Materials for Digital Production

Guidelines for Seals and Folding Bellows made from TPS, DIPRO®flex S / HSBC

When designing geometries for the production of injection-molded seals in housings or for the manufacture of bellows, some special design features must be taken into account.

1 Processing

1.1 The sprue must always be positioned at the thickest point or - if the wall thickness is the same - at the largest cross-section. In other words, a thick wall thickness must never follow a thin one.

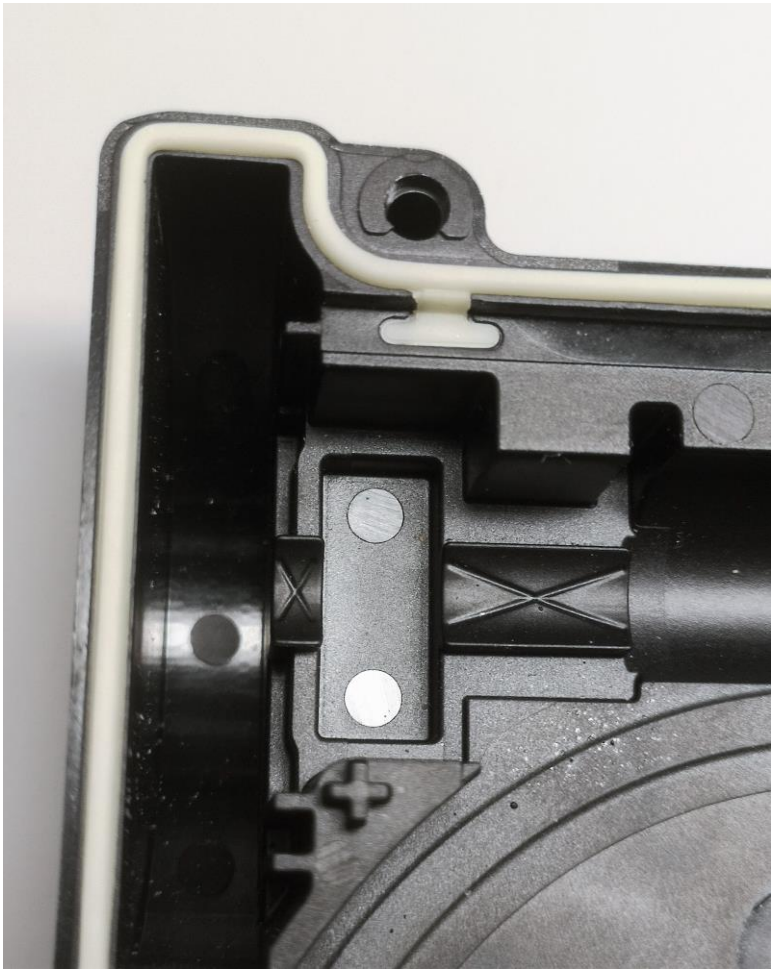
1.2 Matt surfaces are necessary for better demolding and more appealing surfaces.
In addition, pressure drop at the end of the flow path becomes visible through shiny spots.

Surface structures such as VDI no. 27-35 (Ra = 2.24 - 4.5 µm) have proven their effectiveness. Etched structures result in better scratch resistance than structures produced by spark erosion machining.

1.3 For cold runners, select a wall thickness greater than that of the part to prevent freezing, which renders the holding pressure ineffective.
Select a geometry with the lowest possible heat dissipation (round is optimum).

1.4 No gating in the sealing geometry; the high stresses in the gate lead to post shrinkage in hot storage. This can cause the application to leak.

1.5 Ensure good ventilation (otherwise there will be imperfections in the flow line), possibly provide overflow.



1.6 For bellows and domes, ensure a “ring-shaped” connection with a slightly thicker wall thickness in order to avoid weld lines and minimize module differences (md/pmd).

It should be considered that the ring has a greater wall thickness than the bellows, so that a flow front is created, which is similar to the umbrella sprue, i.e. without a weld line.

The usual md/pmd shrinkage differences then have no influence on the geometry.

1.7 The “partial standstill” of the TPE melt during mold filling must be avoided.

1.8 TPE-compatible processing:

Compound temperature according to data sheet (upper limit for good adhesion), inject quickly with little holding pressure.

The properties are a function of the injection time.

Injection speeds that are too low result in poorer part properties, as **DIPRO®flex S** is structurally viscous.

These processing conditions are necessary to achieve reliable mold filling.

The holding pressure must be able to compensate for part of the mold shrinkage even at the end of the flow path.

2 Seal-specific features

2.1 Adhesion of the TPE component to the hard component

2.2 A major advantage of hard/soft combinations with a suitable selection of composite components is the inevitable tightness of the composite surface

Position the sealing lip against the pressure. The applied pressure should compress the seal.

2.3 The CS (compression set) A/B must be matched to the application temperature.

2.4 The internal stresses (post-shrinkage during hot storage) must be taken into account (see data sheet).

2.5 The deformation of the seal should not exceed the deformation in the CS measurement (25 % for soft types).

2.6 The wall thickness of the seal must be sufficient and the seal must be able to escape.

2.7 Number of sealing lips - also multiple

2.8 Resistance to media must be taken into account.

2.9 Pressurized gaskets should have “rounded flanks” to prevent “buckling”. The direction of deformation is thus clearly specified.

2.10 Surface friction - This can be reduced by using lubricants and blends to prevent long sealing lips from “turning upside down”.

3 Housing materials, hard component made of ETP

For most ETPs, engineering thermoplastics, there are bonding grades with adhesion to PA, PC, ABS, PC/ABS, ASA, PMMA, PBT and PET.

The sealing properties at higher temperatures have limits.

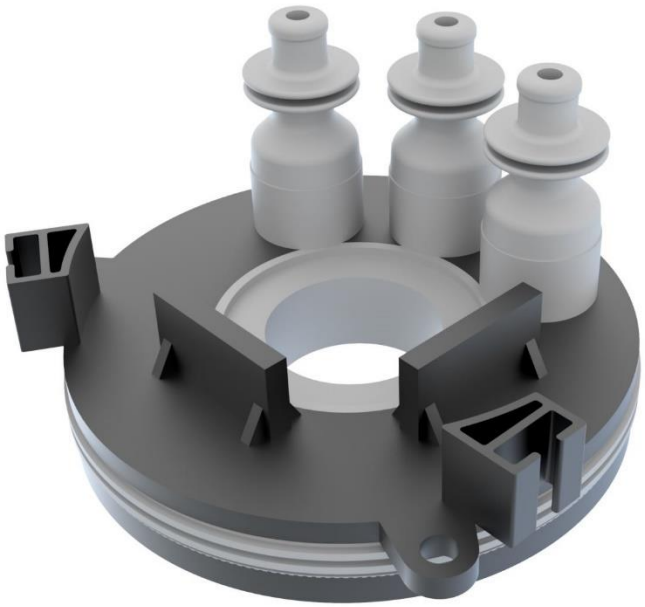
PP is not suitable for many applications due to its lack of dimensional stability, especially for glass fiber reinforced housings.

Brittleness from 0 °C must also be taken into account.

Seal carrier with cable sleeves

Cable sleeves (natural/light):
DIPRO®flex S - Thermoplastic Elastomer, 50 ShA, with polyamide adhesion
Product ID 1173, PX-DIPRO®flex S50H23B2/1230*702/0201

Housing component (black):
PA 30 % GF



4 Housing materials made from DIPRO®blend H/GF High-Performance Polyolefin

DIPRO®mat has developed a complete range of 10 - 50 % special glass fiber reinforced materials with minimal warpage and excellent notched impact strength.

In combination with **LOW-COMPRESSION-SET- DIPRO®flex**, especially with low hardness, hard/soft compounds can be produced with very easy processing and good recyclability.

The soft gaskets put little strain on the housing structures.
Seals up to 120 °C are possible with **DIPRO®flex S/H2.DIPRO®flex S/H2.**

5 Hard/soft combinations from the 3D printer

Hard/soft parts can be printed with **DIPRO®blend H** materials for filament and pellet printing.

Source: GRAUTS

Source: DIPRO®mat

As of May 2024, Author: Uwe Stenglin