



Standard Test Methods for Evaluating Design and Performance Characteristics of Elliptical Trainers¹

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INTRODUCTION

The goal of these test methods is to provide reliable and repeatable methods for the evaluation of elliptical trainers. The equipment user must recognize, however, that a standard alone will not necessarily prevent injuries. Like other physical activities, exercise involving fitness equipment involves the risk of injury, particularly if the equipment is used improperly or not properly maintained. In addition, users with physical limitations should seek medical advice or instruction from the fitness facility, or both, prior to using this equipment. Certain physical conditions or limitations may preclude some persons from using this equipment properly and without increasing the risk of serious injury.

1. Scope

1.1 These test methods specify procedures and equipment used for testing and evaluating elliptical trainers for compliance to Specification F2810. Both design and operational parameters will be evaluated. Where possible and applicable, accepted test methods from other recognized bodies will be used and referenced. In case of a conflict between this document and Specification F2810, Specification F2810 takes precedence.

1.2 *Requirements*—An elliptical trainer is to be tested for all of the following parameters:

- 1.2.1 Endurance,
- 1.2.2 Static loading,
 - 1.2.2.1 Handlebars
 - 1.2.2.2 Foot supports
- 1.2.3 Adjustable guide systems,
- 1.2.4 Control panel,
- 1.2.5 Warnings, and
- 1.2.6 Documentation.

1.3 The values stated in SI units are to be regarded as the standard. The values in parenthesis are for information only.

1.4 *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.*

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2. Referenced Documents

2.1 *ASTM Standards*:²

- F1749 Specification for Fitness Equipment and Fitness Facility Safety Signage and Labels
- F2276 Specification for Fitness Equipment
- F2571 Test Methods for Evaluating Design and Performance Characteristics of Fitness Equipment
- F2810 Specification for Elliptical Trainers

3. Terminology

3.1 *Definitions*—For definitions applicable to this standard, see Specification F2810.

4. Significance and Use

4.1 The purpose of these test methods is to provide reliable and repeatable test methods for the evaluation of elliptical trainers assembled and maintained according to the manufacturer's specifications. Use of these test methods, in conjunction with Specification F2810, is intended to ensure appropriate performance and reliability of an elliptical trainer and reduce the risk of serious injury from design deficiencies.

5. Sample Preparations

5.1 Assemble and adjust the elliptical trainer on a horizontal surface according to the manufacturer's instructions. On trainers that are fully assembled, verify according to the manufacturer's instructions that all components are functioning and that

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.

they have been adjusted and aligned properly. Unless otherwise stated, the trainer must pass the following tests without adjustment from this initial condition. Apply power to, if required, or use the trainer and verify that the unit functions properly. If the unit is equipped with a guide system, operate it through its full range.

5.2 The individual test methods will describe any variations or modifications that are required to the test sample.

5.3 Upon completion of the tests the equipment shall function as intended by the manufacturer.

6. Test Methods and Procedures

6.1 In addition to the tests specified in Test Methods **F2571**, elliptical trainers shall be evaluated as follows:

6.2 Exterior Design:

6.2.1 *Foot Supports*—The purpose of this test is to evaluate the dimensions of the foot supports used on the sample.

6.2.1.1 *Apparatus and Set Up*—The sample shall be set up as described in **5.1**.

6.2.1.2 *Calibration*—Verify that the measurement device is properly calibrated and has a resolution of 1 mm (0.04 in.).

6.2.1.3 *Procedure*—Measure the dimensions of the slip resistant area of the pedal. Measure the guard heights of the pedal at the front and inside edge.

6.2.1.4 *Pass/Fail Criteria*—The dimensions of the slip resistant surface of each pedal shall be at least 300 mm (11.8 in.) long and 100 mm (3.9 in.) wide. The guard heights of the pedal shall be at least 30 mm (1.2 in.) along the front and 12 mm (0.5 in.) along the inside edge.

6.2.1.5 Precision and Bias:

(1) *Precision*—The precision of this test method has not been determined.

(2) *Bias*—The bias of this test method includes quantitative estimates of the uncertainties of the measuring devices, the calibrations of testing equipment and the skill of the operators. At this time, the statements on bias should be limited to documented performance of particular laboratories.

6.2.2 *Handlebars*—The purpose of this test is to verify the existence of the handlebar.

6.2.2.1 *Apparatus and Set Up*—The sample shall be set up as described in **5.1**.

6.2.2.2 *Calibration*—No calibration required.

6.2.2.3 *Procedure*—Visually verify the presence of a handlebar.

6.2.2.4 *Pass/Fail Criteria*—The handlebar must be present.

6.2.2.5 *Precision and Bias*—No information is presented about either the precision or bias of this test since the test result is non-quantitative.

6.2.3 *Movable Handlebar Design*—The purpose of this test is to evaluate the dimensions of the movable handlebars used on the sample.

6.2.3.1 *Apparatus and Set Up*—The sample shall be set up as described in **5.1**.

6.2.3.2 *Calibration*—Verify that the measurement device is properly calibrated and has a resolution of 1 mm (0.04 in.).

6.2.3.3 *Procedure*—Measure the dimensions of the end portion of the movable handlebar. The evaluator shall also use

the elliptical trainer per the manufacturer's instructions and observe the orientation of the end portion of the movable handlebars with respect to the head of the evaluator throughout the range of travel of the movable handlebars.

6.2.3.4 *Pass/Fail Criteria*—The dimension of the end portion of the movable handlebar shall be at least 50 mm (1.97 in.) in diameter. Alternately, if the end portion of the movable handlebars is always angled away from the user during operation of the elliptical trainer then it shall be concluded that the movable handlebars meet the requirements of the specifications.

6.2.3.5 Precision and Bias:

(1) *Precision*—The precision of this test method has not been determined.

(2) *Bias*—The bias of this test method includes quantitative estimates of the uncertainties of the measuring devices, the calibrations of testing equipment and the skill of the operators. At this time, the statements on bias should be limited to documented performance of particular laboratories.

6.3 *Endurance*—The purpose of this test is to confirm the endurance of the main components of the elliptical trainer. Load input to the elliptical trainer can be accomplished by securing weight to the foot pedals and lifting the weight using pneumatic cylinders, or by pushing down with pneumatic cylinders (with or without weight). Regardless of how the load is input to the elliptical trainer under test, careful consideration shall be given by the testing facility as to how the test apparatus is constructed. The testing facility shall communicate with the manufacturer prior to commencing the test and verify that the apparatus functions and loads the elliptical trainer in a manner similar to how a user would actually use and interface with the elliptical trainer. **Figs. 1 and 2** illustrate pneumatic apparatuses that have been used successfully to conduct endurance testing. The elliptical trainer shown in **Fig. 2** is driven by the two pneumatic cylinders which are attached to the footplates of the device under test. The cylinders can be pivoted or mounted to linear bearings on the test apparatus frame so that the cylinders

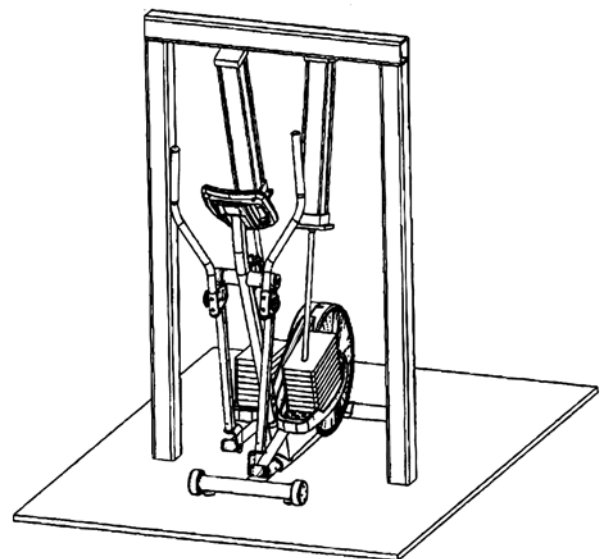


FIG. 1 Isometric View of a Pivoting Test Apparatus