Safety cutting and grinding

Safetybrand Tyrolit

We strive to provide operators products with maximum safety. We achieve this through our work as the founder member of the "Organisation for the Safety of Abrasives (oSa)", through close cooperation with the safety authorities and through practical communication with our operators across the globe.

aim of oSa®

The main aim of oSa® is defined in terms of absolute protection for the users of grinding tools, whereby members undertake to provide a consistently high level of quality, adopt a rigorous approach towards quality assurance and strive to develop new, improved standards of safety.

Tyrolit quality management system

The Tyrolit quality management system has been certified to ISO 9001:2015 for the entire production area by an external authorised body. The products are manufactured and tested in line with European safety standards:

- EN 12413 for grinding wheels made of bonded abrasives
- EN 13236 for grinding wheels made of diamond or boron nitride
- EN 13743 for special abrasives on an underlay such as vulcanised fibre grinding wheels, flap grinding wheels, flap discs and mounted points

On account of the fact that in the approval principles (EN-Standard) very high requirements are set on the grinding tools concerning defined technical grinding parameters, Tyrolit basically delivers all grinding tools corresponding to these principles. As a result we guarantee a constantly high safety level, also in countries without compulsory approvals.

Final inspection – checks at Tyrolit

Tyrolit carries out final inspections in accordance with EN safety standards. In addition, internal testing procedures are also used to determine efficiency and material properties.

Resin bonded products undergo a final inspection regarding a visual and identification test, a geometry, imba- lance, bursting and side load test as well as a control grinding and cutting process.

Resin and ceramic bonded products undergo a final inspection regarding a visual and identification test, a geometry, imbalance, bursting and side load test as well as a test run, a sound test.

Safety

The following plays an equal part when it comes to safety when grinding: machine manufacturer, grinding wheel producer and user.

Grinding wheels are subject to a high load during the grinding process. This is why grinding machines, grinding bodies, handling and application must be optimally harmonised to ensure safe grinding. For the grinding machines, it is generally important to observe the machine conditions and the stipulation of the protection cover.

Whereas the manufacturer implements the safety measures in line with regulations in relation to the grinding machine and grinding wheels, the user is responsible for safety when grinding through use of the grinding machine for the intended purpose, as well as through correct handling and application of the grinding wheels.

The following must be observed:

- Checking of grinding bodies on delivery
- Handling and storage of grinding bodies
- Labelling, synchronisation with machine data
- Checking of grinding wheels prior to clamping
- Clamping methods for grinding wheels
- Test run of grinding bodies prior to start-up
- Eye protection and protective clothing (see also FEPA safety code)

Storage of the grinding wheels

Grinding wheels are to be stored in suitable racks or containers so that they are not damaged and so that it is easily possible to remove wheels without disturbing the storage setup. Older stock should be used first.

During storage, the following must be noted

Store the grinding wheels in a dry, rust-free condition and do not expose grinding wheels to large temperature fluctuations.

Storage for different types of grinding bodies

- Store cut-off wheels on a level underlay without intermediate layers and weigh them down with a steel or cast iron plate
- Store large straight grinding wheels in an upright position and make sure they cannot roll away
- Stack cylinder wheels, cylindrical grinding discs and grinding plates using soft intermediate layers
- Stack grinding discs, shape 11, in each cases faces or bases together
- Store small grinding wheels in suitable containers

Checking of grinding wheels on delivery

Check packaging on delivery. If damage is visible on the packaging, the grinding wheel should be checked particularly thoroughly for any possible transport damage.

Identification of the grinding wheels

The purpose of the identification is to give people, in particular those who carry out the clamping of the grinding wheels, information for safe use and proper application.

Grinding wheels may only be used if they are identified with the following minimum information

- Manufacturer
- Dimensions of grinding wheel
- Material (at least the type of bond)
- Maximum permissible RPM of new grinding wheel and maximum operating speed in m/s

The user is obliged to match the machine speed to the maximum permissible speed given in the identification.

Checking of grinding wheels prior to clamping

Each time before clamping, the grinding wheels must be cleaned and checked for damage by means of visual inspection.

The sound test should be repeated. Damaged grinding wheels must not be mounted.

For the sound test, lightweight grinding wheels are pushed onto a mandrel or shaft, heavy grinding wheels are placed on a firm floor.

The grinding wheel is tapped with a non-metal object at several points.

An undamaged grinding wheel gives a clear ring, while a damaged on gives a dull or clanking sound.

All contact surfaces on grinding wheels, intermediate layers and wheel flanges must be level (flat) and be free from foreign bodies. Foreign particles between grinding wheels and wheel flanges create pressure points and stresses, which can lead to breakage of the grinding wheel.

Clamping methods for grinding wheels

Depending on the type of machine and grinding

method, as well as the grinding wheel shape, a distinction can be made between the following clamping methods

- Mounting in the central bore using wheel flanges
- Mounting using embedded fixing elements
- Mounting using support plates
- Mounting using clamping head

Mounting in the central bore using wheel flanges
A distinction should be made between the following wheel flange types for central bores

- Recessed wheel flange
- Straight wheel flanges for portable grinding machines
- Special flanges
- Stepped flanges
- Locating flanges and tapered wheel flanges

The purpose of the wheel flanges is to transfer drive forces. They must therefore be in such a condition that there is no deformation of the wheel flange during clamping. The contact surfaces must be level (flat) and must not show any burring, and the run-out of the grinding wheel must be safeguarded.

Only wheel flanges that have the same external diameter and the same shape on the contact side may be used. They must be recessed so that only a ring-shaped area of the wheel flange is on the surface.

Clamping using embedded fixing elements
The grinding wheels are fixed using embedded fixing ele- ments on the grinding machine. Examples of this are the clamping of cylindrical and taper cup wheels, or the fixing of mounted points with embedded steel shafts in collets on portable grinding machines.

Clamping of grinding wheels on support plates
The grinding wheels are either cemented or fixed with inserted nuts.

Clamping of grinding segments in clamping heads
Grinding segments are clamped to one grinding unit (segment head) in clamping heads. On the contact surfaces between the grinding segments and the clamping pieces, adhesive strips can be placed on the grinding segments to avoid stresses in the grinding segments.

Test run prior to start-up
Every grinding wheel without a diameter restriction must undergo a test run at maximum operating speed before being used for the first time and after every re-clamping.

The duration of a test run is one minute.

The test run may only be carried out once the danger zone has been secured and – where the grinding wheel must be used with the machine guard – this has been placed on it. The grinding wheel can only be used for the intended work once the test run has been passed without complaint.

Eye protection and protective clothing
All grinding tasks where people are at risk form flying particle off grinding wheels or workpieces must only be carried out using eye protection (safety glasses) and when necessary, other protective clothing (e.g. leather apron and leather gloves).

Summary
The most important points for safe use of grinding wheels are summarised again below:

- Adjustment of the machine data to the identification data
- Checking of grinding wheels prior to mounting
- Mounting carried out by skilled people
- Checking of the functionality of the machine guard
- Test run of grinding wheels prior to grinding work
- Personal safety

Do’s & don’ts

- ✓ Handle and store grinding tools carefully; use the oldest tools first.
- ✓ Prior to mounting or use, grinding wheels must be cleaned and undergo a visual check for cracks or possible damage.
- ✓ Ceramic bonded grinding tools must undergo a sound check before mounting.
- ✓ Make sure that the speed of the machine (RPM) does not exceed the maximum operating speed specified on the packaging or on the abrasive.
- ✓ Ensure that the bore of the grinding tool – with or without thread – fits the shaft of the machine perfectly; and that the wheel flanges are clean, flat, the same size and suitable for the grinding tool to be clamped.
- ✓ As intended or supplied, use the intermediate layers between the grinding wheel and wheel flanges.
- ✓ Only use machines with protection/guards and ensure their proper condition and fixture before the machine is switched on.
- ✓ After each mounting, carry out a test run for at least one minute at the operating speed and ensure machine guard is mounted correctly. In doing so, ensure that any fragments would not be able to hit you or someone else in the event of a possible breakage.
- ✓ Eye protection is always recommended for all grinding processes. For off-hand grinding, protective goggles or a safety mask is recommended.
- ✓ When working with cut-off or roughing wheels, ensure that the air supply and protective measures sufficiently correspond with the material to be processed. Suitable extraction systems should be fitted for all dry grinding processes.
- ✓ Only use machines that are also suitable for grinding tools with hub.
- ✓ Before stopping the machine, cut off the supply of cooling lubricant and remove the excess cooling lubricant from the grinding wheel.

- × Do not use abrasives that are exposed to particularly humid/wet conditions or high temperatures prior to mounting.
- × Never use abrasives that have been dropped, damaged or that look like they would not be fit for purpose.
- × Never exceed the maximum permissible operating speed specified.
- × Do not use wheel flanges with surfaces that are not free of foreign bodies (e. g. grinding swarf), flat or burrfree.
- × Do not tighten the clamping device or wheel flange too much.
- × Do not use recessed wheel flanges or flanges with recesses for grinding discs or cones.
- × Never use force when clamping and do not make any changes to the grinding tool.
- × Only use one-way adapters (hubs) once.
- × Only switch on the machine when the protection cover is correctly and securely fixed (machine guards or covers should be set in such a way that they divert sparks and grinding particles away from the body).
- × Only start the machine if there is no contact between the workpiece and the grinding tool.
- × Never work with grinding tools without sufficient air supply (never without breathing apparatus and ear protection, particularly in enclosed spaces) and without personal safety equipment (see pictogram).
- × Use a suitable grinding tool – an unsuitable product can create excessive grinding particles and dust.
- × Avoid mechanical damage to the grinding wheel as a result of force effects, jolting or heating.
- × Never use grinding machines in an improper condition or that contain faulty components.
- × Do not use cut-off wheels for grinding work (do not exert a lateral load on any cut-off wheels of shape 41 or 42).
- × Never mount more than one grinding tool on one shaft.
- × Never use grinding tools after the indicated expiry date. This is expressed as a month and year (e.g. 04/2016) and is usually located on the metal ring around the bore on cut-off or roughing wheels. On other tool types (e.g. cup wheels), the expiry date may also be located on the label.

Safety information


Use gloves


Use eye protection


Use ear protection


Use dust mask


Declaration of conformity, EN safety standard


Pay attention to the safety recommendations


Wet grinding

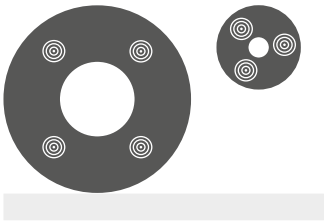

Dry grinding


Do not use damaged wheels

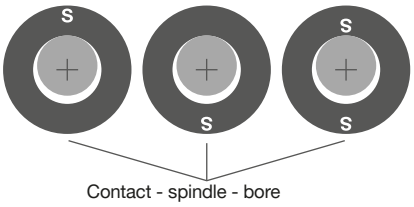

Not permitted for side grinding


No freehand work

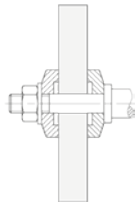

Free from Fe, S, Cl



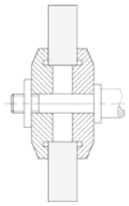
Examples of tapping points during the sound test



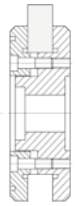
Examples of identifying wheel orientation



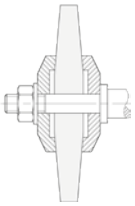
Recessed wheel flange



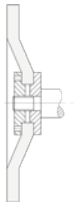
Stepped flange



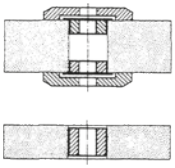
Locating flange



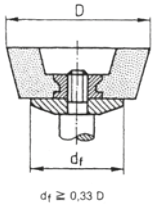
Tapered wheel flange



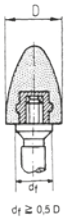
Straight wheel flange



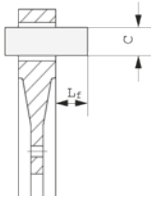
Example of the correct way to use reducing rings



Clamping of taper cup wheels with a thread insert



Clamping of a grinding cone, shape 16, with a thread insert



Clamping of grinding segments in clamping heads Lf = 1.5 C

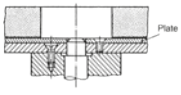


Figure 1

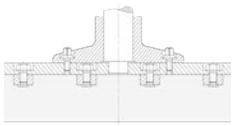


Figure 2

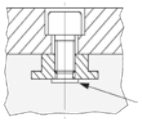


Figure 3

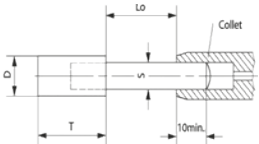


Figure 4

Fig. 1: Grinding wheel, cemented
Fig. 2: Grinding wheel with inserted nuts
Fig. 3: Correct bolt connection, bolt end must not touch the base of the grinding wheel
Fig. 4: Clamping of mounted points

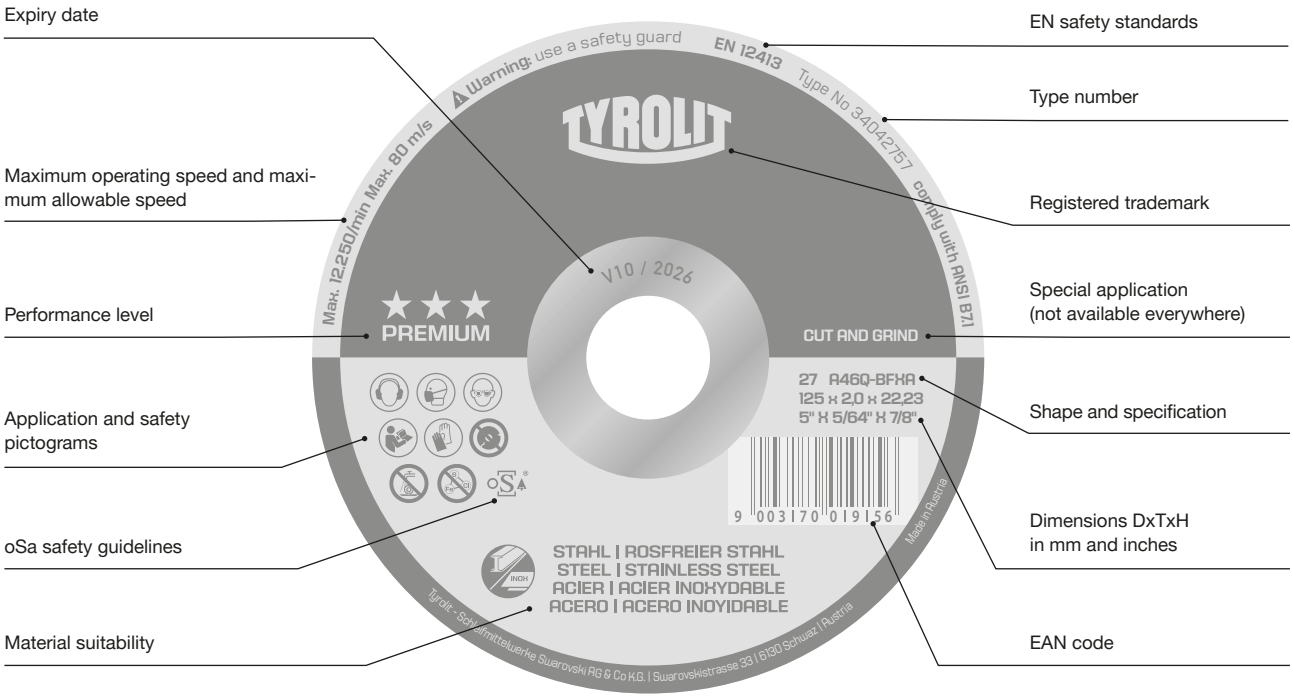
Speed recommendations

Rotational speeds and peripheral speeds depending on the external diameter Ø=D of the grinding wheels.

	Rotations n per minute min-1 depends on external diameter D of grinding wheel and the maximum operating speed V_s										
	Maximum operating speed V_s in m/s										
D in mm	**16**	**20**	**25**	**32**	**35**	**40**	**50**	**63**	**80**	**100**	**125**
3											
4	75 300	95 400									
5	61 100	76 300	95 400								
6	50 900	63 600	79 500								
8	38 100	47 700	59 600	76 300	83 500	95 400					
10	30 500	38 100	47 700	61 100	66 800	76 300	95 400				
13	23 500	29 300	36 700	47 000	51 400	58 700	73 400	92 500			
16	19 000	23 800	29 800	38 100	41 700	47 700	59 600	75 200	95 400		
20	15 200	19 000	23 800	30 500	33 400	38 100	47 700	60 100	76 300	95 400	
25	12 200	15 200	19 000	24 400	26 700	30 500	38 100	48 100	61 100	76 300	95 400
32	9 540	11 900	14 900	19 000	20 800	23 800	29 800	37 600	47 700	59 600	74 600
35	8 730	10 900	13 600	17 400	19 000	21 800	27 200	34 300	43 600	54 400	68 200
40	7 630	9 540	11 900	15 200	16 700	19 000	23 800	30 000	38 100	47 700	59 600
50	6 110	7 630	9 540	12 200	13 300	15 200	19 000	24 000	30 500	38 100	47 700
63	4 850	6 060	7 570	9 700	10 600	12 100	15 100	10 000	24 200	30 300	37 800
80	3 810	4 770	5 960	7 630	8 350	9 540	11 900	15 000	19 000	23 800	29 800
100	3 050	3 810	4 770	6 110	6 680	7 630	9 540	12 000	15 200	19 000	23 800
115	2 650	3 320	4 150	5 310	5 810	6 640	8 300	10 400	13 200	16 600	20 700
125	2 440	3 050	3 810	4 880	5 340	6 110	7 630	9 620	12 200	15 200	19 000
150	2 030	2 540	3 180	4 070	4 450	5 090	6 360	8 020	10 100	12 700	15 900
175	1 740	2 180	2 720	3 490	3 810	4 360	5 450	6 870	8 730	10 900	13 600
180	1 690	2 120	2 650	3 390	3 710	4 240	5 300	6 680	8 480	10 600	13 200
200	1 520	1 900	2 380	3 050	3 340	3 810	4 770	6 010	7 630	9 540	11 900
225	1 350	1 690	2 120	2 710	2 970	3 390	4 240	5 340	6 790	8 480	10 600
230	1 320	1 660	2 070	2 650	2 900	3 320	4 150	5 230	6 640	8 300	10 300
250	1 220	1 520	1 900	2 440	2 670	3 050	3 810	4 810	6 110	7 630	9 540
300	1 010	1 270	1 590	2 030	2 220	2 540	3 180	4 010	5 090	6 360	7 950
350	870	1 090	1 360	1 740	1 900	2 180	2 720	3 430	4 360	5 450	6 820
400	760	950	1 190	1 520	1 670	1 900	2 380	3 000	3 810	4 770	5 960
450	670	840	1 060	1 350	1 480	1 690	2 120	2 670	3 390	4 240	5 300
500	610	760	950	1 220	1 330	1 520	1 900	2 400	3 050	3 810	4 770
600	500	630	790	1 010	1 110	1 270	1 590	2 000	2 540	3 180	3 970
700	430	540	680	870	950	1 090	1 360	1 710	2 180	2 720	3 410
750	400	500	630	810	890	1 010	1 270	1 600	2 030	2 540	3 180
800	380	470	590	760	830	950	1 190	1 500	1 900	2 380	2 980
900	330	420	530	670	740	840	1 060	1 330	1 690	2 120	2 650
1 000	300	380	470	610	660	760	950	1 200	1 520	1 900	2 380
1 060	280	360	450	570	630	720	900	1 130	1 440	1 800	2 250
1 250	250	310	390	500	550	630	790	1 000	1 270	1 590	1 980
1 500	200	250	310	400	440	500	630	800	1 010	1 270	1 590

Resin-bonded cut-off wheels

Cut-off wheels product label



Colour codes

Label

Steel	2in1	INOX	Nonferrous metals	Cast iron	Stone

Colour code

Blue	Blue	Red	Orange	Purple	Green

Material

Steel	2in1 = Steel and stainless steel	Stainless steel	Aluminium, copper, zinc, brass, bronze, stone	Cast materials	Stone