

DIAMOND 4C



Clarity



Cut

4C

Carat

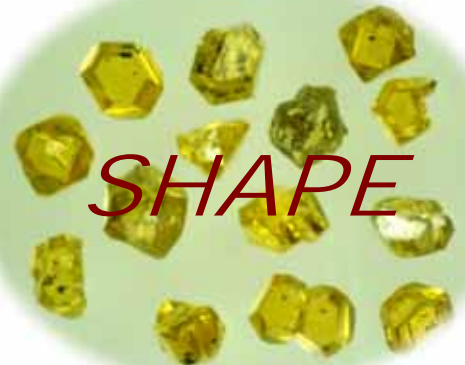


Color

DIAMOND 4S



SURFACE



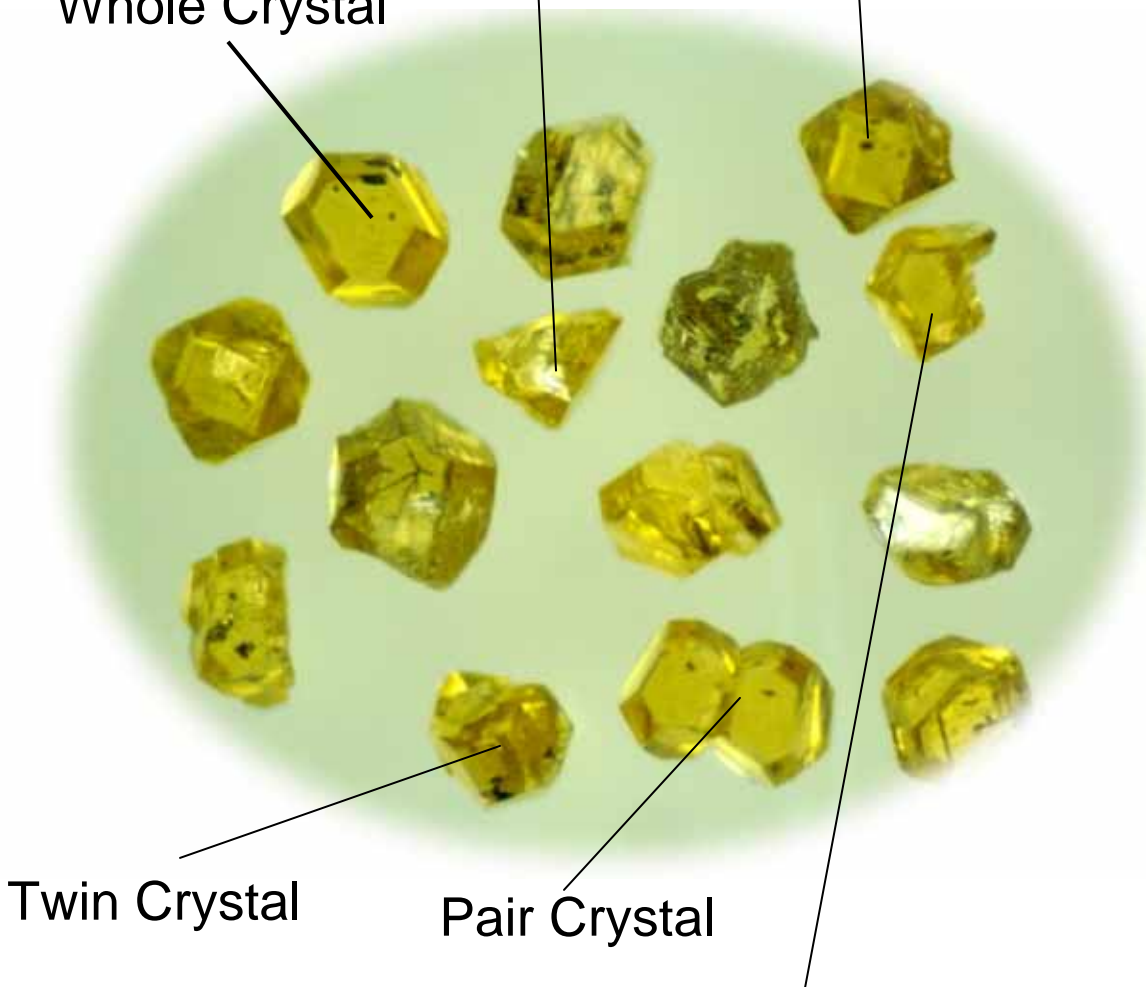
SIZE

4S - DIAMOND SHAPE

Crystal with Micro-fractured Edge

Irregular Crystal

Whole Crystal



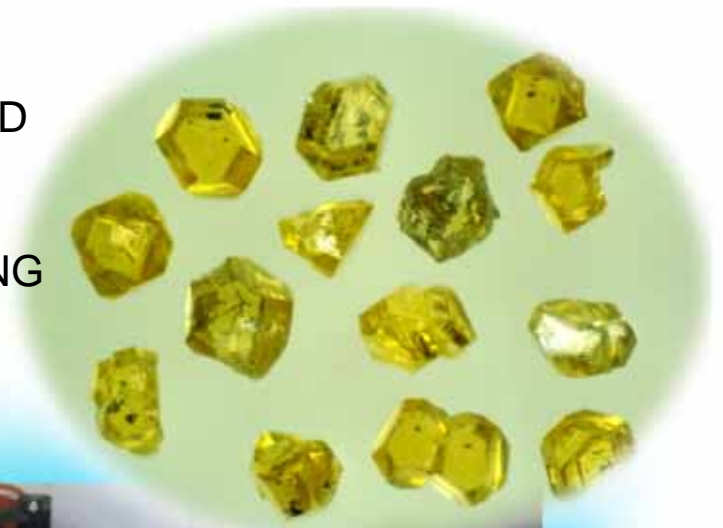
Twin Crystal

Pair Crystal

Crystal with Macro-fractured Edge

SHAPE SORTING

DIAMOND IS CONTROLLED
AND FURTHER REFINED
WITH CONTINUAL SORTING
BY PARTICLE SHAPE.



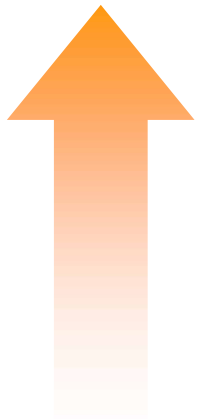
4S - DIAMOND SHAPE 9 TO 1

SHAPE

AK

YK

WHOLE
CRYSTAL
C + O



REGULAR
C + O



IRREGULAR

9



8



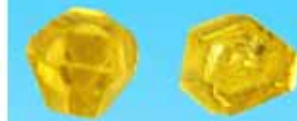
7



6



5



4



3



2

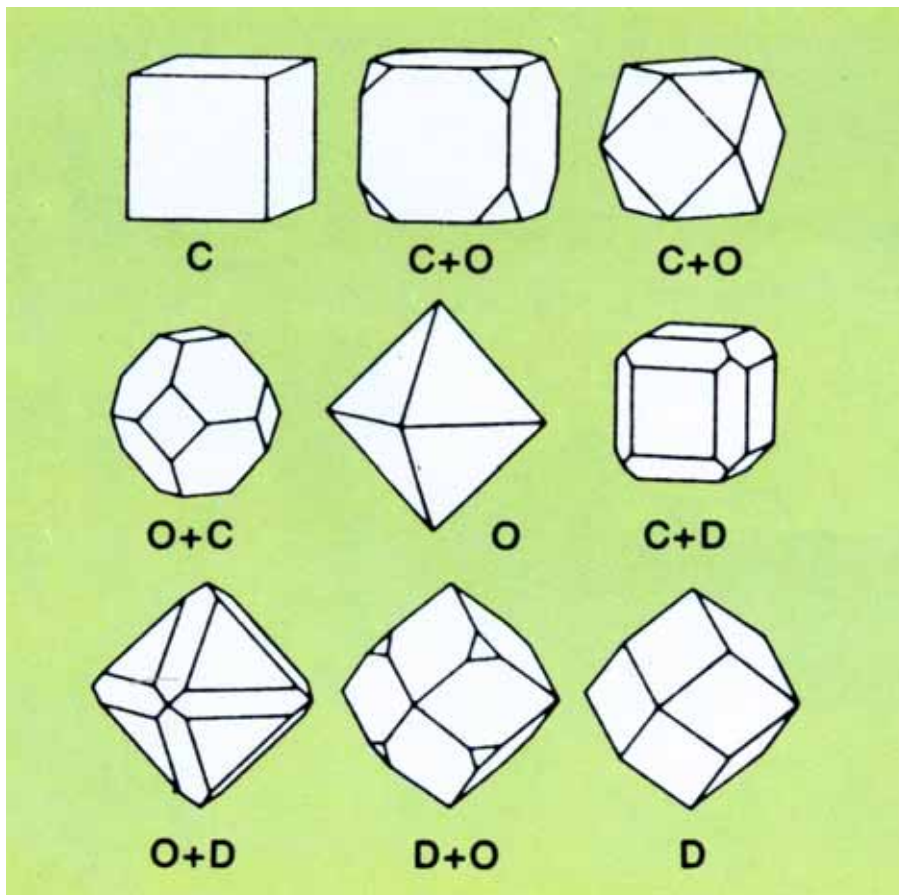


1



COMMON SHAPES OF SYNTHETIC DIAMOND CRYSTALS

According to the conditions of temperature and pressure applied we obtain diamond grits more or less coloured and more or less faceted.



C :CUBE O:OCTAHEDRAL D:DODECAHEDRON

4S - SAW DIAMOND STRENGTH (1)

COMPRESSION STRENGTH

S.C.T. : SINGLE CRYSTAL TEST



CHINESE
AUTO TYPE



FACT MANUAL



CHINESE
MANUAL TYPE

4S - SAW DIAMOND STRENGTH (2)

IMPACT STRENGTH

T.I. : TOUGHNESS INDEX

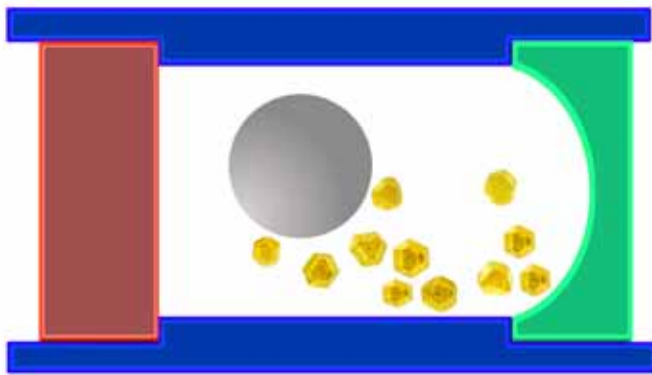
T.T.I. : THERMAL TOUGHNESS INDEX

T.T.I. HAVE 3 TYPES :

1.SUPER T.T.I. , 1,200 / 15 min

2.STANDARD T.T.I. , 1,100 / 15min

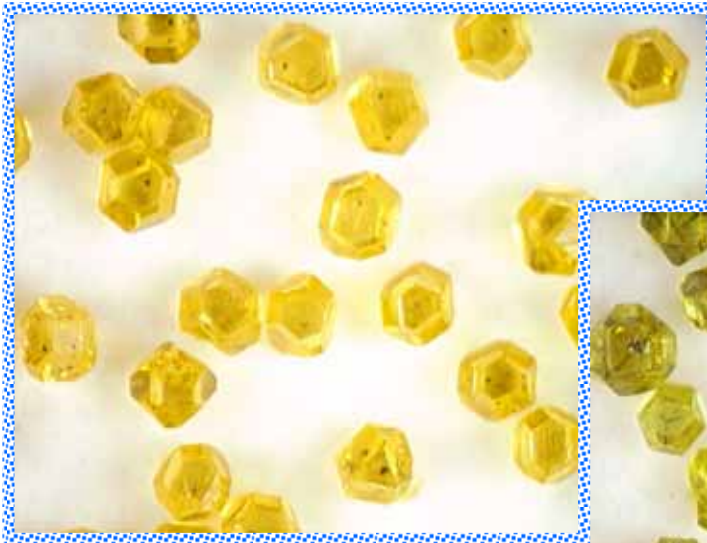
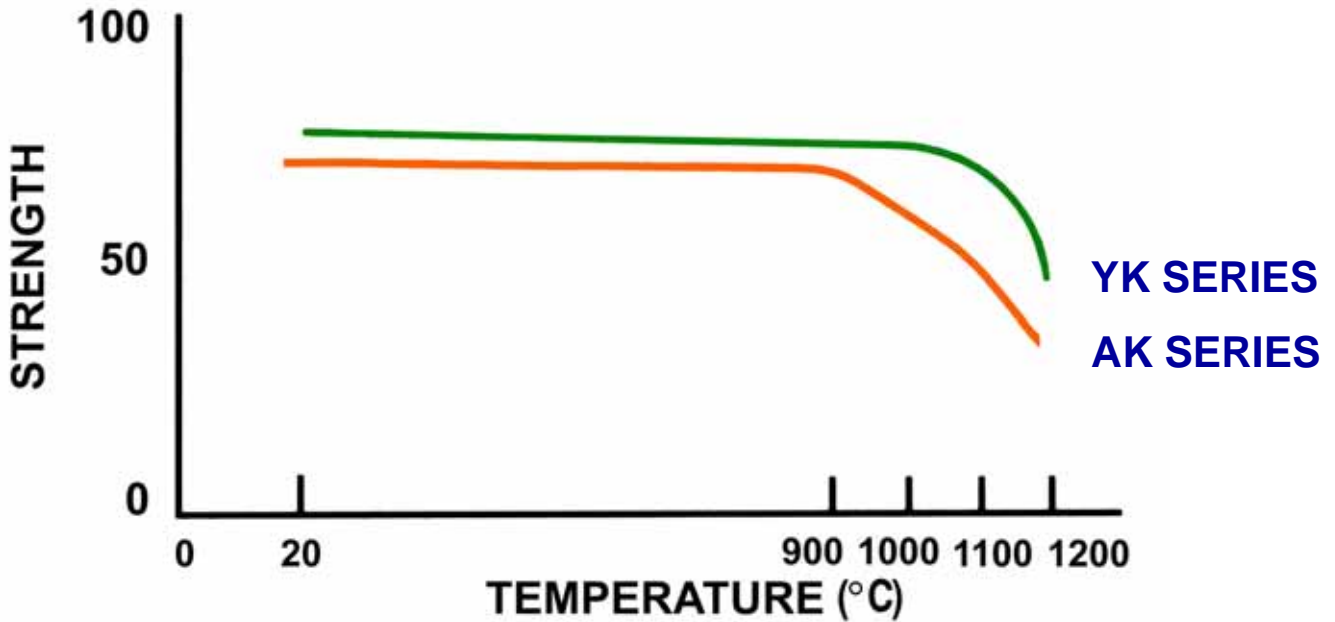
3.LOW T.T.I. 950 / 15 min



INPUT 2cts DIAMOND



STRENGTH vs. TEMPERATURE

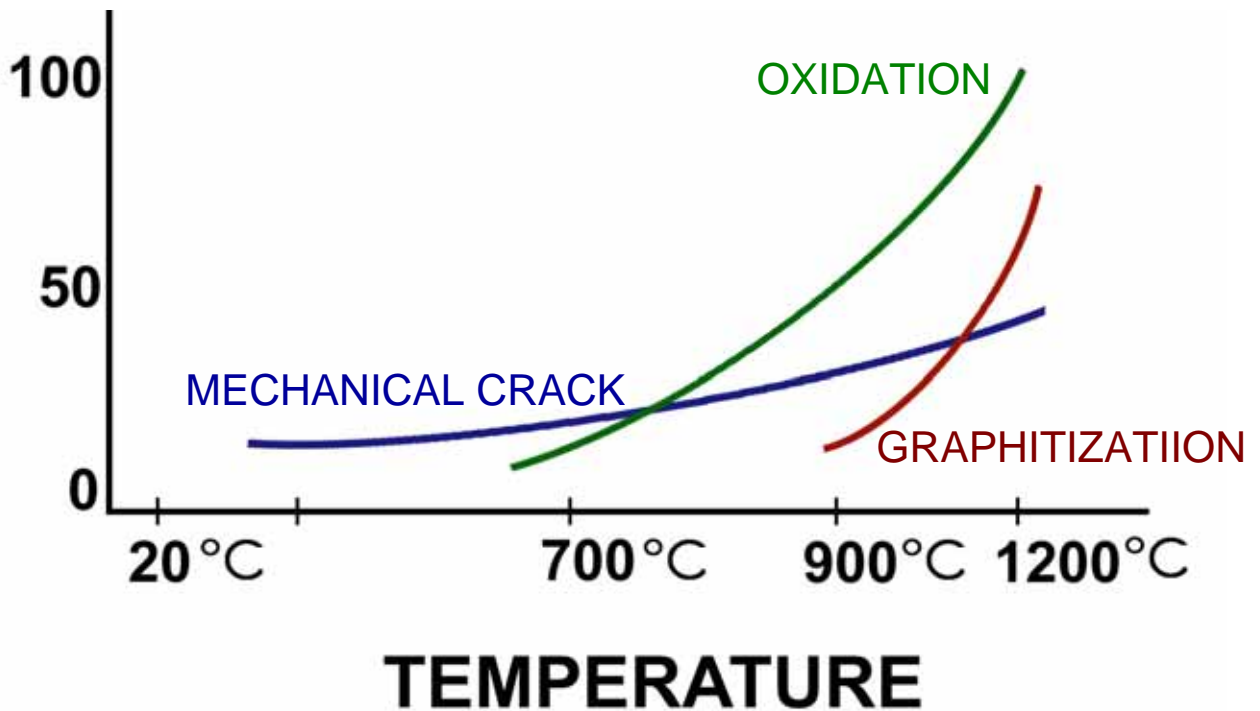


YK SERIES



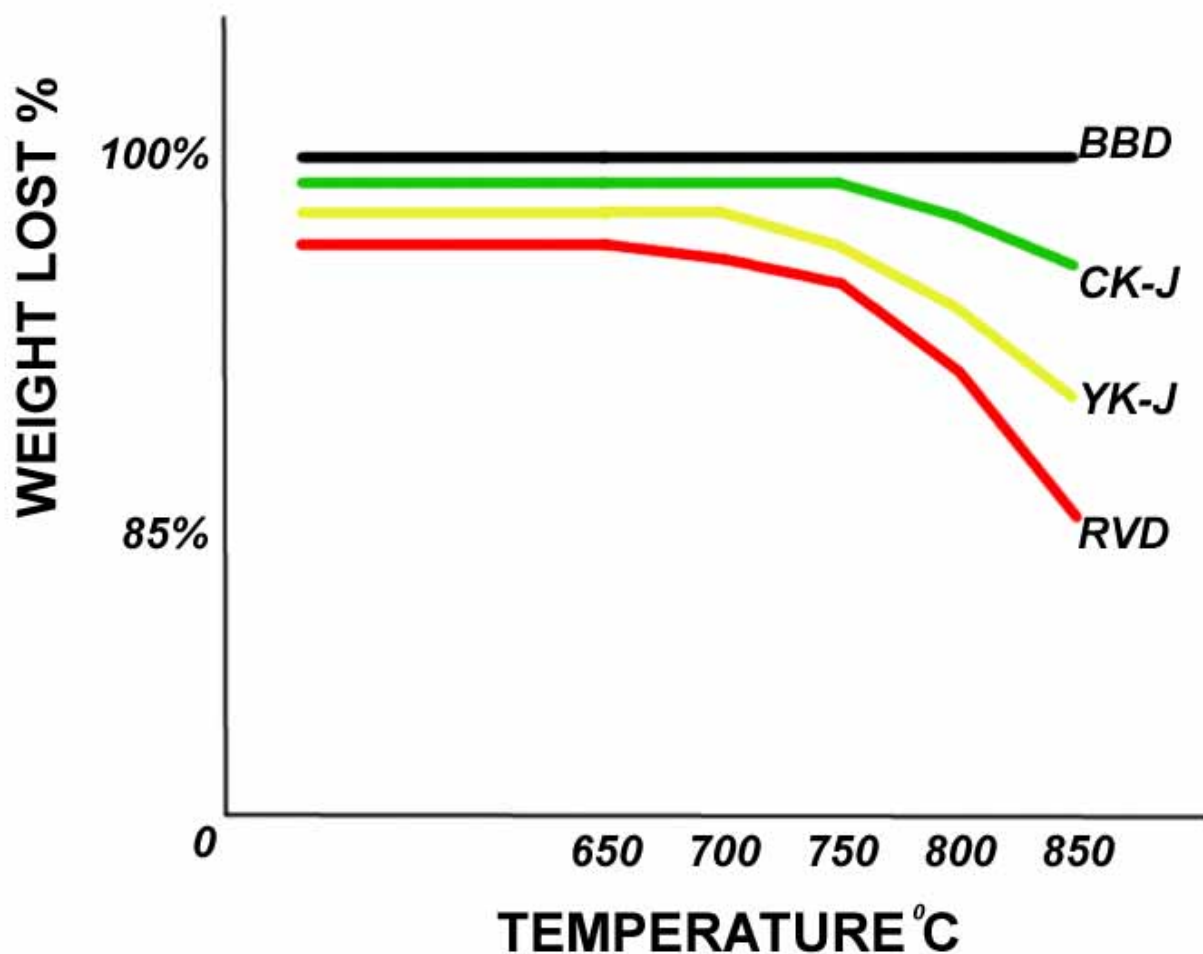
AK SERIES

DIAMOND DAMAGE



- OXIDATION : $C \rightarrow CO + CO_2$
- GRAPHITIZATION : DIAMOND \rightarrow GRAPHITE
- MECHANICAL MICRO-CRACK :
CAUSED BY THE THERMAL EXPANSION
OF METAL INCLUSION INSIDE THE
DIAMOND CRYSTAL .

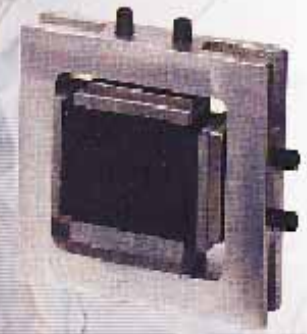
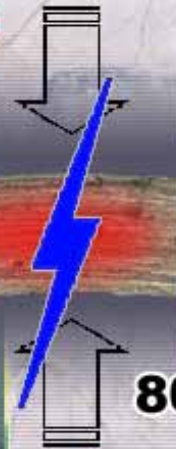
DIAMOND WEIGHT LOST



TEMP.	DIAMOND WEIGHT LOST %				
	650°C	700°C	750°C	800°C	850°C
BBD	-	-	-	-	-
CK-J	-	-	-	1.84	3.95
YK-J	-	-	1.70	4.62	9.02
RVD	1.66	2.40	3.53	7.67	14.69
MESH	170/200 D91				

3 TIMES HEAT IMPACT TO SAW DIAMOND

1ST: SINTERING



800 ~ 1000 °C

2ND: BRAZING OR LASER WELDING



680 °C



CO₂
LASER WELDING

3RD: SAWING



4S – DIAMOND SIZE

MICRON SIZE (μm)

841/595

250/177

44/37

US MESH SIZE

20/30

60/80

325/400



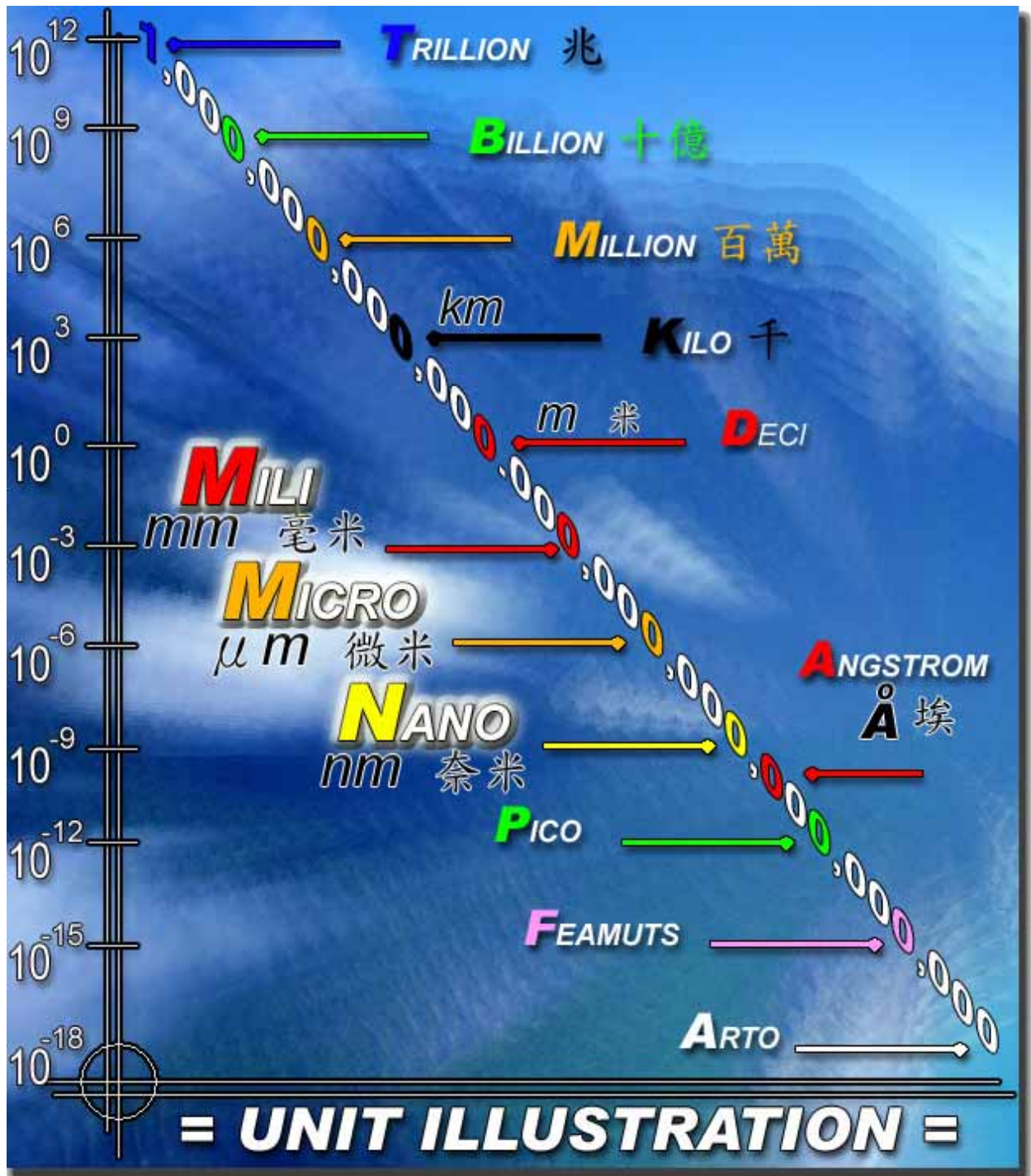
SAW DIAMOND

GRINDING DIAMOND

LAPPING and POLISHING
DIAMOND

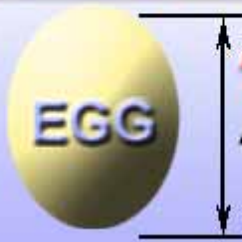


UNIT ILLUSTRATION



HOW BIG IS THIS EGG? (1)

LENGTH



3. $AVG. SIZE = \frac{A+B}{2}$

4. CHINESE STD.
 $D = B \times 1.29$

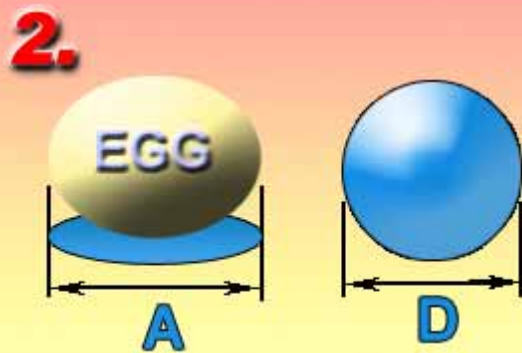
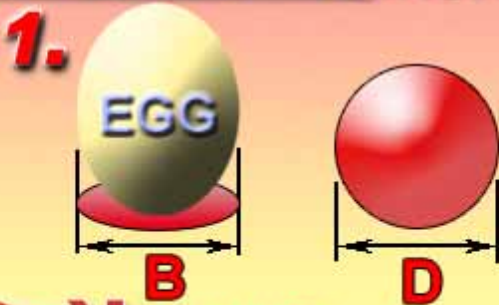
CIRCLE



2. TWO CIRCLES

$AVG. SIZE = \frac{D+D}{2}$

AREA DIASHAPE

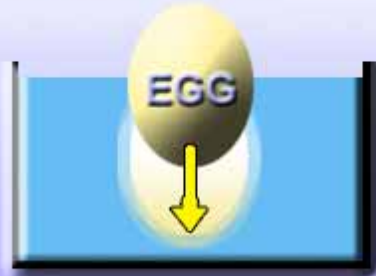


VOLUME



HOW BIG IS THIS EGG? (2)

SPEED STOKES LAW

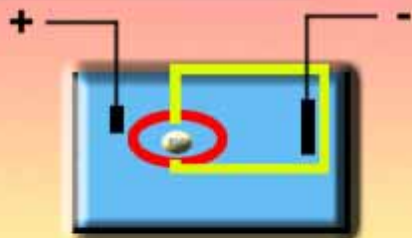


$$D = \sqrt{\frac{18v\eta}{(\rho_s - \rho_f)g}}$$

WEIGHT



ELECTRIC RESISTANCE

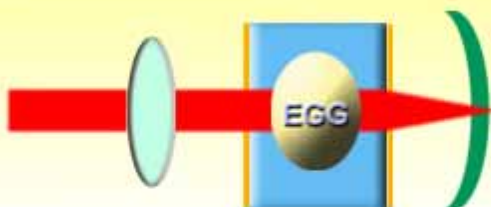


ELECTROLYTE

$$R_0 = \rho \left(\frac{L}{S} + \frac{V}{S^2} \right)$$

- ELZONE
- COULTER

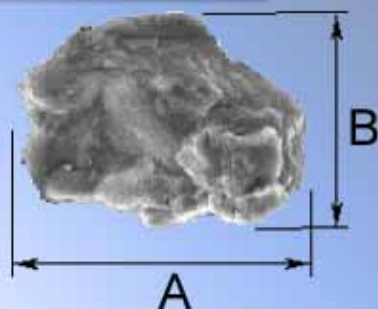
LASER DIFFRACTION



- MICROTRAC
- MALVERN
- HORIBA
- BETTER
- SHIMAZU
- OMEC

PARTICLE SIZE MEASUREMENT (1)

1. LENGTH

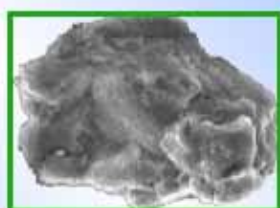


$$\frac{A + B}{2} = \text{MEAN DIAMETER}$$

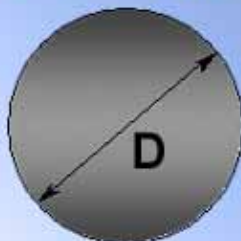
B = SIEVE SIZE

$$A / B = F_E$$

2. AREA



=



DIASHAPE & MICRO-DIASHAPE

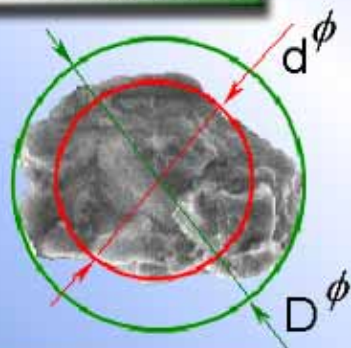
D = GRAIN SIZE

$$A \times B \doteq \frac{\pi D^2}{4}$$

IF $F_E = A / B = 1.32$

THEN $D \doteq B \times 1.29$

3. TWO CIRCLES



$$\frac{D_\phi + d_\phi}{2} = \text{MEAN DIAMETER}$$

4. OTHERS

* * * *

PARTICLE SIZE MEASUREMENT (2)

EQUIVALENT AREA CALCULATED DIAMETER

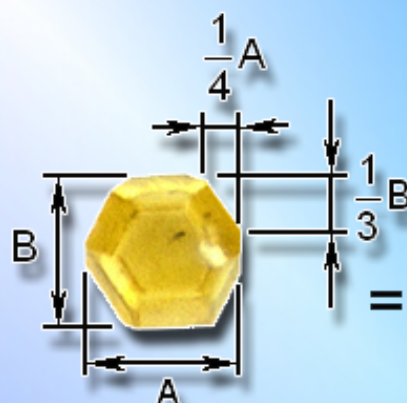


$$A = B = 1$$

$$F_E = A / B = 1.0000$$

$$A \times B = \frac{\pi D_s^2}{4}$$

$$D_s = 1.1284 \times B$$



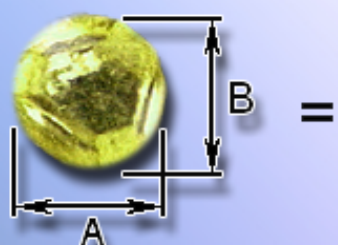
$$A = B = 1$$

$$F_E = A / B = 1.0000$$

$$A \times B - 4 \times \frac{\frac{1}{4}A \times \frac{1}{3}B}{2} = \frac{\pi D_o^2}{4}$$

$$\frac{5}{6} = \frac{\pi D_o^2}{4}$$

$$D_o = 1.0301 \times B$$



$$A = B = 1$$

$$F_E = A / B = 1.0000$$

$$\frac{\pi \times A \times B}{4} = \frac{\pi D_R^2}{4}$$

$$D_R = B = A$$

$$D_R = 1.0000 \times B$$

MESH SIZE COMPARISON

GROUP	ANSI US MESH	FEPA D	ISO R 6109-80 (um)	REMARK
SAW DIAMOND	20/30	D852	600-841	
	30/35	D601	500-600	
	30/40	D602	425-600	
	35/40	D501	425-500	
	35/45	D502	355-500	
	40/45	D426	355-425	
	40/50	D427	300-425	
	45/50	D356	300-355	
	45/60	D357	250-355	
	50/60	D301	250-300	
	60/70	D251	212-250	
	60/80	D252	180-250	
	70/80	D213	180-212	
GRINDING DIAMOND	80/100	D181	150-180	
	100/120	D151	125-150	
	120/140	D126	106-125	
	140/170	D107	90-106	
	170/200	D91	75-90	
	200/230	D76	63-75	
	230/270	D64	53-63	
	270/325	D54	45-53	
	325/400	D46	38-45	
	400/500	D39	32-38	
	500/600	D33	26-32	
MICRON DIAMOND	(600)	D25	20-30	
	(800)	D20	15-25	
	(1000)	D15	12-22	
	(1200)	D12	10-15	
	(1500)	D10	6-12	
	(2000)	D7	5-10	
	(3000)	D5	4-8	
	(5000)	D3	2-4	
	(15000)	D1	1-2	

() : VALUE FOR REFERENCE

4S - DIAMOND SIZE PARTICLES COUNT CHART

Mesh# Size	Mircron Size(um)	Particles per carat
3.5	5,660	0.32
4	4,760	0.52
5	4,000	0.88
6	3,360	1.4
7	2,830	2.8
8	2,380	4.2
10	2,000	7
12	1,680	12
14	1,410	20
16	1,190	33
18	1,000	57
20	841	97
25	707	160
30	595	282
35	500	460

Mesh# Size	Micron Size(um)	Particles per carat
40	420	770
45	354	1,334
50	297	2,080
60	250	3,240
70	210	6,140
80	177	10,400
100	149	17,140
120	125	20,920
140	105	49,400
170	88	83,400
200	74	140,000
230	63	252,000
270	53	384,000
325	44	660,000
400	37	1,120,000

US mesh	Particles per carat (PPC)	Concentration (particles per cc)					
		10	15	20	25	30	35
20/30	260+/-10	114	171	228	286	343	400
25/35	400+/-20	176	264	352	440	528	616
30/40	660+/-30	290	435	580	726	871	1,016
35/45	1,075+/-50	473	709	946	1,182	1,419	1,655
40/50	1,850+/-80	814	1,221	1,628	2,035	2,442	2,849
45/60	3,000+/-150	1,320	1,980	2,640	3,300	3,960	4,620
50/70	4,800+/-240	2,112	3,168	4,224	5,280	6,336	7,392

4S - DIAMOND SIZE PARTICLES COUNT CHART (1)

ANSI MESH	FEPA D	ISO R 565 - 1990 SIZE μ m			FACT STANDARD	
		MAX	MIN	MEAN	PPC	TOL. +/-
20/25	D851	850	710	780	200	10
20/30	D852	850	600	725	260	10
25/30	D711	710	600	655	330	15
25/35		710	500	605	400	20
30/35	D601	600	500	550	500	25
30/40	D602	600	425	513	660	30
35/40	D501	500	425	463	920	45
35/45	D502	500	355	428	1,075	50
40/45	D426	425	355	390	1,400	65
40/50	D427	425	300	363	1,850	80
45/50	D356	355	300	328	2,400	120
45/60	D357	355	250	303	3,000	150
50/60	D301	300	250	275	3,900	195
50/70		300	212	256	4,800	240
60/70	D251	250	212	231	6,800	340
60/80	D252	250	180	215	8,800	440
70/80	D213	212	180	196	12,000	600

 SPEC. OF ELEMENT SIX

REMARK

4S - DIAMOND SIZE PARTICLES COUNT CHART (2)

ANSI MESH	FEPA D	ISO R 565 - 1990 SIZE μm			FACT STANDARD
		MAX	MIN	MEAN	*PPC
80/100	D181	180	150	165	16,000
100/120	D151	150	125	138	28,000
120/140	D126	125	106	116	48,000
140/170	D107	106	90	98	91,000
170/200	D91	90	75	83	155,000
200/230	D76	75	63	69	260,000
230/270	D64	63	53	58	360,000
270/325	D54	53	45	49	680,000
325/400	D46	45	38	42	1,150,000
400/500	D39	38	32	35	1,750,000
500/600	D33	32	26	29	2,950,000

*:PPC FOR REFERENCE ONLY

REMARK

MESH VS. μm

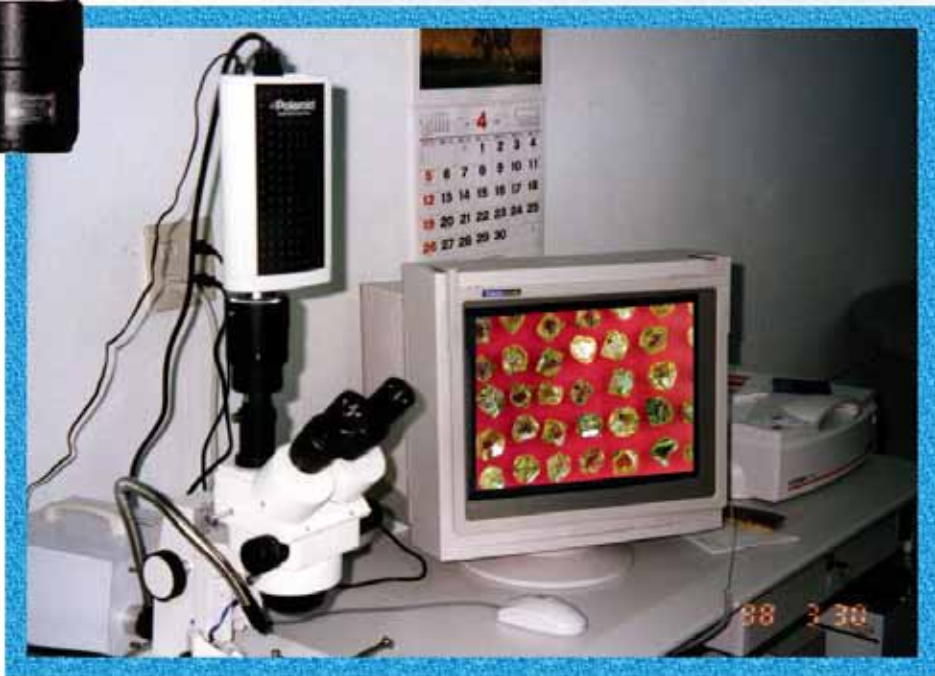
定 值		鑽石顆粒粒度(mesh)	顆粒平均粒徑(um)
15,000	÷	400	38
15,000	÷	500	30
15,000	÷	600	25
15,000	÷	700	21
15,000	÷	800	19
15,000	÷	1,000	15
15,000	÷	1,200	13
15,000	÷	1,500	10
15,000	÷	2,000	8
15,000	÷	2,500	6
15,000	÷	3,000	5
15,000	÷	4,000	4
15,000	÷	5,000	3
15,000	÷	8,000	2
15,000	÷	15,000	1

換算方式說明：

* $15,000 \div \text{粒度(MESH)} = \text{粒徑(MICRON)}$

* 粒度(MESH): 為每一英吋長度被等分的目數

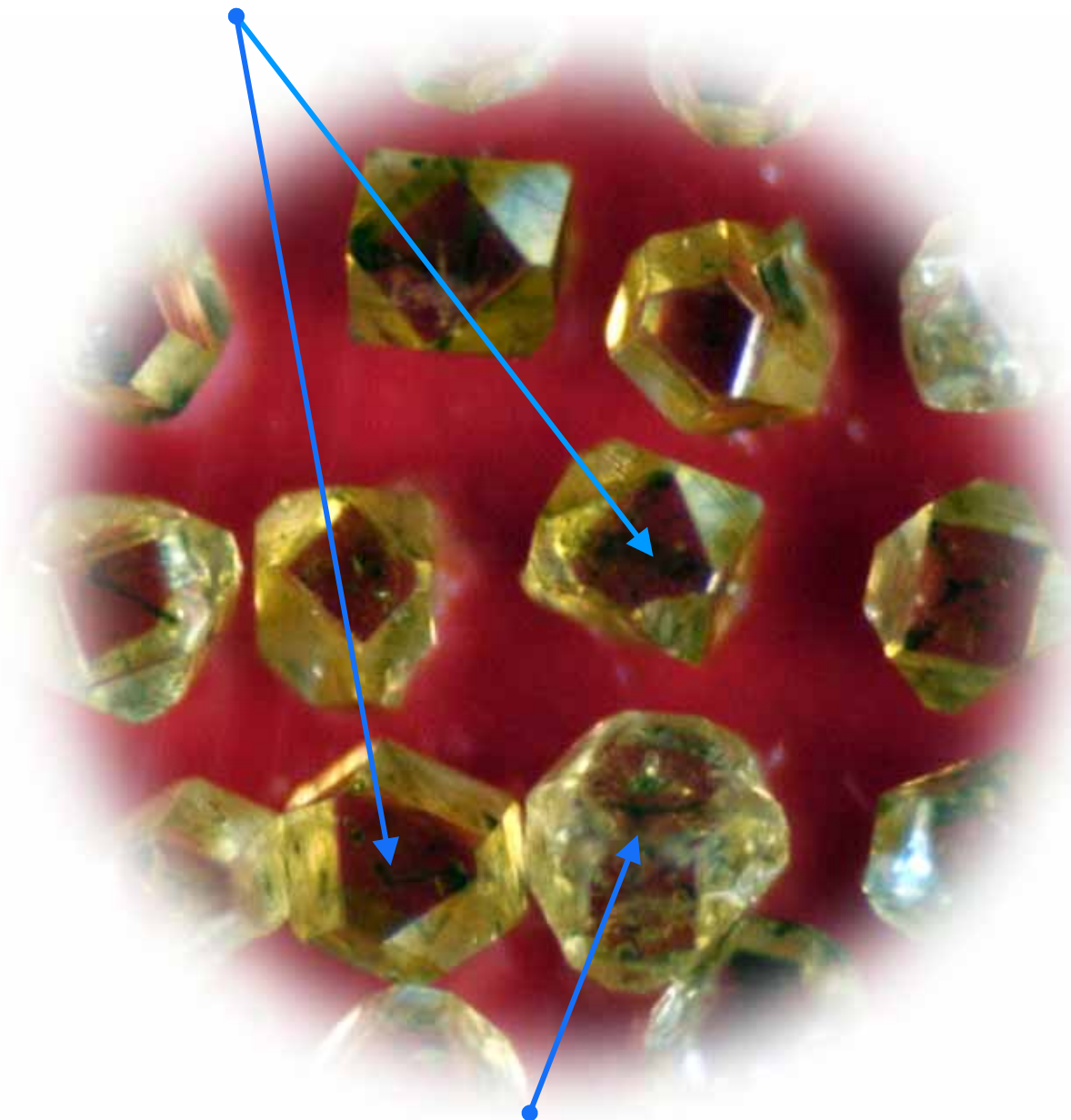
FACT PHOTOSHOP



**COMPANY IS EQUIPPED WITH
STATE OF THE ART COMPUTER
AIDED PHOTOGRAPHY**

4S - DIAMOND SURFACE (1)

TWO SMOOTH SURFACES MAKE SHARP CUTTING EDGE. & STRAIGHT CUTTING EDGE LINES FORM A STRONG TIP.



ROUGH SURFACE MAKES NO SHARP CUTTING EDGE LINE.

4S - DIAMOND SURFACE (2)

YK SERIES AK SERIES
YELLOW DIAMOND GREEN DIAMOND



MAGNETIC SORTING



MAGNETIC CONTROL

MAGNETIC INSPECTION INSTRUMENT



PRODUCT: YH08 AB
 LOT NO: 2005-1 QTY: 100
 DATE: 2005.09.07 INSPECTOR: JCC
 RESULT: GO NO
 NOTE:

DIMSHAPE	F ₁	F ₂	F ₃	F ₄	F ₅
SPEC.	1.0420	1.1220	1.0125	1.0285	3.00
ACTUAL	1.0262		1.0205		4.20
GO/NO	GO		GO		GO

DIMSHAPE	PPC	OPTICAL		COLOR		
		CLAR.	TRAN.	R-G	R-B	G-B
SPEC.	640 / 7140	REF.	≥83	REF.	REF.	REF.
ACTUAL	640	14.1020	137	1.0114	1.1537	1.3427
GO/NO	GO		GO			

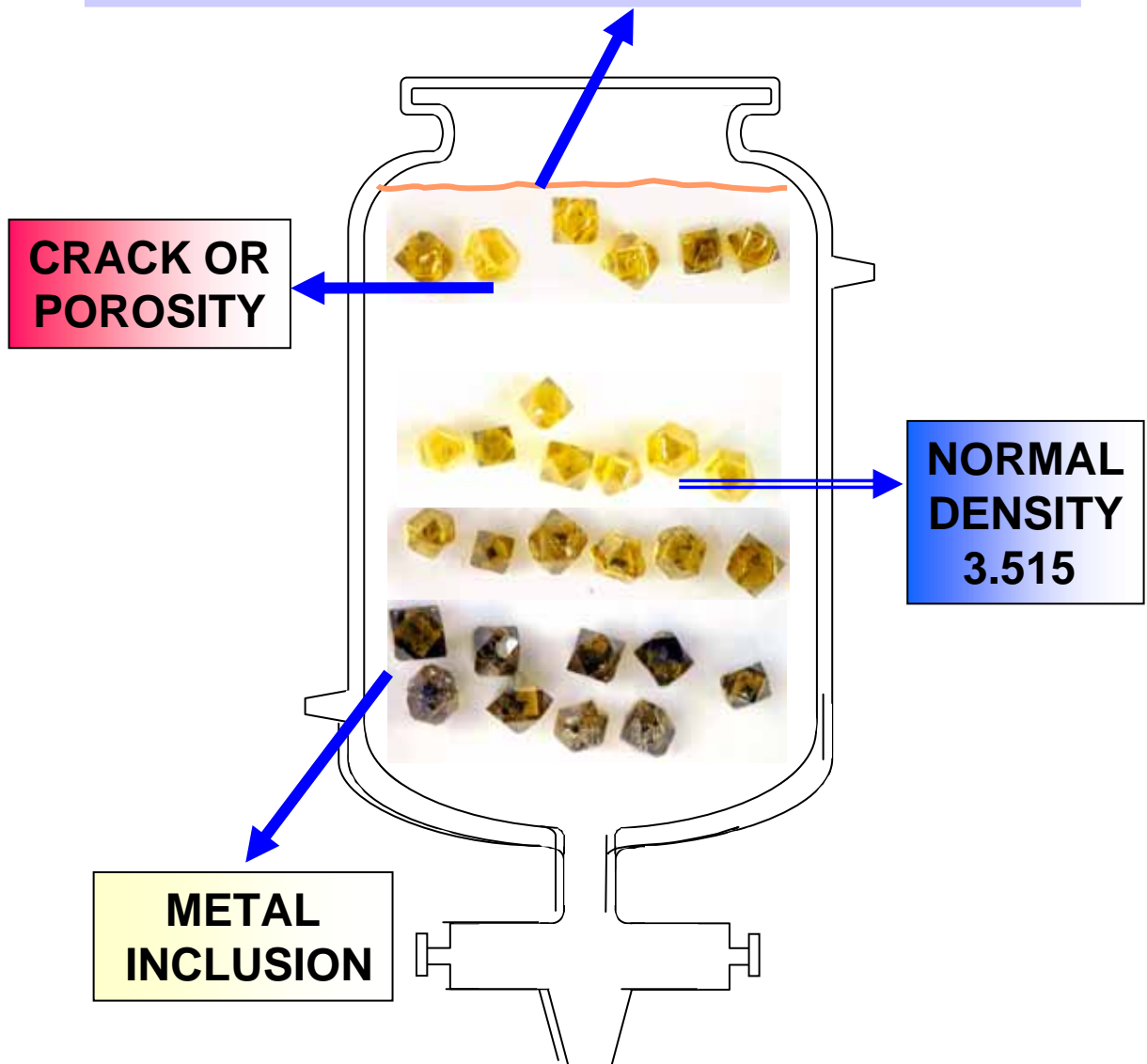
SIZE	GRAIN SIZE D50 (μm)	80	100	150	200	250
SPEC.	REF.	80.8%	82%	84.5%	86%	87%
ACTUAL	200		0.4%	81.2%	0.4%	
GO/NO			GO			

TH	T1	T2	REF. S.C.T (μg)	MAGNETIC
80	86	76	82	<30
81				4.6
GO				GO

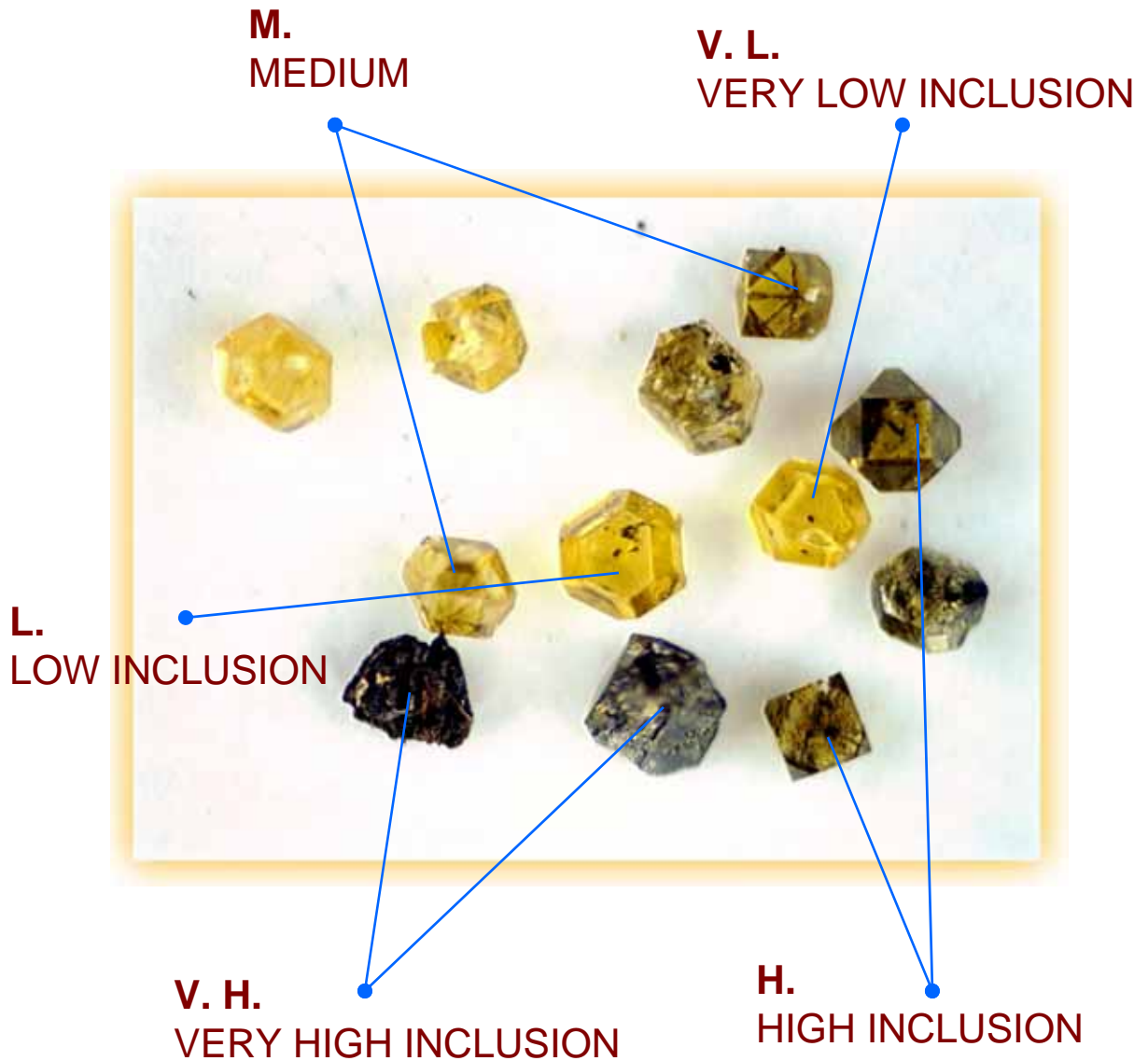
MAGNETIC
<30
4.6
GO

DENSITY SORTING

**PRECISION TEMPERATURE CONTROLLED
HEAVY LIQUID DENSITY = 3.512~3.523**



5 INCLUSION LEVEL



INCLUSION : GRAPHITE OR CATALYST

DIASHAPE SYSTEM



SWISS SOFTWARE



NEW USB LOCK

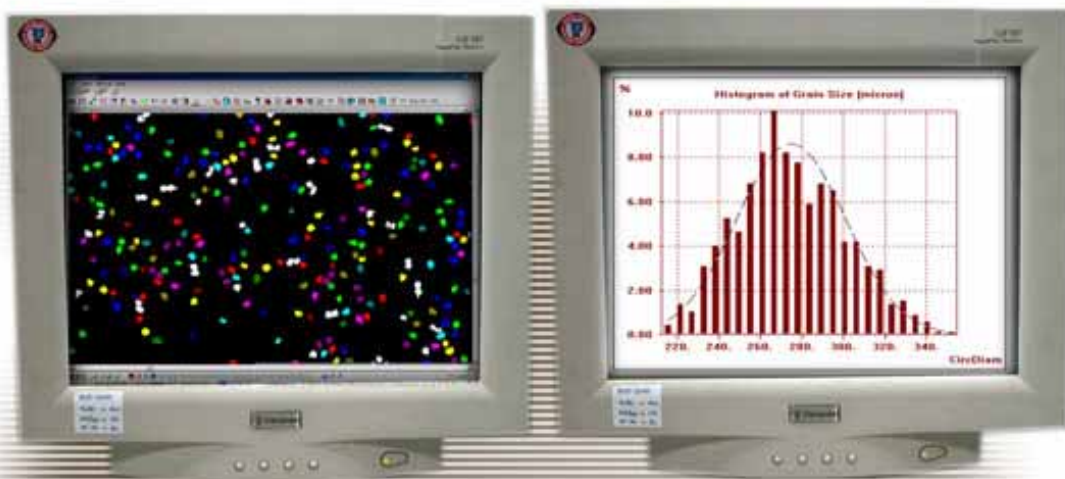


1ST USER GUIDE



MINOLTA SCANNER

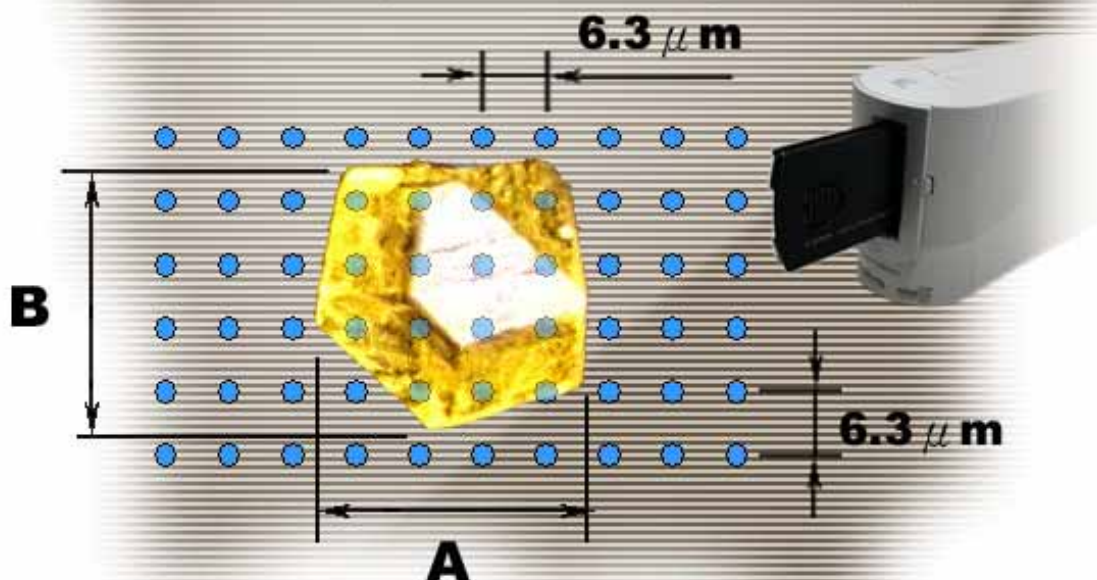
DIASHAPE MEASUREMENT PRINCIPLE



CanoScan FS 4000US:

MEASUREMENT SIZE

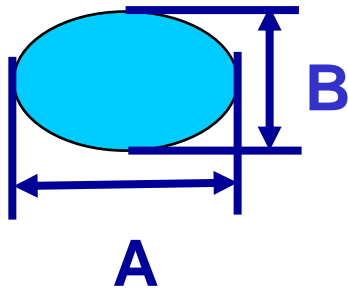
$$= 25400 \mu\text{m} / 4000 \text{ dpi} = 6.3 \mu\text{m}$$



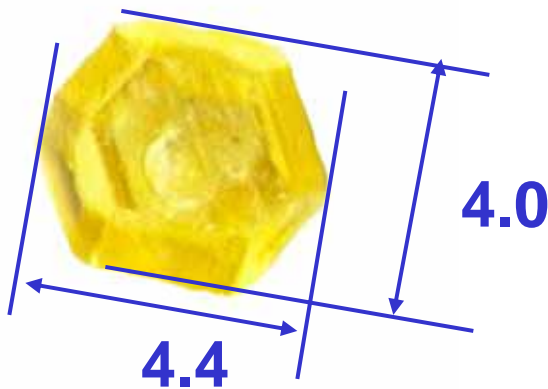
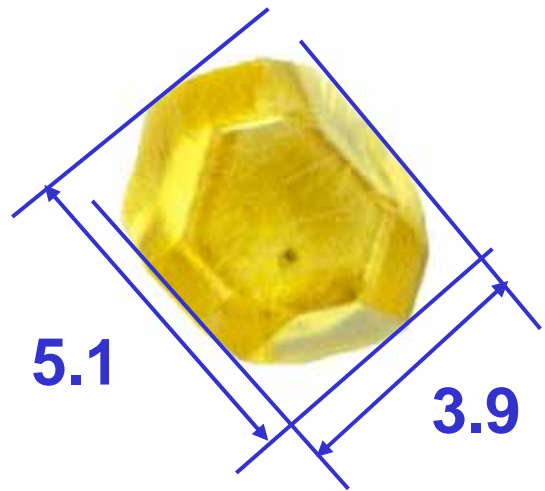
SHAPE FACTOR ELLIPTICITY



$$F_E = \frac{A}{B}$$



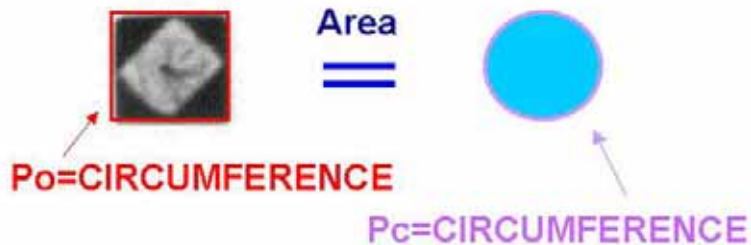
$$F_E = \frac{5.1}{3.9} = 1.31$$



$$F_E = \frac{4.4}{4.0} = 1.10$$

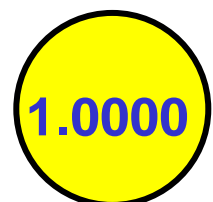
SHAPE FACTOR CRYSTALLINITY

$$F_c = \frac{P_o}{P_c} = \frac{\text{Area of Polygon}}{\text{Area of Circle}}$$

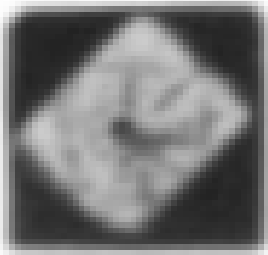


§ F_c : LENGTH RATIO §

THEORETICAL F_c VALUE



TRANSPARENCY

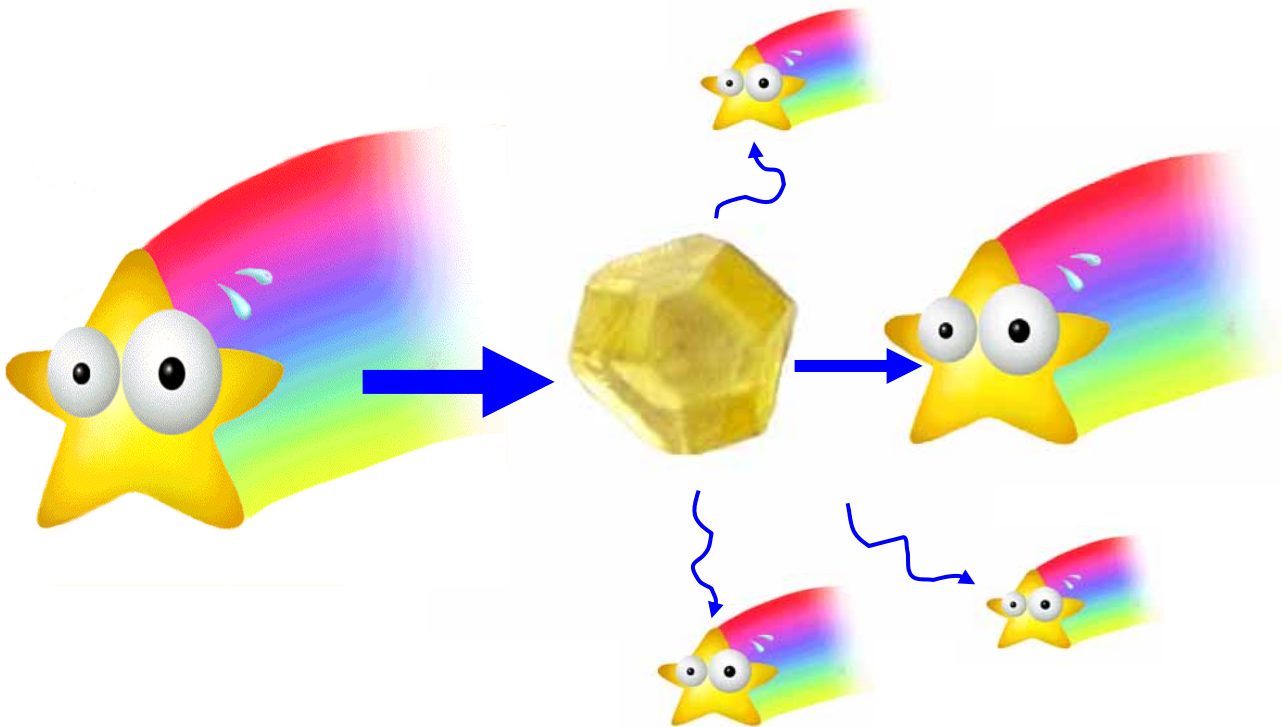


TRANSPARENCY

AVERAGE GREY
VALUE OF EACH
DIAMOND

OR

HOW MUCH LIGHT
PASSED THROUGH
THE DIAMOND



ROUGHNESS

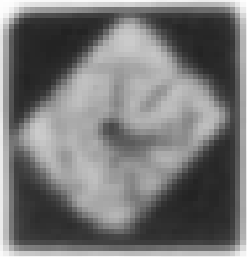
ROUGHNESS

$$= (1 - \text{CONVEXITY}) \times 100\%$$

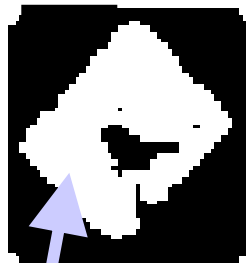
$$\text{CONVEXITY} = \frac{\text{Two small circles}}{\text{Two large circles}} < 1$$

§ THE SMALLER,
THE SMOOTHER §

CLARITY

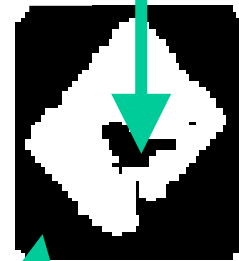


REAL
OBJECT



WHITE SURFACE
WS

INCLUDED
IN BS



BLACK SURFACE
BS

CLARITY

$$= \frac{WS}{BS} \%$$

COLORS

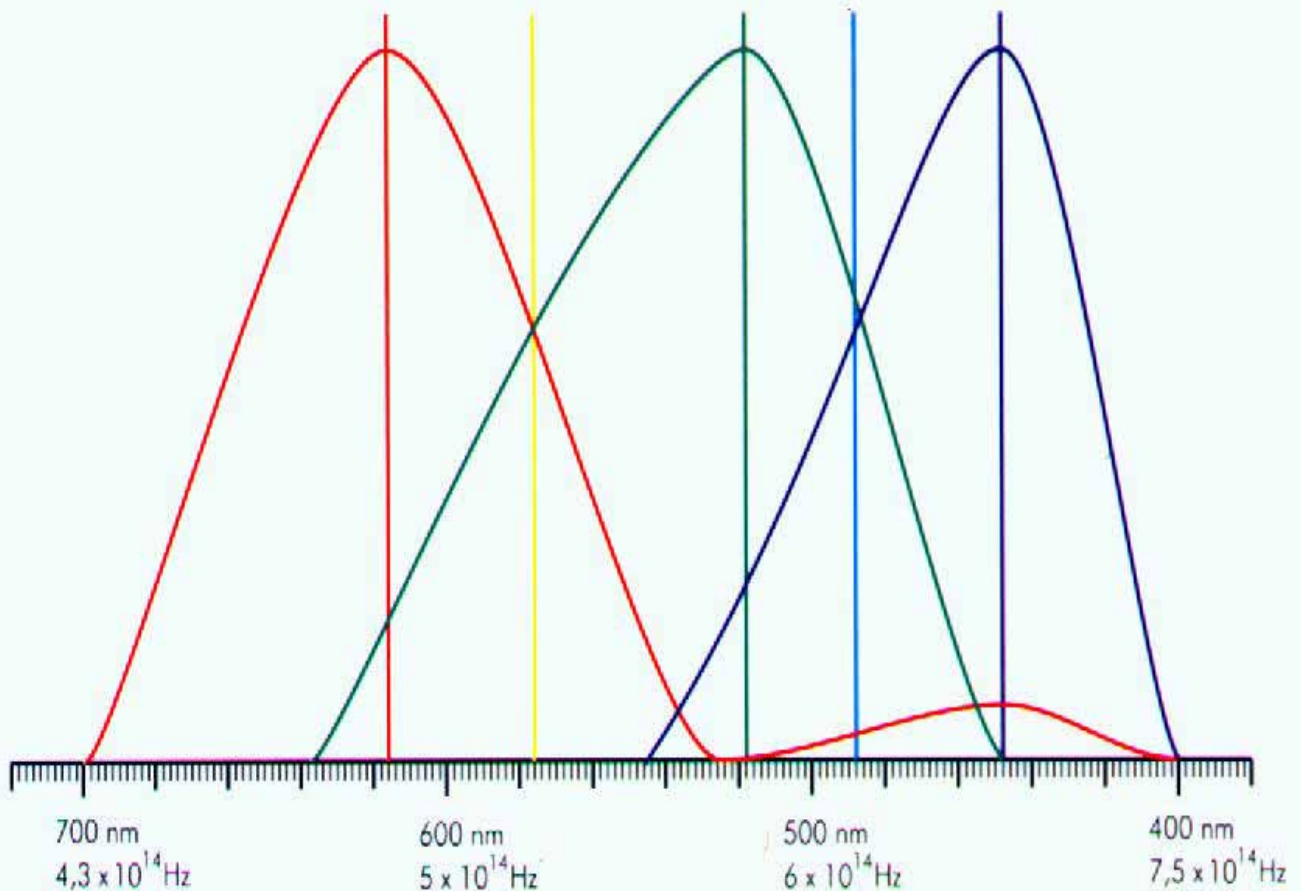
R/G, G/B, R/B



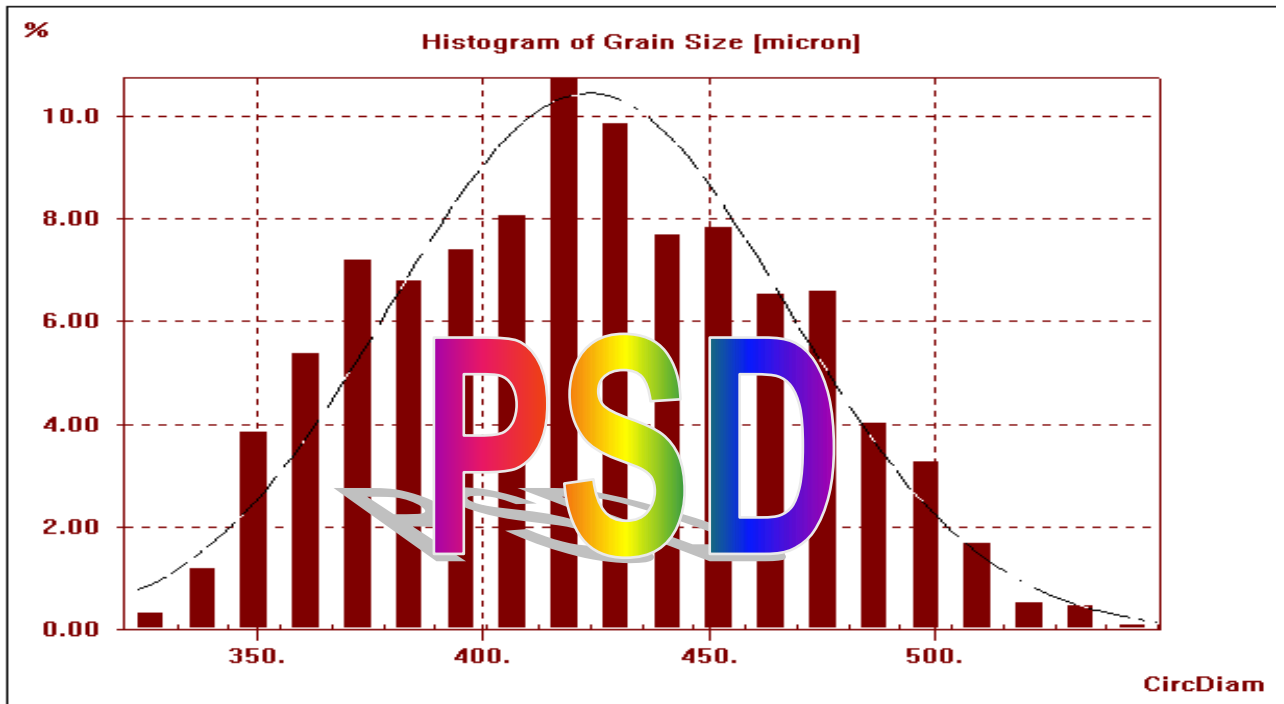
Red

Green

Blue



PARTICLE SIZE DISTRIBUTION

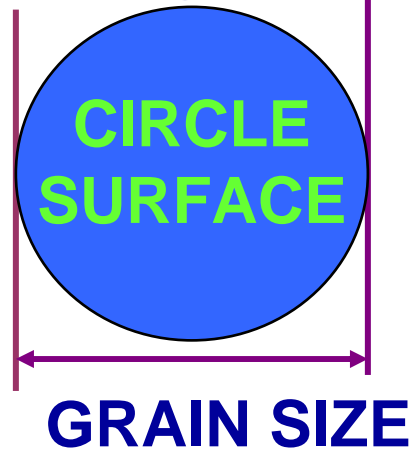


COMPUTER
CALCULATED















=

SPHERE
MODEL



DIASHAPE EXAMPLES

12 TYPICAL DIAMONDS WITH DIFFERENT SHAPES

results DIASHAPE			<i>some results DIASHAPE - Expert</i>					
	Grain Size µm	Sieve Size µm	Shape Factor	<i>Elliptical Shape Fact</i>	<i>Convex Shape Fact</i>	<i>Convex Circ. Misfit</i>	<i>Convex Roughness</i>	
1		476	428	1.11	1.09	1.07	8.28	2.61
2		415	360	1.15	1.06	1.07	9.56	4.99
3		418	364	1.15	1.03	1.09	11.45	3.16
4		442	395	1.12	1.07	1.07	9.49	2.12
5		524	487	1.08	1.04	1.03	4.12	3.34
6		518	477	1.09	1.13	1.03	4.63	3.80
7		452	418	1.08	1.09	1.02	3.95	3.92
8		409	381	1.07	1.06	1.02	3.80	3.46
9		459	433	1.06	1.05	1.01	2.50	3.44
10		413	388	1.07	1.02	1.01	2.68	3.76
11		399	374	1.07	1.03	1.01	2.74	3.80
12		405	382	1.06	1.07	1.01	2.78	3.35