



TOOL FLO



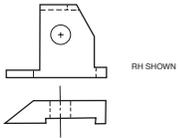
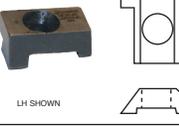
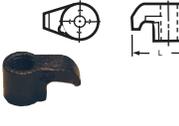
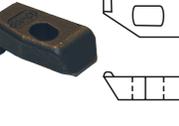
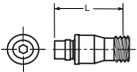
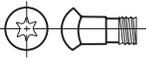
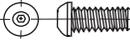
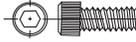
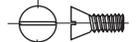
SPARE PARTS



	Description	D.O.C.	W.O.C.	Insert		Description	D.O.C.	W.O.C.	Insert		
ANVILS Deep Grooving 	DGAHL-113	1.250	.105-.125	VDG	CLAMPS Internal 	CBL-84			V84/V85		
	DGAHR-113	1.250	.105-.125	VDG		CBR-84			V84/V85		
	DGAHL-138	1.375	.170-.188	VDG		CBL-98			V98		
	DGAHR-138	1.375	.170-.188	VDG		CBR-98			V98		
	DGAHL-248	1.500	.218-.250	VDG		CBL-120			V120		
	DGAHR-248	1.500	.218-.250	VDG		CBR-120			V120		
	DGAHL-258	1.500	.250-.312	VDG		CBL-132	.312	.105-.125	DBP/VDB		
	DGAHR-258	1.500	.250-.312	VDG		CBR-132	.312	.105-.125	DBP/VDB		
	DGAHL-268	1.750	.350-.375	VDG		CBL-411	.180	.188-.250	V84		
	DGAHR-268	1.750	.350-.375	VDG		CBR-411	.180	.188-.250	V84		
Face Grooving 	AFHL-113-I	.312	.105-.125	DBP/VDB	External 	CHL-98			V98		
	AFHL-113-O	.312	.105-.125	DBP/VDB		CHR-98			V98		
	AFHR-113-I	.312	.105-.125	DBP/VDB		CHL-120			V120		
	AFHR-113-O	.312	.105-.125	DBP/VDB		CHR-120			V120		
	AFHL-128-I	.812	.105-.125	DBP/VDB		CHL-132	.312	.105-.125	DBP/VDB		
	AFHL-128-O	.812	.105-.125	DBP/VDB		CHR-132	.312	.105-.125	DBP/VDB		
	AFHR-128-I	.812	.105-.125	DBP/VDB		CHL-382	.812	.170-.188	DBP/VDB		
	AFHR-128-O	.812	.105-.125	DBP/VDB		CHR-382	.812	.170-.188	DBP/VDB		
	AFHL-138-I	.812	.170-.188	DBP/VDB		CHL-431	.312	.220-.312	V84/V85		
	AFHL-138-O	.812	.170-.188	DBP/VDB		CHR-431	.312	.220-.312	V84/V85		
	AFHR-138-I	.812	.170-.188	DBP/VDB		CHL-452					
	AFHR-138-O	.812	.170-.188	DBP/VDB		CHR-452					
	AFHL-148-I	.812	.220-.250	DBP/VDB		CHL-482	.812	.220-.312	DBP/VDB		
	AFHL-148-O	.812	.220-.250	DBP/VDB		CHR-482	.812	.220-.312	DBP/VDB		
	AFHR-148-I	.812	.220-.250	DBP/VDB		CHL-582	.812	.350-.375	DBP/VDB		
	AFHR-148-O	.812	.220-.250	DBP/VDB		CHR-582	.812	.350-.375	DBP/VDB		
	Grooving/Threading Internal 	ABL-113	.312	.105-.125		DBP/VDB	Face Grooving 	CHLF-132I	.312	.105-.125	DBP/VDB
		ABR-113	.312	.105-.125		DBP/VDB		CHLF-132O	.312	.105-.125	DBP/VDB
ABL-131		.180	.188-.250	V84	CHRF-132I	.312		.105-.125	DBP/VDB		
ABR-131		.180	.188-.250	V84	CHRF-132O	.312		.105-.125	DBP/VDB		
ABL-135		.530	.170-.188	DBP/VDB	CHLF-282I	.812		.105-.125	DBP/VDB		
ABR-135		.530	.170-.188	DBP/VDB	CHLF-282O	.812		.105-.125	DBP/VDB		
ABL-143		.312	.295-.312	V85	CHRF-282I	.812		.105-.125	DBP/VDB		
ABR-143		.312	.295-.312	V85	CHRF-282O	.812		.105-.125	DBP/VDB		
ABL-145		.530	.220-.250	VDB 250A	CHLF-382I	.812		.170-.188	DBP/VDB		
ABR-145		.530	.220-.250	VDB 250A	CHLF-382O	.812		.170-.188	DBP/VDB		
ABL-171		.180	60P V	V84	CHRF-382I	.812		.170-.188	DBP/VDB		
ABR-171		.180	60P V	V84	CHRF-382O	.812		.170-.188	DBP/VDB		
ABL-245		.530	.220-.250	DBP/VDB	CHLF-482I	.812		.220-.312	DBP/VDB		
ABR-245		.530	.220-.250	DBP/VDB	CHLF-482O	.812		.220-.312	DBP/VDB		
ABL-345		.530	.220-.250	VDB250A	CHRF-482I	.812		.220-.312	DBP/VDB		
ABR-345		.530	.220-.250	VDB250A	CHRF-482O	.812		.220-.312	DBP/VDB		
External 		AHL-113	.312	.105-.125	VDB	Chipbreakers External 		Description		Length	
		AHR-113	.312	.105-.125	VDB			CK-21		.73	
	AHL-138	.812	.170-.188	VDB	CL-6			.58			
	AHR-138	.812	.170-.188	VDB	CL-7			.64			
	AHL-148	.812	.220-.250	VDB	CL-9			.75			
	AHR-148	.812	.220-.250	VDB	CL-12			.88			
	AHL-173	.812	V-THD	V84/V85	CL-20			.73			
	AHR-173	.812	V-THD	V84/V85	CL-22			.85			
	AHL-248	.812	.250-.312	VDB250B	CL-24			1.000			
	AHR-248	.812	.250-.312	VDB250B	CL-30			1.000			
	AHL-268	.812	.350-.375	VDB375	Description		Insert				
	AHR-268	.812	.350-.375	VDB375	CM-65			FLPL/R-33			
	AVR-FC094	.500	.094	FC-094	CM-66			FLPL/R-33			
	AVR-FC125	.800	.125	FC-125	CM-68			FLPR-5			
	AVR-FC187	.800	.187	FC-187	CM-71			FLPL-5			
	AVL-FC094	.500	.094	FC-094	CM-79			FLPR-5			
	AVL-FC125	.800	.125	FC-125	CM-81			FL -5L			
	AVL-FC187	.800	.187	FC-187	CM-111			FLPR-5			
				CM-112		FLPL-5					
				CM-113		VPGR (RH HOLDER)					
				CM-114		VPGR (LH HOLDER)					
				CM-116		DPGR (RH HOLDER)					
				CM-117		DPGR (LH HOLDER)					
				CM-118		DPGR (RH BAR)					
				CM-119		DPGR (LH BAR)					
				CM-121		Replaced with TF-121					
				CM-143							
				CM-180		FLPR-5					
				CM-181		FLPL-5					
Internal 	CR 5B75-4E CB TF2993			CR-5B75-4E	 	Description		Insert			
	CR 8R-4E CB TF3083E			CR-8RD-4E		CM-65		FLPL/R-33			
	CR 8R-3E CB 1353E			CR-8RD-3E		CM-66		FLPL/R-33			
	#3 CB w/o Coolant TF26424			CR-8R/10R-3E		CM-68		FLPR-5			
						CM-71		FLPL-5			
						CM-79		FLPR-5			
						CM-81		FL -5L			
						CM-111		FLPR-5			
						CM-112		FLPL-5			
						CM-113		VPGR (RH HOLDER)			
						CM-114		VPGR (LH HOLDER)			
						CM-116		DPGR (RH HOLDER)			
						CM-117		DPGR (LH HOLDER)			
						CM-118		DPGR (RH BAR)			
						CM-119		DPGR (LH BAR)			
						CM-121		Replaced with TF-121			
						CM-143					
						CM-180		FLPR-5			
				CM-181		FLPL-5					



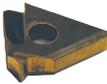
SPARE PARTS

Description		D.O.C.	W.O.C.	Insert	Description	Threads	Length	Wrench	
CLAMPS (cont.) 	DGCHL-132	1.250	.105-.125	VDG	S-111 (SF-20)	4-40	3/8	T-9 TORX	
	DGCHR-132	1.250	.105-.125	VDG	SA3	5-40	1/2	T-10 TORX	
	DGCHL-382	1.375	.170-.188	VDG	SA4	8-32	5/8	T-20 TORX	
	DGCHR-382	1.375	.170-.188	VDG	SA5	10-32	5/8	T-25 TORX	
	DGCHL-482	1.500	.218-.250	VDG	SF10	4-40	1/4	T-9 TORX	
	DGCHR-482	1.500	.218-.250	VDG	SF20 (S-111)	4-40	3/8	T-10 TORX	
	DGCHL-500	1.500	.250-.312	VDG	SF25	4-40	1/2	T-9 TORX	
	DGCHR-500	1.500	.250-.312	VDG	SF30	5-40	3/8	T-10 TORX	
	DGCHL-582	1.750	.350-.375	VDG	SF40	5-40	1/2	T-10 TORX	
	DGCHR-582	1.750	.350-.375	VDG	SF42	5-40	5/8	T-10 TORX	
	Description		Insert		Flat Head Cap Screw  				
	MCL-30		MLPE-1251						
	MCR-30		MLPE-1251						
	MCL-40		MLPE-2532						
	MCR-40		MLPE-2532						
	MCL-50		MLPE-3425						
MCR-50		MLPE-3425							
	Description		Length						
	TC-190		.530						
	TC-191		.640						
	TC-250		.730						
	TC-251		.850						
	TC-310		.750						
	TC-311		.880						
	TC-380		1.000						
	Description		Insert						
	TF-72		FL-3R/4R						
	TF-73		FL-3L/4L						
	TF-74		FL-2R						
	TF-75		FL-2L						
	TF-77*		FL-4L*						
	TF-78*		FL-4R*						
	TF-80		FL-5R						
	TF-81		FL-5L						
	TF-120		FL-6R						
	TF-121		FL-6L						
	DOWEL PINS  	Description		DIA	L				
DP-1			1/8	1					
DP-2			1/8	1-1/2					
DP-3			1/4	3/8					
DP-4			3/16	3/8					
DP-5			3/32	3/16					
DP-6			1/4	1					
DP-7			4,0	10,0					
DP-8			4,0	8,0					
DP-9			1/4	1/2					
DP-10			1/4	3/4					
DP-11			3/16	5/8					
DP-135			1/8	1-3/8					
LOCK PINS  		Description		Threads	Length	Wrench			
	NL-33		1/4-20	.340	5-64 HEX				
	NL-33L		1/4-20	.410	5-64 HEX				
	NL-34		1/4-20	.450	5-64 HEX				
	NL-34L		1/4-20	.510	5-64 HEX				
	NL-44		1/4-28	.510	3/32 HEX				
	NL-46		1/4-28	.680	3/32 HEX				
	NL-46L		1/4-28	.730	3/32 HEX				
	NL-56		5/16-24	.690	1/8 HEX				
	NL-57		5/16-24	.810	1/8 HEX				
	NL-58		5/16-24	.860	1/8 HEX				
	NL-66		3/8-24	.690	9/64 HEX				
	NL-66L		3/8-24	.830	9/64 HEX				
	NL-68		3/8-24	.860	9/64 HEX				
	NL-68L		3/8-24	.950	9/64 HEX				
	NL-810		7/16-20	1.170	5/32 HEX				
	SCREWS Ballnose (Rigid-Lock)  	Description		Wrench					
		STBN-1A		K2					
STBN-2			K3						
STBN-3			K3						
STBN-4			K3						
STBN-5			K3						
STBN-6			K4						
STBN-7			K5						
STBN-8			K6						
STBN-9			K7						
STBN-10		K8							
Button Head 	Description		Threads	Length	Wrench				
	SB10		4-40	1/4	1/16 HEX				
	SB90		5/16-18	3/4	3/16 HEX				
	SB100		5/16-18	1	3/16 HEX				
	S-518		8-32	3/8	3/32 HEX				
	S-524		10-24	1/2	1/8 HEX				
	S-532		1/4-20	3/4	5/32 HEX				
S-625		1/4-28	7/8	5/32 HEX					
Clamp Screw  	Description		Threads	Length	Wrench				
	STC-4		5-16-24	1.160	5/32HEX				
	STC-5		10-32	.840	3/32 HEX				
	STC-8		5/16-24	1.000	5/32HEX				
	STC-9		10-32	.590	3/32 HEX				
STC-11		1/4-28	.810	1/8HEX					
SCREWS (cont.) SD Torx Flat Head  	Description		Threads	Length	Wrench				
	SD1		6-40	1/2	T-10 TORX				
	SD2		10-32	3/4	T-20 TORX				
	SD3		10-32	3/4	T-20 TORX				
	SD4		1/4-20	1-1/4	1/8 HEX				
	SD-25								
	Socket Head Cap Screw  	Description		Threads	Length	Wrench			
		S-310		6-32	1/2	7/64 HEX			
		S-312		6-32	3/4	7/64 HEX			
		S-352 (SS90)		5/16-18	1	1/4 HEX			
		S-412		10-32	3/4	5/32 HEX			
		S-532							
		SS10		4-40	1/4	3/32 HEX			
		SS20		4-40	3/8	3/32 HEX			
		SS25		5-40	1/4	3/32HEX			
		SS30		5-40	3/8	3/32HEX			
		SS40		5-40	1/2	3/32HEX			
		SS45		5-40	3/4	3/32HEX			
SS50			8-32	3/8	9/64 HEX				
SS60			8-32	1/2	9/64 HEX				
SS65			8-32	5/8	9/64 HEX				
SS70			10-24	3/8	5/32 HEX				
SS80			10-24	1/2	5/32 HEX				
SS-84M									
SS85		10-24	5/8	5/32 HEX					
SS87		10-24	7/8	5/32 HEX					
SS90 (S-352)		5/16-18	1	1/4 HEX					
SS-91									
SS100		1/4-20	3/4	5/32 HEX					
Socket Head Torx Screw W/WASHER  	Description		Threads	Length	Wrench				
	SY-3		5-40	1/4	T-10 TORX				
	SY-4		8-32	3/8	T-20 TORX				
SY-5		M5 x 0.8	1/4	T-25 TORX					
Special Flat Head Screw  	Description		Threads	Length	Wrench				
	SL-111		4-40	5/16	-				
	SL-344		2-56	1/4	-				
S-959									
TS Torx Head Screw  	Description		Threads	Length	Wrench				
	TS1		1-72	3/32	T-6 TORX				
	TS20		1-72	3/32	T-6 TORX				
	TS25		M2.5 x 0.45	5.5MM	T-8 TORX				
	TS250		M2.5 x 0.45	4,8MM	T-8 TORX				
	TS252 (SF05)		M2.5 x 0.45	8,0MM	T-8 TORX				
	TS3		2-56	1/8	T-7 TORX				
	TS40		5-40	3/8	T-10 TORX				
	TS45		4-40	5/16	T-9 TORX				
	TS6		4-40	13/64	T-10 TORX				
TS60		8-32	1/2	T-20 TORX					
TS65		10-32	1/2	T-20 TORX					
SEATS Chaser Style 	Description		Insert						
	TF1207		CR-8R-3E/4E						
	TF1780		CR-8R-3I/4I						
	TF3218		CR-8R-7I						
	TF8132-E		CR-5B75-4E						
	TF8132-I		CR-5B75-4I						

*Designed for Sandvik® Toolholders & Bars.

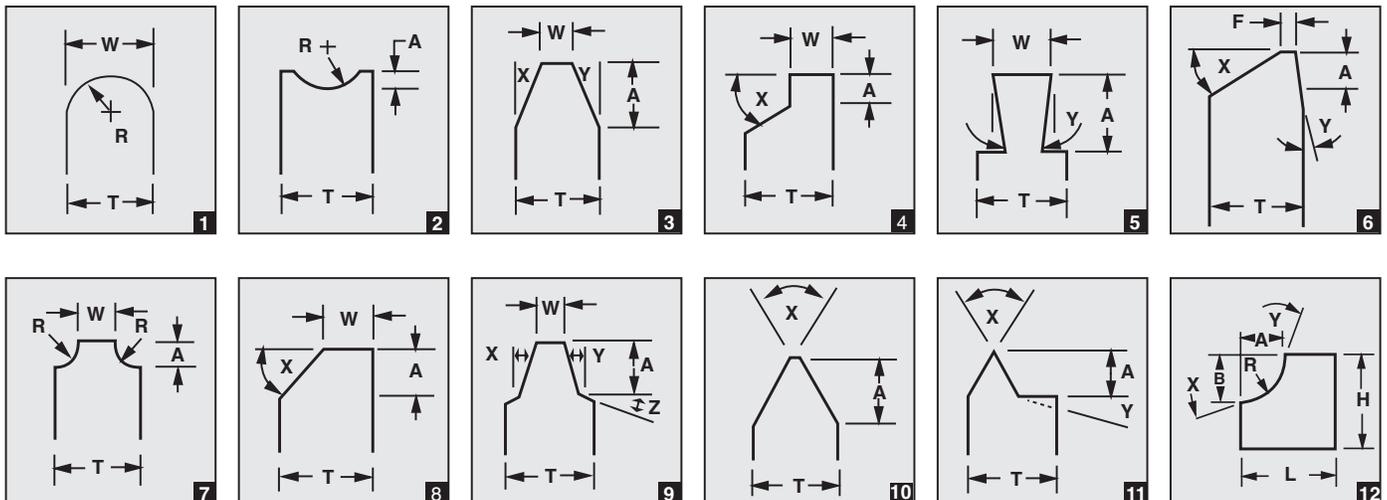
SPARE PARTS



	Description	Length	Description	Angle*	Insert	
SEATS (cont.) Flo-Lock Style 	SM-267	FLPL-33	Laydown LT Style (cont.) 	Y13 3N	16NR/16EL	
	SM-268	FLPR-33		Y13 2N	16NR/16EL	
	SM-271	FLPL-13		Y13 1.5N	16NR/16EL	
	SM-272	FLPR-13		Y13 1N	16NR/16EL	
	SM-285	FLPR-5		Y13	16NR/16EL	
	SM-286	FLPL-5		Y13 1P	16NR/16EL	
	SM-412	VPGR		Y13 2P	16NR/16EL	
	SM-414	DPGR		Y13 3P	16NR/16EL	
	SM-416	FL-6		Y13M NO FORM	16NR/16EL	
	SM-420	FL-4		Y13M 1N	16NR/16EL	
Laydown L Style 	LS 43 NO FORM EXT	L43 EXT	Y13M 1.5N	16NR/16EL		
	LS 43 NO FORM INT	L43 INT	Y13M 2N	16NR/16EL		
	LS 53 NO FORM EXT	L53 EXT	Y14 3N	22NR/22EL		
	LS 53 NO FORM INT	L53 INT	Y14 2N	22NR/22EL		
	LS 43 API EXT	L43 API EXT	Y14 1.5N	22NR/22EL		
	LS 43 API INT	L43 API INT	Y14 1N	22NR/22EL		
	LS 53 API EXT	L53 API EXT	Y14	22NR/22EL		
	LS 53 API INT	L53 API INT	Y14 1P	22NR/22EL		
	Laydown LT Style 	Description	Angle*	Insert	Y14 2P	22NR/22EL
		YE3 3N	-1.5°	16ER/16NL	Y14 3P	22NR/22EL
YE3 2N		-0.5°	16ER/16NL	Y14M NO FORM	22NR/22EL	
YE3 1.5N		0°	16ER/16NL	Y14M 1N	22NR/22EL	
YE3 1N		0.5°	16ER/16NL	Y14M 1.5N	22NR/22EL	
YE3		1.5°	16ER/16NL	Y14M 2N	22NR/22EL	
YE3 1P		2.5°	16ER/16NL	Y15 3N	27NR/27EL	
YE3 2P		3.5°	16ER/16NL	Y15 2N	27NR/27EL	
YE3 3P		4.5°	16ER/16NL	Y15 1.5N	27NR/27EL	
YE3M NO FORM		1.5°	16ER/16NL	Y15 1N	27NR/27EL	
YE3M 1N	0.5°	16ER/16NL	Y15	27NR/27EL		
YE3M 1.5N	0°	16ER/16NL	Y15 1P	27NR/27EL		
YE3M 2N	-0.5°	16ER/16NL	Y15 2P	27NR/27EL		
YE4 3N	-1.5°	22ER/22NL	Y15 3P	27NR/27EL		
YE4 2N	-0.5°	22ER/22NL	Y15 8NPT 2M	27NR/EL 8NPT 2M		
YE4 1.5N	0°	22ER/22NL	Y15 8RD 2M	27NR/EL 8RD 2M		
YE4 1N	0.5°	22ER/22NL	Y15M NO FORM	27NR/27EL		
YE4	1.5°	22ER/22NL	Y15M 1N	27NR/27EL		
YE4 1P	2.5°	22ER/22NL	Y15M 1.5N	27NR/27EL		
YE4 2P	3.5°	22ER/22NL				
YE4 3P	4.5°	22ER/22NL				
YE4M NO FORM	1.5°	22ER/22NL				
YE4M 1N	0.5°	22ER/22NL				
YE4M 1.5N	0°	22ER/22NL				
YE4M 2N	-0.5°	22ER/22NL				
YE5 3N	-1.5°	27ER/27NL				
YE5 2N	-0.5°	27ER/27NL				
YE5 1.5N	0°	27ER/27NL				
YE5 1N	0.5°	27ER/27NL				
YE5	1.5°	27ER/27NL				
YE5 1P	2.5°	27ER/27NL				
YE5 2P	3.5°	27ER/27NL				
YE5 3P	4.5°	27ER/27NL				
YE5 8NPT 2M	1.5°	27ER/NL 8NPT 2M				
YE5 8RD 2M	1.5°	27ER/NL 8RD 2M				
YE5M NO FORM	1.5°	27ER/27NL				
YE5M 1N	0.5°	27ER/27NL				
YE5M 1.5N	0°	27ER/27NL				
STOP BLOCKS 	Description					
	SBH-1					
	SBH-2					
	SBH-4					
WRENCHES Flag Style Torx 	Description		Wrench			
	K05		T-6 TORX			
	K1		T-7 TORX			
	K2		T-8 TORX			
	K3		T-10 TORX			
	K4		T-20 TORX			
L-Style Torx 	K5		T-25TORX			
	K05L		T-6 TORX			
	K2L		T-8 TORX			
	K3L		T-10 TORX			
	K35L		T-15TORX			
	K4L		T-20 TORX			
K5L		T-25TORX				

*Angle effective in the holder/bar.

We welcome specials! Please call us with your specs.



SPARE PARTS



Infeed Values for Threading Operations

External UN Threads --- Recommendations for Steel Workpieces (<300BHN)

TPI	4	5	6	7	8*	9	10	11	12	13	14	16	18	20	24	28	32	36	40	44	48
THREAD DEPTH	.1578	.1262	.1052	.0902	.0789	.0701	.0631	.0574	.0526	.0485	.0451	.0394	.0350	.0315	.0263	.0225	.0197	.0175	.0157	.0143	.0131
# OF PASSES																					
1	.0353	.0298	.0248	.0213	.0197	.0175	.0169	.0157	.0152	.0142	.0136	.0125	.0124	.0119	.0118	.0112	.0098	.0087	.0078	.0073	.0065
2	.0146	.0122	.0105	.0088	.0082	.0073	.0070	.0066	.0064	.0057	.0059	.0054	.0053	.0049	.0048	.0046	.0042	.0036	.0032	.0028	.0027
3	.0113	.0094	.0078	.0077	.0063	.0056	.0053	.0048	.0048	.0044	.0043	.0039	.0039	.0039	.0039	.0036	.0031	.0028	.0028	.0022	.0020
4	.0095	.0079	.0067	.0059	.0053	.0047	.0045	.0041	.0042	.0037	.0036	.0034	.0033	.0032	.0031	.0031	.0026	.0024	.0020	.0020	.0019
5	.0084	.0070	.0058	.0050	.0047	.0042	.0039	.0036	.0036	.0033	.0032	.0029	.0029	.0028	.0027						
6	.0076	.0063	.0052	.0045	.0043	.0037	.0036	.0031	.0032	.0030	.0029	.0026	.0026	.0025							
7	.0070	.0058	.0048	.0041	.0039	.0034	.0031	.0028	.0029	.0027	.0026	.0024	.0024	.0023							
8	.0065	.0054	.0045	.0038	.0036	.0032	.0030	.0026	.0027	.0025	.0024	.0022	.0022								
9	.0061	.0051	.0042	.0036	.0034	.0030	.0029	.0025	.0026	.0024	.0023	.0021									
10	.0057	.0048	.0040	.0034	.0032	.0028	.0028	.0024	.0025	.0023	.0022	.0020									
11	.0054	.0045	.0038	.0032	.0031	.0027	.0027	.0023	.0023	.0022	.0021										
12	.0052	.0043	.0036	.0031	.0029	.0026	.0026	.0022	.0022	.0021											
13	.0049	.0042	.0035	.0030	.0027	.0025	.0025	.0021													
14	.0048	.0041	.0034	.0029	.0026	.0024	.0024	.0020													
15	.0046	.0040	.0033	.0028	.0025	.0023															
16	.0044	.0039	.0032	.0027	.0025	.0022															
17	.0043	.0038	.0031	.0026																	
18	.0042	.0037	.0030	.0025																	
19	.0041																				
20	.0039																				

Infeed Values for Threading Operations

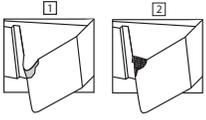
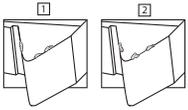
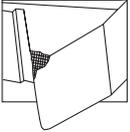
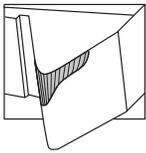
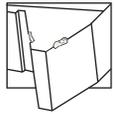
Internal UN Threads --- Recommendations for Steel Workpieces (<300BHN)

TPI	4	5	6	7	8	9	10	11	12	13	14	16	18	20	24	28	32	36	40	44	48
THREAD DEPTH	.1353	.1082	.0902	.0773	.0676	.0601	.0541	.0492	.0451	.0416	.0386	.0338	.0300	.0270	.0225	.0193	.0169	.0150	.0135	.0123	.0112
# OF PASSES																					
1	.0303	.0255	.0213	.0183	.0169	.0150	.0145	.0132	.0131	.0120	.0117	.0107	.0106	.0102	.0101	.0096	.0084	.0075	.0067	.0061	.0056
2	.0125	.0105	.0090	.0076	.0073	.0062	.0064	.0055	.0054	.0050	.0048	.0043	.0044	.0042	.0042	.0039	.0035	.0031	.0029	.0025	.0023
3	.0096	.0083	.0069	.0058	.0053	.0047	.0046	.0044	.0041	.0038	.0037	.0034	.0033	.0032	.0032	.0033	.0027	.0023	.0021	.0019	.0017
4	.0081	.0068	.0057	.0049	.0047	.0040	.0038	.0035	.0035	.0032	.0031	.0028	.0028	.0027	.0027	.0025	.0023	.0021	.0018	.0018	.0011
5	.0071	.0060	.0050	.0043	.0041	.0035	.0034	.0031	.0031	.0028	.0027	.0025	.0025	.0024	.0023						
6	.0064	.0054	.0045	.0039	.0036	.0032	.0031	.0028	.0028	.0025	.0025	.0029	.0023	.0022							
7	.0059	.0050	.0041	.0036	.0033	.0029	.0028	.0026	.0026	.0023	.0023	.0021	.0021	.0021							
8	.055	.0046	.0038	.0033	.0030	.0027	.0026	.0024	.0024	.0022	.0021	.0020	.0029								
9	.0052	.0043	.0036	.0031	.0028	.0025	.0024	.0022	.0022	.0021	.0020	.0019									
10	.0049	.0041	.0034	.0029	.0027	.0024	.0023	.0021	.0021	.0020	.0019	.0018									
11	.0046	.0039	.0032	.0028	.0026	.0023	.0022	.0020	.0020	.0019	.0018										
12	.0044	.0037	.0031	.0027	.0025	.0022	.0021	.0019	.0019	.0018											
13	.0042	.0036	.0030	.0026	.0024	.0021	.0020	.0018													
14	.0041	.0035	.0029	.0025	.0023	.0020	.0019	.0017													
15	.0040	.0034	.0028	.0024	.0022	.0019															
16	.0039	.0033	.0027	.0023	.0021	.0019															
17	.0038	.0032	.0026	.0022																	
18	.0037	.0031	.0025	.0021																	
19	.0036																				
20	.0035																				



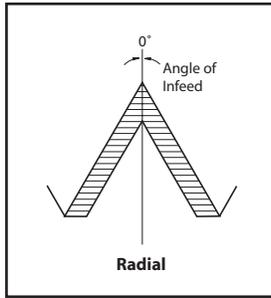
Trouble Shooting & Optimizing Tool Life/ Threading Economy

Modern PVD grades and insert geometries have done much to improve the productivity and reliability of thread turning. They have also helped to eliminate or minimize problems in threading. The following chart lists problems, in order of severity, which may still occur in modern threading.

Problem	Cause	Solution	Problem	Cause	Solution																																																																																														
Plastic Deformation  <p>Starts as plastic deformation (1) which leads to plastic break (2)</p>	Excessive temperature in the cutting area Unsuitable grade Inadequate coolant supply	Reduce cutting speed Increase number of infeeds Reduce the largest infeed depth Check diameter before threading Improve coolant supply Choose grade with better resistance to plastic deformation	Poor Chip Control	Incorrect method of infeed Wrong geometry	Modified Flank infeed 3P-5P "CB" or "HCB" geometry with modified flank infeed 1P																																																																																														
Built-up Edge/ Edge Spalling  <p>Built-up edge (1) and edge spalling (2) often occur in combination. Built-up edge accumulates and is then ripped away taking insert material with it</p>	Cutting edge temperature too low Stainless material; CMC codes 05.2, 05.51, and 05.52 Low carbon steel Unsuitable grade	Increase cutting speed Choose an insert with good toughness, preferably PVD coated	Shallow Profile	Wrong center height Insert breakage Excessive wear	Adjust the center height Change cutting edge																																																																																														
Insert Breakage 	Wrong Diameter prior to threading operation Infeed series too tough Unsuitable grade Poor chip control Center height incorrect	Turn to correct diameter before threading--0.0012-0.0028 radially larger than maximum diameter for thread Increase number of infeeds Reduce size of the large infeeds Choose a tougher grade Change to "CB" geometry and use modified flank infeed Correct center height	Incorrect Thread Profile	Unsuitable thread profile angle of thread and nose radius; external inserts used for internal operation and vice versa Wrong center height Holder not 90P to center line Pitch error in machine	Correct tool / insert combination Adjust the center height Adjust to 90P Correct in machine																																																																																														
Rapid Flank Wear 	Highly abrasive material Cutting speed too high Infeed depths too shallow Insert is above centerline	Choose a more wear resistant grade Reduce cutting speed Reduce number of infeeds Correct center height	Excessive Edge Pressure 	Work hardening material in combination with infeed depths which are too shallow Excessive pressure on cutting edge Profile with too small thread profile angle	Reduce the number of infeeds Change to "CB" or "HCB" geometry Use a tougher grade Use incremental flank infeed																																																																																														
Abnormal Flank Wear Poor Finish on One Flank of Thread	Incorrect method for flank infeed Insert's inclination angle does not agree with thread's lead angle	Change method of infeed Change shim to obtain correct angle of inclination	<h3>ACME TABLE</h3> <table border="1"> <thead> <tr> <th rowspan="2">PITCH</th> <th colspan="2">REGULAR</th> <th colspan="2">STUB</th> </tr> <tr> <th>WIDTH</th> <th>DEPTH</th> <th>WIDTH</th> <th>DEPTH</th> </tr> </thead> <tbody> <tr><td>16</td><td>.0206</td><td>.0362</td><td>.0238</td><td>.0238</td></tr> <tr><td>14</td><td>.0239</td><td>.0407</td><td>.0276</td><td>.0264</td></tr> <tr><td>12</td><td>.0283</td><td>.0467</td><td>.0326</td><td>.0300</td></tr> <tr><td>10</td><td>.0319</td><td>.0600</td><td>.0370</td><td>.0400</td></tr> <tr><td>9</td><td>.0360</td><td>.0656</td><td>.0417</td><td>.0433</td></tr> <tr><td>8</td><td>.0411</td><td>.0725</td><td>.0476</td><td>.0475</td></tr> <tr><td>7</td><td>.0478</td><td>.0814</td><td>.0551</td><td>.0529</td></tr> <tr><td>6</td><td>.0566</td><td>.0933</td><td>.0652</td><td>.0600</td></tr> <tr><td>5</td><td>.0689</td><td>.1100</td><td>.0793</td><td>.0700</td></tr> <tr><td>4</td><td>.0875</td><td>.1350</td><td>.1004</td><td>.0850</td></tr> <tr><td>3-1/2</td><td>.1007</td><td>.1529</td><td>.1155</td><td>.0957</td></tr> <tr><td>3</td><td>.1184</td><td>.1767</td><td>.1356</td><td>.1100</td></tr> <tr><td>2-1/2</td><td>.1431</td><td>.2100</td><td>.1638</td><td>.1300</td></tr> <tr><td>2</td><td>.1802</td><td>.2600</td><td>.2060</td><td>.1600</td></tr> <tr><td>1-1/2</td><td>.2419</td><td>.3433</td><td>.2764</td><td>.2100</td></tr> <tr><td>1-1/3</td><td>.2728</td><td>.3850</td><td>.3116</td><td>.2350</td></tr> <tr><td>1</td><td>.3655</td><td>.5100</td><td>.4172</td><td>.3100</td></tr> </tbody> </table>			PITCH	REGULAR		STUB		WIDTH	DEPTH	WIDTH	DEPTH	16	.0206	.0362	.0238	.0238	14	.0239	.0407	.0276	.0264	12	.0283	.0467	.0326	.0300	10	.0319	.0600	.0370	.0400	9	.0360	.0656	.0417	.0433	8	.0411	.0725	.0476	.0475	7	.0478	.0814	.0551	.0529	6	.0566	.0933	.0652	.0600	5	.0689	.1100	.0793	.0700	4	.0875	.1350	.1004	.0850	3-1/2	.1007	.1529	.1155	.0957	3	.1184	.1767	.1356	.1100	2-1/2	.1431	.2100	.1638	.1300	2	.1802	.2600	.2060	.1600	1-1/2	.2419	.3433	.2764	.2100	1-1/3	.2728	.3850	.3116	.2350	1	.3655	.5100	.4172	.3100
PITCH	REGULAR		STUB																																																																																																
	WIDTH	DEPTH	WIDTH	DEPTH																																																																																															
16	.0206	.0362	.0238	.0238																																																																																															
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12	.0283	.0467	.0326	.0300																																																																																															
10	.0319	.0600	.0370	.0400																																																																																															
9	.0360	.0656	.0417	.0433																																																																																															
8	.0411	.0725	.0476	.0475																																																																																															
7	.0478	.0814	.0551	.0529																																																																																															
6	.0566	.0933	.0652	.0600																																																																																															
5	.0689	.1100	.0793	.0700																																																																																															
4	.0875	.1350	.1004	.0850																																																																																															
3-1/2	.1007	.1529	.1155	.0957																																																																																															
3	.1184	.1767	.1356	.1100																																																																																															
2-1/2	.1431	.2100	.1638	.1300																																																																																															
2	.1802	.2600	.2060	.1600																																																																																															
1-1/2	.2419	.3433	.2764	.2100																																																																																															
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1	.3655	.5100	.4172	.3100																																																																																															
Vibration	Incorrect clamping work piece Incorrect set-up of the tool Incorrect cutting data Incorrect center height	Use softer jaws Minimize overhang of tool Check that the clamping sleeve for bars is not worn Increase cutting speed; if this does not help lower speed dramatically Use constant infeed series Try "CB" or "HCB" geometry Adjust the center height Use heavy metal, solid carbide or carbide cored bar.																																																																																																	
Bottom Surface Quality	Cutting speed too low The insert is above center Uncontrolled chips	Increase cutting speed Adjust center height Use "CB" or "HCB" geometry and modified flank infeed																																																																																																	



Optional Infeed Angles for Threading Applications



Advantage-

Cutting on both sides of the thread form places all of the cutting edge in the cut and protects edge from chipping.

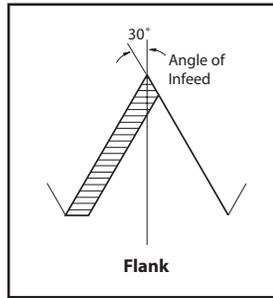
Disadvantage-

Tool develops a channel chip which may be difficult to handle.

Tip chipping occurs when cutting high-tensile materials.

Burr condition is increased.

Entire cutting edge is engaged at finish of thread, causing increased tendency to chatter.



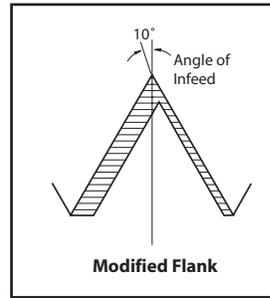
Advantage-

Cutting with the leading edge of the threading tool gives the chip a definite flow out of the thread form area. This reduces the burr problem on the trailing edge of the tool. To avoid bad surface finish, chipping, or excessive flank wear due to rubbing of the trailing edge, the infeed angle should be 3P to 5P smaller than the angle of the thread. This is a type of modified flank.

Disadvantage-

Trailing edge of threading insert may drag or rub, and tends to chip.

Torn or poor surface finish threads result when cutting soft, gummy materials such as low carbon steels, aluminum, and stainless steels.

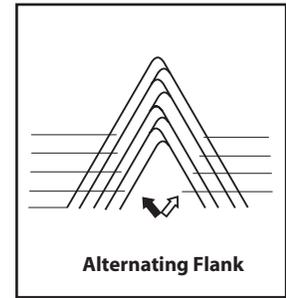


Advantage-

Tool cuts both sides of thread form and, therefore, is protected from chipping similar to 0P infeed. Channel-type chip develops but uneven chip thickness helps remove the chip similar to flank infeed.

Disadvantage-

Similar disadvantages as with 0P infeed, although slightly reduced in magnitude as the cutting forces are better equalized and chip flow is much less of a problem.



Advantage-

Increased tool life because both edges are used equally. NOTE: Some machine tools may require special programming techniques to achieve this method.

Disadvantage-

Difficult to cut on conventional machinery.

*For premium performance based upon optimal machining conditions, select the grade that will provide you with the highest allowable SFM for the material that is being machined. Optimum grades are in bold print. Grades are specific to certain insert styles. The grades listed below in bold print are stock within the style listed, see appropriate catalog page for precise stocking status.

Bantam: C22 GP22 GP4 AC22	Flo-Lock: C25 GP4 GP3 GP4 GP5 GP50 AC22 AC3 AC50 GPM6 CB200 CB400 PC33 C22 C3	Laydown: GP22 GP3 GP5 GP50 AC22 AC50 C22	Threadmill: C3 GP3 GP22
Ballnose: C26 ZS26 CB400 DX200		Milling: GP5 C5H	Turning: G525 (Negative) AG525 AG535 AG615
Chasers: G50 GP50 AC50 ZA50		On Edge: GP22 GP3 GP54 GP50 GPM6 AC22 AC3 AC50 AC54 C22 C25 C3	Turning: AC3 (Positive) AC50 C3
Cutoff: GP22 AC22 AC50 C22	Laydown: GP22 (LT style) GP4 GP50 AC22 AC50 C22		V-Bottom: GP3 (V84/V85) GP50 AC50 C3
			V-Bottom: C3 (VDB/VDG) GP3 AC3 AC50 CB200 CB400 PC33



Recommended SFM for Grooving Applications

	Free Machining Carbon Steels	Plain Carbon Steels	Alloy Steels 190-330 HB	Alloy Steels 330-450 HB	Martensitic/Ferritic Stainless Steel 400 Series	Austenitic Stainless 300 Series	Gray Cast Iron 190-330 HB	Gray Cast Iron 330-450 HB	Alloy / Ductile Irons	Free Machining Aluminum Alloys	High-Silicon Aluminum Alloys	Copper / Zinc / Brass	Non-Metallics	High Temperature Alloys 200-260 HB	High Temperature Alloys 260-450 HB	Titanium Alloys (Ti 6Al-4V)	Hardened Materials 48-65 HRC
C22	---	---	---	---	---	150-300	100-350	100-300	---	100-1500	---	100-500	100-1000	80-130	50-100	100-200	---
C25	---	---	---	---	---	200-350	100-375	100-350	---	200-1700	---	200-600	400-1200	80-130	50-100	100-200	---
C26S	---	---	---	---	---	---	---	---	---	1500-3K	---	400-800	400-1200	---	---	---	---
C3	---	---	---	---	---	200-400	100-375	100-350	---	200-2K	---	200-700	400-1400	80-130	50-100	100-200	---
G50	300-700	300-700	300-700	300-600	300-600	---	---	---	300-600	---	---	---	---	---	---	---	---
GP22	150-300	150-300	150-300	150-300	150-300	150-400	150-400	150-350	150-300	150-2K	---	150-700	500-1500	100-175	80-150	100-250	---
GP25	150-300	150-300	150-300	150-300	150-300	150-400	150-400	150-350	150-300	150-2K	---	150-700	500-1500	100-175	80-150	100-250	---
GP26	400-800	400-800	300-600	200-500	300-600	200-500	400-800	300-600	300-600	1200-3500	---	300-8K	300-1200	100-200	100-200	100-250	---
GP3	200-400	200-400	200-400	200-350	200-400	200-500	200-600	200-500	200-100	300-2K	---	200-900	300-1500	100-200	100-175	150-300	---
GP4	60-175	60-175	60-150	60-150	60-150	60-150	60-150	60-150	60-150	60-150	---	---	---	50-80	50-80	50-80	---
GP5	200-500	200-500	200-400	200-400	200-400	---	---	---	200-400	---	---	---	---	---	---	---	---
GP54	200-500	200-500	200-400	200-400	200-400	---	---	---	200-400	---	---	---	---	---	---	---	---
GP50	200-600	200-600	200-500	200-450	200-500	---	---	---	200-500	---	---	---	---	---	---	---	---
AC22	250-500	250-500	250-450	250-400	200-450	300-600	300-600	200-550	250-450	600-2200	---	300-900	350-1200	80-200	80-175	80-300	---
AC26	500-1K	500-1K	400-800	300-600	400-800	300-700	500-1000	400-800	400-800	1500-5K	---	400-1K	400-1500	100-200	100-200	200-300	---
AC3	250-450	250-450	250-400	250-400	250-450	250-700	300-700	300-600	200-450	600-2500	---	400-1K	400-1500	100-250	100-200	100-300	80-150
AC54	350-500	350-500	350-500	300-500	300-500	---	---	---	300-500	---	---	---	---	---	---	---	---
AC50	400-800	450-800	400-800	400-750	350-700	---	---	---	300-700	---	---	---	---	---	---	---	---
ZA22	250-500	250-500	250-450	250-400	200-450	300-600	300-600	200-550	250-450	600-2200	---	300-900	350-1200	80-200	80-175	80-300	---
ZA26	500-1K	500-1K	400-800	300-600	400-800	300-700	500-1000	400-800	400-800	1500-5K	---	400-1K	400-1500	100-200	100-200	200-300	---
ZA3	250-450	250-450	250-400	250-400	250-450	250-700	300-700	300-600	200-450	600-2500	---	400-1K	400-1500	100-250	100-200	100-300	80-150
ZA50	400-800	450-800	400-800	400-750	350-700	---	---	---	300-700	---	---	---	---	---	---	---	---
ZL22	250-500	250-500	250-450	250-400	200-450	300-600	300-600	200-550	250-450	600-2200	---	300-900	350-1200	80-200	80-175	80-300	---
ZL26	500-1K	500-1K	400-800	300-600	400-800	300-700	500-1000	400-800	400-800	1500-5K	---	400-1K	400-1500	100-200	100-200	200-300	---
ZL3	250-450	250-450	250-400	250-400	250-450	250-700	300-700	300-600	200-450	600-2500	---	400-1K	400-1500	100-250	100-200	100-300	80-150
ZR22	250-500	250-500	250-450	250-400	200-450	300-600	300-600	200-550	250-450	600-2200	---	300-900	350-1200	80-200	80-175	80-300	---
ZR26	500-1K	500-1K	400-800	300-600	400-800	300-700	500-1000	400-800	400-800	1500-5K	---	400-1K	400-1500	100-200	100-200	200-300	---
ZR3	250-450	250-450	250-400	250-400	250-450	250-700	300-700	300-600	200-450	600-2500	---	400-1K	400-1500	100-250	100-200	100-300	80-150
ZR50	400-800	450-800	400-800	400-750	350-700	---	---	---	300-700	---	---	---	---	---	---	---	---
ZS22	250-500	250-500	250-450	250-400	200-450	300-600	300-600	200-550	250-450	600-2200	---	300-900	350-1200	80-200	80-175	80-300	---
ZS26	500-1K	500-1K	400-800	300-600	400-800	300-700	500-1000	400-800	400-800	1500-5K	---	400-1K	400-1500	100-200	100-200	200-300	---
ZS3	250-450	250-450	250-400	250-400	250-450	250-700	300-700	300-600	200-450	600-2500	---	400-1K	400-1500	100-250	100-200	100-300	80-150
ZS50	400-800	450-800	400-800	400-750	350-700	---	---	---	300-700	---	---	---	---	---	---	---	---
ZU22	250-500	250-500	250-450	250-400	200-450	300-600	300-600	200-550	250-450	600-2200	---	300-900	350-1200	80-200	80-175	80-300	---
ZU26	500-1K	500-1K	400-800	300-600	400-800	300-700	500-1000	400-800	400-800	1500-5K	---	400-1K	400-1500	100-200	100-200	200-300	---
ZU3	250-450	250-450	250-400	250-400	250-450	250-700	300-700	300-600	200-450	600-2500	---	400-1K	400-1500	100-250	100-200	100-300	80-150
ZU50	400-800	450-800	400-800	400-750	350-700	---	---	---	300-700	---	---	---	---	---	---	---	---
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Zenith

Grade Name	ANSI range	ISO range	Coating	Description
C2	C1-C2	K05-K15	Uncoated	Uncoated general purpose C2 grade. Good for all non-ferrous materials.
C22	C1	K30	Uncoated	Uncoated grade with a tough, micro-grain, unalloyed substrate. Good for threading at low to medium speeds, while capable of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
C25	C1-C2	K05-K10 M05-M10	Uncoated	Uncoated general purpose C2 grade. Good for all non-ferrous materials.
C26S	C1	K30-K40	Uncoated	Uncoated grade with a tough, fine grain, unalloyed substrate. Main uncoated grade for Rigid-lock endmill inserts. Edge is up-sharp for use in non-ferrous and composite applications.
C3	C3	K15-K25 M05-M20	Uncoated	Uncoated micro-grain C3 grade. Versatile grade that combines high hardness with toughness. Good for all non-ferrous, stainless steel, and nickel-based alloys at low to medium SFM.
GFI	C1-C5A	K30/P30	Uncoated	Uncoated extremely tough grade that perform well at very slow SFPM with minimal breakage or chipping.
C5	C5	P10-P35 M15-M30	Uncoated	Uncoated general purpose C5 grade. Good for all carbon/alloy steels at low to medium SFM.
C6	C6	P15-P20 M10-M20	Uncoated	Uncoated general purpose C5/C6 harder grade. Good for all carbon/alloy steels at low to medium SFM.
GP2	C1-C2	K05-K15	PVD TiN coated	PVD TiN coated grade. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
GP22	C1	K30	PVD TiN coated	PVD TiN grade with a tough, micro-grain substrate. Good for threading at low to medium speeds, while capable of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
GP25	C1-C2	K05-K10 M05-M10	PVD TiN coated	PVD TiN coated general purpose C2 grade. Good for all non-ferrous materials at low to medium SFM.
GP26	C1	K30-K40	PVD TiN coated	PVD TiN grade with a tough, micro-grain, unalloyed substrate. Rigid-Lok endmill grade. Good choice for steels, stainless, high-temperature alloys, and non-ferrous materials. Good in low to high SFM, will handle interruptions and high feed rates.
GP3	C3	K15-K25 M05-M20	PVD TiN coated	PVD TiN grade with a wear resistant micro-grain substrate. Excellent choice in stainless steels, high-temperature alloys, aerospace materials, and non-ferrous materials. Good in standard steels at low to medium SFM.
GP4	C1-C5A	K30/P30	PVD TiN coated	PVD TiN grade with our toughest substrate. First choice at low SFM (50-150) applications and heavy interruptions. Used in all applications where tool breakage is an issue.
GP44	C5A	P35-P50	PVD TiN coated	PVD TiN coated extremely tough sub-micron grade that perform well at very slow SFPM with minimal breakage or chipping.
GP5	C5	P10-P35 M15-M30	PVD TiN coated	PVD TiN grade with a medium tough substrate. Good general purpose grade for steel applications. Primary grade in LPGC and TPGC style inserts.
GP50	C5	P10-P35 M15-M30	PVD TiN coated	PVD TiN grade with a medium tough substrate and excellent wear properties. Great general purpose grade for steel applications.
GP54	C5A	P35-P50	PVD TiN coated	PVD TiN grade with a tough substrate.
GP6	C6	P15-P20 M10-M20	PVD TiN coated	PVD TiN coated general purpose grade. Good for all carbon/alloy steels at medium SFM.
AC2	C1-C2	K05-K15	PVD AlTiN coated	PVD AlTiN coated grade with a tough, micro-grain, unalloyed substrate. Good for threading at low to medium speeds, while capable of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
AC22	C1	K30	PVD AlTiN coated	PVD TiAlN grade with a tough, micro-grain substrate. First choice in Laydown Threading in all materials. Dry machining capable.
AC25	C1-C2	K05-K10 M05-M10	PVD AlTiN coated	PVD AlTiN coated general purpose C2 grade. Good for all non-ferrous materials at medium to high SFM.
AC26	C1	K30-K40	PVD AlTiN coated	PVD TiAlN grade with a tough, fine grain, unalloyed substrate with excellent wear properties. First choice in Rigid-Lock inserts for steels, stainless, high-temp alloys, and non-ferrous materials. Performs very well at low to high SFM and will handle interruptions and high feed rates. Coating provides highest resistance to oxidation, physical abrasion, and chip welding. Dry machining capable.
AC3	C3	K15-K25 M05-M20	PVD AlTiN coated	PVD TiAlN grade. First choice for grooving and threading in stainless steel, high-temperature alloys, aerospace materials, and non-ferrous materials. Excellent in standard steels at medium SFM. Dry machining capable.
AC5	C5	P10-P35 M15-M30	PVD AlTiN coated	PVD AlTiN coated general purpose grade. Good for all carbon/alloy steels at medium to high SFM.
AC50	C5	P10-P35 M15-M30	PVD AlTiN coated	PVD TiAlN grade. First choice for grooving and threading in all standard steels and 400 series stainless. Application range is medium to high SFM. Dry machining capable.
AC54	C5A	P35-P50	PVD AlTiN coated	PVD AlTiN coated grade. Good for all carbon/alloy steels at medium SFM.
AC6	C6	P15-P20 M10-M20	PVD AlTiN coated	PVD AlTiN coated grade. Good for all carbon/alloy steels at medium SFM.

COATINGS



Grade Name	ANSI range	ISO range	Coating	Description
ZA22	C1	K30	PVD AlTiN coated	PVD TiAlN grade with a tough, micro-grain substrate. Dry machining capable.
ZA26	C1	K30-K40	PVD AlTiN coated	PVD TiAlN grade with a tough, fine grain, unalloyed substrate with excellent wear properties. First choice in Rigid-Lock inserts for steels, stainless, high-temp alloys, and non-ferrous materials. Performs very well at low to high SFM and will handle interruptions and high feed rates. Coating provides highest resistance to oxidation, physical abrasion, and chip welding. Dry machining capable.
ZA3	C3	K15-K25 M05-M20	PVD AlTiN coated	PVD TiAlN grade. First choice for grooving in stainless steel, high-temperature alloys, aerospace materials, and non-ferrous materials. Excellent in standard steels at medium SFM. Dry machining capable.
ZA50	C5	P10-P35 M15-M30	PVD AlTiN coated	PVD TiAlN grade. First choice for grooving and threading in all standard steels and 400 series stainless. Application range is medium to high SFM. Dry machining capable.
ZS22	C1	K30	PVD AlTiN coated	PVD AlTiN grade with a tough, micro-grain substrate. Good in Laydown Threading in all materials. Dry machining capable.
ZS26	C1	K30-K40	PVD AlTiN coated	PVD AlTiN grade with extra lubricity, a tough, fine grain, unalloyed substrate with excellent wear properties. First choice in Rigid-Lock inserts for steels, stainless, high-temp alloys, and non-ferrous materials. Performs very well at low to high SFM and will handle interruptions and high feed rates. Coating provides highest resistance to oxidation, physical abrasion, and chip welding. Dry machining capable.
ZS3	C3	K15-K25 M05-M20	PVD AlTiN coated	PVD AlTiN grade for grooving and threading in stainless steel, high-temperature alloys, aerospace materials, and non-ferrous materials. Excellent in standard steels at medium SFM. Dry machining capable.
ZS50	C5	P10-P35 M15-M30	PVD AlTiN coated	PVD AlTiN grade for grooving and threading in all standard steels and 400 series stainless. Application range is medium to high SFM. Dry machining capable.
ZL22	C1	K30	PVD AlTiN coated	PVD grade with a tough, micro-grain, unalloyed substrate. Good for turning at low to medium speeds, while capable of handling interruptions. Works well in high-temperature alloys and aluminum.
ZL26	C1	K30-K40	PVD AlTiN coated	PVD grade with a tough, micro-grain, unalloyed substrate. Rigid-Lok endmill grade. Good choice for aluminum, high-temperature alloys, and non-ferrous materials. Good in low to high SFM, will handle interruptions and high feed rates.
ZL3	C3	K15-K25 M05-M20	PVD AlTiN coated	PVD grade with a wear resistant micro-grain substrate. Excellent choice in high-temperature alloys, aerospace materials, and non-ferrous materials.
ZR22	C1	K30	PVD AlTiN coated	PVD AlTiN grade with a tough, micro-grain, unalloyed substrate. Good for threading at low to medium speeds, while capable of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
ZR26	C1	K30-K40	PVD AlTiN coated	PVD AlTiN grade with a tough, micro-grain, unalloyed substrate. Rigid-Lok endmill grade. Good choice for steels, stainless, high-temperature alloys, and non-ferrous materials. Good in low to high SFM, will handle interruptions and high feed rates.
ZR3	C3	K15-K25 M05-M20	PVD AlTiN coated	PVD AlTiN grade with a wear resistant micro-grain substrate. Excellent choice in stainless steels, high-temperature alloys, aerospace materials, and non-ferrous materials. Good in standard steels at low to medium SFM.
ZR50	C5	P10-P35 M15-M30	PVD AlTiN coated	PVD AlTiN grade with a medium tough substrate and excellent wear properties. Great general purpose grade for steel applications.
ZU22	C1	K30	PVD AlTiN coated	PVD AlTiN grade with a tough, micro-grain, unalloyed substrate. Good for threading at low to medium speeds, while capable of handling interruptions. Works well in stainless steel, high-temperature alloys, and standard steels at low to medium SFM.
ZU26	C1	K30-K40	PVD AlTiN coated	PVD AlTiN grade with a tough, micro-grain, unalloyed substrate. Rigid-Lok endmill grade. Good choice for steels, stainless, high-temperature alloys, and non-ferrous materials. Good in low to high SFM, will handle interruptions and high feed rates.
ZU3	C3	K15-K25 M05-M20	PVD AlTiN coated	PVD AlTiN grade with a wear resistant micro-grain substrate. Excellent choice in stainless steels, high-temperature alloys, aerospace materials, and non-ferrous materials. Good in standard steels at low to medium SFM.
ZU50	C5	P10-P35 M15-M30	PVD AlTiN coated	PVD AlTiN grade with a medium tough substrate and excellent wear properties. Great general purpose grade for steel applications.
GPM6	C6/C7	P1-P10 K1-K10	PVD TiN coated Cermet	PVD TiN coated cermet grade. First choice for grooving in high-speed finishing of most carbon, alloy, and stainless steels. Performs very well in cast and ductile irons. Provides excellent workpiece finishes.
G50	C5	P10-P35 M15-M30	CVD coated	CVD TiN/TiC/TiN grade. API chaser grade for Q-Series material.
CB200	C8	K01	PCBN	PCBN tip brazed onto a carbide insert. High content CBN. First choice for cast iron and high-temperature alloys. Suited for roughing to finishing in hardened steels greater than 45 HRC, such as bearing steel, hot and cold work tool steels, high-speed steels, die steels, case hardened steels, nitrided irons, and some hard coatings.
CB400	C8		PCBN	PCBN tip brazed onto a carbide insert. Low content CBN. First choice for roughing to finishing of hardened steels 45 HRC and higher. Use on bearing steel, hot and cold work steels, die steels, case hardened steels, carburized and nitrided irons.
CB410	C8		PCBN	PCBN tip brazed onto a carbide insert. Low content CBN. First choice for roughing to finishing of hardened steels 45 HRC and higher. Use on bearing steel, hot and cold work steels, die steels, case hardened steels, carburized and nitrided irons.
PC33			PCD	PCD tip brazed onto a carbide insert. First choice for high silicone aluminum applications at high SFM. Use on all types of highly abrasive materials including non-ferrous metals and non-metallics. High SFM only!
DX200	C1-C2	K05-K15	PCD CVD coated	PCD CVD coated grade. Rigid-Lock insert grade. First choice at high SFM in non-metallic materials such as graphite, epoxy based resins, plastics and aluminum.

ORDERING INFORMATION

CONDITION OF SALE

Sales are made in accordance with our standard Conditions of Sale current at the time orders are accepted. Specifications and prices subject to change without notice.

QUOTATIONS

Will be subject to acceptance 60 days from the date of quotation unless otherwise agreed. **In order to receive special quoted pricing, a quote number must be referenced at the time the order is placed.**

TERMS OF PAYMENT

Net 30 Days

DELIVERY TERMS

F.O.B. Shipping point; Charges will be added to invoice.

WARRANTY

We will replace any material which is proven defective within 90 days from date of shipment to the customer. No claim for labor or damage will be allowed. Claims for error must be made upon receipt of material.

PRICING

So far as the resale of items in this price list is concerned, the prices referred to are to be regarded as suggested only. The distributor, in its sole discretion, determines the actual resale price. These suggested resale prices are based on quantities of identical items released by purchaser on one order for shipment at one time to one destination. The reseller should determine whether savings in cost can justify the suggested quantity price differential, as may be required by the Robinson-Patman Act or other applicable law.

OVER AND UNDER SHIPMENTS

For Non-Stock or Special items, unless otherwise specified or agreed, the following over and under allowances may be made:

Lots of	10-19	20-49	50-99	100+
Over/Under	1 piece	2 pieces	3 pieces	5%

MINIMUM ORDER

\$50 Net per order. For Extended Discount Program - \$100 Net per order.

RETURNS

Each Distributor will be allowed at a certain time of year to exchange 1% of their Net Sales for the previous year up to a maximum of \$1,000. These exchanges will be limited to Stock Standard items only and will be replaced by such. The exchange schedule is as follows:

Group A Distributors:	January - March
Group B Distributors:	July - September
Group C Distributors:	April - June
Group D Distributors:	October - December

All Non-Stock and Specials are non-returnable and/or non-exchangeable.

A Returned Material Authorization (RMA) number must be assigned by Tool-Flo prior to any material being returned. Purchase Order numbers and original invoice numbers must be supplied before an RMA number can be issued.

RELEASE ORDER POLICY

- A. Prices are to be based on total quantity of each item. Prices will be firm for six (6) months from the date of purchase. In the event of a price increase during the term of the order, one of the following conditions will apply:
1. If the increase becomes effective during the first six (6) months of the order, the balance of the order can be released within six (6) months from the date of purchase at existing prices. Any subsequent releases will be invoiced at the new price.
 2. If the increase becomes effective after the first six (6) months of the order, the balance can be released immediately upon notification of the price increase at existing prices. All items not released immediately will be invoiced at the new price.
- B. Minimum release order is 400 pieces. Releases must be made ever 30 days. Initial release must be made within 30 days of order date. Minimum release is 50 pieces every 30 days. Releases not to exceed twelve (12) months. At the end of the twelve (12) month period from the date of the order, any remaining pieces will be shipped.

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CHL/R-FCS.....	72	H-AVR.....	23,126	SI-MTFNL/R.....	199		
CLVOR.....	68	H-BLANK.....	25	SI-MTHOL/R.....	157		