



Datum Diameters

A New Industry Standard

PA NOTE

During the mid to late 1980's major changes were made to many design materials, including our Heavy Duty Drive Design Manual (14995-A) and the Gates Design Flexibility Program. The changes reflect a new industry standard for classical V-belts and sheaves - a move from the "Pitch" System to the recently adopted "Datum" System.

The term "Datum" was first adopted by the International Standards Organization (ISO 1081-1980) and most recently by the Rubber Manufacturers Association Engineering Standard for Classical V-Belts and Sheaves (IP-20-1988). This datum system defines specific sheave and belt dimensions previously known as the pitch system for classical belts and sheaves. What were previously identified as pitch diameter or pitch length are now known as datum diameter or datum length. These are the new catalog identifiers which allow all belt and sheave manufacturers and users to use the same nomenclature.

The change to the datum system addresses some fundamental problems with the pitch system. The previous PD to OD [Pitch Diameter to Outside Diameter] values were based on the old multiple unit constructions, which have long since been replaced by the newer single unit constructions. The pitch line of these single unit construction belts was determined to ride closer to the outside diameter of the sheaves. The true pitch diameter and pitch length are not predetermined values, however, but change according to the belt dimensions and construction. It is very difficult to come up with PD to OD values which cover single and joined, wrapped and raw edge, new and old, and Gates and its competitors belts. The datum system dimensions, as outlined in the RMA standard, are a compromise of all belt types and belt manufacturers.

The new pitch diameter values are equal to the outside diameter of a standard (not deep groove or combination groove) sheave, since this is judged to be the best approximation of the pitch line location of most belt products manufactured. This will yield a sufficiently accurate speed ratio calculation for virtually all industrial drives. It is important to note that this change is for classical belts and sheaves only and does not affect the Super HC® line [Narrow Belts] which is based on the effective system.

Most V-belt users and drive designers need only to understand the concept of this new system. All of the calculations and necessary steps for proper drive analysis have been incorporated in Design Flexibility and the upcoming edition of the Heavy Duty Drive Design Manual. Although these two design tools will assist in most common drive analyses, there are those who deal with more unique drives and require a more comprehensive understanding of the datum system. The question then will arise, "When is the datum diameter used for calculations, and when is the pitch or outside diameter used?" Although all of the formulas have remained the same, different values must be used for some of the calculations as shown below.



GatesFacts™ Technical Information Library

Gates Compass™ Power Transmission CD-ROM version 1.2

The Gates Rubber Company
Denver, Colorado USA



To Calculate:	Previously Used:	Now Use:
Speed Ratio	Pitch Diameters	Pitch Diameters
Belt Speed	Pitch Diameters	Pitch Diameters
Horsepower Rating	Pitch Diameters	Pitch Diameters
Rim Speed	Outside Diameters	Outside Diameters
Center Distance	Pitch Diameter and Pitch Length	Datum Diameter and Datum Length
Belt Length (Datum)	Pitch Diameters	Datum Diameters
Center Distance Factor "h"	Pitch Diameters	Datum Diameters
Arc of Contact correction Factor "G"	Pitch or Outside Diameters	Datum, Pitch, or Outside Diameters
Span Length	Pitch or Outside Diameters	Datum, Pitch, or Outside Diameters

Figure 1 (attached) shows the position of the datum diameters in relation to the pitch and outside diameters. As you can see, the datum diameter is less than the pitch diameter. Table 1 shows how to get from datum to pitch or outside diameters. It is a good idea to post this attached page (Figure 1 and Table 1) for easy reference.

Although this system may seem a bit confusing at first, it is important to take the time to understand it as it will be used from now on for all classical V-belt drive designs.



DATUM SYSTEM

Relationship of DD – PD – OD

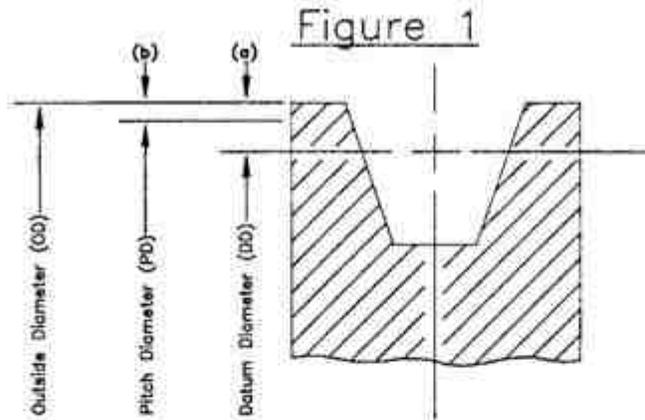


Table 1

<u>CROSS SECTION</u>	<u>DATUM DIAMETER RANGE</u>	<u>2(a) DD – OD</u>	<u>2(b) PD – OD</u>
A, AX	ALL	0.250	0
B, BX	ALL	0.350	0
A, AX (COMBO)	≤ 7.4	0.634	0.37
	> 7.4	0.602	0.37
B, BX (COMBO)	≤ 7.4	0.333	-0.01
	> 7.4	0.334	-0.01
C, CX	ALL	0.400	0
D	ALL	0.600	0

Formulas: $OD = DD + 2a$
 $PD = DD + 2a - 2b$

Example:

For an 'A' section belt in a Combination Sheave having a datum diameter of 10.6 inches:

Outside Diameter = $10.6 + 0.602 = 11.202$
 Pitch Diameter = $11.202 - 0.37 = 10.832$

Note: The datum system is used for classical v-belts and sheaves only.