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Synchronous belt drives — Metric pitch - Curvilinear profile systems G, H, R and S - Belts and pulleys — Complementary element

Transmissions par courroies synchrones à denture curviligne
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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. 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 2.

The main task of technical committees is to prepare International Standards. 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.

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

This second/third/... edition cancels and replaces the first/second/... edition (), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Synchronous belt drives — Metric pitch - Curvilinear profile systems G, H, R and S - Belts and pulleys — Complementary element

1 Scope

This International Standard specifies the principal characteristics of metric pitch curvilinear synchronous endless belts and pulleys in G, H, S and R profile systems 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; and tolerances;

d) belt length measurement specifications;

e) pulley groove dimensions and tolerances;

f) pulley diameter and width dimensions and tolerances;

g) pulley quality specification

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

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*.

ISO 1101:1983, *Technical drawings -- Geometrical tolerancing -- Tolerancing of form, orientation, location and run-out -- Generalities, definitions, symbols, indications on drawings.*

3 Synchronous belt drive system types

Four profile systems and fourteen profiles for curvilinear synchronous drives are standardized.

Profile System G

Profile G8M
(Tooth / groove pitch 8)

Profile G14M
(Tooth / groove pitch 14)

Profile System R

Profile R3M
(Tooth / groove pitch 3)

Profile R5M
(Tooth / groove pitch 5)

Profile R8M
(Tooth / groove pitch 8)

Profile R14M
(Tooth / groove pitch 14)

Profile R20M
(Tooth / groove pitch 20)

Profile System H

Profile H3M
(Tooth / groove pitch 3)

Profile H5M
(Tooth / groove pitch 5)

Profile H8M
(Tooth / groove pitch 8)

Profile H14M
(Tooth / groove pitch 14)

Profile H20M
(Tooth / groove pitch 20)

Profile system S

Profile S8M
(Tooth / groove pitch 8)

Profile S14M
(Tooth / groove pitch 14)

4 Belt nomenclature

A belt is identified as follows:

a) the belt length or pitch length in millimeters, e.g. 1400 mm

b) the profile system, e.g. “G”,“H”, “R”, or “S”

c) the pitch or tooth pitch in millimetres; e.g. 14mm

d) the width or belt width in millimetres; e.g. 40mm (for Profile System S, the width in millimetres x 10)

e) double-sided belts are designated by adding the letter "D" before the designation of the profile system

EXAMPLE – A synchronous belt in the above profile systems of 1400mm length, 14mm pitch and 40mm wide is identified as follows:

Profile System G
1400-G14M-40
1400-DG14M-40

Profile System R
1400-R14M-40
1400-DR14M-40

Profile System H
1400-H14M-40
1400-DH14M-40

Profile System S
1400-S14M-400
1400-DS14M-400

5 Pulley nomenclature

A pulley is identified as follows:

a) the letter “P” indicates a pulley

b) the number of grooves; e.g. 30

c) the profile system, e.g. “G“, “H”, “R”, or “S”

d) the pitch or groove pitch in millimetres; e.g. 14mm

e) the width or belt width in millimetres; e.g. 40mm (for Profile System S, the width in millimetres x 10)

EXAMPLE – A pulley in the above profile systems of 30 grooves, 14mm pitch and 40mm wide is identified as follows:

Profile System G
P30-G14M-40

Profile System R
P30-R14M-40

Profile System H
P30-H14M-40

Profile System S
P30-S14M-400

6 Profile system G

6.1 Belt dimensions and tolerances

6.1.1 Belt tooth dimensions

The nominal belt tooth dimensions are given in Table 1 and shown in Figure 1.

Table 1 – Nominal tooth dimensions
Dimensions in millimetres

Profile	Belt Pitch	bg	hg	R1	Ao	a[a]	xo	L1
G8M	8	5,200	3,43	0,74	2,29	0,80	0,379	1,378
G14M	14	9,100	6,00	1,30	4,00	1,40	0,661	2,422

[a] *a* is the belt design pitch differential.

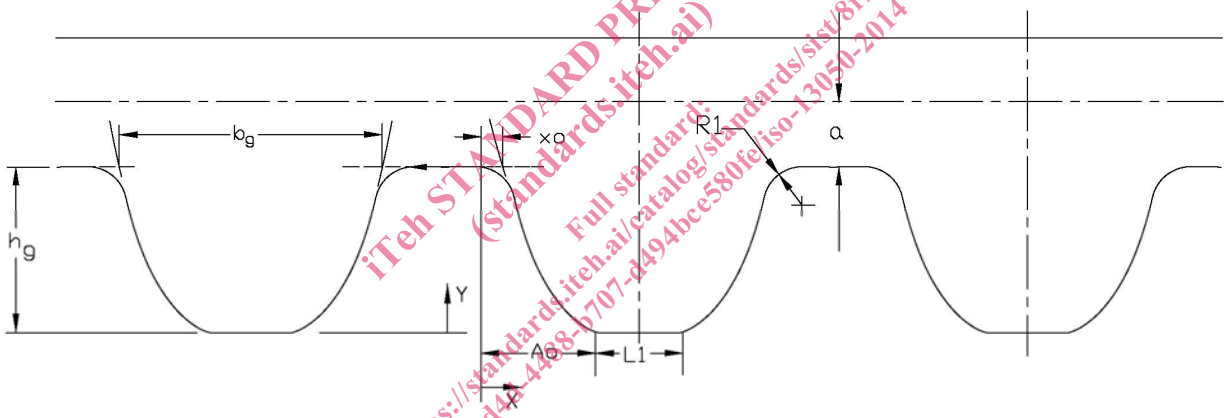


Figure 1 – Tooth Dimensions – Profile System G

Detail of Tooth Face
For Ao ≥ x ≥ xo:

$$y = \left[\ln\left(Ao/x + \sqrt{(Ao/x)^2 - 1} \right) - \sqrt{1-(x/Ao)^2} \right]$$

Where: xo corresponds to y=hg
L1 = bg - 2(Ao-xo)

NOTES:
1. Indicated base tooth profile remains constant in all parts.
2. "O" Reference points remain in contact with the part outer surface generated by part radius of curvature.
3. Groove profile bottom surface in circular part form is an arc whose chordal distance is L1 and whose radius originates at the part center.

6.1.2 Belt widths and tolerances

Belt widths and tolerances are given in Table 2.

Table 2 — Widths and width tolerances

Dimensions in millimetres

Profile	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
G8M	12	+0,8 -0,8	+0,8 -1,2	+0,8 -1,2
	21	+0,8 -0,8	+0,8 -1,2	+0,8 -1,2
	36	+0,8 -0,8	+0,8 -1,2	+0,8 -1,2
	62	+1,2 -1,2	+1,2 -1,6	+1,6 -1,6
G14M	20	+0,8 -0,8	+0,8 -1,2	+0,8 -1,2
	37	+0,8 -0,8	+0,8 -1,2	+0,8 -1,2
	68	+1,2 -1,6	+1,6 -1,6	+1,6 -2,0
	90	+1,6 -1,6	+1,6 -2,0	+2,0 -2,0
	125	+2,4 -2,4	+2,4 -2,8	+2,4 -3,2

6.1.3 Pitch length measurement

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

6.1.3.1 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.

6.1.3.1.1 **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. One pulley shall be free to rotate on a fixed-position shaft, while the other shall be free to rotate on a moveable shaft to permit the centre distance to change.

6.1.3.1.2 **Means of applying a total measuring force** to the moveable pulley.

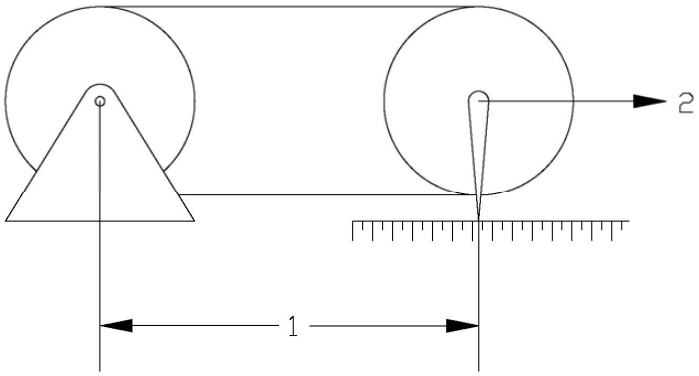
6.1.3.1.3 **Means of measuring the centre distance** between the two pulleys with the necessary degree of accuracy for centre distance measurement.

6.1.3.2 Total measuring force

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

6.1.3.3 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 spans 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.



Key

1 Centre distance
2 Total measuring force

Figure 2 - Diagram of fixture for measuring pitch length

Table 3 – Belt length measuring pulleys

Dimensions in millimetres

Profile	Numberof grooves	Pitch circumference	Outside diameter[a]	Radial runout F.I.M.[b]	Axial runout F.I.M.[b]
G8M	34	272	84,980 ±0,013	0,013	0,025
G14M	40	560	175,454 ±0,025	0,013	0,051

[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

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.

Table 4 – Total measuring force

Forces in newtons

Profile	Belt Width (mm)								
	12	20	21	36	37	62	68	90	125
G8M	267		467	756		1223			
G14M		1179			2046		3447	4315	5627

6.2 Pulleys, profile system G

6.2.1 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.

6.2.2 Generating tool rack

Dimensions and tolerances for the generating tool rack for pulleys with profile system G are given in Table 5 and shown in Figure 3.