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**Plastics—Determination
of environmental stress
cracking (ESC)—
Constant-tensile-stress method**

ICS 83.080.01

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Reference number : JIS K 7108 : 1999 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS K 7108 : 1987** is replaced with **JIS K 7108 : 1999**.

This revision has been prepared based on **ISO 6252 : 1992** in order to conform to the International Standard.

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In the event of any doubts arising as to the contents,
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Plastics—Determination of environmental stress cracking (ESC)— Constant-tensile-stress method

Introduction This Japanese Industrial Standard has been prepared based on the second edition of *ISO 6252 Plastics—Determination of environmental stress cracking (ESC)—Constant-tensile-stress method*, published in 1992 without changing the technical contents.

The portion underlined with dots and annex 1 (informative) are not specified in the original International Standard.

1 Scope This Standard specifies methods for the determination of environmental stress cracking (ESC) of plastics when they are subjected to a constant tensile force in the presence of chemical agents.

It is applicable to test specimens prepared by moulding and/or machining and can be used both for the assessment of ESC of plastics materials exposed to different environments, and for the determination of ESC of different plastics materials exposed to a specific environment.

NOTE 1 Methods for the determination of environmental stress cracking by means of a constant-strain test are specified in *ISO 4599* and *ISO 4600*.

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of coming into effect or the year of publication is given to these referred standards, only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter are not applied. The normative references without the indication of the year of coming into effect or the year of publication apply limiting only to the most recent edition (including the amendment).

JIS K 7139 : 1996 *Plastics—Multipurpose test specimens*

Remarks: *ISO 3167 : 1993 Plastics—Multipurpose test specimens* is identical with the said standard.

JIS K 7151 : 1995 *Plastics—Compression moulding test specimens of thermoplastic materials*

Remarks: *ISO 293 : 1986 Plastics—Compression moulding test specimen of thermoplastic materials* is identical with the said standard.

JIS K 7152 : 1995 *Plastics—Injection moulding of test specimens of thermoplastic materials*

Remarks: *ISO 294 : 1995 Plastics—Injection moulding test specimen of thermoplastic materials* is identical with the said standard.

JIS K 7162 : 1994 *Plastics—Determination of tensile properties—Part 2 : Test conditions for moulding and extrusion plastics*

Remarks: *ISO 527-2 : 1993 Plastics—Determination of tensile properties—Part 2 : Test conditions for moulding and extrusion plastics* is identical with the said standard.

- ISO 150 : 1980 *Raw, refined and boiled linseed oil for paints and varnishes—Specifications and methods of test*
- ISO 291 : 1997 *Plastics—Standard atmospheres for conditioning and testing*
- ISO 899 : 1981 *Plastics—Determination of tensile creep*
- ISO 2557-1 : 1989 *Plastics—Amorphous thermoplastics—Preparation of test specimens with a specified maximum reversion—Part 1 : Bars*
- ISO 2818 : 1980 *Plastics—Preparation of test specimens by machining*
- ISO 4599 : 1986 *Plastics—Determination of resistance to environmental stress cracking (ESC)—Bent strip methods*
- ISO 4600 : 1992 *Plastics—Determination of environmental stress cracking (ESC)—Ball or pin impression methods*

3 Principle A test specimen is subjected to a constant tensile force, corresponding to a stress lower than that at yield, while immersed in a specified environment at the temperature selected for testing. The time and/or stress at which the specimen breaks is recorded.

The environmental stress cracking of the test specimens is determined by one of the following methods (A, B or C), depending upon the time to rupture:

- Method A: Determination of the tensile stress leading to rupture at 100 h. This stress is obtained by interpolation of the graph of time to rupture versus applied tensile stress.
- Method B: Determination of the time to rupture under a specified tensile stress. This method is used when the time to rupture exceeds 100 h.
- Method C: Determination of the tensile stress versus time to rupture curve up to an agreed time.

NOTE 2 If creep measurements are desired, the method outlined in **ISO 899** is followed.

4 Apparatus

4.1 Testing device, allowing test specimens to be submitted simultaneously to a tensile stress and to the chemical environment.

If the chemical is a liquid at the test temperature, the test specimen shall be completely immersed in it. If it is highly viscous at the test temperature, the specimens may be covered with a coating of the agent at least 2 mm thick (see clause 5).

The parts of the device that come into contact with the chemical shall be made of an inert material, for example stainless steel.

The constant tensile stress may be applied with weights (figures 1 and 2 are schematic diagrams of suitable apparatus).

The force shall be accurate to $\pm 1\%$. Care shall be taken to ensure that there is no loss of stress in the system, for example by friction.

If the testing device has several test stations, means shall be provided to prevent the vibration occurring through failure at one station from being transmitted to the whole system.

Care shall be taken that the specimens are subjected only to forces parallel to their longitudinal axis, and not to bending or twisting forces.

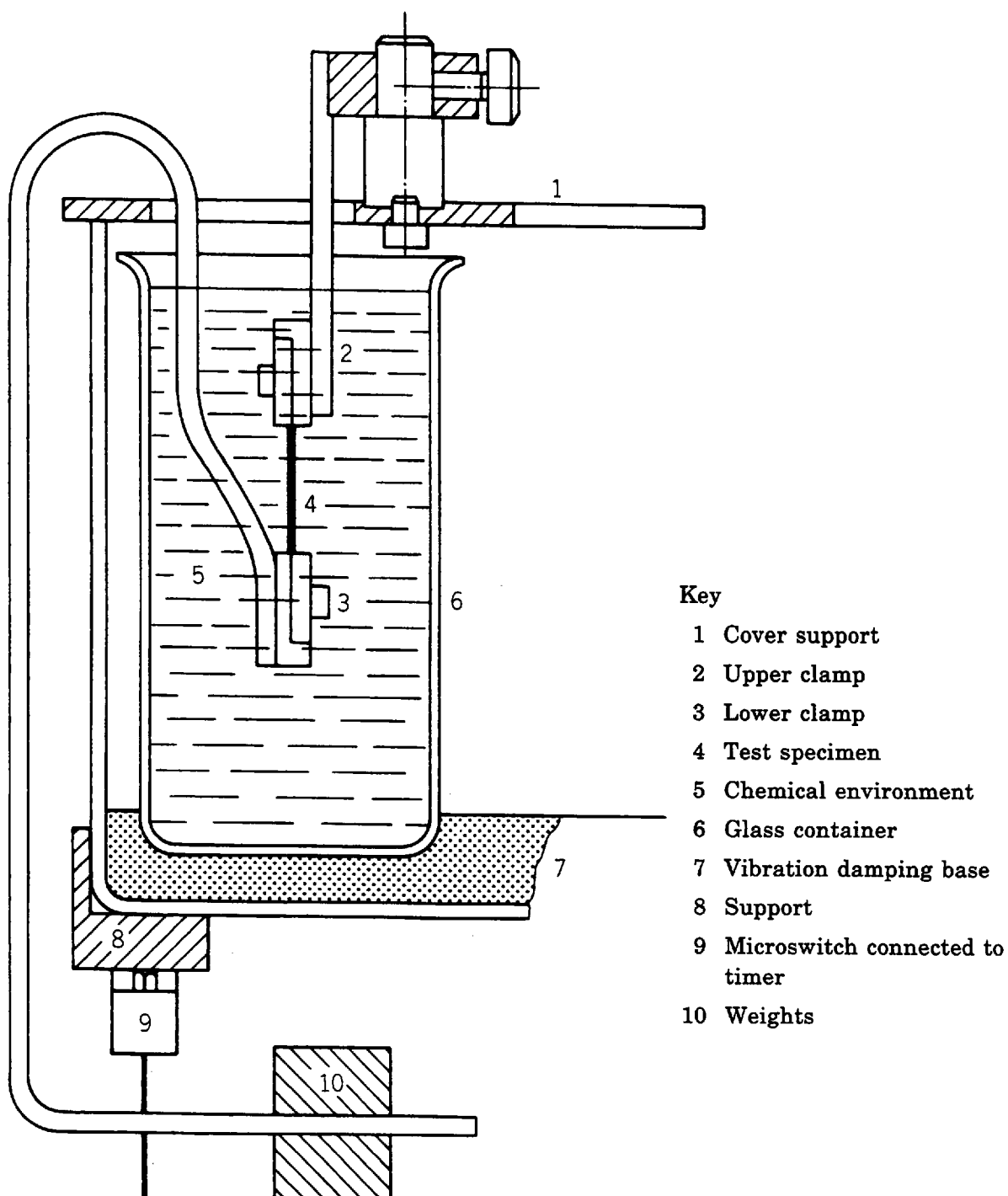


Fig. 1 One type of apparatus for measuring fracture under constant stress