

Assessment of departures from roundness —

Part 3: Methods for determining departures from roundness using two- and three-point measurement

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This British Standard, having been prepared under the direction of the Mechanical Engineering Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 December 1982

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Foreword

This Part of this British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee. It takes account of discussions within ISO/TC 57 Metrology and properties of surfaces, the results of which will be published as ISO 4292. At the time of publication the technical content of this Part of this standard was in agreement with the ISO draft.

Appendix A gives worked examples of calculations for the departure from roundness.

This standard together with Parts 1 and 2 supersedes BS 3730:1964 which is now withdrawn.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of this British Standard describes methods for the numerical assessment of departures from roundness by the combination of two- and three-point measurement. The following methods are dealt with:

- a) determination by means of two-point measurement (measurement of diameters);
- b) determination by means of three-point measurement, summit (symmetrical or asymmetrical setting);
- c) determination by means of three-point measurement, rider (symmetrical setting).

Any statement regarding an out-of-round section is incomplete unless the extent and nature of the departures from roundness is given and this is dealt with in Appendix A to D of BS 3730-2:1982.

For routine or in-process inspection, the requirements of BS 3730-2 may either be needlessly accurate or the items to be inspected may be too large to be accommodated.

The methods described in this Part of this standard may give faster and cheaper ways of assessing departures from roundness. This assessed value will deviate from the true value. The difference between the measured value and the true value can be estimated with help of Table 2 to Table 8, under the presumption that the undulation numbers are known and of sinusoidal nature. For non-sinusoidal undulations, a theory for estimating such deviations is not yet available.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 3730 the definitions given in Part 1 apply, together with the following.

2.1

two-point measurement

measurement between coaxial anvils, one fixed and one moving in the direction of measurement (see Figure 1 and Figure 5)

2.2

three-point measurement

measurement between anvils, two fixed and one moving in the direction of measurement (see Figure 2, Figure 3, Figure 4, Figure 6, Figure 7 and Figure 8)

2.3

summit method

a three-point measurement in which the two fixed anvils are situated on one side and the measuring anvil is situated on the other side of the workpiece axis in the plane of measurement (see Figure 2, Figure 3, Figure 6, and Figure 7)

2.4

rider method

a three-point measurement in which the two fixed anvils are situated on the same side as the measuring anvil in the plane of measurement (see Figure 4 and Figure 8)

2.5

symmetrical (three-point) setting

a setting at which the direction of measurement coincides with the bisector angle between fixed anvils (see Figure 2, Figure 4, Figure 6 and Figure 8)

2.6

asymmetrical (three-point) setting

a setting at which the direction of measurement constitutes an angle with the bisector angle between fixed anvils (see Figure 3 and Figure 7)

3 Measuring conditions and instrument

3.1 Measuring anvil static force. The static measuring force shall not exceed 1 N.

NOTE 1 Preferably, the force should be adjustable and set at the lowest value that will ensure continuous contact between anvil and the surface being measured.

NOTE 2 For thin-walled workpieces, a high measuring force may affect the measuring result. Therefore it is necessary to reduce the force to the minimum value possible.

3.2 Measuring anvils. Depending on the form of the object, the measuring anvil shall be selected from Table 1.

NOTE Where the form of the object precludes the use of the anvils given in Table 1, other anvils may be used.

Table 1 — Types of anvil

Surface form	Anvil radius	Surface radius
	mm	mm
Convex surface	Spherical: 2.5	All
Convex edge	Cylindrical: 2.5	All
Concave surface	Spherical: 2.5	≥ 10
Concave edge	Cylindrical: 2.5	≥ 10
Concave surface	Spherical: 0.5	< 10
Concave edge	Cylindrical: 0.5	< 10