



Instron Video Extensometer AVE2 and SVE2



Operator's Guide

M16-16905-EN Revision D

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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.

Warnings



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

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



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

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



Hazard - Protect electrical cables from damage and inadvertent disconnection.

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

Warnings



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

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



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

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



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

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



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

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

Warnings



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

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



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

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



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

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



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

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



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

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

Warnings



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



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



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

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

Table of Contents

Chapter 1: Introduction	13
Overview	13
AverEdge32™ option (AVE2 only)	14
Product support	15
Product documentation	15
Chapter 2: Specifications	17
General	17
Standard Mounting Configuration	17
AverEdge32™ Mounting Configuration	19
Environmental	21
Conformity with EU directives	21
Dimensions and weight	22
Software compatibility	22
Chapter 3: Installation	25
Initial installation	25
Moving between machines	26
Electromechanical dual column table top testing machines	27
Electromechanical single column testing machines	32
5980 (not 5988 or 5989) Floor model testing machines	36
5988 and 5989 High-capacity floor model testing machines	40
LX Static hydraulic testing machines	42
8800 and ElectroPuls testing machines	44
System interconnections	47
Chapter 4: Mark specimens	51
Overview	51
Marking tips	52
Applying ink dots	52

Troubleshooting ink dots	53
Chapter 5: Set up hardware	55
Extensometer lenses	55
AverEdge32™ configuration.....	56
Set up the load string.....	57
Set up for AverEdge32™ configuration	57
Chapter 6: Set up Bluehill Universal® software.....	59
Fully integrated testing systems	59
Calibrate in Bluehill® Universal software	60
Non-integrated testing systems.....	62
Calibrate in the Instron Video Extensometer application.....	63
Chapter 7: Set up Bluehill® 3 software	67
Fully integrated testing systems	67
Set up the transverse option	68
Calibrate in Bluehill® 3 software	69
Non-integrated testing systems.....	70
Calibrate in the Instron Video Extensometer application.....	71
Chapter 8: Set up other software (not Bluehill®)	75
Set up WaveMatrix™ software for dynamic testing	75
Set up systems not using Bluehill® or WaveMatrix™.....	75
Chapter 9: Run tests	77
Using Bluehill® Universal	78
Transverse strain using the AverEdge32™ configuration	78
Using Bluehill Universal® software with DIC Replay.....	79
Using Bluehill® 3	80
Using Bluehill® 3 software with DIC Replay	80
Using WaveMatrix™	81
Systems not using Bluehill® or WaveMatrix™	82

Chapter 10: Maintenance	83
General	83
Index	85

Chapter 1

Introduction

• Overview.....	13
• Product support.....	15
• Product documentation.....	15

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 second generation Instron video extensometer; the AVE2 (Advanced Video Extensometer) and the SVE2 (Standard Video Extensometer).

AVE2 includes:

- CDAT (Constant Density Air Tube) system of fans 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
- an option for dynamic axial strain measurement and control using WaveMatrix™

SVE2 does not include the CDAT system and the transverse strain measurement, DIC option and dynamic axial strain measurement are not available.



Figure 1. AVE2

AverEdge32™ option (AVE2 only)

The AverEdge32™ option, available for the AVE2, 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. In the US and Canada, you can call directly at 1-800-473-7838.

Product documentation

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

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

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

Chapter 2

Specifications

- General..... 17
- Environmental 21
- Conformity with EU directives 21
- Dimensions and weight..... 22
- Software compatibility..... 22

General

Standard Mounting Configuration

The following tables contain specifications for the AVE2 and SVE2 when installed on different testing machines using the standard mounting configuration. Refer to [“AverEdge32™ Mounting Configuration”](#) on page 19 if you are using the AverEdge32™ mounting configuration.

Table 1. Table model testers, (e.g. 5940 and 5960) ElectroPuls and 8800 testing systems

	Lens focal length (mm) ¹			
	35	16	9	6
Axial field of view (mm)	100	240	425	620
Transverse field of view (mm)	13	33	57	85
Minimum axial gauge length (mm)	5	6	12	15
Minimum transverse gauge width (mm)	5	6	12	15
AVE2 resolution (µm)	0.5	0.5 ²	1.5	3.0
SVE2 resolution (µm)	1.0	1.0	3.0	6.0

Table 1. Table model testers, (e.g. 5940 and 5960) ElectroPuls and 8800 testing systems (Continued)

	Lens focal length (mm) ¹			
	35	16	9	6
AVE2 measurement accuracy (axial and transverse) (µm) (the greater of the two listed)	the greater of:			
	±1 or ±0.5% of reading	±1 or ±0.5% of reading ³	±3 or ±1% of reading	±9 or ±1% of reading
SVE2 measurement accuracy (axial and transverse) (µm) (the greater of the two listed)	the greater of:			
	±3 or ±0.5% of reading	±5 or ±0.5% of reading	±10 or ±1% of reading	±15 or ±1% of reading
Recommended dot diameter (mm)	1-3	2-4	3-6	3-6

1. when used for dynamic testing on ElectroPuls or 8800, the 16mm lens is the only available option.

2. when used for dynamic testing on ElectroPuls or 8800, resolution is 2.5µm

3. when used for dynamic testing on ElectroPuls or 8800, accuracy is ±0.5µm or ±0.5% of reading

Table 2. Floor model testers, e.g. 5985 (not 5988 or 5989) and LX static hydraulic testing machines

	Lens focal length (mm)			
	35	16	9	6
Axial field of view (mm)	130	310	560	840
Transverse field of view (mm)	16	40	70	110
Minimum axial gauge length (mm)	5	6	12	15
Minimum transverse gauge width (mm)	5	6	12	15
AVE2 resolution (µm)	0.5	0.5	1.5	3.0
SVE2 resolution (µm)	1.0	1.0	3.0	6.0
AVE2 measurement accuracy (axial and transverse) (µm)	the greater of:			
	±1 or ±0.5% of reading	±1 or ±0.5% of reading	±3 or ±1% of reading	±9 or ±1% of reading
SVE2 measurement accuracy (axial and transverse) (µm) (the greater of the two listed)	the greater of:			
	±3 or ±0.5% of reading	±5 or ±0.5% of reading	±10 or ±1% of reading	±15 or ±1% of reading

Table 2. Floor model testers, e.g. 5985 (not 5988 or 5989) and LX static hydraulic testing machines (Continued)

	Lens focal length (mm)			
	35	16	9	6
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)	160	390	680	not suitable
Transverse field of view (mm)	20	50	90	not suitable
Minimum axial gauge length (mm)	5	6	12	not suitable
Minimum transverse gauge width (mm)	5	6	12	not suitable
AVE2 resolution (μm)	1.0	1.0	2.0	not suitable
SVE2 resolution (μm)	2.0	2.5	8.0	not suitable
AVE2 measurement accuracy (axial and transverse) (μm) (the greater of the two listed)	the greater of:			
	± 1 or $\pm 0.5\%$ of reading	± 1 or $\pm 1\%$ of reading	± 9 or $\pm 1\%$ of reading	not suitable
SVE2 measurement accuracy (axial and transverse) (μm) (the greater of the two listed)	the greater of:			
	± 3 or $\pm 1\%$ of reading	± 5 or $\pm 0.5\%$ of reading	± 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.

The AverEdge32™ mounting configuration affects both axial and transverse fields of view, whether you are using dot-based or edge-based methods.

Table 4 on page 20 contains specifications for all lenses when using the dot-based method for transverse strain.

Table 5 on page 20 contains specifications for the 16 mm lens when using the edge-based method for transverse strain.

Table 4. Dot-based method

	Lens focal length (mm)			
	35	16	9	6
Axial field of view (mm)	130	310	560	840
Transverse field of view (mm)	16	40	70	110
Minimum axial gauge length (mm)	5	6	12	15
Minimum transverse gauge width (mm)	5	6	12	15
AVE2 resolution (μm)	0.5	0.5	1.5	3.0
AVE2 measurement accuracy (axial and transverse) (μm) (the greater of the two listed)	± 1 or $\pm 0.5\%$ of reading, whichever is greater			
Recommended dot diameter (mm)	1-3	2-4	3-6	3-6

Table 5. Edge-based method - 16 mm lens only

Parameter	Value
Axial field of view (mm)	205
Transverse field of view (mm)	40
Minimum axial gauge length (mm)	25
Minimum transverse gauge width (mm)	12.5
AVE2 resolution (μm)	0.5
AVE2 axial measurement accuracy (μm)	± 1 or $\pm 0.5\%$ of reading, whichever is greater
AVE2 transverse measurement accuracy (μm)	± 3 or $\pm 1\%$ of reading, whichever is greater
Recommended dot diameter (mm)	2-4

Environmental

Table 6. 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® declares under our sole responsibility that AVE2 and SVE2 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® testing systems are CE marked. A signed CE declaration of conformity is supplied with each system.

Dimensions and weight

Dimensions of the AVE or SVE mounted on various frames are shown in [Figure 4](#), [Figure 10](#), [Figure 13](#), [Figure 17](#), [Figure 19](#) and [Figure 20](#). All dimensions are in mm.

Weights are as follows:

- AVE2 including standard light bar weighs 3.4 kg (7.5 lb)
- SVE2 including standard light bar weighs 3.1 kg (6.8 lb)
- Mounting post with cables weighs 6.2 kg (13.6 lb)

Software compatibility

[Table 7](#) on page [22](#) lists the versions of Bluehill® that are compatible with the AVE2 and the SVE2 installed on various electromechanical and static hydraulic testing systems.

Table 7. Electromechanical and Static Hydraulic Testing Systems

Testing system	Compatible software
5900 series, 3300 series, 5500 series, LX static hydraulic	Bluehill® V3.62 or later
3400 series	Bluehill® V4.11 or later
6800 series	Bluehill® V4.18 or later
Any compatible system using the AverEdge32™ for transverse measurement (AVE2 only)	Bluehill® V4.19 or later

If you are using an 8800 or ElectroPuls system for static testing, the AVE2 is compatible with the following versions of software:

- Console V8.9 or later
- Firmware V12.14 or later
- Bluehill® V3.63 or later

If you are using an 8800 or ElectroPuls system for dynamic testing, the AVE2 is compatible with the following versions of software:

- Console V8.11 or later
- Firmware V12.15 or later
- WaveMatrix™ V1.9 or later
- Bluehill® V3.67 or later

Chapter 3

Installation

• Initial installation	25
• Moving between machines	26
• System interconnections.	47

Initial installation

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

- adaptation of the connections to the controller in the testing machine; if you want to use the extensometer on more than one testing machine, these modifications must be performed on each machine. For example:
 - 5900 systems - adapt the Strain 1 connector on the 5900 controller to connect to the encoder in the testing machine.
 - 8800/ElectroPuls systems - install one (axial) or two (axial and transverse) encoder SCMs to the connectors on the controller.
- installation of the AVE2 or SVE2 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 AVE2 for transverse measurement
- verification of the extensometer



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 and 5500 frames require the custom cable.

Moving between machines

You can move the extensometer between different testing machines by removing the entire assembly of extensometer and mounting bracket and mounting it on another machine of the same type. Different testing machines may require different mounting brackets and various spacers, although the vertical post assembly that supports the extensometer is common to all machines. Additional accessories, such as a temperature chamber, may require different post assemblies. 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.

For the purposes of installation and moving between testing machines, the AVE2 and SVE2 are identical. All references to AVE2 in the following sections also apply to SVE2.

[Figure 2](#) on page 26 shows the T-nut (A) inserted in the appropriate 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.

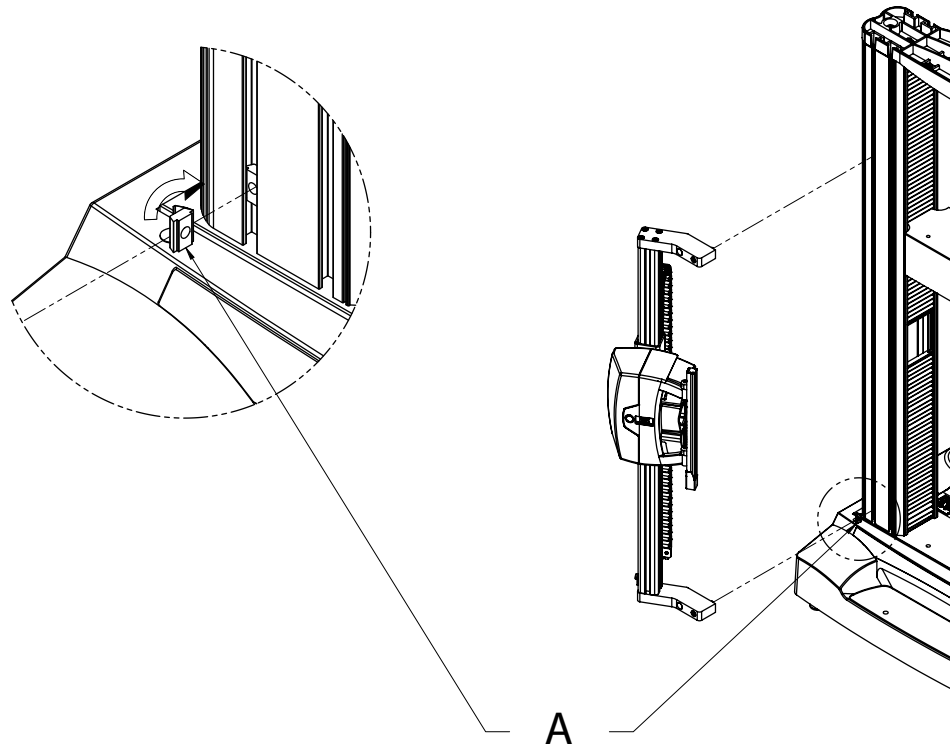


Figure 2. T-nut inserts for columns

Electromechanical dual column table top testing machines

This installation applies to dual column table top machines 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 (e.g. 5566, 5569)

Figure 3 on page 27 and Figure 4 on page 28 show the AVE2 installed on a 5960 dual column table top testing machine. Dimensions are in mm.

The mounting bracket (A) is an angled bracket.

Make sure that you mount the bracket into the T-slot closest to the outer edge of the column to ensure proper alignment.

The optional AverEdge32™ configuration uses the same mounting methods but a different mounting bracket and an additional back screen. Refer to “[AverEdge32™ configuration](#)” on page 31.

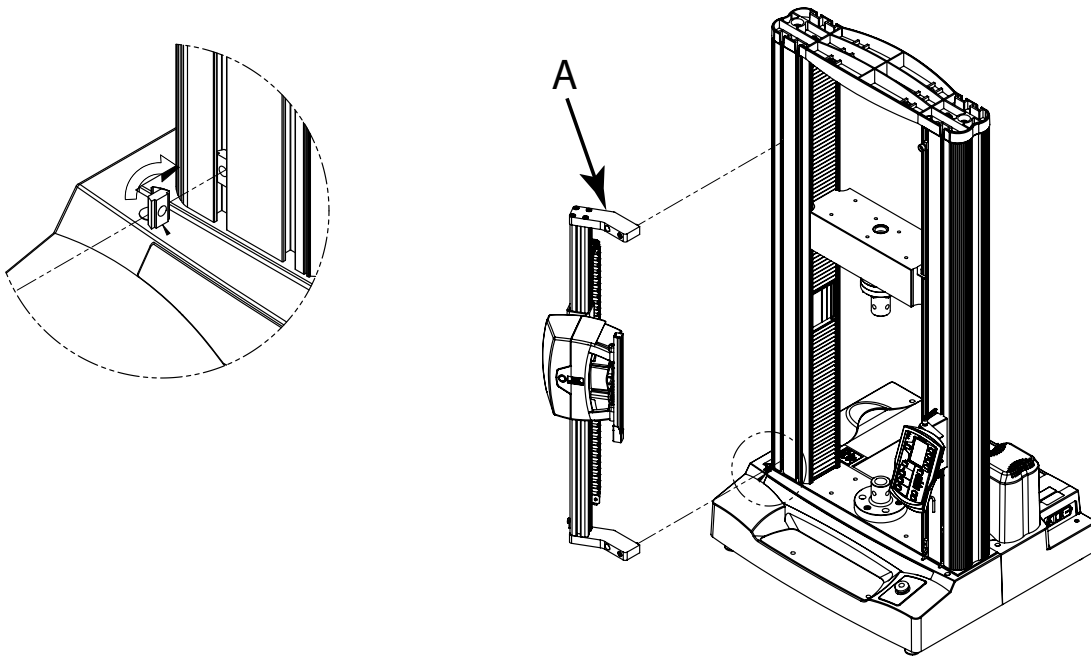


Figure 3. AVE2 on a 5960 dual column table top testing machine

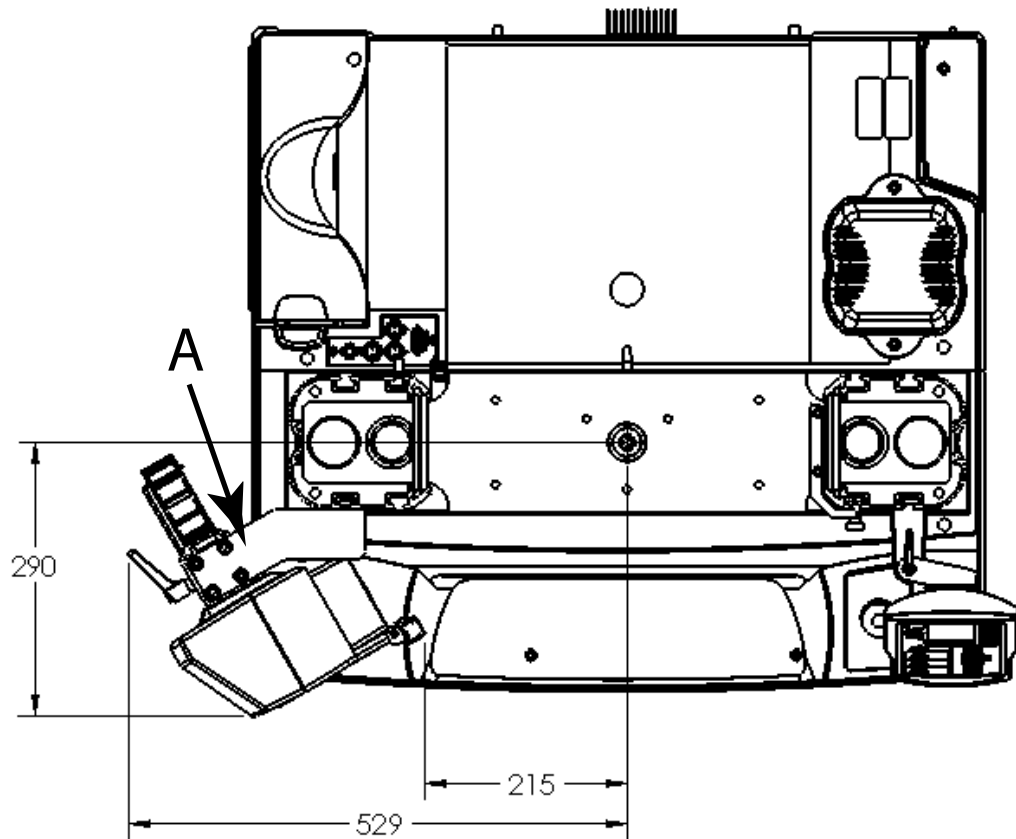


Figure 4. Footprint of AVE2 on a 5960 dual column table top testing machine

Alternative mounting location

If the T-slot on the left front of the testing machine is already occupied by another accessory (a debris shield, for example), you can mount the AVE2 in the T-slot on the right rear (see [Figure 5](#) on page 29).

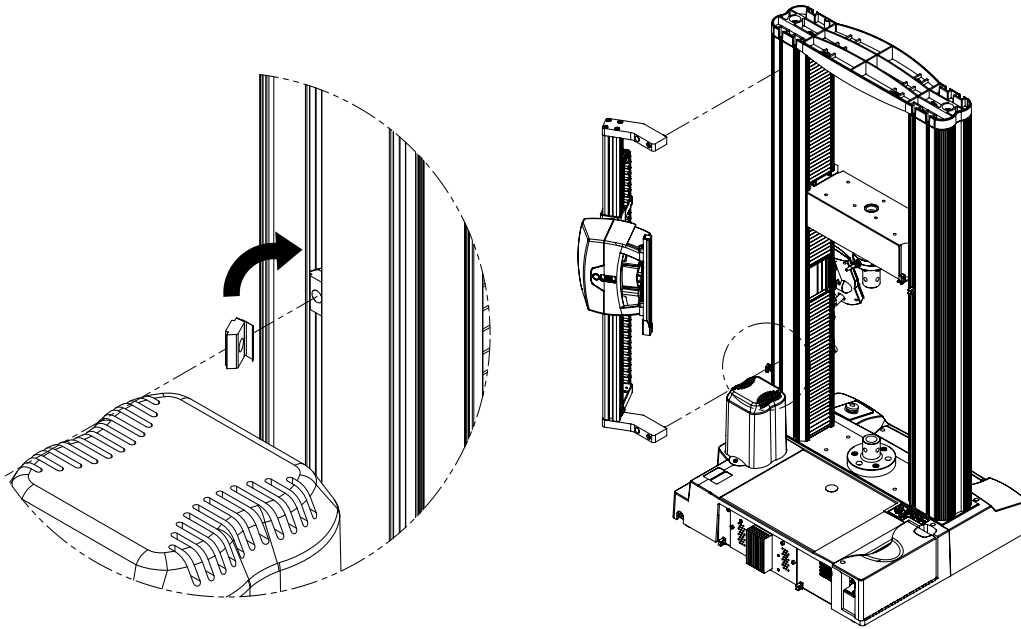


Figure 5. AVE2 alternative location



The motor cover on the testing machine restricts the lower limit of travel of the AVE2.

Caution

Make sure that the bottom bracket is at least 25mm above the top of the motor cover to allow adequate cooling (see [Figure 6](#) on page 30).

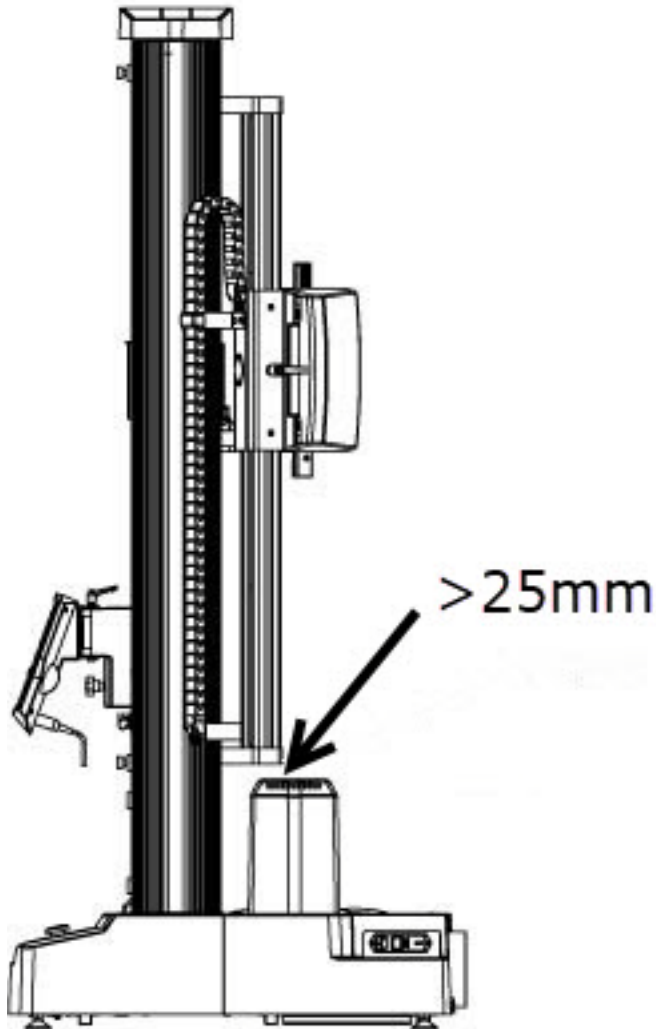


Figure 6. AVE2 alternative location - minimum clearance

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 7](#) on page 31 mounted on a 6800 series testing system.

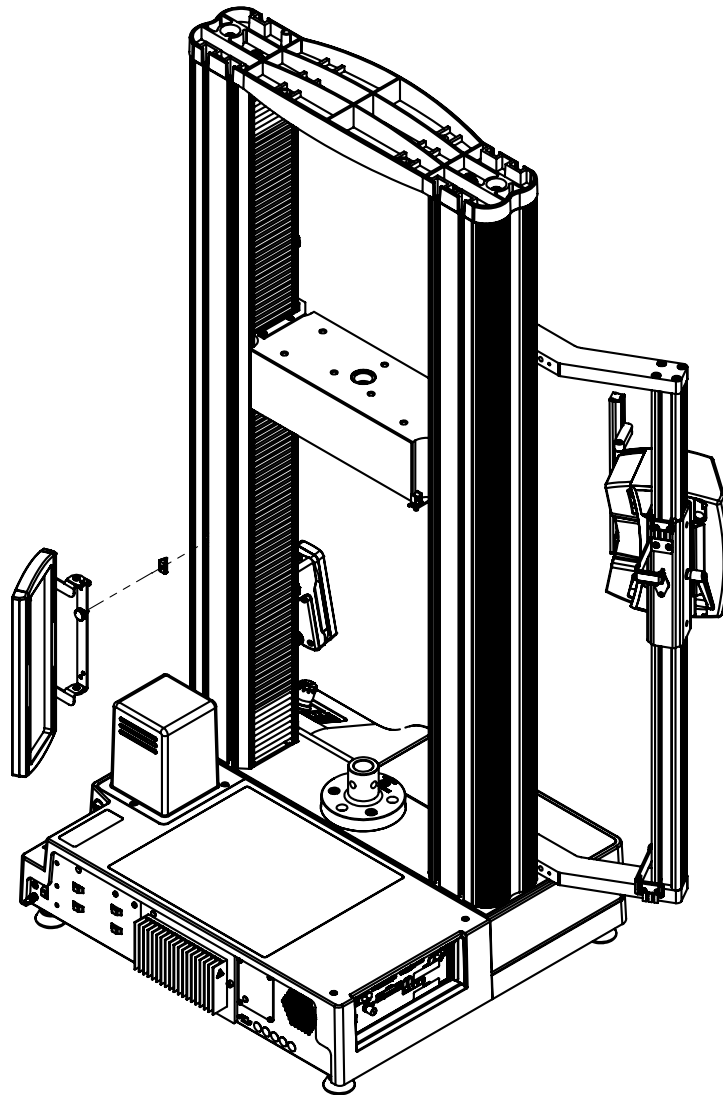


Figure 7. Installation shown on a 6800 Series testing system

Figure 8 on page 32 shows the footprint dimensions of the AverEdge32™ configuration on a 6800 Series testing system, including the back screen (1). Note that the mounting bracket and back screen are installed in the T-slot closest to the outer edge of each column.

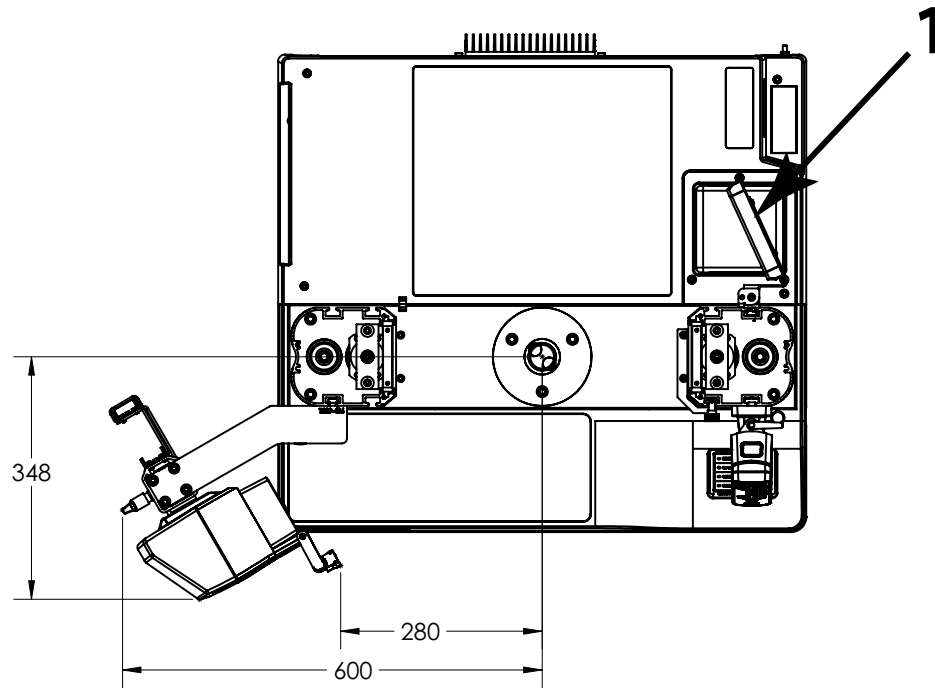


Figure 8. Footprint shown on 6800 Series testing system

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)
- 5500 (e.g. 5543, 5544)

[Figure 9](#) on page [34](#) and [Figure 10](#) on page [35](#) show the AVE2 installed on a 5940 single column testing machine. Dimensions are in mm.

The mounting bracket (A) is designed for use with a single column testing machine only.

Make sure that you mount the bracket into the second T-slot from the front of the column ([Figure 11](#) on page [36](#)) to ensure proper alignment.

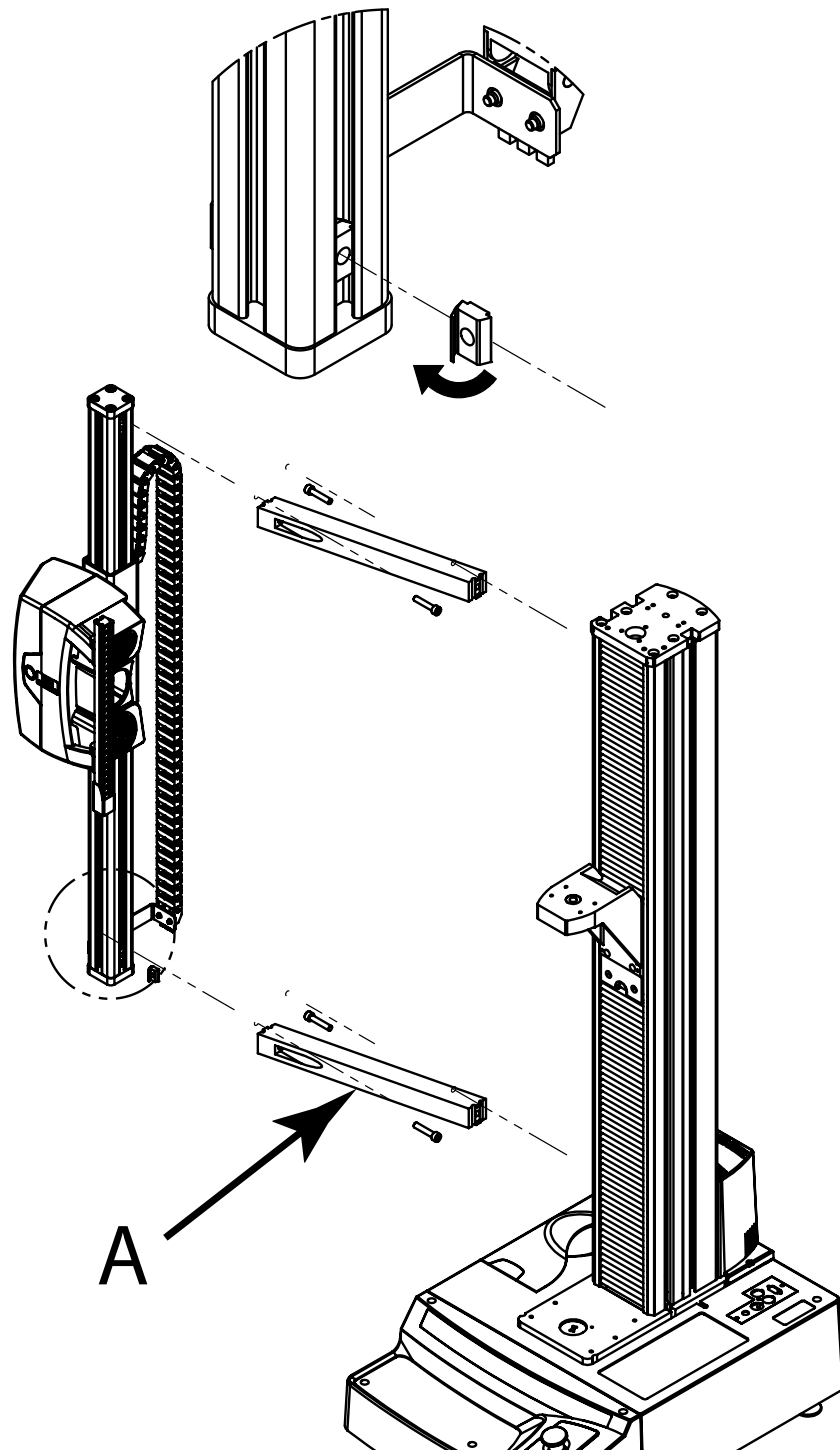


Figure 9. AVE2 on a 5940 single column testing machine

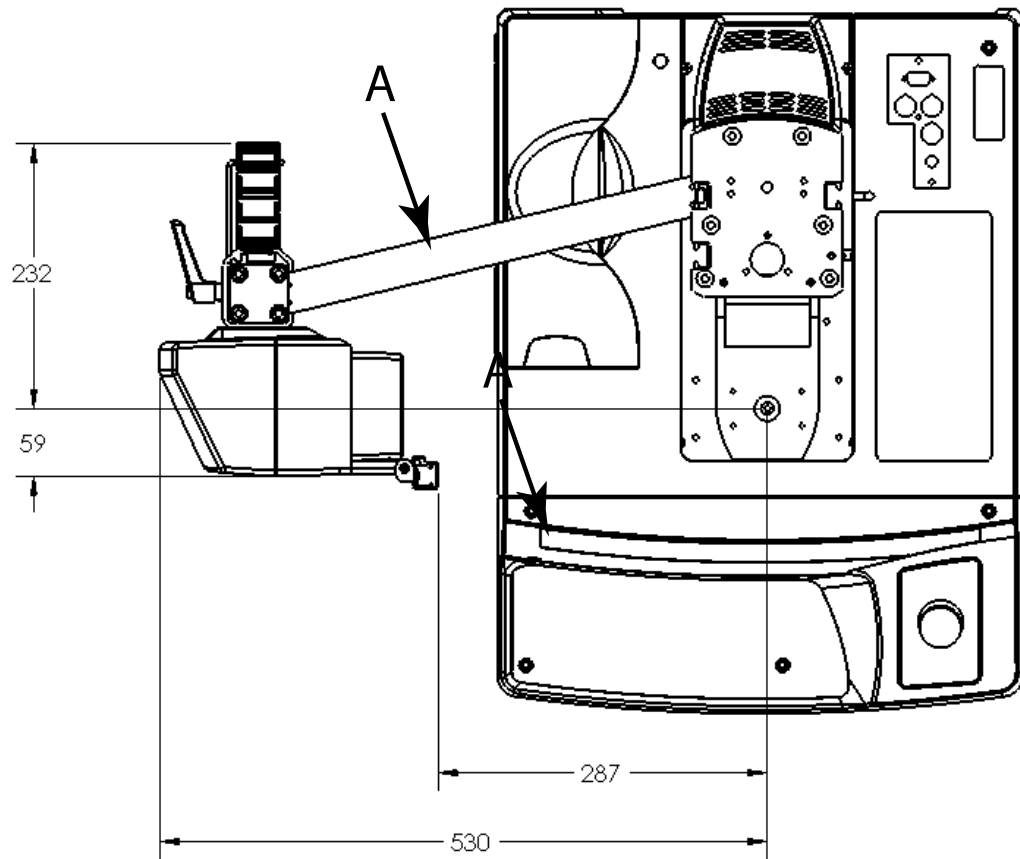


Figure 10. Footprint of AVE2 on a 5940 single column testing machine

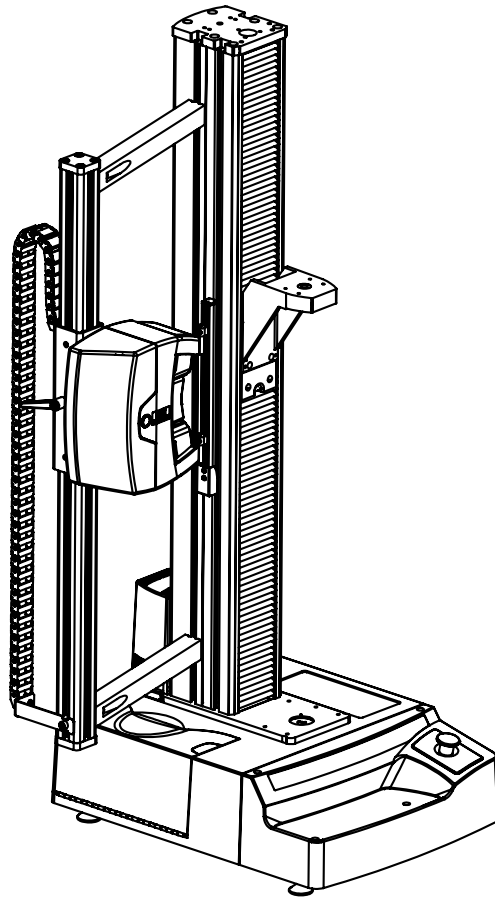


Figure 11. AVE2 mounted in second slot from front of 5940

5980 (not 5988 or 5989) Floor model testing machines

[Figure 12](#) on page [37](#) and [Figure 13](#) on page [38](#) show the AVE2 installed on a 5985 floor model testing machine. Dimensions are in mm.

The mounting bracket (A) is the same angled bracket that is used on the 5960 dual column table model but with additional spacers (B).

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

The optional AverEdge32™ configuration uses the same mounting methods but a different mounting bracket and an additional back screen. Refer to [“AverEdge32™ configuration”](#) on page [38](#).

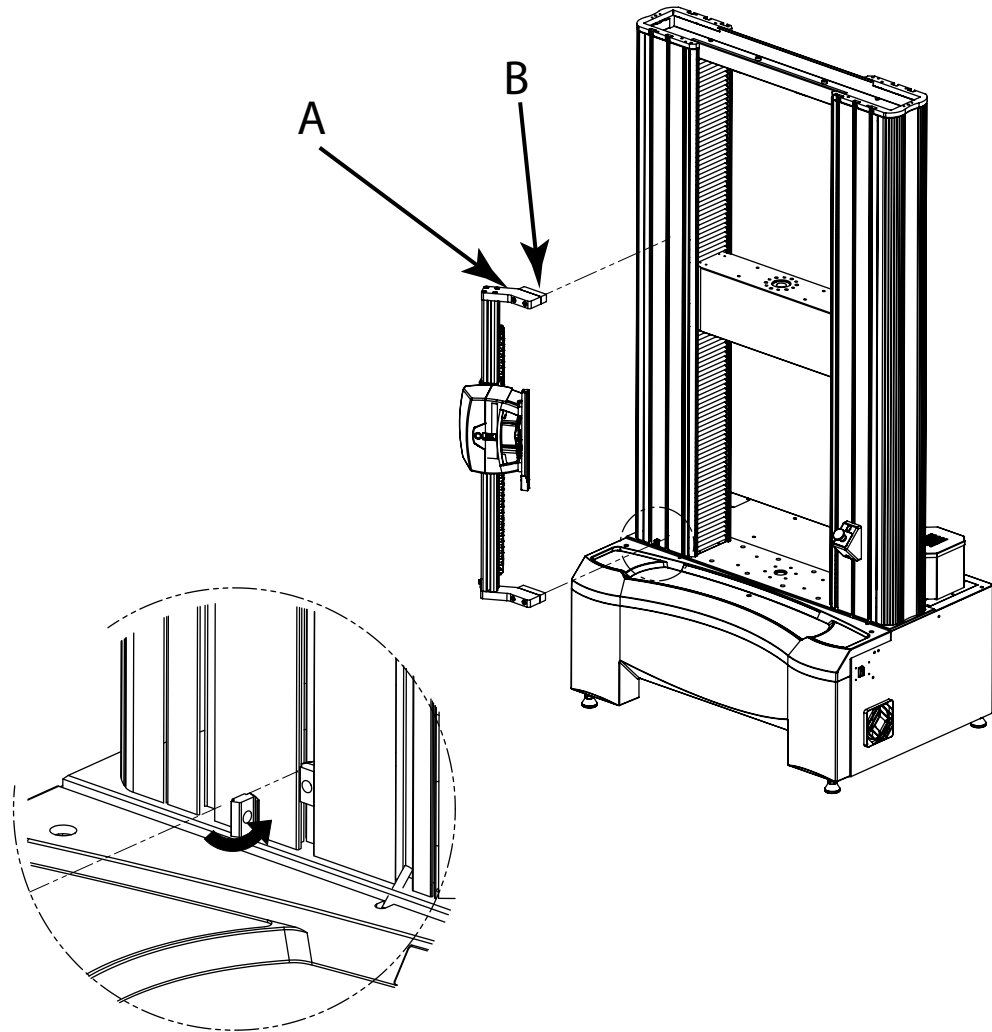


Figure 12. AVE2 on a 5985 dual column floor model testing machine

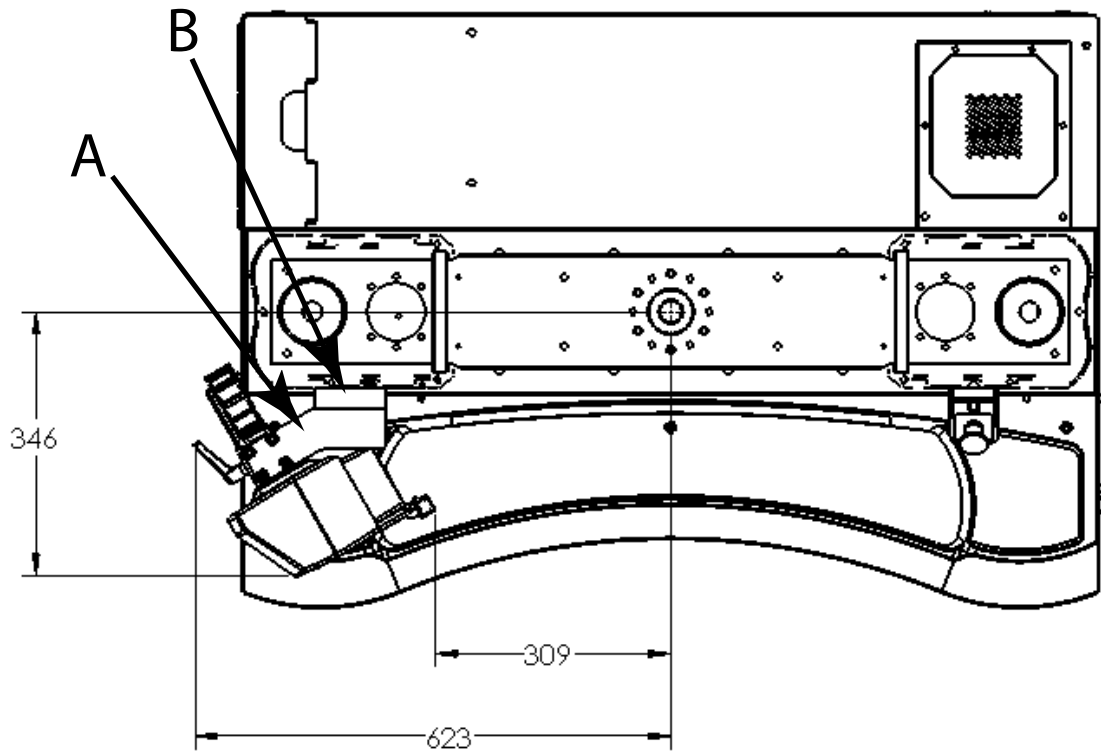


Figure 13. Footprint of AVE2 on a 5985 dual column floor model testing machine

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 14](#) on page 39 mounted on a 5980 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.

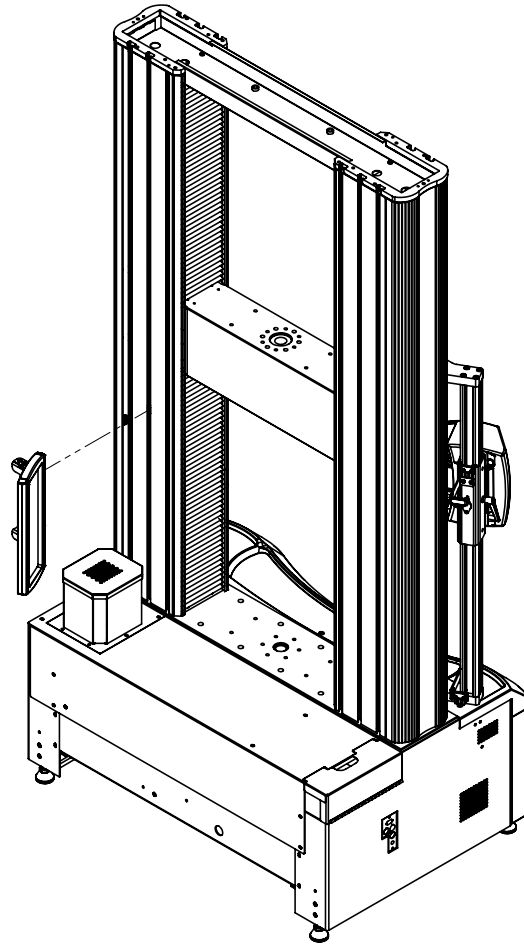


Figure 14. Installation shown on a 5980 Series testing system

Figure 15 on page 40 shows the footprint dimensions of the AverEdge32™ configuration on a 5980 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.

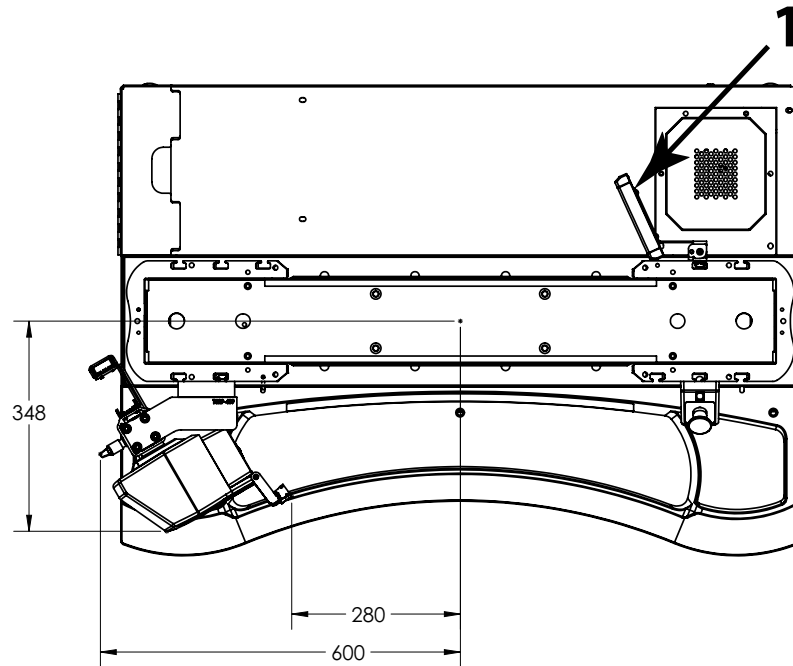


Figure 15. Footprint shown on 5980 Series testing system

5988 and 5989 High-capacity floor model testing machines

Figure 16 on page 41 and Figure 17 on page 42 show the AVE2 installed on a 5988 high capacity floor model testing machine. Dimensions are in mm.

The mounting bracket (A) is the same angled bracket that is used on the 5960 dual column table model but with additional spacers (B).

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

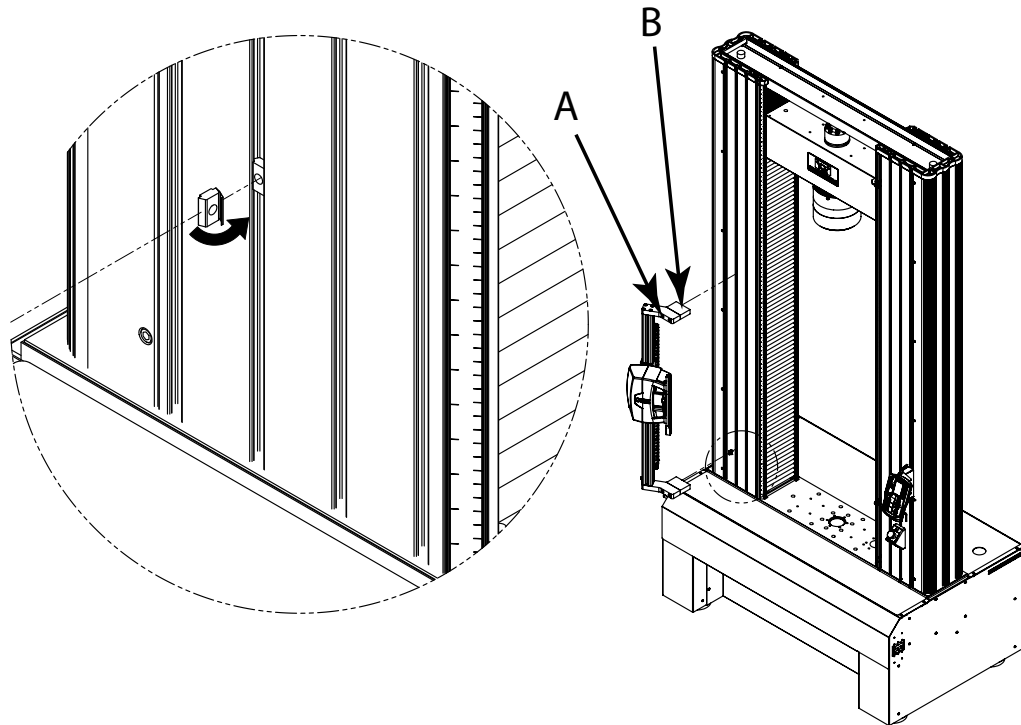


Figure 16. AVE2 on a 5988 or 5989 floor model testing machine

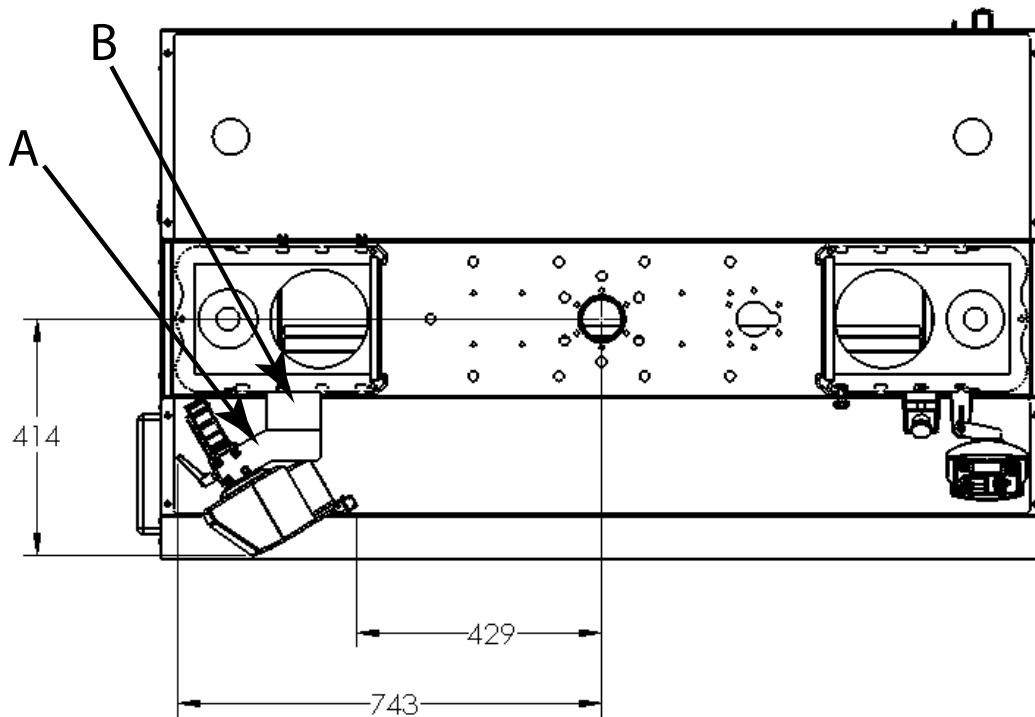


Figure 17. Footprint of AVE2 on a 5988 or 5989 floor model testing machine

LX Static hydraulic testing machines

Figure 18 on page 43 and Figure 19 on page 44 show the AVE2 installed on an LX static hydraulic testing machine. Dimensions are in mm.

As shown in Figure 18, mount bracket A to the top of the left hand column, and mount bracket B to the left front corner of the top plate of the base.

If the system includes high-capacity hydraulic wedge grips, the bracket for the handset controls should be mounted to the top of bracket B as shown in views C and D.

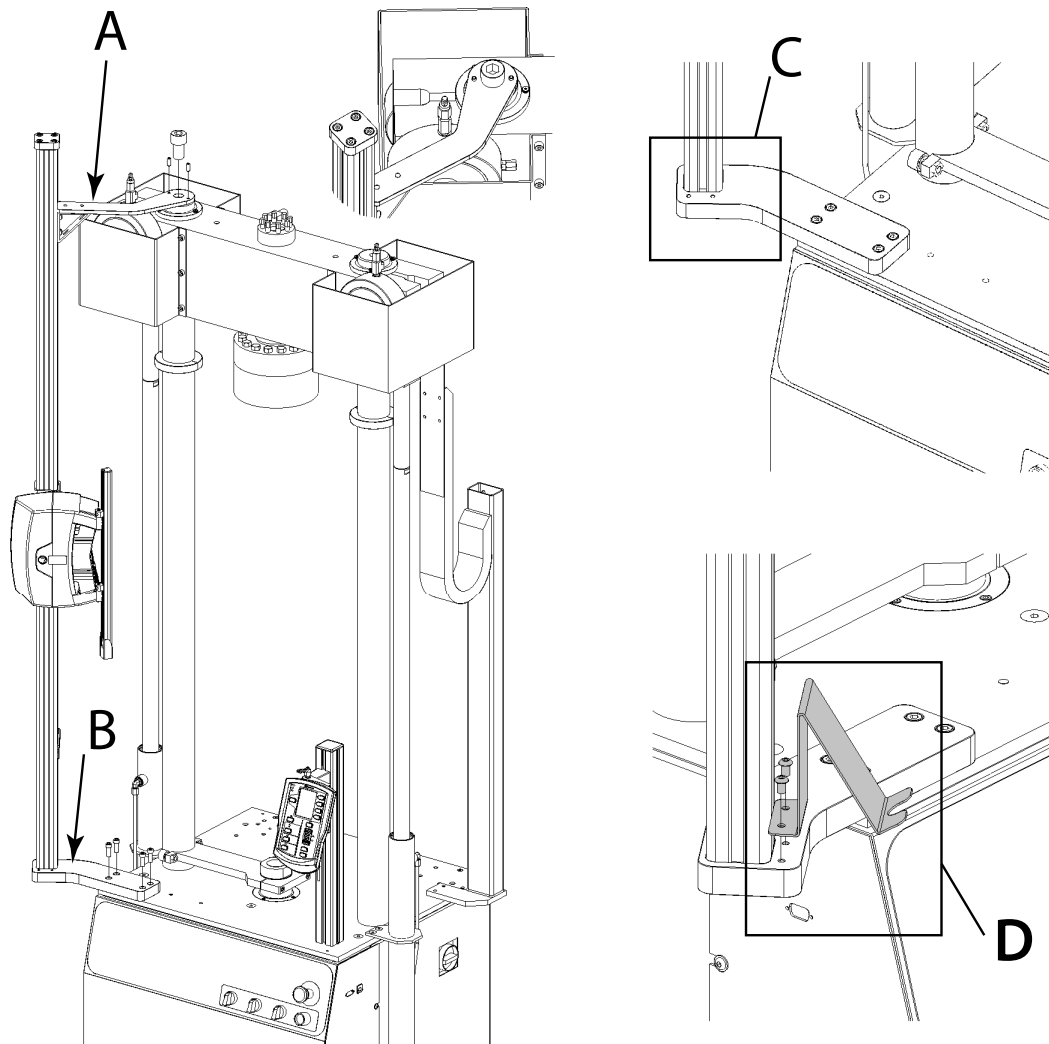


Figure 18. AVE2 on a LX static hydraulic testing machine

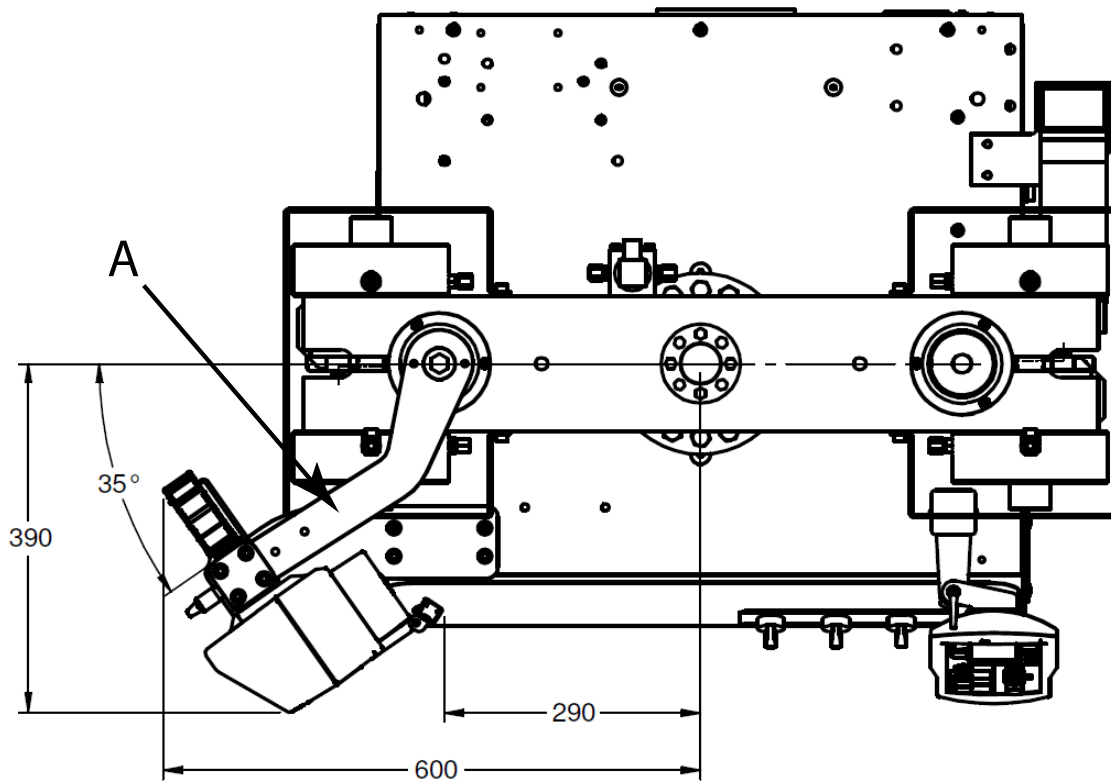


Figure 19. Footprint of AVE2 on an LX static hydraulic testing machine

8800 and ElectroPuls testing machines

The AVE2 is mounted to the 8800 and ElectroPuls testing machines via a plate mounted to the base platen. All 8800 and ElectroPuls machines use the same mounting plate in the same position. The mounting bracket that attaches to the column varies slightly according to the machine model. Refer to the installation drawing supplied with your testing machine for more details.

[Figure 20](#) on page 45 and [Figure 21](#) on page 46 show the AVE2 installed on an ElectroPuls and 8801 testing machine. Dimensions are in mm.

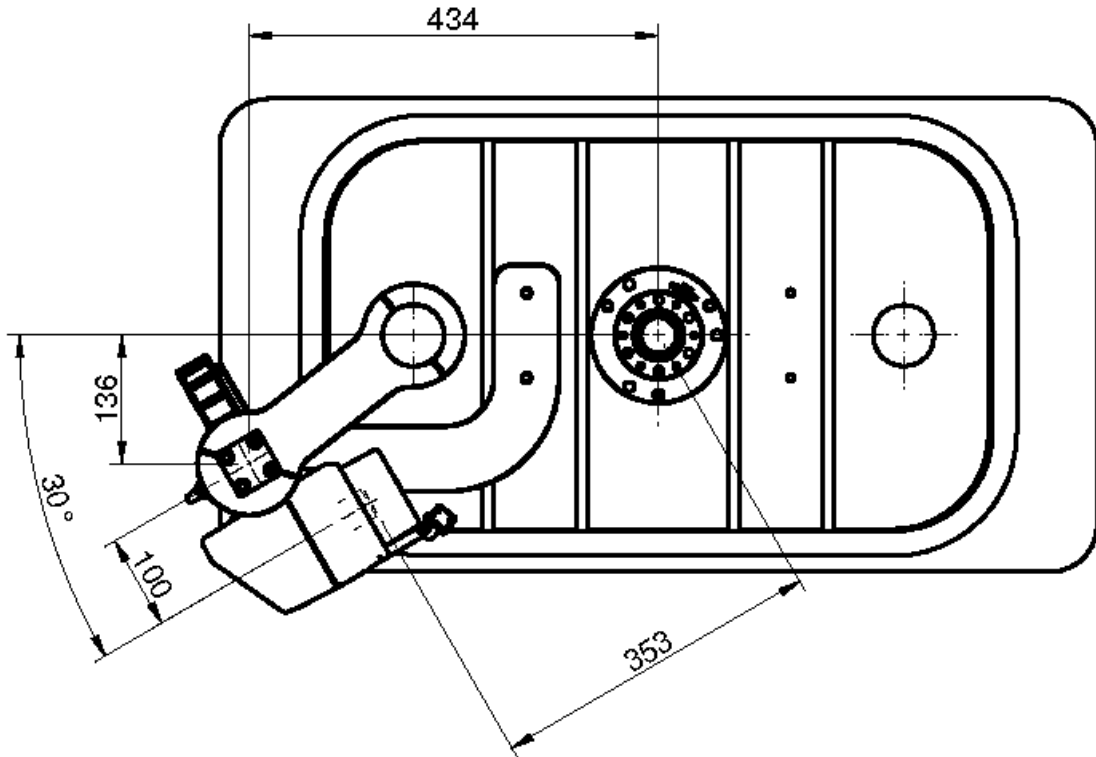


Figure 20. Footprint of AVE2 on an ElectroPuls testing machine

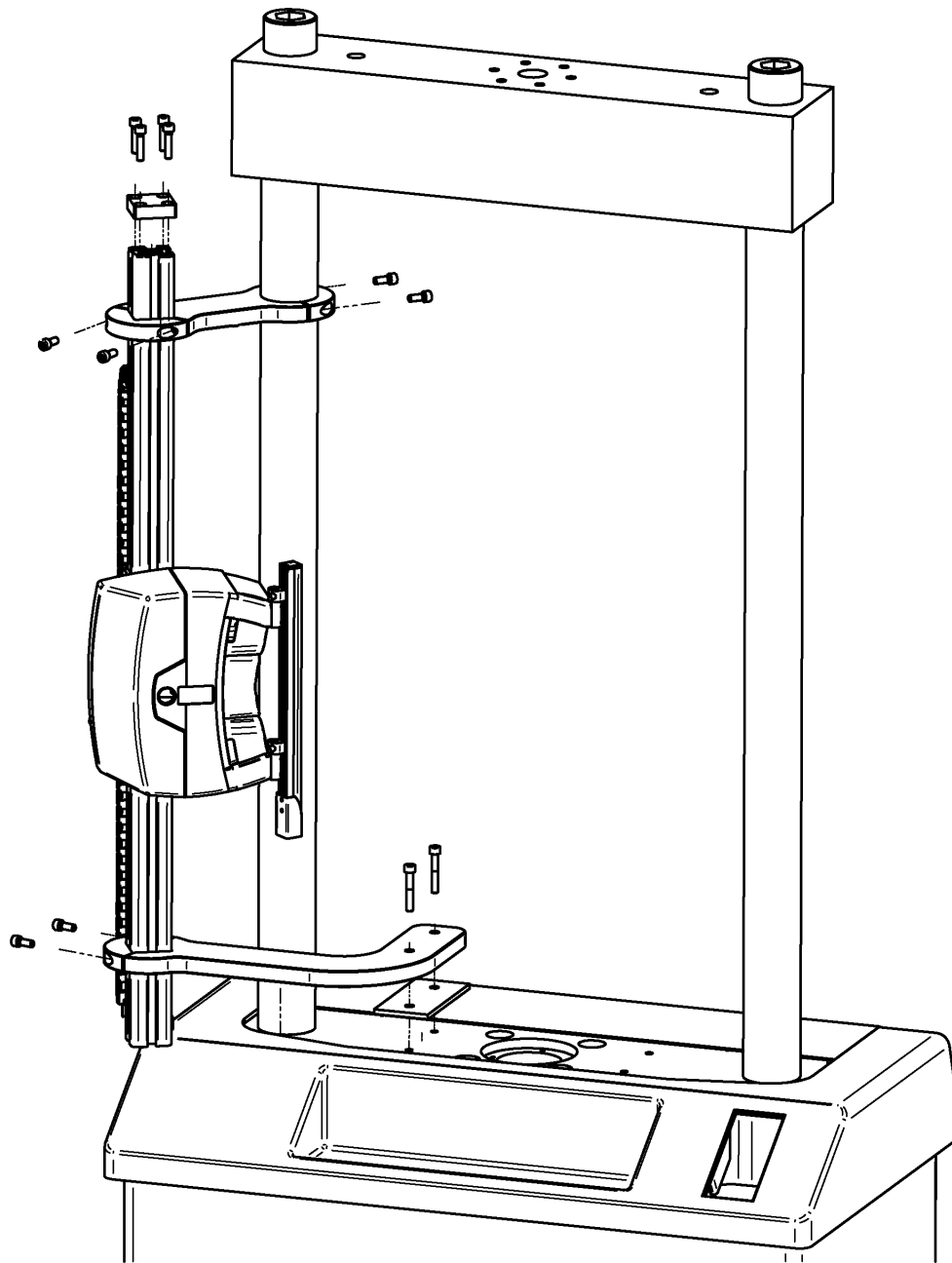


Figure 21. AVE2 on an 8801 series testing machine

System interconnections

Figure 22 on page 47 shows an overview of the interconnections between the video extensometer, the controller on the load frame and the computer running the control software.

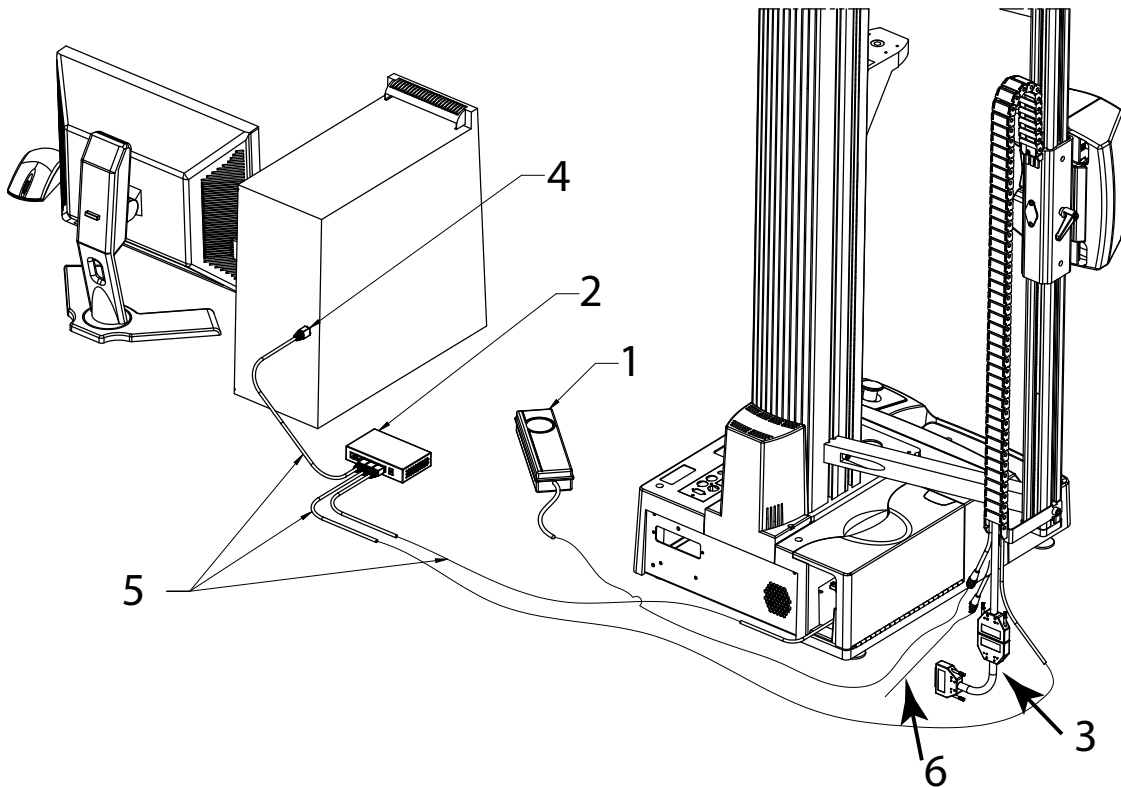


Figure 22. Video extensometer system interconnections (5900 shown)

The numbers in the following description refer to Figure 22 on page 47.

The video extensometer connects to power (1), the Ethernet switch (2) and the appropriate strain connector on the frame controller via the interface cable and an adapter cable (3). The Ethernet switch (2) connects to the computer's Ethernet connection (4) and to the frame controller's Ethernet connection. There are three Ethernet cables (5). An additional cable (6) is the sync cable required for use with DIC Replay software. If you are using DIC Replay, connect this cable to the **SYNC** connector on the controller panel on the load frame.

Figure 23 on page 49 shows a closer view of the video extensometer connections. The power cable (1) and the Ethernet cable (2) are shown with the video extensometer interface cable and the video extensometer adapter cable (3). The adapter cable shown

is appropriate for 5900 frames. Other frames have different adapter cables to accommodate different controllers. Refer to the installation drawing supplied with your load frame for more details. The sync cable (6) must be connected to the **SYNC** connector on the load frame if you are using DIC Replay software.

Table 8. Video extensometer adapter cables

Frame/ Controller	Video extensometer adapter	Connection location on controller
6800 and 3400	None	Connector labeled ENCODER .
5900	44-way connector to 25-way connector	Connector labeled ENCODER STRAIN 1 .
5500 and 3300	44-way connector to two 25-way connectors; one for axial strain and one for transverse strain	Axial connector to connector labeled ENCODER STRAIN 1 and transverse connector to connector labeled SCM STRAIN 2 .
8800MT controller	44-way connector to two 25-way connectors; one for axial strain and one for transverse strain	Axial and transverse connectors to connectors labeled SCM # (the exact connector numbers depend on your system configuration).
8800T or 8800D controller	44-way connector to two BNC connectors; one for axial strain and one for transverse strain. Each BNC connector is connected to an analog SCM on the controller via a BNC adapter cable.	Axial and transverse connectors to connectors labeled CHANNEL # (the exact connector numbers depend on your system configuration).
Others	44-way connector to two BNC connectors; one for axial strain and one for transverse strain	Analog inputs

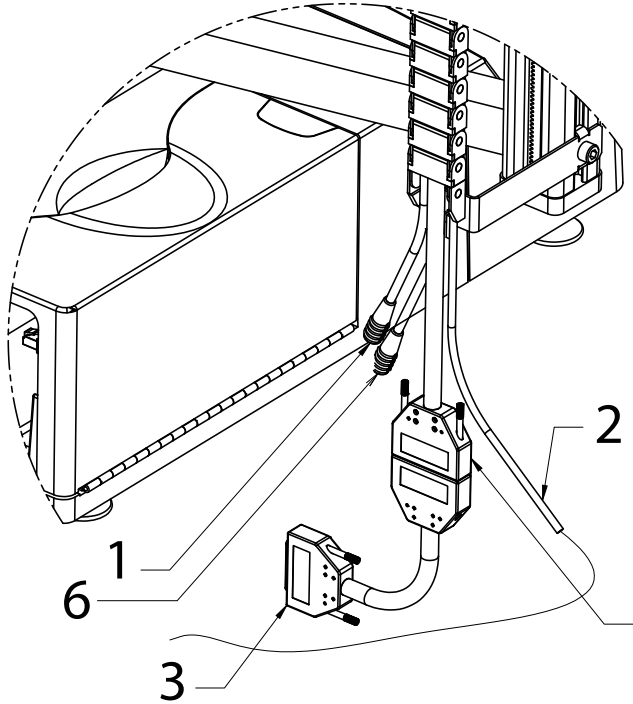


Figure 23. Video extensometer connectors

Chapter 4

Mark specimens

• Overview.....	51
• Marking tips.....	52
• Applying ink dots.....	52
• Troubleshooting ink dots.....	53

Overview

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

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 jigs 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 jig 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 jig 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 jig.

2. Locate the holes in the jig 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 jig over it so that your chosen holes are located an equal distance from the center line of the specimen. The jig is shaped into sections of different widths to aid positioning on the center line on specimens of different widths. Make sure the jig is positioned so that the printed text on the jig is readable and the countersink on the holes is towards the specimen surface. The countersink prevents the ink from running between the jig and the specimen.
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. Run the pen around the edge of the hole twice, then fill in the center.
 - d. Apply all the marks without disturbing the jig.
 - e. Apply sufficient ink to make a dense mark but not so much that the ink runs.
7. Carefully remove the jig 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 jig 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

Set up hardware

-
- Extensometer lenses 55
 - Set up the load string 57
 - Set up for AverEdge32™ configuration 57
-

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 AVE2 and SVE2 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

Most users can do all of their testing using the standard 16mm focal length 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. 5940 and 5960), ElectroPuls and 8800 Series systems ¹	Floor Model testers (e.g. 5982, 5984, 5985) and LX static hydraulic testing machines	High-capacity floor model testers (e.g. 5988, 5989)
35	100	130	160
16 (standard)	240	310	390
9	425	560	680
6	620	840	not suitable

1. when used for dynamic testing on 8800 or ElectroPuls, the 16mm lens is the only available option.

To examine and, if necessary, change the lens:

1. Remove the lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens. You can now read the focal length of the lens printed on the body.
2. If you need to change the lens, unscrew the lens from the extensometer and store it in the case provided.
3. Screw in the new lens and focus it.
4. Replace the lens cover (AVE2 only).
5. If you have changed the lens, recalibrate the extensometer.

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.

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.

Lens focal length (mm)	Nominal field of view (mm)	
	Dot-based method	Edge-based method
35	130	not applicable
16 (standard)	310	205
9	560	not applicable
6	840	not applicable

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.

Set up for AverEdge32™ configuration

The AverEdge32™ configuration requires some additional setup to check that the illumination is sufficient but not too bright.

1. Swing the back screen so that it faces towards the load string until it impacts on the mechanical stop.
2. Install the set of grips that will be used for testing and a typical specimen.
3. In the AVE2 tab in the Transducer dialog, enable the **Show saturated pixels** option.
4. View the live image of the specimen and check for any saturated pixels, which display as red dots in the image. If there are too many red dots to display on the image, a warning message displays instead.

5. If saturated pixels are indicated, rotate the light on the AVE2 system to the left or right to adjust the illumination. The desired result is maximum illumination of the specimen but without any saturated pixels.
6. When you are satisfied with the lighting, disable the **Show saturated pixels** option.

You should run this check whenever you change any component of the load string.

Chapter 6

Set up Bluehill Universal[®] software

• Fully integrated testing systems	59
• Non-integrated testing systems	62

Fully integrated testing systems

This section describes the following systems:

- 6800
- 3400
- 5900
- 3300
- 5500 and 5500A
- 8800 and ElectroPuls using the 8800MT controller

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

Table 9. 3400 and 6800 systems

Connections	Axial and transverse signals via Encoder connector.
Software requirements	3400 requires Bluehill Universal [®] V4.11 or later. 6800 requires Bluehill Universal [®] V4.18 or later.
Recognition and configuration in Bluehill [®] software	Video extensometer recognition. No configuration required in Admin tab.
Compatibility with DIC Replay	Available option.

Table 10. 5900 systems

Connections	Axial and transverse signals via Strain 1 connector to encoder.
-------------	---

Table 10. 5900 systems (Continued)

Software requirements	Requires Bluehill® V3.62 or later.
Recognition and configuration in Bluehill® software	Video extensometer recognition. No configuration required in Admin tab.
Compatibility with DIC Replay	Available option.

Table 11. 3300, 5500 and 5500A systems

Connections	Axial signals via Strain 1 connector to encoder. Transverse signals via analog signals and the Strain 2 connector.
Software requirements	Requires Bluehill® V3.62 or later.
Recognition and configuration in Bluehill® software	Strain device recognition. Requires selection of appropriate device in Admin tab.
Compatibility with DIC Replay	Available option.

Table 12. 8800 and ElectroPuls systems using the 8800MT controller

Connections	Varies depending on system details. Refer to 8800/ElectroPuls Console online help.
Software requirements	Requires Bluehill® V3.63 and Console V8.9 or later for static operation. Requires Bluehill® V3.67 and Console V8.11 or later for dynamic operation.
Recognition and configuration in Bluehill® software	Strain device recognition. Requires selection of appropriate device in Admin tab.
Additional requirements	Limits must be set in 8800/ElectroPuls Console, cannot be set in Bluehill®.
Compatibility with DIC Replay	Available option.

Calibrate in Bluehill® Universal software

You should calibrate the extensometer upon initial start up and also after you change anything in the setup, such as changing a lens or changing the position of the AVE2.


This procedure requires a calibration bar. If you are using a 6mm lens, then two calibration bars are required.


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 **AVE2** (or **SVE2**) screen.
3. Position the crosshead and the video extensometer as required for the specimens that will be tested.
4. For all lenses except the 6mm lens:
 - a Install the calibration bar in the upper grip only, making sure that the matrix of dots faces towards the extensometer.
 - b If necessary, remove the lower grip to avoid damage to the calibration bar.
 - c Move the crosshead so that the image of the calibration bar fills the field of view.
5. If you are using the 6mm lens, you must use two calibration bars to accommodate the large field of view, as follows:
 - a Install one calibration bar in the upper grip, making sure that the matrix of dots faces towards the extensometer.
 - b Install one calibration bar in the lower grip, making sure that the matrix of dots faces towards the extensometer.
 - c Move the crosshead so that the upper bar is near the top of the field of view and the bottom bar is near the bottom of the field of view. Make sure, however, that the bottom bar is at least 50mm above the bottom of the field of view to optimize accuracy.
6. Select **Calibration**.

The dialog moves to the **Calibration** screen.
7. Remove the red lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens.
8. Follow the instructions in the calibration dialog to select and focus the lens.
 - a Select the lens that you have installed from the drop-down list.
 - b Focus of the lens until the check mark appears, then lock the thumb screw.
9. Replace the red lens cover (AVE2 only).
10. In the image window in the **Calibration** screen, drag the dotted center line so that it is in the center of the dot matrix pattern.
11. Draw a box around the area of the dot matrix that you want to calibrate. The border of the box displays green.

 *If you are using the 6mm lens, draw the box so that it includes both calibration bars.*
12. Select **Calibrate**.
13. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the highest accuracy.

 *You should ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of each test.*

14. Select **AVE2** (or **SVE2**).

The dialog moves to the **AVE2** (or **SVE2**) screen.

15. Remove the calibration bar from the grips.

16. Select **Close** to close the Transducer settings dialog.

17. Close System Details.

The strain transducers for the video extensometer are now calibrated.

Non-integrated testing systems

This section describes the following systems:

- 8800 and ElectroPuls using the 8800T or 8800D controller
- Other non-integrated testing systems, including non-Instron

Warning



When using the 8800T or 8800D controller, the AVE2 or SVE2 is intended for strain monitoring only. It is not suitable for use as the controlling channel when conducting a test in strain control.

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

Table 13. 8800 and ElectroPuls systems using the 8800T or 8800D controller

Connections	Axial connection to an analog SCM on the controller via a BNC adapter cable. Transverse connection requires an additional SCM and adapter cable. Calibration via the $\pm 10V$ signal.
Software requirements	Requires Bluehill Universal [®] V4.01 and Console V8.9 or later.
Operation in Bluehill [®] software	<ul style="list-style-type: none"> • Calibration via the Instron Video Extensometer Application. • Additional manual calibration in 8800/ElectroPuls Console calibration wizard in conjunction with the Analog Outputs screen in the Instron Video Extensometer Application. As part of the manual calibration, set transducer type to Strain (Calibration wizard > Transducer details screen) to ensure that it is recognized as a strain transducer in Console and software applications such as Bluehill[®] and WaveMatrix[™] software.
Recognition and configuration in Bluehill [®] software	Strain device recognition. Requires selection of appropriate device in Admin tab.

Table 13. 8800 and ElectroPuls systems using the 8800T or 8800D controller

Additional requirements	Limits must be set in 8800/ElectroPuls Console, cannot be set in Bluehill®.
Compatibility with DIC Replay	Not available.

Table 14. Other non-integrated systems, including non-Instron

Connections	Connection to analog inputs. Calibration via the $\pm 10V$ or $\pm 5V$ signal.
Software requirements	Calibration via the Instron Video Extensometer Application.
Compatibility with DIC Replay	Not available.

Calibrate in the Instron Video Extensometer application

8800 or ElectroPuls testing systems using the 8800T or 8800D controller use the Instron Video Extensometer application for calibration. You cannot calibrate the AVE2 or SVE2 from Bluehill®.

The Instron Video Extensometer application is supplied with the video extensometer instrument, separately from any other software, such as Bluehill®.

The following procedures describe how to calibrate the video extensometer:

- using the tabbed dialog version of the Instron Video Extensometer Application (resembles the Bluehill® 3 user interface)
- using the touch-enabled version of the Instron Video Extensometer Application (resembles the Bluehill® Universal user interface)

Calibrate using tabbed dialog

You should calibrate the extensometer upon initial start up and also after you change anything in the setup, such as changing a lens or changing the position of the AVE2.

This procedure requires a calibration bar. If you are using a 6mm lens, then two calibration bars are required.

1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.
2. If it is not already open, launch the Instron Video Extensometer application. The video extensometer dialog displays.

3. Position the crosshead and the video extensometer as required for the specimens that will be tested.
4. For all lenses except the 6mm lens:
 - a Install the calibration bar in the upper grip only, making sure that the matrix of dots faces towards the extensometer.
 - b If necessary, remove the lower grip to avoid damage to the calibration bar.
 - c Move the crosshead so that the image of the calibration bar fills the field of view.
5. If you are using the 6mm lens, you must use two calibration bars to accommodate the large field of view, as follows:
 - a Install one calibration bar in the upper grip, making sure that the matrix of dots faces towards the extensometer.
 - b Install one calibration bar in the lower grip, making sure that the matrix of dots faces towards the extensometer.
 - c Move the crosshead so that the upper bar is near the top of the field of view and the bottom bar is near the bottom of the field of view. Make sure, however, that the bottom bar is at least 50mm above the bottom of the field of view to optimize accuracy.
6. Select **Calibrate...** to open the calibration dialog.
7. Remove the red lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens.
8. Follow the instructions in the calibration dialog to select and focus the lens.
 - a Select the lens that you have installed from the drop-down list.
 - b Focus of the lens until the check mark appears, then lock the thumb screw.
9. Replace the red lens cover (AVE2 only).
10. In the image window in the calibration dialog, drag the dotted center line so that it is in the center of the dot matrix pattern.
11. Draw a box around the area of the dot matrix that you want to calibrate. The border of the box displays green.



If you are using the 6mm lens, draw the box so that it includes both calibration bars.

12. Select **Calibrate**.
13. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the highest accuracy.



You should ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of each test.

14. Select **OK** to accept the calibration and close the calibration dialog.
15. Remove the calibration bar from the grips.
16. If you are using the video extensometer on an 8800 or ElectroPuls testing system with an 8800T or 8800D controller, you now need to manually calibrate the exten-

someter in 8800/ElectroPuls console. As part of the manual calibration, set the transducer type to Strain (**Calibration wizard > Transducer details** screen). For more details refer to “Using the AVE2 with an 8800T or 8800D Controller” in the Console online help.

The strain transducers for the video extensometer are now calibrated.

Calibrate using touch-enabled user interface

You should calibrate the extensometer upon initial start up and also after you change anything in the setup, such as changing a lens or changing the position of the AVE2.

This procedure requires a calibration bar. If you are using a 6mm lens, then two calibration bars are required.

1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.
2. If it is not already open, launch the Instron Video Extensometer application. The video extensometer dialog displays.
3. Position the crosshead and the video extensometer as required for the specimens that will be tested.
4. For all lenses except the 6mm lens:
 - a. Install the calibration bar in the upper grip only, making sure that the matrix of dots faces towards the extensometer.
 - b. If necessary, remove the lower grip to avoid damage to the calibration bar.
 - c. Move the crosshead so that the image of the calibration bar fills the field of view.
5. If you are using the 6mm lens, you must use two calibration bars to accommodate the large field of view, as follows:
 - a. Install one calibration bar in the upper grip, making sure that the matrix of dots faces towards the extensometer.
 - b. Install one calibration bar in the lower grip, making sure that the matrix of dots faces towards the extensometer.
 - c. Move the crosshead so that the upper bar is near the top of the field of view and the bottom bar is near the bottom of the field of view. Make sure, however, that the bottom bar is at least 50mm above the bottom of the field of view to optimize accuracy.
6. Select **Calibration**.

The dialog moves to the **Calibration** screen.
7. Remove the red lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens.

8. Follow the instructions in the calibration dialog to select and focus the lens.
 - a Select the lens that you have installed from the drop-down list.
 - b Focus of the lens until the check mark appears, then lock the thumb screw.
9. Replace the red lens cover (AVE2 only).
10. In the image window in the **Calibration** screen, drag the dotted center line so that it is in the center of the dot matrix pattern.
11. Draw a box around the area of the dot matrix that you want to calibrate. The border of the box displays green.



If you are using the 6mm lens, draw the box so that it includes both calibration bars.

12. Select **Calibrate**.
13. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the highest accuracy.



You should ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of each test.

14. Select **AVE2** (or **SVE2**).

The dialog moves to the **AVE2** (or **SVE2**) screen.

15. Remove the calibration bar from the grips.
16. If you are using the video extensometer on an 8800 or ElectroPuls testing system with an 8800T or 8800D controller, you now need to manually calibrate the extensometer in 8800/ElectroPuls console. As part of the manual calibration, set the transducer type to Strain (**Calibration wizard > Transducer details** screen). For more details refer to “Using the AVE2 with an 8800T or 8800D Controller” in the Console online help.

The strain transducers for the video extensometer are now calibrated.

Chapter 7

Set up Bluehill[®] 3 software

- Fully integrated testing systems 67
- Non-integrated testing systems 70



References in Bluehill[®] 3 help to the “video extensometer” are applicable only to the older AVE and SVE instruments, they do not apply to AVE2 and SVE2.

For example, Bluehill[®] help states that the video extensometer must use the two specially-created strain transducer configurations, video axial strain and video transverse strain. This is true for the older video extensometers, but is not true for AVE2 and SVE2; Bluehill[®] does not create these configurations.

Bluehill[®] 3 software can run on a variety of testing systems with the AVE2 or SVE2. The level of integration and control depends on the testing system.

Fully integrated testing systems

This section describes the following systems:

- 5900
- 3300
- 5500 and 5500A
- 8800 and ElectroPuls using the 8800MT controller

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

Table 15. 5900 systems

Connections	Axial and transverse signals via Strain 1 connector to encoder.
Software requirements	Requires Bluehill [®] V3.62 or later.
Recognition and configuration in Bluehill [®] software	Video extensometer recognition. No configuration required in Admin tab.

Table 15. 5900 systems (Continued)

Compatibility with DIC Replay	Available option.
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Table 16. 3300, 5500 and 5500A systems

Connections	Axial signals via Strain 1 connector to encoder. Transverse signals via analog signals and the Strain 2 connector.
Software requirements	Requires Bluehill® V3.62 or later.
Recognition and configuration in Bluehill® software	Strain device recognition. Requires selection of appropriate device in Admin tab.
Compatibility with DIC Replay	Available option.

Table 17. 8800 and ElectroPuls systems using the 8800MT controller

Connections	Varies depending on system details. Refer to 8800/ElectroPuls Console online help.
Software requirements	Requires Bluehill® V3.62 and Console V8.9 or later.
Recognition and configuration in Bluehill® software	Strain device recognition. Requires selection of appropriate device in Admin tab.
Additional requirements	Limits must be set in 8800/ElectroPuls Console, cannot be set in Bluehill®.
Compatibility with DIC Replay	Available option.

Set up the transverse option

If you have purchased the AVE2 with transverse strain enabled, you will see an additional strain icon in the Bluehill console, labeled 14.

To configure transverse strain:


1. Select **Admin** on the Home screen.
2. Go to **Configuration > Transducers**.
3. Select **Strain** in the Available Transducer types list and add it to the **Transducers** list.
4. In the **Transducer configuration** field, edit the name to something that represents transverse strain. The name must be unique.
5. In the **Connector** field, select 14.
6. In the **Identify transducer using** field, select **Resistor codes**.
7. Select **Find** and the field should display resistor code **3000,2**.
8. Restart Bluehill.

If the configuration has been successful, the icon for Strain 14 disappears.

Calibrate in Bluehill[®] 3 software

You should calibrate the extensometer upon initial start up and also after you change anything in the setup, such as changing a lens or changing the position of the AVE2.

This procedure requires a calibration bar. If you are using a 6mm lens, then two calibration bars are required.

1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.
2. If not already open, start Bluehill[®] and select  in the console to open the video extensometer dialog.
3. Position the crosshead and the video extensometer as required for the specimens that will be tested.
4. For all lenses except the 6mm lens:
 - a. Install the calibration bar in the upper grip only, making sure that the matrix of dots faces towards the extensometer.
 - b. If necessary, remove the lower grip to avoid damage to the calibration bar.
 - c. Move the crosshead so that the image of the calibration bar fills the field of view.
5. If you are using the 6mm lens, you must use two calibration bars to accommodate the large field of view, as follows:
 - a. Install one calibration bar in the upper grip, making sure that the matrix of dots faces towards the extensometer.
 - b. Install one calibration bar in the lower grip, making sure that the matrix of dots faces towards the extensometer.
 - c. Move the crosshead so that the upper bar is near the top of the field of view and the bottom bar is near the bottom of the field of view. Make sure, however, that the bottom bar is at least 50mm above the bottom of the field of view to optimize accuracy.
6. Select **Calibrate...** to open the calibration dialog.
7. Remove the red lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens.
8. Follow the instructions in the calibration dialog to select and focus the lens.
 - a. Select the lens that you have installed from the drop-down list.
 - b. Focus of the lens until the check mark appears, then lock the thumb screw.
9. Replace the red lens cover (AVE2 only).

10. In the image window in the calibration dialog, drag the dotted center line so that it is in the center of the dot matrix pattern.
11. Draw a box around the area of the dot matrix that you want to calibrate. The border of the box displays green.



If you are using the 6mm lens, draw the box so that it includes both calibration bars.

12. Select **Calibrate**.
13. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the highest accuracy.



You should ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of each test.

14. Select **OK** to accept the calibration and close the calibration dialog.
15. Remove the calibration bar from the grips.

The strain transducers for the video extensometer are now calibrated.

Non-integrated testing systems

This section describes the following systems:

- 8800 and ElectroPuls using the 8800T or 8800D controller
- Other non-integrated testing systems, including non-Instron

Warning



When using the 8800T or 8800D controller, the AVE2 or SVE2 is intended for strain monitoring only. It is not suitable for use as the controlling channel when conducting a test in strain control.

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

Table 18. 8800 and ElectroPuls systems using the 8800T or 8800D controller

Connections	Axial connection to an analog SCM on the controller via a BNC adapter cable. Transverse connection requires an additional SCM and adapter cable. Calibration via the $\pm 10V$ signal.
Software requirements	Requires Bluehill® V3.62 and Console V8.9 or later.

Table 18. 8800 and ElectroPuls systems using the 8800T or 8800D controller

Operation in Bluehill® software	<ul style="list-style-type: none"> • Calibration via the Instron Video Extensometer Application. • Additional manual calibration in 8800/ElectroPuls Console calibration wizard in conjunction with the Analog Outputs screen in the Instron Video Extensometer Application. As part of the manual calibration, set transducer type to Strain (Calibration wizard > Transducer details screen) to ensure that it is recognized as a strain transducer in Console and software applications such as Bluehill® and WaveMatrix™ software.
Recognition and configuration in Bluehill® software	Strain device recognition. Requires selection of appropriate device in Admin tab.
Additional requirements	Limits must be set in 8800/ElectroPuls Console, cannot be set in Bluehill®.
Compatibility with DIC Replay	Not available.

Table 19. Other non-integrated systems, including non-Instron

Connections	Connection to analog inputs. Calibration via the ±10V or ±5V signal.
Software requirements	Calibration via the Instron Video Extensometer Application.
Compatibility with DIC Replay	Not available.

Calibrate in the Instron Video Extensometer application

8800 or ElectroPuls testing systems using the 8800T or 8800D controller use the Instron Video Extensometer application for calibration. You cannot calibrate the AVE2 or SVE2 from Bluehill®.

The Instron Video Extensometer application is supplied with the video extensometer instrument, separately from any other software, such as Bluehill®.

The following procedures describe how to calibrate the video extensometer:

- using the tabbed dialog version of the Instron Video Extensometer Application (resembles the Bluehill® 3 user interface)
- using the touch-enabled version of the Instron Video Extensometer Application (resembles the Bluehill® Universal user interface)

Calibrate using tabbed dialog

You should calibrate the extensometer upon initial start up and also after you change anything in the setup, such as changing a lens or changing the position of the AVE2.

This procedure requires a calibration bar. If you are using a 6mm lens, then two calibration bars are required.

1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.
2. If it is not already open, launch the Instron Video Extensometer application. The video extensometer dialog displays.
3. Position the crosshead and the video extensometer as required for the specimens that will be tested.
4. For all lenses except the 6mm lens:
 - a. Install the calibration bar in the upper grip only, making sure that the matrix of dots faces towards the extensometer.
 - b. If necessary, remove the lower grip to avoid damage to the calibration bar.
 - c. Move the crosshead so that the image of the calibration bar fills the field of view.
5. If you are using the 6mm lens, you must use two calibration bars to accommodate the large field of view, as follows:
 - a. Install one calibration bar in the upper grip, making sure that the matrix of dots faces towards the extensometer.
 - b. Install one calibration bar in the lower grip, making sure that the matrix of dots faces towards the extensometer.
 - c. Move the crosshead so that the upper bar is near the top of the field of view and the bottom bar is near the bottom of the field of view. Make sure, however, that the bottom bar is at least 50mm above the bottom of the field of view to optimize accuracy.
6. Select **Calibrate...** to open the calibration dialog.
7. Remove the red lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens.
8. Follow the instructions in the calibration dialog to select and focus the lens.
 - a. Select the lens that you have installed from the drop-down list.
 - b. Focus of the lens until the check mark appears, then lock the thumb screw.
9. Replace the red lens cover (AVE2 only).
10. In the image window in the calibration dialog, drag the dotted center line so that it is in the center of the dot matrix pattern.
11. Draw a box around the area of the dot matrix that you want to calibrate. The border of the box displays green.



If you are using the 6mm lens, draw the box so that it includes both calibration bars.

12. Select **Calibrate**.

13. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the highest accuracy.



You should ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of each test.

14. Select **OK** to accept the calibration and close the calibration dialog.

15. Remove the calibration bar from the grips.

16. If you are using the video extensometer on an 8800 or ElectroPuls testing system with an 8800T or 8800D controller, you now need to manually calibrate the extensometer in 8800/ElectroPuls console. As part of the manual calibration, set the transducer type to Strain (**Calibration wizard > Transducer details** screen). For more details refer to “Using the AVE2 with an 8800T or 8800D Controller” in the Console online help.

The strain transducers for the video extensometer are now calibrated.

Calibrate using touch-enabled user interface

You should calibrate the extensometer upon initial start up and also after you change anything in the setup, such as changing a lens or changing the position of the AVE2.

This procedure requires a calibration bar. If you are using a 6mm lens, then two calibration bars are required.

1. Start the video extensometer by pressing the power button on the front. The light bar illuminates.
2. If it is not already open, launch the Instron Video Extensometer application. The video extensometer dialog displays.
3. Position the crosshead and the video extensometer as required for the specimens that will be tested.
4. For all lenses except the 6mm lens:
 - a. Install the calibration bar in the upper grip only, making sure that the matrix of dots faces towards the extensometer.
 - b. If necessary, remove the lower grip to avoid damage to the calibration bar.
 - c. Move the crosshead so that the image of the calibration bar fills the field of view.

5. If you are using the 6mm lens, you must use two calibration bars to accommodate the large field of view, as follows:
 - a Install one calibration bar in the upper grip, making sure that the matrix of dots faces towards the extensometer.
 - b Install one calibration bar in the lower grip, making sure that the matrix of dots faces towards the extensometer.
 - c Move the crosshead so that the upper bar is near the top of the field of view and the bottom bar is near the bottom of the field of view. Make sure, however, that the bottom bar is at least 50mm above the bottom of the field of view to optimize accuracy.

6. Select **Calibration**.

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

7. Remove the red lens cover (AVE2 only; there is no lens cover on the SVE2) by gently pulling it away from the lens.
8. Follow the instructions in the calibration dialog to select and focus the lens.
 - a Select the lens that you have installed from the drop-down list.
 - b Focus of the lens until the check mark appears, then lock the thumb screw.
9. Replace the red lens cover (AVE2 only).
10. In the image window in the **Calibration** screen, drag the dotted center line so that it is in the center of the dot matrix pattern.
11. Draw a box around the area of the dot matrix that you want to calibrate. The border of the box displays green.



If you are using the 6mm lens, draw the box so that it includes both calibration bars.

12. Select **Calibrate**.

13. When calibration is complete, the calibration status updates and a yellow box appears indicating the region in the field of view that generates the highest accuracy.



You should ensure that the dots defining the gauge length on each specimen are within this yellow box at the start of each test.

14. Select **AVE2** (or **SVE2**).

The dialog moves to the **AVE2** (or **SVE2**) screen.

15. Remove the calibration bar from the grips.
16. If you are using the video extensometer on an 8800 or ElectroPuls testing system with an 8800T or 8800D controller, you now need to manually calibrate the extensometer in 8800/ElectroPuls console. As part of the manual calibration, set the transducer type to Strain (**Calibration wizard > Transducer details** screen). For more details refer to “Using the AVE2 with an 8800T or 8800D Controller” in the Console online help.

The strain transducers for the video extensometer are now calibrated.

Chapter 8

Set up other software (not Bluehill®)

-
- Set up WaveMatrix™ software for dynamic testing. 75
 - Set up systems not using Bluehill® or WaveMatrix™ 75
-

Set up WaveMatrix™ software for dynamic testing

- To use the AVE2 for dynamic testing, you must use Console V8.11 or later with WaveMatrix™ V1.9 or later.
- Set up the video extensometer in 8800/ElectroPuls Console as described in “Setting up and Running Tests with the AVE2” in the Console online help.
- Set up and run your test in WaveMatrix™ in the usual way. For more details, refer to “Setting up a WaveMatrix Test Method with the AVE2 Video Extensometer” in the WaveMatrix™ online help.

Set up systems not using Bluehill® or WaveMatrix™

If the AVE2 or SVE2 is installed on a testing machine that is not running Bluehill® or WaveMatrix™ software, you interact with the video extensometer through the Instron Video Extensometer Application.

- The default system of units is SI. You can change this selection in the **Admin** screen.
- The video extensometer communicates with the testing machine via the analog output connections.
 - a. Perform the calibration procedure for a device connected to the analog outputs on your testing machine.
 - b. Enter the full-scale value for axial and transverse strain in the **Analog Outputs** screen in the Instron Video Extensometer Application.

Chapter 9

Run tests

• Using Bluehill® Universal	78
• Using Bluehill® 3.	80
• Using WaveMatrix™	81
• Systems not using Bluehill® or WaveMatrix™.	82

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 AVE2 and SVE2 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.



Important - before using the video extensometer to measure strain on an 8800 or ElectroPuls testing system with an 8800T or 8800D controller:

- use the Instron Video Extensometer application to measure the gauge length
 - select **Measure** or , depending on the version of the application
- In 8800/ElectroPuls console, enter the measured gauge length on the **[Channel Name] > Calibration** page.



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 AVE2 is as follows:

1. Go to **Measurement** and create a physical strain measurement using **Strain 1** as the transducer configuration. The video extensometer is always connected to **Strain 1**. You can name the measurement **AVE2**.
2. Go to **Test Control > Strain** and choose the new **AVE2** measurement as the primary source.
3. Go to **Test Control > Pre-Test** and enable auto-balance for the **AVE2**.
4. Setup the workspace to your requirements. You will probably want to assign one of the live displays to show **AVE2** 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 **AVE2** connection to the load frame. Examples include **DIGITAL STRAIN 2** for 6800, 3400 and 5900 systems and **STRAIN 2** for 3300 and 5500 systems.
 - 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 SVE2 extensometer.

DIC Replay requires Bluehill® software. It is not available for testing systems that use the Instron Video Extensometer Application to communicate with the AVE2.

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 **AVE2** 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 **AVE2**.
The dialog moves to the **AVE2** 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 AVE2 as a strain device in the normal way during testing with Bluehill®. You are only using the AVE2 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 AVE2.
- Do not set the AVE2 as the strain source for the test method.
- Do not enable auto-balance on the AVE2.

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 **AVE2** screen.
3. Select **Image Capture**.
The dialog moves to the **Image Capture** screen.
4. Select **Open Digital Image Correlation software....**

Using Bluehill[®] 3

Once calibrated, the video extensometer behaves like any other transducer when you operate it with Bluehill[®] 3 software. For full details, refer to the Bluehill[®] online help and reference. A summary of possible setup steps using Bluehill[®] 3 software and an AVE2 is as follows:

1. Go to **Measurements > Setup** and create a physical strain measurement using Strain 1 as the transducer configuration. The video extensometer is always connected to Strain 1. You can name the measurement AVE2.
2. Go to **Test Control > Strain** and choose the new AVE2 measurement as the primary source.
3. Go to **Test Control > Pre-Test** and enable auto-balance for the AVE2.
4. Setup the workspace to your requirements. You will probably want to assign one of the live displays to show AVE2 strain.

Using Bluehill[®] 3 software with DIC Replay

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




DIC Replay is not available for the SVE2 extensometer.



DIC Replay requires Bluehill® software. It is not available for testing systems that use the Instron Video Extensometer Application to communicate with the AVE2.

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 to open the video extensometer dialog.
2. Go to the Image Capture tab and check **Enable image capture**.
3. Use the slider control to set the image capture rate.
4. Go to the AVE tab and 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 AVE2 as a strain device in the normal way during testing with Bluehill®. You are only using the AVE2 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 AVE2.
- Do not set the AVE2 as the strain source for the test method.
- Do not enable auto-balance on the AVE2.

To use DIC Replay software to analyze images



1. Select  in the console to open the video extensometer dialog.
2. Go to the Image Capture tab and select **Open Digital Image Correlation software....**

Using WaveMatrix™

Set up and run your test in WaveMatrix™ in the usual way. For more details, refer to “Setting up a WaveMatrix Test Method with the AVE2 Video Extensometer” in the WaveMatrix online help.

Systems not using Bluehill[®] or WaveMatrix[™]

Follow the appropriate procedures in your software for running at test using a calibrated strain transducer.

Return to the Instron Video Extensometer Application whenever you need to recalibrate the instrument.

Chapter 10

Maintenance

• General.....	83
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General

The AVE2 and SVE2 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.

Index

A	
AverEdge32 option	
installation on floor model frame.....	38
installation on table model frames	31
overview	14
set up hardware	57
C	
calibrate	
Bluehill Universal.....	60
Bluehill3.....	69
Instron Video Extensometer application	63, 71
connections.....	47
contact information	15
D	
DIC Replay	
with Bluehill 3	80
with Bluehill Universal.....	79
dimensions	22
E	
EU directives	
Conformity with EU directives.....	21
extensometer lenses	55
I	
installation	25
initial.....	25
move to 34SC	32
move to 34TM	27
move to 5940	32
move to 5960	27
move to 5980	36
move to 5988 or 5989.....	40
move to 68SC	32
move to 68TM	27
move to 8800	44
move to ElectroPuls.....	44
move to LX static hydraulic.....	42
moving between machines	26
Instron	
contact information	15
product support	15
interconnections	47
L	
load string setup	57
M	
maintenance	83
mark specimens	51
P	
product support.....	15
R	
run tests.....	77
other software	82
using Bluehill 3.....	80
using Bluehill 3 with DIC Replay	80
using Bluehill Universal	78
using Bluehill Universal with DIC Replay	79
using WaveMatrix.....	81
S	
set up hardware	
AverEdge32 option.....	57
extensometer lenses	55
load string.....	57
set up software	
Bluehill 3.....	67
3300 systems	67
5500 systems	67
5500A systems.....	67
5900 systems	67
8800MT systems	67
8800T and 8800D systems.....	70
ElectroPuls systems	67
Bluehill Universal	59
3300 systems	59

3400 systems	59
5500 systems	59
5500A systems	59
5900 systems	59
6800 systems	59
8800D and 8800T systems	62
8800MT systems.....	59
ElectroPuls systems.....	59
non-Bluehill	75
WaveMatrix	75
software compatibility	22
specifications	17
dimensions	22
environmental	21
general.....	17
software compatibility.....	22
weight.....	22
specimens	
marking	51
support	15
system interconnections	47

T

technical support	15
testing	77
other software	82
using Bluehill 3	80
using Bluehill 3 with DIC Replay.....	80
using Bluehill Universal.....	78
using Bluehill Universal with DIC Replay .	79
using WaveMatrix	81

W

weight	22
--------------	----



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