

Fire resistance tests for service installations —

Part 4: Linear joint seals

The European Standard EN 1366-4:2006 has the status of a
British Standard

ICS 13.220.50

National foreword

This British Standard is the official English language version of EN 1366-4:2006.

The UK participation in its preparation was entrusted to Technical Committee FSH/22, Fire resistance tests, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Calfeutrements de joints linéaires

Feuerwiderstandsprüfungen für Installationen - Teil 4:
Abdichtungssysteme für Bauteilfugen

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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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This European Standard (EN 1366-4:2006) has been prepared by Technical Committee CEN/TC 127 "Fire safety in buildings", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by November 2006, and conflicting national standards shall be withdrawn at the latest by November 2006.

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 the Construction Products Directive.

EN 1366 'Fire resistance tests for service installations' consists of the following Parts:

- Part 1: Ducts
- Part 2: Fire dampers
- Part 3: Penetration seals
- Part 4: Linear joint seals
- Part 5: Service ducts and shafts
- Part 6: Raised access and hollow core floors
- Part 7: Conveyor systems and their closures
- Part 8: Smoke extraction ducts
- Part 9: Single compartment smoke extraction ducts
- Part 10: Smoke control dampers
- Part 11: Fire protection system for essential services (in course of preparation)¹⁾

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

¹⁾ To be published.

Introduction

Linear joint seals are positioned in joints, voids, gaps or other discontinuities within one or between two or more construction elements.

Normally such openings are denoted as linear because their length is greater than their width - defined by a typical ratio of at least 10:1 in practice.

Joints are present in buildings due to the following:

- a) acceptable dimensional tolerances between two or more building elements, e.g. between non-load bearing walls and floors;
- b) by design to accommodate various movements induced by thermal differentials, seismicity and movement induced by wind loads;
- c) as a result of inadequate design, inaccurate assembly, repairs or damage to the building.

The purpose of the tests in this European Standard is to assess:

- d) the effect of a linear joint seal on the integrity and insulation of the construction;
- e) the integrity and insulation performance of the linear joint seal;
- f) the effect of movement within the supporting construction on the fire performance of linear joint seals (see Annex B).

The results of these tests are one factor in assessing the fire performance of joint seals.

Annex A describes the principles of standard conditions for linear joint seals where no mechanically induced relative movement occurs between the joint faces.

Annex B provides standard conditions for joints with mechanically induced movement of opposing joint faces during the fire resistance test.

CAUTION The attention of all persons concerned with managing and carrying out this fire resistance test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may also arise during the construction of the test elements or structures, during their testing and during the disposal of test residues.

An assessment of all potential hazards and risks to health should be made and safety precautions should be identified and provided. Written safety instructions should be issued. Appropriate training should be given to relevant personnel. Laboratory personnel should ensure that they follow written safety instructions at all times.

1 Scope

This European Standard specifies a method for determining the fire resistance of linear joint seals based on their intended end use. This European Standard is used in conjunction with EN 1363-1.

The following tests are included in this European Standard:

- no mechanically induced movement;
- mechanically induced movement, either prior to or during fire exposure.

This European Standard does not provide quantitative information on the rate of leakage of smoke and/or hot gases, or on the transmission or generation of fumes.

The load-bearing capacity of a linear joint seal is not addressed in this European Standard.

2 Normative references

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

EN 1363-1:1999, *Fire resistance tests — Part 1: General requirements*

EN 1363-2, *Fire resistance tests — Part 2: Alternative and additional procedures*

EN ISO 13943:2000, *Fire safety – Vocabulary (ISO 13943:2000)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1363-1:1999 and EN ISO 13943:2000 and the following apply.

3.1

linear joint

linear void having a length to width ratio of at least 10:1 within one or between two or more juxtaposed construction elements

NOTE Typical locations of linear joints include floors, the perimeter of floors, walls, ceilings and roofs.

3.2

linear joint seal

system designed to maintain the fire separating function and, if relevant, to accommodate a specified degree of movement within the linear joint

3.3

movement capability

maximum amount of movement the joint seal is able to tolerate as stated by the manufacturer or the sponsor, expressed as a percentage of the nominal width

NOTE The movement capability is usually the same over the entire range of the nominal widths.

3.4

nominal joint width

specified width of a joint seal, to be selected by the manufacturer or test sponsor

3.5**splice**

connection or junction between or within the length of a linear joint seal

3.6**supporting construction**

construction that may be required for the testing of some separating elements into which the test specimen is assembled, e.g. the wall into which a linear joint seal is fitted

3.7**test construction**

complete assembly of the test specimen(s) together with its supporting construction

3.8**test specimen**

linear joint seal of a specific material, design and dimensions provided for the purpose of determining either its fire resistance or its contribution to the fire resistance of another separating element

4 Test equipment

In addition to the test equipment specified in EN 1363-1, and if applicable EN 1363-2, the internal dimensions of the test furnace shall be such that a distance of at least 200 mm exists between the long edge of a linear joint and the wall of the furnace, subject to a minimum internal size of 1 m × 1 m × 1 m. Where the nominal width of the linear joint seal is greater than 300 mm, the initial size of the furnace shall be at least 3 m × 3 m × 1 m (see 6.2). Where the nominal width of the linear joint seal in the test specimen is greater than 100 mm and less than or equal to 300 mm, the size of the furnace shall at least be able to heat a length of 10 times the nominal width of the linear joint.

5 Test conditions**5.1 Heating conditions**

The heating and furnace atmosphere shall conform to those given in EN 1363-1 or, if applicable, EN 1363-2.

5.2 Pressure conditions

A vertical furnace shall be operated so that a minimum pressure of 15 Pa exists in the centre of the test specimen mounted in the lowest position.

A horizontal furnace shall be operated so that a minimum pressure of (20 ± 2) Pa is established at a position (100 ± 10) mm below the lowest point of the test construction.

6 Test specimen**6.1 General**

The test specimen consists of a linear joint seal. One test specimen shall be prepared for each type of supporting construction and type of movement, if relevant, for which the sponsor seeks classification (see Annexes A and B).

6.2 Size

A linear joint seal shall be of uniform design cross-sectional area and of the maximum length that can be accommodated in the separating element selected for test. For non-movement joints a shorter length may be used subject to a minimum of 900 mm. In order to avoid boundary effects, the distance between the long edge of the linear joint seal and the outer perimeter of the heated part of the separating element shall be not less than 200 mm at any point.

A typical minimum length to width ratio for a linear joint seal is 10:1. In order to maintain this ratio a test furnace of appropriate dimensions shall be used.

6.3 Number of test specimens

In the case of vertical elements two tests shall be carried out, one from each direction of exposure. If in practice the fire risk can be identified as coming from one side only, or where the linear joint seal is fully symmetrical, then only one specimen may be tested with the appropriate face exposed to the heating regime.

Where it can be established clearly in a non-symmetrical construction that there is a weaker direction of exposure only one specimen may be tested. In such a case, a full justification for the procedure adopted shall be included in the report.

In the case of horizontal elements the test specimen shall be exposed to heating from the underside.

Where a linear joint seal is intended for use in both horizontal and vertical separating elements, each orientation shall be tested.

7 Installation of test specimen

7.1 General

All materials used in the construction, fabrication and installation process of the test specimen shall be representative of the design, materials and workmanship of those to be used in practice.

Where voids exist within a linear joint seal (e.g. when it is in the form of a tube), the ends shall be hermetically sealed in order to prevent airflow through the test specimen.

The standard conditions are given in Annexes A and B.

7.2 Supporting construction

7.2.1 General

The supporting construction shall be of known fire resistance and representative of that used in practice. The supporting construction for test purposes shall be as shown in Figures 1 and 2. The supporting construction may be either one of the standard constructions listed in 7.2.2 or a specific construction. In the latter case, however, the field of direct application is limited (see 13.2).

7.2.2 Standard supporting construction

7.2.2.1 Concrete and masonry elements

a) Wall constructions

Density: $(650 \pm 200) \text{ kg/m}^3$

Material: Autoclaved aerated concrete

or $(2\,400 \pm 200) \text{ kg/m}^3$ Material: Normal density concrete

b) Floor constructions

Density: $(650 \pm 200) \text{ kg/m}^3$ Material: Autoclaved aerated concrete

or $(2\,400 \pm 200) \text{ kg/m}^3$ Material: Normal density concrete

7.2.2.2 Timber elements

Timber used for test constructions shall have a nominal density of $(500 \pm 50) \text{ kg/m}^3$ as measured at 12 % moisture content.

7.2.2.3 Steel elements

Any steel joint face may be simulated by the following test construction. The face of a concrete supporting construction is covered by 10 mm mineral fibre insulation of a density of at least 35 kg/m^3 and by an 8 mm thick steel angle. The side of the test construction where the steel angle is visible shall be at the non-exposed side of the test construction (see Figure 14).

7.3 Test construction

For the purpose of tests, joints may be formed in monolithic slabs or by adjacent discrete members (see Figure 1).

The linear joint seal shall be installed in accordance with the manufacturer's instructions. The linear joint seal shall have a minimum heated length of 900 mm. The installation procedures shall be described in the test report.

A test construction may incorporate several discrete linear joint seals, evaluating the performance of different systems or the effect of different joint face substrates (see Figures 2 and 3) provided that the following conditions are met:

- a) The minimum distance on the exposed side between adjacent seals shall be not less than the thickness of the supporting construction T , but not less than 200 mm. On the unexposed side the minimum distance between adjacent seals shall not be less than 200 mm (see Figure 4). Where a monolithic slab is used for non-movement joints the minimum distance between all edges of the joint and the edge of the supporting construction shall be minimum 200 mm.
- b) The test construction can either be inserted in the furnace opening or put onto the furnace walls. The minimum width of the supporting elements adjacent to the edges of the furnace opening shall be such that a distance of at least 200 mm exists between the longitudinal edge of the linear joint seal and the interior furnace face (see Figure 4).

The minimum distance between a joint edge and an adjacent blackout edge shall be at least 200 mm (see Figure 4).

7.4 Splice locations

Where splices (see 3.5) or consecutive lengths of pre-formed components require to be jointed in practice, a typical joint shall be included in a location with a minimum pressure of 15 Pa. If two methods of joining consecutive lengths of component(s) are to be incorporated in the same specimen of linear joint seal, then each method shall be separated by at least 200 mm and shall be subject to a minimum furnace pressure of 15 Pa.

7.5 Induced movement

The various possibilities to impose mechanically induced movement, including standard conditions, are described in Annex B.

8 Conditioning

The test construction shall be conditioned in accordance with EN 1363-1.

9 Application of instrumentation

9.1 General

The control, monitoring and recording equipment shall be in accordance with EN 1363-1.

9.2 Thermocouples

9.2.1 Furnace thermocouples

Plate thermometers shall be provided in accordance with EN 1363-1. The plate thermometer shall be located in a plane 100 mm from the exposed face of the separating element. At least one thermometer shall be provided for every 1,5 m² of the heated area of the test construction, subject to a minimum number of four thermometers for each test construction. These thermometers shall be symmetrically distributed with respect to the heated area of the test construction.

For vertical test constructions, the plate thermometers shall be oriented so that side 'A' faces the walls of the furnace opposite the test construction being evaluated.

For horizontally oriented test constructions, side 'A' of the plate thermometers positioned below the test construction being evaluated shall face the floor of the furnace.

9.2.2 Unexposed face thermocouples

Surface temperature measurements and the thermocouples shall be in accordance with EN 1363-1. The test specimen thermocouples shall be at the centre line of the linear joint seal. Figures 5 to 11 and 13 show examples of thermocouple application.

In the case of non-planar surfaces the disc and the pad shall be deformed to follow the surface profile. In the case of small sections it is permissible to reduce the size of the pad to a minimum dimension of 12 mm. If a linear joint seal is recessed from the unexposed face of the supporting construction and the linear joint seal is less than 12 mm wide, thermocouples shall be installed on the supporting construction at a distance of not more than 15 mm from the joint seal (see Figure 13).

If a potential weak point can be identified, additional fixed thermocouples shall be attached to this point, e.g. over a splice.

Where it is impractical to attach thermocouples because of the nature of the surface of the linear joint seal (which may change significantly during the test period), careful use may be made of a roving thermocouple.

9.2.3 Roving thermocouple

The information obtained on unexposed face surface temperatures shall be supplemented by additional data derived from measurements obtained using a roving thermocouple applied to identify any local "hot spots" in accordance with EN 1363-1. If it is determined that the roving thermocouple may damage the test specimen, it shall not be used and the reason noted in the test report.

9.3 Deformation and deflection

Deformations of the supporting construction shall be measured and recorded. Instrumentation for the deflection measurement of the supporting construction shall be located so as to provide data in terms of the amount and rate of deflection during and, where appropriate, after the fire test.

9.4 Integrity measurement

The integrity of the specimen shall be assessed as described in EN 1363-1, except that gap gauges shall not be used.

10 Test procedure

10.1 General

Tests shall be carried out according to the procedures given in EN 1363-1.

Tests can be carried out either with or without movement. In the case of tests with movement it can be in the plane of the supporting construction (lateral) or normal to it (shear), or it can be any other movement appropriate to the intended application. The movement can be imposed prior to test or during the test.

Depending on the required field of application (see Clause 13) tests shall be carried out in accordance with the appropriate subclause of Annex A or the appropriate subclause of Annex B.

NOTE The test should be run until failure of all the linear joint seals within a test construction.

10.2 Installation of test construction

When the conditioning procedures are satisfied, the test construction shall be mounted to form the vertical or horizontal face of the test furnace as appropriate. Measuring equipment and ancillary apparatus shall be provided in accordance with this European Standard.

10.3 Mechanically induced movement of the test specimen

If the test specimen is to be tested with mechanically induced movement, this shall be carried out according to the provisions given in Annex B.

The sponsor shall specify the type of movement (e.g. lateral, shear), if movement is applied prior to or during the test, the movement capability and the anticipated fire resistance time.

10.4 Measurements and observations

Subject to the modifications referred to in Clause 9, measurements and observations during the test shall be made in accordance with EN 1363-1.

11 Performance criteria

11.1 Insulation

Transmission of heat through the test construction shall not raise any one of the thermocouple temperatures of the unexposed surface of the test specimen more than 180 K above its initial temperature. If there is more than one test specimen in a test construction, failure to maintain the insulation criterion on a test specimen constitutes failure only of that test specimen, provided the furnace conditions are maintained.

11.2 Integrity

Integrity shall be determined in accordance with EN 1363-1, except that the gap gauges shall not be used.

If there is more than one test specimen in a test construction, failure to maintain integrity on a test specimen constitutes failure only of that test specimen, provided the furnace conditions are maintained.

11.3 Expression of results

The result shall be stated in terms of elapsed time to the nearest completed minute of test between the commencement of the test and the time at which the integrity and insulation criteria are no longer complied with in accordance with the provisions of this European Standard. If multiple seals are included in a single test, then the performance of each linear joint seal shall be judged separately.

12 Test report

In addition to the items required by EN 1363-1, the following shall also be included in the test report:

- a) a full description of any procedure used to induce relative movement of the linear joint seal faces, when tested as described in Annex B;
- b) the test specimen orientation;
- c) the limits of the range of nominal widths and the movement capability successfully tested;
- d) a full description of the splicing method(s) used;
- e) if relevant, a presentation in graphs.

13 Field of direct application of test results

13.1 Orientation

The field of application regarding the orientation of the linear joint is given in Table 1. The possible orientation of linear joints (A to E) and of the specimens in the test (A to C) is illustrated in Figure 12.

Table 1 – Field of application regarding orientation

Tested orientation	Application
A	A, D, E ^a
B	B
C	C, D ^b
^a Orientation E will only be covered by test orientation A if shear movement was chosen and one face of the joint was fixed and the other face was moved. ^b Orientation D will only be covered by test orientation C if shear movement was chosen and one face of the joint was fixed and the other face was moved.	

Key

- A linear joint in a horizontal test construction
- B vertical linear joint in a vertical test construction
- C horizontal linear joint in a vertical test construction
- D horizontal wall joint abutting a floor, ceiling or roof
- E horizontal floor joint abutting a wall

Table 1 only applies when both the supporting construction and the location of the seal within the linear joint remain unchanged. See 13.3.

13.2 Supporting construction

Results obtained with autoclaved aerated concrete standard supporting constructions apply to concrete, block work and masonry separating elements of a thickness and density equal to or greater than that tested.

Results obtained with normal concrete standard supporting constructions apply to concrete and block work separating elements of a thickness and density equal to or greater than that tested.

Results obtained with timber standard supporting construction apply to timber separating elements of a thickness and density equal to or greater than that tested.

Results obtained with the steel angle standard supporting construction as described in 7.2.2.3 apply to separating element constructions made of metals with a melting point higher than 1 000 °C.

Results obtained with a combination of a standard supporting construction as described in 7.2.2.1 and a standard supporting construction as described in 7.2.2.3 apply to concrete, block work and masonry separating elements of a thickness and density equal to or greater than that tested forming one joint face and separating element constructions made of metals with a melting point higher than 1 000 °C forming the other joint face.

A fire resistance time obtained on a specific non-standard supporting construction applies only to that particular construction.

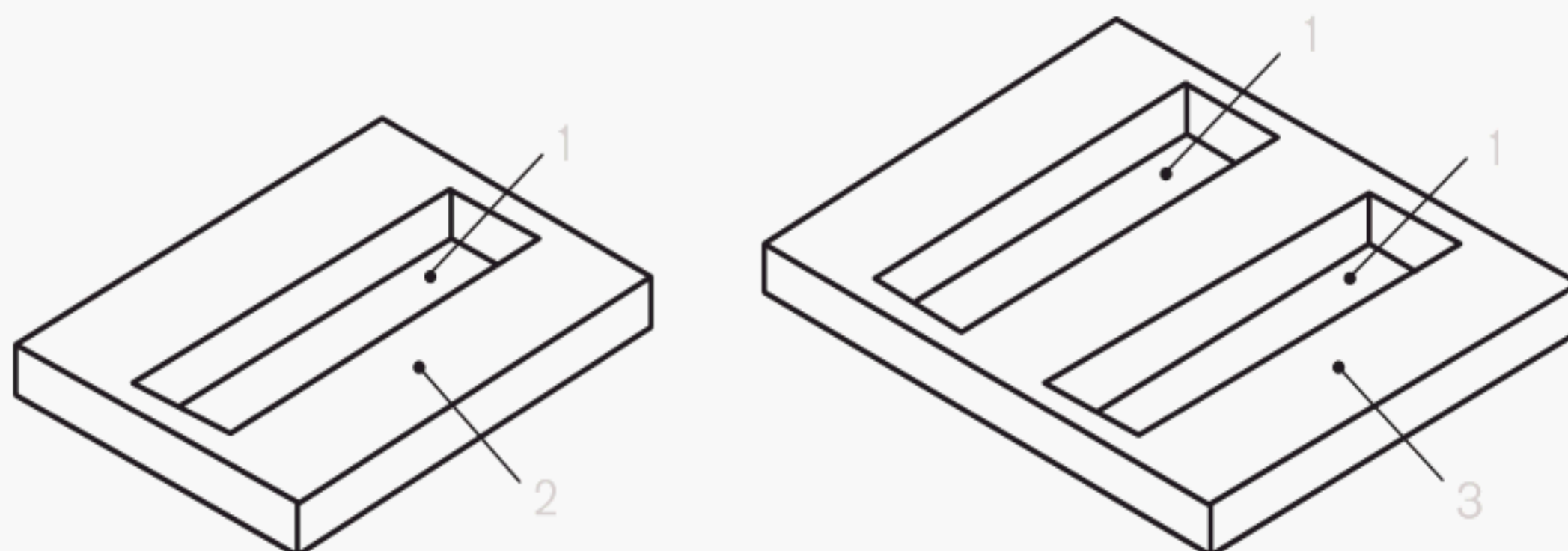
13.3 Seal position

Test results are valid only for the position (see Figure 3) in which the seal was tested, except that where the linear joint seal was fitted flush with the surface of the supporting construction and is exposed to the fire (see Figure 3, test specimen B), the result will also be applicable to test specimen C and E.

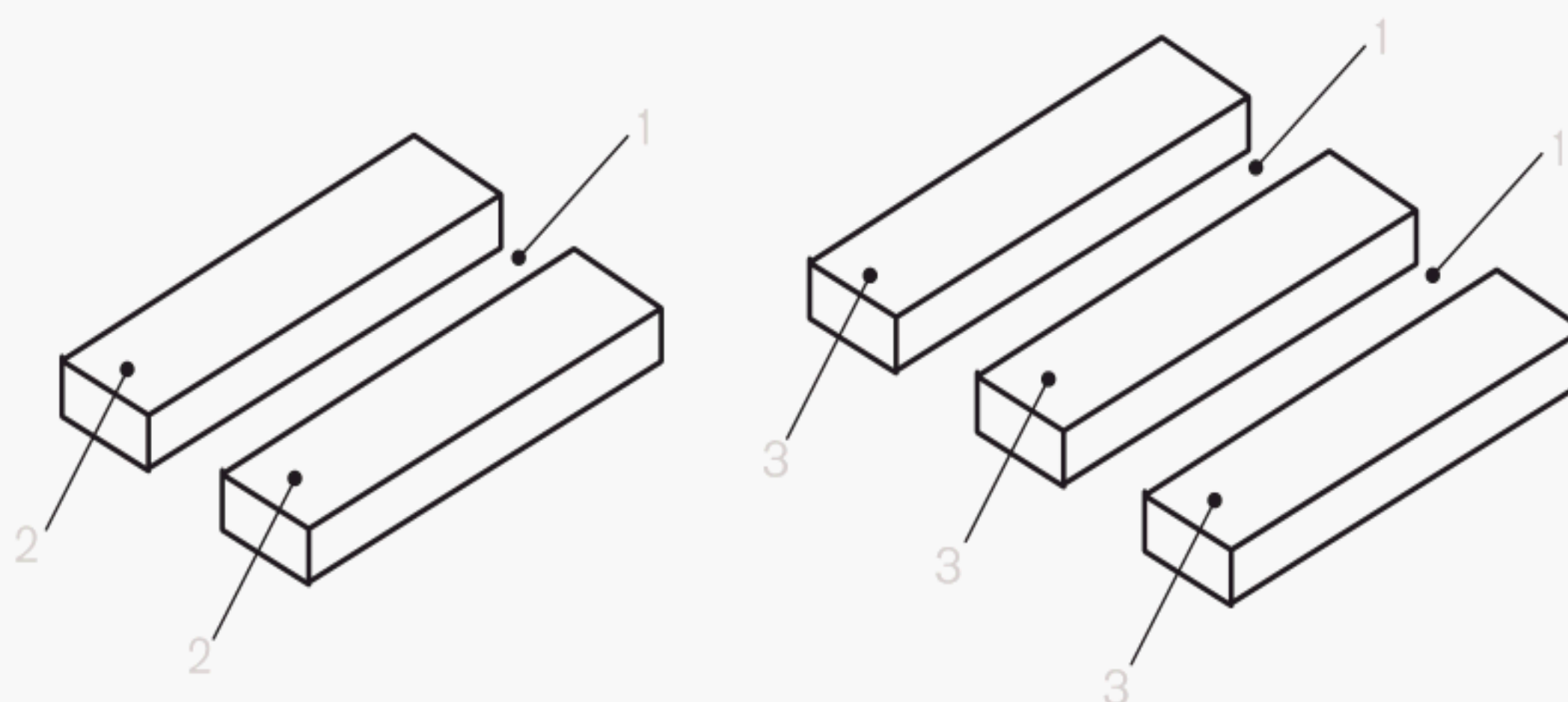
13.4 Mechanically induced movement

If the movement capability of a linear joint seal is less than $\pm 7,5$ %, the linear joint seal may be tested without mechanically induced movement and the result applies to the movement capability reported.

Results obtained with mechanically induced movement prior to or during the tests are only valid for the movement capability tested or lower.

**Key**

- 1 linear joints
- 2 monolithic slab, single joint
- 3 monolithic slab, multiple joints

**Key**

- 1 linear joints
- 2 adjacent discrete members, single joint
- 3 adjacent discrete members, multiple joints

Figure 1 – Examples of supporting constructions

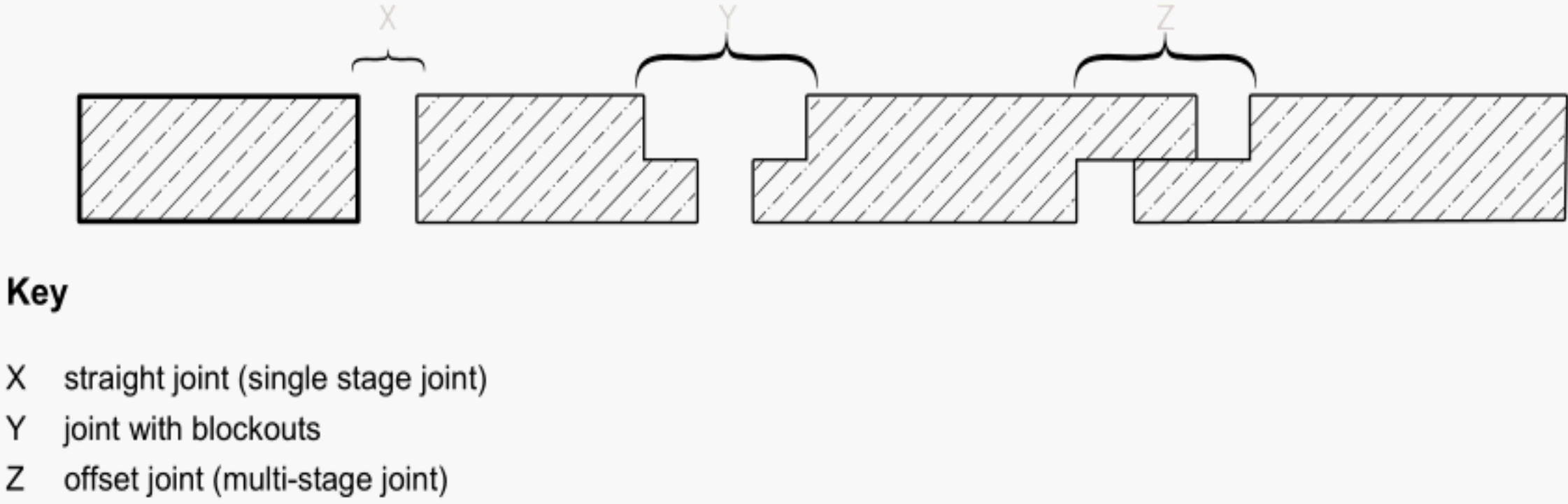


Figure 2 – Examples of joint configurations

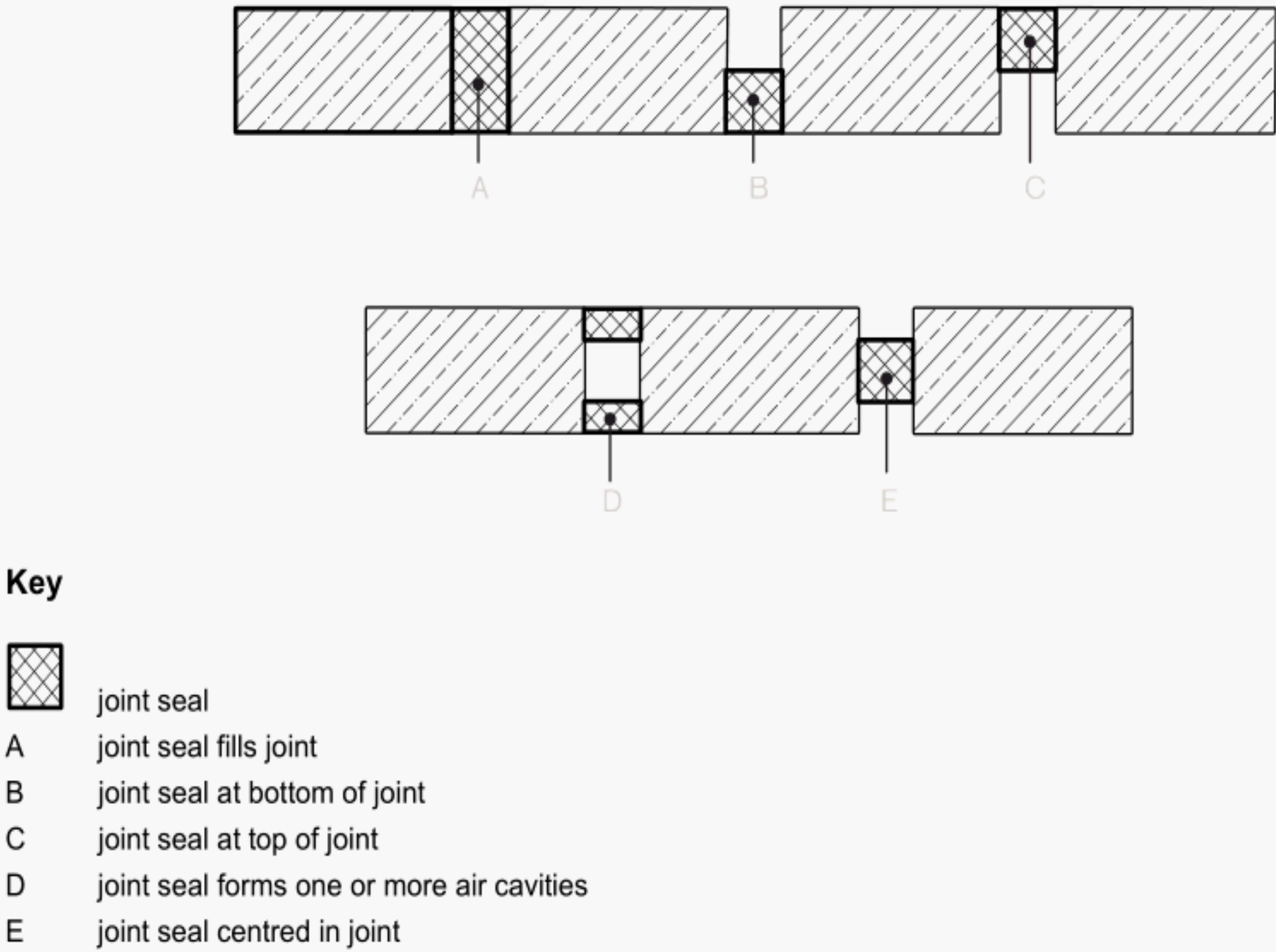
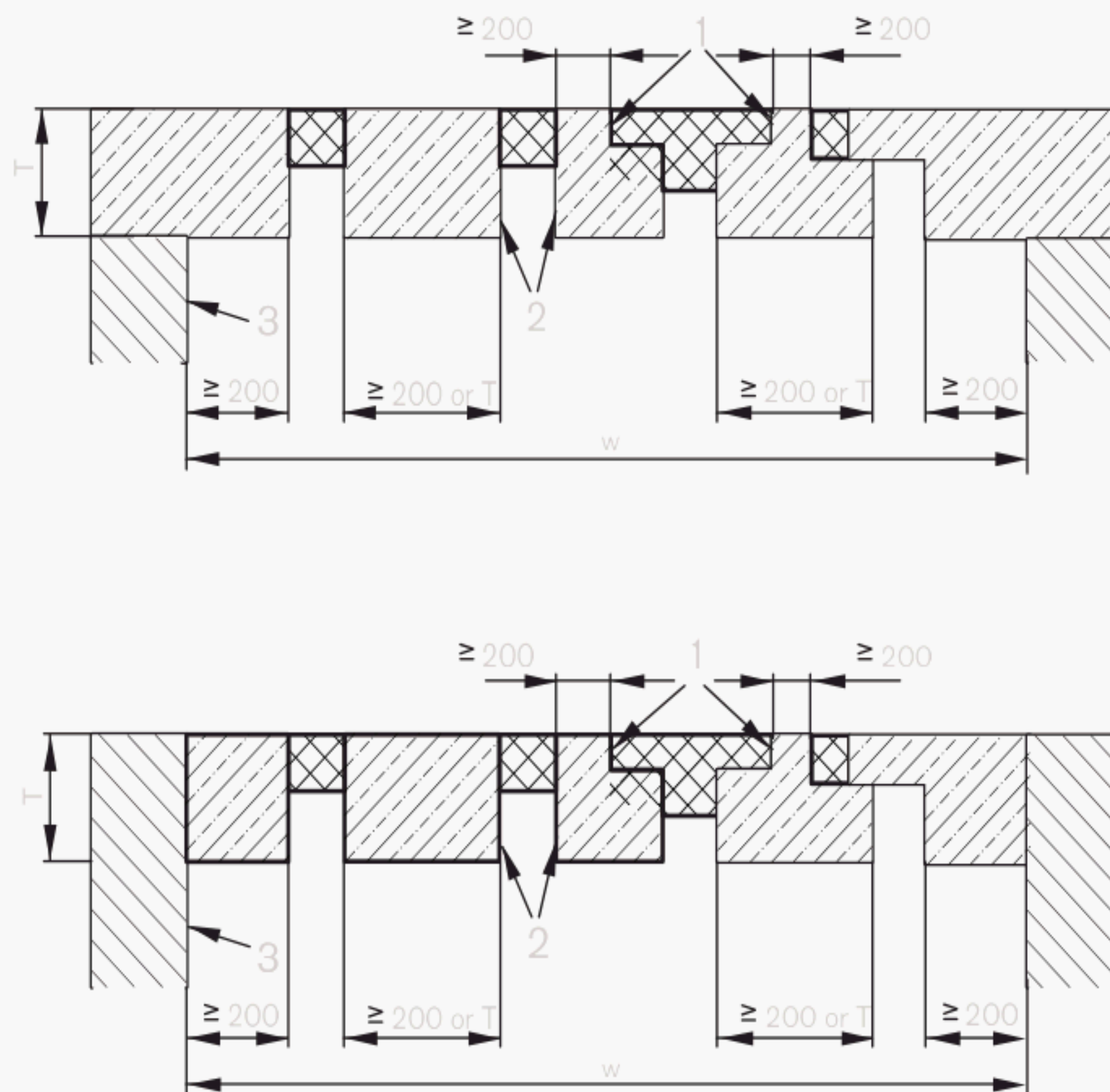


Figure 3 – Examples of joint seal position in a joint

Dimensions in millimetres

**Key**

joint seal



supporting construction



furnace wall

1 blackout edge

2 joint edge

3 interior furnace face

w width of the test construction

T thickness of the supporting construction

Figure 4 – Minimum separation distances

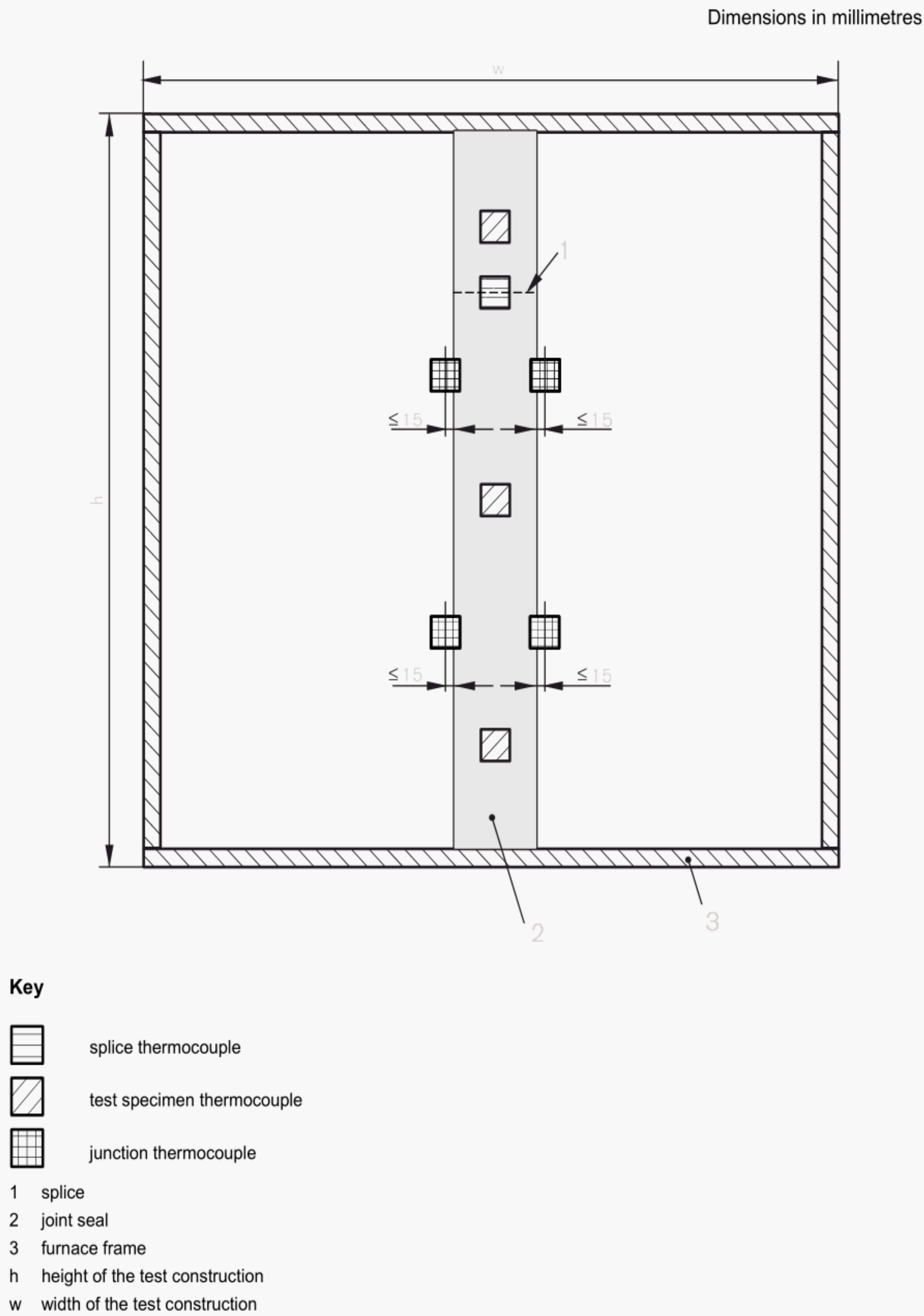
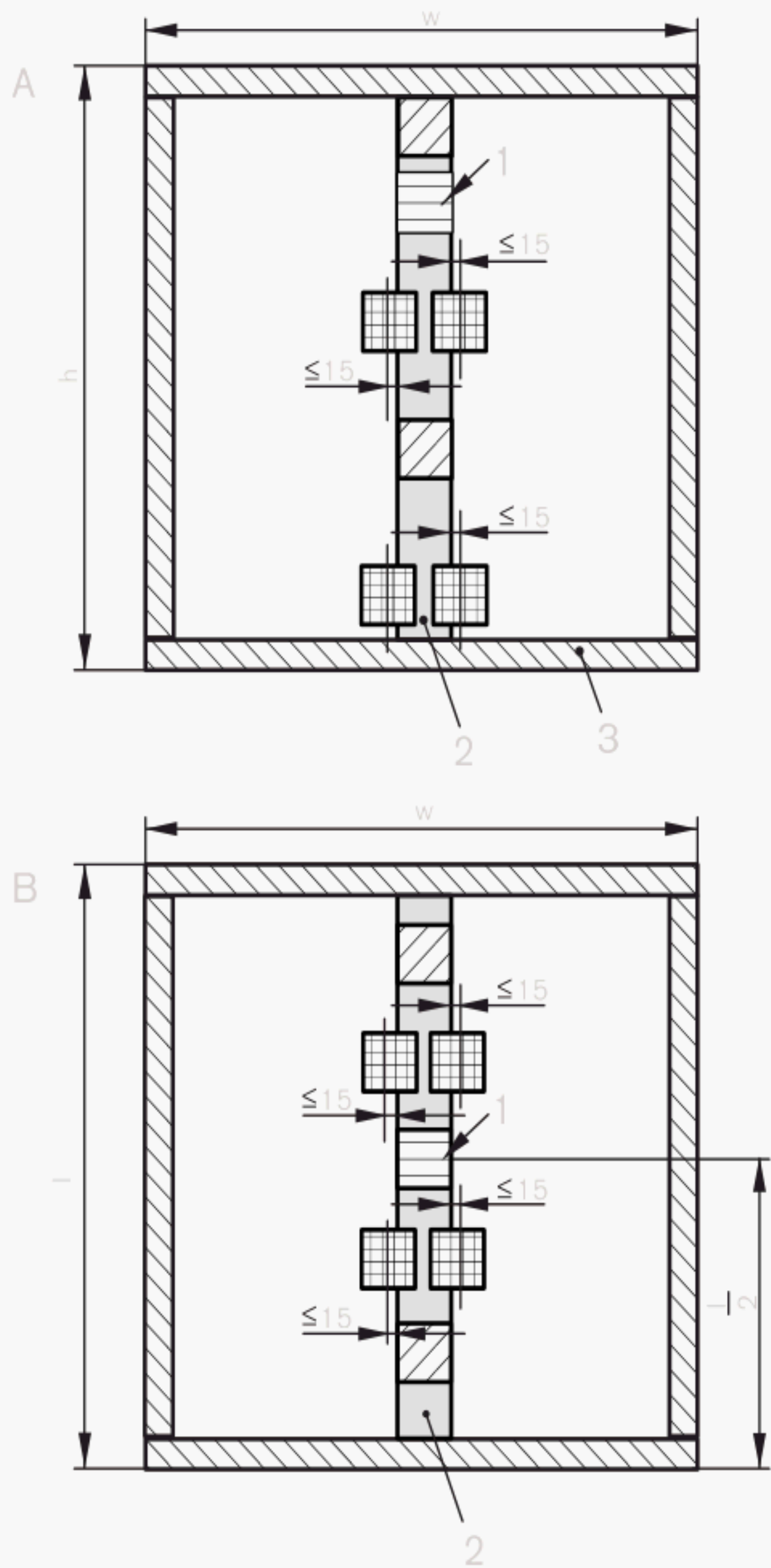


Figure 5 – Typical thermocouple layout (full scale vertical furnace, single test specimen)

Dimensions in millimetres



Key

A vertical furnace

B horizontal furnace



splice thermocouple



test specimen thermocouple



junction thermocouple

1 splice

2 joint seal

3 furnace frame

h height of the test construction

l length of the test construction

w width of the test construction

Figure 6 – Typical thermocouple layout (small scale furnace, single test specimen)

Dimensions in millimetres

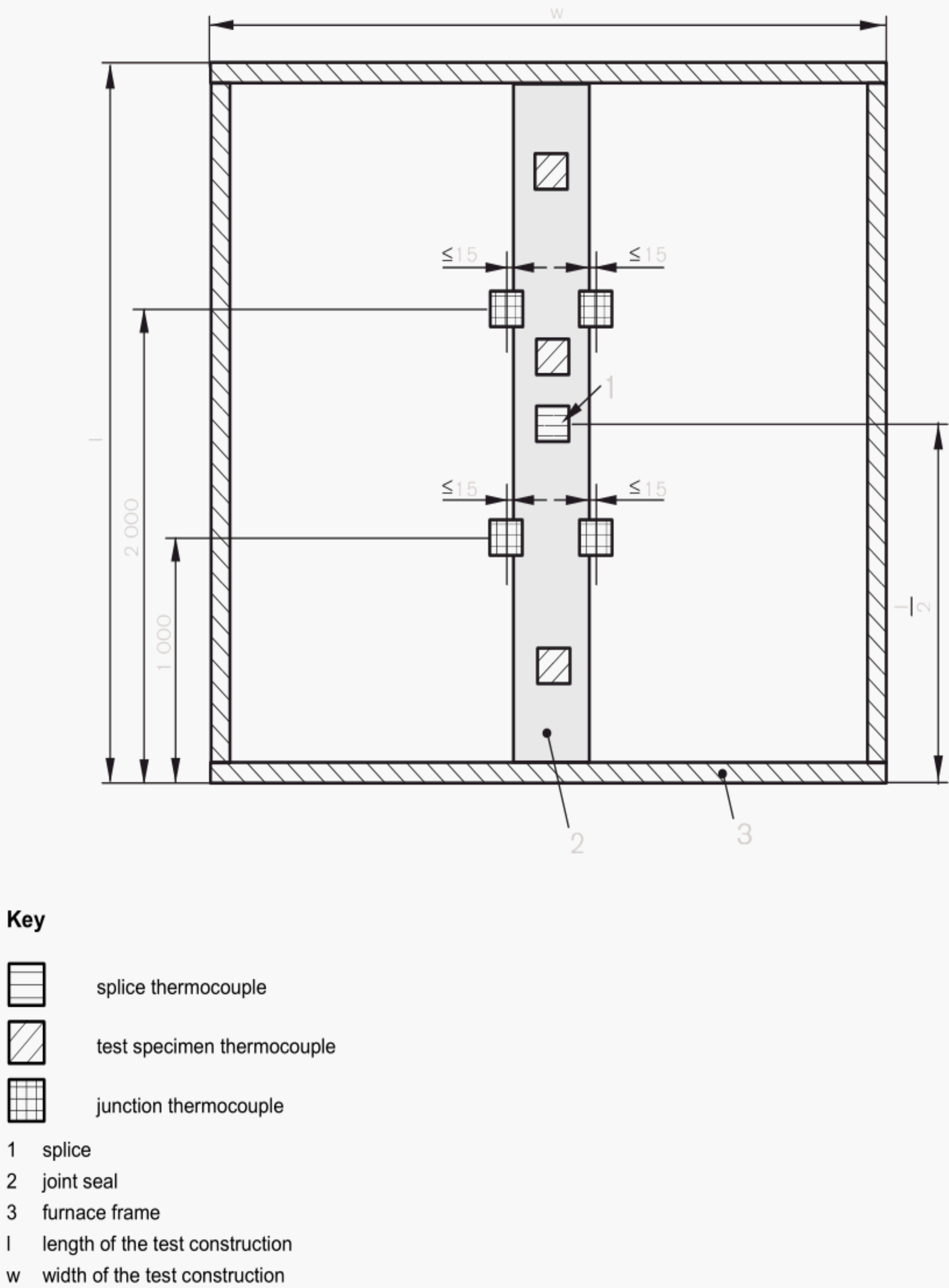
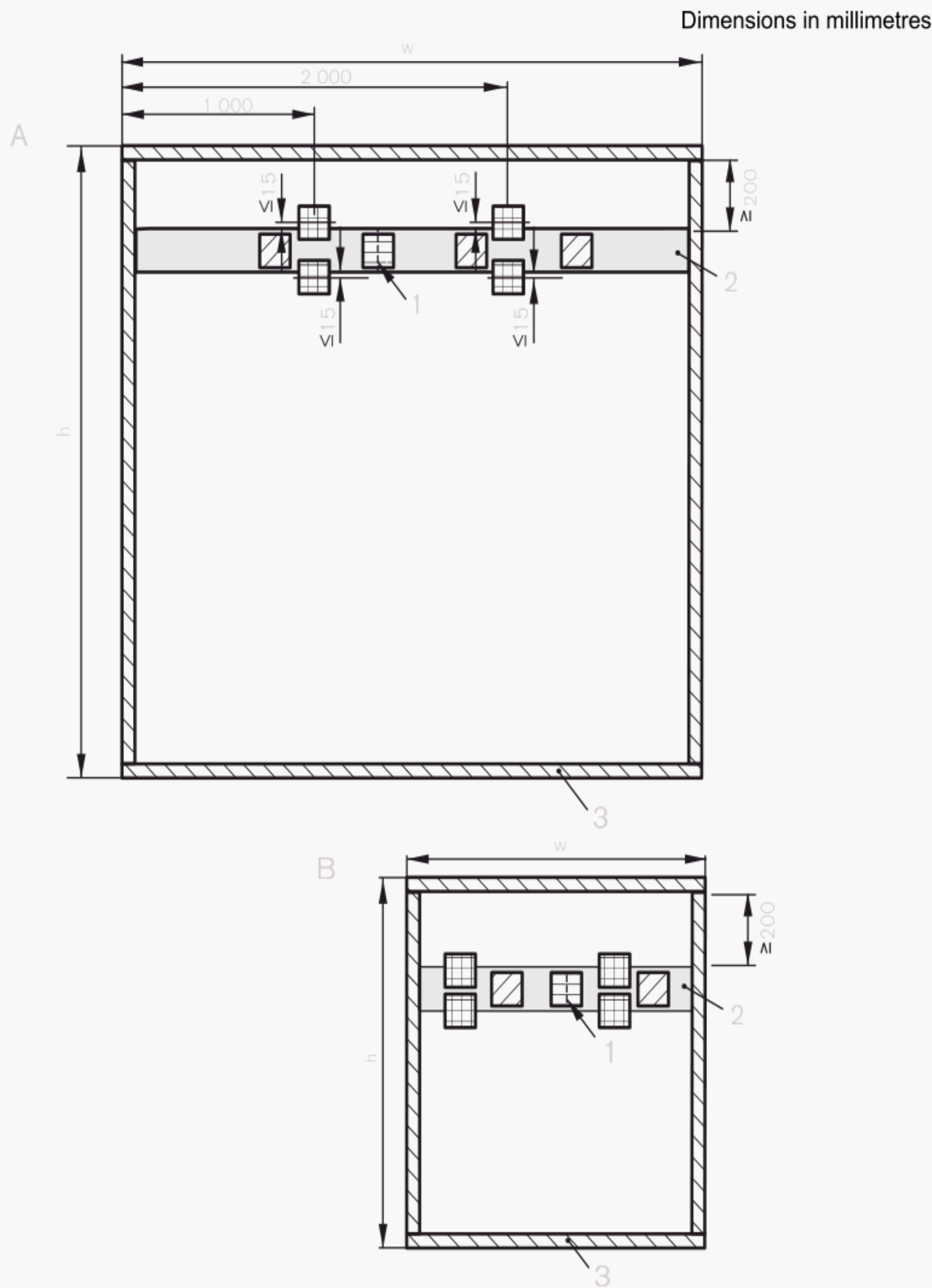


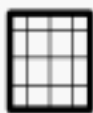


Figure 7 – Typical thermocouple layout (full scale horizontal furnace, single specimen)



Key

- A full scale furnace
B small scale furnace

-  splice thermocouple
 test specimen thermocouple
 junction thermocouple

- 1 splice
2 joint seal
3 furnace frame
h height of the test construction
w width of the test construction

Figure 8 – Typical thermocouple layout (vertical furnace, horizontal specimen)

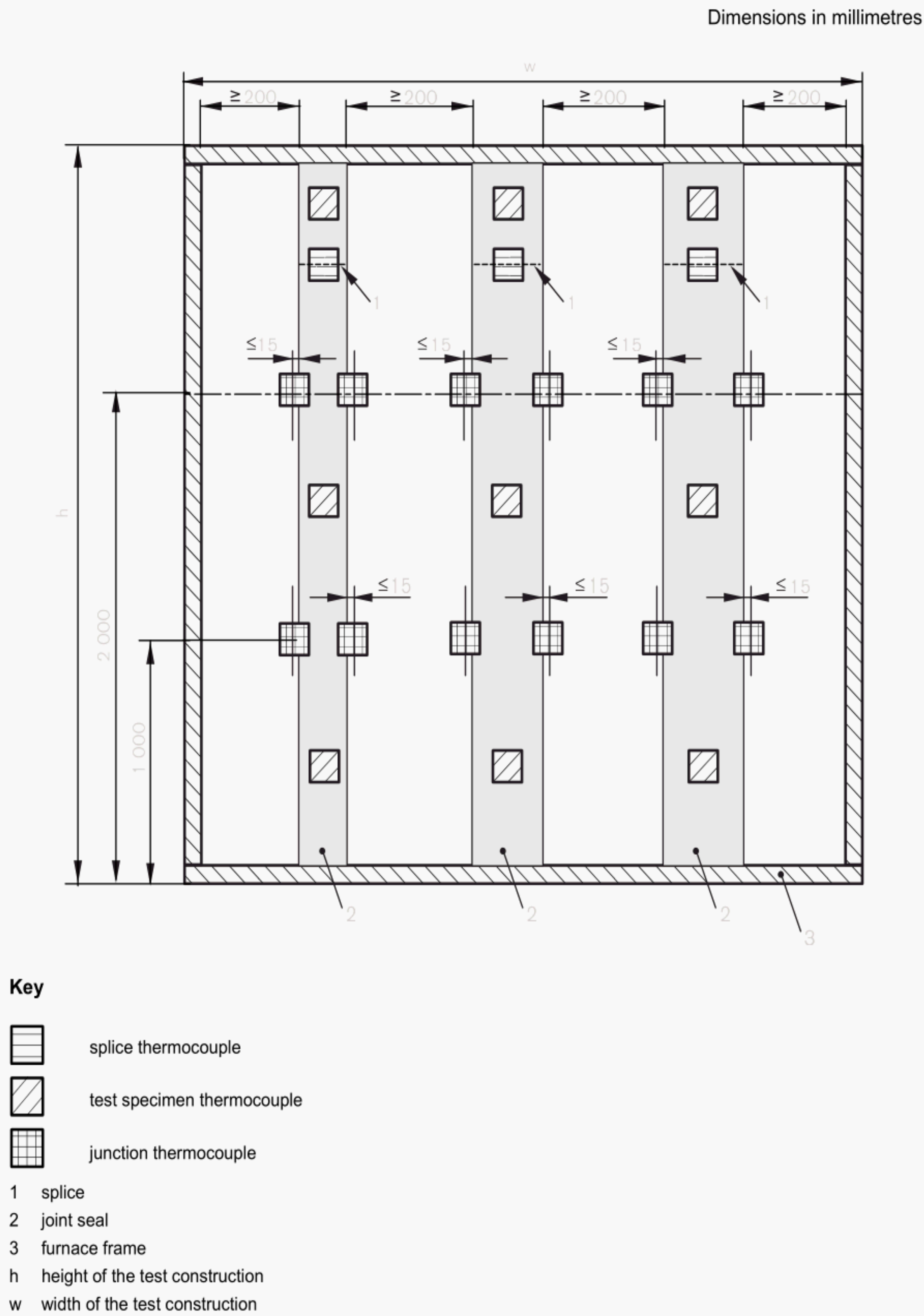
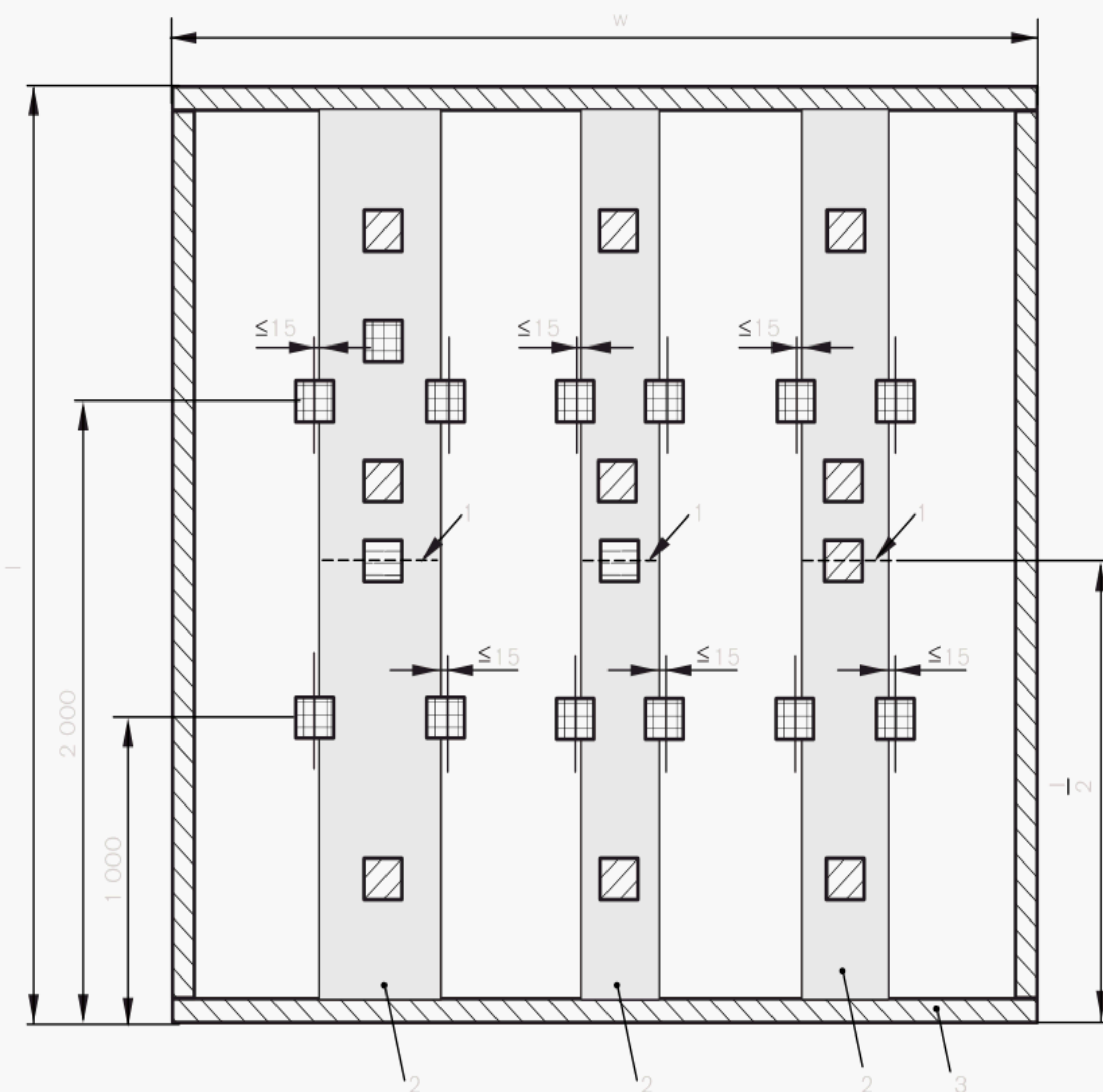


Figure 9 – Typical thermocouple layout (full scale vertical furnace, multiple test specimens)

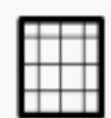
Dimensions in millimetres

**Key**

splice thermocouple



test specimen thermocouple



junction thermocouple

- 1 splice
- 2 joint seal
- 3 furnace frame
- l length of the test construction
- w width of the test construction

Figure 10 – Typical thermocouple layout (full scale horizontal furnace, multiple test specimens)

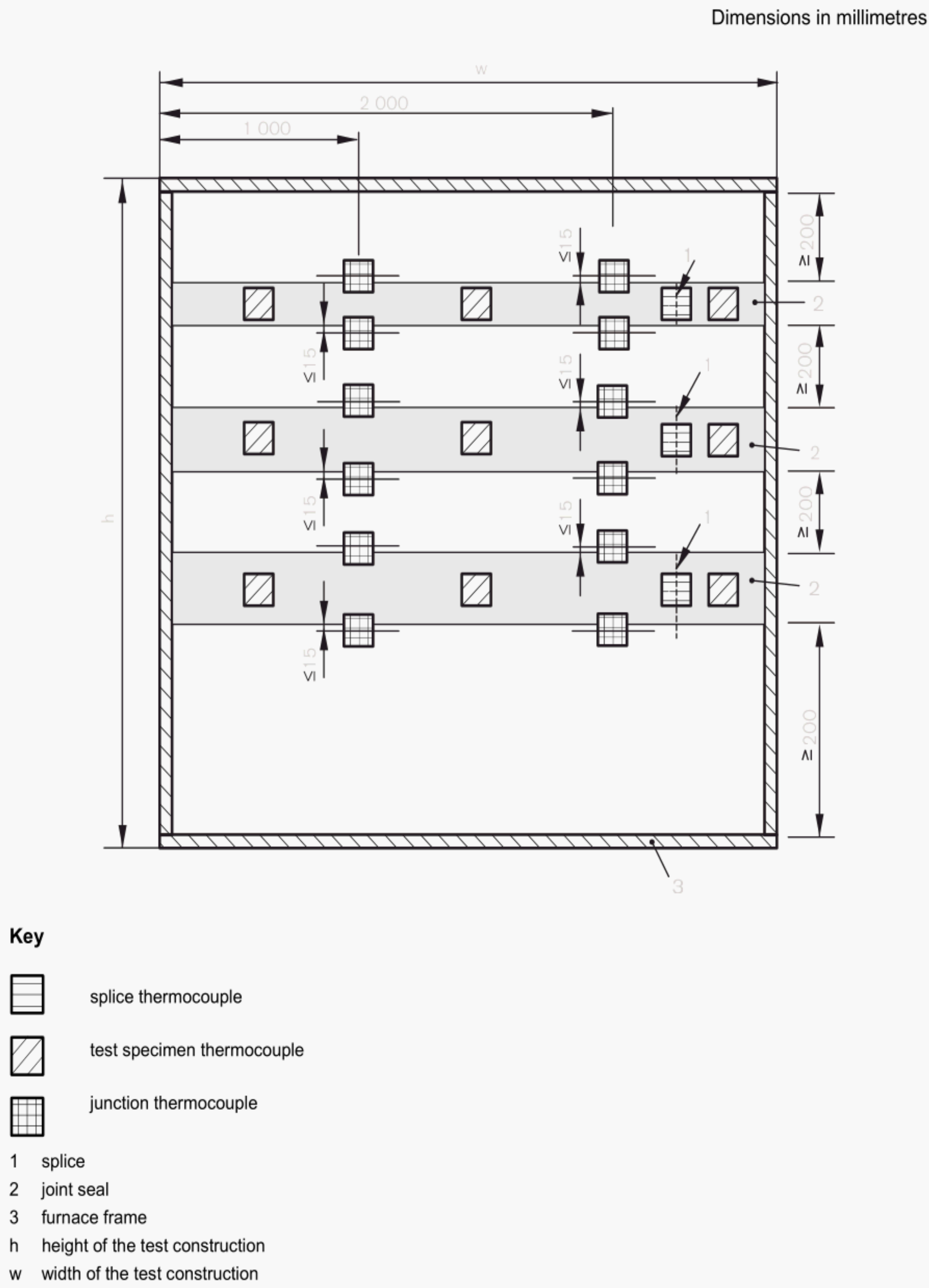


Figure 11 – Typical thermocouple layout (full scale vertical furnace, multiple horizontal test specimens)

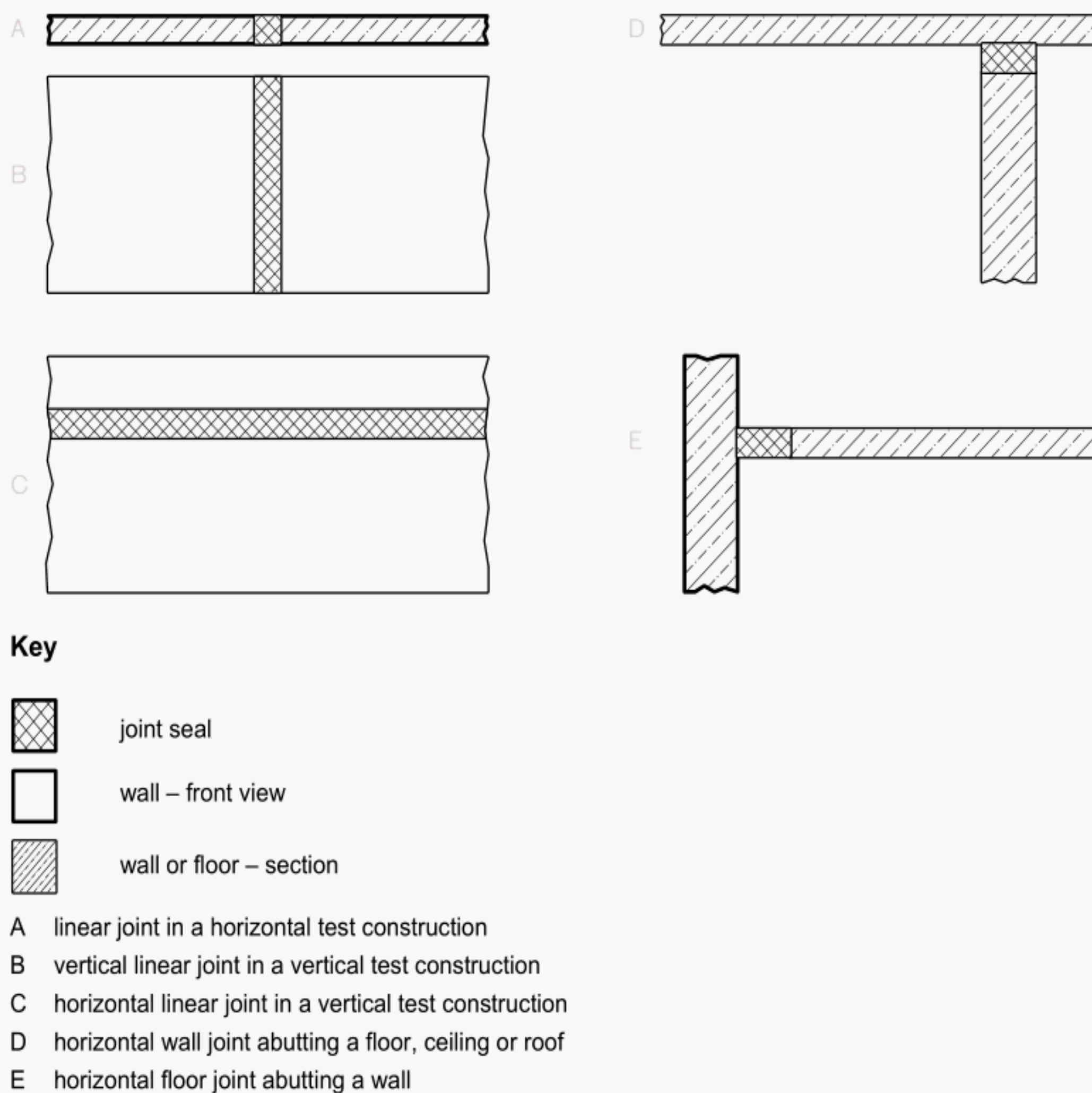


Figure 12 – Test and application orientation of joint seals

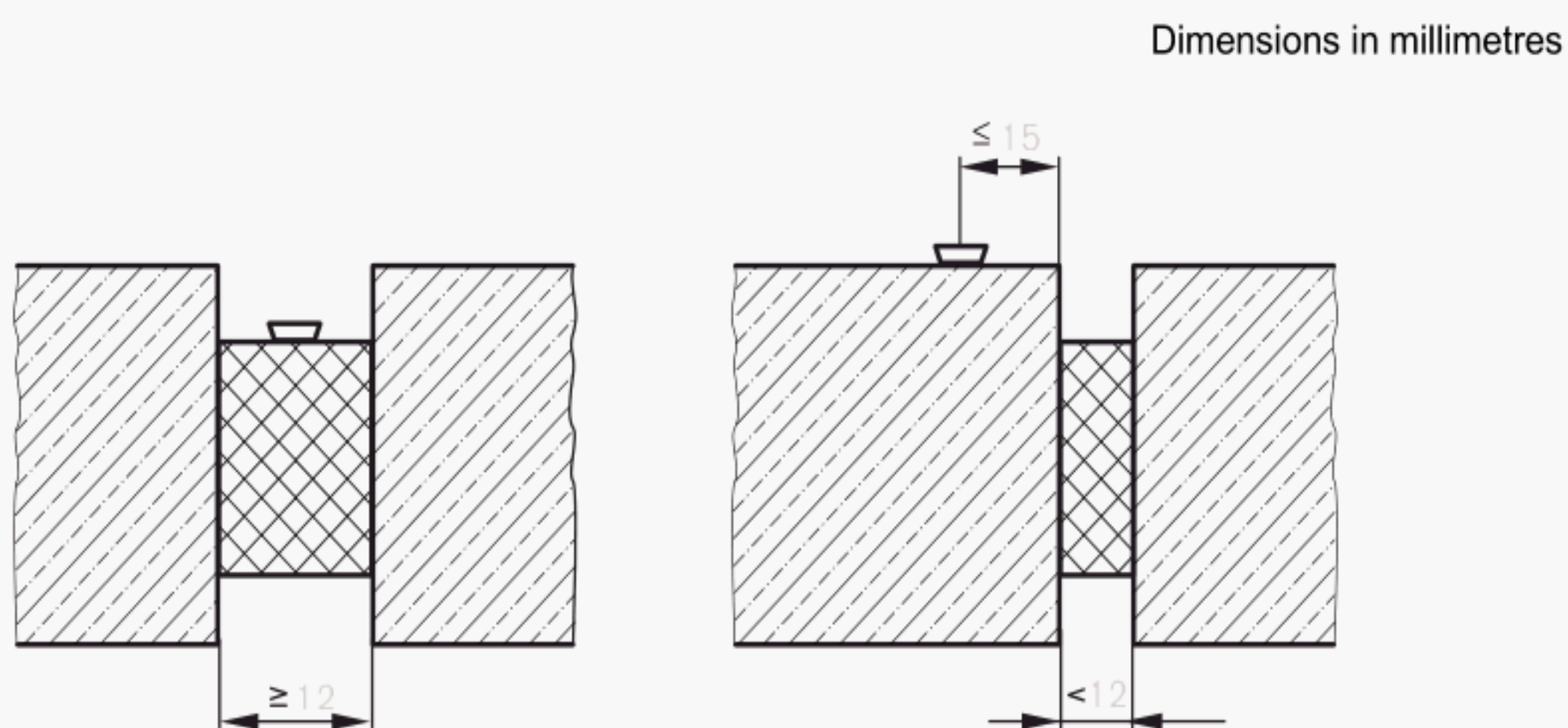
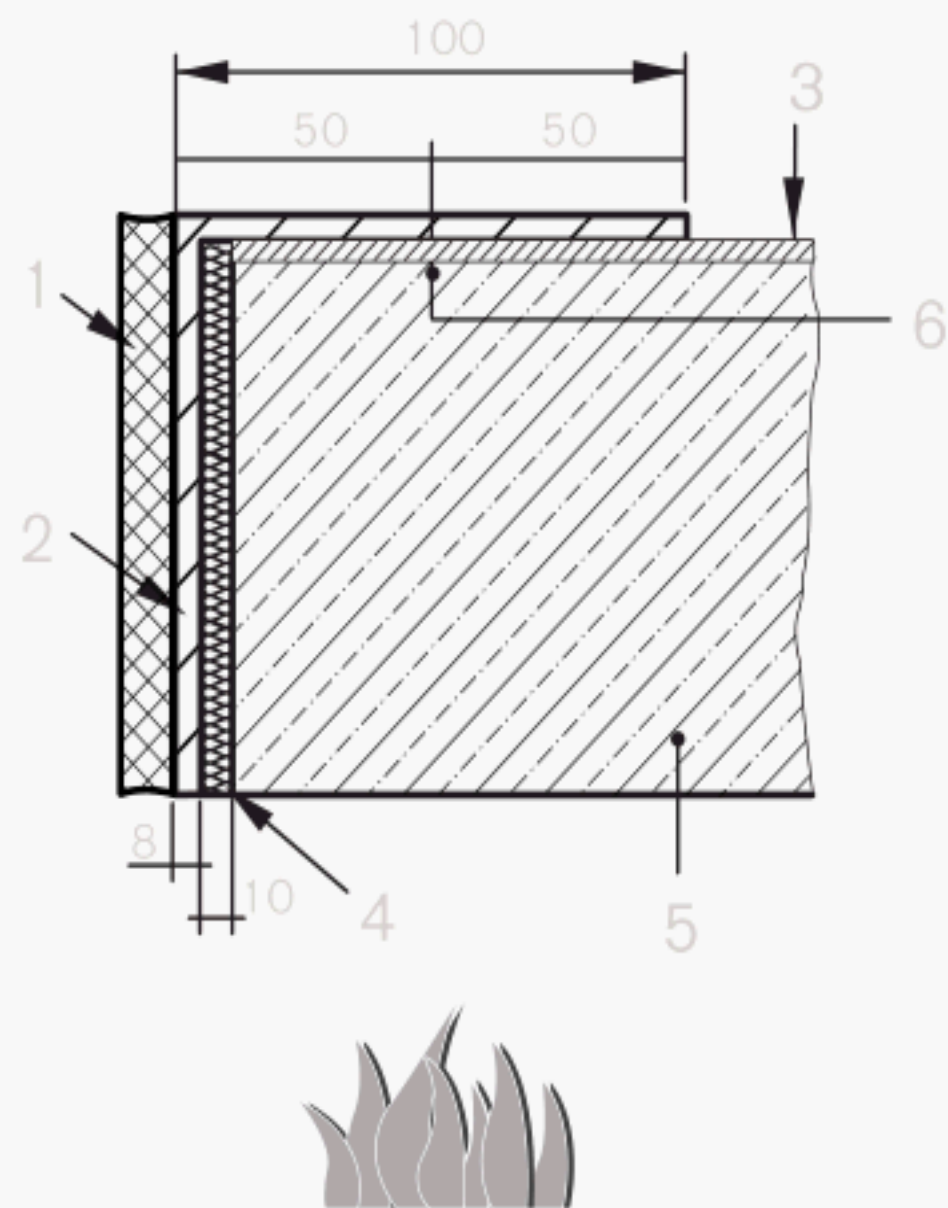


Figure 13 – Location of test specimen thermocouples

Dimensions in millimetres



Key

- 1 joint seal
- 2 steel angle, thickness = 8 mm
- 3 cement mortar bedding
- 4 mineral fibre insulation 10 mm (35 kg/m³)
- 5 concrete supporting construction, wall or floor
- 6 position of the fixings of the steel angle to the concrete supporting construction at nominal 300 mm centre

Figure 14 – Standard configuration for steel faced joints

Annex A

(normative)

Standard condition for linear joint seals with no mechanically induced movement of the joint faces

A.1 Standard condition

The standard condition is when no movement is applied.

The linear joint seal shall be installed according to the provisions given in Clauses 6 to 9. If discrete members are used for the supporting construction measures may be taken to avoid uncontrolled movement during the test.

A.2 Test procedure

Tests shall be carried out according to the provisions given in Clause 10 with the exception of 10.3.

Annex B

(normative)

Standard condition for linear joint seals with mechanically induced movement of the joint faces

B.1 General

The two parameters that influence the effect of mechanically induced movement are the direction of the movement, the extent of the movement (displacement) and the time when the movement is imposed.

The possible types of movement are (see Figures B.1 and B.2):

- lateral;
- shear (deflection);
- combination of lateral and shear;
- rotational.

The extent of movement is related to the movement capability of the linear joint seal.

The sponsor shall state the limits of the nominal joint width together with the movement capability of the linear joint seal to be tested.

The movement can be imposed either prior or during the fire resistance test.

B.2 Standard condition(s)

B.2.1 Standard conditions for lateral movement

B.2.1.1 Movement prior to test

The movement before the test shall be 100 % of the movement capability which will be maintained throughout the test duration (see Figure B.1).

B.2.1.2 Movement during the test

The test apparatus shall be capable of straining the test specimen laterally (see Figure B.1) in a linear manner. The test shall be started at a movement equivalent to 20 % of the movement capability. 100 % of movement capability shall be reached during the first 80 % of the anticipated fire resistance time, subject to maximum 60 min. After 60 min, no further mechanically induced movement is imposed to the test specimen.

B.2.2 Standard condition for shear movement

B.2.2.1 Movement prior to test

The movement before the test shall be 100 % of movement capability which will be maintained throughout the test duration (see Figure B.2).

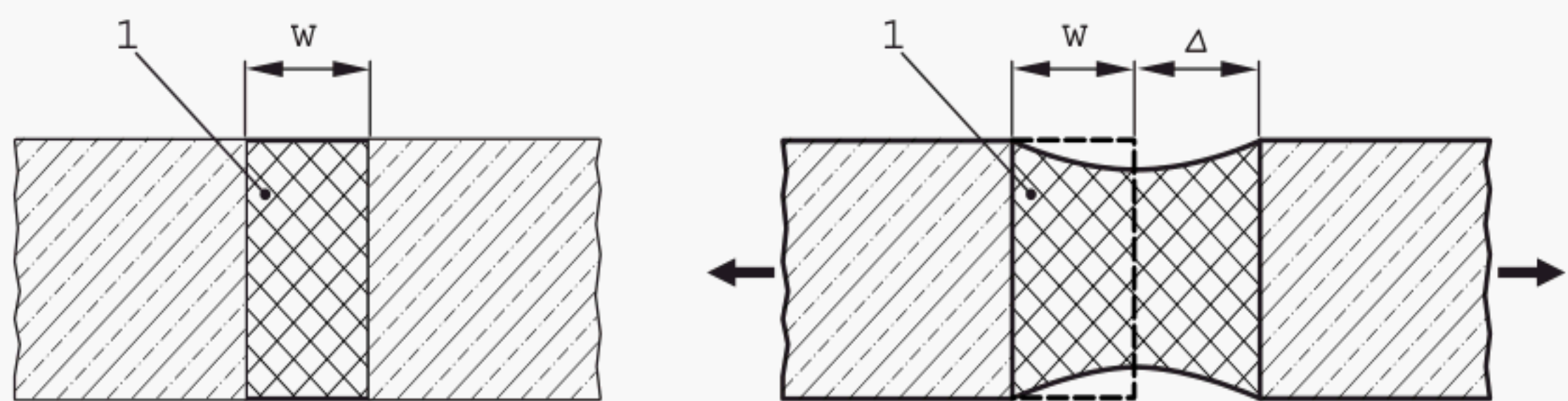
B.2.2.2 Movement during the test

The test apparatus shall be capable of straining the test specimen in shear direction (see Figure B.2) in a linear manner. The test shall be started at a movement equivalent to 20 % of the movement capability. 100 % of movement capability shall be reached during the first 80 % of the anticipated fire resistance time, subject to maximum 60 min. After 60 min no further mechanically induced movement is imposed to the test specimen.

B.3 Conditions for other movements

The test apparatus shall be capable of simulating the intended type of movement. See Figure B.3 for an example of a test arrangement. The movement can occur before or during the test. Other movements (other than shear or lateral) depend upon the requirements of sponsors or particular applications.

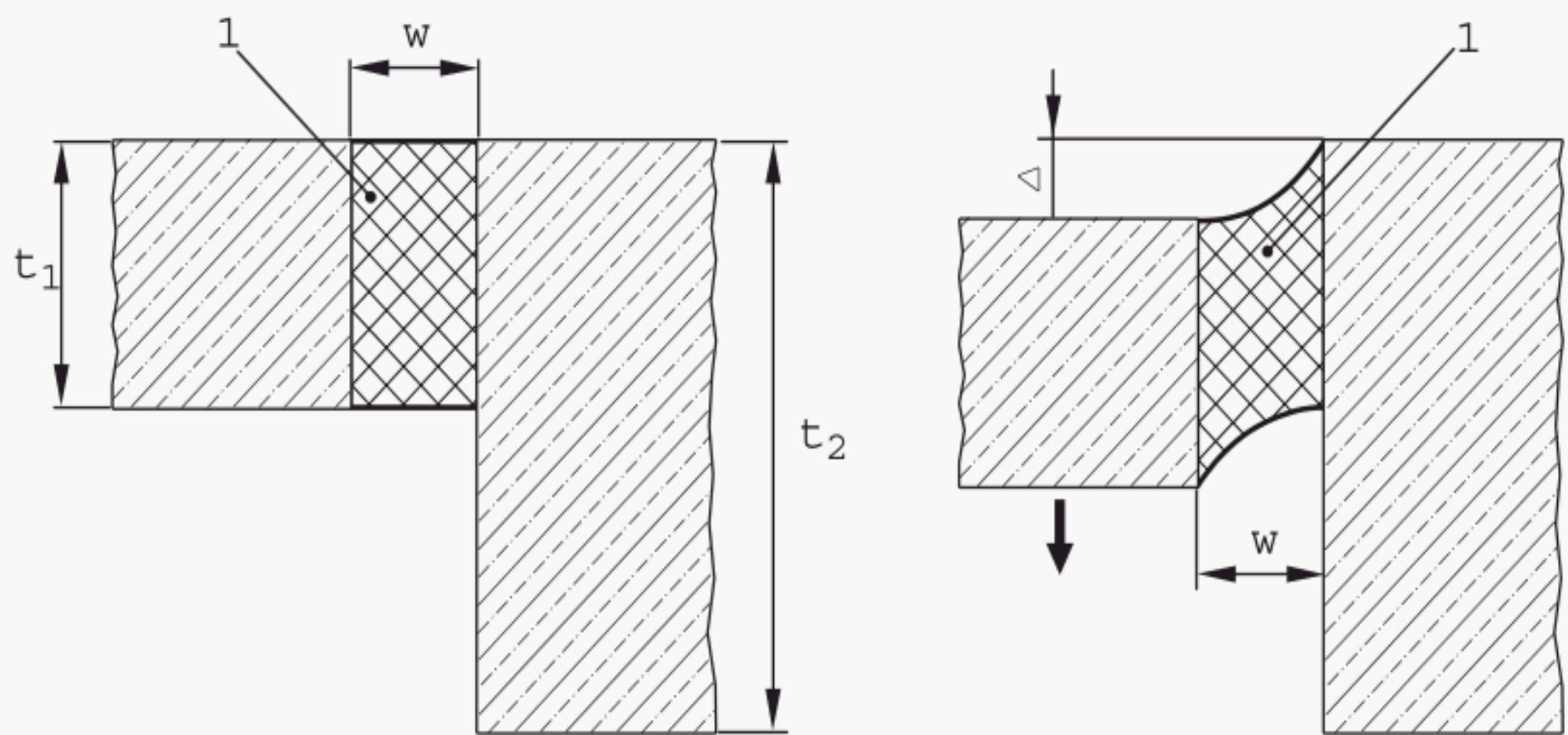
The test procedure is given in B.2 above.



Key

- 1 joint seal
- w nominal joint width
- Δ elongation (100 % of the movement capability)

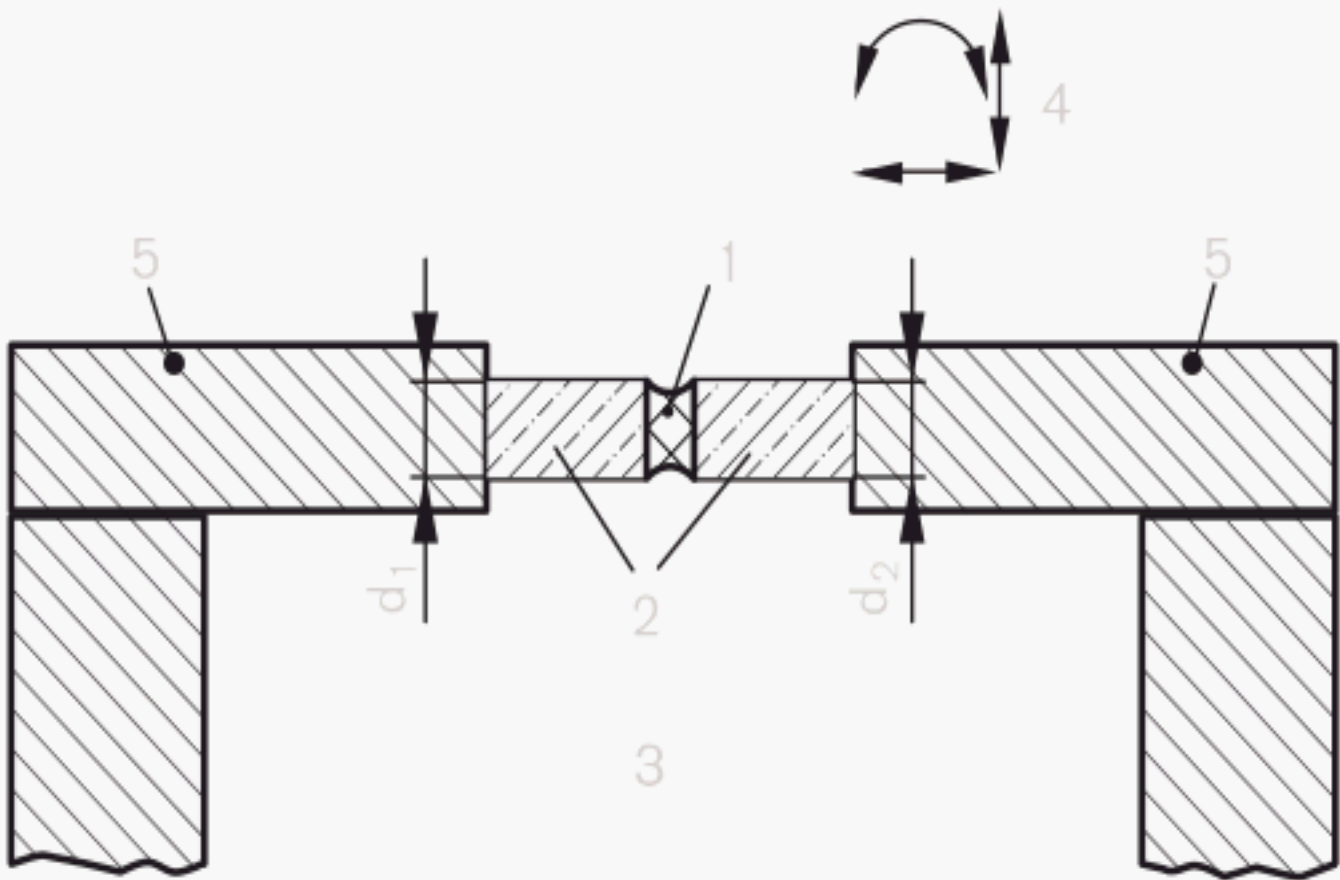
Figure B.1 – Lateral movement (standard conditions)



Key

- 1 joint seal
- w nominal joint width
- Δ deflection (100 % of the movement capability)
- t_1 thickness of the moving gap face
- t_2 thickness of the fixed gap face

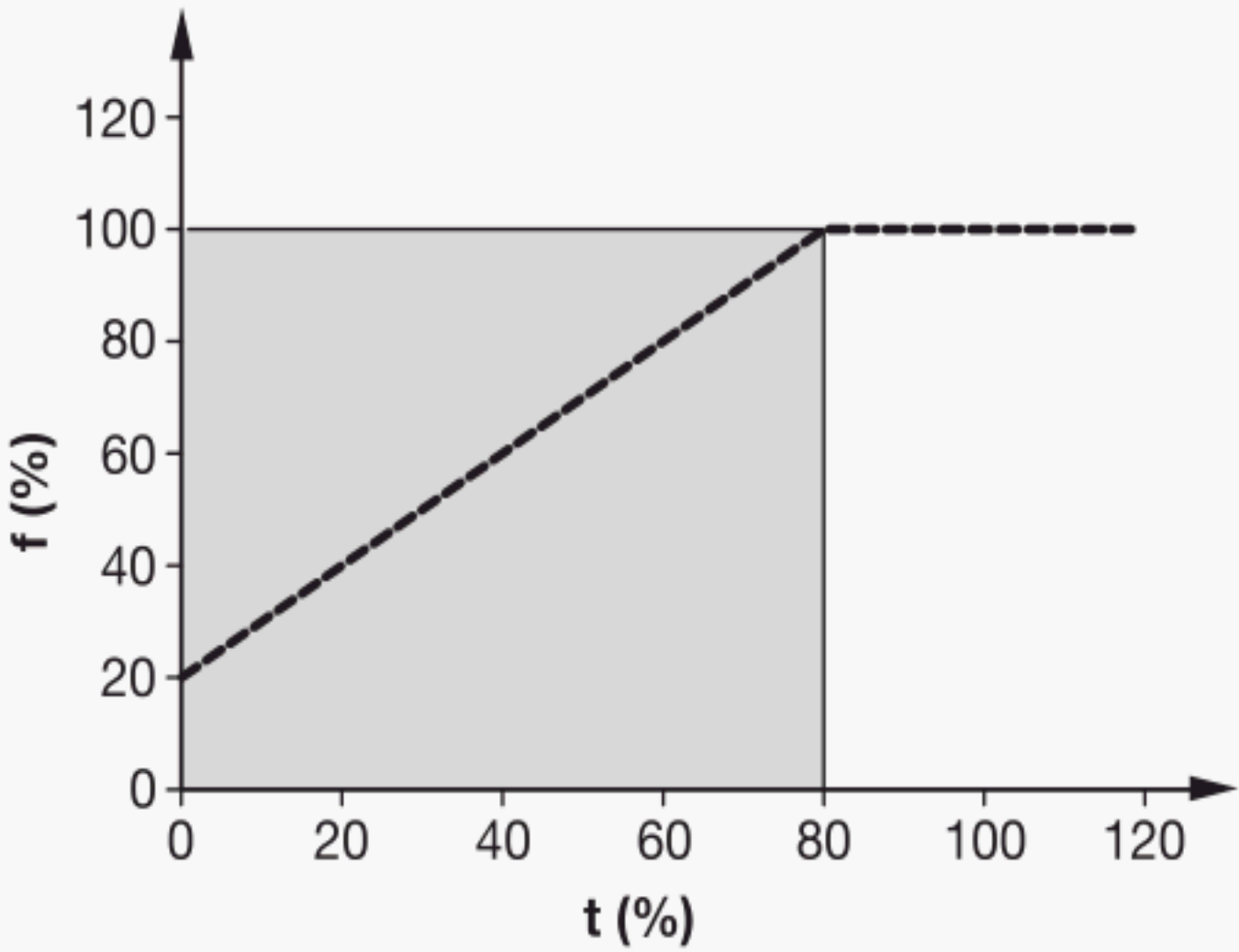
Figure B.2 – Shear movement (standard conditions)



Key

- 1 joint seal
- 2 supporting construction
- 3 furnace
- 4 all movements
- 5 test frame
- d1, d2 thickness of the supporting construction

Figure B.3 – Test arrangement for other movements



Key

- f deflection (%)
- t anticipated fire resistance time (%)

Figure B.4 – Movement during the test (standard condition)

Annex C (informative)

Guidance on the use of this European Standard

C.1 General

This annex provides the user of this European Standard with background information on the development of the standard. It also provides guidance on the planning, performance and reporting of fire resistance tests carried out in conformity with this European Standard and the interpretation and application of the test results.

The fire resistance performance of a structure is only as good as the weakest component, which may be the linear joint between two adjacent elements. It is therefore important to establish the contribution of sealing systems designed to protect such linear joints.

As the test results should be reproducible, the test specimen should be accurately prepared and the test conditions, e.g. movements, clearly specified.

C.2 Application of the test

Linear joints are openings in fire resistant constructions. In general, this type of opening can be divided into the following groups:

- a) linear joints that will not move under normal conditions or under fire conditions;
- b) linear joints whose dimension may alter prior to the fire event. These movements are normally due to wind loading, variation in moisture content and or changes in ambient temperature. These stresses could be present during the fire event;
- c) linear joints that will move under fire conditions, e.g. connections:
 - between walls and floors with floor deformation;
 - between columns and walls with different deformation under fire conditions;
- d) linear joints between facades and floors with load bearing capacity at the connection.

The impact of a fire on a linear joint can vary considerably. A strict scientific approach to the adequate testing of linear joint sealing systems would therefore be to design a series of tests each of which corresponds to a specific fire situation and linear joint type. Such an approach would fail due to its costs. This test has been designed with the intention to cover a wide range of fire situations in a minimum of tests corresponding to a "worst case" situation.

C.3 Test conditions

Linear joints only form a minor percentage of the area of a vertical or horizontal separating element. As a minimum length of only 900 mm is required, it is possible that the whole of the joint could fall totally within the positive or negative pressure zone if the furnace is operated under standard conditions.

The pressure of 15 Pa is related to the pressure that would be applicable to testing a linear joint seal located at the top of a 3 m × 3 m test construction, when operating under the conditions specified in EN 1363-1.

The pressure boundary conditions have therefore been defined such that where a large furnace accommodates a number of linear joint seals at different levels, the lowermost linear joint seal has a pressure of not less than 15 Pa in its centre. Linear joint seals positioned at higher levels will thus be in areas of higher pressure.

It should be noted that conditioning of the linear joint can have influence on the behaviour of the linear joint during fire.

C.4 Specimen preparation

The linear joint given in Figure C.1 simulates the worst case of linear joints between steel structures as these are, e.g. steel-concrete floors and partitions.

The sponsor is free to fill the gaps at the side he requires (see Figure 3). For intumescent materials, the filling of the gap at the fireside is seen as the worst case.

Where tests are carried out without movement according to Annex A, a test set up as illustrated in Figure C.2 can also be used.

C.5 Notes on general performance criteria

Because of the kind of test, the mean unexposed face temperature is not relevant in assessing insulation compliance.

C.6 Notes on validity of test results

From the definitions it is clear that the test procedure is not applicable to joints round pipes and ducts.

When linear joint seals are part of a partition, ceiling or ceiling membrane they are normally tested in a full-scale test together with the element.

When a combination of materials is used to fill a linear joint, it can be impossible to predict the worst case situation.

The fire resistance of the linear joint seal depends on the material used for the separating element. The behaviour of a linear joint seal tested in aerated concrete can differ totally when used between mineral wool sheets or in connection with a steel partition.

Results from a test with a particular standard supporting construction are therefore only valid for the type of construction used in the test. Linear joints between other types of building elements require separate testing.

C.7 Notes on Annex B

With the given standard conditions in Annex B, it is possible to simulate different movements of the gap faces before or during the test:

- lateral movement (horizontal displacement, B.2.1)
- deflection (shear displacement, B.2.2)
- rotation (B.3)

The different movements of the adjoining supporting construction are given in Figure C.3.



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Dimensions in millimetres

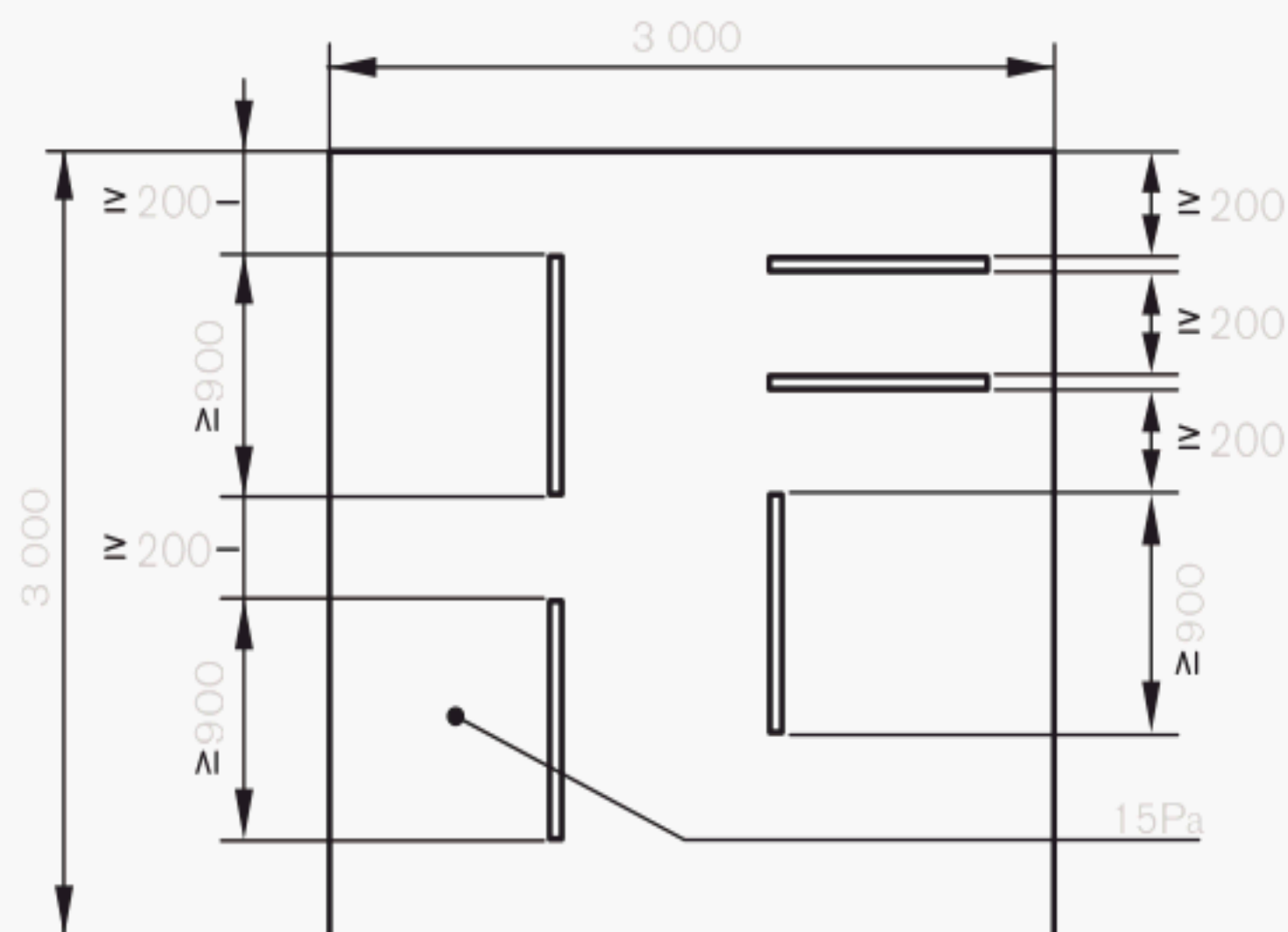
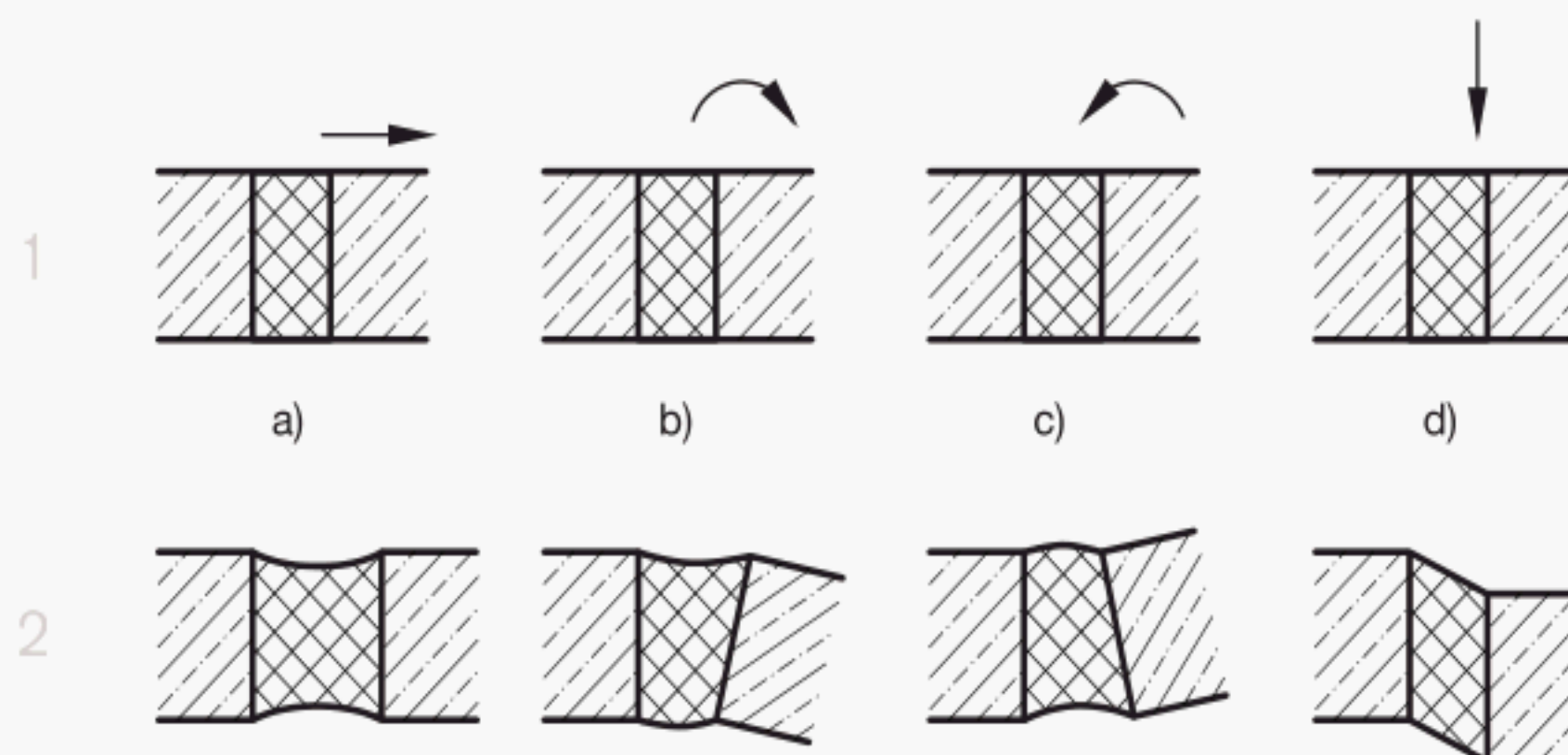


Figure C.2 – Several short joint seals in a full scale vertical furnace: pressure and boundary conditions



Key

- 1 service condition
- 2 heated condition
- a) lateral movement
- b) rotation
- c) rotation
- d) vertical displacement

Figure C.3 – Movements of the adjoining supporting construction