HSS CATALOGUE

HSS

julia
USA

LE HUNG

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TYPICAL PROBLEMS AND SOLUTIONS

There are many factors that influence cutting procedure. Sometimes we think that everything depends on the piece to be cut and the cutting tool. A more careful analysis indicates there are other factors.

The most important are: the quality of the circular saw blade, the quality of the material being cut, the correct clamping of the piece, the quality and quantity of the lubricant, the stiffness of the cut-off machine, the control of feed rate, the quality of resharpening, etc.

Sometimes the problems which arise during the cutting operation are the sum of several different factors, and it's particularly difficult to find a solution. We have indicated below some of the most common problems we have encountered, and some possible solutions.

PROBLEMS	POSSIBILE CAUSE	SOLUTION
Clogged tooth gullet	Pitch too law	Reduce number of teeth
	Cutting speed too high	Reduce the number of revolutions
Poor quality of the cut surface	Wrong tooth form	Contact our technicians
	Wrong cutting parameters	Verify cutting parameters on the chart
Poor cutting performance	Cutting speed too high	Reduce the number of revolutions
	Insufficient lubrication	Increase pressure and flow rate of the coolant
	Wrong feed rate per tooth	Verify feed rate with charts
	Wrong cutting angles	Verify cutting angles
Filling material at the tip of the tooth	Poor sharpening	Verify sharpening quality
	Vibration during cutting	Verify stability of piece
Filling material on the sides of the tooth	Insufficient lubrication	Verify flow rate of coolant
	Excessive disc side run-out	Use reduced side run-out sawblades
Blade breakage during cutting	High working parameters	Verify parameters with the charts
	Poor clamping of the piece being cut	Verify the quality and strength of clamp
	Unsteady feed rate	Verify feeding system of the cut-off machine
	Wrong pitch	Verify parameters against the charts
Burn marks on the piece being cut	Worn saw blade	Blade must be resharpened
	Insufficient lubrication	Increase coolant flow / Check concentration

PINHOLES OF THE CUT- OFF MACHINES

CUT-OFF MACHINE CHARACTERISITICS

Cut-off machine	Ø Saw diameter	Ø Center bore	Pinhole pitch
ADIGE BLM GROUP	200-250	32	4/9/50
	275-350	32	2/9/50 + 2/11/63
	400-425	50	4/15/80
BAIER	175-250	32	chiavette/keyway/keilnut
BERG & SCHMID	250-350	32	2/8/45 + 2/11/63
	315-350	40	2/8/55 + 4/12/64
BEWO	250-300	32	2/8/45 + 2/11/63
	315-350	40	2/8/55 + 4/11/63
BIMAX	100-300	32	2/8/45
BONAK	250-350	40	2/8/55 + 4/12/64
BROBO WALDOWN	225-250	32	2/8/45 + 2/11/63
	300	38	2/9/55
	300-400	40	2/8/55 + 4/12/64
	500	40	2/8/55 + 4/12/64 + 2/12/80
RALC ITALIA CONNI / C.T.S.	200-315	32	2/8/45 + 2/11/63
	400-425	40	4/11/63
	400-500	50	4/15/80
DALLY	250-500	40	2/8/55 + 4/12/64 + 2/12/80
DEMURGER	160-300	25,4	-
	200-250	32	2/8/45 + 2/11/63
	225-350	40	2/8/55 + 4/12/64
DONG JIN	225-350	32	2/8/45 + 2/11/63
	275-370	40	2/8/55 + 4/11/63
DORINGER	300-350	40	2/8/55 + 4/12/64
BEHRINGER EISELE	200-370	40	2/8/55 + 4/12/64
	400-425	40	4/12/64 + 2/15/80
	450-500	40	2/15/80 + 2/15/100
FABRIS	225-350	32	2/8/45 + 2/11/63
FEMI	225-315	32	2/8/45 + 2/11/63
FONG HO	250-275	32	2/8/45 + 2/9/50 + 2/11/63
	300-400	32	4/11/63
	360	40	2/11/63 + 3/11/65
GERNETTI	250-350	40	4/11/63
	350-400	50	4/15/80
	500	50	4/18/100
HÄBERLE	225	32	2/8/45
	225-450	40	2/8/55 + 4/12/64
IBP PEDRAZZOLI	200-350	32	2/8/45 + 2/11/63
	425	50	4/15/80
IMET	250-350	32	2/8/45 + 2/11/63
	315-350	40	2/8/55 + 4/12/64
KALTENBACH	250	32	-
	350-450	50	4/15/80
KASTO	250-350	32	2/8/45 + 2/11/63
	400-425	50	4/15/80 + 4/14/85
MACC	225-350	32	2/8/45 + 2/11/63
	350-450	40	2/8/55 + 4/12/64

Cut-off machine	Ø Saw diameter	Ø Center bore	Pinhole pitch
MACO	315-425	50	4/15/80
MAIR	300-350	32	2/8/45 + 2/11/63
	300-350	40	2/8/55 + 4/12/64
MEP	225-350	32	2/8/45 + 2/11/63
METORA	250-350	32	2/11/80
MBM MERCURY	300-350	32	-
MTM	300	32	2/8/45
	400	40	4/12/64
	400	50	4/15/80
	450-550	90	3/12,5/160
OMES	250-370	32	2/8/45 + 2/11/63
OMP	250-370	32	2/8/45 + 2/11/63
	400-525	50	4/15/80
FIVES OTO MILLS	315-370	32	2/8/45 + 2/11/63
	450-500	50	4/15/80
	550-620	140	4/17/170
RGA	225-275	25,4	-
	250-370	40	2/8/55 + 4/12/64
ROBEJO	250-350	32	2/8/45 + 2/11/63
ROHBI	175-300	32	2/8/45 + 2/11/63
RURACK OTTO	300-350	40	2/8/55 + 4/12/64
SCOTCHMAN INDUSTRIES	250-315	32	2/8/45 + 2/11/63
	275-350	40	2/8/55 + 4/12/64
SIMEC	200-350	32	2/8/45 + 2/11/63
SINICO	350-370	32	2/8/45 + 2/11/63
SOCO	250-370	32	2/8/45 + 2/11/63
STARTRITE	250	32	2/9/56 + 2/12/64
	300-315	32	2/11/80
STAYER	225	32	-
	300-350	32	-
THOMAS	225-350	32	2/8/45 + 2/11/63
TOMET	225-350	32	2/8/45 + 2/11/63
TRENNJÄGER	250	32	2/9/50
	250-315	40	4/12/64 + 2/8/55
	315-450	50	4/14/85 + 4/15/80
	450-525	50	4/18/100
ULMIA	200-300	32	-
	250-400	40	4/11/63
VIEMME	250-350	32	2/8/45 + 2/11/63
	500	40	4/11/196
VOUCHER	275	35	2/13,5/57,2
WAGNER	200-315	32	4/9/50
	350	50	4/14/85 + 4/15/80
WAHLEN	250-400	40	2/8/55 + 4/11/63
WEIDMANN	210-275	32	2/8/45 + 2/11/63
WINTER	250-315	40	2/8/55 + 4/11/63
WUNSCH	210-250	32	2/8/45 + 2/11/63
	210-400	40	2/8/55 + 4/12/64

SURFACE C

Coatings carefully designed for each specific cutting application

Our surface coating department is equipped with the machines that use the very latest technology in the field of Physical Vapour Deposition.

Our nanocoating machines enable us to deposit a higher number of molecules per surface unit thus greatly improving both the adherence and wearing resistance of the coating.

These coatings are unique and are the result of continuous theoretical research into mechanics and materials with universities and practical collaboration on applications with leading machine manufacturers and their users.

These partners in particular, have allowed Julia to coat their own circular saw blades with shells made of nanotapes consisting of noble chemical components (Titanium, Aluminium, Chromium, Zirconium) whose unique composition our company is very proud of.

The close cooperation between our technical department and research centres, machine manufacturers and end users enables our engineers to recommend for each specific application the tool which provides the highest performance in terms of speed, feed rate and durability, all of which guarantee the lowest possible cutting cost.

COATINGS

CUTTING EDGE TECHNOLOGY FOR OUR PVD COATING PLANT

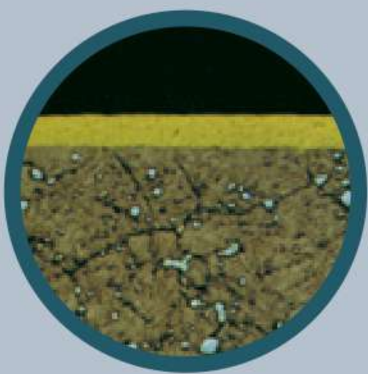
THE COATINGS

In order to obtain the best possible coating performance it is essential to ensure that the substrate is of the highest standard and that the blade surface is adequately prepared in order to optimize adherence.

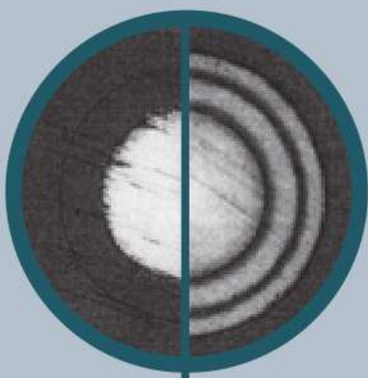
To achieve such results Julia has arranged a detailed preparation procedure.

This procedure depends on the adjustment of the surface that is to be coated with a superficial roughness inferior to 0.3 Rz, a washing phase with chemical activation of the surface and subsequent vacuum drying; the washing/drying procedure produces a surface which is completely dry and clean, with no oxidation, which in turn guarantees the best possible adherence of the deposited layers.

The surface coating, side run-out and flatness are then checked on all our circular sawblades, and if they are found to be outside tolerance, they are retensioned. We have given our coatings simple names partly because they are easy to remember but above all because we can no longer compare them to standard TIN, TICN, TIALN coatings.



MICROSCOPE ENLARGEMENT OF THE YELLOW TIGER COATING TH. 3 MICRON.



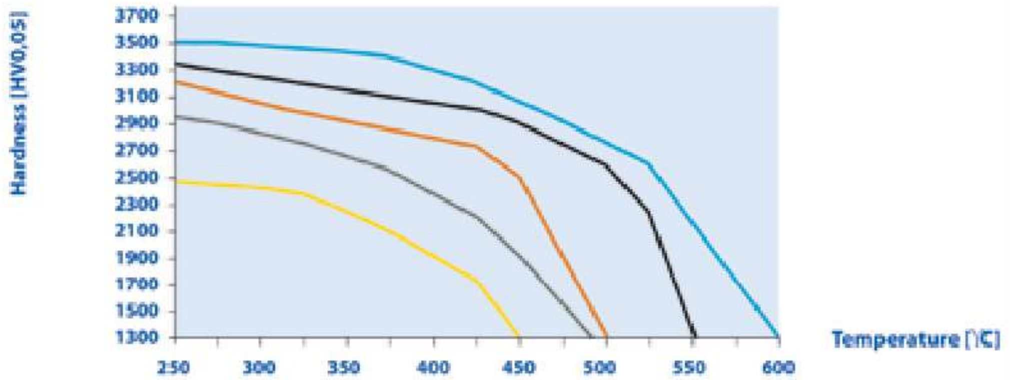
MONOLAYER | **MULTILAYER**

TECHNICAL FEATURES OF COATINGS

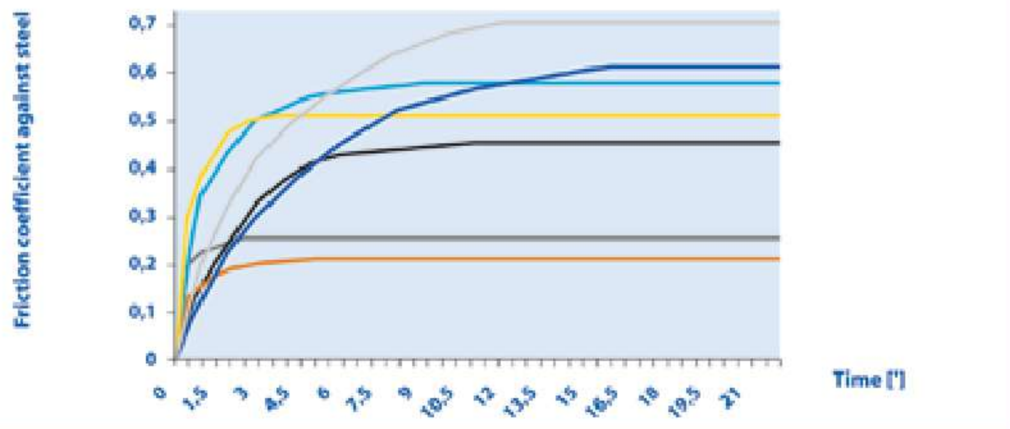
To show the main technical features of our coatings we include some of the results obtained from the tests carried out by our research team.

Without coating | Steam treated | YELLOW TIGER | GREY SHARK | RED DRAGON | BLACK HAWK | SILVER FOX

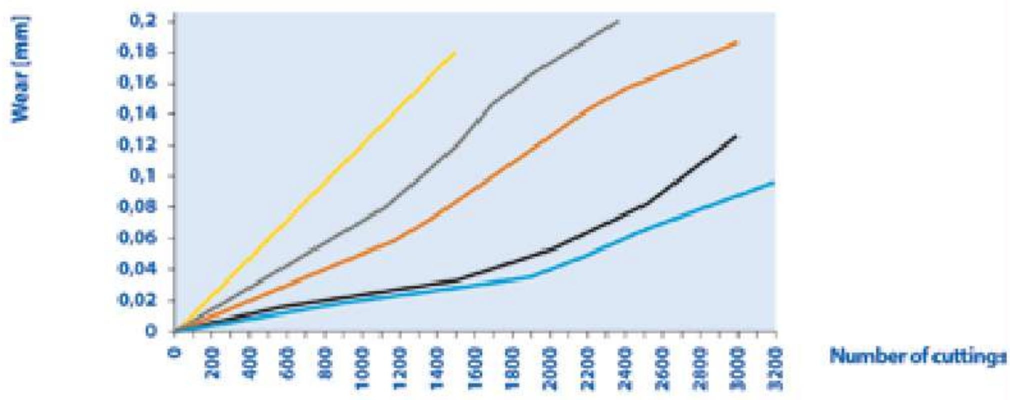
LAYER HARDNESS VARIATION RESULTING FROM TEMPERATURE INCREASE



COATING FRICTION COEFFICIENT



TOOTH WEAR



COATING FEATURES

Coating with a titanium base 3 microns thick.

It is obtained at a process temperature of approximately 490°C.

It guarantees a friction coefficient of 0,50 and an oxidation temperature of 640°C. The hardness of the coated layer reaches 2.480 Vickers (HV 0,05).

Its low thermal conductivity provides a reliable heat shield for the sublayer.

It is a coating suitable for cutting low alloy steel and must always be used with plenty of lubrication. It is not suitable for cutting copper, brass or bronze.

Coating 2,5 microns thick.

It is made by means of a plasma of titanium and carbon that increases the hardness to 3.000 Vickers (HV 0,05).

The friction coefficient 0,20 is very low due to the high carbon content. This makes it very suitable for cutting highly abrasive materials such as stainless steel and medium alloyed steels with a hardness of up to 800 N/mm^2.

The low friction coefficient considerably reduces chipping at the cutting edge and the disc sidewall. This coating has an oxidation temperature of 400°C and should always be used with plenty of lubrication during the cutting process.

RED DRAGON

Multilayer coating 2,5 microns thick.

It is obtained from a plasma with a specific titanium, carbon and acetylene composition; this gives the coating a very low friction coefficient of 0,20 as well as a considerable deposited-layer hardness of 3.200 Vickers (HV 0,05).

These two characteristics give the circular blades not only high performance standards by reducing wear but also an improvement in cut finish. This coating has an oxidation temperature of 470°C and therefore lubrication must be used during cutting. It is particularly suitable for cutting stainless steel, titanium, hardened steel as well as brass and copper.

BLACK HAWK

Multilayer coating 3 microns thick.

The plasma is obtained from the fusion of a titanium/aluminium cathode.

The addition of an inert gas during the process and the energy with which the molecules are loaded allow the surface to be bombarded, thereby obtaining excellent coating properties that guarantee high thermal resistance to the sublayer; it has an oxidation temperature of 800°C resulting in a surface hardness of 3.400 Vickers (HV 0,05).

The friction coefficient is 0,55 and allows circular saws to be used with excellent results even in conditions of limited or minimal lubrication and misting. It is particularly suited to high alloy steels of up to 1100 N/mm^2, cutting cast iron, stainless steel and all materials that develop considerable heat.

SILVER FOX

Multi-layer coating with a thickness of 2,5 microns opaque grey coloured.

The particular and innovative mix of noble elements which compose it gives it a hardness of 3.650 Vickers (HV 0,05) not reached by any other coating.

This new coating is very tenacious, very resistant to high temperatures (far over the anealing limit of the HSS blades) but, it differs from other coatings because it doesn't need to reach high temperatures to obtain the best perfomances.

It is highly recommended for high speed cuts (HSC) with critical cutting parameters, where the performance losses due to the cutting speed increase is sensibly lower than with other traditional coating.

The friction coefficient is 0,45 and this permits to use the circular saws both when cutting without or with low cooling or micro-nebulization or when cutting with plenty of cooling. It's suggested when cutting high alloyed steels up to 1000 N/mm^2, stainless steel and all material developing a high thermal energy.

CIRCULAR SAW COATING

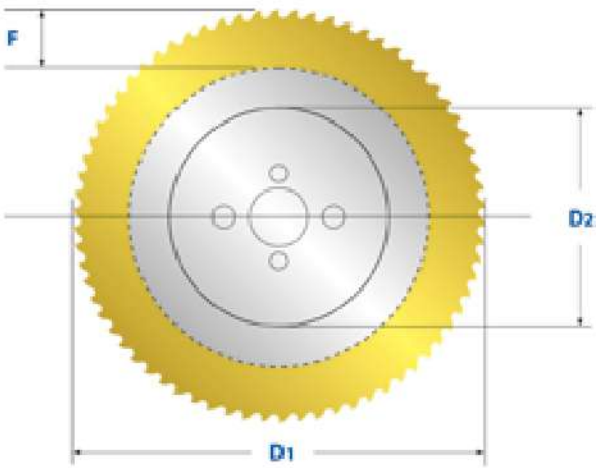
Circular saws are tools that require specific solutions in order to obtain the best results. It is not enough to guarantee the excellent quality and correct adherence of the coated surface, but it is also essential to keep unmodified the technical features, dimensions and cutting proprieties of the circular saw.

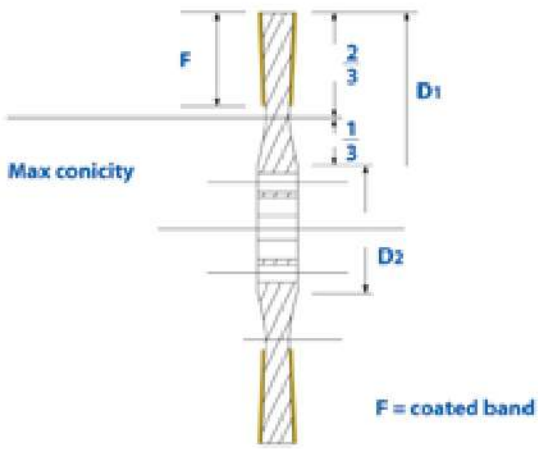
To obtain such results all our saw blades are coated in order to prevent the teeth from rounding-off due to a hard build-up and have a lateral belt which has been designed for all dimensions with regard to blade conicity, its range of use and its later resharpenings.

The result obtained guarantees top performances in compliance with tight manufacturing tolerances and side run-out which is far less than the market norm.

COATING BANDS

D_1 mm	D_2 mm	F mm	Maximum sharing section mm
20-125	-	voll full	-
175	75	35	40
200	90	37	45
225	90	38	55
250	100	50	60
275	100	50	65
300	100	50	70
315	100	57	75
325	120	60	78
350	120	60	80
370	120	65	86
400	120	65	96
425	120	77	106
450	130	70	112
500	130	95	128
525	140	77	135
550	140	90	140
600	200	90	160
620	225	100	170
650	225	115	180
700	225	140	190





COATING CHOICE

The choice of coating depends on different parameters. It is not always easy to keep all of these in mind when choosing.

The most important elements that influence the choice of coating are: the material to be cut, the stiffness of the cut-off machine, the quality and the quantity of the cooling agent and the clamping stiffness of the piece to be cut. In the following chart we would like to give an indication of the results obtained by our engineers with the most common materials.

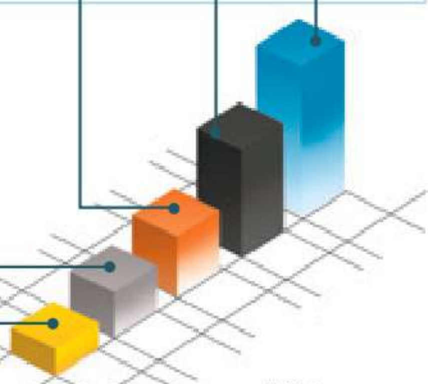
MATERIAL TO BE CUT	RECOMMENDED COATING	
	With lubrication	**Misting**
Low- alloy steel **400 - 600 N/mm²**	**YELLOW TIGER**	**GREY SHARK**
Medium hard alloy stee **700 - 900 N/mm²**	**GREY SHARK**	**BLACK HAWK**
Hard steel **950 - 1100 N/mm²**	**BLACK HAWK**	**SILVER FOX**
Stainless steel	**GREY SHARK / BLACK HAWK**	**SILVER FOX**
Cast iron	**BLACK HAWK**	**BLACK HAWK**
Inconel	**BLACK HAWK**	**SILVER FOX**
Titanium	**BLACK HAWK**	**SILVER FOX**
Copper	**RED DRAGON**	**RED DRAGON**
Bronze	**RED DRAGON**	**RED DRAGON**
Brass	**RED DRAGON**	**RED DRAGON**
Aluminium	**NEUTRO**	**RED DRAGON**
Avional	**GREY SHARK**	**SILVER FOX**
Nickel	**BLACK HAWK**	**SILVER FOX**

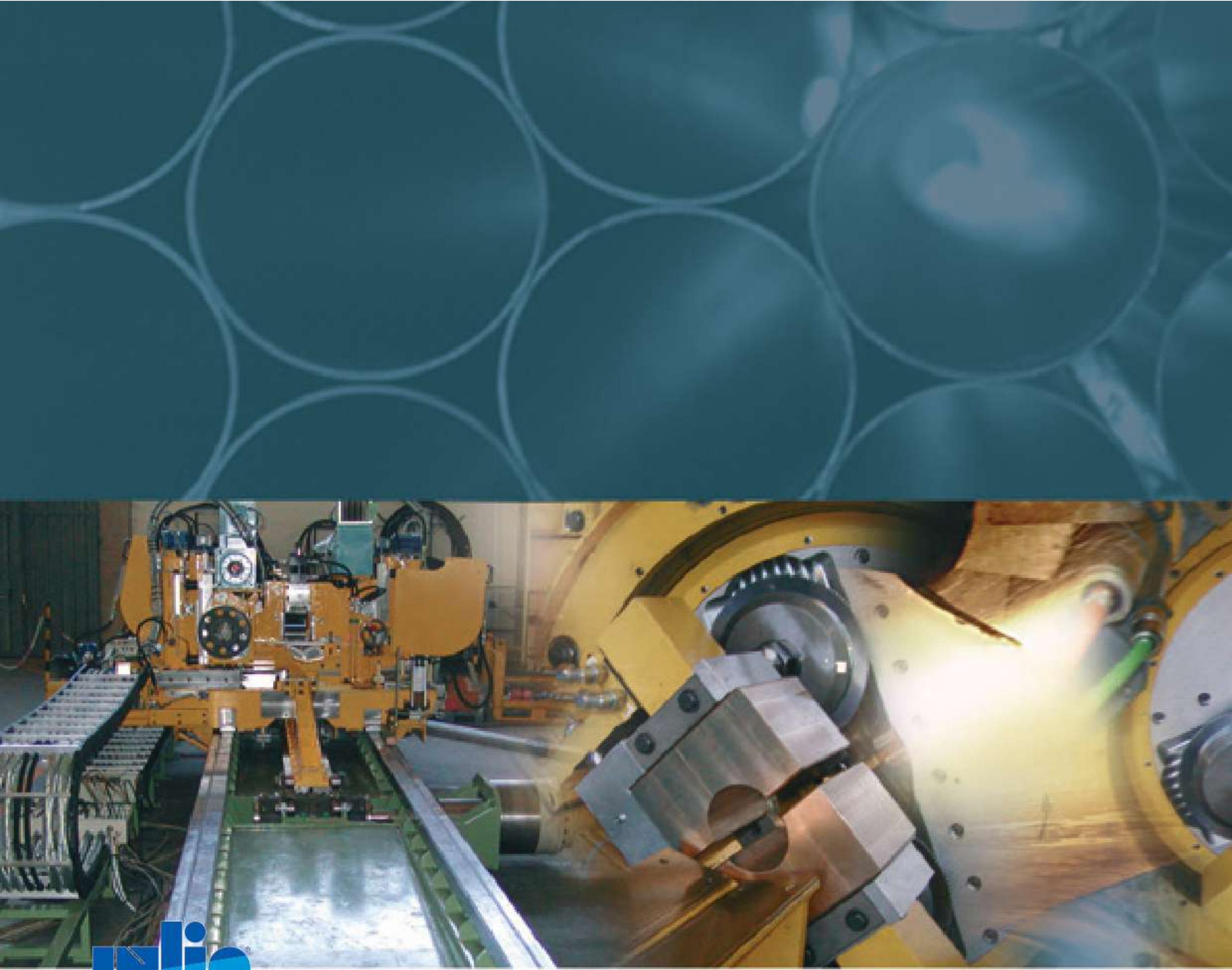
COATING FEATURES

	YELLOW TIGER	**GREY SHARK**	**RED DRAGON**	**BLACK HAWK**	**SILVER FOX**
Micro-Hardness HV (0,05)	2480	3000	3200	3400	3650
Steel friction coefficient (dry)	0,50	0,20	0,20	0,55	0,45
Thickness (µm) / Stärke (µm)	3	2,5	2,5	3	2,5
Maximum Working Temperature	450 °C	400 °C	450 °C	*560 °C	*560 °C
Deposition temperature	480 °C	480 °C	480 °C	490 °C	490 °C
Coefficient of thermal expansion (10^{-6}/°K)	9,4	9,4	10	13	14

* Maximum working temperature should be equal to the tool's tempering temperature; if it is exceeded, the structure will be badly damaged.

COMPARATIVE PERFORMANCE TABLE





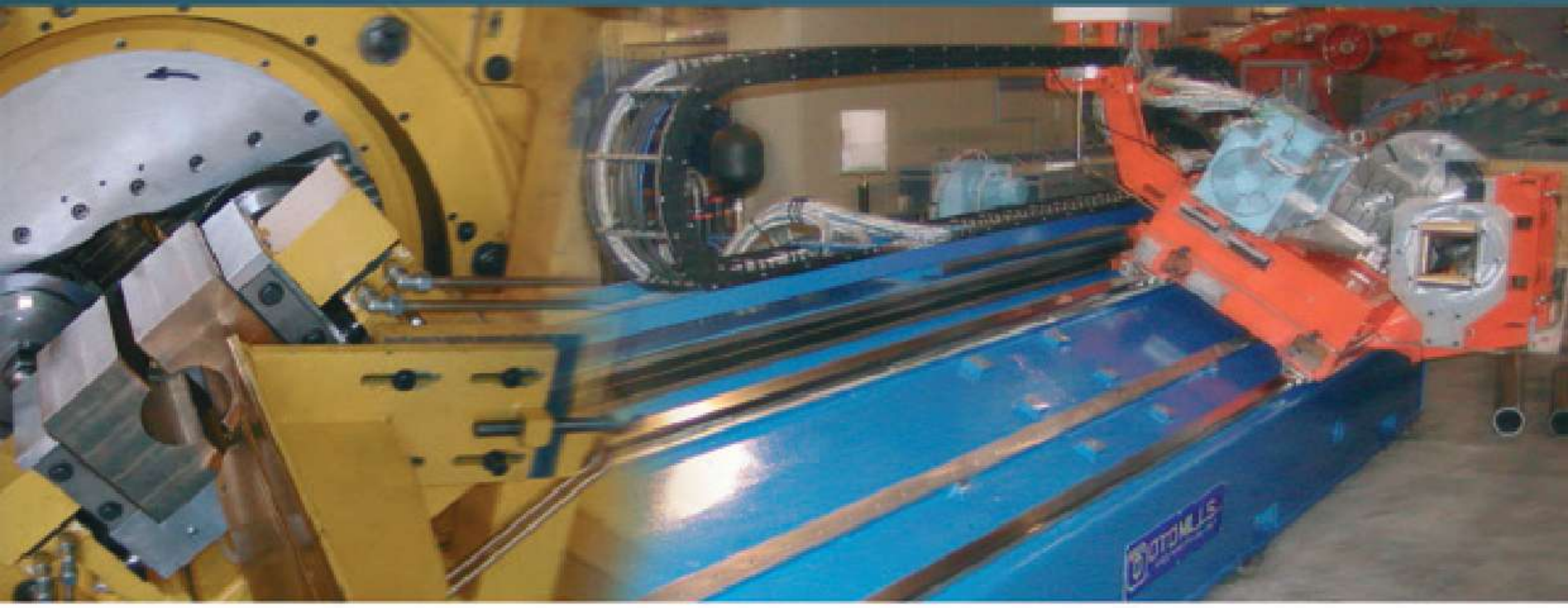
HSS CI

Our tools have been used for thirty years all over the world in a wide range of applications.

The quality of our products has enabled us to become the world leader in circular saw blade production for metal cutting.

The evolution of our quality control system, Kiwa certified, is one of our main objectives and we firmly believe that excellence can only be achieved with extreme attention to detail and by responding to our customers' needs.

This is what we would like to achieve with the cooperation of our suppliers.



RCULAR RANGE

OUR AIM IS TO MEET ALL OUR CUSTOMERS' NEEDS

RAW MATERIALS

Julia produces circular saws using super high-speed steel manufactured by steel plants that are ISO 9000 approved.

This guarantees the consistent quality of the products supplied, which always come with a casting certificate and a detailed chemical analysis of the steel.

The material used is as follows:

HSS - Dmo5 - AISI M2 - DIN 1.3343 - JIS SKH51

Chemical Composition %									
C	Si	Mn	P	S	Co	Cr	Mo	V	W
0,86 - 0,94	≤ 0,45	≤ 0,40	≤ 0,030	≤ 0,030	-	3,80 - 4,50	4,70 - 5,20	1,70 - 2,00	6,00 - 6,70

It is a super high speed steel with a high content of tungsten and molybdenum.

After heat treatment, these elements ensure good hardness and adequate toughness. A certain percentage of **tungsten** is essential to create the correct quantity of very hard wear-resistant carbides in order to reduce tool wear especially in extreme working conditions.

The tungsten also increases the mechanical endurance of the tool, increasing cutting performance and preventing austenitic grain enlargement.

The **molybdenum** is essential to guarantee the formation of a fine martensitic structure; it also increases tool tenacity and maintains high mechanical resistance. **Vanadium** is the element that forms the hardest wear-resistant carbides of all alloys.

HSS-Co5 - AISI M35 - DIN 1.3243 - JIS SKH55

Composizione chimica % / Chemical Composition % / Chemische Zusammensetzung %									
C	Si	Mn	P	S	Co	Cr	Mo	V	W
0,88 - 0,96	≤ 0,45	≤ 0,40	≤ 0,030	≤ 0,030	4,5 - 5,00	3,80 - 4,50	4,70 - 5,20	1,70 - 2,00	6,00 - 6,70

It is a super high speed steel that, in addition to the alloy elements already present in the Dmo5, also contains 5% cobalt.

Cobalt does not form carbides but, in high speed steel, favours the stability of the structure during tempering, obstructs critical grain growth and above all, maintains an excellent degree of hardness at high operating temperatures.

These characteristics are very important when cutting very high-alloy materials such as stainless steel and very hard metals, which tend to develop high temperatures in the cutting zone.

S 390 PM - ASP 2052

Chemical Composition %										
C	Si	Mn	P	S	Co	Cr	Mo	V	W	Ni
1,63	0,30	0,26	0,018	0,018	8,32	4,91	2,28	5,12	10,09	0,20

This steel is obtained by sintering with powder metallurgy. Such technology enables us to obtain steel with significantly reduced blade tension resulting from lamination and, thanks to its high degree of homogeneity, with a reduced risk of microscopic cracks.

These features give these steels a lower razor edge wear with greater tool endurance, greater tool toughness and increased hardness (66-67 HRc).

HEAT TREATMENT

Correct and constant heat treatment is fundamental in order to fully utilize the metallurgical and technological features of our high-speed steels and emphasize all their technical features.

Julia has very modern computerized equipment which constantly monitors the hardening and tempering process, thereby guaranteeing the highest standards of quality and stability. Our metallographic laboratory checks the process results on a daily basis, thereby guaranteeing the highest quality standards.

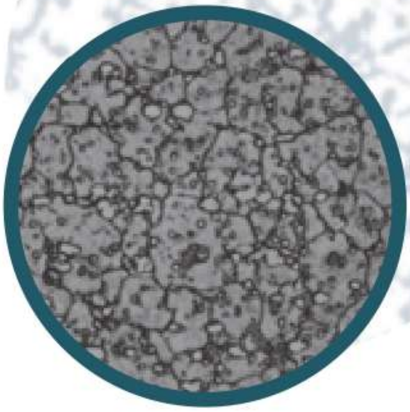
THE ROUGH DISC IS AUTOMATICALLY WITHDRAWN AND BROUGHT TO A TEMPERATURE OF 1200°C AND THEN QUICKLY COOLED TO 60° C IN AN ANTI-DEFORMATION QUENCHING PRESS AND FINALLY AUTOMATICALLY CONVEYED TO THE FINISHED GOODS WAREHOUSE.

RESEARCH AND DEVELOPMENT LABORATORY

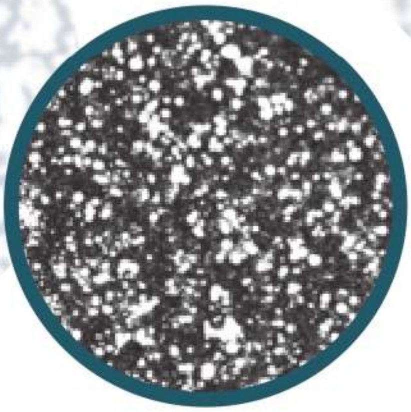
The heating process treatment, like all other steps in our production system, is monitored on a daily basis by our lab technicians in the metallographic dept.

This guarantees that all our saws match the defined quality standards. Our research and development team ensure our processes are constantly improved and updated in order to obtain the best possible performance quality during all phases.

AUSTENITIC GRAIN



STRUCTURE AFTER ANNEALING



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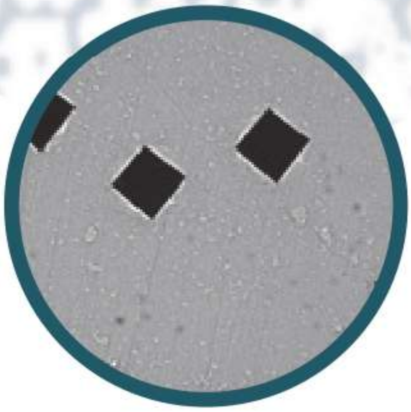
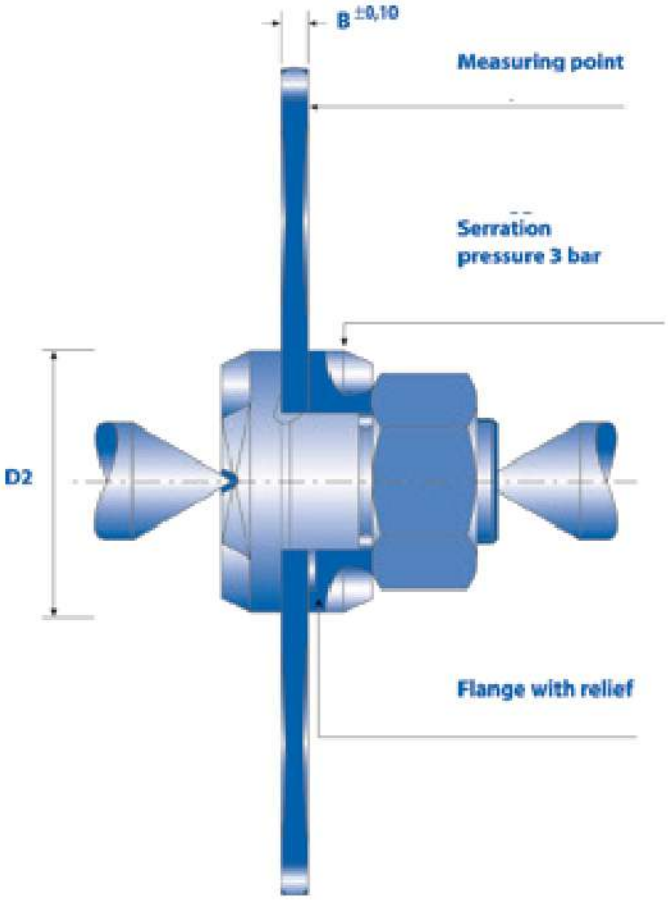
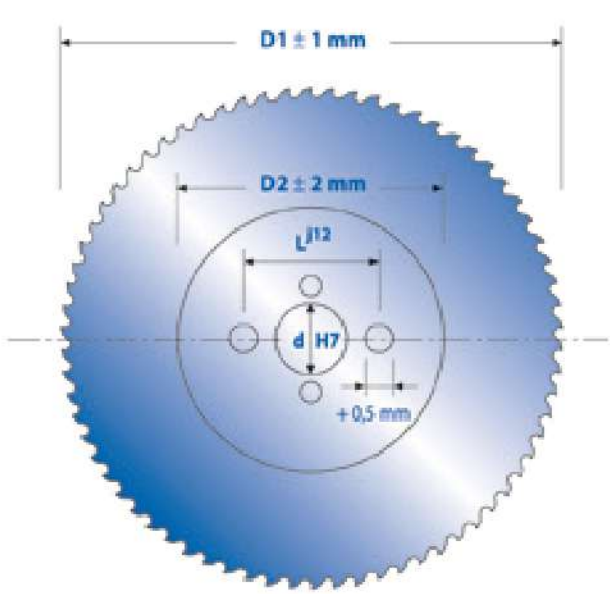


MINERALS OF VANADIUM, MOLYBDENUM, COBALT

EXECUTION TOLERANCES OF CIRCULAR SAWS

The DIN 1840 industrial standard determine the execution tolerance of circular saws. The steady technological evolution of our plans (created and patented by Julia) has led to a progressive reduction in all manufacturing tolerances.





D1	Saw diameter
D2	Hub diameter
L	Pinhole pitch
d	Center Bore
B	Thickness

TECHNICAL SPECIFICATIONS

In the table below you can see the conicity and side run-out values of our circular sawblades.

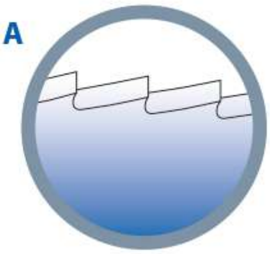
TECHNICAL SPECIFICATIONS

Diameter D1	Thickness B	Hub D2	Conicity Max	Side run out STANDARD	Side run out PREMIUM
175	1,2	75	0,20	0,20	0,12
	2,0	75	0,30	0,20	0,12
200	1,0	100	0,20	0,20	0,12
	1,2	100	0,25	0,20	0,12
	1,5 / 1,6	90	0,25	0,20	0,12
	1,8	90	0,35	0,20	0,12
	2,0	90	0,35	0,20	0,12
225	1,2	100	0,25	0,20	0,15
	1,5 / 1,6	90	0,25	0,20	0,15
	1,9 / 2,0	90	0,35	0,20	0,15
250	1,2	100	0,22	0,20	0,15
	1,5 / 1,6	100	0,32	0,20	0,15
	2,0	100	0,40	0,20	0,15
	2,5	100	0,40	0,20	0,15
	3,0	100	0,48	0,20	0,15
275	1,2	100	0,22	0,25	0,15
	1,6	100	0,30	0,25	0,15
	2,0	100	0,40	0,25	0,15
	2,5	100	0,45	0,25	0,15
	3,0	100	0,50	0,25	0,15
300	1,6	100	0,30	0,25	0,15
	2,0	100	0,40	0,25	0,15
	2,5	100	0,46	0,25	0,15
	3,0	100	0,55	0,25	0,15
315	1,6	120	0,30	0,25	0,18
	1,8	100	0,40	0,25	0,18
	2,0	100	0,40	0,25	0,18
	2,5	100	0,46	0,25	0,18
	3,0	100	0,55	0,25	0,18
325	2,0	120	0,45	0,25	0,18
	2,5	120	0,55	0,25	0,18
	3,0	120	0,60	0,25	0,18
350	1,8	120	0,40	0,25	0,18
	2,0	120	0,45	0,25	0,18
	2,5	120	0,55	0,25	0,18
	3,0	120	0,60	0,25	0,18
370	2,0	120	0,45	0,30	0,20
	2,5	120	0,55	0,30	0,20
	3,0	120	0,60	0,30	0,20
	3,5	120	0,65	0,30	0,20
400	2,2	130 x 2,5	0,40	0,30	0,20
	2,5	120	0,60	0,30	0,20
	3,0	120	0,65	0,30	0,20
	3,5	120	0,70	0,30	0,20
	4,0	120	0,75	0,30	0,20
425	2,5	120	0,60	0,30	0,20
	3,0	120	0,70	0,30	0,20
	3,5	120	0,75	0,30	0,20
	4,0	120	0,75	0,30	0,20
450	2,5	130	0,60	0,30	0,20
	3,0	130	0,70	0,30	0,20
	3,5	130	0,75	0,30	0,20
	4,0	130	0,80	0,30	0,20
500	3,0	130	0,60	0,30	0,22
	3,5	130	0,75	0,30	0,22
	4,0	130	0,80	0,30	0,22
525	3,5	140	0,80	0,35	0,25
	4,0	140	0,85	0,35	0,25
550	3,0	200/225	0,64	0,35	0,25
	3,5	140/200/225	0,80	0,35	0,25
	4,0	140/200/225	0,85	0,35	0,25
600	3,5	225	0,75	0,35	0,25
	4,0	200/225	0,90	0,35	0,25
620	3,5	225	0,75	0,35	0,25
	4,0	225	0,95	0,35	0,25
650	4,0	225	0,95	0,40	0,30
	5,0	225	1,00	0,40	0,30
700	4,0	225	0,95	0,40	0,30
	5,0	225	1,00	0,40	0,30

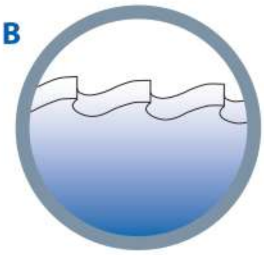
TOOTH SHAPE

In tooth production Julia uses only CNC machines with a CBN grinding wheel to obtain a very low surface roughness that guarantees excellent chip removal, and avoids material sticking to the cutting surface of the gullet. Our technicians can advise on the best tooth shape for each specific application.

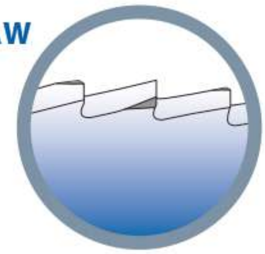
A



B



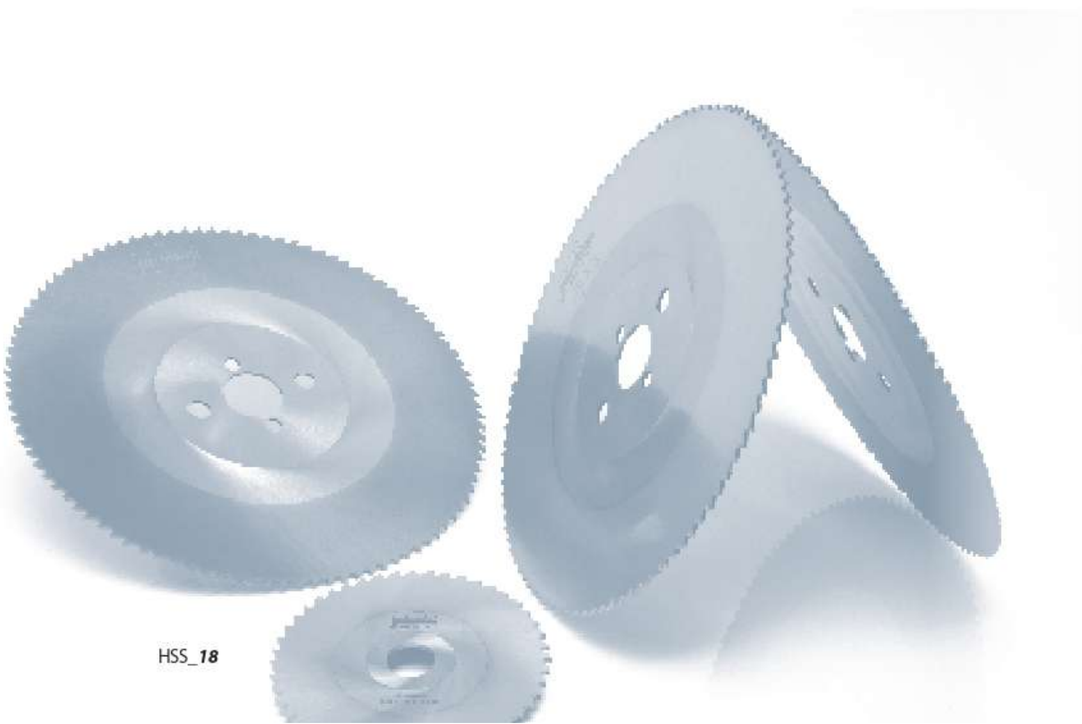
AW

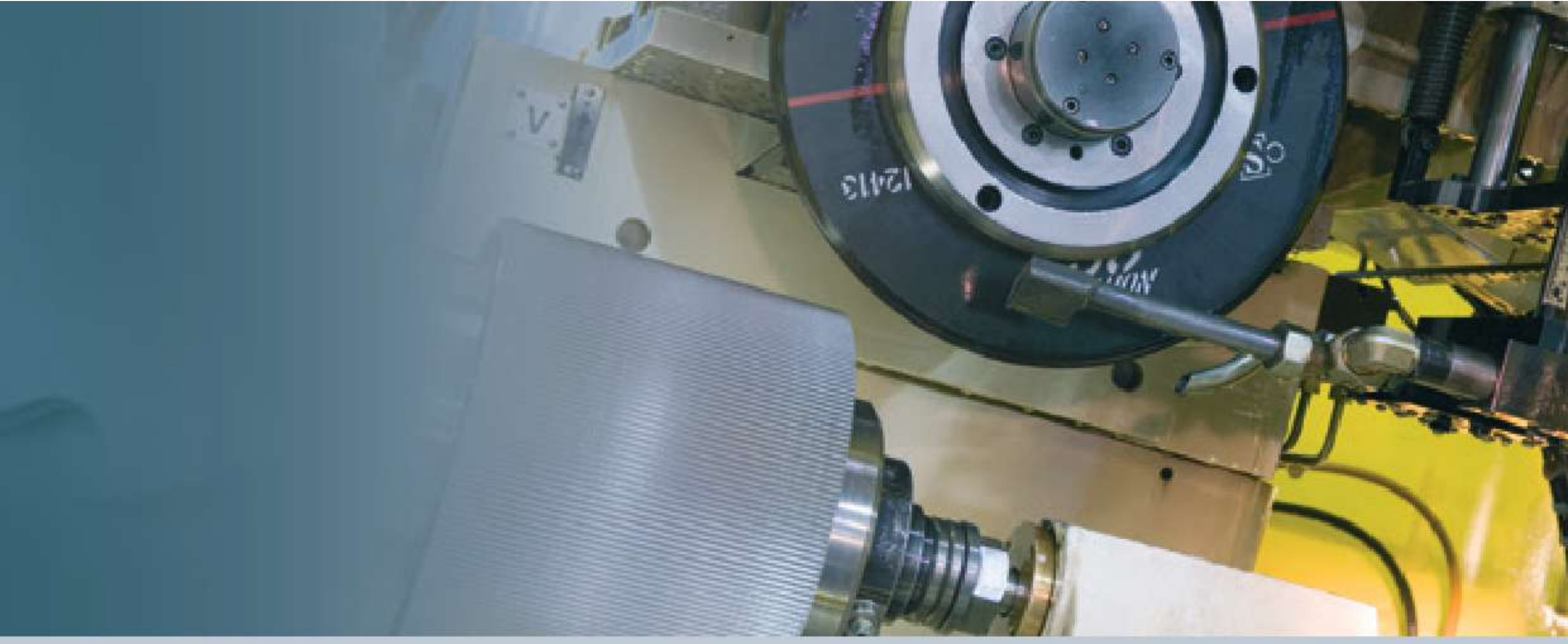


Tooth shape A is normally used on fine toothing (<T3) for applications such as brass alloy cutting, jewellery and screw slotting.

Tooth shape B is normally used for thin-walled pipes and the cutting of structural shapes, especially where chip removal is not an issue.

Tooth shape AW, unlike type A, is alternately bevelled, thus optimizing chip shredding.
It is particularly suitable for precision cutting.

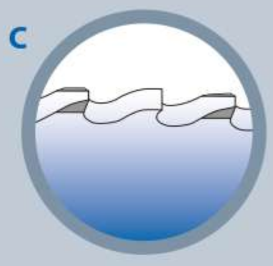




BW

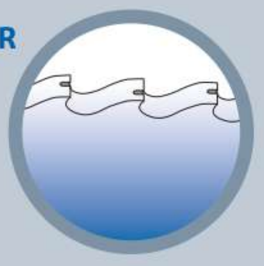
Tooth shape BW is primarily used for cutting pipes and sections. The tooth is alternately bevelled at 45°, breaks the chip in two and guarantees good chip evacuation.

C



Tooth shape C is used for solid sections or very thick pipes. The chip is shredded into three parts due to the presence of both a finishing tooth without chamfer and a pre-cutting tooth (longer than 0.25 mm) with two chamfers on each side.

BR



Tooth shape BR has been successfully introduced for cutting pipes. It has double the number of cutting edges and guarantees a higher number of cuts and a better finish to the section. It also improves tool durability by about 20% because it reduces the removed section per each single sharpening.

TYPICAL PROBLEMS AND SOLUTIONS

There are many factors that influence cutting procedure. Sometimes we think that everything depends on the piece to be cut and the cutting tool. A more careful analysis indicates there are other factors.

The most important are: the quality of the circular saw blade, the quality of the material being cut, the correct clamping of the piece, the quality and quantity of the lubricant, the stiffness of the cut-off machine, the control of feed rate, the quality of resharpening, etc.

Sometimes the problems which arise during the cutting operation are the sum of several different factors, and it's particularly difficult to find a solution. We have indicated below some of the most common problems we have encountered, and some possible solutions.

PROBLEMS	POSSIBILE CAUSE	SOLUTION
Clogged tooth gullet	Pitch too law	Reduce number of teeth
	Cutting speed too high	Reduce the number of revolutions
Poor quality of the cut surface	Wrong tooth form	Contact our technicians
	Wrong cutting parameters	Verify cutting parameters on the chart
Poor cutting performance	Cutting speed too high	Reduce the number of revolutions
	Insufficient lubrication	Increase pressure and flow rate of the coolant
	Wrong feed rate per tooth	Verify feed rate with charts
	Wrong cutting angles	Verify cutting angles
Filling material at the tip of the tooth	Poor sharpening	Verify sharpening quality
	Vibration during cutting	Verify stability of piece
Filling material on the sides of the tooth	Insufficient lubrication	Verify flow rate of coolant
	Excessive disc side run-out	Use reduced side run-out sawblades
Blade breakage during cutting	High working parameters	Verify parameters with the charts
	Poor clamping of the piece being cut	Verify the quality and strength of clamp
	Unsteady feed rate	Verify feeding system of the cut-off machine
	Wrong pitch	Verify parameters against the charts
Burn marks on the piece being cut	Worn saw blade	Blade must be resharpened
	Insufficient lubrication	Increase coolant flow / Check concentration

PINHOLES OF THE CUT- OFF MACHINES

CUT-OFF MACHINE CHARACTERISITICS

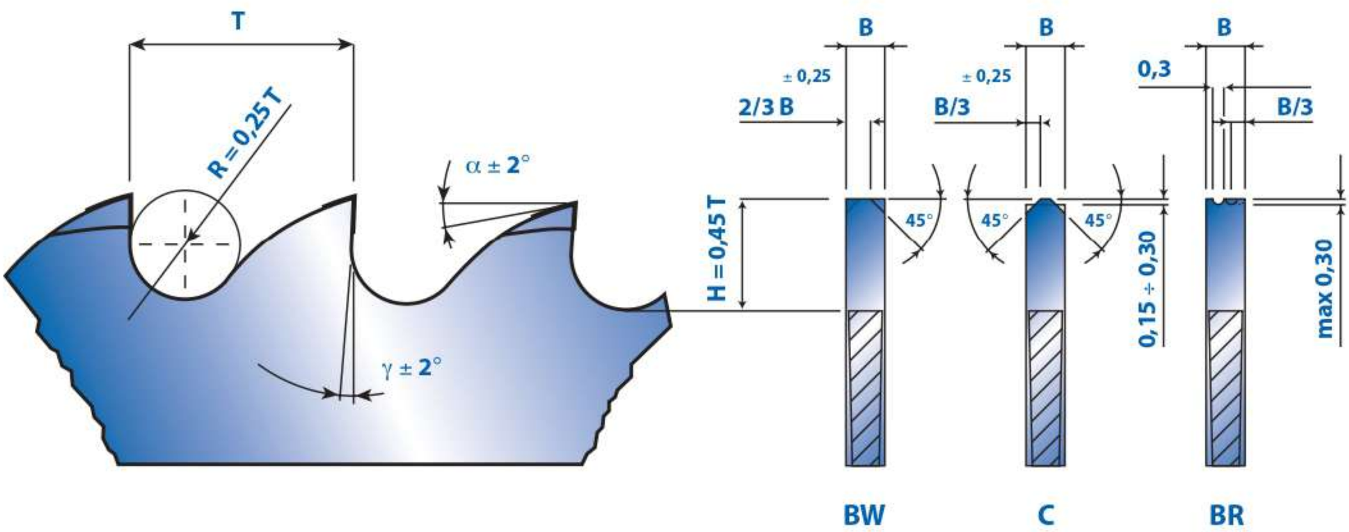
Cut-off machine	Ø Saw diameter	Ø Center bore	Pinhole pitch
ADIGE BLM GROUP	200-250	32	4/9/50
	275-350	32	2/9/50 + 2/11/63
	400-425	50	4/15/80
BAIER	175-250	32	chiavette/keyway/keilnut
BERG & SCHMID	250-350	32	2/8/45 + 2/11/63
	315-350	40	2/8/55 + 4/12/64
BEWO	250-300	32	2/8/45 + 2/11/63
	315-350	40	2/8/55 + 4/11/63
BIMAX	100-300	32	2/8/45
BONAK	250-350	40	2/8/55 + 4/12/64
BROBO WALDOWN	225-250	32	2/8/45 + 2/11/63
	300	38	2/9/55
	300-400	40	2/8/55 + 4/12/64
	500	40	2/8/55 + 4/12/64 + 2/12/80
RALC ITALIA CONNI / C.T.S.	200-315	32	2/8/45 + 2/11/63
	400-425	40	4/11/63
	400-500	50	4/15/80
DALLY	250-500	40	2/8/55 + 4/12/64 + 2/12/80
DEMURGER	160-300	25,4	-
	200-250	32	2/8/45 + 2/11/63
	225-350	40	2/8/55 + 4/12/64
DONG JIN	225-350	32	2/8/45 + 2/11/63
	275-370	40	2/8/55 + 4/11/63
DORINGER	300-350	40	2/8/55 + 4/12/64
BEHRINGER EISELE	200-370	40	2/8/55 + 4/12/64
	400-425	40	4/12/64 + 2/15/80
	450-500	40	2/15/80 + 2/15/100
FABRIS	225-350	32	2/8/45 + 2/11/63
FEMI	225-315	32	2/8/45 + 2/11/63
FONG HO	250-275	32	2/8/45 + 2/9/50 + 2/11/63
	300-400	32	4/11/63
	360	40	2/11/63 + 3/11/65
GERNETTI	250-350	40	4/11/63
	350-400	50	4/15/80
	500	50	4/18/100
HÄBERLE	225	32	2/8/45
	225-450	40	2/8/55 + 4/12/64
IBP PEDRAZZOLI	200-350	32	2/8/45 + 2/11/63
	425	50	4/15/80
IMET	250-350	32	2/8/45 + 2/11/63
	315-350	40	2/8/55 + 4/12/64
KALTENBACH	250	32	-
	350-450	50	4/15/80
KASTO	250-350	32	2/8/45 + 2/11/63
	400-425	50	4/15/80 + 4/14/85
MACC	225-350	32	2/8/45 + 2/11/63
	350-450	40	2/8/55 + 4/12/64

Cut-off machine	Ø Saw diameter	Ø Center bore	Pinhole pitch
MACO	315-425	50	4/15/80
MAIR	300-350	32	2/8/45 + 2/11/63
	300-350	40	2/8/55 + 4/12/64
MEP	225-350	32	2/8/45 + 2/11/63
METORA	250-350	32	2/11/80
MBM MERCURY	300-350	32	-
MTM	300	32	2/8/45
	400	40	4/12/64
	400	50	4/15/80
	450-550	90	3/12,5/160
OMES	250-370	32	2/8/45 + 2/11/63
OMP	250-370	32	2/8/45 + 2/11/63
	400-525	50	4/15/80
FIVES OTO MILLS	315-370	32	2/8/45 + 2/11/63
	450-500	50	4/15/80
	550-620	140	4/17/170
RGA	225-275	25,4	-
	250-370	40	2/8/55 + 4/12/64
ROBEJO	250-350	32	2/8/45 + 2/11/63
ROHBI	175-300	32	2/8/45 + 2/11/63
RURACK OTTO	300-350	40	2/8/55 + 4/12/64
SCOTCHMAN INDUSTRIES	250-315	32	2/8/45 + 2/11/63
	275-350	40	2/8/55 + 4/12/64
SIMEC	200-350	32	2/8/45 + 2/11/63
SINICO	350-370	32	2/8/45 + 2/11/63
SOCO	250-370	32	2/8/45 + 2/11/63
STARTRITE	250	32	2/9/56 + 2/12/64
	300-315	32	2/11/80
STAYER	225	32	-
	300-350	32	-
THOMAS	225-350	32	2/8/45 + 2/11/63
TOMET	225-350	32	2/8/45 + 2/11/63
TRENNJÄGER	250	32	2/9/50
	250-315	40	4/12/64 + 2/8/55
	315-450	50	4/14/85 + 4/15/80
	450-525	50	4/18/100
ULMIA	200-300	32	-
	250-400	40	4/11/63
VIEMME	250-350	32	2/8/45 + 2/11/63
	500	40	4/11/196
VOUCHER	275	35	2/13,5/57,2
WAGNER	200-315	32	4/9/50
	350	50	4/14/85 + 4/15/80
WAHLEN	250-400	40	2/8/55 + 4/11/63
WEIDMANN	210-275	32	2/8/45 + 2/11/63
WINTER	250-315	40	2/8/55 + 4/11/63
WUNSCH	210-250	32	2/8/45 + 2/11/63
	210-400	40	2/8/55 + 4/12/64

CUTTING ANGLES AND TOOTH CHOICE

Tooth choice and the correct cutting angle are the keys to obtaining the best results from your saw blades: this choice depends on the material and the section that needs to be cut.

The following information has been provided by our technicians and is the result of many years' experience.



B	Sawblade thickness
T	Tooth pitch
H	Tooth height
R	Gullet diameter
γ	Rake angle
α	Relief angle
S	Thickness of piece

The circular saw blades are manufactured with the following standard angles:	**HSS- Dmo5** γ = 18° ± 2° α = 10° ± 2°	**HSS- Co5** γ = 18° ± 2° α = 10° ± 2°

HSS

PITCH CHOICE

In order to choose the right number of teeth, it is important to consider the section that needs to be cut and the material.

The pitch is correct when the teeth to section ratio is at least 1:3 for solid bars and 1:1 for pipes and structural shapes.

HSS - Dmo5 CUTTING EDGES

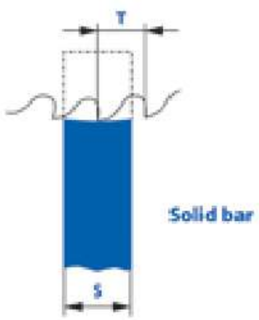
Material	γ°	α°	
Steel (< 700 N/mm)	18°	10°	STANDARD
Steel (> 700 N/mm)	18°	10°	
Stainless steel	18°	10°	
Brass	15°	15°	
Copper	20°	10°	
Bronze	12°	10°	
Aluminium	25°	10°	
Cast iron	10°	6°	
Zinc alloy	12°	8°	

HSS - Co5 CUTTING EDGES

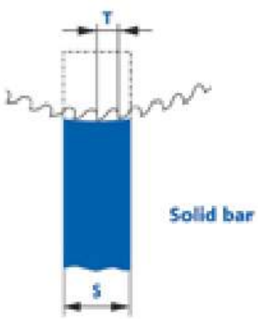
Material	γ°	α°	
Stainless steel	18°	10°	STANDARD
Steel	18°	10°	
Inconel	18°	10°	
Titanium	18°	10°	

For specific applications the angles recommended by our technicians are shown above.

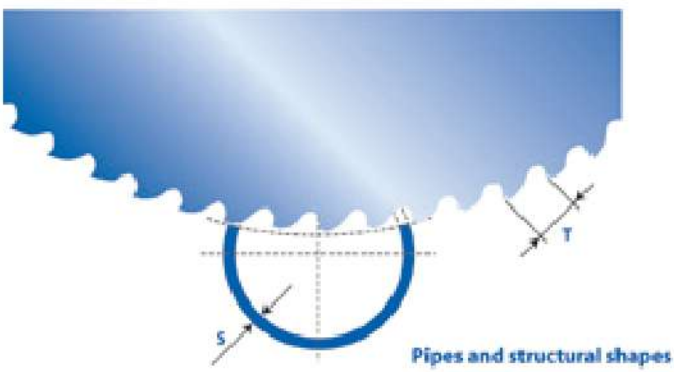
Wrong pitch S<3T



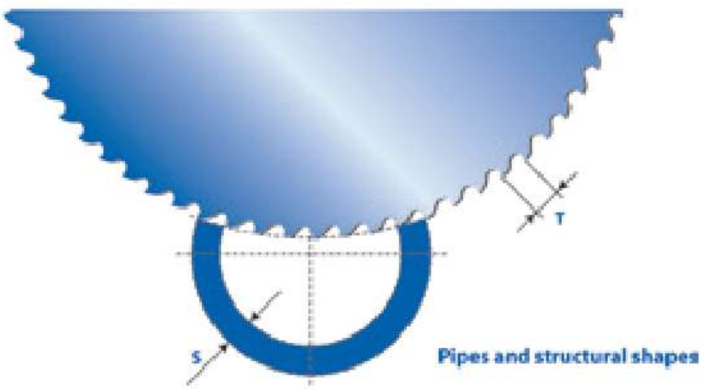
Right pitch S>3T



Wrong pitch 2S<T



Right pitch 2S>T



TECHNICAL FEATURES

Diameter	Bore	Thickness	Standard pinholes
175	32	1,2 / 2,0	2/8/45 + 2/11/63
			BAIER
200	32	1,0 / 1,2 / 1,5 / 1,6 / 1,8 / 2,0	2/8/45 + 2/11/63
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
225	32	1,2 / 1,5 / 1,6 / 1,9 / 2,0	2/8/45 + 2/11/63
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
	40	1,9 / 2,0	2/8/55 + 4/12/64
250	32	1,2 / 1,5 / 1,6 / 2,0 / 2,5 / 3,0	2/8/45 + 2/11/63
			2/8/45 + 2/9/50 + 2/11/63
			BAIER
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
	40	2,0 / 2,5	2/8/55 + 4/12/64
275	32	1,2 / 1,6 / 2,0 / 2,5 / 3,0	2/8/45 + 2/11/63
			2/8/45 + 2/9/50 + 2/11/63
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
	40	1,6 / 2,0 / 2,5 / 3,0	2/8/55 + 4/12/64
300	32	1,6 / 2,0 / 2,5 / 3,0	2/8/45 + 2/11/63
			2/8/45 + 2/9/50 + 2/11/63
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
	40	1,6 / 2,0 / 2,5 / 3,0	2/8/55 + 4/12/64
315	32	1,6 / 1,8 / 2,0 / 2,5 / 3,0	2/8/45 + 2/11/63
			2/8/45 + 2/9/50 + 2/11/63
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
	40	1,6 / 1,8 / 2,0 / 2,5 / 3,0	2/8/55 + 4/12/64
325	32	2,0 / 2,5	2/8/45 + 2/11/63
	40	2,5 / 3,0	2/8/55 + 4/12/64
350	32	1,8 / 2,0 / 2,5 / 3,0	2/8/45 + 2/11/63
			2/8/45 + 2/9/50 + 2/11/63
			ASOLE UNI / UNI SLOTS / LANGLÖCHER (*)
	40	1,8 / 2,0 / 2,5 / 3,0	2/8/55 + 4/12/64
	50	1,8 / 2,0 / 2,5 / 3,0	4/15/80 + 4/14/85
370	32	2,5 / 3,0 / 3,5	2/8/45 + 2/11/63
	40	2,0 / 2,5 / 3,0 / 3,5	2/8/55 + 4/12/64
	50	2,5 / 3,0	4/15/80 + 4/14/85
400	32	2,5 / 3,0	2/8/45 + 2/9/50 + 2/11/63 + 2/12/64
	40	2,2 / 2,5 / 3,0 / 3,5	2/8/55 + 4/12/64
	50	2,2 / 2,5 / 3,0 / 3,5 / 4,0	4/15/80 + 4/14/85
425	40	2,5 / 3,0 / 3,5	2/8/55 + 4/12/64
	50	2,5 / 3,0 / 3,5 / 4,0	4/15/80 + 4/14/85
450	40	2,5 / 3,0 / 3,5 / 4,0	2/8/55 + 4/12/64
	50	2,5 / 3,0 / 3,5 / 4,0	4/15/80
			4/15/80 + 4/14/85
500	40	3,0 / 3,5 / 4,0	2/8/55 + 4/12/64
	50	3,0 / 3,5 / 4,0	4/15/80 + 4/14/85
525	50	3,5 / 4,0	4/15/80 + 4/14/85
550	50	3,0 / 3,5 / 4,0	4/15/80 + 4/14/85
	90	3,0 / 3,5 / 4,0	3/12,5/160
	140	3,0 / 3,5 / 4,0	4/17,5/170
600	50	3,5 / 4,0	4/15/80 + 4/14/85
	90	3,5 / 4,0	3/12,5/160
	140	3,5 / 4,0	4/17,5/170
620	140	3,5 / 4,0	4/17,5/170
650	80	4,0 / 5,0	4/23/120
700	80	4,0 / 5,0	4/23/120

(*) UNI Slots = 2/8/45 + 2/9/50 + 2/9/56 + 2/11/63 + 2/11/75 + 2/11/80

HSS-DMo5 (M2 - W.Nr. 1.3343) / HSS/E-Co5% (M35 - W.Nr. 1.3243)

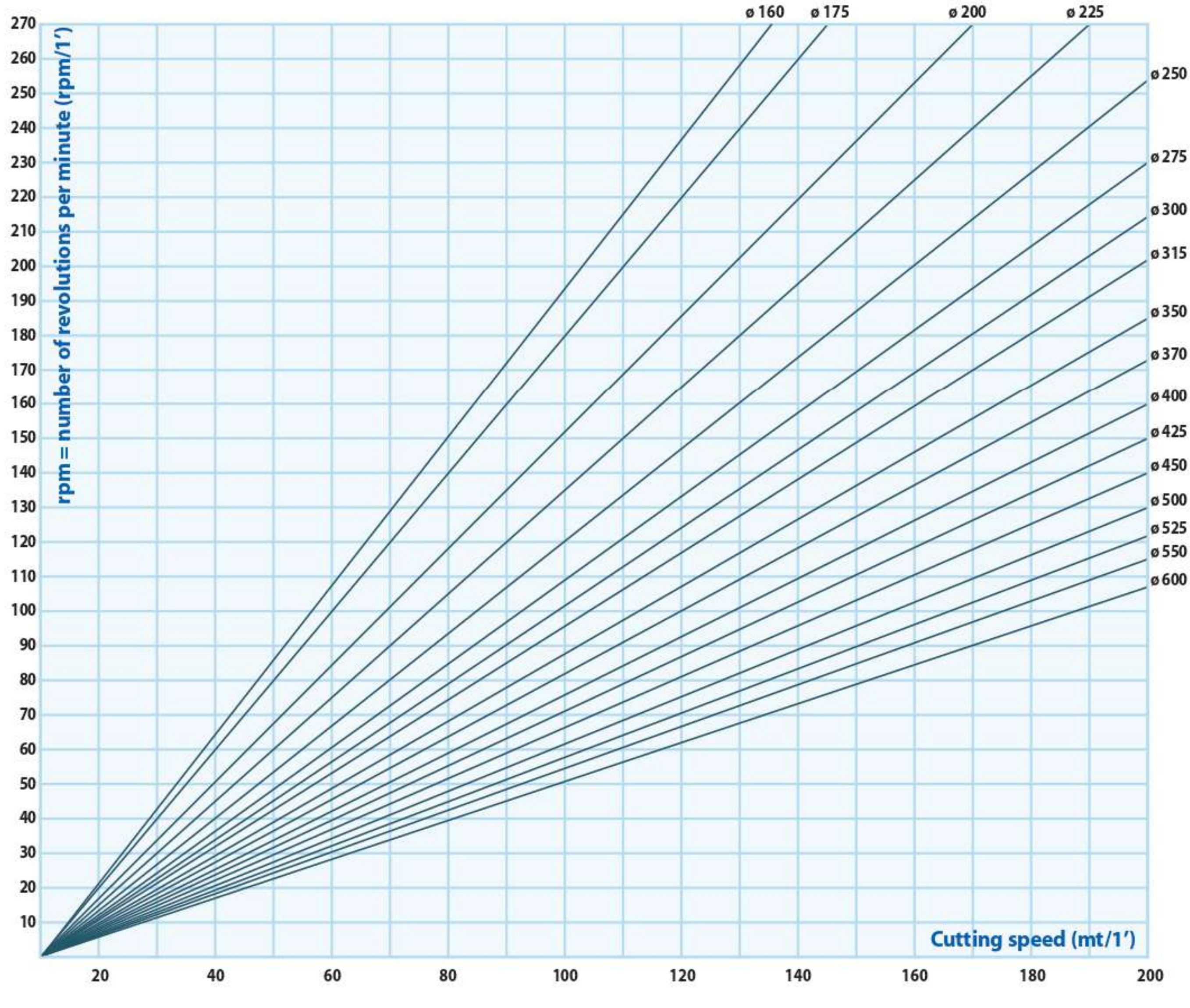
Diameter	Bore	Thickness	Hub	Number and shape of teeth															
				T1.5	T2.5	T3	T4	T 4.5	T5	T5.5	T6	T7	T8	T9	T10	T12	T14	T16	T18
				A	A	Bw	Bw	Bw	Bw	Bw	C	C	C	C	C	C	C	C	C
175	32	1,2	75	360	220	180	140	120	110	100	90	80	70	60					
	32	2,0	75																
200	32	1,0	100	420	250	200	160	140	130	120	100	90	80	70	60				
	32	1,2	100																
	32	1,5 / 1,6	90																
	32	1,8	90																
	25,4 / 32	2,0	90																
225	32	1,2	100	470	280	220	180	160	140	128	120	100	90	80	70	60			
	32	1,5 / 1,6	90																
	32 / 40	1,9 / 2,0	90																
250	32	1,2	100	520	320	250	200	180	160	140	128	110	100	90	80	66			
	32	1,5 / 1,6	100																
	25,4 / 32 / 40	2,0	100																
	25,4 / 32 / 40	2,5	100																
	32	3,0	100																
275	32	1,2	100		340	280	220	200	180	160	140	120	110	96	90	70	60		
	32	1,6	100																
	32 / 40	2,0	100																
	25,4 / 32 / 40	2,5	100																
	32 / 40	3,0	100																
300	32 / 40	1,6	100		380	300	220	210	180	170	160	140	120	104	90	80	68		
	32 / 40	2,0	100																
	32 / 38 / 40	2,5	100																
	32 / 40	3,0	100																
315	32 / 40	1,6	100		400	300	240	220	200	180	160	140	120	110	100	80	70	60	
	40	1,8	100																
	32 / 40	2,0	100																
	32 / 40	2,5	100																
	32 / 40	3,0	100																
325	32	2,0	120		410	320	250	220	200	190	170	150	128	110	100	80	72	64	
	32 / 40	2,5	120																
	40	3,0	120																
350	32 / 40 / 50	1,8	120		440	350	280	240	220	200	180	160	140	120	110	90	80	70	60
	32 / 40 / 50	2,0	120																
	32 / 40 / 50	2,5	120																
	32 / 40 / 50	3,0	120																
370	40	2,0	120			380	280	260	220	210	190	160	140	120	110	96	80	70	64
	40 / 50	2,5	120																
	32 / 40 / 50	3,0	120																
	40	3,5	120																
400	40 / 50	2,2	130 x 2,5				310	280	250	230	200	180	160	140	120	100	90	80	70
	32 / 40 / 50	2,5	120																
	32 / 40 / 50	3,0	120																
	40 / 50	3,5	120																
	50	4,0	120																
425	40 / 50	2,5	120				320	300	260	240	220	190	160	150	130	110	90	84	70
	40 / 50	3,0	120																
	50	3,5	120																
	50	4,0	120																
450	40 / 50	2,5	130				350	320	280	260	230	200	180	160	140	120	100	90	80
	40 / 50	3,0	130																
	40 / 50	3,5	130																
	40 / 50	4,0	130																
500	40 / 50	3,0	130				380	350	310	280	260	220	200	170	160	130	110	100	90
	40 / 50	3,5	130																
	40 / 50	4,0	130																
525	50	3,5	140				410	360	330	300	270	230	200	180	164	130	110	104	90
	50	4,0	140																
550	50 / 90 / 140	3,0	200 / 225				430	380	340	310	290	250	220	190	170	140	120	110	90
	50 / 90 / 140	3,5	140 / 200 / 225																
	50 / 90 / 140	4,0	140 / 200 / 225																
600	50 / 90 / 140	3,5	225				460	420	380	340	320	270	240	210	190	160	130	120	100
	50 / 90 / 140	4,0	200 / 225																
620	140	3,5	225				480	430	390	350	320	280	240	220	190	160	140	120	110
	140	4,0	225																
650	80	4,0	225				510	450	410	370	340	290	260	230	200	170	150	130	110
	80	5,0	225																
700	80	4,0	225				540	480	430	390	360	310	270	240	220	180	150	140	120
	80	5,0	225																

CUTTING SPEED AND FEED RATE

In order to find the correct working parameters for each single application, the user normally has to carry out numerous careful comparative checks. The factors to be considered (material, machine, tool etc) directly determine the result.

Our engineers, attentive to our customers' requirements, have created very sophisticated software which analyzes all this data simultaneously and allows us to considerably reduce the optimization time during the various applications.

Our engineers can recommend the best cutting parameters for each single application.
The following formula and graphs indicate how to calculate the cutting speed, number of revolutions and feed rate.



V	D1	Av	Avz	Z	rpm
Cutting speed (mt/1')	Saw blade diameter (mm)	Feed rate (mm/1')	Feed rate per tooth (mm/Z)	Number of teeth	Number of revolutions/minute

Formula $rpm = \frac{V \times 1000}{D_1 \times 3{,}14}$ $Av = Avz \times Z \times rpm$

CHOICE OF PITCH AND FEED RATE

Once the material and the section to be cut have been identified, the pitch must be chosen.

The correct pitch will prevent dangerous vibration and guarantee correct chip evacuation.

The following data are approximate. Our engineers can advise on the most appropriate pitch for each specific application (stationary cut, flying cut, transfer) and the materials to be cut.

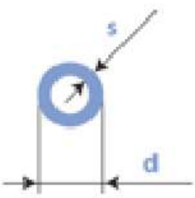
CUTTING SPEED DATA AND FEED RATE

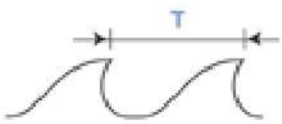
Material	V (mt/1′)	Avz (mm/Z)
Steel (UTS < 450 MPa)	50 - 110	0,04 - 0,08
Steel (UTS < 650 MPa)	30 - 80	0,03 - 0,07
Steel (UTS < 900 MPa)	15 - 40	0,03 - 0,06
Stainless steel	12 - 30	0,02 - 0,05
Cast iron	20 - 30	0,03 - 0,05
Titanium	10 - 25	0,02 - 0,05
Brass	400 - 600	0,04 - 0,07
Copper	200 - 300	0,04 - 0,06
Bronze	200 - 400	0,05 - 0,07
Aluminium	500 - 700	0,05 - 0,08

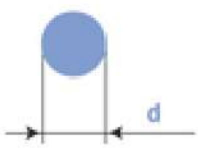
PITCH SELECTION

PIPES AND STRUCTURAL SHAPES					SOLID BAR	
		Avz ≈ 0,05 mm/z				Avz ≈ 0,04 mm/z
d	s	T	s	T	d	T
20,0	≤ 2	4,5	> 2	5,0	≤ 20	6
30,0	≤ 2	5,0	> 2	6,0	≤ 30	8
40,0	≤ 3	6,0	> 3	8,0	≤ 40	10
50,0	≤ 3	7,0	> 3	8,0	≤ 50	12
60,0	≤ 3	7,0	> 3	8,0	≤ 60	14
70,0	≤ 3	7,0	> 3	9,0	≤ 70	16
80,0	≤ 4	8,0	> 4	9,0	≤ 80	18
90,0	≤ 4	9,0	> 4	10,0	≤ 90	20
100,0	≤ 4	9,0	> 4	12,0	≤ 100	20
110,0	≤ 5	10,0	> 5	14,0	≤ 110	22
120,0	≤ 6	12,0	> 6	14,0	≤ 120	24

Pipes and structural shapes







Solid

HSS

RECOMMENDED WORKING PARAMETERS

In the following charts we have highlighted the working parameters (cutting speed and feed rate) which our engineers recommend when cutting solid materials or pipes.

		Steel $\leq$ 500 N/mm^2 INOX		Steel $\leq$ 800 N/mm^2 INOX		Steel $\leq$ 1200 N/mm^2	
D1 350 x 2,5		Pipe	Solid	Pipe	Solid	Pipe	Solid
		V = 75 m/min.	V = 50 m/min.	V = 35 m/min.	V = 25 m/min.	V = 18 m/min.	V = 12 m/min.
		Avz = 0,06 mm/Z		Avz = 0,06 mm/Z		Avz = 0,06 mm/Z	
T	**Z**	Av = mm/min.	Av = mm/min.	Av = mm/min.	Av = mm/min.	Av = mm/min.	Av = mm/min.
3	**350**	1428	-	670		290	190
4	**280**	1140	765	535	380	230	150
5	**220**	900	600	420	300	180	120
6	**180**	735	490	345	245	147	98
7	**160**	650	435	305	220	130	87
8	**140**	570	380	265	190	115	75
9	**120**	490	330	230	165	100	65
10	**110**	450	300	210	150	90	60
12	**90**	365	245	170	120	74	50
14	**80**	325	220	150	110	66	45
16	**70**	285	190		95	57	38
18	**60**	-	165		80	50	33

● Solid ○ Pipe

		BRASS		BRONZE COPPER		ALUMINIUM	
D1 350 x 2,5		Pipe	Solid	Pipe	Solid	Pipe	Solid
		V = 600 m/min.	V = 400 m/min.	V = 400 m/min.	V = 200 m/min.	V = 800 m/min.	V = 500 m/min.
		Avz = 0,05 mm		Avz = 0,05 mm		Avz = 0,05 mm	
T	**Z**	Av = mm/min.	Av = mm/min.	Av = mm/min.	Av = mm/min.	Av = mm/min.	Av = mm/min.
3	**350**	9100		6000		13300	
4	**280**	7300		4800		10600	
5	**220**	6100	4000	4000	2000	8350	5940
6	**180**	4800	3200	3200	1600	6840	4860
7	**160**	4200	2800	2800	1400	6080	4320
8	**140**	3600	2400	2400	1200	5320	3780
9	**120**	3300	2200	2200	1100	4560	3240
10	**110**	3000	2000	2000	1000	4180	2970
12	**90**	2400	1600	1600	800	3420	2430
14	**80**	1400		700			2160
16	**70**	1200		600			1890
18	**60**	1100		550			1620

● Solid ○ Pipe

FORMULAS AND CALCULATION EXAMPLES

In order to determine saw cutting speed, the number of revolutions per minute and the feed rate we can use the following formulas. The use of these formulas guarantees more precise data results than the previous charts.

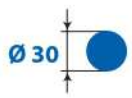
CUTTING SPEED **The cutting speed** (Vt) is expressed in revolutions per minute and represents the speed of the tooth against the piece being cut; cutting speed does not directly influence cutting time.	$Vt = \frac{3{,}14 \times D_1 \times rpm}{1000}$
NUMBER OF REVOLUTIONS **Cutting speed** (rpm) is expressed in revolutions per minute and represents the disc rotating speed around its own axis; it can be determined by a rev counter, or obtained with the following formula:	$rpm = \frac{Vt \times 1000}{3{,}14 \times D_1}$
FEED RATE **The feed rate** (Av) is expressed in millimetres per minute and represents the feeding speed of the saw while it breaks into the piece being cut. This figure is directly proportional to the cutting time: the higher the feed rate, the lower the contact time.	$Av = Avz \times Z \times rpm$

INDEX

Vt = Cutting speed (mt / 1')
Avz = Feed rate per tooth (mm/Z)
D = Diameter of the circular saw (mm)
Z = Number of teeth
Av = Feed rate speed (mm/min)
Rpm = Number of revolutions per minute (giri/min)

EXAMPLES FOR THE CALCULATION OF CUTTING PARAMETERS

Steel to be cut: **38NCD4 R = 1000 N/mm**
Section to be cut: **ø 30 mm**
Circular saw diameter: **D_1 = 350 mm**



From the charts page 27:	**Vt**	=	15 - 25 mt/1'	= 25 mt/1'
	Avz	=	0,02 - 0,06 mm	= 0,03 mm
	T	=	7	**Z** = 160

The parameters are:

$$Rpm = \frac{Vt \times 1000}{3{,}14 \times D_1} = \frac{25 \times 1000}{3{,}14 \times 350} = 23 \text{ giri/min}$$

$$Av = Avz \times Z \times Rpm = 0{,}03 \times 160 \times 23 = 110 \text{ mm/1'}$$

APPLICATIONS AND CUTTING RESULTS

The choice of tool depends on what the user wants to achieve. Reducing cutting time is not always the target.

There are other requirements such as surface finish, or blade life where the saw has to guarantee good performance for a specific number of shifts so that its replacement can be properly planned.

APPLICATION N. 1 **STATIC CUT**

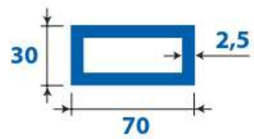
Material
Inox AISI 304 800 N/mm²
Section to be cut:

Machine cost per hour:
50 Euro/h = 0,83 Euro/min

Parameters used and client's results	Results obtained with Julia's saw blades
CIRCULAR SAW 400 x 2,5 x 32 Z 200 C **VAPO** • Vt = 16 mt/min • Rpm = 13 giri/min • Av = 160 mm/min • t = 32″ • N° = 1132 pz • T = 13h 15′ • S = 0,70′ • C = 0,70 x 0,83 = **0,58** Euro/pz	CIRCULAR SAW 400 x 2,5 x 32 Z 250 BW **BLACK HAWK** • Vt = 30 mt/min • Rpm = 24 giri/min • Av = 260 mm/min • t = 19″ • N° = 2740 pz • T = 18h 40′ • S = 0,40′ • C = 0,40 x 0,83 = **0,33** Euro/pz

APPLICATION N° 2 **FLYING CUT**

Material
S 235 450 N/mm²
Section to be cut:



Machine cost per hour:
50 Euro/h = 0,83 Euro/min

Parameters used and client's results	Results obtained with Julia saw blades
CIRCULAR SAW 550 x 3,5 x 50 Z 220 C **VAPO** • Vt = 150 mt/min • Rpm = 87 giri/min • Av = 2400 mm/min • t = 1,75″ • N° = 3600 pz • T = 2h 25′ • S = 0,04′ • C = 0,04 x 0,83 = **0,033** Euro/pz	CIRCULAR SAW 550 x 3,5 x 50 Z 240 C **GREY SHARK** • Vt = 185 mt/min • Rpm = 106 giri/min • Av = 3100 mm/min • t = 1,35″ • N° = 5650 pz • T = 2h 45′ • S = 0,029′ • C = 0,029 x 0,83 = **0,024** Euro/pz

Reducing cutting time however, remains the ultimate goal; below are some practical examples where considerable reductions have been achieved.

APPLICATION N. 3 **STATIC CUT**

Material
SMn Pb 37 500 N/mm²
Section to be cut:

Machine cost per hour:
50 Euro/h = 0,83 Euro/min

Parameters used and client's results	**Results obtained with Julia saw blades**
CIRCULAR SAW 300 X 2,0 X 32 Z 150 C **VAPO** • Vt = 30 mt/min • Rpm = 32 giri/min • Av = 230 mm/min • t = 7,05″ • N° = 3200 pz • T = 8h 10′ • S = 0,153′ • C = 0,153 x 0,83 = **0,127** Euro/pz	CIRCULAR SAW 300 X 2,0 X 32 Z 140 C **YELLOW TIGER** • Vt = 44 mt/min • Rpm = 47 giri/min • Av = 350 mm/min • t = 4,63″ • N° = 4200 pz • T = 7h 05′ • S = 0,101′ • C = 0,101 x 0,83 = **0,084** Euro/pz

Vt	Cutting speed
Rpm	Number of revolutions
Av	Feed rate
t	Contact time/piece
N°	Number of cutted pieces
T	Total time
S	Time per piece
C	Cost per cut piece

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PAYMENTS / TAXES / TERMS: Customer shall pay JULIA USA for all amounts and/or charges listed on the accepted purchase order, including without limitation all packaging, shipping and handling charges. Customer shall be responsible for all applicable federal, state, municipal, and government taxes, duties, and levies, however designated or levied on the manufacture, assembly, sale, transportation, and/or disposal of the Product. All payments required under such purchase order shall be in U.S. dollars. Unless otherwise stated in writing by JULIA USA, all payments shall be due, by wire transfer, upon Customer's receipt of the Product. If a payment is not received within ten (10) days after it is due, then a finance charge equal to the lesser of eighteen percent (18)% per annum or the maximum interest allowed by law shall apply to such overdue amount. As security for payment of any balances due, JULIA USA shall have the right to retain possession of and shall have a security interest in all of Customer's property and shall have a purchase money security interest and right of possession in the Product, even if already shipped. Customer agrees to execute any requested financing statement and provide any document requested by JULIA USA to protect its security interest. JULIA USA may suspend performance of any order, defer shipments, accelerate the due date on all amounts owed, require security and/or require adequate assurances when, in JULIA USA's sole opinion, the financial condition of Customer warrants such action. Customer agrees to pay all of JULIA USA collection costs, including without limitation reasonable attorneys' fees.

TITLE / DELIVERY / RISK OF LOSS: JULIA USA shall determine the schedule for delivery of the Product in its sole discretion and subject to the availability of finished Products. JULIA USA shall have the right to make partial shipment of the Product, and Customer shall pay the amounts due and payable for such partial shipment. Unless otherwise provided in writing by JULIA USA delivery of the Product shall be made Ex-works (Incoterms 2010). The title to and risk of loss or damage with respect to the Product shall pass to Customer upon delivery to Customer or Customer's designated carrier at the Ex-works point of shipment. JULIA USA's obligation to deliver the Product, when and if applicable, is subject to receipt from Customer of all necessary information and documentation from Customer including, but not limited, to exemption and/or resale certificates, licenses, and other documents as may be required from Customer. Transportation shall be at Customer's sole risk and expense, and any claims for losses or damage in transit shall be against the carrier only, and Customer hereby agrees to waive any such claim against JULIA USA. If delay in delivery is caused, in whole or in part, by Customer, JULIA USA reserves the right to invoice Customer for the applicable Product and to make reasonable charges for storage until such time as delivery can be made. The Product shall be packed for shipment in such manner as may be determined by JULIA USA.

SHORTAGES AND REJECTION: Customer shall promptly notify JULIA USA, in no event later than ten (10) business days after delivery, of any claimed shortages or rejection as to any Product that is in material non-conformance. Such notice must be in writing and shall reasonably detail the grounds for any such rejection. Failure to give such notice within such time shall be deemed an acceptance in full of any such delivery. Customer shall provide JULIA USA with a reasonable time to cure any notified shortage or material non-conformance of the Product. In the event of Customer's order for specially manufactured Products, as defined from time to time by JULIA USA, if JULIA USA delivers to Customer a quantity of Products of up to ten-percent (10%) more or less than the quantity set forth in the accepted purchase order, Customer shall not be entitled to object to or reject the Products or any portion of them by reason of the surplus or shortfall and shall pay for such Products the price set forth in the accepted purchase order adjusted accordingly. Notwithstanding the foregoing, in the event of Customer's order for a Minimum Quantity of specially manufactured Products (as hereinafter defined), Customer agrees that JULIA USA might supply a quantity of Product up to one (1) more or less Product than the quantity set forth in the accepted purchase order, and Customer further agrees that Customer shall not be entitled to object to or reject such Products or any portion of them by reason of the shortfall and shall pay for such Products the price set forth in the accepted purchase order adjusted accordingly. For the purposes of this Section, the term "Minimum Quantity" shall mean an ordered quantity of Products between no less than five (5) and up to a maximum of nine (9).

CONFIDENTIAL INFORMATION: All proprietary information (whether written, electronic, or oral) furnished (whether before or after the date of the agreement entered into by and between JULIA USA and Customer) by JULIA USA to Customer relating to the Product, except information that legally is or becomes publicly available or is rightfully received by Customer from a third party, is hereinafter referred to as the "**Confidential Information**". Customer, together with its officers, directors, employees, and agents, agrees: (i) to keep the Confidential Information confidential and not to disclose such Confidential Information in any manner whatsoever without the prior written consent

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