INTERNATIONAL STANDARD

ISO 3442-3

First edition
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Machine tools — Dimensions and geometric tests for self-centring chucks with two-piece jaws —

Part 3: Power-operated chucks with serrated jaws

Machines-outils — Dimensions et essais géométriques pour mandrins à serrage concentrique et à mors rapportés —

Partie 3: Mandrins à commande axiale assistée avec mors à assemblage par dentelure

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3442-3 was prepared by Technical Committee ISO/TC 39, *Machine tools*, Subcommittee SC 8, *Work holding spindles and chucks*.

This first edition of ISO 3442-3, together with ISO 3442-1 and ISO 3442-2, cancels and replaces ISO 3442:1991 and ISO 9401:1991. ISO/TC 39/SC 8 decided to divide ISO 3442:1991 into three parts and to combine them with ISO 9401:1991. When all three parts of ISO 3442 are published, ISO 3442:1991 and ISO 9401:1991 will be withdrawn.

ISO 3442 consists of the following parts, under the general title *Machine tools — Dimensions and geometric tests for self-centring chucks with two-piece jaws*:

— *Part 1: Manually operated chucks with tongue and groove type jaws*

— *Part 2: Power-operated chucks with tongue and groove type jaws*

— *Part 3: Power-operated chucks with serrated jaws*

Machine tools — Dimensions and geometric tests for self-centring chucks with two-piece jaws —

Part 3: Power-operated chucks with serrated jaws

1 Scope

This part of ISO 3442 specifies 90° and 60° serrations and jaw nuts applicable to 90° and 60° serrations for mounting the top jaws on the base jaws of power chucks, in order to ensure interchangeability. It also describes, with reference to ISO 230-1, the geometric tests for self-centring, power-operated chucks with two or more two-piece jaws (serrated type), and the corresponding tolerances which apply.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 230-1:1996, *Test code for machine tools — Part 1: Geometric accuracy of machines operating under no-load or finishing conditions*

ISO 965-3, *ISO general purpose metric screw threads — Tolerances — Part 3: Deviations for constructional screw threads*

3 Preliminary remarks

3.1 Measuring units

All dimensions and tolerances in this part of ISO 3442 are expressed in millimetres.

3.2 Geometric tests

This part of ISO 3442 deals only with the inspection of rotational accuracy of the chuck, the straightening and the centring of workpieces. It does not apply to other dynamic qualities, such as the measurement of lack of balance during rotation, balancing or the measurement of gripping power.

3.3 Tests to be performed

When inspecting a chuck, it is not always necessary to carry out all the tests described in this part of ISO 3442. The users of this part of ISO 3442 may choose those tests which relate to the properties that are of interest to them.

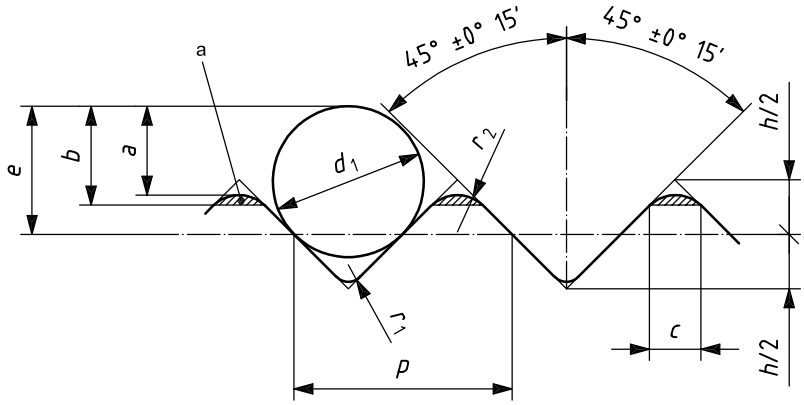
4 Accuracy classes

This part of ISO 3442 specifies only one accuracy class.

5 Sizes for interchangeability

5.1 90° serrations — Dimensions

The sizes for interchangeability are shown in Figure 1 and Table 1.



a Any profile contained within the hatched area is acceptable.

Figure 1 — 90° serrations

Table 1 — Dimensions of 90° serrations

Designation	p	$h/2$	r_1	r_2 min.	Checking dimensions a min.	Checking dimensions b max.	c max.	d_1[a]	e
1/16" × 90° [b]	1,587 5	0,397	0,12 to 0,18	0,25	0,64	0,71	0,35	1,1	0,93
3/32" × 90° [b]	2,3812 5	0,595	0,15 to 0,25	0,4	0,97	1,08	0,57	1,65	1,4

a The pin diameters given are recommended values. If pins of non-standard diameter are used, the manufacturer shall be responsible for recalculating the dimensions such that the form and geometry conform with this part of ISO 3442.

b 1/16" and 3/32" designations are commonly used even though they originate from inch dimensions.

5.2 90° serrations — Permissible cumulative pitch deviation

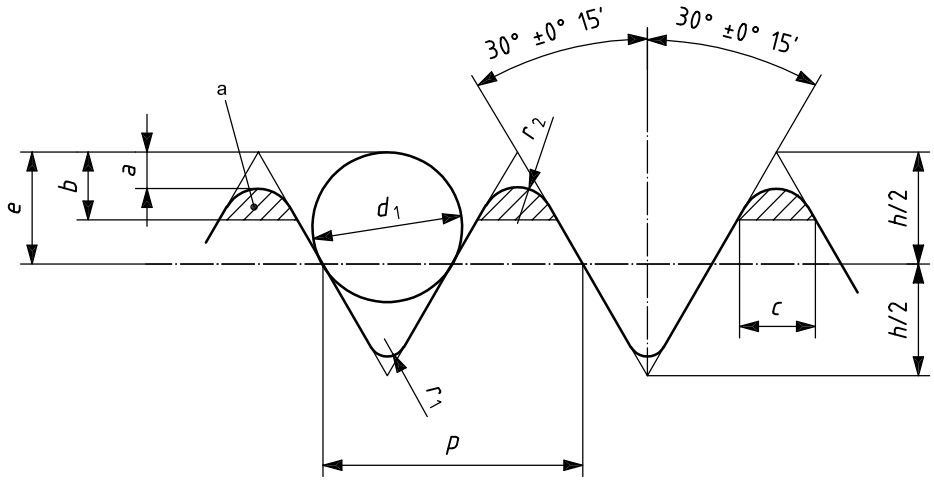
The permissible deviations are shown in Table 2 in function of the measuring length and the number of teeth, for both 1/16" × 90° and 3/32" × 90° serrations.

Table 2 — Permissible deviations for 90° serrations

Permissible deviation	Designation			
	1/16" × 90°		3/32" × 90°	
	Measuring length	Number of teeth	Measuring length	Number of teeth
± 0,008	25,4	16	26,194	11
± 0,012	50,8	32	50,006	21
± 0,016	76,2	48	76,2	32
± 0,020	101,6	64	102,394	43
± 0,024	127	80	126,206	53
± 0,028	152,4	96	152,4	64

5.3 60° serrations — Dimensions

The sizes for interchangeability are shown in Figure 2 and Table 3.



a Any profile contained within the hatched area is acceptable.

Figure 2 — 60° serrations

Table 3 — Dimensions of 60° serrations

Designation	p	$h/2$	r_1	r_2 min.	Checking dimensions a min.	b max.	c max.	d_1[a]	e
1,5 × 60°	1,5	0,65	0,12 to 0,2	0,24	0,24	0,435	0,502	0,866	0,65
3 × 60°	3	1,299	0,22 to 0,5	0,42	0,42	0,780	0,901	1,732	1,299

a The pin diameters given are recommended values. If pins of non-standard diameter are used, the manufacturer shall be responsible for recalculating the dimensions such that the form and geometry conform with this part of ISO 3442.

5.4 60° serrations — Permissible cumulative pitch deviation

The permissible deviations are shown in Table 4 in function of the measuring length and the number of teeth, for both 1,5 × 60° and 3 × 60° serrations.

Table 4 — Permissible deviations for 60° serrations

Permissible deviation	Designation			
	1,5 × 60°		3 × 60°	
	Measuring length	Number of teeth	Measuring length	Number of teeth
± 0,008	30	20	30	10
± 0,013	60	40	60	20
± 0,018	90	60	90	30
± 0,023	120	80	120	40
± 0,028	150	100	150	50

5.5 Jaw nuts — Dimensions

The sizes for interchangeability are shown in Figure 3 and Table 5, in function of the nominal size of the chuck and the corresponding serration adopted.

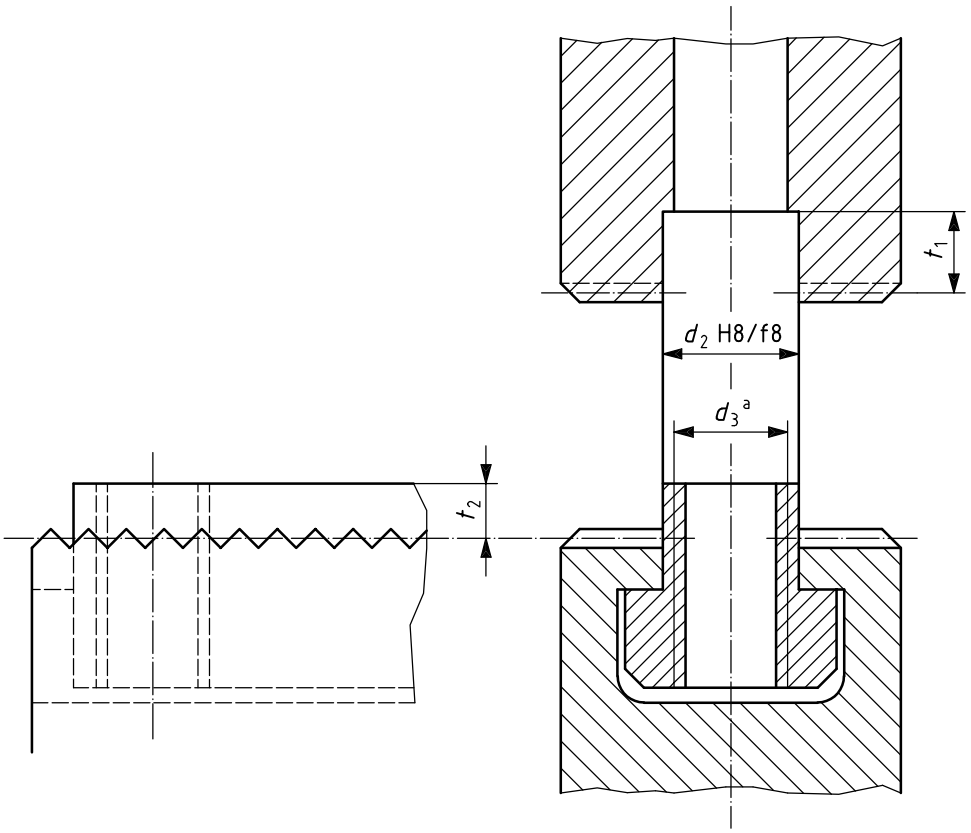


Figure 3 — Jaw nuts

Table 5 — Dimensions of jaw nuts

Nominal diameter of chuck d_{nom}		100	125	160	200	250	315	400	500	630	800
Jaw nut	d_2	10	12	14	17	21	21	25,5	25,5	25,5	25,5
	t_2	2,5	2,5	2,5	2,5	2,5	2,5	3,5	3,5	3,5	3,5
	t_1	4,5	4,5	4,5	4,5	4,5	4,5	5,5	5,5	5,5	5,5
	d_3 [a]	M6	M8	M10	M12	M16	M16	M20	M20	M20	M20
Designation of the serration		1/16" × 90° 1,5 × 60°						3/32" × 90° 3 × 60°			

[a] Tolerance of thread, 6H (see ISO 965-3).

6 Geometric tests

6.1 Test mandrels

The test mandrels shall be manufactured from solid steel and hardened to avoid damage to external surface due to the gripping force of the chuck. The test mandrel diameter should be approximately equal to 20 % of the nominal chuck diameter or as agreed between the manufacturer and the user. The accuracy of test mandrels used shall be as specified in ISO 230-1:1996, A.3, for test mandrels of similar diameters.

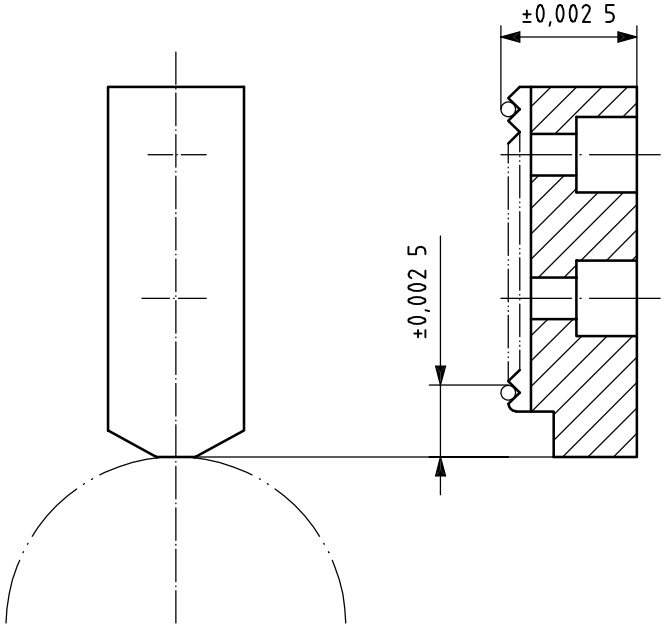


Figure 4 — Tolerances of test jaws

6.2 Spindle or face plate accuracy

For the geometric tests which involve chuck rotation, the chuck should be mounted on a test spindle either directly or by means of a chuck adaptor. The radial run-out on the outside diameter of the spindle or face plate, and the camming at any point on its face, shall have been previously checked as in G01 and G02.

6.3 Chuck body accuracy

Tests G1 and G2 refer to the accuracy of the body only. The tests should be carried out without clamping force.

6.4 Test with test top jaws (hard jaws)

The geometric test shall be performed using test jaws with flat nose, machined off the chuck, case hardened (60 HRC to 62 HRC) to allow them to withstand the clamping forces without permanent distortion.

The clamping force shall be at the level of 67 % (2/3) of the maximum gripping force for that chuck.

The functional dimensions for a set of test jaws shall be within 0,005 mm (see Figure 4).

6.5 Tests with machined top jaws

Tests G5 and G6 are performed with a set of top jaws mounted, paired, marked and machined in assembly with the base jaws on the chuck. The top jaws are machined both on the clamping surfaces and on the axial part locating surfaces, under clamped conditions.

The clamping force, for machining of the top jaws and for performing tests G5 and G6, shall be at the level of 67 % (2/3) of the maximum clamping force for that chuck.

These tests show the maximum possible accuracy of the chuck clamping as long as the top and base jaws are kept paired together as machined. Switching the top and base jaws will in most cases diminish the clamping accuracy of the chuck (unless G3 shows perfect compliance).

These tests are used to validate the accuracy of the chuck for a given diameter.

6.6 Tests off-the-spindle

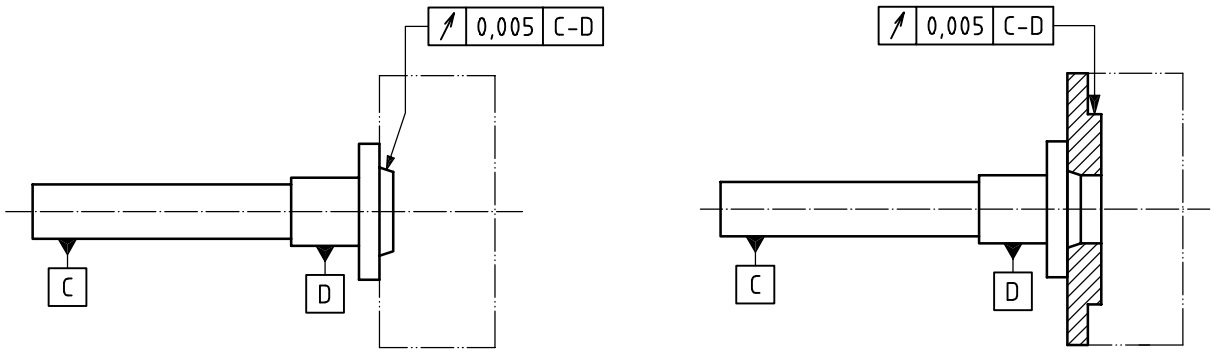
Tests G7 and G8 do not require use of the test spindle mentioned in 6.2.

Object

Checking radial run-out of the spindle nose or face plate.

G01

Diagram



Tolerance

0,005

Measured deviation

Measuring instruments

Dial gauge.

References to ISO 230-1:1996 and observations 5.611.4 and 5.612.2

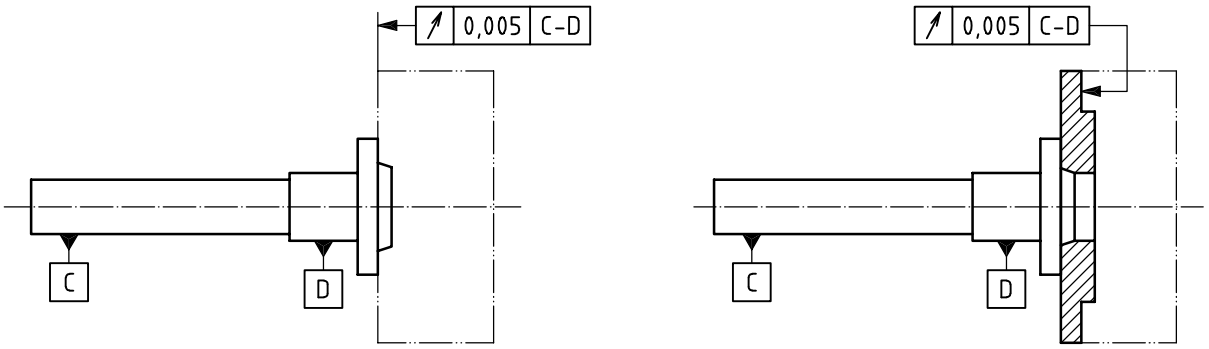
In the case of a tapered spindle nose, the stylus of the dial gauge shall be set normal to the surface which is to be checked.

Object

Checking camming of the spindle nose or face plate.

G02

Diagram



Tolerance

0,005

Measured deviation

Measuring instruments

Dial gauge.

References to ISO 230-1:1996 and observations 5.63

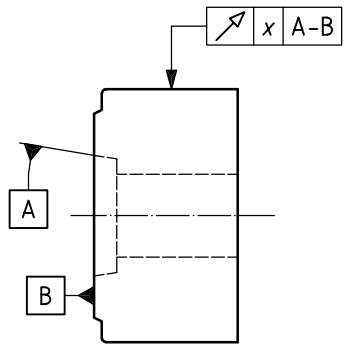
6.7 Chuck accuracy

Object

Checking radial run-out of the outside diameter.

G1

Diagram



Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,02
$125 < d_{nom} \leqslant 200$	0,03
$200 < d_{nom} \leqslant 315$	0,04
$315 < d_{nom} \leqslant 500$	0,05
$500 < d_{nom} \leqslant 800$	0,06

Measured deviation

For d_{nom} = ……

Measuring instruments

Dial gauge.

References to ISO 230-1 and observations

NOTE Two measurements are possible:

a) with the chuck mounted on a spindle, or

b) with a measuring machine.

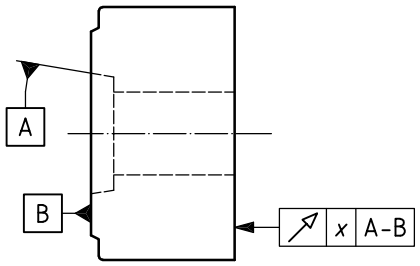
The results of the two measurements may differ depending on the tolerances of spindle noses and chuck bodies.

Object

Checking camming of chuck face.

G2

Diagram



Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,02
$125 < d_{nom} \leqslant 200$	0,03
$200 < d_{nom} \leqslant 315$	0,04
$315 < d_{nom} \leqslant 500$	0,05
$500 < d_{nom} \leqslant 800$	0,06

Measured deviation

For d_{nom} = ……

Measuring instruments

Dial gauge.

References to ISO 230-1 and observations

The dial gauge should be placed on the maximum possible diameter.

NOTE Two measurements are possible:

a) with the chuck mounted on a spindle, or

b) with a measuring machine.

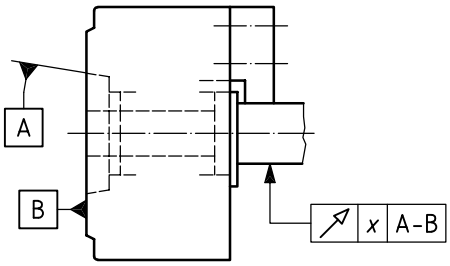
The results of the two measurements may differ depending on the tolerances of spindle noses and chuck bodies.

Object

Checking radial run-out of the test mandrels clamped by test jaws (close to the jaw).

G3

Diagram



Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,08
$125 < d_{nom} \leqslant 200$	0,10
$200 < d_{nom} \leqslant 315$	0,12
$315 < d_{nom} \leqslant 500$	0,14
$500 < d_{nom} \leqslant 800$	0,16

Measured deviation

For d_{nom} = ……

Measuring instruments

Dial gauge.

References to ISO 230-1 and observations

To ensure maximum stability of jaw gripping on the test mandrel, it may be axially held on the chuck face, where necessary, by a ground holding plate.

This test is performed with an interchangeable set of test jaws, as described above. The results obtained by this test represent only the geometric accuracy of the chuck assembly including the base jaws.

Compliance with the tolerances as specified for this test will assure interchangeability of the top jaws.

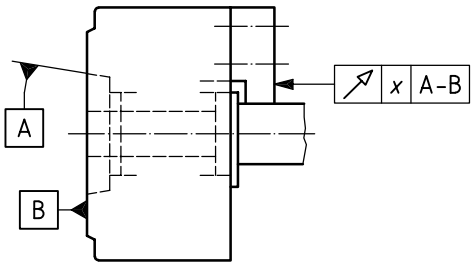
The actual clamping accuracy of the chuck can be determined by the use of a set of production jaws ground or turned on the chuck (see G5).

Object

Checking equidistance between the top surfaces of the top jaws (measured with test jaws).

G4

Diagram



Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,03
$125 < d_{nom} \leqslant 200$	0,04
$200 < d_{nom} \leqslant 315$	0,06
$315 < d_{nom} \leqslant 500$	0,08
$500 < d_{nom} \leqslant 800$	0,10

Measured deviation

For d_{nom} = ……

Measuring instruments

Dial gauge.

References to ISO 230-1 and observations

To ensure maximum stability of jaw gripping on the test mandrel, it may be axially held on the chuck face, where necessary, by ground holding plate.

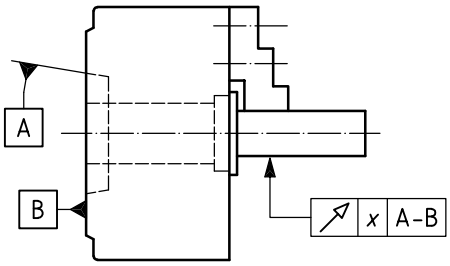
The dial gauge should be placed on the smallest possible diameter.

Object

Checking radial run-out of the test mandrels clamped by machined top jaws (close to the jaw).

G5

Diagram



Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,03
$125 < d_{nom} \leqslant 200$	0,04
$200 < d_{nom} \leqslant 315$	0,05
$315 < d_{nom} \leqslant 500$	0,06
$500 < d_{nom} \leqslant 800$	0,08

Measured deviation

For d_{nom} = ……

Measuring instruments

Dial gauge.

References to ISO 230-1 and observations

Test G5 shall be repeated not less than three times to check the repeatability of gripping; each measured deviation shall fall within the quoted full indicator movement figure.

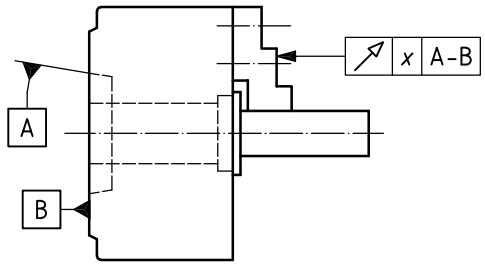
See also 6.5.

Object

Checking equidistance between the top surfaces of the top jaws (measured with machined top jaws).

G6

Diagram



Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,03
$125 < d_{nom} \leqslant 200$	0,04
$200 < d_{nom} \leqslant 315$	0,05
$315 < d_{nom} \leqslant 500$	0,06
$500 < d_{nom} \leqslant 800$	0,08

Measured deviation

For d_{nom} = ……

Measuring instruments

Dial gauge.

References to ISO 230-1 and observations

Test G6 shall be repeated not less than three times to check the repeatability of gripping; each measured deviation shall fall within the quoted full indicator movement figure.

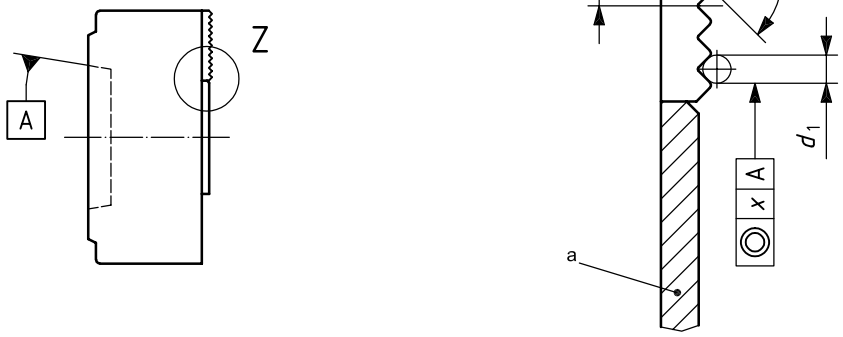
See also 6.5.

Object

Checking radial run-out of base jaw serrations

G7

Diagram



a Auxiliary disc.

Nominal diameter of chuck d_{nom}	Tolerance x (full indicator movement)
$d_{nom} \leqslant 125$	0,08
$125 < d_{nom} \leqslant 200$	0,10
$200 < d_{nom} \leqslant 315$	0,12
$315 < d_{nom} \leqslant 500$	0,14
$500 < d_{nom} \leqslant 800$	0,16

	d_1	p	α
Recommended gauge diameters	1,1	1,587 5 (1/16")	90°
	1,65	2,381 3 (3/32")	90°
	0,866	1,5	60°
	1,732	3	60°

Measuring instruments

Cylindrical gauge or adequate measuring equipment.

References to ISO 230-1 and observations

Chuck preloaded by 2/3 of maximum gripping force. Auxiliary disc clamped between the inner ends of the base jaws.

The position of the measurement pin shall be in the smallest diameter serration.

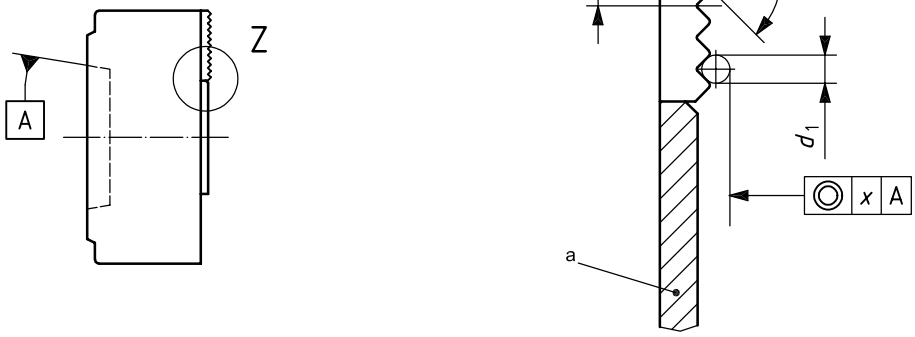
Tests G3 and G7 are alternative tests.

Object

Checking equidistance between the top surfaces of base jaws and the back surfaces of the chuck.

G8

Diagram



a Auxiliary disc.

Nominal diameter of chuck d_{nom}	Axial runout x (full indicator movement)
$d_{nom} \leqslant 125$	0,08
$125 < d_{nom} \leqslant 200$	0,10
$200 < d_{nom} \leqslant 315$	0,12
$315 < d_{nom} \leqslant 500$	0,14
$500 < d_{nom} \leqslant 800$	0,16

	d_1	p	α
Recommended gauge diameters	1,1	1,587 5 (1/16")	90°
	1,65	2,381 3 (3/32")	90°
	0,866	1,5	60°
	1,732	3	60°

Measuring instruments

Cylindrical gauge or adequate measuring equipment.

References to ISO 230-1 and observations

Chuck preloaded by 2/3 of maximum gripping force. Auxiliary disc clamped between the inner ends of the base jaws.

The position of the measurement pin shall be in the smallest diameter serration.

Tests G4 and G8 are alternative tests.

ICS 25.060.20

Price based on 16 pages