

Aluminum

TuffCut[®] End Mills

Twister[®] Drills

Al

(<12.2% Si)

(>12.2% Si)

Non-ferrous

**NEW Sizes
Series 136
& 138**

**NEW
Metric Sizes
Series 135BN,
138B &
138BN**

 **M.A. FORD**
High Performance Cutting Tools

TuffCut® AL

Twister® AL

Celebrating

90 Years

1919 - 2009

M.A. Ford®

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Coatings Available

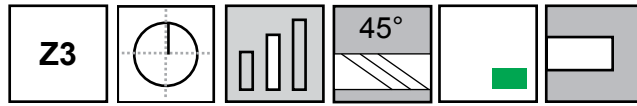
Fordlube - Titanium DiBoride (TiB₂)
 A unique coating with low Aluminum affinity, smooth surface finish and high hardness. It is ideal for Aluminum and Magnesium alloys as it prevents build-up on cutting edge, provides superior chip flow along with extended wear resistance.

Gem Coat - M.A. Ford's answer to diamond coated tooling. It has the hardness of diamond, excellent thermal stability and is excellent for milling graphite and aluminum. Tools may be refurbished and completely recoated! Call for details. Available upon Request.

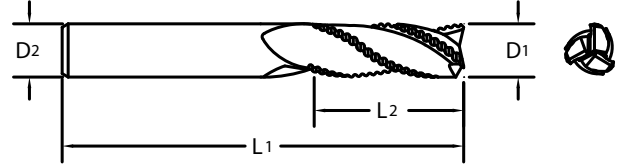
Coating Properties

| | Fordlube | Gem Coat |
|-------------------------|-------------------|-------------------|
| Micro Hardness (HV) | 4000 | 8000 |
| Max Working Temperature | 700° C 1292° F | 700° C 1292° F |
| Color | Light Gray | Black |

TuffCut® AL
Series 134



High helix 3 flute design ideal for rapid stock removal in aluminum alloys.



- Unique geometry.
- Improved chip flow and prevents chips from packing in flute.

| Tool No. | EDP | Diameter | | | Shank | | OAL | | Flute Length | |
|----------|-------|----------|------|---------|-------|------|-------|-----|--------------|------|
| | | D1 | | | D2 | | L1 | | L2 | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm |
| 13423620 | 13409 | | 6.0 | .2362 | | 6.0 | | 64 | | 20.0 |
| 13425000 | 13411 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 3/4 | |
| 13431500 | 13414 | | 8.0 | .3150 | | 8.0 | | 64 | | 20.0 |
| 13437500 | 13417 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 7/8 | |
| 13439370 | 13419 | | 10.0 | .3937 | | 10.0 | | 70 | | 25.0 |
| 13447240 | 13423 | | 12.0 | .4724 | | 12.0 | | 76 | | 25.0 |
| 13450000 | 13425 | 1/2 | | .5000 | 1/2 | | 3 | | 1 | |
| 13455120 | 95321 | | 14.0 | .5512 | | 14.0 | | 89 | | 30.0 |
| 13462990 | 13429 | | 16.0 | .6299 | | 16.0 | | 89 | | 30.0 |
| 13470870 | 13430 | | 18.0 | .7087 | | 18.0 | | 102 | | 35.0 |
| 13475000 | 13431 | 3/4 | | .7500 | 3/4 | | 4 | | 1-1/2 | |
| 13478740 | 13433 | | 20.0 | .7874 | | 20.0 | | 102 | | 38.0 |
| 13498430 | 13435 | | 25.0 | .9843 | | 25.0 | | 102 | | 50.0 |
| 13410000 | 13401 | 1 | | 1.0000 | 1 | | 4 | | 2 | |

| Inch | |
|-------|---------------|
| D1 | Tolerance |
| 1/4-1 | +0.000/-0.005 |

| Metric (mm) | |
|-------------|---------------|
| D1 | Tolerance |
| 6.00-25.00 | +0.000/-0.127 |

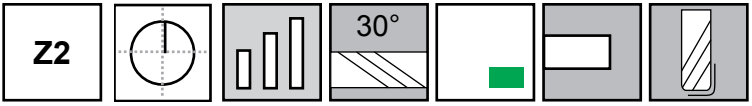
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ISO 9001:2000 Certified
An ESOP Company

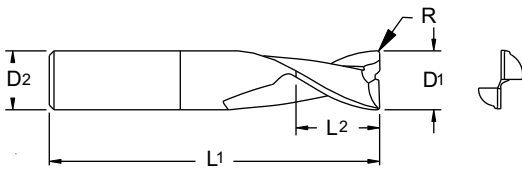
Safety Note
Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded. Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

For product information, call your local distributor.

TuffCut® AL Series 135



The geometry of M.A. Ford® 135 Series solid carbide end mill allows it to be run at extremely high chip loads surpassing the current market leaders.



- Extremely high chip loads - .040"/1mm per tooth and above.
- Performs equally well across a broad range of operating speeds.
- Zirconium coating also available.

| Tool No. | EDP | Diameter | | | Shank | | OAL | Flute Length | | Corner Radius | | |
|----------|-------|----------|------|---------|-------|------|-------|--------------|------|---------------|-------|------|
| | | D1 | | | D2 | | L1 | L2 | | R | | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13511810 | 13523 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 0.20 |
| 13515750 | 13533 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 0.20 |
| 13518750 | 13500 | 3/16 | | .1875 | 3/16 | | 2 | | 1/4 | | 0.008 | |
| 13518751 | 13513 | 3/16 | | .1875 | 3/16 | | 3 | | 1/4 | | 0.008 | |
| 13519680 | 13502 | | 5.0 | .1968 | | 5.0 | | 51 | | 6.0 | | 0.25 |
| 13523620 | 13504 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 0.30 |
| 13525000 | 13506 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 5/16 | | 0.011 | |
| 13525001 | 13514 | 1/4 | | .2500 | 1/4 | | 3-1/2 | | 5/16 | | 0.011 | |
| 13531500 | 13508 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 0.35 |
| 13537500 | 13510 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1/2 | | 0.015 | |
| 13537501 | 13511 | 3/8 | | .3750 | 3/8 | | 3 | | 1/2 | | 0.015 | |
| 13537502 | 13512 | 3/8 | | .3750 | 3/8 | | 4 | | 1/2 | | 0.015 | |
| 13539370 | 13515 | | 10.0 | .3937 | | 10.0 | | 70 | | 12.0 | | 0.50 |
| 13539371 | 13516 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 0.50 |
| 13539372 | 13517 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 0.50 |
| 13547240 | 13525 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 0.50 |
| 13547241 | 13526 | | 12.0 | .4724 | | 12.0 | | 102 | | 14.0 | | 0.50 |
| 13547242 | 13527 | | 12.0 | .4724 | | 12.0 | | 127 | | 14.0 | | 0.50 |
| 13550000 | 13520 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | | 0.020 | |
| 13550001 | 13521 | 1/2 | | .5000 | 1/2 | | 4 | | 5/8 | | 0.020 | |
| 13550002 | 13522 | 1/2 | | .5000 | 1/2 | | 5 | | 5/8 | | 0.020 | |
| 13555120 | 13552 | | 14.0 | .5512 | | 14.0 | | 89 | | 16.0 | | 0.50 |
| 13555121 | 13554 | | 14.0 | .5512 | | 14.0 | | 102 | | 16.0 | | 0.50 |
| 13555122 | 13573 | | 14.0 | .5512 | | 14.0 | | 127 | | 16.0 | | 0.50 |
| 13562500 | 13538 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 3/4 | | 0.025 | |
| 13562501 | 13539 | 5/8 | | .6250 | 5/8 | | 4-5/8 | | 3/4 | | 0.025 | |
| 13562502 | 13543 | 5/8 | | .6250 | 5/8 | | 5-1/4 | | 3/4 | | 0.025 | |
| 13562990 | 13535 | | 16.0 | .6299 | | 16.0 | | 89 | | 18.0 | | 0.75 |
| 13562991 | 13536 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 0.75 |
| 13562992 | 13537 | | 16.0 | .6299 | | 16.0 | | 133 | | 18.0 | | 0.75 |
| 13570870 | 13563 | | 18.0 | .7087 | | 18.0 | | 102 | | 20.0 | | 0.75 |
| 13570871 | 13568 | | 18.0 | .7087 | | 18.0 | | 127 | | 20.0 | | 0.75 |
| 13570872 | 13574 | | 18.0 | .7087 | | 18.0 | | 152 | | 20.0 | | 0.75 |
| 13575000 | 13530 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | | 0.030 | |

| Inch | |
|----------|---------------|
| D1 | Tolerance |
| 3/16-1/4 | +0.000/-0.002 |
| > 1/4-1 | +0.000/-0.003 |

| Metric (mm) | |
|--------------|---------------|
| D1 | Tolerance h10 |
| 3.00 | +0.00/-0.040 |
| >3.00-6.00 | +0.00/-0.048 |
| >6.00-10.00 | +0.00/-0.058 |
| >10.00-18.00 | +0.00/-0.070 |
| >18.00-25.00 | +0.00/-0.084 |

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Series 135 Continued

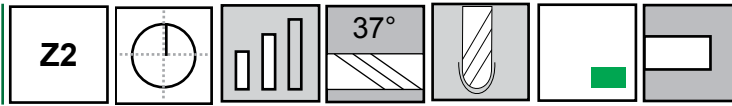
| Tool No. | EDP | Diameter | | | Shank | | OAL | | Flute Length | | Corner Radius | |
|----------|-------|----------|------|---------|-------|------|------|-----|--------------|------|---------------|------|
| | | D1 | | | D2 | | L1 | | L2 | | R | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13575001 | 13531 | 3/4 | | .7500 | 3/4 | | 5 | | 1 | | 0.030 | |
| 13575002 | 13532 | 3/4 | | .7500 | 3/4 | | 6 | | 1 | | 0.030 | |
| 13578740 | 13545 | | 20.0 | .7874 | | 20.0 | | 102 | | 22.0 | | 0.75 |
| 13578741 | 13546 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 0.75 |
| 13578742 | 13547 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 0.75 |
| 13598430 | 13555 | | 25.0 | .9843 | | 25.0 | | 102 | | 25.0 | | 0.75 |
| 13598431 | 13556 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 0.75 |
| 13598432 | 13557 | | 25.0 | .9843 | | 25.0 | | 152 | | 25.0 | | 0.75 |
| 13510000 | 13540 | 1 | | 1.0000 | 1 | | 4 | | 1-1/4 | | 0.045 | |
| 13510001 | 13541 | 1 | | 1.0000 | 1 | | 5 | | 1-1/4 | | 0.045 | |
| 13510002 | 13542 | 1 | | 1.0000 | 1 | | 6 | | 1-1/4 | | 0.045 | |

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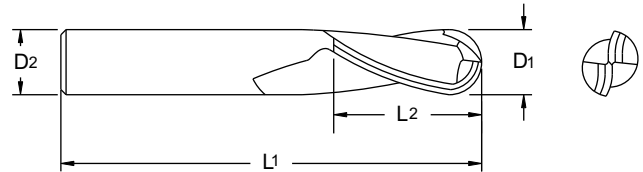


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TuffCut® AL
Series 135B



The geometry of M.A. Ford® 135 Series solid carbide end mill allows it to be run at extremely high chip loads surpassing the current market leaders.



- Performs equally well across a broad range of operating speeds.
- Zirconium coating also available.

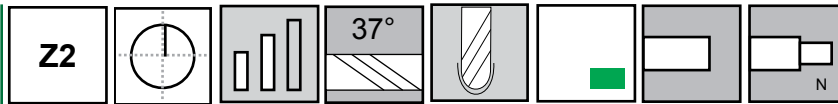
| Tool No. | EDP | Diameter | | Shank | OAL | Flute Length |
|-----------|-------|----------|---------|-------|-------|--------------|
| | | D1 | | D2 | L1 | L2 |
| | | Inch | Decimal | Inch | Inch | Inch |
| 135B12500 | 13440 | 1/8 | .1250 | 1/8 | 1-1/2 | 3/8 |
| 135B12501 | 13442 | 1/8 | .1250 | 1/8 | 2 | 1/2 |
| 135B18750 | 13444 | 3/16 | .1875 | 3/16 | 2 | 3/8 |
| 135B18751 | 13446 | 3/16 | .1875 | 3/16 | 2-1/2 | 5/8 |
| 135B25000 | 13448 | 1/4 | .2500 | 1/4 | 2-1/2 | 1/2 |
| 135B25001 | 13450 | 1/4 | .2500 | 1/4 | 2-1/2 | 3/4 |
| 135B31250 | 13452 | 5/16 | .3125 | 5/16 | 2-1/2 | 1/2 |
| 135B31251 | 13454 | 5/16 | .3125 | 5/16 | 2-1/2 | 13/16 |
| 135B37500 | 13456 | 3/8 | .3750 | 3/8 | 2-1/2 | 5/8 |
| 135B37501 | 13458 | 3/8 | .3750 | 3/8 | 2-1/2 | 1 |
| 135B43750 | 13460 | 7/16 | .4375 | 7/16 | 2-3/4 | 9/16 |
| 135B43751 | 13462 | 7/16 | .4375 | 7/16 | 2-3/4 | 1 |
| 135B50000 | 13464 | 1/2 | .5000 | 1/2 | 3 | 5/8 |
| 135B50001 | 13466 | 1/2 | .5000 | 1/2 | 3 | 1-1/4 |
| 135B50002 | 13468 | 1/2 | .5000 | 1/2 | 6 | 1-1/4 |
| 135B62500 | 13470 | 5/8 | .6250 | 5/8 | 3-1/2 | 1-1/4 |
| 135B62501 | 13472 | 5/8 | .6250 | 5/8 | 4 | 1-5/8 |
| 135B75000 | 13474 | 3/4 | .7500 | 3/4 | 4 | 1 |
| 135B75001 | 13476 | 3/4 | .7500 | 3/4 | 4 | 1-5/8 |
| 135B10000 | 13478 | 1 | 1.0000 | 1 | 4 | 1-1/2 |
| 135B10001 | 13480 | 1 | 1.0000 | 1 | 5 | 2-1/4 |

| Inch | |
|---------|--------------|
| D1 | Tolerance |
| 1/8-1/4 | +.000/- .002 |
| > 1/4-1 | +.000/- .003 |

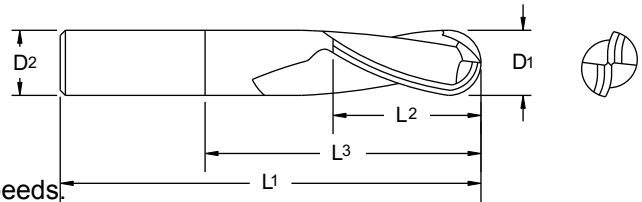
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**NEW
Sizes**

**TuffCut® AL
Series 135BN**



The geometry of M.A. Ford® 135 Series solid carbide end mill allows it to be run at extremely high chip loads surpassing the current market leaders.



- Performs equally well across a broad range of operating speeds.
- Zirconium coating also available.

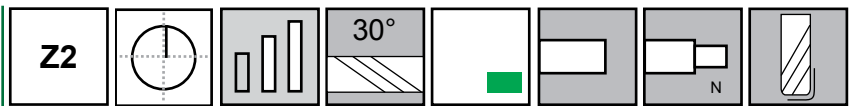
| Tool No. | EDP | Diameter | | | Shank | | OAL | | Flute Length | | Neck Length | |
|------------|-------|----------|------|---------|-------|------|------|-------|--------------|------|-------------|------|
| | | D1 | | | D2 | | L1 | | L2 | | L3 | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 135B0787N5 | 13252 | | 2.0 | .0787 | | 6.0 | | 75.0 | | 4.0 | | 12.0 |
| 135B1181N3 | 13236 | | 3.0 | .1181 | | 3.0 | | 38.0 | | 5.0 | | 11.0 |
| 135B1181N5 | 13254 | | 3.0 | .1181 | | 6.0 | | 75.0 | | 5.0 | | 17.0 |
| 135B1575N3 | 13238 | | 4.0 | .1575 | | 4.0 | | 51.0 | | 6.0 | | 14.0 |
| 135B1575N5 | 13256 | | 4.0 | .1575 | | 6.0 | | 75.0 | | 6.0 | | 22.0 |
| 135B1968N3 | 13240 | | 5.0 | .1968 | | 5.0 | | 64.0 | | 7.0 | | 17.0 |
| 135B1968N5 | 13258 | | 5.0 | .1968 | | 6.0 | | 75.0 | | 7.0 | | 27.0 |
| 135B2362N3 | 13242 | | 6.0 | .2362 | | 6.0 | | 64.0 | | 8.0 | | 20.0 |
| 135B2362N5 | 13260 | | 6.0 | .2362 | | 6.0 | | 110.0 | | 8.0 | | 32.0 |
| 135B25001N | 13482 | 1/4 | | .2500 | 1/4 | | 4 | | 3/4 | | 2-1/8 | |
| 135B31251N | 13484 | 5/16 | | .3125 | 5/16 | | 4 | | 13/16 | | 2-1/8 | |
| 135B3150N3 | 13244 | | 8.0 | .3150 | | 8.0 | | 64.0 | | 10.0 | | 26.0 |
| 135B3150N5 | 13262 | | 8.0 | .3150 | | 8.0 | | 110.0 | | 10.0 | | 42.0 |
| 135B37501N | 13486 | 3/8 | | .3750 | 3/8 | | 4 | | 1 | | 2-1/8 | |
| 135B3937N3 | 13246 | | 10.0 | .3937 | | 10.0 | | 70.0 | | 12.0 | | 32.0 |
| 135B3937N5 | 13264 | | 10.0 | .3937 | | 10.0 | | 110.0 | | 12.0 | | 52.0 |
| 135B4724N3 | 13248 | | 12.0 | .4724 | | 12.0 | | 76.0 | | 16.0 | | 38.0 |
| 135B4724N5 | 13266 | | 12.0 | .4724 | | 12.0 | | 120.0 | | 16.0 | | 62.0 |
| 135B50001N | 13488 | 1/2 | | .5000 | 1/2 | | 4 | | 1-1/4 | | 2-1/8 | |
| 135B62501N | 13490 | 5/8 | | .6250 | 5/8 | | 6 | | 1-5/8 | | 3-3/8 | |
| 135B6299N3 | 13250 | | 16.0 | .6299 | | 16.0 | | 89.0 | | 20.0 | | 50.0 |
| 135B6299N5 | 13268 | | 16.0 | .6299 | | 16.0 | | 130.0 | | 20.0 | | 82.0 |
| 135B75001N | 13492 | 3/4 | | .7500 | 3/4 | | 6 | | 1-5/8 | | 3-3/8 | |
| 135B10000N | 13494 | 1 | | 1.0000 | 1 | | 6 | | 1-1/2 | | 3-1/4 | |

| Inch | |
|---------|---------------|
| D1 | Tolerance |
| 1/4 | +0.000/-0.002 |
| > 1/4-1 | +0.000/-0.003 |

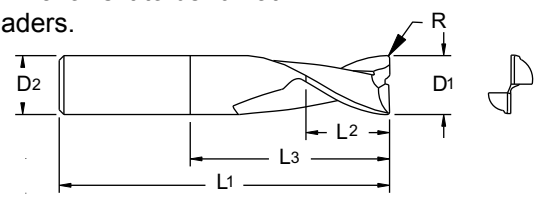
| Metric (mm) | |
|--------------|---------------|
| D1 | Tolerance h10 |
| 2.00-3.00 | +0.000/-0.040 |
| >3.00-6.00 | +0.000/-0.048 |
| >6.00-10.00 | +0.000/-0.058 |
| >10.00-16.00 | +0.000/-0.070 |

Technical information on page 23.

TuffCut® AL Series 135N



The geometry of M.A. Ford® 135 Series solid carbide end mill allows it to be run at extremely high chip loads surpassing the current market leaders.



| Necked | | Diameter | | | Shank | | OAL | | Flute Length | | Neck Length | | Corner Radius | |
|------------|-------|----------|-----|---------|-------|-----|-------|----|--------------|-----|-------------|----|---------------|------|
| Tool No. | EDP | D1 | | | D2 | | L1 | | L2 | | L3 | | R | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13511800N3 | 96620 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 11 | | |
| 13511800N5 | 96623 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 16 | | |
| 13511801N3 | 96621 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 11 | | 0.50 |
| 13511801N5 | 96624 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 16 | | 0.50 |
| 13511803N3 | 96622 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 11 | | 1.00 |
| 13511803N5 | 96625 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 16 | | 1.00 |
| 13511810N | 13524 | | 3.0 | .1181 | | 3.0 | | 38 | | 3.5 | | 11 | | 0.20 |
| 13515700N3 | 96626 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 14 | | |
| 13515700N5 | 96629 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 22 | | |
| 13515701N3 | 96627 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 14 | | 0.50 |
| 13515701N5 | 96630 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 22 | | 0.50 |
| 13515703N3 | 96628 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 14 | | 1.00 |
| 13515703N5 | 96631 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 22 | | 1.00 |
| 13515750N | 13534 | | 4.0 | .1575 | | 4.0 | | 51 | | 4.8 | | 22 | | 0.20 |
| 13518750N | 13501 | 3/16 | | .1875 | 3/16 | | 2 | | 1/4 | | 9/16 | | 0.008 | |
| 13518751N | 13518 | 3/16 | | .1875 | 3/16 | | 3 | | 1/4 | | 1-9/16 | | 0.008 | |
| 13519600N3 | 96632 | | 5.0 | .1968 | | 6.0 | | 64 | | 6.0 | | 17 | | |
| 13519600N5 | 96635 | | 5.0 | .1968 | | 6.0 | | 64 | | 6.0 | | 27 | | |
| 13519601N3 | 96633 | | 5.0 | .1968 | | 6.0 | | 64 | | 6.0 | | 17 | | 0.50 |
| 13519601N5 | 96636 | | 5.0 | .1968 | | 6.0 | | 64 | | 6.0 | | 27 | | 0.50 |
| 13519603N3 | 96634 | | 5.0 | .1968 | | 6.0 | | 64 | | 6.0 | | 17 | | 1.00 |
| 13519603N5 | 96637 | | 5.0 | .1968 | | 6.0 | | 64 | | 6.0 | | 27 | | 1.00 |
| 13519680N | 13503 | | 5.0 | .1968 | | 5.0 | | 51 | | 6.0 | | 22 | | 0.25 |
| 13523600N3 | 96638 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 20 | | |
| 13523600N5 | 96643 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 32 | | |
| 13523601N3 | 96639 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 20 | | 0.50 |
| 13523601N5 | 96644 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 32 | | 0.50 |
| 13523603N3 | 96640 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 20 | | 1.00 |
| 13523603N5 | 96645 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 32 | | 1.00 |
| 13523604N3 | 96641 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 20 | | 1.50 |
| 13523604N5 | 96646 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 32 | | 1.50 |
| 13523605N3 | 96642 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 20 | | 2.00 |
| 13523605N5 | 96647 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 32 | | 2.00 |
| 13523620N | 13505 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 26 | | 0.30 |
| 13525000N | 13507 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 5/16 | | 3/4 | | 0.011 | |
| 13525001N | 13519 | 1/4 | | .2500 | 1/4 | | 3-1/2 | | 5/16 | | 1-3/4 | | 0.011 | |
| 13531500N | 13509 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 0.35 |
| 13531500N3 | 96648 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | |
| 13531500N5 | 96654 | | 8.0 | .3150 | | 8.0 | | 75 | | 9.5 | | 42 | | |
| 13531501N3 | 96649 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 0.50 |
| 13531501N5 | 96655 | | 8.0 | .3150 | | 8.0 | | 75 | | 9.5 | | 42 | | 0.50 |
| 13531503N3 | 96650 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 1.00 |
| 13531503N5 | 96656 | | 8.0 | .3150 | | 8.0 | | 75 | | 9.5 | | 42 | | 1.00 |
| 13531504N3 | 96651 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 1.50 |

| Inch | |
|----------|---------------|
| D1 | Tolerance |
| 3/16-1/4 | +0.000/-0.002 |
| > 1/4-1 | +0.000/-0.003 |

| Metric (mm) | |
|--------------|---------------|
| D1 | Tolerance h10 |
| 3.00 | +0.000/-0.040 |
| >3.00-6.00 | +0.000/-0.048 |
| >6.00-10.00 | +0.000/-0.058 |
| >10.00-18.00 | +0.000/-0.070 |
| >18.00-25.00 | +0.000/-0.084 |

Technical information on page 21.

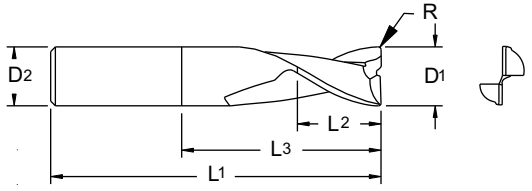
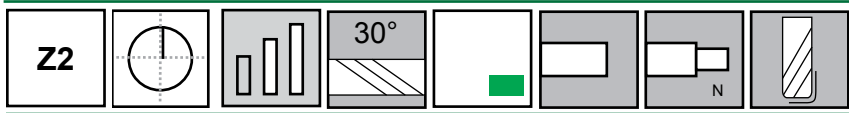
Series 135N Continued

| Necked | | Diameter | | | Shank | | OAL | | Flute Length | | Neck Length | | Corner Radius | |
|-------------|-------|----------|------|---------|-------|------|-------|-----|--------------|------|-------------|----|---------------|------|
| | | D1 | | | D2 | | L1 | | L2 | | L3 | | R | |
| Tool No. | EDP | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13531504N5 | 96657 | | 8.0 | .3150 | | 8.0 | | 75 | | 9.5 | | 42 | | 1.50 |
| 13531505N3 | 96652 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 2.00 |
| 13531505N5 | 96658 | | 8.0 | .3150 | | 8.0 | | 75 | | 9.5 | | 42 | | 2.00 |
| 13531507N3 | 96653 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 3.00 |
| 13531507N5 | 96659 | | 8.0 | .3150 | | 8.0 | | 75 | | 9.5 | | 42 | | 3.00 |
| 13537500N | 13560 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1/2 | | 7/8 | | 0.015 | |
| 13537501N | 13561 | 3/8 | | .3750 | 3/8 | | 3 | | 1/2 | | 1-3/8 | | 0.015 | |
| 13537502N | 13562 | 3/8 | | .3750 | 3/8 | | 4 | | 1/2 | | 2-3/8 | | 0.015 | |
| 13539300N3 | 96660 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | |
| 13539301N3 | 96661 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 0.50 |
| 13539301N5 | 96666 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 52 | | 0.50 |
| 13539303N3 | 96662 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 1.00 |
| 13539303N5 | 96667 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 52 | | 1.00 |
| 13539304N3 | 96663 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 1.50 |
| 13539304N5 | 96668 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 52 | | 1.50 |
| 13539305N3 | 96664 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 2.00 |
| 13539305N5 | 96669 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 52 | | 2.00 |
| 13539307N3 | 96665 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 3.00 |
| 13539307N5 | 96670 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 52 | | 3.00 |
| 13539370N | 13565 | | 10.0 | .3937 | | 10.0 | | 70 | | 12.0 | | 28 | | 0.50 |
| 13539371N | 13566 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 0.50 |
| 13539372N | 13567 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 47 | | 0.50 |
| 13547200N3 | 96671 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | |
| 135472011N3 | 96721 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 5.00 |
| 135472011N5 | 96723 | | 12.0 | .4724 | | 12.0 | | 110 | | 14.0 | | 62 | | 5.00 |
| 13547201N3 | 96672 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 0.50 |
| 13547201N5 | 96678 | | 12.0 | .4724 | | 12.0 | | 110 | | 14.0 | | 62 | | 0.50 |
| 13547203N3 | 96673 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 1.00 |
| 13547203N5 | 96679 | | 12.0 | .4724 | | 12.0 | | 110 | | 14.0 | | 62 | | 1.00 |
| 13547204N3 | 96674 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 1.50 |
| 13547204N5 | 96680 | | 12.0 | .4724 | | 12.0 | | 110 | | 14.0 | | 62 | | 1.50 |
| 13547205N3 | 96675 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 2.00 |
| 13547205N5 | 96681 | | 12.0 | .4724 | | 12.0 | | 110 | | 14.0 | | 62 | | 2.00 |
| 13547207N3 | 96676 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 3.00 |
| 13547207N5 | 96682 | | 12.0 | .4724 | | 12.0 | | 110 | | 14.0 | | 62 | | 3.00 |
| 13547209N3 | 96677 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 38 | | 4.00 |
| 13547209N5 | 96683 | | 12.0 | .4724 | | 12.0 | | 110 | | 15.0 | | 62 | | 4.00 |
| 13547240N | 13575 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 28 | | 0.50 |
| 13547241N | 13576 | | 12.0 | .4724 | | 12.0 | | 102 | | 14.0 | | 54 | | 0.50 |
| 13547242N | 13577 | | 12.0 | .4724 | | 12.0 | | 127 | | 14.0 | | 79 | | 0.50 |
| 13550000N | 13570 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | | 1-1/8 | | 0.020 | |
| 13550001N | 13571 | 1/2 | | .5000 | 1/2 | | 4 | | 5/8 | | 2-1/8 | | 0.020 | |
| 13550002N | 13572 | 1/2 | | .5000 | 1/2 | | 5 | | 5/8 | | 3-1/8 | | 0.020 | |
| 13555120N | 13553 | | 14.0 | .5512 | | 14.0 | | 89 | | 16.0 | | 42 | | 0.50 |
| 13555121N | 13558 | | 14.0 | .5512 | | 14.0 | | 102 | | 16.0 | | 55 | | 0.50 |
| 13555122N | 13559 | | 14.0 | .5512 | | 14.0 | | 127 | | 16.0 | | 80 | | 0.50 |
| 13562500N | 13544 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 3/4 | | 1-1/2 | | 0.025 | |
| 13562501N | 13548 | 5/8 | | .6250 | 5/8 | | 4-5/8 | | 3/4 | | 2-1/2 | | 0.025 | |
| 13562502N | 13549 | 5/8 | | .6250 | 5/8 | | 5-1/4 | | 3/4 | | 3-1/2 | | 0.025 | |
| 13562900N3 | 96684 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | |
| 13562901N3 | 96685 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | 0.50 |
| 13562901N5 | 96691 | | 16.0 | .6299 | | 16.0 | | 127 | | 18.0 | | 85 | | 0.50 |
| 13562903N3 | 96686 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | 1.00 |
| 13562903N5 | 96692 | | 16.0 | .6299 | | 16.0 | | 127 | | 18.0 | | 85 | | 1.00 |
| 13562904N3 | 96687 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | 1.50 |
| 13562904N5 | 96693 | | 16.0 | .6299 | | 16.0 | | 127 | | 18.0 | | 85 | | 1.50 |

Technical information on page 21.

For product information, call your local distributor.

Series 135N Continued

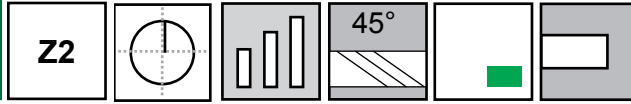


| Necked | | Diameter | | | Shank | | OAL | | Flute Length | | Neck Length | | Corner Radius | |
|-------------|-------|----------|------|---------|-------|------|------|-----|--------------|------|-------------|-----|---------------|------|
| Tool No. | EDP | D1 | | | D2 | | L1 | | L2 | | L3 | | R | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13562905N3 | 96688 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | 2.00 |
| 13562905N5 | 96694 | | 16.0 | .6299 | | 16.0 | | 127 | | 18.0 | | 85 | | 2.00 |
| 13562907N3 | 96689 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | 3.00 |
| 13562907N5 | 96695 | | 16.0 | .6299 | | 16.0 | | 127 | | 18.0 | | 85 | | 3.00 |
| 13562909N3 | 96690 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 53 | | 4.00 |
| 13562909N5 | 96696 | | 16.0 | .6299 | | 16.0 | | 127 | | 18.0 | | 85 | | 4.00 |
| 13562990N | 13585 | | 16.0 | .6299 | | 16.0 | | 89 | | 18.0 | | 39 | | 0.75 |
| 13562991N | 13586 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 83 | | 0.75 |
| 13562992N | 13587 | | 16.0 | .6299 | | 16.0 | | 133 | | 18.0 | | 99 | | 0.75 |
| 13570870N | 13564 | | 18.0 | .7087 | | 18.0 | | 102 | | 20.0 | | 52 | | 0.75 |
| 13570871N | 13569 | | 18.0 | .7087 | | 18.0 | | 127 | | 20.0 | | 77 | | 0.75 |
| 13570872N | 13578 | | 18.0 | .7087 | | 18.0 | | 152 | | 20.0 | | 102 | | 0.75 |
| 13575000N | 13580 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | | 1-7/8 | | 0.030 | |
| 13575001N | 13581 | 3/4 | | .7500 | 3/4 | | 5 | | 1 | | 2-7/8 | | 0.030 | |
| 13575002N | 13582 | 3/4 | | .7500 | 3/4 | | 6 | | 1 | | 3-7/8 | | 0.030 | |
| 135787011N3 | 96722 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 5.00 |
| 135787011N5 | 96724 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 5.00 |
| 13578701N3 | 96697 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 0.50 |
| 13578701N5 | 96703 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 0.50 |
| 13578703N3 | 96698 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 1.00 |
| 13578703N5 | 96704 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 1.00 |
| 13578704N3 | 96699 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 1.50 |
| 13578704N5 | 96705 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 1.50 |
| 13578705N3 | 96700 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 2.00 |
| 13578705N5 | 96706 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 2.00 |
| 13578707N3 | 96701 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 3.00 |
| 13578707N5 | 96707 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 3.00 |
| 13578709N3 | 96702 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 65 | | 4.00 |
| 13578709N5 | 96708 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 105 | | 4.00 |
| 13578740N | 13594 | | 20.0 | .7874 | | 20.0 | | 102 | | 22.0 | | 50 | | 0.75 |
| 13578741N | 13595 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 75 | | 0.75 |
| 13578742N | 13596 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 100 | | 0.75 |
| 13598401N3 | 96709 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 80 | | 0.50 |
| 13598401N5 | 96715 | | 25.0 | .9843 | | 25.0 | | 180 | | 25.0 | | 130 | | 0.50 |
| 13598403N3 | 96710 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 80 | | 1.00 |
| 13598403N5 | 96716 | | 25.0 | .9843 | | 25.0 | | 180 | | 25.0 | | 130 | | 1.00 |
| 13598404N3 | 96711 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 80 | | 1.50 |
| 13598404N5 | 96717 | | 25.0 | .9843 | | 25.0 | | 180 | | 25.0 | | 130 | | 1.50 |
| 13598405N3 | 96712 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 80 | | 2.00 |
| 13598405N5 | 96718 | | 25.0 | .9843 | | 25.0 | | 180 | | 25.0 | | 130 | | 2.00 |
| 13598407N3 | 96713 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 80 | | 3.00 |
| 13598407N5 | 96719 | | 25.0 | .9843 | | 25.0 | | 180 | | 25.0 | | 130 | | 3.00 |
| 13598409N3 | 96714 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 80 | | 4.00 |
| 13598409N5 | 96720 | | 25.0 | .9843 | | 25.0 | | 180 | | 25.0 | | 130 | | 4.00 |
| 13598430N | 13597 | | 25.0 | .9843 | | 25.0 | | 102 | | 25.0 | | 36 | | 0.75 |
| 13598431N | 13598 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 61 | | 0.75 |
| 13598432N | 13599 | | 25.0 | .9843 | | 25.0 | | 152 | | 25.0 | | 86 | | 0.75 |
| 13510000N | 13590 | 1 | | 1.0000 | 1 | | 4 | | 1-1/4 | | 1-5/8 | | 0.045 | |
| 13510001N | 13591 | 1 | | 1.0000 | 1 | | 5 | | 1-1/4 | | 2-5/8 | | 0.045 | |
| 13510002N | 13592 | 1 | | 1.0000 | 1 | | 6 | | 1-1/4 | | 3-5/8 | | 0.045 | |

Technical information on page 21.

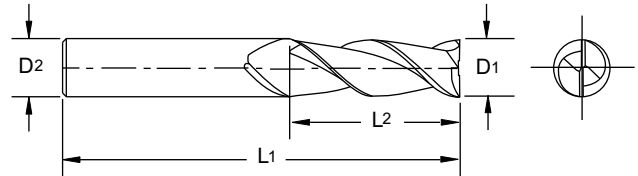
**NEW
Sizes**

**TuffCut® AL
Series 136**



High performance aluminum finisher out performs competitors.

- Available with corner radius upon request. Call customer service for radius pricing.



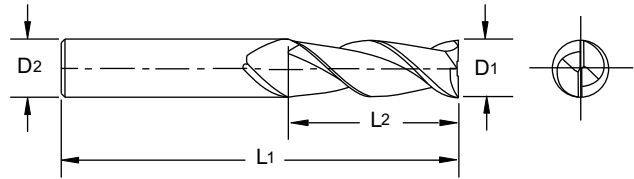
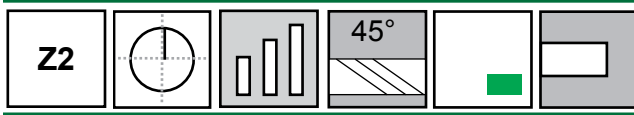
| Tool No. | EDP | Diameter | | | Shank | | OAL | | Flute Length | |
|----------|-------|----------|-----|---------|-------|-----|--------|----|--------------|------|
| | | D1 | | | D2 | | L1 | | L2 | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm |
| 13611810 | 13600 | | 3.0 | .1181 | | 6.0 | | 52 | | 8.0 |
| 13612500 | 13641 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 1/4 | |
| 13612501 | 13642 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 1/2 | |
| 13612502 | 13643 | 1/8 | | .1250 | 1/8 | | 2-1/2 | | 1 | |
| 13612503 | 13671 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 3/8 | |
| 13612504 | 13672 | 1/8 | | .1250 | 1/8 | | 2 | | 3/4 | |
| 13615620 | 13673 | 5/32 | | .1562 | 5/32 | | 2 | | 5/16 | |
| 13615621 | 13674 | 5/32 | | .1562 | 5/32 | | 2 | | 9/16 | |
| 13615750 | 13602 | | 4.0 | .1575 | | 6.0 | | 55 | | 11.0 |
| 13618750 | 13644 | 3/16 | | .1875 | 3/16 | | 2 | | 5/16 | |
| 13618751 | 13646 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 5/8 | |
| 13618752 | 13647 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 1 | |
| 13618753 | 13675 | 3/16 | | .1875 | 3/16 | | 2 | | 3/8 | |
| 13618754 | 13676 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 3/4 | |
| 13619680 | 13605 | | 5.0 | .1968 | | 6.0 | | 58 | | 13.0 |
| 13623620 | 13610 | | 6.0 | .2362 | | 6.0 | | 58 | | 13.0 |
| 13625000 | 13640 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 3/4 | |
| 13625001 | 13648 | 1/4 | | .2500 | 1/4 | | 3-1/16 | | 1-1/4 | |
| 13625002 | 13649 | 1/4 | | .2500 | 1/4 | | 3-9/16 | | 1-3/4 | |
| 13625003 | 13678 | 1/4 | | .2500 | 1/4 | | 2 | | 3/8 | |
| 13625004 | 13679 | 1/4 | | .2500 | 1/4 | | 2 | | 1/2 | |
| 13625005 | 13680 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 5/8 | |
| 13625006 | 13681 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 1 | |
| 13625007 | 13682 | 1/4 | | .2500 | 1/4 | | 3 | | 1-1/2 | |
| 13625008 | 13683 | 1/4 | | .2500 | 1/4 | | 4 | | 2 | |
| 13631250 | 13651 | 5/16 | | .3125 | 5/16 | | 2 | | 1/2 | |
| 13631251 | 13652 | 5/16 | | .3125 | 5/16 | | 3-1/8 | | 1-3/8 | |
| 13631252 | 13653 | 5/16 | | .3125 | 5/16 | | 3-1/4 | | 1-3/4 | |
| 13631253 | 13684 | 5/16 | | .3125 | 5/16 | | 2 | | 7/16 | |
| 13631254 | 13685 | 5/16 | | .3125 | 5/16 | | 2-1/2 | | 13/16 | |
| 13631500 | 13615 | | 8.0 | .3150 | | 8.0 | | 64 | | 19.0 |
| 13637500 | 13645 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 3/4 | |
| 13637501 | 13654 | 3/8 | | .3750 | 3/8 | | 3-1/4 | | 1-1/2 | |
| 13637502 | 13660 | 3/8 | | .3750 | 3/8 | | 4-1/4 | | 2-1/2 | |
| 13637503 | 13686 | 3/8 | | .3750 | 3/8 | | 2 | | 1/2 | |
| 13637504 | 13687 | 3/8 | | .3750 | 3/8 | | 2 | | 5/8 | |
| 13637505 | 13688 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1 | |
| 13637506 | 13689 | 3/8 | | .3750 | 3/8 | | 3 | | 1-1/4 | |

| Inch | |
|----------|---------------|
| D1 | Tolerance |
| 1/8-1/4 | + .000/- .002 |
| >1/4-1.0 | + .000/- .003 |

| Metric (mm) | |
|--------------|---------------|
| D1 | Tolerance h10 |
| 3.00 | + .000/- .040 |
| >3.00-6.00 | + .000/- .048 |
| >6.00-10.00 | + .000/- .058 |
| >10.00-18.00 | + .000/- .070 |
| >18.00-20.00 | + .000/- .084 |

Technical information on page 22.

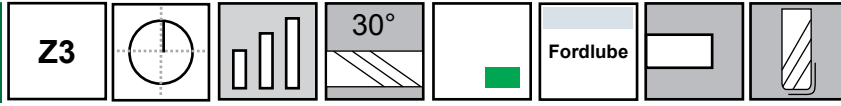
Series 136 Continued



| Tool No. | EDP | Diameter | | | Shank | | OAL | | Flute Length | |
|----------|-------|----------|------|---------|-------|------|-------|-----|--------------|------|
| | | D1 | | | D2 | | L1 | | L2 | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm |
| 13637507 | 13690 | 3/8 | | .3750 | 3/8 | | 4 | | 2 | |
| 13639370 | 13620 | | 10.0 | .3937 | | 10.0 | | 70 | | 22.0 |
| 13647240 | 13625 | | 12.0 | .4724 | | 12.0 | | 84 | | 26.0 |
| 13650000 | 13650 | 1/2 | | .5000 | 1/2 | | 3-1/2 | | 1-1/4 | |
| 13650001 | 13661 | 1/2 | | .5000 | 1/2 | | 4 | | 2 | |
| 13650002 | 13662 | 1/2 | | .5000 | 1/2 | | 5 | | 3 | |
| 13650003 | 13691 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | |
| 13650004 | 13692 | 1/2 | | .5000 | 1/2 | | 3 | | 3/4 | |
| 13650005 | 13693 | 1/2 | | .5000 | 1/2 | | 3 | | 1 | |
| 13650006 | 13694 | 1/2 | | .5000 | 1/2 | | 4 | | 1-1/2 | |
| 13650007 | 13695 | 1/2 | | .5000 | 1/2 | | 5 | | 2-1/2 | |
| 13655120 | 13626 | | 14.0 | .5512 | | 14.0 | | 84 | | 26.0 |
| 13662500 | 13663 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 3/4 | |
| 13662501 | 13664 | 5/8 | | .6250 | 5/8 | | 3-3/4 | | 1-5/8 | |
| 13662502 | 13665 | 5/8 | | .6250 | 5/8 | | 4-5/8 | | 2-1/2 | |
| 13662503 | 13696 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 1-1/4 | |
| 13662504 | 13697 | 5/8 | | .6250 | 5/8 | | 5 | | 2 | |
| 13662990 | 13630 | | 16.0 | .6299 | | 16.0 | | 89 | | 32.0 |
| 13670870 | 13631 | | 18.0 | .7087 | | 18.0 | | 92 | | 32.0 |
| 13675000 | 13655 | 3/4 | | .7500 | 3/4 | | 4 | | 1-5/8 | |
| 13675001 | 13666 | 3/4 | | .7500 | 3/4 | | 5-1/4 | | 3 | |
| 13675002 | 13667 | 3/4 | | .7500 | 3/4 | | 6-1/4 | | 4 | |
| 13675003 | 13698 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | |
| 13675004 | 13699 | 3/4 | | .7500 | 3/4 | | 5 | | 2 | |
| 13675005 | 13601 | 3/4 | | .7500 | 3/4 | | 5 | | 2-1/2 | |
| 13678740 | 13635 | | 20.0 | .7874 | | 20.0 | | 102 | | 38.0 |
| 13610000 | 13668 | 1 | | 1.0000 | 1 | | 4 | | 1-1/4 | |
| 13610001 | 13669 | 1 | | 1.0000 | 1 | | 4-1/2 | | 2 | |
| 13610002 | 13670 | 1 | | 1.0000 | 1 | | 6-1/2 | | 4 | |
| 13610003 | 13603 | 1 | | 1.0000 | 1 | | 6 | | 3 | |
| 13610004 | 13604 | 1 | | 1.0000 | 1 | | 8 | | 5-1/2 | |

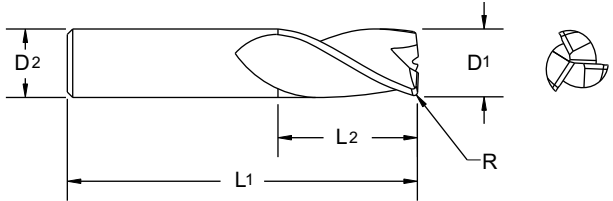
Technical information on page 22.

TuffCut® X-AL
Series 137



High performance aluminum rougher.

- Gem coating available upon request.



| Uncoated | | Fordlube* | | Diameter | | | Shank | | OAL | | Flute Length | | Corner Radius | |
|----------|-------|-----------|-------|----------|------|---------|-------|------|-------|-----|--------------|------|---------------|------|
| Tool No. | EDP | Tool No. | EDP | D1 | | | D2 | | L1 | | L2 | | R | |
| | | | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13718750 | 13700 | 13718750F | 14346 | 3/16 | | .1875 | 3/16 | | 2 | | 1/4 | | 0.008 | |
| 13718751 | 14415 | 13718751F | 14347 | 3/16 | | .1875 | 3/16 | | 3 | | 1/4 | | 0.008 | |
| 13719680 | 13701 | 13719680F | 14348 | | 5.0 | .1968 | | 5.0 | | 51 | | 6.0 | | 0.25 |
| 13723620 | 13702 | 13723620F | 14349 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 0.30 |
| 13725000 | 13703 | 13725000F | 14350 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 5/16 | | 0.011 | |
| 13725001 | 14416 | 13725001F | 14351 | 1/4 | | .2500 | 1/4 | | 3-1/2 | | 5/16 | | 0.011 | |
| 13731500 | 13704 | 13731500F | 14352 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 0.35 |
| 13737500 | 13705 | 13737500F | 14353 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1/2 | | 0.015 | |
| 13737501 | 13706 | 13737501F | 14354 | 3/8 | | .3750 | 3/8 | | 3 | | 1/2 | | 0.015 | |
| 13737502 | 13707 | 13737502F | 14355 | 3/8 | | .3750 | 3/8 | | 4 | | 1/2 | | 0.015 | |
| 13739370 | 13708 | 13739370F | 14356 | | 10.0 | .3937 | | 10.0 | | 70 | | 12.0 | | 0.50 |
| 13739371 | 13709 | 13739371F | 14357 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 0.50 |
| 13739372 | 13710 | 13739372F | 14358 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 0.50 |
| 13747240 | 13711 | 13747240F | 14414 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 0.50 |
| 13747241 | 13712 | 13747241F | 14360 | | 12.0 | .4724 | | 12.0 | | 102 | | 14.0 | | 0.50 |
| 13747242 | 13713 | 13747242F | 14361 | | 12.0 | .4724 | | 12.0 | | 127 | | 14.0 | | 0.50 |
| 13750000 | 13714 | 13750000F | 14362 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | | 0.020 | |
| 13750001 | 13715 | 13750001F | 14363 | 1/2 | | .5000 | 1/2 | | 4 | | 5/8 | | 0.020 | |
| 13750002 | 13716 | 13750002F | 14364 | 1/2 | | .5000 | 1/2 | | 5 | | 5/8 | | 0.020 | |
| 13762500 | 14417 | 13762500F | 14429 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 3/4 | | 0.025 | |
| 13762501 | 14418 | 13762501F | 14430 | 5/8 | | .6250 | 5/8 | | 4-5/8 | | 3/4 | | 0.025 | |
| 13762502 | 14419 | 13762502F | 14431 | 5/8 | | .6250 | 5/8 | | 5-1/4 | | 3/4 | | 0.025 | |
| 13762990 | 13717 | 13762990F | 14365 | | 16.0 | .6299 | | 16.0 | | 89 | | 18.0 | | 0.75 |
| 13762991 | 13718 | 13762991F | 14366 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 0.75 |
| 13762992 | 13719 | 13762992F | 14367 | | 16.0 | .6299 | | 16.0 | | 133 | | 18.0 | | 0.75 |
| 13775000 | 13720 | 13775000F | 14368 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | | 0.030 | |
| 13775001 | 13721 | 13775001F | 14369 | 3/4 | | .7500 | 3/4 | | 5 | | 1 | | 0.030 | |
| 13775002 | 13722 | 13775002F | 14370 | 3/4 | | .7500 | 3/4 | | 6 | | 1 | | 0.030 | |
| 13778740 | 13723 | 13778740F | 14371 | | 20.0 | .7874 | | 20.0 | | 102 | | 22.0 | | 0.75 |
| 13778741 | 13724 | 13778741F | 14372 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 0.75 |
| 13778742 | 13725 | 13778742F | 14373 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 0.75 |
| 13798430 | 13726 | 13798430F | 14374 | | 25.0 | .9843 | | 25.0 | | 102 | | 25.0 | | 0.75 |
| 13798431 | 13727 | 13798431F | 14375 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 0.75 |
| 13798432 | 13728 | 13798432F | 14376 | | 25.0 | .9843 | | 25.0 | | 152 | | 25.0 | | 0.75 |
| 13710000 | 13729 | 13710000F | 14377 | 1 | | 1.0000 | 1 | | 4 | | 1-1/4 | | 0.045 | |
| 13710001 | 13730 | 13710001F | 14378 | 1 | | 1.0000 | 1 | | 5 | | 1-1/4 | | 0.045 | |
| 13710002 | 13731 | 13710002F | 14379 | 1 | | 1.0000 | 1 | | 6 | | 1-1/4 | | 0.045 | |

| Inch | |
|----------|---------------|
| D1 | Tolerance |
| 3/16-1/4 | +0.000/-0.002 |
| > 1/4-1 | +0.000/-0.003 |

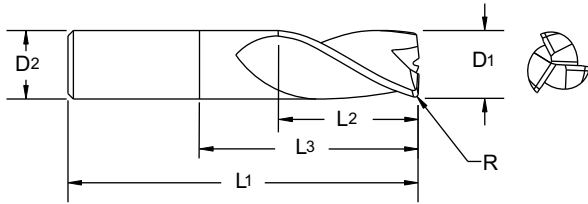
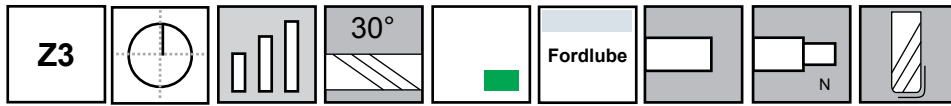
| Metric (mm) | |
|--------------|---------------|
| D1 | Tolerance h10 |
| 5.00-6.00 | +0.000/-0.048 |
| >6.00-10.00 | +0.000/-0.058 |
| >10.00-18.00 | +0.000/-0.070 |
| >18.00-25.00 | +0.000/-0.084 |

*Allow 2 weeks to ship non-stock items.

Technical information on page 21.

For product information, call your local distributor.

TuffCut® X-AL Series 137N



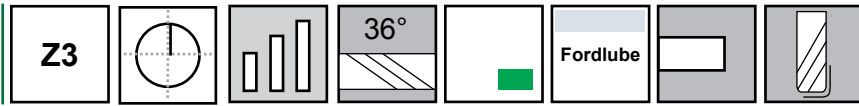
Technical information on page 21.

| Necked Uncoated | | Necked Fordlube* | | Diameter | | | Shank | | OAL | | Flute Length | | Neck Length | | Corner Radius | |
|-----------------|-------|------------------|-------|----------|------|---------|-------|------|-------|-----|--------------|------|-------------|-----|---------------|------|
| Tool No. | EDP | Tool No. | EDP | D1 | | | D2 | | L1 | | L2 | | L3 | | R | |
| | | | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13718750N | 13732 | 13718750NF | 14380 | 3/16 | | .1875 | 3/16 | | 2 | | 1/4 | | 9/16 | | 0.008 | |
| 13718751N | 13733 | 13718751NF | 14381 | 3/16 | | .1875 | 3/16 | | 3 | | 1/4 | | 1-9/16 | | 0.008 | |
| 13719680N | 13734 | 13719680NF | 14382 | | 5.0 | .1968 | | 5.0 | | 51 | | 6.0 | | 22 | | 0.25 |
| 13723620N | 13735 | 13723620NF | 14383 | | 6.0 | .2362 | | 6.0 | | 64 | | 7.0 | | 26 | | 0.30 |
| 13725000N | 13736 | 13725000NF | 14384 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 5/16 | | 3/4 | | 0.011 | |
| 13725001N | 13737 | 13725001NF | 14385 | 1/4 | | .2500 | 1/4 | | 3-1/2 | | 5/16 | | 1-3/4 | | 0.011 | |
| 13731500N | 13738 | 13731500NF | 14386 | | 8.0 | .3150 | | 8.0 | | 64 | | 9.5 | | 26 | | 0.35 |
| 13737500N | 13739 | 13737500NF | 14387 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1/2 | | 7/8 | | 0.015 | |
| 13737501N | 13740 | 13737501NF | 14388 | 3/8 | | .3750 | 3/8 | | 3 | | 1/2 | | 1-3/8 | | 0.015 | |
| 13737502N | 13741 | 13737502NF | 14389 | 3/8 | | .3750 | 3/8 | | 4 | | 1/2 | | 2-3/8 | | 0.015 | |
| 13739370N | 13742 | 13739370NF | 14390 | | 10.0 | .3937 | | 10.0 | | 70 | | 12.0 | | 28 | | 0.50 |
| 13739371N | 13743 | 13739371NF | 14391 | | 10.0 | .3937 | | 10.0 | | 76 | | 12.0 | | 34 | | 0.50 |
| 13739372N | 13744 | 13739372NF | 14392 | | 10.0 | .3937 | | 10.0 | | 89 | | 12.0 | | 47 | | 0.50 |
| 13747240N | 13745 | 13747240NF | 14393 | | 12.0 | .4724 | | 12.0 | | 76 | | 14.0 | | 28 | | 0.50 |
| 13747241N | 13746 | 13747241NF | 14394 | | 12.0 | .4724 | | 12.0 | | 102 | | 14.0 | | 54 | | 0.50 |
| 13747242N | 13747 | 13747242NF | 14395 | | 12.0 | .4724 | | 12.0 | | 127 | | 14.0 | | 79 | | 0.50 |
| 13750000N | 13748 | 13750000NF | 14396 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | | 1-1/8 | | 0.020 | |
| 13750001N | 13749 | 13750001NF | 14397 | 1/2 | | .5000 | 1/2 | | 4 | | 5/8 | | 2-1/8 | | 0.020 | |
| 13750002N | 13750 | 13750002NF | 14398 | 1/2 | | .5000 | 1/2 | | 5 | | 5/8 | | 3-1/8 | | 0.020 | |
| 13762500N | 14420 | 13762500NF | 14432 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 3/4 | | 1-1/2 | | 0.025 | |
| 13762501N | 14421 | 13762501NF | 14433 | 5/8 | | .6250 | 5/8 | | 4-5/8 | | 3/4 | | 2-1/2 | | 0.025 | |
| 13762502N | 14422 | 13762502NF | 14434 | 5/8 | | .6250 | 5/8 | | 5-1/4 | | 3/4 | | 3-1/2 | | 0.025 | |
| 13762990N | 13751 | 13762990NF | 14399 | | 16.0 | .6299 | | 16.0 | | 89 | | 18.0 | | 39 | | 0.75 |
| 13762991N | 13752 | 13762991NF | 14400 | | 16.0 | .6299 | | 16.0 | | 117 | | 18.0 | | 83 | | 0.75 |
| 13762992N | 13753 | 13762992NF | 14401 | | 16.0 | .6299 | | 16.0 | | 133 | | 18.0 | | 99 | | 0.75 |
| 13775000N | 13754 | 13775000NF | 14402 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | | 1-7/8 | | 0.030 | |
| 13775001N | 13755 | 13775001NF | 14403 | 3/4 | | .7500 | 3/4 | | 5 | | 1 | | 2-7/8 | | 0.030 | |
| 13775002N | 13756 | 13775002NF | 14404 | 3/4 | | .7500 | 3/4 | | 6 | | 1 | | 3-7/8 | | 0.030 | |
| 13778740N | 13757 | 13778740NF | 14405 | | 20.0 | .7874 | | 20.0 | | 102 | | 22.0 | | 50 | | 0.75 |
| 13778741N | 13758 | 13778741NF | 14406 | | 20.0 | .7874 | | 20.0 | | 127 | | 22.0 | | 75 | | 0.75 |
| 13778742N | 13759 | 13778742NF | 14407 | | 20.0 | .7874 | | 20.0 | | 152 | | 22.0 | | 100 | | 0.75 |
| 13798430N | 13760 | 13798430NF | 14408 | | 25.0 | .9843 | | 25.0 | | 102 | | 25.0 | | 36 | | 0.75 |
| 13798431N | 13761 | 13798431NF | 14409 | | 25.0 | .9843 | | 25.0 | | 127 | | 25.0 | | 61 | | 0.75 |
| 13798432N | 13762 | 13798432NF | 14410 | | 25.0 | .9843 | | 25.0 | | 152 | | 25.0 | | 86 | | 0.75 |
| 13710000N | 13763 | 13710000NF | 14411 | 1 | | 1.0000 | 1 | | 4 | | 1-1/4 | | 1-5/8 | | 0.045 | |
| 13710001N | 13764 | 13710001NF | 14412 | 1 | | 1.0000 | 1 | | 5 | | 1-1/4 | | 2-5/8 | | 0.045 | |
| 13710002N | 13765 | 13710002NF | 14413 | 1 | | 1.0000 | 1 | | 6 | | 1-1/4 | | 3-5/8 | | 0.045 | |

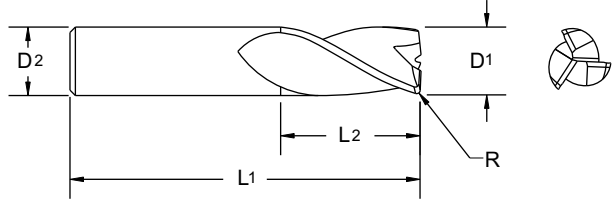
*Allow 2 weeks to ship non-stock items.

**NEW
Corner
Radius
Sizes**

**TuffCut® X-AL
Series 138**



Series 138 takes aluminum milling to the extreme with chip loads and speeds, definitely designed for extreme productivity.



• Gem coating available upon request.

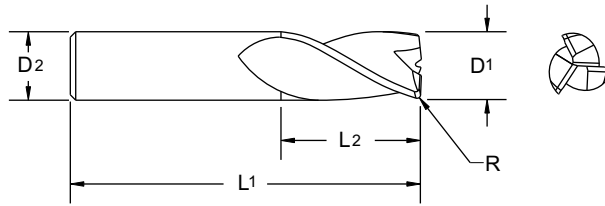
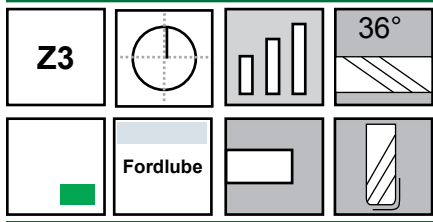
| Inch | | Metric (mm) | |
|-----------|----------------|-------------|---------------|
| D1 | Tolerance | D1 | Tolerance |
| 1/8-1-1/4 | + .000/- .0005 | 3.00-20.00 | + .000/- .013 |

| Uncoated | | Fordlube* | | Diameter | | | Shank | | OAL | Flute Length | | Corner Radius | |
|---------------|-------|-----------|-------|----------|-----|---------|-------|-----|-------|--------------|-------|---------------|------|
| Tool No. | EDP | Tool No. | EDP | D1 | | | D2 | | L1 | L2 | | R | |
| | | | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch |
| 13811810 | 13892 | 13811810F | 14295 | | 3.0 | .1181 | | 6.0 | | 52.0 | | 8.0 | |
| 13811810R.020 | 13100 | | | | 3.0 | .1181 | | 6.0 | | 52.0 | | 8.0 | 0.50 |
| 13811810R.039 | 13101 | | | | 3.0 | .1181 | | 6.0 | | 52.0 | | 8.0 | 1.00 |
| 13812500 | 13800 | 13812500F | 14203 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 3/16 | | |
| 13812501 | 13801 | 13812501F | 14204 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 1/4 | | |
| 13812502 | 13802 | 13812502F | 14205 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 5/16 | | |
| 13812503 | 13803 | 13812503F | 14206 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 3/8 | | |
| 13812504 | 13804 | 13812504F | 14207 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 1/2 | | |
| 13812505 | 13805 | 13812505F | 14208 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 5/8 | | |
| 13812506 | 13806 | 13812506F | 14209 | 1/8 | | .1250 | 1/8 | | 2 | | 3/4 | | |
| 13812507 | 13807 | 13812507F | 14210 | 1/8 | | .1250 | 1/8 | | 2 | | 1 | | |
| 13815750 | 13893 | 13815750F | 14296 | | 4.0 | .1575 | | 6.0 | | 55.0 | | 11.0 | |
| 13815750R.020 | 13102 | | | | 4.0 | .1575 | | 6.0 | | 55.0 | | 11.0 | 0.50 |
| 13815750R.039 | 13103 | | | | 4.0 | .1575 | | 6.0 | | 55.0 | | 11.0 | 1.00 |
| 13818750 | 13808 | 13818750F | 14211 | 3/16 | | .1875 | 3/16 | | 2 | | 1/4 | | |
| 13818751 | 13809 | 13818751F | 14212 | 3/16 | | .1875 | 3/16 | | 2 | | 3/8 | | |
| 13818752 | 13810 | 13818752F | 14213 | 3/16 | | .1875 | 3/16 | | 2 | | 1/2 | | |
| 13818753 | 13811 | 13818753F | 14214 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 5/8 | | |
| 13818754 | 13812 | 13818754F | 14215 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 3/4 | | |
| 13818755 | 13813 | 13818755F | 14216 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 1 | | |
| 13819680 | 13894 | 13819680F | 14297 | | 5.0 | .1968 | | 6.0 | | 58.0 | | 13.0 | |
| 13819680R.020 | 13104 | | | | 5.0 | .1968 | | 6.0 | | 58.0 | | 13.0 | 0.50 |
| 13819680R.039 | 13105 | | | | 5.0 | .1968 | | 6.0 | | 58.0 | | 13.0 | 1.00 |
| 13823620 | 13895 | 13823620F | 14298 | | 6.0 | .2362 | | 6.0 | | 58.0 | | 13.0 | |
| 13823620R.020 | 13106 | | | | 6.0 | .2362 | | 6.0 | | 58.0 | | 13.0 | 0.50 |
| 13823620R.039 | 13107 | | | | 6.0 | .2362 | | 6.0 | | 58.0 | | 13.0 | 1.00 |
| 13823620R.059 | 13108 | | | | 6.0 | .2362 | | 6.0 | | 58.0 | | 13.0 | 1.50 |
| 13823620R.079 | 13109 | | | | 6.0 | .2362 | | 6.0 | | 58.0 | | 13.0 | 2.00 |
| 13825000 | 13814 | 13825000F | 14217 | 1/4 | | .2500 | 1/4 | | 2 | | 3/8 | | |
| 13825001 | 13815 | 13825001F | 14218 | 1/4 | | .2500 | 1/4 | | 2 | | 1/2 | | |
| 13825002 | 13816 | 13825002F | 14219 | 1/4 | | .2500 | 1/4 | | 4 | | 1/2 | | |
| 13825003 | 13817 | 13825003F | 14220 | 1/4 | | .2500 | 1/4 | | 2 | | 5/8 | | |
| 13825004 | 13818 | 13825004F | 14221 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 3/4 | | |
| 13825005 | 13819 | 13825005F | 14222 | 1/4 | | .2500 | 1/4 | | 3 | | 1 | | |
| 13825006 | 13820 | 13825006F | 14223 | 1/4 | | .2500 | 1/4 | | 3 | | 1-1/8 | | |
| 13825007 | 13821 | 13825007F | 14224 | 1/4 | | .2500 | 1/4 | | 3 | | 1-1/4 | | |
| 13825008 | 13822 | 13825008F | 14225 | 1/4 | | .2500 | 1/4 | | 3 | | 1-1/2 | | |
| 13825009 | 13823 | 13825009F | 14226 | 1/4 | | .2500 | 1/4 | | 4 | | 1-3/4 | | |
| 13825010 | 13824 | 13825010F | 14227 | 1/4 | | .2500 | 1/4 | | 4 | | 2 | | |

Technical information on page 22.

* Allow 2 weeks to ship non-stock items.
Weldon flats available. Please specify when ordering.
When ordering Weldon flats or corner radius please call customer service for pricing.

Series 138 Continued



| Uncoated | | Fordlube* | | Diameter | | | Shank | | OAL | | Flute Length | | Corner Radius | |
|---------------|-------|-----------|-------|----------|------|---------|-------|------|-------|------|--------------|------|---------------|------|
| | | | | D1 | | | D2 | | L1 | | L2 | | R | |
| Tool No. | EDP | Tool No. | EDP | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13831250 | 13825 | 13831250F | 14228 | 5/16 | | .3125 | 5/16 | | 4 | | 5/16 | | | |
| 13831251 | 13826 | 13831251F | 14229 | 5/16 | | .3125 | 5/16 | | 4 | | 3/8 | | | |
| 13831252 | 13827 | 13831252F | 14230 | 5/16 | | .3125 | 5/16 | | 4 | | 7/16 | | | |
| 13831253 | 13828 | 13831253F | 14231 | 5/16 | | .3125 | 5/16 | | 4 | | 1/2 | | | |
| 13831254 | 13829 | 13831254F | 14232 | 5/16 | | .3125 | 5/16 | | 2-1/2 | | 13/16 | | | |
| 13831255 | 13830 | 13831255F | 14233 | 5/16 | | .3125 | 5/16 | | 2-1/2 | | 1-1/8 | | | |
| 13831256 | 13831 | 13831256F | 14234 | 5/16 | | .3125 | 5/16 | | 3-1/8 | | 1-3/8 | | | |
| 13831257 | 13832 | 13831257F | 14235 | 5/16 | | .3125 | 5/16 | | 3 | | 1-1/4 | | | |
| 13831258 | 13833 | 13831258F | 14236 | 5/16 | | .3125 | 5/16 | | 4 | | 1-1/2 | | | |
| 13831500 | 13896 | 13831500F | 14299 | | 8.0 | .3150 | | 8.0 | | 64.0 | | 19.0 | | |
| 13831500R.020 | 13110 | | | | 8.0 | .3150 | | 8.0 | | 64.0 | | 19.0 | | 0.50 |
| 13831500R.039 | 13111 | | | | 8.0 | .3150 | | 8.0 | | 64.0 | | 19.0 | | 1.00 |
| 13831500R.059 | 13112 | | | | 8.0 | .3150 | | 8.0 | | 64.0 | | 19.0 | | 1.50 |
| 13831500R.079 | 13113 | | | | 8.0 | .3150 | | 8.0 | | 64.0 | | 19.0 | | 2.00 |
| 13831500R.118 | 13114 | | | | 8.0 | .3150 | | 8.0 | | 64.0 | | 19.0 | | 3.00 |
| 13837500 | 13834 | 13837500F | 14237 | 3/8 | | .3750 | 3/8 | | 2 | | 1/2 | | | |
| 13837501 | 13835 | 13837501F | 14238 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 9/16 | | | |
| 13837502 | 13836 | 13837502F | 14239 | 3/8 | | .3750 | 3/8 | | 2 | | 5/8 | | | |
| 13837503 | 13837 | 13837503F | 14240 | 3/8 | | .3750 | 3/8 | | 4 | | 5/8 | | | |
| 13837504 | 13838 | 13837504F | 14241 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 3/4 | | | |
| 13837505 | 13839 | 13837505F | 14242 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1 | | | |
| 13837506 | 13840 | 13837506F | 14243 | 3/8 | | .3750 | 3/8 | | 3 | | 1-1/4 | | | |
| 13837507 | 13841 | 13837507F | 14244 | 3/8 | | .3750 | 3/8 | | 3-1/2 | | 1-1/2 | | | |
| 13837508 | 13842 | 13837508F | 14245 | 3/8 | | .3750 | 3/8 | | 4 | | 2 | | | |
| 13837509 | 13843 | 13837509F | 14246 | 3/8 | | .3750 | 3/8 | | 4-1/2 | | 2-1/2 | | | |
| 13837510 | 13844 | 13837510F | 14247 | 3/8 | | .3750 | 3/8 | | 3 | | 9/16 | | | |
| 13837511 | 13845 | 13837511F | 14248 | 3/8 | | .3750 | 3/8 | | 3 | | 1 | | | |
| 13839370 | 13897 | 13839370F | 14300 | | 10.0 | .3937 | | 10.0 | | 70.0 | | 22.0 | | |
| 13839370R.020 | 13115 | | | | 10.0 | .3937 | | 10.0 | | 70.0 | | 22.0 | | 0.50 |
| 13839370R.039 | 13116 | | | | 10.0 | .3937 | | 10.0 | | 70.0 | | 22.0 | | 1.00 |
| 13839370R.059 | 13117 | | | | 10.0 | .3937 | | 10.0 | | 70.0 | | 22.0 | | 1.50 |
| 13839370R.079 | 13118 | | | | 10.0 | .3937 | | 10.0 | | 70.0 | | 22.0 | | 2.00 |
| 13839370R.118 | 13119 | | | | 10.0 | .3937 | | 10.0 | | 70.0 | | 22.0 | | 3.00 |
| 13843750 | 13846 | 13843750F | 14249 | 7/16 | | .4375 | 7/16 | | 2-3/4 | | 9/16 | | | |
| 13843751 | 13847 | 13843751F | 14250 | 7/16 | | .4375 | 7/16 | | 2-3/4 | | 1 | | | |
| 13847240 | 13898 | 13847240F | 14301 | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | |
| 13847240R.020 | 13120 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 0.50 |
| 13847240R.039 | 13121 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 1.00 |
| 13847240R.059 | 13122 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 1.50 |
| 13847240R.079 | 13123 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 2.00 |
| 13847240R.118 | 13124 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 3.00 |
| 13847240R.157 | 13125 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 4.00 |
| 13847240R.196 | 13126 | | | | 12.0 | .4724 | | 12.0 | | 84.0 | | 26.0 | | 5.00 |
| 13850000 | 13848 | 13850000F | 14251 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | | | |
| 13850001 | 13849 | 13850001F | 14252 | 1/2 | | .5000 | 1/2 | | 3 | | 3/4 | | | |
| 13850002 | 13850 | 13850002F | 14253 | 1/2 | | .5000 | 1/2 | | 3 | | 1 | | | |
| 13850003 | 13851 | 13850003F | 14254 | 1/2 | | .5000 | 1/2 | | 3 | | 1-1/4 | | | |
| 13850004 | 13852 | 13850004F | 14255 | 1/2 | | .5000 | 1/2 | | 4 | | 1-1/2 | | | |
| 13850005 | 13853 | 13850005F | 14256 | 1/2 | | .5000 | 1/2 | | 4 | | 2 | | | |
| 13850006 | 13854 | 13850006F | 14257 | 1/2 | | .5000 | 1/2 | | 4 | | 2-1/4 | | | |
| 13850007 | 13855 | 13850007F | 14258 | 1/2 | | .5000 | 1/2 | | 6 | | 2-1/2 | | | |

Technical information on page 22.

Series 138 Continued

| Uncoated | | Fordlube* | | Diameter | | | Shank | | OAL | | Flute Length | | Corner Radius | |
|---------------|-------|-----------|-------|----------|------|---------|-------|------|-------|-------|--------------|----|---------------|----|
| | | | | D1 | | | D2 | | L1 | | L2 | | R | |
| Tool No. | EDP | Tool No. | EDP | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 13850008 | 13856 | 13850008F | 14259 | 1/2 | | .5000 | 1/2 | | 6 | | 3-1/4 | | | |
| 13850009 | 13857 | 13850009F | 14260 | 1/2 | | .5000 | 1/2 | | 8 | | 4 | | | |
| 13855120 | 13899 | 13855120F | 14302 | | 14.0 | .5512 | | 14.0 | | 84.0 | 26.0 | | | |
| 13862500 | 13858 | 13862500F | 14261 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 3/4 | | | |
| 13862501 | 13859 | 13862501F | 14262 | 5/8 | | .6250 | 5/8 | | 6 | | 3/4 | | | |
| 13862502 | 13860 | 13862502F | 14263 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 7/8 | | | |
| 13862503 | 13861 | 13862503F | 14264 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 1-1/4 | | | |
| 13862504 | 13862 | 13862504F | 14265 | 5/8 | | .6250 | 5/8 | | 4 | | 1-5/8 | | | |
| 13862505 | 13863 | 13862505F | 14266 | 5/8 | | .6250 | 5/8 | | 5 | | 2 | | | |
| 13862506 | 13864 | 13862506F | 14267 | 5/8 | | .6250 | 5/8 | | 5 | | 2-1/2 | | | |
| 13862507 | 13865 | 13862507F | 14268 | 5/8 | | .6250 | 5/8 | | 6 | | 3-1/4 | | | |
| 13862990 | 13900 | 13862990F | 14303 | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | | |
| 13862990R.020 | 13127 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 0.50 | |
| 13862990R.039 | 13128 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 1.00 | |
| 13862990R.059 | 13129 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 1.50 | |
| 13862990R.079 | 13130 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 2.00 | |
| 13862990R.118 | 13131 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 3.00 | |
| 13862990R.157 | 13132 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 4.00 | |
| 13862990R.196 | 13133 | | | | 16.0 | .6299 | | 16.0 | | 89.0 | 32.0 | | 5.00 | |
| 13870870 | 13901 | 13870870F | 14304 | | 18.0 | .7087 | | 18.0 | | 92.0 | 32.0 | | | |
| 13875000 | 13866 | 13875000F | 14269 | 3/4 | | .7500 | 3/4 | | 4 | | 3/4 | | | |
| 13875001 | 13867 | 13875001F | 14270 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | | | |
| 13875002 | 13868 | 13875002F | 14271 | 3/4 | | .7500 | 3/4 | | 6 | | 1 | | | |
| 13875003 | 13869 | 13875003F | 14272 | 3/4 | | .7500 | 3/4 | | 6 | | 1-1/2 | | | |
| 13875004 | 13870 | 13875004F | 14273 | 3/4 | | .7500 | 3/4 | | 4 | | 1-5/8 | | | |
| 13875005 | 13871 | 13875005F | 14274 | 3/4 | | .7500 | 3/4 | | 5 | | 2 | | | |
| 13875006 | 13872 | 13875006F | 14275 | 3/4 | | .7500 | 3/4 | | 5 | | 2-1/4 | | | |
| 13875007 | 13873 | 13875007F | 14276 | 3/4 | | .7500 | 3/4 | | 5 | | 2-1/2 | | | |
| 13875008 | 13874 | 13875008F | 14277 | 3/4 | | .7500 | 3/4 | | 6 | | 3 | | | |
| 13875009 | 13875 | 13875009F | 14278 | 3/4 | | .7500 | 3/4 | | 6 | | 3-1/4 | | | |
| 13875010 | 13876 | 13875010F | 14279 | 3/4 | | .7500 | 3/4 | | 6 | | 3-1/2 | | | |
| 13875011 | 13877 | 13875011F | 14280 | 3/4 | | .7500 | 3/4 | | 6-1/4 | | 4 | | | |
| 13875012 | 13878 | 13875012F | 14281 | 3/4 | | .7500 | 3/4 | | 8 | | 5 | | | |
| 13878740 | 13902 | 13878740F | 14305 | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | | |
| 13878740R.020 | 13134 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 0.50 | |
| 13878740R.039 | 13135 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 1.00 | |
| 13878740R.059 | 13136 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 1.50 | |
| 13878740R.079 | 13137 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 2.00 | |
| 13878740R.118 | 13138 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 3.00 | |
| 13878740R.157 | 13139 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 4.00 | |
| 13878740R.196 | 13140 | | | | 20.0 | .7874 | | 20.0 | | 102.0 | 38.0 | | 5.00 | |
| 13810000 | 13879 | 13810000F | 14282 | 1.00 | | 1.0000 | 1.00 | | 6 | | 1-1/4 | | | |
| 13810001 | 13880 | 13810001F | 14283 | 1.00 | | 1.0000 | 1.00 | | 8 | | 1-1/4 | | | |
| 13810002 | 13881 | 13810002F | 14284 | 1.00 | | 1.0000 | 1.00 | | 4 | | 1-1/2 | | | |
| 13810003 | 13882 | 13810003F | 14285 | 1.00 | | 1.0000 | 1.00 | | 5 | | 2 | | | |
| 13810004 | 13883 | 13810004F | 14286 | 1.00 | | 1.0000 | 1.00 | | 5 | | 2-1/2 | | | |
| 13810005 | 13884 | 13810005F | 14287 | 1.00 | | 1.0000 | 1.00 | | 6 | | 3 | | | |
| 13810006 | 13885 | 13810006F | 14288 | 1.00 | | 1.0000 | 1.00 | | 6 | | 3-1/2 | | | |
| 13810007 | 13886 | 13810007F | 14289 | 1.00 | | 1.0000 | 1.00 | | 6 | | 4 | | | |
| 13810008 | 13887 | 13810008F | 14290 | 1.00 | | 1.0000 | 1.00 | | 7 | | 4-1/8 | | | |
| 13810009 | 13888 | 13810009F | 14291 | 1.00 | | 1.0000 | 1.00 | | 8 | | 5-1/2 | | | |
| 13812510 | 13889 | 13812510F | 14292 | 1-1/4 | | 1.2500 | 1-1/4 | | 6 | | 2 | | | |
| 13812511 | 13890 | 13812511F | 14293 | 1-1/4 | | 1.2500 | 1-1/4 | | 8 | | 5 | | | |
| 13812512 | 13891 | 13812512F | 14294 | 1-1/4 | | 1.2500 | 1-1/4 | | 12 | | 2 | | | |

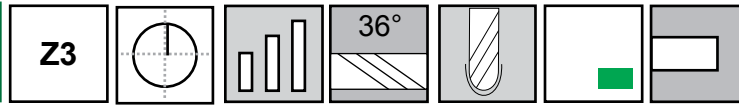
* Allow 2 weeks to ship non-stock items.
Weldon flats available. Please specify when ordering.
When ordering Weldon flats or corner radius please call customer service for pricing.

Technical information on page 22.

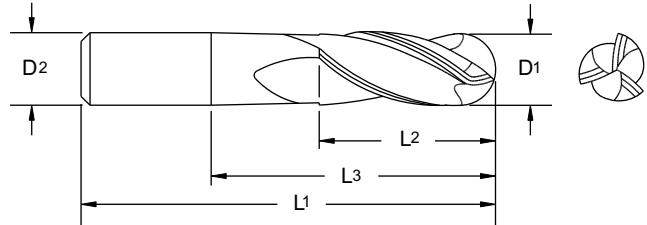
For product information, call your local distributor.

**NEW
Metric
Sizes**

**TuffCut® X-AL
Series 138B**



Designed for extreme productivity.



| Inch | |
|---------|-----------------|
| D1 | Tolerance |
| 1/8-1.0 | +0.0000/-0.0005 |

| Metric (mm) | |
|-------------|---------------|
| D1 | Tolerance |
| 3.00-16.00 | +0.000/-0.013 |

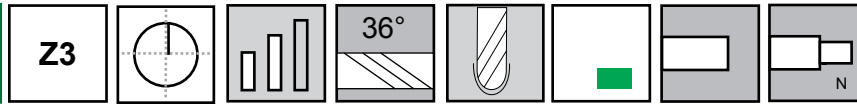
| Tool No. | EDP | Diameter | | | Shank | | OAL | | Flute Length | |
|-----------|-------|----------|------|---------|-------|------|-------|------|--------------|------|
| | | D1 | | | D2 | | L1 | | L2 | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm |
| 138B11810 | 13356 | | 3.0 | .1181 | | 3.0 | | 38.0 | | 12.0 |
| 138B12500 | 13300 | 1/8 | | .1250 | 1/8 | | 1-1/2 | | 3/8 | |
| 138B12501 | 13302 | 1/8 | | .1250 | 1/8 | | 2 | | 1/2 | |
| 138B15750 | 13358 | | 4.0 | .1575 | | 4.0 | | 51.0 | | 15.0 |
| 138B18750 | 13304 | 3/16 | | .1875 | 3/16 | | 2 | | 3/8 | |
| 138B18751 | 13306 | 3/16 | | .1875 | 3/16 | | 2-1/2 | | 5/8 | |
| 138B19680 | 13360 | | 5.0 | .1968 | | 5.0 | | 64.0 | | 20.0 |
| 138B23620 | 13362 | | 6.0 | .2362 | | 6.0 | | 64.0 | | 20.0 |
| 138B25000 | 13308 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 1/2 | |
| 138B25001 | 13310 | 1/4 | | .2500 | 1/4 | | 2-1/2 | | 3/4 | |
| 138B31250 | 13312 | 5/16 | | .3125 | 5/16 | | 2-1/2 | | 1/2 | |
| 138B31251 | 13314 | 5/16 | | .3125 | 5/16 | | 2-1/2 | | 13/16 | |
| 138B31500 | 13364 | | 8.0 | .3150 | | 8.0 | | 64.0 | | 20.0 |
| 138B37500 | 13316 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 5/8 | |
| 138B37501 | 13318 | 3/8 | | .3750 | 3/8 | | 2-1/2 | | 1 | |
| 138B39370 | 13366 | | 10.0 | .3937 | | 10.0 | | 70.0 | | 25.0 |
| 138B43750 | 13320 | 7/16 | | .4375 | 7/16 | | 2-3/4 | | 9/16 | |
| 138B43751 | 13322 | 7/16 | | .4375 | 7/16 | | 2-3/4 | | 1 | |
| 138B47240 | 13368 | | 12.0 | .4724 | | 12.0 | | 76.0 | | 25.0 |
| 138B50000 | 13324 | 1/2 | | .5000 | 1/2 | | 3 | | 5/8 | |
| 138B50001 | 13326 | 1/2 | | .5000 | 1/2 | | 3 | | 1-1/4 | |
| 138B50002 | 13328 | 1/2 | | .5000 | 1/2 | | 6 | | 1-1/4 | |
| 138B62500 | 13330 | 5/8 | | .6250 | 5/8 | | 3-1/2 | | 1-1/4 | |
| 138B62501 | 13332 | 5/8 | | .6250 | 5/8 | | 4 | | 1-5/8 | |
| 138B62990 | 13370 | | 16.0 | .6299 | | 16.0 | | 89.0 | | 35.0 |
| 138B75000 | 13334 | 3/4 | | .7500 | 3/4 | | 4 | | 1 | |
| 138B75001 | 13336 | 3/4 | | .7500 | 3/4 | | 4 | | 1-5/8 | |
| 138B10000 | 13338 | 1 | | 1.0000 | 1 | | 4 | | 1-1/2 | |
| 138B10001 | 13340 | 1 | | 1.0000 | 1 | | 5 | | 2-1/4 | |

Technical information on page 23.

TuffCut® X-AL Series 138B

**NEW
Metric
Sizes**

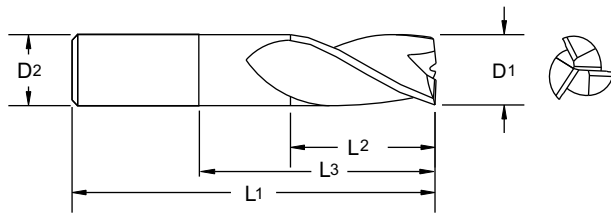
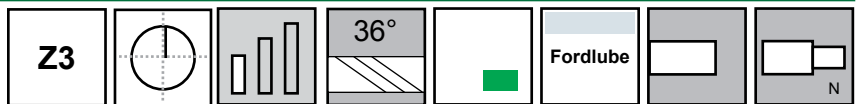
**TuffCut® X-AL
Series 138BN**



| Necked | | Diameter | | | Shank | | OAL | | Flute Length | | Neck Length | |
|------------|-------|----------|------|---------|-------|------|------|-------|--------------|------|-------------|------|
| Tool No. | EDP | D1 | | | D2 | | L1 | | L2 | | L3 | |
| | | Inch | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 138B0787N5 | 13372 | | 2.0 | .0787 | | 6.0 | | 75.0 | | 4.0 | | 12.0 |
| 138B1181N5 | 13374 | | 3.0 | .1181 | | 6.0 | | 75.0 | | 5.0 | | 17.0 |
| 138B1575N5 | 13376 | | 4.0 | .1575 | | 6.0 | | 75.0 | | 6.0 | | 22.0 |
| 138B1968N5 | 13378 | | 5.0 | .1968 | | 6.0 | | 75.0 | | 7.0 | | 27.0 |
| 138B2362N5 | 13380 | | 6.0 | .2362 | | 6.0 | | 110.0 | | 8.0 | | 32.0 |
| 138B25001N | 13342 | 1/4 | | .2500 | 1/4 | | 4 | | 3/4 | | 2-1/8 | |
| 138B31251N | 13344 | 5/16 | | .3125 | 5/16 | | 4 | | 13/16 | | 2-1/8 | |
| 138B3150N5 | 13382 | | 8.0 | .3150 | | 8.0 | | 110.0 | | 10.0 | | 42.0 |
| 138B37501N | 13346 | 3/8 | | .3750 | 3/8 | | 4 | | 1 | | 2-1/8 | |
| 138B3937N5 | 13384 | | 10.0 | .3937 | | 10.0 | | 110.0 | | 12.0 | | 52.0 |
| 138B4724N5 | 13386 | | 12.0 | .4724 | | 12.0 | | 120.0 | | 16.0 | | 62.0 |
| 138B50001N | 13348 | 1/2 | | .5000 | 1/2 | | 4 | | 1-1/4 | | 2-1/8 | |
| 138B62501N | 13350 | 5/8 | | .6250 | 5/8 | | 6 | | 1-5/8 | | 3-3/8 | |
| 138B6299N5 | 13388 | | 16.0 | .6299 | | 16.0 | | 130.0 | | 20.0 | | 82.0 |
| 138B75001N | 13352 | 3/4 | | .7500 | 3/4 | | 6 | | 1-5/8 | | 3-3/8 | |
| 138B10000N | 13354 | 1 | | 1.0000 | 1 | | 6 | | 1-1/2 | | 3-1/4 | |

Technical information on page 23.

**TuffCut® X-AL
Series 138N**



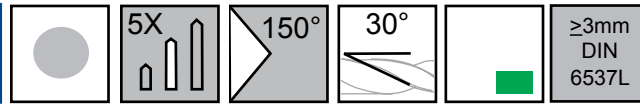
Technical information on page 22.

| Inch | |
|---------|-----------------|
| D1 | Tolerance |
| 1/4-1.0 | + .0000/- .0005 |

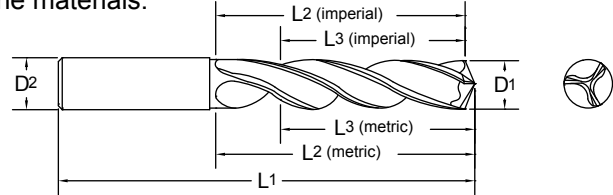
| Uncoated | | Fordlube* | | Diameter | | Shank | OAL | Flute Length | Neck Length |
|-----------|-------|------------|-------|----------|---------|---------|---------|--------------|-------------|
| Tool No. | EDP | Tool No. | EDP | D1 Inch | | | | | |
| | | | | Size | Decimal | D2 Inch | L1 Inch | L2 Inch | L3 Inch |
| 13825002N | 14450 | 13825002NF | 14459 | 1/4 | .2500 | 1/4 | 4 | 1/2 | 1-1/8 |
| 13831252N | 14451 | 13831252NF | 14460 | 5/16 | .3125 | 5/16 | 4 | 7/16 | 2-1/8 |
| 13837503N | 14452 | 13837503NF | 14461 | 3/8 | .3750 | 3/8 | 4 | 5/8 | 2-1/8 |
| 13850000N | 14453 | 13850000NF | 14462 | 1/2 | .5000 | 1/2 | 3 | 5/8 | 1-3/8 |
| 13850010N | 14454 | 13850010NF | 14463 | 1/2 | .5000 | 1/2 | 4 | 5/8 | 2-1/8 |
| 13850011N | 14455 | 13850011NF | 14464 | 1/2 | .5000 | 1/2 | 6 | 3/4 | 3-3/8 |
| 13862501N | 14456 | 13862501NF | 14465 | 5/8 | .6250 | 5/8 | 6 | 3/4 | 3-3/8 |
| 13875002N | 14457 | 13875002NF | 14466 | 3/4 | .7500 | 3/4 | 6 | 1 | 3-3/8 |
| 13810000N | 14458 | 13810000NF | 14467 | 1.00 | 1.0000 | 1.00 | 6 | 1-1/4 | 3-3/8 |

* Allow 2 weeks to ship non-stock items.
Welded flats available. Please specify when ordering.
When ordering Welded flats or corner radius please call customer service for pricing.

Twister® AL Series 229



Twister® AL series 229 recommended for increased speeds and feeds when drilling aluminum, cast iron and other easy to machine materials.



- Easily re-ground point design.
- Special 3 flute parabolic flute form for increased chip evacuation.
- Metric Sizes 3mm and above manufactured to DIN 6537L.
- Coolant Fed extended lengths available by special order.

| Tool No. | EDP | Diameter | | | | Shank | | OAL | | Flute Length | | Drill Length | |
|----------|-------|----------|------|------|---------|-------|-----|-------|----|--------------|------|--------------|----|
| | | D1 | | | | D2 | | L1 | | L2 | | L3 Ref. | |
| | | Fraction | Wire | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 22904690 | 23050 | 3/64 | | | .0469 | 3/64 | | 1-1/2 | | 3/4 | | 9/16 | |
| 22905500 | 23051 | | 54 | | .0550 | .0550 | | 1-1/2 | | 3/4 | | 9/16 | |
| 22905950 | 23052 | | 53 | | .0595 | .0595 | | 1-1/2 | | 3/4 | | 9/16 | |
| 22906250 | 22900 | 1/16 | | | .0625 | 1/16 | | 1-1/2 | | 3/4 | | 9/16 | |
| 22906700 | 23054 | | 51 | | .0670 | .0670 | | 1-1/2 | | 3/4 | | 9/16 | |
| 22907000 | 23055 | | 50 | | .0700 | .0700 | | 1-3/4 | | 7/8 | | 11/16 | |
| 22907300 | 23056 | | 49 | | .0730 | .0730 | | 1-3/4 | | 7/8 | | 11/16 | |
| 22907870 | 22950 | | | 2.00 | .0787 | | 2.0 | | 38 | | 16 | 12 | |
| 22908200 | 23057 | | 45 | | .0820 | .0820 | | 1-3/4 | | 7/8 | | 11/16 | |
| 22908900 | 22901 | | 43 | | .0890 | .0890 | | 2 | | 1 | | 3/4 | |
| 22909060 | 23058 | | | 2.3 | .0906 | | 2.3 | | 43 | | 20.5 | 15 | |
| 22909380 | 22902 | 3/32 | | | .0938 | 3/32 | | 2 | | 1 | | 3/4 | |
| 22909600 | 22903 | | 41 | | .0960 | .0960 | | 2 | | 1 | | 3/4 | |
| 22909800 | 22904 | | 40 | | .0980 | .0980 | | 2 | | 1 | | 3/4 | |
| 22909840 | 22951 | | | 2.50 | .0984 | | 2.5 | | 43 | | 20.5 | 15 | |
| 22909950 | 23059 | | 39 | | .0995 | .0995 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22910150 | 22942 | | 38 | | .1015 | .1015 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22910400 | 23060 | | 37 | | .1040 | .1040 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22910650 | 22943 | | 36 | | .1065 | .1065 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22911000 | 23061 | | 35 | | .1100 | .1100 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22911300 | 22944 | | 33 | | .1130 | .1130 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22911420 | 22952 | | | 2.90 | .1142 | | 2.9 | | 46 | | 25 | 19 | |
| 22911810 | 22953 | | | 3.00 | .1181 | | 6.0 | | 66 | | 28 | 23 | |
| 22912000 | 22905 | | 31 | | .1200 | .1200 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22912200 | 23063 | | | 3.10 | .1220 | | 6.0 | | 66 | | 28 | 23 | |
| 22912500 | 22906 | 1/8 | | | .1250 | 1/8 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22912600 | 22945 | | | 3.20 | .1260 | | 6.0 | | 66 | | 28 | 23 | |
| 22912850 | 22935 | | 30 | | .1285 | .1285 | | 2-1/4 | | 1-1/4 | | 15/16 | |
| 22912990 | 22954 | | | 3.30 | .1299 | | 6.0 | | 66 | | 28 | 23 | |
| 22913390 | 22949 | | | 3.40 | .1339 | | 6.0 | | 66 | | 28 | 23 | |
| 22913600 | 22907 | | 29 | | .1360 | .1360 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22913780 | 22955 | | | 3.50 | .1378 | | 6.0 | | 66 | | 28 | 23 | |
| 22914060 | 22908 | 9/64 | | | .1406 | 9/64 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22914170 | 22992 | | | 3.60 | .1417 | | 6.0 | | 66 | | 28 | 23 | |
| 22914400 | 22946 | | 27 | | .1440 | .1440 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22914570 | 22994 | | | 3.70 | .1457 | | 6.0 | | 66 | | 28 | 23 | |
| 22914950 | 22973 | | 25 | | .1495 | .1495 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22914960 | 22996 | | | 3.80 | .1496 | | 6.0 | | 74 | | 36 | 29 | |
| 22915200 | 23064 | | 24 | | .1520 | .1520 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |

| Inch | |
|---------------|-----------------|
| D1 | Tolerance |
| .0469 - .1250 | + .0001/+ .0004 |
| .1251 - .2500 | + .0002/+ .0006 |
| .2501 - .3750 | + .0003/+ .0008 |
| .3751 - .7500 | + .0003/+ .0010 |

| Metric (mm) | |
|---------------|---------------|
| D1 | Tolerance m7 |
| 2.00 - 3.00 | + .002/+ .012 |
| 3.01 - 6.00 | + .004/+ .016 |
| 6.01 - 10.00 | + .006/+ .021 |
| 10.01 - 16.00 | + .007/+ .025 |

Technical information on page 24.



Factory Regrind
Service

800-553- 8024
or
563-391-6220

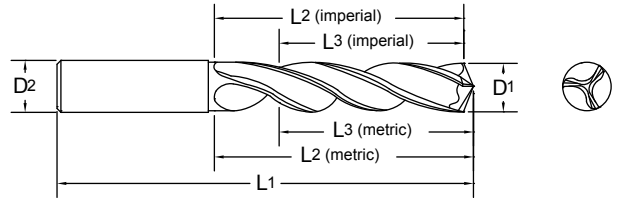
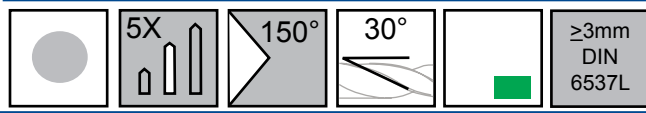
Series 229 Continued

| Tool No. | EDP | Diameter | | | | Shank | | OAL | | Flute Length | | Drill Length | |
|----------|-------|----------|------|------|---------|-------|-----|-------|----|--------------|----|--------------|----|
| | | D1 | | | | D2 | | L1 | | L2 | | L3 Ref. | |
| | | Fraction | Wire | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 22915350 | 22997 | | | 3.90 | .1535 | | 6.0 | | 74 | | 36 | | 29 |
| 22915620 | 22909 | 5/32 | | | .1562 | 5/32 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22915750 | 22956 | | | 4.00 | .1575 | | 6.0 | | 74 | | 36 | | 29 |
| 22915900 | 22936 | | 21 | | .1590 | .1590 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22916100 | 22937 | | 20 | | .1610 | .1610 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22916140 | 22998 | | | 4.10 | .1614 | | 6.0 | | 74 | | 36 | | 29 |
| 22916540 | 22957 | | | 4.20 | .1654 | | 6.0 | | 74 | | 36 | | 29 |
| 22916600 | 22947 | | 19 | | .1660 | .1660 | | 2-1/2 | | 1-3/8 | | 1-1/32 | |
| 22916950 | 22948 | | 18 | | .1695 | .1695 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22917190 | 22939 | 11/64 | | | .1719 | 11/64 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22917300 | 22972 | | 17 | | .1730 | .1730 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22917320 | 22999 | | | 4.40 | .1732 | | 6.0 | | 74 | | 36 | | 29 |
| 22917700 | 22910 | | 16 | | .1770 | .1770 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22917720 | 22958 | | | 4.50 | .1772 | | 6.0 | | 74 | | 36 | | 29 |
| 22918110 | 23000 | | | 4.60 | .1811 | | 6.0 | | 74 | | 36 | | 29 |
| 22918500 | 22911 | | 13 | | .1850 | .1850 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22918750 | 22912 | 3/16 | | | .1875 | 3/16 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22918890 | 23001 | | | 4.80 | .1889 | | 6.0 | | 82 | | 44 | | 35 |
| 22918900 | 22974 | | 12 | | .1890 | .1890 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22919100 | 22976 | | 11 | | .1910 | .1910 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22919290 | 23002 | | | 4.90 | .1929 | | 6.0 | | 82 | | 44 | | 35 |
| 22919350 | 22938 | | 10 | | .1935 | .1935 | | 2-3/4 | | 1-5/8 | | 1-7/32 | |
| 22919680 | 22959 | | | 5.00 | .1968 | | 6.0 | | 82 | | 44 | | 35 |
| 22920100 | 22975 | | 7 | | .2010 | .2010 | | 3 | | 1-3/4 | | 1-5/16 | |
| 22920470 | 23003 | | | 5.20 | .2047 | | 6.0 | | 82 | | 44 | | 35 |
| 22921300 | 22977 | | 3 | | .2130 | .2130 | | 3 | | 1-3/4 | | 1-5/16 | |
| 22921650 | 22960 | | | 5.50 | .2165 | | 6.0 | | 82 | | 44 | | 35 |
| 22921870 | 22913 | 7/32 | | | .2187 | 7/32 | | 3 | | 1-3/4 | | 1-5/16 | |
| 22922050 | 23004 | | | 5.60 | .2205 | | 6.0 | | 82 | | 44 | | 35 |
| 22922800 | 22978 | | 1 | | .2280 | .2280 | | 3 | | 1-3/4 | | 1-5/16 | |
| 22923400 | 23065 | | A | | .2340 | .2340 | | 3-1/4 | | 2 | | 1-1/2 | |
| 22923620 | 22961 | | | 6.00 | .2362 | | 6.0 | | 82 | | 44 | | 35 |
| 22924410 | 22980 | | | 6.20 | .2441 | | 8.0 | | 91 | | 53 | | 43 |
| 22925000 | 22914 | 1/4 | | | .2500 | 1/4 | | 3-1/4 | | 2 | | 1-1/2 | |
| 22925590 | 22962 | | | 6.50 | .2559 | | 8.0 | | 91 | | 53 | | 43 |
| 22925700 | 22915 | | F | | .2570 | .2570 | | 3-1/4 | | 2 | | 1-1/2 | |
| 22926380 | 22979 | | | 6.70 | .2638 | | 8.0 | | 91 | | 53 | | 43 |
| 22926560 | 22916 | 17/64 | | | .2656 | 17/64 | | 3-1/2 | | 2-1/8 | | 1-19/32 | |
| 22926770 | 22963 | | | 6.80 | .2677 | | 8.0 | | 91 | | 53 | | 43 |
| 22927200 | 22981 | | I | | .2720 | .2720 | | 3-1/2 | | 2-1/8 | | 1-19/32 | |
| 22927560 | 22964 | | | 7.00 | .2756 | | 8.0 | | 91 | | 53 | | 43 |
| 22928120 | 22917 | 9/32 | | | .2812 | 9/32 | | 3-1/2 | | 2-1/8 | | 1-19/32 | |
| 22928350 | 23005 | | | 7.20 | .2835 | | 8.0 | | 91 | | 53 | | 43 |
| 22928740 | 22940 | | | 7.30 | .2874 | | 8.0 | | 91 | | 53 | | 43 |
| 22929130 | 22965 | | | 7.40 | .2913 | | 8.0 | | 91 | | 53 | | 43 |
| 22929530 | 22966 | | | 7.50 | .2953 | | 8.0 | | 91 | | 53 | | 43 |
| 22929690 | 22982 | 19/64 | | | .2969 | 19/64 | | 3-3/4 | | 2-3/8 | | 1-25/32 | |
| 22930710 | 23006 | | | 7.80 | .3071 | | 8.0 | | 91 | | 53 | | 43 |

Technical information on page 24.

For product information, call your local distributor.

Series 229 Continued



| Tool No. | EDP | Diameter | | | | Shank | | OAL | | Flute Length | | Drill Length | |
|----------|-------|----------|------|-------|---------|-------|------|-------|-----|--------------|----|--------------|----|
| | | D1 | | | | D2 | | L1 | | L2 | | L3 Ref. | |
| | | Fraction | Wire | mm | Decimal | Inch | mm | Inch | mm | Inch | mm | Inch | mm |
| 22931250 | 22918 | 5/16 | | | .3125 | 5/16 | | 3-3/4 | | 2-3/8 | | 1-25/32 | |
| 22931500 | 22967 | | | 8.00 | .3150 | | 8.0 | | 91 | | 53 | | 43 |
| 22931890 | 23008 | | | 8.10 | .3189 | | 10.0 | | 103 | | 61 | | 49 |
| 22932810 | 22919 | 21/64 | | | .3281 | 21/64 | | 4 | | 2-1/2 | | 1-7/8 | |
| 22933070 | 22985 | | | 8.40 | .3307 | | 10.0 | | 103 | | 61 | | 49 |
| 22933200 | 22983 | | Q | | .3320 | .3320 | | 4 | | 2-1/2 | | 1-7/8 | |
| 22933460 | 22968 | | | 8.50 | .3346 | | 10.0 | | 103 | | 61 | | 49 |
| 22934380 | 22987 | 11/32 | | | .3438 | 11/32 | | 4 | | 2-1/2 | | 1-7/8 | |
| 22935430 | 22989 | | | 9.00 | .3543 | | 10.0 | | 103 | | 61 | | 49 |
| 22935940 | 22984 | 23/64 | | | .3594 | 23/64 | | 4-1/4 | | 2-3/4 | | 2-1/16 | |
| 22936800 | 22991 | | U | | .3680 | .3680 | | 4-1/4 | | 2-3/4 | | 2-1/16 | |
| 22937400 | 23009 | | | 9.50 | .3740 | | 10.0 | | 103 | | 61 | | 49 |
| 22937500 | 22920 | 3/8 | | | .3750 | 3/8 | | 4-1/4 | | 2-3/4 | | 2-1/16 | |
| 22938190 | 23011 | | | 9.70 | .3819 | | 10.0 | | 103 | | 61 | | 49 |
| 22939060 | 22921 | 25/64 | | | .3906 | 25/64 | | 4-1/2 | | 2-7/8 | | 2-5/32 | |
| 22939370 | 22969 | | | 10.00 | .3937 | | 10.0 | | 103 | | 61 | | 49 |
| 22940160 | 22970 | | | 10.20 | .4016 | | 12.0 | | 118 | | 71 | | 56 |
| 22940620 | 22922 | 13/32 | | | .4062 | 13/32 | | 4-1/2 | | 2-7/8 | | 2-5/32 | |
| 22940940 | 23012 | | | 10.40 | .4094 | | 12.0 | | 118 | | 71 | | 56 |
| 22941340 | 22986 | | | 10.50 | .4134 | | 12.0 | | 118 | | 71 | | 56 |
| 22941730 | 23013 | | | 10.60 | .4173 | | 12.0 | | 118 | | 71 | | 56 |
| 22942190 | 22923 | 27/64 | | | .4219 | 27/64 | | 4-1/2 | | 2-7/8 | | 2-5/32 | |
| 22943310 | 22993 | | | 11.00 | .4331 | | 12.0 | | 118 | | 71 | | 56 |
| 22943750 | 22924 | 7/16 | | | .4375 | 7/16 | | 4-1/2 | | 2-7/8 | | 2-5/32 | |
| 22945280 | 23014 | | | 11.50 | .4528 | | 12.0 | | 118 | | 71 | | 56 |
| 22945310 | 22941 | 29/64 | | | .4531 | 29/64 | | 4-3/4 | | 3 | | 2-1/4 | |
| 22946880 | 22995 | 15/32 | | | .4688 | 15/32 | | 4-3/4 | | 3 | | 2-1/4 | |
| 22947240 | 22971 | | | 12.00 | .4724 | | 12.0 | | 118 | | 71 | | 56 |
| 22948440 | 22925 | 31/64 | | | .4844 | 31/64 | | 4-3/4 | | 3 | | 2-1/4 | |
| 22949210 | 22988 | | | 12.50 | .4921 | | 14.0 | | 124 | | 77 | | 60 |
| 22950000 | 22926 | 1/2 | | | .5000 | 1/2 | | 4-3/4 | | 3 | | 2-1/4 | |
| 22951180 | 23015 | | | 13.00 | .5118 | | 14.0 | | 124 | | 77 | | 60 |
| 22951560 | 22927 | 33/64 | | | .5156 | 33/64 | | 5 | | 3-1/4 | | 2-7/16 | |
| 22953120 | 22928 | 17/32 | | | .5312 | 17/32 | | 5 | | 3-1/4 | | 2-7/16 | |
| 22953150 | 23017 | | | 13.50 | .5315 | | 14.0 | | 124 | | 77 | | 60 |
| 22954690 | 22929 | 35/64 | | | .5469 | 35/64 | | 5 | | 3-1/4 | | 2-7/16 | |
| 22955120 | 23018 | | | 14.00 | .5512 | | 14.0 | | 124 | | 77 | | 60 |
| 22956250 | 22930 | 9/16 | | | .5625 | 9/16 | | 5 | | 3-1/4 | | 2-7/16 | |
| 22957090 | 23020 | | | 14.50 | .5709 | | 16.0 | | 133 | | 83 | | 63 |
| 22959060 | 23021 | | | 15.00 | .5906 | | 16.0 | | 133 | | 83 | | 63 |
| 22961020 | 23022 | | | 15.50 | .6102 | | 16.0 | | 133 | | 83 | | 63 |
| 22962200 | 23023 | | | 15.80 | .6220 | | 16.0 | | 133 | | 83 | | 63 |
| 22962500 | 22931 | 5/8 | | | .6250 | 5/8 | | 5-1/4 | | 3-1/2 | | 2-5/8 | |
| 22962990 | 23024 | | | 16.00 | .6299 | | 16.0 | | 133 | | 83 | | 63 |
| 22965620 | 22932 | 21/32 | | | .6562 | 21/32 | | 5-1/2 | | 3-5/8 | | 2-23/32 | |
| 22968750 | 22933 | 11/16 | | | .6875 | 11/16 | | 5-1/2 | | 3-5/8 | | 2-23/32 | |
| 22975000 | 22934 | 3/4 | | | .7500 | 3/4 | | 5-3/4 | | 3-7/8 | | 2-29/32 | |



Factory Regrind Service

800-553-8024
or
563-391-6220

Technical information on page 24.

Speeds and Feeds

Series 134, 135 and 137 Inch

| Material | Aluminum / Aluminum Alloys < 10% Si | | Aluminum / Aluminum Alloys > 10% Si | | Brass / Bronze | | Magnesium / Magnesium Alloys | |
|----------|-------------------------------------|--------------|-------------------------------------|--------------|----------------|--------------|------------------------------|--------------|
| Examples | 6061-T6/7075-T6 | | | | | | | |
| Diameter | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth |
| 3/16 | 1000-1400 | .002-.004 | 800-1000 | .002-.004 | 500-900 | .0015-.0020 | 700-1000 | .0015-.0020 |
| 1/4 | 1000-1400 | .004-.009 | 800-1000 | .004-.009 | 500-900 | .0020-.0025 | 700-1000 | .0020-.0025 |
| 5/16 | 1000-1400 | .010-.025 | 800-1000 | .010-.025 | 500-900 | .0025-.0030 | 700-1000 | .0025-.0030 |
| 3/8 | 1000-1400 | .010-.035 | 800-1000 | .010-.035 | 500-900 | .0030-.0035 | 700-1000 | .0030-.0035 |
| 1/2 | 1000-1400 | .010-.045 | 800-1000 | .010-.045 | 500-900 | .0035-.0050 | 700-1000 | .0035-.0050 |
| 5/8 | 1000-1400 | .015-.035 | 800-1000 | .015-.035 | 500-900 | .0050-.0080 | 700-1000 | .0050-.0080 |
| 3/4 | 1000-1400 | .015-.040 | 800-1000 | .015-.040 | 500-900 | .0075-.0095 | 700-1000 | .0075-.0095 |
| 1 | 1000-1400 | .020-.040 | 800-1000 | .020-.040 | 500-900 | .0085-.0100 | 700-1000 | .0085-.0100 |

| Material | Plastics / Bakelite | | Plastic | | Copper | |
|----------|---------------------|--------------|---------|--------------|---------|--------------|
| Examples | Glass Filled | | | | | |
| Diameter | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth |
| 3/16 | 800-1200 | .0020-.0030 | 350-600 | .0015-.0020 | 500-800 | .0015-.0020 |
| 1/4 | 800-1200 | .0020-.0040 | 350-600 | .0020-.0030 | 500-800 | .0020-.0030 |
| 5/16 | 800-1200 | .0030-.0050 | 350-600 | .0020-.0040 | 500-800 | .0020-.0040 |
| 3/8 | 800-1200 | .0040-.0060 | 350-600 | .0030-.0050 | 500-800 | .0030-.0050 |
| 1/2 | 800-1200 | .0040-.0060 | 350-600 | .0040-.0060 | 500-800 | .0040-.0060 |
| 5/8 | 800-1200 | .0050-.0080 | 350-600 | .0040-.0060 | 500-800 | .0040-.0060 |
| 3/4 | 800-1200 | .0080-.0100 | 350-600 | .0050-.0080 | 500-800 | .0050-.0080 |
| 1 | 800-1200 | .0100-.0140 | 350-600 | .0080-.0100 | 500-800 | .0080-.0100 |

Series 134, 135 and 137 Metric

| Material | Aluminum / Aluminum Alloys < 10% Si | | Aluminum / Aluminum Alloys > 10% Si | | Brass / Bronze | | Magnesium / Magnesium Alloys | |
|----------|-------------------------------------|------------|-------------------------------------|------------|----------------|-----------|------------------------------|-----------|
| Examples | 6061-T6/7075-T6 | | | | | | | |
| Diameter | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth |
| 3 | 305-425 | .025-.051 | 245-305 | .025-.051 | 150-275 | .020-.038 | 215-305 | .020-.038 |
| 5 | 305-425 | .051-.102 | 245-305 | .051-.102 | 150-275 | .038-.051 | 215-305 | .038-.051 |
| 6 | 305-425 | .102-.229 | 245-305 | .102-.229 | 150-275 | .051-.064 | 215-305 | .051-.064 |
| 8 | 305-425 | .254-.635 | 245-305 | .254-.635 | 150-275 | .064-.076 | 215-305 | .064-.076 |
| 10 | 305-425 | .254-.889 | 245-305 | .254-.889 | 150-275 | .076-.089 | 215-305 | .076-.089 |
| 12 | 305-425 | .254-1.010 | 245-305 | .254-1.010 | 150-275 | .089-.127 | 215-305 | .089-.127 |
| 16 | 305-425 | .381-1.010 | 245-305 | .381-1.010 | 150-275 | .127-.200 | 215-305 | .127-.200 |
| 20 | 305-425 | .381-1.010 | 245-305 | .381-1.010 | 150-275 | .191-.241 | 215-305 | .191-.241 |
| 25 | 305-425 | .508-1.100 | 245-305 | .508-1.100 | 150-275 | .216-.254 | 215-305 | .216-.254 |

| Material | Plastics / Bakelite | | Plastic | | Copper | |
|----------|---------------------|-----------|---------|-----------|---------|-----------|
| Examples | Glass Filled | | | | | |
| Diameter | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth |
| 3 | 245-365 | .038-.051 | 105-185 | .020-.038 | 150-245 | .020-.038 |
| 5 | 245-365 | .051-.076 | 105-185 | .038-.051 | 150-245 | .038-.051 |
| 6 | 245-365 | .051-.102 | 105-185 | .051-.064 | 150-245 | .051-.064 |
| 8 | 245-365 | .076-.127 | 105-185 | .064-.076 | 150-245 | .064-.076 |
| 10 | 245-365 | .102-.152 | 105-185 | .076-.089 | 150-245 | .076-.089 |
| 12 | 245-365 | .102-.152 | 105-185 | .089-.127 | 150-245 | .089-.127 |
| 16 | 245-365 | .127-.200 | 105-185 | .127-.200 | 150-245 | .127-.200 |
| 20 | 245-365 | .200-.254 | 105-185 | .191-.241 | 150-245 | .191-.241 |
| 25 | 245-365 | .254-.356 | 105-185 | .216-.254 | 150-245 | .216-.254 |

These are general speed and feed recommendations that may need to be adjusted. For application questions, contact M.A. Ford.

**Don't Exceed 20,000 RPM
Requires Balanced Tool Holder**

Speeds and Feeds

Series 136 and 138

Inch

| Material | Aluminum / Aluminum Alloys < 10% Si | | Aluminum / Aluminum Alloys > 10% Si | | Brass / Bronze | | Magnesium / Magnesium Alloys | |
|----------|-------------------------------------|--------------|-------------------------------------|--------------|----------------|--------------|------------------------------|--------------|
| Examples | 6061-T6/7075-T6 | | | | | | | |
| Diameter | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth |
| 1/8 | 1000-1400 | .001-.004 | 800-1000 | .001-.004 | 500-900 | .001-.004 | 700-1000 | .001-.004 |
| 3/16 | 1000-1400 | .002-.006 | 800-1000 | .002-.006 | 500-900 | .002-.006 | 700-1000 | .002-.006 |
| 1/4 | 1000-1400 | .002-.006 | 800-1000 | .002-.006 | 500-900 | .002-.006 | 700-1000 | .002-.006 |
| 5/16 | 1000-1400 | .004-.008 | 800-1000 | .004-.008 | 500-900 | .004-.008 | 700-1000 | .004-.008 |
| 3/8 | 1000-1400 | .004-.008 | 800-1000 | .004-.008 | 500-900 | .004-.008 | 700-1000 | .004-.008 |
| 1/2 | 1000-1400 | .006-.010 | 800-1000 | .006-.010 | 500-900 | .006-.010 | 700-1000 | .006-.010 |
| 5/8 | 1000-1400 | .008-.012 | 800-1000 | .008-.012 | 500-900 | .008-.012 | 700-1000 | .008-.012 |
| 3/4 | 1000-1400 | .010-.014 | 800-1000 | .010-.014 | 500-900 | .010-.014 | 700-1000 | .010-.014 |
| 1 | 1000-1400 | .014-.016 | 800-1000 | .014-.016 | 500-900 | .014-.016 | 700-1000 | .014-.016 |

| Material | Plastics / Bakelite | | Plastic | | Copper | |
|----------|---------------------|--------------|---------|--------------|---------|--------------|
| Examples | Glass Filled | | | | | |
| Diameter | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth |
| 1/8 | 800-1200 | .001-.004 | 350-600 | .0010-.0040 | 500-800 | .0008-.0012 |
| 3/16 | 800-1200 | .002-.006 | 350-600 | .0020-.0060 | 500-800 | .0015-.0020 |
| 1/4 | 800-1200 | .002-.006 | 350-600 | .0020-.0060 | 500-800 | .0020-.0030 |
| 5/16 | 800-1200 | .004-.008 | 350-600 | .0040-.0080 | 500-800 | .0020-.0040 |
| 3/8 | 800-1200 | .004-.008 | 350-600 | .0040-.0080 | 500-800 | .0030-.0050 |
| 1/2 | 800-1200 | .006-.010 | 350-600 | .0060-.0100 | 500-800 | .0040-.0060 |
| 5/8 | 800-1200 | .008-.012 | 350-600 | .0080-.0120 | 500-800 | .0040-.0060 |
| 3/4 | 800-1200 | .010-.014 | 350-600 | .0100-.0140 | 500-800 | .0050-.0080 |
| 1 | 800-1200 | .014-.016 | 350-600 | .0140-.0160 | 500-800 | .0080-.0100 |

Series 136 and 138

Metric

| Material | Aluminum / Aluminum Alloys < 10% Si | | Aluminum / Aluminum Alloys > 10% Si | | Brass / Bronze | | Magnesium / Magnesium Alloys | |
|----------|-------------------------------------|-----------|-------------------------------------|-----------|----------------|-----------|------------------------------|-----------|
| Examples | 6061-T6/7075-T6 | | | | | | | |
| Diameter | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth |
| 3 | 305-425 | .025-.102 | 245-305 | .025-.102 | 150-275 | .025-.102 | 215-305 | .025-.102 |
| 5 | 305-425 | .051-.152 | 245-305 | .051-.152 | 150-275 | .051-.152 | 215-305 | .051-.152 |
| 6 | 305-425 | .051-.152 | 245-305 | .051-.152 | 150-275 | .051-.152 | 215-305 | .051-.152 |
| 8 | 305-425 | .102-.200 | 245-305 | .102-.200 | 150-275 | .102-.200 | 215-305 | .102-.200 |
| 10 | 305-425 | .102-.200 | 245-305 | .102-.200 | 150-275 | .102-.200 | 215-305 | .102-.200 |
| 12 | 305-425 | .152-.200 | 245-305 | .152-.200 | 150-275 | .152-.200 | 215-305 | .152-.200 |
| 16 | 305-425 | .200-.305 | 245-305 | .200-.305 | 150-275 | .200-.305 | 215-305 | .200-.305 |
| 20 | 305-425 | .254-.356 | 245-305 | .254-.356 | 150-275 | .254-.356 | 215-305 | .254-.356 |

| Material | Plastics / Bakelite | | Plastic | | Copper | |
|----------|---------------------|-----------|---------|-----------|---------|-----------|
| Examples | Glass Filled | | | | | |
| Diameter | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth |
| 3 | 245-365 | .025-.102 | 105-185 | .025-.102 | 150-245 | .020-.030 |
| 5 | 245-365 | .051-.152 | 105-185 | .051-.152 | 150-245 | .038-.051 |
| 6 | 245-365 | .051-.152 | 105-185 | .051-.152 | 150-245 | .051-.076 |
| 8 | 245-365 | .102-.200 | 105-185 | .102-.200 | 150-245 | .051-.102 |
| 10 | 245-365 | .102-.200 | 105-185 | .102-.200 | 150-245 | .076-.127 |
| 12 | 245-365 | .152-.200 | 105-185 | .152-.200 | 150-245 | .102-.152 |
| 16 | 245-365 | .200-.305 | 105-185 | .200-.305 | 150-245 | .102-.152 |
| 20 | 245-365 | .254-.356 | 105-185 | .254-.356 | 150-245 | .127-.200 |

These are general speed and feed recommendations that may need to be adjusted. For application questions, contact M.A. Ford.

**Don't Exceed 20,000 RPM
Requires Balanced Tool Holder**

Speeds and Feeds

Series 135B and 138B

Inch

| Material | Aluminum / Aluminum Alloys < 10% Si | | Aluminum / Aluminum Alloys > 10% Si | | Brass / Bronze | | Magnesium / Magnesium Alloys | |
|----------|-------------------------------------|--------------|-------------------------------------|--------------|----------------|--------------|------------------------------|--------------|
| Examples | 6061-T6/7075-T6 | | | | | | | |
| Diameter | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth |
| 1/8 | 1000-1400 | .001-.004 | 800-1000 | .001-.004 | 500-900 | .0010-.0020 | 700-1000 | .0010-.0020 |
| 3/16 | 1000-1400 | .002-.006 | 800-1000 | .002-.006 | 500-900 | .0015-.0025 | 700-1000 | .0015-.0025 |
| 1/4 | 1000-1400 | .002-.006 | 800-1000 | .002-.006 | 500-900 | .0020-.0040 | 700-1000 | .0020-.0040 |
| 5/16 | 1000-1400 | .004-.008 | 800-1000 | .004-.008 | 500-900 | .0030-.0050 | 700-1000 | .0030-.0050 |
| 3/8 | 1000-1400 | .004-.008 | 800-1000 | .004-.008 | 500-900 | .0030-.0050 | 700-1000 | .0030-.0050 |
| 1/2 | 1000-1400 | .006-.010 | 800-1000 | .006-.010 | 500-900 | .0040-.0080 | 700-1000 | .0040-.0080 |
| 5/8 | 1000-1400 | .008-.012 | 800-1000 | .008-.012 | 500-900 | .0040-.0080 | 700-1000 | .0040-.0080 |
| 3/4 | 1000-1400 | .010-.014 | 800-1000 | .010-.014 | 500-900 | .0060-.0100 | 700-1000 | .0060-.0100 |
| 1 | 1000-1400 | .014-.016 | 800-1000 | .014-.016 | 500-900 | .0080-.0120 | 700-1000 | .0080-.0120 |

| Material | Plastics / Bakelite | | Plastic | | Copper | |
|----------|---------------------|--------------|---------|--------------|---------|--------------|
| Examples | Glass Filled | | | | | |
| Diameter | SFM | inches/tooth | SFM | inches/tooth | SFM | inches/tooth |
| 1/8 | 800-1200 | .0010-.0020 | 350-600 | .0010-.0020 | 500-800 | .0008-.0012 |
| 3/16 | 800-1200 | .0015-.0025 | 350-600 | .0015-.0025 | 500-800 | .0015-.0020 |
| 1/4 | 800-1200 | .0020-.0040 | 350-600 | .0020-.0040 | 500-800 | .0020-.0030 |
| 5/16 | 800-1200 | .0030-.0050 | 350-600 | .0030-.0050 | 500-800 | .0020-.0040 |
| 3/8 | 800-1200 | .0030-.0050 | 350-600 | .0030-.0050 | 500-800 | .0030-.0050 |
| 1/2 | 800-1200 | .0040-.0080 | 350-600 | .0040-.0080 | 500-800 | .0040-.0060 |
| 5/8 | 800-1200 | .0040-.0080 | 350-600 | .0040-.0080 | 500-800 | .0040-.0060 |
| 3/4 | 800-1200 | .0060-.0100 | 350-600 | .0060-.0100 | 500-800 | .0050-.0080 |
| 1 | 800-1200 | .0080-.0120 | 350-600 | .0080-.0120 | 500-800 | .0080-.0100 |

Series 135B and 138B

Metric

| Material | Aluminum / Aluminum Alloys < 10% Si | | Aluminum / Aluminum Alloys > 10% Si | | Brass / Bronze | | Magnesium / Magnesium Alloys | |
|----------|-------------------------------------|-----------|-------------------------------------|-----------|----------------|-----------|------------------------------|-----------|
| Examples | 6061-T6/7075-T6 | | | | | | | |
| Diameter | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth |
| 3 | 305-425 | .025-.102 | 245-305 | .025-.102 | 150-275 | .025-.051 | 215-305 | .025-.051 |
| 5 | 305-425 | .051-.152 | 245-305 | .051-.152 | 150-275 | .038-.064 | 215-305 | .038-.064 |
| 6 | 305-425 | .051-.152 | 245-305 | .051-.152 | 150-275 | .051-.102 | 215-305 | .051-.102 |
| 8 | 305-425 | .102-.200 | 245-305 | .102-.200 | 150-275 | .076-.127 | 215-305 | .076-.127 |
| 10 | 305-425 | .102-.200 | 245-305 | .102-.200 | 150-275 | .076-.127 | 215-305 | .076-.127 |
| 12 | 305-425 | .152-.254 | 245-305 | .152-.254 | 150-275 | .102-.200 | 215-305 | .102-.200 |
| 16 | 305-425 | .200-.305 | 245-305 | .200-.305 | 150-275 | .102-.200 | 215-305 | .102-.200 |

| Material | Plastics / Bakelite | | Plastic | | Copper | |
|----------|---------------------|-----------|---------|-----------|---------|-----------|
| Examples | Glass Filled | | | | | |
| Diameter | m/min | mm/tooth | m/min | mm/tooth | m/min | mm/tooth |
| 3 | 245-365 | .025-.051 | 105-185 | .025-.051 | 150-245 | .020-.030 |
| 5 | 245-365 | .038-.064 | 105-185 | .038-.064 | 150-245 | .038-.051 |
| 6 | 245-365 | .051-.102 | 105-185 | .051-.102 | 150-245 | .051-.076 |
| 8 | 245-365 | .076-.127 | 105-185 | .076-.127 | 150-245 | .051-.102 |
| 10 | 245-365 | .076-.127 | 105-185 | .076-.127 | 150-245 | .076-.127 |
| 12 | 245-365 | .102-.200 | 105-185 | .102-.200 | 150-245 | .102-.152 |
| 16 | 245-365 | .102-.200 | 105-185 | .102-.200 | 150-245 | .102-.152 |

**Don't Exceed 20,000 RPM
Requires Balanced Tool Holder**

These are general speed and feed recommendations that may need to be adjusted. For application questions, contact M.A. Ford.

Speeds and Feeds

Series 229

Inch

| Material | Aluminum (<10% Si) | | Aluminum (>10% Si) | | Copper / Brass | | Plastic | |
|----------|--------------------|-------|--------------------|-------|----------------|-------|---------|-------|
| Examples | 6061-T6 / 7075-T6 | | | | | | | |
| Diameter | SFM | IPR | SFM | IPR | SFM | IPR | SFM | IPR |
| 1/16 | 700 | .0030 | 500 | .0020 | 225 | .0020 | 300 | .0020 |
| 1/8 | 700 | .0080 | 500 | .0030 | 225 | .0030 | 300 | .0030 |
| 3/16 | 700 | .0100 | 500 | .0040 | 225 | .0040 | 300 | .0040 |
| 1/4 | 700 | .0120 | 500 | .0060 | 225 | .0060 | 300 | .0060 |
| 5/16 | 700 | .0140 | 500 | .0060 | 225 | .0060 | 300 | .0060 |
| 3/8 | 700 | .0140 | 500 | .0080 | 225 | .0080 | 300 | .0080 |
| 7/16 | 700 | .0160 | 500 | .0100 | 225 | .0100 | 300 | .0100 |
| 1/2 | 700 | .0180 | 500 | .0100 | 225 | .0100 | 300 | .0100 |
| 9/16 | 700 | .0200 | 500 | .0110 | 225 | .0110 | 300 | .0110 |
| 5/8 | 700 | .0200 | 500 | .0110 | 225 | .0110 | 300 | .0110 |
| 11/16 | 700 | .0220 | 500 | .0120 | 225 | .0120 | 300 | .0120 |
| 3/4 | 700 | .0240 | 500 | .0120 | 225 | .0120 | 300 | .0120 |

Series 229

Metric

| Material | Aluminum (<10% Si) | | Aluminum (>10% Si) | | Copper / Brass | | Plastic | |
|----------|--------------------|--------|--------------------|--------|----------------|--------|---------|--------|
| Examples | 6061-T6 / 7075-T6 | | | | | | | |
| Diameter | m/min | mm/rev | m/min | mm/rev | m/min | mm/rev | m/min | mm/rev |
| 2.0 | 210 | .0760 | 150 | .0510 | 70 | .0510 | 90 | .0510 |
| 3.0 | 210 | .2030 | 150 | .0760 | 70 | .0760 | 90 | .0760 |
| 6.0 | 210 | .3050 | 150 | .1520 | 70 | .1520 | 90 | .1520 |
| 8.0 | 210 | .3560 | 150 | .1520 | 70 | .1520 | 90 | .1520 |
| 10.0 | 210 | .3560 | 150 | .2030 | 70 | .2030 | 90 | .2030 |
| 12.0 | 210 | .4570 | 150 | .2540 | 70 | .2540 | 90 | .2540 |
| 16.0 | 210 | .5080 | 150 | .2790 | 70 | .2790 | 90 | .2790 |

These are general speed and feed recommendations that may need to be adjusted. For application questions, contact M.A. Ford.

ISO 9001:2000 Certified





Factory Regrind Service

Request a box by contacting M.A. Ford® Customer Service.
800-553-8024 or 563-391-6220

Your box will arrive with foam inside to protect tools from damage, return labels and zip ties to insure box is secure for shipment.

Package tools for regrinding in original packaging or equivalent packages to prevent damage in shipping.

M.A. Ford® IS NOT RESPONSIBLE FOR TOOLS RECEIVED DAMAGED AND BEYOND REPAIR DUE TO POOR PACKAGING/SHIPPING.

Complete Regrind Order Form (form can be found at www.maford.com).

Regrind Order Form and your purchase order/packing list must accompany tools being returned for reshaping.

Place Red Regrind Box in cardboard box to avoid extra shipping costs.

Ship to M.A. Ford

7737 Northwest Blvd.

Davenport, Iowa 52806

M.A. Ford will quote cost after receipt and inspection of shipment.

M.A. Ford requires prior approval before starting all regrind orders. After 10 days without a response, M.A. Ford will return tools to you.

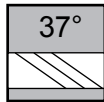
After approval, M.A. Ford will complete the regrinding and return ship to you.

Icon Glossary

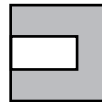
TuffCut® End Mills



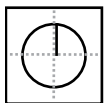
of Flutes



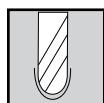
Helix Angle



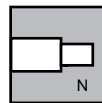
Shank



Center Cutting



Ball Nose



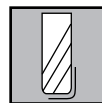
Neck Relief



Lengths



Workpiece Material Group

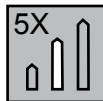


Corner Radius

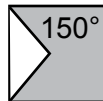
Twister® Drills



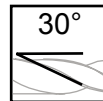
Solid



Lengths



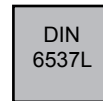
Point Angle



Helix Angle



Workpiece Material Group



DIN Specs

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M.A. Ford employs a full service sales, marketing and customer service staff that is readily available to assist you with all your cutting tool needs. From tool selection and order processing to the technical applications consultation with world-class service and products.

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World Class Products

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