

Plate Design Guidelines for Husky Manifold Systems

6762104-12

HUSKY®

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How to Use This Guide

This guide is designed to help a mold maker integrate a Husky Manifold System into their plate and mold design. The guide is broken into three main sections:

1.) Nomenclature used with Husky Manifold Systems

2.) General Recommendations

3.) Plate design steps which include adding:

- Manifold pocket

- Plate bolts

- Guide pins and cavity plate interface taps

- Hot runner plate alignment dowels

- Plate cooling

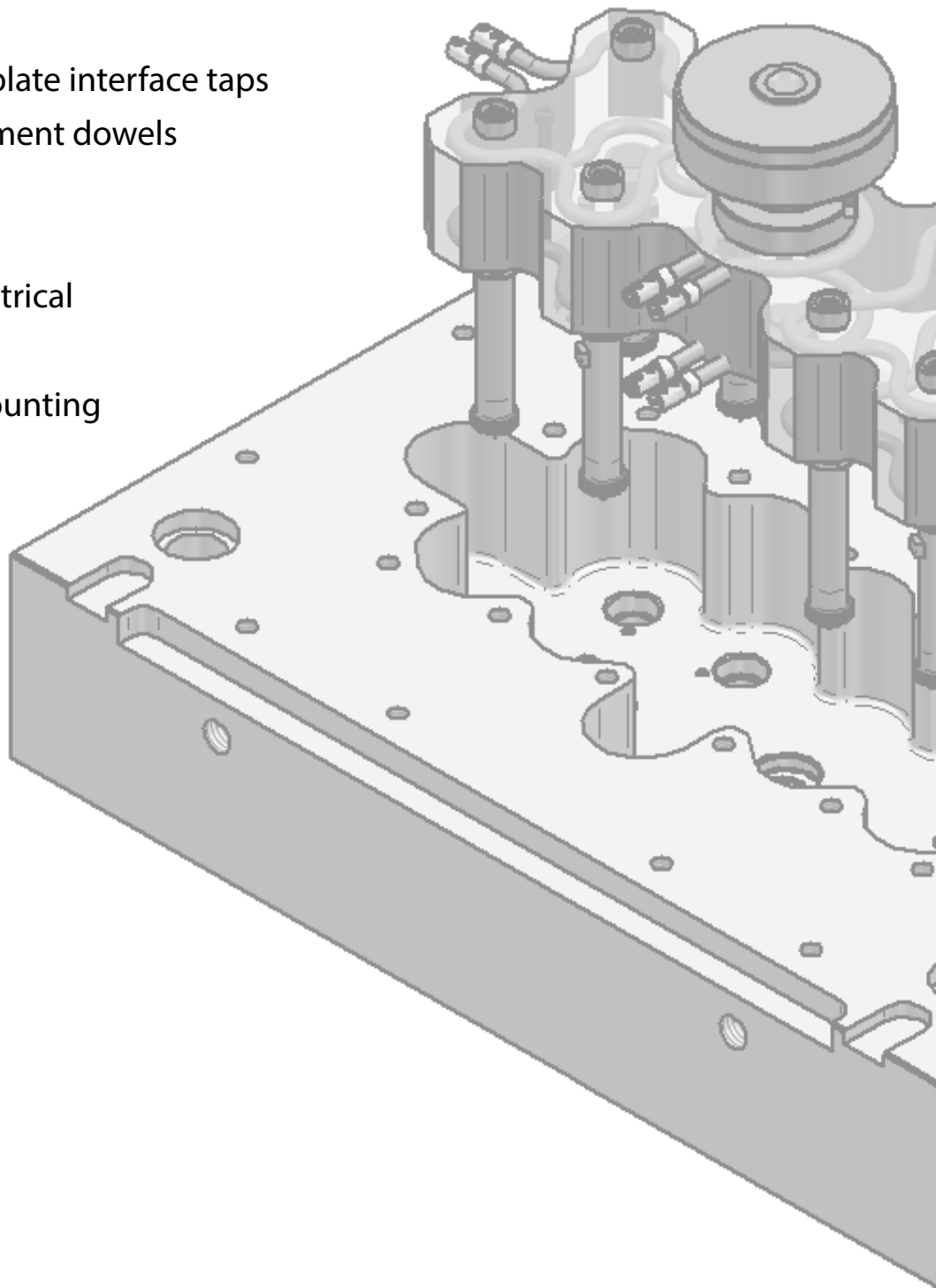
- Air lines (if valve gate)

- Wire channels and electrical

- Pry slots and drainage

- Lift taps and platen mounting

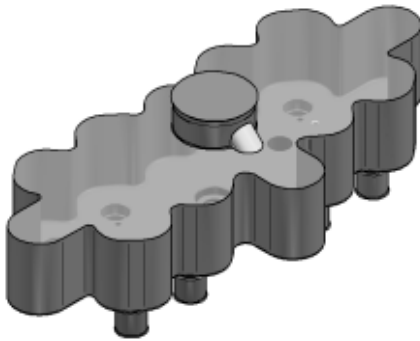
- Nameplate



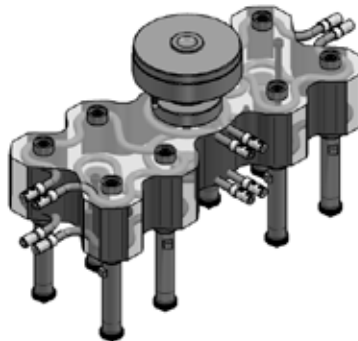
Design Package

The following design items are provided by Husky with all manifold systems

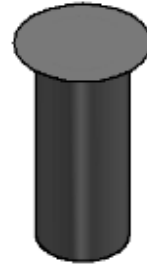
3D Models



Pocket Inverse

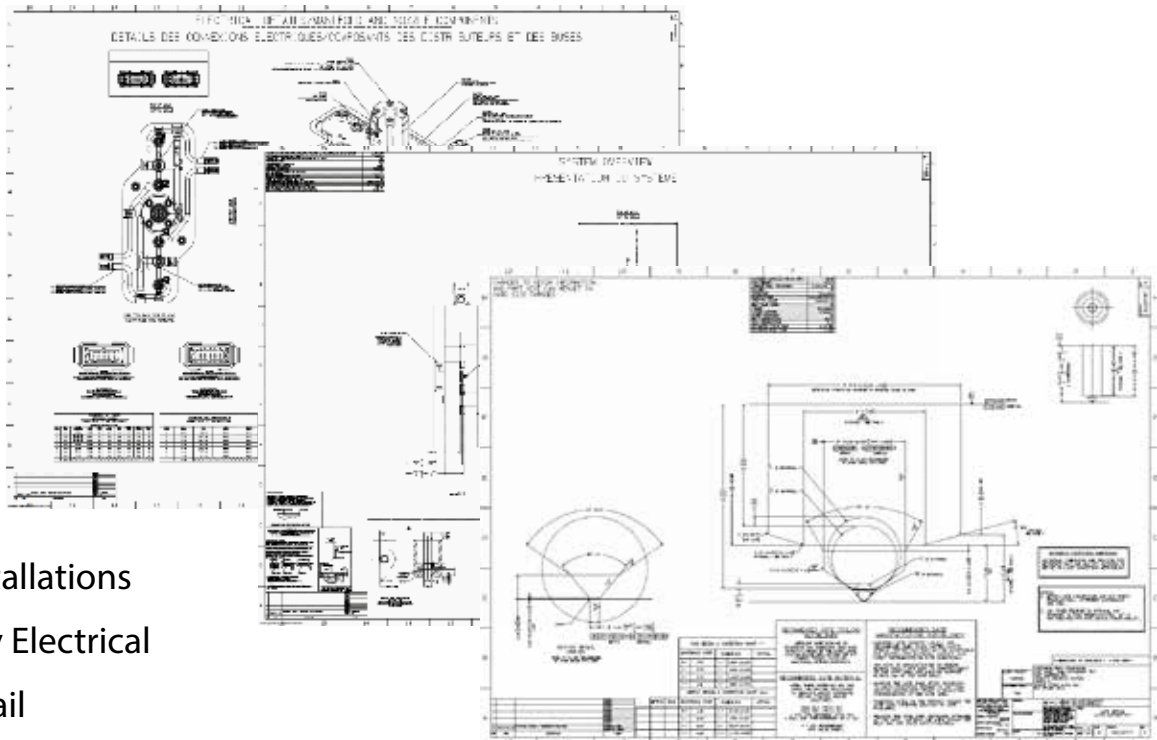


Manifold Assembly



Gate Detail Inverse

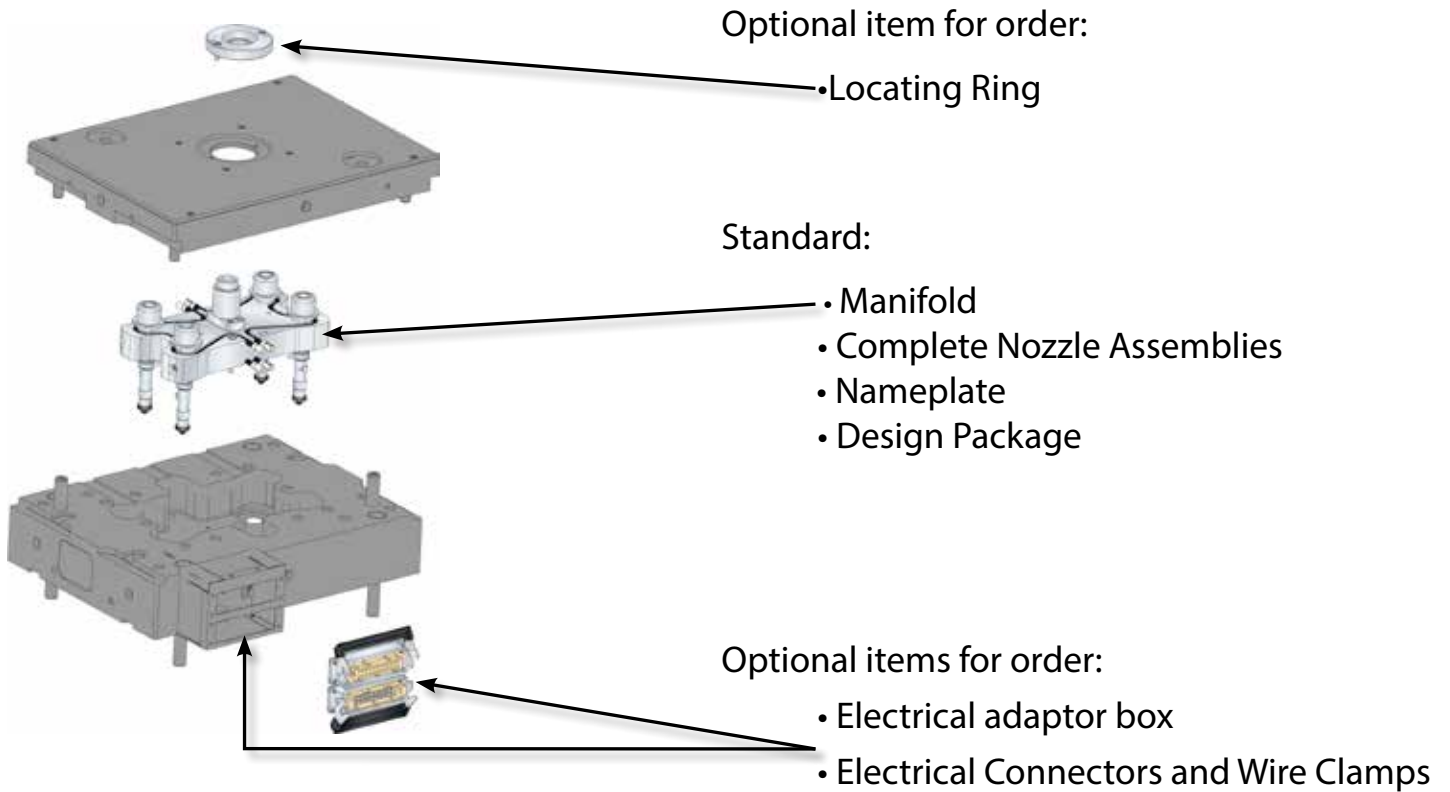
2D Print Package



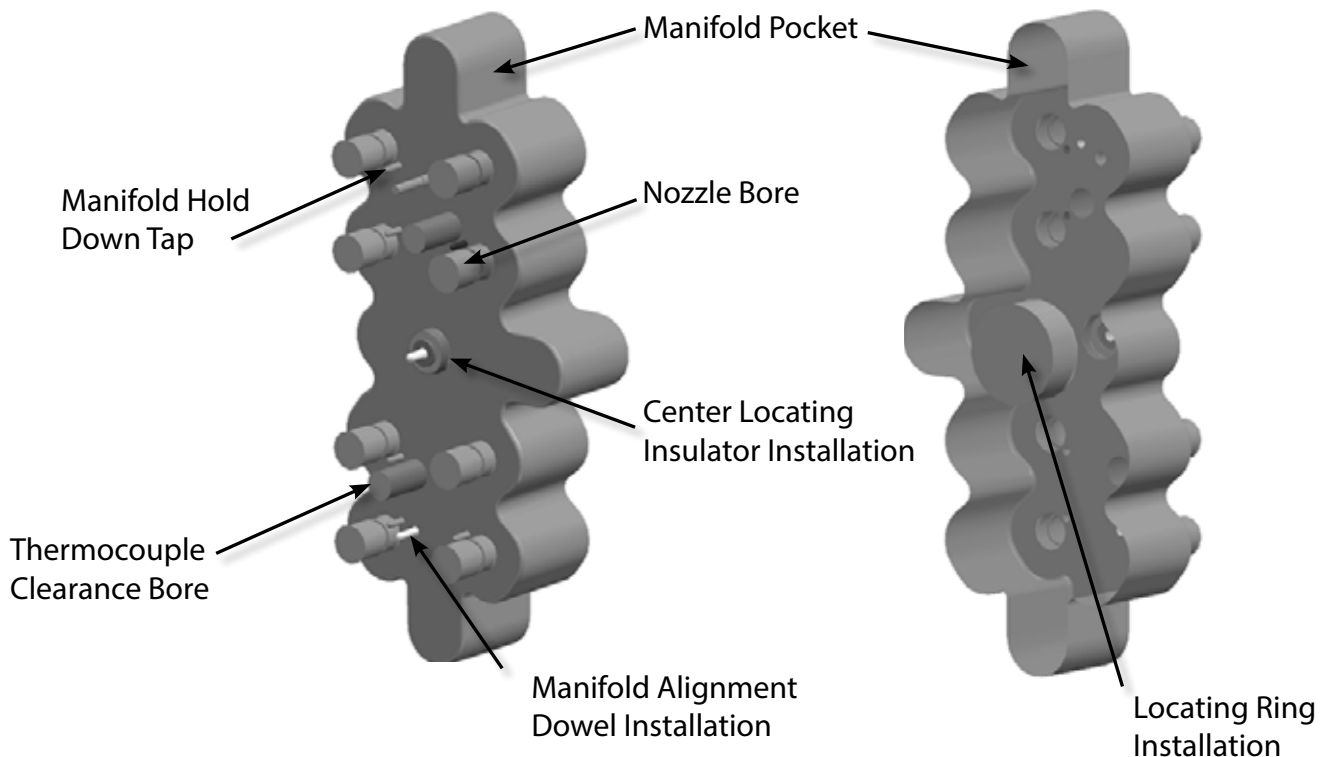
- Plate Installations
- Assembly Electrical
- Gate Detail

Nomenclature

Supplied by Husky

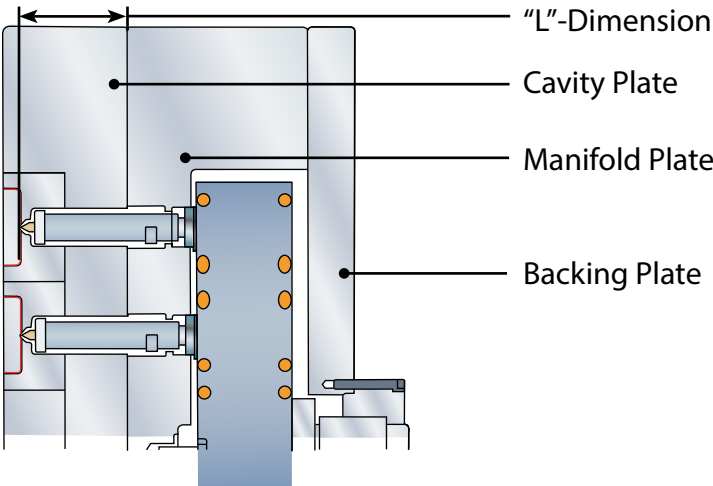
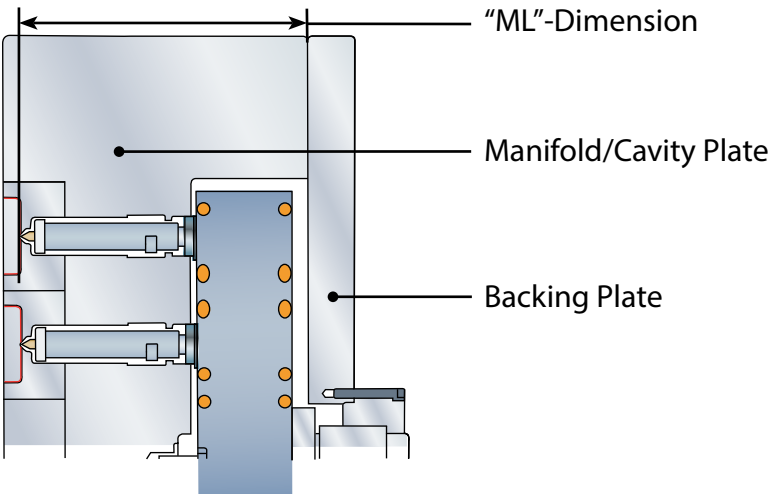
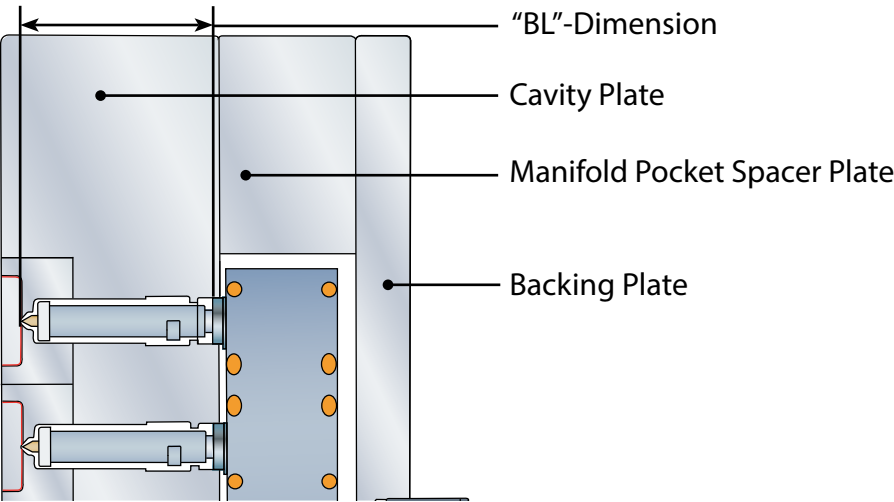


3D Pocket Geometry



Nomenclature

Typical Plate Split Options*

<div>Husky Standard</div> <div><p>"L"-Dimension</p><p>Cavity Plate</p><p>Manifold Plate</p><p>Backing Plate</p></div>	<p>*The remainder of this guide assumes "Husky Standard" installation. However, the basic steps are unchanged regardless of plate split option. Husky calculates and accounts for thermal expansion in manifold and nozzle design</p> <p>**BL-dimension is to the bottom of the nozzle locating bore</p>
<div>Integrated Manifold and Cavity Plate</div> <div><p>"ML"-Dimension</p><p>Manifold/Cavity Plate</p><p>Backing Plate</p></div>	
<div>Manifold Pocket Spacer Plate</div> <div><p>"BL"-Dimension</p><p>Cavity Plate</p><p>Manifold Pocket Spacer Plate</p><p>Backing Plate</p></div>	

General Recommendations

Plate Steel

Stainless steel is the recommended material for plate manufacture.

Recommended plate material properties:

- Minimum Yield Strength 640 Mpa
- Hardness 24-36 HRC

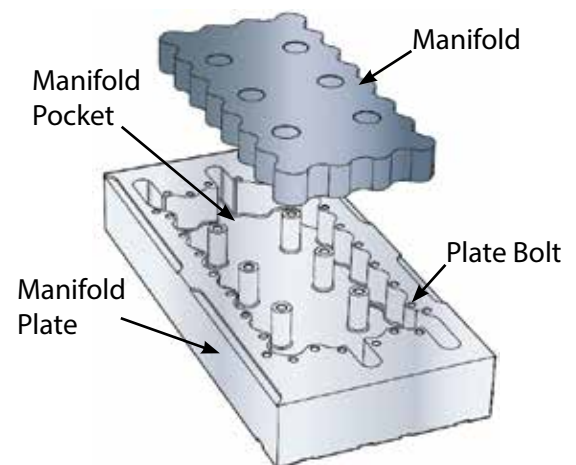
Examples of suitable steels types are listed below:

Type	Hardness (HRC)
AISI 4140	30-35 HRC
AISI P20	30-35 HRC
AISI 420	30-35 HRC
DIN 1.2316	30-35 HRC

Manifold Pocket

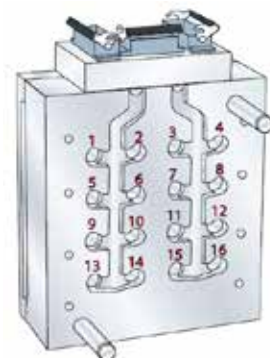
Husky recommends machining a pocket into the manifold plate for the manifold. The 3D model provided by Husky includes all necessary geometry. A pocket profiled to match the manifold:

- Allows close positioning of the plate bolts to the nozzle components, minimizing plate deflection
- Provides superior structural support for the mold and cavities
- Maintains a consistent air gap between the manifold and manifold pocket to thermally insulate the manifold from the surrounding plates



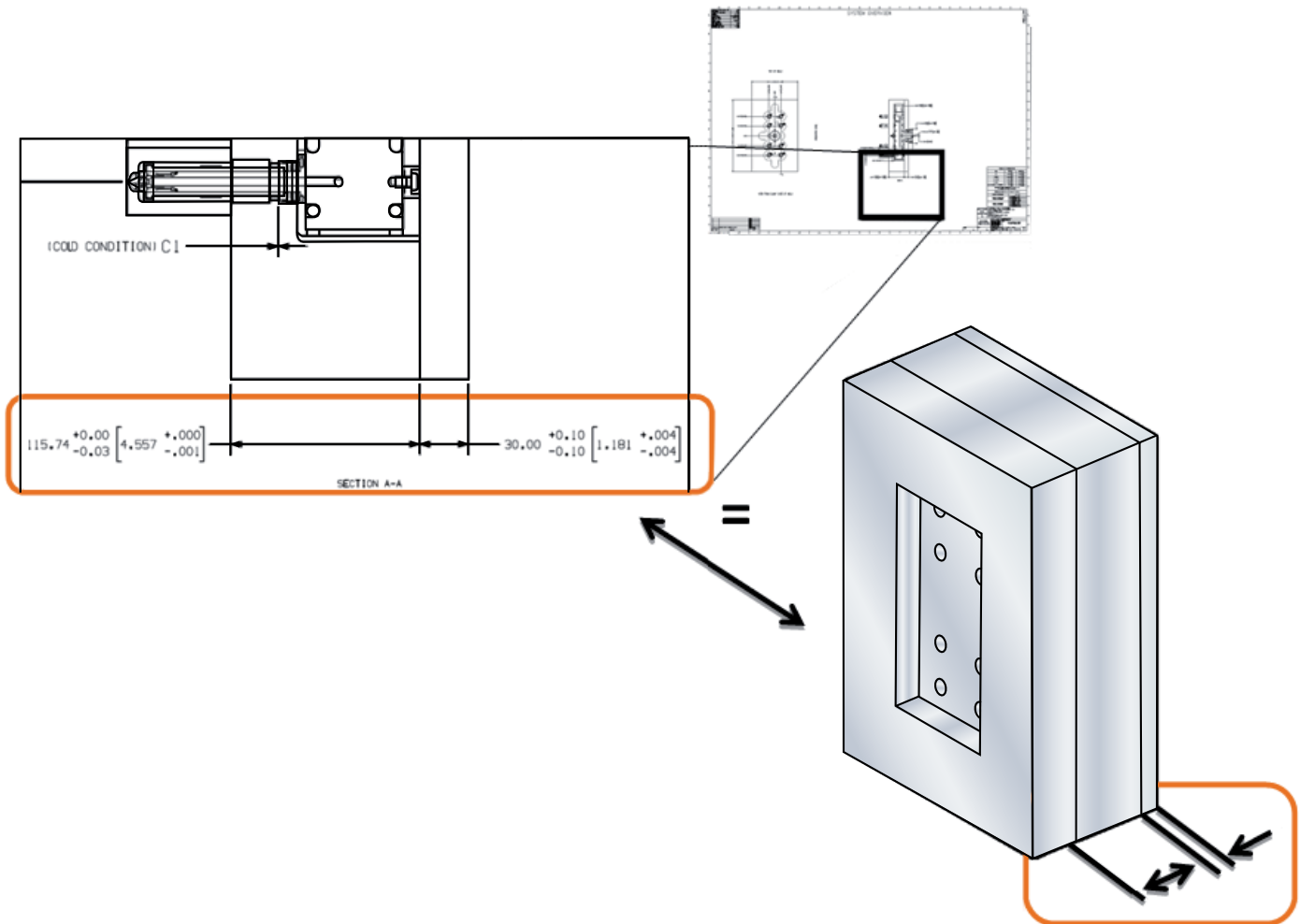
Cavity Numbering

Clear nozzle identification is necessary to ensure the hot runner properly interfaces with the mold and that the nozzles are mapped correctly.

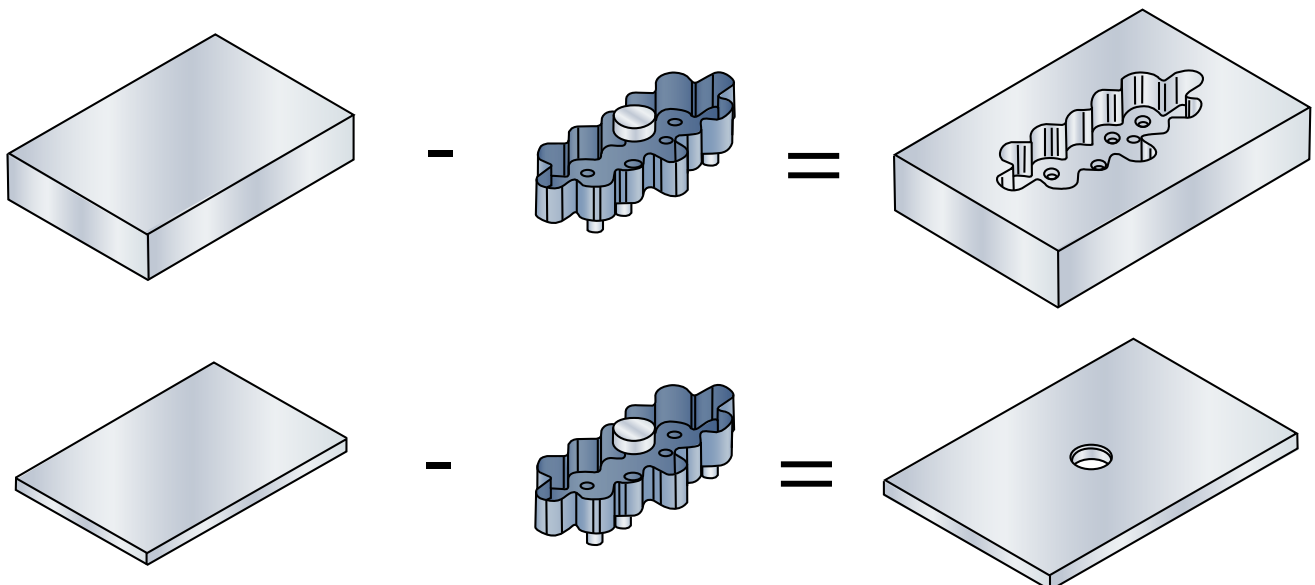


Installing Manifold Pocket in Plates

Step 1- Adjust Plate Thicknesses



Step 2- Subtract Pocket Inverse from Plates



Add Plate Bolts

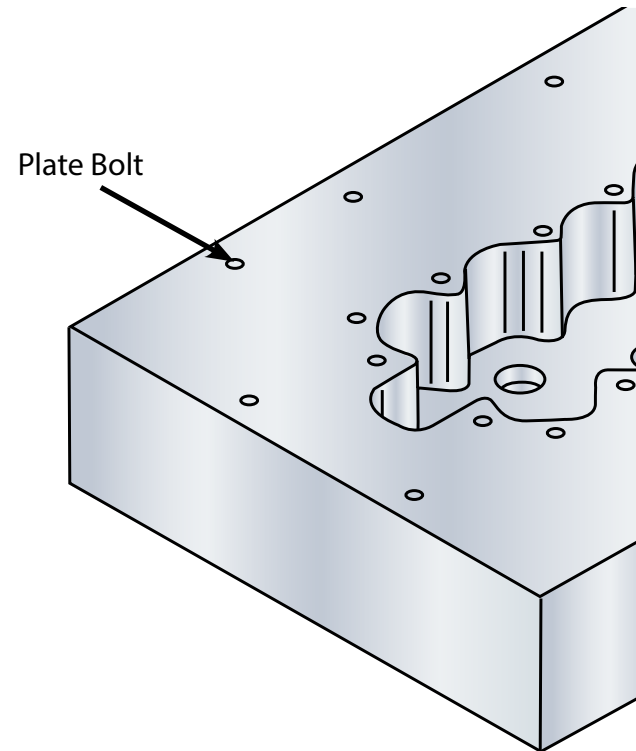
Why good plate bolting is important

The function of the plate bolts is to resist plate separation forces generated under normal operation. If the forces are not balanced, they can bend (or “bow”) the plates which in certain situations can cause:

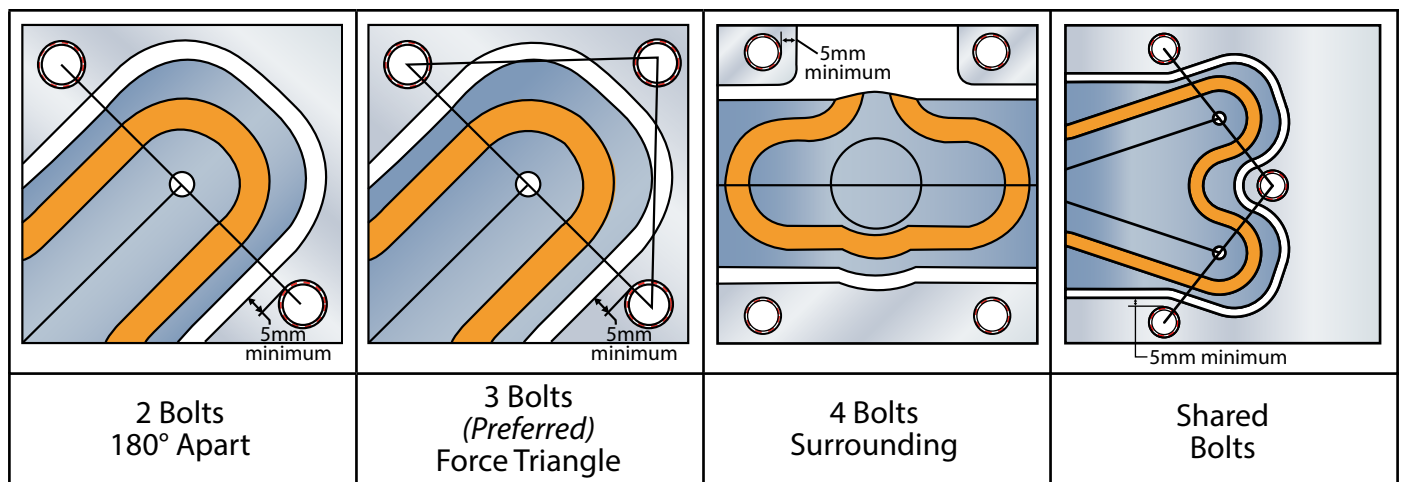
- Premature wear of tightly-toleranced mold and hot runner components
- Leakage in manifold pocket
- Part flash

Step 1- Determine Bolt Size

	Nozzle Size (Refer to Hot Runner Description)	Quantity x Size (minimums)
Nozzle	Ultra 250	2xM12 or 1/2"
	Ultra 350	2xM12 or 1/2"
	Ultra 500	2xM12 or 1/2"
	Ultra 750	2xM16 or 5/8"
	Ultra 750 and Injection Pressure >26K psi [1793 bar]	3xM16 or 5/8"
	Ultra Packaging (UP)	2xM16 or 5/8"
	U1000	3xM16 or 5/8"
	U1250	4xM20 or 3/4"
Other	Around Center Insulator	4xM16 or 5/8"
	Cross Manifold Spring Pack	4xM20 or 3/4"



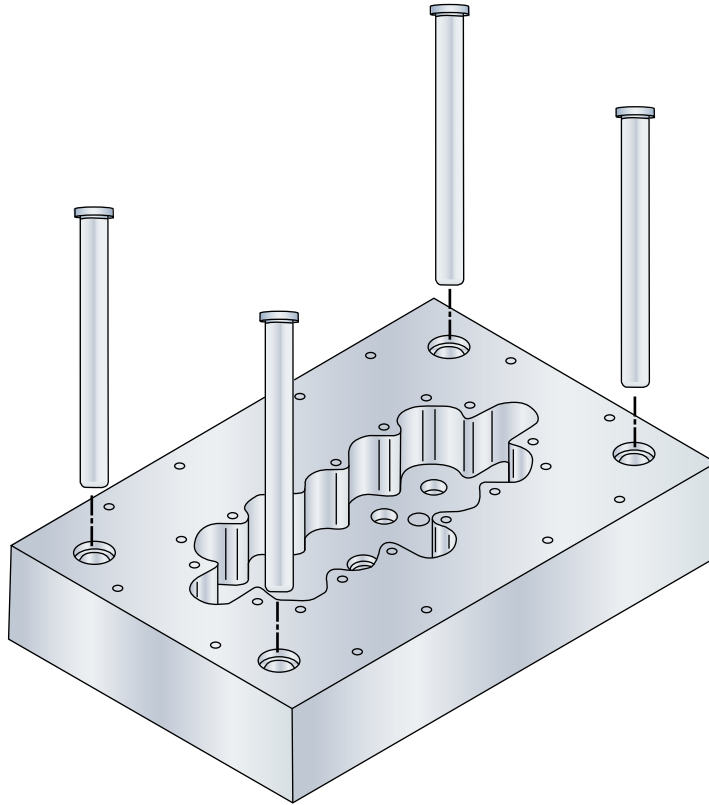
Step 2- Position Bolts



Add Mold Interfaces

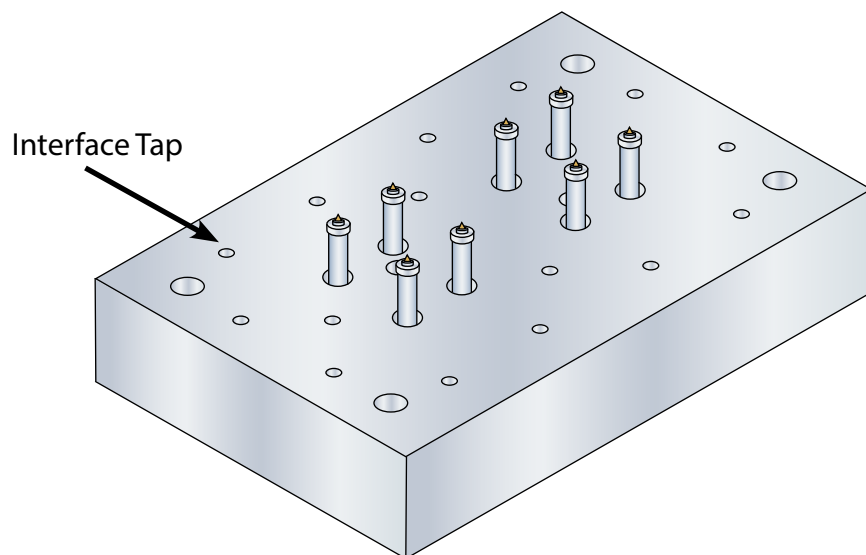
Step 1- Add Guide Pin Installations

Guide pins align the hot runner manifold plate to the cavity plate and protect nozzle tips during lifting and handling (if hot runner built “hot half” style). Husky recommends guide pin protrusion greater than or equal to 5mm [0.19"] longer than the nozzle length in order to protect the tips



Step 2- Add Cavity Plate Interface Taps

Interface taps secure the cavity plate to the hot runner manifold plate



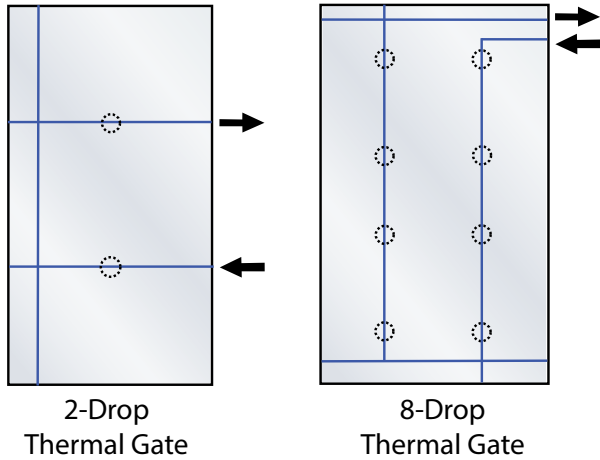
Add Backing Plate Cooling

Plate cooling circuits maintain a uniform mold plate temperature and match thermal expansion of the mold plates. To design a uniformly cooled mold, consideration must be given to the cooling circuit layout, number of channels, lengths, and diameters.

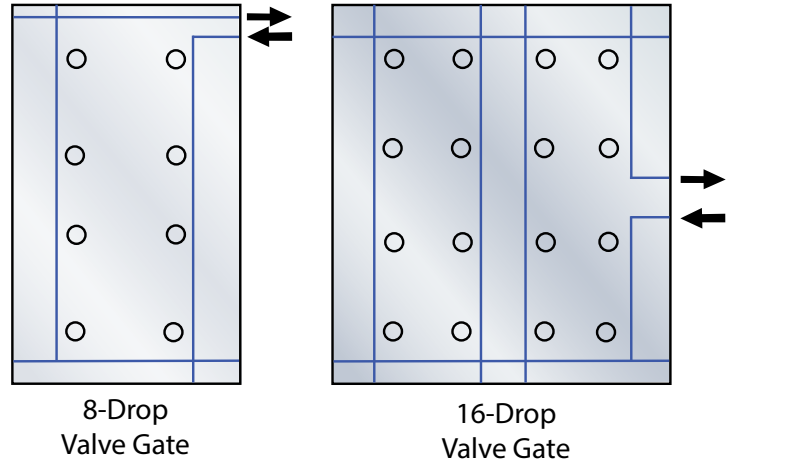
Apply cooling to all drops.

Sample Layouts

Thermal Gate Examples



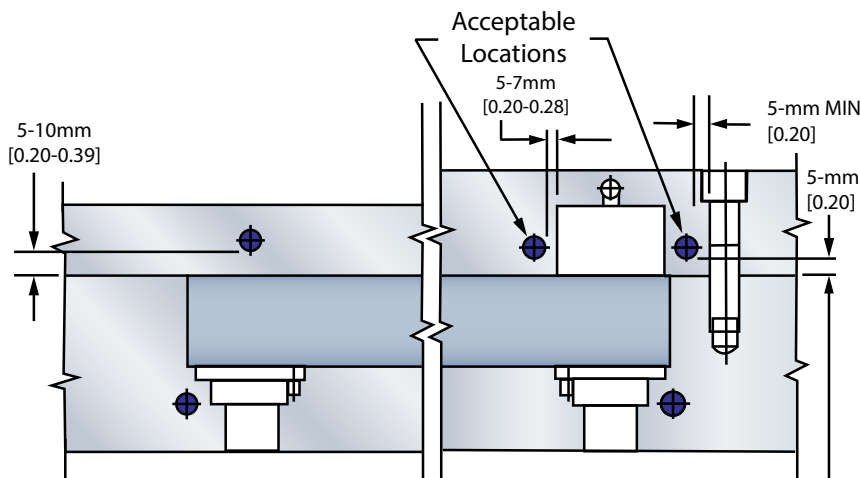
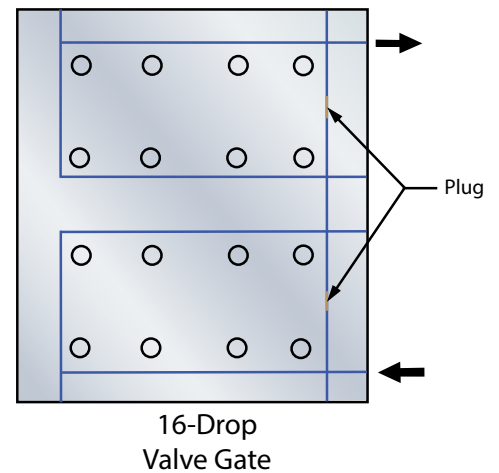
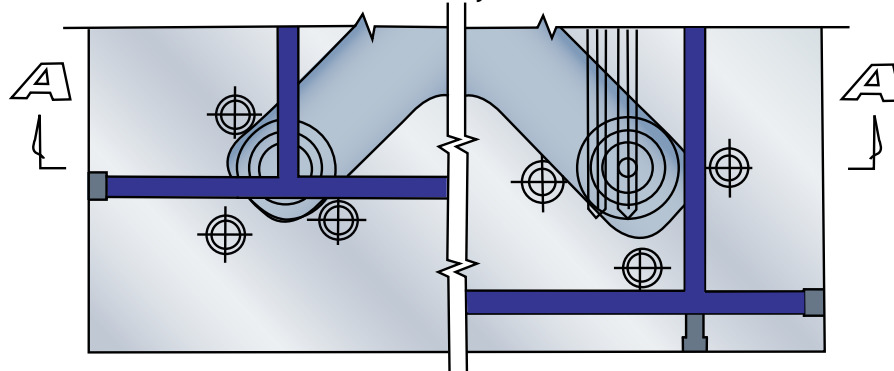
Valve Gate Examples



Thermal Gate

Valve Gate

View from Injection Side

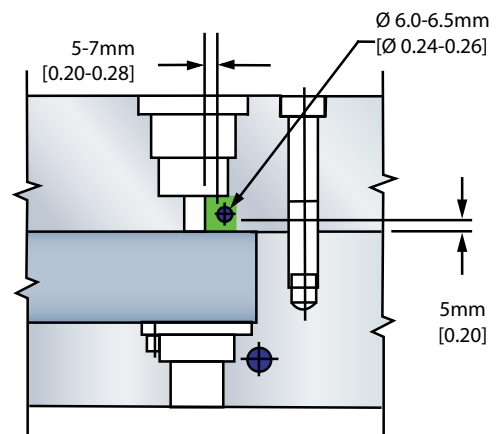


Thermal Gate

Valve Gate

Section A-A

IMPORTANT
Cooling lines should remain close to the contact area of the drop backup pad



EMI Valve Gate

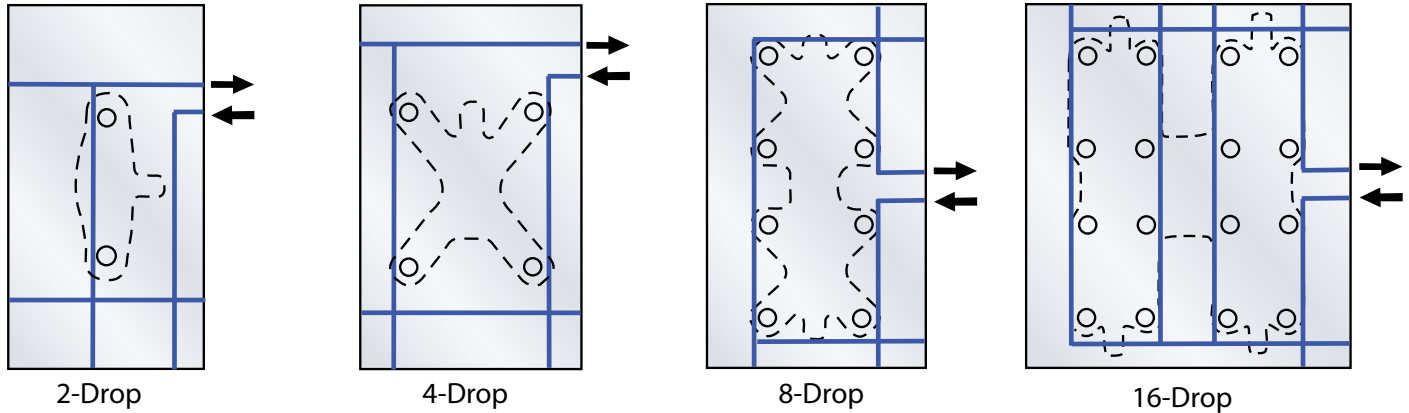
For best results, apply cooling in the green region shown above

Add Manifold Plate Cooling

Plate cooling circuits maintain a uniform mold plate temperature and match thermal expansion of the mold plates. To design a uniformly cooled mold, consideration must be given to the cooling circuit layout, number of channels, lengths, and diameters.

Apply cooling to all drops.

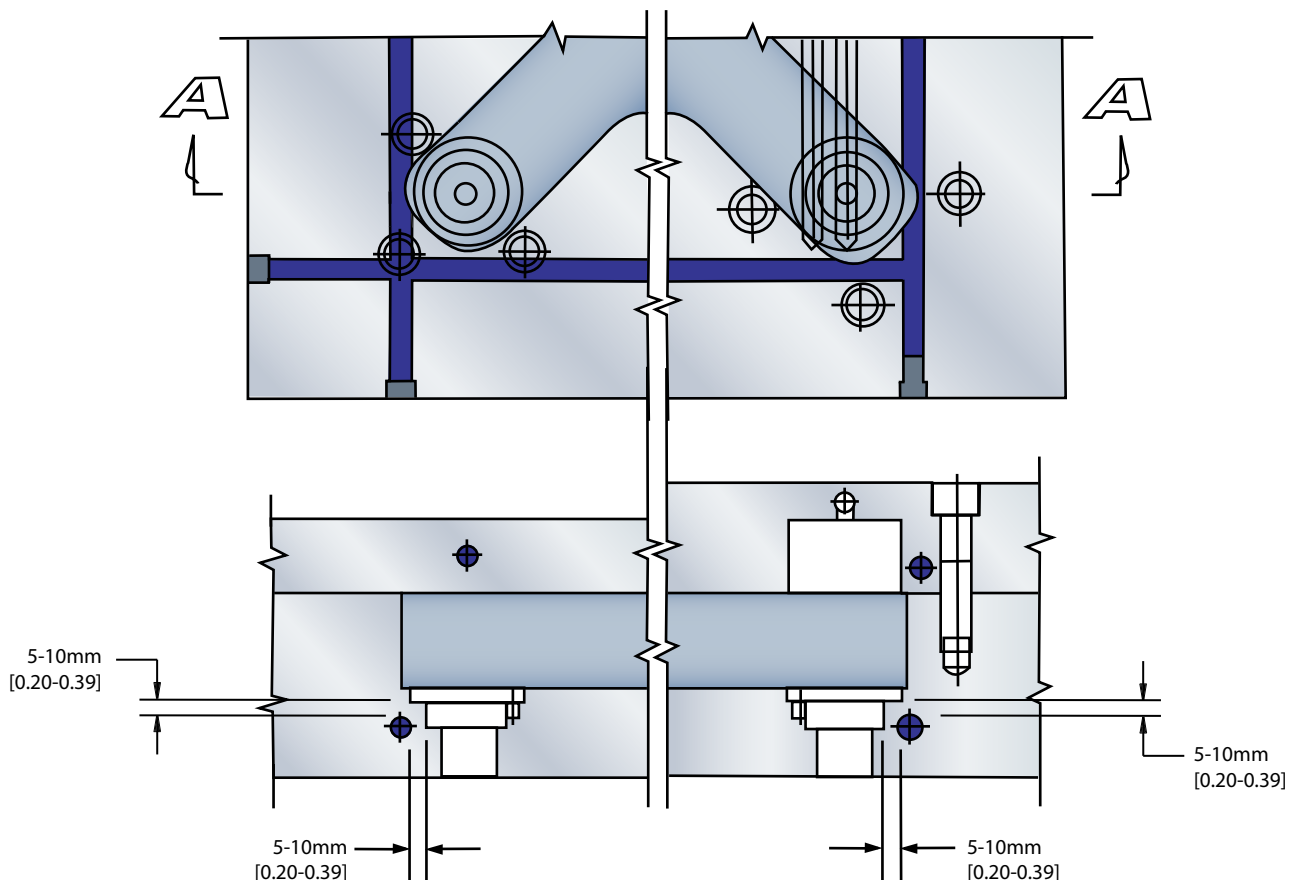
Sample Layouts



Thermal Gate

Valve Gate

View from Injection Side



Section A-A

Add Air Lines (if Valve Gate)

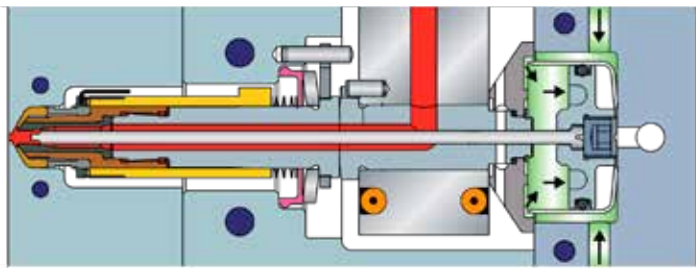
Step 1- Add Air Lines for VG Open and Close

A maximum of 36 drops can be on one circuit. Use a balanced design wherever possible (same distance to each piston)

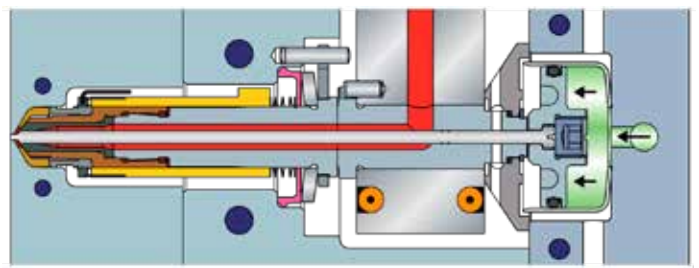
Air fittings on the Hot Runner should have an internal diameter of no smaller than 9.525mm [3/8"] and no larger than 15.875mm [5/8"]

Husky recommends using Quick Disconnect from:

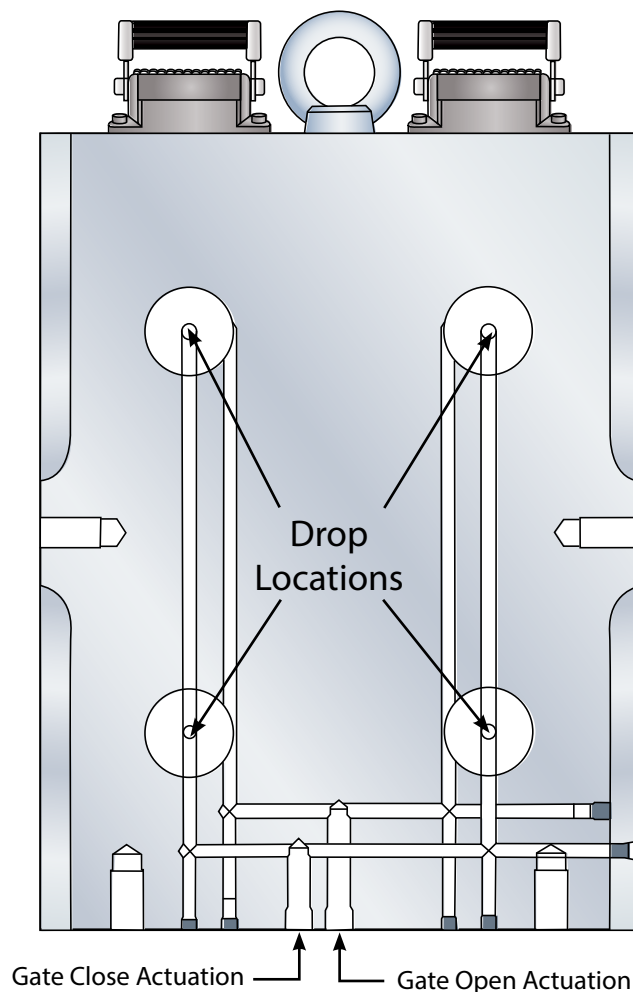
- DME, part number JP-353
- Hasco, part number Z81/19/24x1.5



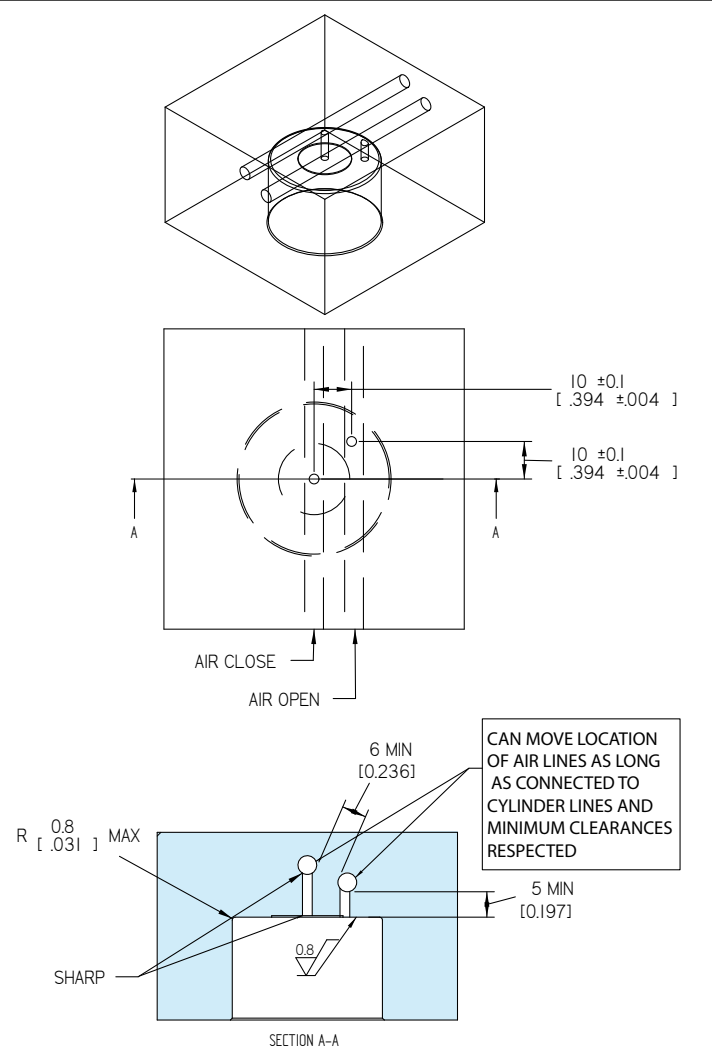
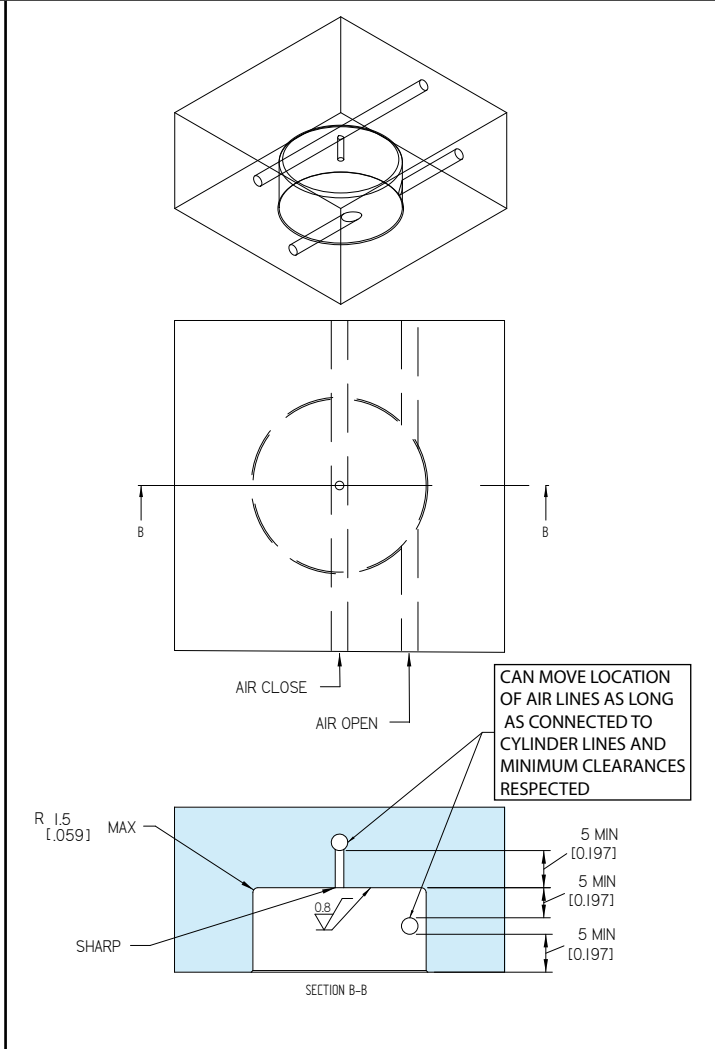
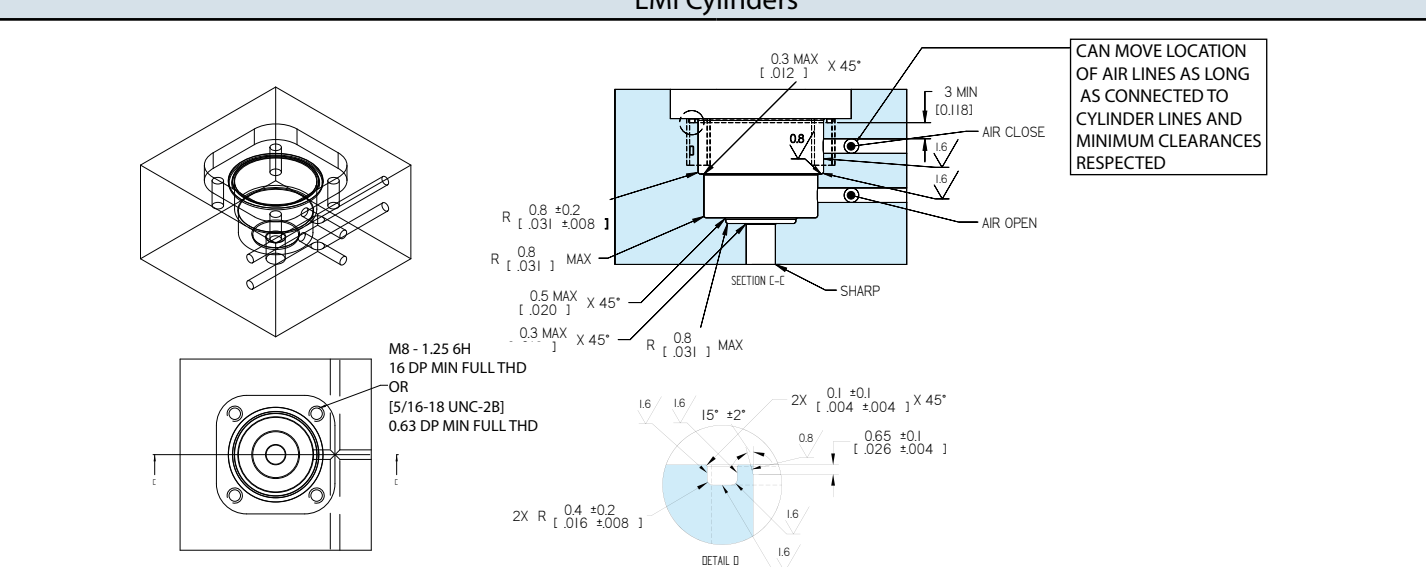
Open Stroke



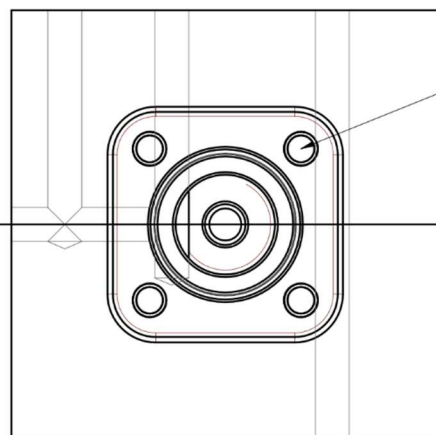
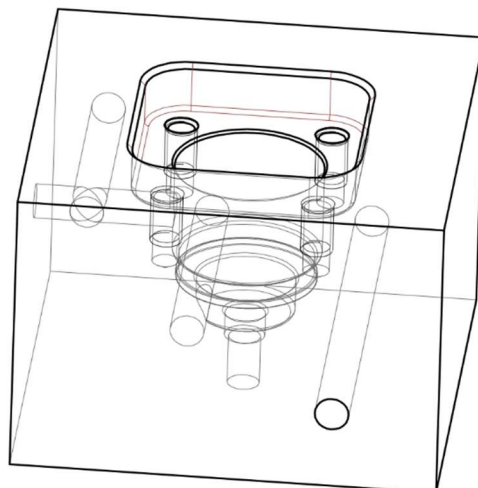
Close Stroke



Refer to 3D model for complete geometry

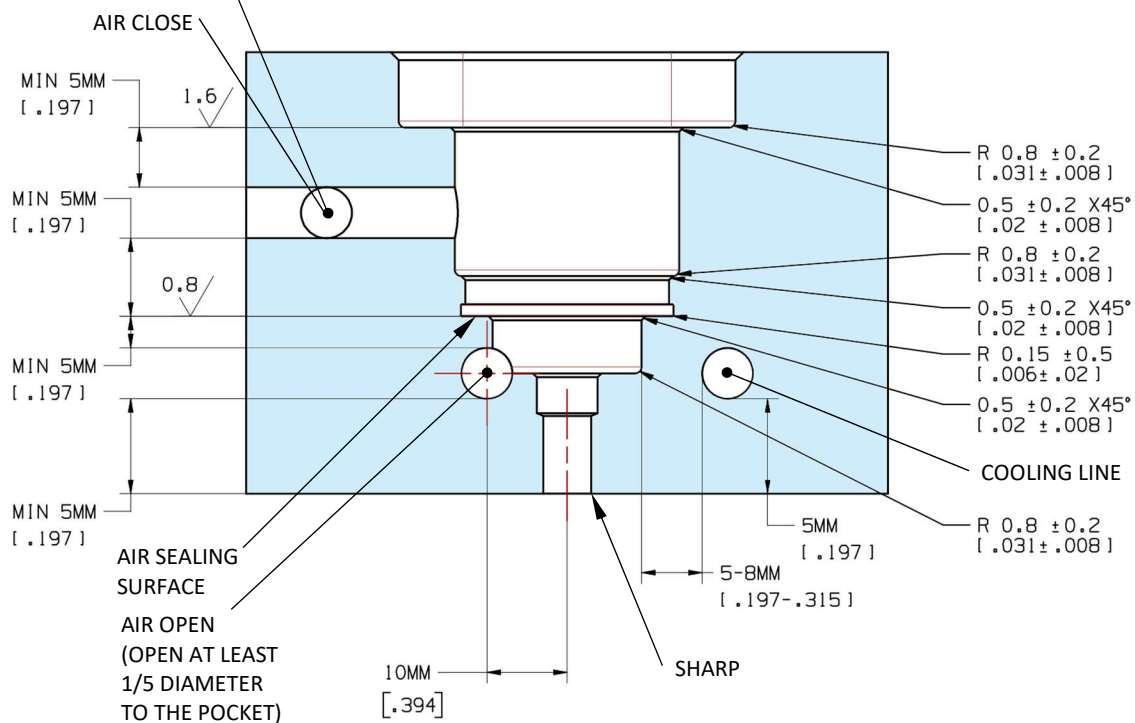
SX Cylinders	LX , EX and Ultra 1000 Cylinders
 <p>Isometric view of SX Cylinders.</p> <p>Cross-sectional view (Section A-A) showing air lines and dimensions:</p> <ul style="list-style-type: none">Air line diameter: 10 ± 0.1 [.394 ± 0.004]Air line length: 6 MIN [0.236]Air line clearance: 5 MIN [0.197]Radius: $R \ 0.8$ [.031] MAXChamfer: 0.8 SHARP <p>Section A-A</p> <p>CAN MOVE LOCATION OF AIR LINES AS LONG AS CONNECTED TO CYLINDER LINES AND MINIMUM CLEARANCES RESPECTED</p>	 <p>Isometric view of LX, EX and Ultra 1000 Cylinders.</p> <p>Cross-sectional view (Section B-B) showing air lines and dimensions:</p> <ul style="list-style-type: none">Air line diameter: 10 ± 0.1 [.394 ± 0.004]Air line length: 5 MIN [0.197]Air line clearance: 5 MIN [0.197]Radius: $R \ 1.5$ [.059] MAXChamfer: 0.8 SHARP <p>Section B-B</p> <p>CAN MOVE LOCATION OF AIR LINES AS LONG AS CONNECTED TO CYLINDER LINES AND MINIMUM CLEARANCES RESPECTED</p>
EMI Cylinders	
 <p>Isometric view of EMI Cylinders.</p> <p>Cross-sectional view (Section E-E) showing air lines and dimensions:</p> <ul style="list-style-type: none">Air line diameter: 0.3 MAX [.012] X 45°Air line length: 3 MIN [0.118]Air line clearance: 1.6Radius: $R \ 0.8$ [.031] MAXChamfer: 0.5 MAX [.020] X 45°Chamfer: 0.3 MAX [.012] X 45°Chamfer: 0.8 SHARP <p>Section E-E</p> <p>CAN MOVE LOCATION OF AIR LINES AS LONG AS CONNECTED TO CYLINDER LINES AND MINIMUM CLEARANCES RESPECTED</p> <p>DETAIL D</p> <p>M8 - 1.25 6H 16 DP MIN FULL THD OR [5/16-18 UNC-2B] 0.63 DP MIN FULL THD</p>	

PX Cylinder



M6 -1 6H
9 DP MIN FULL THD
OR
[1/4-20 UNC-2B]
0.37 DP MIN FULL THD

CAN MOVE LOCATION
OF AIR LINES AS LONG
AS CONNECTED TO
CYLINDER LINES AND
MINIMUM CLEARANCES
RESPECTED



Add Hot Runner Plate Alignment

The alignment dowel provides precise alignment between the manifold plate and the backing plate. In doing so, the following are maintained:

- Clearance fit between the sprue bushing and locating ring.
- Alignment between the sprue bushing and the machine nozzle (via the locating ring).
- In Valve Gate systems, alignment between valve gate piston cylinders and air open/close holes in the backing plate.

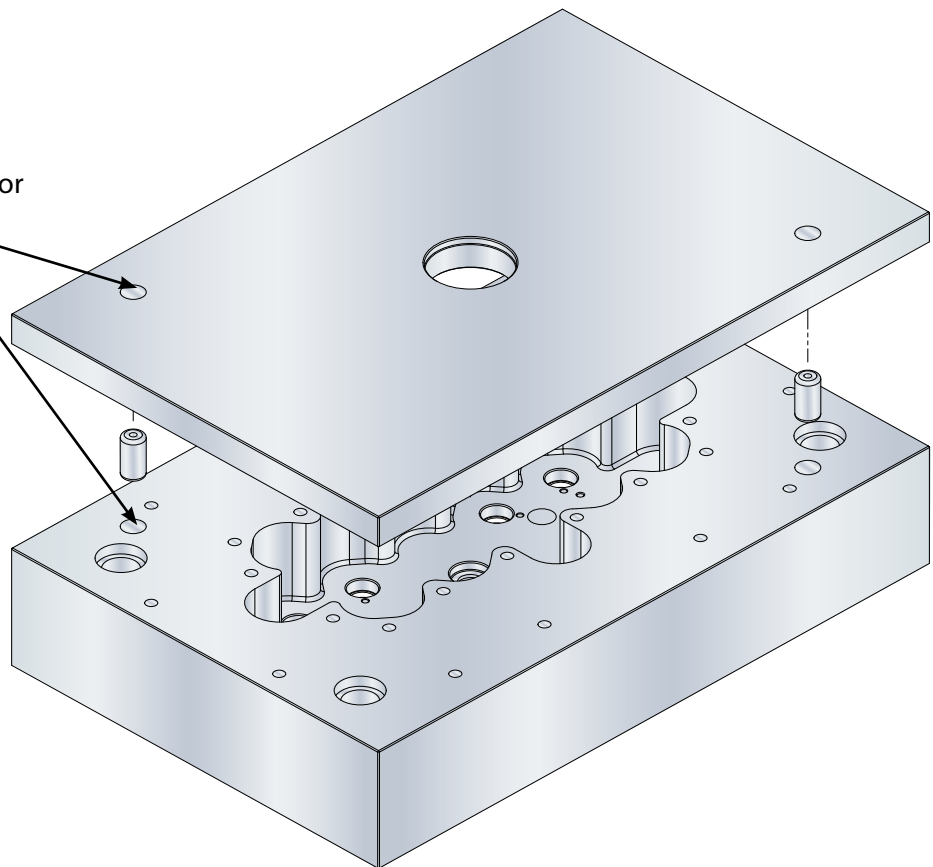
Step 1- Add dowel installation to manifold plate

Husky recommends press fit installation in manifold plate

Step 2- Add dowel installation to backing plate

Husky recommends locational fit installation in backing plate

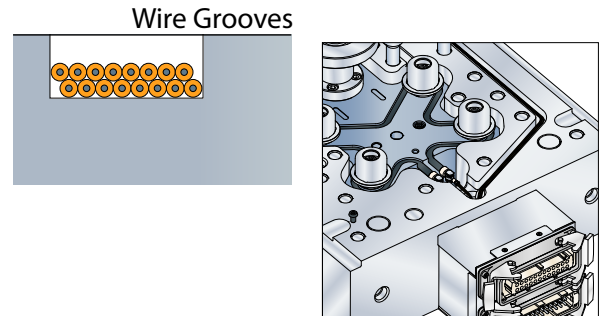
Alignment must be
within 0.010mm
[0.0005in] Total Indicator
Run out (T.I.R.)



Add Wire Channels and Electrical

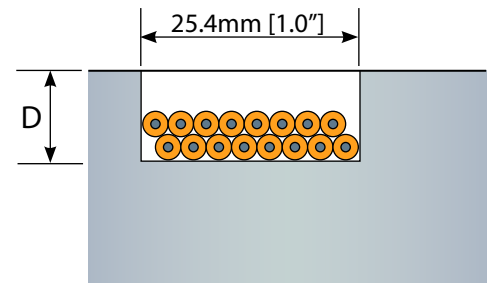
Power and thermocouple wires are typically routed to the electrical connectors within wire grooves, providing the following benefits:

- Protect the machine operator from live wires
- Provide orderly routing of hot runner wires
- Prevent potential wire damage

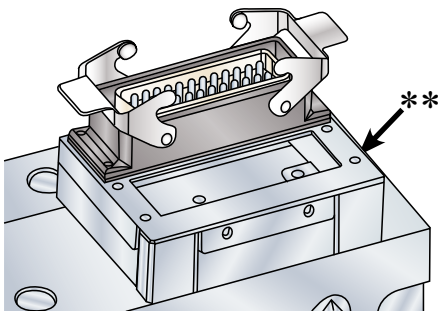


Step 1- Determine Wire Groove Depth

Number of Heaters and Thermocouples (Nozzle and Manifold)*	Recommended Groove Depth
≤ 12	11mm
13-24	18mm
25-32	23mm
*Number of heaters and TCs, not the number of wires	

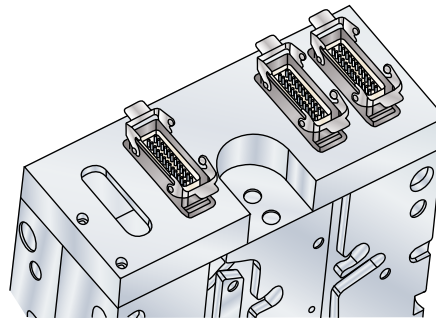


Step 2- Add Electrical Connectors

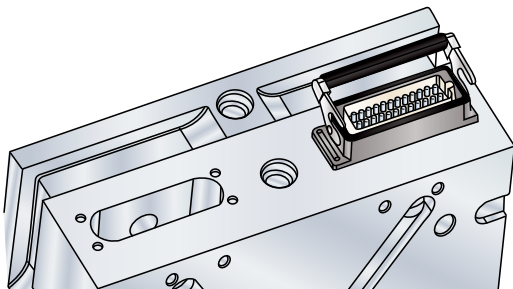


Sheet Metal Adapter Box

(**Husky can supply this box-Just ask!)



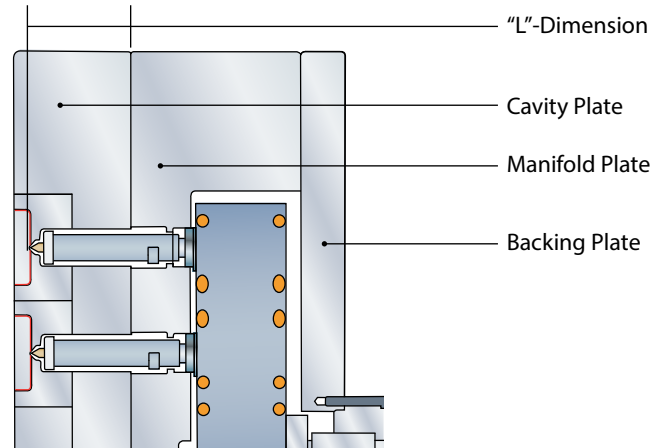
Machined Adaptor Box



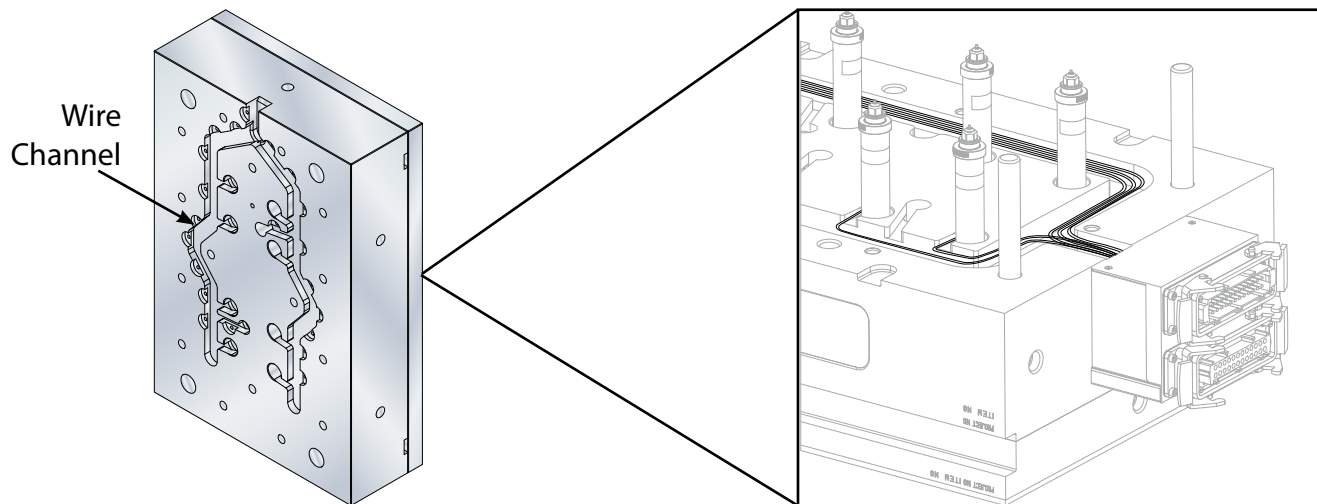
Direct Mounted

Add Wire Channels and Electrical

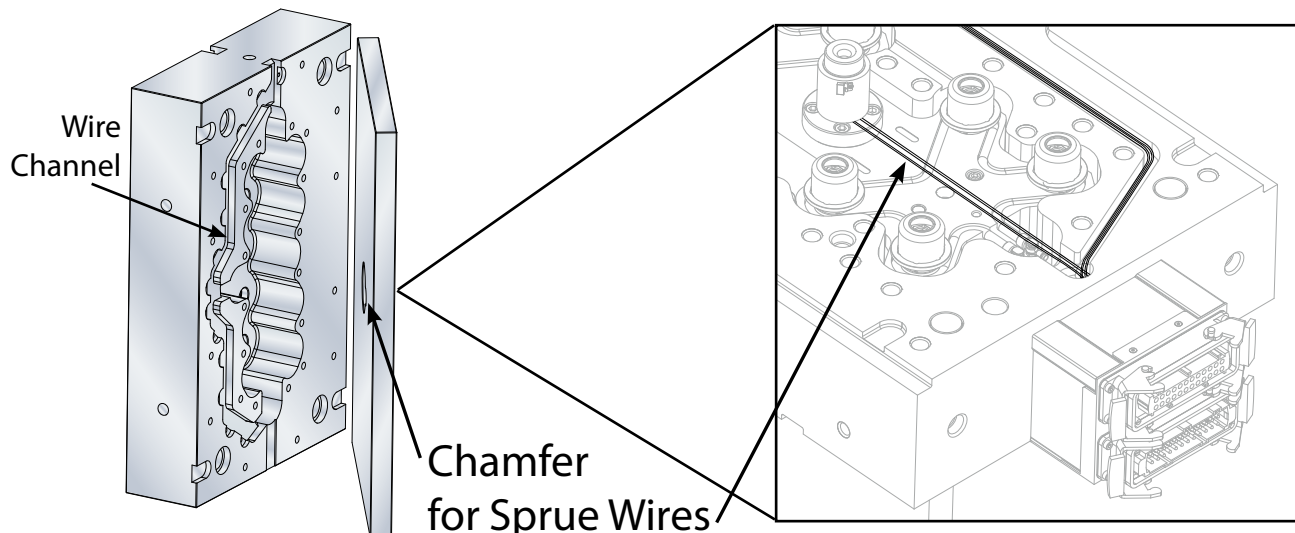
If plate split design is Husky Standard, the following wire routing is recommended



Step 3a - Route Wires for Nozzles and any Manifold TCs on Clamp Face of Manifold Plate



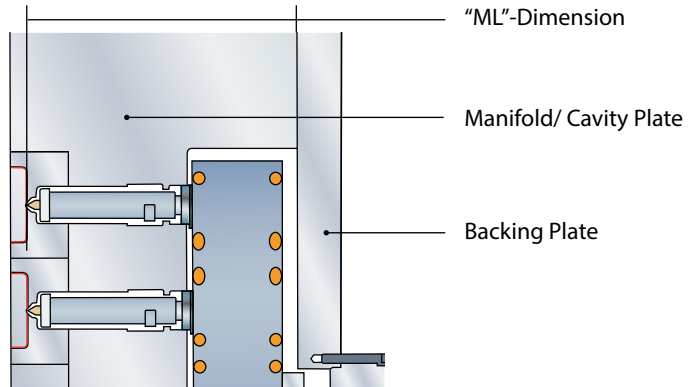
Step 4a - Route Wires for Manifold Heaters, Manifold TCs, Sprue Heater, and Sprue TC on Injection Face of Manifold Plate



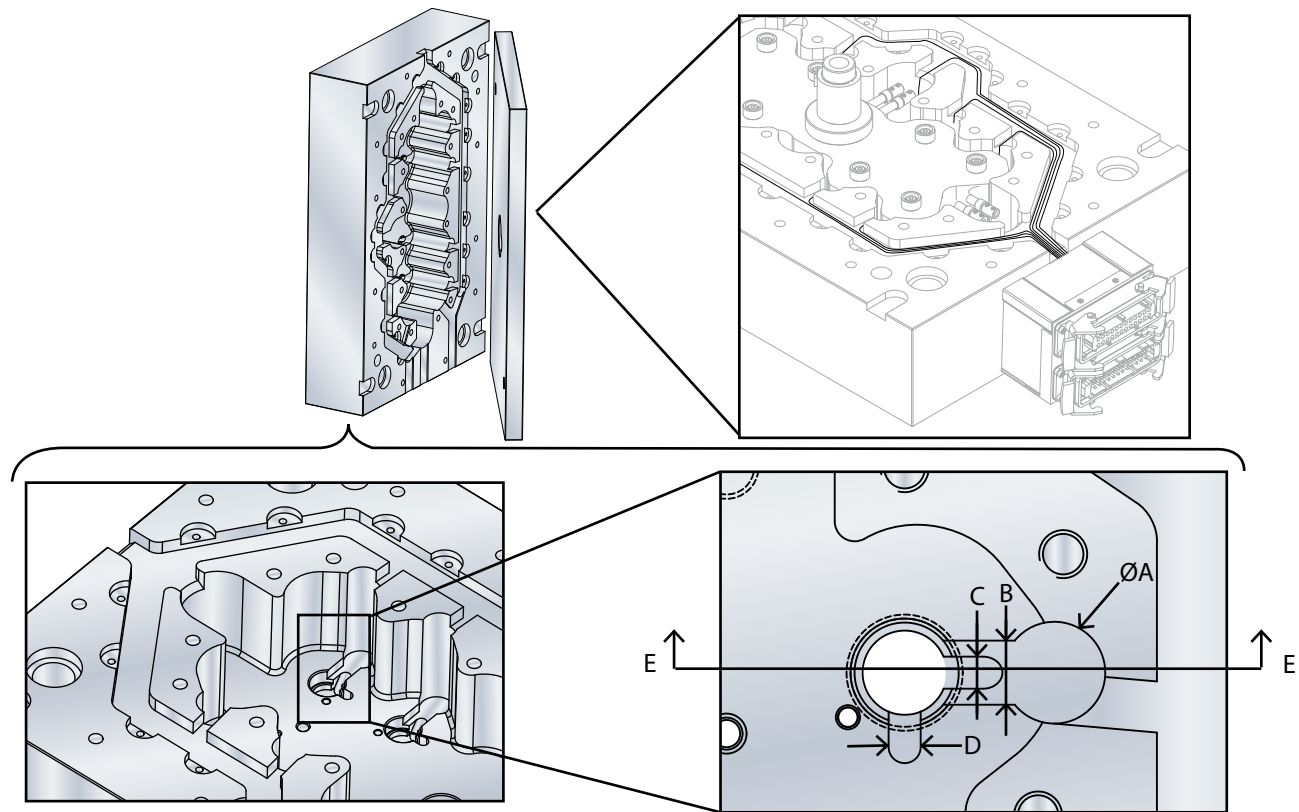
Add Wire Channels and Electrical

If integrated cavity and manifold plate, the following wire routing is recommended.

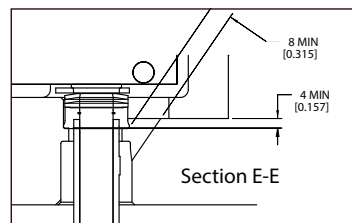
Note: This method is not recommended with Ultra Helix T2 Nozzle tip and is not suitable for Ultra 250, Ultra 350 and Ultra 500 high pressure systems.



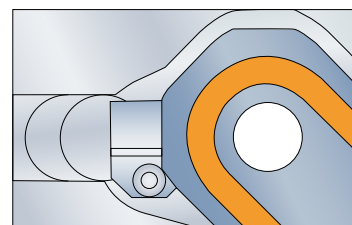
Step 3b - Route Wires for Nozzles and any Manifold TCs on Injection Face of Manifold Plate



Nozzle	A	B _{max}	C _{max}	D* _{max}
U500	25.4mm [1.0"]	12.7mm [0.5"]	8mm [0.31"]	8mm [0.31"]
U750	25.4mm [1.0"]	16mm [0.63"]	12.7mm [0.5"]	12.7mm [0.5"]
U1000	25.4mm [1.0"]	25.4mm [1.0"]	12.7mm [0.5"]	12.7mm [0.5"]



8mm [0.31"] min
clearance for wires

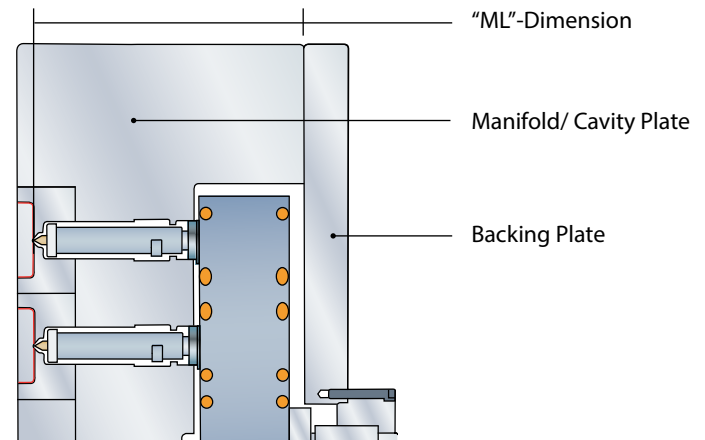


Add tap and wire
clamp

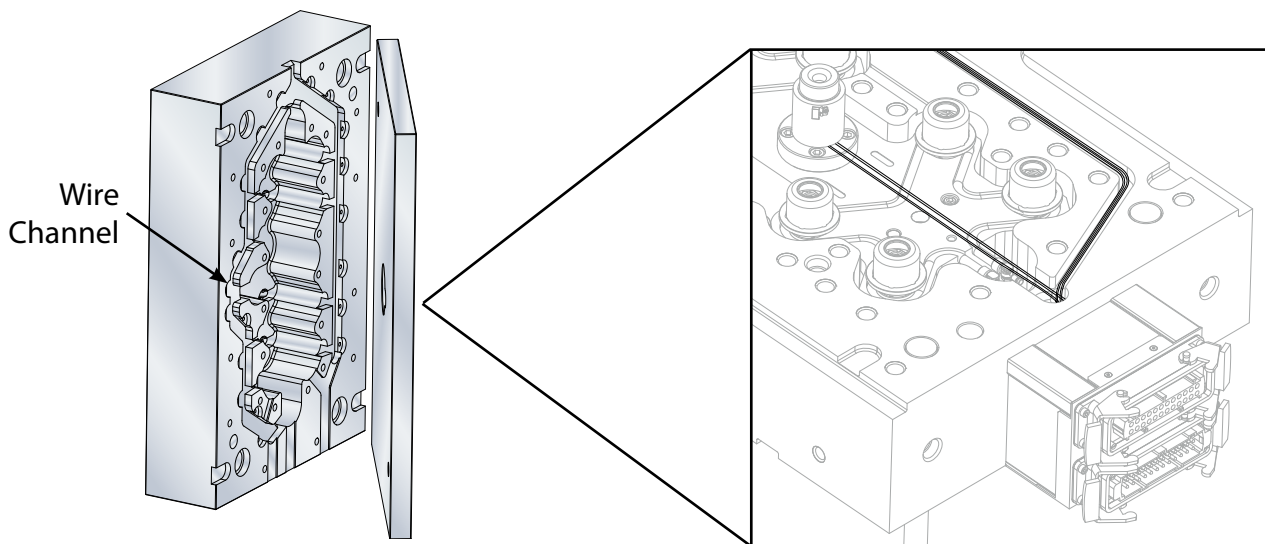
*This feature is for condensation drainage from the nozzle bore

Add Wire Channels and Electrical

If integrated cavity and manifold plate, the following wire routing is recommended.



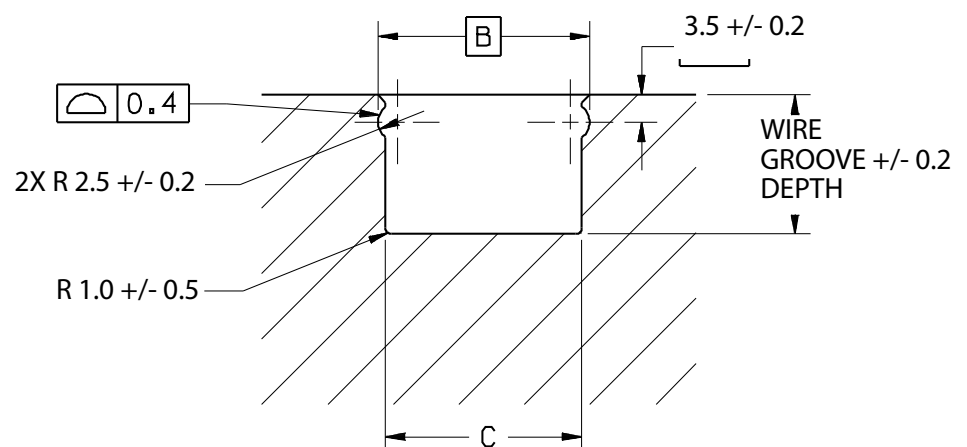
Step 4b - Route Wires for Manifold Heaters and any Manifold TCs on Injection Face of Manifold Plate



Step 5a – Add Wire Clip Installations (if using Wire Clamps see Step 5b)

Note: Wire clips are available from Husky

B	C +/-0.2
14.7	12.7
21.1	19.05
27.4	25.4
40.1	38.1

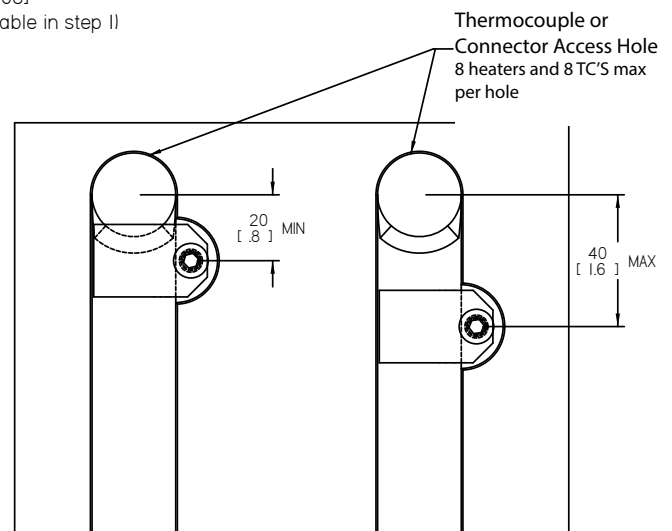
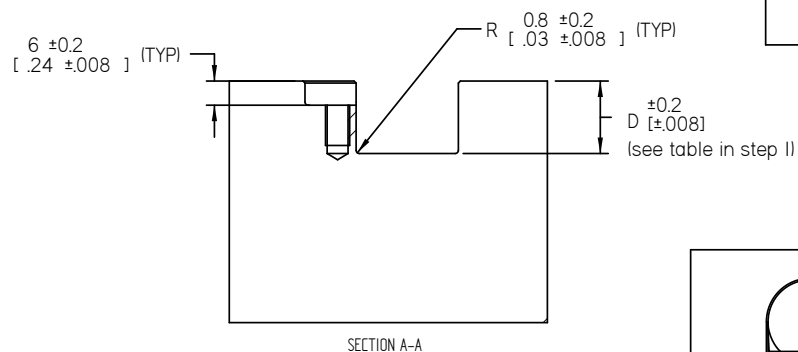
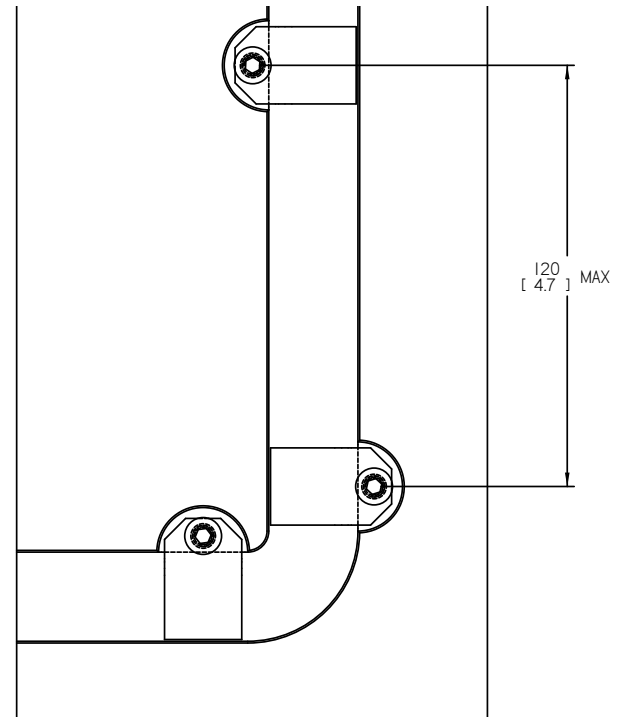
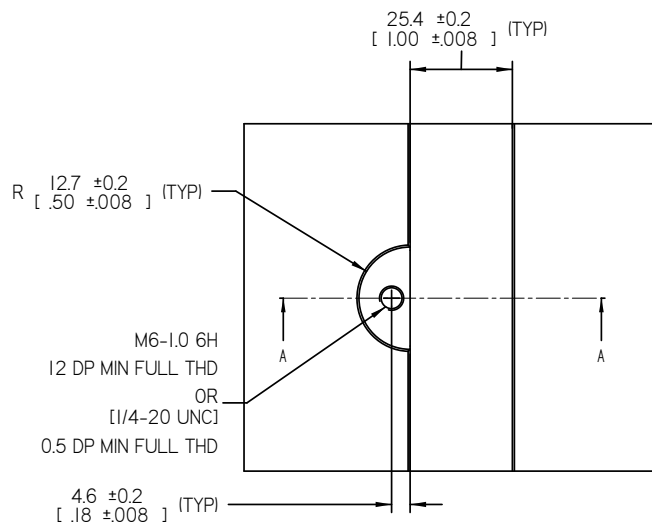


Add Wire Channels and Electrical

Step 5b – Add Wire Clamp Installations (if using Wire Clips see Step 5a)

Clamps should be positioned as close to the nozzle as possible and at every bend and/or interval of 120mm [4.7"]

Wire clamps for 25.4mm [1.0"] wire grooves are available for Husky Manifold Systems
(Suggested quantity: 40 or 2 times the number of drops, whichever is greater)



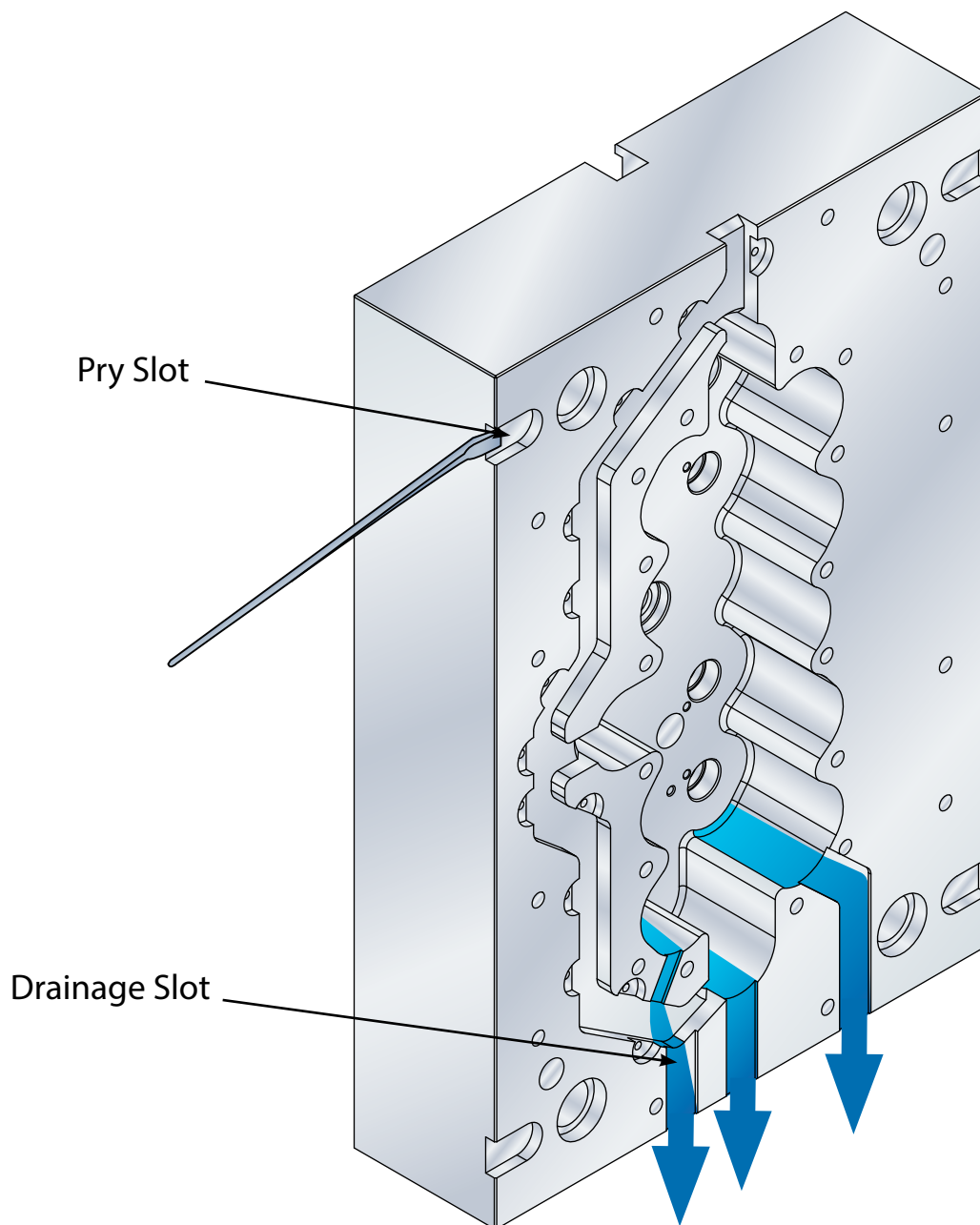
Add Pry Slots and Drainage

Step 1- Add Pry Slots

Pry slots allow easier separation of the plates. Position pry slots between all plate interfaces, near plate alignment features (guide pins, alignment dowels)

Step 2- Add Drainage Slots

Drain slots (also referred to as condensation slots) allow any water which condenses on the cooled plates to drain out of the hot runner. Add these slots anywhere water can pool when the tool is oriented for production - bottom of manifold pocket and wire grooves.



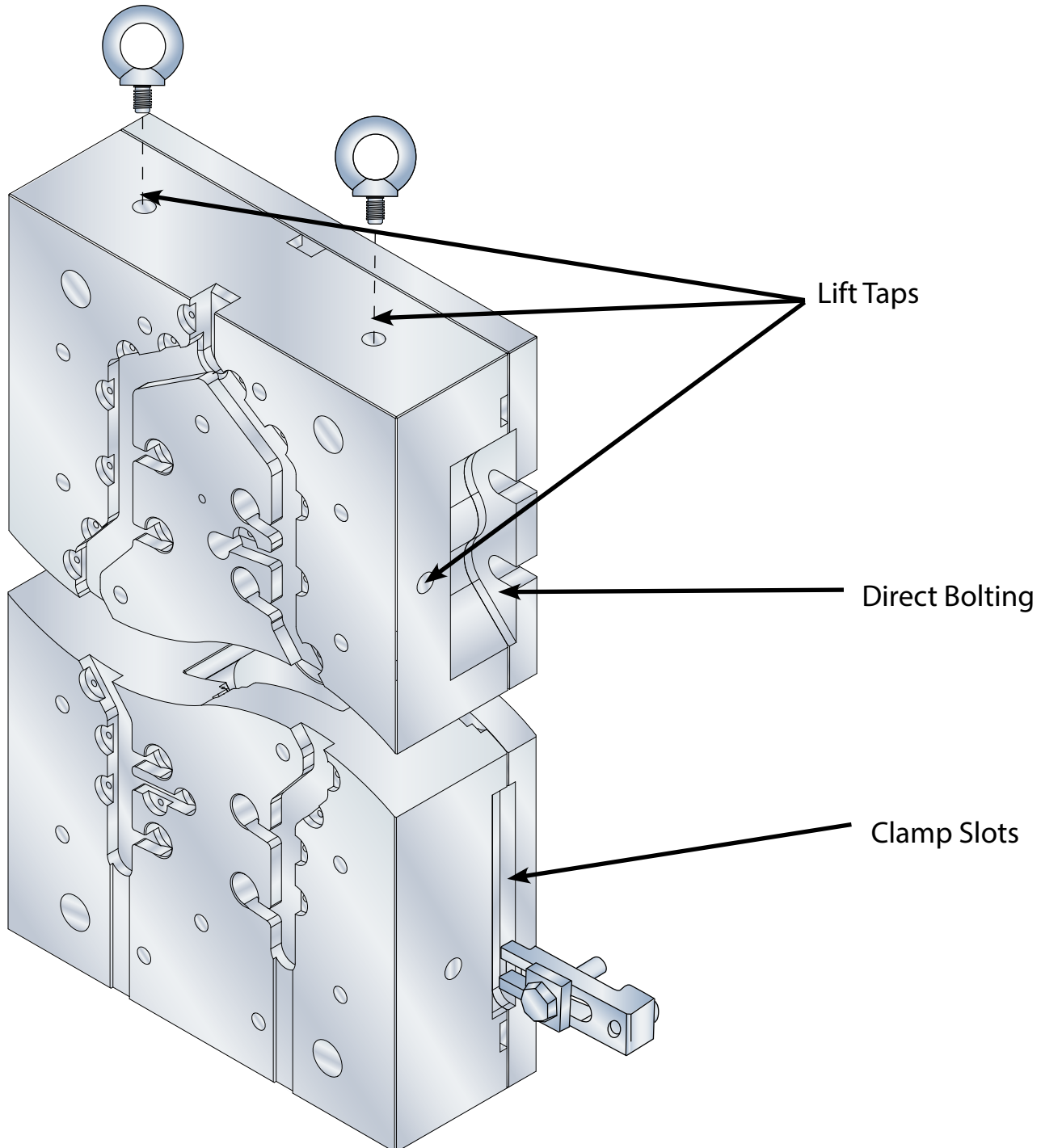
Add Lift Taps and Platen Mounting

Step 1- Add Lift Taps

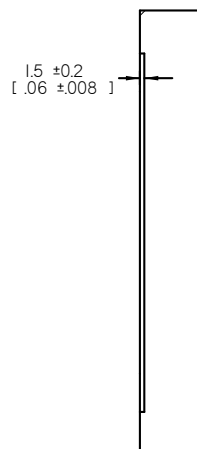
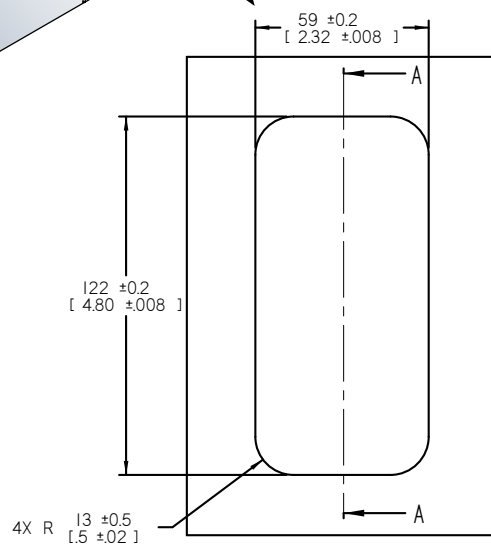
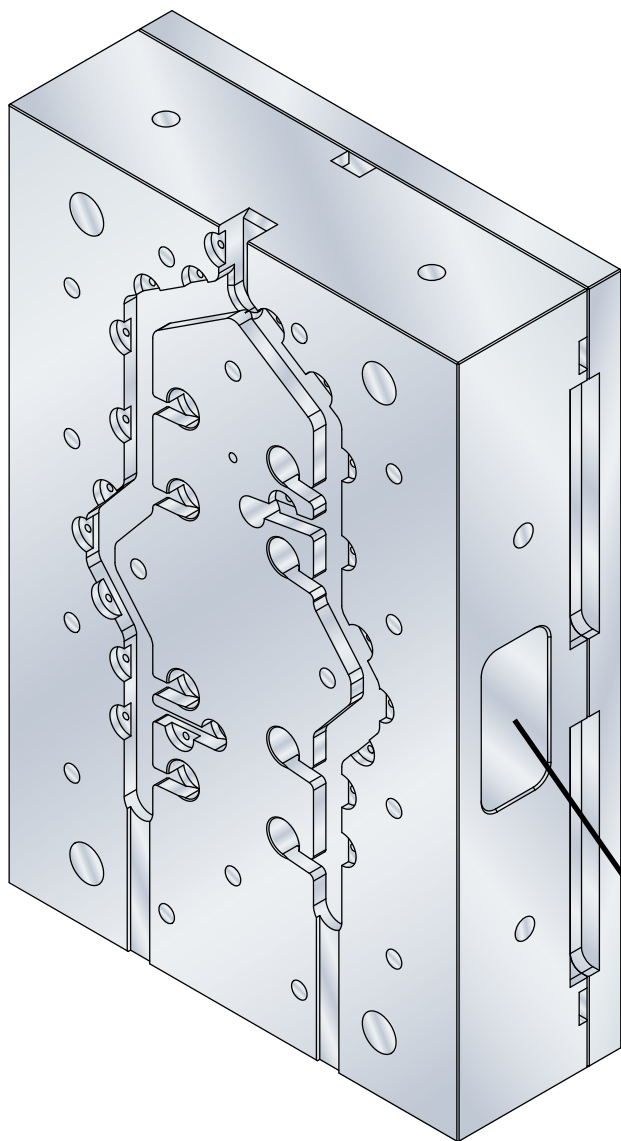
Add sufficient lift taps for handling individual plates as well as the assembly

Step 2- Add Platen Mounting

Platen mounting can either be clamp slots or direct bolting through an overhanging backing plate or cutouts



Add Nameplate Installation

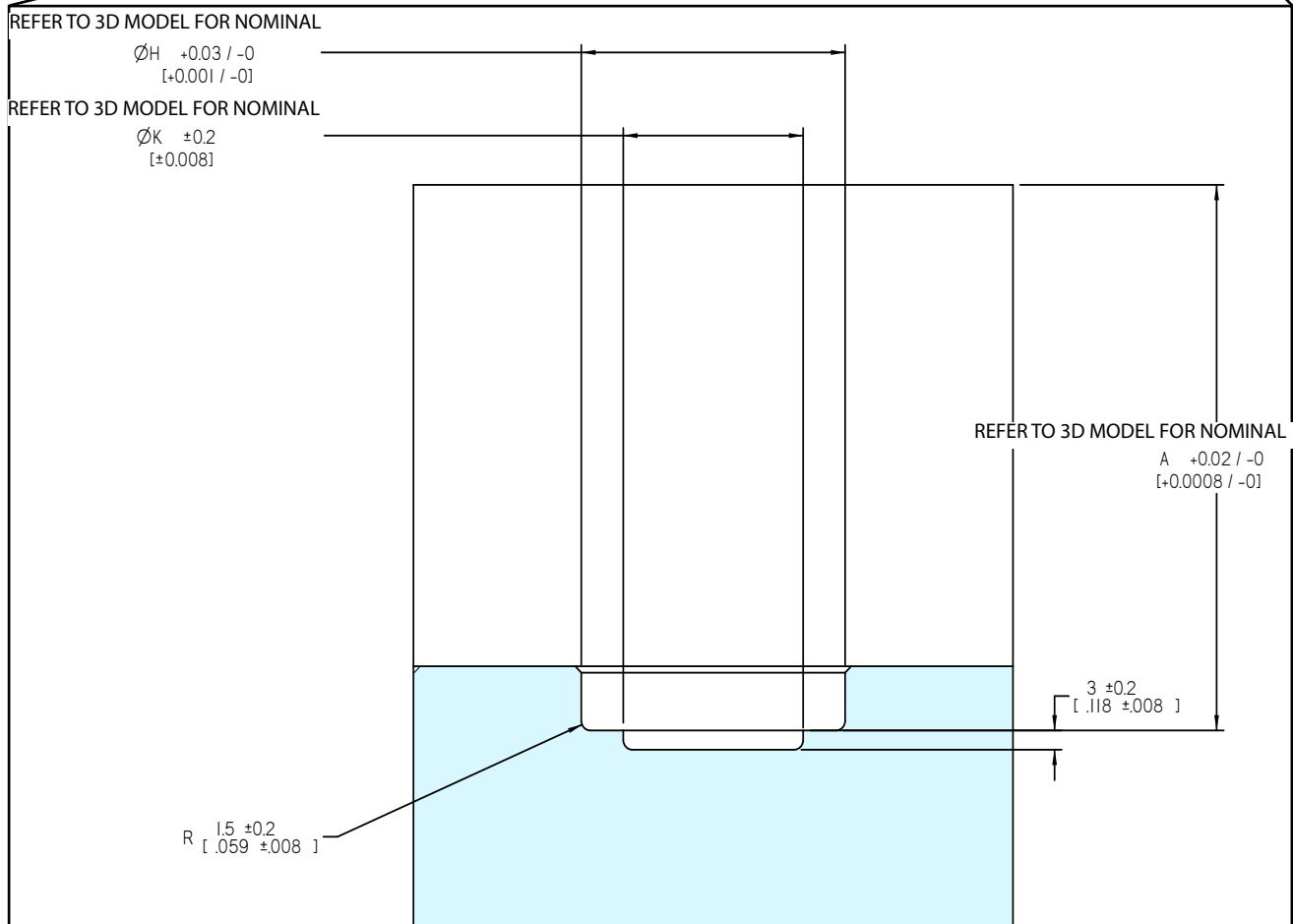
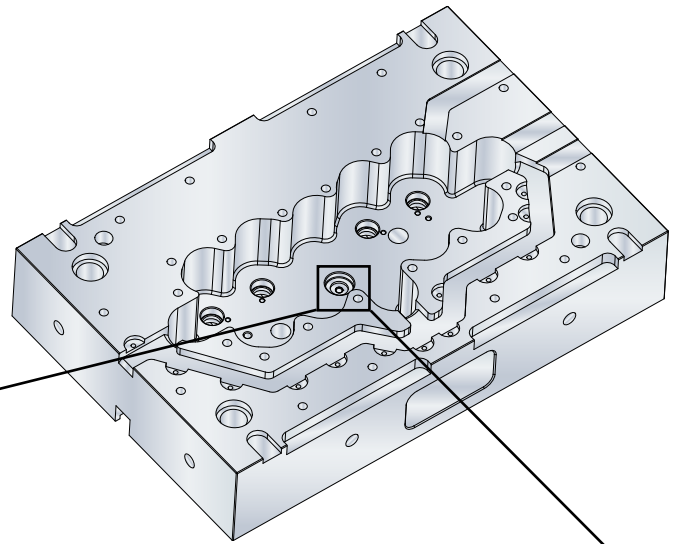


SECTION A-A

Tolerance Reference

Refer to 3D model for complete geometry

Center Locating Insulator



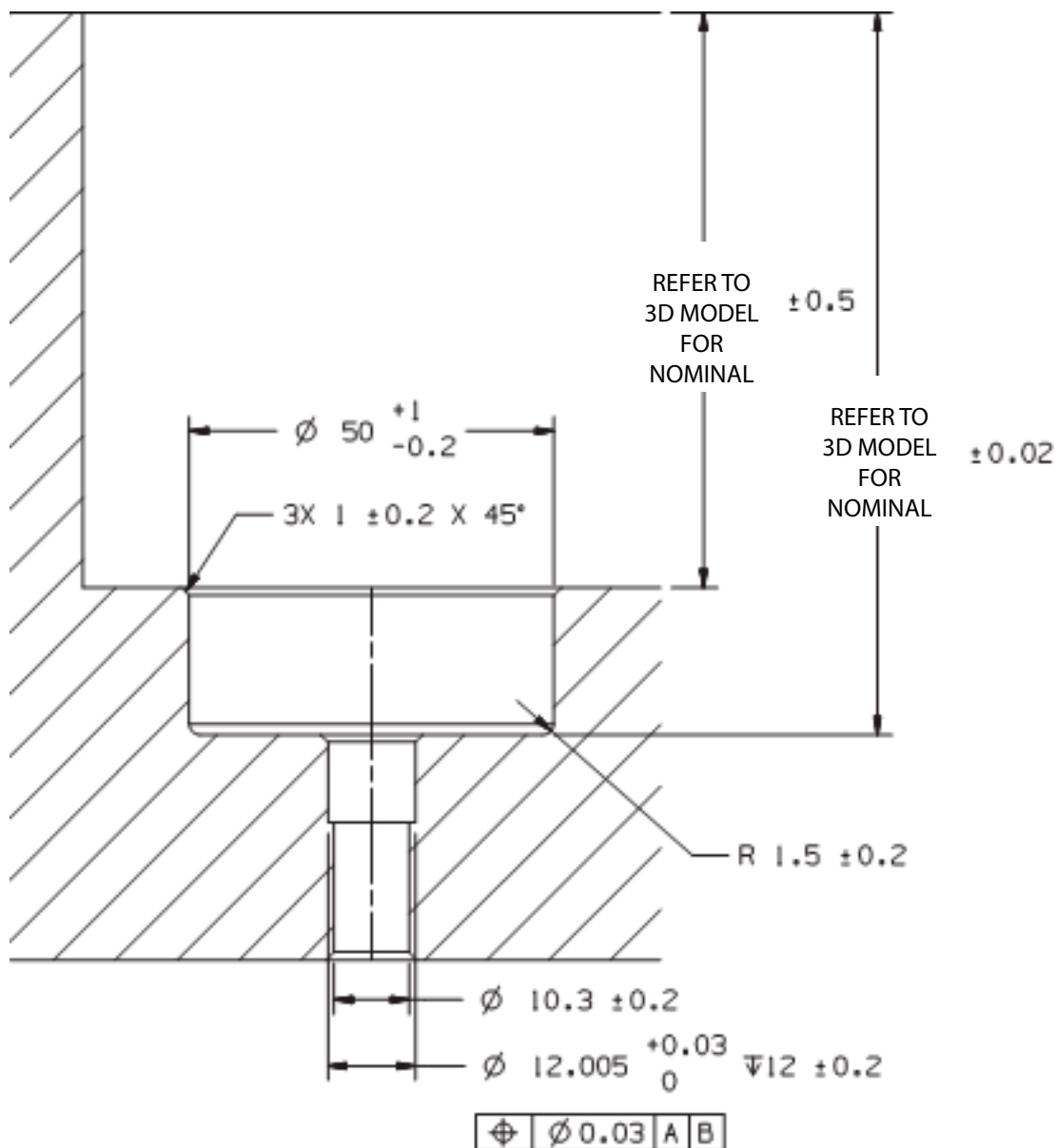
Insulator Type	H	K
Small Pitch	32.01mm [1.26"]	20mm [0.78"]
Standard Pitch	44.01mm [1.73"]	30mm [1.29"]
Large Pitch	64.01mm [2.52"]	50mm [1.96"]

Tolerance Reference

Refer to 3D model for complete geometry

Center Locating Insulator

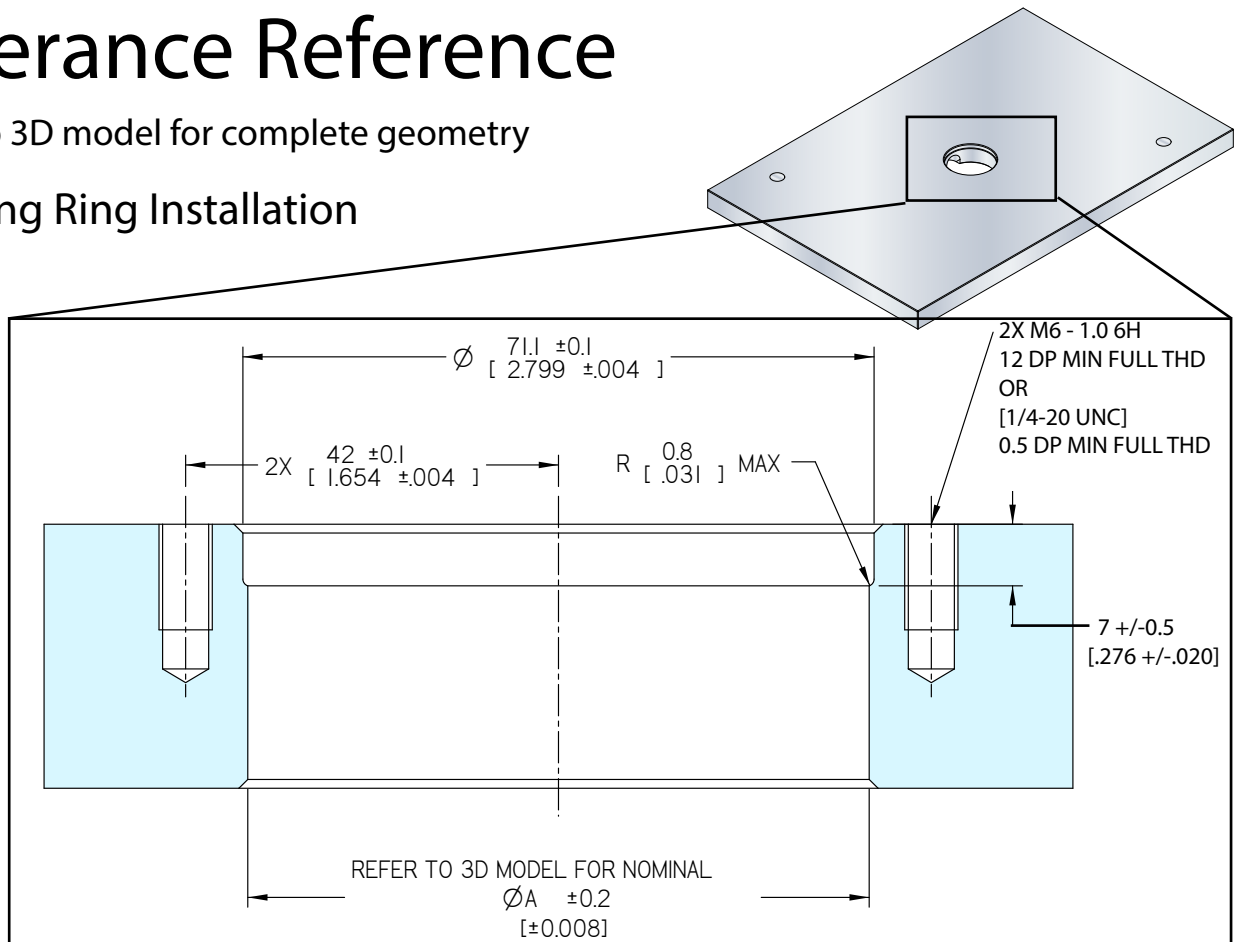
UNIFY Specific Requirements



Tolerance Reference

Refer to 3D model for complete geometry

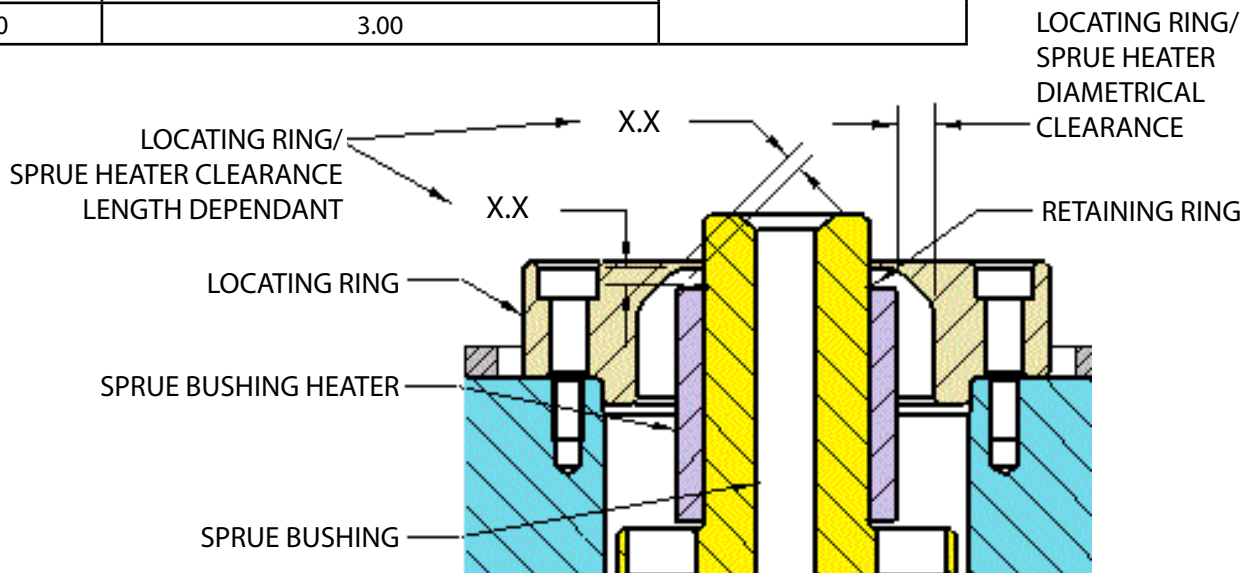
Locating Ring Installation



Locating Ring - Sprue Bushing Clearances

Husky recommends the diametrical clearance between the locating ring and sprue bushing to be $0.45 + 0.10 / - 0.03$ mm. Locating ring to Sprue Heater clearances should follow the table below.

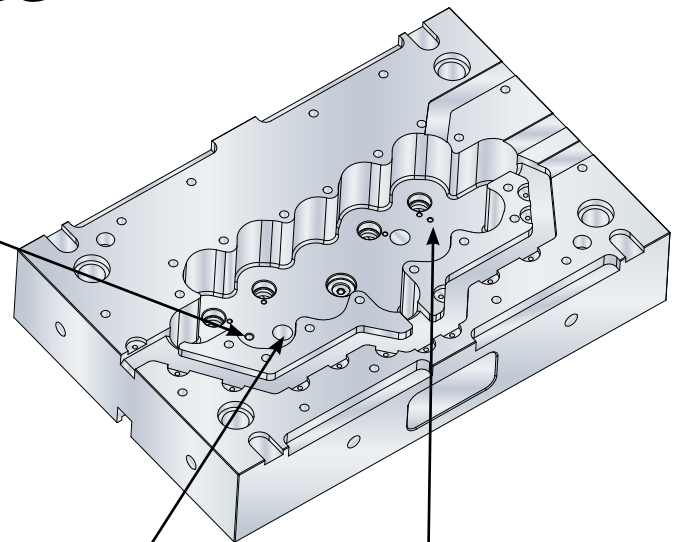
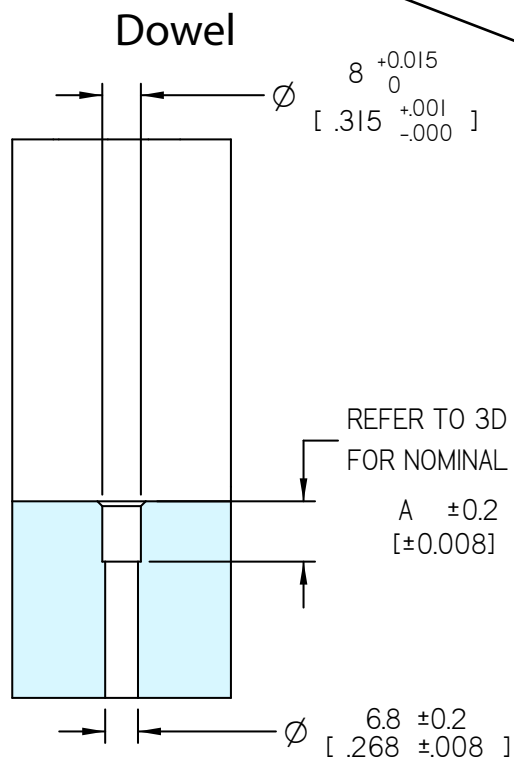
LOCATING RING / SPRUE HEATER CLEARANCE		
SPRUE BUSHING LENGTH (mm)	MINIMUM CLEARANCE (LENGTH-DEPENDENT) IN COLD CONDITION (mm)	MINIMUM DIAMETRICAL CLEARANCE (mm)
< 80	1.75	3.00
81-200	2.25	
201-300	2.75	
>300	3.00	



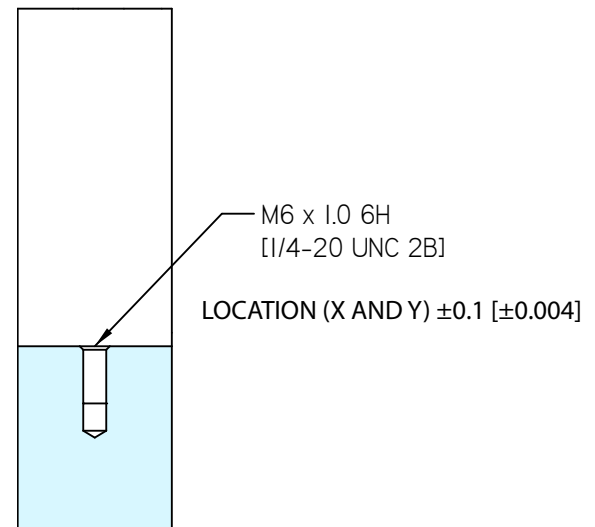
Tolerance Reference

Refer to 3D model for complete geometry

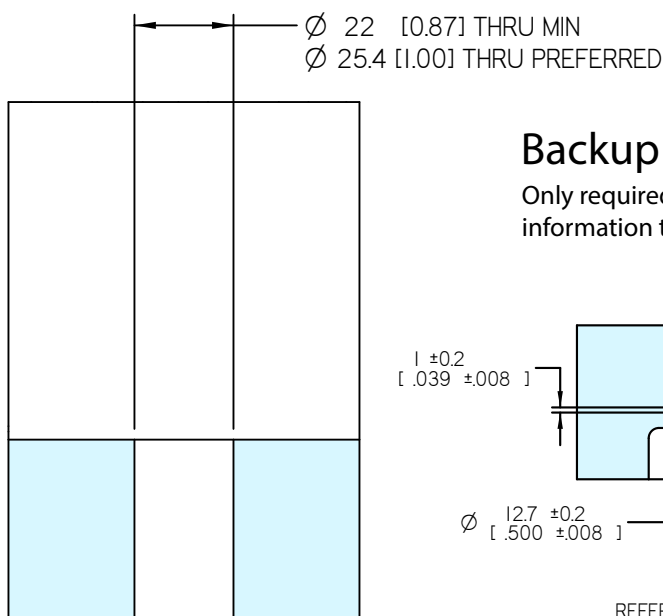
Manifold Alignment



Manifold Hold Down Tap

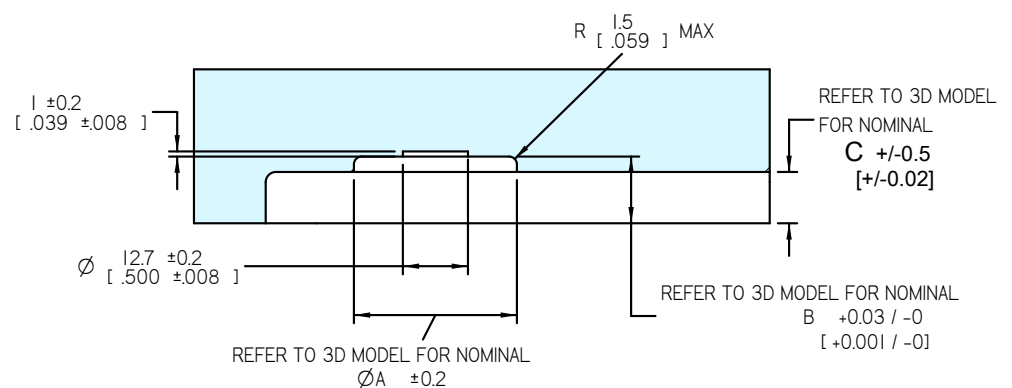


Manifold Thermocouple Thru Hole



Backup Pad Installation

Only required on select designs – refer to 3D model sent with project information to determine if required



UNIFY Specific Requirements

UNIFY simplifies integration into the mold design.
Use this same guide, but only these steps:

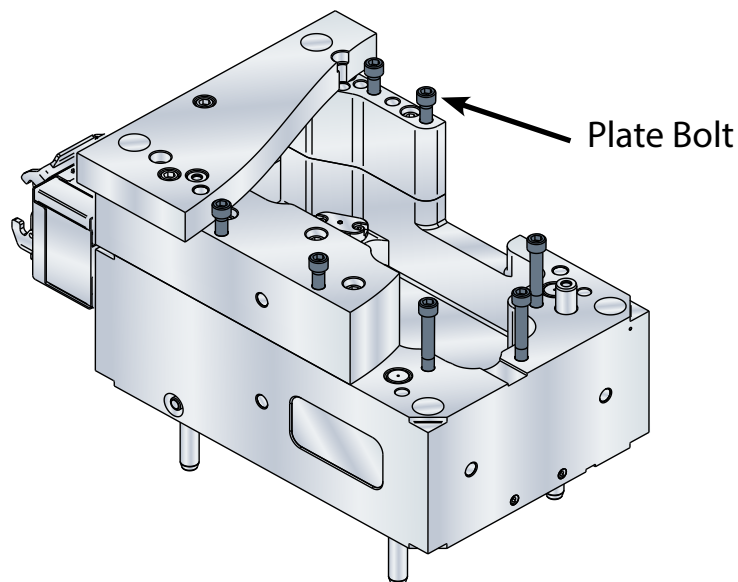
- 1.) Install manifold pocket into plates
- 2.) Mold interfaces
- 3.) Manifold plate cooling
- 4.) Hot Runner plate alignment
- 5.) Plate bolts (Unique to UNIFY, see requirements below)
- 6.) Pry slots and drainage
- 7.) Lift taps and platen mounting
- 8.) Nameplate

The following are NOT required for UNIFY:

- Backing plate cooling
- Air lines in backing plate
- Air cylinder installation
- Wire channels

UNIFY Plate Bolting:

Plate bolts on UNIFY Manifold Systems connect the backing plate to the manifold plate for adequate support when clamped to the machine platen. These bolts do not influence any sealing connections in the manifold. Add sufficient bolts per your mold design practices.



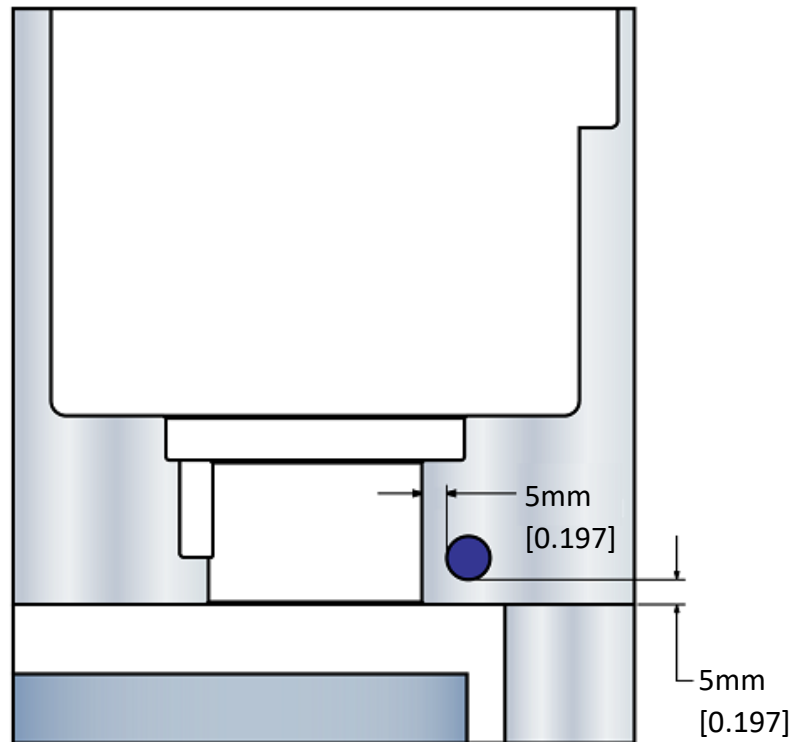
ISVG Specific Requirements

Backing Plate Cooling lines

Position the cooling lines as close to the clamp face of the backing plate and the through bore of the ISVG installation as possible while Maintaining $\geq 5\text{mm}$ clearance to all surfaces.

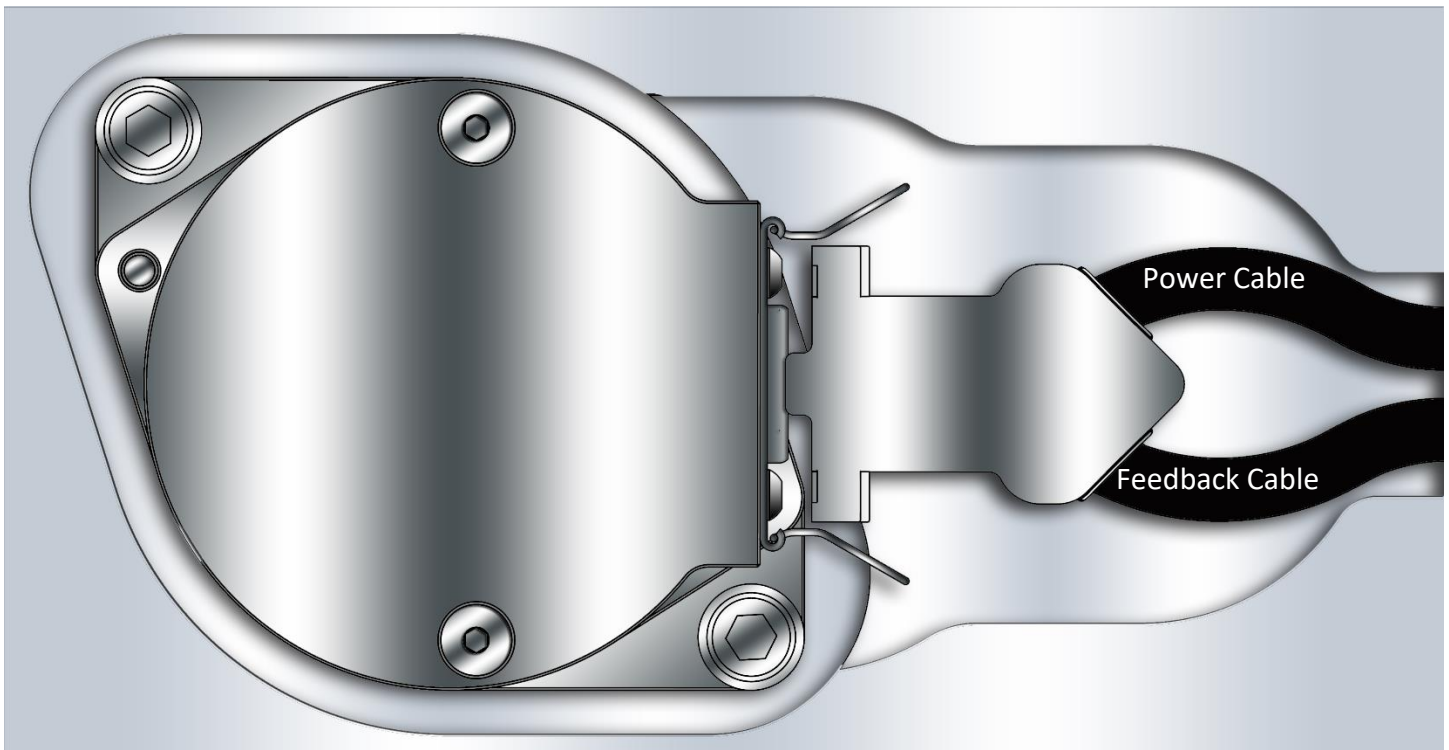
Wire Grooves

Each actuator has two cables exiting from it, one for power and one for feedback. These cables are cut to length and terminate in the electrical adapter box.



Power cable: 4.9mm OD nominal – Area 18.8mm^2

Feedback cable: 6.5mm OD nominal – Area 33.2mm^2



Wire groove depth:

Drop Count*	Recommended Groove Depth	Drop Count*	Recommended Groove Depth
1	9	5	33
2	15	6	40
3	21	7	46
4	27	8	52
*Drop count: the number of drops that share a single wire groove			

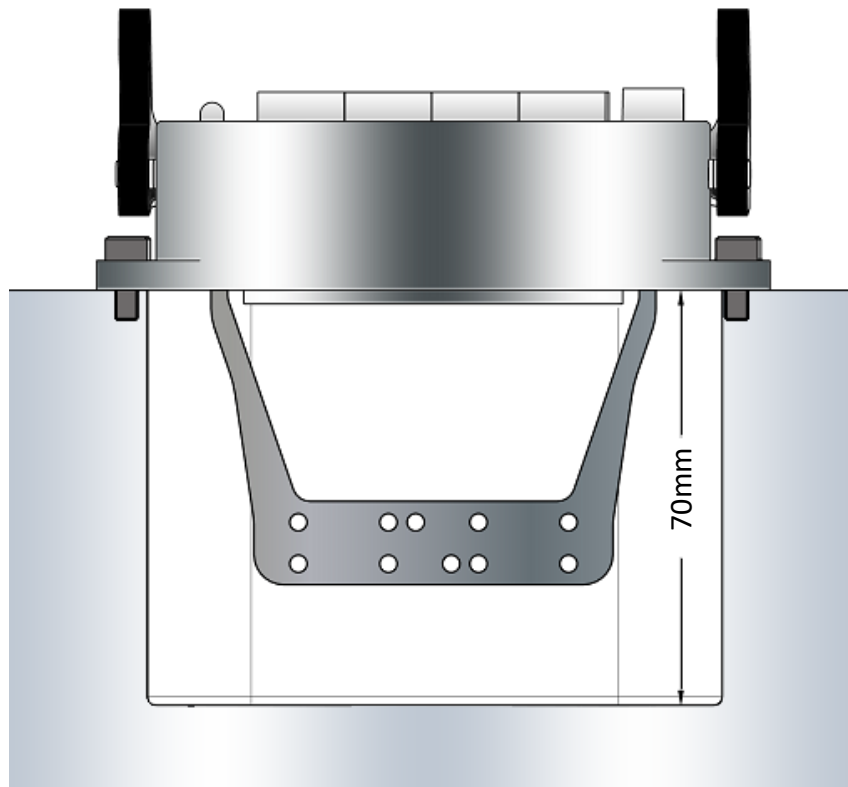
Electrical connector & box requirements

It is recommended that the actuator power and feedback cables are routed to the backing plate adapter box, while the manifold, sprue, nozzle heaters and T/C's are routed to the manifold plate adapter box.

The power connector for the ISVG actuators utilizes a ground bar for attaching ground wires from the actuators. This ground bar protrudes from the underside of the connector so care must be taken when designing connector layout.

If the connectors are directly mounted on the backing plate, a minimum pocket depth of 70mm is recommended to accommodate the ground bar and associated wiring.

If an electrical adapter plate is used for the actuator connectors, it must be at least 75mm (or 3") thick. Thinner adapter plates should be avoided as they do not provide adequate clearance between the ground bar and backing plate.



Questions?

Contact your Husky Project Engineer or the general inquiry numbers below

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Brazil São Paulo - Tel. (55) 11 4589 7200

Europe Luxembourg - Tel. (352) 52 11 51

Asia China – Tel. (86) 21 3850 8000