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FPT-H1 Horizontal Friction, Peel, and Tear Tester

Installation, Assembly, and Operating Manual



Mecmesin
FORCE & TORQUE TEST SOLUTIONS
www.mecmesin.com

431-449-01

February 2015

This manual

This document illustrates the use of the Mecmesin FPT-H1 horizontal coefficient of friction tester. Please refer also to 431-398 *A Guide to Safe Use of Mecmesin Mains Powered Test Systems*.

For more information on running programs in Console mode, please refer to Manual 431-389, *Emperor™ Programming for Mecmesin-xt Force and Torque Test Systems*.

For writing, editing and running programs for the FPT-H1-i, please refer to Manual 431-382, *Emperor™ Force and Torque Testing Software: Operator Manual*.

Warranty

The *-xt* console is pre-configured at Mecmesin. Any unauthorised changes to the console configuration and set-up will invalidate the warranty.

The 24-month end-user warranty for the console itself is with a third party. Please contact your local Mecmesin agent for assistance with this warranty.

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Part no. 431-449-01

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1. Parts Supplied With Your Tester

See also Section 4: *Identification of Parts*

1. FPT-H1 tester
2. Mains cable for the tester
3. FPT loadcell
4. 6 mm, 5 mm, 4 mm Allen keys and Torx key, for assembly
5. Sample sled(s) as specified for required test standard(s)
6. Plane sample spring clamp
7. 10-32 UNF-fitting draw hook for loadcell
8. Rigid and elastic sled-crosshead links
9. Manual: *A Guide to Safe Use of Mecmesin Mains-powered Test Stands*
10. Programming Manual for operating the Emperor™ software

Additional items with FPT-H1-xt

11. Touch screen PC console with mounting bracket, preloaded with Emperor™ software
12. USB-serial data cable and power supply for the console

Additional items with FPT-H1-i

11. PC data cable
12. Emperor CD-ROM

Optional: loadcell accuracy checking kits

Comprising a pulley bracket, mass hanger and line. This kit combines with a calibrated mass kit appropriate to the loadcell to be checked.

Optional: BS ISO 15359 coefficient of friction test fixture

Motorised lift with set-down and guide rails, with 3 mm Allen key to attach rails.

Optional: Barcode reader and menu card

With this option, users can scan codes to enter standard text information more easily, reliably and quickly, for example, notes and batch reference data.

Optional: Fixtures for peel testing and tear testing

The FPT-H1 is suitable for certain peel testing standard methods. Fixtures for 90°, 180° and T-peel are available. It is suitable for single-rip (trouser) tear testing standard methods. Fixtures for this are also available.

2. Suggested Test Standard Methods

2.1 Suggested coefficient of friction test standards

| | |
|----------------|--|
| BS EN ISO 8295 | Plastics. Film and sheeting. Determination of the coefficients of friction |
| ASTM D1894 | Standard Test Method for Static and Kinetic Coefficients of Friction of Plastic Film and Sheeting |
| BS ISO 15359 | Paper and board – Determination of the static and kinetic coefficients of friction – Horizontal plane method |
| TAPPI T 549 | Coefficients of static and kinetic friction of uncoated writing and printing paper by use of the horizontal plane method |

2.2 Suggested peel test standards

| | |
|-------------|---|
| AFERA 5001 | Self Adhesive Tapes – Measurement of Peel Adhesion from Stainless Steel or from its own Backing |
| ASTM D3330 | Standard Test Method for Peel Adhesion of Pressure-Sensitive Tape |
| ASTM F88 | Standard Test Method for Seal Strength of Flexible Barrier Materials |
| ISO 8510-2 | Adhesives – Peel Test for a Flexible-bonded-to-rigid Test Specimen Assembly – Part 2: 180 degree peel |
| FINAT FTM-1 | 180° peel adhesion at 300 mm per minute (from application substrate) |
| FINAT FTM-2 | 90° peel adhesion at 300 mm per minute (from application substrate) |
| FINAT FTM-3 | 180° peel adhesion at 300 mm per minute (from backing) |

2.3 Suggested tear test standards

| | |
|---------------|---|
| ASTM D1938-08 | Standard Test Method for Tear-Propagation Resistance (Trouser Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method |
| ISO 6383-1 | Plastics – Film and Sheeting – Determination of Tear Resistance – Part 1: Trouser Tear Method |

3. Installation

3.1 Unpacking the tester

When you first receive your FPT-H1 please check that there is no obvious damage to the packaging. If there is any sign that the packaging or the test stand itself has been damaged, please contact Mecmesin or your authorised distributor immediately. Do not use the stand until you have confirmation that it is safe to use.

We strongly recommend that the packaging is kept, as this can be useful if the machine needs to be returned for any reason.

Section 1 lists items that should be included with your test stand. Please contact Mecmesin or your authorised distributor if any items are missing or damaged.

3.2 Lifting the tester

The unpackaged weight of the tester is given in the Specification table at the back of this manual. The tester should be lifted by two people.

3.3 Locating the tester

The tester should be positioned on a level, stable work surface, and levelled by using the adjustable feet as necessary.

3.4 Mains power supply

The FPT-H1 tester can be used on 110–120 or 220–240 V ac 50-60 Hz supplies. The rear fuse carrier will be set for your local requirement, but is reversible, so should you replace a fuse, the correct local voltage must read in an upright position (carrier and holder arrows align):

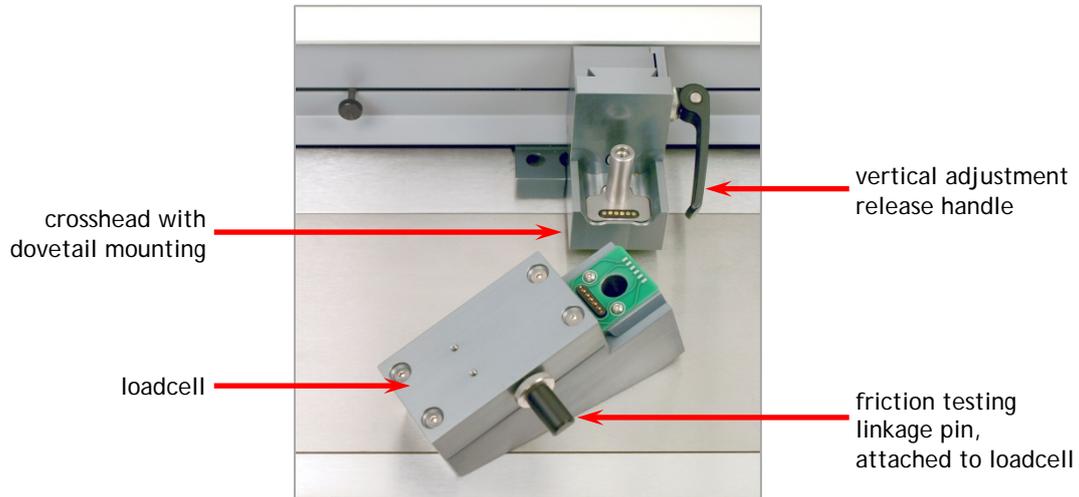


Fuse carrier

Carrier removal

4. Identification of Parts

4.1 Crosshead and loadcell

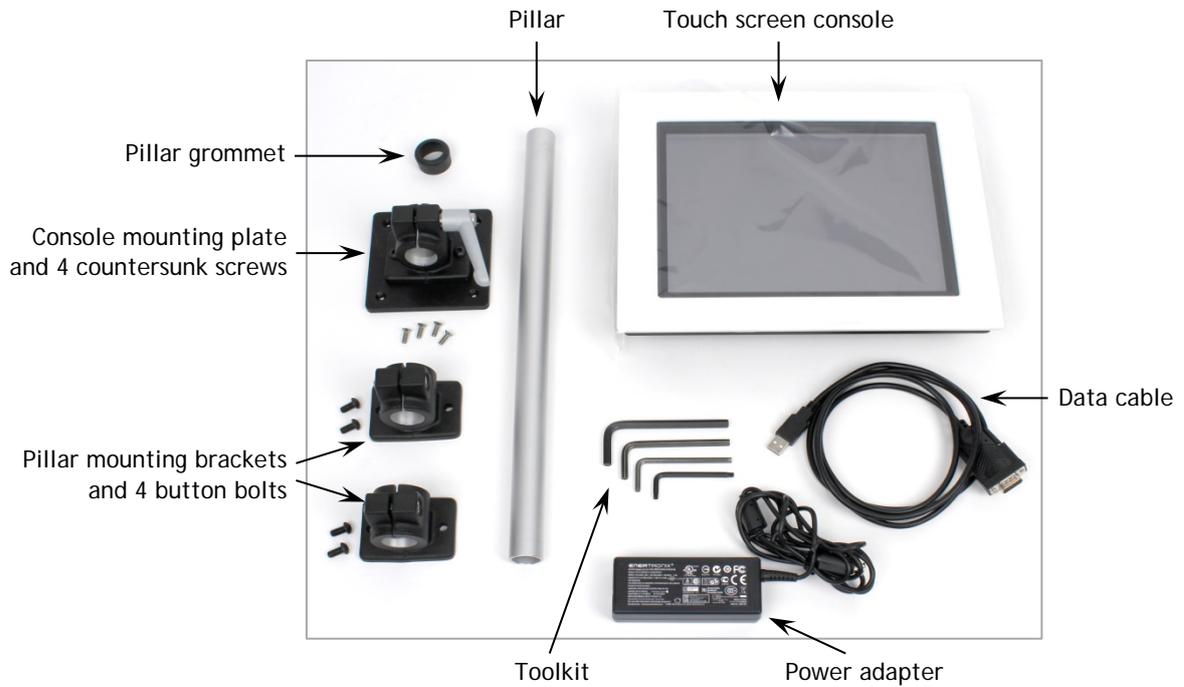


4.2 Rear panel connections



5. Assembly and Connection

5.1 Mounting the console (FPT-H1-xt)



5.1.1 Bracket assembly

Attach the pillar brackets to the FPT-H1 back panel, using the 4 mm Allen key and four button bolts, but do not tighten:



Insert the pillar into the brackets and tighten the brackets very firmly onto the pillar, using the 6 mm Allen key, and then tighten the brackets to the FPT-H1 using the 4 mm Allen key:



At this stage you can pass the USB end of the data cable up through the pillar, to save a trailing cable (see right, below).

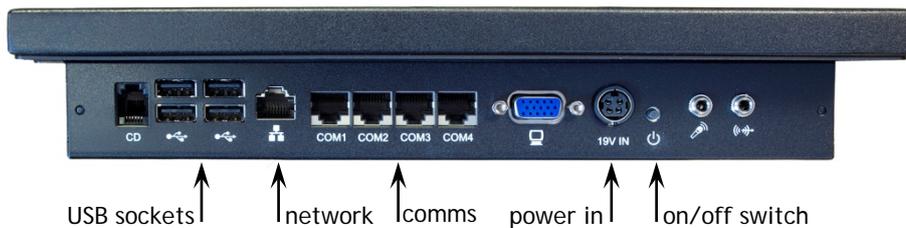
Secure the mounting plate to the back of the console using the four countersunk screws, using the Torx key, mount the bracket onto the pillar, and secure it using the grey handle:



Push the button on the grey handle to lift and turn it as required, and to leave it tidily.

5.1.2 Connecting the console

Data and power connections are on the underside of the console:



Pass the pillar grommet over the USB cable and push it onto the top of the pillar. Insert the USB plug into one of the available sockets on the underside of the console (circled):



The console is powered from a separate adapter plugged into a mains socket.

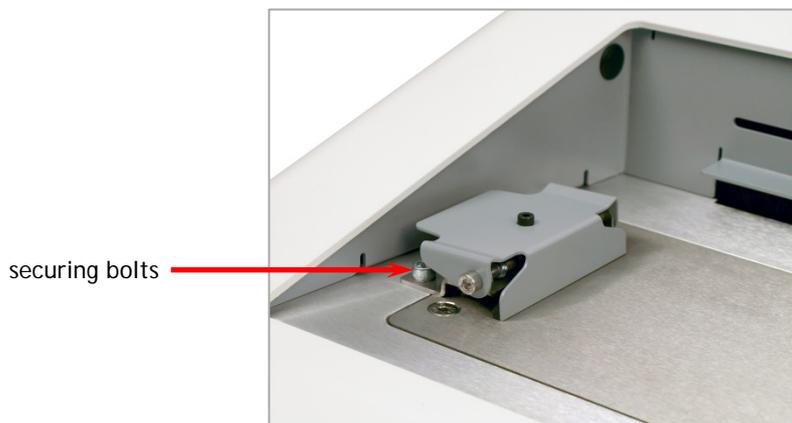
Caution: use only the mains adaptor supplied by Mecmesin, do not use any other type.

Ensure that the power lead and USB lead are firmly fitted to the console. Plug the power adaptor into a suitable mains supply socket. Plug the other end of the USB cable into the 9-way socket labelled 'PC-RS232' on the rear left of the FPT-H1. Normally it will not be necessary to remove the USB cable, but should this be required, return the Emperor software to the front screen display before disconnecting the data cable.

Connect printers or other device using the spare USB sockets.

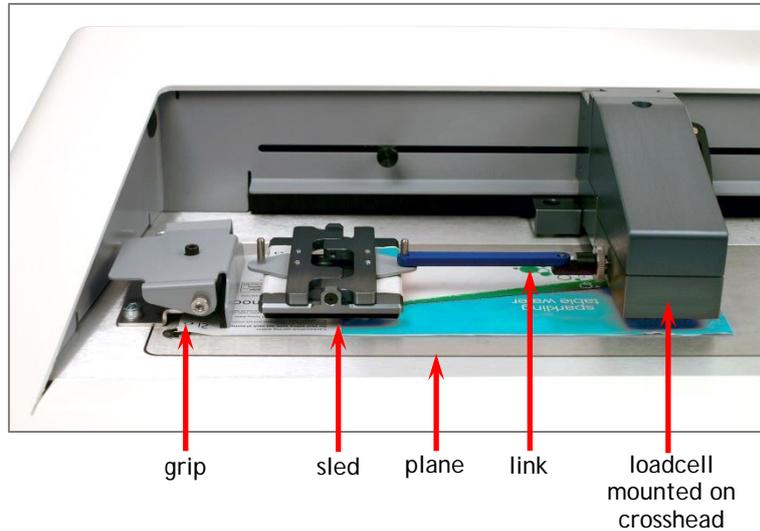
5.2 Coefficient of friction grips and fixtures

Samples for coefficient of friction testing on the plane bed are secured under the neoprene-edged spring clamp at the left-hand side. Advice on securing the sample free end and sides, to provide a completely flat sample, is given under each of the coefficient of friction test standards described in this manual.



The clamp is secured by means of two cap-head bolts (arrowed). Use a 5 mm Allen key to release the grip mount and secure alternative fixtures for peel or tear testing.

The moving part of the tester is the sled, which is attached to the loadcell on the crosshead by a link (rigid link shown):



5.3 Coefficient of friction sleds

There are three sleds available for the FPT-H1, designed to comply with the testing standards in dimension, weight and sample facing. Be sure to select the correct sled:

| Sled | Used for | | Weight | Face dimensions | Facing material |
|------|------------------------------|-------------------------------------|--------|-------------------|------------------|
| A | BS EN ISO 8295 ASTM D1894 | plastics, film and sheeting | 200 g | 63.5 mm × 63.5 mm | compressive foam |
| B | TAPPI T 549 | uncoated writing and printing paper | 200 g | 63.5 mm × 63.5 mm | neoprene |
| C | BS ISO 15359 | paper and board | 800 g | 65 mm × 65 mm | neoprene |

5.4 Sled links for coefficient of friction testing

65 mm rigid and elastic links are supplied. The supplied test programs are set for links of this length, so please use only these links, or suitable links of this length.

The purpose of the elastic link is to damp the starting load of the crosshead when measuring static friction, especially of plastic films. The rigid link is required wherever stick-slip behaviour is observed, typically with paper samples (see Section 11, *Elements of Friction*).

6. Working in the Test Area

6.1 Emergency stop and jog buttons

On the front left of the tester, the red button is for an emergency stop. Pressing this will stop all movement of the crosshead and will override all other controls. Once pressed, the button stays latched down. To re-set the button, rotate it clockwise.



Emergency stop button



Crosshead jog buttons

Jog buttons are used to position the crosshead so that samples can be attached or removed. The blue-lit physical buttons move the crosshead at a factory-set fixed rate of around 100 mm/min when the console software is running. When the console software is not running, the jog buttons will only progress the crosshead by 10 mm for each press of a button.

Another pair of similar 'jog' buttons are on the software test screen. The two sets of buttons function in different ways.

- The hardware buttons move at a factory-set fixed speed.
- The software buttons can be user-set in Emperor (select Programmed Testing at logon, then *Setup > Preferences > [General]* to set a fixed speed, or variable speed (repeatedly pressing an onscreen jog button progressively changes the speed).

6.2 Attaching and changing the loadcell



Turn off the tester power before changing loadcells.

You can swap loadcells by simply disconnecting one cell and fitting another. First, return to the Emperor software Main Screen and switch off the tester, before removing the

loadcell. When the new loadcell has been fitted, switch the tester on again, and after a few seconds the new loadcell will be automatically recognised. The tester will read in the new cell's range, serial number and calibration status.

Do not attempt to remove the crosshead itself. The loadcell is attached via a captive hex caphead bolt, secured and released with the 5 mm Allen key:

- lower the loadcell onto the mounting pillar
- support the loadcell with one hand
- insert the caphead bolt, and tighten using the Allen key.



Do not overtighten. Low-capacity loadcells are delicate and require careful handling.



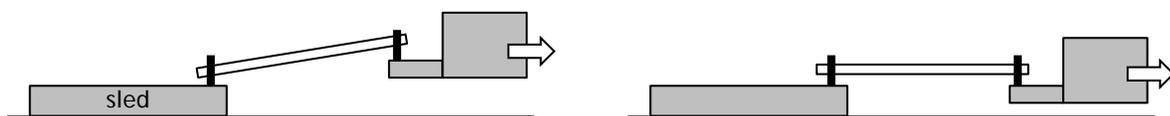
Attaching and removing the loadcell



Do not rest the loadcell with the stud down.

6.3 Adjusting crosshead height

The height of the crosshead will need adjusting to ensure horizontal alignment when force is applied using different fixtures. For example, in friction testing:



Incorrect alignment

Correct alignment

- attach the required link or grips
- jog the crosshead left or right as required, to secure a sample with the link or grips
- support the loadcell with your left hand
- release the black lever on the right of the crosshead
- carefully position the crosshead vertically, so as to achieve sample alignment

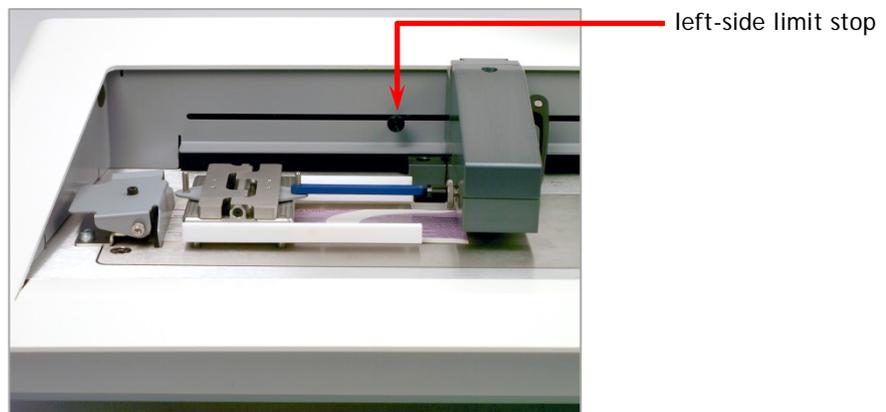
- tighten the black lever.



Adjusting crosshead height

6.4 Setting the limit stops

The system prevents the motor drive from overloading the loadcell. However, other parts may come into contact, undetected by the loadcell, such as between the crosshead and the BS ISO 15359 sled guide fixture when raised, or at maximum or minimum travel. Left- and right-side limit stops stop crosshead travel before physical over-travel limits are reached. The right-side limit stop will not normally need to be adjusted, but advice is given on positioning the left stop depending on the test being run.



If the crosshead reaches a limit stop during a test, it will stop then reverse direction for approximately 5 mm, then stop again. A warning message is displayed:



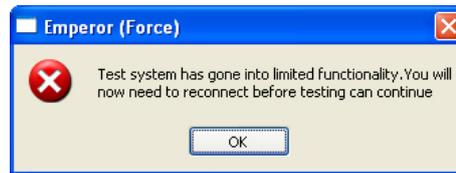
Press **OK** to acknowledge the warning and use the Jog buttons to move the crosshead so that you can then check the position of the limit stops and re-set if required.

If a limit stop is reached while pressing one of the Jog buttons on the front panel of the FPT-H1, a different warning message is displayed.



Pressing **OK** will allow you to correct the situation and continue.

Pressing **Abort** will disconnect the stand from the console, and display the following message:



Press **OK** then the toolbar Info. button.

On the [Test Stand] Tab, press **Reconnect** then **OK**.

Limit stops should be adjusted after grips or holding accessories have been fitted so that the limit positions will prevent contact between moving and static parts (for example, the sled lifting rails for BS ISO 15359). To set a limit stop, slacken the knurled knob by turning it anti-clockwise, then slide the stop to the desired position and re-tighten the knob.



Remember to check and, if necessary, adjust the position of the left-side limit stop if the grips are exchanged for a different holding accessory (e.g. peel tests).

7. Starting the Emperor Software

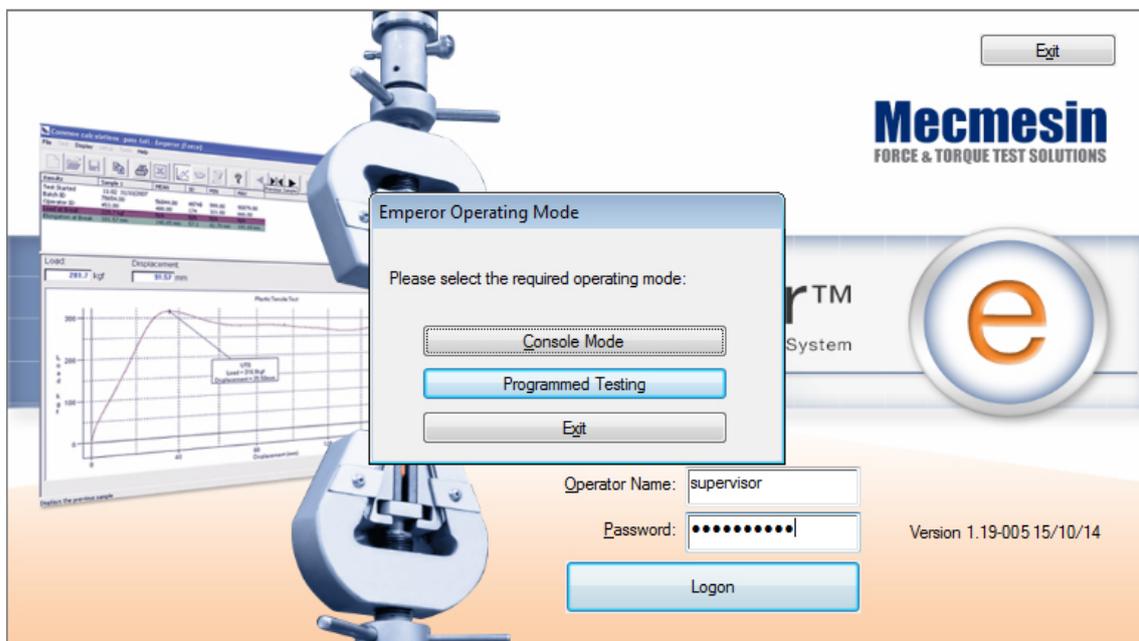
Start the program by using the Emperor icon on the Windows desktop – the splash screen is displayed.

Logon with a Master level username and password (for full access). If this is the first time you have started the program, you can use:

Default Username: supervisor

Default Password: supervisor

Note: both the username and password are case-sensitive.



FPT-H1-xt

On the Operating Mode selection screen, click on **Console Mode** to use the system as described in this manual.

FPT-H1-i

On the Operating Mode selection screen, click on **Programmed Testing** to use the system as described in the manual: 431-382 *Emperor™ Force and Torque Testing Software: Operator Manual*. See also Section 17, *Installing Emperor Software on a PC (FPT-H1-i)*.

7.1.1 User accounts

To add user accounts, press **System Settings** and the [User Accounts] tab. Type in a new user's details, then **Add**. You will notice that for Operators, you choose only those permissions you wish to give.

New programs can only be written by Master users, using Programmed Testing mode.

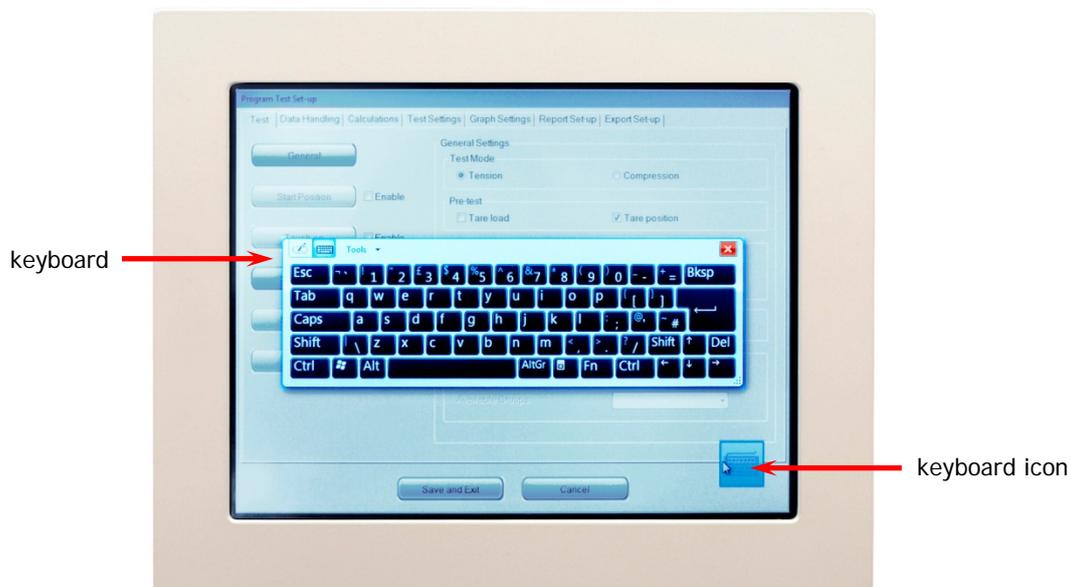
For full information on using all aspects of the Emperor™ programming and analysis software, refer to manual 431-382 *Emperor™ Force and Torque Testing Software: Operator Manual*.

7.2 The touch screen console

The touch screen is used to control the FPT-H1-xt system. Please note that this Windows computer does not contain an internal battery. If power to the system is interrupted, any unsaved data will be lost.

You can select operations and options by pressing or tapping on the relevant button on the touch screen with a finger or a stylus. In the bottom right of any screen layout requiring typed entry, there is a keyboard icon. Touch this, and a floating keyboard appears so you can type in numbers or text. If this obscures an entry field, just drag it out of the way. Where a layout has no data entry, the keyboard will automatically slide out of sight to the left, but it does not appear automatically when data may be required. Simply tap the keyboard icon whenever you need it.

If preferred, a standard USB mouse and/or keyboard may be used.



The FPT-H1-xt console showing the floating keyboard icon bottom right, and keyboard

- a single tap or press is the same as a left mouse button
- press-and-hold is the same as a right mouse button
- a double-tap is a double-click
- touch and drag a finger to select text
- combination keys such as Shift+ and Ctrl+ are used sequentially. For example, to select contents of a field, press Ctrl and then A. To copy, press Ctrl and then C. To paste, press Ctrl and then V.
- touch and drag a window element by its title bar – such as the floating keyboard itself
- to close Windows from the desktop, bring up the floating keyboard and touch the Windows button twice.

8. Setting the Absolute Zero Crosshead Position



This process must be run prior to using the tester, or if ever there appears to be a change in programmed positioning.

All preset programs are written to position the crosshead at various stages to allow sample fixing, sled linking, and to slide the sled the correct distance within the plane sample length.

To achieve this, an absolute zero reference position is used. Before using a test program, you will need to establish this position and set it via the Emperor software. The tester will retain this position even when switched off.

General setting

If you do *not* use the FPT-H1 for BS ISO 15359, follow these general settings. If you *do* use the FPT-H1 for BS ISO 15359, follow the specific instructions under the next heading.

1. Switch the tester and console on, and logon to the software in Console Mode.
2. Ensure the left-side limit stop is tightened in a position to the far left of the tester.
3. Place the sled to the left, close to the grip, where you will start each slide.
4. Drop a link onto the sled pin.
5. Jog the crosshead left towards the sled, using the blue buttons on the machine, until the link can be dropped freely onto the loadcell pin.
6. Press the Quick Test button



7. Now just press **Run** and then the Zero button on the toolbar at the top of the screen.
8. Select the [Absolute Zero] tab, and touch to place the cursor in the Offset position box:



Using the onscreen keyboard, enter zero (0) and press the **Set Absolute Position** button, then **Exit**.

9. Press Exit: .

Setting Absolute Zero for users of BS ISO 15359

If you use the FPT-H1 for BS ISO 15359, follow these more specific instructions.

1. With the sled rails fitted, ensure the crosshead is clear of the rails, to the right and raised above the rail height.



Important! The crosshead must never be allowed to collide with the rails.

2. Loosen the left-side limit stop.
3. Switch the tester and console on, and logon to the software in Console Mode.
4. From the Advanced Test Library, select the program: 'ISO 15359 sled position only'.
5. Press the green start button
This will raise the sled rails so that you can place the sled on the four locating pins, and then lower the sled into the correct starting position.
6. Drop a link onto the sled pin.
7. Jog the crosshead left towards the sled, using the blue buttons on the machine, until the link can be dropped freely onto the loadcell pin.
8. Now press the Zero button on the toolbar at the top of the screen.
9. Select the [Absolute Zero] tab, and touch to place the cursor in the Offset position box:



Using the onscreen keyboard, enter zero (0) and press the **Set Absolute Position** button, then **Exit**.

10. Press Exit:  and discard the results (there are none).
11. Slide the left-side limit stop up to this crosshead position, and back off to the left by 1-2 mm, and retighten.

9. Running Supplied Test Programs



Before running supplied programs for the first time, you must set the absolute zero crosshead position, as described in Section 8 *Setting the Absolute Zero Crosshead Position*.

Programs supplied with the FPT-H1-*xt* have been written for the Advanced Program Builder (Emperor™) and appear under Advanced Test.

For more information on running programs in Console mode, please refer to Manual 431-389, *Emperor™ Programming for Mecmesin-xt Force and Torque Test Systems*.

For writing, editing and running programs for the FPT-H1-*i*, please refer to Manual 431-382, *Emperor™ Force and Torque Testing Software: Operator Manual*.

The FPT-H1 is supplied pre-programmed with key industry standard test programs. Up to five of these can be assigned to the 'favourites' buttons. Any number of other programs can be held in the libraries under Program Test or Advanced Test. Here five programs to coefficient of friction standard methods have been assigned:



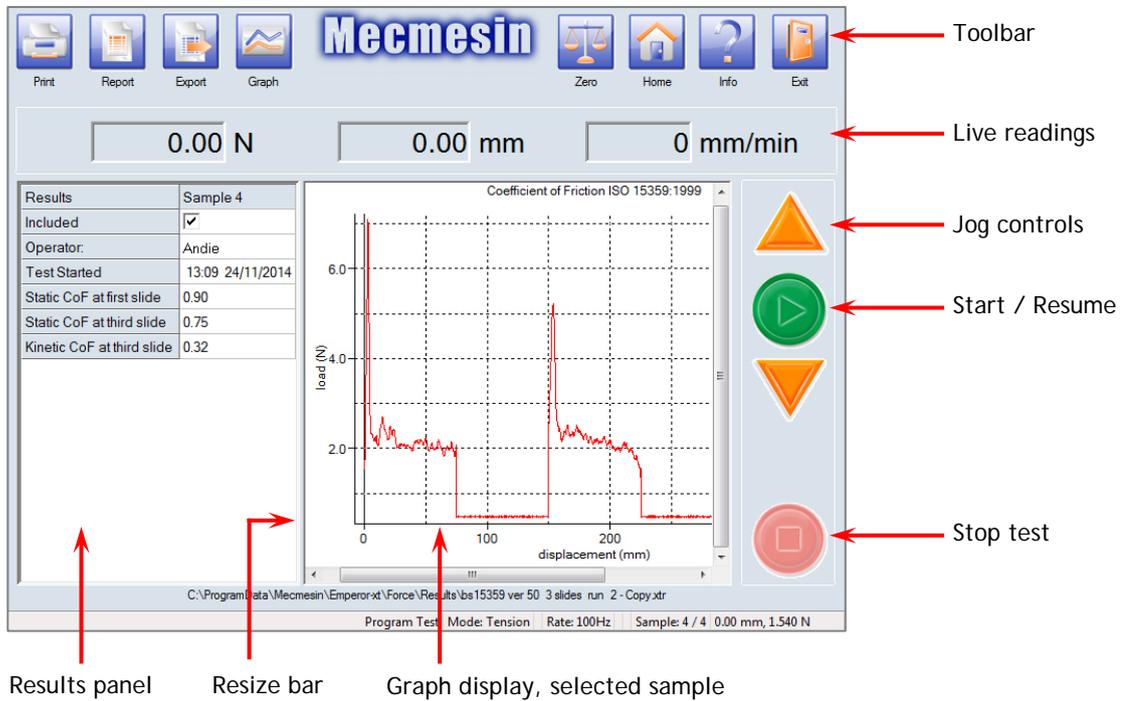
All supplied programs are listed under 'Advanced Test' in the Test Library, and any can be assigned to, or removed from, a Favourites position. (See the Emperor™ software manuals for full details.)

Any programs that you write in Console mode will be listed under 'Program Test'.

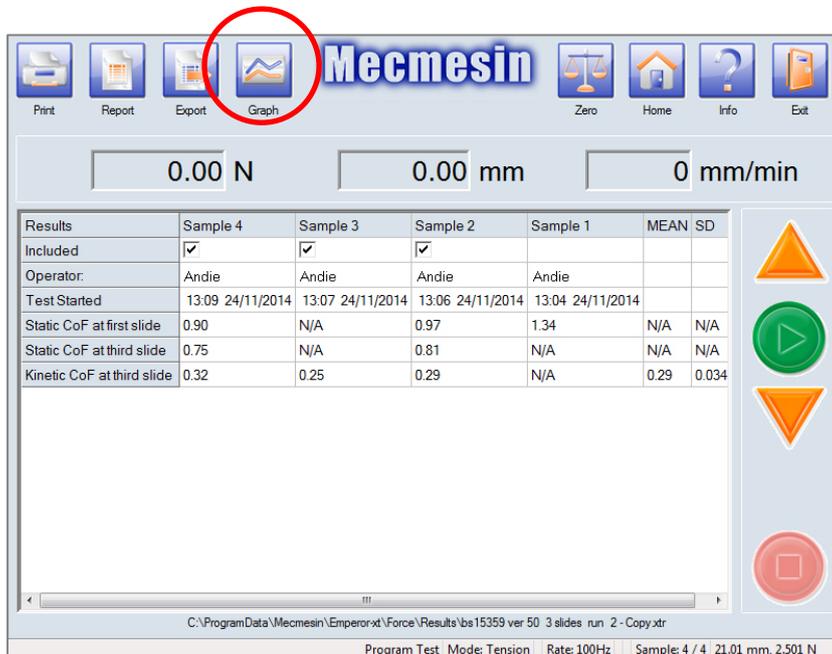
Please refer to the published test standards for complete details of sample preparation and conditioning, and to note any relevant changes that may be introduced from time to time by the relevant standards bodies.

9.1 Running programs: the test screen

You will probably want to run the test with the live graph on display:



Touch the Graph button to reveal all sample results instead, and compare results:



- Sample 1, Sample 2 ... etc. are default titles. Double click them to edit this text, using the onscreen keyboard.
- Select any sample and touch the graph button to examine the graph for that sample.

- Select any sample and touch the Info button  to access Sample Management, where individual samples can be deleted, and where additional descriptive information for the batch of samples can be added. This information will be included in printed reports.

9.2 Viewing and handling results

On completing any run of tests, touch Exit  and you will be prompted to save or discard the results. Results are saved in .for format, which can be opened in Emperor to be viewed and analysed again.

Results save to default folder C:\ProgramData\Mecmesin\Emperor\Force\Results.

Test results can also be exported to a delimited format file. Touch the Export button  and name the file, saved in C:\ProgramData\Mecmesin\Emperor\Force\Export.

'Results' format will save just the same information that you can see in the results grid on screen. 'Raw' data format will export all data points. Batch information is not saved in this format.

Touch the Report button  to generate a printout incorporating the results details for each sample, a results graph, and any batch information entered. This report can be saved as a PDF file, in default folder C:\ProgramData\Mecmesin\Emperor\Force\Reports. The Print button will just print this same report without the option to save it.

9.2.1 Excel

Results and raw data can be sent to Excel, via an export Scheme. For full explanation of the export file, its name and location, and export options in a Scheme, see the manual 431-382 *Emperor™ Force and Torque Testing Software: Operator Manual*.

Results can be sent to Excel only from Programmed Testing mode, not Console mode (Excel toolbar button, or *File > Send to Excel*).

Results, when sent to Excel, include the test batch notes fields.

10. Coefficient of Friction Testing

10.1 Test programs

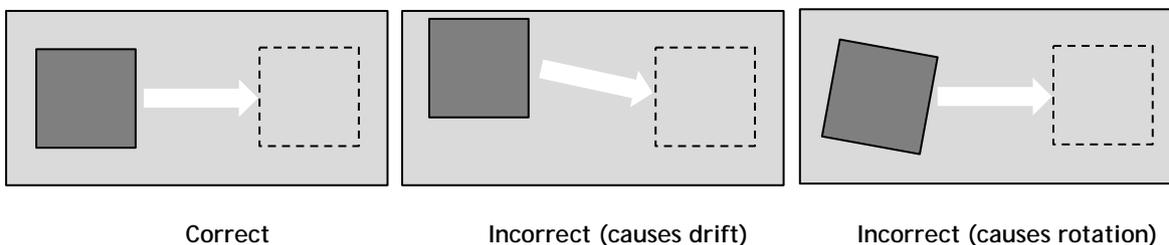
Standard programs are supplied preinstalled on the FPT-H1 Favourites menu (Console mode). They are also listed under the button: Advanced Test, Advanced Test Library.

10.2 Plane sample attachment

The FPT-H1 has a spring clamp for securing one end of the plane sample. Note that some standards permit further adhesive attachment to ensure the sample lies flat, especially for plastic films.

10.3 Alignments

Alignment of the sled is critical to accurate measurement, especially of static friction. For accurate measurement, the sled must not rotate or be pulled at an angle as movement begins. Throughout kinetic friction measurement, the travel of the sled must remain perpendicular to the travel of the loadcell.



There must be full-area contact between the sled sample and the plane bed sample at all times, and no contact with any fixing tape attaching a sample.

10.4 Sled sample attachment

The purpose of the prescribed sleds by dimension and weight is to provide a consistent pressure between the two sample surfaces in the contact system being tested. It is essential, then, that despite any incidental lateral movement of the sled, full surface area contact is maintained.

For some tests (typically paper and card), the sample is cut to size and stuck to the sled surface.



Apply low-tack double-sided adhesive tape to secure the sample



Sample not set square
card edge projects, area not fully supported



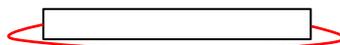
Sample set square
no edge friction, whole sample supported

It is important that residues do not build up on the neoprene so as to create an uneven surface. Clean carefully with detergent or light application of a 'sticky stuff' remover.

For other tests, the sample material is thin enough to wrap around the sled, secured by the magnetic grips. Wrapping must not lead to unevenness in the contact plane:



good fit



bad fit



bad fit



Clamp one end of the film sample
being careful not to handle the contact area



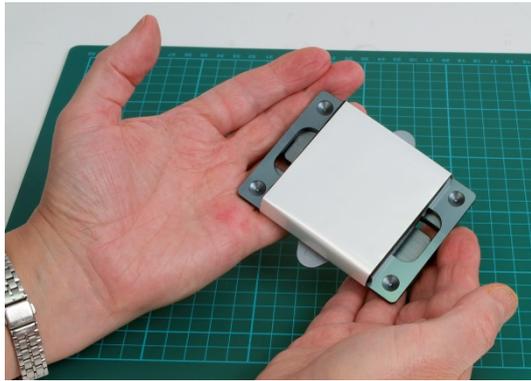
Draw the film into place without stretching,
maintaining alignment with the sled surface



Fold the film under the second magnetic catch



Hold in place and lower the catch



A correctly-prepared sled sample

10.5 Sled linking

Two kinds of link are provided, rigid and elastic. The requirement and use of each is described in the standards methods sections of this manual.

10.6 Crosshead positions during preset test programs

Preloaded programs use crosshead positions relative to a specific reference position (referred to as absolute zero). You may need to check, change or reset the absolute zero position depending on your use of the machine. See section 8 *Setting the Absolute Zero Crosshead Position*.

Sample loading position

This is where the crosshead is driven to clear the plane area for attaching and removing samples, or cleaning.

Test start position

This is where the crosshead is driven in order to attach a link between the sled and the loadcell, and from which each slide movement begins.

11. Elements of Friction

The FPT-H1 is designed for daily use of standard coefficient of friction tests for film and sheet materials. These typically produce figures for static coefficient of friction (the force overcome to initiate sliding movement) and the kinetic coefficient of friction (the force resisting continued sliding motion).

Friction is the product of a system, not a material. This may be paper sliding over a standardised steel surface, or two samples of the same plastic film sliding over each other. The value for coefficient of friction μ is the ratio of the force required to move one object over another, divided by the normal force applied to press the surfaces together (mass \times acceleration due to gravity):

$$\mu = \frac{F}{mg}$$

- F is directly proportional to the applied load. (*Amontons' First Law*)
- F is independent of the apparent area of contact. (*Amontons' Second Law*)
- Kinetic friction is independent of the sliding velocity. (*Coulomb's Law of Friction*)

Static friction (sometimes called stiction) may be measured in a test by itself, or as an initial peak value in a sliding test from rest, through a sliding distance at a given speed, back to rest. Kinetic friction is typically measured as an average value over a sliding distance.

11.1 Practical considerations

Values for the coefficient of friction may seem stable, but can involve very small values for F , and are affected by environmental conditions of temperature and humidity, which may exacerbate potential surface changes. Surfaces are also altered by contact that may abrade, lubricate or polish, or create adhesion (blocking). This includes handling during sample preparation and mounting, and the amount of time one surface rests on another, during which volatile additives may accumulate to form a lubricating layer, inks and coatings may adhere, or where fibres compress to exclude air.

Dwell, or resting time

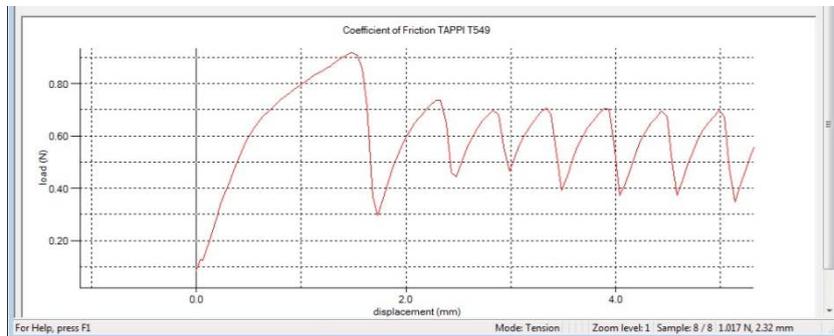
Some standard test methods include a resting time for the sled on the bed sample, but where they do not, consistency should nonetheless be maintained.

Applying load for static friction measurement

In measuring the coefficient of friction, care must be taken not to apply an impact as the initial load is applied so as to affect the static friction value. This can be avoided by using a less-than-rigid link.

Stick-slip

An elastic link can cause stick-slip behaviour during measurement of kinetic friction, where the relative motion between surfaces oscillates with a periodicity:



Where stick-slip is observed, a more rigid sled link should be used.

Sleds may tend to rotate or slew if friction properties across the width of a sample are variable. This will affect the average values for the coefficient of kinetic friction, but may have to be accepted as a characteristic of the material under test. Testing in different orientations can therefore be important.

In practice, surfaces moving in contact may not in any case be uniform, as with printed or embossed materials, so average values are sought by comparing friction in different orientations, with samples taken from different positions in a larger sample sheet. The requirement may simply be to make handling of sheet, or sheet-constructed packaging, predictable in order to optimise throughput.

11.2 International standard test methods

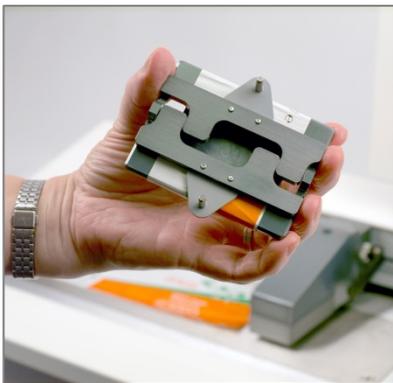
The most common coefficient of friction tests are provide as preloaded programs. The use of these is described in the following sections. Please refer to the latest standards themselves for the precise procedures, requirements and sample preparation for these test methods.

12.BS EN ISO 8295, Plastics, Film and Sheeting, Static and Kinetic Coefficients of Friction

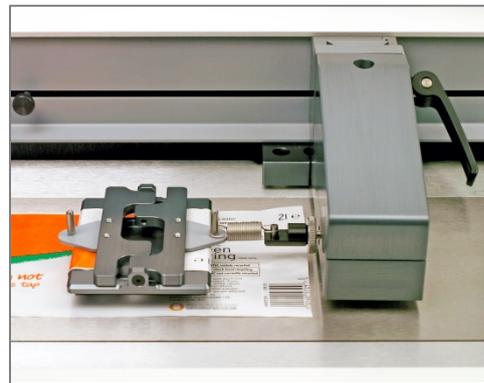
Replaces BS 2782-8 Method 824A

| | |
|--------------------------|---|
| Sled dimensions: | 63 mm × 63 mm |
| Sled weight: | 200 g ±2 g |
| Plane sample dimensions: | 200 mm × 80 mm |
| Linkage type: | Elastic link, unless stick-slip observed when measuring kinetic friction, in which case use rigid link. |
| Speed: | 100 mm/min ±10 mm/min |
| Length of slide: | 60 mm |
| Number of samples: | at least 3 sample pairs |
| Passes per sample: | 1, and discard |

Coefficient of friction may also be tested between different surfaces (e.g. film against stainless steel) where the film is applied to the sled. In this case the plane surface must be cleaned to a standard between tests.



Magnetic catches secure the sample ends



Use the elastic link to pull the sled

12.1 Process for static and kinetic friction (continuous test)

1. Ensure the tester is switched on, the software is running, and the test area is clear.
2. Load the BS EN ISO 8295 library program and press Start. This will move the crosshead to the sample loading position.

3. Prepare and attach both samples, and press Resume. This will move the crosshead to the test start position.
4. Attach the link to the sled pin and place the sled as gently as possible, such that the link drops into place over the loadcell pin.
5. Press the Start button. **Note: this method begins by resting the sled for 15 seconds.**
6. When the crosshead stops, the program will indicate that the sample test is complete.
7. Remove the sled and press Resume to clear the crosshead away to the sample loading position.
8. Discard both samples.

Press Start and repeat the test until at least three sample pairs have been tested.

If you require a report, press the Report button. This can then be saved and/or printed

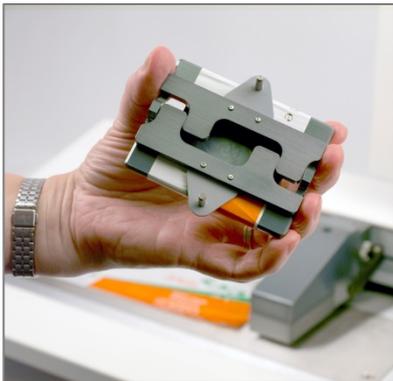
Press Exit and when prompted, Save the results to file.

12.2 Kinetic (dynamic) friction test when stick-slip is observed

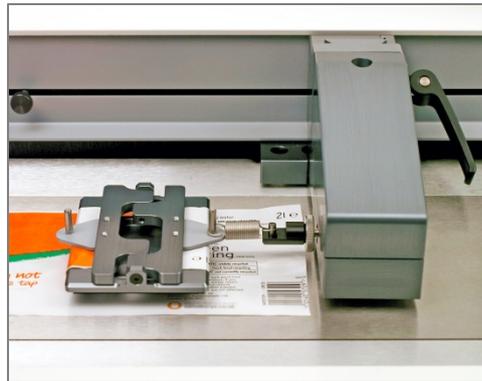
If you observe stick-slip occurring after the static friction point (see page 25), measure static and kinetic friction with separate samples, using the rigid link for kinetic friction testing. In each case use only the relevant part of the results.

13. ASTM D1894 Plastic film and sheeting

| | |
|--------------------------|---|
| Sled dimensions: | 63.5 mm × 63.5 mm |
| Sled weight: | 200 g ±5 g |
| Sled sample dimensions: | 63.5 mm × 63.5 mm |
| Plane sample dimensions: | 250 mm × 130 mm (L × W) |
| Linkage type: | Elastic link, unless stick-slip observed when measuring kinetic friction, in which case use rigid link. |
| Speed: | 150 mm/min ±30 mm/min |
| Length of slide: | 130 mm |
| Number of samples: | 5 sample pairs |
| Passes per sample: | 1, and discard |



Magnetic catches secure the sample ends



Use the elastic link to pull the sled

13.1 Process for static and kinetic friction (continuous test)

1. Ensure the tester is switched on, the console software is running, and the test area is clear.
2. Load the ASTM D1894 library program and press Start. This will move the crosshead to the sample loading position.
3. Prepare and attach both samples, and press Resume. This will move the crosshead to the test start position.
4. Attach the link to the sled pin and place the sled as gently as possible, such that the link drops into place over the loadcell pin.
5. Press the Start button.

Note that leaving samples in contact can alter the blocking or lubricating characteristics and therefore the static friction measurement.

6. When the crosshead stops, the program will indicate that the sample test is complete.
7. Remove the sled and press Resume to clear the crosshead away to the sample loading position.
8. Discard both samples.

Press Start and repeat the test until five sample pairs have been tested.

If you require a report, press the Report button. This can then be saved and/or printed

Press Exit and when prompted, Save the results to file.

13.2 Kinetic (dynamic) friction test when stick-slip is observed

If you observe stick-slip occurring after the static friction point (see page 25), measure static and kinetic friction with separate samples, using the rigid link for kinetic friction testing. In each case use only the relevant part of the results.

14. TAPPI T 549, Uncoated Writing and Printing Paper, Static and Kinetic Coefficients of Friction

| | |
|--------------------------|-----------------------|
| Sled dimensions: | 63.5 mm × 63.5 mm |
| Sled weight: | 200 g ±5 g |
| Sled sample dimensions: | 63.5 mm × 63.5 mm |
| Plane sample dimensions: | 215 mm × 100 mm |
| Speed: | 150 mm/min ±30 mm/min |
| Length of slide: | 130 mm |
| Number of samples: | 5 sample pairs |
| Passes per sample: | 1, and discard |

14.1 Process for static and kinetic friction (continuous test)

Observe sampling methods as described and referred to in the TAPPI standards. A rigid link may be used throughout, except for the lowest friction papers, where an elastic link may give a more accurate measurement for static friction.

1. Ensure the tester is switched on, the software is running, and the test area is clear.
2. Load the TAPPI T 549 library program and press Start. This will move the crosshead to the sample loading position.
3. Prepare and attach both samples, and press Resume. This will move the crosshead to the test start position.
4. Attach the link to the sled pin and place the sled as gently as possible, such that the link drops into place over the loadcell pin.
5. Press the Start button.
6. When the crosshead stops, the program will indicate that the sample test is complete.
7. Remove the sled and press Resume to clear the crosshead away to the sample loading position.
8. Discard both samples.

Press Start and repeat the test until five sample pairs have been tested.

If you require a report, press the Report button. This can then be saved and/or printed

Press Exit and when prompted, Save the results to file.

15.BS ISO 15359, Paper and Board, Static and Kinetic Coefficients of Friction

| | |
|--------------------------|--|
| Required fixtures: | Sled raising and lowering rails (lifter mechanism is a factory installed option) |
| Sled dimensions: | 60 mm × 60 mm ±5 mm |
| Sled weight: | 800 g ±100 g |
| Plane sample dimensions: | ≥ 60 mm × ≥ 70 mm + gripping length |
| Speed: | 1200 mm/min ±120 mm/min |
| Number of samples: | 6, two test methods for static only, or static and kinetic |

15.1 Attaching the sled-lift rails

The rails have captive screws for attachment, and can be removed for alternative tests.

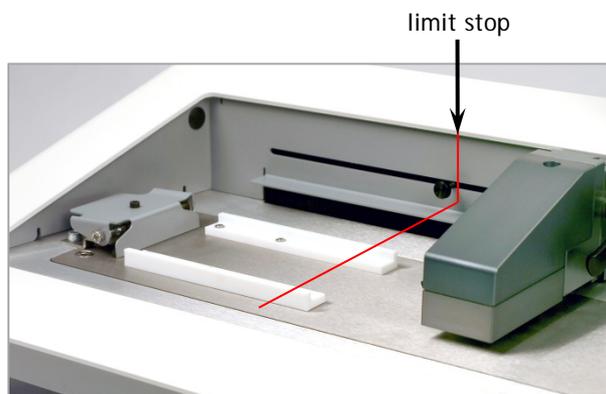


Secure the first rail; do not overtighten



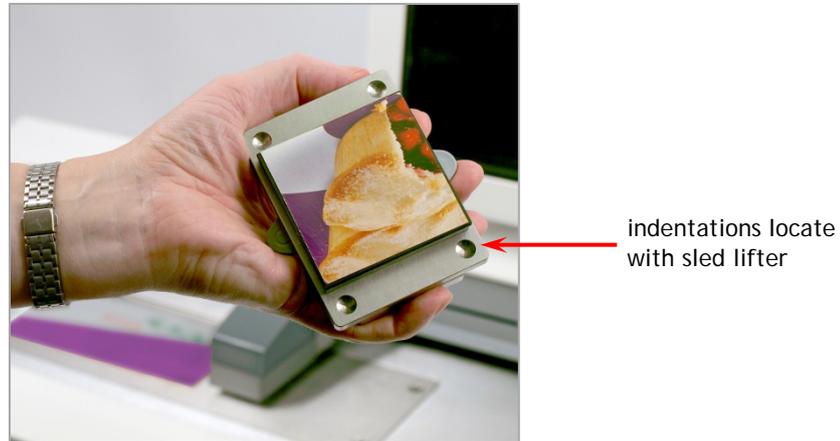
Secure the second rail, facing

The left-hand limit stop must be positioned to prevent any possible collision between the loadcell and the sled-lifting rails:



Securing samples to the sled

Samples may be attached using low-tack double-sided tape or adhesive (see Section 10.4, *Sled sample attachment*). This must not leave a raised profile in the surface. Be especially careful to apply the cut sample square-on, so that edges do not protrude to touch the guide rails:



15.2 Static friction at first slide (BS ISO 15359, section 9.2)

Take 6 sample pairs, measure static friction only for each and discard. Use the elastic spring link provided. Follow the on-screen prompts.

For each sample pair:

1. Ensure the tester is switched on and the console software is running.
2. Load the library program and press Start. This raises the rails and sends the crosshead to the sample loading position.
3. Secure your prepared samples and position the sled on the four locating pins.
4. Press Resume. This sends the crosshead to the test starting position.
5. Link the sled to the loadcell.
6. Press Resume. This lowers the sled lift, rests it for 2 seconds, then slides it for 75 mm.
7. Remove the link and sled, discard the samples.

15.3 Static coefficient of friction at the first slide, static and kinetic at the third slide (BS ISO 15359, section 9.3)

Take 6 sample pairs, for each pair take three consecutive sets of measurements and discard. The supplied elastic link is suitable for damping the initial load.

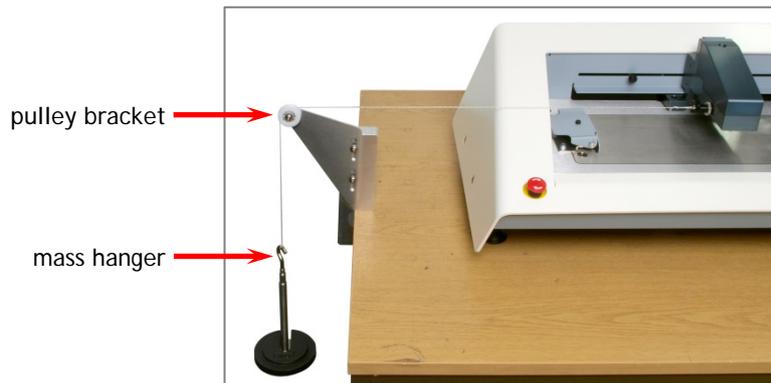
Should you observe stick-slip (see page 25) within the measurement of kinetic friction, the rigid link should be used for measuring kinetic friction as a separate test, taking values for the third slides only.

For each sample pair:

1. Ensure the tester is switched on and the software is running.
2. Load the library program and press Start. This raises the sled lift and sends the crosshead to the sample loading position.
3. Secure your prepared samples and position the sled on the four locating pins.
4. Press Resume. This sends the crosshead to the test starting position.
5. Link the sled to the loadcell.
6. Press Resume. This lowers the sled lift, rests it for 2 seconds, then slides it for 75 mm, raising the sled at the end.
7. Remove the link and replace the sled back on the locating pins.
8. Press Resume. This returns the crosshead to the test start position.
9. Link the sled and loadcell and press Resume. The test is repeated.
10. After three slides the test ends. Remove the sled and discard the samples.

16. Loadcell Accuracy Verification

When an FTP loadcell is beyond its calibration date, this will be indicated when you switch the system on. It should be returned to Mecmesin or your distributor, for recalibration. You can also periodically check your loadcell's accuracy, using the optional loadcell accuracy verification kit, and appropriate mass kit.



Level the line horizontally ...



... and align centrally

16.1 Method



Take great care not to overload the loadcell. Only the Mecmesin mass hanger of mass below the overload capacity of the loadcell must be used.

- Clamp the pulley bracket to the bench end.
- Position the crosshead towards the left side of its travel.
- Raise the loadcell to its upper stop position.
- Attach the loop of the line to the loadcell link pin and draw the line over the nylon pulley.
- Attach the other end of the line to the mass hanger.
- Level the line horizontally over the end of the tester casing, by adjusting the pulley bracket.
- Position tester and bracket so that the line runs over the centre of the spring grip.
- Zero (tare) the load via the Emperor software.
- Carefully add a calibrated slotted mass or masses.
- Verify that the load measurement on the console is within 0.1% of the total applied load.

17. Installing Emperor Software on a PC (FPT-H1-i)

This section applies to users of the FPT-H1-i model, without the touch-screen console, driven by Emperor™ software installed on a separate PC (not supplied).

17.1 Minimum system requirements

The minimum specification for the Windows PC is 2 GB RAM and 60 GB free space on the hard drive, running Windows™ XP Pro with SP1, or above. A CD drive is required for installation. At least one USB port or RS232 port are required for connecting to the system.

Note: Emperor software is not available for Linux or Mac OS X operating systems.

17.2 Access to data folders

Emperor will need access to certain folders listed below. Before installing the program, please make sure that read and write access is granted for these folders. In particular if the computer is part of a centrally controlled Windows Domain system, it may be necessary to consult with your IT department to allow correct access to these locations.

| Windows XP User Data location | |
|---|---|
| Emperor Force | C:\Documents and Settings\All Users\Application Data\Mecmesin\Emperor\Force |
| Windows Vista or Windows 7 User Data location | |
| Emperor Force | C:\ProgramData\Mecmesin\Emperor\Force |
| All Windows versions Program files location | |
| Emperor Force | C:\Program Files\Emperor\Force |

Insert the Emperor CD; Emperor should start automatically and ask if you wish to proceed with the installation of the software.

If the installation program does not start automatically or if you have other problems:

- On your computer desktop click the shortcut to 'My Computer'
- Click on the CD drive that contains the Emperor software CD
- Navigate to the Emperor folder
- Right click on the Set-up.exe file, and Run as Administrator

Emperor will begin the process of installing the program onto your hard-drive. Follow the instructions, and accept the license agreement. You can choose which languages are installed: English only, all languages, or custom, so you can select languages you need.

17.3 Start Emperor

Start the program by using the Emperor icon that was installed on your computer desktop – the splash screen is displayed.

Emperor software provides two levels of user, and a password is used to restrict access to either a simple choice of pre-defined tests or some limited functions, or to give access to the full capabilities of the Emperor system.

Operators can select from tests that are pre-defined, and for which reports have already been written, and some functions that can be assigned to each user account.

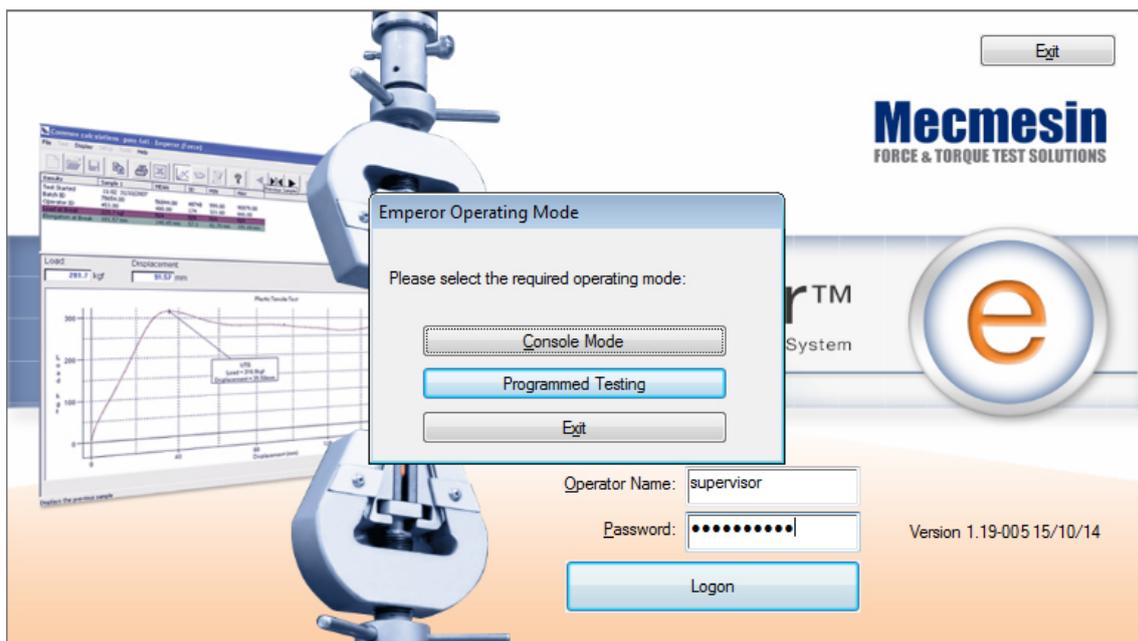
Masters have full access to all the functions of the Emperor system. The master user has control over which users are operators and masters.

Logon with a Master level username and password. If this is the first time you have started the program, you can use:

Default Username: supervisor

Default Password: supervisor

Note: both the username and password are case-sensitive.



On the Operating Mode selection screen, click on **Programmed Testing** for full programming access, or **Console Mode** to use as described in this manual.

This will start Emperor, and you can set your system preferences, user accounts, create and run test programs, review results, perform calculations for analysis, produce test reports and export data for use elsewhere. For full details, see the manual: *Emperor Programming for Mecmesin Test Systems* (Part no. 431-382).

18. Creating Test Programs

You can program your FPT-H1 for many kinds of tensile or compression tests, with suitable fixtures, using the full scope of the Emperor™ software.

Refer to manual 431-382 *Emperor™ Force and Torque Testing Software: Operator Manual* for writing full programs

Refer to manual 431-389 *Emperor™ Programming for Mecmesin-xt Force and Torque Test Systems* for writing or editing simpler console-mode test programs

19. Specification

| Load measurement | |
|--|---|
| Loadcell range | 10 N, 100 N (2.2 lbf, 22.5 lbf). Contact Mecmesin for other loadcell capacities. |
| Load resolution | 1:6500 |
| Load accuracy | 0.1% of full scale output |
| Speed | |
| Speed, continuously variable | 0.016 mm/s (1.0 mm/min) or (0.039 in/min) to 20 mm/s (1200 mm/min) or (47.2 in/s) * |
| Speed accuracy | 0.2% of indicated |
| Test area | |
| Sled lowering rate | 3.0 mm/s \pm 2.0 mm/s (0.12 in/s \pm 0.079 in/s) |
| Crosshead height adjustment | 30 mm (1.18") |
| Max. crosshead travel | 275 mm (10.8") |
| Test surface | Stainless steel 304 |
| Dimensions | |
| Height | 226 mm (8.9") [console + 293 mm (11.5")] |
| Width | 914 mm (36.0") |
| Depth | 415 mm (16.3") |
| Weight | 29.3 kg (64.6 lb) [25.6 kg (56.4 lb) without console] |
| Communications | |
| Digital I/O | 6 input, 6 output |
| Ports | RS232 and USB |
| Network communications (FPT-H1-xt) | RJ45 USB for external wireless connectivity |
| Power requirement | |
| Maximum power consumption | 120 W |
| Supply voltage | 230 V AC 50 Hz, or 110 V AC 60 Hz |
| Pneumatic connections (optional extra) | |
| Crosshead | 4 mm, 8 bar max. (116 psi) |
| Fixed | 4 mm, 8 bar max. (116 psi) |
| Environment | |
| Recommended temperature range | +10° to +35° C (50° to 95°F) |
| Noise emissions | Less than 70 dbA |

* where mains voltage is unreliable (significantly under voltage) the machine may not run above 1000 mm/min

Mecmesin reserves the right to alter equipment specifications without prior notice. E & OE

20. Declaration of Conformance

EC DECLARATION OF CONFORMITY

we,

Mecmesin Limited
Newton House, Spring Copse Business Park, Slinfold, West Sussex, RH13 0SZ

hereby declare that the product(s):

MultiTest 0.5-i, MultiTest 1-i, MultiTest 2,5-i, MultiTest 5-i, MultiTest 10-i, MultiTest 25-i, MultiTest 50-i,
Vortex-i, Helixa-i and FPT-H1-i Computer Controlled Test Stands

and associated and derivative product(s):

MultiTest 0.5-xt, MultiTest 1-xt, MultiTest 2,5-xt, MultiTest 5-xt, MultiTest 10-xt, MultiTest 25-xt, MultiTest 50-xt,
Vortex-xt, Helixa-xt and FPT-H1-xt Console Controlled Test Stands

to which this declaration relates. are in conformity with the essential requirements of the Council Directives:

- EMC Directive 2004/108/EEC
- Low Voltage Directive 2006/95/EEC
- Machinery Directive 2006/42/EEC

and tested to the following standards and other normative documents:

EN 61000-6-2, EN 61000-6-3, EN 60204-1, EN 60950-1

Declaration Issue Date: 18 February 2015



Technical Director, Mecmesin Limited: Dr Patrick Collins

431-DoC08-03



飛捷科技股份有限公司
FLYTECH TECHNOLOGY CO., LTD.

公司: 11494 台北市內湖區行業路168號
Headquarters: No. 168, Sing-ai Rd., Neihu District, Taipei City 11494, Taiwan, R.O.C.
TEL: 886-2-8791-4988 FAX: 886-2-8791-4966

DECLARATION OF CONFORMITY

Name of Responsible Party: Flytech Technology Co., Ltd.
Address of Responsible Party: No. 168, Sing-ai Rd., Neihu District,
Taipei City, 114Taiwan, R.O.C.
Declares that product: Touch POS
Model: K784(C36); K785(C36); K786(C36); K784; K785; K786
Assembled by: Same as above
Address: Same as above

Conforms to the EMC Directive 2004/108/EC as attested by conformity with the following harmonized standards:

- EN55022: 2006 +A1:2007 Class A
- EN55024: 1998+A1: 2001+A2: 2003
- EN 61000-3-2: 2006 Class D
- EN 61000-3-3: 1995+A1: 2001+A2: 2005
- AS/NZS CISPR 22: 2006 Class A

Reference: Report No.: NEI-EMC-1-E1006102, dated Aug 4, 2010

Conforms to the Low Voltage Directive 2006/95/EC as attested by conformity with the following harmonized standard:

- IEC 60950-1: 2005 (2nd Edition) and/or
- EN 60950-1: 2006+A11:2009

Reference: Report No.: NEI-LVD-1-S1007043, dated August 26, 2010

We, Flytech Technology Co., Ltd., hereby declare that the equipment bearing the trade name and model number specified above was tested conforming to the applicable Rules under the most accurate measurement standards possible, and that all the necessary steps have been taken and are in force to assure that production units of the same equipment will continue to comply with the requirements.

Y.P. Liu
Vice-President, R&D Division
Flytech Technology Co., Ltd.
Date: 2012/10/29

Appendix A

Microsoft® Windows® Embedded Standard 7 Licensing

Each -xt system supplied with a console controller has Microsoft® Windows® Embedded Standard 7 Operating System pre-installed and licensed by Mecmesin. Each console is supplied with the following as proof of licensing:

- End User License Agreement (EULA)
- Certificate of Authentication (COA)

End User License Agreement (EULA)

A multi-language EULA is enclosed with each system.

Certificate of Authentication (COA)

The COA is supplied as a sticker located on the rear of each console supplied with a system, as proof of licensing.

This COA sticker lists the following:

- Microsoft® product title
- COA serial number
- Microsoft® SKU (stock keeping unit) number

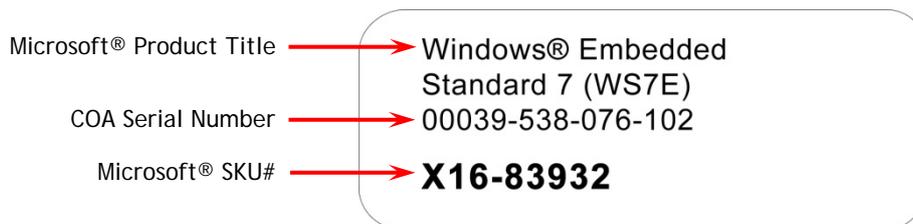


Figure 1: Certificate of Authentication

This template contains section breaks; be careful not to delete them.

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| | | | |
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| Bangladesh | France | Mexico | South Africa |
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| Brazil | Greece | Myanmar | Sri Lanka |
| Bulgaria | Hungary | Netherlands | Sweden |
| Cambodia | India | New Zealand | Switzerland |
| Canada | Indonesia | Norway | Taiwan |
| Chile | Iran | Peru | Thailand |
| China | Ireland | Philippines | Tunisia |
| Colombia | Israel | Poland | Turkey |
| Costa Rica | Italy | Portugal | UK |
| Croatia | Japan | Romania | USA |
| Czech Republic | Korea | Russia | Vietnam |
| Denmark | Laos | Saudi Arabia | |

The Mecmesin global distribution network guarantees your testing solution is rapidly delivered and efficiently serviced, wherever you are.



FS 58553

Certificate no. FS 58553

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