

Details of Linear Friction Test

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EN 14 837

Determination of Slip Resistance

published May 2006

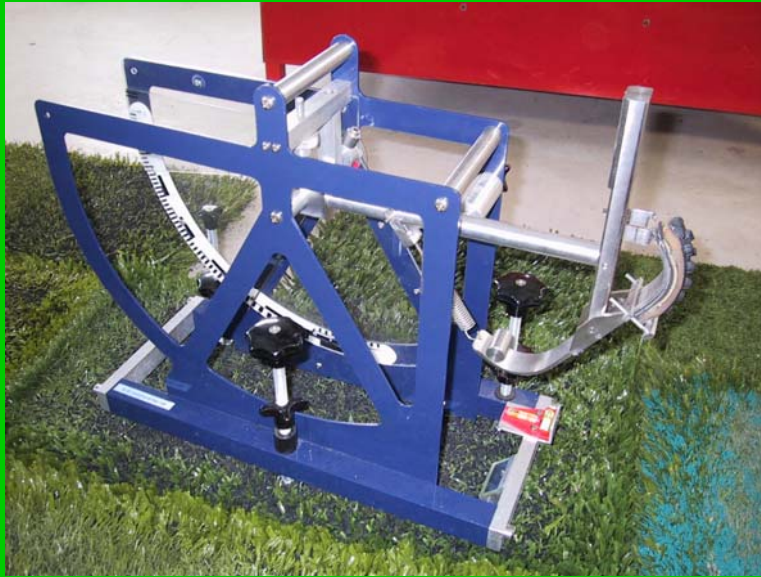
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EN Standard on predecessor of Linear Friction test. Passed EN TC217 Committee although all delegates denied its suitability. Standard must be implemented in national standardization systems within 6 month from May 2006 on. However, this happened in a few countries only.



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Leroux Pendulum Device acc. EN 14837 / FIH



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EN 13 036-4

Measurement of Skid/Slip Resistance

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Model for new (FIFA) Linear Friction Tester. This standard was originally developed for road surface testing. Since 1990 used within the IAAF Performance Specifications testing.

ASTM E 303:2003

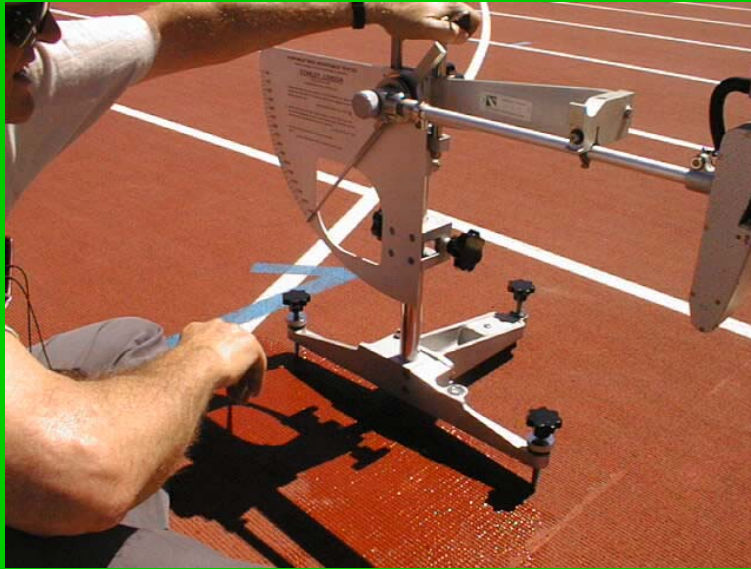
**Measurement of
Surface Frictional
Properties using
the British Pendulum**

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Use of British Pendulum on a track surface.

FIFA
February 2006
Determination of Linear Friction:
Slide Value
&
Deceleration Value

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Version of FIFA Testing Manual (March 2006) is overridden by February version.



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Linear Friction tester with pendulum in start position.
This device exhibits 3 new features:

- test foot with studs;
- new scale (derived from original scale); Readings on new scale = Stud Slide Values (starting with reading 250).
- accelerometer at the rear of the test foot.



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Linear Friction Tester with pendulum after test. The pendulum after having slid through the pile layer of the turf taking the pointer to the highest swing and then falling back.



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Mechanism of test foot. Sliding plate in its widest position.



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Sliding plate in its narrowest position (i.e. 10mm from widest position)



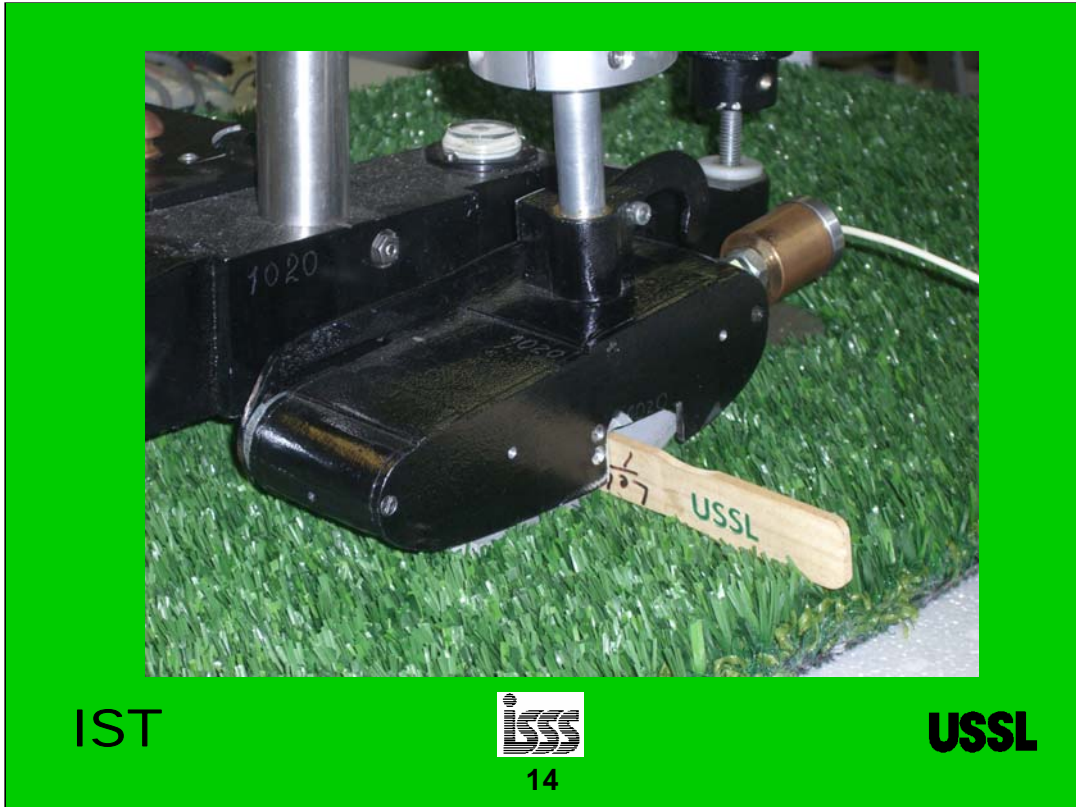
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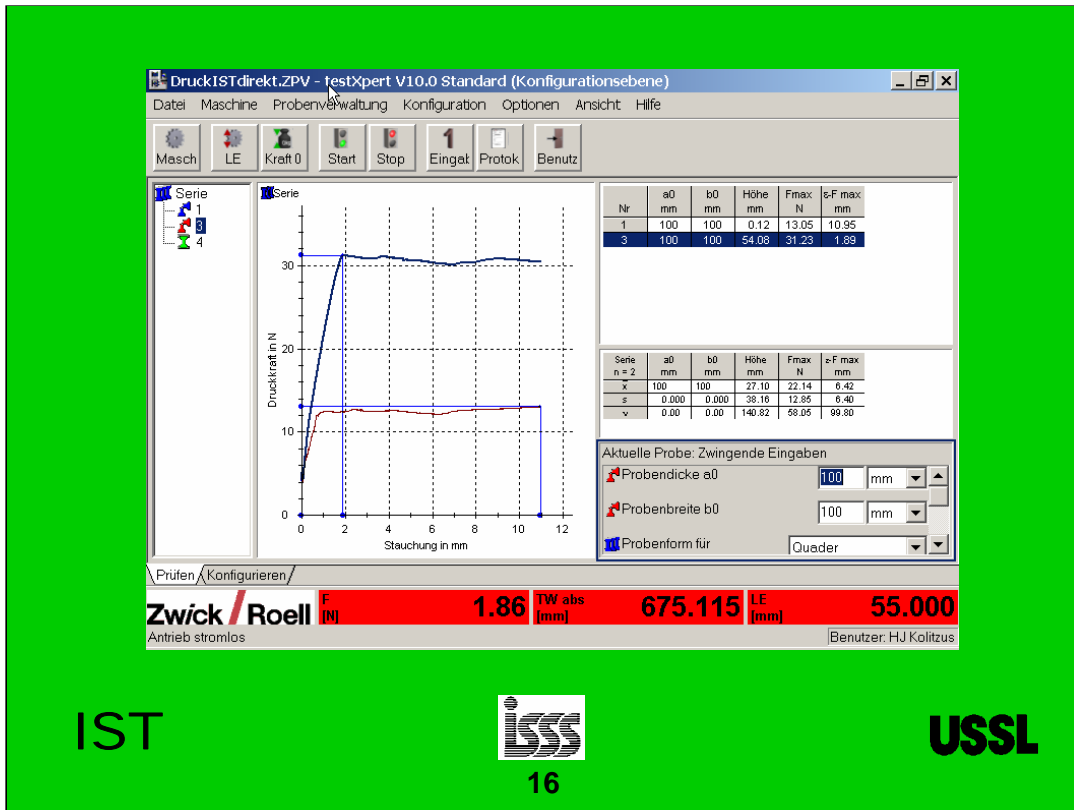
Sliding plate in its narrowest position (marks) controlled by moving the axis of the pendulum up/down until marked position is reached.



Mechanical control of sliding plate position



Calibration of force of sliding plate with a tensile strength machine. Test can be performed with test foot down.



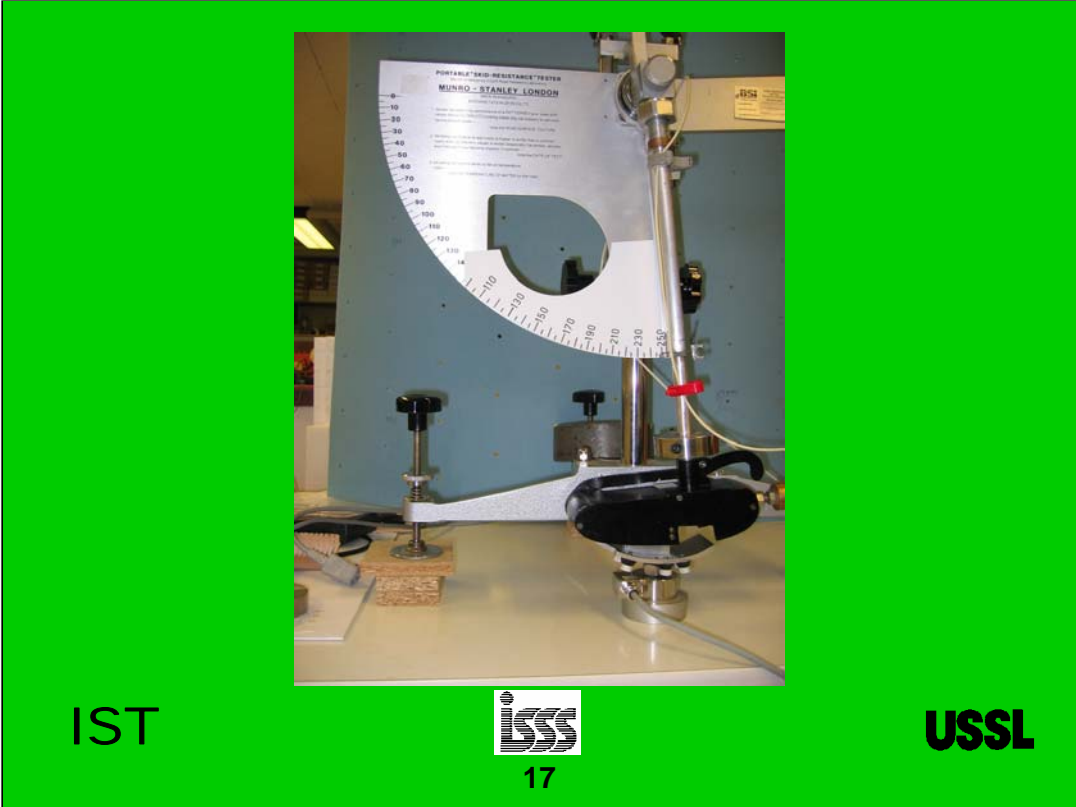
Recording of sliding plate calibration: test foot up and down. See build-up of force over 2mm !

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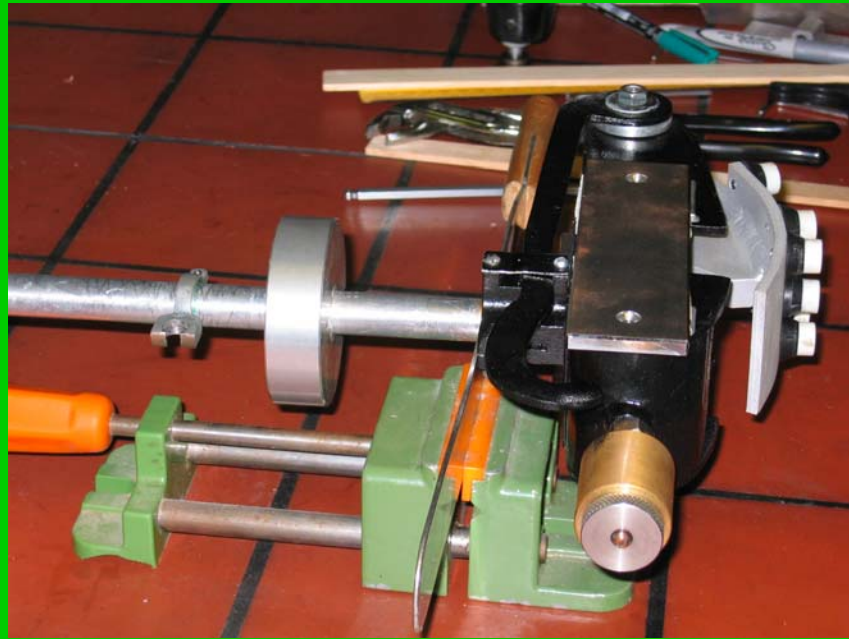
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Calibration of sliding plate with load cell calibrated for range 0-200 N.



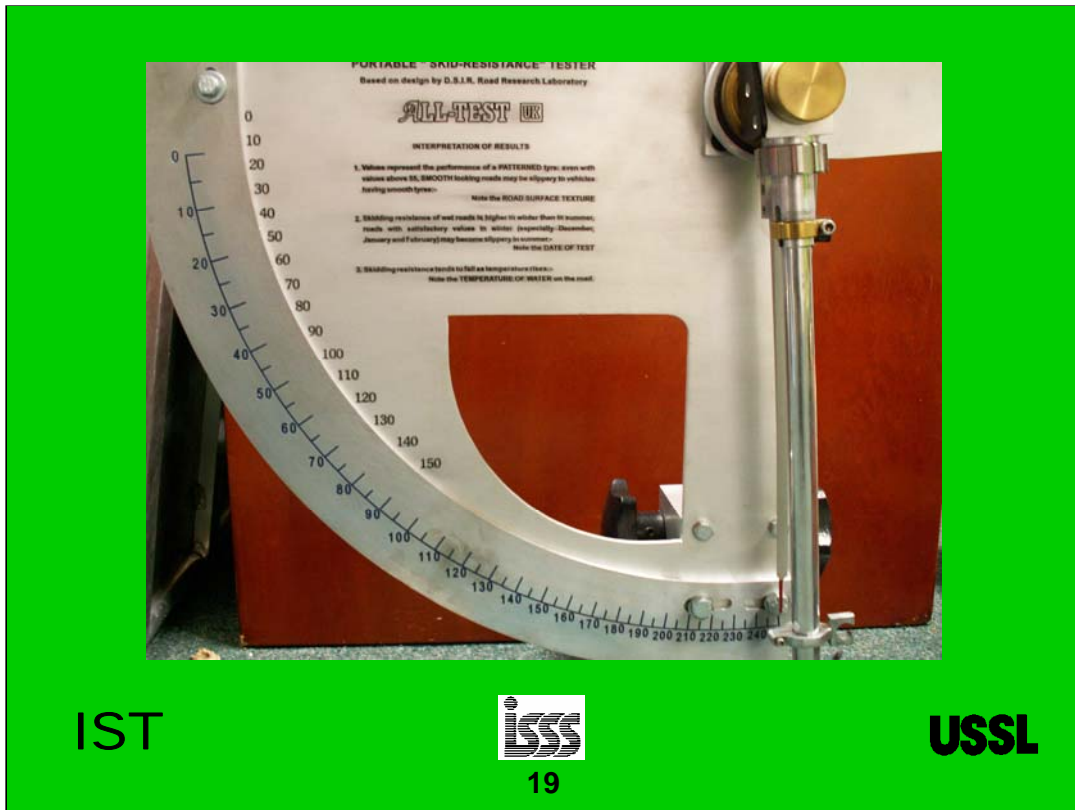
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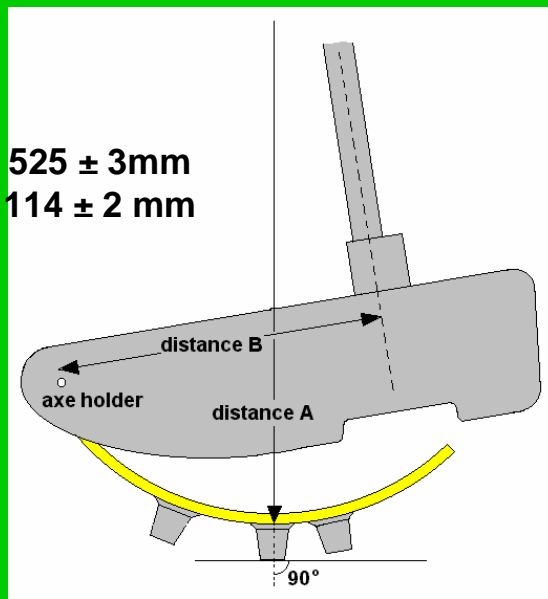
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Determination of center of gravity acc. ASTM E 303.
Necessary since pendulum of Linear Friction Tester is
500g heavier than pendulum of British Pendulum
device.



Mirrored scale of Linear Friction tester.

distance A = 525 ± 3 mm
distance B = 114 ± 2 mm

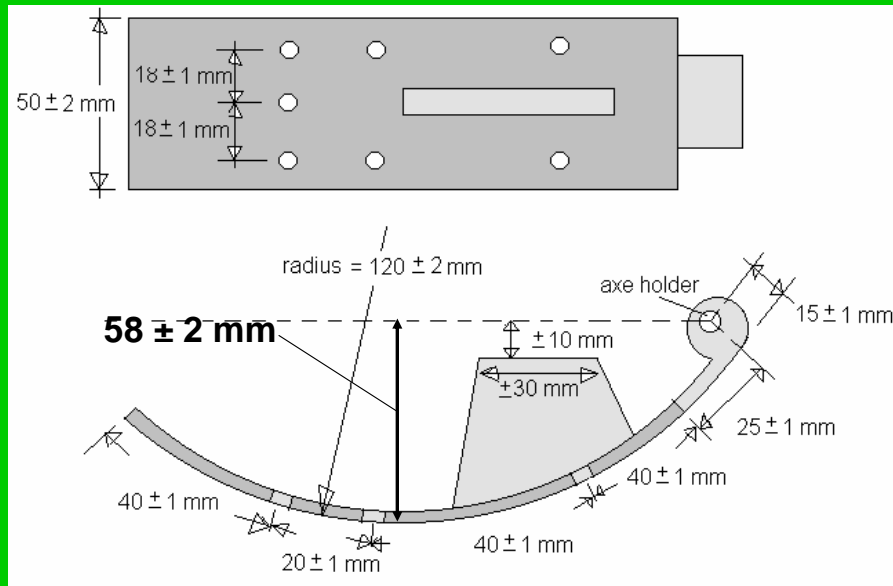


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Configuration how to calibrate the test foot (sliding plate).



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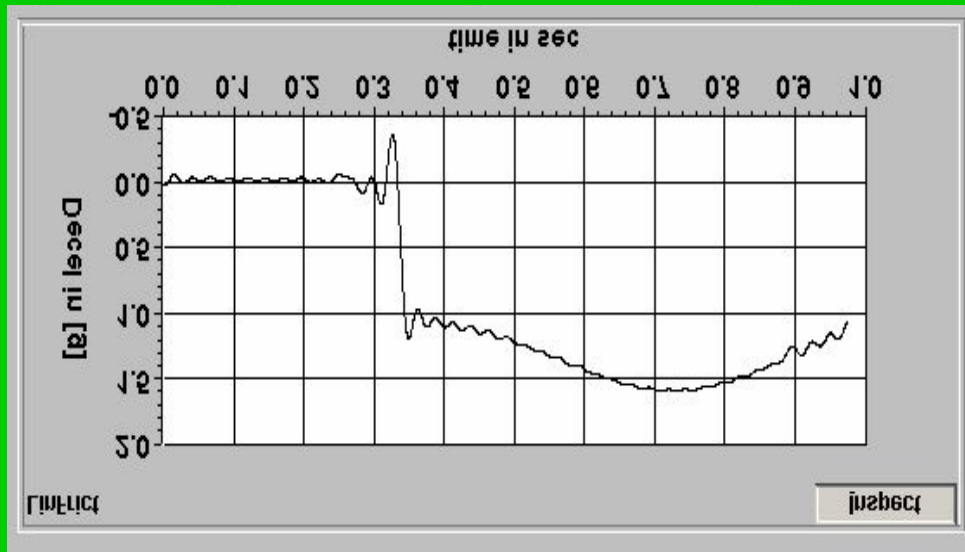


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Configuration of sliding plate (widest position). Very important is information about distance of bottom of sliding plate to axis level of sliding plate (58 ± 2 mm)

This information is not specified in the FIFA Specifications. Needs to be amended urgently.



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Deceleration recording of free swing of pendulum (when not hitting a surface). After release of the pendulum, the signal jumps to 1.0g. Then the signal changes as axis of accelerometer axis changes its direction. The minimum of the curve occurs when the pendulum is at its lowest point.



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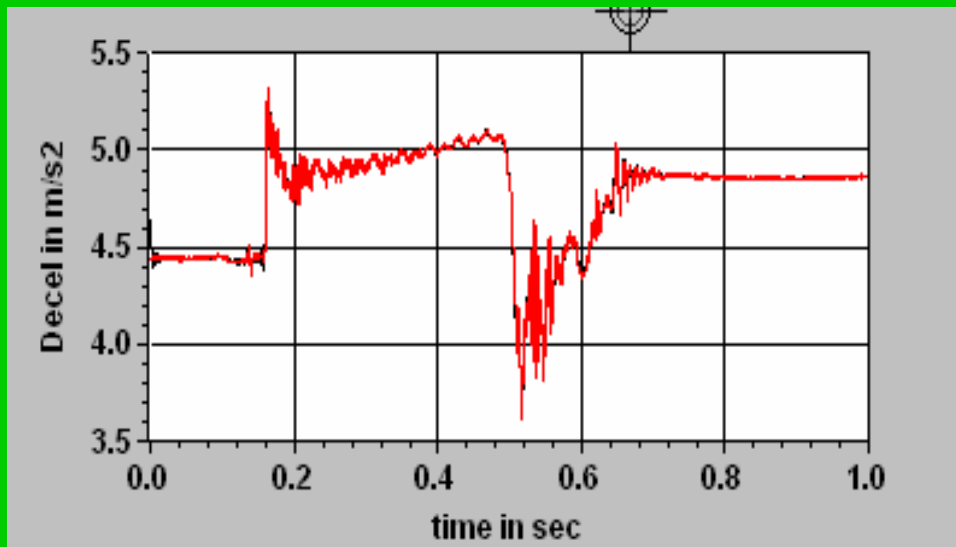


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Recording of a test with hitting the surface. The correct method how to read the Stud Deceleration Value has not been specified yet in the FIFA documents. Needs to be amended urgently.

Maximum deceleration is caused by sudden braking resistance right after the test foot hits the surface.



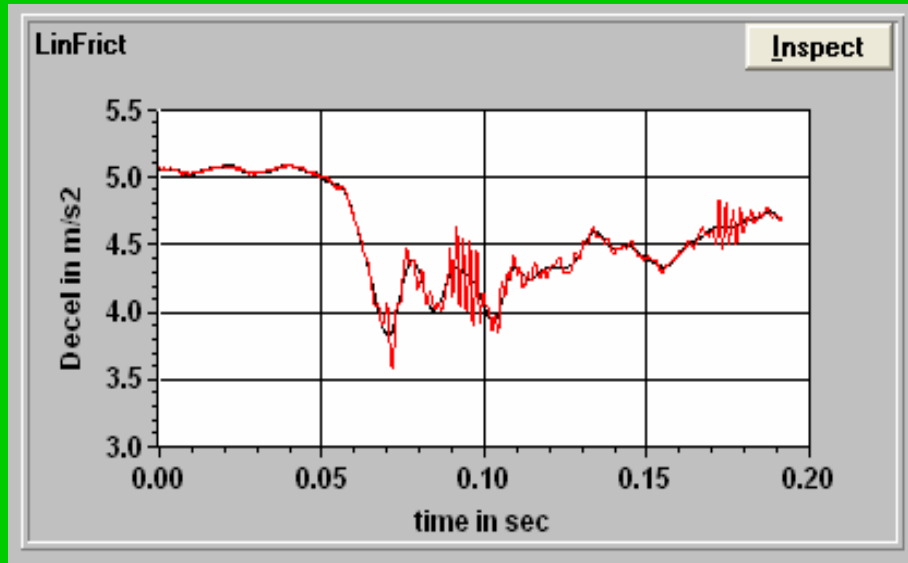
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Recordings of tests often show enormous vibrations/erratic oscillations which cannot be understood as caused by the turf.



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Therefore, the signal must be filtered with 120Hz FFT (black trace)

Requirements

	FIFA *	FIFA **
Stud Slide Value	120 – 220	130 - 210
Deceleration Value	3.0 – 6.0	3.0 – 5.5

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Stud Slide Value
and
Deceleration

indicate
same physical parameter:

Loss of Energy

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Integral
of
decel * mass of test foot
over sliding path
=
Loss of Energy

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Consequence:

Stud Slide Values
must correspond somehow with
Deceleration Values

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Coherence Condition:

if a surface meets

Stud Slide Requirement

it should also meet

Deceleration Requirement

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Introduction of New Test Procedure

1. Development of Test
2. Scrutiny (Coherence)
3. Determination of Repeatability
4. Standardization
5. Setting Requirements

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Testing in gorgeous environment (Switzerland)

**Thank you
for
your attention**

www.iss.de/ist-ch

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