

**Metric**

# TuffCut® XR

**NEW  
Micro Sizes  
&  
Extended  
Reach  
Range**

**Use Roughing Speeds  
*and*  
Achieve Your Finishing Needs!**

**Schruppgeschwindigkeit nutzen  
*und*  
Endbearbeitung erreichen!**

**Utilisez des Vitesses  
pour l'Ebauche  
*et*  
Obtenez vos Besoins  
en Finition !**

 **M.A. FORD**  
*High Performance Cutting Tools*

ISO 9001:2000 Certified

## Series 177, 178 & 179

# XTREME ROUGHING End Mills

### Features

- Unique M.A. Ford® Heli-Pitch Geometry.
- Proprietary Carbide Substrate.
- Eccentric Primary Relief Angle.
- ALtima® Coating.

### Benefits

- Higher Feeds and Speeds for Increased Productivity. Reduced Vibration Harmonics.
- Maintains Cutting Edge Strength & Sharpness for Improved Tool Life.
- Strong Cutting Edges Allowing for Increased Depths of Cut at Elevated Cutting Data.
- State-of-the-Art ALtima® (AlTiN) PVD Coating for Superior Tool Life in Virtually All Materials.

**Use Roughing Speeds  
*and*  
Achieve Your  
Finishing Needs!**

## Séries 177, 178 & 179

# Ebauche Xtrême Fraises pour Ebauche

### Caractéristiques

- Géométrie Héll Décalée de M.A. Ford®
- Substrat Carbure sous licence.
- Angle de dépouille primaire excentrique.
- Revêtement ALtima®

### Avantages

- Avances et Vitesses supérieures pour un Meilleur Rendement. Diminution des Vibrations.
- Maintient la Résistance et l'Acuité de l'arête de coupe pour une meilleure Durée de Vie.
- Fortes Arêtes permettant des Profondeurs de Coupe Accrues avec des paramètres de coupe élevés.
- Revêtement PVD de pointe ALtima® (AlTiN) pour Une Durée de vie supérieure pour presque toutes matières.

**Utilisez des Vitesses  
pour l'Ebauche  
*Et*  
Obtenez vos Besoins  
en Finition !**

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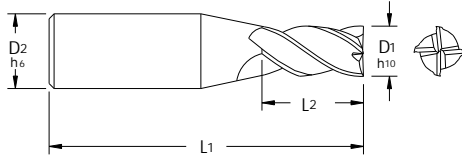
**Schruppgeschwindigkeit nutzen  
*und*  
Endbearbeitung erreichen!**

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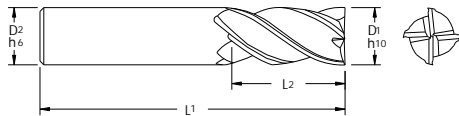
VHM	Z4		35°/38°		7° Max			<48HRC	HA DIN 6535
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**NEW  
NOUVEAU**  
★ **177  
Series**

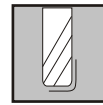


**Micro**

★ Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2
177 0150A	17680	1.5	3	38	3
177 0200A	17682	2	3	38	4
177 0250A	17684	2.5	3	38	5
177 0303A	17686	3	3	38	6

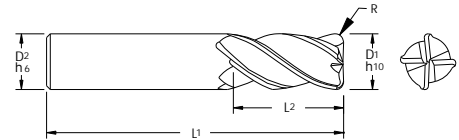


Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2
177 0300A	17928	3	6	57	8
177 0350A	17688	3.5	6	63	7
177 0400A	17930	4	6	57	11
177 0450A	17690	4.5	6	63	9
177 0500A	17932	5	6	57	13
177 0600A	17934	6	6	57	13
177 0800A	17937	8	8	63	19
177 1000A	17940	10	10	72	22
177 1200A	17943	12	12	83	26
177 1400A	17946	14	14	83	26
177 1600A	17950	16	16	92	32
177 1800A	17952	18	18	92	32
177 2000A	17955	20	20	104	38
177 2500A	17957	25	25	104	38



Corner Radius  
Eckenradius  
Rayon

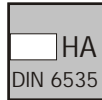
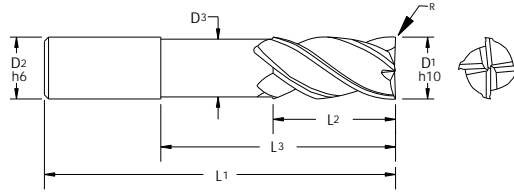
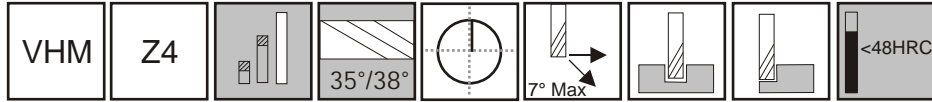
★ **177R  
Series**



Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2	R
177 0300-0.25RA	17929	3	6	57	8	0.25
177 0300-0.50RA	17783	3	6	57	8	0.50
177 0400-0.25RA	17931	4	6	57	11	0.25
177 0400-0.50RA	17784	4	6	57	11	0.50
177 0500-0.25RA	17933	5	6	57	13	0.25
177 0500-0.50RA	17785	5	6	57	13	0.50
177 0600-0.25RA	17786	6	6	57	13	0.25
177 0600-0.50RA	17935	6	6	57	13	0.50
177 0600-1.0RA	17787	6	6	57	13	1.00
177 0600-1.5RA	17788	6	6	57	13	1.50
177 0600-2.0RA	18070	6	6	57	13	2.00
177 0800-0.50RA	17938	8	8	63	19	0.50
177 0800-1.0RA	17789	8	8	63	19	1.00
177 0800-1.5RA	17790	8	8	63	19	1.50
177 0800-2.0RA	17791	8	8	63	19	2.00
177 0800-3.0RA	18072	8	8	63	19	3.00
177 1000-0.50RA	17941	10	10	72	22	0.50
177 1000-1.0RA	17792	10	10	72	22	1.00
177 1000-1.5RA	17793	10	10	72	22	1.50
177 1000-2.0RA	17794	10	10	72	22	2.00
177 1000-3.0RA	96603	10	10	72	22	3.00
177 1200-0.50RA	17795	12	12	83	26	0.50
177 1200-0.75RA	17944	12	12	83	26	0.75
177 1200-1.0RA	17796	12	12	83	26	1.00
177 1200-1.5RA	17797	12	12	83	26	1.50
177 1200-2.0RA	17798	12	12	83	26	2.00
177 1200-2.5RA	18074	12	12	83	26	2.50
177 1200-3.0RA	96506	12	12	83	26	3.00
177 1200-4.0RA	18076	12	12	83	26	4.00
177 1400-0.75RA	17947	14	14	83	26	0.75
177 1600-0.50RA	18078	16	16	92	32	0.50
177 1600-1.0RA	17951	16	16	92	32	1.00
177 1600-1.5RA	17799	16	16	92	32	1.50
177 1600-2.0RA	17673	16	16	92	32	2.00
177 1600-2.5RA	18080	16	16	92	32	2.50
177 1600-3.0RA	17674	16	16	92	32	3.00
177 1600-4.0RA	18082	16	16	92	32	4.00
177 1800-1.0RA	17953	18	18	92	32	1.00
177 2000-1.0RA	17956	20	20	104	38	1.00
177 2000-1.5RA	18091	20	20	104	38	1.50
177 2000-2.0RA	18084	20	20	104	38	2.00
177 2000-3.0RA	18086	20	20	104	38	3.00
177 2000-4.0RA	18088	20	20	104	38	4.00
177 2000-5.0RA	18090	20	20	104	38	5.00
177 2000-6.0RA	18092	20	20	104	38	6.00
177 2500-1.0RA	17958	25	25	104	38	1.00

**NEW  
NOUVEAU**

**177S  
Series**

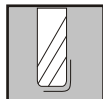


Tool No.	EDP	D1 Tol h10	D2 h6	D3	L1	L2	L3	Shank
177S 0300A	18218	3	6	2.9	50	5	11	DIN 6535 HA
177S 0400A	18220	4	6	3.9	50	6	14	DIN 6535 HA
177S 0500A	18222	5	6	4.9	57	8	17	DIN 6535 HA
177S 0600A	18224	6	6	5.8	57	9	20	DIN 6535 HA
177S 0800A	18226	8	8	7.6	63	12	26	DIN 6535 HA
177S 1000A	18228	10	10	9.6	72	15	32	DIN 6535 HA
177S 1200A	18230	12	12	11.4	83	18	38	DIN 6535 HA
177S 1600A	18232	16	16	15.2	98	24	50	DIN 6535 HA
177S 2000A	18234	20	20	19.2	112	30	62	DIN 6535 HA



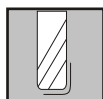
Tool No.	EDP	D1 Tol h10	D2 h6	D3	L1	L2	L3	Shank
177S 0300AW	18254	3	6	2.9	50	5	11	DIN 6535 HB
177S 0400AW	18256	4	6	3.9	50	6	14	DIN 6535 HB
177S 0500AW	18258	5	6	4.9	57	8	17	DIN 6535 HB
177S 0600AW	18260	6	6	5.8	57	9	20	DIN 6535 HB
177S 0800AW	18262	8	8	7.6	63	12	26	DIN 6535 HB
177S 1000AW	18264	10	10	9.6	72	15	32	DIN 6535 HB
177S 1200AW	18266	12	12	11.4	83	18	38	DIN 6535 HB
177S 1600AW	18268	16	16	15.2	98	24	50	DIN 6535 HB
177S 2000AW	18270	20	20	19.2	112	30	62	DIN 6535 HB

Corner Radius  
Eckenradius  
Rayon

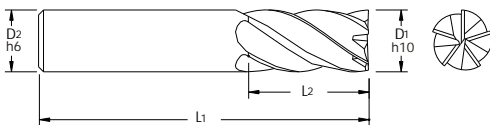
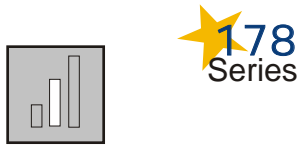
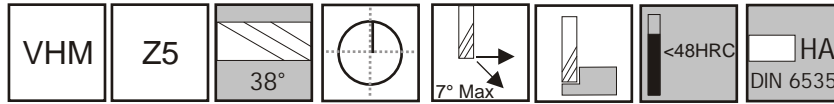


Tool No.	EDP	D1 Tol h10	D2 h6	D3	L1	L2	L3	R	Shank
177S 03-0.2RA	18200	3	6	2.9	50	5	11	0.2	DIN 6535 HA
177S 04-0.2RA	18202	4	6	3.9	50	6	14	0.2	DIN 6535 HA
177S 05-0.2RA	18204	5	6	4.9	57	8	17	0.2	DIN 6535 HA
177S 06-0.3RA	18206	6	6	5.8	57	9	20	0.3	DIN 6535 HA
177S 08-0.5RA	18208	8	8	7.6	63	12	26	0.5	DIN 6535 HA
177S 10-0.5RA	18210	10	10	9.6	72	15	32	0.5	DIN 6535 HA
177S 12-0.5RA	18212	12	12	11.4	83	18	38	0.5	DIN 6535 HA
177S 16-1.0RA	18214	16	16	15.2	98	24	50	1.0	DIN 6535 HA
177S 20-1.0RA	18216	20	20	19.2	112	30	62	1.0	DIN 6535 HA

Corner Radius  
Eckenradius  
Rayon



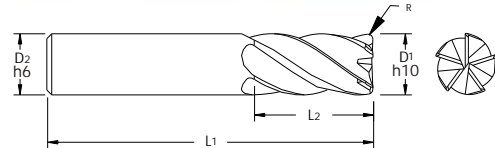
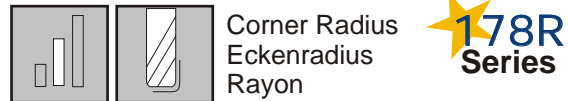
Tool No.	EDP	D1 Tol h10	D2 h6	D3	L1	L2	L3	R	Shank
177S 03-0.2RAW	18236	3	6	2.9	50	5	11	0.2	DIN 6535 HB
177S 04-0.2RAW	18238	4	6	3.9	50	6	14	0.2	DIN 6535 HB
177S 05-0.2RAW	18240	5	6	4.9	57	8	17	0.2	DIN 6535 HB
177S 06-0.3RAW	18242	6	6	5.8	57	9	20	0.3	DIN 6535 HB
177S 08-0.5RAW	18244	8	8	7.6	63	12	26	0.5	DIN 6535 HB
177S 10-0.5RAW	18246	10	10	9.6	72	15	32	0.5	DIN 6535 HB
177S 12-0.5RAW	18248	12	12	11.4	83	18	38	0.5	DIN 6535 HB
177S 16-1.0RAW	18250	16	16	15.2	98	24	50	1.0	DIN 6535 HB
177S 20-1.0RAW	18252	20	20	19.2	112	30	62	1.0	DIN 6535 HB



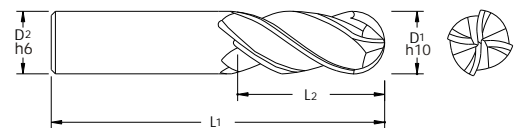
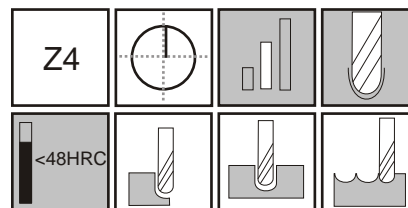
Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2
178 0300A	17959	3	6	57	8
178 0400A	17961	4	6	57	11
178 0500A	17963	5	6	57	13
178 0600A	17965	6	6	57	13
178 0800A	17968	8	8	63	19
178 1000A	17971	10	10	72	22
178 1200A	17974	12	12	83	26
178 1400A	17977	14	14	83	26
178 1600A	17981	16	16	92	32
178 1800A	17983	18	18	92	32
178 2000A	17986	20	20	104	38
178 2500A	17988	25	25	104	38



Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2
178 0300-1A	17998	3	3	75	25
178 0400-1A	17999	4	4	75	25
178 0500-1A	18026	5	5	75	25
178 0600-1A	18027	6	6	75	25
178 0800-1A	18028	8	8	75	30
178 1000-1A	18029	10	10	100	45
178 1200-1A	18030	12	12	150	75
178 1600-1A	18031	16	16	150	75
178 2000-1A	18032	20	20	150	75






Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2	R
178 0600-0.50RA	17966	6	6	57	13	0.50
178 0800-0.50RA	17969	8	8	63	19	0.50
178 1000-0.50RA	17972	10	10	72	22	0.50
178 1200-0.75RA	17975	12	12	83	26	0.75
178 1400-0.75RA	17978	14	14	83	26	0.75
178 1600-1.0RA	17982	16	16	92	32	1.00
178 1800-1.0RA	17984	18	18	92	32	1.00
178 2000-1.0RA	17987	20	20	104	38	1.00
178 2500-1.0RA	17989	25	25	104	38	1.00











Tool No.	EDP	D1 Tol h10	D2 h6	L1	L2
179 0150A	18272	1.5	3	38	3
179 0200A	18274	2	3	38	4
179 0250A	18276	2.5	3	38	5
179 0300A	18018	3	6	57	8
179 0303A	18278	3	3	38	6
179 0350A	18280	3.5	6	63	7
179 0400A	18019	4	6	57	11
179 0450A	18282	4.5	6	63	9
179 0500A	18020	5	6	57	13
179 0600A	18021	6	6	57	13
179 0800A	18022	8	8	63	19
179 1000A	18023	10	10	72	22
179 1200A	18024	12	12	83	26
179 1600A	18059	16	16	92	32

# Cutting Parameters

Material/Iso	Material Description	Application & Cutting Speeds (m/min)					
		Cooling			Slotting 0.5 - 1.0 x D	Heavy Profiling >1.0 x D	Light Profiling 0.1 x D
		Max	Air	MMS			
Steels/P	Free Machining	•	•	•	130	140	180
	Low Carbon	•	•	•	120	130	150
	Medium Carbon	•	•	•	120	130	150
	Alloy Steels	•	•	•	80	90	120
	High Strength Alloys	•	•	•	65	75	100
	Structural Steels	•	•	•	120	140	180
	Die/Tool Steels	•	•	•	80	90	110
Stainless/M	Free Machining	•	x	o	90	100	120
	Moderate Stainless	•	x	o	80	90	110
	Difficult Stainless	•	x	o	60	70	90
	PH Stainless	•	x	o	50	60	70
	Cobalt Chrome Alloys	•	x	o	40	50	60
	Duplex (22%)	•	x	o	40	50	60
	Super Duplex (25%)	•	x	o	30	40	50
Special Alloys/S	High Temp Alloys	•	x	x	25/30	40	50
	Titanium Alloys	•	x	x	50	60	90
Cast Irons/K	Grey Cast Iron	•	o	o	140	150	180
	SG Iron	•	o	o	120	130	150
	Ductile Cast Iron	•	o	o	90	100	120
	Malleable Iron	•	o	o	70	80	100

• Preferred  
o Possible  
x Not Possible

Tool	Feed Per Tooth (fz - mm/tooth)				
	Slotting 0.5 x D	Slotting 1.0 x D	Heavy Profiling (Aa) > 1.0 x D (Ar) > 1.0 x D	Light Profiling (Aa) > 0.1 x D (Ar) > 1.5 x D	
					
Steels/P	1.5-2.0	0.01	0.005	0.005	0.01
	3.0	0.02	0.01	0.01	0.02
	5.0	0.03	0.018	0.018	0.018-0.03
	6.0	0.04-0.05	0.025 - 0.04	0.025 - 0.04	0.025 - 0.05
	8.0	0.045-0.06	0.033 - 0.053	0.033 - 0.053	0.033 - 0.06
	10.0	0.05-0.076	0.04 - 0.066	0.04 - 0.066	0.04 - 0.076
	12.0	0.06-0.09	0.05 - 0.08	0.05 - 0.08	0.05 - 0.09
	16.0	0.076-0.10	0.066 - 0.085	0.066 - 0.085	0.066 - 0.10
	20.0	0.09-0.115	0.08 - 0.09	0.08 - 0.09	0.08 - 0.115
	25.0	0.10-0.15	0.09 - 0.13	0.09 - 0.13	0.09 - 0.15
Stainless/M Special Alloys- Titanium/S	1.5-2.0	0.01	0.005	0.005	0.01
	3.0	0.02	0.01	0.01	0.02
	5.0	0.03	0.018	0.018	0.018-0.03
	6.0	0.033-0.05	0.025 - 0.04	0.025 - 0.04	0.025 - 0.05
	8.0	0.04-0.06	0.03 - 0.053	0.03 - 0.053	0.03 - 0.06
	10.0	0.053-0.076	0.03 - 0.066	0.03 - 0.066	0.03 - 0.076
	12.0	0.05-0.09	0.05 - 0.08	0.05 - 0.08	0.05 - 0.09
	16.0	0.06-0.10	0.05 - 0.085	0.05 - 0.085	0.05 - 0.1
	20.0	0.055-0.115	0.055 - 0.09	0.055 - 0.09	0.055 - 0.115
	25.0	0.08-0.13	0.06 - 0.10	0.06 - 0.10	0.06 - 0.13

Tool	Feed Per Tooth (fz - mm/tooth)				
	Slotting 0.5 x D	Slotting 1.0 x D	Heavy Profiling (Aa) > 1.0 x D (Ar) > 1.0 x D	Light Profiling (Aa) > 0.1 x D (Ar) > 1.5 x D	
					
Special Alloys - High Temp/S	1.5-2.0	0.005	0.003	0.003	0.005
	3.0	0.01	0.005	0.005	0.01
	5.0	0.015	0.009	0.009	0.15
	6.0	0.016-0.025	0.012 - 0.02	0.012 - 0.02	0.012 - 0.033
	8.0	0.02-0.03	0.015 - 0.026	0.015 - 0.026	0.015 - 0.05
	10.0	0.026-0.038	0.015 - 0.033	0.015 - 0.033	0.015 - 0.065
	12.0	0.025-0.045	0.025 - 0.04	0.025 - 0.04	0.025 - 0.076
	16.0	0.03-0.05	0.025 - 0.042	0.025 - 0.042	0.025 - 0.09
	20.0	0.027-0.57	0.027 - 0.045	0.027 - 0.045	0.027 - 0.1
	25.0	0.04-0.065	0.03 - 0.05	0.03 - 0.05	0.03 - 0.115
Cast Irons/K	1.5-2.0	0.01	0.005	0.005	0.01
	3.0	0.02	0.01	0.01	0.02
	5.0	0.03	0.018	0.018	0.03
	6.0	0.03-0.05	0.02 - 0.04	0.02 - 0.04	0.02 - 0.05
	8.0	0.033-0.06	0.025 - 0.055	0.025 - 0.055	0.025 - 0.06
	10.0	0.048-0.08	0.035 - 0.07	0.035 - 0.07	0.035 - 0.08
	12.0	0.06-0.097	0.046 - 0.085	0.046 - 0.085	0.046 - 0.097
	16.0	0.076-0.1	0.06 - 0.09	0.06 - 0.09	0.06 - 0.1
	20.0	0.08-0.115	0.07 - 0.1	0.07 - 0.1	0.07 - 0.115
	25.0	0.1-0.13	0.06 - 0.13	0.06 - 0.13	0.06 - 0.13

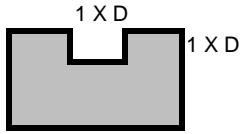
Note:  
 When Profiling Using Full Cutting Length of 178-1A Long Series Tools, The Maximum Radial Cut Should Be 7-10% of the Cutting Diameter.  
 When Profiling with an Axial Depth of 1.5 x D, the Maximum Radial Cut Should Be 15-20% of the Cutter Diameter.

## Material Groups & Cross Reference

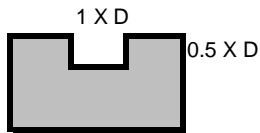
Material Group/ISO	Material Description	Material Examples By Market Sector								
		USA	Germany		UK		France	Italy	Spain	Sweden
		AISI/SAE	W.-nr.	DIN	BS970	EN	AFNOR	UNI	UNE	SIS
Steels/P	Free Machining	1118, 1215,	1.0736	9SMn36	240M07	1A, 1B,	10PbF2	CF9SMn28	11SMn28	1912
		12L14	1.0737	9SMn36Pb36	212M36	3B	S300Pb	CF9SMnPb36	12SMnPb35	1926
	Low Carbon	1010, 1018	1.0301	C10	045M10	EN32C	XC10	C10	C10K	1265
		1020, 1025	1.0406	C22, C25	050A20, 070M26	EN36A	XC20	C20	C25K	
	Medium Carbon	1030, 1040	1.0528/1.0511	C40	080M40		CC32			
		1050, 1527	1.054	C50/Ck50	080M50	8	XC42	C30	F.114.A	1614
	Alloy Steels	1140, 1151	1.0726	35S20	212M36	14	35MF4			
		4140, 5140	1.7045	42CR4	530.A40	16	42C4TS	41CR4	42Cr4	2245
		8640	1.7131	16MnCr5	527M17	19	16MC5	16MnCr5	16MnCr5	2173
	High Strength Alloys	4340, 4330V	1.6582	34CrNiMo6	817M40	24	35NCD6	35NiCrMo6Kb	40NiCrMo4	2541
		300M				26				
	Structural Steels	A36, A285	1.0581	St52	4360-40C		E24	Fe37-3	A360C	1312
A570										
Die/Mould/Tool Steels	H-13, H-21	1.2344	X40CrMoV51	BH13		Z40CDV5	X40CrMoV5/11Ku		2242	
	A-4, 0-2			B02				F5318		
	S-3, P20, D2	1.2379	X155CrVMo121	BD2		Z160CDV12	X215CrW121ku	X210CrW12	2312	
Stainless Steels/M	Free Machining	303, 304	1.4305	X10CrNiS189	303S21		Z10CNF18.09	X10CrNiS1809	X10CrNiS1809	2346
		etc								
	Moderate Stainless	304, 316	1.4401	X5CrNiMo17122	304S11		Z6CND17.11	X5CrNiMo1712	X5CrNiMo1712	2347
		416, 420	1.4005	X12CrS13	416S21		Z12CF13	X12CrS13		2380
	Difficult Stainless	316S16, 440C	1.4125	X105CrMo17	316S61	EN58J	Z100CD17	X102CrMo17ku		
	PH Stainless	17-4PH, 15-5PH	1.4542/1.4548	X5CrNiCuNb16.4			Z6CNU17-04			
	Cobalt Chrome Alloys	F75		Co28Cr6Mo			Z6CNU15-5			
	Duplex (22%)	F51	1.4462	X2CrNiMoN22.5.3	318S13		Z2CND22.05AZ			2377
Super Duplex (25%)	F55	1.4501	X2CrNiMoCuWN25.7.4	ZERON 100		Z3CND25.06AZ				
Special Alloys/S	High Temperature Alloys	Hastelloy B								
		Inconel 625	2.4856							
		Inconel 718	2.4668							
	Titanium/Titanium Alloys	Nimonic, A286								
Ti6AL-4V		3.7165	Ti6AL-4V	TA 10,13		T-A 6V				
	TiAl5Sn2	3.7114	TiAl5Sn2							
Cast Irons/K	Grey Cast Iron	A48-40B	0.6025, 0.6035	GG10/GG50	GRADE150/400		F110B/F150D	G10/G50	FG10/FG50	0120-00
	Spheroidal Graphite Cast Iron	65 45 12	0.7050, 0.7055	GGG25/GGG50	420/12		FGS---	GS500/7		0717-15
	Ductile Cast Iron		0.8055	GTW55	B340/12		MN35-10			
	Malleable Iron	5005	0.8155	GTS5504	P570/3		MP50-5	GMB55		0815

# 177 Series - Slotting Capability

## Série 177 - Paramètres de coupe pour RAINURAGE



M/Min Diameter	Moderate Stainless/Inox modérés 304/316												Cast/Fonte Ductile	
	High Temp/Réfractaire/Inconel						Inox difficiles 304-316/Titane Duplex/Difficult stainless/Titanium							
	20		30		40		50		60		70			80
	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min
	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance
1.5-2	4240	21	6360	32	8480	42	10600	53	12720	64	14840	74	16960	85
3	2120	85	3180	127	4240	170	5300	212	6360	254	7420	297	8480	339
4	1590	64	2385	95	3180	127	3975	159	4770	191	5565	223	6360	254
5	1272	92	1908	137	2544	183	3180	229	3816	275	4452	321	5088	366
6	1060	106 170	1590	159 254	2120	212 339	2650	265 424	3180	318 509	3710	371 594	4240	424 678
7	909	91 145	1363	136 218	1817	182 291	2271	227 363	2726	273 436	3180	318 509	3634	363 581
8	795	95 169	1193	143 253	1590	191 337	1988	239 421	2385	286 506	2783	334 590	3180	382 674
9	707	85 150	1060	127 225	1413	170 300	1767	212 375	2120	254 449	2473	297 524	2827	339 599
10	636	84 168	954	126 252	1272	168 336	1590	210 420	1908	252 504	2226	294 588	2544	336 672
11	578	76 153	867	114 229	1156	153 305	1445	191 382	1735	229 458	2024	267 534	2313	305 611
12	530	106 170	795	159 254	1060	212 339	1325	265 424	1590	318 509	1855	371 594	2120	424 678
13	489	98 157	734	147 235	978	196 313	1223	245 391	1468	294 470	1712	342 548	1957	391 626
14	454	91 145	681	136 218	909	182 291	1136	227 363	1363	273 436	1590	318 509	1817	363 581
15	424	85 136	636	127 204	848	170 271	1060	212 339	1272	254 407	1484	297 475	1696	339 543
16	398	80 135	596	119 203	795	159 270	994	199 338	1193	239 405	1391	278 473	1590	318 541
18	353	71 120	530	106 180	707	141 240	883	177 300	1060	212 360	1237	247 420	1413	283 481
20	318	70 114	477	105 172	636	140 229	795	175 286	954	210 343	1113	245 401	1272	280 458
25	254	61 132	382	92 198	509	122 265	636	153 331	763	183 397	890	214 463	1018	244 529

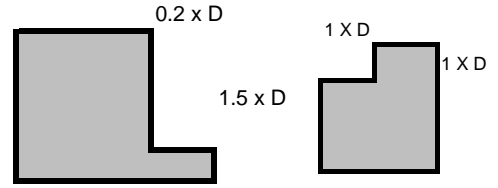


M/Min Diameter	Moderate Stainless/Inox modérés 304/316												Cast/Fonte Ductile	
	High Temp/Réfractaire/Inconel						Inox difficiles 304-316/Titane Duplex/Difficult stainless/Titanium							
	20		30		40		50		60		70			80
	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min
	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance
1.5-2	4240	42	6360	64	8480	85	10600	106	12720	127	14840	148	16960	170
3	2120	170	3180	254	4240	339	5300	424	6360	509	7420	594	8480	678
4	1590	127	2385	191	3180	254	3975	318	4770	382	5565	445	6360	509
5	1272	153	1908	229	2544	305	3180	382	3816	458	4452	534	5088	611
6	1060	140 212	1590	210 318	2120	280 424	2650	424 530	3180	509 636	3710	594 742	4240	678 848
7	909	120 182	1363	180 273	1817	240 363	2271	363 454	2726	436 545	3180	509 636	3634	581 727
8	795	127 191	1193	191 286	1590	254 382	1988	358 477	2385	429 572	2783	501 668	3180	572 763
9	707	113 170	1060	170 254	1413	226 339	1767	318 424	2120	382 509	2473	445 594	2827	509 678
10	636	135 193	954	202 290	1272	270 387	1590	318 509	1908	382 580	2226	445 677	2544	509 773
11	578	123 176	867	184 264	1156	245 352	1445	289 463	1735	347 527	2024	405 615	2313	463 703
12	530	106 191	795	191 286	1060	254 382	1325	318 477	1590	382 572	1855	445 668	2120	509 763
13	489	98 176	734	176 264	978	235 352	1223	294 440	1468	352 528	1712	411 616	1957	470 704
14	454	91 164	681	164 245	909	218 327	1136	273 409	1363	327 491	1590	382 572	1817	436 654
15	424	85 153	636	153 229	848	204 305	1060	254 382	1272	305 458	1484	356 534	1696	407 611
16	398	95 159	596	143 239	795	175 318	994	302 398	1193	363 477	1391	423 557	1590	483 636
18	353	85 141	530	127 212	707	155 283	883	269 353	1060	322 424	1237	376 495	1413	430 565
20	318	76 146	477	105 219	636	193 293	795	286 366	954	343 439	1113	401 512	1272	458 585
25	254	81 132	382	134 198	509	163 265	636	254 331	763	305 397	890	356 463	1018	407 529

Low carbon Steels/Aciers bas carbone													
Medium carbon-Alloy steels/Alliages moyens													
Stainless/Inox 303													
Mould and die steels/Aciers pour moule													
Grey Iron/Fonte grise													
90		100		110		120		130		140		150	
RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min
trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance
19080	95	21200	106	23320	117	25440	127	27560	138	29680	148	31800	159
9540	382	10600	424	11660	466	12720	509	13780	551	14840	594	15900	636
7155	286	7950	318	8745	350	9540	382	10335	413	11130	445	11925	477
5724	412	6360	458	6996	504	7632	550	8268	595	8904	641	9540	687
4770	477	5300	530	5830	583	6360	636	6890	689	7420	742	7950	795
4089	409	4543	454	4997	500	5451	545	5906	591	6360	636	6814	681
3578	429	3975	477	4373	525	4770	572	5168	620	5565	668	5963	716
3180	382	3533	424	3887	466	4240	509	4593	551	4947	594	5300	636
2862	378	3180	420	3498	462	3816	504	4134	546	4452	588	4770	630
2602	343	2891	382	3180	420	3469	458	3758	496	4047	534	4336	572
2385	477	2650	530	2915	583	3180	636	3445	689	3710	742	3975	795
2202	440	2446	489	2691	538	2935	587	3180	636	3425	685	3669	734
2044	409	2271	454	2499	500	2726	545	2953	591	3180	636	3407	681
1908	382	2120	424	2332	466	2544	509	2756	551	2968	594	3180	636
1789	358	1988	398	2186	437	2385	477	2584	517	2783	557	2981	596
1590	318	1767	353	1943	389	2120	424	2297	459	2473	495	2650	530
1431	315	1590	350	1749	385	1908	420	2067	455	2226	490	2385	525
1145	275	1272	305	1399	336	1526	366	1654	397	1781	427	1908	458

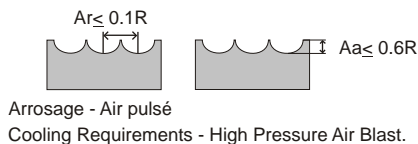
Low carbon Steels/Aciers bas carbone													
Medium carbon-Alloy steels/Alliages moyens													
Stainless/Inox 303													
Mould and die steels/Aciers pour moule													
Grey Iron/Fonte grise													
90		100		110		120		130		140		150	
RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min
trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance
19080	191	21200	212	23320	233	25440	254	27560	276	29680	297	31800	318
9540	763	10600	848	11660	933	12720	1018	13780	1102	14840	1187	15900	1272
7155	572	7950	636	8745	700	9540	763	10335	827	11130	890	11925	954
5724	687	6360	763	6996	840	7632	916	8268	992	8904	1068	9540	1145
4770	763	5300	848	5830	933	6360	1018	6890	1102	7420	1187	7950	1272
4089	654	4543	727	4997	800	5451	872	5906	945	6360	1018	6814	1090
3578	644	3975	716	4373	787	4770	859	5168	930	5565	1002	5963	1073
3180	572	3533	636	3887	700	4240	763	4593	827	4947	890	5300	954
2862	572	3180	636	3498	700	3816	763	4134	827	4452	890	4770	954
2602	520	2891	578	3180	636	3469	694	3758	752	4047	809	4336	867
2385	572	2650	636	2915	700	3180	763	3445	827	3710	890	3975	954
2202	528	2446	587	2691	646	2935	704	3180	763	3425	822	3669	881
2044	491	2271	545	2499	600	2726	654	2953	709	3180	763	3407	818
1908	458	2120	509	2332	560	2544	611	2756	661	2968	712	3180	763
1789	544	1988	604	2186	665	2385	725	2584	785	2783	846	2981	906
1590	483	1767	537	1943	591	2120	644	2297	698	2473	752	2650	806
1431	515	1590	572	1749	630	1908	687	2067	744	2226	801	2385	859
1145	458	1272	509	1399	560	1526	611	1654	661	1781	712	1908	763

# 178 Series Profiling Découpage au profil Série 178



M/Min Diameter	Moderate Stainless/Inox modérés 304/316													
	High Temp/Réfractaire/Inconel						Inox difficiles 304-316/Titane Duplex/Difficult stainless/Titanium							
	20		30		40		50		60		70		80	
	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min
	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance
3	2120	106	3180	159	4240	212	5300	265	6360	318	7420	371	8480	424
4	1590	80	2385	119	3180	159	3975	199	4770	239	5565	278	6360	318
5	1272	114	1908	172	2544	229	3180	286	3816	343	4452	401	5088	458
6	1060	133	1590	199	2120	265	2650	331	3180	398	3710	464	4240	530
7	909	114	1363	170	1817	227	2271	284	2726	341	3180	398	3634	454
8	795	119	1193	179	1590	239	1988	298	2385	358	2783	417	3180	477
9	707	106	1060	159	1413	212	1767	265	2120	318	2473	371	2827	424
10	636	105	954	157	1272	210	1590	262	1908	315	2226	367	2544	420
11	578	95	867	143	1156	191	1445	239	1735	286	2024	334	2313	382
12	530	133	795	199	1060	265	1325	331	1590	398	1855	464	2120	530
13	489	122	734	183	978	245	1223	306	1468	367	1712	428	1957	489
14	454	114	681	170	909	227	1136	284	1363	341	1590	398	1817	454
15	424	106	636	159	848	212	1060	265	1272	318	1484	371	1696	424
16	398	99	596	149	795	199	994	248	1193	298	1391	348	1590	398
18	353	88	530	133	707	177	883	221	1060	265	1237	309	1413	353
20	318	87	477	131	636	175	795	219	954	262	1113	306	1272	350
25	254	76	382	114	509	153	636	191	763	229	890	267	1018	305

Diameter mm	R mm	RPM trs	Semi Roughing/Roughing Steel (25-48 HRC)/ Ebauche intermédiaire/Ebauche Acier (25-48 HRC)				Semi Finishing/Finishing Steel (25-48 HRC)/ Finition intermédiaire/Finition Acier (25-48 HRC)			
			f	fz	Ar Max.	Aa Max.	f	fz	Ar Max.	Aa Max.
			mm/min.	mm/z	mm	mm	mm/min.	mm/z	mm	mm
1.5	R 0.75	35,000	1,950 - 3,300	0.0139 - 0.0235	0.075	0.450	1,950 - 3,300	0.0139 - 0.0235	0.450	0.075
2.0	R 1.0	30,000	2,100 - 3,600	0.0175 - 0.0300	0.100	0.600	2,100 - 3,600	0.0175 - 0.0300	0.600	0.100
2.5	R 1.25	28,000	2,100 - 3,600	0.0185 - 0.0320	0.125	0.750	2,100 - 3,600	0.0185 - 0.0320	0.750	0.125
3.0	R 1.5	26,500	2,100 - 3,600	0.0198 - 0.0330	0.150	0.900	2,100 - 3,600	0.0198 - 0.0330	0.900	0.150
3.5	R 1.75	24,000	2,250 - 3,900	0.0230 - 0.0400	0.175	1.000	2,250 - 3,900	0.0230 - 0.0400	1.000	0.175
4.0	R 2.0	23,000	2,250 - 3,900	0.0240 - 0.0420	0.200	1.200	2,250 - 3,900	0.0240 - 0.0420	1.200	0.200
4.5	R 2.25	22,000	2,250 - 3,900	0.0250 - 0.0440	0.220	1.350	2,250 - 3,900	0.0250 - 0.0440	1.350	0.220
5.0	R 2.5	20,000	1,800 - 5,500	0.0225 - 0.0687	0.250	1.500	1,800 - 5,500	0.0225 - 0.0687	1.500	0.250
6.0	R 3.0	20,000	1,800 - 5,500	0.0225 - 0.0687	0.300	1.800	1,800 - 5,500	0.0225 - 0.0687	1.800	0.300
8.0	R 4.0	15,000	2,200 - 5,000	0.0366 - 0.0833	0.400	2.400	2,200 - 5,000	0.0366 - 0.0833	2.400	0.400
10.0	R 5.0	12,000	2,300 - 4,600	0.0479 - 0.0958	0.500	3.000	2,300 - 4,600	0.0479 - 0.0958	3.000	0.500
12.0	R 6.0	10,000	1,900 - 4,100	0.0475 - 0.1025	0.600	3.600	1,900 - 4,100	0.0475 - 0.1025	3.600	0.600
16.0	R 8.0	7,500	1,600 - 3,200	0.0533 - 0.1066	0.800	4.800	1,600 - 3,200	0.0533 - 0.1066	4.800	0.800



Low carbon Steels/Aciers bas carbone													
Medium carbon-Alloy steels/Alliages moyens													
Stainless/Inox 303													
Mould and die steels/Aciers pour moule													
Grey Iron/Fonte grise													
90		100		110		120		130		140		150	
RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min	RPM	mm/min
trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance	trs	avance
9540	477	10600	530	11660	583	12720	636	13780	689	14840	742	15900	795
7155	358	7950	398	8745	437	9540	477	10335	517	11130	557	11925	596
5724	515	6360	572	6996	630	7632	687	8268	744	8904	801	9540	859
4770	596 954	5300	663 1060	5830	729 1166	6360	795 1272	6890	861 1378	7420	928 1484	7950	994 1590
4089	511 818	4543	568 909	4997	625 999	5451	681 1090	5906	738 1181	6360	795 1272	6814	852 1363
3578	537 948	3975	596 1053	4373	656 1159	4770	716 1264	5168	775 1369	5565	835 1475	5963	894 1580
3180	477 843	3533	530 936	3887	583 1030	4240	636 1124	4593	689 1217	4947	742 1311	5300	795 1405
2862	472 944	3180	525 1049	3498	577 1154	3816	630 1259	4134	682 1364	4452	735 1469	4770	787 1574
2602	429 859	2891	477 954	3180	525 1049	3469	572 1145	3758	620 1240	4047	668 1336	4336	716 1431
2385	596 954	2650	663 1060	2915	729 1166	3180	795 1272	3445	861 1378	3710	928 1484	3975	994 1590
2202	550 881	2446	612 978	2691	673 1076	2935	734 1174	3180	795 1272	3425	856 1370	3669	917 1468
2044	511 818	2271	568 909	2499	625 999	2726	681 1090	2953	738 1181	3180	795 1272	3407	852 1363
1908	477 763	2120	530 848	2332	583 933	2544	636 1018	2756	689 1102	2968	742 1187	3180	795 1272
1789	447 760	1988	497 845	2186	547 929	2385	596 1014	2584	646 1098	2783	696 1183	2981	745 1267
1590	398 676	1767	442 751	1943	486 826	2120	530 901	2297	574 976	2473	618 1051	2650	663 1126
1431	394 644	1590	437 716	1749	481 787	1908	525 859	2067	568 930	2226	612 1002	2385	656 1073
1145	343 744	1272	382 827	1399	420 909	1526	458 992	1654	496 1075	1781	534 1158	1908	572 1240

Titanium/Titane				
Diameter	R	RPM	f	fz
mm	mm	trs	mm/min.	mm/z
1.5	R 0.75	32,000	2,700	0.020
2.0	R 1.0	24,000	2,400	0.025
2.5	R 1.25	24,000	2,400	0.025
3.0	R 1.5	16,000	1,950	0.030
3.5	R 1.75	16,000	1,950	0.030
4.0	R 2.0	12,000	1,950	0.040
4.5	R 2.25	12,000	1,950	0.040
5.0	R 2.5	10,000	1,650	0.040
6.0	R 3.0	8,000	1,500	0.046
8.0	R 4.0	6,000	1,650	0.068
10.0	R 5.0	5,000	1,650	0.080
12.0	R 6.0	4,000	1,500	0.093
16.0	R 8.0	3,000	1,200	0.100

High Temperature Alloys/Alliages Pour Hautes Températures						
Diameter	R	RPM	f	fz	Ar Max.	Aa Max.
mm	mm	trs	mm/min.	mm/z	mm	mm
1.5	R 0.75	10,000	825	0.020	0.075	0.05
2.0	R 1.0	7,300	750	0.025	0.100	0.06
2.5	R 1.25	6,000	700	0.029	0.125	0.08
3.0	R 1.5	5,000	630	0.030	0.150	0.09
3.5	R 1.75	4,100	575	0.035	0.175	0.11
4.0	R 2.0	3,600	555	0.040	0.200	0.12
4.5	R 2.25	3,200	510	0.040	0.220	0.14
5.0	R 2.5	3,000	510	0.040	0.250	0.15
6.0	R 3.0	2,500	495	0.046	0.300	0.18
8.0	R 4.0	1,900	510	0.068	0.400	0.24
10.0	R 5.0	1,500	510	0.080	0.500	0.30
12.0	R 6.0	1,200	450	0.093	0.600	0.36
16.0	R 8.0	900	360	0.100	0.800	0.48



Arrosage - débit/pression maximum  
Cooling Requirements - Maximum coolant flow/pressure

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