

BANDSAWING

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CIRCULAR SAWING

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- 16 Speeds and feeds
- 17 Positioning of workpiece
- 18 Problem solving

A BANDSAW AROUND THE WORLD

French: une scie-ruban

German: eine Bandsäge

Italian: una sega a nastro

Spanish: una sierra cinta



In bandsawing, a continuous bandsaw blade cuts in one direction with a uniform cutting action and evenly distributed, low individual tooth load. Chips produced have a constant thickness.

Bandsaws can be used for cut-off operation, straight sawing or contour sawing.

Three types of bandsawing machines are available:

- vertical, mainly used for contour sawing
- horizontal, for productive cut-off operations
- pendular machines.

TOOL MAKER'S TIP

*Use TiN coated
bandsaws for longer
blade life and
resistance to
abrasion*

HSS

- Seldom used

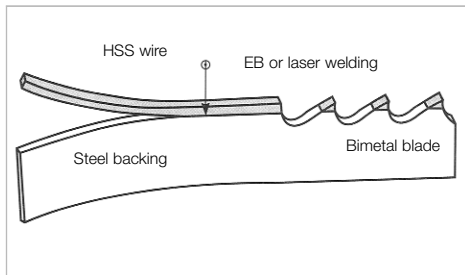
HSS-E
8% cobalt

- Basic choice

HSS-E-PM

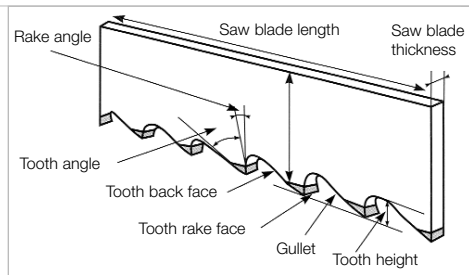
- For high performance and long tool life
- For nickel alloys, titanium alloys and hard steels





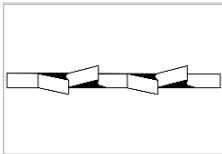
Bimetal saw concept

In bimetal saws, a HSS wire is welded by electron beam or laser on a steel backing



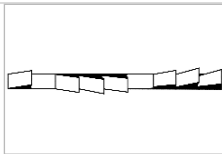
Vocabulary





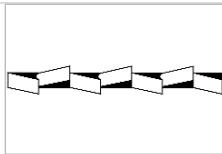
Raker set

- 3-tooth sequence, left, right, straight
- Reduces tooth load, for heavy cutting
- Uniform set angle
- Preferred for ferrous applications



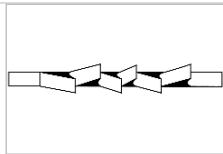
Wave set

- Progressive sine-wave offset pattern with fine pitch
- Reduces tooth load
- Smoother in thin wall sections
- Also for high speed cutting at reduced cutting depth



Alternate set

- 2-tooth sequence, left, right
- Preferred for non-ferrous metals

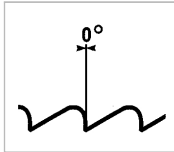
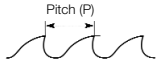


Variable (multipitch) set

- One unset tooth (raker) in each repeating pitch sequence
- Only the largest tooth in each sequence is unset
- Appropriate for most applications

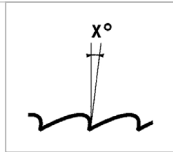


Tooth pitch



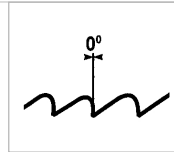
Fixed pitch

- General purpose use
- Good chip carrying capacity



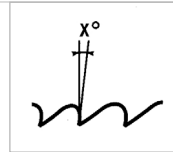
Fixed pitch positive

- General purpose use
- Good chip carrying capacity



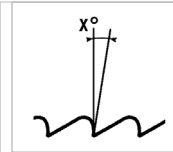
Variable pitch

- Smooth cutting
- Reduces harmonic vibrations and noise
- Good chip carrying capacity
- Long blade life



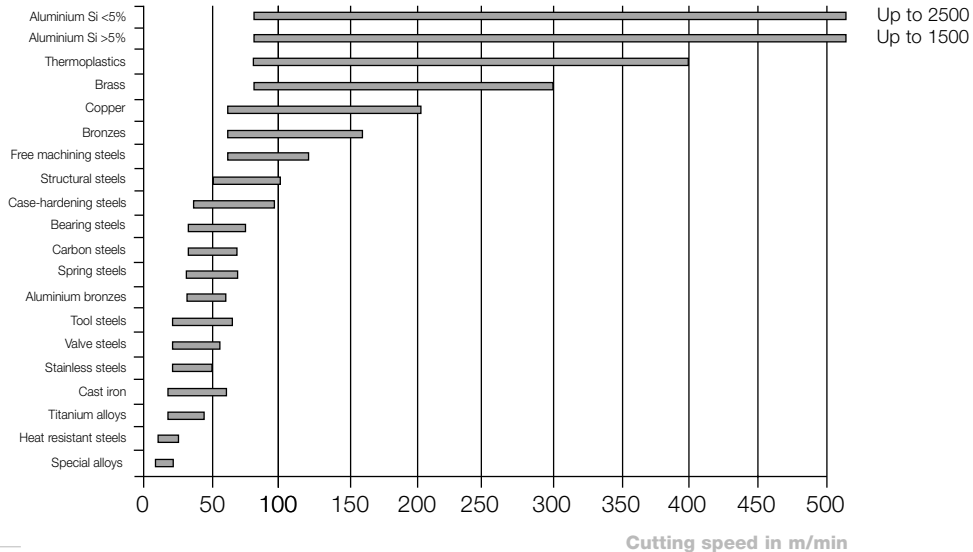
Variable pitch positive

- Smooth cutting
- Reduces harmonic vibrations and noise
- Good chip carrying capacity and easy chip formation
- Good tooth penetration
- Long blade life

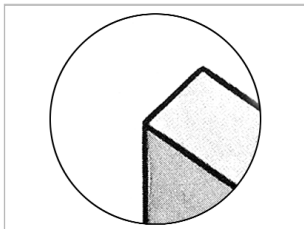


Hook positive

- Allows coarse pitch on narrow blades
- Easy chip formation
- Good chip carrying capacity
- Use in cast iron and non-metallic applications (wood, plastics, composites)

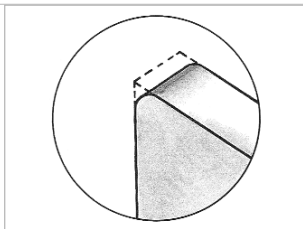


TOOL MAKER'S TIP
*Break-in is necessary
for long blade life*



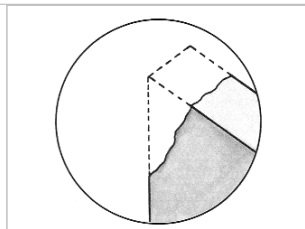
New blade

- Razor-sharp tooth



With break-in

- Micro-fine radius
- Break-in is done by reducing the feed rate/force control to achieve a cutting rate approximately 20 to 50% of the normal cutting rate.



Without break-in

- Premature tooth breakage



Very fine or pulverized chips

- Increase the feed rate
- Or lower band speed



Thick, heavy or blue-colored chips

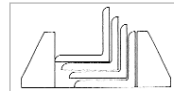
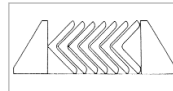
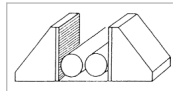
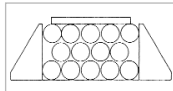
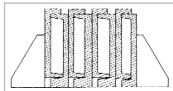
- Decrease the feed rate



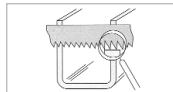
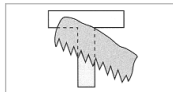
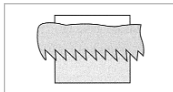
Loosely rolled chips

- Ideal cutting conditions

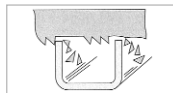
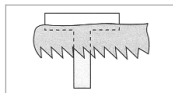
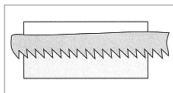
Methods of clamping workpieces



Positioning of blade and workpiece



Right



Wrong

Select saws
with large teeth

Select saws
with small teeth

Select saws
with small teeth

| Problem | Solutions |
|------------------------------|---|
| Tooth stripping and chipping | Reduce feed and increase speed. Use finer tooth pitch. Increase coolant flow. Check workpiece clamping. |
| Inaccurate cut | Reduce feed. Check coolant flow. Adjust blade tension and guides. Check for tooth set damage. |
| Blade stalling in work | Increase band tension. Increase speed. Reduce feed. Check for blade wear or chips. |
| Chip welding | Increase coolant flow. Reduce speed. Use coarser tooth pitch. |
| Premature blade wear | Use coarser tooth pitch. Increase feed or decrease speed. Check coolant flow. |
| Premature dulling of teeth | Check blade fixture. Increase feed. Check blade break-in. Check coolant flow and type. |
| Teeth fracture | Check speed and feed. Adjust saw guides. Check chip brush. |
| Blade breakage | Use finer tooth pitch and finer blade. Reduce blade tension and feed. Check coolant. Adjust speed. |



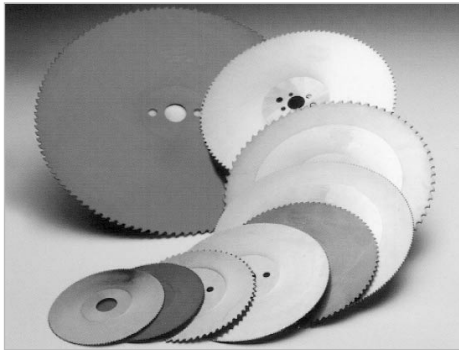
**A CIRCULAR SAW
AROUND THE WORLD**

*French: une scie
circulaire*

*German: eine
Kreisäge*

*Italian: una sega
circolare*

*Spanish: una sierra
circular*



- Circular saws are used for high performance cutting of all forms of ferrous and non-ferrous metals: billets, tube, profile, bar, rounds, etc...
- Circular saws are available as:
 - solid saws
 - with HSS segments riveted onto a steel body, useful when large saw diameter is required.

HSS et HSS-E

- Basic choice

HSS-E

- For longer tool life
- For difficult-to-machine alloys

TiCN Grey-violet

- For abrasive materials
- For hard steels, titanium alloys and stainless steels
- For higher cutting speeds (up to 90% higher)

TiN Gold

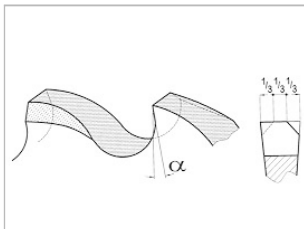
- Multi-purpose
- For steels, tubes and profiles
- For higher cutting speeds (up to 50% higher)

TiAlN Black-violet

- For hard steels, stainless steels and cast iron
- For materials with low thermal conductivity
- For dry cutting
- For higher cutting speeds (+60%)

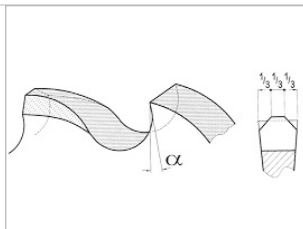
CrN Metal

- Low friction coatings preventing gumminess and built-up edges
- For copper alloys, bronze, brass and aluminium
- For higher cutting speeds (up to 70% higher)



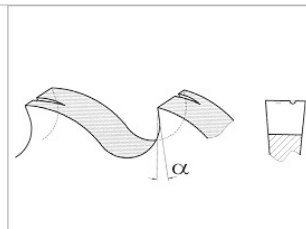
BW or ACME

Generally used for cutting thin walled steel tubes (3- and 4 mm pitch)



C or Heller forms

Generally used for cutting flat sections or thick walled tubes (greater than 4 mm pitch)



BC or Chipbreaker

For cutting thin walled tubes and small profiles.

Improves the quality of the cut

Improves performance

Pitch choice for plain section

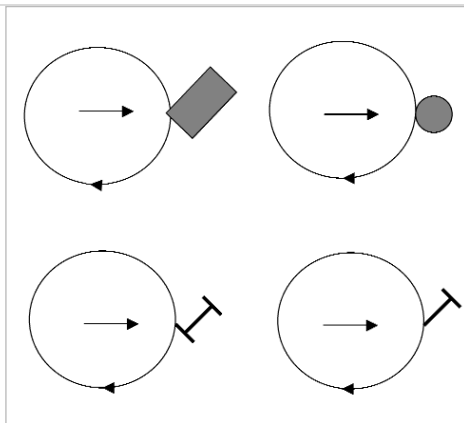
| Pitch (mm) | Material thickness (mm) |
|------------|-------------------------|
| 3 | 3-5 |
| 4 | 5-10 |
| 5 | 10-15 |
| 6 | 15-30 |
| 7 | 20-35 |
| 8 | 25-40 |
| 10 | 30-50 |
| 12 | 35-60 |
| 14 | 40-80 |

Pitch choice for tubes and profiles

For tubes and profiles, make sure that at least two teeth are in contact with the workpiece.



| Material | Cutting speed (m/min) | Feed (mm/min) |
|---------------------------------|----------------------------------|--------------------------|
| Steels 35-50 kg/mm ² | 28-35 | 70-160 |
| Steels 50-65 kg/mm ² | 20-28 | 60-120 |
| Steels 70-85 kg/mm ² | 15-22 | 40-100 |
| Hardened steels | 12-18 | 25-50 |
| Austenitic stainless steels | 5-12 | 30-45 |
| Martensitic stainless steels | 7-10 | 20-35 |
| Cold rolled profiles | 25-40 | 80-130 |
| Tubes with thin walls | 40-80 | 80-150 |
| Tubes with thick walls | 30-50 | 70-130 |
| Girders | 19-30 | 70-130 |
| Grey cast iron | 12-25 | 80-110 |
| Aluminium | 900-1500 | 1200-1400 |
| Copper | 80-400 | 400-600 |
| Brass | 400-600 | 800-1000 |
| Bronze | 40-120 | 400-800 |
| Titanium alloys | 10-15 | 80-160 |
| Hard plastics | 900-1500 | 1200-1400 |



| Problem | Causes |
|------------------|---|
| Premature wear | Pitch too large Excessive cutting speed Wrong feed Cooling inadapted Wrong positioning of the workpiece |
| Teared-off teeth | Wrong pitch Excessive feed Poor cooling |
| Saw breakage | Seizing-up due to poor sharpening Excessive feed Clamping problem |

