भारतीय मानक

Indian Standard

IS 4931 (Part 1) : 2024

कृषि ट्रैक्टर — रियर-माउंटेड पावर टेक-ऑफ के प्रकार 1, 2, 3 और 4

भाग 1 सामान्य विशिष्टियां, सुरक्षा आवश्यकताएँ, मास्टर शील्ड और क्लीयरेंस ज़ोन के लिए आयाम

(ISO 500-1 : 2014, संशोधित)

(चौथा पुनरीक्षण)

Agricultural Tractors — Rear-Mounted Power Take-off Types 1, 2, 3 and 4

Part 1 General Specifications, Safety Requirements, Dimensions for Master Shield and Clearance Zone

(ISO 500-1 : 2014, MOD)

(Fourth Revision)

ICS 91.060.50

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Agricultural Machinery and Equipment Sectional Committee, FAD 11

NATIONAL FOREWORD

This Indian Standard (Part 1) (Fourth Revision) which is a modified adoption of ISO 500-1 : 2014 'Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 — Part 1: General specifications, safety requirements, dimensions for master shield and clearance zone' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Agricultural Machinery and Equipment Sectional Committee and approval of the Food and Agriculture Division Council.

This Indian Standard 4931 was originally published in 1968 and subsequently revised in 1977 and 1984. In the third revision in 1995, the standard was aligned with corresponding ISO standard, ISO 500 : 1991 and the tolerance on diameter of shaft profile of Type 1 PTO shaft, requirements of hardness, location of PTO and dimension of master shield were modified. Also, the safety requirements as per IS 12239 (Part 1) : 1988 ' Guide for safety and comfort of operator of agricultural tractors and power tillers: Part 1 General requirements' and alternate clearance zone were included.

Subsequently, ISO 500 was revised in 2004 splitting it into three parts under the general title 'Agricultural tractors — Rear-mounted power take-off types 1, 2, and 3'. Further, Part 1 and Part 3 of ISO 500 were revised in 2014 with the modification of the general title as 'Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4'. In this fourth revision of IS 4931, the Indian Standard is also being split into three parts as given below:

Part 1 General specifications, safety requirements, dimensions for master shield and clearance zone

Part 2 Narrow-track tractors, dimensions for master shield and clearance zone

Part 3 Main PTO dimensions and spline dimensions, location of PTO

The text of ISO standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'; and

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this standard, **4.2** of ISO 500-1 : 2014 has been modified to align with national practices and particular need of the tractor industry in order to increase the acceptance of the standard in the country. The technical deviation is as under:

Clause/Sub clause of the Standard	*Modifications from ISO*	*Justification*
4.2	Substitute the following for the existing text under **4.2**: 'The direction of PTO rotation shall be clockwise when viewed from behind the tractor except when a ground-driven PTO is operated with the tractor in reverse direction. However, manufacturer may provide PTO rotation in anticlockwise direction (when viewed from behind the tractor) for special application requirements.	Reverse PTO option is extensively used in India in threshing/rotavation etc, operations for cleaning the machines.

In this adopted standard, reference appears to the following International Standards for which Indian Standards also exist. The corresponding Indian Standards, which is to be substituted in their respective place, is listed below along with its degree of equivalence for the edition indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6489-1 Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 1: Dimensions of hitch-hooks	IS 12362 (Part 1) : 2007/ISO 6489-1 : 2001 Agricultural vehicles — Mechanical connections between towed and towing vehicles: Part 1 Dimensions of hitch-hooks (*second revision*)	Identical
ISO 5673-2 Agricultural tractors and machinery — Power take-off drive shafts and power-input connection — Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments	ISO 10318 (Part 2) : 2021/ ISO 5673-2 : 2005 Agricultural tractors and machinery — Power take-off drive shafts and power-input connection: Part 2 Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments (*second revision*)	Identical
ISO 6489-3 Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 3: Tractor drawbar	IS 12362 (Part 3) : 2023/ISO 6489-3 : 2021 Agricultural vehicles — Mechanical connections between towed and towing vehicles: Part 3 Tractor drawbar (*second revision*)	Identical

The Committee has reviewed the provisions of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard.

International Standard	*Title*
ISO 6489-2 : 2002	Agricultural vehicles — Mechanical connections between towed and towing vehicles — Part 2: Specifications for clevis coupling 40

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.

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AGRICULTURAL TRACTORS — REAR-MOUNTED POWER TAKE-OFF TYPES 1, 2, 3, 4

PART 1 GENERAL SPECIFICATIONS, SAFETY REQUIREMENTS, DIMENSIONS FOR SHIELD AND CLEARANCE ZONE

(ISO 500-1 : 2014, MOD)

1 Scope

This part of ISO 500 gives general specifications, including speeds, safety requirements, the dimensions for master shield, and clearance zones for rear-mounted power take-offs (PTOs) of types 1, 2, 3, and 4 on agricultural tractors with a track setting of more than 1 150 mm (those with track setting width of 1 150 mm or less are covered in ISO 500-2).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5673-2, *Agricultural tractors and machinery — Power take-off drive shafts and power-input connection — Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments*

ISO 6489 (all parts), *Agricultural vehicles — Mechanical connections between towed and towing vehicles*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
power take-off
PTO
external shaft on the rear of the tractor to provide rotational power to implements

4 Specifications

4.1 The tractor rear power take-off (PTO) is classified into four types (see Table 1).

4.2 The direction of PTO rotation shall be clockwise when viewed from behind the tractor except when a ground-driven PTO is operated with the tractor in reverse direction.

4.3 The nominal PTO rated rotational frequency can be realized by one or more engine speed ranges.

Table 1 — Characteristics of PTO types

PTO type	Nominal diameter mm	Number and type of splines	Nominal PTO rated rotational frequency min^{-1}	Recommended PTO power at rated engine speed[a] kW
1	35	6 straight splines	540	<65
			1 000[b]	<110
2	35	21 involute splines	1 000	<130
3	45	20 involute splines	1 000	<300
4	57,5	22 involute splines	1 300	<450

[a] Determined in accordance with ISO 789-1 or OECD code 2.

[b] This option is not available in North America.

5 PTO-speed requirements for shiftable PTO

5.1 Should more than one ratio between the engine speed and the PTO rotation speed be provided, any change of ratio shall be indicated. In addition, specific design measures shall be taken to ensure that unintentional changes of ratio, particularly in changing to a higher rotational speed, cannot occur. This safety device shall operate each time the PTO is engaged.

5.2 A means to indicate when the PTO is operating at which nominal speed shall be provided.

6 Safety requirements

6.1 The PTO master shield, as shown in Figure 1 and Table 2, shall be supplied by the tractor manufacturer and shall be fixed to the tractor. If the same degree of safety protection is reached and the clearance zone is respected, equivalent protection devices (e.g. towing hook or clevis supports) can be used instead of the master shield. In this case, provisions shall be made for anchoring the restraining member of the PTO drive shaft guard.

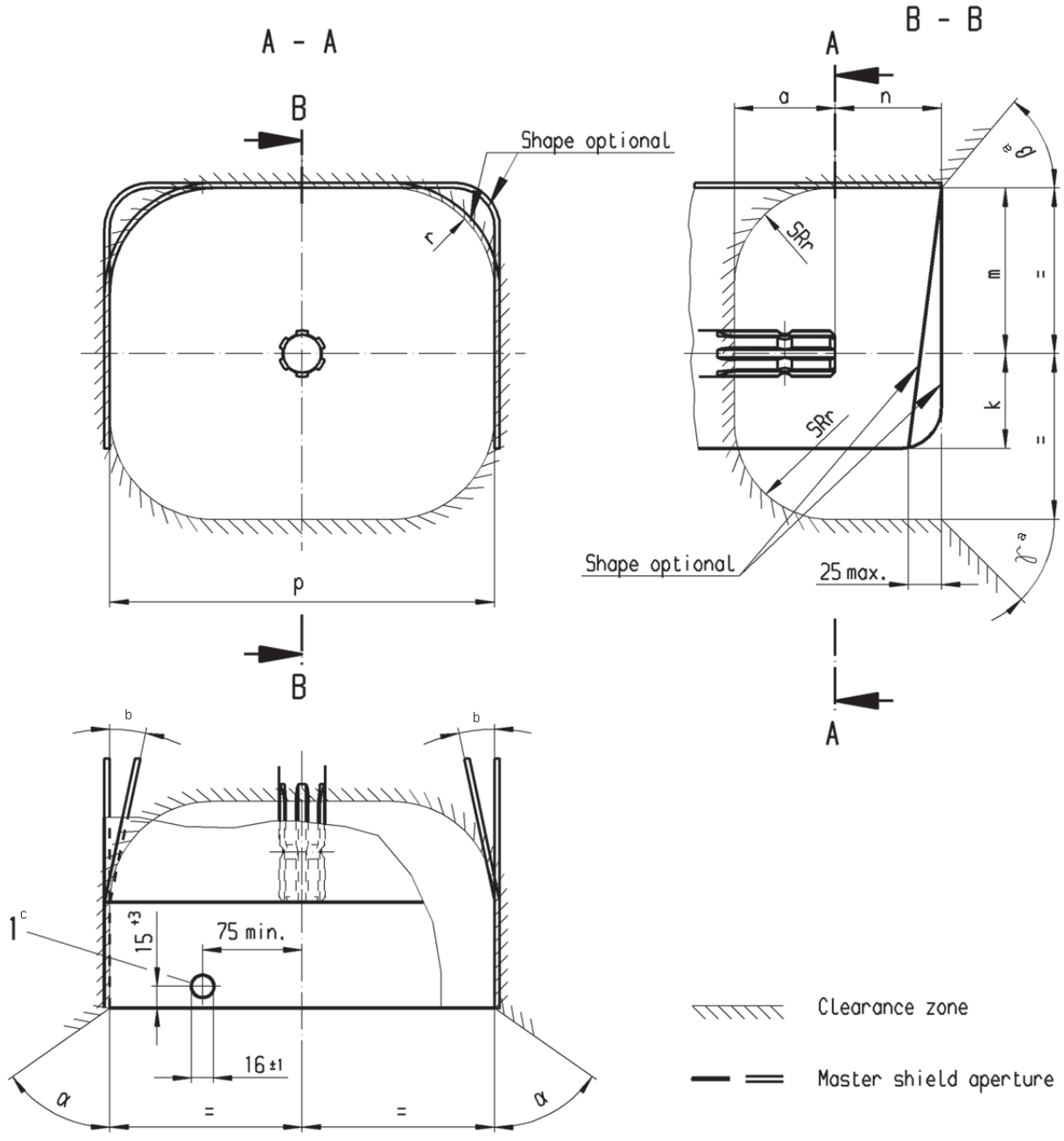
6.2 If necessary, the PTO master shield or a part of the shield can be movable without detachment from the tractor to facilitate attachment of the PTO drive shaft. The movable portion of the master shield shall be resistant to unintentional movement when in the operating position. The master shield can be made of flexible material.

6.3 If the PTO master shield can be used as a step, it shall withstand a vertical static load of 1 200 N without permanent deformation.

6.4 An additional non-rotating casing which fully covers the PTO can also be supplied with the tractor to cover the PTO when the PTO is not in use.

7 Dimensions for tractor master shield aperture and clearance zone of PTO

The dimensions of the tractor master shield aperture and the clearance zone around the PTO shall be in accordance with Figure 1 and Table 2.



Key

1 Hole

a The clearance can be restricted by movable and/or detachable devices. The clearance zone on towing vehicles shall be in accordance with ISO 6489 (all parts) and ISO 5673-2.

b Angle optional under consideration of clearance zone.

c For coupling up the restraining member of the PTO drive shaft guard preventing guard rotation.

Figure 1 — Tractor master shield aperture and clearance zone around PTO

Table 2 — Tractor master shield controlling dimensions for aperture and clearance zone dimensions

Dimension	PTO type			
	1	2	3[a]	4[b]
a_{min}	80 mm	80 mm	95 mm	105 mm
α_{min}	60 °	60 °	60 °	60 °
β_{min}	50 °	50 °	50 °	50 °
γ_{min}	45 °	45 °	45 °	45 °
SRr_{max}	76 mm	76 mm	90 mm	90 mm
k_{min}	70 mm	70 mm	80 mm	80 mm
m ± 5 mm	125 mm	125 mm	150 mm	150 mm
n ± 5 mm	85 mm	85 mm	100 mm	100 mm
p ± 10 mm	290 mm	290 mm	360 mm	360 mm
r_{max}	76 mm	76 mm	90 mm	90 mm

[a] For tractors equipped with the PTO type 3 that can be adapted to also provide a PTO type 1 or 2, the master shield only needs to meet the specifications in Figure 1 and Table 2 for the PTO type 3.

[b] For tractors equipped with the PTO type 4 that can be adapted to also provide a PTO type 1, 2, or 3, the master shield only needs to meet the specifications in Figure 1 and Table 2 for the PTO type 4.

Bibliography

[1] ISO 789-1:1990, *Agricultural tractors — Test procedures — Part 1: Power tests for power take-off*

[2] OECD code 2, *OECD standard code for the official testing of agricultural and forestry tractor performance*

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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