Inserts
Design for HP MJF: Union joints design

Introduction

Threaded inserts provide a strong, reusable, and permanent thread in plastic parts, and they are typically used when frequent assembly and disassembly are required for service or repair. Threaded inserts are often available in brass, stainless steel, and aluminum, and can be installed using various techniques (e.g., heat-staking, ultrasonic vibrations, or press-in).

Recommended inserts for HP Multi Jet Fusion

Selecting the best threaded insert type and installation technique depends on a few factors, such as part application, plastic part material, and strength requirements.

HP Multi Jet Fusion parts are made of thermoplastic materials and can be re-melted and re-formed once printed. For this reason, inserts that are installed by heat-staking and ultrasonic vibrations are recommended for thermoplastic materials due to their high overall performance; however, press-in (screw-to-expand or hexagonal-shaped) and self-threading inserts may also be used in some applications.

Type of insert			Performance
Heat-staking and ultrasonic vibrations insert			High overall performance. Not very dependent on hole size. Material is melted around the insert.
Press-in insert	Screw-to-expand		Very dependent on hole size tolerances. Recommended for non-critical applications.
	Hexagonal-shaped		Dependent on hole size tolerances. Good pull-out resistance. Recommended for non-critical applications.
Self-threading insert			Excellence pull-out resistance. Easy to install.

Table 1: Types of inserts

Design guidelines

Hole diameter

A pre-formed hole is necessary to install a threaded insert, so the hole diameter is a very important element in achieving the desired strength: Oversized holes will result in a reduction of the joint strength and undersized holes can potentially crack the part. Usually, suppliers of threaded inserts specify the hole diameter size and depth needed to install an insert.

> The hole size is dependent upon the part orientation, and for this reason it is recommended to always print the part using the same orientation.

HP Multi Jet Fusion–produced parts may have dimensional variations in small features up to +/-0.2 mm (ISO 286, IT Grade 13), which is usually higher than supplier specifications. For this reason, it is important to select a type of insert that is compliant with hole deviations.
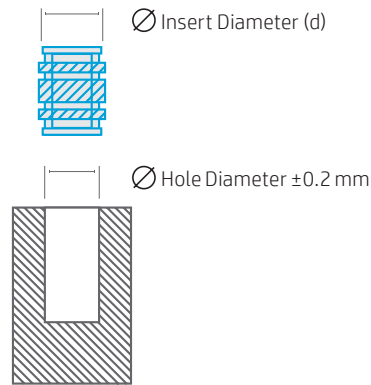
⌀ Insert Diameter (d)

⌀ Hole Diameter ±0.2 mm

Figure 1: Hole diameter

Bosses

Bosses are typically used for mounting purposes such as attaching fasteners or as a receptacle for threaded inserts. Traditionally a boss diameter is twice the size of the external diameter of inserts that are less than 6 mm, while a 3-mm wall thickness applies to all larger inserts.
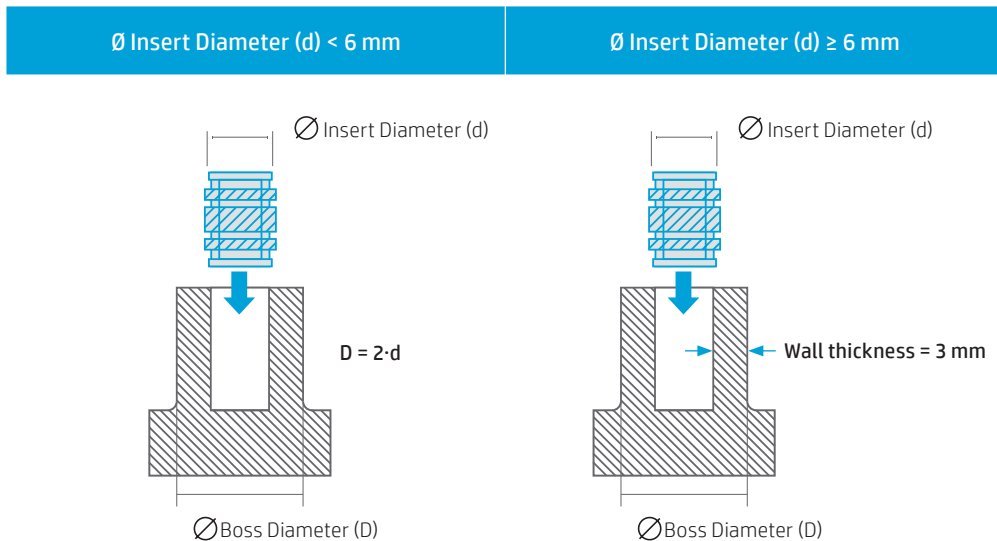
Ø Insert Diameter (d) < 6 mm	Ø Insert Diameter (d) ≥ 6 mm
⌀ Insert Diameter (d)	⌀ Insert Diameter (d)
D = 2·d	Wall thickness = 3 mm
⌀ Boss Diameter (D)	⌀ Boss Diameter (D)

Figure 2: Boss diameter

Special consideration should be given to cold-press installations where
increased stress may require larger boss diameters.

Mating part

The threaded insert—not the plastic part—should bear the load. For this reason, the diameter of the mating part hole is also important to keep the insert from being pulled through the hole.

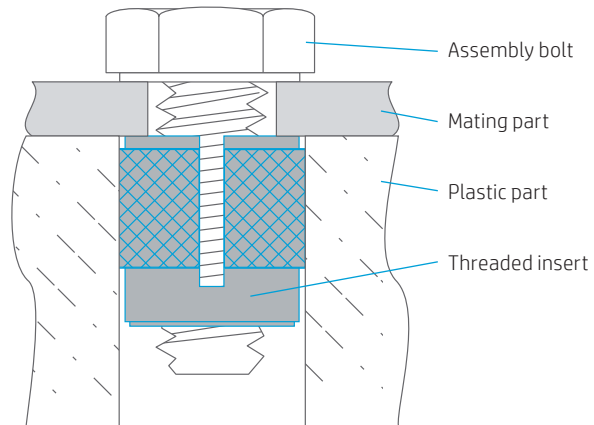Thus, the diameter of the mating part hole must be larger than the outside diameter of the assembly bolt but smaller than the diameter of the insert, as shown below:

Assembly bolt

Mating part

Plastic part

Threaded insert

Figure 3: Threaded joint assembly

The mating part must also withstand the stress generated by the
clamping force. In instances where the mating part will also be plastic, the
use of a collar or a washer between the assembly bolt and the mating part
should be considered.