

Cutting Speed Recommendations - Circular Saws



These are general cutting speed recommendations on SFM - m/min. rates, and may vary from application to application. Gaylee Corporation does not assume any liability in the following recommendations, which are basically suggestions on where to start. Contact Gaylee if you have questions on speeds and feeds.

MATERIAL* TO BE CUT	HARDNESS RANGE (Bhn)**	CARBIDE SAW CUTTING SPEED (SFM / m/min.)	H.S.S. SAW CUTTING SPEED (SFM / m/min.)	MATERIAL* TO BE CUT	HARDNESS RANGE (Bhn)**	CARBIDE SAW CUTTING SPEED (SFM / m/min.)	H.S.S. SAW CUTTING SPEED (SFM / m/min.)
Free Machining Carbon Steels-Wrought	100-425	<u>130-555</u> 40-170	<u>30-130</u> 9-40	Malleable Cast Irons	110-320	<u>130-470</u> 40-145	<u>30-110</u> 9-34
Carbon Steels-Wrought	85-425	<u>105-530</u> 35-165	<u>25-125</u> 8-38	Chromium-Nickel Alloy Castings	275-375	<u>85-105</u> 25-35	<u>20-25</u> 6-8
Carbon & Ferritic Alloy Steels (High Temp. Service)	150-200	<u>320-425</u> 100-130	<u>75-100</u> 23-30	Aluminum Alloys-Wrought	30-150	<u>3400-4250</u> 1042-1300	<u>800-1000</u> 245-305
Free Machining Alloy Steels-Wrought	150-425	<u>35-470</u> 11-145	<u>8-110</u> 2.5-34	Aluminum Alloys-Cast	40-125	<u>2125-5315</u> 640-1615	<u>500-1250</u> 150-380
Alloy Steels, Wrought	125-425	<u>35-425</u> 11-130	<u>8-100</u> 2.5-30	Magnesium Alloys-Wrought	40-125	<u>5100-6375</u> 1555-1955	<u>1200-1500</u> 365-460
High Strength Steels-Wrought	225-400	<u>35-255</u> 11-80	<u>8-60</u> 2.5-18	Magnesium Alloys-Cast	50-90	<u>5100-6375</u> 1555-1955	<u>1200-1500</u> 365-460
Maraging Steels-Wrought	275-425	<u>35-215</u> 11-65	<u>8-50</u> 2.5-15	Titanium Alloys-Wrought	110-440	<u>65-530</u> 25-165	<u>15-125</u> 5-38
Tool Steels-Wrought	100-375	<u>35-470</u> 11-145	<u>8-110</u> 2.5-34	Titanium Alloys-Cast	150-350	<u>170-470</u> 55-145	<u>40-110</u> 12-34
Nitriding Steels-Wrought	200-350	<u>150-215</u> 50-65	<u>35-50</u> 11-15	Copper Alloys-Wrought	10Rb-100Rb	<u>340-2125</u> 105-640	<u>80-500</u> 24-150
Armor Plate, Ship Plate, Aircraft Plate-Wrought	200-350	<u>65-215</u> 25-65	<u>15-50</u> 5-15	Copper Alloys-Cast	40-200	<u>340-1700</u> 105-510	<u>80-400</u> 24-120
Structural Steels-Wrought	100-400	<u>35-255</u> 11-80	<u>8-60</u> 2.5-18	Nickel Alloys-Wrought and Cast	80-360	<u>65-300</u> 25-90	<u>15-70</u> 5-21
Free Machining Stainless Steels-Wrought	135-425	<u>150-470</u> 50-145	<u>35-110</u> 11-34	Beryllium Nickel Alloys-Wrought and Cast	200-425 47-52Rc	<u>35-215</u> 11-65	<u>8-50</u> 2.5-15
Stainless Steels-Wrought	135-425	<u>35-425</u> 11-130	<u>8-100</u> 2.5-30	High Temp. Alloys-Wrought and Cast	140-475	<u>35-255</u> 11-80	<u>8-60</u> 2.5-18
Precipitation Hardening Stainless Steels-Wrought	150-440	<u>85-340</u> 25-105	<u>20-80</u> 6-24	Refractory Alloys-Cast, P/M	170-320	<u>150-300</u> 50-90	<u>35-70</u> 11-21
Stainless Steels-Cast	135-425	<u>105-425</u> 35-130	<u>25-100</u> 8-30	Zinc Alloys-Cast	80-100	<u>1380-1700</u> 425-510	<u>325-400</u> 100-120
Precipitation Hardening Stainless Steels-Cast	325-450	<u>65-130</u> 25-40	<u>15-30</u> 5-9	Lead Alloys-Cast	5-20	<u>1065-1275</u> 325-385	<u>250-300</u> 76-90
Carbon Steels-Cast	100-300	<u>170-530</u> 55-165	<u>40-125</u> 12-38	TiN Alloys-Cast	15-30	<u>1065-1275</u> 325-385	<u>250-300</u> 76-90
Alloy Steels-Cast	150-400	<u>105-340</u> 35-105	<u>25-80</u> 8-24	Zirconium Alloys-Wrought	140-280	<u>215-255</u> 65-80	<u>50-60</u> 15-18
Tool Steels-Cast	150-375 & 48-50Rc	<u>35-300</u> 11-90	<u>8-70</u> 2.5-21	Manganese-Wrought	140-220	<u>105-130</u> 35-40	<u>25-30</u> 8-9
Gray Cast Irons	120-320	<u>105-470</u> 35-145	<u>25-110</u> 8-34	P/M Alloys-Copper	50-70Rf	<u>170-215</u> 55-65	<u>40-50</u> 12-15
Compacted Graphite Cast Irons	120-330	<u>105-170</u> 35-55	<u>25-40</u> 8-12	P/M Alloys-Brasses	35-81Rh	<u>215-255</u> 65-80	<u>50-60</u> 15-18
Ductile Cast Irons	120-330	<u>85-510</u> 25-160	<u>20-120</u> 6-37	P/M Alloys-Bronzes	30-75Rf	<u>170-215</u> 55-65	<u>40-50</u> 12-15

Cont.

*Materials list from Machining Data Handbook-3rd Edition, published by the Machinability Data Center. For specific metals/materials within each material category, refer to Machining Data Handbook.

**Hardness range listed in Brinell unless otherwise noted. 'Range' covers all metals/materials listed within each material group.

***Thermosetting plastics have various hardness scales. Refer to Machining Data Handbook.



Cutting Speed
Recommendations (cont.)

MATERIAL* TO BE CUT	HARDNESS RANGE (Bhn)**	CARBIDE SAW CUTTING SPEED (SFM / m/min.)	H.S.S. SAW CUTTING SPEED (SFM / m/min.)
P/M Alloys- Copper-Nickel Alloys	22-100RH	<u>170-215</u> 55-65	<u>40-50</u> 12-15
P/M Alloys- Nickel and Nickel Alloys	70-83	<u>170-215</u> 55-65	<u>40-50</u> 12-15
P/M Alloys- Refractory Metal Base	101-260	<u>405-510</u> 124-160	<u>95-120</u> 29-37
P/M Alloys- Irons	50-67	<u>215-255</u> 65-80	<u>50-60</u> 15-18
P/M Alloys- Steels	101-426	<u>150-255</u> 50-80	<u>35-60</u> 11-18
P/M Alloys- Stainless Steels	107-285	<u>170-215</u> 55-65	<u>40-50</u> 12-15
P/M Alloys- Aluminum Alloys	55-98RH	<u>510-640</u> 160-195	<u>120-150</u> 37-46
Machinable Carbides	40-51Rc	<u>35-45</u> 11-13	<u>8-10</u> 2.5-3
Free Machining Magnetic Alloys	185-240	<u>215-340</u> 65-105	<u>50-80</u> 15-24
Magnetic Alloys	185-240	<u>55-215</u> 16-65	<u>12-50</u> 3.6-15
Free Machining Controlled Expansion Alloys	125-220	<u>215-255</u> 65-80	<u>50-60</u> 15-18
Controlled Expansion Alloys	125-250	<u>35-45</u> 11-13	<u>8-10</u> 2.5-333
Carbons and Graphites	8-100 Shore	<u>150-215</u> 50-65	<u>35-50</u> 11-15
Glasses and Ceramics- Machinable	250 Knoop	<u>85-105</u> 25-35	<u>20-25</u> 6-8
Plastics- Thermoplastics	60-120Rm	<u>1065-1490</u> 325-450	<u>250-350</u> 76-105
Plastics- Thermosetting	50-120Rr ***	<u>340-1490</u> 105-450	<u>80-350</u> 24-105

*Materials list from Machining Data Handbook-3rd Edition, published by the Machinability Data Center. For specific metals/materials within each material category, refer to Machining Data Handbook.

**Hardness range listed in Brinell unless otherwise noted. 'Range' covers all metals/materials listed within each material group.

***Thermosetting plastics have various hardness scales. Refer to Machining Data Handbook.

USEFUL METALWORKING FORMULAS

$$\begin{aligned} \text{SFPM} &= .262 \times (\text{CUTTER DIA.} \times \text{RPM}) \\ & \text{(or) } (\text{RPM} \times \text{CUTTER DIA.}) \div .382 \\ \text{RPM} &= (3.82 \times \text{SFPM}) \div \text{CUTTER DIA.} \\ & \text{(or) } \text{SFPM} \div (\text{CUTTER DIA.} \times .262) \\ \text{IPM} &= \text{IPR} \times (\# \text{ TEETH} \times \text{RPM}) \\ \text{IPT} &= \text{IPM} \div (\# \text{ TEETH} \times \text{RPM}) \\ \text{IPR} &= \text{IPM} \div \text{RPM} \\ \text{CIM} &= \text{IPR} \times \text{SPD.} \times \text{DOC} \\ \text{HP} &= \text{CIM} \times \text{UHF} \\ \text{FORCE} &= (33,000 \times \text{HP}) \div \text{SFM} \end{aligned}$$

FEED RATES:

Carbide Saws:

.0002"-.0015" (in.per tooth - IPT)
or chip load per tooth - CLPT)

H.S.S. Saws:

.002-.006 (in.per tooth - IPT)
or chip load per tooth - CLPT)

NOTE: This is a conservative recommendation as a *starting point* for feed rates, and may vary depending on material being cut and cutting speed (SFPM).

COATINGS FOR SAWS AND CUTTERS

Cutting tool surface coatings are available upon request. Tool coatings provide tool wear resistance while significantly improving the performance of saws in most applications, particularly when cutting ferrous materials. These coatings are extremely thin, harder than steel and greatly reduce friction and wear. The most common coatings available for Gaylee saws are:

- **TiN: Titanium Nitride** - General purpose TiN hard coating. Best suited for iron-based materials, unalloyed and alloyed steels and hardened steels.
- **TiCN: Titanium Carbonitride** - Enhanced hardness and wear resistance over TiN with better surface lubricity. Suited for difficult to machine materials such as cast iron, aluminum alloys, tool steels, copper, Inconel, titanium alloys and nonferrous materials.
- **TiAlN: Titanium Aluminum Nitride** - Nano-layered coating, high toughness and oxidation resistance. Recommended for high temperature cutting, and a good choice when coating carbide. Suited for difficult materials like cast iron, aluminum alloys, tool steels and nickel alloys.
- **AlCrN: Aluminum Chromium Nitride** - Expanded performance capabilities over titanium-based coatings. Highest oxidation resistance and hot hardness for high temperature wear resistance. Can be used in wet/dry cutting applications. Well suited for a wide range of materials - cast iron, unalloyed steels, high strength steels, high hardness steels.



TEST APPLICATION DATA SHEET

Solid Carbide, Carbide-Tipped and H.S.S. Saws

NATool Rep.: _____
Customer Name: _____ Date: ____ / ____ / ____
City/State: _____ Distributor: _____
Phone: _____ Fax: _____ Salesperson: _____
Contact: _____ Title: _____ Extn.: _____

GENERAL INFORMATION

(Application) B/P or Job # _____
 SC C-Tipped H.S.S. Saw Dia. _____ Saw Width _____ Tolerance _____
Arbor Hole Dia. _____ # Teeth _____ Special Tooth Form _____
Keyway (Y/N) _____ Keyway Dimension _____ Hub (Y/N) _____
Hub Dimension: Dia. _____ Thickness _____ Rake Angle _____
Positive / Negative _____ Surface Treatment _____
Unique Job Details _____

JOB APPLICATION

Operation _____ Slot Width _____ Tolerance _____
Depth of Cut _____ Tolerance _____ Material _____
Hardness _____ Machine Tool _____ Condition _____
Speed _____ Feed _____ Coolant Type _____ Mix _____
Are saws ganged? (Y/N) _____ If yes, tolerance required _____
Form to be generated _____ (Sketch or B/P helpful)

COMPETITION

Brand Name _____ Price (\$) _____
Delivery _____ Annual Usage _____
Current performance \$/or problem _____

Criteria for successful test _____

TEST EVALUATION

GAYLEE PO# _____ Date _____ Dist. PO# _____
Results _____
Were you present for test? Y/N _____ Comments _____

6650 Burroughs Ave.
Sterling Heights, MI 48314 U.S.A.
Phone: 800.435.5800 or 586.803.1100
Fax: 800.810.7297 or 586.803.1101

FAX OR SEND TO GAYLEE CORPORATION WITH YOUR CONTACT INFORMATION