SFI FOUNDATION INC.™

QUALITY ASSURANCE SPECIFICATIONS™

SFI SPECIFICATION 1.1 EFFECTIVE: NOVEMBER 9, 2001*

PRODUCT: Replacement Flywheels and Clutch Assemblies

1.0 GENERAL INFORMATION

1.1 This SFI Specification establishes uniform test procedures and minimum standards for evaluating and determining performance capabilities for Replacement Flywheels and Clutch Assemblies used by individuals engaged in competitive motorsports.

1.2 The procedures, test evaluations and standards contained herein, are intended only as minimum guidelines for construction and evaluation of products. Certification that products meet such minimum standards is made by the product manufacturer and products are not certified, endorsed or approved by SFI under this program.

1.3 Use of the "This Manufacturer Certifies That This Product Meets SFI Specification 1.1" logo/designation, the authorized artwork style, or conventional lettering by a manufacturer, on a subject product, is intended only to indicate that the manufacturer of the product has represented that they have submitted the product to the recommended tests, with positive results, in compliance with the standards established herein.

1.4 This SFI Specification requires a demonstration that the product of a manufacturer meets or exceeds the requirements when the manufacturer enters the program; and on a periodic basis thereafter. Any manufacturer may participate in the program by providing Replacement Flywheels and Clutch Assemblies that meet or exceed the SFI Specification 1.1 test standards, by complying with the requirements of the SFI Specification 1.1 program, and by signing a licensing agreement with the SFI Foundation, Inc.

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1.5 Compliance with this specification is entirely voluntary. However, when a manufacturer provides Replacement Flywheels and Clutch Assemblies in compliance with all requirements of the SFI Specification 1.1 and enters into the licensing agreement with the SFI Foundation, Inc., they may certify that compliance with such standards is in accordance with the guidelines established herein.

1.6 Manufacturers wishing to participate in the program, in addition to the other requirements of this specification, must label each of their products with the manufacturer's name, trademark or symbol as well as the date of manufacture of the product.

1.7 No manufacturer may display the SFI logo/designation on their product unless the manufacturer has signed a licensing agreement with SFI and has successfully complied with all the requirements of this specification and the self-certification program.

2.0 DEFINITIONS

2.1 Replacement Flywheels and Clutch Assemblies are aftermarket products for racing applications that replace stock components.

2.2 Components evaluated under this specification include flywheels, friction discs, pressure plate rings (donuts), pressure plate covers (hats) and fasteners.

2.3 All components shall be inspected every two years by the original manufacturer for recertification. When the components are determined to be acceptable for continued service, a new conformance label marked with the inspection date shall be used. The recertification serial number shall also be permanently marked on the component beneath the original serial number.

2.4 A Certification Card is as a document provided by the original manufacturer indicating the serial number(s) of all components in the clutch assembly to be certified by the original manufacturer as being in conformance with this specification.

3.0 CONSTRUCTION

3.1 NON-ACCEPTABLE MATERIALS

Metallurgical material tests relative to mechanical and physical properties of Replacement Flywheels and Clutch Assemblies manufactured from cast (gray) iron; sand, die or permanent mold castings of aluminum or magnesium indicate marginal performance and therefore are not acceptable.

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3.2 ACCEPTABLE MATERIALS

Replacement Flywheels and Clutch Assemblies manufactured from pearlitic, malleable, ductile iron, mild and cold finished steel, age hardenable steel, wrought aluminum, magnesium forgings and titanium appear adequate for racing use provided that they exhibit acceptable mechanical properties shown in Table 1 on Page 5. As new technology is developed, it will be considered for application.

3.3 FLYWHEEL AND CLUTCH ASSEMBLY CAP SCREWS

The quality of cap screws attaching the pressure plate assembly to the flywheel and the flywheel to the crankshaft is extremely important. Because of poor strength characteristics, cap screws made from low carbon steels can cause failure. Cap screws with minimum mechanical properties of 150,000 psi (10,545kg/cm^2) tensile, 130,000 psi (9,139kg/cm^2) yield and 12% elongation are required. Grade 8 (Class 10.9) fasteners are recommended and meet this requirement.

4.0 MODEL CLASSIFICATION

A change of material or construction method constitutes a model change. If all other factors remain the same, a dimensional change in outside diameter or mounting bolt patterns is not considered a model change.

5.0 TESTING

Two tests are specified. For a component to qualify, it shall be subjected to and successfully pass at least one of the tests. The four major components (flywheel, friction disc, pressure plate ring (donut) and pressure plate cover (hat) shall be tested. If the manufacturer does not make or wish to certify all of the major components, then only those applicable need be tested.

5.1 MECHANICAL PROPERTIES

5.1.1 SAMPLES

Test bars used in determining mechanical properties shall be machined from finished products. Use of standard test bars of a like material are not acceptable.

5.1.2 APPARATUS

A standard tensile test machine shall be used. The machine shall be capable of applying the required tensile load in accordance with ASTM E-8, and shall have adequate instrumentation to verify the test load. The test machine shall also be in calibration and traceable to the National Institute of Standards and Technology.

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5.1.3 PROCEDURE

Record the physical dimensions of the test bar. Increase the tensile load until the test bar breaks. Record the load and elongation in accordance with ASTM E-8 test procedures.

5.1.4 INTERPRET RESULTS

Determine the yield strength, tensile strength and elongation for each sample.

5.2 ROTATIONAL INTEGRITY

Due to the variety of components and applications, and the engines they are used on, a set rotational speed is not given. The test rotational speed shall be 150 percent of the maximum engine speed that the component will be subjected to in actual service. The maximum engine speed shall be furnished by the submitting manufacturer. It is acceptable to test more than one component in one test. It is recommended that a flywheel and clutch assembly be tested as a unit.

5.2.1 SAMPLES

For a given model, the largest outside diameter shall be tested. In addition, flywheels shall be tested with the smallest crankshaft mounting bolt pattern.

5.2.2 APPARATUS

The test fixture shall provide an environment similar to the rear portion of an engine block. A suitable containment chamber shall be used to protect test personnel. It shall incorporate the following features:

A. A tachometer with an accuracy of $\pm$2% at the test speed.

B. A spindle that can be driven to the required rotational speed of the test and allow attachment of the tachometer. The spindle shall accept the component(s) in a manner similar to actual use and allow it to be attached rigidly and concentrically. An adapter shall be used if a component is not capable of being mounted on its own.

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5.2.3 PROCEDURE

A. Mount the component(s) to the spindle and attach the tachometer.

B. The component(s) shall be driven to a minimum rotational speed of 150 percent of the maximum engine speed as provided by the submitting manufacturer and maintained at that level for one hour.

5.2.4 INSPECTION

Upon completion of the test, the component(s) shall be examined for signs of failure, such as cracks, by either Fluorescent Dye Penetrant Inspection or Magnetic Particle Inspection.

6.0 PROOF OF COMPLIANCE

Replacement Flywheel and Clutch Assembly manufacturers are required to provide the following information to enroll in this program:

6.1 LETTER OF CERTIFICATION

For initial design validation, a letter of certification shall be submitted. It shall include the name, title and signature of a representative from the manufacturer along with the date signed. The letter shall state that all component parts incorporated into the product are new and not reconditioned or reclaimed. Previously sold assemblies rebuilt by the original manufacturer can be recertified by using new, certified replacement parts.

6.2 TEST RESULTS

Test results shall be documented in a test report. A component shall successfully pass one of the two tests.

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6.2.1 MECHANICAL PROPERTIES

For the material used, the component shall have mechanical properties in accordance with minimums listed in Table 1.

Table 1

Material	Minimum Yield Strength psi (kg/cm²)	Minimum Tensile Strength psi (kg/cm²)	Minimum Percent Elongation
Pearlitic, Malleable and Ductile Iron	40,000 (2,812)	60,000 (4,218)	10
Mild and Cold Finished Steel	40,000 (2,812)	60,000 (4,218)	10
Age Hardenable Steel	100,000 (7,030)	120,000 (8,346)	10
Wrought Aluminum	35,000 (2,461)	42,000 (2,953)	8
Magnesium Forgings/AZ80A-T5 (example)	34,000 (2,390)	50,000 (3,515)	6
Titanium / Ti-6AL 4V (example)	125,000 (8,788)	135,000 (9,491)	10

6.2.2 ROTATIONAL INTEGRITY

The test shall be considered successful when the component does not fail during the rotational test and post inspection does not reveal signs of failure such as cracks, discontinuities or elongation.

7.0 TEST REPORTS

A separate test report, or set of test reports if required, shall be submitted for each product model. If more than one test facility is required to complete all necessary tests, then a separate test report shall be submitted from each one. A test report shall be submitted for each component, if tested separately. The test facility shall assign a unique number to each test report. This number along with the report date and page number shall appear on each page. Each test report shall include:

7.1 RELEVANT INFORMATION

7.1.1 Manufacturer's name, contact name, address and telephone number.

7.1.2 Name, address and telephone number of the test facility.

7.1.3 Name and signature of the responsible test supervisor.

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7.1.4 Actual date of the test.

7.1.5 Specification number and effective date.

7.1.6 Product name, description and model designation.

7.1.7 Component name and description.

7.1.8 Photograph of the submitted component.

7.2 TESTS

Each test conducted shall be listed showing the test name, apparatus used, procedure used and test results obtained along with any other appropriate information.

7.3 AUTHENTICATION

Test reports shall be authenticated and stamped by a Professional Engineer who is registered in the state in which the testing is conducted. If necessary, SFI may allow an equivalent entity to provide authentication.

8.0 INITIAL DESIGN VALIDATION

To receive initial recognition from SFI as a participant in the SFI Specification 1.1 Program, the manufacturer must submit to SFI all information delineated in the Proof of Compliance section. This information shall be provided for each Replacement Flywheel and Clutch Assembly model offered by the applicant that is to be included in the program. Any change in design, materials and/or methods of manufacturing not specifically excluded is considered a model change and, therefore, requires initial design validation.

Note: If a model certification is based on a successful rotational integrity test of a component with the largest diameter and/or smallest crankshaft mounting bolt pattern, then a component variation shall not be considered certified under this model if it is later produced with a larger diameter and/or smaller crankshaft mounting bolt pattern unless it is also successfully tested.

9.0 PERIODIC REVALIDATION

Test reports with successful test results must be submitted to SFI at least once every 24 month period following the date of the initial design validation test for each model of Replacement Flywheel and Clutch Assembly manufactured by the participant. If multiple test reports are required to obtain all test results, then the earliest test date shall be used to determine when the periodic revalidation reports are due. Also, SFI shall retain the option to conduct random audit reviews. SFI shall purchase the product on a commercial basis and test for compliance to the specification. The submitting manufacturer shall reimburse SFI for all audit costs.

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10.0 CERTIFICATION OF COMPLIANCE

Upon demonstration of successful compliance with all the requirements of the specification and the self-certification program and upon entering the licensing agreement with SFI, the manufacturer may advertise, present and offer the Replacement Flywheels and Clutch Assemblies for sale with the representation that their product meets the SFI Specification 1.1. Continuing certification is contingent upon the following additional considerations: (1) the product shall be resubmitted for testing following any change in design, materials and/or methods of manufacturing not specifically excluded, and (2) periodic revalidation test reports are submitted when due to SFI.

11.0 CONFORMANCE LABELS

The conformance label is a sticker which shall be placed on the flywheel and on each major component of the clutch assembly. The flywheel, friction disc, floater plates, pressure plate ring (donut) and pressure plate cover (hat) must each have a label. Alternately, the conformance label may be placed on a certification card. Besides placing the label on the component or card, the serial number of the label shall be permanently marked on the component. The permanently marked number should be on the outside or outer perimeter, if possible. The serial numbers should also appear on the customer invoice to aid in identification and tracking.

11.1 ACTIVATION OPTION

All parts to be certified to SFI 1.1 are shipped with SFI conformance labels affixed, or labels on certification cards as specified elsewhere in this specification. The manufacturer may also include a certification activation form for use if time of certification is lost due to the chain of commerce. The certification activation form is submitted to the manufacturer by the end purchaser via mail or electronically, with a copy of proof of purchase and the existing SFI conformance label original serial number. The manufacturer will then mail to the end purchaser a certification activation card which 1) has a new SFI 1.1 serialized label attached; 2) displays the original SFI 1.1 conformance label serial number; 3) indicates a current activation date to the purchaser. The certification of the product will then extend two years from the activation date. The form must be submitted within 30 days of initial purchase and submitted only by the original purchaser. This process is only valid for initial activation of the certification time period and is not to be used for re-certification.

12.0 DECERTIFICATION

Participating manufacturers are subject to decertification when not in compliance with the requirements of this program or when their products are not in compliance with the requirements of this specification. Decertification will provide SFI the right to effect any and all remedies which are available to SFI in the licensing agreement.

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13.0 APPEAL PROCEDURE

In the event of decertification, the manufacturer is entitled to an appeal of the decision of SFI. Requests for appeal must be received by SFI no later than thirty days following receipt of the notice of decertification. Appeals of such decisions will be heard at the next meeting of the Board of Directors of SFI.

14.0 STATEMENT OF LIMITATIONS

Testing procedures and/or standards contained in this specification are intended for use only as a guide in determining compliance with the minimum performance requirements as defined herein. The granting and assignment of the "This Manufacturer Certifies That This Product Meets SFI Specification 1.1" logo/designation is in no way an endorsement or certification of product performance or reliability by SFI. SFI, its officers, directors and/or members assume no responsibility, legal or otherwise, for failure or malfunctions of a product under this program.

15.0 COSTS

All costs involved in this program will be absorbed by the submitting manufacturer.

16.0 COMPLIANCE PERIOD

As this specification is revised to reflect changes in technology and/or field conditions, to remain current, participating manufacturers in the SFI Specification 1.1, Replacement Flywheels and Clutch Assemblies, Program, must demonstrate full compliance with the requirements of this specification within ninety (90) days of the latest effective date.

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