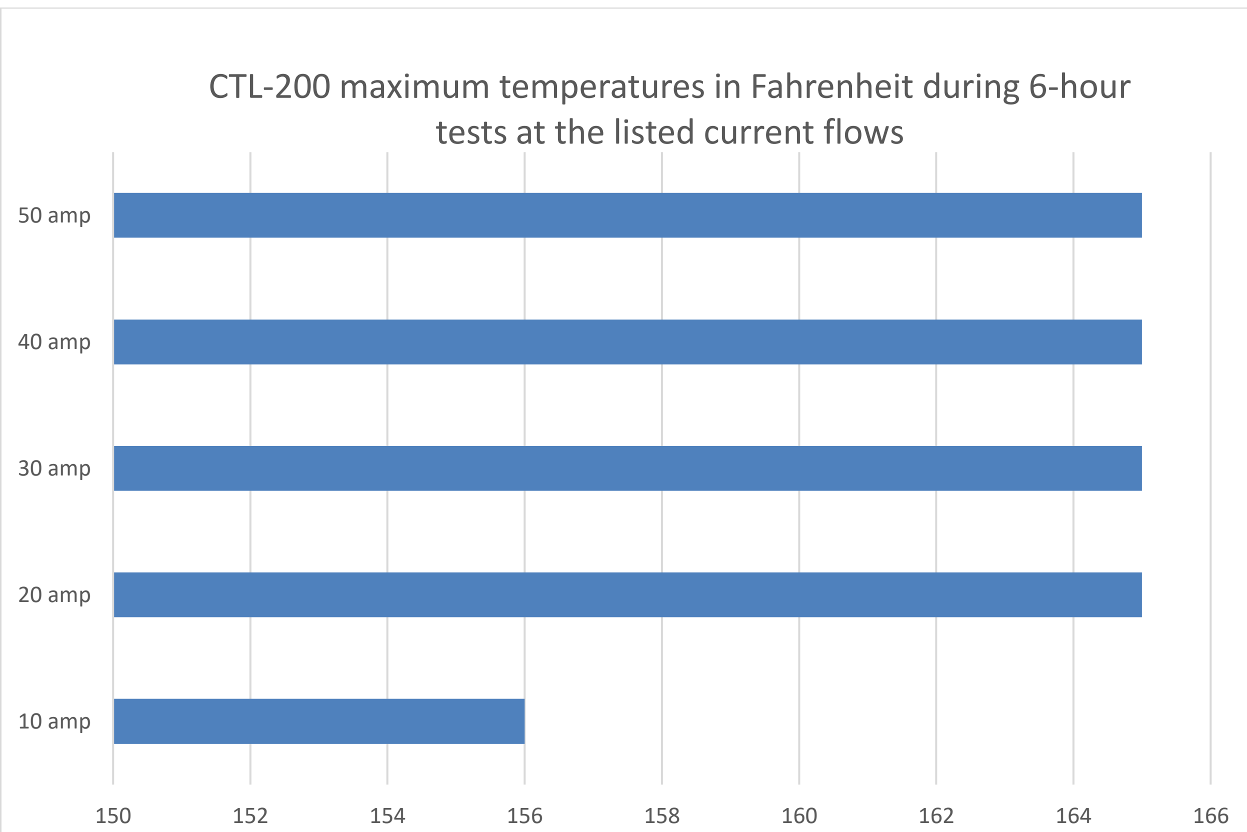
Comparing the CTL-200 recombiner's temperature control capability to others' products.

The following graph shows the maximum temperature that was measured on the Philadelphia Scientific CTL-200 battery gas recombiner during each 6-hour test at the listed current flow. As can be seen, no matter how much current was going through the cell, at no time does the temperature ever go above 165 degrees F (73.8C).

This is due to the design of the self-limiting catalytic core which is responsible for how much gas is allowed to contact the catalyst material, which determines how much heat will be generated during recombination. This control prevents the plastics from exceeding their temperature limits during any unexpected overcharge. In addition, the engineered plastic utilized in the CTL-200 has the highest temperature resistance on the market and is patent pending. This is done to ensure that the product and battery are safe under all conditions. Not all designs have this precise control, or utilize extremely high temperature plastics, and some can deform or melt during an overcharge event, as is explained on page 2.

An unexpected overcharge can be caused by several things, such as a thermal runaway event, or the failure of the controls of the charging source which allows the string voltage to become severely elevated, or the cell temperatures become severely elevated due to an elevated ambient without a reduction in the charging voltage, or by some other abnormal condition.



The following graph shows the comparison between the CTL-200 (on the left side) and two other manufacturers' recombiners during their 30-amp tests. As shown in the previous graph, the CTL-200 beginning in the 20-amp test, stopped increasing its temperature, and continued to control that temperature throughout each increase in current all the way up through the 50-amp test. This demonstrates that no matter how much excess current is going through the cells and generating any amount of excess gas that the CTL-200 will remain stable.

Mfg. 2 and Mfg. 3 do not have that same level of control and when we increased the current flow from the initial test which was at 10 amps, then to 20 amps, and ending with the 30-amp test, their units continued to increase in temperature with each increase in current. With those units, each increase in current created additional gases, which were allowed to contact the catalyst material, which during the recombination process generated additional heat. Eventually this continuing heat generation reached the melting point of their respective plastics.

During both Mfg. 2 and Mfg. 3's 30-amp tests, their units physically failed. With one unit the outer housing melted open, and with the other the catalyst core melted its support structure, and the catalyst core ended up setting down on the bottom of the unit surrounded by melted plastic, which after cooling became a solid, which if left in the cell would have prevented passage of any gas, which would increase the pressure within the cell.

With either of those two units, their inability to limit how much gas is allowed to reach the catalyst material makes them a more at risk, or less desirable product.