INTERNATIONAL STANDARD

ISO 500-3

Second edition
2014-04-01

Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 —

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

Tracteurs agricoles — Prises de force montées à l'arrière des types 1, 2, 3 et 4 —

Partie 3: Dimensions principales de la prise de force et dimensions des cannelures, emplacement de la prise de force

Reference number
ISO 500-3:2014(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 4, *Tractors*.

This second edition cancels and replaces the first edition (ISO 500-3:2004), of which it constitutes a minor revision.

ISO 500 consists of the following parts, under the general title *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*

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

— *Part 3: Main PTO dimensions and spline dimensions, location of PTO*

Agricultural tractors — Rear-mounted power take-off types 1, 2, 3 and 4 —

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

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*

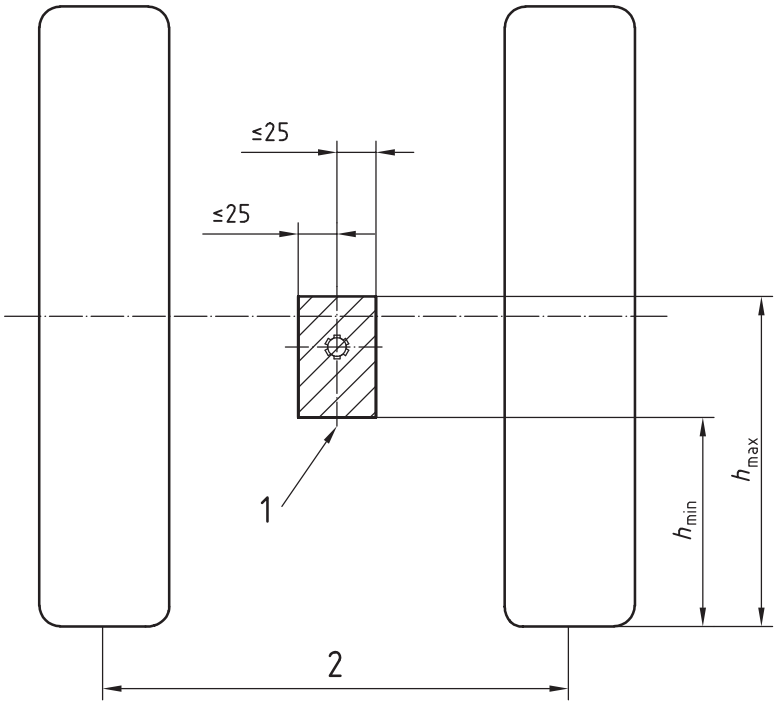
3 PTO location

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;

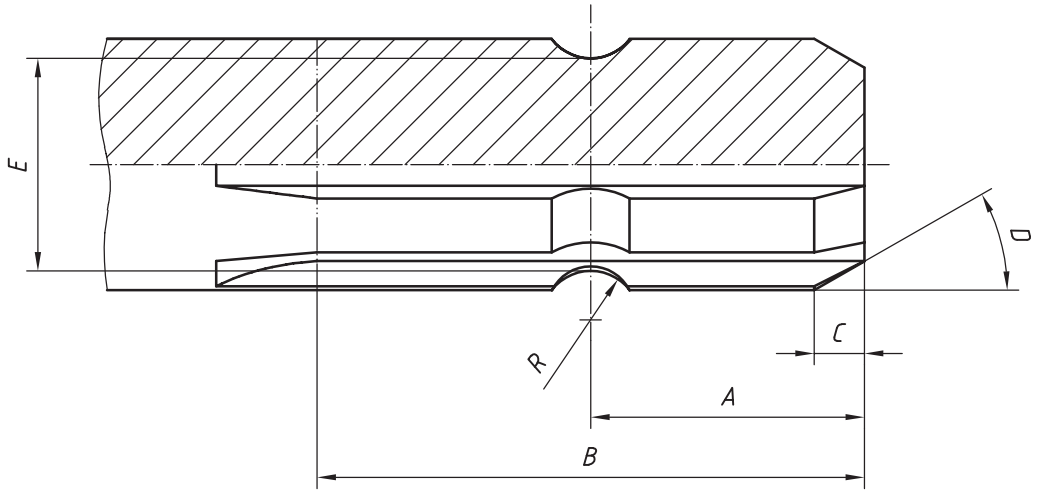
— Figure 8 and Table 8, for internal, involute spline dimensions — Type 3;

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

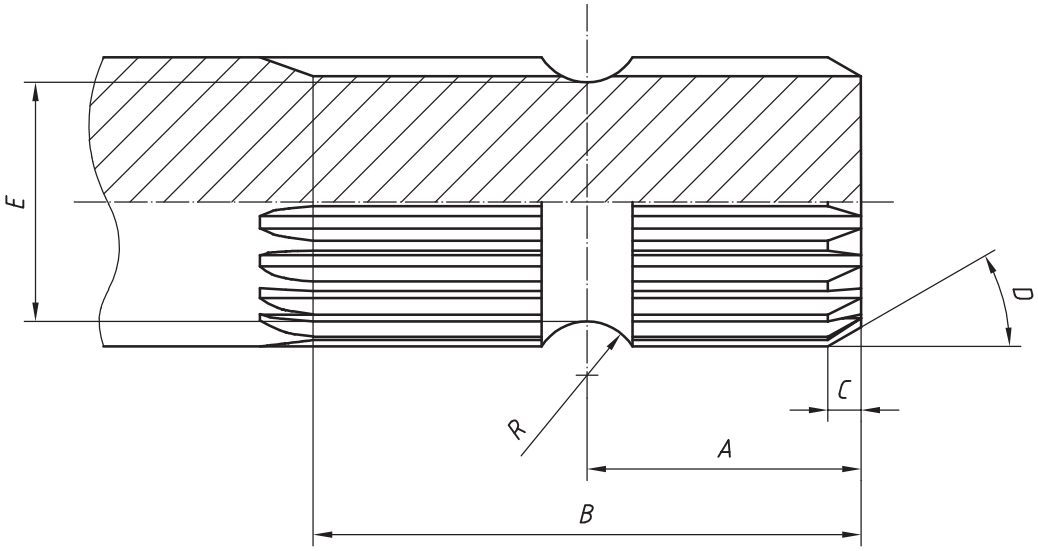
— Figure 10 and Table 10, for internal, involute spline dimensions — Type 4.

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

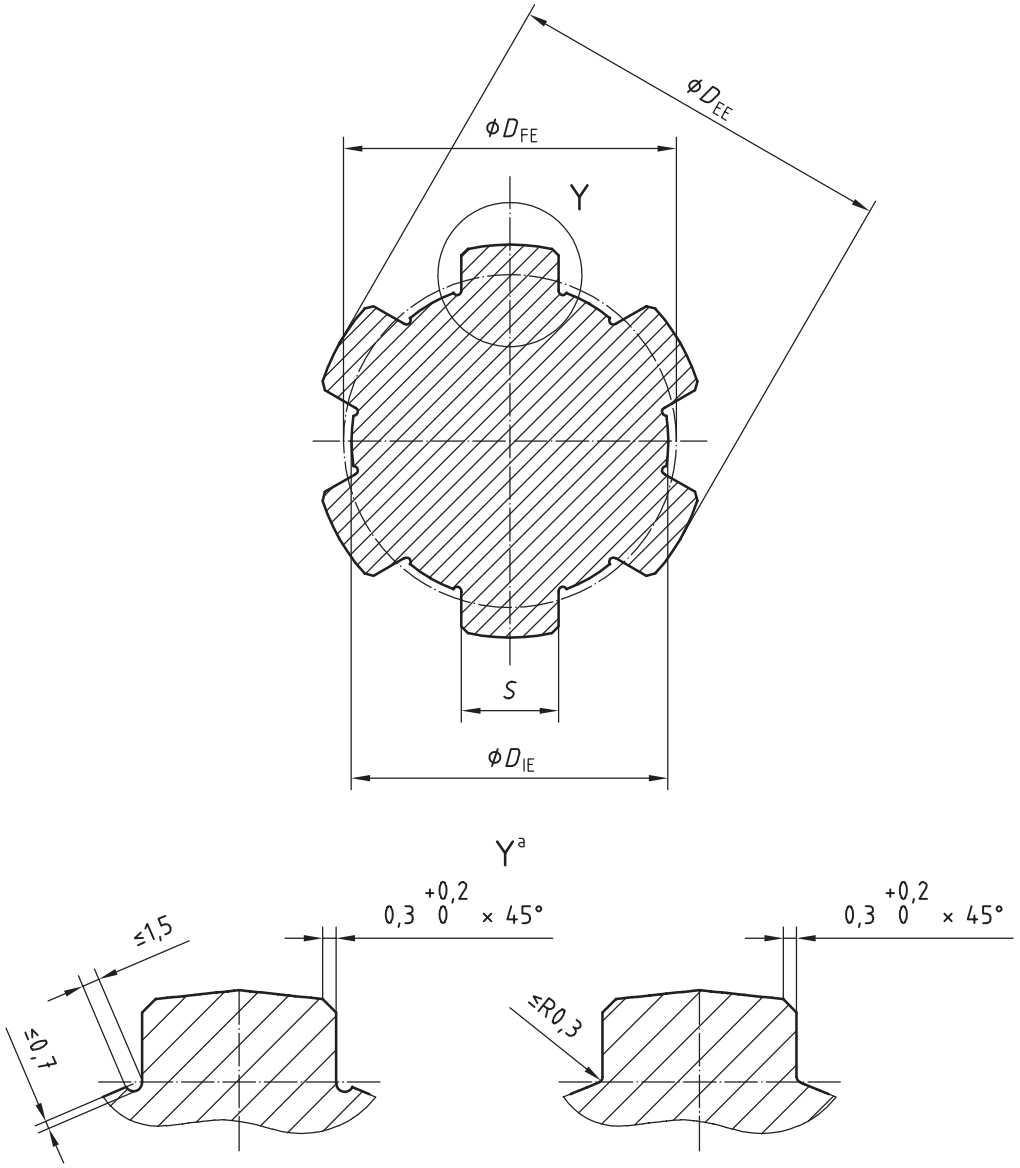
Figure 2 — PTO dimensions

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

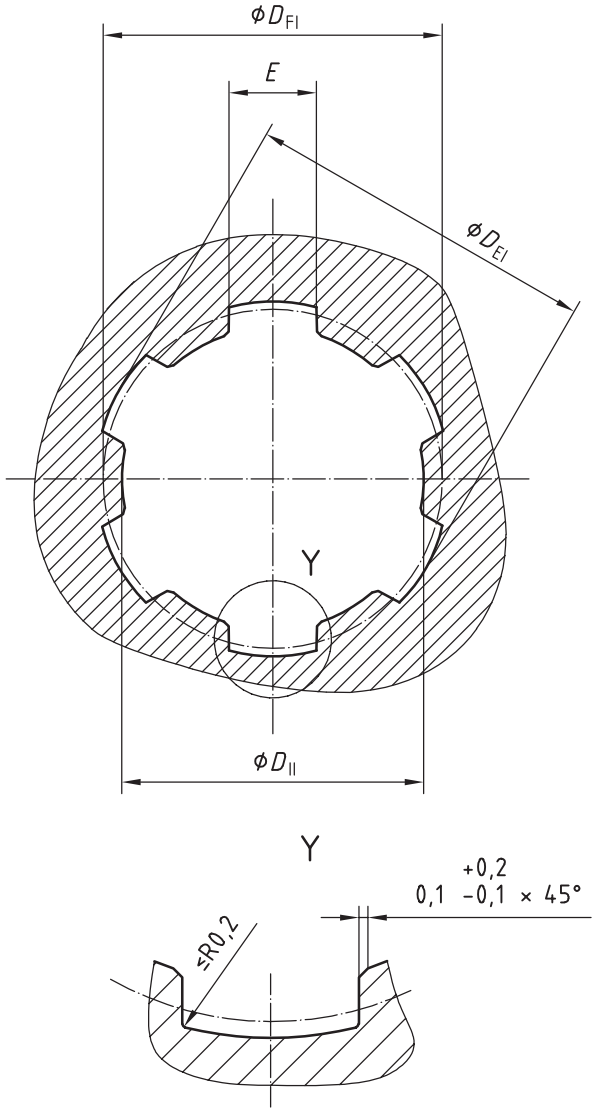


Figure 4 — Internal, straight-sided spline dimensions — Type 1

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

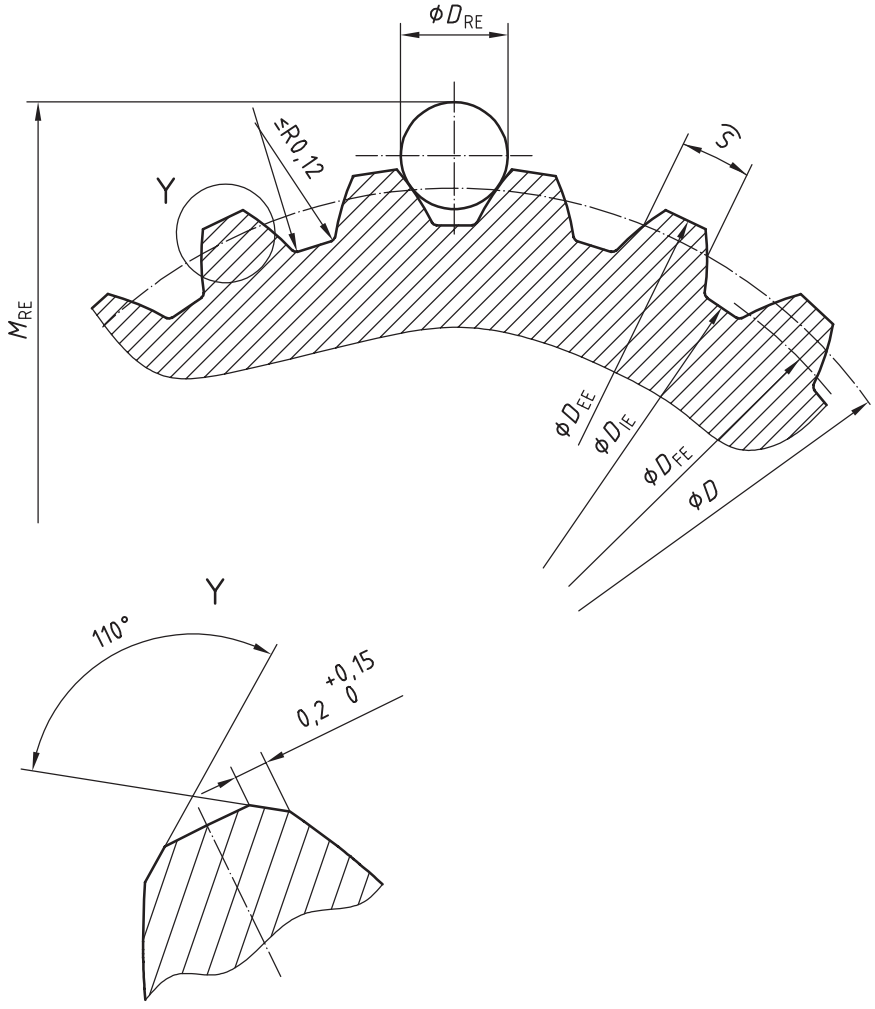


Figure 5 — External, involute spline dimensions — Type 2

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

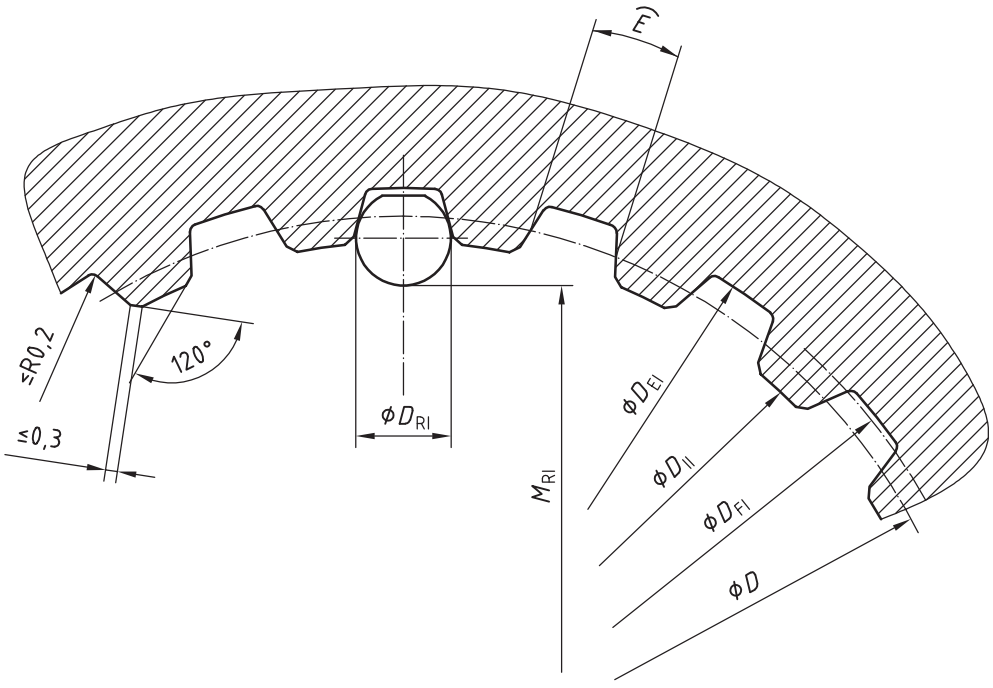


Figure 6 — Internal, involute spline dimensions — Type 2

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

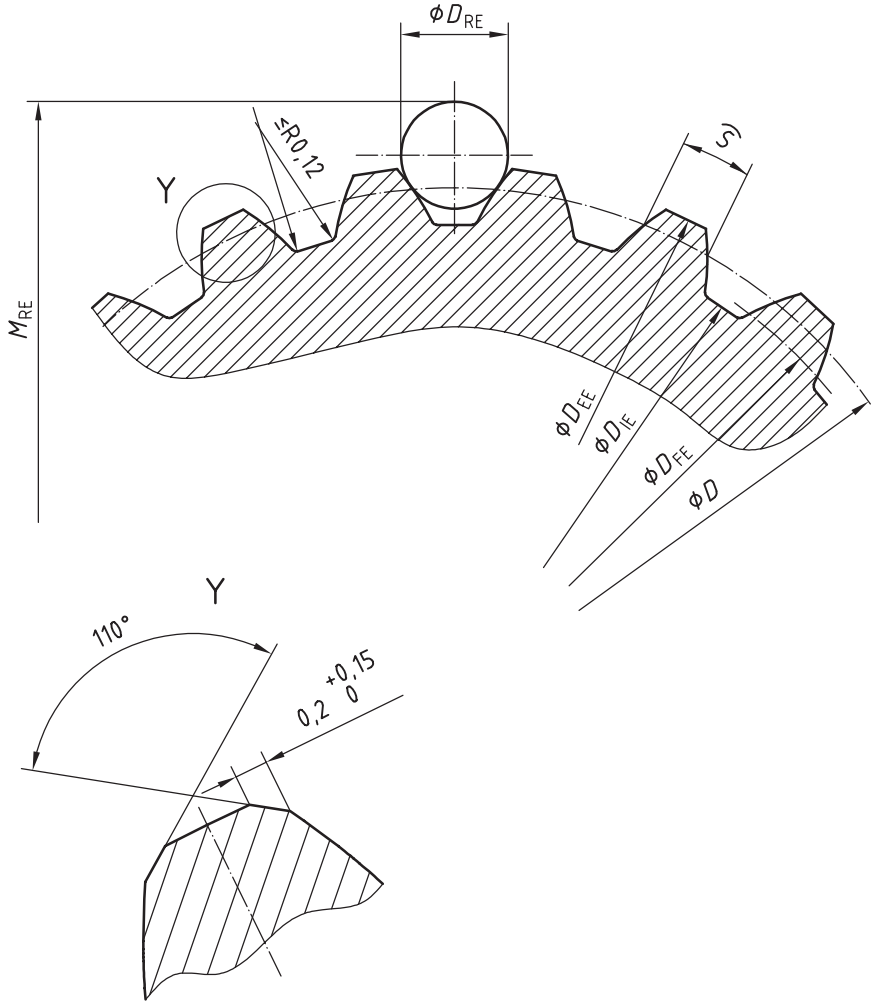


Figure 7 — External, involute spline dimensions — Type 3

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

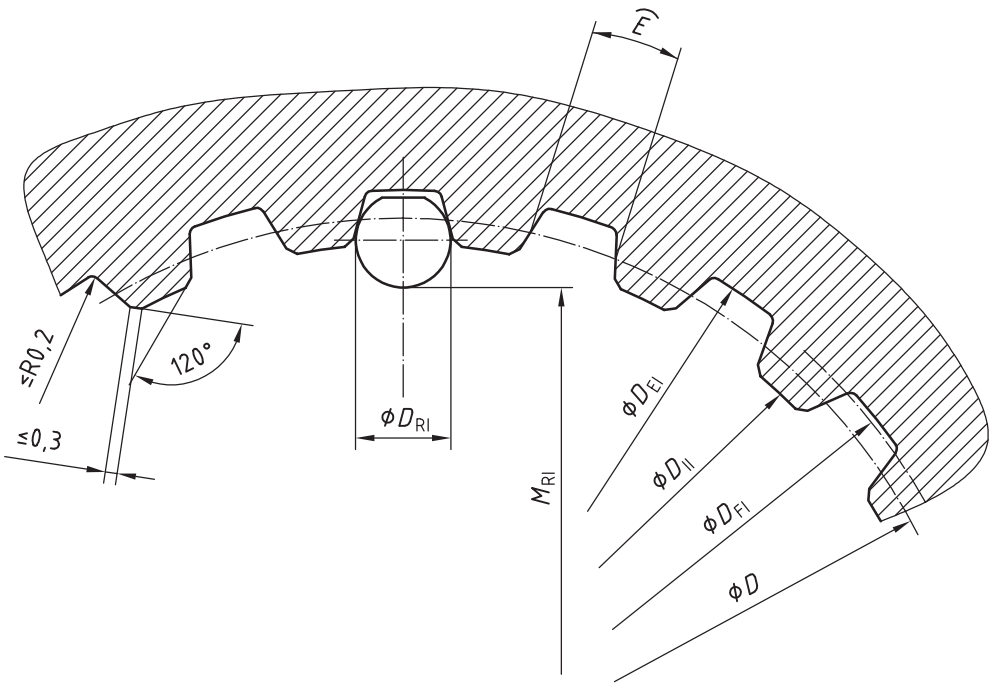


Figure 8 — Internal involute spline dimensions — Type 3

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

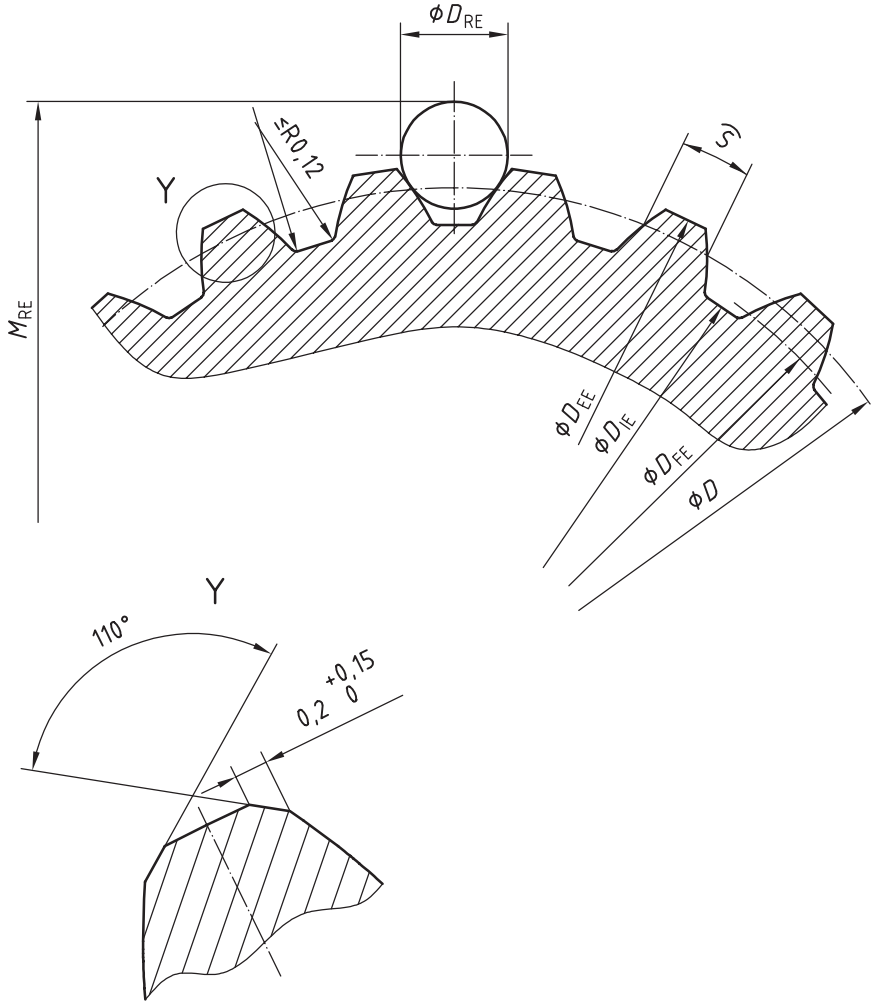


Figure 9 — External, involute spline dimensions — Type 4

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

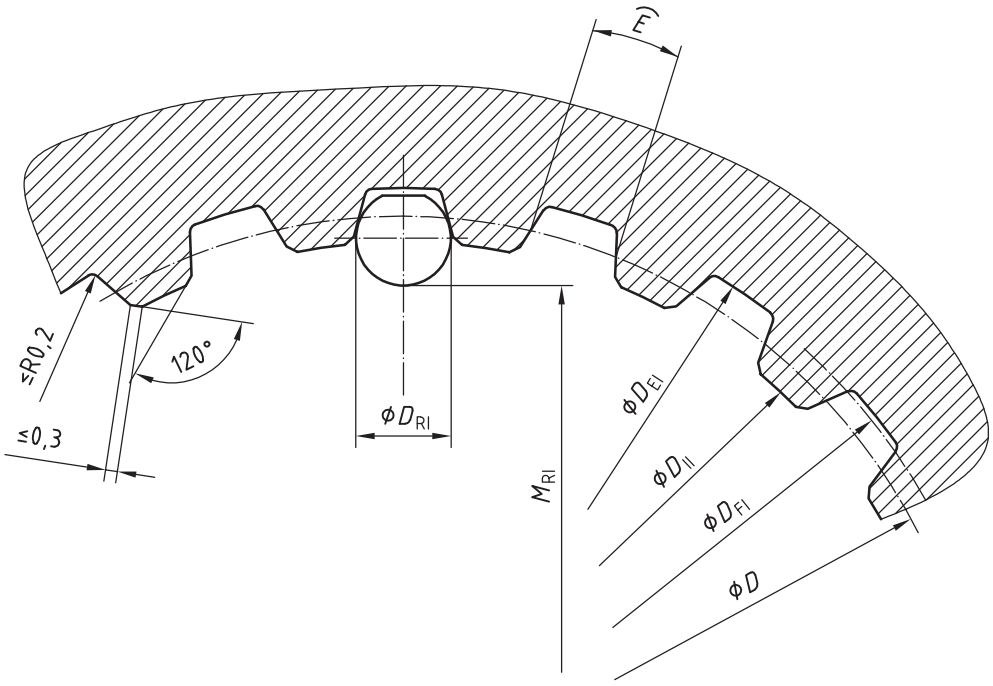


Figure 10 — Internal, involute spline dimensions — Type 4

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*

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