भारतीय मानक

Indian Standard

IS 4931 (Part 3) : 2024
ISO 500-3 : 2014

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

भाग 3 मुख्य पीटीओ आयाम एवं स्प्लीन आयाम, पीटीओ का स्थान

(चौथा पुनरीक्षण)

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

Part 3 Main PTO Dimensions and Spline Dimensions, Location of PTO

(Fourth Revision)

ICS 65.060.10

भारतीय मानक ब्यूरो
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Agricultural Machinery and Equipment Sectional Committee, FAD 11

NATIONAL FOREWORD

This Indian Standard (Part 3) (Fourth Revision) which is identical to ISO 500-3 : 2014 'Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 — Part 3: Main PTO dimensions and spline dimensions, location of PTO' 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.

IS 4931 was first 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 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 6508-1 Metallic materials — Rockwell hardness test — Part 1: Test method	IS 1586 (Part 1) : 2018/ISO 6508-1 : 2016 Metallic materials — Rockwell hardness test: Part 1 Test method (*fifth revision*)	Identical

(*Continued on third cover*)

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Indian Standard

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

PART 3 MAIN PTO DIMENSIONS AND SPLINE DIMENSIONS, LOCATION OF PTO

(Fourth Revision)

1 Scope

This part of ISO 500 specifies the manufacturing requirements for, and the location of, rear-mounted power take-offs (PTOs) of types 1, 2, 3, and 4 on agricultural tractors.

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 6508 (all parts), *Metallic materials — Rockwell hardness test*

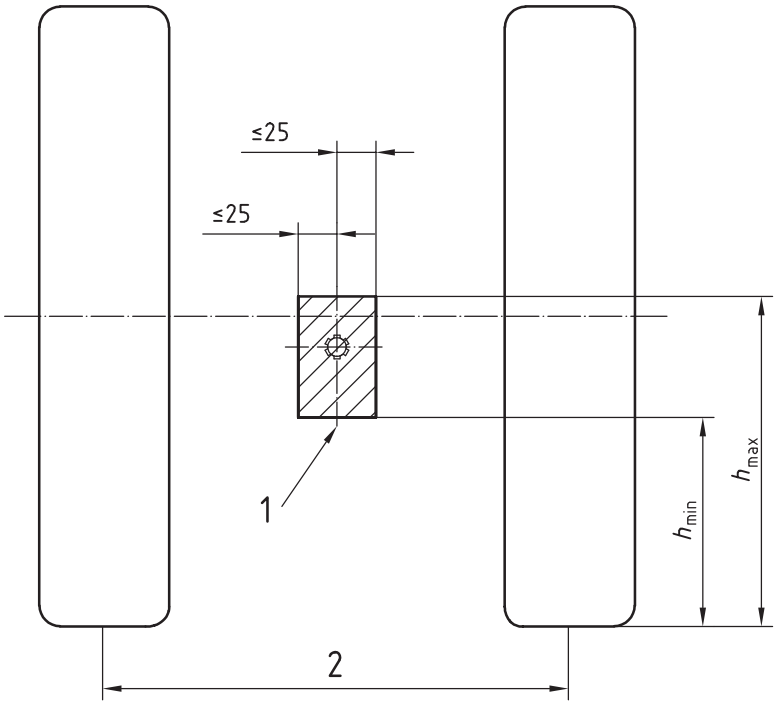
3 PTO location

The location of the PTO axis shall lie within the shaded rectangle shown in Figure 1 and in accordance with Table 1, parallel to the longitudinal axis of the tractor and should be parallel to the ground within ±3°.

The values of the dimension h are for normal agricultural applications (see Figure 1 and Table 1). On tractors especially designed for high ground clearance, such as working in standing vegetable crops or sugar cane, h_{max}, can exceed the given values. On agricultural tractors designed for low ground clearance, such as lawn mowing or ground care which require a low centre of gravity, for narrow-track tractors, and for track-laying tractors, h_{min}, can be less than the given values.

For tractors that can accommodate multiple PTO types, h_{max} shall be the value for the largest PTO type specified for the tractor.

Dimensions in millimetres



Key

1 centre line of tractor

2 track width

Figure 1 — PTO location

Table 1 — PTO location

Dimensions in millimetres

PTO type	h_{min}	h_{max}
1	480	800
2	530	900
3	600	1 000
4	600	1 000

4 Manufacturing requirements — Main PTO and spline dimensions

The dimensions of the rear PTO on agricultural tractors and the mating part of the PTO drive shaft shall comply with:

— Figure 2 and Table 2, for PTO dimensions;

— Figure 3 and Table 3, for external, straight-sided spline dimensions — Type 1;

— Figure 4 and Table 4, for internal straight-sided spline dimensions — Type 1;

— Figure 5 and Table 5, for external, involute spline dimensions — Type 2;

— Figure 6 and Table 6, for internal, involute spline dimensions — Type 2;

— Figure 7 and Table 7, for external, involute spline dimensions — Type 3;

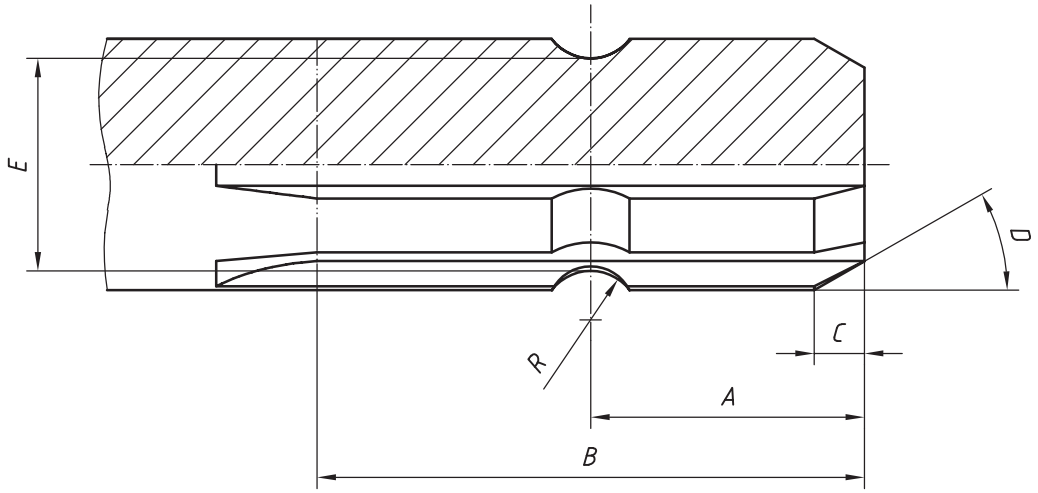
— Figure 8 and Table 8, for internal, involute spline dimensions — Type 3;

— Figure 9 and Table 9, for external, involute spline dimensions — Type 4;

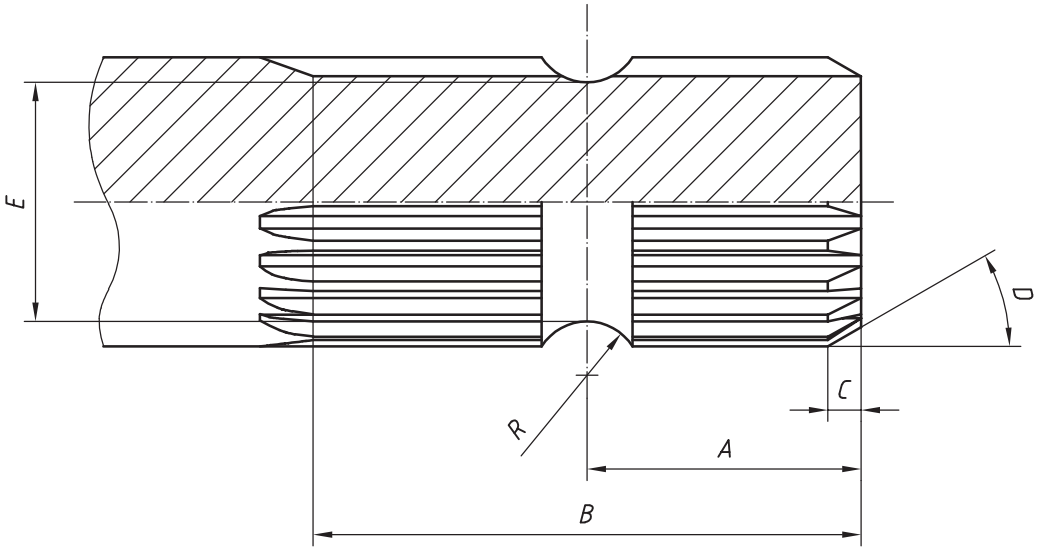
— Figure 10 and Table 10, for internal, involute spline dimensions — Type 4.

The hardened portion of the splines shall have a minimum surface hardness of 48 HRC when tested in accordance with ISO 6508 (all parts).

NOTE For general spline information, including inspection, see ISO 4156 (all parts).



a) Type 1



b) Types 2, 3, and 4

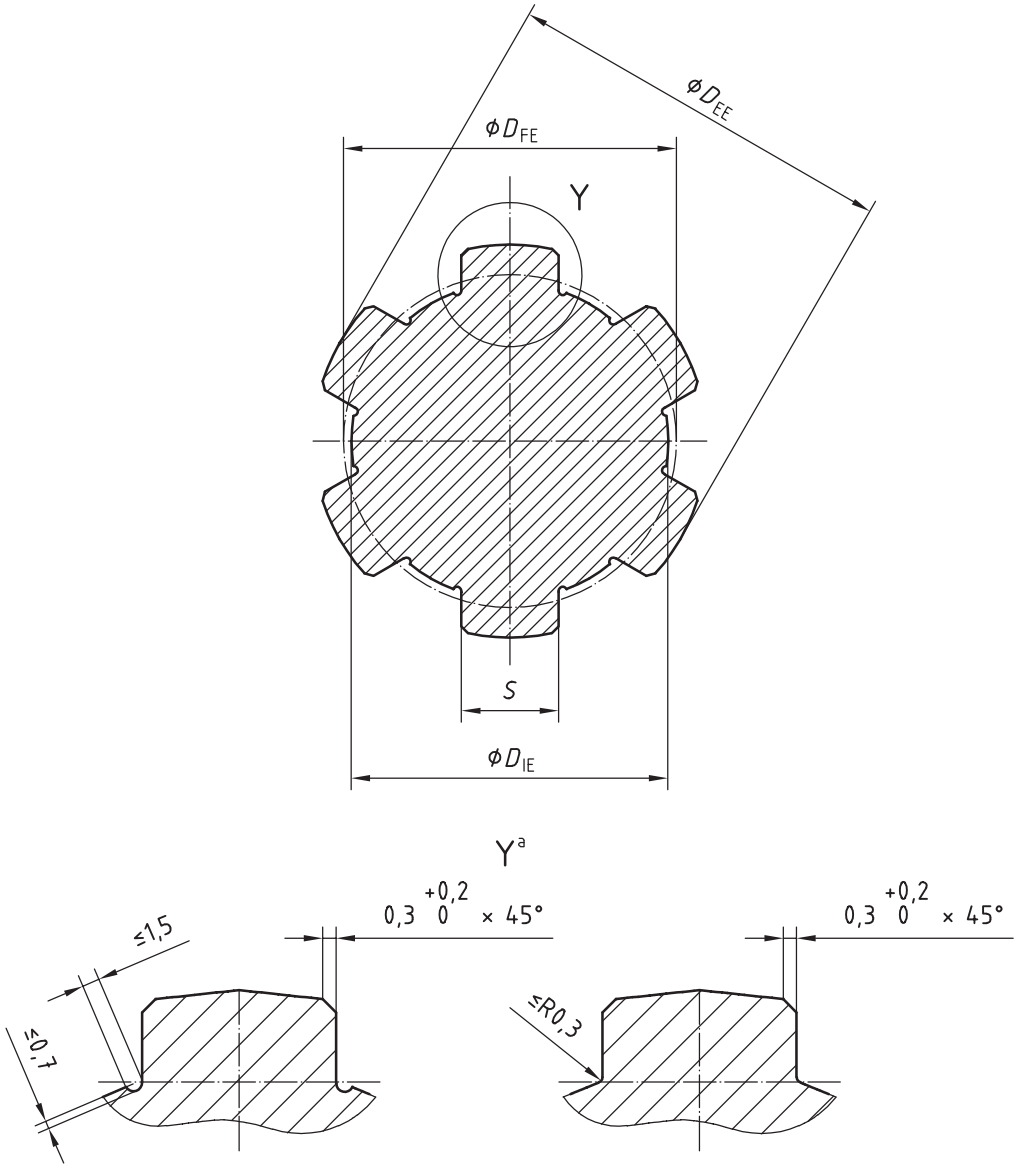
Figure 2 — PTO dimensions

Table 2 — PTO dimensions

Dimensions in millimetres

Dimensions		Type 1	Type 2	Type 3	Type 4
A	Groove to end of shaft	38 ± 0,8	25,5 ± 0,8	38 ± 0,8	50 ± 0,8
B	Effective spline length and hardened portion	≥ 76	≥ 64	≥ 89	≥ 100
C	Chamfer	$6\ ^{+1}_{0}$	$5\ ^{+1}_{0}$	$6\ ^{+1}_{0}$	$8\ ^{+1}_{0}$
D	Chamfer angle	30° ± 3°	30° ± 3°	30° ± 3°	30° ± 3°
E	ID of groove	29,40 ± 0,1	29,40 ± 0,1	37,25 ± 0,1	48 ± 0,1
R	Radius of groove	6,8 ± 0,25	6,8 ± 0,25	8,4 ± 0,25	10,4 ± 0,25

Dimensions in millimetres



Key

a Optional.

Figure 3 — External, straight-sided spline dimensions — Type 1

Table 3 — External, straight-sided spline dimensions — Type 1

Dimensions in millimetres

Dimension	Symbol	Value
Number of teeth	Z	6
Major diameter	D_{EE}	$34{,}87\ ^{0}_{-0{,}12}$
Form diameter	D_{FE}	≤ 30,00
Minor diameter	D_{IE}	$29{,}00\ ^{0}_{-0{,}10}$
Tooth thickness max. eff.	S_{Vmax}	8,64
Tooth thickness max. act. REF	S_{max}	(8,60)
Tooth thickness min. act.	S_{min}	8,51
Allowed form variations	Composite GO gage has priority	
Total profile variation	F_F	0,020
Total lead variation	F_B	0,015
Total index variation	F_P	0,040

Dimensions in millimetres

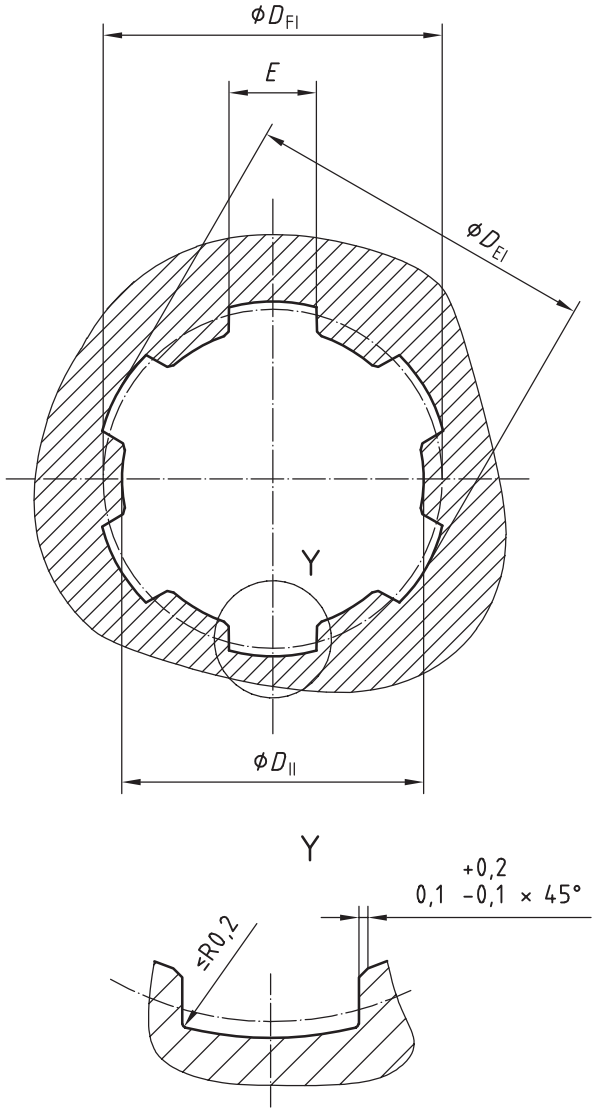


Figure 4 — Internal, straight-sided spline dimensions — Type 1

Table 4 — Internal, straight-sided spline dimensions — Type 1

Dimensions in millimetres

Dimension	Symbol	Value
Number of teeth	Z	6
Major diameter	D_{EI}	$34{,}95\ ^{0}_{-0{,}05}$
Form diameter	D_{FI}	≥ 34,50
Minor diameter	D_{II}	$29{,}80\ ^{0}_{-0{,}15}$
Space width max. act.	E_{max}	8,76
Space width min. act. REF	E_{min}	(8,71)
Space width min. eff.	E_{Vmin}	8,69
Allowed form variations	Composite GO gage has priority	
Total profile variation	F_F	0,020
Total lead variation	F_B	0,015
Total index variation	F_P	0,040

Dimensions in millimetres

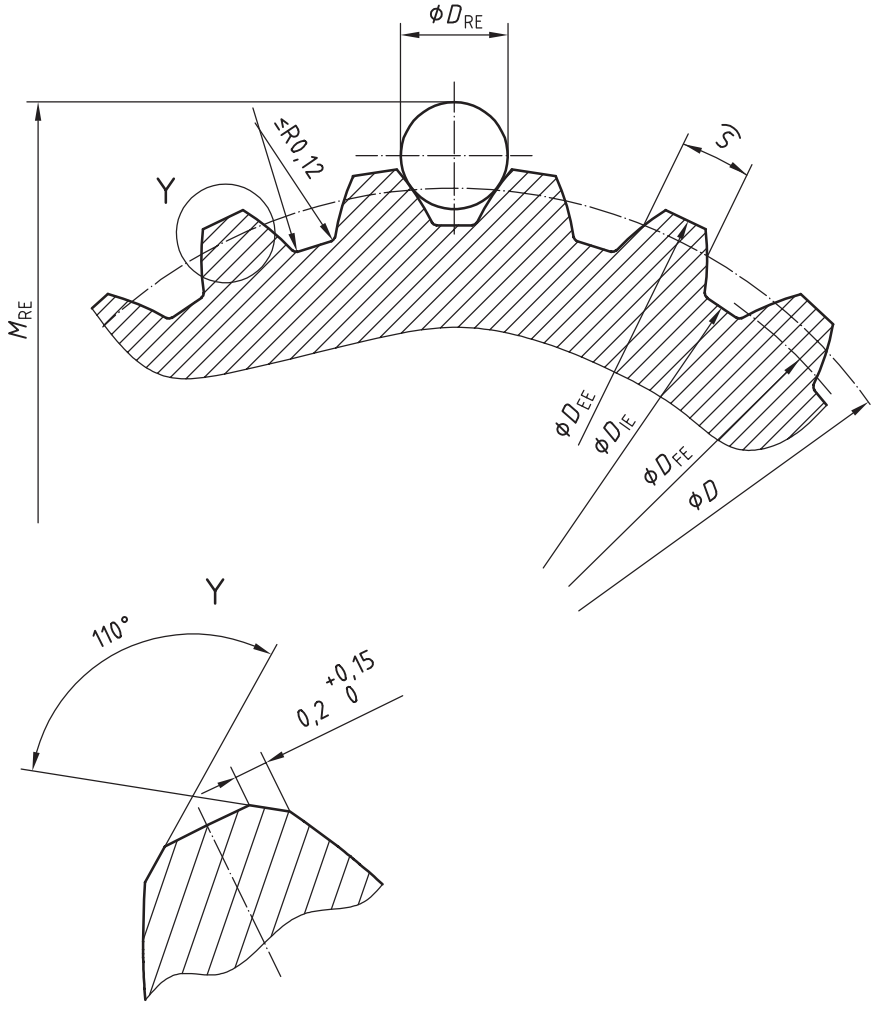


Figure 5 — External, involute spline dimensions — Type 2

Table 5 — External, involute spline dimensions — Type 2

Dimensions in millimetres

Dimension	Symbol	Value	For alternative imperial pin size
Number of teeth	Z	21	—
Module	M	1,587 5	—
Pressure angle	α	30°	—
Pitch diameter	D	33,338	—
Base diameter	D_B	28,871 1	—
Major diameter	D_{EE}	$34{,}874\ ^{0}_{-0{,}025}$	—
Form diameter	D_{FE}	≤ 31,65	—
Minor diameter	D_{IE}	$31{,}100\ ^{0}_{-0{,}250}$	—
Tooth thickness max. eff.	S_{Vmax}	2,406	—
Tooth thickness max. act. REF	S_{max}	(2,369)	—
Tooth thickness min. act.	S_{min}	2,306	—
Pin diameter	D_{RE}	3,50	3,048
Dim. over pins max. REF	M_{REmax}	(39,00)	(37,759)
Dim. over pins min.	M_{REmin}	38,906	37,662
Allowed form variations	Composite GO gage has priority		
Total profile variation	F_F	0,020	—
Total lead variation	F_B	0,013	—
Total index variation	F_P	0,040	—
Concentricity	D_{EE} to D	0,03	—

Dimensions in millimetres

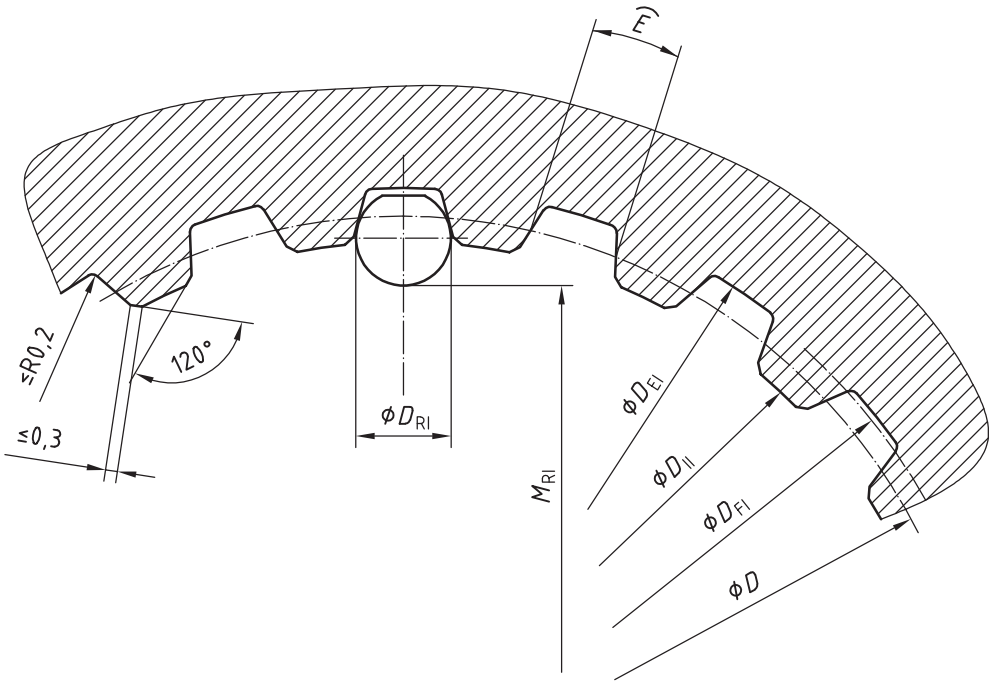


Figure 6 — Internal, involute spline dimensions — Type 2

Table 6 — Internal, involute spline dimensions — Type 2

Dimensions in millimetres

Dimension	Symbol	Value	For alternative imperial pin size
Number of teeth	Z	21	—
Module	M	1,587 5	—
Pressure angle	α	30°	—
Pitch diameter	D	33,338	—
Base diameter	D_B	28,871 1	—
Major diameter	D_{EI}	$34{,}925\ ^{+0{,}036}_{0}$	—
Form diameter	D_{FI}	≥ 34,62	—
Minor diameter	D_{II}	$31{,}750\ ^{+0{,}150}_{0}$	—
Space width max. act.	E_{max}	2,565	—
Space width min. act. REF	E_{min}	(2,520)	—
Space width min. eff.	E_{Vmin}	2,494	—
Pin diameter/flattened	D_{RI}	2,75/2,60	2,743/2,60
Dim. between pins max.	M_{RImax}	29,380	29,403
Dim. betw. pins min. REF	M_{RImin}	(29,290)	(29,315)
Allowed form variations	Composite GO gage has priority		
Total profile variation	F_F	0,020	—
Total lead variation	F_B	0,013	—
Total index variation	F_P	0,040	—
Concentricity	D_{EI} to D	0,02	—

Dimensions in millimetres

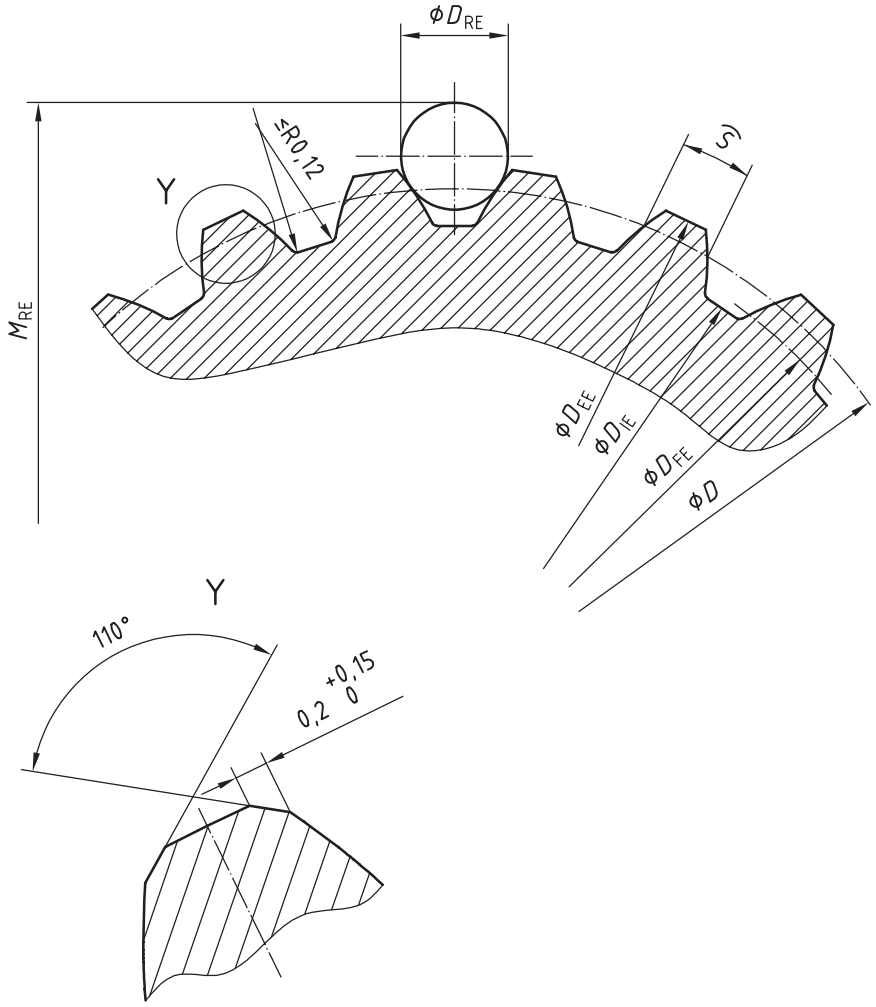


Figure 7 — External, involute spline dimensions — Type 3

Table 7 — External, involute spline dimensions — Type 3

Dimensions in millimetres

Dimension	Symbol	Value	For alternative imperial pin size
Number of teeth	Z	20	—
Module	M	2,116 7	—
Pressure angle	α	30°	—
Pitch diameter	D	42,333	—
Base diameter	D_B	36,661 7	—
Major diameter	D_{EE}	$44{,}425\ ^{0}_{-0{,}025}$	—
Form diameter	D_{FE}	≤ 40,10	—
Minor diameter	D_{IE}	$39{,}210\ ^{0}_{-0{,}250}$	—
Tooth thickness max. eff.	S_{Vmax}	3,237	—
Tooth thickness max. act. REF	S_{max}	(3,200)	—
Tooth thickness min. act.	S_{min}	3,137	—
Pin diameter	D_{RE}	4,000	4,064
Dim. over pins max. REF	M_{REmax}	(48,239)	(48,418)
Dim. over pins min.	M_{REmin}	48,142	48,321
Allowed form variations	Composite GO gage has priority		
Total profile variation	F_F	0,020	—
Total lead variation	F_B	0,013	—
Total index variation	F_P	0,040	—
Concentricity	D_{EE} to D	0,03	—

Dimensions in millimetres

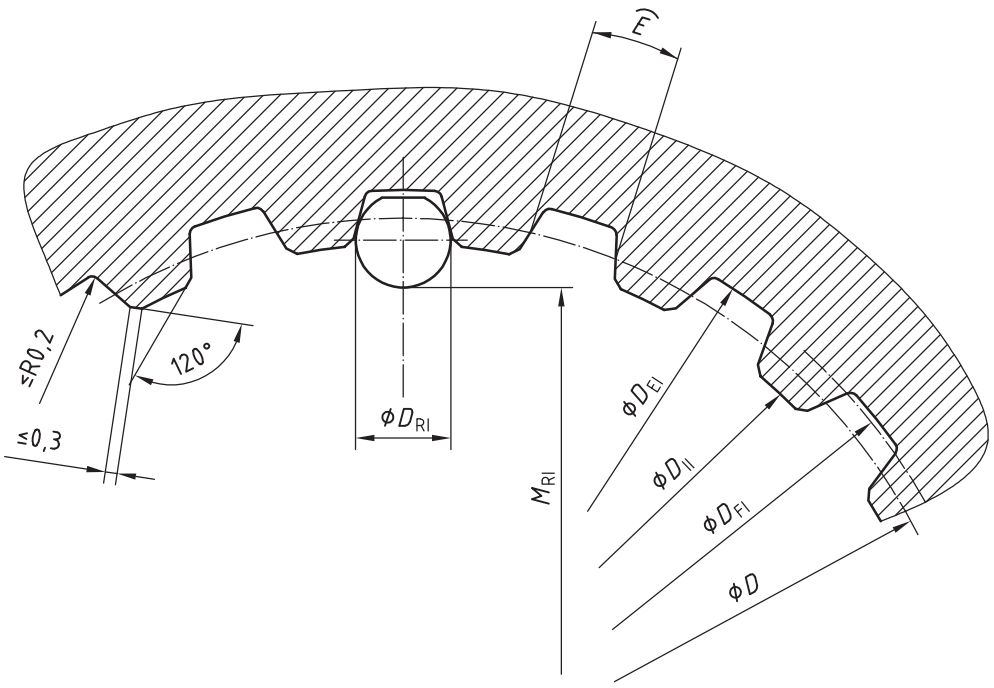


Figure 8 — Internal involute spline dimensions — Type 3

Table 8 — Internal involute spline dimensions — Type 3

Dimensions in millimetres

Dimension	Symbol	Value	For alternative imperial pin size
Number of teeth	Z	20	—
Module	M	2,116 7	—
Pressure angle	α	30°	—
Pitch diameter	D	42,333	—
Base diameter	D_B	36,661 7	—
Major diameter	D_{EI}	$44{,}450\ ^{+0{,}038}_{0}$	—
Form diameter	D_{FI}	≥ 44,044	—
Minor diameter	D_{II}	$40{,}200\ ^{+0{,}150}_{0}$	—
Space width max. act.	E_{max}	3,396	—
Space width min. act. REF	E_{min}	(3,351)	—
Space width min. eff.	E_{Vmin}	3,325	—
Pin diameter	D_{RI}	3,75	3,658
Dim. between pins max.	M_{RImax}	36,850	37,153
Dim. betw. pins min. REF	M_{RImin}	(36,758)	(37,064)
Allowed form variations	Composite GO gage has priority		
Total profile variation	F_F	0,020	—
Total lead variation	F_B	0,013	—
Total index variation	F_P	0,040	—
Concentricity	D_{EI} to D	0,02	—

Dimensions in millimetres

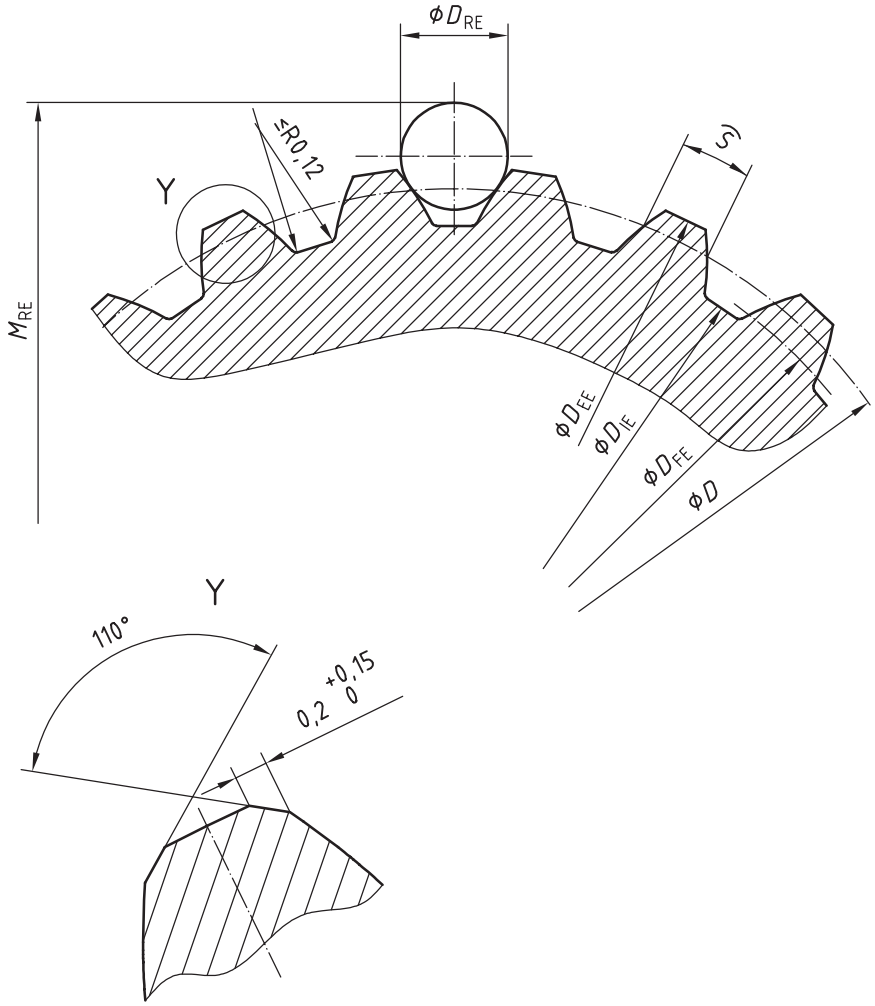


Figure 9 — External, involute spline dimensions — Type 4

Table 9 — External, involute spline dimensions — Type 4

Dimensions in millimetres

Dimension	Symbol	Value	For alternative imperial pin size
Number of teeth	Z	22	—
Module	M	2,50	—
Pressure angle	α	30°	—
Pitch diameter	D	55,000	—
Base diameter	D_B	47,631 4	—
Major diameter	D_{EE}	$57{,}500\ ^{0}_{-0{,}025}$	—
Form diameter	D_{FE}	≤ 52,26	—
Minor diameter	D_{IE}	$51{,}18\ ^{0}_{-0{,}250}$	—
Tooth thickness max. eff.	S_{Vmax}	3,842	—
Tooth thickness max. act. REF	S_{max}	(3,805)	—
Tooth thickness min. act.	S_{min}	3,742	—
Pin diameter	D_{RE}	5,300	5,309
Dim. over pins max. REF	M_{REmax}	(63,618)	(63,641)
Dim. over pins min.	M_{REmin}	63,523	63,548
Allowed form variations	Composite GO gage has priority		
Total profile variation	F_F	0,020	—
Total lead variation	F_B	0,013	—
Total index variation	F_P	0,040	—
Concentricity	D_{EE} to D	0,03	—

Dimensions in millimetres

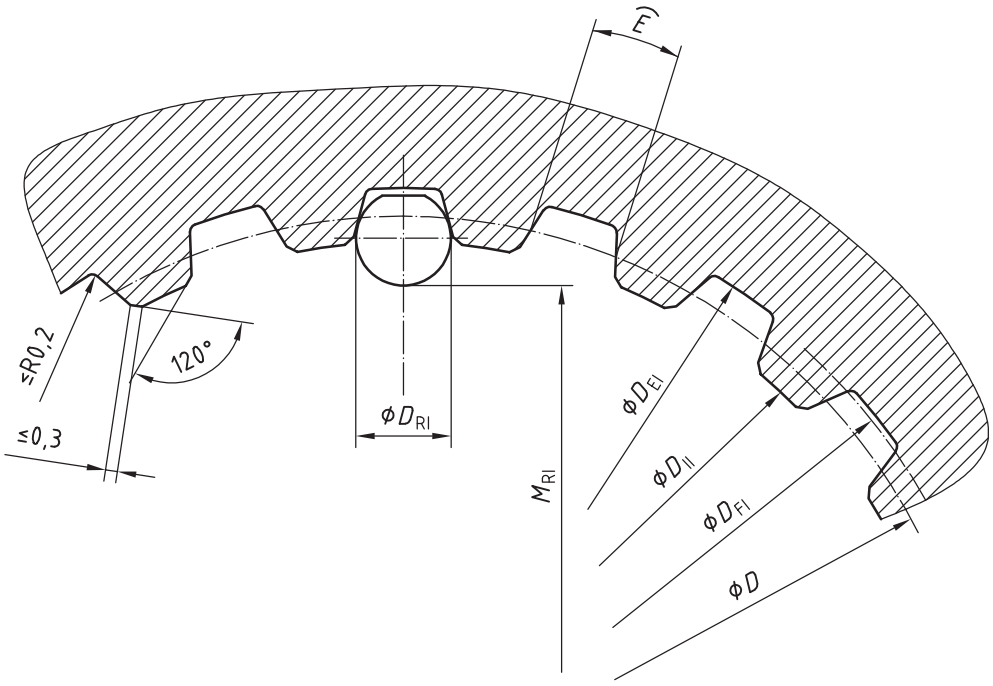


Figure 10 — Internal, involute spline dimensions — Type 4

Table 10 — Internal, involute spline dimensions — Type 4

Dimensions in millimetres

Dimension	Symbol	Value	For alternative imperial pin size
Number of teeth	Z	22	—
Module	M	2,500	—
Pressure angle	α	30°	—
Pitch diameter	D	55,000	—
Base diameter	D_B	47,631 4	—
Major diameter	D_{EI}	$57{,}525\ ^{+0{,}038}_{0}$	—
Form diameter	D_{FI}	≥ 57,000	—
Minor diameter	D_{II}	$52{,}760\ ^{+0{,}150}_{0}$	—
Space width max. act.	E_{max}	4,001	—
Space width min. act. REF	E_{min}	(3,955)	—
Space width min. eff.	E_{Vmin}	3,927	—
Pin diameter	D_{RI}	4,50	4,496
Dim. between pins max.	M_{RImax}	48,284	48,311
Dim. betw. pins min. REF	M_{RImin}	(48,191)	(48,209)
Allowed form variations	Composite GO gage has priority		
Total profile variation	F_F	0,020	—
Total lead variation	F_B	0,013	—
Total index variation	F_P	0,040	—
Concentricity	D_{EI} to D	0,02	—

Bibliography

[1] ISO 4156 (all parts), *Straight cylindrical involute splines — Metric module, side fit*

(*Continued from second cover*)

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 6508-2 Metallic materials — Rockwell hardness test — Part 2: Verification and calibration of testing machines and indenters	IS 1586 (Part 2) : 2018/ISO 6508-2 : 2015 Metallic materials — Rockwell hardness test: Part 2 Verification and calibration of testing machines and indenters (*fifth revision*)	Identical
ISO 6508-3 Metallic materials — Rockwell hardness test — Part 3: Calibration of reference blocks	IS 1586 (Part 3) : 2018/ISO 6508-3 : 2015 Metallic materials — Rockwell hardness test: Part 3 Calibration of reference blocks (*fifth revision*)	Identical

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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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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