Water Cooled Cables

Sizing Instructions

Sizing a water cooled cable:

When sizing a water cooled cable you should consider the available water flow, the allowable power loss, and the allowable voltage drop.

1. As a starting point, divide the current by 4.7. This yields an MCM size which corresponds with a current density of 6000 amps per square inch. This is a reasonable current density for a typical application. Example...10,000 A / 4.7 = 2127 MCM

2. Next check the power loss and water flow rate using the attached graphs. First use the LENGTH VS RESISTANCE graph to find the resistance of the cable. Next use the KW LOSS VS RESISTANCE graph to find the power loss.

3. For a water temperature rise of 30 degrees F, 2 GPM will adsorb 8.8 KW, 5 GPM will adsorb 22 KW, and 8 GPM will adsorb 35 KW. These flow rates are marked on the KW LOSS VS RESISTANCE graph. 2 GPM is appropriate for cables up to 1000 MCM with 1/4" or 3/8" ports. 5 GPM is appropriate for cables from 1000 MCM to 2000 MCM with 1/2" ports. 8 GPM is appropriate for 3000 MCM cables and larger with 3/4" or 1" ports.

4. For DC systems the voltage drop can be calculated as the product of the current and the resistance. For AC systems the voltage drop calculations are complicated by skin effect and reactance. In this case we suggest you consult with our engineers.

5. After determining the voltage drop and power loss you may find that your initial estimate (which was based on 6000 amps per square inch) can be changed. Use higher current densities with caution. This can cause maintenance problems. At high current densities a very short interruption in water flow can cause the cable to fail. Cables which operate at lower current densities are generally more trouble free. As in all engineering calculations it is advisable to include a safety margin. This safety margin is to allow for wire deterioration, unexpected overloads, heating due to loose joints, irregular water flow, and so on. We suggest a 100% margin (double your water flow).

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