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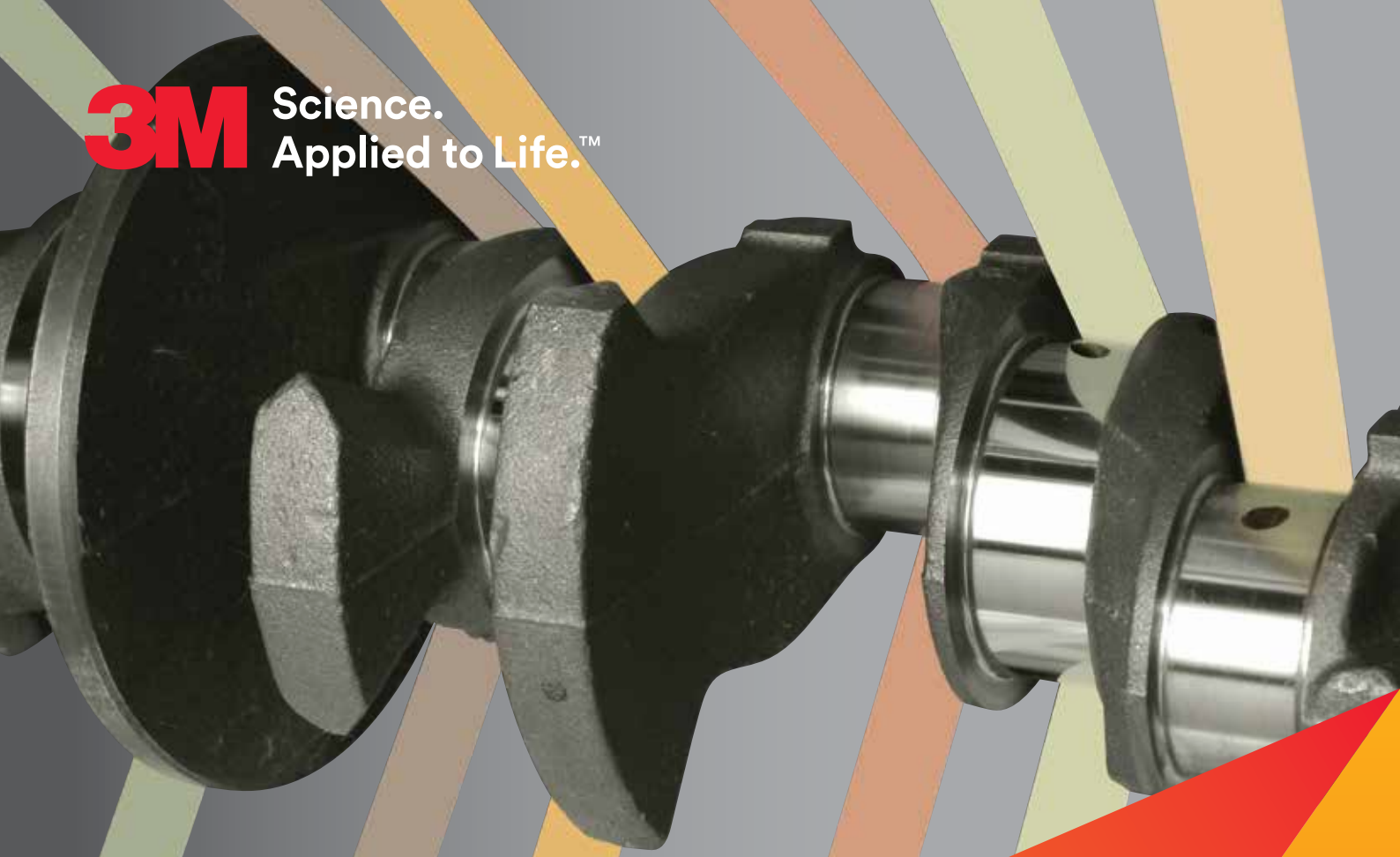
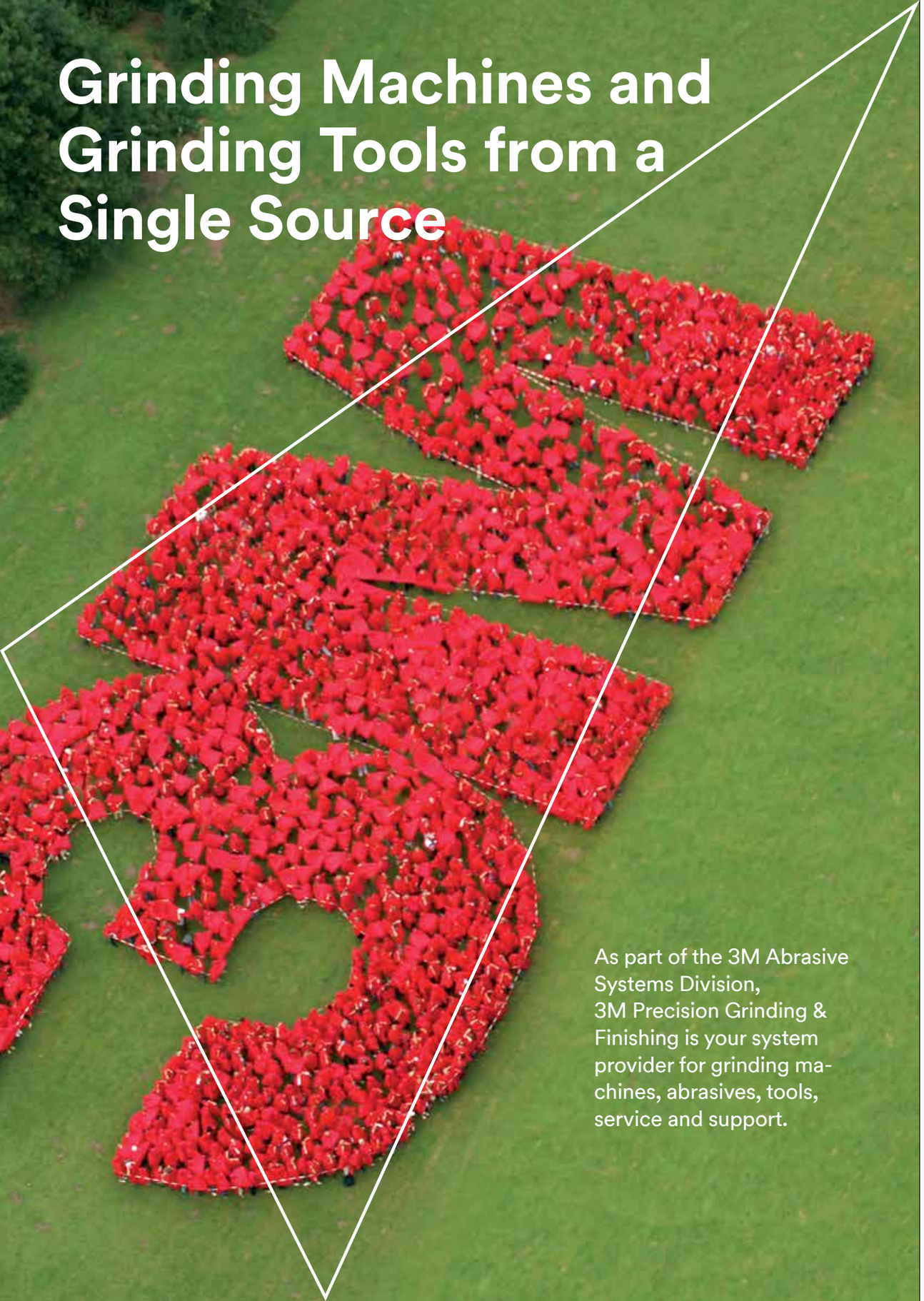


3M Precision Grinding & Finishing

Precision Finishing Film

Grinding Machines and Grinding Tools from a Single Source



As part of the 3M Abrasive Systems Division, 3M Precision Grinding & Finishing is your system provider for grinding machines, abrasives, tools, service and support.

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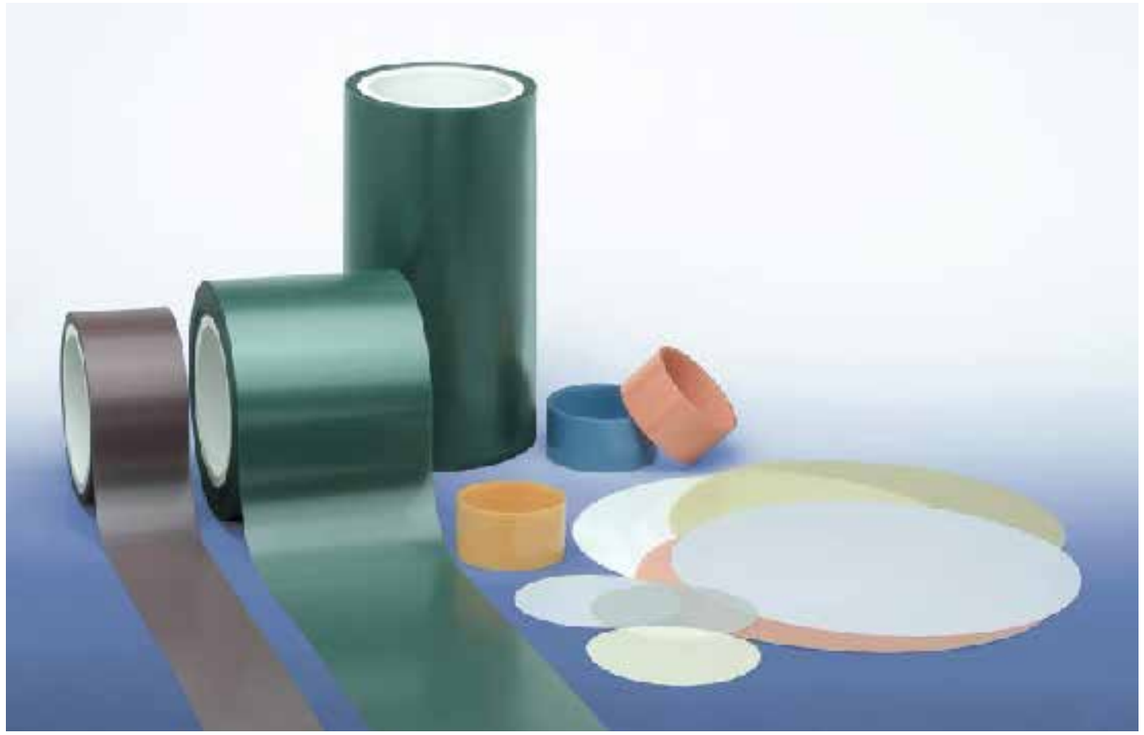
Introduction

Microfinishing films are flexible tools on a polyester film carrier material that are only used for fine finishing.



A distinction is made between two different types of films:

1. Fine Finishing Film
2. Super Finishing Film

The difference lies in the way the abrasive is applied. The following grain types can be used:

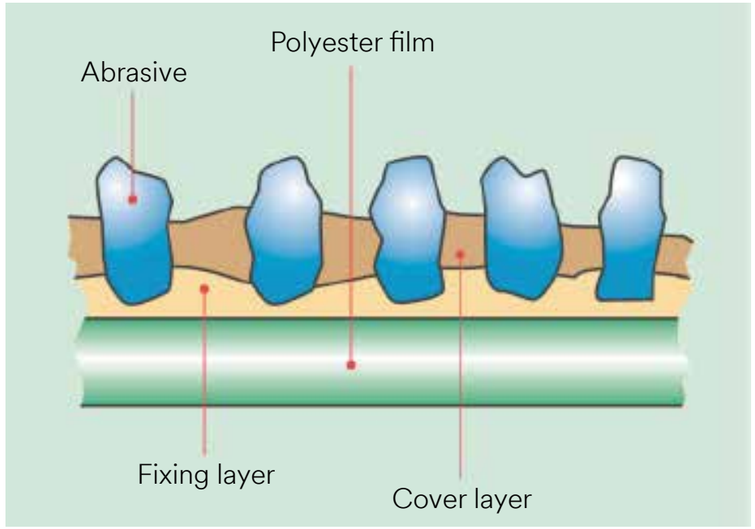
- Aluminium oxide
- Silicon carbide
- Diamond

Product Features

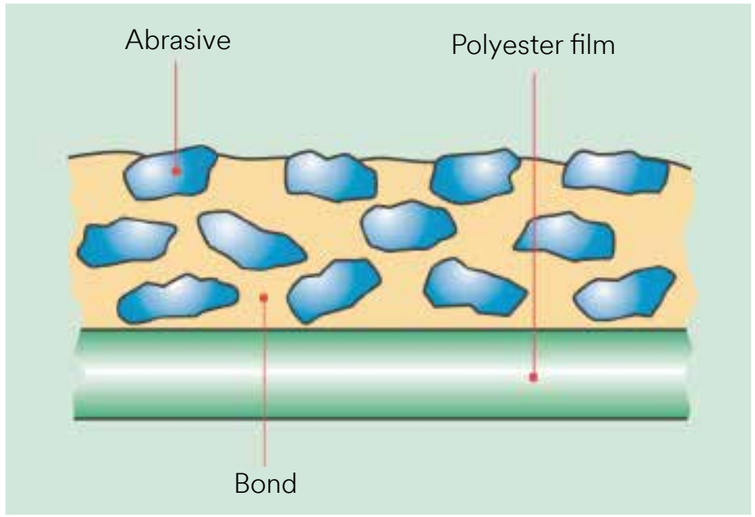
Structure

The different grain types can be applied to an extremely thin polyester film in two different processes. A distinction is made between an electrostatically oriented coating and a resin-bonded slurry-type coating.

Electrostatically oriented: Fine Finishing Film



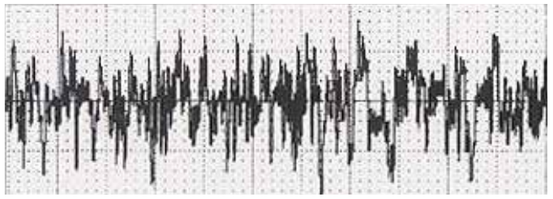
Slurry coating: Super Finishing Film

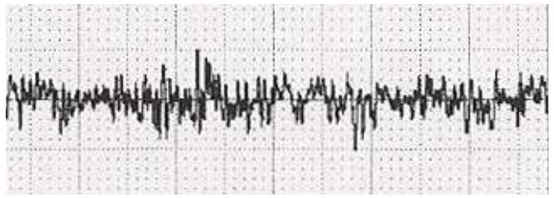


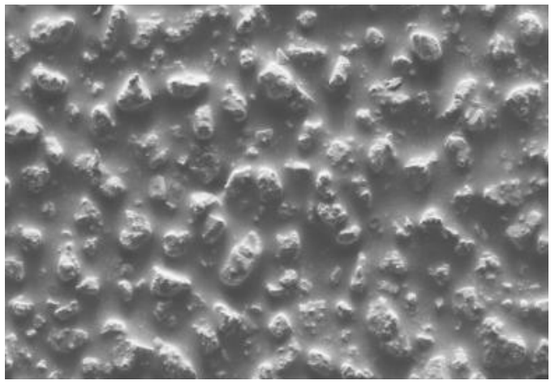
Fine Finishing Film also achieves a grinding effect because of the oriented grain and can therefore be used for fine grinding and lapping. Super Finishing Film can only be used for lapping and polishing.

Product Features

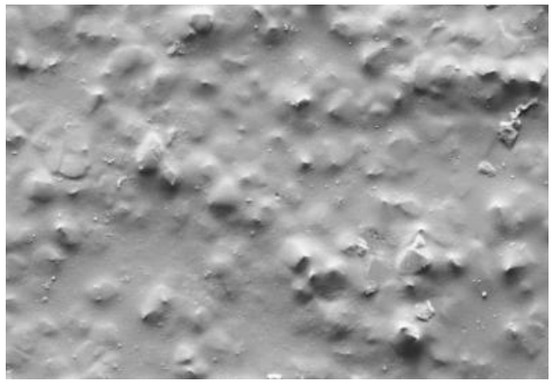
A comparison with the same grain size shows how different the surface quality can be.







Fine Finishing Film

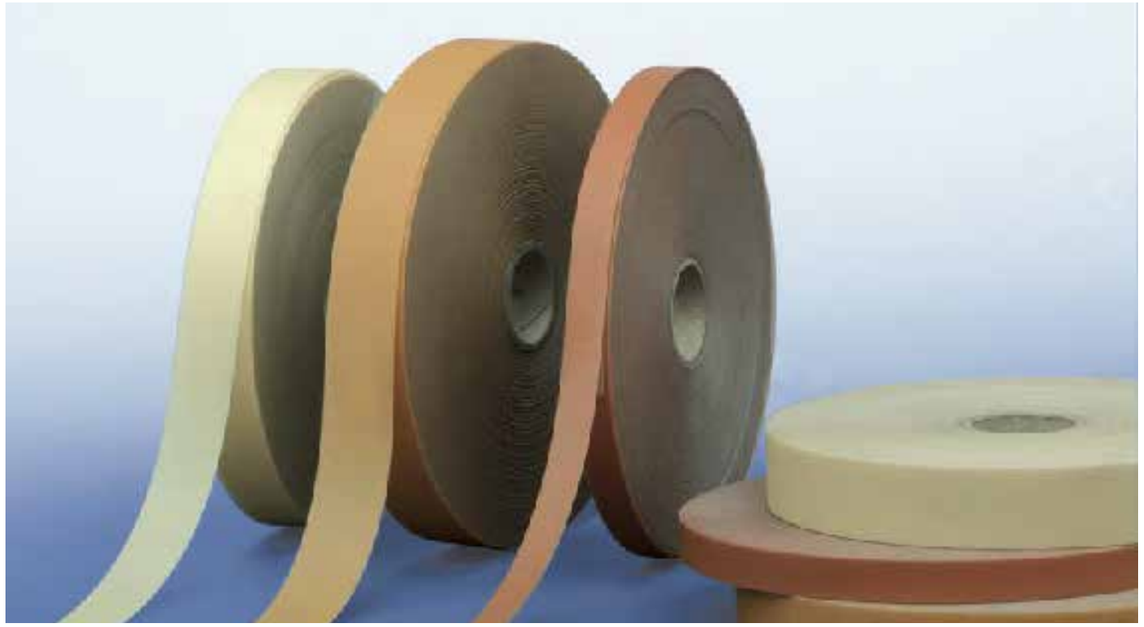


Super Finishing Film

Possible Forms

The films are available in different designs and forms.

Wound as a roll:



In sheet or disc form:

Product Features

Backing Material Design

The backing material consists of a polyester film (PET) characterised by special properties:

- Very precise, uniform thickness
- Extremely even and smooth backing
- Very high resistance to elongation
- Extremely tear-resistant
- Insensitive to moisture

This evenness of the base film provides the high precision required for fine finishing. The base material is supplied in different thicknesses depending on the application.

The thickness of the backing material is defined internationally by the following units of measurement:

1 MIL = 25 µm

The standard thicknesses are:

1 MIL	2 MIL	3 MIL	4 MIL	5 MIL
25 µm	50 µm	75 µm	100 µm	125 µm

A special coating is also applied to the backing material depending on the application. To do this, a special abrasive coating is applied to the reverse side. This coating should then prevent the underside of the film slipping or the film being carried away by the workpiece.

Coating	Grain size	Hardness of bond	Application
None → smooth	–	–	Rollers; powered rollers
Standard (S)	small	soft	For hard and soft shoes

The film may be carried away especially when using shoes for finishing crankshafts and camshafts

Grain Types and Sizes Used

Grain types used:

Fine Finishing Film	Super Finishing Film
Aluminium oxide	Aluminium oxide
Silicon carbide	Silicon carbide
Diamond	Diamond

Standard grain sizes

Fine Finishing Film	Super Finishing Film
5 – 100 µ	0.1 – 40 µ

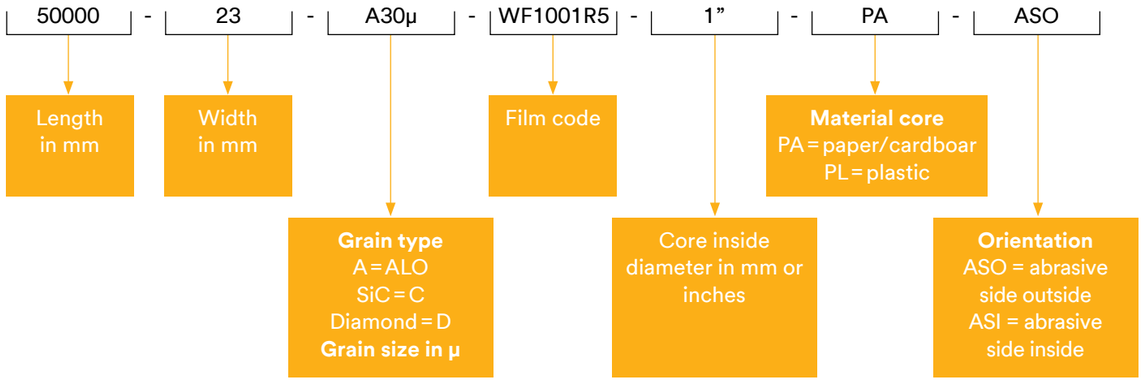
Product Features

3M Product Description

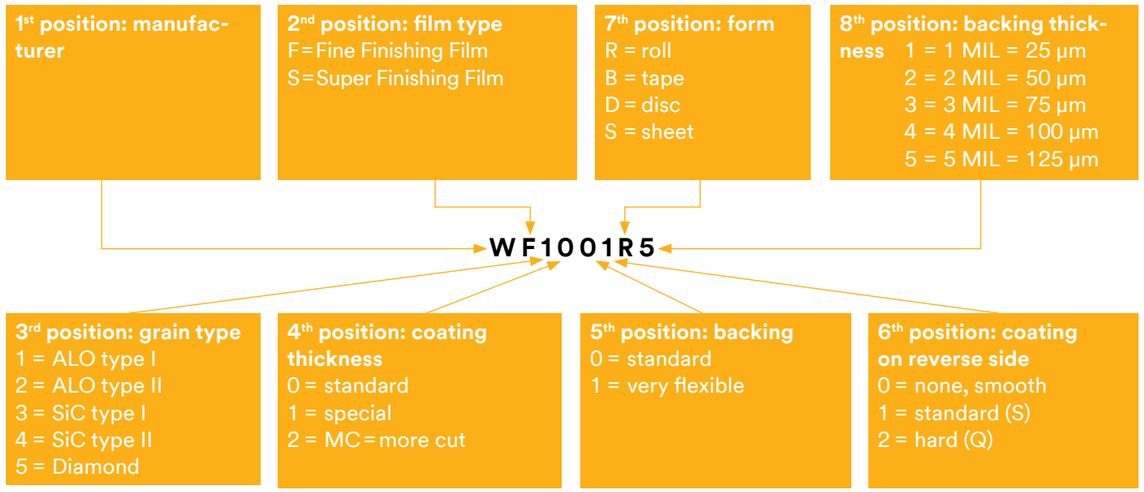
The short product number text describes the dimensions and specification of the film. The specification is defined by a special code.

Films on rolls are described as follows:

Product number	Short
P86R.000.001	50000-23-A30µ-WF1001R5-1”PA-ASO



The film code specifies the following information:



Interpretation of the example above:

- Dimensions: Length 50,000 mm; width 23 mm
- Fine Finishing Film; aluminium oxide type I; grain size 30 µ
- Standard backing, standard coating on the reverse side (S); roll; backing thickness: 5 MIL = 125 µm thick
- Cardboard core diameter = 25.4 mm or 1 inch
- Abrasive side outside

Product Portfolio

3M Precision Grinding & Finishing Division has a large range of films for different applications. The product portfolio is just as extensive.

The films are produced in so-called jumbos (large rolls). This is why there is usually only a restriction regarding the width. All intermediate dimensions are cut from these jumbos. This results in the following maximum dimensions:

Fine Finishing Film with ALO and SiC:	Maximum width: 1,140 mm; jumbo lengths: 100, 200, 300 m
Fine Finishing Film with diamond:	Maximum width: 200 mm; jumbo lengths: 100, 200, 300 m
Super Finishing Film (all grain types):	Maximum width: 230 mm; jumbo lengths: 100, 200, 300 m

he following standards are defined:

	Current Prod ID	Grain	Backing	Backing thickness	Grain size in µm	3M ID
Fine Finishing Film	WF1001	ALO	coated	3 5	40, 30, 20, 15, 9, 5	269L 279L
	WF1201	ALO	coated	5	100, 80, 60, 50, 40, 30, 20	279LW
	WF3001	SiC	coated	5	80, 60, 40, 30, 15	479L
	WF5100	Diamond	smooth	4	60, 45, 30, 15	669L
	WF5101	Diamond	coated	5	100, 80, 60, 45, 30, 15	679L
Super Finishing Film	WS2000	ALO	smooth	3	40, 30, 20, 15, 12, 9, 5, 3, 2, 1, 0.5, 0.1	269X
	WS3000	SiC	smooth	3	30, 15, 9, 5	469X
	WS5000	Diamond	smooth	3	60, 45, 30, 15, 9, 5, 3, 2, 1	669X

Super Finishing with Films

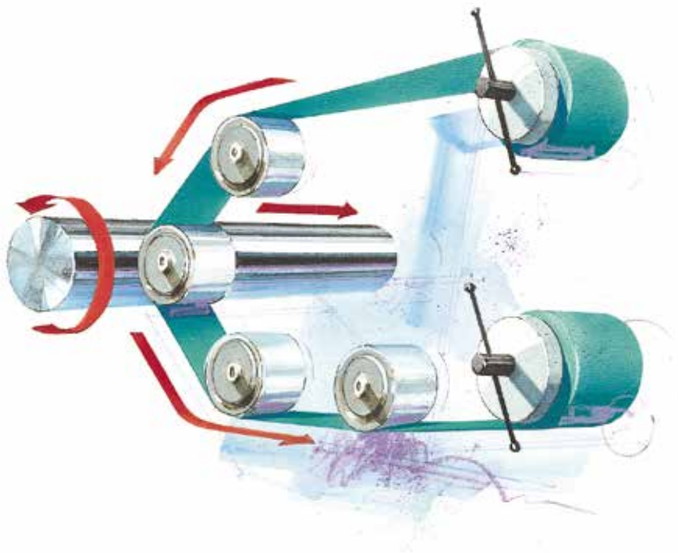
Film finishing has its origins in the super finishing of magnetic heads for video and audio systems. The development of even thinner carrier materials and the improvements in coating technology lay the foundations for using this tool for other applications as well. The precise refinement of the grain scattering, the guaranteed consistency of the orientation of the abrasive and the ongoing development of machinery have given this tool access to mass production, such as the finishing of crankshafts and camshafts. At the same time, there is a steady increase in the requirements placed on machinery and components and consequently on the demand for precisely defined surface structures. The field of application for films will also continue to grow in the future.

Description of the Process

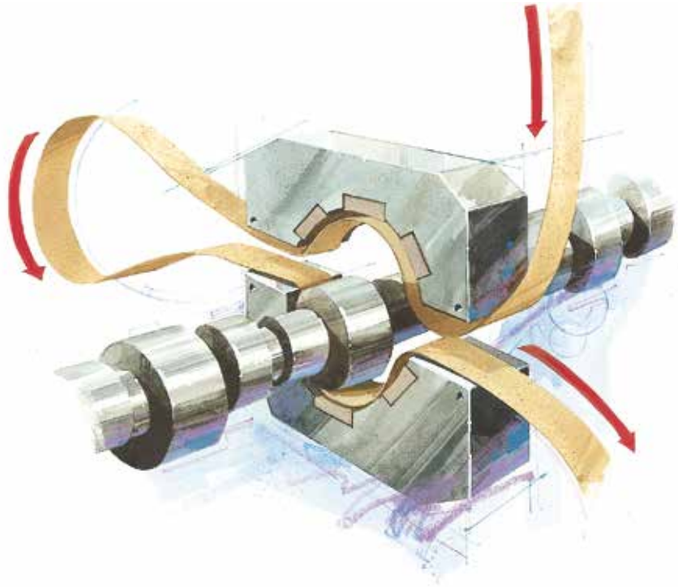
The big advantage of this process is that unused abrasive arises because of the continuous controlled feed of the film. This provides a consistent level of abrasion, the same operating conditions at all times and therefore the same work results.

In contrast to grinding, there is no thermal influence on the structure because virtually no heat is introduced into the process. This means that no thermal cracks or surface tensions occur.

As shown in the illustration below, the tape is clamped between the two rollers and a contact roller presses it onto the workpiece. The winding roller transports the film.



So-called shoes or shells are mainly used for finishing bearings and the film is incrementally feeded into the process at each bearing position.



Advantages of the Process

The finishing process with films has the following advantages:

- Thermally uncritical process with a significant improvement to the surface structure
- Increased contact area
- Improvement to the tribological properties of the component
- Short processing time
- Low tool costs
- Low investment costs
- Low energy costs
- Low noise level
- Safe application
- High flexibility

Fields of Application for Films

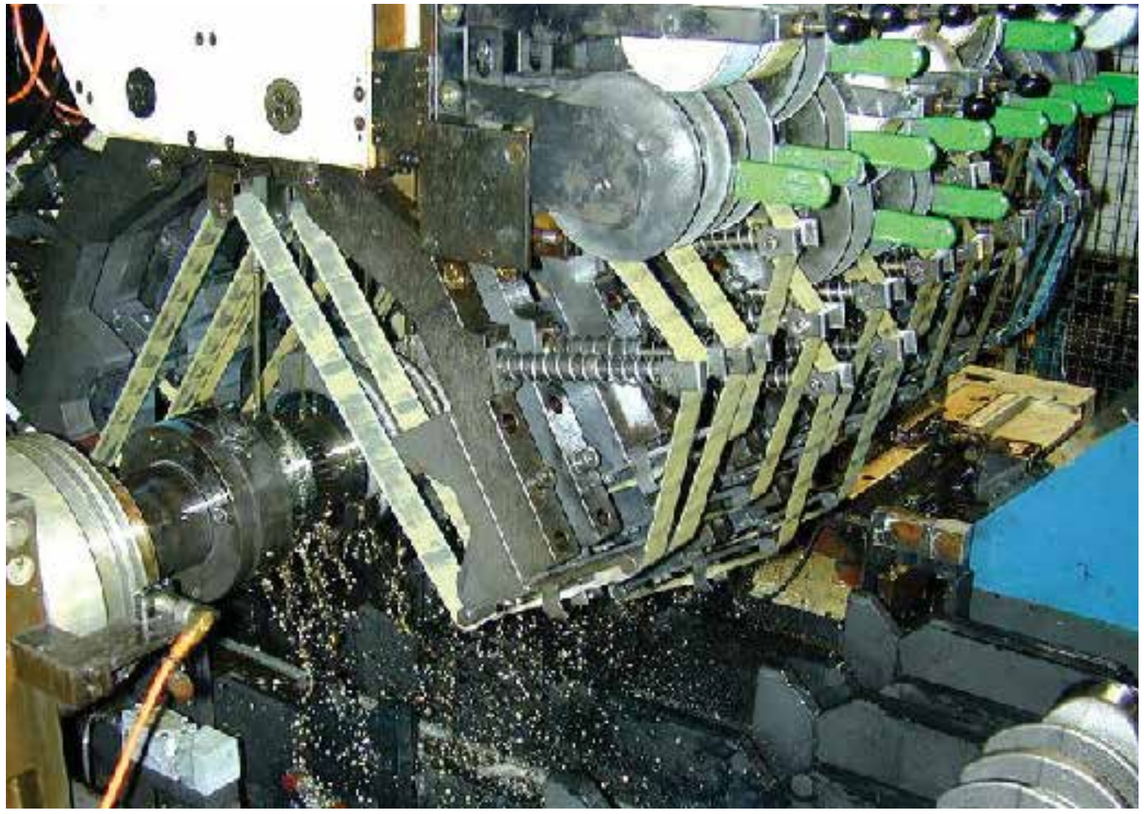
The fields of application can be very different. The main fields of application are in the automotive industry, the roller and printing industry and the electronics industry.

Finishing of Automotive Parts

Finishing has proven successful these days with the following components:

- Crankshafts and camshafts
- Piston rods
- Gear shafts
- Balance shafts
- Gear wheels
- Toothed racks
- Shock absorbers
- Components in injection pumps (drive shaft, spray manifold etc.)

Example of the use of tapes for the finishing of a crankshaft:



Roller Finishing

Roller finishing is much more complex than finishing automotive parts. High demands are placed on the quality and performance of the film in particular because of the different types of coatings and the extreme requirements placed on the surface to be achieved.
So-called attachments that can subsequently be reinstalled on lathes or roller grinding machines – are used for the finishing.

Film finishing is used for the following roller types:

- Calender rollers
- Guide rollers
- Anilox rollers
- Calibrating rollers
- Press rollers
- Printing rollers
- Transport rollers

The following abrasives can be recommended for the different materials:

- Use of diamonds, e.g. for: Coatings made of tungsten carbide, permanent ceramic mould casting or composite materials
- Use of aluminium oxide, e.g. for: Coatings made of steel, chrome (HV900), copper, aluminium, brass
- Use of silicon carbide, e.g. for: Coatings made of rubber, polyamide

The finishing of a large ceramic roller with diamond films:

Other Fields of Application

Films can also be used, for example, for the following workpieces:

- Hydraulic and pneumatic components
- Bearing rings
- Sealing ring surfaces
- Guide elements
- Ejector pins
- Spherical roller bearings
- Cone bearings

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