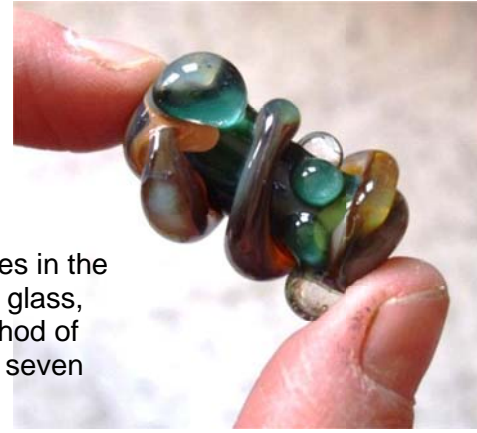


Lampworking Annealing Schedules – for COE 90, 96, and 104

Introduction (Skip to page 2 to view and print the schedules)

Lampworking, a technique of creating glass beads (and other glass objects) in the flame of a torch, introduces stresses in the glass that must be released through *annealing* if your bead is to be strong. Annealing is a process that gradually cools glass, resting it at several temperature points along the way while bringing it slowly down to room temperature. The best method of annealing is with a digitally-controlled kiln designed specifically for beadmaking. Annealing beads typically takes six to seven hours from the moment you put your last bead in the kiln until you can take your beads out of the kiln.



For those interested in physics, I recommend researching the annealing process to understand what each of those rest points means. For most of us, it's enough to know that every type of glass, as represented by its COE (Coefficient of Expansion) number, requires a different annealing schedule, and the lampworker must program the correct schedule into the kiln's controller.

The schedules on the following page are my personal schedules, developed over time through experience. You'll probably find slightly different schedules on different websites, as each glass worker tends to tweak their schedules according to what works best with their kiln, and glass manufacturers occasionally publish new recommendations. These schedules work for me, and I hope they will work for you. To use them, first find the glass type – COE 90, 96, or 104 – that you are making beads with, and select the schedule for Fahrenheit (yellow) or Celsius (blue). Two programs are available in each set: Rd, and Rm.

Rd should be used for kilns that refer to rate as the number of degrees the temperature in the kiln's chamber should change in one hour. Rm should be used for kilns that refer to Rate as the number of minutes the kiln should spend reaching a target temperature. If a kiln should heat to 500 degrees in 2 hours, Rd would be 250, but Rm would be 120. The results would be the same, but obviously you must know what kind of kiln you have before selecting a schedule.

The first step of each schedule is your work time, and so is quite lengthy. When you finish your lampworking session, there is no need to continue step 1: After shutting down your torch, manually SKIP your kiln to step 2 to begin the annealing process. The last step of each schedule is END, which shuts off your kiln. FULL refers to programming the kiln to change temperature as quickly as possible. Refer to your kiln's instructions on how to manually SKIP and how to program the FULL and END commands.

In my schedules, T = Target Temperature and H = Time, where the first value is hours, and the second is minutes. (80 minutes would be written H1.20.) If your kiln programs time only according to the number of minutes, you must change the schedule to reflect this (ie 1 hour = H60).



For information about how to make beads, how to sculpt hot glass, how to batch anneal, how to set up a lampworking studio, and much more, I'm pleased to refer you to my book, ***The Glass Artist's Studio Handbook***, published by Quarry Books/Rockport Publishers (June 2011).

Sincerely,
Cecilia Cohen
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Bead Annealing Schedules

90 COE Glass - Bullseye

| Schedule for working in Fahrenheit (F°) | | | Schedule for working in Celsius (C°) | |
|---|----------------------|----------------------|--------------------------------------|----------------------|
| Step | Rd Program | Rm Program | Rd Program | Rm Program |
| 1 | FULL - T961 - H7.00 | FULL - T961 - H7.00 | FULL - T516 - H7.00 | FULL - T516 - H7.00 |
| 2 | FULL - T961 - H1.00 | FULL - T961 - H1.00 | FULL - T516 - H1.00 | FULL - T516 - H1.00 |
| 3 | Rd150 - T500 - H0.10 | Rm180 - T500 - H0.10 | Rd100 - T260 - H0.10 | Rm180 - T260 - H0.10 |
| 4 | FULL - T165 - H0.01 | FULL - T165 - H0.01 | FULL - T75 - H0.01 | FULL - T75 - H0.01 |
| 5 | End | End | End | End |

96 COE Glass - Spectrum

| Schedule for working in Fahrenheit (F°) | | | Schedule for working in Celsius (C°) | |
|---|----------------------|---------------------|--------------------------------------|---------------------|
| Step | Rd Program | Rm Program | Rd Program | Rm Program |
| 1 | FULL - T950 - H7.00 | FULL - T950 - H7.00 | FULL - T510 - H7.00 | FULL - T510 - H7.00 |
| 2 | FULL - T950 - H0.30 | FULL - T950 - H0.30 | FULL - T510 - H0.30 | FULL - T510 - H0.30 |
| 3 | Rd160 - T830 - H0.10 | Rm45 - T830 - H0.10 | Rd100 - T443 - H0.10 | Rm45 - T443 - H0.10 |
| 4 | Rd120 - T799 - H0.10 | Rm15 - T799 - H0.10 | Rd100 - T426 - H0.10 | Rm15 - T426 - H0.10 |
| 5 | Rd80 - T599 - H0.01 | Rm75 - T599 - H0.01 | Rd100 - T315 - H0.01 | Rm75 - T315 - H0.01 |
| 6 | FULL - T165 - H0.01 | FULL - T165 - H0.01 | FULL - T75 - H0.01 | FULL - T75 - H0.01 |
| 7 | End | End | End | End |

104 COE Glass - Effetre (Moretti)

| Schedule for working in Fahrenheit (F°) | | | Schedule for working in Celsius (C°) | |
|---|----------------------|---------------------|--------------------------------------|---------------------|
| Step | Rd Program | Rm Program | Rd Program | Rm Program |
| 1 | FULL - T968 - H7.00 | FULL - T968 - H7.00 | FULL - T520 - H7.00 | FULL - T520 - H7.00 |
| 2 | FULL - T968 - H1.00 | FULL - T968 - H1.00 | FULL - T520 - H1.00 | FULL - T520 - H1.00 |
| 3 | Rd440 - T848 - H.030 | Rm15 - T848 - H0.30 | Rd120 - T453 - H0.30 | Rm15 - T453 - H0.30 |
| 4 | FULL - T780 - H0.30 | FULL - T780 - H0.30 | FULL - T421 - H0.30 | FULL - T421 - H0.30 |
| 5 | FULL - T644 - H0.30 | FULL - T644 - H0.30 | FULL - T340 - H0.30 | FULL - T340 - H0.30 |
| 8 | FULL - T165 - H0.01 | FULL - T165 - H0.01 | FULL - T75 - H0.01 | FULL - T75 - H0.01 |
| 9 | End | End | End | End |

