $(1 \pm 0{,}1)$ h in an air circulation oven at (100 ± 5) °C. The impregnation of each tape piece in g/m^2 is determined as mass loss of the tape with respect to the area of the piece of tape.

7.1.2 ***Test of corrosive properties***

Metal strips of commercial copper, brass, aluminium, low carbon steel and zinc not less than 0,5 mm thick are cut into pieces 75 mm long and 13 mm wide. Mechanically abrade each strip on the two faces and edges to obtain a uniform finish free from defects. Polish each strip with emery paper (grade No. 400) and then clean with successive pads of cotton wool until a fresh pad remains unsoiled after use. Wash each strip with acetone and allow to dry. Use clean forceps for all further handling of the strips.

Fill a beaker (tall form, 100 ml) with a sample of the jointing compound to within 6 mm of the top, level with a spatula, and smooth the surface. Coat each freshly prepared strip with a thin film of the sample for a distance of 48 mm from one end and insert that end vertically to a depth of 50 mm into the sample of jointing compound contained in the beaker. Press the surface of the sample into contact with the strip and level it again with the spatula. Place the beaker in an oven controlled at (70 ± 1) °C for jointing compounds of Class A and C and (125 ± 1) °C for Class B.

Impregnated tapes are spirally wrapped around the strips with 50 % overlap and placed in the oven at the appropriate test temperature under a load of approximately 500 g to ensure a good contact between tape and strip.

After $(168^{\ 0}_{-2})$ h remove the beaker or the wrapped strips from the oven.

Wipe them with cotton wool and wash them in acetone. Examine the surface for etching, pitting, discolouration, bloom or corrosion deposits.

7.2 Test of jointing compounds after assembly

7.2.1 *Test of the sealing properties*

7.2.1.1 *Preparation of test assemblies*

The test shall be performed on test assemblies prepared from new unused threaded joints.

The parts specified in table 2 are required for the preparation of the test assemblies for jointing compounds of Class A.

Table 2. Parts list for test assemblies for Class A

Quantity	Part	Thread	Characteristics
4	Thread pipe	R 1½	EN 10255 – DN 40 – welded; medium series, Length: 250 mm
4	Socket	Rp 1½	EN 10242
4	Socket, reducing	Rp 1½ × ½	EN 10242
4	Plug	R 1½	EN 10242
4	Plug	R ½	EN 10242

Cut threads R 1½ in accordance with ISO 7-1 on both ends of the pipe sections. Use only pipes and fittings with threads without any defects visible to the naked eye. When screwing pipes and plugs by hand into the sockets used for preparing the test assemblies ($2½ \pm ½$) fully cut threads shall be visible. Clean male and female threads before assembly with absorbent tissue paper to remove any cutting oil.

Apply the jointing compound to make threads only together with any supporting bases (for Class A), if applicable, according to the manufacturer's instructions.

Judge applicability, adherence, and wetting properties of the jointing compound or tape.

Use a pipe vice (three- or four-point clamp) to assemble the parts. Screw one socket and one reducer onto the ends of the pipe sections and close the socket with a plug. Ensure that the full length of the outer threads is covered by the socket, but that at least a part of one fully cut thread is visible and take care during assembly not to transmit the force to the joints already made. Use absorbent tissue paper to wipe off excess jointing compound in the direction of the thread or remove excess tape with a knife.

Test assemblies for jointing compounds of Class B and C are prepared in a similar manner using the parts listed in table 3.

In this case, when screwing pipes and plugs by hand into the sockets for preparing test assemblies ($2 \pm ½$) fully cut threads shall be visible.

Table 3. Parts list for test assemblies for Class B and C

Quantity	Part	Thread	Characteristics
4	Thread pipe	R ¼	brass[1)] tube – DN 6 Length: 250 mm
8	Socket	Rp ¼	prepared from a brass[1)] hexagon bar
8	Plug	R ¼	prepared from a brass[1)] hexagon bar

[1)] Free machining brass $CuZn_{40}Pb_2$ in accordance with EN 12164.

All test assemblies are successively tested in accordance with **7.2.1.2** up to **7.2.1.7**.

7.2.1.2 *Soundness test*

Pressurize the test assemblies 0,5 h to 1 h after preparation of the test assemblies with air or nitrogen to the pressure given in table 4.

Table 4. Test pressure

Class	Test pressure bar
A	$7,5 \pm 0,3$
B	$0,3 \pm 0,015$
C	$30 \pm 1,5$

Immerse in a water bath at (20 ± 5) °C for 5 min and inspect all R ¼ and R 1½ threaded joints for leakage. Gas leakage shall be determined by the appearance of bubbles during the immersion period, ignoring those noted during the first 15 s of immersion.

Test assemblies prepared with jointing compounds of Class A are additionally hydraulically tested by filling with water at a test pressure of $(16 \pm 1,0)$ bar, and the joint inspected for leaks, for a period of 1 h after $(72 {}^{0}_{-2})$ h storage at (20 ± 5) °C.

7.2.1.3 *Soundness test after adjusting* (additional test for Class ARp only)

The threaded joints between sockets and pipes on each assembly are turned back for $(45 \pm 2)°$. After storage for a further period of $(72 {}^{0}_{-2})$ h at (20 ± 5) °C repeat the soundness test according to **7.2.1.2** (only with air or nitrogen).

NOTE. It is advisable to perform this test on every jointing compound because otherwise the application of such jointing compound would be limited to countries where adjustment is not permissible.

7.2.1.4 *Test of resistance to gas condensates*

Two test assemblies are filled to a level sufficient to cover the joints with n-pentane the other three with a mixture of 70 parts iso-octane and 30 parts toluene. All assemblies are closed with a plug and then stored vertically for $(72 {}^{0}_{-2})$ h at (20 ± 5) °C. Drain the test assemblies and repeat the soundness test according to **7.2.1.2** (only with air or nitrogen).

7.2.1.5 *Hot water resistance test*

The test assemblies with Class A jointing compounds are half filled with water and the reducing socket closed by a R ½ plug using the jointing compound under test. Test assemblies are placed in an oven in a horizontal position at (130 ± 2) °C for $(168^{\ 0}_{-2})$ h.

NOTE. The oven temperature should be fitted with a safety cut off set to 140 °C to avoid higher temperatures which might cause uncontrolled pressure increases in the test assemblies.

After having been left to cool to (20 ± 5) °C for at least 2 h the plugs are removed and the assemblies are drained and tested for leaks in accordance with **7.2.1.2** (with air or nitrogen and water).

Test assemblies with Class B and C jointing compounds are closed with a R ¼ plug and immersed in a water bath at (70 ± 2) °C for $(6^{\ 0}_{-0,5})$ h. After having been left to cool to (20 ± 5) °C for at least 1 h the test assemblies are inspected for any leakage in accordance with **7.2.1.2** (only with air or nitrogen).

7.2.1.6 *Temperature cycling test*

Place the test assemblies in an oven and expose them to five temperature cycles. During each 24 h test cycle put the test assemblies at first in an oven heated to the temperature given in table 5 according to the class of jointing compound $(22^{\ 0}_{-0,5})$ h and then cool down to (20 ± 5) °C for $(2^{\ 0}_{-0,2})$ h. After the last temperature cycle the test assemblies are put to a freezer (cold cabinet) cooled to $-(20 \pm 2)$ °C for $(4^{\ 0}_{-0,4})$ h and then subjected to the soundness test in accordance with **7.2.1.2** after warming up to (20 ± 5) °C (only with air or nitrogen).

NOTE. The individual cycles in this test need not take place consecutively.

Table 5. Test temperature

Class	Test temperature °C
A	100 ± 2
B	150 ± 2
C	100 ± 2

7.2.1.7 *Vibration test*

Clamp the plugged sockets of the test assemblies successively in a rotating chuck (see figure 1). Screw a stud bolt threaded G ½ B to ISO 228-1 (Class A) or G ¼ B (Class B and C) into the other socket and secure a bearing (ball race) to it. Suspend a mass of 5 kg (Class A) or 1 kg (Class B and C) from a spring (spring constant approximately 5000 Nm^{-1} for Class A to C) attached to the bearing. Rotate each test assembly at a rotation frequence of (700 ± 20) min^{-1} for a period of (30 ± 1) min. Repeat the soundness test in accordance with **7.2.1.2** (only with air or nitrogen).

7.2.2 ***Compatibility test with foam forming leak tester***

One test assembly which has completed the tests in accordance with **7.2.1** is connected to an air supply of 0,1 bar. The joint between pipe and socket is loosened to give a leakage rate of (30 ± 5) mlh^{-1}. An aqueous detergent solution (1 % *m/m* of sodium salt of n-butylnaphthaline sulfonic acid) with a surface tension between 0,025 and 0,030 Nm^{-1} is applied by brush to the leaking joint. Judge the formation of foam and its stability.

7.2.3 ***Test of hardening and dismantling***

After all tests have been completed according to **7.2.1** the joints of test assemblies are dismantled with commercial tools (pipe wrench) at (20 ± 5) °C. The jointing compound between the threads shall not be hardened to such an extent that it is ground to a loose powder when dismantling the joints. After dismantling, the threads of the pipes and fittings are cleaned and inspected for damage or corrosion.

8 Marking and instruction

8.1 Marking on packages

Packages of jointing compounds shall be clearly and indelibly marked in the language of the country of destination with the following information:

a) the manufacturer's or supplier's name and/or registered trade mark;

b) the class(es) in accordance with table 1 and typical application e.g.:

Class A and Arp	: general installation purpose
Class B	: gas appliances
Class C	: LPG storage

c) the quantity of jointing compound in the package;

d) a unique identification mark providing traceability (e.g. batch number) and production date or 'use by' date;

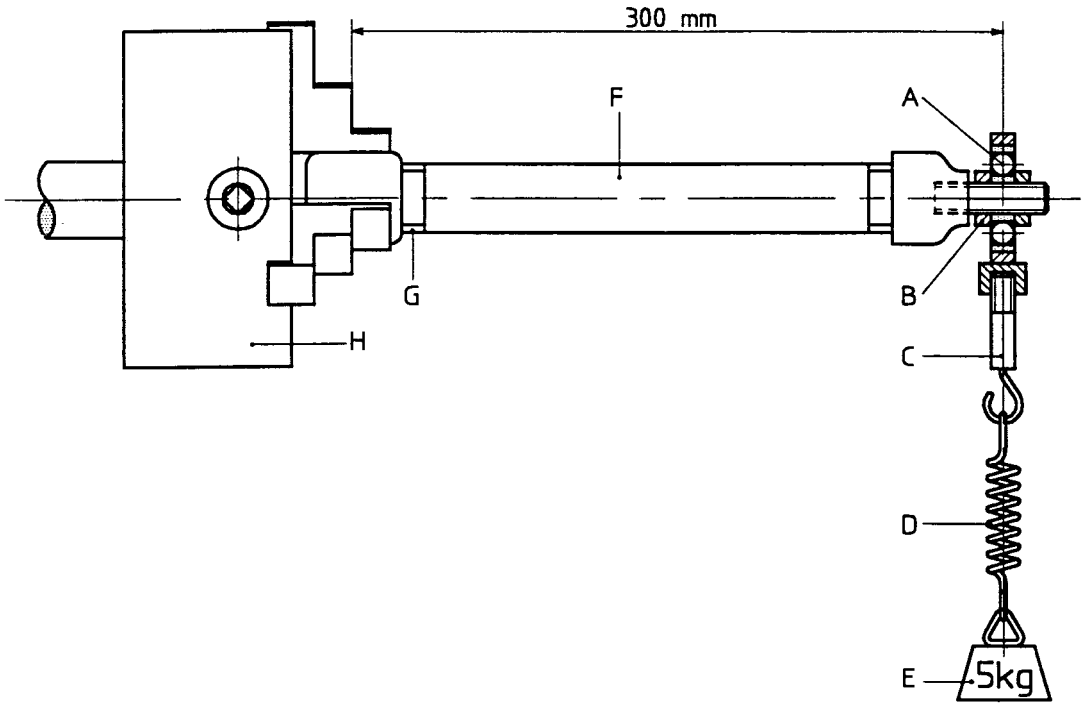
e) essential instructions for use, storage and possible limitations;

f) appropriate handling and safety labelling.

8.2 Instructions

The data mentioned under a), b), e) and f) of **8.1** shall be included in the manufacturer's instructions and in the language of the country of destination.

At least one set of instructions shall be provided with each consignment.



A Ball race

B Nut

C Attachment

D Spring

E Mass

F Test piece, pipe length 250 mm

G Jointing compound to be tested

H Rotable chuck

Figure 1. Vibration rig

List of references

See national foreword.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

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