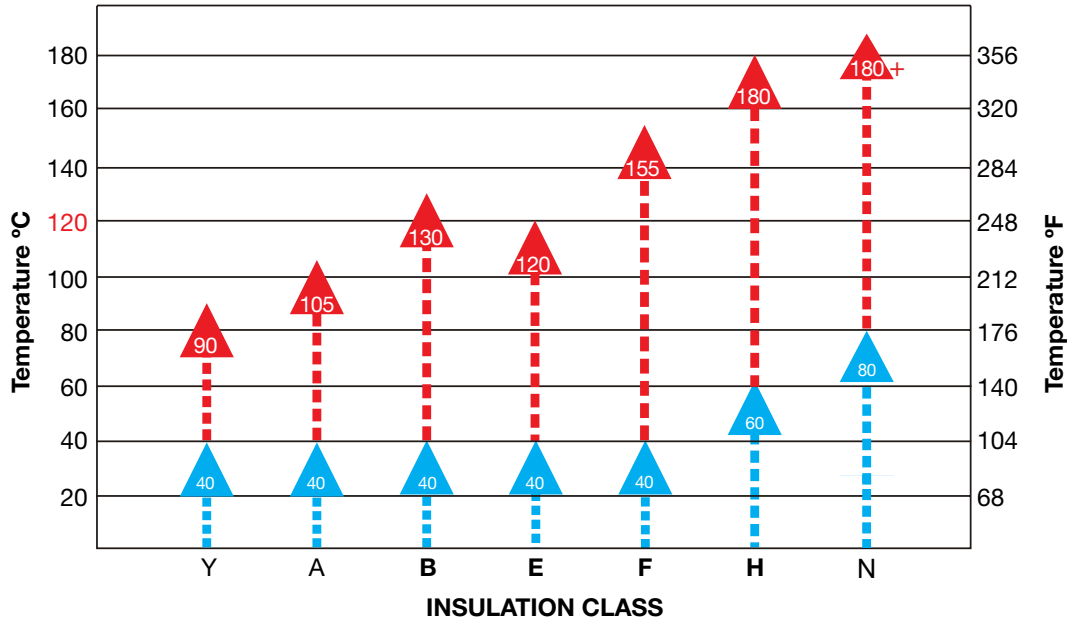


SUBMERSIBLE PUMP INSULATION CLASSES

The chart below shows the temperature ratings for insulation classes used for electric motors. Tsurumi typically utilizes, four of the below classes in their submersible pumps, classes B - H. The amount of temperature rise above ambient temperature is dictated by the motor compartment size, (cooling area). That is to say the higher the temperature rating of the insulation system, the smaller the motor compartment requirement. Temperature rises in the motor windings as soon as the motor is powered on. If the motor is operated at a higher winding temperature than the values shown below, motor service life will be reduced. As a rule of thumb a 10°C increase in the operating temperature above the max permissible motor temperature can cut the motor's insulation in half.



- = Maximum ambient temperature, water or air.
- = Maximum permissible motor temperature (limiting hottest - spot temperature, including service factor)

Continuous vs. Intermittent Operation:

Continuous duty also known as S1 duty is a motor operating under a constant load long enough to reach thermal equilibrium. This type of operation is for an application where the motor will start and run steadily for an extended period. Because the motor is on for extended periods, it is not afforded the opportunity to cool. It is then important to apply the proper insulation class to maintain the motor's life.

Alternatively, intermittent or short duty is a motor operating under a constant load for a 30 minute period followed by a rest period of 30 minutes. This rest period allows for the motor to cool while off. Motors operating in this start-rest-stop application may not require the insulation class that a similar continuous duty application.

High Temperature Effects:

High temperatures may have an adverse to the pump even if the proper insulation class is applied to the motor. A number of elastomer parts critical to pump operation such as o-rings, gaskets, and seals have temperature ratings that must be considered. In these high temperature applications, please contact Tsurumi for assistance.