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ISO  
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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION  
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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

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## Synchronous belt drives — Automotive pulleys

*Transmissions synchrones par courroies — Poulies pour la construction automobile*

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ISO 9011:1987

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Reference number  
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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 9011 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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# Synchronous belt drives — Automotive pulleys

## 1 Scope and field of application

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

The principal characteristics include

- a) tooth dimensions and tolerances;
- b) pulley tolerances and quality specifications.

## 2 References

ISO 254, *Quality, finish and balance of transmission pulleys.*

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

## 3 Pulley types

Two pulley types for synchronous drives for automotive applications are standardized :

- type ZA light-duty automotive pulley;
- type ZB heavy-duty automotive pulley.

Both types of pulley are characterized by their tooth profile, the pitch  $p_b$  being 9,525 mm<sup>1)</sup>.

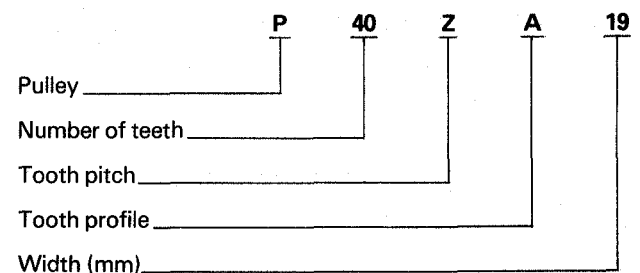
## 4 Tooth dimensions

### 4.1 Type

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 :

- a) the first letter "P" indicates a pulley;
- b) the first set of numbers indicates the number of teeth;
- c) the second letter indicates tooth pitch;
- d) the third letter indicates tooth profile;
- e) the second set of numbers indicates the width in millimetres.

Example :



1) Carried to the third decimal place because corresponding belt pitch is a defined value.

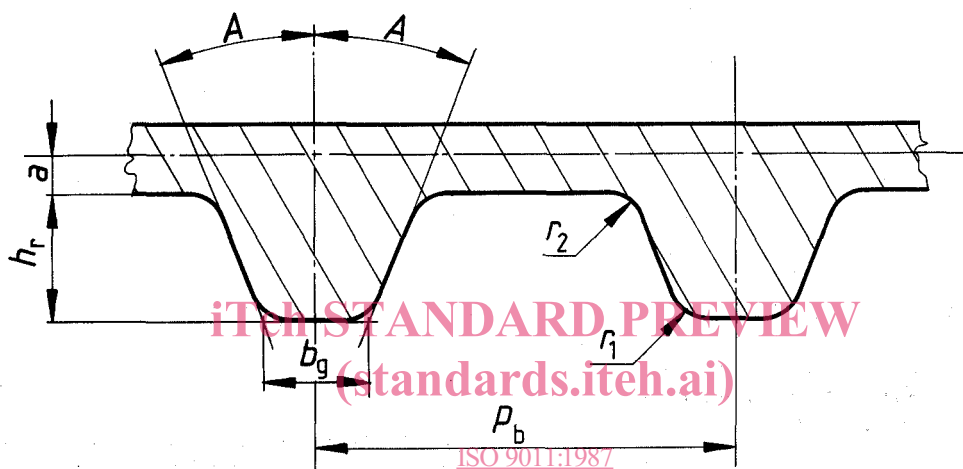
### 4.2 Involute tooth profile

The pulley is characterized by the involute contour of the tooth flanks. This contour is different for each pulley diameter. In view of the practical difficulty of giving size specifications for the contour relative to each diameter, this International Standard sets the characteristics for the generator rack required to machine-finish the involute teeth.

Dimensions and tolerances for the rack generating tool for automotive synchronous pulleys with involute teeth are given in table 1 and shown in figure 1.

### 4.3 Pitch to 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 2. This tolerance applies to the distance between the same point on either the right or left corresponding flanks of adjacent teeth.



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Figure 1 – Generating tool rack for pulleys

Table 1 – Generating tool rack dimensions and tolerances

Type	Number of teeth in pulley $z$	$p_b$	$A$	$h_r$	$b_g$	$r_1$	$r_2$	$2a$
		$\pm 0,003$ mm	$\pm 0,12$ degrees	$+ 0,05$ $0$ mm	$+ 0,05$ $0$ mm	$\pm 0,03$ mm	$\pm 0,03$ mm	
ZA	$z > 19$	9,525	20	2,13	3,10	0,86	0,71	1,372
ZB	$19 < z < 20$	9,525	20	2,59	4,24	1,47	1,04	1,372
	$z \geq 21$						1,42	

Table 2 – Pitch to pitch tolerances

Dimensions and tolerances in millimetres

Number of teeth $z$	Outside diameter $d_o$	Allowable deviation of pitch	
		between any two adjacent teeth	total within a 90° arc <sup>1)</sup>
$19 < z < 33$	$56,23 < d_o < 98,68$	0,03	0,1
$34 < z < 59$	$101,71 < d_o < 177,51$	0,03	0,13
$60 < z < 100$	$180,54 < d_o < 301,82$	0,03	0,15

1) The allowable deviation of pitch is to include the next full tooth past a 90° arc.

## 5 Pulley dimensions and tolerances

### 5.1 Pulley outside diameter tolerances

Tolerances on pulley outside diameters are shown in table 3.

**Table 3 — Pulley outside diameter tolerances**

Dimensions and tolerances in millimetres

Number of teeth $z$	Outside diameter $d_o$	
	Range	Tolerance
$19 < z < 33$	$56,23 < d_o < 98,68$	$+0,10$ $0$
$34 < z < 59$	$101,71 < d_o < 177,51$	$+0,13$ $0$
$60 < z < 100$	$180,54 < d_o < 301,82$	$+0,15$ $0$

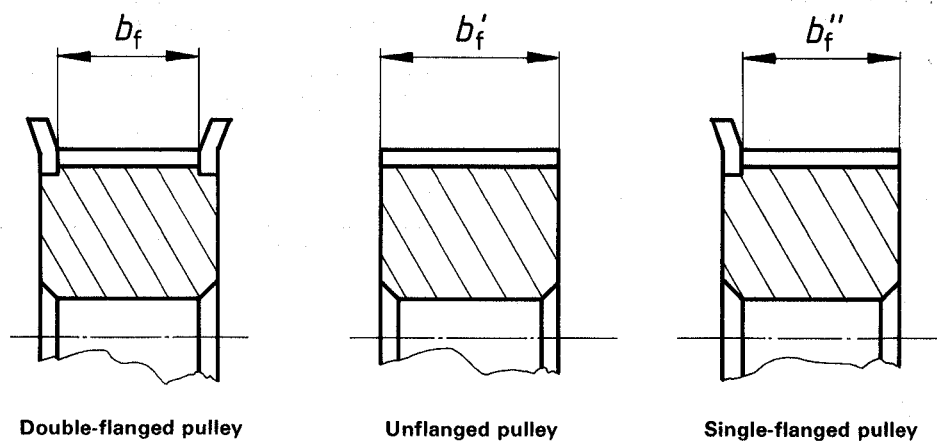
### 5.2 Minimum pulley width

The minimum widths  $b_f$ ,  $b'_f$  and  $b''_f$  relative to the toothed part of the flanged and unflanged pulleys indicated in figure 2 for a belt with a nominal width of  $b_s$  are defined by the following formulae:

$$b_f = b_s + 3 \text{ (double-flanged pulley)}$$

$$b'_f = b_s + 5 \text{ (unflanged pulley)}$$

$$b''_f = b_s + 4 \text{ (single-flanged pulley)}$$



**Figure 2 — Minimum pulley width**

5.3 Flange dimensions

The pulley flange dimensions are shown in figure 3.

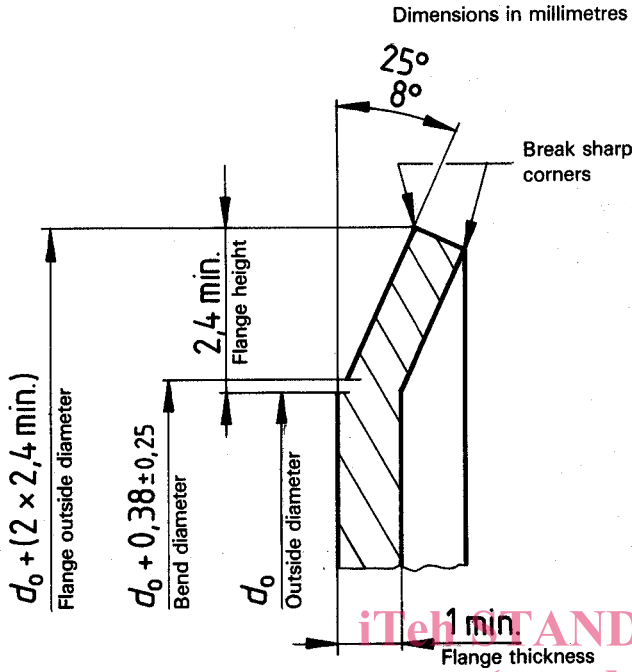


Figure 3 – Flange dimensions

5.4 Other pulley tolerances

5.4.1 Axial runout

See table 4.

5.4.2 Radial runout

See table 5.

5.4.3 Parallelism

Teeth shall be parallel to the axis of the bore within 0,001 mm per millimetre of width.

5.4.4 Taper

The maximum taper shall be 0,001 mm per millimetre of face width provided that the outside diameter is within the tolerance given in table 3.

6 Quality specification

The quality, finish and balance of pulleys shall comply with the requirements specified in ISO 254.

Table 4 – Axial runout

Dimensions and tolerances in millimetres

Number of teeth $z$	Outside diameter $d_o$	TIR <sup>1)</sup> max.
$19 < z < 33$	$56,23 < d_o < 98,68$	0,1
$34 < z < 84$	$101,71 < d_o < 253,31$	0,001 per millimetre of outside diameter
$z > 85$	$d_o > 256,34$	$0,25 + 0,000 5$ per millimetre of outside diameter $d_o > 254$

1) Total indicator reading.

Table 5 – Radial runout

Dimensions and tolerances in millimetres

Number of teeth $z$	Outside diameter $d_o$	TIR <sup>1)</sup> max.
$19 < z < 67$	$56,23 < d_o < 201,77$	0,13
$z > 68$	$d_o > 204,8$	$0,13 + 0,000 5$ per millimetre of outside diameter $d_o > 203,2$

1) Total indicator reading.

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