INSTRON®

2712 Series Pneumatic Side-Action Grips

Operator's Guide M10-16235-EN Revision E

The difference is measurable®

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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Trademarks

Original Instructions

Worldwide Headquarters

Instron
825 University Avenue
Norwood, MA 02062-2643
United States of America

European Headquarters

Instron
Coronation Road
High Wycombe, Bucks HP12 3SY
United Kingdom

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 in the testing system that are potentially hazardous, particularly force actuators or a moving crosshead.

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

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

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

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

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.

Table of Contents

Chapter 1
Introduction

Description

Instron Series 2712 pneumatic action grips are designed for materials 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. The grips are available in the following capacities:

Catalog number	Capacity (kN)
2712-052	0.25
2712-041	1
2712-042	2
2712-045	5
2712-046	10

2712-052 grips can support loads up to 500N but some specimens may slip at loads over 250N. We recommend the use of serrated jaw faces for expected loads higher than 250N.

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 can be equipped with a variety of interchangeable jaw faces in various sizes and surface types. Refer to Table 3 on page 21 to find compatible jaw faces for your specific model. Contact your Instron sales representative for assistance with selecting jaw faces that are suitable for your testing requirements.

These 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 grips have an integral toggle air valve to open and close the grips. You can also operate the grips using a separate pneumatic foot switch.

Grip Components

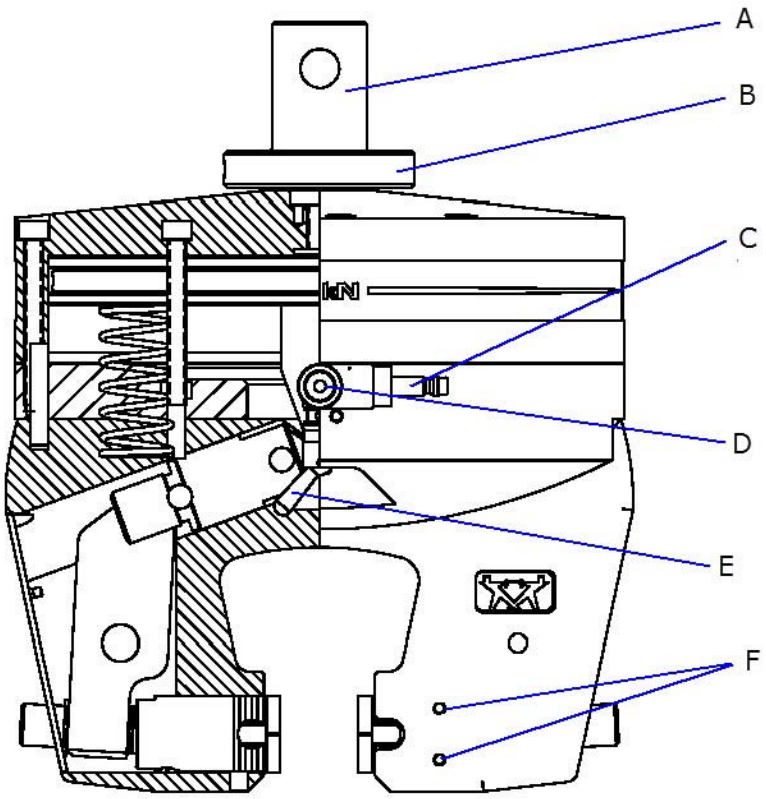

Figure 1. Grip Components

Letter	Description
A	Grip coupling
B	Locknut
C	Quick connect coupling

Letter	Description
D	Flow control
E	Air switch
F	Accessory mounting holes

Accessories

The following accessories are available. Refer to “Installation” for more details.

- Jaw face shields
- Specimen alignment device
- Pneumatic foot switch
- Automatic grip controller

Chapter 2
Specifications

Grip Specifications

Grips

Table 1. Grip Specifications

	2712-052	2712-041	2712-042	2712-045	2712-046
Load capacity (kN)	0.25[1]	1	2	5	10
Test Application	Tensile				
Mechanical connection (upper and lower)	Type Om 6 mm (0.25 in) clevis pin	Type Om 6 mm (0.25 in) clevis pin	Type Om 6 mm (0.25 in) clevis pin)	Type Dm 13 mm (0.5 in) clevis pin	Type Dm 13 mm (0.5 in) clevis pin)
Maximum specimen thickness	Varies according to jaw face, refer to Table 4 on page 23	Varies according to jaw face, refer to Table 3 on page 21			
Nominal specimen thickness (mm)[2]	5.82	13	20	26	26

Table 1. Grip Specifications (Continued)

	2712-052	2712-041	2712-042	2712-045	2712-046
Gripping force at 90 psi (6 bar) air pressure (mid-stroke)	496 N (112 lbf)	2.3 kN (517 lbf)	5.0 kN (1124 lbf)	12.6 kN (2832 lbf)	23.9 kN (5373 lbf)
Temperature range	-20 °C to +100 °C				
Weight (each grip)	0.35 kg (0.78 lb)	2.5 kg (5.6 lb)	4.1 kg (9.1 lb)	6.8 kg (15.0 lb)	9.7 kg (21.4 lb)
Air supply pressure range	2.8 bar (40 psi) to 6.2 bar (90 psi)				
Air supply - consumption[3](SCFM)	0.002	0.006	0.018	0.018	0.032

1. These grips can support loads up to 500N but some specimens may slip at loads over 250N. We recommend the use of serrated jaw faces for expected loads higher than 250N.
2. This value assumes 51mm x 51 mm serrated jaw faces. Refer to Table 3 on page 21 for different faces.
3. SCFM is Standard Cubic Feet per Minute, assuming 1 gripping cycle per minute for the entire grip set. This measurement assumes air pressure of 5.5 bar (80 psi).

Air Supply

To ensure long term operation of the grips the air supply must be dry and filtered. To ensure dry air you can install an in-line desiccant air dryer (not available from Instron) at the compressor. Use of a local regulator and 5 µm filter assembly near the testing system is also recommended.

Grip operating pressure range is 2.8 bar (40 psi) to 6.2 bar (90 psi). If the air pressure is below the minimum recommended 2.8 bar (40 psi), gripping force will be diminished. Figure 3 on page 18 and Figure 4 on page 19 illustrate this effect.

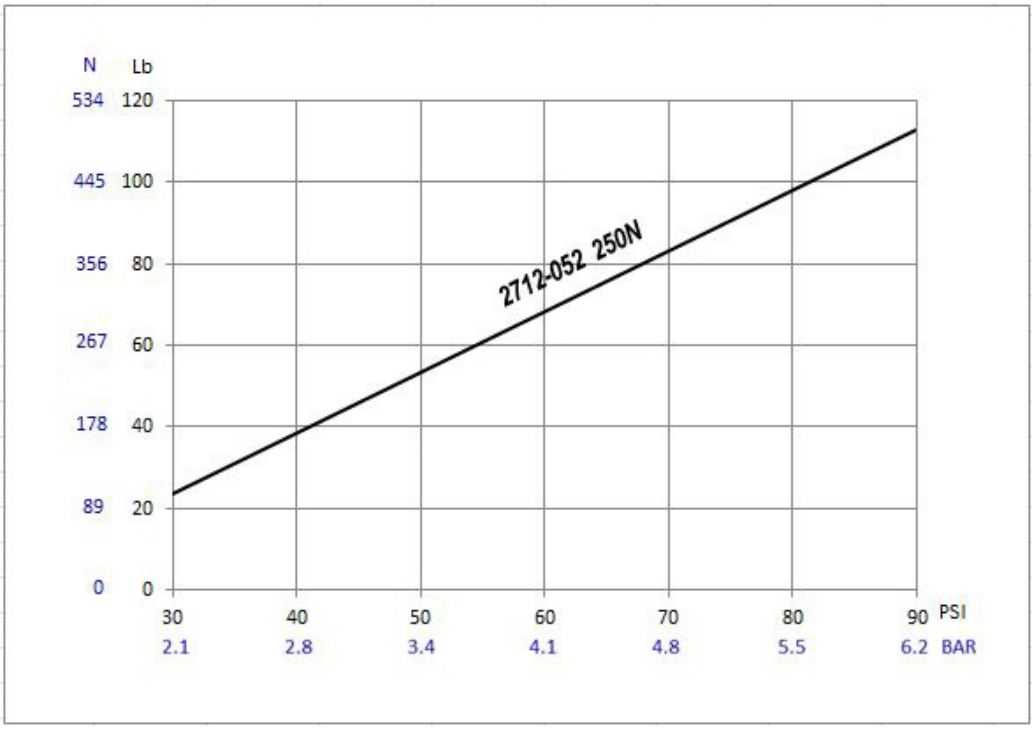

Figure 2. Clamping force vs Air pressure for 250N grips

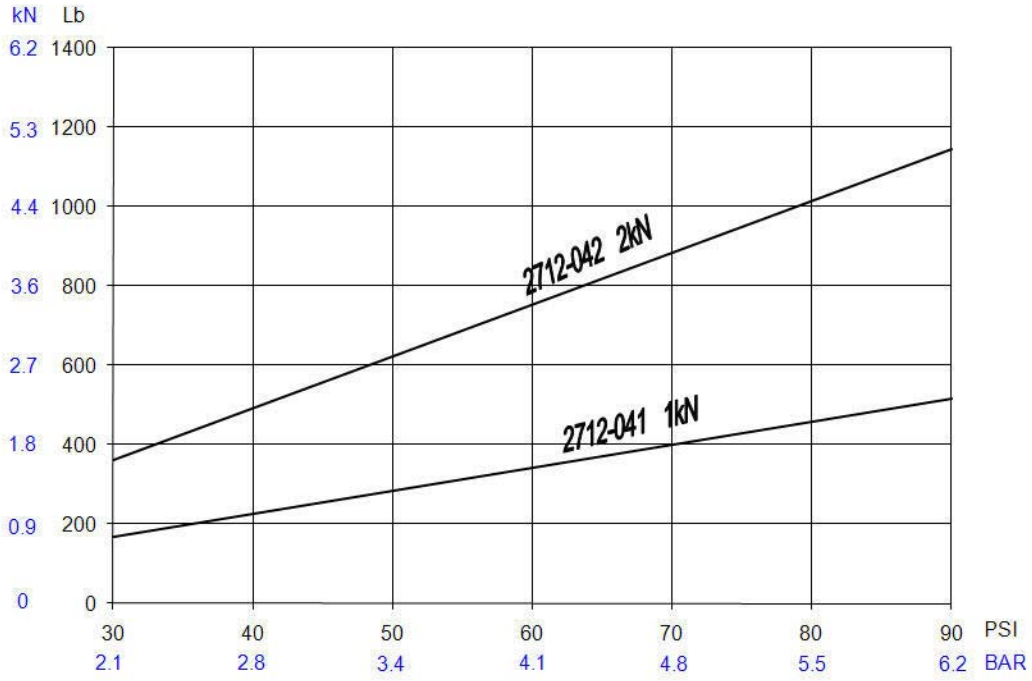

Figure 3. Clamping force vs Air pressure for 1kN and 2kN grips

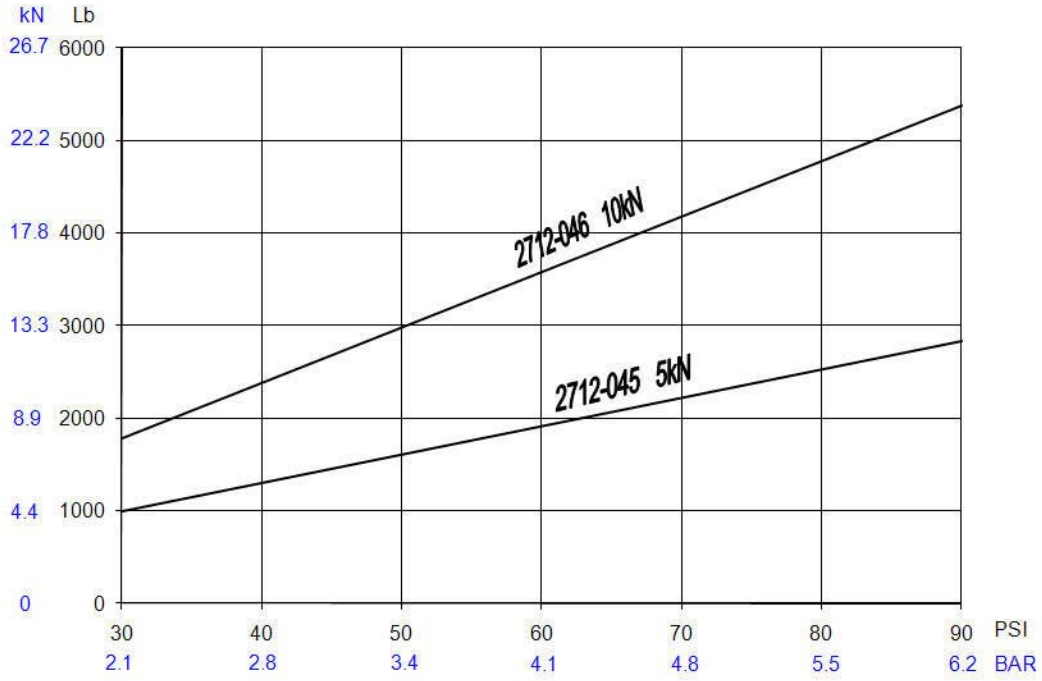

Figure 4. Clamping force vs Air pressure for 5kN and 10kN grips

Grip Dimensions

Table 2. Grip Dimensions - mm (in)

Dimension - mm (in)	Label on Figure 5	2712-052	2712-041	2712-042	2712-045	2712-046
Overall width	A	68.8 (2.7)	126 (5.0)	152 (6.0)	199 (7.8)	208 (8.1)
Overall height	B	130.4 (5.1)	184 (7.2)	194 (7.6)	251 (9.9)	255 (10.0)
Depth including fittings	C	87.4 (3.4)	129 (5.1)	173 (6.8)	184 (7.2)	226 (8.9)
Piston outside diameter	D	62.8 (2.5)	100 (3.9)	145 (5.7)	160 (6.3)	202 (8.0)
Body thickness	E	15.6 (0.61)	31 (1.2)	31 (1.2)	42 (1.7)	54 (2.1)
Effective length	F	122.4 (4.8)	176 (6.9)	186 (7.3)	236 (9.3)	239 (9.4)

Table 2. Grip Dimensions - mm (in) (Continued)

Dimension - mm (in)	Label on Figure 5	2712-052	2712-041	2712-042	2712-045	2712-046
Jaw center to grip edge	G	7.96 (0.31)	16 (0.63)	16 (0.63)	19 (0.75)	19 (0.75)

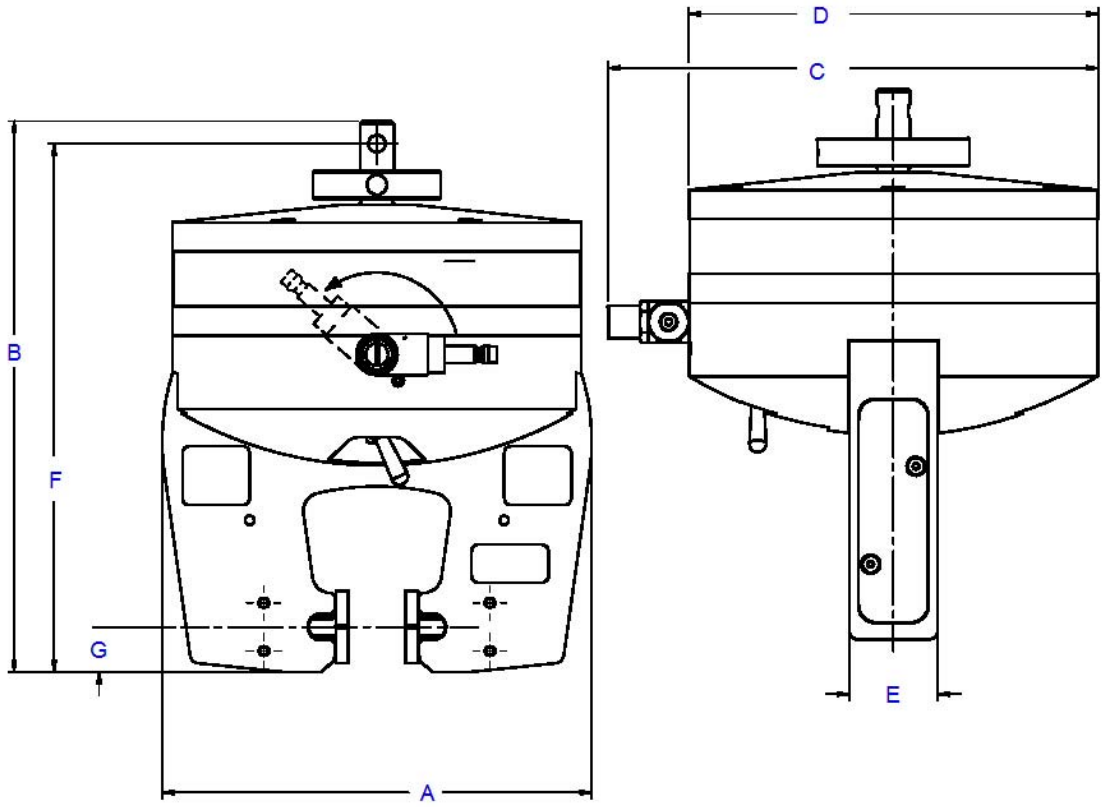

Figure 5. Grip Dimensions

Compatible Jaw Faces

Table 3. Compatible Jaw Faces (1kN through 10kN)

Catalog No.	Surface	Width - mm (in)	Height - mm (in)	Maximum Specimen Thickness - mm (in)		
				2712-041	2712-042	2712-045 2712-046
2702-300	Rubber	25 (1.0)	25 (1.0)	11 (0.43)	18 (0.71)	24 (0.95)
2702-301	Rubber	25 (1.0)	38 (1.5)	11 (0.43)	18 (0.71)	24 (0.95)
2702-302	Rubber	25 (1.0)	51 (2.0)	11 (0.43)	18 (0.71)	24 (0.95)
2702-303	Rubber	38 (1.5)	13 (0.5)	11 (0.43)	18 (0.71)	24 (0.95)
2702-304	Rubber	38 (1.5)	25 (1.0)	11 (0.43)	18 (0.71)	24 (0.95)
2702-305	Rubber	38 (1.5)	51 (2.0)	11 (0.43)	18 (0.71)	24 (0.95)
2702-306	Rubber	51 (2.0)	25 (1.0)	11 (0.43)	18 (0.71)	24 (0.95)
2702-307	Rubber	51 (2.0)	38 (1.5)	11 (0.43)	18 (0.71)	24 (0.95)
2702-308	Rubber	51 (2.0)	51 (2.0)	6 (0.24)	13 (0.5)	19 (0.75)
2702-309	Rubber	76 (3.0)	25 (1.0)	11 (0.43)	18 (0.71)	24 (0.95)
2702-310	Rubber	76 (3.0)	51 (2.0)	6 (0.24)	13 (0.5)	19 (0.75)
2702-311	Rubber	152 (6.0)	51 (2.0)	6 (0.24)	13 (0.5)	19 (0.75)
2702-315	Serrated	25 (1.0)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-316	Serrated	25 (1.0)	38 (1.5)	13 (0.5)	20 (0.79)	26 (1.0)
2702-317	Serrated	25 (1.0)	51 (2.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-318	Serrated	38 (1.5)	13 (0.5)	13 (0.5)	20 (0.79)	26 (1.0)
2702-319	Serrated	38 (1.5)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-320	Serrated	38 (1.5)	51 (2.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-321	Serrated	51 (2.0)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-322	Serrated	51 (2.0)	38 (1.5)	13 (0.5)	20 (0.79)	26 (1.0)
2702-323	Serrated	51 (2.0)	51 (2.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-324	Serrated	76 (3.0)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)

Table 3. Compatible Jaw Faces (1kN through 10kN) (Continued)

Catalog No.	Surface	Width - mm (in)	Height - mm (in)	Maximum Specimen Thickness - mm (in)		
				2712-041	2712-042	2712-045 2712-046
2702-325	Serrated	76 (3.0)	51 (2.0)	8 (0.31)	15 (0.6)	21 (0.83)
2702-326	Serrated	152 (6.0)	51 (2.0)	8 (0.31)	15 (0.6)	21 (0.83)
2702-330	Smooth	25 (1.0)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-331	Smooth	25 (1.0)	38 (1.5)	13 (0.5)	20 (0.79)	26 (1.0)
2702-332	Smooth	25 (1.0)	51 (2.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-333	Smooth	38 (1.5)	13 (0.5)	13 (0.5)	20 (0.79)	26 (1.0)
2702-334	Smooth	38 (1.5)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-335	Smooth	38 (1.5)	51 (2.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-336	Smooth	51 (2.0)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-337	Smooth	51 (2.0)	38 (1.5)	13 (0.5)	20 (0.79)	26 (1.0)
2702-338	Smooth	51 (2.0)	51 (2.0)	8 (0.31)	15 (0.6)	21 (0.83)
2702-339	Smooth	76 (3.0)	25 (1.0)	13 (0.5)	20 (0.79)	26 (1.0)
2702-340	Smooth	76 (3.0)	51 (2.0)	8 (0.31)	15 (0.6)	21 (0.83)
2702-341	Smooth	152 (6.0)	51 (2.0)	8 (0.31)	15 (0.6)	21 (0.83)
2702-345	Brake Lining (HFC)	25 (1.0)	38 (1.5)	10 (0.39)	17 (0.67)	23 (0.91)
2702-346	Brake Lining (HFC)	38 (1.5)	25 (1.0)	10 (0.39)	17 (0.67)	23 (0.91)
2702-347	Brake Lining (HFC)	51 (2.0)	38 (1.5)	10 (0.39)	17 (0.67)	23 (0.91)
2702-350	Line	25 (1.0)	n/a	13 (0.5)	20 (0.79)	26 (1.0)
2702-351	Line	76 (3.0)	n/a	13 (0.5)	20 (0.79)	26 (1.0)
2702-352	Wave	51 (2.0)	51 (2.0)	n/a	6.5 (0.25)	12.5 (0.5)

Table 3. Compatible Jaw Faces (1kN through 10kN) (Continued)

Catalog No.	Surface	Width - mm (in)	Height - mm (in)	Maximum Specimen Thickness - mm (in)		
				2712-041	2712-042	2712-045 2712-046
2702-353	Wave	76 (3.0)	51 (2.0)	n/a	6.5 (0.25)	12.5 (0.5)
2702-354	Vee-serrated	3 - 6.5 (0.12 - 0.25)	25 (1.0)	6.5 (0.25)	6.5 (0.25)	6.5 (0.25)
2702-355	Vee-serrated	6 - 18.5 (0.24 - 0.73)	25 (1.0)	7 (0.28)	14 (0.55)	18.5 (0.73)
2702-357	Serrated	25 (1.0)	51 (2.0)	8 (0.31)	15 (0.6)	21 (0.83)

Table 4. Compatible Jaw Faces (250N)

Catalog No.	Surface	Width - mm (in)	Height - mm (in)	Maximum Specimen Thickness
2702-360	Rubber	10 (0.4)	10 (0.4)	3.2 (0.13)
2702-361	Rubber	12 (0.5)	25 (1.0)	3.2 (0.13)
2702-362	Rubber	25 (1.0)	25 (1.0)	3.2 (0.13)
2702-363	Rubber	50 (2.0)	25 (1.0)	3.2 (0.13)
2702-364	Rubber	100 (4.0)	25 (1.0)	3.2 (0.13)
2702-365	Serrated	10 (0.4)	10 (0.4)	5 (0.2)
2702-366	Serrated	12 (0.5)	25 (1.0)	5 (0.2)
2702-367	Serrated	25 (1.0)	25 (1.0)	5 (0.2)
2702-368	Serrated	50 (2.0)	25 (1.0)	5 (0.2)
2702-369	Serrated	100 (4.0)	25 (1.0)	5 (0.2)
2702-370	Smooth	10 (0.4)	10 (0.4)	5 (0.2)
2702-371	Smooth	12 (0.5)	25 (1.0)	5 (0.2)
2702-372	Smooth	25 (1.0)	25 (1.0)	5 (0.2)
2702-373	Smooth	50 (2.0)	25 (1.0)	5 (0.2)
2702-374	Smooth	100 (4.0)	25 (1.0)	5 (0.2)

Table 4. Compatible Jaw Faces (250N) (Continued)

Catalog No.	Surface	Width - mm (in)	Height - mm (in)	Maximum Specimen Thickness
2702-375	Brake Lining (HFC)	25 (1.0)	25 (1.0)	3.2 (0.13)
2702-376	Brake Lining (HFC)	50 (2.0)	25 (1.0)	3.2 (0.13)
2702-377	Line Contact	25 (1.0)	n/a	5 (0.2)

The jaw faces listed in Table 4 are also compatible with the 2712-051 50N pneumatic grips.

Jaw Face Shields

Jaw face shields help to keep an operator's fingers away from the moving jaw faces. They can be mounted at the front or back of the grips and should be adjusted to the minimum opening required to install a specimen into the grip. They are designed to remain fixed during testing and you can change jaw faces without removing the shields using the access hole in the side of each shield.

The shields also feature visual alignment aids and a large V-notch for easy alignment of round specimens.

Each set of grips is supplied with 2 sets of shields, designed to be used with the most popular jaw face sizes for those grips. Table 5 on page 24 lists the shields that are supplied and those that are available for each set of grips.

Table 5. Jaw Face Shield Compatibility

Catalog no.	Size - mm (height x width)	2712-052	2712-041	2712-042	2712-045	2712-046
2701-215	25 x 25	Supplied				
2701-201	25 x 38		Supplied	Supplied		
2701-202	38 x 50		Supplied	Supplied		
2701-203	25 x 75		Available	Available		
2701-204	25 x 50				Supplied	
2701-205	50 x 75				Supplied	
2701-206	25 x 75				Available	

Table 5. Jaw Face Shield Compatibility (Continued)

Catalog no.	Size - mm (height x width)	2712-052	2712-041	2712-042	2712-045	2712-046
2701-207	25 x 50					Supplied
2701-208	50 x 75					Supplied
2701-209	25 x 75					Available

Specimen Alignment Device

This device provides a backstop to align rigid or semi-rigid specimens. The rod can be adjusted by loosening the clamp with the thumbscrew. It can be used on either side of the face and can be used in combination with the jaw face shields.

Chapter 3
Installation

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

Installing onto a Load Frame

Checklist

Before you begin, check the following:

- There is sufficient space between the load cell and the load frame base to install the grips.
- The testing system is in standby mode and other personnel cannot operate any of the system controls.
- The limit stops on the load frame are set to prevent the upper and lower grips from colliding with each other.
- The mating surfaces of the grips, load cell and load frame base are free of dirt and debris.

Procedure - installing 250N, 1kN and 2kN grips

The 250N, 1 kN and 2 kN grips can be held in one hand. Therefore, you can use the following procedure to install both the upper and lower grip onto the load frame.

1. Insert the adapter on the grip into the female clevis socket on the load frame base or load cell as shown in Figure 6 on page 28.

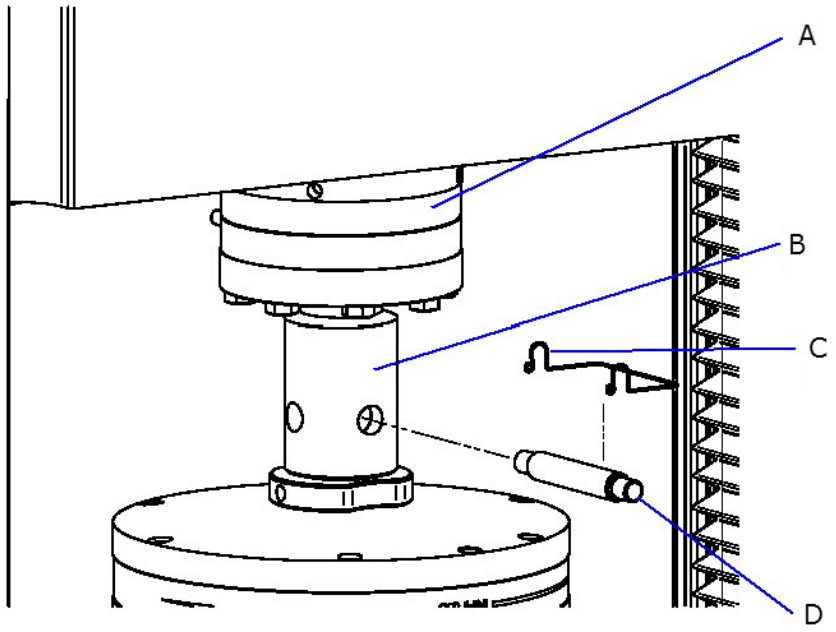

Figure 6. Installing Grip onto Load Frame

Letter	Description
A	Load cell
B	Clevis socket
C	Clevis pin clip
D	Clevis pin

2. Align the clevis holes and insert the clevis pin through the holes.
3. Secure the clevis pin in position with the clevis pin clip.
4. Tighten the lock nut by hand. This is sufficient for 250N, 1kN and 2kN grips, you should not need to preload the loadstring.

Procedure - installing 5kN and 10kN grips

The 5 kN and 10 kN grips are too heavy to be held comfortably in one hand. You must use a different procedure for installing the upper and lower grip and you must install the upper grip first.

The packaging for the 5 kN and 10 kN grips has been designed to assist you when installing the upper grip, providing support for the heavy grip.

Install the upper grip

Refer to Figure 6 on page 28.

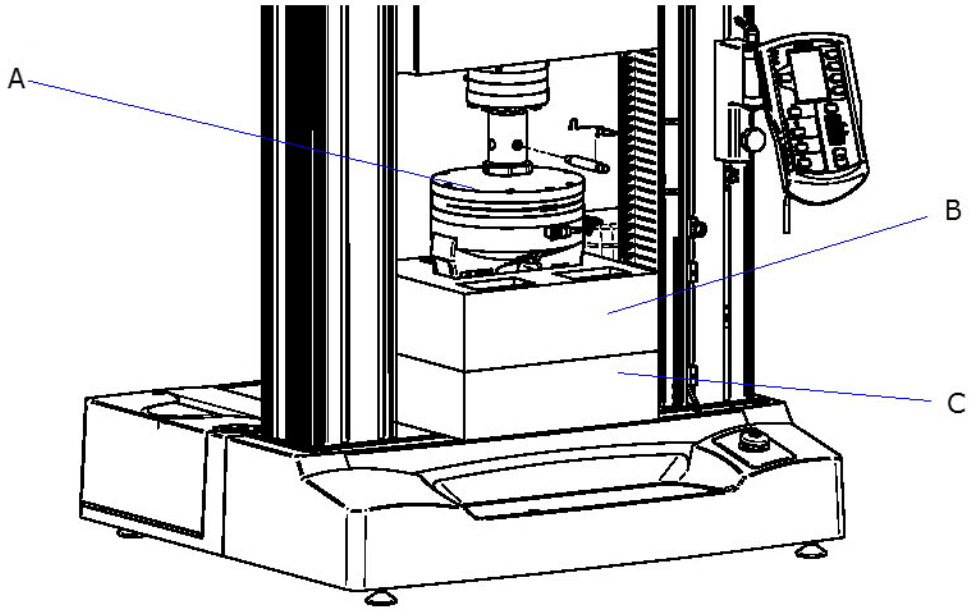

Figure 7. Using the packaging to help install the 5kN and 10kN upper grip

Letter	Description
A	10kN upper grip
B	Foam packaging - bottom
C	Foam packaging - top

1. Make sure that the space between the crosshead and frame base is sufficient to place the upper grip and its packaging between them.

2. Remove the top foam packaging piece from the upper grip and place it on the frame base.
3. Lift the upper grip, retaining the bottom foam packaging piece, and place it on top of the top foam packaging piece.
4. Using the jog controls on the control panel, carefully and slowly drive the crosshead down so that the adapter on the grip inserts into the female clevis socket on the load cell.
5. Align the clevis holes and insert the clevis pin through the holes.
6. Secure the clevis pin in position with the clevis pin clip.
7. Tighten the lock nut by hand at this stage, when you have installed all the grip components and connected the pneumatics, refer to “Preload the Load String” on page 44.
8. Using the jog controls on the control panel, carefully and slowly drive the crosshead up so that the grip is lifted out of the packaging.
9. Remove the packaging from the frame base.

Install the lower grip

1. Lift the lower grip into position and insert the adapter on the grip into the female clevis socket on the load frame base.
2. Align the clevis holes and insert the clevis pin through the holes.
3. Secure the clevis pin in position with the clevis pin clip.
4. Tighten the lock nut by hand at this stage, when you have installed all the grip components and connected the pneumatics, refer to “Preload the Load String” on page 44.

Installing and Removing Jaw Faces

Warning

Crush hazard - disconnect the pneumatic supply to the grips before installing or removing jaw faces.

Installing and removing jaw faces involves working very close to the hazard area between the grips. Disconnect the pneumatic supply to the grips to remove the risk of accidental operation of the toggle switch or foot switch.

Install Jaw Faces

1. Verify that the pneumatic supply to the grip is disconnected.
2. Push the jaw face into the grip body as shown in Figure 8 on page 31 until you feel it locate in the socket.

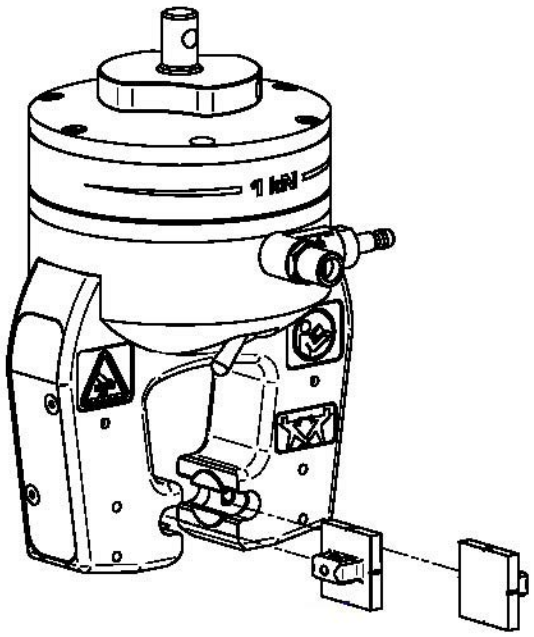

Figure 8. Installing Jaw Faces

3. Grasp the top and bottom edges of the jaw face between finger and thumb and rock it up and down to ensure that it is fully located in the socket.

Remove Jaw Faces

1. Verify that the pneumatic supply to the grip is disconnected.
2. If jaw face shields are not installed, simply push the jaw face out of the grip body.
3. If jaw face shields are installed, insert a pencil or similar small probe into the hole in the shields and push the jaw face out of the grip body.

Install Jaw Face Shields

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 jaw faces with the shields still in place.

Figure 9 on page 32 shows how to install jaw face shields.You can install the shields using the holes on the front or back, using two M4 x 6thumbscrews for each shield.

Adjust the shields so that the space between them is only slightly more than the specimen thickness.

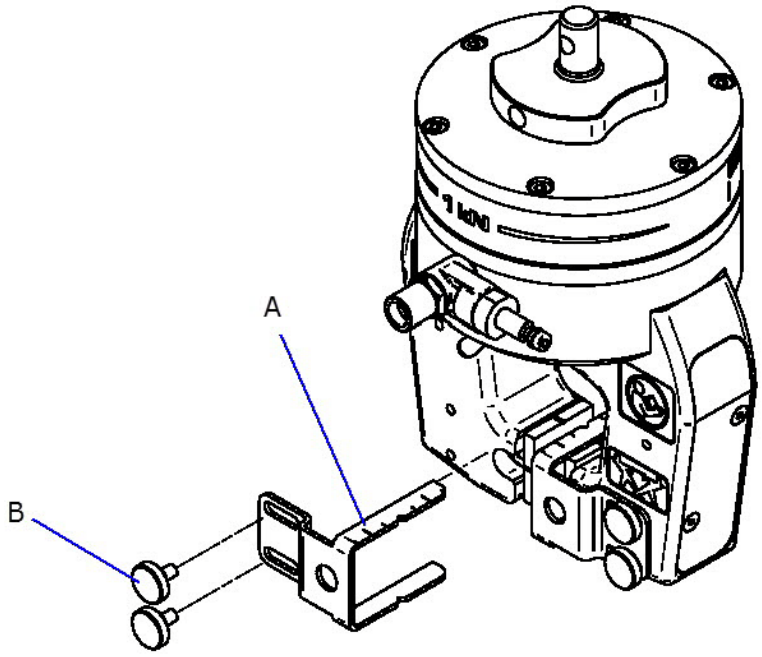

Figure 9. Installing Jaw Face Shields

Letter	Description
A	Jaw face shield
B	M4 x 6 thumbscrew

Install the Specimen Alignment Device

Figure 10 on page 33 shows how to install the device onto the grips. You can install the backstop block on the right or left, front or back, using the two M4 x 20 thumbscrews. The backstop block has a slot that lets you adjust the position up and down. Use the M4 x 8 thumbscrew to attach the backstop to the backstop block.

Two different lengths of backstop are provided. Use the one that fits your particular test setup and minimizes how far the backstop protrudes out of the grip.

Figure 11 on page 34 shows the device in use.

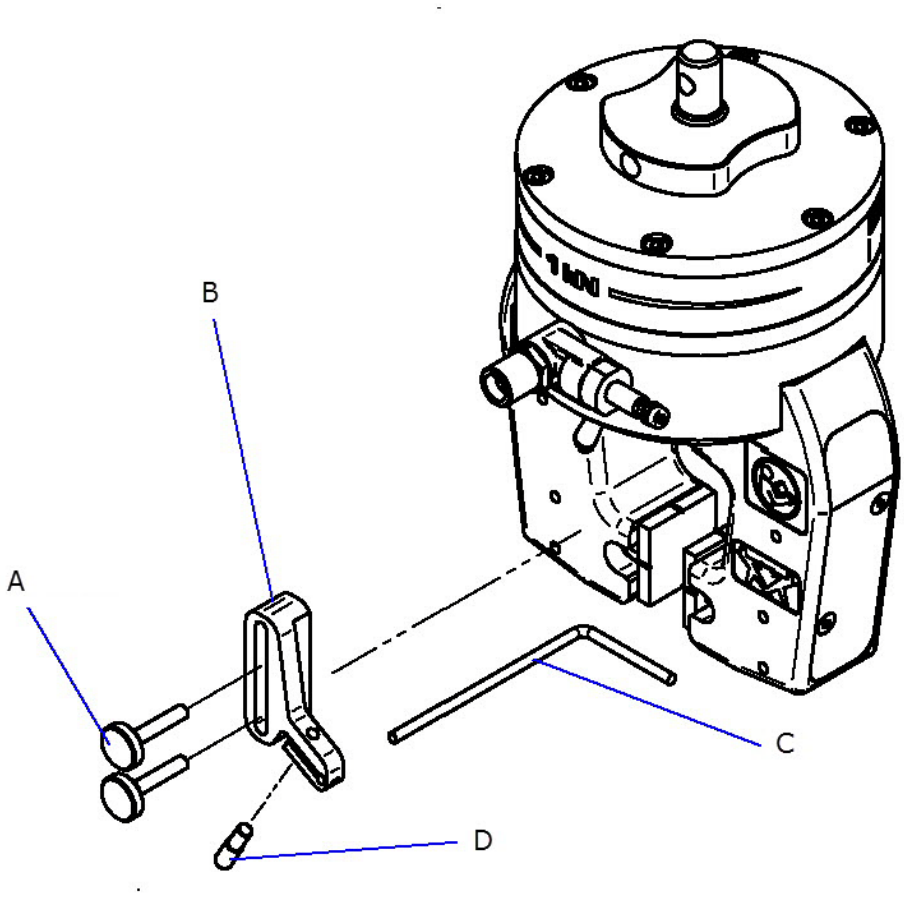

Figure 10. Installing the Specimen Alignment Device

Letter	Description
A	M4 x 20 thumbscrew

Letter	Description
B	Backstop block
C	Backstop
D	M4 x 8 thumbscrew

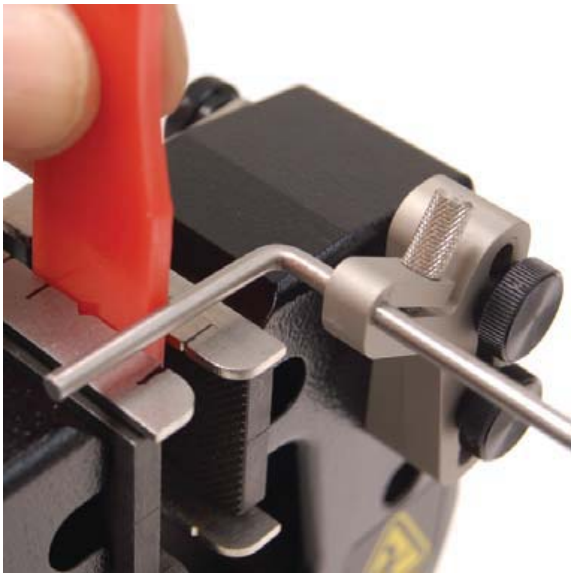

Figure 11. Using the Specimen Alignment Device

Adjust the Jaw Face Opening

The larger grips (5 kN and 10 kN capacity) have thumbscrews on the side of the arms that let you adjust the jaw face opening to accommodate specimens of different thicknesses.

When you rotate the thumbscrew, there is an audible click with each complete rotation and each complete rotation corresponds to 1mm of travel of the jaw face holder.

Connecting Pneumatics

When connected to the air supply you can operate the grips in one of the following ways:

- using the integral air valve toggle switch

- using the optional manual foot switch
- using the optional grip controller unit

Grip Air Inlets

All Instron pneumatic grips have a quick release type connector. Figure 12 on page 35 illustrates the grip nozzle and hose coupling.

The air inlets on the grips can swivel to let you keep the air hoses tidy and out of the way of testing.

Warning

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.

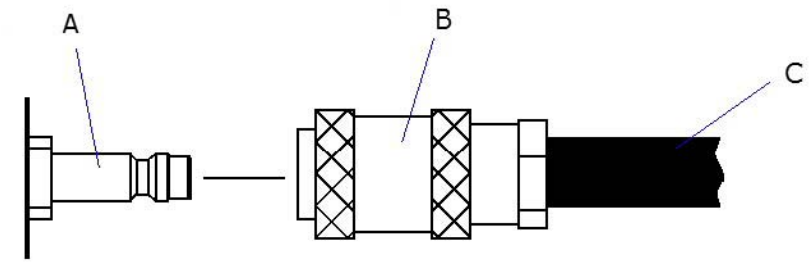

Figure 12. Grip Air Inlet Connection

Letter	
A	Male fitting
B	Quick connect coupling
C	Hose

To connect:

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.

To disconnect:

Grasp the coupling sleeve and push it towards the nozzle until it disengages. If air pressure is flowing to the grip when you disconnect the nozzle, there will be a pressure discharge.

Adjusting the Air Inlet Flow Valve

Warning

Do not increase the air flow on grips that are not fitted with jaw face shields. The pinch hazard increases significantly as the speed of closing of the grips increases.

If you are not using jaw face shields, you should only operate the grips at the lowest speed. If you want a higher speed of grip closure, install jaw face shields to protect the operator's fingers.

The time taken to pinch a finger if the air flow is set to maximum is approx. 0.3 seconds for the 1kN grips, 1 second for the 2kN and 5kN grips, and 2.5 seconds for the 10kN grips.

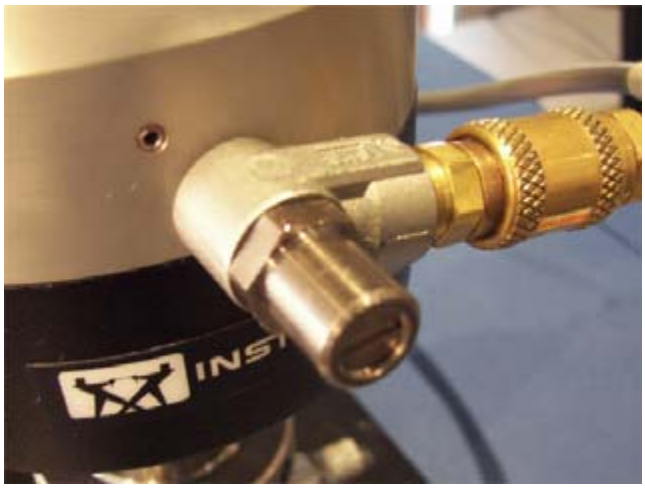

Figure 13. Air Inlet Flow Adjustment

The screw on the front of the air inlet valve lets you adjust the air flow. Rotate the screw clockwise to decrease the flow, or counter-clockwise to increase the flow.

Adjusting the air flow affects the time taken for the grips to pressurize fully. You should not start a test until the grips have reached at least 95% of their full pressure.

If the air flow is set at the maximum, you must wait after the grips have closed at least 1 second for 1 kN grips, 3 seconds for 2kN and 5 kN grips, and 7 seconds for 10kN grips before you start a test.

If the air flow is set at the minimum, the time to achieve 95% of full pressure increases to approximately three times the values for maximum air flow. This is an issue primarily for the 10kN grips, where you should wait approximately 20 seconds to be sure that full gripping force is achieved.

Air Valve Toggle Switch

The air valve toggle switch lets you open and close the each grip manually without using a foot switch or grip controller.

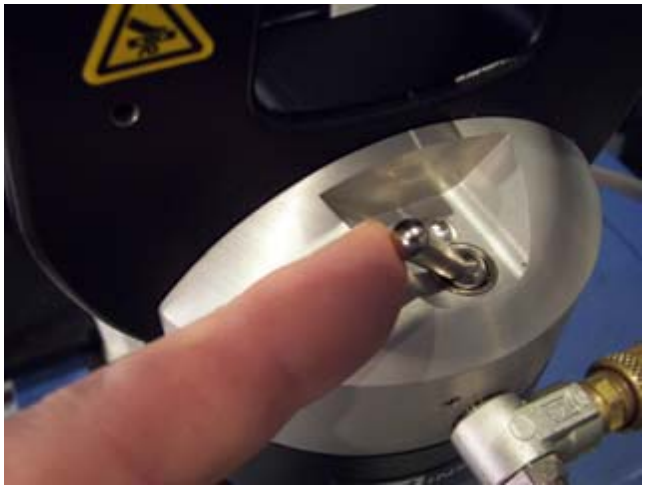

Figure 14. Air Valve Toggle Switch

As you view the assembled load string from the front of the frame, the grips are:

- open when both toggle switches are to the left.
- closed when both toggle switches are to the right.

Install or remove air valve toggle switch

Depending on the system that the grips are shipped with, or if they are shipped alone, the air valve toggle switch may or may not be installed.

If you are using a foot switch with or without an automatic grip control system, you may want to remove the toggle switch to avoid multiple points of control for the grips.

The following procedures describe how to install the toggle switch and the plug that replaces it if it is not required.

Install the plug

1. Stretch the o-ring around the plug and seat it into the groove on the plug.

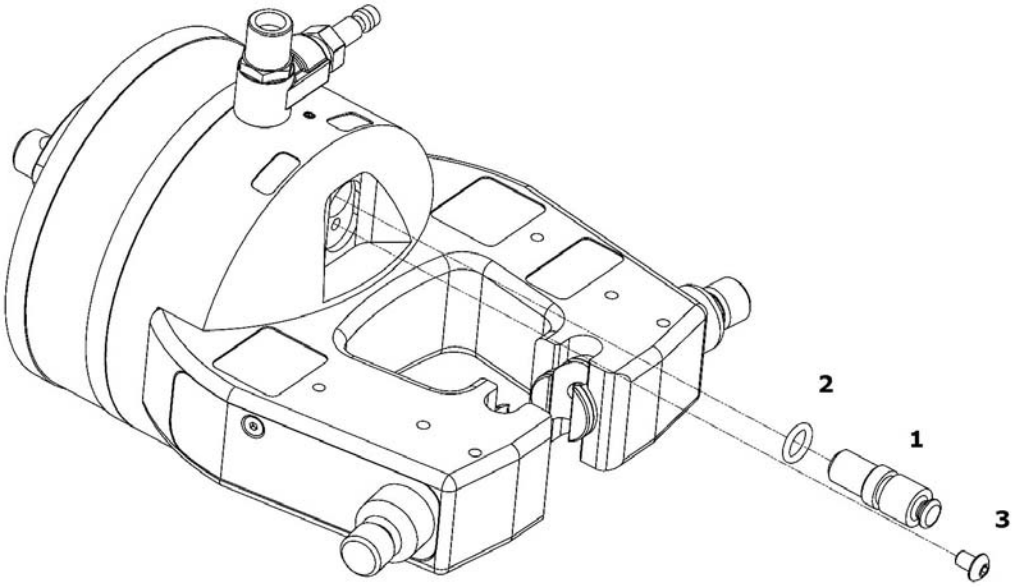

Figure 15. Install the plug

Table 6. Install the plug

Label on Figure 15	Description
1	Plug
2	O-ring
3	M4 x 6 socket head cap screw

2. Apply a small amount of Magnalube-G lubricant to the o-ring and push the plug into the bore as shown in Figure 15 on page 38.
3. Thread the screw into the grip as shown in Figure 15 on page 38 and tighten it to secure the plug into the bore.

Install the toggle switch

1. Apply a small amount of Magnalube-G lubricant to the o-rings on the cartridge valve and push the valve into the bore as shown in Figure 16 on page 39.

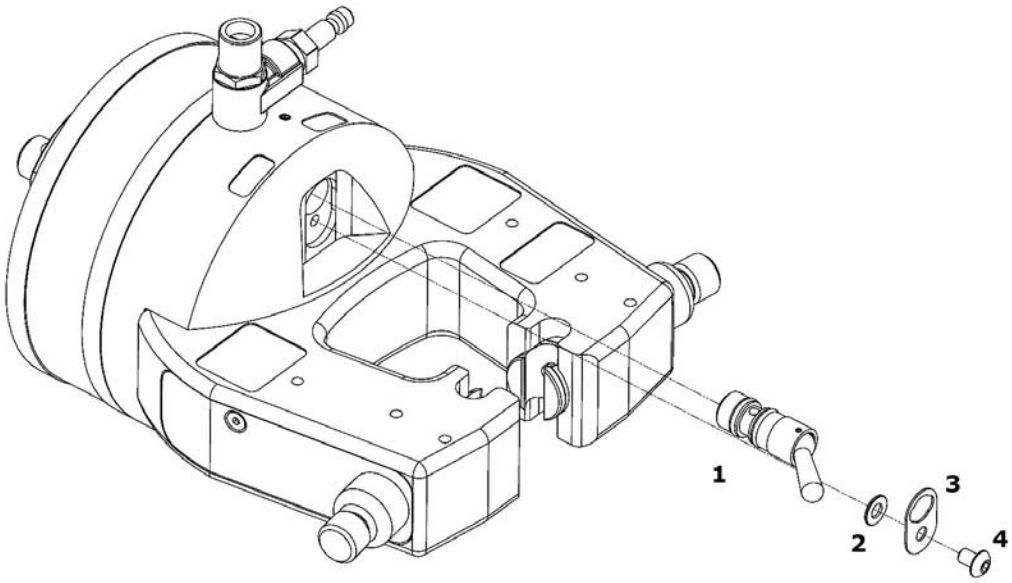

Figure 16. Install the toggle switch

Table 7. Install the toggle switch

Label on Figure 16	Description
1	Pneumatic cartridge valve
2	M4 washer (1kN and 2kN grips only)
3	Deflector plate (250N, 1kN and 2kN grips)
4	M4 x 6 socket head cap screw

2. Ensure that the toggle switch is oriented as shown in Figure 17 on page 40 and Figure 18 on page 40.

Figure 17. Switch in open position, round side visible toward closed label

Figure 18. Switch in closed position, cut side visible toward open label

3. Put the screw through the deflector plate and washer (if provided) and thread the screw into the grip as shown in Figure 16 on page 39. The cartridge valve should sit inside the cutout on the deflector plate.
4. Tighten the screw to secure the valve into the bore.

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 19 on page 42 illustrates the foot switch.

Caution

Be sure to attach the hose for the upper grip to the clip on the crosshead as shown. If you do not, your test results will be affected by the weight of the hose, especially at low loads.

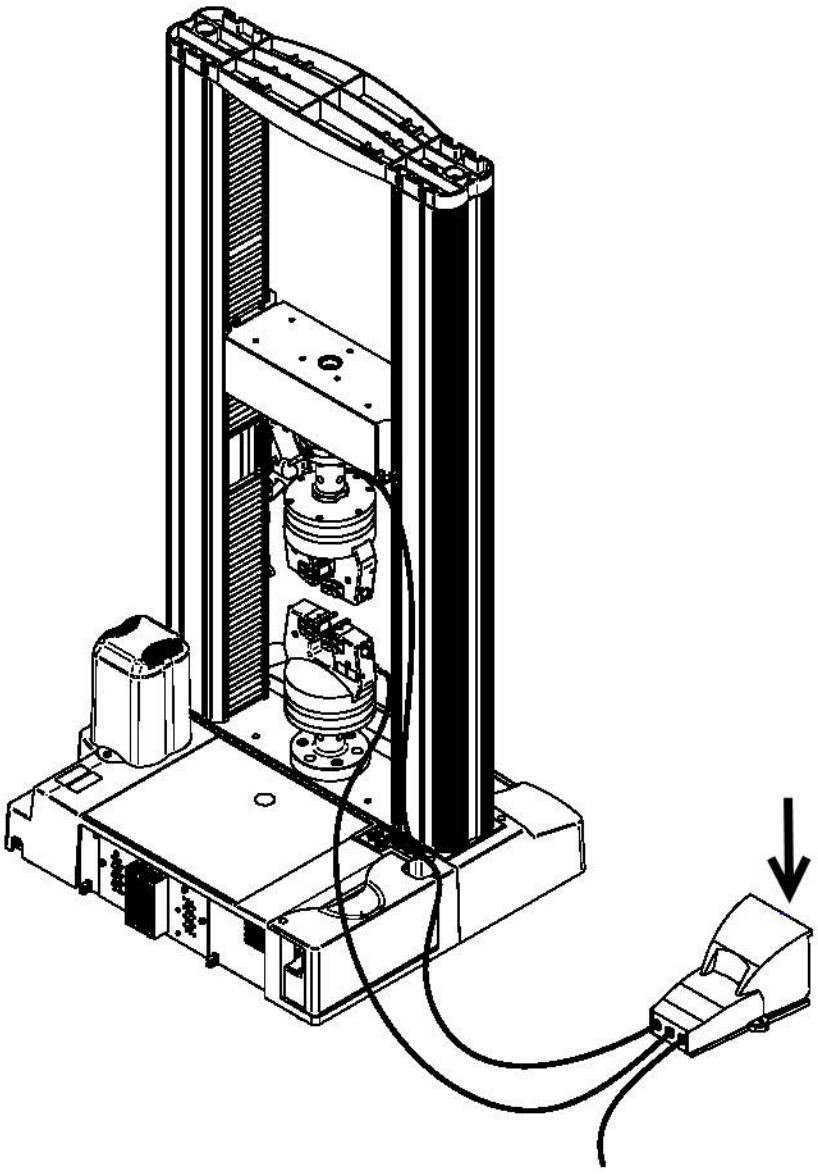

Figure 19. Manual Foot Switch

Automatic Grip Control Unit

An automatic grip control integrates the grips with the load frame's control system. Figure 20 on page 43 illustrates the grip controller. There are various configurations for each type. Refer to the automatic grip control unit manual for specific installation details.

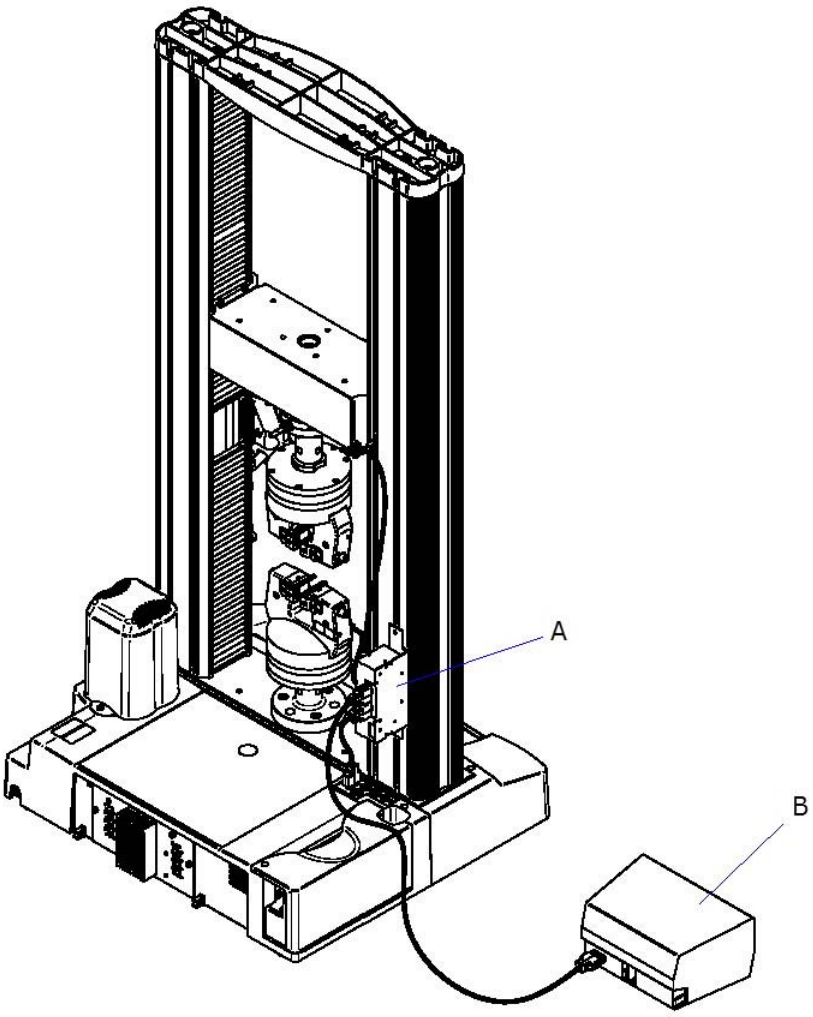

Figure 20. Grip Controller

Letter	Description
A	Grip controller

Letter	Description
B	Foot switch

Preload the Load String

The purpose of this procedure is to eliminate backlash and deflections within the load string which can degrade the integrity of test results, especially when testing at high loads. The procedure involves preloading the entire load string and then hand-tightening all the locknuts on all the grips and couplings. Even when using self-aligning couplings on the upper grip, it is good practice to preload the lower grip.

You will need a rigid specimen that is strong enough to sustain the preload value without breaking. This means a specimen that can sustain a load that is:

- 10% above the expected test load, or
- the maximum load rating of the weakest component of the load string (grips or load cell)

whichever is less. For example, if your grips are rated at 1kN, the load cell at 2kN and your expected test load is 500N then you should preload to at least 550N but not more than 1kN.

Before inserting the specimen ensure that:

- The grips and couplings are installed but the locknuts are not tightened.
- Crosshead travel limits are set.
- The value of load in the live display is near zero. If it is not, balance the load.
- The load limits are set in the software to a value that matches the maximum load capacity of the weakest component in the load string.

Procedure to preload the load string:

1. Install the strong specimen.
2. Increase the load on the load string to the chosen preload value.
3. Hand tighten all the locknuts on the grips and any intermediate couplings.
4. Reduce the load to zero.
5. Remove the specimen.

The load string is now preloaded and all the locknuts are tight and should not move during subsequent testing. The system is now ready to test.

When you next need to change grips or any other part of the loadstring, the locknuts will be too tight to loosen by hand. Follow the unload procedure ("Procedure to unload the load string:" on page 45).

Procedure to unload the load string:

1. Install the strong specimen.
2. Increase the load on the load string to the chosen preload value.
3. Loosen all the locknuts on the grips and any intermediate couplings.
4. Reduce the load to zero.
5. Remove the specimen.

The load string is now unloaded and all the locknuts are loose so that you can change any component.

Chapter 4
Operation

Materials testing systems are inherently hazardous. The following two statements warn of behavior that offers the highest probability of personal injury from using the system.

Warnings

Hazard - do not allow more than one person to operate a testing machine.

Operator injury may result if more than one person operates the testing machine. For example, injury can occur if one person moves the crosshead or actuator while the other is working inside the hazard area between the grips or fixtures.

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.

Preparing for Use

Before using the grips for testing, make sure that:

- 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, make sure the toggle switch is in the closed position.

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 air toggle valve to the right.
- To open the grip, move the air toggle valve to the left.

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 for installing a specimen

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.

If your testing system has a Specimen Protect function, use it when installing a specimen. Refer to the testing system documentation for operating details.

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 for installing a specimen

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 21 on page 50.

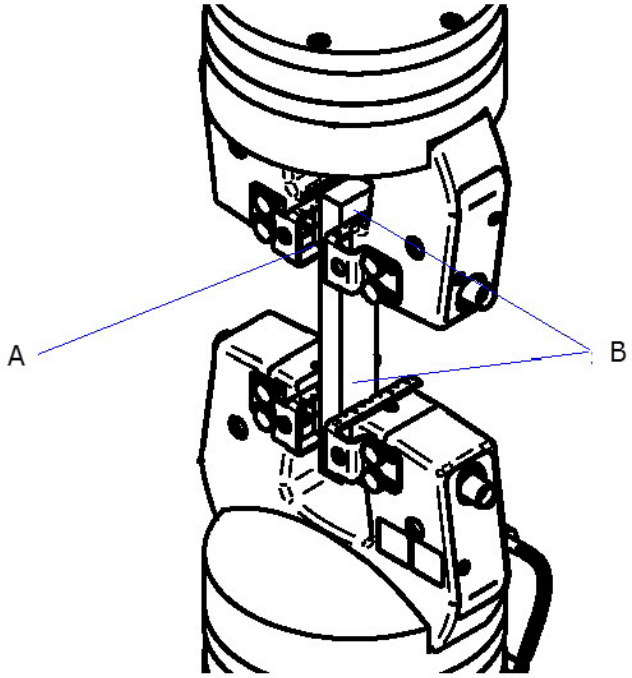

Figure 21. Specimen Installation

Letter	Description
A	Jaw faces
B	Specimen

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 for removing a specimen

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

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 for removing a specimen

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

Caution

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

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

Checklist

- Lubricate the grips, if necessary. Refer to “Lubrication” on page 53.
- 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

Lubricate the grips every 50,000 cycles, or every 6 months, whichever comes first.

The recommended lubricant is Magnalube-G, a PTFE-based grease that is water resistant and stable at temperatures up to 260 °C (500 °F). A tube is supplied with each set of grips.

Warning

Disconnect the air supply before performing this procedure.

1. Using a 2mm allen wrench, remove the allen screws that secure the covers on each side of the grip, exposing the bores.
2. Using a cotton swab, smear a light coating of grease on the two main bores (refer to Figure 22 on page 54).

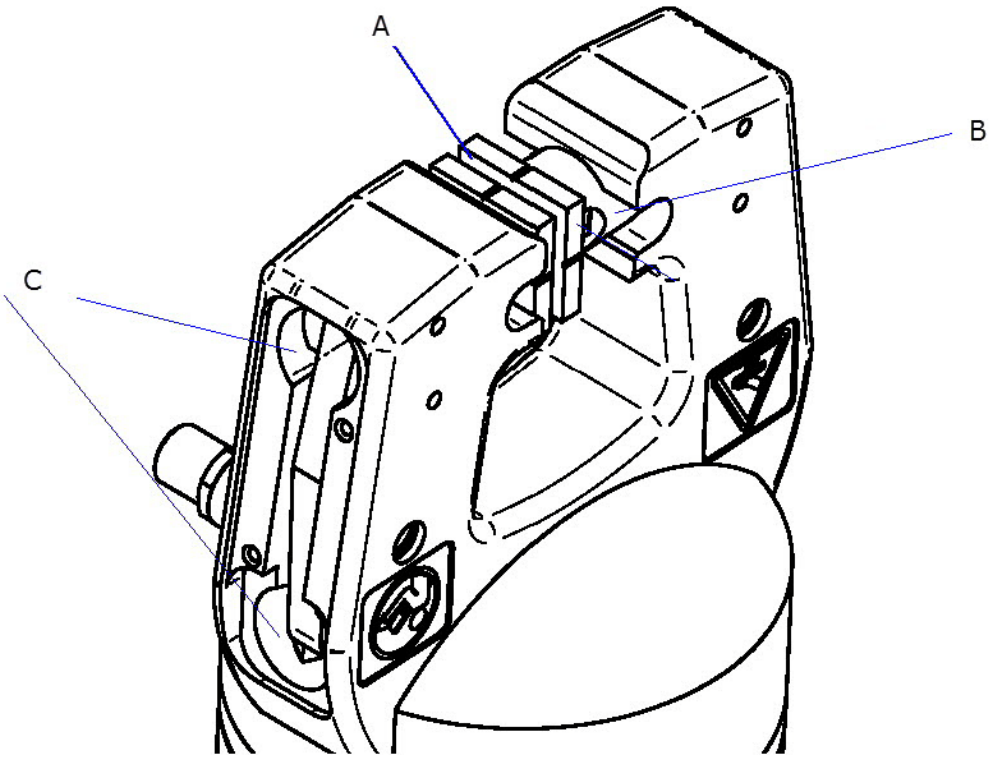

Figure 22. Grips Lubrication Points

Letter	Description
A	Jaw faces
B	Lubricate jaw face holder (both sides of grip)
C	Lubricate bores (both sides of grip0

3. To lubricate each jaw face holder, insert a pencil or similar probe into the exposed hole that houses the jaw face holder. Push the jaw face holder out to expose the jaw face holder.
4. Using a cotton swab, smear grease on the jaw face holder barrel behind the jaw faces.

5. Re-install the side covers and reconnect the air supply.
6. Close the grips.
7. Operate the grips 4 or 5 times to distribute the grease.

Servicing

- Contact Instron Service regarding warranty and repair services.
- The grip seals are designed to last approximately 250,000 cycles and then must be replaced by a qualified Instron Service Engineer.

Troubleshooting

Improper adjustments or the lack of maintenance cause most grip operating problems. When a problem develops, Table 8 suggests a probable cause and recommends a remedy. If you are unable to solve a problem, contact Instron Service.

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 8. 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.	Open the toggle switch.
	Air flow is restricted.	Check that the air hoses to the grips are not damaged. Check that all fittings and valves are clean and unobstructed.
	Grip requires lubrication.	Lubricate the grip. Refer to "Lubrication" on page 53.
	Faulty grip seal.	Replace the grip seal. Contact Instron's Service department for assistance.
	For 5kN and 10kN grips only - jaw faces not adjusted correctly.	Adjust the jaw faces closer to the specimen width.
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. Also refer to "Jaw faces sticking and jaw holder not retracting" on page 57.
	Grip requires lubrication.	Lubricate the grip. Refer to "Lubrication" on page 53.
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.
	For 5kN and 10kN grips only - jaw faces not adjusted correctly.	Adjust the jaw faces closer to the specimen width.

Table 8. Troubleshooting (Continued)

Problem	Cause	Remedy
Specimen breaks at jaw face	Initial gripping force is too great for specimen.	Reduce the air pressure to the grip. Use taller jaw faces to distribute the clamping force over more of the specimen area.
	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.

Jaw faces sticking and jaw holder not retracting

If the jaw faces bind to the specimen, you can release them by gently tapping the jaw face to release the bond. Sometimes, in addition to this, the jaw holder does not fully retract into the grip body and turning the thumb screw has no effect. This is caused by parts of the advancing and retracting mechanism becoming detached from each other.

Figure 23 on page 58 shows the interconnecting parts of the mechanism.

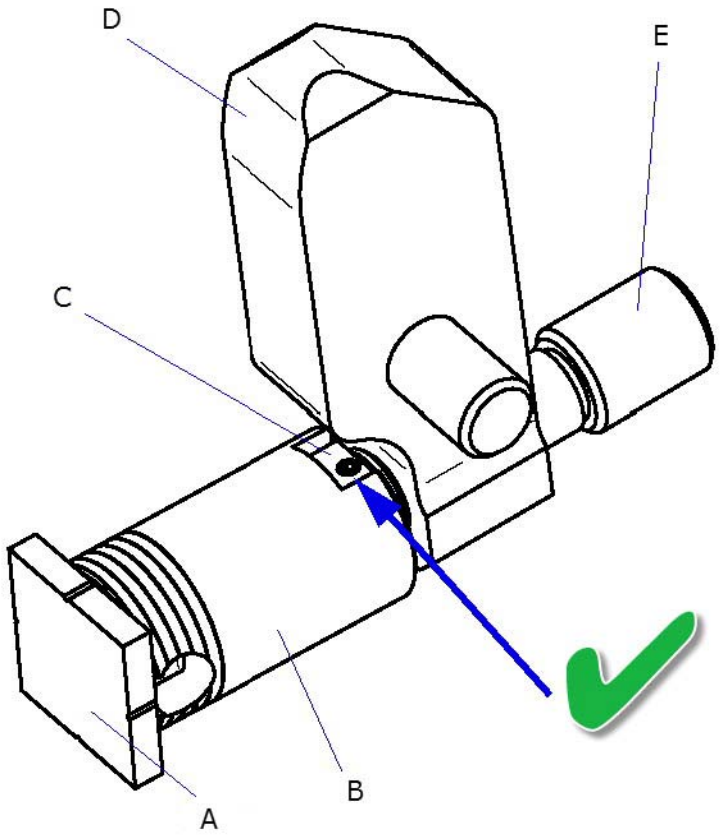

Figure 23. Jaw Face Advancing Mechanism Correctly Aligned

Letter	Description
A	Jaw face
B	Jaw holder
C	Advancing foot
D	Multiplier link
E	Thumb screw

The connection between the jaw face and the jaw holder is visible and the thumb screw is visible but the connection between the advancing foot and the jaw holder is not. It is this connection that can be broken if the advancing foot becomes misaligned with the corresponding groove in the jaw holder. This is shown in Figure 24 on page 59.

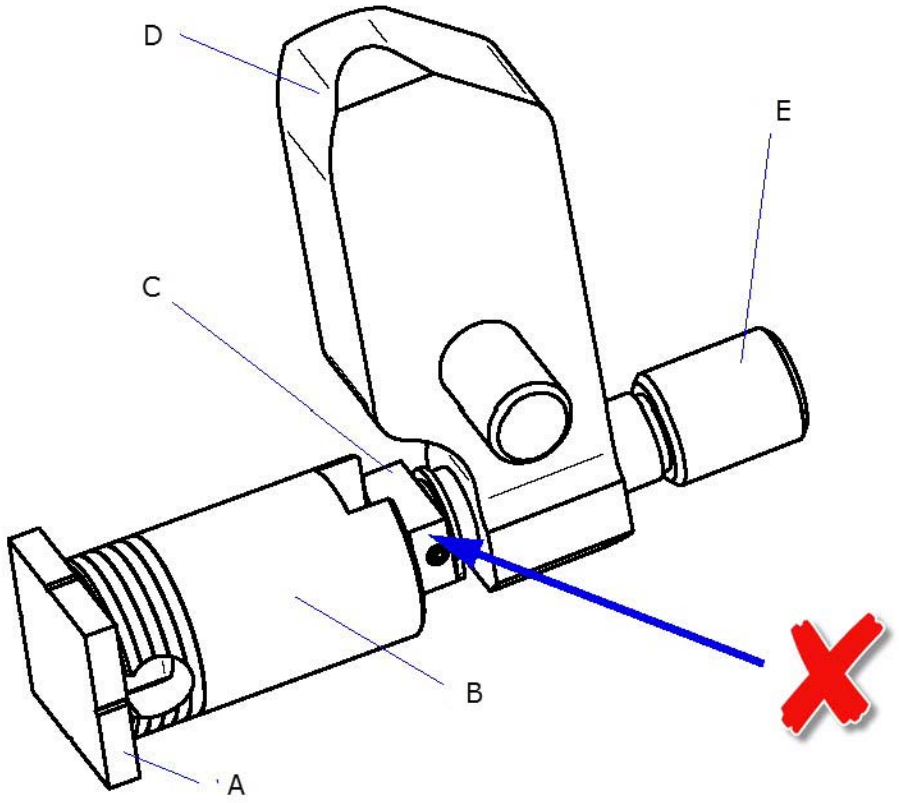

Figure 24. Jaw Face Advancing Mechanism Misaligned

To reconnect the components:

1. Retract the jaw faces completely by turning the thumb screws counterclockwise.
2. If the jaw holder is not completely inside the grip body, pull gently on the jaw face and rotate the thumbscrew clockwise a little.
3. Release the jaw face and check to see if the jaw holder retracts deeper into the grip body.
4. If it does not, pull gently again on the jaw face and rotate the thumbscrew a little more.
5. Release the jaw face again and check to see if the jaw holder retracts deeper into the grip body.
6. As you repeat this process, “snapping” the jaw face in and out while rotating the thumbscrew, you should be able to feel the advancing foot reconnect with the groove on the plunger. The thumb screw will then be in the correct orientation and the jaw faces will retract completely.