



5 kN Flexure Fixture

Reference Manual - Equipment

M10-82810-11 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.

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Original Instructions

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General Safety Precautions



Materials testing systems are potentially hazardous.

Materials testing involves inherent hazards from high forces, rapid motions, and stored energy. You must be aware of all moving and operating components 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.



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.



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	9
Overview	9
3-point flexure testing	10
4-point flexure testing	10
Description	11
Chapter 2: Specifications	15
Dimensions	15
Weight	17
General	18
Chapter 3: Installation	19
Install the fixture	19
Before you begin	19
Install the lower anvil assembly	19
Install the upper anvil assembly	20
Align the lower and upper anvils	21
Set the anvil spans	22
Install the specimen stops	22
Install the deflectometer	23
Before you begin	23
Install the deflectometer	23

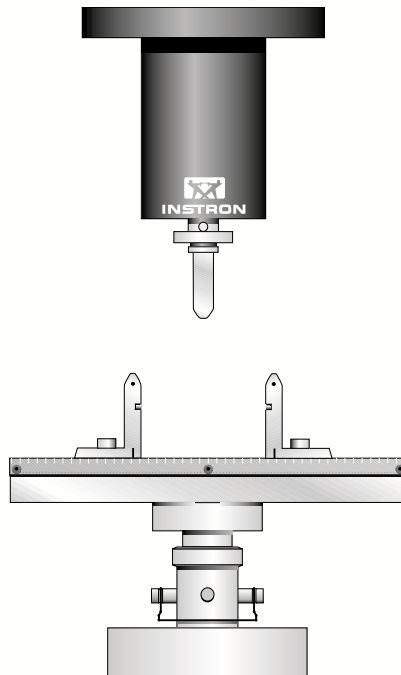
Chapter 1

Introduction

- Overview..... 9
- Description..... 11

Overview

The bend fixture tests flexural properties of a specimen. With the appropriate adapters, the fixture can be installed on any Instron load frame up to a load capacity of 5kN.



To perform a flexure test, you set a span for the lower anvils and place the specimen across the anvils as a beam. The testing system applies load to the specimen via the

upper anvil, measures the deflection, and calculates the flexural properties of the specimen.



If you want to use the fixture on a servohydraulic testing machine, the machine requires anti-rotation control.

3-point flexure testing

For 3-point testing, you connect the single anvil upper assembly, applying the load to the center of the specimen span, as shown in [Figure 1](#) on page 10

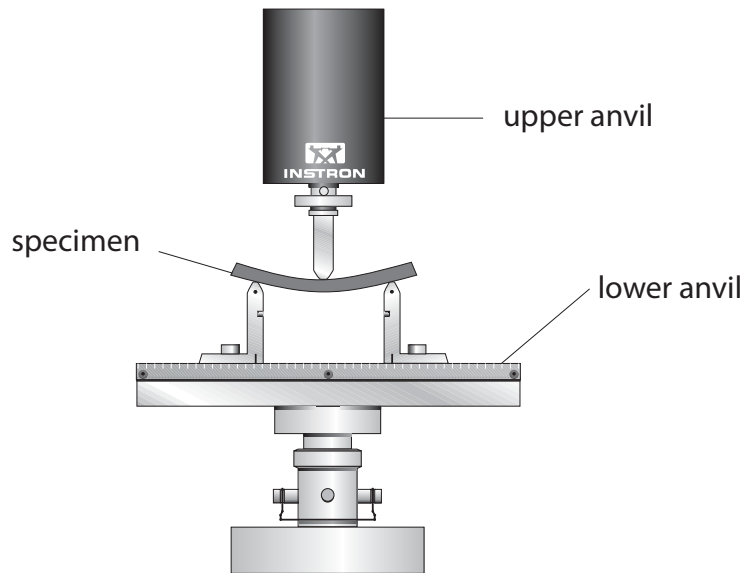


Figure 1. 3-point flexure testing

4-point flexure testing

For 4-point testing, you connect the double anvil upper assembly, applying the load to two points on the specimen span, as shown in [Figure 1](#) on page 10.

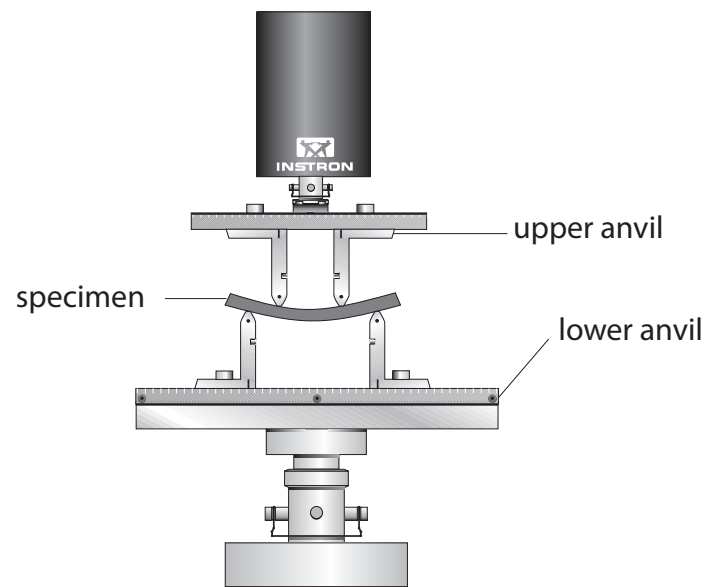


Figure 2. 4-point flexure testing

Description

[Figure 3](#) on page [12](#) shows the components of the 3-point fixture.

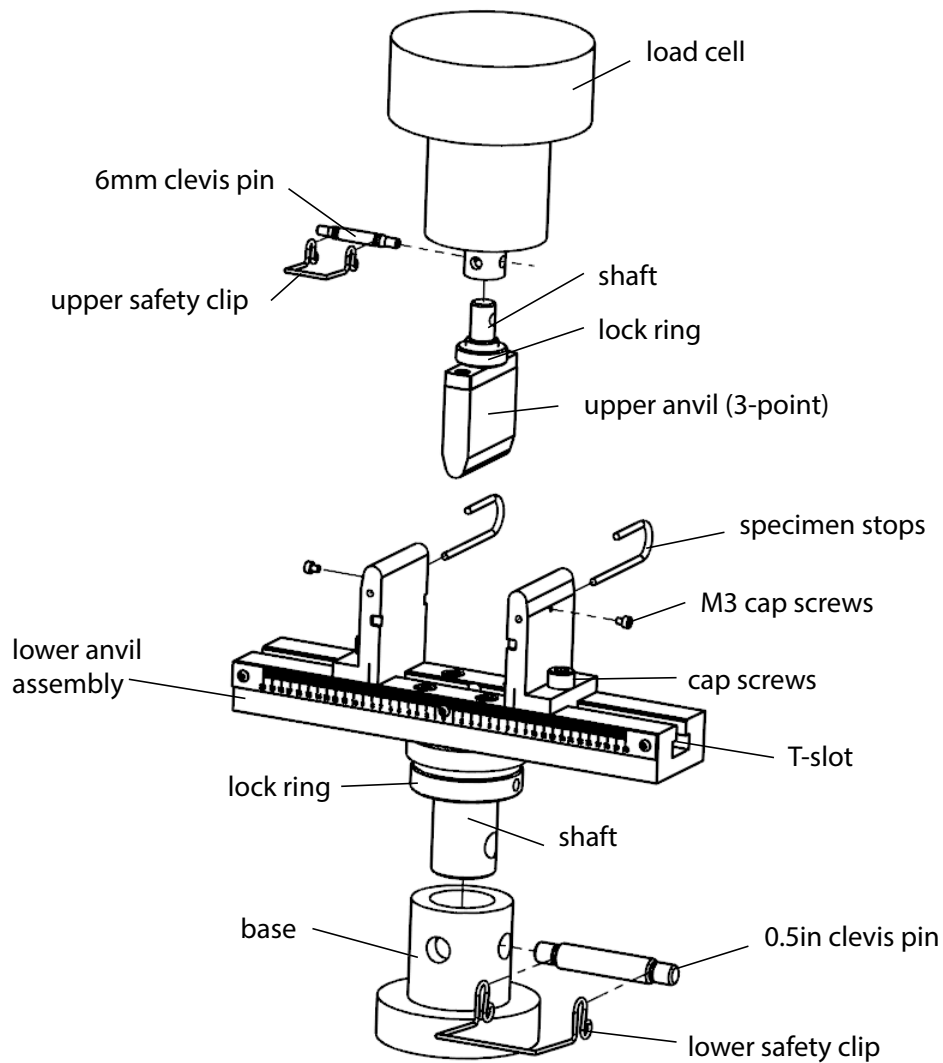


Figure 3. Fixture components

The fixture includes the following:

- base - secures the lower anvil assembly in place on the load frame using the 0.5in clevis pin and clip.
- lower anvil assembly - supports the specimen as a beam. The two anvils slide laterally to accommodate different spans and are secured with cap screws.
- specimen stops - these position the specimen on the lower anvils.
- upper anvil assemblies - these apply load to the specimen, at one point for 3-point testing or at two points for 4-point testing.
- load cell - secures the upper anvil assemblies to the load frame.

- alignment plate (not shown) - enables alignment of upper and lower anvil assemblies
- deflector - a spring-loaded plunger used to measure specimen deflection (see [Figure 4](#) on page 13).

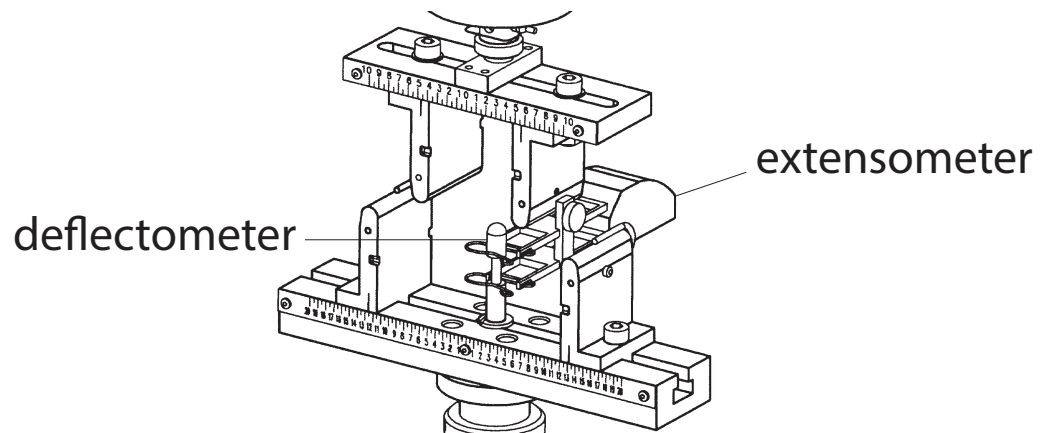


Figure 4. Deflectometer

“[Installation](#)” on page 19 describes how to install the components into the load string.

Chapter 2

Specifications

- Dimensions 15
- Weight..... 17
- General..... 18

Dimensions

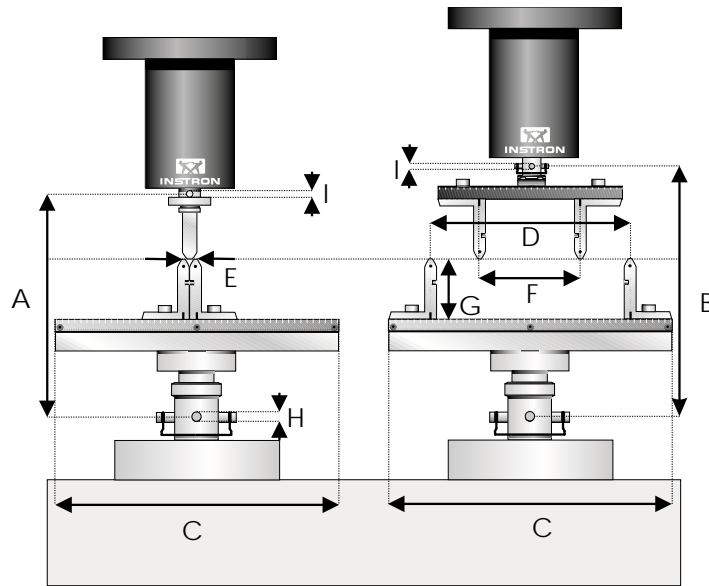


Figure 5. 3-point and 4-point fixture dimensions

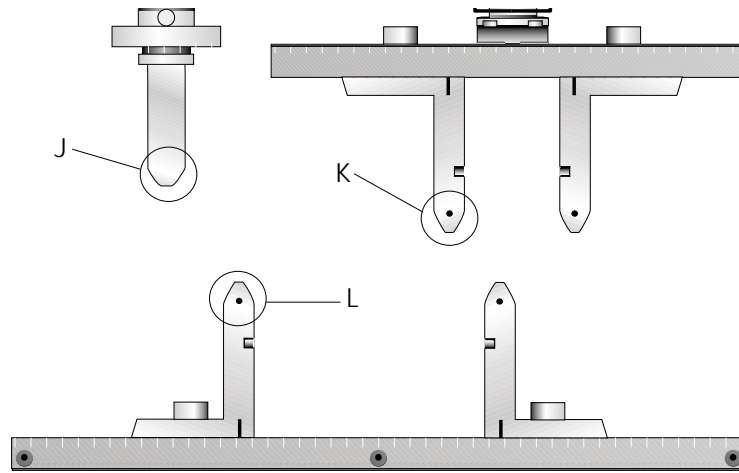


Figure 6. Upper and lower anvil diameters

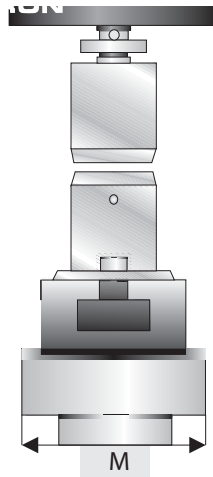


Figure 7. Fixture width

Table 1. Flexure fixture dimensions

Letter	Description	Dimension mm (in)
A	3-point height when upper and lower anvils are on the same horizontal plane	220 (8.66)

Table 1. Flexure fixture dimensions (Continued)

Letter	Description	Dimension mm (in)
B	4-point height when upper and lower anvils are on the same horizontal plane	254 (10.0)
C	Length	234 (9.21)
D	Maximum lower anvil span	194 (7.64)
E	Minimum lower anvil span: 10mm 4mm	10 (0.39) 4 (0.16)
F	Maximum 4-point upper anvil span	97 (3.82)
G	Maximum testing travel: 10mm lower anvil 4mm lower anvil	60 (2.36) 57 (2.24)
H	Clevis hole diameter	12.7 (0.5)
I	Clevis hole diameter	6 (0.236)
J		
K		
L		
M	Maximum fixture width	60 (2.36)

Weight

Component	Weight N (lb)
Upper anvil assembly for 3-point testing	2.97 (0.67)
Upper anvil assembly for 4-point testing	13.9 (3.09)
Lower anvil assembly	32.5 (7.24)

General

Parameter	Specification
Testing standards	ASTM D790 ISO 178
Load capacity	5 kN (1000 lb)
Material	Electroless nickel plated steel
Operational temperature range	-100 °C to +350 °C (-148 °F to +662 °F) fits into Instron environmental chamber
Connections	Load cell - type O Base - type D Any other connection requires an adapter

Chapter 3

Installation

• Install the fixture	19
• Install the deflectometer.....	23

This chapter describes installation of the flexure fixture onto a load frame and installation of the deflectometer.

Install the fixture

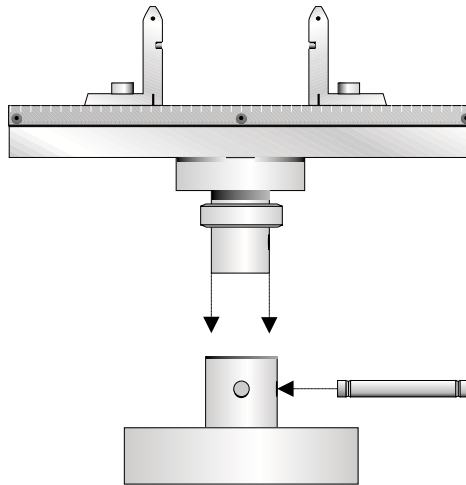
Before you begin

Check for the following:

- there is enough room between the load cell and the base to install the fixture.
- the testing system is in standby mode.
- the testing system limits have been set to prevent collision between the upper anvils and the fixture.
- all mating surfaces of the anvil assemblies, load cell and base are free from dirt and debris. Use a soft cloth to clean them, if necessary.

Install the lower anvil assembly

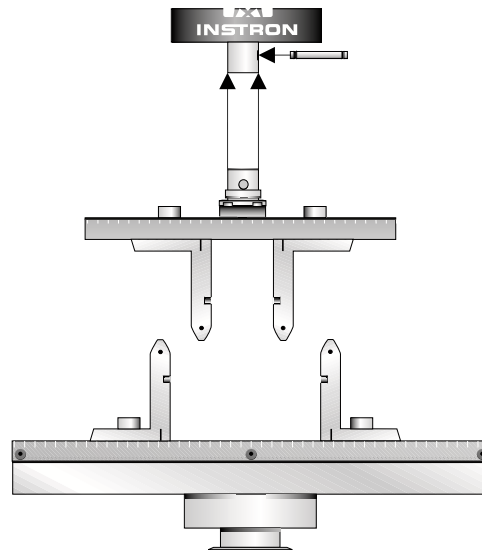
1. Place the lower anvil assembly into the clevis adapter, located on the base.



2. Rotate the assembly until the scale faces the front of the machine and the clevis holes are aligned.
3. Insert the 0.5in clevis pin through the holes and secure with the lower safety clip.
4. Tighten the lock ring against the base.

Install the upper anvil assembly

1. Insert the appropriate upper anvil assembly for your testing (3-point or 4-point) into the load cell clevis adapter.



2. Rotate the assembly until the anvil is parallel with the lower anvils and the clevis holes are aligned.
3. Insert the 6mm clevis pin through the holes and secure with the upper safety clip.
4. Tighten the upper lock ring against the load cell.

You must now align the upper and lower anvils, as described in [“Align the lower and upper anvils”](#) on page 21.

Align the lower and upper anvils

1. Place the alignment plate (side with only two v-grooves downwards) onto the lower anvils. If the alignment plate does not fit snugly, loosen the cap screws that secure the lower anvils, reposition the anvils, and tighten the cap screws.
2. Lower the upper anvil assembly until it is just above the alignment plate.
3. If you are aligning a 4-point fixture, position the upper anvils over the two outside alignment plate notches. If you are aligning a 3-point fixture, position the upper anvil over the central alignment plate notch.
4. Lower the upper anvil assembly until the anvils (or anvil) fit snugly in the alignment plate. [Figure 8](#) on page 22 illustrates a snug fit of the upper anvils for 4-point testing.

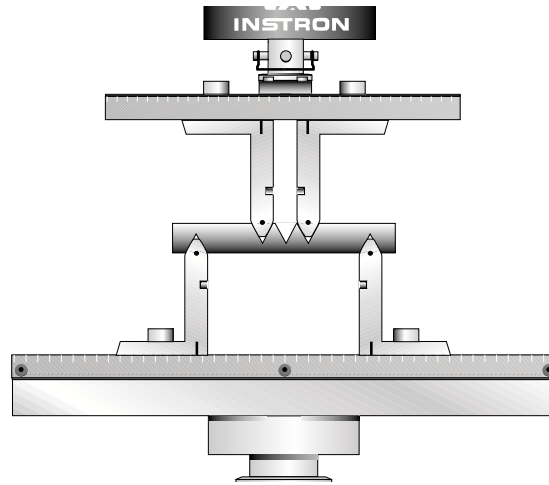


Figure 8. Aligning the anvils

5. If any of the anvils do not fit snugly, loosen the cap screws on the appropriate anvil assembly, adjust accordingly, and tighten the cap screws.

Set the anvil spans

You need to set the span of the lower anvils and, for 4-point testing, the upper anvils to the appropriate spacing for your specimens.

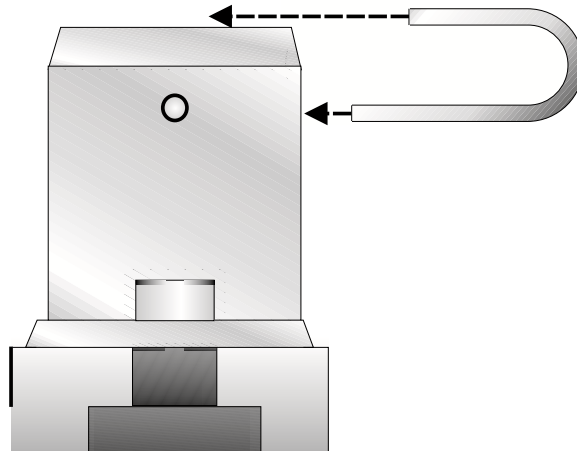
For each anvil:

1. Loosen the cap screws.
2. Slide the anvil to the desired position.
3. Tighten the cap screws.

Install the specimen stops

Specimen stops ensure that you place each specimen consistently in the same position on the fixture.

1. Raise the crosshead.
2. Slide each specimen stop through the hole on the back of each lower anvil.



3. Secure the specimen stops in the desired position with the M3 cap screws located on the side of the each anvil.

Install the deflectometer

A deflectometer, used with an extensometer, lets you measure the deflection of the specimen during a flexure test.

Before you begin

Check for the following:

- there is enough room between the upper and lower assemblies to install the deflectometer.
- the testing system is in standby mode.

Install the deflectometer



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.

1. Place the deflector in the center hole, located in the T-slot, as shown [Figure 9](#) on page [24](#).

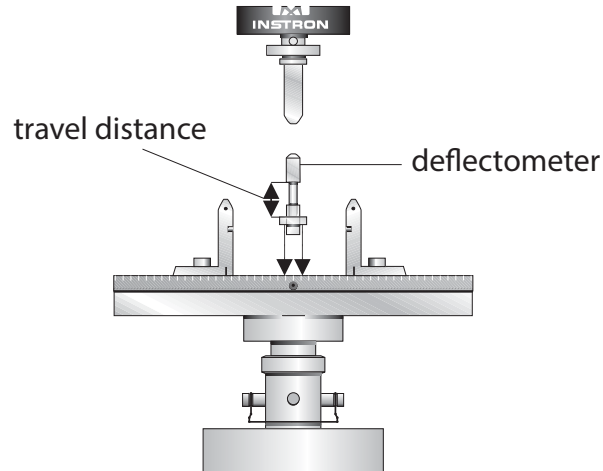


Figure 9. Install the deflector

2. Attach an extensometer to the deflector. Refer to the extensometer manual for instructions (see [Figure 10](#) on page [24](#)).

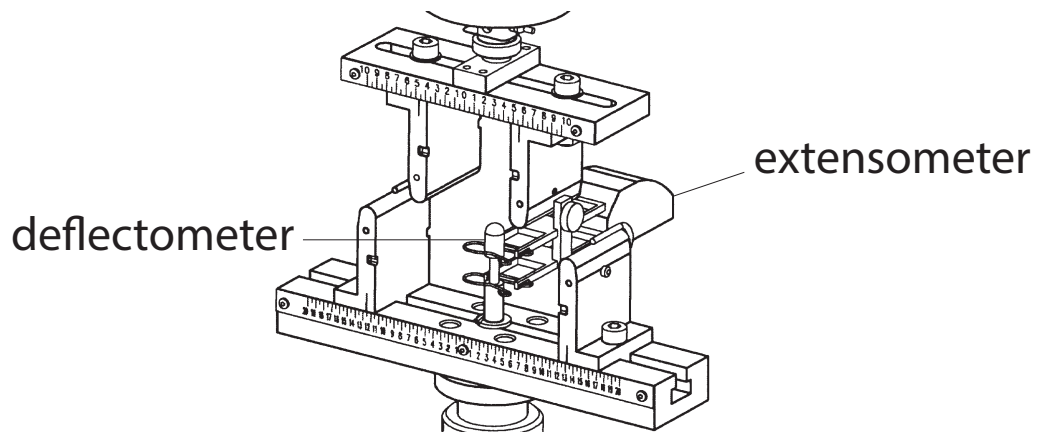


Figure 10. Attach an extensometer to the deflector

Caution

Make sure that the deflector travel distance does not exceed the travel distance of the extensometer arms.

The deflector could damage the extensometer during a test.

3. Connect the extensometer to the load frame.

The background of the page is a light gray color with abstract, flowing, curved lines in a slightly darker shade of gray. There are also sections with a fine, repeating dot pattern, similar to a halftone or perforated metal texture, located on the left and bottom right sides.

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