

## APPENDIX 3 — HEATWORK

Heatwork is the measurement of the effects of time and temperature. In Ceramics, this measurement is gauged through the use of Pyrometric Cones. They are composed of materials which are carefully measured and compressed into the shape of a tetrahedron. The cones are placed in the kiln on a shelf with your ware and, when they have received the proper amount of heatwork, they bend over indicating that it is time to turn off the kiln.

Pyrometric Cones come in a variety of shapes and sizes. Each size and shape has a different temperature chart associated with it. The chart below is based on a Large Self-Supporting Cone and has become the standard for commercial clay bodies, glazes and controller software.

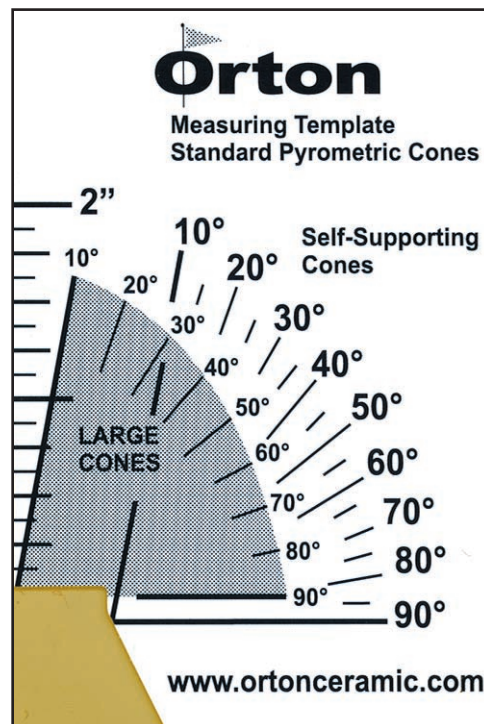
All clay bodies and glazes are designed to fire to a certain cone value. In a KilnMaster Kiln the computer calculates the heatwork and shuts the kiln off at the proper heat and time combination. This is called Cone Correlation. ConeFire Mode programs all are controlled by Cone Correlation, Ramp and Hold Programs are not

Skutt Kilns are designed to fire a range of cone values from 022 to 10. As you can see by the chart below, the temperature associated with each cone value gradually increases from 022 to 10. It is very important not to forget to add the leading zero when entering a cone value (if it is required) or the kiln will fire much hotter than you want it to.

Cone No.	°F	°C
022	1087	586
021	1112	600
020	1159	626
019	1252	678
018	1319	715
017	1360	738
016	1422	772
015	1456	791
014	1485	807
013	1539	837
012	1582	861
011	1607	875
010	1657	903
09	1688	920
08	1728	942
07	1789	976
06	1828	998
051/2	1859	1015
05	1888	1031
04	1945	1063
03	1987	1086
02	2016	1102
01	2046	1119
1	2079	1137
2	2088	1142
3	2106	1152
4	2124	1162
5	2167	1186
51/2	2197	1203
6	2232	1222
7	2262	1239
8	2280	1249
9	2300	1260
10	2345	1285

Remember that heatwork is the combination of time and temperature. This is most important during the last 200 °F of the firing. If the kiln is firing very slow during this period, the controller will automatically adjust the temperature down to ensure the ware does not receive too much heatwork. The cone values listed in the chart are only valid if the kiln is firing at exactly 108 °F/hr. during the last 200 °F of the firing. That is why it is very important to know the capabilities of your kiln when writing Ramp Hold Programs or entering Hold times.

We recommend that you still use Self Supporting Witness cones on every firing to monitor the accuracy of your kiln. Place the appropriate cone on a shelf approximately 2 inches from the kiln wall and two inches from the tip of the thermocouple. Make sure the space between the thermocouple and cone is unobstructed.



The Cone Measuring Template shown here can be used to determine the exact bend measured in degrees of angle. A perfect bend is considered to be at 90 degrees.

Remember that cones can vary slightly and are meant to be a general indicator of the heatwork within the kiln. Bends between 20 degrees and the tip of the cone just above the shelf are acceptable for most projects. If you find your bends are consistently low or high you can usually fine tune the heatwork by adjusting Hold times.

