

Technical Annex

Appendix of chapter 3 of the Conditions of Use for the oSa Trademark

Additional technical requirements and conditions for abrasive products to be marked with the oSa trademark

This Technical Annex gives guidance and explanations not included in the EN Standards for the designing, testing and controlling of abrasive products and processes.

Conformance to the European safety standards is the primary requirement for membership of oSa, namely:

- **EN 12413:** Safety requirements for bonded abrasives products
- **EN 13236:** Safety requirements for superabrasive products
- **EN 13743:** Safety requirements for coated abrasive products

To verify conformance to the standards members must:

- Define concisely the products under the scope of oSa membership according to this Technical Annex (section 3)
- Possess all of the necessary test equipment at each site of manufacture
- Carry out design and in-process testing according to this Technical Annex
- Implement a documented test and control system sufficient to confirm consistent conformance to the requirements of the standards

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1 ESSENTIAL TEST EQUIPMENT

The following test equipment must be available at each manufacturing location (**Table 1**). Consideration will be given to two or more sites sharing specific high cost equipment so that regular tests can be carried out. This must be supported by documentary evidence.

The equipment must be calibrated regularly and be marked clearly with the current calibration status. This must be supported by documentary evidence.

Test data must be recorded accurately. This must be supported by documentary evidence.

Calibration and test data must be stored at least for 3 years.

Essential equipment required	Bonded Abrasives	Superabrasives	Coated abrasives
Speed test equipment (for products over 100 mm diameter) ¹⁾	• ²⁾	• ³⁾	•
Side load and impact test equipment (wheel types 27, 28, 29, 41 & 42)	•		
Balance checking equipment	•		
Bending test equipment for diamond cutting-off wheels		•	
Shear test equipment for portable dish/cup wheels		•	
Tensile test equipment for diamond wires		•	
Device to verify blade tensioning (for non-precision cutting off wheels with 100 m/s and blade diameters 300 – 400 mm for hand-held machines)		•	
Humidity and temperature enclosure to condition products prior to testing			•
Dimensional measuring and weighing equipment	•	•	•

Table 1: Essential test equipment

- 1) For products 100 mm diameter and under, burst testing can be carried out externally by an oSa approved facility or by testing a larger diameter wheel in the same specification.
- 2) If the speed test equipment for abrasive products for stationary grinding and cutting-off machines is not available, testing must be performed externally by an oSa approved facility.
- 3) If the speed test equipment for superabrasive products with metal blanks/cores is not available, testing must be performed externally by an oSa approved facility.

1.1 Implementation of Bursting speed test

The test must be carried out as stipulated in the respective EN safety standards.

1.2 Implementation of Side load test

The test must be carried out as stipulated in the EN 12413. The material of the pressure roll can be chosen free. But it is of utmost importance to use only rolls with the correct geometry (**Figure 1**).

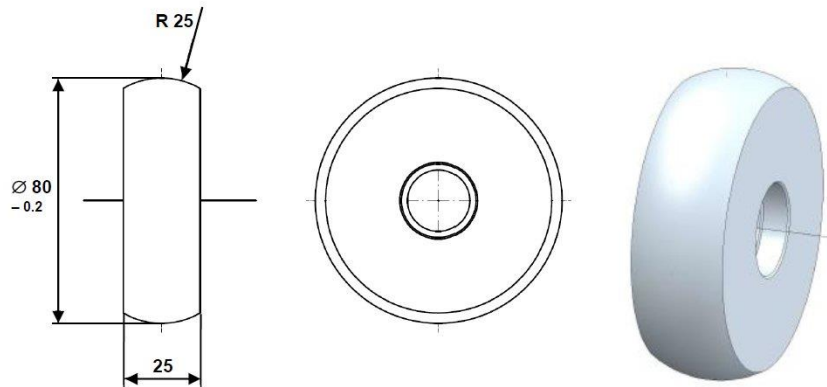


Figure 1: Roller geometry

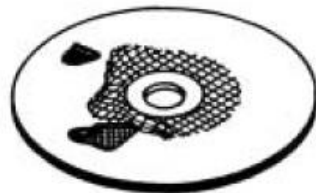
The roller diameter should be 80 mm with a tolerance of +0, - 0.2 mm. Roller wear should not exceed more than 1 mm of initial roller diameter for abrasive wheels with $D \leq 150$ mm and 3 mm for abrasive wheels with $D > 150$ mm.

1.3 Implementation of Impact test

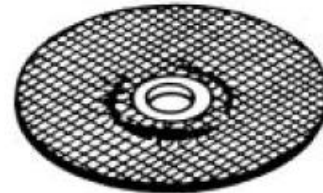
The test must be carried out as stipulated in the EN 12413. The material of the striker can be chosen freely, but it is of utmost importance to know which impact energy in Nm can be reached at a certain position of the pendulum on the test machine.

Once the wheel has reached the maximum operating speed, the first impact shall be carried out at an energy level that corresponds to the minimum requirement of EN 12413 (refer to Table 5 of EN 12413: i.e. 2 Nm).

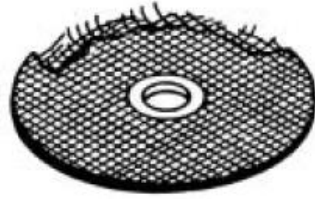
After each impact, the test sample must be visually inspected for damage. If the test sample is not damaged, the next strike at a higher energy level shall be carried out and then the test sample must be visually inspected again. This procedure shall be repeated until clear damage occurs. Refer to the following sketches, to determine the type of damage (**Figure 2**).



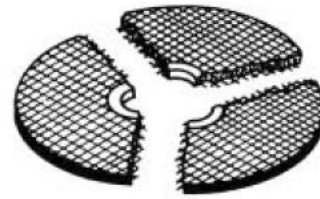
Type a) Delamination between abrasive material and cloth



Type b) Breakage at bore area



Type c) Breakage at periphery



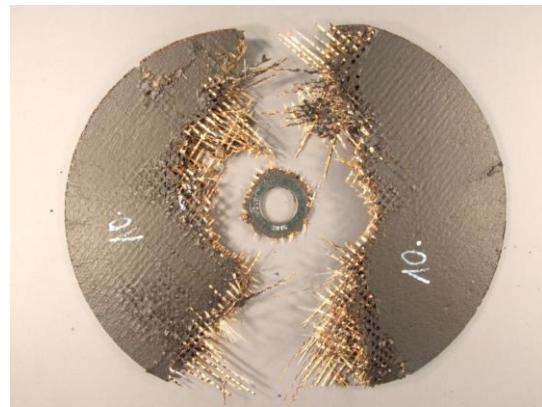
Type d) Breakage into several pieces

Figure 2: Types of damage in impact tests

The following examples (**Figure 3**) were obtained at the IFA and show clearly the different types of damage.



Type b) Breakage at bore area



Type d) Breakage into several pieces

Figure 3: Examples of types of damage

2 DESIGN AND IN-PROCESS TESTING

2.1 Design testing

Design tests must be carried out when developing new products or when there is any change to the product that the manufacturer considers would seriously affect the product safety. Records must be available to verify consistent conformance to the requirements.

Design tests must also be conducted on oSa defined products when requested by oSa. Additionally, some of these products will require external testing. Results must be made available to oSa.

In exceptional cases¹, where it is not possible to break the product the requirement for abrasive products on portable machines will be considered to be met if all samples withstand a test level of at least 110% of the requirement (100% for abrasive products on stationary machines).

2.2 In-process testing

In-process testing must be carried out to confirm that the process is under control and that defective products are identified and quarantined. In-process testing must be carried out on all production batches at a sampling level determined by the manufacturer. Analytical records should be kept of all defective products.

Where a burst speed test or side load and impact test is specified, if the product survives the minimum requirement there is no need to take it to destruction but it must be destroyed after testing. Products surviving the safety speed test do not need to be destroyed.

2.3 Testing requirements for abrasive products (Table 2)

	DESIGN TEST	IN-PROCESS TEST
	Tested to destruction	Tested to minimum requirement
BONDED ABRASIVES		
Types 27, 28, 29, 41 and 42 reinforced wheels for hand-held machines	Burst speed test Side load test Impact test	Burst speed test Side load test Impact test
Type 41 reinforced cutting-off wheels for mobile machines and manually guided stationary machines	Burst speed test	Burst speed test
All other wheels	Burst speed test	Safety speed test
COATED ABRASIVES		
Flap wheels, flap discs and fibre discs	Burst speed test	Burst speed test
SUPERABRASIVES		
Non-precision diamond cutting-off wheels	Burst speed test Bending test	Non-destructive bending test
Portable cup/dish wheels	Burst speed test Shear test	Non-destructive shear test
Diamond wires	Tensile test	
Precision superabrasives:		
with non-metal core (e.g. vitrified or resin)	Burst speed test	Safety speed test
with metal core	Burst speed test	

Table 2: Testing requirements for abrasive products

¹ risk of spindle damage

3 PRODUCTS UNDER THE SCOPE OF OSA MEMBERSHIP

Table 3 below shows manually-guided and hand-held grinding and cutting applications. Any product within the scope of the EN safety standards manufactured in these categories should be included in the scope of oSa membership.

For products outside the scope of oSa membership it is recommended to be at least produced and tested according to a recognized safety standard.

Type of application	Type of machine	Abrasive product	Workpiece	Examples
manually-guided grinding and cutting	stationary machines	fixed	manually guided	bench, pedestal and floor stand grinding machines
	mobile machines	manually guided	fixed	swing frame grinding and cutting machines, floor saws and grinders
hand-held grinding and cutting	hand-held machines	manually guided	fixed	angle grinders, straight grinders, petrol saws

Table 3: Manually-guided and hand-held grinding and cutting applications

Table 4 below shows mechanically-guided grinding and cutting applications. Selection of products in this category to be included in the scope of oSa membership is optional.

Type of application	Type of machine	Abrasive product	Workpiece	Examples
mechanically-guided grinding and cutting	stationary machines and stationary machines totally enclosed	fixed	mechanically guided	All stationary grinding and cutting machines with the exception of those given in Table 3
		mechanically guided	fixed	
		mechanically guided	mechanically guided	

Table 4: Mechanically-guided grinding and cutting applications

4 PRODUCTS OUTSIDE THE SCOPE OF THE EN SAFETY STANDARDS

The following approval procedure applies to innovative rotating abrasive tools not covered by the existing safety standards EN 12413, EN 13236 or EN 13743. Especially for products with potential safety hazards a verification of a safety standard is important both for the user and the producer of the product.

Descriptions are valid for design tests as well as in-process tests, number of tests to be defined by manufacturer. The approval procedure is based on a potential hazard analysis on the use of rotating grinding tools. Criteria for the hazard analysis are:

- Type of machine: handheld, mobile, stationary, stationary totally enclosed
- workpiece handheld or fixed
- application cutting off or grinding
- potential hazards are listed in **Table 5**:

Potential hazard	Test method	Parameter	Description
Bursting	Burst speed test	Safety factor s_{br}	EN 12413, EN 13236, EN 13743 (whichever is closest in product description)
Spindle breakage	Spindle deflection test (only applicable for spindle mounted abrasive products)	Safety factor s_{ab}	
Tool breakage	Side load / impact test (for bonded abrasives in applications where side load can occur)	load [N] / impact [Nm]	EN 12413
	Destructive bending test (for superabrasives)	load [N]	EN 13236
	Destructive shear test (for superabrasives)	load [N]	EN 13236

Table 5: Hazard analysis for products outside the safety standards

4.1 Requirements for products outside the safety standards

Given values in the following table (**Table 6**) are worst case values (highest value in safety standards for a similar application). For products listed in the applicable safety standard the value given in the standard applies.

MACHINE TYPE	WORK-PIECE	APPLI-CATION	PRODUCT TYPE	MINIMUM BURST SPEED TEST S FACTOR	SPINDLE DEFLECTION TEST S FACTOR	SIDE LOAD AND IMPACT TEST		BENDING TEST	SHEAR TEST
						Single-point side load (N)	Impact (Nm)		
Hand-held	Fixed	Grinding	Bonded abrasives similar to types 27, 28 & 29	3.5	-	290 (≥ 115 mm)	4.5 (150mm) 5.4 (180mm) 6.9 (230mm)	-	-
			All other products	3.5	-	-	-	-	-
			Diamond dish wheels	3.5	-	-	-	-	> 6400 N or □□60 N/mm ²
			All spindle-mounted	3.5	1.3	-	-	-	-
		Cutting	Bonded abrasives similar to types 41 & 42	3.5	-	40 (115-125mm) 50 (150-230mm)	1.2 (150mm) 1.5 (180mm) 2.0 (230mm)	-	-
			Bonded abrasives similar to type 41	3.5	-	125 (>230mm)	5.4	-	-
			Diamond saws	3.5	-	-	-	segmented: □ _b = 900 N/mm ² or M _b = 10 Nm (whatever larger) continuous rim: M _b = 125*D/2 Nm	-

**Table 6: Requirements for products outside the safety standards,
Machine type: hand-held**

MACHINE TYPE	WORK-PIECE	APPLICA-TION	PRODUCT TYPE	MINIMUM BURST SPEED TEST S FACTOR	SPINDLE DEFLECTION TEST S FACTOR	SIDE LOAD AND IMPACT TEST		BENDING TEST	SHEAR TEST
						Single-point side load (N)	Impact (Nm)		
Mobile	Fixed	Grinding	All products	3.5	-	-	-	-	-
		Cutting	Diamond saws	3.5	-	-	-	450 N/mm ²	-
			All other products	3.5	-	-	-	-	-
Stationary	Hand-held	Grinding	All products	3.5	-	-	-	-	-
		Cutting	All products	3.5	-	-	-	-	-
	Fixed	Grinding	High pressure grinding	3.5	-	-	-	-	-
			All spindle-mounted	3.0	1.3	-	-	-	-
			All other products	3.0	-	-	-	-	-
		Cutting	Diamond saws	2.0	-	-	-	450 N/mm ²	-
			All other products	2.0	-	-	-	-	-
Stationary-totally enclosed	Fixed	Grinding	High pressure grinding	3.0	-	-	-	-	
			All other products	1.75	-	-	-	-	
		Cutting	All products	1.75	-	-	-	-	

**Table 6 (continued): Requirements for products outside the safety standards,
 Machine type: mobile, stationary, stationary totally enclosed**