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Draft Indian Standard

**SAFETY RELIEF DEVICE FOR PRESSURE COOKERS —
SPECIFICATION**

ICS 98.540.50

Utensils, Cutlery and Domestic Hardware
Sectional Committee, MED 33

Last date for receipt of
comments is **21 June 2024**

FOREWORD

(Formal clause will be added later)

A safety relief device for pressure cookers operates on a mechanism that automatically releases excess pressure to prevent explosions. It typically consists of a valve or regulator that opens when pressure surpasses safe levels, allowing steam to escape.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (second revision)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1 SCOPE

This standard covers the requirements for safety relief device of destructive-fusible type and metal safety device-repeatable type: gasket release device, spring operated release device, and silicone device, with and without pintle.

NOTE — The gasket release system, which is a resettable safety device, if used shall conform to IS 2347/IS 17870.

2 REFERENCES

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards

are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

3.1 Safety Relief Device — Safety relief device is a device, which functions to prevent the pressure cooker from exceeding the safety pressure/temperature limit.

3.2 Safety Relief Device-Destructive/Fusible Type — The fusible type safety relief device is destructible in nature which is temperature and pressure responsive device filled with fusible alloy. The destructible type of safety relief device shall consist of an ejectable disc or fusible safety pellet.

3.3 Safety Relief Device-Spring Loaded/Repeatable Type — The spring-loaded or repeatable type safety relief device is re-usable in nature which is pressure responsive device fitted with spring loaded mechanism. Repeatable type is a reusable device.

- a) Spring loaded device;
- b) Silicone housing with slit; and
- c) Silicone housing with a pintle or only a housing.

3.4 Pressure Cooker — A closed domestic pressure-cooking vessel for use with external/integral heat source and capable of maintaining nominal cooking steam pressure over 0.1 kgf/cm² and up to 1.0 kgf/cm² gauge nominal.

3.5 Pressure Regulating Device — Device which regulates the pressure inside the pressure cooker during its use.

3.6 Pressure Gauge — Brass or stainless-steel mechanical, bourdon tube pressure gauge which displays the pressure inside the pressure cooker.

3.7 Nominal Cooking Pressure — The pressure at which the cooker operates, within a limit of ± 20 percent of the declared nominal cooking steam pressure.

3.8 Gross Nominal Capacity of the Cooker — The full water capacity of the vessel, that is, total internal volume of the cooker with its lid in position.

NOTE — For any clarification on the above definitions, please *see* IS 2347 or IS 17870.

4 MATERIALS

4.1 Aluminium and Its Alloys

Designations 19000/19500/64430 as per IS 733 or grade 1900 and grade 5230 as per IS 617.

4.2 Stainless Steel and Its Alloys

Designation X04Cr18Ni10/X02Cr18Ni11/X07Cr18Ni9 as per IS 6257 or X02Cr19Ni10/X10Cr17Mn6Ni4N as per IS 6603 or properties conforming to Annex Q of IS 2347.

4.3 Brass and Its Alloys

Brass as per IS 319 (nickel chrome plated complying to service condition 2 as per IS 1068).

4.4 Rubber Parts

4.4.1 The gasket shall comply to IS 7466.

4.4.2 If rubber parts other than gasket is used, it shall comply with the requirements of IS 7466. The hardness and elongation is to be agreed between the purchaser and supplier.

4.5 Fusible Alloy Pellet

The chemical composition of the fusible plug shall be such that it melts/ejects before a gauge pressure greater than 3 kgf/cm² (300 kN/m² approximately) is reached. Maximum lead content shall not exceed 0.05 percent by mass in fusible plug pellet, when determined by any standard instrumental method or chemical method. The fusible alloy raw materials shall not contain any volatile organic compounds, when tested according to the method prescribed in IS 101 (Part 2/Sec 2).

NOTE — Supplier certificate is also acceptable.

The fusible alloy raw material shall not contain more than 0.1 percent as metal of any toxic metals such as cadmium, mercury, and chromium (VI).

NOTE — Supplier certificate is also acceptable. The fusible alloy shall pass the requirements as given in Annex B.

4.6 Spring

The spring shall be made of stainless-steel wire as per IS 4454 (part 4).

NOTES — With reference to 4.

- 1 Only chemical composition of aluminium alloy and stainless steel needs to be complied with.
- 2 Supplier certificate is acceptable for rubber parts.
- 3 Supplier certificate is acceptable for electroplated and hard anodized coated parts.
- 4 Supplier certificate for spring is acceptable.

5 CONSTRUCTION

In the safety pressure relief device, the orifice or orifices, disclosed when the device functions, shall be of a form not susceptible to clogging by the issue of food or other contents of the cooker. The safety pressure relief device under its normal conditions of use, shall not be susceptible to corrosion or dimensional changes or clogging which might interfere with its satisfactory functioning.

5.1 Safety Relief Device-Destructive/Fusible Type

5.1.1 The fusible type safety relief device may be constructed from some of these following parts:

- a) Carrier/housing;
- b) Fusible alloy/pellet/disc;
- c) Nut; and
- d) Washer and/or O-ring.

5.1.2 The passage from the interior of the vessel giving access through the valve to the atmosphere shall be so arranged that it is not liable to clog while the cooking is in progress/actuation of valve.

5.1.2.1 For domestic pressure cooker, the minimum internal diameter (through passage) shall be 3 mm.

5.1.2.2 For commercial pressure cooker, the minimum internal diameter (through passage) shall be 8 mm.

5.2 Safety Relief Device-Spring Loaded/Repeatable Type

5.2.1 The repeatable type safety relief device may be constructed from some of these following parts:

- a) Valve and seat;
- b) Spring;
- c) Nut; and
- d) Washer and/or O-ring.

5.2.2 The passage from the interior of the vessel giving access through the valve to the atmosphere shall be so arranged that it is not liable to clog while the cooking is in progress/actuation of valve.

5.2.2.1 For domestic pressure cooker, the minimum internal diameter (through passage) shall be 3 mm.

5.2.2.2 For commercial pressure cooker, the minimum internal diameter (through passage) shall be 8 mm.

5.3 Safety Relief Device-Repeatable Type Polymer Safety Relief Device

5.3.1 The repeatable type of polymer safety relief device may be constructed from silicone disc with slit.

5.3.2 The passage from the interior of the vessel giving access through the valve to the atmosphere shall be so arranged that it is not liable to clog while the cooking is in progress/actuation of valve.

5.3.2.1 For domestic pressure cooker, the steam release area should be more than area of 3 mm diameter hole (7 mm² area).

5.3.2.2 For commercial pressure cooker, the steam release area should be more than area of 8 mm diameter hole (50 mm² area).

5.4 Safety Relief Device-Repeatable Type Polymer Safety Relief Device

5.4.1 The repeatable type polymer safety relief device may be constructed from some of these parts:

- a) Food grade silicone housing-disc; and
- b) Food grade plastic or metal pintle or only a silicone housing.

5.4.2 The passage from the interior of the vessel giving access through the valve to the atmosphere shall be so arranged that it is not liable to clog while the cooking is in progress/actuation of valve.

5.4.2.1 For domestic pressure cooker, the steam release area should be more than area of 3 mm diameter hole (7 mm² area).

5.4.2.2 For commercial pressure cooker, the steam release area should be more than area of 8 mm diameter hole (50 mm² area).

NOTE — The physical properties of the silicone housing-disc may be as per the design of the valve and shall be defined by the manufacturer.

5.4.3 Safety Relief Device — Gasket Release System

Gasket release system consists mainly the food grade rubber gasket.

6 WORKMANSHIP AND FINISH

6.1 Coating

If any part is coated, the type of coating shall comply with their respective IS standards as mentioned below:

- a) Nickel chrome plated of brass: complying to service condition 2 as per IS 1068; and
- b) Hard anodizing of aluminium as per IS 6057.

NOTES

- 1 There shall be no leakage from the safety device in normal usage.
- 2 When the safety valve operates, the ingredients inside the cooker or steam shall not impinge on the consumer/user.

6.2 The device shall be defect free when visually inspected with naked eye or corrected vision for no surface defects, burrs, cracks, blow holes, blisters, chip offs, short fills, sharp edges, scratches, the pellet shall be embedded properly and finished smooth. The threads shall be smooth with no cuts. The nut shall move smoothly over the threads. In case an O-ring has been used, there shall be no visual defects, cuts, flash, etc.

7 TESTS

7.1 Sampling Plan: In every lot/batch, minimum 10 nos or 0.10 percent of the lot/batch size whichever is higher, shall be taken as sample size.

NOTES

- 1 The results of all the samples shall be within a range of ± 20 percent of the mean value subject to the limits prescribed in IS 2347/IS 17870.
- 2 For safety purpose, this test may be performed inside cage.

7.2 Test Procedure: (The test prescribed in IS 2347/IS 17870 shall supersede this test)

The cooker shall be fitted with a calibrated pressure gauge in place of the pressure regulating device/in the lid. It shall be filled with water equal in quantity to 1/16 of the internal volume of the vessel and placed in still air on a burner such as a pressure stove (*see* IS 1342) or LPG stove (*see* IS 4246). In case of electric pressure cookers, the heating has to be switched on to start this test. Before starting the test, it shall be ensured that the steady stream of steam starts coming out of the vent pipe of the cooker, minimum for 2 min.

NOTES

- 1 For safety purposes, this test may be performed inside cage.
- 2 In case more than one safety relief device is provided in the pressure cooker, each device is to be tested separately by blocking the other.

7.3 Performance: To be tested as per 7.2.

NOTES

- 1 The results of all the samples shall be within a range of ± 20 percent of the mean value subject to the limits prescribed in IS 2347/IS 17870.
- 2 The performance criteria prescribed in IS 2347/IS 17870 shall supersede the criteria given in 7.3.1, 7.3.2 and 7.3.3 in case of any revisions.

7.3.1 Destructible Type (see 5.1)

The temperature responsive device shall release before a gauge pressure not greater than 3 kgf/cm² (300 KN/m² approximately) is reached.

7.3.2 Resettable Type (see 5.2, 5.3, 5.4)

The safety relief device shall be deemed to have passed the test if it functions when the steam reaches a gauge pressure between 1.25 and 3 times the greatest nominal cooking pressure.

7.3.3 Gasket Release System (see 5.5)

The device shall be deemed to have passed the test if it functions when the steam reaches a gauge pressure between 1.25 and 2.5 times the greatest nominal cooking pressure.

NOTE — Type test for performance: The resettable safety device shall be tested 25 times (criteria 7.3.2/7.3.3 respectably).

7.3 Test for Spring

The spring shall be compressed completely and released 365 times consecutively. After the test, the spring shall not suffer a permanent set of more than 3 percent in length (This could be a type test).

7.4 Ageing Test : Type Test

7.5.1 Destructive Type : (see 5.1) temperature responsive safety relief device: shall comply with the tests given in Annex B.

7.5.2 Resettable Type : (see 5.2) spring loaded pressure safety relief device: shall comply with the tests given in Annex C.

7.5.3 Resettable Type : (see 5.3) silicone disc with slit- pressure safety relief device: shall comply with the tests given in Annex D.

7.5.4 Resettable Type : (see 5.4) silicone housing with pintle-pressure safety relief device: shall comply with tests given in Annex E.

NOTES

1 This type test for domestic pressure cooker shall be done group wise:

- a. Group 1- up to 6.5 litre capacity.
- b. Group 2 – 7 to 15.5 litre capacity.
- c. Group 3 – 16 to 24 litre capacity.

2 This type test for commercial pressure cooker shall be done group wise:

- a. Group 1 – up to 50 litre capacity.
- b. Group 2- above 50 and up to 100 litre capacity.

8 MARKING

8.1 Each safety relief device shall be marked with:

- a) Brand name/logo; and
- b) Batch number.

The packaging box shall be marked with:

- a) Brand name;
- b) CML/number;
- c) ISI mark;
- d) Batch number; and
- e) Type of cooker (domestic or commercial).

8.2 BIS Certification Marking

The product may also be marked with Standard Mark.

8.2.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

9 PACKAGING

The packaging requirements shall be as required between the manufacturer and purchaser.

10 INSTRUCTIONS ON MANUAL/PACKAGING

- a) Always use genuine and original spares for replacement;
- b) Avoid interchanging the safety components between brands and different sizes of the same brand;
- c) Replacement-It is recommended that the safety relief device should be replaced on or before 12 months from the first use. Where applicable, the manufacturer can recommend shelf life of the safety relief device;
- d) Complete address of manufacturer;
- e) CML number;
- f) Batch number;
- g) Must replace by month; and
- h) Suitable for sizes/model.

ANNEX A
(Clause 2)

LIST OF REFFERED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>
IS 101(Part 2/Sec 2) : 1986	Methods of sampling and test for paints, varnishes and related products: Part 2 Test on liquid paints (chemical examination): Sec 2 Volatile matter (<i>third revision</i>)
IS 319 : 2007	Free cutting brass bars, rods and section — Specification (<i>fifth revision</i>)
IS 617 : 1994	Cast aluminium and its alloys — Ingots and castings for general engineering purposes — Specification (<i>third revision</i>)
IS 733 : 1983	Specification for wrought aluminium and aluminium alloy bars, rods and sections (for general engineering purposes) (<i>third revision</i>)
IS 1068 : 1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium — Specification (<i>third revision</i>)
IS 1342 : 2019	Oil Pressure Stoves — Specification (<i>seventh revision</i>)
IS 2347 : 2023	Domestic pressure cooker — Specification (<i>seventh revision</i>)
IS 4454 (Part 4) : 2001	Steel wire for mechanical springs — Specification: Part 4 Stainless steel wire (<i>second revision</i>)
IS 6057 : 1988	Specification for Hard Anodic Coatings on Aluminium and Aluminium Alloys (<i>first revision</i>)
IS 6257 : 1982	Specification for shell end mills (<i>first revision</i>)
IS 7466 : 2023	Rubber gaskets for pressure cookers — Specification (<i>second revision</i>)
IS 17870 : 2022	Commercial pressure cooker — Specification

ANNEX B
(Clause 7.5.1)

**DESTRUCTIVE TYPE: TEMPERATURE RESPONSIVE
SAFETY RELIEF DEVICE**

B-1 MELTING TEMPERATURE OF ALLOY (test done on the raw material of the alloy before it is put into the housing using various processes).

B-1.1 Test Equipment/Rig/Measuring Instruments:

- a) Gas stove;
- b) Ceramic crucible;
- c) Calibrated thermometer;
- d) Glass rod; and
- e) Tongs.

B-1.1.2 Testing Procedure:

- a) Take 25 cm length fusible alloy rod (approximately 35 g). Cut it in to pieces and put in the ceramic crucible;
- b) Place the ceramic crucible with the fusible alloy on the gas burner and melt the fusible alloy by continuously stirring with glass rod;
- c) Once the fusible alloy is completely melted. Switch off the stove and continuously stir the molten fusible alloy;
- d) When the molten fusible alloy starts to resolidify. Dip the thermometer and check the temperature once the fusible alloy reaches the solid state; and
- e) Pass criteria: The measured temperature shall be between 125 °C to 130 °C.

B-2 LIFE TEST (TYPE TEST):

NOTE — For safety purpose, this test may be performed inside cage.

B-2.1 General

The test consists of exposing the safety device to actual service conditions and observing effects of the test on the safety device.

B-2.1.1 Apparatus

B-2.1.2 Pressure Cooker

For which the safety device has been designed.

B-2.3 Procedure

B-2.3.1 Fill up the pressure cooker to half its height with water. Close the lid properly, ensuring that the safety device fits properly on the cooker lid. Put the cooker on the burner or hot plate taking precaution to put the safety counterweight as soon as the steam is generated. Continue the operation for a period of 180 h, stopping the operation at periodic intervals of 4 h, replenishing water to maintain

water level if need be in the cooker. During this operation of 180 h, no leakage of steam shall be observed from the safety device. On completion of 180 h, test the safety device as per **B-2.3.2**.

NOTE — After each 4 h of testing, water and pressure cooker either be changed after cooling down to the normal ambient temp then start testing for the next 4 h and so on until 180 h of testing.

B-2.3.2 *Test as per 2347 : Test for Temperature Responsive Safety Relief Device*

The cooker, fitted with a calibrated pressure gauge, with all relief device, sealed and containing a quantity of water equal to 1/16 part of the internal volume of the cooker, shall be placed in still air on a burner such as a pressure stove (*see IS 1342*) or LPG stove (*see IS 4246*). In case of electric pressure cooker, after disabling the pressure control devices and other safety relief devices, the integral heating has to be switched on to start this test. Before sealing the cooker, it shall be ensured that the steam starts coming out of vent pipe of the cooker steadily. The temperature responsive device shall release before a gauge pressure not greater than 3 kgf/cm² (300 kN/m² approximately) is reached.

ANNEX C
(Clause 7.5.2)

**RESETTABLE TYPE: SPRING LOADED PRESSURE
SAFETY RELIEF DEVICE**

C-1 TEST FOR SPRING:

The spring shall be compressed completely and released 365 times consecutively. After the test, the spring shall not suffer a permanent set of more than 3 percent in length.

C-2 LIFE TEST (TYPE TEST)

NOTE — For safety purpose, this test may be performed inside cage.

C-2.1 General:

The test consists of exposing the safety device to actual service conditions and observing effects of the test on the safety device.

C-2.1.2 Pressure Cooker

For which the safety device has been designed.

C-2.3 Procedure

C-2.3.1 Fill up the pressure cooker to two thirds of the capacity with water. Close the lid properly, ensuring that the safety device fits properly on the cooker lid and block all the other safety devices. Put the cooker on the burner. Continue the operation for a period of 60 h, stopping the operation at approximately periodic intervals of 2 h, replenishing water to maintain water level if need be in the cooker. During this operation of 60 h, the safety relief device should be operating as and when the pressure in the cookers raises. On completion of 60 h, test the Safety device as per **C-2.3.2** .

NOTE — After each 2 h of testing, water and pressure cooker either be changed after cooling down to the normal ambient temp then start testing for the next 2 h and so on until 60 h of testing. In case the water level is found to be depleting faster, reduce the interval from 2 h to 1 and 1/2 h and so forth, to ensure water is always there in the cooker.

C-2.3.2 Test as per IS 2347: Test for Pressure Safety Relief Device

The cooker, fitted with a calibrated pressure gauge, with all relief device, sealed and containing a quantity of water equal to 1/16 part of the internal volume of the cooker, shall be placed in still air on a burner such as a pressure stove (*see* IS 1342) or LPG stove (*see* IS 4246). In the case of electric pressure cooker, after disabling the pressure control devices and other safety relief devices, the integral heating has to be switched on to start this test. Before sealing the cooker, it shall be ensured that the steam starts coming out of vent pipe of the cooker steadily. The pressure relief device shall release between a gauge pressure of 1.25 kgf/cm² to 2.5 kgf/cm².

ANNEX D
(Clause 7.5.3)

**RESETTABLE TYPE: SILICONE DISC WITH SLIT-PRESSURE
SAFETY RELIEF DEVICE**

D-1 LIFE TEST (Type test)

NOTE — For safety purpose, this test may be performed inside cage.

D-1.1 General

The test consists of exposing the safety device to actual service conditions and observing effects of the test on the safety device

D-1.1.2 Pressure Cooker: for which the safety device has been designed.

D-1.2 Procedure

D-1.2.1 Fill up the pressure cooker to two third capacity with water. Close the lid properly, ensuring that the safety device fits properly on the cooker lid. Block all the other safety devices. Put the cooker on the burner or hot plate. Continue the operation for a period of 60 h, stopping the operation at approximately periodic intervals of 2 h, replenishing water to maintain water level if need be in the cooker. During this operation of 60 h, the safety relief device would be operating as and when the pressure in the cookers rises. On completion of 60 h, test the safety device as per **D-1.2.2**.

NOTE — After each 2 h of testing, water and pressure cooker either be changed after cooling down to the normal ambient temp then start testing for the next 2 h and so on until 60 h of testing. In case the water level is found to be depleting faster, reduce the interval from 2 h to 1 and 1/2 h and so forth, to ensure water is always there in the cooker.

D-1.2.2 Test as per IS 2347: Test for Pressure Safety Relief Device

The cooker, fitted with a calibrated pressure gauge, with all relief device, sealed and containing a quantity of water equal to 1/16 part of the internal volume of the cooker, shall be placed in still air on a burner such as a pressure stove (*see* IS 1342) or LPG stove (*see* IS 4246). In case of electric pressure cooker, after disabling the pressure control devices and other safety relief devices, the integral heating has to be switched on to start this test. Before sealing the cooker, it shall be ensured that the steam starts coming out of vent pipe of the cooker steadily. The pressure relief device shall release between a gauge pressure of 1.25 kgf/cm² to 2.5 kgf/cm².

ANNEX E
(Clause 7.5.4)

**RESETTABLE TYPE: SILICONE HOUSING WITH PINTLE
— PRESSURE SAFETY RELIEF DEVICE**

E-1 LIFE TEST (Type test)

NOTE — For safety purpose, this test may be performed inside cage.

E-1.1 General

The test consists of exposing the safety device to actual service conditions and observing effects of the test on the safety device.

E-1.1.2 Pressure Cooker

For which the safety device has been designed.

E-1.2 Procedure

E-1.2.1 Fill up the pressure cooker to two third capacity with water. Close the lid properly, ensuring that the safety device fits properly on the cooker lid. Block all the other safety devices. Put the cooker on the burner or hot plate. Continue the operation for a period of 60 h, stopping the operation at approximately periodic intervals of 2 h, replenishing water to maintain water level if need be in the cooker. During this operation of 60 h, the safety relief device would be operating as and when the pressure in the cookers rises. On completion of 60 h, test the safety device as per **E-1.2.2**. The safety relief device shall be reset each time it operates.

NOTE — After each 2 h of testing, water and pressure cooker either be changed after cooling down to the normal ambient temp then start testing for the next 2 h and so on until 60 h of testing. In case the water level is found to be depleting faster, reduce the interval from 2 h to 1 & 1/2 h and so forth, to ensure water is always there in the cooker.

E-1.2.2 Test: as per IS 2347 : Test for Pressure Safety Relief Device

The cooker, fitted with a calibrated pressure gauge, with all relief device, sealed and containing a quantity of water equal to 1/16 part of the internal volume of the cooker, shall be placed in still air on a burner such as a pressure stove (*see* IS 1342) or LPG stove (*see* IS 4246). In case of electric pressure cooker, after disabling the pressure control devices and other safety relief devices, the integral heating has to be switched on to start this test. Before sealing the cooker, it shall be ensured that the steam starts coming out of vent pipe of the cooker steadily. The pressure relief device shall release between a gauge pressure of 1.25 kgf/cm² to 2.5 kgf/cm².