INTERNATIONAL STANDARD

ISO
9457-2

First edition
1994-10-01

Road vehicles — Metric starter motor pinions —

Part 2:
Pinions with 20° pressure angle

Véhicules routiers — Pignons de démarreurs à module métrique —

Partie 2: Pignons à angle de pression de 20°

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9457-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 15, *Interchangeability of components of commercial vehicles and buses*.

ISO 9457 consists of the following parts, under the general title *Road ve-hicles — Metric starter motor pinions*:

— *Part 1: Currently used pinions*

— *Part 2: Pinions with 20 degree pressure angle*

Annex A of this part of ISO 9457 is for information only.

Road vehicles — Metric starter motor pinions —

Part 2:
Pinions with 20° pressure angle

1 Scope

This part of ISO 9457 specifies the metric modules, number of teeth and other tooth characteristics which are necessary to ensure interchangeability of starter motor pinions with a pressure angle of 20°, used on starter motors for reciprocating internal combustion engines for road vehicles.

2 Specified starter pinions

Table 1 shows the specified combinations between the metric modules and the number of teeth.

Table 1 — Combinations between metric modules and number of teeth

Module	Number of teeth, z							Pressure angle
m	8 [1)	9	10	11	12	13	15	α
2,25	×	×	×	×	—	—	—	
2,5	×	×	×	×	×	—	—	20°
3,0	—	×	×	×	×	—	—	
4,0	—	—	×	×	×	×	×	

1) Care shall be taken regarding the contact ratio and hence the noise that eight-tooth pinions can generate.

3 Dimensions

Detailed tooth dimensions and the inspection value W_2 (base tangent length) of the starter motor pinions specified in table 1 are given in table 3.

The tooth dimensions specified in table 3 are calculated by using the values for the tooth proportions h_a/m given in table 2, h_f/m of 1,167 and a maximum tool radius of ϱ_{fP}, expressed in millimetres, of 0,3m.

If necessary, a radius may be inserted between $d'_{a,\,min}$ and d_a.

NOTE 1   The symbols used, which are in accordance with ISO 701[2], are illustrated in figure 1.
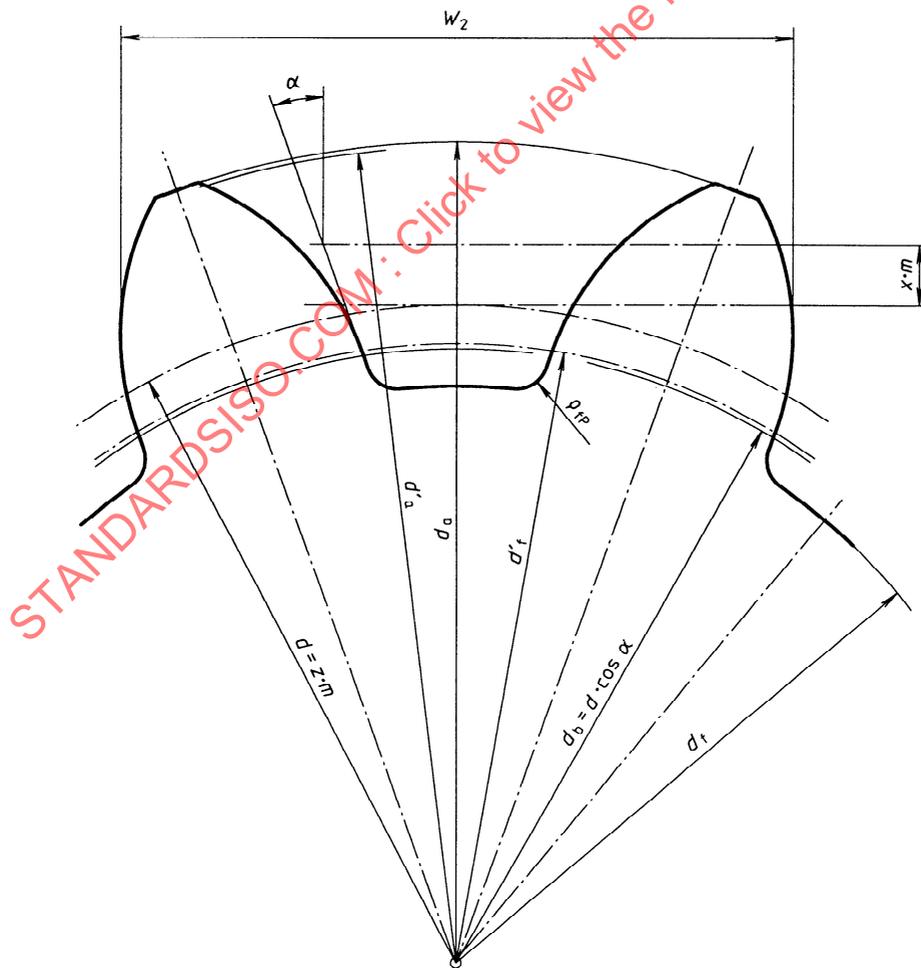
4 Other dimensions and specifications

Should a chamfer be required on the pinion teeth, this shall be on the opposite face to the driving side. Dimensions and requirements not given in this part of ISO 9457 are left to the manufacturer's choice.

5 Contact ratio

The contact ratio should not be less than 1,05 with minimum active tip diameter, $d'_{a, min}$, on both ring gear and pinion, and maximum design centre distance.

Table 2 — Tooth proportions

Module	h_a/m						
	Number of teeth, z						
m	8	9	10	11	12	13	15
2,25	0,85	0,90	0,90	0,95	—	—	—
2,5					0,95	—	—
3,0	—	0,95	0,95	1,00	1,00	—	—
4,0	—	—	1,00			1,00	1,00

Figure 1

Module, m		2,25				2,5					3				4				
Pressure angle, α		20°																	
Number of teeth, z		8	9	10	11	8	9	10	11	12	9	10	11	12	10	11	12	13	15
Addendum modification coefficient, x		0,5																	
Tip diameter d_a	max.	24,08	26,55	28,80	31,28	26,75	29,50	32,00	34,75	37,25	35,70	38,70	42,00	45,00	52,0	56,0	60,0	64,0	72,0
	min.[1]	23,87	26,34	28,59	31,03	26,54	29,29	31,75	34,50	37,00	35,45	38,45	41,75	44,75	51,7	55,7	59,7	63,7	71,7
Active tip diameter, d'_a	min.	23,77	26,24	28,49	30,93	26,44	29,19	31,65	34,4	36,9	35,35	38,35	41,65	44,65	51,6	55,6	59,6	63,6	71,6
Active root diameter, d'_f	max.	16,92	19,04	21,20	23,37	18,79	21,16	23,55	25,97	28,4	25,39	28,26	31,16	34,07	37,68	41,55	45,43	49,34	57,18
Root diameter, d_f	max.	15,00	17,25	19,50	21,75	16,67	19,17	21,67	24,17	26,67	23,00	26,00	29,00	32,00	34,66	38,66	42,66	46,66	54,66
	min.[2]	14,73	16,98	19,17	21,42	16,40	18,84	21,34	23,84	26,34	22,67	25,67	28,67	31,61	34,27	38,27	42,27	46,27	54,20
Base tangent length, W_2	max.	10,99	11,02	11,05	11,08	12,21	12,24	12,28	12,31	12,35	14,69	14,73	14,77	14,82	19,64	19,70	19,75	19,81	19,93
	min.[3]	10,92	10,95	10,98	11,01	12,14	12,17	12,21	12,24	12,28	14,62	14,66	14,70	14,75	19,56	19,61	19,67	19,73	19,84

NOTE — The following equations were used to calculate the values above:

$$d_{a,\,max} = d + 2m\left(\frac{h_a}{m} + x\right)$$

$$d'_{a,\,min} = d_{a,\,min} - 0,1$$

$$d'_{f,\,max} = \sqrt{d_b^2 + \left[d\sin\alpha - 2\times\frac{m\left(\frac{h_f}{m} - x\right) - \varrho_{fP}(1 - \sin\alpha)}{\sin\alpha}\right]^2}$$

$$d_{f,\,max} = d - 2m\left(\frac{h_f}{m} - x\right)$$

$$W_2 = m\{[1,5\pi + z\,(\tan\alpha - \alpha)]\cos\alpha + 2x\sin\alpha\}$$

where α is expressed in radians and all dimensions in millimetres.

1) Tolerance class equivalent to h12[1].

2) Tolerance class equivalent to h13[1].

3) Tolerance class equivalent to h10[1].

Table 3 — Tooth dimensions and pinion inspection values

Dimensions in millimetres

Annex A
(informative)

Bibliography

[1] ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts.*

[2] ISO 701:1976, *International gear notation — Symbols for geometrical data.*