

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1708

TEST CONDITIONS
FOR GENERAL PURPOSE PARALLEL LATHES

TESTING OF THE ACCURACY

1st EDITION

April 1970

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Printed in Switzerland

Also issued in French and Russian. Copies to be obtained through the national standards organizations.

BRIEF HISTORY

The ISO Recommendation R 1708, *Test conditions for general purpose parallel lathes – Testing of the accuracy*, was drawn up by Technical Committee ISO/TC 39, *Machine tools*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question led to the adoption of Draft ISO Recommendation No. 1708 which was circulated to all the ISO Member Bodies for enquiry in October 1968. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	India	South Africa, Rep. of
Austria	Israel	Spain
Belgium	Italy	Sweden
Brazil	Japan	Switzerland
Chile	Korea, Rep. of	Thailand
Czechoslovakia	Netherlands	Turkey
France	New Zealand	United Kingdom
Germany	Poland	U.S.A.
Greece	Portugal	
Hungary	Romania	

No Member Body opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in April 1970, to accept it as an ISO RECOMMENDATION.

CONTENTS

	Page
1. Scope	5
2. Preliminary remarks	5
3. Test conditions and permissible deviations (Dimensions in millimetres)	
3.1 Geometrical tests	7
3.2 Practical tests	15
4. Test conditions and permissible deviations (Dimensions in inches)	
4.1 Geometrical tests	17
4.1 Practical tests	25
5. Precise details concerning the straightness of the slideways	
5.1 Definition of the term “convex slideway”.	27
5.2 Definition of the term “local deviation from straightness”	27
5.3 Case of slideways with a regular convex curve	27

TEST CONDITIONS FOR GENERAL PURPOSE PARALLEL LATHES

TESTING OF THE ACCURACY

1. SCOPE

This ISO Recommendation describes, with reference to ISO Recommendation R 230, *Machine tool test code*, both geometrical and practical tests on general purpose parallel lathes, and gives the corresponding permissible deviations which apply.

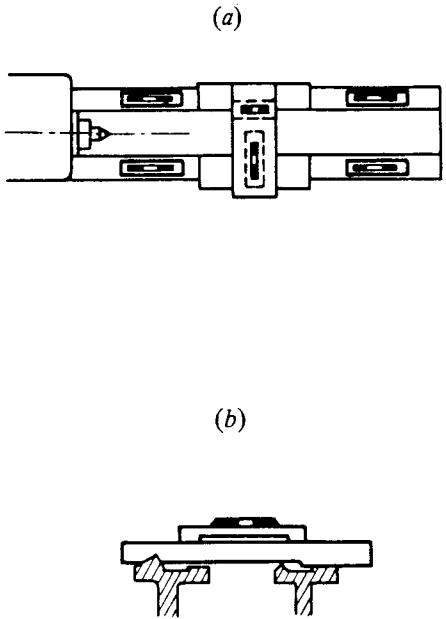
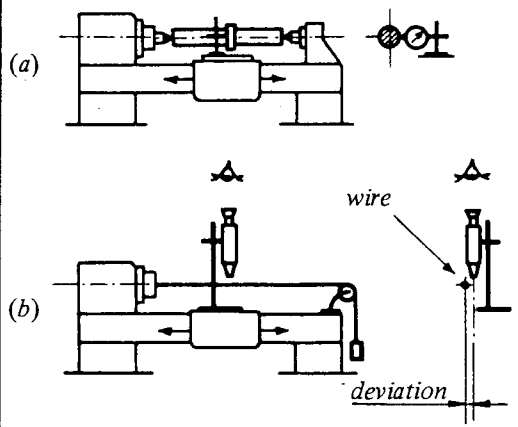
It deals only with the verification of accuracy of the machine. It does not apply to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc.), or to characteristics (speeds, feeds, etc.) which should generally be checked before testing accuracy.

2. PRELIMINARY REMARKS

- 2.1 In this ISO Recommendation, all the dimensions are expressed in millimetres in section 3 and in inches in section 4.
- 2.2 To apply this ISO Recommendation, reference should be made to ISO Recommendation R 230, especially for installation of the machine before testing, warming up of spindles and other moving parts, description of measuring methods and recommended accuracy of testing equipment.
- 2.3 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.
- 2.4 When inspecting a machine, it is not always necessary to carry out all the tests given in this ISO Recommendation. 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.
- 2.5 Practical tests should be made with finishing cuts — for instance, depth = 0.1 mm (0.004 in); feed = 0.1 mm (0.004 in) per revolution — and not with roughing cuts which are liable to generate appreciable cutting forces.
- 2.6 When establishing the tolerance for a measuring range different from that indicated in this ISO Recommendation (see clause 2.311 in ISO Recommendation R 230) it should be taken into consideration that the minimum value of tolerance is 0.005 mm (0.0002 in) for precision lathes and 0.010 mm (0.0004 in) for other lathes.

3. TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

3.1 Geometrical tests

No.	Diagram	Object	Precision lathe
			$Da \leq 500$ and $DC \leq 1500$
G 1		A – BED Inspection of the straightness of the slideways : (a) Longitudinal inspection : straightness of the slideways in the vertical plane;	$DC \leq 500$ 0.01 (convex)
			$500 < DC \leq 1000$ 0.015 (convex) Local tolerance** : 0.005 for any length of 250
			$1000 < DC \leq 1500$ 0.02 (convex) Local tolerance** : 0.005 for any length of 250.
		(b) Transverse inspection : slideways should be in the same plane.	Variation of level : 0.03/1000
G 2		B – CARRIAGE Checking of straightness of carriage movement in a horizontal plane or, possibly, in a plane defined by the axis of the centres and the tool point.	$DC \leq 500$ 0.01
			$500 < DC \leq 1000$ 0.015
			$1000 < DC \leq 1500$ 0.02

* DC = distance between centres.

Da = maximum permissible diameter.

** See section 5, page 27.

Dimensions in millimetres

Permissible deviation*		Measuring instruments	Observations and references to the test code ISO/R 230
Other lathes			
$Da \leq 800$	$800 < Da \leq 1600$		
$DC \leq 500$ 0.01 (convex)	0.015 (convex)	Precision levels, optical or other methods	Clause 3.11. (It is reminded that this test cannot be separated from the levelling operation). Clauses 5.212.21 and 5.212.22. Measurements should be made at positions equally distributed throughout the length of the bed. The levels may be placed on the transverse slide. When the slideways are not horizontal, use a special straightedge as mentioned in Figure 12 of clause 5.212.21 (2°).
$500 < DC \leq 1000$ 0.02 (convex)	0.03 (convex)		
Local tolerance** : 0.0075 0.01 for any length of 250			
$DC > 1000$ For each 1000 increase in distance between centres beyond 1000, add to the corresponding preceding tolerance : 0.01 0.02 Local tolerance** : 0.015 0.02 for any length of 500			
Variation of level : 0.04/1000		Precision levels	A level should be placed transversely on the slideways and measurements taken at a number of positions equally spaced along the length of the slideways. The variation of level measured at any position should not exceed the permissible deviation.
$DC \leq 500$ 0.015	0.02	(a) For $DC < 1500$, dial gauge and mandrel between centres or straightedge (b) Whatever the value of DC , taut wire and microscope or optical methods	(a) clause 5.232.3 (a) or 5.232.1. Touch the front generatrix of the mandrel (instead of the mandrel, a straightedge with parallel faces may be used). Length of mandrel between centres should be as nearly as possible equal to the value of DC . (b) clauses 5.212.3 and 5.232.3 (b). The deviation of straightness of carriage movement should, other than in exceptional cases, be concave relative to the axis of the centres.
$500 < DC \leq 1000$ 0.02	0.025		
$DC > 1000$ For each 1000 increase in distance between centres beyond 1000, add to the corresponding preceding tolerance : 0.005 Maximum permissible deviation : 0.03 0.05			

No.	Diagram	Object	Precision lathes
			$Da \leq 500$ and $DC \leq 1500$
G 3		Checking of parallelism of tailstock to carriage movements : (a) in the horizontal plane; (b) in the vertical plane.	(a) 0.02 Local tolerance : 0.01 for any length of 500 (b) 0.03 Local tolerance : 0.02 for any length of 500
G 4		C – HEADSTOCK SPINDLE (a) Measurement of periodic axial slip; (b) Measurement of camming of the face plate resting surface.	(a) 0.005 (b) 0.01 including periodic axial slip
G 5		Measurement of run-out of spindle nose centring sleeve	0.007
G 6		Measurement of run-out of axis of centre : (a) at the spindle nose of the housing; (b) at a distance from the spindle nose equal to $\frac{Da}{2}$ or not more than 300⁽¹⁾.	(a) 0.005 (b) 0.015 for a measuring length of 300 0.01 for a measuring length of 200 0.005 for a measuring length of 100

* DC = distance between centres.
 Da = maximum permissible diameter.

** F = constant pressure on spindle to eliminate axial bearing end play.

Dimensions in millimetres

Permissible deviation*		Measuring instruments	Observations and references to the test code ISO/R 230
Other lathes			
$Da \leq 800$	$800 < Da \leq 1600$		
$DC \leq 1500$ (a) and (b) 0.03 Local tolerance : 0.02 for any length of 500 $DC > 1500$ (a) and (b) 0.04 Local tolerance : 0.03 for any length of 500	$DC \leq 1500$ (a) and (b) 0.04 Local tolerance : 0.02 for any length of 500 $DC > 1500$ (a) and (b) 0.04 Local tolerance : 0.03 for any length of 500	Dial gauge	Clause 5.422.5. With the tailstock as close as possible to the carriage, readings are made when both are moved together; the tailstock sleeve should remain locked so that the dial gauge fixed on the carriage always touches the same point.
(a) 0.01 (b) 0.02 including periodic axial slip	(a) 0.015 (b) 0.02	Dial gauge and, possibly, a special device	Clauses 5.62, 5.621.2, 5.622.2 and 5.632. For the position of the dial gauge, see Figures 59 to 64 and 67 of clauses 5.62, 5.622 and 5.632. The value of force F to be applied for the tests (a) and (b) should be specified by the manufacturer.
0.01	0.015	Dial gauge	Clauses 5.612.2 and 5.621.2. The value of force F to be applied should be specified by the manufacturer. In the case of a tapered spindle nose, the dial gauge should be placed perpendicular to the generating line of the taper.
(a) 0.01 (b) 0.02 for a measuring length of 300	(a) 0.015 (b) 0.05 for a measuring length of 500	Dial gauge and test mandrel	Clause 5.612.3. (1) For lathes such as $Da > 800$, the measuring length might be increased up to 500.