

INNOKETONE® PK Injection Molding Guide

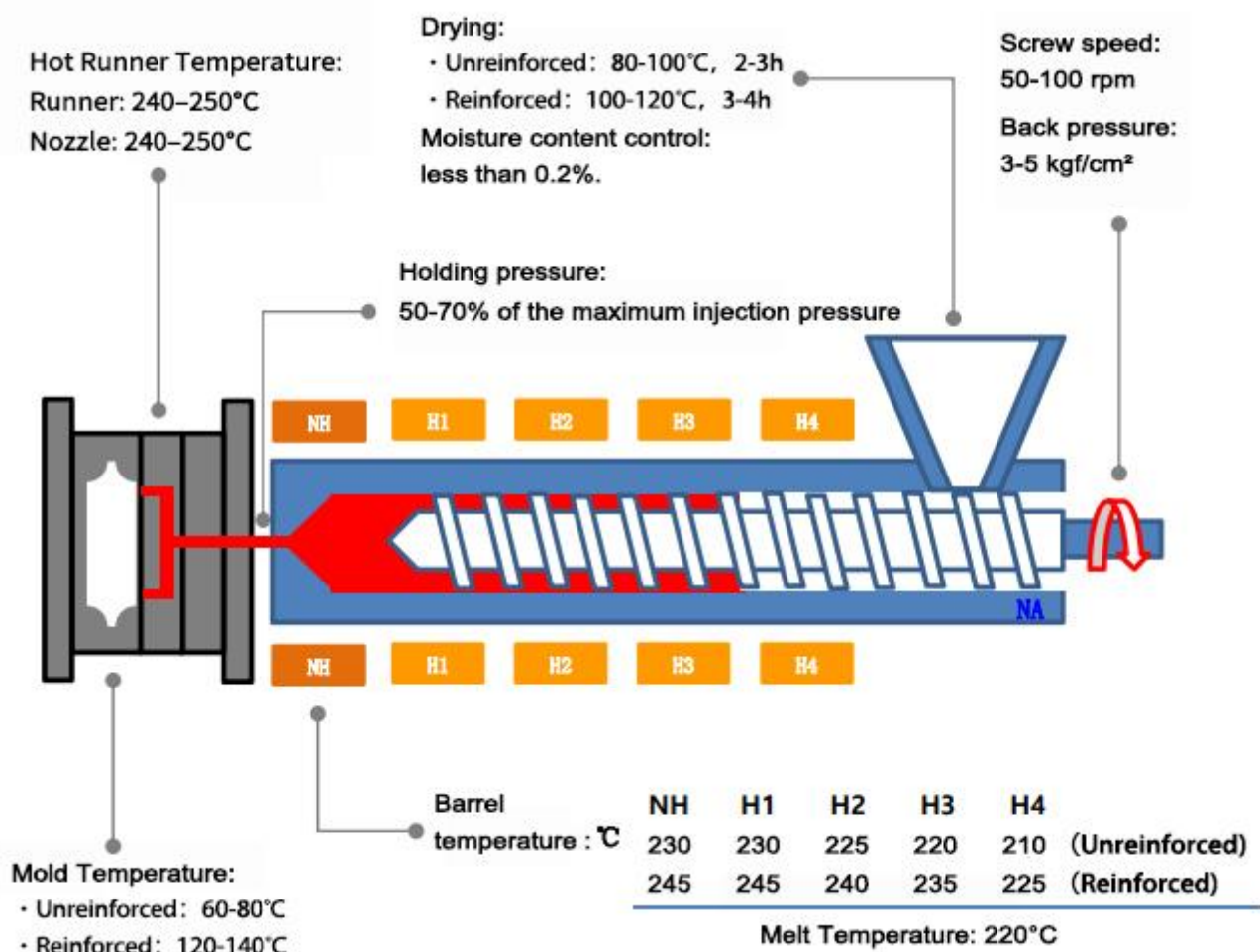
1、INNOKETONE® PK Pre-drying:

INNOKETONE® PK is a low-hygroscopic engineering plastic. Under standard conditions (23°C, 50% RH), its equilibrium moisture absorption is **0.5%**, and the recommended processing moisture content should be **< 0.2%**.

Recommended Drying Parameters: ① **Unreinforced: 80-100 °C, 2-3h;**

② **Reinforced: 100-120 °C, 3-4h.**

2、General Processing Parameters:



Characteristic differences of INNOKETONE® PK material versus traditional engineering plastics:

(1) Shear-sensitive properties

INNOKETONE® PK is a shear-sensitive material that demonstrates increased flowability with higher shear intensity, while temperature has limited effect on improving its flow characteristics;

Optimum processing temperature range: 240°C (465°F) to 250°C (482°F). Considering

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shear heating during processing, the actual melt temperature can be maintained **between 230-245 °C**. Generally, increasing temperature settings is not recommended as a method to enhance INNOKETONE® PK's flow characteristics. (Note: Nozzle temperature may vary depending on the injection molding machine manufacturer, nozzle type, and nozzle heater configuration. In general, the nozzle temperature is recommended to be set toward the upper limit of the processing temperature range to reduce shear and minimize the risk of material degradation caused by excessive shearing.)

(2) Thermal Reactivity

INNOKETONE® PK contains abundant reactive carbonyl groups on its molecular chains. Under thermal exposure, these carbonyl groups can undergo cross-linking reactions with adjacent molecular chains, leading to **gelation or carbonization**. In processing INNOKETONE® PK, strict temperature control must be maintained (optimal melt temperature range: 230 - 245 °C), while simultaneously minimizing the material's residence time in processing equipment.

(3) Rapid Crystallization Characteristics

INNOKETONE® PK is a semi-crystalline engineering plastic with a crystallization rate 50% faster than conventional engineering plastics. This rapid crystallization enables shorter molding cycle times in production, but may lead to nozzle clogging.

INNOKETONE® PK exhibits excellent flowability, enabling the production of complex, thin-walled components. However, during processing, special attention must be paid to its shear-sensitive behavior, thermal reactivity, and rapid crystallization characteristics to prevent injection molding defects.

3、Injection Molding Shutdown Procedure Guide

Shutdown

Duration

≤ 10min

- ① Purge all residual molten material from the barrel (excluding unmelted pellets in the feed throat).
- ② Shut down the machine directly without temperature adjustment.
- ③ Before resuming production, perform several purging shots with INNOKETONE® PK pellets.

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Shutdown Duration 10min~2h	①Purge all residual molten material from the barrel (excluding unmelted pellets in the feed throat).
	②Reduce heating temperatures for barrel/hot runner by 20-40°C (to 180-200°C).
	③Shut down the machine.
	④Before resuming production: restore original temperature settings, perform several purging shots with INNOKETONE® PK pellets, then begin normal production.

Shutdown Duration 2h~12h	①Purge all residual molten material from the barrel (excluding unmelted pellets in the feed throat).
	②Reduce barrel/hot runner temperatures to 170 °C – 180 °C;
	③Shut down the machine.
	④Before resuming production, restore original temperature settings and perform several purging shots with INNOKETONE® PK pellets prior to normal operation.

Shutdown Duration > 12h	①Purge all residual molten material from the barrel (excluding unmelted pellets in the feed throat).
	②Purge unmelted INNOKETONE® PK pellets from the feed throat;
	③With temperatures maintained, thoroughly purge the barrel using PP, PE, or PETG.
	④Shut down the machine.
	⑤Before resuming production, perform several purging shots with INNOKETONE® PK pellets.

4、Screw Selection

(1) Screw Type: **When selecting an injection screw**, the primary consideration is whether material stagnation zones exist. As shown in the diagram, the flights of **Screw #1** do not extend to the check valve position, making the transition zone prone to material accumulation. Therefore, **Screw #1** is unsuitable for processing PK material and **Screw #2** should be selected instead.

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INNOKETONE® PK can be processed using standard screws. For optimal results, the following screw configuration is recommended:

L/D ratio: 18:1 to 22:1 Compression ratio: 2:1 to 3:1

(2) Screw Diameter: The optimal melt residence time (MRT) is ≤ 6 minutes, and it is recommended to use more than 50% of the maximum shot size. The melt residence time should not exceed 10 minutes. The following formula can be used to estimate the melt residence time:

$$\text{MRT} = \frac{\pi D^3 \rho}{m} * \frac{t}{60}$$

MRT = Melt residence time [minutes]

D = Screw diameter [cm]

ρ = Melt density [g/cm³]

m = Shot weight [g]

t = Injection molding cycle time [s]

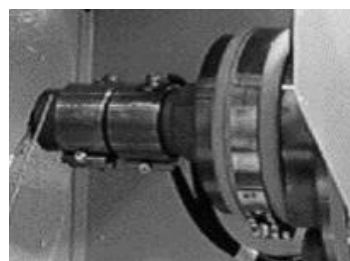
* **Note:** The hot runner volume is not included in the above calculation. If a hot runner system is used, please add the hot runner volume to the calculation.

5、 Nozzle Design for Injection Molding Machines

The nozzle should ideally adopt a **fully enclosed** heating structure to prevent clogging, and **properly arrange the thermocouples** to prevent localized overheating.

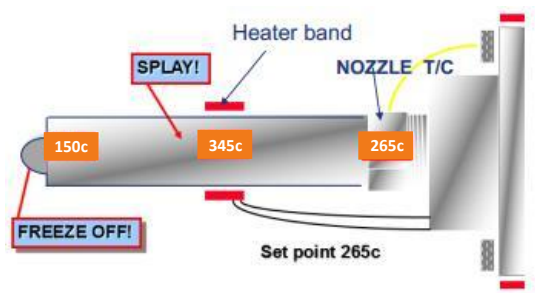


Partially enclosed heating

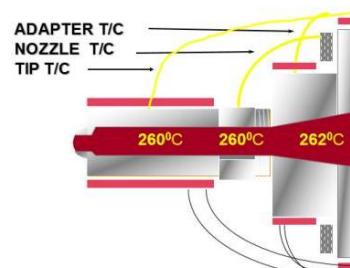


Fully enclosed heating

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Improper thermocouple arrangement



Proper thermocouple arrangement

A conventional **open-flow nozzle** is recommended. It is strongly recommended to use a heater with sufficient capacity and a dedicated thermocouple to precisely control the nozzle temperature, preventing material solidification at the nozzle due to a **small nozzle orifice** or the **rapid crystallization of PK**.

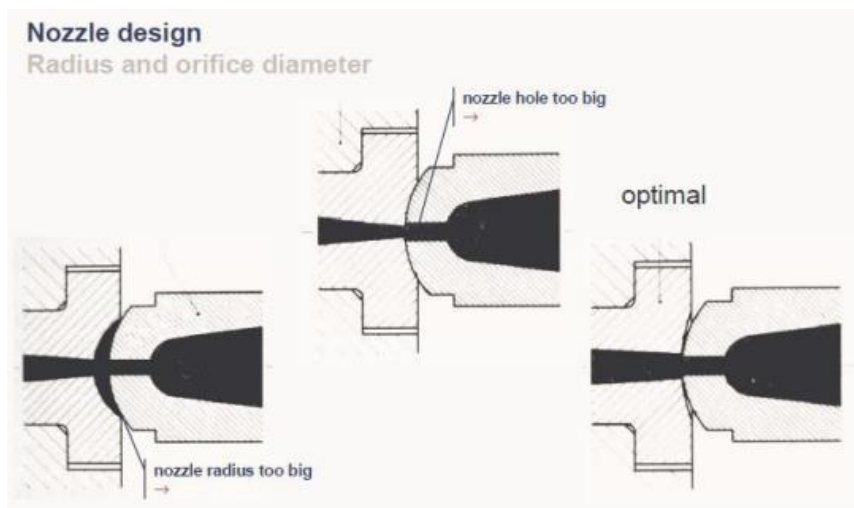
The recommended processing temperature for this material, as specified in the TDS, is **200–240°C**. For the plasticizing temperature, since nozzle diameter and nozzle heating control capability vary among different equipment manufacturers and machines, **perform a purge shot first** to check for any blockage. **Then gradually increase the nozzle temperature** until the material can be purged smoothly. Where possible, the difference between the nozzle set temperature and actual temperature can also be measured. **The actual nozzle temperature should not exceed 250°C**.

Recommended Nozzle Orifice Dimensions:

- > Small sized m/c (200T less): min. Ø 3.5mm
- > Mid sized m/c (200~450T): min. Ø 4.0mm
- > Mid~Large sized m/c (500T over): min. Ø 5.0mm
- > Reinforced grades: +0.5mm

- The nozzle orifice diameter should generally be **0.5mm to 1.0mm** smaller than the sprue gate opening. If too large, it may cause material leakage; if too small, it may lead to flow restriction.
- The draft angle of the sprue bushing should be **2° to 4°**.

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6、Feed Throat



To prevent premature pellet melting at the barrel feed throat. The hopper temperature should not be set too high, typically 40°C (104°F).