ASME B5.60-2002

WORKHOLDING CHUCKS: JAW TYPE CHUCKS

Incorporating ASME B5.60.1 and ASME B5.60.4

AN AMERICAN NATIONAL STANDARD

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ASME B5.60.6 Chuck Assembly: Sizes and Designation (to be added)

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FOREWORD

During the review, revision, and update of the existing inch-based American National Standard B5.8 on Chucks and Chuck Jaws, Technical Committee 11 of the ASME B5 Committee on Machine Tools recognized the need for an industry standard on metric-dimensioned chucks.

This Standard was developed after reviewing currently available national and international standards, which were used as its foundation.

B50.60.1 and B5.60.4 were completed in November 1999 and submitted to ASME.

The standard titled, *Workholding Chucks: Jaw Type Chucks,* comprises six parts, with each covering a specific aspect of workholding chucks, as follows:

ASME B5.60.1: General Description and Definitions of Terms
ASME B5.60.2: Chuck-to-Spindle Interface
ASME B5.60.3: Jaw Mountings
ASME B5.60.4: Performance Testing
ASME B5.60.5: Safety Code of Practice
ASME B5.60.6: Chuck Assembly: Sizes and Designation

ASME B5.60.1 was approved by the American National Standards Institute on June 26, 2002.
ASME B5.60.4 was approved by the American National Standards Institute on June 26, 2002.
ASME B5.60.2, ASME B5.60.3, ASME B5.60.5, and ASME B5.60.6 will be added.

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Proposed Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible: citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Attending Committee Meetings. The B5 Main Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B5 Main Committee.

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PREFACE

ORGANIZATION OF THIS DOCUMENT

This Standard compiles the following standards.

Standard	*Title*
ASME B5.60.1	General Description and Definitions of Terms
ASME B5.60.2	Chuck-to-Spindle Interface (to be added)
ASME B5.60.3	Jaw Mountings (to be added)
ASME B5.60.4	Performance Testing
ASME B5.60.5	Safety Code of Practice (to be added)
ASME B5.60.6	Chuck Assembly: Sizes and Designation (to be added)

ADDENDA SERVICE

This edition of ASME B5.60 includes an automatic addenda subscription service up to the publication of the next edition. The addenda subscription service will include the additional B5.60 documents not already included in the initial publication, and approved revisions to the existing parts.

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ASME B5.60.1

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GENERAL DESCRIPTION AND DEFINITIONS OF TERMS

1 INTRODUCTION

This American National Standard establishes technical requirements for workholding chucks used primarily in turning operations. It covers jaw type chucks whether manual or power-operated.

2 SCOPE

This Part of the ASME B5.60 standard covers the General Description and Definitions of Terms related to jaw type workholding chucks.

3 TYPES OF JAW CHUCKS BY DESIGN

self-centering chuck: a chuck in which all jaws move to or away from the workpiece and maintain one common center.

compensating chuck: a chuck in which jaw(s) move to or away from the workpiece without altering the position of the workpiece.

independent chuck: a chuck in which each individual workholding jaw is moved to or from the workpiece without disturbing the position of any other jaw.

An example of a power chuck assembly is presented in Fig. 1.

4 METHODS OF ACTUATION

manual: a chuck that is actuated by hand with the aid of human energy (e.g., by means of a chuck wrench). Refer to Fig. 2.

power: a chuck that is actuated by means of pneumatic, hydraulic, or electrical energy, etc. Refer to Fig. 3.

5 DEFINITIONS

actuator: a component within a chuck's body, used to operate the chuck's mechanism, such as a wedge, lever, scroll, etc.

base jaw: see *master jaw.*

centrifugal force: force generated by rotation that tends to move all parts away radially from the axis of rotation of the chuck.

chuck adapter: interface between the machine and the chuck. It can be a separate component or integral to chuck body.

chuck body: that part of the chuck that contains the actuator and master jaws.

clamping cylinder: device that actuates the chuck through a draw bar or draw tube with the aid of pneumatic or hydraulic energy.

clamping force: algebraic sum of the individual radial forces applied by the top jaws on the workpiece.

clamping torque: product of the clamping force, clamping radius, and the coefficient of friction between the top jaw(s) and the workpiece.

countercentrifugal chuck: a chuck in which there is a system that permits compensation for the loss of clamping force due to centrifugal force.

draw bar: a bar or tube that connects the clamping cylinder to the chuck's actuator to transmit the input force to the chuck.

dynamic clamping force: actual clamping force when the chuck is rotating.

hysteresis: change in static clamping force after the chuck has been rotated at working rotational speed with a constant input force.

indicating band: a diameter on the chuck body designated for measuring runout of a chuck.

input force: force acting on the chuck's actuator, applied from an external energy source.

input torque: torque acting on the chuck's actuator, applied from an external energy source.

master jaw: radial moving part within the chuck body to which the top jaw is mounted.

maximum rotational speed: maximum rotational speed in RPM specified by the manufacturer for a

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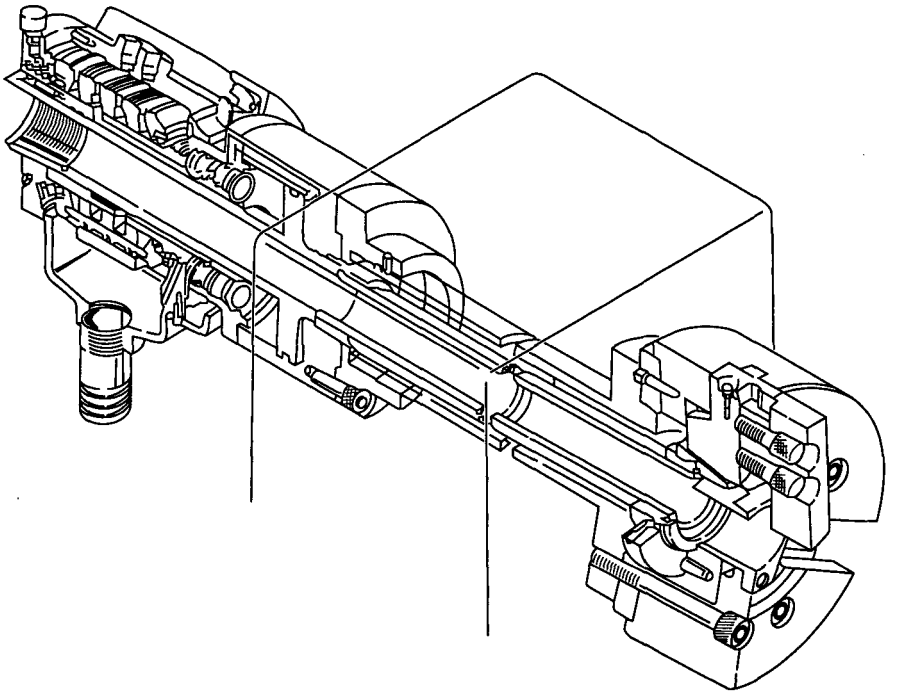


FIG. 1 EXAMPLE OF A POWER CHUCK ASSEMBLY

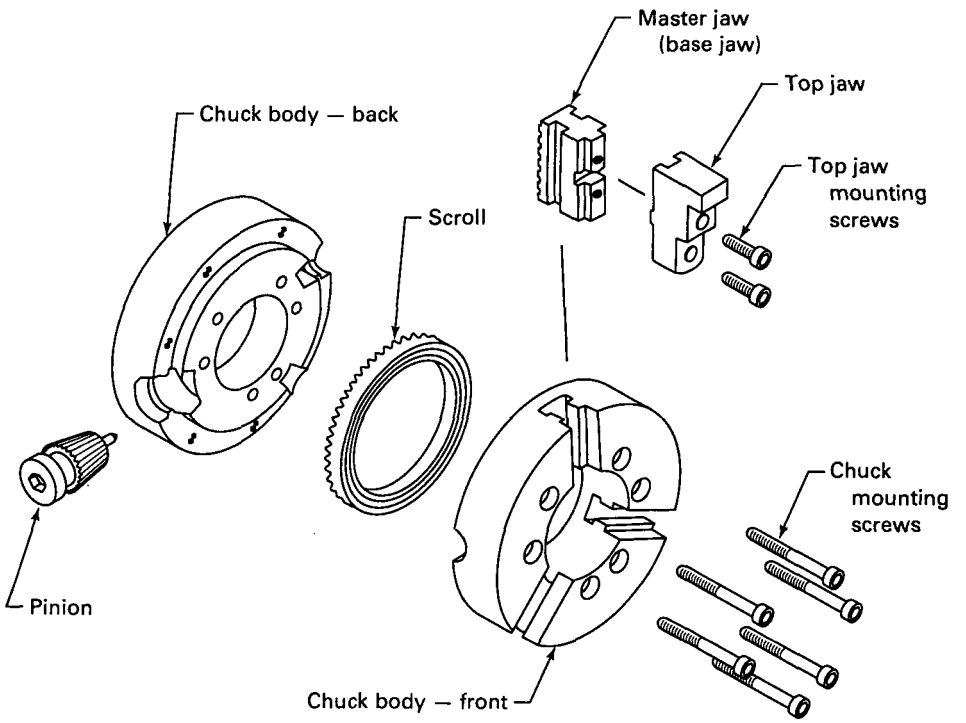


FIG. 2 EXPLODED VIEW OF A TYPICAL MANUAL CHUCK

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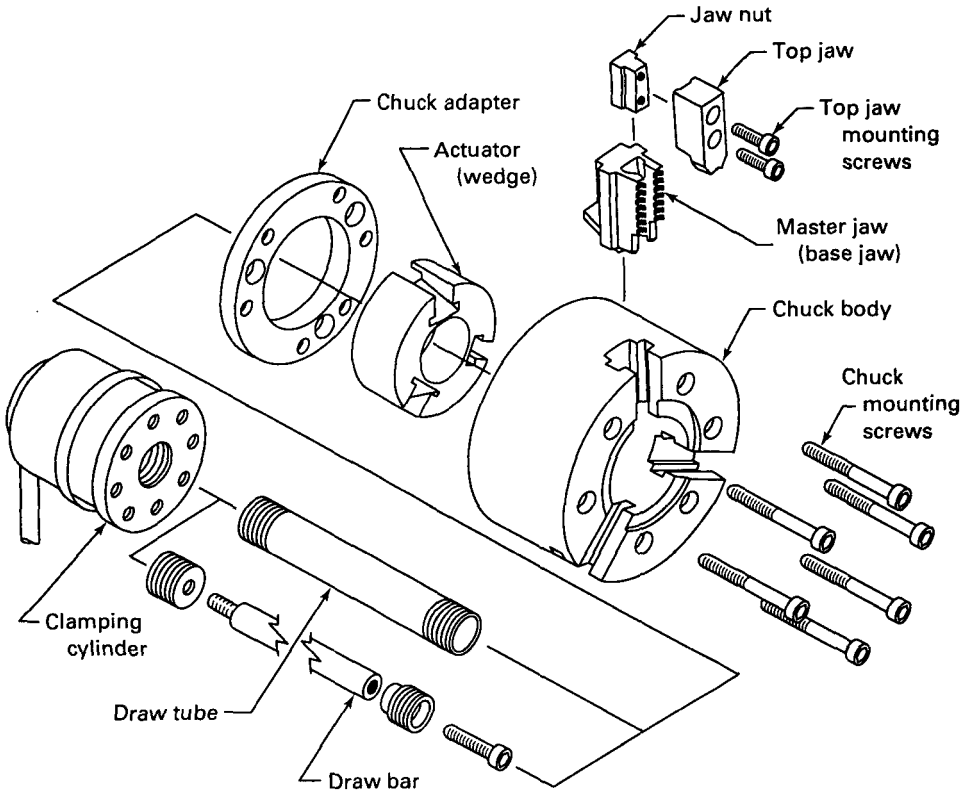


FIG. 3 EXPLODED VIEW OF A POWER CHUCK

chuck with standard jaws in compliance with the manufacturer's instructions.

maximum static clamping force: maximum clamping force obtained when the maximum permissible input force (or maximum input torque) is applied to a particular chuck.

moment of inertia: moment of inertia with respect to a given axis is the limit of the sum of the products of the mass of each of the elemental particles in which the body may be conceived to be divided and the square of their distance from the given axis.

rotational balance: equilibrium of all masses around the axis of rotation [any difference(s) between the axis of rotation and the center of gravity will cause imbalance].

static clamping force: clamping force of the chuck when the chuck is not rotating.

top jaw: component that clamps the workpiece and is mounted on a master jaw.

workholding chuck: a clamping device with moveable jaw(s) to hold a workpiece, designated hereinafter as "chuck."

working rotational speed: rotational speed in RPM under machining conditions.

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PERFORMANCE TESTING

1 INTRODUCTION

This American National Standard establishes technical requirements for workholding chucks used primarily in turning operations. It covers jaw type chucks whether manual or power-operated.

2 SCOPE

This Part of the ASME B5.60 standard covers geometric test procedures for measuring accuracy of self-centering jaw-type chucks. It addresses the procedures for the inspection of rotational and axial accuracy, centering, and repeatablity of the chuck by using a qualified test piece.

NOTE: For specific limits and specifications, contact the chuck manufacturer.

3 SPINDLE VERIFICATION

All the geometric tests to be carried out involve chuck rotation. The mounting of the chuck may be made either directly on the test spindle (Fig. 1) or with an adapter placed between the spindle and the chuck (Fig. 2). Where an adapter is used, these tests shall be carried out on the adapter that has been mounted on the spindle. This spindle or adapter shall have been previously tested for the accuracy of size, centering, and concentricity with the spindle axis and absence of camming of the spindle or adapter.

4 GEOMETRIC TESTS

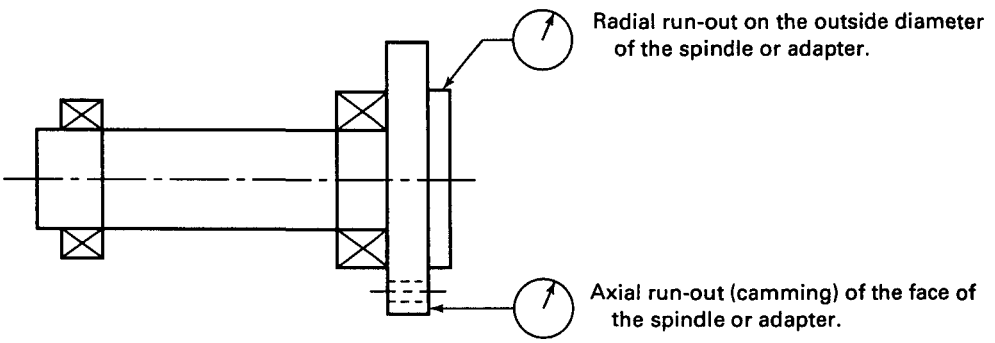
Geometric tests including both manual and power chucks are illustrated in Fig. 3.

5 CHECKING OF CENTERING ACCURACY AND REPEATABILITY OF MANUAL SCROLL CHUCKS

A test for checking accuracy and repeatability of outside diameter grip is presented in Fig. 4. Refer to Fig. 5 for a test of accuracy and repeatability of jaw steps.

6 CHECKING OF CENTERING ACCURACY AND REPEATABILITY OF POWER CHUCKS

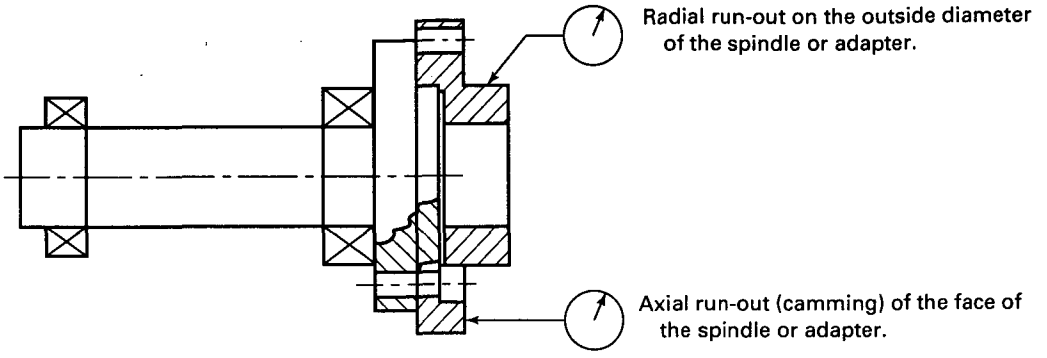
External chucking is presented in Fig. 6. Internal chucking is presented in Fig. 7.



GENERAL NOTE: The maximum total indicator reading (TIR) for both objectives is 0.005 mm (0.0002 in.). Deviations in excess of these specifications will adversely affect the accuracy of the chuck.

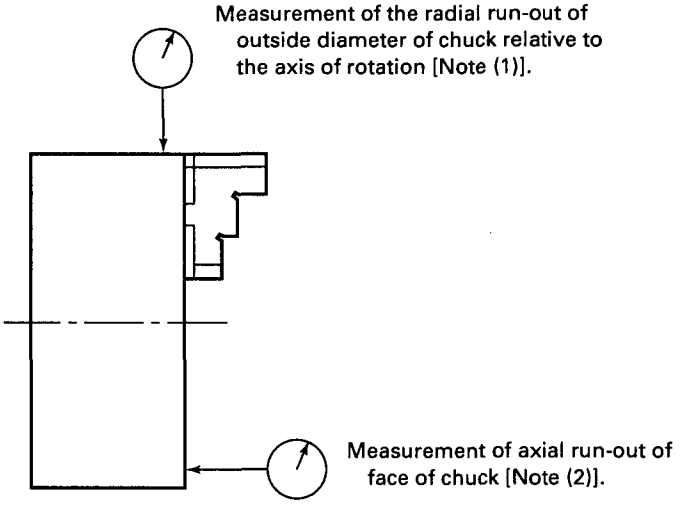
FIG. 1 SPINDLE VERIFICATION TEST FOR CHUCK MOUNTED DIRECTLY ON THE TEST SPINDLE

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GENERAL NOTE: The maximum total indicator reading (TIR) for both objectives is 0.005 mm (0.0002 in.). Deviations in excess of these specifications will adversely affect the accuracy of the chuck.

FIG. 2 SPINDLE VERIFICATION TEST FOR CHUCK MOUNTED ON AN ADAPTER



GENERAL NOTE: The measured radial and axial runout should be compared to the chuck manufacturer's specifications.

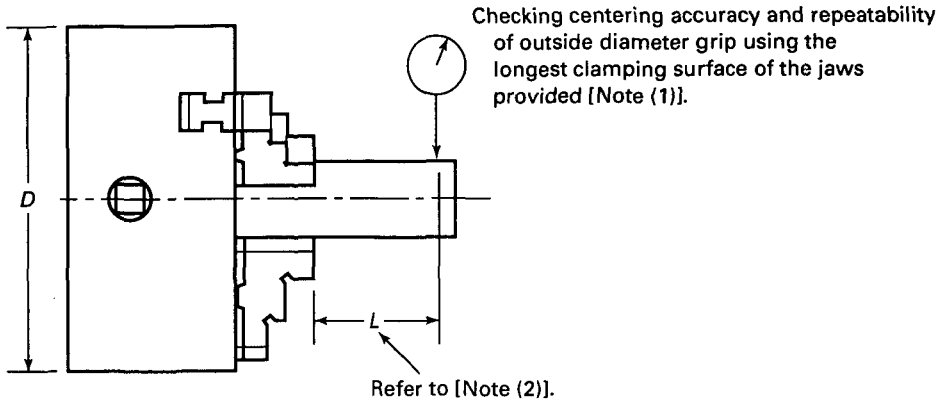
NOTES:

(1) The contact point of the indicator shall be placed on the largest uninterrupted diameter closest to the chuck face or on the qualified indicating band provided by the chuck manufacturer.

(2) The contact point of the indicator shall be placed on the face of the chuck as near to the periphery as practical.

FIG. 3 GEOMETRIC TESTS

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GENERAL NOTES:

(a) D = nominal diameter of chuck; L = minimum distance of indicator contact point from the jaw face

(b) Five test bars of different diameters shall be used.

(c) The sizes of the test bar diameters shall be proportional to the scroll pitch so that the various scroll positions differ from one test bar to another through an arc of approximately 90 deg of scroll movement.

(d) To ensure the maximum stability of grip, the test bar diameter shall not exceed the diameter of the bore in the chuck.

(e) The contact on the test bars shall be made along the centerline of each jaw.

(f) Test bars shall be made of heat treated steel to withstand the grip of the jaws without deformation, internal or superficial, and shall be round and straight within 0.005 mm (0.0002 in.) for up to 400 mm (16 in.), 0.010 mm (0.0004 in.) for up to 630 mm (24 in.), and 0.025 mm (0.0010 in.) for up to 1 000 mm (40 in.) chuck diameter.

(g) For geometric tests the input torque shall be approximately two-thirds of the maximum allowed.

NOTES:

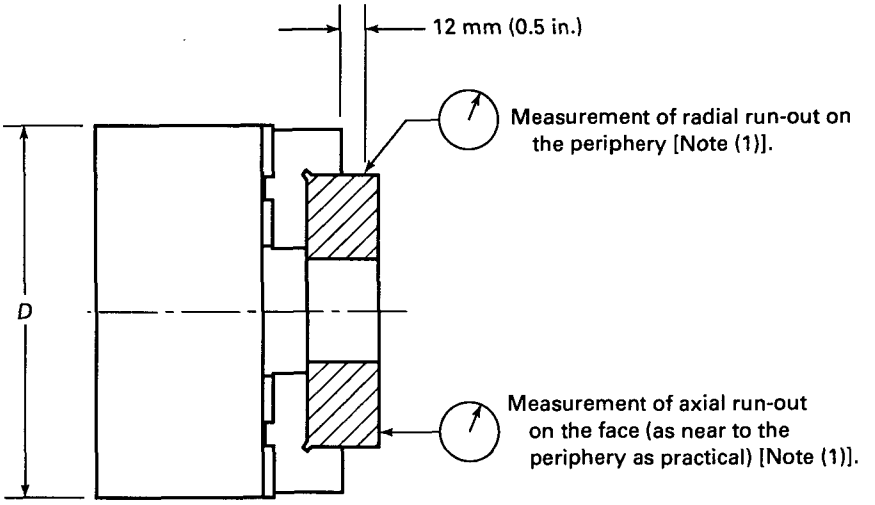
(1) This test shall be repeated no less than three times and maximum run-out shall be reported.

(2) Determination of Minimum Distance of Indicator Contact Point From the Jaw Face, L, is as follows:

Nominal Diameter of Chuck, D		Minimum Distance of Indicator Contact Point From the Jaw Face, L	
mm	in.	mm	in.
$D < 250$	$D < 10$	50	2
$250 < D < 400$	$10 < D < 16$	75	3
$400 < D < 630$	$16 < D < 24$	100	4
$630 < D < 1000$	$24 < D < 40$	125	5

FIG. 4 MANUAL SCROLL CHUCKS: CHECKING CENTERING ACCURACY AND REPEATABILITY OF OUTSIDE DIAMETER GRIP

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GENERAL NOTES:

(a) Each jaw step shall be tested. A single test piece should be used for each step.

(b) The external diameter of the test piece shall be equal to or smaller than the diameter at which the steps of the jaws have been manufactured.

(c) Test pieces shall be made of heat treated steel to withstand the grip of the jaws without deformation, internal or superficial, and shall be round, straight, and square within 0.005 mm (0.0002 in.) for up to 400 mm (16 in.), 0.010 mm (0.0004 in.) for up to 630 mm (24 in.), and 0.025 mm (0.0010 in.) for up to 1 000 mm (40 in.) chuck diameter.

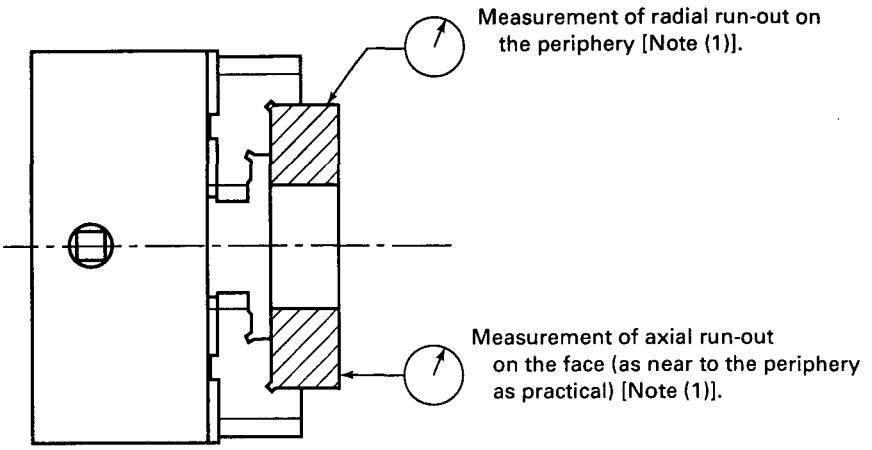
(d) For geometric tests the input torque shall be approximately two-thirds of the maximum allowed.

NOTE:

(1) This test shall be repeated no less than three times and maximum run-out shall be reported.

FIG. 5 MANUAL SCROLL CHUCKS: CHECKING CENTERING ACCURACY AND REPEATABILITY OF JAW STEPS

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GENERAL NOTES:

(a) A test piece with an outside diameter of approximately 60% of the chuck outside diameter, *D*, shall be used.

(b) Test piece shall be gripped in jaws manufactured to the chuck manufacturer's specified procedure.

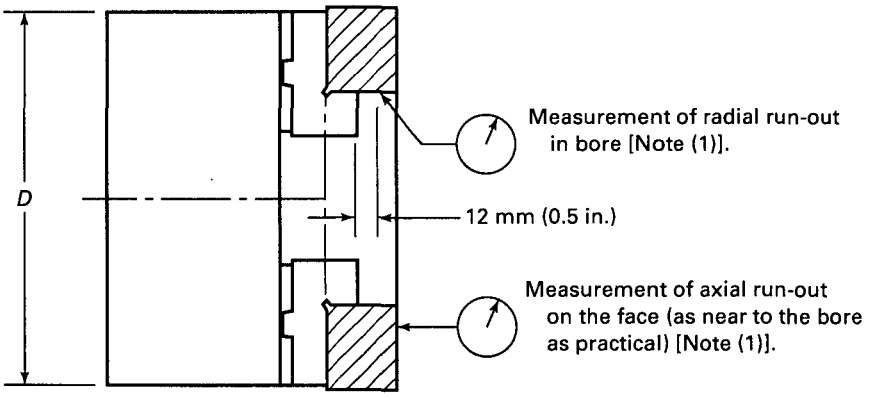
(c) Test pieces shall be made of heat treated steel to withstand the grip of the jaws without deformation, internal or superficial, and shall be round, straight, and square within 0.005 mm (0.0002 in.) for up to 400 mm (16 in.), 0.010 mm (0.0004 in.) for up to 630 mm (24 in.), and 0.025 mm (0.0010 in.) for up to 1 000 mm (40 in.) chuck diameter.

(d) For geometric tests the input torque shall be approximately two-thirds of the maximum allowed.

NOTE:

(1) This test shall be repeated no less than three times and maximum run-out shall be reported.

FIG. 6 POWER CHUCKS: CHECKING OF CENTERING ACCURACY AND REPEATABILITY FOR EXTERNAL CHUCKING



GENERAL NOTES:

(a) A test piece with an outside diameter of approximately 30% of the chuck outside diameter, *D*, shall be used.

(b) Test piece shall be gripped in jaws manufactured to the chuck manufacturer's specified procedure.

(c) Test pieces shall be made of heat treated steel to withstand the grip of the jaws without deformation, internal or superficial, and shall be round, straight, and square within 0.005 mm (0.0002 in.) for up to 400 mm (16 in.), 0.010 mm (0.0004 in.) for up to 630 mm (24 in.), and 0.025 mm (0.0010 in.) for up to 1 000 mm (40 in.) chuck diameter.

(d) For geometric tests the input torque shall be approximately two-thirds of the maximum allowed.

NOTE:

(1) This test shall be repeated no less than three times and maximum run-out shall be reported.

FIG. 7 POWER CHUCKS: CHECKING OF CENTERING ACCURACY AND REPEATABILITY FOR INTERNAL CHUCKING

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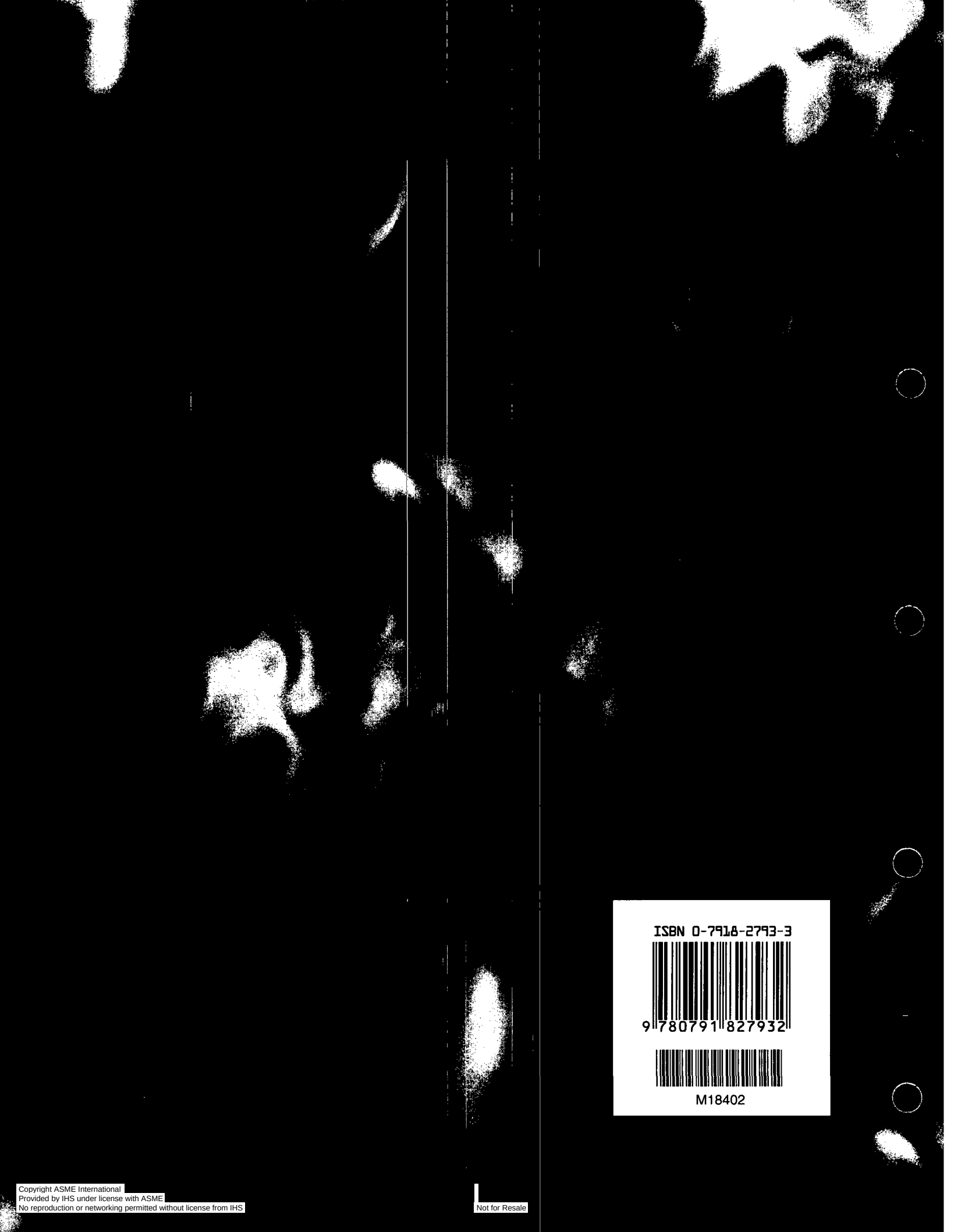
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