

ph HORN ph



NEW

## 狭长槽的铣槽刀具

Schneidplatten für Schneidbreiten von 0,25 - 1,0 mm

## SLOT MILLING CUTTERS FOR NARROW WIDTHS

Inserts for cutting widths from 0.25 - 1.0 mm





PH HORN PH



# 不同之处： 更多可能

## THE DIFFERENCE: MORE POSSIBILITIES

- **铣削宽度从0.25毫米起, 可节省材料**

Material-saving cutting due to milling widths from 0.25 mm

- **铣削深度达13.5毫米**

Milling depths up to 13.5 mm

- **由于最多可达12个有效齿, 因此具有高性能**

High performance because of up to 12 effective teeth



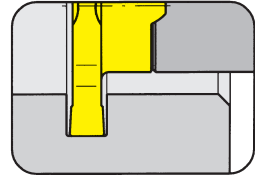
# 槽铣削 ( 圆弧插补铣削 )

## Groove Milling by circular interpolation



刀片  
Insert

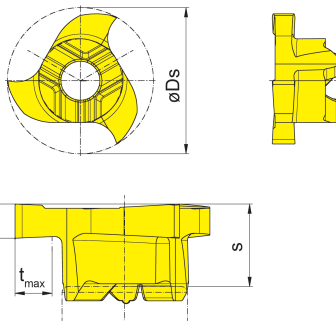
# 304



切槽深度可达  
槽宽  
切削刃 $\varnothing$

Depth of groove up to  
Width of groove  
Cutting edge  $\varnothing$

1.3 mm  
0.25-0.7 mm  
7.7 mm



用于铣削刀柄  
for Milling shank

型号 M304  
Type M304.ST

图示=右手型  
Picture = right hand cutting version

产品型号 Part number	Ds	w	s	t <sub>max</sub>	Z	EG35	EG55	IG35	
304.0025.20	7.7	0.25	2.6	1.3	3	▲		△	
304.0030.20	7.7	0.30	2.6	1.3	3	▲		△	
304.0040.20	7.7	0.40	2.6	1.3	3	▲		△	
304.0050.20	7.7	0.50	2.6	1.3	3	▲	▲	△	
304.0060.20	7.7	0.60	2.6	1.3	3	▲		△	
304.0070.20	7.7	0.70	2.6	1.3	3	▲		△	
▲ 库存 / on stock    △ 4周 / 4 weeks    x 根据要求 / upon request						P	●	●	-
● 推荐 / recommended						M	●	○	●
○ 次推荐 / alternative recommendation						K	○	○	-
- 不合适 / not suitable						N	-	-	-
■ 非涂层 / uncoated grades						S	-	-	●
■ 涂层 / coated grades						H	-	-	-
■ 钎焊/金属陶瓷 / brazed/Cermet									

尺寸单位 : mm  
Dimensions in mm

硬质合金牌号  
Carbide grades



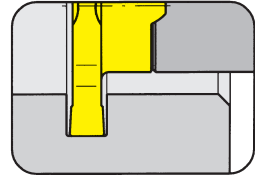
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刀片  
Insert

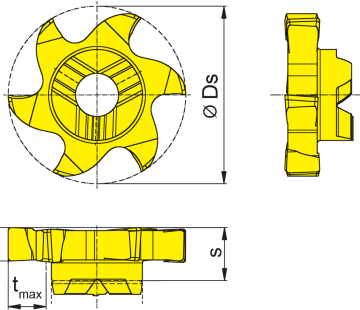
# 606



切槽深度可达  
槽宽  
切削刃Ø

Depth of groove up to  
Width of groove  
Cutting edge Ø

2.5 mm  
0.25-1 mm  
11.7 mm



用于铣削刀柄  
for Milling shank

型号 M306  
Type M306.ER  
M306.M  
M306.ST

图示=右手型  
Picture = right hand cutting version

产品型号 Part number	Ds	w	s	t <sub>max</sub>	Z	EC35		IG35	
						▲	△	▲	△
606.0025.00	11.7	0.25	3.5	2.5	6	▲	△	▲	△
606.0030.00	11.7	0.30	3.5	2.5	6	▲	△	▲	△
606.0040.00	11.7	0.40	3.5	2.5	6	▲	△	▲	△
606.0050.00	11.7	0.50	3.5	2.5	6	▲	△	▲	△
606.0060.00	11.7	0.60	3.5	2.5	6	▲	△	▲	△
606.0070.00	11.7	0.70	3.5	2.5	6	▲	△	▲	△
606.0080.00	11.7	0.80	3.5	2.5	6	▲	△	▲	△
606.0090.00	11.7	0.90	3.5	2.5	6	▲	△	▲	△
606.0100.00	11.7	1.00	3.5	2.5	6	▲	△	▲	△

▲ 库存 / on stock    △ 4周 / 4 weeks    x 根据要求 / upon request

● 推荐 / recommended

○ 次推荐 / alternative recommendation

- 不合适 / not suitable

■ 非涂层 / uncoated grades

■ 涂层 / coated grades

■ 钎焊/金属陶瓷 / brazed/Cermet

尺寸单位 : mm

Dimensions in mm

P	●	-	-
M	●	●	-
K	●	-	-
N	-	-	-
S	-	●	-
H	-	-	-

硬质合金牌号  
Carbide grades



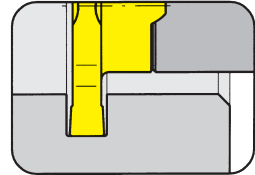
# 槽铣削 ( 圆弧插补铣削 )

## Groove Milling by circular interpolation

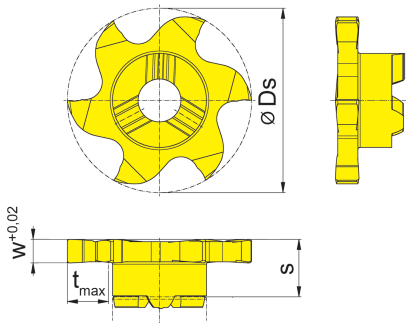


刀片  
Insert

# 608



切槽深度可达	Depth of groove up to	3.5 mm
槽宽	Width of groove	0.25-1 mm
切削刃Ø	Cutting edge Ø	15.7 mm



用于铣削刀柄  
for Milling shank

型号 M308  
Type M308.ER  
M308.M  
M308.ST

图示=右手型  
Picture = right hand cutting version

产品型号 Part number	Ds	w	s	t <sub>max</sub>	Z	EC35		IG35	
						▲	△	▲	△
608.0025.00	15.7	0.25	4.9	3.5	6	▲	△	▲	△
608.0030.00	15.7	0.30	4.9	3.5	6	▲	△	▲	△
608.0040.00	15.7	0.40	4.9	3.5	6	▲	△	▲	△
608.0050.00	15.7	0.50	4.9	3.5	6	▲	△	▲	△
608.0060.00	15.7	0.60	4.9	3.5	6	▲	△	▲	△
608.0070.00	15.7	0.70	4.9	3.5	6	▲	△	▲	△
608.0080.00	15.7	0.80	4.9	3.5	6	▲	△	▲	△
608.0090.00	15.7	0.90	4.9	3.5	6	▲	△	▲	△
608.0100.00	15.7	1.00	4.9	3.5	6	▲	△	▲	△

▲ 库存 / on stock    △ 4周 / 4 weeks    x 根据要求 / upon request

● 推荐 / recommended

○ 次推荐 / alternative recommendation

- 不合适 / not suitable

■ 非涂层 / uncoated grades

■ 涂层 / coated grades

■ 钎焊/金属陶瓷 / brazed/Cermet

尺寸单位 : mm

Dimensions in mm

P	●	-
M	●	●
K	○	-
N	-	-
S	-	●
H	-	-

硬质合金牌号  
Carbide grades

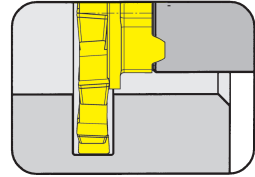
# 槽铣削 ( 圆弧插补铣削 )

## Groove Milling by circular interpolation



刀片  
Insert

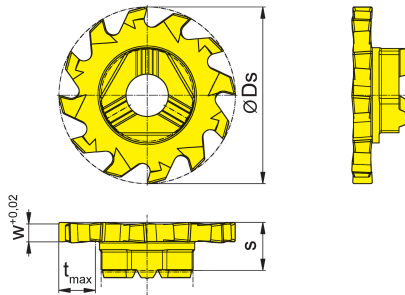
# 713



切槽深度可达  
槽宽  
切削刃Ø

Depth of groove up to  
Width of groove  
Cutting edge Ø

4.5 mm  
0.25-1 mm  
21.7 mm



用于铣削刀柄  
for Milling shank

型号 M313  
Type M313.ER  
M313.M  
M313.ST

图示=右手型  
Picture = right hand cutting version

产品型号 Part number	Ds	w	s	t <sub>max</sub>	Z	AN25	AS45	EG35	EG55	IG35	TI25
713.0025.00	21.7	0.25	5.9	2.3	12			▲		x	
713.0030.00	21.7	0.30	5.9	2.3	12		x	▲		x	
713.0040.00	21.7	0.40	5.9	2.3	12	Δ		▲			
713.0050.00	21.7	0.50	5.9	2.8	12	Δ		▲			
713.0060.00	21.7	0.60	5.9	4.5	12			▲		x	
713.0070.00	21.7	0.70	5.9	4.5	12			▲		x	
713.0080.00	21.7	0.80	5.9	4.5	12	Δ		▲			
713.0090.00	21.7	0.90	5.9	4.5	12			▲		x	
713.0100.00	21.7	1.00	5.9	4.5	12			▲			▲
▲ 库存 / on stock Δ 4周 / 4 weeks x 根据要求 / upon request						P	●	●	●	●	●
● 推荐 / recommended						M	○	●	●	○	●
○ 次推荐 / alternative recommendation						K	-	●	○	○	●
- 不合适 / not suitable						N	-	○	-	-	●
■ 非涂层 / uncoated grades						S	-	●	-	-	●
■ 涂层 / coated grades						H	-	-	-	-	-
■ 钎焊/金属陶瓷 / brazed/Cermet											

尺寸单位 : mm  
Dimensions in mm

硬质合金牌号  
Carbide grades

# 槽铣削 ( 圆弧插补铣削 )

## Groove Milling by circular interpolation



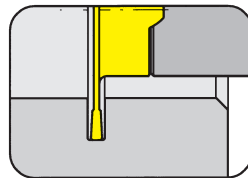
刀片  
Insert

# 939

切槽深度可达  
槽宽  
切削刃 $\varnothing$

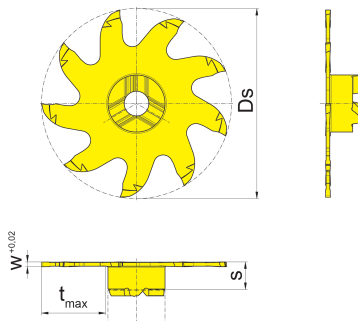
Depth of groove up to  
Width of groove  
Cutting edge  $\varnothing$

14 mm  
0.4-1 mm  
40 mm



用于铣削刀柄  
for Milling shank

型号 M332.0012.3.00A  
Type



图示=右手型  
Picture = right hand cutting version

产品型号 Part number	Ds	w	s	t <sub>max</sub>	Z	AN25
939.0040.4.00	40	0.4	5.8	14	9	▲
939.0050.4.00	40	0.5	5.8	14	9	▲
939.0060.4.00	40	0.6	5.8	14	9	▲
939.0070.4.00	40	0.7	5.8	14	9	▲
939.0080.4.00	40	0.8	5.8	14	9	▲
939.0090.4.00	40	0.9	5.8	14	9	▲
939.0100.4.00	40	1.0	5.8	14	9	▲

▲ 库存 / on stock  $\Delta$  4周 / 4 weeks x 根据要求 / upon request

● 推荐 / recommended

○ 次推荐 / alternative recommendation

- 不合适 / not suitable

■ 非涂层 / uncoated grades

■ 涂层 / coated grades

■ 钎焊/金属陶瓷 / brazed/Cermet

尺寸单位 : mm

Dimensions in mm

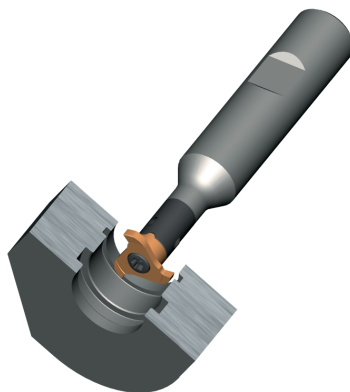
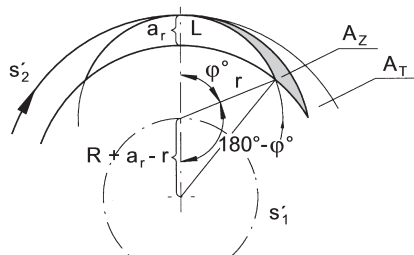
P	●
M	○
K	-
N	-
S	-
H	-

硬质合金牌号  
Carbide grades



## 内槽铣削

Milling of an internal groove



$$\cos [180^\circ - \varphi^\circ] = \frac{r^2 + [R + a_r - r]^2 - R^2}{2r [R + a_r - r]} \rightarrow 180^\circ - \varphi^\circ \rightarrow \varphi^\circ$$

$L = \frac{\dot{U} \cdot 2r \cdot \varphi^\circ}{360^\circ} \text{ mm}$	切削长度 Length of cut
$A_z = L \cdot h_m \text{ mm}^2$	切屑面积 Area of chip
$A_T = \pi [(R + a_r)^2 - R^2] \text{ mm}^2$	槽截面的面积 Area of groove section

$t = \frac{A_T}{n \cdot z \cdot A_z} \text{ min}$	加工时间 (用于AT) Time for cut (for $A_T$ )
$s'_1 = \frac{\pi \cdot 2 (R - r + a_r)}{t} \text{ mm/min}$	刀具中心的进给 Feed rate of tool centre
$s'_2 = s'_1 \frac{R + a_r}{R - r + a_r} \text{ mm/min}$	刀尖进给 Feed rate of tool tip

## 规格

### Specification

	规格 Specification	ISO 规格 Specification
进给率 Feed rate	$s'$	$v_f$
转速 Revolutions	$n$	$n$
齿数 Number of teeth	$z$	$z$
进给/齿 Feed/tooth	$s_z$	$f_z$
切屑中间厚度 medium thickness of chip	$h_m$	$h_m$
径向切削深度 radial depth of cut	$a_r$	$a_e$

	规格 Specification	ISO 规格 Specification
刀具半径 Radius of cutter	$r$	$r$
工件半径 Radius of workpiece	$R$	$R$
刀具中心的进给 Feed rate of tool centre	$s'_1$	$v_{f3}$
刀尖进给 Feed rate of tool tip	$s'_2$	$v_{f2}$

# 切削参数

## Cutting data



材料 Material		硬度 Hardness Brinell (HB)	切削速度 $v_c$ Cutting speed $v_c$						切屑中间厚度 $h_m$ medium thickness of chip $h_m$			
			MG12	EG35 EG55	AS45* AN25	IG35*	DD25	HS35	刀片 / Insert 304, 606, 608, 713, 939			
									非常稳定 very rigid	稳定 rigid	不稳定 not rigid	
P 碳钢 Carbon steel	0,2% C	140	-	240 280-140	260 300-160	-	-	-	0,05	0,03	0,01	
	0,4% C	180	-	210 230-150	230 250-170	-	-	-				
	0,6% C	200	-	160 180-110	170 190-120	-	-	-				
	合金钢 Alloyed steel	退火 annealed	180	-	150 170-100	160 180-110	-	-				-
		淬火 quenched	280	-	140 160-100	140 160-100	-	-				-
	高合金钢 high alloyed steel (>5%)	淬火 quenched	350	-	120 140-80	110 130-70	-	-				-
		退火 annealed	200	-	110 130-70	120 140-80	-	-				-
铸钢 Cast steel	硬化 hardened	-	-	-	-	-	90 100-80	-	-	-		
	非合金 unalloyed	180	80	180 200-140	200 220-160	-	-	-	-	-		
M 不锈钢 Stainless steel	合金 alloyed	220	70	120 140-80	120 140-80	-	-	-	-	-		
	马氏体, 铁素体 martensitic, ferritic	200	-	-	120 140-80	-	-	-	-	-		
K 灰铸铁 Grey cast iron	奥氏体 austenitic	180	-	-	100 130-70	-	-	-	-	-		
	低拉伸强度 low tensile strength	180	-	100 120-60	130 150-90	-	-	-	-	-		
		250	-	90 100-70	90 100-70	-	-	-	-	-		
	球墨铸铁 Spheroidal graphite cast iron	铁素体 ferritic	160	-	100 110-70	120 130-90	-	-	-	-	-	
		珠光体 perlitic	250	-	80 100-50	80 100-50	-	-	-	0,05	0,03	0,01
	可锻铸铁 Malleable cast iron	铁素体 ferritic	125	-	100 120-60	100 120-60	-	-	-	-	-	-
珠光体 perlitic		225	-	120 140-80	120 140-80	-	-	-	-	-	-	
N 铝合金 Al-alloys	非热处理 not heat treatable	30-80	550	-	-	-	800 850-650	-	-	-	-	
	热处理 heat treatable	80-120	220	-	-	-	300 350-200	-	-	-	-	
	铸铝合金 Al-cast-alloy	非热处理 not heat treatable	80	220	-	-	-	300 350-200	-	-	-	-
		热处理 heat treatable	100	100	-	-	-	200 230-90	-	-	-	-
	铜合金 Copper-alloys	非热处理 not heat treatable	90	120	-	-	-	90 100-70	-	-	-	-
热处理 heat treatable		100	100	-	-	-	100 110-80	-	-	-	-	
S 耐热合金 (Fe) Heat resistant alloy	退火 annealed	200	-	-	80 100-70	-	80 100-70	-	-	-	-	
	耐热合金 (Ni, Co) Heat resistant alloy	硬化 annealed	250	-	-	40 50-25	-	40 50-25	-	-	-	
		退火 annealed	250	-	-	40 50-25	-	40 50-25	-	-	-	
	纯钛 / Titanium pure	100	-	-	80 100-70	-	-	-	-	-	-	
钛合金 / Titanium alloys	266	-	-	80 100-70	-	-	-	-	-	-		

备注:

\*替代方案: TI25

- 以2或6为结尾的刀片材质 => 倾向于有更低的切削速度

- 以5为结尾的刀片材质 => 倾向于有更低的切削速度

-  $f_z = (hm^* \pi^n \cdot de^{\phi s}) / (360^{\phi} \cdot ae^{\phi} \cdot \text{sink})$  [简化  $f_z = hm^* \sqrt{(de/ae)}$  当  $ae/de < 0,3$ ]

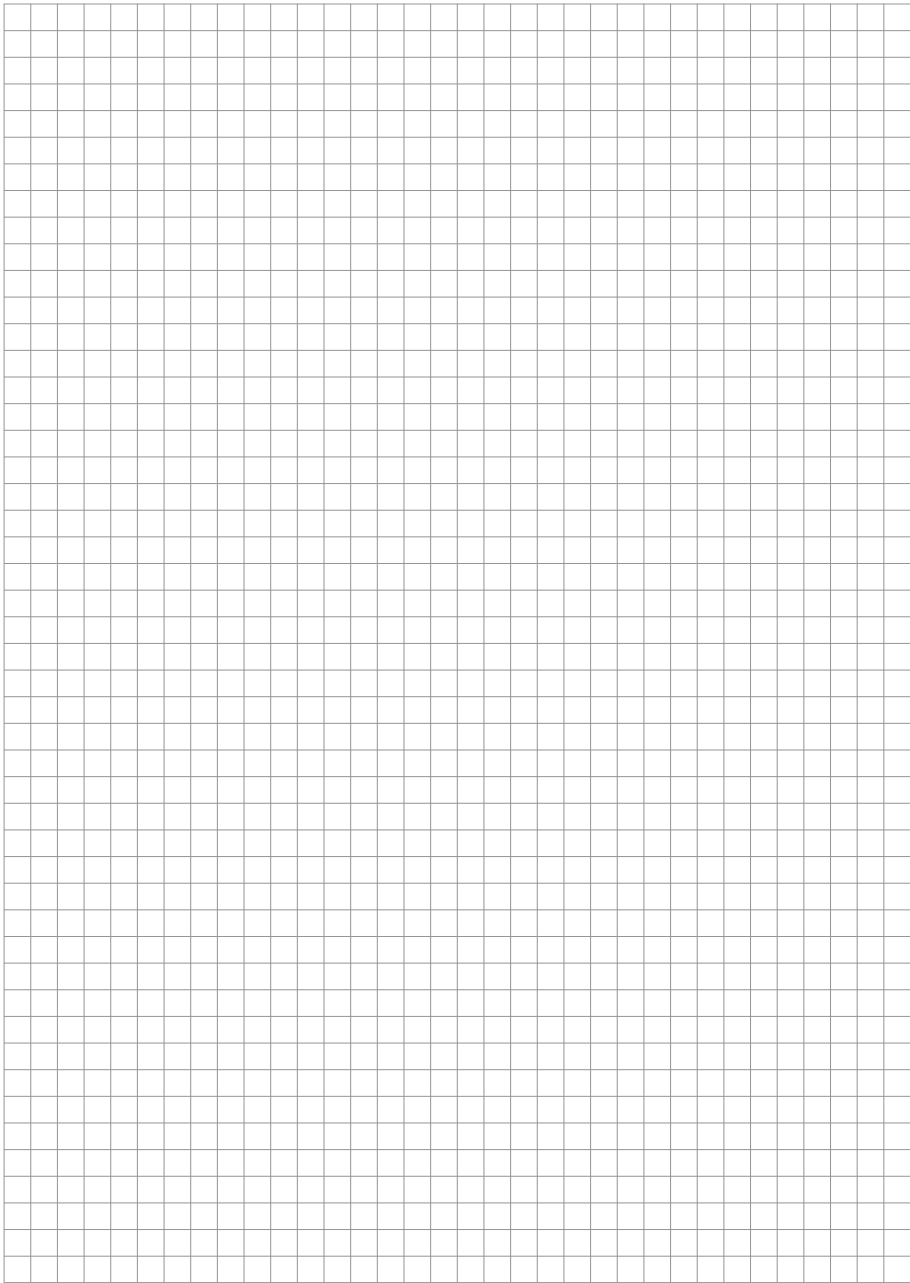
Note:

\*Alternative: TI25

- Cutting materials with suffix 2 or 6 => tendentially higher cutting speed

- Cutting materials with suffix 5 => tendentially lower cutting speed

-  $f_z = (hm^* \pi^n \cdot en^{\phi s}) / (360^{\phi} \cdot ae^{\phi} \cdot \text{sink})$  [simplified  $f_z = hm^* \sqrt{(de/ae)}$  at  $ae/en < 0,3$ ]







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