

Single Cavity Valve Gates (SCVG) and Hot Sprues

Hot Runner Service Manual

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This product manual is intended to provide information for safe operation and/or maintenance. Husky reserves the right to make changes to products in an effort to continually improve the product 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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General Information

Telephone Support Numbers

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Europe	EC (most countries)	008000 800 4300
	Direct and Non-EC	+ (352) 52115-4300
Asia	Toll Free	800-820-1667
	Direct:	+86-21-3849-4520
Latin America	Brazil	+55-11-4589-7200
	Mexico	+52-5550891160 option 5

For on-site service, contact your nearest Husky Regional Service and Sales office.

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.co.

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 Husky equipment, visit our website at www.husky.co or call your nearest Husky Regional Service and Sales Office.

Ordering Spare Parts

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

Hot Runner Refurbishing

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

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Chapter 1 Introduction

This chapter describes the hot runner, training opportunities, and the available equipment manuals.

1.1 Purpose of the Equipment

Husky equipment and systems are designed for injection molding applications only, using approved materials and operating within design guidelines.

Contact your nearest Husky Regional Service and Sales office if you plan to use a Husky product for anything other than its intended use.

1.2 Restrictions of Use

Husky injection molding equipment must never be:

- operated by more than one person
- used for any purpose other than that described in [Section 1.1](#), unless otherwise approved by Husky
- used to extrude any materials not outlined in the scope of the harmonized EN201 or ANSI B151.1 standard
- operated or serviced by personnel unfamiliar with the inherent risks and necessary precautions related to injection molding equipment
- operated at temperatures higher than the maximum permissible temperature for the resin

1.3 Unauthorized Modifications

Unauthorized modifications or reconstruction of any Husky injection molding system is strictly prohibited. Modifications can be unsafe and/or void warranty.

Contact your nearest Husky Regional Service and Sales office to discuss modifications or requirements for Husky systems.

1.4 Auxiliary Equipment

Husky is only responsible for the interaction of Husky equipment and systems with auxiliary equipment when Husky is the system integrator. If auxiliary equipment is removed, the user must install proper safeguards to prevent access to the hazards.

For information about integrating non-Husky auxiliary equipment, contact your nearest Husky Regional Service and Sales office.

1.5 Documentation

A full set of manuals, drawings, schematics, certificates and other documentation are available for every Husky hot runner.

The following describes the documentation provided with each system, along with common conventions all readers should be familiar with.



IMPORTANT!

Keep all manuals in a convenient location for future reference.

1.5.1 Manuals

Husky manuals aid in the safe and proper use of Husky products. Where applicable, the manuals provide instructions on installation, operation and maintenance.

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!

Images in the manuals are for reference only and may not represent specific equipment details. Refer to engineering drawings and schematics for specific details.

The following manuals are available for each hot runner system:

Operator Manual	Describes the basic startup, operation, shut down and daily maintenance of the hot runner
Service Manual	Describes the installation, startup, operation, shut down and maintenance the hot runner NOTE: Refer to the hot runner <i>Service Manual</i> for product specific instructions.

These manuals are available online through www.husky.co.

**IMPORTANT!**

Some manuals may contain addendums that detail new or updated information. Before reading a manual, make sure to review all available addendums located at the end of the manual.

1.5.2 Engineering Drawings and Schematics

Each Husky hot runner is provided with a set of drawings and schematics specific to the hot runner. These are used for troubleshooting the hot runner and ordering spare parts.

NOTE:

Each drawing and schematic is specific to the hot runner it is provided with.

1.5.3 Safety Alert Conventions

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.

Other non-safety related alert types used in the manuals highlight important information needed by the user to install, operate or maintain the equipment 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 or Important.

NOTE:

The NOTE alert is used to add information to a subject that does not fit within the general flow of the document.

**IMPORTANT!**

The IMPORTANT alert is used to highlight important steps, conditions, or considerations related to the subject.

1.6 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.husky.co 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 the 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.

1.7 Special Tools

The following sections list various component-specific tools developed by Husky for use during maintenance of hot runner systems. Contact Husky to order special tools applicable to your hot runner system.

1.7.1 Nozzle Tip Sockets and Heater Removal Tools

Nozzle	Tip	Part Number	
		Nozzle Tip Socket	Heater Removal Tool
U350	All	3872686 8 mm (0.25 in) 12 points	3163811 (Hex Key) OR 7287617 (Torque Wrench Assembly), 0.45 N·m (4 lbf·ft) OR 4715152 (Hex Driver) 3734732 Large Pitch >28 mm (1.1 in) OR 6599345 Small Pitch ≤28 mm (1.1 in)
U500	VG	2338059 12 mm (0.47 in) 6 points	2341532 (Bi-Metal and UNH with Front Ring) 3163811 (HTM Heater) Hex Key 4715152 (HTM Heater) Hex Driver 7307376 (UNH with Ring Thermocouple) 7287617 (HTM Heater) Torque Wrench Assembly, 0.45 N·m (4 lbf·ft)
		531983 11 mm (0.43 in) 12 points	
	VG-X	3436695	
	VG-XX		
	VX	3253169	
U750	VG-R	531983	3163811 (HTM Heater) Hex Key 4715152 (HTM Heater) Hex Driver 535160 (Bi-Metal and UNH with Front Ring) 7298786 (UNH with Ring Thermocouple) 7287617 (HTM Heater) Torque Wrench Assembly, 0.45 N·m (4 lbf·ft)
	VG	2338059	
	VX	3253170	
	VG-EXX RGA	22 mm (0.87 in) socket to remove nozzle tip adapter	
U750-UP	Ultra Packaging (UP)	3722920	3756216
U1000	VG	2449784	2410903 (Bi-Metal)
	VX	2816672	

1.7.2 Tip Insert Removal Tools

Description	Part Number
U500	2789767
U750	2787663
U750 Ultra Flow	3341023
U750 HT-UP	3388887
U1000	2641085

1.7.3 Valve Stem Removal Tools

Description	Part Number
VG-LX	4793599
VG-EX	4793600

1.7.4 Backup Pad Removal Tools

Description	Part Number
U350	2603927
U500	
U750	
U1000	2948588

1.7.5 Front Ring Removal Tools

Description	Part Number
U500	3634736
U750	4925394

1.7.6 Retaining Clip Installation Tool

Description	Part Number
U350	4405801

1.7.7 Standard Nozzle Tip Sockets

Size	Points	Drive	Part Number
4 mm	6 (Allen Key)	3/8 inch	622974
6 mm	6 (Allen Key)	3/8 inch	622972
6mm	6	3/8 inch	533942
8 mm	6	1/4 inch	2996145
8 mm	12	1/4 inch	3436695
8 mm	6	3/8 inch	1501813
10 mm	12	3/8 inch	3253169
11 mm	6	3/8 inch	3320712
11 mm	12	3/8 inch	531983
12 mm	6	3/8 inch	2338059
13 mm	6	3/8 inch	536678
14 mm	12	3/8 inch	533533
15 mm	6	3/8 inch	2449784
15 mm	12	3/8 inch	3253170
16 mm	6	3/8 inch	2402461
16 mm	12	3/8 inch	2816670
17 mm	6	3/8 inch	2308879
20 mm	6	1/2 inch	3722920
21 mm	12	1/2 inch	3274535
22 mm	6	1/2 inch	3311845
22 mm	12	1/2 inch	2816672
29 mm	6	1/2 inch	1502743

Size	Points	Drive	Part Number
30 mm	6	1/2 inch	535571
1/2 inch	6	3/8 inch	2192309

1.7.8 Thermocouple Wire Stripping Tools

Description	Part Number
Strippers for Thermocouple Wires	4240042

1.7.9 Single Probe Thermocouple Removal Tools

Description	Part Number
11 mm Split Socket	4395427

1.7.10 Crimping Tools for Contact Pins (25 or 64 Pin Connectors)

Description		Part Number
Crimp Tool		2292562
Locator		2292574
Removal Tool		534645
Crimp Dies	0.5 to 1.5 mm ² (20 to 16 AWG) ^[1]	238569
	4.0 to 10 mm ² (12 to 8 AWG) ^[1]	2292575
	0.14 to 4.0 mm ² (26 to 12 AWG) ^[2]	2292576
	0.14 to 0.5 mm ² (26 to 20 AWG) ^[1]	2748316
	1.5 to 2.5 mm ² (16 to 14 AWG) ^[1]	2748326

^[1] Stamped crimp pins.

^[2] Machined crimp pins.

1.7.11 Double Delta Single Cavity Valve Gate Tools

Description		Part Number
Double Delta Seal Installation Tools	U350, U500, U750 SCVG	6476378
	U1000 SCVG	6574760
Seal Replacement Kits	U350 and U500 SCVG	6735398
	U750 SCVG	6798713
	U1000 SCVG	6735413

Chapter 2 Safety Summary

This chapter describes the general requirements and conditions for safe installation, operation and maintenance of the mold and hot runner.



IMPORTANT!

Personnel must read, understand and follow all safety precautions.



IMPORTANT!

Personnel must follow applicable industry and regulatory safety requirements for safe installation, operation and maintenance of equipment.

2.1 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.

2.2 Safety Guidelines

Personnel operating, installing, maintaining or servicing Husky equipment must adhere to safe working practices that are in compliance with the following guidelines:

- Lockout and tag electrical, pneumatic and hydraulic energy sources before servicing the mold/hot runner or entering the mold area
- Do not operate the mold/hot runner if scheduled preventive maintenance has not been performed
- Do not use a magnetic platen without approval from Husky and the magnetic platen supplier/manufacture
- Do not operate a hot runner outside the maximum melt and mold temperatures specified on the hot runner nameplate

2.3 Safety Hazards

Some common safety hazards associated with injection molding equipment are:

- Mechanical
- Electrical
- Burn
- High pressure (hydraulic system pressure and molten material spray)
- Slip, trip or fall
- Lifting
- Gas, vapor and dust emissions
- Noise

2.3.1 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.
- **Seized Screws or Plugs**
If screws or plugs cannot be removed by normal methods using standard tooling and force, there is a high possibility these items have become seized; contact Husky for repair recommendation.



WARNING!

Mechanical and/or flying debris hazard - Tool breakage: risk projectile debris, serious injury and/or mechanical damage. Do not use excessive force and/or use tools beyond their designated limits. Do not use torque multiplying bars. Failure of tools may produce fragments that can become projectiles that may cause injury. For seized parts, consult Husky for safe disassembly instructions.

NOTE:

Manifold plugs are not a field repairable item and should never be removed. These items can only be serviced at a Husky manufacturing location.

2.3.2 Burn Hazards

- **Hot Surfaces**
The mold area, auxiliary mold equipment, and injection unit heating elements have numerous high temperature surfaces. At normal operating temperatures, contact with these surfaces will cause severe skin burns. These areas are clearly marked with safety signs. Wear personal protective equipment when working in these areas.

- **Molten Material**
Never touch process material purged or otherwise flowing from the nozzle, mold, hot runner or 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.

2.3.3 High Pressure Hazards



WARNING!

Burn and hot resin spray hazard – risk of death, serious injury and/or damage to the hot runner. All nozzle and sprue heaters (if equipped) 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 (if equipped) 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.

Moisture that infiltrates and is trapped in the hot runner molten material can also increase the risks of this potential hazard. If the temperature of the water in the molten material becomes greater than 400 °C (725 °F), the pressure of this trapped water can be significant enough to rupture the metal housing and cause serious injury to personnel.

To avoid this hazard, do the following:

1. Always make sure all nozzle and sprue heaters (if equipped) 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.

2.3.4 Electrical Hazards

- **Power Supply**
Molding equipment draws high amperage current at high voltage. The electrical power requirements are indicated on the nameplate and in the electrical schematics. Connect equipment to a suitable power supply as specified in the electrical schematics and in compliance with all applicable local regulations.
- **Water**
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.

2.3.5 Gas, Vapor and Dust Emissions

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

2.3.6 Slip, Trip or Fall Hazards

Do not walk, stand, climb or sit on machine surfaces not approved for safe access.

Do not step on the tie bar or any surfaces with grease and/or oil.

Use a safety approved platform, walkway and step ladders designated to access areas that are not accessible from the floor.

2.3.7 Lifting Hazards

When lifting equipment, use suitable lifting devices, proper balancing techniques and designated lifting points. Refer to the installation details, and to handling and lifting instructions. Do not exceed the rated capacity of the lifting equipment.

2.4 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 that all signs are in the proper locations. Refer to the drawing package for details.
- Do not alter signs.
- Keep signs clean and visible.
- Order replacement signs when necessary. Refer to the drawing package 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.

Safety Symbol (ANSI)	Safety Symbol (ISO)	General Description of Symbol
		<p>General</p> <p>This symbol indicates a potential personal injury hazard. It is usually accompanied by another pictogram or text to describe the hazard.</p>
		<p>Hazardous Voltage</p> <p>This symbol indicates a potential electrical hazard that will cause death or serious injury.</p>
		<p>High Pressure Molten Material</p> <p>This symbol indicates the presence of a high pressure molten material hazard that could cause death or severe burns.</p>
		<p>Lockout/Tagout</p> <p>This symbol identifies an energy source (electrical, hydraulic or pneumatic) that must be de-energized before maintenance is performed.</p>
		<p>Crushing and/or Impact Points</p> <p>This symbol indicates a crushing and/or impact area that could cause serious crushing injury.</p>
		<p>High Pressure</p> <p>This symbol indicates a heated water, steam or gas hazard that could cause severe injury.</p>
		<p>High Pressure Accumulator</p> <p>This symbol indicates the sudden release of high pressure gas or oil could cause death or serious injury.</p>
		<p>Hot Surfaces</p> <p>This symbol identifies the presence of exposed hot surfaces that could cause serious burn injuries.</p>

Safety Symbol (ANSI)	Safety Symbol (ISO)	General Description of Symbol
		<p>Slip, Trip or Fall Hazard This symbol indicates a slip, trip or fall hazard that could cause injury.</p>
		<p>Do Not Step This symbol identifies a location that should not be used as a step because it may be a slip, trip or fall hazard and could cause injury.</p>
		<p>Crushing and/or Shearing Hazard This symbol indicates the presence of a crushing and/or shearing hazard at the rotating screw that could cause serious injury.</p>
		<p>Read Manual Before Operation This symbol indicates that qualified personnel should read and understand all instructions in the equipment manuals before working on the equipment.</p>
		<p>Class 2 Laser Beam This symbol indicates a laser beam hazard that could cause personal injury with prolonged exposure.</p>
		<p>Barrel Cover Grounding Strap This symbol indicates an electrical hazard related to the barrel cover grounding strap that could cause death or serious injury.</p>
		<p>Do Not Grease This symbol indicates greasing is not required under normal operating conditions. Greasing could cause equipment failure.</p>

2.5 Lockout and Tagout

A lockout/tagout procedure in accordance with local codes must be performed on the machine, controller and auxiliary equipment before any maintenance activities are performed while in the machine or connected to an external energy source.



WARNING!

Complete the Lockout/Tag out of all energy sources in accordance with applicable local codes before performing maintenance activities. Failure to do so could result in serious injury or death. Refer to the machine and associated equipment manufacturer’s manual for instructions.

Only qualified personnel should be permitted to install and remove locks and tags.





Lockout and tagout includes: the isolation of energy; depletion of stored energy; and prevention of re-energization from all energy sources.



2.6 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 auxiliary equipment.

2.6.1 Personal Protective Equipment (PPE)

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

Item	Description
	<p>Safety Glasses For protecting the eyes from flying objects/particles, heat, sparks, splash from molten material, and more.</p>
	<p>Face Shield For protecting the entire face area from flying objects/particles, heat, sparks, splash from molten material, and more.</p>
	<p>Heat Resistant Gloves For protecting the hands from extreme heats.</p>
	<p>Hearing Protection For protecting the ears from loud ambient noise.</p>

Item	Description
	<p>Safety Shoes For protecting the feet from electrical shocks, crushing hazards, puncture hazards, splash from molten material, and more.</p>
	<p>Non-Melting Natural Fiber Pants and Long Sleeved Shirt For protecting the body from abrasions, cuts, and potential splash from molten material.</p>

2.6.2 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 hot runner nozzle tips from outside the mold area
- **Brass Hammers and Brass Rods**
For safely removing dried resin deposits

2.7 Material Safety Data Sheet (MSDS)



WARNING!

Chemical hazard - Some of the chemicals used with Husky equipment are potentially hazardous and could cause injury and illness. Before storing, handling, or working with any chemical or hazardous material, thoroughly read and understand each applicable Material Safety Data Sheet (MSDS), use recommended personal protective equipment and follow the manufacturer's instructions.

The Material Safety Data Sheet (MSDS) is a technical document which indicates the potential health effects of a hazardous product. It contains safety guidelines to protect personnel, as well as information about use, storage, handling, and emergency procedures.

Always refer to the applicable Material Safety Data Sheet before doing the following:

- handling a chemical product
- disassembling any portion of Husky equipment that may result in exposure to a chemical product

Contact the material supplier to obtain a copy of the MSDS sheet.

2.8 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 for the resin
- The maximum temperature set point is set below the flash point of the material being processed
- Lubricants, oils, process materials and tools used on equipment meet Husky specifications
- Only authentic Husky parts are used

2.9 Safety Latch Bars

All mold and hot runner assemblies are delivered with safety latch bars installed on the operator and non-operator side of the assembly.

Safety latch bars are used to hold plates together for maintenance and installation purposes. They provide a safe means for transporting and handling the assembly, and for securing plates that are normally fastened together during normal operation.

**WARNING!**

Crushing hazard – risk of death or serious injury. Plates could separate from each other and fall during handling if not properly secured. Under no circumstances are multiple plates to be handled with only one safety latch bar installed.

Safety latch bars must always be installed in pairs on diagonally opposite sides of the mold and hot runner assembly to provide equal pull on the plates.

NOTE:

Specific instructions on how to install safety latch bars are provided when needed in this manual.

2.10 Lift Bars and Swivel Hoist Rings

Every mold and hot runner assembly is equipped with tapped lift holes for lifting either the complete assembly or individual plates. Husky only supplies special lifting equipment (including a lift bar and swivel hoist rings) when required. This lifting equipment is designed specifically for the mold/hot runner assembly. When Husky provides special lifting equipment, use only Husky specified and supplied lifting equipment.

NOTE:

Separate lift bars for the hot and cold halves of the mold and hot runner assembly may be provided based on the requirements of the assembly.

**IMPORTANT!**

Make sure all lifting equipment is rated for the load and in safe operating condition. Follow the recommendations and use care when moving or handling plates or assemblies.

For instructions about lifting plates and plate assemblies and using the Husky provided lift bar and swivel hoist rings, refer to [Section 4.1.3](#).

NOTE:

The Husky provided lift bar, swivel hoist rings and associated hardware must be stored together while the mold and hot runner are in operation.

Chapter 3 Specifications

This chapter outlines the necessary temperature, electrical, air and lubricant information needed to operate and maintain the hot runner.

3.1 Weight

The full weight of the hot runner assembly is listed on the assembly drawings.

3.2 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 assembly drawings as the temperature difference between the manifold and the mold.



IMPORTANT!

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

3.3 Electrical System Specifications

Refer to the electrical schematic for the following information:

- Control zones
- Multi-pin connector and pin positions for each heater and thermocouple wire
- Connecting heater wiring in parallel (if applicable)
- Amperage, wattage and resistance of each heater
- Keypin locations

3.3.1 Controller Requirements

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



DANGER!

Electrical hazard – risk of serious injury, fire and/or overload of electrical components. 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 hot runner.

The type of controller can be either:

- Automatic control using a thermocouple to sense the nozzle tip temperature
- Manual control where the controller is set to provide power during a percentage of time

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 to 60 Hz single phase.

3.3.2 Nozzle Heaters

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

3.3.3 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.

3.3.3.1 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.

A spare thermocouple for each zone is 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 having to disassemble the mold. The failed thermocouple can be replaced at the next maintenance interval.

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. 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.

3.3.4 Power Fluctuation

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

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 approximately 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.

3.4 Pneumatic Specifications

Pneumatic pressure is used to actuate the valve stems. Compressed air for the pneumatic system must meet the following requirements:

- The pressure dew points must be set to 11 °C (20 °F) below the lowest ambient temperature of the pneumatic system in order to keep compressed air clean and dry.
- Compressed air quality must meet the standards specified in DIN ISO 8573-1.
 - Solid particles - Class 1
 - Humidity - Class 4
 - Oil - Class 1
- Typical air pressure required is 5.52 to 8.27 bar (80 to 120 psi) , unless otherwise specified in the mold manufacturer's documentation.

NOTE:

For many pneumatic VG applications, air pressure of 7 bar (100 psi) may be sufficient, while some applications may require up to 12.5 bar (180 psi) for optimal and stable performance.

- Compressed air hoses must be large enough to permit adequate flow to the locations where air is required.
- Compressed air used for mold actuators must be interlocked with the machine operator's gate, so opening the gate prevents any motion.

- Quick exhaust valves must be located 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 (according to ANSI Z244.1 or local regulations) to the air supply for use when:
 - Serving the mold
 - Performing maintenance
 - Installing and removing the mold

3.5 Recommended Lubricants

The following are recommended lubricants to be used during the assembly and maintenance of Husky hot runners:

NOTE:

Husky recommends only the following lubricants and assumes no responsibility for lubricants not specified. It is the customer's responsibility when consulting with an alternate supplier to make sure a suitable equivalent is used.

NOTE:

Lubricants of inferior quality can cause premature wear of components.

**WARNING!**

Chemical hazard - Some of the chemicals used with Husky equipment are potentially hazardous and could cause injury and illness. Before storing, handling, or working with any chemical or hazardous material, thoroughly read and understand each applicable Material Safety Data Sheet (MSDS), use recommended personal protective equipment and follow the manufacturer's instructions.

CAUTION!

Contamination hazard – risk of contaminating lubricants or greases. Do not mix different brands or grades of lubricants or greases. Mixing lubricants or greases can cause premature breakdown of the lubricant or grease and could result in equipment damage.

**WARNING!**

Poison hazard – risk of death or serious injury. Some recommended lubricants may contain toxic and/or non-ingestible additives and may not be Food and Drug Administration (FDA) approved under the United States Department of Agriculture (USDA) rating H1 (formerly AA). Consult with the lubricant manufacturer for specific details.

Type/Description	Trade Name	Part Number	Quantity	Used For
High temperature Anti-seize lubricant	Loctite Nickel Anti-Seize 771	5541918	225 g (8 oz) Can	Screws installed into the manifold
	Tri-Flow Food-Grade Anti-Seize Thread Compound	5541922	255 g (9 oz) Jar	Teflon-encapsulated piston seals ^[1]
Protective spray	LPS 2 Lubricant	1501808	566 g (20 oz) Non-Aerosol Spray Bottle	Hot runner plates

^[1] Apply only as directed. Refer to maintenance procedures and/or assembly drawings for more information.

3.6 Rust Inhibitor Specifications

Any rust inhibitor used on the mold must meet the following specifications:

Type	Trade Name
Protective Spray	LPS 2 Protective Spray

3.7 Torque Specifications

Torque specifications are provided on the assembly drawings.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Use of improper torque can result in equipment damage. Always consult the assembly drawings for torque specifications.

Chapter 4 Installation and Removal

This chapter contains procedure for assembling, disassembling, installing and removing single cavity valve gate and hot sprue assemblies.



IMPORTANT!

The procedures contained in this chapter were written for a standard hot runner and do not take special options into consideration.

4.1 Lifting and Handling

The following procedures describe how to safely lift plates and plate assemblies.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not lift plates using magnetic lifting devices. These devices could potentially scratch a finely ground plate.



IMPORTANT!

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



IMPORTANT!

Every mold and hot runner assembly is equipped with tapped lift holes for lifting either the complete assembly or individual plates. Husky only supplies special lifting equipment (including a lift bar and swivel hoist rings) when required. This lifting equipment is designed specifically for the mold/hot runner assembly. When Husky provides special lifting equipment, use only Husky specified and supplied lifting equipment. Use Husky special lifting equipment to lift only the designated mold or hot runner or component.



WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment could fail and cause death or serious injury. Use only Husky specified or supplied lifting equipment.

**WARNING!**

Crushing hazard – risk of death or serious injury. Misuse of lifting equipment could lead to equipment failure and cause death or serious injury. Use Husky only specified or supplied lifting equipment for lifting the assembly or the component for which the equipment has been designated by Husky.

4.1.1 Lifting and Handling Using a Single Lifting Point

The following procedures describe how to lift and lower plates using a single lifting point.

4.1.1.1 Laying Down Plates Using a Single Lifting Point

To properly lay a plate on a work surface using a single lifting point, do the following:

**WARNING!**

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and could cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

1. Install a lift bar or swivel hoist ring and connect it to an overhead lifting device.
 - For information about lifting using a lift bar, refer to [Section 4.1.3](#).
 - For information about lifting using swivel hoist rings, refer to [Section 4.1.4](#).
2. Lift the plate above the work surface.

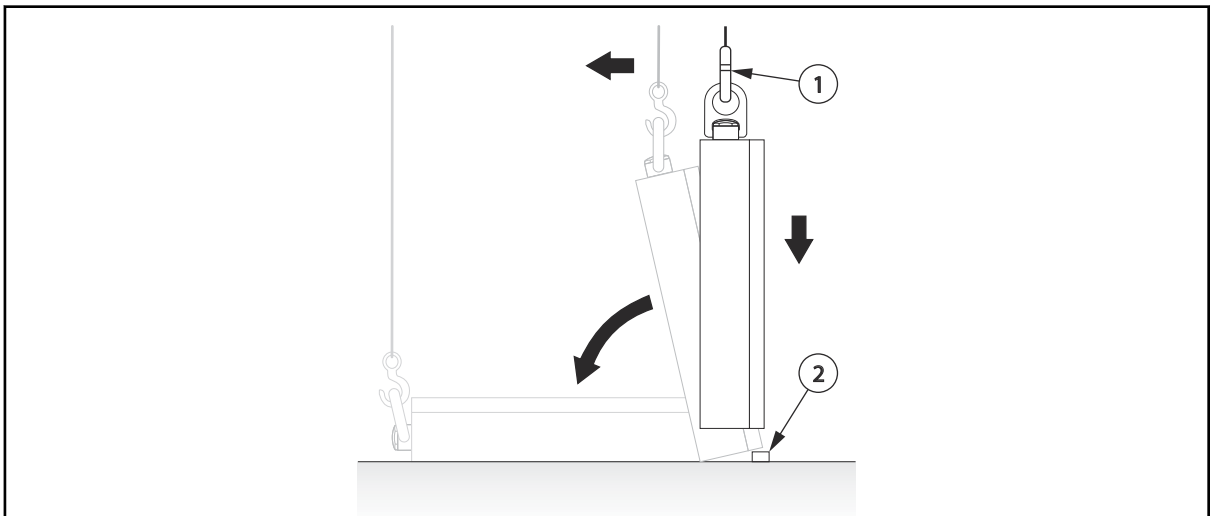


Figure 4-1: Laying Down a Plate

1. Overhead Lifting Device 2. Wood Block

3. Secure a wood block to the work surface on the side opposite the area where the plate will be laid down.

4. Lower the plate slowly onto the edge of the secured wood block.
5. Continue to slowly lower the plate until it tips over towards the work surface.
6. Lay the plate down on the work surface.

4.1.1.2 Picking Up Plates Using a Single Lifting Point

When lifting a plate that has been laid down using a single lifting point, the lifting device may go slack just as the load is in its full vertical position. This may cause the plate to swing over-center in the opposite direction.

To prevent this from happening, do the following:



WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and could cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

1. Install a lift bar or swivel hoist ring and connect it to an overhead lifting device.
 - For information about lifting using a lift bar, refer to [Section 4.1.3](#).
 - For information about lifting using swivel hoist rings, refer to [Section 4.1.4](#).
2. Secure a wood block to the work surface near the foot of the plate. This will prevent the plate from going over-center.

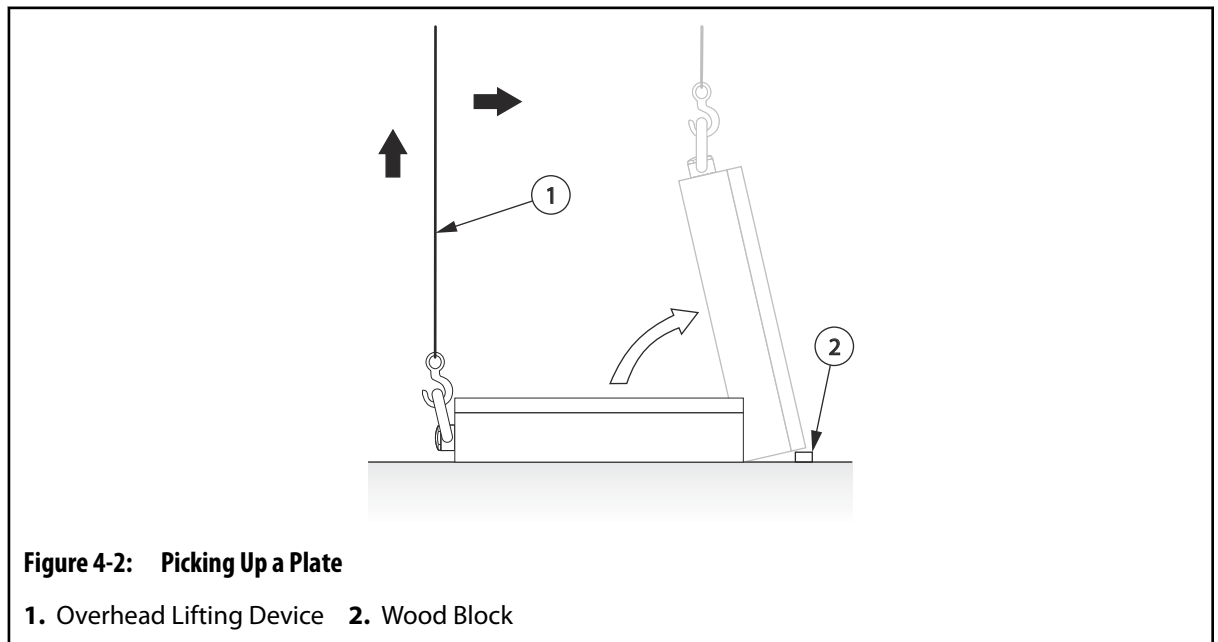


Figure 4-2: Picking Up a Plate

1. Overhead Lifting Device 2. Wood Block

3. Lift the plate until it touches the secured wood block.



WARNING!

Impact hazard – risk of serious injury. The plate could swing in a pendulum motion just as the plate is lifted off of the wood block. Lift slowly to reduce the pendulum motion. Stand clear of the possible swing area to prevent injury.

4. Continue to lift the plate, keeping the tension on the lifting cable.

CAUTION!

Mechanical hazard – risk of damage to equipment. When storing the plate, make sure it is secured in the vertical or horizontal position. Do not rest the plate against another object.

5. After the plate has stabilized, move it to a safe location and remove the wood block.

4.1.2 Lifting and Handling Using Multiple Lifting Points

To lift a plate using more than one lifting point, do the following:

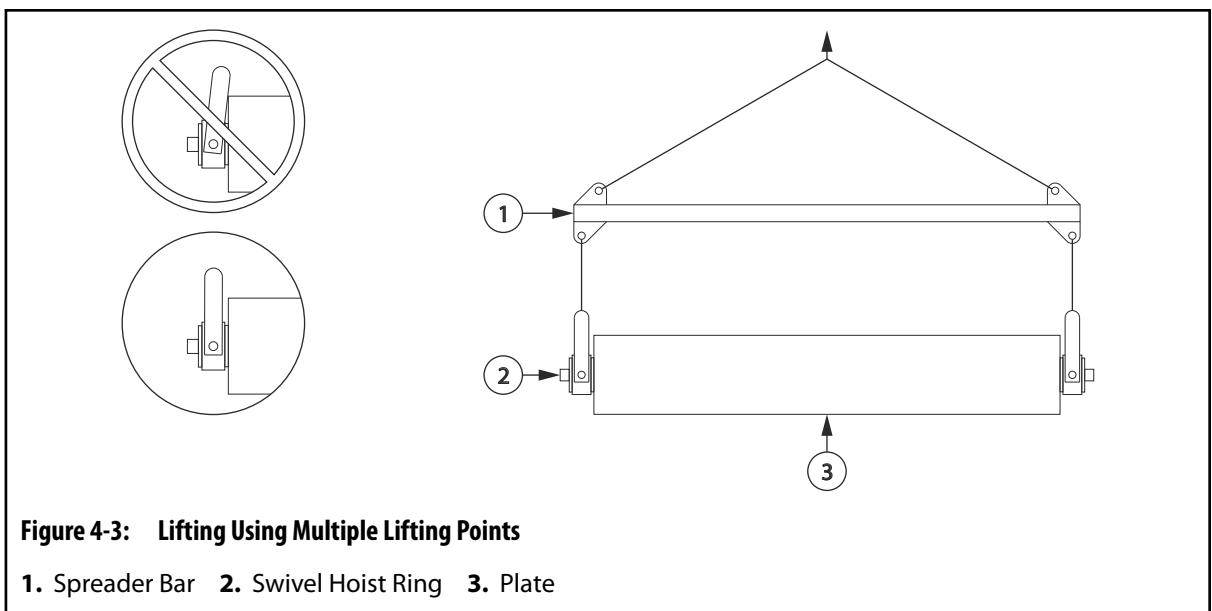


WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and could cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

1. Install the swivel hoist rings in the designated lifting points. Make sure the swivel hoist rings are positioned on opposite sides of the plate to evenly distribute the weight when the plate is lifted vertically.

For information about lifting using swivel hoist rings, refer to [Section 4.1.4](#).



2. Connect the swivel hoist rings to an overhead lifting device. Use a spreader bar if either of the following conditions occur:
 - The pivot angle of any swivel hoist ring exceeds 90°.
 - The angle of lifting cables, slings or chains is less than 45°.
3. Lift the plate and move it to a safe location.

4.1.3 Lifting Using a Lift Bar

To properly lift plates and assemblies using a lift bar, do the following:

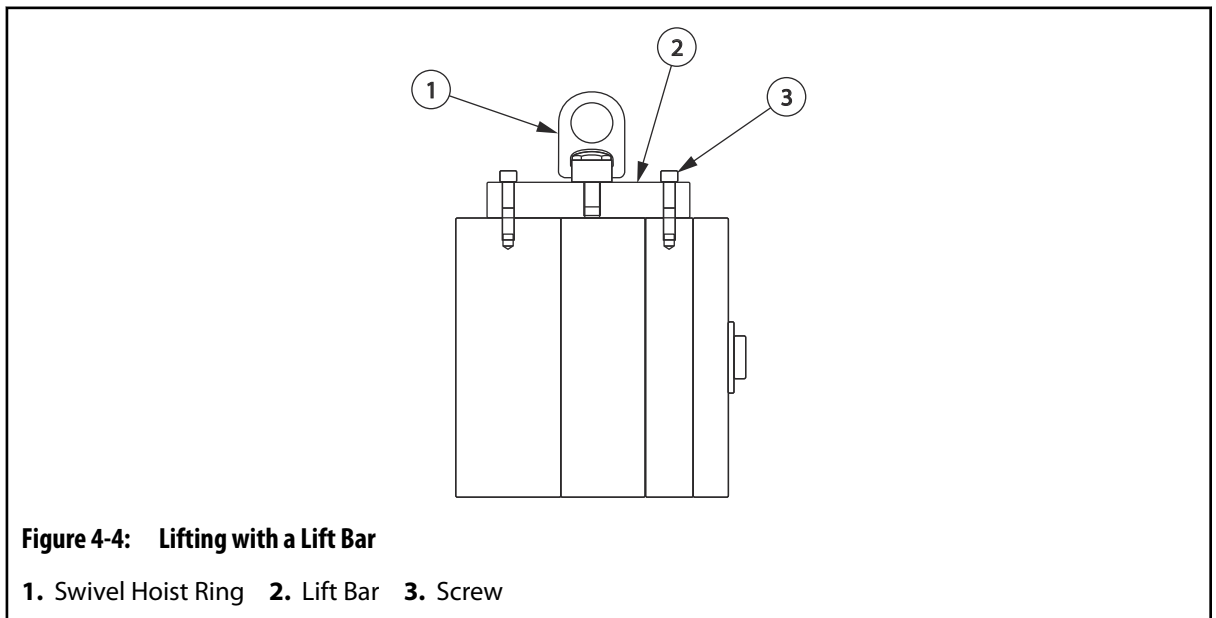
NOTE:

For the installation locations of the lift bars, refer to the hot runner for the markings “Lift Bar Only” or to the assembly drawings.

NOTE:

The maximum weight the bar can lift is stamped on the Husky lift bar. If using a lift bar that is not provided by Husky, make sure the lift bar is suitably rated for the weight of the mold/hot runner assembly.

1. Install the lift bar to the lifting holes on the top of the component.



2. Torque the hoist ring to the specified value. Refer to [Section 3.7](#) for torque requirements.
3. Attach a suitable overhead lifting device to the swivel hoist ring and lift the plate or plate assembly vertically.
4. While the mold and hot runner are in operation, store the Husky provided lifting equipment together and in a readily accessible area.

4.1.4 Lifting Using Swivel Hoist Rings

When using swivel hoist rings, remember the following:

- For the installation locations of the swivel hoist rings, refer to the hot runner for the markings “Hoist Ring Only” or to the assembly drawings.
- Always make sure the swivel hoist ring is properly torqued before lifting.
- Make sure the swivel hoist ring used can support the weight of the plate or component at the chosen angle of attack.
- 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.
- After installation and during operation, store the Husky provided lifting equipment together and in a readily accessible area.
- 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.

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 4-1: General Hoist Ring Specifications

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

Table 4-2: Specifications for Metric Coarse Swivel Hoist Rings

Part Number	Rated Capacity ^[1]	Torque	Thread Ø	Minimum Full Thread Depth	Pitch
2761800	1050 kg (2315 lb)	37 N·m (27 lbf·ft)	M12	24	1.75
2770570	1900 kg (4189 lb)	80 N·m (59 lbf·ft)	M16	32	2.00
2502267	4200 kg (9259 lb)	311 N·m (229 lbf·ft)	M24	48	3.00
536013	7000 kg (15432 lb)	637 N·m (470 lbf·ft)	M30	60	3.50
2761801	11000 kg (24250 lb)	1085 N·m (800 lbf·ft)	M36	72	4.00
2761803	12500 kg (27558 lb)	1085 N·m (800 lbf·ft)	M42	84	4.50

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

Table 4-3: Specifications for Inch UNC Swivel Hoist Rings

Part Number	Rated Capacity ^[2]	Torque	Thread Ø	Minimum Full Thread Depth	Pitch
2732764	1130 kg (2500 lb)	38 N·m (28 lbf·ft)	1/2	1.0	13
2732765	2260 kg (5000 lb)	135 N·m (100 lbf·ft)	3/4	1.5	10
2760517	4530 kg (10000 lb)	310 N·m (229 lbf·ft)	1	2.0	8
2732766	6800 kg (15000 lb)	640 N·m (472 lbf·ft)	1 1/4	2.5	7
2732767	10880 kg (24000 lb)	1080 N·m (797 lbf·ft)	1 1/2	3.0	6

^[2] Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)

4.2 Assembling and Disassembling the Single Cavity Valve Gate (SCVG)

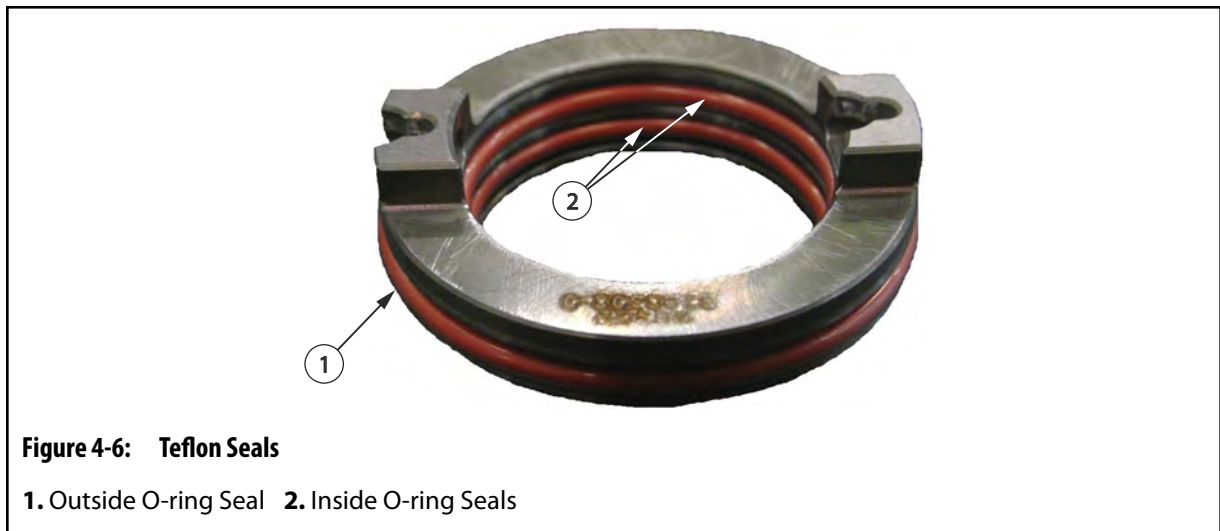
The following procedures describe how to assemble and disassemble a single cavity valve gate assembly.

Before assembling the single cavity valve gates, determine whether the hot runner is equipped with double delta or teflon single cavity valve gates.

4.2.1 Distinguishing Between Double Delta and Teflon Single Cavity Valve Gates

The following differences exist between the annular piston O-ring seals:

Seal Type	Seal Color	Assembly Instructions
Double Delta	Black	Section 4.2.2
Teflon	Red	Section 4.2.3



4.2.2 Assembling the Single Cavity Valve Gate (SCVG) — Double Delta

Before assembling the single cavity valve gates, determine whether the hot runner is equipped with double delta or teflon single cavity valve gates. For more information, refer to [Section 4.2.1](#).

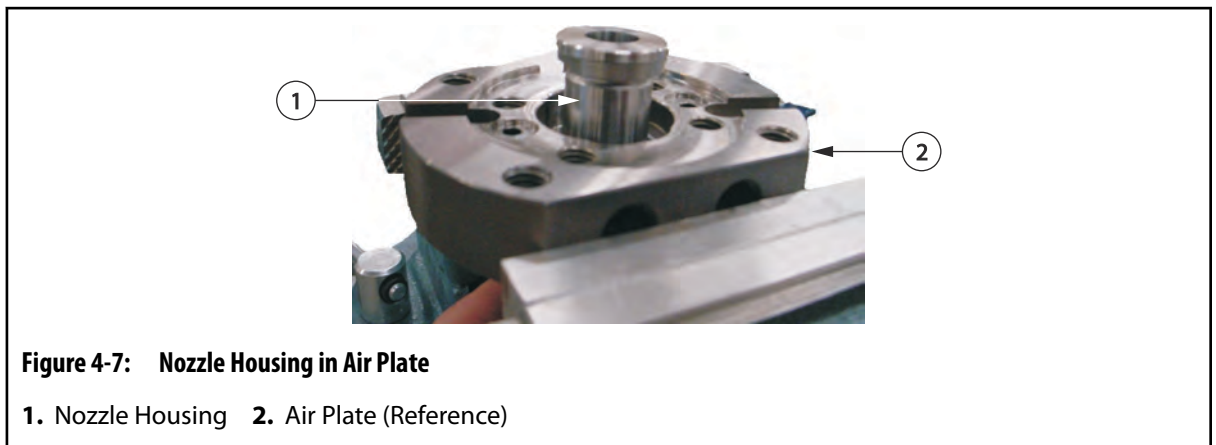
To assemble the double delta single cavity valve gate assembly, do the following:

**IMPORTANT!**

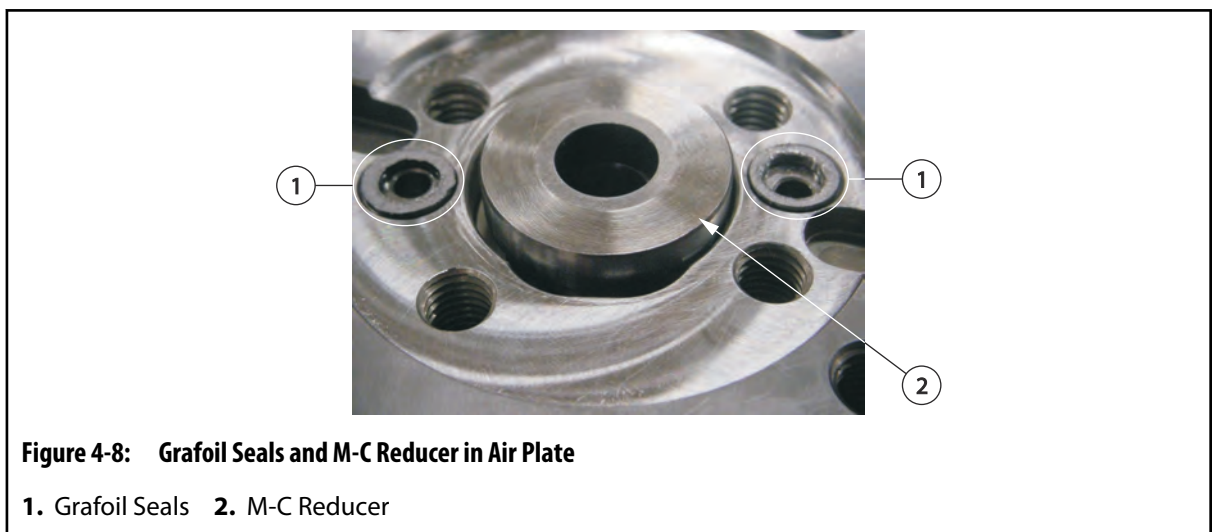
To maintain optimal sealing, all seals in the single cavity valve gate must be replaced whenever the unit is re-assembled. Seal kit part numbers for double delta SCVG systems are as follows:

- U350 and U500 series: part number 6735398
- U750 series: part number 6798713
- U1000 series: part number 6735413

1. Unpack and clean all required components.
2. Compare all components to the parts list.
3. Compare the nozzle housing and valve stem details to the assembly drawings.
4. Make sure the melt channels in the sprue body and nozzle housing are clean and free of burrs.
5. Set the air plate in a vice clamp with soft jaws, with the air plate boss facing down.
6. Insert the nozzle housing into the air plate.



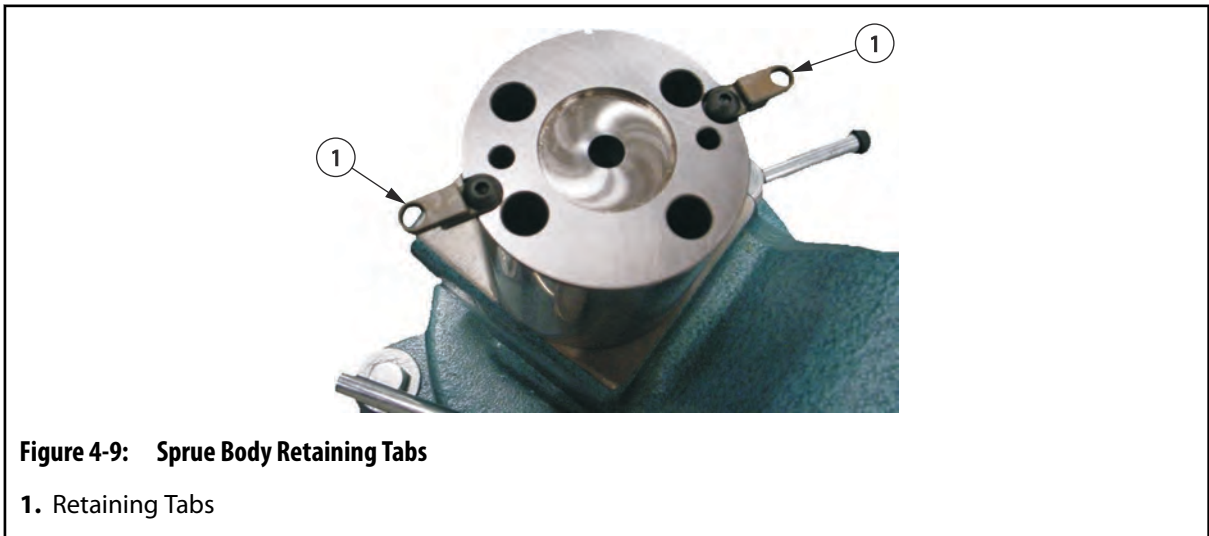
7. Install the M-C reducer and new Grafoil seals in the air plate.



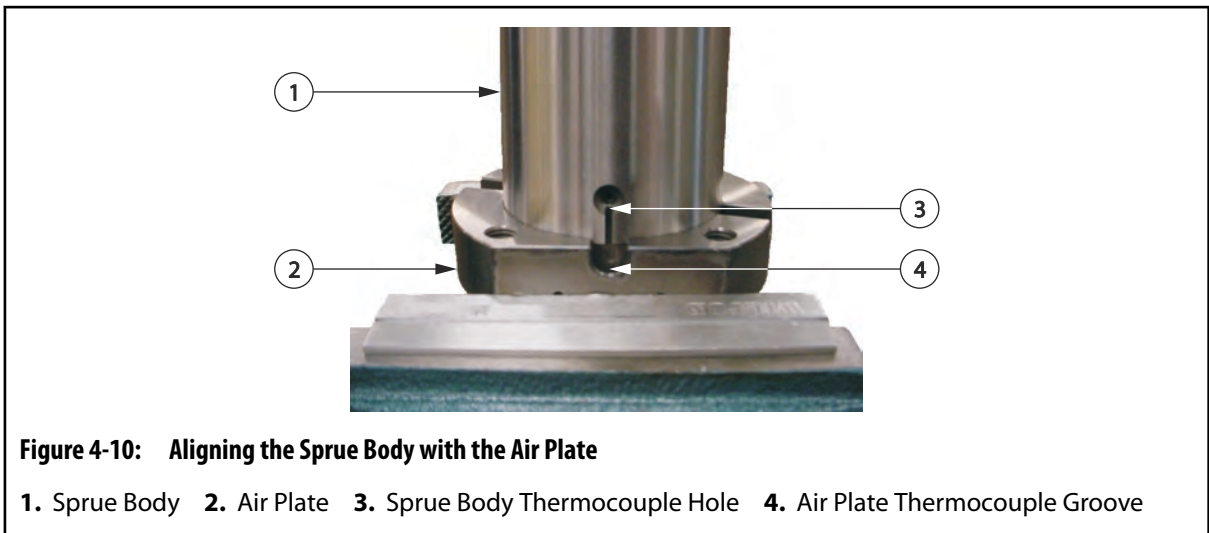
8. Connect retaining tabs to the sprue body in the retaining tab slots.

NOTE:

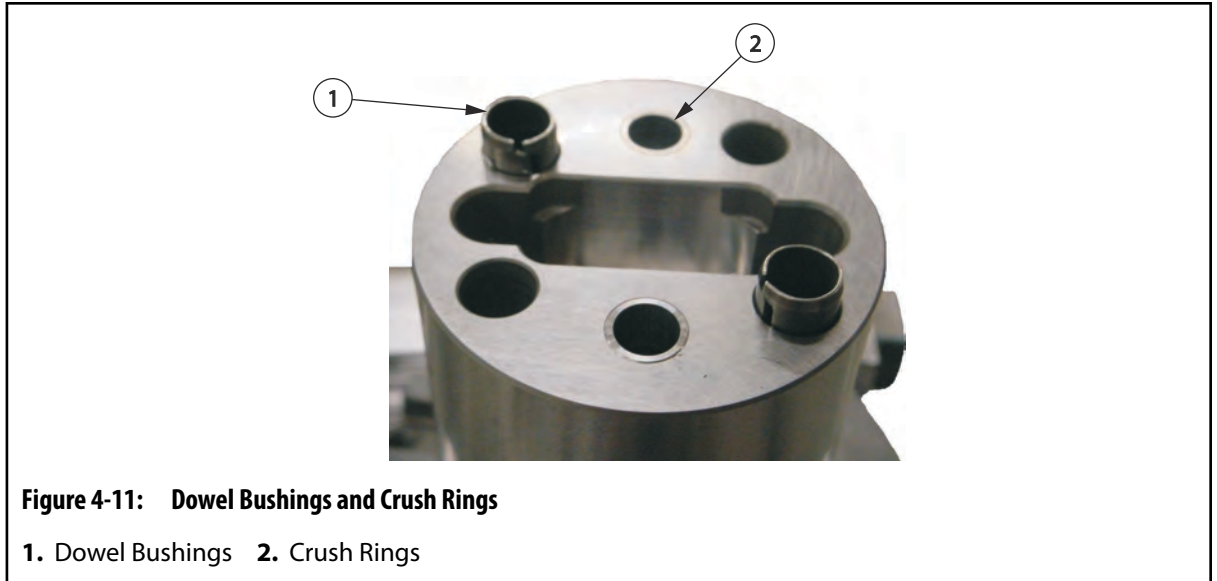
Older sprue body designs do not feature retaining tab slots.



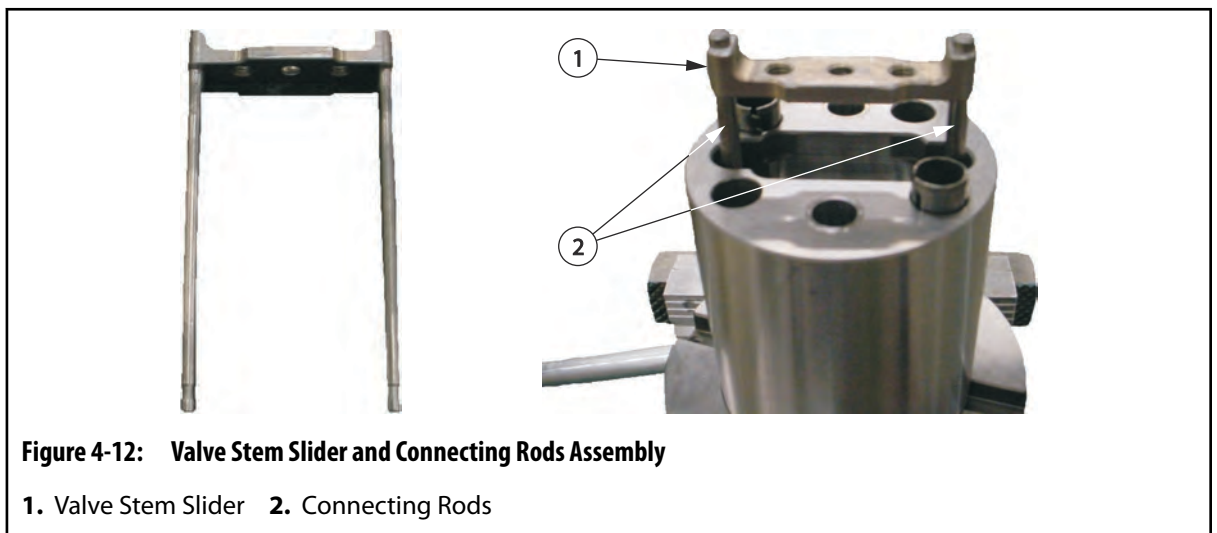
9. Place the sprue body on the air plate and align the retaining tabs with the slots in the air plate. Make sure the thermocouple hole on the sprue body is in line with the thermocouple groove in the air plate.



10. Install new dowel bushings and crush rings to the sprue body.



- 11.** 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.



- 12.** Tilt the sprue body 45° in the vise clamp.



Figure 4-13: Sprue Body Tilted in Vise Clamp

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

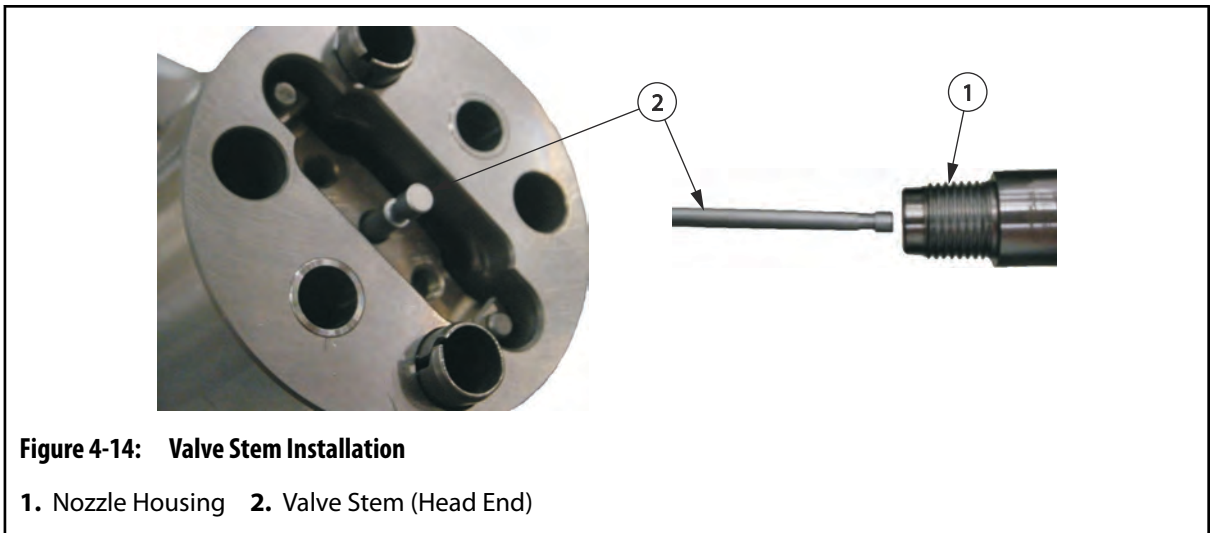


Figure 4-14: Valve Stem Installation

1. Nozzle Housing
2. Valve Stem (Head End)

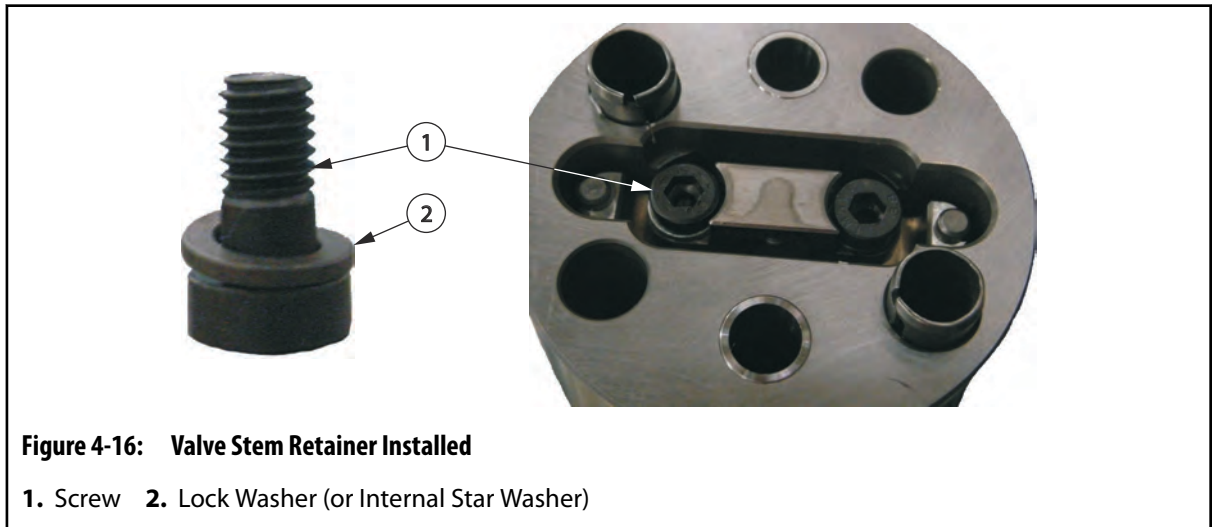
14. Place the valve stem retainer over the valve stem head.



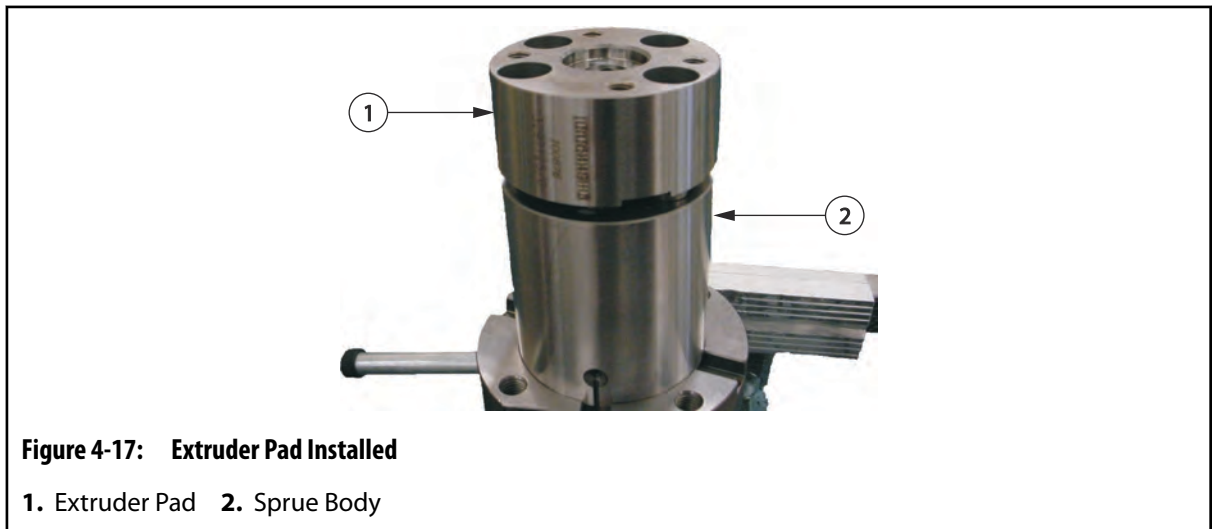
Figure 4-15: Valve Stem Retainer

1. Valve Stem Retainer

15. Apply a high temperature anti-seize lubricant to the screws that secure the valve stem retainer. Refer to [Section 3.5](#) for a list of recommended lubricants.
16. Install the screws that secure the valve stem retainer to the sprue body along with lock washers (or internal star washers). Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.



17. Make sure the valve stem moves freely within the sprue body.
18. Assemble the extruder pad onto the sprue body and align the screw holes.



19. Apply a high temperature anti-seize lubricant to screws that secure the extruder pad. Refer to [Section 3.5](#) for a list of recommended lubricants.
20. Install the screws that secure the extruder pad to the sprue body. Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.
21. Rotate the SCVG 180° in the vise clamp with the nozzle housing facing up. Make sure the extruder pad is in the clamp.



IMPORTANT!

Do not lubricate the double delta SCVG seals.

- 22. Install the inner wear ring into the annular piston. The inner wear ring has a cut in it to improve fit into the seal groove. For seal replacement kit part numbers, refer to [Section 1.7](#).

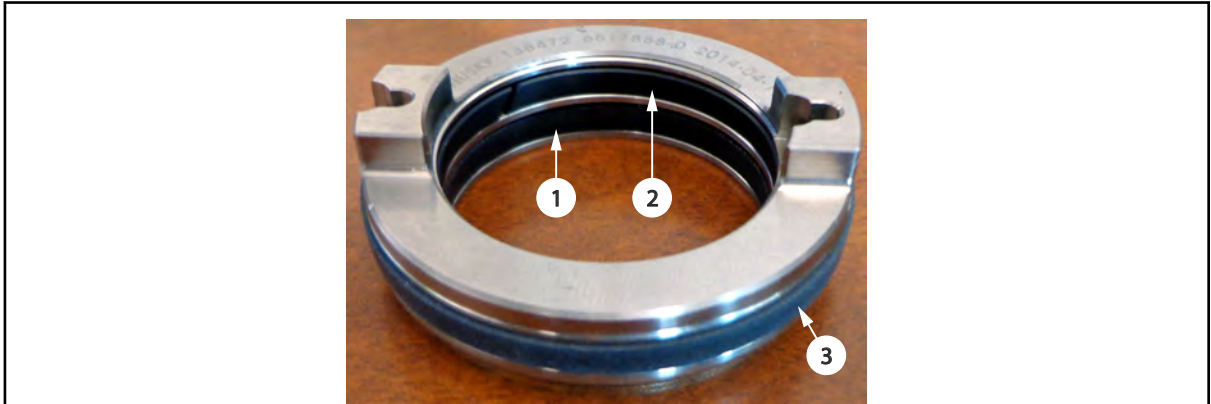


Figure 4-18: Annular Piston O-Ring Seals

1. Inner Double Delta Seal 2. Inner Wear Ring 3. Outer Double Delta Seal

- 23. Install the inner wear ring in the inside groove in the annular piston.
- 24. Install the inner double delta seal ring in the inside groove of the annular piston.

To assist with the installation, do the following:



Figure 4-19: Installing the Inner Double Delta Seal Ring

1. Annular Piston 2. Double Delta Seal Ring 3. Thumb Placement
4. Double Delta Seal Ring Installation Direction

- a. Gently form the inner double delta seal ring into a kidney shape.
- b. Using both thumbs, gently press the inner double delta seal ring in the installation direction until it fits snugly in the inside groove of the annular piston.

CAUTION!

Mechanical hazard – risk of equipment damage. Make sure the double delta seal ring is installed smoothly and free of kinks. If the seal is installed incorrectly, installing the annular piston could damage the seal.

- c. Make sure the flat inner diameter of the double delta seal ring is installed smoothly and free of kinks.

25. Place the installation tool provided in the kit on top of the annular piston.

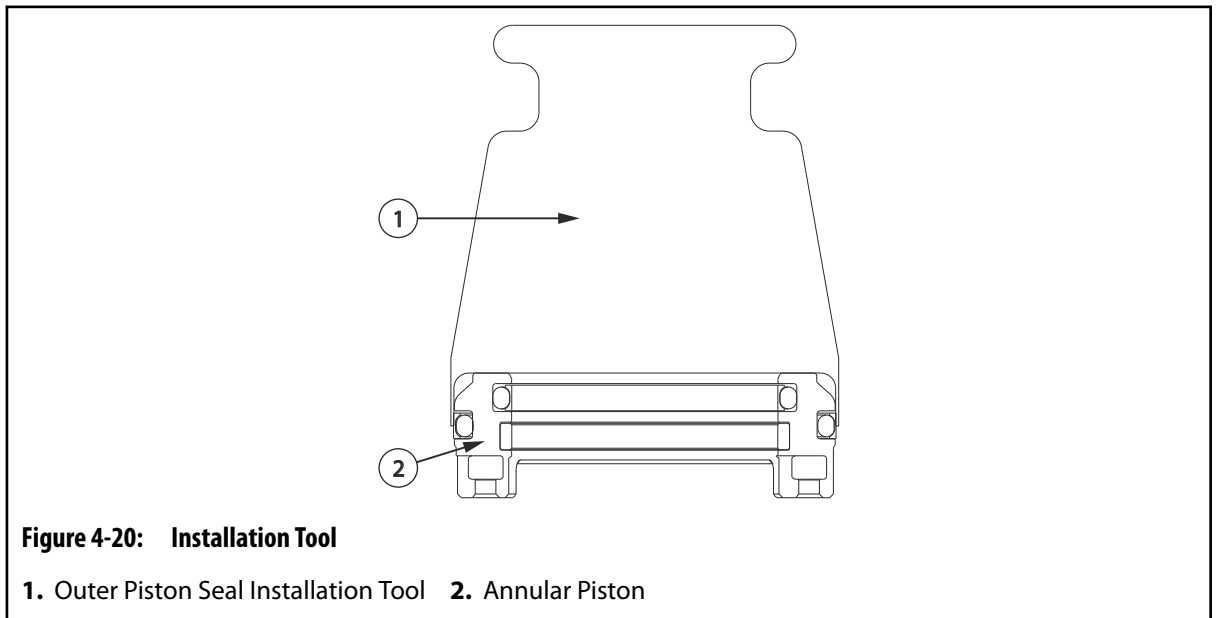


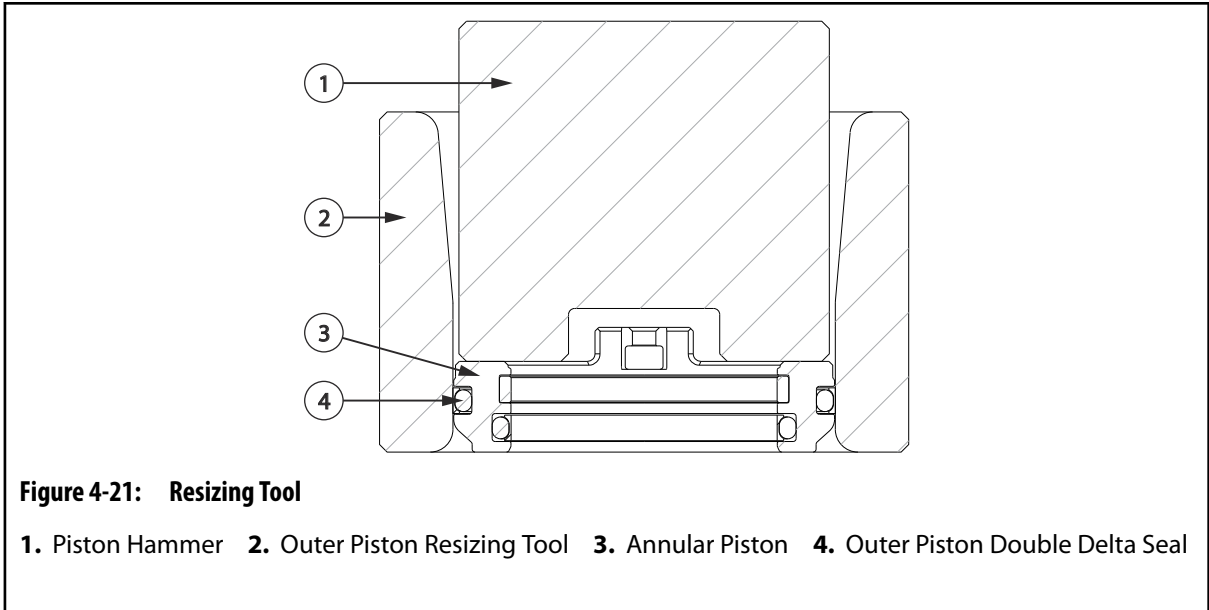
Figure 4-20: Installation Tool

1. Outer Piston Seal Installation Tool **2.** Annular Piston

- 26.** Place the outer piston O-ring seal over the tool.
- 27.** Push the outer piston O-ring seal down and stretch it uniformly into place in the outer seal groove of the annular piston.
- 28.** Place the installation tool provided in the kit on top of the annular piston.
- 29.** Place the outer double delta seal ring over the tool.
- 30.** Push the outer double delta seal ring down and stretch it uniformly into place in the outer seal groove of the annular piston.
- 31.** Place the annular piston, with the outer piston O-ring seal and outer double delta seal installed, inside the resizing tool.

NOTE:

If the resizing tool is not available, install the outer piston O-ring seal with caution.



- 32. Use the piston hammer to gently hammer the annular piston into the resizing tool. The resizing tool has a gradual lead in chamfer to assist with installation.
- 33. Leave the annular piston inside the resizing tool for five minutes to ensure the seals resize.
- 34. Remove the annular piston from the resizing tool.
- 35. Install the O-ring seal around the cylinder insert.



- 36. Install an additional O-ring seal for U1000 systems.

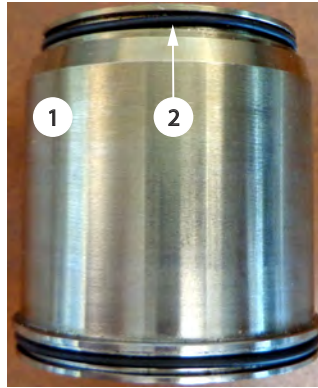


Figure 4-23: Additional O-Ring Seal for U1000 Systems

1. Cylinder Insert 2. O-Ring Seal

37. Install the O-ring seal around the air plate boss.

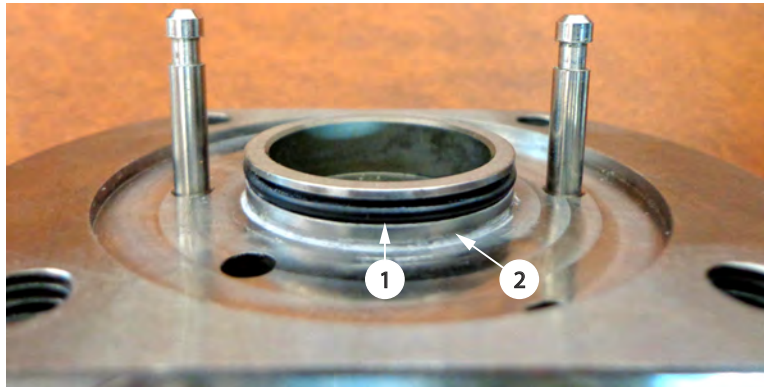


Figure 4-24: O-Ring on Air Plate Boss (For U350, U500 and U750 Systems Only)

1. O-Ring Seal 2. Air Plate Boss

38. 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.



Figure 4-25: Cylinder Insert and Annular Piston Assembly

1. Connecting Rod Slots 2. Cylinder Insert

39. Assemble the cylinder insert and annular piston assembly onto the connecting rods.

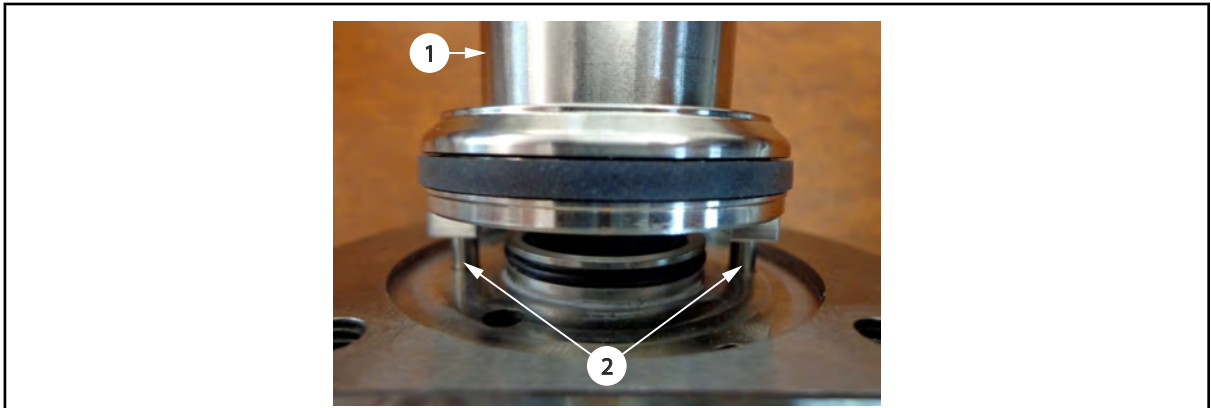


Figure 4-26: Cylinder Insert and Annular Piston Assembly Installed

1. Cylinder Insert and Annular Piston Assembly 2. Connecting Rods

40. Slide the cylinder insert and annular piston assembly over the air plate boss O-ring seal (for U350, U500 and U750 systems only) or into the air plate hole (for U1000 systems only).

41. Install the cylinder onto the air plate. Make sure the arrows on the cylinder and the arrows on the air plate are aligned.

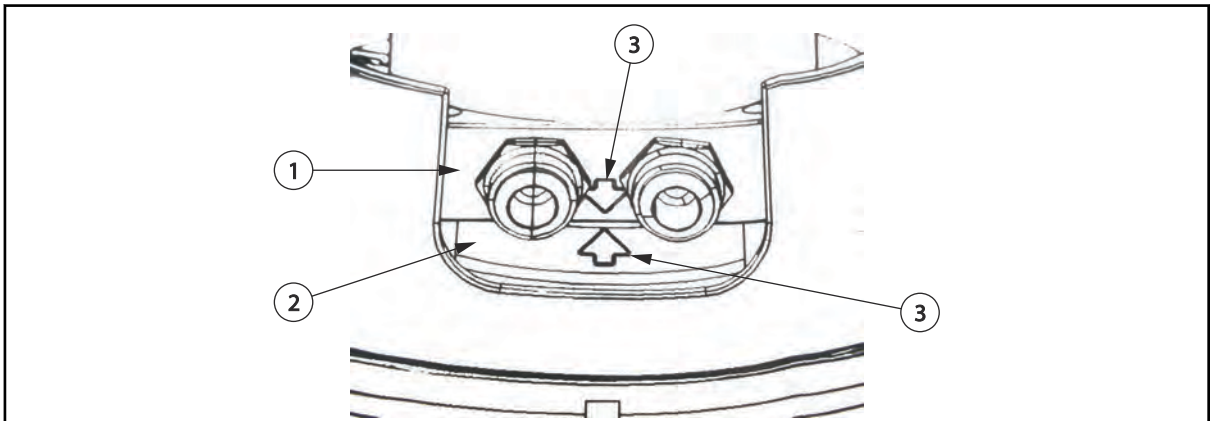


Figure 4-27: Air Plate to Cylinder Alignment

1. Air Plate 2. Cylinder 3. Arrows

42. Apply a high temperature anti-seize lubricant to the screws that secure the cylinder to the air plate. Refer to [Section 3.5](#) for a list of recommended lubricants.

43. Install the screws that secure the cylinder to the air plate. Torque the screws to the specified torque value. Refer to the assembly drawings for torque specifications.

44. 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.



Figure 4-28: Air Pressure Testing (Typical)

- 45.** 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.

- 46.** Install the nozzle tip and torque to the value specified on the assembly drawings.

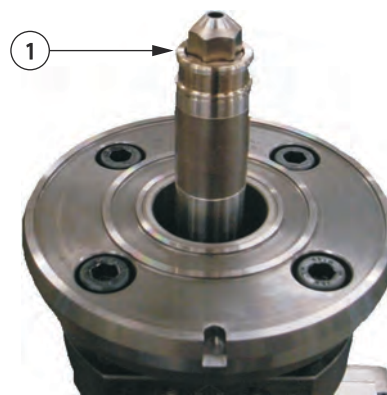


Figure 4-29: Nozzle Tip Installed

- 1.** Nozzle Tip

- 47.** Rotate the SCVG 180° in the vise clamp with the sprue bushing insert facing up. Make sure the air plate is in the clamp.
- 48.** Using electrical pliers, temporarily install the sprue body thermocouple into the sprue body. Fit the thermocouple to the sprue body as shown in [Figure 4-30](#).

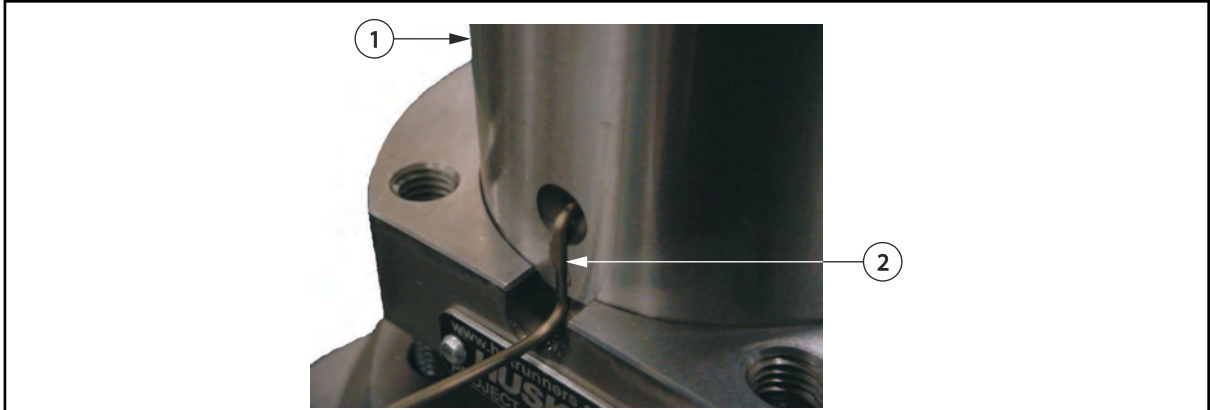


Figure 4-30: Sprue Body Thermocouple Temporary Fit

1. Sprue Body 2. Sprue Body Thermocouple

- 49. Remove the sprue body thermocouple to facilitate the installation of the sleeve.
- 50. Install the sleeve over the air plate.
- 51. Install screws to secure the sleeve to the air plate.
- 52. Apply teflon tape to the air fittings and install them in the air plate.



Figure 4-31: Air Fittings

- 53. Install the pre-fitted sprue body thermocouple to the sprue body.

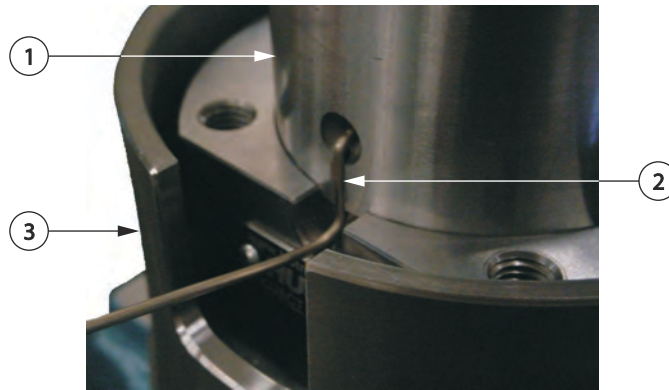


Figure 4-32: Sprue Body Thermocouple Installed

1. Sprue Body 2. Sprue Body Thermocouple 3. Sleeve (Reference)

54. Prepare the heater by positioning the slide lock in the open position.

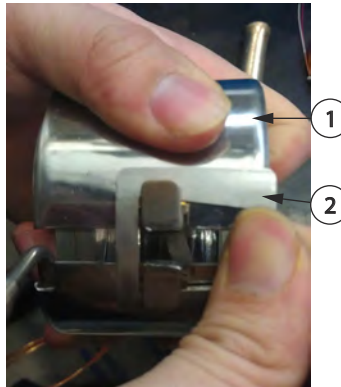


Figure 4-33: Open the Slide Lock

1. Heater 2. Slide Lock

55. Prepare the heater by positioning the slide lock in the open position.



Figure 4-34: Install the Heater

56. Slide the heater on to the sprue body with the wire lead end facing forward.

57. Align the heater with weep hole in SCVG body.

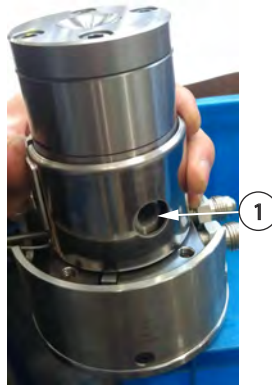


Figure 4-35: Sprue Body Heater Installed

1. Weep Hole

58. Install the weep fitting.

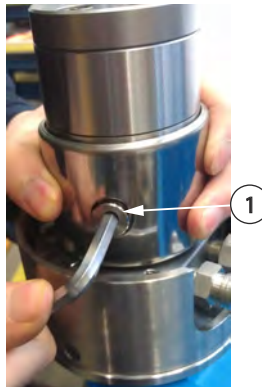


Figure 4-36: Install the Weep Fitting

1. Weep Fitting

59. Tighten the clamp by using a hammer and a brass rod tap the slide lock forward to the end of its travel.

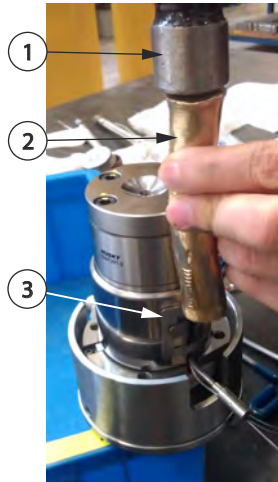


Figure 4-37: Tighten the Clamp

1. Hammer **2.** Brass Rod **3.** Slide Lock



Figure 4-38: Locked Position

- 60.** 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.



Figure 4-39: Sprue Bushing Insert Installed

- 1. Sprue Bushing Insert
- 2. Screw

- 61. Apply a high temperature anti-seize lubricant to the screws that secure the sprue bushing insert to the cylinder. Refer to [Section 3.5](#) for a list of recommended lubricants.
- 62. Install the screws that secure the sprue bushing insert to the cylinder. Torque the screws to the specified torque value. Refer to the assembly drawings for torque specifications.
- 63. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing up. Make sure the extruder pad is in the clamp.
- 64. Install the nozzle heater over the nozzle tip.
- 65. Install the nozzle heater thermocouple and bend the leads to prevent the thermocouple from being pinched between the cavity plate and the manifold plate.

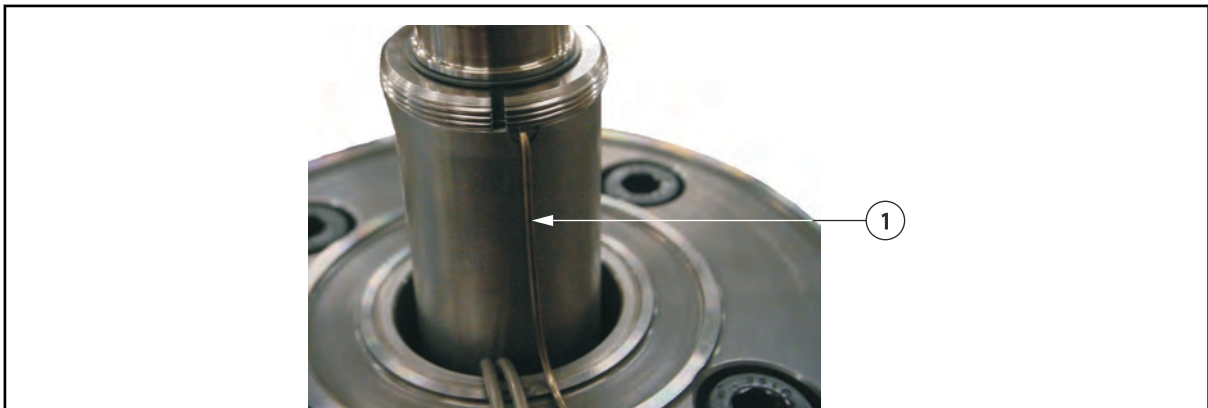


Figure 4-40: Nozzle Heater Thermocouple Installation

- 1. Nozzle Heater Thermocouple

- 66. Install and hand tighten the front ring.
- 67. Install the nameplate on the cylinder sleeve:
 - a. Before removing the backing from the adhesive tape on the back of the nameplate, pre-bend the nameplate to the approximate curvature of the cylinder sleeve using either the outer diameter of the extruder pad or the outer diameter of the sprue bushing insert.



Figure 4-41: Pre-bend the Nameplate

- b.** Clean the surface of the cylinder sleeve with isopropyl alcohol to remove any excess debris or grease.



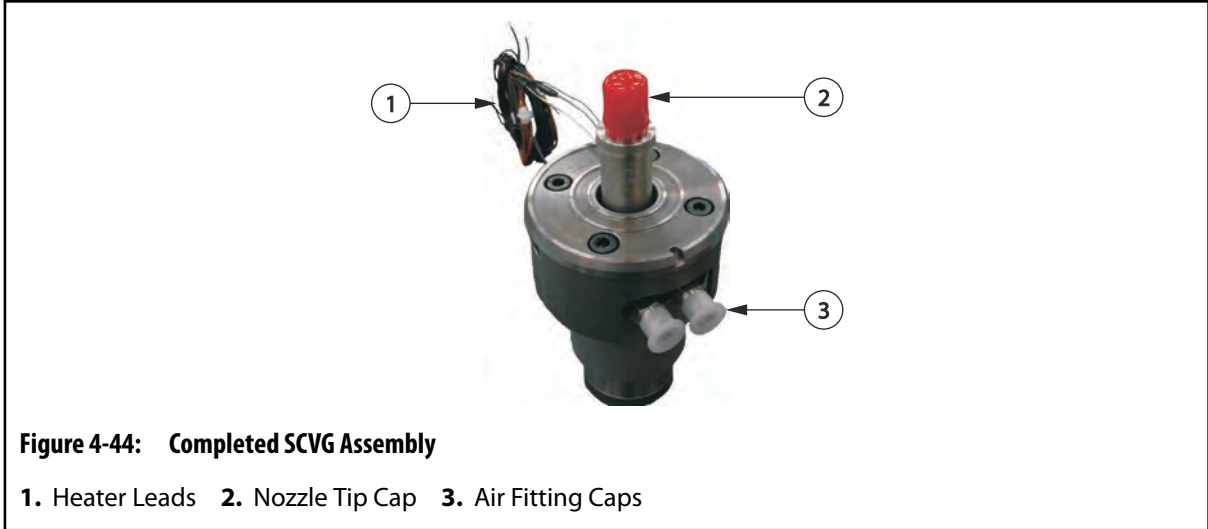
Figure 4-42: Clean the Cylinder Sleeve

- c.** Remove the backing from the adhesive tape on the back of the nameplate and affix the nameplate onto the cylinder sleeve.



Figure 4-43: Affix the Nameplate

- 68.** If necessary, prepare the SCVG assembly for storage or shipment by doing the following:
 - a.** Install the air fitting caps.
 - b.** Install the nozzle tip cap.
 - c.** Tie wrap the heater leads.



4.2.3 Assembling the Single Cavity Valve Gate (SCVG) — Teflon

Before assembling the single cavity valve gates, determine whether the hot runner is equipped with double delta or teflon single cavity valve gates. For more information, refer to [Section 4.2.1](#).

To assemble the teflon single cavity valve gate assembly, do the following:



IMPORTANT!

To maintain optimal sealing, all seals in the single cavity valve gate must be replaced whenever the unit is re-assembled. Seal kit part numbers for teflon SCVG systems are as follows:

- U350, U500 and U750 series: part number 3509936
- U1000 series: part number 3509937

1. Unpack and clean all required components.
2. Compare all components to the parts list.
3. Compare the nozzle housing and valve stem details to the assembly drawings.
4. Make sure the melt channels in the sprue body and nozzle housing are clean and free of burrs.
5. Set the air plate in a vice clamp with soft jaws, with the air plate boss facing down.
6. Insert the nozzle housing into the air plate.

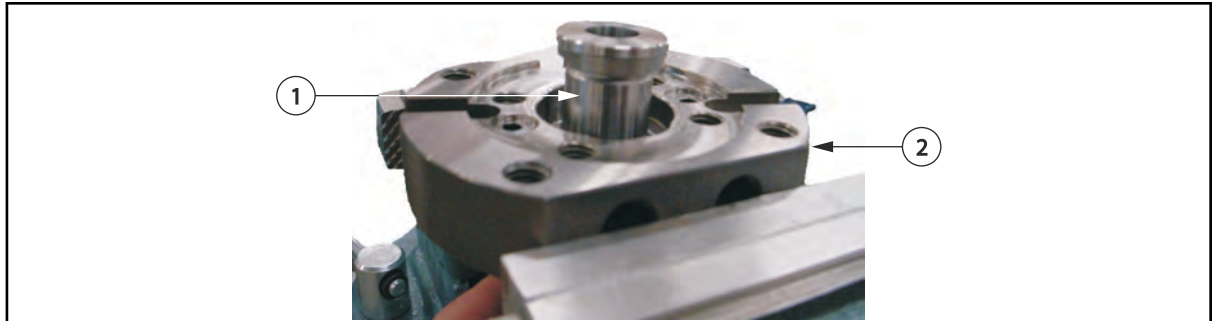


Figure 4-45: Nozzle Housing in Air Plate

1. Nozzle Housing 2. Air Plate (Reference)

7. Install the M-C reducer and new Grafoil seals in the air plate.



Figure 4-46: Grafoil Seals and M-C Reducer in Air Plate

1. Grafoil Seals 2. M-C Reducer

8. Connect retaining tabs to the sprue body in the retaining tab slots.

NOTE:

Older sprue body designs do not feature retaining tab slots.



Figure 4-47: Sprue Body Retaining Tabs

1. Retaining Tabs

9. 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 in line with the thermocouple groove in the air plate.

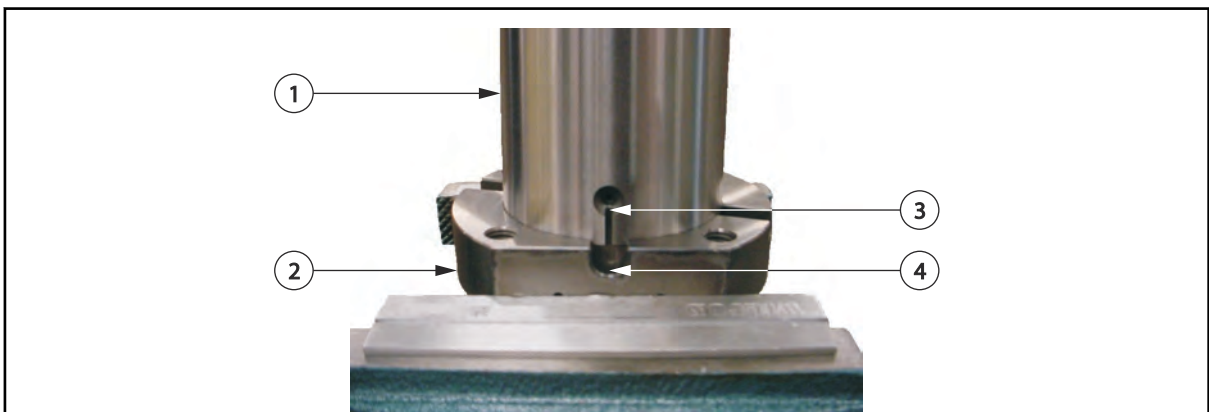
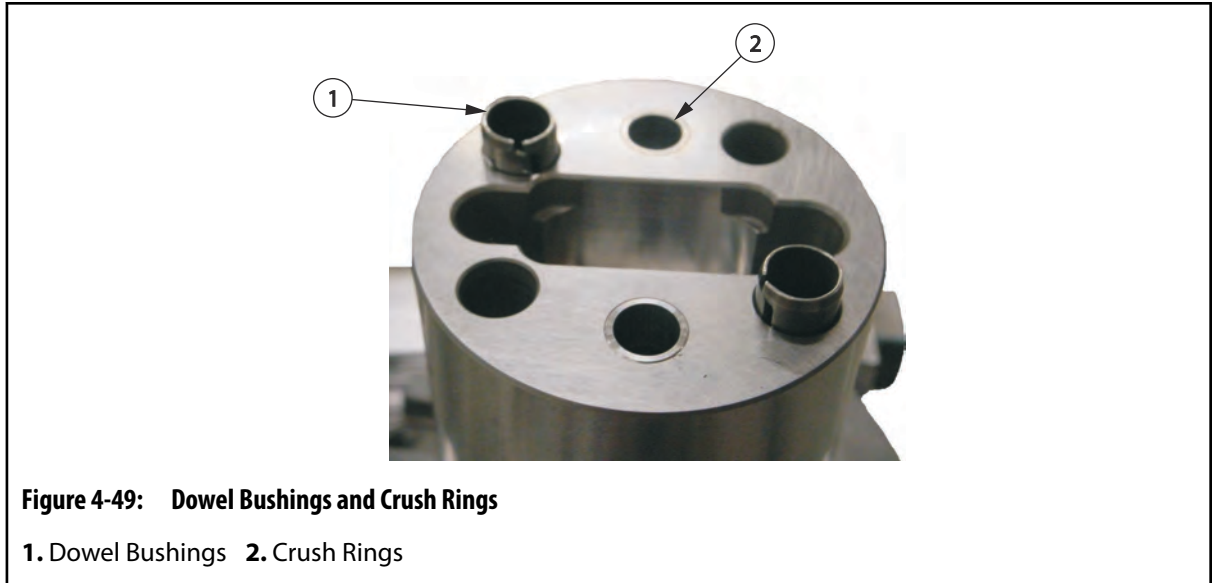


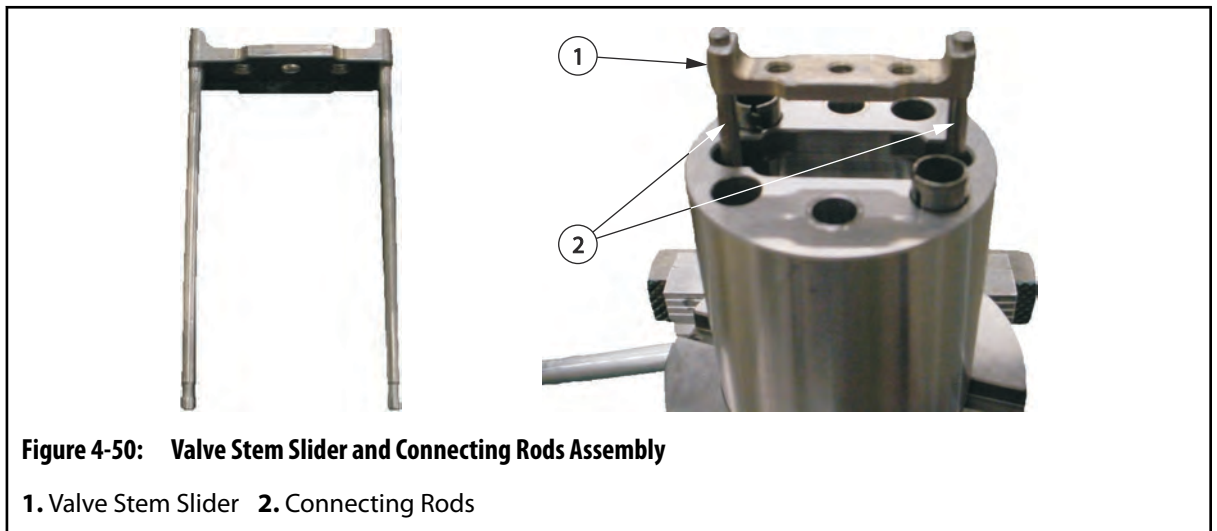
Figure 4-48: Aligning the Sprue Body with the Air Plate

1. Sprue Body 2. Air Plate 3. Sprue Body Thermocouple Hole 4. Air Plate Thermocouple Groove

10. Install new dowel bushings and crush rings to the sprue body.



- 11.** 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.



- 12.** Tilt the sprue body 45° in the vise clamp.



Figure 4-51: Sprue Body Tilted in Vise Clamp

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

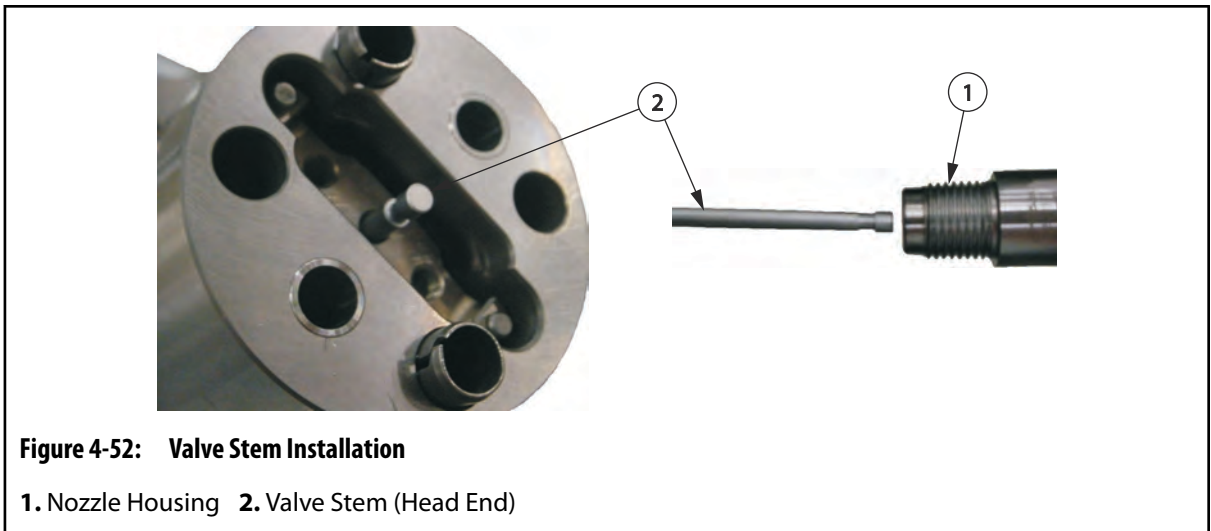


Figure 4-52: Valve Stem Installation

1. Nozzle Housing
2. Valve Stem (Head End)

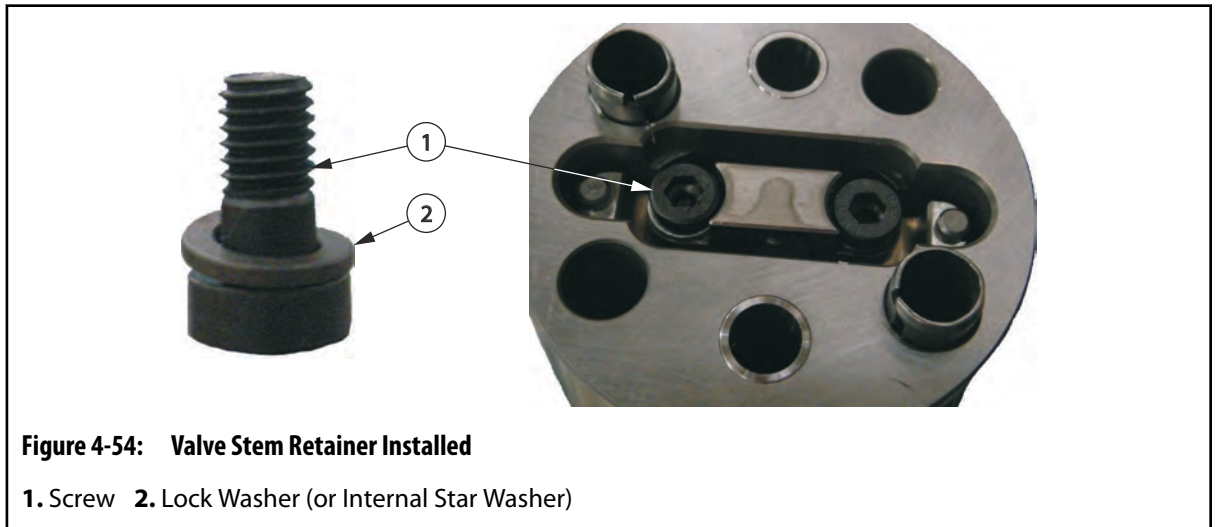
14. Place the valve stem retainer over the valve stem head.



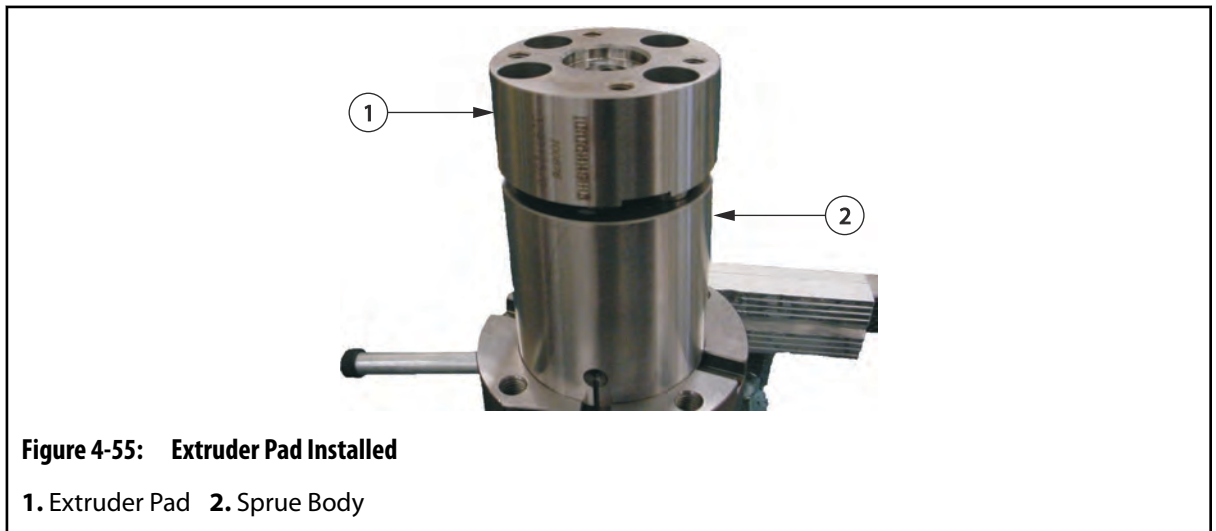
Figure 4-53: Valve Stem Retainer

1. Valve Stem Retainer

15. Apply a high temperature anti-seize lubricant to the screws that secure the valve stem retainer. Refer to [Section 3.5](#) for a list of recommended lubricants.
16. Install the screws that secure the valve stem retainer to the sprue body along with lock washers (or internal star washers). Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.



17. Make sure the valve stem moves freely within the sprue body.
18. Assemble the extruder pad onto the sprue body and align the screw holes.



19. Apply a high temperature anti-seize lubricant to screws that secure the extruder pad. Refer to [Section 3.5](#) for a list of recommended lubricants.
20. Install the screws that secure the extruder pad to the sprue body. Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.
21. Rotate the SCVG 180° in the vise clamp with the nozzle housing facing up. Make sure the extruder pad is in the clamp.
22. Apply a static application grease to the new O-ring seals for the annular piston. Refer to [Section 3.5](#) for a list of recommended lubricants.
23. Install the outside O-ring seal around the annular piston.

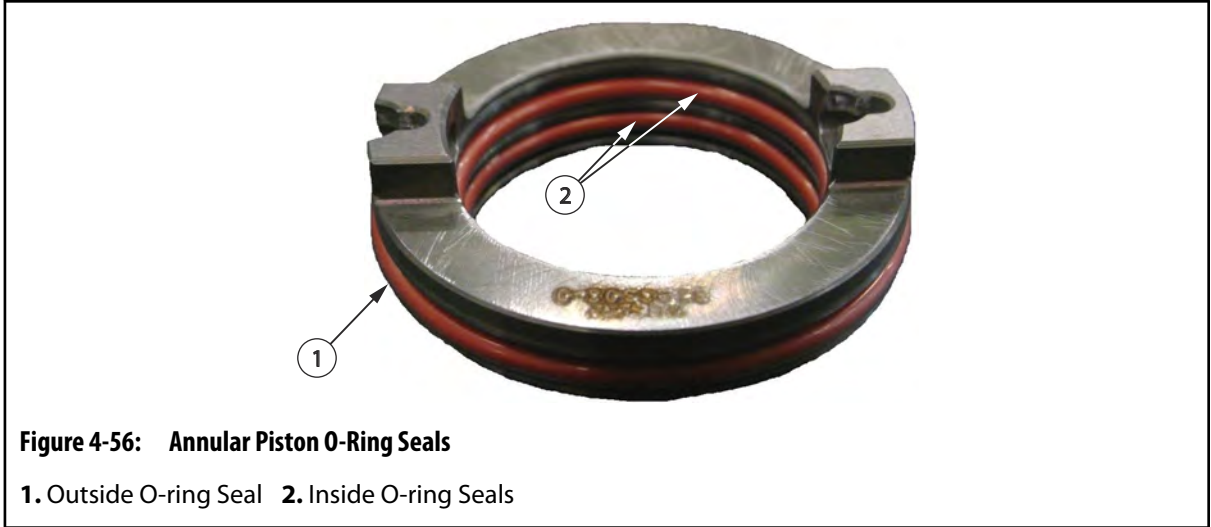


Figure 4-56: Annular Piston O-Ring Seals

1. Outside O-ring Seal 2. Inside O-ring Seals

- 24. Install the two inside O-ring seals in the inside grooves in the annular piston.
- 25. Apply a static application grease to a new O-ring seal for the cylinder insert. Refer to [Section 3.5](#) for a list of recommended lubricants.
- 26. Install the O-ring seal around the cylinder insert.

NOTE:

Install an additional O-ring for U1000 systems.



Figure 4-57: Cylinder Insert O-Ring Seal

1. Cylinder Insert 2. O-Ring Seal

- 27. For U350, U500 and U750 systems only, apply a static application grease to a new O-ring seal for the air plate boss. Refer to [Section 3.5](#) for a list of recommended lubricants.
- 28. Install the O-ring seal around the air plate boss.

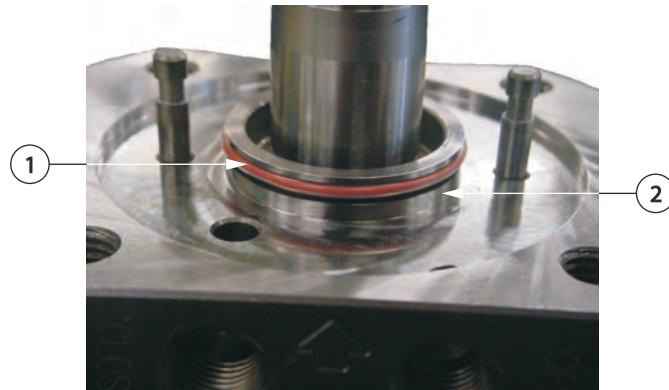


Figure 4-58: O-Ring on Air Plate Boss (For U350, U500 and U750 Systems Only)

1. O-Ring Seal 2. Air Plate Boss

- 29.** 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.

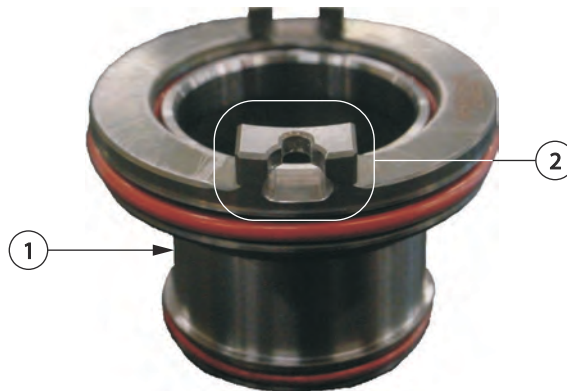


Figure 4-59: Cylinder Insert and Annular Piston Assembly

1. Cylinder Insert 2. Connecting Rod Slots

- 30.** Assemble the cylinder insert and annular piston assembly onto the connecting rods.

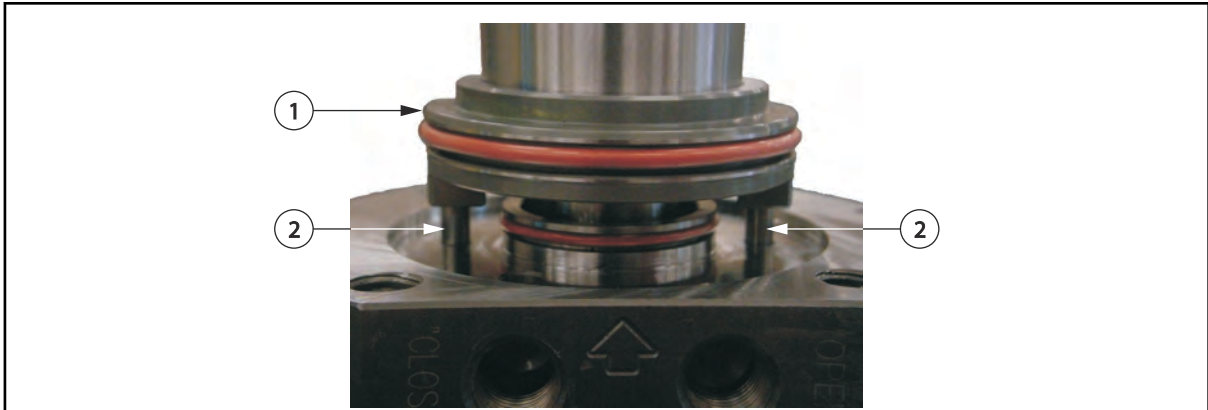


Figure 4-60: Cylinder Insert and Annular Piston Assembly Installed

1. Cylinder Insert and Annular Piston Assembly 2. Connecting Rods

- 31. Slide the cylinder insert and annular piston assembly over the air plate boss O-ring seal (for U350, U500 and U750 systems only) or into the air plate hole (for U1000 systems only). Refer to [Section 3.5](#) for a list of recommended lubricants.
- 32. Apply a static application grease to the inner wall of the cylinder.
- 33. Install the cylinder onto the air plate. Make sure the arrows on the cylinder and the arrows on the air plate are aligned.

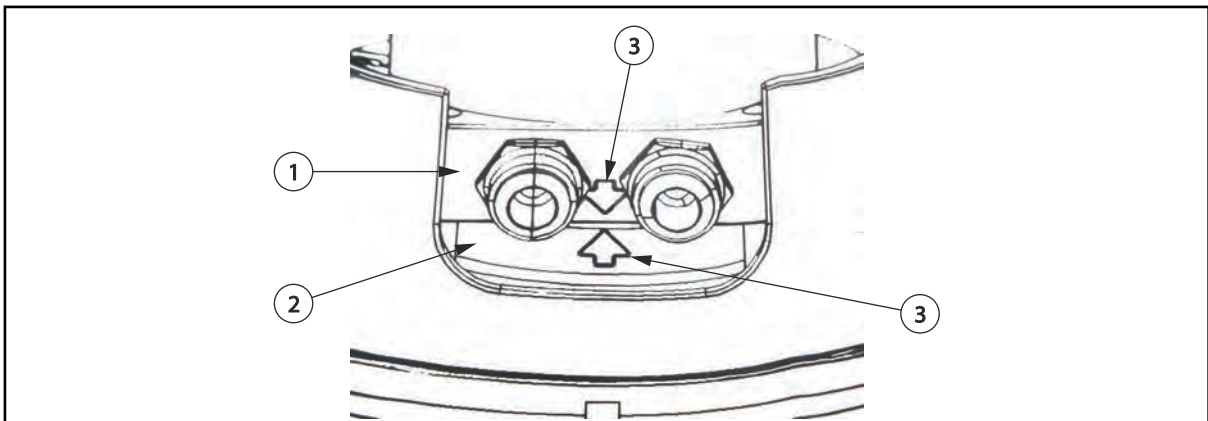


Figure 4-61: Air Plate to Cylinder Alignment

1. Air Plate 2. Cylinder 3. Arrows

- 34. Apply a high temperature anti-seize lubricant to the screws that secure the cylinder to the air plate. Refer to [Section 3.5](#) for a list of recommended lubricants.
- 35. Install the screws that secure the cylinder to the air plate. Torque the screws to the specified torque value. Refer to the assembly drawings for torque specifications.
- 36. 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.



Figure 4-62: Air Pressure Testing (Typical)

- 37.** 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.

- 38.** Install the nozzle tip and torque to the value specified on the assembly drawings.

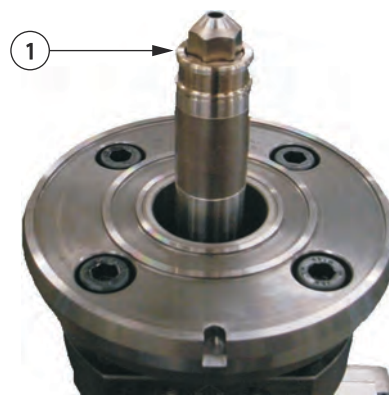


Figure 4-63: Nozzle Tip Installed

1. Nozzle Tip

- 39.** Rotate the SCVG 180° in the vise clamp with the sprue bushing insert facing up. Make sure the air plate is in the clamp.
- 40.** Using electrical pliers, temporarily install the sprue body thermocouple into the sprue body. Fit the thermocouple to the sprue body as shown in [Figure 4-64](#).

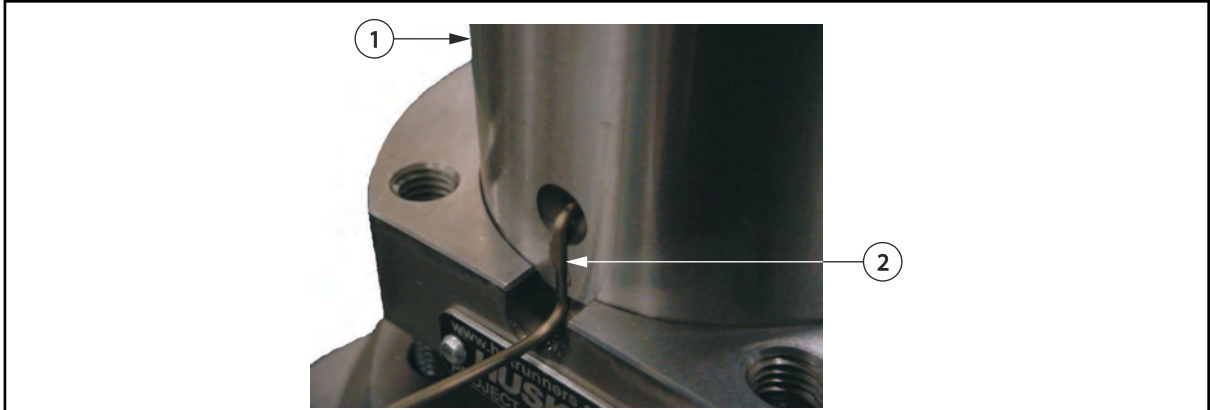


Figure 4-64: Sprue Body Thermocouple Temporary Fit

1. Sprue Body 2. Sprue Body Thermocouple

- 41. Remove the sprue body thermocouple to facilitate the installation of the sleeve.
- 42. Install the sleeve over the air plate.
- 43. Install screws to secure the sleeve to the air plate.
- 44. Apply teflon tape to the air fittings and install them in the air plate.



Figure 4-65: Air Fittings

- 45. Install the pre-fitted sprue body thermocouple to the sprue body.

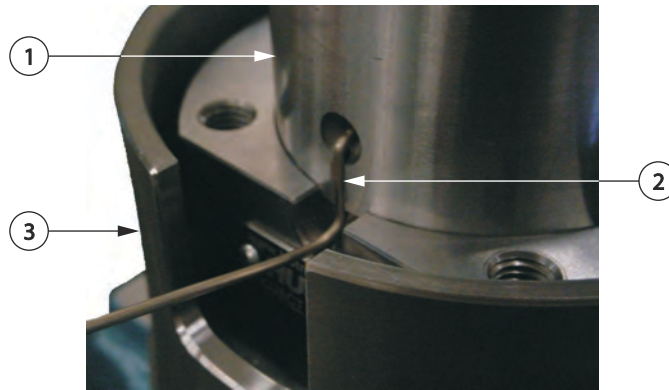


Figure 4-66: Sprue Body Thermocouple Installed

1. Sprue Body 2. Sprue Body Thermocouple 3. Sleeve (Reference)

46. Prepare the heater by positioning the slide lock in the open position.

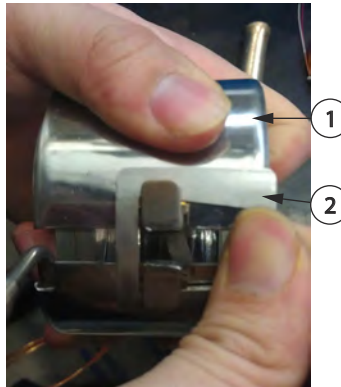


Figure 4-67: Open the Slide Lock

1. Heater 2. Slide Lock

47. Prepare the heater by positioning the slide lock in the open position.



Figure 4-68: Install the Heater

48. Slide the heater on to the sprue body with the wire lead end facing forward.

- 49.** Align the heater with weep hole in SCVG body.

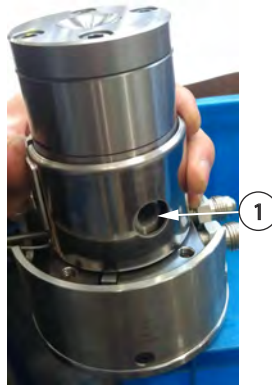


Figure 4-69: Sprue Body Heater Installed

- 1.** Weep Hole

- 50.** Install the weep fitting.

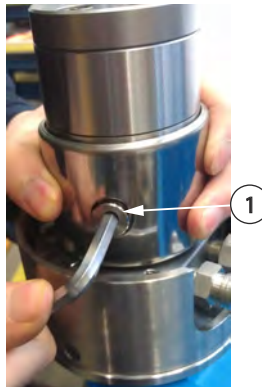


Figure 4-70: Install the Weep Fitting

- 1.** Weep Fitting

- 51.** Tighten the clamp by using a hammer and a brass rod tap the slide lock forward to the end of its travel.

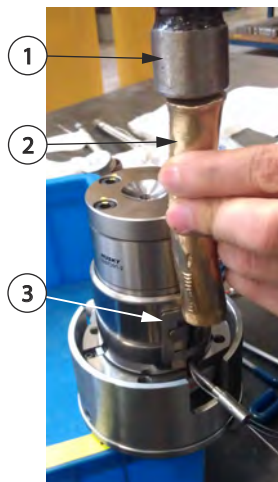


Figure 4-71: Tighten the Clamp

1. Hammer **2.** Brass Rod **3.** Slide Lock



Figure 4-72: Locked Position

- 52.** 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.



Figure 4-73: Sprue Bushing Insert Installed

1. Sprue Bushing Insert 2. Screw

- 53. Apply a high temperature anti-seize lubricant to the screws that secure the sprue bushing insert to the cylinder. Refer to [Section 3.5](#) for a list of recommended lubricants.
- 54. Install the screws that secure the sprue bushing insert to the cylinder. Torque the screws to the specified torque value. Refer to the assembly drawings for torque specifications.
- 55. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing up. Make sure the extruder pad is in the clamp.
- 56. Install the nozzle heater over the nozzle tip.
- 57. Install the nozzle heater thermocouple and bend the leads to prevent the thermocouple from being pinched between the cavity plate and the manifold plate.

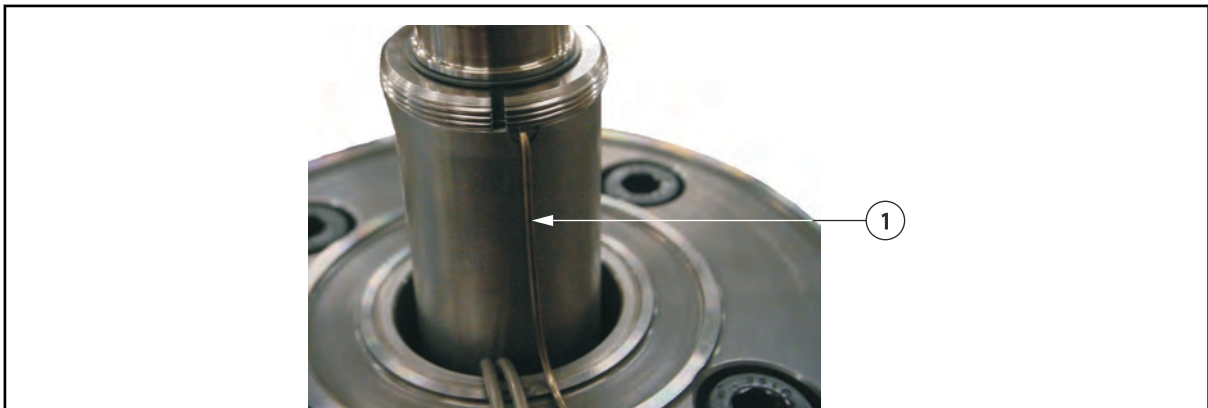


Figure 4-74: Nozzle Heater Thermocouple Installation

1. Nozzle Heater Thermocouple

- 58. Install and hand tighten the front ring.
- 59. Install the nameplate on the cylinder sleeve:
 - a. Before removing the backing from the adhesive tape on the back of the nameplate, pre-bend the nameplate to the approximate curvature of the cylinder sleeve using either the outer diameter of the extruder pad or the outer diameter of the sprue bushing insert.



Figure 4-75: Pre-bend the Nameplate

- b.** Clean the surface of the cylinder sleeve with isopropyl alcohol to remove any excess debris or grease.



Figure 4-76: Clean the Cylinder Sleeve

- c.** Remove the backing from the adhesive tape on the back of the nameplate and affix the nameplate onto the cylinder sleeve.



Figure 4-77: Affix the Nameplate

- 60.** If necessary, prepare the SCVG assembly for storage or shipment by doing the following:
 - a.** Install the air fitting caps.
 - b.** Install the nozzle tip cap.
 - c.** Tie wrap the heater leads.



4.2.4 Disassembling the Single Cavity Valve Gate (SCVG)

To disassemble the single cavity valve gate assembly, do the following:

1. Remove the SCVG from the cavity plate. Refer to [Section 4.3.1](#) for more information.
2. Set the SCVG in a vise clamp with soft jaws with the nozzle tip facing up. Make sure the sprue body is in the clamp.
3. Remove the nozzle heater from the nozzle housing.
4. Remove the air fittings from the air plate.



5. Remove the screws that secure the cylinder to the air plate.
6. Remove the screws that secure the sleeve to the cylinder.
7. Remove the cylinder and sleeve from the SCVG.
8. Remove the annular piston and cylinder insert from the SCVG.
9. Disconnect the cylinder insert from the annular piston and remove all O-ring seals from both components. Cut and discard all O-ring seals.
10. Remove the O-ring seal from the air plate boss. Cut and discard the O-ring seal.

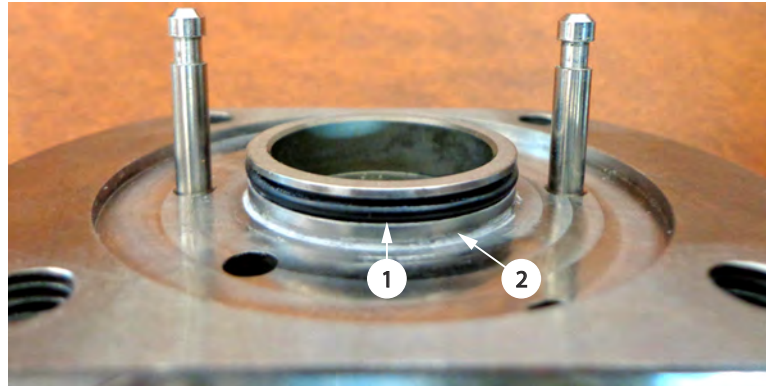


Figure 4-80: O-Ring on the Air Plate Boss

1. O-Ring Seal 2. Air Plate Boss

11. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing down. Make sure the air plate is in the clamp.
12. Remove the sprue bushing insert from the extruder pad.
13. Remove the extruder pad from the sprue body.
14. Rotate the SCVG 180° in the vise clamp with the nozzle tip facing up. Make sure the sprue body is in the clamp.
15. Remove the nozzle tip. Refer to [Section 6.7](#) for more information.
16. Remove the air plate from the sprue body.
17. Remove the nozzle housing from the air plate.
18. Remove the brackets from the sprue body.
19. Remove the grafoil seals from the air plate.
20. Rotate the SCVG 180° in the vise clamp with the valve stem facing down. Make sure the sprue body is in the clamp.
21. Remove the valve stem retainer from the valve stem slider.
22. Remove the valve stem slider and connecting rods from the sprue body.
23. Connect the sprue body thermocouple and heater to a controller.



WARNING!

Hot resin spray hazard - risk of serious injury. Unexpected release of hot resin spray could cause serious burns. Wear adequate personal protective equipment whenever entering the mold area.



WARNING!

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



WARNING!

Electrocution hazard – risk of serious injury and/or damage to the hot runner. Do not turn on the heaters if water has leaked into the hot runner. If water has leaked into the hot runner, the hot runner must be completely disassembled, dried and assembled before the heaters are turned on.



WARNING!

Burn hazard – risk of serious injury. Hot runner components stay hot for long periods of time after heaters have been turned off. Wear personal protective equipment when working near the hot runner and place a warning sign in the area before leaving the hot runner unattended.

- 24. 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.



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.

- 25. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.
- 26. Insert a reverse taper valve stem removal tool through the valve stem slider. Gently tap the removal tool, making sure to contact the valve stem only until the valve stem is free of the sprue body.

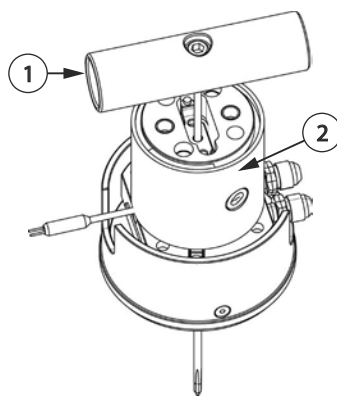


Figure 4-81: Inserting the Valve Stem Removal Tool

- 1. Reverse Taper Valve Stem Removal Tool 2. Sprue Body

- 27. Remove the sprue body heater. Refer to [Section 6.13.1](#).
- 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.

4.3 Installing and Removing the Single Cavity Valve Gate (SCVG)

The following procedures describe how to install and remove the single cavity valve gate assembly.

4.3.1 Removing the Single Cavity Valve Gate (SCVG)

To remove the single cavity valve gate assembly from the hot runner, do the following:

1. Remove the cavity plate from the machine and set it down on a suitable work bench. Make sure the nozzle tip is facing down. Refer to [Section 6.5.1](#) for more information.
2. Remove the locating ring that secures the SCVG to the hot runner. Jacking screws 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.
6. If equipped, remove the nozzle tip insulator from the nozzle tip and/or cavity plate. Refer to [Section 6.9.1](#) for more information.
7. If present, remove the insulating gate bubble on the nozzle tip or in the cavity plate gate detail. Refer to [Section 6.10](#) for more information.

4.3.2 Installing the Single Cavity Valve Gate (SCVG)

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

1. Connect two flexible air hoses to the air fittings. Refer to [Figure 4-82](#).

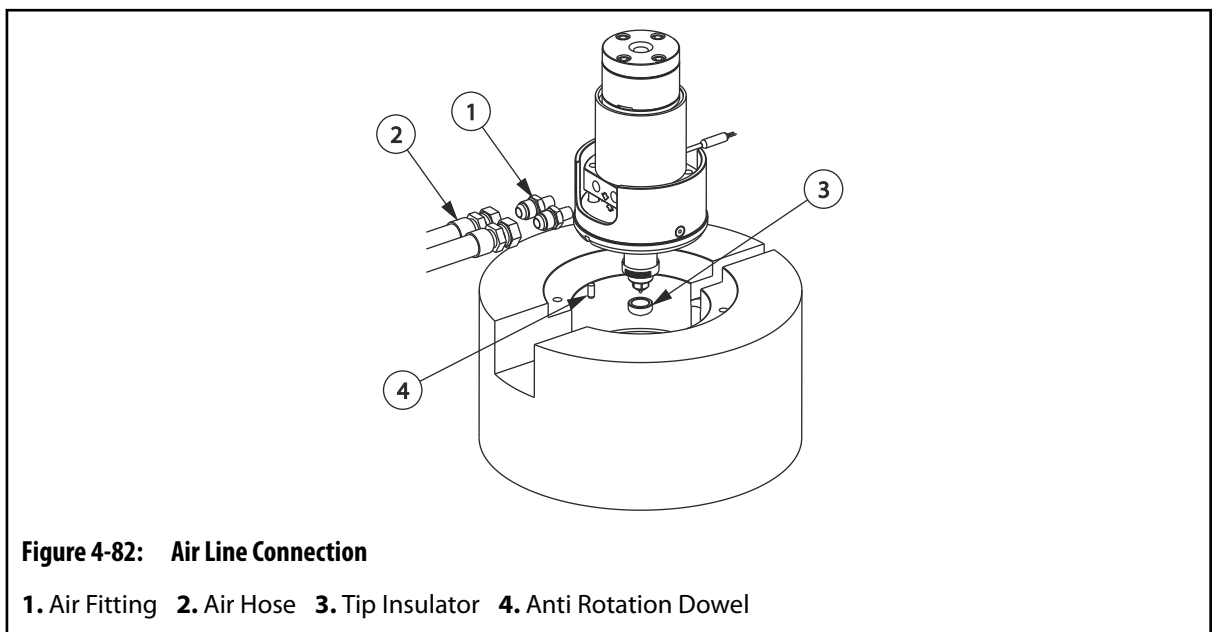


Figure 4-82: Air Line Connection

1. Air Fitting 2. Air Hose 3. Tip Insulator 4. Anti Rotation Dowel

NOTE:

Label which hose is for air open and which one is for air closed.

2. Make sure the nozzle and cavity plate sealing diameters are clean and free of burrs or oil.

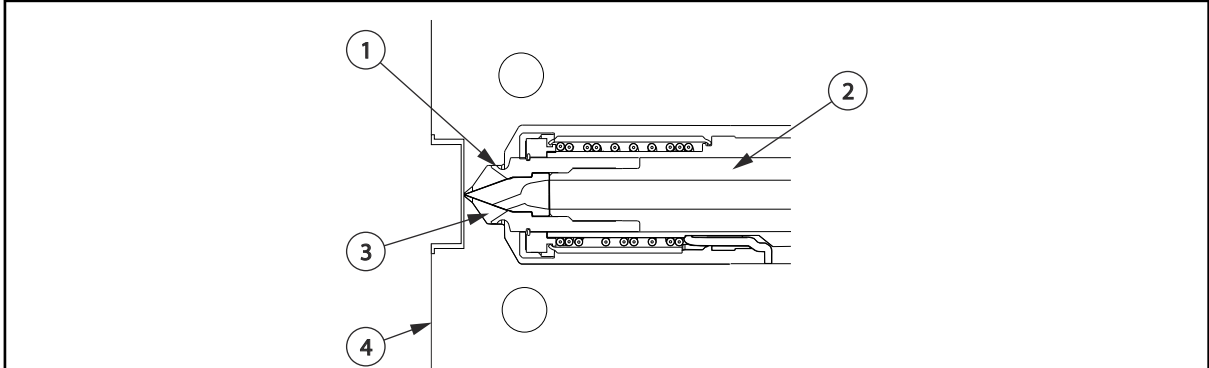


Figure 4-83: Cavity and Nozzle Sealing Diameters

1. Nozzle and Cavity Plate Sealing Diameters 2. Nozzle Housing 3. Gate Bubble 4. Cavity Plate

3. If equipped, install a nozzle tip insulator. Refer to [Section 6.9.2](#) for more information.
4. Insert an anti rotation dowel into the cavity plate.
5. Install the SCVG assembly into the cavity plate, rocking it gently if necessary, until the assembly is fully seated in the bore.

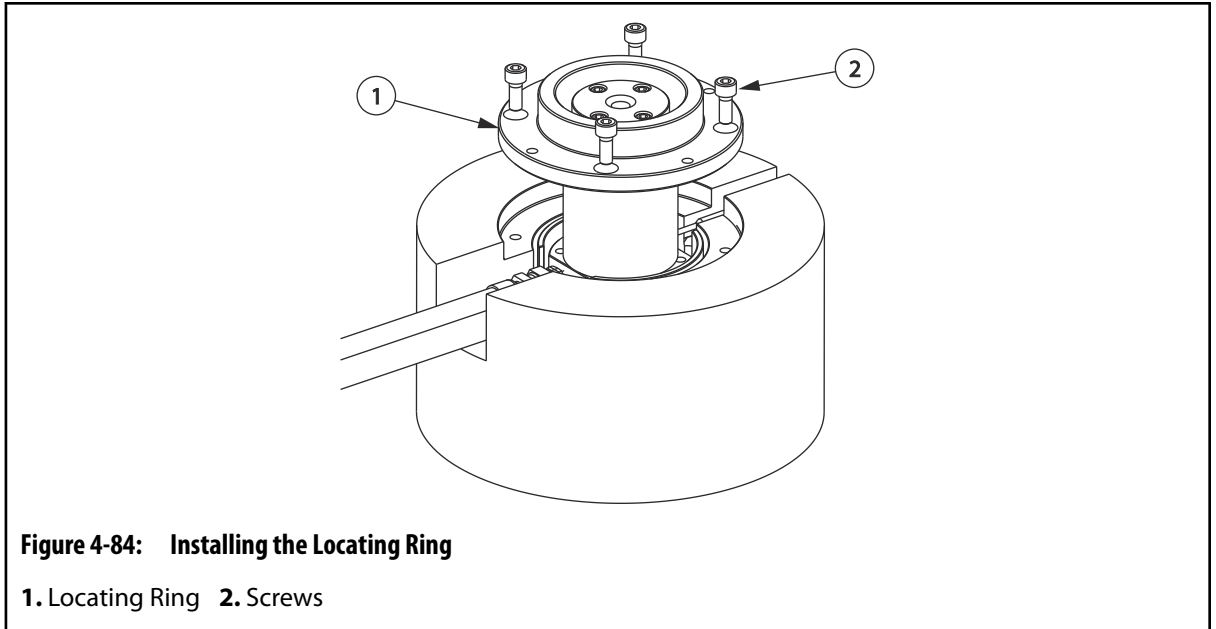
CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

6. Route the wires through the wire grooves in the cavity plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.
Refer to the electrical schematic for wiring information.
7. Place 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 4-84](#).

NOTE:

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



8. Secure the locating ring to the cavity plate with screws and even torque the screws in a cross pattern. Refer to the assembly drawings for the required torque value.

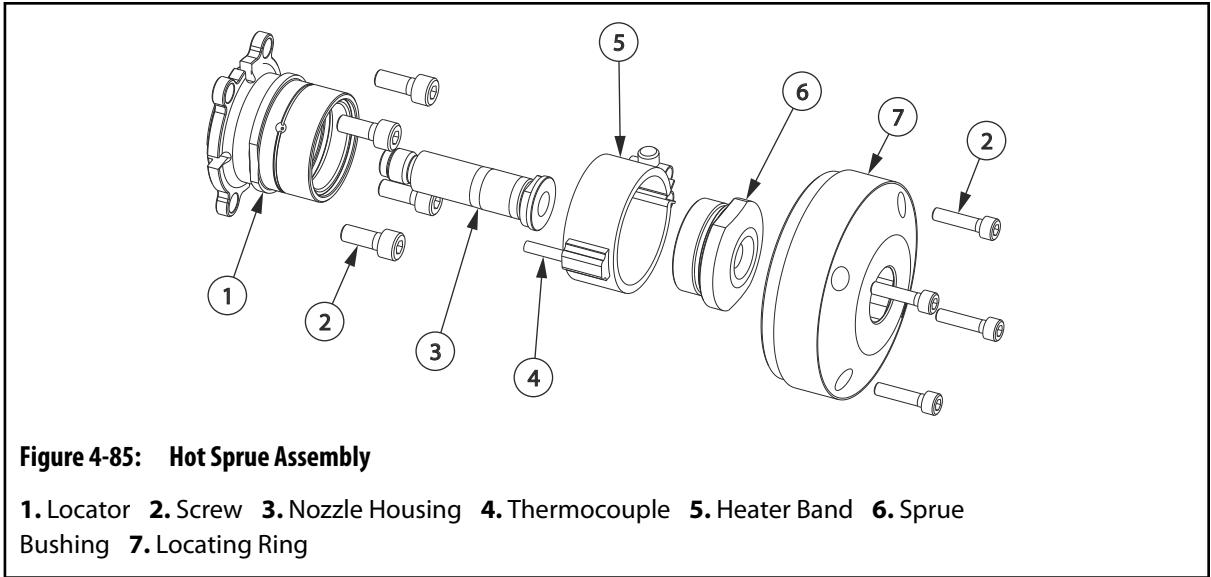
4.4 Assembling and Disassembling the Hot Sprue Assembly

The following procedures describe how to assemble and disassemble a hot sprue system.

4.4.1 Disassembling the Hot Sprue Assembly

To disassemble the hot sprue assembly, do the following:

1. Remove the cavity plate from the machine and set it down on a suitable work bench. Make sure the nozzle tip is facing down. Refer to [Section 6.5.1](#) for more information.
2. Remove the wires for the hot sprue assembly from the wire grooves in the cavity plate.

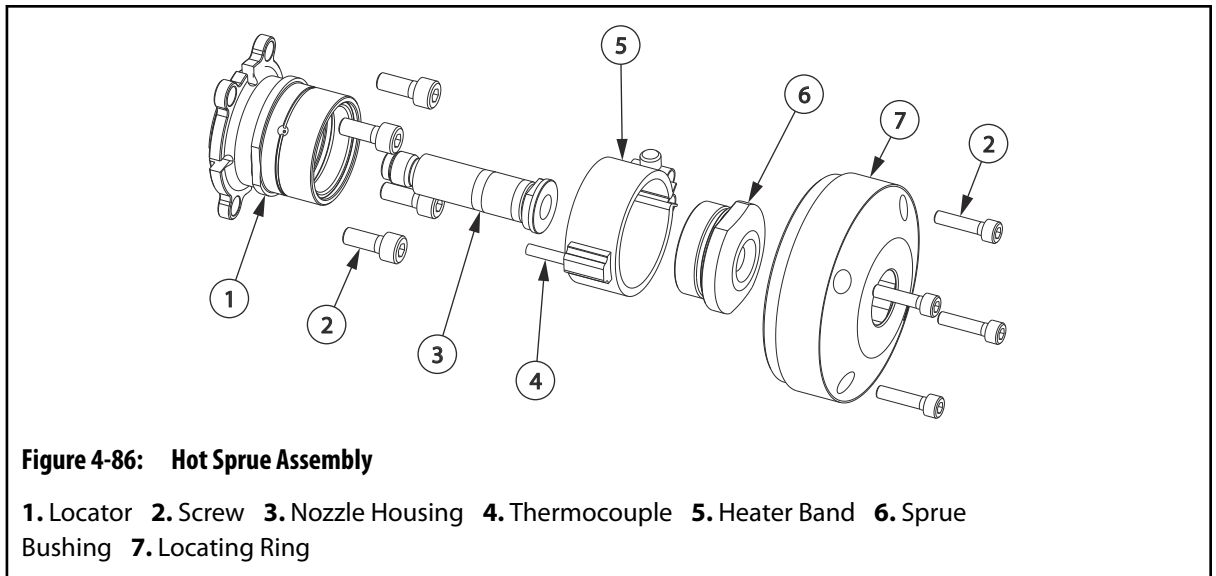


- 3. Remove the screws that secure the locating ring to the cavity plate.
- 4. Remove the screws that secure the locator to the cavity plate.
- 5. Remove the hot sprue assembly from the cavity plate gate well.
- 6. Remove the nozzle heater. Refer to [Section 6.8](#) for more information.
- 7. Remove the nozzle tip from the nozzle housing. Refer to [Section 6.7](#) for more information.
- 8. Remove the sprue bushing, heater band and thermocouple.
- 9. Remove the nozzle housing from the locator.

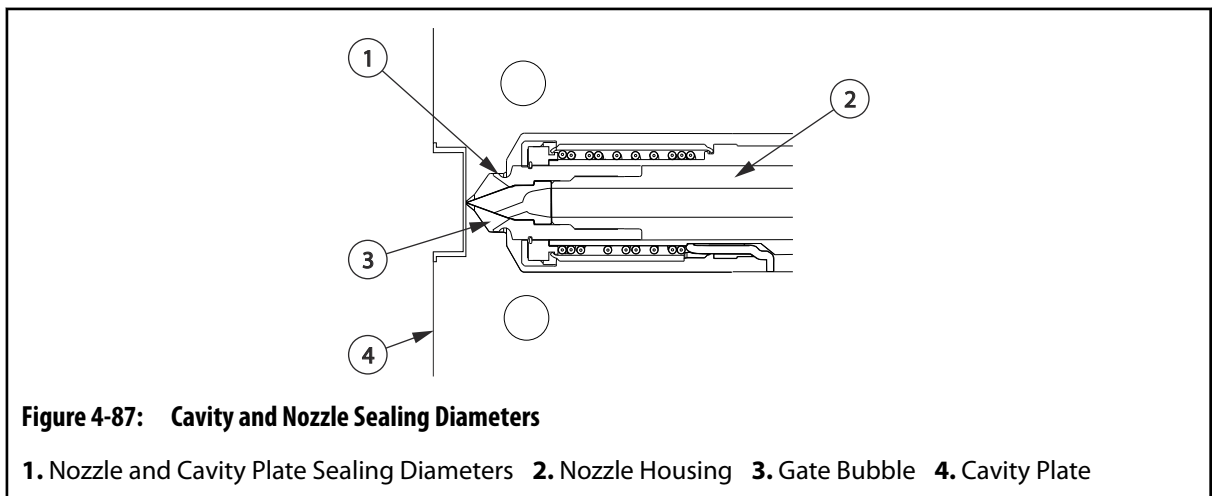
4.4.2 Assembling the Hot Sprue Assembly

To assemble the hot sprue assembly, do the following:

- 1. Unpack and clean all required components.
- 2. Compare all components to the parts list.
- 3. Make sure the melt channel in the nozzle housing is clean and free of burrs.



4. Insert the nozzle housing through the locator and make sure it is properly seated.
5. Insert the sprue bushing into the back of the locator. Refer to the assembly drawings for the required torque value.
6. Install the nozzle tip. Refer to [Section 6.7](#) for more information.
7. Install the nozzle heater. Refer to [Section 6.8](#) for more information.
8. Install the heater band and thermocouple on the locator.
9. Make sure the nozzle and cavity plate sealing diameters are clean and free of burrs or oil.



10. Insert the hot sprue assembly into the cavity plate gate well.
11. Connect the locator to the cavity plate. Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

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

Refer to the electrical schematic for wiring information.

- 13.** Connect the locating ring to the back of the cavity plate. Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.

Chapter 5 Startup and Operation

This chapter describes how to safely startup and operate the hot runner. Follow these instructions along with any in the machine manufacturer's documentation.

NOTE:

If the hot runner is installed in a Husky machine, refer to the startup instructions in the machine manufacturer's documentation.

To startup the hot runner for operation, perform the following procedures in order:

Step	Task	Reference
1	Prepare the hot runner	Section 5.1
2	Heat up the mold, hot runner and machine	Section 5.2
3	Precharge the hot runner with resin	Section 5.3
4	Produce test parts	Section 5.4



IMPORTANT!

The mold and hot runner must be installed properly by qualified personnel before production begins.



IMPORTANT!

Hot runners may not be put into service in a machine that does not comply with the provisions of Machinery Directive 2006/42/EC, as amended, and with the regulations transposing it into national law.

5.1 Preparing the Hot Runner

To prepare the hot runner for startup, do the following:

CAUTION!

Mechanical hazard – risk of 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.

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

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

2. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.
3. Make sure the mold and hot runner are installed properly.
4. Make sure the heaters and thermocouples are connected to the machine or a controller.
5. Make sure the resin type in the machine matches the required type indicated on the hot runner assembly drawings.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. In the event of water leaking into the hot runner, the nozzle heaters could fail. Make sure all water is removed before starting up the hot runner.

6. Using compressed air, remove any water around the nozzle tips and parting lines.
7. Make sure all safety latches have been removed from the mold and hot runner.
8. Remove all locks and tags. Refer to [Section 2.5](#) for more information.

5.2 Heating Up the Hot Runner, Mold and Machine

To bring the hot runner, mold and machine up to operating temperature, do the following:

1. If equipped, make sure the dryer is enabled and adjusted to the proper operating temperature.
2. Make sure the water chiller is enabled and adjusted to the proper operating temperature.
3. If equipped, make sure the mold enclosure de-humidifier, air compressor and water tower supplies are enabled.
4. For SCVG systems, check the air pressure settings for the machine.
5. For SCVG systems, make sure the compressed air for the mold is turned off. If the compressed air is left on as the hot runner heats up, air will leak from the system. This will cool the hot runner and delay the startup.
6. Slowly open the clamp to full shutheight.

7. Turn on the mold/hot runner cooling system.

**WARNING!**

Hot resin spray hazard – risk of death or serious injury. Overheated resin can generate pressurized gas that when suddenly released can cause material to spray out. Do not allow resin to overheat. If the startup process is interrupted, turn off all barrel heaters and retract the injection unit to allow the hot runner to vent between the machine nozzle and the sprue bushing. For extended delays, follow the machine manufacturer’s and resin supplier’s procedures for machine shutdown.

8. Turn on the machine barrel heaters and allow them approximately 1/2 to 1 1/2 hours to reach operating temperature, depending on the size of the injection unit.
9. If equipped, turn on the controller.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Never operate the hot runner outside of the melt and mold temperatures indicated on the nameplate. Internal resin leakage or component damage could occur.

10. Set the temperature of the sprue heater to the melt temperature indicated on the assembly drawings.

**WARNING!**

Hot resin spray hazard – risk of death or serious injury. The sprue heater must be turned on when the manifold heaters are turned 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.

11. Turn on the sprue heater zone. Wait for the heater to reach operating temperature. Wait an additional 10 minutes or more of soak time to make sure the resin has reached the operating temperature.
12. Open the process material feed. Refer to the machine manufacturer’s documentation for more information.

5.3 Precharging the Hot Runner

To precharge the hot runner with resin, do the following:

1. Close the clamp and apply tonnage.

**WARNING!**

Hot resin spray hazard – risk of death or serious injury. Molten resin under high pressure can suddenly release and spray out from the machine nozzle. Before purging the barrel or shooting pot, clear the area of all non-essential personnel and wear personal protective equipment consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses.

2. Purge the injection unit. Refer to the machine manufacturer's documentation for more information.
 3. Clean the machine nozzle, stationary platen and purge guard of any resin deposits. Refer to the machine manufacturer's documentation for more information.
 4. Turn on the nozzle heaters and allow them approximately 5 to 7 minutes before mold operation to reach operating temperature.
-

CAUTION!

Mechanical hazard – risk of damage to equipment. Do not allow nozzle tips to stay energized for more than 10 minutes without injecting resin. Resin residing in the nozzle tip area will degrade.

5. While the nozzle heaters are reaching operating temperature, do the following:
 - a. Turn on the extruder screw to start plasticizing the resin.
 - b. Repeat [step 2](#) to [step 3](#).
 6. Move the machine nozzle forward until it is firmly seated against the sprue bushing.
 7. Inject resin into the hot runner until the injection piston stops. The piston must stop before it makes contact with the injection housing. If the piston makes contact with the injection housing, inject resin again.
-

NOTE:

The hot runner channels are properly filled with resin when the injection piston stops before making contact with the injection housing.

8. Once the injection piston stops, start the extruder screw and make sure it retracts fully.
-

5.4 Producing Test Parts

To produce test parts that will verify the settings and functions for the hot runner and machine, do the following:

1. Make sure the nozzle heaters have not timed out. If the nozzle heaters have timed out, do the following:
 - a. Enable the heaters and wait approximately 5 to 7 minutes to reach operating temperature.
 - b. Purge the injection unit. Refer to the machine manufacturer's documentation for more information.

- c. Clean the machine nozzle, stationary platen and purge guard of any resin deposits. Refer to the machine manufacturer’s documentation for more information.
2. Close the clamp and apply tonnage.
3. Make sure the machine nozzle is firmly seated against the sprue bushing.
4. Reduce the injection pressure to 70 bar (1000 psi) .
5. Disable all ejector functions to prevent the machine from automatically ejecting parts.
6. Cycle the machine once in normal mode to produce a set of parts.
7. Check that all parts have been properly molded.
8. Manually control the ejector functions to eject the parts.
9. If all cavities are producing parts, reset the injection pressure to the recommended value.
10. Cycle the machine four times in normal mode to produce parts. This will remove any air trapped in the resin.
11. Visually inspect the last set of parts to verify the part quality. Repeat [step 10](#) until the part quality is satisfactory.
12. Enable the ejector functions.
13. If equipped, enable the product handling equipment.
14. Cycle the machine 10 times in semi-cycle mode. During each cycle, if equipped, make sure the product handling equipment properly transfers the parts to the conveyor.
15. Enable the auto-cycle mode for the machine and begin production.

Chapter 6 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.



WARNING!

Risk of injury. When entering the molding area, personal protective equipment must be worn to guard against burns, abrasions, hearing, foot, eye, and face hazards and any other procedure specific hazards listed in the manual.



WARNING!

Chemical hazard - Some of the chemicals used when servicing or maintaining Husky equipment are potentially hazardous and could cause injury and illness. Before storing, handling, or working with any chemical or hazardous material, thoroughly read and understand each applicable Material Safety Data Sheet (MSDS), use recommended personal protective equipment and follow the manufacturer's instructions.

6.1 Scheduled and Non-Scheduled Maintenance

Throughout the life of the mold and hot runner, various systems and components will need to be inspected and serviced on a scheduled or non-scheduled basis.

There are two types of maintenance procedures:

- Preventive procedures are performed at scheduled intervals
- Service procedures are performed when required

6.1.1 Preventive Maintenance

The following procedures must be performed when indicated as part of the recommended preventive maintenance program for the mold and hot runner.

Interval	Cycles	Task Description	Reference
Every 6 Months	500,000	Test the hot runner heaters	Section 6.4
Every 12 Months	1,000,000	Inspect the valve stem and piston assemblies (SCVG only)	Section 6.6.1

6.1.2 Service Procedures

The following procedures are to be performed only when needed.

Procedure	Reference
Changing the resin color	Section 6.2
Cleaning drool from the weep holes	Section 6.11
Extending nozzle and sprue heater wire leads	Section 6.3
Removing insulating gate bubbles	Section 6.10
Removing and installing nozzle heaters (hot sprue only)	Section 6.8
Removing and installing nozzle tip insulators (if equipped)	Section 6.9
Removing and installing nozzle tips	Section 6.7
Removing and installing the cavity plate	Section 6.5
Removing and installing valve stems (SCVG only)	Section 6.6
Testing heaters	Section 6.4
Testing the electrical system	Section 6.12

6.2 Changing the Resin Color

To change the color of the resin, do the following:

1. Lock out and tag the machine and controller (if equipped). For machine lockout and tag procedures refer to the machine documentation.
2. Remove all traces of the original resin from the material feed equipment.
3. Depending on application restrictions, add one of the following to the material feed equipment to reduce the cleaning time required:
 - Purge compound
 - Natural (uncolored) resin
 - New colored resin
4. Remove all locks and tags. For machine lockout and tag procedures refer to the machine documentation.
5. Power up the machine and turn on the controller (if equipped).

**WARNING!**

Hot resin spray hazard – risk of serious injury. Molten resin under high pressure can suddenly release and spray out from the machine nozzle. Before purging the injection unit, clear the area of all non-essential personnel and wear personal protective equipment consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses.

6. Purge the injection unit until all traces of the old color are eliminated. For instructions, refer to the machine manufacturer's documentation.
7. Increase the injection speed to the maximum value allowed by the application.
8. Reduce the hold time and cooling time to the minimum values allowed by the application.
9. Increase the temperature of the hot runner nozzle tips, manifold and sprue by 20 to 30 °C (68 to 86 °F).
10. Repeat [step 3](#) to replenish the material feed system, if required.
11. Produce a series of test parts until all traces of the old color are eliminated.
12. When the color change is complete, decrease the temperature of the nozzle tips, manifold and sprue by 20 to 30 °C (68 to 86 °F).
13. Return the hold time, cooling time and injection speed back to their original values.
14. Fill the material feed equipment with the new resin.

6.3 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. Slide heat shrink tubing over the butt connector. Make sure the butt connector is centered in the tubing.

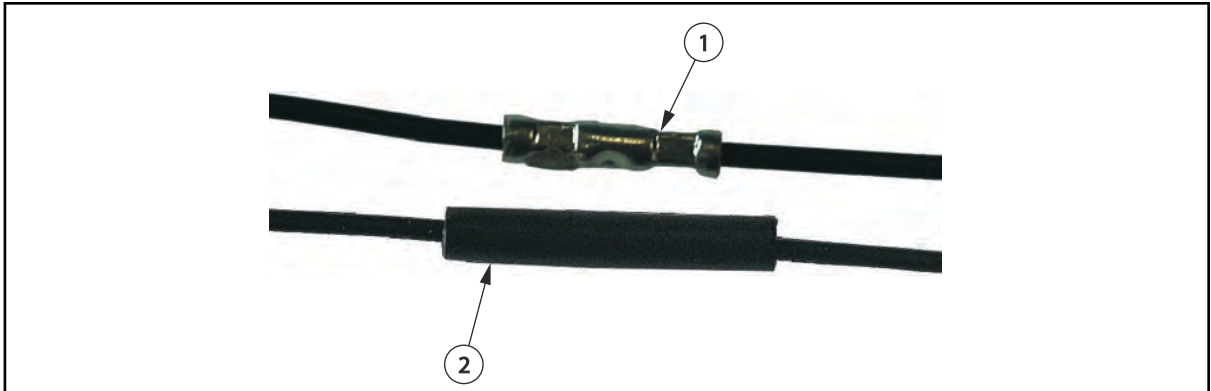


Figure 6-1: Installing the Heat Shrink Tubing

1. Butt Connector 2. Heat Shrink Tubing

3. Insert the wires into both ends of the butt connector until no wire lead is visible.

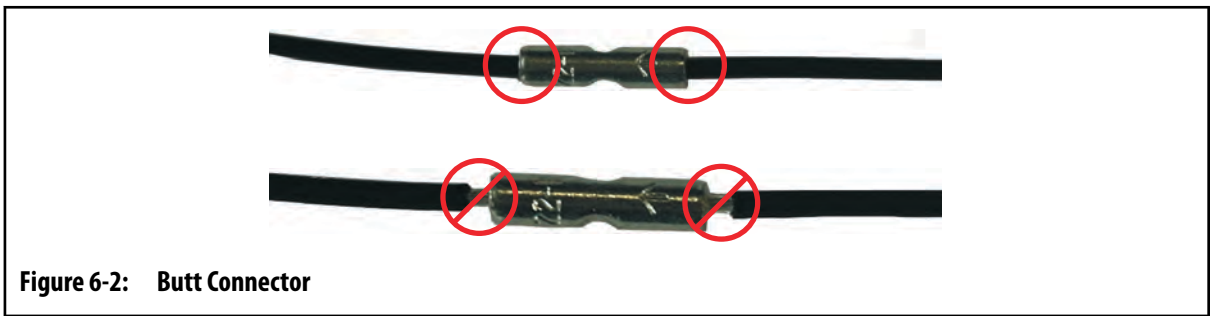


Figure 6-2: Butt Connector

4. Using a crimping tool, crimp one end of the butt connector at a time.
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.



Figure 6-3: Completed Wire Lead Extension

6.4 Testing Heaters

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

1. With the heater at or near room temperature, use an ohmmeter to measure the resistance through the heater. Refer to the electrical schematic for the required ohms measurement.
The normal tolerance for all heaters is $\pm 15\%$.

**IMPORTANT!**

A common problem with heaters is moisture absorption due to the hygroscopic nature of the insulation. A heater with a low case to center conductor insulation reading ($<10\text{K } \Omega$) should be baked out and retested to determine if moisture was the cause. Contact Husky for more information.

2. Using an ohmmeter, measure the resistance through each lead to ground. A measurement from either lead to ground that is below $100\text{K } \Omega$ indicates a short to ground. A measurement from $100\text{K } \Omega$ to $1\text{M } \Omega$ is often associated with a wet heater.

A measurement greater than $1\text{M } \Omega$ 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 damaged 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 $150\text{ }^\circ\text{C}$ ($203\text{ }^\circ\text{F}$) minimum.

NOTE:

Refer to the electrical schematics for resistance information.

6.5 Removing and Installing the Cavity Plate

The nozzle tip, nozzle heater and nozzle thermocouple can be accessed for maintenance purposes by removing the cavity plate.

Refer to [Section 4.1](#) 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 hoist rings, lifting chain, and crane can support the weight of the plate(s) and hot runner.

6.5.1 Removing the Cavity Plate

To remove the cavity plate from the machine, do the following:

**WARNING!**

Hot resin spray hazard – risk of serious injury. Residual pressure from gases in the hot runner may cause hot resin to spray from the nozzle tips when released. Make sure the valve gates are open when turning off the heaters to relieve pressure in the hot runner.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not actuate the valve stems when the hot runner is cold. Damage to the valve stems could occur.

1. For SCVG systems only, open the valve gates.
2. 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 hot runner.
3. Open the clamp.
4. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.
5. Purge all cooling water from the cooling hoses to minimize the risk of a coolant spill should a hose come loose during maintenance. Refer to the machine manufacturer’s documentation for more information.
6. Disconnect all cooling hoses from the hot runner.
7. Disconnect all electrical cables and connectors from the hot runner.



WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and could cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

8. Install a suitable hoist ring in the lifting location at the top of the cavity plate.
9. Attach an overhead crane to the hoist ring and lift only until the lifting chain has a slight tension on it.

CAUTION!

Mechanical hazard – risk of damage to the nozzle sealing surfaces. The temperature of the nozzle tips must cool to room temperature <25 °C (<77 °F) before the cavity plate is removed. Damage to the nozzle sealing surfaces will occur if the temperature is too high.

10. Remove the screws that secure the cavity plate to the stationary platen.

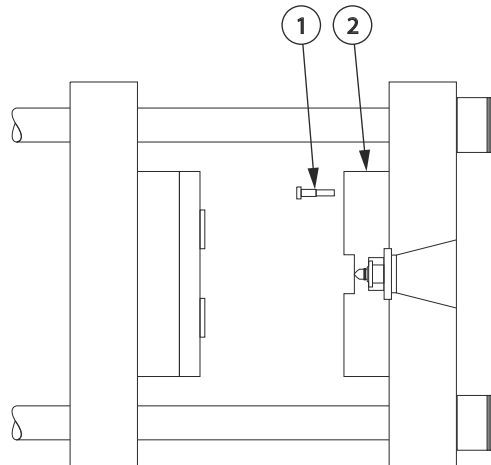


Figure 6-4: Disconnecting the Cavity Plate from the Stationary Platen

1. Retaining Screw 2. Cavity Plate

CAUTION!

Mechanical hazard – risk of damage to the mold and hot runner. Lift the cavity plate slowly until the alignment dowels are cleared. Damage to the cavity plate and/or alignment dowels could occur.

11. Lift the cavity plate out of the machine.



WARNING!

Crushing hazard – risk of death or serious injury. Do not work under suspended loads. To prevent injury, install safety blocks.

12. Install feet on the bottom of the cavity plate to protect the hose fittings.



WARNING!

Crushing hazard - risk of death or serious injury. Do not work under suspended loads. To prevent injury, install safety blocks.

13. Install feet on the bottom of the cavity plate to protect the hose fittings.

14. Move the cavity plate out of the work area. Store the plate in a location where the plate cannot fall or tip over.

6.5.2 Installing the Cavity Plate

To install the cavity plate, do the following:

1. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.

2. Make sure the guide pins are installed in the cavity plate.
3. Apply a static application grease to the guide pins. Refer to [Section 3.5](#) for a list of recommended lubricants.



WARNING!

Crushing hazard – risk of death or serious injury. Inadequate lifting equipment can fail and could cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.

4. Install a hoist ring in the designated lifting point marked on the top of the cavity plate.



WARNING!

Crushing hazard – risk of death or serious injury. Do not work under suspended loads. To prevent injury, install safety blocks.

5. Attach an overhead crane to the hoist ring and lift the cavity plate over the mold area. Refer to [Section 4.1](#) for lifting and handling instructions.



WARNING!

Crushing hazard - risk of death or serious injury. Do not work under suspended loads. To prevent injury, install safety blocks.

6. Remove the feet from the bottom of the cavity plate.
7. Lower the cavity plate into the mold area. If necessary, rotate the assembly 90° to fit the cavity plate between the tie bars.
8. Make sure the hot runner nozzle faces the moving platen.
9. Engage the guide pins into the stationary platen.
10. Secure the cavity plate to the stationary platen and torque the screws to the specified value. Refer to the assembly drawings for torque requirements.
11. Check the electrical circuit with an ohmmeter to make sure no wires were damaged during installation. Refer to the electrical schematic to identify each zone.

6.6 Removing and Installing the Valve Stems (SCVG Only)

The following procedures describe how to remove and install the valve stem in the single cavity valve gate (SCVG) assembly.

6.6.1 Removing the Valve Stem

Valve stems can be removed when the single cavity valve gate is cold or hot, with each method offering its own advantages and disadvantages.

Cold		Hot	
Advantage	Disadvantage	Advantage	Disadvantage
<ul style="list-style-type: none"> Fast removal reduces down time Easy to clean No danger from heat 	<ul style="list-style-type: none"> Valve stem may break More difficult to remove valve stem 	<ul style="list-style-type: none"> Reduces the risk of valve stems breaking Valve stems are easy to remove 	<ul style="list-style-type: none"> Slow, increased down time Difficult to clean Danger from heat May require a custom cable

To remove the valve stem from the single cavity valve gate (SCVG) assembly, do the following:

1. Remove the SCVG from the cavity plate. Refer to [Section 4.3.1](#) for more information.
2. Set the SCVG in a vise clamp with soft jaws with the nozzle tip facing down. Make sure the sprue body is in the clamp.
3. Inspect the weepage fitting for excess resin weepage. Refer to [Section 6.11](#) for information about the effects of excess resin weepage.
4. Remove the sprue bushing insert and extruder pad.
5. Remove the nozzle heater.
6. Remove the nozzle tip. Refer to [Section 6.7](#) for more information.
7. Remove the BHCS screws, lock washers and internal star washers that secure the valve stem retainer to the valve stem slider.
8. Remove the valve stem retainer.
9. If the valve stem will be removed while the SCVG is cold, proceed to [step 10](#). However, if the valve stem will be removed while the SCVG is hot, do the following:
 - a. Connect the SCVG to a controller.



DANGER!

Electrocution hazard – risk of death, serious injury and/or damage to the hot runner. Do not turn on the heaters if water has leaked into the hot runner. If water has leaked into the hot runner, the hot runner must be completely disassembled, dried and assembled before the heaters are turned on.



WARNING!

Hot resin spray hazard – risk of death or serious injury. The sprue heater must be turned on when the nozzle heater is on. Failure to do so could result in the generation of dangerous pressure levels in the nozzle housing, resulting in explosion or sudden release of hot resin.

**WARNING!**

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

**WARNING!**

Burn hazard – risk of serious injury. Hot runner components stay hot for long periods of time after heaters have been turned off. Wear personal protective equipment when working near the hot runner and place a warning sign in the area before leaving the hot runner unattended.

- b.** Increase the temperature of all heaters to a temperature high enough to soften the resin in the melt channels.
-

NOTE:

The Vicat Softening Temperature for the resin type is recommended. Refer to the resin suppliers documentation for more information.

**WARNING!**

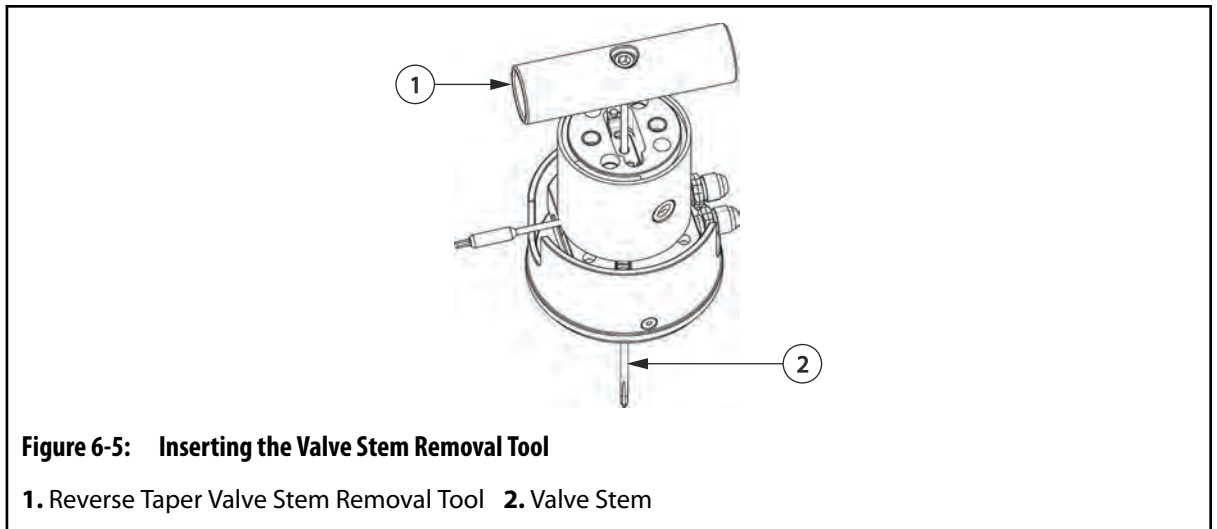
Electrocution hazard - risk of death or serious injury. Complete the lockout/tagout procedure of the electrical power source before disconnecting the electrical connectors.

- c.** Lock out and tag the electrical power source.
-

**IMPORTANT!**

Do not allow the nozzle to overheat or degraded material will have to be cleaned out of the nozzle housing before the valve stem can be installed later on.

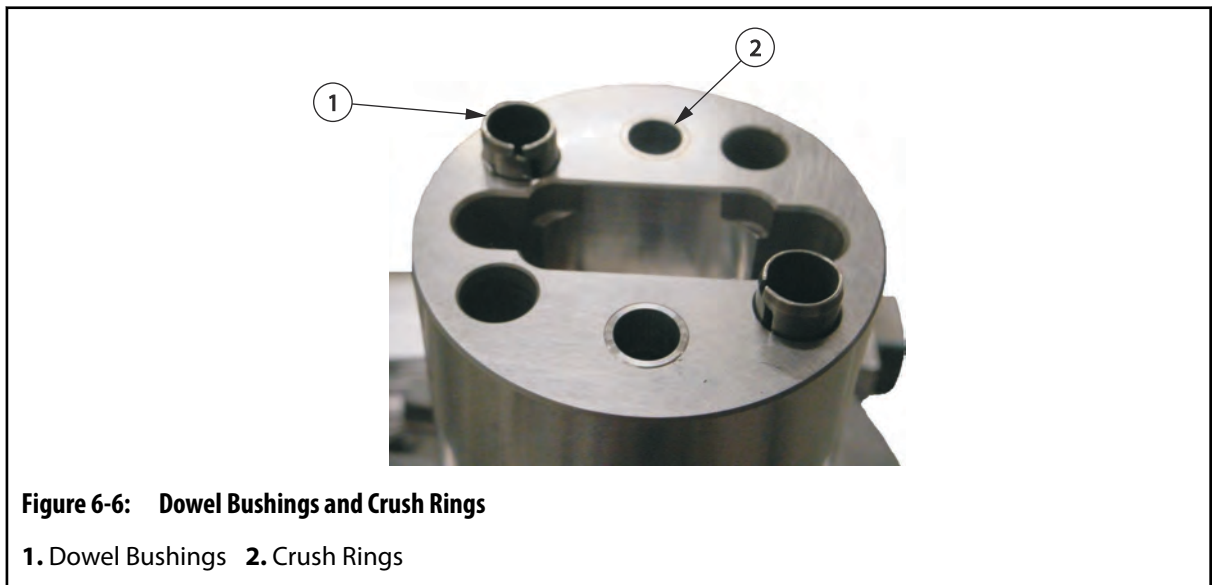
- d.** Disconnect the controller.
- 10.** Insert a reverse taper valve stem removal tool through the valve stem slider. Gently tap the removal tool, making sure to contact the valve stem only until the valve stem is free of the sprue body.
-



6.6.2 Installing the Valve Stem

To install the valve stem into the single cavity valve gate (SCVG), do the following:

1. Make sure the sprue body is set in a vise clamp with soft jaws with the nozzle tip facing down.
2. Replace the dowel bushings and crush rings in the sprue body.



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

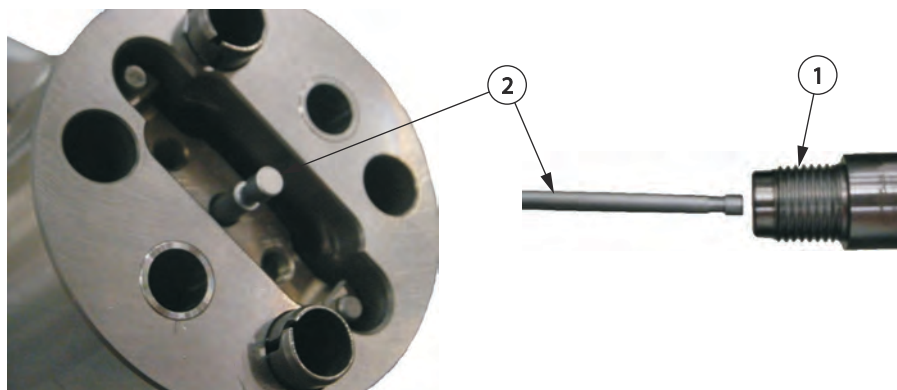


Figure 6-7: Valve Stem Installation

1. Nozzle Housing 2. Valve Stem (Head End)

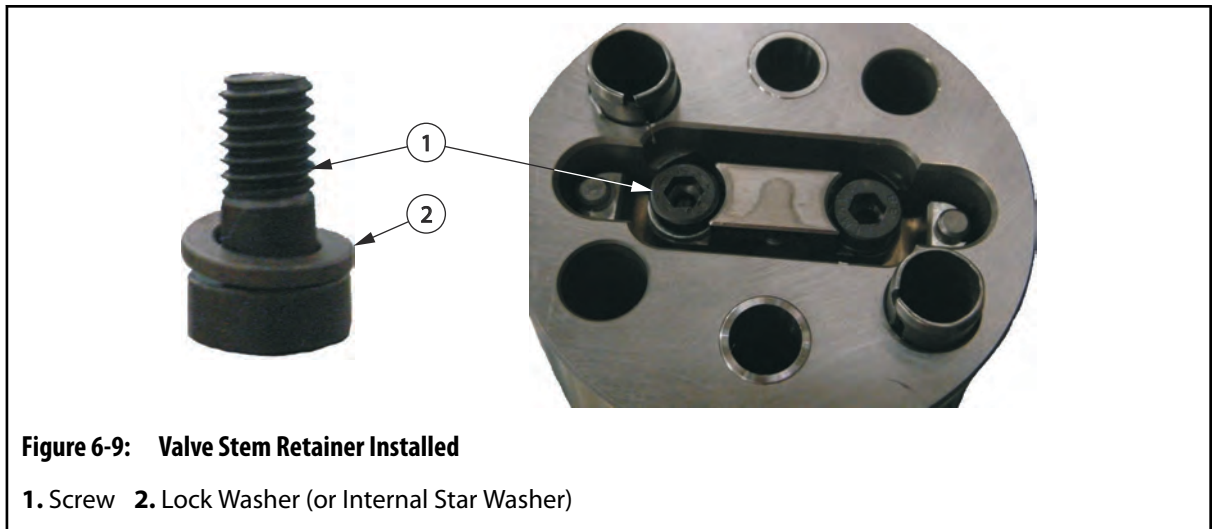
4. Place the valve stem retainer over the valve stem head.



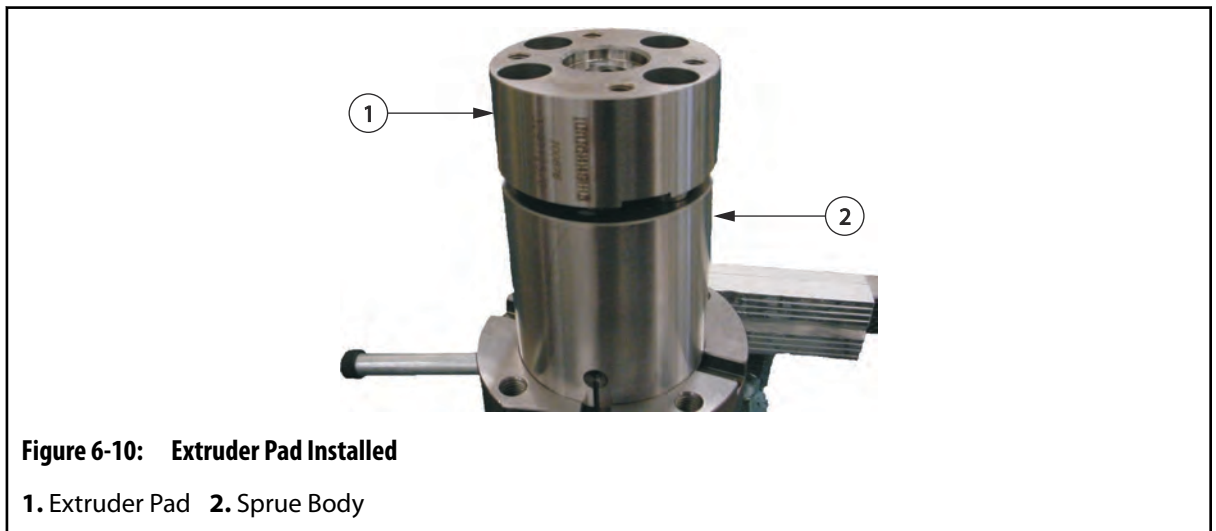
Figure 6-8: Valve Stem Retainer

1. Valve Stem Retainer

5. Apply a high temperature anti-seize lubricant to the screws that secure the valve stem retainer. Refer to [Section 3.5](#) for a list of recommended lubricants.
6. Install the screws that secure the valve stem retainer to the sprue body along with lock washers (or internal star washers). Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.



7. Make sure the valve stem moves freely within the sprue body.
8. Assemble the extruder pad onto the sprue body and align the screwholes.



9. Apply a high temperature anti-seize lubricant to screws that secure the extruder pad. Refer to [Section 3.5](#) for a list of recommended lubricants.
10. Install the screws that secure the extruder pad to the sprue body. Torque the screws to the specified value. Refer to the assembly drawings for torque specifications.
11. 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.
12. Coat four screws with a high temperature anti-seize lubricant.
13. 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.

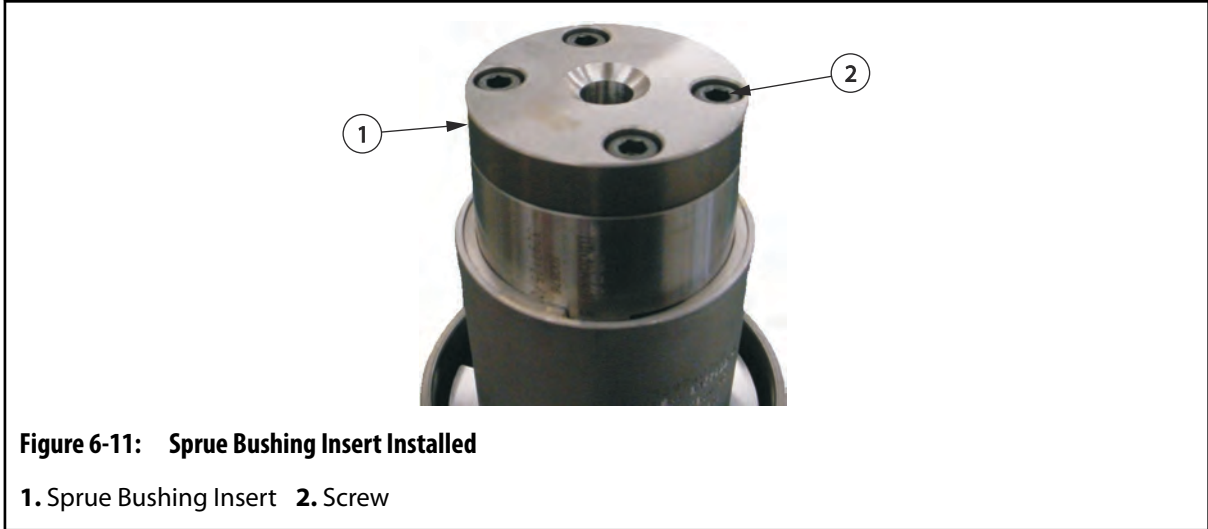


Figure 6-11: Sprue Bushing Insert Installed

1. Sprue Bushing Insert 2. Screw

- 14. Apply a high temperature anti-seize lubricant to the screws that secure the sprue bushing insert to the cylinder. Refer to [Section 3.5](#) for a list of recommended lubricants.
- 15. Install the screws that secure the sprue bushing insert to the cylinder. Torque the screws to the specified torque value. Refer to the assembly drawings for torque specifications.
- 16. Install the nozzle tip. Refer to [Section 6.7.3](#) for more information.
- 17. Install the nozzle heater.
- 18. Install the SCVG in the cavity plate. Refer to [Section 4.3.2](#) for more information.

6.7 Removing and Installing Nozzle Tips

The following procedures describe how to remove and install nozzle tips.



IMPORTANT!

The Ultra Helix Valve Gate nozzle heater must be removed to allow full engagement of the torque tool. The Husky supplied torque tool must be used to install the Ultra Helix nozzle tip or the tip may be damaged.

NOTE:

When removing the nozzle tips, it is recommended they be removed when the hot runner is at room temperature (< 25 °C or < 77 °F).

6.7.1 Removing the Nozzle Tips when Hot

To remove the nozzle tips when they are hot, do the following:

NOTE:

The following procedure should only be performed when the nozzle tips cannot be removed when the hot runner is at room temperature (<25 °C or <77 °F).

NOTE:

Thermal gate nozzle tips for U250 and U750 UP systems must always be removed when cold.

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5.1](#) for more information.
 2. For hot sprue systems, remove all nozzle heater components except for the nozzle heater and thermocouple. Refer to [Section 6.8](#) for more information.
 3. If necessary, connect the hot runner to a controller.
 4. Remove all locks and tags. Refer to [Section 2.5](#) for more information.
 5. Power up the machine or turn on the controller (if equipped).
-

**DANGER!**

Electrocution hazard – risk of death, serious injury and/or damage to the hot runner. Do not turn on the heaters if water has leaked into the hot runner. If water has leaked into the hot runner, the hot runner must be completely disassembled, dried and assembled before the heaters are turned on.

**WARNING!**

Hot resin spray hazard – risk of death or serious injury. Hot resin may unexpectedly spray from the nozzle tips while the hot runner is reaching operating temperature. To avoid serious burns, wear personal protective equipment consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

Burn hazard – risk of serious injury. Hot runner components stay hot for long periods of time after heaters have been turned off. Wear personal protective equipment when working near the hot runner and place warning sign in the area before leaving the hot runner unattended.

6. Increase the temperature of the nozzle housing to a temperature high enough to soften the resin around the nozzle tip threads. If there is no resin in the system, set the heat zones to room temperature (<25 °C or <77 °F).
-

NOTE:

The Vicat Softening Temperature for the resin type is recommended. Refer to the resin supplier’s 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.

7. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.



WARNING!

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

CAUTION!

Mechanical hazard – risk of damage to the equipment. Support nozzle tip sockets squarely over the nozzle tips to prevent side-load on the tip.

8. Using an appropriate nozzle tip socket, loosen each nozzle tip that will be removed. Do not unscrew or remove the nozzle tips.

Refer to [Section 1.7](#) for a list of available nozzle tip sockets.



WARNING!

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

9. Wearing appropriate personal protective equipment, hand tighten each nozzle tip while the resin is still soft until the nozzle tips touch the nozzle housing.
10. 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 hot runner. However, this step will reduce the risk of resin solidifying on the nozzle tip sealing surfaces.
11. Remove the nozzle tips using the nozzle tip socket.
12. For hot sprue systems, remove the nozzle heaters. Refer to [Section 6.8](#) for more information.
13. For thermal gate nozzle tips, separate the tip insert from the tip retainer. Refer to [Section 6.7.4](#) for more information.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

14. Remove any resin from the interior of the nozzle tip using a soft wire brush or equivalent.
15. Remove any resin from the interior and exterior of the nozzle housing using a soft wire brush or equivalent.

NOTE:

Do not remove locks and tags until the nozzle tips are installed.

6.7.2 Removing the Nozzle Tips when Cold

To remove the nozzle tips when they are cold, do the following:

NOTE:

Thermal gate nozzle tips for U250 and U750-UP systems must always be removed when cold.

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5.1](#) for more information.
2. For hot sprue systems, remove all nozzle heater components except for the nozzle heater and thermocouple. Refer to [Section 6.8](#) for more information.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Solidified resin can make it difficult to loosen the nozzle tips. Too much force when loosening the nozzle tips could damage the sealing surfaces.

If the nozzle tips do not loosen easily, heat up the nozzle tips before removing them. Refer to [Section 6.7.1](#) for more information.

3. Using an appropriate nozzle tip socket, loosen each nozzle tip that will be removed. Do not unscrew or remove the nozzle tips.
Refer to [Section 1.7](#) for a list of available nozzle tip sockets.
4. Remove the nozzle tips using the nozzle tip socket.
5. For thermal gate nozzle tips, separate the tip insert from the tip retainer. Refer to [Section 6.7.4](#) for more information.
6. For hot sprue systems, remove the nozzle heaters. Refer to [Section 6.8](#) for more information.

**IMPORTANT!**

Care must be taken to prevent damage to the nozzle tip and nozzle sealing surfaces.

7. Remove any resin from the interior of the nozzle tip using a soft wire brush or equivalent.

8. Remove any resin from the interior and exterior of the nozzle housing using a soft wire brush or equivalent.

NOTE:

Do not remove locks and tags until the nozzle tips are installed.

6.7.3 Installing Nozzle Tips

To install the nozzle tips, do the following:



IMPORTANT!

UltraHelix VG nozzle tips need to be installed after the valve stems are installed to reduce the risk of stem damage in cold condition, especially with drop locations farther away from the center of expansion. UltraHelix is especially susceptible to damage due to the smaller diameter of the Helix guiding feature.



IMPORTANT!

The Ultra Helix Valve Gate nozzle heater must be removed to allow full engagement of the torque tool. The Husky supplied torque tool must be used to install the Ultra Helix nozzle tip or the tip may be damaged.

NOTE:

Nozzle tips must be installed when the resin and nozzle housings are cold.

1. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.



IMPORTANT!

If resin or other residues are not thoroughly cleaned off the threads and seating areas of both the nozzle tip and 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 nozzle tip insulator, permitting the formation of degraded resin
- Thread stripping

2. Remove any resin or other residue found on the nozzle tips and nozzle housings.

3. If the nozzle housing has an external thread, proceed to [step 4](#). Otherwise, clean the nozzle tip seating surface at the bottom of the nozzle housing bore with a soft wire brush.
4. Make sure the nozzle tip and nozzle housing are clean and dry.
5. Using a nozzle tip socket, install the nozzle tip and torque it to the value printed on the nozzle tip. Refer to [Section 1.7](#) for a list of available nozzle tip sockets.
6. For hot sprue systems, install the nozzle heater. Refer to [Section 6.8](#) for more information.
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 assembly drawings.

If the nozzle tip height is outside the tolerances listed on the Tip Chart, refer to [Section 6.7.5](#).



Figure 6-12: Measuring the Nozzle Tip Height

8. Remove all locks and tags. Refer to [Section 2.5](#) for more information.
9. Install the cavity plate. Refer to [Section 6.5](#) for more information.

6.7.4 Removing Nozzle Tips from Nozzle Retainers (Thermal Gate Only)

The following procedures describe how to separate a tip insert from a nozzle retainer. Tip inserts can be removed using either a special tool available from Husky or manually using a brass rod (or equivalent).



IMPORTANT!

Using the removal tool to separate the tip inserts from the nozzle retainers is recommended. Removing the tip inserts using any other method will damage the tip inserts.



IMPORTANT!

Tip inserts cannot be removed from U250 nozzle tips.

6.7.4.1 Separating Tip Inserts and Nozzle Retainers With a Removal Tool

To remove a tip insert using the removal tool, do the following:

1. Place the nozzle retainer in the tip removal tool.

NOTE:

Refer to [Section 1.7](#) for a list of special Husky tools and order numbers.

2. Turn the knob on top of the tool clockwise until the tip insert is free of the retainer.

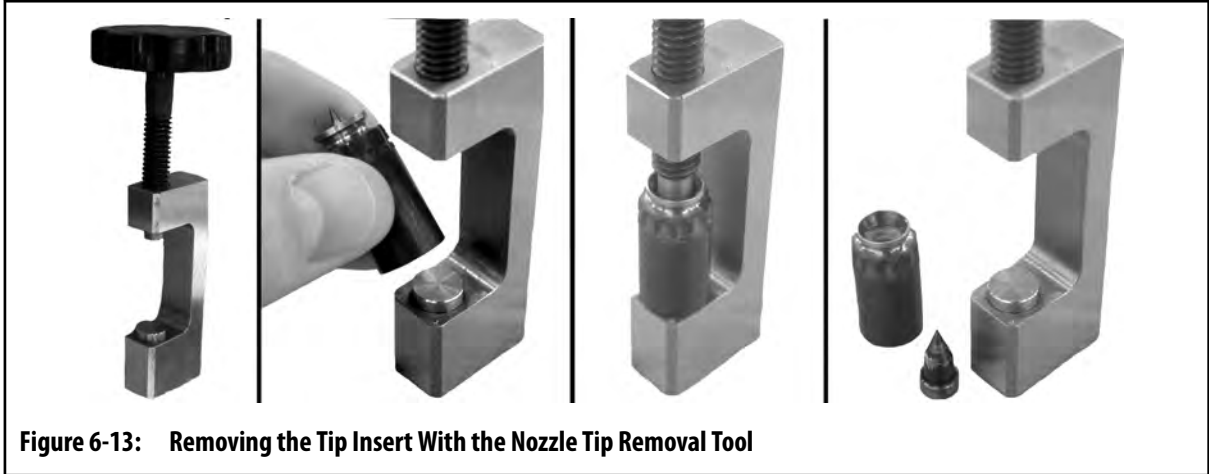


Figure 6-13: Removing the Tip Insert With the Nozzle Tip Removal Tool

3. Inspect the nozzle tip for excessive wear, scoring, or other damage. Replace if necessary.

6.7.4.2 Separating Tip Inserts and Nozzle Retainers Without a Removal Tool

To remove a tip insert without using the removal tool, do the following:

CAUTION!

Mechanical hazard – risk of damage to equipment. Using any tool other than the removal tool offered by Husky will damage the tip inserts. Replace all tip inserts after removing them.



WARNING!

Burn, fire and gas hazard – risk of death or serious injury, and property damage. Use of an open flame to remove resin could 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.

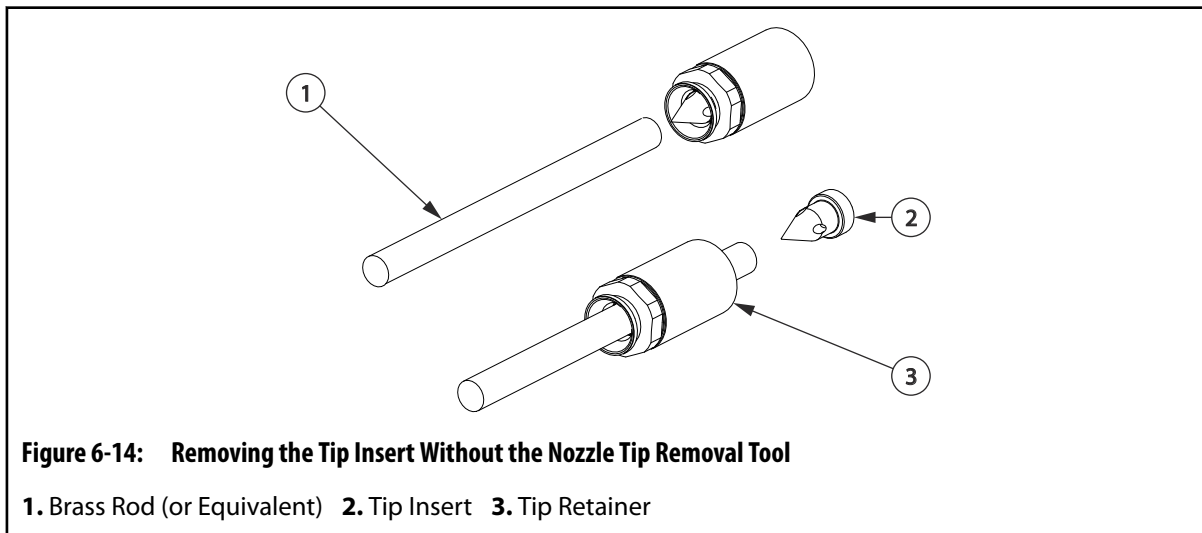


WARNING!

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

1. Using a propane torch, carefully heat the tip retainer until the resin inside softens.

- Press the nozzle tip out of the nozzle retainer using a soft brass rod or equivalent. The tool must have an outer diameter smaller than the inside diameter of the tip retainer.



- Replace the tip insert.

6.7.5 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.

Problem	Reason	Action
Dimension is shorter than required tip height	Nozzle tip has been over-tightened, worn, or damaged	<ol style="list-style-type: none"> Remove the nozzle tip Clean resin from the nozzle tip and nozzle housing 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.	<ol style="list-style-type: none"> Remove the nozzle tip Clean resin from the nozzle tip and nozzle housing Re-apply the torque to the nozzle tip Verify the nozzle tip height

6.8 Removing and Installing Nozzle Heaters

The following procedures describe how to remove and install nozzle heaters. The following types of nozzle heaters are supported:

- HTM heaters for U250 systems
- HTM heaters for U350, U500 and U750 systems

- HTM heaters for U1000 systems
- Copper heaters for U500 systems
- Ultra Nozzle Heaters (UNH) with front rings for U500 and U750 systems
- Ultra Nozzle Heaters (UNH) with ring thermocouples for U500 and U750 systems
- Bi-metal heaters for U750 and U1000 systems
- Triton heaters for U750-UP systems



IMPORTANT!

Husky nozzle heaters are rugged and have a long service life. Only replace nozzle heaters with Husky approved parts. Use of components not sold or approved by Husky will void the hot runner warranty.

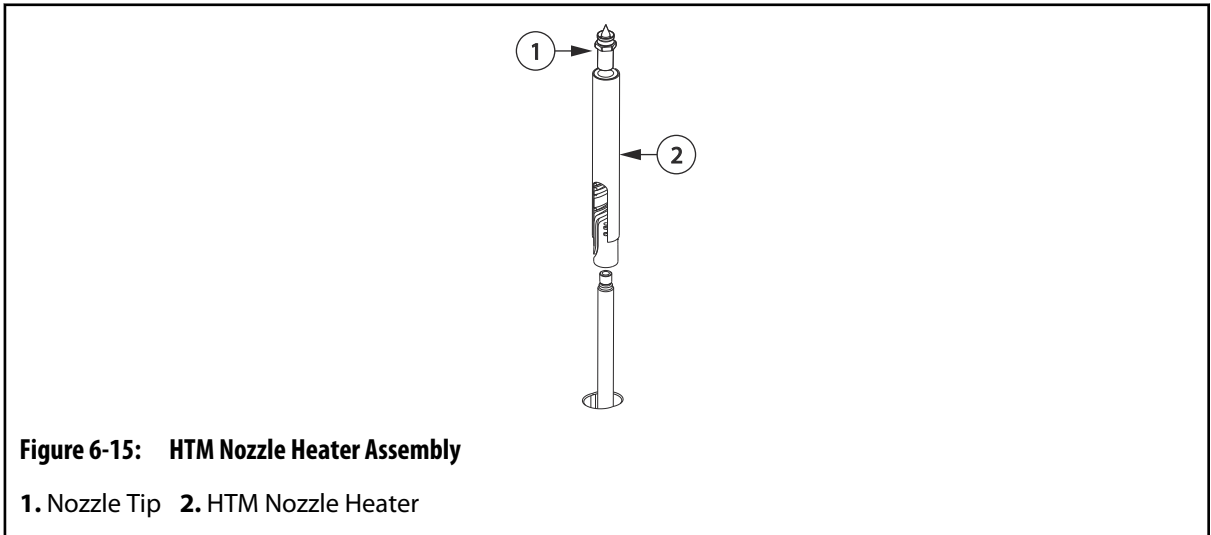
6.8.1 Removing and Installing HTM Nozzle Heaters for U250 Systems

The following procedures describe how to remove and install HTM nozzle heaters for U250 systems.

6.8.1.1 Removing HTM Heaters for U250 Systems

To remove an HTM nozzle heater, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5](#) for more information.
2. Loosen the set screw at the top of the nozzle heater.



3. Remove the nozzle tip.
4. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

NOTE:

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

5. Remove the nozzle heater assembly.

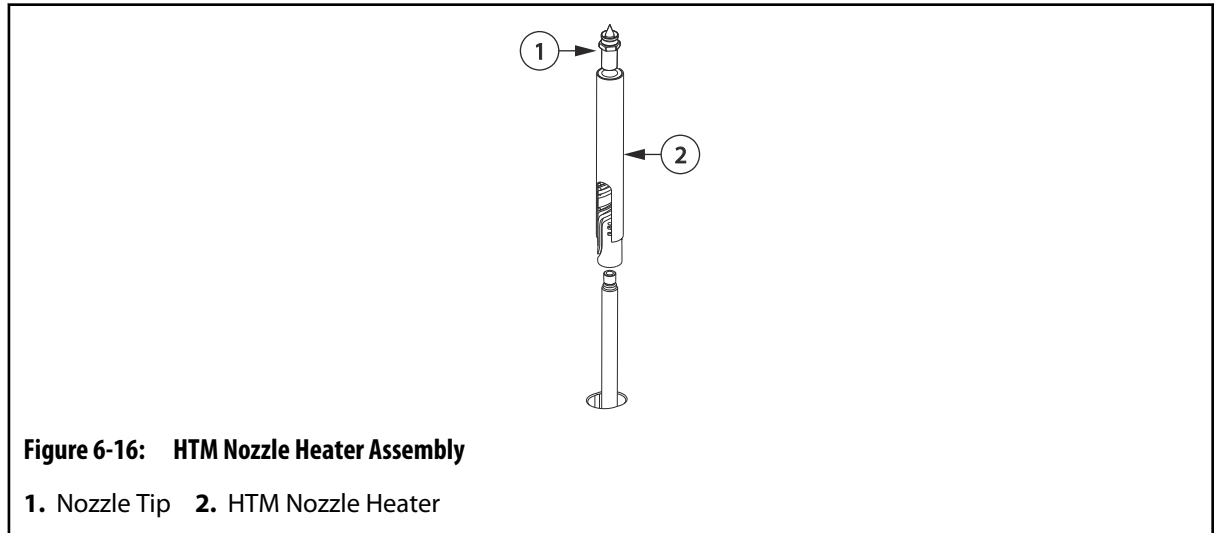
6.8.1.2 Installing HTM Heaters for U250 Systems

To install an HTM nozzle heater for U250 systems, do the following:

NOTE:

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

1. Slide the nozzle heater assembly over the nozzle housing.



2. Install the nozzle tip. Refer to [Section 6.7](#) for more information.
3. Raise the nozzle heater assembly up until it contacts the hex section of the nozzle tip and tighten the set screw.
4. Torque the set screw to the value specified on the assembly drawing.
5. Route the nozzle heater and thermocouple wires through the wire channels in the manifold plate. Make sure all wiring is properly retained in the wire channels using wire clips.
6. Make sure to stagger the knuckles in the wire grooves.



NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

7. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.
8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
9. Test each nozzle heater. Refer to [Section 6.4](#) for more information.

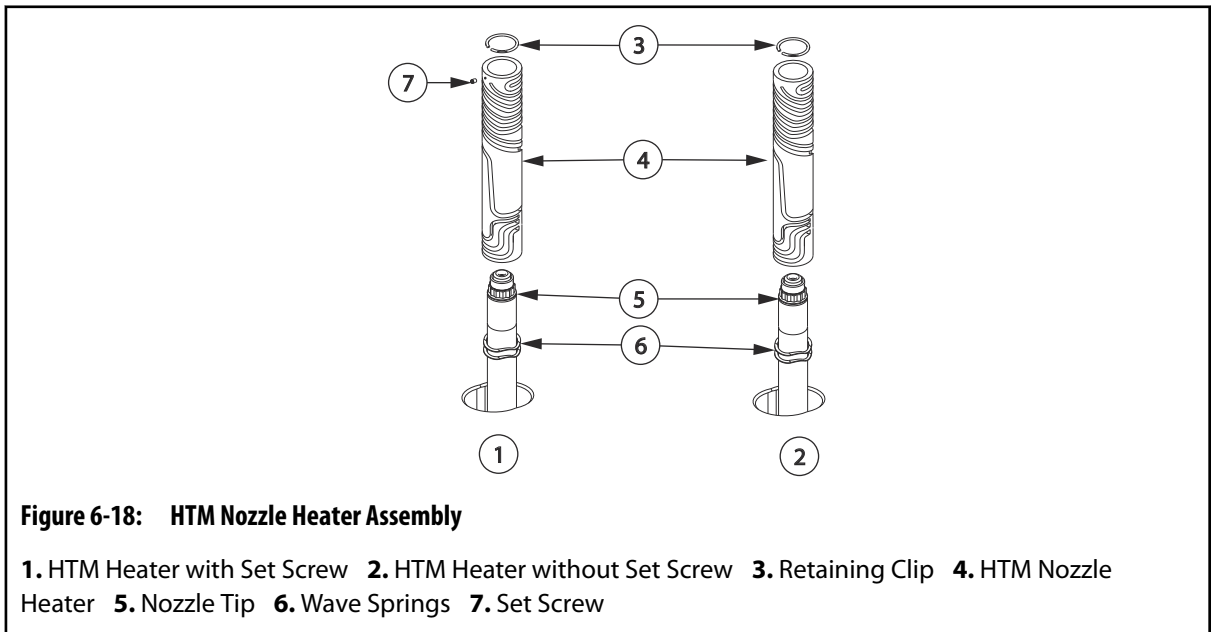
6.8.2 Removing and Installing HTM Nozzle Heaters for U350, U500 and U750 Systems

The following procedures describe how to remove and install HTM nozzle heaters for U350, U500 and U750 systems.

6.8.2.1 Removing HTM Nozzle Heaters

To remove an HTM nozzle heater, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5](#) for more information.
2. Remove the retaining clip from the nozzle tip.



3. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

NOTE:

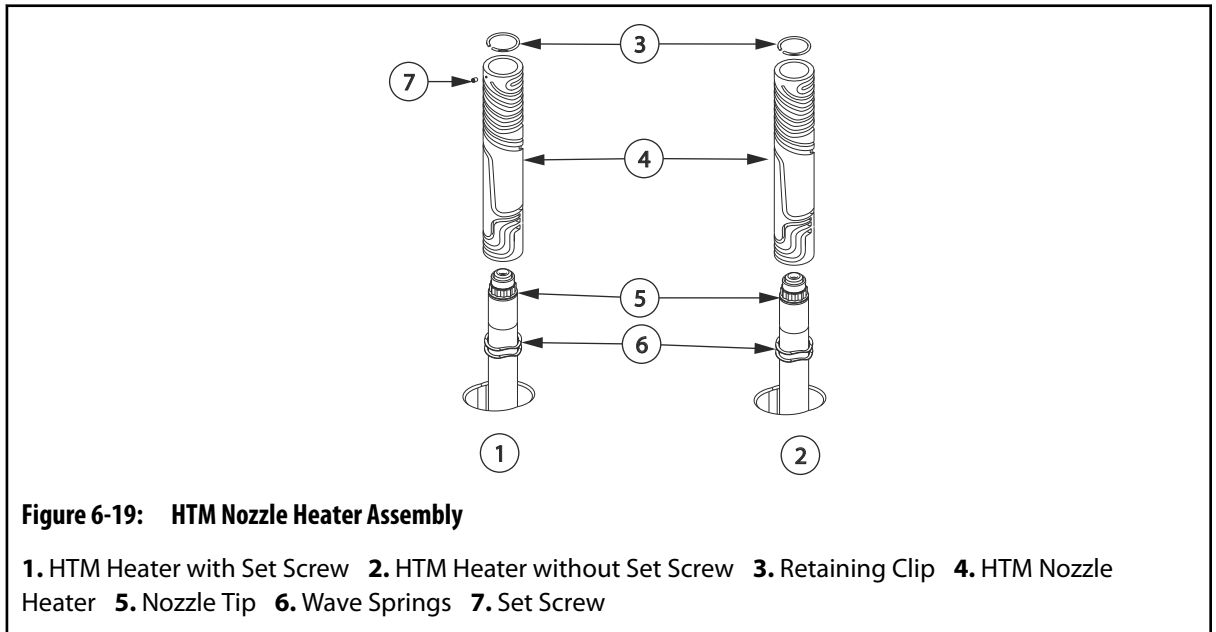
The nozzle heater assembly includes the retaining sleeve, nozzle heater and thermocouple.

4. Remove retaining set screw on the heater sleeve, if applicable.
5. Remove the nozzle heater assembly.
6. Remove and discard the wave springs.

6.8.2.2 Installing HTM Nozzle Heaters

To install an HTM nozzle heater, do the following:

1. Install new wave springs over the nozzle housing and nozzle tip.



NOTE:

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

2. Slide the nozzle heater assembly over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.
3. Install the retaining clip on the nozzle tip and pull the nozzle heater assembly up against it.
4. Install the set screw, if applicable.
5. Route the nozzle heater and thermocouple wires through the wire channels in the manifold plate. Make sure all wiring is properly retained in the wire channels using wire clips.
6. Make sure to stagger the knuckles in the wire grooves.



NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

7. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.
8. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
9. Test each nozzle heater. Refer to [Section 6.4](#) for more information.
10. Install the cavity plate. Refer to [Section 6.5](#) for more information.

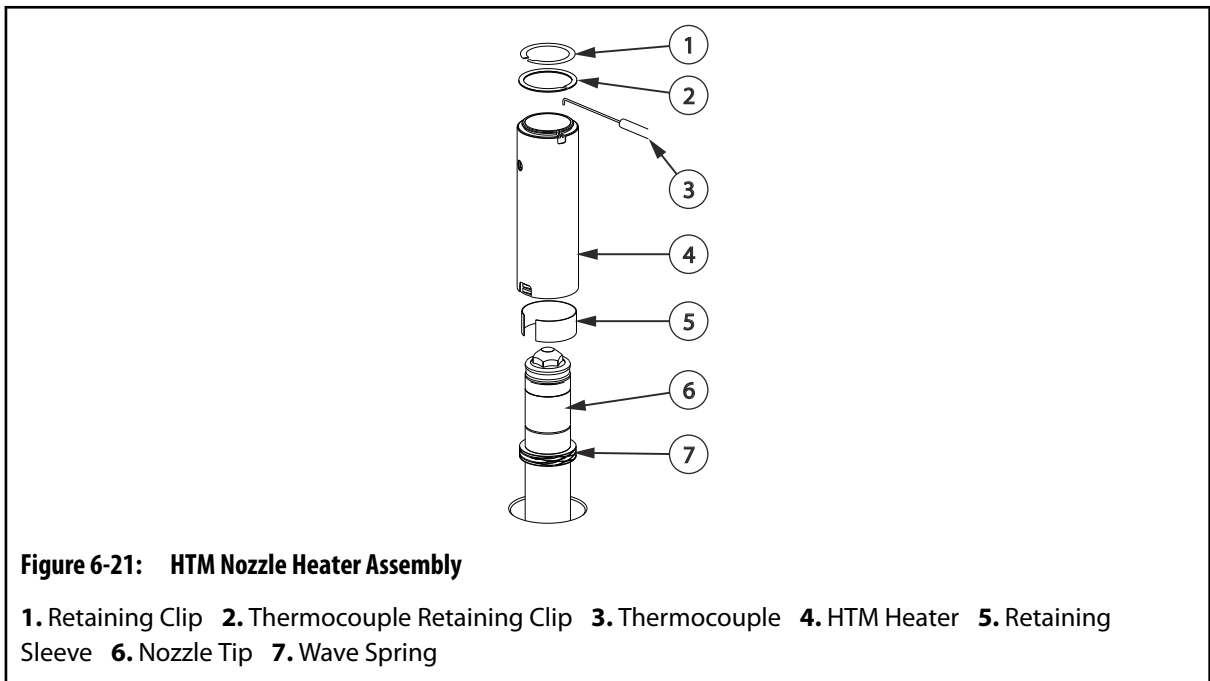
6.8.3 Removing and Installing HTM Nozzle Heaters for U1000 Systems

The following procedures describe how to remove and install HTM nozzle heaters for U1000 systems.

6.8.3.1 Removing HTM Nozzle Heaters for U1000 Systems

To remove the HTM nozzle heaters for a U1000 system, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5](#) for more information.
2. Remove the retaining clip from the nozzle tip.



3. Remove the retaining sleeve, if applicable.
4. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.

NOTE:

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

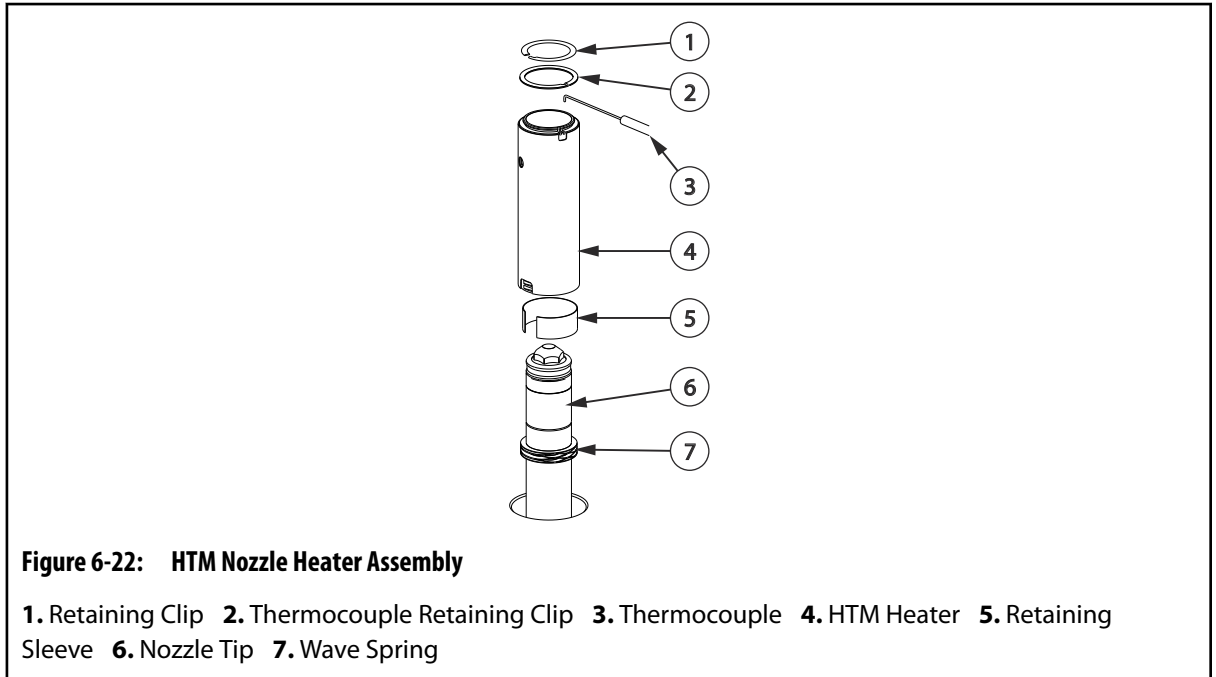
5. Remove the thermocouple retaining clip from the nozzle heater.
6. Disconnect the thermocouple from the nozzle heater.
7. Remove the nozzle heater and thermocouple.

8. Remove and discard the wave springs.

6.8.3.2 Installing HTM Nozzle Heaters for U1000 Systems

To install an HTM heater for a U1000 system, do the following:

1. Install new wave springs over the nozzle housing and nozzle tip.



2. Slide the nozzle heater assembly over the nozzle housing.
3. With the tip of the thermocouple pointed down, insert the thermocouple into one of the thermocouple probe holes. If required, insert a second thermocouple into the other hole.
4. Install the thermocouple retaining clip on the nozzle heater.
5. Install the retaining clip on the nozzle tip.
6. Bend the thermocouple so it is tight to the heater body.
7. Install the retaining sleeve over the nozzle heater and thermocouple, if applicable.
8. Route the nozzle heater and thermocouple wires through the wire channels in the manifold plate. Make sure all wiring is properly retained in the wire channels using wire clips.
9. Pull the heater away from the retaining clip and release it. Make sure the heater moves back into place and contacts the retaining clip.
10. Make sure to stagger the knuckles in the wire grooves.



NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

11. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.
12. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
13. Test each nozzle heater. Refer to [Section 6.4](#) for more information.
14. Install the cavity plate. Refer to [Section 6.5](#) for more information.

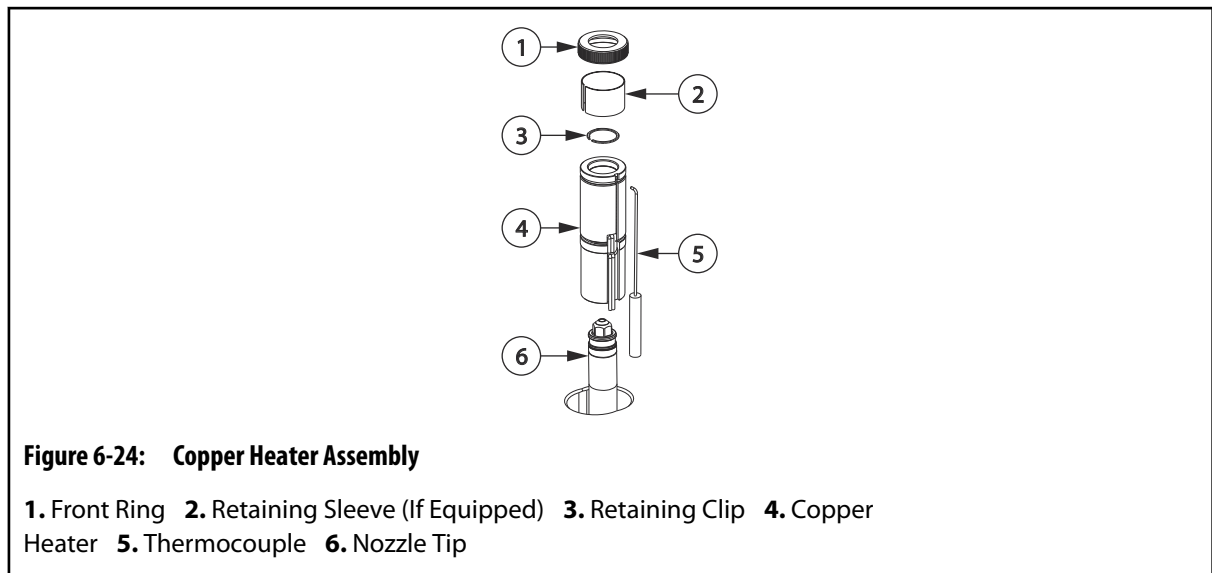
6.8.4 Removing and Installing Copper Heaters

The following procedures describe removing and installing copper heaters.

6.8.4.1 Removing Copper Heaters

To remove a copper heater, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5.1](#) for more information.
2. Remove the front ring.



3. If equipped, remove the retaining sleeve.
4. Disconnect the thermocouple from the nozzle heater.
5. Remove the retaining clip from the nozzle tip.

CAUTION!

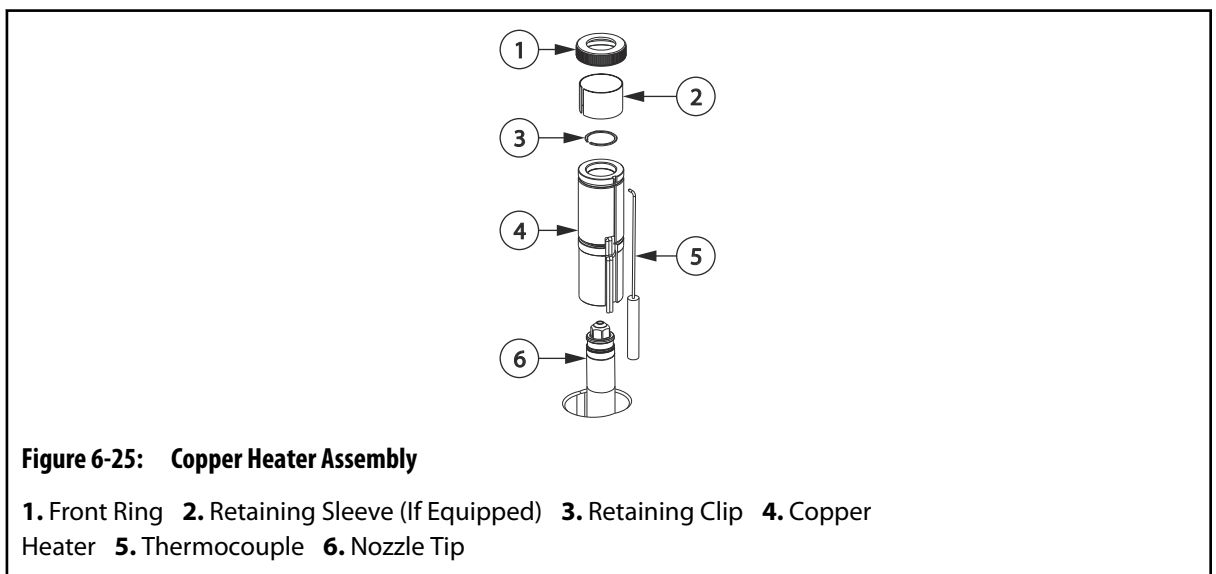
Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

6. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
7. Remove the nozzle heater and thermocouple.

6.8.4.2 Installing Copper Nozzle Heaters

To install a copper heater, do the following:

1. Slide the nozzle heater assembly over the nozzle housing.



2. Install the retaining clip on the nozzle tip.
3. Insert the probe end of the thermocouple into the probe slot in the nozzle heater.
4. If equipped, install the retaining sleeve over the nozzle heater and thermocouple.
5. Raise the nozzle heater until it makes contact with the retaining clip and install the front ring.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Caution must be taken to not pull the thermocouple out from under the front ring when connecting the wires. This could result in faulty temperature readings and possibly overheat the nozzle heater and other components.

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



Figure 6-26: Staggering the Knuckles in the Wire Grooves

NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

8. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.
9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
10. Test each nozzle heater. Refer to [Section 6.4](#) for more information.
11. Remove all locks and tags. Refer to [Section 2.5](#) for more information.

6.8.5 Removing and Installing Ultra Nozzle Heaters With Front Rings (UNH 500 and 750)

The following procedures describe how in remove and install ultra nozzle heaters with front rings.

6.8.5.1 Removing Ultra Nozzle Heaters (UNH) With Front Rings

To remove an Ultra Nozzle Heater (UNH) with a front ring, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5.1](#) for more information.
2. Remove the front ring.

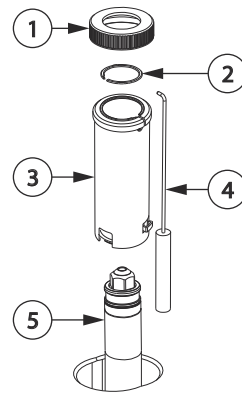


Figure 6-27: Ultra Nozzle Heater (UNH) Assembly With Front Rings

1. Front Ring 2. Retaining Clip 3. Ultra Nozzle Heater (UNH) 4. Thermocouple 5. Nozzle Tip

3. Disconnect the thermocouple from the nozzle heater.
4. Remove the retaining clip from the nozzle tip.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater and thermocouple.

6.8.5.2 Installing Ultra Nozzle Heaters (UNH) with Front Rings

To install an Ultra Nozzle Heater (UNH) with a front ring, do the following:

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

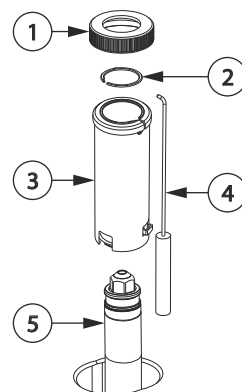


Figure 6-28: Ultra Nozzle Heater (UNH) Assembly with a Front Ring

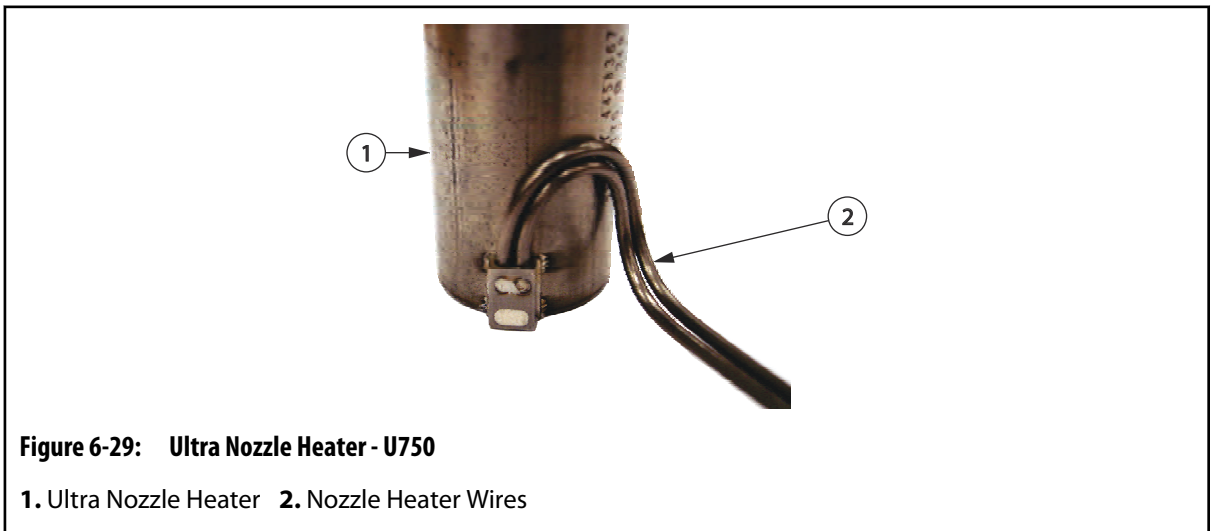
1. Front Ring 2. Retaining Clip 3. Ultra Nozzle Heater (UNH) 4. Thermocouple 5. Nozzle Tip

2. Install the retaining clip around the nozzle tip.
3. Connect the thermocouple to the nozzle heater.
4. Pull the nozzle heater up against the retaining clip.
5. Install the front ring and tighten by hand.

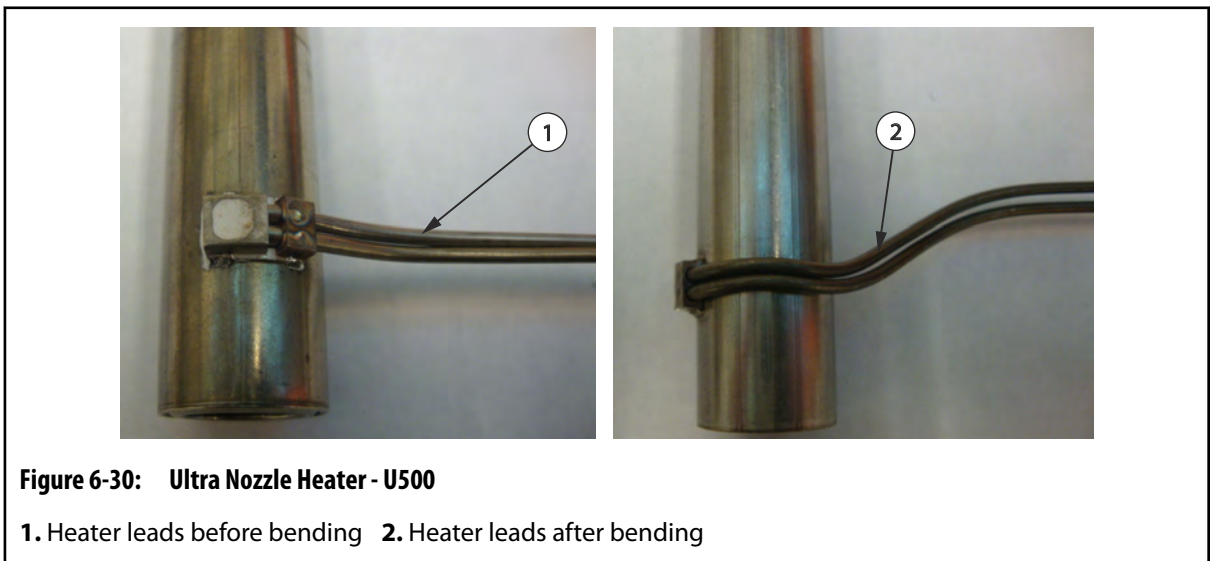
CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle. Do not bend the nozzle heater wires directly at the lead exit of the heater body. The wires will crack or break over time.

6. On the U750 heaters, bend the nozzle heater wires in an arc against the heater body. Make sure each bend has a minimum 10 mm (0.4 in) radius.



7. On U500 heaters, first bend the leads along the curvature of the heater, and then bend them up or down (away from the lead exit of the heater body) to meet the manifold plate wire groove as required.



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



Figure 6-31: Staggering the Knuckles in the Wire Grooves

NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

-
10. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.
 11. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
 12. Test each nozzle heater. Refer to [Section 6.4](#) for more information.

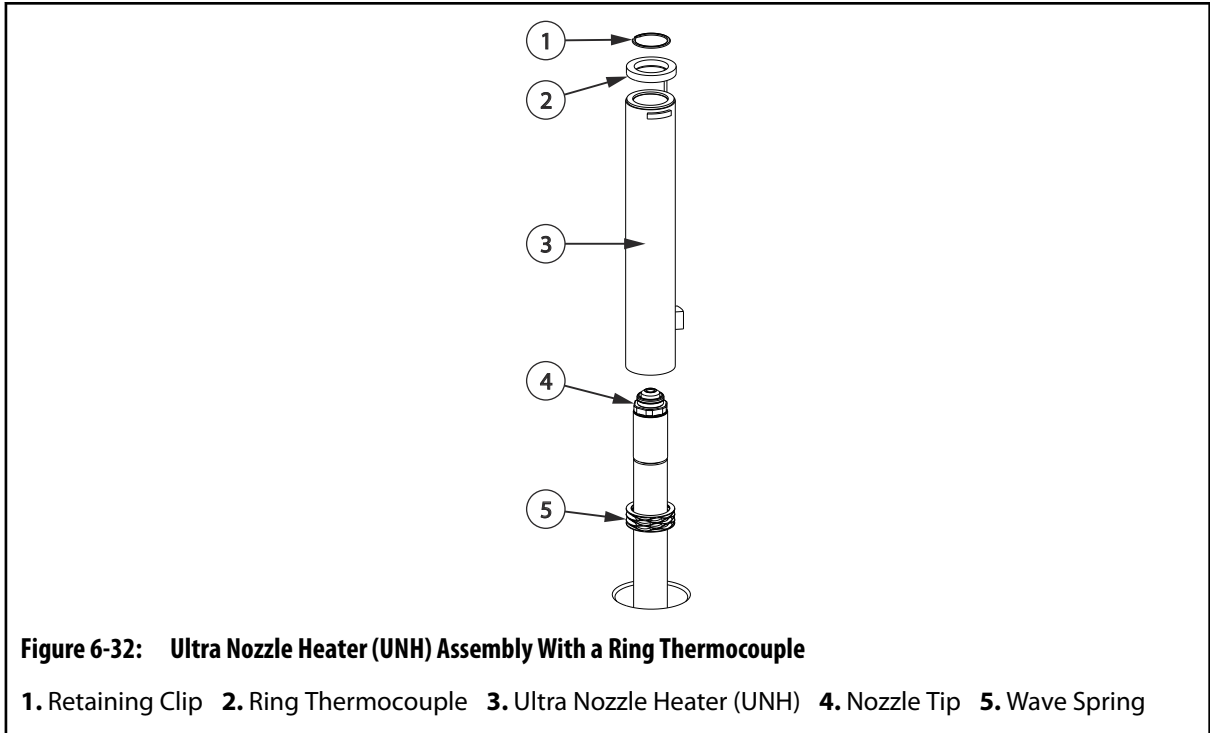
6.8.6 Removing and Installing Ultra Nozzle Heaters (UNH) With Ring Thermocouples

The following procedures describe how to remove and install ultra nozzle heaters with ring thermocouples (UNH 500 and UNH 750).

6.8.6.1 Removing Ultra Nozzle Heaters (UNH) With Ring Thermocouples

To replace an Ultra Nozzle Heater (UNH) with a ring thermocouple, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5](#) for more information.
2. Remove the retaining clip from the nozzle tip.
3. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
4. Remove the ring thermocouple.



- 5. Remove the nozzle heater.
- 6. Remove and discard the wave springs.

6.8.6.2 Installing Ultra Nozzle Heaters (UNH) With Ring Thermocouples

To install an Ultra Nozzle Heater (UNH) with a ring thermocouple, do the following:

- 1. Install new wave springs over the nozzle housing and nozzle tip.

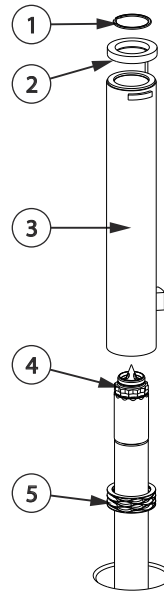


Figure 6-33: Ultra Nozzle Heater (UNH) Assembly With a Ring Thermocouple

1. Retaining Clip 2. Ring Thermocouple 3. Ultra Nozzle Heater (UNH) 4. Nozzle Tip
5. Wave Spring

2. Slide the nozzle heater over the nozzle housing far enough to show the retaining clip groove on the nozzle tip.
3. Slide the ring thermocouple over the nozzle tip, on to the nozzle heater, far enough to show the retaining clip groove on the nozzle tip.
4. Install the retaining clip on the nozzle tip and pull the nozzle heater and ring thermocouple up against it.



IMPORTANT!

Make sure the retaining ring is snapped fully into the retaining clip groove around the whole diameter of the nozzle tip. Refer to the following figure.

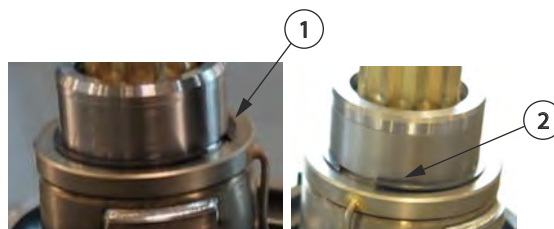


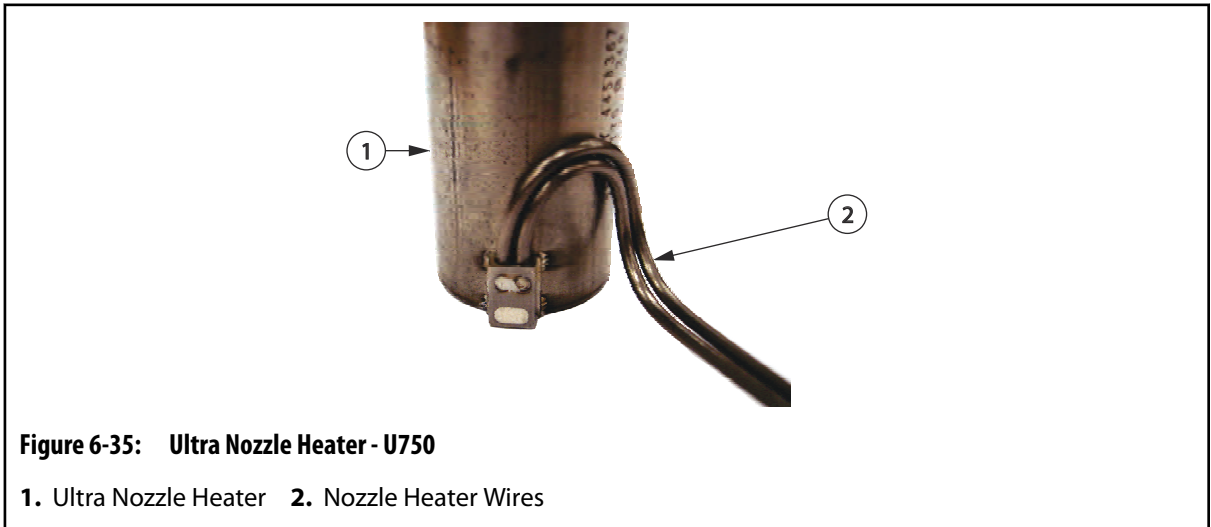
Figure 6-34: Retaining Ring in Nozzle Tip Groove

1. Retaining Clip Fully Seated in Groove (Correct)
2. Retaining Clip Not Fully Seated in Groove (Incorrect)

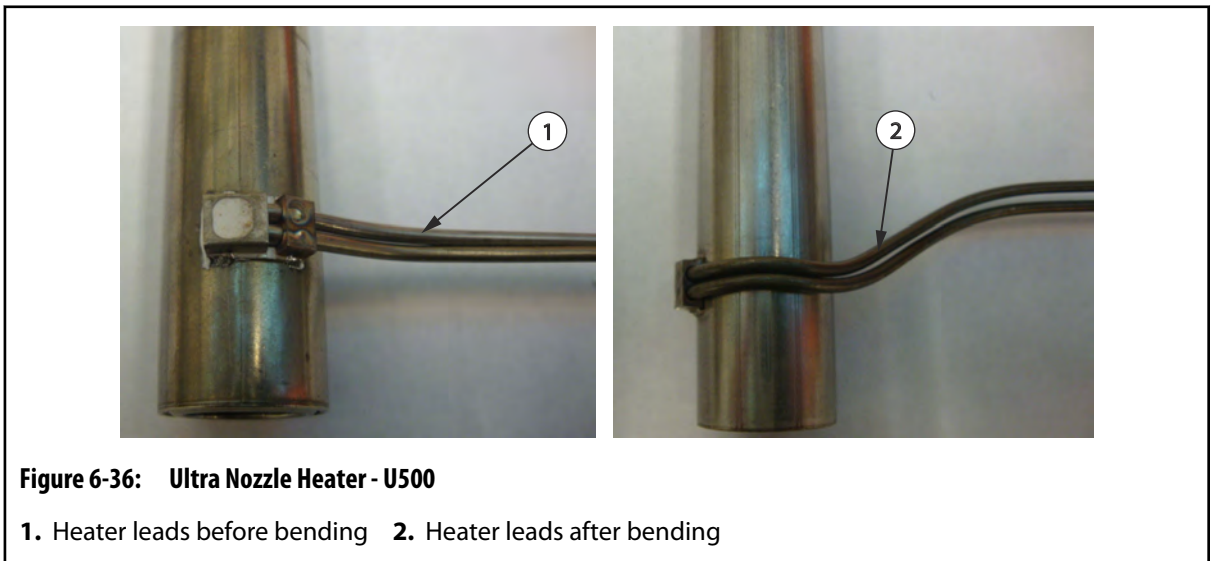
CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle. Do not bend the nozzle heater wires directly at the lead exit of the heater body. The wires will crack or break over time.

5. On U750 heaters, bend the nozzle heater wires in an arc against the heater body. Make sure each bend has a minimum 10 mm (0.4 in) radius.



6. On U500 heaters, first bend the leads along the curvature of the heater, and then bend them up or down (away from the lead exit of the heater body) to meet the manifold plate wire groove as required.



7. Route the nozzle heater and thermocouple wires through the wire channels in the manifold plate. Make sure all wiring is properly retained in the wire channels using wire clips. Make sure of the following:
 - a. Wiring does not protrude above the plate surface.

- b.** The heater and thermocouple spring back to the retaining ring and maintain contact with each other after being pushed down (0.5 to 2mm) on the housing. See the following figure.

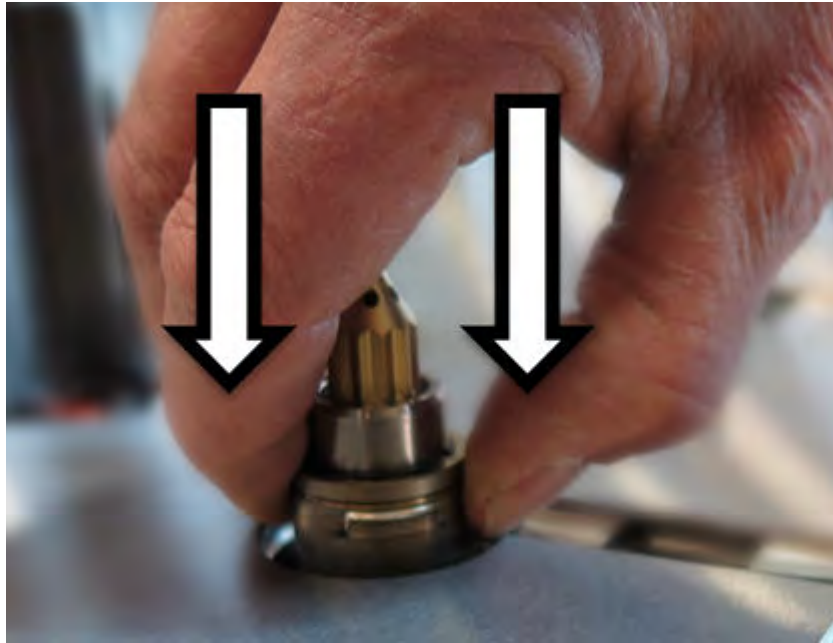


Figure 6-37: Heater/ Thermocouple Spring Back to Retaining Ring

NOTE:

If the heater and thermocouple do not spring back to the snap ring or maintain contact with each other, the bends in the wiring may be at fault.

- Wire routing must not over constrain heater positioning on nozzle.
- Wiring contacting a wire groove clip can restrict spring-back motion.
- Adjust wiring by pushing it down towards the bottom of the wire groove.
- Wiring must not protrude above the plate surface.

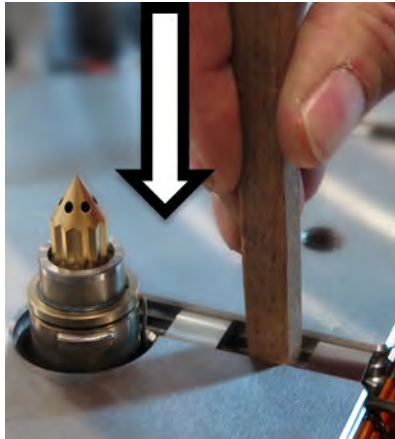


Figure 6-38: Wiring Placement in Groove

NOTE:

Proper operation of the Ultra Nozzle Heater requires the force of the wave spring to maintain contact between the thermocouple ring and nozzle heater. Improper installation may result in processing issues.

8. Make sure to stagger the knuckles in the wire grooves.



Figure 6-39: Staggering the Knuckles in the Wire Grooves

NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

9. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.

10. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
11. Test each nozzle heater. Refer to [Section 6.4](#) for more information.
12. Remove all locks and tags. Refer to [Section 2.5](#) for more information.

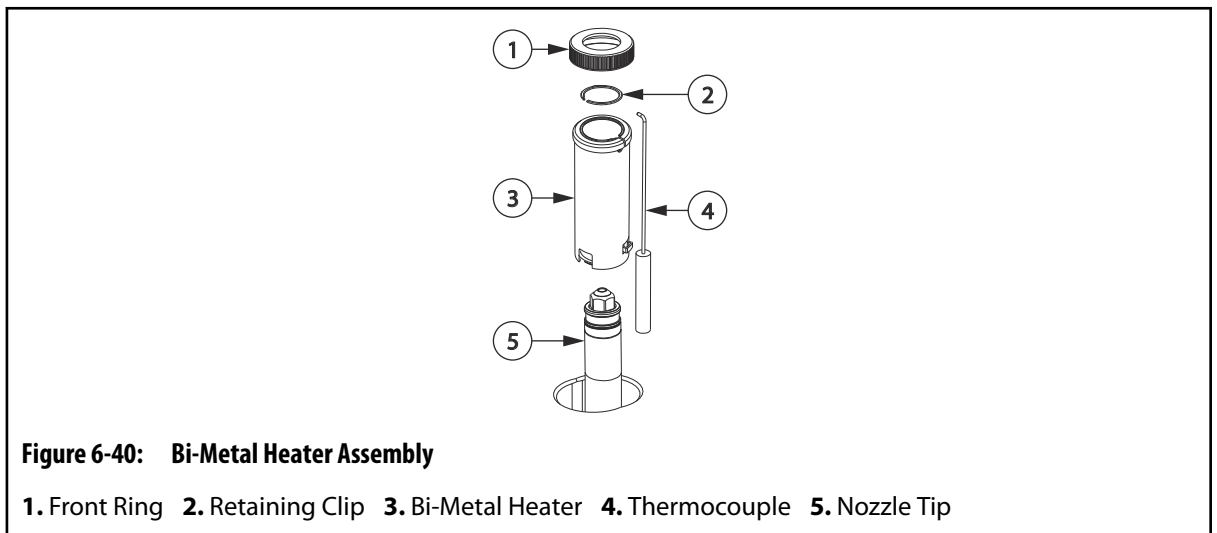
6.8.7 Removing and Installing Bi-Metal Heaters

The following procedures describe how to remove and install bi-metal heaters.

6.8.7.1 Removing Bi-Metal Heaters

To remove a bi-metal heater, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5.1](#) for more information.
2. Remove the front ring.



3. Disconnect the thermocouple from the nozzle heater.
4. Remove the retaining clip from the nozzle tip.

CAUTION!

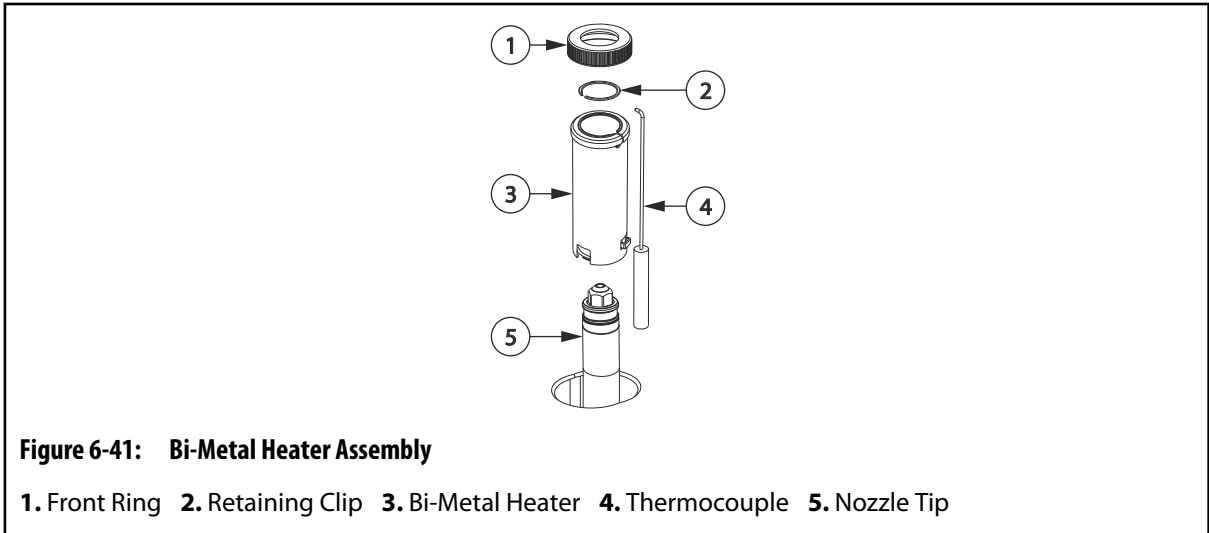
Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

5. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
6. Remove the nozzle heater and thermocouple.

6.8.7.2 Installing Bi-Metal Heaters

To install a bi-metal heater, do the following:

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



2. Install the retaining clip around the nozzle tip.
3. Connect the thermocouple to the nozzle heater.
4. Pull the nozzle heater up against the retaining clip.
5. Install the front ring and tighten by hand.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

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



NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

8. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.

9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
10. Test each nozzle heater. Refer to [Section 6.4](#) for more information.
11. Remove all locks and tags. Refer to [Section 2.5](#) for more information.

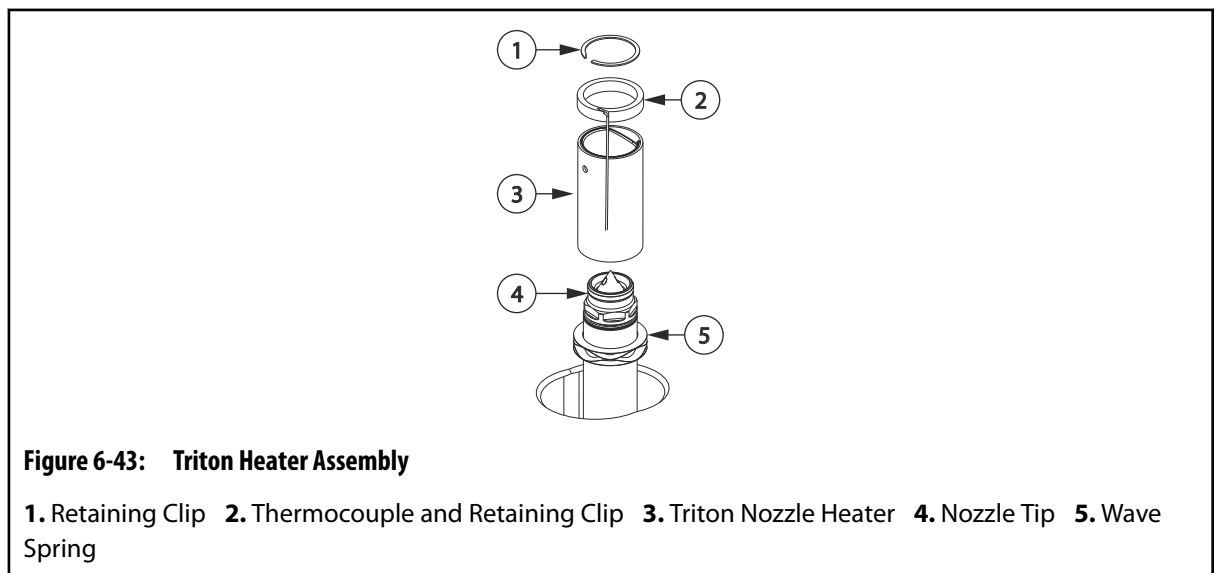
6.8.8 Removing and Installing Triton Heaters

The following procedures describe how to remove and install Triton heaters.

6.8.8.1 Removing Triton Heaters

To remove a Triton heater, do the following:

1. Separate or remove the cavity plate from the hot runner. Refer to [Section 6.5.1](#) for more information.
2. While holding the retaining clip and nozzle heater firmly against the wave springs, remove the retaining clip from the nozzle tip.



3. Remove the thermocouple and retaining clip from the nozzle heater.

CAUTION!

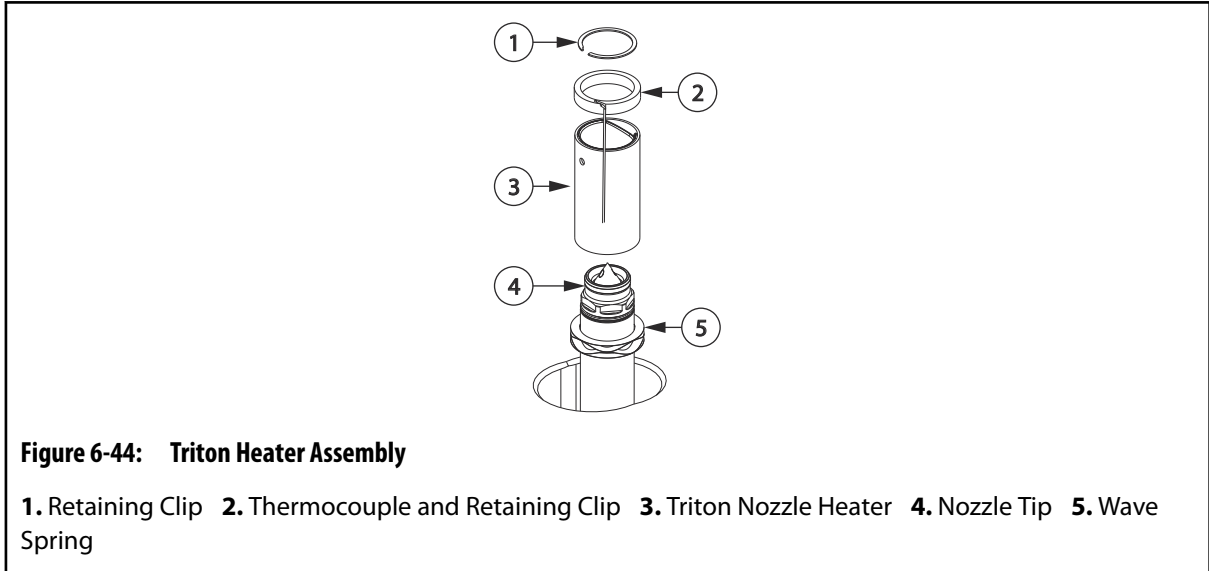
Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

4. Remove the necessary wire clips to expose the nozzle heater and thermocouple wires.
5. Remove the retaining clip.
6. Remove and inspect the wave springs. Discard the wave springs if either they are compressed by more than 3 mm (0.12 in) or show signs of wear or damage.

6.8.8.2 Installing Triton Heaters

To install a Triton heater, do the following:

1. Slide the wave springs over the nozzle housing and nozzle tip. Refer to the assembly drawings to determine the number of wave springs required.



2. Slide the nozzle heater over the nozzle housing and nozzle tip.
3. Install the thermocouple and retaining clip over the nozzle heater.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not bend the nozzle heater wires at a 90° angle because the wires will crack or break over time. Bend the nozzle heater wires in an arc against the heater body and make sure each bend has a minimum radius of 10 mm (0.4 in).

4. Orient the thermocouple wires on the same side as the nozzle heater wires.
5. While holding the retaining clip and nozzle heater firmly against the wave springs, install the retaining clip in the groove in the nozzle tip.
6. Route the nozzle heater and thermocouple wires through the wire channels in the manifold plate. Make sure all wiring is properly retained in the wire channels using wire clips.
7. Make sure to stagger the knuckles in the wire grooves.



NOTE:

All wire, including heater or thermocouple wire, that could contact a heated component such as a nozzle housing or manifold must be mineral insulated high temperature wire (hard lead). If the mineral insulated lead is not long enough to allow this, additional steps must be taken, such as using high temperature sleeving, to prevent the knuckles and PTFE or Kapton insulated wire (soft lead) from overheating.

-
8. Label each wire with the heater zone number. Refer to the electrical schematic for the zone number.
 9. Crimp the wire ends and connect the wires to the appropriate multi-pin connectors. Refer to the electrical schematic for more information.
 10. Test each nozzle heater. Refer to [Section 6.4](#) for more information.
 11. Remove all locks and tags. Refer to [Section 2.5](#) for more information.

6.9 Removing and Installing Nozzle Tip Insulators

Nozzle tip insulators protect the gate details and nozzle tips from damage and prevent resin leaks. The following procedures describe how to remove and install nozzle tip insulators.

6.9.1 Removing the Nozzle Tip Insulator

To remove the nozzle tip insulator, do the following:



WARNING!

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

1. Remove the single cavity valve gate assembly or hot sprue assembly from the cavity plate.
 - For single cavity valve gate assemblies, refer to [Section 4.3.1](#)
 - For hot sprue assemblies, refer to [Section 4.4.1](#)

NOTE:

Some nozzle tip insulators may remain in the gate detail in the cavity plate.

-
2. Lock out and tag the machine and controller (if equipped). Refer to [Section 2.5](#) for more information.



IMPORTANT!

Due to geometric variations between the gate details and the witness marks left in the nozzle tip insulators by the nozzle tips, Husky does not recommend reusing nozzle tip insulators. Previously used nozzle tip insulators should always be replaced with new nozzle tip insulators. If reuse is absolutely necessary (i.e. unscheduled maintenance with no spares on hand), order new nozzle tip insulators and replace as soon as possible. Contact your nearest Husky Regional Service and Sales Office or www.husky.co.



IMPORTANT!

Nozzle tip insulators form to the dimensions of the nozzle tip and gate detail when compressed. Before removing a nozzle tip, make sure to record the orientation of the nozzle tip insulator. This will help avoid resin leakage if the nozzle tip insulator is reused.

3. If nozzle tips must be reused, record the position and orientation of each nozzle tip insulator.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not allow molten resin to drop on nozzle tip insulators while the insulators are being removed. The additional material will increase the calculated preload for the nozzle tip insulator and damage the hot runner during assembly with the cavity plate.

Make sure the nozzle tip insulator is clean during removal and installation.

4. Remove the nozzle tip insulator from the nozzle tip using needle nose pliers. Be careful not to damage the nozzle tip or sealing surfaces.
5. If the nozzle tip insulator is found in the gate detail in the cavity plate, remove the nozzle tip insulator using a 10 mm or 3/8"-18 NPT tap or pipe and then clean the gate.

Clean the gate detail using a pointed hardwood stick and soft cloth, or a 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.

6. Inspect the nozzle tip insulator for resin. If resin is found, the nozzle tip 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.
7. Remove all locks and tags. Refer to [Section 2.5](#) for more information.

6.9.2 Installing the Nozzle Tip Insulators

To install the nozzle tip insulators, do the following:

**IMPORTANT!**

Due to geometric variations between the gate details and the witness marks left in the nozzle tip insulators by the nozzle tips, Husky does not recommend reusing nozzle tip insulators. Previously used nozzle tip insulators should always be replaced with new nozzle tip insulators. If reuse is absolutely necessary (i.e. unscheduled maintenance with no spares on hand), order new nozzle tip insulators and replace as soon as possible. Contact your nearest Husky Regional Service and Sales Office or www.husky.co.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Make sure all nozzle tip insulators are clean before they are installed. Any additional material on the nozzle tip insulator will increase the calculated preload and damage the hot runner during assembly with the cavity plate.

1. Make sure the hot runner is either installed in the machine or laying on a work bench with the nozzle tips facing up.
2. Make sure all nozzle tip insulators are clean and in good condition.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Nozzle tip insulators form to the dimensions of the nozzle tip and gate detail when compressed. Make sure previously used nozzle tips are installed on the same nozzle tip in the same orientation. Resin leakage will occur otherwise.

3. Place a nozzle tip insulator on each nozzle tip. If used nozzle tip insulators are being installed, make sure they are installed on the same nozzle tip as previously removed and in the same orientation.



Figure 6-46: Nozzle Tip Insulator

4. Make sure there are no nozzle tip insulators in the gate inserts.
5. Install the cavity plate. Refer to [Section 6.5](#) for more information.

6.10 Removing Insulating Gate Bubbles (If Equipped)

In place of nozzle tip insulators, some hot runners form a bubble of resin at the nozzle tip referred to as an insulating gate bubble. The bubbles provide thermal insulation between the nozzle tip and the cold cavity plate steel. They also increase the speed of color changes and prevent the degradation of some heat sensitive resins. The gate bubble needs to be removed if the gate hole is blocked by contamination.

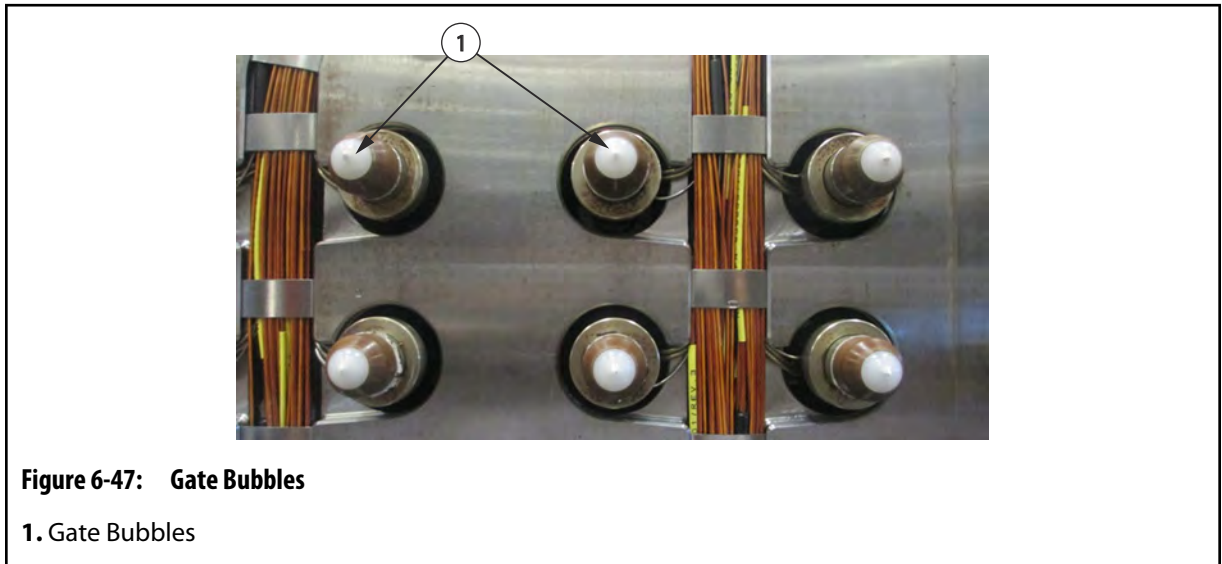


Figure 6-47: Gate Bubbles

1. Gate Bubbles

To remove the insulating gate bubbles, do the following:

1. Remove the cavity plate. Refer to [Section 6.5](#) for more information.
2. Connect the hot runner to a controller.
3. Turn on the controller.



DANGER!

Electrocution hazard – risk of serious injury and/or damage to the hot runner. Do not turn on the heaters if water has leaked into the hot runner. If water has leaked into the hot runner, the hot runner must be completely disassembled, dried and assembled before the heaters are turned on.



WARNING!

Hot resin spray hazard – risk of serious injury. Hot resin may unexpectedly spray from the nozzle tips while the hot runner is reaching operating temperature. To avoid serious burns, wear personal protective equipment consisting of a heat-resistant coat, heat-resistant gloves and a full face shield over safety glasses. Use adequate ventilation for fumes.

**WARNING!**

Burn hazard – risk of serious injury. Hot runner components stay hot for long periods of time after heaters have been turned off. Wear personal protective equipment when working near the hot runner and place a warning sign in the area before leaving the hot runner unattended.

4. Increase the temperature of a row of nozzle tips to a temperature high enough to soften the insulating gate bubble.

NOTE:

The Vicat Softening Temperature for the resin type is recommended. Refer to the resin supplier's documentation for more information.

5. Once the nozzle tips have reached their setpoint approximately 120 °C (248 °F), wait until the gate bubble on the first nozzle tip is soft enough to remove and then turn off all the nozzle tip heaters.

**WARNING!**

Electrocution hazard - risk of death or serious injury. Complete the lockout/tagout procedure of the electrical power source before disconnecting the electrical connectors.

6. Lock out and tag the electrical power source.

**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.

7. Disconnect the controller.
8. Remove all gate bubbles from the row with brass pliers, a clean cloth or a soft wire brush.
9. Repeat [step 4](#) to [step 8](#) for all subsequent rows.

**WARNING!**

Burn, fire and gas hazard – risk of death or serious injury, and property damage. Use of an open flame to remove resin could 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 – risk of serious injury. To avoid serious burns, wear personal protective equipment consisting of a heat-resistant coat, heat-resistant gloves, and a full face shield over safety glasses. Use adequate ventilation for fumes.

CAUTION!

Mechanical hazard – risk of damage to the equipment. Abrasives should never be used to clean the nozzle tips, as this could damage the critical sealing surfaces.

Do not remove the gate bubble with a hammer or tools made of hard material. Use tools made of soft materials such as brass, copper or wood. Hammering or using hard material tools could result in damage to the nozzle tips.

10. Remove any insulating 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.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not allow molten resin to drop on or build up under the nozzle tip insulators while the gate bubbles are being removed. The additional material will increase the calculated preload for the nozzle tip insulator and damage the hot runner during assembly with the cavity plate.

Make sure all nozzle tip insulators are clean and seated correctly before installing the cavity plate.

11. Make sure all nozzle tip insulators (if equipped) are seated correctly with a minimal and even gap between the nozzle tip insulator and the nozzle housing. For reused nozzle tips, the gap may not be noticeable. When plastic is under the nozzle tip insulator, it will have a larger than usual and/or uneven gap in relation to the nozzle housing. If plastic is under the nozzle tip insulator it must be cleaned or replaced. For more information on removing and installing the nozzle tip insulator refer to [Section 6.9](#).



Figure 6-48: Seating the Nozzle Tip Insulator (Example)

To remove, clean and install the nozzle tip insulator, do the following:

- a. Mark the orientation of the nozzle tip insulator.
- b. Remove the nozzle tip insulator.

**IMPORTANT!**

If the nozzle tip insulator is damaged or cannot be cleaned then it must be replaced.

- c. Clean the nozzle tip insulator by heating to melt the residual plastic and wiping it clean.
 - d. Install the nozzle tip insulator. Nozzle tip insulators must be installed on the same nozzle tip in the original orientation.
12. Make sure the hot runner is at room temperature <math><25\text{ }^\circ\text{C}</math> (<math><77\text{ }^\circ\text{F}</math>).

NOTE:

If the hot runner is still in the machine the cooling water can be turned on to cool the hot runner down.

13. Install the cavity plate. Refer to [Section 6.5](#) for more information.

6.11 Cleaning Drool from Weep Holes (SCVG Only)

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 polypropylenes 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 cavity plate or covers any electrical wiring. Based on observations made during an inspection, determine an appropriate interval for cleaning the cavity plate and bleeder holes.

CAUTION!

Mechanical hazard – risk of damage to the hot runner. Do not extend the cleaning interval beyond six months. If the rate of weepage increases significantly, the valve stem and nozzle housing should be inspected for wear and replaced if needed.

To clean the drool from the weep holes, do the following.

1. Separate or remove the cavity plate from the machine. Refer to [Section 6.5.1](#) for more information.
2. Remove the single cavity valve gate assembly from the cavity plate. Refer to [Section 4.3.1](#) for more information.
3. Using a brass rod or chisel, remove any resin on the outside of the weep fitting and sprue body.
4. Using a brass rod or chisel, remove any resin that has bled into the cavity plate. Do not scratch or score any sealing surfaces.

5. If removal of the valve stem and piston assemblies is required, refer to [Section 4.2.4](#) for more information.
6. Check all heaters using an ohmmeter. Refer to the electrical schematic for specific heater resistances.
7. Install the single cavity valve gate assembly into the cavity plate. Refer to [Section 4.3.2](#) for more information.
8. Install the cavity plate into the machine. Refer to [Section 6.5.2](#) for more information.

6.12 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 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. 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. Clear the area of all non-essential personnel. Never purge the barrel when the nozzle tip is outside the purge guard.

**WARNING!**

Burn hazard – risk of serious injury. Hot runner components stay hot for long periods of time after heaters have been turned off. Wear personal protective equipment when working near the hot runner and place a warning sign in the area before leaving the hot runner unattended.

4. Turn on and test each heater zone one at a time, starting with the smallest mass zones (that is, nozzles) and ending with the largest mass zones (that is, 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 63 140 °F) above room temperature, heat all manifolds to 60 °C (140 °F) to make sure the zones are working properly.

CAUTION!

Mechanical hazard – risk of damage to the hot runner and/or mold. The nozzle 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 nozzle is still hot.

6. Where applicable, install the cavity plate retaining screws and torque as specified in the mold manufacturer's documentation.
7. Check electrical circuits with an ohmmeter to make sure that no wires have been shorted during assembly.

**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.

6.13 Removing and Installing the SCVG Sprue Body Heater

The following procedures describe how to remove and install the SCVG sprue body heater in the single cavity valve gate (SCVG) assembly.

6.13.1 Removing the SCVG Sprue Body Heater

To remove the SCVG sprue body heater, do the following:

1. Disconnect the leads from the connector.
2. Pry the slide lock loose using locating ring as a fulcrum.

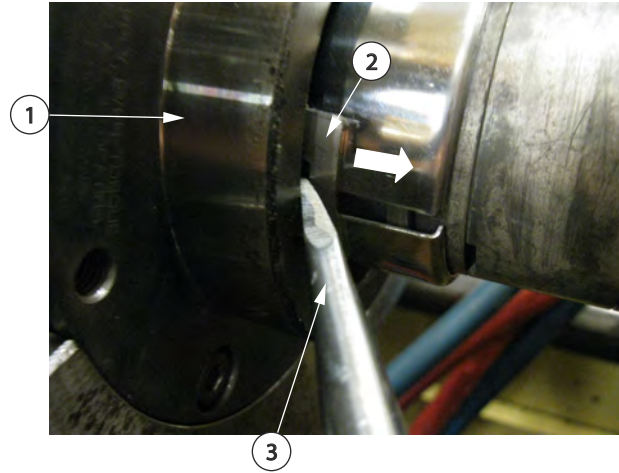


Figure 6-49: Opening the Slide Lock

1. Locating Ring 2. Slide Lock 3. Screw Driver

3. Remove the locating ring.

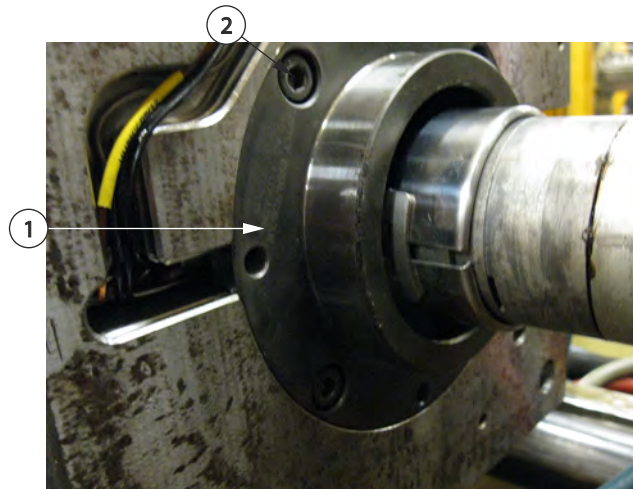


Figure 6-50: Locating Ring

1. Locating Ring 2. Screw

4. Remove the weep fitting.

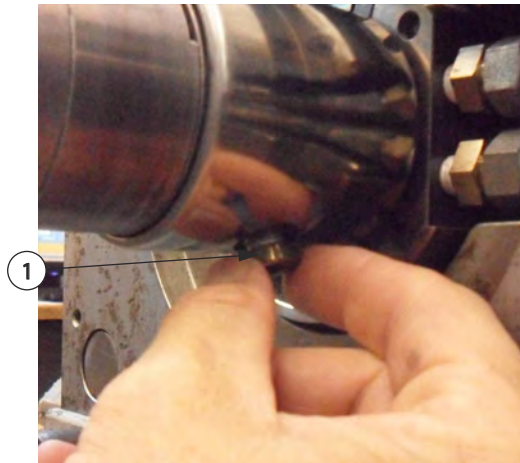


Figure 6-51: Remove the Weep Fitting

1. Weep Fitting

5. Remove the heater.

6.13.2 Installing the SCVG Sprue Body Heater

To install the SCVG body heater. For cavity plate removal instruction refer to the [Section 6.5](#).



WARNING!

The lockout/tagout procedure must be performed before the removal and replacement of the SCVG body heater and any maintenance and service tasks.

Refer to the [Section 2.5](#) prior to the removal and replacement of the SCVG body heater.

1. Prepare the heater by positioning the slide lock in the open position.



Figure 6-52: Open the Slide Lock

1. Slide Lock

2. Prepare the heater by positioning the slide lock in the open position.



Figure 6-53: Install the Heater

3. Slide the heater on to the sprue body with the wire lead end facing forward.
4. Rotate and align the heater wire leads with the wire groove in the plate and the through hole in the heater with weep hole in SCVG body.

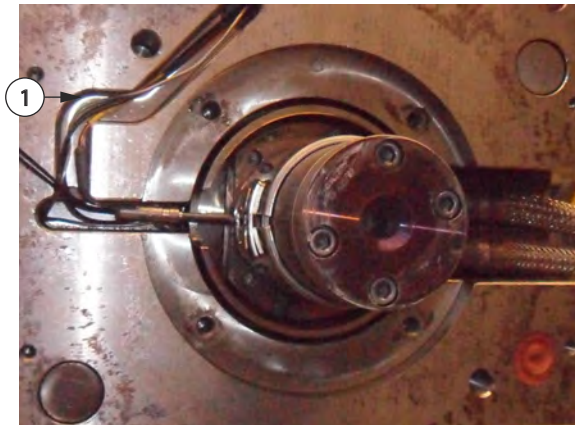


Figure 6-54: Align Heater Wire

1. Wire Groove



Figure 6-55: Sprue Body Heater Installed

5. Install the weep fitting.

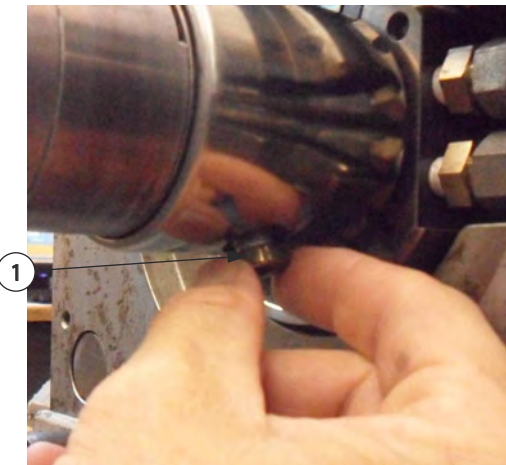


Figure 6-56: Install the Weep Fitting

1. Weep Fitting

6. Tighten the clamp by using a hammer and a brass rod tap the slide lock forward to the end of its travel.

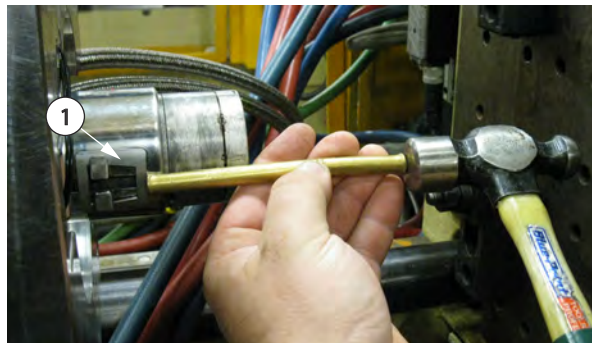


Figure 6-57: Tighten the Clamp

1. Slide Lock

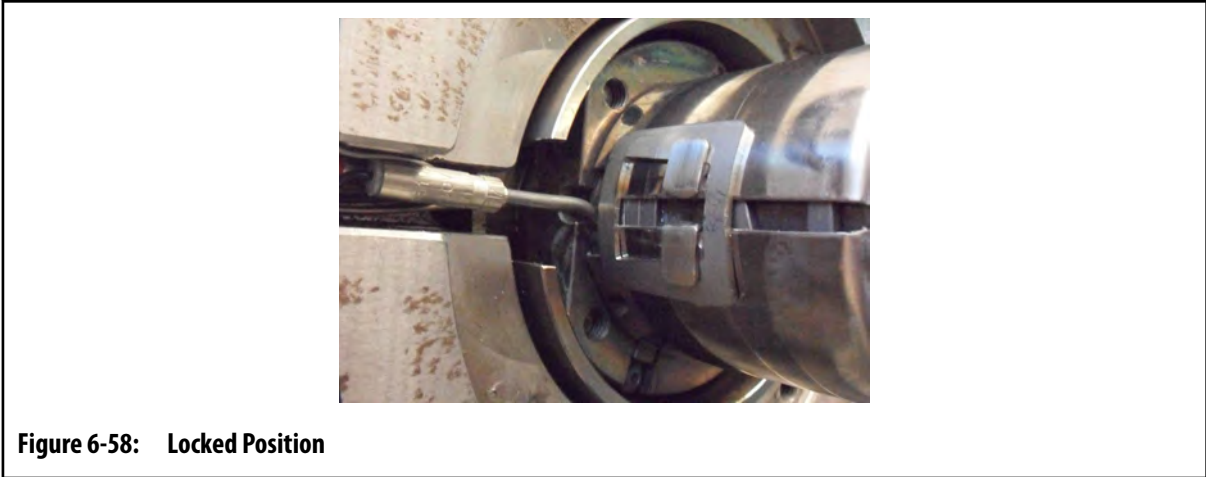


Figure 6-58: Locked Position

7. Route the wires through the wire grooves in the cavity plate and connect them to the multi-pin connectors. Make sure all wires are retained in the wire grooves using wire clips.
Refer to the electrical schematic for wiring information.
8. Place 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 6-59](#).

NOTE:

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

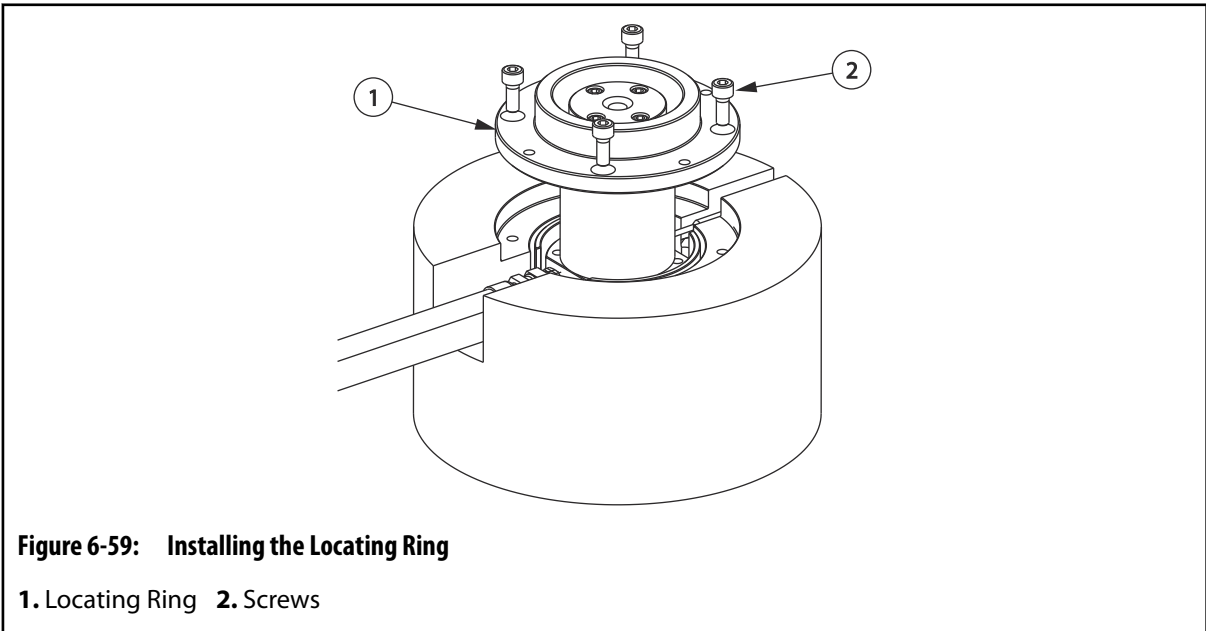


Figure 6-59: Installing the Locating Ring

1. Locating Ring 2. Screws

9. Secure the locating ring to the cavity plate with screws and even torque the screws in a cross pattern. Refer to the assembly drawings for the required torque value.
10. If the cavity plate was removed, refer to the [Section 6.5.2](#) for installation instructions.

NOTE:

During start up it is normal to see the body heater glow red until the heater is at operating temperature.
