RÖNTGEN
Metallsägen

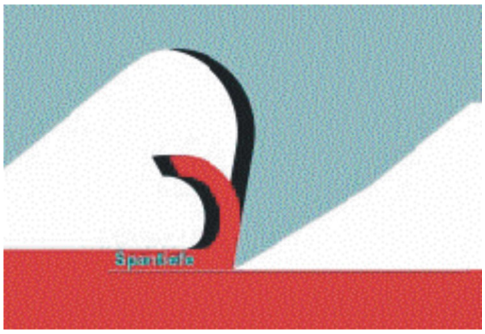
Technical

Manual

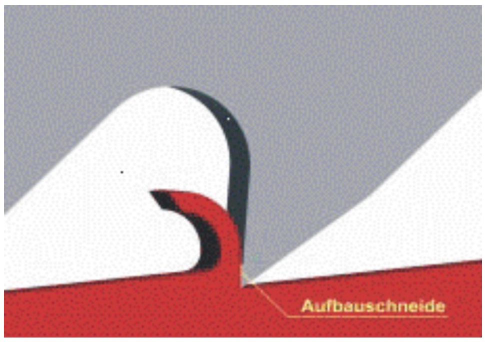
Band Saw Guide

Band sawing
Feed

The feed rate decribes the depth the tooth is penetrating the material in a certain time.



In order to cut cost-efficient you want to run the highest feed rate on your machine. The feed rate however is restricted by the machinability of the workpiece and the life time of the blade. A higher feed rate results in smaller cutting angles. The cutting is faster but the blade life is significantly lower. A smaller feed rate creates higher cutting angles but increases the cutting time. So how you know that you uses the right feed rate? Check the chips and assess the form and colour (see also blade speed).



The lubrication is important for a long blade life and a cost-efficient cutting process. Using the lubrication correctly you can reduce thermical stress and create a better chip flow over the tooth face. Without lubrication you can get excessive heat caused by friction which results in built-up edges. The effect reduces the cutting performance and the energy consumption increases which could cause tooth stripping. Follow the manufacturer’s instructions regarding the right ratio of the lubrication. Keep a stock of correctly mixed lubrication. Don’t refill your machine only with water because you will lose the lubrication with results in premature dulling of the teeth. Use a refractometer to check the ratio. Check all outlets of the lubrication system to make sure that all necessary parts will be lubricated.

Optimum feed	>>>	curled and silver chips
Feed too low	>>>	very thin chips
Feed too high	>>>	blue and heavy chips

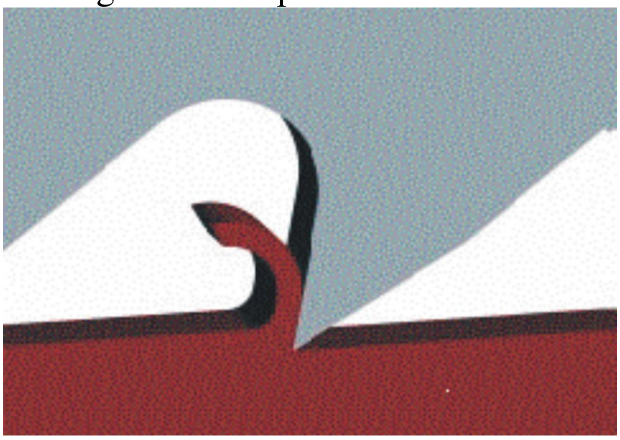
Band sawing

Speed

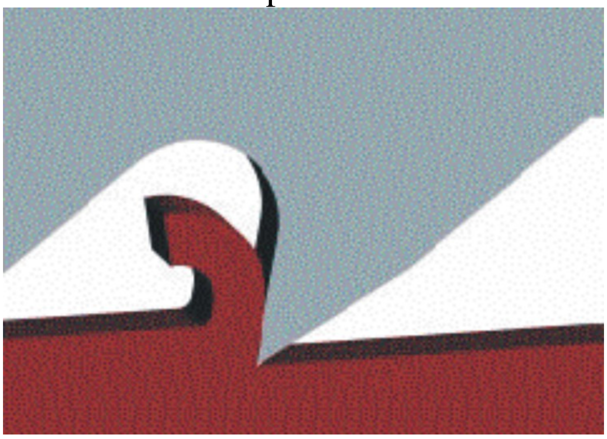
Blade speed or speed defines how fast the blade is running through the material. A higher blade speed results in higher cutting angles and increases therefore the cutting performance.

The speed is restricted by the machinability of the material and the heat created during cutting. Cutting with high blade speed in hard material can cause excessive heat resulting in low blade life.

Higher blade speed



Lower blade speed



How we know whether we are cutting with the correct speed?

Look at the chips and check colour and form. Our aim is to get chips, which are thin, tight rolled and if touched warm. A change in colour from silver to slightly blue means excessive heat and probable a too high speed. Blue chips show a too high temperature resulting in low blade life.

Band sawing
Terminology band sawing

Break-in of the blade:
(rounding of the tooth tips):

The correct speed and feed values (see table) should be reduced by

50% (feed,)
30% (speed).

After cutting about 500 cm² you should increase both values carefully too 100%.

Chip load

The following values are good up to 500 mm workpiece diameter

Chip load per tooth (mm)

Low alloyed steel	0,005 - 0,008
Alloyed steel	0,004 - 0,008
Tool steel	0,002 - 0,005
Stainless steel	0,002 - 0,005
Brass/Copper	0,008 - 0,012
Aluminium	0,010 - 0,030

$$\mathbf{Fz} = \frac{\mathbf{H}}{\mathbf{40 \times speed \times t \times TPI}} = \textbf{chip load per tooth}$$

H	=	height of workpiece
t	=	cutting time per section
TPI	=	tooth pitch (Combi tooth 3/4 = 3,5)

Band sawing
Tips

Tooth Pitches = TPI

- The highest workpiece diameter determines the tooth pitch.

- If you cut in layers or bundles, you have to add the diameters.

- The form of the workpiece, the clamping and the band saw machine have to be considered.

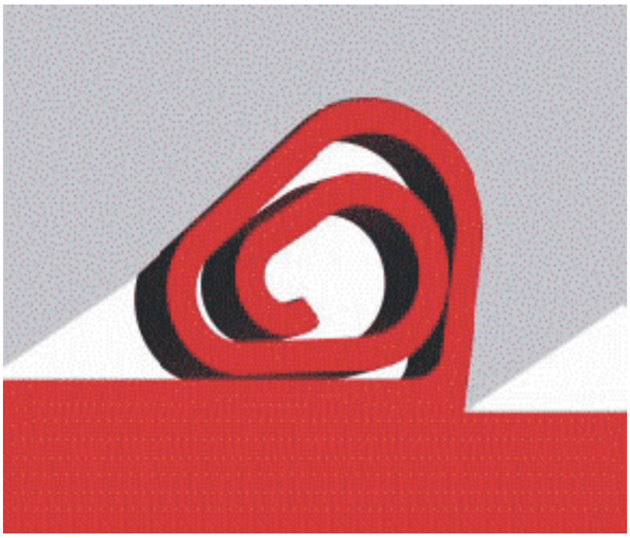
  If you cut thin-walled tube on light-duty machine in layers, add the wall- thicknesses.

See also table tooth pitch selection.

Band sawing
Tips

The capacity of the gullet has an important influence on the cutting performance. If the tooth takes a chips during cutting, the chip is rolled and falls out of the gullet after leaving the workpiece.

If you take a heavy chip, the chip can jam in the gullet and will be drawn back when entering the workpiece the next time. Tooth stripping or crooked cutting are the result.



RÖNTGEN Metallsägen

Band sawing
Tips

How to consult your customer:

1. Determine the material type and look for correct speed and feed (see table).

2. Try to find out what your customer is looking for:
- Blade life
- Surface finish
- Cutting time.
    - Please note that it is not possible to achieve all three.

3. Check the condition of the machine:
- Brush
- Guides

4. Check lubrication (oil cotent about 8 – 12%). If cutting stainless steel or tool steels, you should go up to 15% or higher or using cutting oil.

5. Break-in the blade except using a coated blade.

6. Choose the correct tooth pitch (see table).

7. Check the chips at the beginning of the cutting process and try to avoid vibration by adjusting the feed and speed.

8. Make a full documentation for further usage.

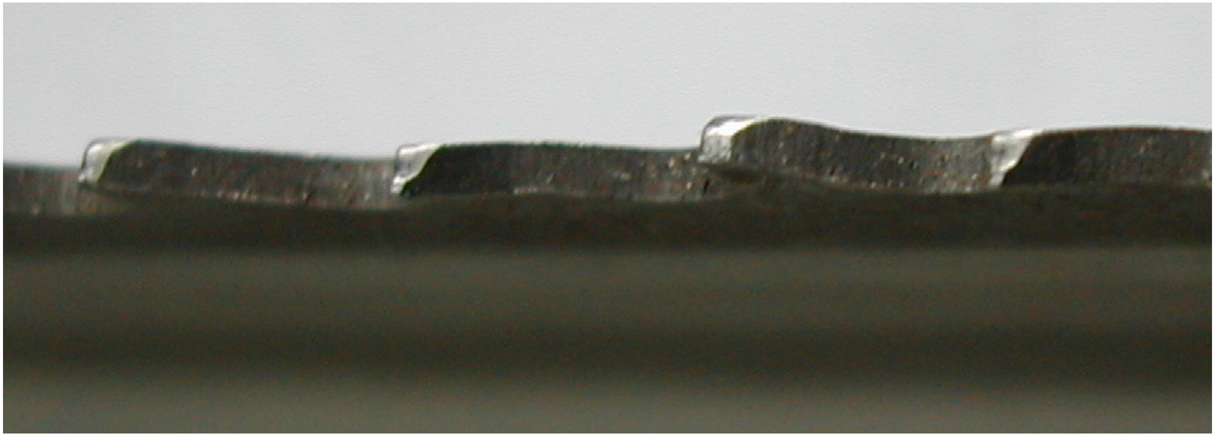
RÖNTGEN
Metallsägen

Typical defects of band saw blades

and

probable causes

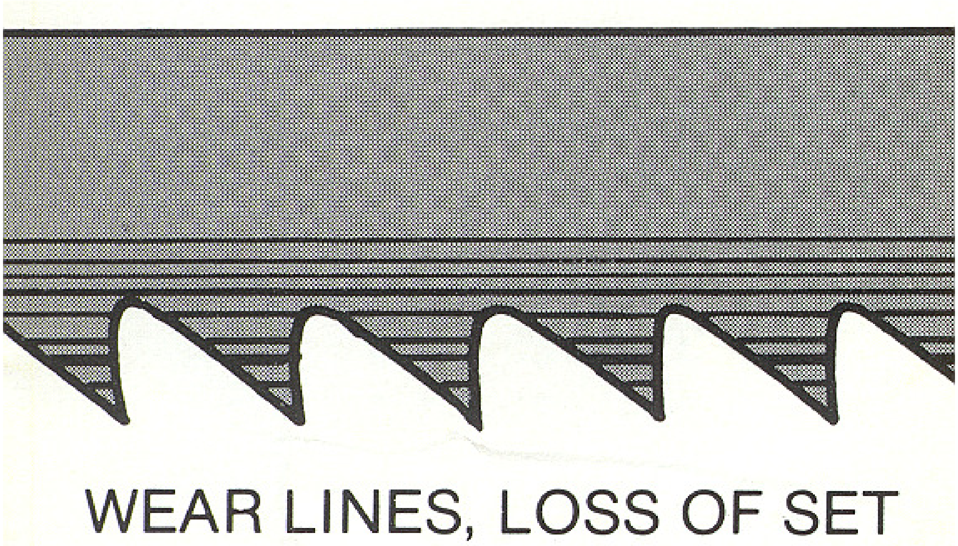
1. **Heavy even wear on tips and corners of teeth**
   The wear on teeth is smooth across the Tipps and the corners of set teeth have become rounded.



Probable Cause:

- Improper break-in procedure.
  Solution: Break-in of blade for about 500 cm² cutting surface with 70 % of normal band speed and 50 % of downfeed (please refer to the charts at the end of this guideline).
- Excessive band speed for the type of material being cut. This generates a high tooth tip temperature resulting in accelerated tooth wear.
  Solution: Consult chart for exact band speed adjustment.
- Low feed rate causes teeth to rub instead of penetrate. This is most common on work hardened materials such as stainless and tool steels.
  Solution: Consult chart for exact feed and speed data. IMPORTANT: Cut stainless steels always with positive tooth rake angle!
- Hard materials being cut such as "flame cut edge" or abrasive materials such as "fiber reinforced composites".
- Insufficient sawing fluid due to inadequate supply, improper ratio, and/or improper application.
  Solution: Check oil coolant content with refractometer. Secure sufficient cooling.

2. Wear on both sides of teeth
The side of teeth on both sides of band have heavy wear markings.



Probable Cause:

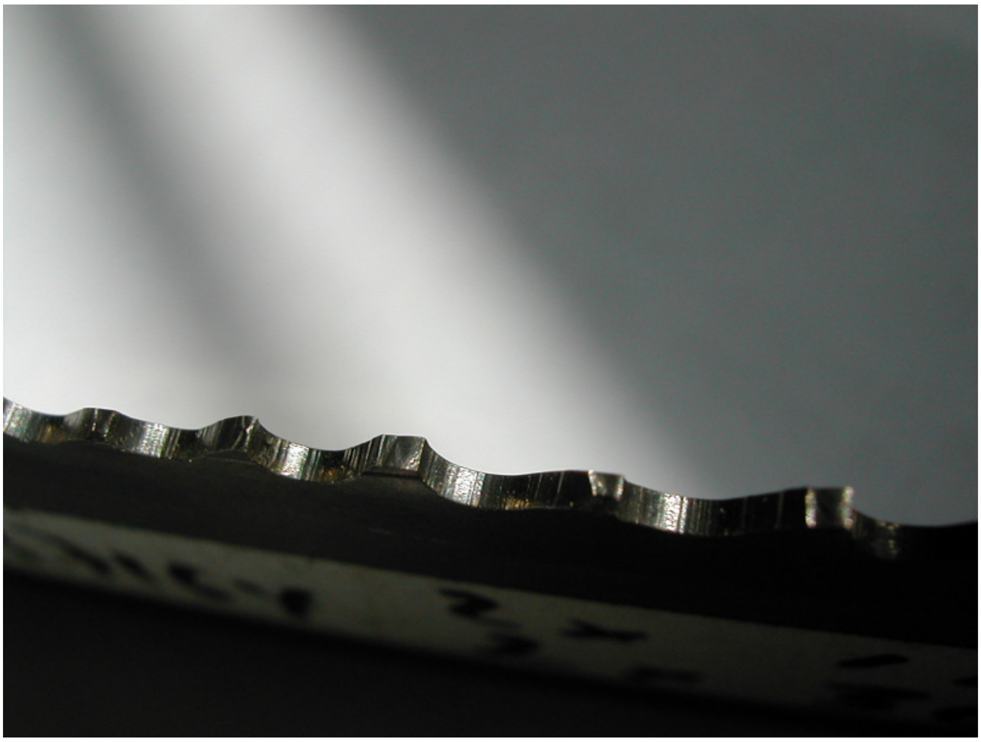
- Broken, worn or missing back-up guides allowing teeth to contact side guides.
  Solution: Change guides
- Improper side guides for band width.
  Solution: Change guides
- Backing the band out of an incomplete cut..
  Solution: Avoid.

3. **Wear on one side of teeth**
   Only one side of teeth has heavy wear markings. Result is a not perpendicular cut.

Probable Cause:

- Worn wheel flange, allowing side of teeth to contact wheel surface or improper tracking on flangeless wheel.
  Solution: Please adjust back-up guides.
- Loose or improperly positioned side guides.
  Solution: Please adjust side guides!
- Blade not perpendicular to cut.
  Solution: Please adjust back-up guide.
- Blade rubbing against cut surface on return stroke of machine head.
- The teeth rubbing against a part of machine such as chip brush assembly, guards etc..
  Solution: Please maintain machine!

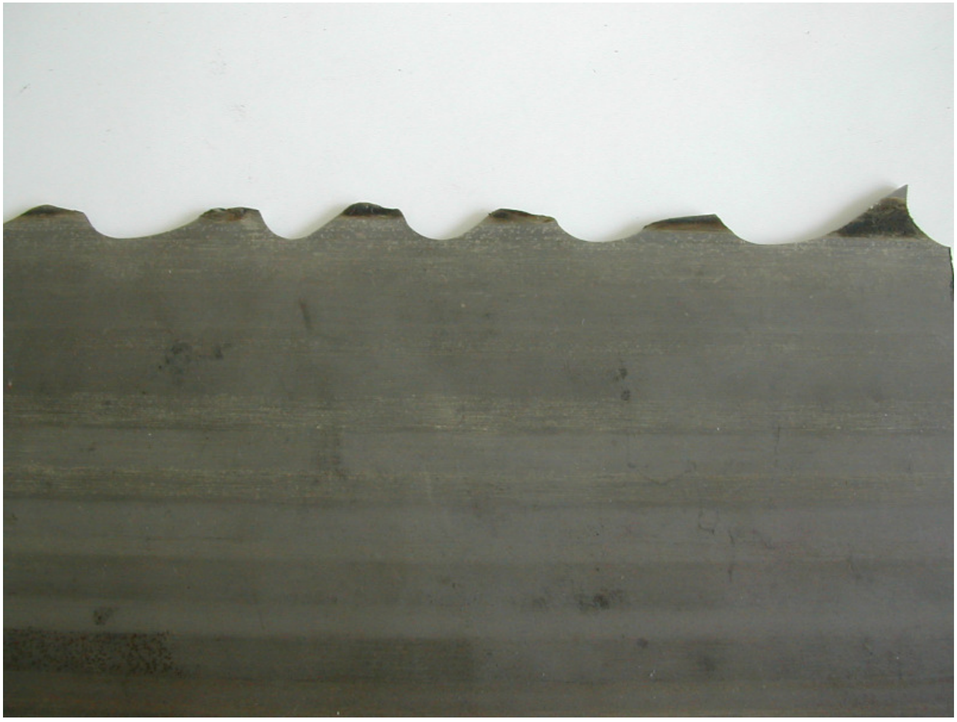
4. **Chipped or broken teeth**
   A scattered type of tooth breakage on tips and corners of the teeth.



Probable Cause:

- Improper break-in procedure.
  Solution: Break-in of blade for about 500 cm² cutting surface with 70 % of normal band speed and 50 % of downfeed (please refer to the charts at the end of this guideline).
- Improper blade selection for application.
- Handling damage due to improper opening of folded band.
  Solution: Please remove teeth protection only when blade is installed on machine..
- Improper positioning or clamping of material.
  Solution: Please refer to instructions for clamping the material.
- Excessive feeding rate or feed pressure.
  Solution: Please refer to cutting parameter table.
- Hitting hard spots or hard scale in material.

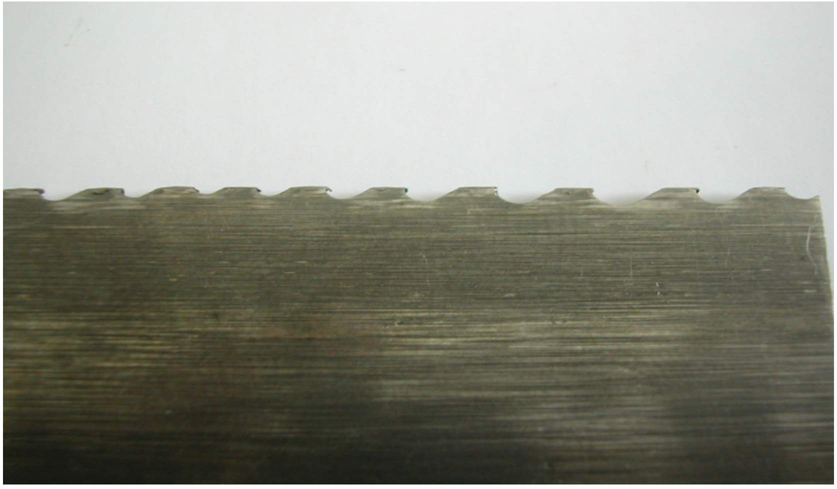
5. **Discolored Tipps of teeth due to excessive frictional heat**
   The tooth Tipps show a discolored surface from generating an aexcessive amount fo frictional heat during use.



Probable Cause:

- Insufficient sawing fluid (inadequate supply, improper ratio and/or improper application.
  Solution: Check oil coolant content with refractometer. Secure sufficient cooling.
- Excessive band speed.
  Solution: Please refer to parameter table.
- Improper feed rate
  Solution: Please refer to parameter table.
- Band installed backwards.

6. **Tooth strippage**
Section or sections of teeth which broke from the band backing.

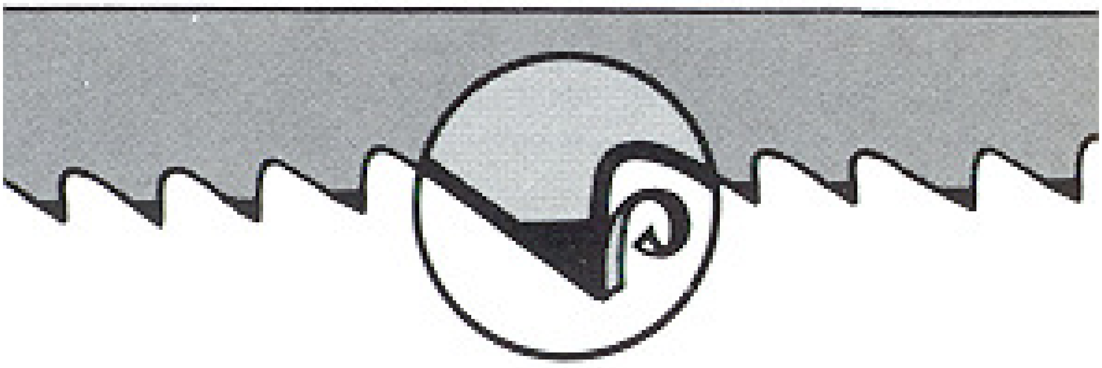


Probable Cause:

- Improper of lack of break-in procedure.
  Solution: Break-in of blade for about 500 cm² cutting surface with 70 % of normal band speed and 50 % of downfeed (please refer to the charts at the end of this guideline).
- Worn, missing or improperly installed chip brush.
  Solution: Adjust or change chip brush.
- Excessive feed rate or feed pressure
  Solution: Please refer to parameter table.
- Movement or vibration of material being cut.
  Solution: Please check clamping unit.
- Improper positioning of material being cut.
  Solution: Please check clamping unit.
- Imsufficient sawing fluid
  Solution: Check oil coolant content with refractometer. Secure sufficient cooling.
- Hard spots in material being cut.
- Improper tooth pitch for cross sectional size of material being cut.
  Solution: Please refer to tooth pitch selection table.
- Band speed too slow for grade of material being cut.
  Solution: Please refer to parameter table.

7. **Chip welded to Tooth Tips**
   High temperature or pressure generated during the cut bonding the chips to the tip and face of the teeth. This is a common effect when cutting alumium with speeds lower than 300 m/min..

   Important: When cutting aluminium always work with positive tooth rake angle. 0° tooth rake angle will most probable cause chip welding.



CHIP WELDING

Probable Cause:

- Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.
  Solution: Check oil coolant content with refractometer. Secure sufficient cooling.
- Worn, missing or improperly installed chip brush.
  Solution: Adjust or change chip brush.
- Improper feeding rate (too high) and/or improper band speed (too low).
  Solution: Please refer to parameter table.

8. Gullets Loading up with Material

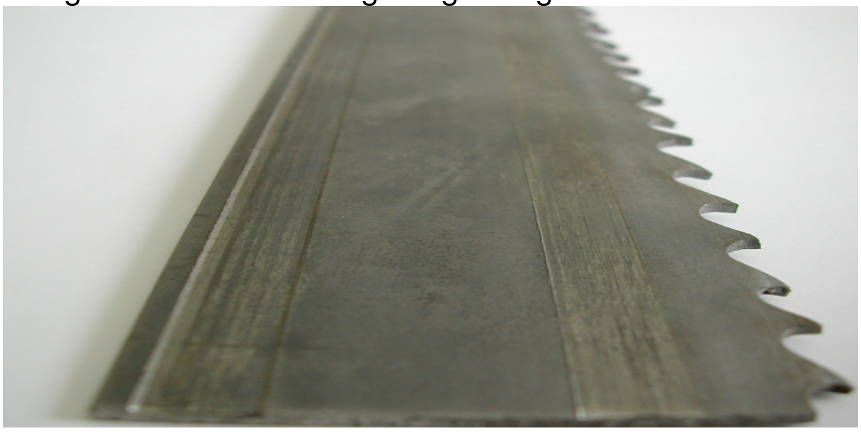
Gullet area has become filled with material being cut.

Probable Cause (basically as under chip welding):

- Too fine tooth pitch – insufficient gullet capacity.
  Solution: Select the right tooth pitch or use tooth pitch selection chart in Roentgen catalogue.
- Excessive feeding rate creating too large of a chip
  Solution: Please refer to parameter table.
- Worn, missing or improperly installed chip brush.
  Solution: Adjust or change chip brush.
- Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.
  Solution: Check oil coolant content with refractometer. Secure sufficient cooling.

9. Heavy Wear on both Sides of Band

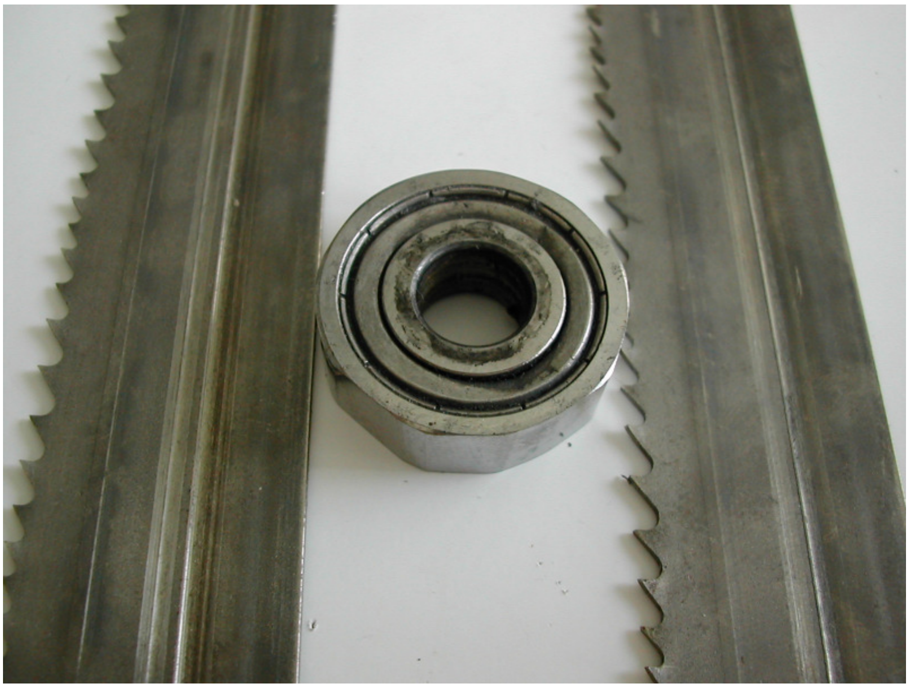
Both sides of band have heavy wear pattern. This wear pattern frequently comes along with a band breakage originating at the wear marks.



Probable Cause:

- Chipped or broken side guides
  Solution: Change side guides.
- Side guide adjustment may be too tight.
  Solution: Adjust side guides.
- Insufficient flow of sawing fluid through the side guides.
  Solution: Maintain machine.
- Insufficient sawing fluid due to inadequate supply, improper ratio and/or improper application.
  Solution: Check oil coolant content with refractometer. Secure sufficient cooling.

10. Uneven wear or scoring on the sides of band
Wear patterns are near gullet area on one side and near back edge on opposite side.

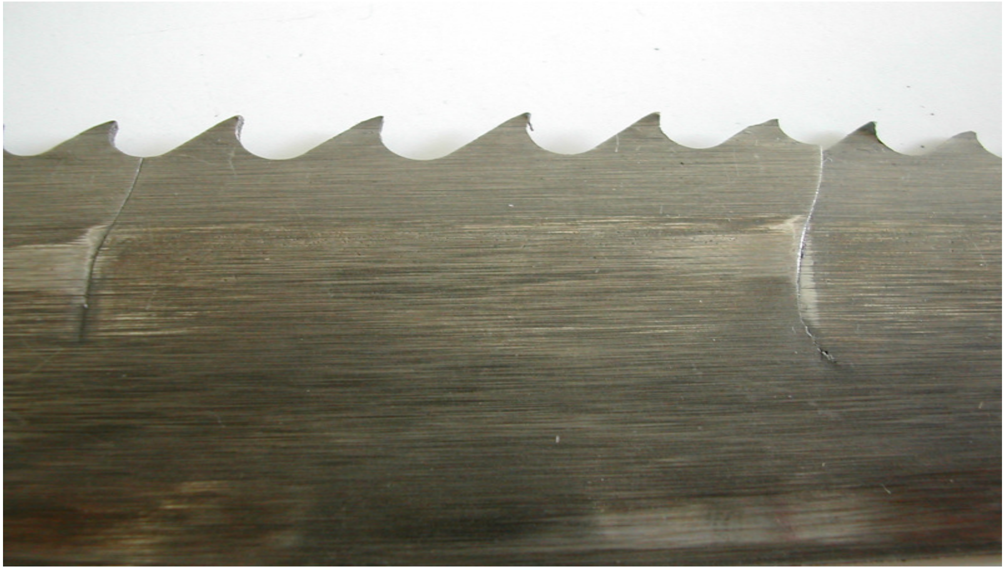


Probable Cause:

- Loose side guides.
  Solution: Adjust side guides.
- Chipped, worn or defective side guides.
  Solution: Change side guides.
- Band is rubbing on part of machine.
  Solution: Maintain machine.
- Guide arms are spread to maximum capacity.
  Solution: Adjust guide arms always according to material dimension.
- Accumulation of chips in side guides.
  Solution: Maintain proper chip removal.

11. Body breakage or cracks from gullets

The origine of the fracture is indicated by a flat area on the fracture surface.

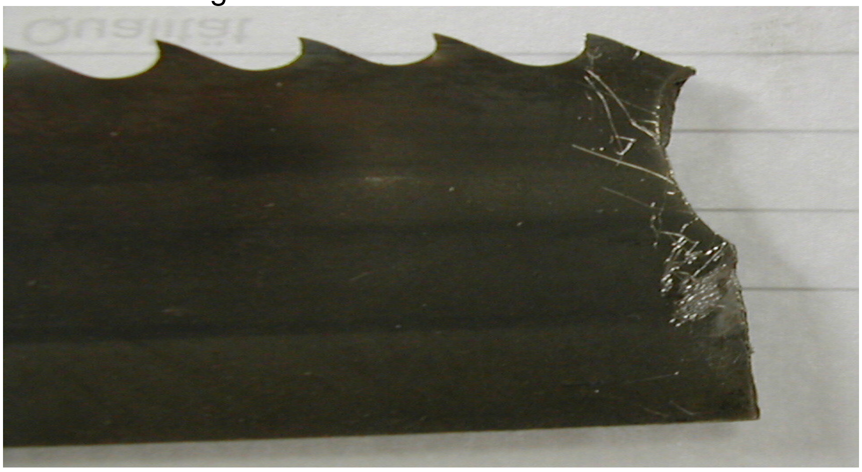


Probable Cause:

- Excessive back-up guide "preload".
  Solution: Refer to operators manual or contact machine manufacturer.
- Improper band tension
  Solution: The recommended band tension is 300 N/mm². Please use band tension gauge to adjust.
- The guide arms are spread to maximum capacity.
  Solution: Adjust guide arms according to material dimension.
- Improper beam bar alignment
  Solution: Contact machine manufacturer.
- Side guide adjustment is too tight.
  Solution: Adjust side guides.
- Excessively worn teeth.
  Solution: Band was dull and therefore heavy loaded, please change band.

12. Body Breakage – Fracture traveling in angular direction

The fracture originates in the gullet and immediately travels in an agular direction into the backing of band.



Probable Cause:

- An excessive twist type of stress existed.
  Solution: Contact machine manufacturer.
- Guide arms spread to capacity causing excessive twist from band wheel to guides.
  Solutions: Adjust guide arm spread to work piece dimension. In case the maximum guide arm capacity has to be used, if possible change to machine with bigger clamping capacity.
- Guide arm spread too wide while cutting small cross section.
  Solution: Adjust guide arm spread according to material dimension.
- Excessive back-up guide "preload".
  Solution: Contact machine manufacturer.

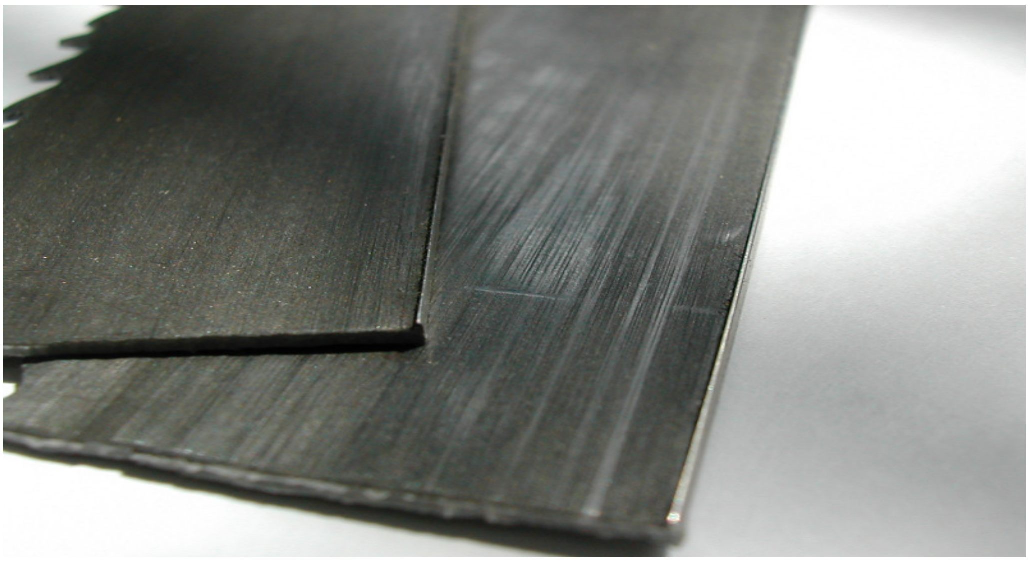
13. Body Breakage or Cracks from Back Edge

The fracture originates from the back edge of band. The origin of the fracture is indicated by a flat area on the fracture surface.

Probable Cause:

- Excessive back-up guide preload will cause back edge to work harden which results in cracking.
  Solution: Adjust pressure block or contact machine manufacturer.
- Excessive feed rate
  Solution: Reduce feed rate or pressure or refer to parameter table
- Improper band tracking – back edge rubbing heavy on wheel flange. This results in a build-up of martensite (very hard layer) which tends to breakage.
  Solution: Adjust back-up guides, adjust wheel alignment.
- Worn or defective back-up guides.
  Solution: Change back-up guides.
- Improper band tension.
  Solution: The recommended band tension is 300 N/mm². Please use band tension gauge to adjust.
- Notches in back edge from handling damage.
  Solution: Please handle blades carefully. Avoid scratching of teeth of one blade on back edge of another.

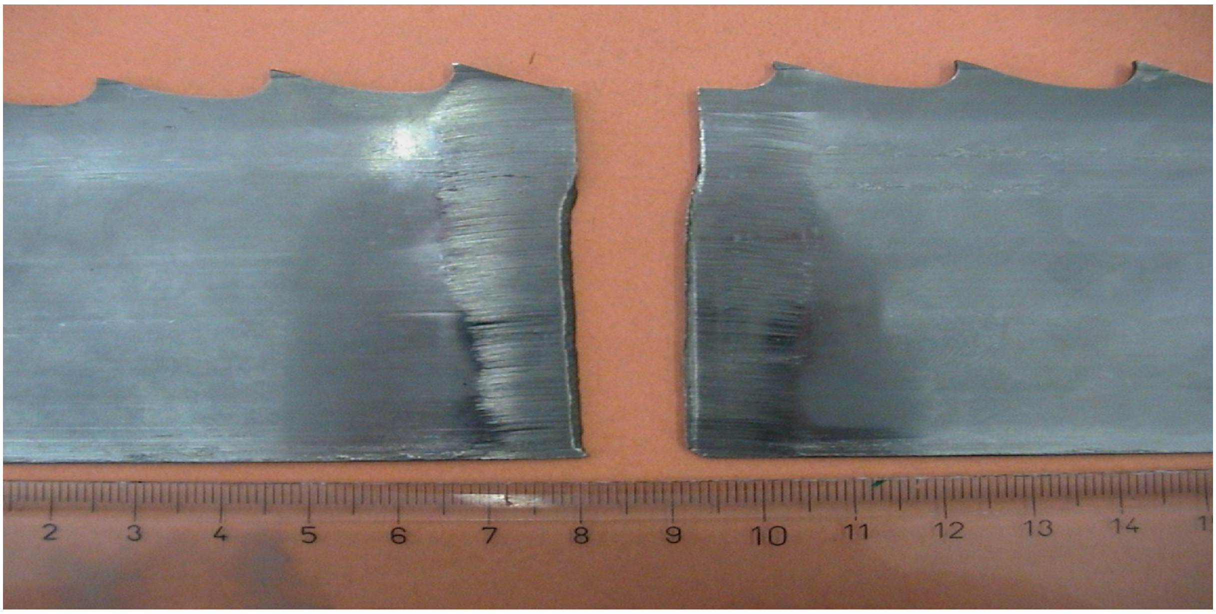
14. Heavy wear and/or swaging on back edge
Heavy back edge wear will have a polished appearance or abnormal grooves worn into surface. Swaging of corners can also occur.



Probable Cause:

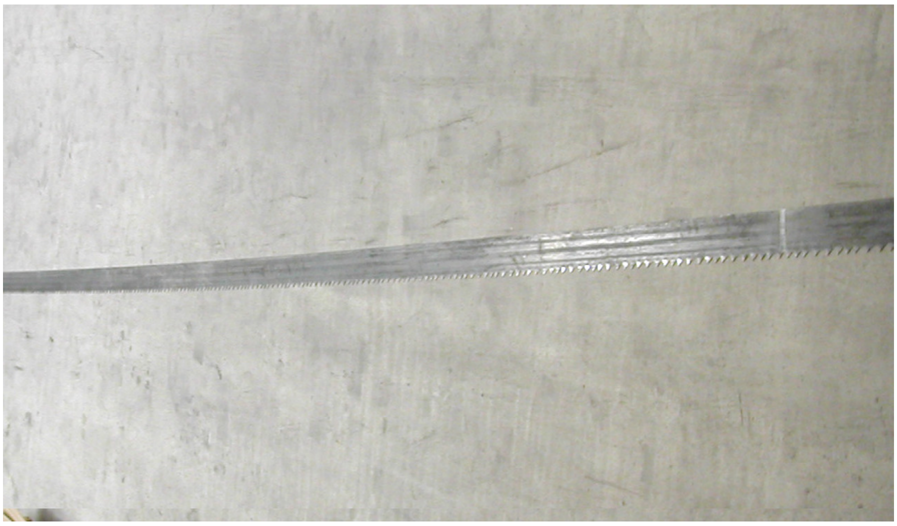
- Excessive feed rate
  Solution: Refer to parameter tabel.
- Excessive back-up guide "preload".
  Solution: Contact machine manufacturer.
- Improper band tracking – back edge rubbing heavy on wheel flange.
  Solution: Adjust back-up guides, adjust wheel alignment.
- Worn or defective back-up guides.
  Solution: Change back-up guides.

15. Butt weld breakage



Probable Cause:
Any of the factors that cause body breakage can also cause butt weld breaks. Please note that the weld joint is the weakest part of the blade. Please refer also to observations no. 11 – 13!

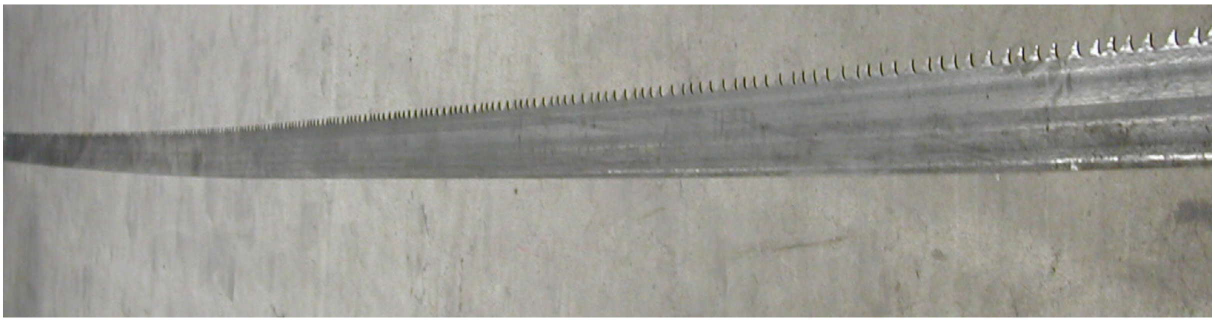
16. **Used band is "long" on the tooth edge**
"Long" on the tooth edge is a term used to describe the straightness of the band. The teeth are on the outside of the arc when the strip is lying on a flat surface



Probable Cause:

- Side guides are too tight – rubbing near the gullets.
  Solution: Adjust side guides.
- Excessive preload – band riding heavily against back-up guides.
  Solution: Refer to operators manual or contact machine manufacturer.
- Worn band wheels causing uneven tension.
  Solution: Contact machine manufacturer.
- Guide arms are spread to maximum capacity.
  Solution: Adjust guide arms according to material dimension.
- Excessive feed rate.
  Solution: Refer to parameter table.

17. Used band is "short" on the tooth edge
Short on the tooth edge is a term used to describe the straightness of the band. The teeth are on the inside of the arc when the strip is lying on a flat surface.



Probable Cause:

- Side guides are too tight – rubbing near back edge.
  Solution: Adjust side guides.
- Worn band wheels causing uneven tension.
  Solution: Contact machine manufacturer.
- Guide arms are spread to maximum capacity resp. too far apart for the workpiece.
  Solution: Adjust guide arms according to workpiece dimension.
- Excessive feed rate
  Solution: Refer to the parameter table.

18. Band is twisted

Probable Cause

- Excessive band tension
  Solution: The recommended band tension is 300 N/mm². Please use band tension gauge to adjust.
- Any of the band conditions mentioned in # 16 and/or 17.
  Solution: See above.
- Cutting a tight radius.
  Solution: Refer to table in order to find max. cutting radius for band width.

19. Broken band shows a twist in band length

Probable Cause:

- Excessive band tension
  Solution: The recommended band tension is 300 N/mm². Please use band tension gauge to adjust.
- Any of the band conditions mentioned in # 16 and/or 17.
  Solution: See above.
- Cutting a tight radius.
  Solution: Refer to table in order to find max. cutting radius for band width.

20. Heavy wear in only the smallest gullets

Heavy wear in only the smallest gullets is an indication that there is a lack of gullet capacity for the chips being produced. Please note that the smallest gullet determines the capacity of the blade.

Probable Cause:

- Excessive feeding rate.
  Solution: Refer to the parameter table.
- Too slow of band speed.
  Solution: Refer to the parameter table.
- Too fine tooth pitch for the size of material to be cut.
  Solution: Refer to tooth pitch selction table or consult your band saw blade supplier.

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Company Name: ____________________________ Date: _____________

Lubrication mixture	
Band tension	
Band speed/Actual machine setting	
Damping rolls - Infeed	
Side guides - Infeed	
Back-up guides - Infeed	
Damping Rolls - Outlet	
Side guides - Outlet	
Back-up guide - Outlet	
Band is rubbing on wheel flange?	NO
Driven wheel runs untrue	NO
Guide wheel runs untrue	NO
Condition/Installation of chip brush	
Comments:	

Metallsägen

Cuttin Parameter Recommendation

for

Röntgen Band Saw Blades

RÖNTGEN Metallsägen

Table 1: Cutting Parameter for Bi-Metal Band Saw Blades

Please note that the undernoted recommendation can only give a limited coverage of cutting parameters. If you do not find your material and/or your band width please contact Röntgen for further information.

Vc = Band speed in m/min
Vz = Cutting performance in cm^2/min

Material + DIN Type		Röntgen						27x0,9mm				34x1,1mm				41x1,3mm			54x1,3mm			54x1,6mm		
		Matrix	bi-alfa cobalt	RP	Master	RP Master	HM-Titan		50 mm	100 - 150 mm	200 - 250 mm		50 - 100 mm	150 - 200 mm	250 - 350 mm		100 - 150 mm	200 - 400 mm		200 - 250 mm	300 - 500 mm		200 - 250 mm	300 - 500 mm
								Vc	Vz	Vz	Vz	Vc	Vz	Vz	Vz	Vc	Vz	Vz	Vc	Vz	Vz	Vc	Vz	Vz
1.0070	St 70-2	✔	✔				✔	68	37	38	41	68	38	40	42	65	41	43	60	38	41	60	40	43
1.0301	C 10	✔	✔				✔	71	40	41	44	71	41	43	45	68	44	46	63	41	44	63	43	46
1.0303	QST 32-3	✔	✔				✔	68	37	38	41	68	38	40	42	65	41	43	60	38	41	60	40	43
1.0401	C 15	✔	✔				✔	68	37	38	41	68	38	40	42	65	41	43	60	38	41	60	40	43
1.0501	C 35	✔	✔				✔	71	40	41	44	71	41	43	45	68	44	46	63	41	44	63	43	46
1.0503	C45	✔	✔				✔	71	40	41	44	71	41	43	45	68	44	46	65	43	46	65	45	48
1.0570	St 52-3	✔	✔				✔	70	39	40	43	70	40	42	44	67	43	45	62	40	43	62	42	45
1.0601	C 60	✔	✔				✔	66	35	36	39	66	36	38	40	63	39	41	58	36	39	58	38	41
1.1121	Ck 10	✔	✔				✔	68	37	38	41	68	38	40	42	65	41	43	62	43	46	62	45	48
1.1133	20 Mn 5	✔	✔				✔	65	34	35	38	65	35	37	39	62	38	40	57	35	38	57	37	40
1.1141	Ck 15	✔	✔				✔	68	37	38	41	68	38	40	42	65	41	43	60	41	44	60	43	46
1.1158	Ck 25	✔	✔				✔	70	39	40	43	70	40	42	44	67	43	45	62	40	43	62	42	45
1.1167	36 Mn 5	✔	✔				✔	65	34	35	38	65	35	37	39	62	38	40	57	35	38	57	37	40
1.1186	Ck 40	✔	✔				✔	70	39	40	43	70	40	42	44	67	43	45	62	40	43	62	42	45
1.1203	Ck 55	✔	✔				✔	68	37	38	41	68	38	40	42	65	41	43	60	38	41	60	40	43
1.1221	Ck 60	✔	✔				✔	70	39	40	43	70	40	42	44	67	43	45	62	40	43	62	42	45
1.1223	Cm 60	✔	✔				✔	63	32	33	36	63	33	35	37	60	36	38	55	33	36	55	35	38
1.1545	C 105 W 1	✔	✔				✔	48	22	24	25	48	23	26	28	45	27	29	40	21	24	40	23	26
1.1730	C 45 W	✔	✔				✔	73	42	43	46	73	43	45	47	70	46	48	65	49	52	65	51	54
1.2060	105 Cr 5		✔	✔			✔	38	15	17	19	38	16	18	20	35	18	20	30	14	17	30	16	19
1.2080	X 210 Cr 12		✔	✔			✔	35	12	14	16	35	13	15	17	33	16	18	28	14	17	28	15	18
1.2162	21 MnCr 5		✔	✔			✔	64	33	34	37	64	34	36	38	61	37	39	56	43	46	56	45	48
1.2309	65 MnCrMo 4		✔	✔			✔	48	22	24	29	48	23	26	28	45	27	29	42	23	26	42	25	28
1.2312	40 CrMnMoS 8-6		✔	✔			✔	52	23	24	26	52	25	27	29	49	31	33	44	28	31	44	30	33
1.2313	21 CrMo 10		✔	✔			✔	52	23	25	28	52	25	27	29	49	31	33	48	32	35	48	34	37
1.2314	X 47 CrMo 15		✔	✔			✔	36	13	15	17	36	14	16	18	33	16	18	28	14	16	28	14	17
1.2316	X 36 CrMo 17		✔	✔			✔	36	13	15	17	36	14	16	18	33	16	18	28	16	19	28	17	20
1.2327	86 CrMoV 7		✔	✔			✔	52	23	25	28	52	25	27	29	49	31	33	44	31	34	44	33	36
1.2343	X 38 CrMoV 5-1		✔	✔			✔	43	17	19	20	43	18	21	23	41	23	25	36	20	23	36	22	25
1.2352	22 CrMoV 7		✔	✔			✔	43	17	19	20	43	18	23	23	41	23	25	36	21	24	36	23	26
1.2363	X 100 CrMoV 5-1		✔	✔			✔	39	16	18	20	39	17	19	21	36	19	21	32	17	20	32	19	22

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Material + DIN Type		Röntgen						27x0,9mm				34x1,1mm				41x1,3mm			54x1,3mm			54x1,6mm		
		Matrix	bi-alfa cobalt	RP	Master	RP Master	HM-Titan		50 mm	100 - 150 mm	200 - 250 mm		50 - 100 mm	150 - 200 mm	250 - 350 mm		100 - 150 mm	200 - 400 mm		200 - 250 mm	300 - 500 mm		200 - 250 mm	300 - 500 mm
								Vc	Vz	Vz	Vz	Vc	Vz	Vz	Vz	Vc	Vz	Vz	Vc	Vz	Vz	Vc	Vz	Vz
1.2365	X 32 CrMoV 3-3		✔	✔			✔	48	22	24	25	48	23	26	28	45	27	29	40	25	28	40	27	30
1.2367	X 38 CrMoV 5-3		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	20	23	36	22	25
1.2379	X 155 CrVMo 12-1		✔	✔			✔	36	13	15	17	36	14	16	18	33	16	18	28	14	17	28	15	18
1.2419	105 WCr 6		✔	✔			✔	42	16	18	19	42	17	20	22	39	22	24	34	21	24	34	23	26
1.2436	X 210 CrW 12		✔	✔			✔	36	13	15	17	36	14	16	18	33	16	18	28	14	17	28	15	18
1.2442	115 W 8		✔	✔			✔	40	14	16	17	40	15	18	20	37	20	22	32	19	22	32	21	24
1.2510	100 MnCrW 4		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	21	24	36	23	26
1.2601	X 165 CrMoV 12		✔	✔			✔	36	13	15	17	36	14	16	18	33	16	18	28	14	17	28	15	18
1.2606	X 37 CrMoW 5-1		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	23	26	36	25	28
1.2678	X 45 CoCrWV 5-5-5		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	21	24	36	23	26
1.2713	55 NiCrMoV 6		✔	✔			✔	46	20	22	23	46	21	24	26	45	27	29	40	25	28	40	27	30
1.2738	40 CrMnNiMo 8-6-4		✔	✔			✔	46	20	22	23	46	21	24	26	45	27	29	40	24	27	40	26	29
1.2766	35 NiCrMo 16		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	21	24	36	23	26
1.2767	X 45 NiCrMo 4		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	21	24	36	23	26
1.2779	X 6 NiCrTi 26-15		✔	✔			✔	33	10	12	14	33	11	13	15	30	13	15	28	13	16	28	15	18
1.2842	90 MnCrV 8		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	23	26	36	25	28
1.3243	S 6-5-2-5		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	21	24	36	23	26
1.3255	S 18-1-2-5		✔	✔			✔	40	14	16	17	40	15	18	20	37	20	22	32	17	20	32	19	22
1.3343	S 6-5-2		✔	✔			✔	38	15	17	19	38	16	18	20	35	18	20	30	15	18	30	17	20
1.3505	100 Cr 6		✔	✔			✔	60	29	30	33	60	30	32	34	57	36	38	52	37	40	52	39	42
1.3536	100 CrMo 7-3		✔	✔			✔	52	23	25	28	52	25	27	29	49	31	33	44	25	28	44	27	30
1.3539	100 CrMnMo 8		✔	✔			✔	52	23	25	28	52	25	27	29	49	31	33	44	28	31	44	30	33
1.3965	X 8 CrMnNi 18-8		✔	✔	✔	✔	✔	31	8	10	12	31	9	11	13	28	13	15	28	13	16	28	14	17
1.4006	X 10 Cr 13		✔	✔	✔	✔	✔	34	11	13	13	34	12	14	16	33	16	18	32	19	22	32	21	24
1.4028	X 30 Cr 13		✔	✔	✔	✔	✔	38	15	17	19	38	16	18	20	35	18	20	32	17	20	32	19	22
1.4057	X 20 CrNi 17-2		✔	✔	✔	✔	✔	38	15	17	19	38	16	18	20	37	20	22	32	17	20	32	19	22
1.4116	X 45 CrMoV 15		✔	✔	✔	✔	✔	36	13	15	17	36	14	16	18	33	16	18	28	15	16	28	17	18
1.4301	X 5 CrNi 18-10	✔	✔	✔	✔	✔	✔	38	15	17	19	38	16	18	20	35	18	20	32	19	22	32	21	24
1.4401	X 5 CrNiMo 17-12-2	✔	✔	✔	✔	✔	✔	36	13	15	17	36	14	16	18	33	16	18	28	14	17	28	15	18
1.4462	X 2 VrNiMoN 22-5-3	✔	✔	✔	✔	✔	✔	33	10	12	14	33	11	13	15	33	16	18	28	15	18	28	17	20
1.4571	X 6 CrNiMoTi 17-12-2	✔	✔	✔	✔	✔	✔	33	10	12	14	33	11	13	15	33	16	18	28	15	18	28	17	20
1.4742	X 10 CrAl 18		✔	✔	✔	✔	✔	33	10	12	14	33	11	13	15	33	16	18	28	15	18	28	17	20
1.4815	GX 8 CrNi 19-10		✔	✔	✔	✔	✔	30	7	9	11	30	8	10	12	30	13	15	25	13	16	25	14	17
1.4841	X 15 CrNiSi 25-20		✔	✔	✔	✔	✔	30	7	9	11	30	8	10	12	30	13	15	25	13	16	25	14	17
1.4923	X 22 CrMoV 12-1		✔	✔	✔	✔	✔	30	7	9	11	30	8	10	12	30	13	15	25	13	16	25	14	17

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Material + DIN Type		Röntgen						27x0,9mm				34x1,1mm				41x1,3mm			54x1,3mm			54x1,6mm		
		Matrix	bi-alfa cobalt	RP	Master	RP Master	HM-Titan		50 mm	100 - 150 mm	200 - 250 mm		50 - 100 mm	150 - 200 mm	250 - 350 mm		100 - 150 mm	200 - 400 mm		200 - 250 mm	300 - 500 mm		200 - 250 mm	300 - 500 mm
								Vc	Vz	Vz	Vz	Vc	Vz	Vz	Vz	Vc	Vz	Vz	Vc	Vz	Vz	Vc	Vz	Vz
1.4980	X 5 NiCrTi 26-15		✔	✔	✔	✔	✔	30	7	9	11	30	8	10	12	30	13	15	25	12	15	25	13	16
1.5415	15 Mo 3		✔	✔			✔	63	32	33	36	63	33	35	37	60	36	38	55	42	45	55	44	47
1.5710	36 NiCr 6		✔	✔			✔	52	23	25	26	52	25	27	29	49	31	33	44	25	28	44	27	30
1.5752	14 NiCr 14		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	32	35	48	34	37
1.5755	31 NiCr 14		✔	✔			✔	54	25	27	30	54	27	29	31	51	30	32	46	30	33	46	32	35
1.5919	15 CrNi 6		✔	✔			✔	59	30	32	35	59	32	34	36	57	36	38	52	33	36	52	35	38
1.6310	20 MnMoNi - 5		✔	✔			✔	52	23	25	28	52	25	27	29	49	28	30	44	25	28	44	27	30
1.6368	15 NiCuMoNb 5		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	32	35	48	34	37
1.6511	36 CrNiMo 4		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.6522	20 NiCrMo 2		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.6546	40 NiCrMo 2-2		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.6565	40 NiCrMo 6		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.6580	30 CrNiMo 8		✔	✔			✔	58	29	31	34	58	31	33	35	55	34	36	50	34	37	50	36	39
1.6582	34 CrNiMo 6		✔	✔			✔	58	29	31	34	58	31	33	35	55	34	36	50	34	37	50	36	39
1.6655	32 NiCrMo 12-5		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	19	22	36	21	24
1.6749	23 Cr NiMo 7-4-7		✔	✔			✔	52	23	25	26	52	25	27	29	49	31	33	44	28	31	44	30	33
1.6946	30 CrNiMoV 5-11		✔	✔			✔	48	22	24	25	48	23	26	28	45	27	29	40	24	27	40	26	29
1.6948	26 NiCrMoV 11-5		✔	✔			✔	48	22	24	25	48	23	26	28	45	27	29	40	24	27	40	26	29
1.6981	21 CrMoNiV 4-7		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	32	35	48	34	37
1.6985	28 CrMoNiV 4-9		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	32	35	48	34	37
1.7034	37 Cr 4		✔	✔			✔	58	29	31	34	58	31	33	35	57	36	38	52	33	36	52	35	38
1.7147	20 MnCr 5		✔	✔			✔	60	29	30	36	60	30	32	34	57	36	38	52	33	36	52	35	38
1.7160	16 MnCrB 5		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	29	32	48	31	34
1.7225	42 CrMo 4		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	32	35	48	34	37
1.7228	50 CrMo 4		✔	✔			✔	58	29	31	34	58	31	33	35	55	34	36	52	36	39	52	38	41
1.7273	24 CrMo 10		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	29	32	48	31	34
1.7335	13 CrMo 4-4		✔	✔			✔	63	32	33	36	63	33	35	37	60	36	38	56	40	43	56	42	45
1.7707	30 CrMoV 9		✔	✔			✔	56	27	29	32	56	29	31	33	53	32	34	48	29	32	48	31	34
1.7735	14 CrMoV 6-9		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.8070	21 CrMoV 5-11		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.8159	50 CrV 4		✔	✔			✔	56	27	28	30	56	29	31	33	53	32	34	48	32	35	48	34	37
1.8159	50 CrV 4		✔	✔			✔	53	24	26	29	53	26	28	30	53	32	34	48	32	35	48	34	37
1.8515	31 CrMo 12		✔	✔			✔	53	24	26	29	53	26	28	30	50	29	31	45	29	32	45	31	34
1.8550	34 CrAlNi 7		✔	✔			✔	44	18	20	21	44	19	22	24	41	23	25	36	20	23	36	22	25

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Table 2: Tooth Pitch selection

For solid material

The combi tooth pitch increases the field of application and reduces vibration in the cutting process.

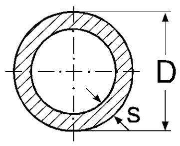
Regular Tooth Pitch		Combi Tooth Pitch	
Material Dimension	Tooth Pitch	Material Dimension	Tooth Pitch
bis 10 mm	14 tpi	bis 25 mm	10/14 tpi
10 - 30 mm	10 tpi	15 - 40 mm	8/12 tpi
30 - 50 mm	8 tpi	25 - 50 mm	6/10 tpi
50 - 80 mm	6 tpi	35 - 70 mm	5/8 tpi
80 - 120 mm	4 tpi	40 - 90 mm	5/6 tpi
120 - 200 mm	3 tpi	50 - 120 mm	4/6 tpi *
200 - 400 mm	2 tpi	80 - 180 mm	3/4 tpi *
300 - 700 mm	1,25 tpi	130 - 350 mm	2/3 tpi
> 600 mm	0,75 tpi	150 - 450 mm	1,5/2 tpi
		200 - 600 mm	1,1/1,6 tpi
		> 500 mm	0,75/1,25 tpi

For Tubes and Pipes

For thin tubes (up to 8 mm of wall thickness) it is recommended to use a toothing with 0° tooth rake angle.

Please also refer to our new products bi-alf cobalt profile P and Q!

Tooth pitch recommendation for tubes and pipes



Wall Thickness S [mm]	Outer Diameter D [mm] Tooth Pitch Z [tpi]									
	20	40	60	80	100	120	150	200	300	500
2	14	10/14	10/14	10/14	10/14	8/12	8/12	8/12	8/12	5/8
3	14	10/14	10/14	8/12	8/12	8/12	8/12	6/10	6/10	5/8
4	10/14	10/14	8/12	8/12	8/12	6/10	6/10	5/8	5/8	4/6
5	10/14	10/14	8/12	8/12	6/10	6/10	5/8	4/6	4/6	4/6
6	10/14	8/12	8/12	6/10	6/10	5/8	5/8	4/6	4/6	4/6
8	10/14	8/12	8/12	6/10	5/8	5/8	4/6	4/6	4/6	4/6
10	-	8/12	6/10	5/8	4/6	4/6	4/6	4/6	4/6	4/5
12	-	8/12	6/10	4/6	4/6	4/6	4/6	4/6	4/6	4/5
15	-	8/12	6/10	4/6	4/6	4/6	4/6	4/5	4/5	4/5
20	-	-	4/6	4/6	4/6	4/6	4/5	4/5	4/5	3/4
30	-	-	-	4/6	4/6	4/5	4/5	4/5	4/5	2/3
50	-	-	-	-	-	-	4/5	3/4	2/3	2/3
80	-	-	-	-	-	-	-	3/4	2/3	2/3
>100	-	-	-	-	-	-	-	-	2/3	1,5/2

Table 3: Twisting distance in sawing machines

In order to secure the blade life it is important to maintain a sufficient distance for the the blade to twist and bend between the guide wheel/driven wheel and the side guides. The below table has been taken from a recommendation of the North American Sawing Association. All values in mm!

Please note that the below data is not suitable for high-speed applications such as cutting of aluminium with band speeds exceeding 1,500 m/min.!

Size / twisting angle	45°	60°	75°	90°
6 x 0,6	160	215	270	325
6 x 0,9	225	300	380	455
10 x 0,6	160	215	270	325
10 x 0,9	225	300	380	455
13 x 0,6	160	215	270	325
13 x 0,9	225	300	380	455
20 x 0,9	225	300	380	455
27 x 0,9	225	300	380	455
34 x 1,1	270	365	455	545
41 x 1,3	325	430	540	650
54 x 1,3	325	430	540	650
54 x 1,6	410	545	680	815
67 x 1,6	410	545	680	815
80 x 1,6	410	545	680	815

Table 4: Contour sawing

The following radii should be considered during contour sawing on vertical machines.

Width of the band saw blade	Minimum radius
3 mm	4 mm
4 mm	8 mm
6 mm	16 mm
8 mm	26 mm
10 mm	40 mm
13 mm	65 mm
16 mm	100 mm
20 mm	140 mm
25 mm	180 mm