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INTERNATIONAL STANDARD

ISO 254

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Belt drives — Pulleys — Quality, finish and balance

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

Reference number
ISO 254:1990(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)*.

This second edition cancels and replaces the first edition (ISO 254:1981), subclauses 4.1 and 5.8 of which have been technically revised. Subclause 3.3 has been deleted.

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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 states specific quality levels for the finish and balance of transmission pulleys.

This International Standard applies to transmission pulleys for V-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 Standard.

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 468:1982, *Surface roughness — Parameters, their values and general rules for specifying requirements.*

ISO 1940-1:1986, *Mechanical vibration — Balance quality requirements of rigid rotors — Part 1: Determination of permissible residual unbalance.*

3 Choice and quality of materials

3.1 The pulleys shall be made of cast iron, steel, suitable alloys, or any material that could be shaped to the standardized dimensions and tolerances, and capable of withstanding without damage the conditions of service (heating, mechanical stresses, abrasion, environment, etc.); moreover it is desirable that the pulley material be capable of dissipating any significant heat which might be generated by the belts.

3.2 Cast or sintered pulleys shall consist of an appropriate material and be free of porosities or flaws and of shrinkage holes or voids.

4 Surface roughness

4.1 The surface roughness of the working surfaces shall be measured in a plane parallel to the action of the belt and shall in any direction not be coarser than the value given in table 1.

Table 1

Working surface	Surface roughness R_a [1] µm
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)	2

1) As defined in ISO 468.

It shall be measured in a radial plane parallel to the motion of the belt.

4.2 The edges of flat pulley rims and V-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; such 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 might 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 on the working diameter (datum or effective, according to the type of pulley) an eccentric residual mass not exceeding the larger of the two following values:

a) 0,005 kg[1];

b) 0,2 % of the equivalent mass of the pulley and 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 power minus one (min^{-1})[2], of a pulley becomes known, it is advisable to ascertain whether dynamic balancing may be necessary, as follows:

Determine the limiting speed n_1, in minutes to power minus one (min^{-1}), 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 $n \leqslant n_1$: static balancing should be suitable;

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

5.8 For dynamic balancing, the operation shall be implemented according to 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 derives from the definition in ISO 1940-1.

In that 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.

1) 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.

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

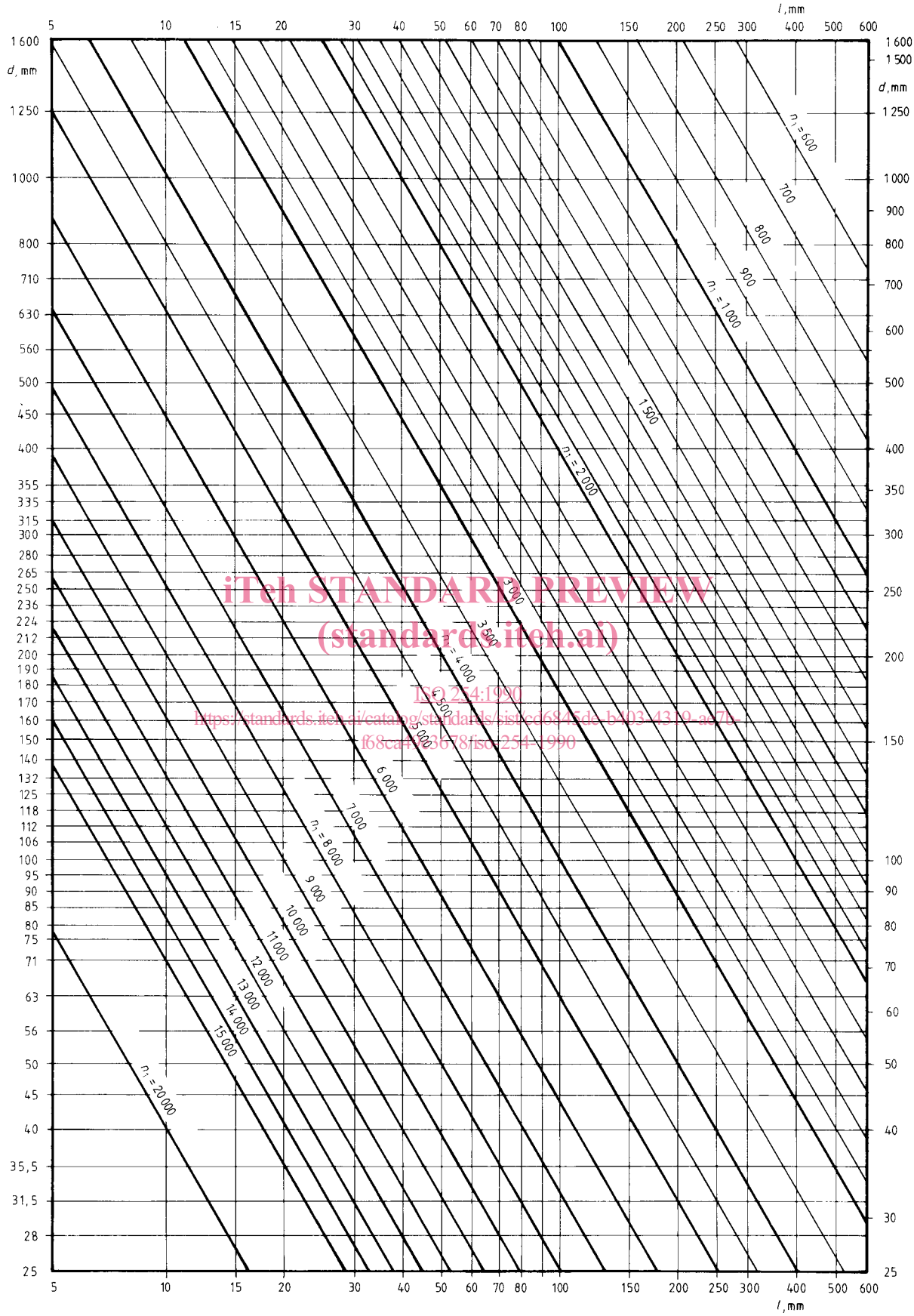

Figure 1 — Limit n_1 (min^{-1}) for static or dynamic balancing

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