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MultiDRILL™

- Advanced flute profile designed to enhance chip evacuation of varying materials.
- Radius cutting edge for high shearing action
- Self centering
- Unique TIALN-T63 tool coating for heat and wear resistance
- Double margin

3xD

5xD



- Coolant holes
- m7 Tolerance on cutting diameter
- h6 Tolerance on shank diameter

COOLANT FED - TIALN-T63 COATING

Size			Shank Dia. (mm)	3xD			Shank Dia. (mm)	5xD		
DEC.	INCH	mm		OAL (mm)	Flute Length (mm)	Part#		OAL (mm)	Flute Length (mm)	Part#
0.1181	1/8"	3.000	6	62	20	TA209744.0300	66	28	TA219744.0300	
0.1220		3.100	6	62	20	TA209744.0310	66	28	TA219744.0310	
0.1240		3.150	6	62	20	TA209744.0315	66	28	TA219744.0315	
0.1250		3.175	6	62	20	TA209744.0318	66	28	TA219744.0318	
0.1260		3.200	6	62	20	TA209744.0320	66	28	TA219744.0320	
0.1268		3.220	6	62	20	TA209744.0322	66	28	TA219744.0322	
0.1280		3.250	6	62	20	TA209744.0325	66	28	TA219744.0325	
0.1299		3.300	6	62	20	TA209744.0330	66	28	TA219744.0330	
0.1319		3.350	6	62	20	TA209744.0335	66	28	TA219744.0335	
0.1331		3.380	6	62	20	TA209744.0338	66	28	TA219744.0338	
0.1339	9/64", #28	3.400	6	62	20	TA209744.0340	66	28	TA219744.0340	
0.1378		3.500	6	62	20	TA209744.0350	66	28	TA219744.0350	
0.1406		3.571	6	62	20	TA209744.0357	66	28	TA219744.0357	
0.1417		3.600	6	62	20	TA209744.0360	66	28	TA219744.0360	
0.1437		3.650	6	62	20	TA209744.0365	66	28	TA219744.0365	
0.1457		3.700	6	62	20	TA209744.0370	66	28	TA219744.0370	
0.1496		3.800	6	66	24	TA209744.0380	74	36	TA219744.0380	
0.1516		3.850	6	66	24	TA209744.0385	74	36	TA219744.0385	
0.1528		3.880	6	66	24	TA209744.0388	74	36	TA219744.0388	
0.1535		3.900	6	66	24	TA209744.0390	74	36	TA219744.0390	
0.1563	5/32"	3.970	6	66	24	TA209744.0397	74	36	TA219744.0397	
0.1575		4.000	6	66	24	TA209744.0400	74	36	TA219744.0400	
0.1590		4.038	6	66	24	TA209744.0404	74	36	TA219744.0404	
0.1614		4.100	6	66	24	TA209744.0410	74	36	TA219744.0410	
0.1634		4.150	6	66	24	TA209744.0415	74	36	TA219744.0415	
0.1654		4.200	6	66	24	TA209744.0420	74	36	TA219744.0420	
0.1693		4.300	6	66	24	TA209744.0430	74	36	TA219744.0430	
0.1713		4.350	6	66	24	TA209744.0435	74	36	TA219744.0435	
0.1719		4.366	6	66	24	TA209744.0437	74	36	TA219744.0437	
0.1732		4.400	6	66	24	TA209744.0440	74	36	TA219744.0440	
0.1752	#25	4.450	6	66	24	TA209744.0445	74	36	TA219744.0445	
0.1772		4.500	6	66	24	TA209744.0450	74	36	TA219744.0450	
0.1811		4.600	6	66	24	TA209744.0460	74	36	TA219744.0460	
0.1831		4.650	6	66	24	TA209744.0465	74	36	TA219744.0465	
0.1850		4.700	6	66	24	TA209744.0470	74	36	TA219744.0470	
0.1875		4.763	6	66	28	TA209744.0476	82	44	TA219744.0476	
0.1890		4.800	6	66	28	TA209744.0480	82	44	TA219744.0480	
0.1929		4.900	6	66	28	TA209744.0490	82	44	TA219744.0490	
0.1969		5.000	6	66	28	TA209744.0500	82	44	TA219744.0500	
0.2008		5.100	6	66	28	TA209744.0510	82	44	TA219744.0510	
0.2010	#7	5.106	6	66	28	TA209744.0511	82	44	TA219744.0511	
0.2031		5.159	6	66	28	TA209744.0516	82	44	TA219744.0516	
0.2047		5.200	6	66	28	TA209744.0520	82	44	TA219744.0520	
0.2087		5.300	6	66	28	TA209744.0530	82	44	TA219744.0530	
0.2126		5.400	6	66	28	TA209744.0540	82	44	TA219744.0540	
0.2130		5.410	6	66	28	TA209744.0541	82	44	TA219744.0541	
0.2165		5.500	6	66	28	TA209744.0550	82	44	TA219744.0550	
0.2187		5.556	6	66	28	TA209744.0556	82	44	TA219744.0556	
0.2205		5.600	6	66	28	TA209744.0560	82	44	TA219744.0560	
0.2244		5.700	6	66	28	TA209744.0570	82	44	TA219744.0570	
0.2264	13/64"	5.750	6	66	28	TA209744.0575	82	44	TA219744.0575	
0.2283		5.800	6	66	28	TA209744.0580	82	44	TA219744.0580	
0.2323		5.900	6	66	28	TA209744.0590	82	44	TA219744.0590	
0.2344		5.954	6	66	28	TA209744.0595	82	44	TA219744.0595	
0.2362		6.000	6	66	28	TA209744.0600	82	44	TA219744.0600	
0.2402		6.100	8	79	34	TA209744.0610	91	53	TA219744.0610	
0.2441		6.200	8	79	34	TA209744.0620	91	53	TA219744.0620	
0.2480		6.300	8	79	34	TA209744.0630	91	53	TA219744.0630	
0.2500		6.350	8	79	34	TA209744.0635	91	53	TA219744.0635	
0.2520		6.400	8	79	34	TA209744.0640	91	53	TA219744.0640	
0.2559	1/4", E	6.500	8	79	34	TA209744.0650	91	53	TA219744.0650	
0.2570		6.528	8	79	34	TA209744.0653	91	53	TA219744.0653	
0.2598		6.600	8	79	34	TA209744.0660	91	53	TA219744.0660	
0.2638		6.700	8	79	34	TA209744.0670	91	53	TA219744.0670	
0.2656		6.746	8	79	34	TA209744.0675	91	53	TA219744.0675	
0.2677		6.800	8	79	34	TA209744.0680	91	53	TA219744.0680	
0.2717		6.900	8	79	34	TA209744.0690	91	53	TA219744.0690	
0.2756		7.000	8	79	34	TA209744.0700	91	53	TA219744.0700	
0.2795		7.100	8	79	41	TA209744.0710	91	53	TA219744.0710	
0.2813		7.145	8	79	41	TA209744.0715	91	53	TA219744.0715	
0.2835	9/32", K	7.200	8	79	41	TA209744.0720	91	53	TA219744.0720	
0.2854		7.250	8	79	41	TA209744.0725	91	53	TA219744.0725	
0.2874		7.300	8	79	41	TA209744.0730	91	53	TA219744.0730	
0.2913		7.400	8	79	41	TA209744.0740	91	53	TA219744.0740	
0.2933		7.450	8	79	41	TA209744.0745	91	53	TA219744.0745	
0.2953		7.500	8	79	41	TA209744.0750	91	53	TA219744.0750	
0.2969		7.541	8	79	41	TA209744.0754	91	53	TA219744.0754	
0.2992		7.600	8	79	41	TA209744.0760	91	53	TA219744.0760	
0.3031		7.700	8	79	41	TA209744.0770	91	53	TA219744.0770	
0.3071		7.800	8	79	41	TA209744.0780	91	53	TA219744.0780	
0.3110	5/16"	7.900	8	79	41	TA209744.0790	91	53	TA219744.0790	
0.3125		7.938	8	79	41	TA209744.0794	91	53	TA219744.0794	
0.3150		8.000	8	79	41	TA209744.0800	91	53	TA219744.0800	
0.3189		8.100	10	89	47	TA209744.0810	103	61	TA219744.0810	
0.3228		8.200	10	89	47	TA209744.0820	103	61	TA219744.0820	
0.3268		8.300	10	89	47	TA209744.0830	103	61	TA219744.0830	
0.3281		8.334	10	89	47	TA209744.0833	103	61	TA219744.0833	
0.3307		8.400	10	89	47	TA209744.0840	103	61	TA219744.0840	
0.3327		8.450	10	89	47	TA209744.0845	103	61	TA219744.0845	
0.3346		8.500	10	89	47	TA209744.0850	103	61	TA219744.0850	
0.3386	21/64"	8.600	10	89	47	TA209744.0860	103	61	TA219744.0860	
0.3425		8.700	10	89	47	TA209744.0870	103	61	TA219744.0870	
0.3438		8.733	10	89	47	TA209744.0873	103	61	TA219744.0873	

Size			Shank Dia. (mm)	3xD			5xD			
DEC.	INCH	mm		OAL (mm)	Flute Length (mm)	Part#	OAL (mm)	Flute Length (mm)	Part#	
0.3465	23/64"	8.800	10	89	47	TA209744.0880	103	61	TA219744.0880	
0.3504		8.900	10	89	47	TA209744.0890	103	61	TA219744.0890	
0.3543		9.000	10	89	47	TA209744.0900	103	61	TA219744.0900	
0.3563		9.050	10	89	47	TA209744.0905	103	61	TA219744.0905	
0.3583		9.100	10	89	47	TA209744.0910	103	61	TA219744.0910	
0.3594		9.129	10	89	47	TA209744.0913	103	61	TA219744.0913	
0.3622		9.200	10	89	47	TA209744.0920	103	61	TA219744.0920	
0.3661		9.300	10	89	47	TA209744.0930	103	61	TA219744.0930	
0.3681		9.350	10	89	47	TA209744.0935	103	61	TA219744.0935	
0.3701		9.400	10	89	47	TA209744.0940	103	61	TA219744.0940	
0.3720	3/8"	9.450	10	89	47	TA209744.0945	103	61	TA219744.0945	
0.3740		9.500	10	89	47	TA209744.0950	103	61	TA219744.0950	
0.3750		9.525	10	89	47	TA209744.0953	103	61	TA219744.0953	
0.3780		9.600	10	89	47	TA209744.0960	103	61	TA219744.0960	
0.3819		9.700	10	89	47	TA209744.0970	103	61	TA219744.0970	
0.3858		9.800	10	89	47	TA209744.0980	103	61	TA219744.0980	
0.3898		9.900	10	89	47	TA209744.0990	103	61	TA219744.0990	
0.3906		25/64"	9.922	10	89	47	TA209744.0992	103	61	TA219744.0992
0.3937			10.000	10	89	47	TA209744.1000	103	61	TA219744.1000
0.3976			10.100	12	102	55	TA209744.1010	118	71	TA219744.1010
0.4016	10.200		12	102	55	TA209744.1020	118	71	TA219744.1020	
0.4035	10.250		12	102	55	TA209744.1025	118	71	TA219744.1025	
0.4055	10.300		12	102	55	TA209744.1030	118	71	TA219744.1030	
0.4063	13/32"		10.320	12	102	55	TA209744.1032	118	71	TA219744.1032
0.4075			10.350	12	102	55	TA209744.1035	118	71	TA219744.1035
0.4094			10.400	12	102	55	TA209744.1040	118	71	TA219744.1040
0.4134			10.500	12	102	55	TA209744.1050	118	71	TA219744.1050
0.4154		10.550	12	102	55	TA209744.1055	118	71	TA219744.1055	
0.4173		10.600	12	102	55	TA209744.1060	118	71	TA219744.1060	
0.4213		27/64"	10.700	12	102	55	TA209744.1070	118	71	TA219744.1070
0.4219			10.716	12	102	55	TA209744.1072	118	71	TA219744.1072
0.4252			10.800	12	102	55	TA209744.1080	118	71	TA219744.1080
0.4291			10.900	12	102	55	TA209744.1090	118	71	TA219744.1090
0.4331	11.000		12	102	55	TA209744.1100	118	71	TA219744.1100	
0.4370	7/16"		11.100	12	102	55	TA209744.1110	118	71	TA219744.1110
0.4375			11.113	12	102	55	TA209744.1111	118	71	TA219744.1111
0.4409			11.200	12	102	55	TA209744.1120	118	71	TA219744.1120
0.4429			11.250	12	102	55	TA209744.1125	118	71	TA219744.1125
0.4449			11.300	12	102	55	TA209744.1130	118	71	TA219744.1130
0.4469		11.350	12	102	55	TA209744.1135	118	71	TA219744.1135	
0.4488		11.400	12	102	55	TA209744.1140	118	71	TA219744.1140	
0.4508		11.450	12	102	55	TA209744.1145	118	71	TA219744.1145	
0.4528		11.500	12	102	55	TA209744.1150	118	71	TA219744.1150	
0.4531		29/64"	11.509	12	102	55	TA209744.1151	118	71	TA219744.1151
0.4567	11.600		12	102	55	TA209744.1160	118	71	TA219744.1160	
0.4606	11.700		12	102	55	TA209744.1170	118	71	TA219744.1170	
0.4646	11.800		12	102	55	TA209744.1180	118	71	TA219744.1180	
0.4685	11.900		12	102	55	TA209744.1190	118	71	TA219744.1190	
0.4688	15/32"		11.908	12	102	55	TA209744.1191	118	71	TA219744.1191
0.4724			12.000	12	102	55	TA209744.1200	118	71	TA219744.1200
0.4783			12.150	14	107	60	TA209744.1215	124	77	TA219744.1215
0.4803			12.200	14	107	60	TA209744.1220	124	77	TA219744.1220
0.4844			31/64"	12.304	14	107	60	TA209744.1230	124	77
0.4921		12.500		14	107	60	TA209744.1250	124	77	TA219744.1250
0.4941		12.550		14	107	60	TA209744.1255	124	77	TA219744.1255
0.4961		12.600		14	107	60	TA209744.1260	124	77	TA219744.1260
0.5000		12.700		14	107	60	TA209744.1270	124	77	TA219744.1270
0.5039		12.800		14	107	60	TA209744.1280	124	77	TA219744.1280
0.5118	13.000	14		107	60	TA209744.1300	124	77	TA219744.1300	
0.5157	13.100	14		107	60	TA209744.1310	124	77	TA219744.1310	
0.5236	13.300	14		107	60	TA209744.1330	124	77	TA219744.1330	
0.5256	17/32"	13.350		14	107	60	TA209744.1335	124	77	TA219744.1335
0.5295		13.450	14	107	60	TA209744.1345	124	77	TA219744.1345	
0.5313		13.495	14	107	60	TA209744.1349	124	77	TA219744.1349	
0.5315		13.500	14	107	60	TA209744.1350	124	77	TA219744.1350	
0.5354		13.600	14	107	60	TA209744.1360	124	77	TA219744.1360	
0.5374		13.650	14	107	60	TA209744.1365	124	77	TA219744.1365	
0.5394		13.700	14	107	60	TA209744.1370	124	77	TA219744.1370	
0.5433		13.800	14	107	60	TA209744.1380	124	77	TA219744.1380	
0.5469		35/64"	13.891	14	107	60	TA209744.1389	124	77	TA219744.1389
0.5512			14.000	14	107	60	TA209744.1400	124	77	TA219744.1400
0.5551	14.100		16	115	65	TA209744.1410	133	83	TA219744.1410	
0.5625	9/16"		14.290	16	115	65	TA209744.1429	133	83	TA219744.1429
0.5709			14.500	16	115	65	TA209744.1450	133	83	TA219744.1450
0.5748			14.600	16	115	65	TA209744.1460	133	83	TA219744.1460
0.5781			14.684	16	115	65	TA209744.1468	133	83	TA219744.1468
0.5827			14.800	16	115	65	TA209744.1480	133	83	TA219744.1480
0.5906			15.000	16	115	65	TA209744.1500	133	83	TA219744.1500
0.5938			15.083	16	115	65	TA209744.1508	133	83	TA219744.1508
0.5945		15.100	16	115	65	TA209744.1510	133	83	TA219744.1510	
0.6043		15.350	16	115	65	TA209744.1535	133	83	TA219744.1535	
0.6102		5/8"	15.500	16	115	65	TA209744.1550	133	83	TA219744.1550
0.6142	15.600		16	115	65	TA209744.1560	133	83	TA219744.1560	
0.6250	15.875		16	115	65	TA209744.1588	133	83	TA219744.1588	
0.6299	16.000		16	115	65	TA209744.1600	133	83	TA219744.1600	
0.6406	41/64"		16.272	18	123	73	TA209744.1627	143	93	TA219744.1627
0.6496			16.500	18	123	73	TA209744.1650	143	93	TA219744.1650
0.6563			16.669	18	123	73	TA209744.1667	143	93	TA219744.1667
0.6693			17.000	18	123	73	TA209744.1700	143	93	TA219744.1700
0.6875			17.463	18	123	73	TA209744.1746	143	93	TA219744.1746
0.6890			17.500	18	123	73	TA209744.1750	143	93	TA219744.1750
0.7087		11/16"	18.000	18	123	73	TA209744.1800	143	93	TA219744.1800
0.7500			3/4"	19.050	20	131	79	TA209744.1905	153	101

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MULTIDRILL TECHNICAL INFORMATION

Extensive EMUGE-FRANKEN research and testing has resulted in a completely new drill design:



MultiDRILL can be used in a wide range of materials, providing longer tool life and excellent productivity.

- ① Advanced TiAlN-T63 Coating - enables top performance at elevated temperatures.
- ② Cutting Edges have a convex geometry for higher chip shearing ability while a tightly controlled edge preparation process allows for consistent tool life on every drill produced. MultiDRILLS are "one-shot" tools that do not require peck cycles. In fact, drill peck feed rates are highly discouraged.
- ③ Coolant-thru
- ④ Double Margin Design helps stabilize the drill within the cut and also allows rounder, more accurate hole location. The drill web construction is also unique to MultiDRILL, and the flute form is wide open to allow for maximum chip evacuation.
- ⑤ MultiDRILLS are self-centering and do not require pre-spot drilling applications.



MultiDRILL CUTTING DATA

Please note that these data are standard values only.

- We recommend the standard values in bold print (rec.) for stable work conditions and for high-performance machine tools with sufficient speed capability.
- Correspondingly, the lower cutting speeds (min.) in connection with higher feed values (up to max.) should be used for machine tools with lower spindle speeds.
- For optimum workpiece conditions, and for machine tools with extremely high performance and high spindle speeds, the high cutting speeds (max.) in connection with possibly reduced feed values can be applied.

Formulas:

$$\text{RPM} = (\text{SFM}/\text{Dia. In.}) \times 3.82$$

$$\text{IPM} = \text{IPR} \times \text{RPM}$$

$$\text{m/min} = \text{SFM} \div 3.28$$

$$\text{mm/rev} = \text{IPR} \times 25.4$$

P	STEEL
M	STAINLESS STEEL
K	CAST IRON
N	ALUMINUM & NON-FERROUS
S	HIGH TEMP ALLOYS
H	HARD MATERIALS

EXCELLENT PERFORMANCE & TOOL LIFE IN:

• STEEL	• STAINLESS STEEL	• HIGH TEMP ALLOYS (INCONEL)	• ALUMINUM
---------	-------------------	------------------------------	------------

		MultiDRILL 3 x D and 5 x D			D = 3 mm			D = 5 mm			D = 8 mm			D = 10 mm			D = 12 mm			D = 16 mm		
					D = 0.118 inch			D = 0.197 inch			D = 0.315 inch			D = 0.394 inch			D = 0.472 inch			D = 0.630 inch		
		Cutting speed vc [SFM]			Feed per revolution f [inch/rev.]																	
		min.	rec.	max.	min.	rec.	max.	min.	rec.	max.	min.	rec.	max.	min.	rec.	max.	min.	rec.	max.	min.	rec.	max.
P	Steel materials																					
	1.1	328	459	591	.0043	.0063	.0098	.0063	.0079	.0110	.0079	.0098	.0138	.0091	.0110	.0157	.0098	.0122	.0169	.0106	.0134	.0185
	2.1	262	394	525	.0043	.0063	.0098	.0063	.0079	.0110	.0079	.0098	.0138	.0091	.0110	.0157	.0098	.0122	.0169	.0106	.0134	.0185
	3.1	262	328	394	.0043	.0059	.0094	.0063	.0071	.0094	.0079	.0094	.0118	.0091	.0102	.0134	.0098	.0114	.0146	.0106	.0126	.0161
	4.1	164	230	328	.0043	.0059	.0094	.0063	.0071	.0094	.0079	.0094	.0118	.0091	.0102	.0134	.0098	.0114	.0146	.0106	.0126	.0161
	5.1	164	213	295	.0039	.0051	.0083	.0051	.0067	.0094	.0067	.0083	.0118	.0075	.0094	.0134	.0083	.0102	.0146	.0106	.0110	.0154
M	Stainless Steel materials																					
	1.1	131	197	262	.0016	.0024	.0035	.0035	.0047	.0075	.0043	.0067	.0102	.0055	.0075	.0118	.0059	.0083	.0130	.0063	.0091	.0142
	2.1	131	180	246	.0016	.0020	.0035	.0031	.0043	.0063	.0039	.0059	.0079	.0055	.0071	.0106	.0059	.0079	.0118	.0063	.0087	.0126
	3.1	131	164	230	.0016	.0020	.0031	.0031	.0043	.0063	.0039	.0059	.0079	.0055	.0071	.0106	.0059	.0079	.0118	.0063	.0087	.0126
K	Cast materials																					
	1.1	394	459	523	.0043	.0063	.0098	.0063	.0079	.0110	.0079	.0098	.0138	.0091	.0110	.0157	.0098	.0122	.0169	.0106	.0134	.0185
	1.2	361	427	492	.0043	.0063	.0098	.0063	.0079	.0110	.0079	.0098	.0138	.0091	.0110	.0157	.0098	.0122	.0169	.0106	.0134	.0185
	2.1	459	525	591	.0043	.0063	.0098	.0063	.0079	.0110	.0079	.0098	.0138	.0091	.0110	.0157	.0098	.0122	.0169	.0106	.0134	.0185
	2.2	328	394	459	.0043	.0059	.0094	.0063	.0071	.0094	.0079	.0094	.0118	.0091	.0102	.0134	.0098	.0114	.0146	.0106	.0126	.0161
	3.1	262	328	394	.0043	.0063	.0098	.0063	.0079	.0110	.0079	.0098	.0138	.0091	.0110	.0157	.0098	.0122	.0169	.0106	.0134	.0185
	3.2	197	262	328	.0039	.0055	.0087	.0055	.0071	.0098	.0071	.0091	.0126	.0079	.0098	.0142	.0087	.0110	.0154	.0094	.0118	.0169
	4.1																					
	4.2																					
	N	Non-ferrous materials																				
Aluminum alloys																						
1.1		525	591	787	.0055	.0075	.0122	.0075	.0110	.0150	.0094	.0130	.0165	.0106	.0146	.0185	.0118	.0161	.0205	.0126	.0177	.0224
1.2		525	591	787	.0055	.0075	.0122	.0075	.0110	.0150	.0094	.0130	.0165	.0106	.0146	.0185	.0118	.0161	.0205	.0126	.0177	.0224
1.3		525	591	787	.0055	.0075	.0122	.0075	.0110	.0150	.0094	.0130	.0165	.0106	.0146	.0185	.0118	.0161	.0205	.0126	.0177	.0224
1.4		525	591	787	.0055	.0075	.0122	.0075	.0110	.0150	.0094	.0130	.0165	.0106	.0146	.0185	.0118	.0161	.0205	.0126	.0177	.0224
1.5		525	591	787	.0055	.0075	.0122	.0075	.0110	.0150	.0094	.0130	.0165	.0106	.0146	.0185	.0118	.0161	.0205	.0126	.0177	.0224
1.6		525	591	787	.0055	.0075	.0122	.0075	.0110	.0150	.0094	.0130	.0165	.0106	.0146	.0185	.0118	.0161	.0205	.0126	.0177	.0224
Copper alloys																						
2.1		394	459	591	.0012	.0020	.0028	.0016	.0024	.0031	.0020	.0039	.0051	.0024	.0047	.0055	.0024	.0055	.0063	.0028	.0059	.0067
2.2	394	459	591	.0012	.0020	.0028	.0016	.0024	.0031	.0020	.0039	.0051	.0024	.0047	.0055	.0024	.0055	.0063	.0028	.0059	.0067	
2.3	394	459	591	.0043	.0055	.0075	.0067	.0087	.0118	.0087	.0110	.0154	.0098	.0122	.0165	.0106	.0130	.0173	.0118	.0142	.0189	
S	High Temp Alloys																					
	Titanium alloys																					
	1.1																					
	1.2	131	164	197	.0016	.0020	.0024	.0024	.0031	.0039	.0039	.0047	.0059	.0043	.0051	.0067	.0047	.0055	.0075	.0055	.0063	.0079
	1.3	98	131	164	.0016	.0020	.0024	.0024	.0031	.0039	.0039	.0047	.0059	.0043	.0051	.0067	.0047	.0055	.0075	.0055	.0063	.0079
	Nickel alloys, cobalt alloys and iron alloys																					
	2.1																					
	2.2	66	131	197	.0016	.0020	.0024	.0016	.0031	.0043	.0039	.0051	.0079	.0043	.0059	.0091	.0047	.0067	.0098	.0055	.0071	.0106
2.3	33	82	131	.0016	.0020	.0024	.0016	.0031	.0039	.0039	.0047	.0059	.0043	.0051	.0067	.0047	.0055	.0075	.0055	.0063	.0079	
2.4																						
2.5																						
2.6																						
H	Hard materials																					
	1.1	66	131	164	.0020	.0024	.0043	.0031	.0043	.0063	.0039	.0063	.0098	.0043	.0071	.0110	.0047	.0075	.0122	.0055	.0079	.0134
	1.2	66	98	164	.0020	.0024	.0043	.0031	.0043	.0063	.0039	.0063	.0098	.0043	.0071	.0110	.0047	.0075	.0122	.0055	.0079	.0134
	1.3	66	98	164	.0020	.0024	.0043	.0031	.0043	.0063	.0039	.0063	.0098	.0043	.0071	.0110	.0047	.0075	.0122	.0055	.0079	.0134
	1.4																					
	1.5																					



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COBALT HIGH PERFORMANCE TAPS (FOR USE IN ALL MATERIALS)

FOR TECHNICAL INFORMATION
SEE BACK COVER

- STAINLESS STEEL
- CARBON STEEL
- ALLOYED STEEL
- ALUMINUM
- COPPER, BRASS & BRONZE
- CAST IRON



- Inch Taps Handle 2B & 3B Class
- All taps are made with Emuge's trademark long shanks- DIN length for extra reach
- HSS-E (Proprietary to Emuge)
- Nitrided with NE2 Surface Treatment (Steam Oxide) or TiCN Coated
- Metric Taps Handle 6H Class

SPIRAL POINT - DIN LENGTH FOR THRU HOLES



INCH SIZES - DIN LENGTH - ANSI SHANK

- Inch taps handle 2B and 3B classes of fit
- CHAMFER: 4-5 threads (Plug)

SIZE	OAL (mm)	SHANK DIA.	Ne2 COATED	TiCN COATED
4-40	56	0.141	BU4973005003	BU4993005003
4-48			BU4973005037	BU4993005037
5-40			BU4973005004	BU4993005004
5-44			BU4973005038	BU4993005038
6-32			BU4973005005	BU4993005005
6-40	63	0.168	BU4973005039	BU4993005039
8-32			BU4973005006	BU4993005006
8-36			BU4973005040	BU4993005040
10-24	70	0.194	BU4973005007	BU4993005007
10-32			BU4973005041	BU4993005041
12-24	80	0.220	BU4973005008	BU4993005008
12-28			BU4973005042	BU4993005042
14-20		0.255	BU4973005009	BU4993005009
14-28			BU4973005043	BU4993005043
5/16-18	90	0.318	BU4973005010	BU4993005010
5/16-24			BU4973005044	BU4993005044
3/8-16	100	0.381	BU4973005011	BU4993005011
3/8-24			BU4973005045	BU4993005045
7/16-14		0.323	CU4973005012	CU4993005012
7/16-20	CU4973005046		CU4993005046	
1/2-13	0.367	CU4973005013	CU4993005013	
1/2-20		CU4973005047	CU4993005047	
9/16-12	0.429	CU4973005014	CU4993005014	
9/16-18		CU4973005048	CU4993005048	
5/8-11	110	0.480	CU4973005015	CU4993005015
5/8-18			CU4973005049	CU4993005049
3/4-10	125	0.590	CU4973005016	CU4993005016
3/4-16			CU4973005050	CU4993005050
7/8-9	140	0.697	CU4973005017	CU4993005017
7/8-14			CU4973005051	CU4993005051
1"-8	140	0.800	CU4973005018	CU4993005018
1"-12			CU4973005052	CU4993005052

METRIC SIZES - DIN LENGTH - DIN SHANK

- Metric taps handle 6H class of fit
- CHAMFER: 4-5 THREADS (Plug)

SIZE	OAL (mm)	SHANK DIA.	Ne2 COATED	TiCN COATED
M4X0.7	63	4.5	B15773000040	B15793000040
M5X0.8	70	6.0	B15773000050	B15793000050
M6X1.0	80	6.0	B15773000060	B15793000060
M8X1.25	90	8.0	B15773000080	B15793000080
M10X1.5	100	10.0	B15773000100	B15793000100
M12X1.75	110	9.0	C15773000112	C15793000112
M16X2.0	110	12.0	C15773000116	C15793000116
M18X2.5	125	14.0	C15773000118	C15793000118
M20X2.5	140	16.0	C15773000120	C15793000120
M24X3.0	160	18.0	C15773000124	C15793000124

METRIC SIZES - DIN LENGTH - ANSI SHANK

- Metric taps handle 6H class of fit
- CHAMFER: 4-5 THREADS (Plug)

SIZE	OAL (mm)	SHANK DIA.	Ne2 COATED	TiCN COATED
M4X0.7	63	0.168	BU4973000040	BU4993000040
M5X0.8	70	0.194	BU4973000050	BU4993000050
M6X1.0	80	0.255	BU4973000060	BU4993000060
M8X1.25	90	0.318	BU4973000080	BU4993000080
M10X1.5	100	0.381	BU4973000100	BU4993000100
M12X1.75	110	0.367	CU4973000112	CU4993000112
M16X2.0	110	0.480	CU4973000116	CU4993000116
M18X2.5	125	0.542	CU4973000118	CU4993000118
M20X2.5	140	0.652	CU4973000120	CU4993000120
M24X3.0	160	0.760	CU4973000124	CU4993000124

SPIRAL FLUTE - DIN LENGTH FOR BOTTOMING HOLES



INCH SIZES - DIN LENGTH - ANSI SHANK

- Inch taps handle 2B and 3B classes of fit
- CHAMFER: 2-3 threads (Modified Bottoming)

SIZE	OAL (mm)	SHANK DIA.	Ne2 COATED	TiCN COATED
4-40	56	0.141	BU5332005003	BU5393005003
4-48			BU5332005037	BU5393005037
5-40			BU5332005004	BU5393005004
5-44			BU5332005038	BU5393005038
6-32			BU5332005005	BU5393005005
6-40	63	0.168	BU5332005039	BU5393005039
8-32			BU5332005006	BU5393005006
8-36			BU5332005040	BU5393005040
10-24	70	0.194	BU5332005007	BU5393005007
10-32			BU5332005041	BU5393005041
12-24	80	0.220	BU5332005008	BU5393005008
12-28			BU5332005042	BU5393005042
14-20		0.255	BU5332005009	BU5393005009
14-28			BU5332005043	BU5393005043
5/16-18	90	0.318	BU5332005010	BU5393005010
5/16-24			BU5332005044	BU5393005044
3/8-16	100	0.381	BU5332005011	BU5393005011
3/8-24			BU5332005045	BU5393005045
7/16-14		0.323	CU5332005012	CU5393005012
7/16-20	CU5332005046		CU5393005046	
1/2-13	0.367	CU5332005013	CU5393005013	
1/2-20		CU5332005047	CU5393005047	
9/16-12	0.429	CU5332005014	CU5393005014	
9/16-18		CU5332005048	CU5393005048	
5/8-11	0.480	CU5332005015	CU5393005015	
5/8-18		CU5332005049	CU5393005049	
3/4-10	110	0.590	CU5332005016	CU5393005016
3/4-16			CU5332005050	CU5393005050
7/8-9	125	0.697	CU5332005017	CU5393005017
7/8-14			CU5332005051	CU5393005051
1"-8	140	0.800	CU5332005018	CU5393005018
1"-12			CU5332005052	CU5393005052

METRIC SIZES - DIN LENGTH - DIN SHANK

- Metric taps handle 6H class of fit
- CHAMFER: 2-3 THREADS (Modified Bottoming)

SIZE	OAL (mm)	SHANK DIA.	Ne2 COATED	TiCN COATED
M4X0.7	63	4.5	B49332000040	B49393000040
M5X0.8	70	6.0	B49332000050	B49393000050
M6X1.0	80	6.0	B49332000060	B49393000060
M8X1.25	90	8.0	B49332000080	B49393000080
M10X1.5	100	10.0	B49332000100	B49393000100
M12X1.75	110	9.0	C49332000112	C49393000112
M16X2.0	110	12.0	C49332000116	C49393000116
M18X2.5	125	14.0	C49332000118	C49393000118
M20X2.5	140	16.0	C49332000120	C49393000120
M24X3.0	160	18.0	C49332000124	C49393000124

METRIC SIZES - DIN LENGTH - ANSI SHANK

- Metric taps handle 6H class of fit
- CHAMFER: 2-3 THREADS (Modified Bottoming)

SIZE	OAL (mm)	SHANK DIA.	Ne2 COATED	TiCN COATED
M4X0.7	63	0.168	BU5332000040	BU5393000040
M5X0.8	70	0.194	BU5332000050	BU5393000050
M6X1.0	80	0.255	BU5332000060	BU5393000060
M8X1.25	90	0.318	BU5332000080	BU5393000080
M10X1.5	100	0.381	BU5332000100	BU5393000100
M12X1.75	110	0.367	CU5332000112	CU5393000112
M16X2.0	110	0.480	CU5332000116	CU5393000116
M18X2.5	125	0.542	CU5332000118	CU5393000118
M20X2.5	140	0.652	CU5332000120	CU5393000120
M24X3.0	160	0.760	CU5332000124	CU5393000124



FORM (FLUTELESS) TAPS FOR USE IN ALL MATERIALS

MultiTAP-Form lasted 3x longer
than regular form taps

- TiN coated
(For TiCN coated, see next page)
- Constructed of a proprietary grade of Cobalt and TiN coated for exceptionally long life and versatility
- Short chamfer lead of 1.5-2 pitch, ideal for bottom tapping
- Lubrication grooves allow coolant flow-to-form action, ideal for holes with long thread length
- **Form both 2B and 3B threads with the same tap**, eliminating the guesswork of calculating H-limits
- All taps made with Emuge's trademark long shanks-DIN length for extra reach. UNC and UNF taps are DIN length-ANSI shanks, metric taps are DIN length-DIN shanks



INCH SIZES

SIZE	OAL (mm)	SHANK DIA.	TIN PART #
4-40	56	0.141	BU5914105003
4-48			BU5914105037
5-40			BU5914105004
5-44			BU5914105038
6-32			BU5914105005
6-40	63	0.168	BU5914105039
8-32			BU5914105006
8-36			BU5914105040
10-24	70	0.194	BU5914105007
10-32			BU5914105041
12-24	80	0.220	BU5914105008
12-28			BU5914105042
14-20		0.255	BU5914105009
14-28			BU5914105043
5/16-18	90	0.318	BU5914105010
5/16-24			BU5914105044
3/8-16	100	0.381	BU5914105011
3/8-24			BU5914105045
7/16-14		0.323	CU5914105012
7/16-20	CU5914105046		
1/2-13	110	0.367	CU5914105013
1/2-20			CU5914105047

METRIC SIZES

SIZE	OAL (mm)	SHANK DIA.	TIN PART #
M2X0.4	45	0.110	B59914000020
M3X0.5	56	0.138	B59914000030
M4X0.7	63	0.168	B59914000040
M5X0.8	70	0.194	B59914000050
M6X1.0	80	0.255	B59914000060
M8X1.25	90	0.318	B59914000080
M10X1.5	100	0.381	B59914000100



IS GUARANTEED!

PUT IT TO THE TEST YOURSELF:
If MultiTAP doesn't outperform your current taps in a range of common materials, Emuge will refund your money.

See MultiTAP in action online at:
www.emuge.com/multitap

MultiTAP		
Main Group	Sub-Group	Example
Aluminum	Casting	356T6, 380, 390, 6061, 7075
Cast Iron	Grey Iron	G10, GG25, GG30
	High Strength	Nodular, Ductile
Steel	Carbon, all grades	1010, 1018, 1045
	Free Cutting	1214, 1215
	Constructual	A36, T1 plate
	Alloyed	4140, 4130, 8620
	Cast, or forged	
Stainless Steel	Tool/ Mold/ Die	D2, S7, P20, H13
	Austenitic	303, 304, 316
	Ferritic	405, 409, 430
	Martensitic	416, 420, 440
Copper	Zinc Alloy	Brass
	Tin Alloy	Bronze

MultiTAP-Form*		
Main Group	Sub-Group	Example
Aluminum	Casting	356T6, 380, 390, 6061, 7075
Steel	Carbon, all grades	1010, 1018, 1045
	Free Cutting	1214, 1215
	Constructual	A36, T1 plate
	Alloyed	4140, 4130, 8620
	Cast, or forged	
Stainless Steel	Tool/ Mold/ Die	D2, S7, P20, H13
	Austenitic	303,304,316
	Ferritic	405,409,430
	Martensitic	416,420,440
Copper	Zinc Alloy	Brass
	Tin Alloy	Bronze

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COBALT HIGH PERFORMANCE TAPS (FOR USE IN ALL MATERIALS)

FOR TECHNICAL INFORMATION
SEE BACK COVER

- STAINLESS STEEL
- CARBON STEEL
- ALLOYED STEEL
- ALUMINUM
- COPPER, BRASS & BRONZE
- CAST IRON



- Inch Taps Handle 2B & 3B Class
- All taps are made with Emuge's trademark long shanks- DIN length for extra reach
- HSS-E (Proprietary to Emuge)
- Nitrided with NE2 Surface Treatment (Steam Oxide) or TiCN Coated
- Metric Taps Handle 6H Class

EXTENDED LENGTH - STEAM OXIDE

$L_2 \approx 10 \times P$



SPIRAL POINT PLUG TAPS

MultiTAP – PLUG STYLE – 2B/3B Class of Fit DIN / ANSI					
				NE2	TiCN
NC/NF	SIZE	OAL (in)	SHANK DIA. (in)	PART #	PART #
NC COARSE THREAD	#6-32	4.409	0.141	BU7973005005	BU7993005005
	#8-32	4.921	0.168	BU7973005006	BU7993005006
	#10-24	5.512	0.194	BU7973005007	BU7993005007
	1/4-20	6.299	0.255	BU7973005009	BU7993005009
	5/16-18	7.087	0.318	BU7973005010	BU7993005010
	3/8-16	7.874	0.381	BU7973005011	BU7993005011
	7/16-14	7.874	0.323	CU7973005012	CU7993005012
	1/2-13	8.819	0.367	CU7973005013	CU7993005013
NF FINE THREAD	5/8-11	8.819	0.480	CU7973005015	CU7993005015
	#6-40	4.409	0.141	BU7973005039	BU7993005039
	#8-36	4.921	0.168	BU7973005040	BU7993005040
	#10-32	5.512	0.194	BU7973005041	BU7993005041
	1/4-28	6.299	0.255	BU7973005043	BU7993005043
	5/16-24	7.087	0.318	BU7973005044	BU7993005044
	3/8-24	7.087	0.381	BU7973005045	BU7993005045
	7/16-20	7.874	0.323	CU7973005046	CU7993005046
	1/2-20	7.874	0.367	CU7973005047	CU7993005047
	5/8-18	7.874	0.480	CU7973005049	CU7993005049

SPIRAL FLUTE - SEMI BOTTOMING (2-3 T. CHAMFER)

MultiTAP – SEMI-BOTTOMING – 2B/3B Class of Fit DIN / ANSI					
				NE2	TiCN
NC/NF	SIZE	OAL (in)	SHANK DIA. (in)	PART #	PART #
NC COARSE THREAD	#6-32	4.409	0.141	BU7832005005	BU7893005005
	#8-32	4.921	0.168	BU7832005006	BU7893005006
	#10-24	5.512	0.194	BU7832005007	BU7893005007
	1/4-20	6.299	0.255	BU7832005009	BU7893005009
	5/16-18	7.087	0.318	BU7832005010	BU7893005010
	3/8-16	7.874	0.381	BU7832005011	BU7893005011
	7/16-14	7.874	0.323	CU7832005012	CU7893005012
	1/2-13	8.819	0.367	CU7832005013	CU7893005013
NF FINE THREAD	5/8-11	8.819	0.480	CU7832005015	CU7893005015
	#6-40	4.409	0.141	BU7832005039	BU7893005039
	#8-36	4.921	0.168	BU7832005040	BU7893005040
	#10-32	5.512	0.194	BU7832005041	BU7893005041
	1/4-28	6.299	0.255	BU7832005043	BU7893005043
	5/16-24	7.087	0.318	BU7832005044	BU7893005044
	3/8-24	7.087	0.381	BU7832005045	BU7893005045
	7/16-20	7.874	0.323	CU7832005046	CU7893005046
	1/2-20	7.874	0.367	CU7832005047	CU7893005047
	5/8-18	7.874	0.480	CU7832005049	CU7893005049

MultiTAP – PLUG STYLE – METRIC COARSE – Iso2/6H Class of Fit				
DIN / DIN				
SIZE	OAL (mm)	SHANK DIA. (mm)	NT2 Coated PART #	TiCN Coated PART #
M 3X0.5	100	3.5	B16673000030	B16693000030
M 4X0.7	125	4.5	B16673000040	B16693000040
M 5X0.8	140	6.0	B16673000050	B16693000050
M 6X1.0	160	6.0	B16673000060	B16693000060
M 8X1.25	180	8.0	B16673000080	B16693000080
M 10X1.5	200	7.0	C16673000100	C16693000100
M 12X1.75	224	9.0	C16673000112	C16693000112
M 14X2.0	224	11.0	C16673000114	C16693000114
M 16X2.0	224	12.0	C16673000116	C16693000116
M 18X2.5	250	14.0	C16673000118	C16693000118
M 20X2.5	280	16.0	C16673000120	C16693000120

MultiTAP – SEMI-BOTTOMING – METRIC COARSE – Iso2/6H Class of Fit				
DIN / DIN				
SIZE	OAL (mm)	SHANK DIA. (mm)	Ne2 Coated PART #	TiCN Coated PART #
M 3X0.5	100	3.5	B58632000030	B58693000030
M 4X0.7	125	4.5	B58632000040	B58693000040
M 5X0.8	140	6.0	B58632000050	B58693000050
M 6X1.0	160	6.0	B58632000060	B58693000060
M 8X1.25	180	8.0	B58632000080	B58693000080
M 10X1.5	200	7.0	C58632000100	C58693000100
M 12X1.75	224	9.0	C58632000112	C58693000112
M 14X2.0	224	11.0	C58632000114	C58693000114
M 16X2.0	224	12.0	C58632000116	C58693000116
M 18X2.5	250	14.0	C58632000118	C58693000118
M 20X2.5	280	16.0	C58632000120	C58693000120



MultiTAP™ - Form Roll Form Taps



TiCN COATED



Making threads without chips has advantages:

- Excellent thread surface quality
- No risk of poor threads due to axial "mis-cutting"
- Increased static and dynamic strength of thread
- Elevated tapping speeds are possible

MultiTAP-Form – NEW TiCN COATED – 2B/3B class of fit							
DIN/ANSI				TiCN COATED			
SIZE	OAL (in)	SHANK DIA. (in)	PART #	SIZE	OAL (in)	SHANK DIA (in)	PART #
#4-40 UNC	2.205	0.141	BU5990105003	#12-28 UNF	3.150	0.220	BU5990105042
#5-40 UNC	2.205	0.141	BU5990105004	1/4-28 UNF	3.150	0.255	BU5990105043
#6-32 UNC	2.205	0.141	BU5990105005	5/16-24 UNF	3.543	0.318	BU5990105044
#8-32 UNC	2.480	0.168	BU5990105006	3/8-24 UNF	3.937	0.381	BU5990105045
#10-24 UNC	2.756	0.194	BU5990105007	7/16-20 UNF	3.937	0.323	CU0390105046
#12-24 UNC	3.150	0.220	BU5990105008	1/2-20 UNF	4.330	0.367	CU0390105047
1/4-20 UNC	3.150	0.255	BU5990105009	METRIC – DIN/DIN – TiCN COATED – 6H class of fit			
5/16-18 UNC	3.543	0.318	BU5990105010	SIZE	OAL (mm)	SHANK DIA. (mm)	PART #
3/8-16 UNC	3.937	0.381	BU5990105011				
7/16-14 UNC	3.937	0.323	CU0390105012	M 2X0.4	45	2.8	B59990000020
1/2-13 UNC	4.330	0.367	CU0390105013	M 3X0.5	56	3.5	B59990000030
#4-48 UNF	2.205	0.141	BU5914105037	M 4X0.7	63	4.5	B59990000040
#5-44 UNF	2.205	0.141	BU5914105038	M 5X0.8	70	6.0	B59990000050
#6-40 UNF	2.205	0.141	BU5914105039	M 6X1.0	80	6.0	B59990000060
#8-36 UNF	2.480	0.168	BU5914105040	M 8X1.25	90	8.0	B59990000080
#10-32 UNF	2.756	0.194	BU5914105041	M 10X1.5	100	10.0	B59990000100





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SUB-MICRO GRAIN CARBIDE THREAD MILLS

AVAILABLE IN

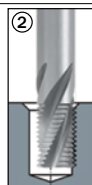
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- STYLES
- ① SINGLE PLANE (1 TOOTH)



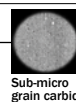
Single Plane

- One tool produces multiple thread sizes
- Pitch diameter can be controlled



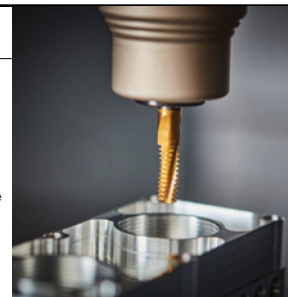
Full Form

- Rigid core diameter reduces deflection
- One cutting rotation saves time



Sub-micro grain carbide

- Superior edge prep process



TIN T21 Coating Reduces chip welding and improves chip evacuation

EMUGE-FRANKEN MultiTHREAD MILL is a cost effective universal thread milling solution for job shop manufacturers.

Ideal for job shops where part applications and materials frequently change, MultiTHREAD™ provides a versatile solution for many threadmaking requirements, enabling shops to boost their production and save on costs, as fewer types of thread mills need to be stocked in the tool crib.

MultiTHREAD features a proprietary TIN T21 coating developed by EMUGE and is offered in a complete size and thread style range in either Full Form or Single Plane types.

• FULL FORM - 15° HELIX - TIN 21 COATED - 2xD WITHOUT COOLANT HOLE



SIZE		THREAD SIZE			CUTTER DIA.	CUT LENGTH	# FL	OAL	SHANK DIA.	PART #
		UNC	UNF	M						
INCH	10	10-24	-	-	0.136	0.395	3	2 1/2"	1/4"	GFR151055007
	1/4	1/4-20	-	-	0.185	0.524	3	2 1/2"	1/4"	GFR151055009
	5/16	5/16-18	-	-	0.242	0.637	3	2 1/2"	1/4"	GFR151055010
	3/8	3/8-16	-	-	0.301	0.780	3	2 1/2"	5/16"	GFR151055011
	7/16	7/16-14	-	-	0.354	0.891	3	3"	3/8"	GFR151055012
	1/2	1/2-13	-	-	0.371	1.036	3	3"	3/8"	GFR151055013
	5/8	5/8-11	-	-	0.496	1.316	4	3 3/4"	1/2"	GFR151055015
	3/4	3/4-10	-	-	0.621	1.548	4	4 1/4"	5/8"	GFR151055016
	7/8	7/8-9	-	-	0.621	1.829	4	4 1/4"	5/8"	GFR151055017
	1"-8 & 1 1/8-8	1"-8 & 1 1/8-8	-	-	0.746	2.058	4	4 3/4"	3/4"	GFR151055018
INCH	10	-	10-32	-	0.150	0.390	3	2 1/2"	1/4"	GFR151055041
	1/4	-	1/4-28	-	0.203	0.517	3	2 1/2"	1/4"	GFR151055043
	5/16	-	5/16-24	-	0.246	0.644	3	2 1/2"	1/4"	GFR151055044
	3/8	-	3/8-24	-	0.309	0.769	3	2 1/2"	5/16"	GFR151055045
	7/16	-	7/16-20	-	0.371	0.874	3	3"	3/8"	GFR151055046
	1/2	-	1/2-20	-	0.371	1.023	3	3"	3/8"	GFR151055047
	3/4	-	3/4-16	-	0.621	1.530	4	4 1/4"	5/8"	GFR151055050
METRIC	6	-	-	M6	0.189	0.491	3	2 1/2"	1/4"	GFR151050060
	8	-	-	M8	0.246	0.663	3	2 1/2"	1/4"	GFR151050080
	10	-	-	M10	0.309	0.796	3	2 1/2"	5/16"	GFR151050100
	12	-	-	M12	0.371	0.997	3	3"	3/8"	GFR151050112

- SINGLE PLANE (1-TOOTH)
- 0° HELIX • TIN 21 COATED
- FULL BOTTOM TREADING TO 1 PITCH



• SIZES 5/16 AND ABOVE HAVE COOLANT HOLES

2xD

TOOL SIZE	THREAD SIZE								CUTTER DIA.	CUT LENGTH	# FL	OAL	SHANK DIA.	SHANK TYPE	COOLANT HOLE	PART #
	UNC	UNF	STI UNC	STI UNF	UNF	UNJC	UNJF	M								
0	-	0-80	-	-	-	-	0-80	1.6 x .35	0.045	0.125	1	1.5/8"	1/8"	HA	NO	GFS137055033
1	1-64	1-72	-	-	-	1-64	1-72	2 x .4	0.056	0.146	3	1.5/8"	1/8"	HA	NO	GFS237055000
2	2-56	2-64	1-64	-	-	2-56	2-64	2.5 x .45	0.064	0.172	3	1.5/8"	1/8"	HA	NO	GFS237055001
4	4-40	4-48	2-56	-	-	4-40	4-48	-	0.081	0.224	3	1.5/8"	1/8"	HA	NO	GFS237055003
STI 4	-	-	4-40	4-48	-	-	-	-	0.117	0.295	3	1.5/8"	1/8"	HA	NO	GFS237055061
5	5-40	5-44	-	-	-	5-40	5-44	3 x .5	0.095	0.250	3	1.5/8"	1/8"	HA	NO	GFS237055004
6	6-32	6-40	-	-	-	6-32	6-40	-	0.100	0.276	3	1.5/8"	1/8"	HA	NO	GFS237055005
STI 6	-	-	6-32	6-40	-	-	-	5 x .8	0.143	0.364	3	2 1/2"	1/4"	HB	NO	GFS231055613
8	8-32	8-36	-	-	-	8-32	8-36	4 x .7	0.124	0.328	3	1.5/8"	1/8"	HA	NO	GFS237055006
STI 8	-	-	8-32	8-36	1/4-32	-	-	-	0.167	0.415	3	2 1/2"	1/4"	HB	NO	GFS231055614
10	10-24	10-32	10-24	10-32	-	10-24	10-32	6 x 1	0.136	0.380	3	2 1/2"	1/4"	HB	NO	GFS231055007
1/4	1/4-20	1/4-28	1/4-20	1/4-28	5/16-24	1/4-28	1/4-28	8 x 1.25	0.185	0.500	3	2 1/2"	1/4"	HB	NO	GFS231055009
5/16	5/16-18	5/16-24	5/16-18	5/16-24	3/8-32	5/16-18	5/16-24	10 x 1.5	0.242	0.625	4	2 1/2"	1/4"	HB	YES	GFS231055010
3/8	3/8-16	3/8-24	3/8-16	3/8-24	7/16-28	3/8-16	3/8-24	12 x 1.75	0.301	0.750	5	2 1/2"	5/16"	HB	YES	GFS231055011
7/16	7/16-14	7/16-20	7/16-14	7/16-20	1 1/2-28	7/16-14	7/16-20	16 x 2	0.354	0.875	5	3"	3/8"	HB	YES	GFS231055012
1/2	1/2-13	1/2-20	1/2-13	1/2-20	5/8-24	1/2-13	1/2-20	18 x 2	0.407	1.000	5	3 3/4"	1/2"	HB	YES	GFS231055013
5/8	5/8-11	5/8-18	5/8-11	5/8-18	3/4-20	5/8-11	5/8-18	16 x 2	0.512	1.250	5	3 3/4"	1/2"	HB	YES	GFS231055015
3/4	3/4-10	3/4-16	3/4-10	3/4-16	7/8-20	3/4-10	3/4-16	20 x 2.5	0.630	1.500	6	4 1/4"	5/8"	HB	YES	GFS231055016

3xD

TOOL SIZE	THREAD SIZE					CUTTER DIA.	CUT LENGTH	# FL	OAL	SHANK DIA.	SHANK TYPE	COOLANT HOLE	PART #
	UNC	UNF	STI UNC	STI UNF	M								
2	2-56	2-64	2-56	2-64	M 2.2	0.067	0.258	3	1.625	1/8"	HA	NO	GFS837055001
4	4-40	4-48	4-40	4-48	M 3	0.085	0.336	3	1.625	1/8"	HA	NO	GFS837055003
6	6-32	6-40	6-32	6-40	M 3.5	0.106	0.414	3	1.625	1/8"	HA	NO	GFS837055005
8	8-32	8-36	8-32	8-36	-	0.132	0.492	3	1.750	3/16"	HA	NO	GFS837055006
10	10-24	-	10-24	-	M 5	0.146	0.570	3	1.875	3/16"	HA	NO	GFS837055007
1/4	1/4-20	-	1/4-20	-	M 6	0.154	0.570	4	1.875	3/16"	HA	NO	GFS837055041
5/16	5/16-18	-	5/16-18	-	M 8	0.195	0.750	4	2.375	1/4"	HB	NO	GFS831055009
3/8	3/8-16	-	3/8-16	-	M 10	0.207	0.750	4	2.375	1/4"	HB	NO	GFS831055043
7/16	7/16-14	-	7/16-14	-	M 12	0.248	0.937	4	2.563	5/16"	HB	YES	GFS831055010
1/2	1/2-13	-	1/2-13	-	-	0.260	0.937	5	2.563	5/16"	HB	YES	GFS831055044
5/8	5/8-11	-	5/8-11	-	-	0.303	1.125	5	2.750	5/16"	HB	YES	GFS831055011
3/4	3/4-10	-	3/4-10	-	-	0.323	1.125	5	2.875	3/8"	HB	YES	GFS831055045
1	1-8	-	1-8	-	-	0.354	1.312	5	3.125	3/8"	HB	YES	GFS831055012
1 1/8	1 1/8-8	-	1 1/8-8	-	-	0.376	1.312	5	3.060	3/8"	HB	YES	GFS831055046
1 1/4	1 1/4-8	-	1 1/4-8	-	-	0.409	1.500	5	3.625	1/2"	HB	YES	GFS831055013
1 1/2	1 1/2-8	-	1 1/2-8	-	-	0.514	1.875	5	4.125	5/8"	HB	YES	GFS831055015
1 3/4	1 3/4-8	-	1 3/4-8	-	-	0.630	2.250	6	4.500	5/8"	HB	YES	GFS831055016

MultiTHREAD NPT/NPTF THREAD

NPT/NPTF Full Profile

- NPT / NPTF American Taper Pipe Threads
- 15° left-hand spiral flute geometry for blind and through hole applications in most materials
- HA - Straight shank design
- h6 Tolerance ground shank
- TiCN coated for wear resistance and longer tool life



NPT - TiCN COATED - 15° LEFT HAND SPIRAL FLUTE

SIZE	PITCH	# FL	CUTTER DIA.	OAL	SHANK DIA.	FLUTE LENGTH	THREAD LENGTH	PART #
1/16 - 1/8"	27	4	.232	2.1/4"	5/16"	.536"	.536"	GFT9B8069676
1/4 - 3/8"	18	4	.400	3.1/4"	1/2"	.803"	.803"	GFT9B8069677
1/2 - 3/4"	14	4	.561	3.1/2"	5/8"	1.034"	1.034"	GFT9B8069678
1 - 2"	11.5	5	.772	3.3/4"	3/4"	1.260"	1.260"	GFT9B8069679

NPTF - TiCN COATED - 15° LEFT HAND SPIRAL FLUTE

SIZE	PITCH	# FL	CUTTER DIA.	OAL	SHANK DIA.	FLUTE LENGTH	THREAD LENGTH	PART #
1/16 - 1/8"	27	4	.232	2.1/4"	5/16"	.536"	.536"	GFT9B8069681
1/4 - 3/8"	18	4	.400	3.1/4"	1/2"	.803"	.803"	GFT9B8069682
1/2 - 3/4"	14	4	.561	3.1/2"	5/8"	1.034"	1.034"	GFT9B8069683
1 - 2"	11.5	5	.772	3.3/4"	3/4"	1.260"	1.260"	GFT9B8069684

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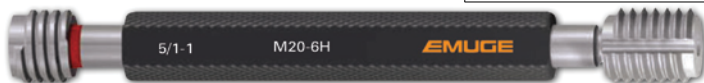
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GO/NO-GO PLUG GAGES

- Short form certificate is supplied at no additional charge
- Long form certificate is available on request



UNC/UNF/UNEF/UNJ GAGES FEATURES:

- Gage dimensions according to ANSI/ASME B1.2
- Manufactures with hardened tool steel for durability
- NO-GO side is clearly marked with a red ring
- A cleansing channel is ground into the GO side to eliminate thread damage from dirt on sizes above 1/4" or M 5.5

UNC (2B & 3B)

Size (in)	Class	PART#
#1-64	2B Class of Fit	L01001005000
#2-56		L01001005001
#3-48		L01001005002
#4-40		L01001005003
#5-40		L01001005004
#6-32		L01001005005
#8-32		L01001005006
#10-24		L01001005007
#12-24		L01001005008
1/4-20		L01001005009
5/16-18		L01001005010
3/8-16		L01001005011
7/16-14		L01001005012
1-12		L01001005013
1-1/8-12		L01001005014
1-1/4-12		L01001005015
1-3/8-12	3B Class of Fit	L01001005016
1-1/2-12		L01001005017
1-3/8-12		L01001005018
1-1/2-12		L01001005019
1-3/8-12		L01001005020
1-1/2-12		L01001005021
1-3/8-12		L01001005022
1-1/2-12		L01001005023
1-3/8-12		L01001005024
1-1/2-12		L01001005025
1-3/8-12		L01001005026
1-1/2-12		L01001005027
1-3/8-12		L01001005028
1-1/2-12		L01001005029
1-3/8-12		L01001005030
1-1/2-12		L01001005031

UNF (2B & 3B)

Size (in)	Class	PART#
#0-80	2B Class of Fit	L01001005033
#1-72		L01001005034
#2-64		L01001005035
#3-56		L01001005036
#4-48		L01001005037
#5-40		L01001005038
#6-32		L01001005039
#8-32		L01001005040
#10-24		L01001005041
#12-24		L01001005042
1/4-20		L01001005043
5/16-18		L01001005044
3/8-16		L01001005045
7/16-14		L01001005046
1-12		L01001005047
1-1/8-12		L01001005048
1-1/4-12	3B Class of Fit	L01001005049
1-3/8-12		L01001005050
1-1/2-12		L01001005051
1-3/8-12		L01001005052
1-1/2-12		L01001005053
1-3/8-12		L01001005054
1-1/2-12		L01001005055
1-3/8-12		L01001005056
1-1/2-12		L01001005057
1-3/8-12		L01001005058
1-1/2-12		L01001005059
1-3/8-12		L01001005060
1-1/2-12		L01001005061
1-3/8-12		L01001005062
1-1/2-12		L01001005063

LEFT HAND UNC - (3B)

Size (in)	Class	PART#
1/4-32	2B Class of Fit	L01001005058
5/16-32		L01001005059
3/8-32		L01001005060
7/16-28		L01001005061
1-28		L01001005062
1-1/8-24		L01001005063
1-1/4-20		L01001005064
1-3/8-16		L01001005065
1-1/2-12		L01001005066
1-3/8-12	3B Class of Fit	L01001005067
1-1/2-12		L01001005068
1-3/8-12		L01001005069
1-1/2-12		L01001005070
1-3/8-12		L01001005071
1-1/2-12		L01001005072
1-3/8-12		L01001005073
1-1/2-12		L01001005074
1-3/8-12		L01001005075
1-1/2-12		L01001005076
1-3/8-12		L01001005077
1-1/2-12		L01001005078
1-3/8-12		L01001005079
1-1/2-12		L01001005080

NPT

Size (in)	PART#
1/16-27	L05001005763
1/8-27	L05001005764
1/4-18	L05001005765
3/8-18	L05001005766
1/2-14	L05001005767
3/4-14	L05001005768
1-11/12	L05001005769

NPTF

Size (in)	PART#
1/16-27	L05201005782
1/8-27	L05201005783
1/4-18	L05201005784
3/8-18	L05201005785
1/2-14	L05201005786
3/4-14	L05201005787

BSW

Size (in)	PART#
5/32-32 BSW	L01001003047
3/16-24 BSW	L01001003048
7/32-24 BSW	L01001003049
1/4-20 BSW	L01001003050
5/16-18 BSW	L01001003051
3/8-16 BSW	L01001003052
7/16-14 BSW	L01001003053
1-12 BSW	L01001003054
1-1/8 BSW	L01001003055
1-1/4 BSW	L01001003056
1-3/8 BSW	L01001003057
1-1/2 BSW	L01001003058
1-3/4 BSW	L01001003059
1-1/2 BSW	L01001003060
1-3/4 BSW	L01001003061
1-1/2 BSW	L01001003062

BSPT/BSPP

Size (in)	PART#
1/16	L18001014068
1/8	L18001014069
1/4	L18001014070
3/8	L18001014071
1/2	L18001014072
3/4	L18001014073
1	L18001014074
1 1/4	L18001014075
1 1/2	L18001014076
2	L18001014077
2 1/2	L18001014078
3	L18001014079
4	L18001014080

Thread Gages

- Manufactured with hardened tool steel for durability
- NO-GO gage is clearly marked with a red ring
- Short form certificate included

UNC - 2A GO

Size	PART#
#2-56	L02005005001
#4-40	L02005005003
#6-32	L02005005005
#8-32	L02005005006
#10-24	L02005005007
1/4-20	L02005005009
5/16-18	L02005005010
3/8-16	L02005005011
7/16-14	L02005005012
1-12	L02005005013
1-1/8-12	L02005005014
1-1/4-12	L02005005015
1-3/8-12	L02005005016
1-1/2-12	L02005005017
1-3/4-12	L02005005018
1-1/2-12	L02005005019
1-3/4-12	L02005005020
1-1/2-12	L02005005021
1-3/4-12	L02005005022
1-1/2-12	L02005005023
1-3/4-12	L02005005024

UNF - 2A GO

Size	PART#
#0-80	L02005005033
#2-64	L02005005035
#4-48	L02005005037
#6-40	L02005005039
#8-36	L02005005040
#10-32	L02005005041
1/4-28	L02005005043
5/16-24	L02005005044
3/8-24	L02005005045
7/16-20	L02005005046
1-20	L02005005047
5/8-18	L02005005049
3/4-16	L02005005050
7/8-14	L02005005051
1-12	L02005005052
1-1/8-12	L02005005053
1-1/4-12	L02005005054
1-3/8-12	L02005005055
1-1/2-12	L02005005056

METRIC 6G GO

Size	PART#
M2 x .4	L02005000020
M2.5 x .45	L02005000025
M3 x .5	L02005000030
M4 x .7	L02005000040
M5 x .8	L02005000050
M6 x 1	L02005000060
M8 x 1.25	L02005000080
M10 x 1.5	L02005000100
M12 x 1.25	L02005000110
M16 x 1.5	L02005000130
M20 x 1.5	L02005000140
M25 x 1.5	L02005000150
M30 x 1.5	L02005000160
M36 x 1.5	L02005000170
M42 x 1.5	L02005000180
M48 x 1.5	L02005000190
M56 x 1.5	L02005000200
M68 x 1.5	L02005000210

METRIC (6H CLASS)

Size (mm)	PART#
M 1.6 x 0.35	L01001000016
M 2 x 0.4	L01001000020
M 2.5 x 0.45	L01001000025
M 3 x 0.5	L01001000030
M 3.5 x 0.6	L01001000035
M 4 x 0.7	L01001000040
M 5 x 0.8	L01001000045
M 6 x 0.85	L01001000050
M 8 x 1	L01001000055
M 10 x 1.25	L01001000060
M 12 x 1.5	L01001000065
M 14 x 1.5	L01001000070
M 16 x 1.5	L01001000075
M 18 x 1.5	L01001000080
M 20 x 1.5	L01001000085
M 22 x 1.5	L01001000090
M 24 x 1.5	L01001000095
M 26 x 1.5	L01001000100
M 28 x 1.5	L01001000105
M 30 x 1.5	L01001000110
M 32 x 1.5	L01001000115
M 34 x 1.5	L01001000120
M 36 x 1.5	L01001000125
M 38 x 1.5	L01001000130
M 40 x 1.5	L01001000135

BSP

Size (in)	PART#
G 1/16-28	L01001004034
G 1/8-28	L01001004035
G 1/4-19	L01001004036
G 3/8-19	L01001004037
G 1/2-14	L01001004038
G 5/8-14	L01001004039
G 3/4-14	L01001004040
G 7/8-14	L01001004041
G 1-11	L01001004042
G 1 1/8-11	L01001004043
G 1 1/4-11	L01001004044
G 1 1/2-11	L01001004045
G 2-11	L01001004046

UNC - 2A NO-GO

Size	PART#
#2-56	L03005005001
#4-40	L03005005003
#6-32	L03005005005
#8-32	L03005005006
#10-24	L03005005007
1/4-20	L03005005009
5/16-18	L03005005010
3/8-16	L03005005011
7/16-14	L03005005012
1-12	L03005005013
1-1/8-12	L03005005014
1-1/4-12	L03005005015
1-3/8-12	L03005005016
1-1/2-12	L03005005017
1-3/4-12	L03005005018
1-1/2-12	L03005005019
1-3/4-12	L03005005020
1-1/2-12	L03005005021
1-3/4-12	L03005005022
1-1/2-12	L03005005023
1-3/4-12	L03005005024

UNF - 2A NO-GO

Size	PART#
#0-80	L03005005033
#2-64	L03005005035
#4-48	L03005005037
#6-40	L03005005039
#8-36	L03005005040
#10-32	L03005005041
1/4-28	L03005005043
5/16-24	L03005005044
3/8-24	L03005005045
7/16-20	L03005005046
1-20	L03005005047
5/8-18	L03005005049
3/4-16	L03005005050
7/8-14	L03005005051
1-12	L03005005052
1-1/8-12	L03005005053
1-1/4-12	L03005005054
1-3/8-12	L03005005055
1-1/2-12	L03005005056

METRIC 6G NO-GO

Size	PART#
M2 x .4	L03005000020
M2.5 x .45	L03005000025
M3 x .5	L03005000030
M4 x .7	L03005000040
M5 x .8	L03005000050
M6 x 1	L03005000060
M8 x 1.25	L03005000080
M10 x 1.5	L03005000100
M12 x 1.25	L03005000110
M16 x 1.5	L03005000130
M20 x 1.5	L03005000140
M25 x 1.5	L03005000150
M30 x 1.5	L03005000160
M36 x 1.5	L03005000170
M42 x 1.5	L03005000180
M48 x 1.5	L03005000190
M56 x 1.5	L03005000200
M68 x 1.5	L03005000210

UNC - 3A GO

Size	PART#
3/8-16	L02005105011
7/16-14	L02005105012
1-12	L02005105013
1-1/8-12	L02005105014
1-1/4-12	L02005105015
1-3/8-12	L02005105016

UNF - 3A GO

Size	PART#
3/8-24	L02005105045
7/16-20	L02005105046
1-20	L02005105047
1-1/8-18	L02005105048
1-1/4-16	L02005105049
1-3/8-16	L02005105050

BASS TOOL & SUPPLY, INC.

2300 Fairway Park Dr.

Houston, TX 77092

**MULTITAP TECHNICAL INFORMATION FOR TAPS SHOWN ON PAGES 4-5****MultiTap SFM SPECIFICATIONS****TAP DRILL SIZE RECOMMENDATIONS****MultiTap**

Size	Recommended Drill Size (in)	Size	Recommended Drill Size (in)
#4-40 UNC	0.0890	1/4-28 UNF	0.2165
#5-40 UNC	0.1015	5/16-24 UNF	0.2717
#6-32 UNC	0.1110	3/8-24 UNF	0.3346
#8-32 UNC	0.1360	7/16-20 UNF	0.3898
#10-24 UNC	0.1520	1/2-20 UNF	0.4528
#12-24 UNC	0.1770	9/16-18 UNF	0.5118
1/4-20 UNC	0.2040	5/8-18 UNF	0.5709
5/16-18 UNC	0.2610	3/4-16 UNF	0.6890
3/8-16 UNC	0.3160	7/8-14 UNF	0.8071
7/16-14 UNC	0.3680	1"-12 UNF	0.9219
1/2-13 UNC	0.4219	METRIC MultiTap	
9/16-12 UNC	0.4844		
5/8-11 UNC	0.5313	M 4 x 0.7	3.30 mm
3/4-10 UNC	0.6563	M 5 x 0.8	4.20 mm
7/8-9 UNC	0.7656	M 6 x 1.0	5.00 mm
1"-8 UNC	0.8750	M 8 x 1.25	6.80 mm
#4-48 UNF	0.0945	M 10 x 1.5	8.50 mm
#5-44 UNF	0.1063	M 12 x 1.75	10.20 mm
#6-40 UNF	0.1181	M 16 x 2.0	14.00 mm
#8-36 UNF	0.1378	M 18 x 2.5	15.50 mm
#10-32 UNF	0.1614	M 20 x 2.5	17.50 mm
#12-28 UNF	0.1820	M 24 x 3.0	21.00 mm

MultiTap FORM (For Fluteless Taps)

Size	Recommended Drill Size (in)	Size	Recommended Drill Size (in)
#4-40 UNC	0.1004	#12-28 UNF	0.2008
#5-40 UNC	0.1142	1/4-28 UNF	0.2343
#6-32 UNC	0.1240	5/16-24 UNF	0.2933
#8-32 UNC	0.1496	3/8-24 UNF	0.3563
#10-24 UNC	0.1713	7/16-20 UNF	0.4154
#12-24 UNC	0.1969	1/2-20 UNF	0.4783
1/4-20 UNC	0.2264	METRIC MultiTap-FORM	
5/16-18 UNC	0.2874		
3/8-16 UNC	0.3465	M 2 x .04	1.85 mm
7/16-14 UNC	0.4035	M 3 x .05	2.80 mm
1/2-13 UNC	0.4646	M 4 x .07	3.70 mm
#4-48 UNF	0.1031	M 5 x .08	4.65 mm
#5-44 UNF	0.1150	M 6 x 1.0	5.60 mm
#6-40 UNF	0.1268	M 8 x 1.25	7.45 mm
#8-36 UNF	0.1516	M 10 x 1.5	9.35 mm
#10-32 UNF	0.1752		

Material Group		Hardness Range			Material Example	MULTITAP	MULTITAP-Form	
		HRC	BHN	N/mm2				
P	Steel materials							
	1.1	Cold-extrusion steels, Magnetic soft iron	–	≤ 120	≤ 400	1008 / 1010 / 1018	25 - 60	35 - 85
	2.1	Free cutting steels, General construction steels	–	≤ 180	≤ 600	1008 / 1010 / 12L14 / A36 11L17 / 1149 / 12L15	25 - 60	35 - 85
	3.1	Free cutting steels, Construction steels, Alloyed steels, Steel castings	≤ 25	≤ 250	≤ 850	1060 / 4130 / 4140 / 41L30 41L45 / 86L20 / 86L40 / 1045	15 - 40	35 - 75
	4.1	Crome alloy steel, Cold work steels, Heat-treatable steels, Nitriding steels	≤ 36	≤ 320	≤ 1100	5115 / A29 / A519 / J404 / 4130 / 8030 4140 / 4330 / Nitrally 125, 135, 230	10 - 35	15 - 40
M	Stainless Steel materials							
	1.1	Corrosion/ acid-proof steels, Heat-resistant steels	≤ 25	≤ 250	≤ 850	410 / 440 / 440C / 17-4 PH	10 - 30	15 - 45
	2.1	Corrosion/ acid-proof steels, Heat-resistant steels	≤ 35	≤ 320	≤ 1100	303 / 304 / 316 / 316L / 321	10 - 25	15 - 45
K	Cast materials							
	1.1	Cast iron	–	≤ 280	–	ASTM A48 / SAE J431c / 1800	35 - 65	N/A
	2.1	Cast iron with nodular graphite	–	–	≤ 1000	ASTM A48 class 20, 30, 35 , 40	15 - 50	N/A
	3.1	Cast iron with vermicular graphite	–	≤ 280	–	–	15 - 50	N/A
	4.1	Malleable cast iron	–	–	≤ 700	ASTM A47 grade 32510, 35018	35 - 65	N/A
N	Aluminum alloys							
	1.1	Aluminum wrought alloys	–	–	–	2014 / 2117 / 5050 / 6061 / 7004	35 - 65	35 - 100
	1.2	Aluminum cast alloys ≤ 5% Si	–	–	–	201 / 213 / 295 / 435.3 / 511.0	35 - 65	35 - 100
	1.3	Aluminum cast alloys 5% < Si ≤ 12%	–	–	–	319 / 333 / 343 / 356 / 369 / 380	35 - 65	35 - 100
	1.4	Aluminum cast alloys 12% < Si ≤ 1	–	–	–	390 / 393 / 413	20 - 50	35 - 85
	Copper, Copper alloys, Bronze, Brass							
	2.1	Pure Copper and low alloyed copper	–	≤ 150	≤ 500	–	15 - 40	35 - 100
	2.2	Copper-zinc alloys (brass, long chipping)	–	–	–	–	35 - 80	35 - 100
	2.3	Copper-zinc alloys (brass, short chipping)	–	–	–	–	35 - 80	35 - 100
	2.4	Copper-aluminum alloys (alubronze, long chipping) Copper-tin alloys (bronze, long chipping)	–	–	–	–	10 - 35	20 - 50
2.5	Copper-tin alloys (bronze, short chipping)	–	–	–	–	15 - 45	35 - 85	