Duraband® Maximum Watt Densities
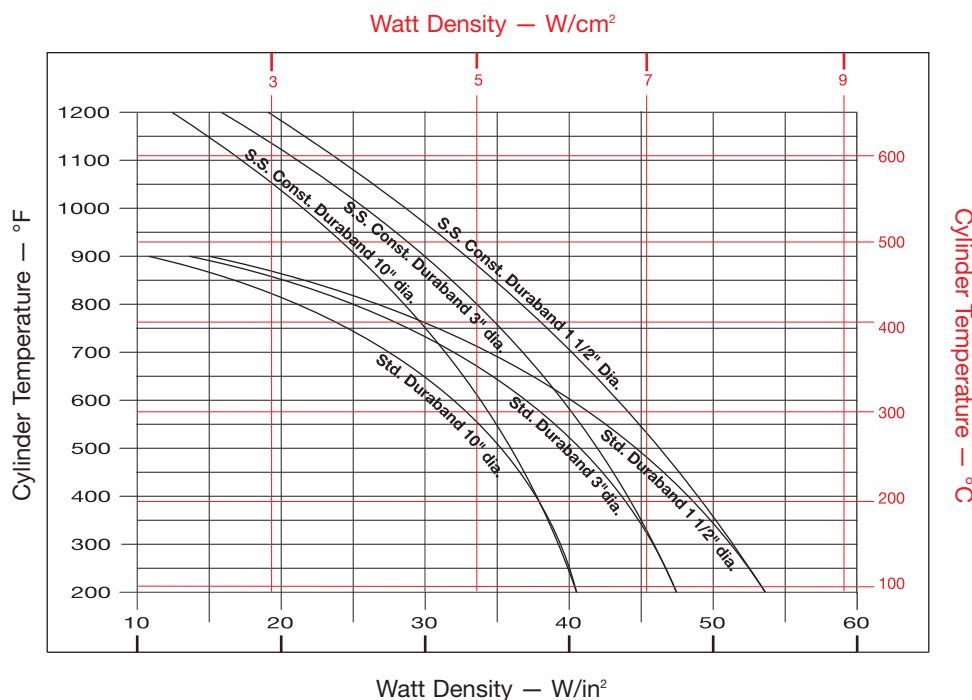
Watt Density — W/cm²

MAXIMUM ALLOWABLE WATT DENSITY

The chart displays the maximum Watt Density curves for various diameter heaters. Use this chart when determining the appropriate wattage value for your chosen heater.

Be aware that certain factors will require you to derate the watt density (W/in²) of your heater selection.

CAUTION Failure to adhere to the maximum allowable watt density per heater size will result in poor operating life.

CORRECTION FACTORS

For heaters wider than 3" (76.2 mm), reduce maximum recommended watt density from chart by 20%.

For applications using insulating shroud, reduce maximum recommended watt density from chart by 25%.

CALCULATING MAXIMUM WATT DENSITY

Factors to be taken into consideration

A. Type of controls

B. Voltage variations

C. Machine cycling rate

D. Type of resin being processed

E. Coefficient of thermal expansion and conductivity of the cylinder

F. Designing a heater that closely matches the wattage requirement will decrease the frequency of cycling and temperature overshoot, thereby increasing the life of the heater.

Once these factors have been established, proceed with the following steps:

1. Determine the maximum operating temperature.

2. Calculate the total wattage required to obtain the maximum operating temperature. (See engineering section.)

3. Determine the quantity and size of the heater bands to be used. 1-1/2" through 3" wide band heaters have proven to be the most efficient and reliable in most cylindrical heating applications.

4. Determine individual band heater wattage by dividing the total required wattage by the quantity of band heaters selected.

5. Determine the band heater watt density by subtracting unheated areas from the band heater diameter created by screw terminals, gaps, holes, and cutouts (see formula below).

6. Determine if the required watt density previously calculated exceeds the maximum recommended watt density. Note the maximum cylinder temperature required on the left-hand side of the graph, follow the horizontal line until it intersects with the line of the band heater being used, and read directly down to obtain the maximum recommended watt density (W/in²).

7. If the calculated watt density is higher than the recommended value, it must be corrected or it will cause poor heater life. This can be accomplished by using more band heaters, lowering the heater wattage, or using a different construction type or a different type of band heater.

8. Should you have a problem in selecting the proper band heater or establishing watt density for your application, consult with one of the qualified engineers at Tempco.

Nominal Unheated Areas

Construction Style	Unheated Area to Subtract
One-piece band	1" × width
Two-piece band	2" × width
Holes and cutouts	Size + 1/2" × width

Watt Density Formula

$$\text{Watt Density (W/in}^2) = \frac{\text{Wattage}}{(3.14 \times \text{(Band ID)} - \text{Gap-1-3/8}) \times \text{Band Width} - \text{Unheated Area (see table)}}$$

Unheated Area (See Table) = Unheated area for construction style + unheated area for any holes or cutouts