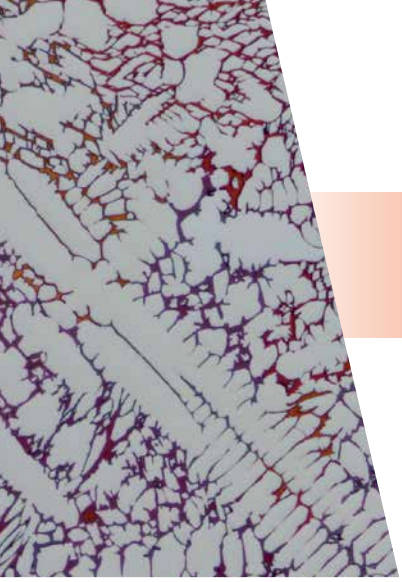
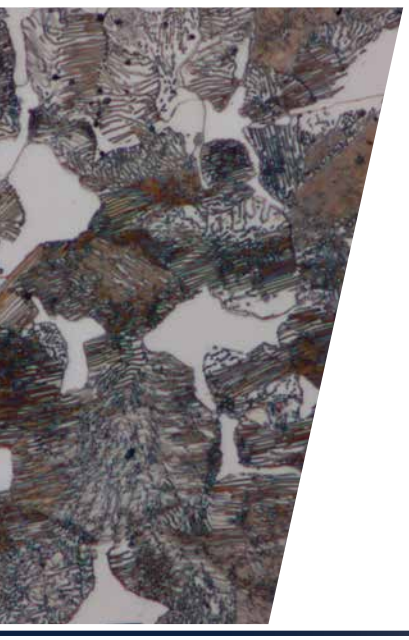




Application Guide

Polishing

BUEHLER

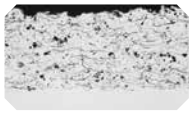
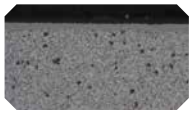
Solutions for Materials Preparation, Testing and Analysis

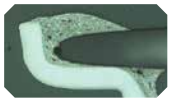
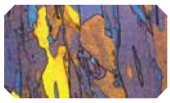
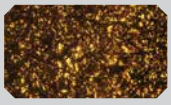
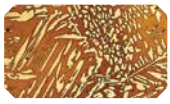
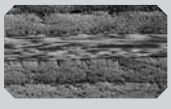
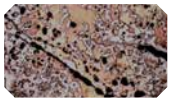
Cloth Selection Guide

Material Type	COARSE				INTERMEDIATE								FINE	
	UltraPad™	UltraPol™	TexMet™ P	Nylon	TexMet C	TriDent™	VerduTex	VelTex	WhiteFelt™	PoliCloth	MicroCloth™	MicroFloc	MasterTex™	ChemoMet™
Aluminum	●			●	●	●	●	●	●	●	●	●		●
Cast Iron	●		●		●	●	●		●		●	●	●	
Ceramic		●	●			●	●				●			
Ceramic Thermal Spray	●				●	●	●							●
Copper				●	●			●	●	●	●	●		●
Generic Bulk Mount		●	●		●	●	●				●			
Generic Thin Section		●	●		●	●	●				●			
Hard Steels			●	●	●	●	●		●		●	●		●
Heat Treated Steels			●	●					●		●	●		●
High Temperature Solder in Ceramic	●		●			●	●				●			●
Metallic Thermal Spray						●	●							●
Micro-Electronic Material	●		●				●	●			●		●	●
Nickel Base Alloys			●	●	●	●	●		●	●	●	●		●
Non Populated PCB	●				●	●	●				●		●	●
Polymers					●						●	●		
Silicon in Micro-Electronics						●	●				●		●	●
Sintered Carbides			●	●			●							●
Soft Steels	●			●	●	●	●	●	●	●	●	●	●	●
Stainless Steel	●			●	●	●	●	●	●		●	●		●
Titanium	●	●		●	●				●		●	●		●

Recommended Methods

Each material, application and need can require specialized methods. Excellent results can be achieved using one of the basic polishing methods shown. For complete methods including grinding steps, forces, times, speeds and other tips and tricks please consult the Buehler SumMet™ guide or our eClub at www.buehler.com.

	Material		Grinding Steps	Polishing Step 1	Polishing Step 2	Polishing Step 3
Ceramics & Coatings	Ceramic		UltraPrep Metal-Bonded 45µm	Apex Hercules H 9µm MetaDi™ Supreme Diamond	VerduTex 3µm MetaDi Supreme Diamond	VerduTex 1µm MetaDi Supreme Diamond
	Metallic Thermal Spray Coating		Apex Color Yellow 35µm Diamond	UltraPad™ 9µm MetaDi Supreme Diamond	TriDent 3µm MetaDi Supreme Diamond	ChemoMet MasterMet™ Silica
	Ceramic Thermal Spray Coating		Apex Color Yellow 35µm Diamond	UltraPad 9µm MetaDi Supreme Diamond	TriDent 3µm MetaDi Supreme Diamond	ChemoMet MasterMet Silica
	Sintered Carbides		Apex Hercules H 30µm MetaDi Supreme Diamond	Apex Hercules S 9µm MetaDi Supreme Diamond	VerduTex 3µm MetaDi Supreme Diamond	ChemoMet MasterMet Silica

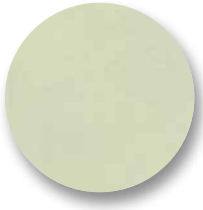
	Material		Grinding Steps	Polishing Step 1	Polishing Step 2	Polishing Step 3	Polishing Step 4
Electronic Materials	Non Populated Printed Circuit Board		CarbiMet 320grit [P400] 600grit [P1200]	TriDent™ 9µm MetaDi™ Supreme Diamond	TriDent 3µm MetaDi Supreme Diamond	TriDent 1µm MetaDi Supreme Diamond	ChemoMet™ MasterPrep™ Alumina
	Silicon in Micro-Electronics		CarbiMet 600grit [P1200]	VerduTex™ 6µm MetaDi Supreme Diamond	VerduTex 3µm MetaDi Supreme Diamond	VerduTex 1µm MetaDi Supreme Diamond	ChemoMet MasterMet™ Silica
	Micro-Electronic Material		CarbiMet 320grit [P400]	TexMet™ P 9µm MetaDi Supreme Diamond	VerduTex 3µm MetaDi Supreme Diamond	VerduTex 1µm MetaDi Supreme Diamond	ChemoMet MasterPrep Alumina
Ferrous & Non-Ferrous Materials	Aluminum Alloys		CarbiMet 320grit [P400]	TexMet C 9µm MetaDi Supreme Diamond	TexMet C 3µm MetaDi Supreme Diamond	TexMet C 1µm MetaDi Supreme Diamond	ChemoMet MasterMet Silica
	Nickel Based Superalloys		CarbiMet 240grit [P280]	TriDent 3µm MetaDi Supreme Diamond	ChemoMet MasterMet Silica		
	Titanium Alloys		CarbiMet 320grit [P400]	UltraPad™ 9µm MetaDi Supreme Diamond	ChemoMet MasterMet Silica		
	Copper & Copper Alloys		CarbiMet 220grit [P240] - 320grit [P400]	TexMet C 9µm MetaDi Supreme Diamond	VerduTex 3µm MetaDi Supreme Diamond	VerduTex 1µm MetaDi Supreme Diamond	ChemoMet MasterMet Silica
	Hard Steels		Apex DGD Red 75µm Diamond	Apex Hercules S 9µm MetaDi Supreme Diamond	TriDent 3µm MetaDi Supreme Diamond	MicroCloth™ MasterPrep Alumina	
	Soft Steels		CarbiMet 320grit [P400]	UltraPad 9µm MetaDi Supreme Diamond Suspension	TriDent 3µm MetaDi Supreme Diamond	MicroCloth MasterPrep Alumina	
	Cast Iron		CarbiMet 320grit [P400]	TexMet C 9µm MetaDi Supreme Diamond Suspension	TriDent 3µm MetaDi Supreme Diamond	MicroCloth MasterPrep Alumina	
	Heat Treated Steel		Apex DGD Red 75µm Diamond	Apex Hercules S 9µm MetaDi Supreme Diamond	MicroFloc 3µm MetaDi Supreme Diamond Suspension		
	Stainless & Maraging Steel		CarbiMet 120grit [P120] - 320grit [P400]	UltraPad 9µm MetaDi Supreme Diamond Suspension	TriDent 3µm MetaDi Supreme Diamond	ChemoMet MasterPrep Alumina	
Composites	Polymer-Matrix Composites		CarbiMet 320grit [P400]	TexMet P 9µm MetaDi Supreme Diamond Suspension	VerduTex 3µm MetaDi Supreme Diamond	MicroCloth MasterPrep Alumina	
Petrographic	Generic Bulk Mount Preparation		Apex DGD 45µm Diamond	TriDent 9µm MetaDi Supreme Diamond	TriDent 3µm MetaDi Supreme Diamond	TexMet C MasterPrep Alumina	

Polishing Cloth Guide

Coarse

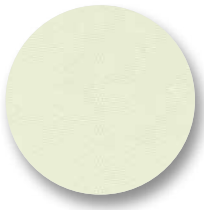
UltraPad™
Hard woven, no nap
6µm & up, Diamond

TexMet™ P
Hard perforated, non-woven cloth
6µm & up, Diamond



UltraPol™
Hard woven, nonaggressive silk cloth
6µm & up, Diamond

Intermediate



Nylon
Oil resistant, medium hard woven, no nap
6µm & up, Diamond

TexMet C
Non-woven pressed cloth
15 to 0.02µm, Diamond, Al_2O_3, SiO_2

TriDent™
Soft, durable, synthetic woven cloth, no nap
15 to 0.02µm, Diamond

VerduTex
Durable, medium hard synthetic silk cloth
9 to 1µm, Diamond

VelTex
Short napped synthetic velvet cloth
9 to 1µm, Diamond

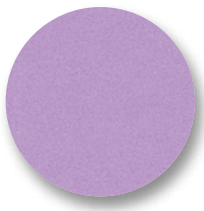
PoliCloth
Medium hard, woven wool cloth
6 to 1µm, Diamond

WhiteFelt™
Soft, durable matted wool cloth
6 to 0.02µm, Diamond, Al_2O_3, SiO_2

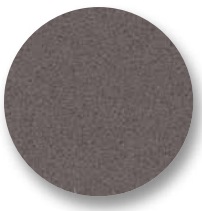
Did You Know?

Abrasive sizes shown are generally best practices, however, in certain applications, abrasives beyond the shown range provide excellent results.

Fine



MicroFloc
Soft, long napped cloth
3 to 0.02µm, Diamond, Al_2O_3, SiO_2



MicroCloth™
Soft, versatile, long napped synthetic rayon cloth
5 to 0.02µm, Diamond, Al_2O_3, SiO_2

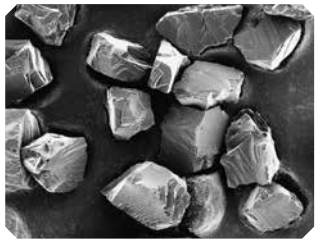
MasterTex™
Soft synthetic velvet with low nap
1 to 0.05µm, Al_2O_3, SiO_2

ChemoMet™
Soft, porous, chemically resistant, synthetic cloth
1 to 0.02µm, Al_2O_3, SiO_2

Diamond is routinely used for the preparation of most materials due to its high removal rates. Available in a wide range of micron sizes, carriers and diamond type MetaDi™ diamond products are a versatile preparation tool.

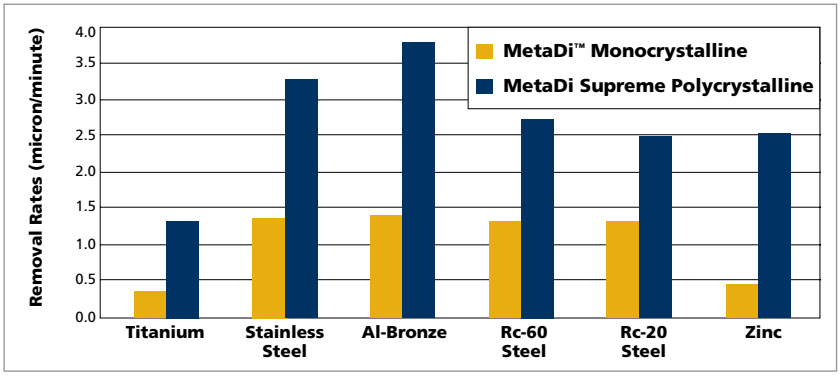
MetaDi & MetaDi Supreme Suspensions

- Contain synthetic diamond graded for particle size as well as shape
- Diamond particles are uniformly suspended for ease-of-use and consistent application
- MetaDi suspensions contain sharp, blocky monocrystalline particles that provide clean and efficient cutting action
- The angular polycrystalline particles of MetaDi Supreme provide additional cutting facets resulting in less subsurface deformation
- Available in both water-based and oil-based carriers
- Suspensions are applied using a spray nozzle or with the automated dispensing system such as the Burst Dispensing System
- All Diamond suspensions are nontoxic, noncombustible and environmentally safe



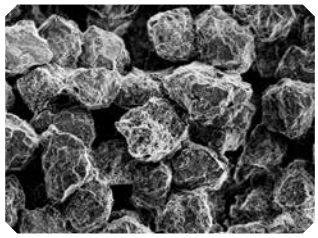
Sharp edges of monocrystalline diamonds ensure clean and efficient cutting action.

Removal Rate Comparison Mono vs Polycrystalline Diamond



MetaDi Diamond Pastes

- Diamond pastes are best suited to materials prone to diamond embedding
- Available in MetaDi – natural monocrystalline particles, MetaDi II – synthetic monocrystalline particles and MetaDi Ultra – a blend of natural and synthetic polycrystalline particles
- Paste are typically applied to a clean cloth by rotating the platen at approximately 50rpm and by placing the syringe tip about 2in [5cm] out from the center of the platen. Start dispensing the paste onto the cloth, resulting, in a spiral pattern
- Require a lubricant such as MetaDi Fluid for most materials or Polishing Oil or AutoMet™ Lapping Oil for water sensitive materials
- All diamond pastes are nontoxic, noncombustible and environmentally safe



Angular, blocky-shaped polycrystalline diamonds provide numerous cutting facets on the particle surface, resulting in less deformation.

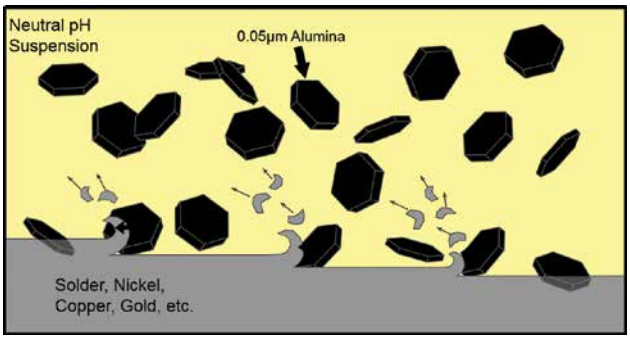
There are materials that simply do not respond to diamond polishing, regardless of cloth (Lead, CP Al, Indium). The use of diamond results in a poor surface finish with embedded abrasives. If you are preparing these materials or similar materials, choose an alternative abrasive, primarily Alumina.

Final Polishing Suspensions

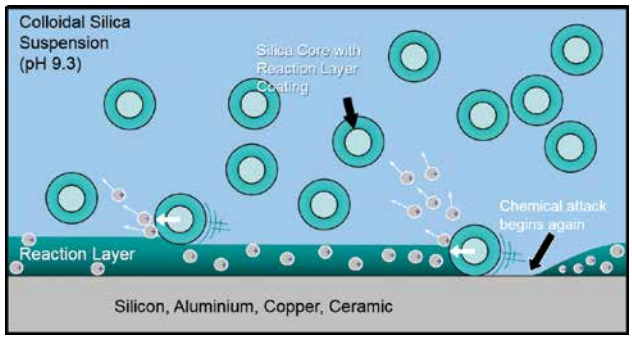
Final polish solutions remove the final layer of surface deformation often invisible to the naked eye. Yet the removal of this deformation is essential when evaluating with high magnifications, polarized light, differential interference contrast as well as using EBSD techniques.

New cloths should be charged with enough suspension to wet the cloth, providing enough lubrication during the polishing cycle. Cloths that have been in use previously should be charged with just enough new suspension to provide sufficient lubrication. Cease dispensing suspension, replacing it with water the last 30 seconds of the polishing cycle, flushing the cloth surface.

All final polishing suspensions are compatible with automated dispensing systems, such as the Burst Dispensing System, and the VibroMet™ 2 Vibratory Polisher.



MasterPrep™ Alumina removes material through a purely mechanical, abrasive process.



MasterMet™ 2 Chemo-mechanical polishing. SiO_2 particles are not abrasive, but rather are used to wipe away the reaction layer on the specimen surface, allowing chemical polishing to continue.

MasterPrep Alumina Suspension

- Sol-gel alumina suspension with a pH ~8.5
- Finely dispersed, nonagglomerated 0.05µm particles

MasterMet 2 Non-Crystallizing Colloidal Silica Suspension

- Fine non-crystallizing 0.02µm amorphous colloidal silica suspension with a pH ~10.5
- Provides gentle material removal without deformation through a chemo-mechanical polishing action

MicroPolish™ Alumina Powder and Suspensions

- Agglomerated alumina offers higher removal rates than other aluminas of the same size
- Available in 1, 0.3, & 0.05µm particle sizes

MicroPolish II Alumina Powder and Suspensions

- Deagglomerated alumina producing enhanced surface finishes over agglomerated versions
- Available in 1 & 0.3µm particle sizes

MasterPolish 2 Suspension

- 0.06µm high purity iron oxide with a pH ~10
- Provides superior surface finishes through a chemo-mechanical polishing action

MasterMet Colloidal Silica Suspension

- Fine 0.06µm Amorphous colloidal silica suspension with a pH ~10
- Provides fine surface finishes through a chemo-mechanical polishing action

MasterPolish™ Suspension

- Blend of 0.05µm high purity alumina and colloidal silica with a pH ~9
- Contains minimal water and is optimal for water sensitive materials

Diamond Polishing Suspensions & Pastes

Most MetaDi™ Diamond Suspensions and Pastes are available in multiple sizes. Please refer to the Buehler Product Catalogue for complete ordering information.

		Suspensions			Pastes		
Micron	Color	MetaDi Monocrystalline	MetaDi Supreme Polycrystalline	MetaDi Monocrystalline, Oil-Based	MetaDi Ultra Polycrystalline	MetaDi Monocrystalline	MetaDi II Monocrystalline
0.05µm			40-6627				
0.25µm			40-6629			40-6112	40-6241
1µm		40-6530	40-6630	40-6540	40-1-6301	40-6138	40-6244
1µm Fine			40-6630F				
3µm		40-6531	40-6631	40-6541	40-1-6303	40-6152	40-6247
3µm Fine			40-6631F				
6µm		40-6532	40-6632	40-6542	40-1-6305	40-6172	40-6250
9µm		40-6533	40-6633	40-6543	40-1-6307	40-6192	40-6253
15µm		40-6534	40-6634	40-6544	40-1-6309	40-6212	40-6256
30µm			40-6635				
45µm			40-6636				

Additional Accessories & Consumables for MetaDi

60-3255	Applicator Bottle, 8oz [0.24ℓ]
40-6650	Spray Pump for 8oz [0.24ℓ] bottles
40-6016	MetaDi Fluid, 16oz [0.47ℓ] (water soluble)
40-6032	MetaDi Fluid, 32oz [0.95ℓ] (water soluble)
40-6064-085	MetaDi Fluid, 85oz [2.5ℓ] (water soluble)
155001 [2, 3]	MetaDi Fluid, 1ℓ (water soluble)
155003 [2, 3]	MetaDi Fluid, 3ℓ (water soluble)
60-3250-006	AutoMet™ Oil, 6oz [0.18ℓ] for use with oil-based diamond suspensions and pastes
60-3250-128	AutoMet Oil, 1gal [3.8ℓ] for use with oil-based diamond suspensions and pastes

[2, 3] *Product only available in Europe, Africa, Middle East and Asia.*

Final Polishing Suspensions

Most Final Polishing Suspensions and Powders are available in multiple sizes. Please refer to the Buehler Product Catalogue for complete ordering information.

	0.02µm	0.05µm	0.06µm	0.25µm	0.3µm	0.7µm	1µm
MasterPrep™ Alumina		40-6377					
MasterMet™ Colloidal Silica			40-6370				
MasterMet 2 Non-Crystallizing Colloidal Silica	40-6380						
MasterPolish™ Final Polish		40-10084					
MasterPolish 2 Final Polish			40-6376				
MicroPolish™ Alumina Powder		40-10075			40-10077		40-10079
MicroPolish Alumina Suspension		40-10083			40-10082		40-10081
MicroPolish II Alumina Powder					40-6323		40-6321
MicroPolish II Alumina Suspension					40-6363		40-6361
Topol				151103 [2, 3]		151102 [2, 3]	151101 [2, 3]

[2, 3] *Product only available in Europe, Africa, Middle East and Asia.*

Premium Polishing Cloths

- Premium performance cloths for all material applications
- Engineered for long life & superior surface finish

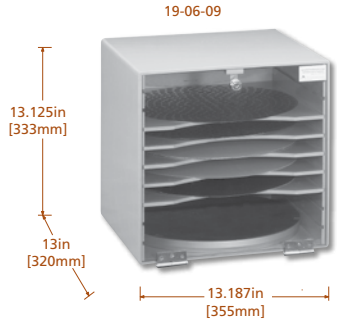
	Cloth	Backing	Quantity	8in [203mm]	10in [254mm]	12in [305mm]
COARSE	UltraPad™	PSA	10	40-7118	40-7120	40-7122
	UltraPol™	PSA	10	40-7448	40-7450	40-7452
	TexMet™ P	PSA	5	40-7638	40-7640	40-7642
INTERMEDIATE	Nylon	PSA	10	40-7068	40-7070	40-7072
	TexMet C	PSA	10	40-1108	40-1110	40-1112
	TriDent™	PSA	10	40-7518	40-7520	40-7522
	VerduTex	PSA	10	40-8018	40-8020	40-8022
	VelTex	PSA	10	40-8218	40-8220 SO	40-8222 SO
	WhiteFelt™	PSA	5	16-2002	16-2502 SO	16-3002 SO
	PoliCloth	PSA	10	40-8418	40-8420 SO	40-8422 SO
FINE	MicroCloth™	PSA	10	40-7218	40-7220	40-7222
	MicroFloc	PSA	10	40-8318	40-8320 SO	40-8322
	MasterTex™	PSA	10	40-7738	40-7740	40-7742
	ChemoMet™	PSA	10	40-7918	40-7920	40-7922

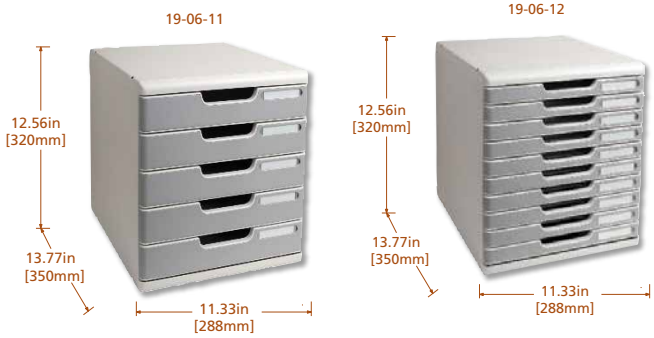
SO - Special Order. Items may have long lead times and minimum orders.

Storage Cabinets

- Durable, easy to clean storage of platens and surfaces
- Two models:
  – 8in [203mm] / 10in [254mm]
  – 12in [305mm]

Part Number	Description
19-06-11	For 8in [203mm] / 10in [254mm] discs and platens *(5 drawers)*
19-06-12	For 8in [203mm] / 10in [254mm] discs and platens *(10 drawers)*
19-06-09	For 12in [305mm] discs and platens
19-06-10	Additional Shelves for 19-06-09





Shop online at www.buehler.com. *(US, DE, FR and UK only)*

For a complete listing of consumables, visit our website at www.buehler.com or refer our Product Catalogue. Buehler continuously makes product improvements; therefore technical specifications are subject to change without notice.

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