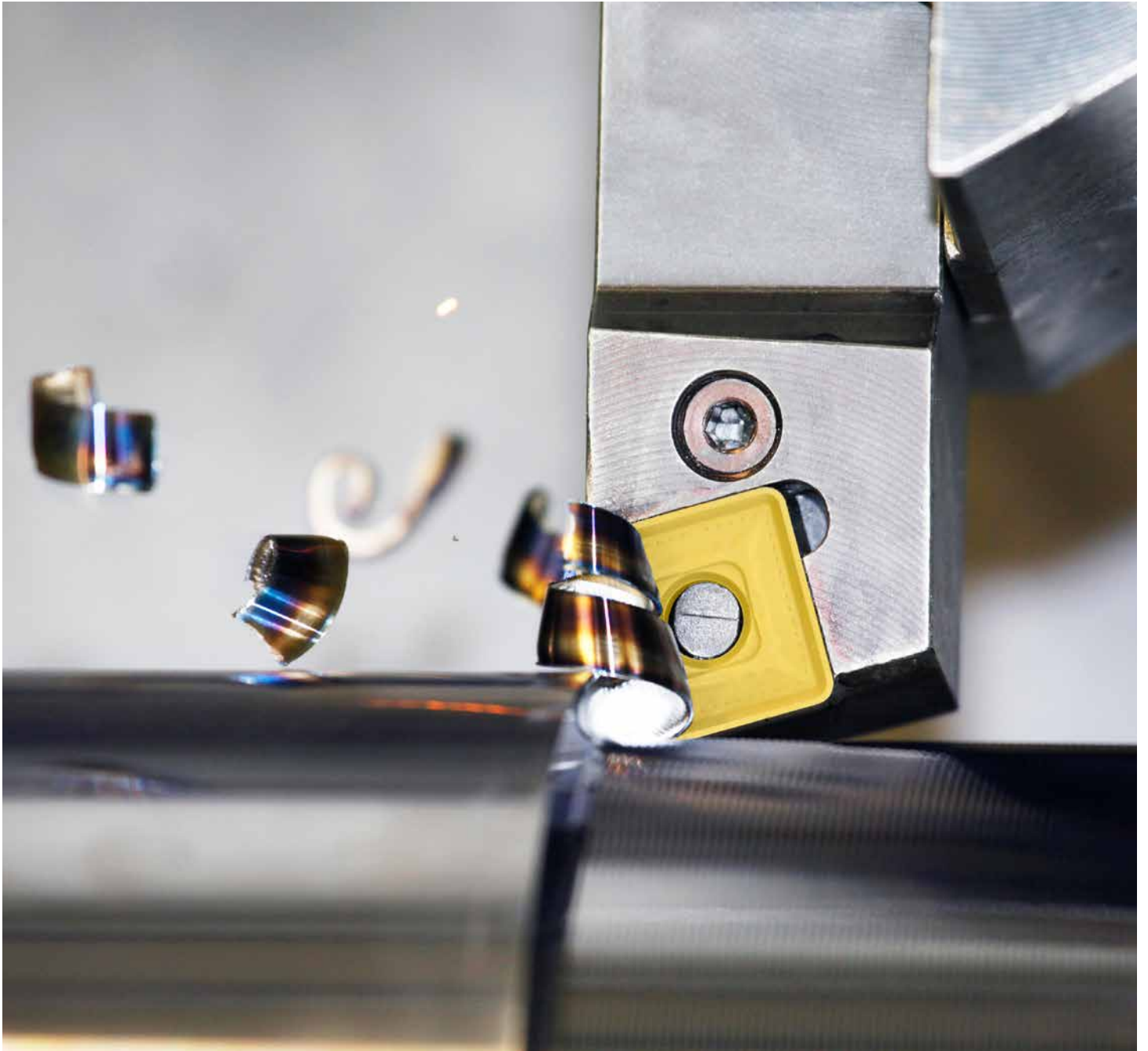


**TURNING
TORNEADO
TOURNAGE**



ISO/ANSI CODE DESIGNATION – INTERNAL TURNING TOOLS
 DESIGNACIÓN CÓDIGO ISO/ANSI - HERRAMIENTAS DE TORNEADO INTERIOR
 CODIFICATION ISO/ANSI - PORTE-OUTILS INTÉRIEURS

ISO	12	13	14	-	1	2	3	4	5	9	-	11
	A	25	T	-	P	C	L	N	L	12	-	X
ANSI	12	13	14	-	1	2	3	4	5	9		
	A	16	T	-	D	C	L	N	L	4		

d = I.C.		Insert cutting edge length (insert size) Longitud del filo de corte (tamaño de plaquita) Longueur de l'arête de coupe (taille de plaquette)												
		H	O	P	S	T	C	D	E	M	V	W	R	K
[mm]	[in]													
3,97	5/32"				03	06		04			06	02		
4,76	3/16"				04	08	04	05	04	04	08	L3		
5,56	7/32"				05	09	05	06	05	05	09	03		
6,35	1/4"	03	02	04	08	11	06	07	08	08	11	04	06	
7,94	5/16"	04	03	05	07	13	08	09	06	07	13	05	07	
9,525	3/8"	05	04	07	09	16	09	11	09	09	16	06	09	16
12,7	1/2"	07	05	09	12	22	12	15	13	12	22	08	12	
15,875	5/8"	09	06	11	15	27	16	19	16	15	27	10	15	
19,05	3/4"	11	07	13	19	33	19	23	19	19	33	13	19	
25,40	1"	14	10	18	25	44	25	31	26	25	44	17	25	
31,75	1 1/4"	18	13	23	31	54	32	38	32	31	54	21	31	

10	
	Manufacturer's designation Designación del fabricante Désignation du fabricant
M	Clamping system "S" with shim Sistema de fijación "S" con placa base Système de fixation "S" avec assise
S	Holder with adjusting screws Portaherramientas con tornillos de ajuste Outil avec vis de réglage
11	
	Manufacturer's designation Designación del fabricante Désignation du fabricant
X	Special shank style Tipo de mango especial Type de queue spéciale
.	.
93	Z - style tool setting angle Ángulo de herramienta tipo Z Angle d'attaque - Outil type Z
.	.

12		12	
	Shank Mango Queue		
S	Steel shank Mango de acero Queue en acier		
A	Steel shank with coolant hole Mango de acero con refrigeración interna Queue en acier avec trou d'arrosage		
E	Tungsten carbide shank with coolant hole Mango de metal duro con refrigeración interna Queue en carbure avec trou d'arrosage		

13		13	
	Shank Ø [mm] Mango Ø [mm] Queue Ø [mm]		
	d [mm]		d [in]
	08	8	03
	10	10	04
	12	12	05
	16	16	06
	20	20	08
	25	25	10
	32	32	12
	40	40	16
	50	50	20
	60	60	

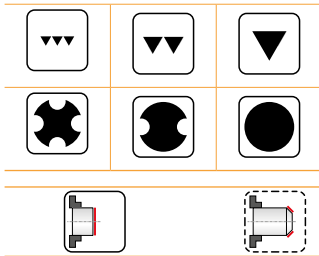
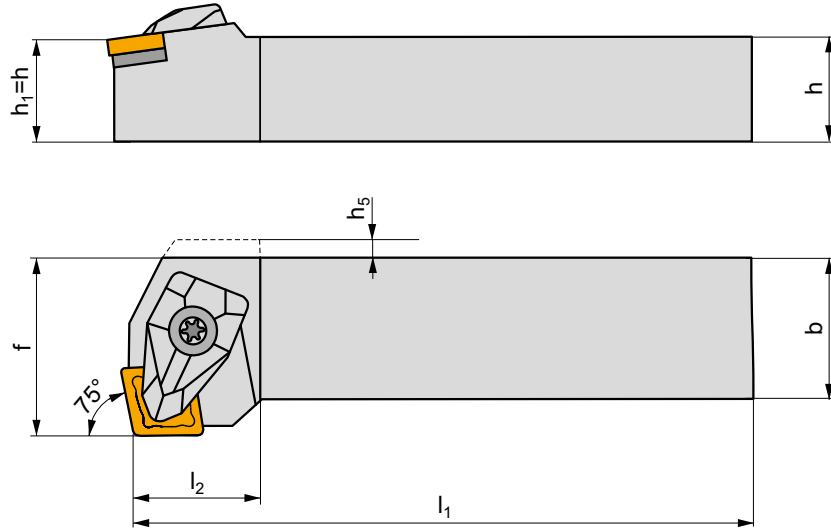
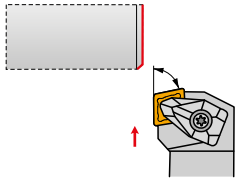
14		14	
	Holder total length Longitud total Longueur totale de l'outil		
			l ₁ [mm]
		D	60
		E	70
		F	80
		H	100
		J	110
F	3.250	K	125
H	4.000	L	140
K	5.000	M	150
M	6.000	N	160
P	6.250	P	170
Q	7.250	Q	180
R	8.000	R	200
S	10.000	S	250
T	12.000	T	300
U	14.000	U	350
V	15.750	V	400
W	17.750	W	450
Y	20.000	X	Spec.
X	Spec.	Y	500

DCKN(RL) EXT

P M K N S H

D

T44 - T56



ANSI	$h=h_1$	b	f	l_1	l_2	h_5	λ°	γ°	lbs	IGI005	DC12	IAT001
DCKNR/L 16 4D	1.000	1.000	1.250	6.000	1.300	-	-6	-6	1.54	IGI005	DC12	IAT001

IGI005	CN.. 43.										
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DC12	DCS 12	3.9	DCS 234-01	US 2002-T15P	FLAG T15P/3.5	-
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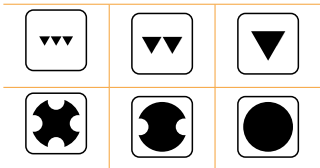
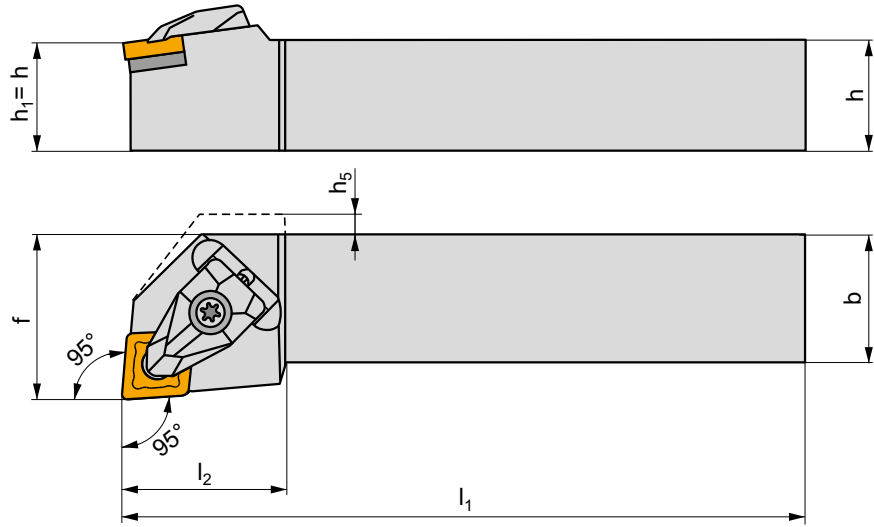
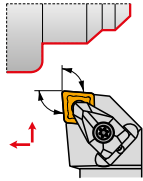
IAT001	CN.. 45.	-	DCS 234-02
IAT001	CER CN.N 43.	DCS 12C4	-
IAT001	CER CN.A 43.	DCS 12C2	-

DCLN(RL) EXT

P M K N S H

D





T44 - T56



ANSI	$h=h_1$	b	f	l_1	l_2	h_5	λ_s°	γ°	lbs			
DCLNR/L 10 3A	.625	.625	.875	4.000	.980	-	-6	-6	.44	IGI004	DC09	-
DCLNR/L 12 3C	.750	.750	1.000	5.000	.980	-	-6	-6	1.06	IGI004	DC09	-
DCLNR/L 12 4B	.750	.750	1.000	4.500	1.260	-	-6	-6	.88	IGI005	DC12	IAT001
DCLNR/L 16 4D	1.000	1.000	1.250	6.000	1.260	-	-6	-6	1.54	IGI005	DC12	IAT001
DCLNR/L 85 4D	1.250	1.000	1.500	6.000	1.260	-	-6	-6	4.70	IGI005	DC12	IAT001
DCLNR/L 85 5D	1.250	1.000	1.500	6.000	1.540	-	-6	-6	4.70	IGI006	DC16	IAT005
DCLNR/L 20 6D	1.250	1.250	1.500	6.000	1.700	-	-6	-6	2.76	IGI007	DC19	-
DCLNR/L 24 6D	1.500	1.500	2.000	6.000	1.700	-	-6	-6	4.96	IGI007	DC19	-
DCLNR/L 24 8E	1.500	1.500	2.000	7.000	2.090	-	-6	-6	6.17	IGI008	DC25	-

IGI004	CN.. 32.
IGI005	CN.. 43.
IGI006	CN.. 54.
IGI007	CN.. 64.
IGI008	CN.. 86.

DC09	DCS 09	1.7	DCS 236-04	US 2004-T09P	FLAG T09P	-
DC12	DCS 12	3.9	DCS 234-01	US 2002-T15P	FLAG T15P/3.5	-
DC16	DCS 16	6.4	DCS 234-03	US 2007-T20P	-	LK T20P
DC19	DCS 19	6.4	DCS 236-01	US 2007-T20P	-	LK T20P
DC25	DCS 25	9.5	DCS 234-05	US 2008-T25P	-	LK T25P

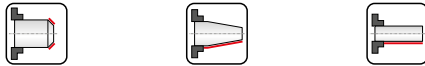
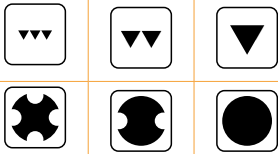
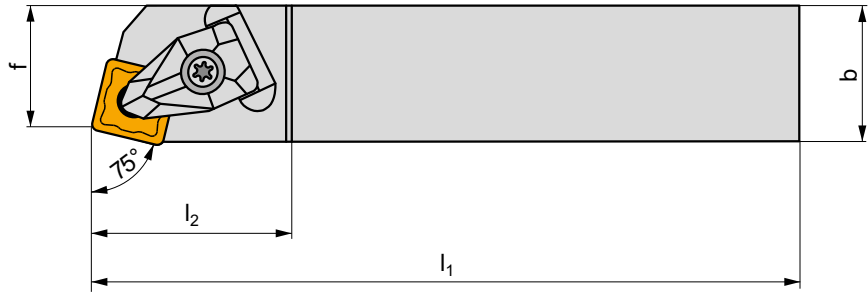
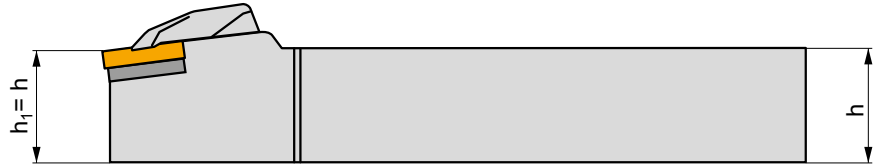
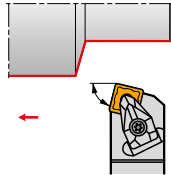
			
IAT001	CN.. 45.	-	DCS 234-02
IAT005	CN.. 55.	-	DCS 234-04
IAT001	CER CN.N 43.	DCS 12C4	-
IAT001	CER CN.A 43.	DCS 12C2	-
IAT005	CER CN.N 54.	DCS 16C4	-
IAT005	CER CN.A 54.	DCS 16C2	-

DCRN(RL) EXT

P M K N S H

D

T44 - T56



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs			
DCRNR/L 12 4B	.750	.750	.855	4.500	1.350	-6	-6	.88	IGI005	DC12	IAT001
DCRNR/L 16 4D	1.000	1.000	1.048	6.000	1.350	-6	-6	1.54	IGI005	DC12	IAT001
DCRNR/L 20 4D	1.250	1.250	1.292	6.000	1.350	-6	-6	2.76	IGI005	DC12	IAT001
DCRNR/L 20 5D	1.250	1.250	1.291	6.000	1.640	-6	-6	2.76	IGI006	DC16	IAT005
DCRNR/L 20 6D	1.250	1.250	1.291	6.000	1.820	-6	-6	2.76	IGI007	DC19	-
DCRNR/L 24 6D	1.500	1.500	1.697	6.000	1.820	-6	-6	4.96	IGI007	DC19	-

IGI005					CN.. 43.						
IGI006					CN.. 54.						
IGI007					CN.. 64.						

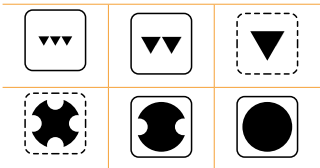
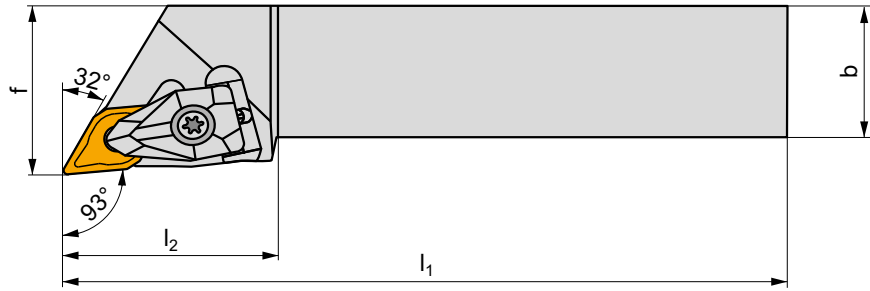
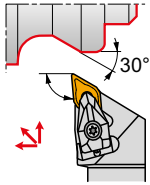
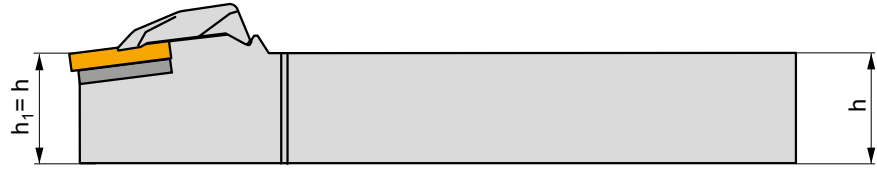
DC12	DCS 12	3.9	DCS 234-01	US 2002-T15P	FLAG T15P/3.5
DC16	DCS 16	6.4	DCS 234-03	US 2007-T20P	-
DC19	DCS 19	6.4	DCS 236-01	US 2007-T20P	-

IAT001	CN.. 45.		-	DCS 234-02
IAT005	CN.. 55.		-	DCS 234-04
IAT001	CER CN.N 43.		DCS 12C4	-
IAT001	CER CN.A 43.		DCS 12C2	-
IAT005	CER CN.N 54.		DCS 16C4	-
IAT005	CER CN.A 54.		DCS 16C2	-

DDJN(RL) EXT

P M K N S H

D
T62 - T70



ANSI	$h=h_1$	b	f	l_1	l_2	λ_c°	γ°	lbs			
DDJNR/L 12 3C	.750	.750	1.000	5.000	1.190	-6	-6	1.06	IGI011	DD11	-
DDJNR/L 16 3D	1.000	1.000	1.250	6.000	1.190	-6	-6	1.54	IGI011	DD11	-
DDJNR/L 12 4B	.750	.750	1.000	4.500	1.450	-6	-6	.88	IGI012	DD156	IAT002
DDJNR/L 16 4D	1.000	1.000	1.250	6.000	1.550	-6	-6	1.54	IGI012	DD156	IAT002
DDJNR/L 20 4D	1.250	1.250	1.500	6.000	1.550	-6	-6	2.76	IGI012	DD156	IAT002

IGI011											DN.. 33.
IGI012											DN.. 43.

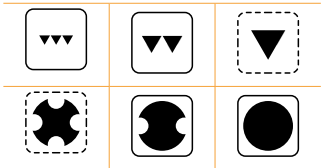
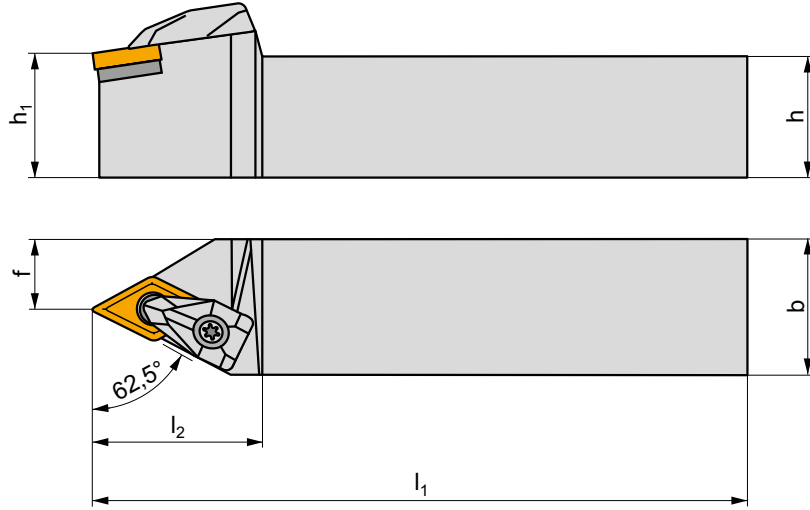
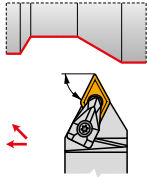
DD11	DCS 09	1.7		DDS 267-01		US 2004-T09P	FLAG T09P
DD156	DCS 12	3.9		DDS 266-01		US 2002-T15P	FLAG T15P/3.5

IAT002		DN.. 44.		-	DDS 266-02
IAT002		CER DN.N 44.		DCS 12C4	DDS 266-02
IAT002		CER DN.A 44.		DCS 12C2	DDS 266-02

DDPNN EXT

P M K N S H

T62 - T70



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs	IGI011	IGI012	DD11	DD156	IAT002
DDPNN 12 3B	.750	.750	.375	4.500	1.230	-9	-5	1.06	IGI011	IGI012	DD11	DD156	-
DDPNN 16 4D	1.000	1.000	.500	6.000	1.610	-9	-5	1.54	IGI011	IGI012	DD11	DD156	IAT002

IGI011	DN.. 33.
IGI012	DN.. 43.

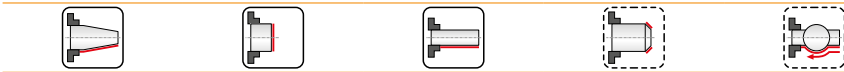
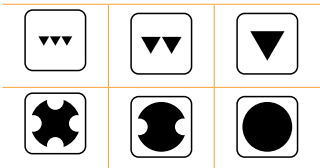
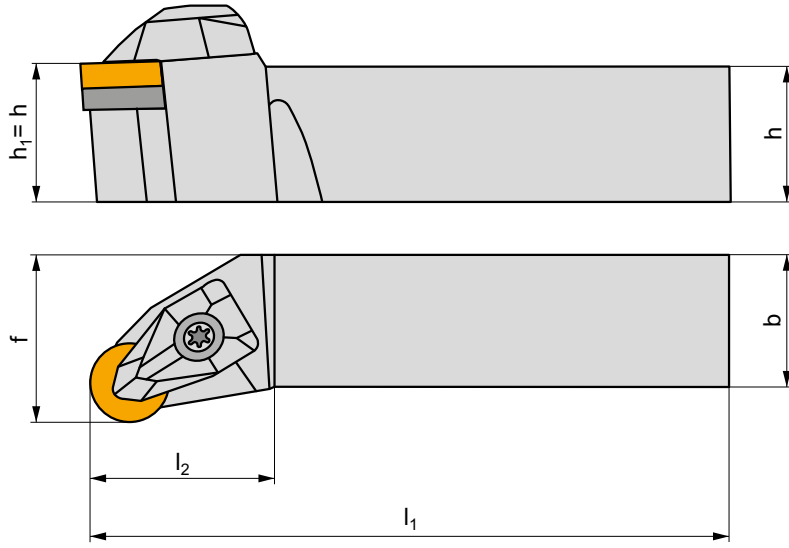
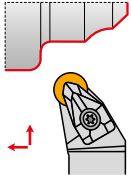
DD11	DCS 09	1.7	DDS 267-01	US 2004-T09P	FLAG T09P
DD156	DCS 12	3.9	DDS 266-01	US 2002-T15P	FLAG T15P/3.5

IAT002	DN.. 44.	-	DDS 266-02
IAT002	CER DN.N 44.	DCS 12C4	DDS 266-02
IAT002	CER DN.A 44.	DCS 12C2	DDS 266-02

DRSNR EXT

P M K

D
T80



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs	IGI038	DR12
DRSNR 16 4D	1.000	1.000	1.250	6.000	1.244	-6	-6	1.54	IGI038	DR12

IGI038										

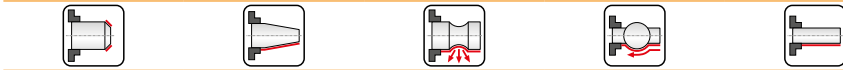
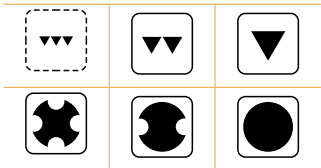
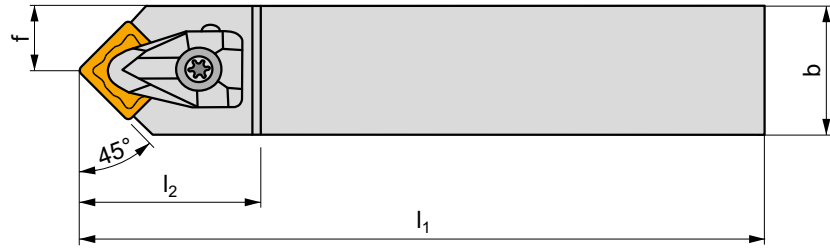
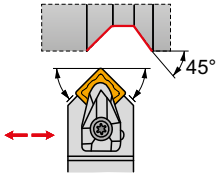
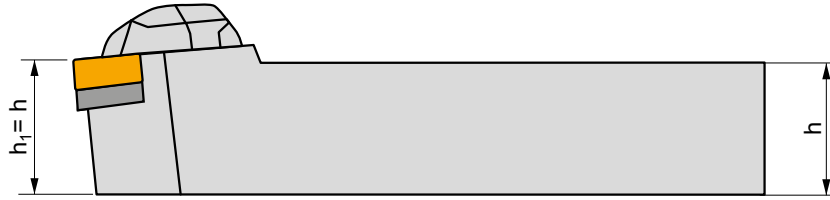
DR12	DCS 12	Nm	3.9	DRS 155-02	US 2002-T15P					FLAG T15P/3.5
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DSDNN EXT

P M K N S H

D

T85-T94



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs			
DSDNN 12 4B	.750	.750	.386	4.500	1.450	-6	-6	.88	IGI040	DS12	IAT003
DSDNN 16 4D	1.000	1.000	.512	6.000	1.450	-6	-6	1.54	IGI040	DS12	IAT003
DSDNN 20 5D	1.250	1.250	.646	6.000	1.760	-6	-6	2.76	IGI041	DS15	IAT006
DSDNN 20 6D	1.250	1.250	.646	6.000	1.970	-6	-6	2.76	IGI042	DS19	-
DSDNN 24 8D	1.500	1.500	.791	6.000	2.260	-6	-6	4.96	IGI043	DS25	-

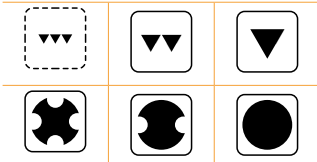
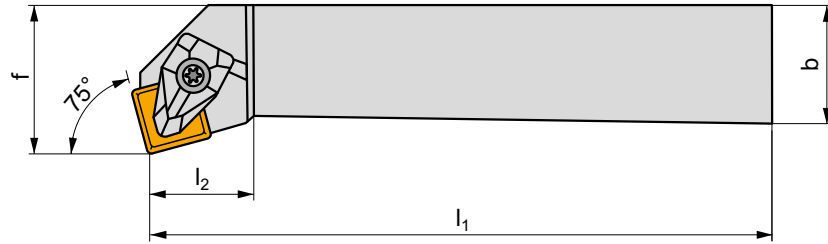
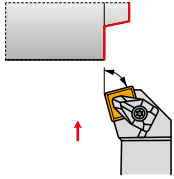
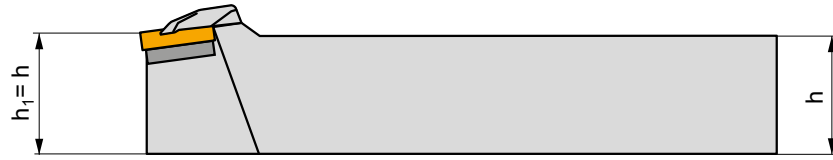
IGI040		SN.. 43.
IGI041		SN.. 54.
IGI042		SN.. 64.
IGI043		SN.. 85.

DS12	DCS 12	3.9	DSS 425-01	US 2002-T15P	FLAG T15P/3.5	-
DS15	DCS 16	6.4	DSS 425-03	US 2007-T20P	-	LK T20P
DS19	DCS 19	6.4	DSS 425-04	US 2007-T20P	-	LK T20P
DS25	DCS 25	9.5	DSS 425-07	US 2008-T25P	-	LK T25P

DSKN(RL) EXT

P M K N S H

D
T85-T94



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs			
DSKNR/L 16 4D	1.000	1.000	1.250	6.000	.930	-6	-6	1.54	IGI040	DS12	IAT003
DSKNR/L 20 5D	1.250	1.250	1.500	6.000	1.140	-6	-6	2.76	IGI041	DS15	IAT006

IGI040											SN.. 43.
IGI041											SN.. 54.

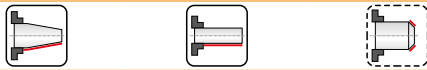
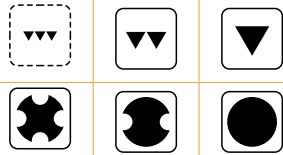
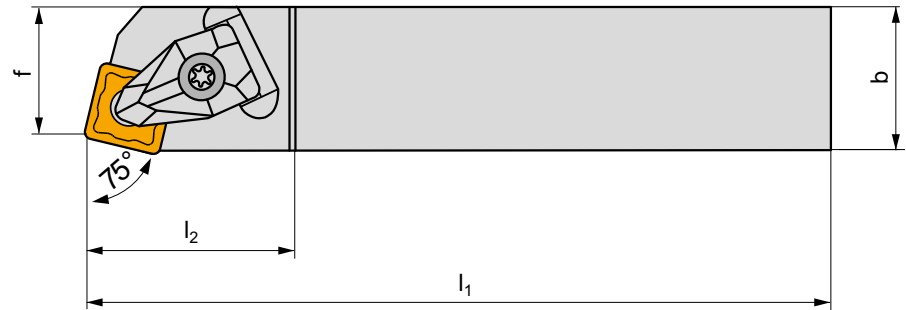
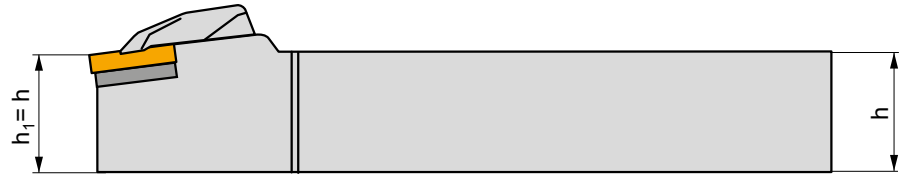
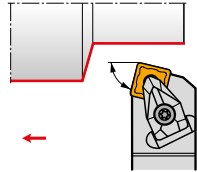
DS12	DCS 12	3.9	DSS 425-01	US 2002-T15P	FLAG T15P/3.5	-
DS15	DCS 16	6.4	DSS 425-03	US 2007-T20P	-	LK T20P

IAT003	SN.. 45.	-	DSS 425-02
IAT006	SN.. 55.	-	DSS 425-05
IAT003	CER SN.N 43.	DCS 12C4	-
IAT003	CER SN.A 43.	DCS 12C2	-
IAT006	CER SN.N 54.	DCS 16C4	-
IAT006	CER SN.A 54.	DCS 16C2	-

DSRN(RL) EXT

P M K N S H





T85-T94



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs	IGI	DS	IAT
DSRNR/L 12 4B	.750	.750	.855	4.500	1.350	-6	-6	.88	IGI040	DS12	IAT003
DSRNR/L 16 4D	1.000	1.000	1.048	6.000	1.350	-6	-6	1.54	IGI040	DS12	IAT003
DSRNR/L 20 5D	1.250	1.250	1.291	6.000	1.640	-6	-6	2.76	IGI041	DS15	IAT006
DSRNR/L 20 6D	1.250	1.250	1.292	6.000	1.830	-6	-6	2.76	IGI042	DS19	-
DSRNR/L 24 6D	1.500	1.500	1.697	6.000	1.830	-6	-6	4.96	IGI042	DS19	-
DSRNR/L 24 8E	1.500	1.500	1.697	7.000	2.220	-6	-6	6.17	IGI043	DS25	-

IGI	SN.
IGI040	SN.. 43.
IGI041	SN.. 54.
IGI042	SN.. 64.
IGI043	SN.. 85.

DS	DCS	Nm	DSS	US	FLAG
DS12	DCS 12	3.9	DSS 425-01	US 2002-T15P	FLAG T15P/3.5
DS15	DCS 16	6.4	DSS 425-03	US 2007-T20P	-
DS19	DCS 19	6.4	DSS 425-04	US 2007-T20P	-
DS25	DCS 25	9.5	DSS 425-07	US 2008-T25P	-

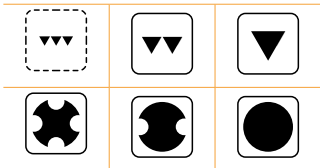
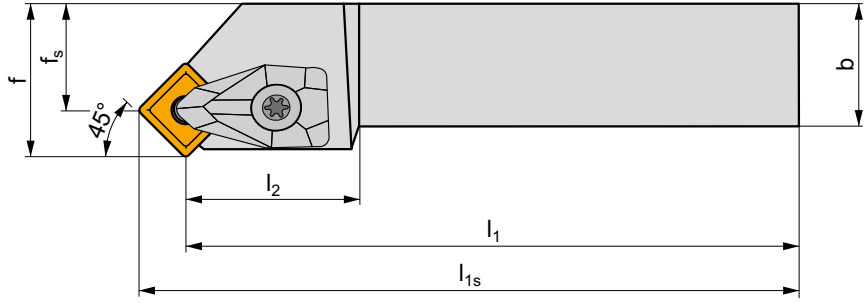
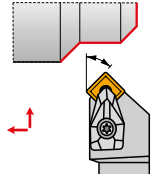
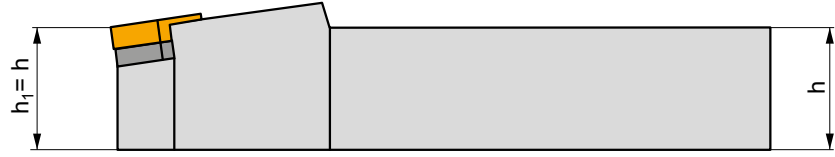
			
IAT003	SN.. 45.	-	DSS 425-02
IAT006	SN.. 55.	-	DSS 425-05
IAT003	CER SN.N 43.	DCS 12C4	-
IAT003	CER SN.A 43.	DCS 12C2	-
IAT006	CER SN.N 54.	DCS 16C4	-
IAT006	CER SN.A 54.	DCS 16C2	-

DSSN(RL) EXT

P M K N S H

D

T85-T94



ANSI	$h=h_1$	b	f	f_s	l_1	l_{1s}	l_2	λ_c°	γ°	lbs			
DSSNR/L 12 4B	.750	.750	1.000	.740	4.500	4.880	1.130	0	-8	.88	IGI040	DS12	IAT003
DSSNR/L 16 4D	1.000	1.000	1.250	.925	6.000	6.327	1.172	0	-8	1.54	IGI040	DS12	IAT003
DSSNR/L 20 5D	1.250	1.250	1.500	1.098	6.000	6.413	1.303	0	-8	2.76	IGI041	DS15	IAT006
DSSNR/L 20 6D	1.250	1.250	1.500	1.008	6.000	6.492	1.413	0	-8	2.76	IGI042	DS19	-
DSSNR/L 24 6E	1.500	1.500	2.000	1.508	7.000	7.492	1.484	0	-8	6.17	IGI042	DS19	-

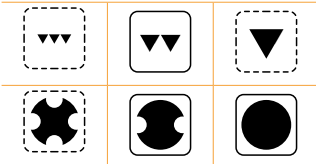
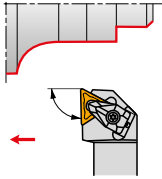
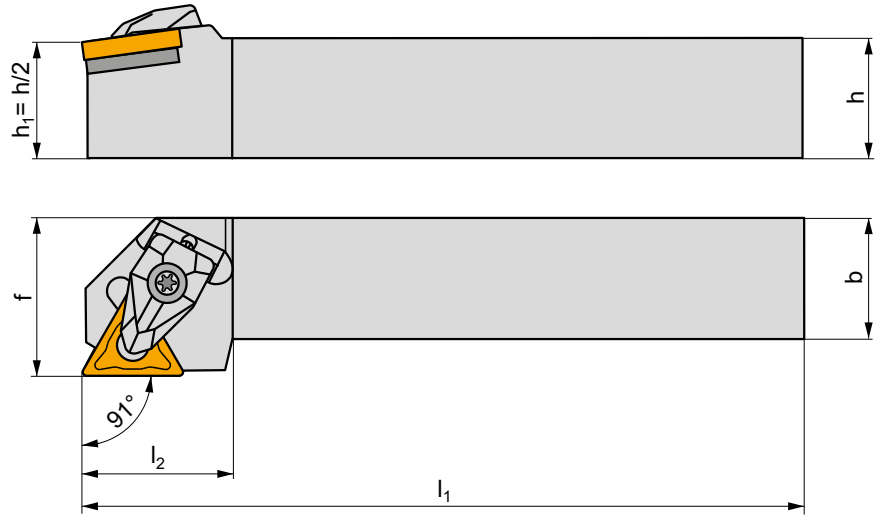
IGI040		SN.. 43.
IGI041		SN.. 54.
IGI042		SN.. 64.

DS12	DCS 12	3.9	DSS 425-01	US 2002-T15P	FLAG T15P/3.5	-
DS15	DCS 16	6.4	DSS 425-03	US 2007-T20P	-	LK T20P
DS19	DCS 19	6.4	DSS 425-04	US 2007-T20P	-	LK T20P

DTGN(RL) EXT

P M K N S H

D
T100-T107



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs		
DTGNR/L 12 3B	.750	.750	1.000	4.500	.970	-6	-6	.88	IGI058	DT16
DTGNR/L 16 3D	1.000	1.000	1.250	6.000	.970	-6	-6	1.54	IGI058	DT16
DTGNR/L 16 4D	1.000	1.000	1.250	6.000	1.260	-6	-6	1.54	IGI059	DT22
DTGNR/L 20 4D	1.250	1.250	1.500	6.000	1.310	-6	-6	2.76	IGI059	DT22
DTGNR/L 24 5D	1.500	1.500	2.000	6.000	1.550	-6	-6	4.96	IGI060	DT27

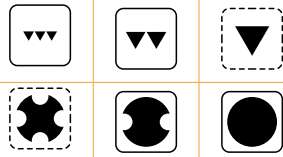
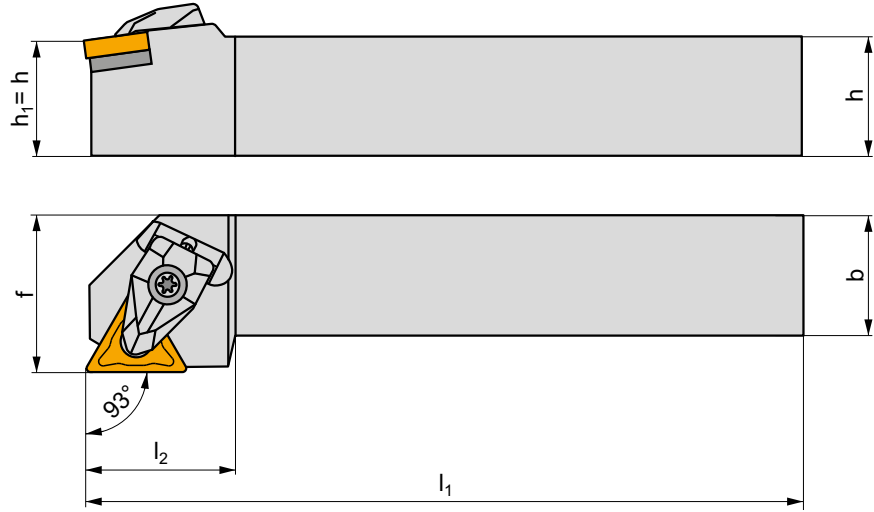
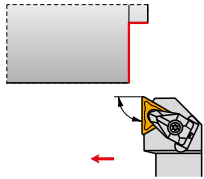
IGI058	TN.. 33.
IGI059	TN.. 43.
IGI060	TN.. 54.

DT16	DCS 09	1.7	DTS 315-02	US 2004-T09P	FLAG T09P
DT22	DCS 12	3.9	DTS 315-04	US 2002-T15P	FLAG T15P/3.5
DT27	DCS 16	6.4	DTS 315-05	US 2007-T20P	LK T20P

DTJN(RL) EXT

P **M** **K** **N** **S** **H**

T100-T107



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs	IGI058	DT16
DTJNR/L 12 3B	.750	.750	1.000	4.500	.953	-6	-6	.88	IGI058	DT16
DTJNR/L 16 3D	1.000	1.000	1.250	6.000	.980	-6	-6	1.54	IGI058	DT16
DTJNR/L 20 4D	1.250	1.250	1.500	6.000	1.283	-6	-6	2.76	IGI059	DT22

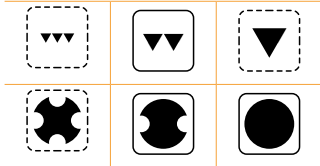
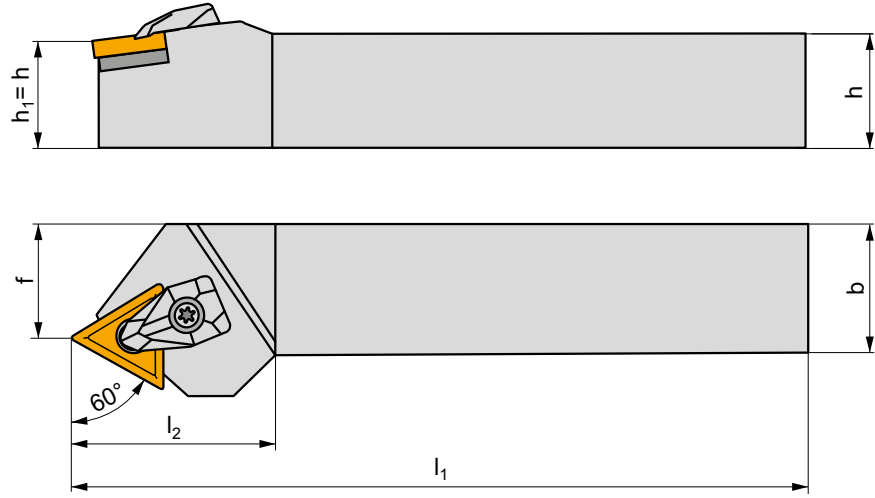
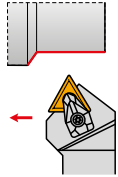
IGI058	TN.. 33.
IGI059	TN.. 43.

DT16	DCS 09	Nm	DTS 315-02	US 2004-T09P	FLAG T09P
DT22	DCS 12	3.9	DTS 315-04	US 2002-T15P	FLAG T15P/3.5

DTTN(RL) EXT

P M K N S H

T100-T107



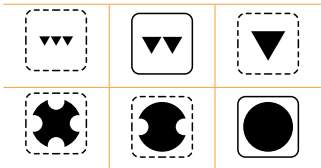
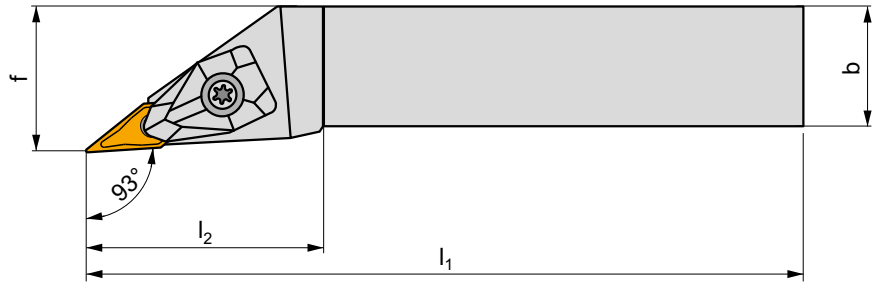
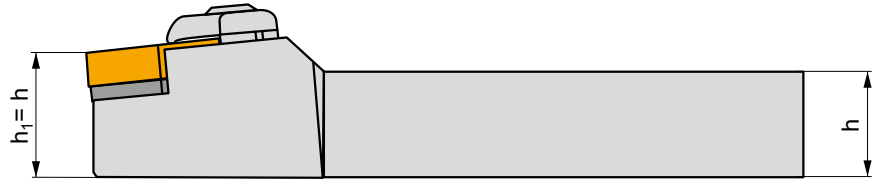
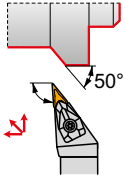
ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs	IGI058	IGI059	DT16	DT22
DTNR/L 12 3B	.750	.750	.598	4.500	1.190	-6	-6	.88	IGI058	IGI059	DT16	DT22
DTNR/L 16 4D	1.000	1.000	.791	6.000	1.560	-6	-6	1.54	IGI058	IGI059	DT16	DT22

IGI058	TN.. 33.
IGI059	TN.. 43.

DT16	DCS 09	Nm	DTS 315-02	US 2004-T09P	FLAG T09P
DT22	DCS 12	3.9	DTS 315-04	US 2002-T15P	FLAG T15P/3.5

DVJN(RL) EXT

P M K N S H



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs	IGI063	DV16
DVJNR/L 12 3B	.750	.750	1.000	4.500	1.830	-13	-4	.88	IGI063	DV16
DVJNR/L 16 3D	1.000	1.000	1.250	6.000	1.830	-13	-4	1.54	IGI063	DV16
DVJNR/L 20 3D	1.250	1.250	1.500	6.000	1.830	-13	-4	2.76	IGI063	DV16

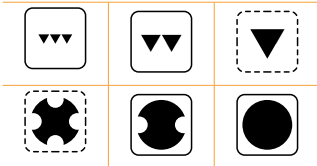
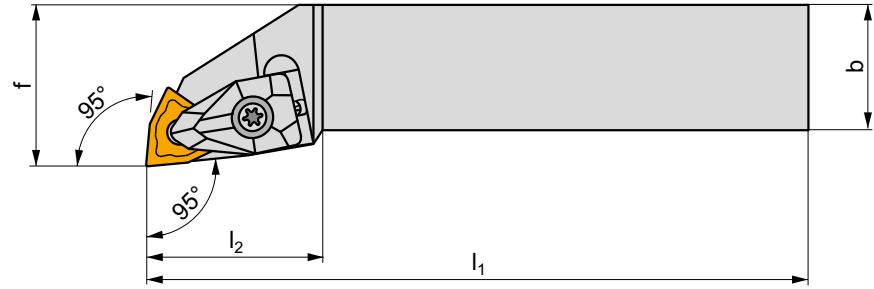
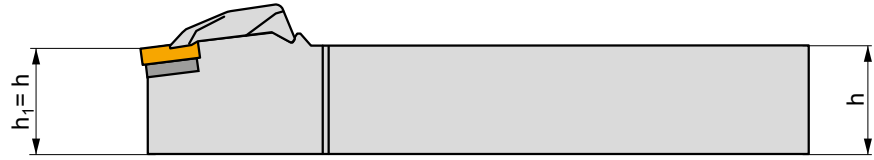
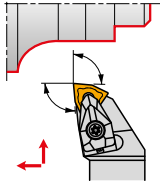
IGI063	VN.. 33.
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DV16	DCS 16V	3.0 Nm	DVS 269-01	US 2009-T15P	FLAG T15P/3.5
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DWLN(RL) EXT

P M K N S H

D
T121-T128



ANSI	$h=h_1$	b	f	l_1	l_2	λ_c°	γ°	lbs			
DWLN/L 10 3B	.625	.625	.875	4.500	1.070	-6	-6	.60	IGI066	DW06	-
DWLN/L 12 3C	.750	.750	1.000	5.000	1.950	-6	-6	1.06	IGI066	DW06	-
DWLN/L 16 3D	1.000	1.000	1.250	6.000	1.950	-6	-6	1.54	IGI066	DW06	-
DWLN/L 12 4C	.750	.750	1.000	5.000	1.378	-6	-6	1.06	IGI067	DW08	IAT004
DWLN/L 16 4D	1.000	1.000	1.250	6.000	1.350	-6	-6	1.54	IGI067	DW08	IAT004
DWLN/L 20 4D	1.250	1.250	1.500	6.000	1.378	-6	-6	2.76	IGI067	DW08	IAT004

IGI066	WN.. 33.
IGI067	WN.. 43.

DW06	DCS 09	1.7	DWS 328-01	US 2004-T09P	FLAG T09P	-
DW08	DCS 12	3.9	DWS 331-12	US 2002-T15P	FLAG T15P/3.5	-

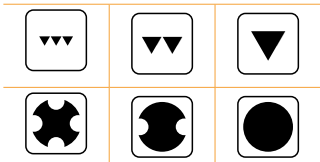
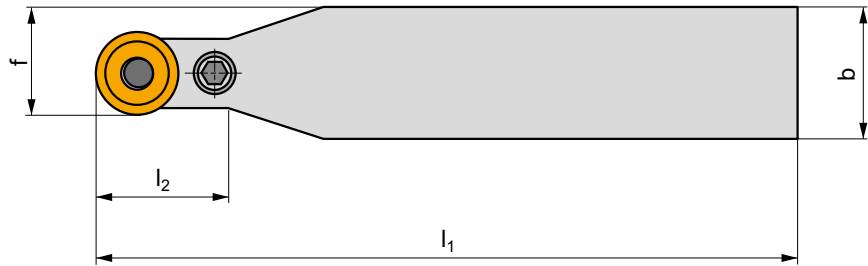
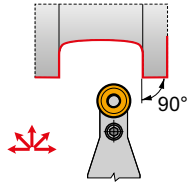
IAT004	CER WN.N 43.	DCS 12C4
IAT004	CER WN.A 43.	DCS 12C2

PRDCN EXT

P M K

P

T74-T80



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ_s°	lbs		
PRDCN 3225 P 16	1.260	.984	.807	6.693	1.260	0	0	1.76	IGI035	IPRP70
PRDCN 3232 P 20	1.260	1.260	1.024	6.693	1.260	0	0	2.87	IGI036	IPRP90
PRDCN 4040 S 20	1.575	1.575	1.181	9.843	1.575	0	0	6.83	IGI036	IPRP90
PRDCN 4040 S 25	1.575	1.575	1.280	9.843	1.575	0	0	7.05	IGI037	IPRP80

IGI035	RCMX 1606MO
IGI036	RCMX 2006MO
IGI037	RCMX 2507MO

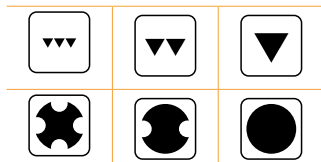
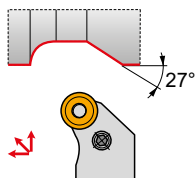
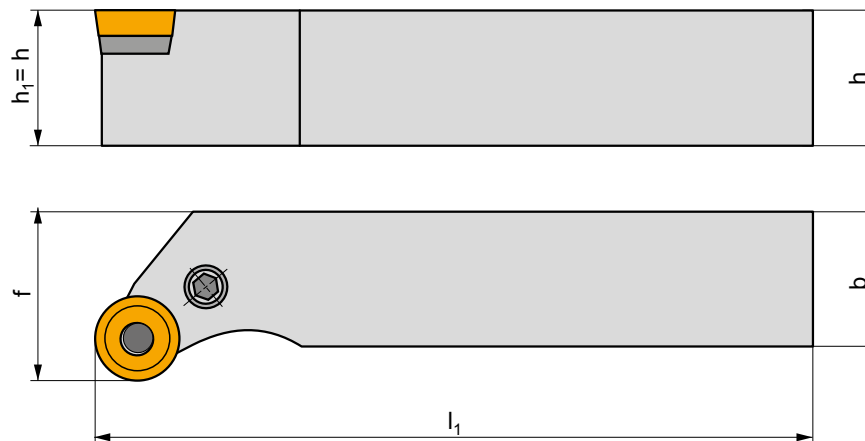
IPRP70	RCU 160300	PU 07	US 36	6.0	M8x1	1.02	NT 05	HXK 4
IPRP80	RCU 250600	PU 08	US 38	8.0	M10x1	1.14	NT 06	HXK 5
IPRP90	RCU 200400	PU 09	US 36	6.0	M8x1	1.02	NT 07	HXK 4

PRSCR(RL) EXT

P **M** **K**

P

T74-T80



ANSI	$h=h_1$	b	f	l_1	λ_s°	γ°	lbs		
PRSCR/L 3225 P 16	1.260	.984	.807	6.693	0	0	1.98	IGI035	IPRP70
PRSCR/L 3232 P 20	1.260	1.260	1.024	6.693	0	0	3.09	IGI036	IPRP90
PRSCR/L 4040 S 25	1.575	1.575	1.280	9.843	0	0	7.50	IGI037	IPRP80

IGI035	RCMX 1606MO
IGI036	RCMX 2006MO
IGI037	RCMX 2507MO

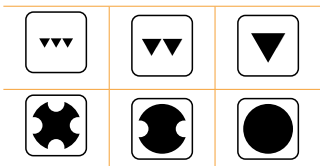
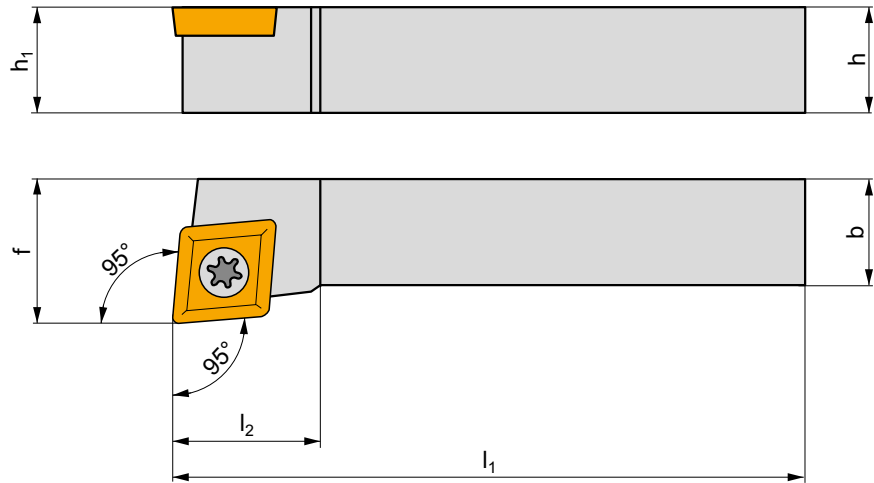
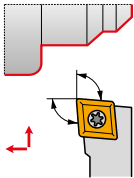
IPRP70	RCU 160300	PU 07	US 36	6.0	M8x1	1.02	NT 05	MT 05	HXK 4
IPRP80	RCU 250600	PU 08	US 38	8.0	M10x1	1.14	NT 06	MT 06	HXK 5
IPRP90	RCU 200400	PU 09	US 36	6.0	M8x1	1.02	NT 07	MT 07	HXK 4

SCLC(RL) EXT

P M K N S H

S

T36-T43



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs		
SCLCR/L 06 2	.375	.375	.500	2.500	.390	0	0	.24	IGI001	ISC06
SCLCR/L 08 3	.500	.500	.625	3.500	.390	0	0	.33	IGI002	ISC09
SCLCR/L 10 3	.625	.625	.750	4.000	.630	0	0	.62	IGI002	ISC095
SCLCR/L 12 4B	.750	.750	1.000	4.500	.830	0	0	.88	IGI003	ISC12
SCLCR/L 16 4D	1.000	1.000	1.250	6.000	.830	0	0	1.54	IGI003	ISC12

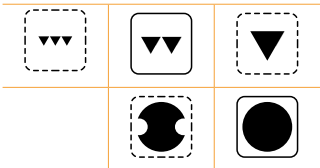
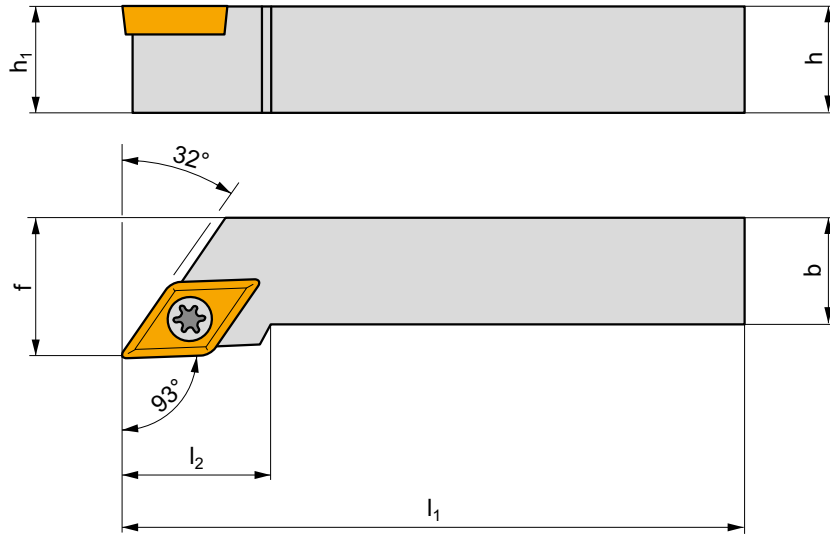
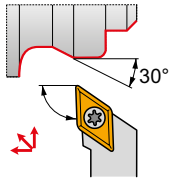
IGI001	CC.. 21.5.
IGI002	CC.. 32.5.
IGI003	CC.. 43.

ISC06	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISC09	US 2010-T15P	3.0	M3.5	.40	-	-	FLAG T15P/3.5	-
ISC095	US 2001-T15P	3.0	M3.5	.48	SCS 232-01	MS 9001	FLAG T15P/3.5	-
ISC12	US 2018-T15P	3.0	M4	.55	SCS 232-02	MS 9003	FLAG T15P/4	-

SDJCR(L) EXT

P M K N S H

S
T57-T61



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs		
SDJCR/L 06 2	.375	.375	.500	2.500	.590	0	0	.24	IGI009	ISD07
SDJCR/L 08 2	.500	.500	.625	3.500	.670	0	0	.33	IGI009	ISD07
SDJCR/L 12 3B	.750	.750	1.000	4.500	.940	0	0	.88	IGI010	ISD11V
SDJCR/L 16 3D	1.000	1.000	1.250	6.000	1.100	0	0	1.54	IGI010	ISD11V

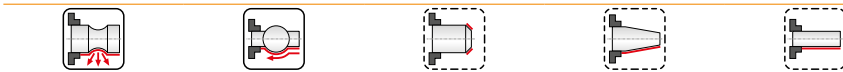
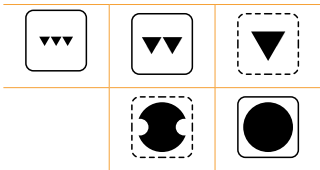
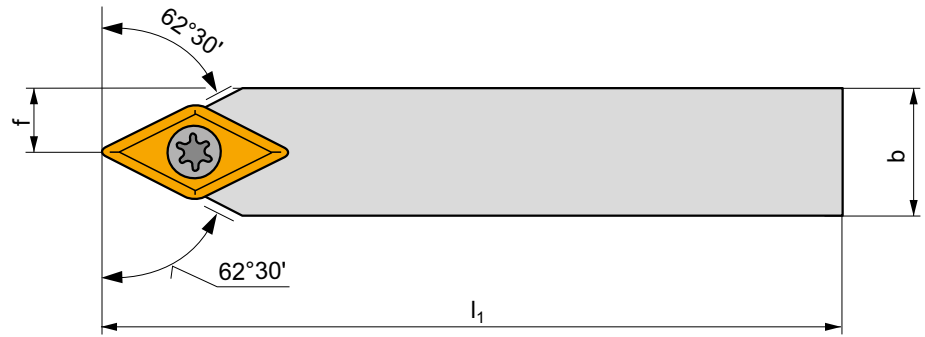
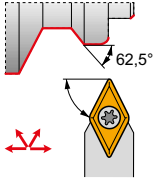
IGI009					DC.. 21.5.					
IGI010					DC.. 32.5.					

ISD07	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISD11V	US 2001-T15P	3.0	M3.5	.48	SDS 263-01	MS 9001	FLAG T15P/3.5	-

SDPCN EXT

P M K N S H

T57-T61



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	γ_f	lbs		
SDPCN 06 2	.375	.375	.216	2.500	.571	0	0	-	.24	IGI009	ISD07
SDPCN 08 2	.500	.500	.279	3.482	.571	0	0	-	.33	IGI009	ISD07
SDPCN 10 3	.625	.625	.341	4.000	.862	0	0	-	.62	IGI010	ISD11V
SDPCN 12 3B	.750	.750	.404	4.500	.862	0	0	-	.88	IGI010	ISD11V
SDPCN 16 3C	1.000	1.000	.529	5.000	.890	0	0	-	1.54	IGI010	ISD11V

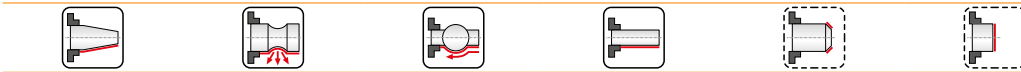
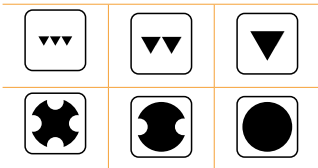
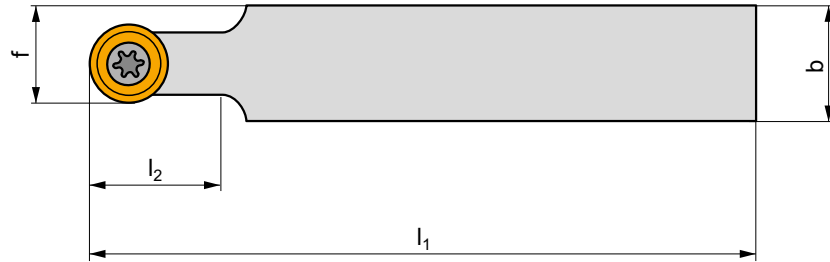
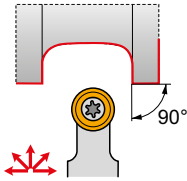
IGI009											
IGI010											

ISD07	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISD11V	US 2001-T15P	3.0	M3.5	.48	SDS 263-01	MS 9001	FLAG T15P/3.5	-

SRDCN EXT

P M K N S H

S
T74-T80



ANSI	h=h ₁	b	f	l ₁	l ₂	λ _c °	γ°	lbs	IGI	ISO
SRDCN 1212 F 06	.472	.472	.354	3.150	.472	0	0	.22	IGI029	ISO1
SRDCN 1616 H 06	.630	.630	.433	3.937	.472	0	0	.44	IGI029	ISO1
SRDCN 2020 K 08	.787	.787	.551	4.921	.787	0	0	.88	IGI030	ISO3
SRDCN 2020 K 1003-M-A	.787	.787	.591	4.921	.984	0	0	.88	IGI031	ISR10
SRDCN 2020 K 10-M-A	.787	.787	.591	4.921	.984	0	0	.88	IGI032	ISR10
SRDCN 2525 M 10-M-A	.984	.984	.689	5.906	.984	0	0	1.54	IGI032	ISR10
SRDCN 2525 M 12-M-A	.984	.984	.728	5.906	1.181	0	0	1.54	IGI033	ISR12
SRDCN 3225 P 10-M	1.260	.984	.689	6.693	.984	0	0	1.98	IGI032	ISR10
SRDCN 3225 P 12-M	1.260	.984	.728	6.693	1.181	0	0	1.98	IGI033	ISR12
SRDCN 3225 P 16-M	1.260	.984	.807	6.693	1.260	0	0	2.20	IGI034	ISR16

IGI	RCMT
IGI029	RCMT 0602MO
IGI030	RCMT 0803MO
IGI031	RCMT 1003MO
IGI032	RCMT 10T3MO
IGI033	RCMT 1204MO
IGI034	RCMT 1606MO

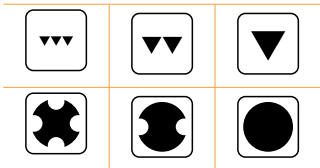
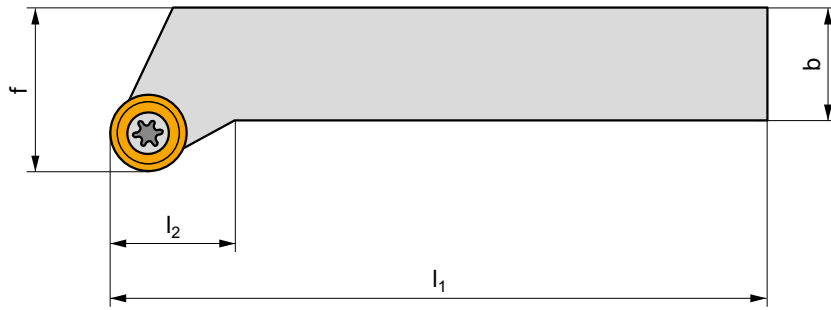
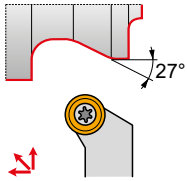
ISO	US	Nm	M	mm	mm	mm	mm	mm
ISO1	US 2506-T07P	.9	M2.5	.25	-	-	FLAG T07P	-
ISO3	US 3007-T09P	2.0	M3	.29	-	-	FLAG T09P	-
ISR10	US 3510-T15P	3.0	M3.5	.42	SRN 100300	MS 3510	FLAG T15P	HXK 3.5
ISR12	US 3510-T15P	3.0	M3.5	.42	SRN 120300	MS 3510	FLAG T15P	HXK 3.5
ISR16	US 5018-T20P	5.0	M5	.71	SRN 16T3MO	MS 5015	FLAG T20P	HXK 5

SRSC(RL) EXT

P M K N S H

S

T74-T80



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs	IGI	ISO
SRSCR/L 1616 H 06	.630	.630	.787	3.937	.472	0	0	.49	IGI029	ISO1
SRSCR/L 2020 K 08	.787	.787	.984	4.921	.787	0	0	.99	IGI030	ISO3
SRSCR/L 2020 K 10-M-A	.787	.787	.984	4.921	.787	0	0	.99	IGI032	ISR10
SRSCR/L 2525 M 10-M-A	.984	.984	1.260	5.906	.787	0	0	1.65	IGI032	ISR10
SRSCR/L 2525 M 12-M-A	.984	.984	1.260	5.906	.787	0	0	1.65	IGI033	ISR12
SRSCR/L 3225 P 16-M	1.260	.984	1.260	6.693	.787	0	0	2.43	IGI034	ISR16

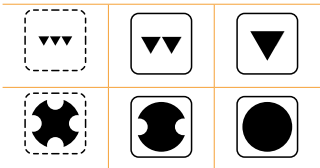
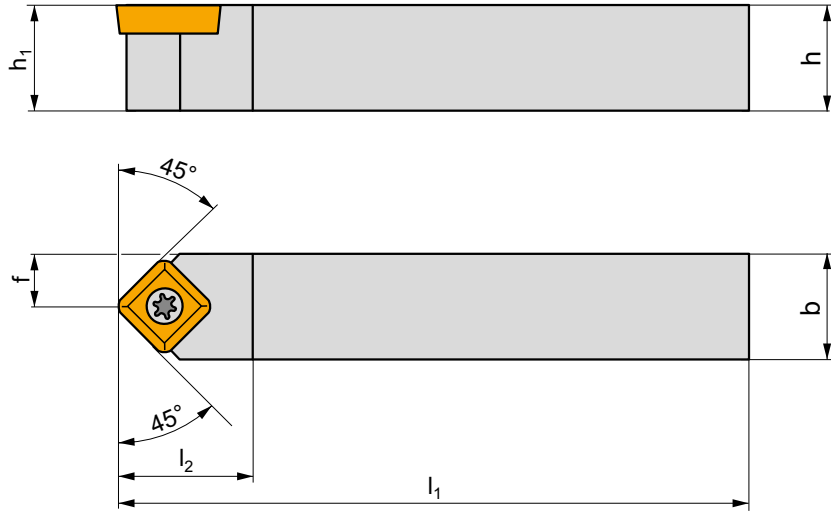
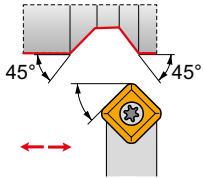
IGI	RCMT
IGI029	RCMT 0602MO
IGI030	RCMT 0803MO
IGI032	RCMT 10T3MO
IGI033	RCMT 1204MO
IGI034	RCMT 1606MO

ISO	US	Nm	M	mm	mm	mm	mm	mm	mm
ISO1	US 2506-T07P	.9	M2.5	.25	-	-	FLAG T07P	-	-
ISO3	US 3007-T09P	2.0	M3	.29	-	-	FLAG T09P	-	-
ISR10	US 3510-T15P	3.0	M3.5	.42	SRN 100300	MS 3510	FLAG T15P	HXX 3.5	-
ISR12	US 3510-T15P	3.0	M3.5	.42	SRN 120300	MS 3510	FLAG T15P	HXX 3.5	-
ISR16	US 5018-T20P	5.0	M5	.71	SRN 16T3MO	MS 5015	FLAG T20P	HXX 5	-

SSDCN EXT

P M K N S H

S
T81-T84



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs	IGI039	ISS09
SSDCN 08 3	.500	.500	.261	3.500	.594	0	0	.33	IGI039	ISS09
SSDCN 10 3	.625	.625	.323	4.000	.594	0	0	.62	IGI039	ISS095

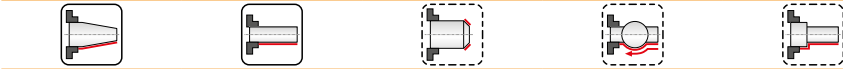
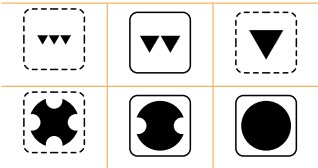
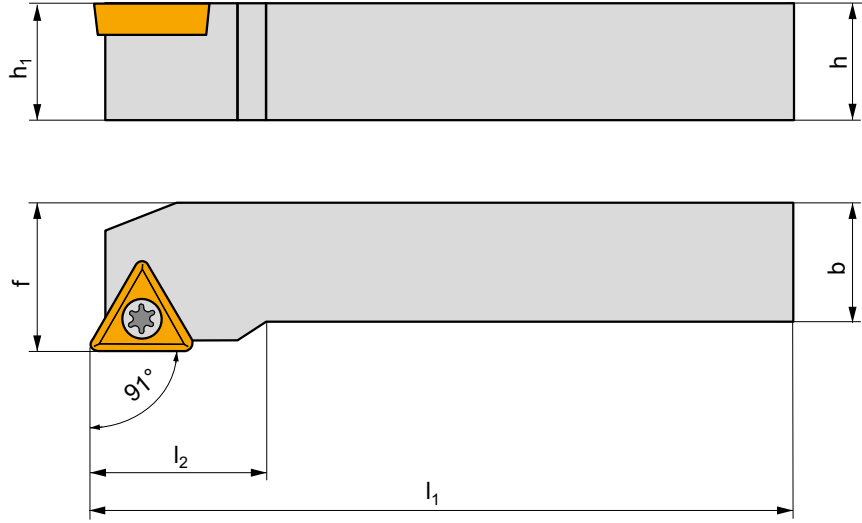
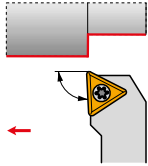
IGI039	SC.. 32.5.
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ISS09	US 2010-T15P	Nm	M3.5	.40	-	-	FLAG T15P/3.5	-
ISS095	US 2010-T15P	3.0	M3.5	.40	SSS 420-01	MS 9001	FLAG T15P/3.5	-

STGC(RL) EXT

P M K N S H

T100-T107



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs		
STGCR/L 08 2	.500	.500	.625	3.500	.543	0	0	.33	IGI044	IST11
STGCR/L 12 3B	.750	.750	1.000	4.500	.815	0	0	.88	IGI045	IST16
STGCR/L 16 3D	1.000	1.000	1.250	6.000	.815	0	0	1.54	IGI045	IST16

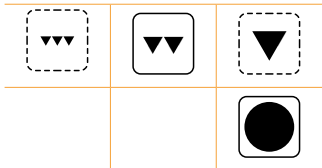
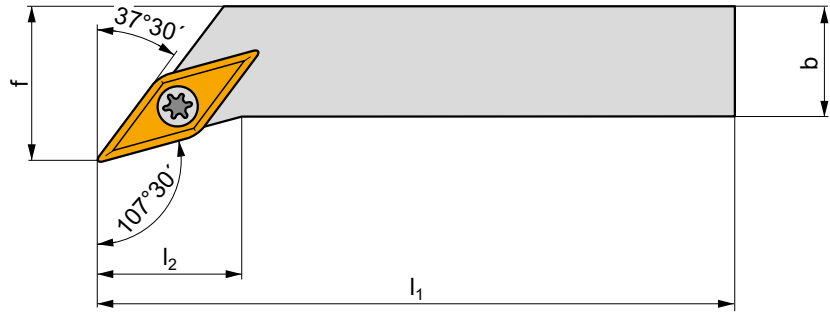
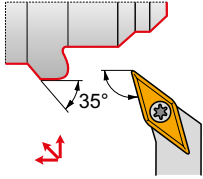
IGI044	TC.. 21.5.
IGI045	TC.. 32.5.

IST11	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
IST16	US 2001-T15P	3.0	M3.5	.48	STS 320-01	MS 9001	FLAG T15P/3.5	-

SVHB(C)(RL) EXT

P M K N S H

S
T108-T116



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	γ°	lbs	IGI062	ISV165
SVHBR/L 12 3B	.750	.750	1.000	4.500	1.087	0	0	.88	IGI062	ISV165
SVHBR/L 16 3D	1.000	1.000	1.250	6.000	1.087	0	0	1.54	IGI062	ISV165

IGI062		VB.. 33.						VC.. 33.		
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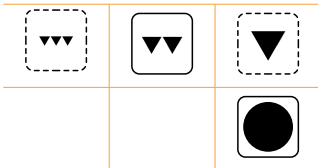
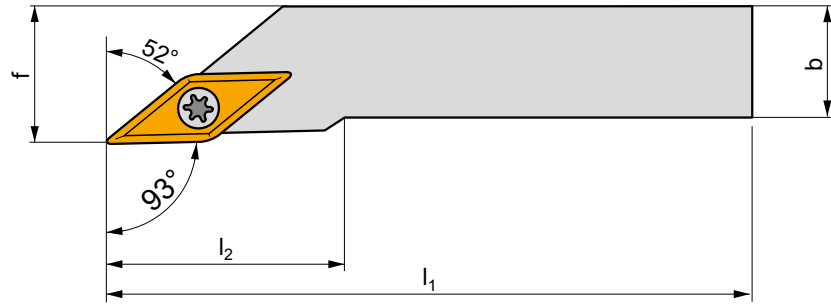
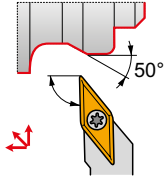
ISV165	US 2001-T15P	3.0	M3.5	.48	SVS 270-01	MS 9001	FLAG T15P/3.5	-
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SVJB(C)(RL) EXT

P M K N S H

S

T108-T116



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs		
SVJBR/L 10 2	.625	.625	.750	4.000	.835	0	0	.22	IGI061	ISV11
SVJBR/L 12 2B	.750	.750	1.000	4.500	.835	0	0	.88	IGI061	ISV11
SVJBR/L 12 3B	.750	.750	1.000	4.500	1.228	0	0	.88	IGI062	ISV16S
SVJBR/L 16 3D	1.000	1.000	1.250	6.000	1.240	0	0	1.54	IGI062	ISV16S
SVJBR/L 20 3D	1.250	1.250	1.500	6.000	1.240	0	0	2.76	IGI062	ISV16S

IGI061		VB.. 22.		VC.. 22.
IGI062		VB.. 33.		VC.. 33.

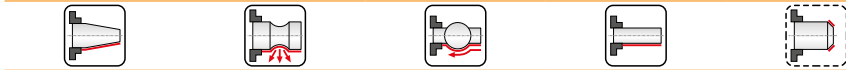
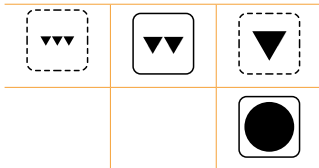
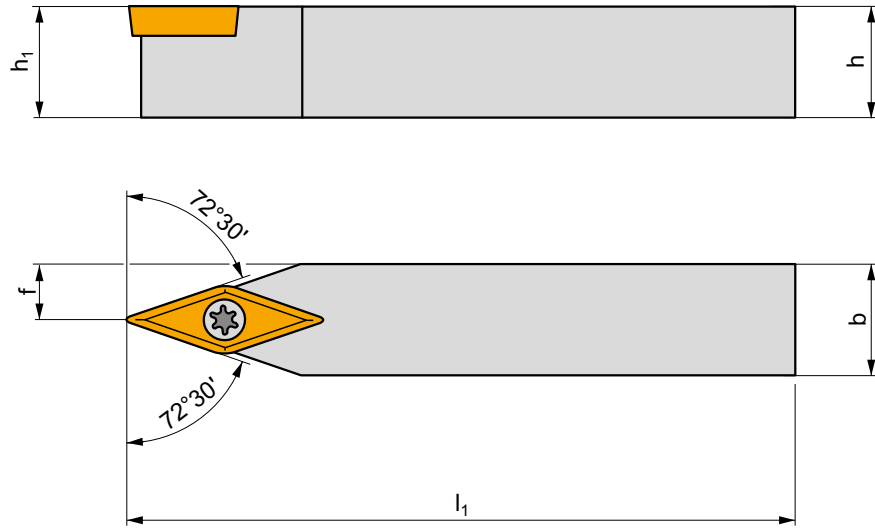
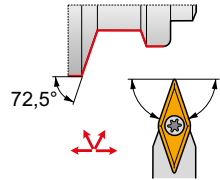
ISV11	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISV16S	US 2001-T15P	3.0	M3.5	.48	SVS 270-01	MS 9001	FLAG T15P/3.5	-

SVVB(C)N EXT

P M K N S H

S

T108-T116



ANSI	$h=h_1$	b	f	l_1	l_2	λ_c°	γ°	lbs		
SVVBN 08 2	.500	.500	.260	3.500	.831	0	0	.22	IGI061	ISV11
SVVBN 12 2B	.750	.750	.384	4.500	.831	0	0	.88	IGI061	ISV11
SVVBN 12 3B	.750	.750	.395	4.500	1.240	0	0	.88	IGI062	ISV16S
SVVBN 16 3D	1.000	1.000	.520	6.000	1.240	0	0	1.54	IGI062	ISV16S
SVVBN 20 3D	1.250	1.250	.645	6.000	1.240	0	0	2.76	IGI062	ISV16S

IGI061	VB.. 22.	VC.. 22.
IGI062	VB.. 33.	VC.. 33.

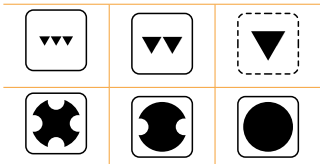
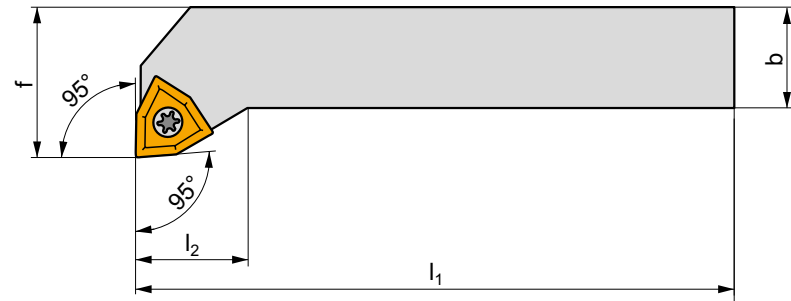
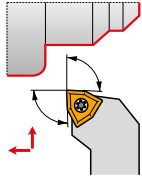
ISV11	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISV16S	US 2001-T15P	3.0	M3.5	.48	SVS 270-01	MS 9001	FLAG T15P/3.5	-

SWLC(RL) EXT

P M K N S H

S

T119-T120



ANSI	$h=h_1$	b	f	l_1	l_2	λ_s°	γ°	lbs		
SWLCR/L 12 3B	.750	.750	1.000	4.500	.630	0	0	.88	IGI064	ISO8
SWLCR/L 16 4D	1.000	1.000	1.250	6.000	.830	0	0	1.54	IGI065	ISO9

IGI064									WC.. 32.5.	
IGI065									WC.. 43.	

ISO8	US 3510-T15P	3.0	M3.5	.42	FLAG T15P
ISO9	US 4512-T15P	5.0	M4.5	.48	FLAG T15P

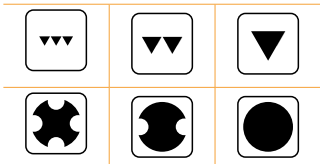
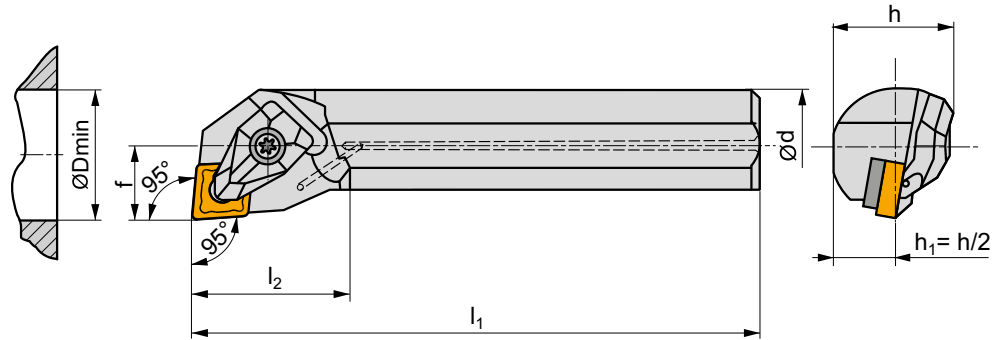
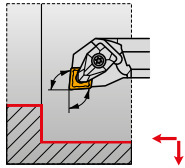


DCLN(RL) INT

P **M** **K** **N** **S** **H**

D

T44-T56



ANSI	d	D _{min}	f	h	l ₁	l ₂	λ _s °	γ°				
A12S-DCLNR/L 3	.750	1.000	.500	.709	10.000	1.024	-14	-6	✓	1.21	IGI004	DC09
A16T-DCLNR/L 4	1.000	1.280	.640	.906	12.000	1.339	-12	-6	✓	1.54	IGI005	DCI12
A20T-DCLNR/L 4	1.250	1.468	.765	1.181	12.000	1.299	-11	-6	✓	3.09	IGI005	DCI12
A24T-DCLNR/L 4	1.500	1.760	.890	1.374	12.000	1.575	-16	-6	✓	8.25	IGI005	DCI12
A24T-DCLNR/L 5	1.500	1.760	.890	1.374	12.000	1.575	-18	-6	✓	8.25	IGI006	DC16

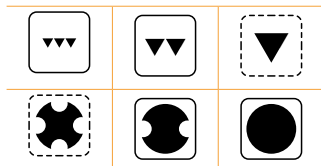
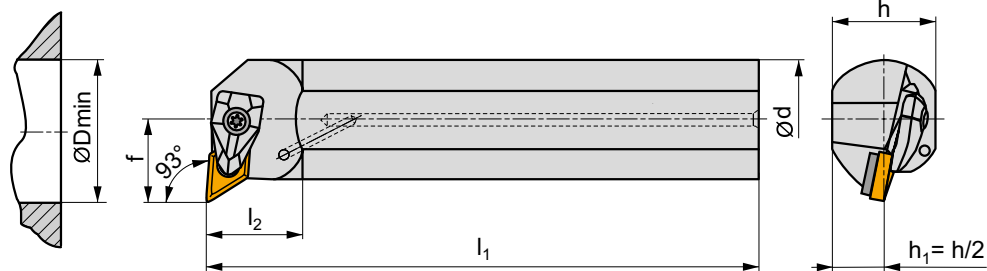
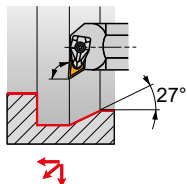
IGI004	CN.. 32.
IGI005	CN.. 43.
IGI006	CN.. 54.

DC09	DCS 09	1.7	DCS 236-04	US 2004-T09P	FLAG T09P	-
DC16	DCS 16	6.4	DCS 234-03	US 2007-T20P	-	LK T20P
DCI12	DCS 12	3.9	DCS 236-03	US 2002-T15P	FLAG T15P/3.5	-

DDUN(RL) INT

P M K N S H

D
T62-T70



ANSI	d	D _{min}	f	h	l ₁	l ₂	λ°	γ°		lbs			
A16T-DDUNR/L 3	1.000	1.299	.750	.906	12.000	1.142	-12	-6	✓	1.54	IGI011	DD11	-
A20T-DDUNR/L 3	1.250	1.705	1.000	1.181	12.000	1.181	-9	-6	✓	3.09	IGI011	DD11	-
A20T-DDUNR/L 4	1.250	1.705	1.000	1.181	12.000	1.181	-13	-6	✓	3.09	IGI013	DD154	IAT007
A24T-DDUNR/L 4	1.500	2.000	1.125	1.374	12.000	1.299	-11	-6	✓	8.25	IGI013	DD154	IAT007

IGI011													
IGI013													

DD11	DCS 09	1.7		DDS 267-01	US 2004-T09P	FLAG T09P
DD154	DCS 12	3.9		DDS 266-02	US 2002-T15P	FLAG T15P/3.5

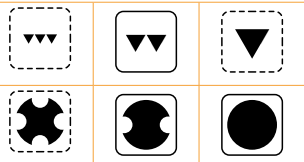
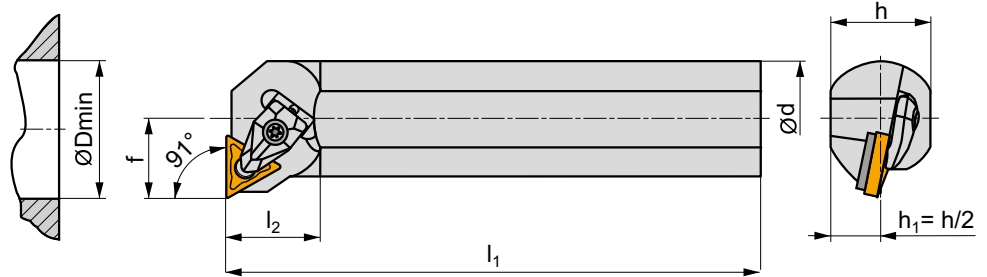
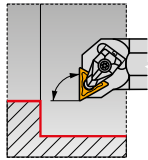
IAT007	DN.. 43.		-	DDS 266-01
IAT007	CER DN.N 44.		DCS 12C4	DDS 266-02
IAT007	CER DN.A 44.		DCS 12C2	DDS 266-02

DTFN(RL) INT

P M K N S H

D

T100-T107



ANSI	d	D _{min}	f	h	l ₁	l ₂	λ _s °	γ°				
A16T-DTFNR/L 3	1.000	1.201	.640	.906	12.000	1.339	-12	-6	✓	1.54	IGI058	DTI16
A20T-DTFNR/L 3	1.250	1.468	.765	1.181	12.000	1.417	-11	-6	✓	3.09	IGI058	DTI16
A24T-DTFNR/L 4	1.500	1.760	.890	1.374	12.000	1.417	-15	-6	✓	8.25	IGI059	DT22

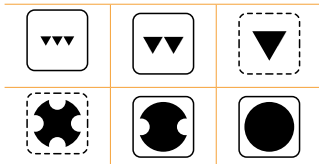
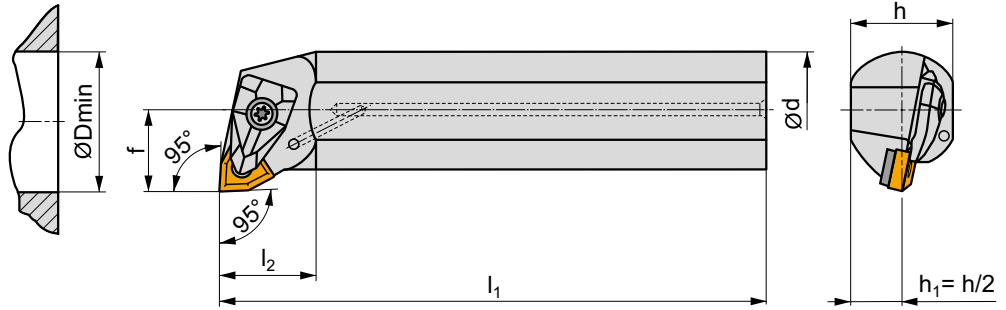
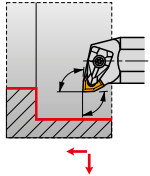
IGI058												TN.. 33.
IGI059												TN.. 43.

DTI16	DCS 09	1.7	DTS 316-01	US 2004-T09P	FLAG T09P
DT22	DCS 12	3.9	DTS 315-04	US 2002-T15P	FLAG T15P/3.5

DWLN(RL) INT

P M K N S H

D
T121-T128



ANSI	d	D _{min}	f	h	l ₁	l ₂	λ°	γ°				
A16T-DWLN(RL) INT	1.000	1.299	.750	.906	12.000	1.339	-12	-6	✓	1.54	IGI067	DWI08
A20T-DWLN(RL) INT	1.250	1.705	1.000	1.181	12.000	1.339	-15	-6	✓	3.09	IGI067	DWI08
A24T-DWLN(RL) INT	1.500	2.000	1.000	1.374	12.000	1.339	-13	-6	✓	8.25	IGI067	DW08

IGI067	WN.. 43.

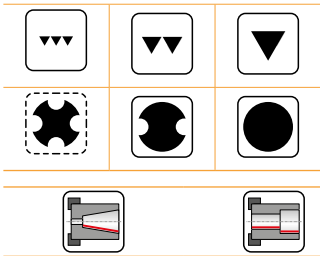
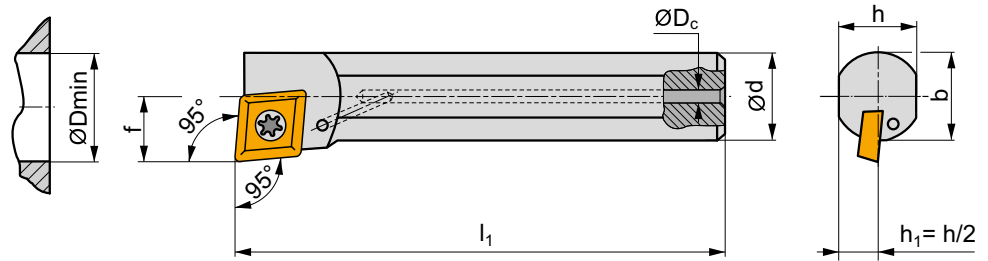
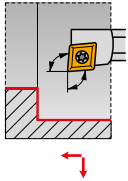
DW08	DCS 12	3.9	DWS 331-12	US 2002-T15P	FLAG T15P/3.5
DWI08	DCS 12	3.9	DWS 328-02	US 2002-T15P	FLAG T15P/3.5

SCLC(RL) INT

P M K N S H

S

T36-T43



ANSI	d	D _{min}	f	h	b	l ₁	D _c	λ°	γ°				
A06M-SCLCR/L 2	.375	.480	.250	.336	-	6.000	-	-11	0	✓	.13	IGI001	ISC06M
A08M-SCLCR/L 2	.500	.598	.312	.460	-	6.000	-	-8	0	✓	.33	IGI001	ISC06
A10R-SCLCR/L 3	.625	.772	.406	.562	-	8.000	-	-9	0	✓	.66	IGI002	ISC09M
A12S-SCLCR/L 3	.750	.929	.500	.709	-	10.000	-	-6	0	✓	1.21	IGI002	ISC09M
A16T-SCLCR/L 3	1.000	1.201	.640	.906	-	12.000	-	-4	0	✓	1.54	IGI002	ISC09
A20T-SCLCR/L 4	1.250	1.468	.765	1.181	-	12.000	-	-11	0	✓	3.09	IGI003	ISC12

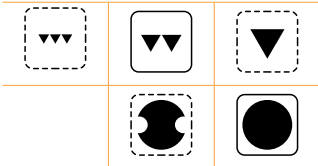
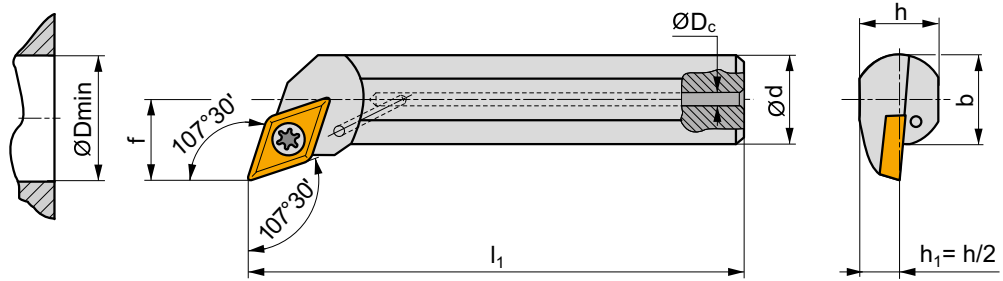
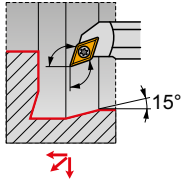
IGI001		CC.. 21.5.
IGI002		CC.. 32.5.
IGI003		CC.. 43.

ISC06M	SC 2046-T07P	.9	M2.5	.20	-	-	FLAG T07P	-
ISC06	SC 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISC09M	US 2009-T15P	3.0	M3.5	.32	-	-	FLAG T15P/3.5	-
ISC09	US 2010-T15P	3.0	M3.5	.40	-	-	FLAG T15P/3.5	-
ISC12	US 2018-T15P	3.0	M4	.55	SCS 232-02	MS 9003	FLAG T15P/4	-

SDQC(RL) INT

P M K N S H

S
T57-T61



ANSI	d	D _{min}	f	h	b	l ₁	D _c	λ°	γ°				
A06M-SDQCR/L 2	.375	.598	.375	.336	-	6.000	-	-8	0	✓	.13	IGI009	ISD07
A08M-SDQCR/L 2	.500	.728	.437	.460	-	6.000	-	-6	0	✓	.33	IGI009	ISD07
A10R-SDQCR/L 2	.625	.850	.500	.562	-	8.000	-	-4	0	✓	.66	IGI009	ISD07
A12S-SDQCR/L 3	.750	.980	.562	.709	-	10.000	-	-6	0	✓	1.21	IGI010	ISD11M
A16T-SDQCR/L 3	1.000	1.299	.750	.906	-	12.000	-	-3	0	✓	1.54	IGI010	ISD11I

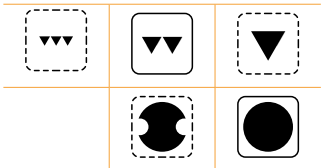
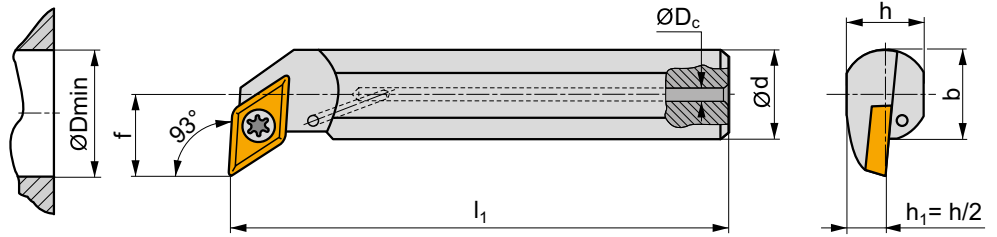
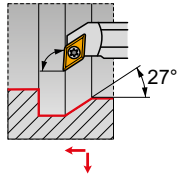
IGI009							DC.. 21.5.						
IGI010							DC.. 32.5.						

ISD07	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISD11M	US 2009-T15P	3.0	M3.5	.32	-	-	FLAG T15P/3.5	-
ISD11I	US 2010-T15P	3.0	M3.5	.40	-	-	FLAG T15P/3.5	-

SDUC(RL) INT

P M K N S H

S
T57-T61



ANSI	d	D _{min}	f	h	b	l ₁	D _c	λ _s °	γ _o °		lbs		
A06M-SDUCR/L 2	.375	.598	.375	.336	-	6.000	-	-7	0	✓	.13	IGI009	ISD07
A08M-SDUCR/L 2	.500	.728	.438	.460	-	6.000	-	-5	0	✓	.33	IGI009	ISD07
A10R-SDUCR/L 2	.625	.850	.500	.562	-	8.000	-	-4	0	✓	.66	IGI009	ISD07
A12S-SDUCR/L 3	.750	1.051	.625	.709	-	10.000	-	-5	0	✓	1.21	IGI010	ISD11M
A16T-SDUCR/L 3	1.000	1.299	.750	.906	-	12.000	-	-3	0	✓	1.54	IGI010	ISD11I
A20T-SDUCR/L 3	1.250	1.579	.875	1.181	-	12.000	-	-8	0	✓	3.09	IGI010	ISD11V

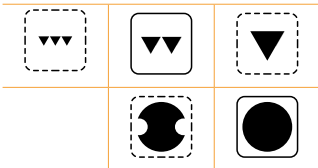
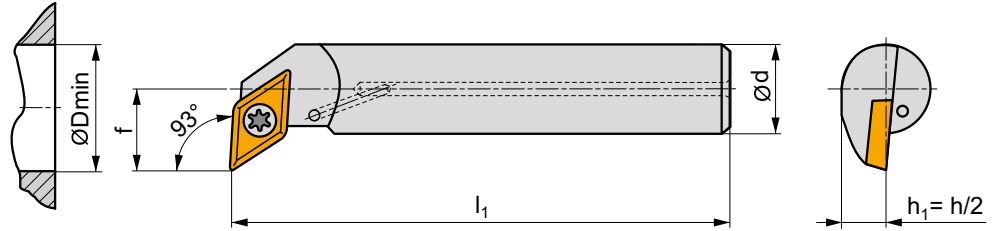
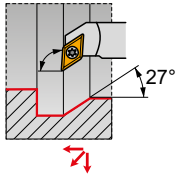
IGI009	DC.. 21.5.
IGI010	DC.. 32.5.

ISD07	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-
ISD11M	US 2009-T15P	3.0	M3.5	.32	-	-	FLAG T15P/3.5	-
ISD11I	US 2010-T15P	3.0	M3.5	.40	-	-	FLAG T15P/3.5	-
ISD11V	US 2001-T15P	3.0	M3.5	.48	SDS 263-01	MS 9001	FLAG T15P/3.5	-

SDUC(RL)-E INT

P M K N S H

S
T57-T61



ANSI	d	D _{min}	f	h	l ₁	λ _s °	γ°				
E06M-SDUCR/L 2	.375	.598	.375	.336	6.000	-7	0	✓	1.19	IGI009	ISD07
E08R-SDUCR/L 2	.500	.716	.438	.460	8.000	-5	0	✓	1.65	IGI009	ISD07
E10R-SDUCR/L 2	.625	.850	.500	.562	8.000	-4	0	✓	2.36	IGI009	ISD07

IGI009	DC.. 21.5.

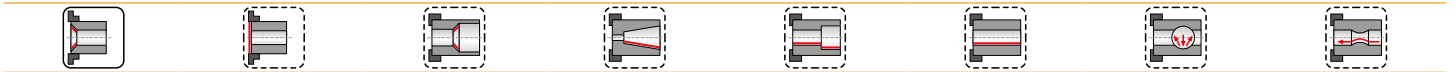
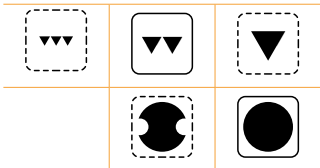
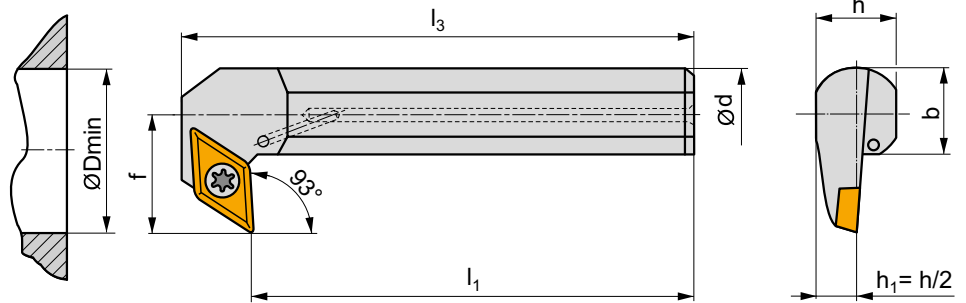
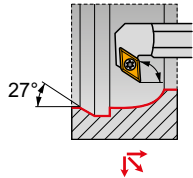
ISD07	US 2003-T07P	.8	M2.5	.26	-

SDZC(RL) INT

P M K N S H

S

T57-T61



ANSI	d	D _{min}	f	h	b	l ₁	l ₃	λ°	γ°	lbs		
A20T-SDZCR/L 3-93	1.250	1.579	.875	1.181	-	12.000	12.658	-7	0	3.09	IGI010	ISD11V

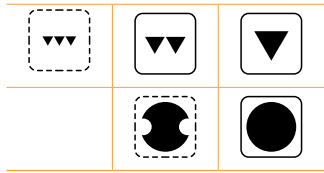
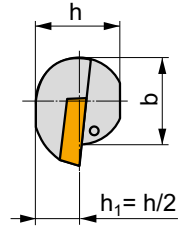
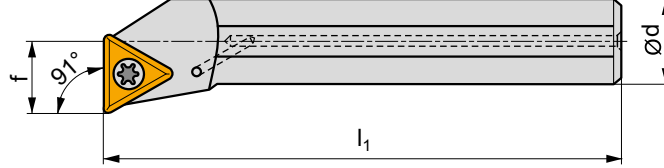
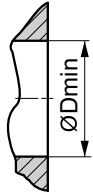
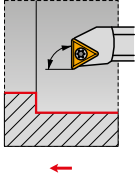
IGI010	DC.. 32.5.											

ISD11V	US 2001-T15P	3.0	M3.5	.48	SDS 263-01	MS 9001	FLAG T15P/3.5	-

STFC(RL) INT

P M K N S H

S
T96-T99



ANSI	d	D _{min}	f	h	b	l ₁	λ°	γ°				
A08M-STFCR/L 2	.500	.598	.312	.460	-	6.000	-7	0	✓	.33	IGI044	IST11
A10R-STFCR/L 2	.625	.772	.406	.562	-	8.000	-5	0	✓	.66	IGI044	IST11
A12S-STFCR/L 2	.750	.929	.500	.709	-	10.000	-3	0	✓	1.21	IGI044	IST11
A16T-STFCR/L 3	1.000	1.201	.640	.906	-	12.000	-4	0	✓	1.54	IGI045	IST16I

IGI044						TC.. 21.5.						
IGI045						TC.. 32.5.						

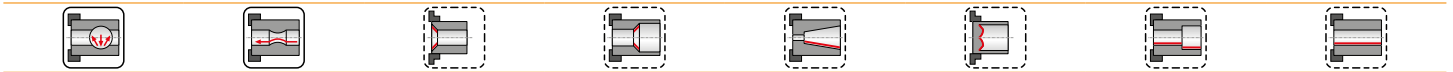
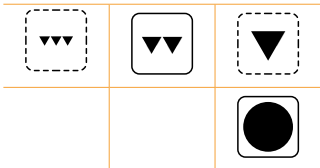
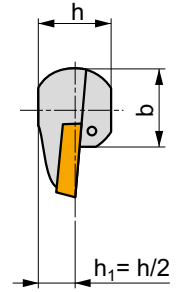
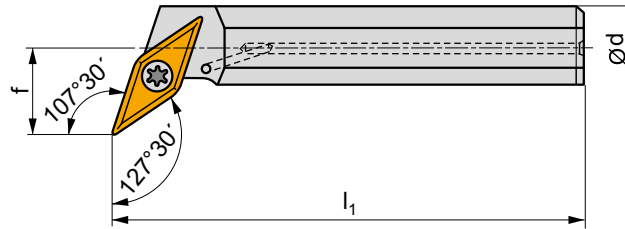
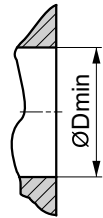
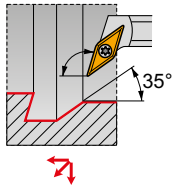
IST11	US 2003-T07P	.8	M2.5	.26	-	-	FLAG T07P	-	-
IST16I	US 2010-T15P	3.0	M3.5	.40	-	-	FLAG T15P/3.5	-	-

SVQB(C)(RL) INT

P **M** **K** **N** **S** **H**

S

T108-T116



ANSI	d	D _{min}	f	h	b	l ₁	λ°	γ°				
A16T-SVQBR/L 3	1.000	1.299	.750	.906	-	12.000	-7	0	✓	1.54	IGI062	ISV16
A20T-SVQBR/L 3	1.250	1.579	.875	1.181	-	12.000	-7	0	✓	4.52	IGI062	ISV16S
A24T-SVQBR/L 3	1.500	1.841	1.063	1.374	-	12.000	-5	0	✓	8.25	IGI062	ISV16S

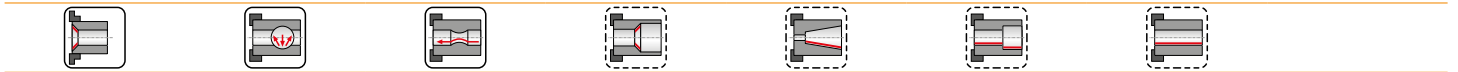
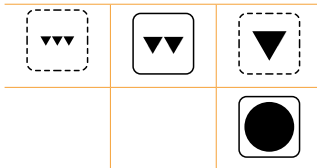
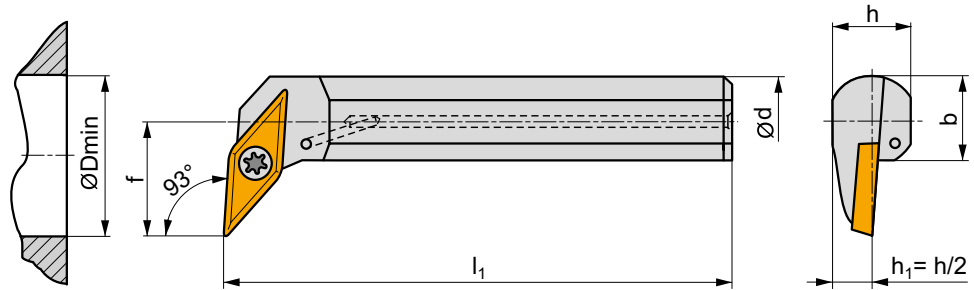
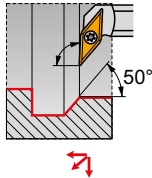
IGI062		VB.. 33.		VC.. 33.

ISV16	US 2010-T15P	3.0	M3.5	.40	-	-	FLAG T15P/3.5	-
ISV16S	US 2001-T15P	3.0	M3.5	.48	SVS 270-01	MS 9001	FLAG T15P/3.5	-

SVUB(C)(RL) INT

P M K N S H

S
T108-T116



ANSI	d	D _{min}	f	h	b	l ₁	λ _s °	γ°				
A10R-SVUBR/L 2	.625	.850	.486	.560	-	8.000	-7	0	✓	.66	IGI061	ISV11I
A12S-SVUBR/L 2	.750	1.012	.580	.710	-	10.000	-5	0	✓	1.21	IGI061	ISV11I
A20T-SVUBR/L 3	1.250	1.705	1.000	1.181	-	12.000	-5	0	✓	4.52	IGI062	ISV16S
A24T-SVUBR/L 3	1.500	2.126	1.125	1.374	-	12.000	-3	0	✓	8.25	IGI062	ISV16S

IGI061	VB.. 22.	VC.. 22.
IGI062	VB.. 33.	VC.. 33.

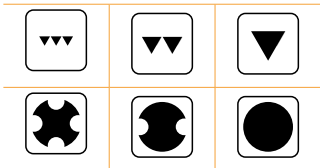
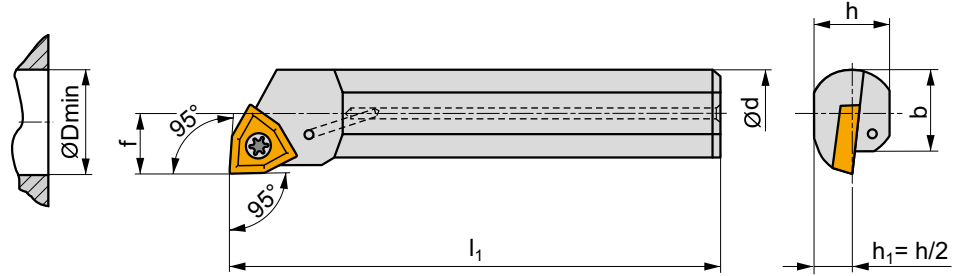
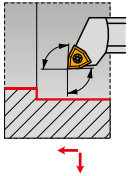
ISV16S	US 2001-T15P	3.0	M3.5	.48	SVS 270-01	MS 9001	FLAG T15P/3.5	-
ISV11I	US 2020-T07P	.8	M2.5	.28	-	-	FLAG T07P	-

SWLC(RL) INT

P M K N S H

S

T119-T120



ANSI	d	D _{min}	f	h	b	l ₁	λ°	γ°				
A12S-SWLCR/L 3	.750	.929	.500	.709	-	10.000	-6	0	✓	1.32	IGI064	ISO8

IGI064						WC.. 32.5						

ISO8	US 3510-T15P	3.0	M3.5	.42	FLAG T15P							

ISO/ANSI CODE DESIGNATION – PARTING AND GROOVING TOOLS – EXTERNAL TURNING
 DESIGNACIÓN CÓDIGO ISO/ANSI - HERRAMIENTAS DE TRONZADO Y RANURADO - EXTERIOR
 CODIFICATION ISO/ANSI - OUTILS DE TRONÇONNAGE ET GORGES - TOURNAGE EXTÉRIEUR

ISO	1	2	3	4	5	6	7	8	9	10	11
	G	F	I	L	25	25	M	0316	R	030	017
ANSI	1	2	3	4	5 & 6	7	8	9	10	11	
	G	F	I	L	16	D	0316	R	1.18	.670	



1	1	2	2	3	3	4	4																										
Clamping designation Tipo de fijación Désignation de la fixation		Holder style – cutting edge angle Tipo de herramienta - ángulo de posición Type d'outil - angle d'attaque		Maximum grooving/turning depth Máxima profundidad de ranurado/torneado Profondeur maximum de gorge/tournage		Version (right/left) R/L Versión (derecha/izquierda) R/L Version (droite/gauche) R/L																											
<p style="text-align: center;">G</p>		<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">α°</th> </tr> </thead> <tbody> <tr><td>G = 0°</td><td>K = 75°</td></tr> <tr><td>R = 15°</td><td>F = 90°</td></tr> <tr><td>T = 30°</td><td>B = 105°</td></tr> <tr><td>S = 45°</td><td>E = 120°</td></tr> <tr><td>W = 60°</td><td>D = 135°</td></tr> </tbody> </table>		α°		G = 0°	K = 75°	R = 15°	F = 90°	T = 30°	B = 105°	S = 45°	E = 120°	W = 60°	D = 135°	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr><td>G = 2,0 × a</td><td>N = 5,5 × a</td></tr> <tr><td>H = 2,5 × a</td><td>O = 6,0 × a</td></tr> <tr><td>I = 3,0 × a</td><td>P = 6,5 × a</td></tr> <tr><td>J = 3,5 × a</td><td>Q = 7,0 × a</td></tr> <tr><td>K = 4,0 × a</td><td>R = 7,5 × a</td></tr> <tr><td>L = 4,5 × a</td><td>S = 8,0 × a</td></tr> <tr><td>M = 5,0 × a</td><td>T = 8,5 × a</td></tr> </tbody> </table>		G = 2,0 × a	N = 5,5 × a	H = 2,5 × a	O = 6,0 × a	I = 3,0 × a	P = 6,5 × a	J = 3,5 × a	Q = 7,0 × a	K = 4,0 × a	R = 7,5 × a	L = 4,5 × a	S = 8,0 × a	M = 5,0 × a	T = 8,5 × a	<p style="text-align: center;">R L</p>	
α°																																	
G = 0°	K = 75°																																
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L = 4,5 × a	S = 8,0 × a																																
M = 5,0 × a	T = 8,5 × a																																

5	6	7	7	8	8																																																																				
Shank height [mm] Altura del mango [mm] Hauteur de manche [mm]	Shank width [mm] Anchura del mango [mm] Largeur de manche [mm]	Holder total length Longitud total Longueur totale de l'outil	Insert width Ancho de plaquita Largeur de plaquette																																																																						
<p style="text-align: center;">12 = 12 mm 16 = 16 mm 20 = 20 mm atd./etc.</p>	<p style="text-align: center;">12 = 12 mm 16 = 16 mm 20 = 20 mm atd./etc.</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">l_1 [mm]</th> <th colspan="2">l_1 [in]</th> </tr> </thead> <tbody> <tr><td>H</td><td>100</td><td>A</td><td>4.000</td></tr> <tr><td>J</td><td>110</td><td>B</td><td>4.500</td></tr> <tr><td>K</td><td>125</td><td>C</td><td>5.000</td></tr> <tr><td>L</td><td>140</td><td>D</td><td>6.000</td></tr> <tr><td>E</td><td>150</td><td>E</td><td>7.000</td></tr> <tr><td>N</td><td>160</td><td>F</td><td>8.000</td></tr> <tr><td>P</td><td>170</td><td></td><td></td></tr> <tr><td>Q</td><td>180</td><td></td><td></td></tr> <tr><td>R</td><td>200</td><td></td><td></td></tr> </tbody> </table>	l_1 [mm]		l_1 [in]		H	100	A	4.000	J	110	B	4.500	K	125	C	5.000	L	140	D	6.000	E	150	E	7.000	N	160	F	8.000	P	170			Q	180			R	200			<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">a [mm]</th> <th colspan="2">a [in]</th> </tr> </thead> <tbody> <tr><td>02</td><td>2,0</td><td></td><td>.079</td></tr> <tr><td>03, 0313, 0316</td><td>3,0</td><td></td><td>.118</td></tr> <tr><td>04, 0413, 0416</td><td>4,0</td><td></td><td>.157</td></tr> <tr><td>05, 0516</td><td>5,0</td><td></td><td>.197</td></tr> <tr><td>06, 0616</td><td>6,0</td><td></td><td>.236</td></tr> <tr><td>08, 0830</td><td>8,0</td><td></td><td>.315</td></tr> </tbody> </table>	a [mm]		a [in]		02	2,0		.079	03, 0313, 0316	3,0		.118	04, 0413, 0416	4,0		.157	05, 0516	5,0		.197	06, 0616	6,0		.236	08, 0830	8,0		.315		
l_1 [mm]		l_1 [in]																																																																							
H	100	A	4.000																																																																						
J	110	B	4.500																																																																						
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N	160	F	8.000																																																																						
P	170																																																																								
Q	180																																																																								
R	200																																																																								
a [mm]		a [in]																																																																							
02	2,0		.079																																																																						
03, 0313, 0316	3,0		.118																																																																						
04, 0413, 0416	4,0		.157																																																																						
05, 0516	5,0		.197																																																																						
06, 0616	6,0		.236																																																																						
08, 0830	8,0		.315																																																																						

6 & 7							
	b [in]	h [in]	b [in]	h [in]	b [in]	h [in]	
05	5/16	5/16	12	3/4	3/4	20	1 1/4
06	3/8	3/8	16	1	1	24	1 1/2
08	1/2	1/2	85	1	1 1/4	32	2
10	5/8	5/8	86	1	1 1/2		

For square shanks, the number is the width or height in terms of 16ths. For rectangular shanks the first digit is the width in terms of 8ths and the second digit is the height in terms of 4ths.

Para mangos cuadrados, el dígito indica el ancho o la altura en número de dieciseisavos de pulgada. Para mangos rectangulares, el primer dígito indica el ancho en número de octavos de pulgada y el segundo dígito indica la altura en número de cuartos de pulgada.

Pour les manches carrés, c'est le nombre 16 de la largeur et de la hauteur en pouce. Pour les manches rectangulaires le premier dígito est le nombre 8 de la largeur en pouce et le second dígito le nombre 4 de la hauteur en pouce.

9	9	10	10
<p style="text-align: center;">L R</p>		<p style="text-align: center;">D_{max}</p>	
<p style="text-align: center;">Blade curvature direction Dirección de la curvatura de la lama Direction de la lame incurvée</p>		<p style="text-align: center;">Maximum diameter - face grooving Diámetro máximo - ranurado frontal Diámetro maximum - gorge frontale</p>	
<p style="text-align: center;">Additional information for axial turning. Información adicional para ranurado axial o frontal. Information complémentaire pour tournage axial</p>		<p style="text-align: center;">Additional information for axial turning. Información adicional para ranurado axial o frontal. Information complémentaire pour tournage axial</p>	
		11	11
		<p style="text-align: center;">D_{min}</p>	
		<p style="text-align: center;">Minimum diameter - face grooving Diámetro mínimo - ranurado frontal Diámetro minimum - gorge frontale</p>	
		<p style="text-align: center;">Additional information for axial turning. Información adicional para ranurado axial o frontal. Information complémentaire pour tournage axial</p>	

ISO/ANSI CODE DESIGNATION – PARTING AND GROOVING TOOLS – INTERNAL TURNING
 DESIGNACIÓN CÓDIGO ISO/ANSI - HERRAMIENTAS DE TRONZADO Y RANURADO - INTERIOR
 CODIFICATION ISO/ANSI - OUTILS DE TRONÇONNAGE ET GORGES - TOURNAGE INTÉRIEUR

ISO	1	2	3	-	4	5	6	7	8
	A	25	S	-	G	G	H	L	0313
ANSI	1	2	3	-	4	5	6	7	8
	A	16	S	-	G	G	H	L	0313



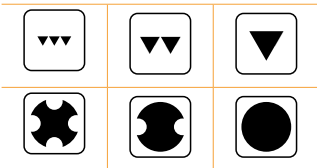
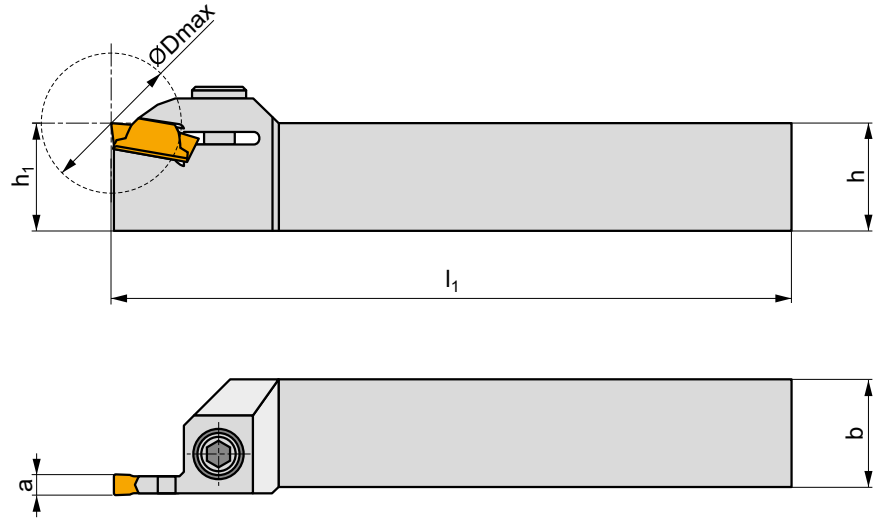
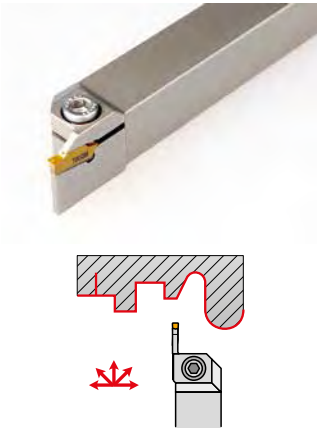
1		2		2		3		3																															
Shank Mango Queue		Diameter of shank Diámetro del mango Diamètre de queue		Diameter of shank Diámetro del mango Diamètre de queue		Holder total length Longitud total Longueur totale de l'outil																																	
S	Steel shank Mango de acero Queue en acier																																						
	A	Steel shank with coolant hole Mango de acero con refrigeración interna Queue en acier avec trou d'arrosage		d [mm]		d [in]		<table border="1"> <thead> <tr> <th>l_1 [mm]</th> <th></th> <th>l_1 [in]</th> <th>l_1 [mm]</th> <th>l_1 [in]</th> </tr> </thead> <tbody> <tr> <td>M</td> <td>150</td> <td>6.000</td> <td>S</td> <td>250</td> <td>10.000</td> </tr> <tr> <td>P</td> <td>170</td> <td>6.250</td> <td>T</td> <td>300</td> <td>12.000</td> </tr> <tr> <td>Q</td> <td>180</td> <td>7.250</td> <td>U</td> <td>350</td> <td>14.000</td> </tr> <tr> <td>R</td> <td>200</td> <td>8.000</td> <td>V</td> <td>400</td> <td>15.750</td> </tr> </tbody> </table>				l_1 [mm]		l_1 [in]	l_1 [mm]	l_1 [in]	M	150	6.000	S	250	10.000	P	170	6.250	T	300	12.000	Q	180	7.250	U	350	14.000	R	200	8.000	V	400
l_1 [mm]			l_1 [in]	l_1 [mm]	l_1 [in]																																		
M		150	6.000	S	250	10.000																																	
P		170	6.250	T	300	12.000																																	
Q		180	7.250	U	350	14.000																																	
R		200	8.000	V	400	15.750																																	
4		5		5		6																																	
Clamping designation Tipo de fijación Désignation de la fixation		Tool style – cutting edge angle Tipo de herramienta - ángulo de posición Type d'outil - angle d'attaque		Tool style – cutting edge angle Tipo de herramienta - ángulo de posición Type d'outil - angle d'attaque		Maximum grooving/turning depth Máxima profundidad de ranurado/torneado Profondeur maximum de gorge/tournage																																	
G																																							
				<table border="1"> <thead> <tr> <th colspan="2">α°</th> </tr> </thead> <tbody> <tr> <td>G = 0°</td> <td>K = 75°</td> </tr> <tr> <td>R = 15°</td> <td>F = 90°</td> </tr> <tr> <td>T = 30°</td> <td>B = 105°</td> </tr> <tr> <td>S = 45°</td> <td>E = 120°</td> </tr> <tr> <td>W = 60°</td> <td>D = 135°</td> </tr> </tbody> </table>		α°		G = 0°	K = 75°	R = 15°	F = 90°	T = 30°	B = 105°	S = 45°	E = 120°	W = 60°	D = 135°	<table border="1"> <tbody> <tr> <td>E = 1,0 × a</td> <td>J = 3,5 × a</td> </tr> <tr> <td>F = 1,5 × a</td> <td>K = 4,0 × a</td> </tr> <tr> <td>G = 2,0 × a</td> <td>L = 4,5 × a</td> </tr> <tr> <td>H = 2,5 × a</td> <td>M = 5,0 × a</td> </tr> <tr> <td>I = 3,0 × a</td> <td>N = 5,5 × a</td> </tr> </tbody> </table> <p>X = Special X = Especial X = Spécial</p>				E = 1,0 × a	J = 3,5 × a	F = 1,5 × a	K = 4,0 × a	G = 2,0 × a	L = 4,5 × a	H = 2,5 × a	M = 5,0 × a	I = 3,0 × a	N = 5,5 × a								
α°																																							
G = 0°	K = 75°																																						
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H = 2,5 × a	M = 5,0 × a																																						
I = 3,0 × a	N = 5,5 × a																																						
7		7		8		8																																	
Version (right/left) R/L Versión (derecha/izquierda) R/L Version (droite/gauche) R/L		Version (right/left) R/L Versión (derecha/izquierda) R/L Version (droite/gauche) R/L		Insert width Ancho de plaquita Largeur de plaquette		Insert width Ancho de plaquita Largeur de plaquette																																	
				a [mm]		a [mm]																																	
				0313		3,0																																	
				0413		4,0																																	

GFK(RL) EXT

P M K N S H

G

T148-T151



ANSI	$h=h_1$	b	l_1	a	D_{max}	lbs	IGI022	IGL03
GFKR/L 10A 02	.625	.625	4.000	.078	1.259	.40	IGI022	IGL03
GFKR/L 12C 02	.750	.750	5.000	.078	1.259	.71	IGI022	IGL03
GFKR/L 16D 02	1.000	1.000	6.000	.078	1.259	1.50	IGI022	IGL05

IGI022	LCMF 022..
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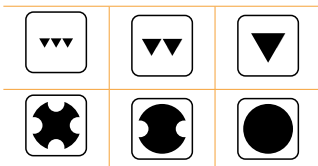
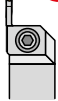
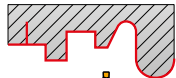
IGL03	HS 0616C	Nm	M6	.63	HXX 5
IGL05	HS 0625C	6.0	M6	.98	HXX 5

GFI(RL) EXT

P M K N S H

G

T148-T153



ANSI	$h=h_1$	b	l_1	a	D_{max}	lbs		
GFIR/L 10A 03	.625	.625	4.000	.118	.708	.40	IGI016	IGL03
GFIR/L 12C 03	.750	.750	5.000	.118	.708	.73	IGI016	IGL03
GFIR/L 16D 03	1.000	1.000	6.000	.118	.708	1.57	IGI016	IGL05
GFIR/L 10A 04	.625	.625	4.000	.157	.944	.40	IGI018	IGL03
GFIR/L 12C 04	.750	.750	5.000	.157	.944	.73	IGI018	IGL03
GFIR/L 16D 04	1.000	1.000	6.000	.157	.944	1.54	IGI018	IGL05
GFIR/L 12C 05	.750	.750	5.000	.196	1.102	.73	IGI019	IGL03
GFIR/L 16D 05	1.000	1.000	6.000	.196	1.102	1.52	IGI019	IGL05
GFIR/L 12C 06	.750	.750	5.000	.236	1.102	.73	IGI020	IGL03
GFIR/L 16D 06	1.000	1.000	6.000	.236	1.102	1.50	IGI020	IGL05
GFIR/L 16D 08	1.000	1.000	7.000	.315	1.890	1.54	IGI021	IGL09
GFIR/L 85E 08	1.250	1.000	7.000	.315	1.890	2.20	IGI021	IGL09

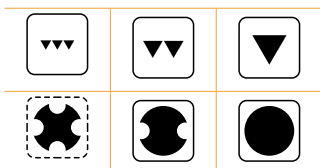
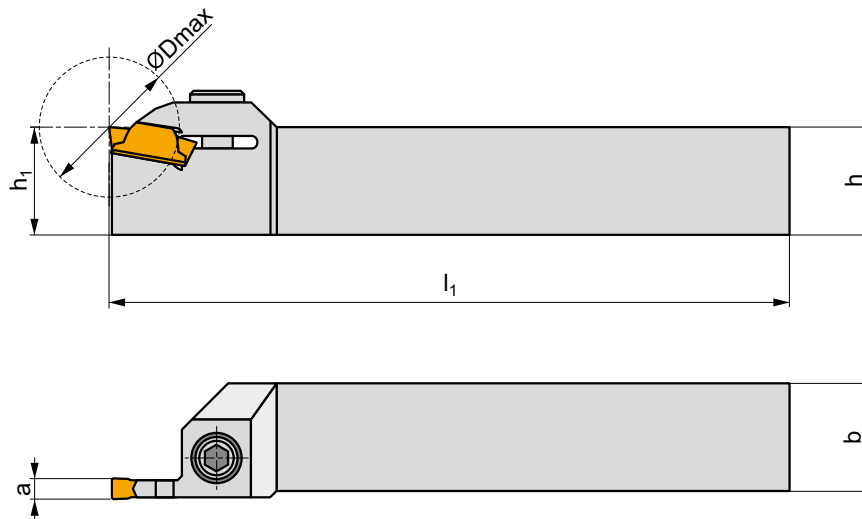
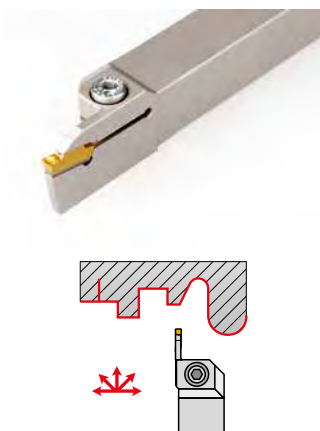
	LCM
IGI016	LCM. 0316..
IGI018	LCM. 0416..
IGI019	LCM. 0516..
IGI020	LCM. 0616..
IGI021	LCM. 083..

IGL05	HS 0625C	6.0	M6	.98	HXK 5
IGL09	HSI 1020	8.0	M10	.79	HXK 6
IGL03	HS 0616C	6.0	M6	.63	HXK 5

GFM(RL) EXT

P M K N S H

G
T148-T153



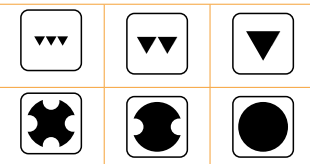
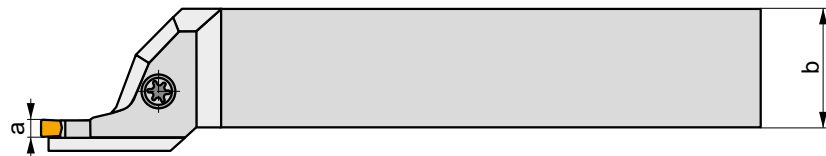
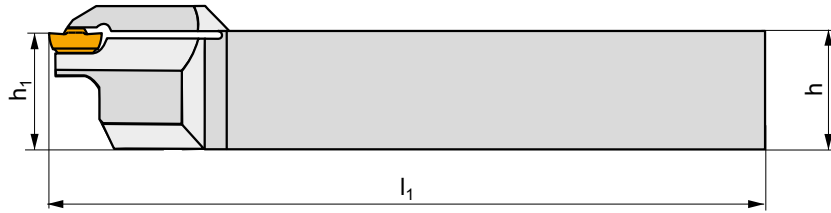
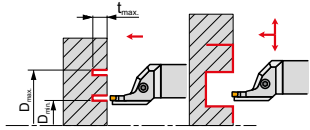
ANSI	$h=h_1$	b	l_1	a	D_{max}	lbs		
GFMR/L 12C 0316	.750	.750	5.000	.118	1.181	.71	IGI016	IGL04
GFMR/L 16D 0316	1.000	1.000	6.000	.118	1.181	.68	IGI016	IGL04
GFMR/L 12C 0416	.750	.750	5.000	.158	1.575	1.50	IGI018	IGL04
GFMR/L 16D 0416	1.000	1.000	6.000	.158	1.575	1.46	IGI018	IGL04
GFMR/L 16D 0516	1.000	1.000	6.000	.197	1.969	1.43	IGI019	IGL04
GFMR/L 85E 0516	1.250	1.000	7.000	.197	1.969	1.41	IGI019	IGL04
GFMR/L 16D 0616	1.000	1.000	6.000	.236	2.362	2.14	IGI020	IGL04
GFMR/L 85E 0616	1.250	1.000	7.000	.236	2.362	2.12	IGI020	IGL04
GFMR/L 85E 0830	1.250	1.000	7.000	.315	3.150	2.03	IGI021	IGL09

IGI016	LCM. 0316..
IGI018	LCM. 0416..
IGI019	LCM. 0516..
IGI020	LCM. 0616..
IGI021	LCM. 083..

IGL04	HS 0620C	6.0	M6	.79	HXK 5
IGL09	HSI 1020	8.0	M10	.79	HXK 6








GFIR-L AXIAL

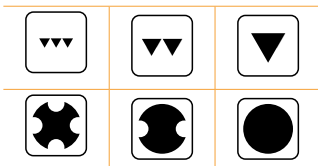
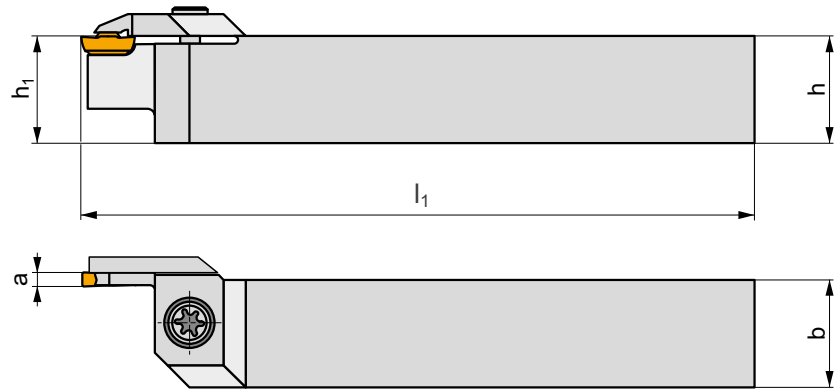
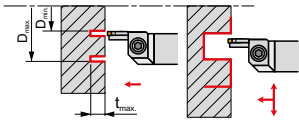
P M K N S H



ANSI	$h=h_1$	b	l_1	a	t_{max}	D_{min}	D_{max}	lbs		
GFIR 16D 03L 1.18-670	1.000	1.000	6.000	.118	.374	.670	1.180	1.52	IGI014	IGL07
GFIR 16D 03L 1.54-940	1.000	1.000	6.000	.118	.374	.940	1.540	1.52	IGI014	IGL07
GFIR 16D 03L 1.97-1.30	1.000	1.000	6.000	.118	.433	1.300	1.970	1.50	IGI014	IGL07
GFIR 16D 03L 2.36-1.69	1.000	1.000	6.000	.118	.433	1.690	2.360	1.50	IGI014	IGL07
GFIR 16D 03L 2.99-2.09	1.000	1.000	6.000	.118	.433	2.090	2.990	1.50	IGI014	IGL07
GFIR 16D 03L 3.94-2.76	1.000	1.000	6.000	.118	.354	2.760	3.940	1.50	IGI016	IGL08
GFIR 16D 03L 5.12-3.54	1.000	1.000	6.000	.118	.354	3.540	5.120	1.52	IGI016	IGL08
GFIR 16D 03L 6.69-4.33	1.000	1.000	6.000	.118	.354	4.330	6.690	1.50	IGI016	IGL08
GFIR 16D 04L 1.18-670	1.000	1.000	6.000	.158	.374	.670	1.180	1.52	IGI017	IGL07
GFIR 16D 04L 1.34-826	1.000	1.000	6.000	.158	.374	.826	1.340	1.54	IGI017	IGL07
GFIR 16D 04L 1.57-1.02	1.000	1.000	6.000	.158	.433	1.020	1.570	1.52	IGI017	IGL07
GFIR 16D 04L 1.97-1.26	1.000	1.000	6.000	.158	.433	1.260	1.970	1.52	IGI017	IGL07
GFIR 16D 04L 2.36-1.65	1.000	1.000	6.000	.158	.433	1.650	2.360	1.52	IGI017	IGL07
GFIR 16D 04L 2.95-2.05	1.000	1.000	6.000	.158	.433	2.050	2.950	1.52	IGI017	IGL07
GFIR 16D 04L 3.94-2.76	1.000	1.000	6.000	.158	.472	2.760	3.940	1.50	IGI018	IGL08
GFIR 16D 04L 5.12-3.54	1.000	1.000	6.000	.158	.472	3.540	5.120	1.50	IGI018	IGL08
GFIR 16D 04L 6.69-4.33	1.000	1.000	6.000	.158	.472	4.330	6.690	1.50	IGI018	IGL08
GFIR 16D 04L 9.06-5.51	1.000	1.000	6.000	.158	.472	5.510	9.060	1.50	IGI018	IGL08








IGI014	LCM. 0313..
IGI016	LCM. 0316..
IGI017	LCM. 0413..
IGI018	LCM. 0416..

		 Nm				
IGL07	US 5018-T20P	5.0	M5	.71	FLAG T20P	-
IGL08	US 6020-T25P	6.0	M6	.79	-	SDR T25P

GFIL-R AXIAL
P M K N S H


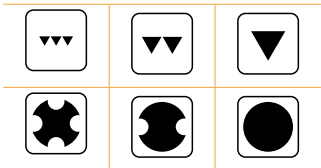
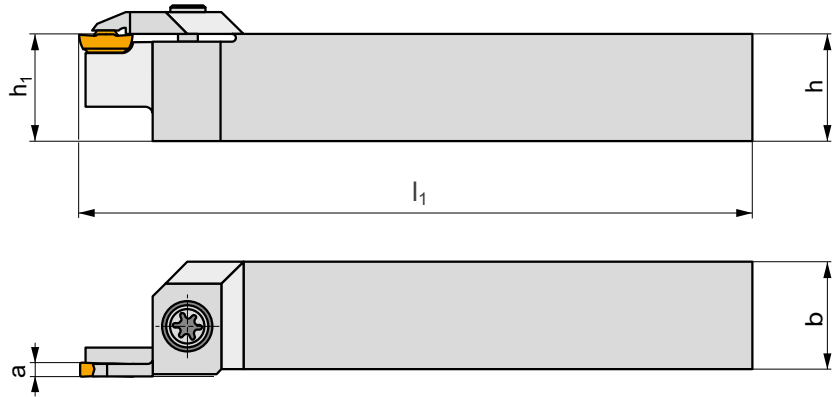
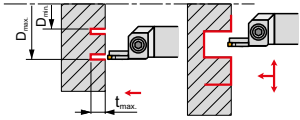
ANSI	$h=h_1$	b	l_1	a	t_{max}	D_{min}	D_{max}	lbs		
GFIL 16D 03R 1.18-.670	1.000	1.000	6.000	.118	.374	.670	1.180	1.52	IGI014	IGL07
GFIL 16D 03R 1.54-.940	1.000	1.000	6.000	.118	.374	.940	1.540	1.52	IGI014	IGL07
GFIL 16D 03R 1.97-1.30	1.000	1.000	6.000	.118	.433	1.300	1.970	1.50	IGI014	IGL07
GFIL 16D 03R 2.36-1.69	1.000	1.000	6.000	.118	.433	1.690	2.360	1.50	IGI014	IGL07
GFIL 16D 03R 2.99-2.09	1.000	1.000	6.000	.118	.433	2.090	2.990	1.50	IGI014	IGL07
GFIL 16D 03R 3.94-2.76	1.000	1.000	6.000	.118	.354	2.760	3.940	1.50	IGI016	IGL08
GFIL 16D 03R 5.12-3.54	1.000	1.000	6.000	.118	.354	3.540	5.120	1.52	IGI016	IGL08
GFIL 16D 03R 6.69-4.33	1.000	1.000	6.000	.118	.354	4.330	6.690	1.50	IGI016	IGL08
GFIL 16D 04R 1.18-.670	1.000	1.000	6.000	.158	.374	.670	1.180	1.52	IGI017	IGL07
GFIL 16D 04R 1.34-.826	1.000	1.000	6.000	.158	.374	.826	1.340	1.54	IGI017	IGL07
GFIL 16D 04R 1.57-1.02	1.000	1.000	6.000	.158	.433	1.020	1.570	1.52	IGI017	IGL07
GFIL 16D 04R 1.97-1.26	1.000	1.000	6.000	.158	.433	1.260	1.970	1.52	IGI017	IGL07
GFIL 16D 04R 2.36-1.65	1.000	1.000	6.000	.158	.433	1.650	2.360	1.52	IGI017	IGL07
GFIL 16D 04R 2.95-2.05	1.000	1.000	6.000	.158	.433	2.050	2.950	1.52	IGI017	IGL07
GFIL 16D 04R 3.94-2.76	1.000	1.000	6.000	.158	.472	2.760	3.940	1.50	IGI018	IGL08
GFIL 16D 04R 5.12-3.54	1.000	1.000	6.000	.158	.472	3.540	5.120	1.50	IGI018	IGL08
GFIL 16D 04R 6.69-4.33	1.000	1.000	6.000	.158	.472	4.330	6.690	1.50	IGI018	IGL08
GFIL 16D 04R 9.06-5.51	1.000	1.000	6.000	.158	.472	5.510	9.060	1.50	IGI018	IGL08

IGI014	LCM. 0313..
IGI016	LCM. 0316..
IGI017	LCM. 0413..
IGI018	LCM. 0416..

		 Nm				
IGL07	US 5018-T20P	5.0	M5	.71	FLAG T20P	-
IGL08	US 6020-T25P	6.0	M6	.79	-	SDR T25P

GFIR-R AXIAL

P M K N S H



ANSI	$h=h_1$	b	l_1	a	t_{max}	D_{min}	D_{max}	lbs	IGI014	IGL07
GFIR 16D 0313R 1.18-.670	1.000	1.000	6.000	.118	.354	.670	1.180	1.46	IGI014	IGL07
GFIR 16D 0313R 1.54-.940	1.000	1.000	6.000	.118	.354	.940	1.540	1.48	IGI014	IGL07
GFIR 16D 0313R 1.97-1.30	1.000	1.000	6.000	.118	.354	1.300	1.970	1.50	IGI014	IGL07
GFIR 16D 0313R 2.36-1.69	1.000	1.000	6.000	.118	.354	1.690	2.360	1.52	IGI014	IGL07
GFIR 16D 0313R 2.99-2.09	1.000	1.000	6.000	.118	.354	2.090	2.990	1.52	IGI014	IGL07
GFIR 16D 0316R 3.94-2.76	1.000	1.000	6.000	.118	.354	2.760	3.940	1.54	IGI016	IGL07
GFIR 16D 0316R 5.12-3.54	1.000	1.000	6.000	.118	.354	3.540	5.120	1.57	IGI016	IGL07
GFIR 16D 0316R 6.69-4.33	1.000	1.000	6.000	.118	.354	4.330	6.690	1.57	IGI016	IGL07

IGI014	LCM. 0313..
IGI016	LCM. 0316..

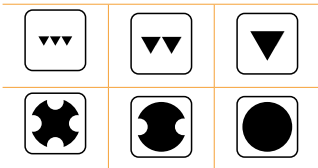
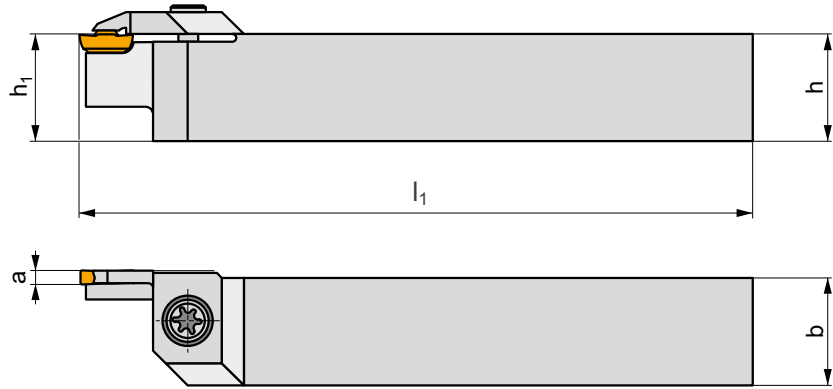
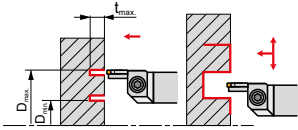
IGL07	US 5018-T20P	5.0	M5	.71	FLAG T20P
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GFIL-L AXIAL

P M K N S H

G

T148-T153



ANSI	$h=h_1$	b	l_1	a	t_{max}	D_{min}	D_{max}	lbs	IGI014	IGL07
GFIL 16D 0313L 1.18-.670	1.000	1.000	6.000	.118	.354	.670	1.180	1.46	IGI014	IGL07
GFIL 16D 0313L 1.54-.940	1.000	1.000	6.000	.118	.354	.940	1.540	1.48	IGI014	IGL07
GFIL 16D 0313L 1.97-1.30	1.000	1.000	6.000	.118	.354	1.300	1.970	1.50	IGI014	IGL07
GFIL 16D 0313L 2.36-1.69	1.000	1.000	6.000	.118	.354	1.690	2.360	1.52	IGI014	IGL07
GFIL 16D 0313L 2.99-2.09	1.000	1.000	6.000	.118	.354	2.090	2.990	1.52	IGI014	IGL07
GFIL 16D 0316L 3.94-2.76	1.000	1.000	6.000	.118	.354	2.760	3.940	1.54	IGI016	IGL07
GFIL 16D 0316L 5.12-3.54	1.000	1.000	6.000	.118	.354	3.540	5.120	1.57	IGI016	IGL07
GFIL 16D 0316L 6.69-4.33	1.000	1.000	6.000	.118	.354	4.330	6.690	1.57	IGI016	IGL07

IGI014	LCM. 0313..
IGI016	LCM. 0316..

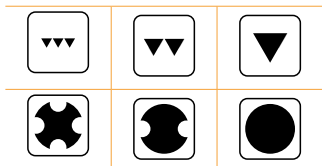
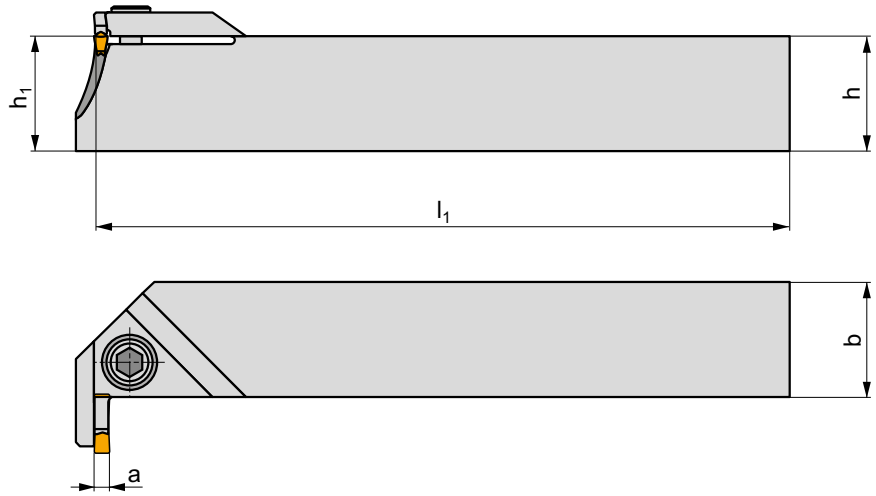
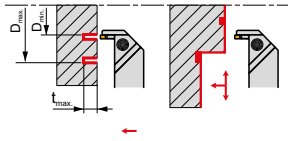
IGL07	US 5018-T20P	5.0	M5	.71	FLAG T20P
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GGI(RL)-90 AXIAL

P M K N S H

G

T148-T153



ANSI	$h=h_1$	b	l_1	a	t_{max}	D_{min}	D_{max}	lbs		
GGIR 16D 03R 1.18-.670	1.000	1.000	6.000	.118	.374	.670	1.180	1.70	IGI014	IGL01
GGIR 16D 03R 1.54-.940	1.000	1.000	6.000	.118	.374	.940	1.540	1.70	IGI014	IGL01
GGIR 16D 03R 1.97-1.30	1.000	1.000	6.000	.118	.433	1.300	1.970	1.70	IGI014	IGL01
GGIR 16D 03R 2.36-1.69	1.000	1.000	6.000	.118	.433	1.690	2.360	1.70	IGI014	IGL01
GGIR 16D 03R 2.99-2.09	1.000	1.000	6.000	.118	.433	2.090	2.990	1.70	IGI014	IGL01
GGIR 16D 03R 3.94-2.76	1.000	1.000	6.000	.118	.354	2.760	3.940	1.70	IGI016	IGL04
GGIR 16D 03R 5.12-3.54	1.000	1.000	6.000	.118	.354	3.540	5.120	1.70	IGI016	IGL04
GGIR 16D 03R 6.69-4.33	1.000	1.000	6.000	.118	.354	4.330	6.690	1.70	IGI016	IGL04
GGIL 16D 03L 1.18-.670	1.000	1.000	6.000	.118	.374	.670	1.180	1.70	IGI014	IGL01
GGIL 16D 03L 1.54-.940	1.000	1.000	6.000	.118	.374	.940	1.540	1.70	IGI014	IGL01
GGIL 16D 03L 1.97-1.30	1.000	1.000	6.000	.118	.433	1.300	1.970	1.70	IGI014	IGL01
GGIL 16D 03L 2.36-1.69	1.000	1.000	6.000	.118	.433	1.690	2.360	1.70	IGI014	IGL01
GGIL 16D 03L 2.99-2.09	1.000	1.000	6.000	.118	.433	2.090	2.990	1.70	IGI014	IGL01
GGIL 16D 03L 3.94-2.76	1.000	1.000	6.000	.118	.354	2.760	3.940	1.70	IGI016	IGL04
GGIL 16D 03L 5.12-3.54	1.000	1.000	6.000	.118	.354	3.540	5.120	1.70	IGI016	IGL04
GGIL 16D 03L 6.69-4.33	1.000	1.000	6.000	.118	.354	4.330	6.690	1.70	IGI016	IGL04

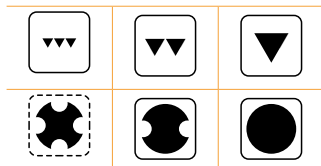
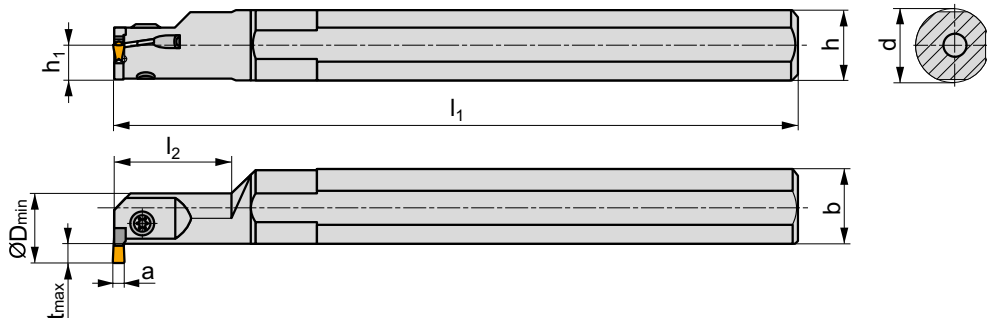
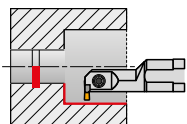
IGI014	LCM. 0313..
IGI016	LCM. 0316..

IGL01	HS 0520C	5.0	M5	.79	HXK 4
IGL04	HS 0620C	6.0	M6	.79	HXK 5

GG.(RL) INT

P M K N S H

G
T148-T153



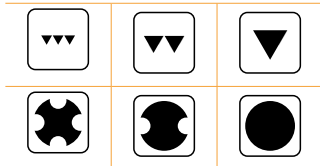
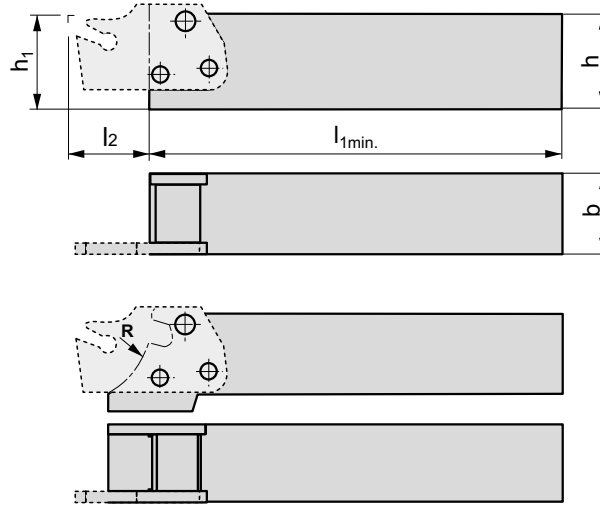
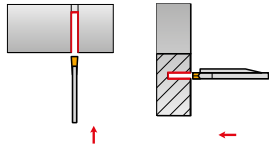
ANSI	d	h	h ₁	b	l ₁	l ₂	a	t _{max}	D _{min}				
A10Q-GGER/L 0313-04	.625	.591	.296	.608	7.000	.984	.118	.118	.630	✓	.51	IGI015	IGL06
A12R-GGFR/L 0313-04	.750	.709	.355	.729	8.000	1.181	.118	.217	.787	✓	.73	IGI015	IGL06
A16S-GGHR/L 0313	1.000	.906	.453	.953	10.000	1.575	.118	.295	.984	✓	1.70	IGI014	IGL06
A16S-GGFR/L 0413	1.000	.906	.453	.953	10.000	1.575	.158	.295	.984	✓	1.70	IGI017	IGL06
A20T-GGHR/L 0413	1.250	1.181	.591	1.216	12.000	1.969	.158	.413	1.260	✓	3.42	IGI017	IGL06

IGI014	LCM. 0313..
IGI015	LCM. 0313....04
IGI017	LCM. 0413..

IGL06	SR 85011-T15P	5.0	M5	.35	FLAG T15P

MS-EN

T148-T154



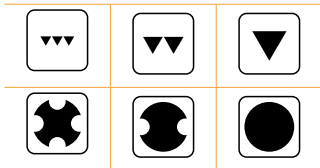
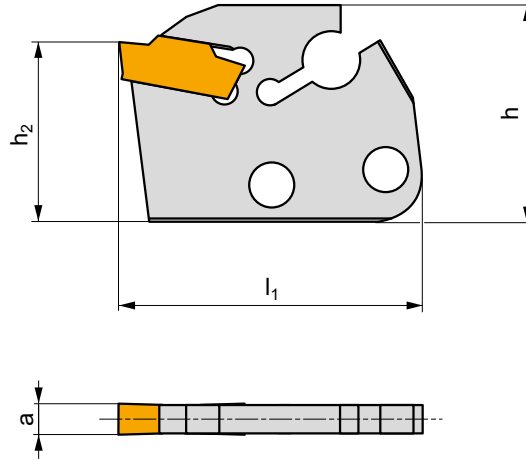
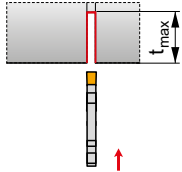
ANSI	$h=h_1$	b	l_{1min}	l_2	R	lbs		
MS-EN-08 A	.500	.500	4.000	.591 (.788)	-	.29	IGI072	IND4
MS-EN-10 A	.625	.625	4.000	.591 (.788)	-	.44	IGI072	IND4
MS-EN-12 C	.750	.750	5.000	.591 (.984)	-	.82	IGI068	IND5
MS-EN-16 D	1.000	1.000	6.000	.591 (.984)	-	1.65	IGI068	IND5
MS-EN-85 E	1.250	1.000	7.000	.591 (.984)	-	2.40	IGI068	IND5

IGI068	XLC.. 25..15...
IGI072	XLCF. 16..15...

IND4	3x US 4011-T15P	3.5	M4	.42	-	-	-	-	FLAG T15P
IND5	2x US 45013-T20P	5.0	M5	.51	US 46017-T20P	5.0	M6	17	FLAG T20P

XLCCN 25 BS

P M K N S H



ANSI	h	h ₂	l ₁	a	t _{max}	lbs		
XLCCN 250215-0316	1.142	.945	1.575	.118	.591	.02	IGI016	-
XLCCN 250225-0316	1.142	.945	1.969	.118	.984	.04	IGI016	-
XLCCN 250315-0416	1.142	.945	1.575	.157	.591	.04	IGI018	-
XLCCN 250325-0416	1.142	.945	1.969	.157	.984	.07	IGI018	-
XLCCN 250425-0516	1.142	.945	1.969	.197	.984	.07	IGI019	-
XLCCN 250525-0616	1.142	.945	1.969	.236	.984	.09	IGI020	-

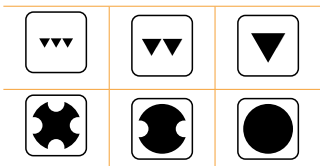
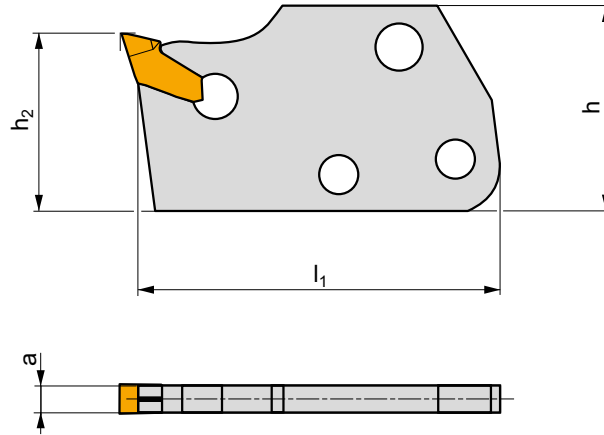
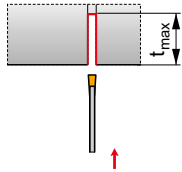
IGI016	LCM. 0316..
IGI018	LCM. 0416..
IGI019	LCM. 0516..
IGI020	LCM. 0616..

XLCF(NRL) BS

P M K N S H

X

T153-T154



ANSI	h	h ₂	l ₁	a	t _{max}	lbs		
XLCFN 160215-3.00	.984	.472	1.378	.122	.591	.02	IGI025	KV
XLCFN 160220-3.00	.984	.472	1.575	.122	.787	.04	IGI025	KV
XLCFN 250215-3.00	1.142	.945	1.575	.122	.591	.04	IGI025	KV
XLCFN 250225-3.00	1.142	.945	1.969	.122	.984	.04	IGI025	KV
XLCFN 250315-4.00	1.142	.945	1.575	.161	.591	.04	IGI026	KV
XLCFN 250325-4.00	1.142	.945	1.969	.161	.984	.07	IGI026	KV
XLCFN 250425-5.00	1.142	.945	1.969	.201	.984	.09	IGI027	KV
XLCFN 250525-6.35	1.142	.945	1.969	.250	.984	.09	IGI028	KV
XLCFR/L 160115-1.60	.984	.472	1.378	.059 - .063	.591	.02	IGI023	KV
XLCFR/L 160115-2.00	.984	.472	1.378	.079 - .087	.591	.02	IGI024	KV
XLCFR/L 250115-1.60	1.142	.945	1.575	.059 - .063	.591	.02	IGI023	KV
XLCFR/L 250115-2.00	1.142	.945	1.575	.079 - .087	.591	.02	IGI024	KV

IGI023	LFMX 1.5.	LFMX 1.6.
IGI024	LFMX 2..	LFMX 2.2.
IGI025	LFMX 3.1.	-
IGI026	LFMX 4.1.	-
IGI027	LFMX 5.1.	-
IGI028	LFMX 6.35.	-

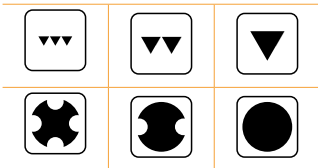
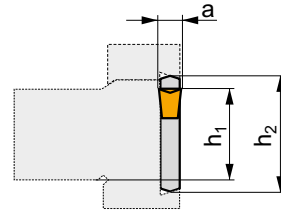
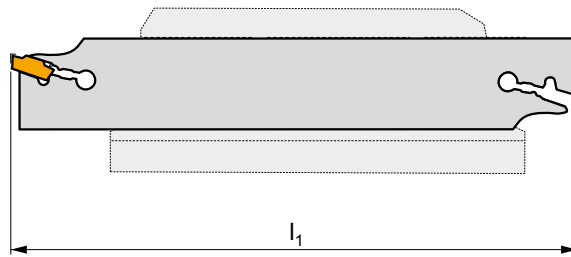
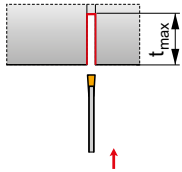
KV	KV 5x70

XLCCN B

P M K N S H

X

T148-T153



ANSI	h_1	h_2	l_1	a	t_{max}	lbs		
XLCCN 2602 J 0316	.787	1.024	4.331	.118	1.378	.11	IGI016	KV1
XLCCN 3202 M 0316	.984	1.260	5.906	.118	1.969	.18	IGI016	KV1
XLCCN 3203 M 0416	.984	1.260	5.906	.157	1.969	.24	IGI018	KV1
XLCCN 3204 M 0516	.984	1.260	5.906	.197	2.362	.31	IGI019	KV1
XLCCN 3205 M 0616	.984	1.260	5.906	.236	2.362	.37	IGI020	KV1

IGI016	LCM. 0316..
IGI018	LCM. 0416..
IGI019	LCM. 0516..
IGI020	LCM. 0616..

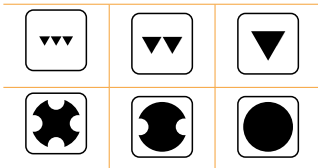
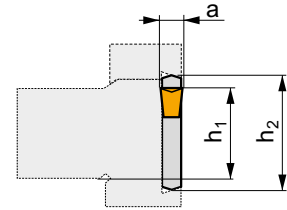
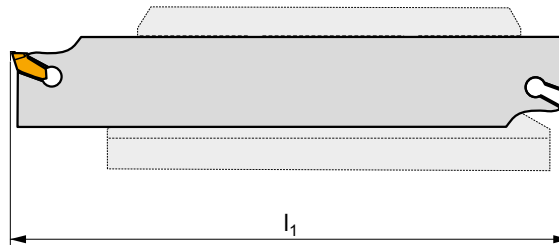
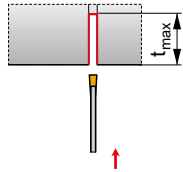
KV1	KV 5x100

XLCFN B

P M K N S H

X

T153-T154



ANSI	h_1	h_2	l_1	a	t_{max}	lbs	IGI023	KV
XLCFN 2601 J 1.60	.787	1.024	4.331	.059 - .063	.591	.07	IGI023	KV
XLCFN 2601 J 2.00	.787	1.024	4.331	.079 - .087	.984	.09	IGI024	KV
XLCFN 2602 J 3.00	.787	1.024	4.331	.122	1.476	.11	IGI025	KV
XLCFN 2603 J 4.00	.787	1.024	4.331	.161	1.575	.13	IGI026	KV
XLCFN 3201 M 1.60	.984	1.260	5.906	.059 - .063	.591	.13	IGI023	KV
XLCFN 3201 M 2.00	.984	1.260	5.906	.079 - .087	.984	.15	IGI024	KV
XLCFN 3202 M 3.00	.984	1.260	5.906	.122	1.969	.18	IGI025	KV
XLCFN 3203 M 4.00	.984	1.260	5.906	.161	1.969	.24	IGI026	KV
XLCFN 3204 M 5.00	.984	1.260	5.906	.201	2.362	.31	IGI027	KV
XLCFN 3205 M 6.35	.984	1.260	5.906	.250	2.362	.37	IGI028	KV
XLCFN 4502 S 3.00	1.260	1.772	9.843	.122	3.150	.26	IGI025	KV
XLCFN 4503 S 4.00	1.260	1.772	9.843	.161	3.150	.42	IGI026	KV
XLCFN 4504 S 5.00	1.260	1.772	9.843	.201	3.150	.62	IGI027	KV
XLCFN 4505 S 6.35	1.260	1.772	9.843	.250	3.150	.88	IGI028	KV

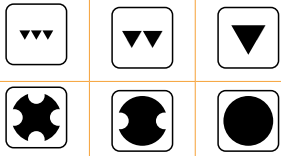
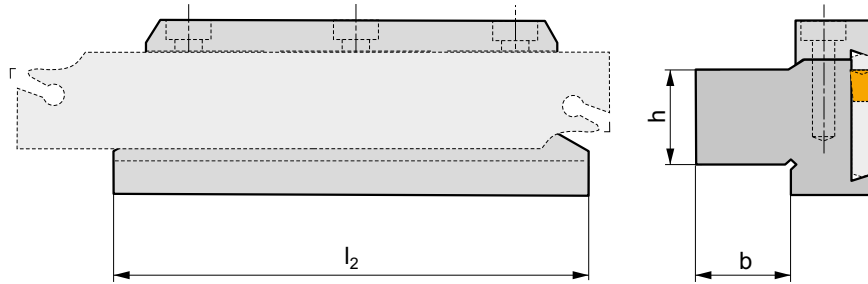
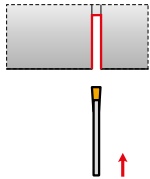
IGI023	LFMX 1.5.	LFMX 1.6.
IGI024	LFMX 2..	LFMX 2.2.
IGI025	LFMX 3.1.	-
IGI026	LFMX 4.1.	-
IGI027	LFMX 5.1.	-
IGI028	LFMX 6.35.	-

KV	KV 5x70

DU. D

P M K N S H

T148-T154



ANSI	h	b	l_2	lbs		
26-DU 12	.750	.750	3.540	1.15	IGI069	IND2
32-DU 74	1.000	.875	4.330	1.87	IGI070	IND2
32-DU 104	1.000	1.250	4.330	2.31	IGI070	IND2
32-DU 95	1.250	1.125	4.330	2.31	IGI070	IND2
45-DU 95	1.250	1.125	4.330	2.98	IGI071	IND7
45-DU 24	1.500	1.500	4.330	3.90	IGI071	IND7

IGI069	XLC.N 26..
IGI070	XLC.N 32..
IGI071	XLC.N 45..

IND2	HS 0625	6.0	M6	.98	HXX 5
IND7	HS 0630	6.0	M6	1.18	HXX 5

ISO/ANSI CODE DESIGNATION – THREADING
 DESIGNACIÓN CÓDIGO ISO/ANSI – ROSCADO
 CODIFICATION ISO/ANSI - FILETAGE

ISO	1	2	3	-	4	5	6	7	-	8
	S	E	R		S	2525	M	16		
ANSI	1	2	3	-	4	5	6	7	-	8
	S	E	R		S	16	D	16		

1	1	2	2	3	3	4	4	
Clamping designation Tipo de fijación Désignation de la fixation		Machining orientation Tipo de mecanizado Procédé d'usinage		Direction of cut Dirección del corte Direction de coupe		Type of construction Tipo de construcción Type de construction		
C		E External Exterior Extérieur		R - Right	External Exterior Extérieur		-	Normal
P					Internal Intérieur			
M		I Internal Intérieur		L - Left	External Exterior Extérieur		S	Special Especial Spécial
S					Internal Intérieur			

5	
Holder dimensions [mm] Dimensiones del portaherramientas [mm] Dimensions de l'outil [mm]	
External turning Mecanizado exterior Tournage extérieur	2525 25 x 25 mm
Internal turning Mecanizado interior Tournage intérieur	1416 Shank - 14 mm / Shank height \varnothing - 16 mm Mango - 14 mm / \varnothing montaje - 16mm Queue - 14 mm / \varnothing Hauteur de manche - 16 mm

6	
Holder total length Longitud total Longueur totale de l'outil	
	l_1 [mm]
	K 125
	L 140
	M 150
	N 160
	P 170
	Q 180
	R 200
	S 250
	T 300

7		7
Insert cutting edge length (insert size) Longitud del filo de corte (tamaño de plaqueta) Longueur de l'arête de coupe (taille de plaquette)		
d = I.C.		T
	[mm]	[in]
	6,350	1/4
	9,525	3/8
	12,700	1/2
		11
		16
		22

5															
Tool dimensions [in] Dimensiones de la herramienta (pulgadas) Dimensions de l'outil [in]															
	<table border="1"> <tr> <td>b [in]</td> <td>h [in]</td> </tr> <tr> <td>10 5/8</td> <td>5/8</td> </tr> <tr> <td>12 3/4</td> <td>3/4</td> </tr> <tr> <td>16 1</td> <td>1</td> </tr> <tr> <td>85 1</td> <td>1 1/4</td> </tr> <tr> <td>86 1</td> <td>1 1/2</td> </tr> <tr> <td>20 1 1/4</td> <td>1 1/4</td> </tr> </table>	b [in]	h [in]	10 5/8	5/8	12 3/4	3/4	16 1	1	85 1	1 1/4	86 1	1 1/2	20 1 1/4	1 1/4
b [in]	h [in]														
10 5/8	5/8														
12 3/4	3/4														
16 1	1														
85 1	1 1/4														
86 1	1 1/2														
20 1 1/4	1 1/4														
	For square shanks, the number is the width or height in terms of 16ths. For rectangular shanks the first digit is the width in terms of 8ths and the second digit is the height in terms of 4ths. Para mangos cuadrados, el dígito indica el ancho o la altura en número de dieciseisavos de pulgada. Para mangos rectangulares, el primer dígito indica el ancho en número de octavos de pulgada y el segundo dígito indica la altura en número de cuartos de pulgada. Pour les manches carrés, c'est le nombre 16 de la largeur et de la hauteur en pouce. Pour les manches rectangulaires le premier dígito est le nombre 8 de la largeur en pouce et le second dígito le nombre 4 de la hauteur en pouce.														
	<table border="1"> <tr> <td>d [in]</td> </tr> <tr> <td>08 .500</td> </tr> <tr> <td>10 .625</td> </tr> <tr> <td>12 .750</td> </tr> <tr> <td>16 1.000</td> </tr> <tr> <td>20 1.250</td> </tr> <tr> <td>24 1.500</td> </tr> </table>	d [in]	08 .500	10 .625	12 .750	16 1.000	20 1.250	24 1.500							
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24 1.500															

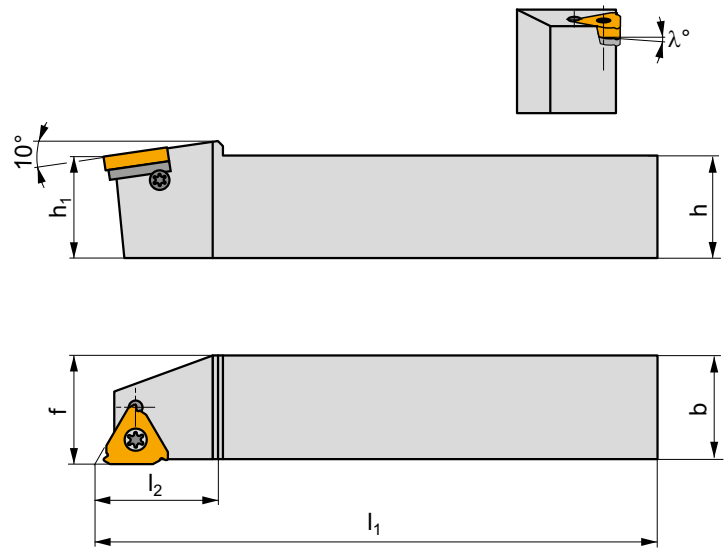
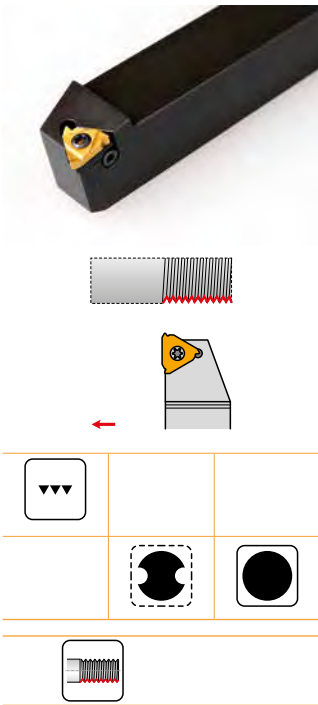
6	
	l_1 [in]
	C 5.000
	D 6.000
	E 7.000
	F 8.000
	l_1 [in]
	K 5.000
	M 6.000
	P 6.250
	Q 7.250
	R 8.000
	S 10.000
	T 12.000
	U 14.000

8		8
Helix angle λ Ángulo de hélice λ Angle d'hélice λ		
0	Helix angle $\lambda = 0^\circ$ Ángulo de hélice $\lambda = 0^\circ$ Angle d'hélice $\lambda = 0^\circ$	
1	Helix angle $\lambda = 1^\circ$ Ángulo de hélice $\lambda = 1^\circ$ Angle d'hélice $\lambda = 1^\circ$	
2	Helix angle $\lambda = 2^\circ$ Ángulo de hélice $\lambda = 2^\circ$ Angle d'hélice $\lambda = 2^\circ$	

SE(RL)

P M K N S H

S
T156-T178



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	lbs		
SER/L 12 C16	.750	.750	.750	5.000	.900	T334	.77	IGI048	IZ12
SER/L 16 D16	1.000	1.000	1.000	6.000	.950	T334	1.54	IGI048	IZ12
SER/L 85 D16	1.250	1.000	1.000	6.000	1.000	T334	1.98	IGI048	IZ12
SER/L 16 D22	1.000	1.000	1.000	6.000	1.000	T334	1.54	IGI052	IZ13
SER/L 85 D22	1.250	1.000	1.000	6.000	1.000	T334	1.98	IGI052	IZ13

IGI048	TN 16EL..	TN 16ER..
IGI052	TN 22EL..	TN 22ER..

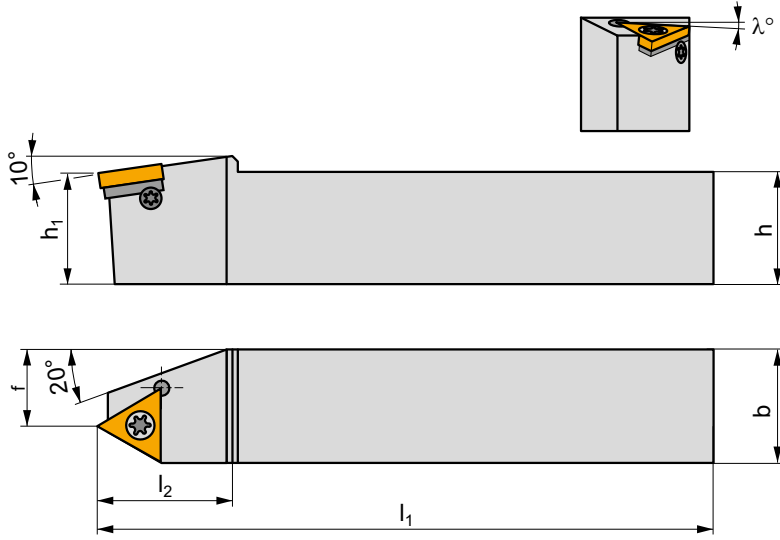
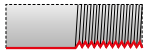
IZ12	US 3512A-T15P	3.0	M3.5	.50	-	HS 0304	FLAG T15P	HXK 2.5	T334
IZ13	US 4514A-T20	5.0	M4.5	.55	SP 0405	-	FLAG T20	-	T334

SE(RL)-S

P M K N S H

S

T156-T178



ANSI	$h=h_1$	b	f	l_1	l_2	λ°	lbs	IGI053	IZ13
SER/L-S 16 D22	1.000	1.000	.575	6.000	1.200	T334	.77	IGI053	IZ13
SER/L-S 85 D22	1.250	1.000	.575	6.000	1.200	T334	1.54	IGI053	IZ13



IGI053



TN 22EN..



IZ13



US 4514A-T20



3.0



M4.5



.55



SP 0405



FLAG T20

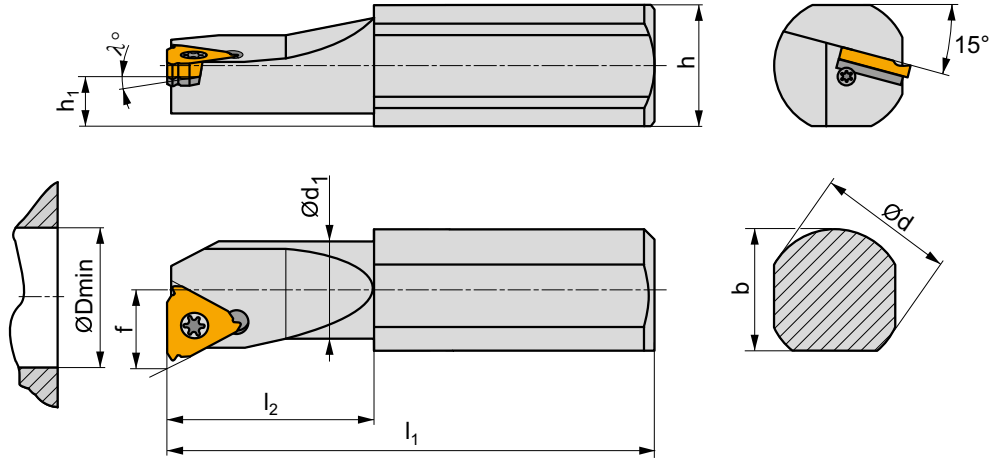
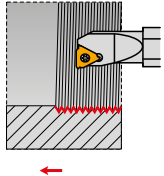


T334

SI(RL)

P M K N S H

S
T156-T178



ANSI	b	d	D _{min}	d ₁	f	h	h ₁	l ₁	l ₂	λ°		lbs			
SIR/L 10 K11-0	.570	.625	.500	.380	.295	.550	-	5.000	1.000	0	-	.33	IGI046	IZ11	
SIR/L 10 K11-1	.570	.625	.500	.380	.295	.550	-	5.000	1.000	1	-	.33	IGI046	IZ11	
SIR/L 10 M11-0	.570	.625	.630	.500	.350	.550	-	6.000	1.250	0	-	.44	IGI046	IZ11	
SIR/L 10 M11-1	.570	.625	.630	.500	.350	.550	-	6.000	1.250	1	-	.44	IGI046	IZ11	
SIR/L 10 M16-0	.550	.625	.850	-	.450	.550	-	6.000	-	0	-	.44	IGI050	IZ9	
SIR/L 10 M16-1	.550	.625	.850	-	.450	.550	-	6.000	-	1	-	.44	IGI050	IZ9	
SIR/L 10 M16-2**	.550	.625	.650	.600	.430	.550	-	6.000	1.500	2	✓	.44	IGI050	IZ10	
SIR/L 12 P16	.700	.750	.850	-	.500	.700	-	6.250	-		T336	-	.66	IGI050	IZ12
SIR/L 16 Q16	.900	1.000	1.150	-	.650	.900	-	7.250	-		T336	-	1.37	IGI050	IZ12
SIR/L 20 S16	1.200	1.250	1.400	-	.760	1.000	-	10.000	-		T336	-	2.98	IGI050	IZ12
SIR/L 20 S22	1.200	1.250	1.450	-	.850	1.000	-	10.000	-		T336	-	2.98	IGI055	IZ13
SIR/L 20 S22-2**	1.200	1.250	1.000	.950	.650	1.000	-	10.000	3.000	2	✓	2.43	IGI055	IZ14	
SIR/L 24 T22	1.250	1.500	1.750	-	.950	1.450	-	12.000	-		T336	-	5.18	IGI055	IZ13

** With internal coolant

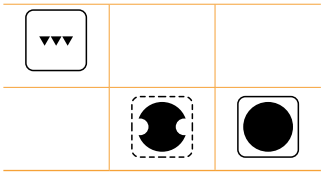
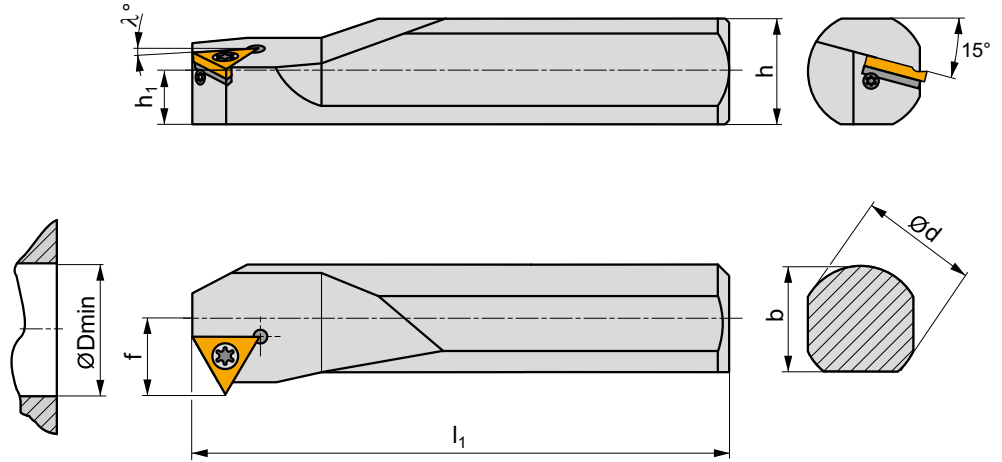
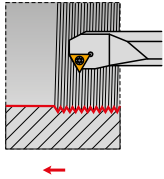
IGI046	TN 11NL..	TN 11NR..
IGI050	TN 16NL..	TN 16NR..
IGI055	TN 22NL..	TN 22NR..

IZ9	US 3510A-T15P	3.0	M3.5	.42	-	-	FLAG T15P	-	P-16	
IZ10	US 3510A-T15P	3.0	M3.5	.42	-	-	FLAG T15P	-	-	
IZ11	US 2506-T07P	.9	M2.5	.25	-	-	FLAG T07P	-	-	
IZ12	US 3512A-T15P	3.0	M3.5	.50	-	HS 0304	FLAG T15P	HXK 2.5		T334
IZ13	US 4514A-T20	5.0	M4.5	.55	SP 0405	-	FLAG T20	-		T334
IZ14	US 4514A-T20	5.0	M4.5	.55	-	-	FLAG T20	-	-	-

SI(RL)-S

P M K N S H

S
T156-T178



ANSI	b	d	D _{min}	f	h	h ₁	l ₁	λ°	lbs	IGI056	IZ13
SIR/L-S 20 S22	1.200	1.250	1.550	.880	1.000	-	10.000	T334	2.87	IGI056	IZ13
SIR/L-S 24 T22	1.250	1.500	1.800	1.020	1.450	-	12.000	T334	5.07	IGI056	IZ13

IGI056	TN 22NN..
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IZ13	US 4514A-T20	5.0	M4.5	.55	SP 0405	FLAG T20	T334
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**TECHNICAL
INFORMATION**

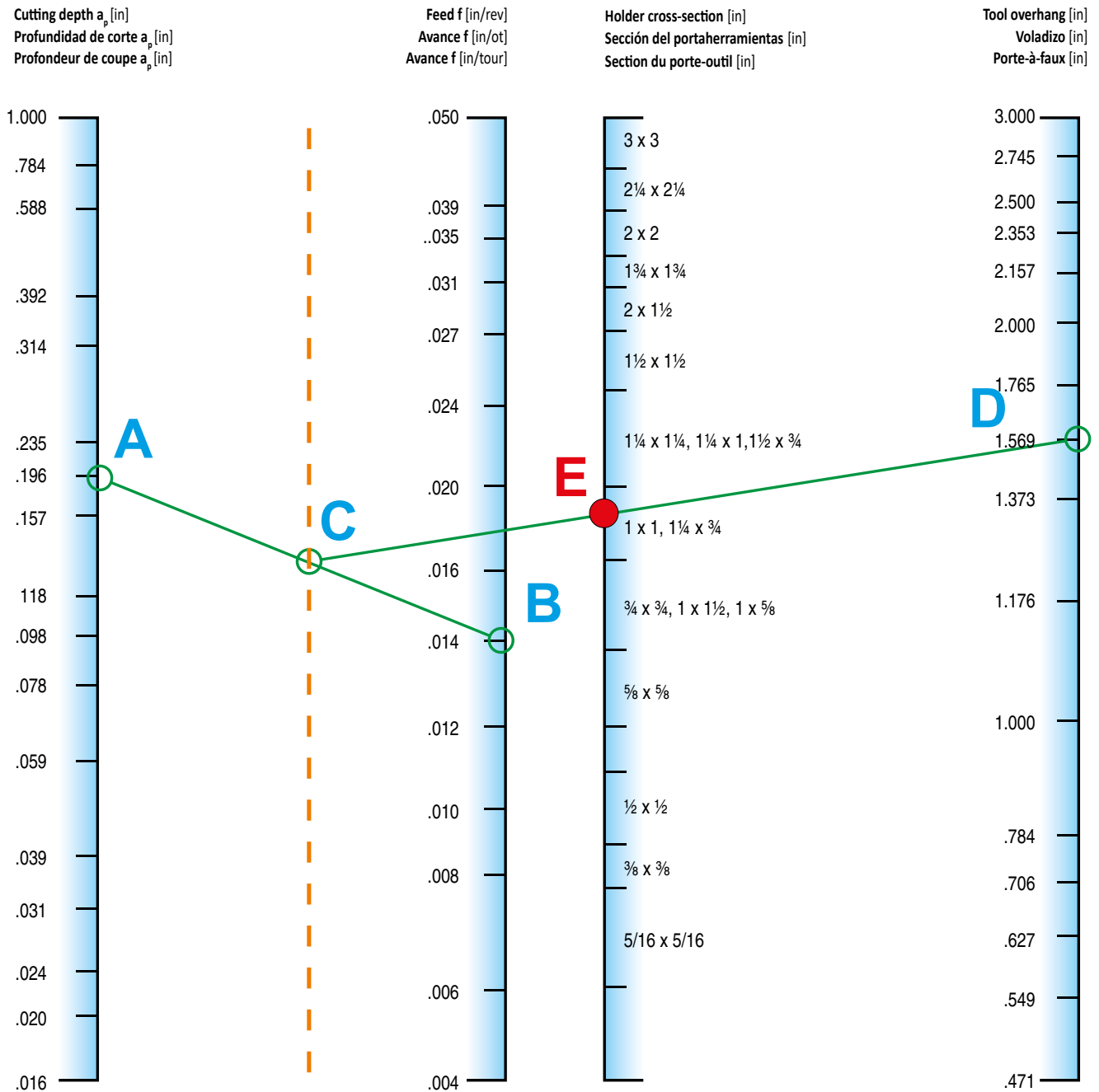
**INFORMACIÓN
TÉCNICA**

**PARTIE
TECHNIQUE**

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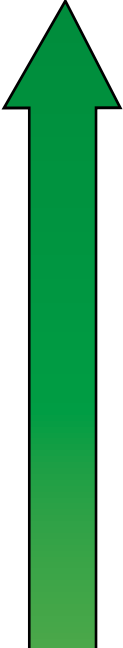





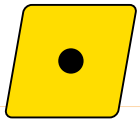
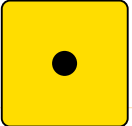
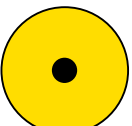
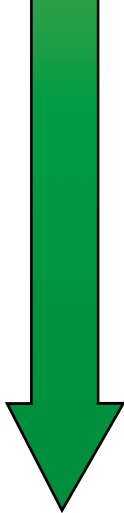
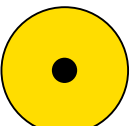
Choosing the cross-section of the tool holder
Selección de la sección transversal del portaherramientas
Choix de la section du porte-outil

Picture / Imagen / Image 1



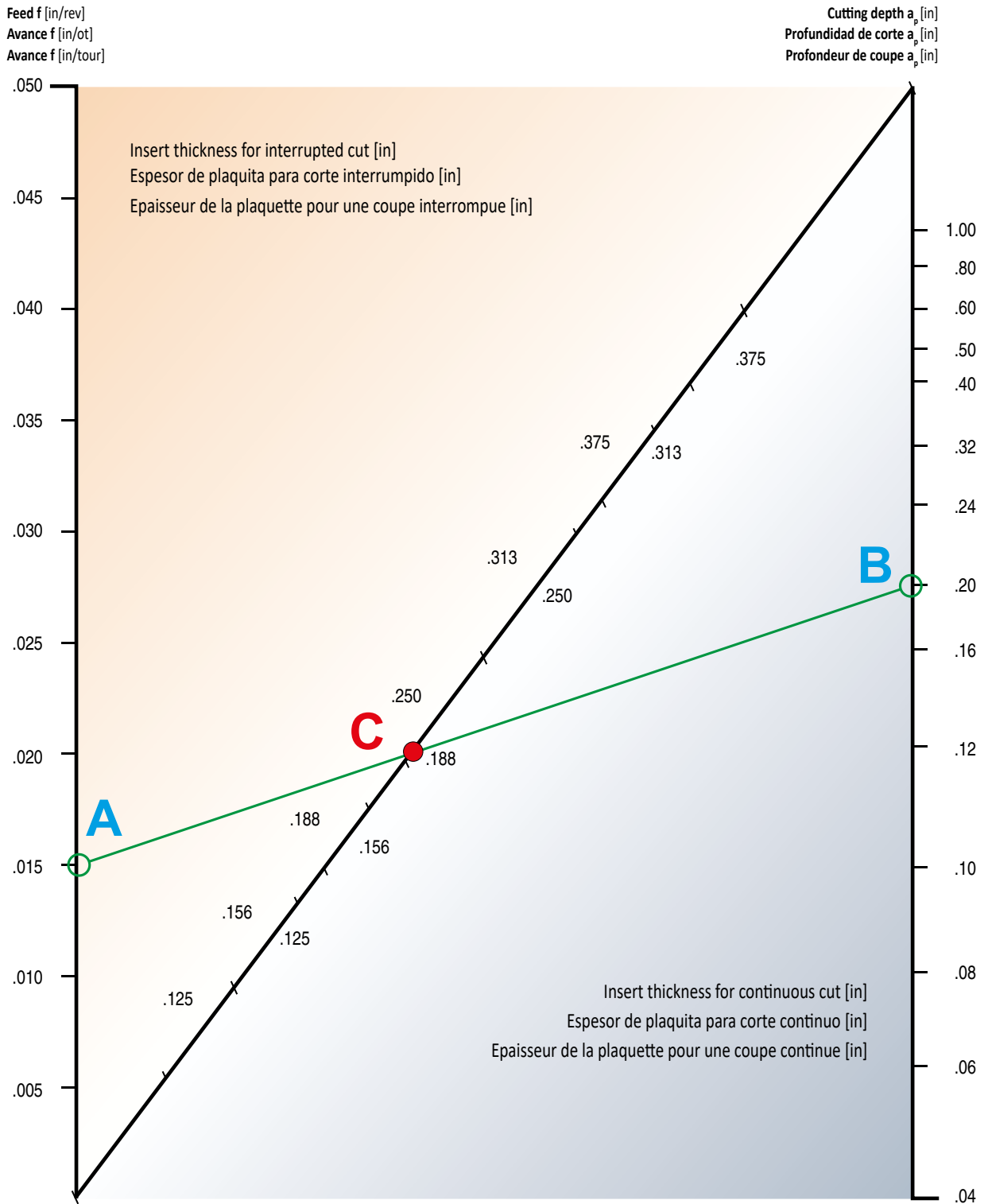
Choosing the shape and size of the insert
Selección de la forma y el tamaño de la plaqueta de corte
Choix de la forme et de la dimension de la plaquette

Table / Tabla / Tableau 1

Priority of choice Prioridad de selección Priorité de choix	Insert shape Forma de la plaqueta Forme de plaquette	Insert size Tamaño de la plaqueta Taille de plaquette	Maximum length of cutting edge L_{max} [in] Longitud máxima del filo en corte L_{max} [in] Longueur maximum de l'arête de coupe L_{max} [in]	Length Longitud Longueur	
 <p>Increasing the accessibility of the cutting edge for profiling and fewer vibrations. Mayor accesibilidad del filo de corte para perfilado y menos vibraciones. Adapter l'arête de coupe à certaines formes de pièces et diminuer les vibrations.</p>		V	1/4"	25% of length	.110
		V	3/8"		.165
		D	1/4"	25% of length	.079
		D	3/8"		.114
		D	1/2"		.154
		K	3/8"	25% of length	.185
		T	1/4"	33% of length	.142
		T	3/8"		.217
		T	1/2"		.287
		T	5/8"		.358
		W	3/8"	50% of length	.130
			1/2"		.173
		C	1/4"	66% of length	.165
			3/8"		.252
			1/2"		.335
			5/8"		.417
			3/4"		.500
		S	1"	66% of length	.650
			3/8"		.248
			1/2"		.331
5/8"			.409		
	R	3/4"	40% of length	.496	
		1"		.661	
		1.1/4"		.984	
		6mm		.094	
		8mm		.126	
 <p>Increasing the strength of the cutting edge and suitability for interrupted cut. Mayor resistencia del filo de corte e idoneidad para cortes interrumpidos. Augmenter la robustesse de l'arête de coupe et la rendre capable de travailler en coupe interrompue.</p>		R	10mm	.157	
		R	12mm	.189	
		R	15mm	.236	
		R	16mm	.252	
		R	19mm	.299	
		R	20mm	.315	
		R	25mm	.394	
R	32mm	.504			

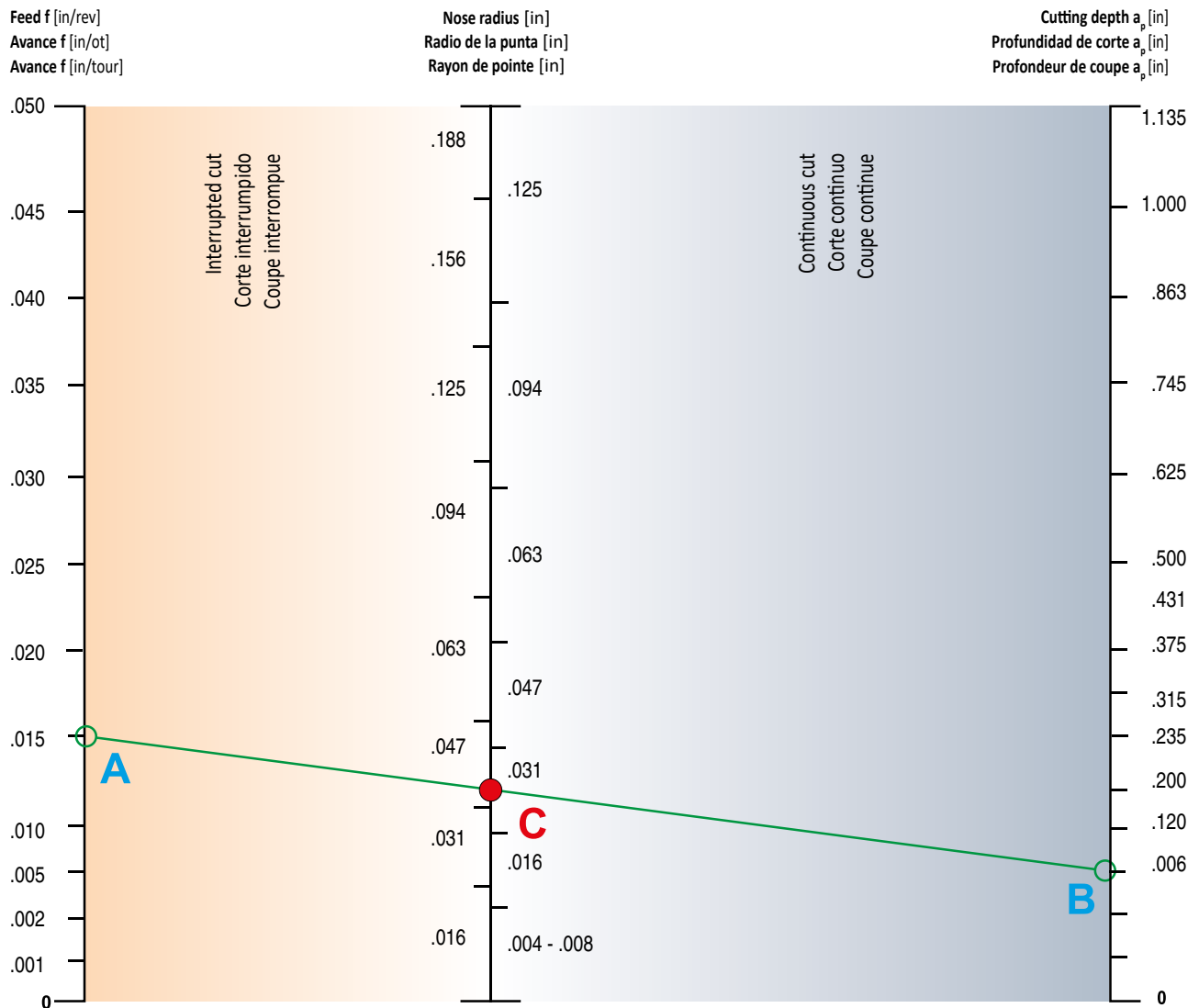
Choosing the optimum thickness of the insert
Selección del espesor máximo de la plaquita de corte intercambiable
Choix de l'épaisseur optimale de la plaquette de coupe indexable

Picture / Imagen / Image 2



Choosing the nose radius of the insert
Selección del radio de la punta de la plaquita de corte intercambiable
Le choix du rayon de pointe d'une plaquette de coupe

Picture / Imagen / Image 3



Choosing the chip breaker

The shape of the chip depends on several factors – the properties of the machined component, material strength, toughness and microstructure, properties of the insert grade, especially the frictional properties (on the rake face), geometry of cutting edge, cutting conditions and the type of chip breaker, also static and dynamic properties of the machine.

Virtually all of these factors in the cutting process work to combine and determine the shape of the chip (shearing action, flow of the chip, or curled chip – which can gather and clog the machining area). Each chip breaker works in a defined range of feed and depth of cut.

The minimum feed at which the chip breaker functions depends on the width of Top Land „x“ and its angle. The maximum feed depends on the distance from the cutting edge to the end of the chip breaker b and the depth of the chip breaker h.

Choix de la géométrie

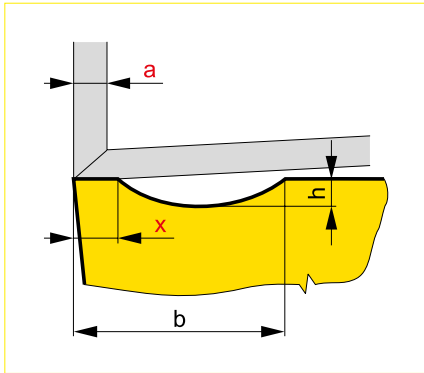
La forme du copeau dépend de plusieurs facteurs – des propriétés du matériau usiné, de la résistance du matériau, de sa tenacité et de sa microstructure, des propriétés du matériau de coupe, spécialement des propriétés de frottement (sur la face de dépouille), des propriétés statique et dynamique de la machine, du lubrifiant, de la géométrie de l'arête de coupe, des conditions de coupe et du type du brise-copeaux. Tous ces facteurs se combinent dans le processus de coupe et déterminent la forme du copeau (son cisaillement, son écoulement, ou son écrasement – qui peut remplir l'espace de travail de la zone usinée).

Chaque brise-copeaux travaille (se fractionne) seulement dans une plage définie d'avances et de profondeurs de coupe. L'avance minimum à laquelle le brise-copeaux fonctionne dépend de la largeur du listel „x“ et de son angle γ_x . L'avance maximum, quand le brise-copeaux agit encore, dépend de la distance „b“ du segment de l'arête de coupe et de la profondeur „h“ de la forme creuse du brise-copeaux.

Selección del rompevirutas:

La forma de la viruta depende de varios factores: propiedades del material mecanizado, resistencia, dureza y microestructura del material mecanizado, propiedades de la calidad de corte, especialmente las propiedades de rozamiento (en la cara de desprendimiento), propiedades estáticas y dinámicas de la máquina, refrigerante, geometría del filo de corte, condiciones de corte y el tipo de rompevirutas. Todos estos factores del proceso de corte se combinan para determinar la forma de las virutas (acción de cizallamiento, flujo de la viruta o rizado de la viruta), que pueden acumularse en el espacio de trabajo de la zona de mecanizado. Cada rompevirutas funciona (rompe la viruta) solo en un rango determinado de avance y profundidad de corte. El avance mínimo al que funciona el rompevirutas depende de la anchura de la faceta superior „x“ y su ángulo γ_x . El avance máximo al que sigue funcionando el rompevirutas depende de la distancia desde la salida del filo de corte b y la profundidad de la ranura h del rompevirutas.

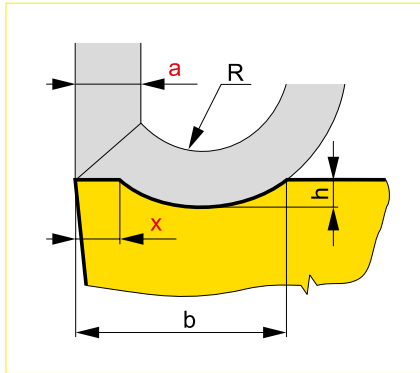
Picture / Imagen / Image 4



If the thickness of layer „a“ cut away (at setting angle $\kappa_r = 90^\circ$, equal to the feed) is significantly smaller than the T-land „x“, the chip is only in contact with the chamfer. It cannot enter the chip breaker and therefore it cannot be broken (see picture).

La capa „a“ muestra la profundidad de corte, y si esta es más pequeño que la anchura de la faceta superior „x“ (a un ángulo de posicionamiento $\kappa_r = 90^\circ$ igual al avance), la viruta no puede alcanzar la cara de formación de virutas de la plaquita. Por lo tanto, la viruta no se romperá (consulte el diagrama de arriba).

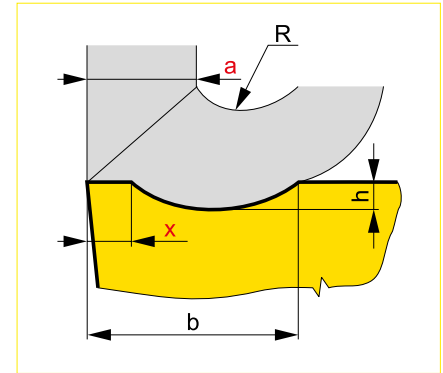
La couche „a“ représente la profondeur de coupe qui, si elle est plus petite que la largeur du listel „x“ (avec un angle d'attaque $\kappa_r = 90^\circ$ égal à l'avance), alors le copeau ne peut pas atteindre la partie creuse du brise-copeau de la plaquette. Par conséquent le copeau ne sera pas fractionné (voir schéma ci-dessus).



If the feed „f“ is greater (thickness greater than the depth of „a“ and $x < a$ (f)), the chip enters the chip breaker and is curved at specific values of radius R (see picture).

Cuando se aplica la velocidad de avance correcta (se está cortando una sección transversal de viruta mayor), y por lo tanto $x < a$ (f), la viruta que se está evacuando entra en el rompevirutas y se perfila y se rompe mediante la formación del radio R (consulte el diagrama de arriba).

Quand la gaine de valeurs d'avance est correctement appliquée, (une plus large section de copeau est coupée), et donc $x < a$ (f), le copeau est contraint à l'entrée du brise-copeaux puis s'enroule et se fractionne par sa forme de rayon R (voir le schéma au dessus).



If $x \ll a$ (see picture) the chip is excessively deformed (chip is crushed). If the chip misses the chip breaker it will not be broken.

Si la sección transversal de la viruta „a“ es significativamente mayor que la faceta superior de la plaqueta „x“, la rotura de virutas será demasiado dura y el resultado serán virutas „demasiado rotas“ o „trituradas“. Tenga en cuenta el ajuste del radio „R“. Si se aumenta más la velocidad de avance, la viruta no llegará a la zona de formación de virutas de la plaqueta. (consulte el diagrama de arriba).

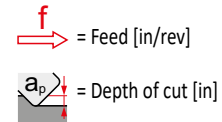
Si la section du copeau „a“ est trop supérieure à la largeur du listel „x“ de la plaquette, alors le fractionnement sera trop difficile et le copeau sera déformé ou écrasé. Noter que le rayon „R“ est très resserré. Si l'avance est encore augmentée le copeau passera au-dessus de la géométrie brise-copeaux et ne sera pas fractionné. (voir schéma ci-dessus).

CHOICE OF CUTTING TOOL
SELECCIÓN DE LA HERRAMIENTA DE CORTE
CHOIX DE L'OUTIL COUPANT

All chip breakers work in a defined range of cutting conditions. This is why the chip breaking area is shown as a continuous range in order to define the most commonly used depth of cut and feed combinations (see following picture). The chip breaker application ranges also overlap.

Todos los rompevirutas funcionan en un rango de condiciones de corte definido. Por este motivo, la zona de rotura de virutas se muestra como un rango continuo, lo que permite definir las combinaciones de profundidad de corte y avance que se utilizan con más frecuencia (consulte el esquema siguiente). Además, los rangos de aplicación de los rompevirutas se superponen.

Toutes les géométries fonctionnent pour une plage de conditions de coupe définies. Pour cette raison, le domaine de fractionnement des copeaux se présente comme une plage continue, qui autorise par définition les avances (f) et les profondeurs de coupe « a_p » les plus utilisées (voir image ci-dessous). Pour cette raison, les plages d'applications des géométries se chevauchent.



Picture / Imagen / Image 5

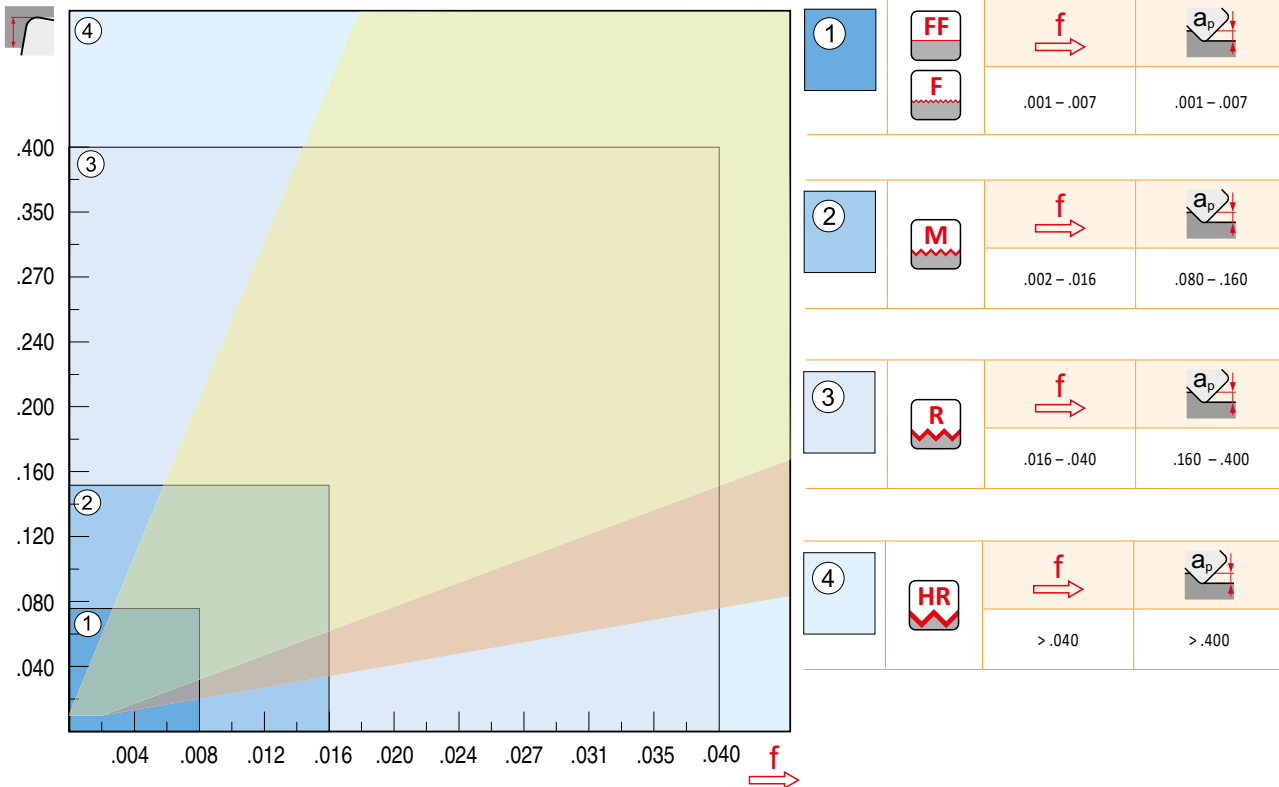


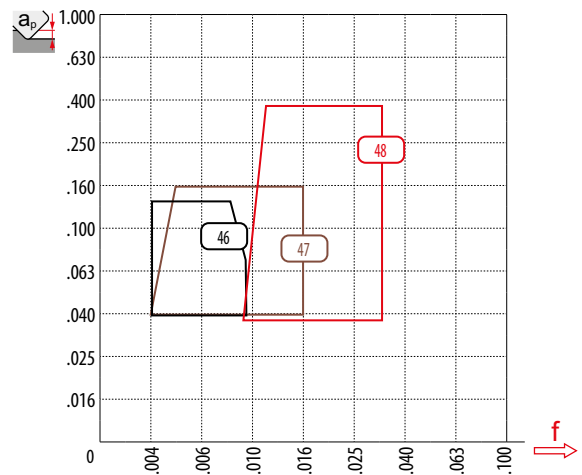
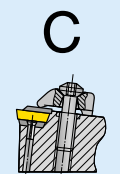
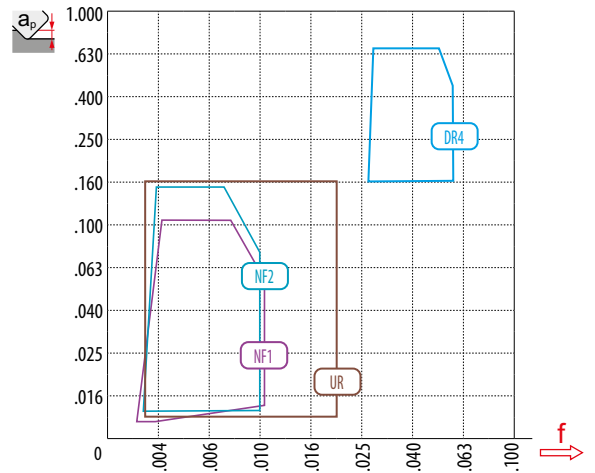
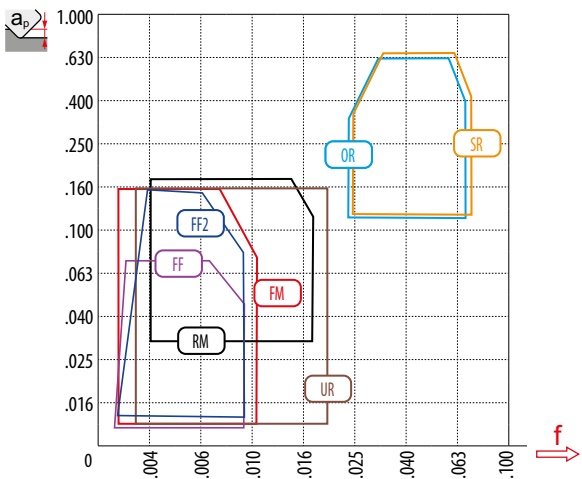
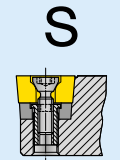
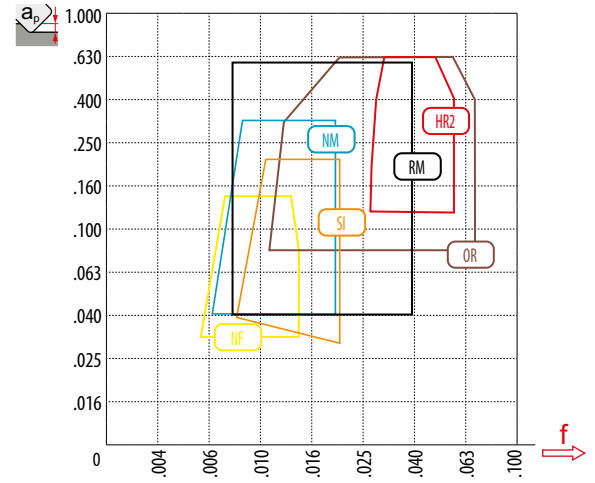
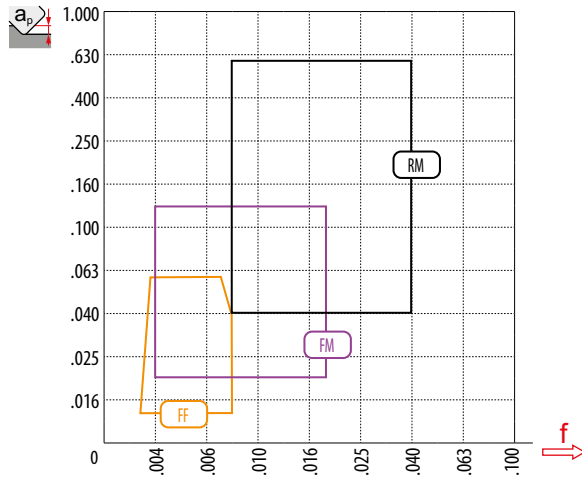
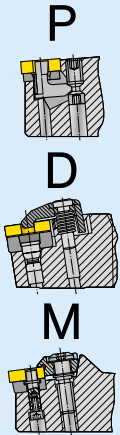
Table 2
 Tabla 2
 Tableau 2

GEOMETRY OF CUTTING INSERTS – TURNING
GEOMETRIA DE LAS PLAQUITAS – TORNEADO
GÉOMÉTRIE DES PLAQUETTES – TOURNAGE



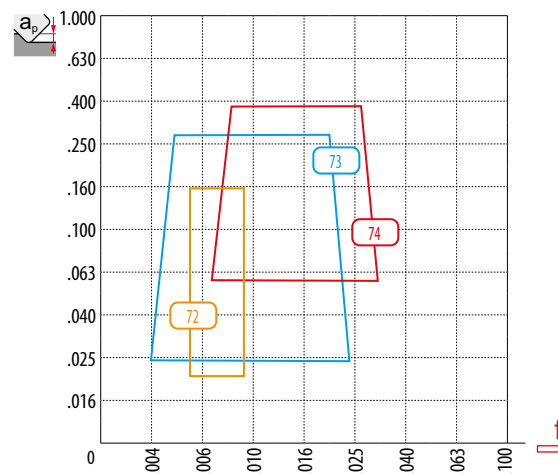
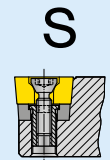
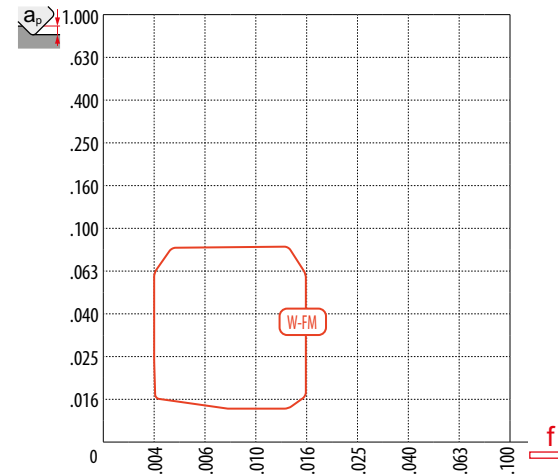
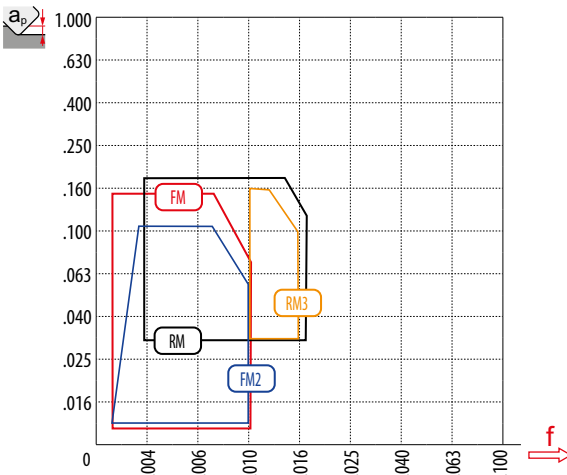
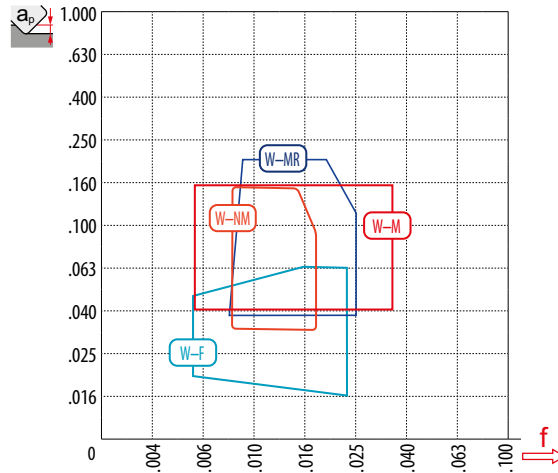
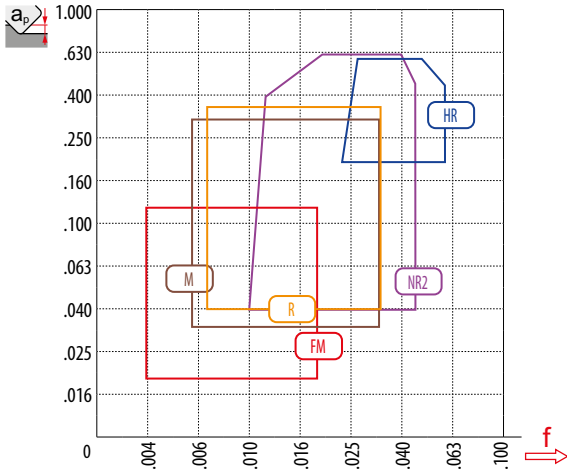
Difficult working conditions
 Malas condiciones de trabajo
 Mauvaises conditions de travail

Specific use
 Uso específico
 Application spécifique



First choice
Primera elección
Premier choix

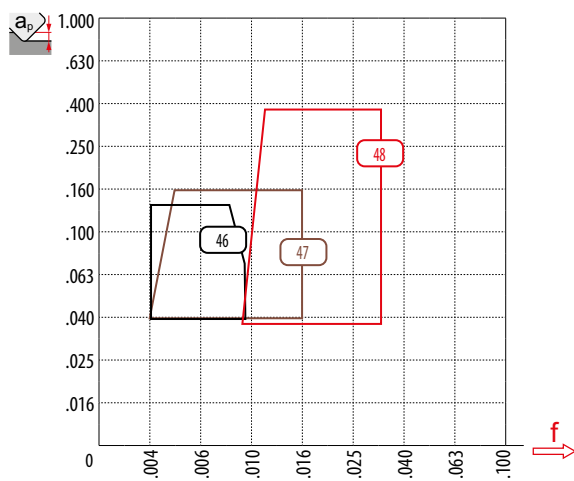
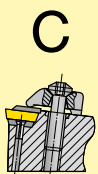
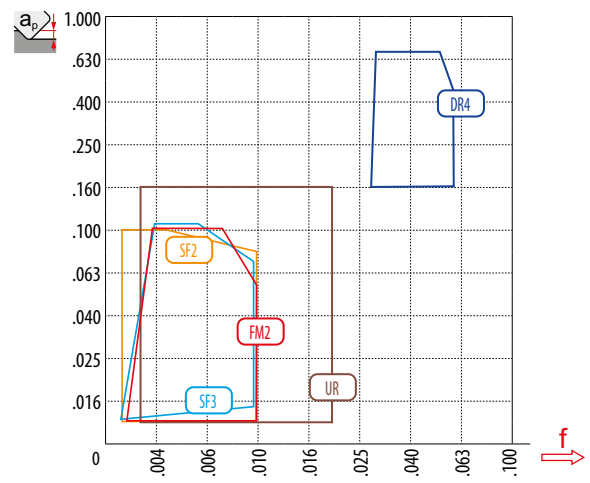
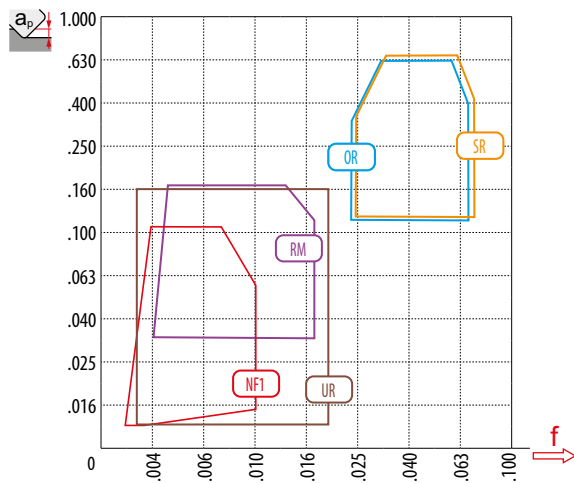
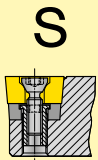
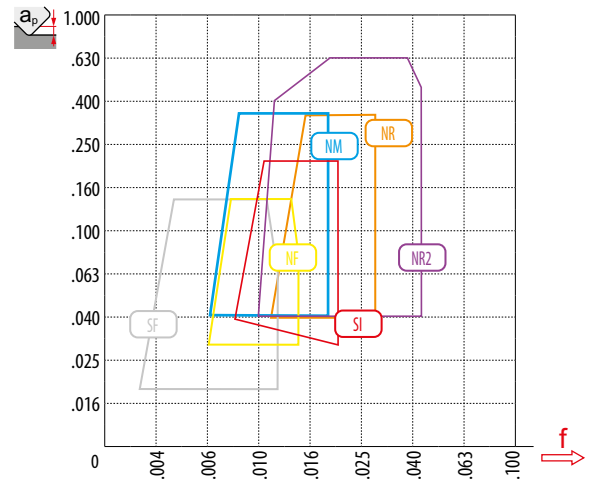
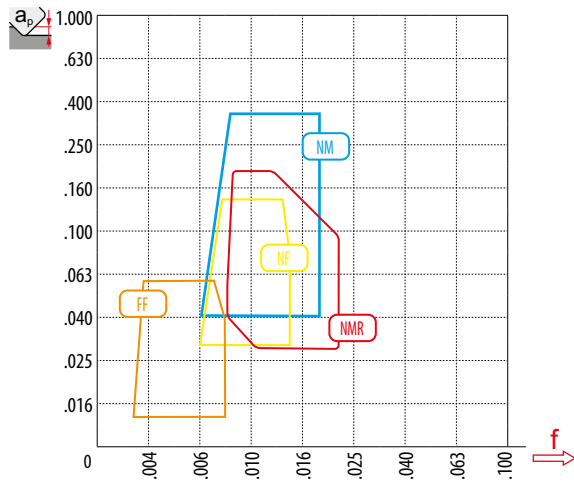
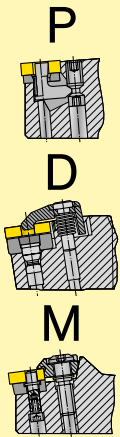
Low cutting resistance / tough material
Bajas fuerzas de corte / material difícil
Forces de coupe / Matériau résistant





Difficult working conditions
Malas condiciones de trabajo
Mauvaises conditions de travail

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Bajas fuerzas de corte / material difícil
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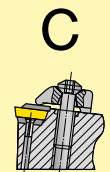
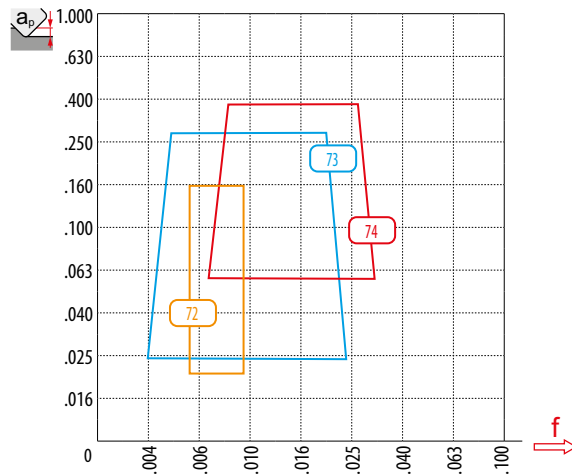
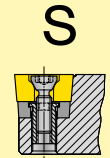
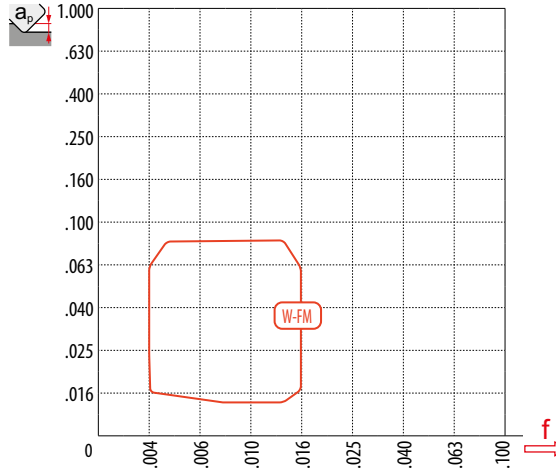
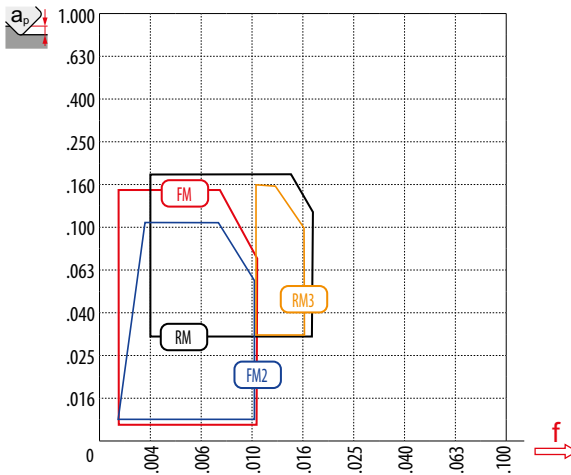
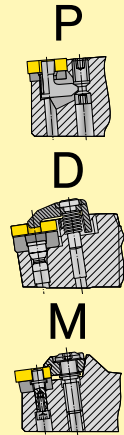
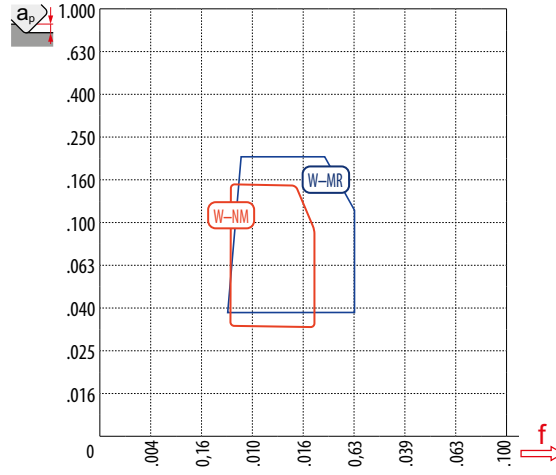
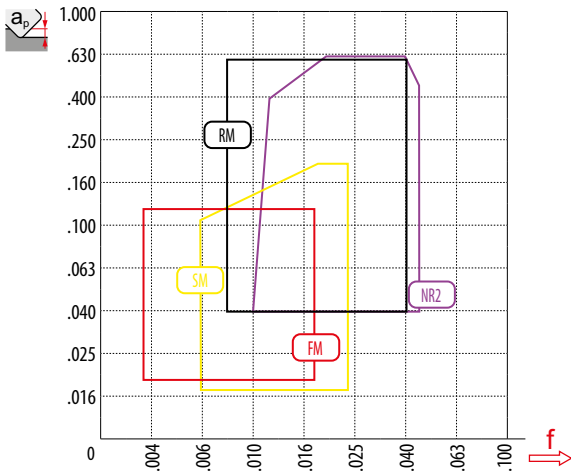


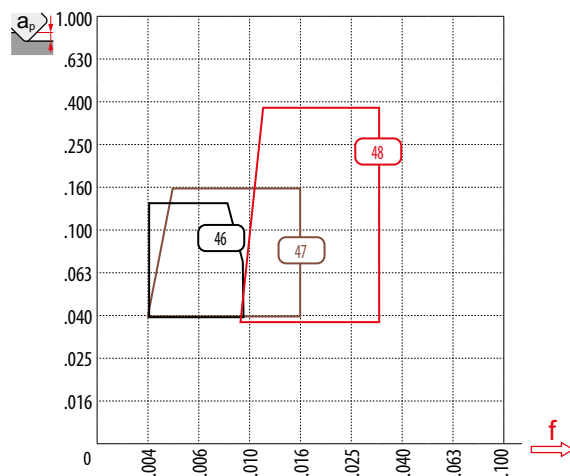
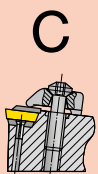
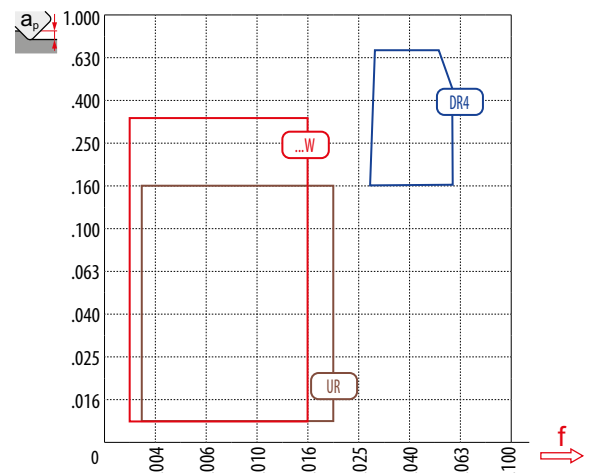
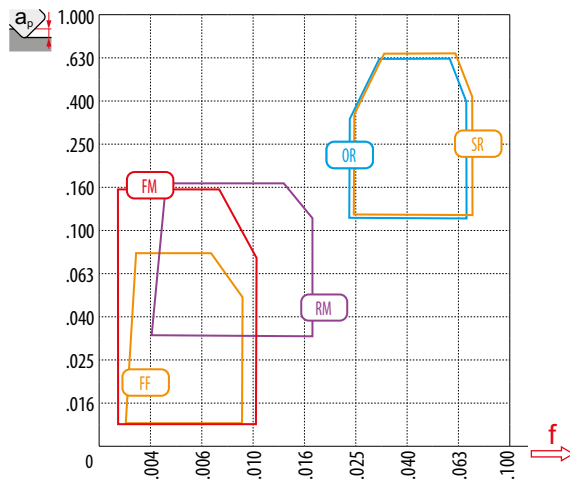
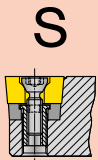
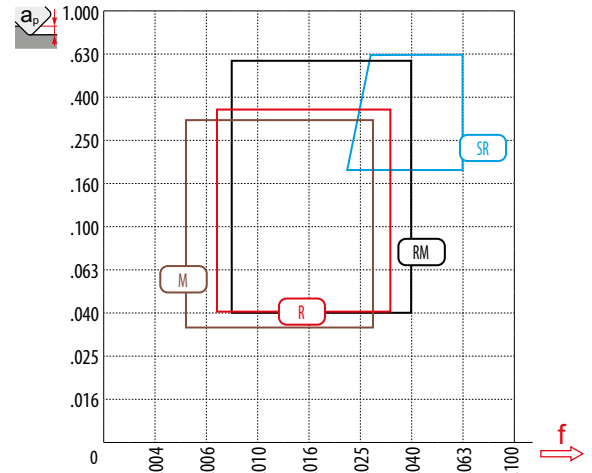
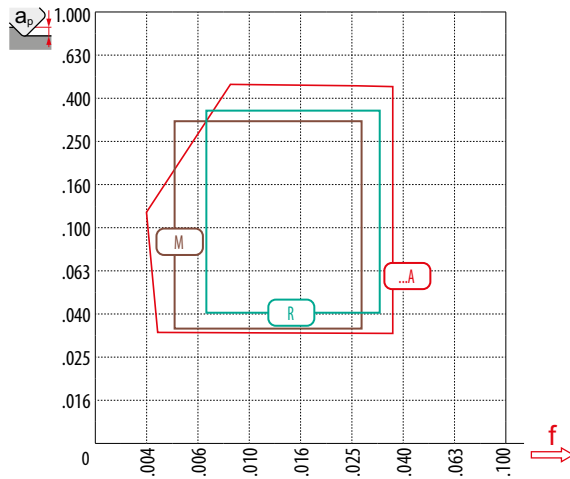
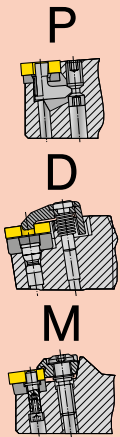
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GEOMETRY OF CUTTING INSERTS – TURNING
GEOMETRIA DE LAS PLAQUITAS – TORNEADO
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K

Difficult working conditions
 Malas condiciones de trabajo
 Mauvaises conditions de travail

Specific use
 Uso específico
 Application spécifique



First choice
Primera elección
Premier choix

Low cutting resistance / tough material
Bajas fuerzas de corte / material difícil
Forces de coupe / Matériau résistant

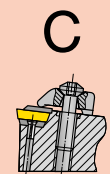
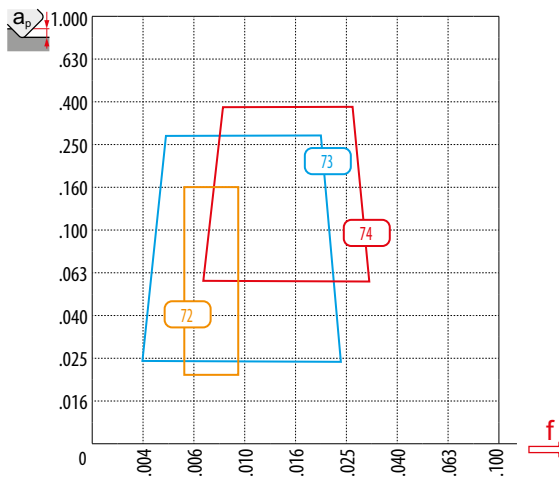
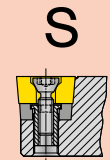
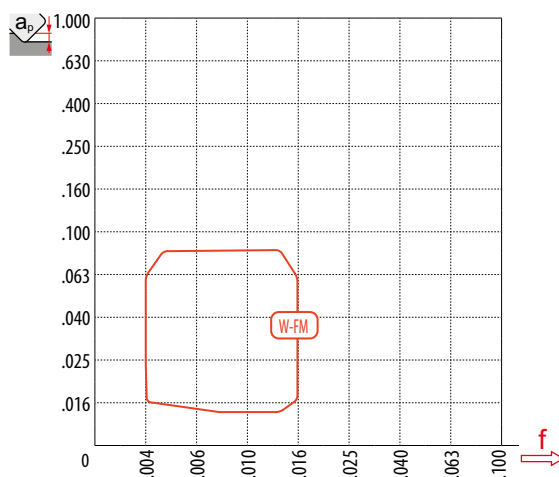
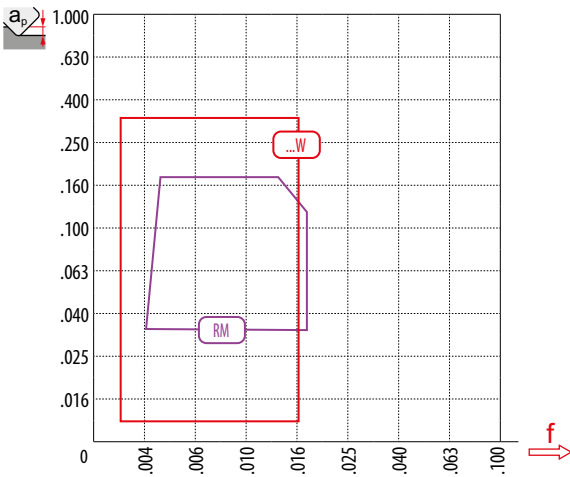
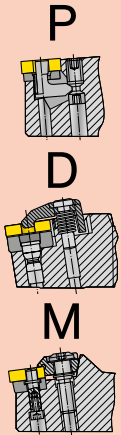
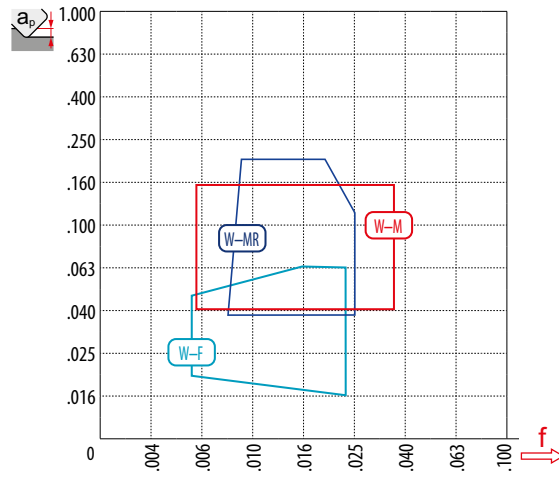
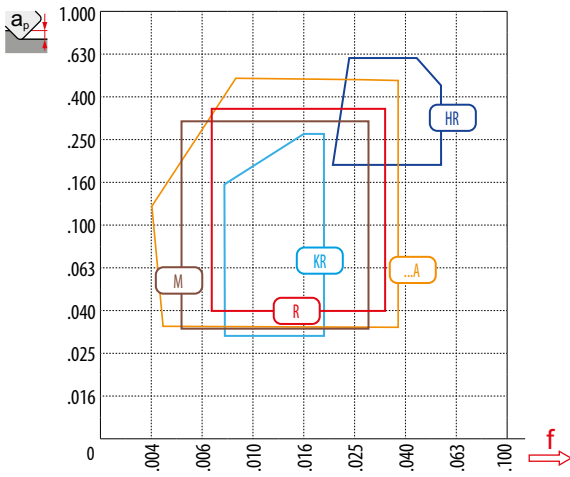


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GEOMETRY OF CUTTING INSERTS – TURNING
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GÉOMÉTRIE DES PLAQUETTES – TOURNAGE

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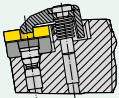
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Specific use
 Uso específico
 Application spécifique

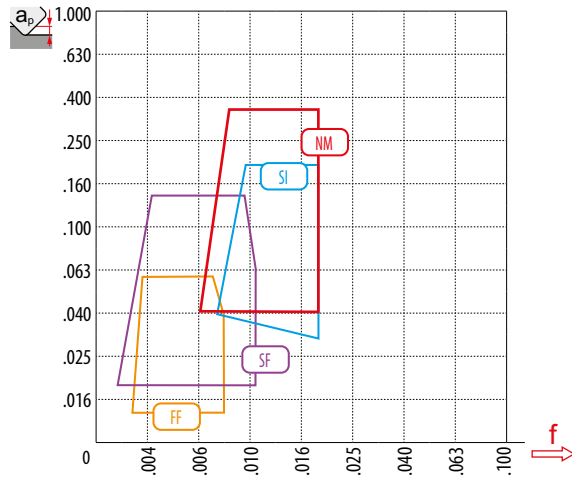
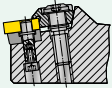
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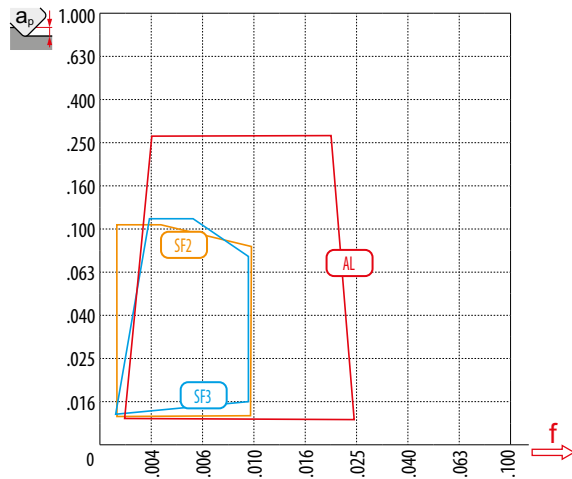
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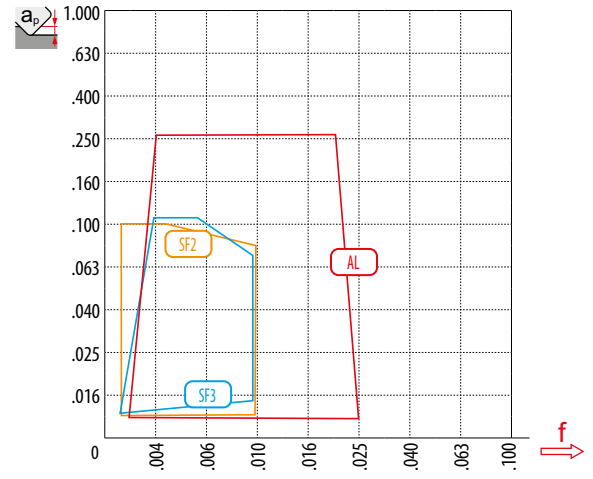
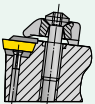




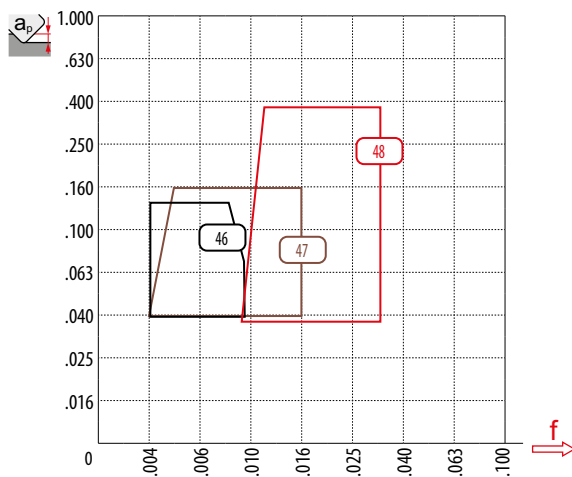
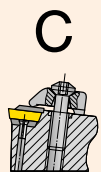
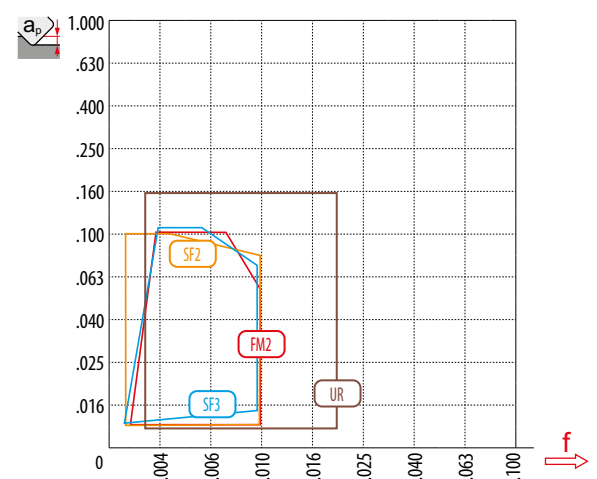
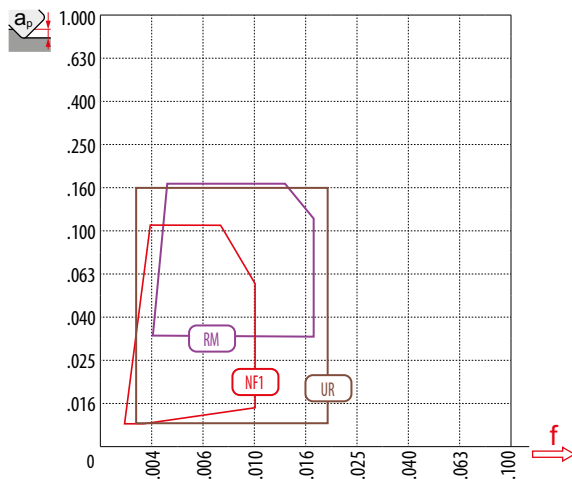
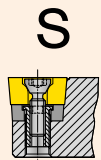
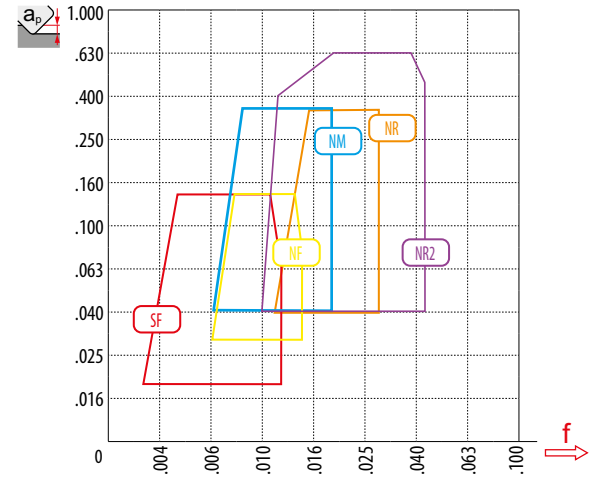
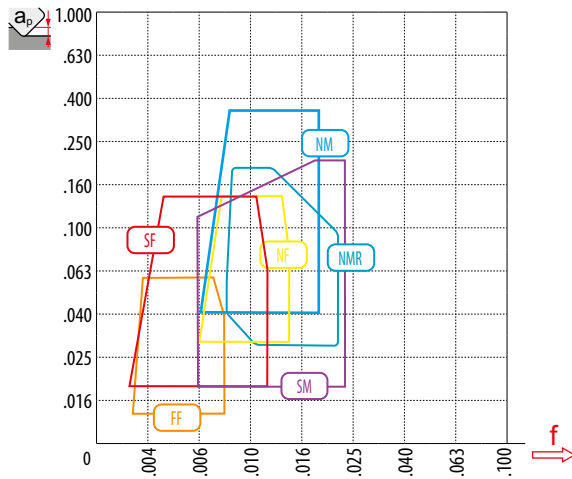
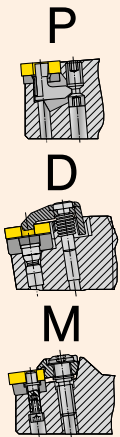
Table 2
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GEOMETRY OF CUTTING INSERTS – TURNING
GEOMETRIA DE LAS PLAQUITAS – TORNEADO
GÉOMÉTRIE DES PLAQUETTES – TOURNAGE

S

Difficult working conditions
 Malas condiciones de trabajo
 Mauvaises conditions de travail

Specific use
 Uso específico
 Application spécifique



First choice
Primera elección
Premier choix

Low cutting resistance / tough material
Bajas fuerzas de corte / material difícil
Forces de coupe / Matériau résistant

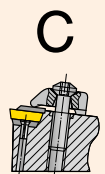
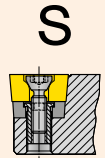
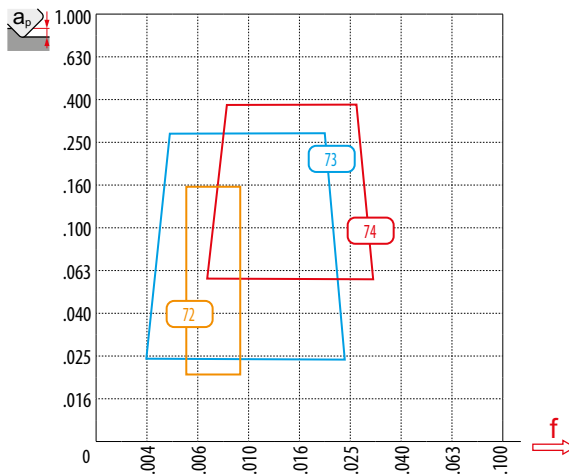
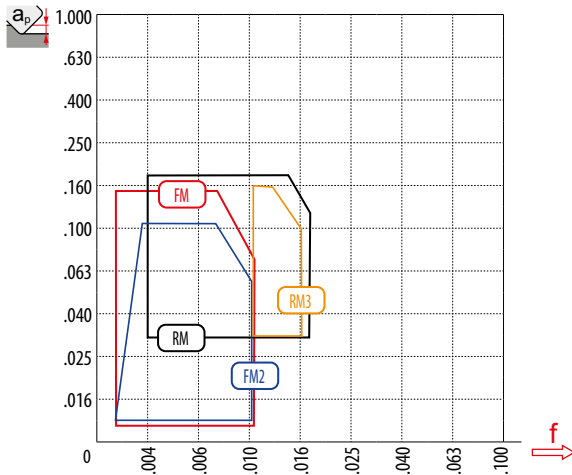
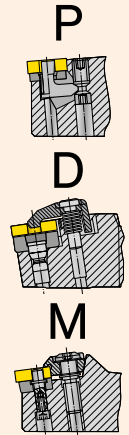
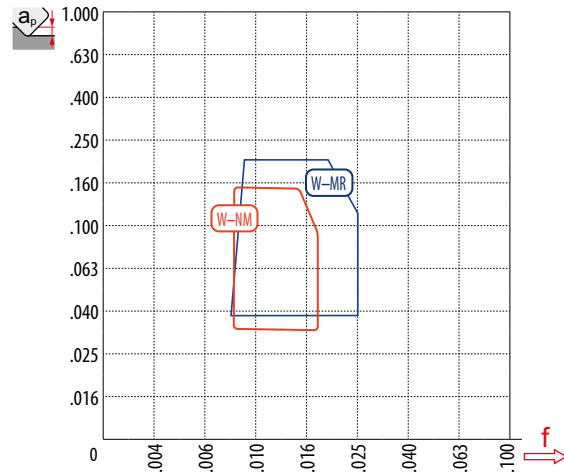
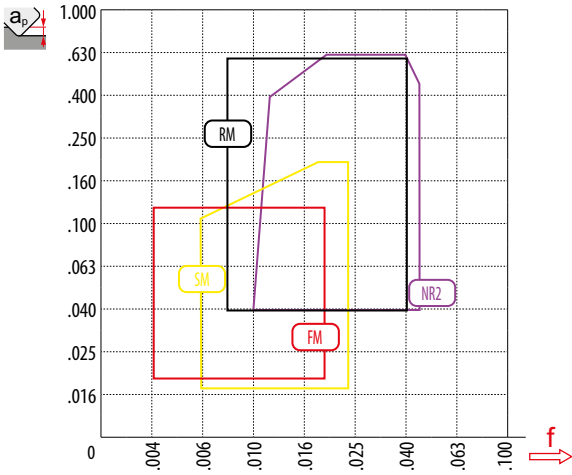


Table 2
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GEOMETRY OF CUTTING INSERTS – TURNING
 GEOMETRIA DE LAS PLAQUITAS – TORNEADO
 GÉOMÉTRIE DES PLAQUETTES – TOURNAGE

H

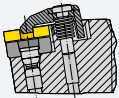
Difficult working conditions
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 Application spécifique

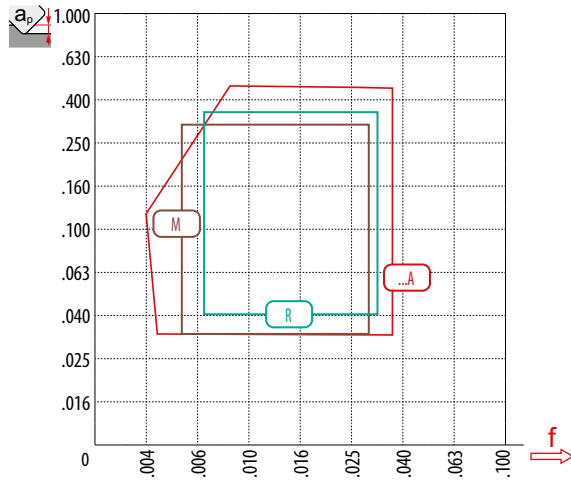
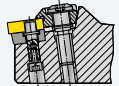
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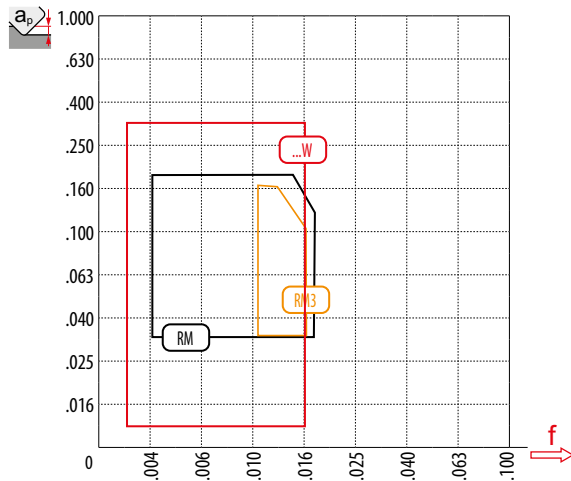
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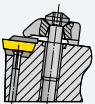
M



S



C





OVERVIEW OF TURNING INSERTS' GEOMETRIES
 GEOMETRÍAS DE PLAQUITAS DE TORNEADO
 GÉOMÉTRIE DES PLAQUETTES – TOURNAGE

Clamping designation – ISO P, M, D / Plaquetas – fijación ISO P, M, D Plaquettes - fixation ISO P, M, D	
08 (RNMG)	T272
31 (RCMX)	T272
81 (RNMG)	T272
321 (RCMX)	T272
331 (RCMX)	T273
361 (RCMX)	T273
923	T273
...A	T273
DR	T274
FF	T274
FM	T274
HR	T274
HR2	T275
KR	T275
M	T275
NF	T275
NM	T276
NMR	T276
NR	T276
NR2	T276
OR	T277
OR1	T277
R	T277
RF1 (RCMX)	T277
RM	T278
RM1 (RCMX)	T278
RM2 (RCM.)	T278
RR2 (RCM.)	T278
RR4 (RCMT)	T279
SF	T279
SI	T279
SM	T279
SR	T280
W-MR	T280
W-F	T280
W-M	T280
W-NM	T281
Clamping designation – ISO S / Plaquetas – fijación ISO S Plaquettes - fixation ISO S	
371 (RCMT)	T282
372 (RCMT)	T282
...W	T282
AL	T282

DR4 (SCMT)	T283
FF	T283
FF2	T283
FM	T283
FM (RCMT)	T284
FM2	T284
NF1	T284
NF2	T284
OR (SCMT)	T285
RF	T285
RM	T285
RM3	T285
SF2	T286
SF3	T286
SI	T286
SR (SCMT)	T286
UR (RCMT)	T287
UR	T287
W-FM	T287
W-UR	T287
Clamping designation – ISO C / Plaquetas – fijación ISO C Plaquettes - fixation ISO C	
46	T288
47	T288
48	T288
61	T288
72	T289
73	T289
74	T289
.PUN	T289
Clamping designation – ISO X, G / Plaquetas – fijación ISO X, G Plaquettes - fixation ISO X, G	
13 F (LCM.)	T290
13 MP (LCM.)	T290
16 F (LCM.)	T290
16 M (LCM.)	T290
16 MP (LCM.)	T291
20 F1 (LCMF)	T291
20 M2 (LCMF)	T291
30 F (LCM.)	T291
CM (LCM.)	T292
F1 (LFMX)	T292
F2 (LFMX)	T292
M2 (LFMX)	T292

Table 3
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GEOMETRY OF CUTTING INSERTS – CLAMPING DESIGNATION ISO P, M, D
 GEOMETRÍA DE PLAQUITAS DE CORTE – TIPO DE FIJACIÓN ISO P, M, D
 GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO P, M, D


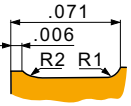
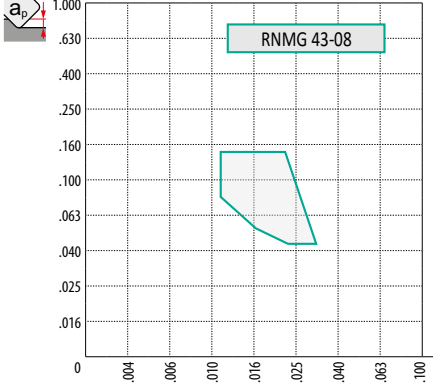







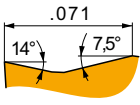
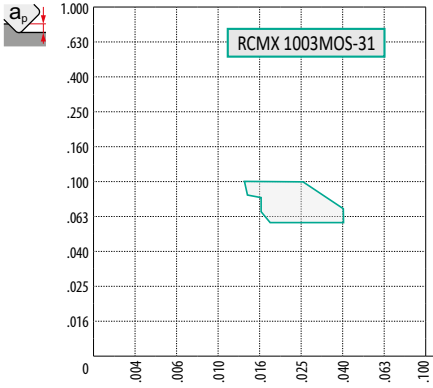







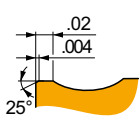
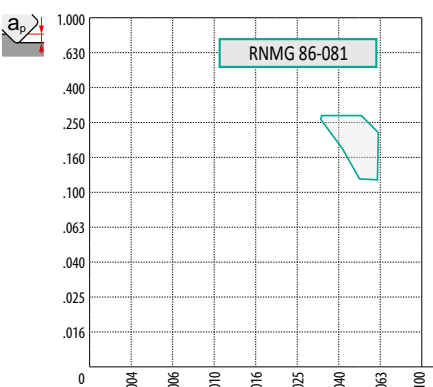







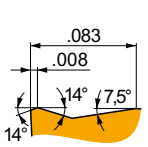
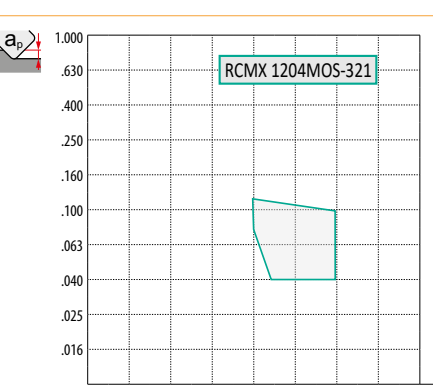






<p>08 (RNMG)</p>  	 <p>RNMG 43-08</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>f</td> <td colspan="5">.012 – .031</td> </tr> <tr> <td>a_p</td> <td colspan="5">.039 – .157</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">RNMG</td> </tr> </tbody> </table>	P	M	K	N	S	H	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	f	.012 – .031					a_p	.039 – .157																	?	RNMG				
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a_p	.039 – .157																																											
																																												
																																												
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<p>31 (RCMX)</p>  	 <p>RCMX 1003MOS-31</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>f</td> <td colspan="5">.016 – .039</td> </tr> <tr> <td>a_p</td> <td colspan="5">.059 – .098</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">RCMX</td> </tr> </tbody> </table>	P	M	K	N	S	H	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	.016 – .039					a_p	.059 – .098																	?	RCMX				
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<p>81 (RNMG)</p>  	 <p>RNMG 86-081</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>f</td> <td colspan="5">.031 – .047</td> </tr> <tr> <td>a_p</td> <td colspan="5">.118 – .276</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">RNMG</td> </tr> </tbody> </table>	P	M	K	N	S	H	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	.031 – .047					a_p	.118 – .276																	?	RNMG				
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331 (RCMX)																	
				<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>□</td> <td>■</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>f .016 – .047</p> <p>a_p .039 – .157</p> <p>RCMX</p>	P	M	K	N	S	H	■	□	■				
P	M	K	N	S	H												
■	□	■															
361 (RCMX)																	
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P	M	K	N	S	H												
■	□	■															
923																	
				<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>▣</td> <td>▣</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>f .018 – .059</p> <p>a_p .118 – .512</p> <p>CNMM, SNMM</p>	P	M	K	N	S	H	■	▣	▣				
P	M	K	N	S	H												
■	▣	▣															
...A																	
				<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>▣</td> <td>□</td> <td>■</td> <td></td> <td></td> <td>▣</td> </tr> </tbody> </table> <p>f .004 – .035</p> <p>a_p .031 – .472</p> <p>CNMA, DNMA, SNMA, TNMA, WNMA</p>	P	M	K	N	S	H	▣	□	■			▣	
P	M	K	N	S	H												
▣	□	■			▣												

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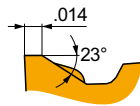
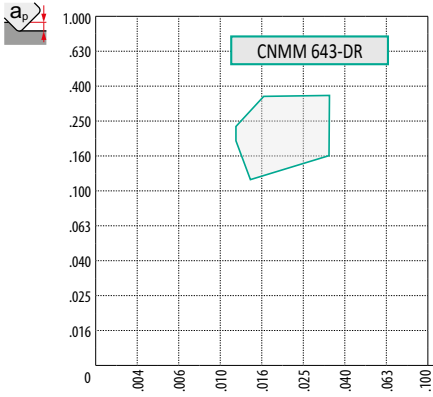







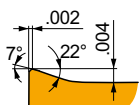
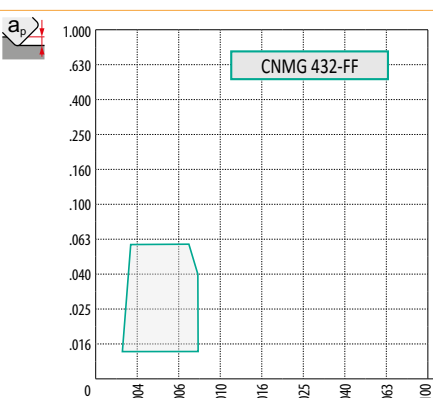







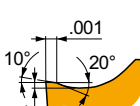
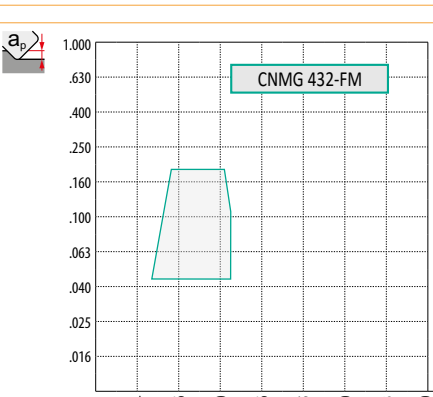







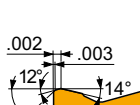
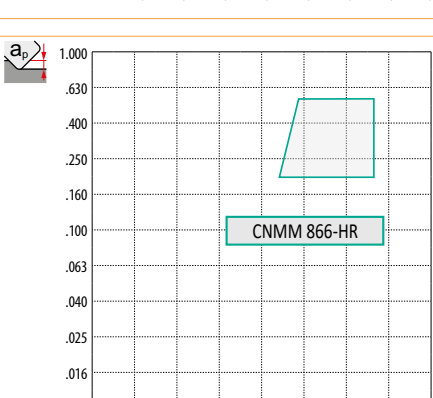






<p>DR</p>  	 <p>CNMM 643-DR</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>■</td> <td>▣</td> <td>□</td> <td>□</td> <td>□</td> </tr> <tr> <td>f</td> <td colspan="5">.012 – .033</td> </tr> <tr> <td>a_p</td> <td colspan="5">.098 – .354</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">CNMM, DNMM, SNMM, TNMM, WNMM</td> </tr> </tbody> </table>	P	M	K	N	S	H	■	■	▣	□	□	□	f	.012 – .033					a_p	.098 – .354																	?	CNMM, DNMM, SNMM, TNMM, WNMM				
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<p>FF</p>  	 <p>CNMG 432-FF</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>■</td> <td>▣</td> <td>□</td> <td>□</td> <td>□</td> </tr> <tr> <td>f</td> <td colspan="5">.002 – .008</td> </tr> <tr> <td>a_p</td> <td colspan="5">.012 – .059</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">CNMG, DNMG, TNMG, VNMG, WNMG</td> </tr> </tbody> </table>	P	M	K	N	S	H	■	■	▣	□	□	□	f	.002 – .008					a_p	.012 – .059																	?	CNMG, DNMG, TNMG, VNMG, WNMG				
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 GEOMETRÍA DE PLAQUITAS DE CORTE – TIPO DE FIJACIÓN ISO P, M, D
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<p>HR2</p>		<p>SNMM 866-HR2</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>f</td> <td colspan="5">.020 – .055</td> </tr> <tr> <td>a_p</td> <td colspan="5">.118 – .630</td> </tr> <tr> <td colspan="6" style="text-align: center;"> </td> </tr> <tr> <td colspan="6" style="text-align: center;"> </td> </tr> <tr> <td colspan="6" style="text-align: center;"> ? CNMM, SNMM </td> </tr> </tbody> </table>	P	M	K	N	S	H	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	.020 – .055					a_p	.118 – .630																	? CNMM, SNMM					
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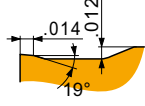







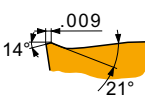
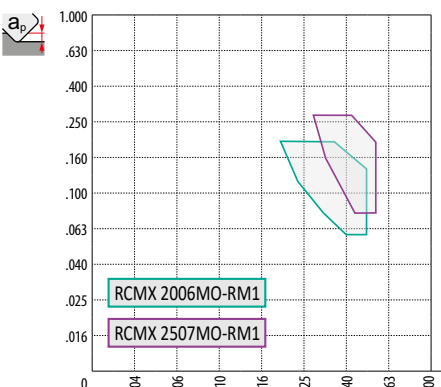




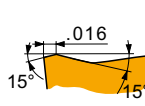
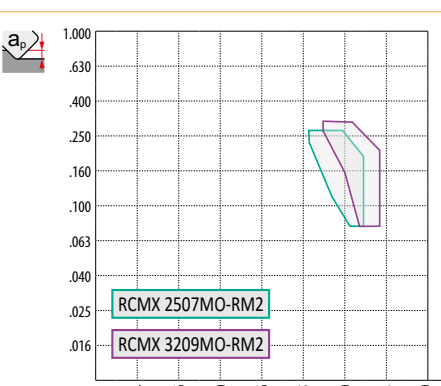







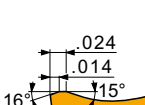
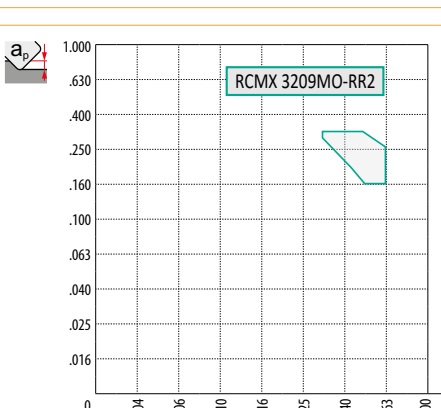






<p>RM</p>  	 <p>CNMG 433-RM</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> <td>□</td> </tr> <tr> <td>f</td> <td colspan="5">.012 – .031</td> </tr> <tr> <td>a_p</td> <td colspan="5">.059 – .276</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">CNMG, DNMG, SNMG, TNMG, WNMG</td> </tr> </tbody> </table>	P	M	K	N	S	H	■	■	■	■	■	□	f	.012 – .031					a_p	.059 – .276																	?	CNMG, DNMG, SNMG, TNMG, WNMG				
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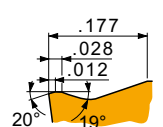
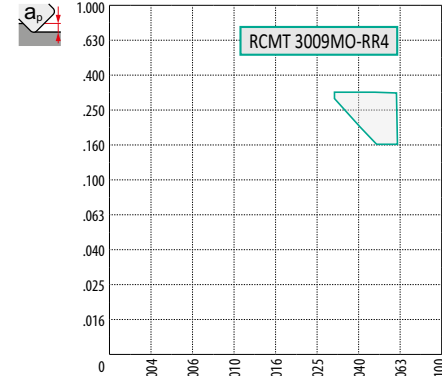







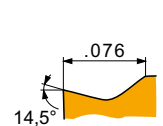
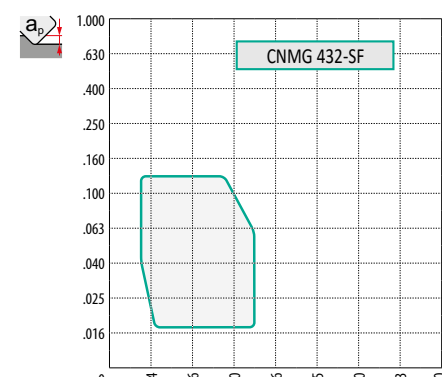







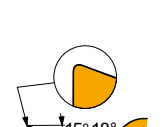
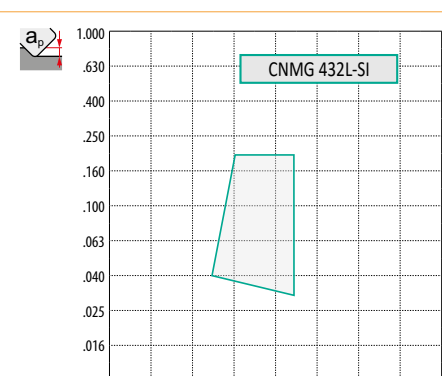








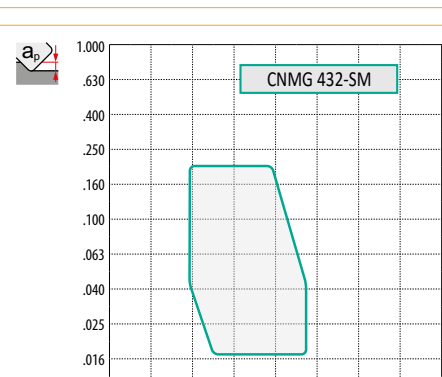






RR4 (RCMT)	 	 <p>RCMT 3009MO-RR4</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>f</td> <td colspan="5">.031 – .063</td> </tr> <tr> <td>a_p</td> <td colspan="5">.059 – .276</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">RCMT 30</td> </tr> </tbody> </table>	P	M	K	N	S	H	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f	.031 – .063					a_p	.059 – .276																	?	RCMT 30				
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 GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO P, M, D

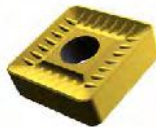
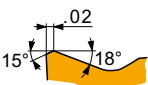
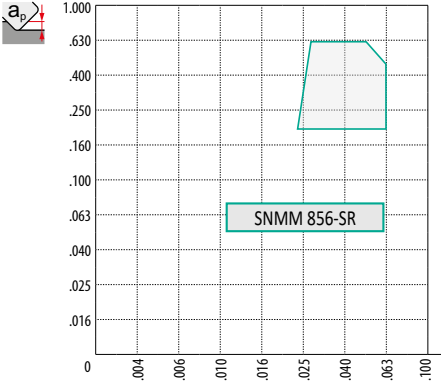
















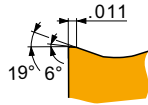
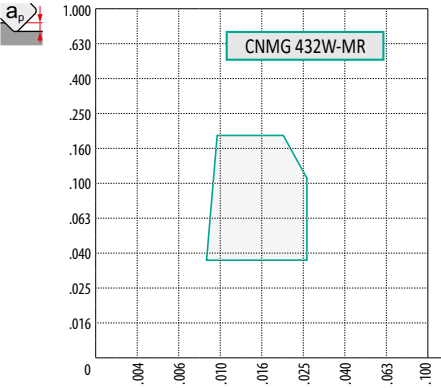
















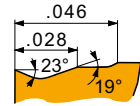
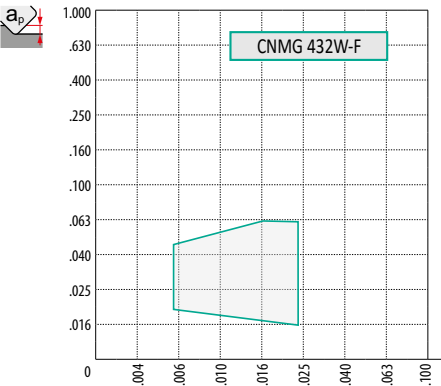


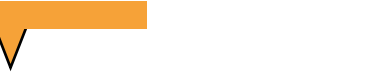




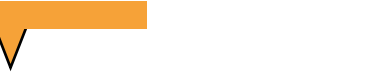




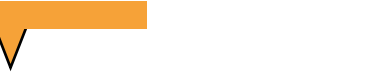



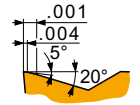
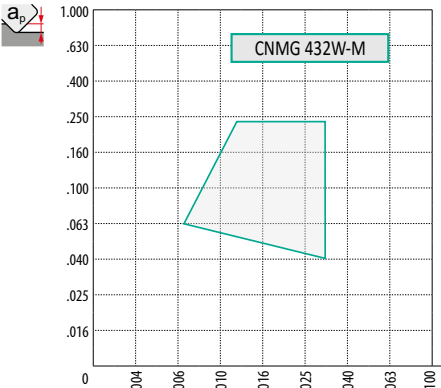















<p>SR</p>  	 <p>SNMM 856-SR</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>■</td> <td>■</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="6">  .028 – .063 </td> </tr> <tr> <td colspan="6">  .197 – .630 </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6">  SNMM, SNMX </td> </tr> </tbody> </table>	P	M	K	N	S	H	■	■	■				 .028 – .063						 .197 – .630																		 SNMM, SNMX					
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 GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO P, M, D

W-NM			P	M	K	N	S	H
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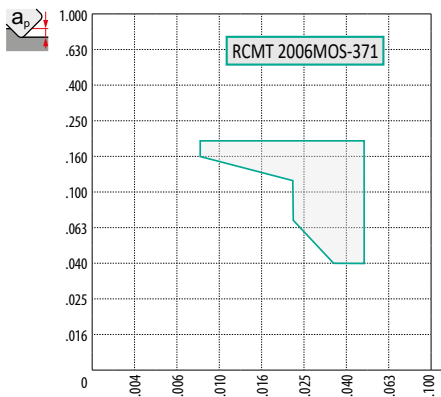







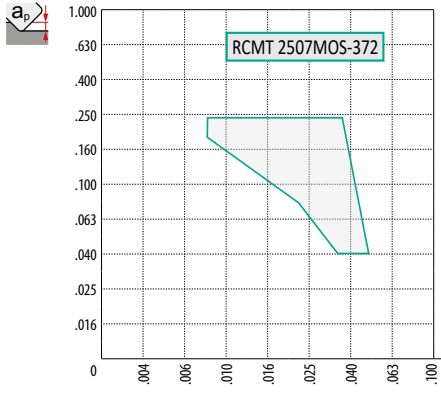







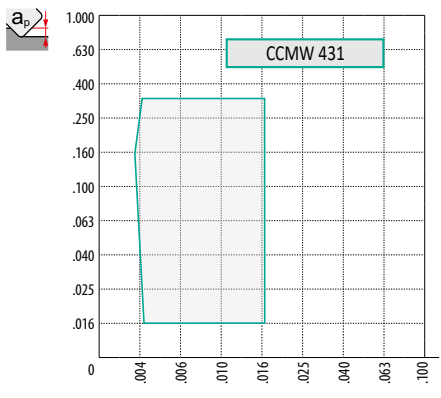







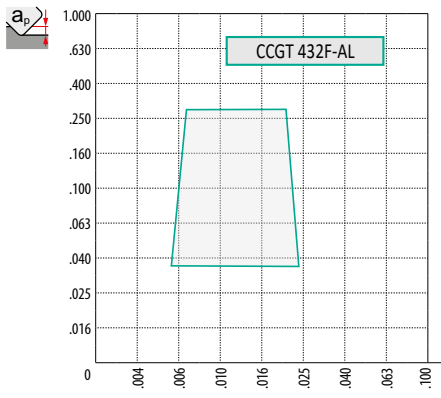






<p>371 (RCMT)</p> 	 <p>RCMT 2006MOS-371</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>□</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> </tr> <tr> <td>f</td> <td colspan="5">.008 – .047</td> </tr> <tr> <td>a_p</td> <td colspan="5">.039 – .197</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">RCMT</td> </tr> </tbody> </table>	P	M	K	N	S	H	■	□	■	■	■	■	f	.008 – .047					a_p	.039 – .197																	?	RCMT				
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<p>372 (RCMT)</p> 	 <p>RCMT 2507MOS-372</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>□</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> </tr> <tr> <td>f</td> <td colspan="5">.008 – .047</td> </tr> <tr> <td>a_p</td> <td colspan="5">.039 – .236</td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td colspan="6" style="text-align: center;">  </td> </tr> <tr> <td>?</td> <td colspan="5">RCMT</td> </tr> </tbody> </table>	P	M	K	N	S	H	■	□	■	■	■	■	f	.008 – .047					a_p	.039 – .236																	?	RCMT				
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 GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO 5

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 GEOMETRÍA DE PLAQUITAS DE CORTE – TIPO DE FIJACIÓN ISO 3
 GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO 3


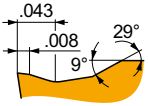
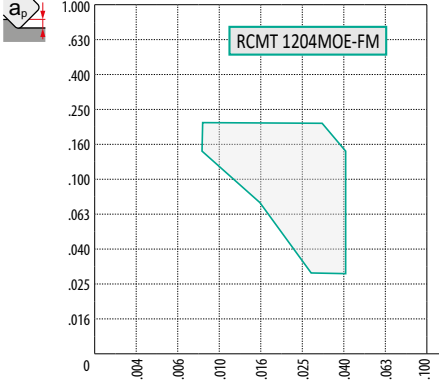







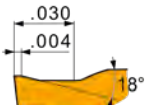
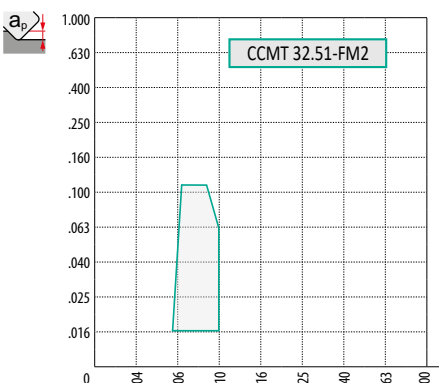







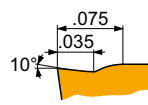
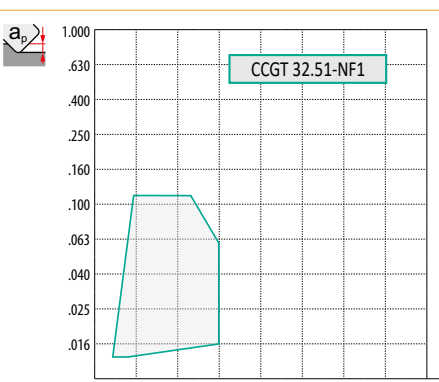








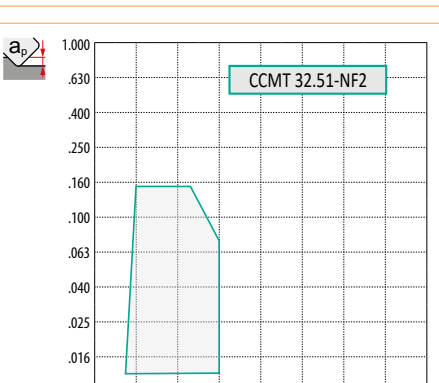






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 GEOMETRÍA DE PLAQUITAS DE CORTE – TIPO DE FIJACIÓN ISO C
 GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO C

46		<p>TPMR 221-46</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>▣</td> <td>■</td> <td>■</td> <td>■</td> <td>■</td> </tr> <tr> <td colspan="6"> </td> </tr> <tr> <td colspan="6"> </td> </tr> <tr> <td colspan="6"> <p>? SPMR, TPMR</p> </td> </tr> </tbody> </table>	P	M	K	N	S	H	■	▣	■	■	■	■													<p>? SPMR, TPMR</p>					
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GEOMETRÍA DE PLAQUITAS DE CORTE – TIPO DE FIJACIÓN ISO X Y G
GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO X ET G

<p>13 F (LCM.)</p>		<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>▣</td> <td>■</td> <td></td> <td></td> <td></td> </tr> <tr> <td>f</td> <td colspan="5">See diagram / Consultar diagrama / Voir diagramme</td> </tr> <tr> <td>a_p</td> <td colspan="5"></td> </tr> <tr> <td colspan="6" style="text-align: center;"> </td> </tr> <tr> <td>?</td> <td colspan="5">LCMF, LCMR</td> </tr> </tbody> </table>	P	M	K	N	S	H	■	▣	■				f	See diagram / Consultar diagrama / Voir diagramme					a_p												?	LCMF, LCMR				
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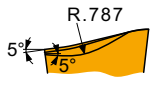
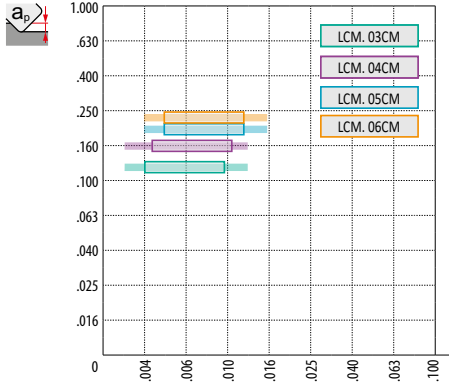

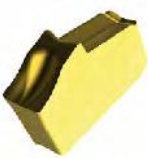

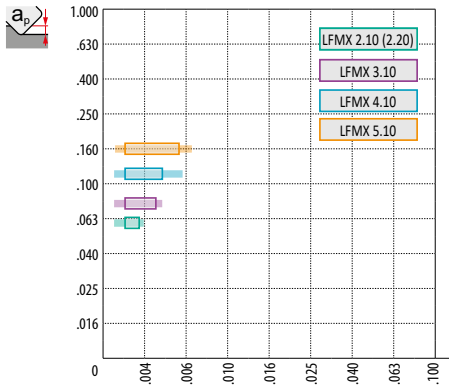

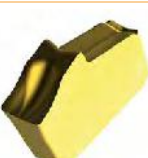
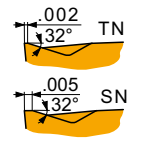
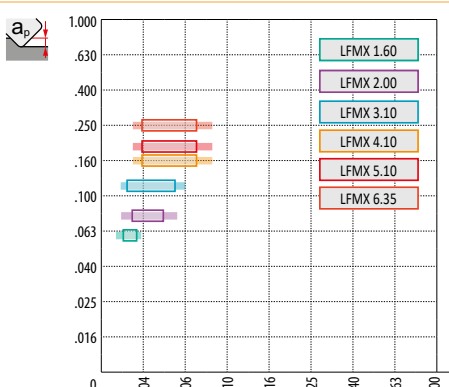


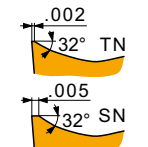
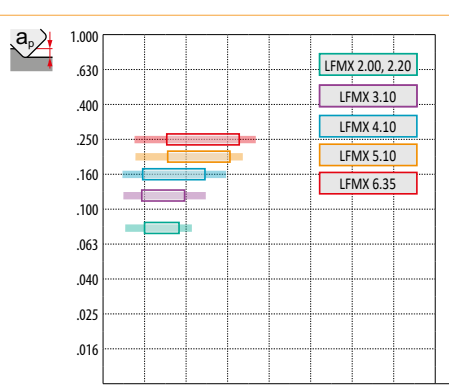

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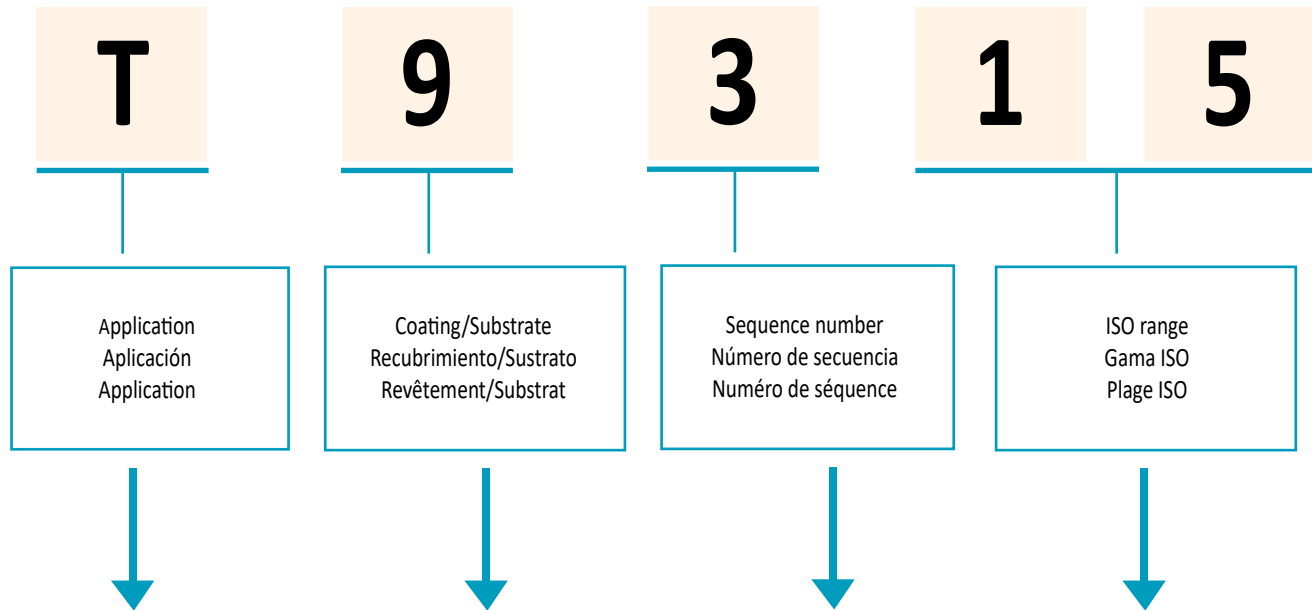
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<p>f .010 – .020</p>																																													
<p>a_p .051 – .236</p>																																													
<p>? LCMF, LCMR</p>																																													

Table 3
Tabla 3
Tableau 3

GEOMETRY OF CUTTING INSERTS – CLAMPING DESIGNATION ISO X AND G
GEOMETRÍA DE PLAQUITAS DE CORTE – TIPO DE FIJACIÓN ISO X Y G
GÉOMÉTRIE DES PLAQUETTES – FIXATION DE TYPE ISO X ET G

<p>CM (LCM.)</p>  	 <p>Graph showing geometry for CM (LCM.) inserts: LCM. 03CM, LCM. 04CM, LCM. 05CM, LCM. 06CM. The x-axis represents feed rate (f) from 0 to 0.100, and the y-axis represents depth of cut (ap) from 0 to 1.000.</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>▣</td> <td>■</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>See diagram / Consultar diagrama / Voir diagramme</p>  <p>LCMF 13 CM, LCMF 16 CM, LCMR 16 CM</p>	P	M	K	N	S	H	■	▣	■			
P	M	K	N	S	H									
■	▣	■												
<p>F1 (LFMX)</p>  	 <p>Graph showing geometry for F1 (LFMX) inserts: LFMX 2.10 (2.20), LFMX 3.10, LFMX 4.10, LFMX 5.10. The x-axis represents feed rate (f) from 0 to 0.100, and the y-axis represents depth of cut (ap) from 0 to 1.000.</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>▣</td> <td>■</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>See diagram / Consultar diagrama / Voir diagramme</p>  <p>LFMX</p>	P	M	K	N	S	H	■	▣	■			
P	M	K	N	S	H									
■	▣	■												
<p>F2 (LFMX)</p>  	 <p>Graph showing geometry for F2 (LFMX) inserts: LFMX 1.60, LFMX 2.00, LFMX 3.10, LFMX 4.10, LFMX 5.10, LFMX 6.35. The x-axis represents feed rate (f) from 0 to 0.100, and the y-axis represents depth of cut (ap) from 0 to 1.000.</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>▣</td> <td>■</td> <td></td> <td>□</td> <td>□</td> </tr> </tbody> </table> <p>See diagram / Consultar diagrama / Voir diagramme</p>  <p>LFMX</p>	P	M	K	N	S	H	■	▣	■		□	□
P	M	K	N	S	H									
■	▣	■		□	□									
<p>M2 (LFMX)</p>  	 <p>Graph showing geometry for M2 (LFMX) inserts: LFMX 2.00, 2.20, LFMX 3.10, LFMX 4.10, LFMX 5.10, LFMX 6.35. The x-axis represents feed rate (f) from 0 to 0.100, and the y-axis represents depth of cut (ap) from 0 to 1.000.</p>	<table border="1"> <thead> <tr> <th>P</th> <th>M</th> <th>K</th> <th>N</th> <th>S</th> <th>H</th> </tr> </thead> <tbody> <tr> <td>■</td> <td>■</td> <td>▣</td> <td>□</td> <td>▣</td> <td>□</td> </tr> </tbody> </table> <p>See diagram / Consultar diagrama / Voir diagramme</p>  <p>LFMX</p>	P	M	K	N	S	H	■	■	▣	□	▣	□
P	M	K	N	S	H									
■	■	▣	□	▣	□									



D	Drilling Taladrado Perçage	0 PVD 1 CVD	Special application Aplicación especial Application spéciale	1 – 9	01 – 50	
	M	Milling Fresado Fraisage	2 PVD 3 CVD		Free Libre Libre	
T		Turning Torneado Tournage	4 PVD 5 CVD	Cast iron Fundición Fonte		05 – 10
	6 PVD 7 CVD		Group M, S Grupos M, S Groupes M, S		10 – 20	
	8 PVD 9 CVD	Universal Universal Universel		20 – 30		
	B	CBN		30 – 40		
	C	Ceramic Cerámica Céramique		40 – 50		
	D	PCD		40 – 50		
	T	Cermet		40 – 50		

Table 4
Tabla 4
Tableau 4

TURNING GRADES
CALIDADES PARA TORNEADO
NUANCE DE TOURNAGE

Grade Identification Calidad Désignation de la nuance	Area of Application Área de aplicación Domaine d'application	Application / Aplicación / Application	Feed Avance Avance	Cutting speed Velocidad de corte Vitesse de coupe	Resistance to adverse Working Conditions Resistencia a condiciones de trabajo adversas Résistance aux chocs et aux conditions défavorables	Substrate Sustrato Substrat	Coating Recubrimiento Revêtement	Colour / Color Couleur	Coolant benefit / Refrigerante Bénéfice de l'arrosage	General / General / Général	Parting off / Tronzado / Tronçonnage	Threading / Roscado / Filetage	Heavy roughing / Desbaste pesado Ebauche lourde
T9226	P15 - P35	<input type="checkbox"/>				FGM	MT-CVD	Yellow	+++				<input checked="" type="checkbox"/>
	M10 - M30	<input type="checkbox"/>											
	K15 - K35	<input checked="" type="checkbox"/>											
	S15 - S25	<input type="checkbox"/>											
T9310	P01 - P15	<input type="checkbox"/>				FGM	MT-CVD	Black	++		<input checked="" type="checkbox"/>		
	H10 - H20	<input checked="" type="checkbox"/>											
T9315	P05 - P25	<input type="checkbox"/>				FGM	MT-CVD	Black	++		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	H10 - H20	<input checked="" type="checkbox"/>											
T9316	P10 - P20	<input type="checkbox"/>				FGM	MT-CVD	Yellow	+++				<input checked="" type="checkbox"/>
	M05 - M15	<input checked="" type="checkbox"/>											
	K10 - K30	<input type="checkbox"/>											
T9325	P15 - P35	<input type="checkbox"/>				FGM	MT-CVD	Black	++		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	M10 - M30	<input type="checkbox"/>											
	K15 - K35	<input checked="" type="checkbox"/>											
	S10 - S20	<input checked="" type="checkbox"/>											
T9335	P20 - P45	<input type="checkbox"/>				FGM	MT-CVD	Black	+++		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	M15 - M40	<input type="checkbox"/>											
	S15 - S25	<input checked="" type="checkbox"/>											
T7325	P15 - P35	<input checked="" type="checkbox"/>				FGM	MT-CVD	Black	+++		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	M10 - M25	<input type="checkbox"/>											
	S10 - S25	<input type="checkbox"/>											
T7335	P20 - P40	<input checked="" type="checkbox"/>				FGM	MT-CVD	Black	+++		<input checked="" type="checkbox"/>		
	M20 - M40	<input type="checkbox"/>											
	S15 - S25	<input checked="" type="checkbox"/>											
T5305	P05 - P15	<input checked="" type="checkbox"/>				H	MT-CVD	Black	+		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	H15 - H20	<input type="checkbox"/>											
		<input type="checkbox"/>											
T5315	P10 - P25	<input checked="" type="checkbox"/>				H	MT-CVD	Black	+		<input checked="" type="checkbox"/>		
	M05 - M15	<input type="checkbox"/>											
	K10 - K25	<input type="checkbox"/>											
6630	P15 - P35	<input type="checkbox"/>				FGM	MT-CVD	Yellow	+++		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
	M10 - M30	<input type="checkbox"/>											
	K20 - K30	<input checked="" type="checkbox"/>											
	S15 - S25	<input type="checkbox"/>											
6640	P20 - P40	<input type="checkbox"/>				H	MT-CVD	Yellow	+++		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	M20 - M35	<input type="checkbox"/>											
	K25 - K40	<input checked="" type="checkbox"/>											
	S20 - S30	<input type="checkbox"/>											

Table 4
Tabla 4
Tableau 4

TURNING GRADES
CALIDADES PARA TORNEADO
NUANCE DE TOURNAGE

Grade Identification Calidad Désignation de la nuance	Area of Application Área de aplicación Domaine d'application	Application / Aplicación / Application	Feed Avance Avance	Cutting speed Velocidad de corte Vitesse de coupe	Resistance to adverse Working Conditions Resistencia a condiciones de trabajo adversas Résistance aux chocs et aux conditions défavorables	Substrate Sustrato Substrat	Coating Recubrimiento Revêtement	Colour / Color Couleur	Coolant benefit / Refrigerante Bénéfice de l'arrosage	General / General / Général	Parting off / Tronzado / Tronçonnage	Threading / Roscado / Filetage	Heavy roughing / Desbaste pesado Ébauche lourde
T6310	P05 - P15	<input checked="" type="checkbox"/>				ultra submicron H	PVD		+++	✓			
	M01 - M15	<input checked="" type="checkbox"/>											
	K05 - K15	<input checked="" type="checkbox"/>											
	N01 - N15	<input checked="" type="checkbox"/>											
	S01 - S15	<input checked="" type="checkbox"/>											
H01 - H15	<input checked="" type="checkbox"/>												
T8310	P05 - P15	<input type="checkbox"/>				ultra submicron H	PVD		++	✓			
	M01 - M15	<input type="checkbox"/>											
	K05 - K15	<input type="checkbox"/>											
	N01 - N15	<input checked="" type="checkbox"/>											
	S01 - S15	<input checked="" type="checkbox"/>											
H01 - H15	<input checked="" type="checkbox"/>												
T8315	P05 - P20	<input checked="" type="checkbox"/>				submicron H	PVD		++	✓			
	M05 - M20	<input checked="" type="checkbox"/>											
	K05 - K25	<input checked="" type="checkbox"/>											
	N05 - N25	<input checked="" type="checkbox"/>											
	S05 - S15	<input type="checkbox"/>											
H05 - H15	<input checked="" type="checkbox"/>												
T8330	P25 - P40	<input checked="" type="checkbox"/>				submicron H	PVD		+++	✓	✓	✓	
	M20 - M35	<input checked="" type="checkbox"/>											
	K20 - K40	<input checked="" type="checkbox"/>											
	N15 - N30	<input type="checkbox"/>											
	S15 - S25	<input checked="" type="checkbox"/>											
H15 - H25	<input type="checkbox"/>												
T8345	P30 - P50	<input checked="" type="checkbox"/>				submicron H	PVD		+++	✓		✓	
	M20 - M40	<input checked="" type="checkbox"/>											
	K30 - K40	<input checked="" type="checkbox"/>											
	S20 - S30	<input checked="" type="checkbox"/>											
T8030	P25 - P40	<input checked="" type="checkbox"/>				submicron H	PVD		+++			✓	
	M20 - M35	<input checked="" type="checkbox"/>											
	K20 - K40	<input checked="" type="checkbox"/>											
	N15 - N30	<input checked="" type="checkbox"/>											
	S15 - S25	<input checked="" type="checkbox"/>											
H15 - H25	<input checked="" type="checkbox"/>												
T0315	N05 - N30	<input checked="" type="checkbox"/>				submicron H	PVD		++	✓			
HF7	M10 - M20	<input type="checkbox"/>				submicron H	X		++	✓			
	K10 - K25	<input checked="" type="checkbox"/>											
	N10 - N25	<input checked="" type="checkbox"/>											
	S10 - S20	<input checked="" type="checkbox"/>											
H10 - H20	<input type="checkbox"/>												
H07	M05 - M15	<input checked="" type="checkbox"/>				H	X		++	✓			
	K10 - K25	<input checked="" type="checkbox"/>											
	N10 - N30	<input checked="" type="checkbox"/>											
S01 - S20	<input checked="" type="checkbox"/>												

Table 4
Tabla 4
Tableau 4

TURNING GRADES
CALIDADES PARA TORNEADO
NUANCE DE TOURNAGE

Grade Identification Calidad Désignation de la nuance	Area of Application Área de aplicación Domaine d'application	Application / Aplicación / Application	Feed Avance Avance	Cutting speed Velocidad de corte Vitesse de coupe	Resistance to adverse Working Conditions Resistencia a condiciones de trabajo adversas Résistance aux chocs et aux conditions défavorables	Substrate Sustrato Substrat	Coating Recubrimiento Revêtement	Colour / Color Couleur	Coolant benefit / Refrigerante Bénéfice de l'arrosage	General / General / Général	Parting off / Tronzado / Tronçonnage	Threading / Roscado / Filetage	Heavy roughing / Desbaste pesado Ébauche lourde
TT310	P10 - P25	■				cermet	PVD		+ / -	✓			
	M15 - M25	■											
TT010	P01 - P10	■				cermet	X		+ / -	✓			
	M01 - M15	■											
TC100	K01 - K15	■				ceramics	X		-	✓			
	S01 - S05	□											
	H05 - H20	□											
SN100	K05 - K15	■				ceramics	X		+ / -	✓			
TB310	H01 - H10	■				CBN	X		-	✓			
PD1	N05 - N25	■				PKD	X		-	✓			
PC30	N01 - N10	■				PKD	X		-	✓			
D720	N05 - N15	■				PKD	X		-	✓			

Substrate / Sustrato / Substrat

H	WC-Co based substrate	Sustrato de base WC-Co	Substrat de base WC-Co
submicron H	WC-Co based substrate fine grained (< 39.37 µm)	Sustrato de base WC-Co de grano fino (< 39.37 µm)	Substrat à grains fins base WC-Co (< 39.37 µm)
ultra submicron H	WC-Co based substrate very fine grained (< 19.69 µm)	Sustrato de base WC-Co de grano muy fino (< 19.69 µm)	Substrat à grains très fins base WC-Co (< 19.69 µm)
FGM	Functionally graded substrate	Sustrato de grado funcional	Substrat gradient fonctionnel
cermet	Cemented carbide without WC	Carburo sin WC	Carbure cémenté sans WC
ceramics	Cutting ceramics	Cerámica de corte	Céramique
PCD	Polycrystalline Diamond	Diamante policristalino	Diamant polycristallin
CBN	Cubic Boron Nitride	Nitruro de Boro Cúbico	Nitru de Bore cubique
HSS	High speed steel	Acero rápido	Acier rapide

Coating / Recubrimiento / Revêtement

MT-CVD	Medium-temperature chemical method of coating	Método de recubrimiento químico a media temperatura	Méthode de revêtement par dépôt chimique à moyenne température
PVD	Low-temperature physical method of coating	Método de recubrimiento físico a baja temperatura	Méthode de revêtement par dépôt physique à basse température
X	Uncoated grade	Sin recubrimiento	Nuance non revêtue

WORKPIECE MATERIALS – CLASSIFICATION
CLASIFICACIÓN DE MATERIALES MECANIZADOS

Correctly identifying the machined material is one of the most important factors when choosing the tool and the initial machining conditions. To facilitate this, the machined materials are divided into six basic groups, or into twenty-four subgroups, combining materials that qualitatively cause the same type of loading (pressure) on the cutting edge and therefore a similar type of wear.

Thus the first step is to assign the workpiece material to one of the (sub)groups – see table 5. below.

Table 5

Identificar correctamente el material mecanizado es uno de los factores más importantes al momento de elegir la herramienta y la condiciones iniciales de mecanizado. Para facilitar esto, los materiales mecanizados se dividen en seis grupos básicos, o en veinticuatro subgrupos, combinando materiales que cualitativamente pueden causar el mismo tipo de carga (esfuerzo) en la arista de de corte y por lo tanto un tipo similar de desgaste. Así, el primer paso es asignar el material de la pieza a uno de los (sub) grupos - véase la tabla 5. a continuación.

Tabla 5

Subgroup Sub-grupo	DORMER AMG	Subgroup definition	Definición de sub-grupo	Example Ejemplo	Correction factor Factor de corrección	
P	P1	1.1, 1.2	Steel and cast steel with very good (enhanced) machinability; automatic steel and low-carbon steel	Acero y fundición de acero con muy buena (mejorado) mecanización, acero automático y de acero bajo en carbono	95Mn28	1.33
	P2	1.3	Non-alloy and low-alloy cast steel and steel with a medium carbon content (0.25 < C < 0.55); rigidity of up to 900 MPa and hardness of 160 – 255 HB	Sin alea y de baja aleación de acero fundido y acero con un contenido de carbono medio (0,25 < C < 0,55); rigidez de hasta 900 MPa y una dureza de 160 – 255 HB	C45	1.00
	P3	1.4	Less machinable non-alloy and low-alloy cast steel and steel with a medium carbon content; rigidity of up to 1000 MPa and hardness of up to 300 HB	Menos mecanizable sin alea y de acero fundido de baja aleación y acero con un contenido de carbono medio; rigidez de hasta 1000 MPa y una dureza de hasta 300 HB	41CrAlMo7	0.80
	P4	1.5	Medium – to high-alloy cast steel and steel (usually with a carbon content of 0.55 < C); rigidity of up to 1270 MPa and hardness of up to 375 HB (resp. 40 HRC)	Medio – alto-aleación de acero fundido y acero (normalmente con un contenido de carbono de 0,55 < C); rigidez de hasta 1270 MPa y una dureza de hasta 375HB (resp. 40 HRC)	X210Cr12	0.60
M	M1	2.1	Ferritic corrosion-resistant steel	Acero resistente a la corrosión ferrítico	X6Cr17	1.09
	M2	(2.1, 2.4)	Martensitic corrosion-resistant steel	Acero resistente a la corrosión martensítico	X 45CrSi 9.3	1.06
	M3	2.2	Austenitic corrosion-resistant steel	Acero resistente a la corrosión austenítico	X 6CrNiTi 18 10	1.00
	M4	2.3, 2.4	Ferritic-austenitic (duplex) and super-austenitic corrosion-resistant steel	Ferrítico-austenítico (dúplex) y super-austenítico acero resistente a la corrosión	X 53 CrMnNiN21 9	0.93
K	K1	3.1, 3.2	Grey cast iron	Gris hierro fundido	GG-25	1.00
	K2	3.1, 3.2	Tempered cast iron	Hierro fundido templado	GTS 45-06	0.95
	K3	3.3	Ductile cast iron ferritic and ferrite-pearlite	Fundición ferrítico hierro y ferrita-perlita	GGG40	0.90
	K4	3.4	Ductile cast iron pearlite-ferritic, pearlite-sorbite and pearlite	Fundición dúctil de perlita y ferrita, perlita-sorbite y perlita	GGG-70	0.85
N	N1	7.1	Aluminium and its soft alloys (with a low Si content), particularly formed and cast (non-hardened); hardness of up to 100 HB	Aluminio y sus aleaciones blandas (con bajo contenido de Si), especialmente formado y yeso (no resistente); dureza de hasta 100 HB	AlMgSi1	1.00
	N2	7.2, 7.3, 7.4	Hard Al alloys, particularly cast and hardened (with a high Si content)	Duro aleaciones de Al, en particular emitidos y endurecidos (con un alto contenido de Si)	G-AlSi11	0.65
	N3	6.1, 6.2, 6.3	Soft Cu alloys, automatic brass and other types of soft brass and bronze	Aleaciones Cu suaves, latón automática y otros tipos de latón blando y bronce	G-CuSn5Zn5Pb	0.60
	N4	6.4	Less machinable and hard Cu alloys	Aleaciones Cu menos mecanizables y duros	G-CuAl10Fe	0.40
S	S1	4.1, 4.2, 4.3	Technically pure Ti, alloys α , $\alpha+\beta$ and β , refined and aged alloys	Técnicamente ti puro, aleaciones α , $\alpha+\beta$ y β , refinado y aleaciones viejas	TiAl6V4	1.75
	S2	(9.1)	Fe-based alloys	Aleaciones a base de hierro	X10NiCrAlTi3221	1.20
	S3	5.1, 5.2, 5.3	Ni-based alloys	Aleaciones a base de níquel	INCONEL 718	1.20
	S4	(9.1)	Co-based alloys	Aleaciones a base de cobalto	Haynes 25	0.75
H	H1	1.6	Highly rigid and hard tool steel and hardened and refined steel with a hardness of 40 – 50 HRC	Muy rígido y duro y acero para herramientas endurecido y acero refinado, con una dureza de 40 – 50 HRC	X30WCrV9.3	1.15
	H2	-	Hardened and white cast iron 350 – 600 HV	Hierro fundido templado y blanco 350 – 600 HV	G-X 260 NiCr 4 2	1.10
	H3	1.7	Hardened and refined steel with hardness in the 50 – 55 HRC range	Acero templado y refinada con dureza en el 50 – 55 gama HRC	X38CrMoV5.1	1.00
	H4	1.8	Hardened and refined (mostly tool) steel with hardness of more than 55 HRC	Endurecido y refinado (en su mayoría de la herramienta) de acero con dureza de más de 55 HRC	X210Cr12	0.95

CLASSIFICATION DES GROUPES DE MATÉRIAUX À USINER

L'identification du matériau à usiner est l'un des facteurs les plus importants pour choisir l'outil et les conditions de coupe de départ. Pour simplifier ce choix, les matériaux usinés sont divisés en six groupes de base, ou vingt quatre sous-groupes. Dans chacun sont associés

des matériaux qui causent le même type de charge sur l'arête de coupe et également un type d'usure similaire. C'est pourquoi la première étape consiste à identifier le matériau à usiner parmi les (sous-)groupes référencés - voir tableau N°5 ci-dessous.

Tableau 5

Subgrupo Sous-groupe	DORMER AMG	Définition du sous-groupe	Exemplo Exemple	Correção Standard Correction à la norme
P	P1	1.1, 1.2 Acier et acier coulé avec une usinabilité améliorée ; acier de construction et acier à faible teneur en carbone	9SMn28	1.33
	P2	1.3 Acier et acier coulé non allié et faiblement allié à moyenne teneur en carbone (0,25 < C < 0,55); résistance jusqu'à 900 MPa et dureté de 160 – 255 HB	C45	1.00
	P3	1.4 Acier et acier coulé non allié et faiblement allié à moyenne teneur en carbone plus difficiles à usiner; résistance jusqu'à 1000 MPa et dureté jusqu'à 300 HB	41CrAlMo7	0.80
	P4	1.5 Acier et acier coulé moyennement et fortement allié (généralement avec une teneur en carbone 0,55 < C); résistance jusqu'à 1270 MPa et dureté jusqu'à 375 HB HRC)	X210Cr12	0.60
M	M1	2.1 Aciers inoxydables ferritiques résistants à la corrosion	X6Cr17	1.09
	M2	(2.1, 2.4) Aciers inoxydables martensitiques résistants à la corrosion	X 45CrSi 9.3	1.06
	M3	2.2 Aciers inoxydables austénitiques résistants à la corrosion	X 6CrNiTi 18 10	1.00
	M4	2. , 2.4 Aciers inoxydables ferritiques-austénitiques (duplex) et super austénitiques résistants à la corrosion	X 53 CrMnNiN21 9	0.93
K	K1	3.1, 3.2 Fontes grises	GG-25	1.00
	K2	3.1, 3.2 Fontes trempées	GTS 45-06	0.95
	K3	3.3 Fontes ductiles ferritiques et ferritiques-perlitiques	GGG40	0.90
	K4	3.4 Fontes ductiles perlites-ferrites, perlites et de perlites sorbitiques	GGG-70	0.85
N	N1	7.1 L'aluminium et ses alliages doux (à faible teneur en Si), en particulier formés et coulés (non trempé); dureté jusqu'à 100 HB	AlMgSi1	1.00
	N2	7.2, 7.3, 7.4 Alliages Al durs, en particulier coulés et traités (à haute teneur en Si)	G-AlSi11	0.65
	N3	6.1, 6.2, 6.3 Alliages Cu doux, laiton automatique et autres types de laiton et de bronze tendre	G-CuSn5Zn5Pb	0.60
	N4	6.4 Alliages moins faciles à usiner et alliages durs Cu	G-CuAl10Fe	0.40
S	S1	4.1, 4.2, 4.3 Ti techniquement pur, alliages α , $\alpha+\beta$ et β , alliages affinés et vieillis	TiAl6V4	1.75
	S2	(9.1) Alliages base Fe	X10NiCrAlTi3221	1.20
	S3	5.1, 5.2, 5.3 Alliages base Ni	INCONEL 718	1.00
	S4	(9.1) Alliages base Co	Haynes 25	0.75
H	H1	1.6 Aciers à outils très résistants durs, trempés, affinés avec une dureté de 40 – 50 HRC	X30WCrV9.3	1.15
	H2	- Fontes trempées et blanches 350 – 600 HV	G-X 260 NiCr 4 2	1.10
	H3	1.7 Aciers trempés et affinés avec une dureté dans la plage 50 – 55 HRC	X38CrMoV5.1	1.00
	H4	1.8 Aciers trempés et affinés (principalement acier à outil) avec une dureté de plus de 55 HRC	X210Cr12	0.95

RECOMMENDATIONS FOR FINDING SUITABLE CHIP BREAKER – GRADE COMBINATION
RECOMENDACIONES PARA ENCONTRAR LA COMBINACIÓN ROMPEVIRUTAS – CALIDAD ADECUADA
RECOMMANDATIONS POUR TROUVER LA BONNE COMBINAISON GÉOMÉTRIE - NUANCE

The choice of insert shape depends on the choice of tool holder. The following procedure will help you to not only choose an optimal product, but to also determine the correct starting conditions.

La elección de la forma de la plaquita depende de la elección del portaherramientas. El siguiente procedimiento le ayudará, no sólo a elegir un producto óptimo, sino también a determinar las condiciones de corte iniciales.

Example: finding a suitable chip breaker – grade combination for machining steel using tool PCLNR 2020M12 with insert CN.. 12.., cutting conditions $a_p = .039$ in, $f = .006$ in/rev

Ejemplo: encontrar la combinación rompevirutas - calidad adecuada para mecanizar acero utilizando una herramienta PCLNR 2020M12 con una plaquita CN..12.., condiciones de corte $a_p = .039$ in, $f = .006$ in/rev

1. Classify machined material into one of six groups according to ISO 513, see Table 5. Result: P – steel.
2. Select the grade and geometry based on insert type and operation type from Tables 6a - 11a (pgs T396-T407). Only variants with the highest probability of successful application upon first deployment are included.

1. Clasificar el material dentro de uno de los seis grupos según ISO 513, ver tabla 5. Resultado: P - acero.
2. Seleccionar calidad y geometría, en base a la forma de la plaquita y el tipo de operación, de las Tablas 6a - 11a (pgs T396-T407). Sólo se incluyen las variantes con la más alta probabilidad de éxito en la aplicación desde el principio.

Le choix de la forme de plaquette dépend du choix du porte-outil. La procédure suivante vous aidera non seulement à choisir le produit optimum, mais aussi à déterminer correctement les valeurs initiales de conditions de travail.

Exemple : trouver la bonne combinaison géométrie - nuance pour l'usinage de l'acier en utilisant un outil PCLNR 2020M12 avec une plaquette CN.. 12.., conditions de coupe $a_p = .039$ in, $f = .006$ in/tour

1. Trouver la matière à usiner dans l'un des six groupes ISO 513, voir Table 5. Résultat: P – acier.
2. Sélectionner la nuance et la géométrie selon le type de plaquette et d'opération dans les tables 6a - 11a (pgs T396-T407). Seules sont incluses les variantes ayant la plus grande probabilité de réussir l'application dès le premier essai.

Picture / Imagen / Image 6

Cutting inserts type according to ISO		FF		F		M		
		f		f		f		
		.002 - .004		.004 - .008		.008 - .016		
a_p		a_p		a_p		a_p		
.008 - .039		.031 - .079		.059 - .157				
●		●		●		●		
P	..A	CNMA, CNMM, CNMG,	T8315	T8315	TT310	T8315	T9315	T9325
	..M	DNMA, DNMM, DNMG,	I	I	I	I	I	I
	..G	DNMU, SNMA, SNMM,	FF	FF	FM	FM(SF)	W-M	M (W-MR)
	..U	SNMG, SNMX, TNMA,	II	II	II	II	II	II
	..N	TNMM, TNMG, VNMU,	T6310	T8330	T9315	T8330	T9315	T9325
		RNMA, RNMM, RNMG,	SF	NF	FM	FM(SF)	FM(SM)	FM(SM)
		WNMA, WNMM, WNMG	III	III	III	III	III	III
			T8330	T8330	T9315	T9325	T9325	T8330
			SF	FM	W-F	W-F	NM(SM)	NM(SM)

RECOMMENDATIONS FOR FINDING SUITABLE CHIP BREAKER – GRADE COMBINATION
RECOMENDACIONES PARA ENCONTRAR LA COMBINACIÓN ROMPEVIRUTAS – CALIDAD ADECUADA
RECOMMANDATIONS POUR TROUVER LA BONNE COMBINAISON GÉOMÉTRIE - NUANCE

Example – legend: / Ejemplo - leyenda / Exemple - Légende :

A	Find blue table (steel – P) - Table 6a Encontrar la tabla azul (acero - P) - Tabla 6a Trouver le tableau bleu (acier – P) - Table 6a
B	Find group with the chosen insert (CN..) Encontrar el grupo con la plaquita elegida (CN..) Trouver le groupe avec la plaquette choisie (CN..)
C	Find operation type based on input parameters (a_p, f) Encontrar el tipo de operación en base a los parametros dados (a_p, f) Trouver le type d'opération selon les paramètres de base (a_p, f)
D	Choose cut type based on planned operation (continuous) Elegir el tipo de corte en base a la operación (continuo) Choisir le type de coupe pour l'opération à réaliser (continue)
E	Result = First choice: grade TT310, chip breaker FM / Second choice: grade T9315, chip breaker FM / Third choice: grade T9315, chip breaker W-F Resultado = Primera elección: calidad TT310, rompevirutas FM / Segunda elección: calidad T9315, rompevirutas FM / Tercera elección: calidad T9315, rompevirutas W-F Résultat = Premier choix : nuance TT310, géométrie FM / Second choix : nuance T9315, géométrie FM / Troisième choix : nuance T9315, géométrie W-F

Note: the choices are graded so that the first variant offers the best power and the third highest operational reliability (it is necessary to always take into consideration the specific conditions).

You can verify the correct choice of chip breaker or grade in the section dedicated to the description of geometry or grades in the technical section for turning.

Note : Les choix sont classés de sorte que la première variante offre la meilleure performance et la troisième la plus grande fiabilité de fonctionnement (il est nécessaire de toujours prendre en compte les conditions spécifiques).

Vous pouvez vérifier le choix correct de la géométrie et de la nuance dans la partie technique de tournage comprenant les descriptions des géométries ou des nuances.

Nota: las elecciones estan graduadas de forma que la primera variante ofrece las mejores prestaciones y la tercera la mejor fiabilidad operacional (es necesario siempre tomar en consideración las condiciones específicas).

Se puede verificar la correcta elección de rompevirutas o calidad en el capítulo dedicado a la descripción de geometrías o calidades en la sección técnica para torneado.

VERIFYING THE CHOICE OF CHIP BREAKER AND CUTTING GRADE
VERIFICAR LA ELECCIÓN DE ROMPEVIRUTAS Y CALIDAD
VÉRIFICATION DE LA GÉOMÉTRIE ET DE LA NUANCE DE COUPE

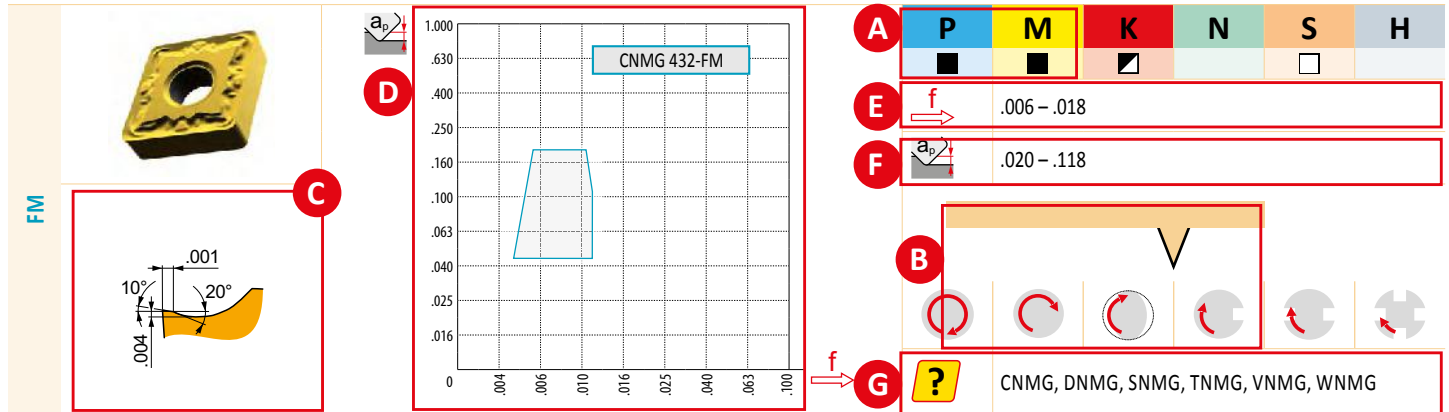
You can verify the correct choice of chip breaker or grade in the section dedicated to the description of geometry or grades – Tables 3 and 4.

Se puede verificar la correcta elección de rompevirutas o calidad en el capítulo dedicado a la descripción de geometrías o calidades - Tablas 3 y 4

Vous pouvez vérifier le choix correct de la géométrie et de la nuance dans la partie technique de tournage présentant les descriptions des géométries ou des nuances – Tables 3 et 4.

VERIFYING THE CHOICE OF CHIP BREAKER AND CUTTING GRADE
 VERIFICAR LA ELECCIÓN DE ROMPEVIRUTAS Y CALIDAD
 VÉRIFICATION DE LA GÉOMÉTRIE ET DE LA NUANCE DE COUPE

Picture / Imagen / Image 7



Verification result:

Chip breaker FM is primarily recommended for machining of, among others, common steels (A) and its geometry is suitable for machining, among others, on medium speeds with slightly worse cutting conditions and fluctuating depth of cut (B). The above corresponds to the assignment – workpiece with skin. In addition, we have obtained the information about the main cutting edge (C), the depth/feed areas where the given geometry does the forming (D), the maximum feed range (E), the maximum range for depth of cut (F) and the insert shapes where this chip breaker can be found (G).

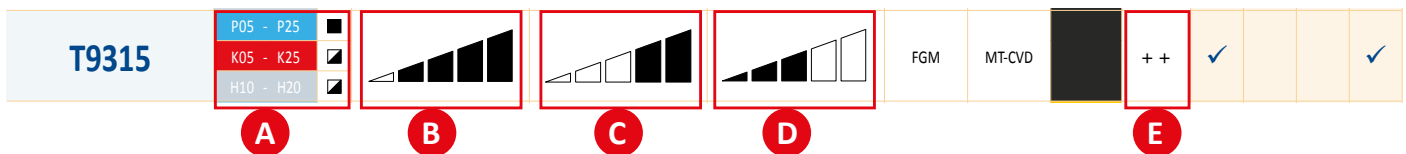
Resultado de la verificación:

El rompevirutas FM es la primera recomendación para el mecanizado de, entre otros, aceros normales (A) y su geometría es adecuada para mecanizar, entre otros, a velocidades medias en condiciones ligeramente desfavorables y una profundidad de corte con fluctuaciones (B). Esto corresponde a la pieza. Adicionalmente, hemos obtenido la información sobre el filo de corte principal (C), el área de aplicación de profundidad y avance en el que esta geometría conforma la viruta (D), el avance máximo (E), la profundidad de corte máxima (F) y las formas de plaqueta en las que este rompevirutas está disponible (G).

Vérification du résultat:

La géométrie (brise-copeaux) FM est principalement recommandée, entre autre, pour l'usinage de l'acier (A) et sa géométrie convient pour usiner, entre autre, avec une avance moyenne dans des conditions de travail légèrement défavorables et avec des profondeurs de coupe variables (B). Ce qui précède correspond à l'état de la pièce - pièce avec croûte. En complément, nous vous donnons l'information du profil de l'arête de coupe principale (C), Les graphes profondeur / avance donnent les valeurs pour lesquelles la géométrie fractionne le copeau (D), la plage d'avances (E), la plage de profondeurs de coupe (F) et les types de plaquettes disponibles avec cette géométrie.

Picture / Imagen / Image 8



Verification result:

Grade T9315 is recommended for machining, among others, common steels (A), for the full range of feeds with the exception of the smallest ones (B), i.e. smaller than 0.15, and further for the band of high and very high cutting speeds (C) and for stable to worse cutting conditions (D). These values comply with the conditions of our example. The resulting productivity of the operation can be further increased by using cutting fluid, which in this case will have a positive effect on the durability of the edge (E).

Resultado de la verificación:

La calidad T9315 esta recomendada para mecanizar, entre otros, aceros normales (A), para toda la gama de avances exceptuando los más bajos (B), es decir, menores de 0,15, además para la gama de velocidades de corte altas y muy altas (C) y para condiciones de corte estables a ligeramente desfavorables (D). Estos valores cumplen con las condiciones de nuestro ejemplo. La productividad resultante de la operación se puede incrementar mediante el uso de refrigerante, que en este caso tiene un efecto positivo en la duración del filo de corte (E).

Vérification du résultat:

La nuance T9315 est recommandée, entre autre, pour l'usinage de l'acier (A) pour une gamme étendue d'avances à l'exception des plus petites (B), par exemple inférieure à 0.15, et également pour une plage de vitesses de coupe élevées à très élevées (C) et pour des conditions de travail favorables à plus mauvaises (D). Ces valeurs sont conformes aux conditions de notre exemple. La productivité résultante de l'opération peut encore être améliorée en utilisant du fluide de coupe, lequel peut dans ce cas avoir un effet positif sur la durée de vie de l'arête (E).

RECOMMENDATIONS FOR DETERMINING STARTING CUTTING CONDITIONS
RECOMENDACIONES PARA DETERMINAR LAS CONDICIONES DE CORTE INICIALES
RECOMMANDATIONS POUR TROUVER LES CONDITIONS DE COUPE DE DÉPART

Example: to continue with the example, we shall work with the second option – grade T9315, chip breaker FM – which offers a compromise between power and operational reliability.
 3. In Tables 6b - 11b (pgs T397-T407) select starting cutting speed:

Ejemplo: para continuar con el ejemplo, trabajaremos con la segunda opción - calidad T9315, rompevirutas FM - que ofrece un compromiso entre prestaciones y fiabilidad.
 3. En las Tablas 6b - 11b (pgs T397-T407) seleccionar la velocidad de corte inicial:

Exemple : pour continuer avec cet exemple, nous travaillerons avec la deuxième option – nuance T9315, brise-copeaux FM – qui offrent un compromis entre la performance et la fiabilité de fonctionnement.
 3. Dans les Tables 6b - 11b (pgs T397-T407), sélectionner la vitesse de coupe de départ:

Picture / Imagen / Image 9

		P																				
		f	a _p	6630	6640	T5305	T5315	T7325	T7335	T9310	T9315	T9325	T9335	T9316	T9226	T6310	T8030	T8310	T8315	T8330	T8345	
FF	I	.002	.020	-	-	1394	1164	-	-	-	-	-	-	-	-	1525	886	1328	1214	902	-	20
	II	.003	.020	-	-	1197	1033	-	-	-	-	-	-	-	-	1263	754	1148	1050	804	-	10
	III	.004	.020	-	-	1115	968	-	-	-	-	-	-	-	-	1164	689	1066	968	754	-	10
F	I	.004	.060	935	836	1000	870	-	-	-	-	-	-	-	1033	623	968	869	672	623	-	10
	II	.006	.060	820	738	918	820	853	853	1050	1000	977	787	-	935	574	902	820	640	574	-	10
	III	.008	.060	820	738	934	836	869	853	1082	1050	1000	820	-	918	574	902	820	672	574	-	10

Example – legend: / Ejemplo - leyenda: / Exemple - Légende:

A Find blue table (steel – P) - Table 6b
 Encontrar la tabla azul (acero - P) - Tabla 6b
 Trouver le tableau bleu (acier – P) - Table 6b

B Find operation type (operation F, f = .006 in/rev, a_p - closest value – .059 in)
 Buscar el tipo de operación (operación F, f = .006 in/rev, a_p - valor más cercano - .059 in)
 Trouver le type d'opération (opération F, f = .006 in/tour, a_p - valeur la plus proche – .059 in)

C Find the chosen material (T9315)
 Buscar la calidad elegida (T9315)
 Trouver la nuance choisie (T9315)

D Result = starting cutting speed 1000 SFM
 Resultado = velocidad de corte inicial 1000 SFM
 Résultat = vitesse de coupe de départ 1000 SFM

The initial cutting speeds are set for 15 minutes (45 minutes for heavy roughing) without cooling. These speeds are listed for threading, parting and grooving inserts with the use of cutting fluid.

La velocidad de corte inicial se da para 15 minutos (45 minutos para desbaste pesado) sin refrigerante. Estas velocidades estan indicadas para plaquitas de roscado, tronzado y ranurado con uso de refrigerante.

Les vitesses de coupe initiales sont données pour 15 minutes (45 minutes pour l'ébauche lourde) sans arrosage. Ces vitesses sont données pour le filetage, les plaquettes pour troncantage et gorges avec l'utilisation de fluide de coupe.

RECOMMENDATIONS FOR DETERMINING STARTING CUTTING CONDITIONS
RECOMENDACIONES PARA DETERMINAR LAS CONDICIONES DE CORTE INICIALES
RECOMMANDATIONS POUR TROUVER LES CONDITIONS DE COUPE DE DÉPART

4. Tables 6b - 11b, see the previous step, are supplemented with correction coefficients for converting the cutting speeds for turning to take into account the condition of the machine, the tool durability required, the material and the hardness of the workpiece. Therefore, where necessary, use these correction coefficients to calculate the final starting speed.

Example: specify with regard to the blank – sandblasted forging with crust, medium carbon steel with hardness 240 HB – and the working conditions – required durability of insert 20 minutes and poor condition of the machine.

4. Tablas 6b - 11b, ver paso previo, estan complementadas con coeficientes de corrección para modificar las velocidades de corte teniendo en cuenta las condiciones de la máquina, la durabilidad requerida, el material de la pieza y su dureza. Por tanto, si es necesario, utilizar estos coeficientes de corrección para calcular la velocidad de corte inicial definitiva.

Ejemplo: especificar en función de la pieza - forja chorreada con arena con cascarilla, acero de medio contenido en carbono con una dureza de 240 HB - y las condiciones de trabajo - una duración del filo de 20 minutos y una máquina en malas condiciones.

4. Les tables 6b - 11b (voir étape précédente) sont complétées par des coefficients correcteurs pour convertir les vitesses de coupe de tournage en prenant en compte la condition de la machine, la durabilité de l'outil demandée, la matière et la dureté de la pièce. Cependant, si nécessaire, utiliser ces facteurs de correction pour calculer la vitesse de coupe finale.

Exemple : spécifier l'état brut de la pièce – avec croûte de forge ou de fonderie, acier à moyenne teneur en carbone d'une dureté de 240 HB – et les conditions de travail – durabilité souhaitée de la plaquette 20 minutes et mauvaises conditions machine.

Picture / Imagen 10

CORRECTION v_c				
Subgroup	P1	P2	P3	P4
Hardness	$k_{vHB} - P1$	$k_{vHB} - P2$	$k_{vHB} - P3$	$k_{vHB} - P4$
120	1.53	1.18	.94	.71
140	1.46	1.12	.90	.67
160	1.37	1.05	.84	.63
180	1.30	1.00	.80	.60
200	1.24	.96	.76	.57
220	1.17	.92	.72	.54
240	1.12	.86	.69	.52
260	1.07	.82	.66	.49
280	1.04	.80	.64	.48
300	1.00	.77	.62	.46
320	.96	.74	.59	.44
340	.92	.71	.57	.43
360	.88	.68	.54	.41
375	.85	.65	.52	.39
$k_{VT(GM)}$				
10				.84
15				.76
20		0.93		.71
$k_{VT(HM)}$				
30		1.10		
45		1.00		
Skin of forging and casting				.70 - .80
Internal turning				.75 - .85
k_{vx}				
Interrupted cut				.80 - .90
Stable machine conditions				.80 - .90
Unstable machine conditions				.85 - .95
Insert shape				k_{vi}
S... C... W...				1.00
V... L... (parting and grooving)				1.00
R... L... (heavy roughing)				1.10

Example – legend:	
A	Find blue table (correction for steels – P) - Table 6b Encontrar la tabla azul (correcciones para acero - P) - Tabla 6b
A1	Find subgroup P2 (steels with medium carbon content) Buscar subgrupo P2 (aceros de medio contenido en carbono)
A2	Find required hardness (240 HB) Buscar la dureza (240 HB)
A3	Result = correction coefficient for machined material of required hardness ($0.86 k_{vHB}$) Resultado = coeficiente de corrección para mecanizar un material con la dureza requerida ($0.86 k_{vHB}$)
B1	Find durability table for general machining (GM) Buscar la tabla de durabilidad para mecanizado general (GM)
B2	Find required durability (20 min) Buscar la duración requerida (20 min)
B3	Result = correction coefficient for required durability ($0.93 k_{VT}$ (GM)) Resultado = coeficiente de corrección para la dureza requerida ($0.93 k_{VT}$ (GM))
C1	Find correction for skin of the forging Buscar la corrección para corteza de forja
C2	Result $k_{vx1} = 0.8$ (choose the higher value from the range offered, since we are dealing with sandblasted forgings with smoother surface) Resultado $k_{vx1} = 0.8$ (elegir el valor más alto de la gama indicada ya que estamos trabajando con forja chorreada con arena y con cascarilla)
C3	Find correction for machine condition (poor) Buscar la corrección para el estado de la máquina (malo)
C4	Result $k_{vx2} = 0.85$ (choose the lower from the range offered) Resultado $k_{vx2} = 0.85$ (elegir el valor más pequeño de la gama indicada)
D1	Find correction for insert shape (C..) Buscar la corrección para la forma de la plaquita (C..)
D2	Result $k_{vi} = 1.00$ Resultado $k_{vi} = 1.00$

RECOMMENDATIONS FOR DETERMINING STARTING CUTTING CONDITIONS
RECOMENDACIONES PARA DETERMINAR LAS CONDICIONES DE CORTE INICIALES
RECOMMANDATIONS POUR TROUVER LES CONDITIONS DE COUPE DE DÉPART

Image 10

A CORRECTION v_c				
Subgroup	P1	P2	P3	P4
Hardness	$k_{vHB} - P1$	$k_{vHB} - P2$	$k_{vHB} - P3$	$k_{vHB} - P4$
120	1.53	1.18	.94	.71
140	1.46	1.12	.90	.67
160	1.37	1.05	.84	.63
180	1.30	1.00	.80	.60
200	1.24	.96	.76	.57
220	1.17	.92	.72	.54
240	1.12	.86	.69	.52
260	1.07	.82	.66	.49
280	1.04	.80	.64	.48
300	1.00	.77	.62	.46
320	.96	.74	.59	.44
340	.92	.71	.57	.43
360	.88	.68	.54	.41
375	.85	.65	.52	.39
$k_{VT(GM)}$	10	30	.84	
	15	45	.76	
	20	60	.71	
$k_{VT(HM)}$	30	60		
	45	1.00		
k_{vx}	Skin of forging and casting			.70 - .80
	Internal turning			.75 - .85
	Interrupted cut			.80 - .90
	Stable machine conditions			1.00
k_{vi}	Unstable machine conditions			.85 - .95
	Insert shape S... C... W...			1.00
k_{vi}	V... L... (parting and grooving)			1.00
	R... L... (heavy roughing)			1.10

Example – legend:

- A** Trouver le tableau bleu (correction pour les aciers – P) - Table 6b
- A1** Trouver le sous-groupe P2 (aciers à moyenne teneur en carbone)
- A2** Trouver la dureté requise (240 HB)
- A3** Résultat = coefficient correcteur pour la matière à usiner avec la dureté requise ($0.86 k_{vHB}$)
- B1** Trouver la table de durabilité pour l'usage général (GM)
- B2** Trouver la durabilité souhaitée (20 min)
- B3** Résultat = coefficient correcteur pour la durabilité souhaitée $0.93 k_{VT}$ (GM)
- C1** Trouver la correction pour croûte de forge ou de fonderie
- C2** Résultat $k_{vx1} = 0.8$ (choisir la valeur la plus élevée dans la plage, puisque l'état du brut de la pièce comprend de la croûte de forge ou de fonderie)
- C3** Trouver la correction pour les conditions de la machine (mauvaises)
- C4** Résultat $k_{vx2} = 0.85$ (choisir la plus basse de la plage)
- D1** Trouver la correction pour la forme de la plaquette (C..)
- D2** Résultat $k_{vi} = 1.00$

$$v_c = v_{15} \cdot k_{vx} \cdot k_{VT} \cdot k_{vHB} \cdot (k_{vN})$$

$$v_c = 305 \times 0.86 \times 0.93 \times 0.80 \times 0.85 \times 1.00 = 166$$

Cutting speed determined in this way is the initial (default) value defining the basic level of cutting speed for a given operation.

The variance in machinability of the machined material, above all, often causes the need to adjust the cutting speed to a certain extent in case we need to adhere relatively precisely to the economical durability of the edge.

La velocidad de corte determinada de esta forma es el valor inicial y define el nivel básico de velocidad de corte para una operación determinada.

La variación en la maquinabilidad del material a mecanizar, en general, hace necesario ajustar la velocidad de corte en cierta medida si tenemos que determinar de manera precisa la durabilidad económica del filo.

La valeur de la vitesse de coupe déterminée de cette façon est une valeur initiale (par défaut) représentant une vitesse de base pour une opération donnée.

C'est avant-tout la variation d'usabilité de la matière usinée qui nécessite d'avoir à ajuster la vitesse de coupe dans le cas où l'on recherche un peu plus précisément une durabilité économique de l'arête.

Table 6a
 Tabla 6a
 Tableau 6a

CHOICE OF INITIAL CUTTING CONDITIONS
 SELECCIÓN DE CONDICIONES DE CORTE INICIALES
 CHOIX DES CONDITIONS DE COUPE INTIALES

	FF		F		M		R		HR		P+G		T
	f	a _p	f	a _p	f	a _p	f	a _p	f	a _p	f	a _p	
Cutting inserts type according to ISO Tipo de plaqueta ISO Tipo de Pastilha ISO Type de plaquettes de coupe définies par la norme ISO	.002 - .004		.004 - .008		.008 - .016		.016 - .040		> .040		.002 - .012		-
	.020 - .040		.040 - .080		.080 - .160		.160 - .400		> .400				-
	T8315		T8315		T9315		T9315		T9316 (T9325)		T9316 (T9325)		-
..A	T8315	TT310	T8315	T9315	T9325	T9315	T9315	T9315	T9316 (T9325)	T9226 (T9325)	T9316 (T9325)	T9316 (T9325)	-
..M	FF	FM	FM(SF)	W-M	M (W-MR)	R (W-M)	R (W-MR)	SR(HR2)	SR(HR2)	SR(HR2)	SR(HR2)	-	
..G	FF	FM	FM(SF)	W-M	M (W-MR)	R (W-M)	R (W-MR)	SR(HR2)	SR(HR2)	SR(HR2)	SR(HR2)	-	
..J	T6310	T9315	T8330	T9315	T9325	T9325	T9325	T8330	T8345	T9335	T9335	-	
..N	SF	FM	FM(SF)	FM(SM)	FM(SM)	FM(SM)	FM(SM)	NR2 (OR)	NR2 (OR)	NR2 (OR)	NR2 (OR)	-	
	T8330	T9315	T9325	T9325	T8330	T9325	T8330	NR2 (OR)	T8345	T9335	T9335	-	
	SF	W-F	W-F	NM(SM)	NM(SM)	NM(SM)	OR (NR2)	NR2 (OR)	SR(HR2)	SR(HR2)	SR(HR2)	-	
..X	-	T9325	T9335	6640	6640	6640	6640	T9310	T9315 (T9325)	T9315 (T9325)	T9315 (T9325)	-	
	-	72	72	73	73	73	73	-	T9325 (T9335)	T9325 (T9335)	T9325 (T9335)	-	
	-	-	-	T9325	T9335	T9335	T9335	T9315	T9315	T9315	T9315	-	
	-	-	-	72	72	72	74	-	T9335	T9335	T9335	-	
..W	TT310	TT310	T8315	T9315	T9315	T9315	T9315	T9315	T9315	T9335	T9335	-	
..T	UR	UR	FF(NF2)	RM	RM	RM	RM	OR	OR	OR	OR	-	
	TT010	T9315	T9325	T9315	T9325	T9325	T9325	T9325	T9335	T9335	T9335	-	
	FF2	FM	FM(FM2)	RM	RM	RM	RM	SR	SR	SR	SR	-	
	T8315	T8315	T8330	T9325	T8330	T8330	T8330	T9316	T9335	T9335	T9335	-	
	FF(NF2)	UR	FM	RM(RM3)	RM(RM3)	RM(RM3)	RM(RM3)	RM1	SR	SR	SR	-	
..R	-	T9325	T9335	T9325	T9335	T9335	T9335	-	-	-	-	-	
..N	-	46	46	46	46	46	46	-	-	-	-	-	
	-	T9325	T9335	T9325	T9335	T9335	T9335	-	-	-	-	-	
	-	47	47	47	47	47	47	-	-	-	-	-	
	-	T9325	T9335	T9325	T9335	T9335	T9335	-	-	-	-	-	
	-	48	48	48	48	48	48	-	-	-	-	-	
..X	T9325	T8330	T8330	-	-	-	-	-	-	-	-	T8330	-
	-	-	-	-	-	-	-	-	-	-	-	T8330	-
	T8330	-	-	-	-	-	-	-	-	-	-	T9325 (6640)	-
	-	-	-	-	-	-	-	-	-	-	-	T8330 (6640)	-
	-	-	-	-	-	-	-	-	-	-	-	-	T8030

Table 7a
 Tabla 7a
 Tableau 7a

CHOICE OF INITIAL CUTTING CONDITIONS
 SELECCIÓN DE CONDICIONES DE CORTE INICIALES
 CHOIX DES CONDITIONS DE COUPE INTIALES

Cutting inserts type according to ISO Tipo de plaqueta ISO Tipo de Pastilha ISO Type de plaquettes de coupe définies par la norme ISO	FF		F		M		R		HR		P+G		T
	.002 - .004	.004 - .008	.008 - .016	.016 - .040	.008 - .016	.080 - .160	.160 - .400	> .040	> .040	.002 - .012			
..A CNMA, CNMM, ..M CNMG, DNMA, DNMM, ..G DNMG, DNML, SNMA, ..U SNMM, SNMG, SNMX, ..N TNMA, TNMM, TNMG, VNML, RNMA, RNMM, RNMG, WNMA, WNMM, WNMG	T8315	TT310	T8315	T7325	T7335	T9325	T8315	T9226 (T9325)	T9335	T8315	T9325	T8330	
..X KNUX, LNUX LNMX	-	T9325	T9335	6640	6640	6640	T9335	T9310	T9315	T9315	T9315	T9325	
..W CCMW, CCMT, SCMW, ..T SCMT, DCMW, DCMT, TCMW, TCMT, VCMW, VCMT, WCMW, WCVMT, RCMW, RCMT, RCMX	TT310	TT310	T8315	T9315	T9315	T9315	T8315	T9315	T9325	T9325	T9325	T9325	
..R SPMR, SPGR, SPUN, ..N SPGN, TPGR, TPGR, TPUN, TPGN	TT010	TT010	T9325	T9325	T9325	T9325	T9325	T9325	T9325	T9325	T9325	T9325	
..X LFMX, LFUX, LOMF(R), TN11Z, TN16Z, TN22 Z, TN11 R, TN16 R, TN22 R	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	
..X TN11, TN16, TN 22	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	T8330	

M

CORRECTION / CORRECCIÓN / CORRECTION v _c												
Subgroup / Subgrupo / Sous-groupe		M1	M2	M3	M4							
Hardness / Dureza / Dureté		k _{VHB} - M1	k _{VHB} - M2	k _{VHB} - M3	k _{VHB} - M4							
		120	1.35	1.31	1.24	1.15						
		140	1.28	1.24	1.18	1.10						
		160	1.22	1.18	1.12	1.04						
		180	1.14	1.11	1.05	.98						
		200	1.09	1.06	1.00	.93						
		220	1.03	1.00	.95	.88						
		240	.98	.95	.90	.84						
		260	.93	.91	.86	.80						
		280	.89	.87	.82	.76						
		300	.87	.84	.80	.74						
		320	.84	.81	.77	.72						
		340	.80	.78	.74	.69						
		360	.77	.75	.71	.66						
		375	.74	.72	.68	.63						
k _{VHB}												
			k _{VT}			k _{VT}						
		10	1.10	30		.84						
		15	1.00	45		.76						
		20	.93	60		.71						
			k _{VT}			k _{VT}						
		30	1.10	60		.93						
		45	1.00									
Skin of forging and casting / Revestimiento de piezas forjadas y fundidas / Croûte de forge et de fonderie						.70 - .80						
Internal turning / Torneado interno / Tournage intérieur						.75 - .85						
Interrupted cut / Corte interrumpido / Coupe interrompue						.80 - .90						
Stable machine conditions / Condiciones de máquina estables / Bonnes conditions machine						1.05 - 1.20						
Unstable machine conditions / Condiciones de máquina inestables / Mauvaises conditions machine						.85 - .95						
Insert shape / Forma de la plaqueta / Forme de plaquette						k _{VHB}						
						1.00						
						.95						
						.88						
						1.10						
k _{VI}												

M											
f		a _p		V _{SI} [m]		V _{SI} [m]		V _{SI} [m]		V _{SI} [m]	
I	.002	.020	-	705	-	918	525	787	722	541	-
II	.003	.020	-	607	-	754	443	689	623	476	-
III	.004	.020	-	574	-	689	410	640	574	443	-
I	.004	.060	558	492	508	623	377	574	525	410	377
II	.006	.060	492	443	492	558	344	541	492	377	344
III	.008	.060	492	443	492	558	344	541	492	394	344
I	.008	.328	459	410	476	525	328	508	476	377	328
II	.012	.328	377	344	426	443	279	459	410	344	279
III	.016	.328	361	328	410	410	262	443	394	328	262
I	.016	.200	312	279	361	361	230	394	344	295	230
II	.024	.200	262	230	328	410	197	344	312	262	197
III	.031	.200	230	197	295	377	180	312	279	246	180
I	.031	.500	164	148	197	279	197	279	197	312	197
II	.040	.500	148	131	197	262	180	262	197	295	180
III	.050	.500	131	115	180	246	164	246	180	279	164
	.004	-	-	-	459	-	-	-	-	312	-
	.006	-	-	-	443	-	-	-	-	295	-
	.008	-	-	-	410	-	-	-	-	279	-
	.012	-	-	-	377	-	-	-	-	246	-
	.004	-	-	-	361	-	-	-	-	246	-
	.006	-	-	-	36	-	-	-	-	230	-
	.008	-	-	-	328	-	-	-	-	197	-
	.012	-	-	-	312	-	-	-	-	197	-
	-	-	-	-	-	-	-	-	-	262	-
	-	-	-	-	-	-	-	-	-	262	-
	-	-	-	-	-	-	-	-	-	230	-

Figures in blue are valid for machining with coolant. / Las cifras en azul son válidas para mecanizado con refrigerante. / Valeurs en bleu pour usinage avec arrosage.

Table 8a
 Tabla 8a
 Tableau 8a

CHOICE OF INITIAL CUTTING CONDITIONS
 SELECCIÓN DE CONDICIONES DE CORTE INICIALES
 CHOIX DES CONDITIONS DE COUPE INTIALES

Cutting inserts type according to ISO Tipo de plaqueta ISO Tipo de Pastilha ISO Type de plaquettes de coupe définies par la norme ISO	FF		F		M		R		HR		P+G		T
	f	a_p	f	a_p	f	a_p	f	a_p	f	a_p	f	a_p	
	.002 - .004	.020 - .040	.004 - .008	.040 - .080	.008 - .016	.080 - .160	.016 - .040	.160 - .400	> .040	> .400		.002 - .012	
..A CNMA, CNMM, CNMG, DNMA, DINMM, DNMG, DNML, SNMA, DNMG, DNML, SNMA, SNMM, SNMG, SNMX, TNMA, TNMM, TNMG, VNML, RNMA, RNMM, RNMG, WNMA, WNMM, WNMG	TC100	T5305	TC100	T5305	TC100	T5305	T5305	T5305	TC100	T5305	T5305	T5305	
	TB310	T5315	TB310	T5315	T5305	T5315	T5315	T5315	T5305	T5315	T5315	T5315	
	T5305	T8315	T5305	T8315	T5305	T8315	T5305	T8315	T5305	T8315	T5305	T8315	
		FF		FF		FF		FF		FF		FF	
..X KNUX, LNUX LNMX													
..W ..T CCMW, CCMT, SCMW, SCMT, DCMW, DGMT, TCMW, TCMT, VCMW, VCMT, WCMW, WCMT, RCMW, RCMT, RCMX	T5305	T5305	T5305	T5305	T5305	T5305	T5305	T5305	T5305	T5305	T5305	T5305	
	UR	UR	UR	UR	UR	UR	UR	UR	UR	UR	UR	UR	
	T5305	T5315	T5305	T5315	T5315	T5315	T5315	T5315	T5315	T5315	T5315	T5315	
..R ..N SPMR, SPGR, SPUN, SPGN, TPMR, TPGR, TPUN, TPGN													
..X LFMX, LFUX, LCMF(R), TN11 Z, TN16 Z, TN22 Z, TN11 R, TN16 R, TN22 R	T9325	T8330	T9325	T8330	T9325	T8330	T9325	T8330	T9325	T8330	T9325	T8330	
TN11.., TN16.., TN 22													

CORRECTION / CORRECCIÓN / CORRECTION v _c										
Subgroup / Subgrupo / Sous-groupe	N1	N2	N3	N4						
Alloy type / Tipo de alea / Type d'alliage					k _{vk}					
Electrotechnical aluminium / Aluminio electrolítico / Aluminium électrolytique					2.00					
Al alloys formed, unhardened HB 60 / Aleaciones de Al formadas, sin endurecer HB 60 / Allages d'Aluminium formé, état naturel HB 60					1.50					
Al alloys formed, hardened HB100 / Al aleaciones formadas, dureza HB100 / Allages d'Aluminium formé, durci HB100					1.00					
Al alloys cast, unhardened HB75 / Aleaciones de Al fundido, HB75 sin endurecer / Allages d'Aluminium coulé, état naturel HB 75					.90					
Al alloys cast, hardened HB90 / Al aleaciones de fundición, HB90 endurecido / Allages d'Aluminium coulé, durci HB 90					.65					
Al alloys cast, unhardened HB 130 >12% Si / Aleaciones de Al fundido, HB sin endurecer 130 > 12% Si / Allages d'Aluminium coulé (S 12%), état naturel HB 130					1.0 PKD / .20					
Highly machinable alloys (>1%Pb) / Aleaciones altamente mecanizables (> 1% de Pb) / Allages à usinabilité améliorée (Pb > 1%)					.90					
Brass and lead bronze (<1%Pb) / Latón y bronce al plomo (<1% Pb) / Laiton et bronze au plomb (Pb > 1%)					.75					
Other brass HB <90 / Otro bronce HB <90 / Autre laiton HB <90					.60					
Other brass HB >90 / Otro bronce HB >90 / Autre laiton HB >90					.54					
Bronze electrolytic Cu / Bronce Cu electrolítico / Bronze électrolytique Cu					.40					
Hard and very hard bronze / Bronce duro y muy difícil / Bronze dur et très dur					.6 PKD / .20					
					k _{vt}					
					10	1.10	30			
					15	1.00	45			
					20	0.93	60			
Skin of forging and casting / Revestimiento de piezas forjadas y fundidas / Croule de forge et de fonderie					.70 - .80					
Internal turning / Torneado interno / Tournage intérieur					.75 - .85					
Interrupted cut / Corte interrumpido / Coupe interrompue					.80 - .90					
Stable machine conditions / Condiciones de máquina estables / Bonnes conditions machine					1.05 - 1.20					
Unstable machine conditions / Condiciones de máquina inestables / Mauvaises conditions machine					.85 - .95					
Insert shape / Forma de la plaqueta / Forme de plaquette					k _{vbd}					
					1.00					
					.95					
					.88					
					1.10					

Subgroup / Subgrupo / Sous-groupe	N	f	a _p	N										V _{sp} [m/min]		
				T0315	T6310	T8030	T8310	T8315	T8330	H7	H07	PC30 D720				
FF	I	.002	.020	3837	2214	3346	3034	2280	2444	1673	1509	1509	1509	1509	1509	5855
	II	.003	.020	2804	1886	2886	2624	2017	2034	2460	2034	2034	2034	2034	2034	5707
	III	.004	.020	2690	1755	2690	2444	1902	2460	2460	2460	2460	2460	2460	2460	5642
F	I	.004	.060	2411	2608	2411	2198	1706	1673	1673	1673	1673	1673	1673	1673	1630
	II	.006	.060	2181	2345	2247	2050	1624	1509	1509	1509	1509	1509	1509	1509	5346
	III	.008	.060	2165	2329	2280	2083	1673	1509	1509	1509	1509	1509	1509	1509	6084
M	I	.008	.100	2050	2214	2181	1968	1624	1427	1427	1427	1427	1427	1427	1427	5920
	II	.012	.100	1755	1870	1919	1738	1427	1214	1214	1214	1214	1214	1214	1214	5609
	III	.016	.100	1656	1755	1837	1673	1394	1148	1148	1148	1148	1148	1148	1148	5871
R	I	.016	.200	1460	1558	1640	1492	1230	1017	1017	1017	1017	1017	1017	1017	-
	II	.024	.200	1246	1328	1443	1312	1115	869	869	869	869	869	869	869	-
	III	.031	.200	1115	1181	1312	1197	1033	771	771	771	771	771	771	771	-
HR	I	.031	.500	-	-	-	-	738	-	-	-	-	-	-	-	-
	II	.040	.500	-	-	-	-	705	-	-	-	-	-	-	-	-
	III	.050	.500	-	-	-	-	656	-	-	-	-	-	-	-	-
[Icon]	I	.004	-	-	-	-	-	1328	-	-	-	-	-	-	-	-
	II	.006	-	-	-	-	-	1263	-	-	-	-	-	-	-	-
	III	.008	-	-	-	-	-	1164	-	-	-	-	-	-	-	-
[Icon]	I	.012	-	-	-	-	-	1066	-	-	-	-	-	-	-	-
	II	.004	-	-	-	-	-	1050	-	-	-	-	-	-	-	-
	III	.006	-	-	-	-	-	1000	-	-	-	-	-	-	-	-
[Icon]	I	.008	-	-	-	-	-	935	-	-	-	-	-	-	-	-
	II	.012	-	-	-	-	-	853	-	-	-	-	-	-	-	-
	III	-	-	-	-	-	-	1148	-	-	-	-	-	-	-	-
[Icon]	I	-	-	-	-	-	-	1132	-	-	-	-	-	-	-	-
	II	-	-	-	-	-	-	1000	-	-	-	-	-	-	-	-
	III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Figures in blue are valid for machining with coolant. / Las cifras en azul son válidas para mecanizado con refrigerante. / Valeurs en bleu pour usinage avec arrosage.

Table 10a
 Tabla 10a
 Tableau 10a

CHOICE OF INITIAL CUTTING CONDITIONS
 SELECCIÓN DE CONDICIONES DE CORTE INICIALES
 CHOIX DES CONDITIONS DE COUPE INTIALES

Cutting inserts type according to ISO Tipo de plaqueta ISO Tipo de Pastilha ISO Type de plaquettes de coupe définies par la norme ISO	FF		F		M		R		HR		P+G		T
	f	a_p	f	a_p	f	a_p	f	a_p	f	a_p	f	a_p	
..A CNUM, CNMM, DNMG, DNMA, DNMM, ..G DNMG, DNML, SNMA, ..U SNMM, SNMG, SNMX, ..N TNMA, TNMM, TNMG, VNVL, RNMA, RNMM, RNMG, WNMA, WNMM, WNMG	T8315 I	T8315 I	T8315 I	T8315 I	T7335 I	T9325 I	T8315 I	T9325 I	T9226 (T9325) I	T9335 I	- I	- I	- I
..M CMW, CCMT, SCMW, SCMT, DCMW, DCMT, TCMW, TCMT, VCMW, VCMT, WCMW, WCMT, RCMW, RCMT, RCMX	FF I	FM I	NF I	FF(NF2) I	SM (W-MR) I	UR(RM) I	UR I	UR I	NR2 (OR) I	NR2 (OR) I	- I	- I	- I
..W SPMR, SPGR, SPUN, ..N SPGN, TPMB, TPGR, TPUN, TPGN	T8330 II	T6310 II	T8330 II	T9325 II	T7335 II	T9315 II	T8315 II	T9325 II	T7335 II	T7335 II	- II	- II	- II
..X LFMX, LFUX, LCMF(R), TN11 Z, TN16 Z, TN22 Z, TN11 R, TN16 R, TN22 R	SF I	SF I	SM I	FM(FM2) I	FM (SI) I	RM I	FM I	FM I	NR2 (OR) I	NR2 (OR) I	- I	- I	- I
..X TN11., TN16., TN 22	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I
..X TN11 R, TN16 R, TN22 R	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I
..X TN11., TN16., TN 22	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I	- I

Table 10b
Tabla 10b
Tableau 10b

CHOICE OF INSERT
ELECCIÓN DE PLAQUITA
CHOIX DE LA PLAQUETTE

CORRECTION / CORRECCIÓN / CORRECTION v _c									
Subgroup / Sous-groupe	S1	S2	S3	S4					
Hardness / Dureza / Dureté	k _{VHB-S1}	k _{VHB-S2}	k _{VHB-S3}	k _{VHB-S4}					
120	2.14	1.46	1.22	.92					
140	2.01	1.38	1.15	.86					
160	1.93	1.32	1.10	.83					
180	1.89	1.30	1.08	.81					
200	1.84	1.26	1.05	.79					
220	1.80	1.24	1.03	.77					
240	1.75	1.20	1.00	.75					
260	1.70	1.16	.97	.73					
280	1.61	1.10	.92	.69					
300	1.54	1.06	.88	.66					
320	1.47	1.01	.84	.63					
340	1.40	.96	.80	.60					
360	1.37	.94	.78	.59					
375	1.30	.89	.74	.56					
k_{VHB}									
k_{VT}									
10	1.10	30							
15	1.00	45							
20	0.93	60							
Skin of forging and casting / Revestimiento de piezas forjadas y fundidas / Croûte de forge et de fonderie									
Internal turning / Torneado interno / Tournage intérieur									
Interrupted cut / Corte interrumpido / Coupe interrompue									
Stable machine conditions / Condiciones de máquina estables / Bonnes conditions machine									
Unstable machine conditions / Condiciones de máquina inestables / Mauvaises conditions machine									
Insert shape / Forma de la plaqueta / Forme de plaquette									
S..., C..., W...									
T..., D..., K...									
V..., L... (parting and grooving / tronchado y ranurado) / (tranchage et gorges)									
R..., L... (heavy roughing / desbaste pesado) / (ébauche lourde)									
k_{VT (GM)}									
k_{VX}									
k_{VI}									

S	f	a _p	V ₁₅ [m/min]																
			TC100	H07	H7	T8345	T8330	T8315	T8310	T8030	T6310	T9226	T9335	T9325	T7335	T7325	6640	6630	
I	.002	.020	886	279	279	-	-	-	-	459	262	394	361	262	-	-	-	-	-
II	.003	.020	754	230	230	-	-	-	-	377	197	344	312	230	-	-	-	-	-
III	.004	.020	705	197	197	-	-	-	-	344	197	312	279	197	-	-	-	-	-
I	.004	.060	656	197	197	-	-	-	-	312	180	279	262	197	180.4	-	-	-	-
II	.006	.060	607	180	180	-	-	-	-	279	164	262	246	180	246	-	-	-	-
III	.008	.060	607	180	180	-	-	-	-	279	164	262	246	197	164	-	-	-	-
I	.008	.100	590	164	164	-	-	-	-	262	164	246	230	180	164	-	-	-	-
II	.012	.100	508	131	131	-	-	-	-	197	131	230	197	164	131.2	-	-	-	-
III	.016	.100	476	131	131	-	-	-	-	197	131	197	197	164	131.2	-	-	-	-
I	.016	.200	-	115	115	-	-	-	-	180	115	197	164	148	114.8	-	-	-	-
II	.024	.200	-	985	985	-	-	-	-	148	98	164	148	132	98.4	-	-	-	-
III	.031	.200	-	82	82	-	-	-	-	131	82	148	131	115	82	-	-	-	-
I	.031	.500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
II	.040	.500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
III	.050	.500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	.004	-	-	-	-	-	-	-	-	-	-	-	-	148	-	-	-	-	-
	.006	-	-	-	-	-	-	-	-	-	-	-	-	148	-	-	-	-	-
	.008	-	-	-	-	-	-	-	-	-	-	-	-	131	-	-	-	-	-
	.012	-	-	-	-	-	-	-	-	-	-	-	-	115	-	-	-	-	-
	.004	-	-	-	-	-	-	-	-	-	-	-	-	115	-	-	-	-	-
	.006	-	-	-	-	-	-	-	-	-	-	-	-	115	-	-	-	-	-
	.008	-	-	-	-	-	-	-	-	-	-	-	-	98	-	-	-	-	-
	.012	-	-	-	-	-	-	-	-	-	-	-	-	98	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	131	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	131	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	115	-	-	-	-	-

Figures in blue are valid for machining with coolant. / Las cifras en azul son válidas para mecanizado con refrigerante. / Valeurs en bleu pour usinage avec arrosage.

Table 11a
 Tabla 11a
 Tableau 11a

CHOICE OF INITIAL CUTTING CONDITIONS
 SELECCIÓN DE CONDICIONES DE CORTE INICIALES
 CHOIX DES CONDITIONS DE COUPE INTIALES

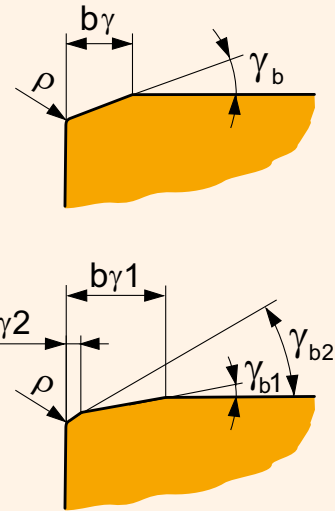
Cutting inserts type according to ISO Tipo de plaqueta ISO Tipo de Pastilha ISO Type de plaquettes de coupe définies par la norme ISO	FF		F		M		R		HR		P+G		T	
	f	a _p	f	a _p	f	a _p	f	a _p	f	a _p	f	a _p		
	.002 - .004	.020 - .040	.004 - .008	.040 - .080	.008 - .016	.080 - .160	.016 - .040	.160 - .400	> .040	> .400	.002 - .012			
..A CNMA, CNMM, CNMG, DNMA, DNMM, DNMG, DNML, SNMA, ..G SNMM, SNMG, SNMX, ..U SNMA, TNMM, TNMG, ..N VNLU, RNMA, RNMM, RNMG, WNMA, WNMM, WNMG	TC100 I	T5305 I	TC100 I	T5305 I	TC100 I	T5305 I	TC100 I	T5305 I	TC100 I	T5305 I	TC100 I	T5305 I	TC100 I	..
..M CMW, CCMT, SCMW, ..W SCMT, DCMW, DCMT, ..T TCMW, TCMT, YCMW, VCMT, WCMW, WCMT, RCMW, RCMT, RCMX	TB310 II	T5305 II	TB310 II	T5305 II	TB310 II	T5305 II	TB310 II	T5305 II	TB310 II	T5305 II	TB310 II	T5305 II	TB310 II	..
..R SPMR, SPGR, SPUN, ..N SPGN, TPMA, TPGR, TPUN, TPUN	T5305 III	R(RM) III	T5305 III	R(RM) III	T5305 III	R(RM) III	T5305 III	R(RM) III	T5305 III	R(RM) III	T5305 III	R(RM) III	T5305 III	..
..X LFMX, LFUX, LCMF(R), TN11 ZZ, TN16 ZZ, TN22 ZZ, TN11 R, TN16 R, TN22 R	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	..
..X TN11..., TN16..., TN 22	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	R(RM) I	T5305 I	..

Edge finishing
 Preparación del filo
 Préparation d'arête

T00820 ⇒

b_γ ($b_{\gamma 1}$)

γ_b ($b_{\gamma 2} \times \gamma_{b2}$ dependent on $b_{\gamma 1} \times \gamma_{b1}$)
 γ_b ($b_{\gamma 2} \times \gamma_{b2}$ dependiente de $b_{\gamma 1} \times \gamma_{b1}$)
 γ_b ($b_{\gamma 2} \times \gamma_{b2}$ dépend de $b_{\gamma 1} \times \gamma_{b1}$)



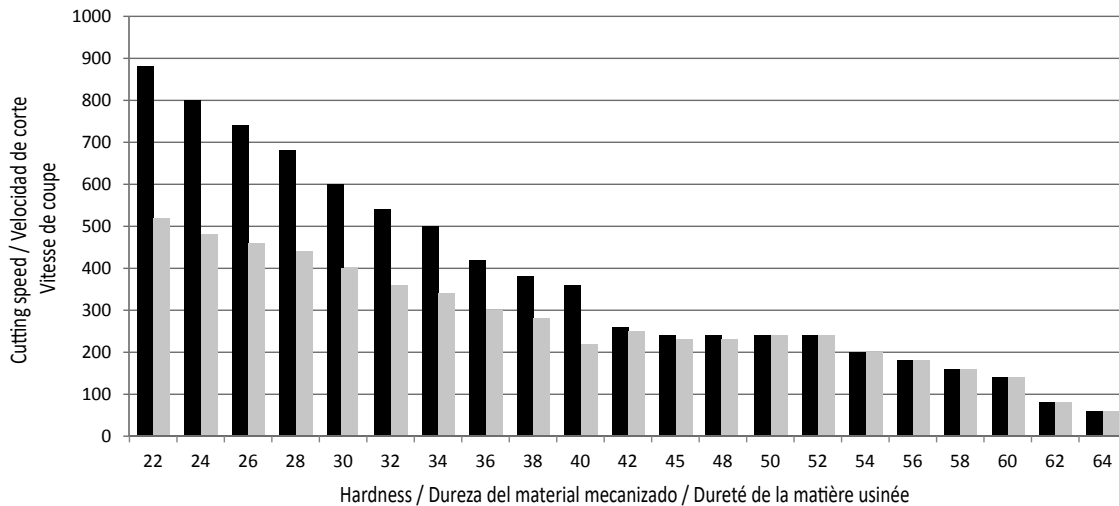
Example: **CNGA 432 T00820** – insert CNGA 120404 with T-land (cutting edge design T) width .008 in and angle -20°
 Ejemplo: **CNGA 432 T00820** – plaquita CNGA 120404 con faceta en T (filo de corte con diseño T) ancho .008 in y ángulo -20°
 Exemple: **CNGA 432 T00820** – plaquette CNGA 120404 avec listel T (arête coupante de forme T) largeur .008 in et angle -20°

Ceramics are materials that have one of the highest levels of thermal stability. During their practical application, however, it is necessary to reduce the cutting speed with regard to the hardness of the machined material and its other characteristics. For illustration purposes, we have provided a concrete example of a round insert used for finishing.

Las cerámicas de corte son materiales con uno de los límites de estabilidad térmica más elevados. No obstante, durante su uso efectivo, también es necesario reducir la velocidad de corte según la dureza y otras características del material mecanizado. A modo de ilustración, facilitamos un ejemplo concreto de una plaquita redonda que se utiliza para el torneado de acabado.

Les céramiques de coupe sont des matériaux qui possèdent les limites de stabilité thermique les plus élevées. Pendant son utilisation pratique, cependant, il est nécessaire de réduire la vitesse de coupe en rapport avec la dureté et les autres caractéristiques de la matière usinée. Voici un exemple concret pour une plaquette ronde utilisée en tournage de finition.

Cutting speed for / Velocidad de corte para / Velocidade de corte para / Vitesse de coupe pour RNGN ($a_p = .059$ in)



Homogenous material / Material homogéneo / Matériau homogène
 Forged materials, cold rolled materials, etc. / Materiales forjados, materiales laminados en frío, etc.
 Matériaux forgés, matériaux laminés à froid, etc.

The following table provides further parameters that need to be taken into account when selecting the cutting speed to use.

La tabla siguiente indica otros parámetros que se deben tener en cuenta cuando se selecciona la velocidad de corte

La table suivante fait état d'autres paramètres qui doivent être pris en compte au moment de sélectionner la vitesse de coupe résultante

Table / Tabla / Tableau 12

Point radius / Radio de la punta / Rayon de plaquette	.016	.031	.047	.063	.094	.118
Reduction v_c by / Reducción de la v_c / Réduction de v_c de	20%	16%	12%	10%	5%	2%
Reduction / Reducción de Kr / Réduction Kr	90°	75°	60°	45°	30°	< 15°
Reduction v_c by / Reducción de la v_c / Réduction de v_c de	0%	5%	8%	12%	15%	18%
Insert shape / Forma de la plaquita / Forme de plaquette	V	D	T	C, W	S	R
Point angle / Ángulo de la punta / Angle de pointe	35°	55°	60°	80°	90°	
Reduction v_c by / Reducción de la v_c / Réduction de v_c de	17%	12%	10%	6%	4%	0%
Depth of cut / Profundidad de corte / Profondeur de coupe [mm]	<.055	.118	.236	.394	.512	.787
Reduction v_c by / Reducción de la v_c / Réduction de v_c de	5%	8%	13%	16%	18%	20%

As previously stated, ceramics are materials that have one of the highest levels of abrasion resistance, yet they also have one of the lowest levels of strength.

With regard to rigidity, it is therefore also necessary to take into account other limiting criteria when selecting the right insert.

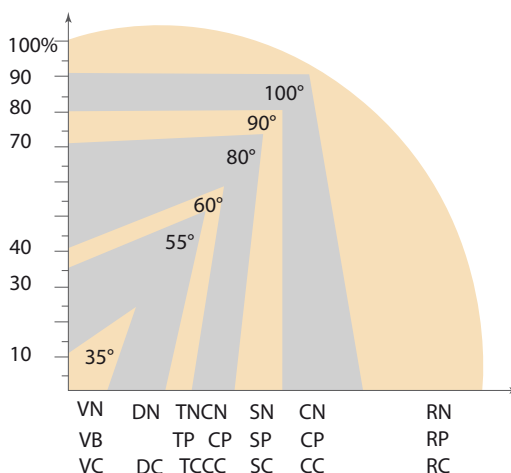
Como se mencionó anteriormente, las cerámicas de corte son materiales con una resistencia a la abrasión muy elevada, pero al mismo tiempo, su dureza es una de las más bajas. Por lo tanto, con respecto a la rigidez, es necesario tener en cuenta también otros criterios limitadores a la hora de seleccionar la plaquita adecuada..

Comme déjà mentionné, les céramiques de coupe sont des matériaux possédant l'une des plus hautes résistances à l'abrasion, cependant, dans le même temps, elles possèdent une des moins bonnes tenacités.

En ce qui concerne la rigidité, il est donc nécessaire de prendre en compte d'autres critères limitatifs pour la sélection de la plaquette appropriée.

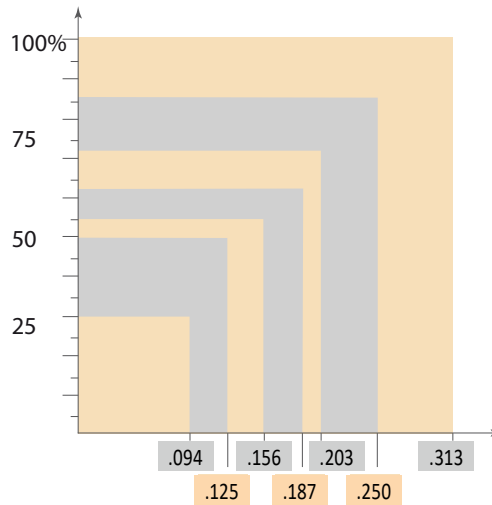
Rigidity in relation to insert shape / Rigidez en relación con la forma de la plaquita / Rigidité en relation avec la forme de plaquette

Picture 11
 Imagen 11
 Image 11



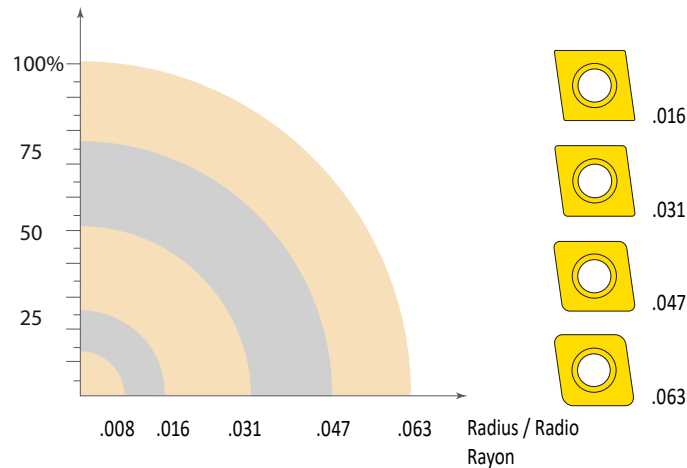
Rigidity in relation to insert thickness / Rigidez en relación con el grosor de la plaquita / Rigidité en relation avec l'épaisseur de plaquette

Picture 12
 Imagen 12
 Image 12



Rigidity in relation to insert radius / Rigidez en relación con el radio de la plaquita / Rigidité en relation avec le rayon de plaquette

Picture 13
 Imagen 13
 Image 13



Finally, we would like to give some recommendations regarding practical application:

1) Burrs at the output of the tool can result in chipped edges and damage the whole insert. It is therefore necessary to bevel the edge to eliminate the burrs first.

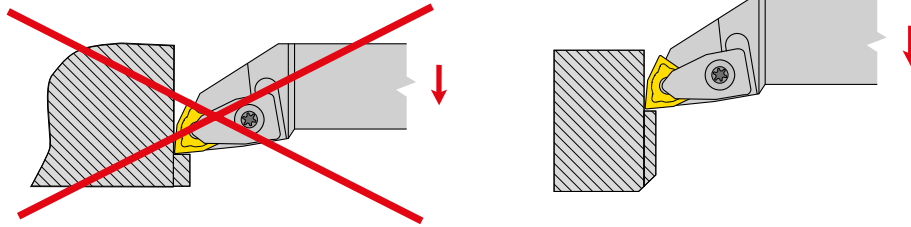
Finalmente, nos gustaría hacer algunas recomendaciones de aplicación práctica:

1) Las rebabas en la salida de la herramienta pueden producir la rotura del filo de corte y la destrucción de toda la plaquita. Por lo tanto, es necesario en primer lugar hacer un chaflán en la pieza para eliminar las rebabas.

Enfin, nous vous donnons quelques recommandations pour une application pratique:

1) Les bavures en sortie de pièce peuvent endommager l'arête de coupe, et parfois détruire entièrement la plaquette. Donc, il est nécessaire de réaliser en premier un chanfrein sur la pièce pour éviter les bavures.

Picture 14
 Imagen 14
 Image 14

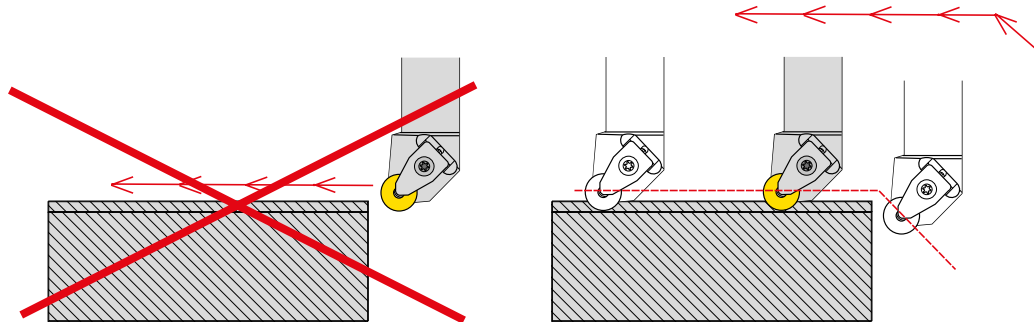


2) It is advisable to modify the standard program (adding the material) as this slows down the creation of burrs on the edge, which increases the durability of the edge and also eliminates the need to bevel the edge.

2) Se recomienda modificar el programa estándar (introduciendo el material); de este modo, se ralentiza la creación de rebabas y se prolonga la duración del filo. Así también se elimina la operación de biselar el filo.

2) Il est recommandé de modifier le programme standard (engagement dans la matière); ceci ralentit la création de bavures sur la pièce et prolonge la durée de vie de l'arête de coupe; cette opération permet également d'éviter l'opération de chanfreinage sur la pièce.

Picture 15
 Imagen 15
 Image 15

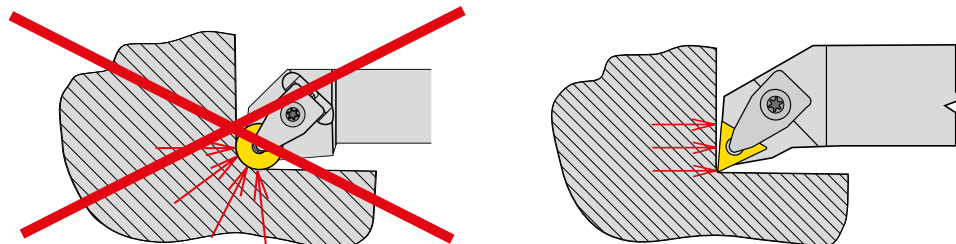


3) If there is a risk of problems occurring as a result of tool vibration, it is better to use inserts with a smaller radius to eliminate radial forces.

3) Si hay riesgo de problemas debido a las vibraciones de la herramienta, deben utilizarse plaquitas con un radio más pequeño para eliminar las fuerzas radiales.

3) Si il y a un risque de problèmes liés aux vibrations de l'outil, il est préférable d'utiliser une plaquette avec un plus petit rayon pour éliminer les forces radiales.

Picture 16
 Imagen 16
 Image 16



Surface quality in turning R_{max} / Calidad de la superficie por torneado R_{max} / Qualité de surface en tournage R_{max}

Table 13a
Tabla 13a
Tableau 13a

$$R_{max} = \frac{f^2}{8 \cdot r_\epsilon} \cdot 1000$$

f	r_ϵ Radius / Radio / Rayon																			
	0.1	0.2	0.4	0.5	0.8	1.0	1.2	1.5	1.6	2.0	2.4	2.5	3.0	3.2	3.5	4.0	5.0	6.0	8.0	
	Surface / Superficie / Surface R_{max} [μm]																			
0.05	3.13	1.56	0.78	0.63	0.39	0.31	0.26	0.21	0.20	0.16	0.13	0.13	0.10	0.10	0.09	0.08	0.06	0.05	0.04	
0.07	6.1	3.06	1.53	1.23	0.77	0.61	0.51	0.41	0.38	0.31	0.26	0.25	0.20	0.19	0.18	0.15	0.12	0.10	0.08	
0.08	8.0	4.0	2.00	1.60	1.00	0.80	0.67	0.53	0.50	0.40	0.33	0.32	0.27	0.25	0.23	0.20	0.16	0.13	0.10	
0.10		6.3	3.13	2.50	1.56	1.25	1.04	0.83	0.78	0.63	0.52	0.50	0.42	0.39	0.36	0.31	0.25	0.21	0.16	
0.12		9.0	4.50	3.60	2.25	1.80	1.50	1.20	1.13	0.90	0.75	0.72	0.60	0.56	0.51	0.45	0.36	0.30	0.23	
0.15		14	7.0	5.6	3.52	2.81	2.34	1.88	1.76	1.41	1.17	1.13	0.94	0.88	0.80	0.70	0.56	0.47	0.35	
0.16		16	8.0	6.4	4.00	3.20	2.67	2.13	2.00	1.60	1.33	1.28	1.07	1.00	0.91	0.80	0.64	0.53	0.40	
0.18		20	10.1	8.1	5.1	4.05	3.38	2.70	2.53	2.03	1.69	1.62	1.35	1.27	1.16	1.01	0.81	0.68	0.51	
0.20			13	10.0	6.3	5.0	4.17	3.33	3.13	2.50	2.08	2.00	1.67	1.56	1.43	1.25	1.00	0.83	0.63	
0.22			15	12.1	7.6	6.1	5.0	4.03	3.78	3.03	2.52	2.42	2.02	1.89	1.73	1.51	1.21	1.01	0.76	
0.25			20	16	9.8	7.8	6.5	5.2	4.88	3.91	3.26	3.13	2.60	2.44	2.23	1.95	1.56	1.30	0.98	
0.27			23	18	11.4	9.1	7.6	6.1	5.7	4.56	3.80	3.65	3.04	2.85	2.60	2.28	1.82	1.52	1.14	
0.30			28	23	14	11.3	9.4	7.5	7.0	5.6	4.69	4.50	3.75	3.52	3.21	2.81	2.25	1.88	1.41	
0.32			32	26	16	13	10.7	8.5	8.0	6.4	5.3	5.1	4.27	4.00	3.66	3.20	2.56	2.13	1.60	
0.35			38	31	19	15	13	10.2	9.6	7.7	6.4	6.1	5.1	4.79	4.38	3.83	3.06	2.55	1.91	
0.37			43	34	21	17	14	11.4	10.7	8.6	7.1	6.8	5.7	5.3	4.89	4.28	3.42	2.85	2.14	
0.40				40	25	20	17	13	13	10.0	8.3	8.0	6.7	6.3	5.7	5.0	4.00	3.33	2.50	
0.45				51	32	25	21	17	16	13	10.5	10.1	8.4	7.9	7.2	6.3	5.1	4.22	3.16	
0.50					39	31	26	21	20	16	13	13	10.4	9.8	8.9	7.8	6.3	5.2	3.91	
0.55					47	38	32	25	24	19	16	15	13	11.8	10.8	9.5	7.6	6.3	4.73	
0.60					56	45	38	30	28	23	19	18	15	14	13	11.3	9.0	7.5	5.6	
0.65					66	53	44	35	33	26	22	21	18	17	15	13	10.6	8.8	6.6	
0.70					77	61	51	41	38	31	26	25	20	19	18	15	12.3	10.2	7.7	
0.75					88	70	59	47	44	35	29	28	23	22	20	18	14	11.7	8.8	
0.80						80	67	53	50	40	33	32	27	25	23	20	16	13	10.0	
0.85						90	75	60	56	45	38	36	30	28	26	23	18	15	11.3	
0.90						101	84	68	63	51	42	41	34	32	29	25	20	17	13	
0.95						113	94	75	71	56	47	45	38	35	32	28	23	19	14	
1.00							104	83	78	63	52	50	42	39	36	31	25	21	16	
1.20								120	113	90	75	72	60	56	51	45	36	30	23	
1.30								141	132	106	88	85	70	66	60	53	42	35	26	
1.40								163	153	123	102	98	82	77	70	61	49	41	31	
1.50									176	141	117	113	94	88	80	70	56	47	35	
1.60										160	133	128	107	100	91	80	64	53	40	
1.70										181	151	145	120	113	103	90	72	60	45	
1.80										203	169	162	135	127	116	101	81	68	51	
1.90										226	188	181	150	141	129	113	90	75	56	
2.00											208	200	167	156	143	125	100	83	63	
2.20												252	242	202	189	173	151	121	101	76
2.50														260	244	223	195	156	130	98

Surface quality in turning R_a / Calidad de la superficie por torneado R_a / Qualité de surface en tournage R_a

Table 13b
Tabla 13b
Tableau 13b

$$R_a = 33337 \cdot \frac{f_z^{1,88}}{r_\epsilon^{0,97}} \text{ [}\mu\text{in]}$$

f	r_ϵ Radius [in]																
	.004	.008	.016	.031	.039	.047	.063	.071	.078	.094	.118	.125	.137	.157	.196	.235	.314
	Surface R_a [μ in]																
.002	58.5	29.9	15.2	7.8	6.3	5.3	4.0	3.5	3.2	2.7	2.2	2.0	1.9	1.6	1.3	1.1	0.8
.003	110.1	56.2	28.7	14.6	11.8	9.9	7.5	6.7	6.0	5.0	4.1	3.8	3.5	3.1	2.5	2.1	1.6
.003	141.5	72.2	36.9	18.8	15.2	12.7	9.6	8.6	7.7	6.5	5.2	4.9	4.5	4.0	3.2	2.7	2.0
.004	-	109.9	56.1	28.6	23.1	19.3	14.6	13.0	11.8	9.9	7.9	7.5	6.8	6.0	4.8	4.1	3.1
.005	-	154.8	79.0	40.3	32.5	27.2	20.6	18.4	16.6	13.9	11.2	10.5	9.6	8.5	6.8	5.7	4.3
.006	-	235.5	120.2	61.4	49.4	41.4	31.3	28.0	25.2	21.1	17.0	16.0	14.7	12.9	10.4	8.7	6.6
.006	-	265.9	135.7	69.3	55.8	46.8	35.4	31.6	28.5	23.9	19.2	18.1	16.6	14.5	11.7	9.8	7.4
.007	-	331.8	169.4	86.5	69.6	58.4	44.1	39.4	35.6	29.8	24.0	22.5	20.7	18.2	14.6	12.2	9.3
.008	-	-	206.5	105.4	84.9	71.1	53.8	48.0	43.3	36.3	29.2	27.5	25.2	22.1	17.8	14.9	11.3
.009	-	-	247.0	126.1	101.6	85.1	64.4	57.4	51.8	43.4	35.0	32.9	30.1	26.5	21.3	17.9	13.5
.010	-	-	314.1	160.4	129.2	108.2	81.9	73.0	65.9	55.2	44.5	41.8	38.3	33.7	27.1	22.7	17.2
.011	-	-	363.0	185.3	149.3	125.1	94.6	84.4	76.2	63.8	51.4	48.3	44.3	38.9	31.3	26.3	19.9
.012	-	-	442.6	225.9	182.0	152.5	115.3	102.9	92.9	77.8	62.7	58.9	54.0	47.4	38.2	32.0	24.2
.013	-	-	499.6	255.1	205.4	172.1	130.2	116.2	104.9	87.9	70.8	66.5	60.9	53.5	43.1	36.1	27.3
.014	-	-	591.3	301.9	243.1	203.7	154.1	137.5	124.1	104.0	83.8	78.7	72.1	63.4	51.0	42.8	32.3
.015	-	-	656.4	335.1	269.9	226.1	171.1	152.6	137.8	115.4	93.0	87.3	80.1	70.3	56.6	47.5	35.9
.016	-	-	-	388.0	312.5	261.8	198.1	176.7	159.5	133.7	107.7	101.1	92.7	81.4	65.6	55.0	41.6
.018	-	-	-	484.2	390.0	326.7	247.2	220.5	199.1	166.8	134.3	126.2	115.7	101.6	81.8	68.6	51.9
.020	-	-	-	590.3	475.4	398.3	301.3	268.8	242.7	203.3	163.8	153.8	141.0	123.9	99.8	83.6	63.2
.022	-	-	-	706.1	568.7	476.5	360.5	321.5	290.3	243.2	195.9	184.0	168.7	148.2	119.4	100.0	75.7
.024	-	-	-	831.6	669.7	561.2	424.5	378.7	341.9	286.5	230.7	216.7	198.7	174.5	140.6	117.8	89.1
.025	-	-	-	966.6	778.5	652.3	493.5	440.2	397.4	333.0	268.2	251.9	230.9	202.9	163.4	136.9	103.6
.027	-	-	-	1111.1	894.9	749.8	567.2	506.0	456.8	382.8	308.3	289.6	265.5	233.2	187.8	157.4	119.1
.029	-	-	-	1265.0	1018.8	853.7	645.8	576.1	520.1	435.8	351.0	329.7	302.2	265.5	213.8	179.2	135.5
.031	-	-	-	-	1150.2	963.8	729.1	650.4	587.2	492.0	396.3	372.2	341.2	299.8	241.4	202.3	153.0
.033	-	-	-	-	1289.1	1080.1	817.1	728.9	658.1	551.4	444.1	417.1	382.4	336.0	270.6	226.7	171.5
.035	-	-	-	-	1435.3	1202.7	909.8	811.6	732.7	614.0	494.5	464.5	425.8	374.1	301.3	252.4	191.0
.037	-	-	-	-	1588.9	1331.3	1007.2	898.4	811.1	679.7	547.4	514.2	471.4	414.1	333.5	279.4	211.4
.039	-	-	-	-	-	1466.1	1109.1	989.4	893.3	748.5	602.8	566.2	519.1	456.0	367.3	307.7	232.8
.047	-	-	-	-	-	-	1562.6	1393.9	1258.5	1054.5	849.2	797.7	731.3	642.4	517.4	433.5	328.0

SURFACE ROUGHNESS CONVERSION CHART

R_a (micrometers)	R_a (microinches)	RMS	CLA (N)	R_{max}	R_a (micrometers)	R_a (microinches)	RMS	CLA (N)	R_{max}
0.025	1	1.1	1	0.3	1.6	63	64.3	63	8.0
0.05	2	2.2	2	0.5	3.2	125	137.5	125	13
0.1	4	4.4	4	0.8	6.3	250	275	250	25
0.2	8	8.8	8	1.2	12.5	500	550	500	50
0.4	16	17.6	16	2.0	25.0	1000	1100	1000	100
0.8	32	32.5	32	4.0	50.0	2000	2200	2000	200

R_a = Roughness Average in micrometers or microinches.
RMS = Root Mean Square in microinches.

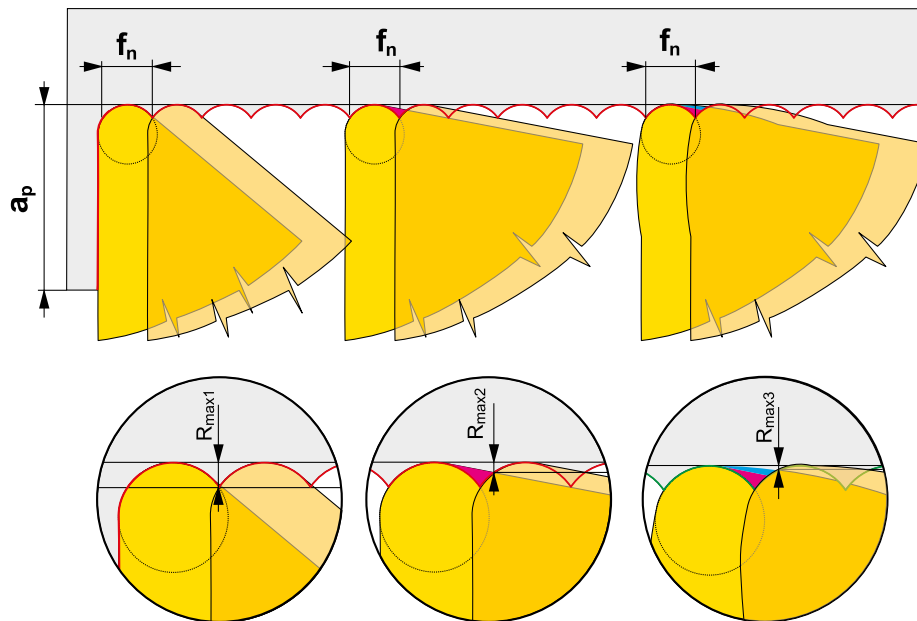
CLA = Center Line Average in microinches.
 R_{max} = Roughness T total in microns

Values of surface finish R_a stated in this table apply for turning by cutting indexable inserts with bigger setting angles of minor cutting edge κ_r' (inserts shapes **T...**, **S...**, **D...**, **K...**, **V...**). The surface finish R_a is better than values mentioned in previous tables, with insert shapes **C...**, **W...** and primarily by inserts with WIPER geometry (tools with setting angle $\kappa_r = 90 - 95^\circ$). The reason is the low value of setting angles of minor cutting edge κ_r' . In this case the value of max. height of profile R_{max} is reduced to $R_{max3} < R_{max2} < R_{max1}$ as you can see in picture no. 17 below.

Los valores de acabado de superficie R_a que se indican en esta tabla se aplican al torneado mediante plaquitas de corte intercambiables con ángulos de posicionamiento mayores del filo de corte secundario κ_r' (plaquitas con formas **T...**, **S...**, **D...**, **K...**, **V...**). El acabado superficial R_a es mejor que los valores indicados en la tabla en el torneado mediante plaquitas de corte con las formas **C...**, **W...** y principalmente mediante plaquitas con geometría de rascadora (herramientas con ángulo de posicionamiento $\kappa_r = 90 \div 95^\circ$). El motivo es el bajo valor de los ángulos de posicionamiento del filo de corte secundario κ_r' . En este caso, el valor de altura máxima del perfil R_{max} se reduce a $R_{max3} < R_{max2} < R_{max1}$ como se puede ver en la imagen n-º 17 siguiente.

Les valeurs de surface R_a indiquées dans ce tableau s'appliquent pour le tournage par plaquettes de coupe indexables avec de grands angles d'attaque κ_r' de l'arête de coupe secondaire (formes plaquettes **T...**, **S...**, **D...**, **K...**, **V...**). La qualité de surface R_a est meilleure que les valeurs mentionnées dans le tableau avec des plaquettes de coupe **C...**, **W...** notamment avec des plaquettes WIPER (outils avec un angle d'attaque $\kappa_r = 90 \div 95^\circ$). La raison est la faible valeur des angles d'attaque κ_r' sur l'arête secondaire. Dans ce cas, la valeur maxi de la hauteur du profil R_{max} est réduite à $R_{max3} < R_{max2} < R_{max1}$ comme vous pouvez le voir sur l'Image 17.

Picture / Imagen / Image 17



WORKING AND CONSTRUCTION ANGLES OF TURNING TOOLS
ÁNGULOS DE TRABAJO Y CONSTRUCTIVO DE LA HERRAMIENTA DE TORNEADO
ANGLES DE TRAVAIL ET DE CONSTRUCTION DES OUTILS DE TOURNAGE

The position and orientation of the cutting edge in relation to the workpiece and its geometric shape determine the cutting angle characteristics.

The angles on the cutting edge are determined by a two coordinate system:

- a) tool
- b) working

a) tool coordinate system (stationary), which is used to determine the cutting edge geometry during design, production and checking. All angles defined in this system are called tool cutting angles. All angles defined by ISO standards according to the insert shape belong in this group.

La posición del filo de corte considerando la pieza de trabajo y su forma geométrica se determinan mediante los ángulos formados por la superficie funcional y los planos auxiliares. Los ángulos del filo de corte se determinan en dos sistemas de coordenadas:

- a) herramienta
- b) trabajo

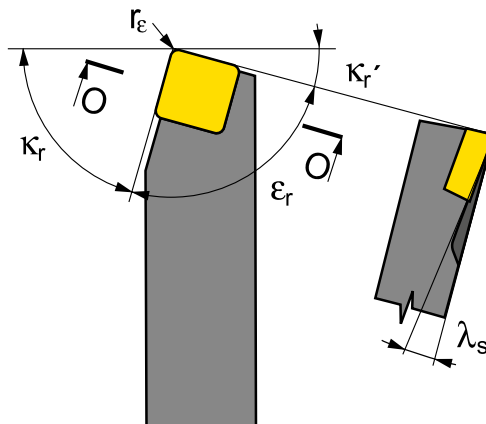
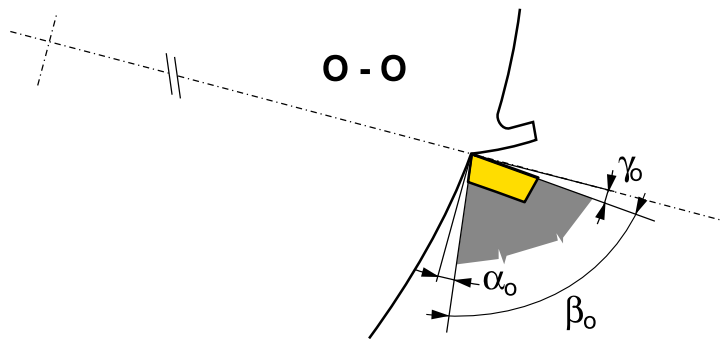
a) Sistema de coordenadas de herramienta (estacionario): se utiliza para la determinación de la geometría del filo de corte en el diseño, la producción y la verificación. Todos los ángulos definidos en este sistema se llaman ángulos corte de herramienta. Todos los ángulos que se definen según la norma ISO de acuerdo con la forma de la plaqueta pertenecen a este grupo.

La position de l'arête de coupe sur la pièce à usiner et sa forme géométrique sont déterminées par les angles formés par la surface fonctionnelle et les plans auxiliaires. Les angles sur l'arête de coupe sont déterminés sur deux systèmes de coordonnées :

- a) référentiel outil
- b) référentiel de travail

a) Le système de coordonnées de l'outil (fixe), est utilisé pour déterminer la géométrie de l'arête de coupe à la conception, la production et la vérification. Tous les angles définis dans ce système sont appelés angles de coupe de l'outil. Tous les angles définis par la norme ISO, selon la forme de plaquette, rentrent dans ce groupe.

Picture / Imagen / Image 18



WORKING AND CONSTRUCTION ANGLES OF TURNING TOOLS
ÁNGULOS DE TRABAJO Y CONSTRUCTIVO DE LA HERRAMIENTA DE TORNEADO
ANGLES DE TRAVAIL ET DE CONSTRUCTION DES OUTILS DE TOURNAGE

b) working coordinate system, used to determine the cutting edge geometry during the machining process. These angles are called working angles and they depend on the position of the insert clamped into the tool holder. For example, the cutting insert SNUN has a tool clearance angle $\alpha = 0^\circ$ and a rake angle $\gamma = 0^\circ$, however the insert is clamped in the tool holder to give a working clearance angle $\alpha_o = 6^\circ$ and a working rake angle $\gamma_o = -6^\circ$. The working angles affect the tool angles with pre-formed chip breakers. However the most important are the working angles for the cutting process.

The basic tool angles are indicated in the picture in the basic tool plane (interlaid by the bearing surface of the tool holder) and in the normal tool plane (interlaid across to cutting edge – cut O-O).

We are concerned with the following angles:

The rake angle γ_o – substantially affects the cutting process. Its size determines the progress and the intensity of plastic deformation during chip forming; it also determines the value of the cutting forces and the thermal stress on the cutting edge. The range of rake angles is wide, from $\gamma_o = +25^\circ$ to -15° for cutting tools with indexable cutting inserts for milling and turning. A positive rake angle improves the chip forming conditions, reduces the cutting forces and reduces the cutting temperature level. A negative rake angle improves the strength of the cutting edge, however it increases plastic deformation during chip forming and thereby also the cutting forces and temperatures.

Clearance angle α_o affects the value of friction between the flank and the machined surface. Increasing the clearance angle α_o reduces this friction and thereby flank wear as well.

Wedge angle β_o is the angle of the cutting insert's wedge. Increasing angle β_o increases the strength of the cutting edge (resistance against shock), however it also increases the cutting resistance.

Inclination angle of main cutting edge λ_s – determines the point of first contact between the cutting edge and the workpiece, which is important for interrupted cut. If λ_s is positive, the point of contact is close to the nose of the cutting insert. The negative angle λ_s moves the point of first contact far from the nose and thereby affects the resistance of the cutting edge against mechanical stress. Furthermore, λ_s affects the direction of chip evacuation. If λ_s is negative, the direction of chip evacuation is towards the machined surface. Whereas if λ_s is positive, the direction of chip evacuation is away from the machined surface.

Setting angle of main cutting edge κ_r affects the shape of the chip cross-section. Reducing angle κ_r makes the chip thinner at a given feed f and depth of cut a_p . Whereas if $\kappa_r = 90^\circ$ the chip thickness $h = f$ and the chip width $b = a_p$ becomes wider.

Setting angle of minor cutting edge κ_l together with nose radius r_n define the final surface quality.

b) Sistema de coordenadas de trabajo: se utiliza para la determinación de la geometría del filo de corte durante el proceso de mecanizado. Estos ángulos se llaman algunos de trabajo y dependen de la posición de la plaquita fijada en el portaherramientas. Por ejemplo, el ángulo de separación de la herramienta de la plaquita de corte SNUN $\square^\circ = 0^\circ$, ángulo de desprendimiento $\square = 0^\circ$. Sin embar γ_o , la plaquita está fijada en el portaherramientas por debajo del ángulo, y por lo tanto, se determinan el ángulo de separación operativo $\square^\circ = 6^\circ$ y el ángulo de desprendimiento operativo $\gamma_o = -6^\circ$.

Los ángulos de trabajo afectan a los ángulos de herramienta con formadores de virutas preformados. No obstante, los más importantes son los ángulos de trabajo del proceso de corte.

Los ángulos básicos de la herramienta se indican en parte en el plano básico de la herramienta (superficie del cojinete del portaherramientas) y en parte en el plano normal de la herramienta (filo de corte – corte O-O).

Hablamos de los ángulos siguientes:

El ángulo de desprendimiento γ_o : afecta sustancialmente al proceso de corte. El progreso y la extensión de la deformación plástica durante la formación de virutas depende de su dimensión, ya que determina el valor de las fuerzas de corte y la fatiga térmica del filo de corte. La dimensión del ángulo de desprendimiento está en el intervalo $\gamma_o = +25^\circ$ a -15° para herramientas de corte con plaquitas de corte intercambiables para fresado y torneado. El ángulo de desprendimiento positivo mejora las condiciones de formación de virutas, reduce la fuerza de corte y el nivel de la temperatura de corte. El ángulo de desprendimiento negativo mejora la resistencia del filo de corte, aunque aumenta la deformación plástica en la formación de virutas y por lo tanto, las fuerzas de corte y las temperaturas.

Ángulo de separación α_o : afecta al valor de fricción entre el flanco y la superficie mecanizada. Con un ángulo de separación α_o mayor se reduce la fricción y también el desgaste del flanco.

Ángulo de cuña β_o : es el ángulo incluido de la plaquita de corte. Con un ángulo β_o mayor aumenta la resistencia del filo de corte (resistencia a los golpes), aunque al mismo tiempo aumenta la resistencia de corte.

Ángulo de inclinación del filo de corte principal λ_s : determina el primer punto de contacto del filo de corte con la pieza de trabajo, muy importante para el corte interrumpido. Si el λ_s es positivo, el punto de contacto está cerca de la punta de la plaquita de corte. El ángulo λ_s desplaza el primer punto de contacto lejos de la punta y por lo tanto, afecta a la resistencia de filo a la fatiga mecánica. Además, λ_s afecta a la dirección de evacuación de las virutas. Si λ_s es negativo, la dirección de evacuación de las virutas es hacia la superficie mecanizada. Si λ_s es positivo, la dirección de evacuación de las virutas es hacia fuera de la superficie mecanizada.

Ángulo de posicionamiento del filo de corte principal κ_r : afecta a la forma de la sección transversal de las virutas. Con un ángulo κ_r más pequeño, la viruta es más ancha y delgada a un avance f y una profundidad de corte a_p determinados. Por otro lado, con $\kappa_r = 90^\circ$ el espesor de las virutas $h = f$ y la anchura de las virutas $b = a_p$.

„Ángulo de posicionamiento del filo de corte secundario κ_l : junto con el radio de punta r_n define la calidad final de la superficie.“

b) Le système de coordonnées de travail, est utilisé pour déterminer la géométrie de l'arête de coupe pendant le processus d'usinage. Ces angles sont appelés angles de travail, ils dépendent de la position de la plaquette fixée dans le porte-outil. Par exemple, une plaquette de coupe SNUN possède un angle de dépouille $\alpha = 0^\circ$ et un angle de coupe $\gamma = 0^\circ$. Toutefois cette plaquette une fois serrée dans le porte-outil conçu avec un angle déterminé, transforme les angles qui deviennent alors: angle de dépouille réel $\alpha_o = 6^\circ$ et angle de coupe réel $\gamma_o = -6^\circ$. Les angles de travail affectent les angles de l'outil équipé de plaquettes à géométrie pressée. Cependant le plus important pour le processus de coupe reste les angles de travail.

Les angles de base de l'outil sont indiqués dans le plan de base de l'outil (à partir de la surface d'appui de l'outil) dans le plan normal à l'outil (suivant le plan de coupe O-O).

Nous parlons des angles suivants :

L'angle de coupe γ_o affecte substantiellement le processus de coupe. La propagation et l'importance de la déformation plastique durant la formation du copeau dépend de sa dimension et détermine la valeur de la force de coupe et de la contrainte thermique de l'arête de coupe. La valeur de l'angle de coupe se situe dans un intervalle $\gamma_o = +25^\circ - 15^\circ$ pour les outils de coupe à plaquettes de coupe indexables pour le fraisage et le tournage. Un angle de coupe positif améliore les conditions de formation du copeau, réduit la force de coupe et le niveau de température de coupe. Un angle de coupe négatif améliore la résistance de l'arête de coupe mais augmente cependant la déformation plastique lors de la formation du copeau, les efforts de coupe et les températures.

L'angle de dépouille α_o affecte les valeurs de frottement entre le flanc et la surface usinée. Avec une augmentation de l'angle de dépouille α_o le frottement diminue et ainsi l'usure en dépouille également.

L'angle de taillant β_o est l'angle résultant sur la plaquette. Plus l'angle β_o est grand, plus l'arête de coupe est robuste (résistance aux chocs), mais dans le même temps la résistance à la coupe augmente.

L'angle d'inclinaison de l'arête de coupe principale λ_s détermine le point de contact de l'arête de coupe avec la pièce à usiner, c'est important pour la coupe interrompue. Si l'angle λ_s est positif, le point de contact est proche de la pointe de la plaquette de coupe. Un angle λ_s négatif déplace le premier point de contact loin de la pointe et agit sur la résistance de l'arête de coupe aux contraintes mécaniques. La modification de l'angle λ_s change la direction de l'évacuation des copeaux. Si λ_s est négatif, l'évacuation des copeaux s'effectue vers la surface usinée. Alors que si λ_s est positif, la direction de l'évacuation des copeaux s'effectue à partir de la surface usinée.

L'angle d'attaque κ_r de l'arête de coupe principale affecte la forme de la section du copeau. Avec un plus petit angle κ_r le copeau est plus large et plus fin avec des valeurs d'avance f et de profondeur de coupe a_p données. Avec un angle $\kappa_r = 90^\circ$ l'épaisseur du copeau $h = f$ et la largeur du copeau $b = a_p$.

L'angle d'attaque κ_f de l'arête de coupe secondaire et le rayon de pointe r_ϵ définissent ensemble la qualité de surface finale.

CORRECTION OF X AND Z COORDINATES BY RADIUS AND HOLDER
CORRECCIÓN EN COORDENADAS X Y Z SEGÚN EL RADIO Y EL PORTAHERRAMIENTAS
CHANGEMENT DE TAILLE (CORRECTION) SUIVANT LE RAYON UTILISÉ

Correction of X and Z coordinates by radius and holder:
Corrección en coordenadas X y Z según el radio y el portaherramientas:
Changement de taille (correction) suivant le rayon utilisé:

Picture / Imagen / Image 19

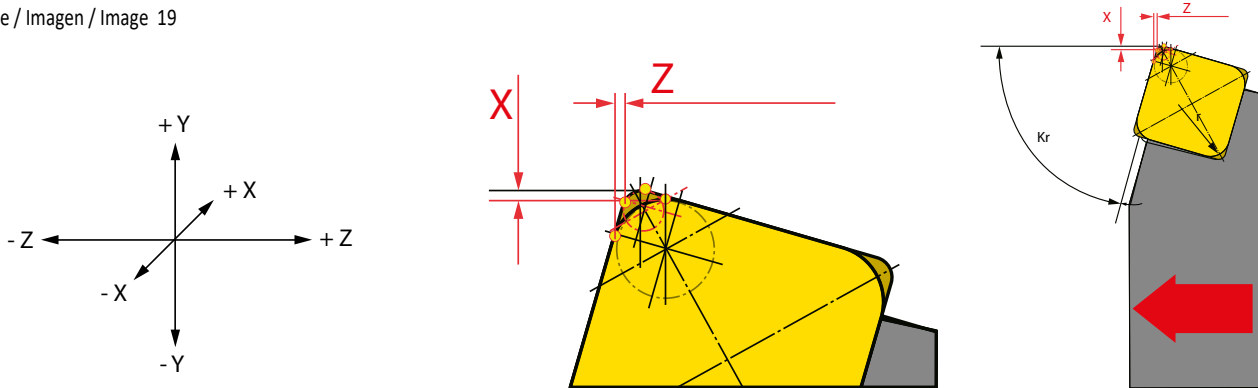


Table / Tabla / Tableau 14

ATTENTION – the data is valid for right-hand holders oriented as shown in picture 19. For internal holders, left-hand holders or other orientations it is necessary to correct or mark +/- (to substitute values X/Z)

ATENCIÓN – los datos son válidos para el portaherramientas del lado derecho orientado según la Imagen 19. Para los portaherramientas internos, es necesaria la orientación hacia el lado izquierdo o de otro tipo para hacer la corrección de las marcas +/- (para sustituir los valores X/Z)

ATTENTION – Les valeurs dans le tableau sont valables pour des outils orientés à droite comme sur l'Image 19. Pour les outils intérieurs, à gauche ou avec d'autres orientations, il est nécessaire de corriger les valeurs avec les signes +/- (pour substituer les valeurs X/Z)

Holder Portaherramientas Outil		Coordinates Coordenadas Coordonnées	Radius .020 Radio .020 Rayon .020	Radius .039 Radio .039 Rayon .039	Radius .059 Radio .059 Rayon .059				
External holder Portaherramientas externo Outils extérieurs	CKJNR/L	x	0.443	0.000	-0.433				
		z	-0.050	0.000	0.050				
Holder Portaherramientas Outil		Coordinates Coordenadas Coordonnées	Radius .008 Radio .008 Rayon .008	Radius .016 Radio .016 Rayon .016	Radius .031 Radio .031 Rayon .031	Radius .047 Radio .047 Rayon .047	Radius .063 Radio .063 Rayon .063	Radius .094 Radio .094 Rayon .094	Radius .125 Radio .125 Rayon .125
External holder Portaherramientas externo Outils extérieurs	DCLNR/L	x	0.00236	0.00157	0.00000	-0.00157	-0.00315	-0.00630	-0.00945
		z	-0.00244	-0.00165	0.00000	0.00165	0.00327	0.00654	0.00980
	DDJNR/L	x	0.02031	0.01366	0.00000	-0.01295	-0.02626	-0.05287	-0.07949
		z	-0.00220	-0.00161	0.00000	0.00087	0.00213	0.00461	0.00709
	DSBNR/L	x	0.00992	0.00669	0.00000	-0.00622	-0.01268	-0.02555	-0.03846
		z	0.01661	0.01102	0.00000	-0.01122	-0.02236	-0.04465	-0.06693
	DSDNN	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
		z	0.00972	0.00650	0.00000	-0.00650	-0.01299	-0.02594	-0.03894
	DSKNR/L	x	0.00528	0.00350	0.00000	-0.00350	-0.00701	-0.01409	-0.02114
		z	-0.00657	-0.00437	0.00000	0.00437	0.00874	0.01748	0.02626
	DSSNR/L	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
		z	0.00965	0.00638	0.00000	-0.00657	-0.01268	-0.02606	-0.03906
	DTFNR/L	x	0.01677	0.01118	0.00000	-0.01118	-0.02240	-0.04476	-0.06713
		z	0.00114	0.00075	0.00000	-0.00075	-0.00157	-0.00307	-0.00461

CORRECTION OF X AND Z COORDINATES BY RADIUS AND HOLDER
CAMBIO DE TAMAÑO (CORRECCIÓN) SEGÚN EL RADIO UTILIZADO
CHANGEMENT DE TAILLE (CORRECTION) SUIVANT LE RAYON UTILISÉ

Holder Portaherramientas Outil		Coordinates Coordenadas Coordonnées	Radius .008 Radio .008 Rayon .008	Radius .016 Radio .016 Rayon .016	Radius .031 Radio .031 Rayon .031	Radius .047 Radio .047 Rayon .047	Radius .063 Radio .063 Rayon .063	Radius .094 Radio .094 Rayon .094	Radius .125 Radio .125 Rayon .125	
External holder Portaherramientas externo Outils extérieurs	DTGNR/L	x	0.01720	0.01157	0.00000	-0.01091	-0.02213	-0.04461	-0.06705	
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	DVJNR/L	x	0.00248	0.00165	0.00000	-0.00165	-0.00331	-0.00665	-0.00996	
		z	0.04858	0.03240	0.00000	-0.03240	-0.06480	-0.12957	-0.19437	
	DVPNR/L	x	0.03110	0.02075	0.00000	-0.02075	-0.04150	-0.08299	-0.12445	
		z	0.03283	0.02181	0.00000	-0.02181	-0.04366	-0.08728	-0.13094	
	DWLNR/L	x	0.00240	0.00173	0.00000	-0.00102	-0.00240	-0.00516	-0.00787	
		z	-0.00248	-0.00177	0.00000	0.00106	0.00244	0.00528	0.00811	
Internal holder Portaherramientas interno Outils intérieurs	DCLNR/L	x	-0.00209	-0.00138	0.00000	0.00138	0.00276	0.00551	0.00827	
		z	-0.00236	-0.00157	0.00000	0.00157	0.00315	0.00626	0.00941	
	DDUNR/L	x	-0.02016	-0.01343	0.00000	0.00134	0.02689	0.05374	0.08059	
		z	-0.00287	-0.00193	0.00000	0.00193	0.00382	0.00768	0.01150	
	DTFNR/L	x	-0.01673	-0.01138	0.00000	0.01000	0.02071	0.04209	0.06350	
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	DVUNR/L	x	0.04937	-0.03291	0.00000	0.03291	0.06579	0.13161	0.19740	
		z	-0.00508	-0.00339	0.00000	0.00339	0.00677	0.01354	0.02031	
	DWLNR/L	x	-0.00209	-0.00138	0.00000	0.00138	0.00276	0.00551	0.00827	
		z	-0.00236	-0.00157	0.00000	0.00157	0.00315	0.00626	0.00941	
	External holder Portaherramientas externo Outils extérieurs	MTJNR/L	x	0.01720	0.01157	0.00000	-0.01091	-0.02213	-0.04461	-0.06705
			z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
MVJNR/L		x	0.04972	0.03335	0.00000	-0.03224	-0.06500	-0.13059	-0.19614	
		z	-0.00295	-0.00217	0.00000	0.00098	0.00256	0.00575	0.00890	
MWLNR/L		x	0.02398	0.00173	0.00000	-0.00102	-0.00240	-0.00516	-0.00787	
		z	-0.00248	-0.00177	0.00000	0.00106	0.00244	0.00528	0.00811	
PCBNR/L		x	0.00177	0.00130	0.00000	-0.00063	-0.00157	-0.00346	-0.00539	
		z	0.00504	0.00327	0.00000	-0.00378	-0.00728	-0.01433	-0.02138	
PCKNR/L		x	0.00673	0.00453	0.00000	-0.00433	-0.00878	-0.01764	-0.02646	
		z	0.02697	0.01799	0.00000	-0.01799	-0.03598	-0.07193	-0.10791	
PCLNR/L		x	0.00240	0.00173	0.00000	-0.00102	-0.00240	-0.00516	-0.00787	
		z	-0.00248	-0.00177	0.00000	0.00106	0.00244	0.00528	0.00811	
PDJNR/L		x	0.02031	0.01366	0.00000	-0.01295	-0.02626	-0.05287	-0.07949	
		z	-0.00220	-0.00161	0.00000	0.00087	0.00213	0.00461	0.00709	
PDNNR/L		x	0.02752	0.01846	0.00000	-0.01783	-0.03602	-0.07232	-0.10862	
		z	0.02063	0.01370	0.00000	-0.01406	-0.02795	-0.05571	-0.08346	
PDXNR/L		x	0.01783	0.01201	0.00000	-0.01134	-0.02299	-0.04634	-0.06969	
		z	-0.00614	-0.00421	0.00000	0.00346	0.00728	0.01496	0.02264	
PLBNR/L		x	0.00539	0.00370	0.00000	-0.00307	-0.00642	-0.01319	-0.01996	
		z	0.00602	0.00394	0.00000	-0.00433	-0.00866	-0.01705	-0.02543	
PSBNR/L		x	0.00539	0.00370	0.00000	-0.00307	-0.00642	-0.01319	-0.01996	
		z	0.00602	0.00394	0.00000	-0.00433	-0.00866	-0.01705	-0.02543	
PSDNN		x	0.00992	0.00669	0.00000	-0.00622	-0.01268	-0.02555	-0.03846	
		z	0.01661	0.01102	0.00000	-0.01122	-0.02236	-0.04465	-0.06689	
PSKNR/L		x	0.00551	0.00370	0.00000	-0.00354	-0.00598	-0.01441	-0.02165	
		z	0.02260	0.01508	0.00000	-0.01512	-0.03020	-0.06035	-0.09055	
PSSNR/L		x	0.00969	0.00646	0.00000	-0.00646	-0.01291	-0.02583	-0.03870	
		z	0.01669	0.01114	0.00000	-0.01114	-0.02228	-0.04453	-0.06681	
PTFNR/L		x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
		z	-0.01618	-0.00957	0.00000	0.01689	0.03012	0.05657	0.08307	
PTGNR/L		x	0.01720	0.01157	0.00000	-0.01091	-0.02213	-0.04461	-0.06705	
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
PTTNR/L	x	0.02366	0.01587	0.00000	-0.01531	-0.03087	-0.06201	-0.09319		
	z	0.02043	0.01358	0.00000	-0.01394	-0.02768	-0.05516	-0.08264		
PWLNR/L	x	0.02398	0.00173	0.00000	-0.00102	-0.00240	-0.00516	-0.00787		
	z	-0.00248	-0.00177	0.00000	0.00106	0.00244	0.00528	0.00811		

**CORRECTION OF X AND Z COORDINATES BY RADIUS AND HOLDER
CAMBIO DE TAMAÑO (CORRECCIÓN) SEGÚN EL RADIO UTILIZADO
CHANGEMENT DE TAILLE (CORRECTION) SUIVANT LE RAYON UTILISÉ**

Holder Portaherramientas Outil		Coordinates Coordenadas Coordonnées	Radius .008 Radio .008 Rayon .008	Radius .016 Radio .016 Rayon .016	Radius .031 Radio .031 Rayon .031	Radius .047 Radio .047 Rayon .047	Radius .063 Radio .063 Rayon .063	Radius .094 Radio .094 Rayon .094	Radius .125 Radio .125 Rayon .125
Internal holder Portaherramientas interno Outils intérieurs	PCLNR/L	x	-0.00240	-0.00181	0.00000	0.00047	0.00157	0.00386	0.00614
		z	-0.00244	-0.00185	0.00000	0.00059	0.00181	0.00630	0.00665
	PDUNR/L	x	-0.01969	-0.01335	0.00000	0.01201	0.02469	0.05004	0.07539
		z	-0.00205	-0.00157	0.00000	0.00024	0.00114	0.00299	0.00480
	PSKNR/L	x	-0.00602	-0.00382	0.00000	0.00248	0.00563	0.01193	0.01823
		z	0.00539	0.00386	0.00000	-0.00488	-0.00921	-0.01795	-0.02665
	PTFNR/L	x	-0.01673	-0.01138	0.00000	0.01000	0.02071	0.04209	0.06350
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	PWLNR/L	x	-0.00236	-0.00181	0.00000	0.00047	0.00169	0.00386	0.00614
		z	-0.00256	-0.00193	0.00000	0.00047	0.00157	0.00413	0.00654
	SCACR/L	x	0.00453	0.00303	0.00000	-0.00303	-0.00602	-0.01209	-0.01811
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SCBCR/L	x	0.00165	0.00110	0.00000	-0.00110	-0.00217	-0.00437	-0.00654	
	z	0.00512	0.00343	0.00000	-0.00343	-0.00685	-0.01366	-0.02051	
SCDCR/L	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	z	-0.01098	-0.00732	0.00000	0.00732	0.01465	0.02933	0.04398	
SCFCR/L	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	z	-0.00488	-0.00327	0.00000	0.00327	0.00654	0.01303	0.01957	
SCLCR/L	x	0.00236	0.00157	0.00000	-0.00157	-0.00315	-0.00630	-0.00945	
	z	-0.00244	-0.00165	0.00000	0.00165	0.00327	0.00654	0.00980	
SDJCR/L	x	0.02047	0.01362	0.00000	-0.01362	-0.02728	-0.05457	-0.08181	
	z	-0.00236	-0.00157	0.00000	0.00157	0.00315	0.00634	0.00949	
SDNCN	x	0.02752	0.01835	0.00000	-0.01835	-0.03673	-0.07343	-0.11016	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
SEGCR/L	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	z	-0.00717	-0.00476	0.00000	0.00476	0.00957	0.01909	0.02866	
SSBCR/L	x	0.00531	0.00354	0.00000	-0.00354	-0.00709	-0.01417	-0.02122	
	z	0.00610	0.00409	0.00000	-0.00409	-0.00815	-0.01630	-0.02445	
SSDCN	x	0.00980	0.00654	0.00000	-0.00654	-0.01303	-0.02610	-0.03913	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
SSKCR/L	x	-0.01480	-0.02035	0.00000	-0.04264	-0.05378	-0.07602	-0.09831	
	z	-0.00531	-0.00354	0.00000	0.00354	0.00709	0.01417	0.02122	
STCFR/L	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	z	-	-	0.00000	-	-	-	-	
STJCR/L	x	0.01598	0.01067	0.00000	-0.01067	-0.02134	-0.04268	-0.06402	
	z	-0.00213	-0.00142	0.00000	0.00142	0.00280	0.00563	-0.00843	
SVACR/L	x	00/0	.004/-0.004	-	-	-	-	-	
	z	00/0	.004/-0.004	-	-	-	-	-	
SVGCR/L	x	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
	z	-0.05130	-0.03421	0.00000	0.03421	0.06839	0.13681	0.20520	
SVHBR/L	x	0.04071	0.02717	0.00000	-0.02717	-0.05429	-0.10862	-0.16291	
	z	-0.02142	-0.01429	0.00000	0.01429	0.02858	0.05717	0.08575	
SVHCR/L	x	0.04071	0.02717	0.00000	-0.02717	-0.05429	-0.10862	-0.16291	
	z	-0.02142	-0.01429	0.00000	0.01429	0.02858	0.05717	0.08575	
SVJBR/L	x	0.04996	0.03331	0.00000	-0.03331	-0.06661	-0.13323	-0.19984	
	z	-0.00390	-0.00260	0.00000	0.00260	0.00520	0.01035	0.01555	
SVJCR/L	x	0.04996	0.03331	0.00000	-0.03331	-0.06661	-0.13323	-0.19984	
	z	-0.00390	-0.00260	0.00000	0.00260	0.00520	0.01035	0.01555	
SVPBR/L	x	0.03193	0.02130	0.00000	-0.02130	-0.04256	-0.08512	-0.12772	
	z	-0.03193	-0.02130	0.00000	0.02130	0.04256	0.08512	0.12772	
SVPCR/L	x	0.03193	0.02130	0.00000	-0.02130	-0.04256	-0.08512	-0.12772	
	z	-0.03193	-0.02130	0.00000	0.02130	0.04256	0.08512	0.12772	
SVVBN	x	0.05492	0.03661	0.00000	-0.03661	-0.07323	-0.14650	-0.21972	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	

CORRECTION OF X AND Z COORDINATES BY RADIUS AND HOLDER
CAMBIO DE TAMAÑO (CORRECCIÓN) SEGÚN EL RADIO UTILIZADO
CHANGEMENT DE TAILLE (CORRECTION) SUIVANT LE RAYON UTILISÉ

Holder Portaherramientas Outil		Coordinates Coordenadas Coordonnées	Radius .008 Radio .008 Rayon .008	Radius .016 Radio .016 Rayon .016	Radius .031 Radio .031 Rayon .031	Radius .047 Radio .047 Rayon .047	Radius .063 Radio .063 Rayon .063	Radius .094 Radio .094 Rayon .094	Radius .125 Radio .125 Rayon .125
External holder Portaherramientas externo Outils extérieurs	SVVCN	x	0.05492	0.03661	0.00000	-0.03661	-0.07323	-0.14650	-0.21972
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	SVXBR/L	x	0.04728	0.03154	0.00000	-0.00315	-0.06303	-0.12606	-0.18913
		z	-0.01020	-0.00681	0.00000	0.00681	0.01358	0.02720	0.04079
	SVXCR/L	x	0.04728	0.03154	0.00000	-0.00315	-0.06303	-0.12606	-0.18913
		z	-0.01020	-0.00681	0.00000	0.00681	0.01358	0.02720	0.04079
	SWLCR/L	x	0.00236	0.00157	0.00000	-0.00157	-0.00315	-0.00630	-0.00945
		z	-0.00236	-0.00157	0.00000	0.00157	0.00315	0.00630	0.00945
	SCFCR/L	x	-0.01654	-0.01102	0.00000	0.01102	0.02205	0.04413	0.06618
		z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	SCKCR/L	x	-0.00157	-0.00106	0.00000	0.00106	0.00213	0.00425	0.00634
		z	0.00512	0.00343	0.00000	-0.00343	-0.00685	-0.01370	0.02051
SCLCR/L	x	-0.00228	-0.00154	0.00000	0.00154	0.00307	0.00610	0.00917	
	z	-0.00244	-0.00165	0.00000	0.00165	0.00327	0.00654	0.00980	
SCXCR/L	x	-0.00701	-0.00469	0.00000	0.00469	0.00933	0.01866	0.02799	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
SDQCR/L	x	-0.01217	-0.00764	0.00000	0.00811	0.01622	0.03248	0.04870	
	z	-0.01220	-0.00811	0.00000	0.01055	0.01965	0.03783	0.05602	
SDUCR/L	x	-0.01984	-0.01323	0.00000	0.01323	0.02646	0.05291	0.07937	
	z	-0.00232	-0.00154	0.00000	0.00161	0.00323	0.00638	0.00953	
SDZCR/L	x	-0.02047	-0.01362	0.00000	0.01362	0.02728	0.0547	0.08181	
	z	0.00232	0.00154	0.00000	-0.00161	-0.00323	-0.00638	-0.00953	
SELPR/L	x	-0.00496	-0.00331	0.00000	0.00331	0.00661	0.01327	0.02021	
	z	-0.00260	-0.00173	0.00000	0.00173	0.00346	0.00693	0.01039	
SEUCR/L	x	-0.00587	-0.00390	0.00000	0.00390	0.00783	0.01563	0.02346	
	z	-0.00161	-0.00106	0.00000	0.00106	0.00209	0.00421	0.00630	
SEUPR/L	x	-0.00583	-0.00390	0.00000	0.00390	0.00780	0.01559	0.02335	
	z	-0.00157	-0.00106	0.00000	0.00106	0.00209	0.00421	0.00630	
SEXPR/L	x	-0.01512	-0.01008	0.00000	0.01008	0.02016	0.04031	0.06051	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
SSSCR/L	x	-0.00980	-0.00654	0.00000	0.00654	0.01303	0.02610	0.03913	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
STFCR/L	x	-0.01705	-0.01138	0.00000	0.01138	0.02272	0.04543	0.06815	
	z	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	
SVLCR/L	x	-0.04894	-0.03260	0.00000	0.03260	0.06524	0.13047	0.19571	
	z	0.00941	0.02724	0.00000	-0.00425	-0.00846	-0.01693	-0.02539	
SVQBR/L	x	-0.04043	-0.02693	0.00000	0.02717	0.05390	0.10780	0.16165	
	z	-0.02146	-0.01429	0.00000	0.01429	0.02858	0.05717	0.08575	
SVQCR/L	x	-0.04043	-0.02693	0.00000	0.02717	0.05390	0.10780	0.16165	
	z	-0.02146	-0.01429	0.00000	0.01429	0.02858	0.05717	0.08575	
SVUBR/L	x	-0.04957	-0.03307	0.00000	0.03307	0.06610	0.13220	0.19831	
	z	0.00390	-0.00260	0.00000	0.00260	0.00520	0.01035	0.01555	
SVUCR/L	x	-0.04957	-0.03307	0.00000	0.03307	0.06610	0.13220	0.19831	
	z	0.00390	-0.00260	0.00000	0.00260	0.00520	0.01035	0.01555	
SVXCR/L	x	-0.03610	-0.02406	0.00000	0.02406	0.04811	0.09626	0.14437	
	z	-0.02740	-0.01827	0.00000	0.01827	0.03654	0.07307	0.10957	
SWLCR/L	x	-0.00236	-0.00154	0.00000	0.00154	0.00311	0.00622	0.00933	
	z	-0.00236	-0.00157	0.00000	0.00157	0.00315	0.00630	0.00945	
SWUCR/L	x	-0.00315	-0.00209	0.00000	0.00209	0.00421	0.00839	0.01256	
	z	-0.00134	-0.00094	0.00000	0.00094	0.00193	0.00386	0.00575	

ATTENTION – the data is valid for right-hand holders oriented as shown in picture 19. For internal holders, left-hand holders or other orientations it is necessary to correct or mark +/- (to substitute values X/Z)

ATENCIÓN – los datos son válidos para el portaherramientas del lado derecho orientado según la Imagen 19. Para los portaherramientas internos, es necesaria la orientación hacia el lado izquierdo o de otro tipo para hacer la corrección de las marcas +/- (para sustituir los valores X/Z)

ATTENTION – Les valeurs dans le tableau sont valables pour des outils orientés à droite comme sur l'Image 19. Pour les outils intérieurs, à gauche ou avec d'autres orientations, il est nécessaire de corriger les valeurs avec les signes +/- (pour substituer les valeurs X/Z)

The choice of production method is influenced by the workpiece and the machine. Workpiece – external or internal thread, right- or left-hand thread. Machine – right- or left-hand tool. For guidance, you can use table 15 below.

La pieza de trabajo y la máquina influyen en la elección del método de producción. Pieza de trabajo: rosca interna o externa, a derecha o a izquierda. Máquina: herramienta a derecha o a izquierda. Puede utilizar la Tabla 15 siguiente.

Le choix de la méthode d'usinage est guidé par la pièce à réaliser et la machine. Pièce avec filetage extérieur ou intérieur, sens des filets à droite ou à gauche. Tourelle placée à l'avant ou à l'arrière. Vous pouvez utiliser les tableaux N° 15.

Table / Tabla / Tableau 15a

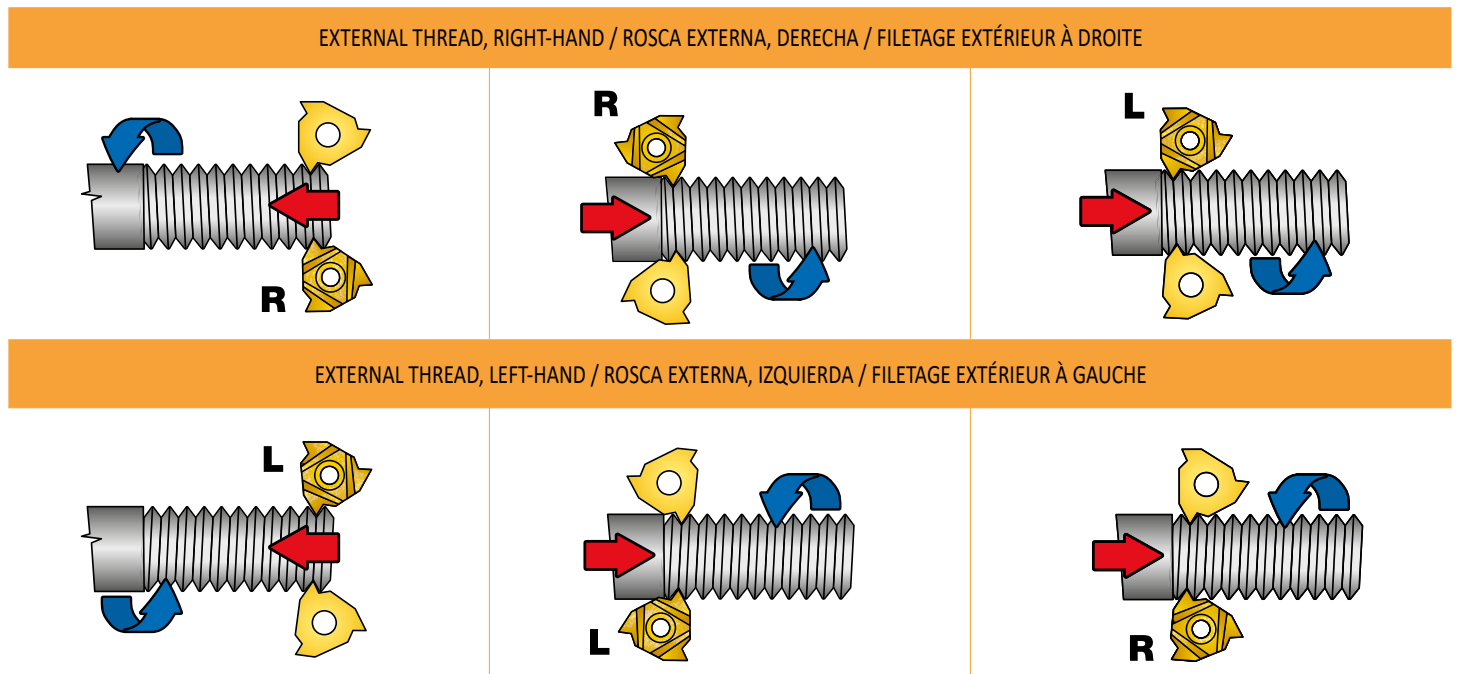
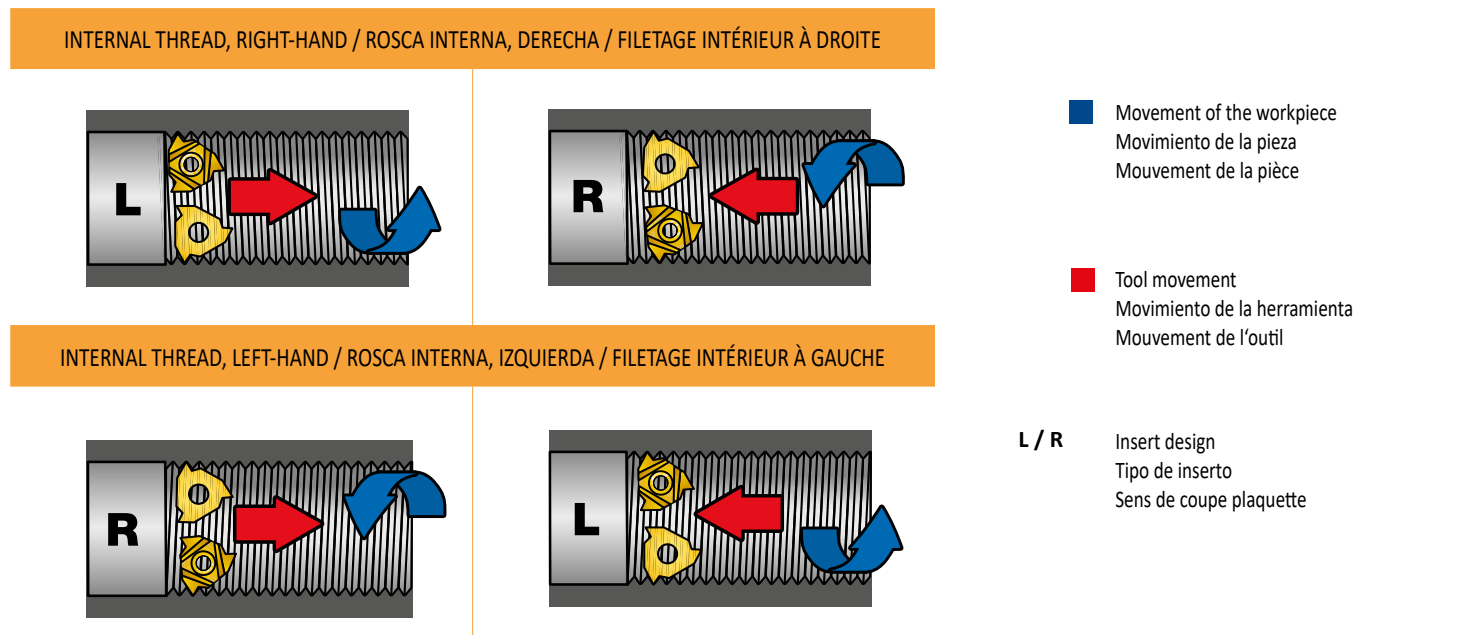


Table / Tabla / Tableau 15b

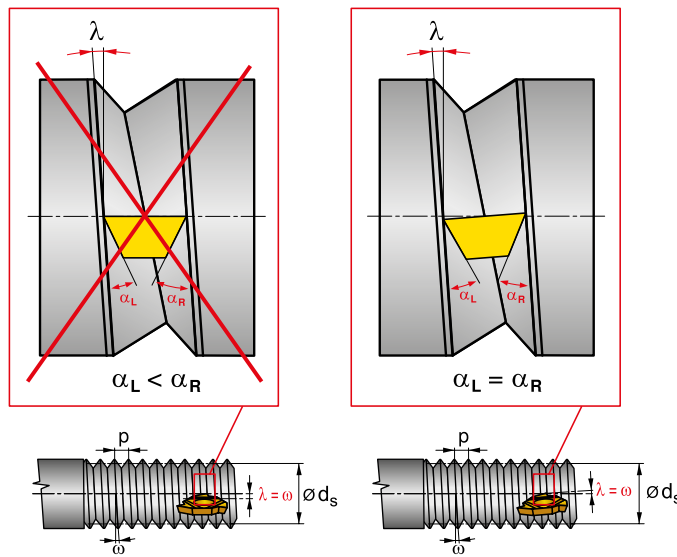


The following formula can be used to calculate the helix angle:
 Se puede utilizar la siguiente fórmula para calcular el ángulo de hélice:
 La formule suivante est à utiliser pour le calcul de l'angle d'hélice :

$$\text{tg } \omega = \frac{P}{d_s \cdot \pi}$$

ω	helix angle	[°]	P	pitch	[in]	d_s	pitch diameter	[in]
ω	ángulo de hélice	[°]	P	paso	[in]	d_s	diámetro de paso	[in]
ω	ângulo da hélice	[°]	P	passo	[in]	d_s	diâmetro do passo	[in]
ω	angle d'hélice	[°]	P	pas	[in]	d_s	diamètre du pas	[in]

Picture / Imagen / Image 20



To generate the correct shape on the thread and uniform wear on the insert, the cutting edge helix angle should be equal to the thread lead angle.

Tool holders are usually supplied with a helix angle $\lambda = 1.5^\circ$. A different helix angle can be selected by changing the anvil.

Use the following graph (picture 21) or table (table 16) to choose the correct anvil.

Pour réaliser la forme correcte du filet et obtenir une usure régulière sur l'arête de coupe, l'angle d'hélice de l'arête doit être égal à l'angle d'inclinaison du filet.

Les outils sont généralement fournis avec un angle d'hélice $\lambda = 1,5^\circ$. Un angle d'hélice différent peut être choisi en changeant la cale.

Voir le graphique ou le tableau ci-dessous pour choisir la bonne cale pentée. Tableau 16 et Image 21.

Para generar la forma correcta de la rosca y un desgaste uniforme en la plaquita el ángulo de hélice del filo de corte debe ser igual al ángulo de inclinación base de la rosca.

Normalmente los portaherramientas se suministran con un ángulo de hélice $\lambda = 1,5^\circ$. Se puede seleccionar un ángulo de hélice diferente cambiando la base.

Utilice el gráfico o la tabla siguientes para elegir la base correcta. Tabla 16 y gráfica en Imagen 21.

Table 16. – Choice of shim
 Tabla 16 – Selección de la base
 Tableau 16 – Choix de l'assise

Helix angle λ Ángulo de hélice λ Angle d'hélice λ	Positive Positivo Positive					Negative Negativo Négative		for grooving inserts Para placas de ranurado Pour plaquettes à gorge TN16... ZZ, TN22... ZZ
	4.5°	3.5°	2.5°	1.5°	0.5°	-0.5°	-1.5°	
Tool holder / Portaherramientas Porte-outil	Anvil specification / Especificación de la base Spécification de base							
SER16; SIL16	PE16+4.5	PE16+3.5	PE16+2.5	PE16+1.5	PE16+0.5	PE16-0.5	PE16-1.5	PE16ZZ
SEL16; SIR16	PI16+4.5	PI16+3.5	PI16+2.5	PI16+1.5	PI16+0.5	PI16-0.5	PI16-1.5	PI16ZZ
SER22; SIL22	PE22+4.5	PE22+3.5	PE22+2.5	PE22+1.5	PE22+0.5	PE22-0.5	PE22-1.5	PE22ZZ
SEL22; SIR22	PI22+4.5	PI22+3.5	PI22+2.5	PI22+1.5	PI22+0.5	PI22-0.5	PI22-1.5	PI22ZZ
SER-S22; SIL-S22	PE22S+4.5	PE22S+3.5	PE22S+2.5	PE22S+1.5	PE22S+0.5	PE22S-0.5	PE22S-1.5	-
SEL-S22; SIR-S22	PI22S+4.5	PI22S+3.5	PI22S+2.5	PI22S+1.5	PI22S+0.5	PI22S-0.5	PI22S-1.5	-

Tool holders are usually supplied with a helix angle $\lambda = 1.5^\circ$. A different helix angle can be selected by changing the anvil.

Shims for holders SER-S , SIR-S are marked with „S“

Nota: Normalmente los portaherramientas se suministran con un ángulo de hélice $\lambda = 1,5^\circ$. Se puede seleccionar un ángulo de hélice diferente cambiando la base. Las bases para portaherramientas SER-S , SIR-S están marcadas con una „S“

Les outils sont généralement fournis avec un angle d'hélice $\lambda = 1.5^\circ$. Un angle d'hélice différent peut être choisi en changeant la cale.

Les assises pour porte-outils SER-S , SIR-S sont marquées avec un „S“

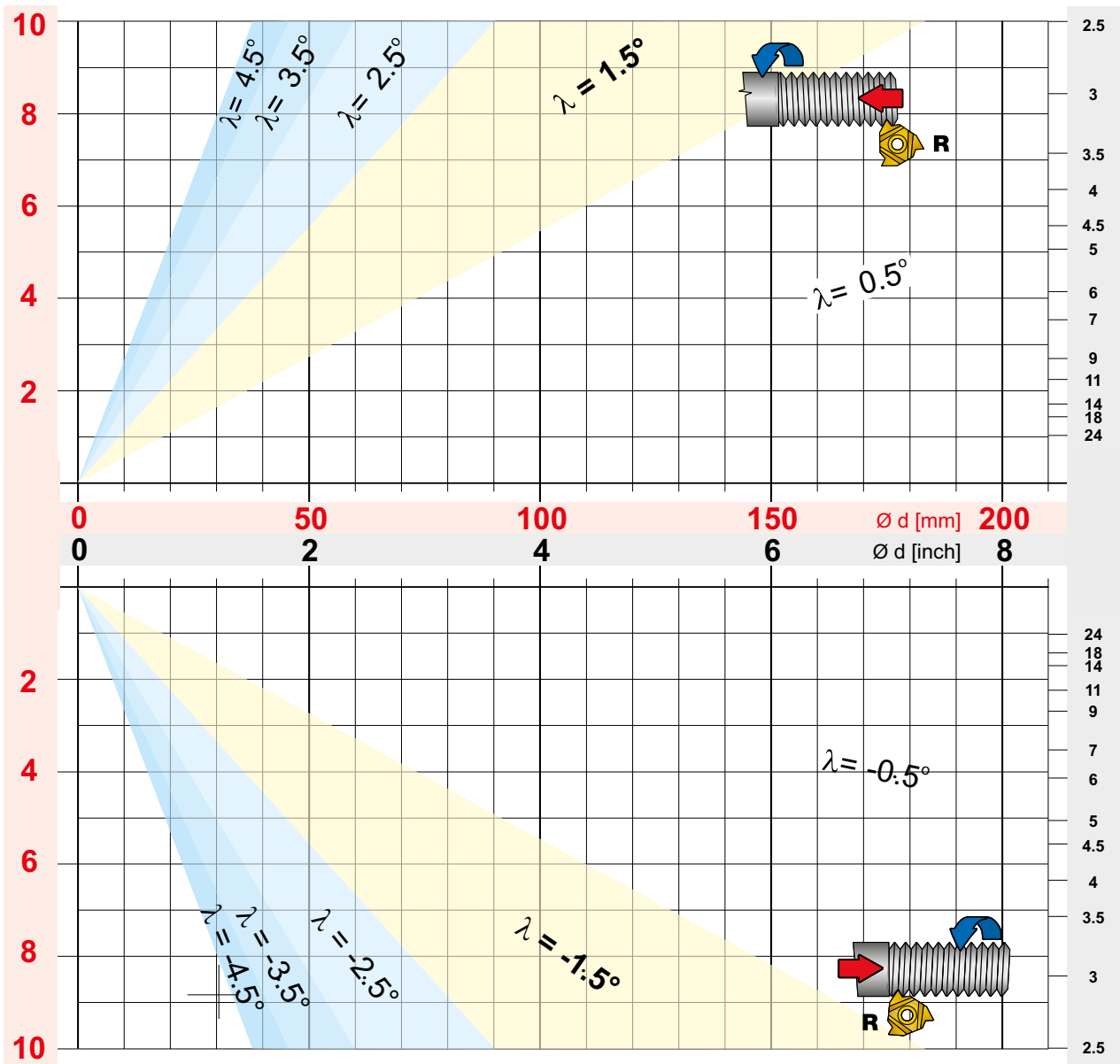
Picture 21. – Graph for shim selection

Imagen 21 – Selección de la base

Image N° 21 – Graphique pour sélection des assises

Thread pitch P [in]
Paso de rosca P [in]
Pas P [in]

No. of threads / 1"
N.º de roscas / 1"
Nb de filets / 1"



■ Movement of the workpiece
Movimiento de la pieza
Mouvement de la pièce

■ Tool movement
Movimiento de la herramienta
Mouvement de l'outil

L / R Insert design
Tipo de inserto
Sens de coupe plaquette

Infeed method and depth

The choice of infeed method is most important for long chipping materials to ensure good chip control.

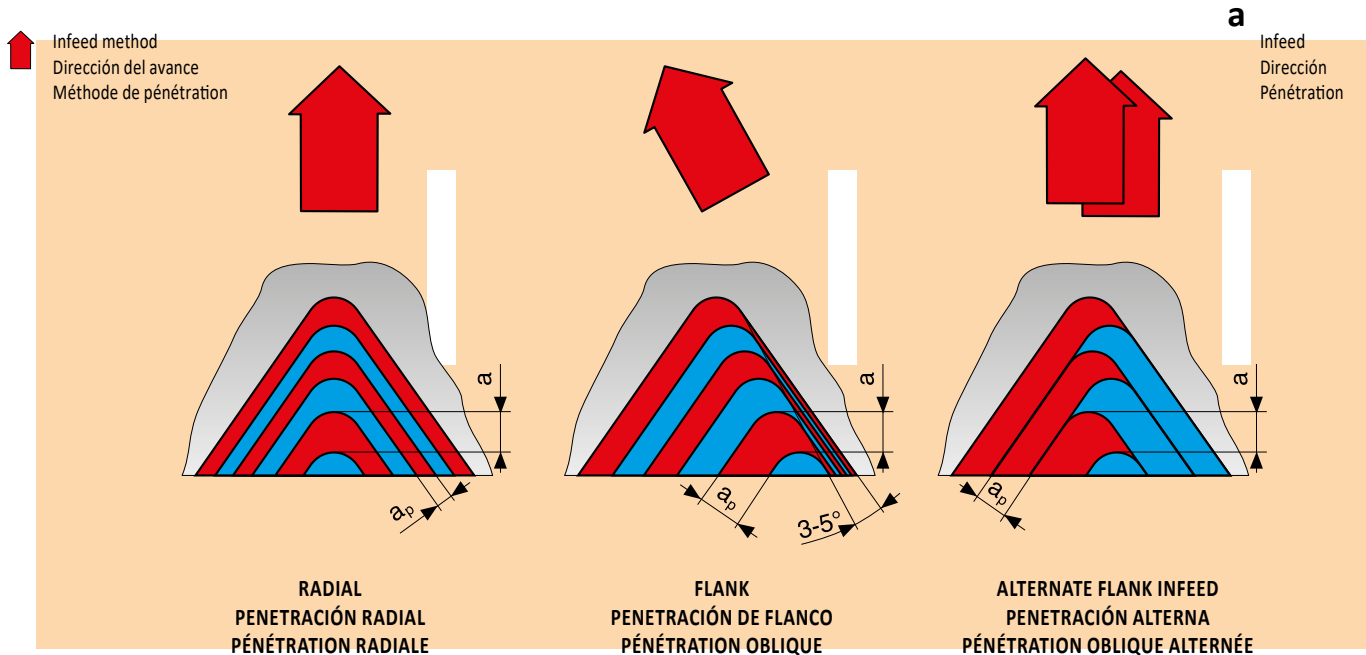
Método de avance y profundidad

La selección del método de avance es muy importante con materiales de viruta larga para garantizar un buen control de las virutas.

Méthode de pénétration et profondeur

Le choix de la méthode de pénétration est important pour assurer une bonne maîtrise des matériaux à copeaux longs.

Picture / Imagen / Image 22



The choice depends on the machine type, the machined material and the pitch.

Radial infeed – the most simple and the most used. The infeed is perpendicular to the axis of rotation of the workpiece. It contributes to good chip formation and uniform wear on the cutting edge. Suitable for threads with a small pitch ($p < .059''$). There is a risk of vibration at higher feeds. First choice for working on hard materials (e.g. austenitic stainless steels, steels with low carbon content).

Flank infeed – reduces thermal stress on the cutting edge and thereby wear. Good chip control. Suitable for threads with a pitch of $p > .059''$ for TR threads. Flank infeed with deviation 3-5° eliminates friction on the thread flank.

Alternate flank infeed – recommended for coarse threads and materials with poor chip formation. Long tool life. For CNC machines, higher demand on CNC programming.

Infeed method and number of passes depend on the thread pitch. The tables give basic recommendations and apply to all geometries. If the insert fractures, the infeed value should be decreased and the number of passes should be increased. The infeed depth should not be less than $.059''/\text{pass}$. On austenitic and soft steels the infeed depth per pass should be greater than $.003''$.

La selección depende del tipo de máquina, el material mecanizado y el paso.

Avance radial: sencillo, el más utilizado. El avance es perpendicular al eje de rotación de la pieza de trabajo. Buena formación de virutas, desgaste uniforme del filo de corte. Adecuado para roscas de paso pequeño ($p < .059''$). Riesgo de vibraciones con avances mayores. Primera opción para materiales endurecidos (por ejemplo, aceros inoxidable austeníticos, aceros con bajo contenido de carbono).

Avance de flanco: reduce la fatiga térmica del filo de corte y por lo tanto, el desgaste. Excelente control de virutas. Adecuado para roscas con paso $p > .059''$ para roscas TR. El avance de flanco con desviación de 3-5° elimina la fricción en el flanco de la rosca.

Avance de flanco alternativo: se recomienda para roscas de paso grande y materiales con mala formación de virutas. Larga vida útil de la herramienta. Para máquinas CNC, demanda alta de programación CNC

El método de avance y el número de pasadas dependen del paso de rosca. Las tablas ofrecen recomendaciones básicas y son aplicables a todas las geometrías. Si se produce una fractura de la plaquita, debe aumentarse el número de pasadas. la profundidad de avance no debe ser inferior a $.059''/\text{pasada}$. En los aceros austeníticos y blandos la profundidad de avance por pasada debe ser superior a $.003''$.

Le choix dépend du type de machine, du matériau à usiner et du pas.

Pénétration radiale – simple et la plus généralement utilisée. La pénétration est perpendiculaire à l'axe de rotation de la pièce. La formation du copeau est bonne, l'usure de l'arête de coupe est uniforme. Convient pour les filets TR avec un petit pas ($p < .059''$). Risque de vibrations avec des vitesses élevées. Premier choix pour les matières difficiles à travailler (ex: aciers inoxydables austénitiques, aciers bas carbone).

Pénétration oblique – Réduit les contraintes thermiques sur l'arête de coupe et donc l'usure. Bon contrôle des copeaux. Convient pour les filets avec un pas $p > .059''$ pour les filets TR. La pénétration oblique suivant un angle de 3,5° élimine le frottement sur le flanc de filet.

Pénétration oblique alternée – recommandée pour les gros filets et les matériaux avec une formation de copeaux difficile. Longue durée de vie. Pour les machines CNC, plus grande demande pour la programmation CNC.

La méthode de pénétration et le nombre de passes dépendent de la valeur du pas de filetage. Les tableaux donnent des recommandations de base et sont applicables à toutes les géométries. Dans le cas d'une casse de plaquette, le nombre de passes doit être augmenté. La profondeur de pénétration ne doit pas être inférieure à $.059''$ par passe. Pour les aciers doux et les austénitiques la profondeur doit être supérieure à $.003''$.

Table / Tabla / Tableau 17

Tubular cylindrical thread profile corresponds with W (WHITWORTH 55°)
 El perfil de rosca cilíndrico tubular corresponde a W (WHITWORTH 55°)
 Profil de filet tubulaire cylindrique correspondant à W (WHITWORTH 55°)

Thread marking Marcado de rosca Marquage du filet	No. of threads / 1" N.º de roscas / 1" No. de filets / 1"	Thread pitch P Paso de rosca P Pas P [in]	Nominal diameter of thread Diámetro nominal de rosca Diamètre nominal de filet [in]	Small diameter of thread Diámetro pequeño de rosca Petit diamètre de filet [in]	Thread insert marking Marcado de plaquita de rosca Marquage du filet sur plaquette
G 1/16"	28	.0357	.304	.258	TN xxxx280W
G 1/8"			.383	.337	
G 1/4"	19	.0526	.518	.450	TN xxxx190W
G 3/8"			.656	.588	
G 1/2"	14	.0714	.825	.733	TN xxxx140W
G 5/8"			.902	.810	
G 3/4"			1.041	.949	
G 7/8"			1.189	1.097	
G 1"	11	.0909	1.309	1.192	TN xxxx110W
G1 1/8"			1.492	1.376	
G1 1/4"			1.650	1.534	
G1 1/2"			1.882	1.767	
G1 3/4"			2.216	1.999	
G 2"			2.347	2.231	
G2 1/4"			2.587	2.471	
G2 1/2"			2.960	2.844	
G2 3/4"			3.210	3.094	
G3"			3.460	3.344	
G3 1/2"			3.950	3.834	
G4"			4.450	4.334	
G4 1/2"			4.950	4.834	
G5"			5.450	5.334	
G5 1/2"			5.950	5.834	
G6"			6.450	6.334	

Example: for right-hand external thread on 1 1/2" tube use thread insert TN 16ER110W; 8030

Ejemplo: para una rosca externa derecha en un tubo de 1 1/2" utilice la plaquita de rosca TN 16ER110W; 8030

Exemple: Pour un filetage extérieur à droite sur un tube 1 1/2" utiliser la plaquette de filetage TN 16ER110W; 8030

INFEEED DEPTH
PROFUNDIDAD DE AVANCE
PROFONDEUR DE PÉNÉTRATION

Table 18a: M – metric 60° – external / Tabla 18a: M – métrica 60° – externa / Tableau 18a : M – métrique 60° – extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS														
	Pitch [mm] / Paso [mm] / Pas [mm]														
	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.75	1.5	1.25	1.0	0.75	0.50
1	.018	.017	.016	.015	.003	.013	.011	.011	.009	.008	.008	.008	.008	.006	.005
2	.017	.016	.015	.013	.013	.012	.010	.009	.009	.008	.008	.007	.006	.006	.004
3	.014	.013	.013	.011	.010	.010	.008	.008	.007	.007	.007	.006	.005	.004	.003
4	.012	.011	.011	.009	.009	.008	.007	.007	.006	.006	.006	.004	.004	.003	.002
5	.011	.010	.010	.009	.008	.008	.007	.006	.006	.005	.005	.004	.003		
6	.010	.009	.009	.008	.007	.007	.006	.006	.005	.004	.003	.003			
7	.009	.008	.009	.008	.007	.006	.006	.005	.004	.003					
8	.009	.008	.008	.007	.006	.006	.005	.004	.003	.003					
9	.009	.007	.007	.007	.006	.006	.005	.004							
10	.008	.007	.007	.006	.005	.005	.004	.003							
11	.007	.007	.006	.006	.005	.004	.004								
12	.006	.006	.006	.005	.004	.003	.003								
13	.006	.006	.005	.005	.004										
14	.006	.005	.004	.004	.003										
15	.005	.005													
16	.004	.004													
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	.151	.139	.126	.113	.100	.088	.076	.063	.049	.044	.037	.032	.026	.019	.014

Table 18b: M – Metric 60° – internal / Tabla 18b: M – métrica 60° – interna / Tableau 18B : M – métrique 60° – intérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS														
	Pitch [mm] / Paso [mm]/ Pas [mm]														
	6.0	5.5	5.0	4.5	4.0	3.5	3.0	2.5	2.0	1.75	1.5	1.25	1.0	0.75	0.50
1	.018	.017	.017	.015	.013	.013	.011	.010	.009	.009	.008	.007	.007	.006	.004
2	.017	.016	.016	.013	.012	.012	.010	.010	.008	.007	.007	.007	.006	.005	.003
3	.014	.013	.013	.011	.009	.009	.008	.007	.007	.006	.006	.006	.004	.004	.003
4	.012	.010	.010	.009	.008	.007	.006	.006	.006	.005	.005	.004	.004	.003	.002
5	.010	.009	.009	.008	.007	.007	.006	.005	.005	.004	.004	.003	.003		
6	.009	.008	.008	.007	.007	.006	.005	.005	.004	.004	.003	.003			
7	.008	.007	.007	.006	.006	.006	.005	.004	.003	.003					
8	.007	.006	.006	.006	.005	.005	.004	.004	.003	.003					
9	.007	.006	.006	.006	.005	.005	.004	.004							
10	.006	.006	.006	.005	.005	.004	.004	.003							
11	.006	.006	.005	.005	.004	.004	.004								
12	.006	.006	.005	.005	.004	.003	.003								
13	.005	.005	.005	.004	.004										
14	.005	.005	.004	.004	.003										
15	.005	.004													
16	.004	.004													
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	.139	.128	.117	.104	.092	.081	.070	.058	.045	.041	.033	.030	.024	.018	.012

Table 19: W – Whitworth 55° – external and internal / Tabla 19: W – Whitworth 55° – externa e interna / Tableau 19 : W – Whitworth 55° – intérieur et extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS																
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]																
	4	4.5	5	6	7	8	9	10	11	12	14	16	18	19	20	26	28
1	0.019	0.018	0.018	0.015	0.015	0.013	0.012	0.011	0.011	0.011	0.009	0.009	0.009	0.009	0.008	0.007	0.007
2	0.018	0.017	0.017	0.014	0.014	0.012	0.011	0.011	0.010	0.010	0.009	0.009	0.009	0.009	0.008	0.007	0.007
3	0.015	0.015	0.015	0.012	0.011	0.009	0.009	0.009	0.009	0.009	0.007	0.007	0.007	0.007	0.007	0.006	0.006
4	0.014	0.013	0.013	0.010	0.010	0.008	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006	0.005	0.005
5	0.013	0.011	0.011	0.009	0.009	0.007	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.003	0.003
6	0.012	0.010	0.010	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.004	0.004	0.003	0.003			
7	0.011	0.009	0.009	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.004	0.003					
8	0.011	0.009	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.003	0.003						
9	0.009	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.003								
10	0.009	0.007	0.007	0.006	0.006	0.005	0.005	0.003									
11	0.008	0.007	0.007	0.006	0.005	0.005	0.003										
12	0.007	0.006	0.006	0.006	0.003	0.003											
13	0.007	0.006	0.005	0.005													
14	0.006	0.006	0.004	0.004													
15	0.005	0.005															
16	0.004	0.004															
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.169	0.150	0.135	0.114	0.098	0.085	0.076	0.069	0.062	0.057	0.047	0.044	0.040	0.038	0.036	0.028	0.027

Table 20a: UN – UN 60° – external / Tabla 20a: UN 60° – externa / Tableau 20a : UN – UN 60° – extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS																	
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]																	
	4	4.5	5	6	7	8	9	10	11	12	13	14	16	18	20	24	28	32
1	0.019	0.018	0.017	0.014	0.014	0.012	0.011	0.011	0.011	0.011	0.010	0.009	0.009	0.009	0.008	0.007	0.007	0.007
2	0.017	0.016	0.016	0.013	0.013	0.011	0.010	0.010	0.010	0.010	0.009	0.009	0.008	0.008	0.007	0.007	0.006	0.006
3	0.016	0.015	0.014	0.011	0.010	0.010	0.008	0.008	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.004	0.005
4	0.014	0.012	0.012	0.009	0.009	0.008	0.008	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.004	0.003
5	0.013	0.010	0.010	0.009	0.008	0.007	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.004	0.003	0.003	
6	0.011	0.009	0.009	0.008	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.004	0.004	0.003	0.003			
7	0.010	0.008	0.008	0.007	0.007	0.006	0.006	0.006	0.005	0.005	0.004	0.004	0.003					
8	0.009	0.008	0.007	0.006	0.006	0.005	0.005	0.005	0.004	0.003	0.003	0.003						
9	0.009	0.007	0.007	0.006	0.006	0.005	0.005	0.004	0.003									
10	0.008	0.007	0.007	0.006	0.005	0.005	0.004	0.003										
11	0.007	0.006	0.007	0.005	0.004	0.004	0.003											
12	0.007	0.006	0.006	0.005	0.003	0.003												
13	0.006	0.006	0.005	0.004														
14	0.006	0.006	0.004	0.004														
15	0.005	0.005																
16	0.004	0.004																
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.160	0.143	0.130	0.107	0.092	0.082	0.072	0.065	0.060	0.055	0.051	0.047	0.041	0.037	0.033	0.028	0.024	0.021

INFEED DEPTH
PROFUNDIDAD DE AVANCE
PROFONDEUR DE PÉNÉTRATION

Table 20b: UN - UN 60° – internal / Tabla 20a: UN 60° – interna / Tableau 20b : UN 60° – intérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS																	
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]																	
	4	4.5	5	6	7	8	9	10	11	12	13	14	16	18	20	24	28	32
1	0.017	0.016	0.017	0.014	0.013	0.012	0.011	0.011	0.011	0.011	0.010	0.009	0.009	0.009	0.008	0.007	0.007	0.007
2	0.016	0.015	0.015	0.013	0.013	0.011	0.010	0.010	0.009	0.009	0.008	0.007	0.007	0.007	0.006	0.006	0.006	0.006
3	0.015	0.013	0.013	0.010	0.009	0.009	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.004	0.004
4	0.013	0.011	0.011	0.008	0.008	0.007	0.006	0.006	0.006	0.006	0.005	0.005	0.005	0.005	0.004	0.004	0.003	0.003
5	0.011	0.009	0.009	0.007	0.007	0.006	0.006	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.003	0.003		
6	0.009	0.008	0.008	0.006	0.006	0.005	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003	0.003			
7	0.009	0.007	0.007	0.006	0.006	0.005	0.005	0.004	0.004	0.004	0.004	0.004	0.003					
8	0.008	0.007	0.007	0.006	0.005	0.004	0.004	0.004	0.004	0.003	0.003	0.003						
9	0.008	0.007	0.006	0.005	0.005	0.004	0.004	0.004	0.003									
10	0.007	0.006	0.006	0.005	0.005	0.004	0.004	0.003										
11	0.007	0.006	0.006	0.005	0.004	0.004	0.003											
12	0.006	0.006	0.006	0.004	0.003	0.003												
13	0.006	0.006	0.005	0.004														
14	0.006	0.005	0.004	0.004														
15	0.005	0.005																
16	0.004	0.004																
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.147	0.131	0.118	0.097	0.084	0.074	0.065	0.059	0.054	0.049	0.045	0.042	0.037	0.033	0.030	0.025	0.022	0.019

Table 21: NPT 60° – internal and external / Tabla 21: NPT 60° – interna ed externa / Tabela 21. NPT 60° – interna e externa / Tableau 21 : NPT 60° – intérieur et extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS				
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]				
	8	11.5	14	18	27
1	0.011	0.010	0.009	0.009	0.007
2	0.010	0.009	0.009	0.007	0.006
3	0.009	0.007	0.007	0.006	0.005
4	0.007	0.006	0.006	0.006	0.004
5	0.007	0.006	0.006	0.005	0.004
6	0.007	0.006	0.005	0.005	0.003
7	0.007	0.006	0.005	0.004	
8	0.007	0.005	0.004	0.003	
9	0.006	0.005	0.004		
10	0.006	0.004	0.003		
11	0.006	0.004			
12	0.005	0.003			
13	0.005				
14	0.004				
15	0.003				
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.100	0.069	0.057	0.044	0.030

Table 22a: RD – RD 30° – external / Tabla 22a: RD – RD 30° – externa / Tableau 22a : RD – RD 30° – extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS			
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]			
	4	6	8	10
1	0.017	0.013	0.011	0.010
2	0.016	0.011	0.010	0.010
3	0.013	0.010	0.008	0.009
4	0.013	0.009	0.007	0.008
5	0.011	0.008	0.007	0.006
6	0.010	0.007	0.006	0.005
7	0.009	0.006	0.006	0.004
8	0.009	0.006	0.005	0.003
9	0.008	0.006	0.004	
10	0.007	0.005	0.003	
11	0.007	0.004		
12	0.006	0.003		
13	0.005			
14	0.004			
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.135	0.088	0.068	0.055

Table 22b : RD – RD 30° – internal / Tabla 22b: RD – RD 30° – interna / Tableau 22b : RD – RD 30° – intérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS			
	Pitch [no of thread/in] / Paso [fpp] / Passo (nº de fios / polegada) / Pas [Nombre de filets/pouce]			
	4	6	8	10
1	0.018	0.015	0.010	0.011
2	0.017	0.013	0.009	0.010
3	0.016	0.012	0.008	0.010
4	0.014	0.010	0.007	0.009
5	0.012	0.008	0.007	0.007
6	0.010	0.007	0.006	0.005
7	0.009	0.007	0.006	0.004
8	0.009	0.006	0.005	0.003
9	0.008	0.006	0.004	
10	0.007	0.005	0.003	
11	0.007	0.004		
12	0.006	0.003		
13	0.005			
14	0.004			
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.141	0.096	0.065	0.059

INFEED DEPTH
PROFUNDIDAD DE AVANCE
PROFONDEUR DE PÉNÉTRATION

Table 23a: TR 30° external / Tabla 23a: TR – TR 30° – externa / Tableau 23a : TR – Trapèze 30° – extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS											
	Pitch [mm] / Paso [mm] / Pas [mm]											
	14.0	12.0	1.0	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0	1.5
1	.40	.38	.38	.38	.37	.37	.37	.34	.31	.27	.25	.23
2	.37	.36	.36	.35	.35	.34	.35	.33	.28	.25	.24	.22
3	.36	.34	.34	.34	.34	.33	.32	.27	.24	.21	.20	.18
4	.36	.34	.34	.33	.33	.31	.29	.25	.20	.17	.17	.14
5	.35	.32	.32	.31	.31	.29	.27	.23	.19	.15	.14	.12
6	.35	.32	.32	.30	.29	.26	.25	.21	.18	.13	.13	.08
7	.34	.30	.31	.29	.28	.26	.23	.20	.16	.13	.11	
8	.34	.30	.29	.28	.27	.26	.22	.20	.15	.12	.09	
9	.34	.30	.28	.26	.25	.24	.22	.18	.15	.12		
10	.33	.29	.27	.25	.24	.23	.20	.16	.15	.10		
11	.33	.29	.25	.24	.23	.22	.18	.15	.14	.10		
12	.32	.29	.24	.23	.21	.22	.17	.14	.13	.08		
13	.32	.28	.23	.22	.20	.20	.17	.13	.10			
14	.31	.27	.22	.21	.19	.19	.16	.10				
15	.31	.25	.22	.21	.19	.17	.14					
16	.30	.25	.20	.19	.18	.16	.12					
17	.30	.24	.19	.18	.17	.12						
18	.29	.22	.18	.16	.15							
19	.28	.20	.17	.15	.13							
20	.27	.20	.16	.15								
21	.23	.19	.15	.13								
22	.23	.18	.15									
23	.21	.17	.13									
24	.19	.16										
25	.17	.15										
26	.16	.13										
27	.16											
28	.15											
29	.13											
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	8.2	6.72	5.7	5.16	4.68	4.17	3.66	2.89	2.38	1.83	1.33	.97

Table 23b: TR - TR 30° – internal / Tabla 23b: TR - TR 30° – interna / Tableau 23b : TR – Trapèze 30° – intérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS											
	Pitch [mm] / Paso [mm] / Pas [mm]											
	14.0	12.0	1.0	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0	1.5
1	.40	.38	.38	.38	.37	.37	.37	.34	.31	.27	.25	.23
2	.37	.36	.36	.35	.35	.34	.34	.33	.28	.25	.24	.22
3	.36	.34	.34	.34	.34	.33	.32	.27	.24	.22	.21	.19
4	.36	.34	.34	.33	.33	.31	.29	.25	.20	.17	.17	.14
5	.35	.32	.32	.31	.31	.29	.27	.23	.19	.15	.14	.12
6	.35	.32	.32	.31	.29	.26	.25	.21	.18	.14	.13	.08
7	.34	.30	.31	.29	.28	.26	.23	.20	.16	.13	.11	
8	.34	.30	.29	.29	.27	.26	.22	.20	.15	.12	.09	
9	.34	.30	.28	.26	.25	.24	.22	.18	.15	.12		
10	.33	.29	.27	.25	.24	.23	.20	.16	.15	.10		
11	.33	.29	.25	.24	.23	.22	.18	.15	.14	.10		
12	.32	.28	.24	.23	.21	.22	.17	.14	.13	.08		
13	.32	.28	.23	.22	.20	.20	.17	.13	.10			
14	.31	.27	.22	.21	.19	.19	.16	.10				
15	.31	.25	.22	.21	.19	.17	.14					
16	.30	.25	.20	.20	.18	.16	.12					
17	.30	.24	.19	.18	.17	.12						
18	.29	.22	.18	.16	.15							
19	.28	.20	.17	.15	.13							
20	.27	.20	.16	.15								
21	.27	.19	.15	.13								
22	.23	.18	.15									
23	.23	.17	.13									
24	.21	.16										
25	.19	.15										
26	.17	.13										
27	.16											
28	.16											
29	.15											
30	.13											
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	8.47	6.71	5.7	5.19	4.68	4.17	3.65	2.89	2.38	1.85	1.34	.98

Table 24: BSPT 55° – internal and external / Tabla 24: BSPT 55° – interna ed externa / Tableau 24: BSPT 55° – intérieur et extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS			
	Pitch [mm] / Paso [mm] / Passo [mm] / Pas [mm]			
	11	14	19	28
1	0.22	0.19	0.19	0.15
2	0.21	0.18	0.18	0.14
3	0.20	0.17	0.17	0.13
4	0.19	0.16	0.15	0.12
5	0.18	0.15	0.13	0.08
6	0.16	0.14	0.08	
7	0.15	0.12		
8	0.13	0.08		
9	0.08			
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	1.52	1.19	0.90	0.62

INFEEED DEPTH
PROFUNDIDAD DE AVANCE
PROFONDEUR DE PÉNÉTRATION

Table 25a: ACME – ACME 29° – external / Tabla 25a: ACME – ACME 29° – externa / Tableau 25a : ACME – ACME 29° – extérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS							
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]							
	4	5	6	8	10	12	14	16
1	0.015	0.013	0.001	0.000	0.011	0.010	0.009	0.009
2	0.013	0.001	0.011	0.010	0.009	0.009	0.008	0.008
3	0.012	0.010	0.009	0.008	0.008	0.007	0.007	0.007
4	0.011	0.009	0.008	0.007	0.007	0.006	0.006	0.006
5	0.010	0.009	0.007	0.006	0.006	0.005	0.005	0.005
6	0.009	0.008	0.007	0.005	0.005	0.005	0.004	0.003
7	0.008	0.007	0.006	0.005	0.005	0.004	0.003	
8	0.008	0.007	0.006	0.005	0.004	0.004		
9	0.008	0.007	0.006	0.005	0.004			
10	0.007	0.006	0.006	0.004	0.004			
11	0.007	0.006	0.006	0.004				
12	0.006	0.006	0.005	0.004				
13	0.006	0.005	0.004					
14	0.006	0.004						
15	0.006							
16	0.005							
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.136	0.111	0.095	0.074	0.062	0.048	0.042	0.038

Table 25b: ACME – ACME 29° – internal / Tabla 25b: ACME – ACME 29° – interna / Tabela 25b: ACME – ACME 29° – interna / Tableau 25b : ACME – ACME 29° – intérieur

Number of passes Número de pasadas Nombre de passes	REDUCE THE CUTTING SPEED PROPORTIONALLY TO INCREASING THE THREAD PITCH REDUZCA LA VELOCIDAD DE CORTE PROPORCIONALMENTE AL AUMENTO DEL PASO DE ROSCA RÉDUIRE LA VITESSE DE COUPE PROPORTIONNELLEMENT AVEC L'AUGMENTATION DU PAS							
	Pitch [no of thread/in] / Paso [fpp] / Pas [Nombre de filets/pouce]							
	4	5	6	8	10	12	14	16
1	0.015	0.013	0.001	0.000	0.011	0.010	0.009	0.009
2	0.013	0.012	0.011	0.010	0.009	0.009	0.008	0.008
3	0.012	0.010	0.009	0.008	0.008	0.007	0.007	0.007
4	0.011	0.009	0.008	0.007	0.007	0.006	0.006	0.006
5	0.010	0.009	0.007	0.006	0.006	0.005	0.005	0.005
6	0.009	0.008	0.007	0.006	0.005	0.005	0.004	0.003
7	0.008	0.007	0.006	0.005	0.005	0.004	0.003	
8	0.008	0.007	0.006	0.005	0.004	0.004		
9	0.008	0.007	0.006	0.005	0.004			
10	0.007	0.006	0.006	0.005	0.004			
11	0.007	0.006	0.006	0.004				
12	0.006	0.006	0.005	0.004				
13	0.006	0.005	0.004					
14	0.006	0.004						
15	0.006							
16	0.005							
Total infeed depth Profundidad de avance total Profondeur totale de pénétration	0.135	0.109	0.094	0.075	0.063	0.048	0.042	0.037

Recesses, parting and copy turning.

Pramet offers a comprehensive range of tools for turning shallow and deep recesses, both radially and axially (face grooving). Circular/copy profile turning can also be performed through side cutting.

The Pramet range of tools for recessing, grooving, profiling and parting are shown in picture 23 below.

Tournage d'évidements, tronçonnage et copiage.

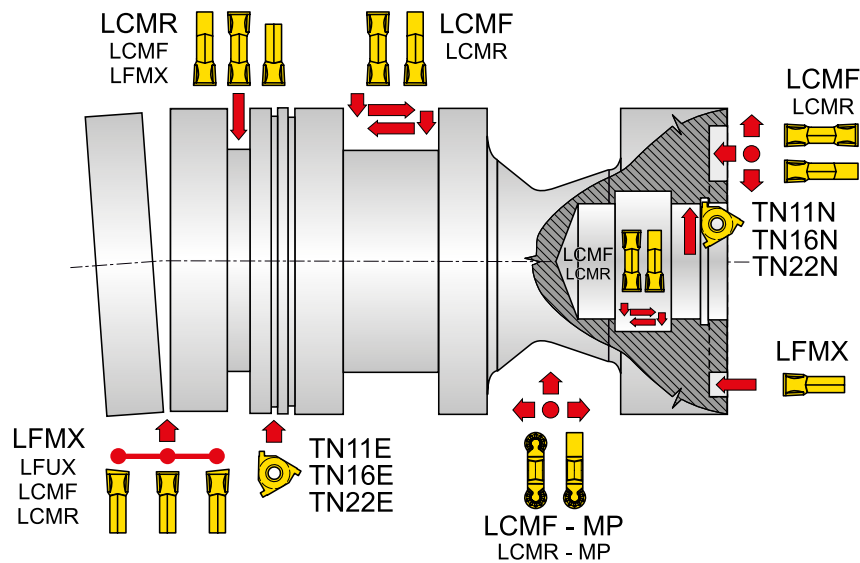
Nous vous offrons un programme complet d'outils de tournage pour le tournage productif d'évidements profonds et peu profonds, radiaux et axiaux (gorges frontales). De plus, nous proposons des plaquettes pour le copiage de profils réalisables avec l'arête de coupe latérale.

Notre gamme d'outils pour les évidements, le rainurage, le profilage et le tronçonnage est représentée schématiquement dans le tableau ci-dessous. Image 23.

Torneado de ranuras, tronzado y torneado en copia

Pramet Tools ofrece una gama completa de herramientas de torneado para el torneado productivo de rebajes superficiales y profundos, tanto radiales como axiales (ranurado frontal). Además, se puede realizar un torneado circular / de copias mediante el corte lateral. La gama de herramientas de Pramet Tools para rebaje, ranurado, perfilado y corte se muestra de forma esquemática en el gráfico siguiente. Imagen 23.

Picture / Imagen /Image 23



Recommendation for practical usage:

The procedure for turning a recess (deepening and widening) is shown in the following illustration – picture 24.

Recomendación para uso práctico:

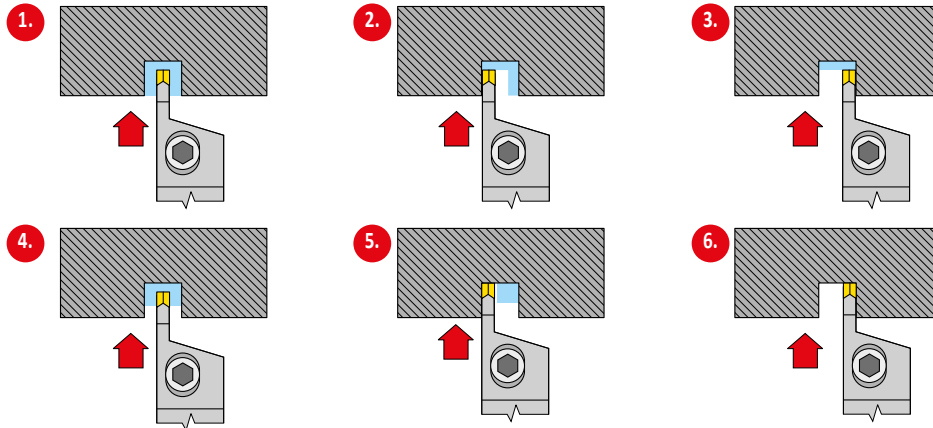
El procedimiento de torneado (profundización y ensanchamiento) de rebaje se describe de forma esquemática en la Imagen 24 siguiente.

Recommandation pour utilisation pratique :

La procédure de tournage (pour approfondir et élargir) un évidement est schématisée sur l'image suivante N° 24.

RECESSES, PARTING AND COPY TURNING
TORNEADO DE REBAJES , TRONZADO Y TORNEADO EN COPIADO
TOURNAGE D'ÉVIDEMENTS, TRONÇONNAGE ET COPIAGE

Picture / Imagen / Image 24



Note: To create a flat seating surface, use insert **type LCMF** with chip breaker **F**. The outboard radial grooving passes should overlap the central pass by two times the insert corner radius.

Nota: Para generar una superficie de asiento plana, utilice el tipo de **plaquita LCMF** con rompevirutas **F**. Las pasadas de ranurado radial de la parte exterior deben superponerse con la pasada central en 2 veces el radio de esquina de la plaquita.

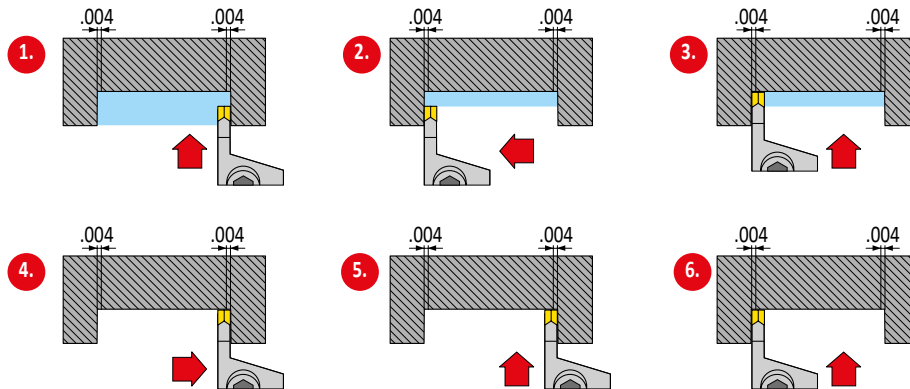
Remarque : Pour générer une face d'appui plane, utiliser une plaquette de **type LCMF** avec géométrie **F**. Les passes de rainurage des flancs doivent chevaucher la passe centrale d'au moins 2 fois le rayon de pointe de la plaquette.

When machining a wide recess, follow the procedure shown in the following illustration – picture 25.

Quando mecanice un rebaje ancho siga el procedimiento que se describe de forma esquemática en la imagen 25 siguiente.

Pour usiner un large évidement, suivre la procédure d'usinage représentée sur l'image suivante N° 25.

Picture / Imagen / Image 25



Note: Use the cutting insert LCMF with chip breaker **M**. You must consider the tool's deformation "y":

Nota: Utilice las plaquitas de corte LCMF con rompevirutas **M**. Debe tener en cuenta la deformación de la herramienta "y"

	– for $f = .006$ in/rev;	$a_p = .118$ in	$y = .003$ in
	– for $f = .010$ in/rev;	$a_p = .118$ in	$y = .003$ in
	– for $f = .014$ in/rev;	$a_p = .118$ in	$y = .004$ in

	– para $f = .006$ in/rev;	$a_p = .118$ in	$y = .003$ in
	– para $f = .010$ in/rev;	$a_p = .118$ in	$y = .003$ in
	– para $f = .014$ in/rev;	$a_p = .118$ in	$y = .004$ in

Note: Utiliser la plaquette LCMF avec une géométrie **M**. Vous devez tenir compte de la déformation de l'outil "y"

	– pour $f = .006$ in/tr;	$a_p = .118$ in	$y = .003$ in
	– pour $f = .010$ in/tr;	$a_p = .118$ in	$y = .003$ in
	– pour $f = .014$ in/tr;	$a_p = .118$ in	$y = .004$ in

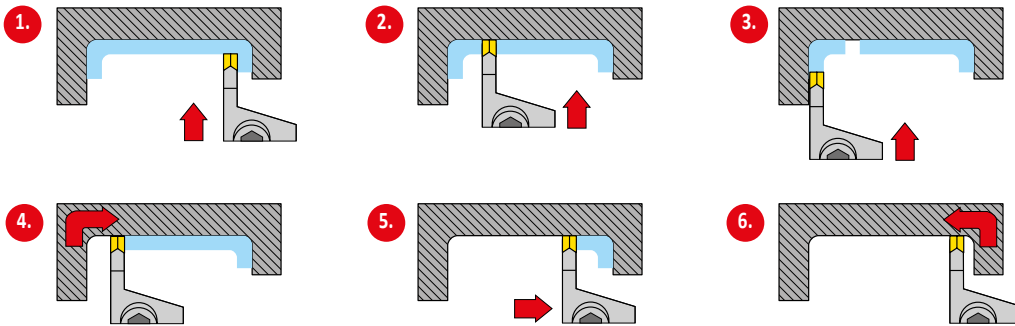
RECESSES, PARTING AND COPY TURNING
TORNEADO DE REBAJES , TRONZADO Y TORNEADO EN COPIADO
TOURNAGE D'ÉVIDEMENTS, TRONÇONNAGE ET COPIAGE

When opening up or deepening a contour using side turning, use the procedure shown in picture 26.

Cuando abra o profundice un contorno utilizando el torneado lateral utilice el procedimiento indicado en la Imagen 26.

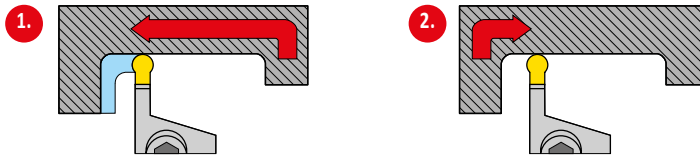
Pour ouvrir ou approfondir un contour en utilisant la coupe latérale utiliser la procédure indiquée sur l'Image 26.

Picture / Imagen / Image 26



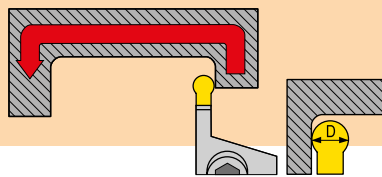
Roughing of contour (insert with round cutting edge) / Desbaste de contorno (plaquita con filo de corte redondo)
Ebauche du contour (plaquette avec arête de coupe ronde)

Picture / Imagen / Image 27



Finishing of contour (insert with round cutting edge) / Acabado de contorno (plaquita con filo de corte redondo)
Finition du contour (plaquette avec arête de coupe ronde)

Picture / Imagen / Image 28



D [in]	a _p [in]
.118	.006
.157	.008
.197	.009
.236	.010
.315	.016

**TURNING OF SLENDER SHAFTS AND INTERNAL TURNING (BORING) OF DEEP HOLES
TORNEADO DE EJES DELGADOS Y TORNEADO INTERIOR (MANDRINADO) DE AGUJEROS PROFUNDOS
TOURNAGE D'ÉVIDEMENTS, TRONÇONNAGE ET GORGES**

When copy turning using indexable inserts with a round cutting edge, the maximum depth of cut is 50% of the diameter of the insert.

Choose the tool holder with the maximum cross-section and minimum tool overhang to eliminate vibrations.

The longitudinal axis of the cutting insert must be perpendicular to the axis of rotation of the workpiece (at radial recesses).

The cutting edge must be on centerline within a tolerance of $\pm .004''$

Coolant must be applied directly onto the cutting edge, and onto the support area of the tool holder under the insert cutting edge, in sufficient quantities to guarantee effective cooling of the insert.

When face grooving it is necessary to select a tool holder with the correct range of diameters for the groove to be machined. The tool must be set parallel to the axis of rotation of the workpiece (perpendicular to the face of the groove). Otherwise there is a risk of rubbing against the wall(s) of the groove during machining.

In the event of the tool rubbing against the outer wall of the groove, it may be necessary to raise the cutting edge above centre (see example A in picture 29).

„Cuando realice torneado de copias con plaquitas intercambiables de filo de corte redondo, la profundidad máxima de corte es del 50% del diámetro de la plaquita redonda.“

Elija el portaherramientas con sección transversal máxima y voladizo de herramienta mínimo para eliminar las vibraciones.

El eje longitudinal de la plaquita de corte debe ser perpendicular al eje de rotación de la pieza de trabajo (en rebajes radiales).

El filo de corte debe estar sobre la línea central con una tolerancia de $\pm .004''$

Se debe aplicar refrigerante sobre el filo de corte en un volumen suficiente, y también en la zona de soporte del portaherramientas debajo del filo de corte de la plaquita.

En el ranurado frontal es necesario seleccionar un portaherramientas con el rango de diámetros correcto para la ranura que se va a mecanizar. La herramienta debe posicionarse en paralelo al eje de rotación de la pieza de trabajo (perpendicular a la parte frontal de la ranura). De lo contrario, existe riesgo de rozamiento contra las paredes de la ranura durante el mecanizado.

En caso de rozamiento de la herramienta contra la pared exterior de la ranura, puede ser necesario elevar el filo de corte por encima del centro (consulte el ejemplo A en la imagen 29).

Pour le copiage avec des plaquettes avec arête de coupe ronde, la profondeur de coupe maximum est de 50% de la valeur du diamètre de l'arête de coupe ronde.

Choisir le porte-outil avec une section maximum et un porte-à-faux minimum pour éliminer les vibrations.

L'axe longitudinal de la plaquette doit être perpendiculaire à l'axe de rotation de la pièce (évidements radiaux).

L'arête de coupe doit être sur l'axe central avec une tolérance de $\pm .004''$

L'arrosage doit être dirigé sur la zone de coupe et de façon abondante, et aussi sur la zone du porte-outil située sous l'arête de coupe.

Pour l'usinage d'une gorge frontale, il est nécessaire de sélectionner un porte-outil ayant une plage de diamètres correspondant à la gorge à usiner. L'outil doit être réglé parallèlement à l'axe de rotation de la pièce à usiner (perpendiculaire à la face de la gorge). Sinon, il y a un risque de frottement sur le flanc de la gorge usinée.

Dans le cas où l'outil frotte contre le flanc extérieur de la gorge, il peut être nécessaire de régler l'arête de coupe au-dessus de l'axe de rotation (voir exemple A sur l'image 29).

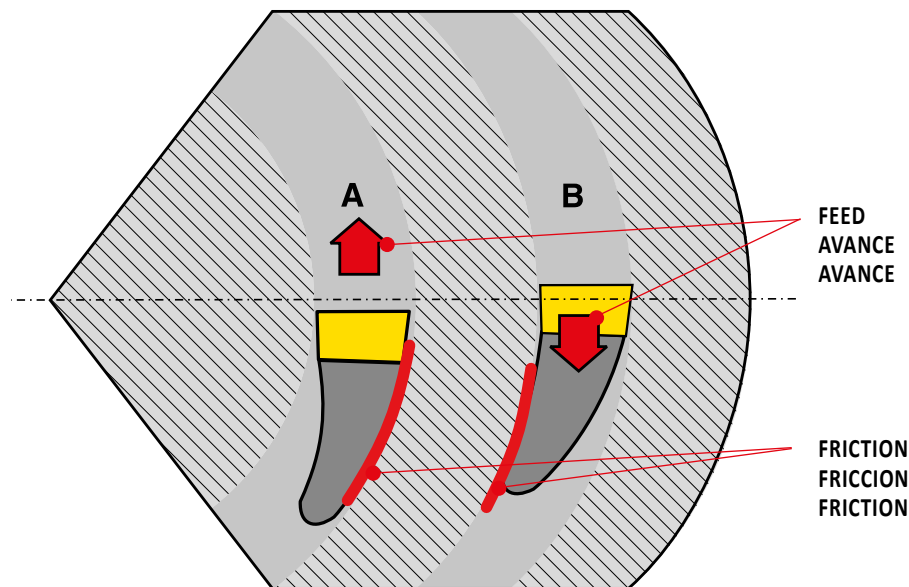
TURNING OF SLENDER SHAFTS AND INTERNAL TURNING (BORING) OF DEEP HOLES
TORNEADO DE REBAJES, TRONZADO Y TORNEADO DE COPIAS
TOURNAGE D'ÉVIDEMENTS, TRONÇONNAGE ET GORGES

When face grooving, the tool must be set to be perpendicular to the face of the workpiece with high accuracy, otherwise the side of the tool will rub against the groove being created.

En el ranurado frontal, la herramienta debe posicionarse con gran precisión para que quede perpendicular a la parte frontal de la pieza de trabajo; en caso contrario, el lateral de la herramienta rozará con la ranura que se está generando.

Pour l'usinage d'une gorge frontale, l'outil doit être réglé avec une grande précision pour être perpendiculaire à la face de la pièce, autrement le côté de l'outil frottera contre la gorge en cours d'usinage.

Picture / Imagen / Image 29



Using effective coolant, applied directly to the cutting edge in sufficient quantities, is very important. Cooling reduces the temperature of the cutting edge and also the lower part of the tool holder, in which the cutting insert is seated.

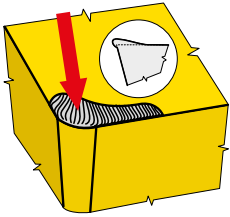







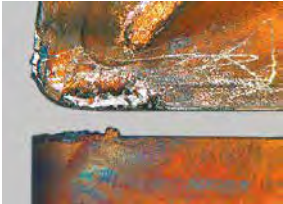
Es muy importante el uso de un refrigerante de corte eficaz, dirigido directamente al filo de corte en un volumen suficiente. El refrigerante debe reducir la temperatura del filo de corte y también de la parte subyacente del portaherramientas con el asiento para la plaquita de corte.

L'utilisation d'un liquide de coupe (arrosage) doit être efficace et dirigé directement sur l'arête de coupe en quantité suffisante. Le refroidissement permet de réduire la température de l'arête de coupe et de la partie du porte-outil supportant la plaquette.

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TYPES OF WEAR ON TURNING INSERTS
TIPOS DE DESGASTE DE LAS PLAQUITAS DE TORNEADO
TYPES D'USURE DES PLAQUETTES DE TOURNAGE

BUILT-UP EDGE / FILO DE APORTACIÓN
ARÊTE RAPPORTÉE

			it has no influence No influye N'a aucune influence
		++	any coating (decisive factor is anti-adhesion effect) Cualquier recubrimiento (el factor decisivo es el efecto anti-adherente) Tout revêtement (le facteur décisif est l'effet anti-adhérence)
		↑	The higher the feed rate the less probability of built-up edge creation. Cuanto mayor sea el avance menor probabilidad de formación de filo de aportación Plus l'avance est forte, moins la probabilité de générer une arête rapportée est grande
		↓↑	Change (generally increase) the cutting speed. Cambiar (generalmente aumentar) la velocidad de corte Modifier (souvent en l'augmentant) la vitesse de coupe
			it has no influence No influye N'a aucune influence
		↓↑	Use more positive geometry (built up edge is not created when the rake angle is more than 40°) Utilizar una geometría más positiva (el filo de aportación no se crea cuando el ángulo de desprendimiento es mayor de 40°) Utiliser une géométrie plus positive (Une arête rapportée n'apparaît jamais sur des angles de coupe de plus de 40°)
		-	Use a coolant with more effective anti-sticking properties (or no coolant at all) Usar un refrigerante con propiedades anti-adherencia más efectivas (o no utilizar ningún refrigerante) Utiliser un arrosage plus efficace quant à ses propriétés anti-adhérentes (ou pas du tout d'arrosage)
			

FLANK WEAR / DESGASTE EN FLANCO (EN INCIDENCIA)
USURE EN DÉPOUILLE







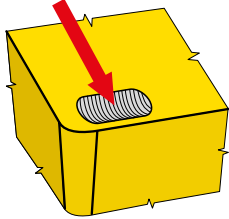
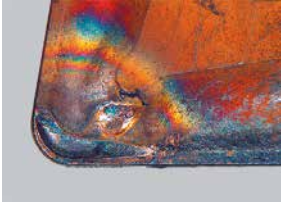







		↑	use a more wear resistant substrate (H) Utilizar un sustrato más resistente al desgaste (H) Utiliser un substrat plus résistant à l'usure (H)
		++	any coating (decisive factor is hardness - TiC, TiCN) Cualquier recubrimiento (el factor decisivo es la dureza - TiC, TiCN) Tout revêtement (le facteur décisif est sa dureté - TiC, TiCN)
		↑	increase feed (especially if it is under .004") Incrementar el avance (especialmente si está por debajo de .004") Augmenter l'avance (particulièrement quand elle est inférieure à .004")
		↓	decrease cutting speed Reducir la velocidad de corte Diminuer la vitesse de coupe
			It has no influence No influye N'a aucune influence
		↑	increase the clearance angle Lo más importante es aumentar el ángulo de incidencia Le plus important est d'augmenter l'angle de dépouille
		+	use a coolant or increase its intensity Usar refrigerante o incrementar su intensidad Utiliser l'arrosage ou augmenter son débit

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TYPES OF WEAR ON TURNING INSERTS
TIPOS DE DESGASTE DE LAS PLAQUITAS DE TORNEADO
TYPES D'USURE DES PLAQUETTES DE TOURNAGE

CRATERING / CRÁTER
USURE EN CRATÈRE

 		↑	use a more wear resistant substrate (S) Utilizar un sustrato más resistente al desgaste (S) Utiliser un substrat plus résistant à l'usure (S)
		++	any coating (decisive factor is thermal resistance - α Al ₂ O ₃) Cualquier recubrimiento (el factor decisivo es la resistencia térmica - α Al ₂ O ₃) Tout revêtement (le facteur décisif est sa résistance à la température - α Al ₂ O ₃)
		↑	feed has influence on shape and position of crater El avance influye en la forma y la posición del cráter L'avance influe sur la forme et la position du cratère
		↓	decrease cutting speed Reducir la velocidad de corte Diminuer la vitesse de coupe
		↓	minimal effect Mínimo efecto Effet minime
		↑	use more positive cutting geometry Utilizar una geometría de corte más positiva Utiliser une géométrie de coupe plus positive
		++	use coolant or increase its intensity Usar refrigerante o incrementar su intensidad Utiliser l'arrosage ou augmenter son débit

OXIDATION GROOVE ON THE MINOR EDGE / ENTALLA POR OXIDACIÓN
ENTAILLE PAR OXYDATION SUR L'ARÊTE SECONDAIRE


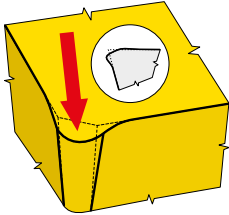
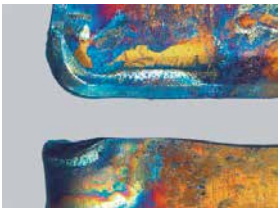





 		↑	use a more wear resistant substrate (S) Utilizar un sustrato más resistente al desgaste (S) Utiliser un substrat plus résistant à l'usure (S)
		++	any coating (decisive factor is oxidation resistance - α Al ₂ O ₃) Cualquier recubrimiento (el factor decisivo es la resistencia a la oxidación - α Al ₂ O ₃) Tout revêtement (le facteur décisif est sa résistance à l'oxydation - α Al ₂ O ₃)
		↓	feed has influence on shape and position of groove El avance influye en la forma y la posición de la entalla L'avance influe sur la forme et la position de l'entaille
		↓	decrease cutting speed Reducir la velocidad de corte Diminuer la vitesse de coupe
		↓	minimal effect Mínimo efecto Effet minime
		↑	use another (more positive) cutting geometry Utilizar otra (más positiva) geometría de corte Utiliser une autre géométrie de coupe (plus positive)
		++	use coolant or increase its intensity Usar refrigerante o incrementar su intensidad Utiliser l'arrosage ou augmenter son débit

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TYPES OF WEAR ON TURNING INSERTS
TIPOS DE DESGASTE DE LAS PLAQUITAS DE TORNEADO
TYPES D'USURE DES PLAQUETTES DE TOURNAGE

PLASTIC DEFORMATION / DEFORMACIÓN PLÁSTICA
DÉFORMATION PLASTIQUE

 		↑	<p>use a more wear resistant grade (decisive factor is content of Co) Utilizar un sustrato más resistente al desgaste (el factor decisivo es el contenido en Co) Utiliser un substrat plus résistant à l'usure (le taux de cobalt est décisif)</p>
		+	<p>any coating (decisive factor is friction) Cualquier recubrimiento (el factor decisivo es la fricción) Tout revêtement (le facteur décisif est le frottement)</p>
		↓	<p>decrease feed rate Reducir el avance Diminuer l'avance</p>
		↓	<p>decrease cutting speed Reducir la velocidad de corte Diminuer la vitesse de coupe</p>
		↓	<p>minimal effect Mínimo efecto Effet minime</p>
		↑	<p>use another (more positive) cutting geometry Utilizar otra (más positiva) geometría de corte Utiliser une autre géométrie de coupe (plus positive)</p>
		++	<p>use coolant or increase its intensity Usar refrigerante o incrementar su intensidad Utiliser l'arrosage ou augmenter son débit</p>

SIDE FLANK NOTCH - REMEDY / ENTALLA LATERAL - REMEDIO
USURE EN ENTALLE

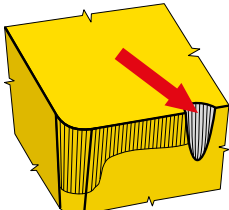
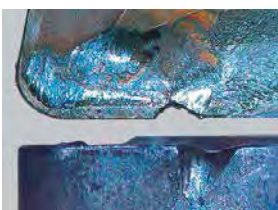







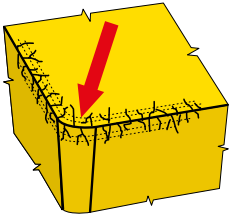
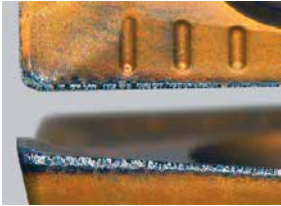






 		↑ ↓	<p>it depends on the character of the damage (abrasive - use more wear resistant substrate; breaking - use tougher substrate) Depende del caracter del problema (abrasivo - usar un sustrato más resistente al desgaste; rotura - usar un sustrato más tenaz) Dépend de la cause de l'usure (abrasion - utiliser un substrat plus résistant à l'usure; rupture - utiliser un substrat plus tenace)</p>
		++	<p>CVD coating (decisive factor is oxidation resistance - α Al₂O₃) Recubrimiento CVD (el factor decisivo es la resistencia a la oxidación - α Al₂O₃) Revêtement CVD (le facteur décisif est sa résistance à l'oxydation - α Al₂O₃)</p>
		↓	<p>feed has influence on intensity, but less than the cutting speed El avance influye en la intensidad, pero menos que la velocidad de corte L'avance influe sur l'intensité, mais moins que la vitesse de coupe</p>
		↓	<p>decrease cutting speed Reducir la velocidad de corte Diminuer la vitesse de coupe</p>
		↑ ↓	<p>use unequal depth of cut Utilizar una profundidad de corte desigual Faire varier la profondeur de coupe</p>
		↓	<p>use less positive cutting geometry Utilizar una geometría de corte menos positiva Utiliser une géométrie moins positive</p>
		+	<p>use coolant or increase its intensity Usar refrigerante o incrementar su intensidad Utiliser l'arrosage ou augmenter son débit</p>
			<p>use tool with smaller setting angle Utilizar una herramienta con menor ángulo de posición Utiliser un outil avec un angle d'attaque plus petit</p>

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TYPES OF WEAR ON TURNING INSERTS
TIPOS DE DESGASTE DE LAS PLAQUITAS DE TORNEADO
TYPES D'USURE DES PLAQUETTES DE TOURNAGE

CREATION OF RACK CRACKS / MICRO-FISURAS
USURE EN PEIGNE (FISSURES)

 		↓	(H) grain has a great influence El sustrato (H) tiene un papel muy importante Choisir un substrat à grains plus gros (H)
		++	PVD coating recommended Se recomienda recubrimiento PVD Un revêtement PVD est recommandé
		↓	feed has influence on intensity, but less than the cutting speed El avance influye en la intensidad, pero menos que la velocidad de corte L'avance influe sur l'intensité, mais moins que la vitesse de coupe
		↓	lower speed means lower temperature Menor velocidad significa menor temperatura Vitesse plus basse veut dire température moins élevée
			it has no influence No influye N'a aucune influence
		↓	use less positive cutting geometry Utilizar una geometría de corte menos positiva Utiliser une géométrie moins positive
		---	no coolant (it is possible to use air to remove chips from cutting area) Sin refrigeración (se puede utilizar aire para evacuar virutas de la zona de corte) Pas d'arrosage (utiliser de l'air pour évacuer les copeaux hors de la zone de coupe)

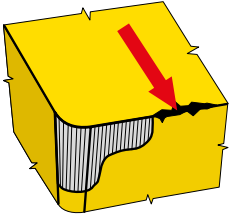








BRITTLE CRACKS AT THE CUTTING EDGE / ASTILLAMIENTO DEL FILO DE CORTE
ÉCAILLAGE DE L'ARÊTE DE COUPE

 		↓	(H) grain has a great influence El sustrato (H) tiene un papel muy importante Choisir un substrat à grains plus gros (H)
		+	PVD coating recommended Se recomienda recubrimiento PVD Un revêtement PVD est recommandé
		↓	Good swarf control is very important Es muy importante una rotura de virutas correcta Un bon fractionnement du copeau est très important
		↑ ↓	it is about swarf control and vibration Influye en la rotura de virutas y las vibraciones Il s'agit d'évacuation copeaux et de vibrations
		↓	reduces the force load (important for machining with long overhangs) Reduce la carga mecánica en el filo de corte (importante cuando se mecaniza con voladizos largos) Réduire la charge (important pour l'usinage avec de longs porte-à-faux)
		↓	use less positive cutting geometry Utilizar una geometría de corte menos positiva Utiliser une géométrie moins positive
			it has no influence No influye N'a aucune influence

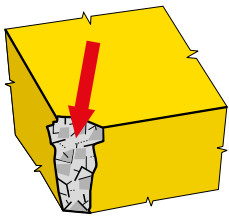







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TIPOS DE DESGASTE DE LAS PLAQUITAS DE TORNEADO
TYPES D'USURE DES PLAQUETTES DE TOURNAGE

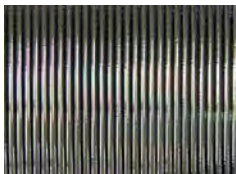
FAILURE OF CUTTING EDGE / DESPRENDIMIENTO DEL FILO POR MARTILLO DE VIRUTAS
AFFAIBLISSEMENT DE L'ARÊTE DE COUPE

		↓	(H) grain has a great influence El sustrato (H) tiene un papel muy importante Choisir un substrat à grains plus gros (H)
		+	PVD coating recommended Se recomienda recubrimiento PVD Un revêtement PVD est recommandé
		↑ ↓	Good swarf control is very important Es muy importante una rotura de virutas correcta Un bon fractionnement du copeau est très important
		↑ ↓	it is about swarf control and vibration Influye en la rotura de virutas y las vibraciones Il s'agit d'évacuation copeaux et de vibrations
		↑ ↓	Good swarf control is very important Es muy importante una rotura de virutas correcta Un bon fractionnement du copeau est très important
		↓	use less positive cutting geometry Utilizar una geometría de corte menos positiva Utiliser une géométrie moins positive
			it has no influence No influye N'a aucune influence
		problem is poor swarf control or evacuation of chips El problema es una mala rotura de virutas, evacuación de virutas o arranque de viruta Le problème est un mauvais fractionnement du copeau, une mauvaise évacuation des copeaux	

INSERT FRACTURE / ROTURA DE PLAQUITA
RUPTURE DE PLAQUETTE

		↓	(H) grain has a great influence El sustrato (H) tiene un papel muy importante Choisir un substrat à grains plus gros (H)
		+	PVD coating recommended Se recomienda recubrimiento PVD Un revêtement PVD est recommandé
		↓	reduces the force load Reduce la carga mecánica en el filo de corte Réduire la charge
		↑ ↓	it is about swarf control and vibration Influye en la evacuación de viruta y vibraciones Il s'agit d'évacuation copeaux et de vibrations
		↓	reduces the force load Reduce la carga mecánica en el filo de corte Réduire la charge
		↓	use less positive cutting geometry Utilizar una geometría de corte menos positiva Utiliser une géométrie moins positive
			it has no influence No influye N'a aucune influence
		Use better working conditions Mejorar las condiciones de trabajo Utiliser de meilleures conditions de travail	

**POOR SURFACE QUALITY / MALA CALIDAD DE LA SUPERFICIE
QUALITÉ DE SURFACE MAUVAISE**



Description and cause:

Numerous causes depending on the workpiece material, cutting conditions (feed rate and cutting speed), the condition of the cutting edge, the extent and type of wear, and the condition and rigidity of the machine–tool–workpiece assembly.

- incorrect tool chosen
- incorrect chip thickness
- incorrect cutting speed
- coolant is needed
- high feed rate

Corrective measures:

- use a wiper insert
- use a cutting insert with the right geometry
- reduce the feed rate
- change (usually increase) the cutting speed
- use a coolant
- improve the stability of the tool and workpiece
- change the chip cross section
- select a more easy-cutting chip breaker
- increase the nose radius

Descripción y causa:

Las causas son diversas, en función del material de la pieza de trabajo, las condiciones de corte (avance y velocidad de corte), la condición del filo de corte, la extensión y el tipo de desgaste, la condición y la rigidez de la pieza de trabajo mecanizada.

- elección incorrecta de herramienta
- espesor de viruta inadecuado
- velocidad de corte inadecuada
- se necesita refrigerante
- velocidad de avance alta

Solución del problema:

- utilizar una plaquita rascadora (wiper)
- utilizar plaquita de corte con la geometría adecuada
- reducir la velocidad de avance
- cambiar (normalmente aumentar) la velocidad de corte
- utilizar un refrigerante
- mejorar la estabilidad de la herramienta y la pieza de trabajo
- cambiar la sección transversal de la viruta
- seleccionar un rompevirutas que corte con más facilidad
- aumentar el radio de punta

Description et cause:

Les causes sont nombreuses, elles dépendent du matériau à usiner, des conditions de coupe (avance et vitesse de coupe), de la condition de l'arête de coupe, du niveau et du type d'usure, de l'état et de la rigidité de la machine.

- mauvais choix d'outil
- mauvaise épaisseur du copeau
- mauvaise vitesse de coupe
- arrosage nécessaire
- vitesse d'avance élevée

Solution:

- utiliser une plaquette racleuse (Wiper)
- utiliser une plaquette avec une géométrie correcte
- réduire la vitesse d'avance
- changer (en général augmenter) la vitesse de coupe
- utiliser l'arrosage
- améliorer la stabilité de l'outil et de la pièce et à usiner
- changer la section du copeau
- sélectionner une géométrie plus coupante
- utiliser une plaquette avec un plus gros rayon de pointe

VIBRATIONS / VIBRACIONES
VIBRATIONS

Description and cause:

This is a very common problem, which is mainly caused by an unbalanced workpiece or tool, unstable fixing of the workpiece, high cutting forces or tool overhang.

Corrective measures:

- improve the stability of the tool and workpiece
- reduce the depth of cut
- minimize tool overhang
- reduce the cutting speed
- use a tool with smaller setting angle
- reduce the chip cross section
- use a tool with a low cutting resistance
- increase the feed rate
- select a more easy-cutting chip breaker
- increase the nose radius

Descripción y causa:

Son muy frecuentes. Los principales motivos son el desequilibrio de la pieza de trabajo o la herramienta, la estabilidad de la pieza de trabajo, las fuerzas de corte elevadas o el voladizo de la herramienta.

Solución del problema:

- mejorar la estabilidad de la herramienta y la pieza de trabajo
- reducir la profundidad de corte
- minimizar el voladizo de la herramienta
- reducir la velocidad de corte
- utilizar una herramienta con un ángulo de posicionamiento más pequeño
- reducir la sección transversal de la viruta
- utilizar una herramienta con una baja resistencia de corte
- aumentar la velocidad de avance
- seleccionar un rompevirutas que corte con más facilidad
- aumentar el radio de punta

Description et cause:


Ceci est très fréquent. Les principales raisons sont le déséquilibre de la pièce ou de l'outil, la mauvaise stabilité de la pièce, des forces de coupe très fortes, du porte-à-faux de l'outil.

Solution:


- améliorer la stabilité de l'outil et de la pièce et à usiner
- réduire la profondeur de coupe
- diminuer le porte-à-faux de l'outil
- réduire la vitesse de coupe
- utiliser un outil avec un angle d'attaque plus petit
- réduire la section copeaux
- utiliser un outil avec une plus faible résistance à la coupe
- augmenter la vitesse d'avance
- sélectionner une géométrie plus coupante
- utiliser une plaquette avec un plus gros rayon de pointe



**BURRS / REBABAS
BAVURE**

	<p>Description and cause: This usually occurs on soft steels and plastic materials.</p>	<p>Corrective measures:</p> <ul style="list-style-type: none"> – use a cutting insert with a sharp cutting edge – use a cutting insert with positive geometry – use a tool with a smaller setting angle
	<p>Descripción y causa: Suelen aparecer en el mecanizado de aceros blandos y materiales plásticos.</p>	<p>Solución del problema:</p> <ul style="list-style-type: none"> – utilizar una plaquita de corte con filo de corte afilado – utilizar una plaquita de corte con geometría positiva – utilizar una herramienta con un ángulo de posicionamiento más pequeño
	<p>Description et cause: Ceci apparaît régulièrement en usinage de matériaux doux ou de matières plastiques.</p>	<p>Solution:</p> <ul style="list-style-type: none"> – utiliser une plaquette avec une arête vive – utiliser une plaquette avec une géométrie positive – utiliser un outil avec un angle d'attaque plus petit

**ERRORS IN DIMENSIONS AND SHAPE OF WORKPIECE / ERRORES EN DIMENSIONES Y FORMA DE LA PIEZA
INEXACTITUDE DES DIMENSIONS ET DE LA FORME DE LA PIÈCE**

	<p>Description and cause: Depends on a number of factors.</p>	<p>Corrective measures:</p> <ul style="list-style-type: none"> – use a wear-resistant cutting insert – improve the stability of the cutter and workpiece – minimize tool overhang – use a workpiece with a suitable machining allowance
	<p>Descripción y causa: Depende de diversos factores.</p>	<p>Solución del problema:</p> <ul style="list-style-type: none"> – utilizar una plaquita de corte resistente al desgaste – mejorar la estabilidad de la herramienta y la pieza de trabajo, minimizar el voladizo – utilizar una pieza de trabajo con un margen de mecanizado adecuado
	<p>Description et cause: Dépend d'un certain nombres de facteurs.</p>	<p>Solution:</p> <ul style="list-style-type: none"> – utiliser une plaquette résistante à l'usure – améliorer la stabilité de l'outil et de la pièce usinée, diminuer le porte-à-faux de l'outil – utiliser une pièce avec une surépaisseur d'usinage mieux appropriée

**INADEQUATE CHIP FORMATION / FORMACIÓN INADECUADA DE VIRUTA
MAÎTRISE DES COPEAUX INACCEPTABLE**

Description and cause:

Producing a chip with a suitable shape is very important to insert durability and service life of the tool. The workpiece material, the feed rate, the depth of cut and the cutting geometry all have an effect on chip forming. A chip that is too long is unacceptable for various reasons, while a chip that is too short is undesirable as it overloads the cutting edge and causes vibrations.

Corrective measures:

- change the feed rate and depth of cut
- use a more suitable cutting geometry
- change the cutting conditions

Descripción y causa:

Una forma adecuada de la viruta es un criterio importante, igual que la durabilidad (vida útil de la herramienta). El material de la pieza de trabajo, el avance, la profundidad de corte y la geometría de corte adecuada (rompevirutas) afectan a la formación correcta de las virutas. Una viruta larga es inaceptable, pero una viruta demasiado corta (triturada) tampoco es deseable, ya que indica una sobrecarga del filo y causa vibraciones.

Solución del problema:

- cambiar el avance y la profundidad de corte
- utilizar una geometría de corte más adecuada
- cambiar las condiciones de corte



Description et cause:

Une forme de copeau convenable est un critère important, comme la durée de vie de l'outil. Le matériau de la pièce à usiner, l'avance, la profondeur de coupe, la géométrie de coupe adaptée (brise-copeaux) agissent sur la forme correcte du copeau. Un copeau long est inacceptable cependant qu'un copeau trop court (écrasé) n'est pas souhaitable, ceci indique une trop forte charge sur l'arête et génère des vibrations.

Solution:

- changer l'avance et la profondeur de coupe
- utiliser une plaquette avec une géométrie correcte
- changer les conditions de coupe

GENERAL PRINCIPLES / PRINCIPIOS GENERALES
PRINCÍPIOS GERAIS / PRINCIPES GÉNÉRAUX

Check the seat condition of the cutting insert

Before clamping a new cutting insert or changing the edge, it is necessary to clean the seat and check its condition or the condition of the anvil and wedge (especially the damage under the corner of the cutting insert).

Check and service the clamping parts

It is also important to check the clamping parts, including clamping levers, screws, wedges and clamps. Only use original, undamaged parts (found in the catalogue). Regularly lubricate the threads and the binding surface of screws, for example using heat-resistant lubricant (Molykote G.). For assembly and disassembly, only use screwdrivers and wrenches specified in our catalogue or recommended by the tool manufacturer. Pay attention to the correct tightening (proportional) – it is advisable to use a torque wrench.

Check the tightening

Before tightening, check the fit of the cutting insert on the whole of the binding surface and in the radial and axial directions. Cutting inserts and tools must always be clean and undamaged.

Comprobar el estado del asiento de la plaquita:

Antes de montar una plaquita nueva o cambiar el filo de corte, es necesario limpiar el asiento y comprobar el estado de la plaquita de apoyo, especialmente la esquina que está bajo el filo de corte.

Comprobar el mantenimiento de los elementos de fijación:

Compruebe los elementos de fijación: palancas de fijación, tornillos, cuñas, abrazaderas. Utilice solo piezas sin daños, utilice solo las piezas originales que se encuentran en el catálogo. Lubrique regularmente las roscas y las superficies de unión de los tornillos, por ejemplo, con un lubricante resistente al calor (Molykote G.). Para el montaje y el desmontaje, utilice solo los destornilladores y las llaves recomendados en nuestro catálogo por el fabricante de la herramienta. Preste atención al apriete adecuado (proporcional), se recomiendan llaves dinamométricas.

Comprobar el apriete:

Antes de apretar, comprobar la forma en que la plaquita asienta en el portaherramientas, tanto en la superficie plana bajo el filo como en las paredes axial y radial del asiento. Herramientas y plaquitas deben estar siempre limpias y sin daños.

Vérification de l'état correct des logements de plaquettes:

Avant le serrage d'une nouvelle plaquette ou avant de changer une arête (indexage ou rotation de la plaquette) il est nécessaire de nettoyer le logement, de vérifier l'état du système de fixation de la plaquette et du corps d'outil (particulièrement l'endroit sous la pointe de la plaquette).

Vérification et maintenance des pièces de fixation:

La vérification des pièces de fixation (leviers, vis, coins, brides) est importante. Utiliser uniquement des pièces d'origine et en bon état (vous les trouvez dans le catalogue). Graisser régulièrement les filets et les surfaces de contact des vis, par exemple avec de la graisse résistante à haute température (Molykote G.). Pour le montage et le démontage, utiliser seulement les clés et les tournevis comme sur le catalogue ou recommandés par le fabricant d'outil. Porter attention au couple de serrage, nous recommandons l'usage d'un tournevis dynamométrique.

Vérification du serrage:

Au serrage, vérifier l'appui de la plaquette sur la surface de contact avec le trou et dans les directions radiale et axiale. Les plaquettes et les outils doivent rester propres et intacts.

Table 28
Tabla 28

FORMULA FOR CALCULATING CUTTING DATA
FÓRMULAS PARA EL CÁLCULO DE LOS PARÁMETROS DE CORTE

Value / Valor	Formula / Fórmula	Unit / Unidad	Note / Nota
Number of revolutions Número de revoluciones	$n = \frac{v_c \cdot 12}{D \cdot \pi}$	[1.min ⁻¹] [rpm]	n Number of revolutions [1.min ⁻¹] D Diameter [in] (of tool or workpiece) v _c Cutting speed [ft.min ⁻¹] f _{rev} Feed per revolution [in.rev] f _{min} Feed per minute [in.min] (Linear Feedrate)
Cutting speed Velocidad de corte	$v_c = \frac{\pi \cdot D \cdot n}{12}$	[ft.min]	n Número de revoluciones [rpm] D Diámetro [in] (de herramienta o pieza de trabajo) v _c Velocidad de corte [m.min ⁻¹] f _{rev} Avance por revolución [in.rot] f _{min} Avance por minuto [in.min ⁻¹] (Velocidad de avance lineal)
Feed per revolution Avance por revolución	$f_{rev} = \frac{f_{min}}{n} = f_z \cdot z$	[in.rev]	
Feed per minute (Linear Feedrate) Avance por minuto	$f_{min} = v_f = f_{ot} \cdot n$	[in.min]	
Max. height of profile R _{max} Altura máx. del perfil R _{max}	$R_{max} = 127000 \cdot \frac{f^2}{r_\epsilon}$	[µin]	R _{max} max. height of profile [µin] R _a surface finish [µin] f _{rev} feed per revolution [in.rev] r _ε nose radius [in]
Surface finish R _a Acabado superficial R _a	$R_a = 33337 \cdot \frac{f_z^{1,88}}{r_\epsilon^{,97}}$	[µin]	R _{max} Altura máx. del perfil [in] R _a Acabado de superficie [in] f _{rev} Avance por revolución [in/rot] r _ε Radio de la punta [in]
Chip cross section Sección transversal de viruta	$A = f_{rev} \cdot a_p$	[in ²]	A Chip cross section [in ²] f _{rev} Feed per revolution [in.rev] a _p Axial depth of cut [in] κ _r Primary edge setting angle [°] h Chip thickness [in] v _c Cutting speed [in.min] f _{min} Feed per minute [in.min] (Linear Feedrate)
Chip thickness (For insert with straight edge) Espesor de viruta	$h = f \cdot \sin \kappa_r$	[in]	Q Material removal rate per minute [in ³ .min]
Chip thickness (For round cutting insert) Espesor de viruta	$h = f_z \cdot \sqrt{\frac{a_p}{D}}$	[in]	A Sección transversal de viruta [in ²] f _{rev} Avance por revolución [in/rev] a _p Profundidad de corte axial [in] κ _r Ángulo de posicionamiento del filo principal [°] h Espesor de viruta [in] v _c Velocidad de corte [m.min] f _{min} Avance por minuto [in.min] (Velocidad de avance lineal)
Metal removal rate Caudal de Viruta	$Q = 12 \cdot a_p \cdot f_{ot} \cdot v_c$	[in ³ /min]	Q Tasa de arranque de material por minuto [in ³ .min]

Material	Steel	Cast iron	Al
Material	Acero	Fundición	Al
Coefficient x	20	25	100
Coefficiente x			

Tableau 28

FORMULES DE CALCUL DES PARAMÈTRES DE COUPE

Valeur	Formule	Unité	Note
Vitesse de rotation	$n = \frac{v_c \cdot 12}{D \cdot \pi}$	[1.min ⁻¹]	n Vitesse de rotation [1.min ⁻¹ D Diamètre [in] (de l'outil ou de la pièce à usiner) v _c Vitesse de coupe [ft.min ⁻¹ f _{rev} Avance par tour [in.tr] f _{min} Avance par minute [in.min] (Avance linéaire)
Vitesse de coupe	$v_c = \frac{\pi \cdot D \cdot n}{12}$	[ft.min]	
Avance par tour	$f_{rev} = \frac{f_{min}}{n} = f_z \cdot z$	[in.U]	
Avance par minute (Avance linéaire)	$f_{min} = v_f = f_{ot} \cdot n$	[in.min]	
Hauteur maximum du profil R _{max}	$R_{max} = 127000 \cdot \frac{f^2}{r_\epsilon}$	[µin]	R _{max} Hauteur maximum du profil [in] R _a Etat de surface [in] f _{rev} Avance par tour [in.tr] r _ε Rayon de pointe [in]
Etat de surface R _a	$R_a = 33337 \cdot \frac{f_z^{1,88}}{r_\epsilon^{,97}}$	[µin]	
Section copeau	$A = f_{rev} \cdot a_p$	[in ²]	A Section copeau [in ² f _{rev} Avance par tour [in.tr] a _p Angle d'attaque principal [in] κ _r Angle d'attaque principal κ _r [°] h Epaisseur copeau [in]
Epaisseur copeau (Pour plaquette avec arête droite)	$h = f \cdot \sin \kappa_r$	[in]	v _c Vitesse de coupe [in.min] f _{min} Avance par minute [in.min] (Avance linéaire) Q Taux d'enlèvement de matière par minute [in ³ .min]
Epaisseur copeau (Pour plaquette ronde)	$h = f_z \cdot \sqrt{\frac{a_p}{D}}$	[in]	
Taux d'enlèvement de matière	$Q = 12 \cdot a_p \cdot f_{ot} \cdot v_c$	[in ³ .min]	Matière Acier Fonte Al Coefficient x

Table 29
Tabla 29
Tableau 29

RECOMMENDED SCREW TORQUES
TORNILLOS DE FIJACIÓN
COUPLES DE SERRAGE RECOMMANDÉS

CLAMPING SCREW / TORNILLO DE FIJACIÓN / VIS DE FIXATION

Screw designation / Tipo de tornillo / Désignation de la vis	Screwdriver / Destornillador / Tournevis	Torque [Nm]* / Par de apriete [Nm]* / Couple [Nm]*
28588	MA2-8304	0.8
28992	MA2-8304	0.8
416.1-832	PT-8002	3.6
5513 020-01	PT-8004	3.6
5513 020-03	PT-8001	0.8
5513 020-04	PT-8003	1.5
5513 020-05	PT-8001	0.8
5513 020-14	TX 225PLUS	8.5
5513 020-24	PT-8002	1.5
5513 020-27	PT-8000	0.6
5513 020-28	PT-8000	0.6
5513 021-03	DMN 3124	13
CS 8601-T09P	SDR T09P	1.7
CS 8601-T15P	SDR T15P	3.9
CS 8601-T20P	SDR T20P	6.4
CS 8601-T25P	SDR T25P	9.5
DVF 0573	PT-8002	1.5
DVF 2260	TX 215PLUS	3.6
DVF 3584	DMD 1650	0.6
DVF 3593	TX 207PLUS	0.8
HS 0408	HXX 3	5
HS 0520C	HXX 4	5
HS 0616C	HXX 5	8
HS 0620	HXX 5	6
HS 0620C	HXX 5	6
HS 0625	HXX 5	6
HS 0625C	HXX 5	6
HS 0630	HXX 5	6
HS 0825	HXX 6	10
HS 0830	HXX 6	10
HS 0835	HXX 6	10
HS 0840	HXX 8	11
HS 1030	HXX 8	8
HS 1060	HXX 6	10
HS 93	HXX 5	8
HS 94	HXX 5	8
HSI 1020	HXX 6	8
PS 0512	HXX 2	2
PS 0512-A	HXX 2	2
PS 0616	HXX 2,5	4
PS 12040	HXX 5	8
PS 6026-709P	SRD T09P	2
PS 8290	HXX 2	2
SR 14	HXX 10	10
SR 85011-T15P	SDR T15P	5
SR 85017-T09P	SDR T09P	2
SR 85020-T15P	SDR T15P	3
SR 86025-T20P	SRD T20P	5
T20.037	DMD 1650	0.6
UP 0909-T09P	SRD T09P	2
UP 1515-T15P	SDR T15P	8
US 2505-T07P	SDR T07P	0.9
US 2506-T07P	SDR T07P	0.9
US 3007-T09P	SDR T09P	2
US 34	HXX 3	5
US 35	HXX 4	6
US 3508-T15P	SDR T15P	3
US 3510A-T15P	SDR T15P	3
US 3510-T15P	SDR T15P	3

CLAMPING SCREW / TORNILLO DE FIJACIÓN / VIS DE FIXATION

Screw designation / Tipo de tornillo / Désignation de la vis	Screwdriver / Destornillador / Tournevis	Torque [Nm]* / Par de apriete [Nm]* / Couple [Nm]*
US 3512A-T15P	SDR T15P	3
US 3512-T15P	SDR T15P	3
US 36	HXX 4	6
US 38	HXX 5	8
US 39	HXX 5	8
US 40	HXX 4	6
US 4008-T15P	SDR T15P	3.5
US 4011-T15P	SDR T15P	3.5
US 41	HXX 4	6
US 42	HXX 4	6
US 45013-T20P	SDR T20P	5
US 4512-T15P	SDR T15P	5
US 4514A-T20	SDR T20	5
US 46	HXX 3	5
US 46017-T20P	SDR T20P	5
US 47	HXX 5	8
US 5012-T15P	SDR T15P	5
US 5015-T20P	SDR T20P	5
US 5018-T20P	SDR T20P	5
US 6020-T25P	SDR T25P	6
US 64518-T15P	SDR T15P	5
US 8025-T30P	SDR T20P	13
US 83	HXX 4	6
US 95	HXX 4	10

TORQUE SCREWDRIVERS / DESTORNILLADORES DINAMOMÉTRICOS TOURNEVIS DYNAMOMÉTRIQUES

Torque handle / Mango de apriete / Tige dynamométrique	Torque (Nm) / Par de apriete (Nm) / Couple (Nm)	Clamping screw thread / Rosca del tornillo de apriete / Pas de la vis de fixation
MR-0.8-2.0 vario	0.5 - 2.0	M 2 - M 3
MR-1.0-5.0 vario	0.8 - 5.0	M 2.5 - M 5
MR-0.9 fix	0.9	M 2
MR-2.0 fix	2.0	M 3
MR-3.0 fix	3.0	M 3.5
MR-3.5 fix	3.5	M 4
MR-5.0 fix	5.0	M 5

REPLACEABLE SHANKS / VÁSTAGOS SUSTITUIBLES POIGNÉES REMPLAÇABLES

Replaceable shanks / Vástagos sustituibles / Poignées remplaçables

D-T6
D-T6P
D-T7
D-T7P
D-T8
D-T8P
D-T9
D-T9P
D-T15
D-T15P
D-T20
D-T20P

SCREW LUBRICATION

Insert clamping screws are subject to high thermal stresses. It is recommended that all screws be lubricated with a high quality paste such as MOLYKOTE 1000. This paste can be ordered in the same way as any other spare part from Dormer Pramet.

LUBRICACIÓN DE TORNILLOS

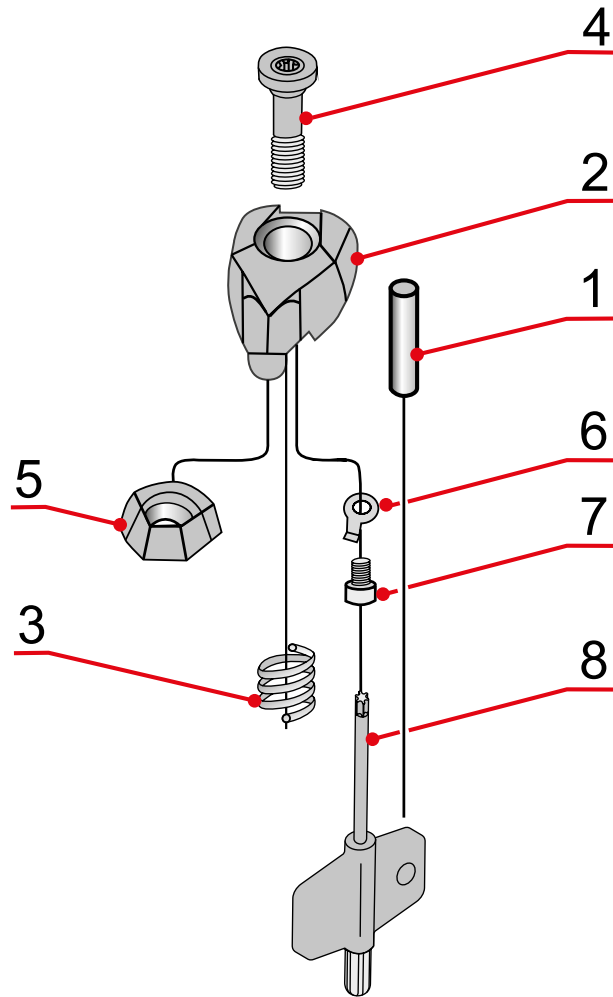
Los tornillos de fijación de las plaquitas están sometidos a tensiones térmicas elevadas. Se recomienda lubricar todos los tornillos con una pasta de alta calidad como MOLYKOTE 1000. Esta pasta se puede pedir de la misma forma que cualquier otro recambio.

LUBRIFICATION DES VIS

Dans le respect des contraintes thermiques élevées des vis de serrage, il est recommandé de les lubrifier avec une pâte haute qualité MOLYKOTE 1000. Cette pâte peut être commandée de la même façon que les pièces détachées.

Picture 30
Imagen 30
Image 30

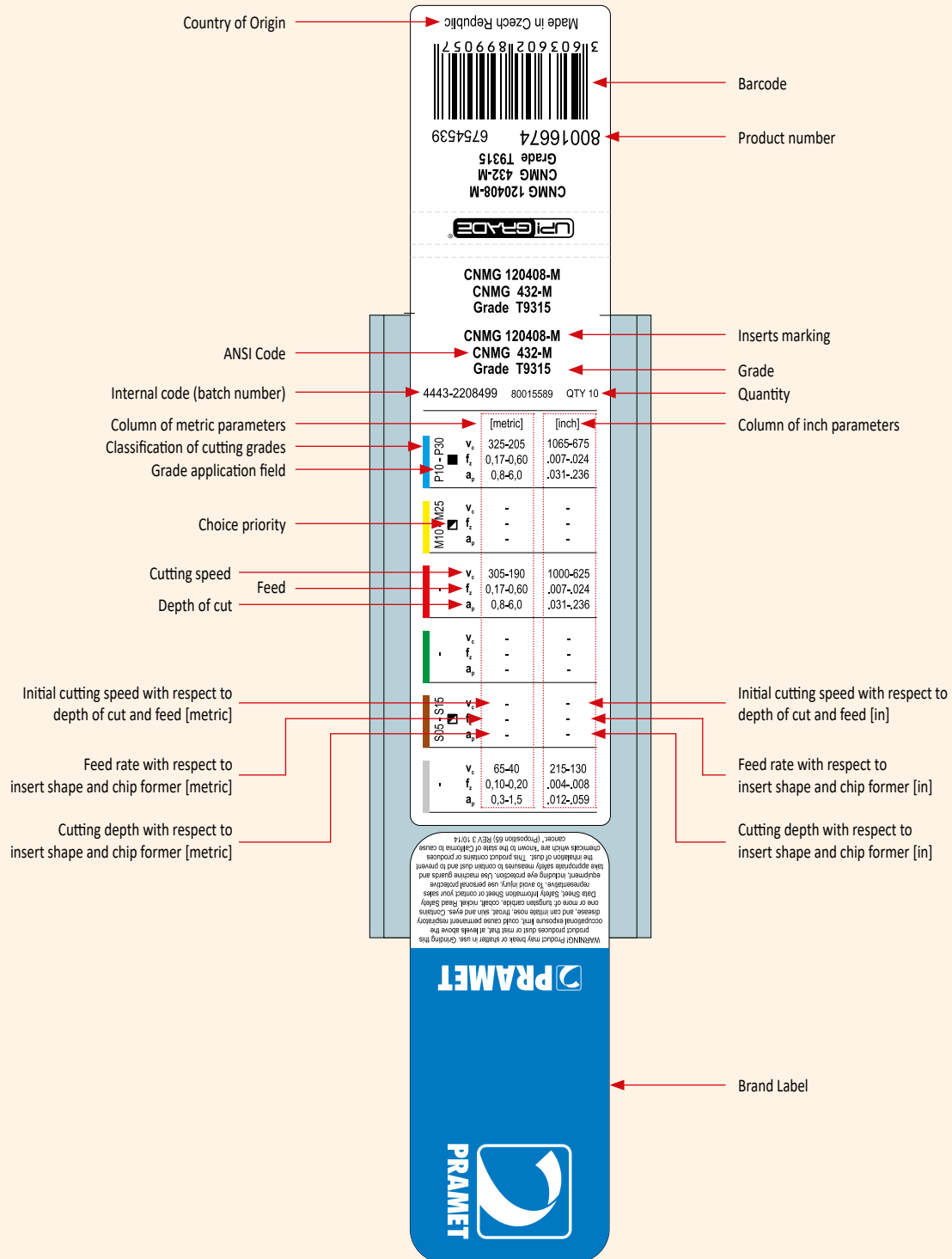
COMPLETE CLAMP SET
JUEGO COMPLETO DE FIJACIÓN
SET DE BRIDE COMPLET



	1	2	3	4		5	6	7	8
DCS 09	CP 3055	CD 09	PR 0157	CS 8601-T09P	1.7	-	-	-	-
DCS 12	CP 3007	CD 12	PR 0158	CS 8602-T15P	3.9	-	-	-	-
DCS 16	CP 3007	CD 16	PR 0159	CS 8603-T20P	6.4	-	-	-	-
DCS 19	CP 3007	CD 19	PR 0159	CS 8603-T20P	6.4	-	-	-	-
DCS 25	CP 3007	CD 25	PR 0101	CS 8604-T25P	9.5	-	-	-	-
DCS 16V	CP 3007	CD 16V	PR 0158	CS 8602-T15P	3.9	-	-	-	-
DCS 12C2	CP 3007	CD 12C2	PR 0158	CS 8602-T15P	3.9	PP 3002	H 1201	US 9701-T07P	FLAG T07P
DCS 16C2	CP 3007	CD 16C2	PR 0159	CS 8603-T20P	6.4	PP 3003	H 1201	US 9701-T07P	FLAG T07P
DCS 12C4	CP 3007	CD 12C4	PR 0158	CS 8602-T15P	3.9	PP 3002	H 1201	US 9701-T07P	FLAG T07P
DCS 16C4	CP 3007	CD 16C4	PR 0159	CS 8603-T20P	6.4	PP 3003	H 1201	US 9701-T07P	FLAG T07P

Picture 31.

TECHNICAL INFORMATION ON INSERT BOX



Labels and Callouts:

- Pais de origen: Made in Czech Republic
- Código de barras: 316036021899057
- Número de producto: 80016674 6754539
- Código ANSI: CNMG 120408-M, CNMG 432-M, Grade T9315
- Código interno (número de lote): 4443-2208499 80015589 QTY 10
- Parámetros métricos: [metric] column
- Clasificación de calidades de corte según ISO 513: P10 - P30
- Campo de aplicación de la calidad: M10 VM25
- Prioridad de selección: M10 VM25
- Velocidad de corte: v_c 305-190
- Avance: f_a 0,17-0,60
- Profundidad de corte: a_p 0,8-6,0
- Velocidad de corte inicial con respecto a la profundidad de corte y el avance (métrico): v_c -
- Velocidad de avance con respecto a la forma de la plaquita y el formador de virutas (métrico): v_f 65-40
- Profundidad de corte con respecto a la forma de la plaquita y el formador de virutas (métrico): a_p 0,3-1,5
- Velocidad de corte inicial con respecto a la profundidad de corte y el avance (pulgadas): v_c -
- Velocidad de avance con respecto a la forma de la plaquita y el formador de virutas (pulgadas): v_f .004-.008
- Profundidad de corte con respecto a la forma de la plaquita y el formador de virutas (pulgadas): a_p .012-.059
- Etiqueta de Marca: PRAMET logo

	[metric]	[inch]
v _c	325-205	1085-675
f _a	0,17-0,60	.007-.024
a _p	0,8-6,0	.031-.236
v _c	-	-
f _a	-	-
a _p	-	-
v _c	305-190	1000-625
f _a	0,17-0,60	.007-.024
a _p	0,8-6,0	.031-.236
v _c	-	-
f _a	-	-
a _p	-	-
v _c	-	-
f _a	-	-
a _p	-	-
v _c	65-40	215-130
f _a	0,10-0,20	.004-.008
a _p	0,3-1,5	.012-.059

Safety Warning:
 WARNING: Product may break or shatter in use. Grinding the product produces dust or mist that, at levels above the disease and can irritate nose, throat and eye tissue. Chronic use or more of irritant particles, cobalt, nickel, Rhodium Shiny Data Sheet Safety Information Sheet or contact your sales representative to read your use personal protective equipment, including eye protection, face shields, gloves and respirators to avoid injury and personal product contamination. This product contains or produces the materials which are known to the state of California to cause cancer. (Proposition 65) (P65) 2 10/14

