INTERNATIONAL STANDARD

ISO 13050

First edition
1999-12-15

Curvilinear toothed synchronous belt drive systems

Transmissions par courroies synchrones à denture curviligne

Reference number
ISO 13050:1999(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 734 10 79
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 13050 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 4, *Synchronous belt drives*.

Annexes A , B and C form a normative part of this International Standard. Annex D is for information only.

Introduction

The International Organization for Standardization (ISO) draws attention to the fact that it is claimed that compliance with this International Standard may involve the use of a patent concerning belt tooth and pulley groove profiles given in 8.1.1 and 8.2.2.

ISO takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO. Information may be obtained from:

Dayco Products, Inc.
1 Prestige Place
P.O. Box 1004
Dayton, OH 45401-1004
USA

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights other than those identified above. ISO shall not be held responsible for identifying any or all such patent rights.

Curvilinear toothed synchronous belt drive systems

1 Scope

This International Standard specifies the principal characteristics of synchronous endless belts and pulleys for use in synchronous belt drives[1)] for mechanical power transmission and where positive indexing or synchronization may be required.

The principal belt and pulley characteristics include:

a) nominal belt tooth dimensions;

b) belt tooth pitch spacing;

c) belt length and width dimensions;

d) belt length-measurement specifications;

e) pulley groove dimensions and tolerances;

f) pulley diameter and width dimensions and tolerances;

g) pulley quality specification.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 254:1998, *Belt drives — Pulleys — Quality, finish and balance*.

3 Belt types

Six belt types for synchronous drives are standardized:

— type H8M (H-type tooth profile);

— type S8M (S-type tooth profile);

— type R8M (R-type tooth profile);

1) Synchronous belt drives have been known by various titles in the past: for example, timing belt drives, positive belt drives, gear belt drives.

— type H14M (H-type tooth profile);

— type S14M (S-type tooth profile);

— type R14M (R-type tooth profile).

4 Belt nomenclature

A belt is identified by a combination of numbers and letters as follows:

a) the belt pitch length in millimetres;

b) the type of tooth profile;

c) the tooth pitch in millimetres;

d) the width in millimetres or 10 times the width in millimetres for the S-type belt;

e) double-sided belts are designated by adding the letter "D" before the tooth profile letter.

EXAMPLE A curvilinear tooth synchronous belt of 14 mm pitch, 40 mm wide, 1 400 mm in pitch length is identified as follows:

1400-H14M-40 for H-type single-sided belt, 1400-DH14M-40 for H-type double-sided belt;

400-S14M-1400 for S-type single-sided belt, 400-DS14M-1400 for S-type double-sided belt;

1400-R14M-40 for R-type single-sided belt, 1400-DR14M-40 for R-type double-sided belt.

5 Pulley types

Six pulley types for synchronous drives are standardized:

— type H8M (H-type groove profile);

— type S8M (S-type groove profile);

— type R8M (R-type groove profile);

— type H14M (H-type groove profile);

— type S14M (S-type groove profile);

— type R14M (R-type groove profile).

6 Pulley nomenclature

A pulley for a synchronous drive is identified by the number of grooves, the groove pitch and profile, and the width. It is identified as is the belt by a combination of numbers and letters as follows:

a) the letter "P" indicates a pulley;

b) the number of grooves;

c) the type of groove profile;

d) the groove pitch in millimetres;

e) the width in millimetres or ten times the width in millimetres for S-type pulleys.

EXAMPLE A pulley for a curvilinear toothed belt which has 14 mm pitch and 30 grooves with a nominal width of 40 mm is identified as follows:

P30-H14M-40 for H-type pulleys;

P30-S14M-0400 for S-type pulleys;

P30-R14M-40 for R-type pulleys.

7 Type H system

7.1 H-type belt dimensions and tolerances

7.1.1 Belt tooth dimensions

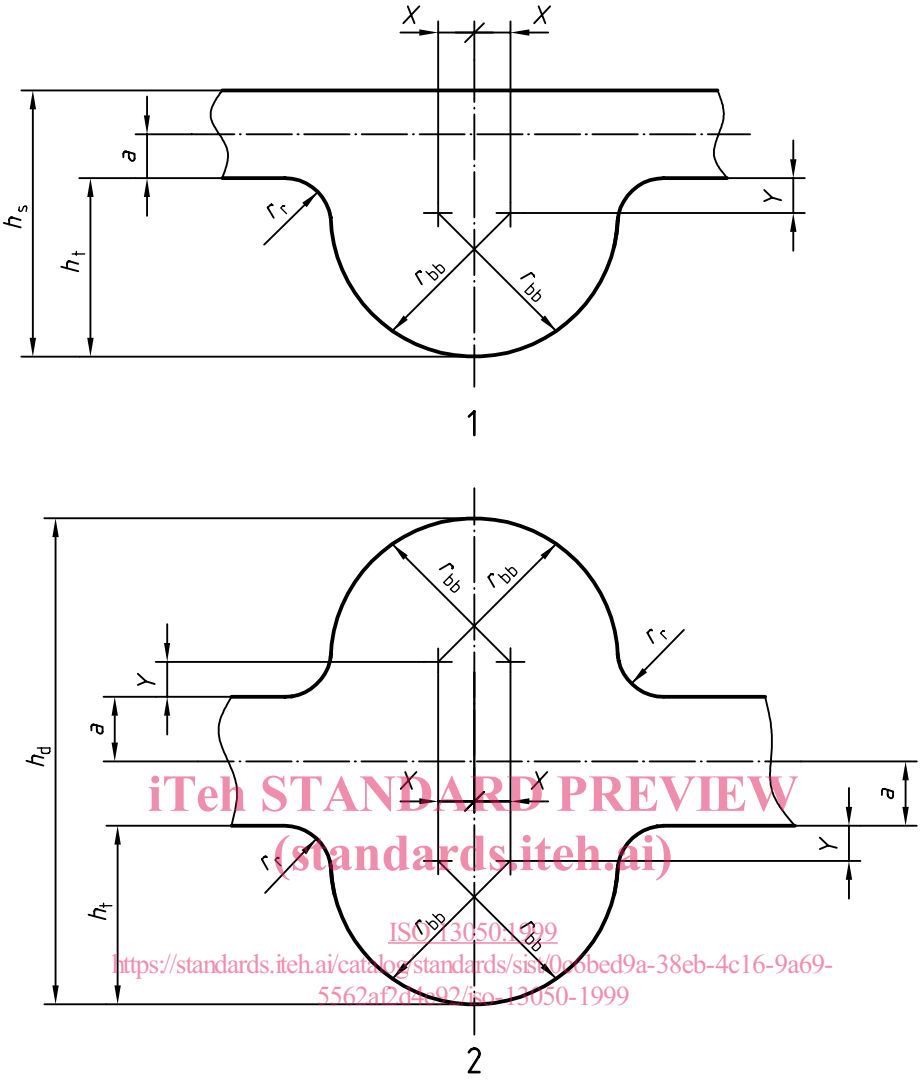
The nominal belt tooth dimensions are the same for single-sided and double-sided belts; they are given in Table 1 and shown in Figure 1.

Table 1 — Nominal tooth dimensions

Dimensions in millimetres

Belt type	Pitch	h_s	h_d	h_t	X ref.	Y ref.	r_{bb}	r_r	a[a]
H8M	8	6		3,38	0,089	0,787	2,59	0,76	0,686
DH8M	8		8,1	3,38	0,089	0,787	2,59	0,76	0,686
H14M	14	10		6,02	0,152	1,470	4,55	1,35	1,397
DH14M	14		14,8	6,02	0,152	1,470	4,55	1,35	1,397

[a] a is the belt design pitch differential.



Key

1 Single-sided belts
2 Double-sided belts

Figure 1 — Belt tooth dimensions

7.1.2 Belt widths and tolerances

Belt widths and tolerances are given in Table 2.

Table 2 — Widths and width tolerances

Dimensions in millimetres

Belt type	Nominal belt width	Tolerance on width for belt pitch lengths		
		Up to and including 840 mm	Over 840 mm and up to and including 1 680 mm	Over 1 680 mm
H8M DH8M	20 30	+ 0,8 − 0,8	+ 0,8 − 1,3	+ 0,8 − 1,3
	50	+ 1,3 − 1,3	+ 1,3 − 1,3	+ 1,3 − 1,5
	85	+ 1,5 − 1,5	+ 1,5 − 2,0	+ 2 − 2
H14M DH14M	40	+ 0,8 − 1,3	+ 0,8 − 1,3	+ 1,3 − 1,5
	55	+ 1,3 − 1,3	+ 1,5 − 1,5	+ 1,5 − 1,5
	85	+ 1,5 − 1,5	+ 1,5 − 2,0	+ 2 − 2
	115 170	+ 2,3 − 2,3	+ 2,3 − 2,8	+ 2,3 − 3,3

7.1.3 Pitch length measurement

See annex A for tolerances and annex B for the relationship between the centre distance and the belt pitch length.

7.1.3.1 **Measuring fixture** (see Figure 3)

The pitch length of a synchronous belt shall be determined by placing the belt on a measuring fixture composed of the following elements.

7.1.3.1.1 Two pulleys of equal diameter, as specified in Table 3, of the proper belt type and having standard tooth space dimensions. These pulleys should be made to the tolerances shown in Table 3 and have the proper clearance C_m, between pulley and theoretical belt as specified in Table 3 (see Figure 2). One pulley shall be free to rotate on a fixed-position shaft, while the other shall be free to rotate on a movable shaft to permit the centre distance to change.

7.1.3.1.2 Means of applying a total measuring force to the movable pulley.

7.1.3.1.3 Means of measuring the centre distance between the two pulleys with the necessary degree of accuracy for centre distance measurement.

NOTE The number of pulley teeth specified in Table 3 determine the recommended sizes for measuring the belt pitch length. Practically, other sizes of pulleys could be used provided they have the same number of teeth, and meet the dimensional requirements of Table 3.

7.1.3.2 Total measuring force

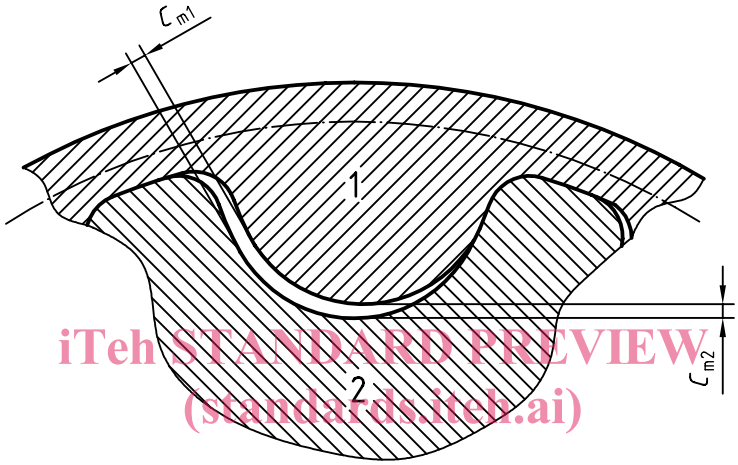
The total measuring force to be applied for measuring belts is given in Table 4.

7.1.3.3 Procedure

In measuring the pitch length of a synchronous belt, the belt should be rotated at least two revolutions to seat it properly and to divide the total force equally between the two lengths of the belt.

The pitch length shall be calculated by adding the pitch circumference of one of the pulleys to twice the measured centre distance.

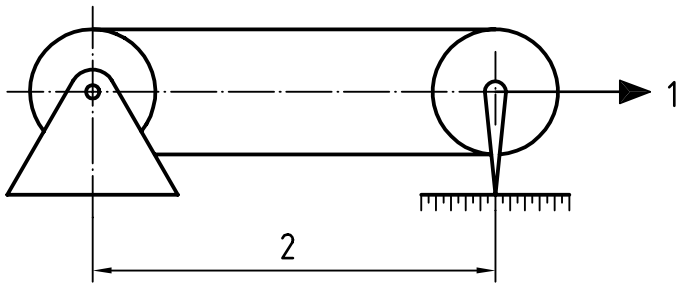
Check double-sided belts on both tooth faces.



Key

1 Belt
2 Pulley

Figure 2 — Clearance between measuring pulley and belt (H-type profile)



Key

1 Total measuring force
2 Centre distance

Figure 3 — Diagram of fixture for measuring pitch length

Table 3 — Belt length measuring pulleys

Dimensions in millimetres

Belt type	Number of grooves	Pitch circumference	Outside diameter [a]	Radial runout F.I.M. [b]	Axial runout F.I.M. [b]	Minimum clearance (see Figure 2)	
						C_{m1}	C_{m2}
H8M, DH8M	34	272	85,209 ± 0,013	0,013	0,025	0,34	0,11
H14M, DH14M	40	560	175,46 ± 0,025	0,013	0,051	0,64	0,20

[a] Pulleys outside of the diameter tolerance range specified may be used if the resulting belt length measurements are corrected for the actual pulley diameters.

[b] Full indicator movement.

Table 4 — Total measuring force

Forces in newtons

Belt type	Total measuring force							
	Belt width, mm							
	20	30	40	50	55	85	115	170
H8M, DH8M	470	750		1 320		2 310		
H14M, DH14M			1 350		2 130	3 660	5 180	7 960

7.2 H-type pulleys

7.2.1 General

See annex C for tolerances.

The pulley is characterized by a curvilinear groove profile. This groove profile is defined as the profile formed by the generating tool rack form required to machine-finish the curvilinear profile. The profile is different for each pulley diameter, but can be closely approximated by a nominal groove profile over specified ranges of number of grooves.