M233 Series Application Guide – Speed & Feed (inch)

Nork Material Iminum Alloys	Type of Cut Slotting	Axial DOC	Radial DOC	Number of Flutes	Speed						
ıminum Alloys	J				(SFM)	1/4	3/8	1/2	5/8	3/4	1
ıminum Alloys		1 x D	1 x D	3	800	.0030	.0045	.0060	.0075	.0090	.0120
Iminum Alloys	Peripheral - Rough	≤ 2 x D	.5 x D	3	1000	.0040	.0060	.0080	.0100	.0120	.0160
Aluminum Alloys 2024, 6061, 7075	Peripheral - Rough	> 2 - 3 x D	.5 x D	3	1000	.0038	.0056	.0075	.0094	.0113	.0150
	Peripheral - Rough	> 3 - 4 x D	.45 x D	3	900	.0033	.0049	.0065	.0081	.0098	.0130
	*Helical Ramp Angle	3.0 deg.	1 x D	3	800	.0024	.0036	.0048	.0060	.0072	.0096
High Silicon Aluminum A380, A390	Slotting	.75 x D	1 x D	3	500	.0023	.0034	.0045	.0056	.0068	.0090
	Peripheral - Rough	≤ 2 x D	.4 x D	3	700	.0029	.0043	.0057	.0071	.0086	.0114
	Peripheral - Rough	> 2 - 3 x D	.4 x D	3	700	.0028	.0041	.0055	.0069	.0083	.0110
	Peripheral - Rough	> 3 - 4 x D	.375 x D	3	600	.0024	.0036	.0048	.0060	.0072	.0096
	*Helical Ramp Angle	2.5 deg.	1 x D	3	500	.0018	.0027	.0036	.0045	.0054	.0072
Magnesium Alloys	Slotting	1 x D	1 x D	3	800	.0030	.0045	.0060	.0075	.0090	.0120
	Peripheral - Rough	≤ 2 x D	.5 x D	3	1000	.0040	.0060	.0080	.0100	.0120	.0160
	Peripheral - Rough	> 2 - 3 x D	.5 x D	3	1000	.0038	.0056	.0075	.0094	.0113	.0150
	Peripheral - Rough	> 3 - 4 x D	.45 x D	3	900	.0033	.0049	.0065	.0081	.0098	.0130
	*Helical Ramp Angle	3.0 deg.	1 x D	3	800	.0024	.0036	.0048	.0060	.0072	.0096
Copper Alloys, Brass	Slotting	.75 x D	1 x D	3	500	.0019	.0028	.0037	.0046	.0056	.0074
	Peripheral - Rough	≤ 2 x D	.4 x D	3	600	.0023	.0035	.0046	.0058	.0069	.0092
	Peripheral - Rough	> 2 - 3 x D	.4 x D	3	600	.0023	.0034	.0045	.0056	.0068	.0090
	Peripheral - Rough	> 3 - 4 x D	.375 x D	3	500	.0020	.0029	.0039	.0049	.0059	.0078
	*Helical Ramp Angle	2.5 deg.	1 x D	3	500	.0015	.0022	.0030	.0037	.0044	.0059
Bronze	Slotting	.75 x D	1 x D	3	500	.0018	.0026	.0035	.0044	.0053	.0070
	Peripheral - Rough	≤ 2 x D	.4 x D	3	600	.0022	.0033	.0044	.0055	.0066	.0088
	Peripheral - Rough	> 2 - 3 x D	.4 x D	3	600	.0021	.0032	.0042	.0053	.0063	.0084
	Peripheral - Rough	> 3 - 4 x D	.375 x D	3	500	.0018	.0026	.0035	.0044	.0053	.0070
	*Helical Ramp Angle	2.0 deg.	1 x D	3	500	.0014	.0021	.0028	.0035	.0042	.0056
	Slotting	.75 x D	1 x D	3	500	.0023	.0034	.0045	.0056	.0068	.0090
mposites,	Peripheral - Rough	≤ 2 x D	.4 x D	3	700	.0029	.0043	.0057	.0071	.0086	.0114
stics,	Peripheral - Rough	> 2 - 3 x D	.4 x D	3	700	.0028	.0041	.0055	.0069	.0083	.0110
erglass	Peripheral - Rough	> 3 - 4 x D	.375 x D	3	600	.0024	.0036	.0048	.0060	.0072	.0096
	*Helical Ramp Angle	3.0 deg.	1 x D	3	500	.0018	.0027	.0036	.0045	.0054	.0072
	h Silicon minum 30, A390 gnesium Alloys oper Alloys, ss nze	Peripheral - Rough *Helical Ramp Angle Slotting h Silicon minum Peripheral - Rough Peripheral - Rough *Helical Ramp Angle Slotting Peripheral - Rough Peripheral - Rough	Peripheral - Rough $> 3 - 4 \times D$ *Helical Ramp Angle3.0 deg.Slotting.75 $\times D$ h SiliconPeripheral - Rough $\leq 2 \times D$ minumPeripheral - Rough $> 2 - 3 \times D$ 30, A390Peripheral - Rough $> 3 - 4 \times D$ *Helical Ramp Angle2.5 deg.ampositionPeripheral - Rough $\leq 2 \times D$ genesium AlloysPeripheral - Rough $\leq 2 \times D$ Peripheral - Rough $\leq 2 \times D$ Peripheral - Rough $\geq 2 - 3 \times D$ Peripheral - Rough $\geq 2 - 3 \times D$ Peripheral - Rough $\geq 2 - 3 \times D$ Peripheral - Rough $\geq 2 \times D$ Peripheral - Rough $\geq 2 \times D$ Peripheral - Rough $\leq 2 \times D$ Peripheral - Rough $\geq 2 - 3 \times D$ Peripheral - Rough $\geq 2 - 3 \times D$ Peripheral - Rough $\geq 2 - 3 \times D$ Peripheral - Rough $\geq 2 - 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Rough $> 2.5 \text{ deg.}$ $1 \times D$ $30, A390$ Peripheral - Rough $< 2 \times D$ $.5 \times D$ $30, A390$ Peripheral - Rough $> 2 - 3 \times D$ $.5 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.5 \times D$ $30, a00$ Peripheral - Rough $> 3 - 4 \times D$ $.45 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ 3.0 deg. $1 \times D$ $1 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough $> 3 - 4 \times D$ $.375 \times D$ $30, a00$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ $30, a00$ Peripheral - Rough <t< td=""><td>Peripheral - Rough$>3 - 4 \times D$$.45 \times D$$.3$"Helical Ramp Angle$3.0 \deg$,$1 \times D$$3$h SiliconPeripheral - 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3 \times D$$4 \times D$$3$600stotting$.75 \times D$$1 \times D$$3$500peripheral - Rough$> 2 - 3 \times D$$4 \times D$$3$600peripheral - Rough$> 2 - 3 \times D$$4 \times D$$3$600peripheral - Rough$> 2 - 3 \times D$$4 \times D$$3$600nzePeripheral - Rough$> 2 - 3 \times D$$4 \times D$$3$600nzeSlotting</td></t<> <td>Peripheral - Rough$> 3 \cdot 4 \times D$$A5 \times D$$3$$900$$1.0033$"Helical Ramp Angle$3.0 \deg$$1 \times D$$3$$800$$0024$h SiliconPeripheral - Rough$\leq 2 \times D$$4 \times D$$3$$700$$0029$minumPeripheral - Rough$> 2 \cdot 3 \times D$$4 \times D$$3$$700$$0028$$80, A390$Peripheral - Rough$> 2 \cdot 3 \times D$$4 \times D$$3$$600$$0024$$80, A390$Peripheral - Rough$> 2 \cdot 3 \times D$$4 \times D$$3$$600$$0024$$90, A390$Peripheral - Rough$> 2 \cdot 3 \times D$$5 \times D$$3$$600$$0024$$90, A390$Peripheral - Rough$> 2 \cdot 3 \times D$$5 \times D$$3$$1000$$0008$$90, A390$Peripheral - Rough$> 2 \cdot 3 \times D$$5 \times D$$3$$1000$$0033$$90, B10, B10, B10, B10, B10, B10, B10, B1$</td> <td>Peripheral - Rough >3 - 4 x D A5 x D 3 900 0.033 0.0049 "Helical Ramp Angle 3.0 deg. 1 x D 3 800 .0024 .0036 h Siloting .75 x D 1 x D 3 500 .0023 .0034 h Siloting .75 x D 1 x D 3 700 .0023 .0034 h Siloting .23 x D .4 x D 3 700 .0028 .0041 80, A390 Peripheral - Rough >2 - 3 x D .375 x D 3 600 .0024 .0036 #Helical Ramp Angle 2.5 deg. 1 x D 3 500 .0018 .0027 gnesium Alloys Peripheral - Rough >2 - 3 x D 5 x D 3 1000 .0040 .0060 gnesium Alloys Peripheral - Rough >2 - 3 x D 5 x D 3 900 .0033 .0049 #Helical Ramp Angle 3.0 deg. 1 x D 3 800 .0023 .0036 gnesium Alloys Feripheral</td> <td>Peripheral - Rough > 3 - 4 × D 4.5 × D 3 900 0.0033 0.0049 0.0049 "Helical Ramp Angle 3.0 deg. 1 × D 3 800 0.0224 0.0336 0.0049 h Silting 75 × D 1 × D 3 500 0.0228 0.0043 0.0055 minum Peripheral - Rough > 2 - 3 × D 4 × D 3 700 0.0228 0.0041 0.055 00, A390 Peripheral - Rough > 2 - 3 × D 3.75 × D 3 600 0.0224 0.0043 0.0461 00, A390 Peripheral - Rough > 2 - 3 × D 3.75 × D 3 600 0.024 0.036 0.0461 4, A300 1 × D 3 800 .0018 0.027 0.0361 900 Slotting 1 × D 1 × D 3 800 .0040 .0060 .0080 901 Peripheral - Rough > 2 - 3 × D .5 × D 3 1000 .0033 .0049 .0056 901</td> <td>Peripheral-Rough >3 - 4 X D 45 x D 3 900 0.033 0.049 0.065 0.0061 ''Helical Ramp Angle 3.0 deg. 1 x D 3 600 0.024 0.036 0.0048 0.0060 h Silting 75 x D 1 x D 3 500 0.023 0.034 0.045 0.0056 h Silting Peripheral-Rough >2 x 3 X D 4 X D 3 700 0.028 0.044 0.055 0.069 initrum Peripheral-Rough >2 x 3 X D 4 X D 3 600 0.024 0.036 0.048 0.060 id0, A390 Peripheral-Rough >3 x 4 X D 3.75 x D 3 600 0.030 0.045 0.060 0.075 ignesium Alloys Peripheral-Rough >2 x 3 X D 5 X D 3 1000 0.040 0.060 0.021 0.060 0.075 gnesium Alloys Peripheral-Rough >2 x X D 5 X D 3 1000 0.038 0.046 0.055 0.061</td> <td>Peripheral-Rough >3 4 x D A5 x D 900 10033 10083</td>	Peripheral - Rough $>3 - 4 \times D$ $.45 \times D$ $.3$ "Helical Ramp Angle $3.0 \deg$, $1 \times D$ 3 h SiliconPeripheral - Rough $\leq 2 \times D$ $.4 \times D$ 3 minumPeripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ 3 $80, A390$ Peripheral - Rough $> 2 - 3 \times D$ $.4 \times D$ 3 $80, A390$ Peripheral - 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Rough $\leq 2 \times D$ $4 \times D$ 3 700 0029 minumPeripheral - Rough $> 2 \cdot 3 \times D$ $4 \times D$ 3 700 0028 $80, A390$ Peripheral - Rough $> 2 \cdot 3 \times D$ $4 \times D$ 3 600 0024 $80, A390$ Peripheral - Rough $> 2 \cdot 3 \times D$ $4 \times D$ 3 600 0024 $90, A390$ Peripheral - Rough $> 2 \cdot 3 \times D$ $5 \times D$ 3 600 0024 $90, A390$ Peripheral - Rough $> 2 \cdot 3 \times D$ $5 \times D$ 3 1000 0008 $90, A390$ Peripheral - Rough $> 2 \cdot 3 \times D$ $5 \times D$ 3 1000 0033 $90, B10, B10, B10, B10, B10, B10, B10, B1$	Peripheral - Rough >3 - 4 x D A5 x D 3 900 0.033 0.0049 "Helical Ramp Angle 3.0 deg. 1 x D 3 800 .0024 .0036 h Siloting .75 x D 1 x D 3 500 .0023 .0034 h Siloting .75 x D 1 x D 3 700 .0023 .0034 h Siloting .23 x D .4 x D 3 700 .0028 .0041 80, A390 Peripheral - Rough >2 - 3 x D .375 x D 3 600 .0024 .0036 #Helical Ramp Angle 2.5 deg. 1 x D 3 500 .0018 .0027 gnesium Alloys Peripheral - Rough >2 - 3 x D 5 x D 3 1000 .0040 .0060 gnesium Alloys Peripheral - Rough >2 - 3 x D 5 x D 3 900 .0033 .0049 #Helical Ramp Angle 3.0 deg. 1 x D 3 800 .0023 .0036 gnesium Alloys Feripheral	Peripheral - Rough > 3 - 4 × D 4.5 × D 3 900 0.0033 0.0049 0.0049 "Helical Ramp Angle 3.0 deg. 1 × D 3 800 0.0224 0.0336 0.0049 h Silting 75 × D 1 × D 3 500 0.0228 0.0043 0.0055 minum Peripheral - Rough > 2 - 3 × D 4 × D 3 700 0.0228 0.0041 0.055 00, A390 Peripheral - Rough > 2 - 3 × D 3.75 × D 3 600 0.0224 0.0043 0.0461 00, A390 Peripheral - Rough > 2 - 3 × D 3.75 × D 3 600 0.024 0.036 0.0461 4, A300 1 × D 3 800 .0018 0.027 0.0361 900 Slotting 1 × D 1 × D 3 800 .0040 .0060 .0080 901 Peripheral - Rough > 2 - 3 × D .5 × D 3 1000 .0033 .0049 .0056 901	Peripheral-Rough >3 - 4 X D 45 x D 3 900 0.033 0.049 0.065 0.0061 ''Helical Ramp Angle 3.0 deg. 1 x D 3 600 0.024 0.036 0.0048 0.0060 h Silting 75 x D 1 x D 3 500 0.023 0.034 0.045 0.0056 h Silting Peripheral-Rough >2 x 3 X D 4 X D 3 700 0.028 0.044 0.055 0.069 initrum Peripheral-Rough >2 x 3 X D 4 X D 3 600 0.024 0.036 0.048 0.060 id0, A390 Peripheral-Rough >3 x 4 X D 3.75 x D 3 600 0.030 0.045 0.060 0.075 ignesium Alloys Peripheral-Rough >2 x 3 X D 5 X D 3 1000 0.040 0.060 0.021 0.060 0.075 gnesium Alloys Peripheral-Rough >2 x X D 5 X D 3 1000 0.038 0.046 0.055 0.061	Peripheral-Rough >3 4 x D A5 x D 900 10033 10083

*Straight-Line Ramp Angle = Helical ramp angle x 5 for entry up to 1 x D.

Tool Tip: M233 Rougher end mills show up to 20% power reduction from M223 in the same cut.

≈ Approximately Equals < Less Than

 \leq Less Than or Equal To > Greater Than

 \geq Greater Than or Equal To = Equals

× Multiply

