Morgan KK Undercutter

Three Models — 3 Saw Spindle Speeds

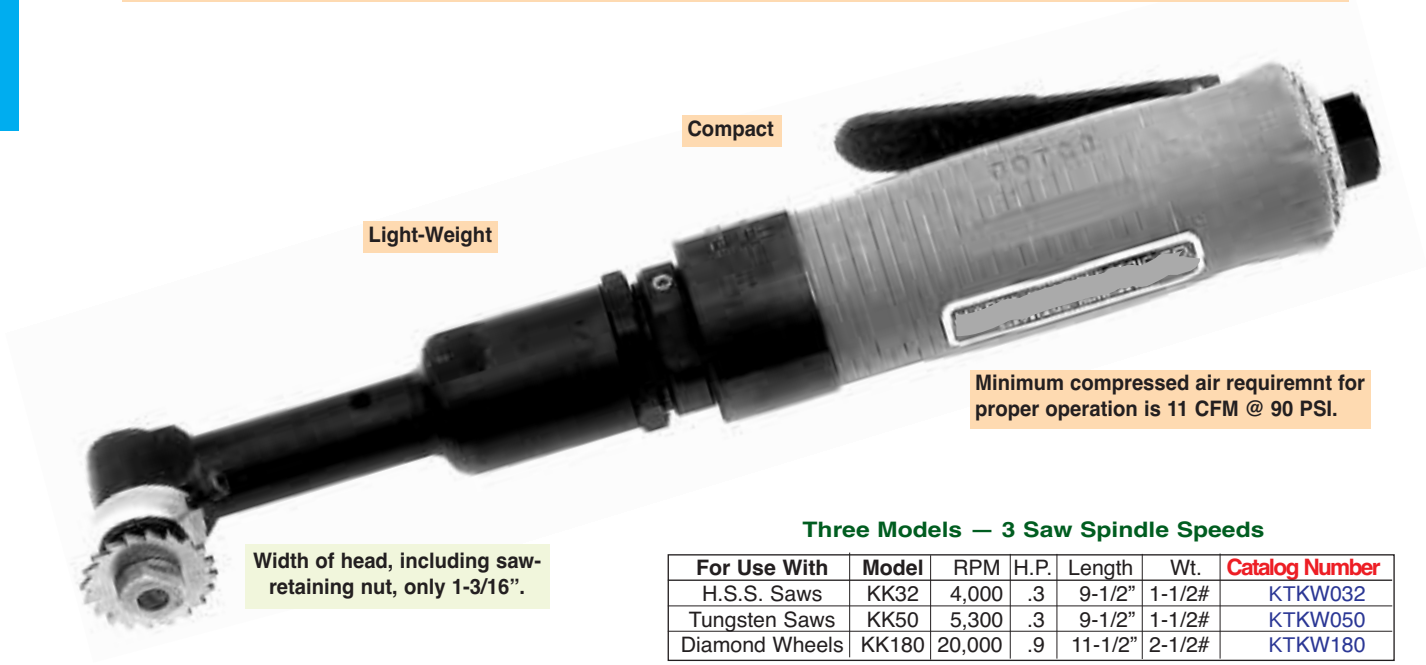
Morgan KK is a very small *light-duty* air-driven undercutter designed for reaching into limited spaces where other undercutters cannot be used. It is not meant for the heavier duty and more continuous service of our other portable undercutters.

There are now 3 versions of the KK Undercutter available to accommodate the various needs of our customers.

☛ Model KK32: 4,000 RPM version has gained increased popularity since it was introduced. It is still the most popular and practical unit for use with high speed steel saws and V-Cutters.

☛ Model KK50: 5,300 RPM version is recommended for use with tungsten carbide saws. It should be noted that because of the brittle nature of carbide, these saws are more susceptible to breakage and should only be used by more skilled operators. The higher price of carbide can normally be justified by the shorter time required to complete a job because of the higher operating speeds and less down-time required to replace cutters.

☛ Model KK180: 20,000 RPM version is intended for use with diamond coated undercutting wheels. Extremely fast undercutting is made possible by this high speed tool which will more than justify the higher priced diamond wheels. Again, this tool is only recommended for use by more skilled operators.



Three Models — 3 Saw Spindle Speeds

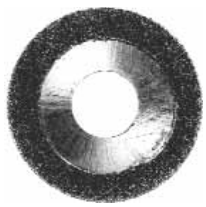
For Use With	Model	RPM	H.P.	Length	Wt.	Catalog Number
H.S.S. Saws	KK32	4,000	.3	9-1/2"	1-1/2#	KTKW032
Tungsten Saws	KK50	5,300	.3	9-1/2"	1-1/2#	KTKW050
Diamond Wheels	KK180	20,000	.9	11-1/2"	2-1/2#	KTKW180

Net Weight 2-1/2 lbs., Shipping Weight 4 lbs.

Diamond Coated Undercutting Wheels

For use with Model KK180, KK350 &

O.D.	I.D.	Thicknesses	Catalog Number
3/4"	5/16"	.020, .030, .040"	DIAW3 (add thickness)
7/8"	5/16"	.020, .025, .030, .035, .040, .045, .050, .055, .060, .065"	DIAW7 (add thickness)

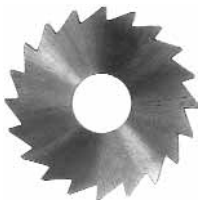


Saws

For use with Model KK32 or KK50

High-Speed Steel	O.D.	I.D.	Catalog Number
65-HS Saws	3/4"	5/16"	HSMS65___
75-HS Saws	7/8"	5/16"	HSMS75___
Tungsten-Carbide	O.D.	I.D.	Catalog Number
65-TC Saws	3/4"	5/16"	TUNS65___
75-TC Saws	7/8"	5/16"	TUNS75___

For further specifications see pages 16 and 17.



Morgan Advanced Materials

Morgan AM&T Hong Kong Company Limited
Unit 4-6, 11/F., Siu Wai Industrial Centre, 29-33 Wing Hong Street, Cheung Sha Wan, Kowloon, Hong Kong
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www.morganamt.com.hk

Morgan Close-Cut Undercutter

For undercutting right up to the riser

Features:

- ☛ Cuts 1/16” deep with 3/8” diameter saw.
- ☛ Cuts 3/32” deep with 7/16” diameter saw.
- ☛ Cuts full depth to within 1/8” of riser.
- ☛ Saw spindle speed 6,000 r.p.m.
- ☛ Weighs only 3-3/4 lbs.
- ☛ 1/15 h.p. A.C.-D.C. ball bearing motor.

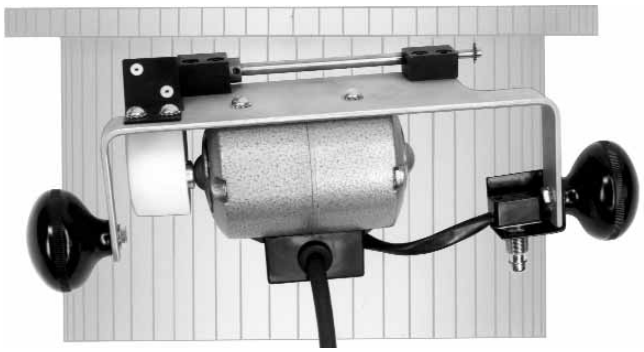
The Close-Cut Undercutter was specially designed to finish off a mica slot when it is necessary to cut within 1/8” of a riser.

This unit has a straight solid shaft and needle bearings, both front and rear, for smoother operation.

While this small machine can be used for undercutting the full length of smaller commutator slots, one of the more substantial Morgan Undercutters should be used on larger commutators for most of the cut and the Close-Cut used for the remaining end against the riser.

Though we hesitate to recommend carbide saws in any hand-held undercutter, we have had success with them in this smaller unit.

Design of the Close-Cut allows ample clearance between the undercutter and the commutator surface on even the largest commutators.



This view (looking down on the commutator) shows plenty of clearance is also available between the undercutter and the riser.

	Catalog Number
Close-Cut Undercutter, 115 V., 50/60 Hz. complete with Carrying Case	CCUCA
Close-Cut Undercutter, 230 V., 50/60 Hz. complete with Carrying Case	CCUCB

Net wt. 4-1/2 lbs., Shipping wt. 11 lbs., with case.

Saws are available in High-Speed Steel or Carbide as shown in table below:

Saws			
High-Speed Steel	O.D.	I.D.	**Catalog Number**
32-HS Saws	3/8”	1/8”	HSMS32___
12-HS Saws	7/16”	1/8”	HSMS12___
Tungsten-Carbide	O.D.	I.D.	**Catalog Number**
32-TC Saws	3/8”	1/8”	TUNS32___
12-TC Saws	7/16”	1/8”	TUNS12___

For further specifications see pages 5 and 6.

Stocked in the following thicknesses: .010”, .015”, .018”, .020”, .023”, .025”, .028”, .030”, .032”, .035”, .038”, .040”, .043”, .045”.

Air-Driven Mica-Miller

The Air-Driven Mica-Miller is lightweight, rugged, and powerful tool that is very popular. This undercutter is available in two models for use with High-Speed Steel or Tungsten-Carbide saw blades.

The 5,800 R.P.M. model, for use with solid carbide saw blades, is great for prolonged use on larger commutators. Less stopping to change blades saves you time and money.

Uses the three interchangeable heads described below.

Full load saw spindle speeds at 90 lbs. air pressure are as follows:

At 90 lbs. air pressure, Air Motor, for H.S.S. Saws develops .6 h.p. and for Tungsten-Carbide Saws develops 1.0 h.p. Overall length 14-1/4".

If you do not already have an automatic oiler in your air-line, be sure to include one in your order (see "Other Products" Catalog pg. 15 for description) as oil is essential in the operation of an air motor.

Air-Driven Mica-Miller:	For Use with H.S.S. Saws		For Use with Tungsten-Carbide Saws	
	RPM	Catalog Number	RPM	Catalog Number
With "Small" Head, 5/16" arbor	2,500	M-MU201	*** See Note	*** See Note
With "Standard" Head, 5/16" or 7mm. arbor	2,000	M-MU202 or (7M)	6,000	M-MU202C or (7M)
With "Heavy-Duty" Head, 3/8" arbor	1,350	M-MU203	5,350	M-MU203C
	Net Weight: 3-1/2 lbs. Shipping Weight: 6 lbs.		Net Weight: 3-1/2 lbs. Shipping Weight: 6 lbs.	

*** Not recommended for use with small head at this speed.

Extra Interchangeable Heads:	Catalog Number
Small, 5/16" arbor	M-MU01
Standard, 5/16" arbor	M-MU02
Standard, 7mm. arbor	M-MU027M
Heavy-Duty, 3/8" arbor	M-MU03
Air Hose, 10 ft. long; complete with quick connector	AIRH10
Automatic Air Filter-Lubricator	FILL01
Steel Carrying Case, No. 1; for Air-Driven Mica-Miller	CASE101

H.S.S. and Tungsten-Carbide Saws & V-Cutters

The table at right lists at least 2 diameters of saws and cutters for each of the three interchangeable Mica-Miller heads.

H.S.S. Saws ("U" slot) are stocked in the following thicknesses (thousandths of an inch): **15, 18, 20, 23, 25, 26, 28, 30, 32, 35, 38, 40, 43, 45, 50, 53, 55, 58, 60, 63, and 65**, and can be supplied in other thicknesses at a slight additional charge. (Standard metric thicknesses available.)

Tungsten-Carbide Saws ("U" slot) are available from **.010" to .065"** thickness.

H.S.S. V-cutters ("V" slots) are all **.045"** thick and are stocked with **40°, 50°, and 60°**, angles between cutting edges.

Tungsten-Carbide V-Cutters ("V" slots) are available from **.030" to .065"** thickness and are available with **40°, 50°, and 60°**, angles between cutting edges.

40°, cutters are generally used for thin mica, 50° for medium mica, and 60° for thick mica.

	Type	O.D.	Hole	Catalog Number H.S.S.	Catalog Number Carbide
For "Small" Head	Saws	23/32"	5/16"	HSMS14___	*** See Above
	Cutters	23/32"	5/16"	HSMSV15___	*** See Above
	Saws	3/4"	5/16"	HSMS65___	*** See Above
	Cutters	3/4"	5/16"	HSMSV65___	*** See Above
For "Standard" Head	Saws	7/8"	5/16"	HSMS75___	TUNS75___
	Cutters	7/8"	5/16"	HSMSV75___	TUNSV75___
	Saws	1"	5/16"	HSMS85___	TUNS85___
	Cutters	1"	5/16"	HSMSV85___	TUNSV85___
	Saws	25 mm	7 mm	HSMM25___	
	Cutters	25 mm	7 mm	HSMMV25___	
For "Heavy-Duty" Head	Saws	1-1/8"	3/8"	HSMS96___	TUNS96___
	Cutters	1-1/8"	3/8"	HSMSV96___	TUNSV96___
	Saws	1-1/4"	3/8"	HSMS106___	TUNS106___
	Cutters	1-1/4"	3/8"	HSMSV106__	TUNSV106__

Steel Carrying Cases

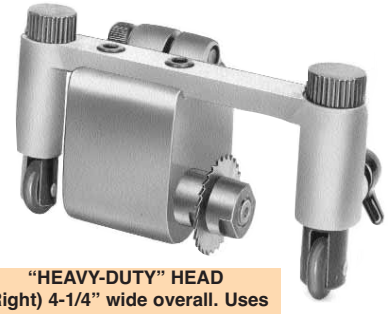
Heavy gauge steel carrying cases to protect your Model K, Air-Driven or Flex-Drive Mica-Miller, extra heads, saws and cutters, accessories, etc., are available.

Three Interchangeable Heads

For all Air & Electric Mica-Millers

"SMALL" HEAD (Below) Only 1-7/8" wide (less Slot-Guide). Uses 23/32" or 3/4" diameter x 5/16" hole Saws or "V" cutters.

"STANDARD" HEAD (Left) 2-1/4" wide (less Slot-Guide). Available for use with 7/8" or 1" diameter x 5/16" hole, or 25 mm. diameter x 7 mm. hole Saws or "V" cutters.

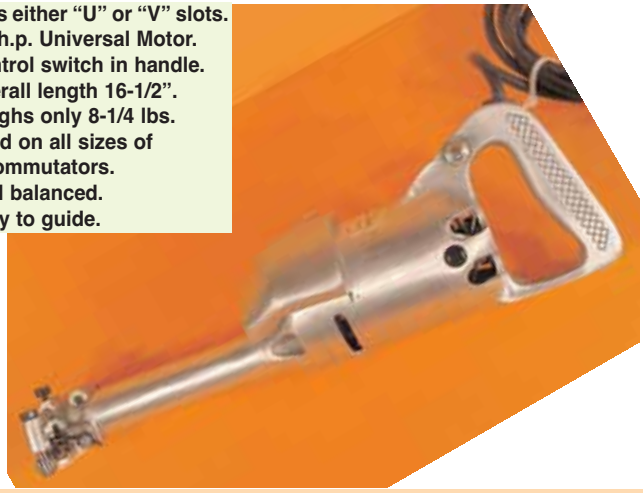


"HEAVY-DUTY" HEAD (Right) 4-1/4" wide overall. Uses 1-1/8" or 1-1/4" diameter x 3/8" hole Saws or "V" cutters.

Model K Mica-Miller

Powerful, Light-Weight, Easy To Use

Cuts either "U" or "V" slots.
1/5 h.p. Universal Motor.
Control switch in handle.
Overall length 16-1/2".
Weighs only 8-1/4 lbs.
Used on all sizes of commutators.
Well balanced.
Easy to guide.



The model K Mica-Miller is an excellent all-around Undercutter for industrial plants or repair shops, as it can be used in the shop or taken to the job, and can be operated on A.C. from any lighting circuit.

Three interchangeable heads (see bottom of page 6) make the Model K most versatile. Saws or "V" cutters from 23/32" to 1-1/4" diameter can be used to undercut commutators of virtually any size.

Full load saw spindle speeds are as follows:

With "Small" Head . . . . . .3500 r.p.m.
With "Standard" Head . . . . . .2800 r.p.m.
With "Heavy-Duty" Head . . . . . .1850 r.p.m.

The slot guide provided on the two smaller heads is positioned by two sensitive screw adjustments. It may be swung out of the way when changing saws. Many operators find the model K so easy to use they remove the guide entirely.

	Catalog Number	
Model K Mica-Miller:	115 V., 50/60 Hz.	230 V. 50/60 Hz.
With "Small" Head, 5/16" arbor	M-MU101A	M-MU101B
With "Standard" Head, 5/16" arbor	M-MU102A	M-MU102B
With "Standard" Head, 7 mm. arbor	M-MU1027MA	M-MU1027MB
With "Heavy-Duty" Head, 3/8" arbor	M-MU103A	M-MU103B

Extra Interchangeable Heads only:	Catalog Number
"Small", 5/16" arbor	M-MU01
"Standard", 5/16" arbor	M-MU02
"Standard", 7 mm. arbor	M-MU027M
"Heavy-Duty", 3/8" arbor	M-MU03
Steel Carrying Case, No. 1; for Model K Mica-Miller	CASE101

Net Weight 8 lbs., Shipping Weight 11 lbs.
For Saws and Cutters, See Page 8 or 16.

Flex-Drive Mica-Miller

Flex-Drive Mica-Miller should be hung overhead by means of its suspension ring, thus lessening operator fatigue and flexible shaft strain.

The flexible shaft (No. 16; 3/8" diam., 5 ft. long) of the Flex-Drive Mica-Miller is strong yet very flexible and transmits full power smoothly, without chatter or vibration.

The three interchangeable heads described above are available for this undercutter. The head mounts on a long slender drive shaft housing making the machine particularly valuable in close quarters as the head is the widest part of the undercutter.

Full load saw spindle speeds are as follows:

With "Small" Head . . . . . .3700/4300 r.p.m.
With "Standard" Head . . . .2850/3450 r.p.m.
With "Heavy-Duty" Head . .1700/2300 r.p.m.

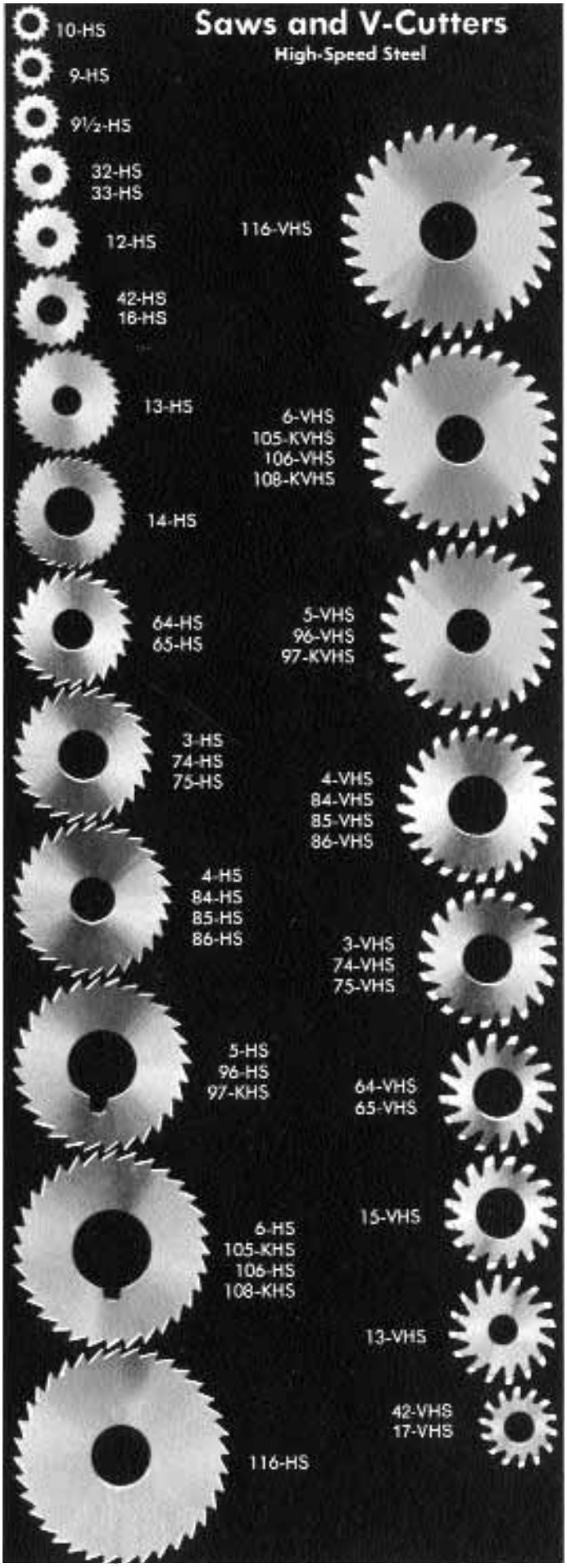
Net Weight with motor 25 lbs., without motor 7 lbs.
Shipping Weight with motor 27 lbs., without motor 9 lbs.

	Catalog Number	
Flex-Drive Mica-Miller:	115 V., 60 Hz.	230 V., 60 Hz.
With "Small" Head and 5/16" arbor	M-MU301A	M-MU301B
With "Standard" Head and 5/16" or (7mm.) arbor	M-MU302A or (7M)	M-MU302B or (7M)
With "Heavy-Duty" Head and 3/8" arbor	M-MU303A	M-MU303B

Flex-Drive Mica-Miller with Flexible Shaft and Swivel Connection for use with your motor:

		Catalog Number
With "Small" Head and 5/16" arbor	and 1/2" diam. Motor Connection	M-MU40112
	and 5/8" diam. Motor Connection	M-MU40158
	and 10mm. diam. Motor Connection	M-MU40110MM
	and 14mm. diam. Motor Connection	M-MU40114MM
With "Standard" Head and 5/16" or (7mm. arbor)	and 1/2" diam. Motor Connection	M-MU40212 or (7M)
	and 5/8" diam. Motor Connection	M-MU40258 or (7M)
	and 10mm. diam. Motor Connection	M-MU40210MM or (7M)
	and 14mm. diam. Motor Connection	M-MU40214MM or (7M)
With "Heavy-Duty" Head and 3/8" arbor	and 1/2" diam. Motor Connection	M-MU40312
	and 5/8" diam. Motor Connection	M-MU40358
	and 10mm. diam. Motor Connection	M-MU40310MM
	and 14mm. diam. Motor Connection	M-MU40314MM

Extra Interchangeable Heads	See pg. 6
No. 16 Core (5 ft.) (replacement for flexible shaft)	MFLXD90
No. 16 Sheath (replacement for flexible shaft)	MFLXD61
Steel Carrying Case, No. 2; for Flex-Drive Mica-Miller	CASE102



Morgan Undercutting Saws

GENERAL

Morgan Undercutting Saws and V-Cutters are available in High-Speed Steel or Tungsten-Carbide. Both types are carefully designed as to tooth form, hollow grind, hardness, etc., and are manufactured to close tolerances in our own plant.

While used primarily for undercutting mica and slotting risers of commutators, Morgan Undercutting Saws and V-cutters are also used for cutting steel, aluminum, plastics, and other materials not requiring set teeth.

Undercutting differs from ordinary machining in that, instead of shearing, it is a combination of crushing, grinding, and conveying. Mica is very abrasive and varies in hardness, making necessary the very best design and production controls in the manufacture of undercutting saws.

HIGH-SPEED STEEL SAWS and V-CUTTERS

These can be used on either portable or stationary equipment with spindle speeds of 1,500 to 5,000 r.p.m.

(See Morgan Mica Undercutters for Undercutters.)

SAWS ("U"-Slot)

Actual size illustrations at left; specifications below. Saws stocked in these thicknesses:

.015" .018" .020" .023" .025" .026" .028" .030" .032" .035" .038" .040" .043" .045" .050" .053" .055" .058" .060" .063" .065"

(Other thicknesses available at extra cost.)

Be sure to specify thicknesses.

Type Number	O.D.	Hole	No. Teeth	Catalog Number
10-HS	1/4"	1/8"	14	HSMS10
9-HS	9/32"	1/8"	14	HSMS9
9-1/2-HS	5/16"	1/8"	16	HSMS9.5
32-HS	3/8"	1/8"	18	HSMS32
33-HS	3/8"	3/16"	18	HSMS33
12-HS	7/16"	1/8"	18	HSMS12
42-HS	1/2"	1/8"	18	HSMS42
16-HS	1/2"	3/16"	18	HSMS16
13-HS	11/16"	3/16"	28	HSMS13
14-HS	23/32"	5/16"	32	HSMS14
64-HS	3/4"	1/4"	22	HSMS64
65-HS	3/4"	5/16"	22	HSMS65
74-HS	7/8"	1/4"	24	HSMS74
3-HS	7/8"	9/32"	24	HSMS3
75-HS	7/8"	5/16"	24	HSMS75
84-HS	1"	1/4"	28	HSMS84
4-HS	1"	9/32"	28	HSMS4
85-HS	1"	5/16"	28	HSMS85
86-HS	1"	3/8"	28	HSMS86
5-HS	1-1/8"	9/32"	28	HSMS5
96-HS	1-1/8"	3/8"	28	HSMS96
97-KHS	1-1/8"	7/16"	28	HSMS97K
6-HS	1-1/4"	9/32"	32	HSMS6
105-KHS	1-1/4"	5/16"	32	HSMS105K
106-HS	1-1/4"	3/8"	32	HSMS106
108-KHS	1-1/4"	1/2"	32	HSMS108K
116-HS	1-3/8"	3/8"	36	HSMS116

Metric Sizes
25 mm. O.D. x 7mm. I.D. Saws in stock, along with other metric sizes upon request.

V-CUTTERS ("V"-Slot)

Actual size illustrations at left; specifications below. These cutters are all .045" thick and stocked with 40°, 50°, and 60° angles between cutting edges. 40° V-cutters are for thin mica, 50° for medium mica, 60° for thick mica.

Be sure to specify angle 40°, 50°, or 60°.

Type Number	O.D.	Hole	No. Teeth	Catalog Number
42-VHS	1/2"	1/8"	12	HSMSV42
17-VHS	1/2"	3/16"	12	HSMSV17
13-VHS	11/16"	3/16"	14	HSMSV13
15-VHS	23/32"	5/16"	14	HSMSV15
64-VHS	3/4"	1/4"	14	HSMSV64
65-VHS	3/4"	5/16"	14	HSMSV65
74-VHS	7/8"	1/4"	18	HSMSV74
3-VHS	7/8"	9/32"	18	HSMSV3
75-VHS	7/8"	5/16"	18	HSMSV75
84-VHS	1"	1/4"	22	HSMSV84
4-VHS	1"	9/32"	22	HSMSV4
85-VHS	1"	5/16"	22	HSMSV85
86-VHS	1"	3/8"	22	HSMSV86
5-VHS	1-1/8"	9/32"	24	HSMSV5
96-VHS	1-1/8"	3/8"	24	HSMSV96
97-KVHS	1-1/8"	7/16"	24	HSMSV97K
6-VHS	1-1/4"	9/32"	24	HSMSV6
105-KVHS	1-1/4"	5/16"	24	HSMSV105K
106-VHS	1-1/4"	3/8"	24	HSMSV106
108-KVHS	1-1/4"	1/2"	24	HSMSV108K
116-VHS	1-3/8"	3/8"	26	HSMSV116

Metric Sizes
25 mm. O.D. x 7mm. I.D. V-Cutters in stock, along with other metric sizes upon request.

See “General” discussion of Undercutting Saws on page 5.

TUNGSTEN-CARBIDE SAWS and V-CUTTERS

These are extremely hard and brittle and are usually used on rigid stationary equipment. The teeth of both saws and V-cutters have a slight land to give strength to the cutting edge. Saws are hollow-ground for clearance, V-cutters have ample radial relief. When Carbide Saws are used on other equipment than our undercutters, steel supporting washers are recommended to reduce breakage. Spindle speeds may vary from 3,000 to 12,000 r.p.m., depending on Saw O.D.

See Undercutters for Morgan Undercutters for use with these saws.

.

SAWS (“U”-Slot)

Actual size illustrations; specifications below. Thickness ranges as follows:

1/4” - 9/16” O.D. from .010” to .045” thick
5/8” - 1-3/8” O.D. from .010” to .065” thick

Be sure to specify thicknesses.

Type Number	O.D.	Hole	No. Teeth	Catalog Number
10-TC	1/4”	1/8”	12	TUNS10
9-1/2-TC	5/16”	1/8”	14	TUNS9.5
32-TC	3/8”	1/8”	14	TUNS32
33-TC	3/8”	3/16”	14	TUNS33
12-TC	7/16”	1/8”	14	TUNS12
42-TC	1/2”	1/8”	14	TUNS42
16-TC	1/2”	3/16”	14	TUNS16
18-TC	9/16”	1/4”	16	TUNS18
54-TC	5/8”	1/4”	16	TUNS54
64-TC	3/4”	1/4”	18	TUNS64
65-TC	3/4”	5/16”	18	TUNS65
75-TC	7/8”	5/16”	20	TUNS75
4-TC	1”	9/32”	20	TUNS4
84-TC	1”	1/4”	20	TUNS84
85-TC	1”	5/16”	20	TUNS85
86-TC	1”	3/8”	20	TUNS86
95-TC	1-1/8”	5/16”	22	TUNS95
96-TC	1-1/8”	3/8”	22	TUNS96
105-TC	1-1/4”	5/16”	24	TUNS105
106-TC	1-1/4”	3/8”	24	TUNS106
108-TC	1-1/4”	1/2”	24	TUNS108
116-TC	1-3/8”	3/8”	24	TUNS116

COMPOUND-LAND SAWS

The compound-land feature, sketched at right, is available on tungsten-carbide “U”-slot saws 9/16” O.D. and up (#18-TC thru #116-TC) at a 30% premium in price. Because of this feature, each tooth cuts only 50% of full slot width, resulting in better chip clearance, cooler operation and production increases of up to 60% over the square-toothed Saw. To order, add “CL” to Catalog Number. Minimum thickness .015”.

V-CUTTERS (“V”-Slot)

Actual size illustrations; specifications below. Thickness ranges as follows:

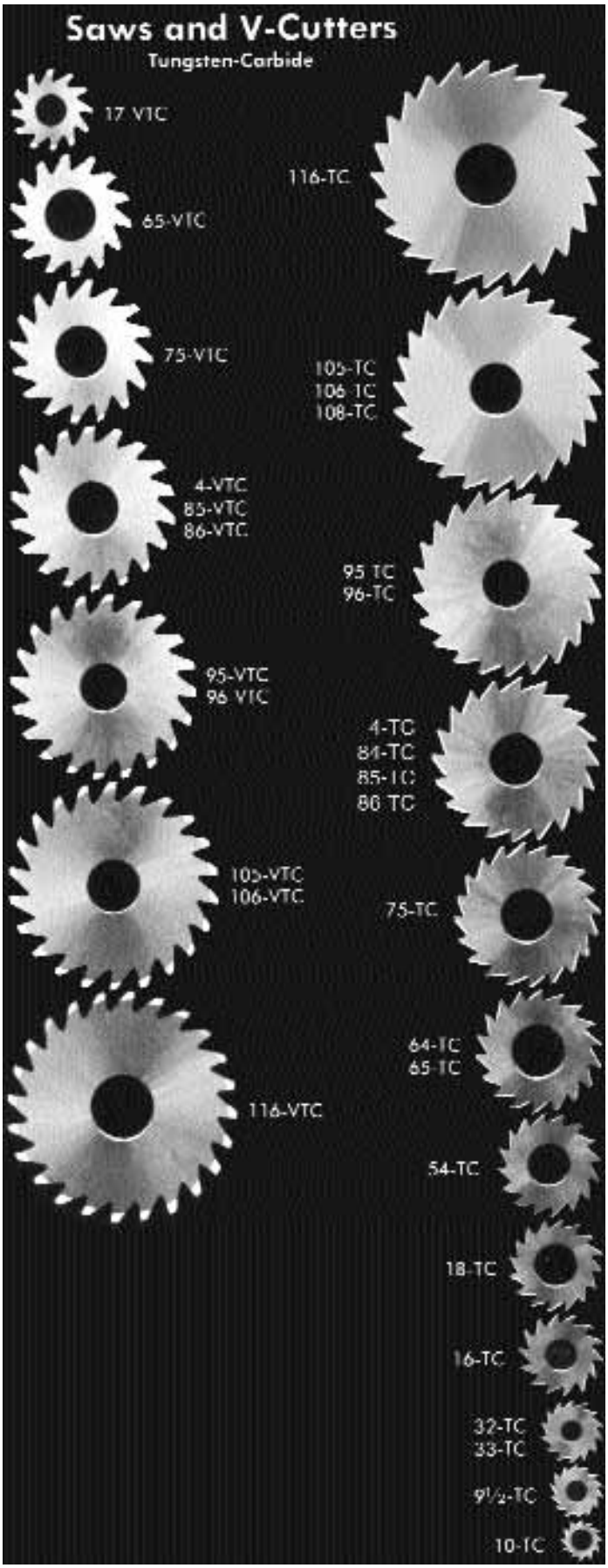
1/2” O.D. from .030” to .045” thick
3/4” - 1-3/8” O.D. from .030” to .065” thick

Angles between cutting edges can be 40°, 50°, and 60°. 40° V-cutters are for thin mica, 50° for medium mica, 60° for thick mica.

Be sure to specify thicknesses and angle, 40°, 50° or 60°.

Type Number	O.D.	Hole	No. Teeth	Catalog Number
42-VTC	1/2”	1/8”	12	TUNSV42
17-VTC	1/2”	3/16”	12	TUNSV17
65-VTC	3/4”	5/16”	14	TUNSV65
75-VTC	7/8”	5/16”	16	TUNSV75
4-VTC	1”	9/32”	18	TUNSV4
85-VTC	1”	5/16”	18	TUNSV85
86-VTC	1”	3/8”	18	TUNSV86
95-VTC	1-1/8”	5/16”	20	TUNSV95
96-VTC	1-1/8”	3/8”	20	TUNSV96
105-VTC	1-1/4”	5/16”	22	TUNSV105
106-VTC	1-1/4”	3/8”	22	TUNSV106
116-VTC	1-3/8”	3/8”	22	TUNSV116

SPECIALS — Your inquiries are invited for sizes not listed on the H.S.S. or Tungsten-Carbide Saw Pages.



Chamfering Tools

Commutator Slot Shaver II

Replaceable Blade

A new twist on an old design, this tool lightly chamfers commutator bar edges after undercutting. Pull it along the copper, shaving off the burs, then flip it over and do the edge of an adjacent bar.

The holder is designed for comfort, important when many bars need to be chamfered by one person! Made of high speed steel, the inexpensive & easily replaceable 45° inserts are available in .020", .040", & .060" thicknesses.

	Catalog Number
Slot Shaver II, complete with .020" thick HSS Insert	SLSC2020
Slot Shaver II, complete with .040" thick HSS Insert	SLSC2040
Slot Shaver II, complete with .060" thick HSS Insert	SLSC2060

Net Weight 2.5 oz., Shipping Weight 1 lb.

	Catalog Number
Insert Only, H.S.S., .020" thick; For Slot Shaver II	SLSC2B020
Insert Only, H.S.S., .040" thick; For Slot Shaver II	SLSC2B040
Insert Only, H.S.S., .060" thick; For Slot Shaver II	SLSC2B060

Net Weight 1 oz., Shipping Weight 1 lb.

Commutator Slot Shaver

The Commutator Slot Shaver is a simple little hand tool to lightly chamfer the edges of commutator bars after undercutting. Pull it along the copper, shaving off the burs — flip it over and do the other edge.

Made of hardened high-speed steel; it can be quickly resharpened on a grinding wheel.

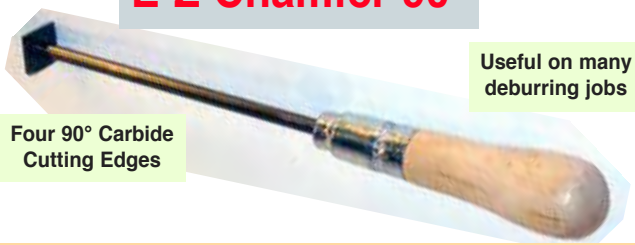
	Catalog Number
Slot Shaver	SLSC73

Net Weight 3 oz., Shipping Weight 6 oz.

E-Z Chamfer 90°

Four 90° Carbide Cutting Edges

Useful on many deburring jobs



Specially ground 4 cornered carbide insert chamfers copper on both sides of commutator slots after undercutting. Flat sides of the insert can be used for scraping, deburring and chamfering corners on many parts.

When insert is dull on all cutting edges, it is easily replaced.

	Catalog Number
E-Z Chamfer 90° complete with carbide insert	SLSC74
Replacement Carbide Insert only (90°)	SLSC745

Net Weight 4 oz., Shipping Weight 8 oz.

E-Z Chamfer 60°

Three 60° Cutting Edges, for thin mica

Special ground, 3 cornered insert, chamfers copper on both sides of commutator slots after undercutting. Tool is originally supplied with a H.S.S. insert. An optional Carbide replacement insert is available.

The offset blade holder provides knuckle clearance when deburring. This holder can be retracted into the handle along with extra inserts, for easier storage when not in use. The insert is easily replaced when it becomes dull on all three corners.

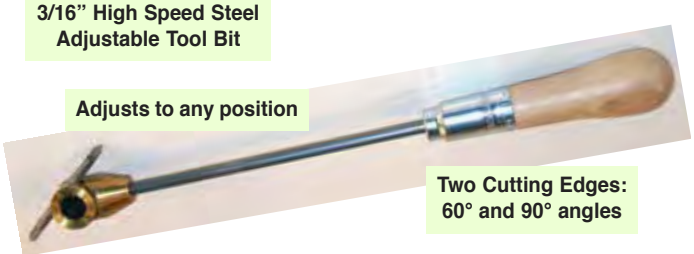
	Catalog Number
E-Z Chamfer 60° complete with H.S.S. Insert	SLSC74PT
Replacement Carbide Insert only (60°)	SLSC745PT

Net Weight 4 oz., Shipping Weight 6 oz.

Adjustable Slot Scraper

3/16" High Speed Steel Adjustable Tool Bit

Adjusts to any position



Two Cutting Edges: 60° and 90° angles

For removing fins of mica and burs of copper from the edges of commutator bars after undercutting with a U-shaped saw.

Do not use for undercutting mica because any tool that rakes out the mica may injure the insulation by tearing out mica slivers and thus permitting dirt to work down into the insulation.

	Catalog Number
Slot Scraper	SLSC69
Extra Blade	SLSC694

Net Weight 8 oz., Shipping Weight 12 oz.

Commutator Slotting Files

If you have only a few motors, undercut your mica with handy Commutator Slotting Files. They do the work rapidly, are easy to use and leave a 60° V-shaped slot.

They are made in the two styles shown below.

8", Double End, Curved — **Net Weight 2 oz.**

Net Weight 2 oz.

Single End with handle

Catalog Number	
8", Double End, Curved	SLFL08
Single End, with handle	SLFL01

Mini-Bar Mica Hand Saw

This hand-held undercutting saw is a handy way of accurately undercutting those small commutators where the use of a powered undercutter is too awkward or cannot be justified.

This tool uses replaceable blades which are ground to specific thicknesses so that the proper width undercut can be made. The blade is reversible so that it can be used for either a "Push" or a "Draw" cut.

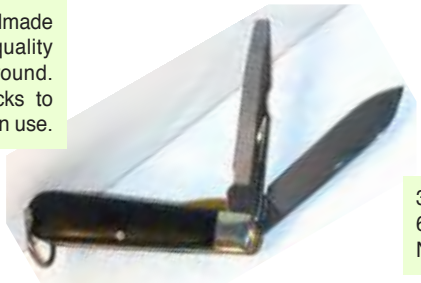
Replaceable blades are available in thicknesses of .015", .020", .026", .030", .035", .040", and .043".

	Catalog Number
Mini-Bar Mica Hand Saw, complete with tool holder and one blade (specify thickness)	SLSC (Plus Thickness)
Replacement Blade (Specify Thickness)	SLSCB (Plus Thickness)

Electrician's Knife

This is not an ordinary pocket knife. It is a quality tool guaranteed to satisfy the exacting demands of workmen accustomed to rugged and dependable performance.

No. 1 Knife — Handmade from very highest quality steel. Hand ground. Screwdriver blade locks to prevent closing when in use.



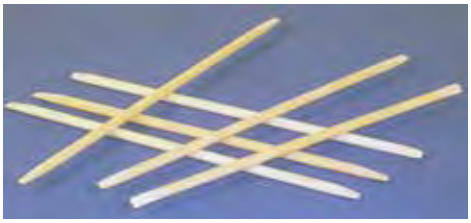
3-3/4" long closed.
6-1/2" long open.
Net Weight 5 oz.

Catalog Number	
No. 1 Electrician's Knife	ELKN01

Orange Sticks

Catalog Number	
Orange Sticks, Package of 12	MARTOS
Net Weight 1 oz. (Pkg. of 12)	

Orange Sticks (called so because they were originally made from orange wood) can be used for forming, shaping and positioning fine magnet wire where fingers can't reach or work comfortably. Also used for opening and holding open, contacts on relays and the such. These hardwood, non conductive, sticks have tapered ends for prying open contacts and can be trimmed and/or sharpened with a knife.



Approximately 3/16" x 7"

Helpful Hints For Saw Users (H.S.S. Metal-Working Saws)

These are general suggestions for conventional machines on where to start, and must be varied to meet a particular application. We do not assume any liability in the following statements.

These STOCK saws will do the job. Variations, such as number of teeth, rake angle, clearance angle, bevel, side clearance, material, land, etc. may do it better, but set-up charges and lead time must be considered.

SPEEDS — With a good set-up the speeds in the table below should be attainable
— Reduce the speed for hard (over Rockwell c30) and abrasive materials, and for deep cuts.
— Increase the speed for "free-machining" and non-ferrous metals.

Saws: M-2 Steel, Ground Teeth, 0° Rake Angle

Material to be cut	Saw Diameter: 1-3/4" Teeth - R.P.M.	2-1/4" Teeth - R.P.M.	2-3/4" Teeth - R.P.M.	3" Teeth - R.P.M.	4" Teeth - R.P.M.	Coolant
Mild Steel	64 - 450	60 - 350	56 - 275	56 - 250	72 - 200	Cutting Oil
Alloy Steel	64 - 200	60 - 175	56 - 150	56 - 125	72 - 100	"
Stainless Steel	64 - 200	60 - 175	56 - 150	56 - 125	72 - 100	"
Steel Castings	64 - 200	60 - 175	44 - 150	44 - 125	60 - 100	"
Steel Forgings	64 - 450	60 - 350	56 - 275	56 - 250	72 - 200	"
Monel	64 - 200	60 - 175	56 - 150	56 - 125	72 - 100	"
Aluminum	64 - 2000	60 - 1750	44 - 1350	44 - 1250	60 - 950	Soluble Oil
Bronze	64 - 750	60 - 600	44 - 500	44 - 450	60 - 350	"
Yellow Brass	64 - 2500	60 - 2000	44 - 1600	44 - 1500	60 - 1100	"
Copper	64 - 1750	60 - 1350	44 - 1100	44 - 1000	60 - 750	"
Malleable Iron	64 - 350	60 - 250	56 - 200	56 - 200	72 - 150	"
Cast Iron	64 - 450	60 - 350	44 - 275	44 - 250	60 - 200	Dry
Die Castings	64 - 2500	60 - 2000	44 - 1600	44 - 1500	60 - 1100	"
Brittle Plastics	64 - 1000	60 - 900	56 - 700	56 - 650	72 - 500	"
Flexible Plastics	Use Set Teeth (Hub saw with maximum side clearance for very thin cuts)					

(There should be at least 2 teeth engaged in the cut.)

Increase Number of Teeth For:
- **Thin Material**
- **Thin Cuts (under .025")**
- **Slow Spindle Speeds**
- **Hard Material**
- **Sandy Castings**
- **Thin Castings**
- **Work Hardened**
- **Hard Spots**

Decrease Number of Teeth For:
- **Chip Clearance and Tooth Strength (Consider MSL & SMF type saws.)**
- **Deep Cuts (over 1/4")**
- **High Speeds**
- **Free Cutting Material**

FEEDS — will vary from .0002" to .002" per tooth. We suggest starting with the cutter described above and trying to arrive at the condition described under "Cutting Fluids" by varying the Feed and Speed. A straw color is the limit. The saw loses its temper when it starts turning blue.

CUTTING FLUIDS — (to cool, lubricate, and wash the chips away. Use Flood. Do not use Mist Units.)
Cutting Oil — Follow Manufacturer's Instructions - or - use a 4% sulphur homogenized cutting oil.
Soluble Oil — Follow Manufacturer's Instructions - or - use 40-1 solution of soluble oil — (Mix thoroughly in a 4 - 1 solution before adding to tank.) **Increase speed and feed until the lubricant starts to give off a slight vapor (smoke).** Frequently saws are run too slow, causing rubbing and premature wear.

DISH — (Side-Clearance or Hollow Grind) Increase it for stainless steel and tenacious metals such as copper, zinc, tin or lead.

MOUNTING OF SAWS — Breakage — Wobble — Rubbing: These problems may be caused by the way the washers are mounted on either side of the saw. — Washers drive the saw, in the absence of a driving key, and must always be clean, flat and bur-free. A speck of dirt will let the saw wobble and cut oversize. If a saw breaks, it may score the washers. Check marks around the saw hole for: Dirt, Shiny Spots (as small as a pinpoint, indicating chips imbedded under the washers), and Circular Skid Marks, which indicate the nut is not tight. — Thin saws should especially be supported by washers as large as possible. — Nut must be wrench-tight. — If the saw blade pauses momentarily in its rotation while the feed advances, it will break. — Washers must be of equal diameter or they will flex out the dish and cause one side of the teeth to rub.

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Morgan Advanced Materials

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Helpful Hints For Saw Users (H.S.S. Metal-Working Saws)

(Continued)

TEETH — Deep cuts and soft material require fewer teeth (for chip clearance) and stronger teeth (landed). — Thin material requires more teeth (at least 2 teeth engaged in cut). — Hard materials and narrow slots (under .025") likewise require more teeth. — Alternately beveled teeth keep chips from sticking in the cut and in the tooth gullets. — Rake Angles: On center for iron and steel, 5° negative for yellow brass, from 5° to 10° positive for other soft materials.

BREAKAGE — In addition to causes noted under "MOUNTING OF SAWS": Teeth break when starting a cut at too fast a feed, spindle bearings worn, drive belts loose or sheaves worn, indexing before saw has cleared the slot, work-piece not tight, or the saw is dull (even the best eventually wear out).

KEYWAYS — No keyways are furnished on saws under .020". Thin saws will warp in the heat treating and grinding processes. Locked up between good supporting washers, they will run true.

HUBS — will allow maximum side clearance when attempting to cut wood or plastics. They are helpful when spacing saws on an arbor.

RESHARPENING — In addition to grinding the tips of the teeth, all marks must be removed from the sides of the teeth. This can be done by grinding the diameter below the marks or, as we do, by grinding the tips and clean-up grinding the sides. Either way the thickness is reduced because of the hollow grind that is necessary for even the shallowest of cuts.

VIBRATION AND CHATTER — Arbor bent or worn undersize. — Work-piece improperly supported, particularly watch on thin material. — Teeth too coarse/fine. — Speed too slow. — Climb milling, "Up-milling" is preferred, but climb milling may help on small parts to keep them from being ripped from the clamping fixture. It may also reduce the bur. — Dull tool / Wrong clearance angles. — Feed too slow.

EXCESSIVE WEAR — Seizing: Not enough coolant in the right place. — Not enough side clearance. — Cutter speed too fast and feed too slow. The work may glaze and the saw will rub.

TOLERANCES — are expensive, don't over-specify.

STEELS — M-2 is the best if the set-up is proper. We do have available saws from M-42 along with various surface treatments such as Titanium Nitride.

SUGGESTION — If a saw is working well, send it to us and we will duplicate it. — If a saw is not working well, send us a used blade. We can some times make recommendations from the marks on the saw.

Helpful Hints For Saw Users

(Mica Undercutting Saws & V-Cutters)

COMMUTATOR UNDERCUTTING

After the commutator has been satisfactorily resurfaced, the mica insulation separating the copper segments must be undercut. Undercutting is one operation that is most easily accomplished with the armature removed from the machine. Various tools are available, however, that enable undercutting to be performed on a commutator "in place" without undue hardship.

Of the various undercutting practices used, only the two most common methods will be discussed herein.

There are three basic types of slots that can be produced by the use of circular cutters. The U-slot, the V-slot and the Compound-angle slot.

Continued Next Page

Helpful Hints For Saw Users

(Mica Undercutting Saws & V-Cutters) (Continued)

U-SLOT

The U-slot (as shown in Fig. 1) is generally preferred if the slots are accessible for easy cleaning. These slots have the advantage, if done carefully, of being effective until the commutator has worn down the full depth of the undercut. The slot should be cut to a depth of 1/32 (.032) inch, or not more than 3/64 (.046) inch. If cut too deep, accumulated dust will not be thrown out by the centrifugal action of the rotating commutator.

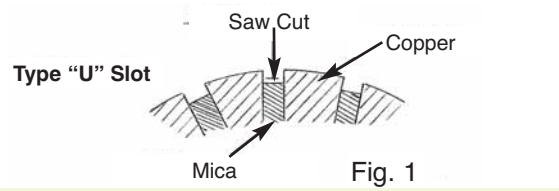


Fig. 1

When using a circular cutter, the width of the cutter is chosen to exceed slightly the thickness of the mica. It is recommended that the SAW THICKNESS be figured on the basis of the mica thickness plus .003" (.08mm). This will allow the saw to remove the full width of the mica pus .0015" (.04mm) of copper on each side of the mica slot. If unable to determine the mica width, the use of a feeler gauge can best determine the required saw thickness. Consequently, some copper is cut or dragged off the bar during undercutting, (as shown in Fig. 2).

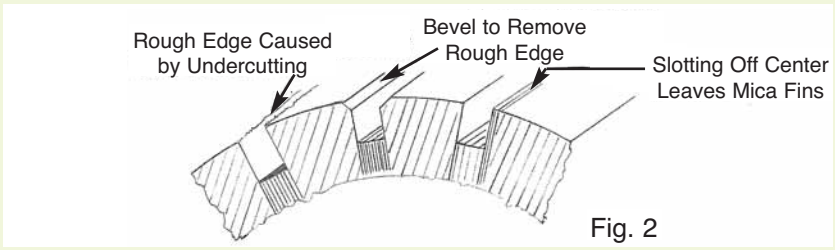


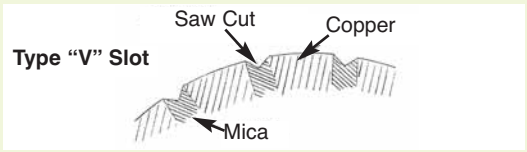
Fig. 2

In addition to leaving a jagged edge projecting from the commutator bar, the edge of the bar becomes somewhat work-hardened and hence will not wear down uniformly. Therefore, the edges of the bars must be chamfered by using a suitable slotting file or a specialty shaped scraper. ** See Morgan slotting scrapers. **

A chamfered face of approximately 1/64 inch is usually adequate to remove any roughness or edge hardening that could be disturbing to the brush faces.

V-SLOT

V-slots keep slots free from dust accumulations at low speeds, and do not require a separate operation for chamfering of the bar edges. V-slots are usually made with either a slotting file, or a "V" tooth circular cutter.
Usual practice is to use a circular cutter having an included angle between cutting edges such that a cut made 1/16 inch deep will also leave 1/32 inch free copper above the mica. The "V" tooth circular cutter are available with 40°, 50° or 60° angles between the cutting edges.



Continued Next Page

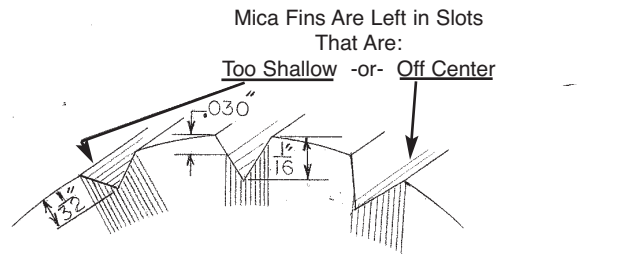
Helpful Hints For Saw Users

(Mica Undercutting Saws & V-Cutters) (Continued)

To obtain a 1/16 inch deep cut with 1/32 inch free copper above the mica, the following table may be used:

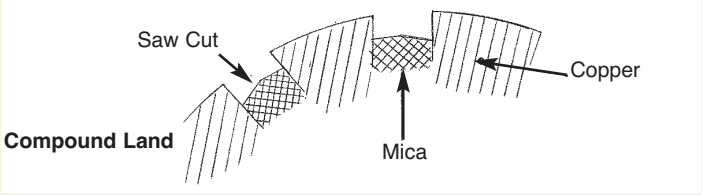
Thickness of Mica	Angle of "V"-cutter
.023 inch	40°
.029 inch	50°
.036 inch	60°

The necessity of accurately centering the circular cutter on the mica is readily apparent. Mica fins in V-slots being wedge-shaped, are more difficult to remove than the fins of uniform thickness left at the sides of U-slots by inaccurate centering of the circular cutter.



COMPOUND LAND

The teeth on the compound land mica saw are alternately ground to a special taper which reduces the impact on each individual tooth and produces chips of just slightly over half the width of the mica slot thereby eliminating the tendency to clog. When undercutting with a compound land saw the bottom of the slot will appear to be flat. However, as a result of the reverse taper on alternate teeth, the slot will have a slight pyramid or convex surface. This type of saw operates cooler and cleans better thereby prolonging the saw life with resulting economy to the user.



After a commutator has been undercut, it should be very carefully inspected to assure that all copper particles have been removed, that the bars have been carefully chamfered, and that all sharp edges and burs have been eliminated. Then each slot should be individually checked and reworked as necessary to remove any traces of fin or side mica.

Finally, the surface should be lightly polished with a fine-grain commutator stone. **A more popular method is the use of a rubber bond cleaning stone, which will properly finish the surface and leave the proper filming required.