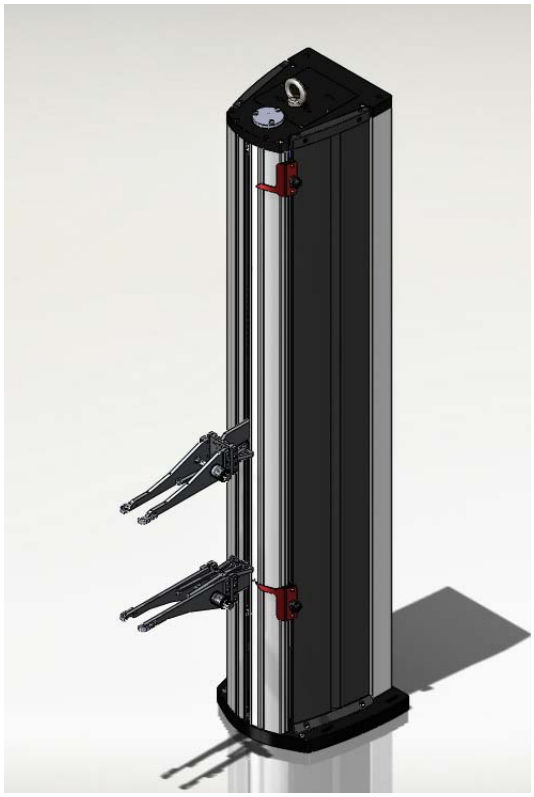
INSTRON®

AutoX Automatic Contacting Extensometer



Operator's Guide M16-16654-EN Revision C

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.

Proprietary Rights Notice

Trademarks

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 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.

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.

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.

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.

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

The AutoX Automatic Contacting Extensometer utilizes automatic gauge length positioning and attachment to the test specimen to improve productivity and repeatability compared to traditional clip-on extensometers.

When not in use, the sliding mounting assembly allows operators to quickly move the extensometer out of the test area to a safe storage location behind the frame. This allows operators to switch grips and fixtures without the need to remove the extensometer completely from the test setup.

Principle of Operation

The AutoX is controlled through a USB interface to the Instron testing machine and Bluehill® software. The software user interface facilitates opening and closing the arms, setting the reference arm position and setting the gauge length.

Prior to the start of a test, the motor automatically disengages from the measuring arms, allowing them to travel freely with the specimen. The measuring arms are counterbalanced on a nearly frictionless guidance system, minimizing any influence on the properties of the test specimen.

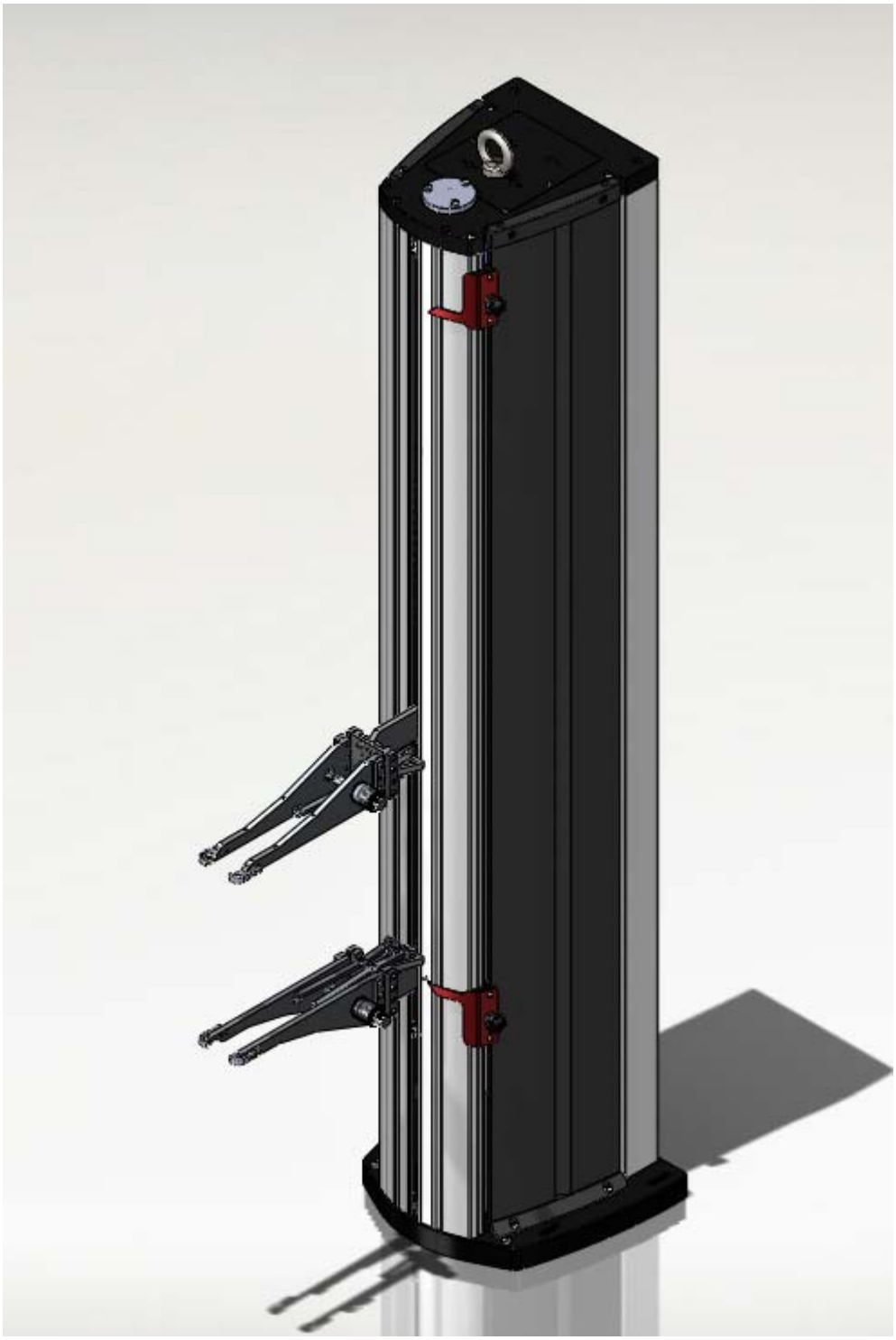

Figure 1. Overview of the AutoX Automatic Contacting Extensometer

Applications

The AutoX is suitable for the following:

- Metals tensile testing
- Composites tensile testing
- Plastics tensile and flexure testing
- Elastomer tensile testing (refer to Caution note below)
- Compression testing
- Various specimen shapes including round, flat, hexagonal and strip

Caution

The AutoX may not be suitable for specimens, typically elastomers, that break with a "whipping" motion that could damage the measuring arms.

The AutoX is supplied with arms that reach 250mm from the body of the instrument. For certain specialist systems, longer arms (300mm and 350mm) are available.

Product Support

Instron provides documentation, including manuals and online help, that can answer many of the questions you may have. It is recommended that you review the documentation sent with the system you purchased for possible solutions to your questions.

If you cannot find answers in these sources, contact Instron's Service department directly. A list of Instron offices is available on our website at www.instron.com. In the US and Canada, you can call directly at 1-800-473-7838.

Product Documentation

Instron offers a comprehensive range of documentation to help you get the most out of your Instron products. Depending on what you have purchased, your documentation may include some or all of the following:

Operator's Guide	How to use your system components and controls, procedures for setting limits, calibration and other frequently performed operating tasks.
System Support	Information about system installation, set up and configuration, transducer connection and calibration.
Online Help	Software products come complete with context sensitive help, which provides detailed information on how to use all software features.
Accessory Equipment Reference	How to set up and use any accessories you have purchased, for example grips, fixtures, extensometers, transducers, and environmental chambers.

We welcome your feedback on any aspect of the product documentation. Please email info_dev@instron.com with your comments.

Chapter 2
Specifications

General

Table 1. General Specifications

Parameter	Specification
Travel (derived from maximum separation of knife edges minus gauge length)	750 mm (29.5 in)
Gauge length	10 - 750 mm (0.4 - 29.5 in)
Resolution	0.1 µm (0.004 µin)
Accuracy	± 1 µm (0.04 µin)
Clamping force	0 - 2.5 N (0 - 9 oz)
Drag force	< 0.08 N (8 gF)
Maximum arm speed (driven)	110 mm/sec (4.3 in/sec)
Maximum arm read speed	200 mm/sec (7.9 in/sec)
Maximum specimen diameter standard width arms wide arms	 50 mm (2 in) 100 mm (4 in)
Maximum specimen thickness (at a maximum width of 30mm) standard width arms wide arms	 50 mm (2 in) 100 mm (4 in)
Maximum specimen width (at a maximum thickness of 30mm)	200 mm (8 in)

Environmental

Table 2. Environmental Specifications

Parameter	Specifications
Operating temperature	+10°C to +38°C (+50°F to +100°F)
Storage temperature	-25°C to +55°C (-13°F to +131°F)
Humidity	10% to 90% (non-condensing)
Environmental conditions	Designed for use under normal laboratory conditions. Protective measures may be required if excessive dust, corrosive fumes, electromagnetic fields or hazardous conditions are encountered.

Dimensions and Weight

Figure 1 on page 15 shows and the AutoX dimensions for standard width arms. Figure 2 on page 16 shows the differences in dimensions for wide arms. All dimensions are in millimeters. Table 3 on page 14 shows the different dimensions for different arm lengths, designated A, B, C and D on the figures.

Table 3. AutoX Dimensions for Different Arm Lengths (mm)

A Arm length	B AutoX Depth	C Carriage Depth	D Arm Height
250	485	258	55
300	535	308	55
350	585	358	61.5

The weight of the AutoX (without the mounting assembly) is 32kg (70lb).

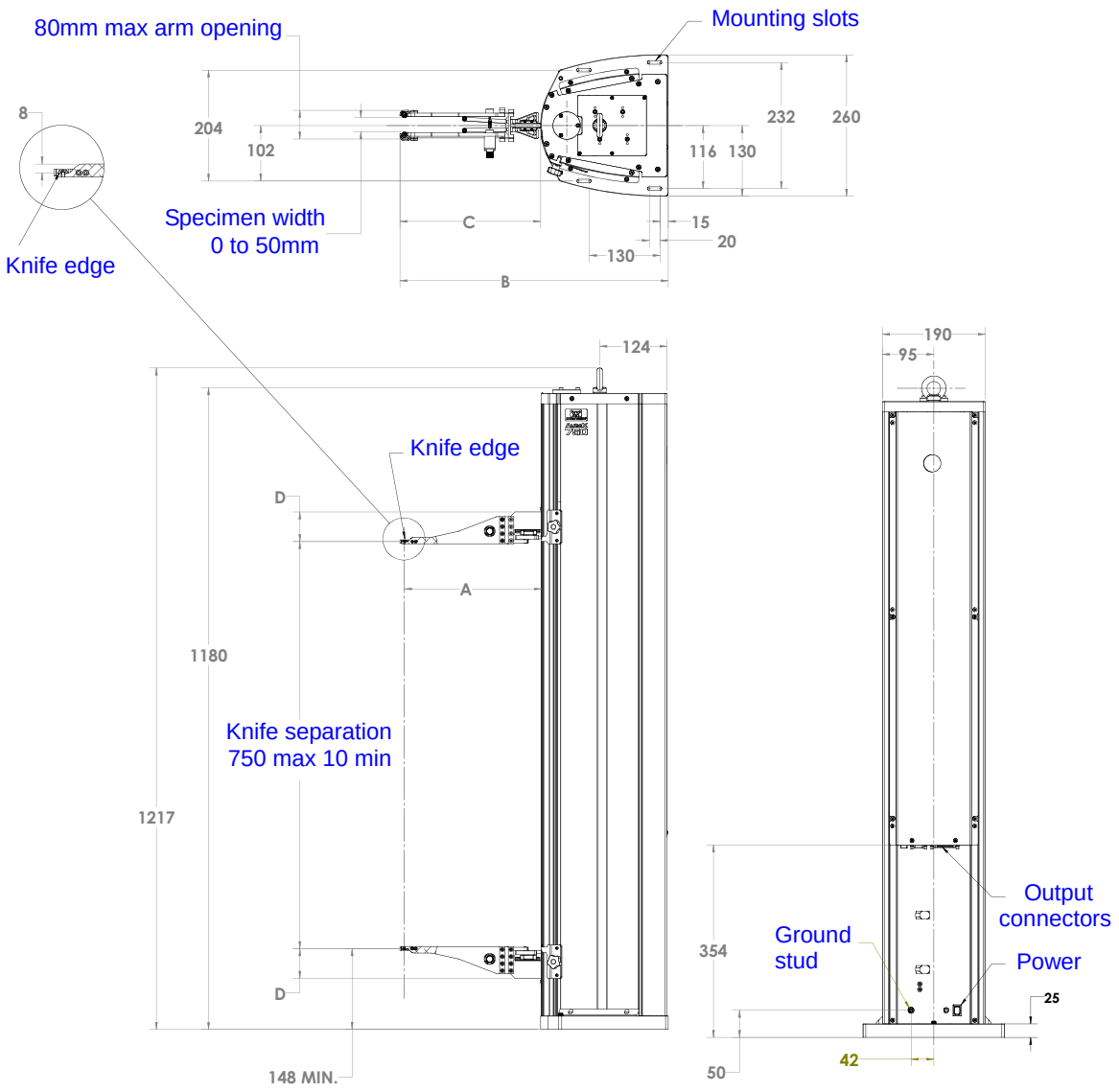

Figure 1. Dimensions - Standard Width Arms

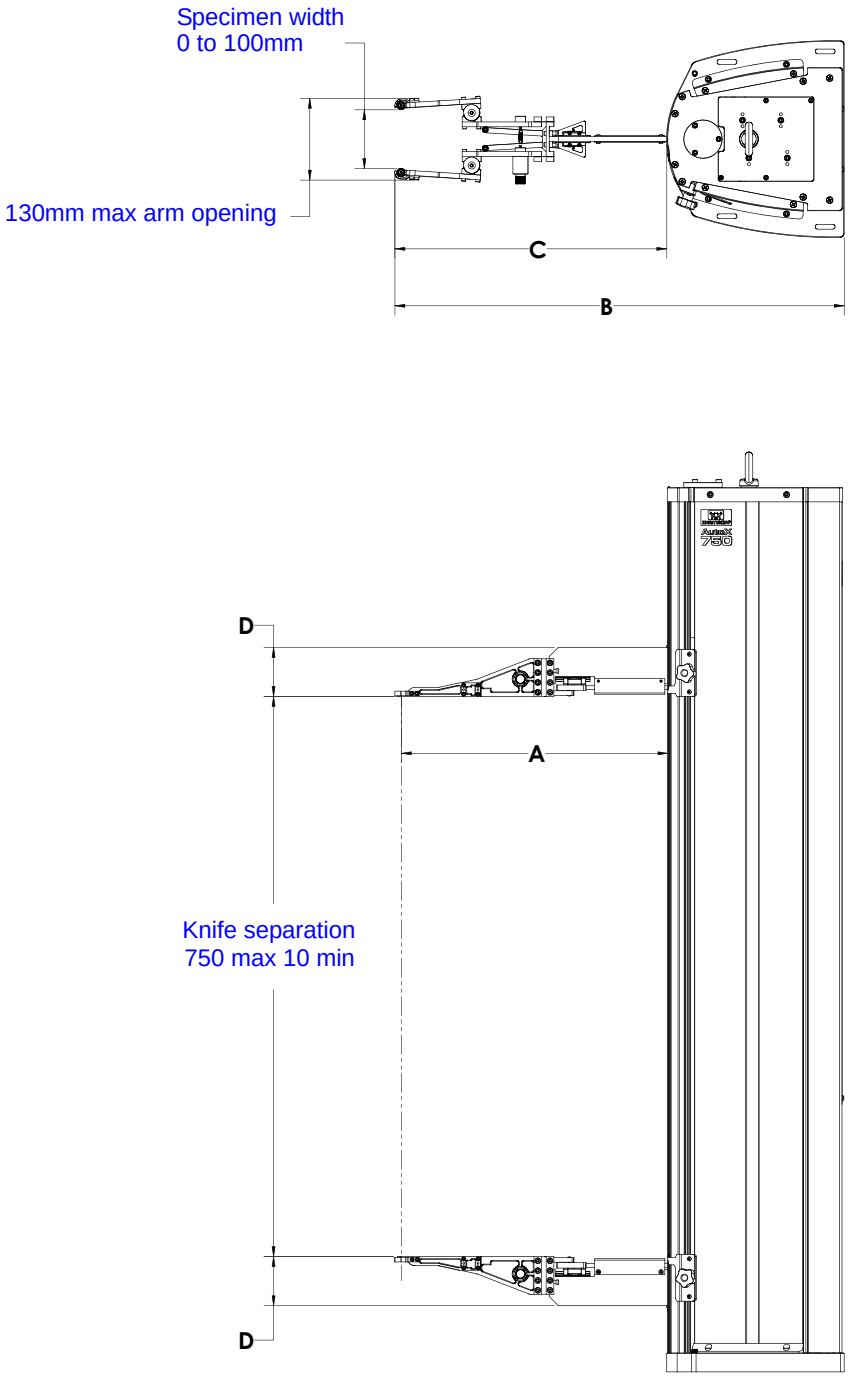

Figure 2. Dimensions - Wide Arms

Chapter 3
Installation

Before you Begin

Warning

Crush hazard - Do not attempt to lift the AutoX manually. Doing so can cause personal injury and equipment damage.

Always use certified lifting equipment operated by trained personnel when moving the AutoX. The lifting equipment should be rated at least twice the weight of the AutoX. The weight of the AutoX is 32 kg (70 lb).

Caution

Any frame that you want to use for testing with the AutoX must have been modified internally for use with the AutoX.

Initial installation of the AutoX is carried out by Instron Service and includes the following:

- modification of the wiring on the frame controller board
- installation of the mounting bracket, sliding assembly and AutoX instrument
- alignment and verification of the instrument

You can move the AutoX and the mounting bracket between different load frames, but each frame must have the wiring modification. The modification is indicated by a label (**AUTOX**) added to the frame controller panel adjacent to the appropriate connector, usually Strain 1. Contact Instron Service to purchase this modification on any additional frames.

Caution

Although it is possible to move the AutoX from frame to frame, realignment and leveling each time may be time consuming, especially if your testing involves an extended range of travel of the AutoX arms. If you perform these types of test, it is recommended that you have a dedicated test setup of load frame and AutoX.

Equipment

- A suitable lifting device with a rated capacity of at least twice the weight of the AutoX. The AutoX weighs 32kg (70 lb).
- Metric hex keys (provided).

Moving the AutoX

Caution

Position the arms at the top of the instrument before moving it. Secure the mechanical limit stops close to the arms to prevent movement of the arms during transportation.

To avoid internal damage caused by the counter balance weights, position the arms at the top of the instrument.

Caution

Take care to avoid damage to the extensometer arms during transportation.

The AutoX is a precision instrument. Its construction is robust but the extensometer arms are vulnerable during any move.

Removing the AutoX from a frame

The procedure for removal and re-installation of the AutoX varies slightly depending on the type of frame that it is installed on. The following procedure refers to:

- Electromechanical frames, for example 5900 and 3300 Series
- Static hydraulic frames, for example DX, LX, HDX, KX, KPX

In addition, the mounting and sliding assembly for electromechanical frames is universal and can be moved from one frame to another. Typically, each static hydraulic frame has a different mounting and sliding assembly therefore you would not normally remove it. This difference is reflected in the following procedure.

1. Turn off power to the AutoX (see Figure 3 on page 20).
2. Turn off power to the frame.

Warning

Take care to avoid pinch points when operating the sliding assembly on the AutoX mounting bracket.

There may be obstructions in the test area that could produce pinch points when you slide the AutoX on the mounting bracket. These include the bolts that attach the mounting bracket to the frame base and may also include large grips and fixtures that form part of your testing system.

3. For electromechanical frames, stand in front of the frame. Move the sliding assembly on the mounting bracket away from you so that it is at the end of its travel toward the rear of the frame. This ensures that the AutoX is free to move upwards when lifted. If necessary, refer to "Electromechanical Frame Mounting" on page 33 for instructions on how to operate the sliding assembly.

   For static hydraulic frames, stand at the rear of the frame. Release and pull the sliding assembly toward you so that it is at the end of its travel. This ensures that the AutoX is free to move upwards when lifted. If necessary, refer to "Static Hydraulic Frame Mounting" on page 34 for instructions on how to operate the sliding assembly.

4. Disconnect and remove the following cables from the rear panel of the AutoX (see Figure 3 on page 20):
   - power cable
   - transducer connection cable (connected to controller on frame)
   - USB cable (connected to computer)
   - ground cable
5. Attach the lifting hook (supplied) to the top of the AutoX body (see Figure 4 on page 20).
6. Attach the lifting equipment to the lifting hook.
7. Using a 5mm hex wrench, remove the four M6 bolts that attach the AutoX to the sliding assembly (see Figure 5 on page 21 for electromechanical frames or Figure 6 on page 22 for static hydraulic frames).

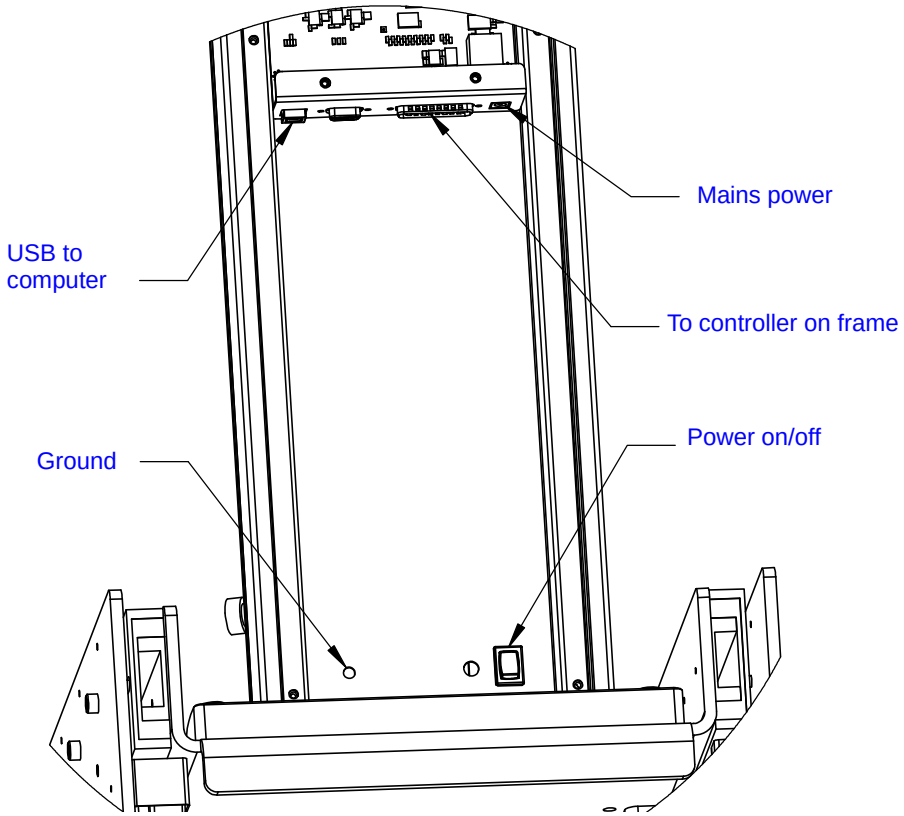

Figure 3. AutoX Connections

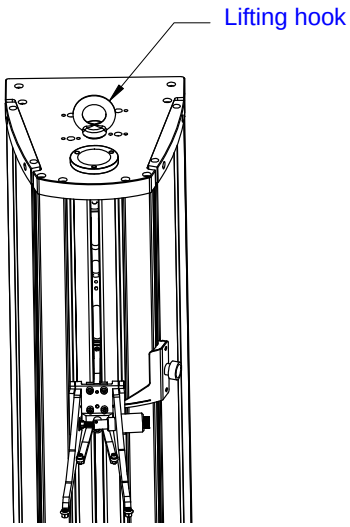

Figure 4. Attach the Lifting Hook

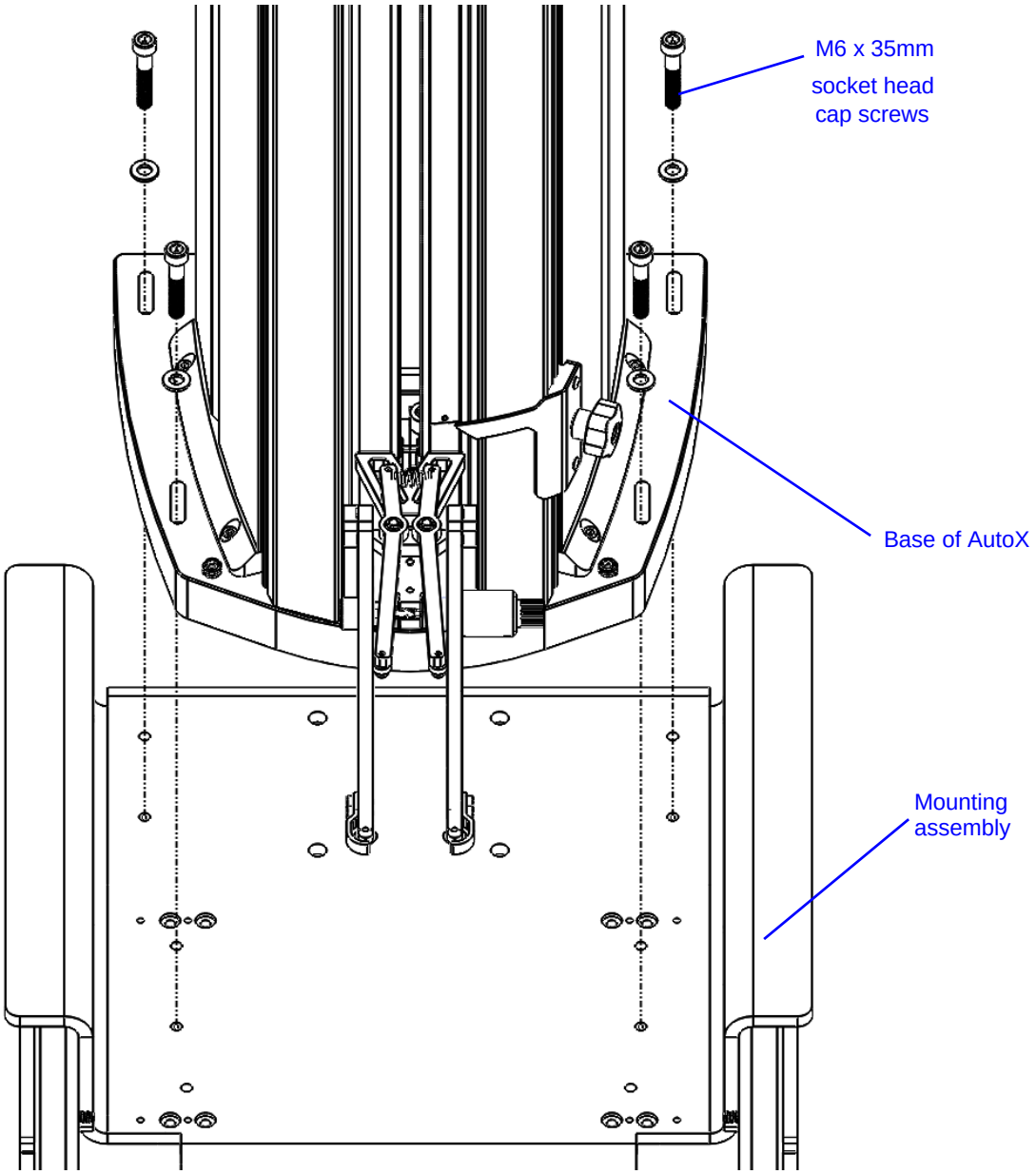

Figure 5. AutoX Mounting Screws (Electromechanical Frame Mounting)

8. Use the lifting equipment to lift the AutoX onto a cart that is capable of supporting its weight 32 kg (70 lb) and move it to the new location.

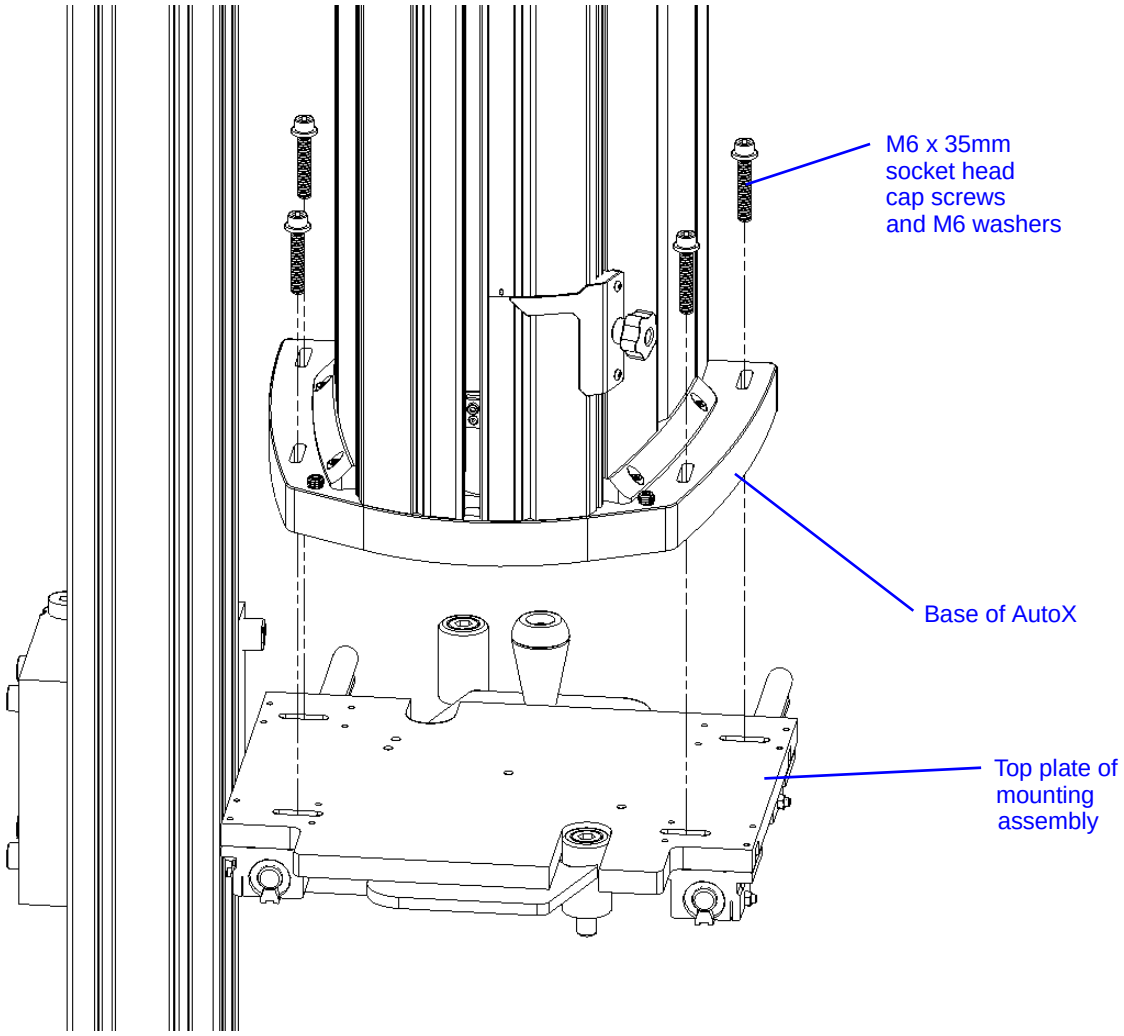

Figure 6. AutoX Mounting Screws (Static Hydraulic Frame Mounting)

9. For static hydraulic frames, the procedure is almost complete because you do not need to remove the mounting and sliding assembly from the frame. Return the M6 bolts and washers to the slots in the sliding assembly so that they do not get lost. Each bolt threads into a nut that is under the top plate of the mounting assembly.

10. For electromechanical frames, you can also move the mounting and sliding assembly to another frame, as follows:

Warning

Take care to avoid pinch points when operating the sliding assembly on the AutoX mounting bracket.

There may be obstructions in the test area that could produce pinch points when you slide the AutoX on the mounting bracket. These include the bolts that attach the mounting bracket to the frame base and may also include large grips and fixtures that form part of your testing system.

a. From the front of the frame, move the sliding assembly on the mounting bracket towards you and lock it in place by turning the handles through 90 degrees. If necessary, refer to "Electromechanical Frame Mounting" on page 33 for instructions on how to operate the sliding assembly.

b. The mounting assembly consists of three components; a sliding assembly and two mounting brackets (see Figure 7 on page 24).

Warning

Take care when handling the sliding assembly. The platform can slide forwards on the tracks.

c. Using a 5mm hex wrench, remove the six M6 bolts that attach the sliding assembly to the brackets and remove the sliding assembly.

d. Using a 8mm hex wrench, remove the four M10 bolts that attach the mounting brackets to the frame base and remove the brackets.

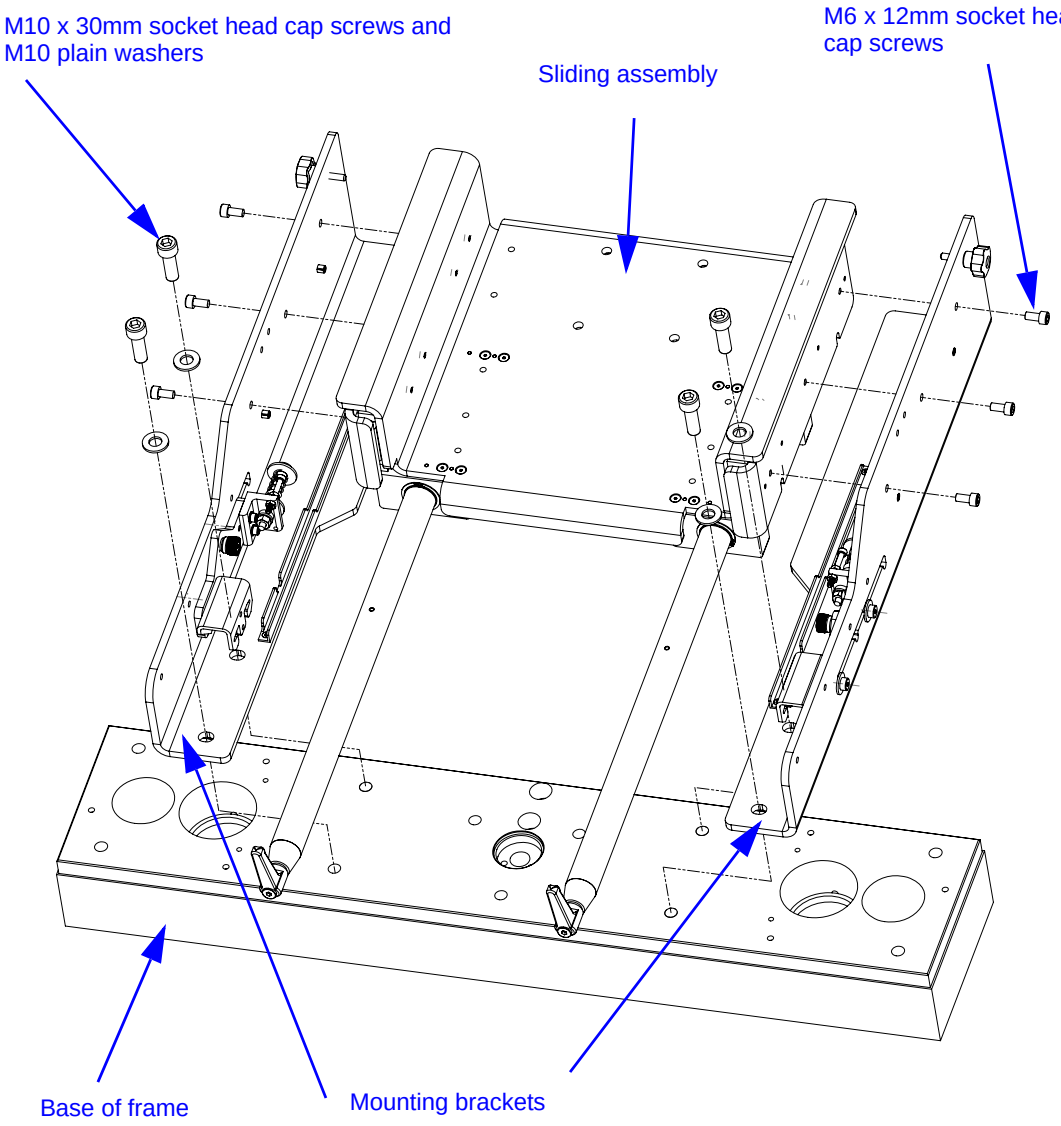

Figure 7. Mounting Bracket Attachment Screws (Electromechanical frames)

Reinstalling the AutoX onto a frame

The procedure for removal and re-installation of the AutoX varies slightly depending on the type of frame that it is installed on. The following procedure refers to:

- Electromechanical frames, for example 5900 and 3300 Series
- Static hydraulic frames, for example DX, LX, HDX, KX, KPX

In addition, the mounting and sliding assembly for electromechanical frames is universal and can be moved from one frame to another. Typically, each static hydraulic frame has a different mounting and sliding assembly therefore you would not normally remove it. This difference is reflected in the following procedure.

Caution

Any frame that you want to use for testing with the AutoX must have been modified internally for use with the AutoX.

You can move the AutoX and the mounting bracket between different load frames, but each frame must have the wiring modification. The modification is indicated by a label (**AUTOX**) added to the frame controller panel adjacent to the appropriate connector, usually Strain 1. Contact Instron Service to purchase this modification on any additional frames.

1. Turn off power to the frame.
2. For electromechanical frames, to re-install the sliding and mounting assembly:
   a. The mounting assembly consists of three components; a sliding assembly and two mounting brackets (see Figure 7 on page 24).
   b. Attach the two mounting brackets to the frame base using the four M10 bolts. Secure the bolts using a 8mm hex wrench but do not tighten them at this stage.

Warning

Take care when handling the sliding assembly. The platform can slide forwards on the tracks.

   c. Attach the sliding assembly to the brackets using the six M6 bolts. You may need to loosen the M10 bolts that secure the two mounting brackets to the frame to achieve alignment with the sliding assembly. Tighten the M6 bolts using a 5mm hex wrench and tighten the M10 bolts using the 8mm hex wrench.

Warning

Take care to avoid pinch points when operating the sliding assembly on the AutoX mounting bracket.

There may be obstructions in the test area that could produce pinch points when you slide the AutoX on the mounting bracket. These include the bolts that attach the mounting bracket to the frame base and may also include large grips and fixtures that form part of your testing system.

3. For electromechanical frames, stand in front of the frame. Move the sliding assembly on the mounting bracket away from you so that it is at the end of its travel toward the rear of the frame. This ensures that the AutoX is free to move upwards when lifted. If necessary, refer to "Electromechanical Frame Mounting" on page 33 for instructions on how to operate the sliding assembly.

   For static hydraulic frames, stand at the rear of the frame. Release and pull the sliding assembly toward you so that it is at the end of its travel. This ensures that the AutoX is free to move upwards when lifted. If necessary, refer to "Static Hydraulic Frame Mounting" on page 34 for instructions on how to operate the sliding assembly.

4. If it is not already attached, attach the lifting hook (supplied) to the top of the AutoX body.

5. Attach the lifting equipment to the lifting hook.

6. Use the lifting equipment to lift the AutoX onto the mounting bracket, aligning the mounting holes on the base of the AutoX with the mounting holes on the bracket. Insert the four M6 mounting bolts but do not tighten them at this stage (see Figure 5 on page 21 for electromechanical frames or Figure 6 on page 22 for static hydraulic frames). This allows for movement in the slotted holes.

7. Reconnect the following cables from the rear panel of the AutoX (see Figure 3 on page 20):

   - power cable
   - transducer connection cable (connected to controller on frame)
   - USB cable (connected to computer)
   - ground cable

8. Align the AutoX using the procedure in "Alignment and Setup" on page 27. Do not remove the lifting equipment until the AutoX is aligned and securely attached to the mounting bracket.

Alignment and Setup

Caution

Before beginning the alignment procedure, check that the load frame is level.

You must align the AutoX with the load string to ensure that the knife edges attach to the specimen correctly throughout the expected range of travel of the arms. The difficulty of achieving alignment relative to the frame depends upon your specimen and the expected range of travel.

- If you are testing metals, for example, where the range of travel is probably small, you can achieve the required alignment quite easily.
- If you are testing plastics, for example, where you expect substantial elongation, you will have to spend some time adjusting the position of the AutoX to ensure that the knife edges are aligned with the center of the load string throughout the expected range of travel.

To align the AutoX:

1. Move the crosshead so that the grip separation is approximately where you expect maximum elongation to be for your specimen type.
2. Install a thin specimen in the grips; a piece of string is the most suitable for alignment purposes.
3. The aim of the alignment is to maintain the knife edges touching the specimen throughout the entire range of travel of the arms. Figure 8 on page 28 shows the various adjustment mechanisms on the base of the AutoX and their effect on the alignment.
    a. Make sure that the four M6 bolts that attach the AutoX to the mounting bracket have sufficient slack that you can slide the instrument in the slots.
    b. Back off the three hex jacking screws (see Figure 8 on page 28).
    c. Use the sliding mechanism on the mounting bracket to slide the AutoX forward into the test space until it stops. Move the instrument back or forward, as required, in the slots in the mounting bracket until it is positioned centrally in the test space. The mounting on static hydraulic frames also allows movement from left to right. Tighten the four M6 bolts finger tight.
    d. Tighten the jacking screw at the rear of the AutoX until the instrument is level in the front to rear direction.
    e. Tighten the two jacking screws at the front of the AutoX until the instrument is level in the side to side direction.

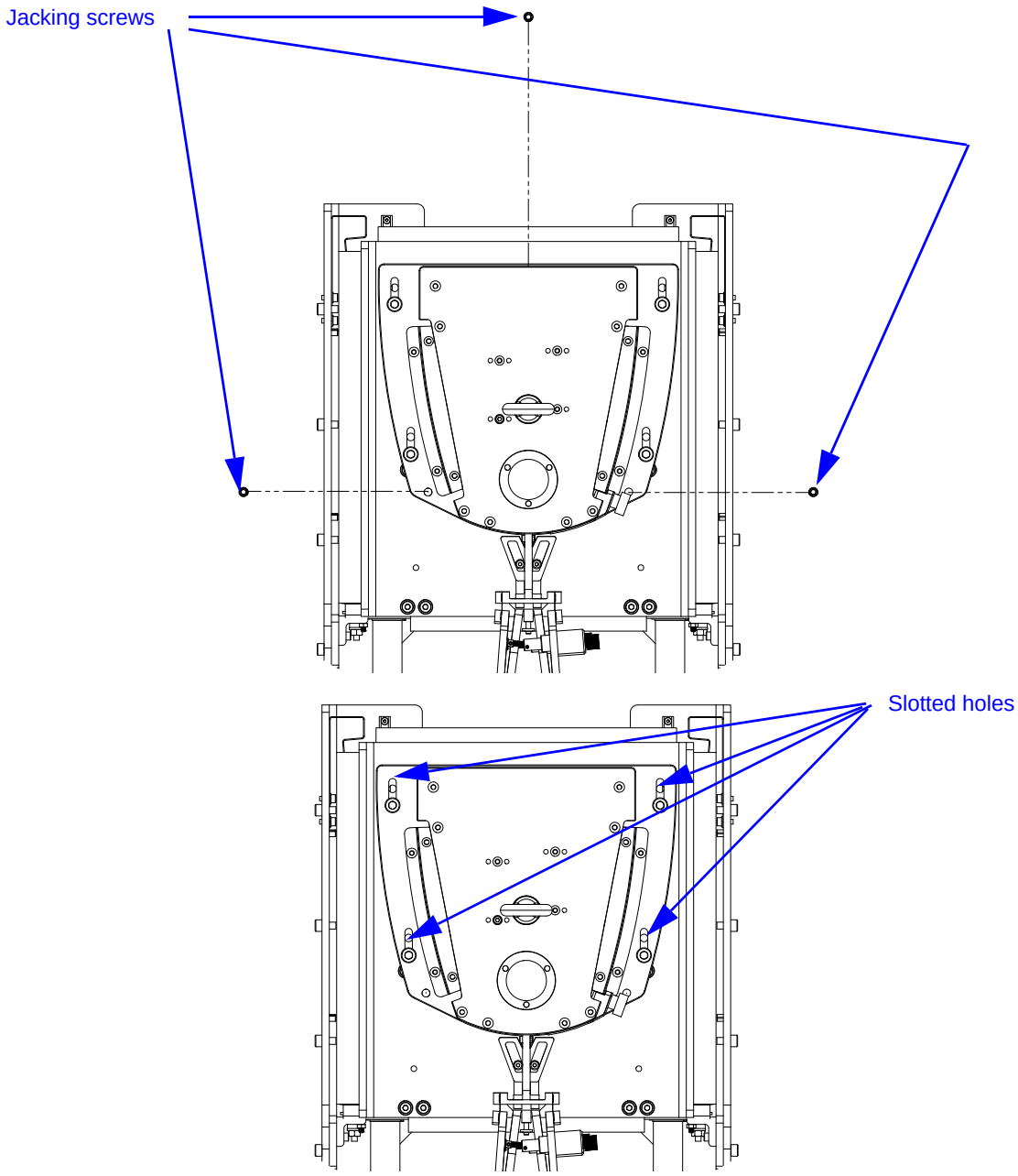

Figure 8. Alignment mechanisms

f. Manually move the AutoX arms up and down along the entire length of the specimen to ensure that it is aligned along the its entire range of expected travel. Use the three jacking screws in combination to achieve this.

Caution

You should only need a very light touch on the extensometer arms to move them gently and smoothly along the entire range of travel.

If you encounter any resistance while manually moving the arms, this may indicate an internal misalignment. Contact Instron Service for assistance.

g. When you have achieved the required alignment, tighten the four M6 bolts using a 5mm hex wrench.

h. Manually move the AutoX arms up and down along the entire length of the specimen once more to confirm the alignment.

You can now remove the lifting equipment and, if desired, remove the lifting hook from the top of the AutoX.

Chapter 4
Preparing to Test

This chapter describes how to prepare the AutoX for testing, including the initialization procedure that sets up communication between the AutoX and Bluehill® software.

Setting up the AutoX for Flexure Testing

The AutoX performs flexure tests by attaching to flags which are attached to the deflectometer. This testing requires the AutoX to be positioned further back in the test space than for other types of testing. This is achieved by moving the stop block as follows (see Figure 9 on page 32):

1. Make sure the AutoX is in its stored position behind the frame with the sliding assembly unlocked.
2. Loosen the thumbscrew on each bracket (right bracket shown in figure).
3. Move the stop block assembly backwards until it engages in the next slot.
4. Tighten the thumbscrew.

Figure 9 on page 32 shows sides views of the mounting bracket in both normal and flexure testing positions.

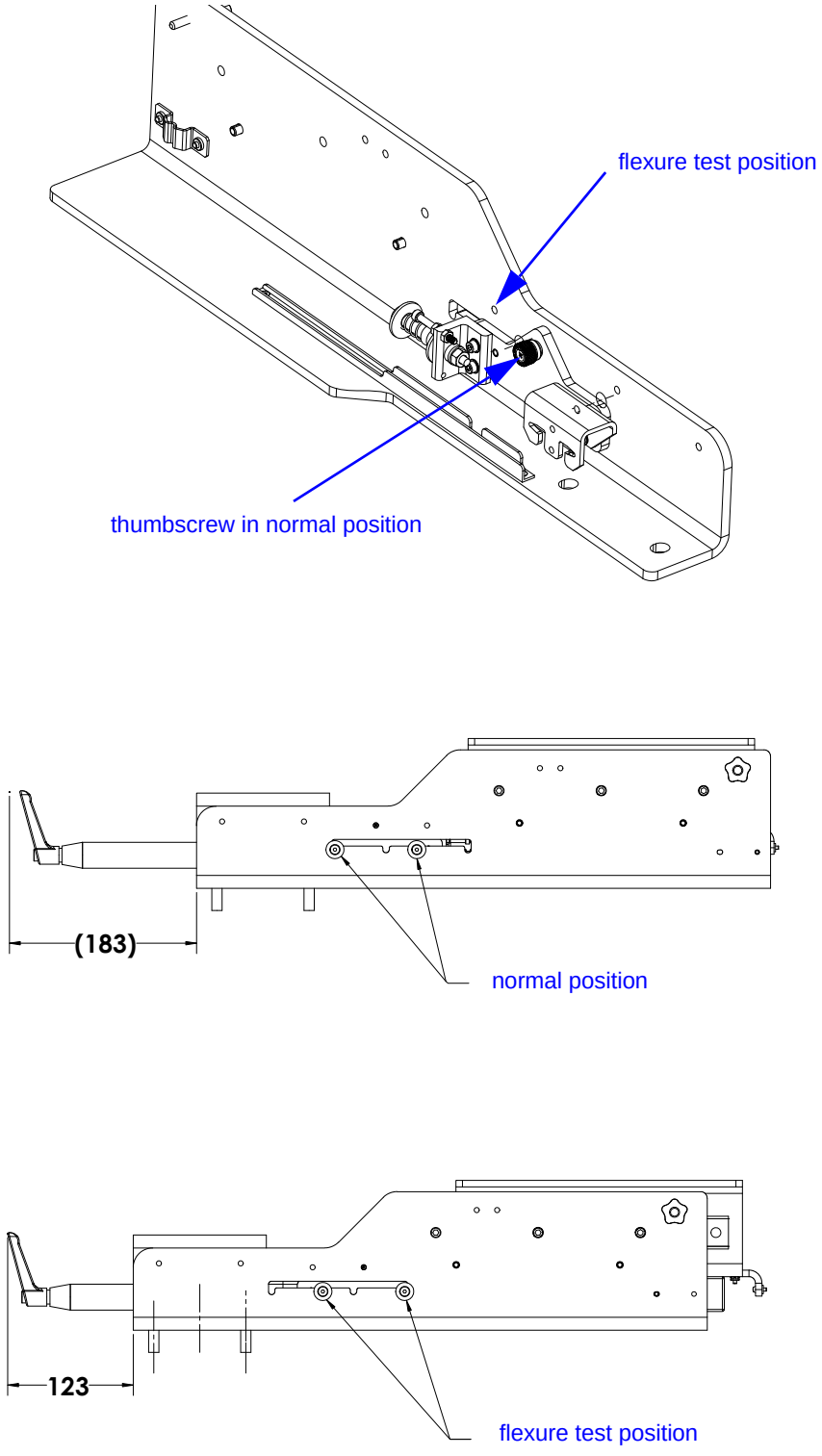

Figure 9. Stop block adjustment for flexure testing

Moving the AutoX into and out of the Test Space

Electromechanical Frame Mounting

When not in use the AutoX is stored behind the frame. The sliding assembly is in the unlocked position, with the handles on the sliding assembly in the vertical position.

To move the AutoX into the test space:

1. Standing in front of the frame, use the handles to pull the sliding assembly toward you until you feel it hit a stop.
2. Continue pulling gently on the handles to compress the spring and rotate the handles inwards (as shown in Figure 10 on page 33) to lock the sliding assembly in place.

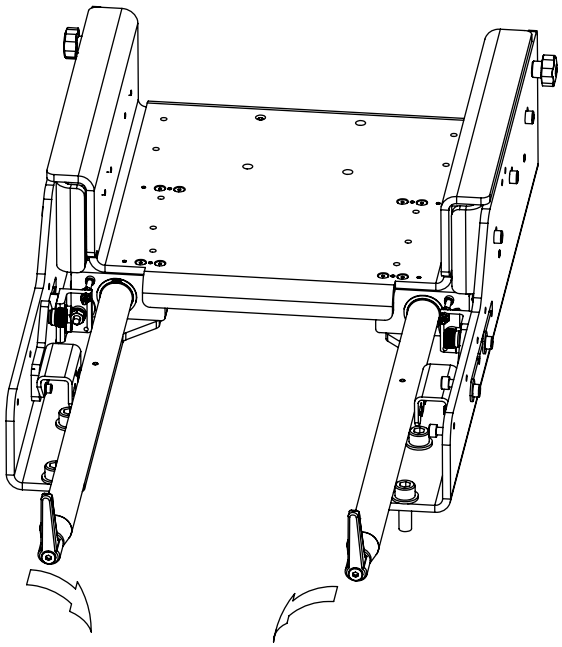

Figure 10. Operating the Sliding Assembly (Electromechanical Frame Mounting)

To move the AutoX out of the test space:

1. Use the handles to pull the arms gently towards you and rotate the handles back to the vertical position.
2. Push the sliding assembly back to the rear of the frame.

Static Hydraulic Frame Mounting

When not in use the AutoX is stored behind the frame. The mounting assembly lets you slide and rotate the AutoX into and out of the test space.

All movement should be carried out from the rear of the frame and whatever combination of sliding and rotating you use, make sure that the AutoX arms do not come into contact with anything as you move it.

Figure 11 on page 34 shows the mechanism.

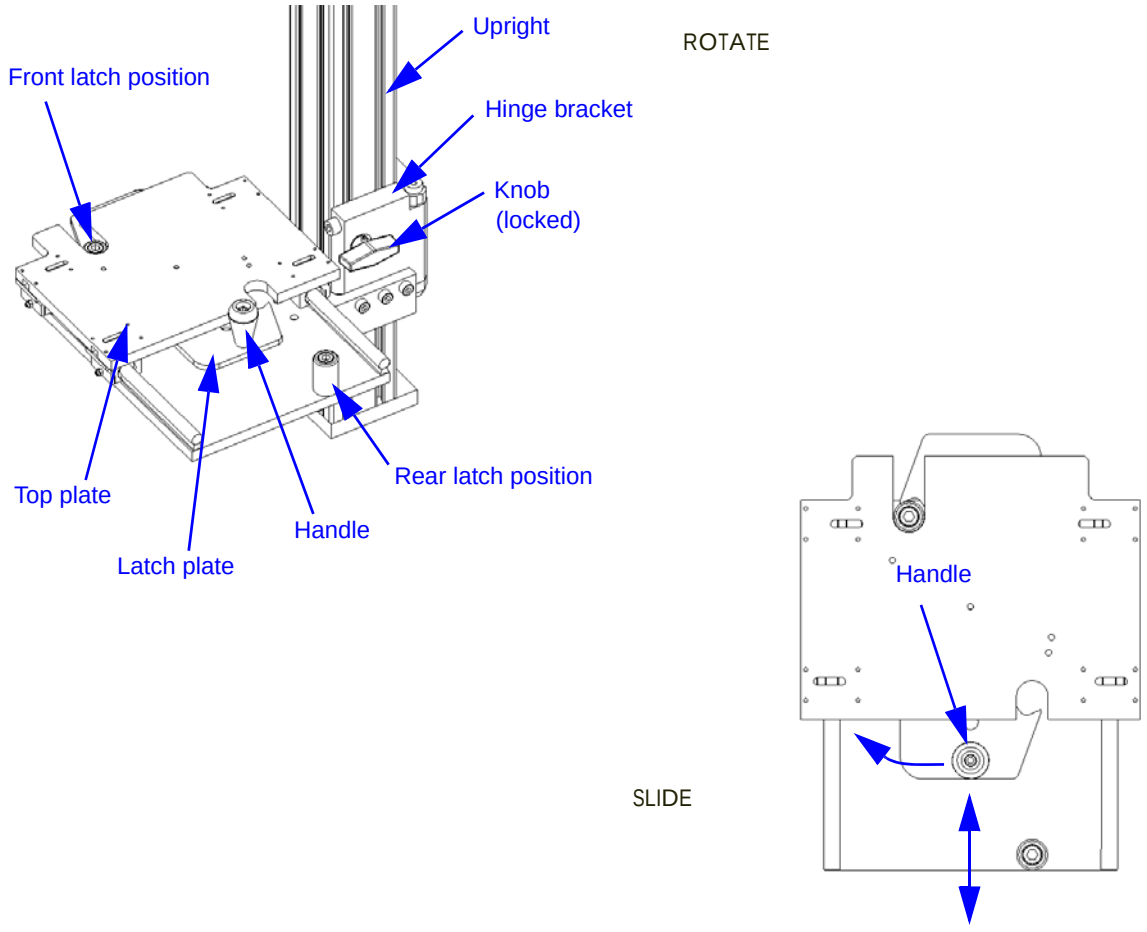

Figure 11. Operating the Sliding Assembly (Static Hydraulic Frame Mounting)

To rotate the AutoX into and out of the test space:

1. Turn the knob to a fully vertical position to release the hinge bracket from the upright.

2. Rotate the entire sliding assembly out of the test space. The hinge bracket has several detent positions that will hold the assembly in place.
3. When you rotate the assembly back into the test space, make sure you return the knob to a fully horizontal position to lock the hinge bracket to the upright.

To slide the AutoX into and out of the test space:

1. Push the handle to the left to release the sliding assembly (the latch plate pivots about its center).
2. Pull or push as necessary to move the sliding assembly to the desired latch position.

The mounting assembly for 3500KPX frames consists only of the sliding assembly; it does not have an upright or hinge bracket.

Routine Adjustments

Setting the Default Opening of the Wide Arms

If your system has wide arms installed (see Figure 12 on page 36) you may need to adjust the default opening to accommodate larger specimens. When first installed, the arms are set to a 50mm opening.

To change the default to the maximum 100mm opening:

1. Loosen the screws at the pivot point of the each arm (see Figure 12 on page 36) and move the arm to its maximum position.
2. Retighten the screw.

Caution

Always set the default opening to either the maximum (100mm) or minimum (50mm) opening. You cannot accurately set each arm to the same point at any interim distance.

Do not attempt to set each arm at any distance other than the maximum or minimum. If you try to set the arms at some intermediate distance, errors will result as you cannot guarantee that each arm is set to the same position.

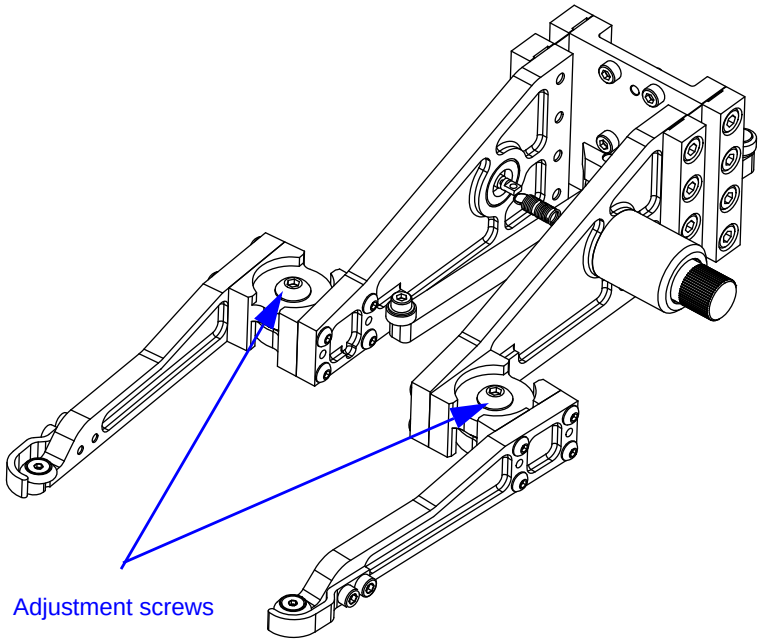

Figure 12. Wide Arms

Setting the Tension of the Arms

You need to adjust the tension of the arms to ensure good contact with the specimen. Rotate counterclockwise to increase the tension, rotate clockwise to decrease the tension.

The adjuster is marked with a numeric scale. The number increases as you increase the tension on the arms. These numbers are for comparison purposes only; make a note of the setting for optimum contact with the specimen and you can then reset the tension at any time to the same setting.

Setting Limit Stops

Make sure that the upper and lower limit stops on the extensometer are set so that the extensometer cannot collide with other equipment or the load frame during use. Figure 14 on page 38 shows the upper limit stop.

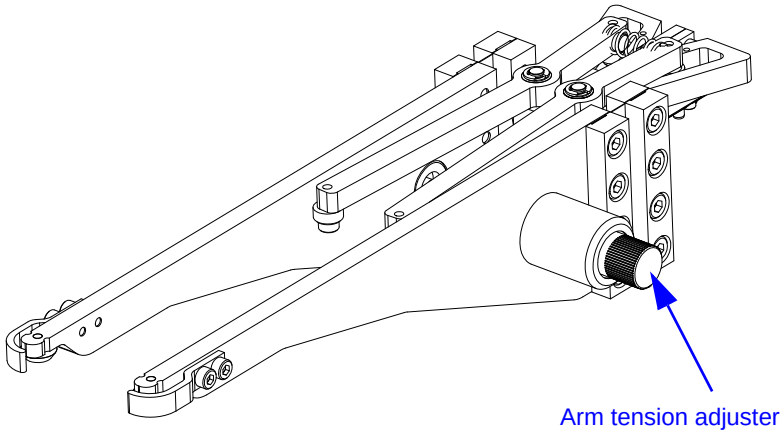

Figure 13. Setting Arm Tension

Caution

Make sure that the screws that secure the limit stops are firmly tightened.

The limit stops must be secure so that if the carriage hits a limit stop, the limit stop does not move.

Setting the limit stops also protects the extensometer from debris. When you set the limit stop, retractable blinds cover the vertical opening outside of the limits area. You should therefore set the limits as close as possible to the maximum expected travel to provide maximum protection.

Initialization

Automatic extensometers must be initialized before the extensometer can be used. The extensometer must be initialized every time the software is started or the extensometer is connected. During initialization, the software identifies where the carriages are located on the extensometer by moving the carriages to the reference stop (refer to "Reference stop settings" on page 40) and then to the specified target positions. The software updates the **Actual carriage position** in the Transducer Settings dialog. This process ensures that the software accurately measures the strain data.

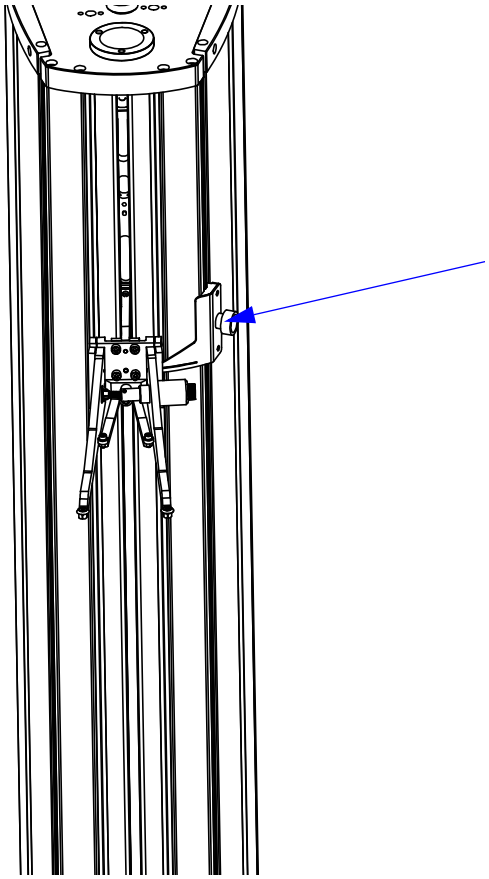

Figure 14. Upper Limit Stop

The initial set up of the extensometer moves the carriages to the target settings to establish a reference point in preparation for measuring strain. Target settings must be between the upper and lower fixtures that grip the specimen.

Although the target settings are saved with each transducer configuration, you only need to initialize the extensometer when the extensometer is started. You do not need to re-initialize the extensometer when a different transducer configuration is selected.

After initialization, the system disengages the carriages so they can move freely. When the carriages are disengaged, the **Actual carriage position** does not display a value. You can click **Move** to manually lock the carriages, and display the actual carriage position.

The combined total of the target carriage position and target gauge length cannot exceed the maximum travel available (750 mm).

When the device is connected to the testing system, the automatic extensometer icon appears in the Bluehill® console. The icon will be grayed at first.

The following procedure lists the steps required to initialize the AutoX. More detail on individual options within the Transducer Settings dialog can be found in the Bluehill Reference Help online documentation.

1. Click  at the top of the screen in the system settings area of the console to open the Transducer Settings dialog for the AutoX.
2. In the first tab, select a transducer configuration in the **Transducer configuration** field. The default is Strain 1.
3. Enter a value in the **Target carriage position** field to change the lower carriage (or upper carriage) location.

   The default target carriage position is 150mm for the lower carriage with the reference stop set to 100mm.
4. Select the type of gauge length: **Manual** or one of the proportional gauge length settings: $5.65\sqrt{So}$ or $11.3\sqrt{So}$.
5. For Manual gauge length, enter a value in the **Target gauge length** field to change the gauge length. The default value is 25mm.
6. Verify that all the target settings are between the upper and lower fixtures that grip the specimen and that no obstructions will prevent movement of the carriages during a test.
7. Click **Initialize**. A second dialog displays with the reference stop settings in which you select the upper or lower stop as the reference stop and enter the position of the selected reference stop. When you click **OK**, the system moves the target carriage to the specified reference stop on the extensometer (upper or lower) and then moves both carriages to the target settings specified in the Transducer settings dialog. This completes the initialization of the automatic extensometer.

   After initialization, the automatic extensometer icon in the console settings area changes to show that the transducer is available. The extensometer is now enabled and ready for testing.

*The **Move** and **Close arms** buttons are optional steps in this procedure and are available to verify the placement of the arms prior to starting a test. When the test starts, the system automatically moves the arms to the specified target settings and then closes the arms onto the specimen before proceeding with the test.*

8. Click **Move** to relocate the carriages to the new settings.

   The system moves the lower carriage (or upper carriage) to the target carriage position and then moves the other carriage to the distance specified as the target gauge length.

9. To fine-tune the carriage placement, use the jog controls in the dialog to move the carriages and then select **Update target position** to enter the current location in the **Target carriage position** field.

   The jog controls move both carriages simultaneously in order to maintain the target gauge length.

10. To verify the placement of the arms on the specimen, click **Close arms**. The arms close on the specimen and the software updates the **Actual gauge length** in the Transducer Settings dialog.

11. Click **Open arms** to release the arms from the specimen.

Reference stop settings

The AutoX750 automatic extensometer has an upper and lower stop that provide the following functions:

- A limit stop to prevent the carriages on the extensometer from hitting fixtures on the test frame.
- One of the stops provides a point of reference for the software to identify the position of the extensometer carriages. The physical reference stop position on the extensometer and the **Reference stop position** in the software must match.

When you initialize the transducer, a second dialog displays with the reference stop settings in which you select the upper or lower stop as the reference stop and enter the position of the selected reference stop. When you click **OK**, the system moves the target carriage to the specified reference stop on the extensometer (upper or lower) and then moves both carriages to the target settings specified in the Transducer settings dialog. This completes the initialization of the automatic extensometer.

The reference stop position limits are:

	Lower stop	Upper stop
Minimum reference stop position:	0 mm	10 mm
Maximum reference stop position:	740 mm	750 mm

Guidelines for setting the reference stop

- During initialization, the system moves the carriages to the specified reference stop and then moves the carriages to the target positions. Set the reference stop

between the fixtures so that the carriages can reach both the reference stop and the target positions with no interference.

- Select the reference stop based on the expected carriage movement during a test. The carriage movement should move away from the specified reference stop.
- When using the lower test space, the upper stop is recommended for compression testing and the lower stop is recommended for tension testing.

Chapter 5
Testing

Before you Begin

Before testing, verify that the system has been properly started and prepared. Refer to the operator's guide for your testing system (e.g. 5900 Operator's Guide) for information on the following:

- Start the system.
- Assemble the load string, including the load cell, adapters and grips required for testing.
- Preload the load string.
- Set travel limit stops on the load frame.

Refer to Chapter 4 for instructions on setting up, adjusting and initializing the AutoX.

Running a Test

The following procedure is a checklist for running a test using the AutoX. More detailed information on each step can be found in the operator's guide for the testing system and in the Bluehill® Reference Help online documentation.

1. In Bluehill, create a new sample. Select a test method that includes:
   - a strain measurement that is assigned to the automatic extensometer.
   - auto balance as a pre-test control parameter, with the strain measurement included in the Selected list.

2. Verify the test area and test direction is correct on the Frame Status indicator in the console area.

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.

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.

Select the correct test area for the test. An incorrectly set test area can cause unanticipated crosshead behavior. Press the Emergency Stop button if the frame moves in an unexpected direction.

An incorrectly set test area can cause unanticipated crosshead behavior and create a hazard that may damage the specimen or load cell. Check the Load Frame Status indicator in the console area to verify the test area and test direction before starting a test.

3. If necessary, initialize the automatic extensometer (refer to Chapter 4).

4. Take measurements of the required specimen dimensions for each specimen and enter the values into the appropriate fields in the operator input component of the

test workspace. This is important if the extensometer gauge length type is set to one of the proportional settings.

5. Use the jog controls to move the crosshead to its starting position for the test and reset the gauge length. Refer to the appropriate operator's guide for the system.

Warning

Set the load frame limit stops to limit crosshead travel, and set adequate transducer limits to ensure the safe operation of the testing system. For the AutoX, set the reference stops to limit carriage travel.

Set all available limits before using the system to avoid crosshead overtravel, contact between grips and fixtures, overloading any component of the load string, or overtravel of a contacting extensometer.

6. Ensure that the crosshead travel limits on the frame are set. Refer to the appropriate operator's guide for the system.
7. Set the reference stops to limit carriage travel on the automatic extensometer (refer to Chapter 4).
8. Ensure that limits are set for each transducer (extension, load, strain, and user-defined) required by the test method.

Warning

Hazard - The AutoX knife edges are sharp. Keep clear of the extensometer edges when installing or removing a specimen in the test area.

9. Install the specimen into the grips. Refer to the documentation provided with the grips for details.
10. Check that the specimen is aligned properly in the grips. If necessary, verify the placement of the automatic extensometer arms on the specimen:
    a. In the transducer settings dialog for the automatic extensometer, click **Move** to relocate the carriages to the target settings.
    b. Click **Close arms**. The arms close on the specimen and you can verify the placement on the specimen. Click **Open arms** to release the arms from the specimen.

*The **Move** and **Close arms** buttons are optional steps in this procedure and are available to verify the placement of the arms prior to starting a test, if necessary. When the test starts, the system automatically moves the arms to the specified target settings and then closes the arms onto the specimen before proceeding with the test.*

11. Start the test by pressing the **START** button on the control panel or by clicking the **Start** button in the Bluehill test workspace.

    The system applies the appropriate preload (if selected as part of the test method), moves the extensometer arms to the target carriage position and gauge length, attaches the arms and balances the extensometer. The system continues the test according to the test method parameters.

12. If you need to stop the test before it completes, press the **STOP** button on the control panel or click the **Stop** button in the Bluehill test workspace.

    If during the test a condition develops that could affect the safety of an operator or could damage the specimen or test equipment, press the Emergency Stop button on the front of the frame.

13. When the test is complete, the system opens the arms of the extensometer and displays the test results as specified in the test method. The carriages return to the target settings.

14. Remove the specimen by first releasing the upper grip followed by the lower grip.

15. Bring the crosshead back to gauge length by pressing the **RETURN** button on the control panel or by clicking the **Return** button in the Bluehill test workspace.

The system is ready for the next specimen.

Troubleshooting

Effects of Vibration

The AutoX is a precision instrument and, depending on the testing environment and the type of frame that it is installed on, may be subject to the effects of vibration in the surrounding environment. Isolation pads are available; contact Instron Service for assistance.

If you use these isolation pads, be aware that the frame and AutoX become more sensitive to direct contact. Take care not to disturb the testing system at all after installing a specimen. For example, start the test from the computer and not from the control panel mounted to the test frame.

High Energy Breaks

In some circumstances, breaks that produce high energy release can cause the extensometer to go into idle mode. The system detects this and re-initializes the extensometer. A message displays in the software to inform you that the extensometer is re-initializing.

Specimens that can damage the extensometer

Some specimens undergo extensive elongation before break and then exhibit a “whipping” motion when they break. These types of breaks can damage the measuring arms.

Arms resist being moved manually

You should only need a very light touch on the extensometer arms to move them gently and smoothly along the entire range of travel.

If you encounter any resistance while manually moving the arms, this may indicate an internal misalignment. Contact Instron Service for assistance.

Chapter 6
Maintenance and Parts

Routine Maintenance

All interior cleaning and maintenance should be performed by an Instron Service engineer. This should be scheduled at least once every year along with the annual calibration but if your testing equipment is operating in an environment where there is substantial debris and dust, you should schedule cleaning more often. Contact Instron Service for advice.

Daily Maintenance

Make sure the exterior of instrument is clean and free of debris. Use a soft lint-free cloth to wipe the exterior.

Maintenance of Knife Edges

Figure 15 on page 50 shows the knife edge assembly. Standard knife edges, provided with the instrument, are circular. Other shapes are available (refer to “Replaceable Parts” on page 53).

Warning

Hazard - The AutoX knife edges are sharp. Take care when handling them to avoid touching the sharp edges.

You can achieve maximum life of knife edges by rotating them. Using a 2mm hex key, loosen the M3 screw. Rotate the knife edge so that a new surface is exposed to the specimen. Retighten the screw.

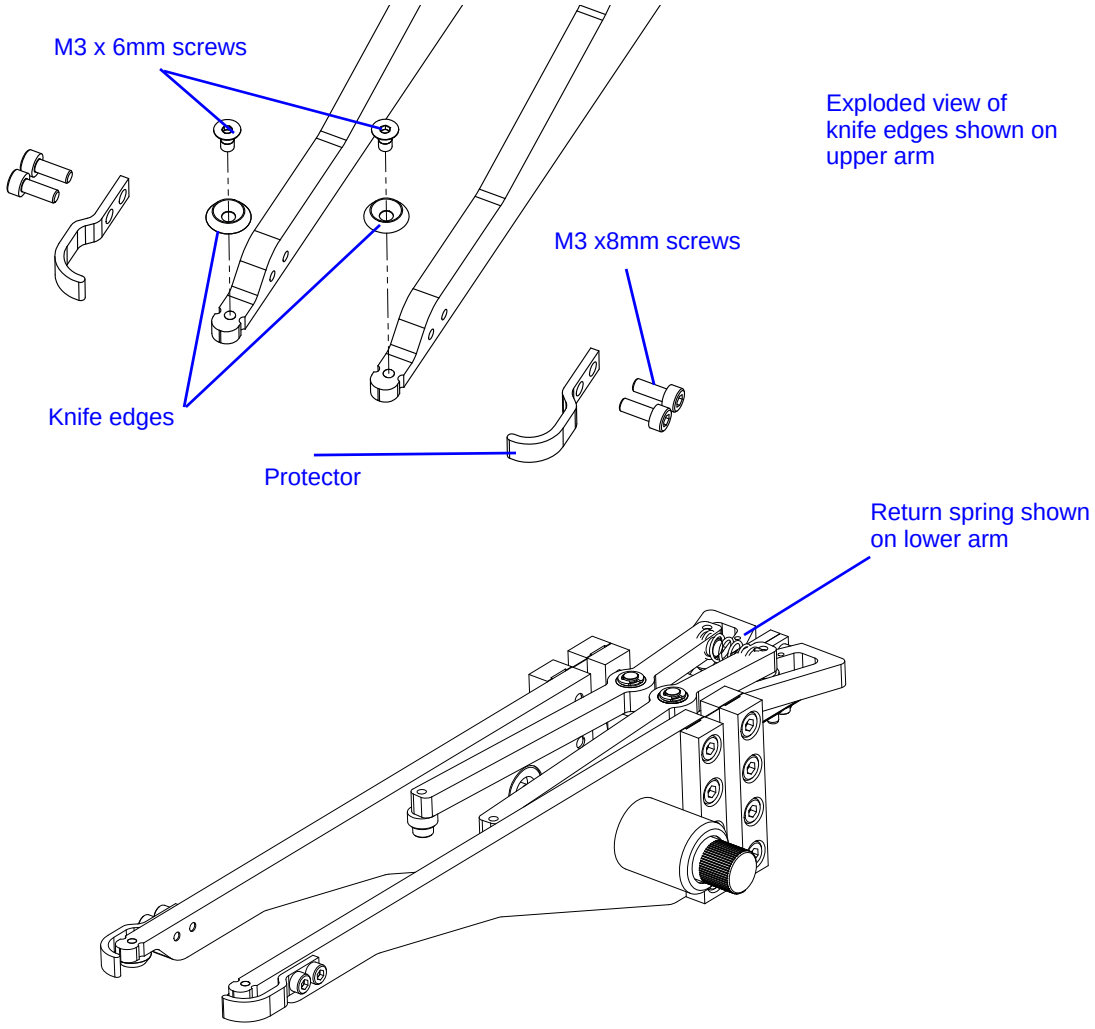

Figure 15. Knife Edges and Return Spring

You can remove and replace the knife edges without removing the protectors. Use a 2mm hex key to remove the M3 screw. Remove the knife edge and replace it with a new one. Replace the M3 screw and tighten it.

Replacing the Return Spring

Prolonged use eventually weakens the return springs on the extensometer arms (see Figure 15 on page 50). Replacement springs are provided in the ancillary parts kit.

To remove the spring, pinch it between your fingers and lift it out. Compress the new spring between your fingers and replace it.

Installing Shock-Tolerant Knife Edges

Some testing requires the use of these knife edges, especially if your testing does not remove the extensometer arms before the specimen breaks.

To replace standard knife edges with shock-tolerant knife edges:

1. Using a 2mm hex key, remove the M3 screws and remove the standard knife edges (see Figure 15 on page 50). Store the knife edges and screws in a safe place.
2. Use the 2mm hex key to remove the special screws required from their location at the rear of the arms (see Figure 16 on page 51).

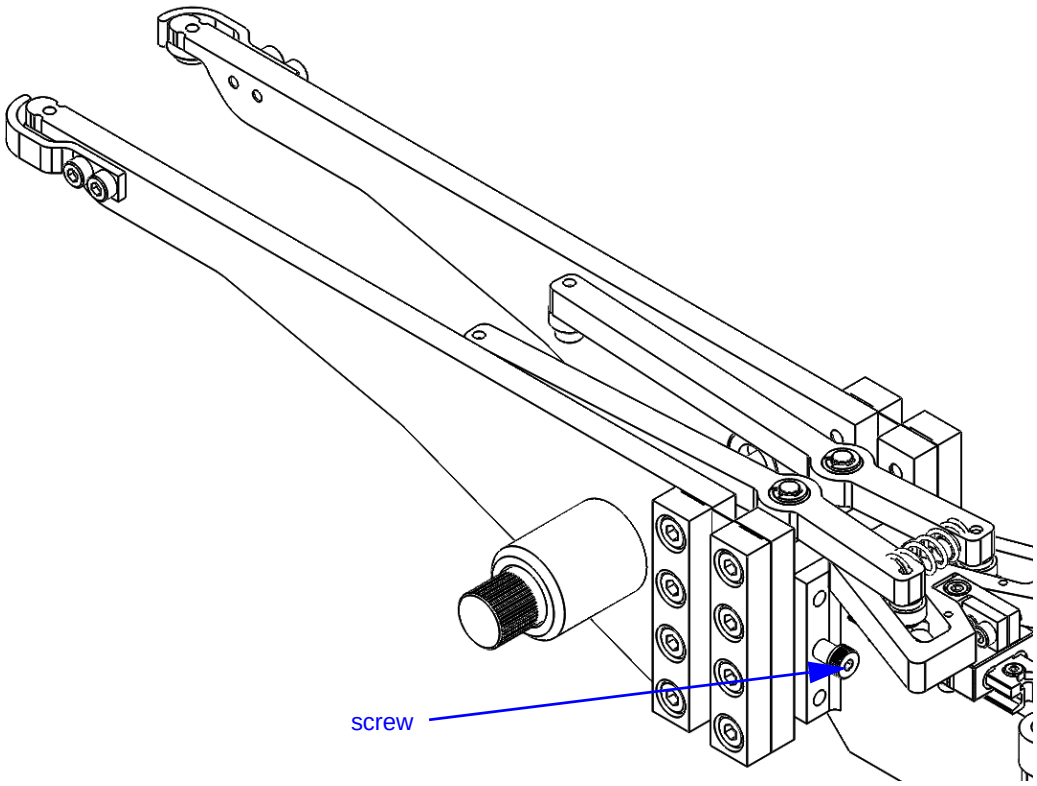

Figure 16. Location of screws required for installation

3. Use the 2mm hex key to install the shock-tolerant knife edges and springs as shown in Figure 17 on page 52).

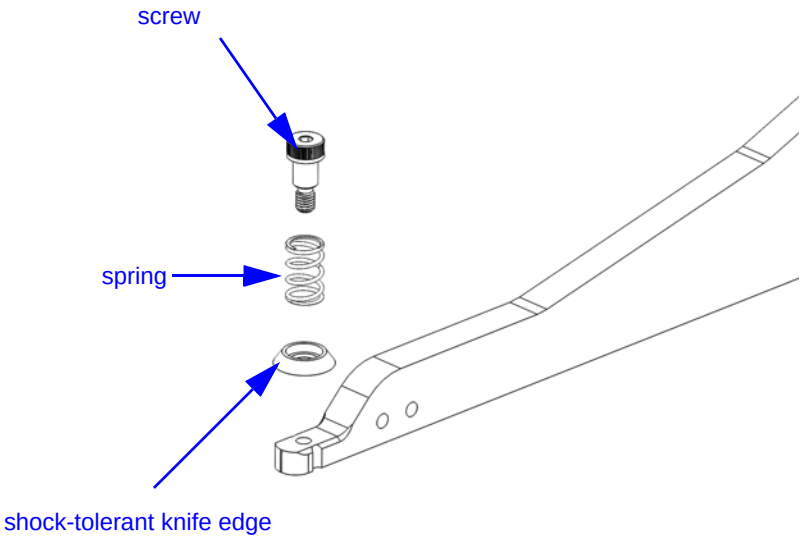

Figure 17. Installing Shock-Tolerant Knife Edges

Caution

Make sure you replace the screws in their location at the rear of the arms if you reinstall standard knife edges.

To maintain the appropriate mass of the arms, the special screws must be replaced in their original positions when you reinstall standard knife edges.

Repair

If the arms are damaged, contact Instron service for repair.

Ancillary Parts

The following parts are supplied with the AutoX:

Table 4. Ancillary Parts

Part no.	Quantity	Description
80-1-1011	1	Set of metric hex keys (1.5 mm- 10mm)
66-1-237	2	Replacement return springs

Replaceable Parts

You can purchase replacement knife edges. Refer to Table 5 on page 53 for the appropriate catalog numbers.

Table 5. Replaceable Parts

Catalog number	Description
2665-800	Circular knife edges, suitable for flat, rectangular specimens
2665-801	Flat knife edges, suitable for thin specimens and wire specimens
2665-802	Shock-tolerant knife edges, suitable for flat, rectangular specimens

Appendix A
Conformance Documents

The copy of the certificate on the following page is a generic version. Refer to the original certificate supplied with your system for specific details.

Certificate of Conformance

English - Original

EC Declaration of conformity for machinery

(Machinery Directive 2006/42/EC, Annex II., sub. A)

Manufacturer: Instron, a division of Illinois Tool Works
Address: 825 University Ave., Norwood, MA, 02062, USA

Name and address of the person authorised to compile the technical file:

Name: Jim Rose
Address: Instron – Division of ITW Limited, Coronation Road, High Wycombe, Buckinghamshire, HP12 3SY, United Kingdom.

Here with declares that the **automatic extensometer series AutoX**
and in particular the **extensometer** identified as

Model/ Description:
Serial Number:

- is in conformity with the relevant provisions of the **Machinery Directive (2006/42/EC)**
- is in conformity with the provisions of the following other EC-Directives

EMC-Directive 2014/30/EC

And furthermore, we declare that

- the applicable parts/clauses of the following European harmonized standards, technical standards and specifications have been used

BS EN 61326-1 (2013) Electrical Equipment for measurement, control and laboratory use - EMC requirements.
BS EN 61010-1 (2010) Safety Requirements for Electrical Equipment for Measurement Control and Laboratory Use.

Place and date of origin
Norwood, MA., USA

Signature:

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