भारतीय मानक
Indian Standard

IS 2405 (Part 3) : 2023

औद्योगिक छलनियाँ — विशिष्टि

भाग 3 छिद्रित प्लेट्स की छलनियाँ

Industrial Sieves — Specification

Part 3 Perforated Plates Sieves

ICS 19.120

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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July 2023 **Price Group 7**

Sieves, Sieving and Other Sizing Methods Sectional Committee, CED 55

FOREWORD

This Indian Standard (Part 3) was adopted by the Bureau of Indian Standards, after the draft finalized by the Sieves, Sieving and Other Sizing Methods Sectional Committee had been approved by the Civil Engineering Division Council.

Industrial sieves are used in different activities in various industries for compliance grade screening purposes including for separation or grading of particles. According to the nature of the process and required percentage opening area, industrial sieves can be manufactured in the form of woven wire cloth, wire sieves or perforated plate sieves. A required percentage opening can be achieved with the various combinations of wire diameter/plates thickness, type of weave/shape of opening and pitch (in plates). The materials of wire and plates can be selected as per the process requirements.

The sizes within each series of sieve aperture follow a geometric progression. Therefore, each size of a series differs from the successive size by a constant percentage. Apart from the omission of a few unusual values in the range of the very small sizes, the ratios of the successive sizes are as follows:

Series from IS 1076 (*Part* 1)	*Ratio*
R 10	1.25
R 20	1.12
R 40	1.06

This standard was first published in 1963, and revised in 1980 with a view to covering the requirements of wire cloth and perforated plates having different shapes of apertures in the sizes most commonly used in a number of industries. This revision of the standard is brought out in three parts:

Part 1 Woven wire cloth sieves
Part 2 Wire sieves
Part 3 Perforated plate sieves

This standard (Part 3) covers requirements of industrial screen manufactured by perforation in plate. The nominal sizes of openings specified in this standard are taken from the R 10, R 20 and R 40 series of preferred numbers in accordance with IS 1076 (Part 1) : 1985/ISO 3 : 1973 ‘Preferred numbers: Part 1 Series of preferred numbers’ and from the R 10, R 20 and R 40 series of rounded values in accordance with IS 1076 (Part 3) : 1985/ISO 497 : 1973 ‘Preferred numbers: Part 3 Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers (*second revision*)’.

In this standard, the following provisions have been incorporated:

a) Material requirements for the sieve media and frame have been improved and permit various new materials available;
b) The number of aperture sizes were considerably increased to align with the current international practices;
c) Formula to calculate the open screening area has been incorporated;
d) Formula to calculate the average and individual size of hole and pitch has been incorporated;
e) A typical example for calculation of tolerance on average size, nominal pitch with respect to open area has been given in Annex A; and
f) Separate clause has been added for the information to be supplied by the purchaser.

(*Continued on third cover*)

Indian Standard

INDUSTRIAL SIEVES — SPECIFICATION

PART 3 PERFORATED PLATES SIEVES

1 SCOPE

This standard (Part 3) lays down the requirements regarding material, dimensions, construction and finish of industrial perforated plate sieves. It applies to industrial perforated plate sieve with nominal aperture sizes from 1 mm up to 125 mm for round holes and 4 mm up to 125 mm for square holes.

2 REFERENCES

The standards given below 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 edition of these standards:

IS No.	*Title*
IS 1076 (Part 1) : 1985/ ISO 3 : 1973	Preferred numbers: Part 1 Series of preferred numbers (*second revision*)
IS 5742 : 2022	Glossary of terms relating to industrial screen and screening (*first revision*)

3 TERMS AND DEFINITIONS

For the purpose of this standard, the definitions given in IS 5742 and the definition given below shall apply.

3.1 Bridge Width or Bar — Distance between the nearest edges of two adjacent holes in a perforated plate.

3.2 Coil — Flat rolled sheet for the manufacture of perforated metal plate, the edges of which are allowed to deform freely during rolling and which immediately after the final rolling pass is wound into regular superimposed laps.

3.3 Feed Direction — Direction in which a plate or sheet was fed through the perforating press.

3.4 Hole Size or Aperture Size — Diameter of a round hole or distance between opposite sides of a square hole of a perforated metal plate.

3.5 Margin — Distance between the outside edges of the outside rows of holes and the edges of a perforated plate.

3.6 Percentage Open Area — Ratio, expressed as a percentage, of the total area of the holes to the total area of the perforated part of the plate (excluding any non-perforated part).

3.7 Perforated Plate — Sieving surface consisting of a plate with uniform holes in symmetrical arrangement. The holes may be square, slotted, circular or of other regular geometrical shape.

3.8 Pitch (*P*) — The distance between the centres of adjacent round holes in a perforated plate, or between the lines of centres of square holes.

3.9 Plate — Flat rolled material for the manufacture of perforated metal plate, 3 mm to 12.5 mm thick, the edges of which are allowed to deform freely during rolling, supplied in flat form and generally in rectangular shape, but also in any other shape according to a design sketch.

3.10 Plate Thickness — Thickness of the plate before perforation.

3.11 Punch Side — Surface of a perforated plate which the punch entered.

3.12 Roller Levelling — Cold mechanical operation on a perforated metal plate to promote flattening.

3.13 Sheet — Flat rolled material for the manufacture of perforated metal plate, less than 3 mm thick and the edges of which are allowed to deform freely during rolling, supplied in flat form and generally in rectangular shape, but also in any other shape according to a design sketch.

4 MANUFACTURING AND CONSTRUCTION

4.1 The plates used in the manufacture of the perforated plate sieve shall be free from scale, rust, etc.

4.2 Any suitable material such as steel, bronze, brass, stainless steel, aluminium and synthetic material may be used as per relevant Indian Standard. The selection of material is done in such a way that sieve material should be compatible with the process and the material to be sieved, and should not be detrimental in achieving desired sieving quality.

The following factors are considered during the selection of perforated plate screen material:

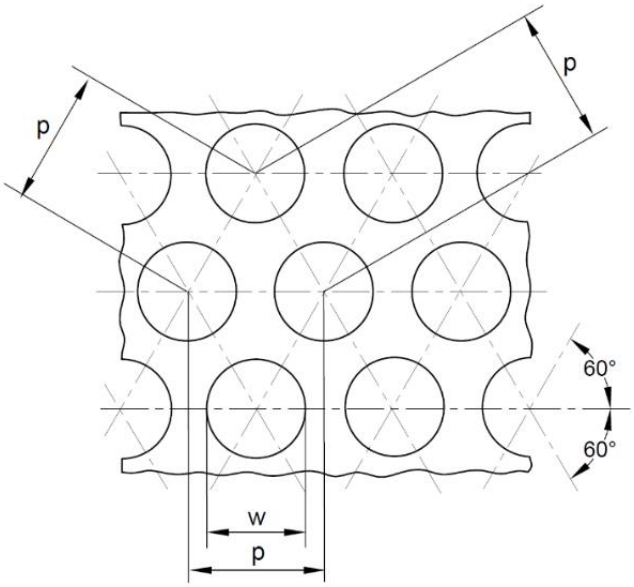
a) The final application of the perforated plate sieve, for example, resistance to environmental corrosion, compatibility with food products, etc; and
b) Further processing, for example, suitability for shaping, welding, and surface treatment.

4.3 Arrangement of Holes

Following arrangements of holes shall be used for the manufacturing of perforated plate sieve (*see* Fig. 1 to Fig. 3).

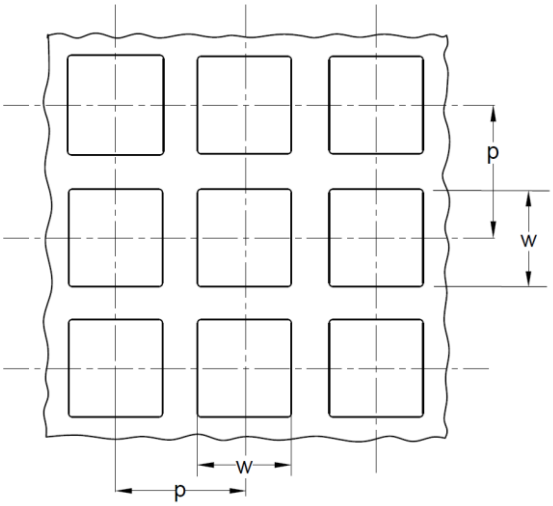
a) Round holes in a 60° staggered arrangement (T-arrangement);
b) Square holes in line arrangement (U-arrangement); and
c) Square holes in staggered at half the pitch arrangement (Z-arrangement).

4.4 Many combinations are possible for manufacturing of perforated plates sieve for a size of hole. The selection should be made from those combinations which suit the products and screening methods. A calculation of tolerance on average size, nominal pitch with respect to open area and tolerance on average pitch is given in Annex A.



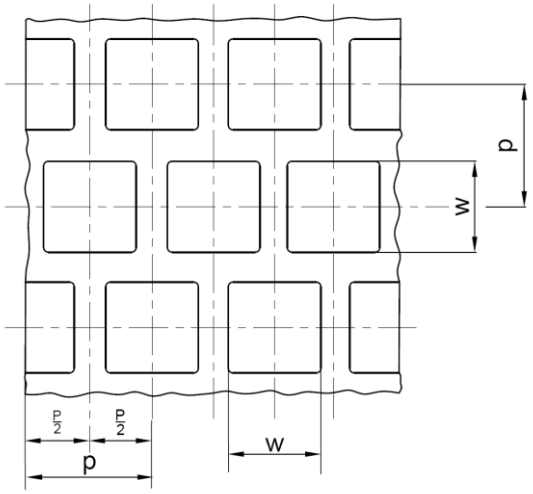
[Open area = 0.9 $(w/p)^2$]

FIG. 1 ROUND HOLES IN A 60° STAGGERED ARRANGEMENT (T-ARRANGEMENT)



[Open area = $(w/p)^2$]

FIG. 2 SQUARE HOLES IN LINE ARRANGEMENT (U-ARRANGEMENT)



[Open area = $(w/p)^2$]

FIG. 3 SQUARE HOLES IN STAGGERED AT HALF THE PITCH ARRANGEMENT (Z-ARRANGEMENT)

5 REQUIREMENTS

5.1 Size of Hole (w)

The size of hole of round or square holes in industrial perforated plates sieve shall be as per Annex B. It is recommended that the sizes from R 10 series be used whenever possible, but if a smaller size is required it should be drawn from R 20 or R 40 as per Annex B. Testing shall be done as per Annex C.

5.1.1 *Tolerance on Average Size of Hole*

a) *For plate thickness greater than equal to* 3 *mm* — The average measured size of hole shall not deviate from the nominal value by more than the value given by the formula:

$$\Delta w = \pm \frac{w\,(4.5 - \lg w)}{100} \qquad \ldots (1)$$

where

Δw and w are given in millimetres.

b) *For plate thickness less than* 3 *mm* — The average measured size of hole shall not deviate from the nominal size, w, by more than the value Δw given by equations (2) and (3), where and Δ are given in millimetres:

1) For sizes of holes above 6.3 mm:

$$\Delta w = \pm \frac{w\,(4.5 - \lg w)}{100} \qquad \ldots (2)$$

2) For sizes of holes of 6.3 mm and below:

$$\Delta w = \pm \frac{w\,(4.5 - 12.5\lg w)}{100} \qquad \ldots (3)$$

With a minimum value of 0.1 mm.

Δw and w are given in millimetres.

5.1.2 *Tolerance on Individual Size of Hole*

The measured value of any individual size of hole shall not deviate from the nominal size, w, by more than 2 Δw.

5.2 Pitch

For a hole size, the pitch shall be calculated from the five options of pitch/hole ratio with respect to the open area given in Table 1. The calculated values shall be rounded to the nearest R 40 number in accordance with IS 1076 (Part 1). Testing shall be done as per Annex C.

5.2.1 *Tolerance on Average Pitch of Hole*

a) *For Plate Thickness greater than 3 mm* — The average measured pitch shall not deviate from the nominal value by more than the value given by the formula.

$$\Delta p = \pm \frac{p\,(4 - \lg p)}{100} \qquad \ldots (4)$$

where

Δp and p are given in millimetres.

Table 1 Pitch/Hole Ratios and Related Open Areas

(*Clause* 5.2)

Sl No.	Pitch/Hole Ratio	Approximate Open Area	
	P/W	Round holes (percent)	Square holes (percent)
(1)	(2)	(3)	(4)
i)	1.25	58	64
ii)	1.4	46	51
iii)	1.6	35	39
iv)	1.8	28	31
v)	2	23	25

b) *For Plate Thickness less than 3 mm* — The average measured pitch shall not deviate from the nominal pitch, p, by more than the value Δp given by equations (5) or (6), where p and Δp are given in millimetres:

For pitches of 6.3 mm and above:

$$\Delta p = \pm \frac{p\,(4-\lg p)}{100} \quad \ldots (5)$$

For pitches below 6.3 mm:

$$\Delta p = \pm \frac{5p}{100} \quad \ldots (6)$$

5.2.2 *Tolerance on Individual Pitch of Hole*

The measured value of any individual pitch shall not deviate from the nominal value by more than 2 Δp.

5.3 Plate Thickness (t)

The plate thickness shall less than the nominal hole size unless otherwise agreed between the manufacture and purchaser.

6 DESIGNATION OF INDUSTRIAL PERFORATED PLATE SIEVE

Designation of the perforated plate sieve shall comprise the following detail with word ‘perforated sieve’:

a) Shape of holes (square holes or round holes);
b) Aperture size, w in mm;
c) Arrangement of holes (*see* **4.3**);
d) Patch/aperture ratio; and
e) Material of perforated plate screen.

Example:

For steel plate industrial perforated plate sieve having aperture size of 56 mm of round hole 60° staggered with pitch aperture ratio of 1.25, the designation shall be:

(perforated sieve, $w - 56$ mm, p/w 1.25, round, steel)

7 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser should state the following with any enquiry and order:

a) Designation of the industrial perforated plate sieve;
b) Industrial perforated plate sieve material with its all technical details such as grade/class/types/finish, as per relevant Indian Standard;
c) Arrangement of aperture;
d) Patch/aperture ratio;
e) Frame dimension and its material;
f) Thickness of plate; and
g) Any other information, if required.

8 MARKING

8.1 The industrial perforated plate sieve shall have marked or attached label or tag on which the following information shall be legibly and indelibly marked:

a) Manufacturer’s name or trade-mark;
b) Designation of industrial perforated plate sieve;
c) Industrial perforated plate sieve material with its all technical details such as grade/class/types/finish, as per relevant Indian Standard;
d) Frame dimension and its material;
e) Batch number or date of manufacture; and
f) Any other information, if required.

9 BIS CERTIFICATION MARKING

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.

ANNEX A

(*Clause* 4.4)

TYPICAL EXAMPLES OF HOLE PERFORATIONS

A-1 Typical examples for industrial wire screen with the sizes of holes in the R 10 series and hole/pitch combinations is given in Table 2 to Table 4.

Table 2 Typical Examples of Round Hole Perforations

(*Clause* A-1)

All dimensions in millimetres

Sl No.	Hole		Nominal Pitch, *p*, for an Approximate Open Area of				
	Nominal size	Tolerance on average size					
	w	Δw	58 percent	46 percent	35 percent	28 percent	23 percent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	10	± 0.35	12.5	14	16	18	–
ii)	8	± 0.3	10	11.2	12.5	14	16
iii)	6.3	± 0.25	8	9	10	11.2	12.5
iv)	5	± 0.25	6.3	7	8	9	10
v)	4	± 0.25	5	5.6	6.3	7.1	8
iv)	3.15	± 0.25	4	4.5	5	5.6	6.3
vii)	2.5	± 0.25	–	3.55	4	4.5	5
viii)	2	± 0.2	–	–	3.15	3.55	4
ix)	1.6	± 0.2	–	–	2.5	2.8	3.15
x)	1.25	± 0.15	–	–	2	2.24	2.5
xi)	1	± 0.15	–	–	1.6	1.8	2
xii)	0.8	± 0.1	–	–	1.25	1.4	1.6
xiii)	0.63	± 0.1	–	–	–	–	1.25
xiv)	0.5	± 0.1	–	–	–	–	1

NOTE — The tolerance Δw are rounded to the nearest 0.05 mm.

Table 3 Typical Examples of Square Hole Perforations

(*Clause* A-1)

All dimensions in millimetres

Sl No.	Hole		Nominal pitch, *p*, for an Approximate Open Area of				
	Nominal size	Tolerance on average size					
	w	Δw	64 percent	51 percent	39 percent	31 percent	25 percent
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	10	± 0.35	12.5	14	16	18	–
ii)	8	± 0.3	10	11.2	12.5	14	–
iii)	6.3	± 0.25	8	9	10	11.2	12.5
iv)	5	± 0.25	–	7.1	8	9	10
v)	4	± 0.25	–	–	6.3	7.1	8
iv)	3.15	± 0.25	–	–	5	–	6.3
vii)	2.5	± 0.25	–	–	4	–	5
viii)	2	± 0.2	–	–	–	–	4

NOTE — The tolerance Δw are rounded to the nearest 0.05 mm.

Table 4 Typical Examples of Tolerances on Pitch

(*Clause* A-1)

All dimensions in millimetres

Sl No.	Nominal Patch	Tolerance on Average Pitch
	p	Δw
(1)	(2)	(3)
i)	18	± 0.5
ii)	16	± 0.45
iii)	14	± 0.4
iv)	12.5	± 0.35
v)	11.2	± 0.35
iv)	10	± 0.3
vii)	9	± 0.25
viii)	8	± 0.25
ix)	7.1	± 0.2
x)	6.3	± 0.2

ANNEX B

(*Clause* 5.1)

NOMINAL OPENING SIZE OF PERFORATED PLATES

B-1 The size of hole in round or square holes shall be as given in Table 5.

Table 5 Nominal Sizes of Openings — Millimetre Sizes

(*Clause* B-1)

Sl No.	Principal Sizes	Supplementary Sizes	
	R 10	R 20	R 40
(1)	(2)	(3)	(4)
i)	125	125	125
			118
		112	112
			106
ii)	100	100	100
			95
		90	90
			85
iii)	80	80	80
			75
		71	71
			67
iv)	63	63	63
			60
		56	56
			53
v)	50	50	50
			47.5
		45	45
			42.5
vi)	40	40	40
			37.5
		35.5	35.5
			33.5
vii)	31.5	31.5	31.5
			30
		28	28
			26.5
viii)	25	25	25
			23.6
		22.4	22.4
			21.2
ix)	20	20	20
			19
		18	18
			17
x)	16	16	16
			15
		14	14
			13.2

Table 5 (*Concluded*)

Sl No.	Principal Sizes	Supplementary Sizes	
	R 10	R 20	R 40
(1)	(2)	(3)	(4)
xi)	12.5	12.5	12.5
			11.8
		11.2	11.2
			10.6
xii)	10	10	10
			9.5
		9	9
			8.5
xiii)	8	8	8
			7.5
		7.1	7.1
			6.7
xiv)	6.3	6.3	6.3
			6
		5.6	5.6
			5.3
xv)	5	5	5
			4.75
		4.5	4.5
			4.25
xvi)	4	4	4
			3.75
		3.55	3.55
			3.35
xvii)	3.15	3.15	3.15
			3
		2.8	2.8
			2.65
xviii)	2.5	2.5	2.5
			2.36
		2.24	2.24
			2.12
xix)	2	2	2
			1.9
		1.8	1.8
			1.7
xx)	1.6	1.6	1.6
			1.5
		1.4	1.4
			1.32
xxi)	1.25	1.25	1.25
			1.18
			1.12
			1.06
xxii)	1	1	1

ANNEX C

(*Clauses* 5.1 *and* 5.2)

TEST METHODS

C-1 The minimum number of holes to be considered in order to arrive average aperture width or pitch shall be as per Table 6. Measurement of size or hole and pitch in perforated plate shall be made at the punch side of the plate. Measure the dimensions of holes and pitches, over any selected area of the plate along two straight line and different directions. If the minimum number of hole is not available in the plate, then check all the hole in the perforated plate sieve. Measure the hole size on the centre line of the square holes and on the diameter of the round holes. For measuring of holes plain plug gauge is used.

Table 6 Minimum Number of Holes to be Measured

(*Clause* C-1)

Sl No.	**Sizes of Holes,** *w* mm	**Number of Holes to be Measured**
(1)	(2)	(3)
i)	125 to 22.4	All (maximum 25 in larger sieves with diameter more than 200 mm)
ii)	20 to 4	2 × 15
iii)	3.55 to 2.24	2 × 20
iv)	2 to 1.6	2 × 25
v)	1.4 to 1	2 × 40

NOTES

1 Where the minimum number of holes prescribed for examination in one or two directions are not available in the plate, all the holes in the sieve shall be checked.

2 Explanation: 2 x 15, means 15 holes to be measured in both directions.

ANNEX D

(*Foreword*)

COMMITTEE COMPOSTION

Sieves, Sieving and Other Sizing Methods Sectional Committee, CED 55

Organization	*Representative(s)*
In Personal Capacity, (*90, Savita Vihar, Vikas Marg, Delhi 110092*)	DR R. P. SINGHAL **(*Chairperson*)**
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DR MANOJ KUMAR RAJAK
SCIENTIST 'D'/JOINT DIRECTOR
(CIVIL ENGINEERING), BIS

(*Continued from second cover*)

In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

ISO 2194 : 1991 'Industrial screens — Woven wire cloth, perforated plate and electroformed sheet — Designation and nominal sizes of openings'

ISO 7805-1 : 1984 'Industrial plate screens — Part 1: Thickness of 3 mm and above'

ISO 7805-2 : 1987 'Industrial plate screens — Part 2: Thickness below 3 mm'

ISO 10630 : 1994 'Industrial plate screens — Specifications and test methods'

The composition of the Committee responsible for the formulation of this standard is given in Annex D.

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 of 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.

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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