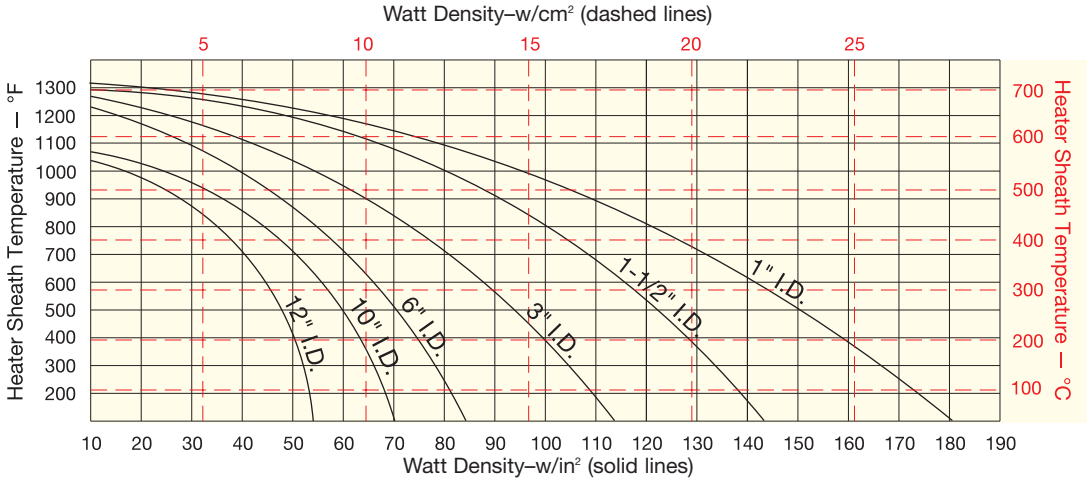
Mi-Plus® Maximum Watt Densities

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.



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.
3. Determine the quantity and size of the heater bands to be used. Due to clamping concerns, 2" through 3" wide band heaters have long 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's heated area by subtracting unheated (cold) areas created by screw terminals, gaps, holes, and cutouts.

Nominal Unheated Areas

Construction Style	Cold Area to Subtract
One-piece band	1" × width
One-piece expandable band	1½" × width
Two-piece band	2" × width

For each hole or cutout add to the cold area from the Table the (Hole size + ½") × heater width. This is total cold area to use in the following formula to calculate the heater watt density.

Watt Density Formula

$$\text{Watt Density } (W/in^2) = \frac{\text{Wattage}}{(3.14 \times \text{Band ID} \times \text{Band Width}) - (\text{Cold Area})}$$

6. Check in the above graph that the calculated watt density does not exceed the maximum recommended watt density. Locate 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 (watts/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 or lowering the heater wattage.
8. Should you have a problem in selecting the proper band heater or establishing watt density for your application, consult Tempco.

CORRECTION FACTORS

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

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

CAUTION Do not use insulating blankets if heater temperatures are above 1200°F (649°C). Failure to adhere will result in premature heater failure.