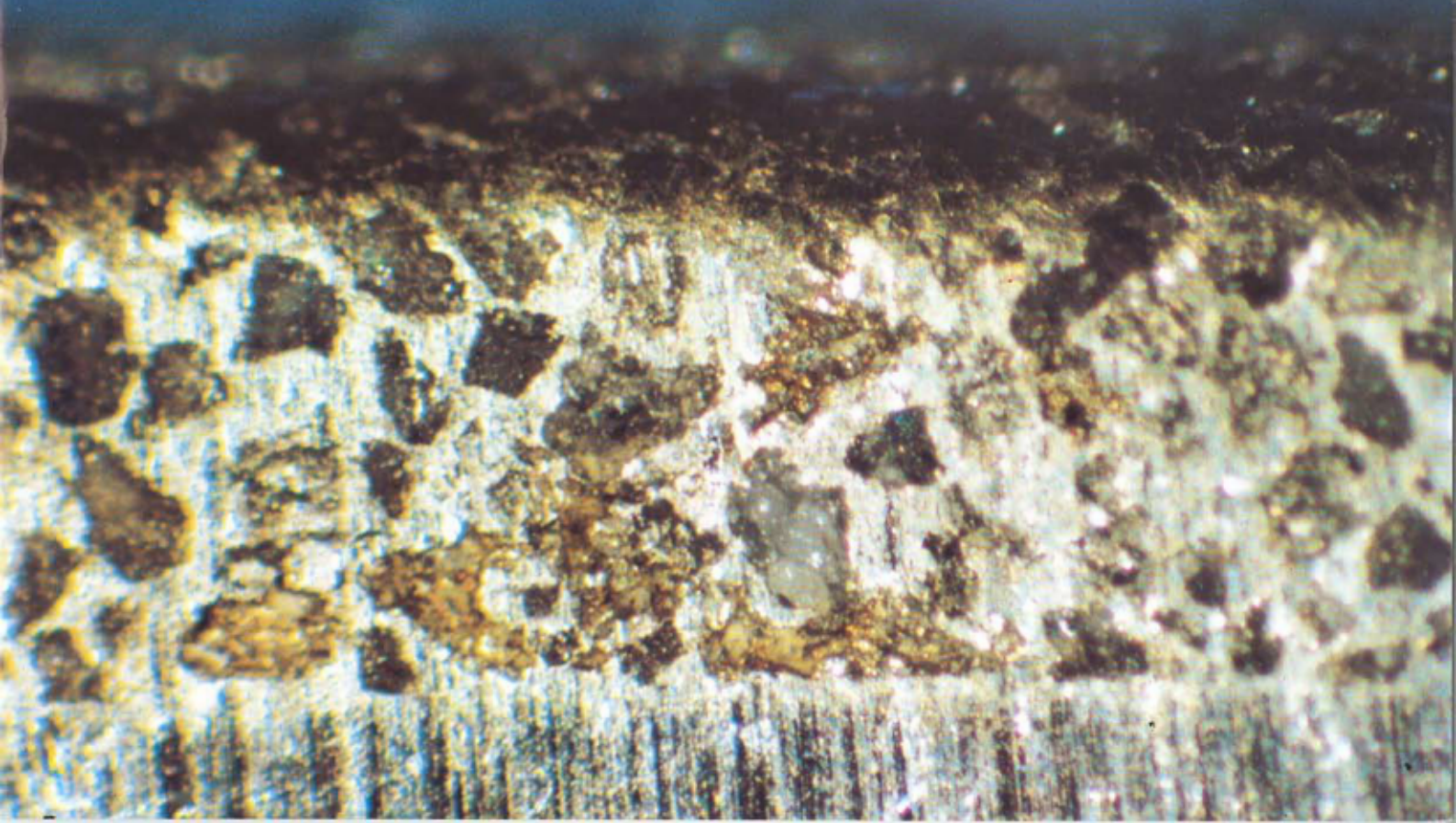


**HUNGER**

**Schleifmittel**

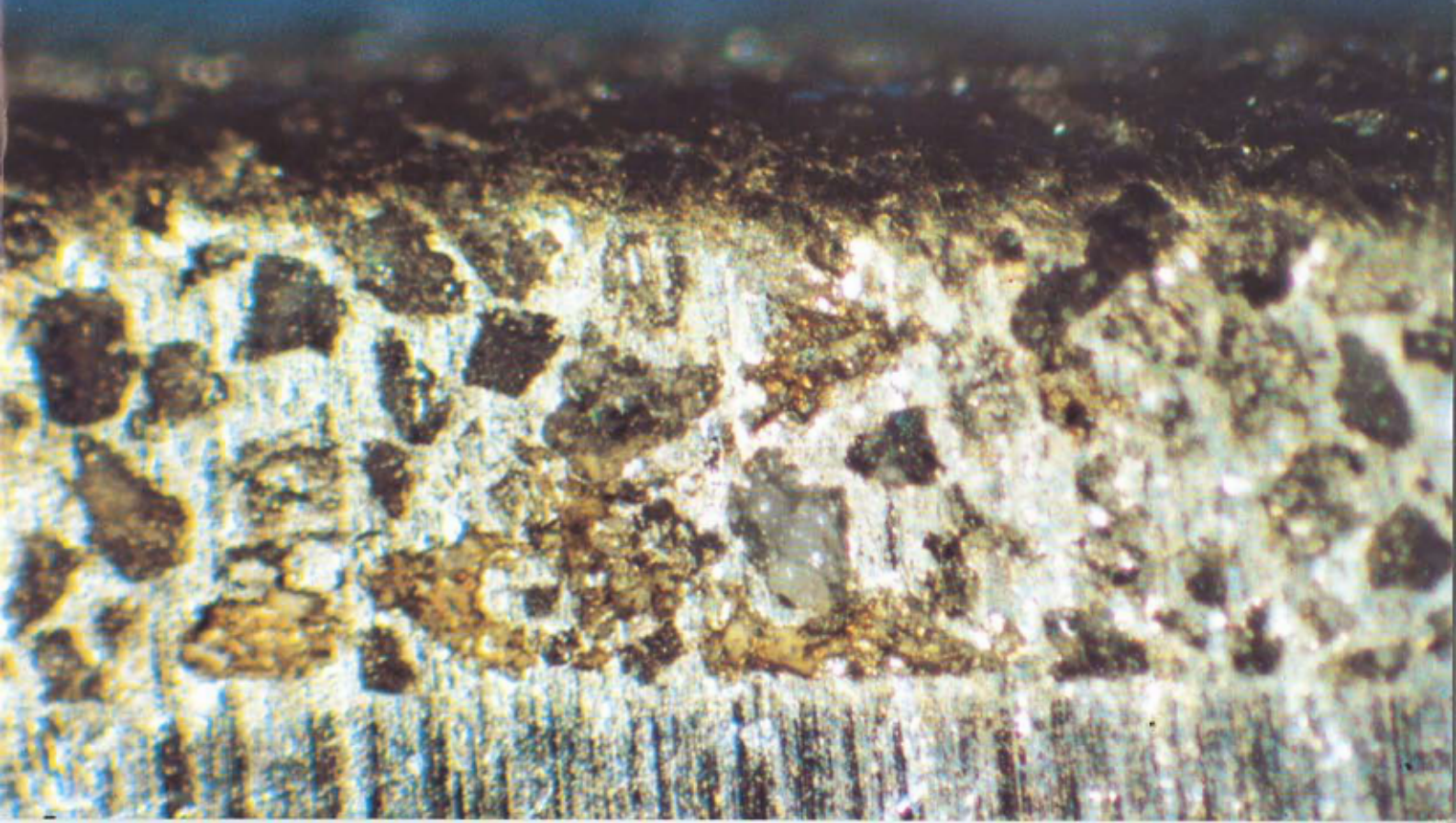
EIN UNTERNEHMEN DER HUNGER-GRUPPE



**HUNGER**

**Schleifmittel**

EIN UNTERNEHMEN DER HUNGER-GRUPPE



## Dovetail honing stone

Every hydraulic cylinder manufacturer knows the problems involved with optimal precision finishing of cylinder tubes and piston rods. Various parameters must be taken into account when selecting honing stones for this purpose including

- service life (honing stone wear), risk of metallic contact, time requirement for changing honing stones, possible contact pressure, bursting of the honing stones, etc.

Hunger Schleifmittel GmbH developed the dovetail honing stone following an intensive study of the above problems – especially for up-to-date honing.

- 100% wear possible
- Hunger honing stones cut dry, i.e. honing oils are generally used as flushing fluid.



- No double stone mountings required
- The plastic casing repels dirt (small particles of dust, which must be kept away from the honing stone) and thus prevents the formation of grooves. In addition these casings allow greater contact pressure and prevent the stones from bursting.

Injected in plastic cages of different colours they are unmistakable as far as their application is concerned:

- Scrubbing stone – in red casing
- Finishing stone – in yellow casing
- Polishing stone – in green casing

## Dovetail honing tools

Previously with conventional tool inserts the honing stones were mounted on honing stone carriers which, in turn called for a double honing stone mounting. This additional expense is not incurred when using our tools because of the replaceable dovetail honing stones used by us.



An extended series of tests have shown that standard tools, equipped with Hunger honing stones, have 5 times the G factor of material removal to honing stone volume.

# Honing stones ceramics- and bakelite bond

## Honing – definition

### Definition according to VDI 3220

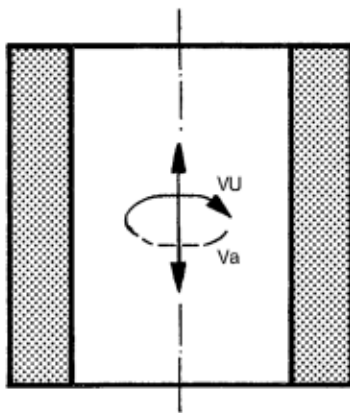
Honing is metal-cutting with a multi-sharp tool made of bonded grain with continual contact between the work-piece and tool to improve the measure, shape and surface of the premachined workpieces. The longitudinal motion is reversed between the tool and work-piece. The surfaces obtained have parallel, intersecting grooves.

### Operating cycle in honing

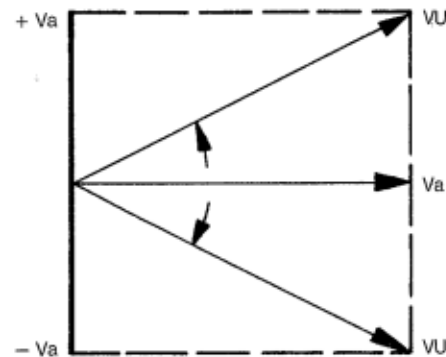
Honing was primarily designed for finishing. However, in the last few years honing has developed into a genuine metal-cutting method. Making a decisive contribution to this has been a further development in honing stones and machines.

### The operating cycle consists of two overlapping movements:

- The rotary motion of the honing tool according to the circumferential speed  $VU$ .
- The reciprocating motion of the honing tool according to the reciprocation speed  $Va$ .



Operating cycle in honing



cutting speed in honing

During the honing movement the honing stones are pressed against the surface which is to be machined hydraulically or mechanically by the expanding mechanism of the honing tool.

The surface structure consists of fine, intersecting lines. As a rule the two speeds are tuned in such a way that the overlapping angle is  $45^\circ$ – $50^\circ$ .

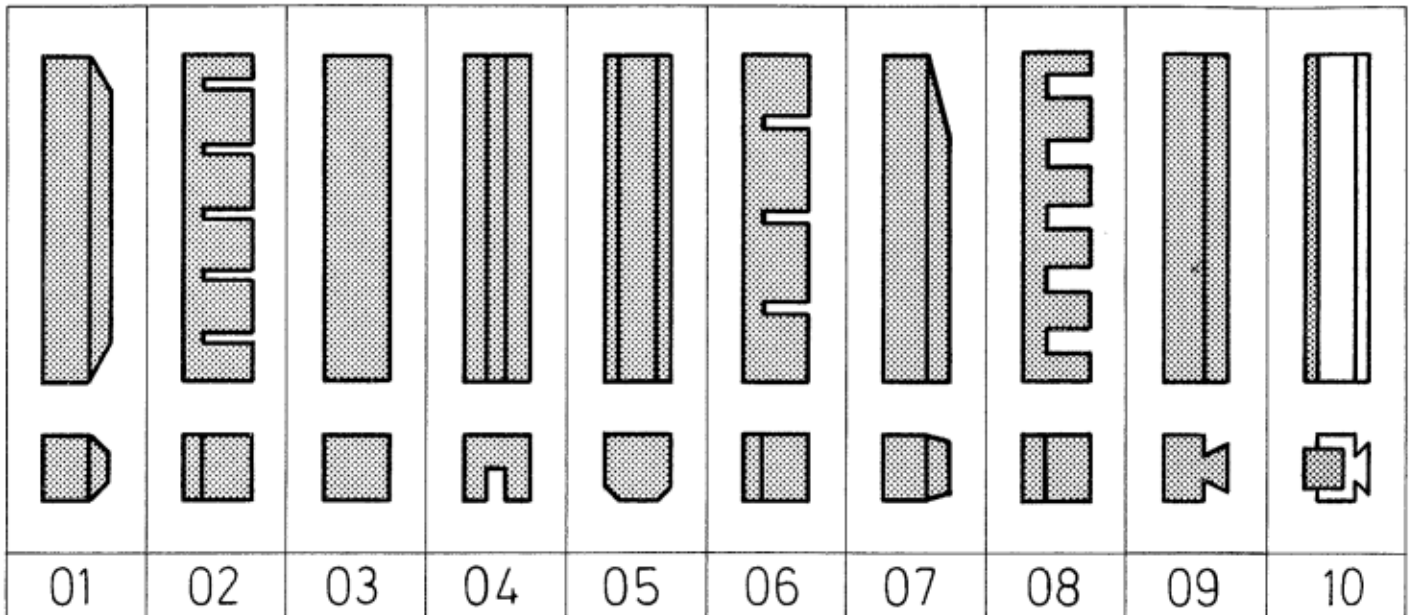
### Specific stone contact pressure

Specific stone contact pressure means the pressure by which  $1 \text{ cm}^2$  honing stone surface is pressed against the bore wall. The contact pressure can be infinitely varied depending on the surface quality required or cutting capacity.

Cross-hatched finish	d	$30^\circ$	$45^\circ$	$60^\circ$	$90^\circ$
Lifting speed	$Va$	1	1	1	1
Circumferential speed	$VU$	3.7	2.4	1.75	1

## Shapes of honing stones

Honing stones are cut to specific shapes for application.



### Some examples

Phasing-in, so that the edges do not break off when entering. Longitudinal and transverse slots for optimum flushing in special honing operations. Dovetail stone that eliminates the

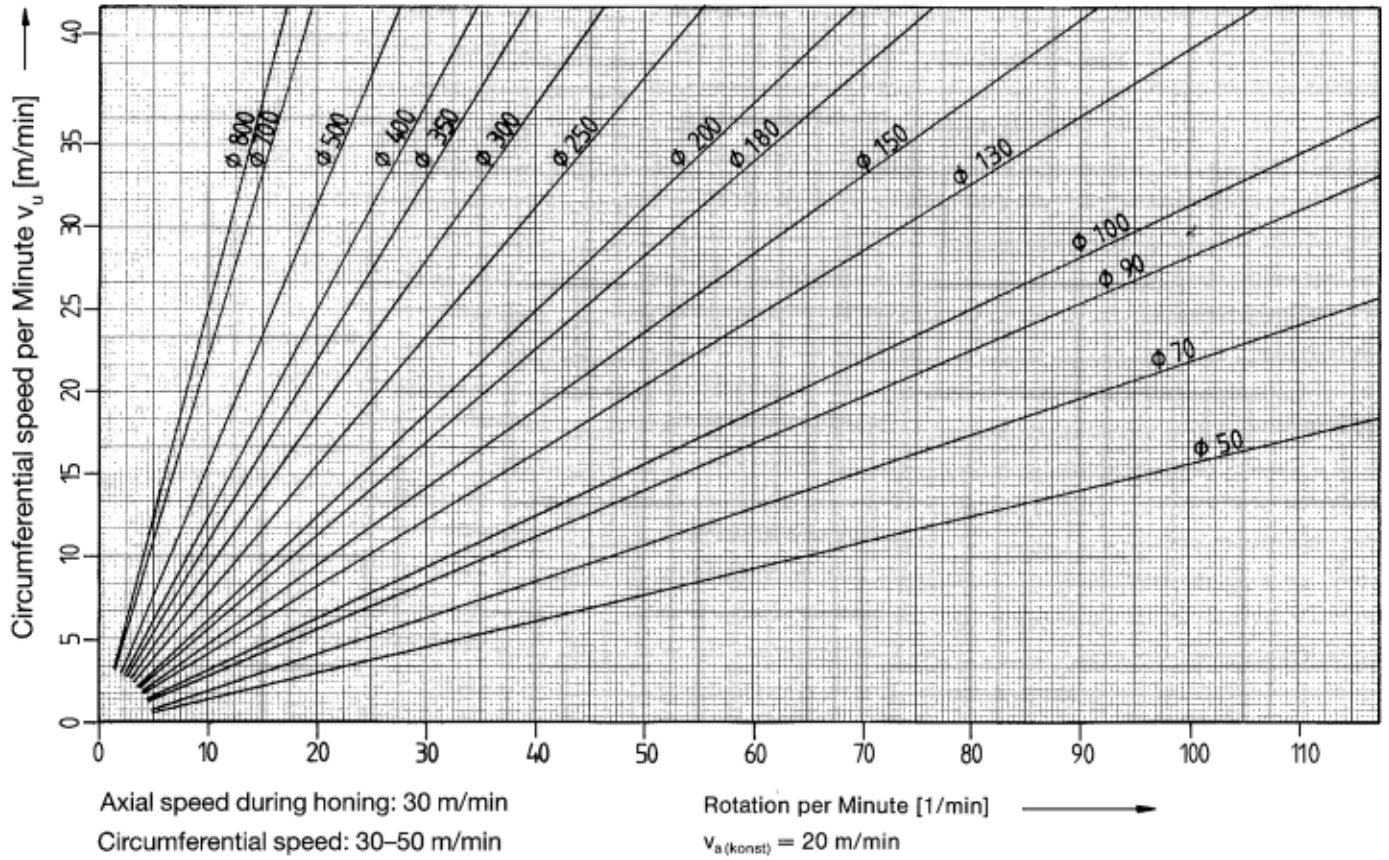
offensive and time consuming cementing of the honing stone and honing stones in a plastic casing with dovetail mounting.

## Honing stone – ceramic and plastic bonded – designation and order key

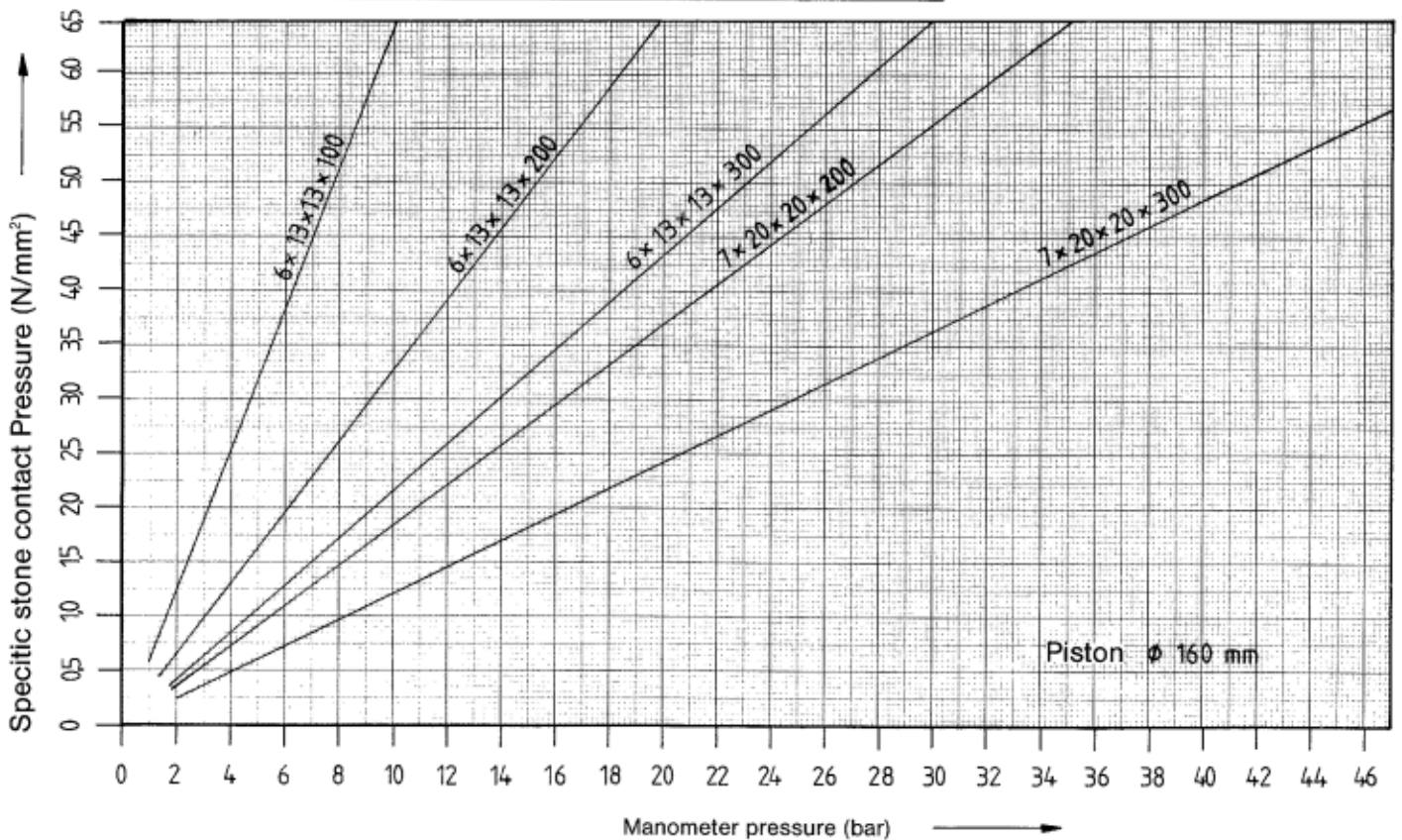
### Example:

<b>EKW</b>	<b>100</b>	<b>F</b>	<b>3</b>	<b>KE</b>	<b>0090</b>	<b>S</b>	<b>F3</b>
grain type	grain size	hardness	structure	bond type	recipe No.	impregnation	shape
<b>grain types</b>		SCG	silicon carbide green	EKW	white fused alumina		
		SCD	silicon carbide dark	EKR	pink fused alumina		
		NK	regular fused alumina	EKW (SP)	single-crystal fused alumina		
		HEK	special semi-fused alumina	ZK	special fused zircon alumina		
<b>grain sizes</b>		8, 10, 12, 14, 16, 20, 24, 30, 36, 40, 46, 54, 60, 70, 80, 90, 100, 120, 150, 180, 200, 220, 240, 280, 320, 360, 400, 500, 600, 800, 1000, 1200.					
<b>hardness</b>		from B to U (in alphabetical order)					
<b>Bonds</b>		KE	= ceramic				
		BA	= bakelite				
		HP	= bakelite, highly compressed				
		KB	= Other resin bonds such as epoxy- or pu-resins				
<b>structure</b>		from 1 = very compact to 9 = very loose					
<b>recipe no.</b>		internal manufacturers' numbers					
<b>impregnations</b>		S	= sulphur				
		V	= plastic impregnation				
		W	= plastic impregnation				
		Z	= plastic impregnation				
		G	= graphite additives				

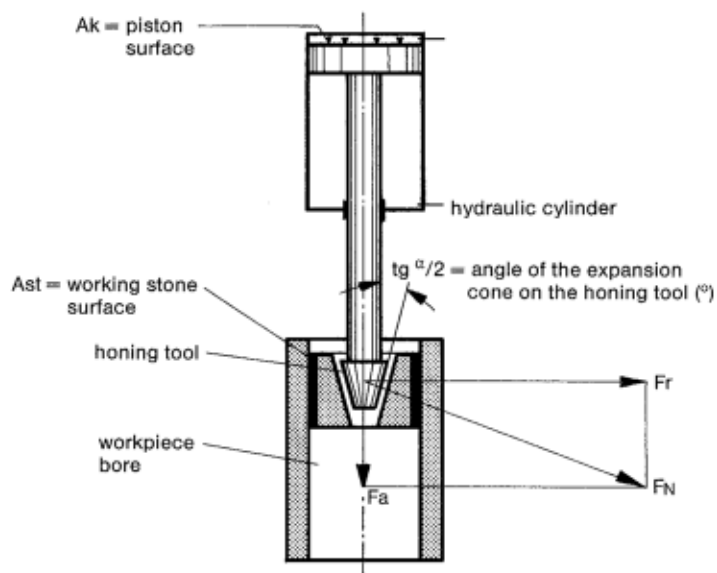
**Cutting speed for honing  
as a function of  $v_u$  and  $n$**



**Diagram for the determination of  
specific stone contact pressure**



## Formula for the calculation of the hydraulic pressure (Manometer pressure)



- P = bar  
 p = specific stone contact pressure (kp/cm<sup>2</sup>)  
 Ast = total honing stone surface area  
 Ak = piston area  
 $\text{tg } \alpha/2$  = constant = 0,414 ( $\text{tg } \alpha/2 = 22.50^\circ$ )

Both Ast and Ak depend on the type of machine and the honing tool.

The value P = Manometer pressure at the respective machine

Example:

Honing tool with 7 stones

Stone measures: 20 mm x 200 mm

Piston diameter: 160 mm

$$\text{Ast} = 2 \text{ cm} \times 20 \text{ cm} \times 7 = 280 \text{ cm}^2$$

$$\text{Ak} = 16 \text{ cm}^2 \times 0.785 = 200 \text{ cm}^2$$

$$P = \frac{q \times \text{tg } \alpha/2 \times \text{Ast}}{\text{Ak}}$$

$$= \frac{20 \times 0.414 \times 280}{200} = \underline{\underline{11.59 \text{ atü}}}$$

## Fields of application for honing-stones

### Standard honing stones

#### Universal honing stones for external and internal honing (Steels 100–800 N/mm<sup>2</sup>)

Rough honing: EKW 100 F7 ke/0090 S  
HEKW 100 G 8 ke/0125 S

Finish honing: EKW 320 D 11 ke/0096 S  
(Universal honing stones for honing of high alloyed steels of strengths up to 2000 N/mm<sup>2</sup>)

#### Chrome and austenitic materials

Rough honing: EKW (SP) 90 F ke/0053 S

Finish honing: EKW 320 D 11 ke/0096 S

### Special honing stones

#### material:

##### Steels tensile strength 100–500 N/mm<sup>2</sup>

St 10, TSt 10, WUSt 12, USt 12–14, R RSt 14 ...  
St 35–45 unalloyed  
St 34–42 welded, SMnPb 20–23 cold-thogh steels

##### Steels tensile strength 500–700 N/mm<sup>2</sup>

ST 52–70, St 54.4–55.4 drawn, 15–21 CrMoV,  
C 10–035, CK 35–CK 45 x 7–13, Cr 13–17, free-cutting steels, 15–35 S 20,  
nitride steels not quenched,  
tempered steels, heat-treated steels, case hardening steels

##### Steels tensile strength 700–1000 N/mm<sup>2</sup>

24 CrMoV 52–58, X12–40, MnCr 15–22, EC 30–80,  
Ct 35–CF 70, X20–X9 CrNiMo, C 45–C70, high-grade steels,  
free-cutting steels 40–60S20

##### Steels tensile strength 900–2000 N/mm<sup>2</sup>

EC 80–EX 100, 15–40 CrNi, 22–39 CrMoV, 34–50 CrMo,  
case hardening steels C 75–120, high-grade steels, alloyed tool steels,  
X8 CrNi-X15 CrNiMo, V2A, V4A, 67 SiCr5, 50–58 CrV4,  
nitride steels, case hardening steels, tool steels,  
tempered steels, high-speed cutting steels, hard alloys,  
cutting alloys X 250 CrCoW 50...  
silicon steels X 250 CoCrW453

##### normal gray-cast iron

GG 10–40, GG 32–45, cast iron with nodular iron and  
lamellar graphite, sand castings GGI 10–25

##### special cast steel (with higher hardnesses)

stainless cast steel with Cr, Mn, 65 NiCu (malleable cast iron)  
70 (heavy malleable cast iron, creep-resistant cast-steel,  
heat-resistant cast steel with low Si-content).  
GGG 46–70 (cast iron with nodular iron)  
GGI 36–40 (cast iron with lamellar graphite)

#### honing stone quality:

EKW 100 F7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW 70 R HP/3004  
EKW 80 R HP/3000  
EKW 240 R HP/5000  
NK 400 O HP/5020  
EKW 500 D 10 ke/0098 S  
HEKW 100 G 8 ke/0125 S

EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW 80 R HP/3000  
HEKW 100 G 8 ke/0125 S  
(NK 400 O HP/5000)  
EKW 500 D ke/0098 S  
EKW 800 D 10 ke/0100 S

EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW (SP) 90 F ke/0053 S  
EKW 240 D 10 ke/0097 S  
HEKW 100 G 8 ke/0125 S  
EKW 600 D 10 ke/0099 S  
EKW 800 D 10 ke/0100 S

EKW (SP) 90 F ke/0053 S  
EKW 240 D 10 ke/0097 S  
EKW 320 D 11 ke/0096 S  
EKW 600 D 10 ke/0099 S  
EKW 800 D 10 ke/0100 S

serial production: CBN

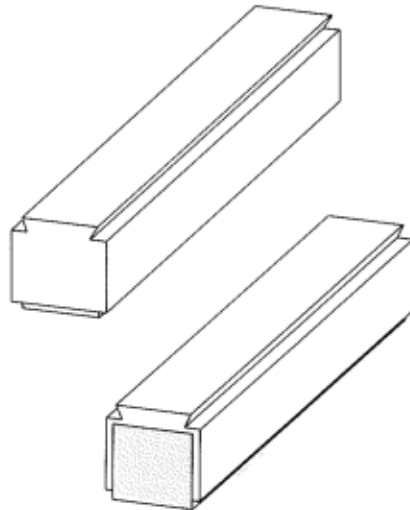
SCG-stone  
SCG 120 L ke/....  
SCG 400 H ke/....  
serial production: diamond

SCG 80 ke/.... S  
SCG 240  
SCG 400

serial production: diamond  
serial production: diamond



## Honing Stone with Plastic Casing – Dovetail Honing Stones



red = roughing

yellow = finishing

Delivery in standard lengths

10 × 10 × 200

13 × 13 × 200

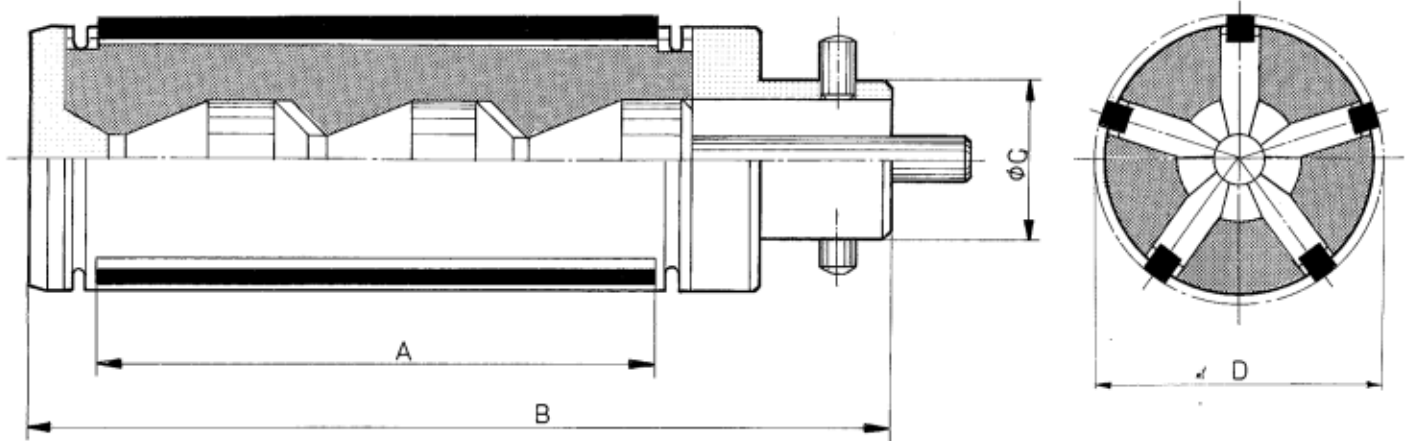
20 × 20 × 200

25 × 25 × 200

### Advantages of the dovetail honing stone compared to conventional stone:

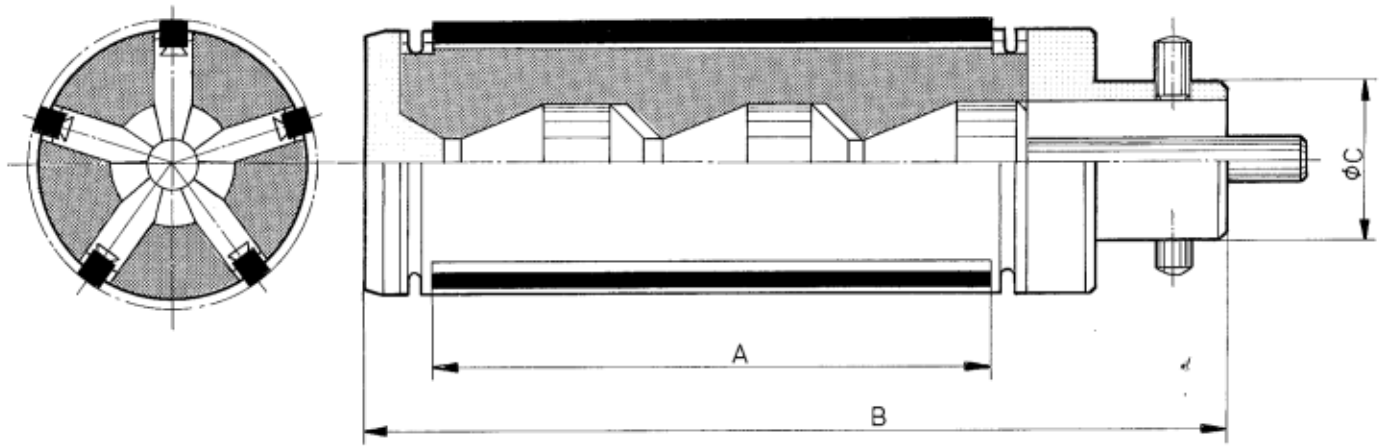
1. The dovetail honing stone with plastic casing can be completely utilized. Conventional stones have only 75% utilization.
2. Metallic contact between stoneholder and workpiece cannot occur.
3. Time consuming removal, reheating and offensive gluing of the honing stone is no longer necessary.
4. Colour coding ensures that the operator selects the correct grade of stone.
5. Compared to conventional honing stones the honing stone with plastic casing allows a much higher contact pressure (specific contact pressure) since the casing prevents the stone from bursting.
6. In addition to this, the plastic casing has a cleaning effect in so far as it keeps steel particles off the honing stone and thus prevents the possibility of grooves.
7. The user no longer needs two stone holders since the same holder can be used for both roughing and finishing.
8. It takes much less time to change from rough honing to finishing since only the honing stone has to be changed instead of readjusting honing stone and stone holder.
9. The dovetail honing stone reduces noise levels.
10. The dovetail honing stone has been tested in the workshops of the Walter Hunger KG, a member of the HUNGER-GROUP. The results are as follows:

Within 1 minute it is possible to remove 0.10 mm in diameter of material from a tube that is 1 m long and 100 mm in diameter.



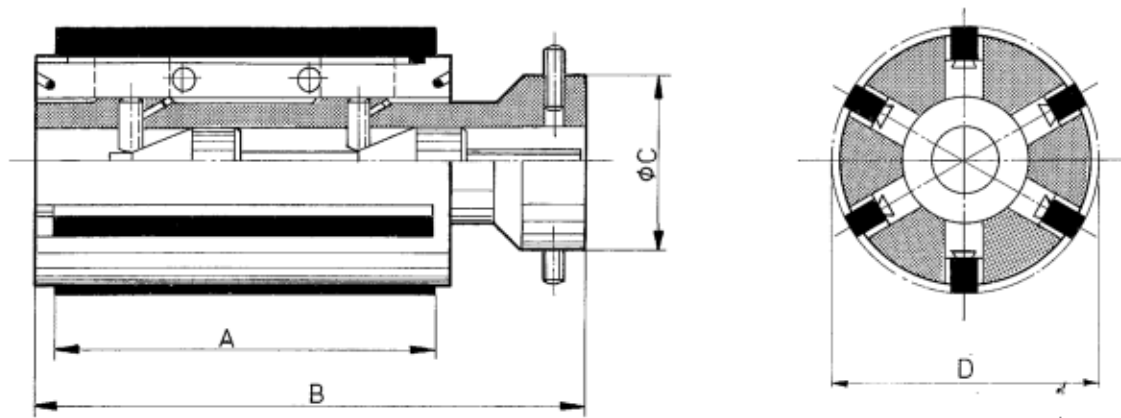
## Honing Tools for ceramic honing stones

Diameter, Working Range <b>D</b>	No. of honing stones	Length of Honing stone <b>A</b>	Honing stone Dimension	Connection Dia. <b>C</b>	Addition Stone Holder
24 – 26	4	100	6 × 4	17	
26 – 28	4	100	6 × 4	17	
28 – 30	4	100	6 × 4	20	
30 – 32	4	100	6 × 4	20	
32 – 34	4	100	6 × 4	23	
34 – 36	4	100	6 × 4	23	
36 – 38	4	100	6 × 6	28	
38 – 44	4	100	6 × 6	28	38 – 40 40 – 42 42 – 44
44 – 46	4	100	6 × 8	28	
46 – 54	4	100	10 × 8	32	46 – 48 48 – 50 50 – 52 52 – 54
54 – 58	4	100	10 × 8	42	54 – 56 56 – 58
58 – 62	4	100	10 × 8	42	58 – 60 60 – 62
62 – 66	4	100/150	10 × 10	42	62 – 64 64 – 66
66 – 70	4	100/150	10 × 10	42	66 – 68 68 – 70
70 – 74	5	100/150	10 × 10	42	70 – 72 72 – 74



## Honing Tools for ceramic honing stones

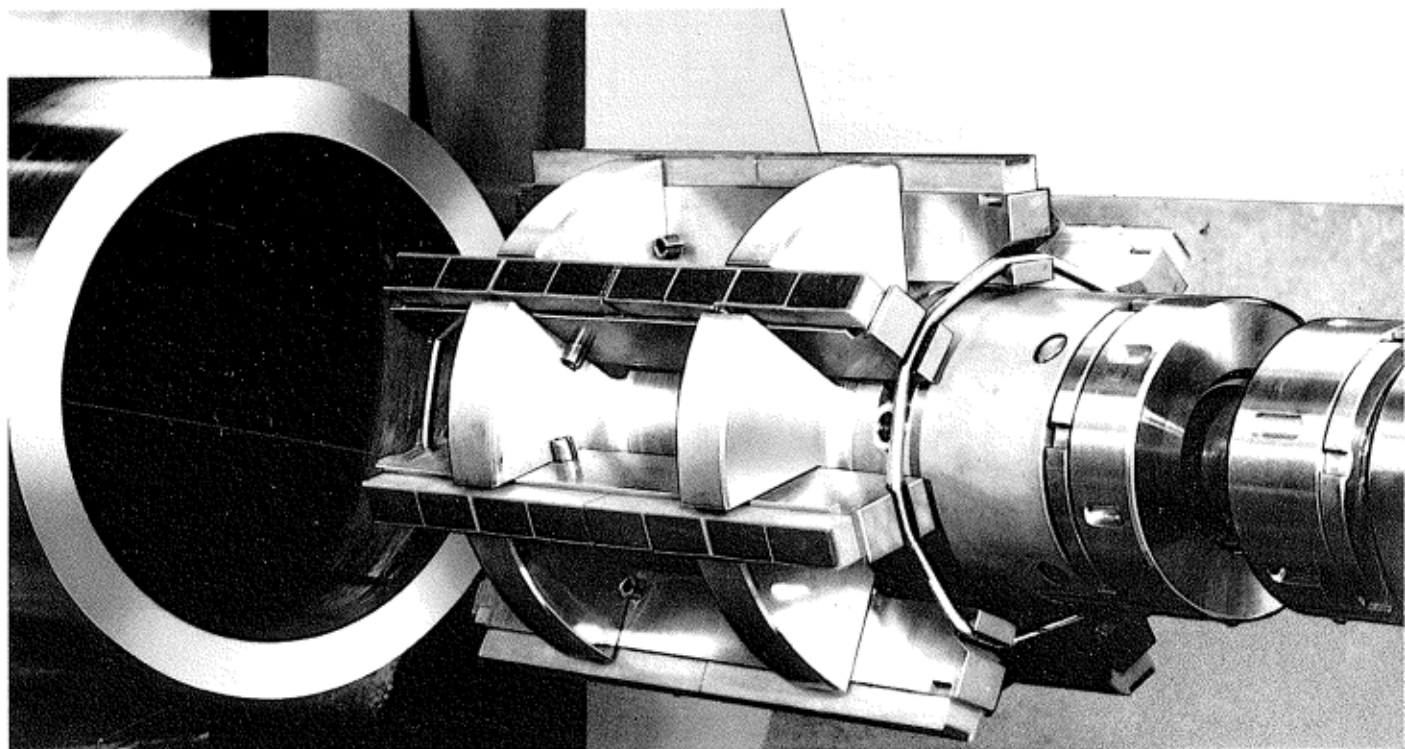
Diameter, Working Range <b>D</b>	No. of honing stones	Length of Honing stone <b>A</b>	Honing stone Dimension Shape 10	Connection Dia. <b>C</b>
70 – 75	5	100	10 × 10	42
75 – 80	5	100	10 × 10	42
80 – 85	5	200	10 × 10	55
85 – 90	5	200	10 × 10	55
90 – 95	5	200	13 × 13	55
95 – 100	5	200	13 × 13	55
100 – 105	5	200	13 × 13	55
105 – 110	5	200	13 × 13	55
110 – 115	5	200	13 × 13	65



## Honing Tools for ceramic honing stones

Diameter, Working Range <b>D</b>	No. of honing stones	Length of Honing stone <b>A</b>	Honing stone Dimension Shape 10	Connection Dia. <b>C</b>
115 – 120	6	200	13 × 13	65
120 – 125	6	200	13 × 13	65
125 – 130	6	200	13 × 13	65
130 – 135	6	200	13 × 13	65
135 – 140	6	200	13 × 13	65
140 – 150	6	300/200	13 × 13	100
150 – 160	6	300/200	13 × 13	100
160 – 170	6	300/200	20 × 20	100
170 – 180	6	300/200	20 × 20	100
195 –	6	300/200	20 × 20	100

# Honing Stones in action



internal honing of cylinder bores



external honing of piston rods.

# DIAMOND- and CBN-honing stones



# Diamond honing

Diamond honing sticks are employed universally in automatic machining procedures today where large numbers of components are being machined.

## Advantages of diamond honing

1. Very long service life compared to ceramic and bakelite honing sticks.
2. Considerably higher form holding tolerances.
3. Great reduction in down time (no need to change the stones frequently)
4. Lower tool wear, less readjustment, resulting in close tolerances over a long period.
5. Produces less heat, no deformation.
6. Reduced noise levels.
7. The honing tools work with less contact pressure, resulting in the tool having greater dimensional stability.

## Construction of diamond honing stones

The diamond honing stick is constructed in a similar way to honing and superfinishing stones. It consists of the diamond grain and bond.

The amount and type of bond together with the pore space determine the hardness of the diamond honing stick.

### Granulation designation D:

This symbol D is international and indicates the average diameter of the diamond grain in  $\mu\text{m}$ .

### Concentration designation:

The weight of diamonds is not given in grams, but in carats. 1 carat is 0.2 g. The concentration indicates the quantity of diamonds contained in a cubic centimetre of coating. A cubic centimetre of diamonds weighs 1.76 g, which is 8.8 carats. This means:

Concentration:	200	Corresponds to:	8.8	Carats/cm <sup>3</sup> of coating
	150		6.6	
	100		4.4	
	75		3.3	
	50		2.2	
	25		1.1	

## We require the following application datas in order to determine the best possible quality.

Technical drawing, material, hardness, tensile strength, bore diameter and length, surface quality required, cycle times required, how many operations are required, rough-honing, finish-honing, machine, number of honing spindles, number of bars per tooling, speed, length of stroke, contact pressure, honing oil ...

**The more data you provide us the better we can solve your problem.**

If you are already honing, please let us know what you have been using so far and what you want to improve, e. g. service life, cutting capacity, cycle time, build-up (material) ...

Alternatively please request our questionnaire to enable us to determine your requirements.

## The cutting means

Cutting means are natural and synthetic diamond grains as well as cubic borazon – also known as CBN for short. Synthetic diamond grains are being used more and more today and can be produced specifically for the individual fields of application, since world supplies of natural diamonds become scarce due to the high demand. Reproducibility with synthetic diamonds is much greater than with natural diamonds since the natural product can vary depending upon its source.

For honing tubular steel and hardened materials a similar hard grain is used, namely borazon (CBN). Regular diamonds are not compatible with the carbon in steel in the cutting process. Synthetic and natural diamonds are employed for honing of all kinds of gray cast iron.

The grain size of the diamond determines the surface quality and is indicated in  $\mu\text{m}$ . This measure is the average grain diameter in  $\mu\text{m}$  and is indicated in D (1–1000).

## Effect of grain size and concentration with diamond honing tools

low concentration	= good cutting capacity (higher roughness)
high concentration	= low cutting capacity (lower roughness)
Fine range of grain sizes D 5 – D 30	middle – low concentration (attention: depends on the material)
middle grain sizes D 50 – D 120	higher concentration (attention: depends on the material)
Coarse range of grain sizes D 150 – D 500	low concentration (attention: depends on the material)

## Hunger diamond bond properties

<b>S =</b> Steel and bronze bonds	<b>K =</b> plastic bond
<b>E =</b> Precious metal bonds	

<b>S 10</b> Easy cutting, especially for small grain sizes, universally applicable	<b>S 20</b> Stable with long-cutting material	<b>EO 71</b> Very ease cutting, well suited for very hard materials, such as gearwheel, sintered ceramic, glass, hard metal
<b>S 11</b> Very easy cutting, for short-cutting material, e. g. types of cast iron, crankcases	<b>S 21</b> For materials difficult to machine, such as tubular steel. Very stable	<b>EO 72</b> For materials difficult to machine, high stock removal, e. g. crankcases, connecting rods. Very easy cutting
<b>S 15</b> For hard and high-alloyed steels, e. g. gearwheels, hard metal	<b>S 25</b> rough honing of hardened parts (gearwheel)	<b>K 01</b> For rough honing of tungsten metal, tungsten carbide
<b>S 16</b> Easy cutting, universally applicable with short-cutting materials of 52 kp/mm <sup>2</sup> up to a hardness of 62 HRc	<b>S 32</b> Very hard and wear-resistant, e. g. for chrome	<b>K 02</b> For high stock removal at low contact pressure (high stone wear)
<b>S 07</b> Applicable in a variety of ways for short and long-cutting materials of 35 kp/mm <sup>2</sup> up to approx. 52 HRc, e. g. connecting rods (cast steel), brake cylinders	<b>S 41</b> Galnikal	
	<b>EO 74</b> cast (cylinder etc.) very easy cutting, plateau honing.	
	<b>EO 77</b> Very easy cutting and wear-resistant, very well suited for hard materials	

The diamond type and bond combination is important. Please consult our specialists to ensure optimum selection.



## Roughness heights in roughness height values with diamond honing

Grain size:	180 HB	250 HB	32 HRC	52 HRC	62 HRC	68 HRC	$\mu\text{m } R_t$
D 7	1.0	0.8	0.6	0.4	0.3	0.2	
D 15	2.0	1.8	1.5	1.1	0.6	0.3	
D 20	2.5	2.0	1.7	1.2	0.8	0.4	
D 30	3.0	2.5	2.0	1.5	1.0	0.6	
D 40	4.0	3.5	2.5	2.0	1.5	1.0	
D 50	5.0	4.0	3.0	2.5	2.0	1.5	
D 60	6.0	4.5	3.5	3.0	2.5	2.0	
D 70	7.0	5.5	4.0	3.5	3.0	2.5	
D 80	8.0	6.0	5.0	4.0	3.5	3.0	
D 100	9.0	7.0	6.0	4.5	4.0	3.5	
D 120	10.0	8.0	7.0	5.0	4.5	4.0	
D 150	11.0	9.0	8.0	6.0	5.0	4.5	
D 180	12.0	11.0	9.0	7.0	5.5	5.0	
D 200	14.0	12.0	10.0	8.0	6.0	5.0	
D 300	18.0	15.0	12.0	10.0	8.0	6.0	
D 500	22.0	18.0	15.0	12.0	10.0	8.0	

The factors stock removal, surface roughness and service life depend directly on the grain size, type of diamond and

bond as well as on the material. The table is only an approximate standard value.

### Diamond bond systems

Diamond grain is bonded with the following types of bond:

#### Sintered bonds

The diamond grain is sintered with metal, hard metal and brass and bronze powder, in graphite molds by means of pressure and temperature.

#### Galvanic bonds

A nickel or chrome jacket that holds the diamond grain on the carrier is formed around the diamond grain in a galvanic bath. This method has the disadvantage that only one layer of diamonds can be applied.

#### High-temperature galvanic bonds

Here the diamond is applied galvanically in special precious metal bonds in several layers according to a special galvanic method. The disadvantage here is the somewhat higher price resulting from the precious metal and the higher concentration of diamonds employed. The cutting capacity is considerably improved at high service life. Good cutting capacity at low contact pressure.

#### Plastic bonds

Similar to plastic-bonded honing stones, the diamond grain is embedded in plastic and bonded by heat and pressure.

#### Ceramic bonds

The diamond is bonded as with normal ceramic honing stones and burned in high vacuum to prevent burning of the diamond grain.

#### The pore space and hardness

The pore space and the hardness of the diamond honing stones is determined individually for any problem of application by the sintering temperature, the fillers used and the individual components of the bond.

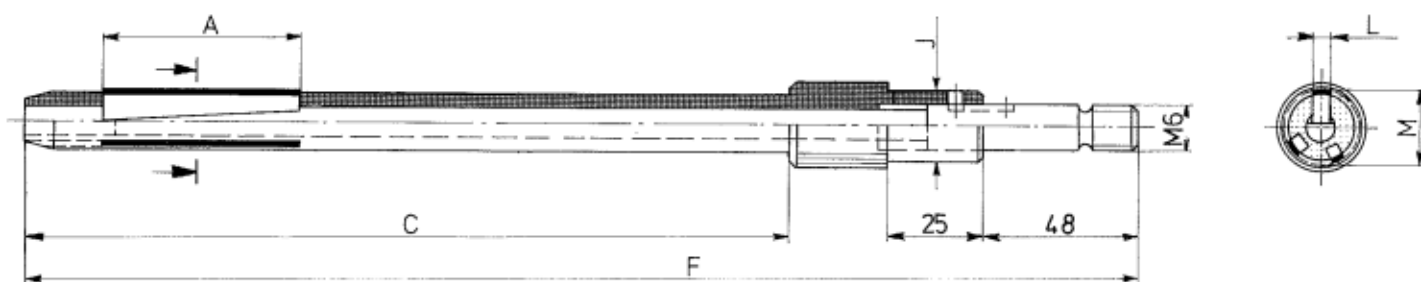
# Single-Stone Honing Tools

mainly depend on the specific use

- length of cutting bar
- length of guiding bars
- working diameter
- construction of tool connection

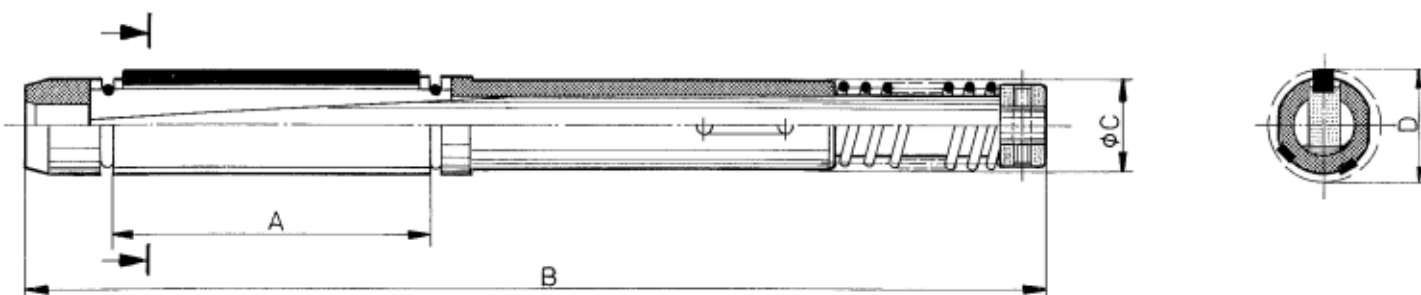
In general we need a drawing of the workpiece.

## Hunger reference: EHD-M

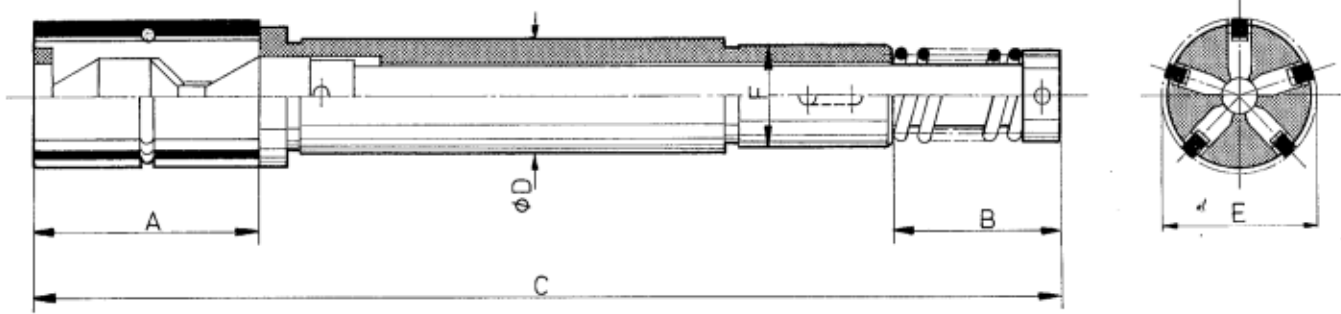


From dia. 8 mm also available as blind hole honing tool

## Hunger reference: EHD-T

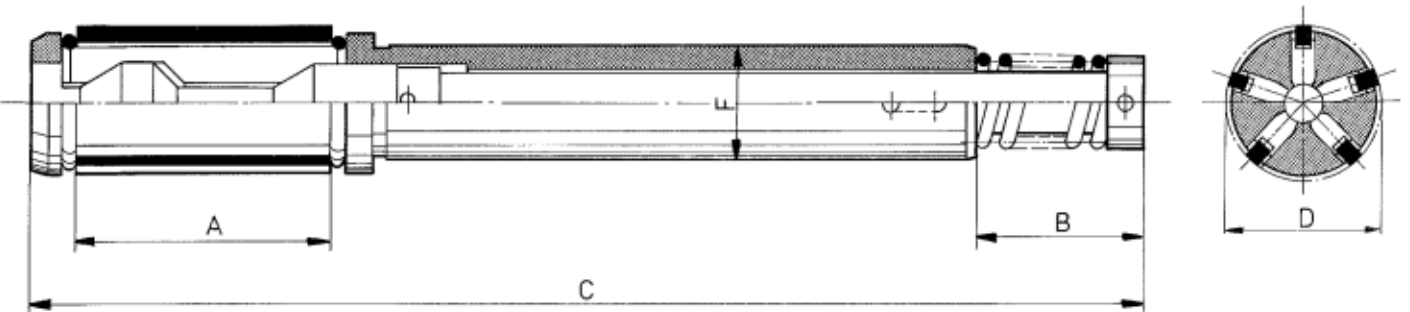


# 5 Element blind hole honing tool SLHD



A mm	B mm	C mm	D Dia.	E Dia.	F Dia.	end diameter	diameter before honing

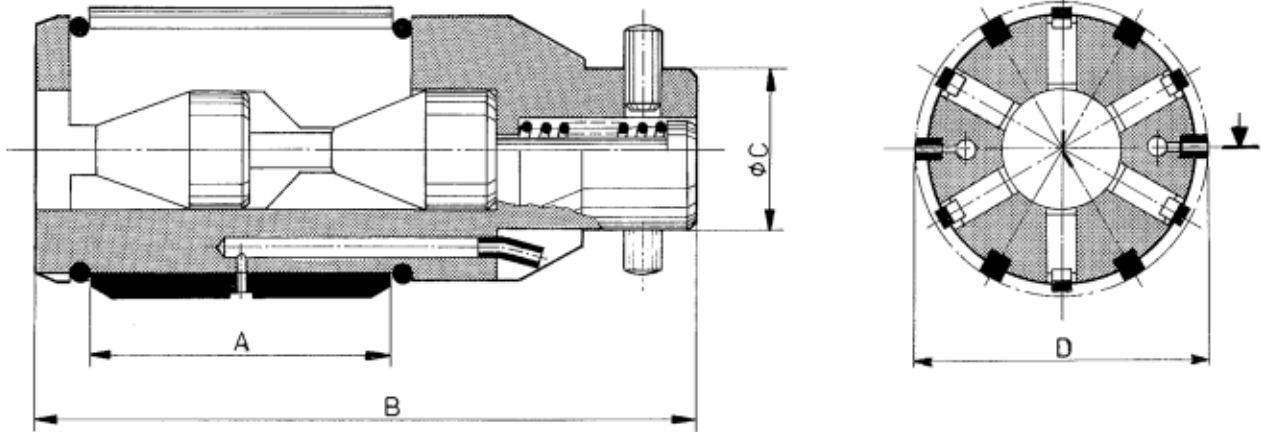
# 5 Element bolt hole honing tool DHD



A mm	B mm	C mm	D Dia.	E Dia.	end diameter	diameter before honing

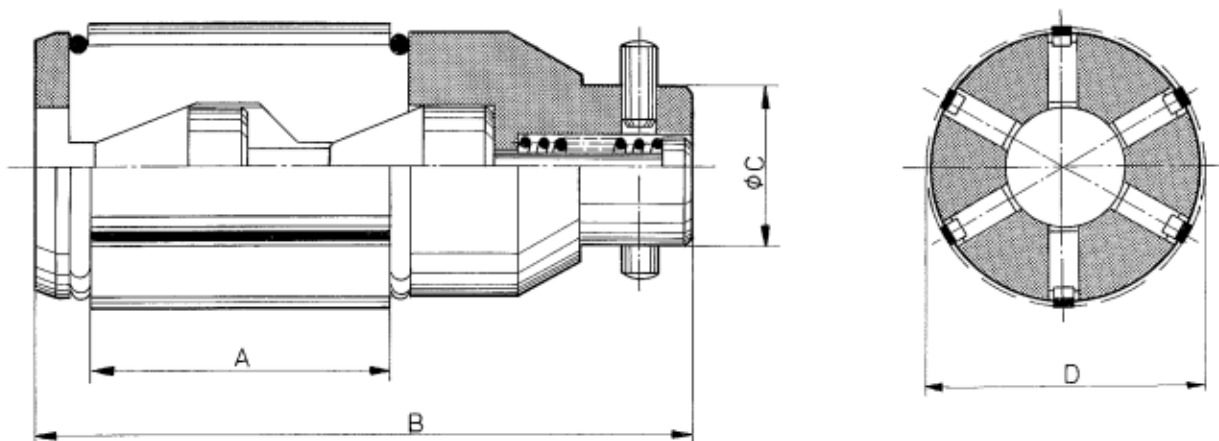
# Honing tool with air meter and supporting bars for bolt hole honing

Hunger reference: DSL HW



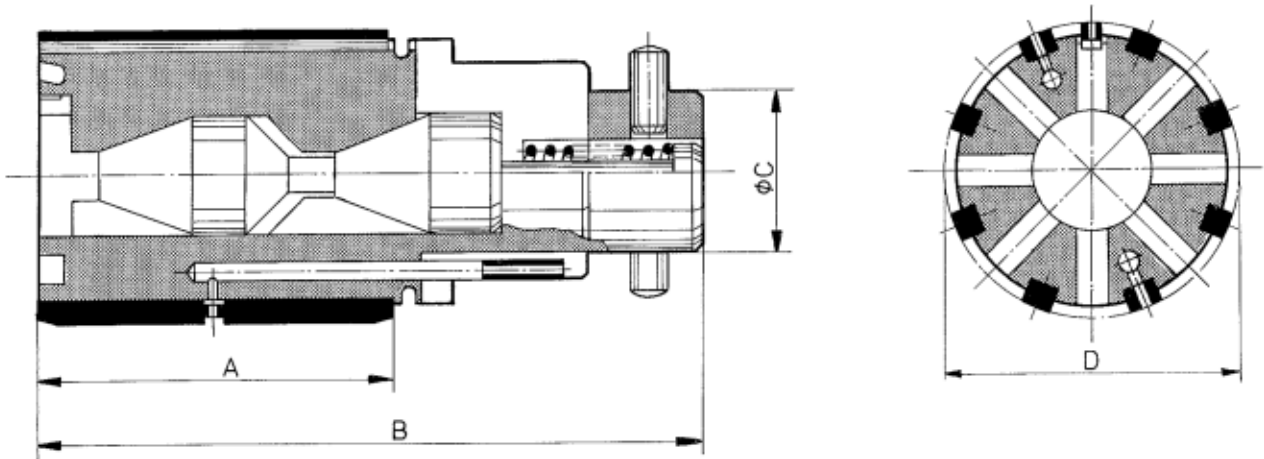
# Honing tool for bolt hole honing

Hunger reference: DHW



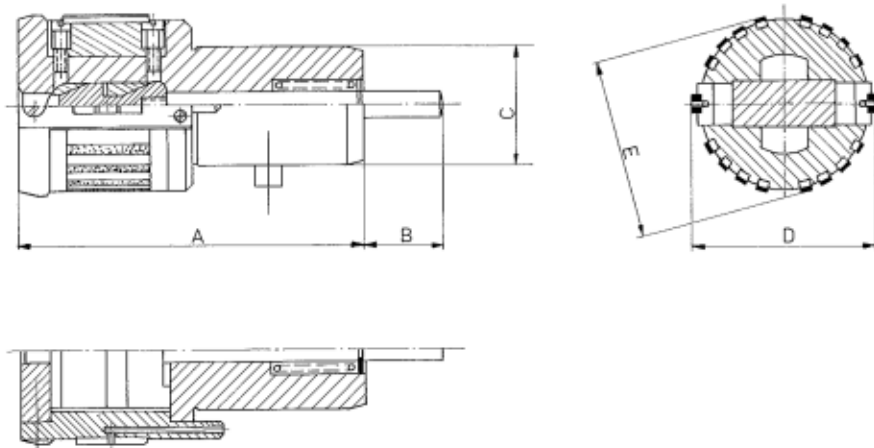
# Honing tool with air meter and supporting bars for blind hole honing

Hunger reference: SSLHW



# Ring peeling tools with air meter

Hunger reference: SALD



# Fitting honing tools with diamond honing stones

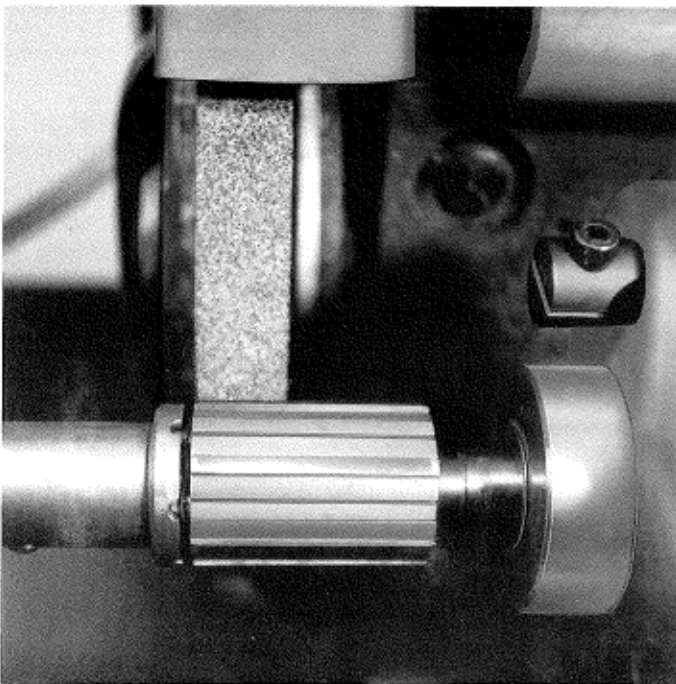
To obtain the best possible results with diamond tools, the bars must be soldered to the honing tools in the following manner:

Clean the honing stone holder and diamond bar thoroughly. Tin the two surfaces with solder. Heat with a not too hot flame. Solder by pressing them together. Take care to ensure

that the numbered holders are inserted back into their correct slots. Bond the expanded DIA bars with wire in the slots for the return spring, so that it is firmly pressed against the expansion cone. Regrind the DIA honing bars with SCG wheels. The honing tool is now ready for use.

Diamond size		Abrasive wheels – Abrasive grain size
D 10 – D 60	=	Grain 280 – 400
D 70 – D 120	=	Grain 100 – 240
D 150 – D 250	=	Grain 46 – 90

Hardness of the wheel:	Approx. Jot
Coolant:	Water
Cutting speed:	1–2 m/sec.



Regrinding the diamond honing tool



Roughing the DIA bar on carrier

If the diamond or CBN-honing stones have become dull they are roughened on a plain steel plate by use of wet, finely granulated abrasive grain.

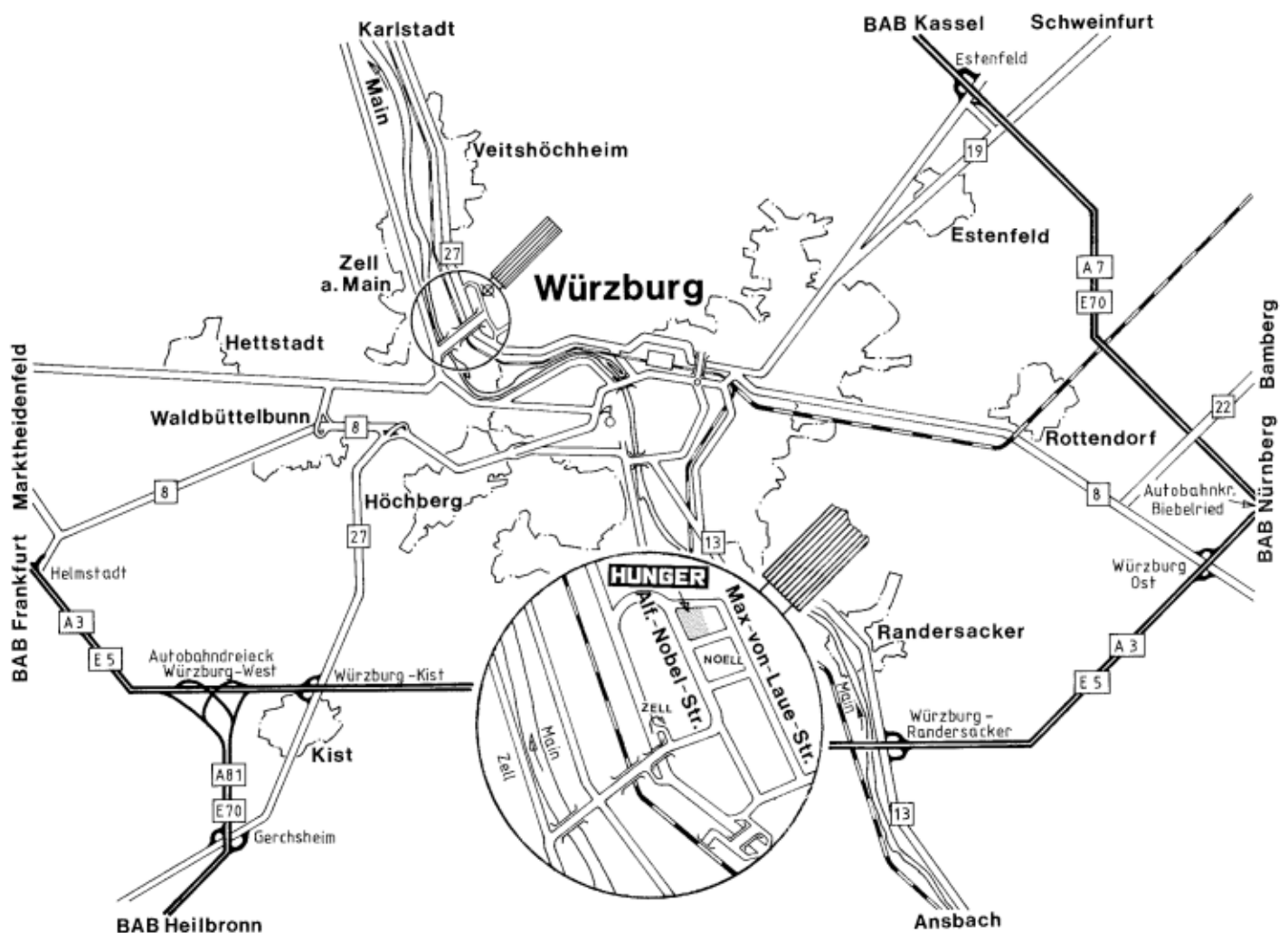
# Here's how to find us:

## Coming from Frankfurt A3. Nürnberg A3 or Heilbronn A81:

Exit Würzburg/Kist – B 27 towards Würzburg – At the junction to the B8 towards Marktheidenfeld – Near Waldbüttelbrunn towards Zell am Main – Before Zell am Main turn right and cross the river Main – follow the through street.

## Coming from Kassel A7:

Exit Estenfeld – towards Würzburg – In Würzburg follow the signposting „Karlstadt B 27“ – Exit Zell am Main/Industriegebiet – turn left – follow the through street.



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## DIA honing bars

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DIA or CBN honing bars are used for a very wide range of applications today. Short honing bars are employed to machine so-called oversquare drill holes, e.g. connecting rods or pinions. Normal lengths are used for the most common machining applications, e.g. engine cylinder bores.



Make use of our experience in individual development and production. Our honing bars guarantee:

- Optimal bonding
- Absolute precision of shape
- Optimal stock removal
- Surface finishing to given specifications
- Service lives of 4,000–40,000 bores each.

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## DIA-Tools

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Our range of efficient tools comprises:

Diamond honing tools with or without air nozzle control system (measurement drop calibration control system) for symmetric and asymmetric numbers of gibs, ring peeling tools, peeling tools, honing shafts, honing mandrel, stepped honing mandrel.



Take advantage of our specialization in making special tools:

Only through guaranteed individual, application specific consultation and thus the best possible design of the required special tool you can be certain that your workpieces will be of constant quality.



# Fields of application for ceramic and synthetic resin bonded honing stones

## Standard honing stones

Universal honing stones for external and internal honing (steels from 100–800 N/mm<sup>2</sup> tensile strength)

Prehoning: EKW 100 F 7 ke/0090 S  
HEKW 100 G 8 ke/0125 S  
Finish honing: EKW 320 D 11 ke/0096 S

### Chrome and additional materials

Prehoning: EKW (SP) 90 F ke/0053 S  
Finish honing: EKW 320 D 11 ke/0096 S  
(universal stones also for honing high-alloy steels up to 2000 N/mm<sup>2</sup> tensile strength)



## Special honing stones (material oriented):

### Material:

Steels tensile strength 100–500 N/mm<sup>2</sup>  
St 10, TSt 10, WUSt 12, USt 12-14 R RSt 14 ...  
ST 34-42 welded,  
SMnPb 20-23 steels tough at subzero

### Honing stone qualities:

EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW 80 R HP/3000  
EKW 240 R HP/5000  
NK 400 O HP/5020  
HEKW 100 G 8 ke/0125 S

### Steels tensile strength 500–700 N/mm<sup>2</sup>

ST 52-70, St 54, 4-55, 4 drawn, 15-21 CrMoV,  
C 10-035, CK 35-CK 45 x 7-13, Cr 13-17  
Free-cutting steel, 15-35 S 20  
Non-finished nitriding steels

EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW 80 R HP/3000

### Steels tensile strength 700–1000 N/mm<sup>2</sup>

24 CrMoV 52-58, X12-40, MnCr 15-22, EC 30-80,  
Ct 35-CF 70, X20-X9 CrNiMo, C 45- C70,  
high-grade steels, Free-cutting steels 40-60S20

HEKW 100 G 8 ke/0125 S  
EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW (SP) 90 F ke/0053 S  
EKW 240 D 10 ke/0097 S  
HEKW 100 G 8 ke/0125 S

### Steels tensile strength 900–2000 N/mm<sup>2</sup>

EC 80-EX 100, 15-40 CrNi, 22-39 CrMoV, 34-50 CrMo,  
case hardening steels C 75-120, high-grade steels,  
alloyed, rolled steels  
Silicium steels such as X 250 CoCrW453

EKW (SP) 90 F ke/0053 S  
EKW 240 D 10 ke/0097 S  
EKW 320 D 11 ke/0096 S

### Cast steel (high tempering)

Stainless cast steel with Cr, Mo, Ni ...  
Finished and annealed, heat-resistant cast steel  
with high Si content, surface hardened cast steel

Series production: CBN  
EKW (SP) F ke/0053 S  
EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S

### External honing (soft material)

EKW 100 F 7 ke/0090 S  
EKW 320 D 11 ke/0096 S  
EKW 80 R HP/3000  
HEKW 100 G 8 ke/0125 S

### External honing (hard material)

hardened or nitrided, high-grade steels

EKW 320 D 11 ke/0096 S  
EKW 600 D 10 ke/0099 S  
EKW 800 D 10 ke/0100 S

## Spare parts



We manufacture spare parts and tools according to your specifications and drawings.

Turn our service to your advantage:

- individual requirement analysis
- Application consulting
- test fields on request
- small lot production
- quick delivery

## The HUNGER Group - Your Partner for complete solutions

### Hydraulics

Walter Hunger KG, Hydraulikzylinderwerk  
Rodenbacher Straße 50  
DE-97816 Lohr am Main  
Tel. +49-9352-501-0 • Fax +49-9352-501-106  
Email: info@hunger-hydraulik.de  
Internet: www.hunger-hydraulik.de

### Seals

Hunger DFE GmbH  
Dichtungs- und Führungselemente  
Alfred-Nobel-Str. 26 • DE-97080 Würzburg  
Tel. +49-931-90097-0 • Fax +49-931-90097-30  
Email: info@hunger-dichtungen.de  
Internet: www.hunger-dichtungen.de

### Automotive

Hunger GmbH & Co.  
Werke für Fahrzeugbau und Mobilhydraulik KG  
Chemnitzer Straße 61a • DE-09669 Frankenberg  
Tel. +49-37206-60080 • Fax +49-37206-600810  
Email: info@hunger-automotive.de  
Internet: www.hunger-automotive.de

### Machines

Hunger Maschinen GmbH  
Alfred-Nobel-Str. 26 • DE-97080 Würzburg  
Tel. +49-931-90097-0 • Fax +49-931-90097-30  
Email: info@hunger-maschinen-gmbh.de  
Internet: www.hunger-maschinen-gmbh.de

### Abrasives

Hunger Schleifmittel GmbH  
Alfred-Nobel-Str. 26 • DE-97080 Würzburg  
Tel. +49-931-90097-0 • Fax +49-931-90097-30  
Email: info@hunger-schleifmittel.de  
Internet: www.hunger-schleifmittel.de

### Hydraulics USA

Hunger Hydraulics C.C., Ltd.  
63, Dixie Highway • Rossford (Toledo), OH 43460  
Tel. +1-419-666-4510 • Fax +1-419-666-9834  
Email: info@hunger-hydraulics.com  
Internet: www.hunger-hydraulics.com

# HUNGER

## Schleifmittel

EIN UNTERNEHMEN DER HUNGER-GRUPPE

Hunger Schleifmittel GmbH  
P.O. Box 5860 • DE-97008 Würzburg  
Tel. 0931/90097-0 • Fax 0931/90097-30  
Email: info@hunger-schleifmittel.de  
Internet: www.hunger-schleifmittel.de