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भारतीय मानक मसौदा

कृषि उत्पाद प्रसंस्करण उपकरण — बीज/अनाज क्लीनर
— परीक्षण संहिता
(आई एस 5718 का तीसरा पुनरीक्षण)

Indian Standard

**AGRICULTURAL PRODUCE PROCESSING EQUIPMENT — SEED/GRAIN CLEANERS
— TEST CODE**

(Third Revision of IS 5718)

ICS 65.060

Agriculture and Food Processing Equipment
Sectional Committee, FAD 20

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FOREWORD

(Adoption clause will be added later)

The freshly harvested seeds often contain inert matter like chaff, stems, stones, deteriorated and damaged seeds, and weeds and other crop seeds. With the fast development of seed industry in the country, seed cleaners are being increasingly manufactured and used.

This standard was first published in 1970 and subsequently revised in 1980 to help in objective evaluation of the performance of the seed cleaners. In this revision, the formula used in the calculation of power has been corrected and the standard has been brought in latest style and format of Indian Standards.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*).

1 SCOPE

This standard prescribes the test methods to evaluate the performance of seed/grain cleaners.

2 REFERENCES

The Indian Standards given reference in this text, constitute provision 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 indicated.

<i>IS No.</i>	<i>Title</i>
IS 4333 (Part 1): 2018	Methods of analysis for food grains: Part 1 Refractions (<i>third revision</i>)
IS 4333 (Part 2): 2017/ ISO 712: 2009	Methods of analysis for food grains: Part 2 Determination of moisture content (<i>second revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Aspirator — A unit used for cleaning the seeds by drawing the air through the seed mass.

3.2 Blower — A device which gives air blast to blow the light material, that is, chaff, small seeds, trash, etc., out of the seed mass.

3.3 Clean Seed — Seed free from foreign matter.

3.4 Feed Hopper — Part of the machine through which the seeds are fed.

3.5 Feed Mechanism — Tile mechanism which regulates the feed rate of uncleaned seeds.

3.6 Feed Rate — The quantity of material fed into the cleaner per unit of time.

3.7 Final Aspiration — The suction or air blast which removes light seeds of poor germination or trash from the screened bold seed mass after it has passed over the last screen of the seed cleaner.

3.8 Foreign Matter — It includes inorganic and organic matter present in the feed lot. The inorganic matter shall include sand, gravel, dirt, pebbles, stones, lumps of earth, mud and iron chips. The organic matter shall include chaff, straw, weed seeds, dead insects, worms and other grains.

3.9 Indented Cylinder Grader — A machine which makes a length separation of seeds on grain length basis by either lifting or rejecting them in pockets or indentations pressed into the side of a cylindrical body which revolves with the seed mass inside the cylinder,

3.10 Magnetic Separator — A device to remove the ferrous material from the seed mass using the magnets.

3.11 Maximum Input Capacity — The maximum feed rate at which no choking occurs in the seed cleaner and no stalling occurs in the prime mover at the specified speed.

3.12 Pre-sieve Aspiration—The suction or air blast which removes dust and light material from seeds before the seed is fed to the sieve of the seed cleaner.

3.13 Rated input Capacity —The feed rate at which the cleaning efficiency and purity of seed are within the specified limit for a particular seed.

3.14 Routine Test — Test carried out on each cleaner to check the requirements which are likely to vary during manufacturing.

3.15 Scalper — A machine used for pre-cleaning of seeds.

3.16 Screen (Sieve) — The component of the seed cleaner in the form of perforated or slotted sheet metal or woven wire mesh which separates seeds by size.

3.16.1 Lower Screen — The screen located at lower position in the sieve set for separating finer fractions.

3.16.2 Scalping Screen — The screen used for pre-cleaning of seeds.

3.16.3 Upper Screen — The screen used to eliminate foreign matter larger in size than the material being cleaned.

3.17 Screen Cleaning Mechanism — The mechanism which keeps perforations of the screen in unchecked condition.

3.18 Screen Slope —The inclination, in degrees, of the screen with the horizontal.

3.19 Seed Cleaner — A machine which removes foreign matter and under size immature seed from the seed lot.

3.20 Shoes — Vibrating or shaking units of the machine into which the screens are fitted.

3.21 Size of Seed — Length, width, thickness or diameter of the seeds.

3.22 Type Test — Test carried out on the cleaner to prove conformity with the requirements of relevant standard. These are intended to prove the general qualities and design of a particular cleaner.

3.23 Unclean Seed — The mixture of clean seed and foreign matter.

3.24 Vibrating Mechanism — The mechanism which shakes the shoe/sieve set.

4 SELECTION AND SPECIFICATION OF CLEANER FOR TESTS

4.1 Selection

The cleaner shall be selected at random by the testing authority from the production line.

4.2 Specification

The manufacturer shall supply the specification sheet duly filled in as given in Annex A as well as any further information required to carry out the tests. The manufacturer shall also supply all the literature, the operational manual, spare parts catalogue and a schematic diagram of grain flow in the cleaner. The manufacturer shall also indicate the rated input capacity with the foreign matter at 5 percent and 10 percent of the seed mass and achievable cleaning efficiency under given test conditions.

5 TESTS

Tests as indicated in **5.1** and **5.2** shall be carried out in the seed cleaner.

5.1 Type Tests

5.1.1 General

- a) Checking of specifications (*see 7.1*),
- b) Checking of material (*see 7.2*), and
- c) Visual observations and checking of provision for adjustments (*see 7.3*).

5.1.2 Test at No-Load

- a) Energy consumption (*see 8.1*), and
- b) Visual observations (*see 8.2*).

5.1.3 Test at Load

- a) Visual observations (*see 9.2.5*)
- b) Cleaning efficiency (*see 9.4*)
- c) Power consumption (*see 9.5*)
- d) Rated input capacity (*see 9.6*)

5.1.4 Long-run test (*see 10*).

5.2 Routine Tests

- a) Visual observations and checking of provision for adjustments (*see 7.3*), and
- b) Test at no-load (*see 8*).

6 PRE-TEST OBSERVATIONS

6.1 Determination of Foreign Matter

The foreign matter present in the seed lot, to be cleaned, shall be determined in accordance with **6.2** of IS 4333 (Part 1).

6.2 Determination of Moisture

The moisture content of the seed shall be determined in accordance with IS 4333 (Part 2).

6.3 Running-in and Preliminary Adjustments

6.3.1 The seed cleaner shall be installed on level and preferably on a hard surface. All the adjustments shall be made in accordance with the manufacturer's recommendations.

6.3.2 The seed cleaner shall be run-in without load before commencing the tests. The procedure for the running-in shall be in accordance with the manufacturer's recommendations.

7 GENERAL TESTS

7.1 Checking of Specifications

The specification given by the manufacturer (*see 4.2*) shall be checked and reported in the proforma as given in Annex A.

7.2 Checking of Material

The material of construction of all the components of the cleaner shall be reported in the data sheet as given in Annex B.

7.3 Visual Observations and Checking of Provision for Adjustments

The observations and adjustments given in data sheet of Annex C shall be made and reported.

8 TEST AT NO-LOAD

8.1 Energy Consumption

8.1.1 All the adjustments shall be made in accordance with the manufacturer's recommendations. The seed cleaner shall be driven by a suitable prime mover preferably with an electric motor with auto-voltage stabilizer and suitable provision for a cut-off device for under voltage. An energy meter or some form of transmission dynamometer shall be fitted. The power delivered to the cleaner may be supplied in the following ways:

- a) Directly coupling the prime mover with the main shaft of the cleaner through a gear box wherever necessary; or
- b) Connecting the prime mover with the help of a flat or V-belt and a pulley with the main shaft of the cleaner.

8.1.1.1 In case of (a), the power delivered to the cleaner would be the power output of the prime mover; whereas in case of (b), the allowance for flat and V-belt drive losses may be taken as 6 and 3 percent, respectively.

8.1.2 The cleaner shall be run at no-load for 10 min at the specified speed and the readings of the energy meter or dynamometer shall be recorded. The energy consumption at no-load shall be calculated.

8.1.3 The test shall be repeated at least 6 times to get the average energy consumption. The data shall be recorded in accordance with **D-1**.

8.2 Visual Observations

During and after completion of the energy consumption test (*see 8.1*), the observations given in **D-2** shall be made visually and recorded.

9 TEST AT LOAD

9.1 Sufficient quantity of seeds of the same variety having foreign matter (*see 6.1*) not exceeding 10 percent and moisture content (*see 6.2*) not exceeding 13 percent for paddy and 12 percent for other seeds shall be taken.

9.2 Operation and Collection of Data

The seed cleaner as installed under **8.1.1** shall be operated at its specified speed for one hour after stabilization of machine operation at the rated input capacity specified by the manufacturer.

9.2.1 During the one hour run, the following samples and data shall be collected:

a) Three sets of samples at an interval of 20 minutes at following outlets for 2 minutes:

- 1) Clean seed outlet
- 2) Foreign matter outlets:
 - i) Pre-sieve aspirator
 - ii) Upper screen
 - iii) Lower screen
 - iv) Final aspirator
 - v) Dust cyclones
 - vi) Indented cylinders

b) The speed of the main shaft and the readings of the energy meter or dynamometer shall be recorded.

9.2.2 At the end of one-hour feeding, the cleaner shall be run idle for some time, so that practically no more material already fed comes out. At the end of the test, the material dropped through sieve and the seed received at cleaned seed outlet shall be collected and weighed. The mass of the sample collected at clean seed outlet [*see 9.1.2.1 (a)*] shall be added to the mass of the seed collected after one hour run. Agricultural tractor or engine is used as prime mover, the fuel consumed during the run period shall also be recorded.

9.2.3 The test given at **9.2** shall be repeated with 10 percent higher rated input capacity in case the cleaner meets with the requirement of cleaning efficiency and purity of seeds (*see 9.6*). In case the cleaner does not meet with the requirements of the cleaning efficiency and purity, the test should be conducted at 10 percent below the rated input capacity specified by the manufacturer. The tests may be conducted with minimum three different crops for establishing rated input capacity of different crops.

9.2.4 The data shall be recorded in the data sheet as given in Annex E.

9.2.5 Visual observations

During and after the run tests, the cleaner shall be inspected visually and the observations recorded in the data sheet given in Annex E.

9.3 Preparation and Analysis of Samples

The three sets of samples obtained at the clean seed outlet and the foreign matter outlets [see **9.2.1 (a)**] for various feed rates shall be thoroughly mixed separately to form a composite sample out of these composite samples, 100 g of sample shall be taken and analyzed for the following and the data shall be recorded in the data sheet given in Annex F.

- a) *Clean seed outlet* — to be analysed for foreign matter and broken grains, and
- b) *Foreign matter outlets* — to be analysed for clean seed and broken grains.

9.4 Determination of Cleaning Efficiency

Cleaning efficiency for various feed rates shall be calculated by the following formula and the data shall be recorded in the data sheet given in Annex G.

$$D = \frac{100 \times E (F-G) \times (E-F) \times (1-G)}{F \times (E-G)^2 \times (1-G)}$$

where,

- D = cleaning efficiency in percent,
- E = fraction of clean seed at clean seed outlet,
- F = fraction of clean seed in feed, and
- G = fraction of clean seed at foreign matter outlets.

9.5 Determination of Power Requirement

9.5.1 In case of the prime mover fitted within energy meter the difference between two consecutive readings [see **9.2.1 (b)**] shall be taken as the energy consumption for 20 min. The energy consumption per hour giving due allowances to the type of drive (see **8.1.1.1**) shall be calculated.

9.5.2 In case of the prime mover fitted with a dynamometer, the average of the readings shall be taken as the average torque required. The power requirement shall be calculated by the following formula:

$$\text{Power in kW} = \frac{T \times S}{9549.30}$$

where,

T = torque in N.m, and

S = speed in rev/min.

9.5.3 The data shall be given in Annex G recorded in the data sheet.

9.6 Determination of Rated Input Capacity

The feed rate at which the cleaning efficiency shall be not less than 80 percent with the purity of the seed being minimum 98 percent shall be selected. The capacity in terms of energy consumed shall be calculated by dividing the capacity by energy consumed (*see 9.5*) and the data shall be recorded in the data sheet given in Annex G.

9.7 Performance Index

Performance index of paddy cleaner shall be determined by following formula and the data shall be recorded in data sheet given in Annex G.

$$\text{PI} = \frac{\text{Capacity} \times \text{Cleaning efficiency}}{\text{Power}} \text{ in kg/kWh}$$

10 Long-Run Test

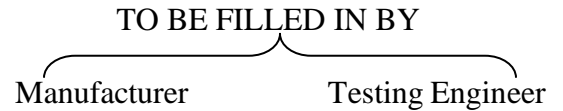
The cleaner shall be operated for at least 50 h at no load which should be covered by a continuous run of atleast 5 h. During and after operations, no breakdown or defect shall develop in the seed cleaner. The major breakdowns, defects developed and repairs made, shall be recorded in the data sheet given in Annex H.

11 SUMMARY REPORT

For the guidance of the user, a summary report on the proforma as given in Annex J shall be compiled.

ANNEX A
(Clauses 4.2 and 7.1)

SPECIFICATION SHEET



A-1 GENERAL

- a) Make
- b) Model
- c) Type
- d) Year of manufacture
- e) Rated capacity

A-2 POWER UNIT

- a) Type of prime mover
- b) Recommended power, k\V
- c) Type of drive

A-3 MAIN DRIVE

- a) Type
- b) Size and number of belts
- c) Size of pulley on prime mover
- d) Diameter of main shaft
- e) Sub-drive, if any
- f) Main shaft speed
- g) Size of pulley on seed cleaner
- h) Type of belt tightening arrangement
- j) Details of gear system

A-4 SCREENS

- a) Type
- b) Number of sieve:
 - 1) Upper
 - 2) Lower
- c) Total length and width of each screen
- d) Effective length and width of each screen
- e) Number of holes per cm: of each screen or percentage opening
- f) Size of hole of each screen
- g) Sieve clearance
- h) Screen slope range

- j) Recommended screen slope
- k) Provision for screen cleaning

A-5 SHOES

- a) Type
- b) Number of strokes per minute
- c) Length of stroke
- d) Number and type of bearings

A-6 BLOWER/ASPIRATOR

- a) Number of blowers
- b) Type
- c) Number of blades
- d) Diameter of blower
- e) Recommended speed/air displacement for:
 - 1) Bold seeds
 - 2) Medium seeds
 - 3) Light seeds
- f) Provision for changing air displacement
- g) Number and type of bearings
- h) Drive, if separate
- j) Air flow rate at static pressure of 500 Pa, m³/min

A-7 FEEDING HOPPER

- a) Storage capacity of feed hopper
- b) Type of feed mechanism
- c) Height and location of feeding hopper
- d) Recommended maximum input capacity
- e) Rated input capacity at 5 percent foreign matter
- f) Rated input capacity at 10 percent foreign matter
- g) Method of arrangement of even distribution of seed mass in the hopper
- h) Type of drive for feed mechanism

A-8 TRANSPORT ARRANGEMENT

- a) Type
- b) Number of wheels
- c) Size of wheels
- d) Wheel bearing
- e) Type of towing arrangement
- f) Wheel tread
- g) Wheel base

A-9 INDENTED CYLINDER GRADER ASSEMBLY

- a) Type
- b) Number of indented cylinder(s)
- c) Length of indented cylinder(s)
- d) Diameters of indented cylinder(s)
- e) Range of speed
- f) Indent size of various indented cylinder(s)
- g) Provision for air aspiration

A-10 OUTLETS

- a) Size and location of seed discharge outlet(s)
- b) Location of outlet(s) for rejects
- c) Size and location of air exhaust outlets

A-11 OVERALL DIMENSIONS AND MASS

- a) Length, mm
- b) Width, mm
- c) Height, mm
- d) Ground clearance, mm
- e) Total mass, kg

A-12 TOOLS, ACCESSORIES AND MANUALS PROVIDED

NOTES

1. The items which are not applicable in a particular cleaner should be crossed while filling,
2. If any other items are provided, their details should be filled in.

ANNEX B
(Clause 7.2)

DATA SHEET FOR MATERIAL OF CONSTRUCTION

B-1 DATE OF TEST

B-2 MATERIAL OF CONSTRUCTION

Sl. No. (1)	Component (2)	Material (3)	Size (4)	Weight (5)
i)	Frame			
ii)	Feeding hopper			
iii)	Blower/Aspirator			
iv)	Main shaft			
v)	Blower shaft			
vi)	Screen (frame included)			
vii)	Shoe			
viii)	Elevator			
ix)	Transport wheel			
x)	Pulleys			
xi)	Indented cylinder(s)			
xii)	Bearing housing			
xiii)	Others			

NOTES

1. Delete the component which is not applicable to a particular cleaner and add if my other component is provided.
2. Column 4 and 5 should be recorded, wherever feasible.

Testing Engineer

ANNEX C
(Clause 7.3)

**DATA SHEET FOR VISUAL OBSERVATIONS AND PROVISION
FOR ADJUSTMENTS**

C-1 OBSERVATIONS

- a) Adequacy of marking of inlets and outlets
- b) Adequacy of protection of bearings against the ingress of dust
- c) Adequacy of safety arrangements, like cover, controls, etc, specially at moving points and at inlet
- d) Provision for lubrication of moving parts
- e) Provision of belt tightening
- f) Provision for air exhaust arrangement
- g) Type of settling chambers provided or collection of waste seeds blown out through air
- h) Provision for easy transportation
- j) Provision for easy changing components requiring frequent replacement
- k) Provision for locking the screens
- m) Provision for easy replacement and cleaning of screens and aspiration chamber
- n) Anti-corrosive coatings provided or not
- p) Provision for inspection windows/covers
- q) Provision for marking of air displacement
- r) Tightness of bolts, nuts and other fasteners
- s) Welding of seams
- t) Adequacy of marking to real speed of both main and blower shafts
- u) Provision of feed regulating and spreading system
- w) Other observations

C-2 PROVISION FOR ADJUSTMENTS

- a) Feed rate
- b) Shaking speed
- c) Screen slope
- d) Air displacement
- e) Screen cleaning assembly
- f) Stroke of shoe assembly
- g) Speed of indented cylinder(s)
- h) Broken grains discharge trough of indented cylinder(s)

Testing Engineer

ANNEX D
(Clauses 8.1.3 and 8.2)

DATA SHEET FOR TEST AT NO-LOAD

D-1 ENERGY CONSUMPTION

- a) Source of power
- b) Type of drive
- c) Total time of run
- d) Average energy consumption for one hour

D-2 OBSERVATIONS

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Any marked unusual wear or slackness in any component
- f) Any marked rise in bearing temperature
- g) Running of fan without vibration
- h) Accessibility of various controls and capability of being locked in a chosen position
- j) Unusual heating of any component
- k) Other observations (if any)

ANNEX E
(Clauses 9.2.4 and 9.2.5)

DATA SHEET FOR TEST AT LOAD

E-1 SOURCE OF POWER

E-2 POWER RATING

E-3 TYPE OF DRIVE

E-4 VARIETY OF SEED

E-5 MOISTURE CONTENT (DRY BASIS OR WET BASIS)

E-6 PERCENTAGE OF FOREIGN MATTER IN SEED BEFORE FEEDING

E-7 SCREEN SLOPE

E-8 SIEVE CLEARANCE

E-9 AIR FLOW

E-10 SPEED OF ROTARY SCREEN

E-11 STROKE LENGTH, cm

E-12 OBSERVATIONS

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Frequent clogging of screen perforations
- f) Smooth flowing of material through different components
- g) Vibration free running of fan
- h) Frequent clogging of grain in elevator unit
- j) Frequent clogging of aspiration unit
- k) Any marked rise in bearing temperature
- m) Any marked wear, deformation and breakdown
- n) Frequent loosening of fasteners
- p) Ease of replacement of the screens
- q) Variation in the position of the screen due to vibration
- r) Leakage of seeds from the cleaner while in operation
- s) Unusual heating of any component
- t) Other observations (if any)

E-13 TEST DATA

Sl. No.	Date	Duration of Operation	Speed (rev/min)	Feed Rate (q/h)	Power Requirement (KW)	Fuel Consumed (1/h)	No. of Samples	Quantity (kg) of sample from		Total Quantity of Grain Mixture at Clean seed Outlet (kg)	Total Quantity of Grain Mixture at Sieve Under flow (kg)
								Clean Speed Outlet	Foreign Matter Outlets		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)

i)
ii)
iii)

Testing Engineer

ANNEX F
(Clause 9.3.1)

DATA SHEET FOR ANALYSIS OF SAMPLE

Sl. No.	Source	Feed Rate (g/h)	Sample Source	Sample Mass	Mass of			Remarks
					Clean Seed (g)	Broken Grain (g)	Foreign Matter (g)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i) From clean seed outlet								
ii) From foreign matter outlet								

NOTE — For different feed rates, use the same proforma as above

Testing Engineer

ANNEX G
(Clauses 9.4, 9.5.3, 9.6 and 9.7)

DATA SHEET FOR EFFICIENCY, POWER REQUIREMENT, CAPACITIES AND PERFORMANCE

SL No.	Item	Test No.				
		1	2	3	4	etc
i)	Cleaning unit speed, rev/min					
ii)	Feed rate, kg/h					
iii)	Power required, kW					
iv)	Total grain received at clean grain outlet, kg					
v)	Cleaning efficiency, percent					
vi)	Purity of seed, percent					
vii)	Rated input capacity, kg/h					
viii)	Performance Index					

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ANNEX H
(Clause 10)

DATA SHEET FOR LONG-RUN TEST

- a) Total running time
- b) Continuous running time
- c) Breakdowns in cleaning unit
- d) Breakdowns in elevation unit
- e) Breakdowns in the main frame
- f) Breakdown in shoe assembly
- g) Breakdown in blower/aspiration unit
- h) Breakdown in indented cylinder grader assembly
- j) Major wear and tear
- k) Any major repairs conducted
- m) Any other observations (if any)

Testing Engineer

ANNEX J
(*Clause 11*)

SUMMARY REPORT

J-1 NAME OF MANUFACTURER

J-2 TYPE, MAKE AND MODEL NUMBER

J-3 NAME OF TESTING STATION

J-4 BRIEF DESCRIPTION OF THE CLEANER

J-5 NAME AND VARIETY OF SEEDS USED

J-6 PERCENTAGE FOREIGN MATTER BEFORE FEEDING

J-7 MOISTURE CONTENT BEFORE FEEDING

J-8 PROVISIONS FOR ADJUSTMENT

- a) Frequency of oscillation of shaking mechanism
- b) Screen slope
- c) Air displacement
- d) Feed rate
- e) Stroke of shoe assembly
- f) Speed of indented cylinder
- g) Amplitude of shoe assembly oscillation

J-9 POWER REQUIREMENT, kW

- a) Recommended power
- b) Observed power at no-load
- c) Observed power at load at rated input capacity

J-10 CLEANING EFFICIENCY

J-11 PURITY OF SEED, PERCENT

J-12 RATED INPUT CAPACITY

J-13 ANY OTHER

Testing Engineer