

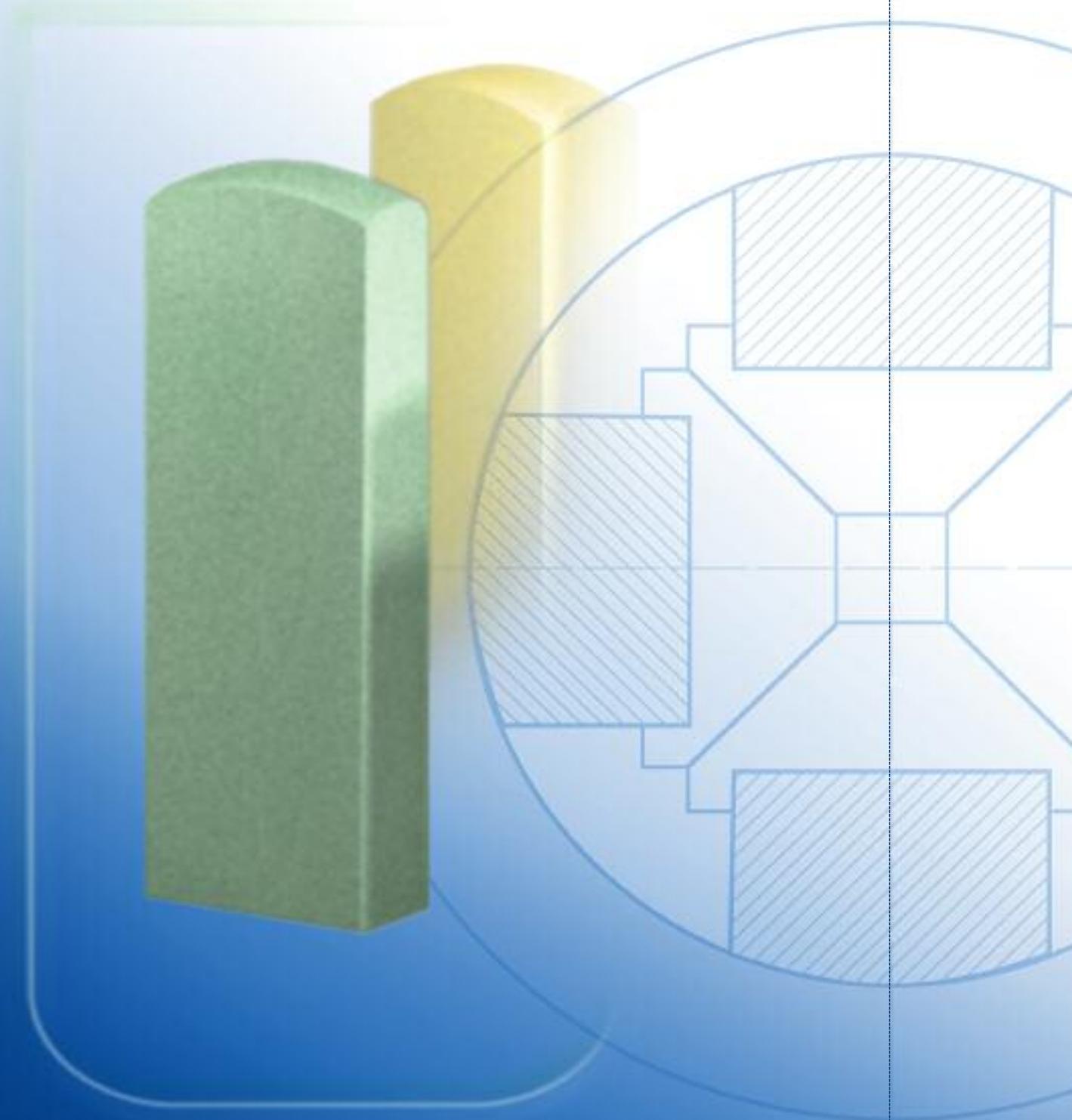


**ATLANTIC**

GRINDING WHEELS + HONING STONES

*creative & dynamic*

**Honing and Superfinishing stones  
for the perfect finish**



**The proven product range for optimum surface requirements**

## A wide selection for the perfect finish

The use of high performance abrasives has become an important factor regarding both the function and economic viability of production in most areas of industry. The progress in tool development relates directly to the continuous optimisation of the quality of abrasive products; Atlantik GmbH has sold such products throughout the world for over 80 years under the trade name **ATLANTIC**.

Atlantik GmbH is your competent partner for the service and customer orientated production of bonded abrasives in all types of grain (aluminium oxide, silicon carbide, sintered aluminium oxide, diamond and cubic boron nitride) in both resin and vitrified bonds.

### More possibilities from A – Z with millions of permutations

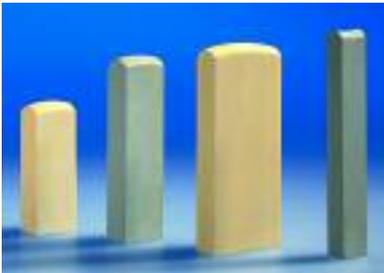
**ATLANTIC** abrasive products are used in the automobile, steel and bearing industries as also indeed within their supply chain. In order to satisfy the requirements, **ATLANTIC** abrasive products achieve high stock removal rates and good surface finish.

Today, the company produces approx. 40 000 different products from which numerous variations are also possible.

### Competence to the core

The various application requirements can seldom be fulfilled with a universal specification. The quality is specifically tailored to the application.

- Grinding wheels and segments
- Diamond and CBN wheels
- Honing and superfinishing stones



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### Strong in superfinishing (short stroke honing)

For the final finishing processes, Atlantik GmbH can offer both honing and superfinishing stones, which not only produce the finest of surfaces and/or precisely defined surface textures whilst optimising size and geometric accuracy, but also guarantee a high stock removal rate.

### Honing (long stroke honing)

As a result of pre-machining operations, the workpiece generally possesses geometrical inaccuracies, which can only be eliminated by honing. The peaks and valleys can be eliminated by the continuous contact between honing stone and workpiece. Roundness errors can be corrected by the honing stones encompassing a large contact area with the workpiece. Honed surfaces have a high bearing area and are extremely durable and wear resistant.



**Stones for superfinishing of ball bearing outer rings**



**Honing stones for long stroke honing**



**Honing stones for superfinishing**

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# Honing - Superfinishing

## Honing

The honing process is characterized by two simultaneous movements

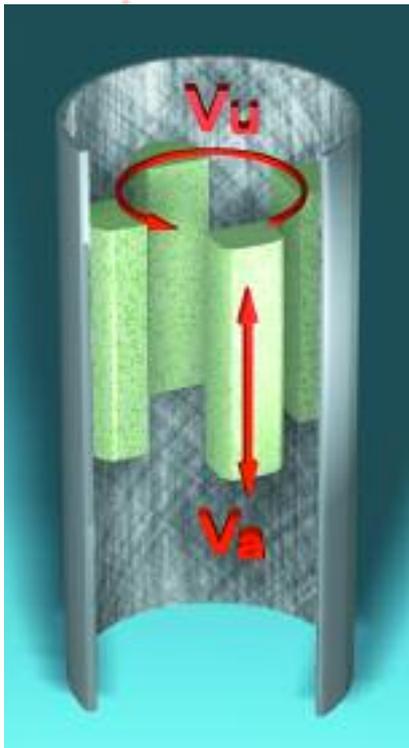
1. The rotational movement of the honing head  $V_u$
2. The linear stroke movement of the honing head  $V_a$

Altering the direction of the stroke results in a crossing over of the machining marks which in turn produces the typical cross-hatch pattern with cross-hatch angle  $\alpha$ .

**Honing**  
 Axial speed  $V_a$   
 Peripheral speed  $V_u$   
 Cutting speed  $V_s$

$$V_s = \sqrt{V_a^2 + V_u^2}$$

$$\frac{\alpha}{2} = \arctan \frac{V_a}{V_u}$$



Cross - hatch angle $\alpha$	30°	45°	60°	90°
Stroke speed	1	1	1	1
Peripheral speed	3.7	2.4	1.75	1

## Superfinishing

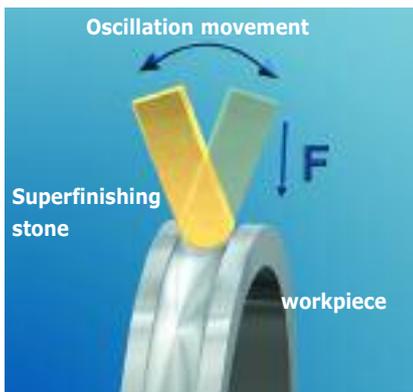
Stroke length and oscillation are the factors which differentiate honing from superfinishing. Due to the method of stone application, unevenness and out-of-round inaccuracies from previous operations can be considerably improved. The surface finish attained produces a high bearing surface essential for components used under high loads.

### Superfinishing with cup wheels

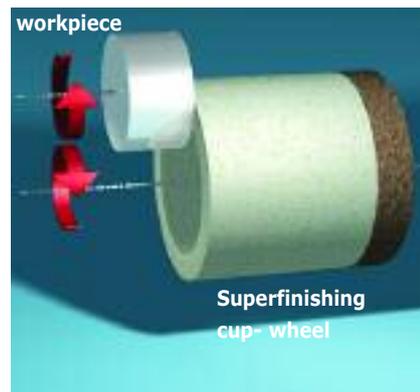
A superfinishing cup-wheel is a thin walled abrasive wheel to achieve both micro and macro geometrical accuracy in addition to the highest surface finish requirement. The grit size used is generally between 220 - 2000. The grain itself is mainly white aluminium oxide or silicon carbide in a vitrified bonding. A sulphur treatment can in certain applications be used to enhance overall performance.

Typical areas of application

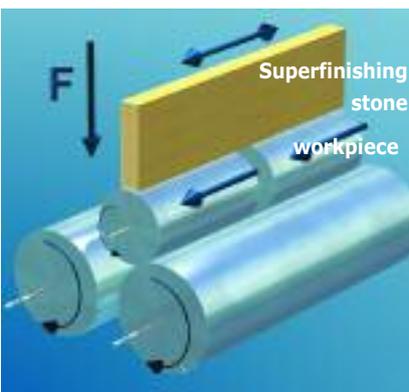
- ⇒ Ball valves
- ⇒ Artificial hip-joints
- ⇒ Side faces of gears
- ⇒ Tappets



Ball track superfinishing



Superfinishing with cup-wheels

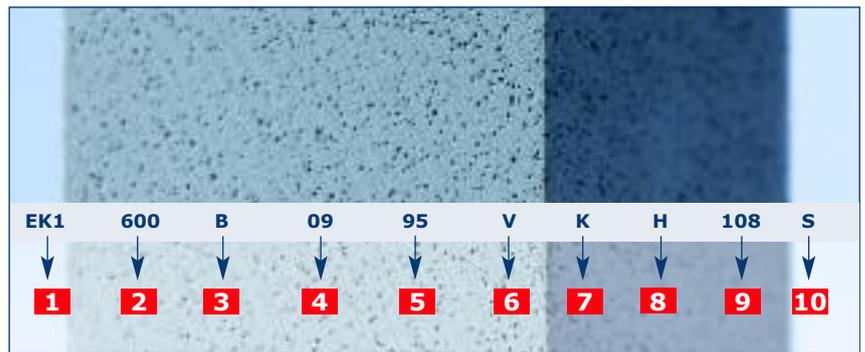


Thrufeed superfinishing

## Method of product identification - grain type

### Identification

A letter - numeral coding system is used to specify the **ATLANTIC** products. By using a complete combination of quality control methods, the precise quality is guaranteed. The documentation of this data ensures traceability and the ability to reproduce the identical **ATLANTIC** product.



- 1** Grain type
- 2** Grit size
- 3** Grit combination\*
- 4** Structure
- 5** Hardness

- 6** Bonding
- 7** Type of bonding
- 8** Production code
- 9** Porosity code \*
- 10** Impregnation \*

### Grain

In the main, crystalline synthetic hard materials are used as the grinding media. The most common and conventional types are alumina (aluminium oxide) and silicon carbide.

\* This information is optional i.e. not stated in every product description

### Fused alumina

Alumina is a crystalline aluminium oxide ( $Al_2O_3$ ) and is divided into the degree of purity i.e. NK - HK - EK (the purest). The raw materials are melted in an electric arc furnace at approximately 2000 °C; NK and HK grain types are produced from calcined bauxite, EK from pure alumina. The toughness of the grain can be influenced by the use of different additives and defined cooling processes. An increase in the  $Al_2O_3$  content increases the hardness and the friability of the grain.

### Microcrystalline sintered alumina

Microcrystalline sintered alumina differentiates itself from the conventional fused alumina by the method of production and properties. The special manufacturing process produces a sintered alumina, which is particularly uniform with a fine crystalline grain structure. The fine crystalline structure allows only the breaking-off of small particles from the whole, even under increasing pressure; this results in each complete grain particle being used to its maximum effect.

### Silicon Carbide

Silicon Carbide (SiC) is a pure synthetic product and is produced from quartz sand and coke heated in an electric resistance furnace to approximately 2200 °C. One differentiates between green and black silicon carbide, which has a slightly higher toughness.

Silicon Carbide is harder, more brittle and sharper edged than alumina. Silicon Carbide is mainly used on hard and brittle materials e.g. grey cast iron, tungsten carbide and non-ferrous metals.



Fused alumina 99,5 %  $Al_2O_3$   
Identification: EK 1



Microcrystalline sintered alumina  
Identification: EB or EX



Silicon carbide green 98-99,5 % SiC  
Identification: SC 9

## Grit size identification

### Grit sizes

**ATLANTIC** products use grit sizes according to DIN ISO 6344. The grain particles are sorted into various groups using standardised sieves. The nominal grit size results from the number of holes per inch in the sieve (mesh).

This means, for example, 60 grit size has been produced from a sieve with 60 mesh holes per inch. The greater the number the finer the grit size.

Grit sizes finer than 240 are no longer classified in terms of mesh size; they are the result of a complex sedimentation process.

### International Comparison

The following table compares the various international standards.

Grit size (mesh)	Average grit diameter in $\mu\text{m}$			
	DIN ISO 6344	JIS	ANSI	
60	270	270	270	<b>Macro grits</b>
70	230		230	
80	190	190	190	
90	160		160	
100	140	165	140	
120	120	120	120	
150	95	95	95	
180	80	80	80	
200	70			
220	60	70	70	
240	45	57	57	<b>Micro grits</b>
280		48	37	
320	29	40	29	
360		35	23	
400	17	30	17	
500	13	25	13	
600	9	20	9	
700		17		
800	7	14	7	
1000	5	12	4	
1200	3	10	3	
1500	2	8		
2000	1	7		
2500		5		
3000		4		
4000		3		
6000		2		
8000		1		

## Hardness - Method of hardness testing

### Honing stone hardness

The hardness denotes the strength by which each particle of grain is retained by the bonding within the honing stone. The hardness is identified by a number for vitrified honing stones with a grit size of 150 and finer;

**200** represents an **extremely soft** stone and **0** an **extremely hard** stone.

The honing stone hardness for grit sizes 120 and coarser are identified in a similar way to grinding wheels by

using an alphabetical letter from A for very soft to Z for very hard.

### Hardness testing

The hardness grading of honing stones is considerably more precise when compared to the method used for grinding wheels.

A special method of testing has been

developed for grit sizes from 150 grit and finer.

This modified Rockwell-system utilizes a ball applied under pressure onto the honing stone block. The hardness value

is the depth of the ball indentation; the higher the value, the softer the stone.

### Honing stone hardness

Marking	Minimum hardness	Maximum hardness
Grit size 150 and finer	200	0
Grit size 120 and coarser	A	Z

### Hardness testing method

Ball diameter	5 mm
Pre - load	98.1 N (10 kg)
Main load	490.5 N (50 kg)

### Grindo-Sonic

This method measures the natural vibration frequency of the abrasive product.

It is dependent upon the physical properties and the dimensions. The results can be converted into the

E - Modulus which assists in establishing a nominal value of the product hardness.

# Bonding - Types of Impregnation - Coolant

## Bonding

The vitrified bonds are based on kaolin, feldspar, quartz and boron silicates. The required honing effect can be achieved by using different mixes of these raw materials combined with precise firing techniques during the manufacturing process.

The honing stone can be exactly suited to the application due to the large variety of vitrified bonds available. The bonding has the function of retaining the grain particle in the honing stone until it is blunted by the machining process;

at this point, the bond should then discard the grain particle in order to allow new sharp particles to be presented. Honing stones are manufactured mainly in vitrified bonds. In special cases, honing stones in a resin bond are used.

## Honing stones with graphite

Honing stones containing graphite are manufactured without exception from white aluminium oxide in a vitrified bond in 400 - 1000 grit sizes. The special feature of this type of stone is the retention of graphite in the vitrified bonding mixture; this provides a high stock removal rate with a good surface finish. Main areas of application can be found in the roller bearing, shock absorber and steel industries.

## Types of impregnation

Sulphurized or wax impregnated honing stones produce a film during the honing process between the stone and the workpiece; this provides the following advantages:

- ⇒ Better surface finish
- ⇒ Less honing stone wear
- ⇒ Better swarf removal

Impregnation	Identification
Sulphur	S
Wax	W

Sulphurized honing stones should not be used on non-ferrous metals due to the possibility of discolourization of the surface.



## Coolant / Filtration

A low viscosity (thin) honing oil is mainly used. The temperature of the honing oil can also have an influence; a cold honing oil (eg. after a weekend in winter in an unheated factory) increases the viscosity. In summer and/or as a result of using a coolant tank with too little capacity, the honing oil can become too thin due to the higher temperature. Due to heat expansion of the machine and the workpiece, it can lead to problems in holding dimensional tolerance. Ideally, the honing oil temperature should be 20-25 °C.

To achieve the best possible surface finish, it is essential to maintain an adequate filtration system.

Poor filtration means unfiltered particles, which in turn leads to deep scratch marks. The industry does however provide a wide selection of filtration systems.

Cause	Effect
<b>Too cold</b>	⇒ high viscosity (thick) poor surface finish
<b>Too hot</b>	⇒ low viscosity (thin) dimensional errors due to heat expansion
<b>Insufficient filtration</b>	⇒ no stock removal poor surface finish
<b>Ideal:</b> Honing oil temperature 20-25 °C	

## Honing stone selection

### Honing stone selection

Due to the wide variation in application, machines and achievable surface finishes, it is impossible to make general recommendations. However, the following tables detail some successful applications using **ATLANTIC** honing stones.



### Honing

Material	Grain type
Steel, non-alloy, low toughness	NK or HK aluminium oxide
Steel, hardened, high toughness	EK aluminium oxide
Steel, nitrided	Silicon carbide
Hard chrome	EK aluminium oxide
Cast materials	Silicon carbide

### Superfinishing

Material	Grain type
Steel, hardened, high toughness	EK / SC
Steel, nitrided	EK
Hard chrome	EK
Cast materials	SC
Non-ferrous metals	SC

### Superfinishing with cup wheels

Workpiece	Material	ATLANTIC Specification
Gear faces	case hardened steel	SC9 600 -09-140 VUE 129S
Fuel injection nozzle body face	case hardened steel	1. Station SC9 800 -08-115 VUC S
		2. Station SC9 1000 -09 -90 VUB S
Artificial hip joints	High alloy steel	1. Station SC9 320 - 4 -55 VDF 8 S
		2. Station SC9 600 - 0 -50 VUF 8 S
		3. Station SC9 800 -04 -60 VUK489 S
		4. Station SC9 1000 -06 -75 VUF S

### Honing

Workpiece	Process	ATLANTIC Specification
Cylinder liners lorry	Rough hone	SC7 100 - G16 VOX 237
	Finish hone	SC7 150B - 00 - 200 VOX 209
Cylinder liners car	Rough hone	Diamond honing stone
	Intermediate hone	SC9 120 - E12 VOS 158 or SC7 150B - 0 - 65 VOS 159 S
	Plateau hone	SC7 400 - 0 - 40 VUL S
Hydraulic cylinders	Rough hone	EK1 120 - I7 VKK S
	Intermediate hone	SC9 400 - 0 - 65 VUK S
	Finish hone	EK1 800 - 22 - 70 VBGR1 S
Hard chrome		EK1 120 - D11 VKF 58 S

## Application

Superfinishing (short stroke honing)

Bearing Industry		ATLANTIC Specification
Ball bearing - track superfinishing	2 Stations	
	1. Station	EK1 800 - 06 - 135 VKH S
	2. Station	SC9 1200 - 00 - 75 VUF 4
Roller bearing - track superfinishing	1. Station	EK1 400 - 0 - 110 VKH S
	2. Station	SC9 600 - 0 - 80 VUC S
Cylinder roller- thrufeed superfinishing (6 stations)	Station 1-3	EK1 600 - 09 - 95 VKH S
	Station 4-5	SC9 800 - 07 - 80 VUF
	Station 6	Superfein N 6000
Automobile Industry		ATLANTIC Specification
Shock absorber rods thrufeed superfinishing (after chroming)	Station 1	EK1 400 - 0 - 110 VKH S
	Station 2-3	EK1 400 - 07 - 175 VKH S
	Station 4-5	EK1 600 - 03 - 200 VKH S
	Station 6-7	EK1 800 - 03 - 200 VKH S
	Station 8	EK1 1000 - 02 - 140 VLO S
Camshaft (cast)		SC9 800 - 05 - 35 GVYY
Crankshaft (cast)		EK1 800 - 08 - 105 VLD 4 S
Crankshaft (steel)		EK1 1000 - 08 - 45 VLO 109 S

### Example for ordering

The following details are necessary for an efficient processing of orders

**Honing stone Shape 5410 / 6 10 x 8 x 150 - SC9 400 0 65 VUK S**

Description

Shape to DIN ISO 525

Edge profile

Dimensions BxCxL

Quality

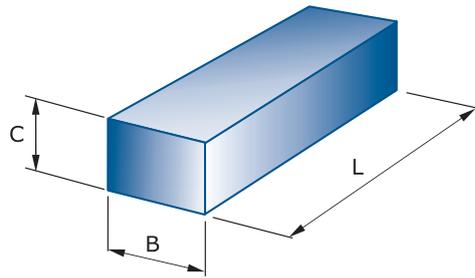
Special shapes can be manufactured to drawing



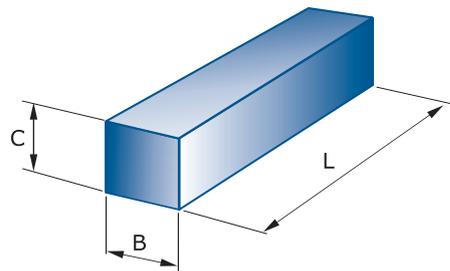
## Honing stone profiles

### Manufacturing to customer drawing

The shape of a honing stone is standardized to ISO 525. Furthermore, these can be supplied with various profiles as illustrated; other profiles can be manufactured to customer drawing.



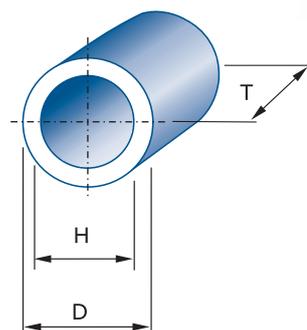
Honing stone Shape 5410  
- B x C x L



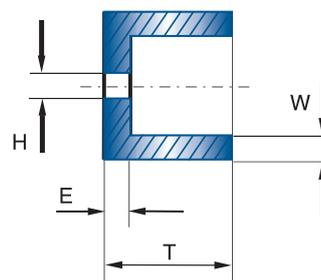
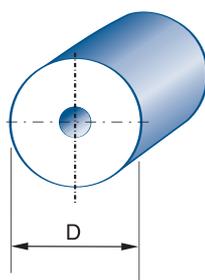
Honing stone Shape 5411  
- B x C x L



Example of a honing stone profile:  
(Shape 5410/6)



Honing stone Shape 5420  
- D x T x H



Honing stone Shape 5421  
- D x T x H - W/E

## Honing stone profiles

### Common honing stone profiles

0



1



2



3



4



5



6



7



8



### Special profiles for superfinishing

In addition to the illustrated profiles, there are a number of other shapes, which can be manufactured to drawing.

0



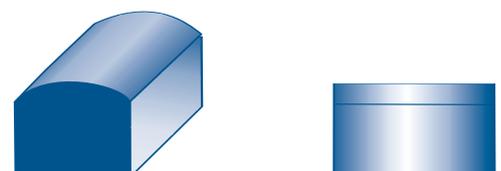
1



2



3



4



5



6



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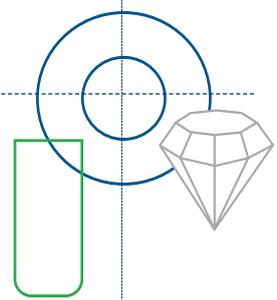
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GRINDING WHEELS + HONING STONES

*creative & dynamic*



**Product range – Grinding wheels – Honing stones**

The required results can be achieved by the use of optimally selected abrasive media and individually tailored specifications from the **ATLANTIC** product range.

We manufacture:

- Grinding wheels and segments
- Honing and superfinishing stones
- From 2 to 1250 mm diameter
- In aluminium oxide and silicon carbide
- In diamond and CBN
- In vitrified and resin bond
- Up to grit size 2000 and superfine qualities to achieve the finest surface finish

in all common sizes and profiles – special profiles are manufactured to drawing at customer's request.



Surface grinding

Profile surface grinding

Cylindrical grinding

Internal grinding

Centerless grinding

Bar grinding

Roll grinding

Thread grinding

Gear tooth grinding

Crankshaft grinding

Cam grinding

Ball grinding

Tool grinding

Track grinding

Hypodermic needle grinding