

Ultra SideGate Information for Mold Makers



Introduction

The Ultra SideGate nozzle is intended for medical, closure, and small technical parts on which gate vestige on an end surface is unacceptable, or for which end gating is not possible due to part geometry. There are two configurations available: Standard and Inline. The Standard configuration locates the tips at the bottom of the nozzle housing, while the Inline configuration has a nozzle head that allows inline tip layout.

The following guidelines identify the unique mold integration requirements of Husky's Ultra SideGate nozzle.

Nozzle Tip Retention

Ultra SideGate nozzle tips are retained by the cavity inserts. This arrangement is different from all other Husky nozzle styles, which retain the nozzle tip in the nozzle housing. Thermal expansion of the housing has no effect on nozzle tip position. The nozzle tips are spring-loaded with Ultra Seal technology to the housing for seal-off. A star retaining ring holds the nozzle tip securely in the cavity insert. Full bore depth as shown on the Husky gate detail drawing is required for nozzle tip retention. (Figure 1 and 2)

CAUTION: securing the tips with the star washer prevents many problems. If use of star washer cannot be correctly done, contact Husky for other option.

See the gate detail drawing that is provided with the hot runner system for all dimensions and tolerances.

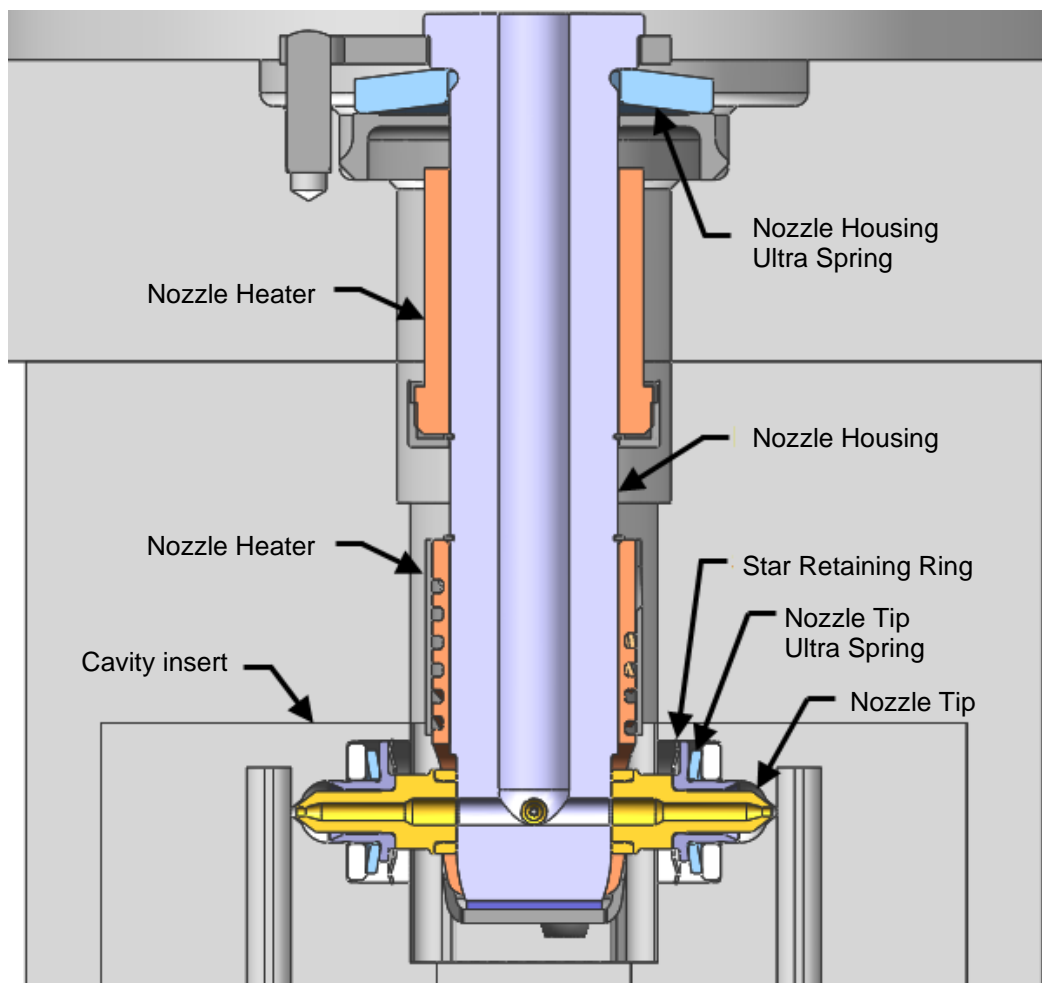


Figure 1 Ultra SideGate Nozzle

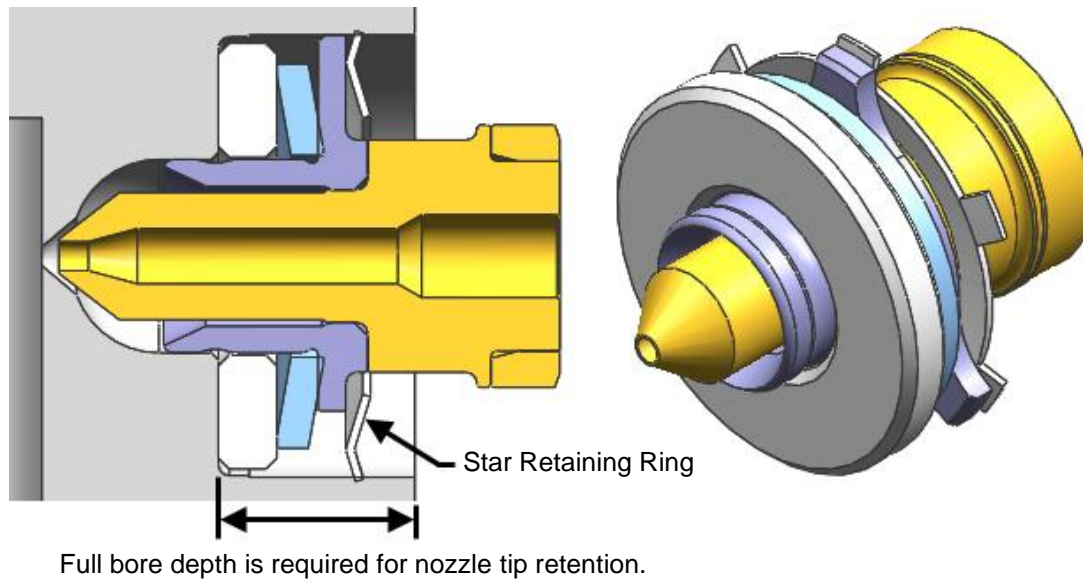


Figure 2 Ultra SideGate Nozzle Tip Assembly

Nozzle Heating

Ultra SideGate nozzles are designed to provide heat to the nozzle housing and the tip area. All Ultra SideGates have a heater located at the top of the nozzle housing to provide heat to the nozzle housing near the Ultra Seal springs where some heat is transferred to the manifold plate. Although not recommended in applications where heating zones are limited these heaters can be combined (bridged) to use on heater/TC to control multiple heaters on different nozzles.

Heating technology near the tips is different for the two configurations.

Standard Configuration

The Standard configuration has a single heater located near the nozzle tips. This single heater has a thermocouple and provides heat to the tips. (Figure 1) This heater should always be controlled as a single zone and not combined (bridged) with other heaters.

Ultra SideGate Inline Configuration

The Ultra SideGate Inline configuration has (4) heaters in the nozzle head. The number of thermocouples depends on the level of control requested by the molder. (Figure 3) Individual control of the tips can be used to improve balance in applications with high demands for balance. This does require additional zones in the temperature controller.

Temperature can be controlled by either:

1. Individual control – each heater is controlled by a thermocouple near the heater
2. Group control #1 – the four heaters are bridged together and controlled by a single thermocouple located near one of the heaters
3. Group control #2 – Two heaters on the ends are bridged together and controlled by a thermocouple located near one of the heaters

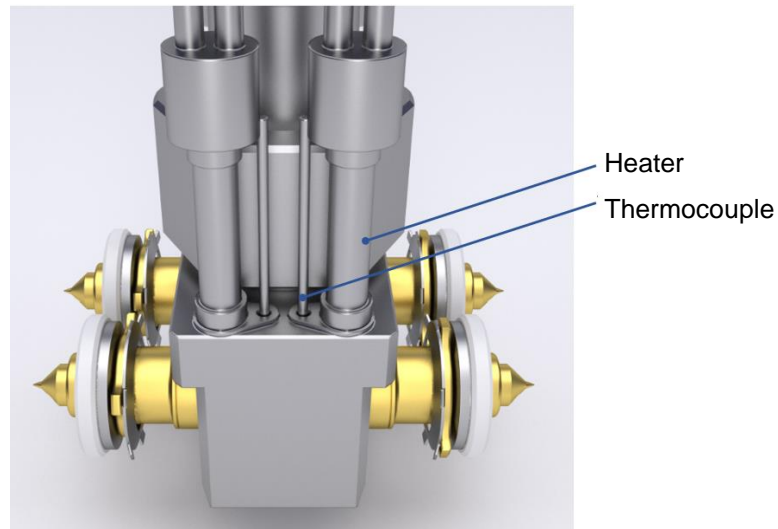


Figure 3 Ultra SideGate Inline Nozzle Head Assembly

Cavity Alignment

Alignment of the cavity inserts is critical for seal-off between the nozzle tips and the nozzle housing. Husky recommends using two of the hot runner guide pin bores as datum features for accurate positioning of the gates. (Figure 4)

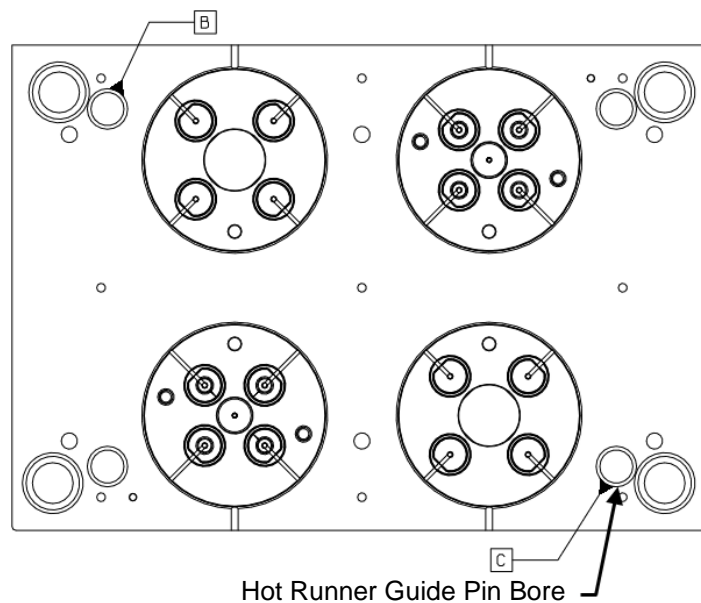


Figure 4 Hot Runner Guide Pin Bores Used as Datum Features

Dowels or other locating features (for instance flats on the cavity inserts) must be used to prevent excessive movement of the cavity block and of the individual cavity inserts. However, it is not necessary to fix these components rigidly. They may have a degree of rotational freedom, as long as their final orientation fits within the constraints defined below.

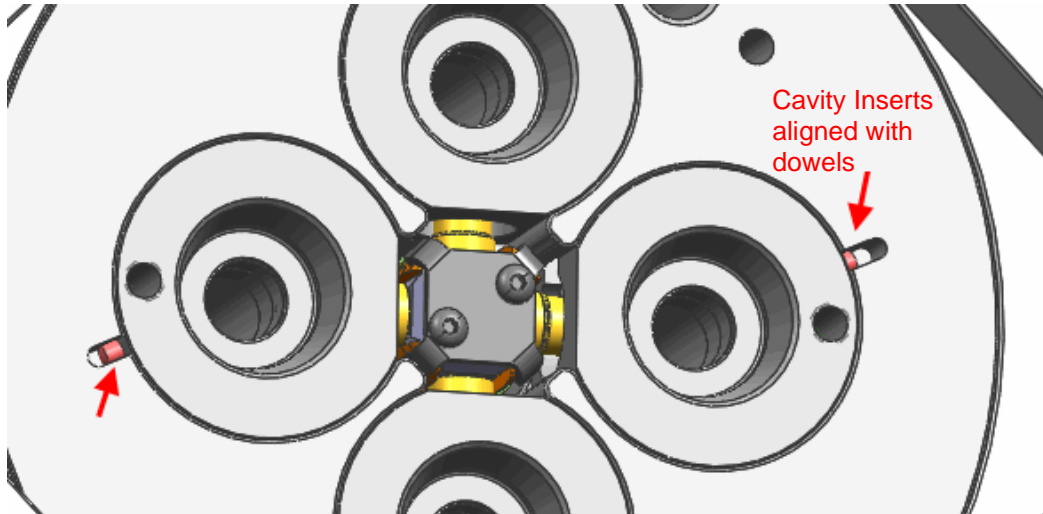


Figure 5 Cavity Insert Alignment Features

As a group, the cavity inserts must be oriented to within $\pm 0.5^\circ$ of the datum reference frame of the cavity plate. During assembly of the mold to the hot runner, the nozzle housing is free to rotate a small degree to align itself to the set of nozzle tips installed in the cavity inserts. (Figure 6)

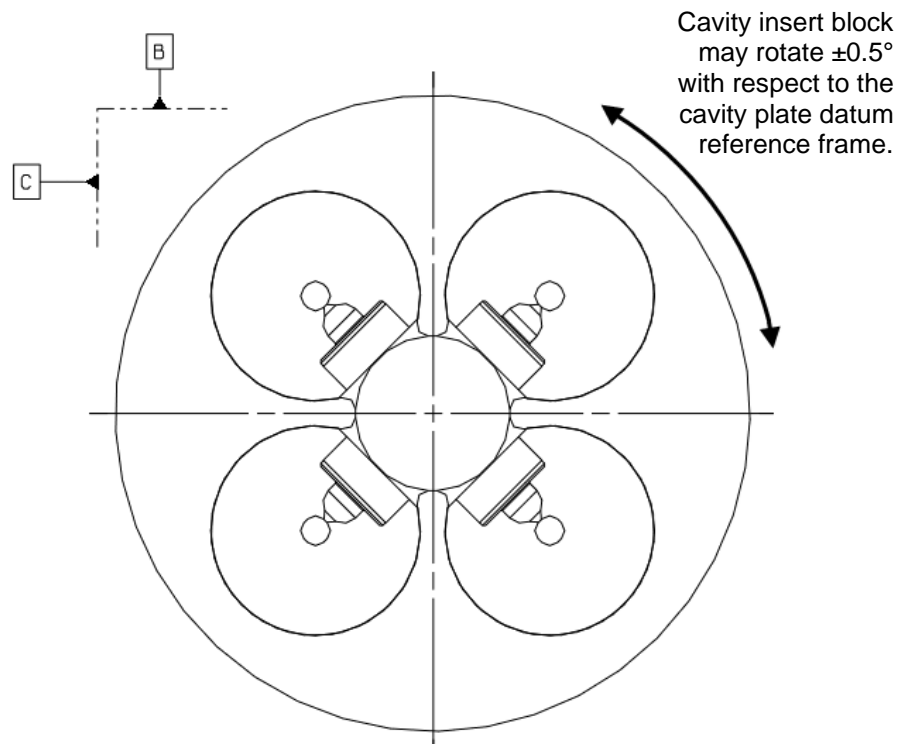


Figure 6 Allowable Cavity Block Rotation

The nozzle tip seating faces in the cavity inserts must be oriented to within $\pm 0.1^\circ$ of the required angle between each other. Again, the individual inserts may have a small degree of rotational freedom to achieve this alignment. (Figure 7)

Important note: If the individual cavities are allowed to rotate in the cavity plate, and are locked in place with a cover plate, it is critical that their orientation to the nozzle housing be maintained. The other option is to allow the individual cavities to free float when reinstalling the cavity plate on the hot runner.

For example, if the cavity plate is removed from the hot runner, and the individual cavities are removed and then reinstalled (and clamped to prevent rotation), they may lose their orientation to the nozzle housing, and leakage may occur after the cavity plate is reinstalled on the hot runner.

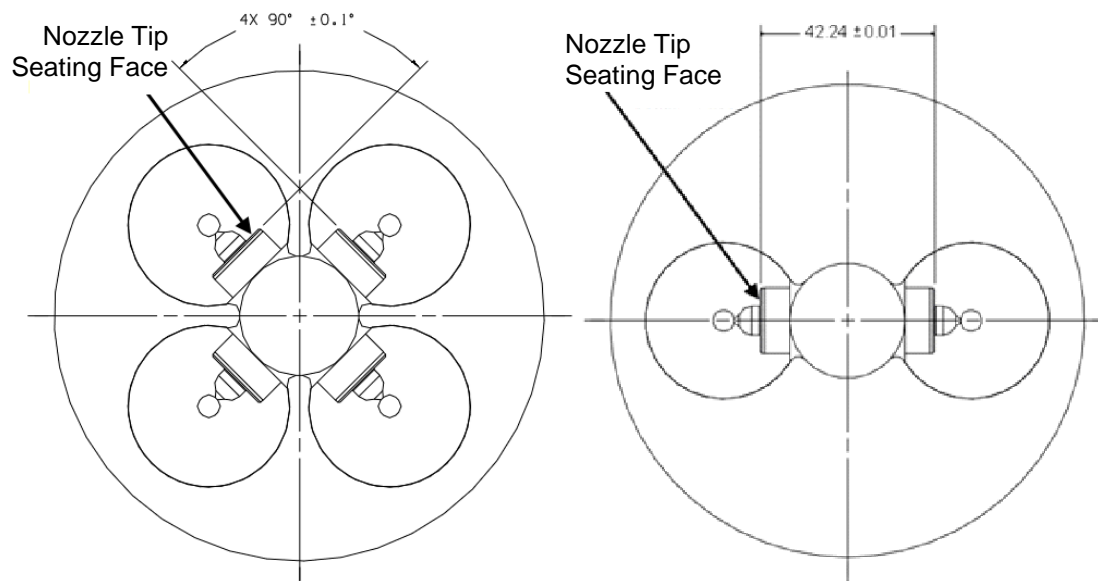


Figure 7 Cavity Insert Alignment – 4 and 2 Cavities

Another cavity insert option is a two piece rectangular cavity insert with tapered side walls. This option is ideal for tools with slight variations in part designs. Cavity inserts are screwed directly to the cavity plate and limit friction from the tip/housing during installation due to their chamfered side wall design. (Figure 8) The spring compression isn't experienced until the gate insert is well engaged into the pocket.

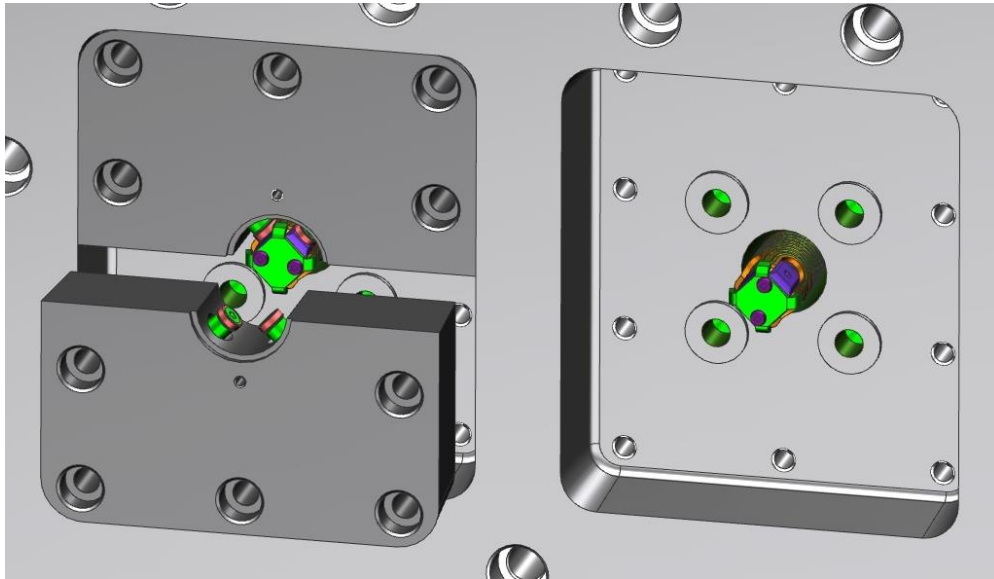


Figure 8 Cavity Insert Alignment – 2 Cavities

Caution: The cavity plate must be designed so that the cavities can be removed to gain access to the nozzle tips. Additionally, each cavity block should only contain the tips for one nozzle, and ideally, each tip should be held within an individual removable gate insert (as shown in figure 5). This allows the individual nozzles to properly locate and seal. Failure to have removable inserts will result in a system that cannot be properly maintained. (Figure 9)

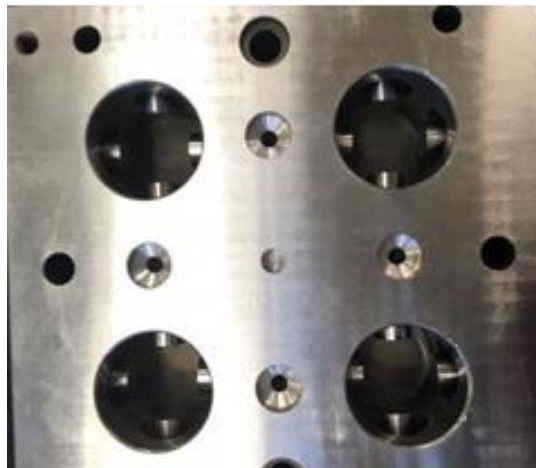


Figure 9 Improper Design of Cavity Plate

Measuring Cavity Alignment

The tight tolerance required between the nozzle tip seating faces (Figure 6) may present a challenge with conventional tools. The preferred method for measuring the location of these faces is by CMM. If a CMM is not available, there are a couple of alternate methods that can use to measure the distance between faces. Each of these methods introduces additional error and should only be used if a CMM is not available. In addition, neither of these methods account for location of the nozzle tip seating surfaces relative to the mold or hot runner datums. They only give an indication of the distance between seating faces for a single drop.

The primary difficulty in measuring the distance between the seating faces is the ability of a tool to extend into both bores at the same time. The first method involves machining a flat reference surface on each cavity (Figure 10). The bore depth can then be measured relative to the flat on each cavity, and then the distance between the flats can be measured after the cavities are installed in the cavity plate. To get a better indication of surface orientation, measure at the 4 quadrants in each bore, and then 4 corresponding locations between the flats (Figure 11) The similar numbers in the figure indicate measurements between the same features, only in different locations (for example A2 and B2 indicate measurements between the 2 cavity flats only A2 being on one side of the bore and B2 being on the other side of the bore).

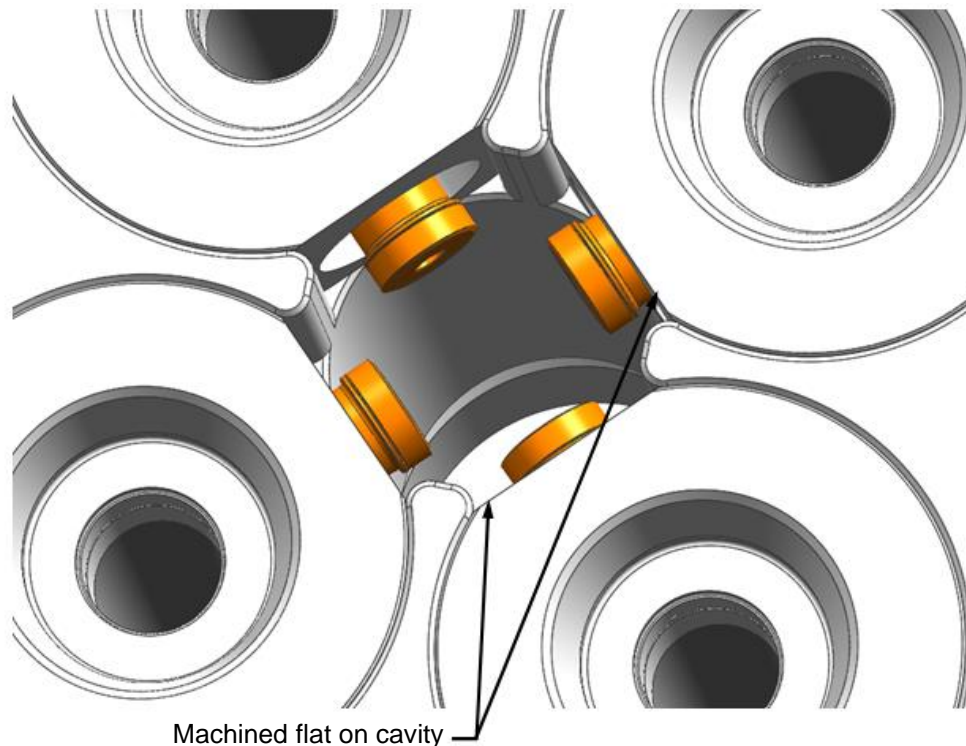


Figure 10 Cavity Insert Reference Flats

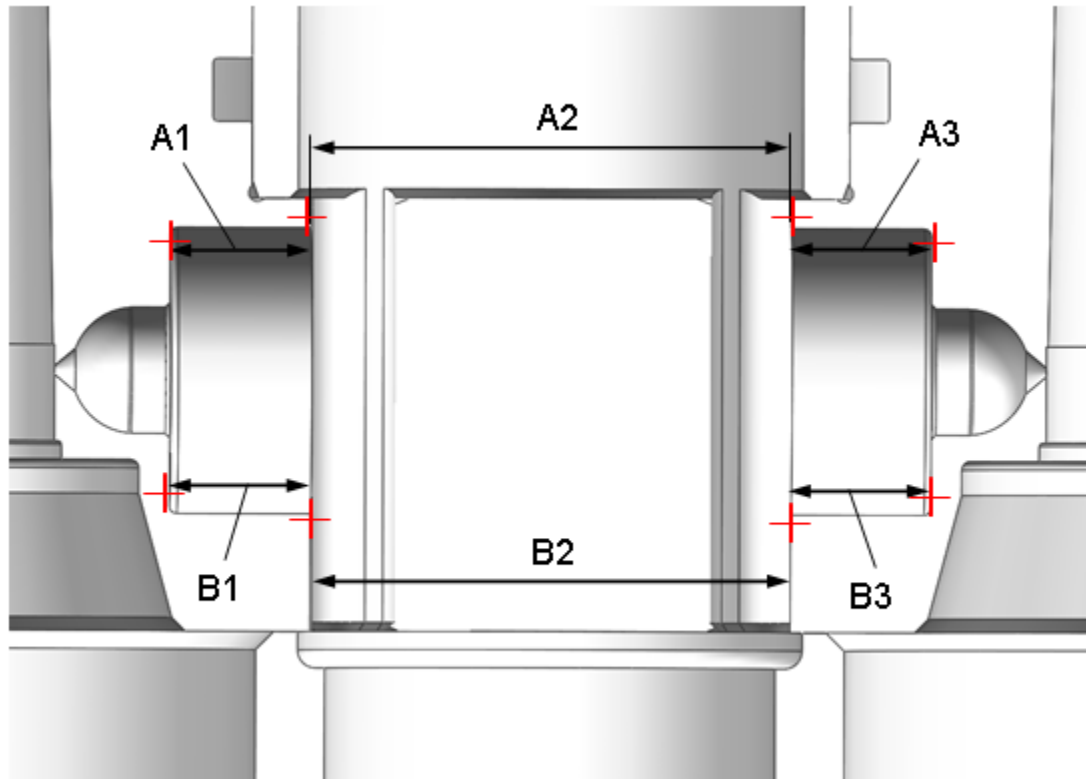


Figure 11 Using Compound Measurements to Determine Seating Face Distance & Orientation

The second method involves using the tip components to determine distance between the seating faces. This is the easiest method to get a quick indication of bore depths. Install all tip components into the bores (insulators, springs, and tips), making sure that components are bottomed out in the bore or against each other. Measure the distance between the back faces of the tips (Figure 12) Measure in 4 locations (each quadrant) to determine the orientation of the faces relative to each other. The nominal distance between these faces is 17.13mm. The measured distance should be within +/- 0.06mm of the nominal dimension.

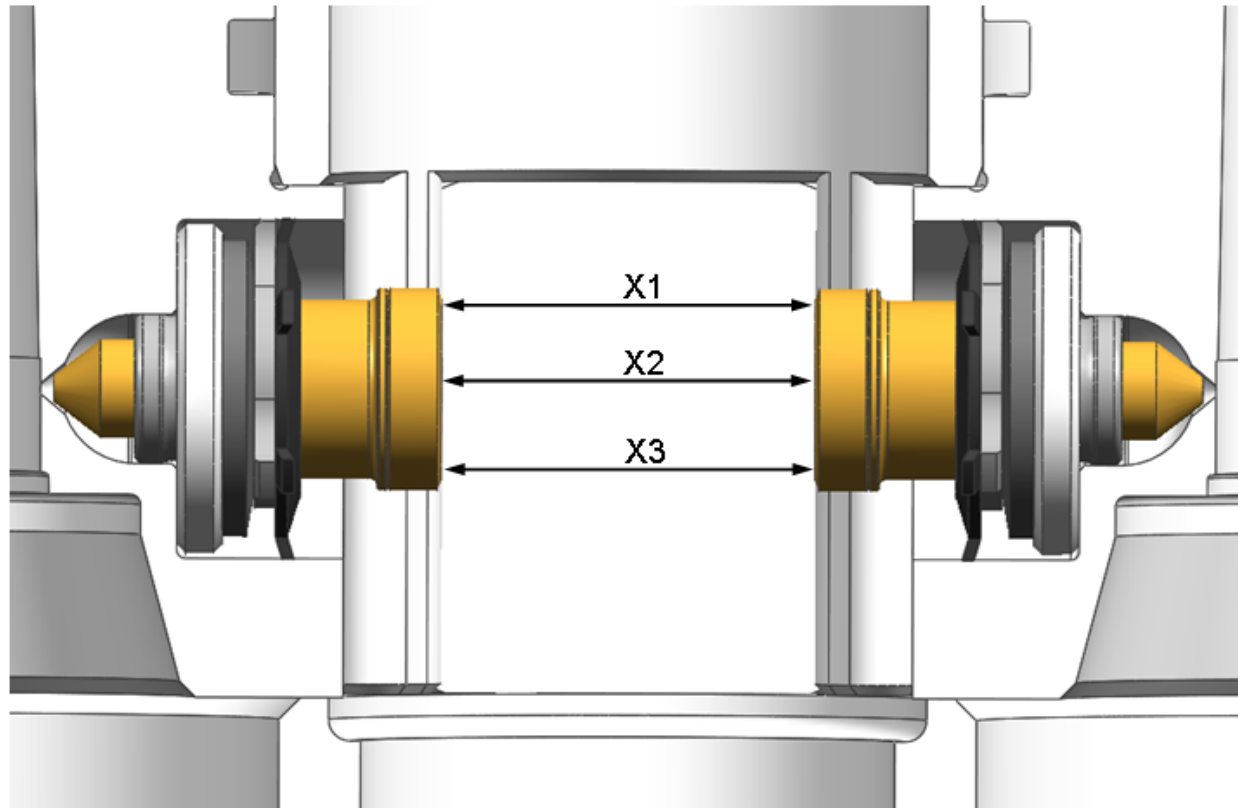


Figure 12 – Measuring Between Tip Sealing Faces

Separating the Cavity Plate

When separating the cavity plate from the hot runner with the cavities installed, the plastic slugs between the tips and housings must all be sheared simultaneously. For larger cavitation systems (above 4 drops), this can be difficult to achieve by using only pry slots. Although the slugs are only 3mm in diameter, and shear rather easily, a large plate may complicate this by having a tendency to slant on the guide pins. In this case, jacking bolts may be added to the cavity plate to allow the plate to separate from the hot runner evenly (Figure 13). Location and size of these jacking bolts will be dictated by the mold design and therefore are at the discretion of the mold maker. Husky recommends that 4 jacking bolts are used, that they are a minimum of M12, and that they are positioned as close to the guidepins as possible.

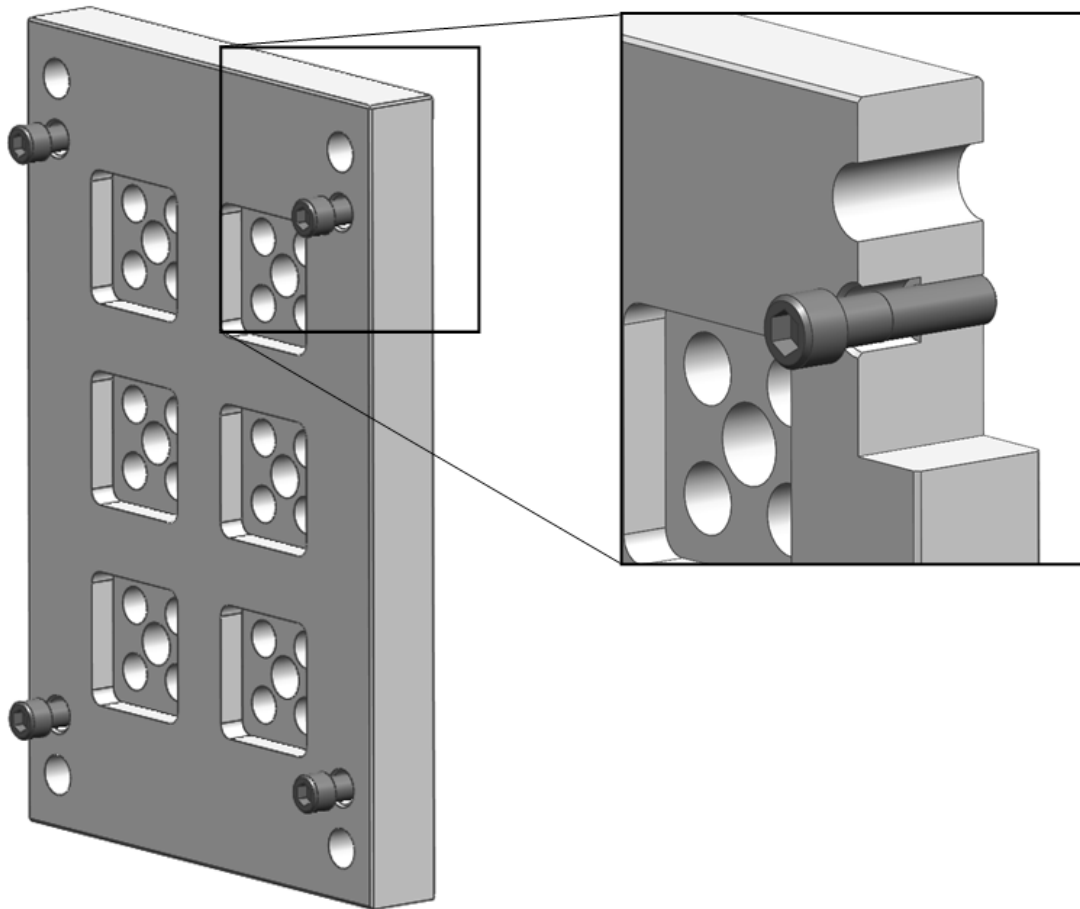


Figure 13 – Example of Jacking Bolt in Cavity Plate

Removing Cavity Inserts

When separating cavity inserts from the cavity plate, a tapped hole in the insert can be helpful to aid in removal (Figure 14). With a screw threaded into the hole in the insert, a slide hammer or small pry bar can be used to help free the insert.

Important note: Husky recommends that the cavity inserts be accessible from the split line so that they can be pulled from the cavity plate without removing the mold and hot runner from the machine. This design offers the benefit of fast bubble cleaning in the press in case of contamination.

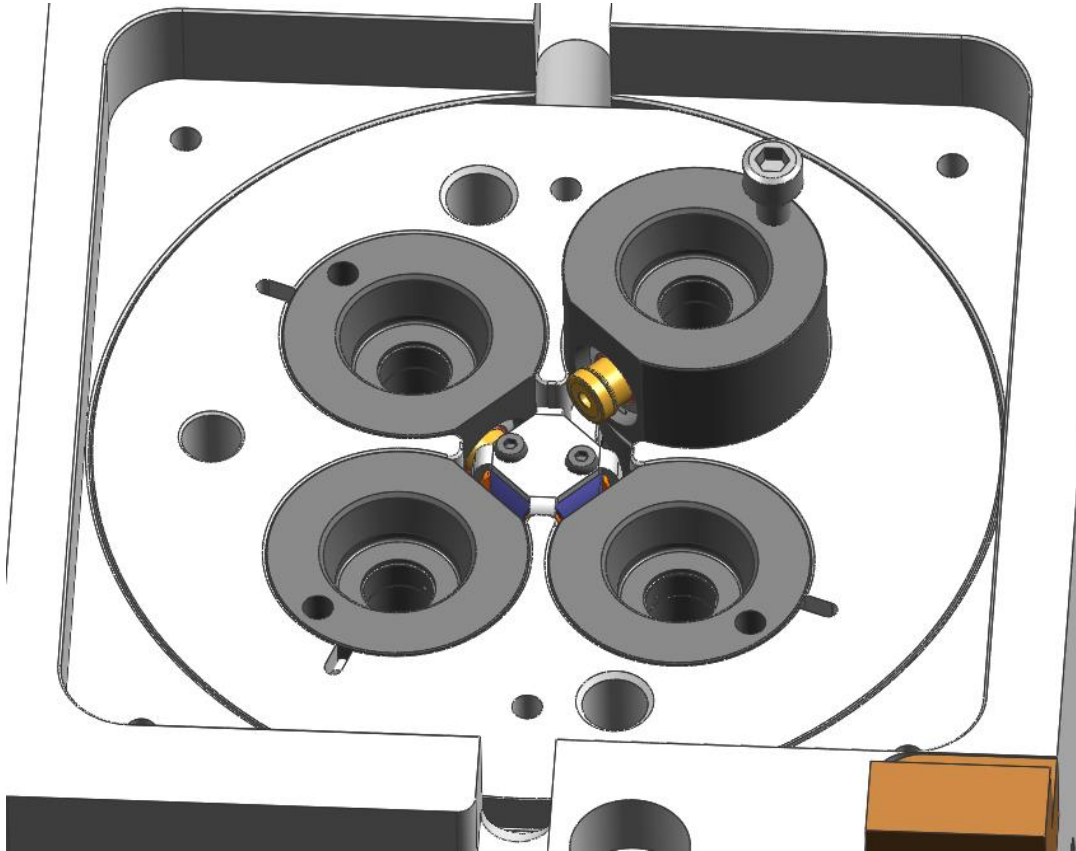


Figure 14 – Example of a Removal Screw in the Cavity Insert

Closed Nozzle Bore

In order to maintain consistent temperature control, the nozzle must not be exposed to the parting line. Either the nozzle bore must be a blind hole, or a cover plate must be used. (Figure 15)

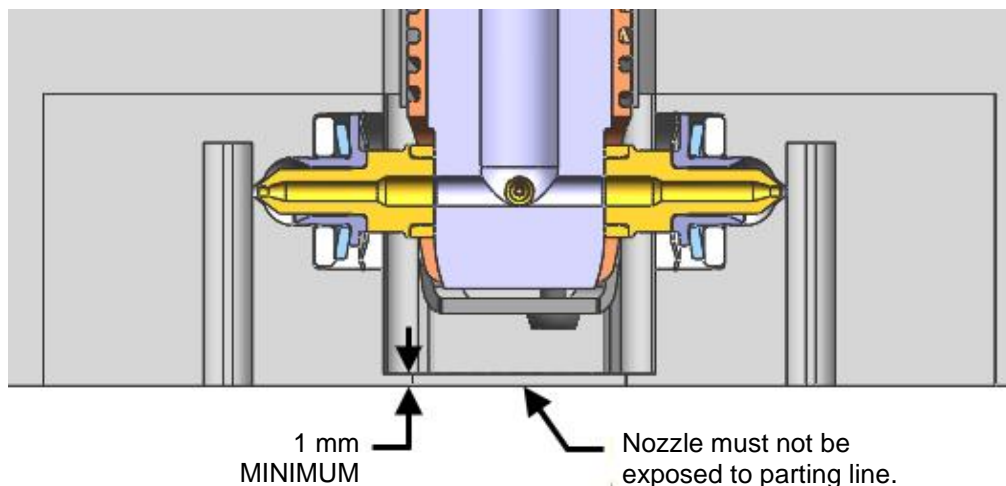


Figure 15 Closed Nozzle Bore

Cooling

Husky recommends an independent cooling circuit for the Side Gate nozzle tips in order to ensure more precise temperature control in the gate area. The layout of the cooling lines relative to the drop (distance to drop and geometry) should be identical for all drops to insure uniformity of cooling from drop to drop. (Figure 16 and 17)

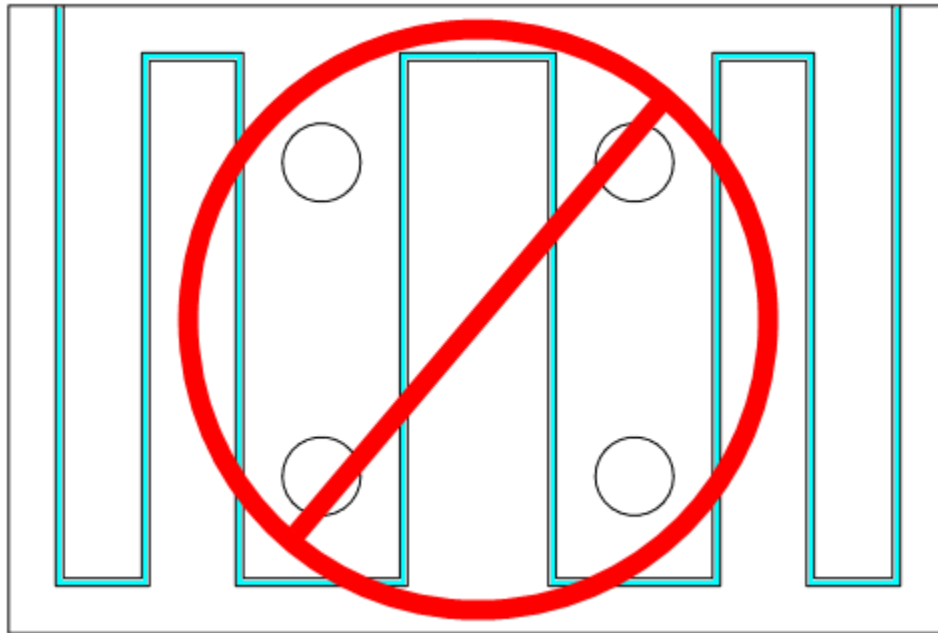


Figure 16 Limited Control of Tip Temperature

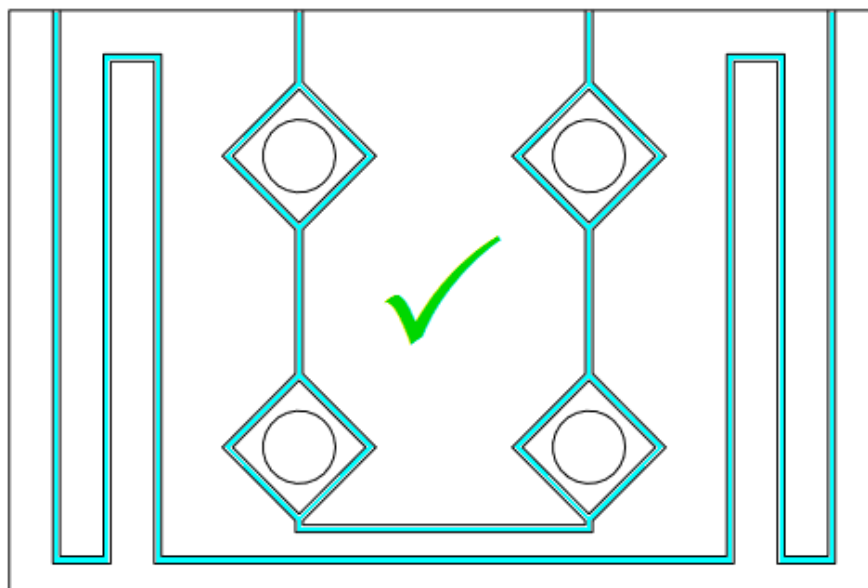


Figure 17 Optimized Control of Tip Temperature

Material Thickness Near Gate

A thin material condition near the gate may lead to early failure of the cavity insert. Adjust the design of the cavity insert for the maximum possible material thickness in this area. Husky recommends a minimum of 1.5 mm of material thickness around the gate bubble. (Figure 18 and 19)

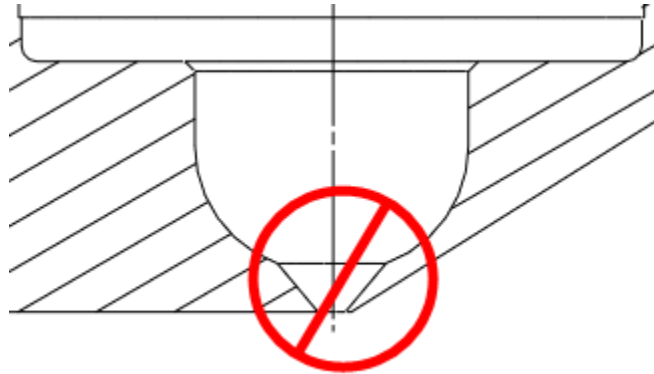


Figure 18 Thin Steel Condition

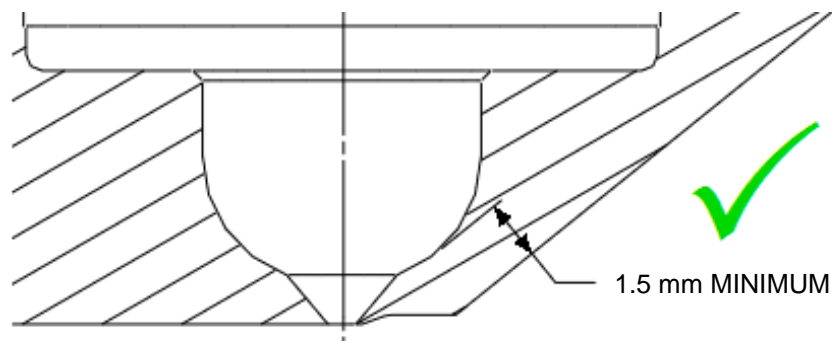


Figure 19 Improved Cavity Insert Design

Gate Related Part Geometry Considerations

For optimal gate quality, Husky recommends that a localized flat be positioned on the part around the gate, and that a section of minimal draft angle (preferably 0 degrees) equal to or greater than the gate diameter exists on the part opposite the direction of demolding. This will insure that the frozen cold slug in the gate shears cleanly and does not pull molten material from the gate bubble (Figure 20)

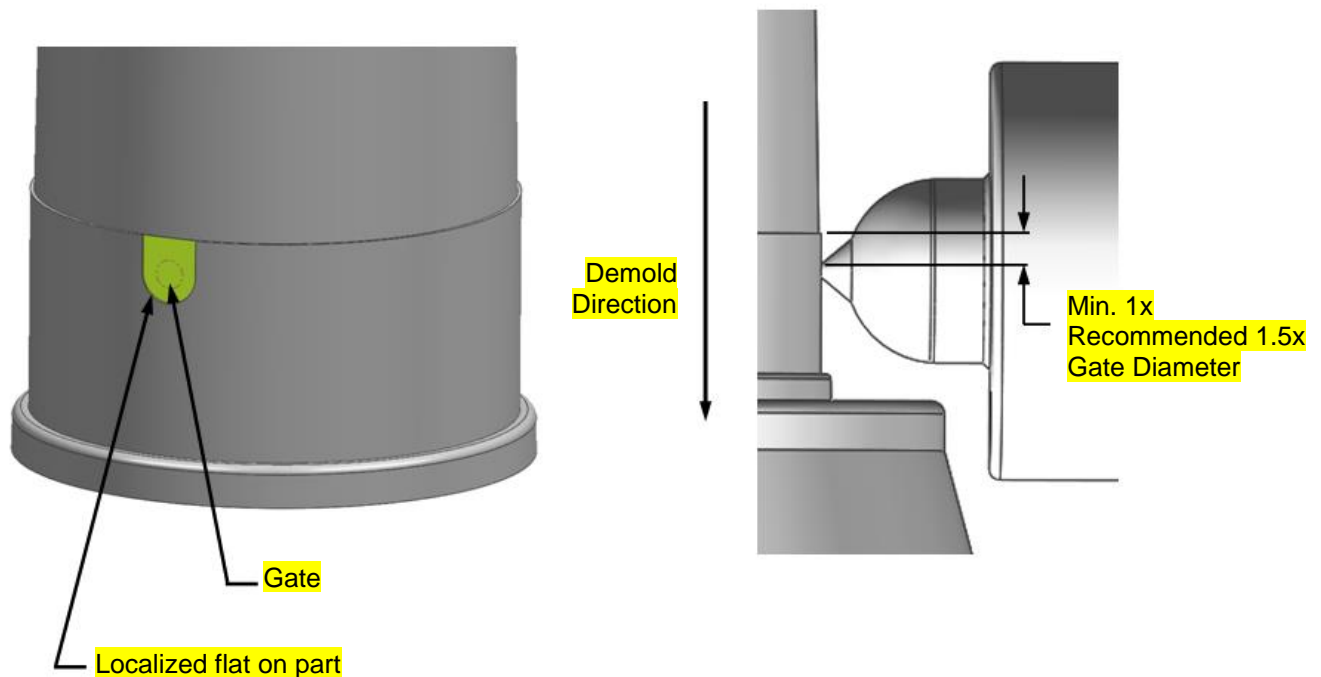


Figure 20 Part Geometry Considerations

L-Dimension

On hot runner systems, the L-dimension is measured from the injection face of the cavity plate to the centerline of the gate. (Figure 21)

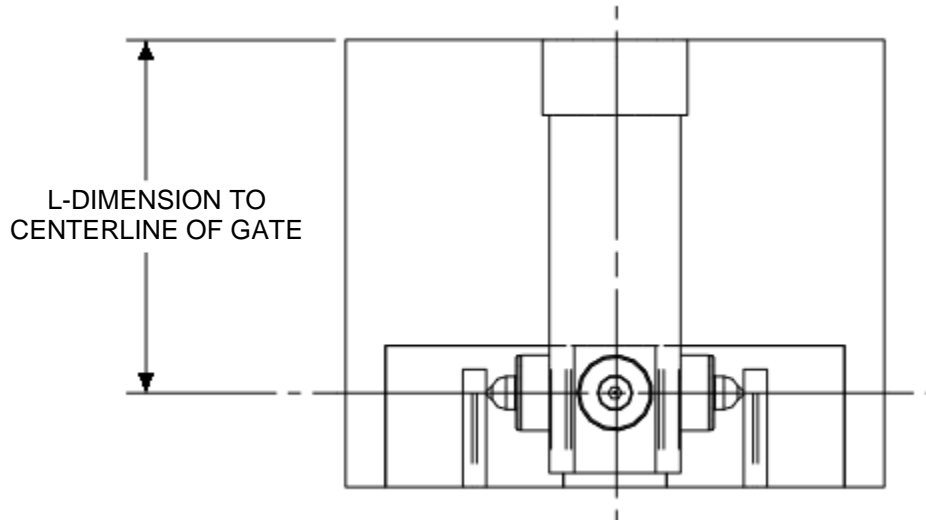


Figure 21 L-Dimension

PL and BL Dimensions

On hot sprue systems, the PL and BL dimensions are measured to the centerline of the gate. (Figure 22)

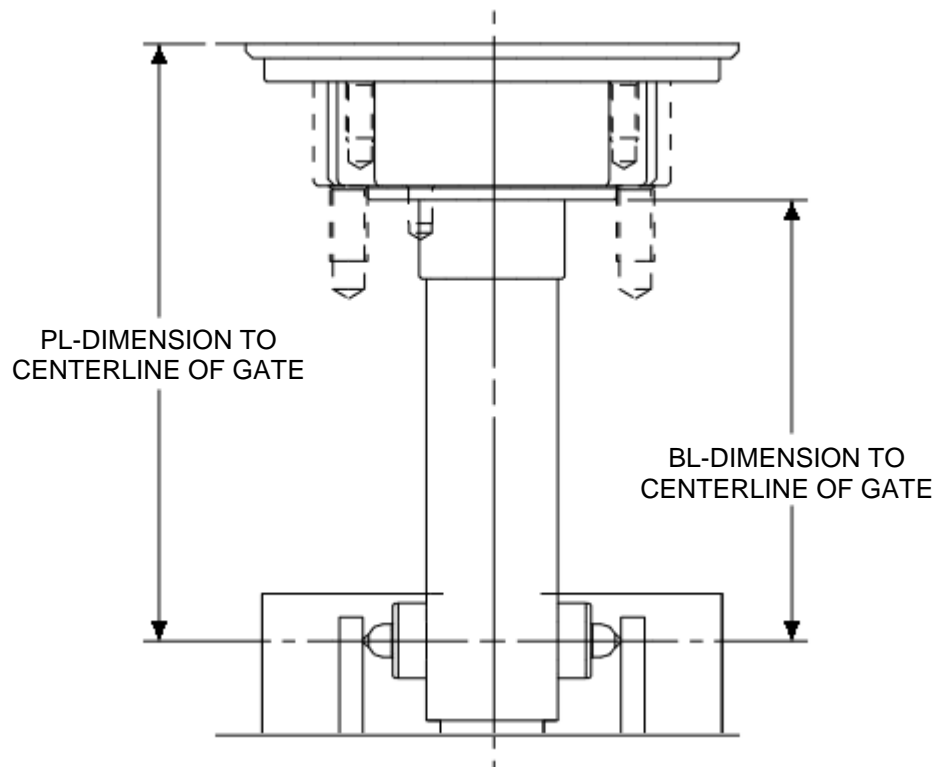


Figure 22 PL and BL Dimensions

Hot Sprue Dowel Location

On a 2 drop or single drop hot sprue, the dowel location in the customers plate (relative to the cavity orientation) is critical to insure that the housing lines up properly with installed tips. (Figure 23)

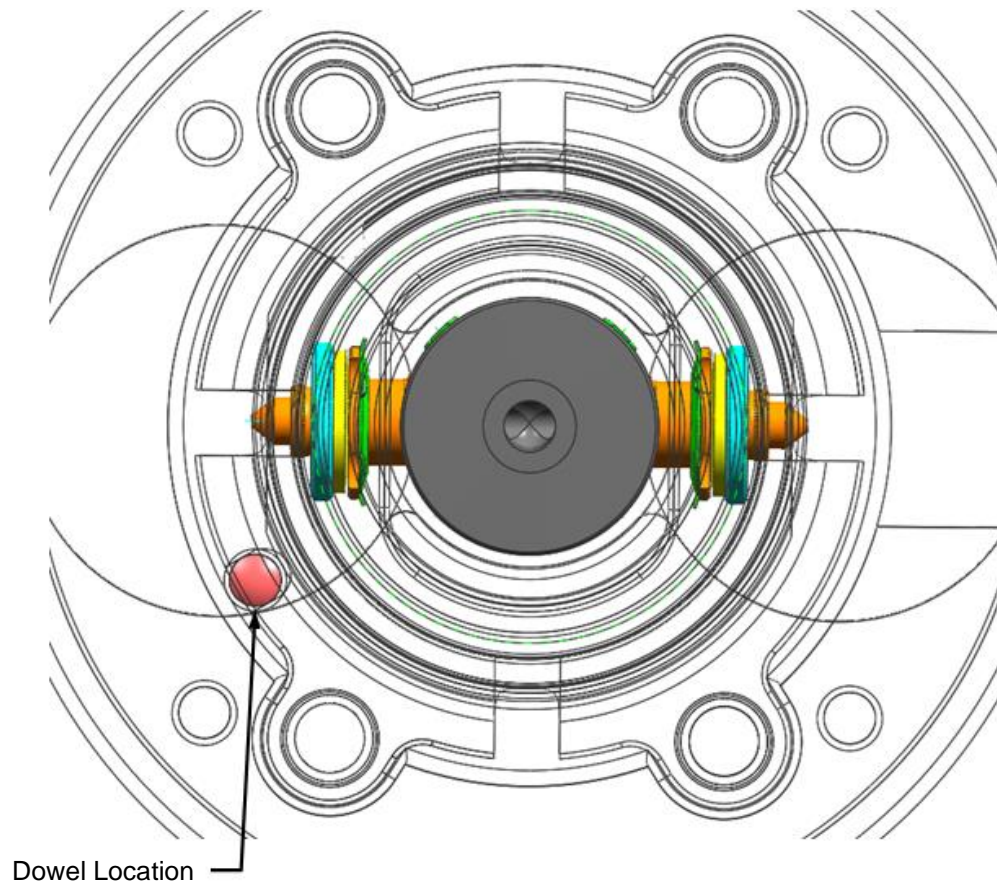
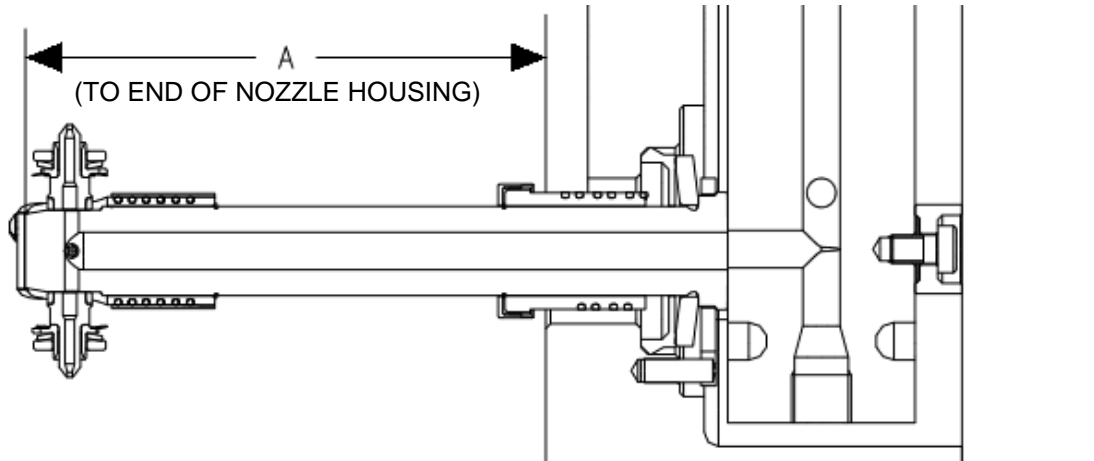


Figure 23 – Dowel Location for 2 Cavity Hot Sprue

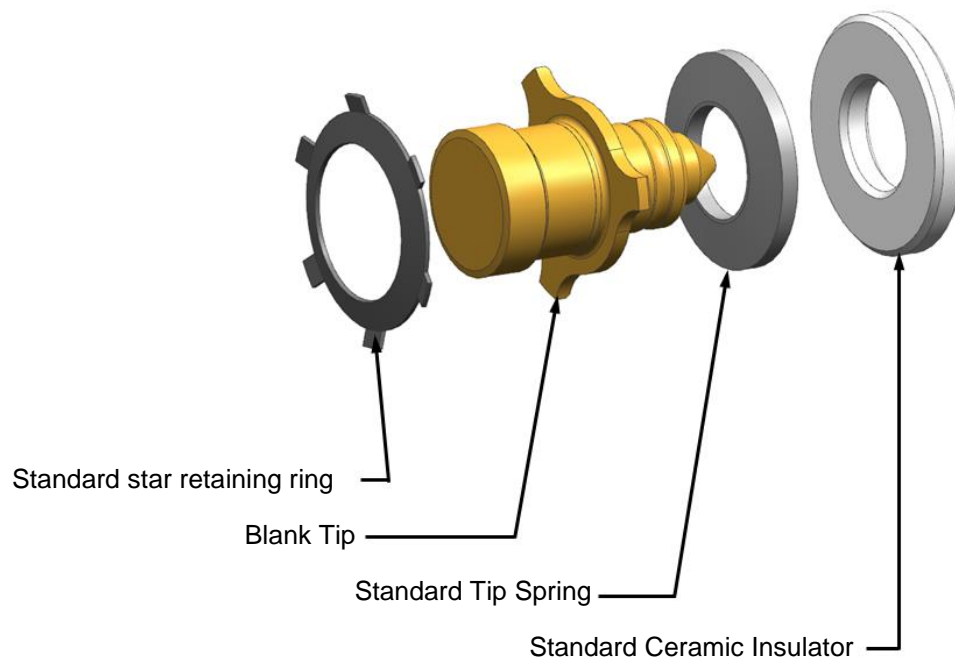
Nozzle Inspection

On conventional hot runners, Dimension A is defined as the nozzle tip height. However, for side gate hot runner inspection, Dimension A is defined as the distance from the face of the manifold plate to the end of the nozzle housing. Dimension A does not include the end cap that retains the front heater. (Figure 24)

**Figure 24 Dimension A**

Cavity Shut Off

In the case when a cavity needs to be shut down for any reason (such as cavity damage or part flash), an available blank tip with no melt channel can be used. This is a standard item which can be ordered from Husky. Simply remove the tip from the affected cavity, and install the blank tip in its place. The blank tip should be installed with all the same components used with the regular tip (insulator, spring, and star washer). (Figure 25) Please be aware that part balance will be negatively affected for the remaining cavities.

**Figure 25 Blank Tip Assembled with Standard Components**

| | | | | |
|---------------------------|--|------------------------------|--------------|----------|
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| | Revision Level 14 | Security Level: UNCLASSIFIED | Standard No. | N/A |

Multi-Material Systems with Side Gate

On rare occasions, customers may wish to combine side gated parts and conventionally gated parts (either hot tip or valve gate) in the same mold. This requires some special considerations relative to the hot runner when designing the mold.

One of the unique characteristics of the Husky side gate is the ability of the nozzle to align itself to the tips and cavities when installing the cavity plate. This is critical to prevent leakage, which is caused by misalignment between the spring loaded tip and the nozzle. To allow nozzle movement, special cams are installed between the manifold plate and backing plate which, when turned to the open position, relieve the spring pressure between the manifold and nozzle (Figure 26) This allows the nozzle to rotate and align itself to the tips which are installed in the cavities.

On a multi-material system, actuating the cams relieves the spring force on all the drops. Because the spring load for the conventional drops may be significantly different than the spring load for the side gate drops, there may be a different gap created between the spring and the nozzle. If the gap is large, it can cause the housings to tilt, and become misaligned with the cavities, which can cause damage during assembly. For this reason, the conventional drops **MUST** be assembled to the cavity plate with the cams closed. When this step is complete, and the nozzles are supported by the cavities, the cams can be rotated to the open position, relieving the spring force on the side gate housings, and the side gate cavities can be installed.

Important Note: Due to this 2 step assembly procedure, at least one set of cavities (either the conventional or the side gate cavities or both) **MUST** have the ability to be removed from the parting line. Husky recommends that the side gate cavities have this ability, due to the additional benefit of fast bubble cleaning in the press in case of contamination. In this case, the conventional drop cavities may still be sandwiched between the cavity plate and manifold plate.

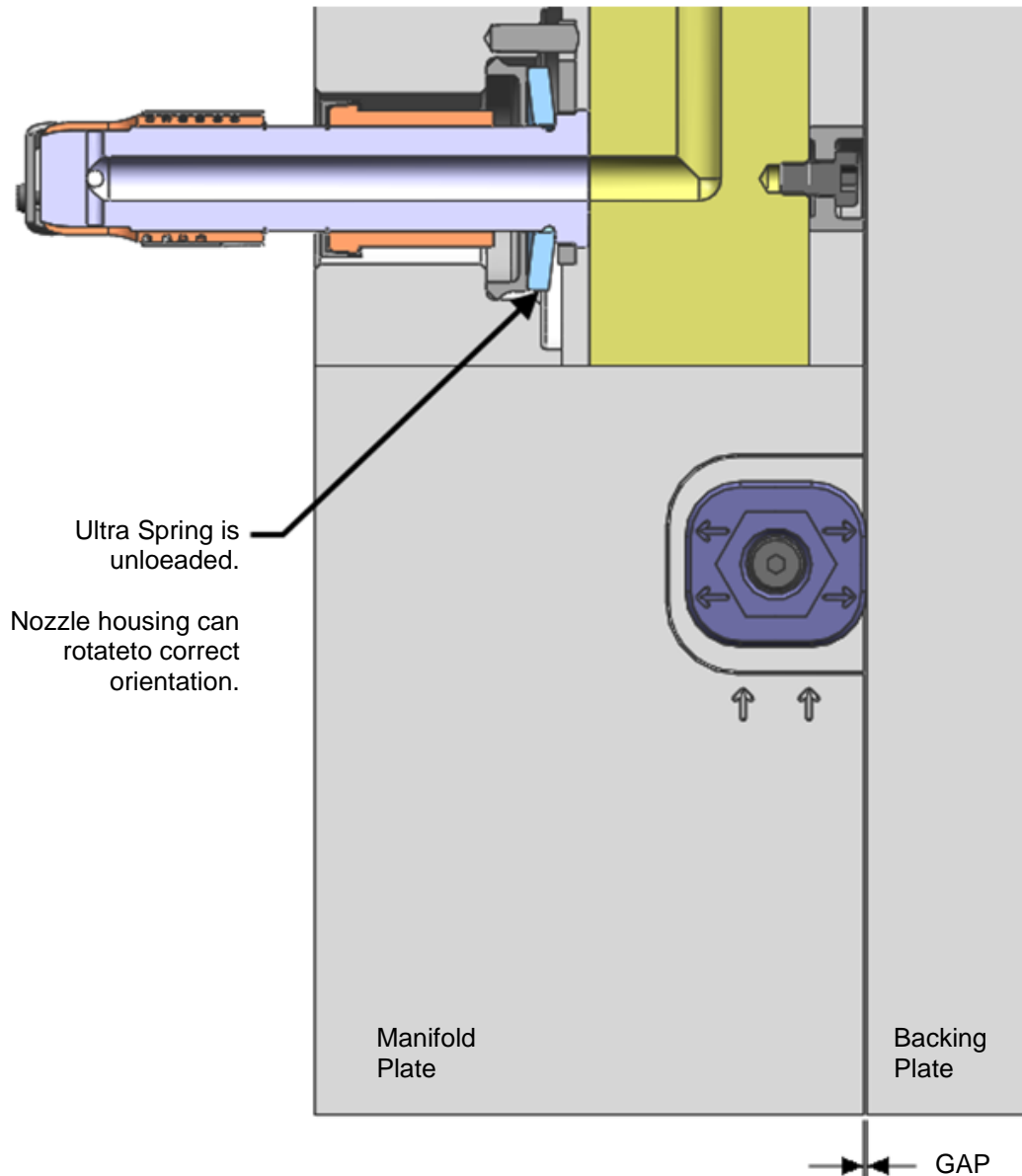


Figure 26 Cams in Open Position

Manifold System with Side Gate

Specific SideGate installations which must be considered for plate design. Images show the installation envelope, the installation details will be on the customer prints.

Cam Jack installations 2 on the Operator and 2 on the Non-Operator side of the manifold plate near the corners. (Figure 27)

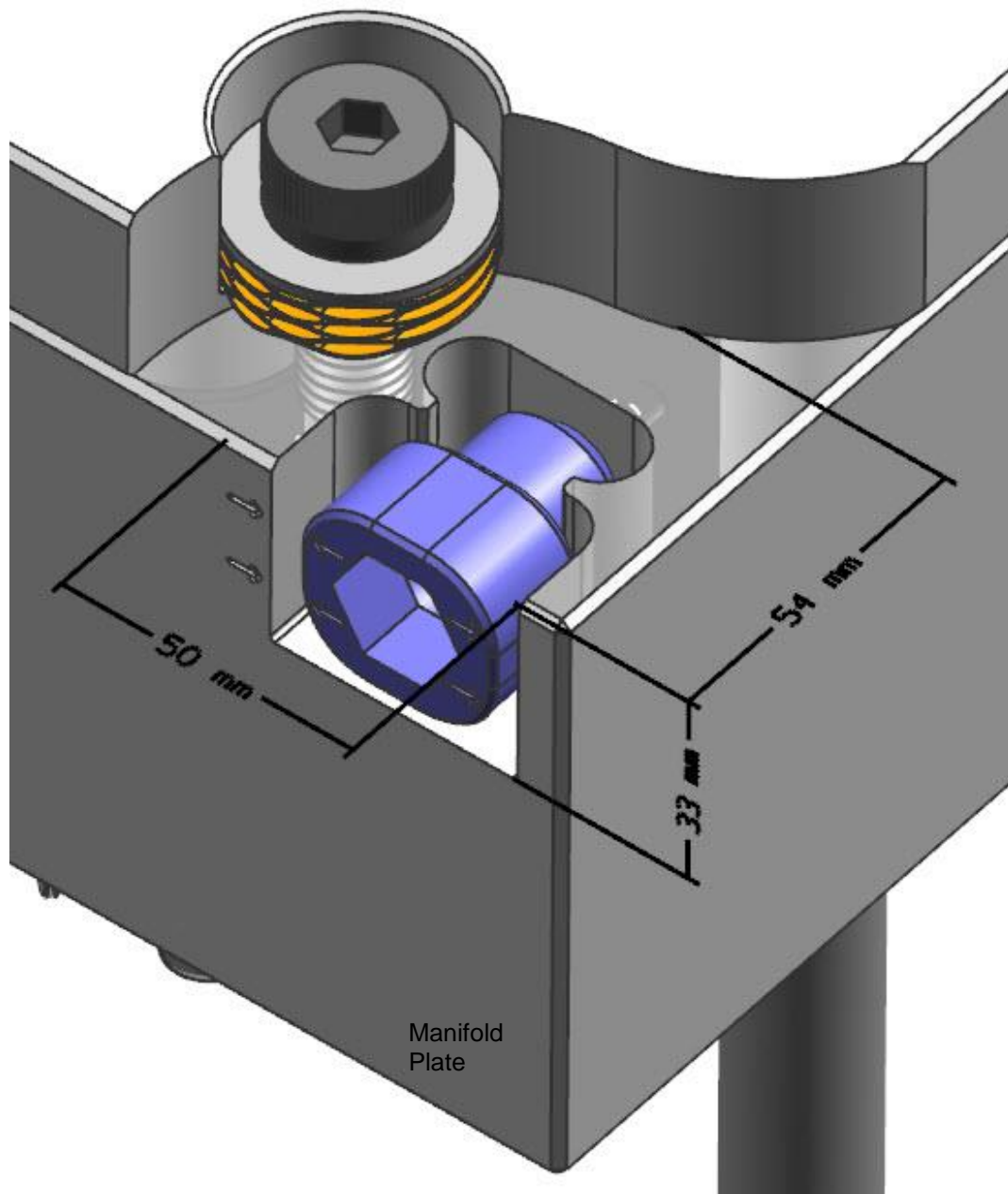


Figure 27 Cam Jack Installation

Spring Loaded Shoulder Screws (Figure 28). Recommend locating near Cam Jacks

- 4 required for Backing plates that are ≤ 49.5 kg,
- For Backing plates that are > 49.5 kg, use the following formula:
 - Number of spring located shoulder screws $\geq 1.5 \times (\text{Backing plate weight in kg}) / 18.6$

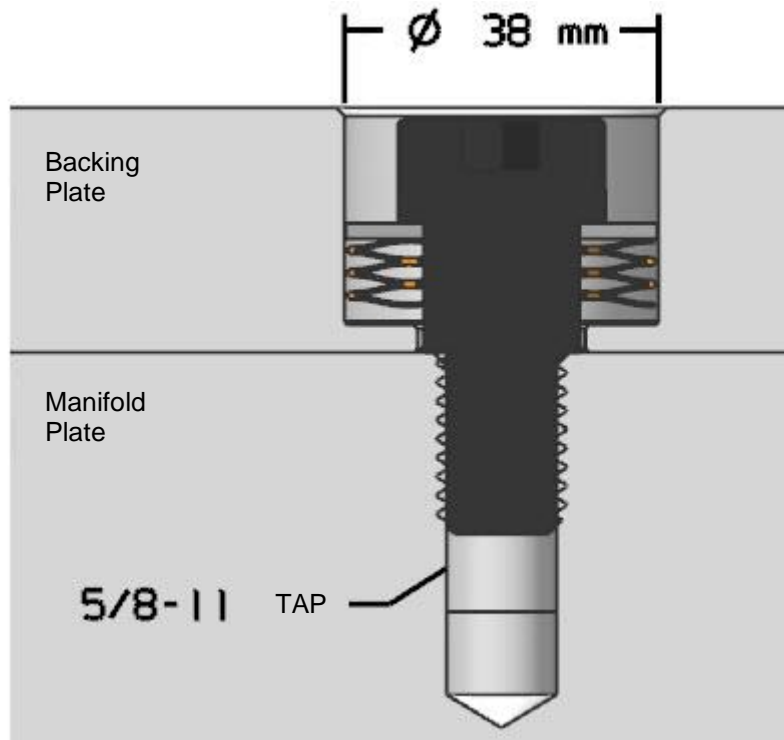


Figure 28 Spring Loaded Shoulder Screw Installation

Cam Jack Information Plate to be placed on the Operator side of the manifold plate, Second option is the Non-Operatir side. (Figure 29)

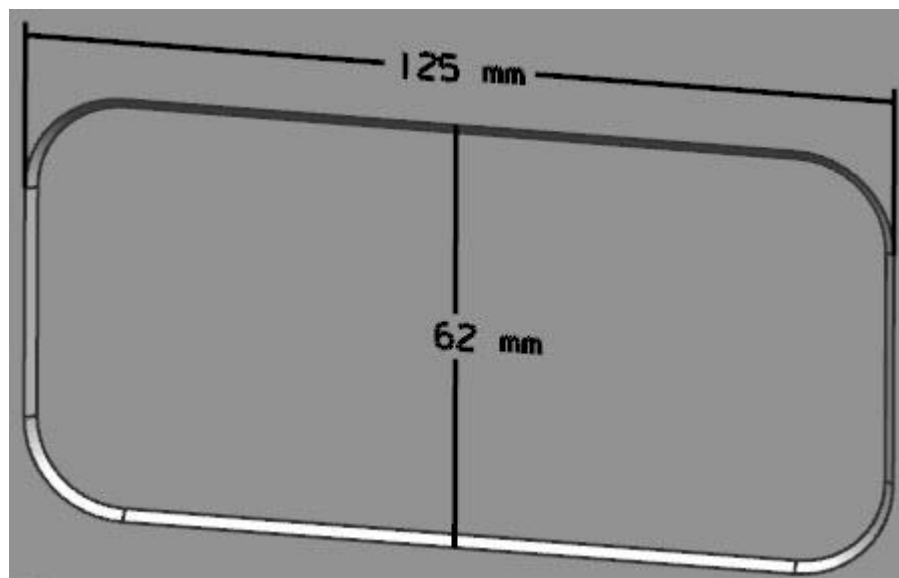


Figure 29 Cam Jack Information Plate Installation

Side Gate Stack Systems

The application of Ultra SideGate nozzles in a stack mold configuration requires special consideration in the mold and hot runner design. Contact Husky for for consultation on stack systems.

| Rev. | Change Description | Name | Date | Driven by |
|------|--|--------------------|------------|-----------|
| 0 | Original Issue | T.Lawrence | 2011-05-09 | |
| 1 | Added cooling guideline. | T.Lawrence | 2011-05-20 | |
| 2 | Added measuring cavity align, sep. cavity plate, HS dowel location | S.Gray | 2012-03-08 | |
| 3 | Added part geometry considerations and jacking bolt image | S.Gray | 2012-06-08 | |
| 4 | Added cavity orientation note | S.Gray | 2013-02-25 | |
| 5 | Added cavity shut off and multi material sections | S.Gray | 2013-07-11 | |
| 6 | Added section for stack systems (pages 21-27) | S.Gray/M.Thweatt | 2014-08-18 | SR 41368 |
| 7 | Figure 13 Changed Minimum Plate thickness from 3mm to 1mm Added two piece cavity insert and image to Cavity Alignment Section | S.Rainville | 2015-01-30 | SR 41301 |
| 8 | Reworded side gate stack system section for clarity | S.Rainville | 2015-02-21 | SR 41301 |
| 9 | Updated Stack Section, Added Inline, various format updates | W. Gunn | 2017-02-24 | |
| 10 | Added SideGate specific installations for manifold systems | S.Rainville | 2018-02-23 | SR 51663 |
| 11 | Added warning regarding tip retention and individual gate insert | A.Dufour | 2020-12-10 | SR 61580 |
| 12 | Clean up document for translation | A.Dufour | 2021-11-12 | SR 61861 |
| 13 | Add max draft angle | A.Dufour | 2021-12-13 | SR 63474 |
| 14 | Reword demolding information in draft angle section | A.Dufour M.Zong | 2023-05-15 | SR 66429 |