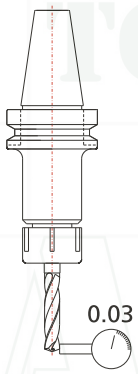
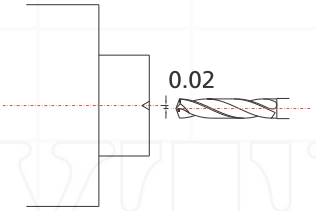
Concentricity, Coolant supply

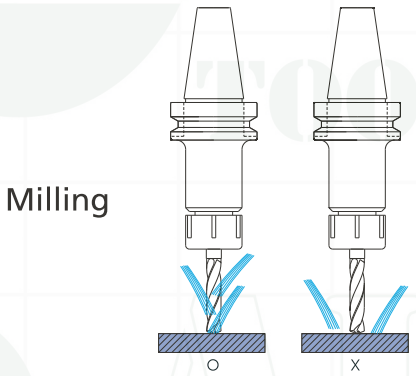
Concentricity

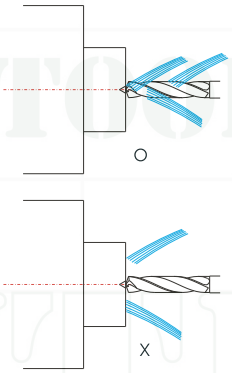
- To achieve the tolerance required or elliminate trouble, total run out between the center line of tool and workpiece must not exceed the below value.



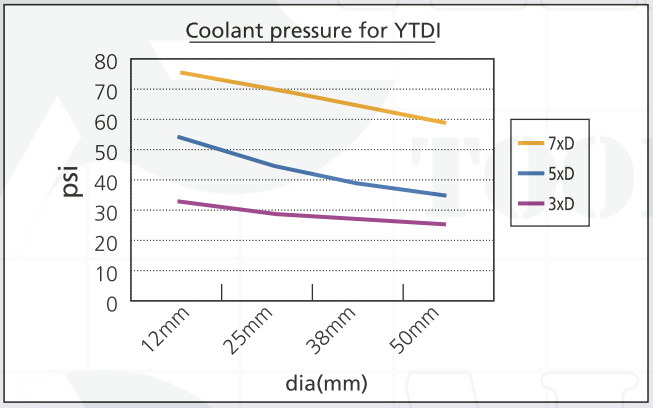


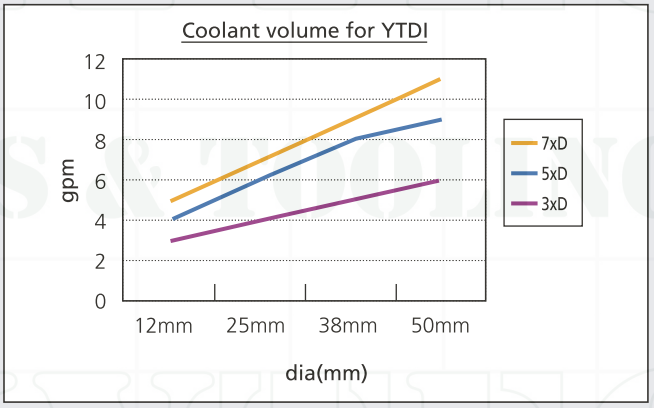
External coolant supply





Internal Coolant supply





Coolant Pressure(psi) for YTDI drill

	12mm	25mm	38mm	50mm
3xD	33	29	27	25
5xD	54	45	39	35
7xD	75	70	64	59

Coolant Volume(gpm) for YTDI drill

	12mm	25mm	38mm	50mm
3xD	3	4	5	6
5xD	4	6	8	9
7xD	5	7	9	11

Recommended Cutting Data

- Feeds and Speed for starting point only. It is recommended to use these values as a starting point until optimal results are obtained.

YTDI Indexable Drills, Metric

Material Group / Condition	Drill Dia.	8~16mm		16~25mm		25~32mm		32~40mm		40~50mm	
		Speed (m/min)	Feed (mm/rev)	Speed (m/min)	Feed (mm/rev)	Speed (m/min)	Feed (mm/rev)	Speed (m/min)	Feed (mm/rev)	Speed (m/min)	Feed (mm/rev)
Grey cast iron	(FC)	50~70	0.20~0.30	50~70	0.25~0.45	50~80	0.35~0.55	60~90	0.34~0.58	80~100	0.38~0.60
Nodular cast iron	(FCD)	40~65	0.15~0.25	40~65	0.22~0.45	45~75	0.32~0.52	50~80	0.35~0.62	70~100	0.38~0.60
Carbon steel	(S45C)	55~70	0.15~0.30	55~70	0.16~0.40	60~85	0.20~0.40	70~90	0.22~0.48	75~95	0.25~0.54
Alloy steel	(SCM440)	50~75	0.15~0.30	50~75	0.15~0.40	55~80	0.18~0.40	60~90	0.25~0.47	65~95	0.27~0.52
Hardened steel	(SKD11)	40~50	0.10~0.20	40~50	0.12~0.28	40~50	0.16~0.35	40~60	0.20~0.38	40~60	0.22~0.42
Stainless steel	(SUS)	30~40	0.10~0.20	35~50	0.10~0.22	35~50	0.15~0.28	40~55	0.18~0.30	40~55	0.22~0.32
Aluminum 130HB	(AL)	80~100	0.20~0.30	80~100	0.25~0.40	90~110	0.30~0.45	90~110	0.30~0.45	90~120	0.30~0.50

- The data is recommended for 3xDia. and should be silghtly reduced for 5xD & 7xD drills.

YTDI Indexable Drills, Inches

Material Group / Condition	Drill Dia.	.3150~.6299		.6299~.9843		.9843~1.2598		1.2598~1.5748		1.5748~1.9685	
		Speed (SFM)	Feed (IPR)	Speed (SFM)	Feed (IPR)	Speed (SFM)	Feed (IPR)	Speed (SFM)	Feed (IPR)	Speed (SFM)	Feed (IPR)
Grey cast iron	(FC)	160~230	0.008~0.012	160~230	0.010~0.018	160~260	0.014~0.022	200~300	0.013~0.023	260~330	0.015~0.024
Nodular cast iron	(FCD)	130~210	0.006~0.010	130~210	0.009~0.018	150~240	0.013~0.021	160~260	0.014~0.025	230~330	0.015~0.024
Carbon steel	(S45C)	180~230	0.006~0.012	180~230	0.006~0.016	200~280	0.008~0.016	230~300	0.009~0.019	240~310	0.010~0.021
Alloy steel	(SCM440)	160~240	0.006~0.012	160~240	0.006~0.016	180~260	0.007~0.016	200~300	0.010~0.009	210~310	0.011~0.021
Hardened steel	(SKD11)	130~160	0.004~0.008	130~160	0.005~0.011	130~160	0.006~0.014	130~200	0.008~0.015	130~200	0.009~0.017
Stainless steel	(SUS)	100~130	0.004~0.008	110~160	0.004~0.009	110~160	0.006~0.011	130~160	0.007~0.012	130~180	0.009~0.013
Aluminum 130HB	(AL)	260~330	0.008~0.01	260~330	0.010~0.016	300~360	0.012~0.018	300~360	0.012~0.018	300~390	0.012~0.020

YTD Carbide Brazed Tipped Drills, Metric

Material Group / Condition	Drill Dia.	13.5~15.0mm		~20.0mm		~41.5mm	
		Speed (m/min)	Feed (mm/rev)	Speed (m/min)	Feed (mm/rev)	Speed (m/min)	Feed (mm/rev)
Grey cast iron	(FC)	50~80	0.20~0.35	50~80	0.20~0.40	50~80	0.25~0.50
Nodular cast iron	(FCD)	50~70	0.20~0.35	50~70	0.20~0.40	50~70	0.25~0.50
Carbon steel	(S45C)	40~65	0.15~0.30	40~65	0.20~0.40	40~65	0.20~0.45
Alloy steel	(SCM440)	40~60	0.10~0.25	40~60	0.15~0.35	40~60	0.20~0.40
Hardened steel	(SKD11)	30~40	0.10~0.25	30~40	0.15~0.30	30~40	0.20~0.35
Stainless steel	(SUS)	30~40	0.10~0.20	30~40	0.15~0.25	30~40	0.20~0.30

YSD, YSDF, YSDP, YCD Solid Carbide Drills

Material Group / Drill Dia.	3~5mm		5~8mm		8~10mm		10~12mm		12~14mm		14~20mm	
	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed	Speed	Feed
Grey cast iron (FC)	80~85	0.1~0.25	80~90	0.2~0.3	85~95	0.2~0.35	90~95	0.2~0.4	90~100	0.2~0.4	95~100	0.2~0.5
Nodular cast iron (FCD)	80~85	0.1~0.25	80~85	0.2~0.3	80~85	0.2~0.35	80~90	0.2~0.4	80~90	0.2~0.4	80~90	0.2~0.5
Carbon steel (S45C)	60~65	0.1~0.2	65~70	0.15~0.25	70~75	0.15~0.25	70~80	0.2~0.3	70~80	0.25~0.3	75~80	0.3~0.4
Alloy steel (SCM440)	50~55	0.1~0.25	55~60	0.15~0.25	60~65	0.15~0.3	60~70	0.2~0.35	65~70	0.25~0.35	65~70	0.3~0.45
Hardened steel (SKD11)	25~30	0.06~0.12	25~30	0.1~0.15	30~35	0.1~0.2	30~35	0.1~0.25	30~35	0.1~0.25	30~35	0.1~0.25
Stainless steel (SUS)	20~25	0.05~0.1	20~25	0.1~0.15	25~30	0.1~0.2	25~30	0.1~0.25	25~30	0.1~0.25	25~30	0.1~0.25

YSDC(D5), YSDCF(D5), YSDCP(D5) Solid Coolant Hole Drills

Materials		speed (V) (m/min)	Feed rate in dia.			
			3~8mm	8~12mm	12~16mm	16~20mm
Unalloyed steel	Carbon < 0.25%	80~100	0.1~0.2	0.15~0.25	0.2~0.4	0.25~0.5
	Carbon : 0.25~0.55%	80~100	0.1~0.2	0.15~0.25	0.2~0.4	0.25~0.5
	High Carbon & Carbon tool steel	80~100	0.1~0.2	0.15~0.25	0.2~0.4	0.25~0.5
Low alloyed steel	Non hardened HB 150~260	70~100	0.1~0.2	0.2~0.3	0.2~0.35	0.25~0.4
High alloyed steel	Annealed HSS HB 150~270	40~70	0.08~0.15	0.12~0.22	0.2~0.4	0.25~0.4
Stainless steel	Austenitic Ni>8%, C=18~25%	35~50	0.08~0.15	0.12~0.25	0.15~0.3	0.2~0.35
Malleable cast iron	Ferritic	80~100	0.15~0.3	0.25~0.35	0.3~0.4	0.3~0.45
	Pearlitic	70~90	0.1~0.25	0.2~0.4	0.25~0.4	0.25~0.5
Grey cast iron	Low tensile strength	80~100	0.1~0.25	0.25~0.35	0.3~0.45	0.35~0.55
	High tensile strength	70~90	0.1~0.22	0.2~0.33	0.3~0.4	0.35~0.5

Note

1. YES Carbide drill is not recommended to operate in low powered equipment.
2. Check spindle, machine and fixture rigidity before operation.
3. Make sure that coincide drill point with the center of material when lathe operation.
4. Feed enough cutting fluids.

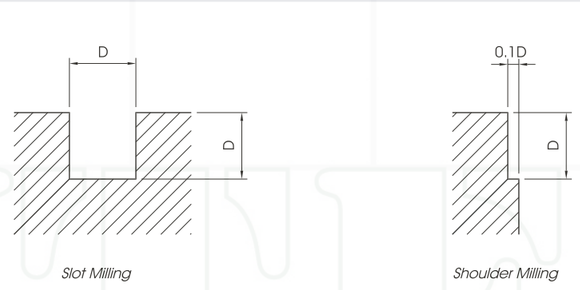
Recommended Cutting Data

YSET Carbide End Mills

Diameter / Material / Condition		Carbon steel (S50C) (Speed = 40m/min)			Alloy steel (SCM, SKD, SUS) (Speed = 30m/min)		
		rpm	Feed(mm/min)		rpm	Feed(mm/min)	
(mm)	Flutes		Slot	Shoulder		Slot	Shoulder
2.0	2	5,600	80	200	4,800	60	150
2.5	2	4,500	80	200	3,800	60	150
3.0	2	3,700	80	200	3,200	60	150
4.0	2	2,800	80	200	2,400	60	150
5.0	2	2,200	80	200	1,900	60	150
	4		-	300		-	230
6.0	2	1,900	80	200	1,600	60	150
	4		-	300		-	230
7.0	2	1,600	80	200	1,400	60	150
8.0	2	1,400	80	200	1,200	60	150
	4		-	300		-	230
9.0	2	1,200	80	200	1,100	60	150
10.0	2	1,100	80	200	950	60	150
	4		-	300		-	230
11.0	2	1,000	80	200	870	60	150
12.0	2	930	80	200	800	60	150
	4		-	300		-	230
14.0	2	800	80	200	680	60	150
	4		-	300		-	230
15.0	2	750	80	200	640	60	150
	4		-	300		-	230
16.0	2	700	80	200	600	60	150
	4		-	300		-	230
18.0	2	620	80	200	530	60	150
	4		-	300		-	230
20.0	2	560	80	200	480	60	150
	4		-	300		-	230

YSET Carbide Roughing End Mills

Diameter / Material / Condition	Carbon steel (S50C) (Speed = 40m/min)			Alloy steel (SCM, SKD, SUS) (Speed = 30m/min)		
	rpm	Feed(mm/min)		rpm	Feed(mm/min)	
		Slot	Shoulder		Slot	Shoulder
6	2100	120	300	1600	100	250
8	1600	120	300	1200	100	250
10	1300	120	300	950	100	250
12	1100	120	300	800	100	250
14	900	120	300	680	100	250
16	800	120	300	600	100	250
20	640	100	250	480	80	200
25	510	100	250	380	80	200



Slot Milling *Shoulder Milling*

YSET/HH Carbide High Helix End Mills

Diameter / Material / Condition	HRC 55 v=25m/min		HRC 60 v=20m/min		HRC 65 v=15m/min		HRC 70 v=12m/min	
	rpm	Feed	rpm	Feed	rpm	Feed	rpm	Feed
6	1300	200	1100	160	800	120	640	100
8	1000	200	800	160	600	120	480	100
10	800	200	640	160	480	120	380	100
12	600	200	530	160	400	120	320	100
16	500	200	400	160	300	120	240	100
20	400	200	320	160	240	120	200	100
25	320	200	250	160	190	120	150	100
32	270	200	210	160	160	120	130	100

Speed formula, Drilling of stacked plate, Chip formation

Major Cutting speed formula

Cutting Speed

$$V = \frac{\pi \times D \times N}{1000} \text{ (m/min)}$$

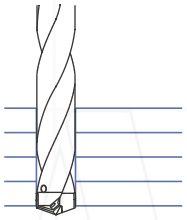
- V : Cutting speed (m/min)
- D : Drill diameter (mm)
- N : Revolution per minute (rpm)
- π : Circular constant (3.14)

Feed

$$f = \frac{F}{N} \text{ (mm/rev)}$$

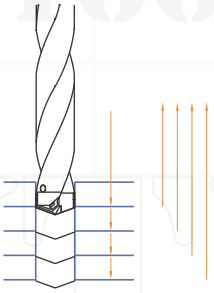
- f : Feed rate (mm/rev)
- F : Depth of cut per minute (mm/min)
- N : Revolution per minute (rpm)

Recommended application for stacked plate by Yes Carbide Drills



X

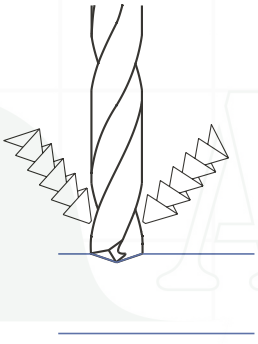
One operation is possible subject to closly tightend stacked plate without any room.



O

"Woodpecker" method recommended in case of certain aperture in the stacked plate.

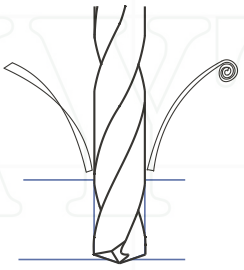
Good chip formation



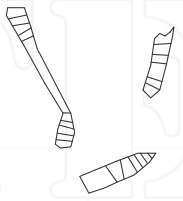
(initial drilling)

O

(drilling through)



(bottoming)

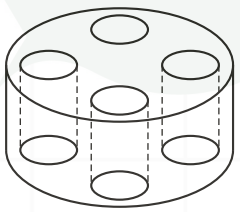
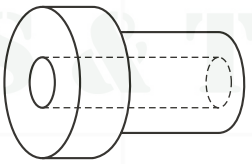
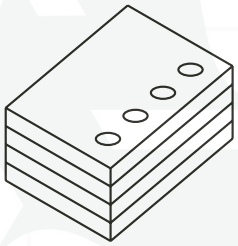
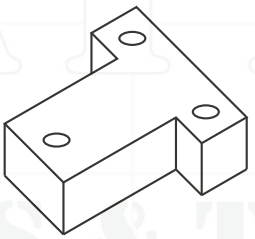
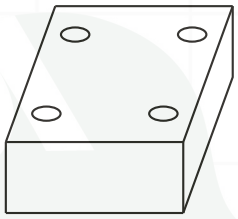
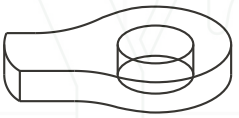


X

(long Stringy chip)

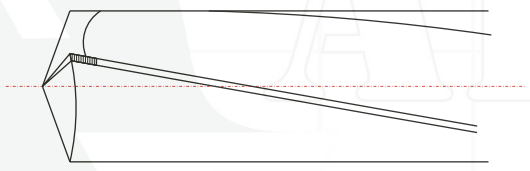
Speed Examples, Maximum Wear

Cutting speed examples for different workpieces by Yes Carbide drills

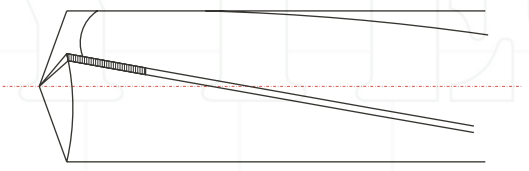
 Φ13 x depth 10mm	**FCD45** **YCD 130** N=1592rpm V=65m/min F=318mm/min f=0.2mm/rev	 Φ20 x depth 70mm	**S50C** **YTDI 200 P** N=876rpm V=55m/min F=263mm/min f=0.3mm/rev
 Φ24 x depth 63mm	**SS41** **YTDI 240 T** N=796rpm V=60m/min F=239mm/min f=0.3mm/rev	 Φ12 x depth 12mm	**SCM440** **YSD 120** N=1194rpm V=45m/min F=179mm/min f=0.15mm/rev
 Φ10 x depth 15mm	**SUS304** **YSDC 100** N=1115rpm V=35m/min F=112mm/min f=0.1mm/rev	 Φ15 x depth 8mm	**FC25** **YTD 150** N=1592rpm V=75m/min F=557mm/min f=0.35mm/rev

How to find maximum wear

1. When long and stringy chip formation without broken chip, require to change new tool or regrinding
2. Below pictures show the time of regrinding



Need to change new tool or regrinding



Excessive wear

Power requirement for YES Carbide Drill

Power reguirement for YES Carbide Drills

$$\text{Power(P)} = \frac{D \times f \times V \times ks}{24{,}480 \times 0.7} \text{ (kw)}$$

- D = drill diameter (mm)
- f = feed (mm/rev)
- V = cutting speed (mm/min)
- ks = specific cutting force (kg/mm)
- ? = constants of performance(0.7~0.85)

ex)

$$\text{Power(P)} = \frac{11.5 \times 0.2 \times 60 \times 230}{24{,}480 \times 0.7} = 1.852\text{kw}$$

Specific cutting force (ks)

Material		Condition	HB	ks(kg/mm)
Steel	Unalloyed steel	C = 0.15%	100~150	195
		C = 0.35%	120~180	215
		C = 0.60%	200~250	230
	Low alloy steel	Non hardened	120~200	215
		Hardened & Tempered	250~300	265
		Hardened & Tempered	300~350	290
	High alloy steel	Annealed	150~250	265
		Hardened	300~350	290
	Stainless steel	Martensitic/ ferritic	175~225	235
		Austenitic	150~200	250
	Steel casting	Unalloyed	150~200	205
		Low alloyed	175~225	255
		High alloyed	200~250	275
	Hard steel	Hardened steel	HRc 55	460
Cast iron	Grey casting iron	Low tensile strength	150~225	110
		High tensile strength	200~300	150
	Malleable cast iron		110~250	115
	Nodular cast iron	Ferritic	125~200	115
		Pearlitic	200~300	185
	Chilled cast iron		350~450	310
Non ferrous	Aluminium alloys	Non heat treatable	40~80	50
		Heat treatable	80~120	80
	Aluminium alloys,Cast	Non heat treatable	50~100	80
		Heat treatable	65~115	95
	Copper alloys	Brass	65~115	80
		Bronze	75~115	180

Trouble Shooting Guide for YES Carbide Drill

Problem		Cause	Remedy
Cutting edge wear	Flank wear	Excessive cutting speed	Reduce cutting speed
	Edge chipping	Vibration or chattering in machine tool, holder or component	Check and adjust machine and tool alignment
		Deflection of tool, part, fixture or machine	Check all rigidity
		Excessive cutting speed	Reduce cutting speed
		Off center set up	Check concentricity not to exceed 0.02mm TIR
	Corner chipping	Excessive cutting speed	Reduce cutting speed
		Insufficient coolant supply	Increase coolant pressure
	Built up edge	Insufficient cutting speed	Increase cutting speed
		Insufficient coolant supply	Increase coolant pressure
		Worn cutting edge	Regrind or replace new drill
	Margin	Improper seating of tool	Check and adjust machine spindle, and fixture
		Rough or angled entry/exit of hole	Reduce feed
		Chip clogging or jamming	Increase coolant pressure and adjust feed to optimize chip-formation
		Insufficient coolant supply	Increase coolant pressure
		Excessive cutting speed	Reduce cutting speed
Long stringy chips		Improper speed and feed	Adjust spped and feed
Tool life too short		Flank wear increase too fast	Reduce cutting speed
Drill breakage		Off center set up	Check set up rigidity of machine, tool, and fixture
		Improper cutting condition	Check cutting parameters, possibly reduce feed
Burrs on exit		Excessive axial force	Reduce the width of edge preparation
Oversize hole		Improper cutting condition	Check cutting data, increase cutting speed
		Clamping chuck	Check fit and clamping of tool
Undersize hole		Tool cooling	Check coolant fluid
		Improper cutting condition	Reduce cutting speed, increase feed

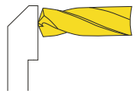
Resharpening Guide for YES Carbide Drills

Yes brand Carbide drill can be resharpened by CNC 5 axis machine or Universal tool grinder with our own special attachment. The below procedure is to regrind by Universal tool grinder, while follow "S"point program in case of CNC machine.

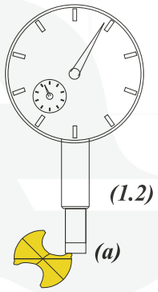
Removal of worn section

Remove all of the worn or chipped section before regrinding.

Regrinding drill point

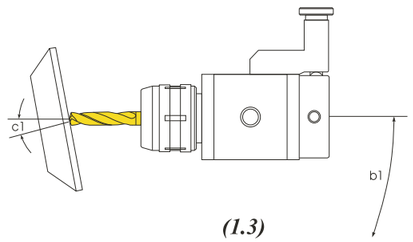


(1.1)

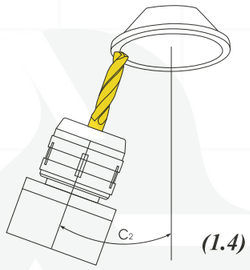


(1.2)

1. Put the drill point horizontally on the stopper.(see 1.1)
2. Set dial gauge on <a> and turn the drill to coincide central line of point.
   Then, tighten the collect chuck securely.(see 1.2)

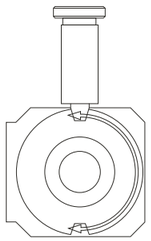


(1.3)



(1.4)

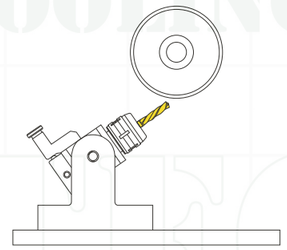
3. Set the cutting edge toward grinding wheel to the point angle <c1, 8°> as shown (1.3).
   Then, keep the angle <c2, 20°> as shown (1.4).
4. Grind the flank up and down repeatedly as shown <b1>.



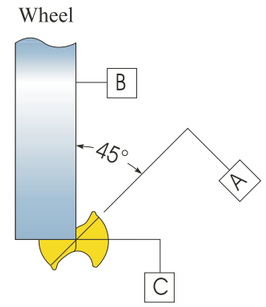
(1.5)

5. Move forawrd the grinding wheel and grind the cutting lips,
   after keeping the attachment horizontally.
6. Rotate the attachment at 180° toward <c3> and grind other cutting edge
   by the same procedure as NO.4, 5.(see 1.5)
   Make sure that both cutting lips should be equal or symmetrical.

Web thinning



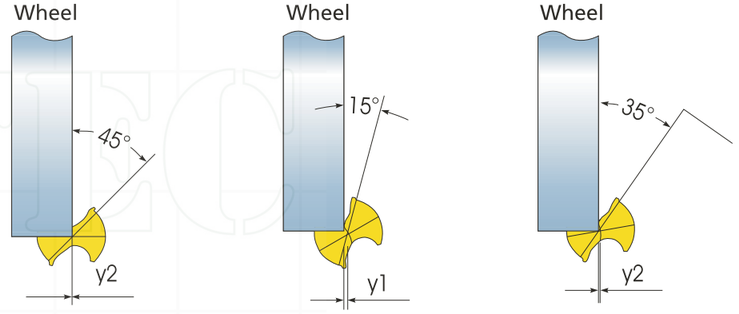
(2.1)



(2.2)

1. Set the drill at 30° or 35° in the drill attachment.(see 2.1)
   (In case of drill for AL, FC material, keep 30°, while others at 35°.)
2. Align the "B" face of wheel at center line of drill.(see 2.2)
3. Set the "B" face of wheel at 45° from cetral line of the drill.

(2.3)



Cut 1 **Cut 2** **Cut 3**

4. Grind as procedure <cut 1>,<cut 2>, <cut3>.(see 2.3)
5. Rotate the attachment at 180° and grind other facet by NO.4 procedure.
   Note that the shape of the thinning should be such that it does not interfer with chip flow.

Note

If you have any difficulty to regrind in your shop, you may use our factory expert service which is being serviced at reasonable cost in one week returning delivery Contact ours.