

suttontools
world class cutting tools

TRULY
MULTI-PURPOSE



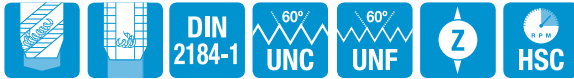
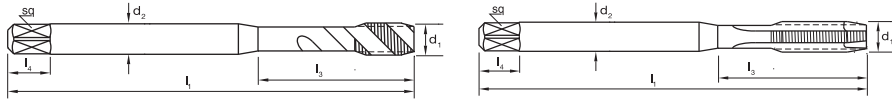
BLACKMAGIC



DIN Taps UNC, UNF & G (BSPF), Spiral Flute, Gun, Black Magic

suttontools **BLACKMAGIC**

- Universal high performance tapping
- PM-HSSE V3 offers superior tool life
- Use in stainless steels and high strength steels up to 850N/mm²
- Blind or through holes up to 3 x d₁
- Suitable for synchronous tapping in machine operations



Product Group

Material

Surface Finish

Sutton Designation

Geometry

Chamfer

Limit & Nut Tolerance

DO410

PM-HSSE V3

HARDLUBE

UNI

R50

Form C / 2.5 x P

2BX

DO410

PM-HSSE V3

HARDLUBE

UNI

Special Relief

Form B / 4.5 x P

2BX

Size Ref.	d ₁	Pitch	l ₁	l ₃	d ₂	sq	l ₄	z	drill Ø	Item #	Item #
DIN 2184-1 UNC REINFORCED SHANK										T691	T693
0218	# 2	56	45	12	2.8	2.1	5	3	1.85	T691 0218	T693 0218
0284	# 4	40	56	18	3.5	2.7	6	3	2.35	T691 0284	T693 0284
0351	# 6	32	56	20	4	3	6	3	2.85	T691 0351	T693 0351
0417	# 8	32	63	21	4.5	3.4	6	3	3.50	T691 0417	T693 0417
0483	# 10	24	70	25	6	4.9	8	3	3.90	T691 0483	T693 0483
0635	1/4	20	80	30	7	5.5	8	3	5.10	T691 0635	T693 0635
DIN 2184-1 UNC REDUCED SHANK											
0794	5/16	18	90	35	6	4.9	8	3	6.60	T691 0794	T693 0794
0953	3/8	16	100	39	7	5.5	8	3	8.00	T691 0953	T693 0953
1270	1/2	13	110	-	9	7	10	4	10.80	T691 1270	T693 1270
1588	5/8	11	110	-	12	9	12	4	13.50	T691 1588	T693 1588
DIN 2184-1 UNF REINFORCED SHANK										T692	T694
0284	# 4	48	56	18	3.5	2.7	6	3	2.40	T692 0284	T694 0284
0318	# 5	44	56	18	3.5	2.7	6	3	2.65		T694 0318
0351	# 6	40	56	20	4	3	6	3	2.95	T692 0351	T694 0351
0417	# 8	36	63	21	4.5	3.4	6	3	3.50	T692 0417	T694 0417
0483	# 10	32	70	25	6	4.9	8	3	4.10	T692 0483	T694 0483
0635	1/4	28	80	30	7	5.5	8	3	5.50	T692 0635	T694 0635
DIN 2184-1 UNF REDUCED SHANK											
0794	5/16	24	90	35	6	4.9	8	3	6.90	T692 0794	T694 0794
0953	3/8	24	90	39	7	5.5	8	3	8.50	T692 0953	T694 0953
1270	1/2	20	100	-	9	7	10	4	11.50	T692 1270	T694 1270
1588	5/8	18	100	-	12	9	12	4	14.50	T692 1588	T694 1588
DIN 5156*										T699	T700
0973	G 1/8	28	90	-	7.0	5.5	8	4	8.8	T699 0973	T700 0973
1316	G 1/4	19	100	-	11.0	9.0	12	4	11.8	T699 1316	T700 1316
1666	G 3/8	19	100	-	12.0	9.0	12	5	15.3	T699 1666	T700 1666
2096	G 1/2	14	125	-	16.0	12.0	15	5	19.0	T699 2096	T700 2096
2291	G 5/8	14	125	-	18.0	14.5	17	5	21.0	T699 2291	T700 2291
2644	G 3/4	14	140	-	20.0	16.0	19	5	24.5	T699 2644	T700 2644
3020	G 7/8	14	150	-	22.0	18.0	21	5	28.5	T699 3020	T700 3020
3325	G 1	11	160	-	25.0	20.0	23	5	31.0	T699 3325	T700 3325

ISO	P							M	K	N						S							H																													
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41			
T691/T692/T699	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
T693/T694/T700	●	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	

P Steel M Stainless Steel K Cast Iron N Non-Ferrous Metals S Titanium & Super Alloys H Hard Materials ● Optimal ○ Effective

* Limit & Nut Tolerance = ISO 228

Application Chart

ISO	VDI	Material Group	Sutton
P	A	Steel	N
M	R	Stainless Steel	VA
K	F	Cast Iron	GG
N	N	Non-Ferrous Metals, Aluminiums & Coppers	Al W
S	S	Titanium & Super Alloys	Ti Ni
H	H	Hard Materials (≥ 45 HRC)	H

^ VDI 3323 material groups can also be determined by referring to the material cross reference listing in the application guide at the back of this catalogue.



Catalogue Code	M	T684	T685	T687	T688
MF		T686		T689	
UNC		T691		T693	
UNF		T692		T694	
G (BSPF)		T699		T700	
Material		PM-HSSE V3		PM-HSSE V3	
Surface Finish		Hardlube		Hardlube	
Sutton Designation		UNI		UNI	
Tapping Depth		≤ 3xØ		≤ 3xØ	
Limit & Nut Tolerance		6HX		6HX	

ISO	VDI ³³²³	Material	Condition	HB	N/mm ²	Vc	Vc	
P	1	Steel - Non-alloy, cast & free cutting	~ 0.15 %C	A	125	440	17	22
	2		~ 0.45 %C	A	190	640	17	22
	3			QT	250	840	14	18
	4		~ 0.75 %C	A	270	910	16	20
	5			QT	300	1010	-	-
	6	Steel - Low alloy & cast < 5% of alloying elements		A	180	610	17	22
	7			QT	275	930	12	14
	8			QT	300	1010	-	-
	9			QT	350	1180	-	-
	10	Steel - High alloy, cast & tool		A	200	680	12	14
	11			HT	325	1100	-	-
M	12	Steel - Corrosion resistant & cast	Ferritic / Martensitic	A	200	680	7	9
	13		Martensitic	QT	240	810	4	5
	14.1		Austenitic	AH	180	610	9	11
M	14.2	Stainless Steel	Duplex		250	840	6	7
	14.3		Precipitation Hardening		250	840	-	-
K	15	Cast Iron - Grey (GG)	Ferritic / Pearlitic		180	610	17	22
	16		Pearlitic		260	880	14	18
	17	Cast Iron - Nodular (GGG)	Ferritic		160	570	17	22
	18		Pearlitic		250	840	14	18
	19	Cast Iron - Malleable	Ferritic		130	460	22	27
20	Pearlitic			230	780	17	22	
N	21	Aluminum & Magnesium - wrought alloy	Non Heat Treatable		60	210	17	22
	22		Heat Treatable	AH	100	360	22	27
	23	Aluminum & Magnesium - cast alloy ≤ 12% Si	Non Heat Treatable		75	270	22	27
	24		Heat Treatable	AH	90	320	22	27
	25	Al & Mg - cast alloy > 12% Si	Non Heat Treatable		130	460	14	18
	26	Copper & Cu alloys (Brass/Bronze)	Free cutting, Pb > 1%		110	390	12	14
	27		Brass (CuZn, CuSnZn)		90	320	26	32
	28		Bronze (CuSn)		100	360	-	-
29	Non-metallic - Thermosetting & fiber-reinforced plastics					-	-	
30	Non-metallic - Hard rubber, wood etc.					-	-	
S	31	High temp. alloys	Fe based	A	200	680	-	-
	32			AH	280	950	-	-
	33		Ni / Co based	A	250	840	-	-
	34			AH	350	1180	-	-
	35		C	320	1080	-	-	
	36	Titanium & Ti alloys	CP Titanium		400 MPa		-	-
	37.1		Alpha alloys		860 MPa		-	-
37.2	Alpha / Beta alloys		A	960 MPa		-	-	
37.3			AH	1170 MPa		-	-	
37.4	Beta alloys		A	830 MPa		-	-	
37.5		AH	1400 MPa		-	-		
H	38.1	Hardened steel	HT	45 HRC			-	-
	38.2			55 HRC			-	-
	39.1		HT	58 HRC			-	-
	39.2		HT	62 HRC			-	-
	40	Cast Iron	Chilled	C	400	1350	-	-
41	HT			55 HRC			-	-

Condition: A (Annealed), AH (Age Hardened), C (Cast), HT (Hardened & Tempered), QT (Quenched & Tempered)
 Blue = Optimal | Black = Effective

Case Study

TEST 1

Capable of tapping a wide range of material groups:

P Carbon Steels N Brass N Aluminium N Copper M Stainless Steel



TEST 2

Productivity Testing

Tap Size: M8 x 1.25

Lubricant: Minimum Quantity (MQL)

Material: AISI 1045 approximately

10HRC (medium carbon steel)

Standard R40 N

Vc = 10 m/min

N = 400 rpm

Fn = 1.25 mm/rev

Vf = 500 mm/min

Depth = 2.5 x D blind

Black Magic

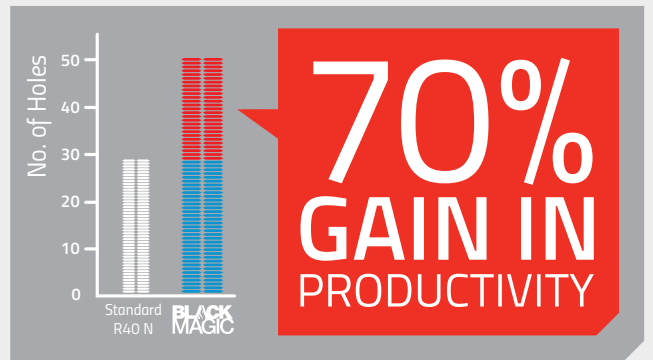
Vc = 22 m/min

N = 876 rpm

Fn = 1.25 mm/rev

Vf = 1095 mm/min

Depth = 2.5 x D blind



IMPERIAL TAPS (inch size)

Ø = nominal tap size (inch)

TPI = thread count per inch (TPI)

n = spindle speed (RPM)

Vc = cutting speed (m/min)

Vf = feed rate (mm/min)

Vr = feed rate per rev (mm/rev)

$$n = \frac{Vc \times 1000}{\frac{\pi \times \text{TPI}}{\pi} \times 25.4} \approx \frac{Vc}{\text{TPI}} \times 12.5$$

$$Vc = \frac{n \times \frac{\pi \times \text{TPI}}{\pi} \times 25.4}{1000} \approx \frac{n \times \text{TPI}}{12.5}$$

$$Vr = \frac{n \times 25.4}{\text{TPI}}$$

METRIC TAPS (mm size)

Ø = nominal tap size (mm)

P = thread pitch (mm)

n = spindle speed (RPM)

Vc = cutting speed (m/min)

Vf = feed rate (mm/min)

Vr = feed rate per rev (mm/rev)

$$n = \frac{Vc \times 1000}{\frac{\pi \times P}{\pi}} \approx \frac{Vc}{P} \times 318$$

$$Vc = \frac{n \times \frac{\pi \times P}{\pi}}{1000} \approx \frac{n \times P}{318}$$

$$Vr = n \times P$$