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Synchronous belt drives — Vocabulary

Transmissions synchrones par courroies — Vocabulaire

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 5288:2001), which has been technically revised. The main change compared to the previous edition is the inclusion of include terms related to curvilinear synchronous belts.

Synchronous belt drives — Vocabulary

1 Scope

This document specifies the terms and definitions related to the use of synchronous belt drives for mechanical power transmission and where positive indexing or synchronization is required.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1 General

3.1.1
synchronous belt drive
system composed of a *synchronous belt* (3.3.1.1) and at least one *synchronous pulley* (3.3.1.1)

Note 1 to entry: Synchronized motion and/or power is transmitted through the engagement of teeth on the belt with *grooves* (3.3.2.1) on the pulleys.

Note 2 to entry: This belt drive has been known in the past by various names such as “timing belt drive”, “positive belt drive” or “gear belt drive”.

3.1.2
centre distance
C
shortest distance between the axes of two *synchronous pulleys* (3.3.1.1) when the belt is under the prescribed measuring force

Note 1 to entry: See Figure 1.

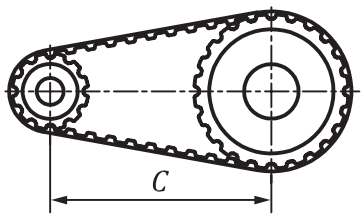


Figure 1

3.1.3
endless synchronous belt drive
synchronous belt drive (3.1.1) with applied endless synchronous belt

Note 1 to entry: See Figure 2.

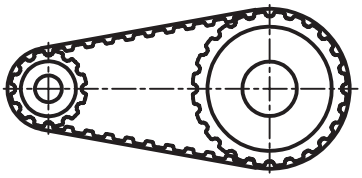


Figure 2

3.1.4
open synchronous belt drive
synchronous belt drive (3.1.1) with applied open synchronous belt

Note 1 to entry: See Figure 3.

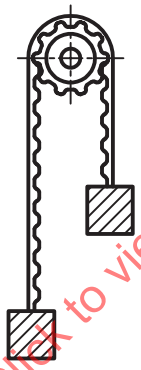


Figure 3

3.2 Synchronous belts

3.2.1 General

3.2.1.1
synchronous belt
belt with transverse teeth of rectangular or curvilinear cross-section extending from the base at regularly spaced intervals

Note 1 to entry: Consult synchronous belt dimensional standards for the full details of belt profiles.

3.2.1.2
tooth pitch
P_b
linear distance between the axes of two consecutive teeth in a section of belt loaded to the prescribed measuring force

Note 1 to entry: See Figure 4.

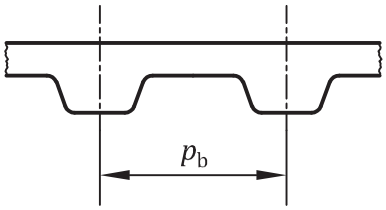


Figure 4

3.2.1.3
pitch line
circumferential line in the belt which keeps the same length when the belt is bent perpendicularly to its base

Note 1 to entry: See Figure 5.

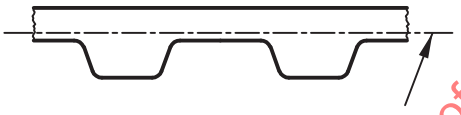


Figure 5

3.2.1.4
pitch line differential
a
<belts> radial distance between the *pitch line* (3.2.1.3) and the *root line* (3.2.5.3)

Note 1 to entry: See Figure 6.

Figure 6

3.2.1.5
belt pitch length
L_p
length of the *pitch line* (3.2.1.3) of a belt

3.2.1.6
width
b_s
transverse dimension of the back of the belt

Note 1 to entry: See Figure 7.

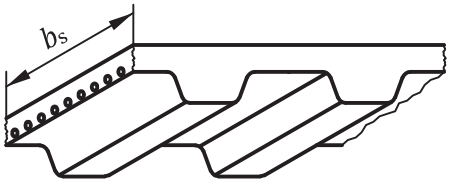
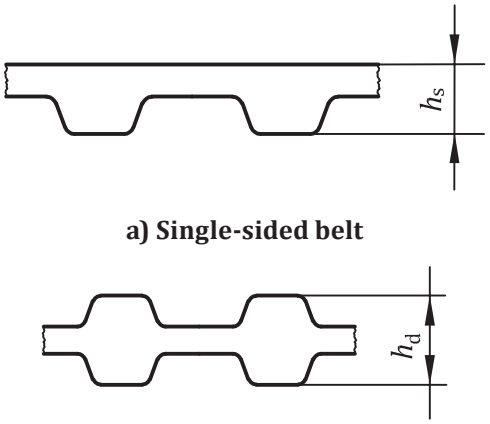


Figure 7

3.2.1.7
height
h_s/h_d
total height of a single-sided or double-sided belt

Note 1 to entry: See Figure 8.



a) Single-sided belt

b) Double-sided belt

Figure 8

3.2.2 Tooth profile

3.2.2.1
trapezoidal profile
transverse *tooth* (3.2.5.1) profile formed by a tooth flank and tip with only straight lines

Note 1 to entry: See Figure 9.

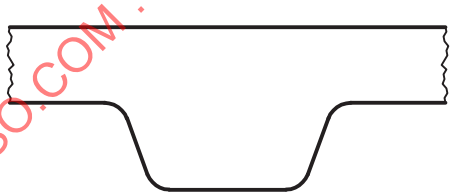


Figure 9

3.2.2.2
curvilinear profile
transverse *tooth* (3.2.5.1) profile formed by a tooth flank or tip with curved lines

Note 1 to entry: See Figure 10.

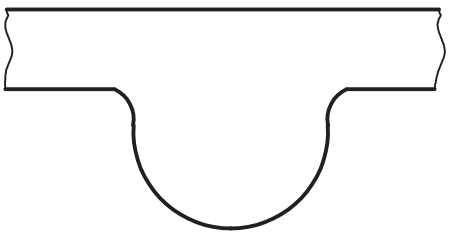


Figure 10

3.2.3 Type of belt drive

3.2.3.1
endless synchronous belt
closed *synchronous belt* (3.2.1.1)

Note 1 to entry: See Figure 11.

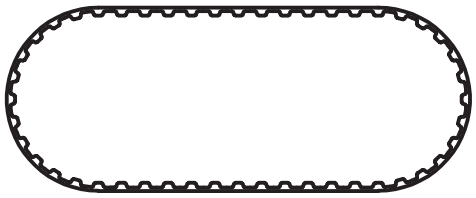


Figure 11

3.2.3.2
open synchronous belt
synchronous belt (3.2.1.1) with two ends

Note 1 to entry: See Figure 12.

Figure 12

3.2.4 Structure

3.2.4.1
single-sided synchronous belt
synchronous belt (3.2.1.1) with teeth located inside of the *pitch line* (3.2.1.3) at regularly spaced intervals

Note 1 to entry: See Figure 13.

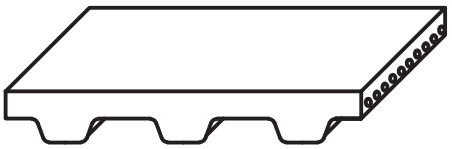
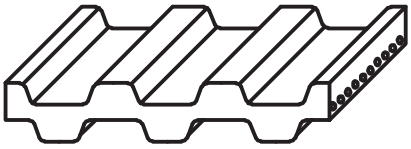


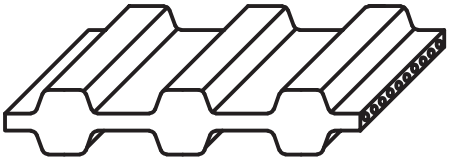
Figure 13

3.2.4.2
double-sided synchronous belt
synchronous belt (3.2.1.1) with teeth located on both sides of the *pitch line* (3.2.1.3) at regularly spaced intervals

Note 1 to entry: See Figure 14.



a) Staggered double-sided synchronous belt



b) Symmetrical double-sided synchronous belt

Figure 14

3.2.5 Teeth

3.2.5.1
tooth
generally transverse element protruding from the root of the belt which have the profile necessary to mesh with the *grooves* (3.3.2.1) in a *synchronous pulley* (3.3.1.1)

Note 1 to entry: See Figure 15.

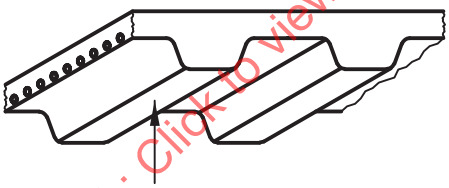


Figure 15

3.2.5.2
tip line
line joining the tips of the belt teeth

Note 1 to entry: See Figure 16.

Figure 16

3.2.5.3
root line
line joining the roots between the belt teeth

Note 1 to entry: See Figure 17.

Figure 17

3.2.5.4
tooth height
h_t
distance between the *tip line* (3.2.5.2) and the *root line* (3.2.5.3)

Note 1 to entry: See Figure 18.

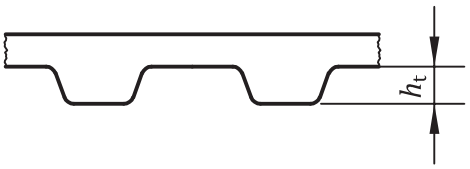
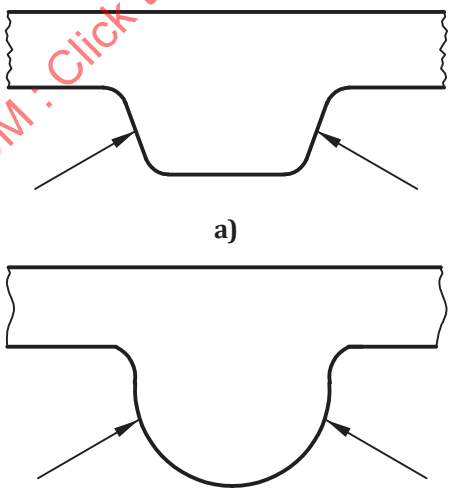


Figure 18

3.2.5.5
flank
area defined by the *width* (3.2.1.6) of the belt *tooth* (3.2.5.1) and the portion of the tooth section contained between the tooth tip radius and the tooth root radius or, if there is no tooth tip radius, contained between the *tip line* (3.2.5.2) and the tooth root radius

Note 1 to entry: See Figure 19.



a)

b)

Figure 19

3.2.5.6
working flank
<teeth> *flank* (3.2.5.5) of a belt *tooth* (3.2.5.1) in contact with the pulley groove flank when it is transmitting power

Note 1 to entry: See Figure 20.

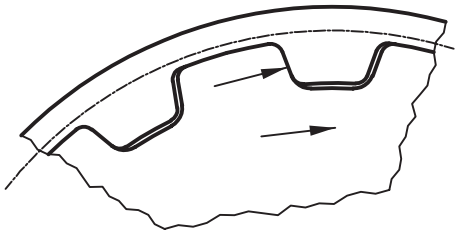


Figure 20

3.2.5.7
non-working flank
<teeth> *flank* (3.2.5.5) of the *tooth* (3.2.5.1) opposite the *working flank* (3.2.5.6)

Note 1 to entry: See Figure 21.

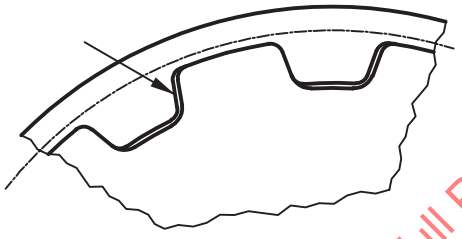


Figure 21

3.2.5.8
radius at tooth tip
r_a
radius of a generally curved section of a belt *tooth* (3.2.5.1) that connects the tooth *flank* (3.2.5.5) with the *tip line* (3.2.5.2)

Note 1 to entry: See Figure 22.

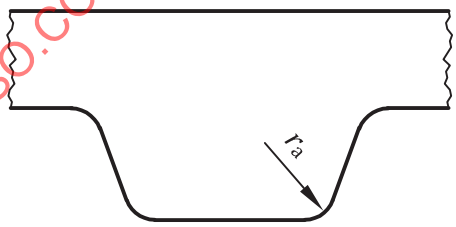


Figure 22

3.2.5.9
radius at tooth root
r_r
radius of a curve connecting the *tooth* (3.2.5.1) *flank* (3.2.5.5) with the *root line* (3.2.5.3)

Note 1 to entry: See Figure 23.

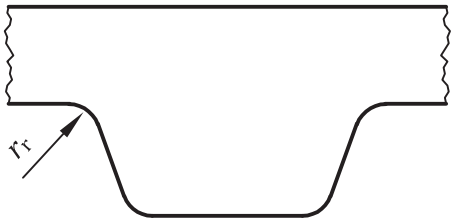


Figure 23

3.2.5.10
width at tooth root
S
linear distance between the theoretical points of intersection of the *tooth* (3.2.5.1) *flanks* (3.2.5.5) with the *root line* (3.2.5.3) when the belt is straight

Note 1 to entry: See Figure 24.

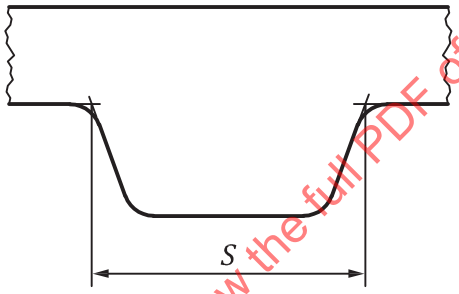


Figure 24

3.2.5.11
tooth angle
2β
included angle between the *flanks* (3.2.5.5) of the belt *tooth* (3.2.5.1)

Note 1 to entry: See Figure 25.

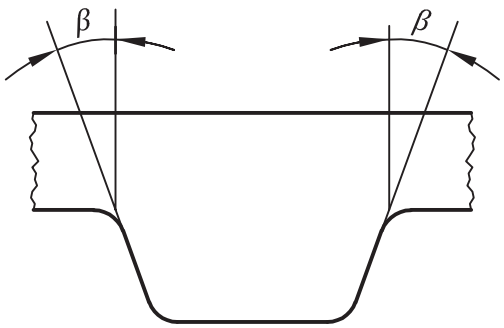


Figure 25

3.3 Pulleys

3.3.1 General

3.3.1.1
synchronous pulley
pulley with generally transverse *grooves* (3.3.2.1) equally spaced around its circumference

Note 1 to entry: See Figure 26.

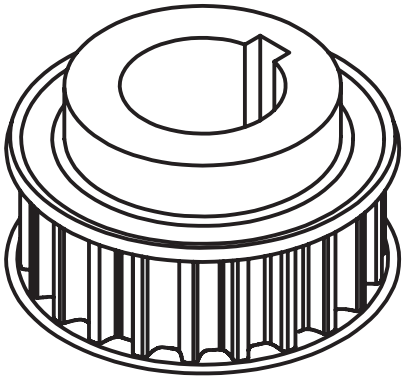


Figure 26

3.3.1.2
pitch reference cylinder
imaginary cylindrical surface, coaxial to a pulley, located at the point at which the circular pitch of the pulley is equal to the pitch of the belt it is used with

Note 1 to entry: See Figure 27.

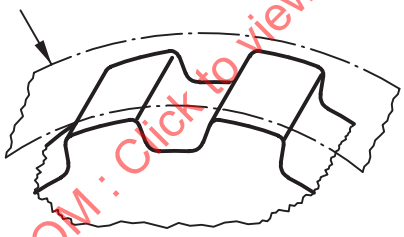


Figure 27

3.3.1.3
pitch circle
section of a *pitch reference cylinder* (3.3.1.2) with a plane perpendicular to the axis of the pulley

Note 1 to entry: See Figure 28.

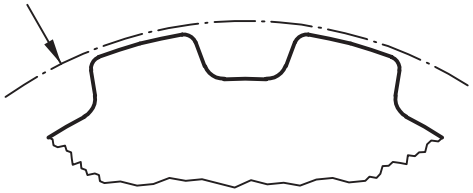


Figure 28

3.3.1.4
pitch diameter
d
diameter of the *pitch circle* (3.3.1.3)

Note 1 to entry: See Figure 29.

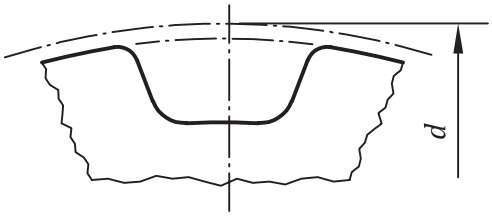


Figure 29

3.3.1.5
outside diameter
d_o
diameter of the *tip circle* (3.3.2.3)

Note 1 to entry: See Figure 30.

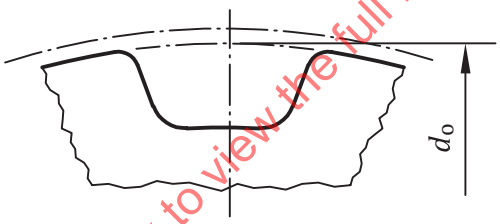


Figure 30

3.3.1.6
pitch line differential
a
<pulleys> radial distance between the *pitch circle* (3.3.1.3) and the *tip circle* (3.3.2.3)

Note 1 to entry: See Figure 31.

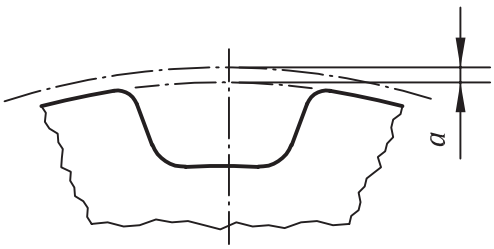


Figure 31

3.3.1.7
pitch
P_b
length of arc on the *pitch circle* (3.3.1.3) contained between the axes of two consecutive *grooves* (3.3.2.1)

Note 1 to entry: See Figure 32.

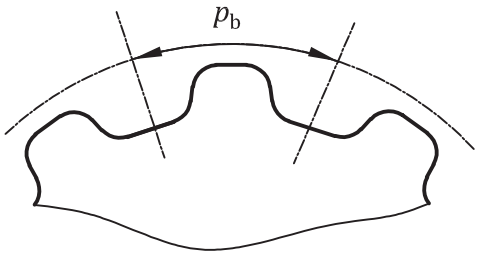
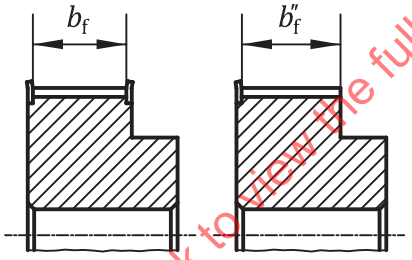


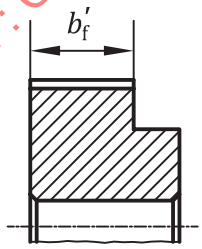
Figure 32

3.3.1.8
minimum pulley width
b_f
b'_f
b''_f
smallest lateral distance across the face of a pulley or between the *flanges* (3.3.1.11) of a flanged pulley or between the face of pulley and the flanges of a flanged pulley that can be used for a stated belt *width* (3.2.1.6)

Note 1 to entry: See Figure 33.



a) Flanged pulley



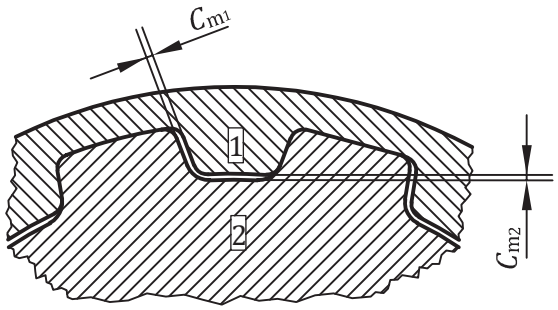
b) Unflanged pulley

Figure 33

3.3.1.9
measuring pulley
pulley specifically machined or selected to permit precise length measurement of a *synchronous belt* (3.2.1.1)

3.3.1.10
measuring pulley groove clearance
C_m
shortest distance between the *non-working flanks* (3.2.5.7) of belt teeth and the *measuring pulley* (3.3.1.9) *grooves* (3.3.2.1), and between the belt *tooth* (3.2.5.1) tip and the pulley groove root, when the *working flanks* (3.2.5.6) of the pulley and belt are in contact

Note 1 to entry: See Figure 34.



Key

1 belt

2 pulley

Figure 34

3.3.1.11
flange
flared, annular ring secured to (usually both) extremities of the working face of a pulley to guide the belt and operate within the working face of a pulley

3.3.2 Grooves

3.3.2.1
groove
equally spaced, generally transverse indentation with which the belt teeth mesh to provide a transfer of force between the belt and the pulley

Note 1 to entry: See Figure 35.

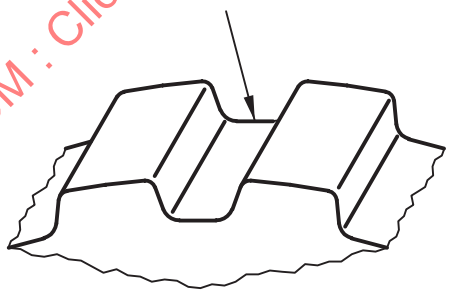


Figure 35

3.3.2.2
tip cylinder
surface coaxial with the pulley containing the crests between the *grooves* (3.3.2.1)

Note 1 to entry: See Figure 36.

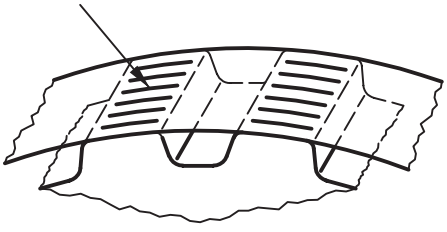


Figure 36

3.3.2.3
tip circle
section of the *tip cylinder* (3.3.2.2) where the plane is perpendicular to the axis of the pulley

Note 1 to entry: See Figure 37.

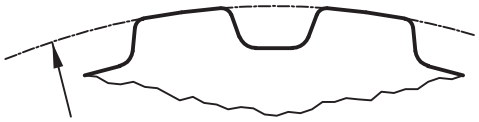


Figure 37

3.3.2.4
root cylinder
surface coaxial with the pulley containing the centre of bottom of the *grooves* (3.3.2.1)

Note 1 to entry: See Figure 38.

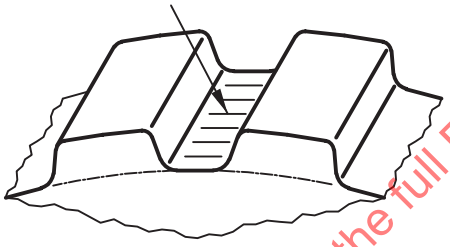


Figure 38

3.3.2.5
root circle
section of the *root cylinder* (3.3.2.4) where the plane is perpendicular to the axis of the pulley

Note 1 to entry: See Figure 39.

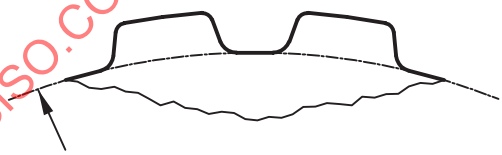


Figure 39

3.3.2.6
groove depth
h_g
radial distance between the *tip circle* (3.3.2.3) and the *root circle* (3.3.2.5)

Note 1 to entry: See Figure 40.

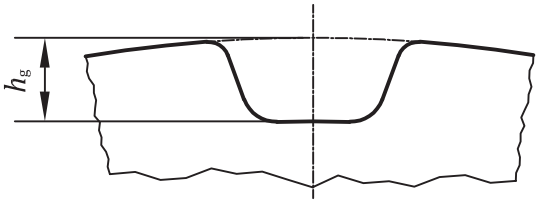


Figure 40

3.3.2.7
flank
area defined by the *width* (3.2.1.6) of the pulley and the portion of a pulley groove contained between the groove crest radius and the groove root radius or, if there is no groove root radius, contained between the groove crest radius and the *root circle* (3.3.2.5)

Note 1 to entry: See Figure 41.

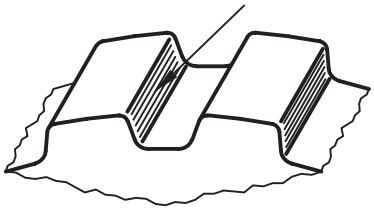


Figure 41

3.3.2.8
working flank
<grooves> *flank* (3.2.5.5) of the pulley in contact with the belt *tooth* (3.2.5.1) flank when the belt is transmitting power

Note 1 to entry: See Figure 42.

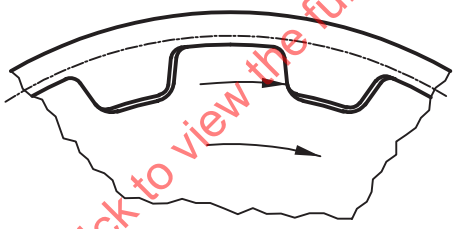


Figure 42

3.3.2.9
non-working flank
<grooves> *flank* (3.2.5.5) of the pulley groove opposite the *working flank* (3.3.2.8)

Note 1 to entry: See Figure 43.

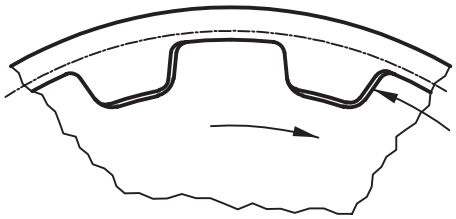


Figure 43

3.3.2.10
radius at the groove crest
r_t
radius of a curve connecting the groove *flank* (3.2.5.5) with the *tip circle* (3.3.2.3)

Note 1 to entry: See Figure 44.

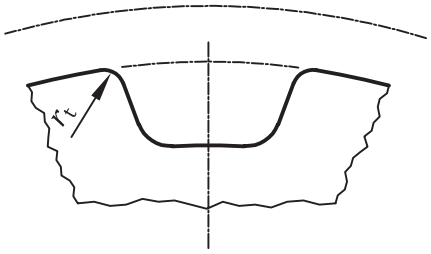


Figure 44

3.3.2.11
radius at the groove root
r_b
radius of a curve connecting the groove *flank* (3.2.5.5) with the *root circle* (3.3.2.5)

Note 1 to entry: See Figure 45.

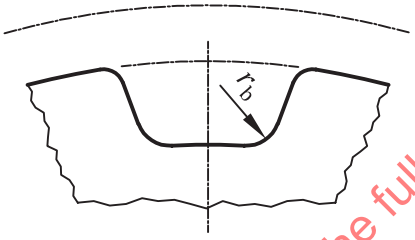


Figure 45

3.3.2.12
width at groove root
b_w
linear distance between the theoretical points of intersection of the groove *flanks* (3.2.5.5) with the *root circle* (3.3.2.5)

Note 1 to entry: See Figure 46.

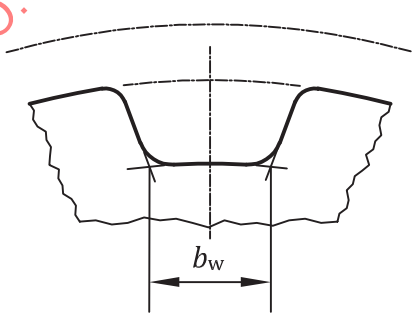


Figure 46

3.3.2.13
width at groove crest
b_r
linear distance between the theoretical points of intersection of the groove *flanks* (3.2.5.5) with the *tip circle* (3.3.2.3)

Note 1 to entry: See Figure 47.

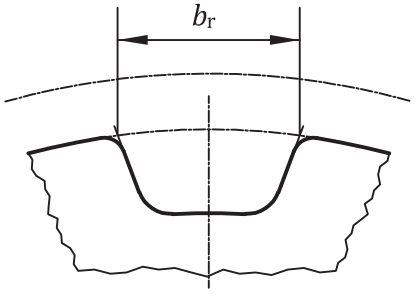


Figure 47

3.3.2.14
groove angle
2ϕ
included angle between the *flanks* (3.2.5.5) of the groove

Note 1 to entry: See Figure 48.

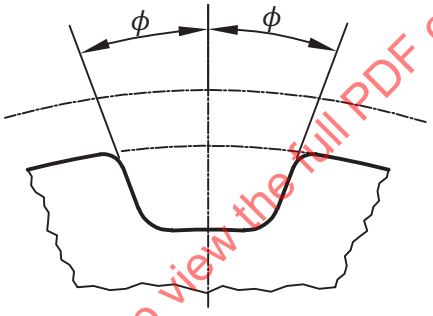


Figure 48

3.3.3 Groove-generating tools

3.3.3.1
rack form
definitive *tooth* (3.2.5.1) form used as a datum for defining the profiles for pulley groove-cutting tools

Note 1 to entry: See Figure 49.

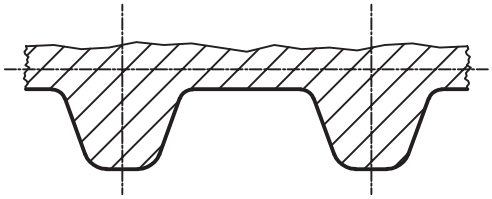


Figure 49

3.3.3.2
reference rack
rack where the profile is used as the base of a standardized system of pulleys having the same generating rack

3.3.3.3
reference rack pitch line
line with reference to which the *pitch* (3.3.1.7) of the rack teeth is defined

Note 1 to entry: See Figure 50.

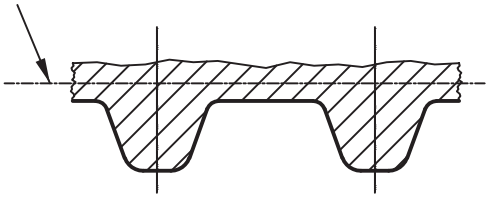


Figure 50

3.3.3.4
reference rack root line
line joining the roots between the teeth of a rack

Note 1 to entry: See Figure 51.

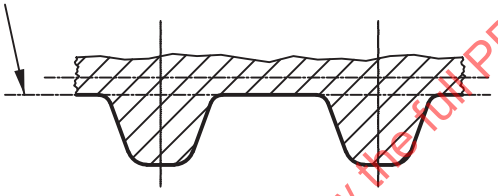


Figure 51

3.3.3.5
reference rack tip line
line joining the tips of the teeth of a rack

Note 1 to entry: See Figure 52.

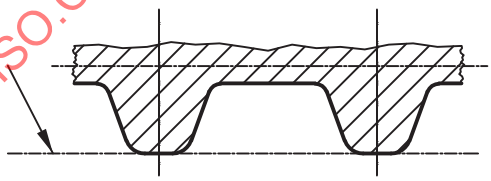


Figure 52

3.3.3.6
reference rack flank
portion of the rack *tooth* (3.2.5.1) contained between the rack tooth tip radius and the tooth root radius or, if there is no rack tooth tip radius, the area contained between the rack *tip line* (3.2.5.2) and the tooth root radius

Note 1 to entry: See Figure 53.