INTERNATIONAL STANDARD

ISO 9011

Second edition
1997-04-01

Synchronous belt drives — Automotive pulleys

Transmissions synchrones par courroies — Poulies pour la construction automobile

Reference number
ISO 9011:1997(E)

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 9011 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 4, *Synchronous belt drives*.

This second edition cancels and replaces the first edition (ISO 9011:1987), which has been technically revised.

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Synchronous belt drives — Automotive pulleys

1 Scope

This International Standard specifies the characteristics of synchronous pulleys for use in automotive applications of synchronous endless belt drives.

The characteristics include

— tooth dimensions and tolerances;

— pulley tolerances and quality specifications.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 254:—[1], *Belt drives — Pulleys — Quality, finish and balance.*

ISO 9010:1997, *Synchronous belt drives — Automotive belts.*

3 Pulley types

The following types of synchronous pulleys for automotive applications are standardized:

— type ZA: trapezoidal tooth;

— type ZB: trapezoidal tooth;

— type ZH: curvilinear tooth, "H" system;

— type YH: curvilinear tooth, "H" system;

1) To be published. (Revision of ISO 254:1990)

— type ZR: curvilinear tooth, "R" system;
— type YR: curvilinear tooth, "R" system;
— type ZS: curvilinear tooth, "S" system;
— type YS: curvilinear tooth, "S" system.

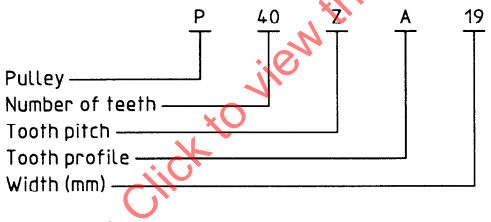
Corresponding belts are standardized in ISO 9010.

4 Designation

A pulley for a synchronous drive for automobiles is characterized by the number of teeth, the tooth pitch and profile and the width. It is identified, as is the belt, by a series of numbers and letters as follows:

— the first letter "P" indicates a pulley;
— the first set of numbers indicates the number of teeth;
— the second letter indicates tooth pitch;
— the third letter indicates tooth profile;
— the second set of numbers indicates the corresponding nominal belt width in millimetres as specified in ISO 9010 (see 6.3 for the actual pulley width recommended).

EXAMPLE



5 Tooth profile

5.1 Pulleys of types ZA and ZB (involute tooth profile)

Dimensions and tolerances for the generating tool rack for the involute profile of automotive synchronous pulleys of types ZA and ZB are given in table 1 and shown in figure 1.

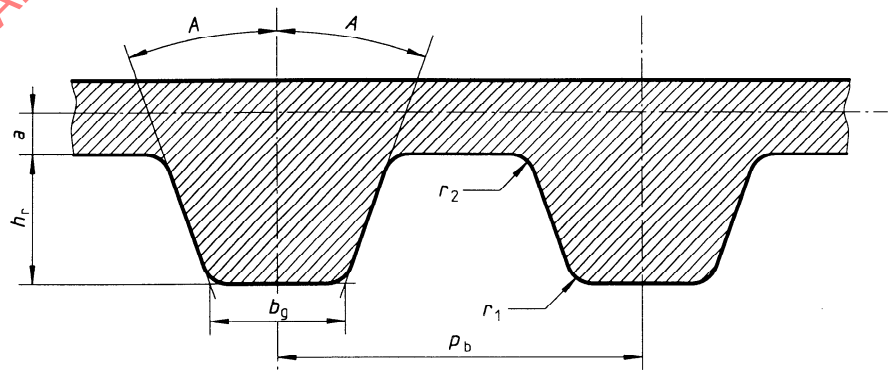


Figure 1 — Generating tool rack for types ZA and ZB

Table 1 — Generating tool rack dimensions and tolerances for types ZA and ZB

Dimensions in millimetres, angle in degrees

Type	Number of teeth in pulley z	p_b ± 0,012	A ± 0,12	h_r + 0,05 0	b_g + 0,05 0	r_1 ± 0,03	r_2 ± 0,03	a
ZA	$z \geqslant 19$	9,525	20	2,13	3,1	0,86	0,71	0,686
ZB	$19 \leqslant z \leqslant 20$	9,525	20	2,59	4,24	1,47	1,04	0,686
	$z \geqslant 21$						1,42	

5.2 Pulleys of types ZH and YH

Dimensions and tolerances for the generating tool rack for automotive synchronous pulleys of types ZH and YH are given in table 2 and shown in figures 2, 3 and 4.

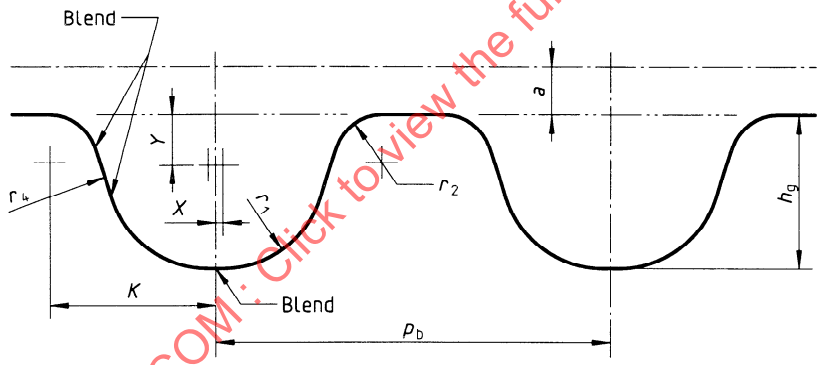


Figure 2 — Generating tool rack for type ZH (17 through 26 teeth)

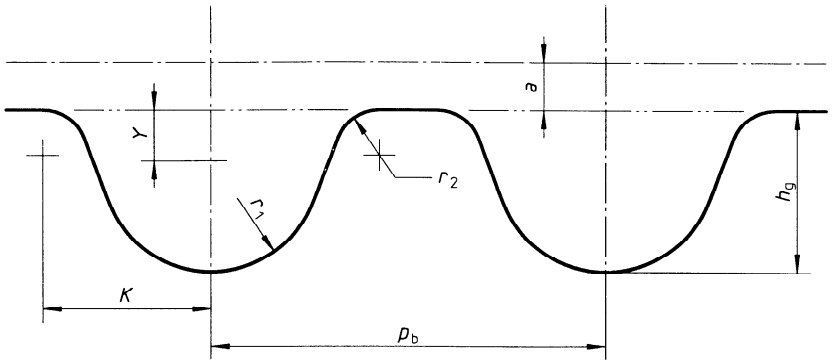


Figure 3 — Generating tool rack for type ZH (27 through 52 teeth)

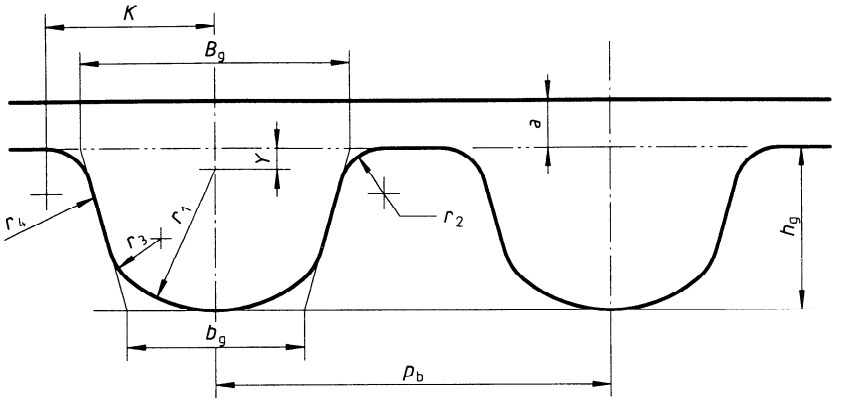


Figure 4 — Generating tool rack for type YH

Table 2 — Generating tool rack dimensions and tolerances for types ZH and YH

Dimensions in millimetres

Type	Number of teeth in pulley z	p_b ± 0,012	B_g	b_g	h_g ± 0,015	r_1 ± 0,012	r_2 ± 0,012	r_3 ± 0,012	r_4 ± 0,012	X	Y	K	a
ZH	$17 \leqslant z \leqslant 26$ $27 \leqslant z \leqslant 52$	9,525 9,525			3,43 3,44	2,41 2,5	0,95 0,95		6,67	0,058	1,02 0,94	3,7 3,61	0,686 0,686
YH	$20 \leqslant z \leqslant 31$ $z \geqslant 32$	8 8	5,28 5,08	3 3,11	3,02 3,06	2,22 2,17	0,8 0,67	2	1,5 1,1		0,80 0,89	3,22 3,06	0,686 0,686

5.3 Pulleys of types ZR and YR

Dimensions and tolerances for the generating tool rack for automotive synchronous pulleys of types ZR and YR and given in table 3 and shown in figure 5.

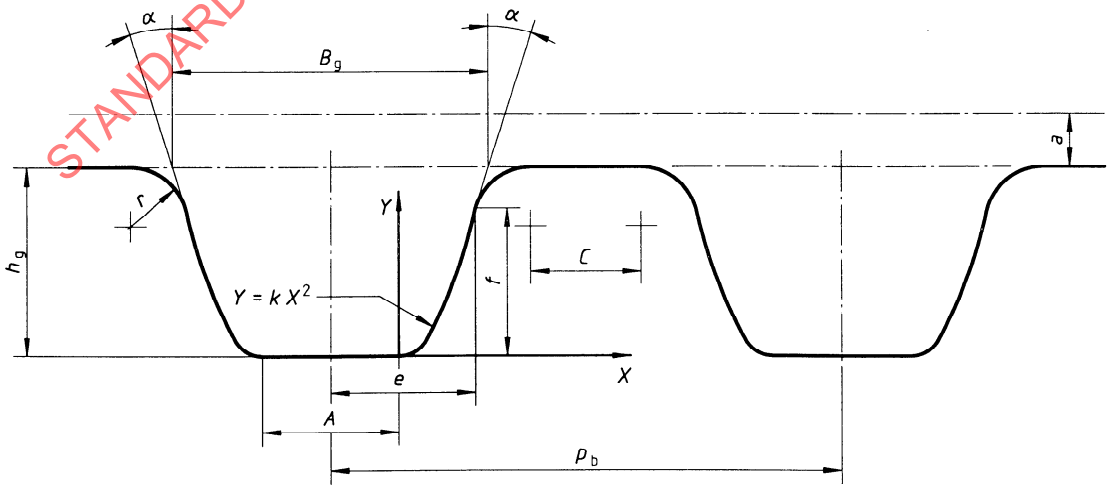


Figure 5 — Generating tool rack for types ZR and YR

Table 3 — Generating tool rack dimensions and tolerances for types ZR and YR

Dimensions in millimetres, angles in degrees

Type	Number of teeth in pulley z	p_b ± 0,01	B_g + 0,05 0	A	C	a	h_g ± 0,02	r	α	Tooth form parameter K	e	f
ZR	$z \geqslant 20$	9,407	5,9	1,865	2,053	0,75	3,45	1	18	0,858	2,726	2,759
YR	$20 \leqslant z \leqslant 29$	7,786	5,6	2,788	0,959	0,75	2,92	0,8	15	1,496	2,641	2,327
	$z > 29$	7,893	5,6	2,788	1,066	0,75	2,92	0,8	15	1,496	2,641	2,327

5.4 Pulleys of types ZS and YS

Dimensions and tolerances for the pulley groove profile automotive synchronous pulleys of types ZS and YS are given in table 4 and shown in figure 6.

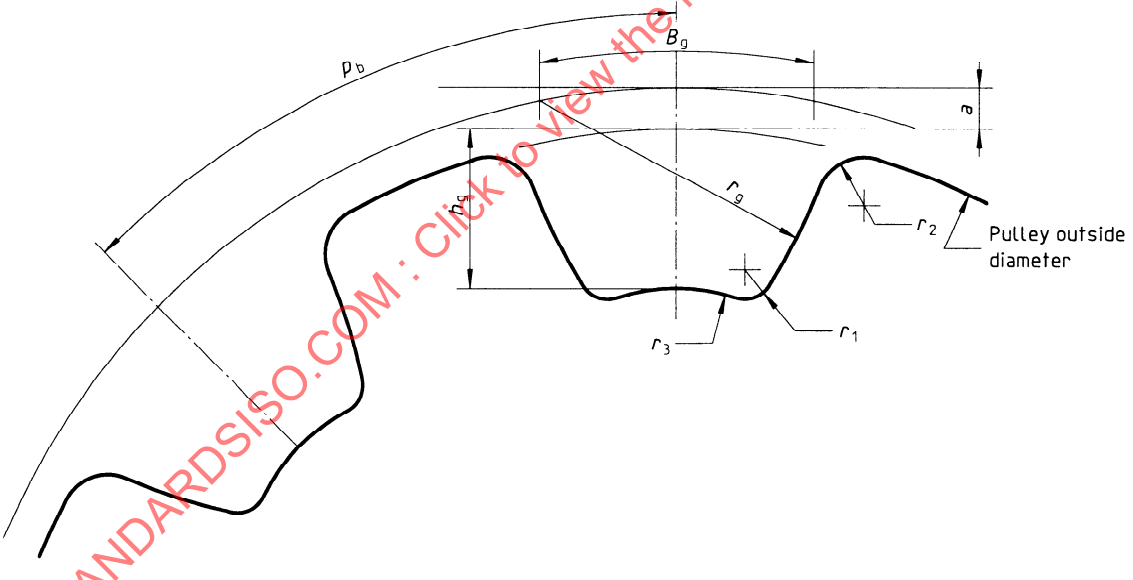


Figure 6 — Pulley groove profile for types ZS and YS

Table 4 — Pulley groove dimensions and tolerances for types ZS and YS

Dimensions in millimetres

Type	Number of teeth in pulley z	p_b Reference[1)]	B_g $^{+0,1}_{0}$	r_g $^{+0,1}_{0}$	h_g ± 0,03	r_1 $^{+0,1}_{0}$	r_2 $^{+0,1}_{0}$	r_3 ± 0,1	a
ZS	$z \geqslant 17$	9,525	6,19	6,31	3,37	0,48	0,89	4,81	0,686
YS	$z \geqslant 20$	8	5,2	5,3	2,83	0,4	0,75	4,04	0,686
1) See table 5 for pulley tooth pitch tolerance.									

6 Pulley dimensions and tolerances

6.1 Pitch tolerances

Tolerances on the deviation of pulley pitch between adjacent teeth and on the total deviation with a 90° arc or a full tooth past a 90° arc of a pulley are given in table 5. This tolerance applies to the distance between the same point on either the right or left corresponding flanks of adjacent teeth.

Table 5 — Pitch tolerances

Dimensions and tolerances in millimetres

Outside diameter d_o	Allowable deviation of pitch	
	Between any two adjacent teeth	Total within a 90° arc[1)]
$49 \leqslant d_o \leqslant 99$	0,03	0,1
$100 \leqslant d_o \leqslant 178$	0,03	0,13
$179 \leqslant d_o \leqslant 305$	0,03	0,15
1) The allowable deviation of pitch is to include the next full tooth past a 90° arc.		

6.2 Pulley outside diameter tolerances

Tolerances on pulley outside diameters are shown in table 6.

Table 6 — Pulley outside diameter tolerances

Dimensions and tolerances in millimetres

Outside diameter d_o	
Range	**Tolerance**
$49 \leqslant d_o \leqslant 99$	$^{+0,1}_{0}$
$100 \leqslant d_o \leqslant 178$	$^{+0,13}_{0}$
$179 \leqslant d_o \leqslant 305$	$^{+0,15}_{0}$

6.3 Minimum pulley width

The minimum widths b_f, b_f', and b_f'' relative to the toothed part of the flanged and unflanged pulleys indicated in figure 7 for a belt with a nominal width of b_s, are defined by the following formulae:

$b_f = b_s + 1{,}2$ mm (double-flanged pulley)

$b_f' = b_s + 5$ mm (unflanged pulley)

$b_f'' = b_s + 3$ mm (single-flanged pulley)

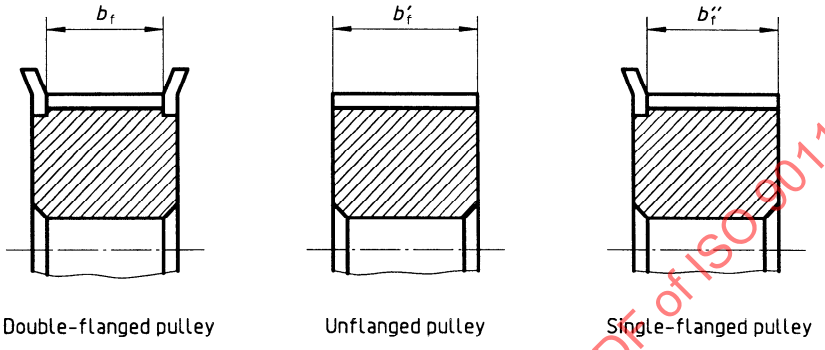


Figure 7 — Minimum pulley width

6.4 Flange dimensions

The pulley flange dimensions are shown in figure 8.

Dimensions in millimetres

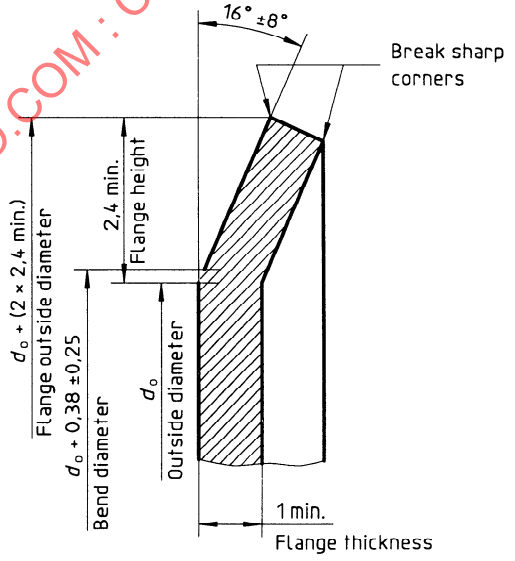


Figure 8 — Flange dimensions

6.5 Other pulley tolerances

6.5.1 Axial runout

See table 7.