SFI FOUNDATION INC.™

QUALITY ASSURANCE SPECIFICATIONS™

SFI SPECIFICATION 61.1 EFFECTIVE: JUNE 26, 2020

PRODUCT: Turbochargers

1.0 GENERAL INFORMATION

1.1 This SFI Specification establishes uniform test procedures and minimum standards for evaluating and determining performance capabilities for Turbochargers 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 61.1" 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 Turbochargers that meet or exceed the SFI Specification 61.1 test standards, by complying with the requirements of the SFI Specification 61.1 program, and by signing a licensing agreement with the SFI Foundation, Inc.

1.5 Compliance with this specification is entirely voluntary. However, when a manufacturer provides Turbochargers in compliance with all requirements of the SFI Specification 61.1 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 Turbochargers: A supercharger powered by the engine's exhaust gasses.

2.2 Turbine: A wheel in a turbocharger driven by exhaust gasses.

2.3 Turbine Housing: A rigid housing that encloses the Turbine and directs exhaust flow to the Turbine Wheel.

2.4 Compressor: The section of the Turbocharger which supplies air at increased pressure to the engine.

2.5 Cross Bolts: Bolts for the retention of a turbine axially exiting the Turbine Housing into the Turbine Outlet.

2.6 Turbocharger Shaft: Shaft to which the Compressor and Turbine Wheels are mounted.

2.7 Turbocharger Assembly components must be inspected every two years by the original manufacturer for recertification. After inspection, when the parts 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.

2.8 The Certification Card is a document provided by the original manufacturer indicating the part number(s) of all components in the Turbocharger assembly to be certified by the original manufacturer as being in conformance with this specification.

2.9 Any Turbocharger Assembly pertaining to this specification shall remain as constructed by the original manufacturer and not modified.

2.10 Similar Material: For the purposes of this specification, is a material having yield strength, and tensile strength, and elongation within 5% of another material. See 6.3.2 MECHANICAL PROPERTIES.

3.0 CONSTRUCTION

Turbine Housings must be constructed in order to prevent the radial escape of material in the event of a catastrophic failure of the turbine.

Grade 5 or higher Cross Bolts with a minimum diameter of 3/8” must be installed in the turbine housing outlet, perpendicular to each other, and perpendicular to the turbocharger shaft. The centerline of a Cross Bolt must be less than 2” from the nose of the turbine wheel.

3.1 MINIMUM BURST TEST SPEEDS

The Minimum Burst Test Speed will represent a minimum Turbine Wheel Tip speed of 700 meters per second. Minimum Burst Test Speed in revolutions per minute may be calculated with the following formula:

(700 / wheel tip circumference m) x 60 = Minimum Burst Test Speed (rpm)

Example; for a 102 mm tip diameter the circumference in meters would be (102 x pi) / 1000 = .3203 m, and the minimum burst test speed would be:

(700 / .3203) x 60 =131,127 rpm

4.0 MODEL CLASSIFICATION

A change of material or construction design constitutes a model change. Any lesser thickness in turbine housing construction constitutes a model change.

The following variations of the turbocharger assembly by the original (certifying) manufacturer, individually or combined, do not constitute a model change if all other factors remain the same: A greater turbine housing thickness, a lesser A/R ratio, a variation of the turbine inlet flange, a smaller diameter and lighter turbine wheel, a variation of the compressor side of the turbocharger.

5.0 TESTING

Test samples shall be fully processed new Turbocharger Assemblies which are representative of Turbochargers currently produced or to be produced.

5.1 ROTATIONAL INTEGRITY

5.1.1 SAMPLES

For a given model, the Turbocharger assembly with the largest Turbine diameter shall be tested.

5.1.2 APPARATUS

The test fixture shall provide an environment similar to a Turbocharger mounted near an engine. A suitable containment chamber shall be used to protect test personnel. It shall incorporate the following features:

A. A tachometer with an accuracy of ±2% at 130,000 revolutions per minute {rpm}, to be installed in the compressor side of the Turbocharger.

B. A machine that can provide heated compressed gasses capable of spinning the Turbocharger shaft and wheel assembly to a point of failure.

C. A self-contained pressure oiling system per the manufacturer's recommendations.

5.1.3 PROCEDURE

A. The Turbine Wheel shall be modified to explode at a speed no less than indicated in section 3.1.

B. The Turbocharger assembly shall have a tachometer probe installed on the compressor side, (which may be modified for the purposes of reducing load), and installed onto the test fixture.

C. The Turbocharger assembly and oil will be pre-heated to duplicate operating conditions.

D. The Turbocharger shaft and wheel assembly shall be driven by compressed air or exhaust gasses at a minimum temperature of 1000 degrees F to a point of burst failure of the Turbine Wheel at no less than speeds indicated in section 3.1.

5.2 MECHANICAL PROPERTIES

5.2.1 SAMPLES

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

5.2.2 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.

5.2.3 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.

5.2.4 INTERPRET RESULTS

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

6.0 PROOF OF COMPLIANCE

Turbocharger 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 DESIGN

Photographs of the assembly from each side, and lists of the following information must be submitted:

Model #
Material of the turbine housing (general, not specific alloy; e.g. Cast Iron)
Turbine wheel material (general)
Weight of the turbine housing
Inside Diameter of the Turbine Housing Inlet and Outlet
Diameter of the turbine wheel
Number of blades on the turbine wheel
Diameter(s) of the shaft
Bearing Type (ball or sleeve)

6.3 TEST RESULTS

Test results shall be documented in a test report.

6.3.1 ROTATIONAL INTEGRITY

The test shall be considered successful if no part penetrates the Turbine Housing, and if the Turbine Housing and Turbine Outlet remain attached to each other and to the Turbocharger assembly during the rotational test.

6.3.2 MECHANICAL PROPERTIES

For the material used, each sample shall have mechanical properties recorded for the purpose of confirming a similar material is used in subsequent production.

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.

7.1.4 Actual date of the test.

7.1.5 Specification number and effective date.

7.1.6 Product name, description, model designation, and photographs from at least 2 angles.

7.1.7 Component name and description.

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 61.1 Program, the manufacturer must submit to SFI all information delineated in the Proof of Compliance section. This information shall be provided for each Turbocharger 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: A model certification is based on a successful rotational integrity test of a Turbocharger with the largest Turbine diameter. A Turbocharger variation shall not be considered certified under this model if it is later produced with a larger Turbine diameter or a heavier Turbine Wheel.

9.0 PERIODIC REVALIDATION

Rotational Integrity and tensile 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 Turbocharger manufactured by the participant. After the second retest cycle following the initial design validation rotational and tensile tests (a total of three test occurrences each), successful tensile test results must be submitted to SFI at least once every 24 months, and rotational testing is not required for regularly scheduled revalidation. 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, including the rotational integrity test. SFI shall purchase the product on a commercial basis and test for SFI Spec 61.1 compliance to the specification. The submitting manufacturer shall reimburse SFI for all audit costs.

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 Turbochargers for sale with the representation that their product meets the SFI Specification 61.1. 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 Turbocharger Certification Card. The serial number should appear on the customer invoice to aid in identification and tracking. In addition to the Certification Card provided by the original manufacturer, the serial number of the label shall be permanently marked on the component bearing housing or compressor backing plate, and also marked on the turbine housing. The permanently marked numbers should be visible when the Turbocharger is installed on the vehicle, if possible.

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.

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 61.1" 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 61.1 Turbocharger Program, must demonstrate full compliance with the requirements of this specification within ninety (90) days of the latest effective date.

Version	Date	Comments
Original Issue	12/04/12	initial
Reviewed	12/14/13	
Revised	2/26/14	
Reviewed	12/12/15	
Reviewed	12/7/17	
Revised	4/20/18	Inspection / re-certification requirement changed from one year to two years
Reviewed	12/12/19	
Revised	6/26/20	Change to revalidation testing requirements