This equipment manual is intended to provide information for safe operation and maintenance. Husky reserves the right to make changes to equipment in an effort to continually improve the equipment, features, and/or performance. These changes may result in different and/or additional safety measures that are communicated to customers through bulletins as changes occur.

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<td>Toll free</td>
<td>1-800-465-HUSKY (4875)</td>
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<tr>
<td>Europe</td>
<td>EC (most countries)</td>
<td>008000 800 4300</td>
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For non-emergency questions and issues you may also e-mail Husky at techsupport@husky.ca.

Husky Regional Service and Sales Offices

For the location closest to you, please visit www.husky.ca.

Product Upgrades

Upgrades are available that can improve your output, reduce cycle times, and add functionality to your Husky equipment.

To see what upgrades are available for your machine visit our website at www.husky.ca/partsandservice or call your sales representative.

Ordering Spare Parts

All spare parts for Husky equipment can be ordered through your nearest Husky Parts Distribution Center or online at www.husky.ca/partsandservice.

Unauthorized Modifications

Under no circumstances should any changes or modifications be made to the electrical circuits, hydraulic circuits, or the safety devices to the machine and guarding on the mold or hot runner without the prior, written permission of Husky Injection Molding Systems Ltd.
Hot Runner Refurbishing

Husky offers services for repairing, modifying, and retrofitting Husky hot runners. Contact your Husky Regional Service and Sales office for details.

European Directives

Husky hot runners are designed to meet the following European (EU) directives:

- 73/23/EEC on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits,
- 89/392/EEC and its amendments on the approximation of the laws of the Member States relating to machinery,
- 93/68/EEC amending Directives 73/23/EEC and 89/393/EEC.

Patents

Husky hot runner products and processes referenced in this document may be covered by the following patents or their foreign equivalents:

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Chapter 1   Safety Summary

This chapter describes general requirements and conditions for safe installation, operation, and maintenance of hot runner equipment. Personnel must read, understand, and follow all safety precautions listed in the equipment manuals. Personnel must follow applicable industry and regulatory safety requirements for safe installation, operation, and maintenance of equipment.

1.1  Material Safety Data Sheet (MSDS)

**WARNING!**

Some resin types produce toxic gases when heated to extreme temperatures. Always review the MSDS for the resin type being used before operating the hot runner and/or machine. Use any additional personal protective equipment (PPE) where required.

The Material Safety Data Sheet (MSDS) is a technical document which indicates the potential health effects of a hazardous product, and contains safety guidelines to protect personnel. Before handling a product, refer to the MSDS. These sheets identify hazards related to use, storage, and handling of the product, including emergency procedures. Contact the material supplier to obtain a copy of the MSDS sheet.

1.2  Personal Protective Equipment and Safety Equipment

Personal injury can be avoided when personnel wear appropriate protective gear and use special safety equipment. The following describes the safety gear and equipment that should be used when working with the machine and any ancillary equipment.
1.2.1  Personal Protective Equipment (PPE)

Wear appropriate personal protective equipment when working on or near equipment.
Standard personal protective equipment includes:

- **Safety Glasses**  
  For protecting the eyes from flying objects/particles, heat, sparks, splash from molten material, and more

- **Face Shield**  
  For protecting the entire face area from flying objects/particles, heat, sparks, splash from molten material, and more

- **Heat Resistant Gloves**  
  For protecting the hands from extreme heats

- **Hearing Protection**  
  For protecting the ears from loud ambient noise

- **Safety Shoes**  
  For protecting the feet from electrical shocks, crushing hazards, puncture hazards, splash from molten material, and more

- **Non-Melting Natural Fiber Pants and Long-Sleeve Shirt**  
  For protecting the body from potential splash from molten material

1.2.2  Safety Equipment

Use appropriate safety equipment when working on or near equipment.
Standard safety equipment includes:

- **Exhaust Fan**  
  For collecting potentially harmful plastic fumes

- **Purging Container**  
  For containing hot resin purged from the injection unit

- **Vacuum Cleaner**  
  For collecting spilled resin pellets and other debris that may create a falling hazard

- **Stairs and Ladders**  
  For ensuring safe access to areas of the machine

- **Danger Signs**  
  For warning other personnel to stand clear of a component or area of the machine

- **Locks and Tags**  
  For preventing the use of specific systems and components

- **Fire Extinguishers**  
  For the expedient suppression of small fires

- **Telescopic Mirror**  
  For safely inspecting valve gates from outside the mold area

- **Brass Hammers and Brass Rods**  
  For safely removing dried resin deposits
1.3 **Materials, Parts, and Processing**

To prevent personal injury or damage to the equipment, make sure of the following:

- The equipment is only used for its intended purpose, as described in the manuals.
- The operating temperatures do not exceed the specified permissible maximum value.
- The maximum temperature set point is set below the ignition point of the material being processed.
- Lubricants, oils, process materials, and tools used on equipment meet Husky specifications.
- Only authentic Husky parts are used.

1.4 **Safety Hazards**

Some common safety hazards associated with hot runner equipment are:

- Mechanical (pinching, shearing, crushing)
- High Pressure
- Burn
- Electrical
- Gas, Vapor, and Dust Emissions
- Slipping, Tripping, or Falling
- Lifting
- Pneumatic Hazards

1.4.1 **Mechanical Hazards**

- **Worn Hoses and Safety Restraints**
  Regularly inspect and replace all flexible hose assemblies and restraints.

- **Cooling Water Hoses**
  Cooling water hoses degrade over time and need to be replaced on a yearly basis. Degraded hoses become brittle and can break or separate from the fitting when manipulated. To minimize the risk of failure, inspect the hoses regularly and replace as required. Wait until the machine has cooled down before servicing cooling water hoses.
1.4.2 High Pressure Hazards

**WARNING!**

All nozzle and sprue heaters must be turned on when manifold heaters are turned on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in component failure and/or sudden release of hot resin.

Pressure inside the hot runner manifold(s) can increase to dangerous levels if the nozzle and sprue heaters are not turned on before or at the same time as the nozzle sprue.

The pressure is generated when the injection nozzle sprue is plugged with frozen resin and the residual resin in the manifold is heated. This pressure can release suddenly causing the resin plug to eject from the sprue and hot resin to spray from the nozzle tips. The risk of serious burn injuries as a result is increased.

Water leaking onto or into the hot runner can also increase the risks of this potential hazard. If the water temperature becomes critical (greater than 400 °C or 752 °F), the water temperature can be significant enough to rupture the metal housing and cause serious injury to personnel.

To avoid this hazard:

1. Always make sure all nozzle and sprue heaters are turned on any time manifold heaters are turned on outside of the mold. The nozzle and sprue heaters can be turned on independently of the manifold heaters, however, it is recommended that they be heated first or slaved to the manifold heaters so they heat up in unison.

2. Always make sure the nozzle tips are open and the nozzle housings are dry prior to applying heat to the manifold.

**IMPORTANT!**

In the event of water leaking onto or into the hot runner, the nozzle tips must be removed (cold) and the plastic in the nozzles drilled out to ensure they are open to atmosphere. This can be done using a standard twist drill with the cutting edges removed to prevent damage to the melt channel.

Replace the cavity plate prior to heating the system.

1.4.3 Burn Hazards

- **Hot Surfaces**
  
  Hot runners have numerous high temperature surfaces. At normal operating temperatures, contact with these surfaces will cause severe skin burns. Wear personal protective equipment (PPE) when working around a hot runner.

- **Molten Material**
  
  Never touch process material purged or otherwise flowing from the nozzle, mold, hot runner, or material in the feed throat area. Molten material can appear cool on the surface, but remain very hot on the inside. Wear personal protective equipment when handling purged material.
1.4.4 **Electrical Hazards**

Hot runners draw high amperage current at high voltage. The electrical power requirements are indicated on the electrical schematics. Connect equipment to a suitable power supply as specified in the electrical schematics and in compliance with all applicable local regulations.

1.4.5 **Gas, Vapor, and Dust Emissions**

Certain processed materials release harmful gas, vapors or dust. Install an exhaust system according to local codes.

1.4.6 **Slip, Trip, or Fall Hazards**

Do not walk, stand, climb, or sit on machine or hot runner surfaces.

Use an approved platform or walkway around equipment to reach areas that are not accessible from the floor.

1.4.7 **Lifting Hazards**

When lifting the hot runner or hot runner components, use suitable lifting equipment, proper balancing techniques, and designated lifting points. Do not exceed the rated capacity of the lifting equipment.

1.4.8 **Pneumatic Hazards**

- **Air Supply Hoses**
  Make sure air supply hoses connected to the hot runner do not interfere with moving parts of the mold or the machine during operation. All air hoses must be sufficiently long so they will not be strained when the mold halves separate.

  Make sure air supply hoses are not routed over edges or where they could rub together, causing motion or vibration damage.

- **Compressed Air**
  Never use compressed air to clear valve gates. A piece of resin can fly out and injure a bystander.

  Always use a brass tool and vacuum cleaner to clear valve gates.
1.5  Manuals

Husky manuals aid in the safe and proper use of Husky products. Where applicable, the manuals provide instructions on installation, operation and maintenance. A separate drawing package includes parts lists and drawings.

Personnel should thoroughly review all manuals provided with their Husky equipment prior to performing any tasks. Proceed with tasks only if all instructions are understood and always follow applicable workplace safety requirements.

![IMPORTANT!]
Keep all manuals in a convenient location for future reference.

1.5.1  Safety Alerts

Safety alerts highlight hazardous conditions that may arise during installation, operation or maintenance and describe methods for avoiding personal injury and/or property damage. Depending on the severity of the hazard, safety alerts start with one of the following signal words: Danger, Warning or Caution.

![DANGER!]
The DANGER safety alert indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

![WARNING!]
The WARNING safety alert indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

![CAUTION!]
The CAUTION safety alert indicates a potentially hazardous situation that, if not avoided, could result in property damage.

1.5.2  Other Alert Types

Other non-safety related alert types used in the manual highlight important information needed by the user to install, operate or maintain the machine properly. They may also, in some cases, describe best practices, offer an expanded explanation, or reference a related section in the manual.

Non-safety related alerts start with one of the following signal words: Note, Important, or Reminder.
1.6 Safety Signs

Safety signs clearly mark potentially hazardous areas in or around equipment. For the safety of personnel involved in equipment installation, operation, and maintenance, use the following guidelines.

- Verify all signs are in the proper locations. Refer to the drawings in Chapter 7 for details.
- Do not alter signs.
- Keep signs clean and visible.
- Order replacement signs when necessary. Refer to the drawings in Chapter 7 for part numbers.

The following safety symbols may appear on safety signs:

NOTE: Safety signs may include a detailed explanation of the potential hazard and associated consequences.

<table>
<thead>
<tr>
<th>Safety Symbol</th>
<th>General Description of Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="General – Warning" /></td>
<td>This symbol indicates a potential personal injury hazard. It is usually accompanied by another pictogram or text to describe the hazard.</td>
</tr>
<tr>
<td><img src="image" alt="Danger – Hazardous Voltage" /></td>
<td>Contact with hazardous voltages will cause death or serious injury. Turn off power and review electrical schematics before servicing equipment. Electrical cabinets can contain more than one live circuit. Test all circuits before handling to make sure circuits have been de-energized.</td>
</tr>
<tr>
<td><img src="image" alt="Danger – Explosion" /></td>
<td>Hot explosive plastic or gases can suddenly spurt out, causing burns. Wear protective clothes, gloves, safety glasses and face shield. Never look directly into feed throat, nozzle, or mold gates. Use a mirror.</td>
</tr>
</tbody>
</table>
1.7 Qualified Personnel

Only fully trained and qualified personnel should be permitted to maintain equipment. Qualified personnel must have demonstrated skills and knowledge related to the construction, installation and operation of the injection molding equipment and have received safety training on the hazards involved.
1.8 Training

All designated operators and maintenance personnel must be fully trained before using or servicing Husky injection molding systems.

If training is required, visit www.huskytraining.com or contact your nearest Husky Regional Service and Sales office to learn more about Husky’s training solutions.

**IMPORTANT!**

It is the obligation of the employer to properly train and instruct all personnel in safe methods of operation and maintenance. Manuals and other reference material, which have been prepared by Husky for the operation and maintenance of Husky equipment, do not in any way absolve the employer from fulfilling these obligations and Husky disclaims liability for injury to personnel which is attributable to the employer’s failure to do so.

1.9 Lockout/Tagout

**WARNING!**

Hazardous voltages, high pressure fluids, crushing or impact hazards - risk of death or serious injury. Lockout/tagout procedures must be performed in accordance with local codes. After performing the lockout/tagout procedure, allow 10 minutes for residual voltage to discharge to less than 50 Volts before performing any electrical procedures.

Only qualified personnel should be permitted to perform the lockout/tagout procedure.

A lockout/tagout procedure in accordance with local codes must be performed on the machine or controller before any maintenance activities are performed. Refer to the machine and/or controller manufacturer’s manual for more information.

1.10 Electrical Safety

**WARNING!**

Only authorized electricians or trained service personnel are permitted to access electrical enclosures. Before servicing any electrical equipment, perform a lockout/tagout procedure to prevent inadvertent activation of the system by other personnel. Failure to lockout/tagout the machine can result in serious injury.
WARNING!

Water on the hot runner can be in close proximity to electrical connections and equipment. This can lead to a short circuit, resulting in serious electrical damage to the equipment. Always keep water lines, hoses, and hose fittings in good condition to avoid leaks.

NOTE: Damaged or worn relays and/or limit switches (e.g., micro switches, proximity switches, photo-electric switches, etc.) must be replaced, not repaired.

1.10.1 Electrical Power Wires and Cables

- The quality, rating, and insulation of electrical power wires and cables have been selected specifically for the requirements of this hot runner. Damaged cables, must be replaced immediately with the same or higher quality cables than those specified for the hot runner.

CAUTION!

Do not mix electrical power cables and thermocouple extension cables. Cables connected incorrectly will fail to either carry power or produce accurate signals (i.e. temperature readings).

- Multi-pin connectors for thermocouple and power are separated to reduce the possibility of electrical interference in thermocouple readings.
- Multi-pin connectors for electrical power must be grounded at both the hot runner and machine/controller. Power cables supplied by Husky contain green, or green and yellow colored ground wires.
- Keyed multi-pin connectors are used for electrical connections on hot runners to prevent assembly of the wrong connectors. The key pins must be in their correct position.

CAUTION!

Only the pins specified should be used in the multi-pin connectors. Damage or malfunction of the hot runner can result if inappropriate pins are installed in the multi-pin connectors. Refer to the electrical schematic diagram for correct positioning.

- Electrical wire grooves are provided in the manifold plate. The wires must not be allowed to be pinched between the mold plates. All wire clips must be installed.

1.11 Auxiliary Equipment

Husky is only responsible for the interaction of the hot runner with auxiliary equipment when Husky is the system integrator. If auxiliary equipment is removed, proper safeguards must be
installed. For information about integrating non-Husky auxiliary equipment, contact your Husky Regional Service and Sales office.
Chapter 2 Specifications and Requirements

This chapter outlines the necessary temperature, electrical, air, and torque information to operate and maintain your hot runner system.

2.1 Weights

The mass of the entire hot runner assembly is listed on the Plan View assembly drawing. Refer to the drawing package provided with the hot runner.

2.2 Operating Temperature Range

The hot runner must operate within a specific temperature range to prevent internal resin leakage and damage to internal components as the result of thermal expansion. This temperature range is listed on the hot runner nameplate as the temperature difference between the manifold and the mold. Refer to Section 3.3 for more information.

The temperature range is critical for the hot runner system to be able to create a proper seal. It is important that the designed operating temperature window be observed at all times.

2.3 Electrical System

Refer to the electrical schematic provided in Chapter 7 for the following information:

- Control zones
- Multi-pin connector and pin position for each heater and thermocouple wire
- Connecting heater wiring in parallel (if applicable)
- Amperage, voltage and resistance of each heater
- Keypin locations
2.3.1 Controller Requirements

**WARNING!**

Electrical hazard – risk of equipment damage, fire and serious injury. Do not use a controller with an amperage rating less than that required by the heaters. Do not use a controller with a higher amperage rating than the connectors or cables to the mold. Failure to use a properly rated controller may result in the overload of electrical components, and further lead to fire or serious injury.

The number of control zones required for the heaters will depend on the size and requirements of the basic system.

The type of controller can be either:
- Automatic control, using a thermocouple to sense the temperature in each zone
- Manual control, where the controller is set to provide power during a percentage of time

**NOTE:** There may be an optional switchbox for turning ON or OFF the power to individual nozzle heaters.

**NOTE:** The controller output to the heaters must be set to 220 to 240 V, 50-60 Hertz single phase.

2.3.2 Nozzle Heaters

The nozzle heaters can be controlled separately or in zones by manual controllers. Refer to the electrical schematics in Chapter 7 for the correct configuration.

2.3.3 Manifold Heaters

Whenever possible, the manifold heaters are wired in parallel and controlled by a single controller zone. The circuit will be completed either at the cable connector or at the manifold.

The heaters are connected in multiple zones if the total amperage of all the heaters connected in parallel exceeds the capacity of a single controller zone.

Each zone is connected to a separate controller zone with its own thermocouple.

2.3.3.1 Spare Thermocouple Wires

The temperature of each manifold heater zone is sensed by a J-type thermocouple.

**NOTE:** Special order thermocouples may be other types.

In some cases, a spare thermocouple for each zone may also be routed to the base of the multi-pin connector to minimize down time. Should the main thermocouple fail, the spare can be easily connected without mold disassembly. The failed thermocouple can be replaced during the next mold maintenance.
The spare thermocouples can also be used to verify the condition of the first thermocouple should a sensing problem develop.

**NOTE:** To establish proper polarity when connecting thermocouples, follow the electrical schematic(s) in Chapter 7. For J-type thermocouples, the white wire is positive (+) and the red wire is negative (-). This wire color coding follows the ANSI J-Type North American Standard. The color coding and wire composition for J-type thermocouples in other parts of the world may be different and produce different readings.

### 2.3.4 Power Fluctuation

Hot runner systems are sensitive to fluctuations in power supply voltage. The nozzle and manifold heaters are rated for 240 volts (or 200 volts in special applications).

**NOTE:** Always refer to the hot runner nameplate on the operator’s side of the clamp before installing a hot runner. Refer to Section 3.3 for more information on the nameplate.

The manifold is always controlled by thermocouples and will compensate for minor voltage fluctuations.

Where the nozzle heaters are regulated by percentage timers, the heat output will be directly affected by voltage fluctuations. For example, a reduction of the voltage by only 10% will affect output (in watts) by about 20%, which will reduce the nozzle temperatures considerably. Adjustment is required.

In severe cases where the stability of the power supply is known to be unreliable, it may be advisable to install an automatic voltage stabilizer rated for the power requirements of the controller.

### 2.4 Air Connections

Compressed air is used by hot runners to actuate valve stems, which open and close valve gates.

#### 2.4.1 General Requirements for Compressed Air

- Typical air pressures required is 5.52 to 8.27 bar (80 to 120 psi), unless otherwise specified in the *Mold Manual*.

  **NOTE:** For optimal performance, air pressure up to 12.41 bar (180 psi) may be required for LX and SX pistons.

- Make sure the size of air lines are large enough to permit adequate flow to the locations where air is required.

- In some cases, air accumulators are installed to provide a larger air volume supply near the point requiring air.

- Make sure air used for mold actuators is interlocked with the machine operator’s gate, so opening the gate prevents any motion.
To improve valve gate quality, locate quick exhaust valves close to the actuators they control, so the compressed air in the mold will decompress rapidly and speed operation of the actuator.

Lockout valves must be installed (ANSI Z244.1 or local regulations) to the air supply for use when:
- Servicing the mold
- Performing maintenance
- Mold installation and removal

2.4.2 Clean, Dry Air

The hot runner air circuit requires clean, dry air.

**IMPORTANT!**
Compressed air quality must meet the standards specified in DIN ISO 8573-1.

In order to clean and dry the air, the system should be set to a pressure dew point 11 °C (20 °F) below the lowest ambient temperature of the air line system.

For air system maintenance procedures, refer to the Service Manual.

2.5 Torque Specifications

Torque specifications are provided on the assembly drawing(s) in Chapter 7—Drawings, Schematics and Parts Lists.

**CAUTION!**
Use of improper torque can result in equipment damage. Always consult the assembly drawings for torque specifications.
Chapter 3  Preparation and Startup

This chapter describes how to move, test, inspect and generally startup a complete hot runner assembly.

3.1  Lifting and Handling

Hot runner assemblies must be lifted and handled using appropriate lifting devices, such as lift bars, swivel hoist rings and/or lifting eyebolts.

CAUTION!

Do not use magnetic lifting devices to lift the hot runner. These can potentially scratch a finely ground plate.

IMPORTANT!

Safety must be the primary consideration when lifting and moving a hot runner assembly. Make sure to always use suitable lifting equipment that is inspected regularly and follow the recommendations outlined in this manual.

3.1.1  Lifting Using the Lift Bar

To properly lift the hot runner assembly using a lift bar, do the following:

1. Install the lift bar to the lifting holes on the top of the component as shown in Figure 3-1.

2. Attach a suitable overhead lifting device to the swivel hoist ring and lift the hot runner assembly vertically.

   NOTE: The maximum weight the bar can lift is stamped on the lift bar.
3.1.2 Lifting Using Swivel Hoist Rings

When using swivel hoist rings, make sure they are properly torqued before lifting.

**NOTE:** Refer to Section 3.1.2.1 for specifications and part numbers for swivel hoist rings.

**NOTE:** Make sure the swivel hoist ring used can support the weight of the plate or component at the chosen angle of attack.

**IMPORTANT!**

When using swivel hoist rings, remember the following:

- Do not lift more than the rated capacity.
- Depending upon the sling angle, the applied load may be more than the weight being lifted. Two point lifting of a 1000 kg (2000 lb) weight, with a sling angle of 30°, will result in an applied load of 1000 kg (2000 lb) to each hoist ring.
- After installation, make sure the hoist ring swivels and pivots freely in all directions. The side of the ring must not contact anything.
- Never use a hook or other lifting device which will pry or open the “U” shaped bar on center-pull hoist rings.
- Screws must be tightened to the recommended torque values.
- Do not apply shock loads. When lifting, apply force gradually.
- Do not use spacers between the hoist ring bushing and the work piece surface.
- The work piece surface must be flat, providing complete contact for the hoist ring bushing.
3.1.2.1 Swivel Hoist Ring Specifications

Metric and Imperial swivel hoist rings are available through your nearest Husky Parts Distribution Center. Swivel hoist rings purchased from other suppliers must meet or exceed the following specifications.

Table 3-1 General Hoist Ring Specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>4140 certified aircraft quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Forged hoist ring</td>
</tr>
<tr>
<td>Finish</td>
<td>Phosphate per DOD-P-16232F</td>
</tr>
<tr>
<td>Safety Factor</td>
<td>5:1</td>
</tr>
<tr>
<td>Swivel</td>
<td>Pivot 180° and swivel 360°</td>
</tr>
<tr>
<td>Thread</td>
<td>ISO 261 and ISO 965 - Coarse</td>
</tr>
<tr>
<td>Surface</td>
<td>Magnetic particle inspected (ASTM E709-80)</td>
</tr>
<tr>
<td>Certification</td>
<td>Individual certificate of conformance with the serial number specified on the hoist ring for traceability</td>
</tr>
</tbody>
</table>

Table 3-2 Specifications for Metric Coarse Swivel Hoist Rings

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rated Capacity[1]</th>
<th>Torque</th>
<th>Thread Ø</th>
<th>Minimum Full Thread Depth</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>2761800</td>
<td>1050 kg (2315 lb)</td>
<td>37 N-m (27 lbf-ft)</td>
<td>M12</td>
<td>24</td>
<td>1.75</td>
</tr>
<tr>
<td>2770570</td>
<td>1900 kg (4189 lb)</td>
<td>80 N-m (80 lbf-ft)</td>
<td>M16</td>
<td>32</td>
<td>2.00</td>
</tr>
<tr>
<td>2502267</td>
<td>4200 kg (9259 lb)</td>
<td>311 N-m (229 lbf-ft)</td>
<td>M24</td>
<td>48</td>
<td>3.00</td>
</tr>
<tr>
<td>536013</td>
<td>7000 kg (15432 lb)</td>
<td>637 N-m (470 lbf-ft)</td>
<td>M30</td>
<td>60</td>
<td>3.50</td>
</tr>
<tr>
<td>2761801</td>
<td>11000 kg (24250 lb)</td>
<td>1085 N-m (800 lbf-ft)</td>
<td>M36</td>
<td>72</td>
<td>4.00</td>
</tr>
<tr>
<td>2761803</td>
<td>12500 kg (27558 lb)</td>
<td>1085 N-m (800 lbf-ft)</td>
<td>M42</td>
<td>84</td>
<td>4.50</td>
</tr>
</tbody>
</table>

[1] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)

Table 3-3 Specifications for Inch UNC Swivel Hoist Rings

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2732764</td>
<td>1130 kg (2500 lb)</td>
<td>28 N-m (38 lbf-ft)</td>
<td>1/2</td>
<td>1.0</td>
<td>13</td>
</tr>
<tr>
<td>2732765</td>
<td>2260 kg (5000 lb)</td>
<td>100 N-m (135 lbf-ft)</td>
<td>3/4</td>
<td>1.5</td>
<td>10</td>
</tr>
<tr>
<td>2760517</td>
<td>4530 kg (1000 lb)</td>
<td>230 N-m (310 lbf-ft)</td>
<td>1</td>
<td>2.0</td>
<td>8</td>
</tr>
<tr>
<td>2732766</td>
<td>6800 kg (15000 lb)</td>
<td>470 N-m (640 lbf-ft)</td>
<td>1 1/4</td>
<td>2.5</td>
<td>7</td>
</tr>
<tr>
<td>2732767</td>
<td>10880 kg (24000 lb)</td>
<td>800 N-m (1080 lbf-ft)</td>
<td>1 1/2</td>
<td>3.0</td>
<td>6</td>
</tr>
</tbody>
</table>

[2] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)
3.1.3 Lifting Using Lifting Eyebolts

When using lifting eyebolts, remember the following:

**IMPORTANT!**

Husky does not recommend the use of lifting eyebolts. Use swivel hoist rings whenever possible in lifting applications.

- Apply loads along the plane of the lifting eyebolt eye. Do not apply loads in the opposite direction.
- Lifting eyebolts without a shoulder are satisfactory for vertical loading applications where the angle of attack is equal to 90°.
- Lifting eyebolts with a shoulder can be used for angular as well as vertical lifts where the angle of attack is anywhere between 0° and 90°.

**NOTE:** Refer to Section 3.1.3.1 for more information on angles of attack.

![Figure 3-2 Lifting Eyebolt Types](image)

1. Lifting Eyebolt with a Shoulder
2. Lifting Eyebolt without a Shoulder

- Use a washer under the shoulder of the lifting eyebolt to stop the lifting eyebolt in the correct orientation.
- Always make sure the lifting eyebolt is tightened securely.
- Do not lift more than the rated capacity.
- Do not apply shock loads. When lifting, apply force gradually.
- Make sure the eyebolt bushing is either in full contact with the work piece surface or separated only by a washer.
- The work piece surface must be flat, providing complete contact for the eyebolt bushing.

**NOTE:** Refer to Section 3.1.3.2 for specifications and part numbers for lifting eyebolts.

**NOTE:** Make sure the lifting eyebolts used can support the weight of the plate or component at the chosen angle of attack.

3.1.3.1 Understanding the Angle of Attack

When using lifting eyebolts to lift individual plates or other heavy components, the force goes through the plane of the lifting eyebolt. For this reason, the lifting angle must be considered when lifting with lifting eyebolts.
The lifting angle, or angle of attack, is the angle between the direction the plate is being hoisted in and the surface the hoist is pulling on.

The recommended method for lifting with lifting eyebolts is to have the ring on a vertical plane and lift at a 0° or 90° angle.

Lifting with the ring in a horizontal plane is not recommended.

### 3.1.3.2 Lifting Eyebolt Specifications

Metric and Imperial lifting eyebolts are available through your nearest Husky Parts Distribution Center. Lifting eyebolts purchased from other suppliers must meet or exceed the following specifications.

#### Table 3-4 General Lifting Eyebolt Specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>C15N carbon steel, heat treated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
<td>Clean drop forgings - permissible variations according to DIN 7526, forging Class F</td>
</tr>
<tr>
<td>Thread</td>
<td>DIN 13 Part 14 or ISO 261 and ISO 965 - coarse</td>
</tr>
<tr>
<td>Marking</td>
<td>Symbol C15 and manufacturer’s trademark stamped on collar</td>
</tr>
<tr>
<td>Certification</td>
<td>Manufacturer must guarantee the material and finish requirements above are met</td>
</tr>
</tbody>
</table>
3.1.4 Laying Down a Hot Runner Assembly

To properly lay a hot runner assembly on a work surface, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist ring, lifting chain, and crane can support the weight of the mold and hot runner assembly.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and are in safe operating condition.

1. Using a crane with sufficient lifting capacity, lift the hot runner assembly above the work surface.

---

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rated Capacity</th>
<th>Thread Ø</th>
<th>Minimum Full Thread Depth</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>654246</td>
<td>340 kg (750 lb)</td>
<td>M12</td>
<td>21.3</td>
<td>1.75</td>
</tr>
<tr>
<td>625405</td>
<td>700 kg (1543 lb)</td>
<td>M16</td>
<td>28.8</td>
<td>2.00</td>
</tr>
<tr>
<td>625407</td>
<td>1800 kg (3968 lb)</td>
<td>M24</td>
<td>43.2</td>
<td>3.00</td>
</tr>
<tr>
<td>625408</td>
<td>3600 kg (7937 lb)</td>
<td>M30</td>
<td>54.0</td>
<td>3.50</td>
</tr>
<tr>
<td>625409</td>
<td>5100 kg (11244 lb)</td>
<td>M36</td>
<td>64.8</td>
<td>4.00</td>
</tr>
<tr>
<td>625410</td>
<td>7000 kg (15432 lb)</td>
<td>M42</td>
<td>75.6</td>
<td>4.50</td>
</tr>
<tr>
<td>230705</td>
<td>11500 kg (25353 lb)</td>
<td>M56</td>
<td>100.8</td>
<td>5.50</td>
</tr>
</tbody>
</table>

**Table 3-5 Specifications for Metric Coarse Lifting Eyebolts**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Rated Capacity</th>
<th>Thread Ø</th>
<th>Minimum Full Thread Depth</th>
<th>Pitch</th>
</tr>
</thead>
<tbody>
<tr>
<td>534335</td>
<td>1089 kg (2400 lb)</td>
<td>1/2</td>
<td>31.8</td>
<td>13.0</td>
</tr>
<tr>
<td>534350</td>
<td>1814 kg (4000 lb)</td>
<td>5/8</td>
<td>39.7</td>
<td>11.0</td>
</tr>
<tr>
<td>533553</td>
<td>2268 kg (5000 lb)</td>
<td>3/4</td>
<td>47.6</td>
<td>10.0</td>
</tr>
<tr>
<td>534336</td>
<td>4082 kg (9000 lb)</td>
<td>1</td>
<td>63.5</td>
<td>8.0</td>
</tr>
<tr>
<td>534337</td>
<td>6804 kg (15000 lb)</td>
<td>1 1/4</td>
<td>79.4</td>
<td>7.0</td>
</tr>
<tr>
<td>534338</td>
<td>9525 kg (21000 lb)</td>
<td>1 1/2</td>
<td>92.3</td>
<td>6.0</td>
</tr>
<tr>
<td>534339</td>
<td>17236 kg (38000 lb)</td>
<td>2</td>
<td>127.0</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Table 3-6 Specifications for Inch UNC Lifting Eyebolts**

[3] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)

[4] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)
2. Secure a wood block to the work surface on the side opposite the area where the assembly will be laid down.

3. Lower the assembly slowly onto the edge of the secured wood block.

4. Continue to slowly lower the assembly until it tips over towards the work surface.

5. Lay the assembly down on the work surface.

3.1.5 Picking Up a Hot Runner Assembly

When lifting a hot runner assembly that has been laid down, the lifting crane may go slack just as the load is righted to the full vertical position. This may cause the assembly to swing over-center in the opposite direction.

To prevent this from happening, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the hoist ring, lifting chain, and crane can support the weight of the mold and hot runner assembly.

**WARNING!**

*Inadequate lifting equipment can fail and cause injury or death. Make sure the hoist rings, chains/slings, and lifting device are rated for the load and are in safe operating condition.*

1. Secure a wood block to the work surface near the foot of the hot runner assembly. This will prevent the assembly from going over-center.
2. Lift the assembly until it touches the secured wood block.

**WARNING!**

The hot runner assembly may attempt to swing on the crane cable in a pendulum motion just as the assembly is lifted off of the wood block. Lift slowly to reduce the pendulum motion. Stand clear of the possible swing area to prevent injury.

3. Continue to lift the assembly, keeping the tension on the crane lifting cable.
4. After the hot runner assembly has stabilized, move the assembly to a safe location and remove the wood block.

### 3.2 Mounting Methods

The hot runner has been designed for a certain size of machine. Changes to a larger machine will affect the requirements for hot runner mounting.

**NOTE:** For direct bolting and clamping, always check the quantity, size, and spacing is sufficient for the size of machine used.

#### 3.2.1 Direct Bolting

Direct bolting uses either screws which pass directly through holes in the hot runner and into the threaded holes in a platen, or screws which pass directly through a platen into threaded holes in the hot runner.

The direct bolting method has the advantage that the maximum possible load that can be carried by the screw is available both for securing the mold weight and for resisting the opening force of the mold. The threads of the bolts should be lubricated.
Make sure Unbrako® manufactured screws are used when installing the hot runner.

**CAUTION!**

Air impact guns can produce excessive torque and damage the hot runner. To minimize the risk of damage, install the hot runner using a torque wrench.

### 3.2.2 Clamping

For hot runners mounted to a platen with mold clamps and clamp slots, be aware that while the holding force of a screw is always used fully in direct bolting, it is only partly used with clamping.

Clamping must be secure, since any slipping may cause damage as the mold closes. The mold and hot runner may slip from under the clamps and may even fall completely off the platens if:

- the screws are not sufficiently tightened;
- there is an insufficient number of clamps; and/or
- the clamps are not appropriately located.

**WARNING!**

Clamps may loosen allowing the mold and hot runner to slip or even fall from the machine, possibly causing serious injury or death. Inspect and re-torque clamps regularly.

When using mold clamps, make sure a sufficient number of clamps are used to safely retain the hot runner to the stationary platen. The clamping screws must be as close as possible to the hot runner.

When using clamps, the mold opening force must also be considered. The molds may become “frozen together” due to overpacking the cavities or malfunction of the mold. The clamps must resist the mold opening force, in addition to preventing slipping of the mold and/or hot runner. Check with the clamp manufacturer and the screw manufacturer for recommendations on the number of clamps required, their position, and the amount of torque required on the screws. Only high strength screws with a minimum yield strength of 690 MPa (100,000 psi) are recommended.

**NOTE:** It is the employer’s responsibility to make sure that clamps are of an adequate size, quantity, and positioned appropriately to mount the mold securely. Husky has no control over the selection and suitability of the clamp equipment used to mount and operate the mold and hot runner and does not recommend clamps for mold or hot runner mounting.

An alternative to using mold clamps is to machine additional mounting holes in the platen. Consult your machine manufacturer.
3.2.2.1 Quick Mold Changers and Clamping Systems

Refer to the mold changers or clamp system manufacturer’s manual for operating and safety procedures.

Any quick mold change or clamping system must be interlocked appropriately with the machine logic and guarding interlock systems.

3.3 Nameplate

Each hot runner has a unique nameplate affixed to the operator side of the manifold. The nameplate lists the project number (required for technical support), the resin type that can be used with the hot runner, the melt and mold temperatures., and other important specifications.

The melt and mold temperatures themselves are very important. They are used to determine the amount of thermal expansion required within the hot runner to create a proper sealing face and prevent internal resin leakage.

**CAUTION!**

Never operate the hot runner outside of the stated melt and mold temperatures indicated on the nameplate. Internal resin leakage or component damage can occur.

---

![Figure 3-7 Hot Runner Nameplate (Sample)](image-url)

1. Project Number  
2. Resin Type Allowed  
3. Melt and Mold Temperatures  
4. Power Requirements  
5. Temperature Warning
3.4 Preparation

1. Prior to installing the cavity plate, verify all cold dimensions of the hot runner listed in the Tip Chart on the Section View Assembly drawing (refer to Chapter 7). All dimensions must be within the tolerances specified.

2. Identify the sprue bushing radius and orifice and select a machine nozzle tip that matches. Never use a machine nozzle tip that is the wrong radius or does not closely match the hot runner sprue bushing orifice.

**CAUTION!**

In order to avoid damage to the hot runner, never use more carriage pressure than what is required.

A normal setting for the carriage force is no more than 6804 kg (15000 lb) pushing on the sprue. Excessive carriage force will cause damage to the hot runner and will not be covered under warranty.

3. Determine and set the carriage pressure required to seal the machine nozzle to the hot runner sprue using the following equation:

\[
Force = (\text{Carriage Cylinder Cross-Sectional Area} - \text{Rod Area}) \times \text{Number of Cylinders} \times \text{Hydraulic Pressure}
\]

4. Make sure all wires are in the retainer grooves are clear of potential pinch points.

**CAUTION!**

Nozzles must be at room temperature (< 25 °C or < 77 °F) prior to installing the cavity plate to avoid damage to the system at the sealing surfaces.

5. Install the cavity plate. Refer to Section 5.6.

6. Install the core half of the mold as described in the Mold Manual.

3.5 System Setup

The following sections describe the conditions required to startup a thermal or valve gate hot runner system.

3.5.1 Thermal Gate Setup

Thermal Gate (or hot tip) systems only require the connection of the power and thermocouple cables from the hot runner to the controller. The mold cooling system must also be connected to the hot runner and mold.
3.5.2 Air Operated Valve Gate Setup

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Wear Personal Protective Equipment (PPE) including a face shield over safety glasses, heat resistant gloves and heat resistant clothing whenever entering the mold area.

Additionally, where possible, make sure the hot runner valve gates are closed and the machine nozzle is retracted from the mold sprue to reduce the chance of hot resin unexpectedly spraying into the mold area.

- Air operated valve gates (VG) require airline connections to the mold from the machine, in addition to power, thermocouple, and cooling connections.
- Typically, valve gated systems require air pressure between 5.5 to 8.3 bar (80 to 120 psi).
- The maximum available air pressure may be limited in some areas of the United States. In this case, always use the maximum air pressure set by your region if the maximum allowed is less than what is required by the hot runner.
- Use clean dry air. Do not use lubricated air. An air filter and oil separation kit is available from Husky to meet the requirements of the system. See Section 3.6 for more information.
- The controls for the solenoid air valves interlock for safe operation. This requires the valve gate air supply to be separate from the other air functions of the mold so that it can remain activated and maintain closed valve gates while other machine air is locked out.
- Never operate the valve stems for more than 2 or 3 shots at startup without resin in the system. Repeated impact of the valve stem on the bare metal of the gate may result in damage to the gate.
- The open time of the valve stems should be adjustable through timers. Generally the valve stems should close just as injection hold times out. See Section 3.6 for more information.

3.6 Recommendations for Optimal Valve Gate Performance

- A quick exhaust valve should be installed on both air lines between the hot runner and solenoid to increase the speed at which the valve stems open and close. This often improves gate quality.
- Air hoses should be rated to at least 17 bar (250 psi) to prevent ballooning of the lines during operation.
- For optimal performance, air pressures up to 12.4 bar (180 psi) may be required for LX and SX pistons.
- All air system components (hoses, valves, fittings, solenoids, exhausts, etc.) should be of adequate size to permit fast air flow to/from the hot runner system, but not so large that time is wasted filling the excess volume of the lines.
- “Airline” shut off type quick connects should not be used unless the mold was designed for their use. They may restrict the airflow.
• Air lines between the mold, quick exhausts and the solenoid valve should be as short as possible.

• In most cases the machine valve gate open signal to the valve gate air solenoid should be energized 0.2 to 0.3 seconds before the machine injection signal. This will allow enough time for the valve stem fully open and minimize the effects of side loading and resin flow over the valve stem.

• Some injection molding machines allow the valve stem to be opened prior to the mold being put under full clamp tonnage. In this case the valve stem should be energized when the mold faces first touch (clamp up). The time between clamp and latch (full tonnage) is typically enough time for the valve stem to travel to the full open position. The injection signal would only be enabled after the machine is under full clamp tonnage. This sequence allows optimization of the machine and mold without affecting the cycle time of the tool.

**NOTE:** If requested, Husky can supply complete air solenoid kits for valve gated systems, including quick exhaust valves, filters, separators and lockouts for the air supply.

![Figure 3-8 Valve Gate Air Kit](image)

1. From Air Supply  2. To Mold

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Do not push on the valve stems when cleaning cavities and wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses to avoid injury.
3.7 Recommended Startup Procedure

Before using the hot runner in production, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Verify the machine nozzle orifice and radius match the manifold sprue bushing. Processing problems can occur if the two systems do not match.

WARNING!

Electrocution hazard – risk of death or serious injury. Make sure all power cables are properly grounded.

3. Make sure the hot runner is installed properly.
4. Make sure the mold is installed properly as described in the Mold Manual.
5. Verify the resin type being used matches the required type indicated on the nameplate. Refer to Section 3.3.
6. Make sure the mold and hot runner are properly secured to each platen.
7. Remove all safety latches.
8. Remove all locks and tags.
9. Open the mold slowly.
10. Lock out and tag the machine. Refer to Section 1.9.
11. Install all cooling lines, testing each loop with air to verify its continuity.
12. Remove all locks and tags.
13. Initiate cooling control of the hot runner temperature using the temperatures indicated on the nameplate as a starting point.
NOTE: Core temperature is often run -15 to -12 °C (5 to 10 °F) cooler than the cavity to generate equal surface temperatures and reduce warpage.

14. Lock out and tag the machine. Refer to Section 1.9.
15. Connect the hot runner to a controller, making sure that the cables and controller cables are properly grounded.
16. Remove all locks and tags.

WARNING!
Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

WARNING!
In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

17. Turn on the machine barrel heats.

CAUTION!
The manifold temperature must not exceed 350 °C (662 °F) when using Ultra 250, Ultra 350 VG, Ultra 500 VG, Ultra 750 VG, and Ultra 1000 VG nozzles. Exceeding this temperature may result in component failure.

18. Set the manifold temperatures to match the “Melt Temperature” indicated on the nameplate. Refer to Section 3.3.

IMPORTANT!
Determine if the controller is set to Celsius (°C) or Fahrenheit (°F) and set temperatures accordingly.

IMPORTANT!
For most Ultra hot runner systems, it is important there be a soak time once the entire system has reached the set-point temperature. Do not start injection until the system has soaked at the set-point temperature for approximately 10 minutes (more if it is a larger system) to make sure the plastic has reached the processing temperature.

WARNING!
Hot resin spray hazard – risk of death or serious injury. Sprue heaters must be turned on when the manifold heaters are on. Failure to do so could result in the generation of dangerous pressure levels in the manifold, resulting in the sudden release of hot resin.
19. Once the barrel heats have reached the set-point temperature, turn on the manifold and sprue bushing zones. The temperatures of the manifold and sprue bushing zones should match the resin melt temperature.

**CAUTION!**

To avoid resin degradation, do not turn on the nozzle heaters until the manifolds and sprue bushing have reached operating temperature. The manifolds and sprue bushing require more time to heat up than nozzle drop zones.

20. Turn on the nozzle heaters.

**IMPORTANT!**

When inspecting mold gates in between cycles, always follow these guidelines:

- Do not look directly at the gates. Always use a telescopic mirror.
- Remove any material that has drooled from the gates.
- Do not push on valve gate stems (if equipped).
- Do not use pressurized air to clean the gates.
- A hardwood or soft brass chisel and a vacuum cleaner are recommended for the removal of drool.
- A hardwood chisel is recommended for highly polished surfaces to prevent damage to the molding surface.

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure may be present in the hot runner and may cause hot resin to spray from the nozzle tips if released. Do not look directly at the mold gates. Use a telescopic mirror to inspect mold gates and wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses to avoid injury.

21. Open the mold fully and then move the moving platen towards the stationary platen. Make sure the mold halves are separated enough for you to see the gates with a telescopic mirror.

22. Inject resin into the hot runner until resin appears at the gates.

23. Lock out and tag the machine. Refer to Section 1.9.

**WARNING!**

Burn hazard – risk of serious injury. Manifolds, nozzles and all hot runner components stay hot for long periods of time after heat has been shut off. Wear Personal Protective Equipment (PPE) and place a warning sign if leaving nozzles unattended.
WARNING!
Burn hazard – risk of serious injury. Never handle plastic purgings or drool until they have completely cooled. Purging may appear solid, but may still be hot and cause serious burns. Never allow purgings or drool to drop onto a conveyor. They may be carried away to other work stations where people could pick them up and be burned.

24. Clean the resin from the gates.
25. Remove the locks and tags.
26. Set the shot size to half of the expected shot size requirement and start the full cycle.

CAUTION!
For valve gate systems only. If a high spike occurs during the first half of the injection pressure profile, make sure the valve gates open fully before injection occurs. Refer to Section 3.6 for more information.

CAUTION!
If the injection unit reaches the setting for maximum injection pressure, it will be necessary to increase this value to avoid controlling fill speed with the injection pressure limit (commonly called a pressure limited injection profile, the use of which is considered poor practice).

27. Continue to increase the shot size in small increments for every cycle. Avoid producing flash parts.
   
   NOTE: With the injection hold time set to 0.1 seconds, the optimum shot size should fill the part 95-98% and still retain a cushion. Add hold time and pressure while increasing the shot size to maintain a cushion of 6 to 12 mm (1/4 to 1/2 in).

28. Once a full part is made, it may be necessary to change the nozzle tip temperature to improve quality. Raising and lowering the tip temperature should be done while recording the results and retaining samples to establish the best gate quality set-point.
   
   NOTE: Tip temperatures can vary across a system to produce the best gate quality.

CAUTION!
For valve gate systems, make sure the valve pins are in the open position during tool shutdown.
Chapter 4  Assembly

This chapter is an overview of a standard Ultra hot runner system assembly. This system can be ordered either as a complete hot half or as a manifold system.

Husky hot runners can be integrated into molds in two different ways:

<table>
<thead>
<tr>
<th>Hot Runner Order</th>
<th>The hot runner order includes the plates and assembly labor. The system is heat tested at Husky's facilities and shipped ready to bolt to the customer's cavity plate. The hot runner is a finished system with all of the required hardware wired to the mold heat control connectors. If a controller has been ordered with the system, it is used during the heat test. This method of ordering minimizes issues and delays during final mold assembly at the customer's facility.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manifold System Order</td>
<td>A manifold system order does not include any Husky manufactured mold plates. The heaters and thermocouples are shipped along with the hardware ordered. This method of ordering requires extensive assembly at the point of final mold assembly.</td>
</tr>
</tbody>
</table>

**NOTE:** The procedures outlined in this chapter are designed for new hot runners. Assembly and disassembly of hot runners that have been used to process plastic parts is described in Chapter 5—Maintenance.

4.1 Assembly Procedures

The following tables outline the steps required to assemble thermal gate, valve gate and back-to-back Ultra hot runners.

Table 4-1  Assembly Procedure for Thermal Gate Systems

<table>
<thead>
<tr>
<th>Step</th>
<th>Task Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assemble the manifold plate</td>
<td>Section 4.3</td>
</tr>
<tr>
<td>2</td>
<td>Assemble and install the nozzle stacks</td>
<td>Section 4.4</td>
</tr>
<tr>
<td>3</td>
<td>Assemble and install the manifold(s)</td>
<td>Section 4.5</td>
</tr>
<tr>
<td>4</td>
<td>Measure the preload for each manifold</td>
<td>Section 4.6.1</td>
</tr>
<tr>
<td>5</td>
<td>Assemble the backing plate</td>
<td>Section 4.9</td>
</tr>
</tbody>
</table>
4.2 General Assembly

The following details the general assembly of thermal gate and valve gate.

**NOTE:** The nozzle type, nozzle layout and wiring paths shown in the following illustrations may vary based on hot runner options and application requirements.
4.2.1 Thermal Gate System

Figure 4-1 Thermal Gate Section View and Terminology

4.2.2 Valve Gate System

Figure 4-2 Valve Gate Section View and Terminology

4.2.3  Thermal Gate and Valve Gate Systems with a Cross Manifold

![Diagram of Thermal Gate and Valve Gate Systems with a Cross Manifold]

Figure 4-3  Thermal Gate and Valve Gate Section View and Terminology with Cross Manifold

1. Manifold Plate  2. Manifold Alignment Dowel  3. Thermal Gate Nozzle Stack (Typical)  
4.3 **Assembling the Manifold Plate**

To assemble a manifold plate, do the following:

1. Place two wooden blocks on a work bench and lay the manifold plate on them. The manifold plate pocket must be facing up.

   **IMPORTANT!**
   The wooden blocks must be high enough to prevent the nozzle tips from touching the work bench when the nozzle stacks are installed.

2. Thoroughly clean all bores, tapped holes, and guide holes to make sure no burrs or oil are present.

3. Install all alignment dowels and backing plate locating dowels into the manifold plate.

![Manifold Plate Assembly](image)

**Figure 4-4  Manifold Plate Assembly**


4. Install the nozzle dowels and manifold locating dowels into manifold plate pocket.

5. Install the manifold insulator into the manifold plate pocket using a socket head cap screw. Torque the screw to the value specified on the *Section View Assembly* drawing in Chapter 7.
4.4  Assembling the Nozzle Stacks

To assemble and install the nozzle stacks, do the following:

1. Make sure the manifold plate has been fully assembled and is laid on a work bench. Refer to Section 4.3 for further instructions.

2. Assemble each nozzle housing as shown in Figure 4-5.
   
   **NOTE:** Refer to the Section View Assembly drawing in Chapter 7 to verify the orientation and correct number of Ultra springs.

3. Place all housing assemblies into the nozzle bores (6) in the manifold plate. Make sure the housing assemblies are properly aligned with the nozzle locating dowels to prevent rotation.
4.5 Assembling/Installing the Manifold(s)

The following procedures describe how to assemble and install manifolds for thermal gate and valve gate systems.

4.5.1 Installing the Backup Insulators for Thermal Gate Systems

To install backup insulators on the manifolds for thermal gate systems, do the following:

1. Make sure the manifold is clean and free of burrs.

2. Install the backup insulators on the injection side of the manifold using LHSCS bolts coated with a high temperature anti-seize lubricant.

4.5.2 Installing Manifold Bushings

The following procedures describe how to install manifold bushings for valve gate systems.

4.5.2.1 Installing Threaded Manifold Bushings

To install threaded manifold bushings for Ultra 350, Ultra 500, Ultra 750 or Ultra 1000 VGLX/EX valve gate systems, do the following:

1. Make sure the interior of the manifold bushing is free of burrs.

2. Clean the stem bore in the manifold bushing with alcohol and cotton swabs. The interior is clean when a cotton swab can be removed from the bushing without any dirt on it.

3. Install the manifold bushing locating dowel into the manifold for each manifold bushing.
4. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

NOTE: Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

5. If the manifold bushing is not press fit into the manifold, place one metal O-ring seal (4) over each manifold bushing to seal between the manifold and the backup pad.

NOTE: The metal O-ring seals must be replaced if the manifold bushings are removed.

6. Place the backup pad over each manifold bushing. Make sure the backup pads contact the metal O-ring seals.

CAUTION!

For Ultra 500 and Ultra 750 systems, it may be necessary to add additional torque to the jam nut and then loosen the nut to the specified torque to properly seat the metal O-ring seal. The amount of additional torque will be specified on the Section View Assembly drawing (refer to Chapter 7) if required.

7. Install a jam nut at the end of each manifold bushing and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
4.5.2.2 Installing Threadless Manifold Bushings

To install threadless manifold bushings for Ultra 350, Ultra 500, Ultra 750 or Ultra 1000 VGLX/EX valve gate systems, do the following:

1. Make sure the interior of the manifold bushing is free of burrs.
2. Clean the stem bore in the manifold bushing with alcohol and cotton swabs. The interior is clean when a cotton swab can be removed from the bushing without any dirt on it.
3. Install the manifold bushing locating dowel into the manifold for each manifold bushing.

**NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

4. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

**NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

5. Place an interior and exterior C-ring seal over each manifold bushing.
6. Place one Grafoil seal over each manifold bushing.

**NOTE:** The C-ring seals must be replaced if the manifold bushings are removed.

7. Install a backup pad over each manifold bushing. Make sure the C-ring seals are properly aligned and seated with the backup pads.
8. Install a retaining ring into the groove at the end of each manifold bushing.
4.5.2.3 Installing Manifold Bushings for Ultra 350 Systems (Tight Pitch Applications Only)

To install manifold bushings for Ultra 350 valve gate systems, do the following:

1. Make sure the interior of the manifold bushing is free of burrs.
2. Clean the stem bore in the manifold bushing with alcohol and cotton swabs. The interior is clean when a cotton swab can be removed from the bushing without any dirt on it.
3. Install the manifold bushing locating dowel into the manifold for each manifold bushing.

4. Connect the manifold to a controller and raise the manifold temperature to minimum 200 °C (392 °F) for 15 minutes.
5. After 15 minutes, lock out and tag the controller.
6. Cool the manifold bushing in liquid nitrogen.
7. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold.

**NOTE:** Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high

**WARNING!**
Burn hazard – Contact with exposed hot surfaces will cause serious burn injury. Wear Personal Protective Equipment (PPE) when working near these areas.

4. Connect the manifold to a controller and raise the manifold temperature to minimum 200 °C (392 °F) for 15 minutes.
5. After 15 minutes, lock out and tag the controller.

**WARNING!**
Burn hazard – contact with liquid nitrogen will cause serious burn injuries. Wear Personal Protective Equipment (PPE) when dispensing and handling liquid nitrogen.

6. Cool the manifold bushing in liquid nitrogen.
7. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold.
temperature or color change applications, manifold bushings are designed for press fit installation. Contact Husky for more information on removing press fit manifold bushings.

8. Repeat step 4 to step 7 for all manifold bushings.
9. Place a C-ring over the hole in the manifold for the bushing. Make sure the C-ring is centered with the hole.
10. Install the retaining rings on the backup pad and backup pad insert.
11. Push the backup pad into the manifold.
12. Push the backup pad insert into the backup pad. Make sure the backup pad insert floats inside the backup pad.

4.5.2.4 Installing Manifold Bushings for Ultra 350 and Ultra 500 VGSX Systems

To install manifold bushings for Ultra 350 and Ultra 500 VGSX valve gate systems, do the following:
1. Make sure the interior of the manifold bushing is free of burrs.
2. Clean the stem bore in the manifold bushing with alcohol and cotton swabs. The interior is clean when a cotton swab can be removed from the bushing without any dirt on it.
3. Install the manifold bushing locating dowel into the manifold for each manifold bushing.

4. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

NOTE: Most manifold bushings are designed with clearance to allow for easy assembly into the manifold bushing bore. However, for systems designed for high temperature or color change applications, manifold bushings are designed for...
press fit installation. Contact Husky for more information on removing press fit manifold bushings.

5. Install the piston cylinder locating dowel into the manifold for each piston cylinder.
6. Place an interior (4) and exterior C-ring seal over each manifold bushing.
7. Place one Grafoil seal over each manifold bushing.
   **NOTE:** The C-ring seals must be replaced if the manifold bushings are removed.
8. Align the piston cylinder with the locating dowel and press the cylinder towards the manifold until the cylinder is fully seated on the C-rings. Repeat this step for all piston cylinders.
9. Install a retaining ring into the groove at the end of each manifold bushing.

### 4.5.3 Installing the Sprue Bushing

To install the sprue bushing to the manifold in a valve gate system, do the following:

**WARNING!**

Any contamination or damage at the sprue bushing and manifold interface may cause hot resin to spray out of the mold. The hot resin spray may result in serious burns. Both the mounting faces of the sprue bushing and the manifold must be spotlessly clean and undamaged. Torque the mounting screws to the appropriate torque.

1. Clean the surfaces on the sprue bushing and manifold where the two components will interface.

![Figure 4-11 Sprue Bushing and Manifold Sealing Faces](image)

**CAUTION!**

Make sure all screws are torqued evenly using a standard torque pattern.
2. Install the sprue bushing to the top of the manifold using socket head cap screws coated with a high temperature anti-seize lubricant.

   **NOTE:** Sprue bushing assemblies may require two or more socket head cap screws. Refer to the *Section View Assembly* drawing in Chapter 7 for more information.

   ![Figure 4-12 Sprue Bushing Installation](image)

   **Figure 4-12 Sprue Bushing Installation**

   1. Manifold  2. Sprue Bushing  3. Socket Head Cap Screw

3. Torque the screws to half the value specified on the *Section View Assembly* drawing (refer to Chapter 7) and then torque them to the full value. This will make sure an even seal is made between the sprue bushing and the manifold.

   **NOTE:** The supplied sprue bushing mounting screws are of a special quality and must not be substituted.

### 4.5.4 Installing the Manifold(s)

To install the manifold(s) into the manifold plate, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Make sure the manifold plate pocket and manifold are clean and free of burrs.

2. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the manifold.

**WARNING!**

*Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.*

3. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift the manifold over the manifold plate pocket.

4. Lower the manifold into the manifold pocket over the manifold insulator and adjust the manifold to engage the locating features.
5. Disconnect the overhead lifting device and remove the lifting eyebolt(s)/hoist ring(s).

6. Install and hand tighten manifold hold down screws to secure the manifold to the manifold plate. Make sure the manifold hold down screws are coated with a high temperature anti-seize lubricant.

7. Turn the manifold hold down screws counter-clockwise 1/4 turn and measure the preload for the manifold. Refer to section Section 4.6 for more information.

8. Hand tighten the manifold hold down screws once the preload measurements have been verified.

9. Install the wires for the manifold heaters and route the wires through the wire channels in the manifold. Make sure all wires are retained in the wire channels with wire clips.

4.6 Measuring Preload

Preload measurements from various sections of the hot runner must be taken and verified before the plates are assembled and when the hot runner is at room temperature (< 25 °C or < 77 °F). Damage to the plates, backup pads or backup insulators, and nozzle stacks could occur if the preload measurements are not within the allowed tolerances.

IMPORTANT!

Before measuring the preload on a manifold or cross manifold system, make sure the manifold hold down bolts are hand tightened and then turned counter-clockwise 1/4 turn. Overtightening the manifold hold down bolts could over-extend the nozzle housings or damage components under the manifold that are not properly seated.
4.6.1 Measuring Preload for Thermal Gate Systems

To measure the preload for all thermal gate systems, do the following:

1. Determine the height of the backup insulators from the Section View Assembly drawing. Refer to Chapter 7.

2. Using a depth micrometer, measure the distance from the top face of the manifold plate to the face of the manifold(s). Subtract this value from the height of the backup insulators to determine the preload value.

   **NOTE:** Alternatively, if a spare backup insulator is available, place the backup insulator on the manifold and measure the distance from the top of the backup pad to the manifold plate. The value obtained will be the preload value.

3. Take measurements from all other corners of the manifold(s) to make sure the preload measurement is consistent.

4. Compare the preload values to the C dimension values listed on the Tip Chart on the Section View Assembly drawing. Refer to Chapter 7.

   **NOTE:** If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

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**IMPORTANT!**

Always measure preload in more than one section of the hot runner to make sure that preload is consistent.

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4.6.2 Measuring Preload for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 VGLX/EX Systems

To measure the preload for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 valve gate systems, do the following:

1. Determine the height of the backup pads from the Section View Assembly drawing. Refer to Chapter 7.

2. Using a depth micrometer, measure the distance from the top face of the manifold plate to the face of the manifold(s). Subtract this value from the height of the backup pads to determine the preload value.

   **NOTE:** Alternatively, if a spare backup pad is available, place the backup pad on the manifold and measure the distance from the top of the backup pad to the manifold plate. The value obtained will be the preload value.

---

**CAUTION!**

Do not tighten the manifold hold down bolts to reduce the preload value. Manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.
3. Take measurements from all other corners of the manifold(s) to make sure the preload measurement is consistent.

4. Compare the preload values to the C dimension values listed on the Tip Chart on the Section View Assembly drawing. Refer to Chapter 7.

   NOTE: If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

---

CAUTION!

Do not tighten the manifold hold down bolts to reduce the preload value. Manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.

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4.6.3 Measuring Preload for Ultra 350 and Ultra 500 VGSX Systems

To measure the preload for Ultra 350 and Ultra 500 VGSX valve gate systems, do the following:

1. Measure the dimensions of the piston cylinder bore depth and verify them with those in the Section View Assembly drawing. Refer to Chapter 7.

2. Using a depth micrometer, measure the distance from the top of the piston cylinder to the manifold plate. Record the distance as measurement "A".
3. On the backing plate, measure the distance from the manifold-plate-to-backing-plate surface to the sealing surface in the piston cylinder bore. Record the distance as measurement "B".

   **NOTE:** The sealing surface is where the piston cylinder contacts the backing plate.

4. Subtract measurement "B" from measurement "A" to determine the preload measurement (i.e. A-B = Preload).

   **NOTE:** If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

5. Take preload measurements from all other corners of the manifold(s) to make sure the preload is consistent.

6. Compare the preload values to the C dimension values listed on the Tip Chart on the *Section View Assembly* drawing. Refer to Chapter 7.

   **NOTE:** If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

---

**CAUTION!**

Do not tighten the manifold hold down bolts to reduce the preload value. Manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.

### 4.6.4 Measuring Preload for Cross Manifolds

To measure the preload for all thermal gate and valve gate systems that use cross manifolds, do the following:

1. Determine the preload for the manifold and compare it to the C1 dimension listed on the Tip Chart in the *Section View Assembly* drawing. Refer to Chapter 7.

   **NOTE:** Refer to Section 4.6.2 for instructions on measuring preload for Ultra 350, Ultra 500, Ultra 750, and Ultra 1000 VGLX/EX systems.

   **NOTE:** Refer to Section 4.6.3 for instructions on measuring preload for Ultra 350 and Ultra 500 VGSX systems.
2. Using a depth micrometer, measure the distance from the cross manifold to the top face of the backup pad. Record this measurement as measurement "A".

![Figure 4-16 Measuring the Distance Between the Backup Insulator Spring Pack and the Backup Pad](image)

3. Make sure the backing plate is laying on a work bench with the pocket facing up.
4. Using a depth micrometer, measure the distance from the top face of the backing plate to the face inside the bore where the backup plate spring pack will make contact. Record this measurement as measurement "B".

![Figure 4-17 Measuring the Height of the Bore in the Backing Plate](image)

5. Subtract measurement "B" from measurement "A" to determine the preload measurement (i.e. A-B = Preload).
6. Take measurements from all other corners of the manifold(s) to make sure the preload measurement is consistent.
7. Compare the preload measurements to the C2 dimension value listed on the Tip Chart on the Section View Assembly drawing. Refer to Chapter 7.

**NOTE:** If the value is not within the tolerances given on the Tip Chart, review the assembly for obstructions or debris.

**CAUTION!**

Do not tighten the manifold or cross manifold hold down bolts to reduce the preload values. Manifold and cross manifold hold down bolts should be hand tightened and then turned counter-clockwise 1/4 turn before preload measurements are taken.
4.7 Assembling the Valve Stems and Pistons

The following procedures describe how to assemble valve stems and pistons for valve gate systems.

4.7.1 Assembly for Ultra 350 VGSX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 350 VGSX system.

**NOTE:** If resin has been run through the hot runner system, refer to Section 5.19.2.2 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

   **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.

2. Insert the valve stem into the stem bore in the piston.

3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.

4. Apply a coat of liquid teflon to the threads of two flat head screws.

5. Install the flat head screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

6. Rotate the valve stem in the piston to make sure no binding has occurred.

   **NOTE:** Make sure the valve stem can rotate freely within the piston.

---

**Figure 4-18 Valve Stem and Piston Assembly**

7. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 4.7.5.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.

   **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.

   **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.

8. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.

   **NOTE:** There should be no resistance on the valve stem in the bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.

### 4.7.2 Assembly for Ultra 500 VGSX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 500 VGSX system.

**NOTE:** If resin has been run through the hot runner system, refer to Section 5.19.2.1 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

   **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.

2. Insert the valve stem into the stem bore in the piston.

3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.

*Figure 4-19 Valve Stem and Piston Assembly*

1. Piston  
2. Double Delta or O-Ring Seal  
3. Valve Stem  
4. Spacer  
5. Screw
4. Install two socket head cap screws through the back of the piston to the spacer to secure
the valve stem to the piston. Torque all screws to the value specified on the Section View
Assembly drawing. Refer to Chapter 7.

5. Rotate the valve stem in the piston to make sure no binding has occurred.
   NOTE: Make sure the valve stem can rotate freely within the piston.

6. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 4.7.5.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high
temperature lubricant and install a new O-ring seal into the seal groove. Do not
remove any excess silicone.
      NOTE: Make sure the O-ring seal is not twisted in the seal groove.
      NOTE: High temperature lubricant is only used for teflon encapsulated seals.

7. Carefully guide the completed valve stem and piston assembly into the manifold
bushing, gently pushing by hand until the spacer rests on the manifold bushing.
   NOTE: There should be no resistance on the valve stem in the bushing. If there is
resistance, make sure no debris is present by running a pipe cleaner or brass brush
through the manifold bushing bore and blowing it out with compressed air.

4.7.3 Assembly for Ultra 350, Ultra 500 and Ultra 750 VGLX/EX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra
350, Ultra 500 or Ultra 750 VGLX/EX system.

NOTE: If resin has been run through the hot runner system, refer to Section 5.19.2.3 for
installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
2. Insert the valve stem through the center hole in the piston. Make sure the point of the valve stem is on the opposite end of the threads in the piston.

   
   **NOTE:** Make sure the piston thread is clean and dry.

   **NOTE:** Kem-A-Trix Fahrenheit 800 lubricant is available in a 3 oz squeeze tube (P/N 3936720) or a 14 oz grease gun tube (P/N 3936725).

4. Install the set screw into the piston and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

5. Rotate the valve stem in the piston to make sure no binding has occurred.
   
   **NOTE:** Make sure the valve stem can rotate freely within the piston.

6. Install a new double delta or O-ring seal:
   
   a. If the assembly uses a double delta seal, refer to Section 4.7.5.

   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal into the seal groove. Do not remove any excess silicone.

      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.

      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.

7. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.

   **NOTE:** There should be no resistance on the valve stem in the bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.
**CAUTION!**

*Do not use any form of lubricant on double delta piston seals.*

8. Place the cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.

**NOTE:** The piston cylinder is installed during the double delta seal installation procedure.

### 4.7.4 Assembly for Ultra 1000 VGLX/EX Systems

The following procedure is for installing valve stem and piston assemblies into a new Ultra 1000 VGLX/EX system.

**NOTE:** If resin has been run through the hot runner system, refer to Section 5.19.2.4 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

2. Insert the valve stem into the piston spacer.

3. Thread the piston spacer (4) onto the piston and torque to the value specified on the *Section View Assembly* drawing. Refer to Chapter 7.

4. Rotate the valve stem in the piston to make sure no binding has occurred.

**NOTE:** Make sure the valve stem can rotate freely within the piston.
5. Install a new double delta or quad seal:
   a. If the assembly uses a double delta seal, refer to Section 4.7.5.
   b. If the assembly uses a quad seal, coat the seal groove in the piston with a high temperature lubricant and install a new quad seal into the seal groove. Do not remove any excess silicone.
      
      **NOTE:** Make sure the quad seal is not twisted in the seal groove.
      
      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.

6. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.
   
   **NOTE:** There should be no resistance on the valve stem in the manifold bushing. If there is resistance, make sure no debris is present by running a pipe cleaner or brass brush through the manifold bushing bore and blowing it out with compressed air.

---

**CAUTION!**

Do not use any form of lubricant on double delta piston seals.

---

7. Place the piston cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
   
   **NOTE:** The piston cylinder is installed during the double delta seal installation procedure.

---

### 4.7.5 Installing the Double Delta Seal

To install the double delta seal on Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 valve gate pistons, do the following:

- **NOTE:** This procedure is for systems that have not been used to process resin. For systems that contain resin in the manifolds and melt channels, refer to Section 5.19.3.

- **NOTE:** The following procedure uses the double delta piston seal installation tool. Refer to Section 5.4.7 for part numbers.

1. Assemble the valve stem, set screw and piston.
2. Place the piston in a vise with soft jaws.
3. Install the interior O-ring seal into the seal groove by rolling it over the piston. No tools are required.

4. Place the seal installation tool on top of the piston.

5. Install the outer O-ring seal by pushing the seal over the seal installation tool until it sits over the interior O-ring seal.

6. Remove the seal installation tool.

7. Insert the piston cylinder into the cylinder cap base tool. Make sure the tool is sitting on a solid work surface.
8. Install the piston installation tool over the piston cylinder.

9. Insert the piston assembly into the piston installation tool with the valve stem pointing up.

10. Slide the hammer tool over the valve stem and use it to press the piston assembly into the piston cylinder.

   **NOTE:** Make sure the piston assembly is pushed to the bottom of the piston cylinder.
11. Remove the hammer and piston installation tools.
12. Remove the piston cylinder assembly from the cylinder cap base tool.

### 4.8 Assembling the Center Air Plate

The following procedure describes how to install the optional air plate for Valve Gate systems:

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Make sure the fully assembled manifold plate is on a work bench with the manifold pocket facing up. The plate must be supported by two wooden blocks.
2. Thoroughly clean all bores, tapped holes, and guide holes to make sure no burrs or oil are present.

3. Make sure the locating dowels for the center air plate are installed in the manifold plate.
   
   **NOTE:** Refer to the *Section View Assembly* drawing in Chapter 7 to determine which side of the center air plate mates with the manifold plate.

4. Coat the tips of the alignment dowels with a high temperature lubricant.

5. Install a suitable lifting eyebolt(s)/hoist ring(s) in the center air plate lifting location(s) on the side opposite the manifold plate.

**IMPORTANT!**

The wooden blocks must be high enough to prevent the nozzle tips from touching the work bench when the nozzle stacks are installed.

6. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift the center air plate over the manifold plate.

7. Align the center air plate with the alignment dowels and lower the center air plate onto the manifold plate.

8. Disconnect the overhead lifting device.

9. Remove the lifting eyebolt(s)/hoist ring(s) from the center air plate.

10. Install a suitable lifting eyebolt(s)/hoist ring(s) to the lifting location(s) on top of the manifold plate.

11. Slowly lift the manifold plate and center air plate until they are on a 45° angle.

12. Apply a coat of high temperature lubricant to the tips of the retaining bolts that will be used to secure plates together.

13. Coat the tips of two retaining bolts with a high temperature lubricant and install them through the manifold plate. Tighten the bolts by hand.

14. Position the manifold plate and center air plate so they are vertical to the work bench. Do not disconnect the lifting device.

15. Coat the tips of the remaining retaining bolts with a high temperature lubricant and install them through the manifold plate.

16. Torque all retaining bolts to the value specified on the *Section View Assembly* drawing (refer to Chapter 4) in the cross-pattern shown in Figure 4-30.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.
17. Install the manifold thermocouples to the manifolds through the access holes in the manifold plate.

**NOTE:** To avoid losing the bolt, assemble the bolt with the thermocouple and pull the wires back when inserting the bolt through the manifold plate. This will create enough tension to keep the assembly together until the bolt is started in the manifold thread.

18. Label each wire with its pin designation.

**NOTE:** Refer to the electrical schematic(s) in Chapter 7 for wiring information.

19. Route the wires through the wire grooves in the plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.

**NOTE:** Refer to the electrical schematic(s) in Chapter 7 for wiring information.

20. Lower the assembly down onto two wooden blocks with the manifold plate facing down.

21. Remove the lifting eyebolt(s)/hoist ring(s) from the manifold plate.
4.9 Assembling the Backing Plate

To assemble the backing plate, do the following:

**NOTE:** The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Make sure the backing plate is clean and free of pry marks around the pry slots. Clean the backing plate surface with a medium India stone (240 grit oilstone) as needed.

2. Verify that all the proper alignment dowels and locating dowels are in place before installing the backing plate.

3. Verify that clearance holes are cut into the backing plate to match with the manifold thermocouple locations in the manifold.

4. Verify the preload measurements for the manifold(s). Refer to Section 4.6.

5. For valve gate systems only, measure the dimensions of the piston cylinder bore depth and verify them with those in the Section View Assembly drawing. Refer to Chapter 7.

6. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the backing plate.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

7. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift the backing plate.
8. Slowly lower the backing plate onto the manifold plate or center air plate (if equipped). Make sure the locating dowels aligns with the backing plate locating bores.

9. Disconnect the overhead lifting device and remove the lifting eyebolt(s)/hoist ring(s).

10. Apply a light coat of high temperature lubricant to the end of each retaining bolt.

11. Install the retaining bolts and torque them to the value specified on the Section View Assembly drawing (refer to Chapter 7) in the cross pattern shown in Figure 4-31.

**IMPORTANT!**

When bolting the backing plate to the manifold plate or center air plate (if equipped), tighten the center most bolts first.

12. Re-torque the bolts to achieve a uniform torque across all bolts.

13. Install the sprue heater and thermocouple. Refer to Section 4.10.

14. Install the manifold thermocouples to the manifold through the access holes in the backing plate.

**NOTE:** To avoid losing the bolt, assemble the bolt with the thermocouple and pull the wires back when inserting the bolt through the manifold plate. This will create enough tension to keep the assembly together until the bolt is started in the manifold thread.

15. Install the locating ring and secure it in place using two SHCS bolts.

16. Run the sprue bushing thermocouple and heater power leads into the appropriate multi-pin connector(s). Use wire clips to secure the wires in the wire channels.

**NOTE:** Refer to the electrical schematic(s) in Chapter 7 for wiring information.

4.10 Assembling the Sprue Heater

The following procedures describe how to install a sprue heater. Sprue heaters come with either a separate thermocouple installed during assembly, or with a thermocouple pre-installed.

4.10.1 Assembling a Sprue Heater with a Separate Thermocouple

To install a sprue heater that comes with a separate thermocouple, do the following:

1. Install the sprue heater and thermocouple through the sprue hole onto the sprue bushing. Hand tighten the sprue heater retaining clip.

2. Slide the sprue heater over the sprue bushing and align the wire leads with the wire grooves in the backing plate. Make sure the sprue heater is pushed down far enough to expose the retaining clip groove in the sprue bushing.

3. Install the retaining clip into the retaining ring groove.
4. Thread the heater removal tool onto the sprue heater and pull up on the tool until the heater makes contact with the retaining clip.

5. Install the sprue heater thermocouple.

**CAUTION!**

The front ring holds the thermocouple in place for proper reading of the sprue heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the sprue heater and other components.

6. Install the front ring over the sprue heater and hand tighten only.

### 4.10.2 Assembling a Sprue Heater with a Combined Thermocouple

To install a sprue heater that includes a thermocouple, do the following:

1. Install the sprue heater assembly through the sprue hole onto the sprue bushing.

2. Slide the sprue heater over the sprue bushing and align the wire leads with the wire grooves in the backing plate. Make sure the sprue heater is pushed down far enough to expose the retaining clip groove in the sprue bushing.
   
   If the wire length is too long, refer to Section 4.10.2.1.

   If the wire length is too short, refer to Section 4.10.2.2.

3. Install the retaining clip into the retaining ring groove.

#### 4.10.2.1 Recommendations for Small Manifold Pockets

For small manifold pockets where the lead length is greater than required, wrap the wires around the heater body to reduce slack and make sure the wires fit properly in the wire channel.

![Figure 4-32 Wire Wrapped Around Sprue Heater](image-url)
4.10.2.2 Recommendations for Large Manifold Pockets

For large manifold pockets where the lead length is insufficient to reach a wire channel, cut and install a length of fiberglass sleeving to protect the wire.

![Figure 4-33 Fiberglass Sleeving](image)

4.11 Assembling the Nozzle Tip and Heater Assemblies

The following procedures describe how to install and test nozzle tip and heater assemblies for thermal gate and valve gate systems.

4.11.1 Assembly for Thermal Gate Systems

The following procedures describe how to install nozzle tip and heater assemblies for thermal gate systems.

4.11.1.1 Assembling a HTM Heater for Ultra 250 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 250 thermal gate system, do the following:

1. Slide the nozzle heater assembly over the nozzle housing until it bottoms out on the housing.

   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
2. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate.

3. Unscrew the set screw at the tip of retaining sleeve so it does not interfere when installing the nozzle tip.

4. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

5. Install the nozzle tip and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

NOTE: Refer to Section 5.4 for a listing of special Husky tools and order numbers.

6. Pull the nozzle heater assembly up until it contacts the hex section of the nozzle tip.

7. Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

8. Install wire clips in the wire grooves to protect the wires from pinching and excess heat.

9. Label each wire with the heater zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

11. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.1.2 Assembling a HTM Heater for Ultra 350 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 350 thermal gate system, do the following:

1. Inspect the nozzle tip and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Thread the nozzle tip onto the nozzle housing. Torque the nozzle tip to the torque value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

   NOTE: Refer to Section 5.4 for a listing of special Husky tools and order numbers.

3. Slide the wave springs onto the nozzle housing. The number of wave springs required is listed on the Plan View Assembly drawing. Refer to Chapter 7.

4. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

   NOTE: The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

5. Install the retaining clip on the tip retainer and pull the nozzle heater assembly up against it.

6. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

7. Label each wire with the heater zone number.
8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

9. Test each nozzle heater zone according to the instructions in Section 4.11.3.

4.11.3 Assembling a HTM Heater for Ultra 500 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 500 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

**NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

**NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-39.
3. Unscrew the set screw at the tip of retaining sleeve so it does not interfere during the installation of the nozzle heater assembly.

4. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.
   
   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

5. Install the retaining clip on the tip retainer and pull the nozzle heater assembly up against it.

6. Torque the set screw at the end of the retaining sleeve to the value specified on the *Section View Assembly* drawing. Refer to Chapter 7.

7. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

8. Label each wire with the heater zone number.

9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

10. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.1.4 Assembling a Copper Heater for Ultra 500 Systems

To assemble the nozzle tip and copper heater assembly for an Ultra 500 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

**NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

**NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-39.
3. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

4. Install the retaining clip on the tip retainer.

5. Install the thermocouple probe end into the probe hole on the nozzle heater as shown in Figure 4-38.

   NOTE: A slot is cut into the nozzle heater to allow the thermocouple to be set in place with the retaining sleeve.

6. Slide the retaining sleeve over the nozzle heater and thermocouple.

   **CAUTION!**

   The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

7. Pull the nozzle heater up against the retaining clip.

8. Hand tighten the front ring onto the nozzle heater.

9. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.

11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

12. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.1.5 Assembling an Ultra Heater for Ultra 500 and Ultra 750 Systems

To assemble the nozzle tip and Ultra heater assembly for an Ultra 500 and 750 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

   **NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

   **NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-41.
3. Install the thermocouple retaining ring over the nozzle heater.
4. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.
5. Slide the nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.
6. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
7. Label each wire with the heater zone number.
8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
9. Test each nozzle heater zone according to the instructions in Section 4.11.3.

---

**Figure 4-41 Thermal Sprue (TS) Orientation**

1. Thermal Sprue (TS) Tip  
2. Flow Pin
4.11.6 Assembling a Bi-Metal Heater for Ultra 750 and Ultra 1000 Systems

To assemble the nozzle tip and bi-metal heater assembly for an Ultra 750 and 1000 thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer onto the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

   **NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

   **NOTE:** When installing thermal sprue (TS) tips, first verify the flow pin orientation before installing the tip, as shown in Figure 4-43.
3. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

4. Install the retaining clip on the tip retainer and pull the nozzle heater assembly up against it.

5. Install the thermocouple probe end into the probe hole on the nozzle heater end as shown in Figure 4-42.

CAUTION!

The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

6. Secure the thermocouple to the nozzle heater by hand tightening the heater front ring on the nozzle heater.

7. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

8. Label each wire with the heater zone number.

9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

10. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.1.7 Assembling a Triton Heater for Ultra 750-UP Systems

To assemble the nozzle tip and Triton heater assembly for an Ultra 750-UP thermal gate system, do the following:

1. Inspect the tip insert, tip retainer and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Insert the tip insert into the tip retainer and thread the tip retainer into the nozzle housing. Torque the tip retainer to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

3. Slide the wave springs onto the nozzle housing. The number of wave springs required is listed on the Plan View Assembly drawing. Refer to Chapter 7.

4. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

   NOTE: Each wave spring can be compressed up to approximately 3 mm (0.12 in).

5. Install the thermocouple retaining ring over the nozzle heater.

6. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

7. While holding the nozzle heater and thermocouple retaining ring firmly against the wave springs, install the retaining clip into the groove in the nozzle housing.
8. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

9. Label each wire with the heater zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

11. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.1.8 Assembling a (Bi-Metal Heater) for Ultra 750 HT-S6 Systems

To assemble the nozzle tip and bi-metal heater assembly for an Ultra 750 HT-S6 thermal gate system, do the following:

1. Inspect the nozzle tip and nozzle housing for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Thread the nozzle tip into the nozzle housing. Torque the nozzle tip to the torque value printed on it. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.
   
   **NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.
3. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

4. Install the retaining clip on the tip retainer and pull the nozzle heater upwards until it stops against the retaining clip.

5. Install the thermocouple probe end into the probe hole on the nozzle heater end as shown in Figure 4-46.

CAUTION!

The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

6. Secure the thermocouple to the nozzle heater by hand tightening the heater front ring on the nozzle heater.

7. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

8. Label each wire with the heater zone number.

9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

10. Test each nozzle heater zone according to the instructions in Section 4.11.3.
4.11.2 Assembly for Valve Gate Systems

The following procedures describe how to install nozzle tip and heater assemblies for valve gate systems.

4.11.2.1 Assembling a HTM Heater for Ultra 350 Systems

To assemble the nozzle tip and HTM heater assembly for an Ultra 350 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

   **NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

3. Slide the wave springs onto the nozzle housing. The number of wave springs required is listed on the Plan View Assembly drawing. Refer to Chapter 7.

4. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.

   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

5. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.

6. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

7. Label each wire with the heater zone number.
8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
9. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.2.2 Assembling a Copper Heater for Ultra 500 Systems

To assemble the nozzle tip and copper heater assembly for an Ultra 500 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

   **NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

3. Slide the nozzle heater over the nozzle housing and nozzle tip.
4. Install the retainer ring around the nozzle tip.
5. Connect the thermocouple to the nozzle heater.
6. Pull the nozzle heater up against the retainer ring.
7. If required, install the retaining sleeve over the thermocouple and nozzle tip.

---

**Figure 4-48 Nozzle Tip and Heater Assembly for Ultra 500 VG Systems (Copper Heater)**

1. Front Ring  
2. Retaining Sleeve  
3. Retainer Ring  
4. Nozzle Heater  
5. Thermocouple  
6. Nozzle Tip
8. Install the front ring and tighten by hand.

9. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.

11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

12. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.2.3 Assembling an Ultra Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems

To assemble the nozzle tip and Ultra heater assembly for an Ultra 500, Ultra 750 or Ultra 1000 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

   **NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

3. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.

4. Slide the nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.
5. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

6. Label each wire with the heater zone number.

7. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

8. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.2.4 Assembling a Bi-Metal Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems

To assemble the nozzle tip and bi-metal heater assembly for an Ultra 500, Ultra 750 or Ultra 1000 valve gate system, do the following:

1. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

2. Install the nozzle tip onto the nozzle housing and torque it to the value printed on the side of the nozzle tip using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

**NOTE:** Refer to Section 5.4 for a listing of special Husky tools and order numbers.

3. Slide the nozzle heater over the nozzle housing and nozzle tip.

4. Install the retainer ring around the nozzle tip.

5. Connect the thermocouple to the nozzle heater.

6. Pull the nozzle heater up against the retainer ring.
7. Install the front ring and tighten by hand.

8. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

9. Label each wire with the heater zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

11. Test each nozzle heater zone according to the instructions in Section 4.11.3.

### 4.11.3 Testing Nozzle Heaters

To confirm a nozzle heater is functioning properly, do the following:

1. Using a multimeter set to ohms, measure the resistance through each nozzle heater zone. Refer to the electrical schematic(s) in Chapter 7 for the ohms measurements required for each zone. The normal tolerance for nozzle heaters is ±5%.

**CAUTION!**

A common problem with nozzle heaters is moisture absorption due to the hygroscopic nature of the insulation. A heater with a low case to center conductor insulation reading (< 10K ohms) should be baked out and retested to determine if moisture was the cause. Contact your Husky Regional Service and Sales office for more information.

2. Using a multimeter set to ohms, measure the resistance through each lead to ground. A measurement from either lead to ground that is below 100K ohms indicates a short to ground. A measurement from 100 kilohms to 1 megohms is often associated with a wet heater. A measurement greater than 1 megohms is good.

   **NOTE:** A short reading can be the result of either a pinched wire or a broken heater element. Inspect the wires first to make sure there are no pinched or damage lead wires. A heater wire can be spliced, however, this should only be done by a certified electrician. The splice should include dual layer heat shrink tubing with an adhesive inner layer to avoid potential water shorts. The heat shrink should be rated for 150 °C (302 °F) minimum.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 7 for resistance information.

### 4.12 Assembling Single Cavity Valve Gates (Generation 1.0)

The following procedures describe how to assemble sections of the single cavity valve gate (SCVG) assembly (Generation 1.0). Follow them in order to assemble the full SCVG assembly.

**NOTE:** Single cavity valve gates are for pneumatic operation only. Refer to Section 3.5.2 for more information.
4.12.1 Sprue Body Assembly

To assemble the sprue body, do the following:

1. Make sure the sprue body and its melt channels are clean and free of burrs.
2. Install a set screw into the weep hole in the side of the sprue body and hand tighten.
3. Install the valve stem into the stem retainer and torque the set screw to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
4. Slide the connecting rods into the stem retainer and insert the stem retainer and connecting rod assembly into the sprue body.

![Sprue Body Assembly Diagram](image)

Figure 4-51 Sprue Body Assembly


4.12.2 Extruder Pad Assembly

To assemble the extruder pad, do the following:

1. Insert two crush rings and two dowel bushings into the sprue body. Verify that components are in the correct bores. All bores are the same diameter, but have different depths.
2. Press the extruder pad onto the sprue body, making sure the weep holes and bolt holes are aligned.
4.12.3 Insulator and Housing Assembly

To assemble the insulator and nozzle housing, do the following:

1. Turn the assembly upside down (valve stem pointing upwards) and insert the melt channel spacer into the sprue body.

2. Install the anti-rotation tab over the nozzle housing.

3. Install the nozzle housing (3) over the valve stem until it bottoms out on the channel spacer.

4. Lower the insulator housing assembly down onto the sprue body.

**NOTE:** Make sure the 8 mm (0.3 in) cutout in the side of the insulator housing assembly is directly below the counter-sunk hole in the side of the sprue body.

**NOTE:** The connecting rods may need to be moved into alignment with the holes in the insulator housing assembly to get the insulator to seat against the sprue body.
4.12.4  Securing Extruder Pad

To secure the extruder pad to the sprue body, do the following:

1. Grip the insulator housing assembly and rotate the sprue body assembly until the extruder pad faces up.

2. Firmly secure the assembly in a vise clamp with soft jaws using the flats on the insulator housing assembly.

3. Coat the tips of four SHCS bolts with a high temperature anti-seize lubricant.

4. Install the SHCS bolts into the extruder pad and torque them to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

5. Remove the sprue body assembly from the vise and set it on a work bench with the insulator housing facing up.

Figure 4-54  Securing Extruder Pad

1. SHCS Bolt
4.12.5 Piston Assembly

To assemble the piston, do the following:

1. Clean the piston to make sure no dirt or oil is present.

   
   **NOTE:** Kem-A-Trix Fahrenheit 800 lubricant is available in a 3 oz squeeze tube (P/N 3936720) or a 14 oz grease gun tube (P/N 3936725).

3. Install the inner piston seal inside of the piston.

4. Install the outer piston seal outside of the piston.
4.12.6 Piston Cylinder Assembly

To assemble the piston cylinder, do the following:

1. Spin the connecting rods until the dowel holes point radially outward from the housing.

2. Carefully lower the piston over the ends of the connecting rods.

3. Tap the dowel pins into the holes in the piston until they are flush with the piston.

4. Assemble the copper ring and cylinder sleeve (4) together.

5. Slide the copper ring and cylinder sleeve assembly through the center of the piston.
   
   **NOTE:** Check the piston dowels to make sure no sharp edges or burrs are present that could damage the inner surface of the outer cylinder.

6. Slide the outer cylinder over the piston.

7. Install two cylinder LHCS bolts into the insulator housing and tighten by hand to secure the outer cylinder.
4.12.7 Sprue Body Thermocouple Installation

To install the sprue body thermocouple, do the following:

1. Carefully secure the assembly in a vise clamp horizontally with the insulator housing pointing to your left or right.

   **NOTE:** The counter-sunk hole must be visible in order to install the thermocouple.

2. Insert the sprue body thermocouple into the counter-sunk hole in the side of the sprue body.

![Figure 4-57 Sprue Body Thermocouple Installation](image)

3. Bend the thermocouple wire as shown in Figure 4-57 so the lead sits in the counter-sunk hole in the sprue body and the leads exit the 8mm cutout in the insulator.
4.12.8 Sprue Body Heater Installation

To install the sprue body heater, do the following:

1. Rotate the assembly in the vise clamp until the extruder pad faces up.
   
   **NOTE:** Make sure the cutout in the insulator housing is clear of the vise jaws. Do not pinch the thermocouple wire in the vise.

2. Slide the sprue body heater over the sprue body until the heater bottoms out on the insulator housing.

![Figure 4-58 Sprue Body Heater Installation](image)

1. Sprue Body Heater  2. Extruder Pad

4.12.9 Weep Fitting Installation

To install the weep fitting, do the following:

1. Install the weep fitting into the sprue body through the hole in the sprue body heater.

2. Hand tighten the weep fitting using the weep fitting installation tool (P/N 3227948).

![Figure 4-59 Weep Fitting Installation](image)

1. Weep Fitting  2. Weep Fitting Installation Tool
4.12.10 Sprue Bushing Insert Installation

To install the sprue bushing, do the following:

1. Install the sprue bushing insert onto the extruder pad.

2. Coat two SHCS bolts with a high temperature lubricant.

3. Install the SHCS bolts into the sprue bushing insert and torque them to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

Figure 4-60 Sprue Bushing Insert Installation
1. Sprue Bushing Insert  2. SHCS Bolt

4.12.11 Nozzle Tip Installation

To install the nozzle tip, do the following:

1. Install the nozzle tip onto the nozzle housing and torque to the designed specification.

   NOTE: Refer to the Section View Assembly drawing in Chapter 7.

Figure 4-61 Nozzle Tip Installation
1. Nozzle Tip
4.12.12 Nozzle Heater Installation

To install the nozzle heater, do the following:

1. Slide the nozzle heater over the housing and orient the heater leads toward the sprue body heater leads.

2. Install the retaining clip into the groove in the nozzle tip.

3. Install the tip of the thermocouple probe end into the probe hole on the nozzle heater end

4. Secure the thermocouple by installing and hand tightening the heater front ring (4) as shown in Figure 4-62.

4.12.13 Air Hose Connections

To connect the air hoses, do the following:

1. Remove the assembly from the vise clamp and lay it on a work bench.

2. Wrap the threaded ends of two air fittings with teflon tape and install the fittings into the insulator housing.
3. Attach two flexible air hoses to the air fittings.

   **NOTE:** Label which hose is for air open and which one is for air closed.

4. If applicable, insert the tip insulator into the gate well in the cavity plate.

5. Insert an anti rotation dowel into the cavity plate.

6. Install the SCVG assembly into the cavity plate, rocking it gently if necessary, until the assembly is fully seated in the bore.

   **NOTE:** Verify that all wires are properly oriented and loosely packed in a wire groove.

### 4.12.14 Final Connections

To complete the final connections, do the following:

1. Finish all wiring connections to the connectors as per the electrical schematic.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 7.

2. Make sure each connector has a ground wire connected to the manifold block.

3. Apply air pressure to one air hose and then the other to check for air leaks in the system. It is not necessary to plug one air hose while applying pressure to the other.

   **NOTE:** The unit is not air-tight unless it is properly installed in the hot runner.

### 4.12.15 Locating Ring Installation

To install the locating ring, do the following:

1. Install the locating ring over the assembly, making sure the slot in the locating ring seat is aligned with the hard wire on the sprue body heater.
CAUTION!

Failure to align the locating ring and the hard wire could damage electrical wires.

2. Install four SHCS bolts into the locating ring and cavity plate. Evenly torque the bolts in a four-point star pattern to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

4.13 Assembling Single Cavity Valve Gates (Generation 2.0)

The following assembly procedures are for generation 2.0 Ultra 350, Ultra 500, Ultra 750, and Ultra 1000 single cavity valve gate (SCVG) assemblies.
Figure 4-65  Single Cavity Valve Gate (Generation 2.0) for Ultra 350, Ultra 500, Ultra 750, and Ultra 1000 (Typical)

4.13.1 Assembling a Single Cavity Valve Gate

To assemble a single cavity valve gate, do the following:

**IMPORTANT!**

All seals in the single cavity valve gate (SCVG) must be replaced whenever the unit is re-assembled to maintain optimal sealing. A seal kit for Ultra 350, Ultra 500 and Ultra 750 series SCVGs is available under P/N 3509936. A seal kit for Ultra 1000 series SCVGs is also available under P/N 3509937.

**NOTE:** The following procedure references items in Figure 4-65.

1. Unpack and clean all required components.
2. Compare all components to the parts list. Refer to Chapter 7.
3. Compare the nozzle housing and valve stem details to the assembly drawings. Refer to Chapter 7.
4. Make sure the melt channels in the sprue body and nozzle housing (16) are clean and free of burrs.
5. If not done already, attach the nameplate to the air plate using the supplied rivets.
6. Set the air plate in a vice clamp with soft jaws, with the air plate boss facing down.
7. Insert the nozzle housing into the air plate.
8. Install the M/C reducer and new Grafoil seals to the air plate.
9. Install retaining tabs to the sprue body in the retaining tab slots using two BHCS bolts.

   **NOTE:** Older sprue body designs do not feature retaining tab slots.

10. Place the sprue body on the air plate and align the retaining tabs with the slots in the air plate. Make sure the thermocouple hole on the sprue body is inline with the thermocouple groove in the air plate.
11. Install new dowel bushings (11) and crush rings to the sprue body.

12. Assemble the valve stem slider with the connecting rods and insert the assembly into the sprue body. Make sure the valve stem slider is assembled with the flat side towards the sprue body.
13. Tilt the sprue body 45° in the vise clamp.

14. Insert the head of the valve stem through the nozzle housing until the head exits the sprue body on the other side.

15. Place the valve stem retainer over the valve stem head.
16. Coat two SHCS bolts with a high temperature anti-seize lubricant.

17. Install the SHCS bolts with lock washers (or internal star washers) to the valve stem retainer. Torque the bolts to the value specified on the *Section View Assembly* drawing. Refer to Chapter 7.

**CAUTION!**

*Make sure the valve stem moves freely within the sprue body.*

18. Assemble the extruder pad onto the sprue body and align the bolt holes.
19. Coat four SHCS bolts with a high temperature anti-seize lubricant.

20. Install the SHCS bolts to the extruder pad and torque them to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

21. Rotate the SCVG 180° in the vise clamp with the nozzle housing facing up. Make sure the extruder pad is in the clamp.


   **NOTE:** Kem-A-Trix Fahrenheit 800 lubricant is available in a 3 oz squeeze tube (P/N 3936720) or a 14 oz grease gun tube (P/N 3936725).

23. Install the O-ring seal around the annular piston.

24. Lubricate two new O-ring seals with a high temperature lubricant. Install the O-ring seals to the inside O-ring grooves in the annular piston.

25. Lubricate a new O-ring seal with a high temperature lubricant. Install the O-ring seal around the cylinder insert.

   **NOTE:** Install an additional O-ring for Ultra 1000 systems.

**NOTE:** Kem-A-Trix Fahrenheit 800 lubricant is available in a 3 oz squeeze tube (P/N 3936720) or a 14 oz grease gun tube (P/N 3936725).

27. Install the O-ring seal to the air plate boss.

28. Insert the chamfer-end of the cylinder insert into the annular piston. Make sure the cylinder insert does not cover the connecting rod slots on the annular piston.
29. Assemble the cylinder insert and annular piston assembly onto the connecting rods.

30. Slide the cylinder insert and annular piston assembly over the air plate boss O-ring seal (for Ultra 350, Ultra 500 and Ultra 750 systems only) or into the air plate hole (for Ultra 1000 systems only).

31. Lubricate the inner wall of the cylinder with Kem-A-Trix Fahrenheit 800 lubricant and install the cylinder onto the air plate.

**Make sure the arrows on the cylinder and the arrows on the air plate are aligned.**

**NOTE:** Kem-A-Trix Fahrenheit 800 lubricant is available in a 3 oz squeeze tube (P/N 3936720) or a 14 oz grease gun tube (P/N 3936725).
32. Coat four SHCS bolts with a high temperature anti-seize lubricant.

33. Install the SHCS bolts into the cylinder and torque them to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

34. Temporarily install an air supply to the air open port on the air plate and apply 7.6 bar (110 psi) to the port. Listen for any audible air leaks. Repeat this step several times on the air open port and then repeat it for the air close port.

35. If an air leak exists, check for damaged O-ring seal(s), partially seated components, or improperly torqued components. Once the problem has been fixed, test the air open and air closed ports again.

**IMPORTANT!**

A small amount of air leakage (less than 5 liters/minute) is expected through the weep hole in the sprue body when the piston-closed air hose is pressurized.

36. Install the nozzle tip and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
37. Rotate the SCVG 180° in the vise clamp with the sprue bushing insert facing up. Make sure the air plate is in the clamp.

38. Using electrical pliers, temporarily install the sprue body thermocouple into the sprue body. Fit the thermocouple to the sprue body as shown in Figure 4-85.

39. Remove the sprue body thermocouple to facilitate the installation of the sleeve.

40. Install the sleeve over the air plate and install two FHCS bolts to the sleeve.

41. Apply teflon tape to the air fittings and install them to the air plate.
42. Install the pre-fitted sprue body thermocouple to the sprue body.

43. Install the sprue body heater onto the sprue body. Make sure the weep fitting hole in the heater aligns with the corresponding hole in the sprue body.

44. Using an M6 Allen key, install the weep fitting into the weep fitting hole in the sprue body.
45. Install the sprue bushing insert onto the extruder pad. Make sure the counter-bores on the sprue bushing insert align with the bore holes in the extruder pad.

46. Coat four SHCS bolt with a high temperature anti-seize lubricant.

47. Install the SHCS bolts to the sprue bushing insert and torque them to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

48. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing up. Make sure the extruder pad is in the clamp.

49. Install the nozzle heater over the nozzle tip. Refer to Section 4.11.1 for more information.

50. Install the nozzle heater thermocouple and bend the leads to prevent the thermocouple from being pinched between the cavity plate and the manifold plate.
4.13.2 Installing Single Cavity Valve Gates

To install a single cavity valve gate, do the following:

1. Attach two flexible air hoses to the air fittings. Refer to Figure 4-93.
NOTE: Label which hose is for air open and which one is for air closed.

2. If applicable, insert the tip insulator into the gate well in the cavity plate.

3. Insert an anti rotation dowel into the cavity plate.

4. Install the SCVG assembly into the cavity plate, rocking it gently if necessary, until the assembly is fully seated in the bore.

NOTE: Verify that all wires are properly oriented and loosely packed in a wire groove.

5. Install the locating ring over the assembly, making sure the slot in the locating ring seat is aligned with the hard wire on the sprue body heater. Refer to Figure 4-94.

NOTE: Failure to align the locating ring and the hard wire could damage electrical wires.

6. Install four SHCS bolts into the locating ring and cavity plate. Evenly torque the bolts in a four-point star pattern to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
4.14 Installing the Hot Runner to the Machine

The following procedure describes how to install a fully assembled hot runner to an injection molding machine.

**IMPORTANT!**
Always refer to the hot runner installation procedure or guidelines included in the *Service Manual* and/or *Mold Manual* before installing the hot runner.

**WARNING!**
Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the lifting eye bolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Clean the backing plate, locating ring, and sprue bushing to make sure no dirt or oil is present.
2. Make sure the mold is open.
3. Lock out and tag the machine. Refer to Section 1.9.
4. Clean the stationary platen to make sure no dirt or oil is present.
5. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the backing plate.

**WARNING!**
Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

6. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift the hot runner into the clamp area. Make sure the backing plate faces the stationary platen.
7. Align the locating ring with the sprue nozzle and position the hot runner against the stationary platen.
8. Install the bolts that secure the hot runner to the stationary platen and torque them to the torque specified on the *Section View Assembly* drawing. Refer to Chapter 7.
9. Connect any electrical cables to the electrical connectors on the hot runner. Refer to the electrical schematic(s) in Chapter 7 for further information.
10. Remove locks and tags.
Chapter 5  Maintenance

This chapter contains assembly and disassembly procedures used to perform specific maintenance tasks on the hot runner system. A list of available removal tools is also provided. The exact details of your hot runner system can be found in the drawings located in Chapter 7.

5.1  Troubleshooting

Troubleshooting methods, terminology, and procedures are discussed in the interactive hot runner Service Investigation Guide (P/N 3719181). Contact your Husky Regional Service and Sales office for more information.

5.2  Periodic Maintenance

The following maintenance procedures must be performed on a regular basis.

5.2.1  Maintenance Each Shift

The following are the maintenance tasks that must be performed at the start of each shift:

WARNING!

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

1.  Follow all safety procedures outlined in Chapter 1.
2.  Lock out and tag the machine. Refer to Section 1.9.
3.  Inspect the finish on the cavity plate, core plate, and other contact surfaces.
4.  Check the cleanliness of the parting line air vents.
5.  Check the operation of the mold-to-machine interlocks.
6.  Remove locks and tags.
5.2.2 Monthly Maintenance

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

1. Review the production of the mold for the past month and compare it to the previous months performance.
2. Review the processing parameters of the mold and hot runner for the past month and compare it to the previous months performance. Look for trends to indicate changes in the process.
3. Check the product dimensions and compare them to the previous months dimensions.
4. Review the Statistical Process Control information for the past month and compare it to the previous months.

5.3 Corrective Maintenance

The following are procedures performed during corrective maintenance of specific components. The procedures are organized by component and listed separately for each type of Ultra system.

5.3.1 Removal Procedures

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<th>Reference</th>
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<tr>
<td>Backing Plate</td>
<td>Section 5.9.1 OR Section 5.9.3</td>
</tr>
<tr>
<td>Cavity Plate</td>
<td>Section 5.6.1 OR Section 5.6.3</td>
</tr>
<tr>
<td>Hot Runner</td>
<td>Section 5.5</td>
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<tr>
<td>Manifold</td>
<td>Section 5.14.1</td>
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<tr>
<td>Manifold Bushing</td>
<td>Section 5.18.1</td>
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### 5.3.2 Installation Procedures

**NOTE:** With the exception of the hot runner installation, installation procedures in this chapter differ from the assembly procedures in Chapter 4—Assembly in that they are for hot runners that have been used to process parts.

<table>
<thead>
<tr>
<th>Component</th>
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<td>OR</td>
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<td>Section 5.13.2.2 (VGSX)</td>
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<td>OR</td>
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<td></td>
<td>Section 5.13.2.4 (VGLX/EX)</td>
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<tr>
<td>Nozzle Tip (Thermal Gate)</td>
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<tr>
<td>Nozzle Tip (Valve Gate)</td>
<td>Section 5.10.3</td>
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<td>Sprue Bushing</td>
<td>Section 5.17.1</td>
</tr>
<tr>
<td>Valve Stem and Piston</td>
<td>Section 5.19.1.2 (VGLX/EX)</td>
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<td></td>
<td>Section 5.19.1.1 (VGSX)</td>
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<td>Section 5.19.1.2</td>
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<td>Section 5.8.2 (On a Work Bench)</td>
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<td>Section 5.8.4 (In the Machine)</td>
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<td>Section 5.9.2 (On a Work Bench)</td>
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<td>Section 5.9.4 (In the Machine)</td>
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<td>Section 5.6.1</td>
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<td>Hot Runner</td>
<td>Section 4.14</td>
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<td>Manifold</td>
<td>Section 5.14.3</td>
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<td>Manifold Bushing</td>
<td>Section 5.18.3</td>
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<td>Nozzle Heater (Thermal Gate)</td>
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<td>Section 5.13.2</td>
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<td>Nozzle Tip (Thermal Gate)</td>
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<td>Section 5.10.4</td>
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<td>Sprue Bushing</td>
<td>Section 5.17.3</td>
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<tr>
<td>Valve Stem and Piston</td>
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5.3.3 Cleaning and Inspection Procedures

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<tr>
<td>Hot Runner</td>
<td>Section 5.15, Removing Resin from the Hot Runner</td>
</tr>
<tr>
<td>Manifold</td>
<td>Section 5.14.2, Inspecting and Cleaning a Manifold</td>
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<tr>
<td></td>
<td>Section 5.7, Cleaning Drool from Weep Holes</td>
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<tr>
<td>Manifold Bushings</td>
<td>Section 5.18.2, Inspecting and Cleaning Manifold Bushings</td>
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<td>Nozzle Tips</td>
<td>Section 5.10.6, Cleaning Nozzle Tips</td>
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<td>Section 5.10.7, Inspecting Nozzle Tips</td>
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<td>Section 5.16.2, Inspecting and Cleaning Nozzle Housings</td>
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<tr>
<td>Valve Stem and Piston Assemblies</td>
<td>Section 5.7, Cleaning Drool from Weep Holes</td>
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</tbody>
</table>

5.4 Hot Runner Tools

The following sections list various component-specific tools developed by Husky for use during maintenance of hot runner systems. Contact your nearest Husky Regional Service and Sales office to order Husky tools applicable to your hot runner system.

5.4.1 Nozzle Tip Sockets and Heater Removal Tools

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<thead>
<tr>
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<th>Tip</th>
<th>Nozzle Tip Socket</th>
<th>Heater Removal Tool</th>
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<tr>
<td>Ultra 250</td>
<td>All</td>
<td>2996145 (8 mm - 6 pts - 1/4”)</td>
<td>3163811</td>
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<tr>
<td>Ultra 350</td>
<td>All</td>
<td>3872686 (8mm - 12 pts - ¼”)</td>
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<td>Nozzle</td>
<td>Tip</td>
<td>Nozzle Tip Socket</td>
<td>Heater Removal Tool</td>
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<td>Ultra 500</td>
<td>HT &lt; 16 Drop</td>
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<td>2341532 (Bi-Metal R.T.) 2695352 (Ultra Heater R.T.)</td>
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<td>HT ≥ 16 Drop or Gen III</td>
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<td>TS</td>
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<td>VG</td>
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<td>VG-X &amp; VG-XX</td>
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<td></td>
<td>HT-CAP</td>
<td>3253169 (10 mm - 12 pts - 3/8&quot;)</td>
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<td>VX</td>
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<td>HT</td>
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<td>HT-R and TS</td>
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<td>HT-CAP</td>
<td>2816670 (16 mm - 12 pts - 3/8&quot;)</td>
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<td>Ultra EG &amp; MP</td>
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<td>Ultra PET</td>
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5.4.2 Nozzle Tip Torque Wrenches

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<th>Description</th>
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<tr>
<td>Ultra 250</td>
<td>2996144(^\text{[1]})</td>
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\(^{[1]}\) Not supplied with reorders.

5.4.3 Valve Stem Removal Tools

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<th>Tool for Stems (&gt; 160) mm</th>
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<td>Ultra350 Ultra 500</td>
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<td>2785591</td>
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<td>Ultra 750</td>
<td>LX 2785590</td>
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<td>EX 2785590 with adaptor 4270799</td>
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<td>Ultra 1000</td>
<td>2505612</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5-1 Typical Valve Stem Removal Tool for Ultra 500 and Ultra 750


5.4.4 Backup Pad Removal Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350 VG</td>
<td>2603927</td>
</tr>
<tr>
<td>Ultra 500 VG</td>
<td>2603927</td>
</tr>
<tr>
<td>Ultra 750 VG</td>
<td>2948588</td>
</tr>
<tr>
<td>Ultra 1000 VG</td>
<td>2948588</td>
</tr>
</tbody>
</table>
5.4.5  Tip Insert Removal Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 500 HT</td>
<td>2789767</td>
</tr>
<tr>
<td>Ultra 750 HT</td>
<td>2787663</td>
</tr>
<tr>
<td>Ultra 750 HT Ultra Flow</td>
<td>3341023</td>
</tr>
<tr>
<td>Ultra 1000 HT</td>
<td>2641085</td>
</tr>
</tbody>
</table>

Figure 5-2  Backup Pad Removal Tools


Figure 5-3  Tip Insert Removal Tool
5.4.6 SCVG Reverse Taper Valve Stem Removal Tool

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350-SCVG</td>
<td></td>
</tr>
<tr>
<td>Ultra 500-SCVG</td>
<td>4339984</td>
</tr>
<tr>
<td>Ultra 750-SCVG</td>
<td></td>
</tr>
<tr>
<td>Ultra 1000-SCVG</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5-4 SCVG Reverse Taper Valve Stem Removal Tool

5.4.7 Double Delta Piston Seal Installation Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350/Ultra 500 SX</td>
<td>3446999</td>
</tr>
<tr>
<td>Ultra 500/Ultra 750 LX (35 mm Piston)</td>
<td>3087823</td>
</tr>
<tr>
<td>Ultra 500/Ultra 750 EX (45 mm Piston)</td>
<td>3446982</td>
</tr>
<tr>
<td>Ultra 1000 (60 mm Piston)</td>
<td>3500798</td>
</tr>
</tbody>
</table>
5.4.8 Valve Bushing and Stem Guide Removal Tool

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET Gen 4.1</td>
<td></td>
</tr>
<tr>
<td>Reverse Taper Valve Bushing Removal Tool Assembly (Ultra 500 and Ultra 750 VG/LX Reverse Taper Hot Runners)</td>
<td>3985781</td>
</tr>
<tr>
<td>Reverse Taper Stem Guide Removal Tool Assembly (VG-SX Reverse Taper Hot Runners)</td>
<td>3176439</td>
</tr>
</tbody>
</table>
5.4.9 Retaining Ring Installation Tool

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra 350</td>
<td>4405801</td>
</tr>
</tbody>
</table>

5.4.10 Standard Nozzle Tip Sockets

<table>
<thead>
<tr>
<th>Nozzle Tip Socket</th>
<th>Size</th>
<th>Points</th>
<th>Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>622974</td>
<td>4 mm</td>
<td>6 (Allen Key)</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>622972</td>
<td>6 mm</td>
<td>6 (Allen Key)</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>533942</td>
<td>6 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2996145</td>
<td>8 mm</td>
<td>6</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>3436695</td>
<td>8 mm</td>
<td>12</td>
<td>1/4 inch</td>
</tr>
<tr>
<td>1501813</td>
<td>8 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3253169</td>
<td>10 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3320712</td>
<td>11 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>531983</td>
<td>11 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2338059</td>
<td>12 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>536678</td>
<td>13 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>533533</td>
<td>14 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2449784</td>
<td>15 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3253170</td>
<td>15 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
</tbody>
</table>

Figure 5-7 Valve Bushing Removal Tool
5.4.11 Thermocouple Wire Stripping Tools

<table>
<thead>
<tr>
<th>Nozzle Tip Socket</th>
<th>Size</th>
<th>Points</th>
<th>Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2402461</td>
<td>16 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2816670</td>
<td>16 mm</td>
<td>12</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>2308879</td>
<td>17 mm</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
<tr>
<td>3274535</td>
<td>21 mm</td>
<td>12</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>3311845</td>
<td>22 mm</td>
<td>6</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>2816672</td>
<td>22 mm</td>
<td>12</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>1502743</td>
<td>29 mm</td>
<td>6</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>535571</td>
<td>30 mm</td>
<td>6</td>
<td>1/2 inch</td>
</tr>
<tr>
<td>2192309</td>
<td>1/2 inch</td>
<td>6</td>
<td>3/8 inch</td>
</tr>
</tbody>
</table>

5.4.12 Single Probe Thermocouple Removal Tools

<table>
<thead>
<tr>
<th>Description</th>
<th>Tool Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strippers for Thermocouple Wires</td>
<td>4240042</td>
</tr>
</tbody>
</table>

5.5 Removing the Hot Runner From the Machine

The following procedure describes how to remove a fully assembled hot runner from an injection molding machine:

**NOTE:** The cavity plate can be separated from the hot runner before or after this procedure. If the cavity plate needs to be separated before the hot runner is removed from the machine, perform the procedure in **Section 5.6.3**. If the cavity plate is to be separated after the hot runner is removed from the machine, perform the procedure in **Section 5.6.1** after completing this procedure.
Removing the Hot Runner From the Machine

NOTE: The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Open the mold and turn off all heaters.

CAUTION!
For valve gate systems, make sure the valve pins are in the open position during tool shutdown.

2. Cool the hot runner by running coolant through it until the nozzles and manifold(s) are at room temperature (< 25 °C or < 77 °F). This may take 1/2 to 4 hours depending on the size of the hot runner.

3. Lock out and tag the machine. Refer to Section 1.9.

4. Remove all electrical cables and connectors from the hot runner and mold.

5. Purge all coolant from the cooling lines to minimize the risk of a coolant spill.

6. Disconnect all air and coolant hoses from the center air plate and/or backing plate.

7. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) at the top of the hot runner.

WARNING!
Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eyebolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

8. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift only until the lifting chain has a slight tension on it.

9. Remove the bolts that secure the backing plate to the stationary platen.

10. Lift the hot runner out of the machine and move it to a clean work area.

IMPORTANT!
If the hot runner is set on a work bench with the nozzle tips facing down, make sure supports are placed under both sides of the manifold plate. The supports must be tall enough to prevent the nozzle tips from touching the work bench.
5.6 Cavity Plate

Nozzle tips, nozzle heaters, nozzle thermocouples, and manifold thermocouples can be accessed for maintenance purposes by removing the cavity plate. This can be done either when the hot runner is on the stationary platen or if the hot runner is on a work bench.

Refer to Section 3.1 before moving the hot runner and cavity plate assembly to a work bench.

NOTE: The following procedures require the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

5.6.1 Removing the Cavity Plate (On a Work Bench)

To remove the cavity plate while the hot runner is on a work bench, do the following:

1. Make sure the mold is cooled to room temperature (< 25 °C or < 77 °F).
2. Remove the hot runner from the machine and set it on a work bench with the nozzles facing up. Refer to Section 5.5.
3. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the cavity plate.

CAUTION!
For valve gate systems, make sure the valve pins are in the open position during tool shutdown.

CAUTION!
The nozzles and manifold must be at room temperature (< 25 °C or < 77 °F) before the cavity plate is separated from the hot runner. Severe damage to the nozzle and cavity plate sealing diameters can result if the mold is still hot.

1. Make sure the mold is cooled to room temperature (< 25 °C or < 77 °F).
2. Remove the hot runner from the machine and set it on a work bench with the nozzles facing up. Refer to Section 5.5.
3. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the cavity plate.

WARNING!
Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.
4. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s).
5. Remove all cavity plate retaining screws.
6. Separate the cavity plate from the manifold plate. Use the pry slots between the manifold and cavity plate to assist in separation.
   
   **NOTE:** The cavity plate is on alignment dowels to protect the nozzle and cavity plate sealing diameters from damage.
7. Move the cavity plate out of the work area and store in a location where the plate cannot fall or tip over.

### 5.6.2 Installing the Cavity Plate (On a Work Bench)

To install the cavity plate while the hot runner is on a work bench, do the following:

**NOTE:** Before assembling the cavity plate to the hot runner, refer to the mold and hot runner assembly drawings. The hot runner assembly drawings are included in Chapter 7.

1. Make sure the nozzle and cavity plate sealing diameters are clean and free of burrs.

#### CAUTION!

The nozzles and manifold must be at room temperature (< 25 °C or < 77 °F), before closing the mold. Severe damage to the nozzle and cavity plate sealing diameters could result if the mold is closed when the nozzles or manifold are hot.

2. Make sure all nozzle tips are clean.
3. If nozzle tip insulators are used, install them in the gate detail before the cavity plate is installed. Refer to the procedure in Section 5.12.3 for more information.
4. Apply a coat of high temperature lubricant to the alignment dowels.
5. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the cavity plate.

#### WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

6. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift it over the manifold plate.

#### IMPORTANT!

When assembling the cavity plate to the hot runner, special attention should be given to prevent damage to the nozzle tips and valve stems. The cavity plate should mate with the hot runner without any resistance. If a plate encounters resistance, remove the plate and check for interference points.

**NOTE:** Do not attempt to force the plate into position as serious damage can result.
7. Align the cavity plate with the manifold plate alignment dowels and lower the cavity plate.
   **NOTE:** Make sure the wires in the wire grooves are not pinched between the plates while closing.

8. Install safety latches between the cavity plate and the manifold plate (or the backing plate) on both sides of the mold. A minimum of two safety latches must be used.

9. Install the cavity plate retaining screws and tighten. Refer to the *Mold Manual* for specific torque values.

10. Check the electrical circuits with an ohmmeter to make sure no wires have been shorted during assembly. Refer to Section 5.21 for more information.

11. Install the mold and hot runner into the machine.
   **NOTE:** Refer to the *Mold Manual* for mold startup instructions.
   **NOTE:** Refer to Section 3.7 for hot runner startup instructions.

### 5.6.3 Removing the Cavity Plate (In the Machine)

To remove the cavity plate while the hot runner is in the machine, do the following:

**CAUTION!**

For valve gate systems, make sure the valve pins are in the open position during tool shutdown.

**CAUTION!**

The nozzles and manifold must be at room temperature (< 25 °C or < 77 °F) before the cavity plate is separated from the hot runner. Severe damage to the nozzle and cavity plate sealing diameters can result if the mold is still hot.

1. Cool the mold by running coolant through it until the hot runner nozzles and manifold(s) are at room temperature (< 25 °C or < 77 °F). This may take 1/2 to 4 hours depending on the size of the mold.

2. Purge all coolant from the cooling lines to minimize the risk of a coolant spill should a hose come loose during maintenance.

3. Open the mold.

4. Lock out and tag the machine. Refer to Section 1.9.

5. Install safety latches between the cavity plate and the manifold plate (or the backing plate) on both sides of the mold. A minimum of two safety latches must be used.
6. Remove all cavity plate retaining screws.
7. Remove locks and tags.
8. Reduce the machine clamp opening and closing speed.
9. Slowly close the mold.
10. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Check hose lengths to be sure the cavity plate hoses are long enough to allow latching without damaging the hoses. In some cases it may be necessary to relieve residual pressure in the system and then disconnect the hoses.

11. Remove the safety latches between the cavity plate and manifold plate (or backing plate). Bolt the safety latches to the cavity plate and core plate (or core backing plate) on both sides of the mold. A minimum of two safety latches must be used.
12. Remove locks and tags.
13. Open the mold.
14. Lock out and tag the machine. Refer to Section 1.9.

The nozzle tips, nozzle heaters, and nozzle thermocouples are now fully exposed for maintenance.

**CAUTION!**

The nozzles and manifolds must be at room temperature (< 25 °C or < 77 °F) before the cavity plate is separated from the hot runner. Severe damage to the nozzle and cavity plate sealing diameters can result if the mold is still hot.
5.6.4 Installing the Cavity Plate (in the Machine)

1. Lock out and tag the machine. Refer to Section 1.9.
2. Make sure the nozzle and cavity plate sealing diameters are clean and free of burrs.

Figure 5-10  Mold Removed (View From Top of Hot Runner)

1. Exposed Nozzle Housings, Tips, and Thermocouples

Figure 5-11  Cavity and Nozzle Sealing Diameters

1. Nozzle and Cavity Plate Sealing Diameters  
2. Nozzle Housing  
3. Manifold Plate  
4. Cavity Plate  
5. Gate Bubble
3. Make sure all nozzle tips are clean.
4. Remove locks and tags.

**IMPORTANT!**

When assembling the cavity plate to the hot runner, special attention should be given to prevent damage to the nozzle tips and valve stems. The cavity plate should mate with the hot runner without any resistance. If a plate encounters resistance, remove the plate and check for interference points.

**NOTE:** Do not attempt to force the plate into position as serious damage can result.

5. Slowly close the mold to move the cavity plate back into position. Make sure the wires in the wire grooves are not pinched between the plates while closing.
6. Lock out and tag the machine. Refer to Section 1.9.
7. Remove the safety latches between the cavity plate and core plate (or core backing plate). Bolt the safety latches to the cavity plate and manifold plate (or backing plate) on both sides of the mold. A minimum of two safety latches must be used.
8. Remove locks and tags.
9. Slowly move the machine clamp away from the stationary platen to allow access to the cavity plate.
10. Lock out and tag the machine. Refer to Section 1.9.

11. Install the cavity plate retaining screws and tighten. Refer to the Mold Manual for specific torque values.

12. Remove the safety latches and store them in an appropriate place.

13. Check the electrical circuits with an ohmmeter to make sure no wires have been shorted during assembly. Refer to Section 5.21 for more information.

   NOTE: Refer to the Mold Manual for mold startup instructions.

5.7 Cleaning Drool from Weep Holes

Valve stem and piston assemblies are designed to allow excess resin to weep or bleed out of the piston area through specially designed bleed holes. Excessive weepage can inhibit valve stem performance, create manifold thermal control issues, and damage electrical wiring.

When using certain low viscosity resins such as high melt polyproplyenes and TPE, weepage should be monitored on a regular basis. Different processing conditions will result in different rates of weepage. For these resins, start by inspecting weepage after one month of run time and after three months of run time to assess weepage accumulation rates.

Weepage should be cleaned before it completely fills the back side of the manifold pocket or covers any electrical wiring. Based on observations made during an inspection, determine an appropriate interval for cleaning the manifold pocket and bleeder holes.

CAUTION!

Do not extend the cleaning interval beyond six months. If the rate of weepage increases significantly, valve stem and manifold bushings should be inspected for wear and replaced if needed.

5.7.1 Cleaning

1. Cool the mold to room temperature (< 25 °C or < 77 °F) by running coolant through it. This may take 1/2 - 4 hours depending on the size of the mold.

2. Remove the backing plate. Refer to Section 5.9.1.

3. If equipped, remove the center air plate. Refer to Section 5.8.1.

4. Using a brass rod or chisel, remove any resin on the outside of the piston cylinders, backup pads, or backup insulators.

5. Using a brass rod or chisel, remove any resin that has bled into the manifold pocket area.

   CAUTION!

   Do not scratch or score any sealing surfaces.

6. If removal of the valve stem and piston assemblies is required, refer to Section 5.19.
7. Clean the mating surfaces of any manifold insulators.
8. Check all manifold wiring and heaters using an ohmmeter. Refer to the electrical schematic(s) in Chapter 7 for specific wire and heater resistances.
   **NOTE:** Use only Husky recommended high temperature power and thermocouple wire.
9. If required, install the center air plate. Refer to Section 5.8.2.
10. Install the backing plate. Refer to Section 5.9.2.

## 5.8 Center Air Plate

### 5.8.1 Removing the Center Air Plate (On a Work Bench)

The following procedure describes how to remove the center air plate when the hot runner is on a work bench:

1. Remove the hot runner from the machine. Refer to Section 5.5 and set it on a work bench with the nozzles facing down.
2. Remove the backing plate. Refer to Section 5.9.1.
3. Remove the bolts from the back of the center air plate.
4. Install a suitable lifting eyebolt(s)/hoist ring(s) into the lifting location(s) in the center air plate.

**WARNING!**

Make sure the lifting eyebolts, lifting chain, and crane can adequately support the weight of the hot runner plates. Failure in lifting could result in serious personal injury or death.

5. Lift the center air plate in stages, using the pry slots between the manifold plate and center air plate to assist in separation.
6. Set the center air plate on supports in a clean, flat work area.

5.8.2 Installing the Center Air Plate (On a Work Bench)

Refer to Section 4.8 for instructions on how to install the center air plate when the hot runner is on a work bench.

5.8.3 Removing the Center Air Plate (In the Machine)

The following procedure describes how to remove the center air plate when the hot runner is in the machine:

**CAUTION!**

Husky does not recommend the following method for removing the center air plate. Equipment damage could occur due to the offset weight on the mold, hot runner, and moving platen.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.
NOTE: The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Close the mold.
2. Turn off all heaters in the hot runner and allow the hot runner to cool to room temperature (\(< 25 \, ^\circ C \) or \(< 77 \, ^\circ F\)). This may take 1/2 - 4 hours depending on the size of the hot runner.

CAUTION!

Make sure all hoses attached to the cavity plate, manifold plate and backing plate are of sufficient length to allow for latching. Hoses that are too short may release unexpectedly when the plates are separated, causing water or air to release that could cause injury. To avoid injury, shut down the machine, lockout and tag the water and air systems, and relieve any residual pressure before adjusting, relocating, or removing such hoses.

3. Lock out and tag the machine. Refer to Section 1.9.
4. Remove all electrical cables and connectors from the hot runner and mold.
5. Purge all coolant from the cooling lines to minimize the risk of a coolant spill.
6. Disconnect all air and coolant hoses from the center air plate.
7. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) on top of the center air plate.

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

8. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift only until the lifting chain has a slight tension on it.
9. Install safety latches between the core plate and the manifold plate on both sides of the mold. A minimum of two safety latches must be used.
10. Install safety latches between the manifold plate and the backing plate on both sides of the mold. A minimum of two safety latches must be used.
11. Remove the bolts that secure the backing plate to the stationary platen.
12. Remove locks and tags.
13. Slowly move the clamp plate and overhead crane away from the stationary platen.
14. Lock out and tag the machine. Refer to Section 1.9.
15. Remove the bolts from the back of the backing plate.
16. Remove the locating ring.
17. Remove the sprue heater and thermocouple from the sprue bushing.
18. Disconnect the sprue heater and sprue thermocouple wires from the multi-pin connector(s). Remove the wires from the wire grooves in the backing plate.
19. Disconnect any manifold thermocouples that are accessed from the backing plate and remove the wires from the manifold wire grooves in the backing plate. Determine if it is necessary to disconnect the thermocouple wires from the multi-pin connector(s).
20. Reinstall the locating ring.
21. Remove locks and tags.
22. Slowly close the mold, making sure to move the overhead crane with the clamp plate.
23. Lock out and tag the machine. Refer to Section 1.9.
24. Reinstall the bolts that secure the backing plate to the stationary platen. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
25. Remove the safety latches between the core plate and the manifold plate.
26. Install safety latches between the core plate and the cavity plate on both sides of the mold. A minimum of two safety latches must be used.
27. Remove locks and tags.
28. Slowly move the clamp plate and overhead crane away from the stationary platen.
29. Lock out and tag the machine. Refer to Section 1.9.
30. Remove the bolts securing the manifold plate to the center air plate.
31. Remove locks and tags.
32. Slowly close the mold, making sure to move the overhead crane with the clamp plate.
33. Lock out and tag the machine. Refer to Section 1.9.
34. Remove the safety latches between the manifold plate and backing plate.
35. Install safety latches between the center air plate and backing plate on both sides of the mold. Two latches must be used.
36. Remove the safety latches between the core plate and the cavity plate.
37. Install safety latches between the core plate and manifold plate on both sides of the mold. A minimum of two safety latches must be used.
38. Remove locks and tags.
39. Slowly move the clamp plate and overhead crane away from the stationary platen.
40. Remove the safety latches between the center air plate and backing plate.
41. Lift and move the center air plate to a clean work area. Set the center air plate on supports.
5.8.4 Installing the Center Air Plate (In the Machine)

The following procedure describes how to install the center air plate when the hot runner is in the machine:

**CAUTION!**

Husky does not recommend the following method for installing the backing plate. Equipment damage could occur due to the offset weight on the mold, hot runner, and moving platen.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the lifting eye bolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Make sure the mold is open with the manifold plate latched to the core plate. A minimum of two safety latches must be used.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Apply a coat of high temperature lubricant to the alignment dowels on the backing plate.
4. Install a suitable lifting eye bolt(s)/hoist ring(s) in the lifting location(s) on top of the center air plate.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

5. Attach an overhead crane to the lifting eye bolt(s)/hoist ring(s) and lift the center air plate into the clamp area.
6. Align the center air plate with the backing plate alignment dowels.
7. Guide the center air plate onto the backing plate alignment dowels until it contacts the backing plate.
8. Apply a coat of high temperature lubricant to the alignment dowels on the manifold plate.
9. Remove locks and tags.
10. Slowly close the mold, making sure to move the overhead crane with the clamp plate.
11. Lock out and tag the machine. Refer to Section 1.9.
12. Remove the safety latches between the core plate and the manifold plate.
13. Install safety latches between the core plate and the cavity plate on both sides of the mold. A minimum of two safety latches must be used.

14. Install safety latches between the manifold plate and the backing plate on both sides of the mold. A minimum of two safety latches must be used.

15. Remove locks and tags.

16. Slowly open the mold.

17. Lock out and tag the machine. Refer to Section 1.9.

18. Install the bolts that secure the manifold plate to the center air plate. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7. Make sure to tighten the bolts using the specified torque sequence.

19. Slowly close the mold.

20. Remove all safety latches.

21. Install safety latches between the core plate and the manifold plate on both sides of the manifold. A minimum of two safety latches must be used.

22. Install safety latches between the manifold plate and the backing plate on both sides of the manifold. A minimum of two safety latches must be used.

23. Remove locks and tags.

24. Slowly move the clamp plate and overhead crane away from the stationary platen.

25. Lock out and tag the machine. Refer to Section 1.9.

26. Install the bolts that secure the backing plate to the center air plate. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7. Make sure to tighten the bolts using the specified torque sequence. Refer to Figure 5-17.

27. Slowly close the mold, making sure to move the overhead crane with the clamp plate.

28. Lock out and tag the machine. Refer to Section 1.9.

29. Reinstall the bolts that secure the backing plate to the stationary platen. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

30. Remove all safety latches.

31. Disconnect the overhead lifting device and remove the lifting eyebolt(s)/hoist ring(s).

32. Reinstall the air and coolant hoses to the hot runner and mold.
33. Reconnect all electrical cables and connectors to the hot runner and mold.
34. Remove locks and tags.
35. Perform the startup procedure. Refer to Section 3.7.

5.9 Backing Plate

5.9.1 Removing the Backing Plate (On a Work Bench)

The following procedure describes how to remove the manifold backing plate when the hot runner is on a work bench:
1. Remove the hot runner from the machine. Refer to Section 5.5 and set it on a work bench with the nozzles facing down.
2. Remove the bolts from the back of the backing plate.
3. Disconnect the sprue heater and sprue thermocouple wires from the multi-pin connector(s). Remove the wires from the wire grooves in the backing plate.
4. Disconnect any manifold thermocouples that are accessed from the backing plate and remove the wires from the manifold wire grooves. Determine if it is necessary to disconnect the thermocouple wires from the multi-pin connector(s).
5. Remove the locating ring and sprue heater.
6. Install a suitable lifting eyebolt(s)/hoist ring(s) into the lifting location(s) in the backing plate.

WARNING!

Make sure the lifting eyebolts, lifting chain, and crane can adequately support the weight of the hot runner plates. Failure in lifting could result in serious personal injury or death.

7. Lift the backing plate in stages, using the pry slots between the manifold plate and backing plate to assist in separation.
8. Set the backing plate on supports in a clean, flat work area.

5.9.2 Installing the Backing Plate (On a Work Bench)

Refer to Section 4.9 for instructions on how to install the backing plate when the hot runner is on a work bench.

5.9.3 Removing the Backing Plate (In the Machine)

The following procedure describes how to remove the backing plate when the hot runner is installed in the machine:

CAUTION!

Husky does not recommend the following method for removing the backing plate. Equipment damage could occur due to the offset weight on the mold, hot runner, and moving platen.

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.
NOTE: The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Close the mold.
2. Turn off all heaters in the hot runner and allow the hot runner to cool to room temperature (< 25 °C or < 77 °F). This may take 1/2 - 4 hours depending on the size of the hot runner.

CAUTION!

Make sure all hoses attached to the cavity plate, manifold plate, and backing plate are of sufficient length to allow for latching. Hoses that are too short may release unexpectedly when the plates are separated, causing water or air to release to could cause injury. To avoid injury, lock out and tag the machine and relieve any residual pressure before adjusting, relocating, or removing such hoses.

3. Lock out and tag the machine. Refer to Section 1.9.
4. Remove all electrical cables and connectors from the hot runner and mold.
5. Purge all coolant from the cooling lines to minimize the risk of a coolant spill.
6. If equipped, disconnect all air and/or coolant hoses from the backing plate.
7. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) on top of the backing plate.

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

8. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift only until the lifting chain has a slight tension on it.
9. Install safety latches between the core plate and the manifold plate on both sides of the mold. A minimum of two safety latches must be used.
10. Install safety latches between the manifold plate and the backing plate on both sides of the mold. A minimum of two safety latches must be used.
11. Remove the bolts that secure the backing plate to the stationary platen.
12. Remove locks and tags.
13. Slowly move the clamp plate and overhead crane away from the stationary platen.
14. Lock out and tag the machine. Refer to Section 1.9.
15. Remove the bolts from the back of the backing plate.
16. Remove the locating ring.
17. Remove the sprue heater and thermocouple from the sprue bushing.
18. Disconnect the sprue heater and sprue thermocouple wires from the multi-pin connector(s). Remove the wires from the wire grooves in the backing plate.
19. Disconnect any manifold thermocouples that are accessed from the backing plate and remove the wires from the manifold wire grooves in the backing plate. Determine if it is necessary to disconnect the thermocouple wires from the multi-pin connector(s).

20. Reinstall the locating ring.
21. Remove locks and tags.
22. Slowly close the mold, making sure to move the overhead crane with the clamp plate.
23. Lock out and tag the machine. Refer to Section 1.9.
24. Reinstall the bolts that secure the backing plate to the stationary platen. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
25. Remove the safety latches between the manifold plate and the backing plate.
26. Remove locks and tags.
27. Slowly move the clamp plate and overhead crane away from the stationary platen.
28. Lock out and tag the machine. Refer to Section 1.9.
29. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) in the backing plate.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

30. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift only until the lifting chain has a slight tension on it.
31. Remove the bolts securing the backing plate to the stationary platen.
32. Lift and move the backing plate to a clean work area. Set the backing plate on supports.

### 5.9.4 Installing the Backing Plate (In the Machine)

The following procedure describes how to install the backing plate when the hot runner is installed in the machine:

**CAUTION!**

Husky does not recommend the following method for installing the backing plate. Equipment damage could occur due to the offset weight on the mold, hot runner, and moving platen.

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.
NOTE: The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Make sure the mold is open with the manifold plate latched to the core plate. A minimum of two safety latches must be used.

2. If required, make sure the center air plate is installed. Refer to Section 5.8.4.

3. Lock out and tag the machine. Refer to Section 1.9.

4. Apply a coat of high temperature lubricant to the alignment dowels on the manifold plate.

5. Reinstall the locating ring.

6. Install a suitable lifting eyebolt(s)/hoist ring(s) in the lifting location(s) on top of the backing plate.

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

7. Attach an overhead crane to the lifting eyebolt(s)/hoist ring(s) and lift the backing plate into the clamp area. Make sure the locating ring faces the stationary platen.

8. Secure the backing plate to the stationary platen with the backing plate mounting screws.

9. Remove locks and tags.

10. Slowly close the mold until the manifold plate/center air plate and backing plate connect.

11. Lock out and tag the machine. Refer to Section 1.9.

12. Install safety latches between the manifold plate and the backing plate on both sides of the mold. A minimum of two safety latches must be used.

13. Remove the bolts that secure the backing plate to the stationary platen.

14. Remove locks and tags.

15. Slowly move the clamp plate and overhead crane away from the stationary platen.

16. Lock out and tag the machine. Refer to Section 1.9.

17. Install the bolts that secure the backing plate to the manifold plate. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7. Make sure to tighten the bolts using the specified torque sequence.
18. Remove the locating ring.
19. Connect all manifold thermocouples.
20. Install the sprue heater wires and any sprue heater thermocouple wires to the multi-pin connector(s).
21. Check electrical circuits with an ohmmeter to make sure that no wires have been shorted during assembly.
22. Install the locating ring.
23. Remove locks and tags.
24. Slowly move the clamp plate and overhead crane towards the stationary platen.
25. Reinstall the bolts that secure the backing plate to the stationary platen. The bolts must be torqued to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
26. Lock out and tag the machine. Refer to Section 1.9.
27. Remove the safety latches.
28. Remove locks and tags.
29. Move the clamp plate away from the hot runner and stationary platen.
30. Lock out and tag the machine. Refer to Section 1.9.
31. Disconnect the overhead lifting device and remove the lifting eyebolt(s)/hoist ring(s).
32. Reinstall the air and coolant hoses to the hot runner and mold.
33. Reconnect all electrical cables and connectors to the hot runner and mold.
34. Remove locks and tags.
35. Perform the startup procedure. Refer to Section 3.7.
5.10 Nozzle Tips

The following procedures describe how to remove, clean, inspect and install nozzle tips for thermal gate and valve gate systems.

**NOTE:** For Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 thermal gate nozzles, refer to Section 5.10.1.5 for instructions on separating the nozzle tip from the nozzle retainer.

5.10.1 Removing Nozzle Tips for Thermal Gate Systems

The following procedures describe how to remove thermal gate tips from Ultra 250, Ultra 500, Ultra 750 and Ultra 1000 systems.

5.10.1.1 Removal for Ultra 250 Systems

To remove thermal gate nozzle tips from Ultra 250 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Use a nozzle tip socket to remove the nozzle tip from the nozzle housing.
   **NOTE:** Refer to Section 5.4.1 for a list of nozzle tip sockets and order numbers.
5. Inspect the nozzle tip for excessive wear, scoring, or other damage. Replace if necessary.
6. Remove any resin inside the nozzle tips and nozzle housing using a wire brush or equivalent. Make sure all sealing surfaces are clean.
7. Remove any resin from the exterior of the nozzle housings using a wire brush or equivalent. Make sure all sealing surfaces are clean.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

5.10.1.2 Removal for Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 Systems

To remove thermal gate nozzle tips from all Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the front ring and retainer ring.
5. Remove all nozzle heater components except for the nozzle heater and thermocouple. Refer to Section 5.13.1 for more information.

6. Connect the hot runner to a controller.

7. Remove locks and tags.

### WARNING!
Unexpected release of hot resin spray from valve gates may cause serious burns. Wear adequate personal protective equipment whenever entering the mold area.

### WARNING!
Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

### WARNING!
In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

### WARNING!
Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

8. Increase the temperature of the nozzle housings to a temperature high enough to soften the resin around the nozzle tip threads. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

### IMPORTANT!
Do not allow the nozzle tips to overheat or degraded material will have to be cleaned out of the nozzle housing before a new nozzle tip can be installed.

9. Lock out and tag the machine. Refer to Section 1.9.

### CAUTION!
Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

10. Using an appropriate nozzle tip socket (refer to Section 5.4), loosen each nozzle tip retainer that will be removed. Do not unscrew or remove the nozzle tip retainers.

11. If necessary, remove the nozzle tips from the nozzle retainers. Refer to Section 5.10.1.5.

12. Fully remove the nozzle heaters. Refer to Section 5.13.1.
13. Remove any resin from the interior of the nozzle tip retainers using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

14. Remove any resin from the interior and exterior of the nozzle housings using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

### 5.10.1.3 Removal for Ultra 750-UP Systems

To remove thermal gate nozzle tips from Ultra 750-UP systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.

**CAUTION!**

Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

4. Using an appropriate nozzle tip socket (refer to Section 5.4), loosen each nozzle tip retainer that will be removed.
5. If necessary, remove the nozzle tips from the nozzle retainers. Refer to Section 5.10.1.5.
6. Fully remove the nozzle heaters. Refer to Section 5.13.1.
7. Remove any resin from the interior of the nozzle tip retainers using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.
8. Remove any resin from the interior and exterior of the nozzle housings using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

### 5.10.1.4 Removal for Ultra 750 HT-S6 Systems

To remove thermal gate nozzle tips from Ultra 750 HT-S6 systems, do the following

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Using an appropriate nozzle tip socket (refer to Section 5.4), loosen each nozzle tip that will be removed.

5. If necessary, remove the nozzle tips from the nozzle retainers. Refer to Section 5.10.1.5.

6. Fully remove the nozzle heaters. Refer to Section 5.13.1.

7. Remove any resin from the interior and exterior of the nozzle tips and nozzle heaters using a soft wire brush or equivalent. Make sure all sealing surfaces are clean.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

**NOTE:** Do not remove locks and tags until the nozzle tips are installed.

### 5.10.1.5 Removing Nozzle Tips from Nozzle Retainers

#### 5.10.1.5.1 With a Removal Tool

The following procedure describes how to remove a nozzle tip from a nozzle tip retainer using a nozzle tip removal tool. This procedure applies to Ultra 500, Ultra 750, and Ultra 1000 thermal gate systems.

1. Place the nozzle retainer in the tip removal tool.

   **NOTE:** Refer to Section 5.4.5 for a listing of tip insert removal tools and order numbers.

2. Turn the knob on top of the tool clockwise until the tip insert is free of the retainer.

3. Inspect the nozzle tip for excessive wear, scoring, or other damage. Replace if necessary.
5.10.1.5.2 Without a Removal Tool

The following procedure describes how to remove a nozzle tip from a nozzle tip retainer without the use of a nozzle tip removal tool. This procedure applies to Ultra 500, Ultra 750, and Ultra 1000 thermal gate systems.

NOTE: Once the nozzle tip has been removed using this method, the nozzle tip must be replaced. This method destroys the nozzle tip geometry.

1. Remove the nozzle tip retainer and nozzle tip and set on a suitable work bench.

WARNING!

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

WARNING!

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

2. Carefully heat the nozzle tip retainer with a propane torch enough to soften the resin inside.

3. Press the nozzle tip out of the nozzle retainer using a brass rod or equivalent. The brass rod or equivalent tool must have an outer diameter smaller than the nozzle tip retainers inside diameter.

CAUTION!

This method will damage the tip insert.

4. Replace the nozzle tip.

Figure 5-21 Nozzle Tip Removal Without the Nozzle Tip Removal Tool
5.10.2 Installing Nozzle Tips for Thermal Gate Systems

The following procedures describe how to install thermal gate nozzle tips on Ultra 250, Ultra 350, Ultra 500, Ultra 750, Ultra 750-UP and Ultra 1000 systems.

5.10.2.1 Installation for Ultra 250 and Ultra 350 Systems

To install thermal gate nozzle tips on Ultra 250 and Ultra 350 systems, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Inspect the nozzle tips and nozzle housings for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
3. Install new or high quality used nozzle tips and torque to the value printed on the side of the nozzle tips using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.
4. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 7.

If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 5.10.5.

5. Remove locks and tags.

5.10.2.2 Installation for Ultra 500, Ultra 750 and Ultra 1000 Systems

To install thermal gate nozzle tips on all Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Install new or high quality used nozzle tips into the nozzle tip retainers.
3. Install a retainer ring around each nozzle tip retainer.
4. Inspect the tip inserts, nozzle tip retainers, and nozzle housings for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

5. Install the nozzle tip retainer and tip insert. Torque the nozzle tip retainers to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

6. Install the front ring and tighten by hand.

7. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 7.

If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 5.10.5.

8. Remove locks and tags.

5.10.2.3 Installation for Ultra 750-UP Systems

To install thermal gate nozzle tips on Ultra 750-UP systems, do the following:

1. Lock out and tag the machine. Refer to Section 1.9.

2. Install new or high quality used nozzle tips into the nozzle tip retainers.

3. Inspect the tip inserts, nozzle tip retainers, and nozzle housings for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.

4. Install the nozzle tip retainer and tip insert. Torque the nozzle tip retainers to the torque value printed on the side of the retainer using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.

5. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 7.
If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 5.10.5.

6. Remove locks and tags.

5.10.2.4 Installation for Ultra 750 HT-S6 Systems

The following procedure describes how to install thermal gate nozzle tips on Ultra 750 HT-S6 systems:

1. Lock out and tag the machine. Refer to Section 1.9.
2. Inspect the nozzle tips and nozzle housings for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
3. Thread new or high quality used nozzle tips into the nozzle housings.
4. Torque the nozzle tips to the torque value printed on them using a nozzle tip socket. The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.
5. Measure the height of the nozzle tip using a depth micrometer and compare the measurement to the tip height listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 7.
5.10.3 Removing Nozzle Tips for Valve Gate Systems

To remove valve gate nozzle tips from Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the nozzle tip insulators or insulating gate bubbles from the nozzle tips. Refer to Section 5.12.
4. Remove all nozzle heater components except for the nozzle heater and thermocouple. Refer to Section 5.13.2 for more information.
5. Connect the hot runner to a controller.
6. Remove locks and tags.

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**WARNING!**

Unexpected release of hot resin spray from valve gates may cause serious burns. Wear adequate personal protective equipment whenever entering the mold area.

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**WARNING!**

Burn hazard – risk of serious injury. To avoid serious burns, wear Personal Protective Equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.
7. Increase the temperature of the nozzle housings to a temperature high enough to soften the resin around the nozzle tip threads. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

8. Lock out and tag the machine. Refer to Section 1.9.

9. Using an appropriate nozzle tip socket (refer to Section 5.4), loosen each nozzle tip that will be removed. Do not unscrew or remove the nozzle tips.

CAUTION!
Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

10. If the nozzle tips are internally threaded:
    a. Wearing heat-resistant gloves, hand-tighten the nozzle tips while the resin is still soft until they touch the nozzle housing.
    b. Allow the nozzle tips to cool to room temperature (< 25 °C or < 77 °F). This may take 1/2 to 4 hours depending on the size of the mold. However, this step will allow for the quick removal of the nozzle tips, while preventing resin from solidifying on the nozzle tip sealing surface.

11. Remove the nozzle tips using the nozzle tip socket.
12. Fully remove the nozzle heaters. Refer to Section 5.13.2.
13. Remove any resin from the interior of the nozzle tip using a soft wire brush or equivalent.
14. Remove any resin from the interior and exterior of the nozzle housing using a soft wire brush or equivalent.
**5.10.4 Installing Nozzle Tips for Valve Gate Systems**

To install valve gate nozzle tips onto Ultra 350, Ultra 500, Ultra 750 and Ultra 1000 systems, do the following:

1. **IMPORTANT!**
   - Make sure of the following before installing nozzle tips:
     - All nozzle tips are cleaned. Refer to Section 5.10.6
     - All nozzle tips are inspected. Refer to Section 5.10.7
     - All nozzle housings are inspected. Refer to Section 5.16.2

2. Lock out and tag the machine. Refer to Section 1.9.
3. Install a retainer ring around each nozzle tip.
4. Inspect the nozzle tip and nozzle housing threads for potential contamination. Remove any contamination found. The threads and all sealing surfaces must be clean and dry.
5. Install the nozzle tip and torque to the value printed on the side of the nozzle tip using a nozzle tip socket.
   - The torque value is also specified on the Section View Assembly drawing. Refer to Chapter 7.
6. If not already installed, install the nozzle heater. Refer to Section 5.13.2.2 if the nozzle heater is copper, or Section 5.13.2.4 if the nozzle heater is an Ultra or bi-metal heater.
7. Install the front ring and tighten by hand.
8. **IMPORTANT!**
   - Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.
   - Do not remove locks and tags until the nozzle tips are installed.

**NOTE:**
- Nozzle tips must be installed when the resin and nozzle housings are cold.

1. **NOTE:**
   - Do not remove locks and tags until the nozzle tips are installed.
If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to Section 5.10.5.

8. Remove locks and tags.

5.10.5 Troubleshooting Nozzle Tip Heights

The following describes reasons and corrective action for nozzle heights that are less or more than the values listed on the Tip Chart.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Reason</th>
<th>Action</th>
</tr>
</thead>
</table>
| Dimension is shorter than required tip height| Nozzle tip has been overtightened, worn, or damaged | a. Remove the nozzle tip  
b. Clean resin from the nozzle tip and nozzle housing  
c. Replace or install new nozzle tip |
| Dimension is longer than required tip height | Nozzle tip is damaged  
OR
Nozzle tip is being prevented from seating in the nozzle housing by resin under the nozzle tip seating surface. | a. Remove the nozzle tip  
b. Clean resin from the nozzle tip and nozzle housing  
c. Re-apply the torque to the nozzle tip  
d. Verify the nozzle tip height |
5.10.6 Cleaning Nozzle Tips

If resin or other residue is not thoroughly cleaned off the threads and seating areas of both the nozzle tip and the nozzle housing, the result could lead to the following:

- Compressive overload of the tip, even at the correct torque recommendation, causing damage to the tip (permanently shortened).
- A tip which is no longer tight after it has been heated up and cooled down.
- Poor performance or quality of the gate due to the incorrect tip position (too far back or too far forward).
- Leakage between the nozzle tip and the nozzle tip insulator (where used) permitting the formation of degraded resin.
- The initiation of thread stripping.

5.10.7 Inspecting Nozzle Tips

To inspect nozzle tips, do the following:

1. Remove the resin found on the nozzle tips.
2. Measure the tip height of each previously used nozzle tip and compare it with the dimensions listed on the Tip Chart in the Section View Assembly drawing. Refer to Chapter 7.
   
   If the tip heights are outside of the required dimensions, refer to Section 5.10.5 for troubleshooting information.

5.11 Backup Pads and Piston Cylinders

The following procedures describe how to remove and install backup pads and piston cylinders.

5.11.1 Replacing Backup Insulator Pads for Thermal Gate Systems

Backup insulator pads are installed to the manifolds using LHSCS bolts. Remove the bolts to disassemble the pads.
5.11.2 Replacing Backup Pads for Valve Gate Systems

The following procedures describe how to replace backup pads in valve gate systems.

5.11.2.1 Replacing Backup Pads on Threaded Manifold Bushings

To replace backup pads on threaded manifold bushings, do the following:

1. Remove any resin deposits on the backup pads.
2. Remove the jam nuts from each backup pad.
3. Place the alignment post on the backup pad removal tool into the valve stem hole of the manifold bushing.
   **NOTE:** Refer to Section 5.4.4 for a listing of backup pad removal tools and order numbers.
4. Install the pull posts.
5. Turn the socket head cap screw on the backup pad removal tool clockwise to remove the backup pad.

6. Discard the metal O-ring seal.

7. Clean or replace the backup pads as needed.

8. Place one new metal O-ring seal over each manifold bushing to seal between the manifold and the backup pad.

9. Place the backup pad over each manifold bushing. Make sure the backup pads contact the metal O-ring seals.

CAUTION!

For Ultra 350, Ultra 500 and Ultra 750 systems, it may be necessary to add additional torque to the jam nut and then loosen the nut to the specified torque to properly seat the metal O-ring seal. The amount of additional torque will be specified on the Section View Assembly drawing if required. Refer to Chapter 7.

10. Install a jam nut to the end of each manifold bushing and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
5.11.2.2 Replacing Backup Pads on Threadless Manifold Bushings

To replace backup pads on threadless manifold bushings, do the following:

1. Remove any resin deposits on the backup pads.

2. Remove the retaining clips from each backup pad.

3. Place the alignment post on the backup pad removal tool into the valve stem hole of the manifold bushing.

   **NOTE:** Refer to Section 5.4.4 for a listing of backup pad removal tools and order numbers.

4. Install the pull posts.
5. Turn the socket head cap screw on the backup pad removal tool clockwise to remove the backup pad.

6. Discard the Grafoil seal, interior C-ring seal, and exterior C-ring seal.

7. Clean or replace the backup pads as needed.

8. Inspect the retaining clips and replace any that are damaged or worn.

9. Place one new interior C-ring seal over each manifold bushing.

10. Place one new Grafoil seal over each manifold bushing.

11. Coat the bottom of each backup pad with a high temperature lubricant and insert a new exterior C-ring seal.

12. Install a backup pad over each manifold bushing. Make sure the backup pads are fully seated against the C-ring seals.

13. Install a retaining clip into the groove of each manifold bushing.
5.11.2.3 Replacing Backup Pads on Ultra 350 Systems (Tight Pitch Applications Only)

To replace backup pads on Ultra 350 manifold bushings, do the following:

**IMPORTANT!**

The following procedure is only for tight pitch applications where the nozzle tip pitch is 18.0 mm to < 25.4 mm.

1. Remove any resin deposits on the backup pads.

2. Remove the backup pad.
3. Remove the backup pad insert from the backup pad.
4. Remove any resin deposits inside the backup pad and on the backup pad insert.
5. Replace the retaining rings on the backup pad and backup pad insert.
6. Replace the C-ring on the bottom of the backup pad.
7. Push the backup pad into the manifold.
8. Push the backup pad insert into the backup pad.

**5.11.3 Replacing the Piston Cylinders for Ultra 350 and Ultra 500 VGSX**

To replace the piston cylinders in Ultra 350 and Ultra 500 VGSX systems, do the following:

1. Remove any resin deposits on the piston cylinders.
2. Remove the retaining clips from each piston cylinder.
3. Remove the piston cylinders.
4. Clean or replace the piston cylinders as needed.
5. Inspect the retaining clips and replace any that are damaged or worn.
6. Discard the Grafoil seal, interior C-ring seal and exterior C-ring seal.
7. Clean or replace the backup pads as needed.
8. Inspect the retaining clips and replace any that are damaged or worn.
9. Place one new interior C-ring seal over each manifold bushing.
10. Place one new Grafoil seal over each manifold bushing.
11. Coat the bottom of each piston cylinder with a high temperature lubricant and insert a new exterior C-ring seal.

Figure 5-35  Piston Cylinder Assembly


Figure 5-36  C-Ring Installation

1. Exterior C-Ring Seal  2. Interior C-Ring Seal
12. Align the piston cylinder with the locating dowel and press it towards the manifold until the cylinder is fully seated on the C-rings. Repeat this step for all piston cylinders.

13. Install a retaining ring into the groove at the end of each manifold bushing.

### 5.12 Removing the Insulating Gate Bubbles or Nozzle Tip Insulators

Access to the insulating gate bubbles or nozzle tip insulators is available when the cavity plate is removed from the hot runner. The gate bubble or nozzle tip insulators must be removed to gain further access to the nozzle tips.

The differences between an insulating gate bubble and a nozzle tip insulator are:

- Insulating gate bubbles are the same color as the resin
- Nozzle tip insulators are brown or black

#### 5.12.1 Removing Nozzle Tip Insulators

To remove the nozzle tip insulators, do the following:

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.

   **NOTE:** Some of the nozzle tip insulators may stay in the gate detail in the cavity plate.

2. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Care must be taken to make sure that no molten resin is allowed to drip onto the nozzle tip insulator.

3. Pull the nozzle tip insulator off the nozzle tip using needle nose pliers. Be careful not to damage the tip.

4. After removal of the insulator, the nozzle tip should be perfectly clean and in “as new” condition.

   If resin is present on the insulator, the insulator is leaking and will not function as required.

   Determine the following:

   - The cause of the leak by inspecting the gate insert dimensions.
   - The nozzle tip position to make sure it is correct before a new insulator is installed Section 5.10.
NOTE: Care must be taken not to damage the nozzle tip sharp point or nozzle sealing surfaces.

5. Remove locks and tags.

5.12.2 Cleaning the Gate Detail

To clean the gate detail, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
   
   NOTE: Some of the nozzle tip insulators may stay in the gate detail.

2. To remove a nozzle tip insulator from the gate detail use a 10 mm or 3/8"-18 NPT tap or pipe.

3. Clean the gate detail in the gate insert by using a pointed hardwood stick and soft cloth or 3M Scotch-Brite™ No. 7447 (Maroon). Care must be taken not to scratch the cylindrical sealing surfaces between the gate insert and the nozzle housing. Even a slight scratch may cause leaks at high injection pressures.
5.12.3 Installing Nozzle Tip Insulators

To install nozzle tip insulators in the gate detail, do the following:

1. Install new or good used nozzle tip insulators in the gate detail.

   **NOTE:** The actual preload of the nozzle tip insulator to nozzle tip will be less than 0.64 mm (0.025 in). Each nozzle tip design has preload designed based on the operating temperatures of the mold. New nozzle tips will not be seated as well in the gate and will create more resistance to closing the mold. Molds with used nozzle tip insulators which have not been removed will not have the same resistance to mold closing.

2. Make sure all nozzle tip insulators are installed before installing the cavity plate.

3. Install the cavity plate following the instructions in Section 5.6.

5.12.3.1 Alternate Installation of Nozzle Tip Insulators

When the “L” Dimension is very long, installing nozzle tip insulators in the gate detail and maintaining alignment may be difficult. In this case, two alternatives are possible:

- Install the nozzle tip insulator on a wooden dowel and insert the insulator into the gate detail or,
- Install the nozzle tip insulator on the nozzle tip.

A used nozzle tip insulator will last much longer, if it is re-installed on the same nozzle tip in the same cavity. The orientation of the nozzle tip insulator with the nozzle tip is critical.

**NOTE:** A nozzle tip insulator that falls off, but is caught in the gate detail will damage the gate and nozzle tip.
5.12.4 Removing the Insulating Gate Bubble Removal

Some hot runner systems have a bubble of resin at the nozzle tip that acts as an insulator. This bubble can be removed from the nozzle tip for expediting color change.

NOTE: The new resin color should be run through the system prior to bubble removal. This will minimize the color change time required.

To remove the insulating gate bubble, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Inspect the nozzle tips to make sure the gate bubbles are intact. If a gate bubble is missing, inspect the matching cavity in the cavity plate.
4. Connect the hot runner to a controller.
5. Increase the temperature of the nozzle housings to a temperature high enough to soften the gate bubble. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.
6. Lock out and tag the machine. Refer to Section 1.9.
7. Remove the gate bubble with a clean, soft cloth or soft wire brush

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

8. Remove any gate bubbles in the cavity plate. If required, carefully heat the gate bubbles with a propane torch and then wipe the deposits away with a clean, soft cloth or soft wire brush. This may have to be repeated several times.

9. Disconnect the hot runner from the controller and reassemble the cavity plate. Refer to Section 5.6.

10. Remove locks and tags.

### 5.13 Nozzle Heaters

To maximize heat control at the nozzle gate, all nozzle heaters must be located the same distance from the front of each nozzle housing. This assures the uniform heating of all nozzle tips.

During installation, the distance between the tip of the nozzle heater and the manifold plate should be verified against the dimensions listed on the Section View Assembly drawing in Chapter 7.

**NOTE:** Always use the correct wattage and length of nozzle heater. Refer to the Section View Assembly drawing in Chapter 7 to determine the nozzle heater required for your system.

When changing a nozzle heater, care must be taken not to damage the nozzle tip retainer or housing sealing diameter. Make sure all electrical and thermocouple wires have been properly connected to their multi-pin connector(s). The wires must be properly fitted in the wire grooves to prevent interference and possible pinching when the cavity plate is reassembled.
5.13.1 Replacing the Nozzle Heater for Thermal Gate Systems

The following procedures describe how to replace nozzle heaters on thermal gate systems.

5.13.1.1 Replacing the HTM Nozzle Heater for Ultra 250 Systems

To replace the HTM nozzle heaters on Ultra 250 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Unscrew the set screw at the tip of retaining sleeve so it does not interfere when removing the nozzle tip.

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CAUTION!
Nozzle heaters must not touch the cavity steel or interfere with the sealing diameter.

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IMPORTANT!
Husky nozzle heaters are rugged and have a long service life. They should only be replaced with Husky approved parts. Use of components not sold or approved by Husky will void the hot runner warranty.
5. Remove the nozzle tip. Refer to Section 5.10.1.1.
6. Remove the necessary wire clips to expose the nozzle heater wires.
7. Remove the nozzle heater assembly.
   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
8. Slide a new nozzle heater assembly over the nozzle housing until it bottoms out on the housing.
9. Re-install the nozzle tip onto the nozzle housing. Refer to Section 5.10.2.1.
10. Pull the nozzle heater assembly up until it makes contact with the hex section of the nozzle tip.
11. Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
12. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
13. Label each wire with the heater zone number.
14. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
15. Test each nozzle heater zone according to the instructions in Section 4.11.3.
16. Remove locks and tags.

5.13.1.2 Replacing the HTM Nozzle Heater for Ultra 350 Systems

To replace the HTM nozzle heaters on Ultra 350 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the retaining clip from the nozzle tip.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater assembly.
   
   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
7. Replace the wave springs.
8. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.
   
   **NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
9. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.
10. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**Figure 5-39  Nozzle Tip and Heater Assembly for Ultra 350 Systems (HTM Heater)**

NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

11. Label each wire with the heater zone number.
12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
13. Test each nozzle heater zone according to the instructions in Section 4.11.3.
14. Remove locks and tags.

5.13.1.3 Replacing the HTM Nozzle Heater for Ultra 500 Systems

To replace the HTM nozzle heaters on Ultra 500 thermal gate systems, do the following:
1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the retaining clip from the tip retainer.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater assembly.
   NOTE: The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
7. Slide a new nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the tip retainer.
8. Install the retaining clip on the tip retainer.
9. Torque the set screw at the end of the retaining sleeve to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
10. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

11. Label each wire with the heater zone number.

12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

13. Test each nozzle heater zone according to the instructions in Section 4.11.3.

14. Remove locks and tags.

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### 5.13.1.4 Replacing the Copper Nozzle Heater for Ultra 500 Systems

To replace the copper nozzle heaters on Ultra 500 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the front ring.

5. If equipped, remove the retaining sleeve that fits over the thermocouple and nozzle heater.

6. Disconnect the thermocouple from the nozzle heater.

7. Remove the retaining clip from the tip retainer.

8. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
9. Remove the nozzle heater and thermocouple.
10. Slide a new nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.
11. Install the retaining clip on the tip retainer.
12. Install the thermocouple probe end into the probe hole on the nozzle heater as shown in Figure 5-41.
   
   **NOTE:** A slot is cut into the nozzle heater to allow the thermocouple to be set in place with the retaining sleeve.
13. Slide the retaining sleeve over the nozzle heater and thermocouple.
14. Pull the nozzle heater up against the retainer ring.
15. Hand tighten the front ring onto the nozzle heater.
16. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
17. Label each wire with the heater zone number.
18. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
19. Test each nozzle heater zone according to the instructions in Section 4.11.3.
20. Remove locks and tags.

### 5.13.1.5 Replacing the Ultra Nozzle Heater for Ultra 500 and Ultra 750 Systems

To replace the Ultra nozzle heaters on Ultra 500 and Ultra 750 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the thermocouple retaining ring from the nozzle heater.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater.
7. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.
8. Slide a new nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.
9. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
10. Label each wire with the heater zone number.
11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
12. Test each nozzle heater zone according to the instructions in Section 4.11.3.
13. Remove locks and tags.

### 5.13.1.6 Replacing the Bi-Metal Nozzle Heater for Ultra 750, Ultra 750 HT-S6 and Ultra 1000 Systems

To replace the bi-metal nozzle heaters on Ultra 750 and Ultra 1000 thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the front ring.

5. Disconnect the thermocouple from the nozzle heater.

6. Remove the retainer clip from the tip retainer.

7. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

8. Remove the nozzle heater and thermocouple.

9. Slide a new nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

10. Install the retaining clip and pull the nozzle heater upwards until it stops against the retaining clip.

11. Install the thermocouple probe end into the probe hole on the nozzle heater end as shown in Figure 5-43.

**CAUTION!**

The front ring holds the thermocouple in place for proper reading of the nozzle heater temperature. Caution should be taken when wiring the thermocouple to not pull the thermocouple out from under the front ring. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

12. Secure the thermocouple to the nozzle heater by hand tightening the front ring on the nozzle heater.

13. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

14. Label each wire with the heater zone number.
15. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

16. Test each nozzle heater zone according to the instructions in Section 4.11.3.

17. Remove locks and tags.

5.13.1.7 Replacing the Triton Nozzle Heater Assembly for Ultra 750-UP Systems

To replace the Triton nozzle heaters on Ultra 750-UP thermal gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the retaining clip from the tip insert.

5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Disconnect the thermocouple retaining ring from the nozzle heater.
7. Remove the nozzle heater and thermocouple retaining ring.
8. Slide a new nozzle heater over the nozzle housing far enough to show the retaining clip groove on the tip retainer.

**NOTE:** Each wave spring (5) can be compressed up to approximately 3 mm (0.12 in).
9. Install the thermocouple retaining ring over the nozzle heater.
10. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.
11. While holding the nozzle heater and thermocouple retaining ring firmly against the wave springs, install the retaining clip into the groove in the tip insert.
12. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

---

**Figure 5-44 Heater Assembly for Ultra 750-UP Systems (Triton Heater)**

NOTE: All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

13. Label each wire with the heater zone number.
14. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
15. Test each nozzle heater zone according to the instructions in Section 4.11.3.
16. Remove locks and tags.

5.13.2 Replacing the Nozzle Heater for Valve Gate Systems

The following procedures describe how to replace nozzle heaters on valve gate systems.

5.13.2.1 Replacing the HTM Nozzle Heater for Ultra 350 Systems

To replace the HTM nozzle heaters on Ultra 350 valve gate systems, do the following:
1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the retaining clip from the nozzle tip.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater assembly.
   NOTE: The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.
7. Replace the wave springs.
8. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.

**NOTE:** The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

9. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.

10. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

11. Label each wire with the heater zone number.

12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

13. Test each nozzle heater zone according to the instructions in Section 4.11.3.

14. Remove locks and tags.

### 5.13.2.2 Replacing the Copper Nozzle Heater for Ultra 500 Systems

To replace the copper nozzle heaters on Ultra 500 valve gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the front ring.

![Figure 5-46 Heater Assembly for Ultra 500 VG Systems (Copper Heater)](image-url)

- 1. Front Ring
- 2. Retaining Sleeve
- 3. Retaining Ring
- 4. Nozzle Heater
- 5. Thermocouple
- 6. Nozzle Tip
5. If equipped, remove the retaining sleeve that fits over the thermocouple (4) and nozzle heater.

6. Disconnect the thermocouple from the nozzle heater.

7. Remove the retaining ring from the nozzle tip.

8. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

9. Remove the nozzle heater and thermocouple.

10. Slide a new nozzle heater over the nozzle housing and nozzle tip.

11. Install the retaining ring around the nozzle tip.

12. Connect the thermocouple to the nozzle heater.

13. Pull the nozzle heater up against the retainer ring.

14. If required, install the retaining sleeve over the thermocouple and nozzle tip or nozzle tip retainer.

15. Install the front ring and tighten by hand.

16. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

17. Label each wire with the heater zone number.

18. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.

19. Test each nozzle heater zone according to the instructions in Section 4.11.3.

20. Remove locks and tags.

5.13.2.3 Replacing the Ultra Nozzle Heater for Ultra 500 and Ultra 750 Systems

To replace the Ultra nozzle heaters on Ultra 500 and Ultra 750 valve gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.

2. Lock out and tag the machine. Refer to Section 1.9.

3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.

4. Remove the thermocouple retaining ring from the nozzle heater.
5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater.
7. Orient the thermocouple retaining ring so the wires are on the same side as the nozzle heater wires.
8. Slide a new nozzle heater onto the nozzle assembly. The thermocouple retaining ring will snap onto the retaining clip groove in the nozzle heater. If required, the thermocouple ring can be opened slightly with a flat head screwdriver.
9. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.

**NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.

10. Label each wire with the heater zone number.
11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
12. Test each nozzle heater zone according to the instructions in Section 4.11.3.
13. Remove locks and tags.

### 5.13.2.4 Replacing the Bi-Metal Nozzle Heater for Ultra 500, Ultra 750 and Ultra 1000 Systems

To replace the bi-metal nozzle heaters on Ultra 500, Ultra 750 and Ultra 1000 valve gate systems, do the following:

1. Separate the cavity plate from the hot runner. Refer to Section 5.6.
2. Lock out and tag the machine. Refer to Section 1.9.
3. Remove the insulating gate bubble or nozzle tip insulator. Refer to Section 5.12.
4. Remove the front ring.
5. Disconnect the thermocouple from the nozzle heater.
6. Remove the retainer ring from the nozzle tip.
7. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
8. Remove the nozzle heater and thermocouple.
9. Slide a new nozzle heater over the nozzle housing and nozzle tip.
10. Install the retainer ring around the nozzle tip.
11. Connect the thermocouple to the nozzle heater.
12. Pull the nozzle heater up against the retainer ring.
13. Install the front ring and tighten by hand.
14. Route the nozzle heater and thermocouple wires through the wire grooves in the manifold plate. Make sure all wiring is properly retained in the wire grooves using wire clips.
   **NOTE:** All wiring along the nozzle heater must be either a high temperature braid or sleeved using a high temperature sleeving.
15. Label each wire with the heater zone number.
16. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic(s) in Chapter 7.
17. Test each nozzle heater zone according to the instructions in Section 4.11.3.
18. Remove locks and tags.
5.13.3 Extending Nozzle and Sprue Heater Wire Leads

The following procedure describes how to install the nozzle and sprue heater lead splice kit (P/N 4047310) to extend the length of the nozzle and sprue heater wires. This kit may be required on systems where the wire leads are not long enough to reach the electrical connectors.

IMPORTANT!

This procedure is only for nozzle and sprue heater leads when standard lead lengths are not long enough.

This procedure is not to be used for extending thermocouple wire leads. Splicing thermocouple wires will cause false and/or erratic temperature readings.

When required, standard thermocouples are available with longer wire lead lengths.

To install the kit, do the following:

1. Strip the ends of the wire and the wire supplied with the kit until 6 mm (0.2 in) of wire lead is exposed on both.
2. Insert the wires into both ends of the butt connector until no wire lead is visible.
3. Using a crimping tool, crimp one end of the butt connector at a time.
4. Slide heat shrink tubing over the butt connector. Make sure the butt connector is centered in the tubing.
5. Shrink the tubing using a heat gun.
6. Seal the ends of the heat shrink tubing where the tubing meets the wire lead insulation.
5.14 Manifolds

The following procedures describe how to remove, maintain and install the manifolds.

5.14.1 Removing a Manifold

To remove a manifold, do the following:

WARNING!

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

NOTE: The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. If resin exists in the manifold, remove the nozzle heaters. Refer to Section 5.13.
   The resin may hold the nozzle housings to the manifold(s) when the manifold(s) is removed.
2. If necessary, remove the nozzle tips. Refer to Section 5.10.
3. Remove the manifold thermocouples.
4. Remove the backing plate. Refer to Section 5.9.1.
5. If equipped, remove the center air plate. Refer to Section 5.8.1.
6. Remove any weepage or resin leakage from the manifold. Refer to Section 5.7.
7. For valve gate systems, remove the valve stem and piston assemblies. Refer to Section 5.19.
8. Disconnect all manifold heater, sprue bushing heater, and related thermocouple wires from the multi-pin connectors and wire channels.
9. Remove the manifold hold down screws.
10. Use the lifting eyebolt holes in the manifold to attach a crane and lift the manifold out of the manifold plate pocket.
11. Place the manifold on a clean, flat work surface.
12. If necessary, remove the nozzle housings. Refer to Section 5.16.1.
13. Separate the manifolds and any cross manifolds.
14. Remove the sprue bushing heater and thermocouple. Refer to Section 5.17.

**IMPORTANT!**

There is no need to remove the sprue bushing from the manifold unless the following conditions occur:
- There is contaminated material in the sprue bushing melt channel;
- The material in the sprue bushing melt channel has been degraded by overheating; or
- A complete disassembly is required for cleaning the manifold melt channels.

### 5.14.2 Inspecting and Cleaning a Manifold

To inspect and clean a manifold, do the following:

**NOTE:** A fluidized bed cleaning process is recommended for cleaning manifolds and manifold components. Refer to section Section 5.15 for more information.

1. If a fluidized bed cleaning process is unavailable, do the following:
   a. Using brass scrapers, remove any resin left protruding from the manifold. Do not damage the sharp corners or sealing surfaces.
   b. Clean the manifold bushing and seating surfaces using brass scrapers. Do not damage the sharp corners or sealing surfaces.
   c. Clean all drool from the weep holes. Refer to Section 5.7.

2. Clean the mating surfaces on the manifold with a medium India stone (240 grit oilstone). Do not scratch the manifold.
   Make sure all contact surfaces on the manifold plate and manifold backing plate are clean and free of residue, scratches, nicks or burrs.
3. Clean the mating surfaces on the manifold insulators with a medium India stone (240 grit oilstone). Do not scratch the manifold insulators.

**CAUTION!**

If the sealing surfaces on the nozzle housings are damaged in any way, the nozzle housings must be replaced.

**CAUTION!**

Do not stone the back surface of the nozzle housing to remove nicks and burrs. The back surface is a precision made section of the housing with a contoured surface. Stoning this section will cause the system to leak and void the leak proof guarantee for the hot runner.

4. Inspect the nozzle housings. Make sure they are free of nicks, burrs, and any resin, especially in the melt channels.
5. Make sure the manifolds and cross manifolds are clean and flat.
6. Check all manifold, heater, and thermocouple wiring. Replace as required.

**NOTE:** Use only Husky recommended high temperature power and thermocouple wire.

**NOTE:** Refer to the electrical schematic(s) in Chapter 7.

### 5.14.3 Installing a Manifold

To install a manifold, do the following:

**WARNING!**

Inadequate lifting equipment can fail and cause injury or death. Make sure the lifting eye bolts/hoist rings, chains/slings, and lifting device are rated for the load and in safe operating condition.

**NOTE:** The following procedure requires the use of a crane. Make sure the lifting eyebolts/hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

1. Replace the manifold bushings as necessary. Refer to Section 5.18 for more information.
2. Make sure all contact surfaces on the manifold plate, backing plate, and manifold bushings are clean and free of resin, scratches, nicks or burrs.
3. Install the manifold locating insulator(s) and retaining screw(s) into the manifold plate.
4. Install the manifold locating dowels into the manifold plate.
5. If removed previously, install the nozzle housings in the manifold plate. Refer to Section 5.16.3.
6. Attach the manifold to a suitable overhead lifting device and lift the manifold over the manifold plate pocket.
7. Lower the manifold into position onto the manifold insulator and manifold locating dowel. Adjust the manifold to engage the locating features.

8. Disconnect the overhead lifting device and remove the lifting eyebolt(s)/hoist ring(s).

9. Install and hand tighten the manifold hold down screws to secure the manifold to the manifold plate. Make sure the manifold hold down screws are coated with a high temperature anti-seize lubricant.

10. Turn the manifold hold down screws counter-clockwise 1/4 turn and measure the preload for the manifold. Refer to section Section 4.6 for more information.

11. Hand tighten the manifold hold down screws once the preload measurements have been verified.

12. If cross manifolds and bridge manifolds are used to join multiple manifolds, install and torque as required to the manifolds. Once the cross manifolds and bridge manifolds are installed, measure the preload. Refer to Section 4.6.4.

   **NOTE:** Refer to the Assembly Section drawing in Chapter 7 for more information.

13. Install the manifold heater wires into the connector bases and secure the wires neatly under the wire clips in the wire channels.

14. Connect the wires to the multi-pin connector(s). Refer to the electrical schematic(s) in Chapter 7 for wiring information.

15. Install the clean sprue bushing and heater(s), if removed, making sure not to damage the sealing surface with the manifold. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

16. If required, install the center air plate. Refer to Section 5.8.2.

17. Install the backing plate. Refer to Section 5.9.2.
5.15 Removing Resin from the Hot Runner

Occasionally, resin may be left in the hot runner or a leakage of resin may occur due to a component failure. The resin will have to be removed at this point. However, removing the resin without damaging components requires careful attention.

The following sections describe how to remove resin from the hot runner and hot runner components carefully.

5.15.1 Plate Cleaning and Inspection

The following procedure describes a general cleaning and inspection process for plates. After this procedure has been completed, the application of a fluidized bed process heat is recommended.

NOTE: The recommended procedure for removing resin from hot runner components is a controlled fluidized bed process heat. Refer to Section 5.15.2 for more information.

To inspect and clean plates, do the following:

1. Using brass or hardwood scrapers, clean the manifold plates of any resin deposits.
2. Remove all cooling fittings and plugs.
3. Clean the deposits from the cooling hoses.
4. Clean the entire plate using a medium India stone (240 grit oilstone) on flat surfaces and 3M Scotch-Brite™ No. 7447 (Maroon) on difficult to reach areas.
5. Remove any deposits from the alignment bushings and alignment dowels.
6. Check the plate for the following:
   - Wear at the alignment bushings and alignment dowels
   - Corrosion in the cooling channels
   - Cracks (especially around the mold mounting bolt holes or clamp mounting slots)
   - Damage to the dowel holes
   - Sharp edges around the wire grooves

WARNING!

Use an appropriate breathing apparatus as protection while using a brass wire bush or wheel. See the material safety data sheet (MSDS) from the resin supplier. As a minimum, a particle mask is recommended.

7. Rework or replace the plates as required.
NOTE: Before re-installing components, the plate pocket(s) must be thoroughly cleaned. An electric hand drill with a brass wire wheel or a brass chisel may be used. This will prevent unnecessary scratching.

8. Install the fittings with new pipe plugs.

9. Pressure test the cooling circuits in the backing plate to be sure there are no coolant leaks.

WARNING!
Wear appropriate eye and face protection following the recommendations of the ABMA (American Brush Manufactures Association) and ANSI (American National Standards Institute) following ANSI Z87.1 “occupational eye and face protection” ANSI B165.1 and ANSI B165.2 “safety requirements power brushes”.

WARNING!
Use an appropriate breathing apparatus as protection while using a brass wire bush or wheel. See the material safety data sheet (MSDS) from the resin supplier. As a minimum, a particle mask is recommended.

10. Brush the plate surfaces with a brass wire brush and collect any dust with a vacuum.

CAUTION!
Do not damage manifold and nozzle seal off surfaces on the plates.

11. Clean the plate with 3M Scotch-Brite™ No. 7447 (Maroon) for final clean up.

NOTE: Resin on plates may also be removed using the fluidized bed cleaning process, provided that all brass and copper components are removed from the plate and the plate assembly is disassembled completely. Refer to Section 5.15.2 for more information.

5.15.2 Cleaning Using a Fluidized Bed Process

The following sections describe fluidized bed cleaning and how to prepare the hot runner for it.

5.15.2.1 What is Fluidized Bed Cleaning

Cleaning the manifold passages is rarely required. However, if necessary, manifold passages must be cleaned using the fluidized bed process. Only the fluidized bed cleaning process will successfully remove the resin completely from the melt channels of the hot runner components.

Fluidized bed cleaning is a process with aluminum oxide particles in a high temperature retort. The heated air at 320 to 385 °C (750 to 900 °F) levitates the aluminum oxide particles
creating a liquid-like behavior. The temperature and flow of the fluidized bed pyrolizes (thermally decomposes) the polymer.

### 5.15.2.2 Assistance

Husky provides a full system repair and cleaning service. Husky is also able to assist customers in finding a fluidized bed cleaning process.

Contact your Husky Regional Service and Sales office for more information.

### 5.15.2.3 Disassembly for Fluidized Bed Cleaning

When disassembling a hot runner for fluidized bed cleaning, do the following:

**IMPORTANT!**

Before disassembling a hot runner for fluidized bed cleaning, please note the following:

- When removing resin from the mold, make sure the faces of the manifold are kept scratch free. Scratches around the nozzle housing, valve bushing, manifold bushing and piston cylinder, or sprue bushing/sprue bar surfaces may cause severe resin leakage.
- The thickness of the manifold(s) is extremely important for the performance of the hot runner. There is a risk that cleaning the surface through grinding or sanding would change the total height of the stack and thereby increase the cold clearance. This would result in a resin leak.

**CAUTION!**

*Do not remove any surface or melt channel plugs. This will void the leak proof guarantee for the hot runner. Plugs can only be removed by Husky.*

1. Any system that is to be sent for fluidized bed cleaning is to be completely disassembled. However do not send the following items for cleaning:
   - Set screws
   - Surface hex head plugs
   - Nozzle tip insulators
   - Nozzle heaters
   - Sprue bushing heaters

2. Make sure all electrical wiring and thermocouples are removed.

3. Do not use the fluidized bed process to clean Beryllium Copper components, such as the following:

**CAUTION!**

*Contact Husky for verification of the item material before cleaning it with a fluidized bed process.*
• Manifold bushings
• Manifold inserts
• Some nozzle tips and tip retainers

The process will anneal the Beryllium Copper (BeCu) causing rapid failure of the components when returned to service.

Mechanical cleaning of BeCu components must not damage any of the sealing surfaces. Use only soft brass, hardwood sticks, Scotch-Brite™, or soft brass brushes. Do not use abrasive methods to clean BeCu components.

**WARNING!**

Do not use abrasives to clean BeCu. Airborne particles of beryllium are known carcinogens. Rework of BeCu using abrasives can be completed under flood coolants to prevent airborne particles.

**IMPORTANT!**

The Husky Warranty does not cover BeCu components used outside the operating temperature range, or cleaned using the Fluidized Bed process.

4. When packing for shipment, make sure the manifold heater ends do not get damaged during shipping.

   The best method is to pack the manifold in a crate where it cannot move, or place the manifold between two pieces of plywood cut approximately 50 mm (2 in) larger all around. Hold the manifold and plywood pieces together with bolts using existing hold down holes or clearance holes in the manifold. Only use plywood thick enough to protect the manifold and absorb impacts if the manifold is dropped.

5. Send a complete packing list of all the components shipped to make sure nothing is overlooked when the components are returned.

6. Follow the assembly and installation instructions in Chapter 4 when the components are received.

### 5.16 Nozzle Housings

The following procedures describe how to remove, maintain and install the nozzle housings.

#### 5.16.1 Removing the Nozzle Housings

To remove the nozzle housings, do the following:

1. Remove the nozzle heaters and all thermocouples. Refer to Section 5.13.
2. Remove the insulating gate bubble or nozzle tip insulators. Refer to Section 5.12.
3. If equipped, disassemble and remove all valve stem and piston assemblies. Refer to Section 5.19 for more information.

4. Remove the nozzle tips. Refer to Section 5.10.

5. Remove the manifold from the manifold plate. Refer to Section 5.14.1 and place it on a clean, flat work surface.

**CAUTION!**

*Use a brass rod to protect the manifold and nozzle from damage.*

6. Break the resin around the nozzle housing with a side impact against the nozzle flange at the manifold face.

7. Pull the nozzle stack assembly out of the manifold and disassemble.

8. Inspect all nozzle stack components for damage or wear. Replace as necessary.

---

## 5.16.2 Inspecting and Cleaning Nozzle Housings

To inspection and clean the nozzle housings after they have been removed, do the following:

**CAUTION!**

*Do not stone the back surface of the nozzle housing to remove nicks and burrs. The back surface is a precision made section of the housing with a contoured surface. Stoning this section will cause the system to leak and void the leak proof guarantee for the hot runner.*

1. If the nozzle housing has an internal thread, clean the nozzle tip seating surface at the bottom of the nozzle housing bore. This step is not required for nozzle housings that have an external thread.

2. Clean the thread with a soft wire brush.
3. Remove all resin from the melt channel in the nozzle housing.
4. Remove all resin from the nozzle housing bore in the manifold plate.

5.16.3 Installing the Nozzle Housings

To install the nozzle housings, do the following:

1. Assemble each nozzle housing as shown in Figure 5-55.
   
   **NOTE:** Refer to the Section View Assembly drawing in Chapter 7 to verify the orientation and correct number of Ultra springs.

2. Place all housing assemblies into the nozzle bores (6) in the manifold plate. Make sure the housing assemblies are properly aligned with the nozzle locating dowels to prevent rotation.

3. Install the manifold. Refer to Section 5.14.3.
5.17  Sprue Bushing

The following procedures describe how to remove, maintain and install the sprue bushing.

5.17.1  Removing the Sprue Bushing

To remove the sprue bushing, do the following:

1. Remove the backing plate. Refer to Section 5.9.
2. If equipped, remove the center air plate. Refer to Section 5.8.

3. Remove the sprue bushing mounting screws.
4. Remove the resin slug from the sprue bushing melt channel with a brass rod.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

5.17.2  Inspecting and Cleaning the Sprue Bushing

To inspect and clean the sprue bushing, do the following:

1. Clean the sprue bushing. Do not damage any sealing surfaces.
2. Check and repair the nozzle radius, if required.

5.17.3  Installing the Sprue Bushing

Refer to the sprue bushing installation instructions in Section 4.5.3.

5.18  Manifold Bushings

The following procedures describe how to remove, maintain and install manifold bushings. Manifold bushings need to be replaced if the following occurs:

- The valve stem is stuck and cannot be removed
- The valve stem bore is worn and leaking heavily back into the piston area
- The manifold bushing is collapsed from overheating
- There is a need to clean the manifold
The air seal face is damaged
The manifold bushing is damaged in a way that renders it unusable

**NOTE:** Husky provides two styles of manifold bushings: press fit or slip fit. Press fit manifold bushings are typically used in systems designed to process heat-sensitive resins. Slip fit manifold bushings are used in systems designed to process resins that are not heat-sensitive. Refer to the Section View Assembly drawing in Chapter 7 to determine if the manifold bushings are press fit or slip fit.

**NOTE:** It is recommended that press fit bushings be removed and replaced by Husky. Contact your Husky Regional Service and Sales office for more information and quoting on removing press fit manifold bushings.

### 5.18.1 Removing Manifold Bushings

To remove manifold bushings, do the following:

1. Disconnect the manifold and thermocouple wires from the manifold(s).
2. Remove the nozzle heaters and thermocouples from the nozzle housings. Refer to Section 5.13.
3. Remove the nozzle tips. Refer to Section 5.10.
4. Remove the nozzle housings. Refer to Section 5.16.1.
5. Remove the manifold from the manifold plate pocket. Refer to Section 5.14.1.
6. If the manifold is used in a valve gate system, remove the valve stem and piston assemblies. Refer to Section 5.19.
7. Remove the backup pads or backup insulators from the manifold bushings.
8. Press the manifold bushings out of the manifold using a heavy brass punch. Take care not to damage the bushings or manifold.

### 5.18.2 Inspecting and Cleaning Manifold Bushings

To inspect and clean manifold bushings, do the following:

1. Remove any resin from the manifold bushing pockets and seating area in the manifold plate using brass scrapers. Do not damage the sharp corners or sealing surfaces.
2. Remove any resin from the exterior of the manifold bushing(s) with brass scrapers. Do not damage the sharp corners or sealing surfaces.
3. Make sure the interior of the manifold bushing is free of resin.
4. Clean the stem bore in the manifold bushing with alcohol and cotton swabs. The interior is clean when a cotton swab can be removed from the bushing without any dirt on it.
5. Use a medium India stone (240 grit oil stone) to clean all mating surfaces on the manifold. Do not scratch the manifold.
6. Check that all contact surfaces on the manifold plate, backing plate, and manifold bushings are clean and free of residue, scratches, nicks, or burrs.
5.18.3 Installing Manifold Bushings

To install manifold bushings, do the following:

1. Make sure the manifold bushing locating dowel is installed in the manifold.
2. Align the manifold bushing with the locating dowel and press the bushing into the manifold until the bushing bottoms out on the manifold. Repeat this step for all manifold bushings.

5.19 Valve Stem and Piston Assemblies

The following procedures describe how to remove and install valve stems and piston assemblies from valve gate systems.

5.19.1 Removing Valve Stem and Piston Assemblies

The following procedures describe how to remove valve stem and piston assemblies.

5.19.1.1 Removing the Valve Stems and Pistons for Ultra 350 and Ultra 500 VGSX

To remove valve stem and piston assemblies from an Ultra 350 and Ultra 500 VGSX systems, do the following:

1. Inspect the interior and exterior of the piston cylinders for drool (or weepage). Refer to Section 5.7 for information on how to remove drool from weep holes.

WARNING!

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

WARNING!

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

2. Remove any resin deposits from the outside of the piston cylinder and the manifold pocket area. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

3. If required, use a brass rod to clean the inside of the piston cylinders. Do not scratch or score the piston cylinder surface.
4. Reconnect any thermocouples that were disconnected when the backing plate was removed.

5. Loosen the socket head cap screws in the piston and use them to pull the piston out of the piston cylinder.

   **NOTE:** Do not attempt to remove the valve stem. This will be done later in this procedure using special Husky tools.

6. Connect the hot runner to a controller.

---

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

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**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

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**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

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**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

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7. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

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**IMPORTANT!**

Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be re-installed later on.

---

**CAUTION!**

Do not allow the hot runner to cool off during the valve stem removal process. A valve stem could be broken during removal if the system cools.
9. Install the valve stem removal tool base shown in Figure 5-56 over the piston cylinder.

10. Install the piston head adapter as shown in Figure 5-57.

11. Attach the piston head adapter to the valve stem removal tool adapter as shown in Figure 5-58.
12. Assemble the remaining components of the valve stem removal tool. Refer to Section 5.4.3 for part numbers.
CAUTION!
Be careful not to bend the valve stem when removing it. Bent valve stems can not be re-used.

CAUTION!
If the valve stem does not pull out easily, the valve stem may have seized in the manifold bushing. If this is the case, remove the manifold bushing from the manifold and then remove the valve stem. Contact your Husky Regional Service and Sales office for more information.

13. Turn the nut at the top of the tool clockwise with an appropriately sized wrench to remove the valve stem and piston.

14. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been removed.

15. Inspect the gate end of each valve stem to make sure there is no damage or wear. If possible, use a new valve stem for comparison.

WARNING!
Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

WARNING!
Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

16. Remove any resin deposits from the valve stems. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

17. Make sure the valve stems are not overheated, scratched, scored, or bent. Replace any valve stem that shows signs of this type of damage.

CAUTION!
Abrasives should never be used to clean the valve stems, as this can damage the critical sealing surfaces.

18. Replace valve stems as required. If the valve stems are being replaced due to severe wear or leakage at the manifold bushing and cylinder, both the valve stem and the manifold bushing must be replaced to guarantee seal quality.

19. Cut and discard the piston seals.
20. Install new piston seals.
21. Inspect the manifold wiring and heaters for damage and replace where required.

**NOTE:** Use only Husky recommended high temperature power and thermocouple wire.

**NOTE:** Refer to the electrical schematic(s) in Chapter 7 for wiring information.

5.19.1.2 Removing the Valve Stems and Pistons Ultra 350, Ultra 500 and Ultra 750 VGLX/EX

To remove valve stems and piston assemblies from Ultra 350, Ultra 500 or Ultra 750 VGLX/EX systems, do the following:

1. Remove the piston cylinders from each valve stem and piston assembly.
2. Inspect the bleeder holes in the base of each backup pad and the manifold pocket for excess resin weepage. Refer to Section 5.7 for information on the effects of excess resin weepage.

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

3. Remove any resin deposits from the outside of the backup pads and the manifold pocket area. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.
4. If required, use a brass rod to clean the inside of the backup pads. Do not scratch or score the backup pad surface.
5. Reconnect any thermocouples that were disconnected when the backup plate was removed.
6. Remove the set screws from each piston using a 1/4" Allen wrench. To prevent the pistons from rotating during this step, install socket head cap screw into the manifold and hold the piston in place with a 16 mm wrench.
7. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

8. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.
9. Lock out and tag the machine. Refer to Section 1.9.

CAUTION!

Do not allow the hot runner to cool off during the valve stem removal process. A valve stem could be broken during removal if the system cools.

10. Install the piston head adapter shown in Figure 5-61. Attach the adapter to the piston head with a socket head cap screw.

Figure 5-61 Piston Head Adapter

11. Place the valve stem removal tool base over the piston head adapter and then attach the valve stem adapter to piston head adapter as shown in Figure 5-62.

Figure 5-62 Assembling the Valve Stem Removal Tool Base
1. Valve Stem Removal Tool Base  2. Valve Stem Removal Tool Adapter
12. Assemble the remaining components of the valve stem removal tool. Refer to Section 5.4.3 for part numbers.

CAUTION!

Be careful not to bend the valve stem when removing it. Bent valve stems cannot be re-used.

13. Turn the nut at the top of the tool clockwise with an appropriately sized wrench to remove the valve stem and piston.

14. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been removed.

15. Inspect the gate end of each valve stem to make sure there is no damage or wear. If possible, use a new valve stem for comparison.

CAUTION!

If the valve stem and piston do not pull out easily, the valve stem may have seized in the manifold bushing. If this is the case, remove the manifold bushing from the manifold and then remove the valve stem. Contact your Husky Regional Service and Sales office for more information.

16. Remove any resin deposits from the valve stems. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

17. Make sure the valve stems are not overheated, scratched, scored, or bent. Replace any valve stem that shows signs of this type of damage.

CAUTION!

Abrasives should never be used to clean the valve stems, as this can damage the critical sealing surfaces.

18. Replace valve stems as required. If the valve stems are being replaced due to severe wear or leakage at the manifold bushing and cylinder, both the valve stem and the manifold bushing must be replaced to guarantee seal quality.

WARNING!

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

WARNING!

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.
19. Cut and discard the piston seals.

20. Inspect the manifold wiring and heaters for damage and replace where required.

**NOTE:** Use only Husky recommended high temperature power and thermocouple wire.

**NOTE:** Refer to the electrical schematic(s) in Chapter 7 for wiring information.

### 5.19.1.3 Removing the Valve Stems and Pistons for Ultra 1000 VGLX/EX

To remove valve stems and piston assemblies from Ultra 1000 VGLX/EX systems, do the following:

1. Remove the piston cylinders from each valve stem and piston assembly.

2. Inspect the bleeder holes in the base of each backup pad and the manifold pocket for excess resin weepage. Refer to Section 5.7 for information on the effects of excess resin weepage.

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

3. Remove any resin deposits from the outside of the backup pads and the manifold pocket area. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

4. If required, use a brass rod to clean the inside of the backup pads. Do not scratch or score the backup pad surface.

5. Reconnect any thermocouples that were disconnected when the backup plate was removed.

6. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.
7. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

8. Lock out and tag the machine. Refer to Section 1.9.

9. Install the piston head adapter shown in Figure 5-61. Attach the adapter to the piston head with a socket head cap screw.
10. Place the valve stem removal tool base over the piston head adapter and then attach the valve stem adapter to piston head adapter as shown in Figure 5-62.

11. Assemble the remaining components of the valve stem removal tool. Refer to Section 5.4.3 for part numbers.

CAUTION!

Be careful not to bend the valve stem when removing it. Bent valve stems can not be re-used.

CAUTION!

If the valve stem and piston do not pull out easily, the valve stem may have seized in the manifold bushing. If this is the case, remove the manifold bushing from the manifold and then remove the valve stem. Contact your Husky Regional Service and Sales office for more information.
12. Turn the nut at the top of the tool clockwise with an appropriately sized wrench to remove the valve stem and piston.

13. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been removed.

14. Inspect the gate end of each valve stem to make sure there is no damage or wear. If possible, use a new valve stem for comparison.

---

**WARNING!**

Burn and fire hazard. Use of an open flame to remove resin can produce harmful gases (depending on the resin type), damage components, and increase the risk of fire. Only use open flames sparingly and in a controlled environment.

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**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

---

15. Remove any resin deposits from the valve stems. If required, carefully heat the resin deposits with a propane torch and then wipe the deposits away with a clean, soft cloth. This may have to be repeated several times.

16. Make sure the valve stems are not overheated, scratched, scored, or bent. Replace any valve stem that shows signs of this type of damage.

---

**CAUTION!**

Abrasives should never be used to clean the valve stems, as this can damage the critical sealing surfaces.

---

17. Replace valve stems as required. If the valve stems are being replaced due to severe wear or leakage at the manifold bushing and cylinder, both the valve stem and the manifold bushing must be replaced to guarantee seal quality.

18. Cut and discard the piston seals.

19. Inspect the manifold wiring and heaters for damage and replace where required.

   **NOTE:** Use only Husky recommended high temperature power and thermocouple wire.

   **NOTE:** Refer to the electrical schematic(s) in Chapter 7 for wiring information.
5.19.2 Installing Valve Stem and Piston Assemblies

The following procedures describe how to install valve stem and piston assemblies.

5.19.2.1 Installing the Valve Stems and Pistons for Ultra 500 VGSX

To install valve stems and piston assemblies into an Ultra 500VGSX system, do the following:

NOTE: The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.7.2 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

2. Insert the valve stem into the stem bore in the piston.

3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.

4. Install two socket head cap screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

5. Rotate the valve stem in the piston to make sure no binding has occurred.

   NOTE: Make sure the valve stem can rotate freely within the piston.

6. Install a new double delta or O-ring seal:

   a. If the assembly uses a double delta seal, refer to Section 5.19.3.

   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal (2) into the seal groove. Do not remove any excess silicone.

      NOTE: Make sure the O-ring seal is not twisted in the seal groove.
NOTE: High temperature lubricant is only used for teflon encapsulated seals.

7. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

8. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**IMPORTANT!**

Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be re-installed later on.

9. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

10. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.

11. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.
5.19.2.2 Installing the Valve Stems and Pistons for Ultra 350 VGSX

To install valve stems and piston assemblies into Ultra 350 VGSX systems, do the following:

**NOTE:** The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.7.1 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.

2. Insert the valve stem into the stem bore in the piston.

3. Slide the spacer carefully over the valve stem until it bottoms out on the piston.

4. Apply a coat of liquid teflon to the threads of two flat head screws.

5. Install the flat head screws through the back of the piston to the spacer to secure the valve stem to the piston. Torque all screws to the value specified on the Section View Assembly drawing. Refer to Chapter 7.

6. Rotate the valve stem in the piston to make sure no binding has occurred.

   **NOTE:** Make sure the valve stem can rotate freely within the piston.

7. Install a new double delta or O-ring seal:
   
   a. If the assembly uses a double delta seal, refer to Section 5.19.3.

   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal (2) into the seal groove. Do not remove any excess silicone.

      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.

      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.

8. Connect the hot runner to a controller.
**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

9. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**IMPORTANT!**

Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be re-installed later on.

10. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

11. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the spacer rests on the manifold bushing.

12. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.
5.19.2.3 Installing the Valve Stems and Pistons for Ultra 350, Ultra 500 and Ultra 750 VGLX/EX

To install valve stems and piston assemblies into Ultra 350, Ultra 500 or Ultra 750 VGLX/EX systems, do the following:

**NOTE:** The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.7.3 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
2. Insert the valve stem into the center hole of the piston.
   **NOTE:** Make sure the piston thread is clean and dry.
4. Install the set screw into the piston and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
5. Rotate the valve stem in the piston to make sure no binding has occurred.
   **NOTE:** Make sure the valve stem can rotate freely within the piston.
6. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 5.19.3.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal (2) into the seal groove. Do not remove any excess silicone.
      **NOTE:** Make sure the O-ring seal is not twisted in the seal groove.
      **NOTE:** High temperature lubricant is only used for teflon encapsulated seals.
7. Connect the hot runner to a controller.
8. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

9. Lock out and tag the machine. Refer to Section 1.9.

CAUTION!

Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

10. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.

11. Place the piston cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
NOTE: The piston cylinder is installed during the double delta seal installation procedure.

12. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.

5.19.2.4 Installing the Valve Stems and Pistons for Ultra 1000 VGLX/EX

To install valve stems and piston assemblies into Ultra 1000 VGLX/EX systems, do the following:

NOTE: The following procedure is for installing valve stem and piston assemblies into previously operated hot runner systems. If resin has not been processed through the hot runner, refer to Section 4.7.4 for installation instructions.

1. Clean the piston to make sure no dirt or oil is present.
2. Insert the valve stem into the piston spacer.
3. Thread the piston spacer onto the piston and torque to the value specified on the Section View Assembly drawing. Refer to Chapter 7.
4. Rotate the valve stem in the piston to make sure no binding has occurred.
   NOTE: Make sure the valve stem can rotate freely within the piston.
5. Install a new double delta or O-ring seal:
   a. If the assembly uses a double delta seal, refer to Section 5.19.3.
   b. If the assembly uses an O-ring seal, coat the seal groove in the piston with a high temperature lubricant and install a new O-ring seal (2) into the seal groove. Do not remove any excess silicone.
      NOTE: Make sure the O-ring seal is not twisted in the seal groove.
      NOTE: High temperature lubricant is only used for teflon encapsulated seals.

![Figure 5-68 Valve Stem and Piston Assembly](image-url)

6. Connect the hot runner to a controller.

**WARNING!**

Sprue heaters must be turned on when manifold heaters are on. Failure to do so could result in generation of dangerous pressure levels in the manifold, resulting in explosion or sudden release of hot resin.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the hot runner, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

7. Increase the temperature of the manifold heaters, nozzles, and sprue to a temperature high enough to soften the resin in the melt channels. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**IMPORTANT!**

Do not allow the nozzles to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be installed.

8. Lock out and tag the machine. Refer to Section 1.9.

**CAUTION!**

Do not allow the hot runner to cool off during the valve stem installation process. A valve stem could be bent during installation if the system cools.

9. Carefully guide the completed valve stem and piston assembly into the manifold bushing, gently pushing by hand until the piston bottoms out on the manifold bushing.

10. Place the piston cylinder over the valve stem piston assembly in the manifold bushing. Make sure the piston cylinder is bottomed out on the backup pad.
NOTE: The piston cylinder is installed during the double delta seal installation procedure.

11. Allow the manifold to cool to room temperature (< 25 °C or < 77 °F) once the valve stem and piston assemblies have been installed.

5.19.3 Installing the Double Delta Seal

To install the double delta seal on valve gate pistons, do the following:

NOTE: This procedure is for systems that have been used to process resin. For systems that do not contain resin in the manifolds and melt channels, refer to Section 4.7.5.

NOTE: The following procedure uses the double delta piston seal installation tool. Refer to Section 5.4.7 for part numbers.

1. Remove the backing plate. Refer to Section 5.9.1.
2. If equipped, remove the center air plate. Refer to Section 5.8.1
3. Remove the piston cylinders and inspect them for damage. Replace as necessary.
4. Clean all piston cylinders.

CAUTION!

Do not damage the pistons when removing the seals. This will later diminish the integrity of the new seals.

5. Remove the outer and inner seals from the pistons.
6. Remove any loose debris or grease from the pistons and surrounding area.

IMPORTANT!

Pistons should be cleaned before new seals are installed. Any debris or grease present will shorten the service life of the seals.
7. Install the interior O-ring seal into the seal groove by rolling it over the piston. No tools are required.

8. Place the seal installation tool on top of the piston.

9. Install the outer O-ring seal by pushing the seal over the seal installation tool until it sits over the interior O-ring seal.

10. Remove the seal installation tool.

11. Slide the piston installation tool over the piston to compress the seals. This will prevent them from getting damaged during the installation of the piston cylinder.

12. Inspect the piston assembly for damage, debris, or grease.
   
   **NOTE:** Install the piston cylinders shortly after the piston installation tool has been removed to make the installation easier.

13. Install the piston cylinders.
5.20 Manifold Heaters and Manifold Thermocouples

The following procedures describe how to maintain manifold heaters and manifold thermocouples.

5.20.1 Manifold Heaters

The manifold(s) is heated by an electrically heated tube referred to as the manifold heater. Manifold heaters are terminated at each end by a protective insulator bushing and connector held to the lead wires with two socket head set screws and a high temperature silicone insulation boot.

![Manifold Heater Electrical Assembly](image-url)

**Figure 5-72 Manifold Heater Electrical Assembly**

1. Manifold Heater Lead Wire  
2. Socket Set Screw Flat (M4 x 6 Long)  
3. Manifold Heater Wire Connector  
4. Protective Insulator Bushing  
5. Manifold Heater

**CAUTION!**

Refer to Section 5.20.1.2 if the manifold heater will be cleaned using a fluidized bed process.

5.20.1.1 Testing and Inspecting the Manifold Heater

To test and inspect a manifold heater, do the following:

1. Using a multimeter set to ohms, measure the resistance through each manifold heater zone. Refer to the electrical schematic(s) in Chapter 7 for the ohms measurements required for each zone. The normal tolerance for manifold heaters is +10% or -5%.

**CAUTION!**

A common problem with manifold heaters is moisture absorption due to the hygroscopic nature of the insulation. A heater with a low case to center conductor insulation reading (< 10K ohms) should be baked out and retested to determine if moisture was the cause. Contact your Husky Regional Service and Sales office for more information.
2. Using a multimeter set to ohms, measure the resistance through each lead to ground. A measurement from either lead to ground that is below 100K ohms indicates a short to ground. A measurement from 100 kilohms to 1 megohms is often associated with a wet heater. A measurement greater than 1 megohms is good.

**CAUTION!**

*Lead wires must be replaced if the lead wire resistance is greater than 0.1 ohms.*

3. Check for loose terminal connections, damaged or melted insulation, and signs of overheating.

4. Inspect the manifold heater for nicks, burrs, cracks, or other damage. Replace or repair as required.

5. Inspect the lead wires for damage. Replace damaged lead wires with Teflon or fiberglass insulation wire of the same gage and insulation rating. For Teflon insulation wires, the insulation rating should be 250 °C (482 °F). For fiberglass insulation wires, the insulation rating should be 450 °C (842 °F).

**CAUTION!**

*Never use a heater lead wire that has bare insulation or a low resistance reading.*

NOTE: Contact your Husky Regional Service or Sales office if a manifold heater must be replaced.

### 5.20.1.2 Removing the Protective Insulator Bushing for Fluidized Bed Cleaning

The protective insulator bushing must be removed before the manifold heater is run through a fluidized bed cleaning process. The temperatures experienced during a fluidized bed cleaning process can reach approximately 454 °C (850 °F), which would destroy the protective insulator bushing.

To remove the protective insulator bushing, twist the bushing in a clockwise or counterclockwise direction approximately 1/4 turn to "break" the adhesive used to attach it.

NOTE: The protective insulator bushing must be re-installed before the manifold lead wire is attached to protect the manifold heater end. It is not necessary to apply new adhesive when the bushing is re-installed.
5.20.2 Manifold Thermocouples

Manifold thermocouple assemblies include a main thermocouple wire and a spare thermocouple wire. The main thermocouple wire is connected to the electrical connector, while the spare thermocouple wire is left loose inside the electrical connector box.

The spare thermocouple wire can be used to replace the main thermocouple wire at the electrical connector should the main wire fail during operation. This allows you to quickly repair the hot runner without having to completely disassemble it.

The spare thermocouple wire is indicated by an "S" that follows the zone number on the wire label.

NOTE: Refer to the thermocouple test procedures in Section 5.22.

5.21 Testing the Electrical System

After any periodic maintenance or service of the hot runner, and before the hot runner is assembled to the cavity plate, a pre-assembly warm up and electrical test should be performed.

To perform an electrical test on the hot runner, do the following:

1. Check the hot runner for electrical shorts or open circuits with an ohmmeter. Use electrical schematic(s) included in Chapter 7 to identify each zone.

   NOTE: The electrical schematic(s) references all information for specific wire and heater resistances.

   NOTE: To establish proper polarity when connecting thermocouples, follow the electrical schematic(s) in Chapter 7. For J-type thermocouples, the white wire is positive (+) and the red wire is negative (-). This wire color coding follows the ANSI J-Type North American Standard. The color coding and wire composition for J-type thermocouples in other parts of the world may be different and produce different readings.
2. Verify that all circuits are correct.
3. Connect the hot runner to the controller.
   
   **NOTE:** Some controllers are built into the injection molding machine, while others are external.

---

**WARNING!**

Explosion hazard - risk of serious injury. Molten material at high pressure can be present. Wear Personal Protective Equipment (PPE). Clear the area of all non-essential personnel. Never purge the barrel when the nozzle tip is outside the purge guard.

---

**WARNING!**

Burn Hazard. Manifolds, nozzles, and all other hot runner components stay hot for long periods after heat has been shut off. Wear protective equipment and place a warning sign if leaving nozzles unattended.

---

4. Turn on and test each heater zone one at a time, starting with the smallest mass zones (i.e. nozzles) and ending with the largest mass zones (i.e. manifolds). The zones should be allowed to rise 10 to 17 °C (50 to 63 °F) above room temperature.

5. When all zones have reached 10 to 17 °C (50 to 63 °F) above room temperature, heat all manifolds to 60 °C (140 °F) to make sure the zones are working properly.

---

**CAUTION!**

The nozzles must be at room temperature before closing the mold. Severe damage to the nozzle and cavity plate sealing diameters could result if the mold is closed when the nozzles are hot.

---

6. Where applicable, install the cavity plate retaining screws and torque as specified in the *Mold Manual*.

7. Check electrical circuits with an ohmmeter to make sure that no wires have been shorted during assembly.

8. The hot runner and/or cavity plate are now ready for installation into the machine.

---

**IMPORTANT!**

If the melt channels in the hot runner are filled with resin and the hot runner is not fully assembled, do not increase the hot runner temperature to full operating temperature. The resin will leak between the shut-off areas.
5.22 Thermocouples

The following procedures describe how to test the electrical, mechanical, and functional properties of thermocouples.

CAUTION!

Thermocouple wires should never be spliced. This could result in faulty temperature readings and possible over heating of the nozzle heater and other components.

5.22.1 Thermocouple Electrical Test

Test the electrical resistance in thermocouples as follows:

NOTE: The following electrical test is for J-type thermocouples only.

1. Using a multimeter set to Ohms, measure the resistance between the two thermocouple leads. Specifically, hold the red meter probe on the white (+) lead and hold the black meter probe on the red (-) lead. The resistance from lead-to-lead should be less than 30 Ohms.

   NOTE: Actual resistances may vary with lead length, however, most thermocouples will read from 6-12 Ohms.

   NOTE: The resistance for all thermocouples of a specific type (manifold or nozzle heater) should be within 25% of each other.

   NOTE: The positive (+) lead wire on K-type thermocouples is yellow and the negative (-) lead wire is red. K-type thermocouples are rarely used in Husky hot runners.

2. Repeat the previous step for all leads.

3. Using the multimeter, measure the resistance between the white (+) leads and ground. Specifically, hold the red meter probe on the white (+) lead and the black meter probe on the manifold plate. The resistance reading should be 25% of the lead-to-lead reading for that lead.

4. Repeat the previous step for all leads.

5. Using the multimeter, measure the resistance between the red (-) leads and ground. Specifically, hold the red meter probe on the red (-) lead and the black meter probe on the manifold plate. The resistance reading should be 80% of the lead-to-lead reading for that lead.

6. Repeat the previous step for all leads.
5.22.2 Thermocouple Mechanical Test

Inspect each thermocouple for the following and replace or correct as required:

- Mechanical damage on the metal sheath, such as nicks, kinks, or cracks
- Pinched or damaged lead wires
- Damage on molded transition
- Thermocouple is making good contact with the heated surface
- Proper ferrules (orange) have been installed

5.22.3 Thermocouple Functional Test

The following procedures describe how to perform a functional test on a thermocouple with a pyrometer or multimeter.

5.22.3.1 With a Pyrometer

To perform a functional test with a pyrometer, do the following:

1. Connect the thermocouple leads to a pyrometer.
2. Insert the thermocouple into a container of boiling water along with a thermometer.
3. Set the pyrometer to 100 °C (212 °F) and verify the temperature at the thermocouple with the thermometer.

5.22.3.2 With a Multimeter

To perform a functional test with a multimeter, do the following:

**NOTE:** This procedure is to be used if a pyrometer is unavailable.

1. Using a multimeter set to Ohms, place the red meter probe on the white (+) lead and the black meter lead on the red (-) lead.
2. Insert the thermocouple into a container of boiling water and monitor the resistance reading. The resistance should increase as the temperature of the thermocouple increases.
5.23 Single Cavity Valve Gates (Generation 2.0)

The following disassembly procedures are for generation 2.0 Ultra 350, Ultra 500, Ultra 750, and Ultra 1000 single cavity valve gate (SCVG) assemblies.
Figure 5-74  Single Cavity Valve Gate (Generation 2.0) for Ultra 350, Ultra 500, Ultra 750, and Ultra 1000 (Typical)

5.23.1 Removing the Single Cavity Vale Gate Assembly from the Hot Runner

1. Remove the hot runner from the machine and set it down on a suitable work bench. Make sure the nozzle tips are facing down. Refer to Section 5.5 for full instructions.

2. Remove the locating ring that secures the SCVG to the hot runner. Jacking bolts are provided with the SCVG if necessary.

3. Make sure all wires and air lines are clear of the SCVG.

4. Pull the SCVG from the hot runner and move it to a clean work bench.

5. Disconnect the inlet and outlet air hoses from the SCVG. Install hose caps.

5.23.2 Disassembling the Single Cavity Valve Gate Assembly

NOTE: The following procedure references items in Figure 5-74.

1. Set the single cavity valve gate (SCVG) in a vise clamp with soft jaws with the nozzle tip facing up. Make sure the sprue body is in the clamp.

2. Remove the nozzle heater from the nozzle housing. Refer to Section 5.13.

3. Remove the air inlet and outlet fittings from the air plate.

4. Remove the SHCS bolts securing the cylinder to the air plate.

5. Remove the FHCS bolts from the sleeve.

6. Remove the cylinder and sleeve from the SCVG.

7. Remove the annular piston and cylinder insert from the SCVG.

8. Disconnect the cylinder insert from the annular piston and remove all O-ring seals from both components. Cut and discard all O-ring seals.

9. Remove the O-ring seal from the air plate boss. Cut and discard the O-ring seal.

10. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing down. Make sure the air plate is in the clamp.

11. Remove the SHCS bolts and sprue bushing insert from the extruder pad.

12. Remove the SHCS bolts and extruder pad from the sprue body.
13. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing up. Make sure the sprue body is in the clamp.

14. Remove the nozzle tip insulator. Refer to Section 5.12.1.

15. Remove the nozzle tip. Refer to Section 5.10.

16. Remove the BHCS bolts from the air plate.

17. Remove the air plate from the sprue body.

18. Remove the nozzle housing from the air plate.

19. Remove the BHCS bolts brackets from the sprue body.

20. Remove the grafoil seals from the air plate.

21. Rotate the SCVG 180° in the vise clamp with the valve stem facing down. Make sure the sprue body is in the clamp.

22. Remove the SHCS bolts, lockwashers or internal star washers, and valve stem retainer from the valve stem slider.

23. Remove the valve stem slider and connecting rods from the sprue body.

24. Connect the sprue body thermocouple to a controller.

**WARNING!**

Unexpected release of hot resin spray may cause serious burns. Wear adequate personal protective equipment whenever entering the mold area.

**WARNING!**

Burn hazard. To avoid serious burns, wear personal protective equipment (PPE) consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

In the event of water leaking into the sprue body, the nozzle housings must be mechanically cleaned out prior to turning the heaters on.

**WARNING!**

Do not leave the hot manifold unattended. If necessary, leave a sign in a visible location indicating “Danger: Hot, Do Not Touch”.

25. Increase the temperature of the sprue body to a temperature high enough to soften the resin inside. The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.
26. Lock out and tag the machine. Refer to Section 1.9.

27. Insert a reverse taper valve stem removal tool through the injection side of the sprue body. Gently tap the removal tool, making sure to contact the valve stem only until the valve stem is free of the sprue body.

28. Remove the sprue body thermocouple.

29. Remove the dowel bushings and crush rings from the sprue body.

30. Rotate the sprue body 180° in the vise clamp.

31. Remove the sprue body from the vise clamp.

IMPORTANT!

Do not allow the sprue body to overheat or degraded material will have to be cleaned out of the nozzle housing before a new nozzle tip can be installed.
Chapter 6  Customer Specials and Service Bulletins

This chapter describes special options ordered by the Customer. In some instances, the descriptions here replace the corresponding items in the rest of this manual.

This section also contains any Safety or Service Bulletins pertaining to the Customer’s machine and issued since the last documentation revision. It can serve as a convenient location for storing any such bulletins as may be issued after receiving the equipment.
Chapter 7   Drawings, Schematics and Parts Lists

This chapter includes reference material required for troubleshooting, assembly, and replacement parts ordering.

**Drawings and Schematics**

Drawings and schematics provided in this manual include:

- Plan View Assembly Drawing
- Section View Assembly Drawing
- Electrical Schematic
- Gate Detail
- Nameplate Drawing

**Parts List**

The parts list is the Bill of Material (BOM) for the hot runner assembly. It lists all replaceable hot runner parts by Husky Part Number (P/N) and provides a description and quantity for each.

Use the drawings provided in co-ordination with the parts list to identify each part in the hot runner assembly.

Under the terms of the warranty, all parts to be replaced must be returned to Husky for proper credit. Damaged or worn parts are used to continuously improve Husky products by assessing the root cause of the failure. Not providing the damaged or worn part could result in an invoice from Husky for the replacement part.