

Iron: Combine low cost with good bearing qualities, widely used in automotive applications, toys, farm equipment, and machine tools. Powdered-iron is frequently blended with up to 10% copper for improved strength. These materials have a relatively low limiting value of PV (on the V side), but have high oil-volume capacity because of the high porosity. They have good resistance to wear, but should be used with hardened and ground steel shafts.

Leaded Iron: Provide improved speed capability, but are still low-cost bearing materials.

Aluminum: In some applications they provide cooler operation, greater tolerance for mis-alignment, lower weight and longer oil life than porous bronze or iron. The limiting PV value is 50000, the same as for porous bronze and porous iron.

2.2 Sizing Sintered Bearings

The load-carrying capacity of porous-metal bearings can be measured by a friction/wear criterion, which is a measure of the heat generated by the bearing. It is called the PV factor. The PV factor, as its name implies, is the product of the bearing load, P, expressed in pounds per square inch of projected bearing area, and the surface velocity of the shaft expressed in feet per minute.

If d = inside bearing diameter (in)

l = length of bearing (in)

F = bearing load (lbs)

and N = shaft speed (rpm), then:

$$P = \frac{F}{ld} \quad (\text{lbs/in}^2) \quad (14)$$

$$V = \frac{\pi dN}{12} \quad (\text{ft/min}) \quad (15)$$

and hence,
$$PV = \left(\frac{F}{ld}\right)\left(\frac{\pi dN}{12}\right) = \frac{\pi FN}{12l} = \frac{0.262 FN}{l} \quad (16)$$

Most engineering data relating to the PV factor lists an upper limit to the factor; i.e., a value which should not be exceeded for satisfactory bearing operation. The working value of the PV factor, however, is often less than this upper limit, such as in the case where the sliding velocity is not sufficiently high to maintain an adequate lubricating film. In addition, the PV limit is affected by the static load-carrying capacity of the material, which should not be exceeded. The latter is a function of environmental factors, bearing clearances, geometry and the nature of the load (continuous, intermittent or shock loading). Detailed information on these considerations is usually furnished by the metal manufacturer. General guidelines are summarized in **Table 2-1**.

2.3 Clearances

As in all bearings, satisfactory operation of porous-metal bearings require suitable clearances between shaft and housing. While guidelines depend on the materials used and the nature of the application, a representative chart showing recommended bearing clearances for porous-bronze and porous-iron bearings is given in **Figure 2-1**.

We carry a full line of both thick and thin wall bushings. Please consult the tables in this section of the handbook for information on recommended shaft size and bore diameter to be used with various bushing sizes.