PROCEDURE FOR ANNEALING QUADRANT'S ENGINEERING PLASTIC PRODUCTS'

Quadrant Engineering Plastic Products' stock shapes are annealed using a proprietary stress-relieving cycle to minimise any internal stresses, which may result from the manufacturing process. This assures optimum dimensional stability during and after machining. However, as stated earlier, when machining parts that have to meet stringent requirements with respect to dimensional stability (tolerances, distortion, warpage, ...) and / or when machining causes asymmetric and / or heavy section changes, it generally proves advantageous to apply an intermediate annealing procedure after pre-machining (*) and prior to final machining of the parts.

Annealing can be done in an air or preferably a nitrogen circulating oven, as well as in an oil bath (depending on the temperature to be applied, paraffin-oil or the more temperature resistant and more expensive silicone-oil can also be used). When carried out on natural coloured material in an air circulating oven at temperatures over 100 °C, a more (particularly with nylon) or less pronounced colour change of the outer surface is to be expected (oxidation of a thin surface-layer that most of the time is removed during further machining operations).

(*): this does not apply to turning, milling or drilling pre-machining operations only. Also annealing small rectangular blocks or thin disks immediately after being cut from plate or rod (before any other machining operation starts) can improve dimensional stability during and after machining considerably.

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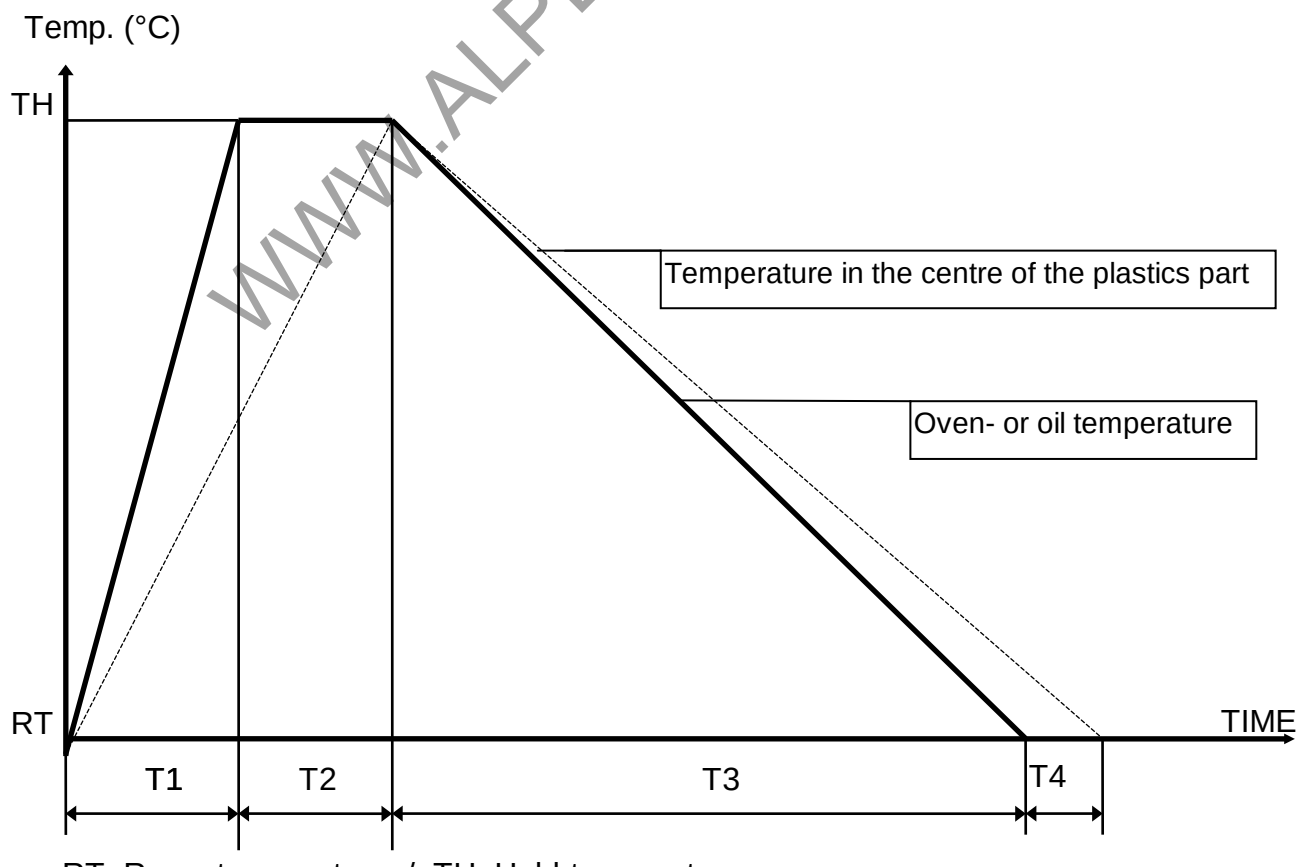
Recommended annealing procedure:



RT: Room temperature / TH: Hold-temperature

General Purpose Plastic Products	*Advanced Engineering Plastic Products*
ERTALON / NYLATRON: 150°C	DURATRON CU60 PBI: see below
ERTALON 66-GF30: 170°C	DURATRON PAI: see below
ERTACETAL C and H: 150°C	KETRON PEEK: 250°C
ERTALYTE and ERTALYTE TX: 155°C	TECHTRON HPV PPS: 200°C
PC 1000: 130°C	PPSU 1000, DURATRON PEI U1000: 200°C
TIVAR: 80°C	PSU 1000: 170°C
	SYMALIT PVDF 1000: 140°C
	FLUOROSINT / SEMITRON ESd 500: 250°C
	SEMITRON ESd 225: 150°C
	SEMITRON ESd 410: 200°C

T1 : time required to heat the oven or the oil bath ; heating rate: 10 - 20°C per hour.
T2 : additional time required to establish the set hold-temperature in the centre of the plastics part (depends on the wall thickness: 10 minutes per mm part thickness).
T3 : time required to cool the oven or the oil bath down to room temperature ; cooling rate: 5 - 10°C per hour.
T4 : additional time required to establish normal room temperature also in the centre of the plastics part (depends on the wall thickness: 3 minutes per mm part thickness).

General remarks:

- When pre-machining, enough oversize should be left to allow the part still to be finish machined (at least 3% on diameters and lengths on circular parts). Therefore, always test the annealing procedure on one or a few parts to ensure adequate material is allowed for dimensional changes due to this heat treatment.
- In order to minimise distortion, it might be necessary to fixture parts during the total annealing cycle (particularly parts machined from plate resulting into asymmetric and / or heavy section changes).
- For uniform heating and cooling, and consequently to avoid stress build up in the plastics material, it is of the utmost importance that annealing temperatures are within +/- 3°C all over the oven or oil bath at all times.
- If the oven or oil bath can not be heated up or cooled down at the recommended rates, we recommend changing the temperature setting manually every hour.

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