

## Series 2712 and 2732 Pneumatic Side Action Grips



## **Electromagnetic Compatibility**

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

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## **Original Instructions**

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## General Safety Precautions



Materials testing systems are potentially hazardous.

Materials testing involves inherent hazards from high forces, rapid motions, and stored energy. You must be aware of all moving and operating components that are potentially hazardous, particularly the actuator in a servohydraulic testing system or the moving crosshead in an electromechanical testing system.

Carefully read all relevant manuals and observe all Warnings and Cautions. The term Warning is used where a hazard may lead to injury or death. The term Caution is used where a hazard may lead to damage to equipment or to loss of data.

Instron products, to the best of its knowledge, comply with various national and international safety standards, in as much as they apply to materials and structural testing. We certify that our products comply with all relevant EU directives (CE mark).

Because of the wide range of applications with which our instruments are used, and over which we have no control, additional protection devices and operating procedures may be necessary due to specific accident prevention regulations, safety regulations, further EEA directives or locally valid regulations. The extent of our delivery regarding protective devices is defined in your initial sales quotation. We are thus free of liability in this respect.

At your request, we will gladly provide advice and quotations for additional safety devices such as protective shielding, warning signs or methods of restricting access to the equipment.

The following pages detail various general warnings that you must heed at all times while using materials testing equipment. You will find more specific Warnings and Cautions in the text whenever a potential hazard exists.

Your best safety precautions are to gain a thorough understanding of the equipment by reading your instruction manuals and to always use good judgement.

It is our strong recommendation that you should carry out your own product safety risk assessment.

## Warnings

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**Hazard - Press the Emergency Stop button whenever you consider that an unsafe condition exists.**

The Emergency Stop button removes hydraulic power or electrical drive from the testing system and brings the hazardous elements of the system to a stop as quickly as possible. It does not isolate the system from electrical power, other means are provided to disconnect the electrical supply. Whenever you consider that safety may be compromised, stop the test using the Emergency Stop button. Investigate and resolve the situation that caused the use of the Emergency Stop button before you reset it.



**Flying Debris Hazard - Make sure that test specimens are installed correctly in grips or fixtures in order to eliminate stresses that can cause breakage of grip jaws or fixture components.**

Incorrect installation of test specimens creates stresses in grip jaws or fixture components that can result in breakage of these components. The high energies involved can cause the broken parts to be projected forcefully some distance from the test area. Install specimens in the center of the grip jaws in line with the load path. Insert specimens into the jaws by at least the amount recommended in your grip documentation. This amount can vary between 66% to 100% insertion depth; refer to supplied instructions for your specific grips. Use any centering and alignment devices provided.



**Hazard - Protect electrical cables from damage and inadvertent disconnection.**

The loss of controlling and feedback signals that can result from a disconnected or damaged cable causes an open loop condition that may drive the actuator or crosshead rapidly to its extremes of motion. Protect all electrical cables, particularly transducer cables, from damage. Never route cables across the floor without protection, nor suspend cables overhead under excessive strain. Use padding to avoid chafing where cables are routed around corners or through wall openings.

## Warnings

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### **High/Low Temperature Hazard - Wear protective clothing when handling equipment at extremes of temperature.**

Materials testing is often carried out at non-ambient temperatures using ovens, furnaces or cryogenic chambers. Extreme temperature means an operating temperature exceeding 60 °C (140 °F) or below 0 °C (32 °F). You must use protective clothing, such as gloves, when handling equipment at these temperatures. Display a warning notice concerning low or high temperature operation whenever temperature control equipment is in use. You should note that the hazard from extreme temperature can extend beyond the immediate area of the test.



### **Crush Hazard - Take care when installing or removing a specimen, assembly, structure, or load string component.**

Installation or removal of a specimen, assembly, structure, or load string component involves working inside the hazard area between the grips or fixtures. When working in this area, ensure that other personnel cannot operate any of the system controls. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.



### **Hazard - Do not place a testing system off-line from computer control without first ensuring that no actuator or crosshead movement will occur upon transfer to manual control.**

The actuator or crosshead will immediately respond to manual control settings when the system is placed off-line from computer control. Before transferring to manual control, make sure that the control settings are such that unexpected actuator or crosshead movement cannot occur.



### **Robotic Motion Hazard - Keep clear of the operating envelope of a robotic device unless the device is de-activated.**

The robot in an automated testing system presents a hazard because its movements are hard to predict. The robot can go instantly from a waiting state to high speed operation in several axes of motion. During system operation, keep away from the operating envelope of the robot. De-activate the robot before entering the envelope for any purpose, such as reloading the specimen magazine.

## Warnings

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**Hazard - Set the appropriate limits before performing loop tuning or running waveforms or tests.**

Operational limits are included within your testing system to suspend motion or shut off the system when upper and/or lower bounds of actuator or crosshead travel, or force or strain, are reached during testing. Correct setting of operational limits by the operator, prior to testing, will reduce the risk of damage to test article and system and associated hazard to the operator.



**Electrical Hazard - Disconnect the electrical power supply before removing the covers to electrical equipment.**

Disconnect equipment from the electrical power supply before removing any electrical safety covers or replacing fuses. Do not reconnect the power source while the covers are removed. Refit covers as soon as possible.



**Rotating Machinery Hazard - Disconnect power supplies before removing the covers to rotating machinery.**

Disconnect equipment from all power supplies before removing any cover which gives access to rotating machinery. Do not reconnect any power supply while the covers are removed unless you are specifically instructed to do so in the manual. If the equipment needs to be operated to perform maintenance tasks with the covers removed, ensure that all loose clothing, long hair, etc. is tied back. Refit covers as soon as possible.



**Hazard - Shut down the hydraulic power supply and discharge hydraulic pressure before disconnection of any hydraulic fluid coupling.**

Do not disconnect any hydraulic coupling without first shutting down the hydraulic power supply and discharging stored pressure to zero. Tie down or otherwise secure all pressurized hoses to prevent movement during system operation and to prevent the hose from whipping about in the event of a rupture.



**Hazard - Shut off the supply of compressed gas and discharge residual gas pressure before you disconnect any compressed gas coupling.**

Do not release gas connections without first disconnecting the gas supply and discharging any residual pressure to zero.

## Warnings

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**Explosion Hazard - Wear eye protection and use protective shields or screens whenever any possibility exists of a hazard from the failure of a specimen, assembly or structure under test.**



Wear eye protection and use protective shields or screens whenever a risk of injury to operators and observers exists from the failure of a test specimen, assembly or structure, particularly where explosive disintegration may occur. Due to the wide range of specimen materials, assemblies or structures that may be tested, any hazard resulting from the failure of a test specimen, assembly or structure is entirely the responsibility of the owner and the user of the equipment.



**Hazard - Ensure components of the load string are correctly pre-loaded to minimize the risk of fatigue failure.**

Dynamic systems, especially where load reversals through zero are occurring, are at risk of fatigue cracks developing if components of the load string are not correctly pre-loaded to one another. Apply the specified torque to all load string fasteners and the correct setting to wedge washers or spiral washers. Visually inspect highly stressed components such as grips and threaded adapters prior to every fatigue test for signs of wear or fatigue damage.





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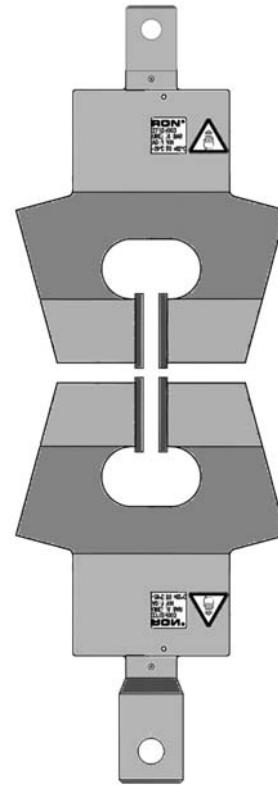
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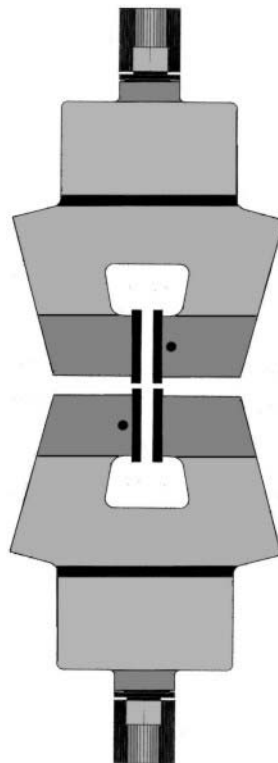
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2712-001



2712-003



2732-003

*Samples of 2712 and 2732 Grips*

# Chapter 1 Introduction

## Outline

This chapter introduces the Series 2712 and 2732 pneumatic grips and details the purpose, description and function of the grips. It includes the following sections:

- Purpose . . . . . 1-2
- Description . . . . . 1-4
- Function . . . . . 1-6
- Accessories . . . . . 1-7

## Purpose

Instron Series 2712 and 2732 pneumatic action grips are designed for material testing applications where specimens are difficult to hold in conventional screw-action grips. Pneumatic action grips allow rapid, easy loading of specimens from delicate films to polymers and woven fabrics. This provides a very simple and efficient method for securing test specimens easily and quickly. The pneumatic action of these grips let you accurately control the gripping force on the specimen with a minimum but constant force.

The primary difference between the Series 2712 grips and the 2732 grips is that the 2712 grips are used at ambient temperatures, whereas the 2732 grips are high temperature grips and are designed for use inside a temperature chamber. The individual grips within both Series differ in several ways:

- Capacity.
- Mechanical connections that secure the grip in the load string.
- Range of applications.

The capacity and mechanical connections for each grip are detailed in [Chapter 2](#). The range of applications for each grip is outlined in [Table 1-1](#).

*Table 1-1. Range of Applications*

Grip Number	Specimen Materials	Specimen Shapes
2712-001 2712-013	Thin sheets, films, foils, threads, filaments and soft materials.	Round (wires or mono filaments) and flat specimen with or without shoulder tab ends.
2712-002 2712-003 2712-004 2712-016 2712-018 2712-019 2712-020	Thin sheets, films, foils, threads, plastic tapes, fine wires and soft materials.	Round (wires) and flat specimen with or without shoulder tab ends.
2732-003 2732-004 2732-006 2732-008 2732-009	Thin sheets, films, foils, threads, plastic tapes, fine wires and soft materials.	Round (wires) and flat specimen with or without shoulder tab ends.

[Figure 1-1](#) and [Figure 1-2](#) display typical grips of both the Series 2712 and Series 2732 grips.

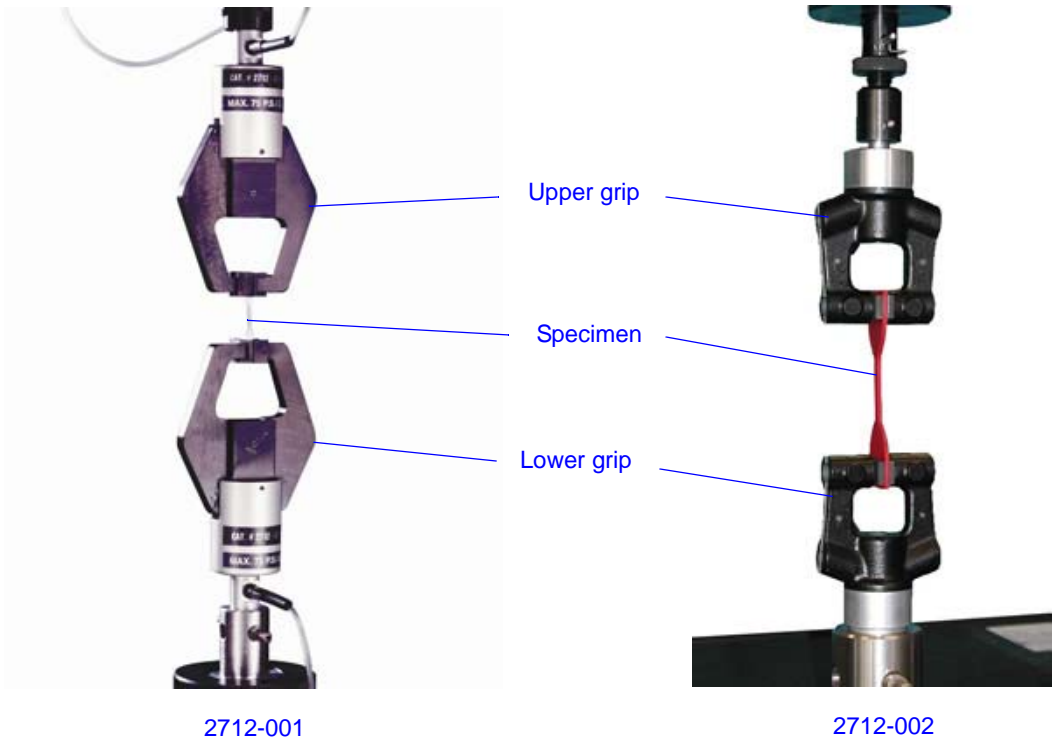


Figure 1-1. Series 2712 Typical Grips



Figure 1-2. Series 2732 Typical Grips

## Description

Both the Series 2712 and 2732 share a common design. The grip consists of a U-shaped frame and a cylindrical piston housing. The housing encloses a conical piston and compression spring. One piston end is cone-shaped and tapers toward the grip's open end. Two integral arms, each housing a transfer lever, roller link and jaw face holder, extend away from the piston housing. The narrow taper of the piston contacts the two roller links, and the roller links couple to the transfer levers via dowel pins. Dowel pins couple the levers to the jaw face holders. A dowel pin couples the rectangular jaw face to the holder.

The 2732 high temperature grips are designed to be inside an environmental chamber. These grips have extension rods that provide maximum travel in a chamber and also conduct air to the grips. Inside the frame cavity, a metal bellows encloses the grip piston.

Models 2712-002 and 2712-019 have an integral toggle valve to open and close the grips. All other grip models require a separate air control, such as a pneumatic foot switch, to operate the grips.

Both jaw faces automatically adjust to different specimen thicknesses to ensure that the line of tensile force remains concentric with the grip body. The grips within both Series 2712 (except the 2712-001 and 2712-013 grips) and Series 2732 can be equipped with a variety of interchangeable jaw faces in various sizes and surface types. Refer to [Table 2-14](#) on page [2-15](#) to find compatible jaw faces for your specific grip model. Contact your Instron sales representative for assistance with selecting jaw faces that are suitable for your testing requirements.

[Figure 1-3](#) on page [1-5](#) illustrates the basic grip components.



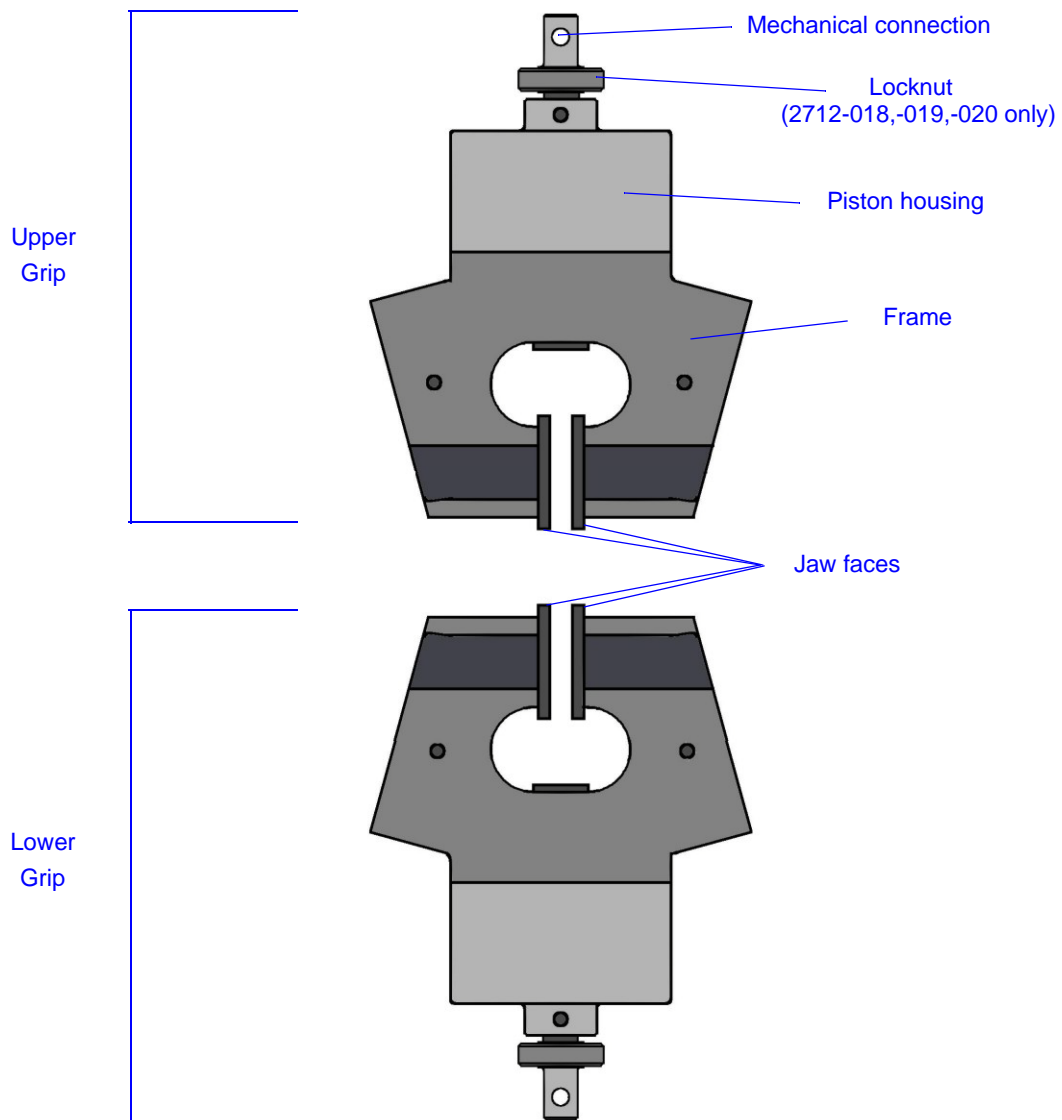


Figure 1-3. Basic Grip Components

## Function

All Instron pneumatic grips operate on the same mechanical principle. Pneumatic action grips clamp the specimen through a dual lever arm, actuated by air cylinders built into the grip body. The gripping force can be increased with air pressure to accommodate materials that are often difficult to hold. This constant gripping force is maintained on the specimen, and provides follow-up action to compensate for any decay in the gripping force.

The interchangeable jaw faces are mounted so that one face is free to swivel on a horizontal axis and the other on a vertical axis. This action allows for self alignment to compensate for variations in specimen thickness.

The following subsections are general functional descriptions of the grip components.

### Closing the Grip

Applying air pressure to the grip creates a pressure differential on the piston causing it to move in toward the specimen. The force of the piston cone against the roller link actuates the transfer levers inward, pushing the jaw face holders toward the specimen.

The pressure inside the grip increases as the jaw faces contact the specimen. Gripping force on the specimen is directly proportional to the air pressure applied to the grip; if pressure increases, gripping force increases. There must be constant air pressure to the grip to maintain a gripping force on a specimen.

Coupling pins allow one jaw face to swivel on the horizontal axis and the other on the vertical axis. This swivel action compensates for small variations in load string alignment and specimen thickness.

The jaw face contact surface affects the grip's hold on the specimen. Jaw faces with serrations penetrate the specimen, smooth faces do not penetrate the specimen and rubber faces have a high coefficient of friction without penetrating the specimen.

### Opening the Grip

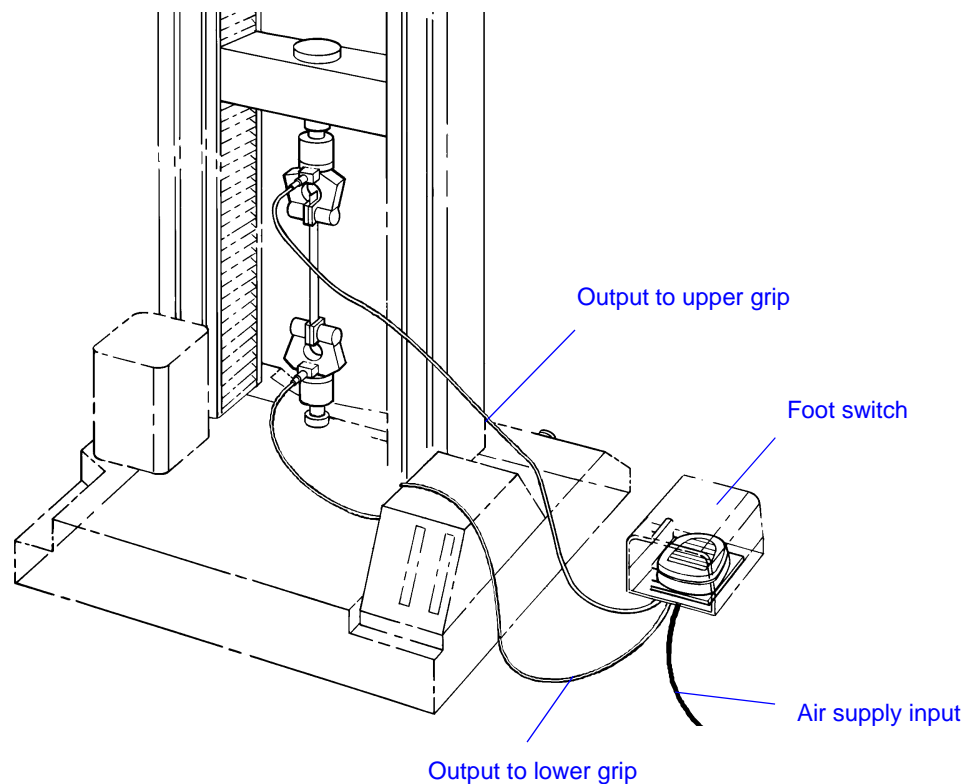
When you remove the air supply from the grip, there is no longer a pressure differential on the piston. With no pressure differential, the return spring retracts the piston from the roller links. The compression spring in each arm retracts the transfer lever which pulls the jaw face away from the specimen.

## Accessories

A pneumatic foot switch or an automatic grip controller are optional accessories for opening and closing the grips.

### Foot Switch

The pneumatic foot switch is a switch assembly and three air lines. [Figure 1-4](#) illustrates the foot switch. Two hoses from the air outlet lines, marked upper grip and lower grip, have quick disconnect fittings that attach to the corresponding grips. The third air line has a female threaded fitting on both ends which connects the foot switch and the air supply.



*Figure 1-4. Foot Switch*

The design of the pneumatic foot switch lets you open and close the grips while leaving your hands free for installing and aligning the specimen in the grips. You can operate the pneumatic grips with an in-house air supply or a small self-contained compressor.

## Automatic Grip Controller

You can operate the grips with an optional automatic grip controller. Controllers are available for Instron electromechanical systems.

A grip control unit, foot switch and interconnecting cables comprise the grip controller. The grip control unit is a small rectangular enclosure which mounts to the outside of a load frame column. The unit contains solenoid valves and a small printed circuit board. On the outside of the unit there are three pneumatic connections and a load frame interface connector.

For more detail on the automatic grip controllers, refer to the appropriate grip controller manuals.

# Chapter 2 Specifications

## Outline

This chapter details the specifications for all the various grips. It includes the following sections:

- 2712-001 and 2712-013 ..... 2-2
- 2712-002 and 2712-019 ..... 2-4
- 2712-003, 2712-004 and 2712-018, 2712-020. .... 2-6
- 2712-016 ..... 2-9
- 2732-003, 2732-004, 2732-008 and 2732-009. .... 2-11
- 2732-006 ..... 2-13
- Compatible Jaw faces. .... 2-15

## 2712-001 and 2712-013

### Specifications

*Table 2-1. 2712-001 and 2712-013 Specifications*

Parameter	Specification
Load capacity	5 N (1 lbf)
Test application	Tensile Not suitable for through zero/reverse stress or fatigue testing
Mechanical connection 2712-001 Upper fitting Lower fitting 2712-013 Upper fitting Lower fitting	Type Am Type Dm (1/2 inch Clevis pin) Type O (6 mm Clevis pin) Type O (6 mm Clevis pin)
Specimen thickness - Maximum	4 mm (0.161 in)
Gripping force - Maximum	285 N (62.7 lbf)
Temperature range	-29 ° to 82 °C (-20 ° to 180 °F)
Air pressure - Maximum	5.2 bar (75 PSI)
Weight 2712-001 (per grip) 2712-013 (per grip)	95 g (0.21 lb) 95 g (0.21 lb)

### Dimensions

Figure 2-1 on page 2-3 illustrates the grip dimensions.

Table 2-2. 2712-001 and 2712-013 Dimensions

Letter Designation	Dimension	Measurement mm (in)
A	Width	60 (2.4)
B	Effective length	
	2712-001 Upper grip	90 (3.5)
	2712-001 Lower grip	125 (4.9)
	2712-013 Upper grip	90 (3.5)
2712-013 Lower grip	90 (3.5)	
C	Throat depth	28 (1.1)
D	Throat depth	5 (0.2)

Specifications

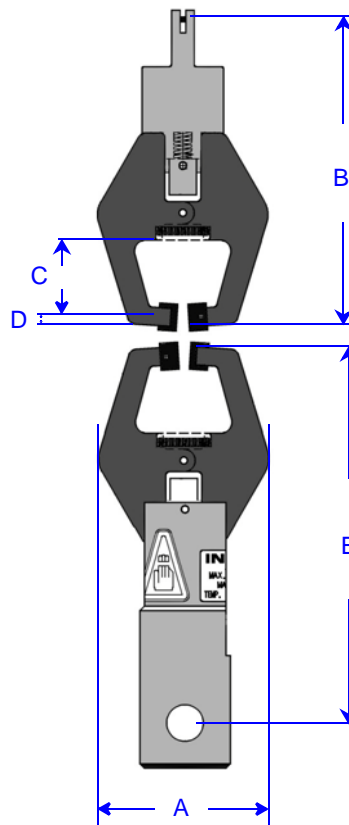


Figure 2-1. 2712-001 and 2712-013 Dimensions

## 2712-002 and 2712-019

### Specifications

*Table 2-3. 2712-002 and 2712-019 Specifications*

Parameter	Specification
Load capacity	250 N (56 lbf)
Test application	Tensile
Mechanical connection 2712-002 Upper fitting Lower fitting 2712-019 Upper fitting Lower fitting	Type Bm (3/16 inch Clevis pin) Type Dm (1/2 inch Clevis pin) Type O (6 mm Clevis pin) with locknut Type O (6 mm Clevis pin) with locknut
Specimen thickness - Maximum	3.2 mm (0.125 in)
Gripping force - Maximum	560 N (128 lbf)
Temperature range	-29 ° to 82 °C (-20 ° to 180 °F)
Air pressure - Maximum	5.2 bar (75 PSI)
Weight 2712-002 (upper grip) 2712-019 (upper grip)	280 g (0.6 lb) 500 g (1.2 lb)

### Dimensions

Figure 2-2 on page 2-5 illustrates the 2712-002 and 2712-019 grip dimensions.

*Table 2-4. 2712-002 Dimensions*

Letter Designation	Dimension	Measurement mm (in)
A	Width	102 (4.0)
B	Effective length	
	Upper grip Lower grip	109 (4.3) 126 (5.0)



Table 2-4. 2712-002 Dimensions (Continued)

Letter Designation	Dimension	Measurement mm (in)
C	Throat depth	34 (1.3)
D	Throat depth	9 (0.35)

Table 2-5. 2712-019 Dimensions

Letter Designation	Dimension	Measurement mm (in)
A	Width	68.4 (2.7)
B	Effective length	116 (4.6)
C	Throat depth	34 (1.3)
D	Throat depth	9 (0.35)

Specifications

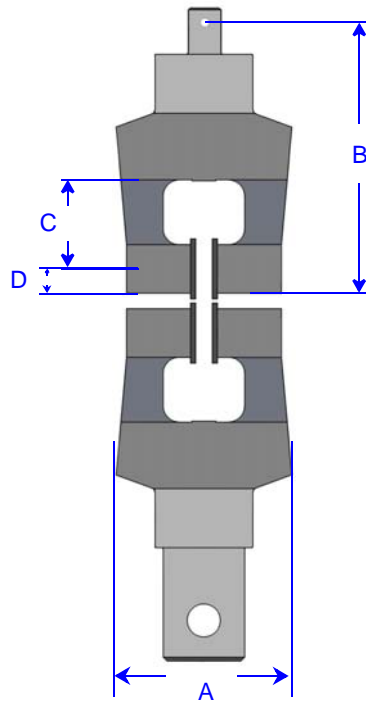


Figure 2-2. 2712-002 and 2712-019 Dimensions

## 2712-003, 2712-004 and 2712-018, 2712-020

### Specifications

Table 2-6. 2712-003, -004, -018, -020 Specifications

Parameter	Specification
Load capacity	1 kN (225 lbf)
Test application	Tensile
Mechanical connection 2712-003 and 2712-004 Upper fitting Lower fitting 2712-018 and 2712-020 Upper fitting Lower fitting	Type Cm (1/4 inch Clevis pin) Type Dm (1/2 inch Clevis pin)  Type O (6 mm Clevis pin) Type O (6 mm Clevis pin)
Specimen thickness - Maximum 2712-003 and 2712-020  2712-004 and 2712-018	6.35 mm (0.25 in) with all jaw faces except: 2.35 mm (0.09 in) with jaw face 2702-060 <sup>a</sup>  12 mm (0.5 in) with all jaw faces except: 8 mm (0.31 in) with jaw face 2702-060 <sup>a</sup>  Refer to <a href="#">Table 2-14</a> on page 2-15 for compatible jaw faces
Gripping force - Maximum 2712-003 2712-004 2712-018 2712-020	3.6 kN (809 lbf) 1.8 kN (405 lbf) 1.8 kN (405 lbf) 3.6 kN (809 lbf)
Temperature range	-29 °C to 82 °C (-20 °F to 180 °F)
Air pressure - Maximum	6.2 bar (90 PSI)
Weight 2712-003 and 2712-004 (upper grip)  2712-018 and 2712-020 (each grip)	1.4 kg (3 lb)  1.2 kg (2.6 lb)

a. Jaw face 2702-060 applies only to 2712-003 and 2712-004 grips.

## Dimensions

Figure 2-3 on page 2-8 illustrates the dimensions for the 2712-003, 2712-004, 2712-018 and 2712-020 grips.

Table 2-7. 2712-003, -004, -018, -020 Dimensions

Letter Designation	Dimension	Measurement mm (in)
A	Width	
	2712-003 and 2712-004	136 (5.3)
	2712-018 and 2712-020	138 (5.4)
B	Effective length	
	2712-003 Upper grip	164 (6.5)
	2712-003 Lower grip	189 (7.5)
	2712-004 Upper grip	164 (6.5)
	2712-004 Lower grip	189 (7.5)
	2712-018 Upper grip	168 (6.6)
	2712-018 Lower grip	168 (6.6)
	2712-020 Upper grip	168 (6.6)
2712-020 Lower grip	168 (6.6)	
C	Throat depth	
	2712-003 and 2712-004	47 (1.8)
	2712-018 and 2712-020	47 (1.8)
D	Throat depth	
	2712-003 and 2712-004	17 (0.7)
	2712-018 and 2712-020	16 (0.62)

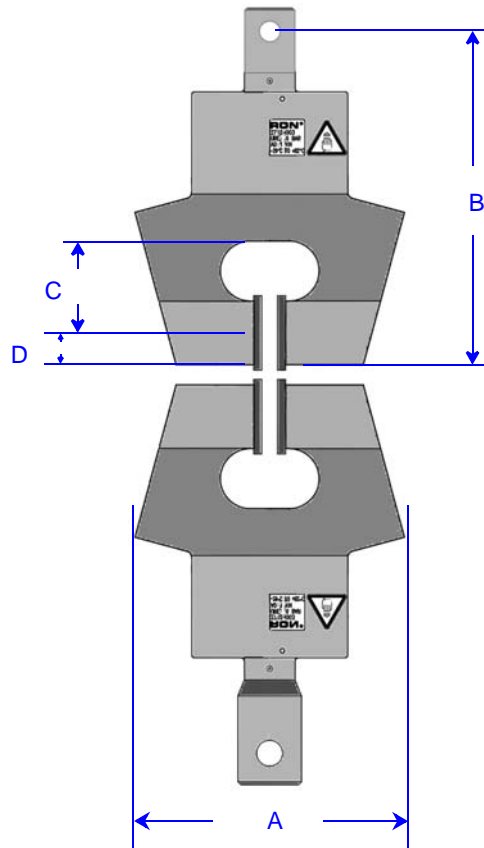


Figure 2-3. 2712-003, -004, -018, -020 Dimensions

# 2712-016

## Specifications

*Table 2-8. 2712-016 Specifications*

Parameter	Specification
Load capacity	2 kN (450 lbf)
Test application	Tensile
Mechanical connection Upper fitting Lower fitting	Type Cm (1/4 inch Clevis pin) Type Dm (1/2 inch Clevis pin)
Specimen thickness - Maximum	12 mm (0.5 in) with all jaw faces except: 8 mm (0.31 in) with jaw face 2702-060 Refer to <a href="#">Table 2-14</a> on page 2-15 for compatible jaw faces
Gripping force - Maximum	5 kN (1000 lbf)
Temperature range	-29 °C to 82 °C (-20 °F to 180 °F)
Air pressure - Maximum	6.2 bar (90 PSI)
Weight (Upper grip)	4.2 kg (5.3 lb)

Specifications

## Dimensions

Figure 2-4 on page 2-10 illustrates the dimensions for the 2712-016 grips.

*Table 2-9. 2712-016 Dimensions*

Letter Designation	Dimension	Measurement mm (in)
A	Width	166 (6.5)
B	Effective length Upper grip Lower grip	230 (9.0) 240 (9.5)
C	Throat depth	47 (1.8)
D	Throat depth	22 (0.8)

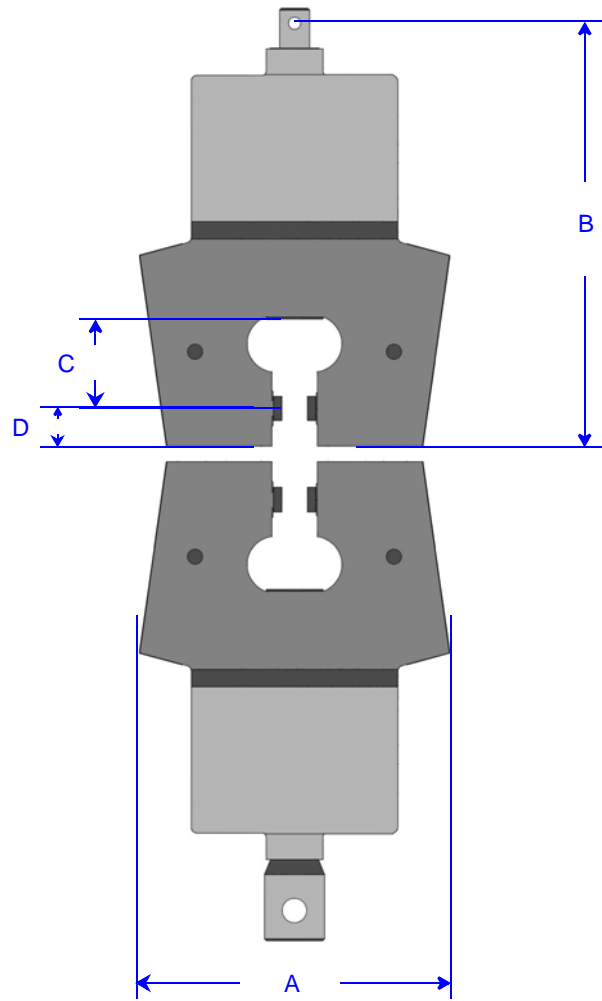


Figure 2-4. 2712-016 Dimensions

## 2732-003, 2732-004, 2732-008 and 2732-009

### Specifications

Table 2-10. 2732-003, 2732-004, 2732-008 and 2832-009 Specifications

Parameter	Specification
Load capacity	1 kN (225 lbf)
Test application	Tensile
Mechanical connection	Pneumatic connection
Specimen thickness - Maximum 2732-003 and 2732-008  2732-004 and 2732-009	6.35 mm (0.25 in) with all jaw faces except: 2.35 mm (0.09 in) with jaw face 2702-060  12 mm (0.5 in) with all jaw faces except: 8 mm (0.31 in) with jaw face 2702-060  Refer to Table 2-14 on page 2-15 for compatible jaw faces
Gripping force - Maximum	1.8 kN (360 lbf)
Temperature range	-70 ° to 315 °C (-100 ° to 600 °F)
Air pressure - Maximum	6.2 bar (90 PSI)
Weight	4 kg (8.8 lb)

### Dimensions

Figure 2-5 on page 2-12 illustrates the dimensions for the 2732-003, 2732-004, 2732-008 and 2732-009 grips.

Table 2-11. 2732-003, 2732-004, 2732-008 and 2732-009 Dimensions

Letter Designation	Dimension	Measurement mm (in)
A	Width	136 (5.3)
B	Effective length	194 (7.6)
C	Throat depth	47 (1.8)
D	Throat depth	17 (0.7)

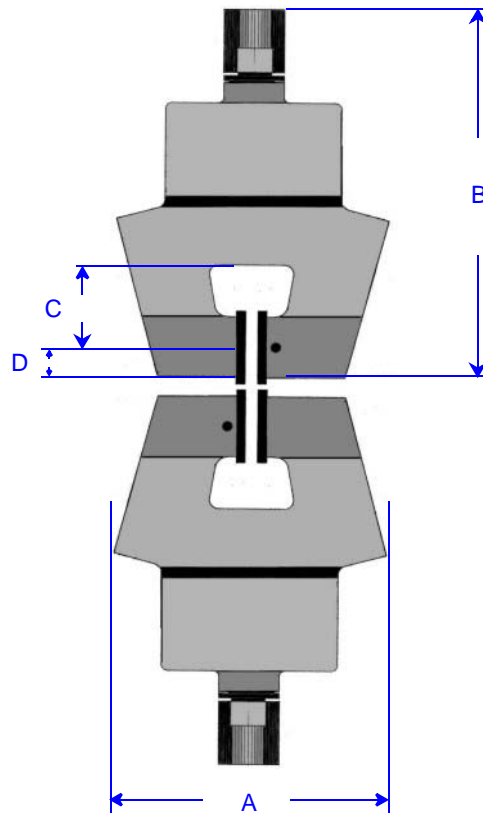


Figure 2-5. 2732-003, 2732-004, 2732-008 and 2732-009 Dimensions



# 2732-006

## Specifications

*Table 2-12. 2732-006 Specifications*

Parameter	Specification
Load capacity	100 N (22 lbf)
Test application	Tensile
Mechanical connection Upper fitting Lower fitting	Type Bm (3/16 inch Clevis pin) Pneumatic connection
Specimen thickness - Maximum	3.2 mm (0.125 in) Refer to <a href="#">Table 2-14</a> on page 2-15 for compatible jaw faces
Gripping force - Maximum	1.8 kN (360 lbf)
Temperature range	-70 ° to 315 °C (-100 ° to 600 °F)
Air pressure - Maximum	6.2 bar (90 PSI)
Weight	4 kg (8.8 lb)

Specifications

## Dimensions

[Figure 2-6](#) on page 2-14 illustrates the dimensions for the 2732-006 grips.

*Table 2-13. 2732-006 Dimensions*

Letter Designation	Dimension	Measurement mm (in)
A	Width	136 (5.3)
B	Effective length -Upper grip with pullrod with no pullrod	560 (22) 100 (3.9)
C	Effective length -Lower grip	134 (5.3)
D	Throat depth	47 (1.8)
E	Throat depth	17 (0.7)

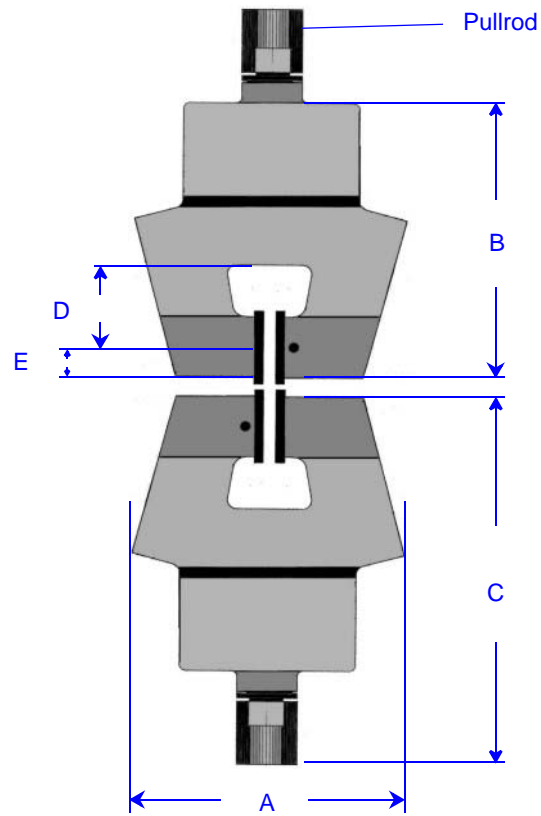


Figure 2-6. 2732-006 Dimensions

## Compatible Jaw faces

The 2712-001 and 2712-013 grips include one pair of 9.5 x 9.5 mm (0.375 x 0.375 in) smooth jaw faces. Alternative face sizes or surfaces are not available.

The other grip models described in this manual can be equipped with a variety of interchangeable jaw faces in various sizes and surface types. Refer to [Table 2-14](#) for a summary of compatible jaw faces for each model.

*Table 2-14. Compatible Jaw faces*

Grip Model	Jaw face Catalog Number	Surface Type	Clamping Area (width x height) mm (in)
2712-002 2712-019 2732-006	2702-001	Smooth ground	12 x 25 (0.5 x 1.0)
	2702-002	Rubber coated	12 x 25 (0.5 x 1.0)
	2702-003	Serrated	12 x 25 (0.5 x 1.0)
	2702-004	Smooth ground	25 x 25 (1.0 x 1.0)
	2702-005	Rubber coated	25 x 25 (1.0 x 1.0)
	2702-006	Serrated	25 x 25 (1.0 x 1.0)
	2702-007	Smooth ground	50 x 25 (2.0 x 1.0)
	2702-008	Rubber coated	50 x 25 (2.0 x 1.0)
	2702-009	Serrated	50 x 25 (2.0 x 1.0)
	2702-010	Line contact	25 x 2.3 (1.0 x 0.09) radius convex surface
	2702-042	High friction compound	25 x 25 (1.0 x 1.0)
	2702-043	High friction compound	50 x 25 (2.0 x 1.0)
	S1-11613-1 <sup>a</sup>	Rubber coated	102 x 25 (4.0 x 1.0)
	S1-11613-2 <sup>a</sup>	Smooth ground	102 x 25 (4.0 x 1.0)

Table 2-14. Compatible Jaw faces (Continued)

Grip Model	Jaw face Catalog Number	Surface Type	Clamping Area (width x height) mm (in)
2712-003 2712-004 2712-016 2712-018 2712-020 2732-003 2732-004 2732-008 2732-009	2702-011	Smooth ground	12 x 38 (0.5 x 1.5)
	2702-012	Rubber coated	12 x 38 (0.5 x 1.5)
	2702-013	Serrated	12 x 38 (0.5 x 1.5)
	2702-014	Smooth ground	25 x 38 (1.0 x 1.5)
	2702-015	Rubber coated	25 x 38 (1.0 x 1.5)
	2702-016	Serrated	25 x 38 (1.0 x 1.5)
	2702-017	Smooth ground	50 x 38 (2.0 x 1.5)
	2702-018	Rubber coated	50 x 38 (2.0 x 1.5)
	2702-019	Serrated	50 x 38 (2.0 x 1.5)
	2702-020	Line contact	25 x 2.3 (1.0 x 0.09) radius convex surface
	2702-031	Smooth ground	25 x 25 (1.0 x 1.0)
	2702-032	Rubber coated	25 x 25 (1.0 x 1.0)
	2702-033	Serrated	25 x 25 (1.0 x 1.0)
	2702-034	Smooth ground	76 x 25 (3.0 x 1.0)
	2702-035	Rubber coated	76 x 25 (3.0 x 1.0)
	2702-059	Serrated	76 x 25 (3.0 x 1.0)
	2702-062	Line contact	76 x 2.3 (3.0 x 0.09) radius convex surface
	2702-044	High friction compound	25 x 38 (1.0 x 1.5)
	2702-045	High friction compound	50 x 38 (2.0 x 1.5)
	2702-060 <sup>b</sup>	Waved profile	75 x 50 (3 x 2)

a. Only available for the 2712-019 grips.

b. Jaw face 2702-060 does not apply to 2712-018 and 2712-020 grips.

# Chapter 3 Installation

## Outline

This chapter contains procedures for installing the grips. It includes the following sections:

- Installing to a Load Frame . . . . . 3-2
- Installing and Removing Jaw Faces . . . . . 3-6
- Installing Jaw Face Shields . . . . . 3-8
- Connecting Pneumatics . . . . . 3-9

Installation

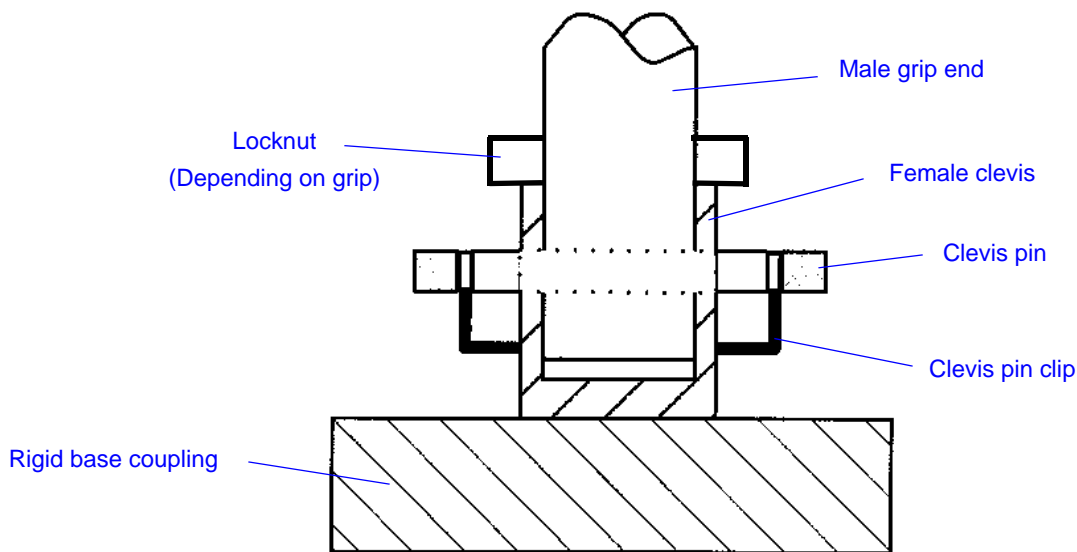
## Installing to a Load Frame

The load string comprises all of the components between a force producing load frame component (actuator or moving crosshead) and a stationary rigid member (base plate or fixed crosshead). This includes the grips, couplings and the specimen. A tight connection between each component is essential for accurate test data. Any backlash in the load string components degrades the integrity of test results.

**Note:** *If you are using a high temperature grip, you must lubricate the grip before installing it. Use a lubricant suitable for the temperature range of your test. Refer to “[Lubrication](#)” on page 5-3 for details.*

### Clevis Pin Couplings

A clevis pin coupling is typically used for attaching the grips to an electromechanical test system. [Figure 3-1](#) on page 3-2 illustrates the clevis pin coupling. A male shank connects to a female clevis socket, which connects to either the load cell or to the base plate. A clevis pin couples the shank and socket together.



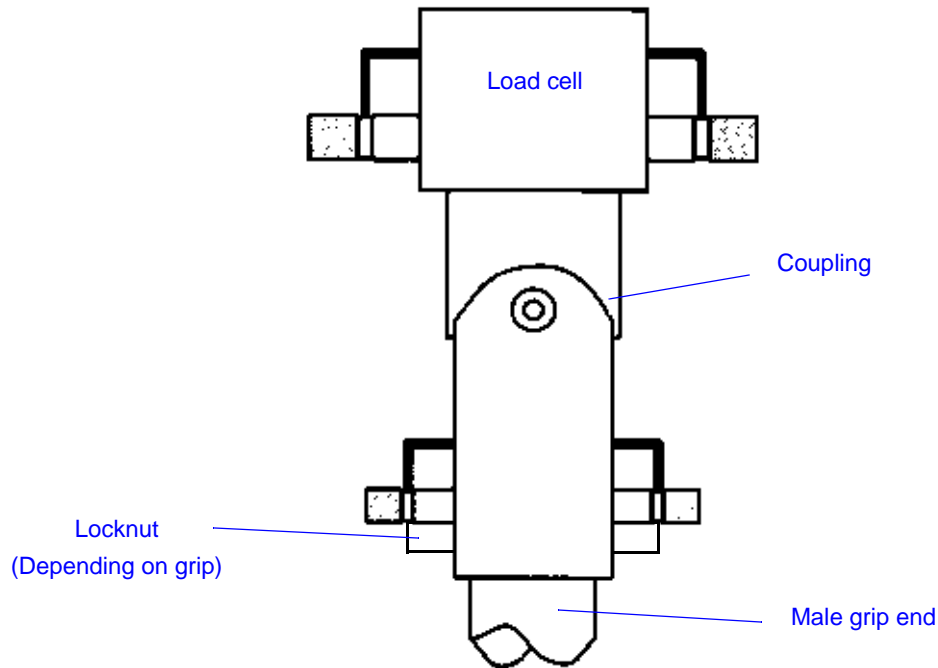
*Figure 3-1. Clevis Pin Coupling*

## Swivel Coupling

### Caution

**Do not load a swivel coupling with compressive force. Compressive forces can damage the swivel coupling and load cell.**

A swivel or flexible coupling, connects the upper grip to the load cell. [Figure 3-2](#) on page 3-3 illustrates this coupling. The coupling consists of two clevis type sockets, one on each end, coupled together by a coupling pin. The coupling allows the grip to swivel from side to side to compensate for variances in the specimen or load string alignment.



*Figure 3-2. Swivel Coupling*

## Threaded Couplings

[Figure 3-3](#) on page 3-4 illustrates a threaded coupling. A threaded attachment kit uses a female clevis socket which threads into the base plate, load cell or actuator piston rod. You eliminate any end play by tightening a locknut against the actuator piston rod or load cell, and the grip locknut against the grip adapter.

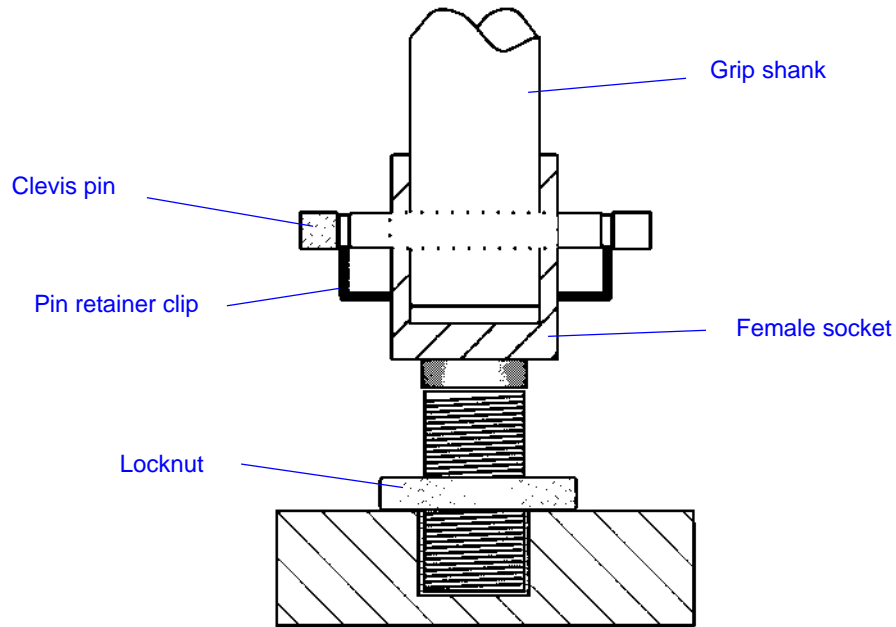


Figure 3-3. Threaded Coupling

## High Temperature Extension Rods

Figure 3-4 on page 3-5 illustrates a pair of Series 2732 grips installed in a chamber. Extension rods provide the Series 2732 grips with the maximum amount of travel within an environmental chamber and carry the air pressure to the grip. The specific extension rod configuration depends on the size of the chamber, specimen length and the amount of crosshead travel during the test.

A swivel coupling connects the upper rod to the load cell while a rigid coupling connects the lower grip to the base plate. All pneumatic connections are outside of the chamber.

## Caution

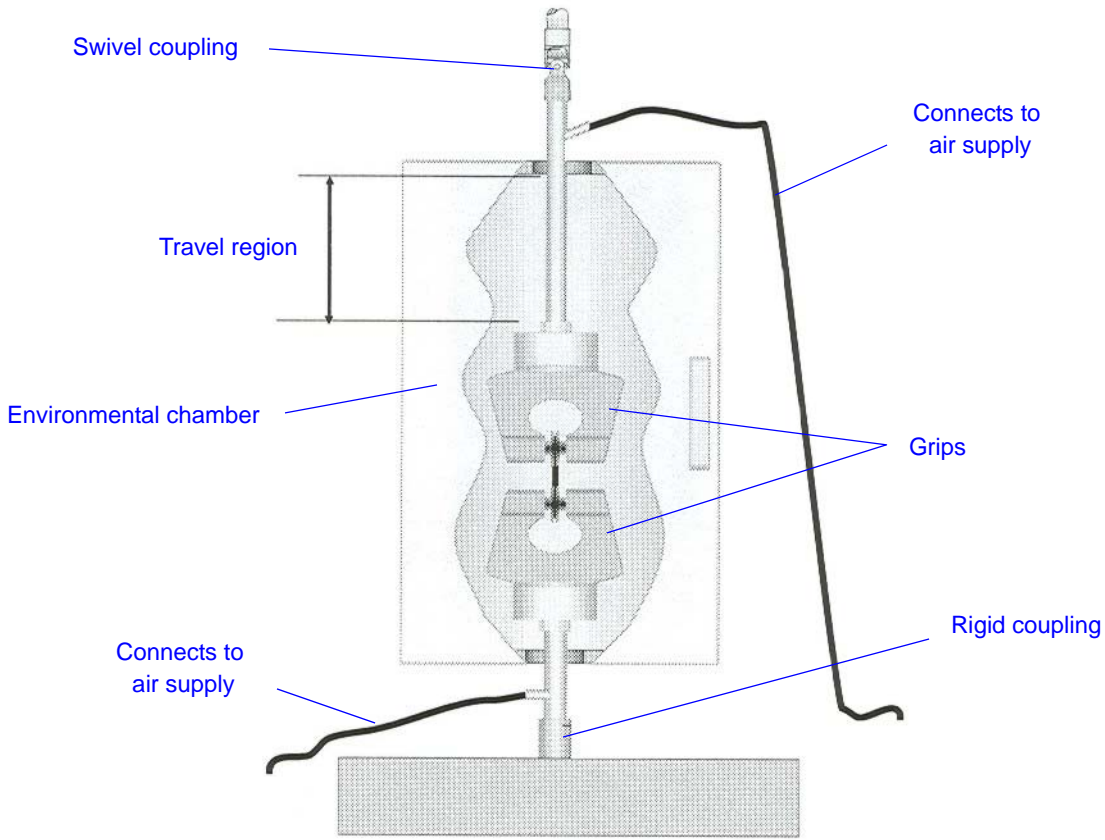
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**Set mechanical and electronic limits before operating the test system when you have extension rods installed inside a chamber.**

Extension rods restrict the total crosshead travel. The grip will collide with the top of the chamber if the crosshead travels beyond the travel region.





Installation

Figure 3-4. Grips Installed in a Chamber

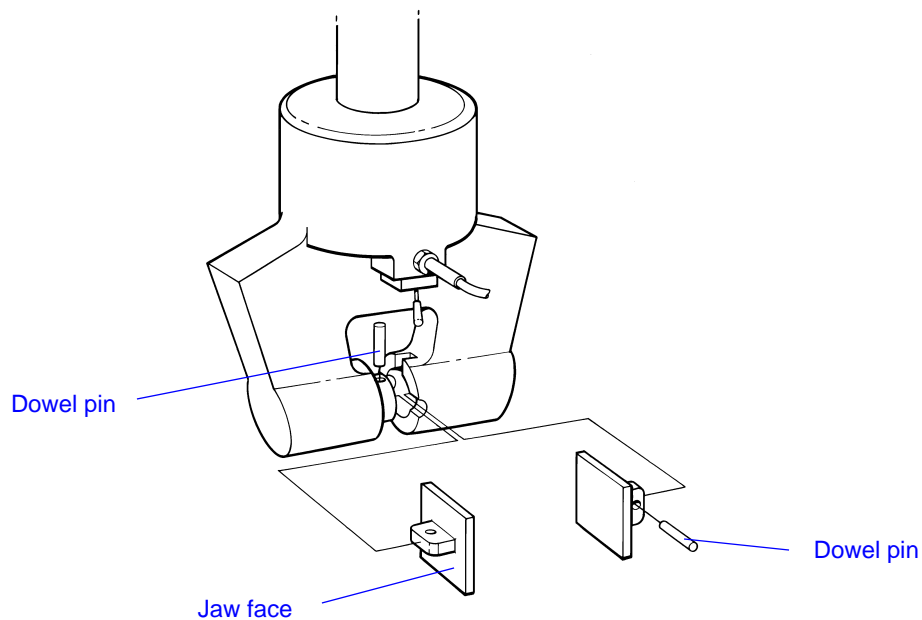
## Installing and Removing Jaw Faces

The following sections detail the installation of jaw faces in the Series 2712 and 2732 pneumatic grips except for the model 2712-001, which has dedicated jaw faces.

### Equipment

You need a pointed probe.

### Installing Jaw faces



*Figure 3-5. Installing Jaw faces*

1. Verify that the grip is disconnected from the pneumatic supply.
2. Use a probe to push in on the shaft to which the left-hand face attaches; this exposes the slot for mounting the face and the hole for the dowel pin that holds the face to the shaft.
3. Insert the dowel pin into the shaft hole until it is flush with the inside of the slot.
4. Place the face in position and fully insert the pin.

5. To expose the mounting face slot and the dowel pin hole, use a small probe to push in on the right hand grip shaft.
6. Insert the dowel pin into the hole in the shaft until it is flush with the inside of the slot. Move the jaw face into position by inserting it through the rectangular slot in the frame that faces the main portion of the grip.
7. Insert the dowel pin.
8. Push in on the face to check that the shaft moves freely in the grip.

### Removing Jaw faces

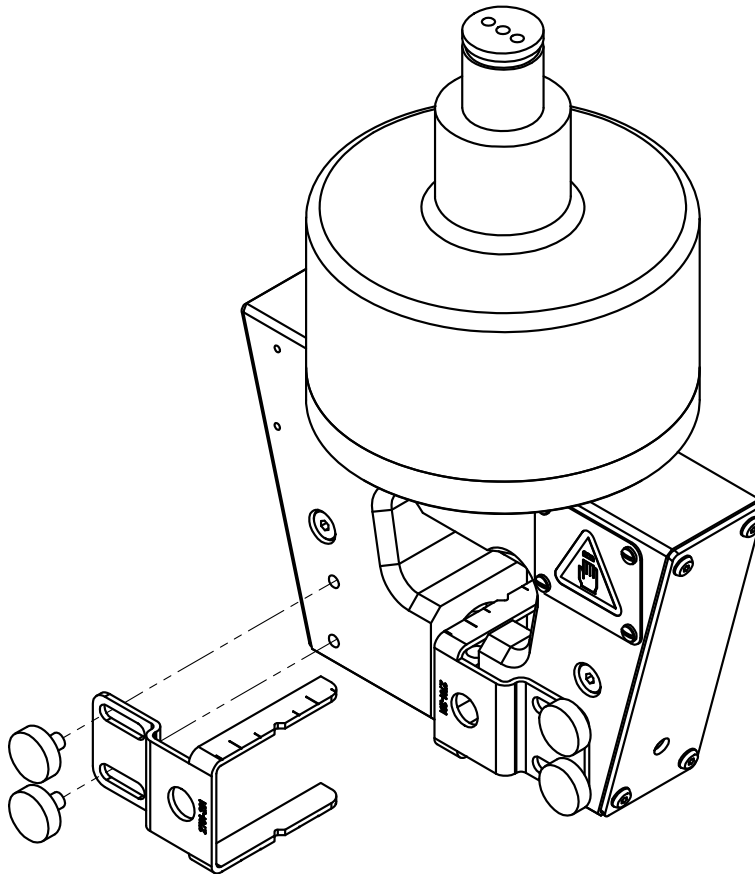
1. Push inward on the right hand face to expose a horizontal dowel pin, which holds the face to the shaft.
2. Use a small probe to push out the dowel pin.
3. Remove the face by moving it toward the main body of the grip through the slot in the frame.
4. Push inward on the left hand face to expose the vertical dowel pin.
5. Push out the pin and remove the face.

## Installing Jaw Face Shields

Jaw face shields are available for grips 2732-008 and 2732-009.

Jaw face shields reduce the risk of pinching your fingers in the grips as they close on a specimen. The shields are designed so that you can replace the faces with the shields still in place.

[Figure 3-6](#) on page 3-8 shows how to install jaw face shields. You can install the shields using the holes on the front or back, using two M4 x 6 thumbscrews for each shield. Adjust the shields so that the space between them is only slightly more than the specimen thickness.



*Figure 3-6. Installing Jaw Face Shields*

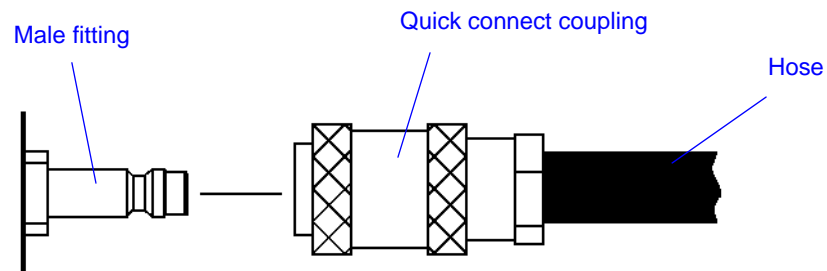
## Connecting Pneumatics

The following is a list of the possible configurations for connecting the pneumatic grips:

- You can connect Series 2712-002 and 2712-019 to the air supply and operate them with their integral toggle switch.
- You can connect any Series 2712 or 2732 grip to the air supply and operate it with an optional manual foot switch.
- All grips can be connected to the air supply and operated from an optional grip controller unit.

### Grip Nozzle

All Intron pneumatic grips have a quick release type connector. [Figure 3-7](#) on page [3-9](#) illustrates the grip nozzle and hose coupling.



*Figure 3-7. Grip Nozzle Connection*

## Warning

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### **Crush Hazard - Take care when installing or removing a specimen, assembly, structure, or load string component.**

Installation or removal of a specimen, assembly, structure, or load string component involves working inside the hazard area between the grips or fixtures. When working in this area, ensure that other personnel cannot operate any of the system controls. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.

## Connecting

Grasp the coupling behind the sleeve and firmly push it inward on the nozzle. Make sure the coupling slides into the nozzle groove and makes complete engagement.

## Disconnecting

Grasp the coupling sleeve and firmly pull it away from the nozzle. If air pressure is flowing to the grip when you disconnect the nozzle, there will be a pressure discharge.

## Manual Foot Switch

The pneumatic foot switch allows you to close or open the grips while keeping your hands free for aligning the test specimen. This mechanically actuated switch is independent of the test system. The foot switch system consists of the switch assembly and three air lines. Two air lines, marked upper and lower grip, are attached to the switch assembly at the factory. The other end of the hoses have quick disconnect fittings for connecting to the grips. The third air line has a female threaded fitting on both ends for connecting to the air supply. [Figure 3-8](#) on page [3-11](#) illustrates the foot switch.

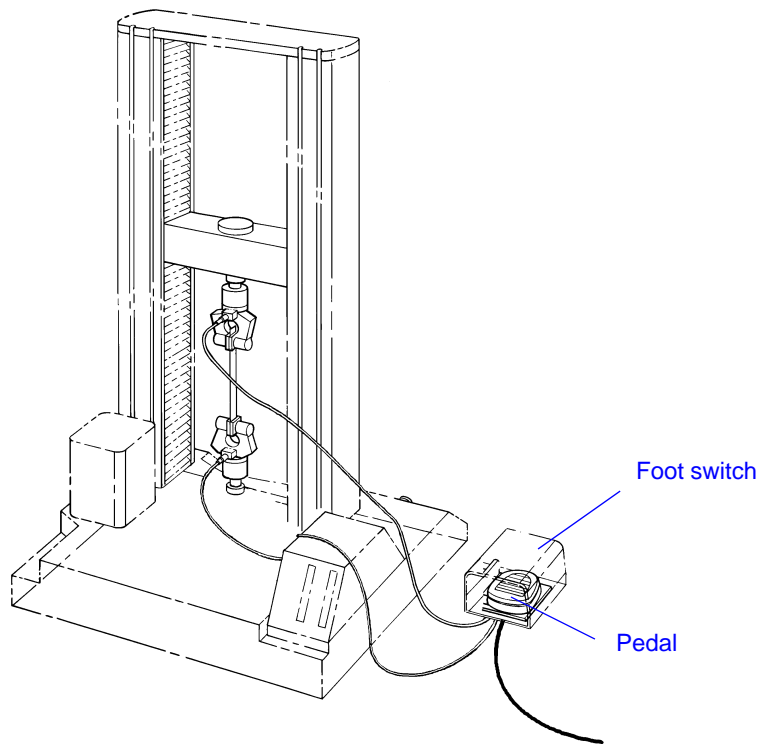
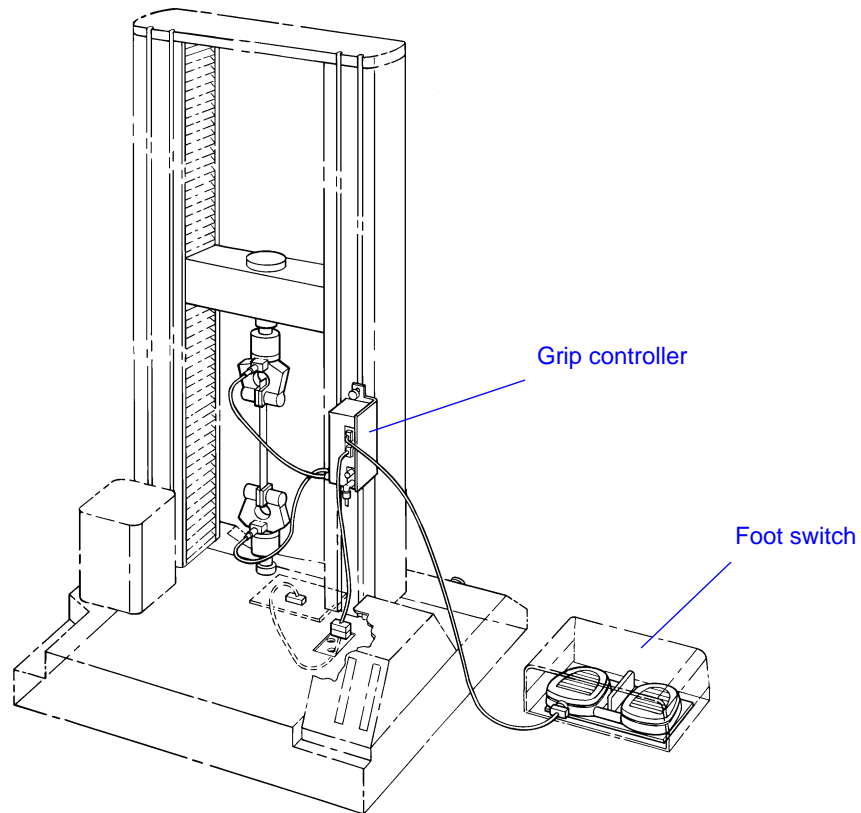


Figure 3-8. Manual Foot Switch

Installation

## Automatic Grip Control Unit

An automatic grip control integrates the grips with the load frame's control system. [Figure 3-9](#) illustrates the grip controller. There are various configurations for each type. Refer to the automatic grip control unit manual for specific installation details.



*Figure 3-9. Grip Controller*



# Chapter 4 Operation

## Outline

This chapter describes the operation of the various types of grips. It includes the following sections:

- Preparing for Use . . . . . 4-2
- Opening and Closing the Grips . . . . . 4-3
- Installing a Specimen . . . . . 4-4
- Removing a Specimen . . . . . 4-6



# Preparing for Use

## General Considerations

- ❑ The grips are installed and the coupling pins are secure.
- ❑ The jaw faces are the appropriate size for the test specimen.
- ❑ The air supply is on, and the air hoses are connected and free of kinks.
- ❑ There is adequate slack in the air hoses to accommodate the crosshead travel that you anticipate during the test.
- ❑ The gauge length your test requires is set between the ends of the upper and lower jaw faces.
- ❑ If you are using an automatic grip controller with Series 2712 grips, make sure the toggle switch is in the closed position.

## Extreme Temperature Considerations

- ❑ Before installing the Series 2732 grip, one pair of faces must be inserted in each grip. The choice of the best gripping surface is determined by practical experience with the material to be tested.

**Note:** Do not use rubber jaw faces for high temperature testing.

- ❑ Standard compressed air is the normal power medium for ambient temperature testing. For temperatures below ambient, use dry air or dry nitrogen.
- ❑ Be aware that if you are using G-N paste to lubricate the Series 2732 grip, there is a burn-off period for this lubricant. The lubricant may smoke the first two or three times that the grip is taken up to temperature but this has no effect on the efficacy of the lubricant.

## Opening and Closing the Grips

The method you use to close the grips depends on the configuration of your pneumatic system.

### Toggle Valve

- To close the grip, move the toggle valve away from the specimen.
- To open grip, move the air toggle valve toward the specimen.

### Foot Switch

- To close the upper grip, press the pedal about half-way to engage the first position.
- To close the lower grip, press the pedal completely until it locks. This position also maintains pressure to both grips.
- To open the grips, kick the toe plate at the front of the switch.

### Automatic Grip Controller

Refer to the Automatic Grip Controller manual for complete operational details.

# Installing a Specimen

## Checklist

Check for the following conditions before you install a specimen:

- ❑ The grip coupling pins are secure.
- ❑ The air pressure supply is on and the pressure setting provides the optimum gripping force on the specimen, without exceeding the grip's maximum air pressure rating. You may have to experiment to determine the optimum air pressure.
- ❑ The crosshead is set to the test gauge length.
- ❑ The load frame's limit stops are set to prevent the grips from colliding with each other or other fixtures.

**Note:** If your control system has a Specimen or Load Protect function, use it when installing a specimen. Refer to the control system documentation for operating details.

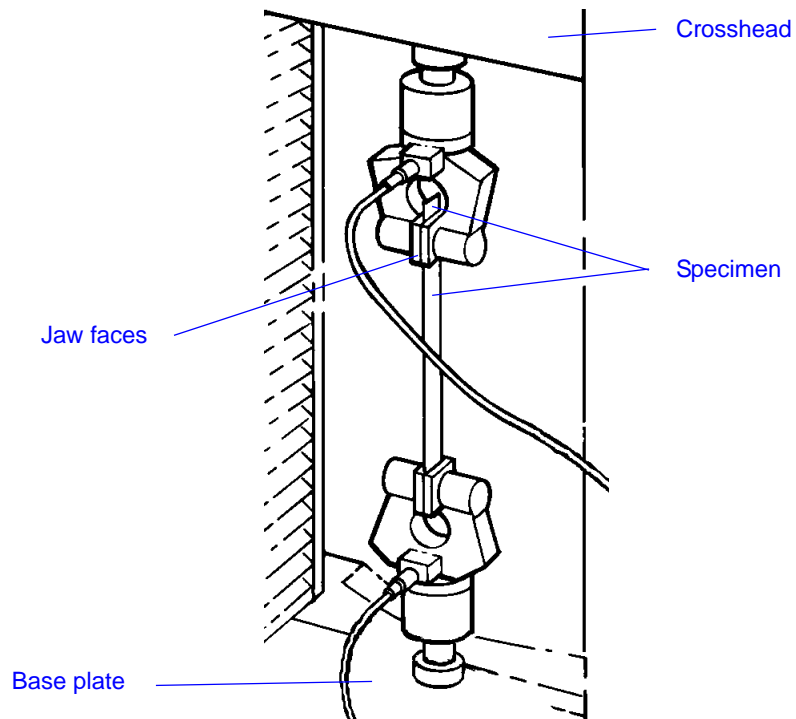


Figure 4-1. Specimen Installation

## Warnings



### **Crush Hazard - Take care when installing or removing a specimen, assembly, structure, or load string component.**

Installation or removal of a specimen, assembly, structure, or load string component involves working inside the hazard area between the grips or fixtures. When working in this area, ensure that other personnel cannot operate any of the system controls. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.



### **Flying Debris Hazard - Make sure that test specimens are installed correctly in grips or fixtures in order to eliminate stresses that can cause breakage of grip jaws or fixture components.**

Incorrect installation of test specimens creates stresses in grip jaws or fixture components that can result in breakage of these components. The high energies involved can cause the broken parts to be projected forcefully some distance from the test area. Install specimens in the center of the grip jaws in line with the load path. Insert specimens into the jaws by at least the amount recommended in your grip documentation. This amount can vary between 66% to 100% insertion depth; refer to supplied instructions for your specific grips. Use any centering and alignment devices provided.

## Procedure

1. Center the specimen in the grips. Make sure the specimen is perpendicular and contacts the entire length of the jaw faces as shown in [Figure 4-1](#) on page 4-4.

**Note:** *Recommended specimen insertion depth is 100%. The specimen should fully contact the entire length of the jaw faces.*

2. Close the upper grip.
3. Close the lower grip.
4. Adjust the air pressure to the minimum required to hold the specimen during the test, without exceeding the grip's maximum air pressure rating.

# Removing a Specimen

## Checklist

Check for the following conditions before you remove a specimen:

- The test is complete and there is no significant load on the specimen.
- There is no measuring device, such as an extensometer or LVDT, on the specimen.

## Warning

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### **Crush Hazard - Take care when installing or removing a specimen, assembly, structure, or load string component.**

Installation or removal of a specimen, assembly, structure, or load string component involves working inside the hazard area between the grips or fixtures. When working in this area, ensure that other personnel cannot operate any of the system controls. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.

## Procedure

1. Open the upper grip. The jaw faces should retract away from the specimen.

## Caution

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### **Secure fragile specimens before opening the lower grip.**

2. Open the lower grip. The jaw faces should retract away from the specimen.
3. Remove the specimen.

# Chapter 5 Maintenance

## Outline

This chapter contains instructions for maintaining and troubleshooting your grips. It includes the following sections:

- Checklist ..... 5-2
- Lubrication ..... 5-3
- Servicing ..... 5-5
- Troubleshooting ..... 5-6

## Checklist

- Lubricate the grips, if necessary. Refer to “[Lubrication](#)” on page 5-3.
- Check the air supply for correct pressure.
- Check the air hoses for damage or excessive wear. Replace if necessary.
- Check the jaw faces for excessive wear. Replace if necessary.
- Periodically check the air supply filter and lubricant.



# Lubrication

## Series 2712

For Series 2712 grips, lubricate the moving parts of the grips using a G-N paste (Instron part #105-1-28). Refer to [Figure 5-1](#) on page 5-3 to identify the lubrication points. Note you need to remove the jaw faces to lubricate the area behind the faces.

It is recommended that you lubricate the grips annually. If the grips are in constant use, as in repetitive testing applications, lubricate every six months.

The pneumatic piston seal should also be lubricated annually. After a long idle period (6 months or more), the piston may require lubrication. If the piston does not operate smoothly, or an air leak develops, then you may need to lubricate the piston. To lubricate the piston and its bore, disassemble the piston using the figures in [Chapter 6](#) as a guide. Lubricate the piston seal and piston bore with a petroleum jelly (Instron part #105-1-24). After lubricating, operate the grip several times to ensure that the grip closes smoothly with no air leaks.

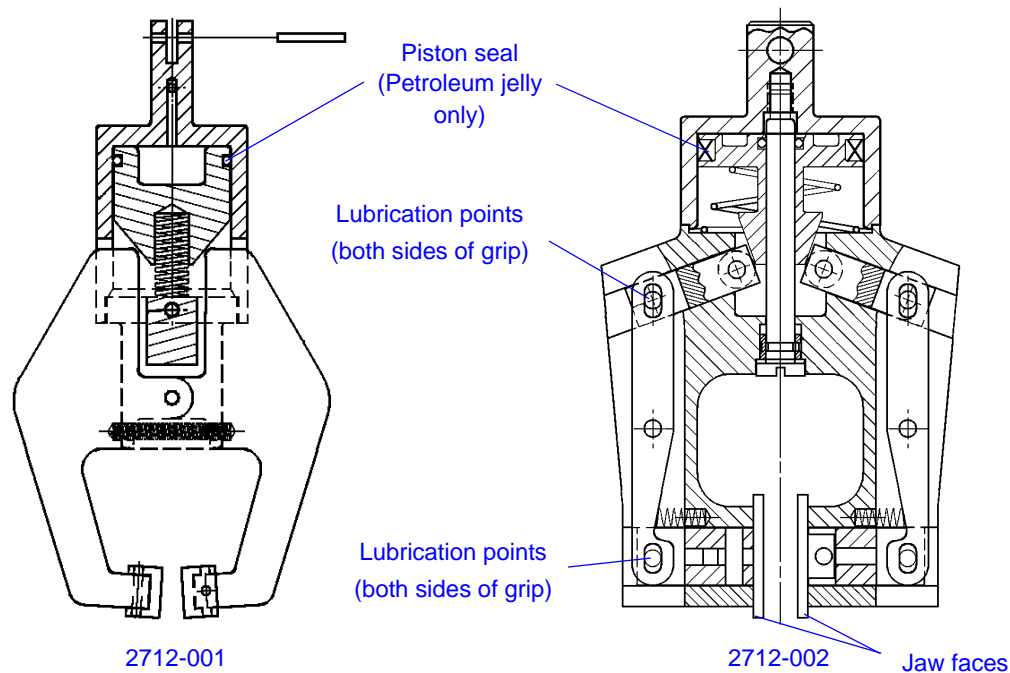


Figure 5-1. Series 2712 Grips Lubrication Points

## Series 2732 (High Temperature)

The type of lubricants used on the high temperature grips depends upon the range of temperature under which it is used. Before installing the grips, lubricate the grip and couplings based on the following recommendations:

Temperature range:	Recommended lubricant:
-73° to 175° C (-100° to 350° F)	Dow Corning 33 (Instron part #105-1-4)
Above 175° C (350° F)	Graphite powder dry lubricant (Instron part #105-1-3) or G-N paste (Instron part #105-1-28), whichever is supplied with your grip.

## Procedure

1. Remove the jaw faces. Refer to [“Installing and Removing Jaw Faces”](#) on page [3-6](#).
2. If the grip has linkage shields, remove the four screws retaining the linkage shields on either side of the grip frame.
3. Clean the linkage and grip frame thoroughly with Stoddard solvent or the equivalent. Dry the frame.
4. Apply a thin film of the proper lubricant to the moving parts. Refer to [Figure 5-1](#) on page [5-3](#).
5. Replace the jaw faces by assembling the face with the horizontal tab first.

## Servicing

Review the following list before you service a grip:

- ❑ Contact Instron Service regarding warranty and repair services.
- ❑ Before you disassemble the clamps for cleaning or servicing, refer to the drawings in [Chapter 6](#).
- ❑ Remove the jaw faces before you service the grips, except for the 2712-001 and 2712-013 grips.
- ❑ When assembling the toggle air valve, check that the slot in the ball is positioned facing the center of the grip. Do not place the ball with the slot facing to either side, because the grip will not open or close with an incorrectly positioned ball valve.

# Troubleshooting

Improper adjustments or the lack of maintenance cause most grip operating problems. When a problem develops, [Table 5-1](#) suggests a probable cause and recommends a remedy. If you are unable to solve a problem, contact Instron Service.

**Note:** Before you contact Instron Service, note the model and serial numbers of the test system and make sure there is a telephone at the test site.

*Table 5-1. Troubleshooting*

Problem	Cause	Remedy
Jaw faces do not close on specimen. Jaw faces do not operate smoothly.	No air pressure to grips.	Ensure that the air pressure supply is on.
	Foot switch is closed.	Toggle the foot switch.
	Grip toggle switch is closed.	On Series 2712 grips only - Open the toggle switch.
	Air flow is restricted.	Check that the air hoses to the grips are not damaged.
	Grip requires lubrication.	Lubricate the grip. Refer to <a href="#">"Lubrication"</a> on page 5-3.
	Faulty grip seal.	Replace the grip seal. Contact Instron's Service department for assistance.
Jaw faces do not retract from the specimen.	Grips are pressurized.	Toggle the foot switch to remove air pressure on the grips.
	Jaw face bound to the specimen.	Lightly tap the jaw face to release the bond.
	Grip requires lubrication.	Lubricate the grip. Refer to <a href="#">"Lubrication"</a> on page 5-3.

*Table 5-1. Troubleshooting (Continued)*

<b>Problem</b>	<b>Cause</b>	<b>Remedy</b>
Specimen slips while under load.	Wrong size or type of jaw face.	Install appropriate jaw faces for specimen size and type.
	Not enough gripping area.	Install specimen for complete engagement with jaw faces.
	Not enough gripping force.	Verify the air supply pressure, and adjust if necessary.
	Worn jaw faces.	Replace with new jaw faces.
Specimen breaks at jaw face	Initial gripping force is too great for specimen.	Reduce the air pressure to the grip.
	Wrong size or type of jaw face.	Install appropriate jaw face for specimen size and type.
	Load string component is out of alignment.	Verify the alignment of the load string and specimen.



# Chapter 6

## Illustrated Parts

### Outline

This chapter contains instructions to help you identify the grip parts from an exploded-view illustration. A list, corresponding to the grip illustration, contains the component description, and part number and quantity. It includes the following sections:

- Finding a Part . . . . . 6-2
- 2712-001 and 2712-013 . . . . . 6-3
- 2712-002 and 2712-019 . . . . . 6-6
- 2712-003 and 2712-004 . . . . . 6-10
- 2712-018 and 2712-020 . . . . . 6-13
- 2712-016 . . . . . 6-16
- 2732-003 and 2732-004 . . . . . 6-19
- 2732-006 . . . . . 6-21
- 2732-008 and 2732-009 . . . . . 6-23

## Finding a Part

Use the following procedure to identify a part from the grip illustration:

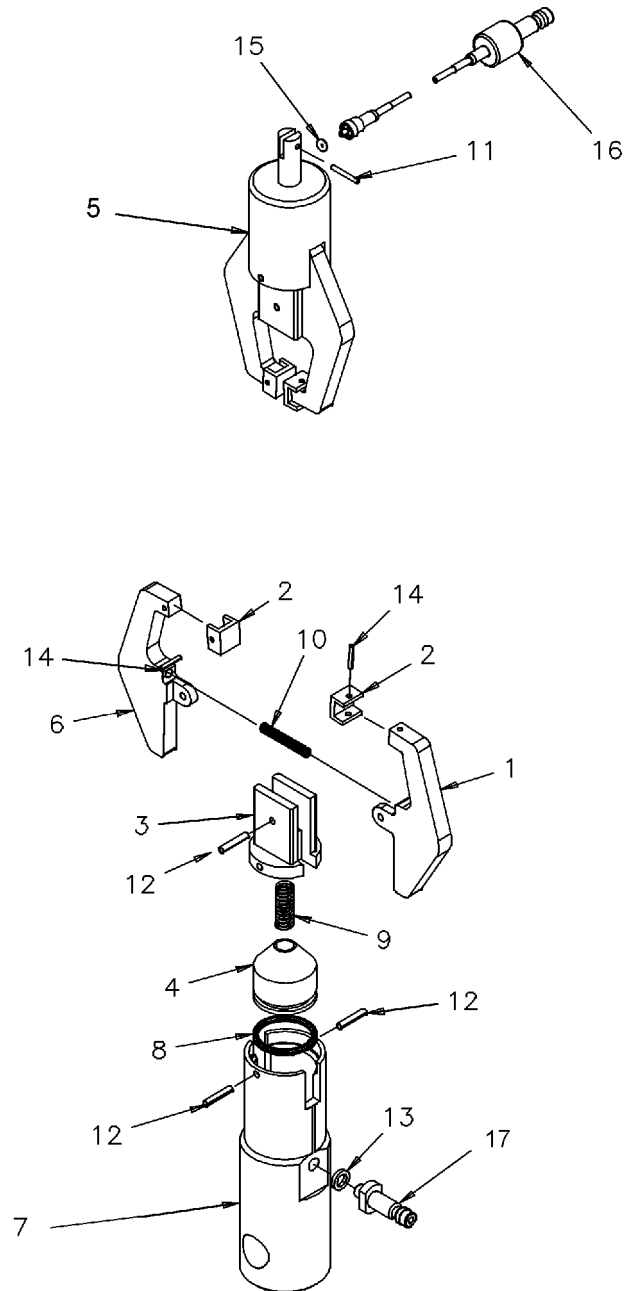
1. Locate the part on the grip illustration.
2. Refer to the item number on the illustration.
3. Refer to the item number on the corresponding parts list.

Each item number has a part description, Instron part number and quantity.

**Note:** *The quantity represents the number of parts for one grip.*



# 2712-001 and 2712-013



Illustrated Parts

Figure 6-1. 2712-001 Parts Identification

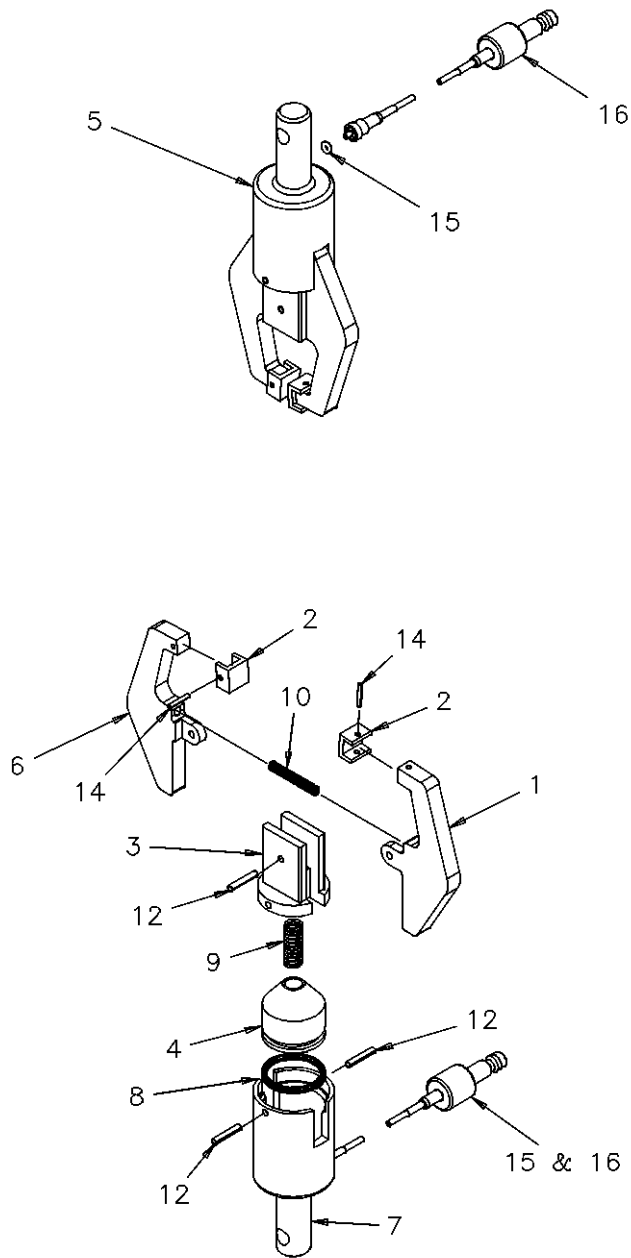


Figure 6-2. 2712-013 Parts Identification

Table 6-1. 2712-001 and 2712-013 Parts List

Item	Description	Part Number	Quantity
1	Grip frame (right side)	T331-8	1
2	Jaw face	T331-2	2
3	Piston housing flange	T331-3	1
4	Jaw piston	T331-4	1
5	Piston housing (upper grip) 2712-001 2712-013	T331-5	1
		T563-314	1
6	Grip frame (left side)	T331-9	1
7	Piston housing (lower grip) 2712-001 2712-013	T331-6	1
		T563-314	1
8	Quad ring, 3/4 x 1/16	33-5-11	1
9	Compression spring	66-2-18	1
10	Compression spring	66-1-48	1
11	Roll pin (upper grip)	703D7	1
12	Roll pin, 3/32 x 1/2	703D40	3
13	Hose fitting gasket (lower grip)	33-4-154	1
14	Roll pin, 1/16 x 3/8	703D5	2
15	O-ring seal	33-2-24	1
16	Hose assembly (upper grip)	A353-3	1
17	Hose fitting, 10-32 (lower grip)	T2-1124	1
Not shown	Grip identification label 2712-001 2712-013	T331-15	1
		T563-700	1
Not shown	Warning hazard label	51-1-226	1

# 2712-002 and 2712-019

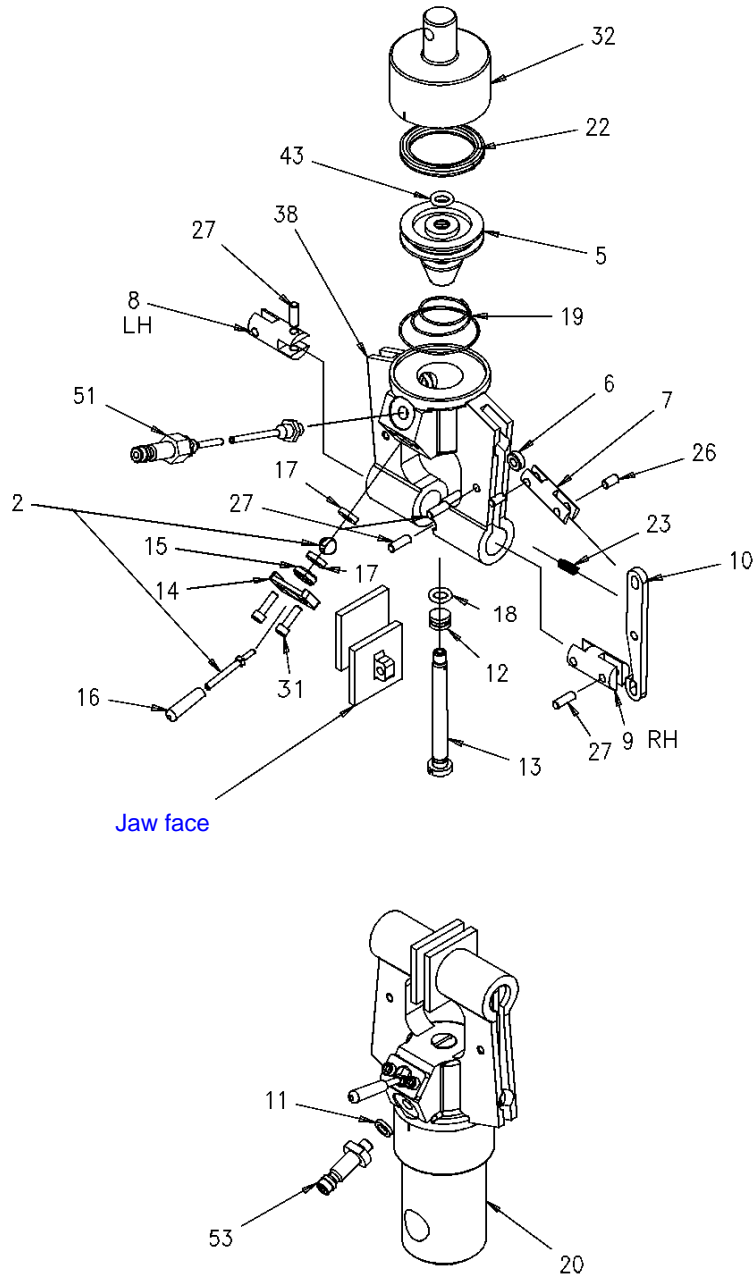


Figure 6-3. 2712-002 Parts Identification

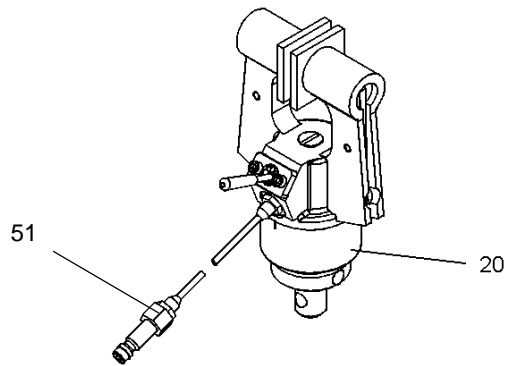
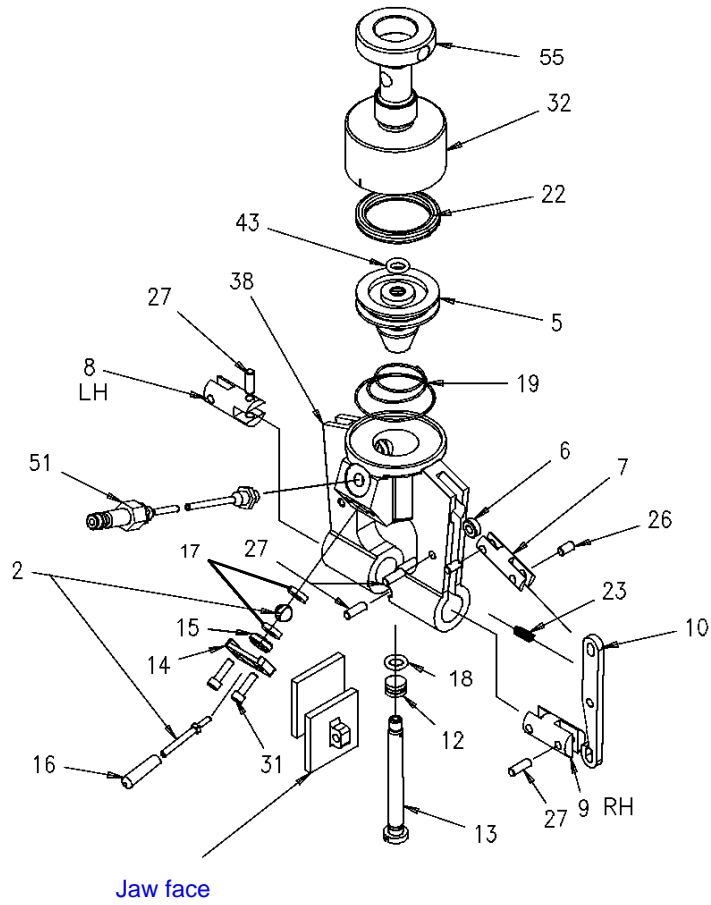


Figure 6-4. 2712-019 Parts Identification

Illustrated Parts

Table 6-2. 2712-002 and 2712-019 Parts List

Item	Description	Part Number	Quantity
2	Handle assembly & ball valve	A2-44	1
5	Piston	T2-247	1
6	Roller wedge	T2-243	2
7	Roller link	T2-245	2
8	Jaw face holder (left side)	T2-248	1
9	Jaw face holder (right side)	T2-249	1
10	Transfer lever	T2-285	2
11	Seal backup ring	33-4-154	1
12	Seal spacer	T2-275	1
13	Bearing tie rod	T2-276	1
14	Valve cap	T2-278	1
15	Adjustable lever guide	T2-279	1
16	Valve handle	T2-280	1
17	Valve seal	T2-284	2
18	Stem seal	T2-281	1
19	Conical spring	T2-251	1
20	Piston housing (lower grip) 2712-002 2712-019	T2-282	1
		T563-659	1
22	Quad ring	33-5-2	1
23	Compression spring	66-1-39	2
26	Dowel pin (1/8 x 1/4 in)	705E36	4
27	Dowel pin (1/8 x 3/8 in)	705E38	6
31	Screw (4-40 x 3/8 in)	201G2	2
32	Piston housing (upper grip) 2712-002 2712-019	T2-283	1
		T563-659	1
38	Grip frame	T2-286	1

Table 6-2. 2712-002 and 2712-019 Parts List (Continued)

Item	Description	Part Number	Quantity
43	O-ring	33-2-21	2
51	Hose assembly (upper grip)	A563-245	1
53	Hose fitting (lower grip)	T2-1124	1
55	Locknut (2712-019 only)	T563-635	1
	Jaw face	Refer to <a href="#">Chapter 2</a>	
Not shown	Grip identification label 2712-002 2712-019	T2-1120	1
		T563-704	1
Not shown	Warning hazard label	51-1-226	1





Table 6-3. 2712-003 and 2712-004 Parts List

Item	Description	Part Number	Quantity
2	Lever and ball valve assembly	A2-44	1
5	Piston	T2-258	1
6	Roller wedge	T2-259	2
7	Roller link	T2-261	2
8	Jaw face holder (left side)	T2-262	1
9	Jaw face holder (right side)	T2-263	1
10	Multiplying link	T2-1038	2
11	Quick connect hose fitting, 10-32	T2-1124	1
12	Seal backup	33-4-154	1
14	Valve cap	T2-278	1
15	Adjustable lever guide	T2-279	1
16	Valve handle	T2-280	1
17	Valve seal	T2-284	2
18	Hole cap	T2-293	1
19	Conical spring	T2-391	1
21	O-ring	33-2-23	1
22	Quad ring	33-5-1	1
23	Compression spring	66-2-10	2
26	Dowel pin (3/16 x 7/16 in)	705B69	4
27	Dowel pin (3/16 x 3/4 in)	705B74	2
28	Dowel pin (3/16 x 5/8 in)	705B72	5
29	Dowel pin (1/8 x 1/2 in)	705B40	1
30	Cap screw (10-24 x 1/2 in)	201G42	4
31	Screw (4-40 x 3/8 in)	201G2	2
38	Grip frame		
	2712-003	T2-274	1
	2712-004	T2-380	1

Illustrated Parts

Table 6-3. 2712-003 and 2712-004 Parts List (Continued)

Item	Description	Part Number	Quantity
39	Screw (4-40 x 1/8 in), Set type AA	400A1	1
41	Adapter (lower grip)	T2-265	1
42	Piston housing	T2-288	1
43	O-ring	33-2-34	1
44	Roll pin (3/16 x 7/8 in)	703D102	1
45	Screw (4-40 x 1/8 in), Set type AA	400N1	1
46	Adapter (upper grip)	T2-260	1
	Jaw faces	Refer to <a href="#">Chapter 2</a>	
Not shown	Grip identification label 2712-003 2712-004	T2-1121	1
		T2-1122	1
Not shown	Warning hazard label	51-1-226	1

# 2712-018 and 2712-020

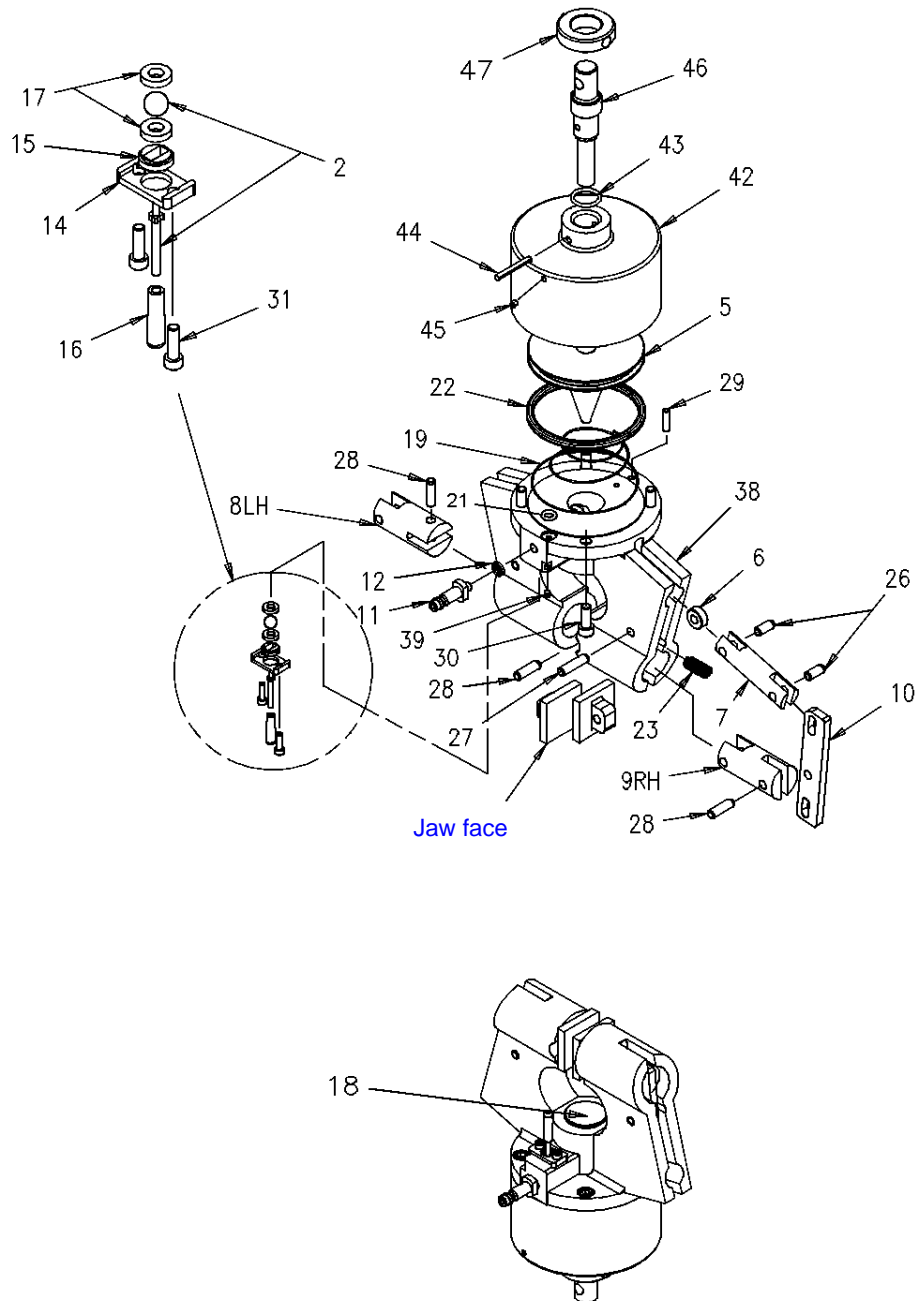


Figure 6-6. 2712-018 and 2712-020 Parts Identification

Table 6-4. 2712-018 and 2712-020 Parts List

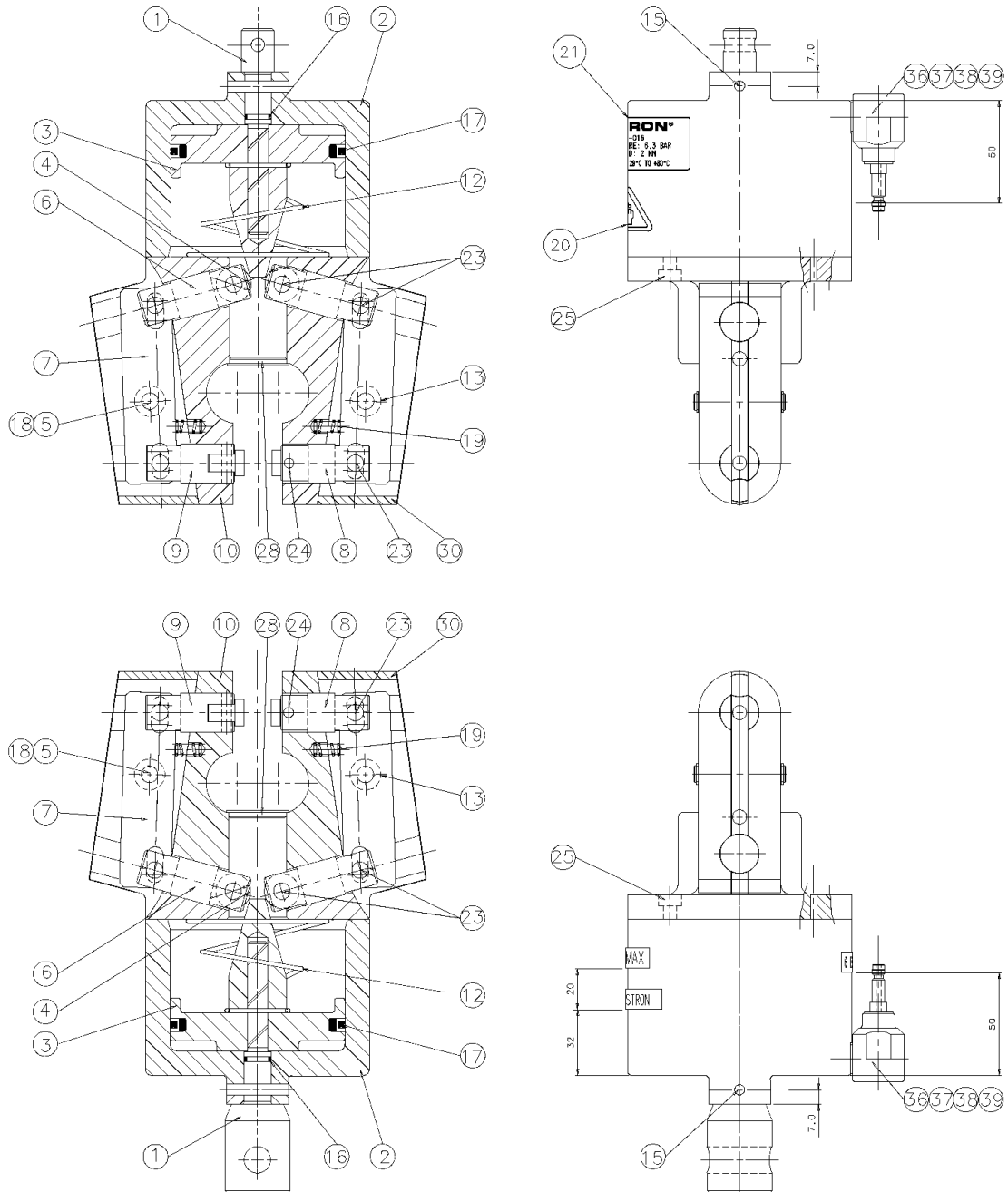
Item	Description	Part Number	Quantity
2	Lever and ball valve assembly	A2-44	1
5	Piston	T2-258	1
6	Roller wedge	T2-259	2
7	Roller link	T2-261	2
8	Jaw face holder (left side)	T2-262	1
9	Jaw face holder (right side)	T2-263	1
10	Multiplying link 2712-018 2712-020	T2-1038 T2-454	2 2
11	Quick clamp hose fitting	T2-267	1
12	Seal backup	33-4-154	1
14	Valve cap	T2-278	1
15	Adjustable lever guide	T2-279	1
16	Valve handle	T2-280	1
17	Valve seal	T2-284	2
18	Hole cap	T2-293	1
19	Conical spring	T2-391	1
21	O-ring	33-2-23	1
22	Quad ring	33-5-1	1
23	Compression spring	66-2-10	2
26	Dowel pin (3/16 x 7/16 in)	705B69	4
27	Dowel pin (3/16 x 3/4 in)	705B74	2
28	Dowel pin (3/16 x 5/8 in)	705B72	5
29	Dowel pin (1/8 x 1/2 in)	705B40	1
30	Cap screw (10-24 x 1/2 in)	201G42	4
31	Screw (4-40 x 3/8 in)	201G2	2

Table 6-4. 2712-018 and 2712-020 Parts List (Continued)

Item	Description	Part Number	Quantity
38	Grip frame 2712-018 2712-020	T2-380	1
		T2-274	1
39	Screw (4-40 x 1/8 in), Set type AA	400A1	1
42	Piston housing	T2-788	1
43	O-ring	33-2-48	1
44	Roll pin (3 x 24 mm)	703F051	1
45	Screw (4-40 x 1/8 in), Set type AA	400N1	1
46	Adapter, Type O	T563-652	1
47	Locknut	T563-635	1
	Jaw faces	Refer to <a href="#">Chapter 2</a>	
Not shown	Grip identification label 2712-018 2712-020	T2-1123	1
		T563-705	1
Not shown	Warning hazard label	51-1-226	1

# 2712-016

Upper grip



Lower grip

Figure 6-7. 2712-016 Parts Identification

Table 6-5. 2712-016 Parts List

Item	Description	Part Number	Quantity
1	Grip adapter Upper grip Lower grip	T1733-1114 T1733-1115	1 1
2	Piston housing	T1733-1116	1
3	Piston	T1733-1117	1
4	Roller	T1733-1118	2
5	Pivot pin	T1733-1119	2
6	Roller link	T1733-1120	2
7	Multiplying link	T1733-1121	2
8	Jaw face holder (right)	T1733-1122	1
9	Jaw face holder (left)	T1733-1123	1
10	Jaw frame	T1733-1124	1
11	Label set (lower grip)	T1733-1125	1
12	Spring	T1733-1126	1
13	Bush	T1733-1128	4
15	Roll pin (M5 x 30)	703E112	1
16	O-ring seal	33-2-1166	1
17	Seal ring	33-53-1098	1
18	Retainer ring, external	60-1-26	4
19	Compression spring	66-2-10	2
20	Warning hazard label (upper grip)	51-1-226	1
21	Grip identification label (upper grip)	T1733-2401	1
23	Dowel pin (8 x 18 mm)	705J300	6
25	Screw (M6 x 16)	201V33	4
27	Dowel pin	T1733-1133	4
28	Hole plug	T1733-1129	1
30	Slot plug	T1733-1130	2

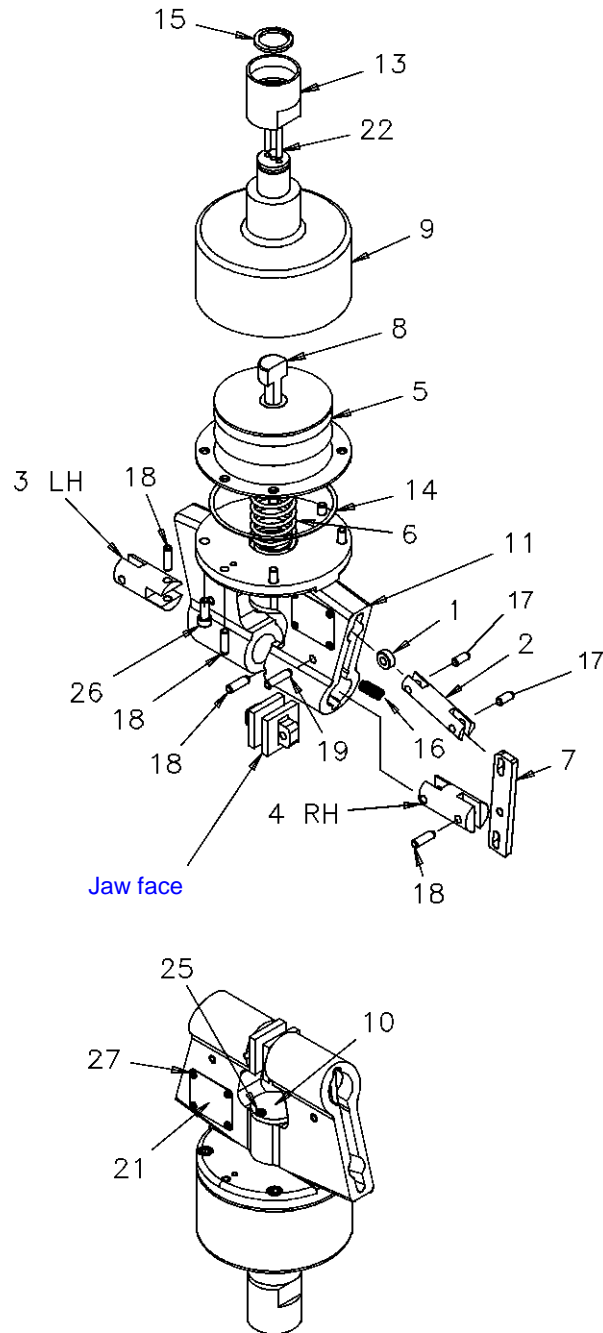
Illustrated Parts

*Table 6-5. 2712-016 Parts List (Continued)*

<b>Item</b>	<b>Description</b>	<b>Part Number</b>	<b>Quantity</b>
36	Restrictor	T1733-1157	1
37	Quick connect hose fitting	T2-1125	1
38	Washer	78-2-1020	2
39	Pneumatic quick exhaust valve	97-8-10	1



## 2732-003 and 2732-004



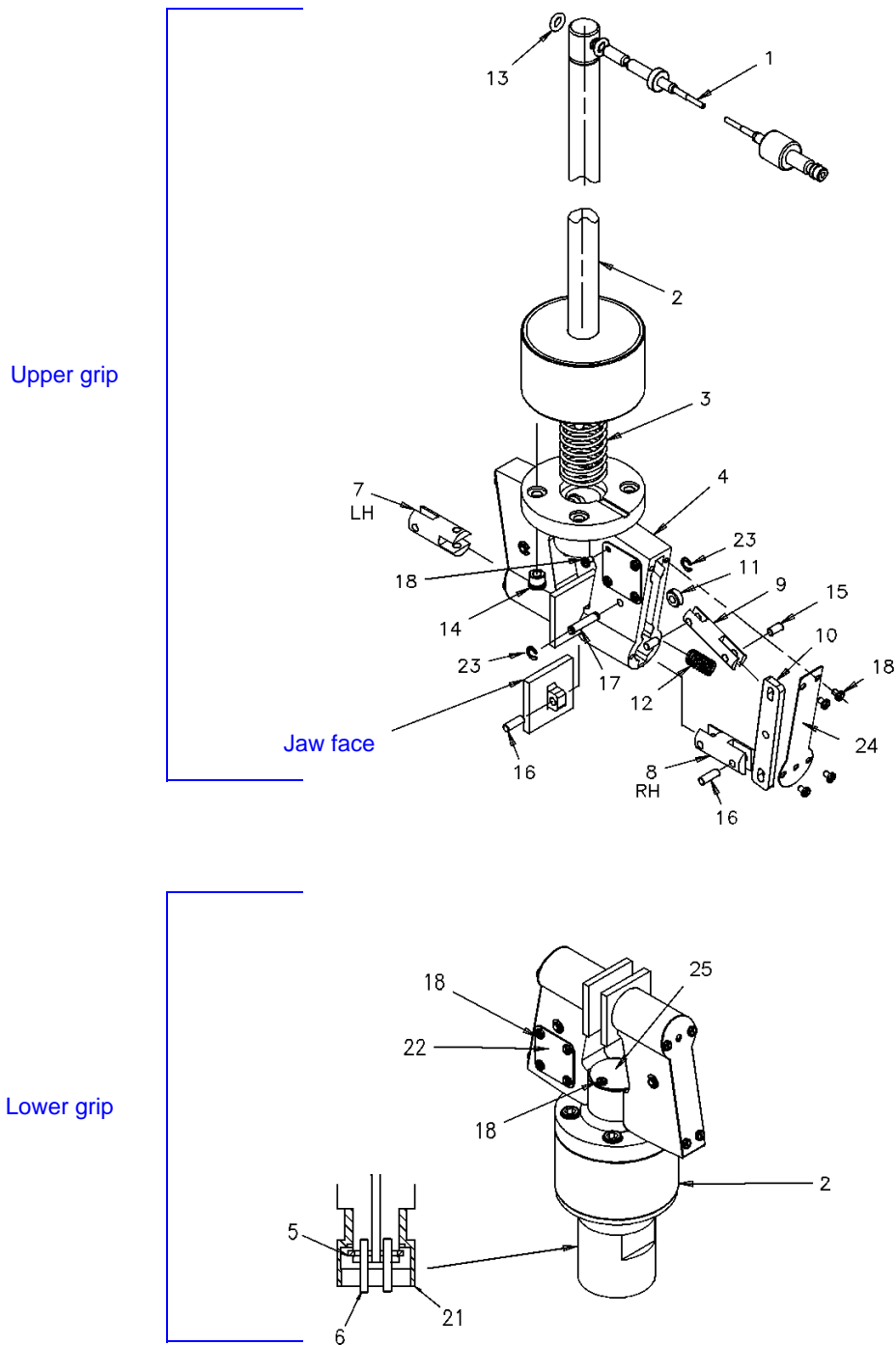
Illustrated Parts

Figure 6-8. 2732-003 and 2732-004 Parts Identification

Table 6-6. 2732-003 and 2732-004 Parts List

Item	Description	Part Number	Quantity
1	Wedge roller	T2-259	2
2	Roller link	T2-261	2
3	Jaw face holder (left)	T2-262	1
4	Jaw face holder (right)	T2-263	1
5	Metal bellows piston seal	T2-392	1
6	Piston spring	T2-453	1
7	Multiplying link	T2-1038	2
8	Piston stem guide	T2-455	1
9	Piston housing	T2-456	1
10	Hole cap	T2-749	1
11	Grip frame 2732-003 2732-004	T2-458 T2-521	1 1
13	Grip nut	T2-475	1
14	Bellows seal	T2-518	1
15	Pull rod ring	T2-539	1
16	Compression spring	66-2-10	2
17	Dowel pin (3/16 x 7/16 in)	705E69	4
18	Dowel pin (3/16 x 5/8 in)	705E72	8
19	Dowel pin (3/16 x 3/4 in)	705E74	2
21	Grip identification label 2732-003 2732-004	T2-1134 T2-1135	1 1
22	Pull rod pin	T2-571	2
25	Screw, 4-40 x 1/4 in, SS	304C43	2
26	Cap screw, 10-32 x 1/2 in	201F42	4
27	Screw, 2-56 x 1/8 in, SS	304C1	4
	Jaw faces	Refer to <a href="#">Chapter 2</a>	

# 2732-006



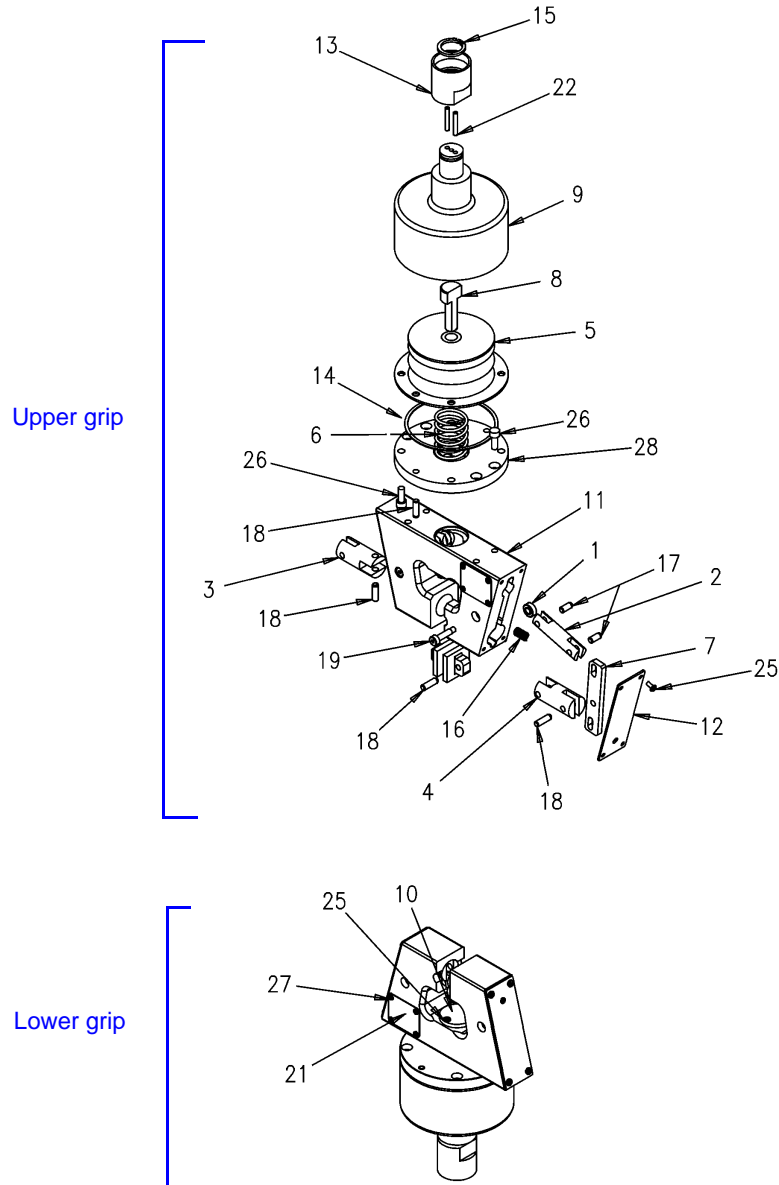
Illustrated Parts

Figure 6-9. 2732-006 Parts Identification

Table 6-7. 2732-006 Parts List

Item	Description	Part Number	Quantity
1	Assembly hose (upper grip)	A2-99	1
2	Upper pullrod Lower pullrod	A2-1021 A2-1023	1 1
3	Spring bellows return	T2-519	1
4	Grip frame	T2-520	1
5	Pull rod ring (lower grip)	T2-539	1
6	Pull rod pin (lower grip)	T2-571	2
7	Jaw face holder (left)	T2-582	1
8	Jaw face holder (right)	T2-583	1
9	Roller link	T2-584	2
10	Transfer link	T2-585	2
11	Wedge roller	T2-243	2
12	Link return spring	T2-593	2
13	O-ring (upper grip)	33-2-33	2
14	Allen nuts	52-2-69	4
15	Dowel pin (1/8 x 1/4 in)	705E36	4
16	Dowel pin (1/8 x 3/8 in)	705E38	4
17	Link pin, 1/8	T2-1148	2
18	Screw, 2-56 x 1/8 in	304C1	14
21	Grip nut (lower grip)	T2-475	1
22	Grip identification label	T2-1137	1
23	Retaining ring, E-style	60-1-243	4
24	Link shield	T2-577	2
25	Hole cap	T2-578	1
	Jaw faces	Refer to <a href="#">Chapter 2</a>	

# 2732-008 and 2732-009



Illustrated Parts

Figure 6-10. 2732-008 and 2732-009 Parts Identification

Table 6-8. 2732-008 and 2732-009 Parts List

Item	Description	Part Number	Quantity
1	Wedge roller assembly	A2-1048	2
2	Roller link	T2-261	2
3	Jaw face holder (left)	T2-262	1
4	Jaw face holder (right)	T2-263	1
5	Metal bellows piston seal	T2-392	1
6	Piston spring	T2-453	1
7	Multiplying link	T2-1145	2
8	Piston stem guide	T2-455	1
9	Piston housing	T2-1146	1
10	Hole cap	T2-749	1
11	Grip frame 2732-008 2732-009	T2-1141 T2-1142	1 1
12	Cover grip side	T2-1144	2
13	Grip nut	T2-475	1
14	Bellows seal	T2-518	1
15	Pullrod ring	T2-539	1
16	Compression spring	66-2-10	2
17	Dowel pin (3/16 x 7/16 in)	705E69	4
18	Dowel pin (3/16 x 5/8 in)	705E72	8
19	Screw shoulder hex socket SS	9-6-19	2
21	Grip identification label 2732-008 2732-009	T2-1160 T2-1161	1 1
22	Pullrod pin	T2-571	2
25	Screw 4-40 x 1/4 in, SS	304C43	2
26	Cap screw 10-32 x 1/4 in, SS	201F42	10
27	Screw 2-56 x 1/8 in, SS	304C1	4

*Table 6-8. 2732-008 and 2732-009 Parts List*

<b>Item</b>	<b>Description</b>	<b>Part Number</b>	<b>Quantity</b>
28	Top plate	T2-1140	1
	Jaw face shields (25mm high x 38mm wide)	T621-266	2
	Jaw face shields (38mm high x 50mm wide)	T621-267	2
	Thumbscrews for jaw face shields	71-2-69	4
	Jaw faces	Refer to <a href="#">Chapter 2</a>	







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