



Standard Test Method for Evaluating Machining Performance of Ferrous Metals Using an Automatic Screw/Bar Machine¹

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INTRODUCTION

This test method was written to fill a requirement for a standard test for determining the machinability of ferrous metals using automatic screw/bar machines. (Hereafter, these machines will be referred to as automatic screw machines.) Although a variety of short-time laboratory tests have demonstrated different machining characteristics among ferrous metals, it has been difficult to apply the resulting data to commercial automatic screw machine practice.

In this test method a standard test piece is machined using tools and machining operations typical of automatic screw machine practice.

Through the use of this test method, the relative machining performance of a metal can be evaluated even though different automatic screw machines are used. Further, comparisons can be made among different lots of the same grade or different grades to determine relative machining performance.

1. Scope

1.1 This test method covers a production-type test for evaluating the machining performance of ferrous metals as they are used in single-spindle or multiple-spindle automatic screw machines. It is based on producing parts of a standard design in such machines to uniform levels of quality with respect to surface roughness and size variation. The standard test piece, designed for this test, is machined from bars using a specified number of tools in a specified sequence. Nothing in this test method should be construed as defining or establishing limits of acceptability for any grade or type of metal.

1.2 *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 *American National Standard:*
B46.1 Surface Texture²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *average surface roughness (per set of samples)*—for each surface (the major and minor diameter formed surfaces)

the surface roughness per set of samples is the average of the roughnesses recorded as in 3.1.5.1 for the six test pieces per set. A test set is described in 9.3.

3.1.2 *calculated hourly production rate (in pieces per hour)*—3600 s/h divided by the cycle time in seconds per piece. (Unit: pieces per hour.)

3.1.3 *cycle time*—the time in seconds per piece from bar feed-out to bar feed-out, or from cutoff to cutoff, during uninterrupted operation of the machine. It includes all stock, machine, and tool movements.

3.1.4 *surface speed*—the product of the original bar circumference (in feet or metres) and the spindle speed in revolutions per minute. (Unit: ft/min or m/min.)

3.1.5 *surface-roughness average value (R_a)*—the surface-roughness average value is the mean reading around which the needle tends to dwell or fluctuate under small amplitude when a continuously averaging meter is used. (Refer to 3.8.1.1 in ANSI B46.1). The surface-roughness value obtained by a continuously averaging digital readout meter is acceptable.

3.1.5.1 The surface-roughness recorded for each surface on the test piece is the maximum of the surface-roughness average values measured on that surface at a minimum of four places equispaced around the circumference and measured as described in 3.1.5.

3.1.6 *surface-roughness range (per set of samples)*—the lowest and highest values of the surface roughnesses recorded for each surface as in 3.1.5.1 for each set.

3.1.7 *surface-roughness range (per test)*—the lowest and highest values of surface roughnesses recorded for each surface as in 3.1.5.1 during the test.

3.1.8 *theoretical hourly production rate (in pieces per*

¹ This test method is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A1.15 on Bars.

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² Available from American National Standards Institutes, 11 West 42nd Street, 13th Floor, New York, NY 10036.