# INTERNATIONAL STANDARD ISO 5289

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# Endless hexagonal belts for agricultural machinery, and groove sections of corresponding pulleys

*Courroies hexagonales sans fin pour machines agricoles et profils de gorges des poulies correspondantes*

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## FOREWORD

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5289 was developed by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, and was circulated to the member bodies in September 1976.

It has been approved by the member bodies of the following countries :

| | | |
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| Austria | Italy | Sweden |
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The member body of the following country expressed disapproval of the document on technical grounds :

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# Endless hexagonal belts for agricultural machinery, and groove sections of corresponding pulleys



## 1 SCOPE AND FIELD OF APPLICATION

This International Standard lays down the main dimensions of endless hexagonal belts, generally intended for use on agricultural machinery (and, in particular, harvester-thresher machines), together with the groove sections of the corresponding fixed diameter pulleys.

## 2 REFERENCE

ISO/R 52, *Grooved pulleys for V-belts — Groove sections A, B, C, D, E.*

## 3 DIMENSIONAL SPECIFICATIONS

### 3.1 Belts

An endless hexagonal belt on an agricultural machine transmits a high degree of force per unit of section; when it approaches a groove pulley, its cross-section undergoes, as a result, appreciable deformation. For this reason, the various dimensions which are defined hereunder are to be taken as being those of the belt placed on the device used for the measurement of its length, and subjected to the measuring force $F$. The dimensions $W$ and $T$ are those relating to the parts of the belt when in contact with the measuring pulleys.

#### 3.1.1 *Cross-section* (see figure 1)

The theoretical profile of these belts is a hexagon consisting of two equal isosceles trapezia joined at their wider base; the neutral axis, coinciding in practice with the transverse diagonal of this hexagon, is located therefore at half the height of the section.

The dimensions of these belts are shown in table 1.

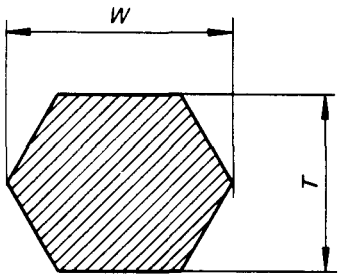


FIGURE 1 — **Cross-section of belt**

TABLE 1 — **Cross-section nominal dimensions**

Dimensions in millimetres

| Designation | Symbol | Profile | | | |
|---|---|---|---|---|---|
| | | HAA | HBB | HCC | HDD |
| Nominal width | $W$ | 13 | 17 | 22 | 32 |
| Nominal height | $T$ | 10 | 13 | 17 | 25 |

### 3.1.2 *Effective lengths of belts*

The range of effective lengths is that of the R 40 series of preferred numbers, from 1 250 mm to 10 000 mm (see table 2).

TABLE 2 – **Range of effective lengths of belts**

Values in millimetres

| Effective length | Tolerance | | Profile | | | |
|---|---|---|---|---|---|---|
| | $+p/2$ | $-p$ | HAA | HBB | HCC | HDD |
| 1 250 | 8 | 16 | + | | | |
| 1 320 | 9 | 18 | + | | | |
| 1 400 | 9 | 18 | + | | | |
| 1 500 | 9 | 18 | + | | | |
| 1 600 | 9 | 18 | + | | | |
| 1 700 | 11 | 22 | + | | | |
| 1 800 | 11 | 22 | + | | | |
| 1 900 | 11 | 22 | + | | | |
| 2 000 | 11 | 22 | + | + | | |
| 2 120 | 13 | 26 | + | + | | |
| 2 240 | 13 | 26 | + | + | + | |
| 2 360 | 13 | 26 | + | + | + | |
| 2 500 | 13 | 26 | + | + | + | |
| 2 650 | 15 | 30 | + | + | + | |
| 2 800 | 15 | 30 | + | + | + | |
| 3 000 | 15 | 30 | + | + | + | |
| 3 150 | 15 | 30 | + | + | | |
| 3 350 | 18 | 36 | + | + | + | |
| 3 550 | 18 | 36 | + | + | + | |
| 3 750 | 18 | 36 | | + | + | |
| 4 000 | 18 | 36 | | + | + | + |
| 4 250 | 22 | 44 | | + | + | + |
| 4 500 | 22 | 44 | | + | + | + |
| 4 750 | 22 | 44 | | + | + | + |
| 5 000 | 22 | 44 | | + | + | + |
| 5 300 | 26 | 52 | | | + | + |
| 5 600 | 26 | 52 | | | + | + |
| 6 000 | 26 | 52 | | | + | + |
| 6 300 | 26 | 52 | | | + | + |
| 6 700 | 32 | 64 | | | + | + |
| 7 100 | 32 | 64 | | | + | + |
| 7 500 | 32 | 64 | | | + | + |
| 8 000 | 32 | 64 | | | + | + |
| 8 500 | 39 | 78 | | | | + |
| 9 000 | 39 | 78 | | | | + |
| 9 500 | 39 | 78 | | | | + |
| 10 000 | 39 | 78 | | | | + |

NOTE – Reduced length tolerances can be used with the agreement of manufacturer and user.

### 3.1.3 *Tolerance on length*

The length of the belts is affected by the maximum admissible deviations of $+p/2$ and $-p$, where $p$ is calculated, with a certain amount of approximation, using the formula :

$$p = 0{,}8\sqrt[3]{L} + 0{,}006\,L$$

$L$ being the preferred number from the R 10 series equal to or immediately greater than the effective length, expressed in millimetres.

## 3.2 Pulleys

### 3.2.1 *Pulleys having parallel axes of rotation*

The hexagonal belts can be used with pulley profiles in accordance with ISO/R 52 for classical belt sections :

- section A grooved pulley for HAA belts;
- section B grooved pulley for HBB belts;
- section C grooved pulley for HCC belts;
- section D grooved pulley for HDD belts.

### 3.2.2 *Pulleys whose axes of rotation are not parallel*

In such cases, it is often necessary to increase the outside diameter of the pulley in relation to the effective diameter, and sometimes the angle of the groove in order to allow the belts to approach and leave the grooves without friction occurring with their edges.

It is not possible to determine any outline of groove which would suit all cases of transmission between shafts that are not parallel. However, certain national specifications define the geometrical characteristics that govern transmission between orthogonal shafts (known as quarter-turn drives) and particularly the special groove profile (known as "deep groove") to be used in this case.

# 4 MEASUREMENT OF LENGTH OF BELTS

## 4.1 Principle of measurement

The device recommended, shown in sketch form in figure 2, consists essentially of two grooved pulleys of similar functional dimensions, one of which is movable in the same plane as the belt by the measuring force $F$ (see table 3).

Rotate the belt to make at least two complete revolutions of the belt, then measure the distance $E$ between centres of the two pulleys.

### 4.2 Calculation of length

The effective length of the belt, i.e. the length measured at the level of its effective width $l_{eff}$, is obtained from the formula :

$$L_{eff} = 2E + C_{eff}$$

$C_{eff}$ indicating the effective circumference of the control pulleys (see table 3).

### 4.3 Groove section of measurement pulleys

Only the values of $l_{eff}$, of $C_{eff}$ and of the angle of the groove $\alpha$ are of importance; the depth $h$ in table 3 is given only for information.

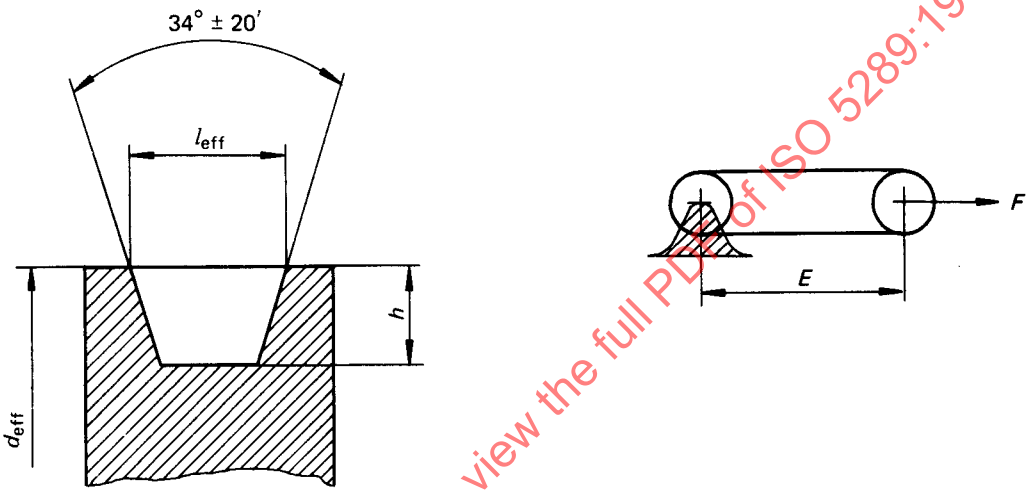


FIGURE 2 – **Measuring device**



TABLE 3 – **Characteristics of measuring pulleys and method of test**

| Designation | Symbol | Unit | Profile | | | |
|---|---|---|---|---|---|---|
| | | | HAA | HBB | HCC | HDD |
| Effective width | $l_{eff}$ | mm | 12,6 | 16,2 | 22,3 | 32,0 |
| Minimum groove depth (approximate expression : 0,6 $l_{eff}$) | $h$ | mm | 8 | 10 | 14 | 20 |
| Effective diameter | $d_{eff}$ | mm | 95,49 | 127,32 | 190,99 | 286,48 |
| Effective circumference | $C_{eff}$ | mm | 300 | 400 | 600 | 900 |
| Measuring force | $F$ | N | 200 | 300 | 750 | 1 400 |
| Groove angle | $\alpha$ | degree | 34 | 34 | 34 | 34 |

## 5 RELATION BETWEEN EFFECTIVE DIAMETER AND PITCH DIAMETER

See figure 3.

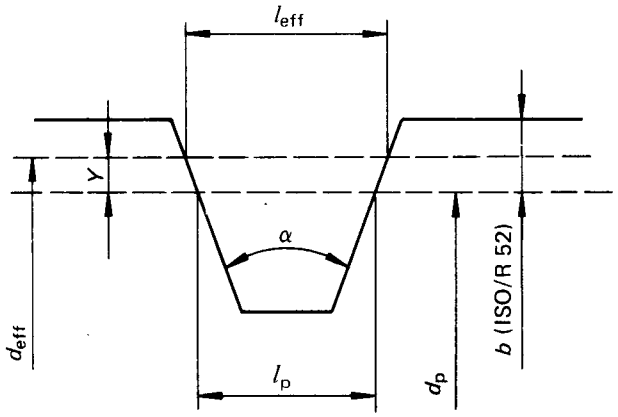


FIGURE 3 – **Pulley diameters**

The pitch diameter of V-belt pulleys, as defined in ISO/R 52, and the corresponding effective diameter when these pulleys are used with hexagonal belts are connected by the following formula :

$$d_{eff} = d\,p + 2\,Y$$

the values of factor $Y$ being as given by table 4.

TABLE 4 – **Values of factor** $Y$

Values in millimetres

| **Belt section** | **Groove angle** $\alpha$ | | |
|---|---|---|---|
| | 34° | 36° | 38° |
| A and HAA | 2,6 | | 2,3 |
| B and HBB | 3,6 | | 3,2 |
| C and HCC | | 5,1 | 4,8 |
| D and HDD | | 7,7 | 7,3 |