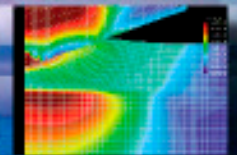


# MTS Insight™ Material Testing Systems Product Information



1kN to 300kN



Copyright information

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Trademark information

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ISO 9001 Certified

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# Preface

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## Safety first!

Before you attempt to use your MTS equipment in your test system, read and understand the *Safety* manual. Like an automobile, your test system is very useful—but if misused, it is capable of deadly force. You should not be afraid of your test system, but you should always maintain a healthy respect for it.

Improper installation, operation, or maintenance of MTS equipment in your test system can result in hazardous conditions that can cause severe personal injury or death, and damage to your equipment and specimen. Again, read and understand the *Safety* manual before you continue. It is very important that you remain aware of hazards that apply to your test system.

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# About This Manual

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- Purpose** This manual provides detailed information about the MTS Insight™ Material Testing Systems. The information includes an overview of all the models available, installation, operation, and maintenance.
- Summary** This manual includes the following sections.
- Introduction** This section reviews the MTS Insight material testing system models, gives you a description of a typical frame, and lists the environmental specifications. This section also provides the technical frame specifications of each MTS Insight frame model and line drawings of the crosshead and baseplate details.
- Installation** This section gives you specific instructions for properly moving MTS Insight frames, cable installation, and line drawings of the basic controller.
- Operation** This section provides a graphic of the manual handset control and handset functions. Other areas such as travel limit switches and fixture and load cell mounting are reviewed.
- Maintenance** This section gives you a complete guide to the preventive maintenance schedule for all MTS Insight frames.

# Conventions

---

The following paragraphs describe some of the conventions that are used in your MTS manuals.

## Hazard conventions

Hazard notices are embedded in this manual and contain safety information that is specific to the task to be performed. Hazard notices immediately precede the step or procedure that may lead to an associated hazard. Read all hazard notices carefully and follow the directions that are given. Three different levels of hazard notices may appear in your manuals. Following are examples of all three levels.

**Note** *For general safety information, see the Safety manual included with your system.*

## Danger notices

Danger notices indicate the presence of a hazard which *will* cause severe personal injury, death, or substantial property damage if the danger is ignored. For example:




---

**High intensity light and dangerous radiation are emitted by class 3B lasers.**

**Viewing a class 3b laser directly or viewing it using optical instruments will cause immediate and severe injury.**

Avoid eye or skin exposure to the laser beam. Ensure that all power to the laser is off before attempting any maintenance, service, or adjustment procedure.

---

## Warning notices

Warning notices indicate the presence of a hazard which *can* cause severe personal injury, death, or substantial property damage if the warning is ignored. For example:




---

**Hazardous fumes can accumulate in the test chamber as a result of testing.**

**Breathing hazardous fumes can cause nausea, fainting, or death.**

Ensure the chamber is properly ventilated before you open the chamber door or put your head or hands into the chamber. To do this, ensure the temperature controller is off and allow sufficient time for the ventilation system to completely exchange the atmosphere within the chamber.

---

## Conventions

### Caution notices

Caution notices indicate the presence of a hazard which *will* or *can* cause minor personal injury, cause minor equipment damage, or endanger test integrity if the caution is ignored. For example:



---

**This specimen can develop sharp edges as a result of testing.**

**Handling the specimen with unprotected hands can result in cuts and slivers.**

Always wear protective gloves when you handle the specimen.

---

### Other conventions

Other conventions used in your manuals are described below:

#### Notes

Notes provide additional information about operating your system or highlight easily overlooked items. For example:

**Note** *Resources that are put back on the hardware lists show up at the end of the list.*

#### Special terms

The first occurrence of special terms is shown in *italics*.

#### Illustrations

Illustrations appear in this manual to clarify text. It is important for you to be aware that these illustrations are examples only and do not necessarily represent your actual system configuration, test application, or software.

### Electronic manual conventions

This manual is available as an electronic document in the Portable Document File (PDF) format. It can be viewed on any computer that has Adobe Acrobat Reader installed.

#### Hypertext links

The electronic document has many hypertext links displayed in a blue font. All blue words in the body text, along with all contents entries and index page numbers are hypertext links. When you click a hypertext link, the application jumps to the corresponding topic.



# Technical Support

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## Start with your manuals

The manuals supplied by MTS provide most of the information you will need to use and maintain your equipment. If your equipment includes MTS software, you should look for README files for additional product information.

If you cannot find answers to your technical questions from these sources, you can use the internet, telephone, or fax to contact MTS for assistance. You can also fill out the Problem Submittal Form that is available on the MTS web site and in the back of many MTS manuals that are distributed in paper form.

## Technical support numbers

MTS provides a full range of support services after your system is installed. If you have any questions about a system or product, contact MTS in one of the following ways.

### MTS web site [www.mts.com](http://www.mts.com)

The MTS web site gives you access to our technical support staff by means of a Problem Submittal Form and a Technical Support link.

- Problem Submittal Form:  
[www.mts.com](http://www.mts.com) > Contact MTS > Problem Submittal Form
- Technical Support:  
[www.mts.com](http://www.mts.com) > Contact MTS > Service & Technical Support

### E-mail:

General information: [info@mts.com](mailto:info@mts.com)

Technical support: [em.techsupport@mts.com](mailto:em.techsupport@mts.com)

### Telephone

HELPLine 800-328-2255  
Weekdays 7:00 A.M. to 6:00 P.M.,  
Central Time

### Fax

952-937-4515  
Please include an MTS contact name if possible.

**Before you  
contact MTS**

MTS can help you more efficiently if you have the following information available when you contact us for support.

**Know your site number  
and system number**

The site number contains your company number and identifies your equipment type (material testing, simulation, and so forth). The number is usually written on a label on your MTS equipment before the system leaves MTS. If you do not have or do not know your MTS site number, contact your MTS sales engineer.

Example site number: 571167

When you have more than one MTS system, the system project number identifies which system you are calling about. You can find your project number in the papers sent to you when you ordered your system.

Example system project number: US1.30123

**Know information from  
prior technical  
assistance**

If you have contacted MTS about this problem before, we can recall your file. You will need to tell us the:

- MTS notification number
- Name of the person who helped you

**Identify the problem**

Describe the problem you are experiencing and know the answers to the following questions.

- How long has the problem been occurring?
- Can you reproduce the problem?
- Were any hardware or software changes made to the system before the problem started?
- What are the model and serial numbers of the suspect equipment?

**Know relevant computer  
information**

If you are experiencing a computer problem, have the following information available.

- Manufacturer's name and model number
- Operating software type and service patch information. Examples:
  - Windows XP Service Pack 1 (SP1)
  - Windows 2000 Service Pack 3 (SP3)
- Amount of system memory. Example: 512 MB of RAM.
- Amount of free space on the hard drive in which the application resides. Example: 11.2 GB free space, or 72% free space.
- Current status of hard-drive fragmentation. Example: 3% total fragmentation.

**Know relevant software information**

For MTS software application problems, have the following information available.

- TestWorks 4 version; for example Version 4.09
- Names of other non-MTS applications that are running on your computer, such as screen savers, keyboard enhancers, print spoolers, and so forth

**If you contact MTS by phone**

Your call will be registered by a HELPLine agent if you are calling within the United States or Canada. Before connecting you with a technical support specialist, your agent will ask you for your site number, name, company, company address, and the phone number where you can normally be reached.

**Identify system type**

To assist your HELPLine agent with connecting you to the most qualified technical support specialist available, identify your MTS Insight system as an **electromechanical materials test system**.

**Be prepared to troubleshoot**

Prepare yourself for troubleshooting while on the phone.

- Call from a telephone close to the system so that you can try implementing suggestions made over the phone.
- Have the original operating and application software media available.
- If you are not familiar with all aspects of the equipment operation, have an experienced user nearby to assist you.

## Technical Support

### Write down relevant information

Prepare yourself in case we need to call you back.

- Remember to ask for the notification number.
- Record the name of the person who helped you.
- Write down any specific instructions to be followed, such as data recording or performance monitoring.

### After you call

MTS logs and tracks all calls to ensure that you receive assistance and that action is taken regarding your problem or request. If you have questions about the status of your problem or have additional information to report, please contact MTS again.

### Problem Submittal Form in MTS manuals

In addition to the Problem Submittal Form on the MTS web site, there is also a paper version of this form (postage paid) in the back of many MTS manuals. Use this form to forward problems you are experiencing with your MTS equipment, whether it be software, hardware, manuals, or service. This form includes check boxes that allow you to select when you expect us to respond to your input. We guarantee a timely response—your feedback is important to us.

# EC Declaration of Conformity

## MTS Insight 1 kN to 100 kN

- Description of Model** MTS Insight Material Testing System 1 kN to 100 kN. This includes the following sub-systems of the machine: Frame, Motor, Amplifier, Controller, Transformer (1 kN to 50 kN only), Handset and Cables (guard is customer option).
- Manufacturer** MTS Systems Corporation  
14000 Technology Drive  
Eden Prairie, MN, USA 55344-2290  
Phone: 952-937-4000
- Directives** Low Voltage directive 73/23/EEC, the EMC directive 89/336/EEC and the Machinery Safety Directive 98/37/EC.
- Standards** EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements
- EN 61326-1: Electrical equipment for measurement, control and laboratory use, EMC requirements.
- EN 55011: Specification for limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment (1991). Group 1, class A (non-domestic where RF is NOT used in the treatment of material).

Description	Basic Standard	Test specification
Limits for harmonic current emissions	EN 61000-3-2	Class A
Limits for voltage fluctuations and flicker	EN 61000-3-3	Class A
Electrostatic discharge	EN 61000-4-2	4 kV contact discharge 4 kV air discharge
Radio frequency electromagnetic field, amplitude modulated	EN 61000-4-3	3 V/m
Electrical fast transient	EN 61000-4-4	0.5 kV control and signal 1 kV mains

Description	Basic Standard	Test specification
Surge immunity test	EN 61000-4-5	0.5 kV line to line 1 kV line to ground
Radio frequency common mode, amplitude modulated	EN 61000-4-6	3 V (rms)
Power frequency magnetic field	EN 61000-4-8	30 A (rms)/m
Voltage dips, short interruptions and voltage variations	EN 61000-4-11	1 cycle/100%
Radiated emissions	EN 55011	
Conducted emissions	EN 55011	

## MTS Insight 150 kN to 300 kN

### Description of Models

MTS Insight Material Testing System 150kN, 200 kN and 300 kN. This includes the following sub-systems of the machine: Frame, Motor, Amplifier, Controller, Handset and Cables (guard is customer option).

### Manufacturer

MTS Systems Corporation  
14000 Technology Drive  
Eden Prairie, MN, USA 55344-2290  
Phone: 952-937-4000

### Directives

Low Voltage directive 73/23/EEC, the EMC directive 89/336/EEC and the Machinery Safety Directive 98/37/EC.

### Standards

EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use, Part 1: General requirements

EN 61326-1: Electrical equipment for measurement, control and laboratory use EMC requirements Part 1: General requirements.

EN 55011: Specification for limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment (1991). Group 1, class A (non-domestic where RF is NOT used in the treatment of material).

Description	Basic Standard	Test specification
Electrostatic discharge	EN 61000-4-2	4 kV contact discharge 4 kV air discharge
Radio frequency electromagnetic field, amplitude modulated	EN 61000-4-3	3 V/m
Electrical fast transient	EN 61000-4-4	0.5 kV control and signal 1 kV mains
Surge immunity test	EN 61000-4-5	Mains 0.5 kV line to line 1 kV line to ground
Radio frequency common mode, amplitude modulated	EN 61000-4-6	3 V (rms)
Power frequency magnetic field	EN 61000-4-8	30 A (rms)/m
Voltage dips, short interruptions and voltage variations	EN 61000-4-11	1 cycle/100%
Radiated emissions	EN 55011	
Conducted emissions	EN 55011	

**Signed:**



**Name:** Phil Leise

**Title:** Product Manager

**Date:** 01 December 2006





# Introduction

---

The MTS Insight™ product series is the latest generation of electromechanical material testing equipment from MTS. The purpose of this manual is to help you understand your testing system, its capabilities, and operating requirements. This manual provides technical information for all MTS Insight material testing frames; from the lowest force model (1 kN), to the highest (300 kN). Read each section carefully and refer to the manual whenever you need assistance.

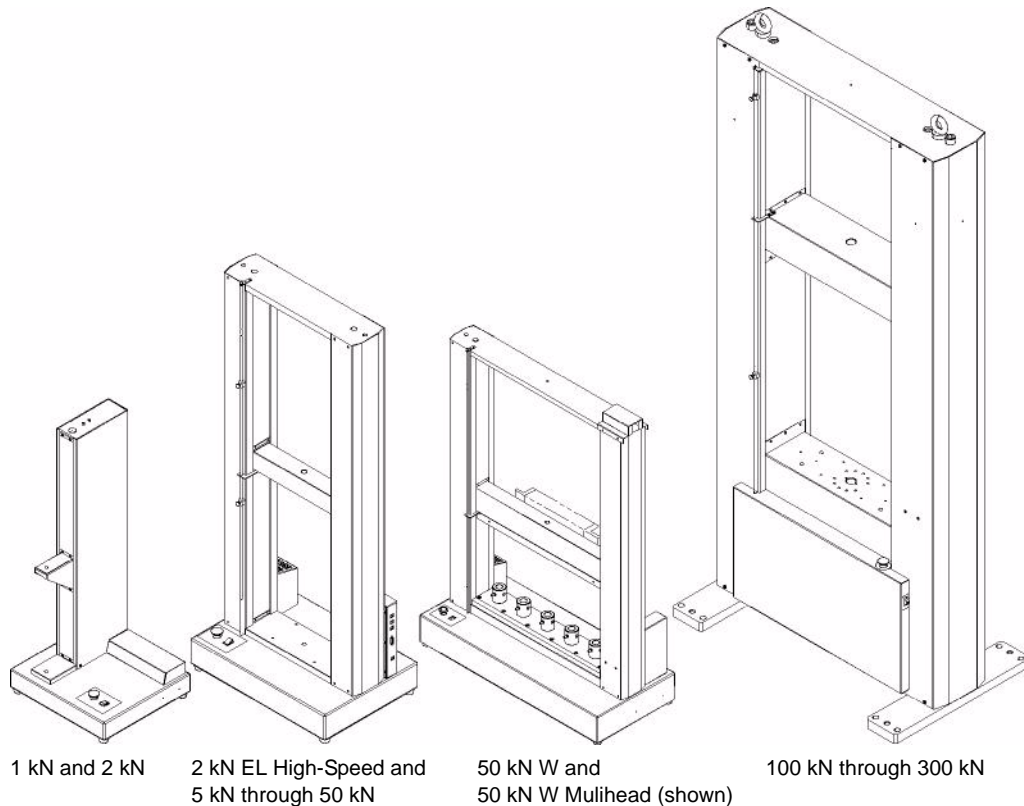
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	Baseplate Detail	35

**Inappropriate use** Before you attempt to use the Insight Material Testing System, read and understand your manual that accompanies this product. Improper installation or operation of this product can result in hazardous conditions that can cause severe personal injury or death, and damage your equipment and specimen.

# Description

---

Every MTS Insight material testing system is comprised of a load frame, electronic frame controller, and TestWorks® software. The following figure shows the external features of the various MTS Insight load frames.



The personal computer is also an integral part of the system. It runs TestWorks software which provides full machine control, data acquisition and management, and advanced data analysis and presentation. MTS has minimized the amount of custom electronics required for your system, thereby making it flexible and reliable. This is done by connecting the frame and the computer via standard USB 2.0 connectors.

The load frame has a rectangular shape and includes a base unit and one or two vertical columns. The two column models have a fixed upper transverse member. The moving crosshead is driven by precision ball screws on the load frame. The crosshead is coupled to the ball screw(s) with high-strength, precision ball nuts and rides on the ball bearings. This configuration is very efficient in minimizing friction and wear. The ball screws are anti-backlash. This feature removes the backlash so that position can be measured with increased accuracy over nonpreloaded ball screws.

The screws are driven by a series of pulleys and belts which in turn are driven by a precision dc servo motor on the MTS Insight 1 through MTS Insight 50 models and an ac brushless motor on the higher force models. The ball screw is connected to an optical encoder for precise position and velocity control.

### Frame controller

The frame controller is responsible for the following:

- Provides main data and signal processing power
- Detects the activation of limit switches
- Provides the interface between the software (computer) and the frame
- Provides digital servo control—for speed and position accuracy
- Responsible for self-ID load cell and frame
- Handset interface
- Programmable, 1000 Hz maximum, data acquisition rate
- Management of frame power

### Software

TestWorks 4 is a versatile software program offering you a host of features that will make the material testing process fast and easy to use. The software has various method templates available. The method templates in the General Testing Package provide a starting point in configuring test methods that conform with your testing needs. The General Testing Package is separated into 4 specific testing categories.

- MTS Tensile
- MTS Compression
- MTS Flex
- MTS Peel-Tear

Many additional features can be purchased to meet your company's specific needs. Some of these features might already be part of the system you ordered, or they can be added to your system as your requirements change. Refer to the TestWorks manual for additional information.

# Specifications

---

This section provides general specifications for the MTS Insight Material Testing System frames and illustrations of the crosshead and baseplate threaded hole patterns for mounting fixtures.

**Note** *At the time of this printing, some specifications have not been tested and calculated specifications are provided in the following tables. Consequently, specifications are subject to change without notice. Contact MTS for verification if critical specifications.*

## General Specifications

---

The following specifications are for all MTS Insight frames. Specifications for the specific models are in the following tables.

Parameter	Specification
<b>Environmental</b>	For indoor use only
<b>Temperature</b>	5 to 40 °C
<b>Relative humidity</b>	10 to 85%, noncondensing
<b>Altitude</b>	For use at altitudes up to 2000 m (6500 ft)
<b>Power</b>	
<b>Insulation over voltage</b>	Category II
<b>Pollution degree</b>	2

## Model Specifications

### Specifications for MTS Insight 1 and MTS Insight 1 EL

Specifications	MTS Insight 1	MTS Insight 1 EL
<b>Force Capacity</b>	1 kN (225 lbf)	1 kN (225 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)	0.001 mm/min (0.00004 in./min.)
<b>Maximum Test Speed</b>	1500 mm/min. (59 in./min.)	1500 mm/min. (59 in./min.)
<b>Force Capacity @ max. test speed</b>	1 kN (225 lbf)	1 kN (225 lbf)
<b>Maximum Test Speed @rated force capacity</b>	1500 mm/min. (59 in./min.)	1500 mm/min. (59 in./min.)
<b>Crosshead Return Speed</b>	1500 mm/min. (59 in./min.)	1500 mm/min. (59 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	750 mm (29.5 in.)	1000 mm (39.5 in.)
<b>Horizontal Test Space (centerline to rear column)</b>	104 mm (4.1 in.)	104 mm (4.1 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05	±0.05
<b>Motor Type</b>	Precision DC Servo Motor	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash	Anti-backlash
<b>Height/Width/Depth</b>	1136 X 490 X 450 mm (45 X 19 X 18 in.)	1394 X 490 X 450 mm (55 X 19 X 18 in.)
<b>Weight</b>	50 kg (110 lb)	55 kg (122 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

**Specifications for MTS Insight 2 and MTS Insight 2 EL**

<b>Specifications</b>	<b>MTS Insight 2</b>	<b>MTS Insight 2 EL</b>
<b>Force Capacity</b>	2 kN (450 lbf)	2 kN (450 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	1000 mm/min. (39.4 in./min.)	1000 mm/min. (39.4 in./min.)
<b>Force Capacity @ max. test speed</b>	2 kN (450 lbf)	2 kN (450 lbf)
<b>Maximum Test Speed @rated force capacity</b>	1000 mm/min. (39.4 in./min.)	1000 mm/min. (39.4 in./min.)
<b>Crosshead Return Speed</b>	1500 mm/min. (59 in./min.)	1500 mm/min. (59 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	750 mm (29.5 in.)	1000 mm (39.5 in.)
<b>Horizontal Test Space (centerline to rear column)</b>	104 mm (4.1 in.)	104 mm (4.1 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05	±0.05
<b>Motor Type</b>	Precision DC Servo Motor	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash	Anti-backlash
<b>Height/Width/Depth</b>	1136 X 490 X 450 mm (45 X 19 X 18 in.)	1394 X 490 X 450 mm (55 X 19 X 18 in.)
<b>Weight</b>	50 kg (110 lb)	55 kg (119 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

### Specifications for MTS Insight 2 EL High-Speed

Specifications	MTS Insight 2 EL High Speed
<b>Force Capacity</b>	2 kN (450 lbf)
<b>Minimum Test Speed</b>	0.003 mm/min. (0.00012 in./min.)
<b>Maximum Test Speed</b>	2540 mm/min. (100 in./min.)
<b>Force Capacity @ max. test speed</b>	2 kN (450 lbf)
<b>Maximum Test Speed @ rated force capacity</b>	2540 mm/min. (100 in./min.)
<b>Crosshead Return Speed</b>	2540 mm/min. (100 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1400 mm (55 in.)
<b>Horizontal Test Space (space between columns)</b>	405 mm (15.9 in.)
<b>Position Resolution</b>	0.003 mm (0.00012 in.)
<b>Position Accuracy</b>	0.03 mm (0.0012 in.)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	1900 X 650 X 450 mm (74.75 X 26 X 18 in.)
<b>Weight</b>	123 kg (261 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

## Specifications for MTS Insight 5 and MTS Insight 5 EL

Specifications	MTS Insight 5	MTS Insight 5 EL
<b>Force Capacity</b>	5 kN (1125 lbf)	5 kN (1125 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	1000 mm/min. (39 in./min.)	1000 mm/min. (39 in./min.)
<b>Force Capacity @ max. test speed</b>	5 kN (1125 lbf)	5 kN (1125 lbf)
<b>Maximum Test Speed @rated force capacity</b>	1000 mm/min. (39 in./min.)	1000 mm/min. (39 in./min.)
<b>Crosshead Return Speed</b>	1000 mm/min. (59 in./min.)	1000 mm/min. (59 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1100 mm (43 in.)	1400 mm (55 in.)
<b>Horizontal Test Space (space between columns)</b>	405 mm (15.9 in.)	405 mm (15.9 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05	±0.05
<b>Motor Type</b>	Precision DC Servo Motor	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash	Anti-backlash
<b>Guide Columns</b>	Two	Two
<b>Height/Width/Depth</b>	1600 X 650 X 450 mm (63 X 25.6 X 17.7 in.)	1900 X 650 X 450 mm (75 X 26 X 18 in.)
<b>Weight</b>	115 kg (255 lb)	123 kg (271 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase



## Specifications for MTS Insight 10

Specifications	MTS Insight 10
<b>Force Capacity</b>	10 kN (2250 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	1000 mm/min. (39 in./min.)
<b>Force Capacity @ max. test speed</b>	5 kN (1125 lbf)
<b>Maximum Test Speed @rated force capacity</b>	500 mm/min. (19.7 in./min.)
<b>Crosshead Return Speed</b>	1000 mm/min. (39 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1100 mm (43 in.)
<b>Horizontal Test Space (space between columns)</b>	405 mm (15.9 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	1600 X 650 X 450 mm (63 X 25.6 X 17.7 in.)
<b>Weight</b>	115 kg (255 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

## Specifications for MTS Insight 30 and MTS Insight 30 EL

Specifications	MTS Insight 30	MTS Insight 30 EL
<b>Force Capacity</b>	30 kN (6750 lbf)	30 kN (6750 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	25 kN (5625 lbf)	25 kN (5625 lbf)
<b>Maximum Test Speed @rated force capacity</b>	500 mm/min. (19.7 in./min.)	500 mm/min. (19.7 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (20 in./min.)	500 mm/min. (20 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1100 mm (43 in.)	1400 mm (55 in.)
<b>Horizontal Test Space (space between columns)</b>	405 mm (15.9 in.)	405 mm (15.9 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05	±0.05
<b>Motor Type</b>	Precision DC Servo Motor	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash	Anti-backlash
<b>Guide Columns</b>	Two	Two
<b>Height/Width/Depth</b>	1619 X 720 X 500 mm (63.7 X 28.3 X 19.7 in.)	1913 X 720 X 500 mm (75.4 X 29 X 20 in.)
<b>Weight</b>	180 kg (397 lb)	191 kg (422 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

## Specifications for MTS Insight 50

Specifications	MTS Insight 50
<b>Force Capacity</b>	50 KN (11250 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	25 KN (5625 lbf)
<b>Maximum Test Speed @ rated force capacity</b>	250 mm/min. (9.8 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (20 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1100 mm (43 in.)
<b>Horizontal Test Space (space between columns)</b>	405 mm (15.9 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	1613 X 720 X 500 mm (63.5 X 28.3 X 19.7 in.)
<b>Weight</b>	180 kg (397 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

**Specifications for MTS Insight 50 W**

<b>Specifications</b>	<b>MTS Insight 50 Wide</b>
<b>Force Capacity</b>	50 KN (11250 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	25 KN (5625 lbf)
<b>Maximum Test Speed @ rated force capacity</b>	250 mm/min. (9.8 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (20 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1100 mm (43 in.)
<b>Horizontal Test Space (space between columns)</b>	835 mm (33 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	1629 X 1145 X 500 mm (64.1 X 45 X 20 in.)
<b>Weight</b>	296 kg (653 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

### Specifications for MTS Insight 50 W Multihead

Specifications	MTS Insight 50 Wide
<b>Force Capacity</b>	50 KN (11250 lbf)
<b>Minimum Test Speed</b>	0.001 mm/min. (0.00004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	25 KN (5625 lbf)
<b>Maximum Test Speed @ rated force capacity</b>	250 mm/min. (9.8 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (20 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1016 mm (40 in.)
<b>Horizontal Test Space (between baseplate adapter centerlines)</b>	155.5 mm (6.125 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	Precision DC Servo Motor
<b>Drive System Type</b>	DC 4 Quadrant Motor Drive
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	1629 X 1145 X 500 mm (64.1 X 45 X 20 in.)
<b>Weight</b>	350 kg (772 lb)
<b>Power</b>	5/3 Amps 120/220-240 Vac 50/60 Hz Single phase

## Specifications for MTS Insight 100

Specifications	MTS Insight 100
<b>Force Capacity</b>	100 kN (22500 lbf)
<b>Minimum Test Speed</b>	0.01 mm/min. (0.0004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	50 kN (11250 lbf)
<b>Maximum Test Speed @rated force capacity</b>	500 mm/min. (19.7 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (19.7 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1200 mm (47.3 in.)
<b>Horizontal Test Space (space between columns)</b>	650 mm (25.6 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	AC Brushless
<b>Drive System Type</b>	Single-phase Sinusoidal
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	2440 X 1133 X 685 mm (96 X 44.6 X 27 in.)
<b>Weight</b>	750 kg (1655 lb)
<b>Power</b>	Max. current 10 Amps 230 Vac 50/60 Hz Single phase

## Specifications for MTS Insight 150

Specifications	MTS Insight 150
<b>Force Capacity</b>	150 kN (33750 lbf)
<b>Minimum Test Speed</b>	0.01 mm/min. (0.0004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	150 kN (33750 lbf)
<b>Maximum Test Speed @rated force capacity</b>	500 mm/min. (19.7 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (19.7 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1200 mm (47.3 in.)
<b>Horizontal Test Space (space between columns)</b>	650 mm (25.6 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	AC Brushless
<b>Drive System Type</b>	3-phase Sinusoidal
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	2440 X 1133 X 685 mm (96 X 44.6 X 27 in.)
<b>Weight</b>	970 kg (2140 lb)
<b>Power</b>	Max. current 18 Amps 400 Vac 50/60 Hz Three phase

**Specifications for MTS Insight 200**

<b>Specifications</b>	<b>MTS Insight 200</b>
<b>Force Capacity</b>	200 kN (45000 lbf)
<b>Minimum Test Speed</b>	0.01 mm/min. (0.0004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	200 kN (45000 lbf)
<b>Maximum Test Speed @rated force capacity</b>	500 mm/min. (19.7 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (19.7 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1200 mm (47.3 in.)
<b>Horizontal Test Space (space between columns)</b>	650 mm (25.6 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	AC Brushless
<b>Drive System Type</b>	3-phase Sinusoidal
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	2440 X 1133 X 685 mm (96 X 44.6 X 27 in.)
<b>Weight</b>	970 kg (2140 lb)
<b>Power</b>	Max. current 20 Amps 400 Vac 50/60 Hz Three phase

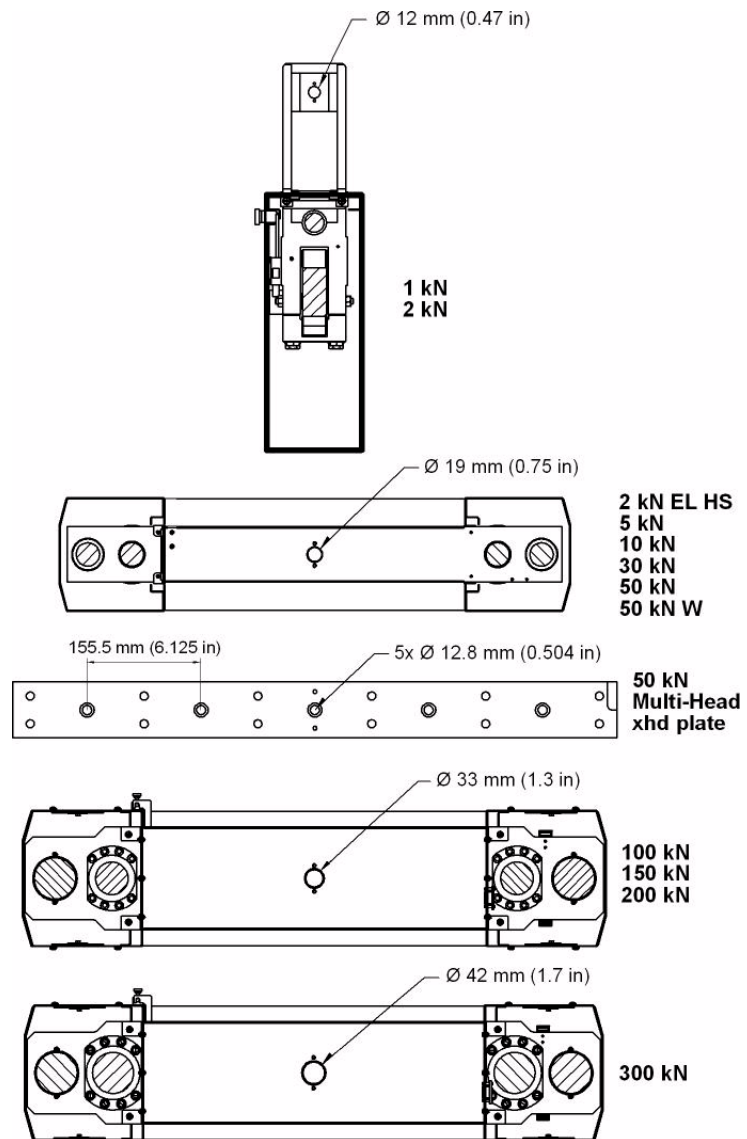


### Specifications for MTS Insight 300

Specifications	MTS Insight 300
<b>Force Capacity</b>	300 kN (67500 lbf)
<b>Minimum Test Speed</b>	0.01 mm/min. (0.0004 in./min.)
<b>Maximum Test Speed</b>	500 mm/min. (19.7 in./min.)
<b>Force Capacity @ max. test speed</b>	300 kN (67500 lbf)
<b>Maximum Test Speed @rated force capacity</b>	500 mm/min. (19.7 in./min.)
<b>Crosshead Return Speed</b>	500 mm/min. (19.7 in./min.)
<b>Vertical Test Space (crosshead travel)</b>	1150 mm (45.3 in.)
<b>Horizontal Test Space (space between columns)</b>	650 mm (25.6 in.)
<b>Position Resolution</b>	0.001 mm (0.00004 in.)
<b>Position Accuracy</b>	0.01 mm (0.0004 in.)
<b>Speed Accuracy % of set speed</b>	±0.05
<b>Motor Type</b>	AC Brushless
<b>Drive System Type</b>	3-phase Sinusoidal
<b>Position Measurement</b>	Optical Encoder
<b>Ball Screw Type</b>	Anti-backlash
<b>Guide Columns</b>	Two
<b>Height/Width/Depth</b>	2440 X 1133 X 685 mm (96 X 44.6 X 27 in.)
<b>Weight</b>	1050 kg (2315 lb)
<b>Power</b>	Max. current 32 Amps 400 Vac 50/60 Hz Three phase

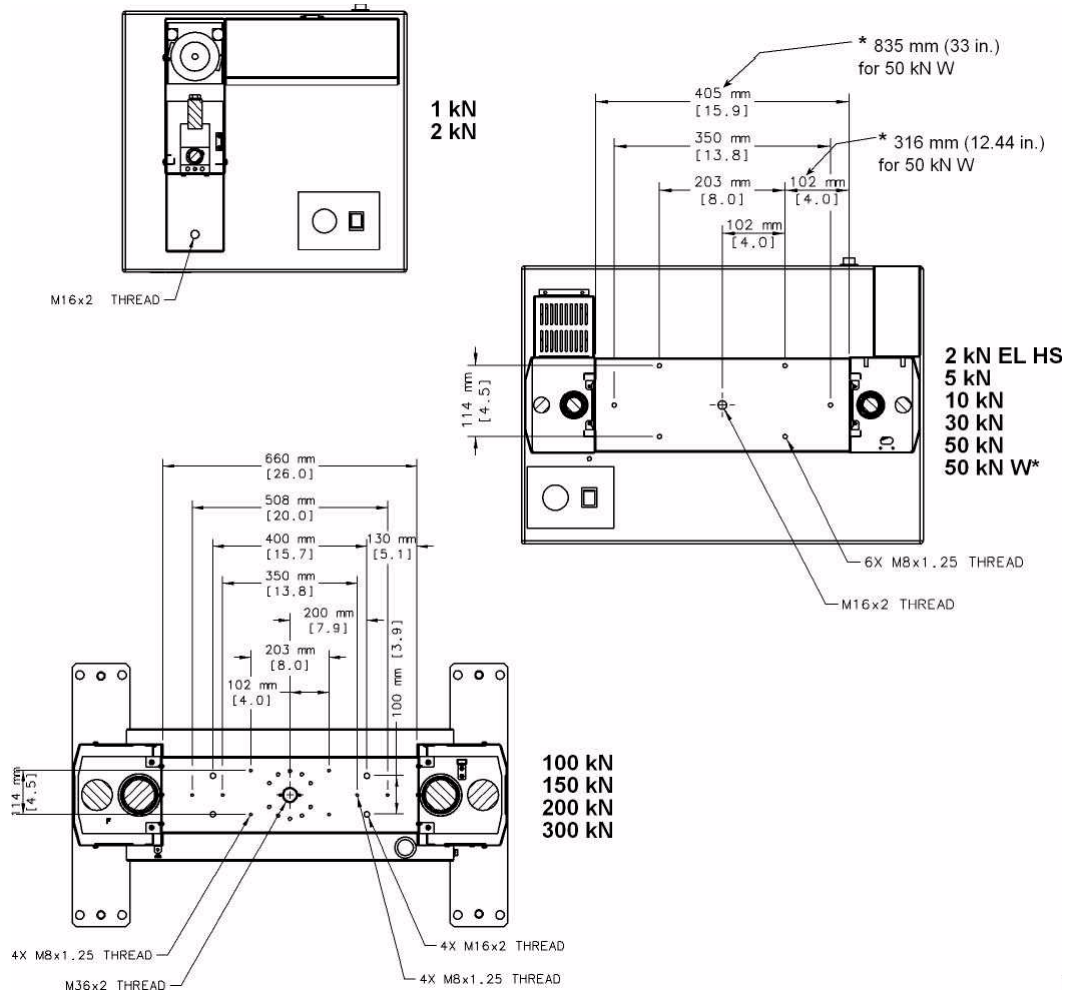
## Crosshead Detail

The crosshead has a single hole drilled through for mounting loadcells, alignment fixtures, grips, etc.



# Baseplate Detail

The baseplate has various patterns of threaded holes for mounting fixtures.





<b>Model</b>	<b>Baseplate Thickness</b>	
	<b>mm</b>	<b>in.</b>
<b>1 kN</b>	19	0.7
<b>2 kN</b>	19	0.7
<b>2 kN EL HS</b>	25	1.0
<b>5 kN</b>	25	1.0
<b>10 kN</b>	25	1.0
<b>30 kN</b>	25	1.0
<b>50 kN</b>	25	1.0
<b>50 kN W</b>	50	2.0
<b>50 kN W Miltihead</b>	50	2.0
<b>100 kN</b>	140	5.5
<b>150 kN</b>	152	6.0
<b>200 kN</b>	152	6.0
<b>300 kN</b>	178	7.0

Specifications

# Installation

---

This section provides guidelines for moving and installing your MTS Insight material testing system.

Unless otherwise specified, it is your responsibility to off-load, unpack, and move the equipment to the final location on your premises. This includes insurance and safety responsibility.

Before moving the machine from the receiving area to its final location, be sure to check the dimensions of all doors and passages through which the machine will travel. Refer to the specification tables in the Introduction section of this manual for dimensions.

<b>Contents</b>	Moving the 1 kN and 2 kN Frames	40
	Moving the 5 kN and Higher Frames	42
	Machine location and ventilation	43
	Controller Connections	44
	Connecting the main power	44
	Installing cables	50

## **WARNING**

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**The MTS Insight frames are heavy.**

**Moving the frame using improper procedures can injure personnel (for example strained muscles and back injuries) or damage the frame.**

When lifting the frame, take the appropriate precautions to prevent injuries to yourself. Moving and positioning the MTS Insight frame must be performed by qualified personnel only.

---

MTS Insight frames weigh from 50 kg (110 lb) to 1050 kg (2315 lb). Other apparatus such as the pallet, packaging, and accessories add to the overall weight. If you have any questions, call MTS.

## Moving the 1 kN and 2 kN Frames

Pallet jacks rated at or above the weight of the machine should be used; refer to the tables in the [Specifications](#) section for frame weights.

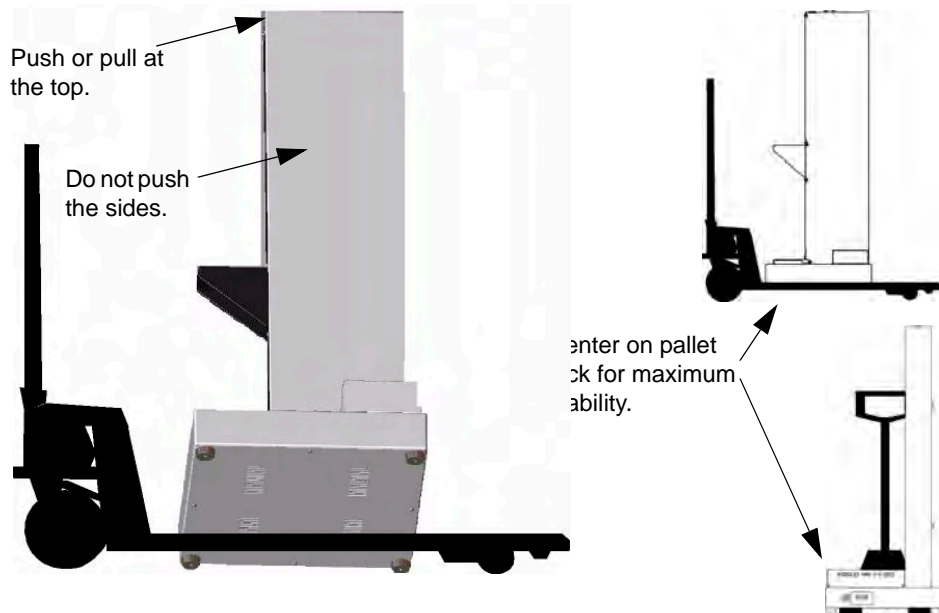
**⚠ CAUTION**

**When tipping the frame, push or pull only at the top. Do not push the frame at the sides.**

Pushing on the side of the frame can damage the sheet metal.

It is recommended that the frame be moved by at least two people: one to tip the frame and one to position the pallet jack. Once the frame is on the pallet jack, one person should operate and move the pallet jack while the other one steadies the frame. It is also recommended to put something on the forks to minimize the chance of damage to the frame; for example, a piece of cardboard or carpet scrap.

Tip the frame by blocking the bottom with your foot to keep it from sliding, then pull the top of the frame towards you to tip it. Do not push on the sheet metal sides. Tip the frame only as far as necessary to gain clearance to position the pallet jack underneath; do not tip more than  $10^\circ$  in any direction.





Once the frame is tipped, push the pallet jack under the frame then return the frame to the upright position resting on top of the pallet jack. Position the frame on the pallet jack such that it is centered and stable.

With one person holding onto the frame and one person operating the pallet jack, move the frame to its final position. Tip the frame as you did when you put it on the pallet jack and pull the pallet jack out from under the frame. Carefully lower the frame back to its normal upright position.



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**The MTS Insight frames are heavy.**

**Moving the frame using improper procedures can injure personnel (for example strained muscles and back injuries) or damage the frame.**

When lifting the frame, take the appropriate precautions to prevent injuries to yourself. Moving and positioning the MTS Insight frame must be performed by qualified personnel only.

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In some cases, the final frame position will be on top of a table. Make sure you have enough help or appropriate lifting devices.

Ensure any table upon which the frame is placed is sturdy, level, and capable of supporting the weight of the machine.

## Moving the 5 kN and Higher Frames

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MTS Insight load frames of 5 kN and higher should only be moved using a forklift rated at or above the weight of the machine; refer to the tables in the [Specifications](#) section for frame weights.

**⚠ CAUTION**

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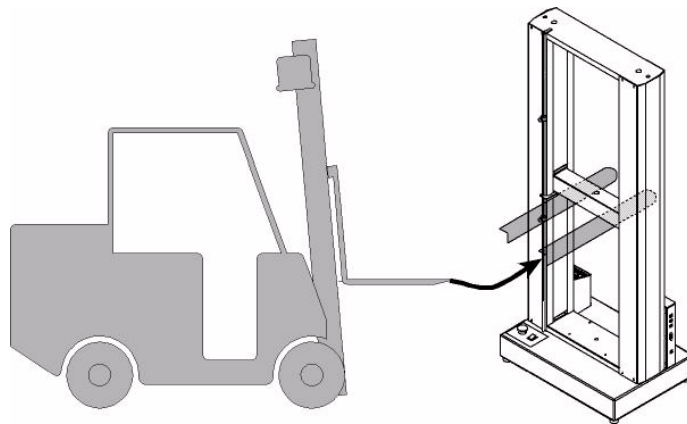
**Improper lifting can damage the frame.**

When lifting and moving the frame, follow these guidelines to minimize the chance of equipment damage:

- Do not lift by the top plate that joins the ends of the ball screws and side covers.
  - Do not lift the machine by the side covers. The weight of the machine will damage the side covers.
  - Do not lift by the ball screws.
- 

On the forklift, adjust the distance between the forks such that they will fit between the columns of the frame. Position the forks on the forklift as shown in the following illustration. Allow enough room between the frame and the forklift to allow a slight tilt once the frame is off the ground. (Weight distribution front to back is not perfectly balanced and the frame will tilt slightly as it is lifted.) It is also recommended to put something on the forks to minimize the chance of damage to the frame; for example, a piece of cardboard or carpet scrap.

Lift the frame only as high as necessary to allow sufficient ground clearance on the way to its final position. Move the frame to its final position and slowly lower onto the ground.



# Machine location and ventilation

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To ensure proper ventilation, locate the load frame approximately 300 mm (12 inches) from adjacent walls and equipment. Allow approximately 1 m (3 feet) behind the equipment for service access. Do not block the vent holes in the bottom of the machine.

For comfortable working conditions and proper equipment operation, heat dissipation of the equipment must be considered in providing adequate heating or air conditioning in the laboratory area. Heat dissipation can be approximated by summing the heat losses going into a room (1 kVA is equivalent to 860 kcal/hr [3,400 Btu/hr]) and the gains from other sources such as furnaces and personnel.

# Controller Connections

## Connecting the main power

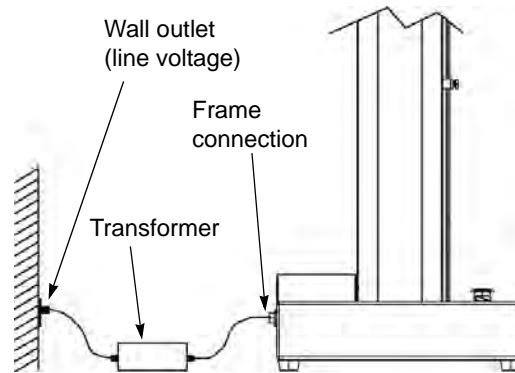
### 1 kN through 50 kN

MTS Insight frames rated 50 kN or less are supplied with a transformer that reduces the voltage for frame operation; see the following illustration.



**Do not connect the frame directly to the main AC line voltage.**

Connecting the frame directly to the main AC line voltage will cause equipment damage.

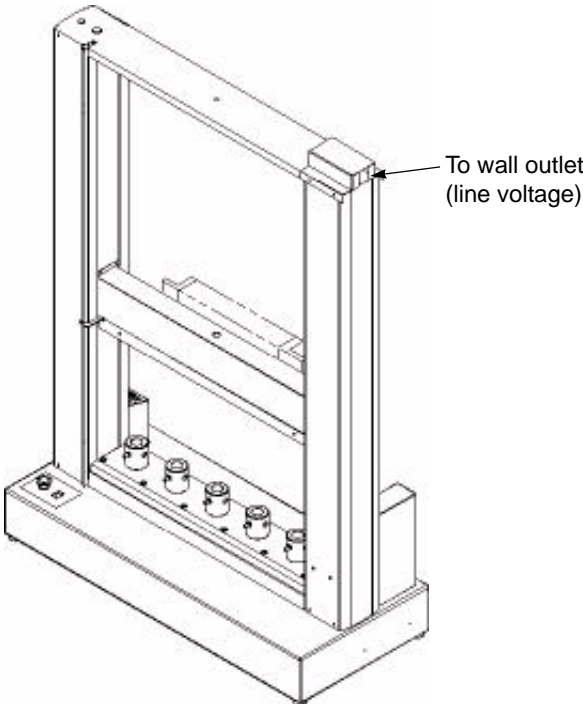


In North America for 220 V operation, the transformer will be equipped with a 3-prong twist-lock plug (NEMA L6-20P). This plug must be used with a matching locking receptacle (NEMA L6-20R) to ensure proper grounding. If you do not have a receptacle of this type available, contact a qualified electrician to make the connection.

In Europe for 220-240 V operation, the unit will be equipped with a plug of type CEE 7/7 (Schuko). If you do not have a mating receptacle available, contact a qualified electrician to make the connection.

Additional power for  
50 kN W Multihead

For 50 kN W Multihead frame, the National Instruments power supply also needs to be connect to main power.



## 100 kN through 300 kN

**Important** *Local electrical codes supersede any information found in this manual.*

Electrical connections must be made by qualified personnel and is their responsibility for using the proper power disconnect along with the correct size and type of wire and conduit that conforms to all their local electrical codes when connecting the machine and transformer to the buildings main power.

### Wire sizes

The minimum wire gauge inside conduit requirements are:

- MTS Insight 100 – 14 AWG
- MTS Insight 150 – 12 AWG
- MTS Insight 200 – 10 AWG
- MTS Insight 300 – 8 AWG

Ground wire needs to be the same gauge wire or larger than those listed above for the associated frame size.

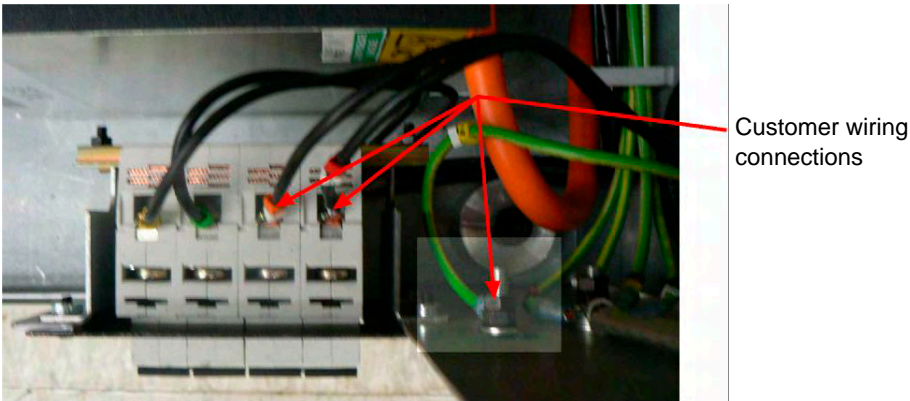
### Electrical Disconnect

The electrical box must have a power disconnect switch that is easy to operate and easy to reach. It must also meet IEC 60947-1 and IEC 60947-3 standards.

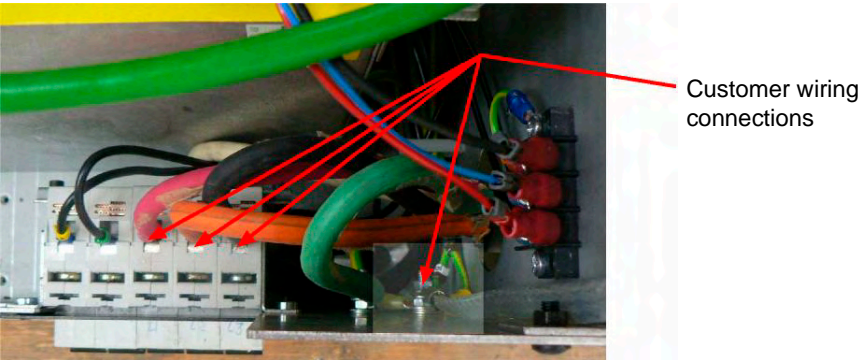
Recommended circuit breakers would be ones that are of the thermal magnetic type with characteristics suitable for large inductive loads (D-type trip characteristic). If fuses are used it is recommended that they are of the time delay type with dual elements. These recommendations should be followed to avoid nuisance tripping.

For the Insight 200 and 300 the electrical box over current device must be Branch circuit rated.

MTS Insight 100      Following shows connections to MTS Insight 100 load frames.



MTS Insight 150, 200  
and 300      Following shows connections to MTS Insight 150, 200, and 300 load frames.



## Transformer Requirements for MTS Insight 150, 200 and 300 Machines

**Important**    *Remember to verify local codes, voltages and frequencies before ordering transformer.*

Following are the minimum requirements for transformers for the MTS Insight 150, 200, and 300 load frames.

- Isolation Type Transformer (Electrical isolation between input and output).
- 3-phase input and output.
- Wye output with neutral connection at 400 VAC.
- Equi-potential between each output phase and earth/ground.
- Ambient operating temperature from 5 deg C to 40 deg C.
- Temperature rise 150 deg C maximum.
- Insulation class 200 deg C minimum.
- Electrostatic Shield.
- UL Listed along with CE and CSA/CUL or equivalent depending country.
- Floor standing.
- NEMA 2 or better enclosure.
- Harmonic Factor can be 0.
- Maximum sound level 45 dB per ANSI Standard C89.2.

### Additional considerations

### Typical Power in Selected Areas

United States - Voltage and Frequency

480 VAC @ 60 Hz

Canada - Voltage and Frequency

600 VAC @ 60 Hz

Europe - Voltage and Frequency

400 VAC @ 50 Hz



**Machine Specific Requirements****Insight 150**

- Nominal output power 12 kVA.
- Nominal output phase current 15 A maximum.
- Peak output phase current 30 A maximum for 1.25 seconds

**Insight 200**

- Nominal output power 16 kVA.
- Nominal output phase current 20 A maximum.
- Peak output phase current 40 A maximum for 1.25 seconds

**Insight 300**

- Nominal output power 24 kVA.
- Nominal output phase current 30 A maximum.
- Peak output phase current 60 A maximum for 1.25 seconds

## Installing cables

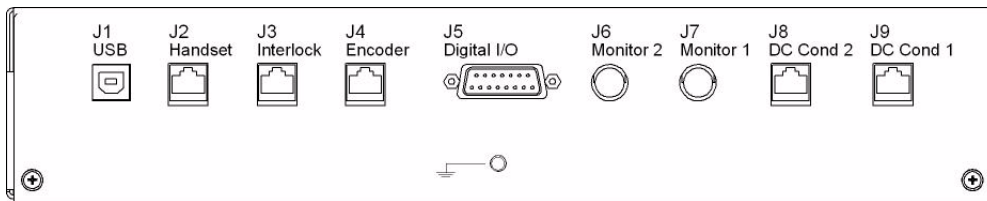
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Exercise care when connecting cables. Ensure that you are using the correct cables and that all connections are secure. When you are finished, double-check to ensure that all components are connected properly.



**Turn the power off before connecting cables.**

Connecting cables with power applied can cause damage to the equipment.



### Controller Connectors

#### **J1 USB**

This is a standard USB 2.0 connector that accepts a USB-B cable connector and connects to the computer. This provides a communications interface between TestWorks on the PC and the controller. This is used to allow TestWorks, or other software, to change settings in the controller. It also allows TestWorks to receive data from the controller.

**J2 Handset**

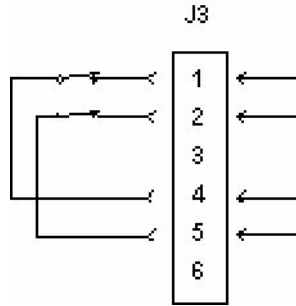
This is intended to interface to the handset. Specifics for this connector are:

- 12 V output power with 200 mA current limit
- RS422 driver (differential)
- RS422 receiver (differential)
- Interlock input. Handset shorts between INTLK+ and INTLK- when it is connected.
- 8-pin RJ-45 connector

Pin	Signal
1	Transmit +
2	Transmit -
3	+12V
4	INTLK+
5	INTLK-
6	Analog GND
7	Receive +
8	Receive -

### J3 Interlock

This is intended to connect to a test area enclosure switch that opens when the door is opened. If not used, a jumper plug (p/n 049-635-901) must be installed. If you are building a cable, maximum length is 30.48 m (100 ft) with 24 gauge wire. Switch should be wired normally closed, such that when the switch opens, an interlock is generated.



### J4 Encoder

This connector is intended for an encoder based extensometer. Specifics for this connector: are

- Power: +5 V +/- 0.25 V at 100 mA max
- Signals: Quadrature A and B with index I
- Logic: Differential receivers (can connect single ended)
- Maximum Rate: 100,000 lines/sec = 400,000 counts/sec

Pin assignment is as follows:

Pin	Signal
1	TEDS data
2	A+
3	A-
4	+5V
5	I+
6	I-
7	Analog GND
8	B+
9	B-
10	TEDS ground

**J5 Digital I/O**

Digital I/O signals include three optically isolated inputs, three optically isolated outputs, and 12V power. Functions of each digital input or output are software selectable. A typical example might be connecting an external switch; see “Additional Digital I/O Information” on page 73. Pin assignment is as follows:

Pin	Signal
1	In 1+
2	In 2+
3	In 3+
4	Out 1+
5	Out 2+
6	Out 3+
7	No Contact
8	+12V
9	In 1-
10	In 2-
11	In 3-
12	Out 1-
13	Out 2-
14	Out 3-
15	Analog GND

### J6 and J7 Monitor

Two Monitor connectors are provided. There are several possible uses for analog monitor outputs: external data acquisition, tuning, troubleshooting, etc. For tuning, it is desirable to monitor command and feedback, or command and error, simultaneously while changing the controller parameters. Therefore, two monitor outputs are provided. Specifics for these connectors are:

- Analog +/-10.5 V
- Calibrated to +/-10 V
- 16-bit resolution minimum
- BNC connectors

**Note** *The load cell is mounted to the crosshead and its wiring is internal to the frame, thus its connector is not on the rear panel.*

### J8 and J9 DC Conditioner

Two DC Conditioner connectors are provided. The two application specific transducers might be biaxial strain gage base extensometers. With external completion resistors, the DC conditioners could be used with quarter bridge strain gages. Pin assignment is as follows:

Pin	Signal
1	TEDS data
2	EX+
3	EX-
4	FB-
5	RCAL1 (FBR+)
6	RCAL2 (FBR-)
7	FB+
8	EXS-
9	EXS+
10	TEDS ground

**Crosshead load cell connector**



Load cell connector (shown on an Insight 50)

A connector (D-15) for the load cell is provided under the crosshead on one of the columns. Pin assignment is as follows:

Pin	Signal
1	EX+
2	EX-
3	No Contact
4	FB+
5	FB-
6	No Contact
7	SHIELD
8	TEDS+
9	No Contact
10	EXS+
11	No Contact
12	RCAL1 (FBR+)
13	RCAL2 (FBR-)
14	TEDS-
15	EXS-

Controller Connections



# Operation

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This section describes the actions performed during normal, day-to-day operation of the MTS Insight frame. For information on using the MTS Insight frame in actual testing, refer to the TestWorks software manual.

<b>Contents</b>	<a href="#">Hazard Icons</a> 58
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	<a href="#">Travel Limit Switches (Physical Limits)</a> 60
	<a href="#">Crush Zone Hazards</a> 62
	<a href="#">Fixture Mounting</a> 63
	<a href="#">Load Cell Mounting</a> 64
	<a href="#">Handset Control</a> 68

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 **CAUTION**

**Do not operate the MTS Insight test frame without the side covers and bellows in place.**

Operating the machine without side covers or bellows in place can expose the operator to moving parts that could cause injury if contact is made.

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 **CAUTION**

**Keep the area clean.**

Sample debris can enter the side covers and puncture bellows causing erratic machine operation.

Damaged bellows should be replaced before operating the MTS Insight Test Frame.

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Users should be aware of the potential of material fragments puncturing the bellows and damaging the ball screw; user needs to be aware of the material properties and the hazards generated by the materials during testing. Refer to [“General cleaning”](#) on page 71.

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 **CAUTION**

**Keep the testing area secure.**

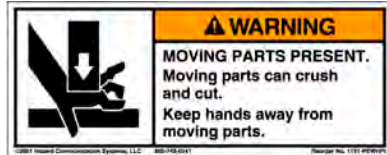
Only qualified, trained personnel should be allowed to operate the machine. Keep bystanders away during machine operation.

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# Hazard Icons

The following hazard icons are located on the MTS Insight Test Frame. Additional icons can also be attached to the frame that are explained in the Safety manual (MTS part number 100003805); refer to the Safety Manual for additional information.

## Moving parts present



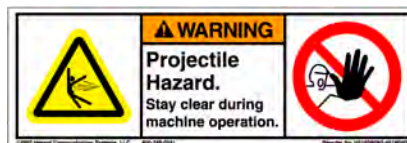
## Flying objects




## Read and understand manuals



## Projectile hazard



## WEEE

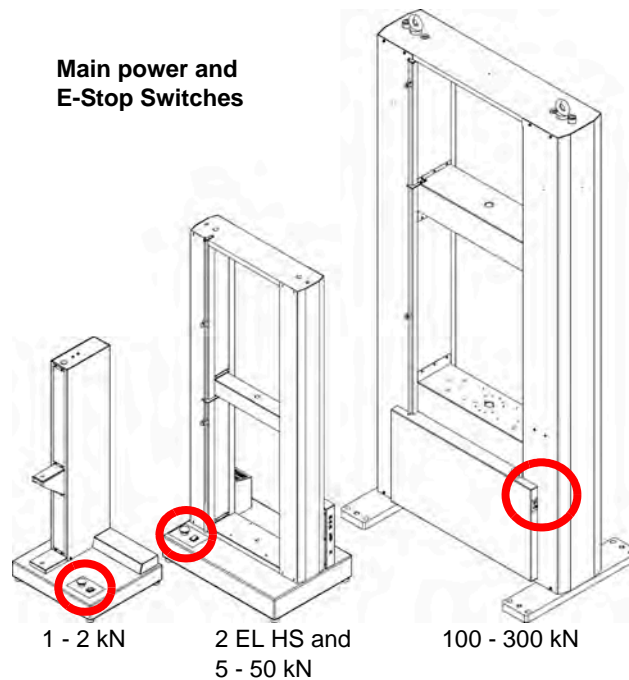
The Waste Electrical and Electronic Equipment (WEEE) symbol (  ) means that the controller and its electronic parts must not be disposed of as unsorted municipal waste. Proper disposal is required by approved electronic waste collection agencies. Customers in the EC region who desire to return an end-of-life controller and its electronic parts are encouraged to contact your local MTS Systems Sales/Service Offices for instructions.

# Main Power Switch (I/O) and E-Stop

The main power switch for the machine is on the base of the frame.

The frame is also equipped with an **Emergency Stop** button. The **Emergency Stop** will cut the power to the motor and should be used for emergency purposes only.

To shut down the motor power and stop the test program, press the **Emergency Stop** button. Twist the switch clockwise to release it. Use the **Emergency Stop** button to shut down your test if something unexpected should happen.



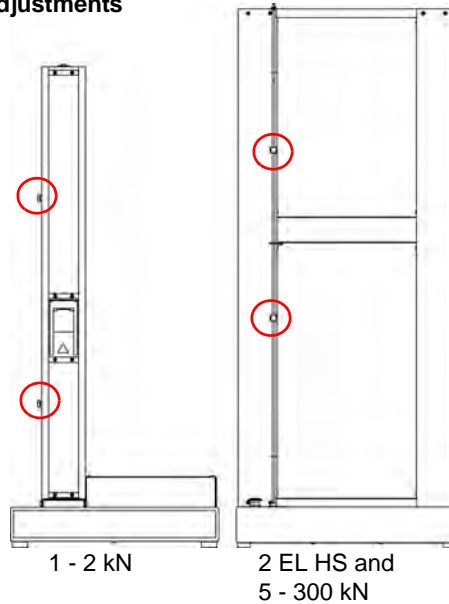
# Travel Limit Switches (Physical Limits)

The limit switches are located on the crosshead. They are normally closed and are activated when the limit switch contacts the adjustable limit rod. The adjustable limit rod can be positioned anywhere along the range of travel to prevent the crosshead from traveling beyond that point.

**Note** Always adjust the limits whenever you change grips or fixtures.

Adjustment of the limit switches are similar for both types of machine. The limit switches are held in position by a locking screw. To set the limit switch, unlock by turning the locking screw in an counterclockwise direction and slide to the required new position. Before locking, allow for the limit switch striker being in the middle of the crosshead for the single screw machine and at the bottom of the crosshead for the twin screw machines. To lock limit switch, rotate locking screw in a clockwise direction. To eliminate slippage tighten locking screw securely.

## Limit Switch Adjustments



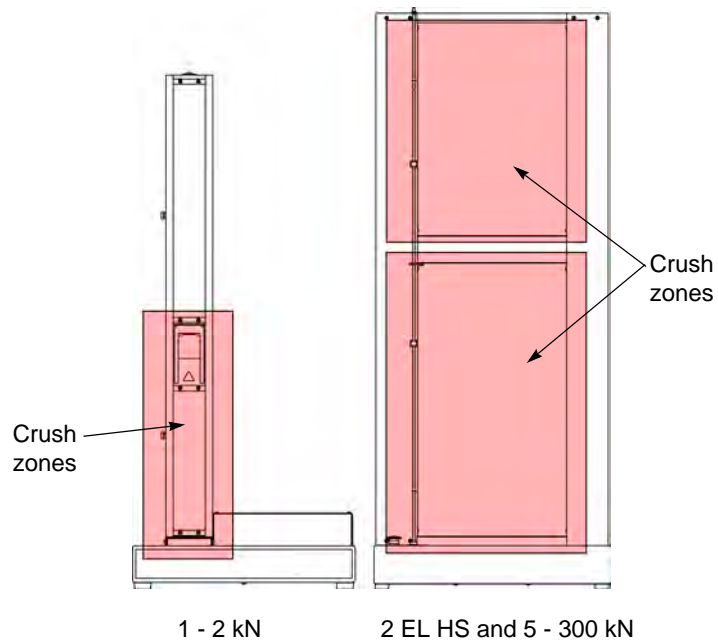
When a physical limit is reached there are three ways to get the crosshead moving again:

- First press Motor Reset in TestWorks 4. Then use the crosshead capabilities of your software (virtual handset). Move the crosshead away from the limit until the switch closes and the crosshead can move in both directions again. See the TestWorks software manual for further details.
- Manually move the adjustable limit along the range of travel away from the crosshead until the limit switch is no longer active. Then press Motor Amp Reset in TestWorks 4 or Handset Enable on the handset.
- If TestWorks 4 is not active, press Handset Enable on the handset. Then use the manual handset control to move the crosshead until the limit switch is no longer active.

# Crush Zone Hazards

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It is important to stay clear of any potential crush zones when the system is operating. Know where the crush zones are in your system and protect yourself and others from those crush zones with appropriate safety devices. The following paragraphs describe crush zones and precautions to take while working around crush zones.



## Locations

A crush zone exists between the platen and crosshead on load units where the crosshead and specimen move (both areas are shown).

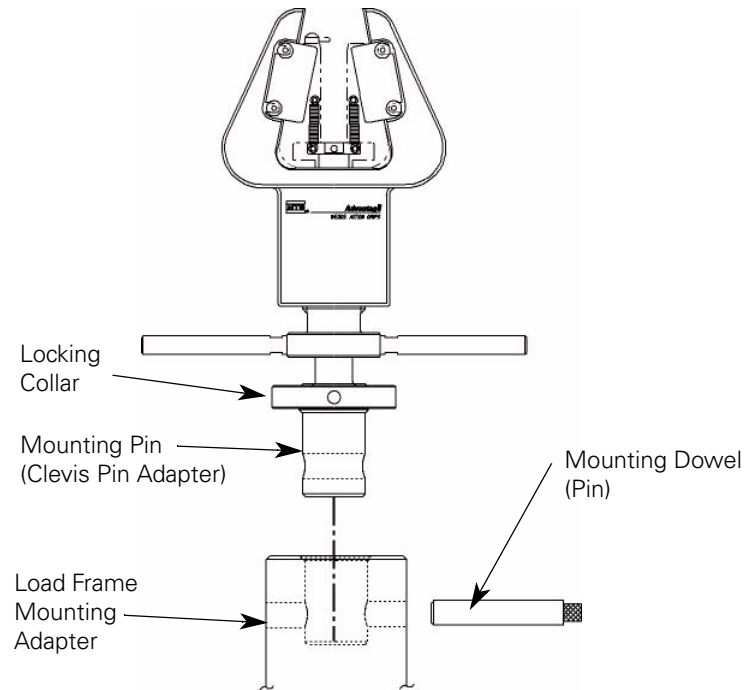
## Precautions

Keep clear of any mechanical linkage that moves within a closed area. If the linkage should move (when the system starts or due to mechanical failure), very high forces can be present that could pinch, cut, or crush anything in the path of linkage movement.

Never allow any part of your body to enter the path of machine movement or to touch moving machinery, linkages, hoses, cables, specimens, etc. These present serious crush points or pinch points.

# Fixture Mounting

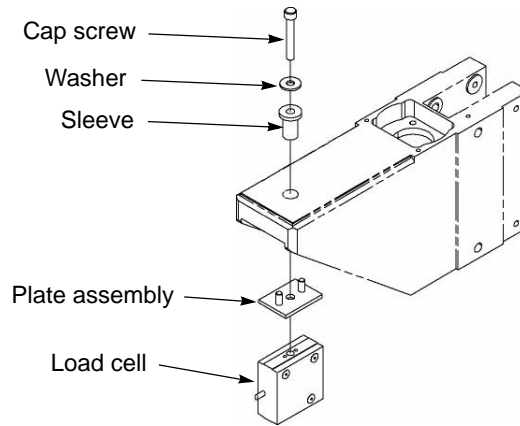
MTS offers a wide variety of fixtures. Mounting these fixtures typically involves installing the fixture or load cell onto a mounting (clevis pin) adapter and securing it with a mounting dowel (pin). To further secure a fixture, some configurations also include locking collars. A typical mounting configuration is shown in the following illustration.



# Load Cell Mounting

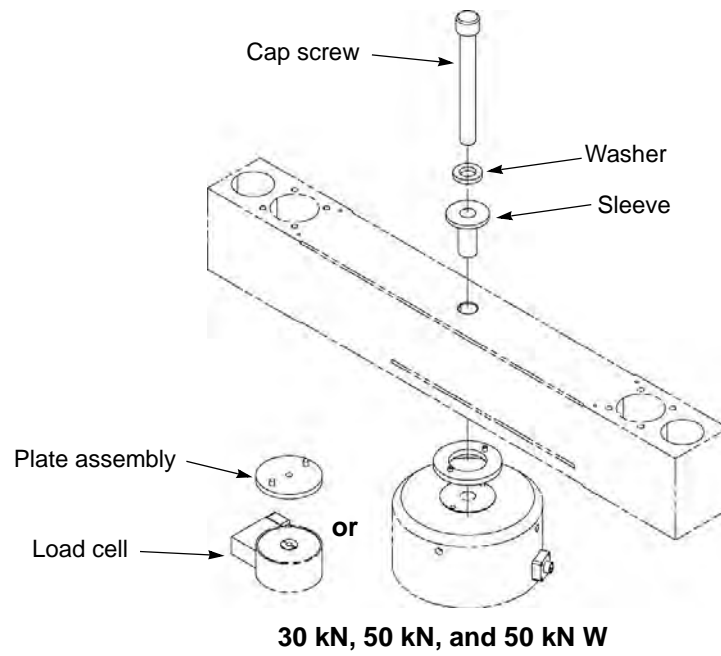
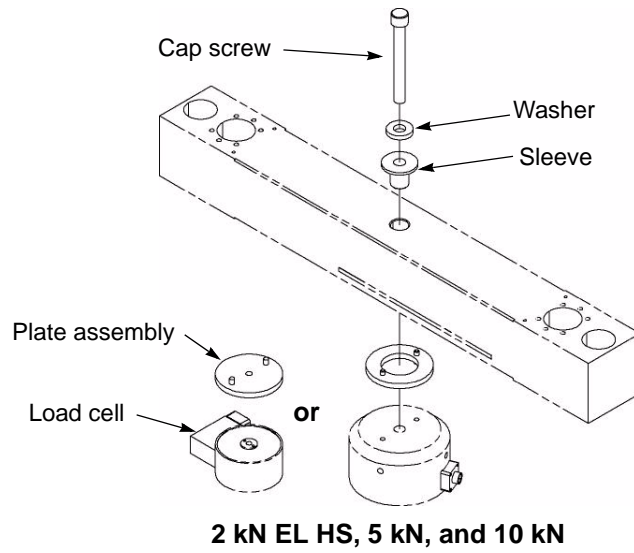
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Mounting load cells typically involves securing the load cell to the frame via a threaded bolt along with associated hardware (in most cases a flat washer, adapter sleeve, and plate assembly). The following illustrations show the standard mounting configurations. Following the illustrations is a table that provides frame size, bolt thread size, and recommended torque value.

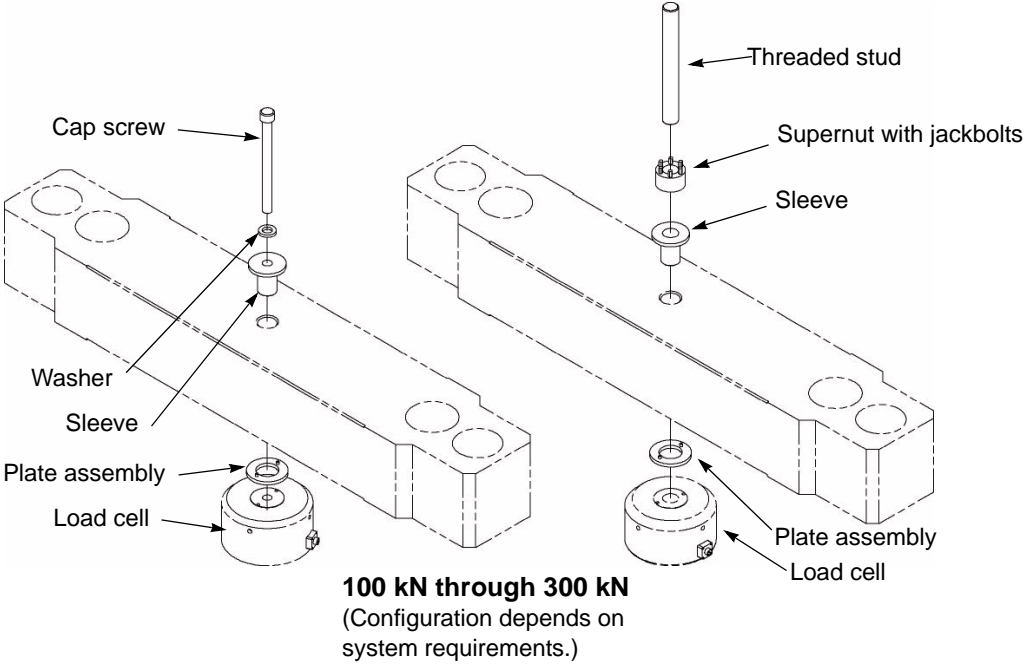
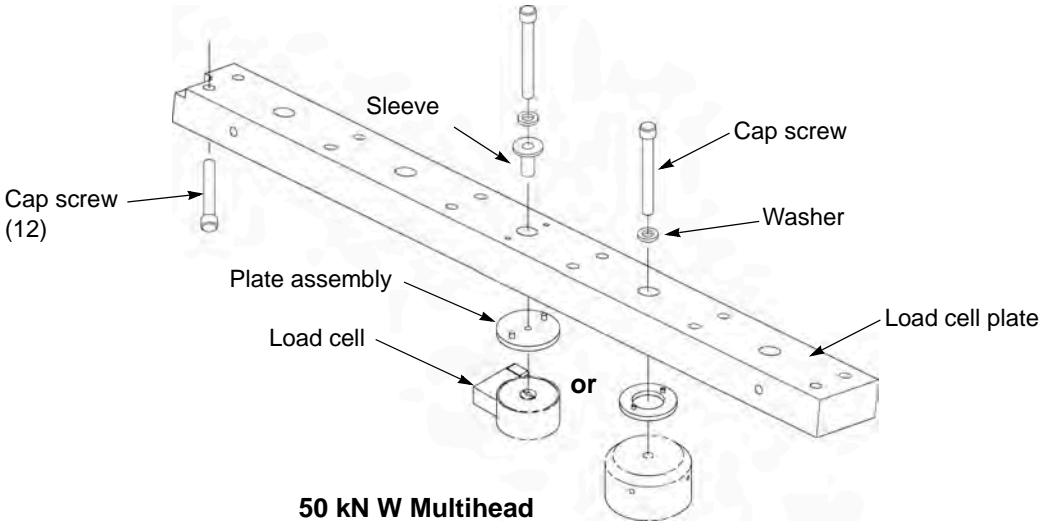


**1 kN and 2 kN**





Load Cell Mounting



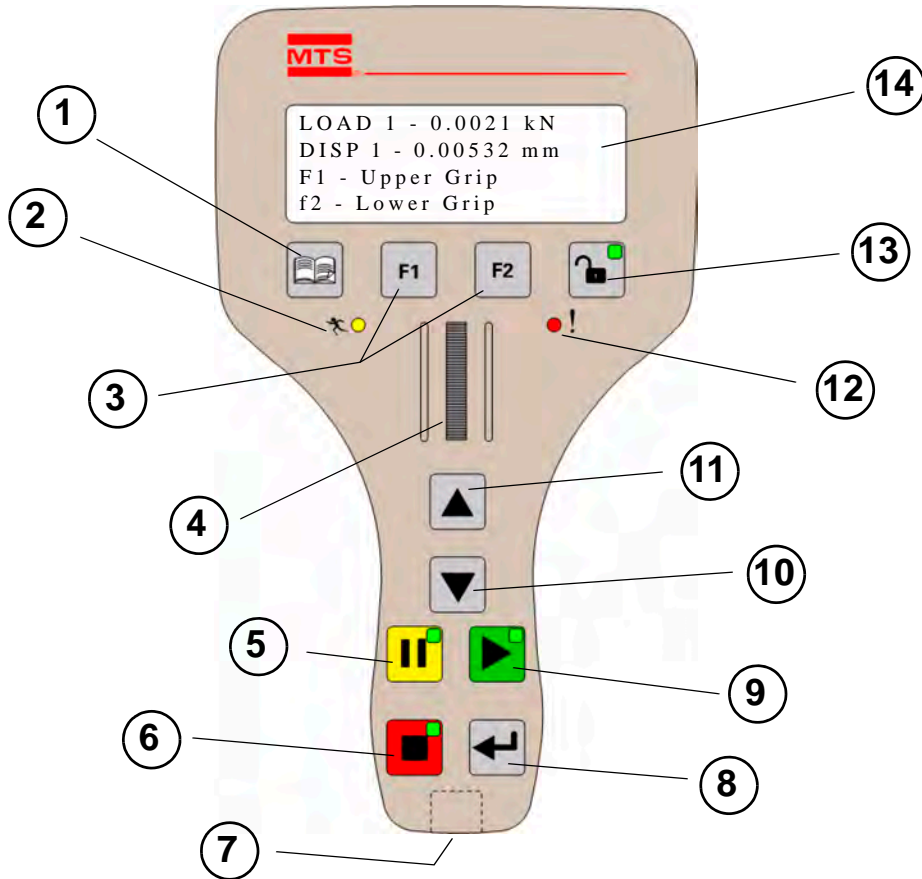
### Load Cell Bolt Torque Specifications

Load Frame Size	Bolt Thread	Lube and Torque to:	Wrench
1 kN and 2 kN	M6 x 1 mm	4 N•m (3 lbf-ft)	M5 hex key (MTS p/n 100-146-009)
2 kN EL HS, 5 kN, and 10 kN	M6 x 1 mm	4 N•m (3 lbf-ft)	M5 hex key (MTS p/n 100-146-009)
2 kN EL HS, 5 kN, and 10 kN	M12 x 1.25 mm	26 N•m (19 lbf-ft)	M10 hex key (MTS p/n 100-146-010)
30 kN, 50 Kn, 50 kN W, and Multihead	M6 x 1 mm	4 N•m (3 lbf-ft)	M5 hex key (MTS p/n 100-146-009)
30 kN, 50 Kn, 50 kN W, and Multihead	M12 x 1.25 mm	102 N•m (75 lbf-ft)	M10 hex key (MTS p/n 100-146-010)
30 kN, 50 Kn, and 50 kN W	M16 x 1.5 mm	179 N•m (132 lbf-ft)	M14 hex key (MTS p/n 100-146-011)
100 kN, 150 kN and 200 kN	M12 x 1.25 mm	102 N•m (75 lbf-ft)	M10 hex key (MTS p/n 100-146-010)
100 kN, 150 kN and 200 kN	M16 x 1.5 mm	244 N•m (180 lbf-ft)	M14 hex key (MTS p/n 100-146-011)
100 kN, 150 kN and 200 kN	M27 x 2 mm	37 N•m (27 lbf-ft)*	6 mm wrench (MTS p/n 100-092-174)
300 kN	M16 x 1.5 mm	244 N•m (180 lbf-ft)	M14 hex key (MTS p/n 100-146-011)
300 kN	M27 x 2 mm	37 N•m (27 lbf-ft)*	6 mm wrench (MTS p/n 100-092-174)
300 kN	M36 x 2 mm	72 N•m (53 lbf-ft)*	8 mm wrench (MTS p/n 100-092-149)

\* Torque superbolt jackbolts to torque specified in the table in a crisscross pattern. Bring jackbolts to 33% of full torque, then bring to 66% of full torque, then to 100% full torque.

# Handset Control

The handset has an encoder and buttons to help you during specimen installation and test execution. The handset also has an alphanumeric display and LEDs to provide feedback.



**Handset functions**

The handset is intended to be used in a system for specimen loading or setup. In some applications, it can be used to completely run a test.

**Handset Controls and Indicators**

#	Control/Indicator	Description
1	<b>Page</b>	Displays the next four lines of text in the display.
2	<b>Active</b>	Indicator. When lit, indicates the system is active (power applied).
3	<b>F1 and F2</b>	Programmable functions that are set up in the software as digital inputs. This allows you to define the test function (that is, start test, pause, hold position, and so forth).
4	<b>Thumb-wheel</b>	Makes fine crosshead adjustment (towards display – up; away from display – down). <i>Only if Handset Enable is active.</i>
5	<b>Pause</b>	Pauses the test action. This must be pressed again for the test to resume. <i>Only if TestWorks 4 software is active.</i>
6	<b>Stop</b>	Stops the test action. <i>Only if TestWorks 4 software is active.</i>
7	<b>Connector</b>	RJ-45, to Controller.
8	<b>Crosshead Return</b>	Returns the crosshead to the original position (zero point).
9	<b>Start</b>	Starts the test action. <i>Only if TestWorks 4 software is active.</i>
10	<b>Crosshead Down</b>	Moves the crosshead in the downward direction while depressed. <i>Only if Handset Enable is active.</i>
11	<b>Crosshead Up</b>	Moves the crosshead in the upward direction while depressed. <i>Only if Handset Enable is active.</i>
12	<b>Fault</b>	Indicator. When lit, indicates and active fault or interlock.
13	<b>Handset enable</b>	Used to enable/disable the handset. When the indicator is lit, the handset is enabled for control of the crosshead.
14	<b>Display</b>	Four lines, 20 characters per line.

Handset Control

# Maintenance

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There are no customer serviceable components on the MTS Insight frames. Maintenance consists of keeping the frame and work area clean, checking interlocks, and scheduled frame calibration.

## WARNING

**Disconnect the power cord from the wall outlet before cleaning or inspecting any part of the test frame.**

Inadvertent electrical component contamination with detergents or cleaning fluids can cause circuits to short resulting in equipment damage. Be careful not to spill and cleaning liquid on the frame.

On MTS Insight 100, 150, 200, and 300 load frames, make sure the wall main disconnect is off.

## CAUTION

**Observe all manufacturers recommendations and cautions when using any cleaning solution.**

To avoid hazardous conditions, always follow the manufacturers recommendations and cautions.

## General cleaning

Clean your machine as often as needed. Use a damp, lint-free rag to clean the side covers, base, and crosshead. If necessary, mild detergent or cleaning fluid can be used.

## Monthly maintenance

Verify that the **Emergency Stop** button is functioning properly.

Test the limit switches by manually moving the adjustable limits—a limit switch fault should be indicated on the computer screen.

Verify any additional interlocks are functioning properly. For example the interlock switch on the door of a test area enclosure.

**Semiannual maintenance**

Verify speed and position accuracy of the frame. This requires standards and other equipment typically not available for routine maintenance. Contact your MTS Field Service Engineer for assistance.

**Other service**

Regular inspection and service of the drive motor system and crosshead positioning components are needed to prolong the life of your frame and keep it performing optimally. This type of service is typically preformed by MTS Field Service Engineers. Contact MTS for additional information.

**Note** *MTS offers annual maintenance and calibration plans. It is strongly recommended that you enroll in one of these plans. Contact your sales engineer for more information.*

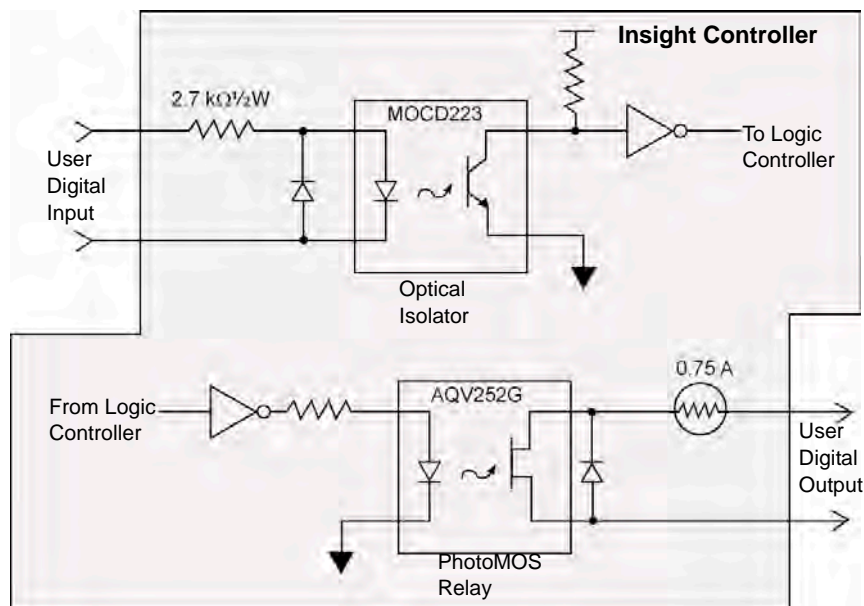


# Appendix

## Additional Digital I/O Information

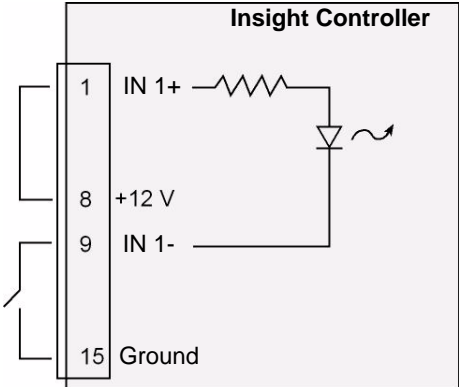
The digital inputs have an MOCD223 optical isolator with 2.7 Kohm, ½ Watt series resistor. To reliably turn on they need 1 mA of current. This means the minimum input high voltage is 4.0 Vdc. The maximum input voltage is 28.0 Vdc. The device should be off for input voltages less than 1.0 V.

The digital outputs are implemented by an AQV252G PhotoMOS relay with a 0.75 Amp poly fuse in series. Although the device is rated at 60 V peak but it is recommended that a maximum of 48 V be applied. If the load is highly inductive, such as a relay coil, an appropriate snubber network should be used near the coil terminals to prevent large flyback voltages from exceeding the device ratings.



Additional Digital I/O Information

A typical example might be connecting an external switch.







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