International Standard 6155/1

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Acceptance conditions for horizontal spindle capstan, turret and single spindle automatic lathes — Testing of the accuracy — Part 1 : Machinable bar diameters greater than 25 mm

Conditions de réception des tours semi-automatiques à tourelle revolver et à broche horizontale, et des tours automatiques monobroches — Contrôle de la précision — Partie 1 : Diamètres de barre usinables supérieurs à 25 mm

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6155/1 was developed by Technical Committee ISO/TC 39, *Machine tools*, and was circulated to the member bodies in November 1977.

It has been approved by the member bodies of the following countries :

Australia	Hungary	Spain
Austria	Italy	Sweden
Belgium	Japan	Turkey
Brazil	Korea, Dem. P. Rep. of	United Kingdom
Bulgaria	Korea, Rep. of	USA
Chile	Mexico	USSR
Czechoslovakia	Poland	Yugoslavia
France	Romania	
Germany, F.R.	South Africa, Rep. of	

The member body of the following country expressed disapproval of the document on technical grounds :

India

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Acceptance conditions for horizontal spindle capstan, turret and single spindle automatic lathes — Testing of the accuracy — Part 1 : Machinable bar diameters greater than 25 mm

0 Introduction

This International Standard applies only to lathes with a multi-tool turret. This turret can be manually indexed, semi-automatically indexed by motion of the turret slide, or automatically indexed by an independent control.

The tests in this International Standard apply only to the geometrical characteristics of the turret in relation to the spindle axis.

1 Scope and field of application

This International Standard describes, with reference to ISO/R 230, both geometrical and practical tests on general purpose and normal accuracy capstan, turret and single spindle automatic lathes. It deals only with the verification of accuracy of the machine. It does not apply to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc.) or to machine characteristics (such as speeds, feeds, etc.) which should generally be checked before testing accuracy.

Machines with contouring numerical control are excluded from the scope of this International Standard, as are lathes with sliding heads and lathes with rotating tools. This International Standard deals only with single spindle automatic lathes which have a machinable bar diameter greater than 25 mm.

Single spindle automatic lathes which have machinable bar diameters less than or equal to 25 mm will be covered in a forthcoming International Standard.

2 References

ISO 68, *ISO general purpose screw threads — Basic profile.*

ISO/R 230, *Machine tool test code.*

ISO 1101, *Technical drawings — Geometrical tolerances — Tolerances of form, orientation, location and runout — Generalities, definitions, symbols, indication of drawings.*[1)]

ISO 3442, *Self-centring chuck for machine tools with two-piece jaws (tongue and groove type) — Sizes for interchangeability and acceptance test specifications.*

3 Definitions

The machines referred to in this International Standard are defined as follows :

3.1 capstan lathe : A lathe on the bed of which is fitted a slide base that may be manually moved longitudinally along the bed and clamped in the desired position. On this slide base is mounted a short stroke slide which in turn carries an indexing turret which may be automatically operated by the return motion of the slide or manually indexed.

3.2 turret lathe : A lathe on the bed of which is fitted a saddle capable of longitudinal motion, which in turn carries an indexing turret.

3.3 combination turret lathe : A turret lathe with the addition of a second saddle which carries a cross slide.

3.4 cross-feeding turret lathe : A lathe on the bed of which is fitted a saddle capable of longitudinal motion, which carries an indexing turret capable of transverse motion.

1) At present at the stage of draft. (Revision of ISO/R 1101/1-1969.)

3.5 single spindle automatic lathe : A lathe having a frame supporting both the spindle headstock and the turret, the axes of the turret bores in the cutting position always being parallel to the spindle axis. The machine must have the ability to function under fully automatic cycling control. The method of control should be of any sequential type.

NOTE — All these types of lathes are manufactured with a variety of turret configurations. The most common types of configuration are designated types A, B and C and are described below :

turret type A : Circular or multi-sided turrets whose axis of rotation cuts the work spindle axis.

Whether or not the turret axis is perpendicular to the work spindle axis, the axis of each turret bore must align with the work spindle axis in its working position. Tools may be located in the bore or recess, attached to the flat turret face or located and clamped in the bore alone.

turret type B : Multi-sided turrets whose axis of rotation does not cut the work spindle axis but is parallel or at right angles to it. Special toolholders are required which are mounted and located on the turret sides (faces).

turret type C : Circular (drum or disc type) turrets whose axis of rotation is parallel to the work spindle axis. Tools are located in the turret bores, which are parallel to the turret axis, and the turret axis is arranged so that the work spindle axis aligns with the axes of the turret bores in their working positions.

4 Machine size ranges

The machines are classified into two ranges, on the basis of the following criteria :

	Range 1	Range 2
— Swing diameter over the bed	≤ 400 mm (16 in)	400 mm (16 in) < diameter ≤ 800 mm (32 in)
— Nominal bar diameter	≤ 63 mm (2.52 in)	> 63 mm (2.52 in)
— Nominal chuck diameter as defined in ISO 3442	≤ 250 mm (10 in)	> 250 mm (10 in)

NOTE — The choice of the criteria is at the manufacturer's discretion.

5 Preliminary remarks

5.1 In this International Standard, all the dimensions and permissible deviations are expressed in millimetres and in inches.

5.2 To apply this International Standard, reference should be made to ISO/R 230, especially for the installation of the machine before testing, warming up of spindles and other moving parts, description of measuring methods and recommended accuracy of testing equipment.

5.3 The sequence in which the geometrical tests are given is related to the sub-assemblies of the machine and this in no way defines the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be applied in any order.

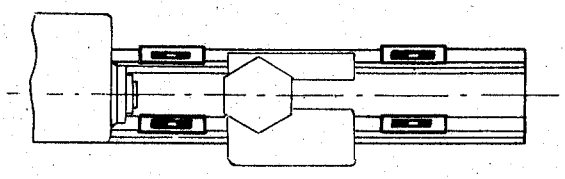
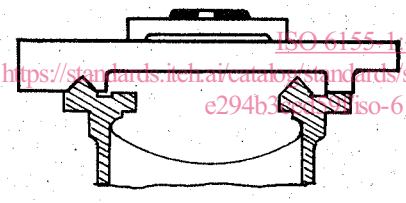
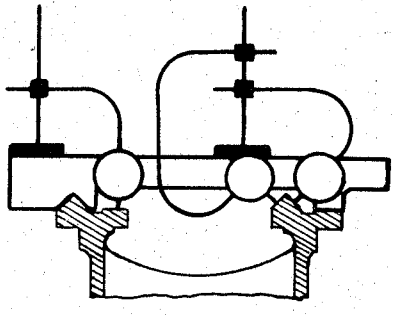
5.4 When inspecting a machine, it is not always necessary or possible to carry out all the tests described in this International Standard. It is up to the user to choose, in agreement with the manufacturer, those relating to the properties which are of interest to him, but these tests are to be clearly stated when ordering a machine.

5.5 Practical tests shall be made with finishing cuts and not with roughing cuts which are liable to generate appreciable cutting forces. The actual feeds and speeds will be selected by the manufacturer to suit the particular machine and could be of the order of 0,1 mm (0.004 in) for the depth of cut and 0,1 mm (0.004 in) per revolution for the feed. Test pieces made of a free-cutting metal should be used for the practical tests.

5.6 When establishing the tolerance for a measuring range different from that given in this International Standard (see sub-clause 2.311 in ISO/R 230) it should be taken into consideration that the minimum value of tolerance is 0,005 mm (0.000 2 in).

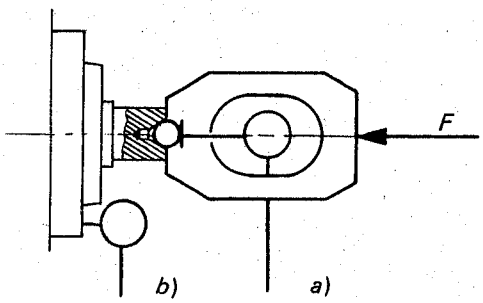
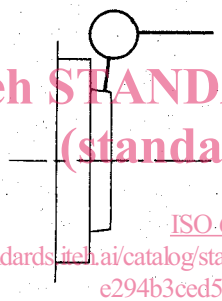
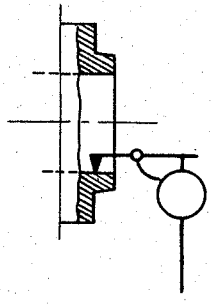
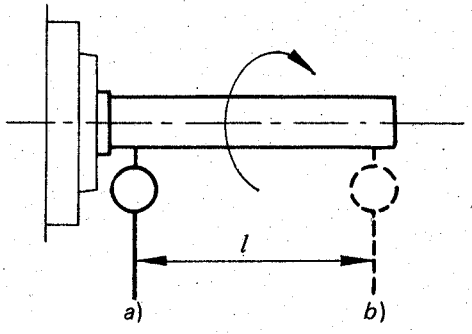
6 Acceptance conditions and permissible deviations

6.1 Preliminary operations

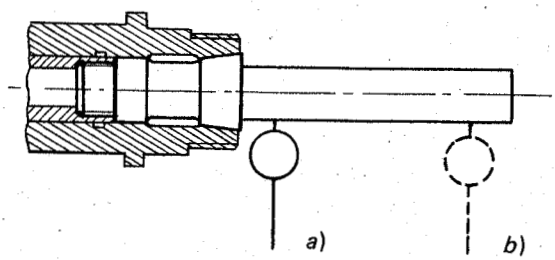
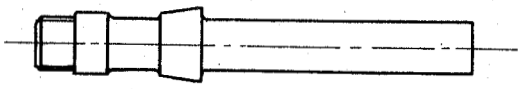
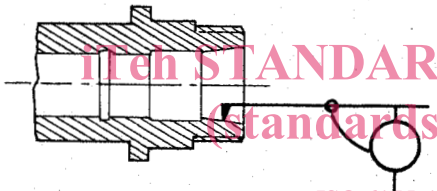
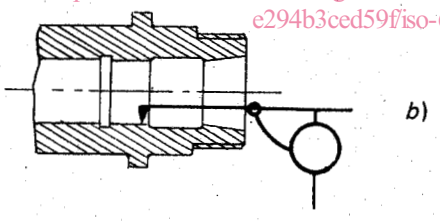
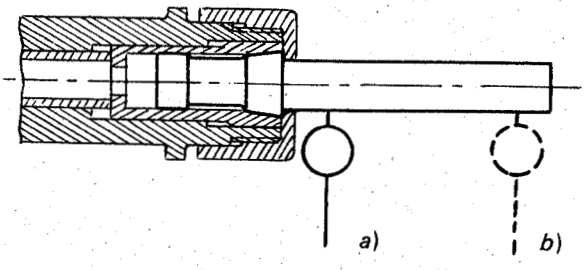
No.	Diagram	Object
G 01		**A – BED** Verification of levelling of slideways : *a*) Longitudinal verification : straightness of slideways in the vertical plane.
		*b*) Transverse verification : slideways should be in the same plane.
G 02		Checking of parallelism of the turret slide slideways to the slide base slideways.

Permissible deviation		Measuring instruments	Observations · and references to the test code ISO/R 230
mm	in		
a) **Range 1 :**		Precision levels, optical or other methods	*a*) Clauses 3.11, 3.21, 5.212.21 and 5.212.22 The measurements should be carried out at a number of positions equally spaced along the length of the bed.
0,02	0.0008		
for any measuring length of :			
1000	40		
Range 2 :			
0,03	0.0012		
for any measuring length of :			
1000	40		
b) Variation of level :		Precision levels	*b*) Clause 5.412.7 Place a level transversely on the slideways and take measurements at a number of positions equally spaced along the length of the slideways. The variation of level measured at any position shall not exceed the permissible deviation.
Ranges 1 and 2 :			
0,04/1000	0.0016/40		
Range 1 :		Dial gauge	Clause 5.422.5 This test applies only to machines having two sets of guideways integral with the bed. This test is made by means of a special support guided on the outside slideways, and supporting a dial gauge checking the parallelism of the inner slideways.
0,01	0.0004		
for any length of :			
1000	40		
Range 2 :			
0,02	0.0008		
for any length of :			
1000	40		

6.2 Geometrical tests

No.	Diagram	Object	
G 1		**B – HEADSTOCK SPINDLE** *a*) Measurement of periodic axial slip. *b*) Measurement of camming of the spindle face.	*a*)
G 2		Measurement of run-out of the centring diameter on the spindle nose.	
G 3		This test only applies to machines with a locating bore for mounting work holding fixtures. Measurement of run-out of the spindle locating bore.	
G 4		This test only applies to machines with internal taper spindle bore. Measurement of run-out of the work spindle internal taper. *a*) at the spindle nose; *b*) at a distance of 300 mm (12 in) from the spindle nose.	*a*) *b*) *a*) *b*)

Permissible deviation			Measuring instruments	Observations and references to the test code ISO/R 230
mm		in		
0,01	*a*)	0.0004	Dial gauge and, possibly, a special device	*a*) Clauses 5.622.1 and 5.622.2 The value of force *F* to be applied for the tests *a*) and *b*) shall be specified by the manufacturer. *b*) Clause 5.632
	b) **Range 1 :**			
0,015		0.0006		
	Range 2 :			
0,02		0.0008		
including periodic axial slip				
	Range 1 :		Dial gauge	Clause 5.612.2 The value of force *F* to be applied shall be specified by the manufacturer.
0,01		0.0004		
	Range 2 :			
0,015		0.0006		
	Range 1 :		Dial gauge	Clause 5.612.3
0,01		0.0004		
	Range 2 :			
0,015		0.0006		
	Range 1 :		Dial gauge and test mandrel	Clause 5.612.3
0,01	*a*)	0.0004		
0,02	*b*)	0.0008		
	Range 2 :			
0,015	*a*)	0.0006		
0,03	*b*)	0.0012		

No.	Diagram	Object
G 5	  Special test mandrel	This test only applies to bar machines with work spindles for draw back collets. Measurement of run-out of the collet internal seating in the spindle : *a*) at the spindle nose; *b*) at a distance of 100 mm (4 in).
	 Alternative 	**Alternative** Measurement by touching directly the front seating cone and the back register.
G 6		This test only applies to bar machines with work spindles for closing sleeve type (dead length) collets. Measurement of run-out of the collet internal seating in the spindle : *a*) at the spindle nose; *b*) at a distance of 100 mm (4 in).