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Solar water heaters — Elastomeric materials for absorbers, connecting pipes and fittings — Method of assessment

Chauffe-eau solaires — Matériaux en élastomères pour absorbeurs, raccords et tuyaux — Méthode d'évaluation

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Foreword

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

International Standard ISO 9808 was prepared by Technical Committee ISO/TC 180, *Solar energy*.

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Solar water heaters — Elastomeric materials for absorbers, connecting pipes and fittings — Method of assessment

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1 Scope

This International Standard specifies a means of assessing elastomeric materials for use in the manufacture of absorbers, connecting piping and fittings for use in solar water heaters.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 34-1:—[1], *Rubber, vulcanized — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces.*

ISO 37:1977, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 48:1979, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD).*

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471:1983, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 1402:1984, *Rubber and plastics hoses and hose assemblies — Hydrostatic testing.*

ISO 1431-1:1989, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static strain test.*

ISO 1653:1975, *Vulcanized rubbers — Determination of compression set under constant deflection at low temperatures.*

ISO 1817:1985, *Rubber, vulcanized — Determination of the effect of liquids.*

ISO 4661-1:1986, *Rubber, vulcanized — Preparation of samples and test pieces — Part 1: Physical tests.*

ISO 7326:1984, *Rubber and plastics hoses — Assessment of ozone resistance under static conditions.*

3 Test pieces

The test pieces shall be as specified in the relevant test method.

The test pieces required for the tests specified in 4.3 and 4.7 should preferably be cut from samples of the finished product. Where this is not practicable test pieces may be cut from sheet material.

If it is required to separate a section of fluid passage from a finished absorber, the test piece shall be prepared in accordance with ISO 4661-1.

4 Qualification tests

4.1 Hardness

Hardness shall preferably be tested using the normal test set out in ISO 48.

The test may also be performed using the micro-test set out in ISO 48, on a test piece of thickness not less than 2 mm, but it should be noted that the two methods may give a different result on a particular

1) To be published.

test piece. In case of doubt, the results of the normal test shall be considered as definitive.

4.2 Compression set at low temperature

Compression set shall be tested in accordance with ISO 1653, using a small-type test piece maintained under a compression of 25 % for 24 h at a temperature of −40 °C.

4.3 Resistance to ozone

Resistance to ozone shall be tested in accordance with ISO 1431-1, procedure A, for test pieces other than hose or absorber fluid passages.

The test period shall be 7 days, and the ozone concentration shall be 200 pphm ± 20 pphm. The temperature of test shall be 40 °C ± 2 °C and the elongation of the test piece shall be 20 %.

For hose or absorber fluid passages, the test shall be carried out in accordance with ISO 7326.

4.4 Tear strength

Tear strength shall be tested in accordance with ISO 34-1, method C, using a crescent test piece.

4.5 Tensile strength

Tensile strength shall be tested in accordance with ISO 37, using a type 2 dumb-bell test piece.

4.6 Elongation at break

Elongation at break shall be tested in accordance with ISO 37, using a type 2 dumb-bell test piece.

4.7 Burst pressure

Burst pressure of hose or absorber fluid passages shall be tested in accordance with the relevant requirements of ISO 1402. The test piece shall be at least 450 mm long for items of internal diameter 76 mm or smaller, and at least 600 mm long for larger items.

NOTE 1 Burst pressure tests carried out at ambient temperature cannot be taken as indicative of the burst pressure at elevated temperatures.

5 Ageing tests

5.1 Artificial ageing

The test pieces required for the tests specified in 5.2 shall be subjected to an ageing test in an air-oven in accordance with ISO 188, for a period of 14 days at a test temperature related to the maximum service temperature as listed in table 1.

Upon being removed from the oven, the test pieces shall be conditioned for 24 h in a standard atmosphere at 23 °C and 50 % humidity, in accordance with ISO 471.

Table 1 — Test temperature for ageing tests

Type[1]	Test temperature[2] °C	Maximum service temperature °C
B	100	70
C	125	100
D	150	125
E	175	150
F	200	175
G	225	200
H	250	225

1) Type (heat resistance) classification in accordance with ISO 4632-1:1982, *Rubber, vulcanized — Classification — Part 1: Description of the classification system.*

2) The test temperatures are one step higher than the maximum service temperature to which the material may be subjected.

5.2 Properties after ageing

The following properties of the material shall be determined upon completion of the artificial ageing:

a) hardness, in accordance with 4.1;

b) resistance to ozone, in accordance with 4.3;

c) tensile strength, in accordance with 4.5;

d) elongation at break, in accordance with 4.6;

e) burst pressure, in accordance with 4.7.

6 Immersion in heat-exchange fluids

6.1 Immersion in propylene glycol

If the material is to be used in conjunction with propylene glycol, the test pieces required for the tests specified in 6.3 shall be immersed in propylene glycol at the appropriate test temperature given in table 1 for a period of 7 days in accordance with ISO 1817:1985, clause 11.

6.2 Immersion in other heat-exchange fluids

If the material is to be used in conjunction with a heat-exchange fluid other than propylene glycol, the immersion shall be performed using the heat-exchange fluid proposed. The test pieces required for the tests specified in 6.3 shall be immersed in the heat-exchange fluid at the appropriate test temper-

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ature given in table 1 for a period of 7 days in accordance with ISO 1817:1985, clause 11.

6.3 Properties after immersion

The following properties of the material shall be determined upon completion of the immersion specified in 6.1 or, if appropriate, 6.2:

a) hardness, in accordance with 4.1;

b) tensile strength, in accordance with 4.5;

c) elongation at break, in accordance with 4.6;

d) burst pressure, in accordance with 4.7.

7 Test report

The results of the tests described in clauses 4, 5 and 6 shall be presented as shown in table 2.

Table 2 — Test report

Property of material	Results[1]			
	Qualification test (clause 4)	After ageing (clause 5)	After immersion in propylene glycol (clause 6)	After immersion in other fluid (to be specified) (clause 6)
Hardness [IRHD[2]]				
Tensile strength (MPa)				
Elongation at break (%)				
Burst pressure of hose (MPa)				
Compression set at low temperature (%)		NR	NR	NR
Resistance to ozone (condition of test piece and any cracking)			NR	NR
Tear strength — crescent test piece (kN/m)		NR	NR	NR

1) NR, not required.

2) IRHD, International Rubber Hardness Degrees.

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