

Tradition. Leadership. Excellence.

Welcome to VSM Abrasives Technical Training Manual. This manual has been carefully developed and designed with you, the distributor in mind, to provide you with a useful and informative information source on VSM coated abrasives.



For over 130 years, VSM has established itself as a leader in the coated abrasives industry. Focusing on customer's needs and making those needs top priority.



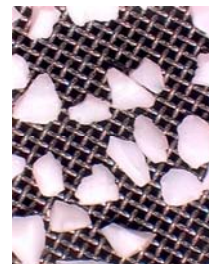
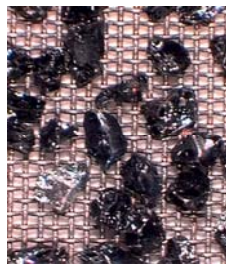
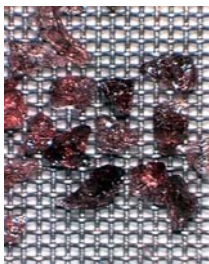
The Key to Quality

VSM is dedicated to providing customers with superior products and solutions for their coated abrasive needs. Quality products are not just produced but are created by understanding the entire production process and how the coated abrasive product performs in an application.

VSM forms a versatile product line drawn from a proven formula that assures dependable performance. This proven formula includes a variety of **minerals**, **backing** and **bonding systems**.

Minerals perform the basic job of grinding, cutting, finishing, and polishing. VSM manufactures abrasives using four man-made minerals:

Aluminum oxide, Silicon carbide, Zirconia alumina and Ceramic alumina.



Backings are the platforms that carry and support the mineral grains. VSM uses four types of backings: **Paper**, **Cloth**, **Vulcanized Fiber** and **Combination**.

The paper backings are further divided into weights designated A, B, C, D, E and F. Cloth backings are designated by their flexibility, identified as E, F, J, T, X and Y. Mechanical flexing the coated abrasives creates this range of flexibility.

Types of flexes employed by VSM (in order of stiffest to most flexible) include: **Single Flex**, **Double Flex**, and **Full Flex**. This flexing procedure creates a controlled cracking in the bond system that ensures consistent flex characteristics and enhances stock removal through better grain regeneration.

The flex of a coated abrasive product is inversely related to the life of the product.

As a rule, use the stiffest product possible for an application.



Single Flex

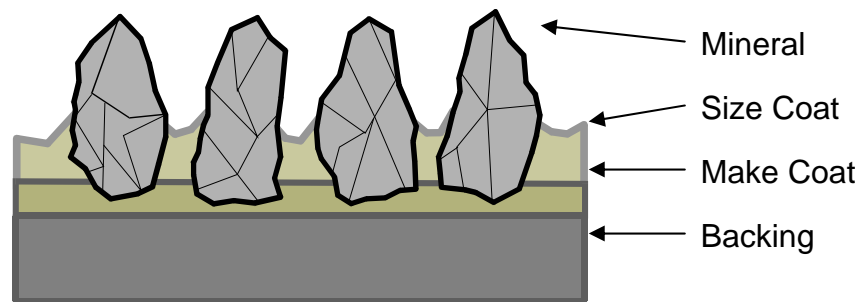


Double Flex



Full Flex

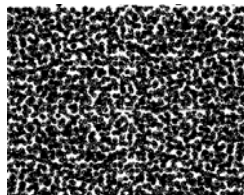
There are two layers of resins, which create the **bonding system** for coated abrasives. The first layer of resin is called the **make coat**, which anchors the grains to the backing. The second layer of resin is the **size coat**, applied over the grains, which further anchors and stabilizes the grains. VSM manufactures coated abrasives exclusively with resin over resin bonding systems. With state-of-the-art production facilities, VSM is formulate the raw materials utilized for resins into a winning combination of long-life and flexibility for the entire line of products.



Abrasive minerals can be applied to backing in several ways. The **gravity coating process**, the abrasive grains are dropped from an overhead hopper onto the adhesive coated backing.

In the **electrostatic coating process**, the adhesive coated backing and the abrasive grains pass through an electrically charged field. This electrically charged field propels the abrasives grains upward toward the backing traveling upside down above the grains. These grains are imbedded in the adhesive with the sharpest edge of the abrasive grains exposed, ensuring uniform cutting characteristics.

With these coating processes, the grain coverage can be modified to produce either **open coat** or **closed coat** products. Traditionally, any product with grain coverage of approximately 60% was considered open coat. A closed coat product would have 100% grain coverage of the backing. Today, coating densities vary from 30% to 100% coverage of the backing.



Closed coat



Open coat



Grading Systems

A grade number identifies the size of the coated abrasives' mineral. There are several systems used to assign a grade number. Some of the most common include:

- ❑ **FEPA**, Federation of European Producers of Abrasives;
- ❑ **ANSI**, American National Standards Institute
(Formerly, **CAMI**, Coated Abrasives Manufacturers Institute)
- ❑ **JIS**, Japanese Standard.

The chart below shows the conversion between some of the most common grading systems.

FEPA P (European Std.)	CAMI (U.S. Std.)	JIS (Japanese Std.)	AVG. GRAIN DIAMETER (μ)
P16	16	16	1292
P20	20	20	973
P24	24	24	743
P30	30	30	626
P36	36	36	523
P40	40	40	412
P50	50	50	328
P60	60	60	262
P80	80	80	196
P100	100	100	157
P120	120	120	122
P150	150	150	98
P180	180	180	76
P220	220	220	66
P240		240	58
P280	240	280	52
P320		320	46
P360	280	360	40
P400		400	35
P500	320	500	30
P600		600	26
P800	400		22
P1000	500	800	18
P1200	600	1000	15

K K 7 1 1 X

Grain:

- C: Silicon carbide
- K: Aluminum oxide
- L: COMPACTGRAIN-
Aluminum oxide
- M: COMPACTGRAIN-
Silicon carbide
- S: Ceramic
- Z: Zirconia Alumina

Backing:

- F: Fiber
- K: Cloth
- P: Paper

Backing Flexibility:

- | | |
|--------------------------|------------------------|
| Paper | Cloth |
| A = 70 g/m ² | E = Extremely Flexible |
| B = 100 g/m ² | F = Very Flexible |
| C = 120 g/m ² | J = Flexible |
| D = 160 g/m ² | T = Moderate |
| E = 250 g/m ² | X = Sturdy |
| F = 300 g/m ² | Y = Very Sturdy |

K = Velcro



PRODUCT CONTENTS					
Product	METAL	WOOD	SEALER	GLASS	RUBBER & STONE...
CK721F	<input type="checkbox"/>	<input type="checkbox"/>			
CK721J	<input type="checkbox"/>	<input type="checkbox"/>			
CK721X	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
CK722Y - ANTISTATIC	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
CK742J - COMPACTGRAIN	<input type="checkbox"/>				
CK748X - COMPACTGRAIN	<input type="checkbox"/>				
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CK917X	<input type="checkbox"/>				
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KF736 - COMPACTGRAIN	<input type="checkbox"/>				
KK078X - COMPACTGRAIN	<input type="checkbox"/>				
KK114F	<input type="checkbox"/>	<input type="checkbox"/>			
KK504F		<input type="checkbox"/>			
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KK505J		<input type="checkbox"/>			
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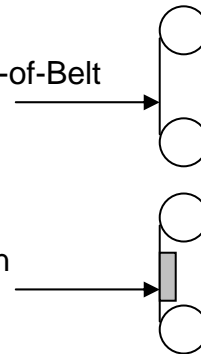


PRODUCT CONTENTS					
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KK815Y	<input type="checkbox"/>				
KK834X - COMPACTGRAIN	<input type="checkbox"/>				
KK841F	<input type="checkbox"/>				
KK853X	<input type="checkbox"/>				
KP408E		<input type="checkbox"/>	<input type="checkbox"/>		
KP508E		<input type="checkbox"/>			
KP510E		<input type="checkbox"/>			
KP520 - ANTISTATIC		<input type="checkbox"/>			
KP532E		<input type="checkbox"/>	<input type="checkbox"/>		
KP709	<input type="checkbox"/>	<input type="checkbox"/>			
KP911	<input type="checkbox"/>	<input type="checkbox"/>			
LK719X - COMPACTGRAIN	<input type="checkbox"/>				
MK748X - COMPACTGRAIN	<input type="checkbox"/>				
MP-10		<input type="checkbox"/>	<input type="checkbox"/>		
MPG		<input type="checkbox"/>	<input type="checkbox"/>		
SF750	<input type="checkbox"/>				
SF840	<input type="checkbox"/>				
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Basic Contact Elements

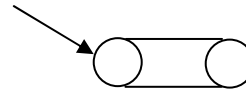
The three basic contact methods employed when using coated abrasive belt include: **slack of belt, platen and contact wheel.**

A **slack of belt** operation is when an abrasive belt runs over a drive wheel and idler, and the work piece is applied to the open, unsupported area. This type of method is used to deburr or Slack-of-Belt polish at light to medium pressures.



Platen applications have a fixed steel plate supporting the abrasive belt where the work piece makes contact. This type of contact element is used for dimensioning and truing flat work pieces.

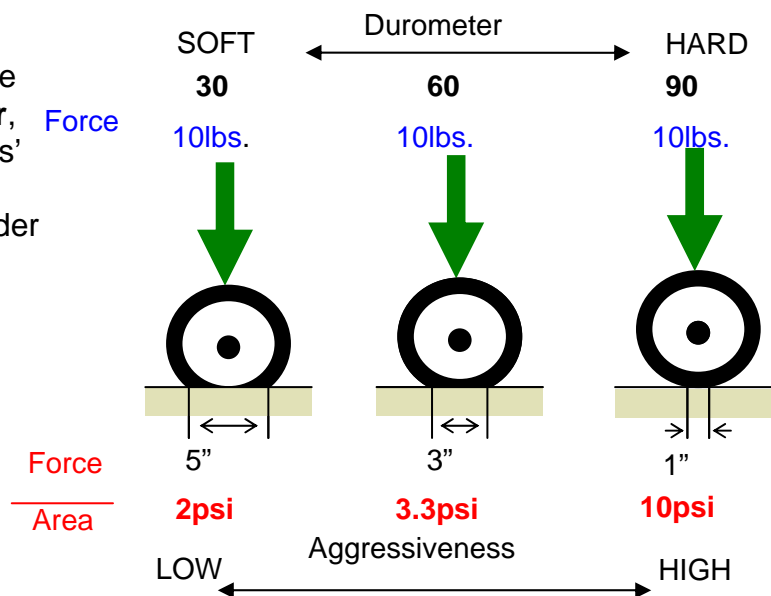
The most commonly used contact elements are **contact wheels.** The contact wheel supports the abrasive belt where the work piece makes contact. The work piece may be presented to the belt on the face of the wheel or occasionally is worked over the edges of the wheel.



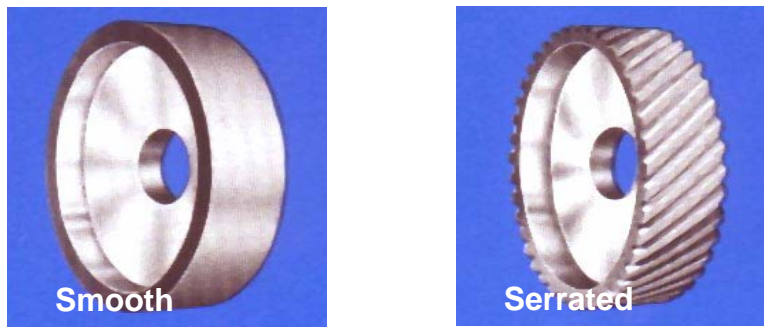
Contact Wheels

The force applied is the primary factor involved in the grinding efficiency and finish of an abrasive belt on a contact wheel. The type of material the contact wheel is made from can vary this force. A contact wheel may be made of **steel, rubber or canvas.** **Rubber** is the most commonly used type of contact wheel.

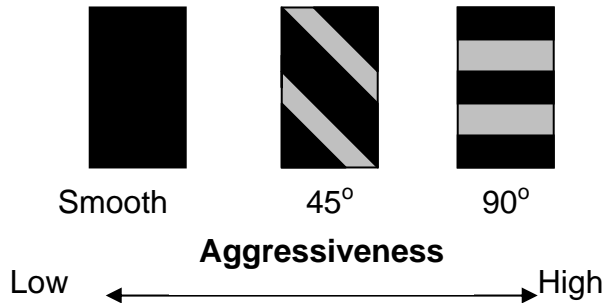
The force applied to a work piece can further be varied by the **durometer**, a measure of the rubbers' hardness. A larger number will indicate harder rubber and increase the grinding force.



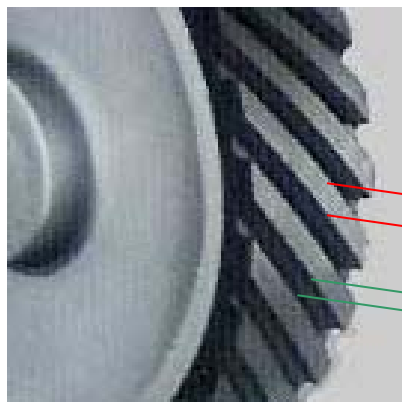
The addition of **serrations** to a contact wheel will also increase the grinding forces. A serrated wheel has a consistent pattern cut at an angle across the face.



This **serration angle** can be manipulated to increase the grinding forces by creating a greater angle across the face.



The raised area is called the **land** and the sunken area is called the **groove**. The **land to groove ratio** is an expression of the length of the land compared to the length of the groove. Narrowing the land and/or widening the groove will increase the grinding forces.



Land to Groove Ratio =
 $\frac{1/2''}{1/4''} : \frac{1/4''}{1/4''} =$
 2:1

1/2'' Land

1/4'' Groove



Belt Speeds

If you know the contact wheel diameter in inches and the revolutions per minute of the machine shaft, the following equation will allow you to arrive at the surface feet per minute of the belt.

Legend: π = 3.1416
 RPM = Revolutions per minute
 SFPM = Surface feet per minute
 D = Diameter (in)

Equation:
$$\frac{\pi \times D \times \text{RPM}}{12} = \text{SFPM}$$

The European equivalent of SFPM is meters per second (M/S). To convert SFPM to M/S, divide by 196.8 or use this formula:

Legend: π = 3.1416
 RPM = Revolutions per minute
 D = Diameter (mm)

Equation:
$$\frac{\pi \times D}{1000} \times \frac{\text{RPM}}{60} = \text{M/S}$$

To convert M/S to SFPM, multiply M/S by 196.8.

Guidelines for speed recommendations (SFPM) based on work piece material

Aluminum	4500 - 5000	Nickel/Chrome	2500 - 3000
Brass/Bronze	5000 - 6000	Plastics	2000 - 2500
Copper	4000 - 5000	Plywood	5000 - 7000
Fiberglass	5000 - 7000	Rockide	1500 - 2000
Glass	2500 - 3500	Hard Rubber	6000-10000
Grey Cast Iron	4000 - 5000	Mild/Carbon Steel	4000 - 5000
Inconel	3000 - 4000	Stainless Steel	4000 - 5000
Lumber Sanding	6500 -10000	Titanium	2000 - 2500
MDF/PB	6000 - 7000	Tool Steel	4000 - 5000



Surface Finish

Variable Factor	Rough Surface Higher Surface Finish Reading	Smooth Surface Lower Surface Finish Reading
Grit Size	Coarse	Fine
Belt Condition	New	Used
Adhesive Bond	Resin	Glue
Coating Method	Open Coated	Close Coated
Product Flex	Single Flex	Double Flex
Contact Wheel - Serrations	Serrated	Smooth
Contact Wheel - Serration Angle	Smaller (0)	Greater (90)
Contact Wheel - Material	Steel	Rubber
Contact Wheel - Diameter	Smaller	Larger
Belt Speed (SFPM)	Slower	Faster
Grinding Aid	Dry	Water
Abrasive Mineral	Zirconia	Ceramic
Work Piece Hardness	Softer	Harder



Grinding Efficiency

Variable Factor	More Aggressive Better Cut Rate	Less Aggressive Lower Cut Rate
Grit Size	Coarse	Fine
Belt Condition	New	Used
Adhesive Bond	Resin	Glue
Coating Method	Open Coated	Close Coated
Product Flex	Single Flex	Double Flex
Contact Wheel - Serrations	Serrated	Smooth
Contact Wheel - Serration Angle	Smaller (0)	Greater (90)
Contact Wheel - Material	Steel	Rubber
Contact Wheel - Diameter	Smaller	Larger
Belt Speed (SFPM)	Slower	Faster
Grinding Aid	Dry	Water
Abrasive Mineral	Zirconia	Ceramic
Work Piece Hardness	Softer	Harder
Belt Length	Longer	Shorter
Work Piece Feed Speed	Slower	Faster
Pressure	Higher	Lower