INSTRON®

2620-600 Series
Dynamic Strain Gauge
Extensometers

Reference Manual - Equipment
M26-16655-EN Revision A

The difference is measurable ®

Electromagnetic Compatibility

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.
To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

Proprietary Rights Notice

Trademarks

Product Support: www.instron.com

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.

Before operating the system, ensure you gain a thorough understanding of the equipment by:

- receiving training on the safe operation of the system.
- reading and understanding the general hazards associated with materials testing systems as detailed on pages iv to vii.
- carefully reading all relevant manuals and observing 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.
- carrying out your own safety risk assessment on the use of the test system, test methods employed, specimen loading and specimen behavior at failure.

General Safety Precautions

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.

Warnings

Crush Hazard - Take care when installing or removing gauges, extensometers, specimens, assemblies, structures, or load string components.

Installation or removal of gauges, extensometers, specimens, assemblies, structures, or load string components involves working inside the hazardous area between the grips or fixtures. 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 - 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.

Warnings

Flying Debris 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 - 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.

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.

Table of Contents

Chapter 1
Introduction

General Description

Instron Dynamic Strain Gauge Extensometers are accurate, lightweight strain gauge units used for accurate direct measurement and closed-loop control of strain in cyclic high frequency materials testing applications. Tensile, compressive, low and high cycle fatigue testing as well as straight line (ramp) testing may be performed with these devices.

They are designed for use with metals, rigid thermoplastic and thermosetting polymers and other materials exhibiting total strains up to ±60% of the original gauge length. Variations of gauge length and percentage strain levels may be achieved by the addition of gauge length extenders.

The extensometers have wide frequency response and high accuracy for use in both tension and compression and can be operated over an ambient temperature range of -80ºC

to +200ºC (-100ºF to +400ºF). They are immersible in a wide variety of non-conductive / non-corrosive cooling or heating fluids.

The flexural element is a special alloy operating beam with fatigue-certified foil gauges bonded to it and arranged in a fully active four-arm Wheatstone Bridge circuit. It is mounted in a light rigid frame and follows accurately the strain amplitudes applied to it. Positive mechanical stops limit overtravel and an aluminium case protects the gauges and the associated wiring from mechanical damage.

A full kit of accessories is packed in a protective box together with the extensometer and includes all parts and special tools necessary for use.

Apart from their use under closed-loop strain control on all Instron servohydraulic testing instruments, the extensometers are suitable for direct measurement and readout of strain on most Instron static testing instruments. However only the Model 1121 table model and the Model 1190 floor model instruments can be fitted with the Instron Load/Strain control necessary to permit strain-controlled testing to be achieved.

The initial gauge length of the particular extensometer is accurately and conveniently set by the insertion of a gauge length pin into a hole precisely located in the flexural beam, enhancing test repeatability and reducing the possibility of damage to the extensometer when not in use.

The extensometers are clamped to the flat or round specimens with special high-tear strength rubber bands or with tension springs. Replaceable tool steel knife edges attached to the ends of both the fixed and flexural beams bear against the specimen and prevent slippage. Although the clamping force is low, positive positioning of the extensometer on the specimen is assured without generating high localised stresses which can initiate fatigue cracks.

The extensometer can be quickly and easily calibrated, the method varies depending on the testing instrument and control console being used. A full description of all calibration procedures is detailed in a later section of this manual. Refer to “Calibration” on page 2-11

If you have a test situation for which you need specific information, contact your local Instron Sales Office or technical support team.

Chapter 2
Operation

Handling Precautions

Caution

Observe all handling precautions given below to prevent damage to the extensometer.

Whenever the extensometer is out of its protective storage box, observe the following handling precautions detailed overleaf.

- Protect the extensometer from mechanical shocks. Do not allow it to drop and do not allow tools and other equipment to strike it. Be careful about placing the extensometer on a flat surface where the electrical connector, which is significantly heavier than the extensometer, can pull the extensometer onto the floor. Always use the magnetic cable cleat.

- Protect the extensometer from bending stresses. Do not try to exercise the flexural element beyond its mechanical stops when handling or installing. When operating the extensometer attached to a specimen, ensure the maximum expected strain for the sample under test does not exceed the full scale of the extensometer in use. Always use the limit control feature of the Strain Conditioners to prevent damage to the extensometer in the event of specimen fracture or inadvertent errors in control settings.

- Always return the extensometer and its accessories to the protective box when not in actual use. This will prevent inadvertent damage to the extensometer and the loss of tiny accessories.

Preparing for Use

Remove the extensometer from its protective box and install the gauge length pin. This will prevent damage to the extensometer while handling and will set the gauge length accurately when attaching the unit to a test specimen.

Select and install a gauge length extender to match the output characteristics of the extensometer to the particular specimen under test. Remove the upper knife edge by removing the two socket head cap screws securing the knife edge to the fixed (black) beam, using the ball end hexagon wrench provided in the accessories kit.

When installing a short extender (12.5 mm or 15 mm), orient the extender so that the wide, raised shelf on the end of the extender is toward the beam of the extensometer. Set the knife edge into the wide recessed shelf at the other end of extender and secure the assembly to the extensometer beam using two long socket head cap screws inserted through the knife edge, all the way through the extender and into the threaded holes of the beam. tighten the screws snugly, but do not overtighten.

The long extenders (37.5 mm or 40 mm) are installed in a similar manner, except that four short screws are used. Attach the knife edge to the extender before attaching the extender to the beam. Use the ball end of the hexagon wrench to tighten the two screws through the lower lip of the extender

Inspect the extensometer for free operation and ensure that the knife edges are aligned parallel with each other and are not dulled or nicked,

Warning

Hazard - Do not operate the testing system in Strain Control with the extensometer disconnected.

Loss of feedback signals from the extensometer will result in loss of closed-loop control, forcing the actuator piston to accelerate into its mechanical stops endangering personnel and equipment.

Mounting the Extensometer

Extensometers are clamped to the specimen by special high tear strength rubber bands or tension springs, pulled tight enough to prevent knife edge slippage during testing. If heating of the specimen is expected, then the springs should be used instead of the rubber bands. The extensometer is mounted on either the test specimen or the calibration fixture in exactly the same manner. The mounting sequence is illustrated in Figure 2-1.

When using the rubber bands as clamping devices, it may be necessary to double-loop the bands on smaller diameter specimens to obtain enough clamping force. Figure 2-1 shows an extensometer mounted with rubber bands.

A magnetic mounting cleat is provided in the extensometer kit of parts to support the extensometer cable. It should be positioned on the frame adjacent to the extensometer assembly, such that the full weight of the cable is removed from the extensometer to prevent strain measurement errors.

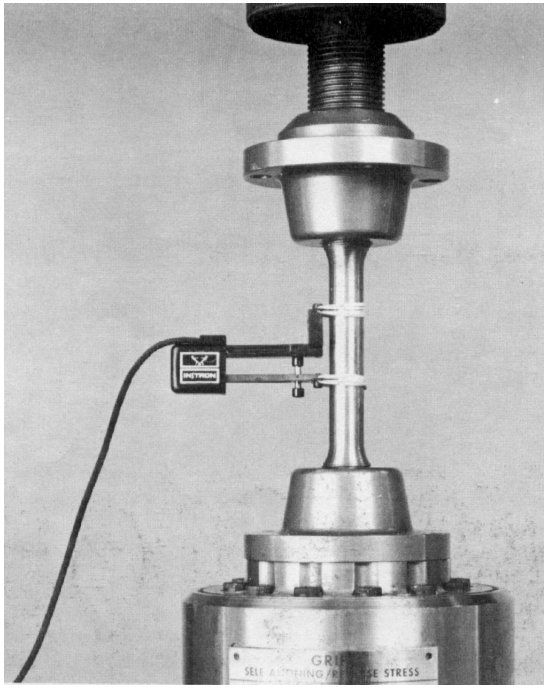

Figure 2-1. Extensometer Mounted with Rubber Bands

Care must be taken not to nick or scratch the test sample with the hardened steel knife edges. Nicks and scratches, particularly on softer samples can be caused by a clamping spring or rubber band that is too tight and will result in the growth of fatigue cracks in the specimen that will render acquired test data meaningless.

The 25-way D type connector wired to the extensometer cable incorporates the normal retaining screws, and an additional mechanical safety locking device. When inserting the connector, push it firmly into the mating plug receptacle and ensure that it is positively retained by the screws or the locking latch.

The fixed receptacle section of this locking device is to be retrofitted on all machines except table models. Special latching hooks are included in all extensometer kits, to be fitted under the mounting screws of the fixed receptacle, for all servohydraulic and floor mounted testing instruments.

Procedure

1. Install the gauge length pin.
2. Orient the extensometer so that the electrical cable exits from the upper side of the extensometer.
3. While holding the extensometer in the left hand, place it against the specimen and hook a clamping spring or rubber band to the far side of the upper knife edge.

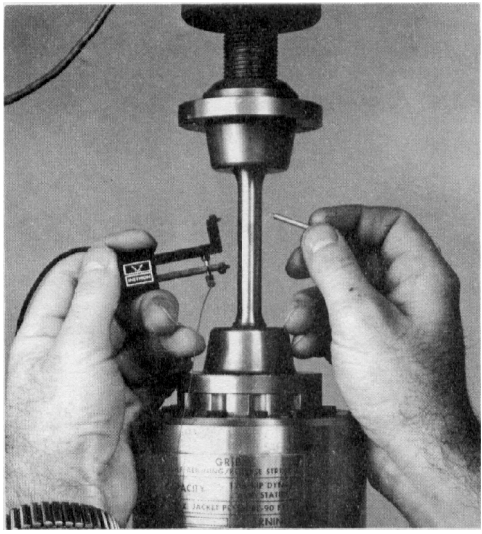

Figure 2-2. Preparation for Mounting

4. Hold the extensometer and the clamping device in place with the fingers of the right hand. Using the crochet hook, slip the near end of the clamping device over the other end of the knife edge. The extensometer will tend to rotate around the specimen, so ensure that the extensometer does not slip from the grasp.

5. Install the lower clamping spring or rubber band in a similar manner.

Figure 2-3. Installing the Upper Clamp

6. If the extensometer is being installed on flat specimens, ensure that both knife edges are flat against the specimen. If one is not, the knife edges are not parallel, loosen the screws mounting the upper knife edge and, while gently pressing the extensometer against the specimen, tighten the screws.

7. To prevent strain measurement errors, support the electrical cable so that the full weight of the cable is removed from the extensometer. Take up most of the

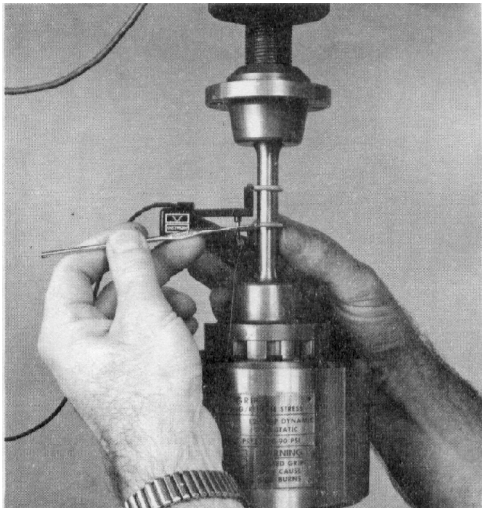

Figure 2-4. Installing the Lower Clamp

slack in the cable and either tape it to the load frame column of other fixed object or use the magnetic cleat to support the cable. Leave a loop or some slack in the cable so that the extensometer is free to move without being pulled by the cable. This is especially important when operating the system in strain control, since cable movement and resulting extensometer vibration will cause erratic control.

Figure 2-5. Removing the Gauge Length Pin

8. Gently withdraw the gauge length pin. Once the pin is out, do not move the extensometer on the specimen or the calibrated gauge length will be lost.

Calibration

To ensure that the Extensometer indicates precisely the relative movement of the specimen, the device should be zeroed and calibrated before use.

Extensometers may be calibrated either manually or electrically, dependant on the signal conditioning used. Most testing machines have an electrical calibration facility which should be used. It is advisable to periodically check this calibration manually.

Electrical Calibration

1. The Extensometer is equipped with a memory device that will identify itself uniquely to an Instron controller, so that basic calibration data does not need re-inputting every time the gauge is moved.
2. Connect the plug into the 25-way transducer socket on the load frame. Make sure that the locking clips or screws are securely latched to prevent accidental disconnection.
3. Mount the Extensometer on the specimen at gauge length.
4. Support the cable using the magnet housing assembly and attach it to the testing machine.
5. In the case of recently manufactured controllers from the Instron range, calibration should be carried out using

the Calibration Wizard feature of the Console software.

6. In the case of other controllers, consult the controller's operating instructions for specific calibration methods appropriate to your gauge.

7. The device is now ready to use.

Manual Calibration

If you wish to calibrate the Extensometer manually, for instance because you need to calibrate the device for use at an elevated temperature, consult the documentation supplied with your control system for the appropriate procedure.

Temperature Calibration

The Extensometer may be used over a wide range of temperatures. Ideally, you should calibrate the gauge as close as possible to the actual temperature at which you expect the testing to take place. Any variation between the testing temperature and the temperature

at which you calibrate the gauge will introduce a small error.

Electrical calibration (using the internal shunt resistance) is only valid at, or close to, 20°C. If you are calibrating the span of the gauge at a temperature outside the range 10°C - 30°C, use a manual calibration procedure.

Chapter 3
Maintenance

Routine Maintenance

Routine maintenance is limited to keeping the extensometer clean and the moving parts free. No lubrication is required. All hydraulic fluid, dust and other foreign matter should be kept off all parts, particularly under the cover. commercial solvents, such as Chlorothene N.U. and Methyl Ethyl Ketone (MEK) may be used sparingly with a soft brush or soft lint-free cloth, but do not immerse the extensometer in solvent. Low pressure compressed air may be used cautiously for cleaning and drying, but do not direct the airstream directly into the cover.

Dullness and small nicks in the knife edges may be dressed using a fine whetstone, careful preserving the edge bevel. When done on a powered wheel, cooling lubricant

must be supplied to the sharpened edge to prevent heating and annealing.

Replacement Parts

Since positioning and bonding of the strain gauges within the extensometer is extremely critical to the unit's electrical characteristics, disassembly of the extensometer, and hence field repairs, are impossible. All defective or damaged units must be return to the factory for repair or replacement. Damaged or lost accessories can be replaced, using the following list, by contacting the nearest Instron Sales Office. The catalog number of the extensometer must be specified, along with the part number and item description when ordering parts.

Table 3-1. Replacement Parts List

Item No.	Description	Part No.
1	Gauge Length Pin	A1351-1011
2	Crochet Hook 1.25 mm	80-9-5
3	M3 Allen Wrench 2.5 mm	80-1-236
4	Knife Edge	T1351-1007

Table 3-1. Replacement Parts List

Item No.	Description	Part No.
5	Gauge Length Extension 12.5 mm	T1351-1019
	Gauge Length Extension 15 mm	T1351-1018
	Gauge Length Extension 37.5 mm	T1351-1017
	Gauge Length Extension 40 mm	T1351-1016
6	Tension Spring, $^{5}/_{8}$ in. long	66-1-76
	Tension Spring, $^{3}/_{4}$ in. long	66-1-77
	Tension Spring, $^{7}/_{8}$ in. long	66-1-75
	Tension Spring, 1 in. long	66-1-78
	Tension Spring, $1^{1}/_{8}$ in. long	66-1-79
	Tension Spring, $1^{1}/_{4}$ in. long	66-1-80
7	Rubber Bands (Packet of 50)	A1351-1010

Appendix A
Specification

General

The following specifications are common to all the Extensometers described in this manual.

Parameter	Value
Linearity	0.15% of Full Scale
Hysteresis	0.15% FS @ 60% Full Scale
Creep (1)	0.15% of Full Scale
Operating Force	(2620-601,-602, -603) 150g (2620-604) 75g
Output Sensitivity	2.5 mV/V (nominal)
Bridge Resistance	350 Ohms
Balance	±2.5% Full Scale
Excitation	5 Volts Nominal, 10 Volts maximum AC (RMS) or DC

Parameter	Value
Temperature Range [2]	-80ºC to +200ºC (-100ºF to +400ºF)
Overtravel	Mechanical Stops
Gauge Length Setting and Lock	Removable Pin
Attachment	Special High Tear Strength Rubber Bands or Tension Springs
Weight (less cable and connector)	Less than 20 grams
Specimen Sizes	Round - 3 mm to 25 mm diameter Rectangular - 3 mm to 12 mm x 25 mm Square - 3 mm to 12 mm

Compatibility

The extensometers may be used with any of the following Instron equipment:

Table Model Static Testers	Servohydraulic Dynamic Machines:
1120 Series 1185 Series 1190 Series 1195 Series 1197 Series 4400 Series 5500 Series 5900 Series	8800 Series 8500 Series 8000 Series 1270 Series 1250 Series 1330 Series

1) Creep Error is the difference between the reading taken at 5 seconds and at 3 minutes after the gauge was opened from gauge length to full-scale deflection.

2) The electrical calibration has been factory set at 20°C. If the Extensometer is to be used outside the range 10 to 30°C, then it should be manually calibrated at the required working temperature

2620-601

Extension length (mm)	none	12.5	37.5
Gauge Length (mm):	12.5	25	50
Full Scale range (mm)	± 5	± 5	± 5
Maximum Strain	40%	20%	10%
Frequency Range (Hz)	0 - 50	0 - 50	0 - 50

2620-602

Extension length (mm)	none	12.5	37.5
Gauge Length (mm):	12.5	25	50
Full Scale range (mm)	± 2.5	± 2.5	± 2.5
Maximum Strain	20%	10%	5%
Frequency Range (Hz)	0 - 70	0 - 70	0 - 70

2620-603

Extension length (mm)	none	15	40
Gauge Length (mm):	10	25	50
Full Scale range (mm)	± 1	± 1	± 1
Maximum Strain	10%	4%	2%
Frequency Range (Hz)	0 - 100	0 - 100	0 - 100

2620-604

Extension length (mm)	15	40
Gauge Length (mm):	25	50
Full Scale range (mm)	+12.5 / -2.5	+12.5 / -2.5
Maximum Strain (%)	+50 / -10	+25 / -5

2620-604 is not used without a gauge length extender.

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