SUMITOMO

CARBIDE - CBN - DIAMOND

Global Support, Global Solutions.

Tools for Machining Cemented Carbide and Hard Brittle Materials

Mold Finish Master SUMIDIA BINDERLESS Endmills NPD series / Mold Finish Master SUMIDIA Coat Ballnose Endmills SDCB type

Rev. 3

Ideal for high-efficiency machining and finishing of cemented carbide

2013 JCTMA Award Technical Achievement Award Winner

Nikkan Kogyo Shimbun 2012 55th Top 10 New Product Award Winner

For Standard Finishing

SUMIDIA BINDERLESS Radius Endmills **NPDRS type** (Corner r) (Binderless PCD)

SUMIDIA BINDERLESS Ballnose Endmills **NPDBS type** (Ballnose R) (Binderless PCD)

For Precision Finishing

SUMIDIA BINDERLESS Ballnose Endmills **NPDB type** (Ballnose R) (Binderless PCD)

For Rough/Medium-Finishing

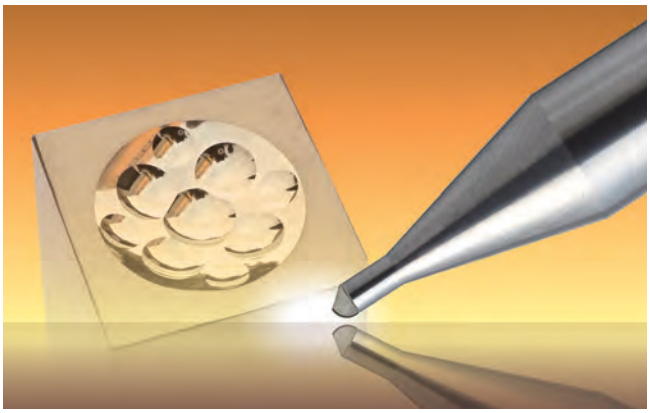
SUMIDIA Coat Ballnose Endmills **SDCB type** (Ballnose R) (SUMIDIA Coat)

Revised standard price (July 2022)

P M K N S H Cemented Carbide Hard Brittle Material

SUMITOMO ELECTRIC GROUP

NPD series / SDCB type



■ Features

SUMIDIA BINDERLESS is polycrystalline diamond that directly binds nano-sized diamond particles with high strength without using any binders. Harder than single-crystal diamond, it has no cleavability, enabling machining of hard brittle materials such as cemented carbide and making new machining methods possible.

- **Ideal for Finishing of Hard Brittle Materials Including Cemented Carbide**
  Provides excellent machined surface quality thanks to a sharp cutting edge and optimised edge treatment.
- **Enables High-Precision Machining and Achieves Long Tool Life**
  Maintains excellent dimensional tolerance for a long time thanks to the high contour accuracy of the cutting edge and excellent wear resistance of the diamond material.

SUMIDIA BINDERLESS Radius Endmills

NPDRS type

For Standard Finishing

Corner r

Binderless PCD

For Finishing of Cemented Carbide and Hard Brittle Materials

SUMIDIA BINDERLESS Ballnose Endmills

NPDBS type/NPDB type

For Standard Finishing

For Precision Finishing

Ballnose R

Binderless PCD

For Finishing of Cemented Carbide and Hard Brittle Materials

- Nano-polycrystalline diamond, which is harder than single-crystal diamond, is used for the cutting edge
- Enables direct engraving of cemented carbide, which is impossible for existing single-crystal or polycrystalline diamonds
- Ideal for finishing of hard brittle materials, including cemented carbide. Realizes high-precision machining and long tool life
- Standard finish NPDBS type dramatically reduces machining cost
- Precision finish NPDB type prevents deformation by eliminating polishing process

SUMIDIA Coat Ballnose Endmills

SDCB type

For Rough/Medium-Finishing

Ballnose R

SUMIDIA Coat

For Rough/Medium Finishing of Cemented Carbide and Hard Brittle Materials

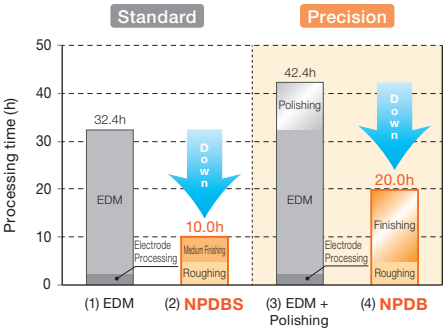
- Realizes high-efficiency rough/medium finishing of carbide molds
- Diamond coating exhibits stable tool life
- Achieves the highest-level of machining precision when combined with SUMIDIA BINDERLESS endmills

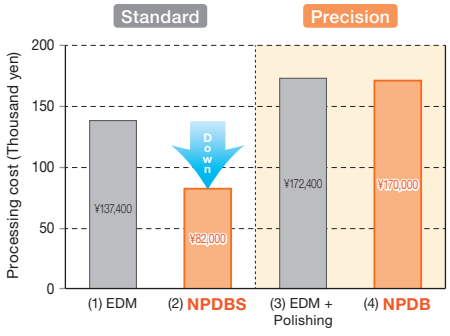
■ Advantages of Machining

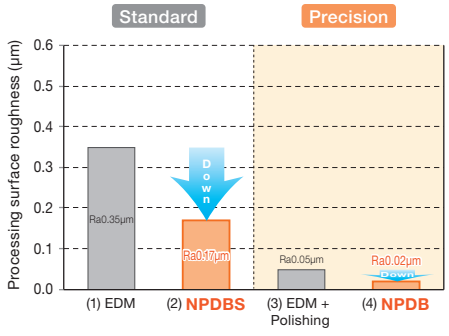
Comparison to EDM

Machining Application : ø10mm Hemispherical Surface Milling × 10

Processing Methods : (1) EDM
(2) Roughing → Standard finishing
(3) EDM + Polishing
(4) Roughing → Standard finishing







■ Cutting Conditions

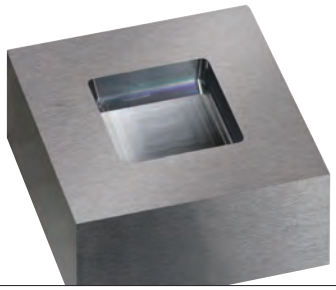
	(2)(4)Roughing	(2)Standard Finishing	(4)Precise Finishing
Tools	SDCB2R100-025	NPDBS1050-020	NPDB1050-020
Spindle Speed n (min^{-1})	30,000	40,000	40,000
Feed Rate vf (mm/min)	300	400	400
Axial Depth of Cut ap (mm)	0.1	0.005	0.005
Radial Depth of Cut ae (mm)	0.3	0.005	0.005
Coolant	Air blow	Oil mist	Oil mist

■ Machined Surface

- Realizes unmanned operation through process integration.
- Improves productivity by shortening processing time.
- Processing cost is significantly reduced by using 'NPDBS type' in standard finishing.
- Precision finish NPDB type prevents deformation by eliminating polishing process.

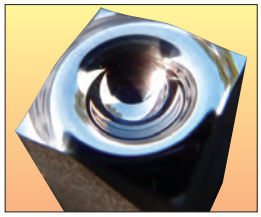
NPD series / SDCB type

■ Application Examples

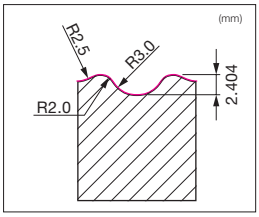


Work Material : Cemented Carbide VF20 (Ultra-fine Grain AF1, 92.5HRA)
Working Conditions : 10mm × 10mm × depth 2mm
Tool : NPDRS1100R005-030
Cutting Conditions : n= 40,000min^{-1}, vf=200mm/min, pf=0.005mm Oil Mist
Cutting Time : 2 hours
Surface Roughness : Ra 0.015μm

Work Material : Cemented Carbide VF20 (Ultra-fine Grain AF1, 92.5HRA)
Tool : NPDB1050-020
Cutting Conditions : n= 40,000min^{-1}, vf=200, 400mm/min, pf=0.01mm Oil Mist
Cutting Time : 19 hours 6 minutes
Surface Roughness : Ra 0.022 - 0.030μm

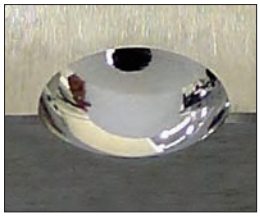


Cemented Carbide (Ultra-fine Grain)

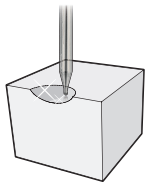


Cross-section

Work Material : Cemented Carbide VF20 (Ultra-fine Grain AF1, 92.5HRA)
Tool : NPDB1050-020 (R0.5)
Cutting Conditions : n= 40,000min^{-1}, vf= 120mm/min Oil Mist
Finishing Stock Removal : 0.003mm
Cutting Length : 74m
Surface Roughness : Ra 0.008μm



Mirror finishing of Cemented Carbide



Polishing process is not required or polishing time could be shortened when machining Cemented Carbide.

Work Material : Cemented Carbide VF20 (Ultra-fine Grain AF1, 92.5HRA)
Tool : NPDB1050-020 (R0.5)
Cutting Conditions : n= 40,000min^{-1}, vf= 120mm/min, ø5.6mm Oil Mist
Depth : 2.0mm
Finishing Stock Removal : 0.003mm
Cutting Length : 18m
Surface Roughness : Ra 0.008μm

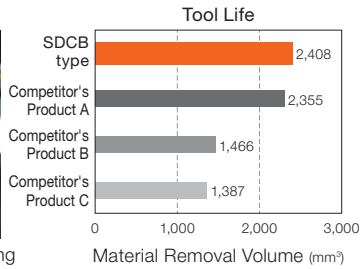
Used for optical applications (fly-eye lens mold)

Work Material : Cemented Carbide VF20 (Ultra-fine Grain AF1, 92.5HRA)
Tool : Finishing NPDB1050-020(R0.5)
: Roughing Diamond-Coated Endmill (R0.5)
Cutting Conditions : n= 60,000min^{-1}, vf= 300mm/min, pf= 0.005mm Oil Mist
Surface Roughness : Ra 0.015μm
Cutting Time : Finishing 2 hours 40 minutes Roughing 55 minutes

Used for medical applications (μ-TAS mold)

Work Material : Cemented Carbide VF20 (Ultra-fine Grain AF1, 92.5HRA)
Tool : NPDB1030-010 (R0.3)
Cutting Conditions : n= 38,000min^{-1}, vf= 95mm/min, pf= 0.001mm Wet (Oil based)
Finishing Stock Removal : 0.003mm
Surface Roughness : Ra 0.016 - 0.020μm
Cutting Length : 8.3m
Cutting Time : Finishing 1 hour 28 minutes

ø10mm Hemispherical Machining



Material Removal Volume (mm^3)

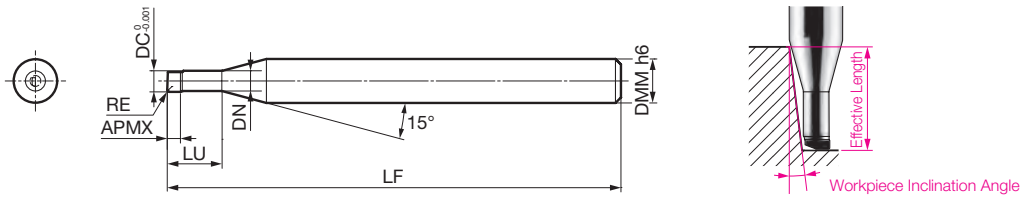
Work Material : Cemented Carbide AF1 (Ultra-Fine Grained Carbide)
Tool : SDCB2R100-060
Cutting Conditions : n= 30,000min^{-1} vf= 300mm/min ae=0.3mm ap=0.1mm
Air blow

NPDRS type

Cemented Carbide | Hard Brittle Material

1 Flute | Binderless PCD | Corner r | Side Milling | Face Milling | Profiling

Fig 1



■ Body (For Standard Finishing)

Dimensions (mm)

Cat. No.	Stock	Dia. DC	Corner Radius RE	Cutting Edge Length APMX	Neck Length LU	Overall Length LF	Neck Dia. DN	Shank Dia. DMM	Effective Length for Workpiece Inclination Angle 0.5°	1°	1.5°	2°	3°	Fig	Standard Price (JPY)
NPDRS 1020R002-006	●	**0.2**	**0.02**	0.10	0.6	40	0.175	4	0.63	0.65	0.67	0.70	0.75	1	92,200
1020R005-006	●	**0.2**	**0.05**	0.10	0.6	40	0.175	4	0.63	0.65	0.67	0.69	0.74	1	92,200
1030R002-010	●	**0.3**	**0.02**	0.15	1.0	40	0.270	4	1.04	1.08	1.11	1.15	1.24	1	86,500
1030R005-010	●	**0.3**	**0.05**	0.15	1.0	40	0.270	4	1.04	1.08	1.11	1.15	1.23	1	86,500
1050R005-015	●	**0.5**	**0.05**	0.25	1.5	40	0.470	4	1.56	1.61	1.66	1.72	1.84	1	86,500
NPDRS 1050R010-015	●	**0.5**	**0.10**	0.25	1.5	40	0.470	4	1.56	1.60	1.65	1.71	1.83	1	86,500
1100R005-030	●	**1.0**	**0.05**	0.55	3.0	40	0.950	4	3.14	3.24	3.35	3.46	3.72	1	80,500
1100R010-030	●	**1.0**	**0.10**	0.55	3.0	40	0.950	4	3.14	3.24	3.34	3.46	3.71	1	80,500
1100R020-030	●	**1.0**	**0.20**	0.55	3.0	40	0.950	4	3.14	3.23	3.33	3.44	3.69	1	80,500
1200R005-040	●	**2.0**	**0.05**	0.55	4.0	40	1.950	4	4.17	4.31	4.45	4.60	4.94	1	144,000
NPDRS 1200R010-040	●	**2.0**	**0.10**	0.55	4.0	40	1.950	4	4.17	4.30	4.44	4.60	4.93	1	144,000
1200R020-040	●	**2.0**	**0.20**	0.55	4.0	40	1.950	4	4.17	4.30	4.43	4.58	4.91	1	144,000

Grade NPD10

The List price is a price only for Japan.

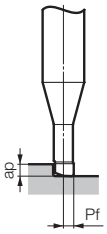
■ Identification Code

NPDR S 1 020 R002 006

Cat. No.	For Standard Finishing	Number of Teeth	Dia.	Corner Radius	Neck Length

■ Recommended Cutting Conditions

1. Use a machine with high accuracy for stable cutting.
2. Non-water soluble coolant recommended. Supply as a mist or external coolant. Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cutting conditions as necessary as machine specs and other conditions may vary.
5. The cutting parameters shown are for reference only. Adjust the cutting conditions to the desired machined surface finish.



Work Material		Cemented Carbide			
DC (mm)	LU (mm)	Spindle Speed (mm^{-1})	Feed Rate (mm/min)	ap (mm)	Pf (mm)
0.2	0.6	40,000	100	0.001	0.001
0.3	1.0	40,000	150	0.002	0.001
0.5	1.5	40,000	200	0.003	0.001
1.0	3.0	40,000	400	0.005	0.003
2.0	4.0	40,000	600	0.010	0.005

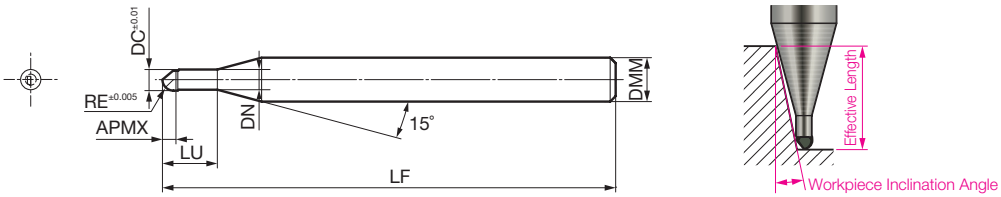
● mark: Standard stock item

NPDBS type

Cemented Carbide | Hard Brittle Material

1 Flute | Binderless PCD | Ballnose R | Side Milling | Face Milling | R-Grooving | Profiling

Fig 1



■ Body (For Standard Finishing)

Dimensions (mm)

Cat. No.	Stock	Ballnose Radius RE	Dia. DC	Cutting Edge Length APMX	Neck Length LU	Overall Length LF	Neck Dia. DN	Shank Dia. DMM	Effective Length for Workpiece Inclination Angle 0.5°	1°	1.5°	2°	3°	Fig	Standard Price (JPY)
NPDBS 1010-004	●	**0.1**	**0.2**	0.1	0.4	40	0.18	4	0.42	0.43	0.44	0.46	0.48	1	92,200
1020-008	●	**0.2**	**0.4**	0.2	0.8	40	0.38	4	0.83	0.85	0.87	0.90	0.95	1	86,500
1030-010	●	**0.3**	**0.6**	0.3	1.0	40	0.58	4	1.03	1.06	1.08	1.11	1.17	1	86,500
1050-020	●	**0.5**	**1.0**	0.5	2.0	40	0.95	4	2.10	2.15	2.20	2.26	2.39	1	80,500
1100-030	●	**1.0**	**2.0**	1.0	3.0	40	1.95	4	3.11	3.18	3.25	3.33	3.51	1	144,000

Grade NPD10

The List price is a price only for Japan.

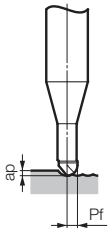
■ Identification Code

NPDB S 1 010 - 004

Cat. No.	For Standard Finishing	Number of Teeth	Ballnose Radius	Neck Length

■ Recommended Cutting Conditions

1. Use a machine with high accuracy for stable cutting.
2. Non-water soluble coolant recommended. Supply as a mist or external coolant. Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cutting conditions as necessary as machine specs and other conditions may vary.
5. The cutting parameters shown are for reference only. Adjust the cutting conditions to the desired machined surface finish.



Work Material		Cemented Carbide			
RE (mm)	LU (mm)	Spindle Speed (mm^{-1})	Feed Rate (mm/min)	ap (mm)	Pf (mm)
0.1	0.4	40,000	100	0.001	0.001
0.2	0.8	40,000	150	0.002	0.001
0.3	1.0	40,000	200	0.003	0.001
0.5	2.0	40,000	400	0.005	0.003
1.0	3.0	40,000	600	0.010	0.005

* Radius accuracy inspection report is included in the case.
* Long neck type is also available depending on the size. Please consult us separately.

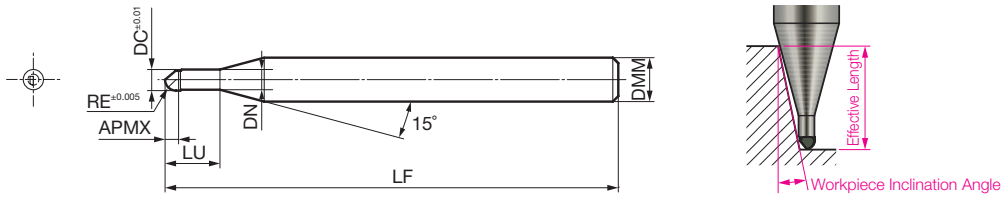
● mark: Standard stock item

NPDB type

Cemented Carbide | Hard Brittle Material

1 Flute | Binderless PCD | Ballnose R | Side Milling | Face Milling | R-Grooving | Profiling

Fig 1



■ Body (For Precise Finishing)

Dimensions (mm)

Cat. No.	Stock	Ballnose Radius RE	Dia. DC	Cutting Edge Length APMX	Neck Length LU	Overall Length LF	Neck Dia. DN	Shank Dia. DMM	Effective Length for Workpiece Inclination Angle 0.5°	1°	1.5°	2°	3°	Fig	Standard Price (JPY)
NPDB 1010-004	●	**0.1**	**0.2**	0.1	0.4	40	0.18	4	0.42	0.43	0.44	0.46	0.48	1	244,000
1020-008	●	**0.2**	**0.4**	0.2	0.8	40	0.38	4	0.83	0.85	0.87	0.90	0.95	1	238,000
1030-010	●	**0.3**	**0.6**	0.3	1.0	40	0.58	4	1.03	1.06	1.08	1.11	1.17	1	238,000
1050-020	●	**0.5**	**1.0**	0.5	2.0	40	0.95	4	2.10	2.15	2.20	2.26	2.39	1	199,000
1100-030	●	**1.0**	**2.0**	1.0	3.0	40	1.95	4	3.11	3.18	3.25	3.33	3.51	1	253,000

Grade NPD10

The List price is a price only for Japan.

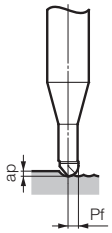
■ Identification Code

NPDB 1 010 - 004

Cat. No.	Number of Teeth	Ballnose Radius	Neck Length

■ Recommended Cutting Conditions

1. Use a machine with high accuracy for stable cutting.
2. Non-water soluble coolant recommended. Supply as a mist or external coolant. Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cutting conditions as necessary as machine specs and other conditions may vary.
5. The cutting parameters shown are for reference only. Adjust the cutting conditions to the desired machined surface finish.



Work Material		Cemented Carbide			
RE (mm)	LU (mm)	Spindle Speed (mm^{-1})	Feed Rate (mm/min)	ap (mm)	Pf (mm)
0.1	0.4	40,000	100	0.001	0.001
0.2	0.8	40,000	150	0.002	0.001
0.3	1.0	40,000	200	0.003	0.001
0.5	2.0	40,000	400	0.005	0.003
1.0	3.0	40,000	600	0.010	0.005

* Radius accuracy inspection report is included in the case.
* Long neck type is also available depending on the size. Please consult us separately.

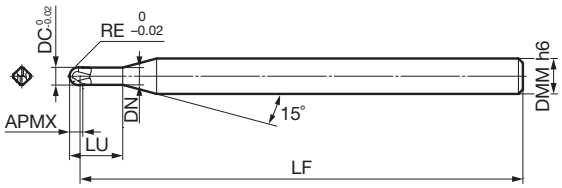
● mark: Standard stock item

SDCB type

Cemented Carbide | Hard Brittle Material

2 Flutes | SUMIDIA Coat | Ballnose R | Side Milling | Face Milling | R-Grooving | Profiling

Fig 1



■ Body (For Rough/Medium-Finishing)

Dimensions (mm)

Cat. No.	Stock	Ballnose Radius RE	Dia. DC	Cutting Edge Length APMX	Neck Length LU	Overall Length LF	Neck Dia. DN	Shank Dia. DMM	Fig	Standard Price (JPY)
SDCB 2R050-015	●	**0.5**	**1.0**	0.6	1.5	50	0.94	4	1	34,500
2R050-020	●	**0.5**	**1.0**	0.6	2.0	50	0.94	4	1	34,500
2R050-030	●	**0.5**	**1.0**	0.6	3.0	50	0.94	4	1	34,500
2R050-050	●	**0.5**	**1.0**	0.6	5.0	50	0.94	4	1	34,500
SDCB 2R100-025	●	**1.0**	**2.0**	1.4	2.5	50	1.92	4	1	34,500
2R100-040	●	**1.0**	**2.0**	1.4	4.0	50	1.92	4	1	34,500
2R100-060	●	**1.0**	**2.0**	1.4	6.0	50	1.92	4	1	34,500
2R100-100	●	**1.0**	**2.0**	1.4	10.0	50	1.92	4	1	34,500

Grade DCM20

The List price is a price only for Japan.

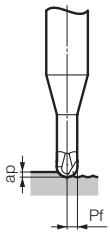
■ Identification Code

SDCB 2 R050 - 015

Cat. No.	Number of Teeth	Ballnose Radius	Neck Length

■ Recommended Cutting Conditions

1. Use a machine with high accuracy for stable cutting.
2. Air blow is recommended, but oil mist or external coolant supply can also be used. Take fire prevention precautions to avoid fire hazards caused by sparks igniting during machining or tool breakage.
3. Shorten overhang as much as possible.
4. Adjust cutting conditions as necessary as machine specs and other conditions may vary.
5. The cutting parameters shown are for reference only. Adjust the cutting conditions to the desired machined surface finish.



Work Material		Cemented Carbide			
RE (mm)	LU (mm)	Spindle Speed (mm^{-1})	Feed Rate (mm/min)	ap (mm)	Pt (mm)
0.5	1.5	30,000	300	0.05	0.25
1.0	2.5	30,000	300	0.10	0.30

● mark: Standard stock item

Sumitomo Electric Cutting Tools Official Apps for iOS/Android

Cutting calculation App

SumiTool Calculator

Download on the App Store

GET IT ON Google Play

Grade & chipbreaker comparison App

SumiTool Converter

Download on the App Store

GET IT ON Google Play

< SAFETY NOTES >

- Very hot or lengthy chips may be discharged while the machine is in operation. Therefore, machine guards, safety goggles or other protective covers must be used. Fire safety precautions must also be considered.
- Please handle with care as this product has sharp edges.
- Improper cutting conditions or mis-handling of the tool may result in breakages or projectiles. Therefore, please use the tool within its recommended conditions.
- When using non-water soluble cutting oil, precautions against fire must be taken and please ensure that a fire extinguisher is placed near the machine.

Sumitomo Electric Industries, Ltd.

Hardmetal Division

Global Marketing Department : 1-1-1, Koyakita, Itami, Hyogo 664-0016, Japan

https://www.sumitool.com/global

R2(2022.8) III 1611 SN/AK