



Standard Test Method for Verification of Multi-Axis Force Measuring Platforms¹

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1. Scope

1.1 This standard specifies procedures for performance verification of multi-axis force platforms commonly used for measuring ground reaction forces during gait, balance and other activities.

1.1.1 This standard provides a method to quantify the relationship between applied input force and force platform output signals across the manufacturer's defined spatial working surface and specified force operating range.

1.1.2 This standard provides definitions of the critical parameters necessary to quantify the behavior of multi-axis force measuring platforms and the methods to measure the parameters.

1.1.3 This standard presents methods for the quantification of spatially distributed errors and absolute measuring performance of the force platform at discrete spatial intervals and discrete force levels on the working surface of the platform.

1.1.4 This standard further defines certain important derived parameters, notably COP (center of pressure) and methods to quantify and report the measuring performance of such derived parameters at spatial intervals and force levels across the working range of the force platform.

1.1.5 This standard defines the requirements for a report suitable to characterize the force platform's performance and provide traceable documentation to be distributed by the manufacturer or calibration facility to the users of such platforms.

1.1.6 Dynamic characteristics and applications where the force platform is incorporated in other equipment, such as instrumented treadmills and stairs, are beyond the scope of this standard.

1.1.7 This standard is written for purposes of multi-axis force platform verification; however the methods and procedures are applicable to calibration of force platforms by manufacturers.

1.2 The values stated in SI units are to be regarded as the standard. Other metric and inch-pound values are regarded as equivalent when required.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

E4 Practices for Force Verification of Testing Machines

E74 Practice of Calibration of Force-Measuring Instruments for Verifying the Force Indication of Testing Machines

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *center of pressure (COP), n*—the spatial point in a system at which a single equivalent force balances the sum of both the distributed forces and the distributed moments acting on the system.

3.1.2 *COP error, n*—difference between the COP x-y position reported by the force platform (or calculated from the force platform outputs) and the actual x-y location of the applied Fz verification force.

3.1.3 *crosstalk or crosstalk error, n*—sensitivity of an unloaded output channel corresponding to an unloaded axis when a force or a moment is applied to a different axis.

3.1.4 *force platform origin, n*—the position on the force platform, specified by the manufacturer, where x, y, and z = 0. The origin serves as a reference position for the COP x and COP y locations, locations for uniaxial forces applied during verification, and for calculating output moments due to input forces. The origin may be at a different x-y-z position from the force platform's geometric center. The force platform origin is sometimes called the electro-mechanical origin.

3.1.5 *F_x and F_y, n*—forces orthogonal to F_z, assigned per Fig. 1 which follows the right-hand coordinate system ("right-hand rule") convention for directionality.

¹ This test method is under the jurisdiction of ASTM Committee F04 on Medical and Surgical Materials and Devices and is the direct responsibility of Subcommittee F04.15 on Material Test Methods.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.