INSTRON®

Industrial Products Group

Models MT1 and MT2 MicroTorsion Testing System

Operating Instructions

M47-16626-EN **Revision C**

www.instron.com

The difference is measurable®

Electromagnetic Compatibility

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

Proprietary Rights Notice

Trademarks

Original Instructions

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General Safety Precautions

Materials testing systems are potentially hazardous.

Materials testing involves inherent hazards from high forces, rapid motions, and stored energy. You must be aware of all moving and operating components in the testing system that are potentially hazardous, particularly force actuators or a moving crosshead.

Carefully read all relevant manuals and observe all Warnings and Cautions. The term Warning is used where a hazard may lead to injury or death. The term Caution is used where a hazard may lead to damage to equipment or to loss of data.

Instron products, to the best of its knowledge, comply with various national and international safety standards, in as much as they apply to materials and structural testing. We certify that our products comply with all relevant EU directives (CE mark).

Because of the wide range of applications with which our instruments are used, and over which we have no control, additional protection devices and operating procedures may be necessary due to specific accident prevention regulations, safety regulations, further EEA directives or locally valid regulations. The extent of our delivery regarding protective devices is defined in your initial sales quotation. We are thus free of liability in this respect.

At your request, we will gladly provide advice and quotations for additional safety devices such as protective shielding, warning signs or methods of restricting access to the equipment.

The following pages detail various general warnings that you must heed at all times while using materials testing equipment. You will find more specific Warnings and Cautions in the text whenever a potential hazard exists.

Your best safety precautions are to gain a thorough understanding of the equipment by reading your instruction manuals and to always use good judgement.

It is our strong recommendation that you should carry out your own product safety risk assessment.

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.

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.

Warnings

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

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

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

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

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

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

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

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

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

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

Warnings

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

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

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

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

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

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

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

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

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

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

Table of Contents

Chapter 1
Introduction

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About these instructions

These instructions describe the function, operation and maintenance for various models of the MT testing systems as depicted in Table 2-2 on page 2-2. If unsure of your specific model, refer to "System identification" on page 1-6.

These instructions assume the following:

- You are an operator familiar with the operation of materials testing systems in general.
- Your system has been installed in its final location according to the requirements outlined in the system's Pre-Installation Manual.
- Your system consists of a frame, a control unit, a user control panel, a torque cell, a computer system with an Instron materials testing software package, and any testing accessories necessary to secure the specimen in the test space.
- Software test methods that are appropriate for your testing requirements are available.

These instructions do not include the development of test methods within the materials testing software. This is covered in more advanced training that can be provided by Instron Service and Training departments.

Throughout these instructions are NOTE, CAUTION, and WARNING statements that alert you to important information. They appear as follows:

Notes provide further clarification on particular issues.

Caution

Cautions alert the user to situations that may cause equipment damage.

Warning

Warnings alert the user to situations that may cause serious personal injury or death.

Please read these instructions, and any other documents provided, thoroughly and carefully. Be sure to understand all Warnings and Cautions before attempting to operate any of the MT system in whole or in part.

System overview

Purpose

Warning

If the equipment is used in a manner not specified by Instron, the protection provided by the equipment may be impaired. Injury to personnel or damage to the system may result. Be sure to read and understand the material presented in these instructions and in any other accompanying instructions.

The Instron Model MT1 and MT2 MicroTorsion Testing Systems are designed specifically for applying a measured torsional force to a specimen. A variety of specimen materials and geometries can be tested.

System components

Model MT1 and MT2 systems consist of:

- Frame (see Figure 1-1)
- 59 Series control unit and other system controls and electronics
- Instron approved computer system with Instron materials testing software

Figure 1-1. Model MT1 and MT2 frames (shown with optional axial preload assembly).

Frame configuration options

Frames can be configured with a variety of options. These options include:

- Test opening variations:
  - E1 - Standard test opening
  - E3 - Increase test opening by 305 mm (12 in)
- Linear guide cover variations:
  - H1 - No linear guide covers
  - H2A - Linear guide covers for E1 test opening
  - H2C - Linear guide covers for E3 test opening

It is very important to be aware of and understand the configuration of your frame as you perform various operations and procedures so that they can be performed correctly. Refer to "System identification" on page 1-6 for ways to identify your frame's configuration.

Torque cell options

The torsional force applied by the frame is measured by a torque cell. Torque cells are available in a variety of capacities and are interchangeable to provide a range of load measurement capabilities. Torque cells must be selected and purchased in addition to the system. The available torque cells are:

- W-5510-T1 - 225 N-m (2,000 lbf-in)
- W-5510-T2 - 22.5 N-m (200 lbf-in)
- W-5510-T3 - 2.25 N-m (20 lbf-in)
- W-5510-T4 - 0.225 N-m (2 lbf-in)

The torque cell is not included with the system; it must be selected and purchased separately. The capacity of the torque cell used could limit system capacity.

Testing accessories

Testing accessories are purchased separately from the frame. Testing accessories either provide a means to secure the specimen in the test space or provide additional functionality to the frame. Instructions on the installation, use and maintenance of Instron testing accessories are provided separately with each testing accessory. A variety of testing accessories are available:

- Axial alignment fixture (MT1 systems only)
- Torque cell protection device (MT2 systems only)
- Axial preload assembly
- Keyless or keyed drill-type chuck assemblies
- Collet grip assemblies
- Socket drive sets

System identification

Your system has been given a unique serial number for system identification. This serial number can be found on the serial tag located on the rear of the frame. In addition, the 59 Series control unit is also given a unique serial number that can be found on the rear of the control unit.

The frame serial tag includes other important system information, including information on your frame's configuration. Frame configuration information can also be found on customer copies of the Instron quote.

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Frame components

Refer to Figure 1-2 and Table 1-1 to identify components of the frame. For proper operation of the system, it is important to be able to identify and to understand the basic function of these components.

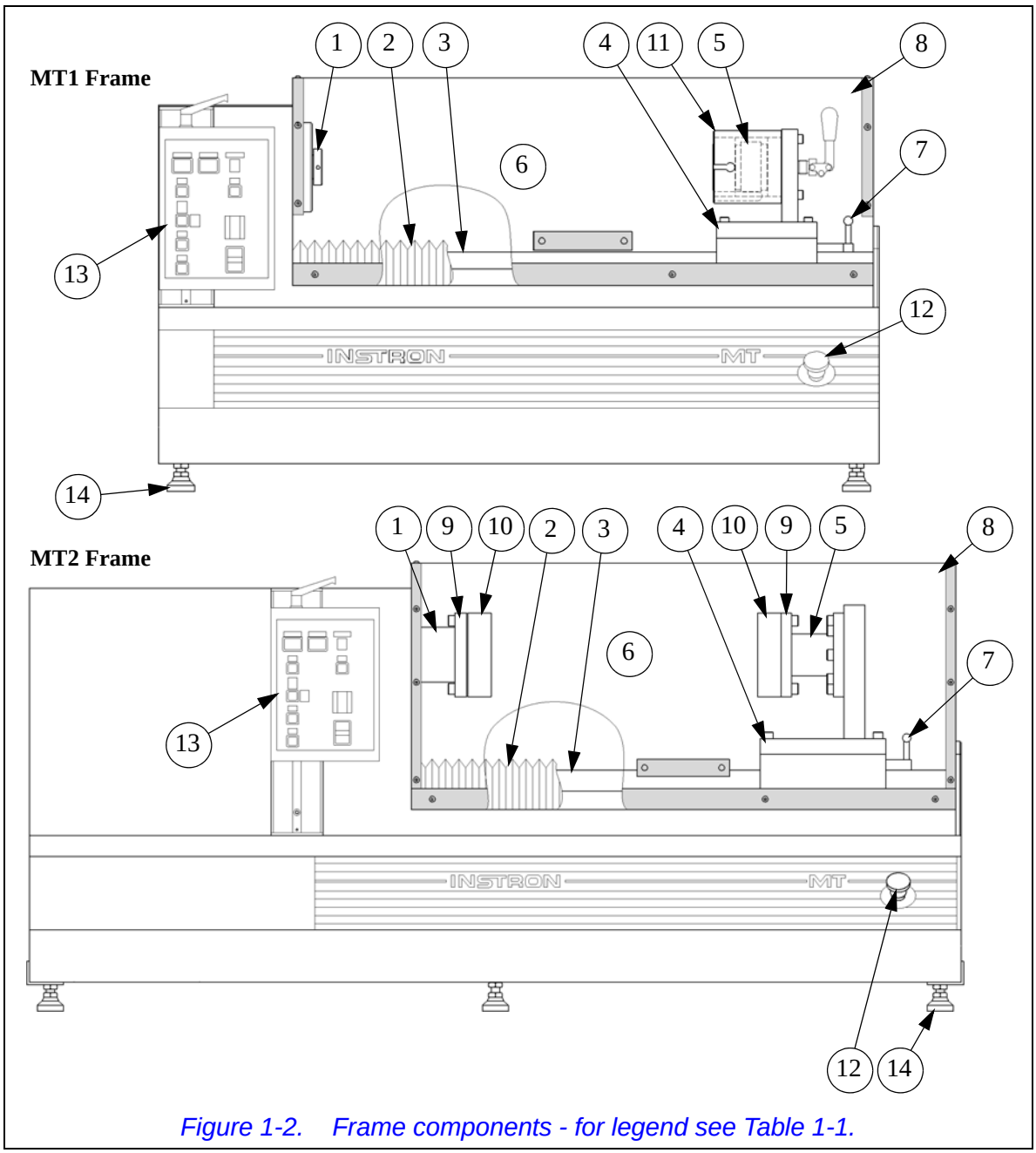


Figure 1-2. Frame components - for legend see Table 1-1.

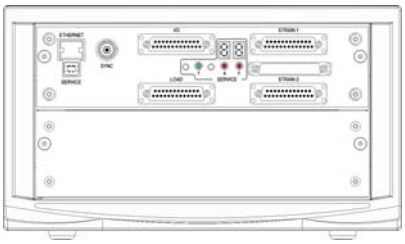
Table 1-1. Frame component descriptions, see Figure 1-2.

Component	Description
1. Output shaft	Applies the torsional force to the specimen. One end of the specimen is mounted to the output shaft using appropriate specimen fixtures (purchased separately).
2. Optional guide covers	Protect the guide rail from dirt and debris.
3. Guide rail	Provides support and guidance for the crosshead.
4. Crosshead 5. Optional torque cell 7. Crosshead clamp	The crosshead provides mounting for the optional torque cell. One end of the specimen is mounted to the torque cell using appropriate specimen fixtures (purchased separately). The torque cell measures the torsional force applied to the specimen. The crosshead can be positioned anywhere along the guide rail and can be locked in position by the crosshead clamp.
6. Test space	The test space is the area between the output shaft and torque cell where tests are performed. The size of the test space can be changed by adjusting the position of the crosshead.
8. Enclosure	When closed, the enclosure provides protection from the rotating output shaft and from specimen failure.
9. Flange 10. Adapter plate	Provides bolt patterns for mounting of standard Instron torsion accessories, custom torsion fixtures and customer torsion fixtures. **Supplied with MT2 frames only.**
11. Torque cell protection device	Provides mounting and protection for sensitive low range torque cells (capacities of 22.5 N-m (200 lbf-in) or less) - also known as miniature torque cells. Proper use of the torque cell protection device is very important to prevent damage to the torque cell; refer to “Torque cell” on page 3-4 for details of use. **Supplied with MT1 frames only.**
12. Emergency stop 13. User control panel	System controls, refer to “System control components” on page 1-10.
14. Leveling feet	Provide support for the frame and can be adjusted to level the frame.

System control components

Refer to Table 1-2 to identify control components of the system. For proper operation of the system, it is important to be able to identify and to understand the basic function of these components.

Table 1-2. System control descriptions.

Component	Description
Emergency stop 	Press this button to immediately stop motion of the frame. This stops the output shaft and disables the frame. This button will take precedence over all other system controls. Additional details are provided in Table 3-1 on page 3-2.
User control panel 	The controls on this panel allow an operator to manually adjust the output shaft, to start and stop tests, to reset and return to gauge length and other testing controls/functions. Additional details are provided in Table 3-1 on page 3-2.
59 Series control unit 	The 59 Series control unit houses control components that: receive and process data from the various system transducers; communicate with the system's controlling software; and provide feedback to the system's drive motor to operate the output shaft as set up in the controlling software. Additional details are provided in Table 3-1 on page 3-2.
Main power disconnect switch MT1 frame  MT2 frame 	Provides control of main power to the frame. Located on the rear of the frame. When the disconnect switch is off, all power to the frame is shut off. Power to the 59 Series control unit and computer system are unaffected as they have their own power supply.
59 Series control unit disconnect switch 	Provides control of power to the 59 Series control unit. This disconnect switch does not affect power to the frame.

System safety and information labeling

Table 1-3 explains the meanings of any safety and information labels that may be attached to any part of the testing system.

Table 1-3. Descriptions of safety and information labeling.

Label	Meaning	Purpose
	Rotating machinery hazard - read manual	Indicates that a rotating hazard exists. Be sure to read and understand the operator's manual before using the system.
	Electrical hazard - do not remove covers	Indicates that a hazard exists from high voltage or electrical current - do not operate the system with covers removed. Be sure to read and understand the operator's manual before using the system. Only authorized personnel should service the equipment.
	Electrical hazard - fuse warning	Indicates that an electrical hazard exists. Advises about disconnecting power mains before changing fuses and using only specified fuses.
	Electrical hazard - high leakage current	Indicates that a hazard exists from leakage current and that the equipment must be connected to a mains ground point.
	Fragile - read manual	Indicates that equipment is fragile and can be easily damaged. Be sure to read and understand the operator's manual before using the system.
	Ground stud	Indicates a ground stud. Connect to an appropriate ground/ earth system.
	Protective earth	Indicates the protective earth terminal for the main power supply.
	Single-phase power supply	Indicates that the equipment requires a single-phase power supply.
	Three-phase power supply	Indicates that the equipment requires a three-phase power supply.

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 Services 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:

Pre-Installation Manual	Information about preparing your site for installation of the system, receiving the system, and lifting and handling of the system.
Operating Instructions	How to use your system components and controls, and other frequently performed operating tasks.
System Concepts	Additional information about your system.
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, hydraulic power units, non-standard actuators, and environmental chambers.

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

System verification

Caution

System verification is vital to ensure the accuracy of your calibration. Current standards recommend that you do not exceed 18 months between verifications.

Instron provides a fully traceable verification service including UKAS/NVLAP certification where appropriate. Contact your local Instron Representative for details.

Chapter 2
Specifications

Use limits

Table 2-1 gives information on the use limits of the testing system, as determined in accordance with ISO 12100, section 5.3.2.

Table 2-1. Use limits of the testing system.

Intended use and foreseeable misuse:	When equipped with appropriate fixtures, the system is intended to conduct torsion tests on a variety of specimen shapes and material types. The system is equipped with a guard that encloses the test space. The guard is intended to protect operators from rotating components and hazardous specimen conditions. The system can operate in servo control mode only through an Instron Materials Testing Software package. An operator must be present at all times while the system is in operation. The system should not be used for any purpose other than torsion testing. The system must not be used as a lathe. The system is not designed for testing any specimen that contains liquids; consult Instron for these applications. The interlocking devices and other hardware components provided with the guard must not be defeated or disabled. The system should not be operated by anyone who does not fit the criteria specified in the "**Operator characteristics:**" and "**Operator training/experience:**" sections of this table.
Intervention procedures:	The system is equipped with **EMERGENCY STOP** and software reset (frame enable) controls (see Table 3-1 on page 3-2 and separately supplied Software documentation).
Use type:	Industrial
Operator characteristics:	Typical adult in good health with no disabilities that prevent safe operation of the testing system.

Table 2-1. Use limits of the testing system. (Continued)

Operator training/ experience:	**Operators** should be familiar with the operation of materials testing systems in general and with the inherent hazards of such testing in particular. Operators should gain a thorough understanding of this equipment by reading these instructions and all other documents provided. Initial basic safety and operational training is provided by Instron Service personnel during installation of the system. **Maintenance personnel or technicians** should have sufficient training and skills so that they can safely perform all procedures outlined in Chapter 4 beginning on page 4-1. **Trainees and apprentices** should only operate or maintain the system under direct supervision of a qualified operator or maintenance personnel. **The general public** should not have access to the system.
Exposure of other persons to hazards:	Exposure to hazards is greatly reduced by the knowledge of qualified operators. Anyone who does not fit the criteria specified in the "**Operator characteristics:"** and "**Operator training/experience:"** sections of this table should not have access to the system.

Frame

The technical specifications for the various models of the MT series frames can be found in Table 2-2. Some specifications are dependent on the frame options included with the frame; these specifications are indicated in the table by the option designations (see footnote[1]). If unsure of the options included with your frame, refer to "System identification" on page 1-6.

Table 2-2. MT frame technical specifications.

Specification[1]	**MT1**	**MT2**
Maximum Capacity[2, 3]	22.5 N-m (200 lbf-in)	225 N-m (2,000 lbf-in)
Design Capacity[4]	18 N-m (159 lbf-in)	180 N-m (1,593 lbf-in)
Test Opening (Maximum)[5]		
E1-H1	470 mm (18.5 in)	420 mm (16.5 in)
E1-H2A	405 mm (16 in)	381 mm (15 in)
E3-H1	775 mm (30.5 in)	720 mm (28.5 in)
E3-H2C	685 mm (27 in)	660 mm (26 in)
Specimen Diameter (Maximum)	127 mm (5 in)	203 mm (8 in)
Dimensions (W x D x H)[6]		
E1	820 x 650 x 653 mm (32.25 x 25.6 x 25.7 in)	1130 x 764 x 711 mm (44.5 x 30.1 x 28 in)
E3	1124 x 650 x 653 mm (44.25 x 25.6 x 25.7 in)	1435 x 764 x 711 mm (56.5 x 30.1 x 28 in)
Weight[7]		
E1	90 kgs (198 lbs)	180 kgs (397 lbs)
E3	110 kgs (243 lbs)	220 kgs (485 lbs)

Table 2-2. MT frame technical specifications.

Specification[1]	MT1	MT2
Testing Speed Range	0.01 to 120 RPM	0.01 to 60 RPM
Angular Displacement Information		
Drive Shaft Rotations (Maximum, clockwise or counterclockwise)	15,000	
Resolution	0.171 arc-min	0.168 arc-min
Accuracy[8]	Equal to or less than +/-0.4 degrees over +/-360 degrees or 0.1% of reading whichever is greater	
Repeatability[8]	Equal to +/-0.1 degrees	
Backlash, Maximum	6 arc-min	10 arc-min
Frame Torsional Stiffness[9]	1 arc-min	
Cyclic Test and Frequency Limits	Consult factory	
Power Requirements		
D1	100-120 VAC, 1 Ph, 50/60 Hz, 10 A	200/230 VAC, 3 Ph, 50/60 Hz, 20 A
D2	200-240 VAC, 1 Ph, 50/60 Hz, 10 A	N/A
D4	N/A	380/400/415/460 VAC, 3 Ph, 50/60 Hz, 15 A
Certifications	Conform to all relevant European standards and carry a CE mark	

1. E1 = Standard test opening
   E3 = Increase test opening by 305 mm (12 in)
   H1 = No linear guide covers
   H2A = Linear guide covers for E1 test opening
   H2C = Linear guide covers for E3 test opening
   D1, D2, D4 = Voltage options
2. The usable frame capacity is limited by the capacity of the torque cell used. Torque cells are available in a range of capacities, refer to "Torque cell" on page 3-4 for more information.
3. Long term static tests should be limited to 30 minutes or less when the test is performed at or near maximum capacity. Time varies inversely with test load. 50% maximum capacity tests should be limited to 60 minutes or less. Test duration is ultimately limited by the temperature of the drive motor. Assumes ambient temperature of 25 deg C (77 deg F).
4. The design capacity is the peak load that the frame should be used at for no more than 80% of the time. In other words, at least 80% of specimen testing should be conducted at peak loads that are at or below the design capacity. The frame should only be used at loads between the design capacity and the maximum capacity less than 20% of the time.
5. Use of linear guide covers reduces the usable test opening. When linear guide covers are purchased and installed, they can be removed to increase the usable test opening up to the maximum opening.
6. Includes clearance above and behind the frame to open the enclosure door and includes feet height of 51 mm (2 in). Does not include clearance to mount optional axial preload assembly (requires clearance of 230 mm (9 in) on **each** side of frame).
7. Does not include weight of any fixtures or optional accessories that can be mounted in frame.
8. Under no load conditions.
9. Frame only. Does not include torque cell or load string. Value measured flange to flange in test space with crosshead in the closest position to the output shaft.

Frame alignment

The crosshead of the MT frame has been aligned at the factory to be within 0.125 mm (0.005 in) in both the horizontal and vertical planes, with respect to the output shaft, when the output flange and the torque cell assembly are face-to-face. This alignment decreases by 0.025 mm (0.001 in) for every 25 mm (1 in) that the flanges are separated. The use of specimen fixtures automatically reduces the alignment of the load train. The degree of misalignment depends on the specimen fixture installed.

For MT1 frames, if alignment is critical for the test being performed, an optional alignment device may be purchased to further improve the alignment of the load train with respect to the frame.

59 Series control unit

Table 2-3. 59 Series control unit technical specifications.

Data Sampling	40 kHz
Data Capture	Selectable up to 1000 Hz[1] Intelligent data capture Synchronous on all channels
Digital Signal Processor	32-bit floating point Self-test diagnostics Real-time closed-loop control Real-time data acquisition
Data Transfer to Computer	1000 Hz
Transducer Inputs	Standard Instron rationalized transducers Any 0-10 V analog DC input
Transducer Resolution	1 part in 500,000 of +/- full scale (19 bits)
Load Measurement Accuracy	+/- 0.5% of reading down to 1/250 of load cell capacity
Linearity	+/- 0.25% of reading over a range of 0.2% to 100% of capacity
Repeatability	+/- 0.25% of reading over a range of 0.2% to 100% of capacity
Strain Measurement Accuracy	+/- 0.5% of reading down to 1/50 of full range with ASTM E 83 class B-1 or B-2, or ISO 9513 class 0.5 extensometer
Certifications	Conform to all relevant European standards

1. Software data capture rate may vary.

Environmental conditions

Table 2-4 lists the recommended environmental conditions in which the system should be operated and stored.

Table 2-4. Recommended environmental conditions.

Operating Temperature:	+10 to +38 deg C (+50 to +100 deg F)
Storage Temperature:	-40 to +66 deg C (-40 to +150 deg F)
Humidity:	10% to 90% (non-condensing)
Atmosphere:	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 level

The A-weighted emission sound pressure level generated by the testing system under normal operating conditions does not exceed 70 dBA. The peak C-weighted instantaneous sound pressure value does not exceed 63 Pa.

Since many variables (such as room layout) affect noise levels, it can not be assumed that these readings will be equal to those in the field. The readings were taken at a location in front of the system as shown in Figure 2-1. This is the typical location for an operator to stand when operating the system.

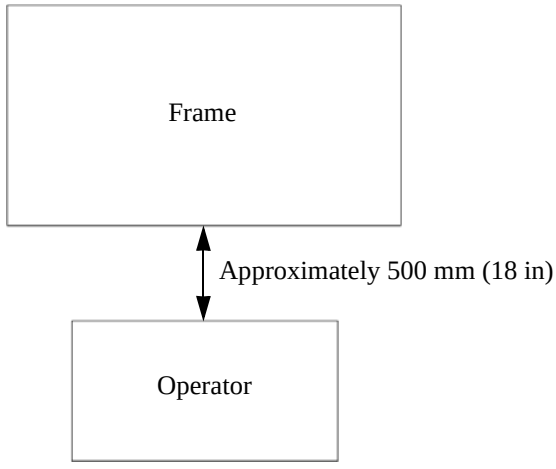


Figure 2-1. Location of noise level reading.

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Chapter 3
Operation

Operation of enclosure

The enclosure is interlocked. It affects operation of the system as follows:

- When the enclosure is opened, the output shaft can only be operated by the **JOG** controls on the user control panel. This permits installation of the specimen and other test setup.
- The enclosure must be closed to start a test.
- If the enclosure is opened during a test, the controls will abort the test and immediately stop the output shaft. When a test is aborted, the controls will not automatically return the frame to start or to gauge length, etc. To restart an aborted test, the frame must be manually returned to the starting position and then the test can be restarted.
- The enclosure can only be opened during a test if the frame is in a “pause” state (i.e. to remove an extensometer). This action must be programmed into the test method. The test will automatically continue once the enclosure is closed and the “Remove Extensometer” message is cleared in the software.
- Anytime the enclosure is opened, the controlling software indicates this by flashing an “Interlock Open” message on the screen.

Operation of controls

Table 3-1 provides details on the function and operation of various system controls.

Table 3-1. Control functions.

Control	Location	Description
Emergency stop 	Frame	When it is necessary to stop motion of the frame immediately, press the **EMERGENCY STOP** button. This stops the output shaft and disables the frame. To resume operation: 1. Release the **EMERGENCY STOP** button by turning it clockwise as depicted by the arrows on the knob face. 2. Enable the frame in the controlling software.
Display and associated buttons	User control panel	The display and its associated buttons operate together with the controlling software. The display can show either soft key actions or live displays. The **TOGGLE** button that is to the left of the display toggles between these two modes. When in soft key mode, the numbered buttons, labeled **1**, **2**, **3** and **4**, operate as “soft keys” that perform actions as defined by the user in the controlling software. Any soft key functions that you have assigned in the controlling software are shown in the display next to the appropriate button. You can assign up to four functions that you use frequently, such as Balance Load and Reset Gauge Length. Pressing a button performs the action displayed next to it. When in live display mode, the display shows copies of any live displays that you have set up in the controlling software. You can assign up to four live displays. The numbered buttons have no effect when the display is in live display mode. For information on setting up the display and numbered buttons; refer to the controlling software’s On-line Help.

Table 3-1. Control functions. (Continued)

Control	Location	Description
Jog Controls	User control panel	Press the ↶ or ↷ button to rotate the output shaft counterclockwise or clockwise. If you press and hold the button, the output shaft begins to move slowly. As you continue to hold the button, shaft speed increases linearly, up to a preset maximum, until you release the button. When a specimen is installed, ↶ rotation of the output shaft creates a clockwise rotation of the torque cell - this is interpreted in the software as positive angular displacement of the specimen and a positive torsional load on the specimen. Likewise for ↷ rotation of the output shaft; it creates negative angular displacement of the specimen and a negative torsional load on the specimen.
FINE POSITION	User control panel	Turn this thumbwheel for slow but accurate positioning of the output shaft. **FINE POSITION** allows you to set an accurate gauge length, or to set a precise grip position for loading specimens. Direction of output shaft rotation produces the same positive/negative torque on the specimen as does the ↶ and ↷ jog buttons.
RESET GL	User control panel	Press this button to set the current angle of the output shaft as the gauge length angle. Once the gauge length is set, the output shaft always returns to this angle when: • The output shaft encounters a pre-set limit or event and the software instructs the output shaft to return to gauge length. • You press the **RETURN** button (with Bluehill software only).
AT GL Indicator	User control panel	This indicator illuminates when the output shaft is at the preset gauge length. It will also illuminate when you press the **RESET GL** button, which indicates that the current position of the output shaft is now the new gauge length.
POWER Indicators	User control panel	The **POWER** indicator illuminates when power to the 59 Series control unit is on. Associated with this are **FRAME STANDBY** and **FRAME READY** indicators. Certain subsystems, such as the torque cell and its conditioner board, require a somewhat lengthy warm-up time. In **FRAME STANDBY**, power is supplied to these subsystems but not to the frame and other transducer circuits (frame is disabled). In **FRAME READY**, the system supplies power to all subsystems including the frame and other transducer circuits (frame is enabled). The system is ready for operation.
SPECIMEN PROTECT and Indicator	User control panel	**SPECIMEN PROTECT** is an electronic function that protects test specimens from overload during test setup. Press this button to toggle this function on and off. The **ON** indicator shows when **SPECIMEN PROTECT** is on and off. The indicator blinks when **SPECIMEN PROTECT** is on. **SPECIMEN PROTECT** must be set up in the controlling software before it can be turned on (see software manual or on-line help for information on setting this feature). Also, it can only be turned on when the frame is enabled.
START TEST	User control panel	Press this button to begin the test once all test parameters are set. Up and Down Arrow indicators show the type of test selected.
STOP TEST	User control panel	Press this button to stop motion of the output shaft at the end of the test, if it has not already been programmed at the computer.
RETURN	User control panel	This function is dependent on the controlling software; refer to the controlling software's On-line Help.
LOAD	59 Series control unit	Load connection for the system's torque cell.

Table 3-1. Control functions. (Continued)

Control	Location	Description
STRAIN 1	59 Series control unit	Optional connection for an extensometer or other transducer.
STRAIN 2	59 Series control unit	Optional connection for an extensometer or other transducer.
SERVICE Display	59 Series control unit	Provides an indication of self-tests that are performed by the controls when the system is powered up and is also an indicator of system status. System status is normal when the **T** indicator is green and the **A** indicator is blinking red.

Figure 3-1. The user control panel.

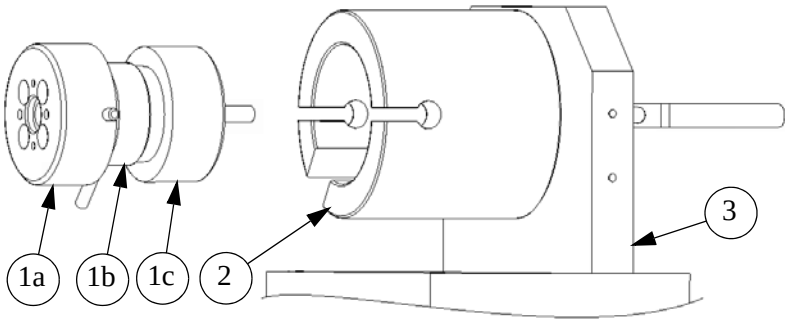
Torque cell

The torque cell is not included with the frame; it must be selected and purchased separately. The capacity of the torque cell that is used could limit system capacity.

The torsional force applied to the specimen by the drive motor can be measured by an optional strain gauge torsion load cell, or torque cell. See "Torque cell options" on page 1-5 for a list of available torque cells; several capacities are available.

Torque cells with a capacity of 22.5 N-m (200 lbf-in) or less are miniature torque cells. Miniature torque cells are very sensitive and can be damaged very easily. Most damage occurs when fixtures or specimens are mounted to the torque cell - the simple act of securing a fixture or specimen to the torque cell can generate enough torsional force to overload and damage the torque cell. For this reason, all miniature torque cells that are purchased from Instron are supplied with special plates mounted to the front and rear of the torque cell. This torque cell assembly (1, Figure 3-2) is designed to be mounted in a torque cell protection device. For MT1 frames, this protection device is supplied as standard equipment with the frame. For MT2 frames, the protection device can be purchased as

optional equipment. The protection devices only protect the miniature torque cell during installation of fixtures or specimens - they do **not** protect the miniature torque cell from overload during a test.



1. Miniature torque cell assembly
   a. Face plate
   b. Miniature torque cell
   c. Base plate
2. Torque cell protection device (MT1 shown)
3. Crosshead

Figure 3-2. Miniature torque cell assembly.

Select torque cell

Selecting a torque cell is the first step in preparing for a torsion test. If the approximate strength of the specimen is known, use these guidelines to choose a torque cell:

- The maximum expected testing torque must be less than the maximum capacity of the torque cell but greater than 2% of the maximum capacity of the torque cell.
- If a choice is possible between two different cells because of overlapping ranges:
  - Select a higher-capacity torque cell whenever a minimum deflection is desired.
  - Select a lower-capacity torque cell whenever a maximum long term balance or stability is desired.

If the specimen's strength is not known, refer to a Properties of Materials handbook to obtain an approximate strength.

If you cannot determine an approximate value of strength, use the highest capacity torque cell rated for the frame. Perform a preliminary test at a very slow speed to obtain the torque range required. After performing the preliminary test, you can determine if a lower capacity torque cell will provide better resolution.

Mount torque cell - MT1 frames

MT1 frames use a miniature torque cell for measuring the torsional load on a specimen. For this reason, MT1 frames include a standard torque cell protection device (2, Figure 3-3) to mount the miniature torque cell assembly (1). The torque cell protection device is mounted to the crosshead (3).

The clamp lever (2b) is used to engage and disengage the torque cell assembly in the protection device housing (2a):

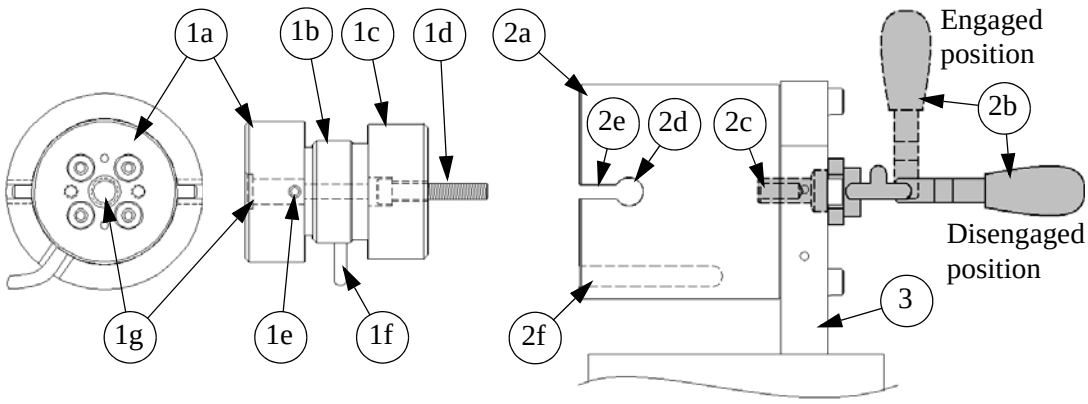
- When the clamp lever is put in the **engaged** (vertical) position, the torque cell assembly (1) is pulled back into the housing (2) so that each engagement pin (1e) is in the head of its slot (2d). There is enough clearance in the head area to allow rotation of the face plate and thus torsional force is transmitted to the torque cell.

- When the clamp lever is put in the **disengaged** (horizontal) position, the torque cell assembly is pushed forward in the housing so that each engagement pin is in the neck of its slot (2e). The neck area has minimal clearance and does not allow the face plate to rotate, and thus no torsional force is transmitted to the torque cell.

The clamp lever should **always** be in the disengaged position before any fixtures or specimens are mounted to the torque cell assembly and in the engaged position for testing. It is very important to follow proper procedures when installing and removing the miniature torque cell assembly from the protection device (see page 3-7) **AND** when installing and removing fixtures and specimens from the torque cell assembly (see "Fixture mounting" on page 3-10).

Caution

It is always good practice to disengage the torque cell assembly anytime it is not directly in use. This prevents accidental damage to the torque cell.



1. Miniature Torque Cell Assembly
   a. Face plate
   b. Miniature torque cell
   c. Base plate
   d. Clamp bolt (M6)
   e. Engagement pins (one each side)
   f. Torque cell cable
   g. Access hole
2. Torque cell protection device
   a. Housing
   b. Clamp lever
   c. Clamp plunger
   d. Engagement slot - head
   e. Engagement slot - neck
   f. Torque cell cable slot
3. Crosshead

Figure 3-3. Miniature torque cell assembly and MT1 torque cell protection device.

Installation of miniature torque cell assembly

Caution

Extreme caution must be used when installing a torque cell assembly into the torque cell protection device. It is extremely easy to damage the torque cell. Be sure to follow recommended procedures.

When the system arrives from the factory, the miniature torque cell assembly will be fully assembled with the face and base plates already attached. It is only necessary to install the assembly into the housing.

Equipment required

You will need the following equipment:

- A 5 mm hex key (supplied)

Recommended procedure:

Perform the following procedure to install a miniature torque cell assembly:

1. Put the torque cell clamp lever (6a, Figure 3-3) in the disengaged position.
2. Carefully insert the miniature torque cell assembly into the housing - the end with the clamp bolt should go in first. Be sure that the torque cell cable (1f) lines up with the cable slot (2f) and that the engagement pins (1e) line up with their engagement slots (2e).
3. Insert the 5 mm hex key through the access hole (1g) on the front of the face plate and thread the clamp bolt (1d) into the plunger (2c) two to three turns.
4. Put the torque cell clamp lever in the engaged position and continue turning the clamp bolt until it just starts to tighten.
5. Check for proper tightness of the clamp bolt by disengaging and engaging the torque cell clamp. The lever should lock firmly in place when engaged. If it is loose and does not snap into place, the clamp bolt is too loose and must be tightened. If the lever cannot be lifted into the engaged position, the clamp bolt is too tight and must be loosened. Use small adjustments of the hex key to get the right tension on the torque cell clamp for locking.
6. Disengage the torque cell assembly.
7. Be sure the torque cell cable is plugged into the **LOAD** connection on the front of the 59 Series control unit.

Removal of miniature torque cell assembly

Caution

Extreme caution must be used when removing a torque cell assembly from the torque cell protection device. It is extremely easy to damage the torque cell. Be sure to follow recommended procedures.

It should only be necessary to remove the torque cell assembly from the torque cell protection device if a different torque cell assembly must be used or if the torque cell is damaged and must be replaced.

Equipment required

You will need the following equipment:

- A 5 mm hex key (supplied)

Recommended procedure:

Perform the following procedure to remove a miniature torque cell assembly:

1. Disengage the torque cell assembly.
2. Unplug the torque cell cable from the **LOAD** connection on the front of the 59 Series control unit.
3. Insert the 5 mm hex key through the access hole (1g) on the front of the face plate and completely loosen the clamp bolt (1d).
4. Carefully remove the torque cell assembly from the housing.

Mount torque cell - MT2 frames

For MT2 frames, the torque cell mounts to the crosshead. When using the full capacity torque cell (225 N-m (2,000 in-lbf)), it mounts directly to the crosshead as shown in Figure 1-2 on page 1-8 - no special mounting is needed. When miniature torque cells are used with an MT2 frame, an optional torque cell protection device (which is similar to the torque cell protection device on the MT1 frames) can be purchased, **and is highly recommended**, to provide protection for the miniature torque cell. When purchased, this torque cell protection device is supplied with separate instructions for installation and use. The torque cell protection device mounts directly to the crosshead.

Torque cell setup

Once a torque cell is chosen, installed and connected, the system should recognize the selected cell. The type and full scale rating of the cell are recalled. If the software's torque cell display shows "Not Calibrated", the torque cell needs calibrated. Click on the Transducer drop-down menu, select Calibrate, and then select the applicable torque cell from the drop-down list. The software will perform a calibration. Follow the prompts as instructed.

The gain settings for the torque cell are set at the factory. These settings can be modified, if needed, for a particular specimen stiffness. For systems with Bluehill software, refer to the on-line Help system for guidance on determining gain settings. For systems with Partner software, the gain setting of the torque cell can be changed as follows:

1. Click on Tools > Configure > Transducers.
2. Select the appropriate torque cell from the list and click the Modify button.
3. Select the Scaling tab. The Stiffness Compensator value sets the torque cell gain. The default value of 0.01 is usually sufficient. This gain number may need adjusted depending on specimen compliance. For more elastic specimens, try a larger number (i.e. 0.015 or 0.02). If the machine oscillates, gain is probably set too high. Try entering a smaller number (i.e. 0.008 or 0.005).

Caution

Do not test with specimens that exceed the torque cell testing capacity. This may cause severe oscillation and failure of the torque cell. Always test with a specimen smaller than cell capacity. If capacity is unknown, start the test at a very low gain setting (0.001 or lower) and slowly increase gain to find the optimum setting.

Current production torque cells use a programmed serial prom to allow the controlling software to automatically identify the torque cell. If you want to use an older torque cell that is identified by the software using resistor identification (instead of a serial prom), then you should contact your local Instron Professional Services department as directed on page 1-12 for guidance.

Fixture mounting

The frame is supplied with multiple bolt patterns for the mounting of specimen gripping fixtures. The bolt patterns are designed to allow standard Instron torsion fixtures to be mounted in the test space. Any bolt pattern can also be used to mount customer fixtures or accessories; appropriate adaptation may be necessary. All bolt patterns can accommodate testing at full frame capacity. The following sections provide details of the bolt patterns - refer to the appropriate section for your frame. For MT1 frames that use miniature torque cells, the recommended procedure to mount fixtures to the torque cell is also included. It is very important to follow the recommended procedure to prevent damage to the miniature torque cell.

MT1 frames

For MT1 frames, fixtures are mounted to the output shaft (1, Figure 3-4) and the face plate of the torque cell assembly (2). Details of the bolt patterns provided on both surfaces are provided in Figure 3-4. To mount fixtures to the torque cell assembly without causing damage to the torque cell, perform the following recommended procedure.

Caution

It is very important to follow recommended procedures when accessories are mounted to the miniature torque cell assembly. Damage to torque cell will result if fixtures are not mounted as recommended.

Caution

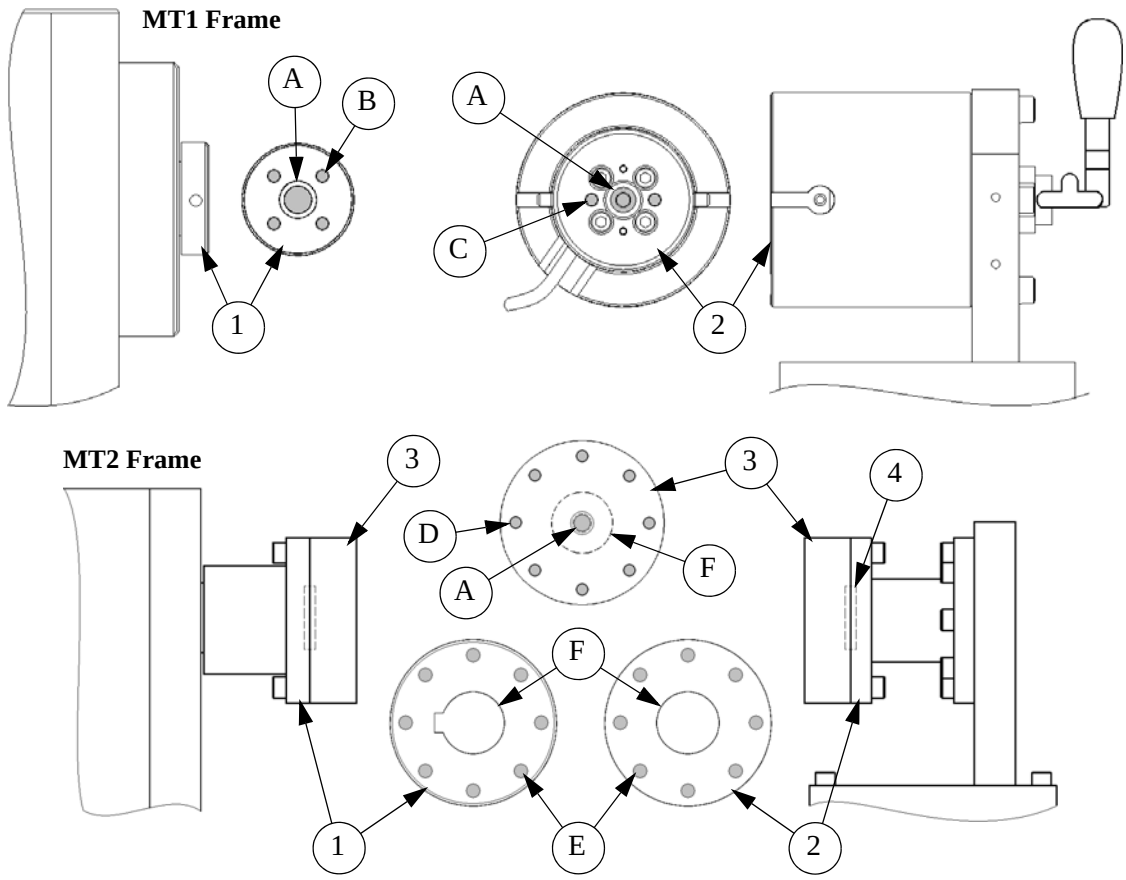
It is always good practice to disengage the miniature torque cell assembly anytime it is not directly in use. This prevents accidental damage to the torque cell.

Before mounting any fixture to the torque cell assembly, be sure the desired miniature torque cell assembly is properly installed in the torque cell protection device. See page 3-7 and page 3-8 for installation and removal procedures.

1. Disengage the torque cell assembly.
2. Tighten the crosshead clamp (7, Figure 1-2 on page 1-8) to secure the crosshead in place.
3. Attach the desired fixture to the face plate of the torque cell assembly (2, Figure 3-4).
4. Once the accessory is completely mounted and any bolts are tightened as desired, the torque cell assembly can be engaged; however, it is recommended that the torque cell assembly remain disengaged until just before any test is started. This will prevent accidental damage to the torque cell.

To remove fixtures, reverse the above procedure. Always be sure to disengage the torque cell assembly before attempting to loosen or tighten fixture mounting bolts.

When mounting a fixture to the output shaft, the output shaft may rotate if the frame is not enabled. If this rotation is objectionable, enable the frame in the controlling software.



1. Output shaft
2. Face plate of torque cell assembly (MT1) or torque cell (MT2)
3. Adapter plate
4. Centering disk

A. M12 mounting hole

B. M5 mounting hole, quantity 4 on a 25 mm (0.984 in) bolt circle diameter

C. M5 mounting hole, quantity 2 on a 25 mm (0.984 in) bolt circle diameter

D. M8 mounting hole, quantity 8 on a 82.5 mm (3.25 in) bolt circle diameter

E. 8.7 mm (11/32 in) through-hole, quantity 8 on a 82.5 mm (3.25 in) bolt circle diameter

F. 40 mm (1.5 in) recess for centering disk (for adapter plates - recess is on rear of plate)

Figure 3-4. Bolt pattern details for fixture mounting.

MT2 frames

For MT2 frames, fixtures are mounted to adapter plates (3, Figure 3-4). These adapter plates are mounted to the output shaft (1) and torque cell face plate (2). Details of the bolt patterns provided on the adapter plates are provided in Figure 3-4.

Alternatively, one or both adapter plates can be removed so that fixtures can be mounted directly to the output shaft and/or torque cell face plate. The output shaft and torque cell face plate provide a bolt pattern of through-holes only (no tapped holes) - details of the bolt pattern are provided in Figure 3-4. Removal of both adapter plates increases the available test opening by approximately 57 mm (2.25 in). When removing the adapter plates, be careful not to lose the centering disks (4). When re-installing the adapter plates, put a centering disk in the recess on the rear of each adapter plate to help align the adapter plates with the output shaft and torque cell face plate.

When mounting a fixture to the output shaft, the output shaft may rotate if the frame is not enabled. If this rotation is objectionable, enable the frame in the controlling software.

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Start the system

This document presumes that customer training (by Instron service personnel) has been completed and that at least one test method has been created in the controlling software.

Before operating the system:

- Familiarize yourself with the operating features and controls described in these instructions and in all other accompanying documentation for the controlling software.
- Verify that your system voltage is compatible with your power supply.

Following is the recommended procedure for system startup:

1. Be sure that the proper rating of main power is supplied to all system components and that all electrical cables are plugged in.
2. Turn the system disconnect switch to ON (|).
3. Turn the power switch on the rear of the 59 Series control unit to ON (|).
4. Turn on power to all peripheral equipment that interfaces with the computer system. This includes the monitor, printer, any digital calipers, etc. Turn on power to the computer's CPU (central processing unit).
5. Check the display on the user control panel. The display shows an hour glass while the controls perform self-tests. Once the hour glass goes away, start the controlling software.

While the controlling software and control electronics are booting up, do not press any control buttons. For some controllers, this could cause a failure during some of the self-test routines.

6. Open or create the desired test method in the controlling software.
7. Check that the lights on the front of the 59 Series control unit are illuminated as follows:
   - **T** indicator of the **SERVICE** display is green
   - **A** indicator of the **SERVICE** display is blinking red

If the **SERVICE** *display flashes the letter "F" during startup, it indicates that an error has occurred. Refer to "Troubleshooting" in the System Concepts Manual (supplied separately) for more information.*

8. Check that the lights on the user control panel are illuminated as follows:
   - **POWER** is green
   - **FRAME STANDBY** is red
   - **TEST STOPPED** is red

9. Calibrate the load cell and let the system warm-up for at least 15 minutes to assure system stability, then re-calibrate.

A fifteen minute warm-up period is also necessary whenever a load cell is changed, or after the initial connection of a strain gauge. After the warm-up period, the load cell or strain gauge must be calibrated.

Run a test

This information is NOT test specific, it is only intended to assist you in the general aspects of running a test. If you are testing to a specific standard or society specification (ASTM, ISO, EN, BS, etc.), those specifications should be obeyed with regard to number of tests run, specimen specifications, fixturing, inserting specimens and all other aspects of materials testing.

This document presumes that customer training (by Instron Service Engineer) has been completed and that at least one test method has been created in the controlling software.

Refer to the supplied software manual for specific information about the controlling software. The following is only a general description of the necessary steps to run a test.

Ensure that the following conditions are met before a test is run:

- If the system is not currently turned on, complete "Start the system" on page 3-14.
- The **LOAD** channel is calibrated.
- The **STRAIN** channel is calibrated if you are using an extensometer.
- You have reviewed the manuals for the controlling software and are familiar with the on-line help system that accompanies the software.
- Know the specific procedures to set up and run a test.
- The appropriate torque cell and testing accessories are installed on the frame. Refer to "Torque cell" on page 3-4 and "Fixture mounting" on page 3-10.

Following is the recommended procedure to run a test on a specimen:

1. Verify that the setup and test parameters are reasonable and correct for your test.
2. Ensure that the displays on the user control panel illuminate.
3. Check that the frame is enabled.
4. Open the enclosure.
5. Install the specimen into the fixtures as specified by your test method.
6. Balance the load, if necessary.
7. Release the crosshead clamp.
8. For systems with a torque cell protection device, engage the torque cell assembly.
9. Install extensometry, strain gages, etc. (if applicable).
10. Close the enclosure.
11. Reset the gauge length, if necessary.
12. Start the test.

The test can be stopped at any time by using either the **STOP TEST** *button on the user control panel or the* ***END TEST*** *button in the controlling software.*

*If it is necessary at any time to turn off the drive motor, press the **DISABLE FRAME** button in the controlling software.*

13. As the test is running, the controlling software dynamically displays the data that is being collected or calculated for graphing and results. Also, the user may be prompted to perform some operation, such as remove an extensometer. When the operation has been performed, click the appropriate button to continue the test.
14. When the test is complete, the system will automatically stop the test as determined by the test method.
15. Open the enclosure, remove the specimen and prepare the system for another test (as applicable).

*If the frame will sit idle between tests, press the **DISABLE FRAME** button in the controlling software to turn off the drive motor. For added precaution, engage the **EMERGENCY STOP** button to ensure that the drive system can not be inadvertently started. Release the **EMERGENCY STOP** button when ready to run the next test.*

Shut down the system

It is recommended that the system as a whole (frame, control unit, computer system, peripherals, etc.) be shut down at the end of each working day or anytime it will sit idle for long periods of time. The procedure to shut down the system is as follows:

1. Remove any specimen from the fixtures.
2. Press the ***DISABLE FRAME*** button in the controlling software to turn off the drive motor.
3. Engage the **EMERGENCY STOP** button.
4. Exit the controlling software and any other software that is running. Shut down the Windows Operating System.
5. Turn off all peripheral equipment.
6. Turn the power switch on the rear of the 59 Series control unit to OFF (**O**).
7. Turn the system disconnect switch to OFF (**O**).

If the frame will sit idle between tests, press the ***DISABLE FRAME*** button in the controlling software to turn off the drive motor. For added precaution, engage the **EMERGENCY STOP** button to ensure that the drive system can not be inadvertently started. Release the **EMERGENCY STOP** button when ready to run the next test.

Chapter 4
Maintenance

General maintenance recommendations

Only the maintenance procedures outlined in these instructions should be performed by the customer or their representative. All other maintenance and repairs should be performed by Instron Service personnel only.

Preventative maintenance schedule

Table 4-1 outlines a recommended preventative maintenance schedule for system components.

Table 4-1. Recommended preventative maintenance schedule.

Frequency	Component	Maintenance Task
Daily:	System	• Make daily checks of system, see page 4-3..
Monthly:	Electronics	• Clean the fans, see page 4-4.[1]
Biannually (or once every 1000 hrs. of operation)[2]:	System	• Inspect the cables, see page 4-4.
	Frame	• Clean, inspect and lubricate the guide rails, see page 4-5.
Annually:	System	• Verify/calibrate system.

1. The frequency listed here is only a recommendation. The correct frequency for your system is heavily dependent on the environmental conditions in which your system is used. Dirty environments may require a more frequent interval, while clean laboratory conditions could require less. We recommend beginning with the frequency listed here and then adjusting this frequency as experience dictates.
2. Whichever is soonest.

Make daily checks of system

Before operating the system each day, a general check of the system is highly recommended. Performing a good general check on a daily basis is an important part of preventative maintenance. It also allows the operator to become familiar with the system, and with what is considered normal behavior and normal appearance. Once familiar with the system, operators will be more likely to notice any abnormalities that could indicate problems, or potential problems, with the system. Before operating the system each day:

- Check that the crosshead is square to the guide rail and not out of alignment. This can be a simple visual check. Stand away from the frame and check that all horizontal components (i.e. the base, guide rail and crosshead) are parallel with each other and aligned vertically. Misalignment indicates that a larger problem exists.
- Check that all testing accessories are free of dirt, damage and deformation. Any fixture with damage or deformation should be corrected before use!
- Check that power is adequately supplied to the electronics. Start up the system and check all indicator lights on the user control panel and 59 Series control unit. Check that the lights are not too bright or too dim, and that they don't flicker. If any of these conditions exist, this could indicate a problem with the power supply in the 59 Series control unit or with system main power (customer supply).
- Check that all cables are free of wear and chafing, have adequate slack to prevent excessive strain on connectors, and have tight connections.

If any of these checks reveal a potential problem, the problem should be investigated and corrected **before** the system is operated. For assistance in troubleshooting the system, contact your local Instron Services department as directed on page 1-12.

Electronics

Clean the fans

The fan opening of the 59 Series control unit and the computer system's CPU should be cleaned at the frequency stated in the "Preventative maintenance schedule" on page 4-2. The fan opening for the 59 Series control unit is on the rear of the unit. Use a vacuum to remove dust and dirt from the grill of the fan and the fan filter.

Fuses

The system is equipped with several fuses. These fuses should only need replaced when they are blown. Refer to the system's System Concepts Manual (supplied separately) for more information on troubleshooting for a blown fuse.

Inspect the cables

Cables should be inspected at the frequency stated in the "Preventative maintenance schedule" on page 4-2. Check the following:

- Inspect all cables for loose connections. This includes power cable and transducer cable connections at the frame and at the 59 Series control unit. Tighten any loose connections that you may find.
- Inspect all cables for deterioration. Check for abrasions, cuts, etc. Replace cables as necessary.

If you notice any problems resulting from this inspection, contact your local Instron Services department as directed on page 1-12 for immediate assistance.

Frame

Clean, inspect and lubricate the guide rails

The guide rails should be cleaned, inspected and lubricated periodically, as outlined in the "Preventative maintenance schedule" on page 4-2, to maintain smooth operation and prevent corrosion. Use of a 3:1 mineral oil is recommended. Perform the following:

1. For frames that are equipped with the optional guide covers, gain access to the guide rails by loosening and removing the guide covers. The guide covers are held in place by Velcro® fastener strips.
2. Check the guide rails for cleanliness. If necessary, wipe the guide rails with a clean, dry cloth. Move the crosshead as necessary to clean all parts of the guide rails.
3. Inspect the guide rails for damage. Move the crosshead and check for smooth operation. Minor damage is acceptable as long as it does not interfere with movement of the crosshead. If damage is severe enough to hinder movement of the crosshead or to affect alignment between the output shaft and torque cell, contact your local Instron Services department as directed on page 1-12 for immediate assistance.
4. Lubricate the guide rails. Apply a thin film of mineral oil to the guide rails. Move the crosshead as necessary to lubricate all parts of the guide rails.
5. For frames that are equipped with the optional guide covers, restore the guide covers to their original position and press the Velcro® into place. Once guide covers are in place, move the crosshead to check for smooth operation.

Ancillary parts

Ancillary parts for the MT systems are listed in Table 4-2. These ancillary parts are included with the frame upon delivery. Be sure to keep these ancillary parts in a safe place so they do not get misplaced.

Table 4-2. Ancillary parts list.

Description	Location or Purpose	Part Number[1]	Quantity
Hex key set, 9 piece, 1.5 - 10 mm ball end	Tighten and loosen various fasteners	300-8875-9290	1

1. The part numbers listed here are for reference only and may not be the part number used if ordering the part from Instron.

Consumable parts

MT systems have no consumable parts.

Spare and replacement parts

The Instron Services department maintains a supply of parts for your system. In the event that your system requires replacement parts, or if you choose to keep spare parts in stock, please contact your local Instron Services department as directed on page 1-12 for the proper part. Parts can be purchased individually as they are needed, or as a spare parts kit. There are three levels of spare parts kits available, see Table 4-3 for descriptions of each kit and their part number.

Table 4-3. Available spare parts kits.

Spare Parts Kit	Description	Part Number[1]
Basic spare parts kit	This kit includes fuses and external cables.	W-1398-A
Recommended spare parts kit	This kit includes fuses, external cables, DSP circuit board and Ethernet frame interface.	W-1398-B
Comprehensive spare parts kit	This kit includes fuses, external cables, DSP circuit board, Ethernet frame interface and other circuit boards.	W-1398-C

1. The part numbers listed here are for reference only and may not be the part number used if ordering the part from Instron.

Appendix A
CE Certificate

INSTRON

Industrial Products Group
900 Liberty Street ■ Grove City, PA 16127-9005
Tel: +1-724-458-9610 ■ Fax: +1-724-458-9614
www.instron.com

EC Declaration of conformity for machinery

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

Manufacturer: Instron, a division of Illinois Tool Works, Inc. - Industrial Products Group
Address: 900 Liberty Street, Grove City, PA, 16127, USA

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

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

Herewith we declare that

Model Number:
Serial Number:

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

  Low Voltage Directive 2006/95/EC
  EMC Directive 2004/108/EC

And furthermore, we declare that

- the following (parts/clauses of) European harmonised standards published in the Official Journal have been used

  BS EN 60204-1 (2006) Safety of Machinery, Electrical Equipment of Machines

- the following (parts/clauses of) other European harmonised standards, technical standards and specifications have been used

  BS EN 61010-1 (2001) Safety Requirements for Electrical Equipment for Laboratory Use
  BS EN 61000-3 (2007) Electromagnetic Compatibility Generic Emission Standard
  BS EN 61000-6-1 (2007) Electromagnetic Compatibility Generic Immunity Standard

Place of Issue: Grove City, PA USA
Date of Issue:

Signature:

Stephen A. Somple
R&D Engineering Manager

Supplier's declaration of conformity (in accordance with ISO/IEC 17050-1)

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