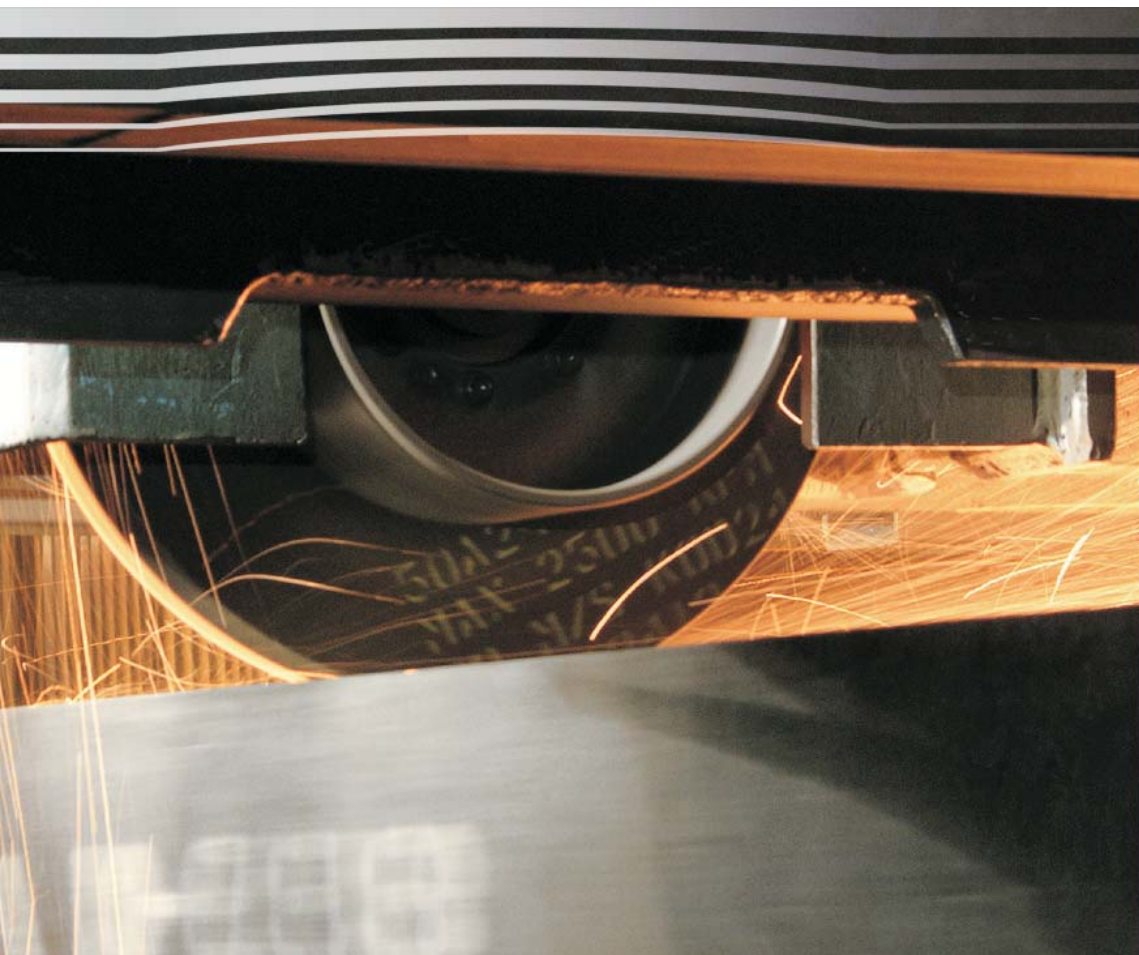




WINTERTHUR
TECHNOLOGY GROUP

HOT PRESSED CONDITIONING WHEELS



Applications

The conditioning of the workpieces serves as the best possible preparation for further processing. Surface scale is removed, and hardness and surface defects are eliminated so that subsequent economical processing can be assured, and that high quality end products will result. Depending on the workpiece-

quality and on the type of finished product, a distinction is made between:

Complete conditioning

The whole surface is freed from scale, cinder patches and other surface defects.

Spot grinding

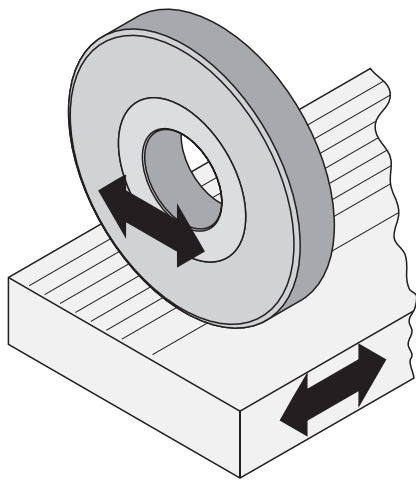
Locally restricted surface defects are ground off

Control grinding

Control marks are ground locally on the workpiece to detect possible defects

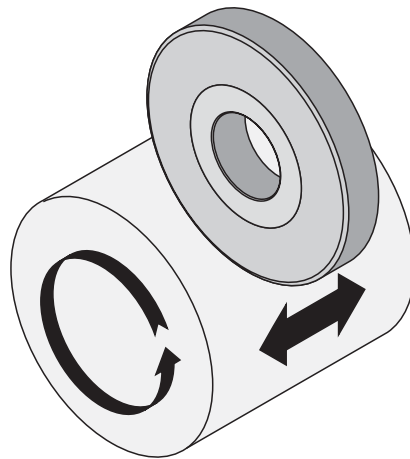
Grinding machines

Table grinding machines



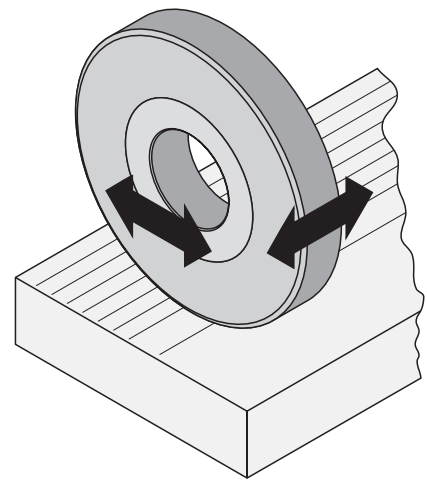
The workpiece is clamped onto a reciprocating table which is guided along the grinding wheel. The grinding head only executes the cross-feed movement.

Cylindrical grinding machines (Roll grinding machines)



The workpiece is clamped onto a reciprocating table which is guided along the grinding wheel in a rotating movement. The grinding head only executes the infeed movement.

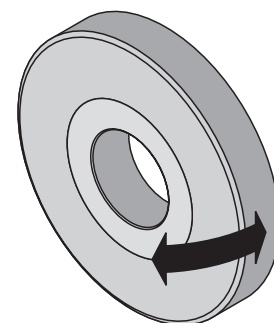
Swing frame and rail type grinders



The workpiece lies on a fixed bed and the grinding head traverses the length of the workpiece. The grinding head executes the traverse- and the cross-feed movement.

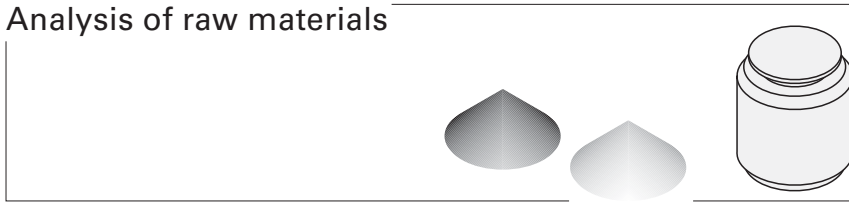
Position of the grinding head

For many applications the angular position of the grinding head is at 90° or 45° (at an angle to the grinding direction). If the grinding head is tilted at 45°, more material (broader marks) can be removed, while at the same time, a rougher surface will result (in comparison to the 90° wheel position).



Production process

Analysis of raw materials



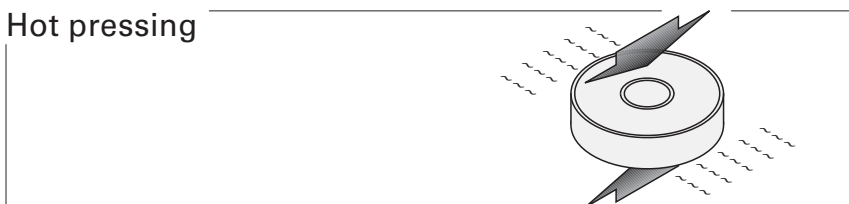
Weighing and mixing



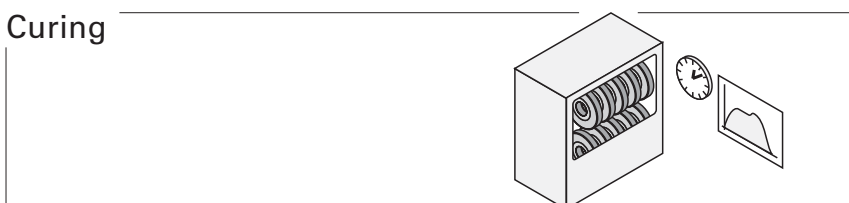
Filling



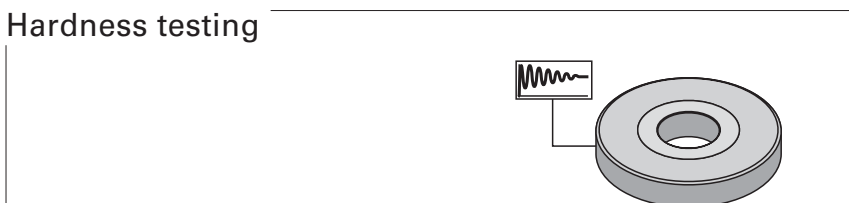
Hot pressing



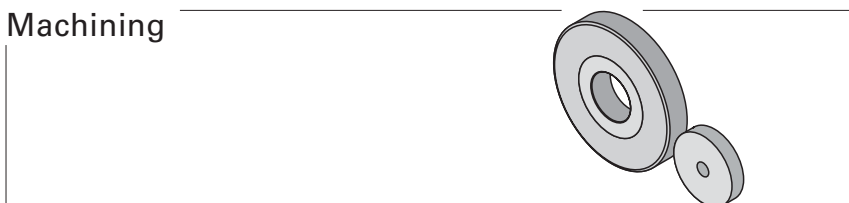
Curing



Hardness testing



Machining

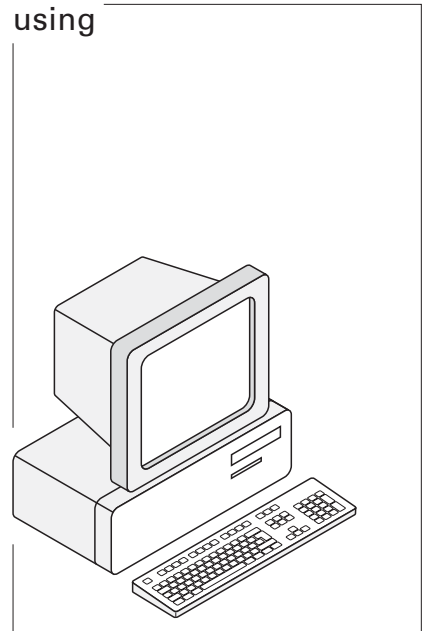


Final checking

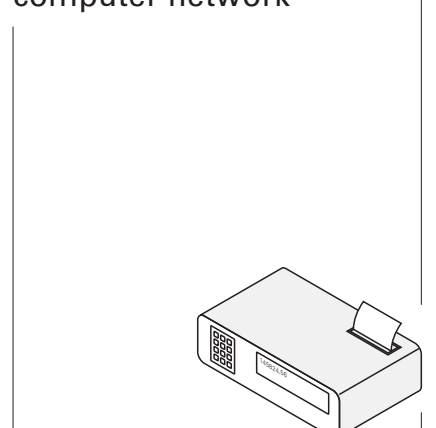


Quality assurance

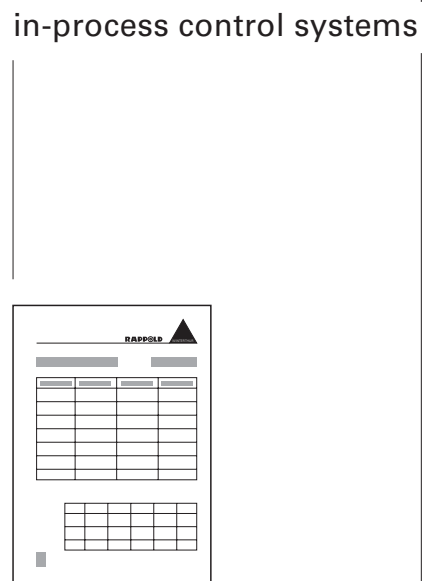
using



computer network



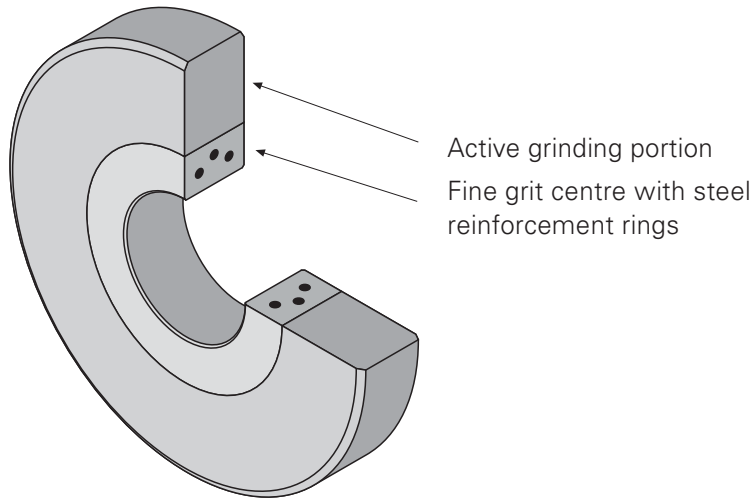
in-process control systems



Test certificates

Hot pressed grinding wheels

Hot pressed grinding wheels are resin bonded wheels compacted under elevated temperatures and by high pressure. Modern HP-wheels have a remaining pore volume of less than 2%. Well established and long term manufacturing know-how and expertise ensure a constant high level of product quality, excellent performance ratios and superior safety. The safety factor, for example, is higher than 3,5.

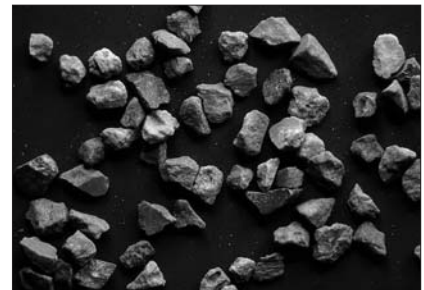


Grain

Regular aluminium oxide

Sintered ceramic aluminium oxide (sintered rods)

Zirconium aluminium



Aluminium oxide produced by melting bauxite in electric arc furnaces.

Micro-crystalline aluminium oxide, sintered after crushing and extruding. Due to this process, the resulting grain has a finer and more homogenous structure than that of regular aluminium oxide.

Aluminium oxide with 25% zirconium aluminium is considerably tougher than regular aluminium oxide. Available in sharp-edged or blocky grit shape.

Abrasive 1A, 12A

Stainless steel

Excellent surface quality

Rt < 60µ

Lower wheel life

Low material removal rate

Grain size 8 to 30

Abrasive 601A, 700A, 801A

Stainless steel

Fine to medium surface quality

60µ < Rt < 150µ

Average wheel life

Medium material removal rate

Grain size 10 to 30

Abrasive ZS, ZF, ZZ, ZB

Carbon steel and alloyed steel

Rough surface finish

Rt > 150µ

Long wheel life

High material removal rate

Grain size 6 to 24

Grain mixtures

By mixing different types of grain the characteristics of hot-pressed wheels can be specifically varied.

625ZS	75 % 601A, 25 % ZS	Adding zirconium aluminium oxide increases the wheel life with the resulting surface becoming marginally rougher
650ZS	50 % 601A, 50 % ZS	
725ZS	75 % 700A, 25 % ZS	
750ZS	50 % 700A, 50 % ZS	

Grain size

FEPA-grit size in mesh

The grain sizes are graded according to international standards. They correspond to the mesh number specified as apertures per linear inch of the screen used to sort the grit. (Grain size 12 corresponds to a sieve with 12 apertures per linear inch.)

The rougher the grain, the higher the material removal capacity, and the rougher the resulting surface. When using finer grains, the material removal capacity is diminished while the surface finish improves.

Grain size mixtures

By mixing different grain sizes the cutting capacity and the surface quality can be specifically optimised.

Bond material

The bond material holds together the abrasive grains. The more resistance the bond puts up against the breaking out of abrasive grains from the bond matrix, the harder the grinding wheel acts. The single grain lasts longer and becomes more and more blunt until it finally breaks out

from the bond matrix. Wheels with hard bonds are, therefore, less aggressive but last longer. When using softer grinding wheels, the single grain breaks out from the bond matrix earlier and exposes new grains for the grinding process. Grinding wheels with softer bond materials

cut, therefore, more aggressively but wear faster.

The hardness of HP-grinding wheels is designated by letters from T to Z; T being the softest and Z the hardest.

Bond	Application	Hardness
BH880, BH929	Carbon steel and low-alloyed steel	Z
BH470, BH468, BH40, BH41, BH42	High-alloyed and stainless steel	Y
BH2	General purpose	Y
B626	Ball bearing steel	X
B321433	Machines with low spindle power	W
BH195	Roll grinding, grinding of engine blocks	U
BH 195 + Induced porosity	Roll grinding, grinding of engine blocks	T

Reinforcements

Fibre glass reinforcement

Increases the resistance to breakage of grinding wheels and prevents the spreading of cracks.

Fine grit centre with steel rings

The wheel's centre area consists of fine grit fused around steel rings. This increases the resistance of the grinding wheel thereby reducing the danger of wheel breakages.

Special curing processes

Many years of experience ensure the selection of the optimal curing process to guarantee proper cross linking within the resin matrix.

Specification

Example

Dimension [mm]

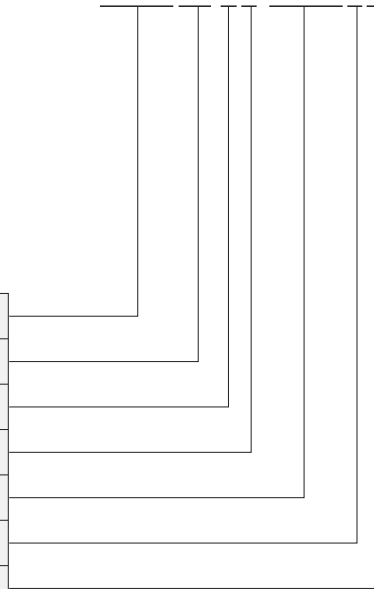
T1-610x102x304,8

Quality

601A16 Y0 B42H8A

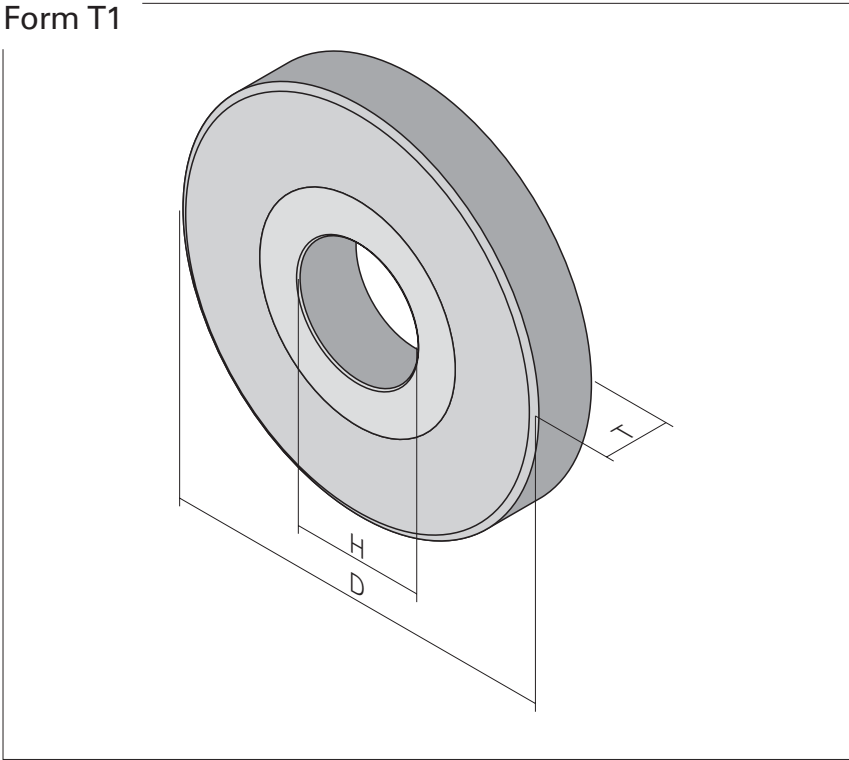
Wheel shape
Diameter D
Thickness T
Bore diameter H

Abrasive
Grain size (mesh)
Hardness
Stucture
Bond material
Maximum permissible peripheral speed
Fine grit centre with steel rings



Dimensions

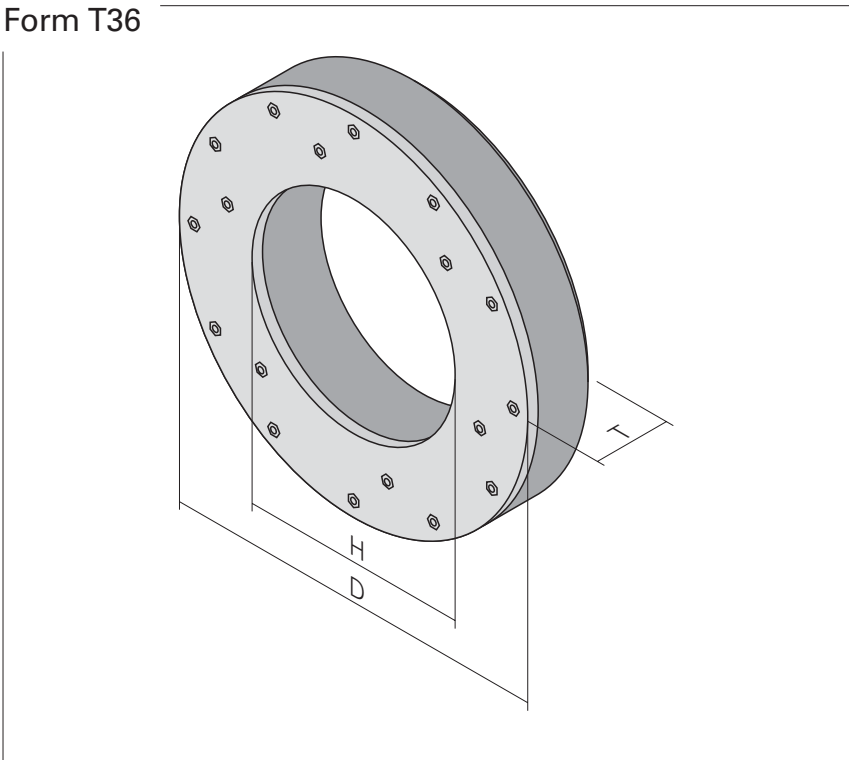
Form T1



D [mm]	T [mm]	H [mm]
406	40	152,4
	50	
508	63	254,0
	76	
610	102	203,0
	127	203,2
	150	304,8
	150	305,0
920	102	304,8
	127	305,0
	150	

Special dimensions are available on request

Form T36



D [mm]	T [mm]	H [mm]
609,6	120,65	355,6

Special dimensions are available on request

Technical grinding information

rpm of the HP-grinding wheel

$$n = \frac{v \cdot 60 \cdot 1000}{D \cdot \pi} \quad [\text{U/min}]$$

v Peripheral speed [m/s]
D Diameter of the HP-grinding wheel [mm]

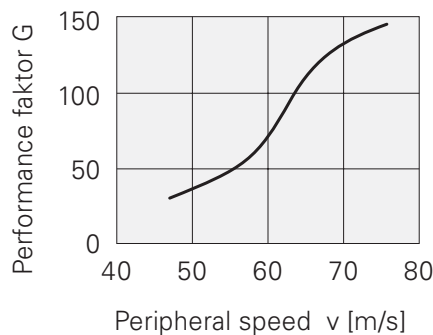
Performance factor G

$$G = \frac{G_w}{G_s}$$

G_w Ground off material [kg]
 G_s Used HP-grinding wheel [kg]

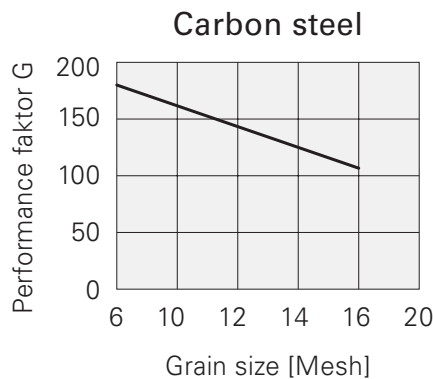
Dependence of the performance factor G on the peripheral speed

A great number of studies have shown that the performance factor goes up with increasing peripheral speed.

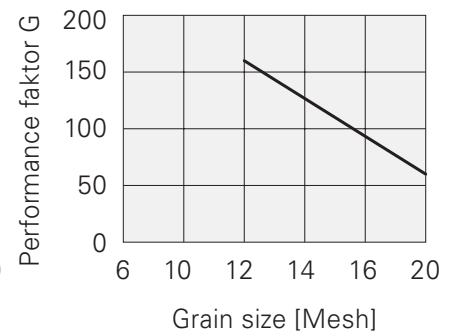


Dependence of the performance factor G on the grain size

The achievable performance factor goes up with increasing grain size (mesh). The grain size should be selected, therefore, as large as possible; the limitation being, of course, the surface roughness.

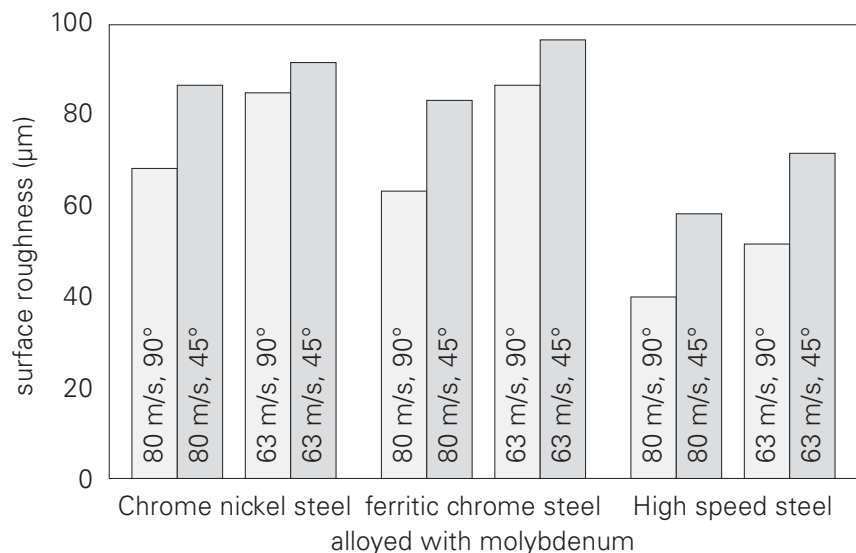


Chrome-nickel steel, austenitic steel



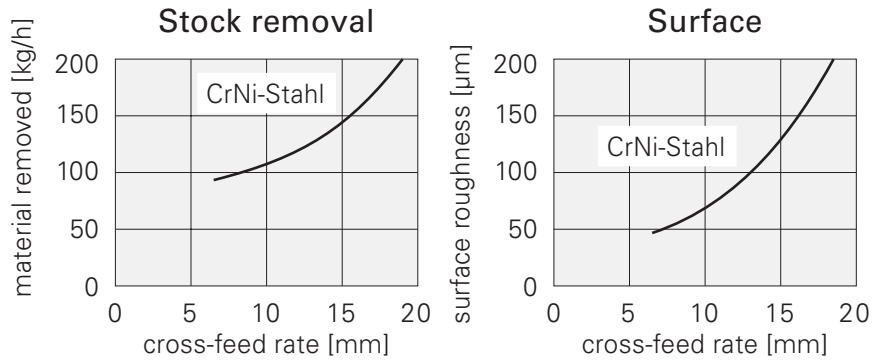
Influence of the position of the grinding head and peripheral speed on the surface quality

By tilting the grinding head to 45° or reducing the peripheral speed, the surface roughness (µm) will be increased.



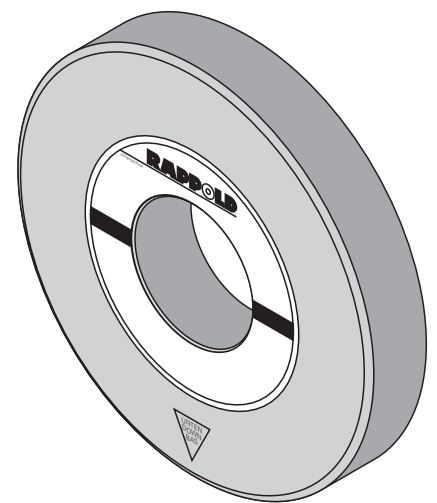
Influence of the cross feed rate on stock removal per hour and surface roughness

With increasing cross-feed rate, the volume of material removed per hour goes up but results in a rougher surface.



Safety information

- HP-grinding wheels require careful handling and storage (The storage area must be dry, protected against changing temperatures, humidity and vibrations).
- Before mounting, always carefully inspect HP-grinding wheels for cracks and damages.
- Never exceed the maximum permissible peripheral speed. This speed is indicated by a colour stripe diagonally marked across the wheel side
Red stripe = 80 m/s
Yellow stripe = 63 m/s
- Cardboard blotters must always be used between the steel flange and the wheel surface.
- The wheel bore must fit easily onto the spindle
Attention: Never mount a wheel by using force !
- The wheel must be mounted with the blotter on the outside and with the mounting arrow facing downwards.
- Flange screws must be tightened in a criss-cross sequence and by using a torque wrench.
- After mounting and prior to starting the grinding process, the wheel should run in idle mode for 5 minutes



User guidelines

- To avoid excessive material removal rates
 - use low cross-feed
 - set position of the grinding head at 45°
 - adapt grinding pressure
- To avoid overheating of workpiece or of wheel:
 - do not keep grinding pressure too low
 - Select grain size as coarse as possible in accordance with the required surface finish

Excessive wheel temperature may reduce the wheel life, thereby increasing overall grinding costs!
- Ensure regular checking of the machine tool and its drives. Worn out driving belts may change the grinding parameter and reduce tool life!
- To avoid vibrations
 - Increase grinding pressure when vibrations arise. Do not reduce grinding pressure should vibrations occur!

Case history

Grinding of stainless steel slabs in steel works

These slabs are made of ferritic or austenitic steel. Due to the required surface finish, two separate machines are necessary for roughing and finishing.

Roughing

HP-grinding wheel

T1-610x76x203,2 ZS6-1 Y0 BXT10H8A

Work piece		Ferritic steel, 350 °C	Austenitic steel
Throughput	[kg]	107.600	424.500
Stock removal	[kg]	3.860	10.620
Contact time	[h]	5,1	13,0
Throughput per hour	[kg/h]	21.098	32.654
Stock removal per hour	[kg/h]	756,9	816,9
Performance factor	[kg/kg]	75,0	191,4

Finishing

HP-grinding wheel

T1-610x76x203,2 801A24 Y0 BT10H8A

Work piece		Ferritic steel, 350 °C	Austenitic steel
Throughput	[kg]	62.290	121.780
Stock removal	[kg]	742	1.850
Contact time	[h]	2,1	5,7
Throughput per hour	[kg/h]	29.662	21.365
Stock removal per hour	[kg/h]	353,3	324,6
Performance factor	[kg/kg]	14,8	37,2

Billet grinding

The billets are made of spring steel (150x150 mm, 7m) and have to be conditioned for the subsequent rolling operation.

HP-grinding wheel

T1-610x76x203,2 ZS6-1 Y0 BXT10H8A

Throughput	[kg]	494.450
Stock removal	[kg]	9.889
Contact time	[h]	31,0
Throughput per hour	[kg/h]	15.950
Stock removal per hour	[kg/h]	319
Performance factor	[kg/kg]	149

Required information for grinding wheel selection

Company name	
Contact person	

Machine type

Manufacturer/year of construction		
Machine spindle drive power		[KW or PS]
Max. grinding pressure		[N]
Max. peripheral speed		[m/s]

Work piece

Type	<input type="checkbox"/> Billets	<input type="checkbox"/> Slabs
Dimension		[mm]
Quality / Temperature	<input type="checkbox"/> Constructional steel <input type="checkbox"/> Steel, low-alloyed <input type="checkbox"/> Steel, high-alloyed <input type="checkbox"/> Stainless steel, austenitic <input type="checkbox"/> Stainless steel, ferritic <input type="checkbox"/> Other	[%] [%] [%] [%] [%] °C [%]

Grinding wheel

Dimension		[mm]
Specification		
Annual consumption		pcs
Current wheel in use		

Grinding parameters

Table speed		[mm/min]
Cross feed		[mm]
Grinding pressure		[N]
Peripheral speed		[m/s]
Grinding head angle	<input type="checkbox"/> 90° <input type="checkbox"/> 45° <input type="checkbox"/> Other	

Requirements

Surface roughness	R_t R_a R_{max}	[μ m]
G-ratio (desired)		[kg/kg]
Stock removal		[kg/h]
Other		



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