

# UltraShot Injection System

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

|                      |                                        |                        |
|----------------------|----------------------------------------|------------------------|
| <b>North America</b> | <b>Toll free</b>                       | 1-800-465-HUSKY (4875) |
|                      | <b>Direct</b>                          | 437-781-8572           |
| <b>Europe</b>        | <b>EC (most countries)</b>             | 008000 800 4300        |
|                      | <b>Direct and Non-EC</b>               | + 352 2786 7967        |
| <b>Asia</b>          | <b>Toll Free</b>                       | 400 021 0557           |
|                      | <b>Direct:</b>                         | +86 21 6146 9058       |
|                      | <b>Japan Toll Free</b>                 | 0120988896             |
|                      | <b>Japan Direct</b>                    | +03 6316 2444          |
| <b>Latin America</b> | <b>Brazil Toll Free</b>                | +55 11 4589-7200       |
|                      | <b>Brazil Direct</b>                   | +55 11 3181-0607       |
|                      | <b>Mexico Toll Free</b>                | +52 80 0024-0580       |
|                      | <b>Mexico and Latin America Direct</b> | +52 55 9085 3008       |

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](mailto:techsupport@husky.ca).

### Husky Regional Service and Sales Offices

For the location closest to you, please visit [www.husky.co](http://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](http://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](http://www.husky.co).

## **Ordering Additional Manuals**

Additional copies of this manual and other documentation can be purchased through your nearest Husky Regional Service and Sales office.

## **Hot Runner Refurbishing**

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

# Table of Contents

|                                                             |               |
|-------------------------------------------------------------|---------------|
| <b>General Information.....</b>                             | <b>iii</b>    |
| Telephone Support Numbers.....                              | iii           |
| Husky Regional Service and Sales Offices.....               | iii           |
| Product Upgrades.....                                       | iii           |
| Ordering Spare Parts.....                                   | iv            |
| Ordering Additional Manuals.....                            | iv            |
| Hot Runner Refurbishing.....                                | iv            |
| <br><b>Chapter 1: Introduction.....</b>                     | <br><b>9</b>  |
| 1.1 Purpose of the Equipment.....                           | 9             |
| 1.2 Restrictions of Use.....                                | 9             |
| 1.3 Unauthorized Modifications.....                         | 9             |
| 1.4 Auxiliary Equipment.....                                | 9             |
| 1.5 Documentation.....                                      | 10            |
| 1.5.1 Manuals.....                                          | 10            |
| 1.5.2 Engineering Drawings and Schematics.....              | 11            |
| 1.5.3 Safety Alert Conventions.....                         | 11            |
| 1.6 Training.....                                           | 12            |
| 1.7 Nameplates.....                                         | 12            |
| 1.7.1 Hot Runner Nameplate.....                             | 12            |
| 1.8 Special Tools.....                                      | 13            |
| 1.8.1 Wrench Sizes.....                                     | 14            |
| <br><b>Chapter 2: Safety Summary.....</b>                   | <br><b>15</b> |
| 2.1 Qualified Personnel.....                                | 15            |
| 2.2 Safety Guidelines.....                                  | 15            |
| 2.3 Safety Hazards.....                                     | 15            |
| 2.3.1 Mechanical Hazards.....                               | 16            |
| 2.3.2 Burn Hazards.....                                     | 16            |
| 2.3.3 High Pressure Hazards.....                            | 17            |
| 2.3.4 Electrical Hazards.....                               | 18            |
| 2.3.5 Gas, Vapor and Dust Emissions.....                    | 18            |
| 2.3.6 Slip, Trip or Fall Hazards.....                       | 18            |
| 2.3.7 Lifting Hazards.....                                  | 18            |
| 2.4 Safety Signs.....                                       | 18            |
| 2.5 Lockout and Tagout.....                                 | 20            |
| 2.6 Personal Protective Equipment and Safety Equipment..... | 21            |
| 2.6.1 Personal Protective Equipment (PPE).....              | 21            |
| 2.6.2 Safety Equipment.....                                 | 22            |
| 2.7 Material Safety Data Sheet (MSDS).....                  | 23            |
| 2.8 Materials, Parts and Processing.....                    | 23            |
| 2.9 Lift Bars and Swivel Hoist Rings.....                   | 23            |

|                                                                                      |           |
|--------------------------------------------------------------------------------------|-----------|
| <b>Chapter 3: Specifications.....</b>                                                | <b>25</b> |
| 3.1 Weight.....                                                                      | 25        |
| 3.2 Operating Temperature.....                                                       | 25        |
| 3.3 Electrical System Specifications.....                                            | 25        |
| 3.3.1 Controller Requirements.....                                                   | 25        |
| 3.3.2 Nozzle Heaters.....                                                            | 26        |
| 3.3.3 Manifold Heaters.....                                                          | 26        |
| 3.3.3.1 Spare Thermocouple Wires.....                                                | 26        |
| 3.3.4 Power Fluctuation.....                                                         | 27        |
| 3.4 Recommended Lubricants.....                                                      | 27        |
| 3.5 Rust Inhibitor Specifications.....                                               | 29        |
| 3.6 Torque Specifications.....                                                       | 29        |
| <b>Chapter 4: Installation and Removal.....</b>                                      | <b>31</b> |
| 4.1 Lifting and Handling.....                                                        | 31        |
| 4.1.1 Lifting and Handling Using a Single Lifting Point.....                         | 32        |
| 4.1.1.1 Laying Down Plates Using a Single Lifting Point.....                         | 32        |
| 4.1.1.2 Picking Up Plates Using a Single Lifting Point.....                          | 33        |
| 4.1.2 Lifting and Handling Using Multiple Lifting Points.....                        | 34        |
| 4.1.3 Lifting Using a Lift Bar.....                                                  | 35        |
| 4.1.4 Lifting Using Swivel Hoist Rings.....                                          | 36        |
| 4.2 Removing and Installing the Hot Runner.....                                      | 38        |
| 4.3 Removing and Installing the UltraShot System.....                                | 38        |
| 4.3.1 Ultra Shot Actuation Assembly Types.....                                       | 38        |
| 4.3.2 Removing and Installing the UltraShot System - Direct Drive Actuation.....     | 40        |
| 4.3.2.1 Removing the UltraShot System - Direct Drive Actuation.....                  | 40        |
| 4.3.2.2 Installing the UltraShot System - Direct Drive Actuation.....                | 42        |
| 4.3.3 Removing and Installing the UltraShot System - Back Mounted Cam Actuation..... | 43        |
| 4.3.3.1 Removing the UltraShot System - Back Mounted Cam Actuation.....              | 43        |
| 4.3.3.2 Installing the UltraShot System - Back Mounted Cam Actuation.....            | 44        |
| 4.3.4 Removing and Installing the UltraShot System - Side Mounted Cam Actuation..... | 45        |
| 4.3.4.1 Removing the UltraShot System - Side Mounted Cam Actuation.....              | 45        |
| 4.3.4.2 Installing the UltraShot System - Side Mounted Cam Actuation.....            | 46        |
| <b>Chapter 5: Maintenance.....</b>                                                   | <b>49</b> |
| 5.1 Scheduled and Non-Scheduled Maintenance.....                                     | 49        |
| 5.1.1 Preventive Maintenance.....                                                    | 50        |
| 5.1.2 Service Procedures.....                                                        | 50        |
| 5.2 Cleaning the UltraShot Manifold.....                                             | 51        |
| 5.3 Removing and Installing the Plungers.....                                        | 51        |
| 5.3.1 Removing the Plungers.....                                                     | 51        |
| 5.3.2 Installing the Plungers.....                                                   | 52        |
| 5.4 Removing and Installing the Load Cell and Linkages.....                          | 53        |
| 5.4.1 Removing the Load Cell and Linkages.....                                       | 53        |
| 5.4.2 Installing the Load Cell and Linkages.....                                     | 55        |
| 5.5 Removing and Installing the Servo Linear Actuator.....                           | 57        |

|        |                                                                                                  |    |
|--------|--------------------------------------------------------------------------------------------------|----|
| 5.5.1  | Removing the Servo Linear Actuator.....                                                          | 57 |
| 5.5.2  | Installing the Servo Linear Actuator.....                                                        | 59 |
| 5.6    | Removing and Installing the Direct Drive Actuation Bar.....                                      | 62 |
| 5.6.1  | Removing the Direct Drive Actuation Bar.....                                                     | 62 |
| 5.6.2  | Installing the Direct Drive Actuation Bar.....                                                   | 63 |
| 5.7    | Removing and Installing the Cam Roller Plate Assembly (Cam Driven Systems Only).....             | 65 |
| 5.7.1  | Removing the Cam Roller Assembly from the Frame or Backing Plate.....                            | 65 |
| 5.7.2  | Installing the Cam Roller Assembly in the Frame or Backing Plate.....                            | 66 |
| 5.8    | Removing and Installing the Actuation Bar into the Cam Roller Plate (Cam Driven Systems Only)... | 68 |
| 5.8.1  | Removing the Actuator Bar from the Cam Roller Plate.....                                         | 68 |
| 5.8.2  | Installing the Actuator Bar into the Cam Roller Plate.....                                       | 69 |
| 5.9    | Removing and Installing the Linear Bearings (Cam Driven Systems Only).....                       | 71 |
| 5.9.1  | Removing the Linear Bearings.....                                                                | 71 |
| 5.9.2  | Aligning the Linear Rails.....                                                                   | 72 |
| 5.9.3  | Installing the Linear Bearings.....                                                              | 73 |
| 5.10   | Removing and Installing the Heat Sink and Cap Assembly.....                                      | 75 |
| 5.10.1 | Removing the Heat Sink and Cap Assembly.....                                                     | 75 |
| 5.10.2 | Installing the Heat Sink and Cap Assembly.....                                                   | 76 |
| 5.11   | Removing and Installing the Heater and Thermocouple.....                                         | 77 |
| 5.11.1 | Removing the Heater and Thermocouple.....                                                        | 77 |
| 5.11.2 | Installing the Heater and Thermocouple.....                                                      | 77 |



# 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/injection system:

| Component        | Manual                 | Description                                                                               |
|------------------|------------------------|-------------------------------------------------------------------------------------------|
| Injection system | <b>Service Manual</b>  | Describes the installation and maintenance the injection system.                          |
| Controller       | <b>User Guide</b>      | Describes the features and use and maintenance of the controller                          |
| Hot runner       | <b>Operator Manual</b> | Describes the basic startup, operation, shut down and daily maintenance of the hot runner |
|                  | <b>Service Manual</b>  | Describes the installation, startup, operation, shut down and maintenance the hot runner  |

## 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.

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**NOTE:**

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

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## 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.



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**DANGER!**

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

---



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**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](http://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 Nameplates

Nameplates are affixed to the operator's side of the mold and hot runner for quick identification of the equipment type, source and general specifications.

**IMPORTANT!**

The mold and hot runner nameplates must never be removed. The information on the nameplates is necessary for mold selection, setup, parts ordering and troubleshooting.

Immediately order a new nameplate for the mold or hot runner if it is missing or damaged.

### 1.7.1 Hot Runner Nameplate

Every hot runner nameplate lists the following information:

- the location where the hot runner was manufactured
- the project number
- the material type allowed to be used in the hot runner
- the melt and mold temperatures
- electrical requirements and specifications

**NOTE:**

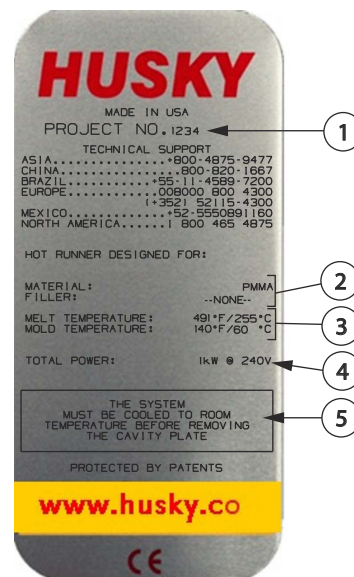
Other details and specifications may be required.

**IMPORTANT!**

Each hot runner is designed to process a specific type and grade of resin/filler based on the customer's requirements. Use of any other type or grade of resin/filler could affect part quality and/or the performance of the hot runner. Before using a different type or grade of resin/filler, contact Husky.

**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.**



**Figure 1-1: Hot Runner Nameplate (Sample)**

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

## 1.8 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.

## 1.8.1 Wrench Sizes

Wrench sizes for load cell adapter removal and installation.

| Model | Size |
|-------|------|
| GSX20 | 12mm |
| GSX30 | 20mm |
| GSX40 | 20mm |
|       | 32mm |
| GSX50 | 32mm |
| GSX60 | 32mm |

## Chapter 2 Safety Summary

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



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**IMPORTANT!**

Personnel must read, understand and follow all safety precautions.

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**IMPORTANT!**

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

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### 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/manufacturer
- 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.**

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#### **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.

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### 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



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**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.



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

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

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

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

## 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 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](#).

---

**NOTE:**

The Husky provided lift bar, swivel hoist rings and associated hardware must be stored together while the mold, hot runner, tooling plate and CoolPik plate 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

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



---

**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.

---

For more information about the nameplate, refer to [Section 1.7.1](#).

### 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).

---

**NOTE:**

Always refer to the hot runner nameplate on the operator's side of the clamp before installing a hot runner. For more information on the nameplate, refer to [Section 1.7](#).

---

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 Recommended Lubricants

The following are recommended lubricants to be used during the assembly and maintenance of Husky UltraShot.

---

**NOTE:**

Husky recommends only the following lubricants and assumes no responsibility for lubricants not specified. It is the customers 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                                                                      |
|-----------------------------------------------------------------------|---------------------------------------------|-------------|------------------------------|-------------------------------------------------------------------------------|
| Extreme pressure<br>Synthetic calcium<br>sulfonate based<br>lubricant | Lubriplate<br>Synxtreme FG-2                | 5817119     | 411 g (14.5 oz)<br>Canister  | Wear or sliding surfaces                                                      |
| Static application<br>Grease                                          | Kem-A-Trix<br>Fahrenheit 800<br>Bearing Gel | 3936720     | 113 g (4 oz)<br>Squeeze Tube | Plunger set screw                                                             |
| High Temperature<br>Anti-Seize                                        | Loctite 77124                               | 5541918     | 225 g (8 oz) can             | Manifold, injector, and<br>thermocouple,<br>mounting screws<br>sprue bushings |
| Thread-Locker                                                         | Loctite 242                                 | 5541917     | 5.7 g (0.2 oz) Tube          | Fasteners                                                                     |
|                                                                       | Loctite 271                                 | 100106      | 50 ml (1.7 oz)               | Servo linear actuator<br>tie rod nuts                                         |
|                                                                       | Loctite 2422                                |             |                              | For high mold<br>temperature<br>applications                                  |

## 3.5 Rust Inhibitor Specifications

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

| Type             | Trade Name             |
|------------------|------------------------|
| Protective Spray | LPS 2 Protective Spray |

## 3.6 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 describes how to install and remove the hot runner assembly



---

**IMPORTANT!**

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

---

---

**NOTE:**

For instructions on how to connect the controller to the hot runner and machine, refer to the *Altanium Delta5 or Matrix5 User Guide*.

---

### 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

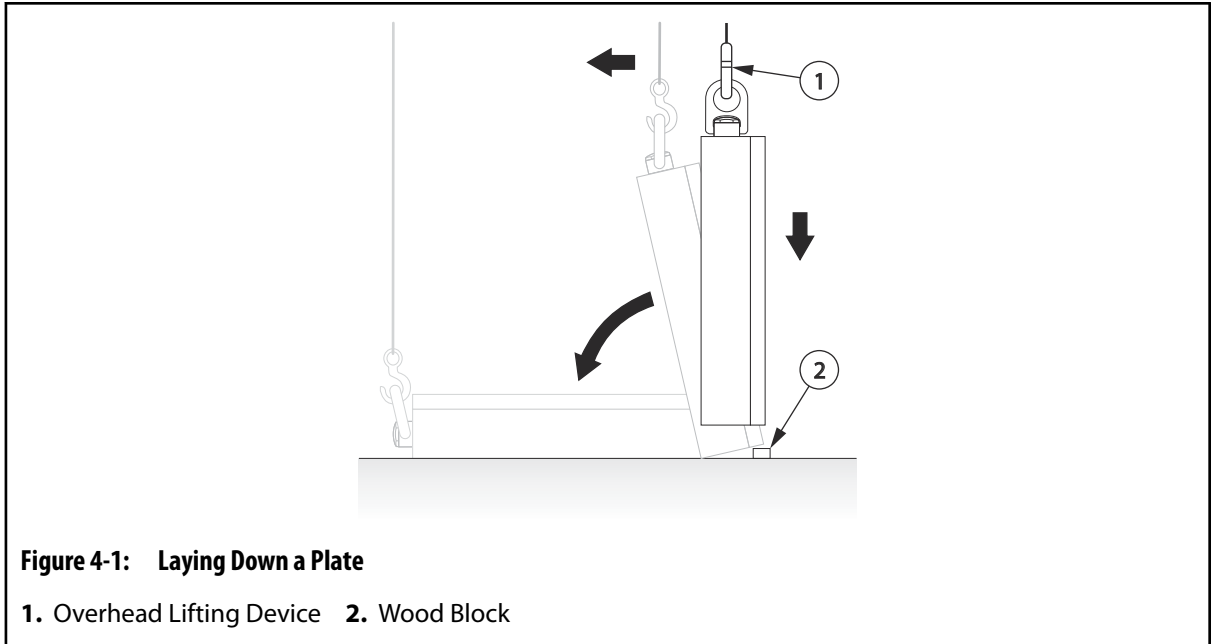
To properly lay a plate on a work surface using a single lifting point, do the following:



**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.



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.

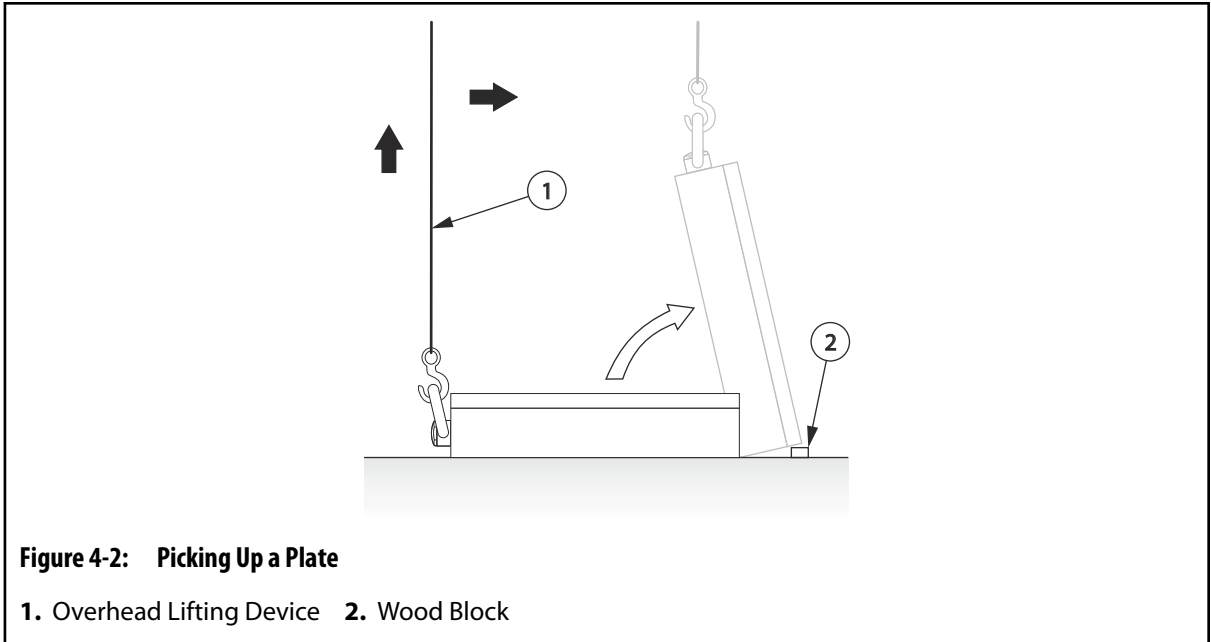
To prevent this from happening, do the following:



#### **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 the mold or hot runner lifting equipment lift bar, swivel hoist ring, or other Husky specified lifting equipment and connect it to the 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.



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:

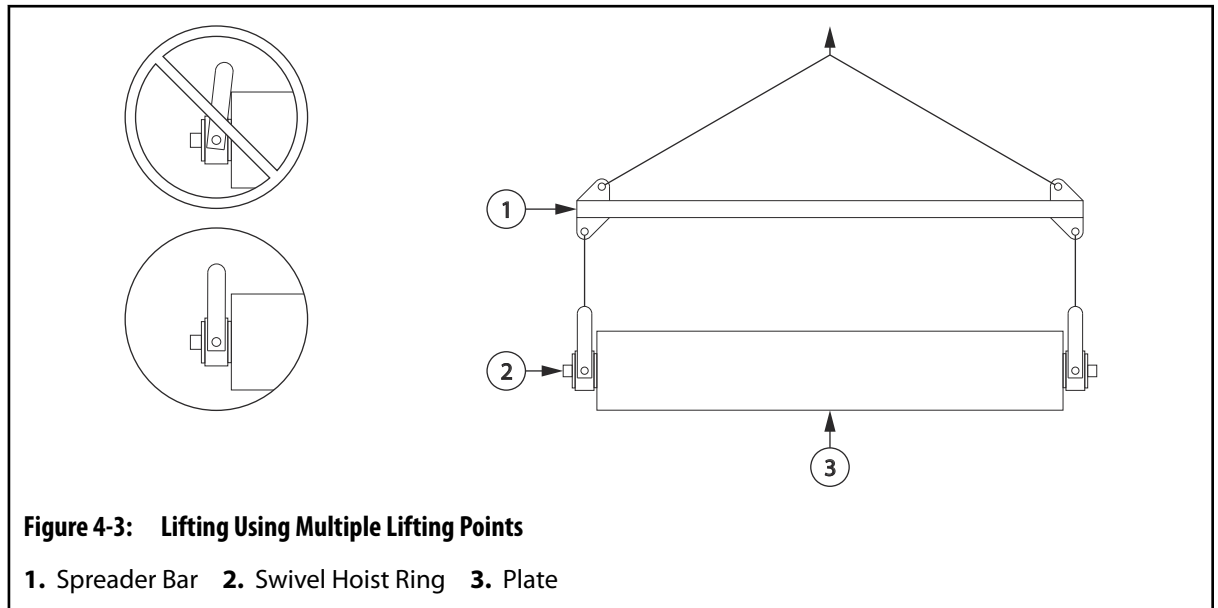


**WARNING!**

**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.

---

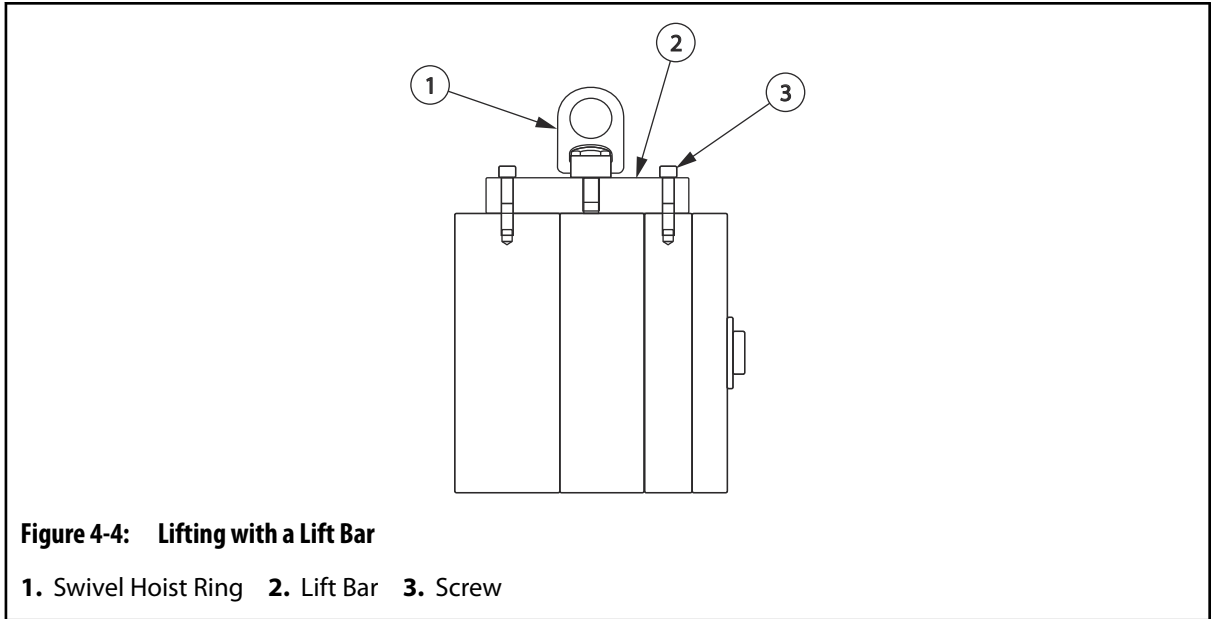
---

**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 3.6](#) 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                                                                                             |
|----------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Material</b>      | 4140 certified aircraft quality                                                                           |
| <b>Type</b>          | Forged hoist ring                                                                                         |
| <b>Finish</b>        | Phosphate per DOD-P-16232F                                                                                |
| <b>Safety Factor</b> | 5:1                                                                                                       |
| <b>Swivel</b>        | Pivot 180° and swivel 360°                                                                                |
| <b>Thread</b>        | ISO 261 and ISO 965 - Coarse                                                                              |
| <b>Surface</b>       | Magnetic particle inspected (ASTM E709-80)                                                                |
| <b>Certification</b> | 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 <sup>[1]</sup> | 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  |

<sup>[1]</sup> 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 <sup>[2]</sup> | 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    |

**Table 4-3: Specifications for Inch UNC Swivel Hoist Rings (Continued)**

| Part Number | Rated Capacity <sup>[2]</sup> | Torque                | Thread Ø | Minimum Full Thread Depth | Pitch |
|-------------|-------------------------------|-----------------------|----------|---------------------------|-------|
| 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     |

<sup>[2]</sup> Minimum rated capacity at any pull angle (between 0° horizontal pull and 90° vertical pull)

## 4.2 Removing and Installing the Hot Runner

For instructions about installing the hot runner. Refer to the hot runner service manual.

## 4.3 Removing and Installing the UltraShot System

UltraShot has three different actuation assembly types. The installation and removal procedures differ depending on the type or actuation assembly.

Three types of actuation assembly:

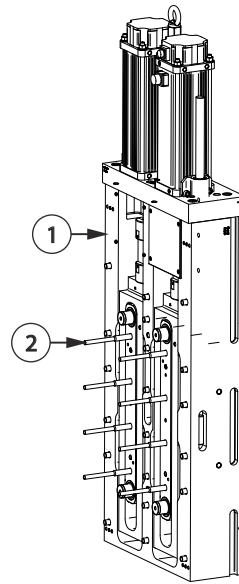
- Direct drive actuation. Refer to [Section 4.3.2](#) for more information.
- Back mounted cam driven actuation. Refer to [Section 4.3.3](#) for more information.
- Side mounted cam driven actuation. Refer to [Section 4.3.4](#) for more information.

### 4.3.1 Ultra Shot Actuation Assembly Types

UltraShot has three different actuation assembly types. The procedures may differ depending on the type or actuation assembly exists. Make sure you follow the procedures for the actuation assembly.

Three types of actuation assembly:

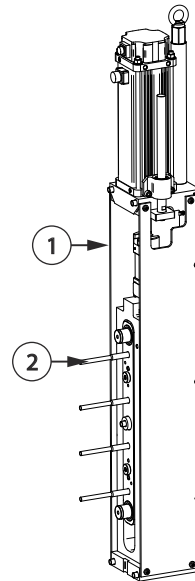
- Back mounted cam driven actuation



**Figure 4-5: Back Mounted Cam Driven Actuation Assembly**

**1.** UltraShot Backing Plate **2.** Plunger

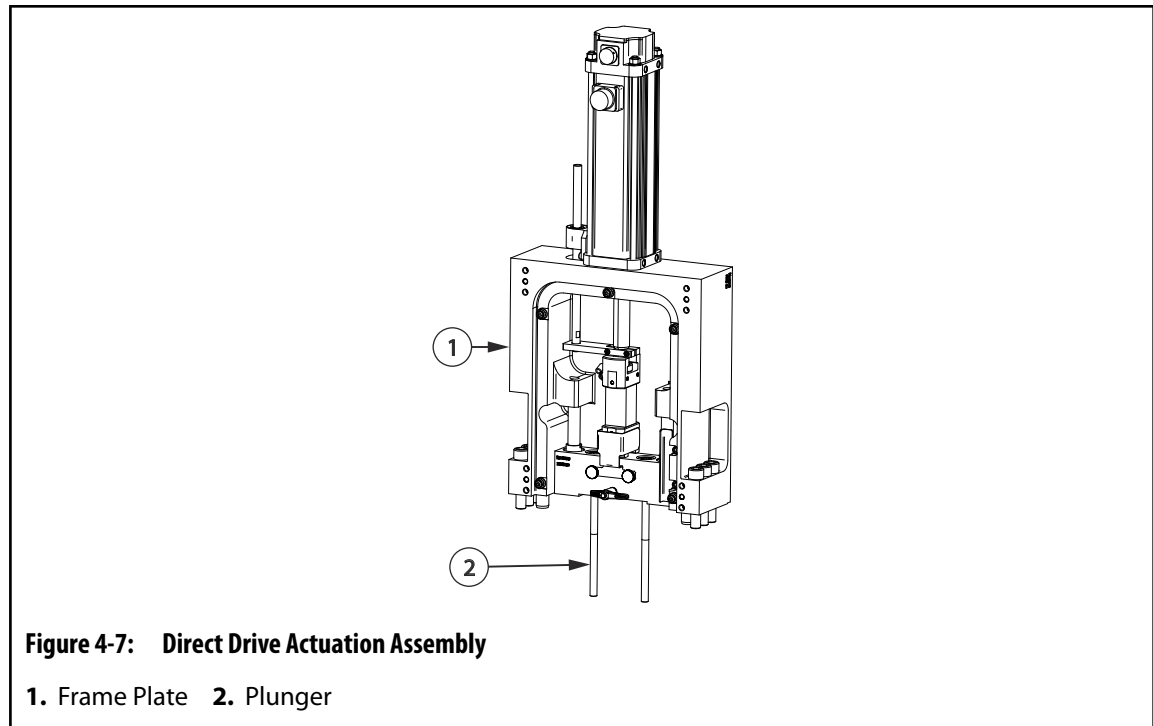
- Side mounted cam driven actuation



**Figure 4-6: Side Mounted Cam Driven Actuation Assembly**

**1.** UltraShot Frame **2.** Plunger

- Direct drive actuation



**Figure 4-7: Direct Drive Actuation Assembly**

1. Frame Plate 2. Plunger

## 4.3.2 Removing and Installing the UltraShot System - Direct Drive Actuation

The direct drive system can have different servo linear actuator configurations:

- Single servo linear actuator with a single plunger
- Systems with multiple plungers mounted in an actuation bar with one or more servo linear actuators

The following procedures describe how to remove and install the UltraShot System - direct drive actuation.

### 4.3.2.1 Removing the UltraShot System - Direct Drive Actuation

The UltraShot direct drive actuation system can be removed on the bench and in the machine except for the bottom mounted actuation system. Due to space constraints and supporting the system, the bottom mounted direct drive actuation assembly must be removed on the bench.

To remove the UltraShot direct drive actuation system, do the following:

1. Purge the resin from the hot runner.

---

#### CAUTION!

**Mechanically hazard - risk of damage to the equipment. Plungers must be removed prior to removing the UltraShot system from the hot runner. Do not remove the plungers cold. Plastic resin may exist in the system making it difficult to remove the plungers. The system should be heated to allow the plungers to be removed. Failure to remove the plungers could cause damage to the equipment.**

---

2. Remove the plungers. Refer to [Section 5.3.1](#) for more information.

---

**NOTE:**

The plungers for the top and bottom mounted actuation assemble can be removed at the same time.

3. If required, remove the hot runner/UltraShot system from the machine. Refer to [Section 4.2](#) for more information.

---

**NOTE:**

The hot runner needs to be removed from the machine if the bottom mounted direct drive actuation assembly is being removed.

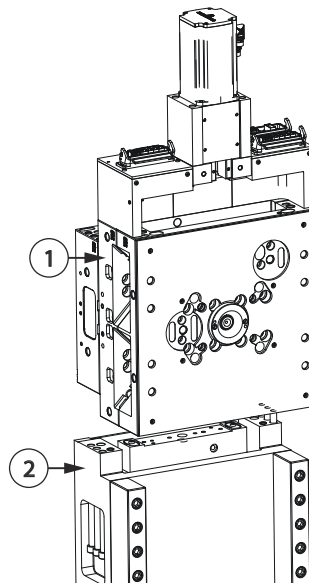


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**WARNING!**

**Pinch point hazard - Risk of personal injury and/or damage to the equipment. T-pins must be installed while moving or flipping the actuation assembly. There is one T-pin per actuation assembly. Failure to do so may cause the actuation bar to move causing injury.**

4. Remove the top servo linear actuator(s) if required. Refer to [Section 5.5.1](#) for more information.
5. Turn the hot runner so the bottom assembly is on top. Make sure to support the hot runner so the services on the top of the hot runner are not damaged.



**Figure 4-8: Removing the Bottom Mounted Actuation Assembly**

1. Hot Runner 2. Actuation Assembly

6. Remove the bottom servo linear actuator(s) if required. Refer to [Section 5.5.1](#) for more information.
7. Install hoist rings to the designated lifting points on the actuation frame.

8. Make sure to disconnect any wiring between the frames.
9. Remove the screws securing the actuation frame to the hot runner.



**WARNING!**

**Crushing hazard – risk of death or serious injury.**

- **Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**
- **Improperly balanced loads can make lifting unmanageable. Always use designated lifting points to lift assemblies.**

10. Slowly lift the UltraShot assembly from the hot runner.
11. Move the UltraShot system assembly to a safe location.
12. For the top mounted assembly:
  - a. Make sure the unit is has the top assembly is on top.
  - b. Repeat [step 7](#) to [step 11](#) for the top mounted assembly.

#### 4.3.2.2 Installing the UltraShot System - Direct Drive Actuation

If equipped, the top mounted direct drive assembly should be mounted first.

To install the UltraShot direct drive actuation system, do the following:

1. Before installing the UltraShot direct drive actuation system the following must be installed:
  - a. The heat sink assembly, refer to [Section 5.10.2](#) for more information
  - b. The actuation bar, refer to [Section 5.6.2](#) for more information.
2. Install hoist rings to the designated lifting points on the assembly.



**WARNING!**

**Crushing hazard – risk of death or serious injury.**

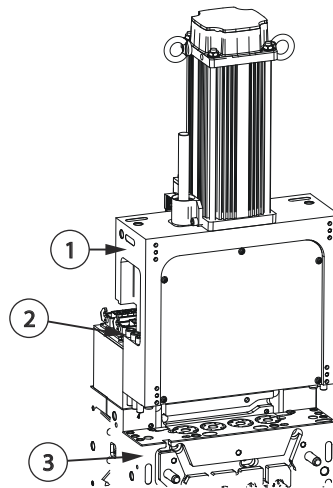
- **Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**
- **Improperly balanced loads can make lifting unmanageable. Always use designated lifting points to lift assemblies.**



**WARNING!**

**T-pins should always be installed while moving or flipping the Ultra Shot Actuation assembly. There is one T-pin per actuation assembly.**

3. Lift the UltraShot assembly over top of the hot runner.



**Figure 4-9: Removing the Actuation Frame**

1. Actuation Frame 2. Screws 3. Hot Runner

4. Slowly lower the assembly onto the hot runner manifold.
5. Install screws that secure the UltraShot assembly to the hot runner.
6. Torque screws to specification.
7. If the bottom assembly was removed:
  - a. Turn the assembly so the bottom side is on top.
  - b. Repeat [step 3](#) to [step 6](#).



**IMPORTANT!**

If resin is in the system, the hot runner must be at a temperature to soften the resin allowing displacement of the plastic in the injector during plunger installation.

8. Install the plungers. Refer to [Section 5.3.2](#) for more information.
9. If removed, install the servo motor(s). Refer to [Section 5.5.2](#) for more information.
10. If removed install the load cell. Refer to [Section 5.4.2](#) for more information.

### 4.3.3 Removing and Installing the UltraShot System - Back Mounted Cam Actuation

The following procedures describe how to remove and install the UltraShot System - back mounted cam actuation.

#### 4.3.3.1 Removing the UltraShot System - Back Mounted Cam Actuation

The UltraShot back mount cam actuation system is removed on the bench.

To remove the UltraShot back mounted cam actuation system, do the following:

1. Remove the plunger(s). Refer to [Section 5.3.1](#) for more information
2. Remove the mold and hot runner from the machine.
3. If required, remove the servo linear actuator. Refer to [Section 5.5.1](#) for more information.



**WARNING!**

**Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**

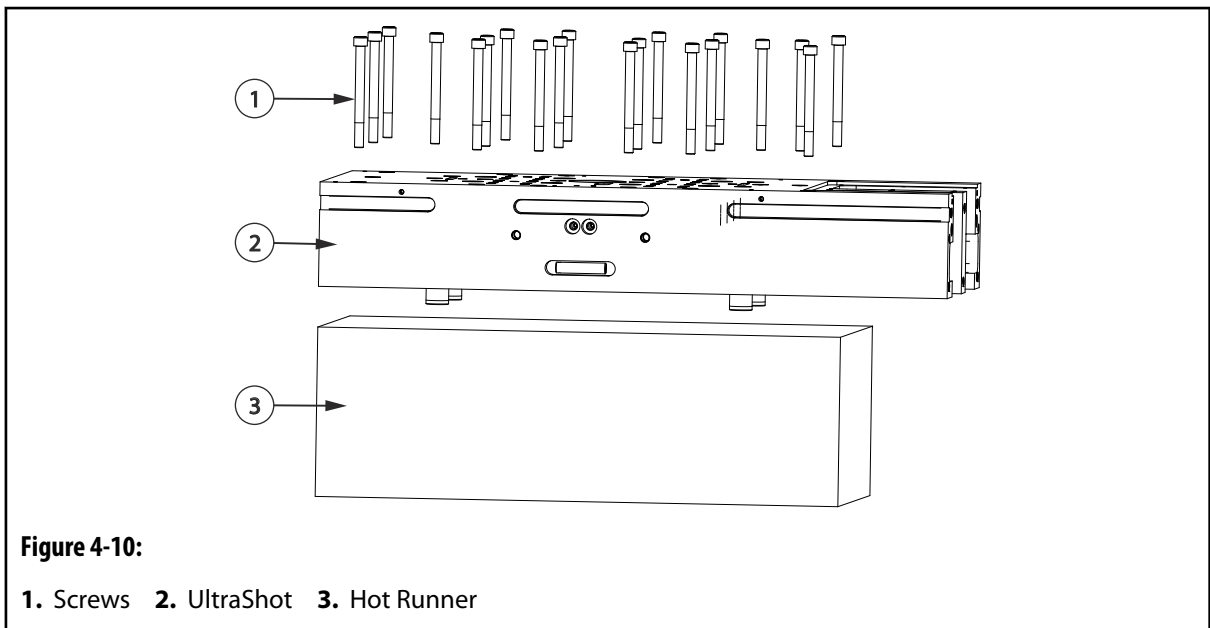
4. Install hoist rings to the designated lifting points on the UltraShot assembly and then connect to an overhead lifting device.



**WARNING!**

**Pinch point hazard - Risk of personal injury and/or damage to the equipment. T-pins must be installed while moving or flipping the actuation assembly. There is one T-pin per actuation assembly. Failure to do so may cause the actuation bar to move causing injury.**

5. Install the T-pins.
6. Remove the screws securing the UltraShot assembly to the hot runner backing plate.



7. Slowly lift the UltraShot assembly from the hot runner.
8. Move the UltraShot assembly to a safe location.

### 4.3.3.2 Installing the UltraShot System - Back Mounted Cam Actuation

The UltraShot back mount cam actuation system is installed on the bench.

To install the UltraShot back mounted cam actuation system, do the following:



**WARNING!**

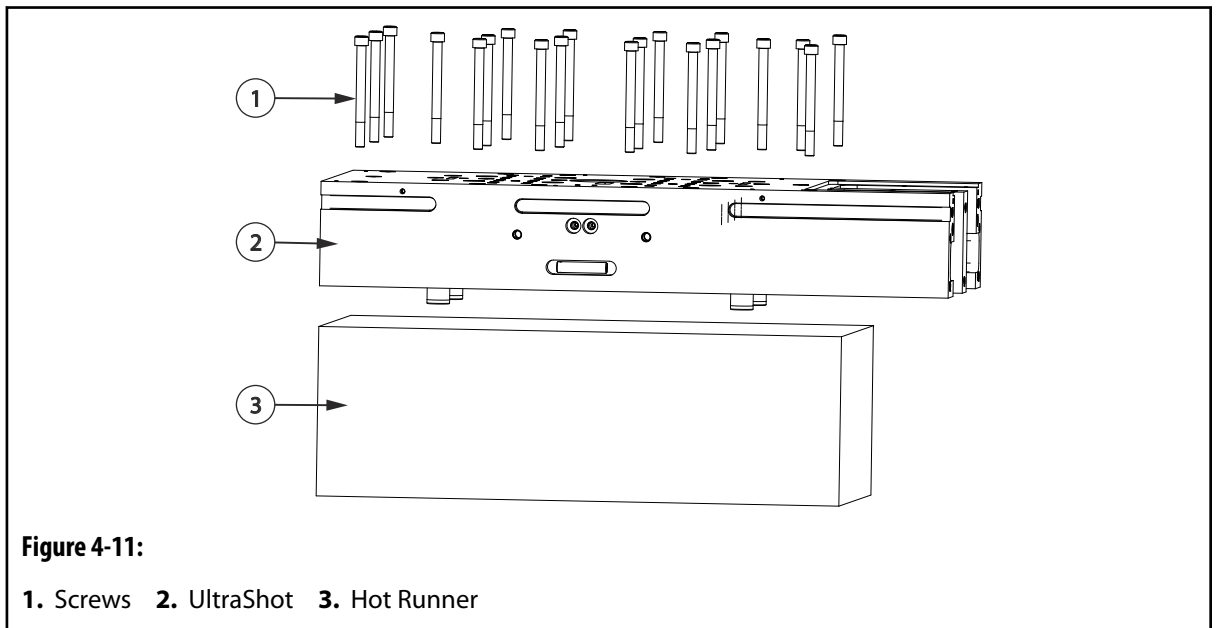
**Pinch point hazard - Risk of personal injury and/or damage to the equipment. T-pins must be installed while moving or flipping the actuation assembly. There is one T-pin per actuation assembly. Failure to do so may cause the actuation bar to move causing injury.**

1. Install the T-pins.

**WARNING!**

**Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**

2. Install hoist rings into the designated lifting points and then connect to an overhead lifting device.
3. Lift the UltraShot assembly and then orient to the hot runner.
4. Install screws to secure the UltraShot assembly to the hot runner.



5. Torque screws to specification.
6. Install the servo linear actuator(s). Refer to [Section 5.5.2](#) for more information.
7. Install the plunger(s). Refer to [Section 5.3.2](#) for more information.
8. Remove T-pins.

### 4.3.4 Removing and Installing the UltraShot System - Side Mounted Cam Actuation

The following procedures describe how to remove and install the UltraShot System - side mounted cam actuation.

#### 4.3.4.1 Removing the UltraShot System - Side Mounted Cam Actuation

To remove the UltraShot side mounted cam actuation system, do the following:

1. Purge the resin from the hot runner.

---

**CAUTION!**

**Mechanically hazard - risk of damage to the equipment. Plungers must be removed prior to removing the UltraShot system from the hot runner. Do not remove the plungers cold. Plastic resin may exist in the system making it difficult to remove the plungers. The system should be heated to allow the plungers to be removed. Failure to remove the plungers could cause damage to the equipment.**

---

2. Remove the plungers from the UltraSync assembly. Refer to [Section 5.3.1](#) for more information.
- 

**WARNING!**

**Pinch point hazard - Risk of personal injury and/or damage to the equipment. T-pins must be installed while moving or flipping the actuation assembly. There is one T-pin per actuation assembly. Failure to do so may cause the actuation bar to move causing injury.**

---

3. Install T-pins.
  4. Remove the servo linear actuator(s) if required. Refer to [Section 5.5.1](#) for more information
  5. Remove the hot runner/UltraShot assemble from the machine. Refer to [Section 4.2](#) for more information.
- 

**WARNING!**

**Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**

---

6. Install hoist rings to designated lifting points on the UltraShot assembly and then connect to an overhead lifting device.
  7. Remove the screws securing the UltraShot assembly to the manifold plate.
  8. Lift the UltraShot assembly away from the manifold plate.
- 

#### 4.3.4.2 Installing the UltraShot System - Side Mounted Cam Actuation

To install the UltraShot side mounted cam actuation system, do the following:

**WARNING!**

**Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**

---

1. Install hoist rings to designated lifting points on the UltraShot assembly.

**WARNING!**

**Pinch point hazard - Risk of personal injury and/or damage to the equipment. T-pins must be installed while moving or flipping the actuation assembly. There is one T-pin per actuation assembly. Failure to do so may cause the actuation bar to move causing injury.**

2. Install the T-pins.
3. Lift and orient the UltraShot assembly with the hot runner manifold plate.
4. Install the screws that secure the UltraShot assembly frame to the hot runner.
5. Torque the screws to specification.
6. If removed, install the servo linear actuator. Refer to [Section 5.5.2](#) for more information.
7. Install the plunger(s). Refer to [Section 5.3.2](#) for more information.



# Chapter 5 Maintenance

This chapter describes the maintenance tasks required to maintain the hot runner. Refer to [Section 5.1](#) for a full list of maintenance procedures.

---

**NOTE:**

Unless specified otherwise, all bolts, screws, fittings and other hardware should be torqued to the values listed on the assembly drawings specific to the hot runner or injection system.

---



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**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.**

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**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.**

---

---

**NOTE:**

The procedures contained in this chapter were written for the injection system and are in addition to the procedures in the hot runner manual. The instructions in both the hot runner manual and the injection system manual are needed to complete service.

---

## 5.1 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

## 5.1.1 Preventive Maintenance

The following procedures must be performed when either the interval or cycle count is reached as part of the preventive maintenance program for the injection system.

| Interval        | Cycles          | Drive Type | Procedure                                                                                                | Reference                                                  |
|-----------------|-----------------|------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Every 2.5 years | Every 5,000,000 | All        | Replace the cage bearing <ul style="list-style-type: none"><li>Direct Drive</li><li>Cam driven</li></ul> | <a href="#">Section 5.6</a><br><a href="#">Section 5.8</a> |
|                 |                 | Cam driven | Replace the linear bearings                                                                              | <a href="#">Section 5.9</a>                                |
|                 |                 | Cam driven | Replace the cam rollers                                                                                  | <a href="#">Section 5.8</a>                                |

## 5.1.2 Service Procedures

The following procedures are to be performed only when needed.

| Procedure                                                                                     | Reference                     |
|-----------------------------------------------------------------------------------------------|-------------------------------|
| Removing and installing the plungers                                                          | <a href="#">Section 5.3</a>   |
| Removing and installing the load cell and linkages                                            | <a href="#">Section 5.4</a>   |
| Removing and installing the servo linear actuator                                             | <a href="#">Section 5.5</a>   |
| Removing and installing the direct drive actuation bar (Direct drive systems only)            | <a href="#">Section 5.6</a>   |
| Removing and installing the actuation bar into the cam roller plate (Cam driven systems only) | <a href="#">Section 5.8</a>   |
| Removing and installing the linear bearings (Cam driven systems only)                         | <a href="#">Section 5.9</a>   |
| Aligning the linear rails                                                                     | <a href="#">Section 5.9.2</a> |
| Removing and installing the cam roller plate assembly (Cam driven systems only)               | <a href="#">Section 5.7</a>   |
| Removing and installing the heat sink and cap assembly                                        | <a href="#">Section 5.10</a>  |
| Removing and installing the heater and thermocouple                                           | <a href="#">Section 5.11</a>  |

## 5.2 Cleaning the UltraShot Manifold

---

**CAUTION!**

**Mechanical hazard - risk of damage to the injectors. Do not thermally clean the UltraShot manifold with the injectors installed and Do Not remove the injectors. Contact Husky for manifold cleaning instructions. Thermally cleaning a manifold with the injectors installed could result in damage to the injectors.**

---

## 5.3 Removing and Installing the Plungers

The plungers must be removed before detaching the hot runner from a cam actuated system or removing the manifold from a direct drive system.

The manifold and injectors must be heated to a temperature that will allow the resin to release the plunger from the injector.

The following procedures describe how to remove and install the plungers.

### 5.3.1 Removing the Plungers

To remove the plungers, do the following:

1. Make sure the hot runner is at temperature before removing the plungers.
2. Remove the plunger retaining set screws.

For cam driven systems, the plunger also passes through the frame plate or backing plate and an extension socket may be needed.

3. Install a long socket head cap screw into the head of the plunger.

This screw can be used to apply force for pulling the plunger from the injector and actuation bar.



**Figure 5-1: Removing the Plunger**

1. Screw 2. Plunger

4. Remove the plunger from actuation bar and injectors.

### 5.3.2 Installing the Plungers

To install the plungers, do the following:

1. Clean the plungers making sure they are free from debris or contamination.



---

#### **IMPORTANT!**

If resin is in the system, the hot runner must be at a temperature to soften the resin allowing displacement of the plastic in the injector during plunger installation.

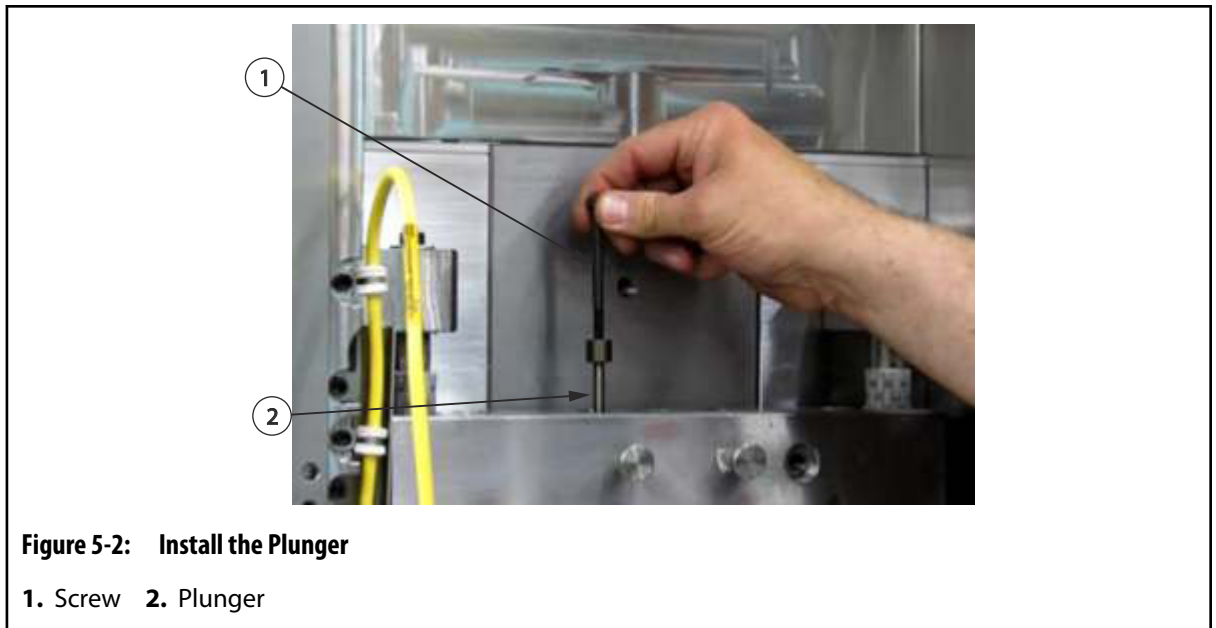
- 
2. Apply a thin layer of static application grease to the threads of the plunger set screw threads. For a list of recommended lubricants, refer to [Section 3.4](#).
  3. Install the plunger into the actuation bar and injector.

---

#### **NOTE:**

For cam actuated systems, the plunger passes through the backing plate.

---

**IMPORTANT!**

Do not apply thread-locker to the plunger retaining set screws.

4. Install the plunger retaining set screws and torque to specification.

## 5.4 Removing and Installing the Load Cell and Linkages

Load cell and linkages are removed and installed when the servo linear actuator or the actuation assembly is removed or installed.

The following procedures describe how to remove and install the load cell and linkages.

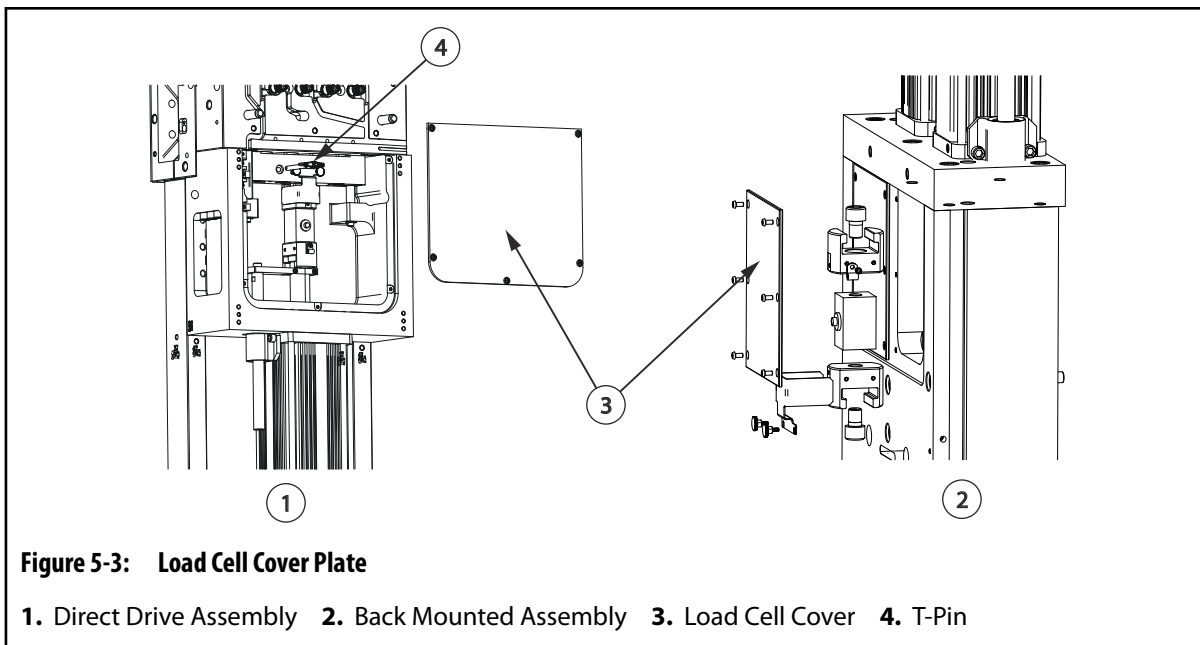
### 5.4.1 Removing the Load Cell and Linkages

The linkage assembly must be disconnected and the load cell removed before removing the servo linear actuator.

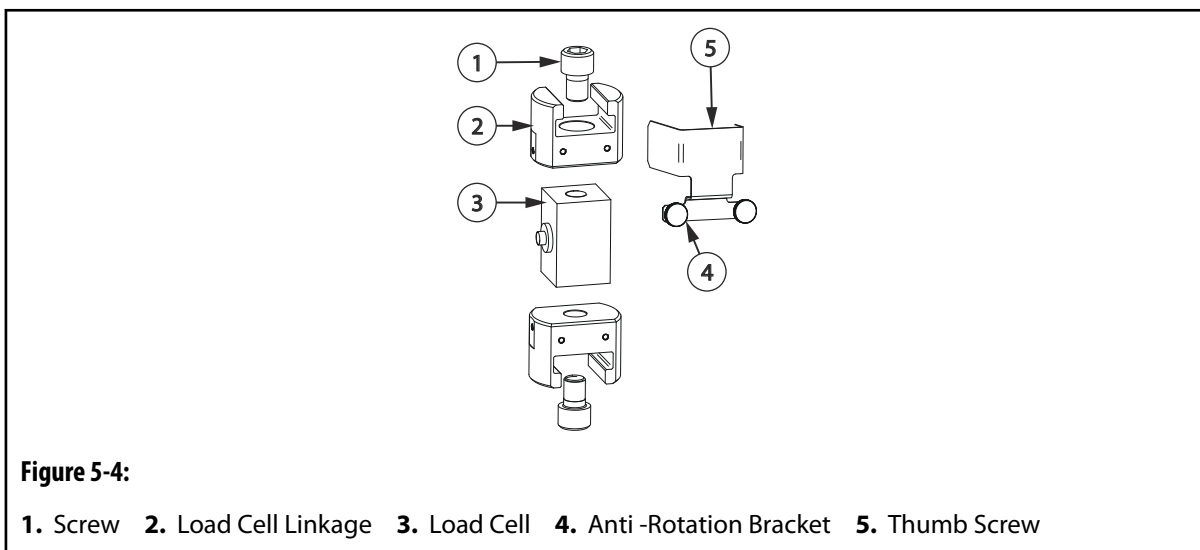
When the system is shut down it is in the retracted position. The T-Pin is installed to retain the actuation in the retracted position when removing the linkage and load cell.

To remove the load cell and linkages, do the following:

1. Remove the load cell cover plate.



2. Disconnect the load cell cable from the load cell.
3. Loosen the thumb screws retaining the anti-rotate bracket.



4. Remove the anti-rotation bracket.
5. Adjust the height of the actuation bar to allow for clearance between the linkage and adapters.



**IMPORTANT!**

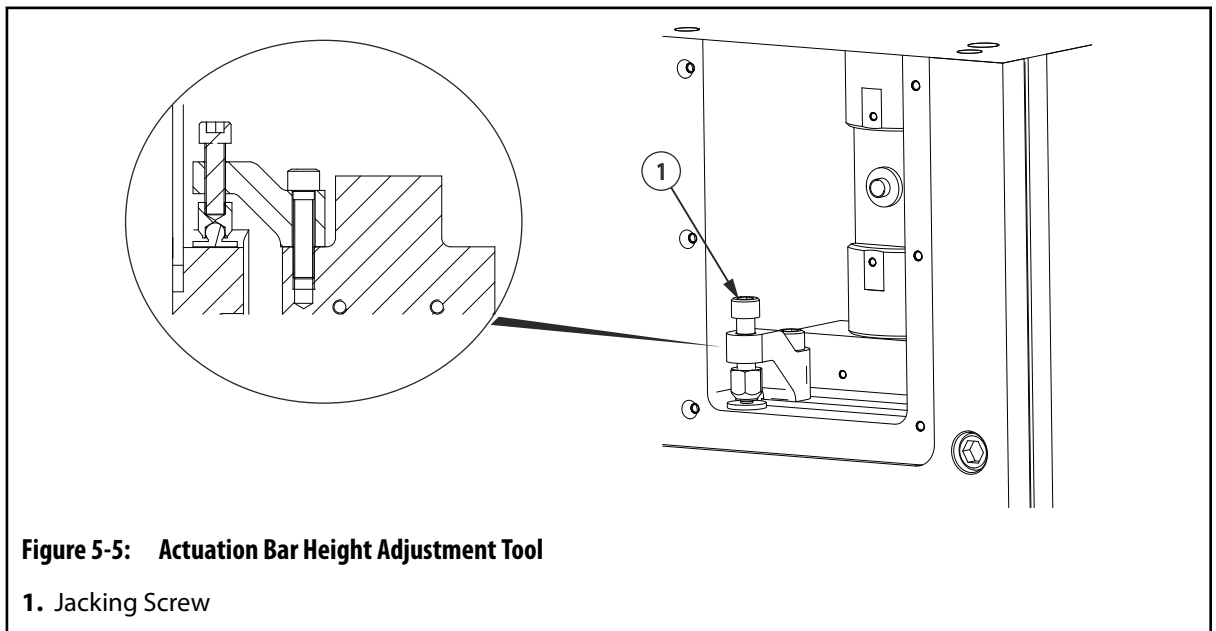
If the plungers have not been removed the hot runner must be a temperature to allow the plunger to move within the injector.

For direct drive systems:

- Adjust the actuation bar to allow clearance for load cell removal by lifting the actuation bar by hand.

For cam actuated systems:

- a. Install the actuation bar height adjustment tool.
- b. Remove the T-pins.
- c. Using the jacking screw on the actuation bar height adjustment tool, raise or lower the height of the actuation bar to allow for clearance to remove the load cell.



- d. Install the T-pins.
  - e. Remove the actuation bar height adjustment tool.
6. Remove the load cell and linkages.

## 5.4.2 Installing the Load Cell and Linkages

1. Adjust the actuation bar to allow for installation of the load cell.



### IMPORTANT!

If the plungers have not been installed the hot runner must be a temperature to allow the plunger to move within the injector.

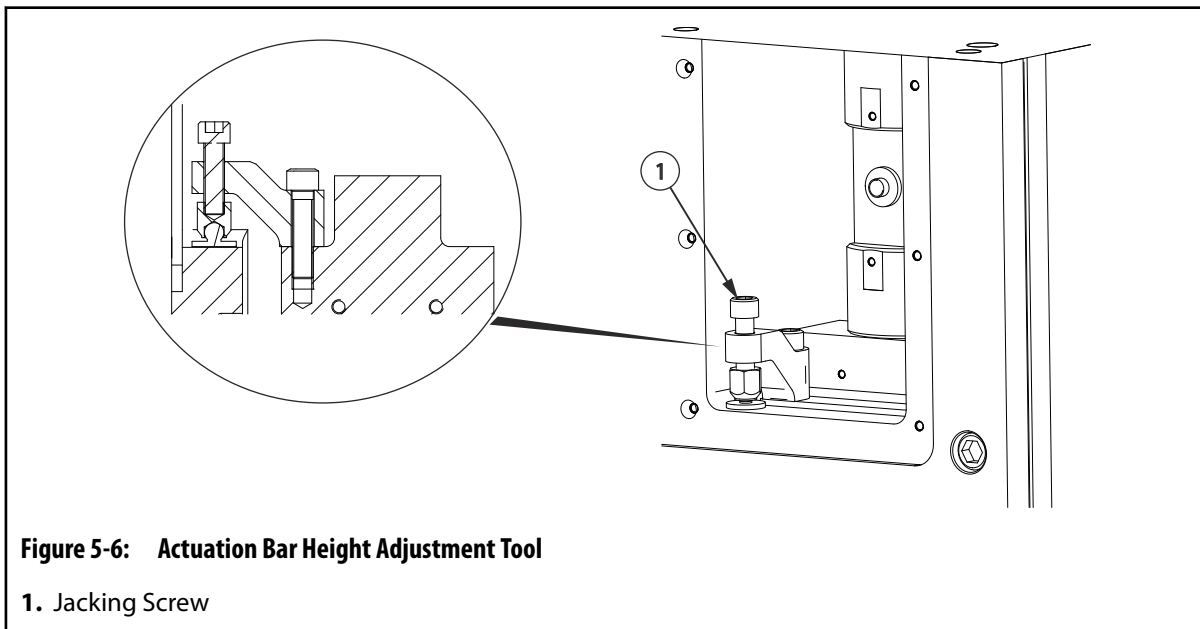
For direct drive systems:

- Adjust the actuation bar to allow clearance for load cell removal by lifting the actuation bar by hand.

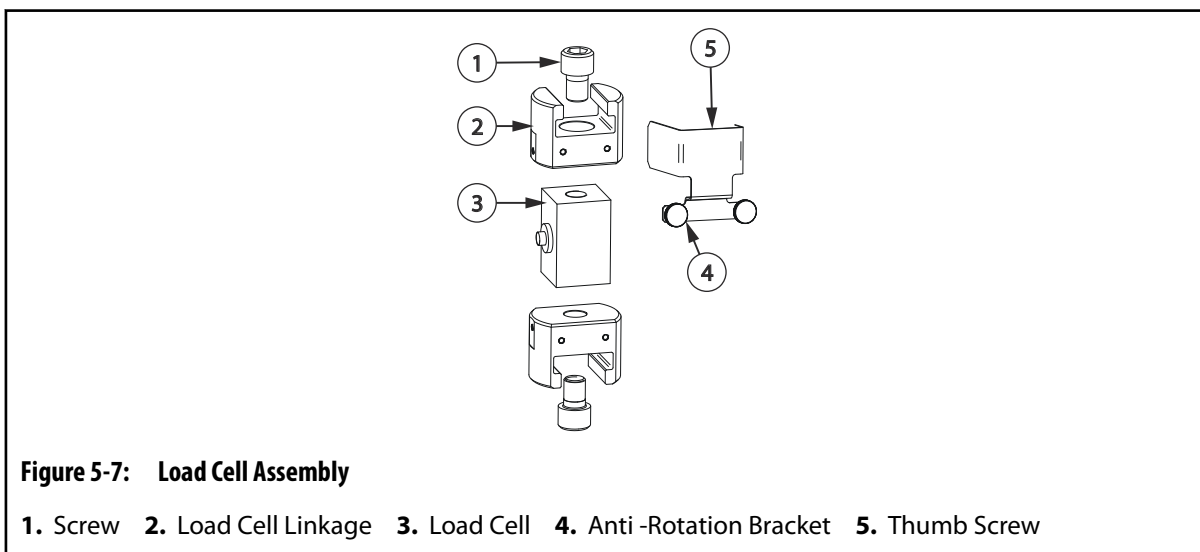
For cam actuated systems:

- a. Install the actuation bar height adjustment tool.
- b. Remove the T-pins.

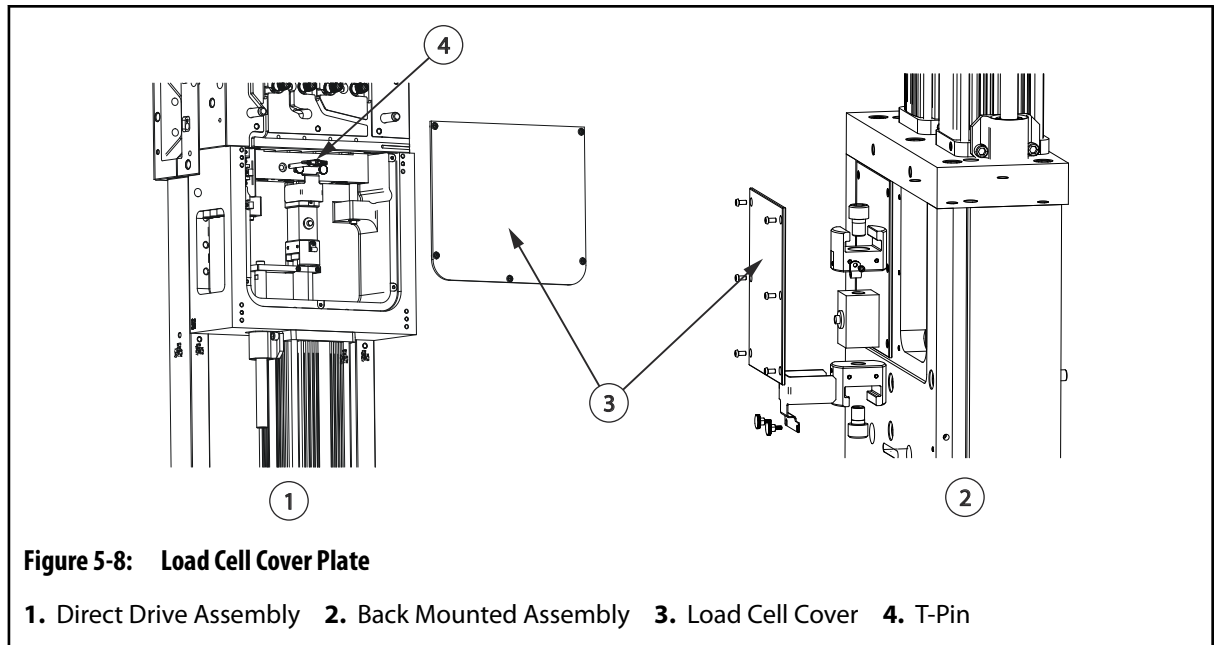
- c. Using the jacking screw on the actuation bar height adjustment tool, raise or lower the height of the actuation bar to allow for clearance to remove the load cell.



- d. Install the T-pins.
  - e. Remove the actuation bar height adjustment tool.
2. Install the load cell and linkages.



3. Connect the load cell cables making sure to route them to prevent damage during operation.
4. Install the anti-rotation bracket and then tighten the thumbs screws.
5. Install the load cell cover plate.



## 5.5 Removing and Installing the Servo Linear Actuator

The following procedures describe how to remove and install the servo linear actuator.

### 5.5.1 Removing the Servo Linear Actuator

To remove the servo linear actuator, do the following:

1. Remove the load cell. Refer to [Section 5.4.1](#) for more information.

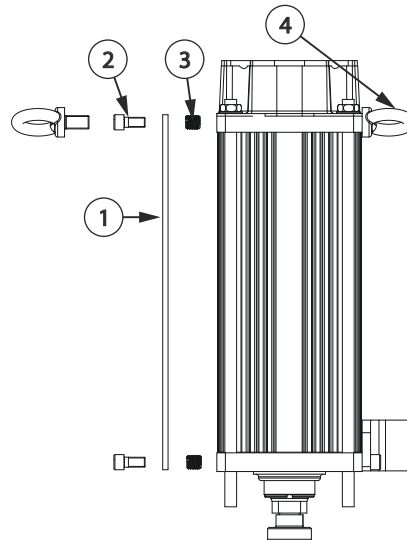
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#### CAUTION!

**Mechanical hazard - risk of damage to the alignment of the feedback device. Do not to disengage, twist, or rotate the top end cap when removing the tie rods. The end cap houses the feedback device. Alignment of this feedback device to the phases of the motor is critical to is operation. A strap must installed to prevent disengagement or rotation of the servo cap when removing the tie rods.**

---

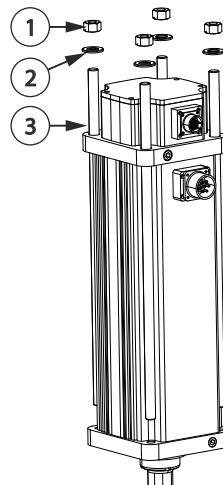
2. Attach a strap securing the servo linear actuator housing, end caps, and plates prior to removing the tie rod nuts.



**Figure 5-9: Installing the Strap**

1. Strap 2. Screw 3. Threaded Insert 4. Hoist Ring

3. Disconnect all cables to the servo linear actuator.
4. Loosen the tie rod nut and washer.



**Figure 5-10: Tie Rod Nut and Washer**

1. Tie Rod Nut 2. Washer 3. Tie Rod

5. Install hoist rings to the lifting points on the servo linear actuator.



**WARNING!**

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



**Figure 5-11: Removing the Servo Linear Actuator**

6. Using a lifting sling and an overhead lifting device, lift the servo linear actuator from the frame.

## 5.5.2 Installing the Servo Linear Actuator

To install the servo linear actuator, do the following:

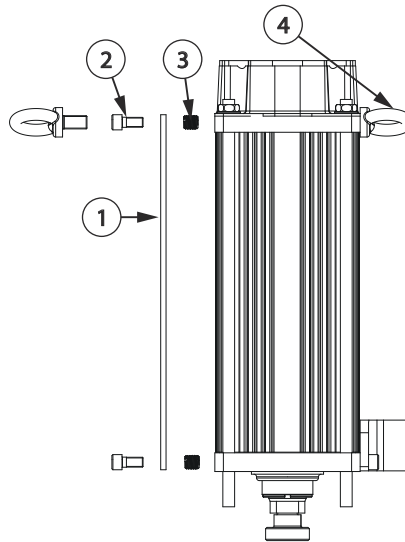
1. Attach the load cell adapter to the motor shaft and torque to specification.
2. Noting the to servo linear actuator orientation when mounted to the UltraShot assembly, attach the anti-rotation bracket with screws, and torque to specification.

---

### CAUTION!

**Mechanical hazard - risk of damage to the alignment of the feedback device. Do not to disengage, twist, or rotate the top end cap when removing the tie rods. The end cap houses the feedback device. Alignment of this feedback device to the phases of the motor is critical to is operation. A strap must installed to prevent disengagement or rotation of the servo cap when removing the tie rods.**

3. Attach a strap securing the servo linear actuator housing, end caps, and plates prior to removing the tie rod nuts.



**Figure 5-12: Securing the Strap**

1. Strap 2. Screw 3. Threaded Insert 4. Hoist Ring

4. Install hoist rings to the lifting points.



**WARNING!**

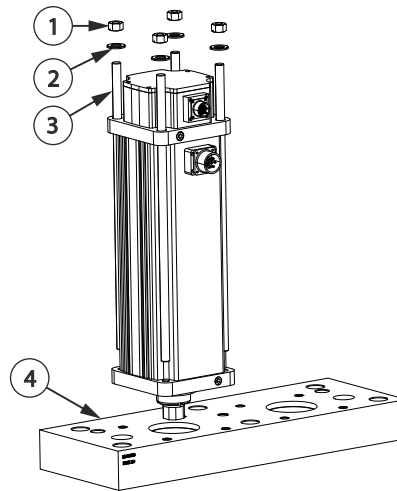
**Crushing hazard – risk of death or serious injury. Inadequate lifting equipment could fail and cause death or serious injury. Make sure all lifting equipment is rated for the load and in safe operating condition.**

5. Using a lifting sling and an overhead lifting device, lift the servo linear actuator on to the frame.



**Figure 5-13: Installing the Servo Linear Actuator**

6. Align the servo linear actuator and thread the tie rods to the servo plate.



**Figure 5-14: Install Servo Linear Actuator**

1. Tie Rod Nut   2. Washer   3. Tie Rod   4. Servo Plate

7. Thread the tie rod to the plate.
8. Loosen the motor strap screw before tightening the tie rod nuts.
9. Torque the tie rod nuts to specification.
10. Install the load cell. Refer to [Section 5.4.2](#) for more information.

## 5.6 Removing and Installing the Direct Drive Actuation Bar

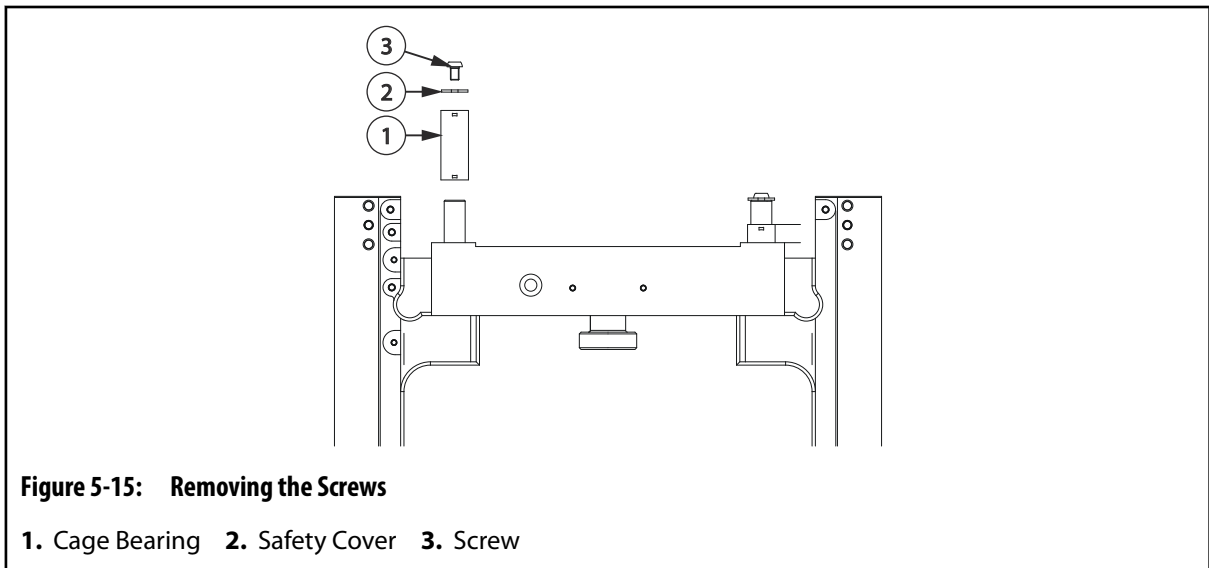
Cage bearings are replaced if damaged or at the maintenance interval specified in the maintenance schedule. Refer to [Section 5.1.1](#) for more information. Follow the procedure for removing the actuation bar to replace the cage bearings.

The following procedures describe how to remove and install the direct drive actuation bar.

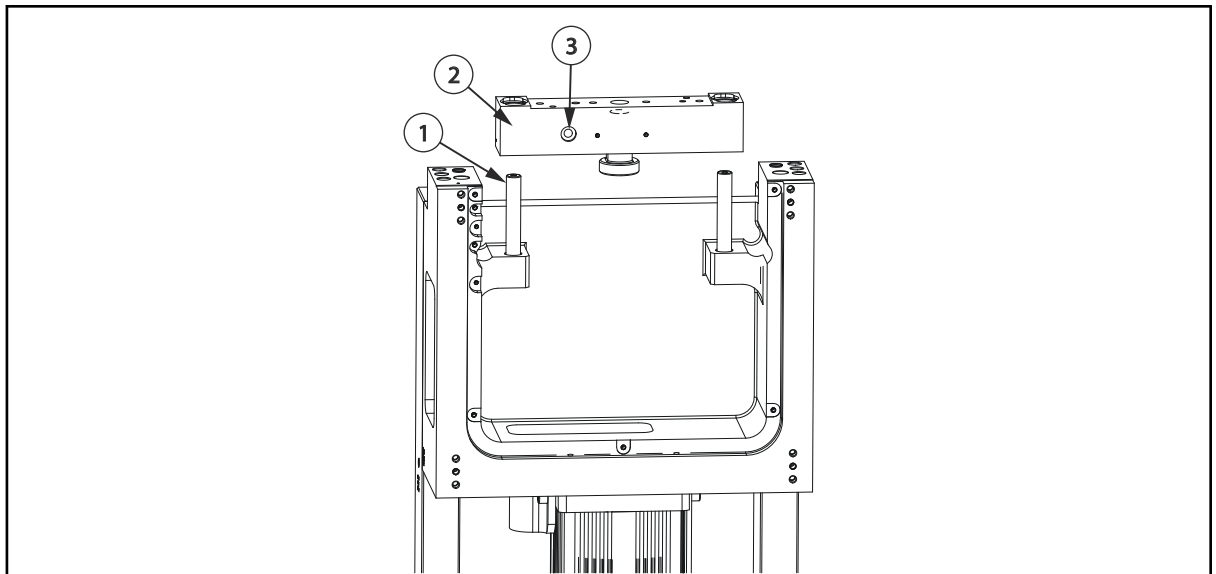
### 5.6.1 Removing the Direct Drive Actuation Bar

To remove the direct drive actuation bar, do the following:

1. Remove the plungers. Refer to [Section 5.3.1](#) for more information.
2. Remove the load cell and linkages. Refer to [Section 5.4.1](#) for more information.
3. Remove the screws, spacers and safety covers from the guide pillars.



4. Remove the actuation bars from the guide pillars.



**Figure 5-16: Removing the Actuation Bar**

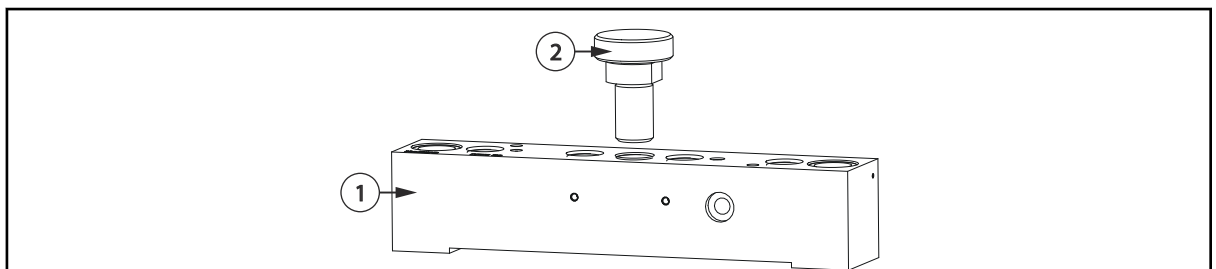
1. Guide Pillar 2. Actuation Bar 3. T-Pin Installation Point

5. Remove the cage bearings from the guide pillars.

## 5.6.2 Installing the Direct Drive Actuation Bar

To install the direct drive actuation bar, do the following:

1. If required, install the front and back stop pads. Refer to the assembly drawing package provided for more information.
2. If removed, install the load cell adapter:
  - a. Install the load cell adapter to the actuation using alignment dowels.



**Figure 5-17: Installing the Load Cell Adapter**

1. Actuation Bar 2. Load Cell Adapter

- b. Apply thread-locking fluid on the threads of the load cell adapter Refer to [Section 3.4](#) for more information.

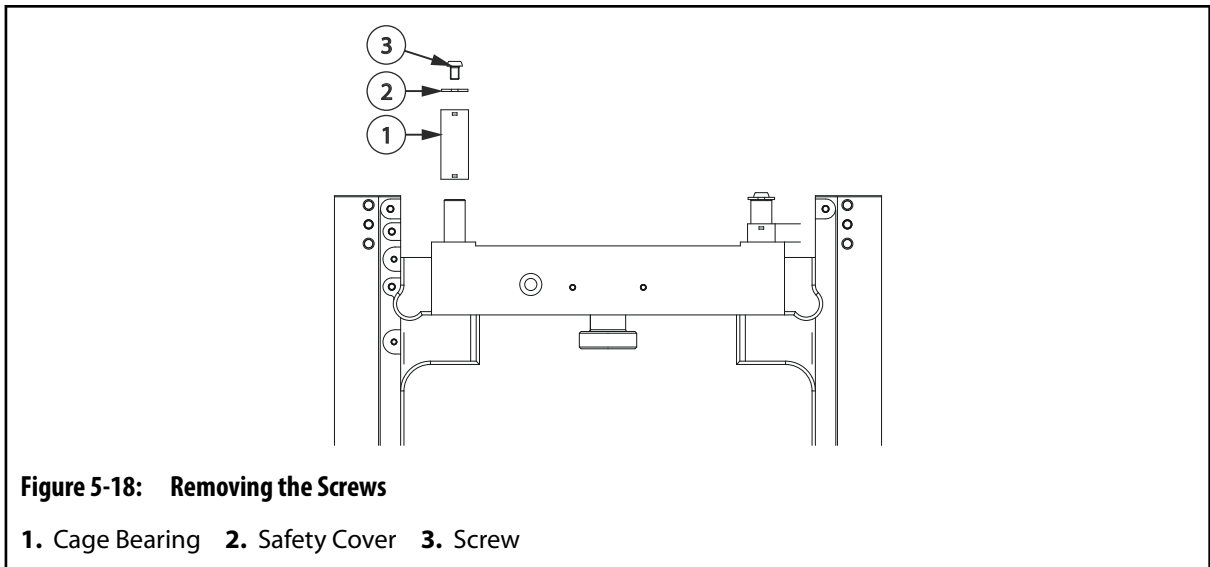
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### NOTE:

Use Loctite 242 applied to the threads. Loctite 2422 may be required for high mold temperature applications.

---

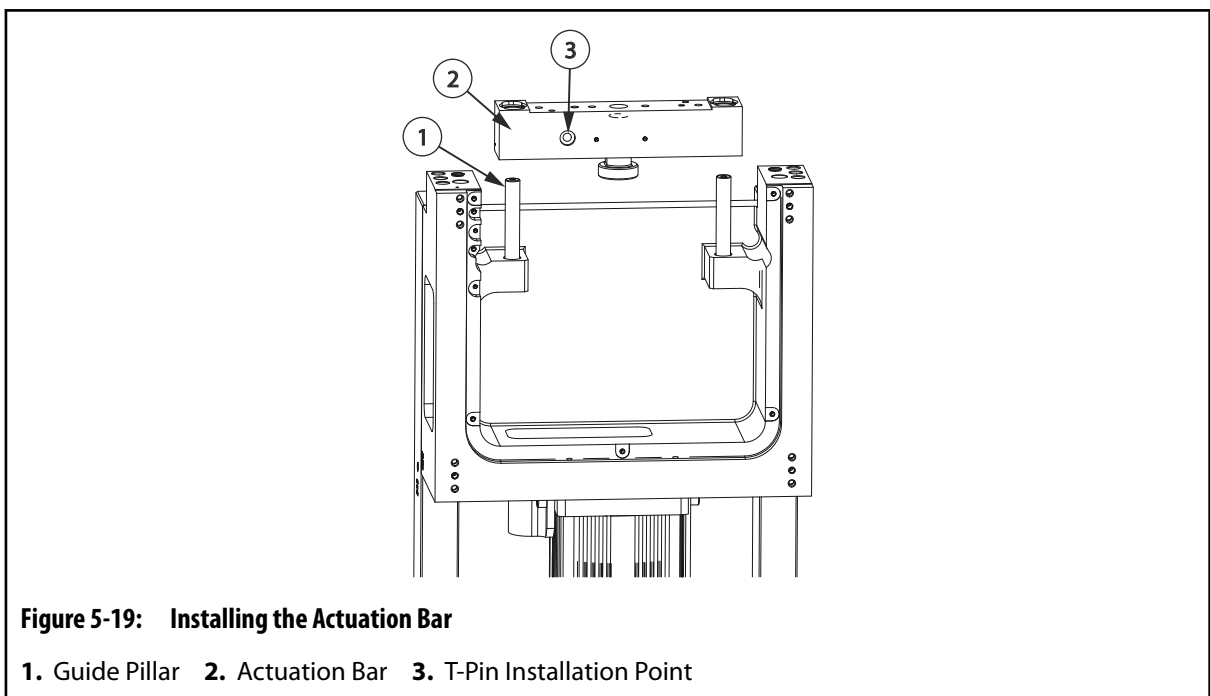
- c. Using a crows foot wrench, apply torque to the adapter.
3. Apply a film of lubricant to the guide pillars, bushings, and cage bearings. Refer to [Section 3.4](#) for recommended lubricants.



4. Install the actuation bars on the guide pillars.

For top mounted sub-assemblies the T-Pin installation is oriented towards the operator (OP) side.

For bottom mounted sub-assemblies the T-Pin installation is oriented towards the non-operator (NOP) side.



**IMPORTANT!**

Cage bearings are replaced if damaged or at the maintenance interval specified in the maintenance schedule. Refer to [Section 5.1.1](#) for more information.

5. Install the cage bearing on the guide pillar and tap it into position with a soft tool that will not damage the cage bearing. Once the cage bearing is below the guide pillar it can be difficult to continue to tap with the soft faced hammer. A cylinder or small wooden block works well to complete the installation.
6. Install spacers, safety cover, and screws to the guide pillars.
7. Install the load cell and linkages. Refer to [Section 5.4.2](#) for more information.
8. Install the plungers. Refer to [Section 5.3.2](#) for more information.

## 5.7 Removing and Installing the Cam Roller Plate Assembly (Cam Driven Systems Only)

The following procedures describe how to remove and install the cam assembly.

### 5.7.1 Removing the Cam Roller Assembly from the Frame or Backing Plate

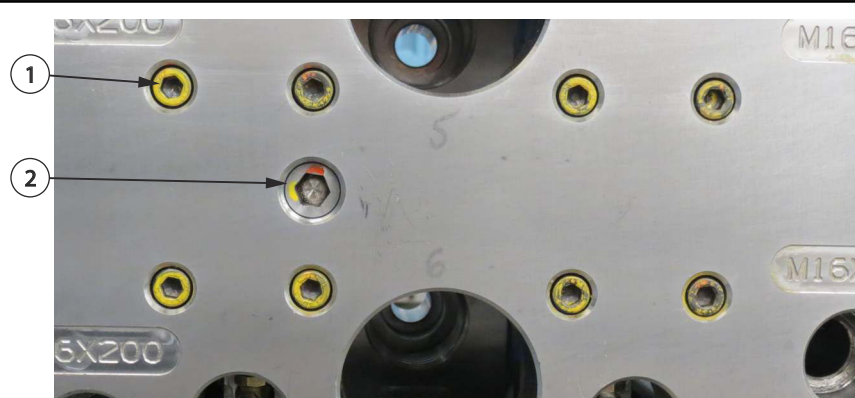
Remove the cam roller plate assembly from the frame or backing plate, do the following:

1. Make sure the assembly is in the upright position.

**NOTE:**

Pinch point hazard - risk of injury. T-pins must be installed while moving and/or flipping the UltraShot cam actuated assembly. There is one T-pin supplied for each actuation assembly

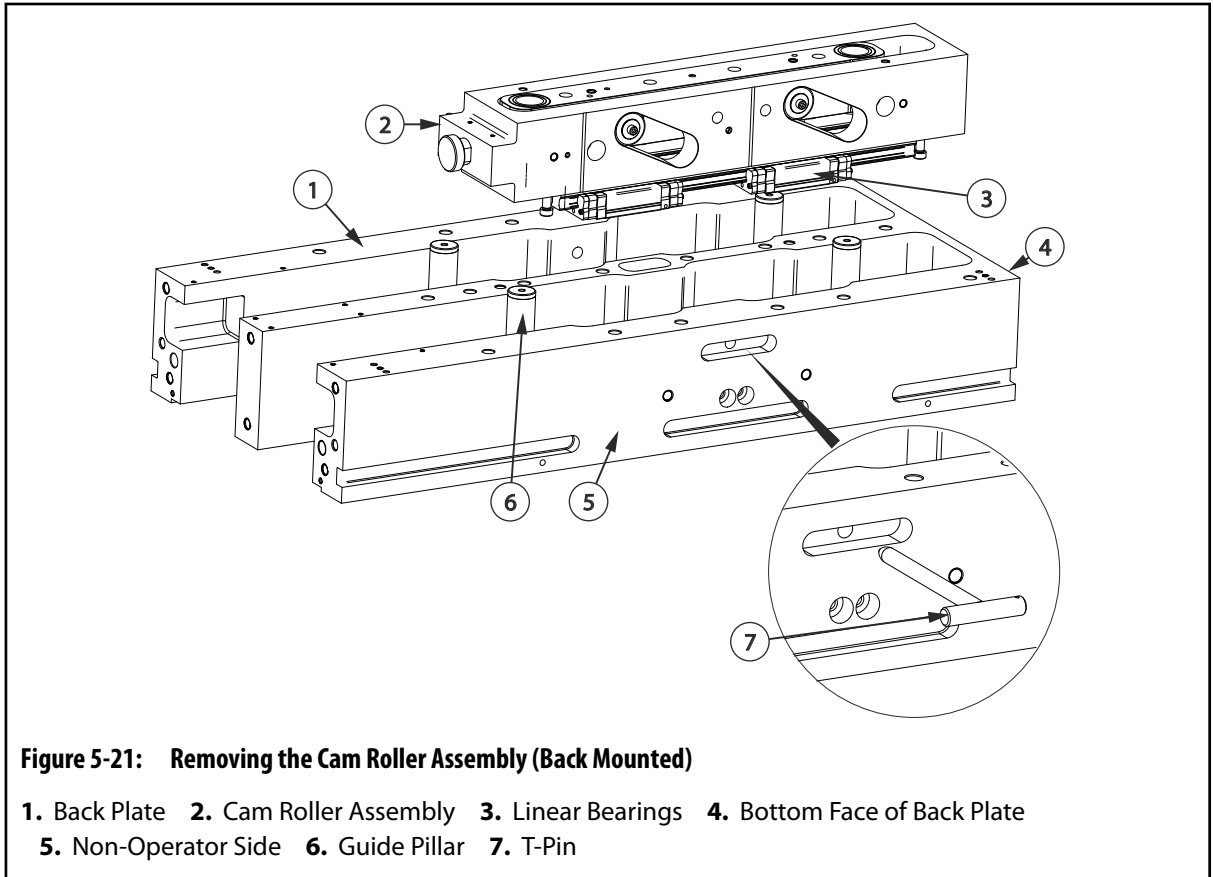
2. Install the safety T-pin.
3. Remove the combo dowels and linear bearing screws.



**Figure 5-20: Removing the Combo Dowels and Screws**

1. Linear Bearing Screws    2. Combo Dowels

4. Using an overhead lifting device, lay the UltraShot onto its back face.
5. Remove the T-pins.
6. Using an overhead lifting device, lift the plate and cam roller plate assembly from the backing plate or frame.

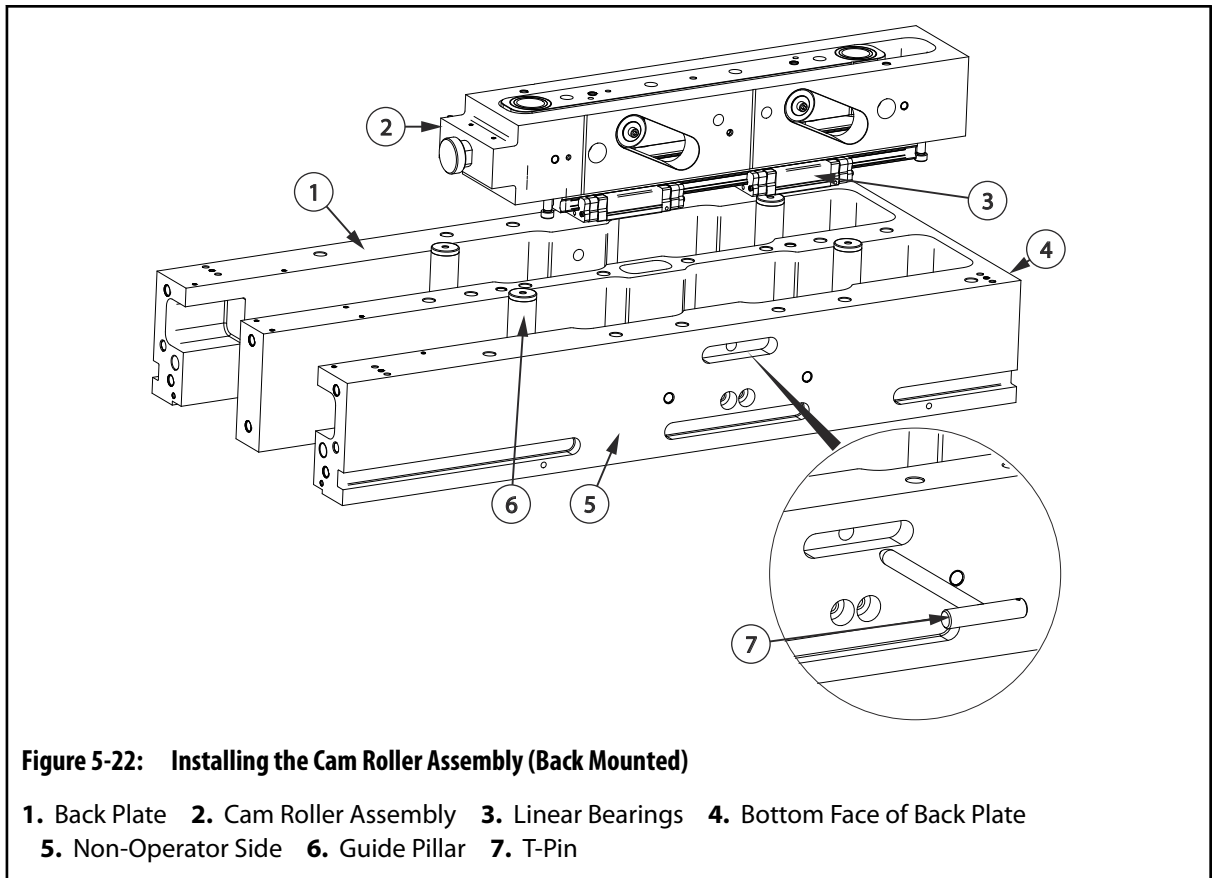


7. Place the plate and cam roller assembly on blocks taking care not to damage.

## 5.7.2 Installing the Cam Roller Assembly in the Frame or Backing Plate

To install the cam roller assembly in the frame or backing plate, do the following:

1. Coat the guide pillars and bushings with a lubricant. Refer to [Section 3.4](#) for recommended lubricants.



**Figure 5-22: Installing the Cam Roller Assembly (Back Mounted)**

1. Back Plate   2. Cam Roller Assembly   3. Linear Bearings   4. Bottom Face of Back Plate  
5. Non-Operator Side   6. Guide Pillar   7. T-Pin



**WARNING!**

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

2. Using an overhead lifting device, lift the cam roller plate assembly.



**WARNING!**

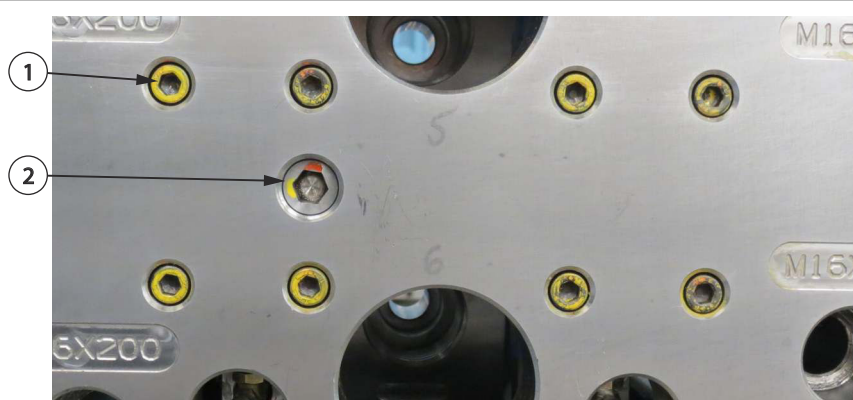
**Pinch point hazard - risk of injury. The actuation bar may move in the roller plate as it is lifted. Keep hands clear of the actuation bar during lifting.**

3. Position the assembly above the backing plate or frame plate.
4. Align the bushings of the actuation bar to the guide pillars in the plate.
5. Position the linear bearings with the indicators on the roller plate.
6. Lower the cam roller plate assembly into the backing plate.
7. Using a soft faced mallet gently tap the cage bearing onto the guide pillar. Once the cage bearing is below the top of the guide pillar a cylinder of the same diameter as the cage bearing or small wooden block can be used to complete installation and making the cage bearing flush with the surface of the actuation bar.
8. Install the safety T-pin.

9. Using an overhead lifting device, lift the plate and cam actuation assembly upright so the top of the plate is facing up to install the combo dowels and bearing screws.

A screwdriver or other small tool may be necessary to position the linear bearings with the bores in the plate.

10. Install the combo dowels and linear bearing screws and torque the combo dowels and screws to specification.



**Figure 5-23:**

**1.** Linear Bearing Screws    **2.** Combo Dowels

## 5.8 Removing and Installing the Actuation Bar into the Cam Roller Plate (Cam Driven Systems Only)

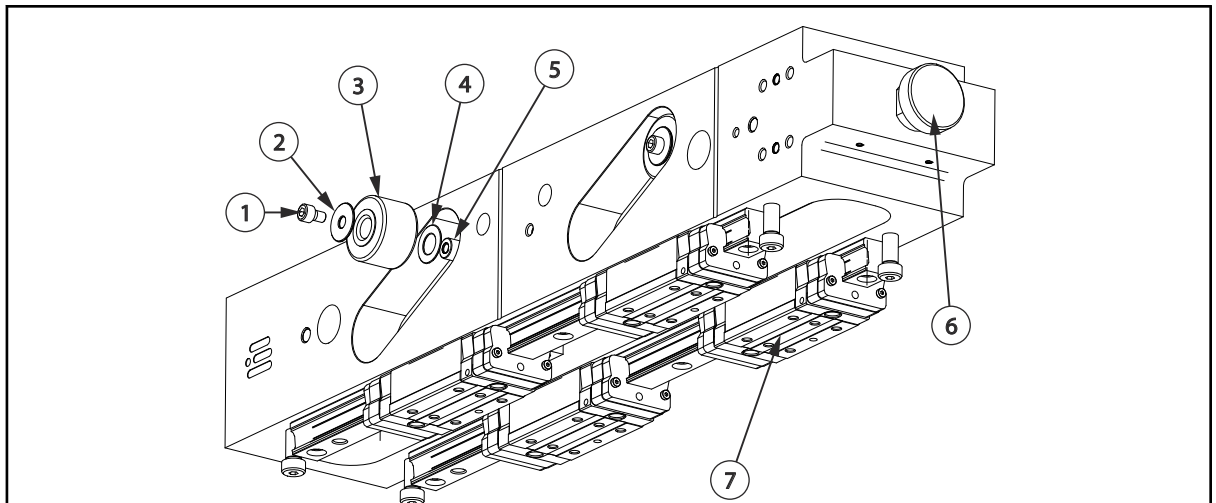
Cage bearings are replaced if damaged or at the maintenance interval specified in the maintenance schedule. Refer to [Section 5.1.1](#) for more information. Follow the procedure for removing the actuation bar to replace the cage bearings.

The following procedures describe how to remove and install the actuation bar into the cam roller plate.

### 5.8.1 Removing the Actuator Bar from the Cam Roller Plate

To remove the actuator bar from the cam roller plate, do the following:

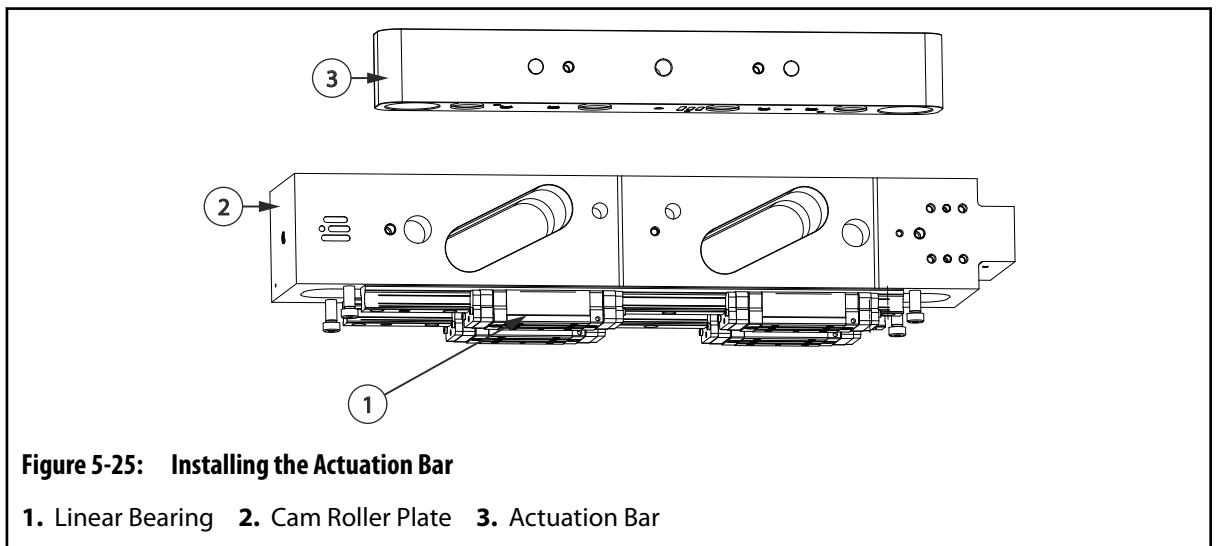
1. Remove the cam roller assembly from the frame or backing plate. Refer to [Section 5.7.1](#) for more information.
2. Place the cam assembly, with linear rails facing down, supported by wooden blocks. Take care in placement of blocking avoiding damage to linear bearings.
3. Remove the roller cam retaining screw.



**Figure 5-24: Removing the Cam Rollers**

1. Screw 2. Outer Washer 3. Cam Roller 4. Inner Washer 5. Cam Shaft 6. Load Cell Adapter  
7. Linear Bearing

4. Remove the cam roller, shaft, and washers.
5. Using an overhead lifting device, lift the actuation bar from the cam roller plate.



**Figure 5-25: Installing the Actuation Bar**

1. Linear Bearing 2. Cam Roller Plate 3. Actuation Bar

## 5.8.2 Installing the Actuator Bar into the Cam Roller Plate

To install the actuator bar into the cam roller plate, do the following:

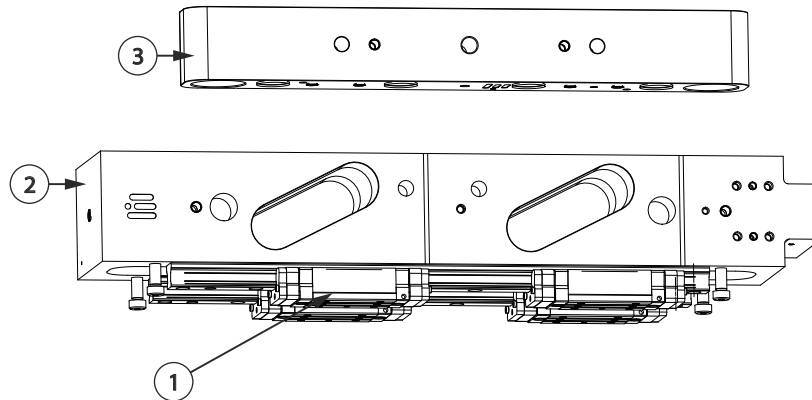
1. Make sure the front and back stop pads are installed on the actuation bar.
2. Place the cam roller plate on bench, with linear rails facing down, supported by wooden blocks. Take care in placement of blocking avoiding damage to linear bearings.
3. Install hoist rings to the lifting points of the actuation bar.



**WARNING!**

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

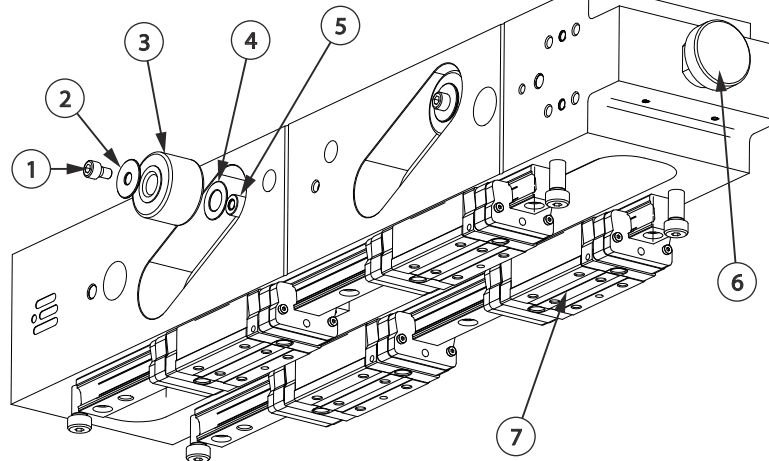
4. Using an overhead lifting device, lift the actuation bar and lower it into the cam roller plate.



**Figure 5-26: Installing the Actuation Bar**

1. Linear Bearing 2. Cam Roller Plate 3. Actuation Bar

5. If necessary, install the cam roller shafts to the cam rollers
6. Gently tap the shaft into position on the cam roller with soft faced mallet so the end of the shaft is flush with the outer surface of the cam roller.
7. Install the outer washer and then secure with a screw.



**Figure 5-27: Installing the Cam Rollers**

1. Screw 2. Outer Washer 3. Cam Roller 4. Inner Washer 5. Cam Shaft 6. Load Cell Adapter 7. Linear Bearing

8. Apply a layer of lubricant to the mating surface of the cam slot and the outer surface of the cam rollers.

9. Install the inner washer to the cam roller shaft.
10. Insert the cam roller shaft through the cam slot and actuation bar until it is seated in the cam slot.
11. On the opposite side of the cam bar, repeat [step 5](#) to [step 10](#).
12. Torque the cam roller retaining screws to specified torque. A hex key wrench or socket and ratchet is needed to keep the shaft from rotating while torque is applied.
13. Make sure the correct torque has been applied to both sides swapping the hex key wrench and torque wrench again applying specified torque
14. Repeat [step 2](#) to [step 13](#) for all other cam roller and actuation bar assemblies.

## 5.9 Removing and Installing the Linear Bearings (Cam Driven Systems Only)

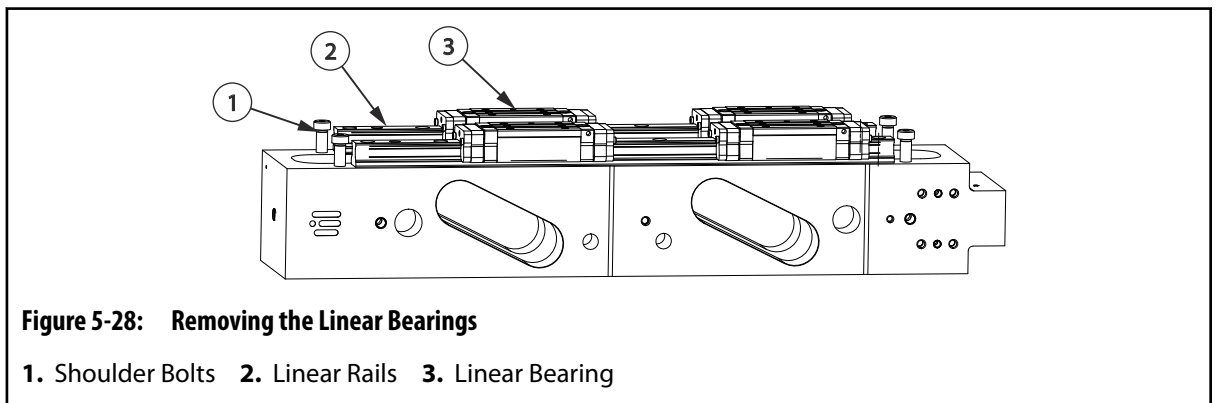
Linear bearings are replaced if damaged or at the maintenance interval specified in the maintenance schedule. Refer to [Section 5.1.1](#) for more information.

The following procedures describe how to remove and install the linear bearings.

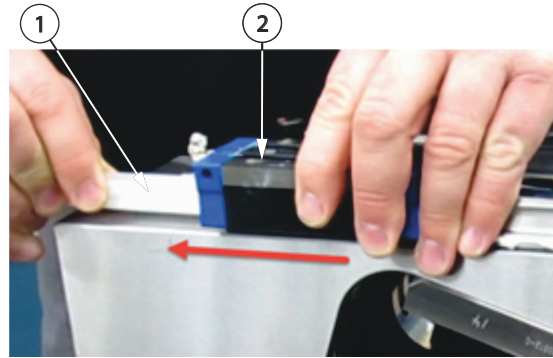
### 5.9.1 Removing the Linear Bearings

To remove the linear bearings, do the following:

1. Remove the UltraShot from the hot runner. Refer to [Section 4.3](#) for more information.
2. Remove the cam assembly from the frame or backing plate. Refer to [Section 5.7](#) for more information.
3. Remove the shoulder at one end of linear rails.



4. Align the plastic sleeve against the linear rail.



**Figure 5-29: Removing the Linear Bearing**

1. Plastic Sleeve 2. Linear Bearing

5. Slide the linear bearing off the rail onto the sleeve.

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**NOTE:**

The plastic sleeve prevents any ball bearings from escaping the bearing track.

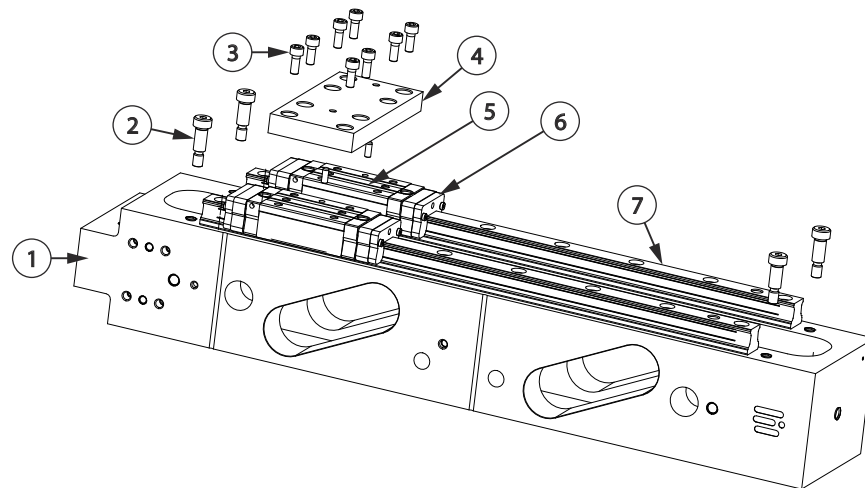
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## 5.9.2 Aligning the Linear Rails

The linear rails need to be aligned if they become loose or if they have been removed.

To align the linear rails, do the following:

1. If not already removed, remove the linear bearings. Refer to [Section 5.9.1](#) for more information.
2. Make sure the linear rails are installed. The linear rail with dowels must be tight and secured. The second rail must be loose to allow for adjustment.
3. Install the a linear bearing on each rail. Refer to [Section 5.9.3](#) for more information.
4. Install the rail alignment plate to the linear bearings using alignment dowels and secure with screws.



**Figure 5-30: Install the Rail Alignment Plate**

1. Cam Roller Plate 2. Shoulder Bolts 3. Rail Alignment Plate Screws 4. Rail Alignment Plate  
5. Linear Bearing 6. Lube Block 7. Linear Rail

5. Align the rails by sliding the linear bearings with the alignment plate along the entire length of the rails three to four times.
6. Torque the rail mounting screws specification.
7. Remove the rail alignment plate.
8. Continue to install the linear bearings. Refer to [Section 5.9.3](#) for more information.

### 5.9.3 Installing the Linear Bearings

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**NOTE:**

The cam roller assembly is not used in the direct drive system.

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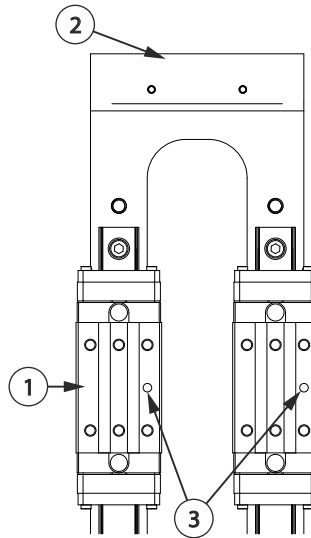
**IMPORTANT!**

Linear bearings are provided pre-lubricated and with the lubrication blocks installed.

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To install the linear bearings, do the following:

1. Orient the linear bearing onto the rail. Linear bearing at the top of the cam roller plate with the dowel locations to the right.



**Figure 5-31: Orient the Linear Bearing**

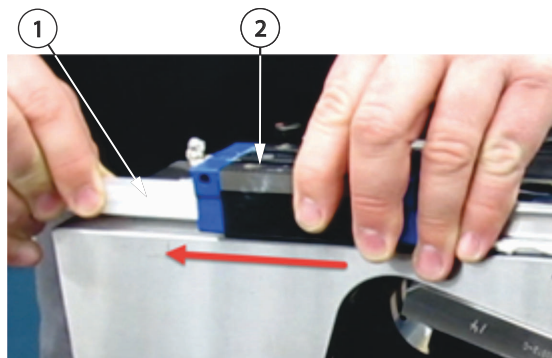
1. Top of Cam Roller Plate 2. Linear Bearing 3. Dowel Locations

2. Install one linear bearing onto each of the linear rails. The plastic guard will be pushed out as the bearing moves onto the rail. This should prevent any bearings escaping the race.



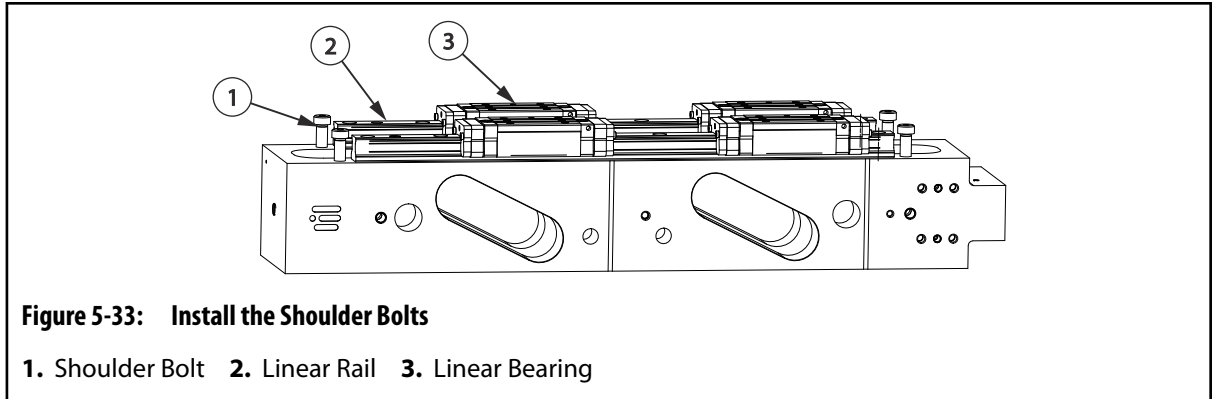
**IMPORTANT!**

Save the plastic guard for use during future maintenance.



**Figure 5-32: Install the Linear Bearing**

3. If the linear rails are loose or have been removed, align the linear rails. Refer to [Section 5.9.2](#) for more information.
4. Install the second linear bearing on each linear rail, repeating [step 2](#).
5. Install shoulder bolts at the end of each rail to prevent the linear bearings from disengaging the rails.



6. Repeat [step 2](#) to [step 5](#) for all the roller cam plates in the system.

## 5.10 Removing and Installing the Heat Sink and Cap Assembly

The following procedures describe how to remove and install the heat sink and cap.



### IMPORTANT!

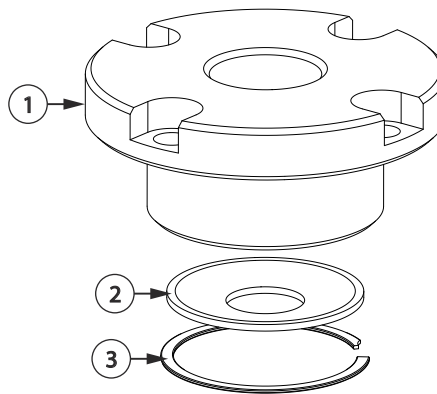
The heat sink cap extends beyond the top of the injector and must be removed as well as the plungers prior to removing the manifold.

### 5.10.1 Removing the Heat Sink and Cap Assembly

If the manifold must be removed, the heat sink cap extends beyond the top of the injector and must be removed.

To remove the heat sink and cap assembly, do the following:

1. Remove the plungers. Refer to [Section 5.3.1](#) for more information.
2. Remove the screws securing the heat sink cap assembly to the manifold.
3. Remove the cap assembly from the manifold pocket.



**Figure 5-34: Removing the Heat Sink and Cap from Manifold Pocket**

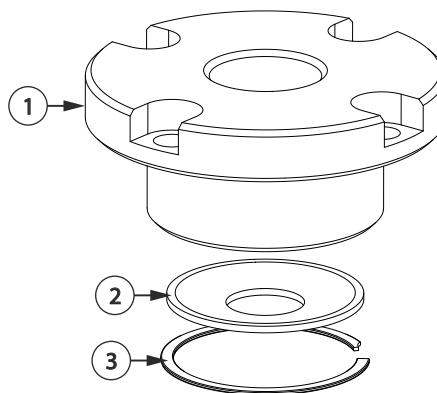
1. Cap 2. Heat Sink Spring 3. Snap Ring

4. If required, remove the retaining clip securing the heat sink spring to the cap and then remove the heat sink spring.

## 5.10.2 Installing the Heat Sink and Cap Assembly

To install the heat sink and cap assembly, do the following:

1. Make sure manifold and manifold plate must be installed . Refer to the hot runner manual for more information.
2. Make sure the injectors are installed.
3. If removed, install the heat sink spring with the retaining rings into the cap.



**Figure 5-35: Install the Heat Sink and Cap Into Manifold Pocket**

1. Cap 2. Heat Sink Spring 3. Snap Ring

4. Install the assembled heat sink cap into the manifold pocket.
5. Secure with screws to hand tight only.
6. If the heat sink spring is positioned without interference to plunger, torque the screws to specification.

## 5.11 Removing and Installing the Heater and Thermocouple

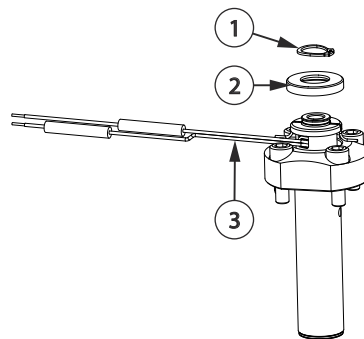
A heater and thermocouple are installed on the injector.

The following procedures describe how to remove and install the heater and thermocouple.

### 5.11.1 Removing the Heater and Thermocouple

To remove the heater and thermocouple, do the following:

1. Remove the internal snap ring retainer, that secures the thermocouple cap, from the groove of the injector.



**Figure 5-36: Thermocouple**

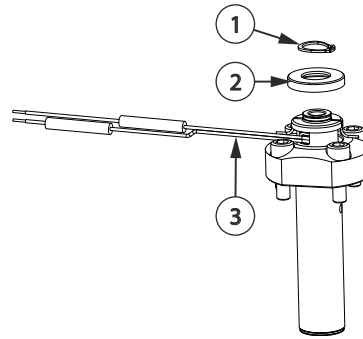
1. Snap Ring 2. Thermocouple Cap 3. Thermocouple

2. Remove the thermocouple cap on the heater.
3. Remove both thermocouples from the injector bore
4. Remove the thermocouple flange.
5. Remove the heater on the injector.
6. For through bore injectors, remove a retaining clip in the groove above the disc spring.

### 5.11.2 Installing the Heater and Thermocouple

To install the heater and thermocouple, do the following:

1. For through bore injectors, install a retaining clip in the groove above the disc spring. This correctly positions the heater.



**Figure 5-37: Thermocouple**

**1. Snap Ring   2. Thermocouple Cap   3. Thermocouple**

- 2.** Install the heater on the injector.
- 3.** Install the thermocouple flange on the injector aligning the slots with the thermocouple holes.
- 4.** Install both thermocouples in the slots and firmly seating them in the thermocouple bore of the injector and then bend the thermocouple lead over the edge of the thermocouple flange.
- 5.** Install the thermocouple cap over the assembly.
- 6.** Install the internal snap ring retainer in the groove of the injector to secure the thermocouple cap in place.