

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 AND IMPLEMENTATION OF TESTS

1.1 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.

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

| 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.

1.2 Minimum requirements for calibration of test equipment

The test equipment must be calibrated at least once a year and be marked clearly with the current calibration status. This must be supported by documentary evidence. Minimum requirements for calibration are listed in **Table 2**.

| Test equipment | Calibration object | Calibration equipment |
|----------------|---------------------------------------|---|
| Burst Speed | Drive (rpm) | Tachometer |
| Side Load | Drive (rpm) | Tachometer |
| | Load cells (force) | 2-3 weights of known mass or load cell |
| Impact | Drive (rpm) | Tachometer |
| | Striking mechanism (mass) | Scale |
| | Striking mechanism (angular position) | Angle meter |
| | Striking mechanism (friction) | Time measurement of e.g. 50 swings or calibration set of machine manufacturer |

Table 2: Minimum requirements for calibration of test equipment

In case of internal calibration: Calibration equipment must be calibrated regularly by an accredited institute according to an internally specified calibration interval.

Calibration and test data must be stored at least for 5 years.

1.3 Implementation of Bursting speed test

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

1.4 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. It is of utmost importance to use only rolls with the correct geometry, see EN 12413.

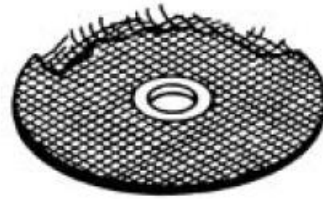
1.5 Implementation of Impact test

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 and to use only strikers with the correct geometry, see EN 12413.

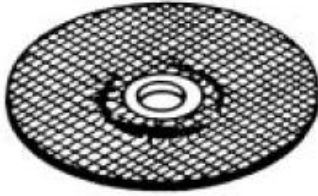
Refer to the following sketches and example pictures to determine the type of damage (**Figure 1**). The relevant criterion for failure is a visible tear or rupture of the reinforcement (fiberglass fabric).



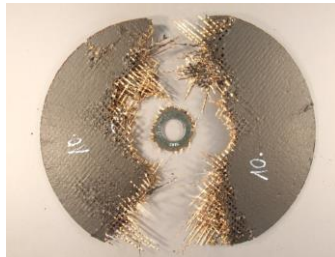
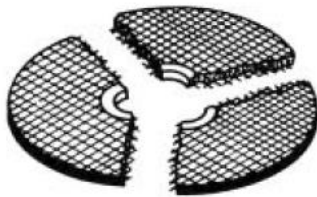
Type a) Delamination between abrasive material and cloth



Type b) Breakage at periphery



Type c) Breakage at bore area; the example pictures were obtained at the IFA and show different types of damage



Type d) Breakage into several pieces; the example picture was obtained at the IFA

Figure 1: Types of damage in impact tests

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 cases (risk of spindle damage), where it is not possible to break the product the requirement (minimum bursting speed) 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 3)

| | 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 | Bending test |
| Portable cup/dish wheels | Burst speed test Shear test | Shear test |
| Diamond wires | Tensile test | |
| Precision superabrasives: | | |
| with non-metal core (e.g. vitrified or resin) | Burst speed test | |
| with metal core | Burst speed test | |

Table 3: Testing requirements for abrasive products

3 PRODUCTS UNDER THE SCOPE OF OSA MEMBERSHIP

Table 4 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 4: Manually-guided and hand-held grinding and cutting applications

Table 5 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 4 |
| | | mechanically guided | fixed | |
| | | mechanically guided | mechanically guided | |

Table 5: Mechanically-guided grinding and cutting applications

4 PRODUCTS OUTSIDE THE SCOPE OF THE EN SAFETY STANDARDS

4.1 Approval Procedure

The use of the oSa® logo on innovative rotating abrasive tools not covered by the existing safety standards EN 12413, EN 13236 or EN 13743 is subject to a formal approval procedure, which requires the submission of a written application on a special oSa form as well as a risk assessment and respective test results. 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 6**:

| 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 6: Hazard analysis for products outside the safety standards

4.2 Requirements for products outside the safety standards

For products not covered by the safety standards, the following table applies (**Table 7**). Risk assessment and testing are the necessary basis for the classification of products according to Table 7.

| Machine Type | Work piece | Application | Product Type | Minimum Burst Speed Test S Factor *rf. EN standards | 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 | 3.0 or 3.5 | - | 290 (≥ 115 mm) | 4.5 (150mm) 5.4 (180mm) 6.9 (230mm) | - | - |
| | | | All other products | 3.0 or 3.5 | - | - | - | - | - |
| | | | Diamond dish wheels | 3.5 | - | - | - | - | F _A ≥ 6400 N or τ _S ≥ 60 N/mm ² |
| | | | All spindle-mounted | 3.0 | 1.3 | - | - | - | - |
| | | Cutting | Bonded abrasives similar to types 41 & 42 | 3.0 or 3.5 | - | 40 (115-125mm) 50 (150-230mm) | 1.2 (150mm) 1.5 (180mm) 2.0 (230mm) | - | - |
| | | | Bonded abrasives similar to type 41 | 3.0 or 3.5 | - | 125 (>230mm) | 5.4 | - | - |
| | | | Diamond saws | 3.5 | - | - | - | segmented: σ _b = 700 N/mm ² or M _b = 10 Nm (whatever larger) continuous rim: M _b = 125*D/2 Nm | - |
| Mobile | Fixed | Grinding | All products | 3.0 or 3.5 | - | - | - | - | - |
| | | Cutting | Diamond saws | 3.5 | - | - | - | 450 N/mm ² | - |
| | | | All other products | 3.0 or 3.5 | - | - | - | - | - |
| Stationary | Hand-held | Grinding | All products | 3.0 or 3.5 | - | - | - | - | - |
| | | Cutting | All products | 3.0 or 3.5 | - | - | - | - | - |
| | Fixed | Grinding | High pressure grinding | 3.5 | - | - | - | - | - |
| | | | All spindle-mounted | 3.0 | 1.3 | - | - | - | - |
| | | | All other products | 3.0 or 3.5 | - | - | - | - | - |
| | | 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 7: Requirements for products outside the safety standards