ROSCAMAT®

GENERAL TAPPING FEATURES

01/03/16 Edition

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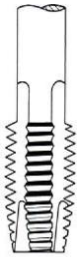
1 TAPPING BASICS

1.1 Tap types

	Straight flutes	Spiral flute
APLICATTION	Thru holes	Blind holes
Chamfer (NO THREADS)	5 threads x pitch	2.5 threads x pitch
NON RECOMMENDED…		Grey cast iron Steels > 1300N/mm^2
DURABILITY	High	Medium-High
EXAMPLE		

1.2 Taps. Recommended hook angles by material.

Material	Hook angle
Steel >1200 N/mm^2	3-5º (Coated tap)
Steel >80 N/mm^2	8-10º
Steel <80 N/mm^2	12-14º
Steel <50 N/mm^2. INOX	14-16º
Grey cast iron	5º
Hard aluminum	12-15º
Aluminum	17-25º
Plastics	

1.3 Coated Taps

PROS	CONS
Durability	Price
Improved cutting speed	-

1.4 Thread forming taps

- Instead of removing material as standard cutting taps do, thread forming taps displace material.
- Only for high elasticity materials.
- 2 to 2.5 times greater torque is required to tap with form taps than

conventional taps.

1.5 Lubrication

- Lubrication is always recommended but not required.
- As material hardness increases lubrication becomes more beneficial.

PROS	CONS
Improved cutting speed	Messy
Improves Tap durability	
Improves Thread quality	

1.5.1 Lubrication type by material

MATERIAL	RECOMMENDED LUBRICATION
Steels	Cutting oil, cutting fluid
High hardness steels	Special cutting oil E.P
Grey cast iron Nodule casting	None
Soft steels (<400N/mm2) Stainless steel	Stainless steel thread cutting oil

More info on lubrication type *[2.2 Cutting speeds by material, pg. -4-6-]*

1.6 Basic tapping suggestions

- A chamfered hole improves thread precision.
- Hole diameter can be between 2-3% bigger to reduce tapping torque needed.
- To tap M3 and under is recommended type 0 (Ø13) torque control adapter and 19/13 reduction cup.
- Is recommended interrupted threaded taps for long threads

2 CUTTING SPEED

2.1 CUTTING SPEED FORMULA

Cutting speed calculates:

$$v_c = \frac{Ø \cdot \pi \cdot \omega}{1000}$$

v_c : Cutting speed [meters/min]
ω: Turning speed [rpm]
Ø: Thread diameter [millimeters]

Cutting speed calculates:

$$SFM = \frac{Ø \cdot \pi \cdot \omega}{12}$$

SFM : Cutting speed [Feet per minute]
ω: Turning speed [rpm]
Ø: Thread diameter [Inches]

2.2 CUTTING SPEED BY MATERIAL

MATERIAL GROUP	MATERIAL SUB-GROUP	HARDNESS (HB)	RESISTANCE (N/mm²)	CUTTING SPEED(m/min)		
				COATING		
				Standard	TiN	TiCN
STEEL (A,B)	Low magnetism Steel	<120	<400	15-20	25-35	
	Construction steel	<200	<700	12-18	20-25	25-35
	Non alloy carbon steel	<250	<850	10-15	15-20	20-25
	Alloy steel	<250	<850	10-15	15-20	20-25
	Treated alloy steel	>250<350	>850<1200	6-10	10 -14	14-18
	Treated alloy steel	>350	>1200	3-5	6-10	10-15
STAINLESS STEEL (A)	Sulfur stainless steel	<250	<850	6-8	10-15	15-20
	Austenitic stainlees steel	<250	<850	4-6	8-12	12-18
	Ferritic and martensitic steel	<300	<1000	3-5	6-10	10-15
CAST (A,B)	Grey cast iron	<150	<500	8-12	14-20	20-30
	Grey cast iron	>150<300	>500<1000	4-6	10 -14	14-20
	Grey cast iron with spheroidal graphite	<200	<700	8-12	14-18	18-25
	Grey cast iron with spheroidal graphite	>200<300	>700<1000	4-6	10 -14	14-20
TITANIUM (B)	Titanium	<200	<700	10-15	-	-
	Alloy titanium	<270	<900	6-10	-	-
	Alloy titanium	>270<350	>900<1250	3-5	-	-
NICKEL (A)	Nickel	<150	<500	8-12	15-20	20-30
	Alloy nickel	<270	<900	3-5	5-8	8-12
	Alloy nickel	>270<350	>900<1200	2-4	3-5	4-6
COPPER (B)	Cooper	<150	<350	8-12	12-18	18-25
	Brass,bronze, alloy cooper	<200	<700	20-28	35-45	45-55
	Brass	<200	<700	15-20	20-30	30-40
	AMPCO (alloy Cu-Al-Fe)	<470	<1500	2-4	-	-
ALUMINUM MAGNESIUM (B)	Non alloy aluminum and magnesium	<100	<350	10-15	15-25	25-35
	Alloy alum with Si <0,5%	<120	<400	25-35	35-45	45-60
	Alloy alum with Si <10%	<120	<400	15-20	20-30	30-40
	Alloy alum with Si >10%. Alloy magnesium	<120	<400	10-15	15-20	20-25
SYNTHETIC MATERIALS (B,C)	Thermoplastic	-	-	20-30	20-30	20-30
	Thermosets	-	-	8-12	10-15	12-18
	Fibre reinforced plastic	-	-	3-5	6-10	8-12
SINTERED MATERIALS (B,C)	Cermet	<550	<1700	2-4	-	-

LUBRICATION: A= Cutting oil B=Cutting Fluid C=None

3 EXAMPLE

Which module and ROSCAMAT® tapping machine is needed for the next job?
Material: Steel 900 N/mm^2
Thread size: M12 - 7/16"

METHOD 1:

Torque needed → *[4.1 RECOMMENDED TAPPING TORQUES. STEEL <800 N/mm2 (Factor =1), pg. -8-]*

15Nm

Factor → *[4.3 TAPPING TORQUE NEEDED APPLYING FACTORS pg. -9-]*

1.2-1.6 → 1.4

Torque calculation → *15x1.4 =21Nm*

Módulos → *[4.2MAXIMUM TORQUE (Nm) ROSCAMAT® TAPPING ARMS pg. -8-]*

Mosquito: 300
Tiger: 550
Shark: 500

METHOD 2:

G2, M12 → *[4.4 THREAD SIZE BY MACHINE, MODULE AND MATERIAL GROUP, pág. -10-]*

Mosquito: 300
R-200: 350
Tiger&Dragon: 550
R-400&700: 550
Shark: 500

4 TABLES

4.1 RECOMMENDED TAPPING TORQUES. STEEL <800 N/mm² (Factor =1)

Torque (Nm)	2,5	5	6	10	15	22	25	31	44	49	54	68	84	95	144	158	225	244	259	274	330
Metric	6	8	-	10	12	14	16	-	18	20	22	-	24	27	30	33	36	39	-	-	42
Whitworth UNC	7/32″	-	5/16″	3/8″	7/16″	½″	9/16″	5/8″		¾″		7/8″	-	1″	1.1/8″	1.¼″		-	1.3/8″	1.½″	-

4.2 MAXIMUM TORQUE (Nm) ROSCAMAT® TAPPING ARMS

	MOSQUITO		TIGER						SHARK					
MODULE	600	300	1050	750	550	300	170	90	900	500	320	140	75	40
REGULAR USE	14	28	12	17	24	40	78	150	15	28	46	95	185	340
INTENSIVE USE	11	22	9	13	18	32	60	115	12	22	36	75	150	260

4.3 TAPPING TORQUE NEEDED APPLYING FACTORS

MATERIAL	Hardness [N/mm²]	FACTOR	COMMENTS
STEEL	>1200	1.8-2.5	- Use straight synthetized tap - Specific oil E.P
	>1000 <1200	1.4-1.9	
	>800 <1000	1.2-1.6	
	<800	1 (0.8-1.2)	
STAINLESS STEEL		1.3-1.9	- Hardened tap - Specific oil
TITANIUM	<850	1.4-2	
	>850	1.6-2.2	
GREY CAST IRON		0.6-0.8	- Use straight synthetized tap
NODULE CAST		0.7-1	
BRONZE		0.7-1	
COOPER and BRASS		0.5-0.7	
ALUMINUM CAST ALUMINUM– MAGNESIUM		0.4-0.6	
PLASTIC		0.1-0.3	

4.4 THREAD SIZE BY MACHINE, MODULE AND MATERIAL GROUP

	MOSQUITO/200						TIGER/400						SHARK					
Vel /Modulo	G1		G2		G3		G1		G2		G3		G1		G2		G3	
300/350	12	7/16″	14	½″	16	9/16″												
600/750	8	5/16″	10	3/8″	12	7/16″												
1050							6	7/32″	8	5/16″	10	3/8″						
750							8	5/16″	10	3/8″	12	7/16″						
550							10	3/8″	12	7/16″	16	9/16″						
300							14	½″	16	9/16″	20	¾″						
170							16	9/16″	20	¾″	24	1″						
90							22	¾″	27	1″	30	1.1/8″						
900													8	5/16″	10	3/8″	12	7/16″
500													10	3/8″	12	7/16″	16	9/16″
320													14	½″	16	9/16″	20	¾″
140													18	¾″	22	¾″	27	1″
75													22	¾″	27	1″	33	1.1/4″
40													30	1.1/8″	36	1.1/4″	42	1.1/2″

***G1**: Steel > 900 N/mm², Stainless steel and Titanium*
***G2**: Steel < 900N/mm², Bronze and Cast iron*
***G3**: Aluminum and Magnesium*

4.5 MODULE THREAD SIZE RANGE & TAP ADAPTOR TORQUE CHART

Pneumatic Machines								Electric Machines		
Roscamat 200 Motors	Roscamat 400&700 Modules	Torque setting Nm	Torque setting thread forming taps (Nm)	Metric	NPT Taper	UNC	UNF	Mosquito Speed	Tiger& Dragon Modules	Shark Modules
750RPM	1050 RPM	0.3	0.6	M2		Nr.2	Nr.2	600RPM	1050 RPM	900 RPM
		0.4	0.8	M2,5			Nr.3			
		0.5	1	M3		Nr.3	Nr.4			
		0.6	1.2							
		0.8	1.6	M3,5		Nr.4	Nr.5			
		1	2			Nr.5	Nr.6			
		1.2	2.4	M4		Nr.6	Nr.8			
		1.6	3.2			Nr.8				
		2	4	M5			Nr.10			
		2.5	5				Nr.12			
		3	6			Nr.10	1/4"			
		4	8	M6		Nr.12				
		5	10				5/16"			
		6	12			1/4"	3/8"			
		8	16	M8						
	750 RPM	10	20			5/16"	7/16"		750 RPM	500 RPM
		12	24				1/2"			
		16	32	M10		3/8"				
350RPM	550 RPM	18	36				9/16"	300RPM	550 RPM	
		20	40		1/8"		5/8"			
		22	44	M12		7/16"				
	300 RPM	25	50						300 RPM	320 RPM
		28	56							
		32	64			1/2"	3/4"			
		36	72	M14						
		40	80	M16		9/16"				
	170 RPM	45	90				7/8"		170 RPM	140 RPM
		50	100			5/8"				
		56	112		1/4"					
		63	126	M18						
	90 RPM	70	140	M20	3/8"	3/4"	1"		90 RPM	
		80	160	M22			1.1/8"			
		90	180				1.1/4"			75 RPM
		100	200			7/8"	1.3/8"			
		110	220				1.1/2"			
		125	250	M24						
		140	280	M27		1"				
		160	320		1/2"					40 RPM
		180	360		3/4"					
		200	400			1.1/8"				
		220	440	M30						
		240	480	M33		1.1/4"				
		260	520							
		280	560	M36						
		300	600							
		320	640			1.3/8"				