

भारतीय मानक
Indian Standard

IS 5994 : 2022

कृषि ट्रैक्टर — टेस्ट कोड
(चौथा पुनरीक्षण)

Agricultural Tractors — Test Code
(*Fourth Revision*)

ICS 65.060.10

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December 2022

Price Group 9

Agricultural Machinery and Equipment Sectional Committee, FAD 11

FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standard after the draft finalized by the Agricultural Machinery and Equipment Sectional Committee had been approved by the Food and Agriculture Division Council.

Agricultural tractors are being increasingly used for mechanization of agricultural operations and the tractor industry has developed as one of the major engineering industry in the country. The increase in the manufacturing and use of tractors has necessitated application of standardized tests for evaluation of their performance on a uniform and rationalized basis.

This standard was originally published in 1970. On the basis of experience gained in testing of tractors, it was revised in 1979 and 1987. The third revision was carried on in 1998 to incorporate various modifications suggested by testing authorities and aligning various other requirements with ISO/OECD test code.

This revision has been taken up for harmonisation of the standard with Automotive Industry Standards (AIS) relating to requirements of ballast mass and load platforms of agricultural tractors.

In the preparation of this standard, assistance has been derived from the following:

- a) Test procedure followed at Central Farm Machinery Training and Testing Institute (Ministry of Agriculture), Budni.
- b) Organization for Economic Co-operation and Development (OECD) Standard codes for the official testing of agricultural tractors, 2021.

The composition of the Committee, responsible for the formulation of this standard is given at Annex F.

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.

Indian Standard
AGRICULTURAL TRACTORS — TEST CODE
(*Fourth Revision*)

1 SCOPE

This standard covers the terminology, general guidelines and tests to be conducted on agricultural tractors. The standard also covers methodology for testing of air cleaner oil pullover, vibration and inspection of components/assemblies.

2 REFERENCES

The standards listed 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 editions of the standards listed below. In case the standards are to be referred in this clause, they are to be listed as follows:

IS No.

Title

IS 4905 : 2015/ISO 24153 : 2009 Random sampling and randomization Procedures (*first revision*)

IS 9253 : 2013 Agricultural Wheeled Tractors — Field performance and Haulage Tests — Guidelines (*third revision*)

IS 9939 : 1981 Glossary of terms relating to agricultural tractors and power tillers

IS 10743 : 1983 Method for determination of centre of gravity of agricultural tractors

IS 11442 : 1996/ISO 5721 : 1989 Agricultural tractors — Operator's field of vision — Test procedures

IS 11859 : 2004 Agricultural tractors — Turning and clearance diameters — Methods of test (*first revision*)

IS 12036 : 1995 Agricultural tractors — Test procedures — Power tests for power take-off (*first revision*)

IS 12061 : 1994 Agricultural tractors — Braking performance — Method of test (*first revision*)

IS 12062 : 1987 Method for measurement of exhaust smoke emitted by agricultural tractors

IS 12180 (Part 1) : 2000/ISO 5131 : 1996 Tractors and machinery for agriculture and forestry — Noise measurement — Method of test: Part 1 Noise at the operator's position — survey method (*first revision*)

IS 12180 (Part 2) : 2000/ISO 7216 : 1992 Tractors and machinery for agriculture and forestry — Noise measurement — Method of test: Part 2 Noise emitted when in motion (*first revision*)

IS 12207 : 2022 Agricultural Tractors Recommendations on selected performance Characteristics (*fifth revision*)

IS 12224 : 1987 Method of test for hydraulic power and lifting capacity of agricultural tractors

IS 12226 : 1995 Agricultural tractors — Power tests for drawbar — Test procedure (*first revision*)

IS 12239 (Part 1) : 2018/ISO 4254-1 : 2013 Guide for safety and comfort of operator of agricultural tractors and power tillers: Part 1 General requirements (*second revision*)

IS 12239 (Part 2) : 1999 Tractors and machinery for agriculture and forestry — Technical means for ensuring safety: Part 2 Tractors (*first revision*)

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3 TERMINOLOGY

For the purpose of this standard, the following definitions in addition to those given in IS 9939 shall apply.

3.1 Commercial Test

The tests conducted for establishing performance characteristics of tractors that are ready for commercial production or already in production.

3.1.1 Initial Commercial Test

The tests conducted on indigenous or imported prototype of tractor ready for commercial production.

3.1.2 Batch Test

The tests conducted on tractors, which have already undergone initial commercial test and/or being manufactured commercially in the country.

3.2 Confidential Test

The tests conducted for providing confidential information on the performance of tractors whether ready for commercial production or not, or to provide any special data that may be required by the manufacturer/applicant.

3.3 Drawbar Power — (see 3.4 of IS 12226)

3.4 Maximum Drawbar Pull — (see 3.5 of IS 12226)

3.5 Tyre Rolling Radius

The effective radius corresponding to the average distance travelled by the tractor in one rotation of wheels (that is, this distance divided by 2π). When the tractor is driven without drawbar load at a speed of approximately 2 km/h.

4 GENERAL GUIDELINES

4.1 Specification Sheet

The tractor manufacturer/applicant shall supply the specification of the tractor consisting of the items listed in the specimen report given in Annex A, as well as any other information required by the testing authority to carry out the tests. The manufacturer/applicant should also supply all literature, operational, maintenance and service manual, and parts catalogues.

4.2 Conditions for Checking of Dimensions

4.2.1 The tractor shall be without any wear on tyres and placed on a firm horizontal surface.

4.2.2 Unless otherwise stated by the manufacturer/applicant, the tractor shall be stationary with its wheels and components in the positions they would be, if the tractor was travelling in a straight line.

4.2.3 The pressure in pneumatic tyres shall be adjusted to the value recommended by the tractor manufacturer for field work.

4.3 Selection

The tractor, if under production, should be selected at random (*see* IS 4905) from the production line complete with its standard accessories and in a condition as generally offered for sale. The tractor shall be new and should not be given any special treatment or preparation for test. The method of selection should be reported in the proforma given in Annex B.

4.4 Running-In

The manufacturer/applicant shall run-in the tractor before the test, under his responsibility and in accordance with his usual instructions. The running-in shall be carried out in collaboration with the testing authority. If this procedure is impracticable due to the tractor being an imported model, the testing authority may itself run-in the tractor in accordance with the procedure prescribed or agreed to with the manufacturer/applicant.

4.4.1 The place and duration of the running-in shall be reported in the proforma given in Annex B.

4.5 Servicing and Preliminary Setting after Running-In

4.5.1 After completion of running-in, servicing and preliminary settings should be done according to the printed literature supplied by the manufacturer/applicant or as per declaration of the manufacturer. The following may be carried out, wherever applicable:

- a) Change of the engine oil;
- b) Change of air cleaner oil (if provided with an oil-bath type air cleaner);
- c) Change of hydraulic and transmission oil;
- d) Change of oil, fuel and hydraulic oil filters;
- e) Greasing/oiling of all the lubricating points;
- f) Adjustment of valve clearance, injection pressure and checking of compression pressure without and with oil;
- g) Tightening the nuts and bolts;
- h) Checking and adjusting the tension of belts and chains;
- j) Checking and adjustment of safety devices, if any; and
- k) Any other checking or adjustment recommended by the manufacturer after the running-in period and included in the printed literature of the tractor.

4.5.2 The manufacturer/applicant may make adjustments in fuel injection pump, governor, fuel injector flashing of Engine Dataset & calibration of system and any other adjustments during the period the tractor is prepared for tests. These adjustments should conform to the values specified by the manufacturer/applicant for agricultural use in the printed literature/specification sheet or declaration submitted by manufacturer during testing. No adjustment shall be made, unless it is recommended in the literature/declaration submitted testing authority. All the parts replaced shall be reported in the test report.

NOTE — Adjustment of fuel injection pumps except for low/high idling speed shall not be permitted under commercial test.

4.6 Ballasting

The ballast mass, which are commercially available and approved by the manufacturer for use in agriculture, may be fitted. For wheeled tractors, liquid ballast in the tyres may also be used. The overall static load on each tyre (including liquid ballast in the tyres and 75 kg mass added to the tractor to represent the driver), and the inflation pressures shall be within the limits specified by the tyre manufacturer or load limit of axle, whichever is lower. Measure inflation Pressure with the tyre valve in the lowest position.

NOTE — In case of tractors provided with a device for transfer of implement load to tractor, the ballasting including weight transfer shall not exceed the load limits specified by the tractor/tyre manufacturer.

4.6.1 Requirements of Ballast Mass

- a) Each ballast mass shall bear the manufacturer's mark and a statement of their mass in kilograms to an accuracy of ± 5 percent.
- b) Front ballast masses which require frequent removal and fitment shall leave a safety clearance of at least 25 mm all around the grab handles.
- c) The method of locating the ballast mass shall be such that any inadvertent separation is avoided (e.g., in the event of tractor roll over).
- d) Access to front coupling device may be limited when using a front ballast mass.

4.7 Repairs and Adjustments during Tests

All repairs and adjustments made during the tests shall be reported, together with comments on any practical defects or shortcomings in Annex B. This shall not include those maintenance jobs and adjustments which are performed in conformity with the manufacturer's recommendations.

4.8 Fuel and Lubricants

Fuel and lubricants for the tests shall conform to **5.3** of IS 12226.

4.9 Auxiliary Equipment

For all power tests, accessories such as hydraulic lift pump or any other power consuming device like air compressor may be disconnected only if it is practicable for the operator to do so as a normal practice during work in accordance with the operator's manual without using any tool. If not, they shall remain connected and operate at minimum load.

4.10 Fuel Consumption

The fuel measurement apparatus shall be so arranged that the fuel pressure at the fuel transfer pump is equivalent to that which exists when the tractor fuel tank is half full. The fuel temperature shall be comparable to that in the normal operation of the tractor when fuel is taken from the tractor fuel

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tank. Efforts shall be made to limit the temperature variations throughout the tests.

4.10.1 To obtain hourly fuel consumption by volume and the work performed per unit volume of fuel, conversion of unit of mass to unit of volume shall be made using the density value at 15 °C.

4.10.2 When the fuel consumption is measured by volume, the specific fuel consumption shall be calculated using the density corresponding to the appropriate fuel temperature.

5 MEASURING TOLERANCES

The measuring apparatus shall be such that the following items shall have the tolerances within the limits shown against each:

- | | |
|-------------------------------|---------------|
| a) Rotational speeds, rev/min | ± 0.5 percent |
| b) Time, s | ± 0.2 s |
| c) Distance, m or mm | ± 0.5 percent |
| d) Force, N and torque, Nm | ± 1.0 percent |
| e) Mass, kg | ± 0.5 percent |

- | | |
|--------------------------------------|---------------|
| f) Atmospheric pressure, kPa | ± 0.2 kPa |
| g) Tyre pressure, kPa | ± 5 percent |
| h) Hydraulic pressure, kPa | ± 2.0 percent |
| j) Temperature of fuels, etc., °C | ± 2.0 °C |
| k) Wet and dry bulb thermometers, °C | ± 0.5 °C |

m) Fuel consumption (overall for the apparatus used):

- | | |
|----------------------------------|---------------|
| 1) Drawbar test, kg | ± 2.0 percent |
| 2) PTO, belt and engine test, kg | ± 1.0 percent |

6 TESTS

Various tests to be conducted on an agricultural tractor are given in Table 1. The implementing authority shall decide about the tests and their frequency to be carried out during initial commercial and batch testing (*see 3.5*).

Table 1 Tests to be Conducted on Agricultural Tractor
(Clause 6)

SI No.	Tests	Conventional Tractor	Remarks
(1)	(2)	(3)	(4)
i)	Checking of the specification	<i>see 7</i>	--
ii)	PTO performance	IS 12036	--
iii)	Belt-pulley performance	IS 12036	--
iv)	Drawbar performance	IS 12226	--
v)	Test for hydraulic power and lifting capacity	IS 12224	--
vi)	Turning ability & steering effort	IS 11859	--
vii)	Centre of gravity	IS 10743	--
viii)	Operator's field of vision	IS 11442	--
ix)	Brake test	IS 12061	--
x)	Test for air cleaner	<i>see 6.2</i>	--
xi)	Smoke measurement	IS 12062	--
xii)	Noise measurement		--
	At operator's position	IS 12180 (Part 1)	
	At bystander position	IS 12180 (Part 2)	
xiii)	Vibration measurement	<i>see 6.3</i>	--
xiv)	Safety	IS 12239 (Part 1) IS 12239 (Part 2)	--
xv)	Field test	2 of IS 9253	--
xvi)	Haulage test	3 of IS 9253	--
xvii)	Component/assembly inspection	<i>see 6.4</i>	--
xviii)	Special characteristic	<i>see 7</i>	If required by the manufacturer and with the mutual agreement of manufacturer and testing station

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6.1 Checking of Specifications

6.1.1 The information given by the manufacturer/applicant in the specification sheet (see 4.1) shall be verified by the testing authority and reported. Details of the components and assemblies which do not conform to the relevant Indian Standards shall also be reported. The adequacy or otherwise of the literature shall be indicated.

6.1.2 While checking the dimensions, the conditions laid down in 4.2 shall be followed.

6.1.3 Load Platforms of Agricultural Tractors

6.1.3.1 Load Platform (If fitted)

A platform attached to the structure in front or rear of the tractor for the carriage of agricultural produce/material, implements, equipment and tools. The Manufacturer shall specify safe load carrying capacity for such load platform on the labelling plate of load platform.

6.1.3.2 Requirements

- a) The centre of gravity of the tractor with loaded (as specified) platform shall be situated between the axles.
- b) The dimensions of the platform shall be such that:
 - 1) The length does not exceed 1.4 times the front or rear track of the tractor, whichever is the larger.
 - 2) The width does not exceed the maximum overall width of the tractor without platform.
 - 3) Adequate side protection shall be provided to prevent falling off goods loaded on load platform.
 - 4) The platform shall be laid out symmetrically in relation to the longitudinal median plane of the tractor.
 - 5) The height of the upper most point of load platform above the ground shall be not more than 1500 mm.
 - 6) The load platform shall be attached to the tractor in such a way as to avoid any risk of accidental detachment.
- c) The type of platform and the way it is attached shall be such that, with a normal

load, the driver's field of vision remains adequate and the various mandatory lighting and light-signalling devices may continue to fulfil their proper function.

Figure to be added both of front and rear load platform.

6.2 Air Cleaner Oil Pull-Over Test

6.2.1 The tractor shall be parked on a level ground. The air-cleaner shall be cleaned and filled up to a level of 5 percent (on mass basis) over the specified level with an oil of viscosity recommended by the manufacturer. The engine shall then be operated at full governed speed for 15 minutes. This shall be followed by sudden accelerations and decelerations made after every 30 seconds for a period of 15 minutes. The air-cleaner assembly shall be weighed before and after the test. The loss of mass of oil, both in grams and in percentage of mass, shall be reported.

NOTE — Before starting the test, the engine shall be run for one hour.

6.2.1.1 The air cleaner Oil Pull-Over test shall be carried out in the following positions:

- a) In horizontal position;
- b) In the case of wheeled tractors, the tests shall be repeated with the tractor tilted 15° to either side and then 15 degrees forward and backward in relation to the direction of travel of the tractor; and
- c) In the case of crawler tractors, the forward and backward tilt shall be 30 degrees.

6.2.2 The data shall be recorded in accordance with Annex C.

6.3 Vibration Measurement

6.3.1 The amplitude of mechanical vibration of these assemblies and components of the tractor, which are functionally important, shall be measured with the help of suitable vibration measuring device.

6.3.2 The tractor shall be parked on a level concrete surface and operated at rated speed at no-load and at load corresponding to 85 percent of maximum PTO power. The maximum horizontal displacement (HD) and vertical displacement (VD)

in microns shall be measured by mounting the measuring device in related positions. Inflation pressure of tyres shall be as given in 4.2.3.

6.3.3 The data shall be recorded in accordance with Annex D.

6.4 Component/Assembly Inspection

6.4.1 The engine, transmission, brakes, front axles, starter motor and dynamo shall be partially dismantled after conducting all the tests. The following measurement/observations shall be made and reported.

6.4.1.1 Cylinder bore

The cylinder bore shall be measured on the thrust side and perpendicular to it at the top, middle and at the bottom position of the liner.

6.4.1.2 Piston diameter

The piston diameter shall be measured on the thrust side and perpendicular to it at the top above the gudgeon pin and at the skirt.

6.4.1.3 Ring end gap

The ring end gap for all compression and oil rings shall be measured at the top, middle and bottom position of the liner.

6.4.1.4 Ring groove clearance

The ring groove clearance shall be measured for all compression and oil rings.

6.4.1.5 Clearances of main and big end bearing

The radial and axial clearance of main and big end bearings shall be measured. The radial clearance shall be measured after tightening the crankshaft bolts with the torque specified by the manufacturer.

6.4.1.6 Valves, guides, tappets and timing gear

The valve shall be inspected for overheating signs and pitting of the seats. The timing gear cover shall be opened and the gears inspected for damage to gear teeth. Stiffness of spring and clearance between valve guide and valve stem shall be measured.

6.4.1.7 Clutch

The clutch shall be opened and inspected for condition of the clutch-release bearing, pilot bearing, springs and fingers. Clutch friction plate wear should be determined by measuring the thickness. The clutch housing shall be inspected for the entry of dust, mud, water and oil.

6.4.1.8 Gear box

The top cover of the gear box shall be opened and inspected for visual damage to the gear teeth.

6.4.1.9 Brakes

The brake housing shall be opened and inspected for the entry of dust, mud, water and oil. The wear of brake lining shall be determined by measuring the thickness.

6.4.1.10 Front axle

The king pin and stub axle shall be dismantled and inspected for the entry of dust, mud, water and oil. Clearances between king pin and bushes as well as between centre pin and bush shall be measured. The condition of thrust bearings, bearings for stub axle and seals for stub axle as well as kingpins shall also be examined for entry of dust. For track-laying tractors, wear of sprocket, pin, grouser plate and idler shall be inspected.

6.4.1.11 Starter, motor and dynamo

These shall be dismantled and inspected for entry of dust, mud, water and oil. The condition of the bearings shall also be examined.

NOTE — The observations covered under 6.4.1.7 to 6.4.1.11 shall be made after cleaning, washing and greasing as recommended by the manufacturer in printed literature.

6.4.2 The data shall be recorded in Annex E.

7 REPORTING THE RESULTS

The test results of tractor shall be reported on the basis of proforma included in various standards dealing with the testing of tractors. While preparing the test report, the provisions of IS 12207 shall also be kept in view.

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ANNEX A
(Clause 4.1)

SPECIFICATION SHEET FOR AGRICULTURAL TRACTORS

A-1 TRACTOR

- a) Name and address of the manufacturer
- b) Name and address of the applicant for test
- c) Make/Type/Model
- d) Serial number
- e) Year of manufacture

A-2 ENGINE

- a) Type/make/model
- b) Serial number
- c) Engine speed (manufacturer's recommended setting)

A-3 CYLINDERS AND CYLINDER HEAD

- a) Number
- b) Disposition
- c) Bore/Stroke, mm
- d) Capacity, cm³
- e) Compression ratio
- f) Compression pressure, kPa (kgf/cm²)
- g) Type of cylinder head
- h) Type of cylinder liners
- j) Type of combustion chamber
- k) Arrangement of valves
- m) Tappet clearance (hot/cold)
 - 1) Inlet valve
 - 2) Exhaust Valve

<i>Maximum Speed at No Load, rev/min</i>	<i>Low Idle Speed, rev/min</i>	<i>Speed at Max Torque, rev/min</i>	<i>Rated speed, rev/min</i>		
			For PTO Use	For Drawbar Use	Other If Any
(1)	(2)	(3)	(4)	(5)	(6)

A-4 FUEL SYSTEM

- a) Type of fuel feed system
- b) Fuel tank
 - 1) Capacity, liters
 - 2) Location
 - 3) Provision for draining of sediments/water
- c) Fuel filters
 - 1) Make/model/type
 - 2) Number
 - 3) Capacity of final stage filter
- d) Fuel transfer pump
 - 1) Type/make/model

- e) Fuel injectors
 - 1) Make/model/type
 - 2) Manufacturer's production setting (valve opening pressure), kPa (kgf/cm²)
- f) Injection timing
- g) Firing order
- h) Magneto, coil and distributor
 - 1) Make/model/type
- j) Injection pump
 - 1) Make/model/type
 - 2) Serial number
 - 3) Pump setting:

<i>Adjustments</i>	<i>Pump Shaft Speed, rev/min</i>	<i>Number of Strokes</i>	<i>Metering and Tolerable Difference</i>		<i>Rate of Displacement</i>	<i>Remarks</i>
(1)	(2)	(3)	cm ³ at °C (4)	g (5)	(6)	(7)
Rated value of fuel pump						
Low idle Setting						
Full load setting						

A-5 GOVERNOR

- a) Make/model/type
- b) Governed range of engine speed, rev/min
- c) Rated engine speed, rev/min

- 4) Method of drive and cooling device (if any)

A-6 PRE-CLEANER

- a) Make/model/type
- b) Location of air intake

A-7 AIR CLEANER

- a) Make/model/type
- b) Location of air intake (in case of no precleaner)
- c) Oil capacity, litres
- d) Oil change period, h

A-8 EXHAUST

- a) Type of silencer
- b) Position of silencer w.r.t. SIP
- c) Detail of spark arresting device, if fitted

A-9 LUBRICATING SYSTEM

- a) Type
- b) Filters
 - 1) Type
 - 2) Number
- c) Oil capacity, litres
- d) Oil changing period, hours
- e) Pump
 - 1) Type
 - 2) Capacity at rated speed, l/min (at...°C)
 - 3) Pressure release setting, kPa (kgf/cm²)

A-10 COOLING SYSTEM

- a) Type
- b) Details of pump and fan
- c) Capacity of pump in l/min at...rev/min
- d) Means of temperature control
- e) Bare radiator capacity, litres
- f) Total coolant capacity, litres
- g) Pressure details, kPa (kgf/cm²)
- h) Method of drive

A-11 ELECTRICAL SYSTEM

- a) Starting system
 - 1) Make/type
 - 2) Aid for cold starting
 - 3) Any other device provided for easy starting
 - 4) Method of drive
- b) Battery
 - 1) Make/type
 - 2) Number
 - 3) Capacity of range
 - 4) Location
- c) Starter
 - 1) Make/model/type
 - 2) Capacity and rating
 - 3) Serial number

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- | | |
|--|---|
| d) Generator

1) Make/model/type
2) Serial number
3) Output rating | e) Voltage regulator

1) Make/type
2) Capacity and setting |
| | f) Detail of lights: |

<i>Description</i>	<i>Height Above Ground of Centre,</i>	<i>Size,</i>	<i>Distance from Centre of the Beam to Outside Edge of Tractor at Standard Rear Track Setting,</i>
(1)	<i>mm</i> (2)	<i>mm</i> (3)	<i>mm</i> (4)
Headlights			
Sidelights			
Rear lights			
Reflectors			
Plough Light			

- | | |
|--|--|
| g) Switches-Main light and other (Type and
Position)
h) Horn-type and location
j) Details of other electrical accessories | 4) Method of operation
5) Friction plate
i) Type
ii) Material |
|--|--|

A-12 INSTRUMENT PANEL DETAILS

A-13 TRANSMISSION SYSTEM

- | | |
|---|--|
| a) Clutch
1) Make/Type
2) Size
3) Number of friction plate | b) Gear box
1) Make/Type
2) Oil capacity, liters
3) Oil changing period, hours
4) Number of speeds
i) Forward
ii) Reverse
5) Nominal speed: |
|---|--|

<i>Movement</i>	<i>Gear Number</i>	<i>Number of Engine Revolutions for One Revolution of Driving Wheel or Sprocket</i>	<i>Nominal Speed at Rated Engine Speed when Fitted with.... Size Tyre, at an Inflation Pressure of...and Rolling Radius of km/h</i>
(1)	(2)	(3)	(4)
Forward	1		
	2		
	3		
	etc		
Reverse	1		
	2		
	etc		

- c) Rear axle and final drive
 - 1) Make/Type
 - 2) Differential lock
 - i) Type
 - ii) Method of operation
 - 3) Reduction in final drive
 - 4) Oil capacity of final drive, litres
 - 5) Oil changing period, hours
- d) Details of transmission if used other than those given in (a), (b) and (c) above
- j) Lower hitch point height
- k) Zone of clearance around each hitch point spherical radius

A-16 POWER LIFT

A-14 POWER TAKE-OFF (PTO) SHAFT

- a) Location
- b) Number of splines
- c) Speed, rev/min
- d) Size, mm
- e) Standard to which it conforms
- f) Height above ground, mm
- g) Proportional engine speed at standard speed. rev/min of PTO rev/min
- h) Direction of rotation (viewed from driving end)
- j) PTO speed at rated engine speed, rev/min
- k) Details of other PTO, if any
- a) Make/Type
- b) No. and Type of cylinders
- c) Type of linkage lock for transport
- d) Make and type of pump
- e) Location and drive
- f) Number and type of filters
- g) Lifting capacity, kN (kgf)
 - 1) At lower links
 - 2) At standard frame
- h) Oil change period
- j) Hydraulic oil capacity (litre)
- k) Provision for external tapping
- m) Details of control levers
- n) Method of draft sensing

A-17 DRAWBAR

A-17.1 Linkage Drawbar/swinging Drawbar

A-15 THREE POINT LINKAGE

- a) Upper hitch points
 - 1) Diameter of hitch pin hole
 - 2) Width of-ball
- b) Lower hitch points
 - 1) Diameter of hitch pin hole
 - 2) Width of-ball
- c) Lateral distance from lower hitch point to centre line of tractor
- d) Lateral movement of lower hitch point
- e) Distance from end of power take-off to centre of lower hitch point (lower links in horizontal position)
- f) Transport height
- g) Power range
- h) Levelling adjustment range
- a) Type
- b) Location
- c) Height above ground level, mm
 - 1) Maximum
 - 2) Minimum
- d) Method of changing position
- e) Distance from rear axle, mm
- f) Position relative to PTO shaft, mm
- g) Lateral adjustment to either side, mm
- h) Pivot position relative to rear wheel or centre of sprocket, mm
- j) Standard to which it conforms

A-18 TOWING HITCH (FRONT/ REAR)

- a) Type
- b) Height above ground level, mm
- c) Type of adjustment
- d) Distance of hitch point (mm)
 - 1) From rear axle centre
 - 2) From PTO shaft end

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A-19 STEERING

- a) Make/Type
- b) Location
- c) Method of operation
- d) Diameter of control wheel, mm
- e) Steering housing oil capacity, liters

A-20 BRAKES

- a) Service brake
 - 1) Make/Type
 - 2) Location
 - 3) Area of liners, cm²
 - 4) Material of liners
 - 5) Method of operation
- b) Parking brake
 - 1) Make/Type
 - 2) Method of operation

A-21 WHEEL EQUIPMENT

- a) Steering wheel
 - 1) Make
 - 2) Number
 - 3) Size
 - 4) Type of tyre
 - 5) Ply rating
 - 6) Maximum permissible loading capacity of each tyre at ...kPa (kgf/cm²) pressure, kN (kgf)
 - 7) Recommended inflation pressure, kPa (kgf/cm²)
 - i) For field work
 - ii) For transport
 - 8) Track width, mm
 - 9) Method of changing track width
- b) Driving Wheel
 - 1) Make
 - 2) Number
 - 3) Size
 - 4) Type of tyre
 - 5) Ply rating

- 6) Maximum permissible loading capacity of each tyre at...kPa (kgf/cm²) pressure
- 7) Recommended inflation pressure, kPa (kgf/cm²)
 - i) For field work
 - ii) For transport
- 8) Track width, mm
- 9) Method of changing track width, range and number of steps
- c) Wheel base, mm
- d) Method of changing wheel base, if any and range

A-22 TRACK-LAYING EQUIPMENT

- a) Track Plate
 - 1) Type
 - 2) Number
 - 3) Width, mm
 - 4) Surface hardness and depth of hardness
 - 5) Grouser height, mm
 - 6) Track pitch, mm
 - 7) Size of pins, mm
 - 8) Track gauge, mm
 - 9) Length of track in ground contact, mm
 - 10) Nominal pressure, kPa (kgf/cm²)
 - 11) Method of track tensioning
 - 12) Type of links
- b) Driving Sprockets
 - 1) Pitch circle diameter, mm
 - 2) Number of teeth
 - 3) Face width, mm
- c) Type of Suspension
- d) Idler Wheel
 - 1) Diameter, mm
 - 2) Face width, mm
 - 3) Method of fixing
 - 4) Lubrication

- | | |
|----------------------|----------------------|
| e) Carrier Rollers | 4) Depth of hardness |
| 1) Number | 5) Type of bearing |
| 2) Diameter | 6) Service schedule |
| 3) Surface hardness | |
| 4) Depth of hardness | |
| 5) Type of bearing | |
| 6) Service schedule | |
| f) Track Rollers | |
| 1) Number | |
| 2) Diameter, mm | |
| 3) Surface hardness | |

A-23 SEAT

- | | |
|----------------------------|---------------|
| a) Make/type | 1) Vertical |
| b) Type of suspension | 2) Lateral |
| c) Type of damping | 3) Horizontal |
| d) Range of adjustment, mm | |

A-24 BALLAST

Re-write as under:

<i>Particulars</i>	<i>Ballast Mass as Used (kg)</i>					
	Front C.I. Weight on			Rear		
i) During drawbar performance test	Water	Wheel	Axle	Water	C.I. Weight on Wheel	
ii) During field performance test						
a) Dry land						
b) Wet land						
iii) During haulage test						

A-25 MASS OF TRACTOR (TRACTOR WITHOUT DRIVER BUT WITH LUBRICANT, FUEL AND COOLANT FULL)

<i>Condition</i>	<i>Mass of tractor, kg</i>		
	Front	Rear	Total
(1)	(2)	(3)	(4)
Without ballast			
With commercial ballast			
With ballast			
i) During drawbar performance test			
ii) During field performance test			
iii) During haulage test			

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A-26 OVERALL DIMENSIONS

<i>Condition</i>	<i>Length</i> <i>mm</i>	<i>Width</i> <i>mm</i>	<i>Height, mm</i>		<i>Ground Clearance, mm</i>
			<i>With Exhaust Pipe</i>	<i>Without Exhaust Pipe</i>	
(1)	(2)	(3)	(4)	(5)	(6)
Without ballast with commercial ballast					

A-27 OPTIONAL FEATURES, IF ANY FOR ACCESSORIES PROVIDED

- 1) Type
- 2) Grade
- 3) Specific gravity at 15 °C
- 4) Viscosity
- 5) Octane or cetane number
- 6) Standard to which it conforms

A-28 FUEL AND LUBRICANTS RECOMMENDED

a) Fuel

b) Lubricants

<i>Sl No.</i> (1)	<i>Location</i> (2)	<i>Type</i> (3)	<i>Grade</i> (4)
i)	Engine		
ii)	Air cleaner Clutch		
iii)	Transmission		
iv)	Final drive		
v)	Steering gear		
vi)	Hydraulic		

c) Number of external lubricating points

- 1) Oiling
- 2) Greasing

- 1) Field operation
- 2) Belt pulley work
- 3) Puddling
- 4) Road haulage

A-29 ADDITIONAL INFORMATION

a) Whether the tractor is suitable for

- 1) Belt pulley work and if so maximum power rating
- 2) Puddling (if suitable for puddling indicate features, such as water sealing, etc., provided)

- c) Standard accessories and fittings
- d) Optional accessories and fittings
- e) Safety features, if any
- f) Any special feature of the tractor

NOTES

- 1 Delete the items not applicable to a tractor.
- 2 Add any additional details, of the tractors, if present.
- 3 Conformity or otherwise of a component, assembly or item with the relevant Indian Standard should be stated, wherever applicable.

b) Recommended throttle setting for:

ANNEX B

(Clauses 4.3, 4.4.1 and 4.7)

PROFORMA FOR SELECTION, RUNNING-IN AND REPAIRS

- | | |
|-----------------------------|---|
| a) Name of the manufacturer | e) Method of selection |
| b) Address | f) Place of running-in |
| c) Submitted for test by | g) Duration and schedule of running-in |
| d) Selected by | h) Repairs and adjustments made during running in |

ANNEX C

(Clause 6.2.2)

AIR-CLEANER OIL PULL-OVER TEST

- | | |
|---|--|
| a) Type of oil used | iii) Relative humidity, percent |
| b) Viscosity at 98.9 °C, mm ² /s (cSt) | d) Mass of oil before test (with 5 percent excess on mass basis) |
| c) Atmospheric conditions | e) Test data |
| i) Temperature, °C | |
| ii) Pressure, kPa (kgf/cm ²) | |

Sl No	Position of Tractor	Starting Time	Stopping Time	Mass of Oil		Loss of Oil ¹⁾	Loss of Oil	Engine Oil Pressure	Remarks
				Before Test	After Test				
(1)	(2)	(3)	(4)	g	g	g	%	kPa (kgf/cm ²)	(10)

- i) Tractor parked on level ground
- ii) Tractor tilted to 15° laterally on right hand side
- iii) Tractor tilted to 15° laterally on left hand side
- iv) Tractor tilted to 15° or 30° longitudinally with front end up
- v) Tractor tilted to 15° or 30° longitudinally with rear end up

¹⁾Percentage of Loss = $\frac{\text{Loss of oil, g}}{\text{Mass of oil before test, g}} \times 100$

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ANNEX D
(Clause 6.3.3)

VIBRATION MEASUREMENT

- 1) Date and location of test
- 2) Type of accelerometer
- 3) Test data

<i>Sl. No.</i>	<i>Measuring Points</i>	<i>At No-Load</i>		<i>Vibration, Micron At Load Corresponding to 85 percent of Maximum PTO Power</i>	
		HD	VD	HD	VD
(1)	(2)	(3)	(4)	(5)	(6)

- i) Foot rest, left
- ii) Foot rest, right
- iv) Steering wheel
- v) Seat, back
- vi) Seat, bottom
- vii) Mud-guard, left
- viii) Mud-guard, right
- ix) Head light, left
- x) Head light, right
- xi) Battery base, centre
- xii) Tail light, right
- xiii) Ploughing light
- xiv) Gear shifting lever
- xv) Accelerator lever, foot
- xvi) Accelerator lever, hand
- xvii) Brake pedal, left
- xviii) Brake pedal, right
- xix) Clutch pedal
- xx) Hydraulic control lever
- xxi) PTO engaging lever
- xxii) Differential lock lever

¹⁾ If a helper's seat is provided on mud-guard

ANNEX E
(Clause 6.4.2)

DATA SHEET FOR COMPONENT/ASSEMBLY

E-1 CYLINDER BORE DIAMETER

Cylinder	Position	Measured Diameter After Test		Maximum Permissible Diameter mm
		Thrust Side mm	Perpendicular to Thrust Side	
(1)	(2)	(3)	(4)	(5)
Top				
Middle				
Bottom				
etc				

E-2 PISTON

Piston No.	Piston Diameter (mm)		Maximum Permissible Play Between Piston and Cylinder Liner at the Skirt of the Piston (mm)
	Top (above compression ring)	At skirt	
	Thrust Side Non Thrust Side	Thrust Side Non Thrust Side	

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E-3 RING END GAP

<i>Type of Ring</i>	<i>Cylinder No.</i>	<i>Ring No. mm</i>	<i>Measured Clearance, mm</i>	<i>Maximum Permissible Clearance, mm</i>
(1)	(2)	(3)	(4)	(5)
Compression	1	1		
		2		
		3		
		etc	etc	
Oil	1	1		
		2		
		3		
		4		
		etc	etc	

E-4 RING GROOVE CLEARANCE

<i>Type of Ring</i>	<i>Cylinder No.</i>	<i>Ring No. mm</i>	<i>Measured Clearance, mm</i>	<i>Maximum Permissible Clearance, mm</i>
(1)	(2)	(3)	(4)	(5)
Compression	1	1		
		2		
		3		
		etc	etc	
Oil	1	1		
		2		
		3		
		4		
		etc	etc	

E-5 RADIAL AND AXIAL CLEARANCE OF CRANKCASE BEARINGS

<i>Bearing No.</i>	<i>Type of Clearance</i>	<i>Measured Clearance After Test, mm</i>	<i>Maximum Permissible Clearance, mm</i>
(1)	(2)	(3)	(4)
1	Radial		
	Axial		

E-6 VALVES, GUIDES, TAPPETS AND TIMING GEAR

- a) Any marked sign of over-heating
- b) Pitting of seat
- c) Any damage to the teeth of timing gear
- d) Spring stiffness, N/mm (kgf/mm)
- e) Clearance between valve guide and valve stem, mm

E-7 CLUTCH

- a) Any marked wear in clutch friction plate
- b) Condition of clutch release bearings
- c) Condition of pilot bearing
- d) Condition of springs and fingers
- e) Presence of oil and water in clutch housing
- f) Thickness of clutch plate

E-8 BRAKE

<i>Type of Brake</i>	<i>Initial Thickness of Brake Lining, mm</i>	<i>Measured Thickness of Lining After Test, mm</i>	<i>Minimum Permissible Thickness, mm</i>
(1)	(2)	(3)	(4)
Left			
Right			

E-9 GEAR BOX (Any damage, pitting and chipping of the gear teeth)

- e) Condition of seals for stub axle and king pin
- f) Presence of dust
- g) Any marked wear in sprockets, pin, grouser plate and idler (in case of laying tractor).

E-10 FRONT AXLE

- a) Clearance between king pin and bushes, mm
- b) Clearance between centre pin and bush, mm
- c) Condition of thrust bearing
- d) Condition of bearings for stub axle

E-11 STARTER MOTOR AND DYNAMO

- a) Presence of dust in housings
- b) Condition of bearings.

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ANNEX F
(Foreword)

COMMITTEE COMPOSITION

Agricultural Machinery and Equipment Sectional Committee, FAD 11

<i>Organization</i>	<i>Representative(s)</i>
ICAR - Central Institute of Agricultural Engineering, Bhopal	DR C. R. MEHTA, DIRECTOR (Chairperson)
Indian Council of Agricultural Research, New Delhi	DR KANCHAN K. SINGH (Former Chairperson)
Agriculture Machinery Manufacturers Association, Pune	DR SURENDRA SINGH SHRI S. V. RAJU (<i>Alternate</i>)
All India Farmers Alliance, New Delhi	DR RAJARAM TRIPATHI ADV APURVA TRIPATHI (<i>Alternate</i>)
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Automotive Component Manufactures Association of India, New Delhi	SHRI A. A. BADUSHA SHRI GIRISH TANAWADE (<i>Alternate I</i>) SHRI GANGARAM AUTI (<i>Alternate II</i>)
Captain Tractors Private Limited, Rajkot	SHRI SHAILASH MOVALIYA
Central Farm Machinery Training and Testing Institute (CFMT and TI), Budni	SHRI P. K. PANDEY SHRI C. V. CHIMOTE (<i>Alternate</i>)
CLAAS India Private Limited, Chandigarh	SHRI K. P. SINGH
CNH Industrial India Private Limited, Pune	SHRI SANTHOSH RAO SHRI SUJIT HINGE (<i>Alternate</i>)
Consumer Guidance Society of India (CGSI), Mumbai	DR SITARAM DIXIT
ICAR - All India Coordinated Research Project on Ergonomics and Safety in Agriculture, Bhopal	DR K. N. AGRAWAL
ICAR - All India Coordinated Research Project on Farm Implements and Machinery (AICRP-FIM), New Delhi	DR C. R. MEHTA
ICAR - All India Coordinated Research Project on Utilization of Animal Energy (AICRP), Bhopal	DR M. DIN
ICAR - Central Institute of Agricultural Engineering, Bhopal	HEAD, AGRI MECHANIZATION, CIAE DR U. R. BADEGAONKA (<i>Alternate I</i>) DR DILIP JAT (<i>Young Professional</i>) (<i>Alternate II</i>)
Indian Council of Agricultural Research, New Delhi	DR PANNA LAL SINGH SHRI PRAKASH CHANDRA JENA (<i>Alternate</i>)
John Deere India Private Limited, Pune	SHRI ANAND RAJ SHRI CHANDRASHEKHAR DESHMUKH (<i>Alternate</i>)
Kerala Agro Machinery Corporation Limited (KAMCO), Athani	SHRI P. C. SAJIMAN SHRI ARUN KUMAR T. K. (<i>Alternate I</i>) SHRI VIPIN V. PAVANAN (<i>Alternate II</i>)

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Power Tillers Manufacturers Association, Kolkata	SHRI A. R. GANESH KUMAR
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This Indian Standard has been developed from Doc No.: FAD 11 (17077).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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