INTERNATIONAL STANDARD

ISO 6103

Second edition
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Bonded abrasive products — Permissible unbalances of grinding wheels as delivered — Testing

Produits abrasifs agglomérés — Déséquilibre admissible des meules en état de livraison — Contrôle

Reference number
ISO 6103:1999(E)

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 3.

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.

International Standard ISO 61033 was prepared by Technical Committee ISO/TC 29, *Small tools*, Subcommittee SC 5, *Grinding wheels and abrasives*.

This second edition cancels and replaces the first edition (ISO 6103:1986) which has been technically revised.

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Bonded abrasive products — Permissible unbalances of grinding wheels as delivered — Testing

1 Scope

This International Standard specifies the maximum permissible values of unbalance for various grinding wheels of ISO 603-1 to ISO 603-9 and ISO 603-12 to ISO 603-16 in the as-delivered condition, with outside diameter equal to or greater than 125 mm and with a maximum operating speed, v_s, equal to or greater than 16 m/s.

It also specifies the method for measuring the unbalance and the practical method for testing whether a grinding wheel is acceptable or not.

This International Standard applies to bonded abrasive grinding wheels in the as-delivered condition.

This International Standard does not apply to

— diamond, cubic boron nitride or natural stone grinding wheels;

— centreless control wheels, lapping and disc wheels, ball wheels or glass grinding wheels.

NOTE 1 The values given refer to the grinding wheel itself, independent of any unbalance which may exist in the balancing arbor or in the means of fastening it to this arbor. These various elements, together with the flanges or hub-flanges, are assumed to be balanced, homogeneous and free from geometrical defects.

NOTE 2 The effects of unbalance are basically

— additional stresses on the arbor, the machine and its mounting;

— excessive wear of the bearings;

— vibration prejudicial to the quality of machining and increased internal stresses in the grinding wheel;

— increased operator fatigue.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 603-1, *Bonded abrasive products — Dimensions — Part 1: Grinding wheels for external cylindrical grinding between centres.*

ISO 603-2, *Bonded abrasive products — Dimensions — Part 2: Grinding wheels for centreless external cylindrical grinding.*

ISO 603-3, *Bonded abrasive products — Dimensions — Part 3: Grinding wheels for internal cylindrical grinding.*

ISO 603-4, *Bonded abrasive products — Dimensions — Part 4: Grinding wheels for surface grinding/peripheral grinding.*

ISO 603-5, *Bonded abrasive products — Dimensions — Part 5: Grinding wheels for surface grinding/face grinding.*

ISO 603-6, *Bonded abrasive products — Dimensions — Part 6: Grinding wheels for tool and tool room grinding.*

ISO 603-7, *Bonded abrasive products — Dimensions — Part 7: Grinding wheels for manually guided grinding.*

ISO 603-8, *Bonded abrasive products — Dimensions — Part 8: Grinding wheels for deburring and fettling/snagging.*

ISO 603-9, *Bonded abrasive products — Dimensions — Part 9: Grinding wheels for high pressure grinding.*

ISO 603-12, *Bonded abrasive products — Dimensions — Part 12: Grinding wheels for deburring and fettling on straight grinder.*

ISO 603-13, *Bonded abrasive products — Dimensions — Part 13: Grinding wheels for deburring and fettling on a vertical grinder.*

ISO 603-14, *Bonded abrasive products — Dimensions — Part 14: Grinding wheels for deburring and fettling/snagging on an angle grinder.*

ISO 603-15, *Bonded abrasive products — Dimensions — Part 15: Grinding wheels for cutting-off on stationary and mobile cutting-off machines.*

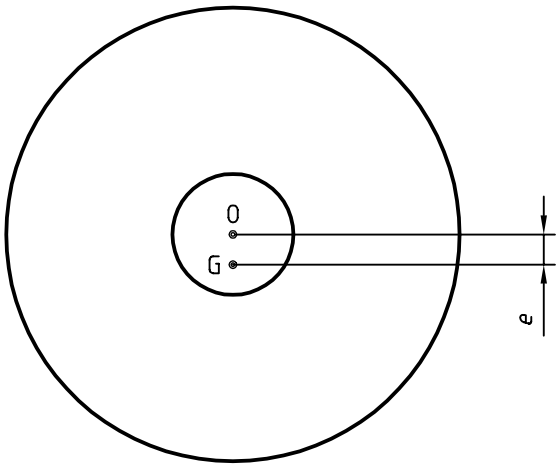
ISO 603-16, *Bonded abrasive products — Dimensions — Part 16: Grinding wheels for cutting-off on hand held power tools.*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
unbalance
the product of the radius, in millimetres, and mass, in grams expressed in grams multiplied by millimetres

3.2
intrinsic unbalance of a grinding wheel
U_i
the product of the mass m_1 of the grinding wheel and the distance e between its centre of mass G (centre of gravity) and the axis O of its bore (see Figure 1)

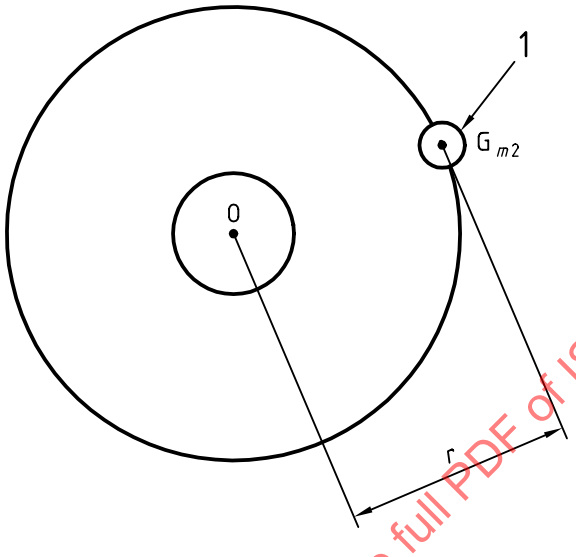


$U_i = m_1 \cdot e$

Figure 1

3.3
measured unbalance
U_c
the product of a mass m_2, affixed to the grinding wheel to balance it and the distance between the centre of mass (G_{m2}) (centre of gravity) of the mass m_2 and the axis O of the grinding wheel bore (see Figure 2)

NOTE In practice, this distance is equal to the radius r of the grinding wheel.



$U_c = m_2 \cdot r$

Key
1 Mass m_2

Figure 2

4 Permissible unbalance, U_a

On the basis of experience, the maximum permissible unbalance U_a is determined using a mass $m_a = U_a/r$, such that

$$m_a = k\sqrt{m_1} \quad (1)$$

where

r is the radius of the grinding wheels, in millimetres;

m_a is the mass whose centre is located on the circumference of the grinding wheel, in grams;

m_1 is the mass of the grinding wheel, in grams;

k is a coefficient which depends on the nature and usage of the grinding wheel.

The values of k are given in Table 1 and the values of m_a, as a function of m_1 and k, are shown in Figure 5.

The values of k have been selected on the basis of experience so that the resulting unbalance allows for normal usage of the grinding wheel.

5 Measurement of the intrinsic unbalance

Place a balancing arbor through the bore of the grinding wheel to hold its mid-plane in a vertical position. For straight wheels or wheels of similar shape, the wheel is free-standing; wheels of other shapes may be supported using suitable flanges.

Rest the balancing arbor on two parallel horizontal bevelled guide-bars or cylindrical bars (see Figure 3), or on a balancing stand consisting of two pairs of overlapping, freely rotating, steel discs (see Figure 4), so that the grinding wheel attains an equilibrium position with minimum friction.

The clearance between the balancing arbor and the bore of the grinding wheel shall not exceed 0,4 mm.

The arbor and the supports (guide-bars, bars or discs) shall have an adequate surface hardness and an appropriate surface condition to minimize friction.

When the grinding wheel attains the equilibrium position, its centre of mass is then as low as possible. In this position, mark the upper peripheral point of the grinding wheel.

Rotate the grinding wheel through 90° to bring this mark into the horizontal plane for the arbor axis.

Determine the mass m_2 which, when affixed to the periphery of the grinding wheel at the mark, maintains the grinding wheel in equilibrium. The amount of unbalance thus introduced, $U_c = m_2 \cdot r$, is equal and opposite to the intrinsic unbalance of the wheel.

The value of the mass m_2 is used to determine the intrinsic unbalance of the wheel using the following formula:

$$U_i = U_c = m_2 \cdot r \qquad (2)$$

6 Checking the intrinsic unbalance

Checking of the intrinsic unbalance according to the method of clause 5.

A grinding wheel is only acceptable if its intrinsic unblance U_i is less than or equal to the permissible unbalance U_a, i.e.

$$U_i \leqslant U_a \qquad (3)$$

The testing is done with a mass

$$m_a = \frac{U_a}{r}$$

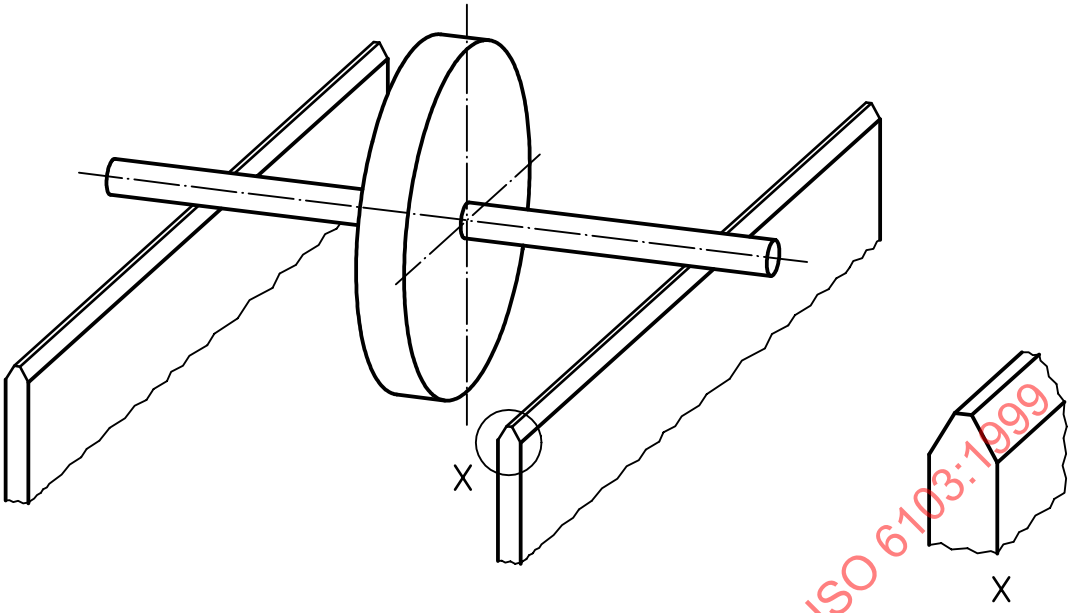
6.1 Determination of m_a

From Table 1, determine the coefficient k by reading off the value according to the various parameters related to the grinding wheel and its application.

Figure 5 then gives the values of the mass m_a, in grams, as a function of the mass m_1 of the wheel, in grams, and the coefficient k.

6.2 Acceptance testing of the grinding wheel

With the grinding wheel mounted in accordance with the instructions given in clause 5, place a mass m_a as determined in 6.1 on the periphery of the grinding wheel at the mark. If the wheel remains stationary or rotates so that the mark is at the bottom, the grinding wheel is accepted. Otherwise, it is rejected.



Alternative: The two bevelled guide-bars may be replaced by two cylindrical bars.

Figure 3

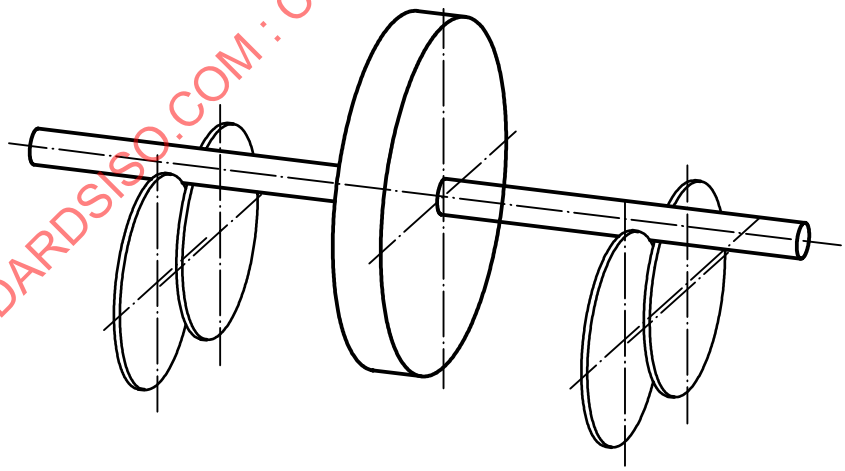


Figure 4

Table 1 — Values of the coefficient k

Grinding method	Type of machine	Type of bonded abrasive product	D (mm)		T (mm)		Coefficient k Maximum operating speed (m/s)		
			over	up to	over	up to	$16 \leqslant v_s \leqslant 40$	$40 < v_s \leqslant 63$	$63 < v_s \leqslant 100$
Grinding (deburring, fettling and snagging)	Hand-held grinding machines	Types 1/2/4/27/28/35 and 36	–	150	–	–	0,40	0,32	0,25
			150	180	–	–	0,40	0,32	0,20
			180	–	–	6	0,40	0,32	0,20
				–	6	–	0,32	0,25	0,16
		Type 6 and Type 11	All dimensions				0,40	0,32	–
Grinding (deburring, fettling and snagging)	Stationary grinding machines, swing frame grinding machines and other grinding machines	Type 1/2/35 and 36	All dimensions				0,63	0,50	0,40
High-pressure grinding	Stationary grinding machines	Type 1	All dimensions				0,8		
Grinding — precision grinding — cylindrical grinding — surface grinding — sharpening	Stationary grinding machines	All Types	–	300	All dimensions		0,25	0,20	0,16
			300	610			0,32	0,25	0,20
			610	–			0,40	0,32	0,25
Cutting-off	Hand-held cutting-off	Type 41 and Type 42	–	⩽ 400	–	–	0,40	0,32	0,20
	Stationary cutting-off machines	Type 41 and Type 42	–	⩽ 300	–	–	0,50	0,40	0,32
			> 300	–	–	–	0,63	0,50	0,40

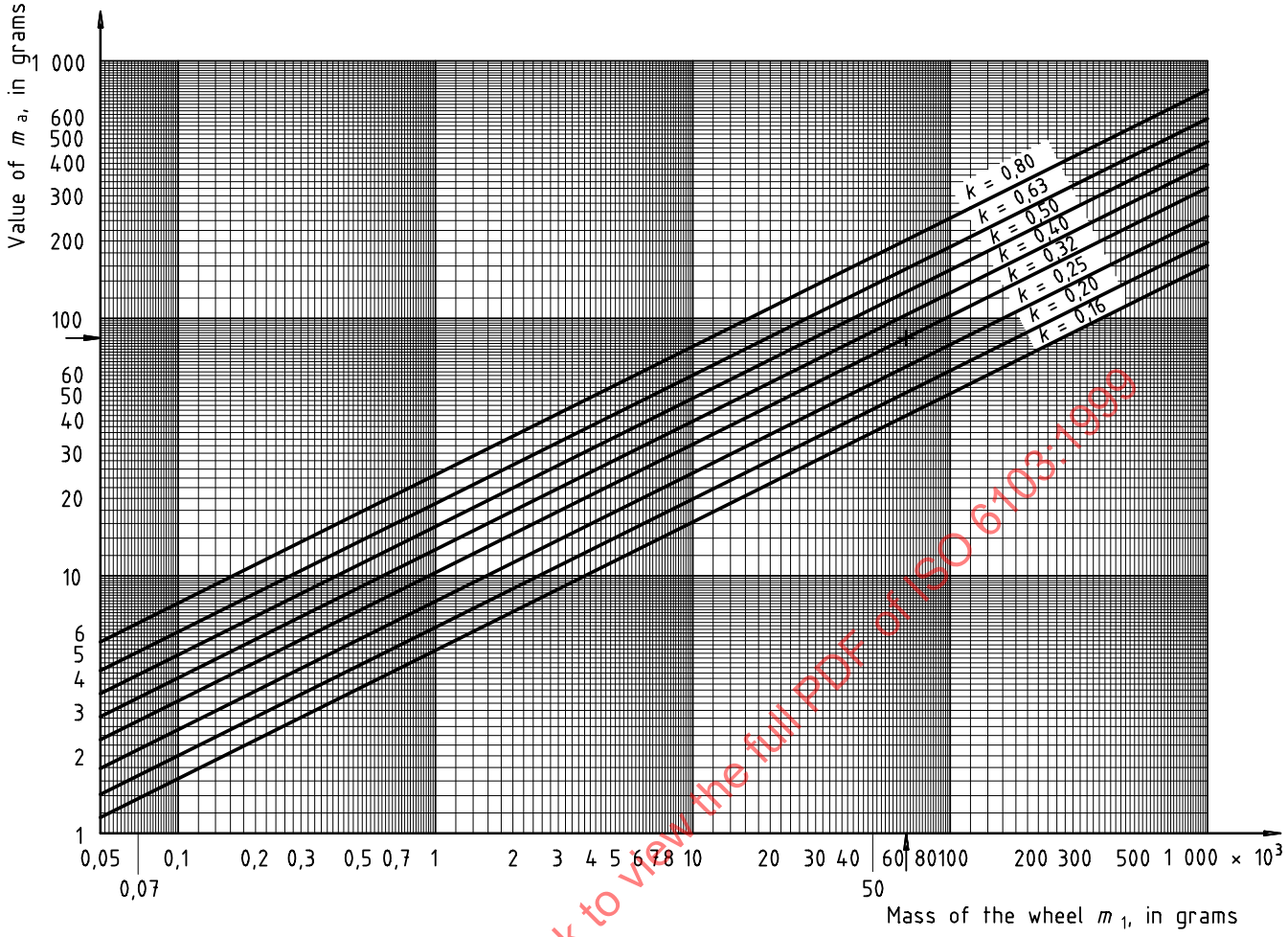


Figure 5

EXAMPLE For a straight grinding wheel for precision grinding, of outside diameter D = 762 mm and mass m_1 = 68 000 g used on a stationary machine at a maximum operating speed v_s = 60 m/s, the coefficient k = 0,32 (see Table 1) and the maximum permissible mass m_a = 83 g.