

# INTERNATIONAL STANDARD

**ISO  
254**

Third edition  
1998-08-15

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## **Belt drives — Pulleys — Quality, finish and balance**

*Transmissions par courroies — Poulies — Qualité, état de surface et équilibrage*



Reference number  
ISO 254:1998(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 254 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 1, *Veebelts and grooved pulleys*.

This third edition cancels and replaces the second edition (ISO 254:1990), clause 4 of which has been technically revised to include test pulleys.

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# Belt drives — Pulleys — Quality, finish and balance

## 1 Scope

This International Standard specifies the characteristics of quality which are common to all transmission pulleys. It establishes specific quality levels for the finish and balance of transmission pulleys and test pulleys.

This International Standard is applicable to transmission pulleys for V-belts, V-ribbed belts, flat or synchronous belts; it does not apply to those pulleys for variable speed drives that have one or more moving flanges.

The other characteristics of transmission pulleys may be found in the relevant International Standards.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of the 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 1940-1:1986, *Mechanical vibration — Balance quality requirements of rigid rotors — Part 1: Determination of permissible residual unbalance*.

ISO 4287:1997, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*.

## 3 Choice and quality of materials

The pulleys shall be made of any material that can be shaped to the standardized dimensions and tolerances, and is capable of withstanding the conditions of service (heating, mechanical stresses, abrasion, environment, etc.) without damage. Moreover, it is desirable that the pulley material be capable of dissipating any significant heat which might be generated by the belts.

## 4 Surface roughness

### 4.1 Transmission pulleys

The surface roughness of the working surfaces shall not be coarser than the value given in table 1.

Table 1

| Working surface  | Surface roughness $R_a$ <sup>1)</sup><br>$\mu\text{m}$ |
|--|--|
| V-pulley and V-ribbed pulley grooves and all pulley bores                | 3,2  |
| Flat pulley rims and all pulley rim edges                                | 6,3  |
| Synchronous pulley tooth flanks and tips:                                |  |
| — industrial type drives   | 3,2  |
| — high-performance type drives (for example for automotive applications) | 1,6  |
| 1) As defined in ISO 4287.   |  |

## 4.2 Test pulleys

The surface roughness of the working surfaces shall not be coarser than the value given in table 2.

Table 2

| Working surface                                     | Surface roughness $R_a$ <sup>1)</sup><br>$\mu\text{m}$ |
|---|--|
| V-pulley and V-ribbed pulley grooves (dynamic test) | 1,6  |
| Synchronous pulley grooves                          | 1,6  |
| Idler pulleys                                       | 1,6  |
| 1) As defined in ISO 4287.                          |  |

## 4.3 Edges

The edges of flat pulley rims, V-pulley grooves and V-ribbed pulley grooves shall be chamfered or radiused.

## 5 Balance

**5.1** The purpose of balancing a pulley is to improve its mass distribution so as to diminish the out-of-balance forces exerted as it revolves; these forces cannot be completely eliminated, but the remaining imbalance shall not be greater than the allowable limit.

**5.2** As balancing is an expensive operation, the specified limit of the residual imbalance should be given a value as large as the envisioned applications allow.

**5.3** Two classes of balancing may be considered:

- balancing in one plane, called static balancing;
- balancing in two planes, called dynamic balancing.

**5.4** Static balancing is usually sufficient; dynamic balancing may be necessary for pulleys with a wide-faced rim or those revolving at relatively high speeds.

**5.5** Pulleys manufactured for stock shall be statically balanced since their future conditions of use are not known at the time of manufacture.

**5.6** Static balancing shall be done so as to leave an eccentric residual mass on the working diameter (datum or effective, according to the type of pulley) which does not exceed the larger of the two following values:

- a) 0,005 kg<sup>1)</sup>;
- b) 0,2 % of the equivalent mass of the pulley, eventually including any companion bushing.

The equivalent mass is taken as the mass of a geometrically identical pulley made of cast iron.

**5.7** When the rotational frequency  $n$ , in minutes to the power minus one (min<sup>-1</sup>)<sup>2)</sup>, of a pulley becomes known, it is advisable to ascertain whether dynamic balancing may be necessary, as follows.

Determine the limiting speed  $n_1$  (min<sup>-1</sup>) by reference to figure 1 or by calculation using the formula:

$$n_1 = \sqrt{\frac{1,58 \times 10^{11}}{ld}}$$

where

$l$  is the pulley rim face width, in millimetres;

$d$  is the diameter (datum or effective) of the pulley, in millimetres.

Then:

if  $n \leq n_1$ : static balancing should be suitable;

if  $n > n_1$ : dynamic balancing may be necessary.

**5.8** For dynamic balancing, the operation shall be implemented in accordance with ISO 1940-1. The G quality grade is determined by the largest of the following two numbers:

$$G_1 = 6,3 \text{ mm/s}$$

$$G_2 = \frac{5v}{M} \text{ mm/s}$$

The expression for  $G_2$  is derived from the definition in ISO 1940-1.

In this formula:

$5$  is the practical limit of the residual eccentric mass, in grams, specified in 5.6 a);

$v$  is the circumferential pulley speed, in metres per second;

$M$  is the equivalent mass of the pulley, in kilograms, as given in 5.6 b).

The G quality grade may be less than  $G_1$  or  $G_2$  if the user specifies a particular requirement.

<sup>1)</sup> This value applies only to pulleys where there is adequate material to remove for balancing. Many light-duty pulleys have inadequate space to drill balancing holes or to add appropriate masses by permanent means.

<sup>2)</sup> The term "rotations per minute (r/min)" is usually used for rotating machines.

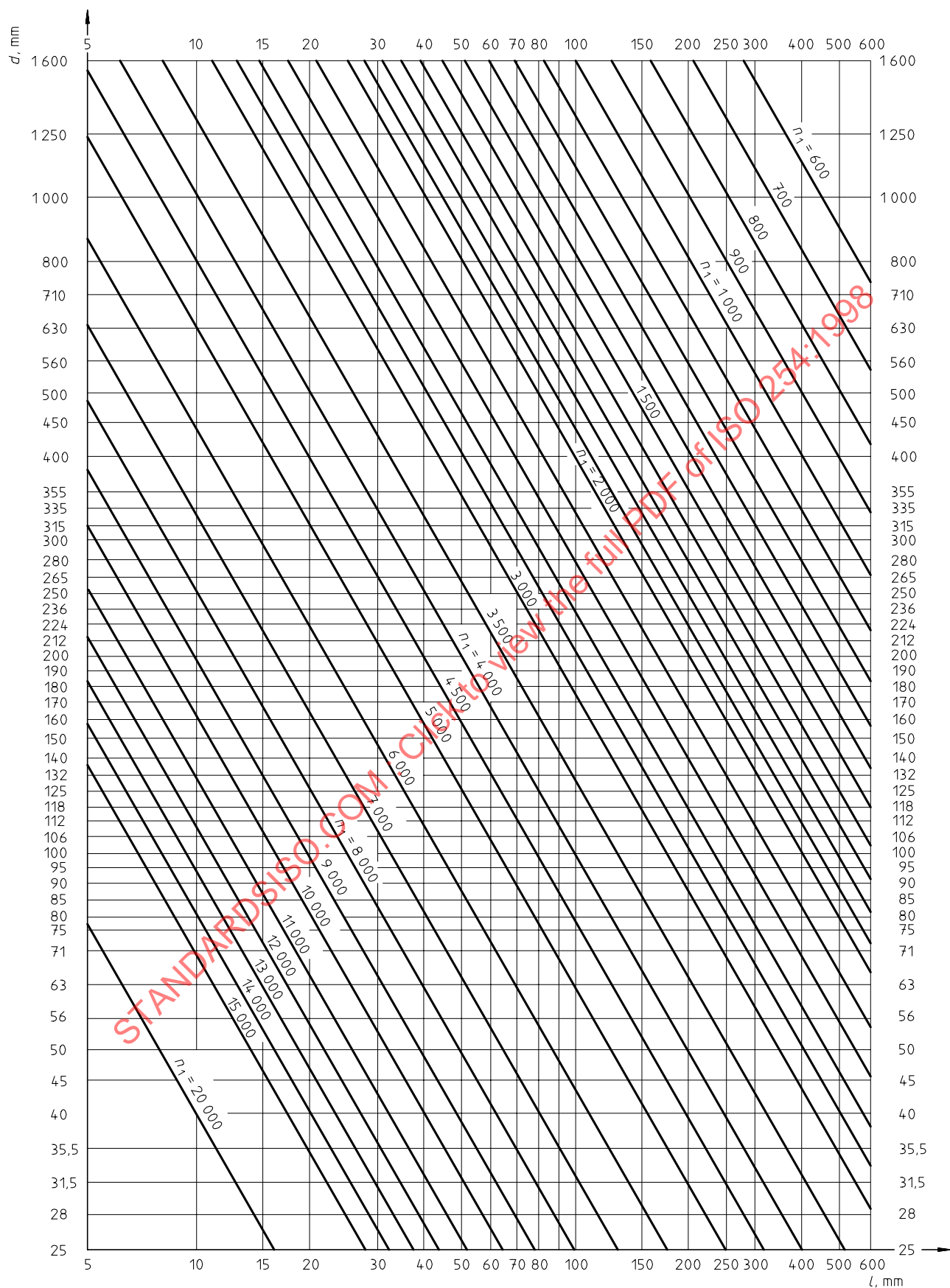


Figure 1 — Limit  $n_1$  ( $\text{min}^{-1}$ ) for static or dynamic balancing