

EXTRUSION PROCESS GUIDE

a) EXTRUDER BARREL

Standard screw machines are suitable for Gharda PEK processing provided that they can operate consistently at the required processing temperatures. Standard screws (three-zone screw) with a length between 18 and 24 D are normally suitable. The barrel should have a smooth bore. Grooved feed sections are not recommended. As Gharda PAEK polymers higher melt temperatures compared to most conventional polymers, a longer feed section is desirable to allow sufficient residence time in this section of the screw for the pellets to approach the melt point. We recommend suitably corrosion- and abrasion resistant steels and bimetals. If traditionally nitrided parts are used, make sure that the Gharda PEK polymer melt does not cool on the surface and solidify on the nitride layer. The adhesion can be so strong that cracks will form and the nitride layer can peel off from the steel core.



b) DRYING

Gharda G-PAEK polymer having moisture of less than 0.25 wt. %. We however recommend additional drying in order to obtain qualitatively high-grade final products.

Drying temperature	150–160 °C
Drying time	2–3 hours in the dry-air dryer or vacuum furnace
Hopper	Heated or thermally insulated
Max. residual moisture:	< 0.02%

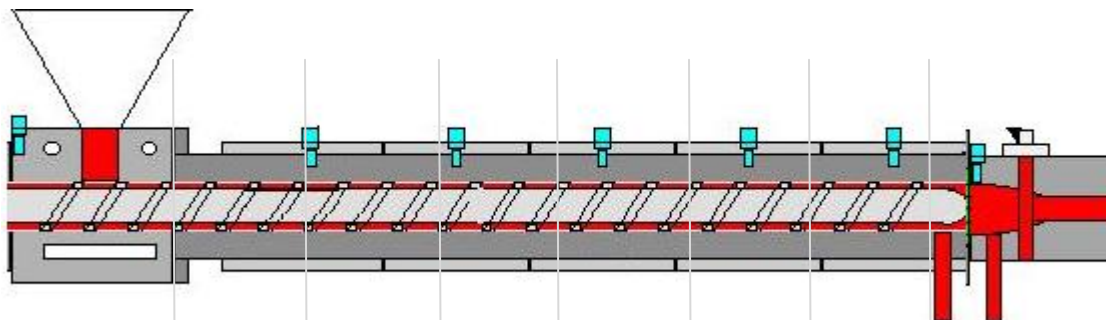
c) SCREW DESIGN

As mentioned in below Figure 1, a feeding zone of at least 50% of total length (L) of the screw is a good basis. A gradual transition from the feed section to the metering section is preferred, shorter compression sections may work but a compression section of 25% of total length of the screw is better. Compression ratios of 2 to 3 will cover most extrusion process situations. Metering lengths is also 25% of total length (L) of the screw. It is possible to use gentle mixing devices in the metering section if it is felt necessary. The screw tips should be rounded or conical shaped to avoid dead zones forming at the end of the screw.



d) PROCESSING TEMPERATURES

The most favorable processing temperatures of Gharda PEK polymer depend on various factors, such as the viscosity of the compound and the technical parameters of the extrusion machine. The material can be heated in the hopper to improve the melting characteristics of the granules. The recommended temperatures recline in the range 140 °C–180 °C. If it is not possible to heat the hopper, the granules can be fed warm. The temperatures of the feed zone must be chosen on the basis of the viscosity and filler of the material. The first heating zone should be heated to about 350 °C–360 °C. Conventional extrusion exhibits a temperature profile similar to the following:



TYPICAL PROCESSING TEMPERATURE FOR GHARDA PEK POLYMER

Feed Zone	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Die
140-160°C	360	370	375	375	380	385	385

CLEANING

Remove other polymers completely from the extruder barrel before processing Gharda PEK polymer. This can be accomplished either by cleaning the cylinder and screw mechanically or by using suitable cleaning materials. These are materials that are thermally stable up to approximately 380 °C. Suitable materials include PES, PEI and, with limitations, high-viscosity HDPE. Since HDPE decomposes at these temperatures, effective ventilation is important.

CLEANING EASY SIX STEPS:

- 1) Remove the polymer material from the hopper.
- 2) Run the screw empty.
- 3) Feed in the cleaning material mention above and continue extruding until there is no longer any visible trace of the PEK polymer.
- 4) Reduce the cylinder temperatures to a lower value that is still acceptable for PEK (370 °C) and, if necessary, reduce further to the temperatures of the cleaning agent.
- 5) Continue to purge with the purging material until the typical temperatures of the cleaning material have been attained.
- 6) If required purge with another material that can be easily removed from the metal before mechanical cleaning.