



# Instron Video Extensometer AVE3 and SVE3



## Operator's Guide

M16-17661-EN Revision A

## Proprietary Rights Notice

This document and the information that it contains are the property of Illinois Tool Works Inc. (ITW). Rights to duplicate or otherwise copy this document and rights to disclose the document and the information that it contains to others and the right to use the information contained therein may be acquired only by written permission signed by a duly authorized officer of ITW.

---

## Trademarks

Instron® is a registered trademark of Illinois Tool Works Inc. (ITW). Other names, logos, icons and marks identifying Instron products and services referenced herein are trademarks of ITW and may not be used without the prior written permission of ITW.

Other product and company names listed are trademarks or trade names of their respective companies.

---

## Original Instructions

Copyright © 2025 Illinois Tool Works Inc. All rights reserved. All of the specifications shown in this document are subject to change without notice.

---

### 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

<b>Chapter 1: Introduction</b> .....	<b>11</b>
Overview .....	11
AverEdge32™ option (AVE3 only) .....	12
Product support .....	13
Product documentation .....	13
<b>Chapter 2: Specifications</b> .....	<b>15</b>
General .....	15
Standard Mounting Configuration .....	15
AverEdge32™ Mounting Configuration .....	17
Environmental .....	18
Conformity with EU directives .....	19
Dimensions and weight .....	19
Software compatibility .....	20
<b>Chapter 3: Installation</b> .....	<b>21</b>
Initial installation .....	21
Removing and reinstalling .....	22
Specific installations .....	24
Electromechanical dual column testing machines .....	25
Electromechanical single column testing machines .....	36
Installation including environmental chambers .....	40
System interconnections .....	44
<b>Chapter 4: Mark specimens</b> .....	<b>47</b>
Overview .....	47
Marking tips .....	48
Applying ink dots .....	48
Troubleshooting ink dots .....	49

<b>Chapter 5: System setup</b> .....	<b>51</b>
Set up hardware .....	51
Extensometer lenses .....	51
Set up the load string .....	55
Bluehill® Universal Software .....	55
<b>Chapter 6: Calibration and Calibration Check</b> .....	<b>57</b>
Factory calibration .....	57
Calibration .....	58
Install spring clips onto the calibration plate .....	60
Attach the calibration plate to a specimen .....	63
Attach the calibration plate to a plate holder .....	65
Attach the calibration plate to a compression platen .....	73
Optional Position Adjustment Plate .....	76
Transducer configurations .....	79
Calibration check .....	80
Calibrate the extensometer .....	80
Run a calibration check .....	82
Additional calibration requirements for DIC Replay .....	82
<b>Chapter 7: Run tests</b> .....	<b>85</b>
Using Bluehill® Universal .....	85
Transverse strain using the AverEdge32™ configuration .....	86
Using Bluehill Universal® software with DIC Replay .....	87
<b>Chapter 8: Maintenance</b> .....	<b>89</b>
General .....	89
Extensometer lenses .....	89
Ancillary parts .....	90
<b>Index</b> .....	<b>91</b>

# Chapter 1

## Introduction

---

• Overview.....	11
• Product support.....	13
• Product documentation.....	13

---

### Overview

A video extensometer is designed to accurately measure specimen strain during a materials test without the need to contact the specimen.

Advantages of the non-contacting measuring process include no mechanical influence on the specimen, ease of use and reproducibility.

The principle of the video extensometer is based upon accurate detection of the gauge length markers using a high resolution digital video camera.

There are two models of the third generation Instron video extensometer; the AVE3 (Advanced Video Extensometer) and the SVE3 (Standard Video Extensometer).

AVE3 includes:

- air flow technology (patent pending) to control air flow between the camera and specimen and minimize optical distortion caused by air currents, enhancing the measurement noise performance
- an option to add transverse strain measurement
- an option to add DIC (Digital Image Correlation) capability

SVE3 does not include any of the above options.



Figure 1. AVE3 installed on a testing system

## AverEdge32™ option (AVE3 only)

The AverEdge32™ option, available for the AVE3, is an advanced capability available in Bluehill® Universal software for measuring strain using the edges of the specimen instead of dots placed on the specimen. It requires a different mounting system that includes a back screen.

Transverse strain is measured at multiple locations along the specimen's edges and averaged to provide a smoother, more repeatable measurement.

It is particularly useful for determinations of the plastic strain ratio (r-value) on specimens that exhibit localized plastic deformation (Luder bands).

## 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](http://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](mailto:info_dev@instron.com) with your comments.



# Chapter 2

## Specifications

---

- General..... 15
- Environmental ..... 18
- Conformity with EU directives ..... 19
- Dimensions and weight..... 19
- Software compatibility..... 20

---

## General

### Standard Mounting Configuration

The following tables contain specifications for the AVE3 and SVE3 when installed on different testing machines using the standard mounting configuration. Refer to [“AverEdge32™ Mounting Configuration”](#) on page 17 if you are using the AverEdge32™ mounting configuration.

*Table 1. Table model testers, (e.g. 68SC-5 and 68TM-10)*

	Lens focal length (mm)			
	35	16	9	6
Axial field of view (mm)	85	202	367	522
Transverse field of view (mm)	14	33	58	82
Minimum axial gauge length (mm)	4	6	8	10
Minimum transverse gauge width (mm)	4	6	8	10
AVE3 resolution (µm)	0.25	0.5	1.5	3.0
SVE3 resolution (µm)	1.0	1.0	3.0	6.0

Table 1. Table model testers, (e.g. 68SC-5 and 68TM-10) (Continued)

	Lens focal length (mm)			
	35	16	9	6
AVE3 measurement accuracy (axial and transverse) ( $\mu\text{m}$ ) (the greater of the two listed)	the greater of:			
	$\pm 1$ or $\pm 0.5\%$ of reading	$\pm 1$ or $\pm 0.5\%$ of reading	$\pm 3$ or $\pm 1\%$ of reading	$\pm 9$ or $\pm 1\%$ of reading
SVE3 measurement accuracy (axial and transverse) ( $\mu\text{m}$ ) (the greater of the two listed)	the greater of:			
	$\pm 3$ or $\pm 0.5\%$ of reading	$\pm 5$ or $\pm 0.5\%$ of reading	$\pm 10$ or $\pm 1\%$ of reading	$\pm 15$ or $\pm 1\%$ of reading
Recommended dot diameter (mm)	1-3	1-3	2-4	3-6

Table 2. Floor model testers, e.g. 68FM-300 (not 5988 or 5989) testing machines

	Lens focal length (mm)			
	35	16	9	6
Axial field of view (mm)	112	261	477	685
Transverse field of view (mm)	19	43	76	109
Minimum axial gauge length (mm)	5	7	10	11
Minimum transverse gauge width (mm)	5	7	10	11
AVE3 resolution ( $\mu\text{m}$ )	0.25	0.5	1.5	3.0
SVE3 resolution ( $\mu\text{m}$ )	1.0	1.0	3.0	6.0
AVE3 measurement accuracy (axial and transverse) ( $\mu\text{m}$ )	the greater of:			
	$\pm 1$ or $\pm 0.5\%$ of reading	$\pm 1$ or $\pm 0.5\%$ of reading	$\pm 3$ or $\pm 1\%$ of reading	$\pm 9$ or $\pm 1\%$ of reading
SVE3 measurement accuracy (axial and transverse) ( $\mu\text{m}$ ) (the greater of the two listed)	the greater of:			
	$\pm 3$ or $\pm 0.5\%$ of reading	$\pm 5$ or $\pm 0.5\%$ of reading	$\pm 10$ or $\pm 1\%$ of reading	$\pm 15$ or $\pm 1\%$ of reading
Recommended dot diameter (mm)	1-3	2-4	3-6	3-6

Table 3. High-capacity floor model testers, e.g. 5988 or 5989

	Lens focal length (mm)			
	35	16	9	6
Axial field of view (mm)	150	343	627	not suitable
Transverse field of view (mm)	25	57	101	not suitable
Minimum axial gauge length (mm)	5	8	12	not suitable
Minimum transverse gauge width (mm)	5	8	12	not suitable
AVE3 resolution ( $\mu\text{m}$ )	0.5	1.0	2.0	not suitable
SVE3 resolution ( $\mu\text{m}$ )	2.0	2.5	8.0	not suitable
AVE3 measurement accuracy (axial and transverse) ( $\mu\text{m}$ ) (the greater of the two listed)	the greater of:			
	$\pm 1$ or $\pm 0.5\%$ of reading	$\pm 1$ or $\pm 1\%$ of reading	$\pm 9$ or $\pm 1\%$ of reading	not suitable
SVE3 measurement accuracy (axial and transverse) ( $\mu\text{m}$ ) (the greater of the two listed)	the greater of:			
	$\pm 3$ or $\pm 1\%$ of reading	$\pm 5$ or $\pm 0.5\%$ of reading	$\pm 10$ or $\pm 1\%$ of reading	not suitable
Recommended dot diameter (mm)	1-3	2-4	3-6	not suitable

## AverEdge32™ Mounting Configuration

The AverEdge32™ mounting configuration lets you use an edge-based method to determine transverse strain during testing. This edge-based method is only available using the 16 mm lens but you can perform dot-based axial and transverse testing using this mounting configuration with all lenses.

Table 4 on page 17 contains specifications for AverEdge32™ configuration using the 16 mm lens when using both edge-based and dot-based methods for transverse strain. Specifications for all other lenses are the same as listed in “Standard Mounting Configuration” on page 15.

Table 4. AverEdge32™ configuration - 16 mm lens only

Parameter	Dot-based method for transverse strain	Edge-based method for transverse strain
Axial field of view (mm)	240	163 <sup>1</sup>

Table 4. *AverEdge32™ configuration - 16 mm lens only (Continued)*

Parameter	Dot-based method for transverse strain	Edge-based method for transverse strain
Transverse field of view (mm)	39	39
Minimum axial gauge length (mm)	7	25
Minimum transverse gauge width (mm)	7	12.5
AVE3 resolution ( $\mu\text{m}$ )	0.5	0.5
AVE3 axial measurement accuracy ( $\mu\text{m}$ )	$\pm 1$ or $\pm 0.5\%$ of reading, whichever is greater	$\pm 3$ or $\pm 1\%$ of reading, whichever is greater
AVE3 transverse measurement accuracy ( $\mu\text{m}$ )	$\pm 1$ or $\pm 0.5\%$ of reading, whichever is greater	$\pm 3$ or $\pm 1\%$ of reading, whichever is greater
Recommended dot diameter (mm)	2-4	2-4

1. the algorithm for edge-based determination requires a reduced axial field of view

## Environmental

Table 5. *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.
Noise	Noise output does not exceed 70dB(A). This does not include noise from specimen breaks.

## Caution

**As far as possible, keep the extensometer away from exposure to conductive dust or debris, from breaking carbon fiber specimens, for example.**

Conductive dust or debris may cause a malfunction in the extensometer electronics. If this is likely to be a problem, you are advised to surround the load string with a transparent protective shield, separating it from the extensometer.

## Conformity with EU directives

Instron<sup>®</sup> declares under our sole responsibility that AVE3 and SVE3 video extensometers and associated accessories are in conformity with all relevant provisions of the following regulations:

- Low Voltage Directive 2014/35/EU
- EMC Directive 2014/30/EU
- ROHS Directive 2011/65/EU including substances added by amendment 2015/863/EU

Instron<sup>®</sup> testing systems are CE marked. A signed CE declaration of conformity is supplied with each system.

## Dimensions and weight

Dimensions of the AVE3 or SVE3 mounted on various frames are shown in [Figure 5](#) on page 28, [Figure 9](#) on page 32, [Figure 13](#) on page 36, and [Figure 16](#) on page 40. All dimensions are in mm.

*Table 6. Weights*

Equipment	Weight kg (lb)	Notes
AVE3 with light bar	3.6 - 3.85 (7.92 - 8.47)	Low weight is shortest light bar and 35 mm, 16 mm or 9 mm lens. High weight is longest light bar with 6 mm lens.
SVE3 with light bar	2.85 - 3.1 6.3 - 6.82	Low weight is shortest light bar and 35 mm, 16 mm or 9 mm lens. High weight is longest light bar with 6 mm lens.
Cable harness	1.3 - 1.35 2.86 - 3.0	Drag chain and cables only. Does not include Ethernet switch or power supply.
Mounting posts	5.35 (11.8)	Standard mounting posts

## Software compatibility

[Table 7](#) on page [20](#) lists the versions of Bluehill® that are compatible with the AVE3 and the SVE3 installed on various electromechanical testing systems.

*Table 7. Electromechanical Systems*

Testing system	Compatible software
5900 series, 3300 series	Bluehill® V4.52 or later
3400 series	Bluehill® V4.52 or later
6800 series	Bluehill® V4.52 or later
Any compatible system using the AverEdge32™ for transverse measurement (AVE3 only)	Bluehill® V4.52 or later

# Chapter 3

## Installation

---

• Initial installation . . . . .	21
• Removing and reinstalling . . . . .	22
• Specific installations . . . . .	24
• System interconnections . . . . .	44

---

For the purposes of installation on a testing machine, the AVE3 and SVE3 are identical. All references to AVE3 in the following sections also apply to SVE3.

### Initial installation

Initial installation is performed by an Instron service engineer and includes the following:

- installation of the AVE3 or SVE3 onto the vertical post assembly,
- installation of the post assembly and mounting bracket onto the testing machine
- installation of the backscreen, if you are using the AverEdge32™ configuration on an AVE3 for transverse measurement
- verification of the extensometer

The installation of the AVE3 or SVE3 on 6800 and 3400 systems requires no internal modifications. Older systems, such as 5900, require that the Strain 1 connector be adapted. If you want to use the extensometer on more than one such testing machine, these modifications must be performed on each machine.

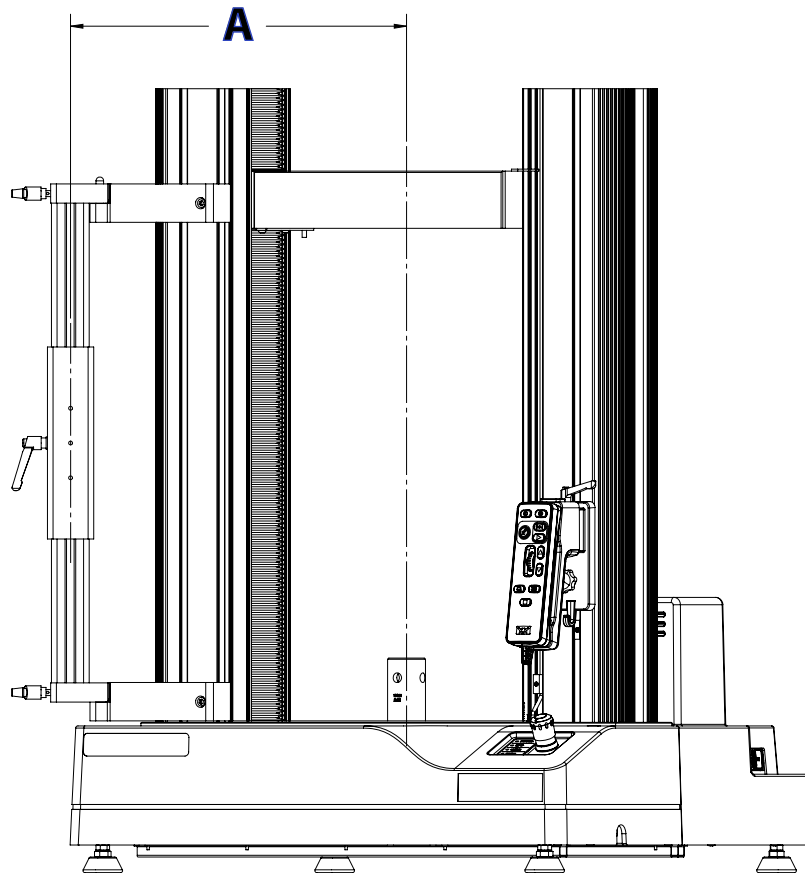


*If you are using the AverEdge32™ configuration on multiple frame types, you may require an additional custom cable. Contact Instron® for more information. For example, 3400, 6800 and 5900 frames use the standard cable; 3300 frames require the custom cable.*

## Removing and reinstalling

Lenses are configured for specific AVE3 instruments with specific mounting distances (see [Figure 2](#) on page 22). If you move the AVE3 from its primary testing system to another system, you must ensure that the mounting distances are the same (refer to [Table 8](#) on page 23). If in doubt, contact Instron<sup>®</sup> Service for advice.

Once the AVE3 is installed onto the post assembly and mounting bracket, you can remove the entire assembly and reinstall it on the same testing machine as necessary. You will need to recalibrate the AVE3 before running any tests.



*Figure 2. Mounting distance (A) shown on a dual column table model*

Table 8. AVE3 mounting distance on different testing systems

Mounting distance (mm)	Testing system
443	Single Column Table Models 68SC05, 68SC1, 68SC2, 68SC5 34SC05, 34SC1, 34SC2, 34SC5 5942, 5943, 5944 3342, 3343, 3344, 3345
443	Dual Column Table Models 68TM5, 68TM10, 68TM30, 68TM50 34TM5, 34TM10, 34TM30, 34TM50 5965, 5966, 5967, 5969 3465, 3466, 3467, 3469
555	Dual Column Floor Models 68FM100, 68FM300 34FM100, 34FM300 5982, 5984, 5985 3382
705	High Capacity Floor Models 5988, 5989
363	Environmental chambers 3119-606, 3119-609 (Internal depth 230 mm)
474	Environmental chambers 3119-607, 3119-608, 3119-610 (Internal depth 400 mm)

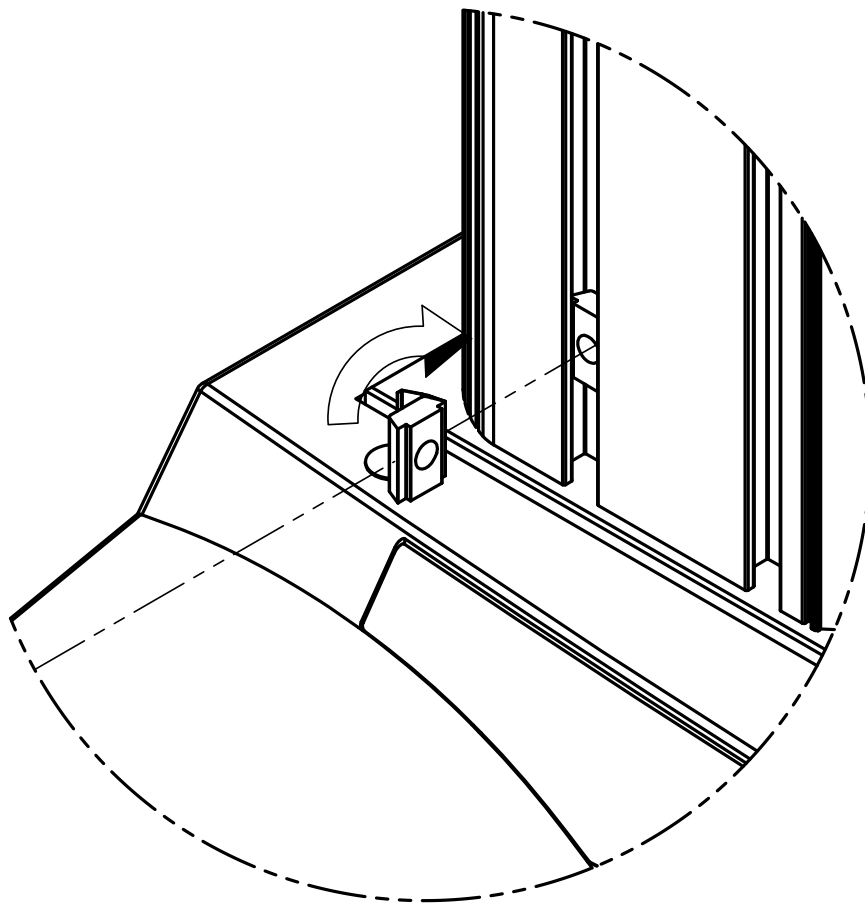
If you install the AVE3 on a different testing system, you need to create a new transducer configuration in the Admin settings in Bluehill® Universal software. Refer to the Bluehill® online help and reference for details.

If the mounting distances are not the same, you will need to purchase a new lens and have Instron® Service calibrate the new configuration. You may also require alternative mounting hardware. Contact Instron® for advice.

## Specific installations

The following sections describe the installation on a number of different testing machines. Installations on older or non-Instron machines may involve custom mounting schemes and are not covered here.

[Figure 3](#) on [page 24](#) shows the T-nut inserted in a slot in the column on the frame. These T-nuts form the anchors for the support brackets on 6800, 3400, 5900, 3300 and 5500 Series testing machines.



*Figure 3. T-nut inserts for columns*

## Electromechanical dual column testing machines

Installation on all dual column testing machines, both table models and floor models, is similar. Each type uses slightly different brackets and the brackets are mounted in different slots in the column.

### Dual column table models

[Figure 4](#) on page 26 and [Figure 5](#) on page 28 show the installation on a 68TM table model testing system. Dimensions are in mm.

This installation applies to dual column table models in the following series:

- 6800 (e.g. 68TM10, 68TM50)
- 3400 (e.g. 34TM10, 34TM50)
- 5900 (e.g. 5966, 5969)
- 3300 (e.g. 3366, 3369)
- 5500 (with appropriate electronics upgrade)

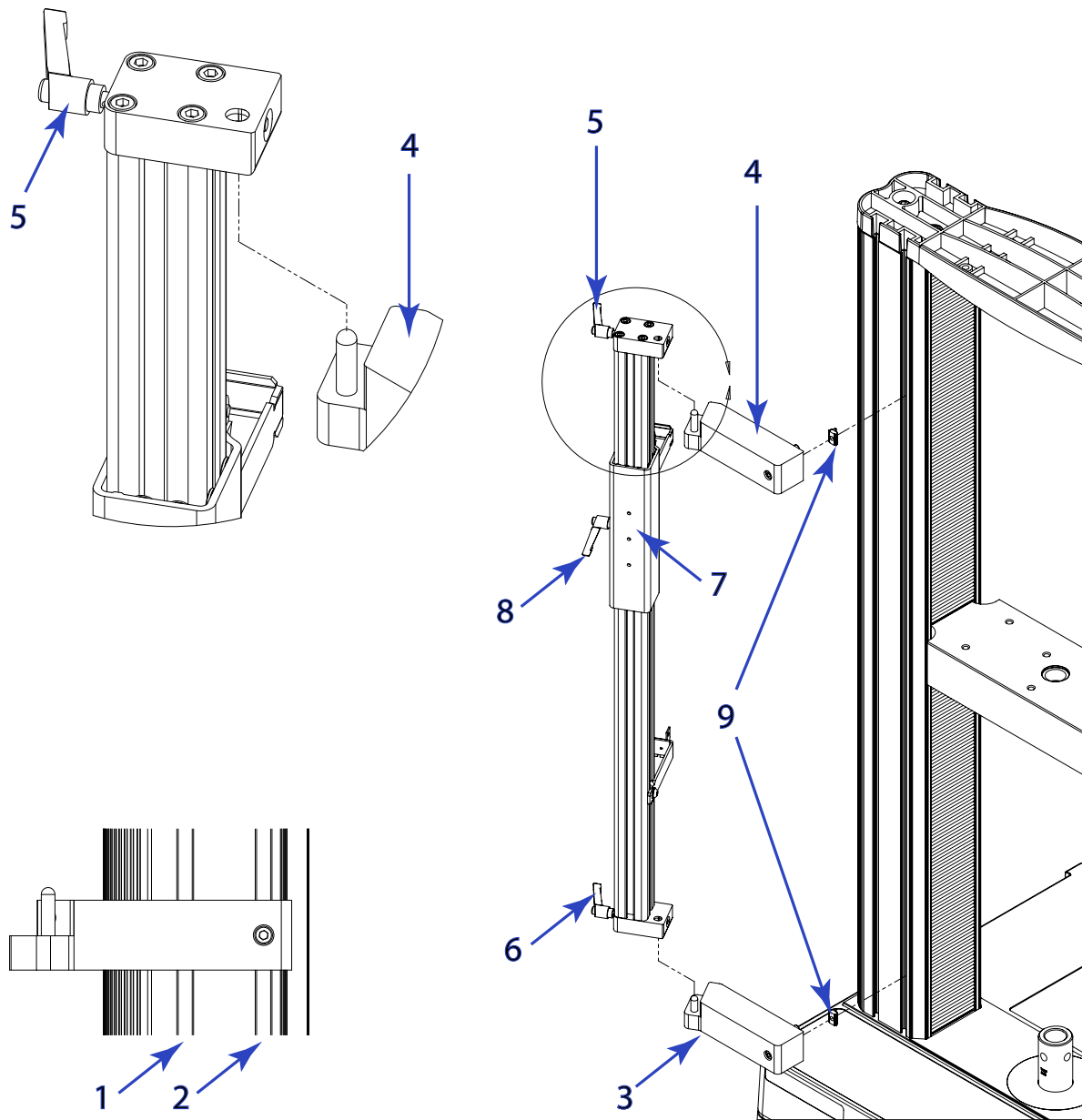


Figure 4. AVE3 on a 68TM dual column table top testing machine

Legend for Figure 4

Label	Description
1	Slot 1 in frame column
2	Slot 2 in frame column

---

Label	Description
3	Lower mounting bracket (shorter pin)
4	Upper mounting bracket (longer pin)
5	Post assembly - upper clamp
6	Post assembly - lower clamp
7	Post assembly - carriage
8	Carriage adjustment handle
9	T-nuts - inserted into the appropriate T-slot on the frame column to attach brackets

- The post assembly must be installed on the front of the left hand column on the testing machine.
- Make sure that you mount the bracket into the T-slot labeled 2 in [Figure 4](#) on page 26 to ensure proper alignment.
- Note that the upper bracket has a longer pin than the lower bracket.
- When the extensometer is not in use, you can loosen the two clamps on the post (5 and 6 in [Figure 4](#) on page 26) and lift the whole assembly clear of the mounting brackets.
- You can change the position of the carriage on the post using the carriage adjustment handle (8 in [Figure 4](#) on page 26).

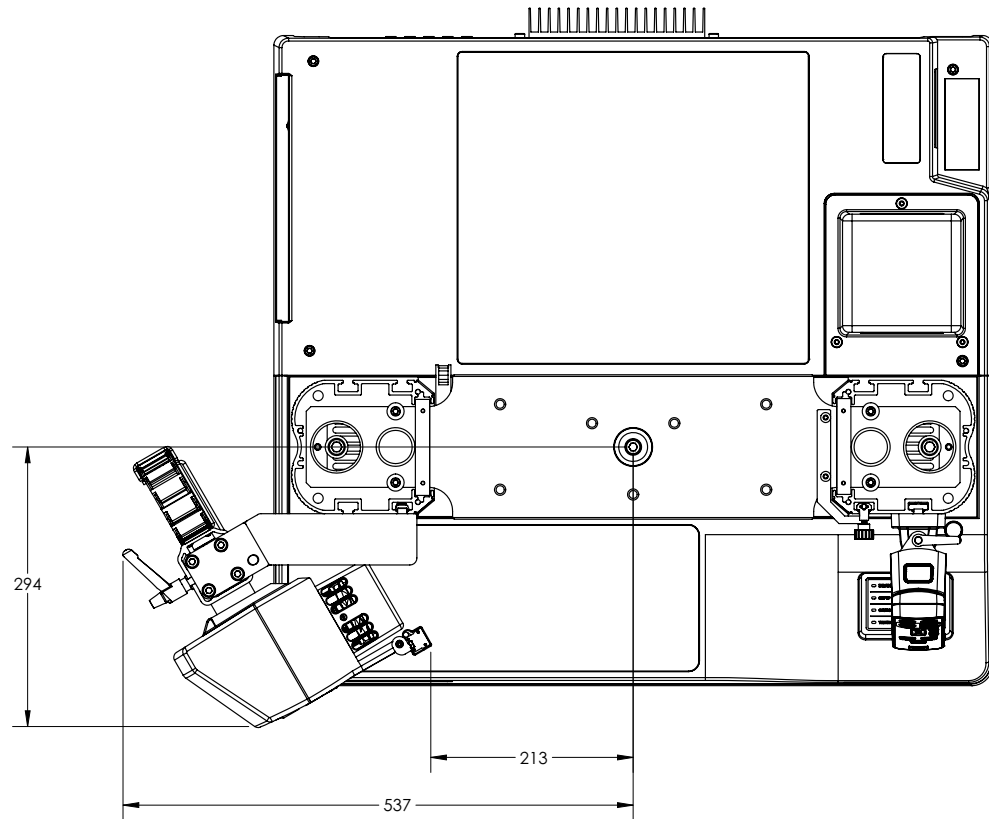
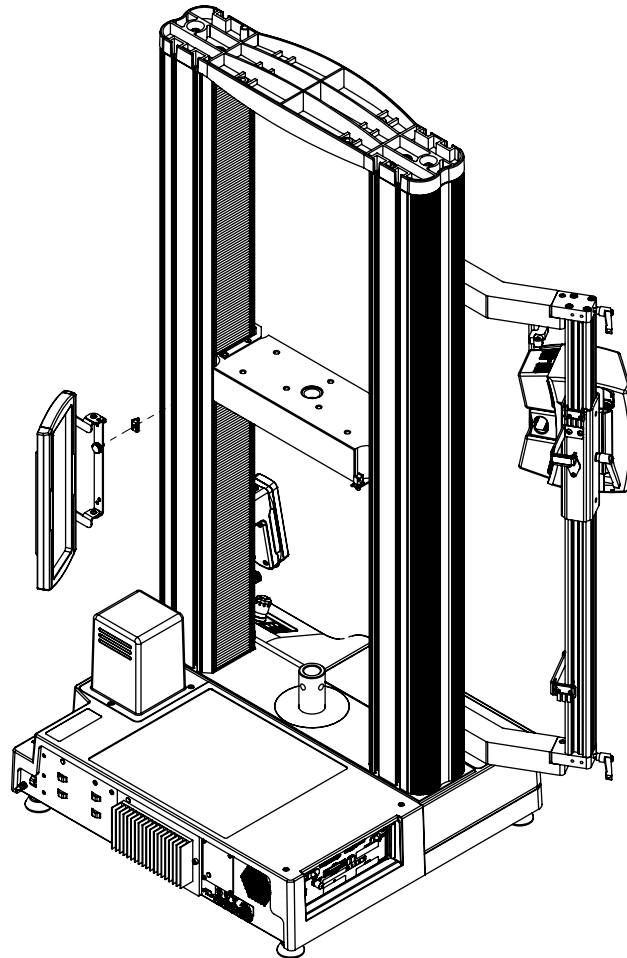


Figure 5. Footprint of AVE3 on a 68TM dual column table top testing machine

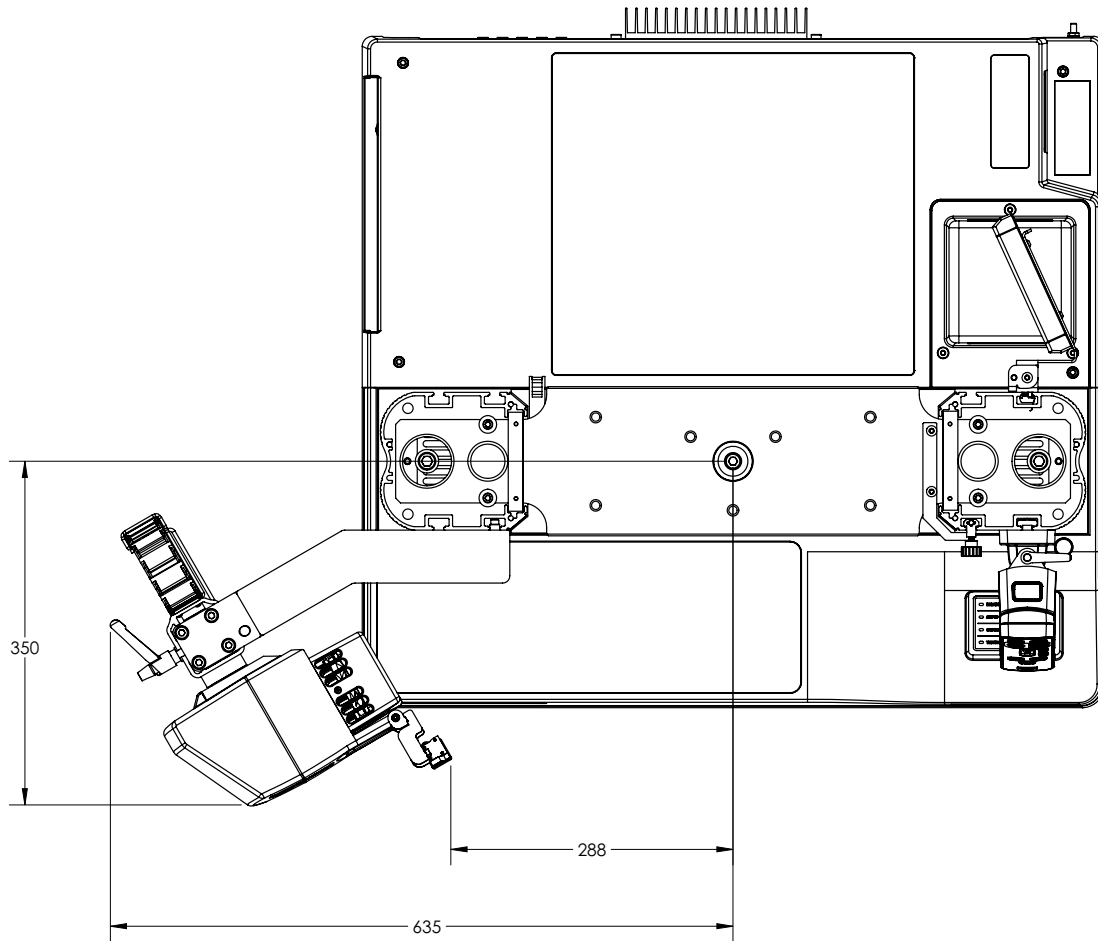
### Dual column table models - AverEdge32™ configuration

The optional AverEdge32™ configuration uses the same mounting methods as the standard configuration but a different mounting bracket and light bar position. The mounting bracket and additional back screen are shown in [Figure 6](#) on page 29 mounted on a 68TM series testing system.



*Figure 6. Installation shown on a 68TM Series testing system*

**Figure 7** on page 30 shows the footprint dimensions of the AverEdge32™ configuration on a 6800 Series testing system, including the back screen (1). Note that the mounting brackets are installed in the T-slot closest to the inner edge of the column but the back screen is installed in the T-slot closest to the outer edge of the column.



*Figure 7. Footprint shown on 6800 Series testing system*

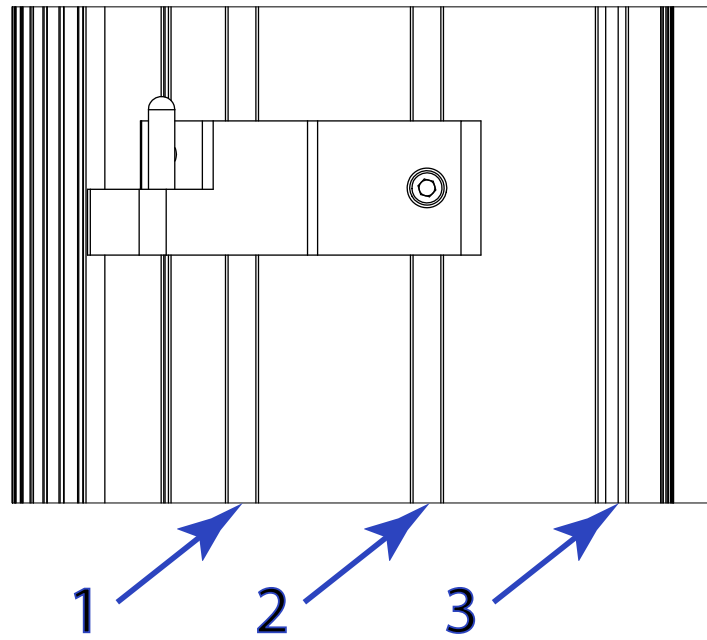
### Dual column floor models

This installation applies to dual column floor models in the following series:

- 6800 (e.g. 68FM100, 68FM300)
- 3400 (e.g. 34FM100, 34FM300)
- 5900 (e.g. 5982, 5985)
- 3300 (e.g. 3382)
- 5500 (with appropriate electronics upgrade)

The installation is the same as shown in [Figure 4](#) on page 26 for dual column table models, except that different brackets are used.

The columns on these floor models have 3 slots; refer to [Figure 8](#) on page [31](#) to ensure installation in the correct slot, slot 2.



*Figure 8. T-slots on dual column floor models*

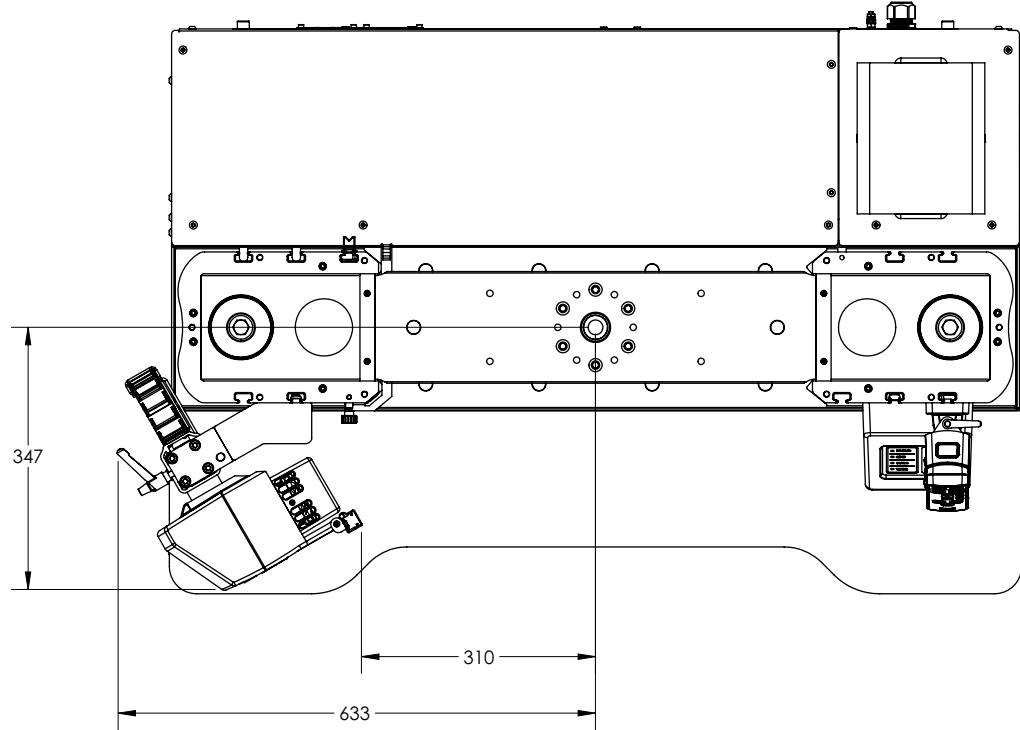
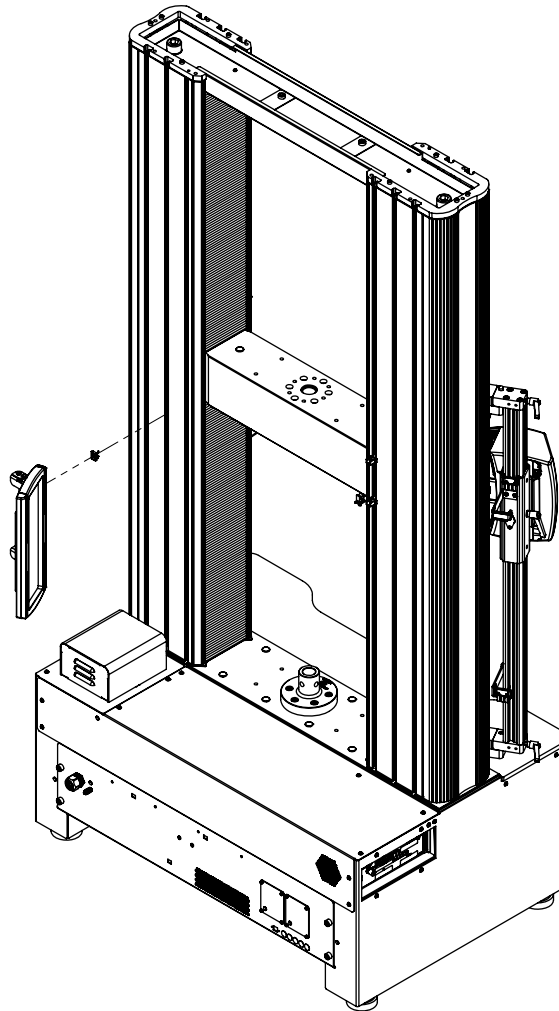


Figure 9. Footprint of AVE3 on a 68FM dual column floor model testing machine

### Dual column floor models - AverEdge32™ configuration

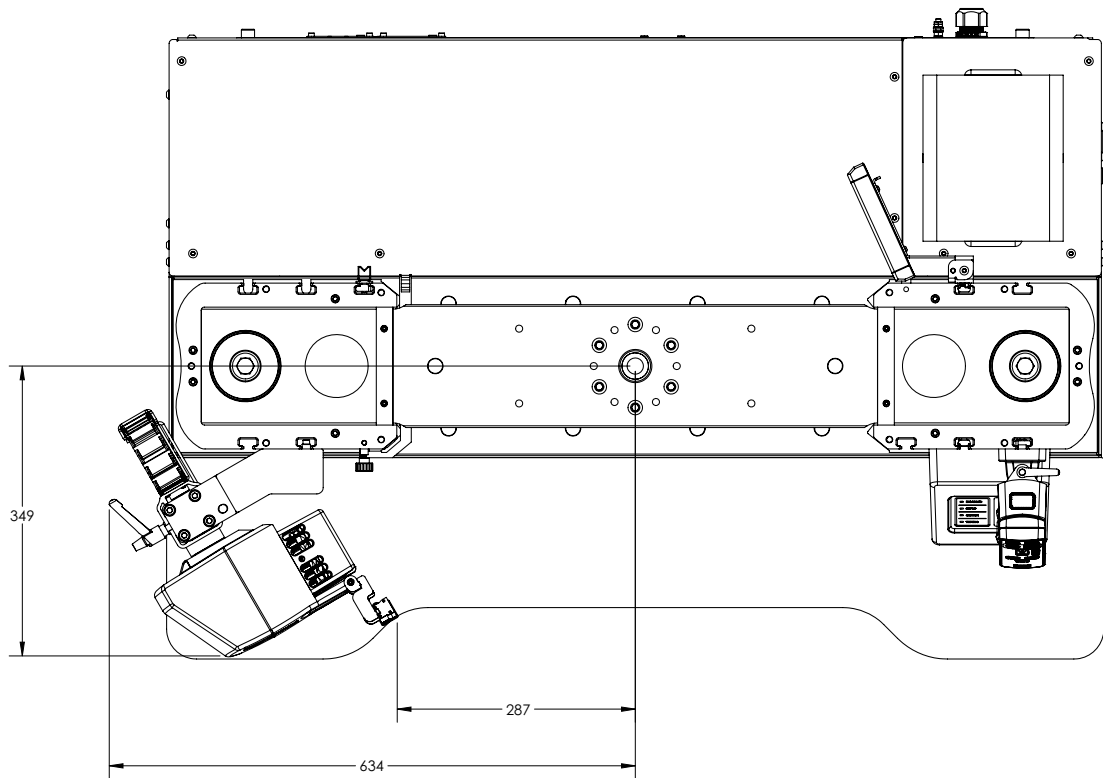
The optional AverEdge32™ configuration uses the same mounting methods as the standard configuration. The mounting bracket and additional back screen are shown in [Figure 10](#) on page 33 mounted on a 68FM Series testing system.

Make sure that you mount the bracket and the back screen into the second T-slot from the outer edge of the column to ensure proper alignment.



*Figure 10. Installation shown on a 68FM Series testing system*

Figure 11 on page 34 shows the footprint dimensions of the AverEdge32™ configuration on a 68FM Series testing system, including the back screen (1). Note that the mounting bracket and back screen are installed in the second T-slot from the outer edge of each column.



*Figure 11. Footprint shown on 68FM Series testing system*

## 5988 and 5989 High-capacity floor model testing machines

This installation applies only to the following dual column floor models:

- Model 5988
- Model 5989

The installation is the same as shown in [Figure 4](#) on page [26](#) for the dual column table model, except that different brackets are used.

The columns on these floor models have 4 slots; refer to [Figure 12](#) on page [35](#) to ensure installation in the correct slot, slot 3.

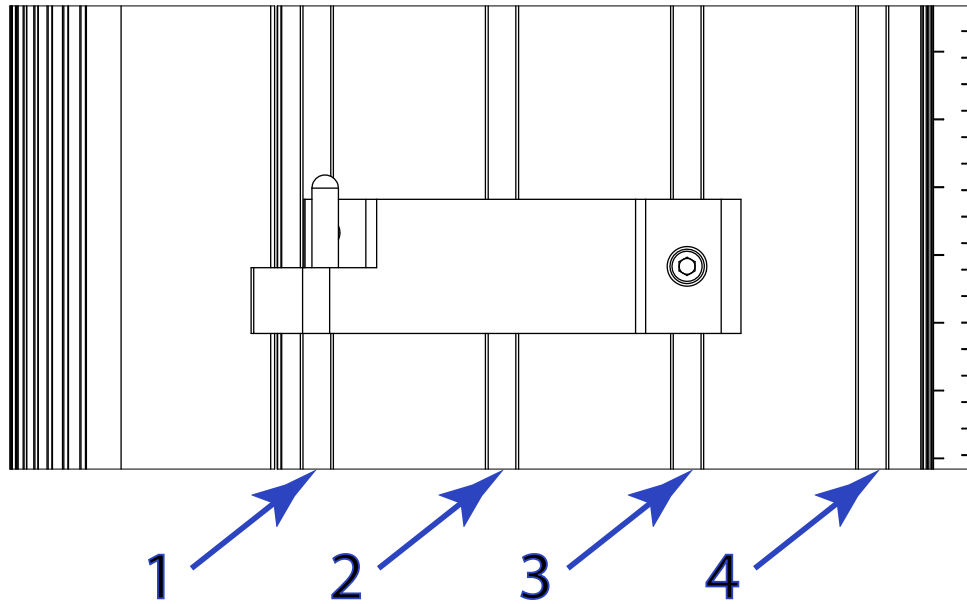


Figure 12. T-slots on 5988 and 5989 high capacity floor models

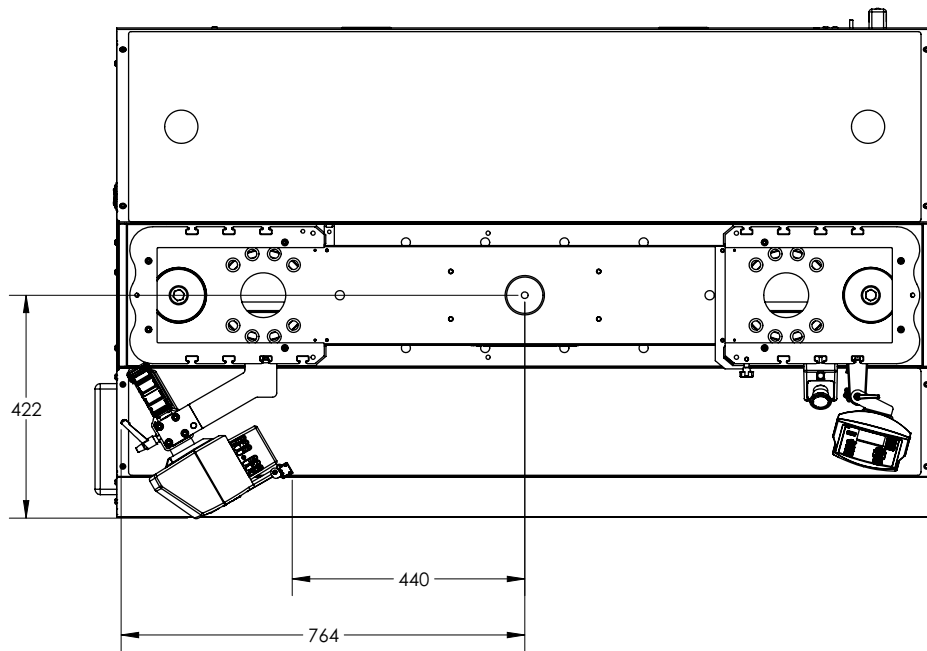


Figure 13. Footprint of AVE3 on a 5988 or 5989 floor model testing machine

## Electromechanical single column testing machines

This installation applies to single column table top machines in the following series:

- 6800 (e.g. 68SC1, 68SC5)
- 3400 (e.g. 34SC1, 34SC5)
- 5900 (e.g. 5943, 5944)
- 3300 (e.g. 3343, 3345)

Figure 14 on page 37 and Figure 16 on page 40 show the AVE3 installed on a 68SC single column testing machine. Dimensions are in mm.

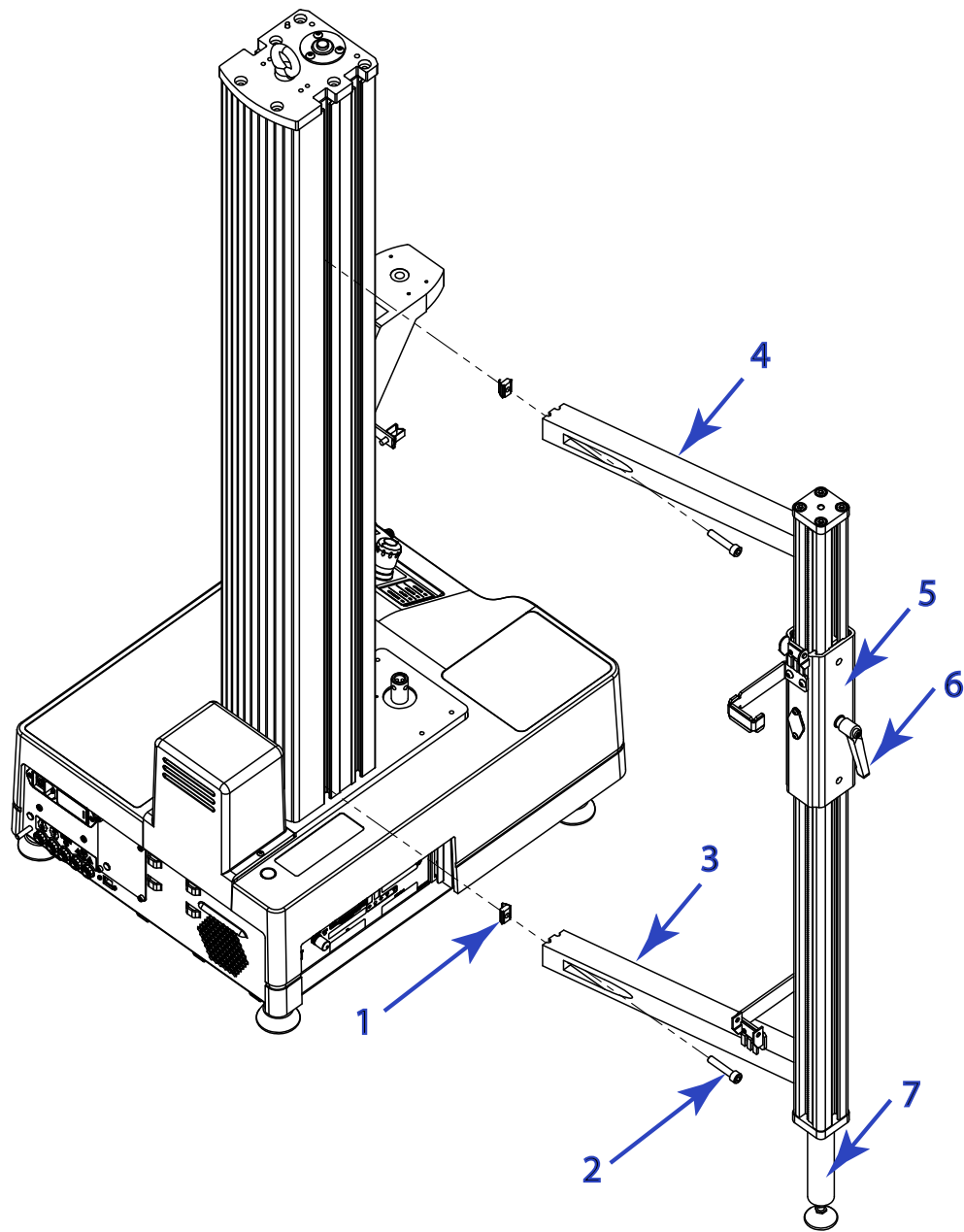
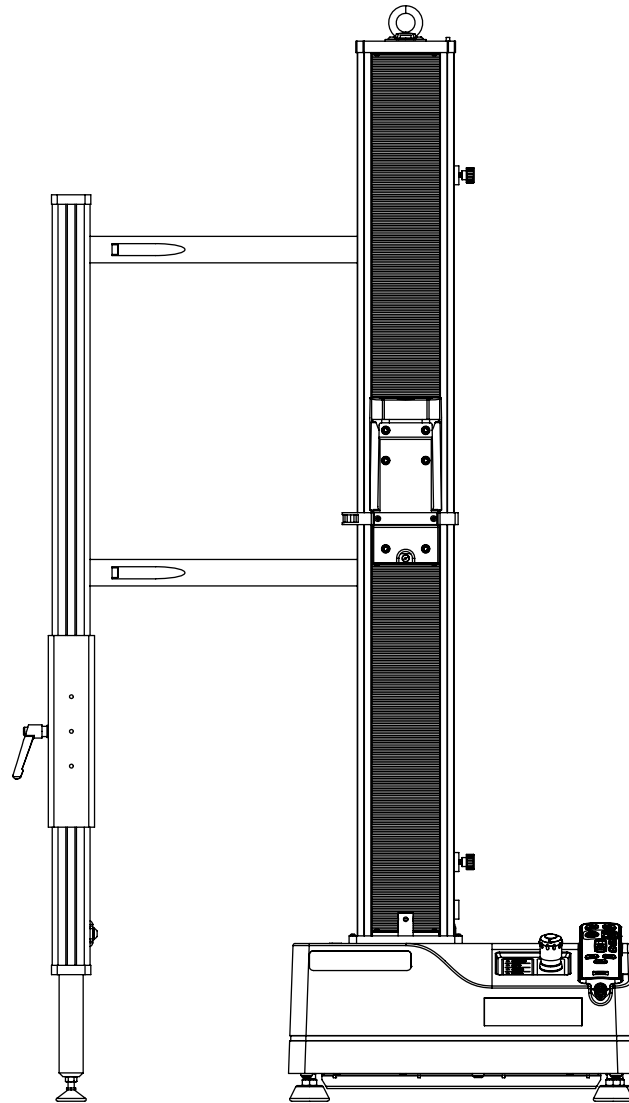


Figure 14. AVE3 on a 68SC single column testing machine

Legend for [Figure 14](#)

Label	Description
1	T-nuts - inserted into the appropriate T-slot on the frame column to attach brackets
2	Securing screws
3	Lower mounting bracket
4	Upper mounting bracket
5	Post assembly - carriage
6	Carriage adjustment handle
7	Post support assembly with adjustable foot

- Make sure that you mount the bracket into the second T-slot from the front of the column to ensure proper alignment.
- The preferred positions of the brackets are shown in [Figure 14](#) on page 37. If the carriage needs to be positioned in the lower half of the post, the brackets may be positioned as shown in [Figure 15](#) on page 39.
- Use the adjustment nut on the support assembly to move the foot so that it is in contact with the table.
- You can change the position of the carriage on the post using the carriage adjustment handle (6 in [Figure 14](#) on page 37).



*Figure 15. Alternate positioning of mounting brackets*

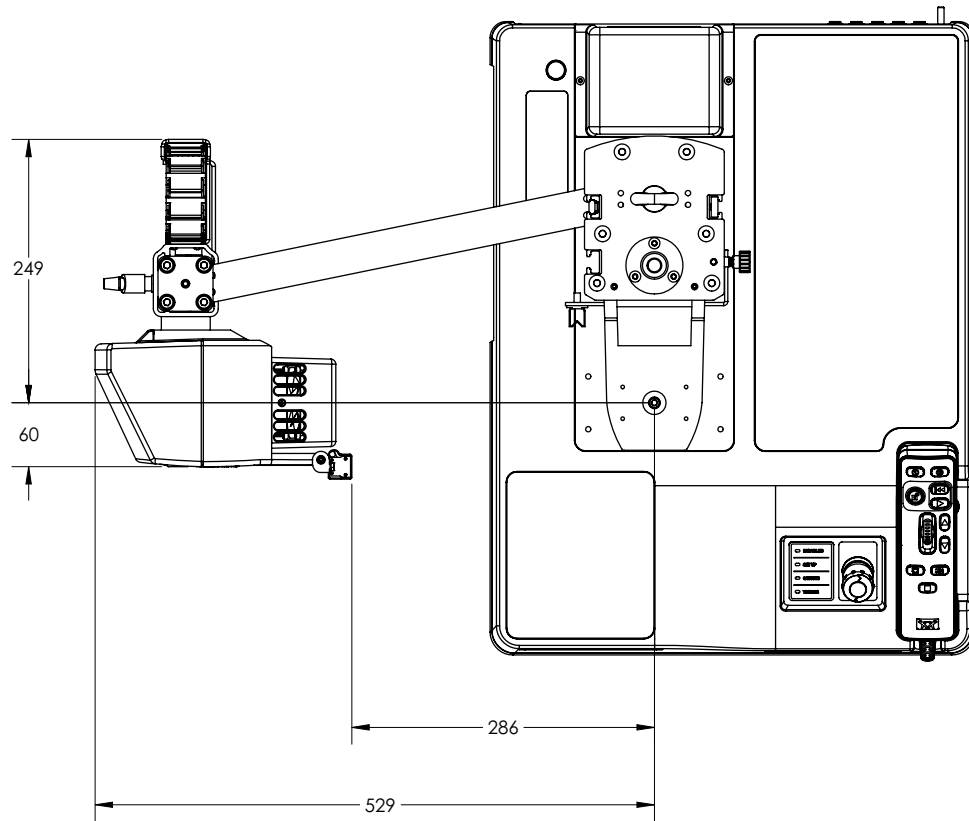


Figure 16. Footprint of AVE3 on a 68SC single column testing machine

## Installation including environmental chambers

Instron<sup>®</sup> Service will install the appropriate hardware on the environmental chamber.

The hardware includes a swing mount for the extensometer and mounting post so that the entire assembly can be removed from the chamber when switching between ambient testing and testing inside the chamber.

[Figure 17](#) on page [41](#) shows how the extensometer and post assembly (1) mounts onto a swing plate (2) which attaches to the front of the chamber.

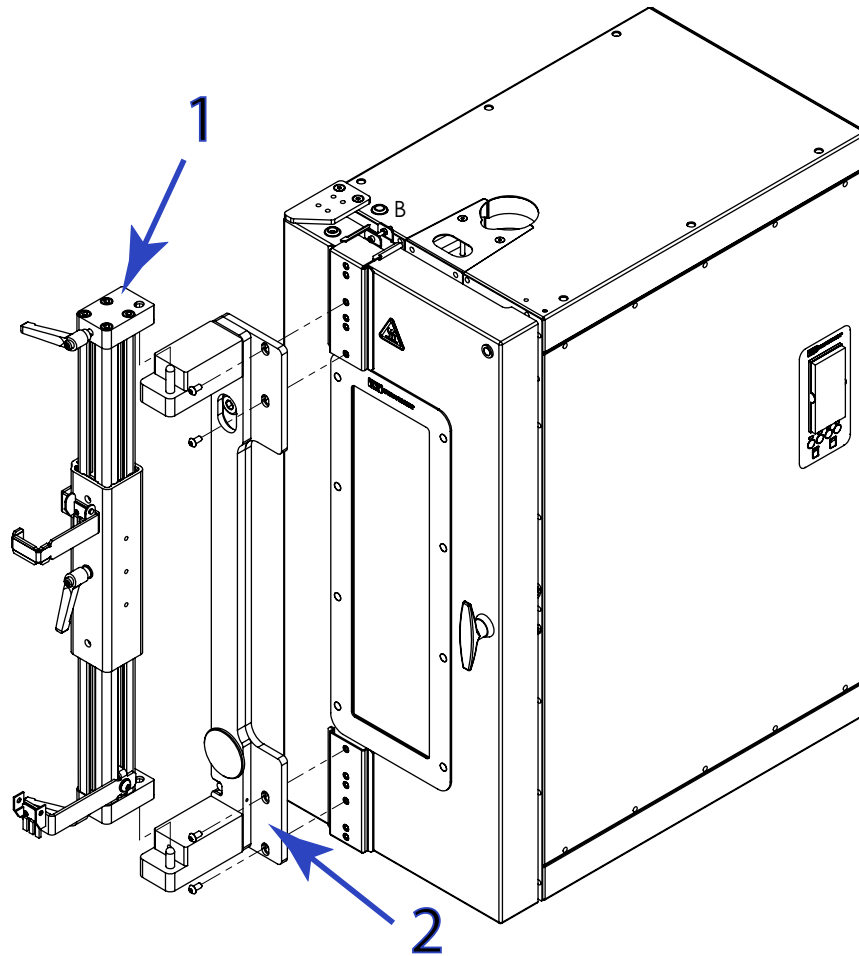


Figure 17. Environmental chamber mounting

Figure 18 on page 42, Figure 19 on page 43 and Figure 20 on page 44 show the stages of removing the extensometer and post assembly and the swing plate from the chamber.

1. Remove the extensometer and post assembly from the swing plate. The attachment mechanism is the same as for attachment to the column on a load frame.
2. Turn knob (no. 1 in Figure 18) counterclockwise to loosen it.
3. Swing the lower part of the swing plate away from the knob (indicated by no. 2 in Figure 18).
4. Lift the swing plate as shown in Figure 19.
5. Lift the swing plate away from the chamber as shown in Figure 20.

6. Remove slot insulators (no. 1 in [Figure 20](#)) and open chamber door (no. 2 in [Figure 20](#)) before pushing the chamber backwards out of the workspace.

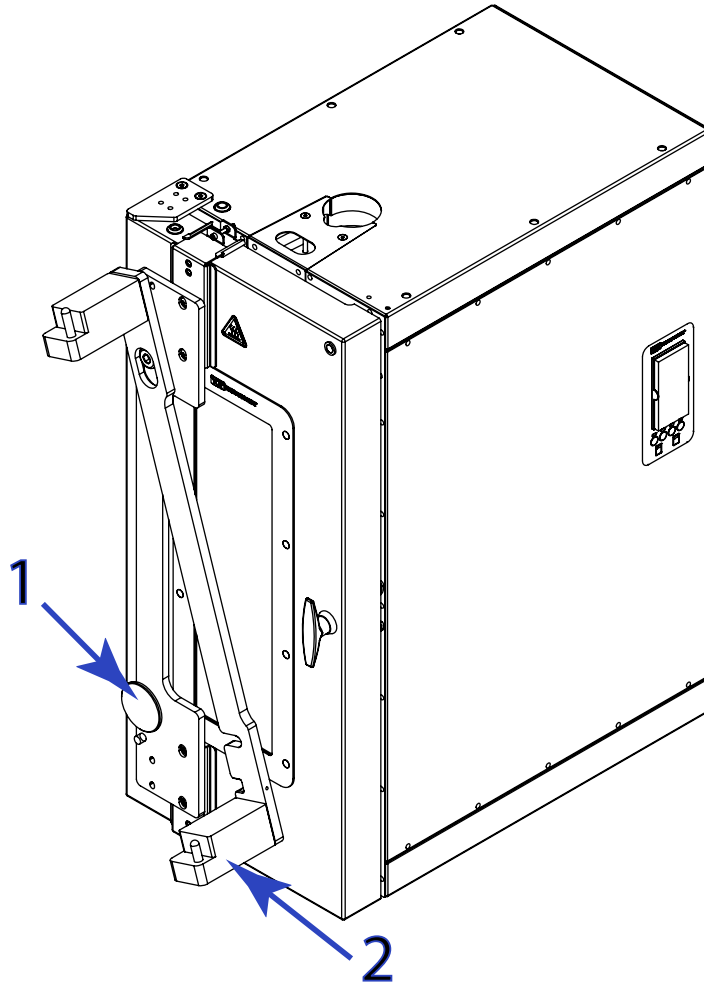


Figure 18. Removing the swing plate - stage 1

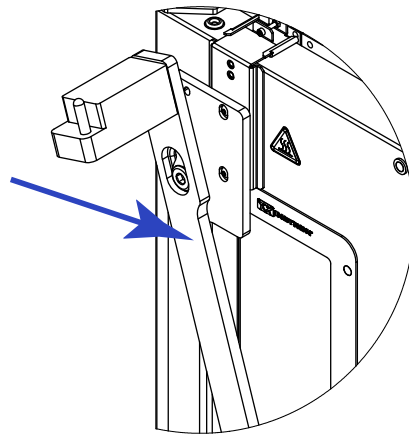
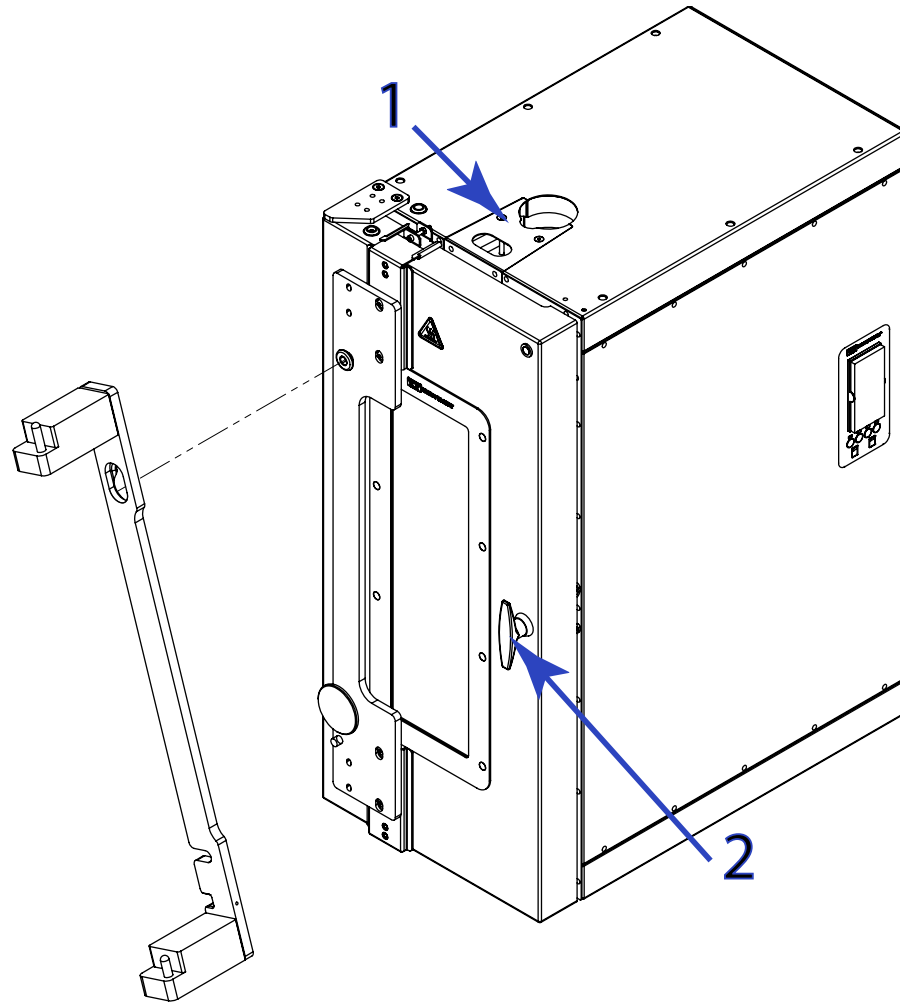


Figure 19. Removing the swing plate - stage 2



*Figure 20. Removing the swing plate - stage 3*

Reinstallation of the swing plate and extensometer and post assembly is a reversal of the above procedure.

## System interconnections

[Figure 21](#) on page 45 shows an overview of the interconnections between the video extensometer, the controller on the load frame and the computer running the control software.

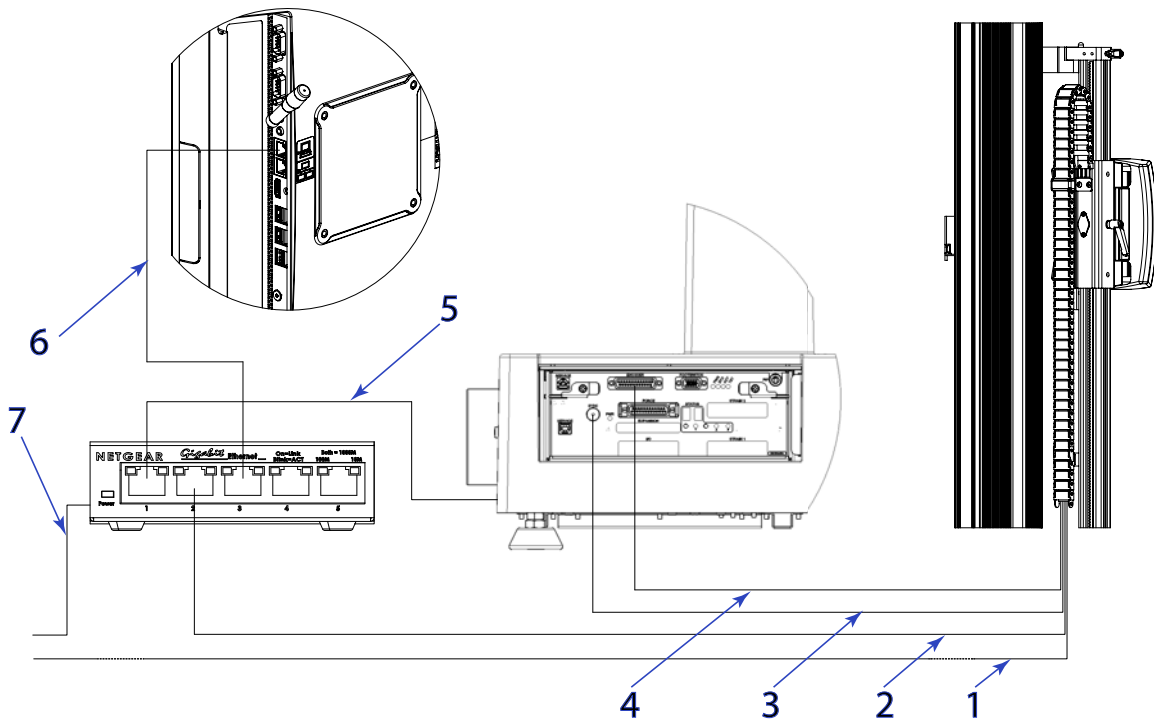


Figure 21. Video extensometer system interconnections (6800 shown)

Label	Description
1	Connects extensometer to mains power
2	Connect extensometer to Ethernet switch
3	Only required if using DIC Replay. Connect extensometer to <b>SYNC</b> port on the frame controller panel
4	Connect extensometer to appropriate strain connector on the frame controller panel. Refer to <a href="#">Table 9</a> on page 46 for specific connectors on different frame types.
5	Connect Ethernet connector on frame controller panel to Ethernet switch
6	Connect Ethernet switch to computer
7	Connect Ethernet switch to mains power

*Table 9. Video extensometer adapter cables*

<b>Frame/ Controller</b>	<b>Video extensometer adapter</b>	<b>Connection location on controller</b>
6800 and 3400	None	Connector labeled <b>ENCODER</b> .
5900 and 3300	44-way connector to 25-way connector	Connector labeled <b>ENCODER STRAIN 1</b> .

# Chapter 4

## Mark specimens

---

• Overview.....	47
• Marking tips.....	48
• Applying ink dots.....	48
• Troubleshooting ink dots.....	49

---

### Overview

The most common method of marking uses white or black ink dots. Marking templates for various gauge lengths are provided with the extensometer. White and black marking pens are also provided.



*Edding marking pens can be used at high temperatures and at ambient temperatures. Schneider pens are for use at ambient temperatures only.*

When deciding how to mark your specimens, you must consider:

- the mark material - inks and tape dots both contain solvents that may affect the strength of the specimen
- the mark color - the color of the mark must contrast with the color of the specimen as seen by the camera, which uses polarized light
  - in most cases, white marks produce the best results, even on specimens that appear white to the human eye
  - white marks produce the best results on reflective metal specimens and dark color plastic specimens
  - if white causes problems, the best alternative is black, provided it contrasts sufficiently with the specimen background color, as seen by the camera, which uses polarized light
  - for most applications, you should not use silver marks as these appear black to the camera, although they may be effective on white specimens if white marks cause problems

- the shape and size of the mark must be compatible with the profile of the specimen
- applying the marks to the specimen so that they stay in place and are visible to the camera throughout the test

If you are testing to a particular standard, gauge length and gauge width are often pre-defined and you must apply marks as specified in the standard.

## Marking tips

- Test your specimens as soon as possible after applying the marks to minimize the possible effects of solvent from inks or adhesive on the specimen properties
- If your specimen breaks at the point where the mark is applied, consider an alternative marking method
- If your specimen undergoes long extension during testing, make sure that the marks are still visible at the end of the test

Dots must be used if you are measuring both axial and transverse strain. Lines can be used for axial measurement only.

## Applying ink dots

The minimum recommended diameter for ink dots is 2mm. The maximum recommended diameter is 4mm.

The marking templates provided are designed to be used with the marking pens provided. These pens have spring-loaded tips that prevent too much pressure being applied which would accelerate damage to the tip. Each template has several sets of holes arranged to produce 3mm diameter dots at commonly-used axial gauge lengths and transverse gauge widths.

1. Ensure that the marking template is clean and has no residue of a previous ink color that could cause cross-contamination and reduce contrast between the dot and the specimen.

If you are continuously swapping between black and white ink, it is recommended that you purchase an additional marking template.

2. Locate the holes in the template that match your chosen gauge length.
3. Select the appropriate ink color.

4. Make sure the specimen is clean and free from grease.
5. Lay the specimen on a flat surface and position the template over it so that your chosen holes are located an equal distance from the center line of the specimen. The template is shaped into sections of different widths to aid positioning on the center line on specimens of different widths. Make sure the template is positioned so that the printed text on the template is readable. The silicon backing on the template helps to keep it in place during marking.
6. Apply the ink through the holes making sure that the dots are round and of an even density:
  - a. Keep the marking pen upright.
  - b. Apply minimum pressure to the pen.
  - c. Place the pen in the center of the hole, then run the pen around the edge of the hole before lifting it.
  - d. Apply all the marks without disturbing the template.
  - e. Apply sufficient ink to make a dense mark but not so much that the ink runs.
7. Carefully remove the template by lifting it vertically, taking care not to smudge the marks.
8. When the ink is dry, inspect the dots to make sure they are:
  - round, without any wicking or bleeding
  - opaque and of an even density

## Troubleshooting ink dots

- Irregular dots can be caused by:
  - too much or too little ink
  - grease or dirt on the specimen
- Smudged dots can be caused by:
  - too much ink
  - careless removal of the template after marking
  - touching the mark before the ink is dry
- Bleeding or wicking of the ink dots can be caused by:

- bleeding can occur when a specimen surface that has been prepared using an abrasive causes the wet ink to be drawn, by capillary action, into the grooves made by the abrasive.
- wicking can occur when testing woven specimens and the wet ink is drawn, by capillary action, into the fibers of the specimen.

If bleeding or wicking is a consistent problem, you should consider using tape dots.

- Loss of detection of ink dots during tests can be caused by:
  - change of specimen color during testing so that contrast between the dot and the specimen is lost - consider using a different ink color
  - fading of the dot due to excessive extension during the test - consider using tape dots
  - flaking of the ink from the specimen - make sure the ink is compatible with the specimen material and consider testing the specimen while the ink is still wet
  - the dot moves outside the field of view of the lens because specimen extension was larger than expected - use a lens with a larger field of view

# Chapter 5

## System setup

---

• Set up hardware .....	51
• Bluehill® Universal Software .....	55

---

### Set up hardware

#### Warning



Set appropriate mechanical limits on the load frame before starting any tests. If you are using an 8800 or ElectroPuls system, you set these limits via the Console software.

If the extensometer loses track of the marks on the specimen during a test, unexpected crosshead or actuator movement can occur. It is very important that you limit any such movement.

The AVE3 and SVE3 can be used on a wide range of testing machines. Newer machines, in combination with Bluehill® or WaveMatrix™ software, are designed to handle the loss of strain signals due to loss of marks in a controlled manner. If you are not using Bluehill® or WaveMatrix™ software or are using an older testing machine, these systems may not be present. It is therefore imperative that you set these limits.

### Extensometer lenses

- The extensometer lenses are fixed focus.
- The kinematic lens mount ensures accurate repeatable removal and installation.
- Lenses have a unique identifier which can be read by the software. When you install a lens, the software identifies it and restores the stored factory calibration.
- If a part is replaced, or if you purchase a new lens, a new factory calibration is required. Contact Instron® for advice.
- You cannot refocus the lens. If you need a different working distance, you need to use a different lens.

Depending on your testing machine, lenses of different focal lengths are available for use with the video extensometer. The field of view achieved by a particular lens depends upon:

- focal length of the lens
- distance between the lens and the specimen

On any one testing machine, the distance between the lens and the specimen is fixed, but that distance is different for different testing machines.

Lens focal length (mm)	Nominal field of view (mm)		
	Table model testers (e.g. 68SC and 68TM)	Floor Model testers (e.g. 68FM)	High-capacity floor model testers (e.g. 5988, 5989)
35	85	112	150
16 (standard)	202	261	343
9	367	477	627
6	522	685	not suitable

## Caution

---

**When removing or installing a lens, do not adjust the focus, aperture or set screws on the lens. Doing so invalidates the factory calibration.**

To examine and, if necessary, change the lens:

1. Remove the lens cover (AVE3 only; there is no lens cover on the SVE3) by gently pulling it away from the lens (see [Figure 22](#) on page 53). You can now read the focal length of the lens printed on the body.

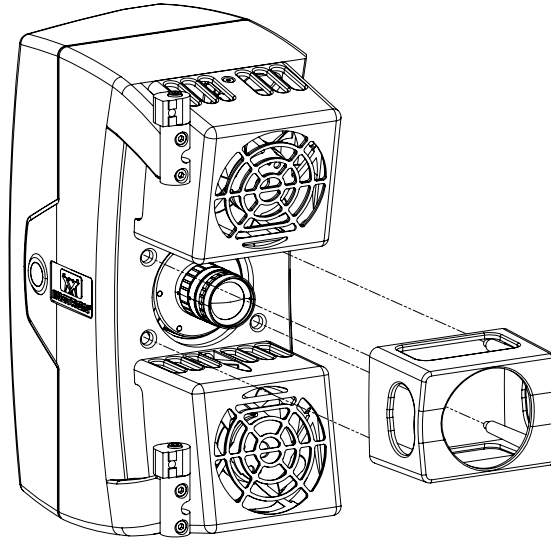


Figure 22. Lens cover

2. If you need to change the lens, pull gently on the lens to separate it from the lens holder and store it in the case provided.
3. To install a new lens, carefully align it so that the connector that allows self-identification on the lens will align with the equivalent connector in the lens mount on the instrument, as shown by the arrows lines in [Figure 23](#) on page 54.

The lens and lens mount have matching magnets for attachment. Ensure that the lens is fully seated in place.

4. Replace the lens cover (AVE3 only), shown in [Figure 22](#) on page 53.
5. If you have changed the lens, check the calibration and if necessary recalibrate the configuration.

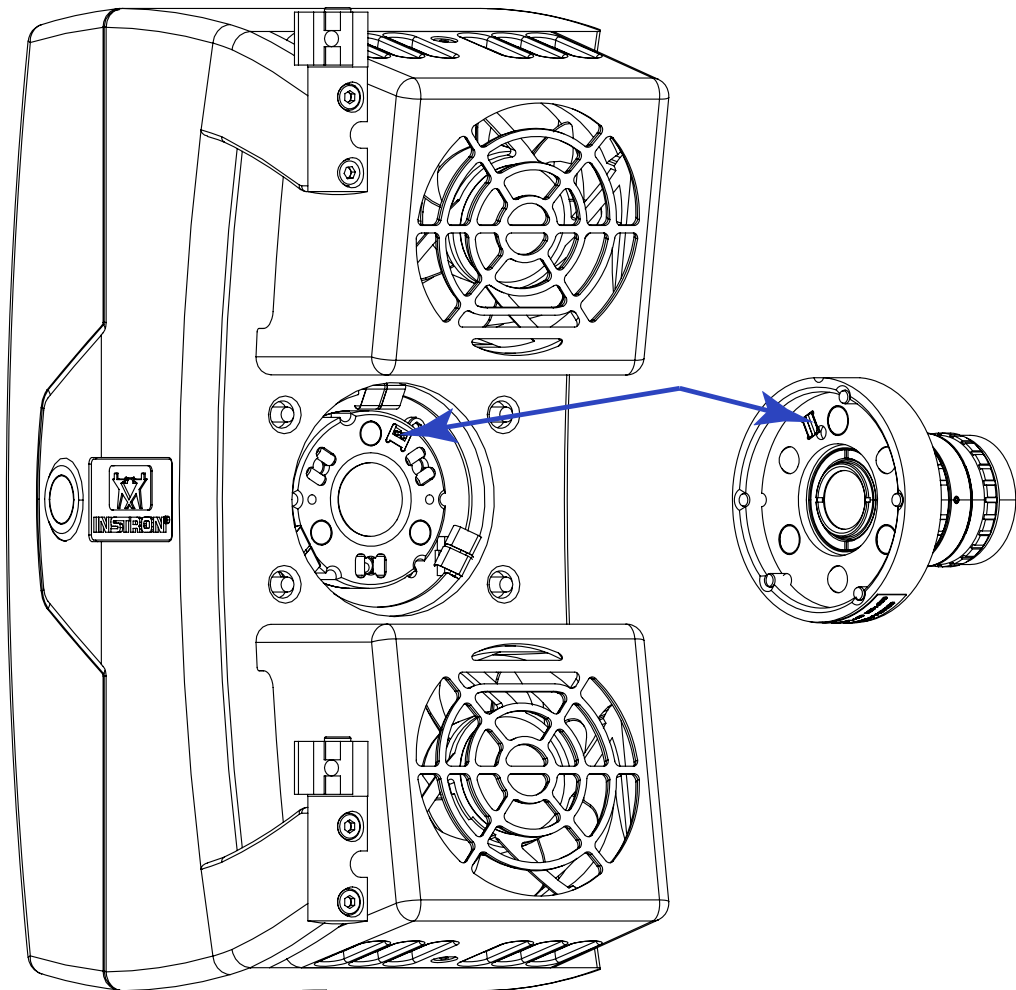


Figure 23. Lens mount and lens

### AverEdge32™ configuration

The AverEdge32™ configuration changes the distance between the lens and the specimen compared to the standard configuration. The field of view for each lens is therefore different (refer to [“AverEdge32™ Mounting Configuration”](#) on page 17).

The values are the same for all supported frame types, both table models and floor models.

Only the 16 mm lens supports use of the edge-based method for measuring transverse strain.



The high capacity floor model testers, 5988 and 5989, are not supported in this configuration.

## Set up the load string

Make sure the orientation is correct with respect to the camera on the video extensometer. You will probably need to rotate the load cell mounting, any adapters, and the base adapter so that the calibration bar and the specimen are facing the camera.

### Caution

As far as possible, keep the extensometer away from exposure to conductive dust or debris, from breaking carbon fiber specimens, for example.

Conductive dust or debris may cause a malfunction in the extensometer electronics. If this is likely to be a problem, you are advised to surround the load string with a transparent protective shield, separating it from the extensometer.

## Bluehill® Universal Software

The following tables list the connections, requirements and configuration details for each testing system operating with Bluehill®.

Table 10. 3400 and 6800 systems (including 5500 systems with appropriate electronics upgrade)

Connections	Axial and transverse signals via Encoder connector.
Software requirements	Requires Bluehill Universal® V4.52 or later.
Recognition and configuration in Bluehill® software	Video extensometer recognition. No configuration required in <b>Admin</b> tab.
Compatibility with DIC Replay	Available option.

Table 11. 5900 systems

Connections	Axial and transverse signals via Strain 1 connector to encoder.
Software requirements	Requires Bluehill Universal® V4.52 or later.
Recognition and configuration in Bluehill® software	Video extensometer recognition. No configuration required in <b>Admin</b> tab.
Compatibility with DIC Replay	Available option.

*Table 12. 3300 systems*

Connections	Axial signals via Strain 1 connector to encoder.
Software requirements	Requires Bluehill Universal <sup>®</sup> V4.52 or later.
Recognition and configuration in Bluehill <sup>®</sup> software	Strain device recognition. Requires selection of appropriate device in <b>Admin</b> tab.
Compatibility with DIC Replay	Available option.

# Chapter 6

## Calibration and Calibration Check

---

• Factory calibration . . . . .	57
• Calibration . . . . .	58
• Calibrate the extensometer. . . . .	80
• Run a calibration check . . . . .	82
• Additional calibration requirements for DIC Replay . . . . .	82

---

The calibration procedure is designed to be as simple as possible for the operator. In addition to a full calibration, you can run a quick calibration check.

- Calibration - calibration of a particular transducer configuration which is saved and retrieved whenever that transducer configuration is used as part of a test method.

Calibration is typically performed at initial installation and then repeated after a specified time interval or when the extensometer is moved.

- Calibration check - a one-click process that checks that all components and parameters that were present at the time of the original calibration are still present and that the saved calibration is still valid.

You can perform a calibration check at any time, typically you might perform the check at the start of a testing session.

### Factory calibration

This procedure is normally carried out at the factory with all the associated lenses purchased with the instrument. It calibrates the entire field of view of the camera.

It is also known as “intrinsic” calibration as it calibrates all components internal to the camera.

If a part of the extensometer is replaced, or if you purchase a new lens, a new factory calibration is required. Contact Instron® for advice.

## Calibration

This calibration is initially carried out on-site by Instron<sup>®</sup> Service as part of the system installation.

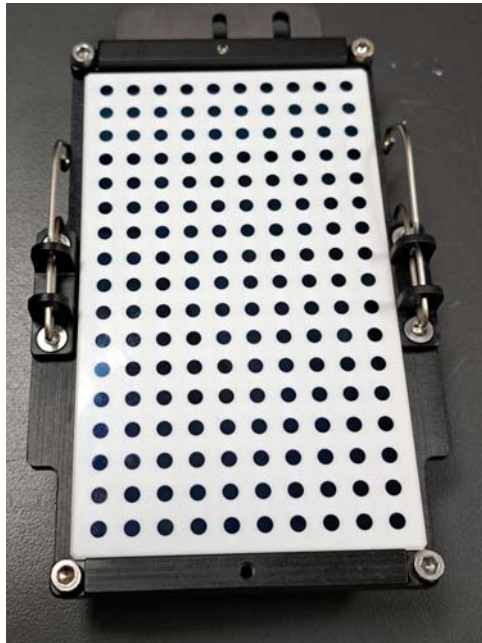
After the initial installation, you should perform the calibration periodically, depending on your testing workload and frequency. Refer to [“Calibrate the extensometer”](#) on page 80 for a list of situations where you should perform a calibration.

The on-site calibration takes into account the relative position of the camera with respect to the specimen being tested.

It is also known as “extrinsic” calibration as it calibrates the camera with respect to components external to the camera.

A factory calibration must have been performed before this calibration can be attempted.

This procedure is carried out on the testing system using a small calibration plate (see [Figure 24](#) on page 58 and [Figure 25](#) on page 59).



*Figure 24. Top view of calibration plate with clips attached*

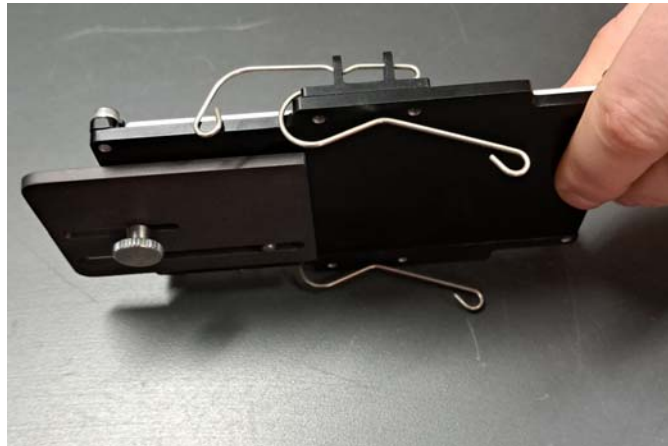


Figure 25. Side view of calibration plate with clips attached

You attach the plate to the specimen using the spring clips provided.

If your specimen is not capable of supporting the calibration plate, you can attach the calibration plate to a holder. The plate holder can be installed directly in the load string, without grips installed, or clamped in the grips.

Different testing fixtures, such as bend fixtures and compression platens, require different mounting schemes for the calibration plate. Refer to [Table 13](#) on page 59 below for more details.

Table 13. Calibration plate mounting options

Mounting	Details
Directly on specimen Refer to <a href="#">“Attach the calibration plate to a specimen”</a> on page 63	Spring clips provided in ancillary parts are suitable for: <ul style="list-style-type: none"> <li>• flat specimens with specimen thickness of 15 mm or less</li> <li>• round specimens with specimen diameter of 20 mm or less</li> </ul> For larger specimens contact Instron® for larger clips. For specimens greater than 20 mm thick, you will need to use the optional Position Adjustment Plate (refer to <a href="#">“Optional Position Adjustment Plate”</a> on page 76).
Plate holder Refer to <a href="#">“Attach the calibration plate to a plate holder”</a> on page 65	The calibration plate holder may be used if the specimen cannot support the weight of the calibration plate. The holder is mounted in the grips in the same location as the specimen.

Table 13. Calibration plate mounting options (Continued)

Mounting	Details
Clevis adapter (Side 1) Refer to “ <a href="#">Attach the calibration plate to a plate holder</a> ” on page 65	Available as an option and is used with Side 1 facing the AVE3 if the testing fixture is unable to grip the plate holder. The clevis adapter positions the calibration plate in the center of the load string.
Clevis adapter (Side 2) Refer to “ <a href="#">Attach the calibration plate to a plate holder</a> ” on page 65	Available as an option and is used with Side 2 facing the AVE3 when a bend fixture is in use. The clevis adapter positions the calibration plate in the same plane as the deflectometer on a bend fixture.
Compression platen Refer to “ <a href="#">Attach the calibration plate to a compression platen</a> ” on page 73	The calibration plate is mounted to a fixture on the front of the compression platen. This configuration requires the use of the optional Position Adjustment Plate (refer to “ <a href="#">Optional Position Adjustment Plate</a> ” on page 76) if the platen diameter is greater than 20 mm.

The following sections describe how to attach the spring clips to the calibration plate and how to install the plate onto a specimen, a plate holder, or other fixture.

## Install spring clips onto the calibration plate

If you want to run a calibration or a calibration check, you must use the small calibration plate.

The calibration plate is supplied with two sets of spring clips to be used to attach it to a specimen. One set of clips (like those shown in [Figure 26](#) on page 61) are designed to be used on rectangular specimens of varying thicknesses. The other set (like those shown in [Figure 27](#) on page 61) are designed to be used with round specimens of varying diameters.

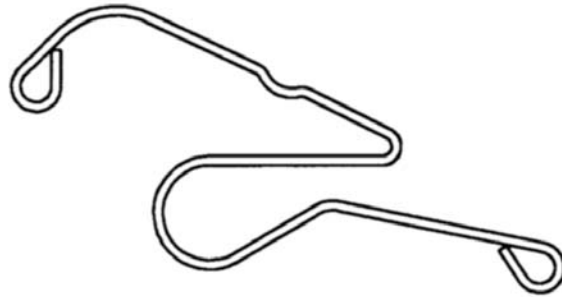


Figure 26. *Clip used for rectangular specimens*

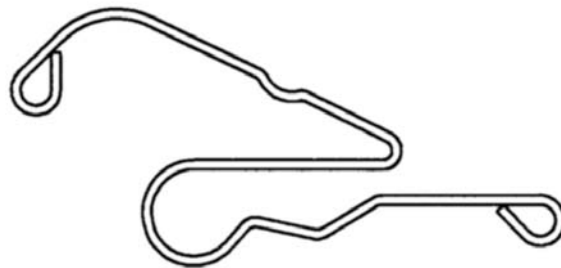


Figure 27. *Clip used for round specimens*

Figure 28 on page 62 shows two spring clips like the one shown in Figure 26 on page 61 installed on the calibration plate.

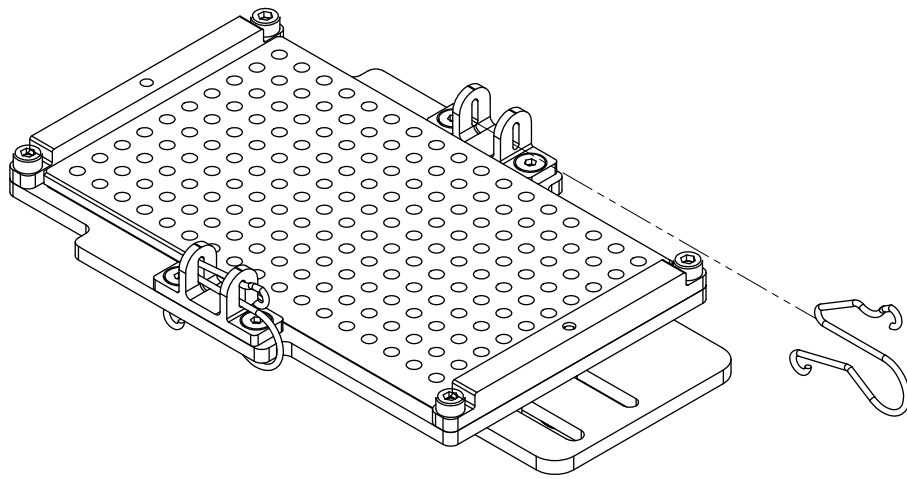


Figure 28. Calibration plate with spring clips attached

1. Compress the spring clip in the direction shown by the arrows in [Figure 29](#) on page [62](#).

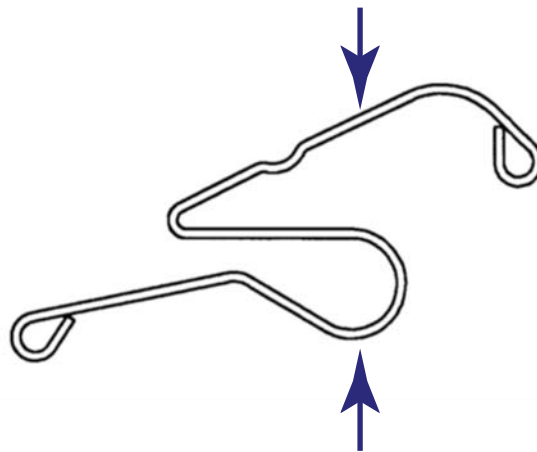
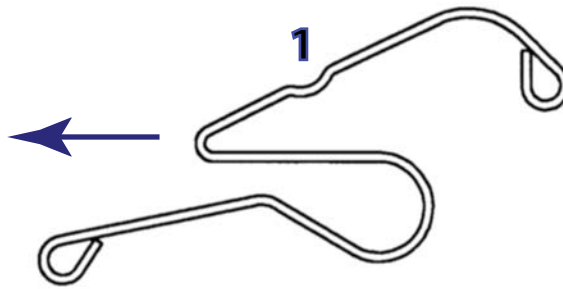


Figure 29. Compress the spring clip

2. Slide the clip into the two lugs on top of the calibration plate in the direction shown by the arrow in [Figure 30](#) on page [63](#) until the dimple in the clip (labeled no. 1 in [Figure 30](#) on page [63](#)) clips into the lug.



*Figure 30. Slide spring clip onto place*

The result should be as shown in [Figure 28](#) on page [62](#).

3. Ensure that both clips are securely in place.

## Attach the calibration plate to a specimen

The small calibration plate must have the appropriate spring clips installed. [Figure 31](#) on page [64](#) shows spring clips suitable for rectangular specimens. An additional set of spring clips is provided for use with round specimens.

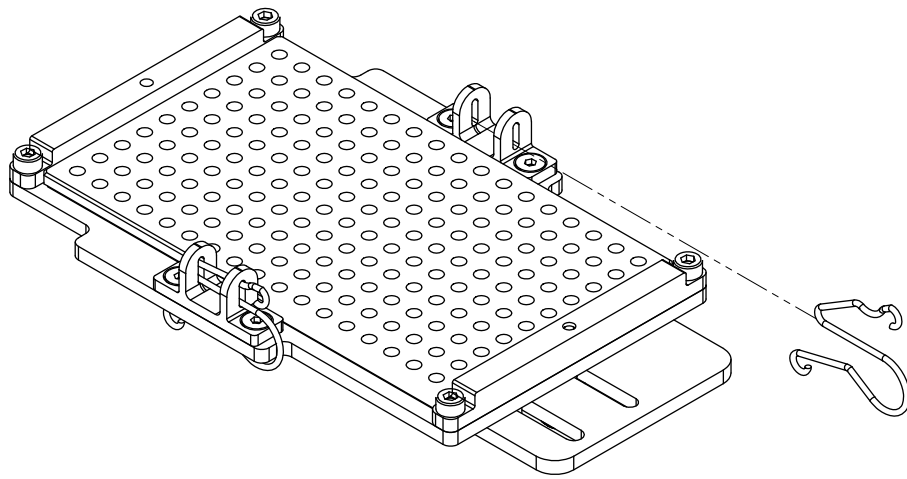


Figure 31. Calibration plate with spring clips attached

1. Loosen the thumb screw (number 1 in [Figure 32](#)) and slide the plate (number 2 in [Figure 32](#)) to the right.

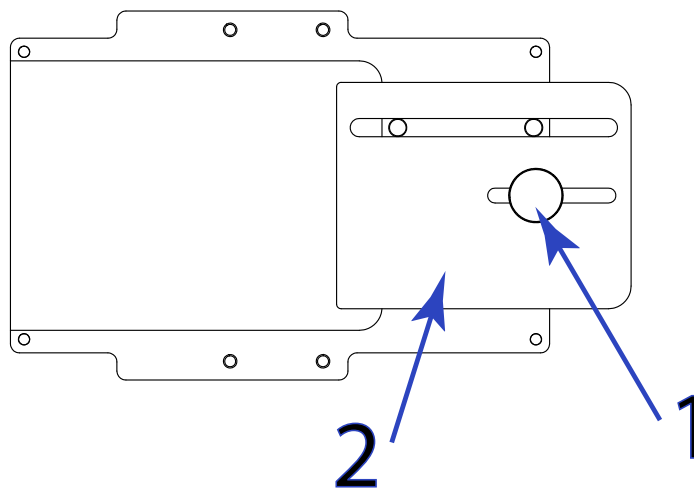


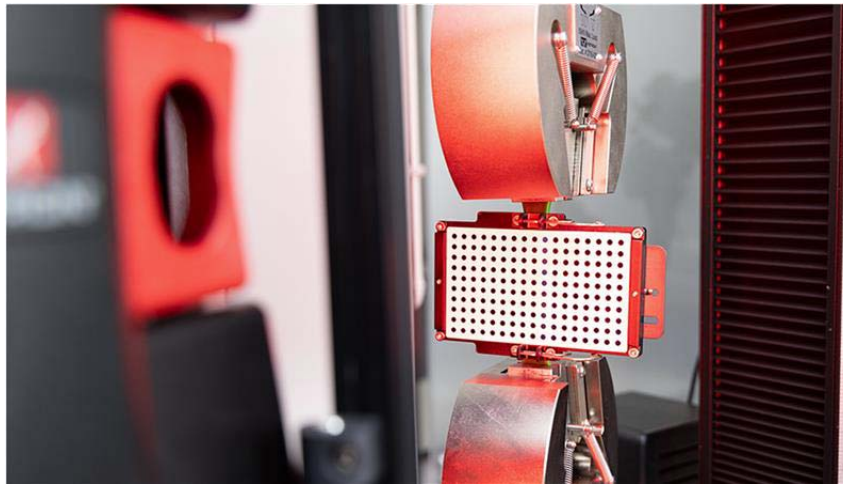
Figure 32. Slider to secure specimen

2. Slide the specimen onto the back of the calibration plate into the spring clips until it is secure.
3. Move the slider back to the left so that it contacts the side of the specimen and tighten the thumb screw to secure it.

The slider plate secures the specimen in the correct position with respect to the calibration plate so that it remains vertical and cannot slide during installation into the grips.

4. Install the specimen in the grips.

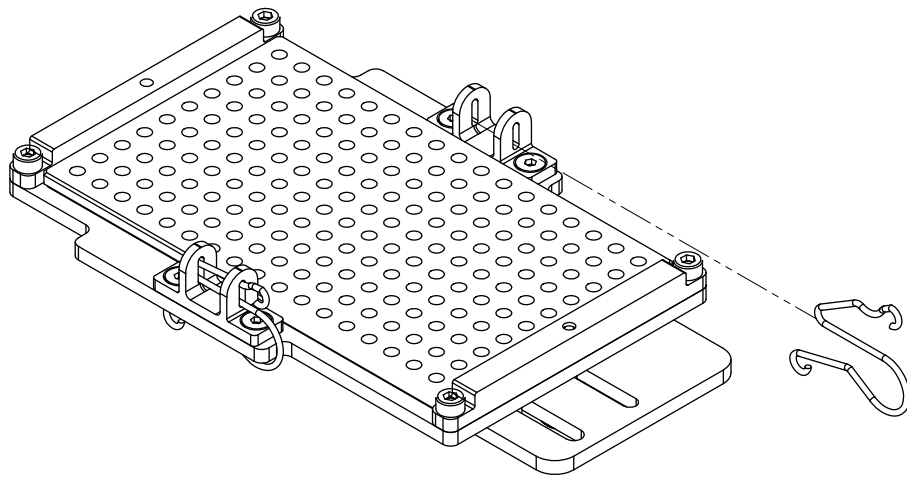
[Figure 33](#) on page [65](#) shows the whole assembly installed in the grips.



*Figure 33. Specimen installed with calibration plate attached*

## Attach the calibration plate to a plate holder

The small calibration plate must have the appropriate spring clips installed. [Figure 34](#) on page [66](#) shows spring clips suitable for rectangular specimens, which are also used to attach to a plate holder.



*Figure 34. Calibration plate with spring clips attached*

1. Loosen the thumb screw (number 1 in [Figure 35](#) on page 67) and slide the plate (number 2 in [Figure 35](#) on page 67) to the right.

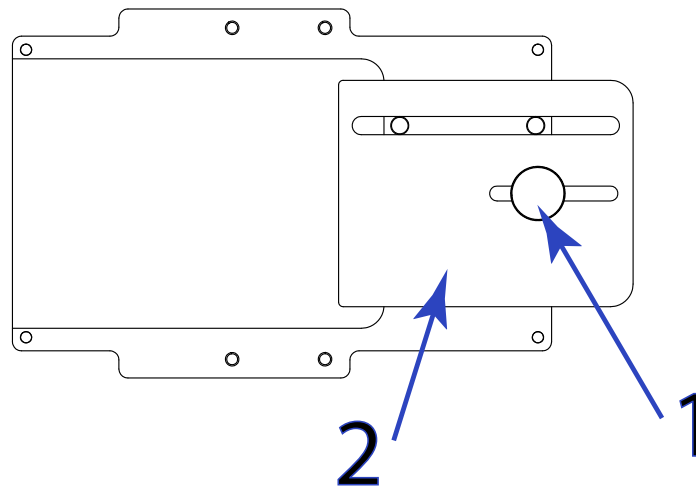


Figure 35. Slider

2. Refer to [Figure 36](#) on page [68](#) and slide the calibration plate (1) into the slot in the plate holder (2) until it stops.

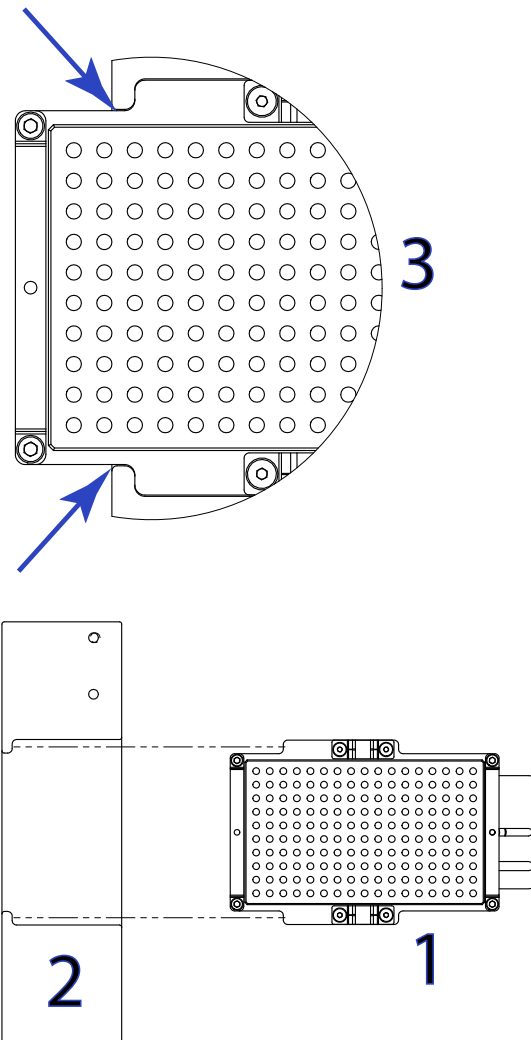


Figure 36. Sliding the calibration plate onto the plate holder

Make sure that the calibration plate is fully inserted into the holder, as shown by (3) in [Figure 36](#) on page [68](#).

3. If necessary, move the slider on the back of the calibration plate to the left and retighten the thumb screw.

## Install calibration plate holder in grips

[Figure 37](#) on page [70](#) shows the installation of the calibration plate holder into the grips.

1. Make sure that the holes in the top and bottom of the plate holder are aligned with the center of the grips, as shown by the two arrows in [Figure 37](#) on page [70](#).
2. Install the plate holder in the grips in the diagram on the right hand side of [Figure 37](#) on page [70](#).

[Figure 38](#) on page [71](#) shows the plate holder installed in grips on a load frame. You can secure the plate holder in one or both of the grips.

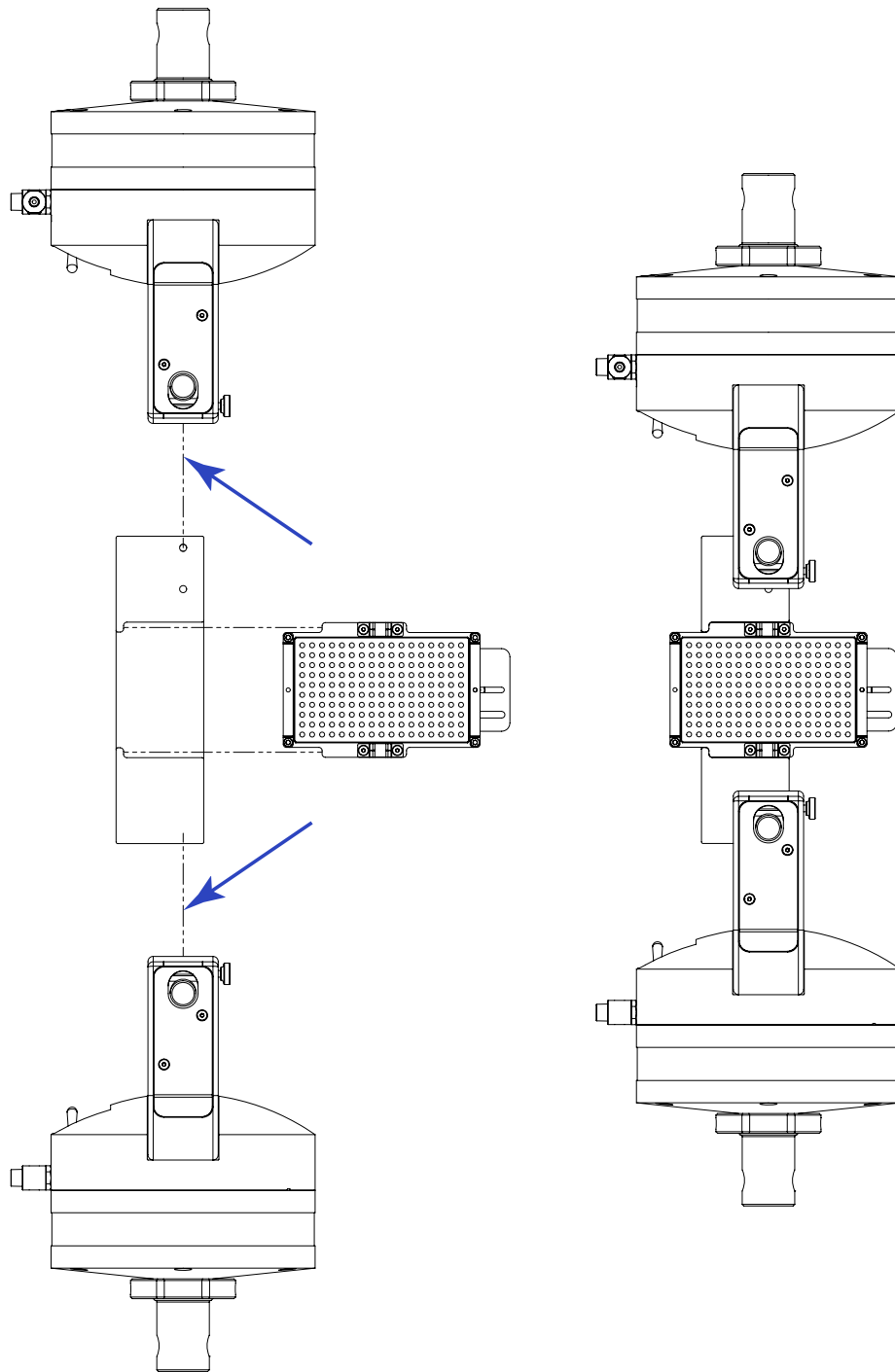


Figure 37. Calibration plate holder installed in grips

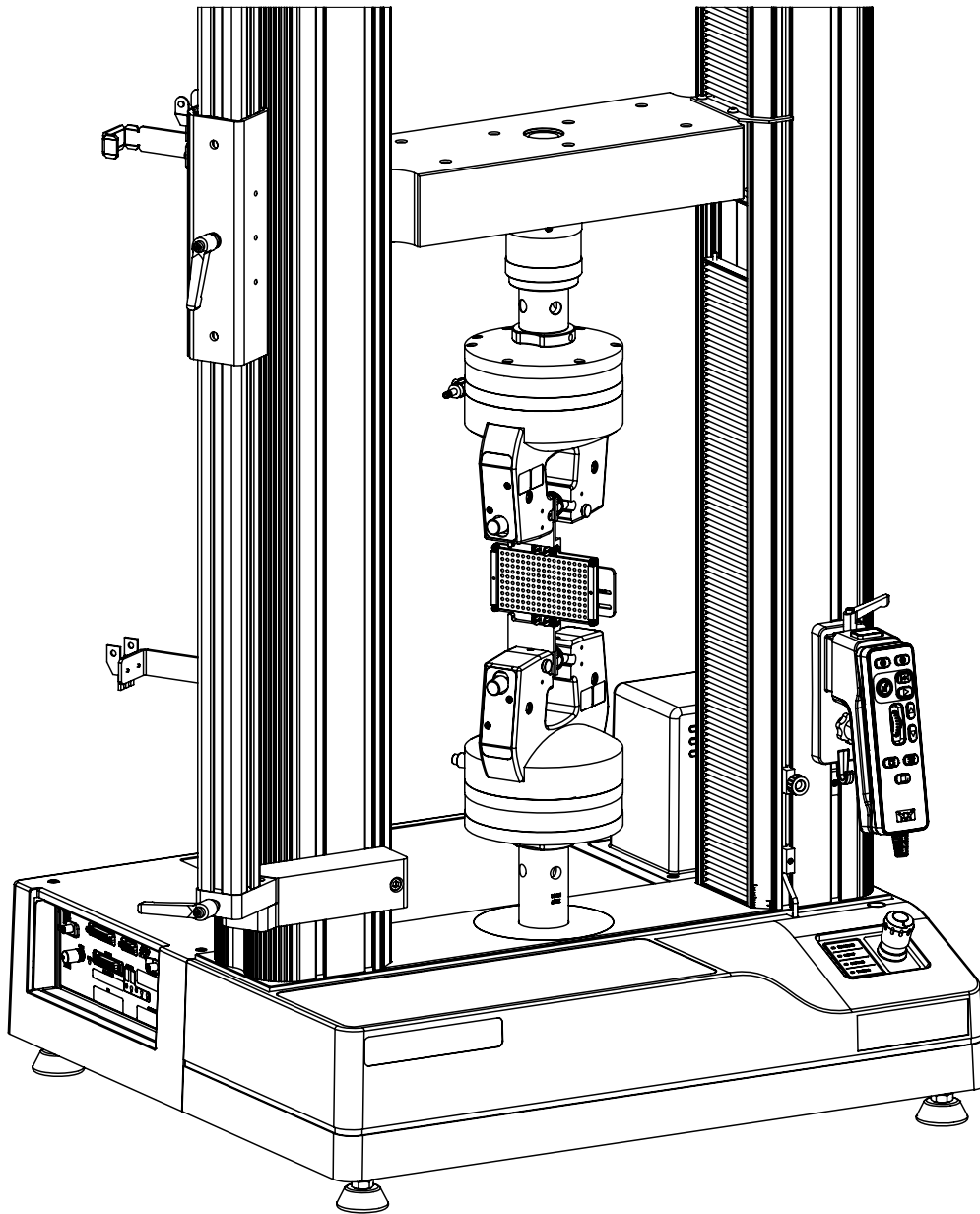


Figure 38. Calibration plate holder installed in testing system

### Install calibration plate holder using clevis adapter

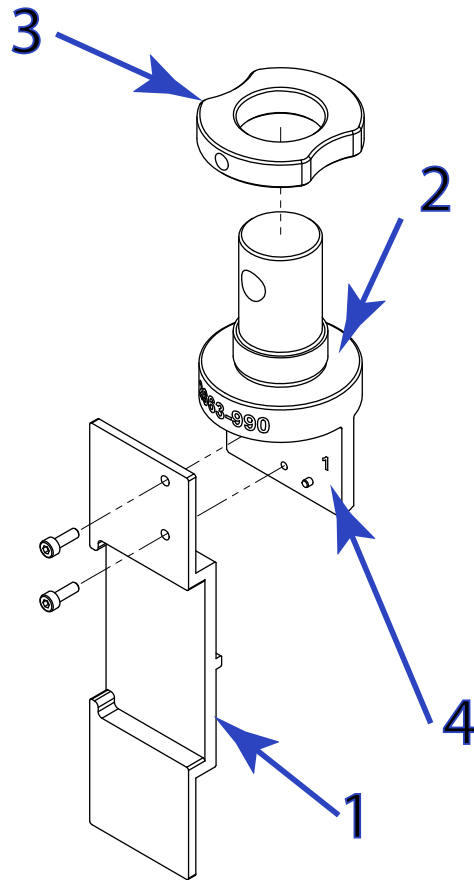


Figure 39. Calibration plate holder installed onto clevis adapter

Legend for [Figure 39](#)

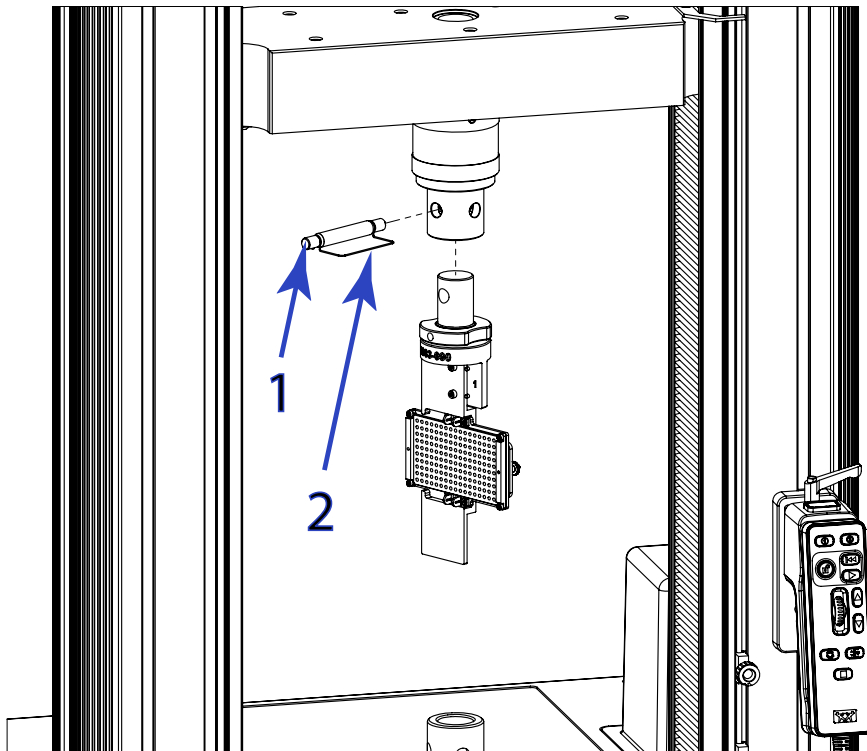
Label	Description
1	Calibration plate holder
2	Clevis adapter (Type D shown)
3	Locknut
4	Label on adapter surface (1 shown here)

1. Attach the calibration plate holder to the clevis adapter as shown in [Figure 39](#) on page 72.

[Figure 39](#) on page 72 shows Side 1 of the adapter facing the camera, which is correct for tensile testing of specimens.

If testing using a bend fixture, where the marks are on the deflectometer and not on the specimen, install the calibration plate holder with Side 2 facing the camera.

2. Install the adapter in the load string using the clevis pin (1) and pin clip (2), as shown in [Figure 40](#) on page 73.



*Figure 40. Clevis adapter installed in load string*

## Attach the calibration plate to a compression platen

The calibration plate should only be attached to the platen if you intend to mark the platen for testing. If you intend to mark the specimen, you should mount the calibration plate on the specimen or on the plate holder.

Figure 41 on page 74 shows the optional calibration plate holder for compression platens and how it mounts on the platen.

Figure 42 on page 75 shows how the calibration plate mounts on the plate holder.

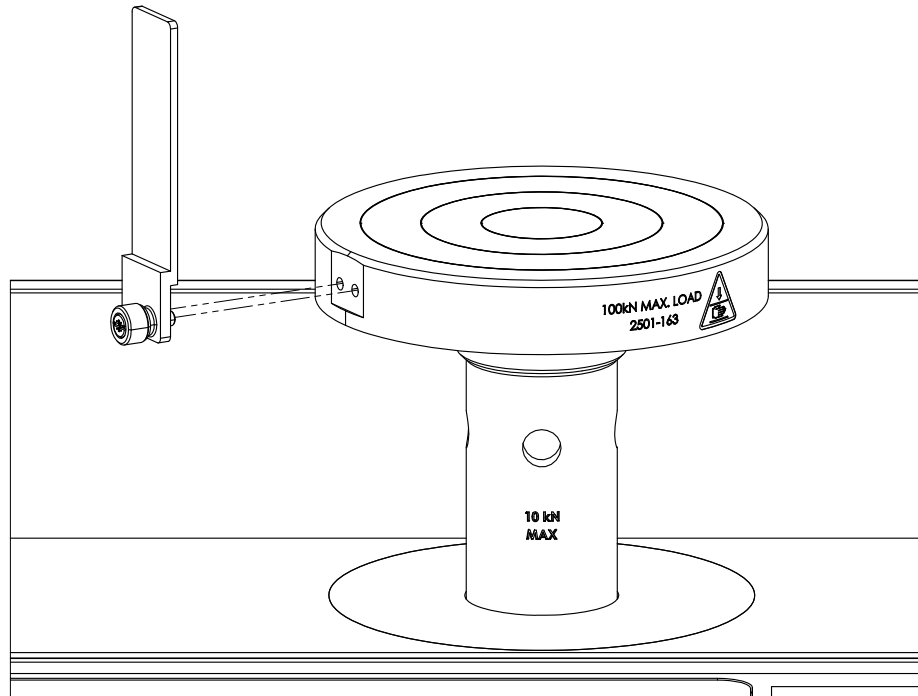


Figure 41. Calibration plate holder for compression platen

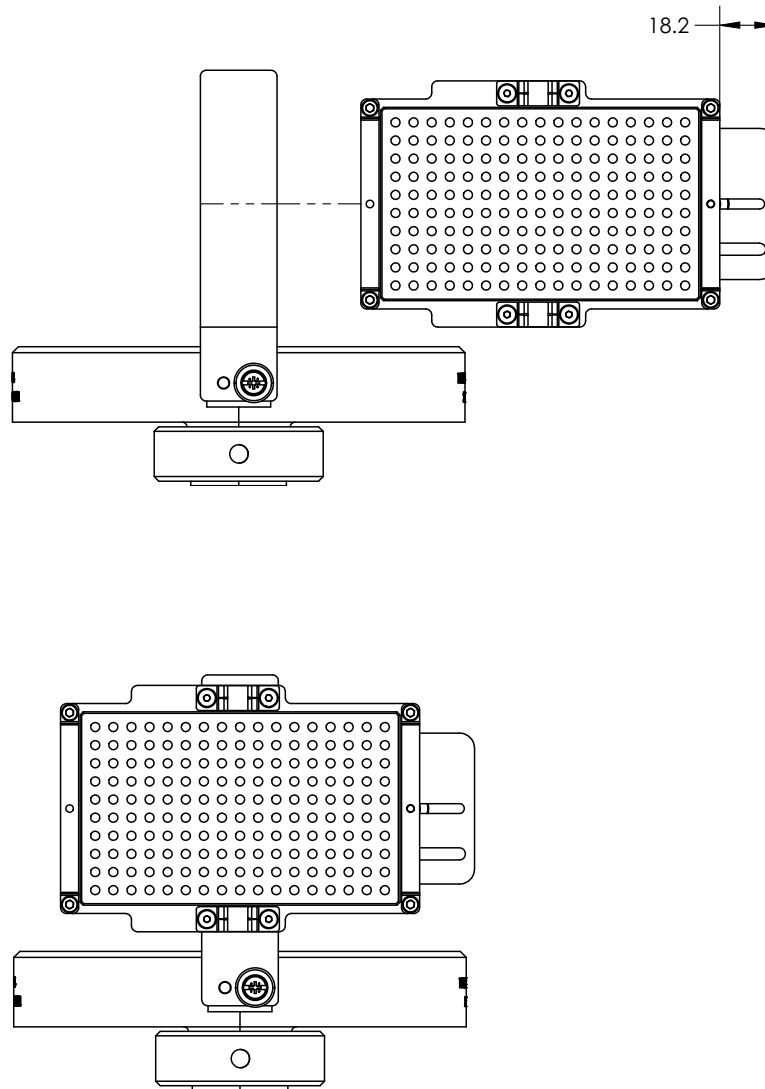


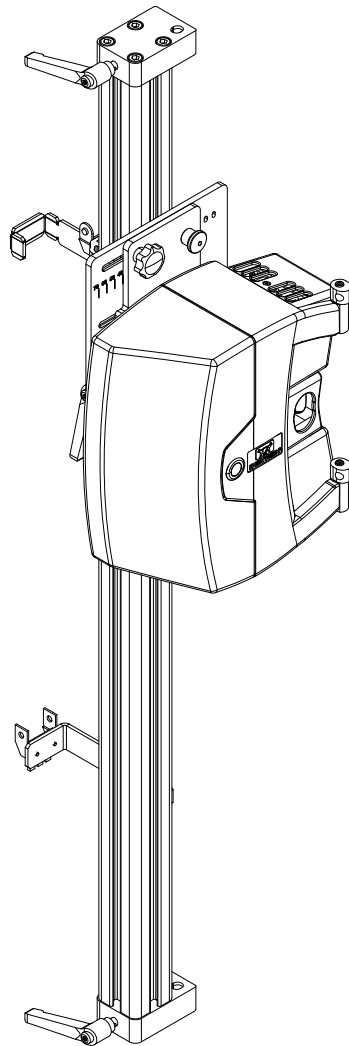
Figure 42. Calibration plate installed on plate holder

Make sure that you remove the plate holder from the compression platen before performing any tests.

## Optional Position Adjustment Plate

This fixture (see [Figure 43](#) on page 76) allows you to move the AVE3 horizontally. It corrects for situations where the dots are not at the appropriate fixed distance from the extensometer. For example:

- rectangular specimen thickness is greater than 20 mm
- round specimen diameter is greater than 20 mm
- dots placed on front of a compression platen, not on the specimen



*Figure 43. Position Adjustment Plate*

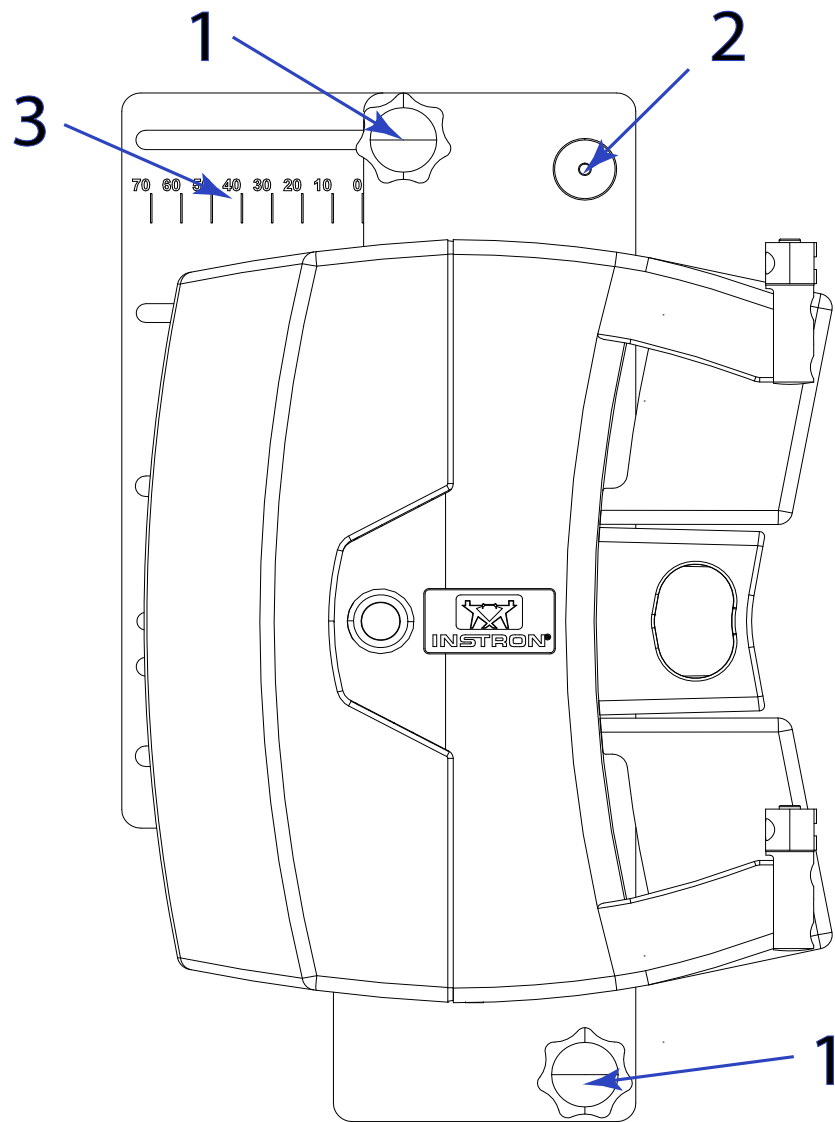


Figure 44. Fixture at default position (zero)

Legend for Figure 44 and Figure 45

Label	Description
1	Thumb screws
2	Indexing plunger
3	Graduated scale

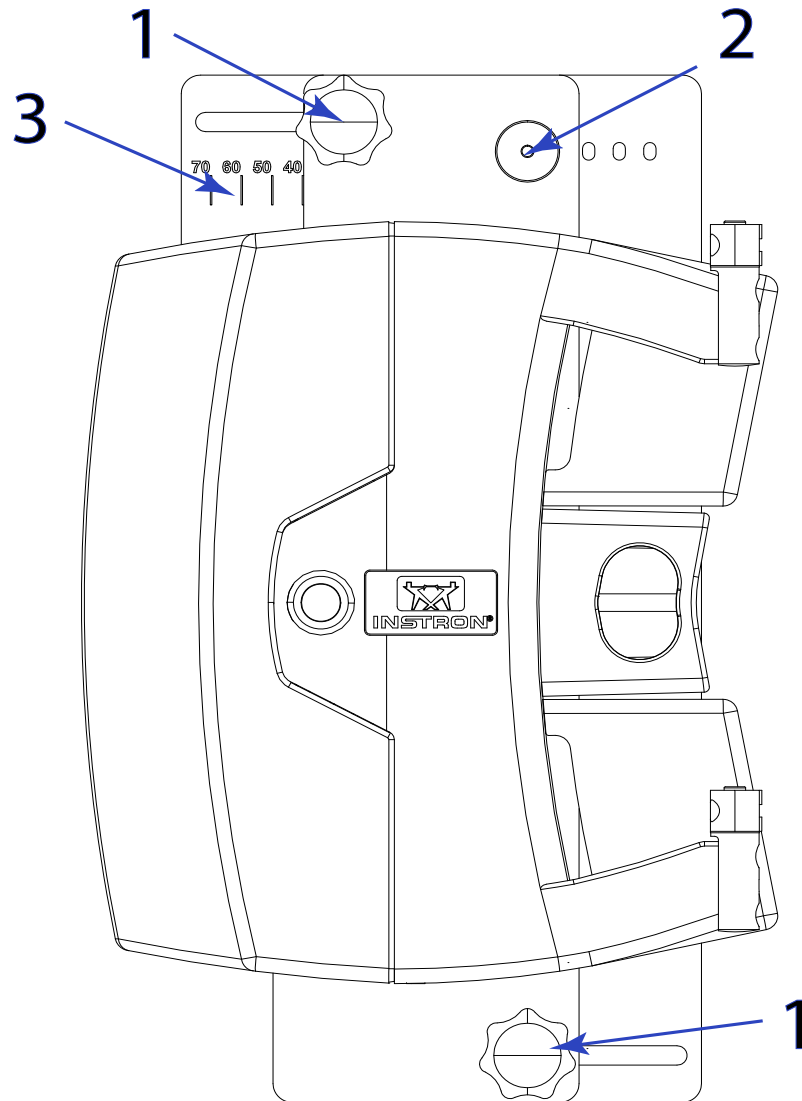


Figure 45. Fixture adjusted to 40 mm

Figure 44 on page 77 shows the fixture at the default position, i.e. zero on the graduated scale. To move to a different position:

1. Loosen both upper and lower the thumb screws; do not remove them completely.
2. Pull on the indexing plunger and rotate it slightly to lock it in the retracted position.
3. Slide the extensometer to the desired position on the graduated scale.
4. Rotate the indexing plunger to release it.
5. Retighten the thumb screws.

Figure 45 on page 78 shows the fixture at the 40 mm position.

Table 14 on page 79 provides guidelines for the appropriate position of the fixture for different specimen and compression platen dimensions

Table 14. Guidelines for fixture position

Graduated scale position	Range of specimen dimension or compression platen diameter (mm)
0	0-10
10	10-30
20	30-50
30	50-70
40	70-90
50	90-110
60	110-130
70	130-160



When you move the extensometer to a different position on the graduated scale, you need to perform a new calibration.

## Transducer configurations

As part of the initial installation, Instron® Service creates transducer configurations in the **Admin** tab of Bluehill® Universal software for each of the extensometer lenses in the testing system. These transducer configurations will then appear for selection whenever you create or edit a test method.



When creating a transducer configuration for the AVE3 in the **Admin** tab, you select the **Strain(AVE3)** item from the list of Available Transducer Types as a starting point (NOT the **Strain** item).

Each transducer configuration is calibrated and that calibration is saved.

When you choose a test method, the software retrieves the appropriate transducer configuration and retrieves its saved calibration data.

For example, if a transducer is created in the **Admin** tab named “16mm lens” that could then be used to create multiple transducer configurations, such as:

- 16mm lens - ambient temp
- 16mm lens - temp chamber
- 16mm lens - ambient, xx1 gauge length
- 16mm lens - ambient, xx2 gauge length

## Calibration check

The calibration check does not change any stored calibration parameters, it merely checks that all conditions that were present when the calibration on a particular transducer configuration was performed still persist.

This procedure is carried out on the testing system using the same calibration plate as is used in the on-site calibration. An on-site calibration must have been performed before this check can be attempted.

You can perform this check right before starting a test by clipping the calibration plate directly to the specimen. If your specimen is not suitable for this, you can replace the specimen with the holder with calibration plate attached.

If you want to check the calibration, you can clip the small calibration plate to the specimen (or install the holder with calibration plate attached), go to the Calibration screen in the AVE3 Transducer Settings and select the Check button. The text above the Check button indicates the last time that a calibration check was run.

The Checks screen in the AVE3 Transducer Settings lets you set a maximum interval between calibration checks. When that time and date is reached, you cannot run any tests until the calibration has been checked.

## Calibrate the extensometer

You should perform a new calibration in the following situations:

- when the extensometer is moved to a different position on the mounting rail
  - when the extensometer is removed and reinstalled on the mounting rail
  - when any changes are made to the grips and fixtures in the load string
1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.

2. Select the video extensometer icon under System Settings to open the Transducer Settings dialog for a video extensometer.

The dialog opens in the **AVE3** screen.

3. Check that the serial number of the lens is correct and that the desired transducer configuration is selected.



*A transducer configuration consists of a collection of settings for the transducer that is restored when the configuration is selected. You can have several configurations for a single transducer.*



*There may be a short delay of 1-2 minutes after starting the video extensometer before the information in the dialog appears. The system needs time to recognize the lens and warm up the image processor.*

4. Select **Calibration**.

The dialog moves to the **Calibration** screen.

5. Either:

- a attach the calibration plate to the specimen being tested, or
- b attach the calibration plate to the holder and install that assembly in the grips or directly in the load string adapter instead of a specimen, or
- c attach the calibration plate to the fixture provided for use with compression platens or bend fixtures

## Caution

---

**If the system includes a BioPuls bath, you must always attach the calibration plate to the holder, NOT to the specimen.**

6. Select the appropriate option for the calibration plate; if it is attached to a specimen, the system prompts you to enter specimen thickness.
7. Move the video extensometer up or down as necessary to bring the entire area of the calibration plate into view.
8. Draw a box around the area of the calibration plate. The border of the box displays green.
9. Select **Calibration**.

When calibration is complete, the calibration status updates.

## Run a calibration check

If you don't need to calibrate the extensometer, but want to check that the current calibration is still valid, you can run a calibration check. This procedure does not update any files in the software, it checks that all the parameters that were in place when the original calibration was run are still in place.

1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.
2. Select the video extensometer icon under System Settings to open the Transducer Settings dialog for a video extensometer.  
The dialog opens in the **AVE3** screen.
3. Check that the serial number of the lens is correct and that the desired transducer configuration is selected.



*A transducer configuration consists of a collection of settings for the transducer that is restored when the configuration is selected. You can have several configurations for a single transducer.*

4. Select **Calibration**.  
The dialog moves to the **Calibration** screen.
5. Either:
  - a attach the calibration plate to the specimen being tested, or
  - b attach the calibration plate to the holder and install that assembly in the grips or directly in the load string adapter instead of a specimen
  - c attach the calibration plate to the fixturing provided for use with compression platens or bend fixtures
6. Select the appropriate option for the calibration plate; if it is attached to a specimen, the system prompts you to enter specimen thickness.
7. Draw a box around the area of the calibration plate. The border of the box displays green.
8. Select **Calibration Check**.

If the check fails, you need to recalibrate the extensometer.

## Additional calibration requirements for DIC Replay

If you are using DIC Replay software, there are additional calibration steps that you must perform.

You must perform this calibration procedure using the larger calibration plate provided with the DIC Replay option.

1. Position the crosshead and the extensometer as required for the specimens to be tested.
2. Select the video extensometer icon under System Settings to open the Transducer Settings dialog for a video extensometer.  
The dialog opens in the **AVE3** screen.
3. Check that the serial number of the lens is correct and that the desired transducer configuration is selected.
4. Under **Axial Strain** select **DIC Replay** to display the **DIC Replay** screen.
5. Enable **Capture images** and use the sliding bar to select the time interval between each image capture.
6. Select **Calibration**.  
The dialog moves to the **Calibration** screen.
7. Press **Calibrate DIC Replay**.  
Another dialog opens for DIC Replay calibration.
8. Place the calibration plate in the upper grip, with the longer side placed vertically in the grip.
9. For 16 mm and 35 mm lenses:
  - a Verify the matrix of dots faces towards the extensometer.
  - b Jog the crosshead so that the calibration plate is centered inside the field of view in the DIC Replay calibration dialog. Make sure the calibration plate is vertical and centered in the image window.
  - c Press **Calibrate**.
10. For 6 mm and 9 mm lenses:
  - a Verify the matrix of dots faces towards the extensometer.
  - b If necessary, remove the lower grip to avoid damage to the calibration plate.
  - c Position the crosshead so that the calibration plate is located at the bottom of the field of view.
  - d Press **Start** and manually jog the crosshead up until the calibration plate is at the top of the field of view. When finished, press **Stop**.
  - e Press **Calibrate**.
11. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the most accuracy.



*During testing, ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of testing.*

12. When calibration is complete, press **Done**.
13. Remove the calibration plate.

# Chapter 7

## Run tests

- 
- Using Bluehill® Universal ..... 85
- 

### Warning

---



Set appropriate mechanical limits on the load frame before starting any tests. If you are using an 8800 or ElectroPuls system, you set these limits via the Console software.

If the extensometer loses track of the marks on the specimen during a test, unexpected crosshead or actuator movement can occur. It is very important that you limit any such movement.

The AVE3 and SVE3 can be used on a wide range of testing machines. Newer machines, in combination with Bluehill® or WaveMatrix™ software, are designed to handle the loss of strain signals due to loss of marks in a controlled manner. If you are not using Bluehill® or WaveMatrix™ software or are using an older testing machine, these systems may not be present. It is therefore imperative that you set these limits.



*In some cases, especially if you are using the 6mm or 9mm lens, some areas of the image are shaded yellow. These areas have reduced accuracy compared to the stated specification. Make sure that the dots on the specimen are not in one of these shaded areas when you start the test. It is acceptable, however, for the dots to move into one of these shaded areas during the test.*

## Using Bluehill® Universal

Once calibrated, the video extensometer behaves like any other transducer when you operate it with Bluehill® Universal software. For full details, refer to the Bluehill® online help and reference. A summary of possible setup steps using Bluehill® Universal software and an AVE3 is as follows:

1. Go to **Measurement** and create a physical strain measurement using the appropriate transducer configuration created previously. You can name the measurement AVE3.





*Make sure that your test method is set up to use the correct transducer configuration for the installed lens. You can remove the lens cover to read the focal length of the installed lens.*

2. Go to **Test Control > Strain** and choose the new AVE3 measurement as the primary source.
3. Go to **Test Control > Pre-Test** and enable auto-balance for the AVE3.
4. If you want to use strain control, go to **Transducer Settings > Gain** and enable strain control. Refer to the Bluehill® online help and reference for details on strain control settings.
5. Setup the workspace to your requirements. You will probably want to assign one of the live displays to show AVE3 strain.

## Transverse strain using the AverEdge32™ configuration

When using AverEdge32™ to measure transverse strain you need to create a virtual measurement in Bluehill® Universal software to ensure that the transverse strain gauge width is set equal to the specimen width for each test.

1. Open the test method file.
2. Go to **Measurements** in the Method menu.
3. In the **Measurement types** list, select **Virtual Measurements > Transverse strain**.
4. Use the  button to add the new measurement to the Selected measurements list.
5. Select the new measurement in the **Selected measurements** list and edit its properties as follows:
  - a. If necessary, edit the name in the **Description** field.
  - b. In the **Source for strain** field select the appropriate connector name for the AVE3 connection to the load frame.
  - c. In the **Transverse strain gauge width** field select the  button to open the Expression builder.
  - d. In the list of variables, open up the **Specimen Properties** list and select **Width**. Add **Width** to the expression and select OK to close the Expression builder.  
The transverse strain gauge width will now be set to the width of each specimen.
6. Go to **Workspace** in the Method menu and add specimen width and specimen thickness to the list of Operator inputs so that the operator can enter a value of width and thickness for each specimen as it is tested.

You can now use the virtual measurement Transverse strain as an input to calculations and you can add it to the live displays.

Refer to the Bluehill® Help and Reference in the software for more information about measurements.


## Using Bluehill Universal® software with DIC Replay

For full details, refer to the manual supplied with DIC Replay software.



*DIC Replay is not available for the SVE3 extensometer.*

You need to enable image capture in Bluehill® so that images of the specimen will be saved during the test.

1. Select  in the console area to open System Details.
2. Select the video extensometer icon under System Settings to open the Transducer Settings dialog for a video extensometer.

The dialog opens in the **AVE3** screen.

3. Select **Image Capture**.

The dialog moves to the **Image Capture** screen.

4. Use the slider control to set the image capture rate.
5. Select **AVE3**.

The dialog moves to the **AVE3** screen.

6. Select the appropriate **Extensometer mode**.


If you choose **Mark finding**, the test runs as normal and DIC images are saved. However, specimen preparation for this mode is more challenging - you need to make sure that there is an area around the dots on the specimen that is free of speckle so that the software can identify the marks.

If you choose **Speckle only**, you cannot use the AVE3 as a strain device in the normal way during testing with Bluehill®. You are only using the AVE3 to capture images for DIC Replay. In this case, specimen preparation is easier as you only require the speckle pattern and you do not need to apply any dots.

If you choose **Speckle only**, note the following:

- Do not create a measurement based on AVE3.
- Do not set the AVE3 as the strain source for the test method.
- Do not enable auto-balance on the AVE3.

### To use DIC Replay software to analyze images

1. Select  in the console area to open System Details.
2. Select the video extensometer icon under System Settings to open the Transducer Settings dialog for a video extensometer.

The dialog opens in the **AVE3** screen.

3. Select **Image Capture**.  
The dialog moves to the **Image Capture** screen.
4. Select **Open Digital Image Correlation software....**

# Chapter 8

## Maintenance

---

• General.....	89
• Extensometer lenses.....	89
• Ancillary parts .....	90

---

### General

The AVE3 and SVE3 require no special maintenance, apart from keeping the instrument clean and free of dust.

#### Caution

---

---

**As far as possible, keep the extensometer away from exposure to conductive dust or debris, from breaking carbon fiber specimens, for example.**

Conductive dust or debris may cause a malfunction in the extensometer electronics. If this is likely to be a problem, you are advised to surround the load string with a transparent protective shield, separating it from the extensometer.

### Extensometer lenses

- Always store lenses in the case provided to keep them clean and free from damage
- Make sure that the mounting surface of the lens is free from any dust or debris before installing it

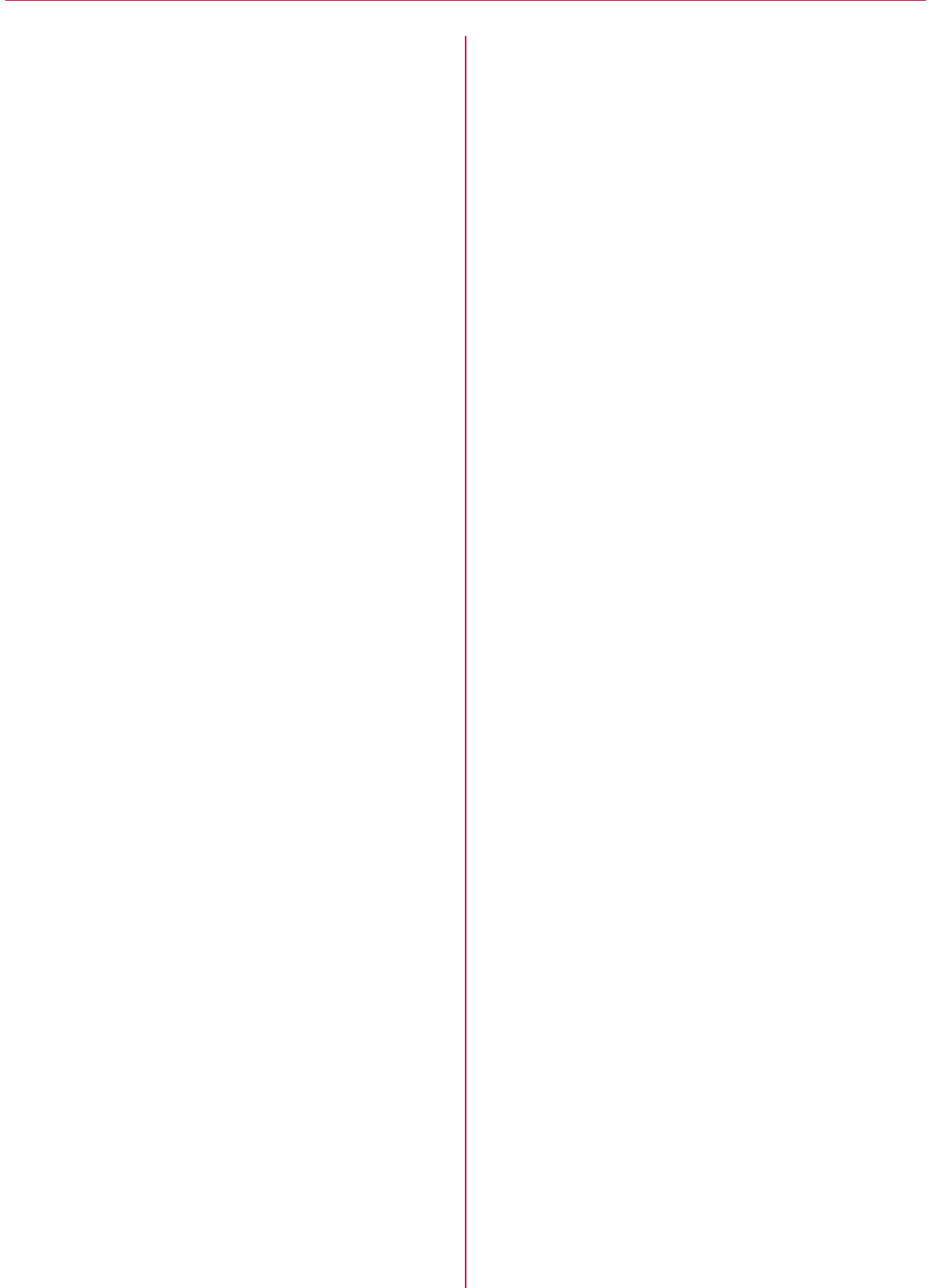
## Ancillary parts

Table 15. Ancillary parts

Description	Part Number	Quantity
Lens cleaning cloth	203-1-1011	1
Round clip assembly	1696-1013	1
Square clip assembly	1696-1014	1
Calibration plate	A629-720	1
Calibration plate fixture	T629-740	1
Specimen marking template, US Customary	A629-756	1
Specimen marking template, metric, 20 mm hole spacing	A629-757	1
Specimen marking template, metric, 25 mm hole spacing	A629-758	1
Schneider 310 acrylic marker, 2 mm bullet tip, white	P629-809	3
Schneider 310 acrylic marker, 2 mm bullet tip, black	P629-810	3
Edding 751 paint marker, 2 mm round tip, white	62-45-1075	3
Edding 751 paint marker, 2 mm round tip, black	62-45-1076	3

# Index

<b>A</b>		<b>R</b>	
AverEdge32 option		run tests.....	85
installation on floor model frame.....	32	using Bluehill Universal.....	85
installation on table model frames.....	28	using Bluehill Universal with DIC Replay	87
overview.....	12		
<b>C</b>		<b>S</b>	
calibrate		set up hardware	
Bluehill Universal.....	57	extensometer lenses.....	51
connections.....	44	load string.....	55
contact information.....	13	set up software	
		Bluehill Universal	
		3300 systems.....	55
		3400 systems.....	55
		5900 systems.....	55
		6800 systems.....	55
		software compatibility.....	20
		specifications.....	15
		dimensions.....	19
		environmental.....	18
		general.....	15
		software compatibility.....	20
		weight.....	19
		specimens	
		marking.....	47
		support.....	13
		system interconnections.....	44
<b>D</b>		<b>T</b>	
DIC Replay		technical support.....	13
with Bluehill Universal.....	87	testing.....	85
dimensions.....	19	using Bluehill Universal.....	85
		using Bluehill Universal with DIC Replay	87
<b>E</b>		<b>W</b>	
EU directives		weight.....	19
Conformity with EU directives.....	19		
extensometer lenses.....	51		
<b>I</b>			
installation.....	21		
initial.....	21		
removing and reinstalling.....	22		
Instron			
contact information.....	13		
product support.....	13		
interconnections.....	44		
<b>L</b>			
load string setup.....	55		
<b>M</b>			
maintenance.....	89		
mark specimens.....	47		
<b>P</b>			
product support.....	13		







[www.instron.com](http://www.instron.com)