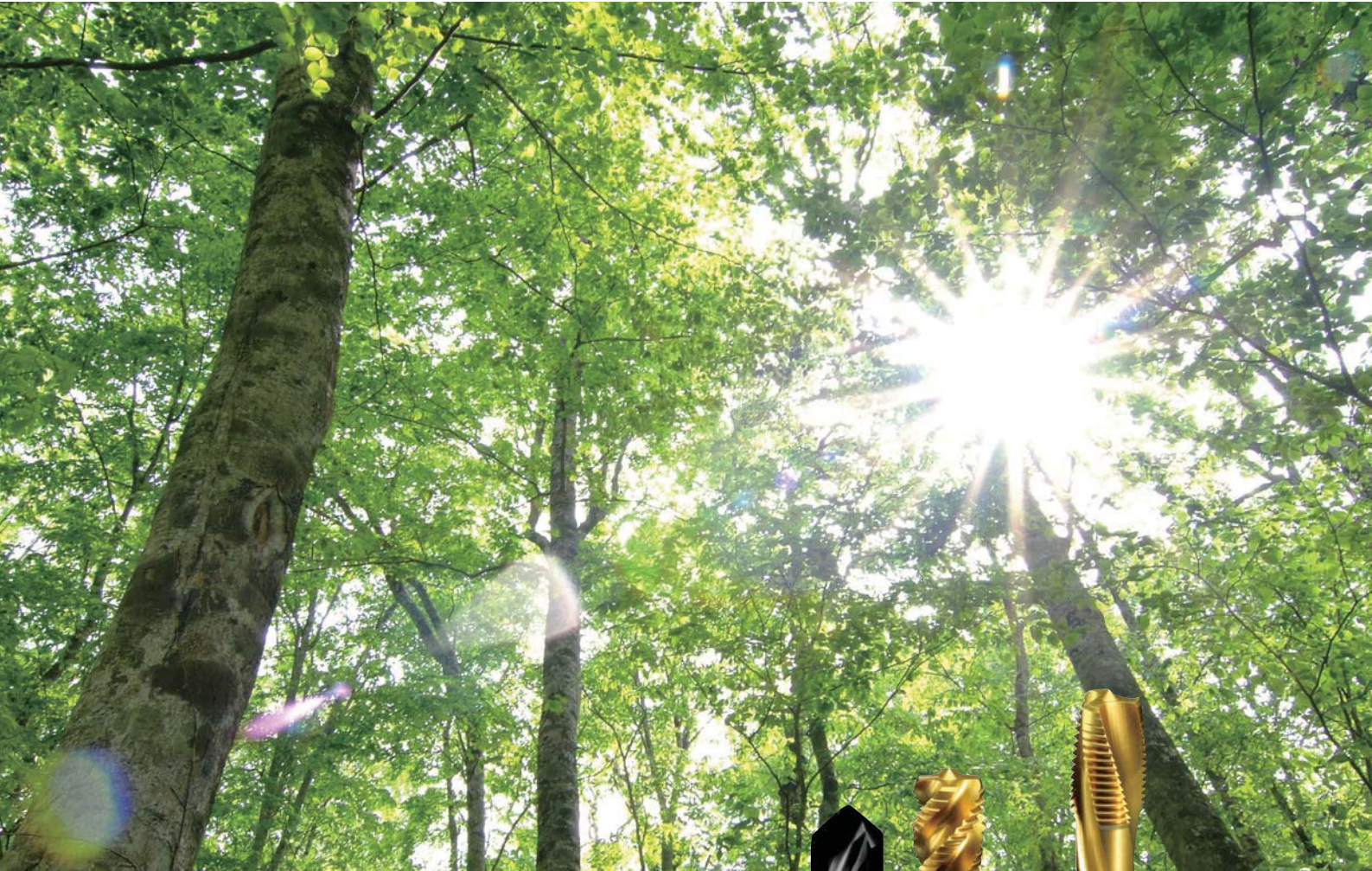


Quick Guide



 Think threads with
YAMAWA

Introduction

■ About Yamawa

Founded in Japan in 1923, Yamawa has made the excellence in taps, dies and centering tools manufacturing as its core mission. Since its foundation, the organization has been focusing on the research and development of the best technologies becoming in this way a global reference for the manufacturing of threading solutions. Products and production process quality has been for over 90 years a milestone, which still distinguishes Yamawa from its competitors: triple quality control on 100% of production, regular calibration of the machinery and the warranty of correspondence to Yamawa's production norms on each tools produced. Yamawa has been the first Japanese threading taps manufacturer to achieve ISO9001 certification. The company combines innovation of products and processes with high care for the environment and therefore has limited to the bare minimum the impact of its manufacturing plants and achieved ISO14001 in all the production sites.

Yamawa is headquartered in Tokyo and has 4 manufacturing sites distributed throughout Japan: Yonezawa, Fukushima, Aizu and Tsutsumi. With subsidiaries and commercial partners all over the world, Yamawa distributes its products globally and has reinforced the presence in Europe through the foundation of Yamawa Europe, based in Venezia-Mestre (Italy) which officially started operations on January 1st, 2016.

■ About this Quick Guide

The Quick Guide is a document designed to provide an introduction and summary of all the most important information included in our new general catalogue. The document presents a selection of all the main product lines arranged by work-piece material and the most relevant technical information:

- Simplified product search
- Easy access to technical information
- Light and handy printed edition

The Quick Guide is not meant to be a replacement of the catalogue but rather a complement to it as a taps quick selection tool.

The general catalogue is always the main choice to have an overview of the complete range and to access all the technical information.

All latest updates and documents in digital format are available at www.yamawa.eu.

Yamawa japanese factories

Yonezawa Plant

(ISO9001:1996) (ISO14001:2003)



Yonezawa is the main manufacturing plant of the Yamawa Group, this location is equipped with production lines and is the Quality Control Center. The plant obtained ISO9001 certification in 1996. Of the four Yamawa plants, the Yonezawa location has the longest history of manufacturing and the highest production capacity. Products include roll taps, spiral pointed, pipe and hand taps. The Yonezawa Plant stepped ahead of our competitors by receiving ISO9001 before any other cutting tool manufacturers in Japan.

Fukushima Plant

(ISO9001:2000) (ISO14001:2002)



The Fukushima plant provides both tap production lines and in house facilities for the manufacturing of specialized production machine tools to produce the exceptional high quality cutting tools. This plant develops and manufactures special taps and die production equipments. It also supplies these machines to our other manufacturing sites. Products include spiral fluted taps, dies and combined drills/countersinks as well as production machinery.

Aizu Plant

ISO9001:2000) (ISO14001:2002)



Equipped with the most sophisticated machine tools available, this plant is famous for its automation and robotized labor saving manufacturing processes. The plant is designed for mass production of the highest quality cutting tools and screw thread tools. Products include spiral fluted taps and carbide taps.

Tsutsumi Plant

(ISO9001:2011) (ISO14001:2011)



The Tsutsumi plant is the main tool blank manufacturing operation of Yamawa group. This location is also the testing center where Yamawa executes the innovation in metal machining and performance tests of the products for the Yamawa group.

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Explanation of icons	p. 6
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Forming taps applications	p. 35
Technical information	p. 43
Old-new code cross reference	p. 73
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Cutting taps		Roll taps	
			

Gr.	Materials	Features	Page No.			
P1	Free cutting steel and structural steel	Rm < 500 N/mm ²	8	12	38	38
P2	Carbon steel and low alloy steel	Rm 500-700 N/mm ²	8	12	38	38
P3	Medium alloy steel and heat treated steel	Rm 600-800 N/mm ²	8	12	38	38
P4	High alloy steel	Rm 800-1000 N/mm ²	8	12	38	38
P5	Tool steel	Rm 900-1200 N/mm ²	8	12	38	38
P6	High tensile strength steel	Rm 1200-1600 N/mm ²	8	12	-	-
M1	Ferritic stainless steel	Rm 400-700 N/mm ²	16	18	38	38
M2	Austenitic stainless steel - good machinability	Rm 500-750 N/mm ²	16	18	38	38
M3	Austenitic stainless steel - medium machinability	Rm 550-850 N/mm ²	16	18	38	38
M4	Martensitic stainless steel	Rm 650-950 N/mm ²	16	18	-	-
M5	PH stainless steel	Rm 800-1250 N/mm ²	-	-	-	-
K1	Grey cast iron	HB 150-250	20	22	-	-
K2	Nodular cast iron	HB 150-350	20	22	-	-
K3	Austenitic cast iron	HB 120-260	20	22	-	-
K4	ADI cast iron	HB 250-500	20	22	-	-
N1	Aluminium alloys < 12% Si		24	26	40	40
N2	Aluminium alloys > 12% Si		24	26	40	40
N3	Copper alloys		24	26	40	40
N4	Brass alloys and bronze alloys		24	26	-	-
N5	Plastic materials		-	-	-	-
N6	Fiber and composites		-	-	-	-
S1	Heat resistant super alloys - good machinability	HRC < 25	28	30	-	-
S2	Heat resistant super alloys - medium machinability	HRC 25-35	28	30	-	-
S3	Heat resistant super alloys - low machinability	HRC 35-45	28	30	-	-
S4	Low alloy Titanium - good machinability		-	-	-	-
S5	High alloy Titanium - medium machinability		28	30	-	-
H1	Hardened general steel	HRC 50-56	32	32	-	-
H2	Hardened bearing steel	HRC 54-62	32	32	-	-
H3	Hardened tool steel	HRC 60-65	32	32	-	-
H4	Hardened martensitic stainless steel	HRC 50-56	32	32	-	-
H5	Hardened white cast iron	HRC 48-55	32	32	-	-

Refer to pages 12-33 of the catalogue for the complete list of work materials.

Hardness conversion table

■ Conversion table from Rockwell C hardness of steel

Rockwell C Scale Hardness	Vickers Hardness	Brinell Hardness		Rockwell Hardness ²			Rockwell Superficial Hardness			Shore Hardness	Tensile Strength MPa ¹	Rockwell C Scale Hardness ²
		Standard ball	Tungsten Carbide ball	A scale	B scale	D scale	15-N scale	30-N scale	45-N scale			
HRC	HV	HB		HRA	HRB	HRD	HS15N	HS30N	HS45N	HS	—	HRC
68	940	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	68
67	900	—	—	85.0	—	76.1	92.9	83.6	74.2	95	—	67
66	865	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	66
65	832	—	(739)	83.9	—	74.5	92.2	81.9	72.0	91	—	65
64	800	—	(722)	83.4	—	73.8	91.8	81.1	71.0	88	—	64
63	772	—	(705)	82.8	—	73.0	91.4	80.1	69.9	87	—	63
62	746	—	(688)	82.3	—	72.2	91.1	79.3	68.8	85	—	62
61	720	—	(670)	81.8	—	71.5	90.7	78.4	67.7	83	—	61
60	697	—	(654)	81.2	—	70.7	90.2	77.5	66.7	81	—	60
59	674	—	(634)	80.7	—	69.9	89.8	76.6	65.5	80	—	59
58	653	—	615	80.1	—	69.2	89.3	75.7	64.3	78	—	58
57	633	—	595	79.6	—	68.5	88.9	74.8	63.2	76	—	57
56	613	—	577	79.0	—	67.7	88.3	73.9	62.0	75	—	56
55	595	—	560	78.5	—	66.9	87.9	73.0	60.9	74	2075	55
54	577	—	543	78.0	—	66.1	87.4	72.0	59.8	72	2015	54
53	560	—	525	77.4	—	65.4	86.9	71.2	58.6	71	1950	53
52	544	(500)	512	76.8	—	64.6	86.4	70.2	57.4	69	1880	52
51	528	(487)	496	76.3	—	63.8	85.9	69.4	56.1	68	1820	51
50	513	(475)	481	75.9	—	63.1	85.5	68.5	55.0	67	1760	50
49	498	(464)	469	75.2	—	62.1	85.0	67.6	53.8	66	1695	49
48	484	451	455	74.7	—	61.4	84.5	66.7	52.5	64	1635	48
47	471	442	443	74.1	—	60.8	83.9	65.8	51.4	63	1580	47
46	458	432	432	73.6	—	60.0	83.5	64.8	50.3	62	1530	46
45	446	421	421	73.1	—	59.2	83.0	64.0	49.0	60	1480	45
44	434	409	409	72.5	—	58.5	82.5	63.1	47.8	58	1435	44
43	423	400	400	72.0	—	57.7	82.0	62.2	46.7	57	1385	43
42	412	390	390	71.5	—	56.9	81.5	61.3	45.5	56	1340	42
41	402	381	381	70.9	—	56.2	80.9	60.4	44.3	55	1295	41
40	392	371	371	70.4	—	55.4	80.4	59.5	43.1	54	1250	40
39	382	362	362	69.9	—	54.6	79.9	58.6	41.9	52	1215	39
38	372	353	353	69.4	—	53.8	79.4	57.7	40.8	51	1180	38
37	363	344	344	68.9	—	53.1	78.8	56.8	39.6	50	1160	37
36	354	336	336	68.4	(109.0)	52.3	78.3	55.9	38.4	49	1115	36
35	345	327	327	67.9	(108.5)	51.5	77.7	55.0	37.2	48	1080	35
34	336	319	319	67.4	(108.0)	50.8	77.2	54.2	36.1	47	1055	34
33	327	311	311	66.8	(107.5)	50.0	76.6	53.3	34.9	46	1025	33
32	318	301	301	66.3	(107.0)	49.2	76.1	52.1	33.7	44	1000	32
31	310	294	294	65.8	(106.0)	48.4	75.6	51.3	32.5	43	980	31
30	302	286	286	65.3	(105.5)	47.7	75.0	50.4	31.3	42	950	30
29	294	279	279	64.7	(104.5)	47.0	74.5	49.5	30.1	41	930	29
28	286	271	271	64.3	(104.0)	46.1	73.9	48.6	28.9	41	910	28
27	279	264	264	63.8	(103.0)	45.2	73.3	47.7	27.8	40	880	27
26	272	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	860	26
25	266	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	840	25
24	260	247	247	62.4	(101.0)	43.1	71.6	45.0	24.3	37	825	24
23	254	243	243	62.0	100.0	42.1	71.0	44.0	23.1	36	805	23
22	248	237	237	61.5	99.0	41.6	70.5	43.2	22.0	35	785	22
21	243	231	231	61.0	98.5	40.9	69.9	42.3	20.7	35	770	21
20	238	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	760	20
(18)	230	219	219	—	96.7	—	—	—	—	33	730	(18)
(16)	222	212	212	—	95.5	—	—	—	—	32	705	(16)
(14)	213	203	203	—	93.9	—	—	—	—	31	675	(14)
(12)	204	194	194	—	92.3	—	—	—	—	29	650	(12)
(10)	196	187	187	—	90.7	—	—	—	—	28	620	(10)
(8)	188	179	179	—	89.5	—	—	—	—	27	600	(8)
(6)	180	171	171	—	87.1	—	—	—	—	26	580	(6)
(4)	173	165	165	—	85.5	—	—	—	—	25	550	(4)
(2)	166	158	158	—	83.5	—	—	—	—	24	530	(2)
(0)	160	152	152	—	81.7	—	—	—	—	24	515	(0)

*1: 1MPa=1N/mm²

*2: In above table, numbers in parenthesis are only for reference.

This table is abstracted from SAE J 417.

Explanation of icons



Class E High Speed Steel



Powder High Speed Steel Coated



High Speed Steel Oxidizing



Powder High Speed Steel Oxidizing



Class E High Speed Steel Oxidizing



Powder High Speed Steel Nitriding / Oxidizing



Class E High Speed Steel Nitriding/Oxidizing



Ultra-fine micro grain cemented carbide



Class E High Speed Steel Nitriding



Ultra-fine micro grain cemented carbide Coated



Class E High Speed Steel Coated



For blind hole with through coolant hole



Cobalt High Speed Steel



For through hole with radial coolant hole



Cobalt High Speed Steel Coated



For synchronized feeding



Powder High Speed Steel Nitriding

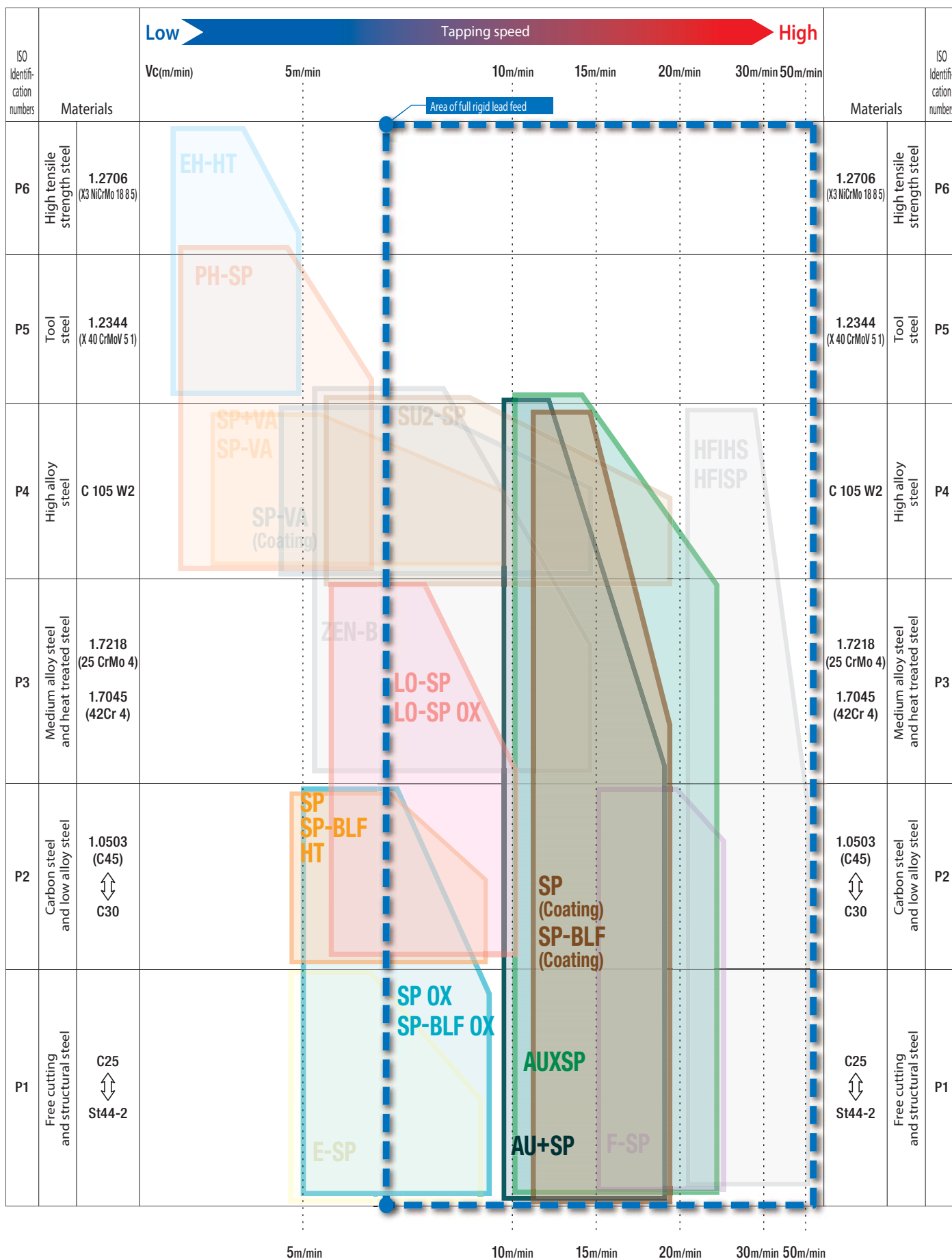


For blind hole >2xD

CUTTING TAPS APPLICATIONS



ISO P	p. 8	p. 12
ISO M	p. 16	p. 18
ISO K	p. 20	p. 22
ISO N	p. 24	p. 26
ISO S	p. 28	p. 30
ISO H	p. 32	p. 32

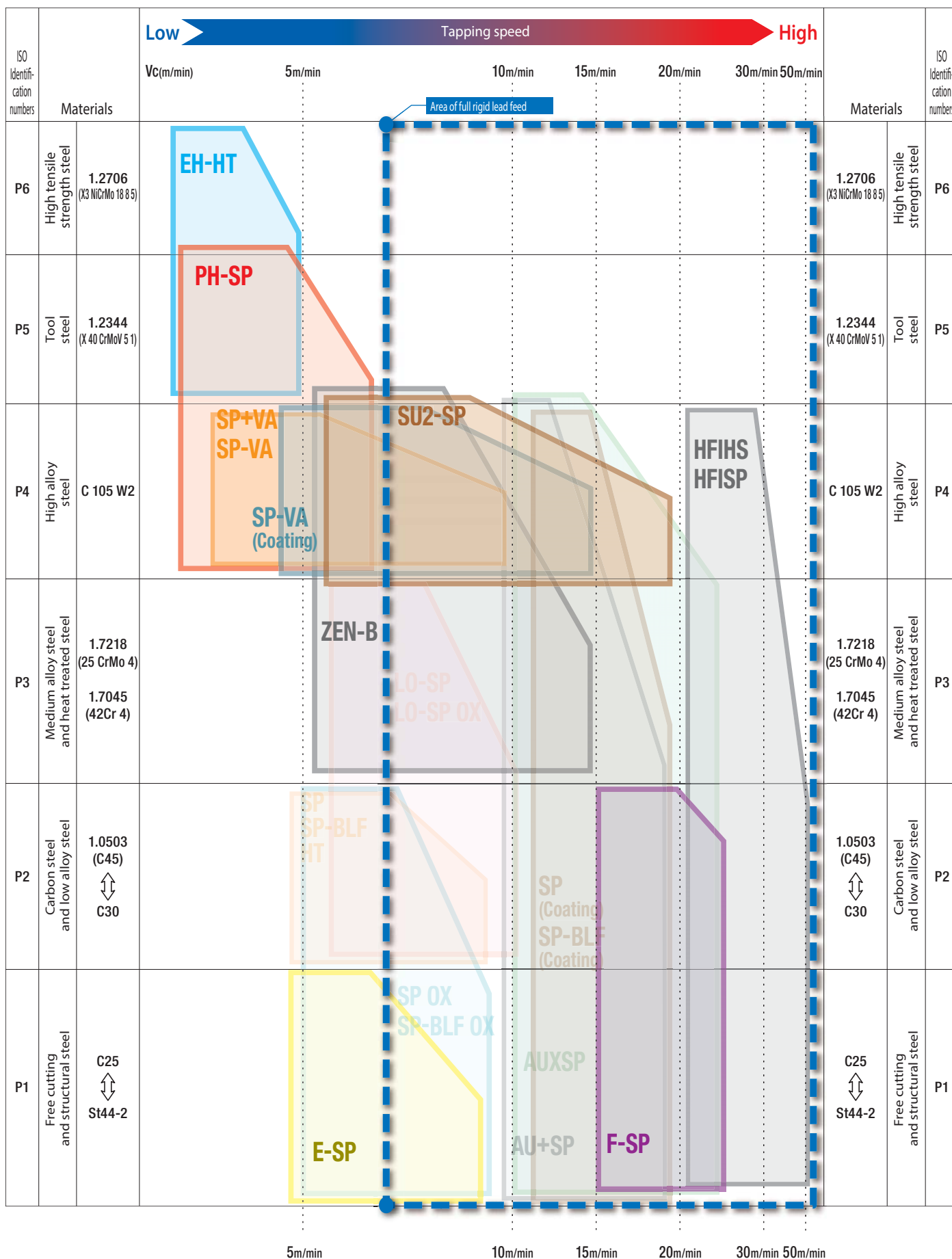


Part 1 - General purpose and universal

[illegible]

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

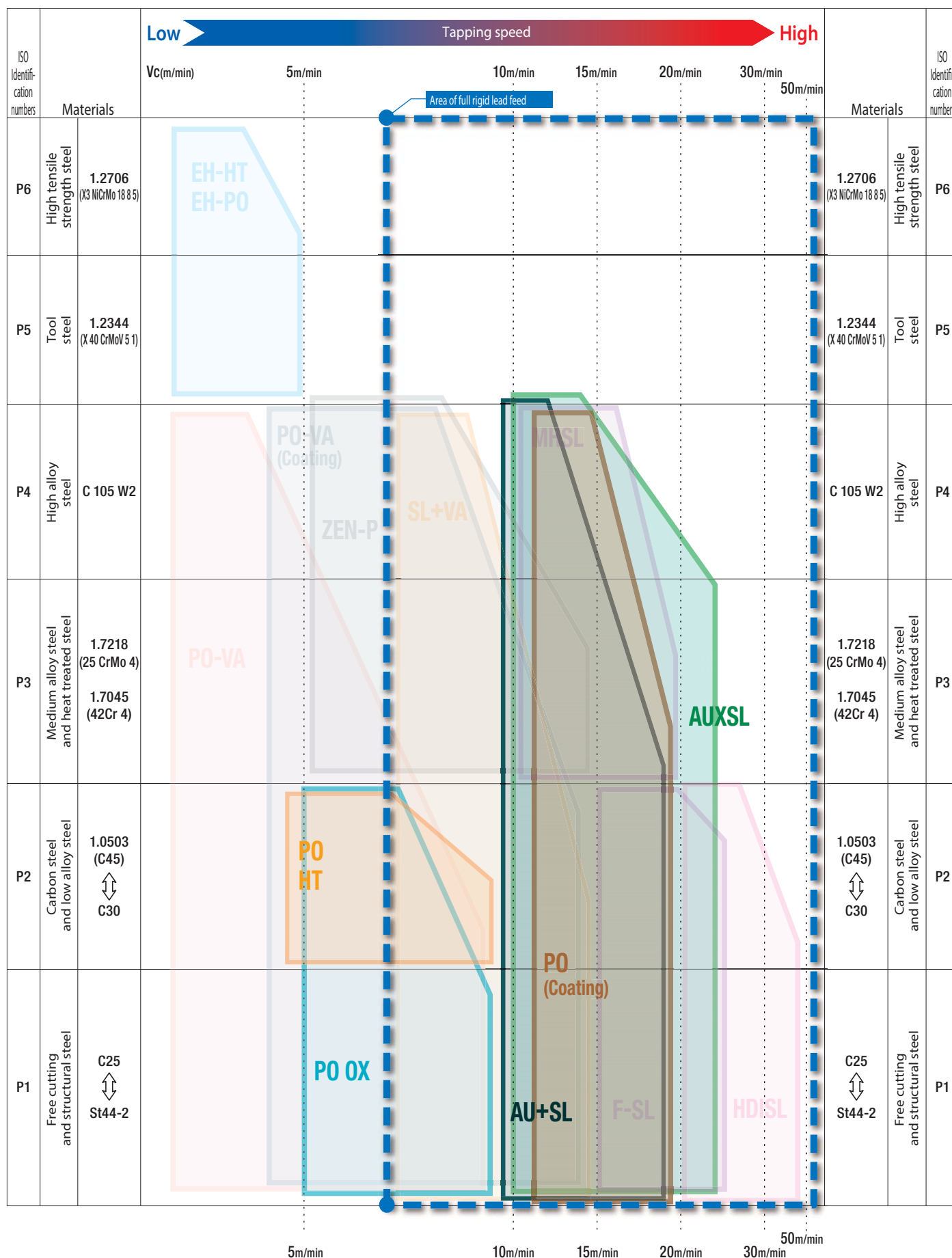


Part 2 - Special purpose and high speed

NEW CODE OLD CODE	SPECIAL PURPOSE								HIGH SPEED			
	E-SP 9□460X	SP-VA 9□450X	SP-VA 9□45TC	SP+VA 9□850X	SU2-SP 9□440X	ZEN-B 1□400X	PH-SP 9□480X	EH-HT 2□20	F-SP	HFISP	HFIHS	
	HSSE OX	HSSE OX	HSSE Coating	HSSE OX	HSSE OX 	HSS-P OX 	HSSE OX	HSS-Co	HSSE Coating 	HSS-Co Coating  	HSS-Co Coating  	
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M3~24 	M2~36 	M3~20 	M3~12 	M3~24 	M3~24 	M3~30 	M3~24 	M3~12 	M6~20 	M6~20 	
MF	MF10~24 	MF8~24 			MF10~24 	MF8~16 	MF8~30 	MF8~16 	MF10~12 	MF10~20 	MF10~20 	
UNC/UNF		No. 4~2 				No. 4~1 		No. 4~3/4 	No. 4~3/4 			
G/Rp		1/8~3/4 			1/8~3/4 		1/8~1/2 	1/8~1/2 				
BSW		3/16~1 										
NPT/NPTF		1/16~1  						1/8~3/4 				
Rc												
NPS/NPSF												
PG												

□ indicates the missing number to complete the old code as follows:

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An image telling possible applications

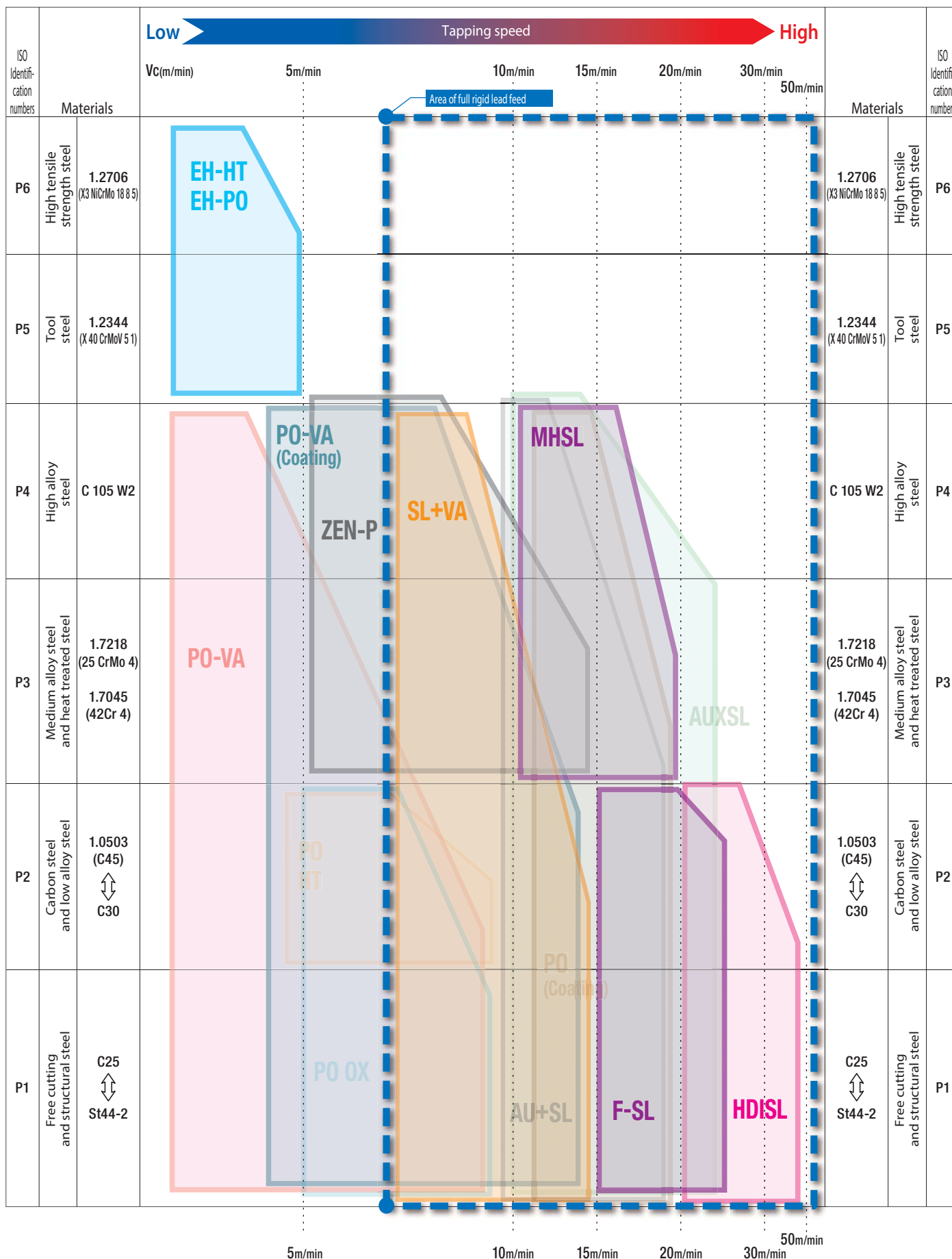
Part 1 - General purpose and universal

	GENERAL PURPOSE				UNIVERSAL							
NEW CODE OLD CODE	HT 9□20	PO 9□30	PO 9□30OX	PO 9□30TI	AU+SL 9□66TI	AUXSL 9□66TI						
						 						
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M2~48 	M1.4~48 	M2~48 	M2~24 	M3~12 	M6~12 						
MF	MF3~48 	MF4~48 	MF4~48 	MF8~20 	MF8~12 	MF8~12 						
UNC/UNF	No. 4~1.3/4 	No. 4~1.3/4 	No. 4~1.3/4 									
G/Rp	1/16~1.1/2  	1/16~1.1/2  	1/16~1.1/2  	1/8~1/2 								
BSW		1/8~1.1/2 										
NPT/NPTF	1/16~2  											
Rc	1/16~4 											
NPS/NPSF	1/8~1  											
PG	7~36 											

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P		ISO M		ISO K		ISO N		ISO S		ISO H	
FORMING TAPS	ISO P - ISO M		ISO N									
TECHNICAL INFORMATION												



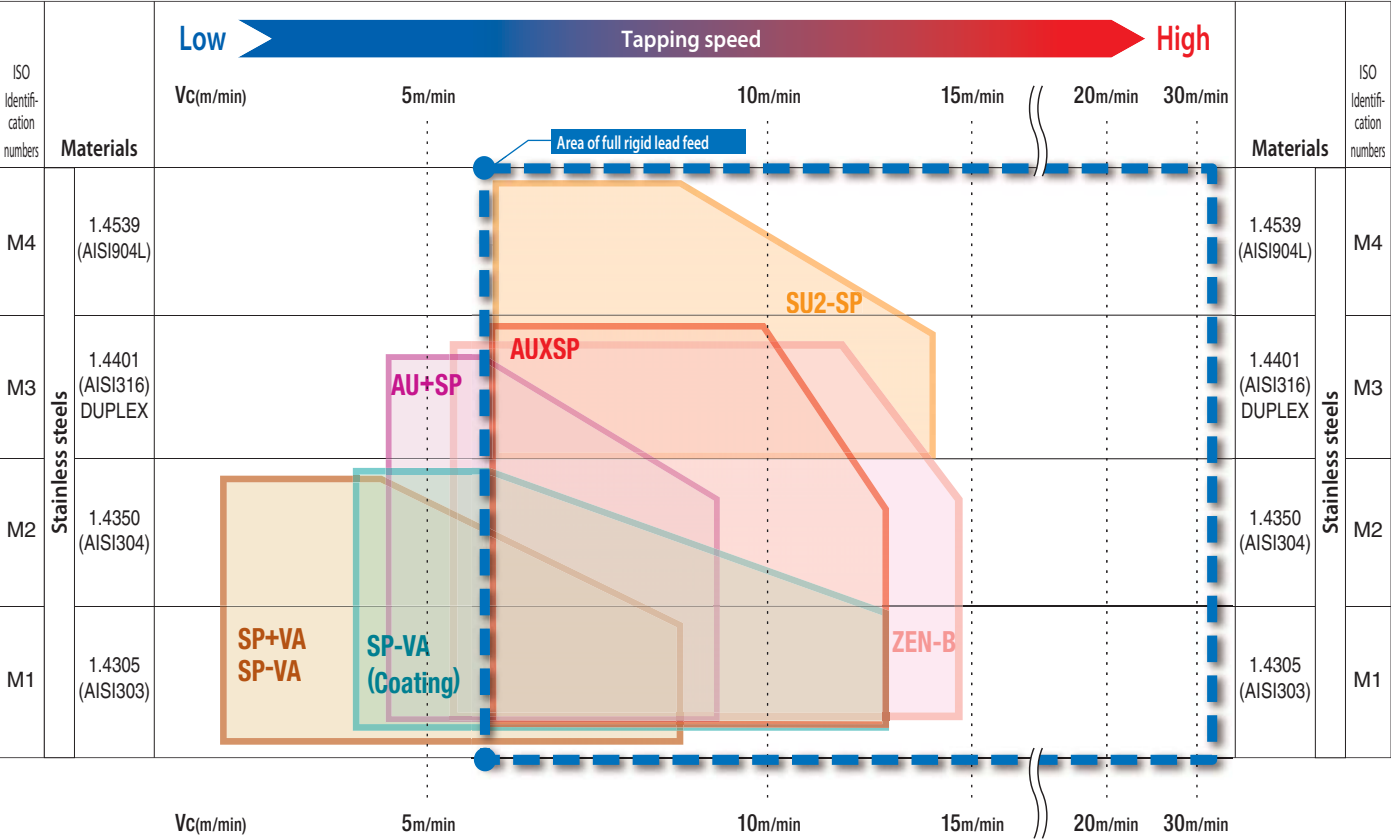
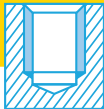
An image telling possible applications

Part 2 - Special purpose, high performance and high speed

	SPECIAL PURPOSE						HIGH PERFORMANCE	HIGH SPEED				
NEW CODE OLD CODE	PO-VA 9□35OX	PO-VA 9□35TC	SL+VA 9□65OX	ZEN-P 1□30NX	EH-PO 2□30	EH-HT 2□20	MHSL	F-SL	HDISL			
	HSSE OX	HSSE Coating	HSSE OX	HSS-P NX 	HSS-Co	HSS-Co	HSS-Co Coating 	HSSE Coating 	HSS-Co Coating  			
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M2~36 	M2~20 	M3~12 	M3~24 	M3~24 	M3~24 	M6~12 	M3~12 	M6~20 			
MF	MF8~24 			MF10~16 	MF8~20 	MF8~16 	MF10~16 	MF10~12 	MF10~20 			
UNC/UNF	No. 4~2 			No. 6~1 		No. 4~3/4 		No. 4~3/4 				
G/Rp						1/8~1/2 						
BSW	3/16~3/4 											
NPT/NPTF						1/8~3/4 						
Rc												
NPS/NPSF												
PG												

□ indicates the missing number to complete the old code as follows:

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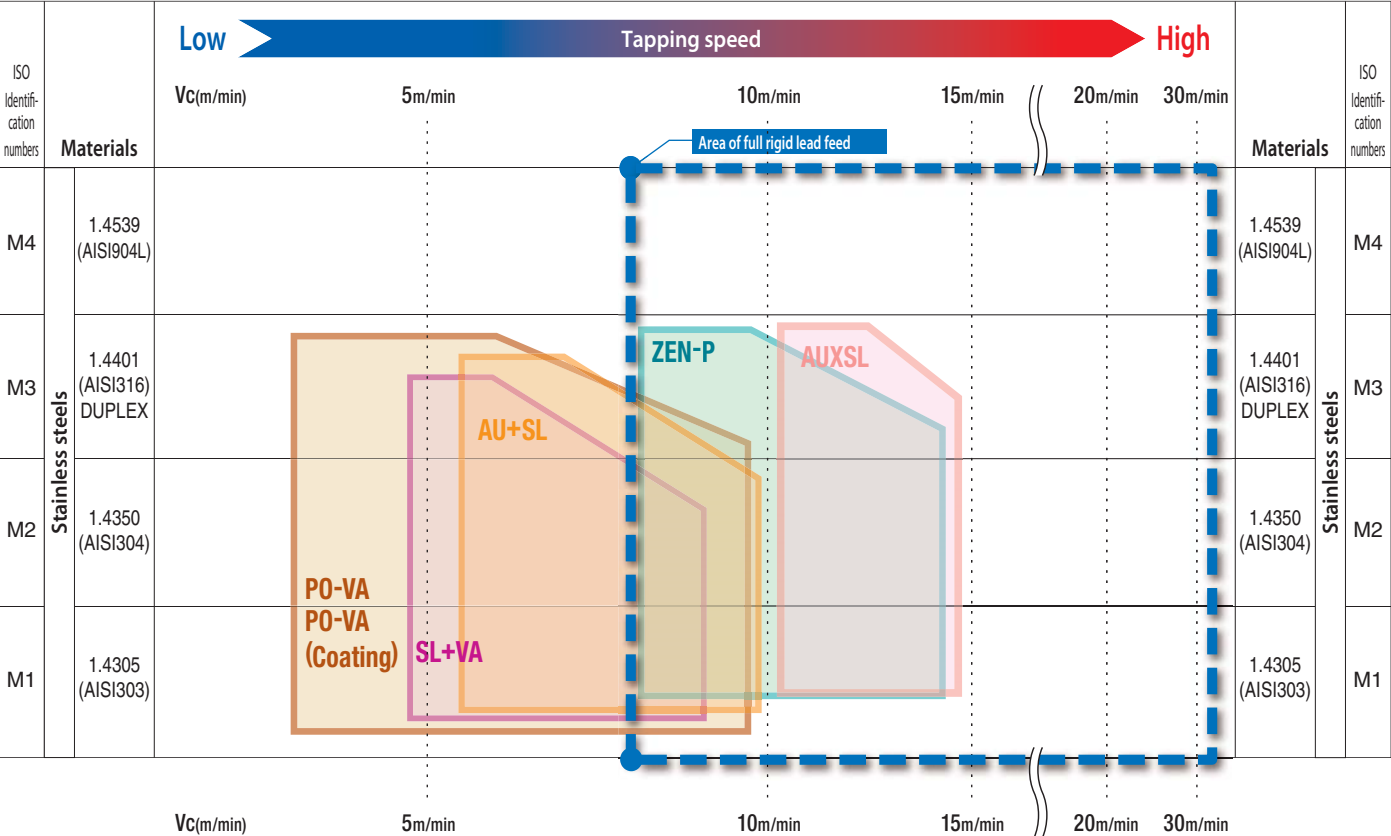
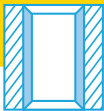
An image telling possible applications

	UNIVERSAL		SPECIAL PURPOSE								
NEW CODE OLD CODE	AU+SP 9□86TI	AUXSP 9□86TI	SP-VA 9□45OX	SP-VA 9□45TC	SP+VA 9□85OX	SU2-SP 9□44OX	ZEN-B 1□40OX				
	HSSE Coating	HSSE Coating 	HSSE OX	HSSE Coating	HSSE OX	HSSE OX 	HSS-P OX 				
											
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available											
M	M3~20 	M6~12 	M2~36 	M3~20 	M3~12 	M3~24 	M3~24 				
MF	MF8~20 	MF8~12 	MF8~24 			MF10~24 	MF8~16 				
UNC/UNF			No. 4~2 				No. 4~1 				
G			1/8~3/4 			1/8~3/4 					
BSW			3/16~1 								
NPT/NPTF			1/16~1  								
STI (EG) UNC/UNF							No. 2~1/2 				

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
FORMING TAPS	ISO S
	ISO H
	ISO P - ISO M
	ISO N
TECHNICAL INFORMATION	



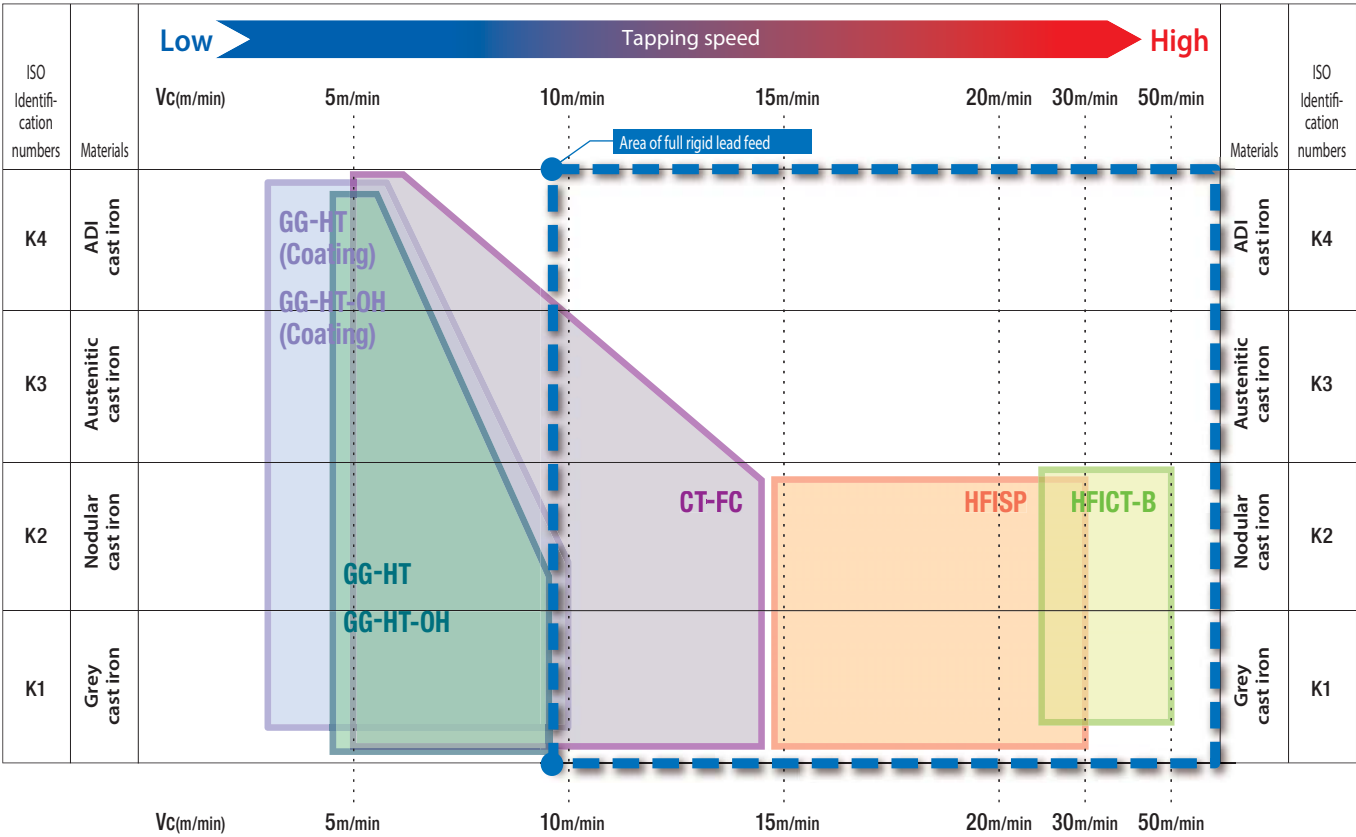
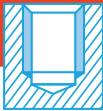
An image telling possible applications

	UNIVERSAL		SPECIAL PURPOSE									
NEW CODE OLD CODE	AU+SL 9□66TI	AUXSL 9□66TI	PO-VA 9□35OX	PO-VA 9□35TC	SL+VA 9□65OX	ZEN-P 1□30NX						
	HSSE Coating	HSSE Coating 	HSSE OX	HSSE Coating	HSSE OX	HSS-P NX 						
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M3~12 	M6~12 	M2~36 	M2~20 	M3~12 	M3~24 						
MF	MF8~12 	MF8~12 	MF8~24 			MF10~16 						
UNC/UNF			No. 4~2 			No. 6~1 						
BSW			3/16~3/4 									
NPT/NPTF												
STI (EG) UNC/UNF						No. 2~1/2 						

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

					ISO P
					ISO M
					ISO K
					ISO N
					ISO S
					ISO H
					ISO P - ISO M
					ISO N
TECHNICAL INFORMATION					



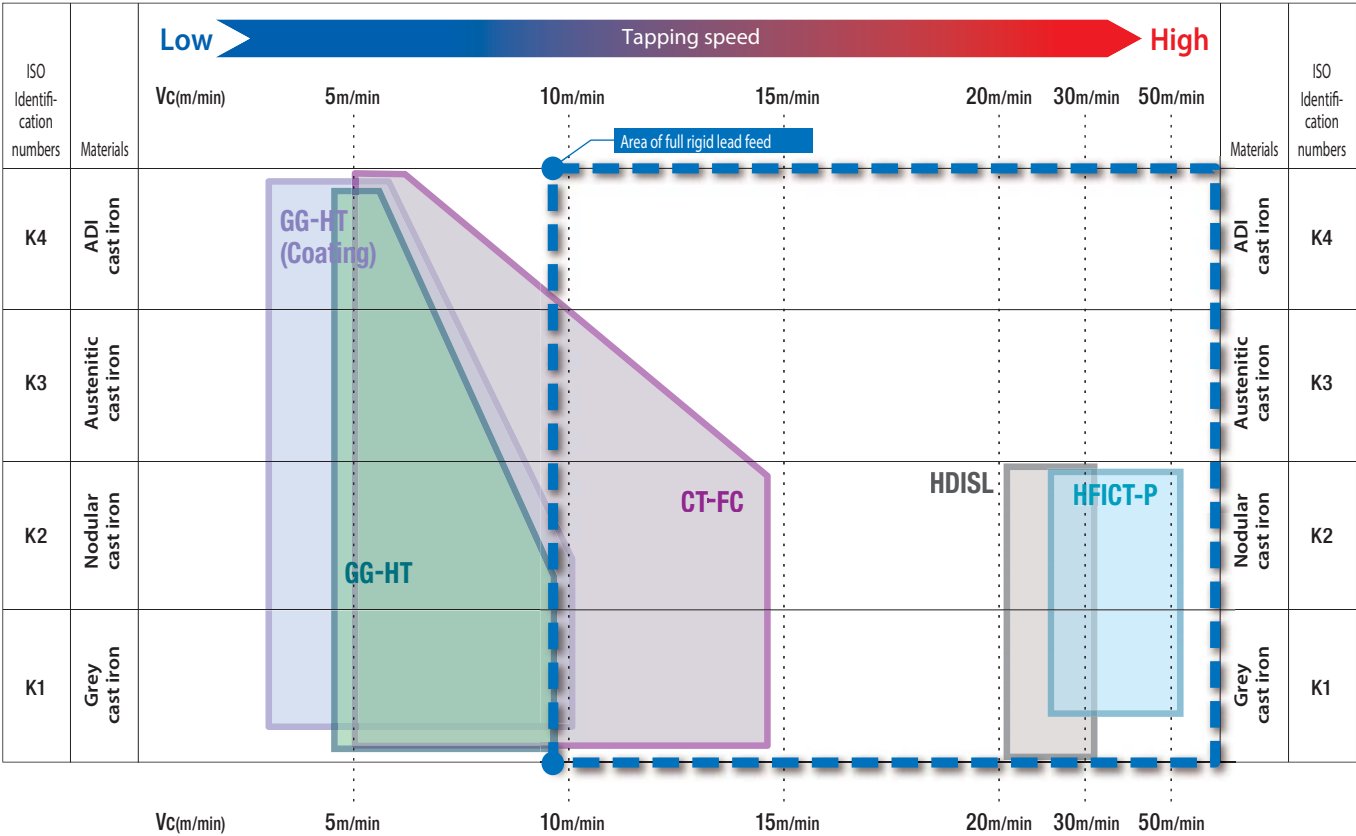
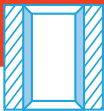
An image telling possible applications

	SPECIAL PURPOSE					HIGH SPEED						
NEW CODE OLD CODE	GG-HT 9□26NI	GG-HT 9□26TC	GG-HT-OH 9□26NIOH	GG-HT-OH 9□26TCOH	CT-FC 3□26	HFISP	HFICT-B					
	HSSE NI	HSSE Coating	HSSE NI 	HSSE Coating 	HF	HSS-Co Coating  	HF Coating  					
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M3~24 	M3~24 	M6~20 	M6~20 	M3~16 	M6~20 	M6~12 					
MF	MF8~24 	MF8~24 	MF8~22 	MF8~22 	MF8~16 	MF10~20 	MF10~12 					
UNC/UNF	1/4~3/4 				No. 10~5/8 							
G/Rp	1/8~1 	1/8~1/2 			1/8~1  							
NPT/NPTF	1/8~2  											
Rc	1/16~2 				1/8~1 							

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
FORMING TAPS	ISO S
	ISO H
	ISO P - ISO M
TECHNICAL INFORMATION	ISO N



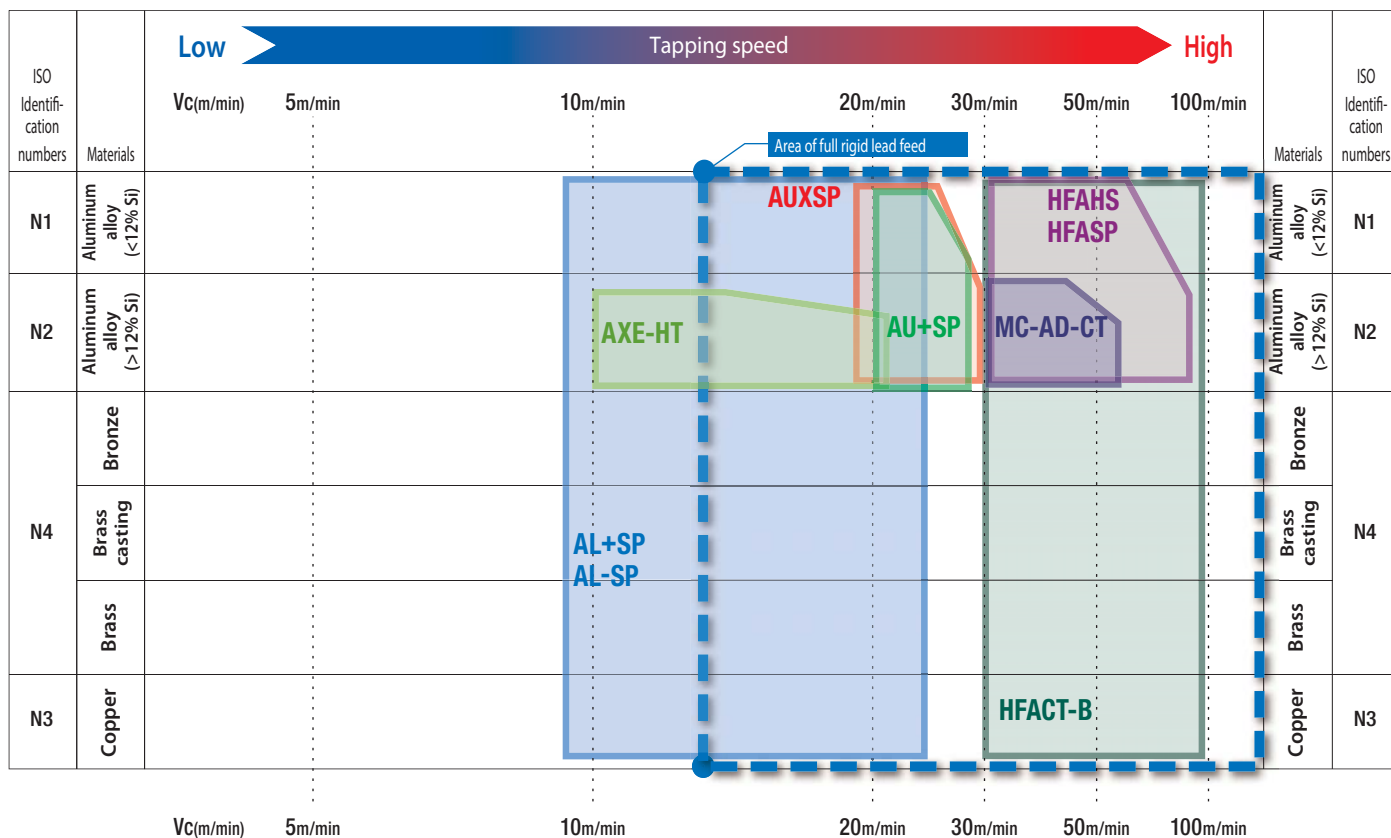
An image telling possible applications

	SPECIAL PURPOSE			HIGH SPEED								
NEW CODE OLD CODE	GG-HT 9□26NI	GG-HT 9□26TC	CT-FC 3□26	HDISL	HFICT-P							
	HSSE NI	HSSE Coating	HF	HSS-Co Coating Synchro nized 	HF Coating Synchro nized 							
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M3~24 	M3~24 	M3~16 	M6~20 	M6~12 							
MF	MF8~24 	MF8~24 	MF8~16 	MF10~20 	MF10~12 							
UNC/UNF	1/4~3/4 		No. 10~5/8 									
G/Rp	1/8~1 	1/8~1/2 	1/8~1 									
NPT/NPTF	1/8~2  											
Rc	1/16~2 		1/8~1 									

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H	ISO P - ISO M	ISO N
FORMING TAPS								
TECHNICAL INFORMATION								



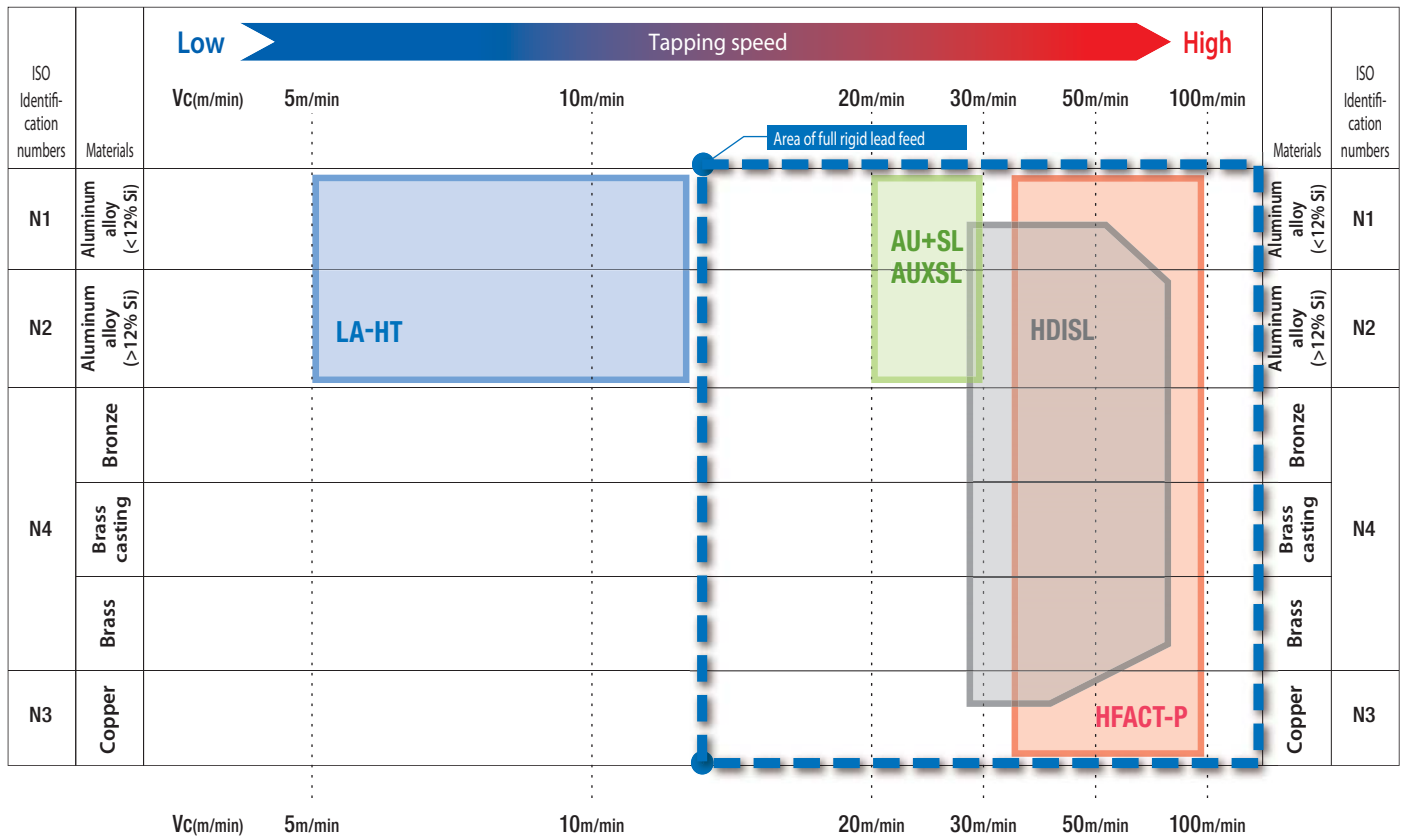
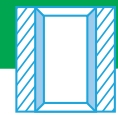
An image telling possible applications

	UNIVERSAL		SPECIAL PURPOSE		HIGH PERFORMANCE		HIGH SPEED					
NEW CODE OLD CODE	AU+SP 9□86TI	AUXSP 9□86TI	AL+SP 9□43NI	AL-SP 9□43NI	AXE-HT	MC-AD-CT	HFASP	HFAHS	HFACT-B			
	HSSE Coating	HSSE Coating 	HSSE NI	HSSE NI	HSS-P Coating 	HF Coating  	HSS-Co Coating  	HSS-Co Coating  	HF Coating  			
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M3~20 	M6~12 	M2~6 	M8~16 	M6~12 	M6~12 	M6~12 	M6~12 	M6~12 			
MF	MF8~20 	MF8~12 		MF10~16 	MF8~12 	MF10~12 	MF10~12 	MF10~12 	MF10~12 			
UNC/UNF				No. 2~1/2 								
STI (EG) M				3~24 								

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
FORMING TAPS	ISO S
	ISO H
	ISO P - ISO M
TECHNICAL INFORMATION	ISO N



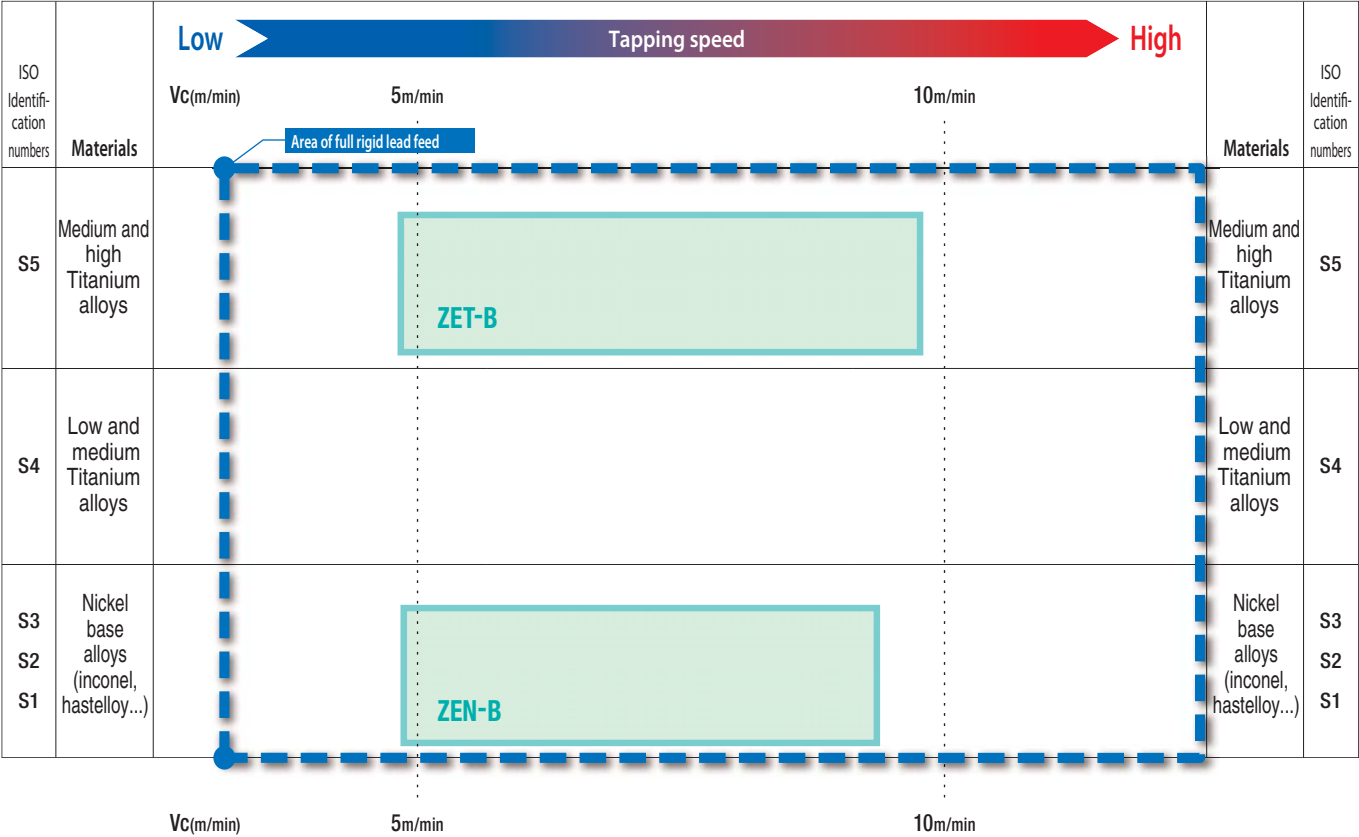
An image telling possible applications

	UNIVERSAL		SPECIAL PURPOSE	HIGH SPEED							
NEW CODE OLD CODE	AU+SL 9□66TI	AUXSL 9□66TI	LA-HT 9□23NI	HDISL	HFACT-P						
	HSSE Coating	HSSE Coating 	HSSE NI	HSS-Co Coating  	HF Coating  						
											
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available											
M	M3~12 	M6~12 	M3~16 	M6~20 	M6~12 						
MF	MF8~12 	MF8~12 	MF8~24 	MF10~20 	MF10~12 						
STI (EG) M			2.6~24 								
STI (EG) UNC/UNF			No. 4~3/4 								

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P	ISO M	ISO K	ISO N	ISO S	ISO H	ISO P - ISO M	ISO N
FORMING TAPS								
TECHNICAL INFORMATION								



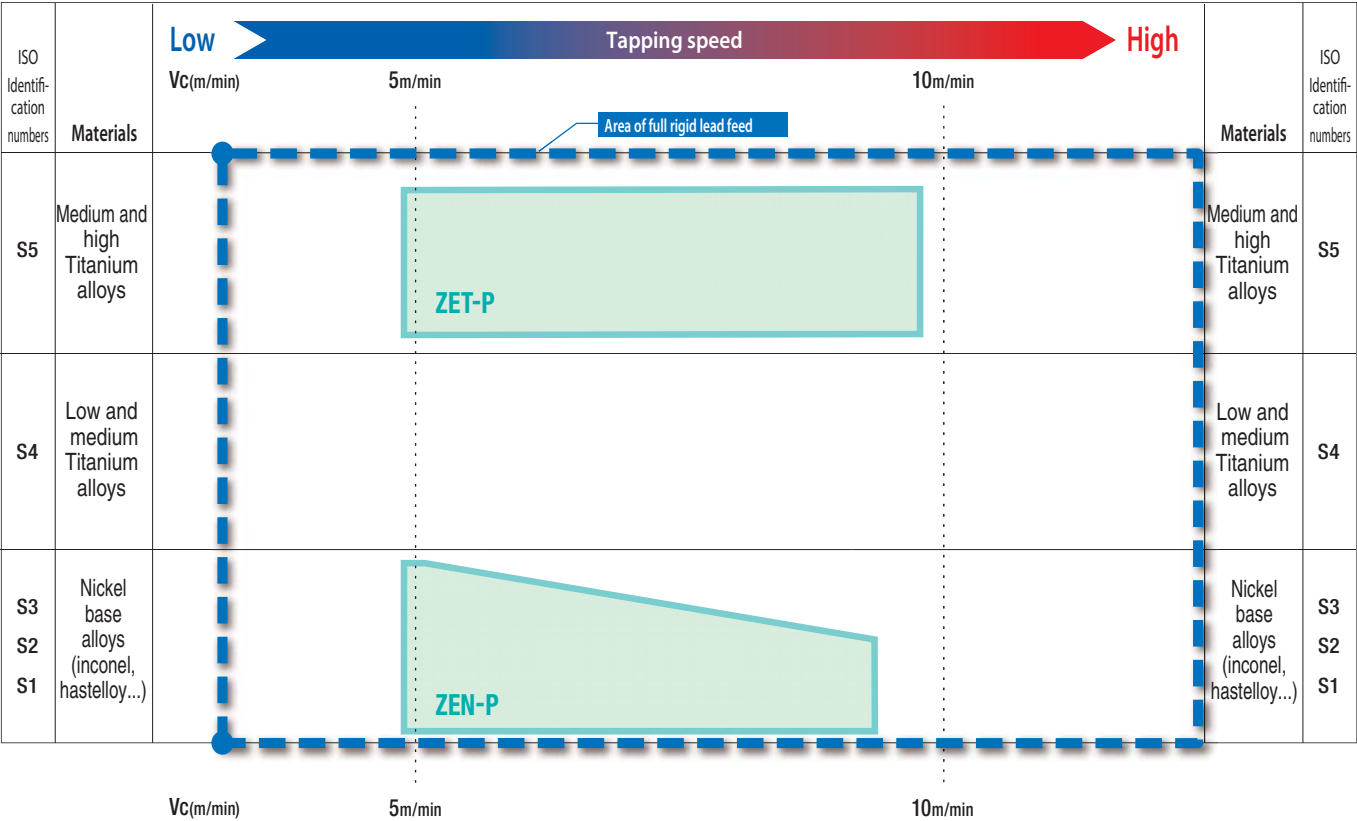
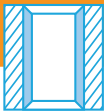
An image telling possible applications

		SPECIAL PURPOSE										
NEW CODE	OLD CODE	ZEN-B 1□400X	ZET-B 1□41NI									
		 	 									
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M		M3~24 	M3~24 									
MF		MF8~16 	MF8~16 									
UNC/UNF		No. 4~1 	No. 4~3/4 									
STI (EG) UNC/UNF		No. 2~1/2 										

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P
	ISO M
	ISO K
ISO S	ISO N
	ISO H
FORMING TAPS	ISO P - ISO M
	ISO N
TECHNICAL INFORMATION	



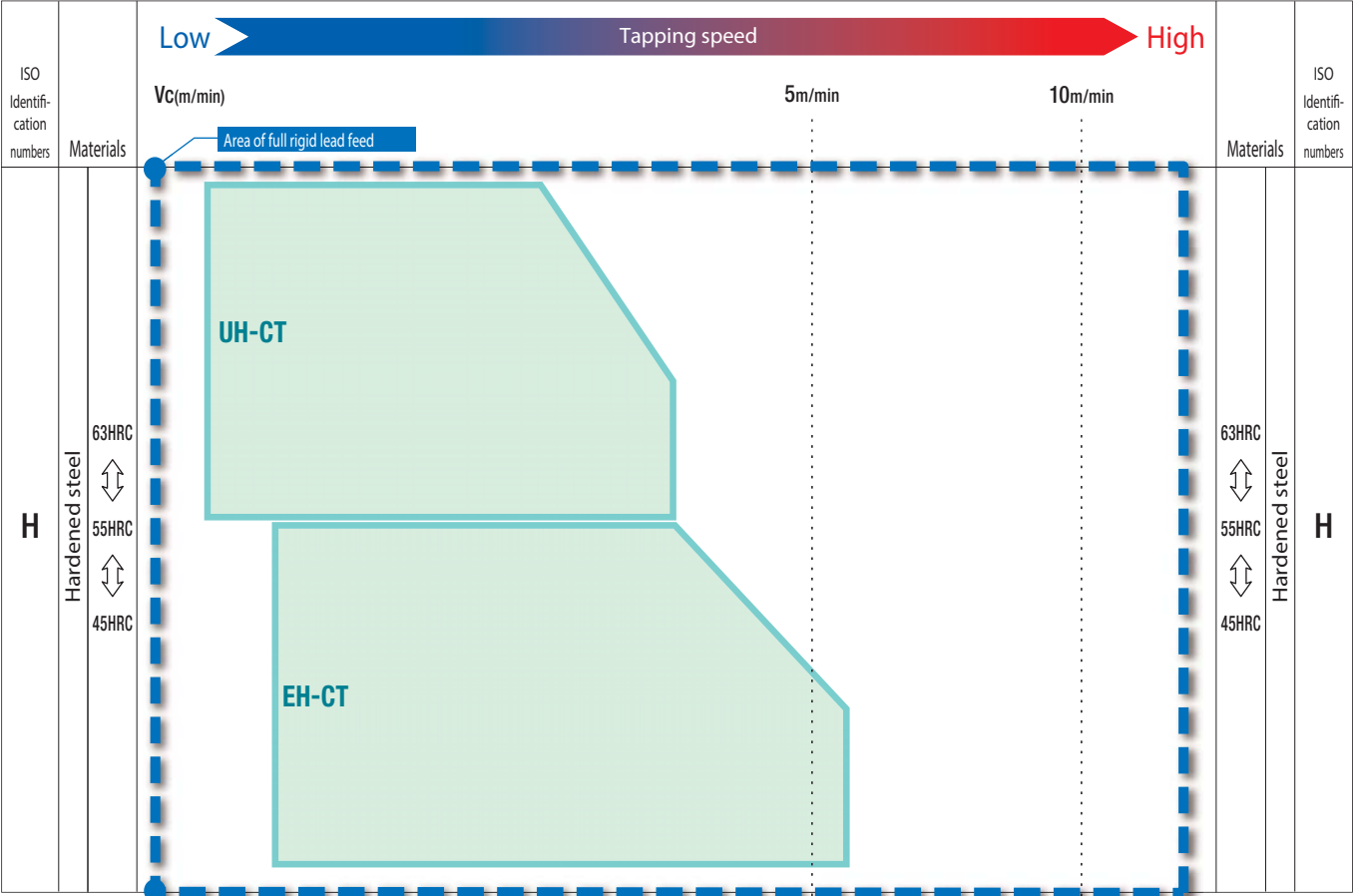
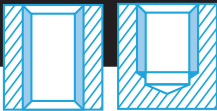
An image telling possible applications

SPECIAL PURPOSE											
NEW CODE	ZEN-P	ZET-P									
OLD CODE	1□30NX	1□49NI									
	 	 									
	 										
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available											
M	M3~24 	M3~16 									
MF	MF10~16 	MF8~16 									
UNC/UNF	No. 6~1 	No. 2~3/4 									
STI (EG) UNC/UNF	No. 2~1/2 										

□ indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

CUTTING TAPS	ISO P
	ISO M
	ISO K
ISO S	ISO N
	ISO H
FORMING TAPS	ISO P - ISO M
	ISO N
TECHNICAL INFORMATION	



An image telling possible applications

SPECIAL PURPOSE												
NEW CODE	OLD CODE	EH-CT	UH-CT									
		 	 									
		 										
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M		M3~12 	M3~20 									
MF			MF10~20 									

 indicates the missing number to complete the old code as follows:

3=DIN371 UN 4=DIN374/376 UN 6=DIN371 M 7=DIN376 M 8=DIN374 MF 9=DIN5156 G

TECHNICAL INFORMATION	FORMING TAPS		CUTTING TAPS							
	ISO N	ISO P - ISO M	ISO H				ISO S			
							ISO N	ISO K	ISO M	ISO P

FORMING TAPS APPLICATIONS

Introduction to Thread Forming Taps	p. 36
ISO P and ISO M	p. 38
ISO N	p. 40

Introduction to Thread Forming Taps (Roll Taps)

Thread Forming Taps are the tools used for producing internal threads by a thread forming process. Currently, Yamawa's Thread Forming Taps have a good reputation by being used in many areas. They are widely used along with the diversity of workpieces and with the change into miniaturization of workpieces. Followings are the characteristics and features of Thread Forming Taps (Roll Taps) which are not available with cutting taps.

■ Features of Roll Taps

- **Tapping without producing chips.** They are suitable for blind hole tapping. In producing internal threads with no chips, they save you a time for chip disposal.
- **Roll taps are stronger than cutting taps due to their design.** The effect of fluteless design gives a large cross-section area to the tap, and there is no worry of chip jamming, which makes Roll taps very tough against breakage.
- **Roll taps produce excellent pitch diameter well within pitch diameter tolerances.** Material deformation process produces the internal threads with good surface finish as well as precise pitch diameter.
- **High efficiency and tool life.** The configuration of the lobes at the crests of the tap threads makes high speed tapping possible and extends tool life compared with cutting type taps. The addition of a supplemental tap surface treatment, such as Oxidizing, Nitriding, TiN, and TiCN can extend tool life 2 to 20 times over an uncoated (bright) tap performance.

■ Points to note during a Roll tapping operation

- Tapping torque is 2 to 3 times larger than that of cutting type taps.
- Roll tapping is only applicable to materials producing stringy chips.
- The deviation of hole size before tapping should be about 5% of pitch. The control of hole size before tapping should be more severe than that of cutting type taps.
- The selection of lubricants is important to prevent sticking or welding.
- Burrs at the face of an internal thread are larger than those produced by cutting type taps. In some cases it is necessary to take additional countersink processing at the top of hole.
- In the minor diameter of internal thread, U-shape form (Tine form) at the hole entrance can be seen. U-shape form is never seen when using cutting type taps.

■ Selection of Yamawa Roll Taps

- **Types of Roll Taps.** Yamawa produces various types of Roll Taps which include General purpose taps, Special purpose taps for non-ferrous and steel, as well as special purpose taps with surface treatment for the specified applications. To provide for longer tool life, specially developed premium materials are also used together with physical vapor deposition coating (PVD) such as TiN and TiCN. In particular, OL-RZ is superior product developed for dry machining with regards to tapping environment and performance.
- **Tap Materials.** Yamawa's standard tap material is SKH58 designed for improving torque, superior anti-friction properties as well as toughness. To extend tool life, we use SKH56, or SKH10(Powder HSS) which is the best tap material for antifriction.
- **Tolerance Class.** Using the datum 12.7μm in a step form, in accordance with ANSI standard GH class, we made up Yamawa's G class system. The differences in materials being Roll tapped, as well as hole size, contribute to differences in thread forming. Yamawa offers 2 to 3 oversized tap tolerance classes in order to achieve the most suitable internal thread pitch diameter size.
- **Chamfer length.** Chamfer lengths: 2 pitches for blind hole use and 4 pitches for through hole use. Basically 4 pitches have longer tool life than 2 pitches because force applied on one blade at 4 pitch chamfer is smaller than that at 2 pitch chamfer. However, it is difficult to say about tool life in a few words because each different tapping condition influences the tool life.

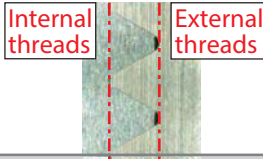
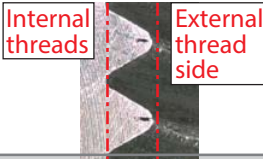
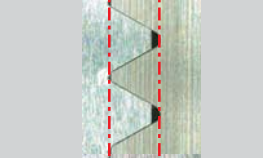
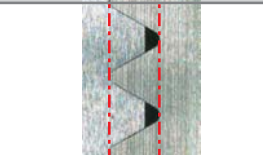
■ Shape of internal threads and the ratio of thread engagement affected by bored hole diameter

Compared with the basic height of thread engagement, the actual height of the thread engagement is called "thread engagement ratio" in percentage.

Depending on the bored hole diameter, internal threads and thread engagement ratio will change.

In tapping, the tapping condition must be chosen by referring to the thread engagement ratio.

The portion of material to be formed can be reduced by selecting the largest possible bored hole diameter. In this way the load on taps is reduced, decreasing tap's wear and damage.

S50C, minor diameter of threads cut		Aluminum, minor diameter of threads formed	
M24x3 minor dia tolerance of internal threads $\phi 20.752 \sim \phi 21.252$		M25x2 minor dia tolerance of internal threads $\phi 22.835 \sim \phi 23.210$	
【S50C internal threads cut ①】 M24x3 bored hole size : $\phi 20.652$ minor dia tolerance of internal threads NG thread engagement ratio: 103.1%		【Aluminum, internal threads formed ①】 M25x2 bored hole size : $\phi 23.903$ minor diameter of finished internal threads : 22.723mm minor dia tolerance of internal threads NG thread engagement ratio: 105.2%	
【S50C internal threads cut ③】 M24x3 bored hole size : $\phi 21.000$ minor dia tolerance of internal threads: Middle thread engagement ratio: 92.4%		【Aluminum, internal threads formed ③】 M25x2 bored hole size : $\phi 24.042\text{mm}$ minor diameter of finished internal threads : 23.067mm minor dia tolerance of internal threads : Middle thread engagement ratio: 89.3%	
【S50C internal threads cut ⑤】 M24x3 bored hole size : $\phi 21.352$ minor dia tolerance of internal threads NG thread engagement ratio: 81.5%		【Aluminum, internal threads formed ⑤】 M25x2 bored hole size : $\phi 24.240\text{mm}$ minor diameter of finished internal threads : 23.462mm minor dia tolerance of internal threads NG thread engagement ratio: 71.0%	

CUTTING TAPS

ISO P

ISO M

ISO K

ISO N

ISO S

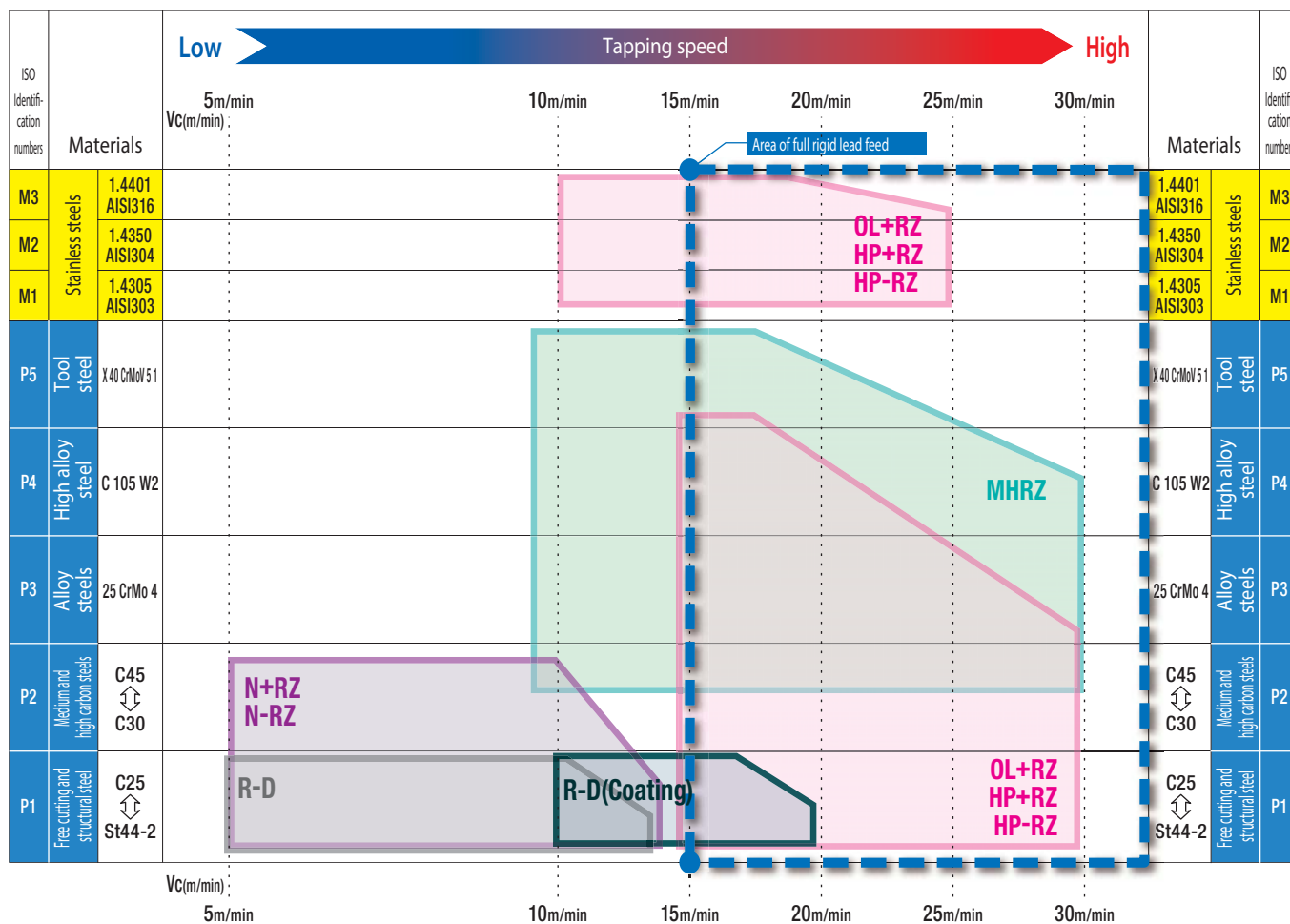
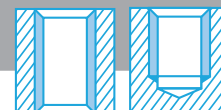
ISO H

FORMING TAPS

ISO P - ISO M

ISO N

TECHNICAL
INFORMATION

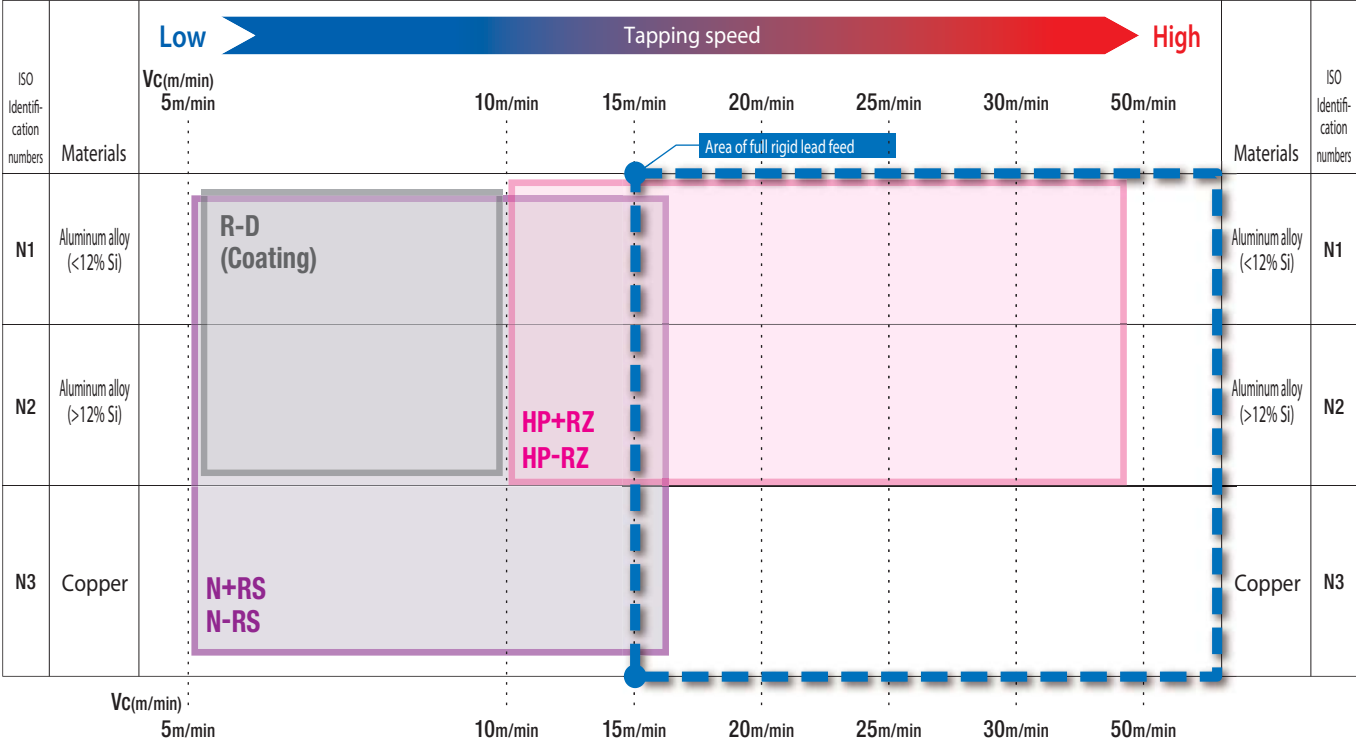
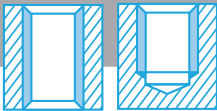


An image telling possible applications

	GENERAL PURPOSE		SPECIAL PURPOSE		HIGH PERFORMANCE							
NEW CODE OLD CODE	R-D 9353	R-D 9353Ti	N+RZ 9351OX	N-RZ 9351OX	OL+RZ 1355TC	HP+RZ 1356TC	HP-RZ 1□56TC	MHRZ				
	HSSE	HSSE Coating	HSSE OX	HSSE OX	HSS-P Coating	HSS-P Coating	HSS-P Coating	HSS-Co Coating				
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M2~16 	M2~16 	M2~6 	M8~16 	M3~6 	M2~6 	M8~16 	M6~10 				
MF				MF2~20 			MF10~16 	MF10~14 				
UNC/UNF				No. 0~1/2 	No. 2~1/4 		No. 0~1/2 					
G	1/8~3/8 	1/8~3/8 										

□ indicates the missing number to complete the old code as follows:
3=DIN371/376 M 8=DIN374 MF

CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
	ISO S
FORMING TAPS	ISO H
	ISO P - ISO M
TECHNICAL INFORMATION	ISO N



An image telling possible applications

	GENERAL PURPOSE	SPECIAL PURPOSE		HIGH PERFORMANCE								
NEW CODE OLD CODE	R-D 9353TI	N+RS 9350NI	N-RS 9350NI	HP+RZ 1356TC	HP-RZ 1□56TC							
	HSSE Coating	HSSE NI	HSSE NI	HSS-P Coating	HSS-P Coating							
												
Please refer to Yamawa general catalogue page  for a complete view on sizes, tolerances and chamfers available												
M	M2~16 	M2~6 	M8~12 	M2~6 	M8~16 							
MF			MF2~20 		MF10~16 							
UNC/UNF			No. 0~1/2 		No. 0~1/2 							
G	1/8~3/8 											
STI (EG) M			3~12 									

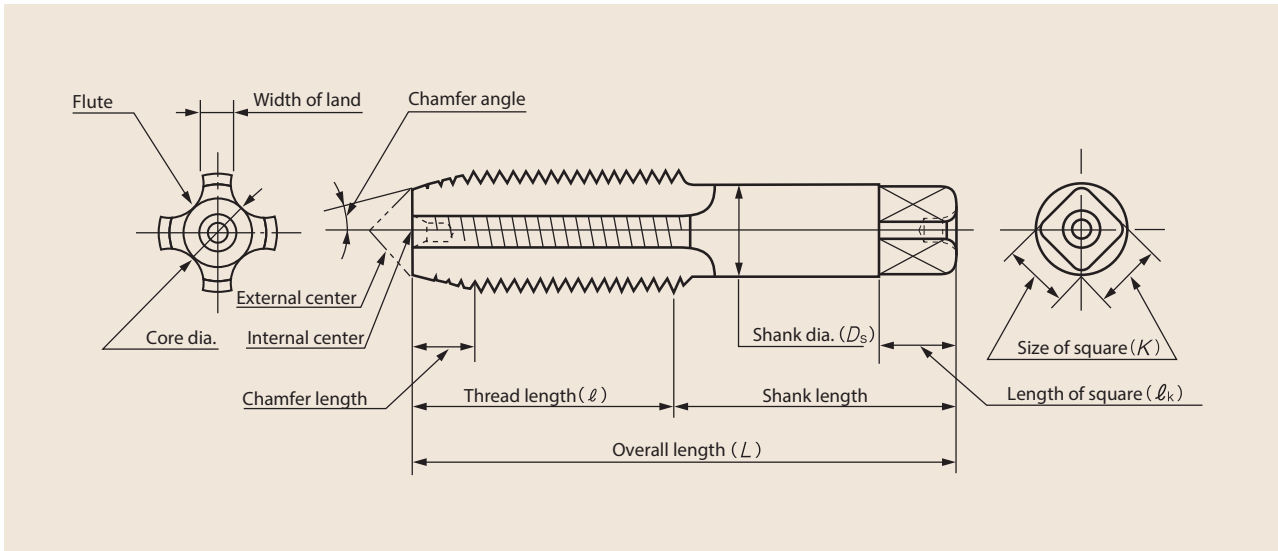
□ indicates the missing number to complete the old code as follows:
3=DIN371/376 M 8=DIN374 MF

CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
	ISO S
FORMING TAPS	ISO H
	ISO P - ISO M
TECHNICAL INFORMATION	ISO N

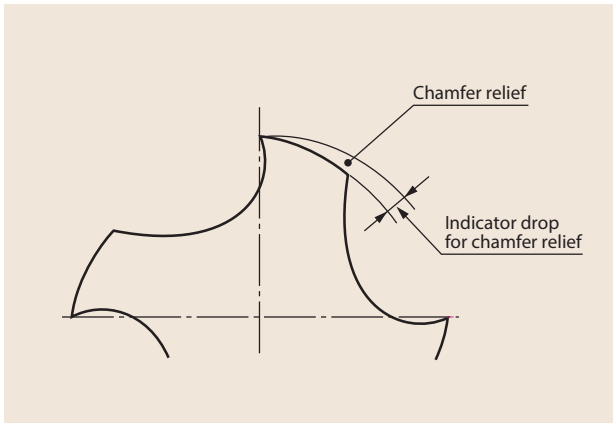
TECHNICAL INFORMATION

1. Terminology of Taps	p. 44
2. Flutes	p. 45
3. Edge angle and Cutting allowance of taps	p. 46
4. Recommended Tapping Speeds	p. 47
5. Bored hole size before tapping (for thread cutting)	p. 48
6. Bored hole size before tapping (for thread forming)	p. 57
7. Materials used for Cutting Tools	p. 59
8. Surface Treatment	p. 61
9. Carbide Taps	p. 64
10. Selecting different tap holder combinations by machine feed system	p. 66
11. The mechanism for a tap to cut oversize on an internal thread	p. 68
12. Symbols for Standard Threads	p. 70

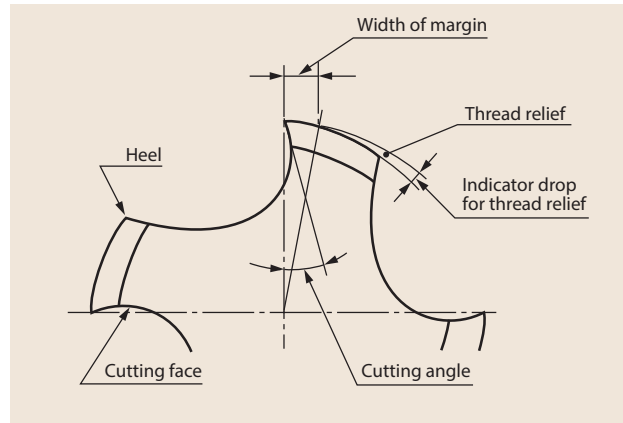
1. Terminology of Taps



■ Chamfer relief

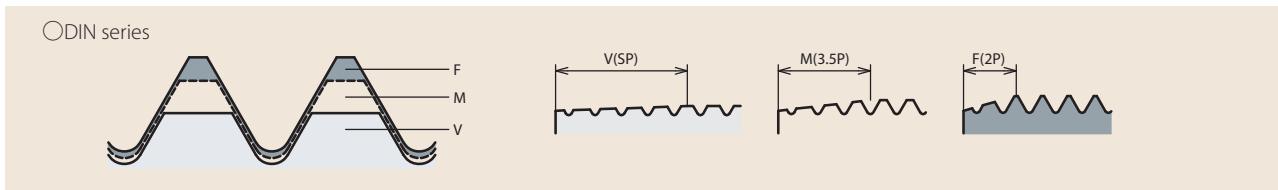


■ Thread relief and cutting angle

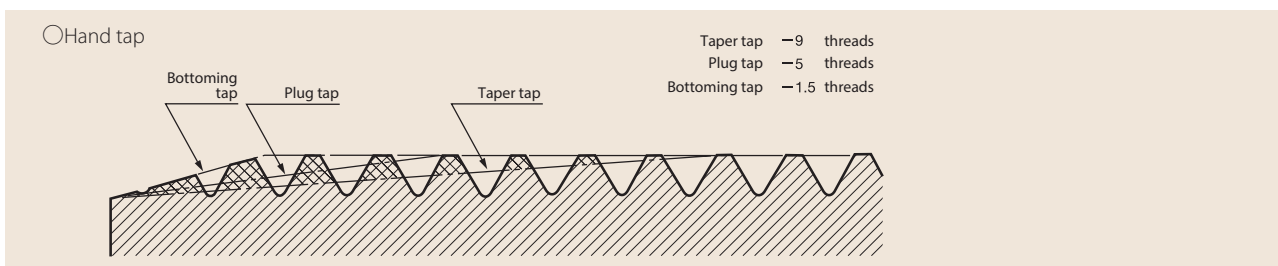


Edge angle, including chamfer relief, thread relief, cutting angle and others, as well as heat treatment, have important functions affecting workpiece shape, tool life, surface finish of internal screw thread, and so on.

■ Chamfer of straight flute taps



Serial taps come in sets of three or two to complete screw threads by cutting work materials in incremental steps. The first tap (V) and the second tap (M) cut screw threads under size. Then, the third tap (F) completes the screw threads.

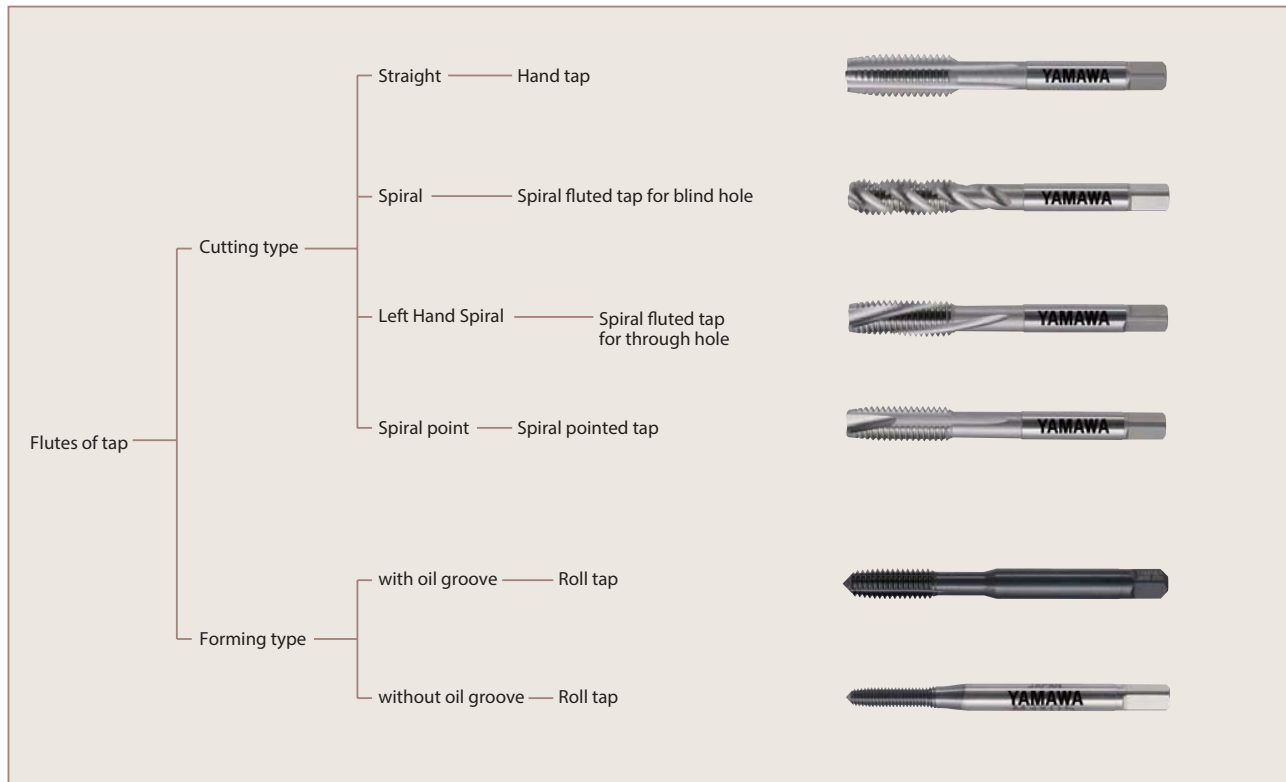


In general, tap chamfer is the most important part of taps to create internal thread. The function of full thread part of taps is to make a guidance.

2. Flutes

■ Major functions of flutes are:

1) Chips' pocket, 2) lubricant supply route, 3) rake angle formation, 4) to determine cutting amount in relation to the number of chamfer threads. And all are very important. Taps' flutes are classified into following groups by tapping methods, fluting method, tapping direction, and hand of screw thread.



■ Type of Flute

Type of Taps		Type of Taps	
Flute	Cutting type	Flute	Forming type
Straight Flute		With oil groove	
Spiral Flute		Without oil groove	
Spiral Point Flute			

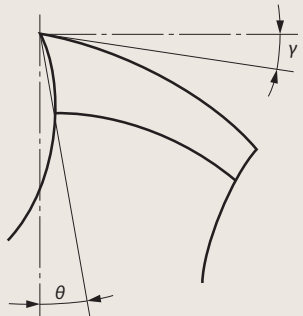
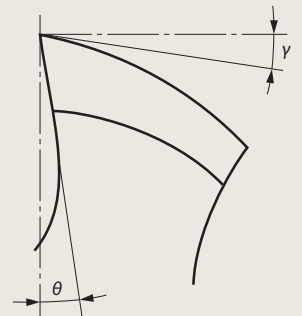
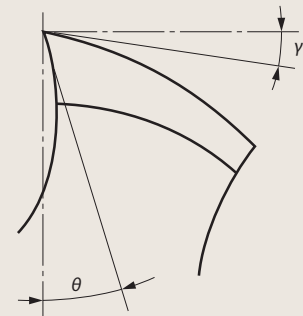
In general, the number of flutes for cutting type taps are usually increased as O.D. becomes larger. However, it is also influenced by tap's strength and rigidity, the accommodation of chip, the amount of cutting, and lubricant supply system.

TECHNICAL INFORMATION	FORMING TAPS		CUTTING TAPS					
	ISO N	ISO P - ISO M	ISO H	ISO S	ISO N	ISO K	ISO M	ISO P

3. Edge angle and cutting allowance of taps

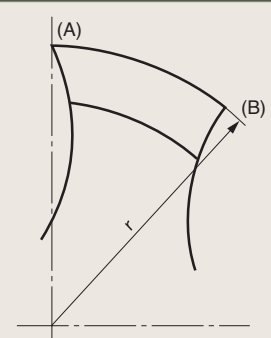
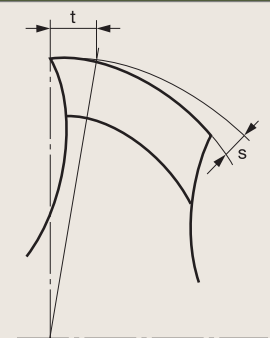
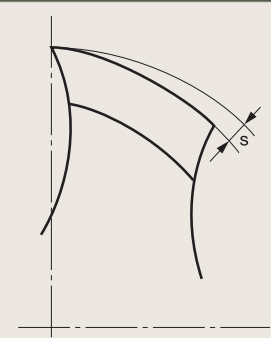
■ Cutting angle and Chamfer relief angle

θ : Cutting angle γ : Chamfer relief angle

Chordal Hook Angle	Rake Angle	Tangential Hook Angle
		
Cutting angle of hook face. The angle between the center line passing the cutting edge and the straight line linking the cutting edge with the thread root.	Cutting angle of rake face. The angle between the center line passing the cutting edge and the straight line linking the cutting edge with thread root.	Cutting angle of hook face. The angle between the center line passing the cutting edge and the straight line tangent to the rake face on the cutting edge.

■ Thread relief

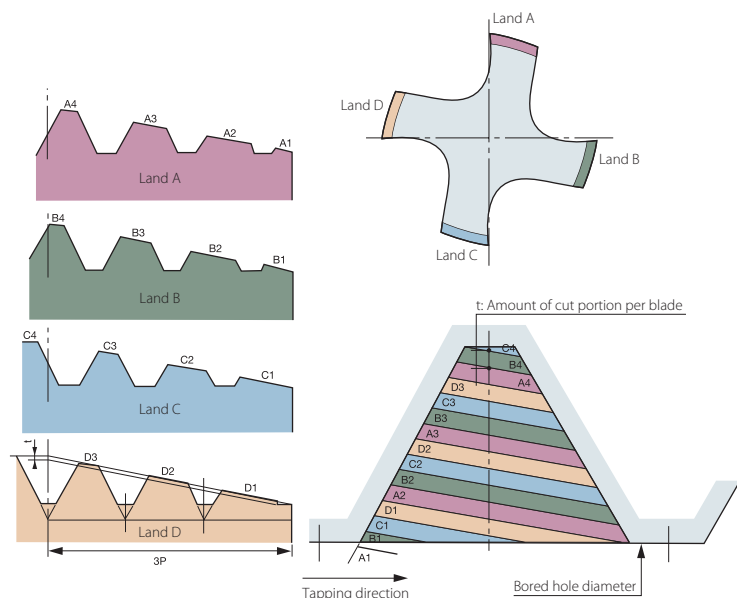
S: Indicator drop for thread relief

Concentric-unrelieved	Con-eccentric thread relief	Eccentric thread relief
		
No relief exists at land. Start (A) and heel (B) of thread land have same concentricity.	Radial relief in the thread form starts at the back of a concentric margin.	Radial relief in the thread form starts at the cutting edge and continues to the heel.

■ The amount of cut portion

Please refer to the pictures shown.

In such taps as have 4 flutes and 3 thread chamfer, the cutting operation progresses in order from the edge of A1, B1, C1, D1...A2, B2...A4. Tap end is usually smaller than the size of bored hole, and A1 may not make any cutting operation.



4. Recommended Tapping Speeds

Tapping Speeds

Following usage conditions affect tapping speeds: kind of taps, workpieces, number of chamfered threads, materials, hole condition and fluid. It is necessary to select the suitable tapping speed by paying attention to these conditions.

When work material has excellent workability, when there is a little depth of tapping, or when tapping fluid can be sufficient, select rather higher tapping speed. When workability of work material is unknown, to be safe, try nearly the lowest tapping speed at first, and then increase the speed gradually.

- Following speed is basically for the cutting condition under the use of insoluble cutting oil. Under the use of water soluble cutting oil, please choose 30% slower speed.

unit: m/min

Workpiece Materials		Tapping Speed				
		Spiral Fluted	Spiral Pointed	Roll Taps	Straight Fluted	Cemented Carbide
Low Carbon Steels	SS400 S10C~S25C	8~15	10~20	8~15	6~10	—
Medium Carbon Steels	S25C~S45C	6~12	8~14	7~12	5~9	—
High Carbon Steels	S45C~S58C	5~10	8~12	5~10	5~8	—
Alloy Steels	SCM · SNCM	5~10	7~10	5~10	5~8	—
Thermal refined steels	20~45HRC	3~5	4~7	—	3~6	—
Stainless Steels	SUS	3~8	4~9	6~15	3~7	—
Tool Steels	SKD	5~8	6~10	—	5~9	—
Cast Steels	SC	6~10	8~13	—	6~10	—
Cast Irons	FC	—	—	—	12~17	15~25
Ductile Cast Irons	FCD	5~10	5~10	—	5~8	12~20
Coppers	Cu	8~12	8~13	25~35	7~11	15~33
Brass · Brass Casting	Bs · BsC	11~22	13~25	25~35	10~20	23~33
Phosphor Bronze · Phosphor Bronze Casting	PB · PBC	8~15	10~18	25~35	8~15	18~33
Wrought Aluminum	Al	15~25	20~25	25~35	15~20	23~40
Aluminum Alloy Castings	AC · ADC	11~22	12~24	15~25	10~20	15~25
Magnesium Alloy Castings	MC	7~15	10~20	—	7~15	12~20
Zinc Alloy Diecastings	ZDC	7~15	10~20	15~25	7~15	12~20
Thermosetting Plastic	Bakelite (Phenol-PF)	11~17	12~18	—	10~15	15~25
Thermoplastic resin	PVC, Nylon	11~17	12~18	—	10~15	15~25
Titanium Alloys	Ti-6Al-4V etc	6~9	6~9	—	—	—
Nickel Base Alloys	Hastelloy, Inconel, Waspaloy	3~6	3~6	—	—	—

Formulas

Tapping Speed (Vc)

$$V_c = \frac{\pi \cdot D_c \cdot n}{1000} \text{ (m/min)}$$

n : Revolution of tap (min⁻¹)

π : 3.14

Dc : Nominal dia. of tap (mm)

Revolution of tap (n)

$$n = \frac{1000 \cdot V_c}{\pi \cdot D_c} \text{ (min}^{-1}\text{)}$$

Vc : Tapping Speed (m/min)

Dc : Nominal dia. of tap (mm)

π : 3.14

5. Bored hole size before tapping (for thread cutting)

■ for Metric Threads

unit: mm

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
M1 × 0.25	(0.785)	(0.729)	0.77
M1 × 0.2	(0.821)	(0.783)	0.81
M1.1 × 0.25	(0.885)	(0.829)	0.87
M1.1 × 0.2	(0.921)	(0.883)	0.91
M1.2 × 0.25	(0.985)	(0.929)	0.97
M1.2 × 0.2	(1.021)	(0.983)	1.01
M1.4 × 0.3	(1.142)	(1.075)	1.13
M1.4 × 0.2	(1.221)	(1.183)	1.21
M1.6 × 0.35	1.321	1.221	1.30
M1.6 × 0.2	(1.421)	(1.383)	1.41
* M1.7 × 0.35	1.421	1.321	1.40
* M1.7 × 0.2	1.521	1.483	1.51
M1.8 × 0.35	1.521	1.421	1.50
M1.8 × 0.2	(1.621)	(1.583)	1.61
M2 × 0.4	1.679	1.567	1.65
M2 × 0.25	(1.785)	(1.729)	1.77
M2.2 × 0.45	1.838	1.713	1.81
M2.2 × 0.25	(1.985)	(1.929)	1.97
* M2.3 × 0.4	1.979	1.867	1.95
* M2.3 × 0.25	2.085	2.029	2.07
M2.5 × 0.45	2.138	2.013	2.11
M2.5 × 0.35	2.221	2.121	2.20
* M2.6 × 0.45	2.238	2.113	2.21
* M2.6 × 0.35	2.321	2.221	2.30
M3 × 0.5	2.599	2.459	2.56
M3 × 0.35	2.721	2.621	2.70
M3.5 × 0.6	3.010	2.850	2.97
M3.5 × 0.35	3.221	3.121	3.20
M4 × 0.7	3.422	3.242	3.38
M4 × 0.5	3.599	3.459	3.56
M4.5 × 0.75	3.878	3.688	3.83
M4.5 × 0.5	4.099	3.959	4.06
M5 × 0.8	4.334	4.134	4.28
M5 × 0.5	4.599	4.459	4.56
M5.5 × 0.5	5.099	4.959	5.06
M6 × 1	5.153	4.917	5.09
M6 × 0.75	5.378	5.188	5.33
* M6 × 0.5	5.599	5.459	5.56
M7 × 1	6.153	5.917	6.09

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
M7 × 0.75	6.378	6.188	6.33
* M7 × 0.5	6.599	6.459	6.56
M8 × 1.25	6.912	6.647	6.85
M8 × 1	7.153	6.917	7.09
M 8 × 0.75	7.378	7.188	7.33
* M 8 × 0.5	7.599	7.459	7.56
M 9 × 1.25	7.912	7.647	7.85
M 9 × 1	8.153	7.917	8.09
M 9 × 0.75	8.378	8.188	8.33
M10 × 1.5	8.676	8.376	8.60
M10 × 1.25	8.912	8.647	8.85
M10 × 1	9.153	8.917	9.09
M10 × 0.75	9.378	9.188	9.33
* M10 × 0.5	9.599	9.459	9.56
M11 × 1.5	9.676	9.376	9.60
M11 × 1	10.153	9.917	10.10
M11 × 0.75	10.378	10.188	10.33
* M11 × 0.5	10.599	10.459	10.56
M12 × 1.75	10.441	10.106	10.4
M12 × 1.5	10.676	10.376	10.6
M12 × 1.25	10.912	10.647	10.85
M12 × 1	11.153	10.917	11.09
* M12 × 0.5	11.599	11.459	11.56
M14 × 2	12.210	11.835	12.1
M14 × 1.5	12.676	12.376	12.6
M14 × 1	13.153	12.917	13.09
M15 × 1.5	13.676	13.376	13.60
M15 × 1	14.153	13.917	14.09
M16 × 2	14.210	13.835	14.1
M16 × 1.5	14.676	14.376	14.6
M16 × 1	15.153	14.917	15.09
M17 × 1.5	15.676	15.376	15.60
M17 × 1	16.153	15.917	16.09
M18 × 2.5	15.744	15.294	15.6
M18 × 2	16.210	15.835	16.1
M18 × 1.5	16.676	16.376	16.6
M18 × 1	17.153	16.917	17.09
M20 × 2.5	17.744	17.294	17.6

The recommended tap drill sizes indicated above are for 6H Metric Threads.

• D_i: Minor diameter of 6H internal thread. The Minor diameters D_i shown in () are of 5H for coarse threads and of 4H • 5H for fine threads.

Bored hole size before tapping (for thread cutting)

unit: mm

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
M20×2	18.210	17.835	18.1
M20×1.5	18.676	18.376	18.6
M20×1	19.153	18.917	19.09
M22×2.5	19.744	19.294	19.6
M22×2	20.210	19.835	20.1
M22×1.5	20.676	20.376	20.6
M22×1	21.153	20.917	21.09
M24×3	21.252	20.752	21.1
M24×2	22.210	21.835	22.1
M24×1.5	22.676	22.376	22.6
M24×1	23.153	22.917	23.09
M25×2	23.210	22.835	23.1
M25×1.5	23.676	23.376	23.6
M25×1	24.153	23.917	24.09
M26×1.5	24.676	24.376	24.6
M27×3	24.252	23.752	24.1
M27×2	25.210	24.835	25.1
M27×1.5	25.676	25.376	25.6
M27×1	26.153	25.917	26.09
M28×2	26.210	25.835	26.1
M28×1.5	26.676	26.376	26.6
M28×1	27.153	26.917	27.09
M30×3.5	26.771	26.211	26.6
M30×3	27.252	26.752	27.1
M30×2	28.210	27.835	28.1
M30×1.5	28.676	28.376	28.6
M30×1	29.153	28.917	29.09
M32×2	30.210	29.835	30.1
M32×1.5	30.676	30.376	30.6
M33×3.5	29.771	29.211	29.6
M33×3	30.252	29.752	30.1
M33×2	31.210	30.835	31.1
M33×1.5	31.676	31.376	31.6
M35×1.5	33.676	33.376	33.6
M36×4	32.270	31.670	32.1
M36×3	33.252	32.752	33.1
M36×2	34.210	33.835	34.1
M36×1.5	34.676	34.376	34.6

• D_i: Minor diameter of 6H internal thread.

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
M38×1.5	36.676	36.376	36.6
M39×4	35.270	34.670	35.1
M39×3	36.252	35.752	36.1
M39×2	37.210	36.835	37.1
M39×1.5	37.676	37.376	37.6
M40×3	37.252	36.752	37.1
M40×2	38.210	37.835	38.1
M40×1.5	38.676	38.376	38.6
M42×4.5	37.799	37.129	37.6
M42×4	38.270	37.670	38.1
M42×3	39.252	38.752	39.1
M42×2	40.210	39.835	40.1
M42×1.5	40.676	40.376	40.6
M45×4.5	40.799	40.129	40.6
M45×4	41.270	40.670	41.1
M45×3	42.252	41.752	42.1
M45×2	43.210	42.835	43.1
M45×1.5	43.676	43.376	43.6
M48×5	43.297	42.587	43.1
M48×4	44.270	43.670	44.1
M48×3	45.252	44.752	45.1
M48×2	46.210	45.835	46.1
M48×1.5	46.676	46.376	46.6
M50×3	47.252	46.752	47.1
M50×2	48.210	47.835	48.1
M50×1.5	48.676	48.376	48.6
M52×5	47.297	46.587	47.1
M52×4	48.270	47.670	48.1
M52×3	49.252	48.752	49.1
M52×2	50.210	49.835	50.1
M52×1.5	50.676	50.376	50.6
M55×4	51.270	50.670	51.1
M55×3	52.252	51.752	52.1
M55×2	53.210	52.835	53.1
M55×1.5	53.676	53.376	53.6
M56×5.5	50.796	50.046	50.6
M56×4	52.270	51.670	52.1
M56×3	53.252	52.752	53.1
M56×2	54.210	53.835	54.1
M56×1.5	54.676	54.376	54.6

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Bored hole size before tapping (for thread cutting)

■ for Metric Threads

unit: mm

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
M58 × 4	54.270	53.670	54.1
M58 × 3	55.252	54.752	55.1
M58 × 2	56.210	55.835	56.1
M58 × 1.5	56.676	56.376	56.6
M60 × 5.5	54.796	54.046	54.6
M60 × 4	56.270	55.670	56.1
M60 × 3	57.252	56.752	57.1
M60 × 2	58.210	57.835	58.1
M60 × 1.5	58.676	58.376	58.6
M62 × 4	58.270	57.670	58.1
M62 × 3	59.252	58.752	59.1
M62 × 2	60.210	59.835	60.1
M62 × 1.5	60.676	60.376	60.6
M64 × 6	58.305	57.505	58.1
M64 × 4	60.270	59.670	60.1
M64 × 3	61.252	60.752	61.1
M64 × 2	62.210	61.835	62.1
M64 × 1.5	62.676	62.376	62.6
M65 × 4	61.270	60.670	61.1
M65 × 3	62.252	61.752	62.1
M65 × 2	63.210	62.835	63.1
M65 × 1.5	63.676	63.376	63.6
M68 × 6	62.305	61.505	62.1
M68 × 4	64.270	63.670	64.1
M68 × 3	65.252	64.752	65.1
M68 × 2	66.210	65.835	66.1
M68 × 1.5	66.676	66.376	66.6
M70 × 6	64.305	63.505	64.1
M70 × 4	66.270	65.670	66.1
M70 × 3	67.252	66.752	67.1
M70 × 2	68.210	67.835	68.1
M70 × 1.5	68.676	68.376	68.6
M72 × 6	66.305	65.505	66.1
M72 × 4	68.270	67.670	68.1
M72 × 3	69.252	68.752	69.1

• D_i: Minor diameter of 6H internal thread.

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
M72 × 2	70.210	69.835	70.1
M72 × 1.5	70.676	70.376	70.6
M75 × 4	71.270	70.670	71.1
M75 × 3	72.252	71.752	72.1
M75 × 2	73.210	72.835	73.1
M75 × 1.5	73.676	73.376	73.6
M76 × 6	70.305	69.505	70.1
M76 × 4	72.270	71.670	72.1
M76 × 3	73.252	72.752	73.1
M76 × 2	74.210	73.835	74.1
M76 × 1.5	74.676	74.376	74.6
M78 × 2	76.210	75.835	76.1
M80 × 6	74.305	73.505	74.1
M80 × 4	76.270	75.670	76.1
M80 × 3	77.252	76.752	77.1
M80 × 2	78.210	77.835	78.1
M80 × 1.5	78.676	78.376	78.6
M82 × 2	80.210	79.835	80.1
M85 × 6	79.305	78.505	79.1
M85 × 4	81.270	80.670	81.1
M85 × 3	82.252	81.752	82.1
M85 × 2	83.210	82.835	83.1
M90 × 6	84.305	83.505	84.1
M90 × 4	86.270	85.670	86.1
M90 × 3	87.252	86.752	87.1
M90 × 2	88.210	87.835	88.1
M95 × 6	89.305	88.505	89.1
M95 × 4	91.270	90.670	91.1
M95 × 3	92.252	91.752	92.1
M95 × 2	93.210	92.835	93.1
M100 × 6	94.305	93.505	94.1
M100 × 4	96.270	95.670	96.1
M100 × 3	97.252	96.752	97.1
M100 × 2	98.210	97.835	98.1

■ for Unified Threads

unit: mm

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
No. 0 - 80UNF	1.305	1.182	1.27
No. 1 - 64UNC	1.582	1.425	1.54
No. 1 - 72UNF	1.612	1.474	1.58
No. 2 - 56UNC	1.871	1.695	1.83
No. 2 - 64UNF	1.912	1.756	1.87
No. 3 - 48UNC	2.146	1.941	2.09
No. 3 - 56UNF	2.197	2.025	2.15
No. 4 - 40UNC	2.385	2.157	2.33
No. 4 - 48UNF	2.458	2.271	2.41
No. 5 - 40UNC	2.697	2.487	2.64
No. 5 - 44UNF	2.740	2.551	2.69
No. 6 - 32UNC	2.895	2.642	2.83
No. 6 - 40UNF	3.022	2.820	2.97
No. 8 - 32UNC	3.530	3.302	3.47
No. 8 - 36UNF	3.606	3.404	3.55
No.10 - 24UNC	3.962	3.683	3.89
No.10 - 32UNF	4.165	3.963	4.12
No.12 - 24UNC	4.597	4.344	4.53
No.12 - 28UNF	4.724	4.496	4.67
No.12 - 32UNEF	4.826	4.623	4.78
1/4 - 20UNC	5.257	4.979	5.19
1/4 - 28UNF	5.588	5.360	5.53
1/4 - 32UNEF	5.689	5.487	5.64
5/16 - 18UNC	6.731	6.401	6.65
5/16 - 24UNF	7.035	6.782	6.97
5/16 - 32UNEF	7.264	7.087	7.22
3/8 - 16UNC	8.153	7.798	8.07
3/8 - 24UNF	8.636	8.382	8.57
3/8 - 32UNEF	8.864	8.662	8.81
7/16 - 14UNC	9.550	9.144	9.5
7/16 - 20UNF	10.033	9.729	9.96
7/16 - 28UNEF	10.337	10.135	10.29
1/2 - 13UNC	11.023	10.592	10.9
1/2 - 20UNF	11.607	11.329	11.54
1/2 - 28UNEF	11.938	11.710	11.88
9/16 - 12UNC	12.446	11.989	12.3
9/16 - 18UNF	13.081	12.751	13.00
9/16 - 24UNEF	13.385	13.132	13.32

Size	Minor diameter of internal threads (D _i)		Bored hole size (ref.)
	Max.	Min.	
5/8 - 11UNC	13.868	13.386	13.8
5/8 - 18UNF	14.681	14.351	14.60
5/8 - 24UNEF	14.986	14.732	14.92
3/4 - 10UNC	16.840	16.307	16.7
3/4 - 16UNF	17.678	17.323	17.59
3/4 - 20UNEF	17.957	17.679	17.89
7/8 - 9UNC	19.761	19.177	19.6
7/8 - 14UNF	20.675	20.270	20.6
7/8 - 20UNEF	21.132	20.854	21.06
1 - 8UNC	22.606	21.971	22.5
1 - 12UNF	23.571	23.114	23.5
1 - 14UNS	23.825	23.445	23.7
1 - 20UNEF	24.307	24.029	24.24
1 1/8 - 7UNC	25.349	24.638	25.2
1 1/8 - 8UN	25.781	25.146	25.6
1 1/8 - 12UNF	26.746	26.289	26.6
1 1/8 - 18UNEF	27.381	27.051	27.30
1 1/4 - 7UNC	28.524	27.813	28.4
1 1/4 - 8UN	28.956	28.321	28.8
1 1/4 - 12UNF	29.921	29.464	29.8
1 1/4 - 18UNEF	30.556	30.226	30.47
1 3/8 - 6UNC	31.115	30.353	30.9
1 3/8 - 8UN	32.131	31.496	32.0
1 3/8 - 12UNF	33.096	32.639	33.0
1 3/8 - 18UNEF	33.731	33.401	33.65
1 1/2 - 6UNC	34.290	33.528	34.1
1 1/2 - 8UN	35.306	34.671	35.2
1 1/2 - 12UNF	36.271	35.814	36.2
1 1/2 - 18UNEF	36.906	36.576	36.82
1 5/8 - 8UN	38.481	37.846	38.3
1 5/8 - 12UN	39.446	38.989	39.3
1 5/8 - 18UNEF	40.081	39.751	40.00
1 3/4 - 5UNC	39.827	38.964	39.6
1 3/4 - 8UN	41.656	41.021	41.5
1 3/4 - 12UN	42.621	42.164	42.5
2 - 4.5UNC	45.593	44.679	45.4
2 - 8UN	48.006	47.371	47.9
2 - 12UN	48.971	48.514	48.9

• The recommended tap drill sizes indicated above are for ANSI B1.1 Class 2B UNC, UNF, UNEF, UN & UNS threads.

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	ISO P - ISO M
	ISO N
FORMING TAPS	ISO P - ISO M
	ISO N
TECHNICAL INFORMATION	ISO P - ISO M
	ISO N

Bored hole size before tapping (for thread cutting)

■ for Helical Coil Wire Thread Inserts, Metric Threads

unit: mm

Nominal size	Bored hole size		Bored hole size (ref.)
	Max.	Min.	
STI M 2 ×0.4	2.16	2.10	2.15
STI M 2.5×0.45	2.68	2.60	2.66
STI M 2.6×0.45	2.78	2.70	2.76
STI M 3 ×0.5	3.20	3.12	3.18
STI M 4 ×0.7	4.30	4.17	4.27
STI M 5 ×0.8	5.33	5.16	5.29
STI M 6 ×1	6.42	6.25	6.38
STI M 8 ×1.25	8.52	8.31	8.47
STI M10 ×1.5	10.62	10.37	10.56
STI M10 ×1.25	10.52	10.31	10.47
STI M10×1	10.42	10.25	10.38
STI M12×1.75	12.73	12.43	12.66
STI M12×1.5	12.62	12.37	12.56
STI M12×1.25	12.52	12.31	12.47
STI M14×2	14.83	14.49	14.75
STI M14×1.5	14.62	14.37	14.56
STI M14×1.25	14.52	14.31	14.47
STI M16×2	16.83	16.49	16.75
STI M16×1.5	16.62	16.37	16.56
STI M18×2.5	19.04	18.58	18.93
STI M18×1.5	18.62	18.37	18.56
STI M20×2.5	21.04	20.58	20.93
STI M20×1.5	20.62	20.37	20.56
STI M22×2.5	23.04	22.58	22.93
STI M22×1.5	22.62	22.37	22.56
STI M24×3	25.25	24.70	25.11
STI M24×1.5	24.62	24.37	24.56

• The figures listed above are according to the data provided by helical coil wire insert manufacturers

■ for Helical Coil Wire Thread Inserts, Unified Threads

unit: mm

Size	Minor diameter of internal threads (D ₁)		Bored hole size (ref.)
	Max.	Min.	
STI No. 2 - 56 UNC	2.440	2.284	2.40
STI No. 4 - 40 UNC	3.180	2.985	3.13
STI No. 4 - 48 UNF	3.121	2.962	3.08
STI No. 5 - 40 UNC	3.487	3.315	3.44
STI No. 6 - 32 UNC	3.878	3.678	3.83
STI No. 6 - 40 UNF	3.817	3.645	3.77
STI No. 8 - 32 UNC	4.523	4.339	4.48
STI No. 8 - 36 UNF	4.498	4.321	4.45
STI No. 10 - 24 UNC	5.283	5.055	5.23
STI No. 10 - 32 UNF	5.184	4.999	5.14
STI No. 12 - 24 UNC	5.943	5.715	5.89
STI 1/4 - 20 UNC	6.868	6.625	6.81
STI 1/4 - 28 UNF	6.720	6.546	6.68
STI 5/16 - 18 UNC	8.488	8.243	8.43
STI 5/16 - 24 UNF	8.351	8.167	8.31
STI 3/8 - 16 UNC	10.126	9.868	10.06
STI 3/8 - 24 UNF	9.931	9.754	9.89
STI 7/16 - 14 UNC	11.783	11.507	11.71
STI 7/16 - 20 UNF	11.584	11.387	11.53
STI 1/2 - 13 UNC	13.393	13.122	13.33
STI 1/2 - 20 UNF	13.172	12.975	13.12
STI 5/8 - 11 UNC	16.672	16.376	16.60
STI 5/8 - 18 UNF	16.385	16.180	16.33
STI 3/4 - 16 UNF	19.608	19.393	19.55

■ for Whitworth Threads

unit: mm

Size	Minor diameter of internal threads (D ₁)		Bored hole size (ref.)
	Max.	Min.	
* 1/8 W 40	(2.591)	(2.362)	2.53
* 3/16 W 24	(3.744)	(3.406)	3.66
1/4 W 20	5.204	4.914	5.13
5/16 W 18	6.670	6.340	6.59
3/8 W 16	8.113	7.733	8.02
7/16 W 14	9.508	9.048	9.4
1/2 W 12	10.830	10.310	10.7
9/16 W 12	12.418	11.898	12.3
5/8 W 11	13.817	13.257	13.7
3/4 W 10	16.778	16.178	16.6
7/8 W 9	19.691	19.031	19.5
1 W 8	22.514	21.814	22.3

• D₁: Minor diameter of JIS Class 2 internal thread.
 • Whitworth Threads have been eliminated from JIS.
 • *Marked sizes are in accordance with BSW.

■ for Sewing Machine Threads

unit: mm

Size	Minor diameter of internal threads (D ₁)		Bored hole size (ref.)
	Max.	Min.	
1/16 SM 80	1.281	1.211	1.26
5/64 SM 64	1.593	1.513	1.57
3/32 SM 56	1.936	1.841	1.91
3/32 SM 100	2.156	2.081	2.14
1/8 SM 40	2.551	2.421	2.52
1/8 SM 44	2.605	2.485	2.58
9/64 SM 40	2.948	2.818	2.92
11/64 SM 40	3.742	3.612	3.71
3/16 SM 24	3.658	3.498	3.62
3/16 SM 28	3.844	3.684	3.80
3/16 SM 32	3.980	3.820	3.94
3/16 SM 40	4.138	4.008	4.11
7/32 SM 32	4.774	4.614	4.73
15/64 SM 28	5.055	4.875	5.01
1/4 SM 24	5.266	5.086	5.22
1/4 SM 40	5.726	5.596	5.69

■ for Pipe Threads

○PS, Rp

unit: mm

Size	Minor Diameter of JIS internal thread (D1)		Bored hole size (ref.)
	Max.	Min.	
PS 1/16 - 28	6.632	6.490	6.60
PS 1/8 - 28	8.637	8.495	8.60
PS 1/4 - 19	11.549	11.341	11.50
PS 3/8 - 19	15.054	14.846	15.00
PS 1/2 - 14	18.773	18.489	18.7
PS 3/4 - 14	24.259	23.975	24.2
PS 1 - 11	30.472	30.110	30.4
PS 1 1/4-11	39.133	38.771	39.0
PS 1 1/2-11	45.026	44.664	44.9
PS 2 - 11	56.837	56.475	56.8

○PF, G

unit: mm

Size	Minor Diameter of JIS internal thread (D1)		Bored hole size (ref.)
	Max.	Min.	
PF 1/16 - 28	6.843	6.561	6.77
PF 1/8 - 28	8.848	8.566	8.78
PF 1/4 - 19	11.890	11.445	11.78
PF 3/8 - 19	15.395	14.950	15.28
PF 1/2 - 14	19.172	18.631	19.0
PF 5/8 - 14	21.128	20.587	21.0
PF 3/4 - 14	24.658	24.117	24.5
PF 7/8 - 14	28.418	27.877	28.3
PF 1 - 11	30.931	30.291	30.8
PF 1 1/8-11	35.579	34.939	35.4
PF 1 1/4-11	39.592	38.952	39.4
PF 1 1/2-11	45.485	44.845	45.3
PF 1 3/4-11	51.428	50.788	51.3
PF 2 - 11	57.296	56.656	57.1

■ for American Standard Pipe Thread

unit: mm

Size	Minor diameter of internal threads		Bored hole size (ref.)
	Max.	Min.	
NPSC 1/8 - 27	8.813	8.636	8.77
NPSC 1/4 - 18	11.592	11.329	11.53
NPSC 3/8 - 18	14.919	14.656	14.85
NPSC 1/2 - 14	18.501	18.161	18.4
NPSC 3/4 - 14	23.835	23.495	23.7
NPSC 1 - 11.5	29.903	29.490	29.8

unit: mm

Size	Minor diameter of internal threads		Bored hole size (ref.)
	Max.	Min.	
NPSM 1/8 - 27	9.246	9.094	9.21
NPSM 1/4 - 18	12.217	11.888	12.13
NPSM 3/8 - 18	15.554	15.317	15.49
NPSM 1/2 - 14	19.278	18.974	19.2
NPSM 3/4 - 14	24.638	24.334	24.5
NPSM 1 - 11.5	30.759	30.506	30.7

■ for Dryseal American Standard Pipe Thread

unit: mm

Size	Minor diameter of internal threads		Bored hole size (ref.)
	Max.	Min.	
NPSF 1/8 - 27	8.740	8.652	8.72
NPSF 1/4 - 18	11.363	11.232	11.33
NPSF 3/8 - 18	14.803	14.672	14.77
NPSF 1/2 - 14	18.288	18.118	18.2
NPSF 3/4 - 14	23.634	23.465	23.5
NPSF 1 - 11.5	29.669	29.464	29.6

CUTTING TAPS

ISO P

ISO M

ISO K

ISO N

ISO S

ISO H

FORMING TAPS

ISO P - ISO M

ISO N

TECHNICAL INFORMATION

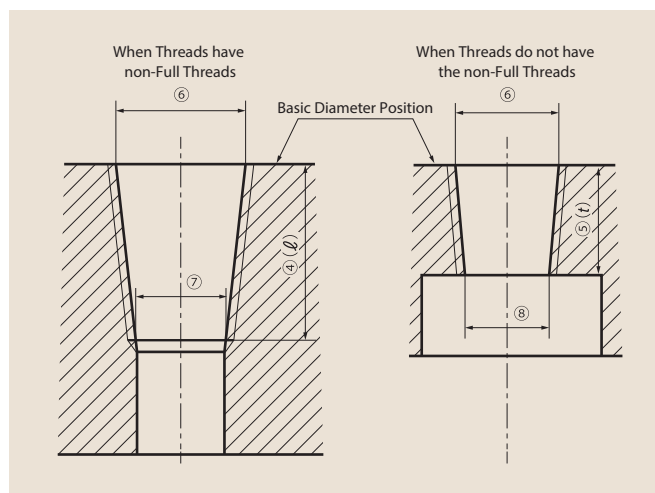
Bored hole size before tapping (for thread cutting)

Recommended Bored Hole Size Table for Taper Pipe Threads (PT)

Remarks during tapping

- PT internal threads have R design on their crests. The taps should cut threads with their thread root.

Size	Thread Standards				Minor Diameter			Recommended Bored Hole Sizes (reference)		reference	
	Basic Diameter	Basic Diameter Position	Effective Thread Length (Minimum)		Pipe End (Workpiece Face) (Basic Diamater)	When Threads have non-Full Threads	When Threads do not have the non-Full Threads	Maximum Size of Straight Bored Hole		Tap	
			Pipe End	When Threads have non-Full Threads ¹⁾		When Threads do not have the non-Full Threads ¹⁾	Basic Diameter Position, ℓg				
		Tolerance in radial direction	Tolerance in axial direction c	When Threads have non-Full Threads ¹⁾ ℓ		When Threads do not have the non-Full Threads ¹⁾ t	Position away from Pipe End by ℓ	Position away from Pipe End by t	When Threads have non-Full Threads	When Threads do not have the non-Full Threads	Long Thread Type
	Basic Size	Basic Size	Basic Size								
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
PT 1/16 - 28	±0.071	±1.13	6.2	4.4	6.561	6.174	6.286	6.1	6.2	13.0	10.5
PT 1/8 - 28	±0.071	±1.13	6.2	4.4	8.566	8.179	8.291	8.1	8.2	13.0	10.5
PT 1/4 - 19	±0.104	±1.67	9.4	6.7	11.445	10.858	11.026	10.7	10.9	21.0	12.5
PT 3/8 - 19	±0.104	±1.67	9.7	7.0	14.950	14.344	14.513	14.2	14.4	21.0	14.0
PT 1/2 - 14	±0.142	±2.27	12.7	9.1	18.631	17.837	18.062	17.6	17.9	25.0	17.0
PT 3/4 - 14	±0.142	±2.27	14.1	10.2	24.117	23.236	23.480	23.0	23.3	25.0	19.0
PT 1 - 11	±0.181	±2.89	16.2	11.6	30.291	29.279	29.566	29.0	29.3	32.0	22.0
PT 1 1/4 - 11	±0.181	±2.89	18.5	13.4	38.952	37.796	38.115	37.6	37.9	32.0	24.5
PT 1 1/2 - 11	±0.181	±2.89	18.5	13.4	44.845	43.689	44.008	43.5	43.8	32.0	25.5
PT 2 - 11	±0.181	±2.89	22.8	16.9	56.656	55.231	55.600	55.0	55.4	35.0	28.0

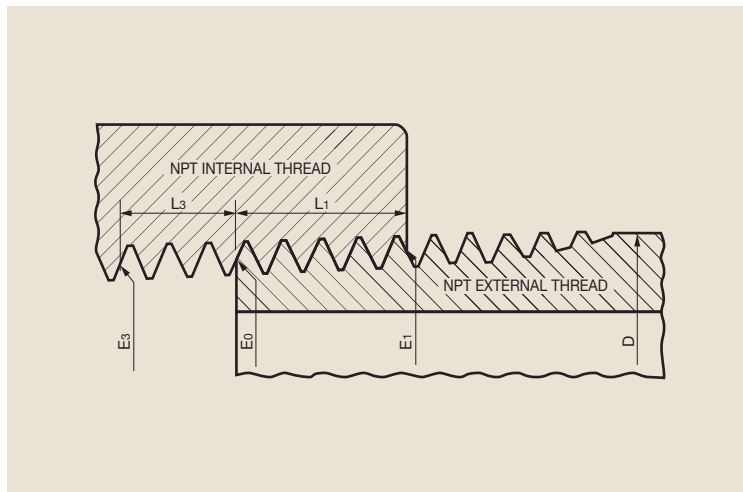


- Remarks 1. Opening of Internal Thread (Face of workpiece) is Basic Diameter Position.
- Remarks 2. Effective Thread Length has 2 types, with non-Full Thread Type and without non-Full Thread Type.
- Remarks 3. Concerning bored hole shape, considering load on taps, taper bored hole is recommended.
- Remarks 4. When applying taper bored hole, by referring to values shown in columns ②-⑥~⑧, prepare the taper hole by using pipe reamer (1/16 taper). By referring to values shown in columns ⑨ and ⑩, select the drill diameter before reaming by taking reamer's margin into account.
- Remarks 5. When preparing straight bored hole, by referring to values shown in columns ⑨ and ⑩, select drill diameter.

■ Recommended Bored Hole Size Table for American Taper Pipe Threads (NPT)

unit: mm

Size	L1	L3	L1+L3	Minor Diameter						Bored Hole Size (reference)	reference
				Pipe End (Basic Diameter Position)			Position away from Pipe End by (L1+L3)				Tap
				Maximum Value	Minimum Value	Tolerance	Maximum Value	Minimum Value	Tolerance	Maximum Size of Straight Bored Hole	Basic Diameter Position ℓg
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
NPT 1/16 - 27	4.064	2.822	6.886	6.510	6.388	0.122	6.080	5.958	0.122	6.05	12.00
NPT 1/8 - 27	4.102	2.822	6.924	8.857	8.736	0.122	8.425	8.303	0.122	8.39	12.05
NPT 1/4 - 18	5.786	4.234	10.020	11.514	11.357	0.157	10.888	10.730	0.157	10.85	17.45
NPT 3/8 - 18	6.096	4.234	10.330	14.953	14.796	0.157	14.308	14.150	0.157	14.27	17.65
NPT 1/2 - 14	8.128	5.443	13.571	18.485	18.323	0.163	17.637	17.475	0.163	17.60	22.85
NPT 3/4 - 14	8.611	5.443	14.054	23.831	23.668	0.163	22.952	22.790	0.163	22.91	22.95
NPT 1 - 11.5	10.160	6.627	16.787	29.868	29.696	0.173	28.819	28.647	0.173	28.78	27.40
NPT 1 1/4 - 11.5	10.668	6.627	17.295	38.625	38.452	0.173	37.544	37.372	0.173	37.50	28.10
NPT 1 1/2 - 11.5	10.668	6.627	17.295	44.695	44.522	0.173	43.614	43.441	0.173	43.57	28.40
NPT 2 - 11.5	11.074	6.627	17.701	56.732	56.560	0.173	55.626	55.454	0.173	55.58	28.00



- Remarks 1. Pipe End is Basic Diameter Position (E1).
 Remarks 2. Effective Thread Length is the length away from Pipe End by (L1+L3).
 Remarks 3. Concerning bored hole shape, considering load on taps, taper bored hole is recommended.
 Remarks 4. When applying taper bored hole, by referring to values in shown columns ⑤, ⑥ and ⑧, ⑨, prepare the taper hole by using pipe reamer (1/16 taper). By referring to values shown in column ⑪, select the drill diameter before reaming by taking reamer's margin into account.
 Remarks 5. When preparing straight bored hole, by referring to values shown in column ⑪, select drill diameter.

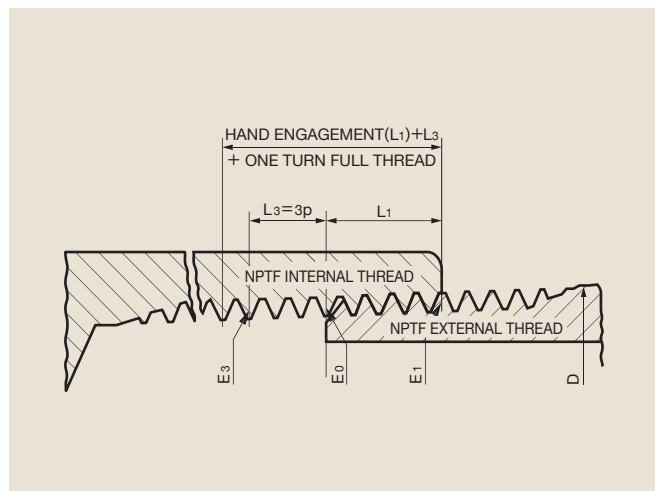
CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
	ISO S
FORMING TAPS	ISO H
	ISO P - ISO M
	ISO N
TECHNICAL INFORMATION	

Bored hole size before tapping (for thread cutting)

Recommended Bored Hole Size Table for American Dryseal Taper Pipe Threads (NPTF)

unit: mm

Size	L1	L3 (3P)	L1+L3+1P	Minor Diameter						Bored Hole Size (reference)	reference
				Pipe End (Basic Diameter Position)			Position of (L1+L3+1P)			Maximum Size of Straight Bored Hole	Basic Diameter Position ℓg
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
NPTF 1/16 - 27	4.064	2.822	7.827	6.505	6.414	0.091	6.015	5.923	0.091	5.99	12.00
NPTF 1/8 - 27	4.102	2.822	7.865	8.852	8.761	0.091	8.362	8.270	0.091	8.34	12.05
NPTF 1/4 - 18	5.786	4.234	11.431	11.484	11.397	0.086	10.770	10.684	0.086	10.75	17.45
NPTF 3/8 - 18	6.096	4.234	11.741	14.923	14.836	0.086	14.189	14.103	0.086	14.17	17.65
NPTF 1/2 - 14	8.128	5.443	15.386	18.419	18.333	0.086	17.459	17.373	0.086	17.44	22.85
NPTF 3/4 - 14	8.611	5.443	15.868	23.764	23.678	0.086	22.773	22.687	0.086	22.75	22.95
NPTF 1 - 11.5	10.160	6.627	18.996	29.812	29.726	0.086	28.625	28.538	0.086	28.60	27.40
NPTF 1 1/4 - 11.5	10.668	6.627	19.504	38.569	38.483	0.086	37.350	37.263	0.086	37.33	28.10
NPTF 1 1/2 - 11.5	10.668	6.627	19.504	44.639	44.552	0.086	43.420	43.334	0.086	43.40	28.40
NPTF 2 - 11.5	11.074	6.627	19.910	56.677	56.590	0.086	55.432	55.345	0.086	55.41	28.00



- Remarks 1. Pipe End is Basic Diameter Position (E1).
 Remarks 2. Effective Thread Length is the length away from Pipe End by (L1+L3+1P).
 Remarks 3. Concerning bored hole shape, considering load on taps, taper bored hole is recommended.
 Remarks 4. When applying taper bored hole, by referring to values shown in columns ⑤, ⑥ and ⑧, ⑨, prepare the taper hole by using pipe reamer (1/16 taper). By referring to values in shown column ⑪, select the drill diameter before reaming by taking reamer's margin into account.
 Remarks 5. When preparing straight bored hole, by referring to values shown in column ⑪, select drill diameter.

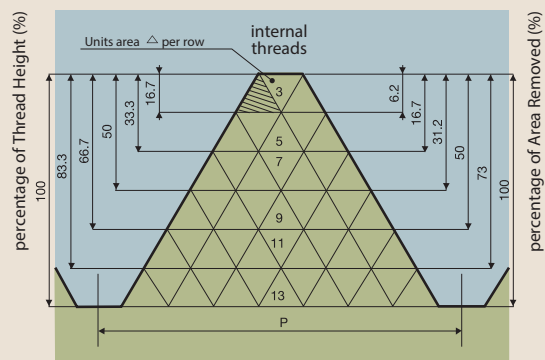
Percentage of Thread Engagement & Relation between Percentage of Thread Height and Area Removed at A Thread Height

Percentage of Thread Engagement

$$\frac{\text{Basic Major Dia. - Hole Size Before Tapping}}{2 \times (\text{Basic Thread Overlap})} \times 100$$

Basic Thread Overlap

Metric & Unified Thread	0.5413P
Whitworth Thread	0.5664P
Pipe Thread (Rc, Rp, G, PT, PS, PF)	0.6403P
P=Pitch	



As shown above, when the thread height increases, the amount of material to be removed increases rapidly, so it is an advantage to tap users to keep the hole size (thread minor diameter) as large as possible.

6. Bored hole size before tapping (for thread forming)

■ for Metric Threads

unit: mm

Size	Class	Recommended hole size (mm)		Thread engagement ratio (Estimation %)	Minor diameter of internal threads (5H/6H)	
		Max.	Min.		Max.	Min.
M1×0.25	ISO2X	0.92	0.89	80~100	0.785	0.729
	ISO3X	0.91	0.89	75~90		
M1.2×0.25	ISO2X	1.11	1.09	80~100	0.985	0.929
	ISO3X	1.11	1.09	75~90		
M1.4×0.3	ISO2X	1.30	1.26	80~100	1.142	1.075
	ISO3X	1.31	1.28	70~90		
M1.6×0.35	ISO2X	1.47	1.43	75~100	1.321	1.221
	ISO3X	1.51	1.46	70~95		
M2×0.4	ISO2X	1.85	1.80	75~100	1.679	1.567
	ISO3X	1.89	1.84	70~95		
M2.5×0.45	ISO2X	2.34	2.27	75~100	2.138	2.013
	ISO3X	2.36	2.31	75~95		
M3×0.5	ISO2X	2.83	2.76	75~100	2.599	2.459
	ISO3X	2.84	2.79	75~95		
M3.5×0.6	ISO2X	3.30	3.22	75~100	3.010	2.850
	ISO3X	3.32	3.25	75~95		
M4×0.7	ISO2X	3.73	3.66	80~100	3.422	3.242
	ISO3X	3.77	3.69	75~95		
M5×0.8	ISO2X	4.68	4.60	80~100	4.334	4.134
	ISO3X	4.73	4.64	75~95		
M6×1	ISO2X	5.60	5.50	80~100	5.153	4.917
	ISO3X	5.64	5.56	80~95		

Size	Class	Recommended hole size (mm)		Thread engagement ratio (Estimation %)	Minor diameter of internal threads (5H/6H)	
		Max.	Min.		Max.	Min.
M8×1.25	ISO2X	7.52	7.39	80~100	6.912	6.647
	ISO3X	7.56	7.46	80~95		
M8×1	ISO2X	7.60	7.49	80~100	7.153	6.917
	ISO3X	7.64	7.56	80~95		
M10×1.5	ISO2X	9.38	9.26	85~100	8.676	8.376
	ISO3X	9.47	9.35	80~95		
M10×1.25	ISO2X	9.52	9.38	80~100	8.912	8.647
	ISO3X	9.55	9.45	80~95		
M12×1.75	ISO2X	11.27	11.13	85~100	10.441	10.106
	ISO3X	11.32	11.23	85~95		
M12×1.5	ISO2X	11.42	11.25	85~100	10.676	10.376
	ISO3X	11.45	11.33	80~95		
M12×1.25	ISO2X	11.51	11.37	80~100	10.912	10.647
	ISO3X	11.54	11.43	80~95		
M14×2	ISO2X	13.17	13.00	85~100	12.210	11.835
	ISO3X	13.2	13.1	85~95		
M14×1.5	ISO2X	13.36	13.23	85~100	12.676	12.376
	ISO3X	13.44	13.32	80~95		
M16×2	ISO2X	15.17	15.00	85~100	14.210	13.835
	ISO3X	15.2	15.09	85~95		
M16×1.5	ISO2X	15.35	15.23	85~100	14.676	14.376
	ISO3X	15.43	15.31	80~95		

CUTTING TAPS

ISO N

ISO S

FORMING TAPS

ISO P - ISO M

ISO H

ISO K

ISO M

ISO P

Bored hole size before tapping (for thread forming)

■ for Unified Threads

unit: mm

Size	Class	Recommended hole size (mm)		Thread engagement ratio (Estimation %)	ref. Minor diameter of internal threads (2B)	
		Max.	Min.		Max.	Min.
No.2-56UNC	2BX	2.04	1.96	65~100	1.871	1.695
No.2-64UNF	2BX	2.06	1.98	65~100	1.912	1.756
No.3-48UNC	2BX	2.35	2.25	65~100	2.146	1.941
No.3-56UNF	2BX	2.37	2.29	65~100	2.197	2.025
No.4-40UNC	2BX	2.64	2.54	70~100	2.385	2.157
No.4-48UNF	2BX	2.68	2.59	70~100	2.458	2.271
No.5-40UNC	2BX	2.97	2.87	70~100	2.697	2.487
No.5-44UNF	2BX	2.99	2.90	70~100	2.740	2.551
No.6-32UNC	2BX	3.22	3.11	75~100	2.895	2.642

Size	Class	Recommended hole size (mm)		Thread engagement ratio (Estimation %)	ref. Minor diameter of internal threads (2B)	
		Max.	Min.		Max.	Min.
No.6-40UNF	2BX	3.29	3.19	70~100	3.022	2.820
No.8-32UNC	2BX	3.89	3.78	75~100	3.530	3.302
No.8-36UNF	2BX	3.91	3.81	75~100	3.606	3.404
No.10-24UNC	2BX	4.44	4.30	75~100	3.962	3.683
No.10-32UNF	2BX	4.53	4.44	80~100	4.165	3.963
No.12-24UNC	2BX	5.07	4.96	80~100	4.597	4.344
No.12-28UNF	2BX	5.13	5.03	80~100	4.724	4.496
1/4-20UNC	2BX	5.86	5.73	80~100	5.257	4.979
1/4-28UNF	2BX	6.00	5.91	80~100	5.588	5.360

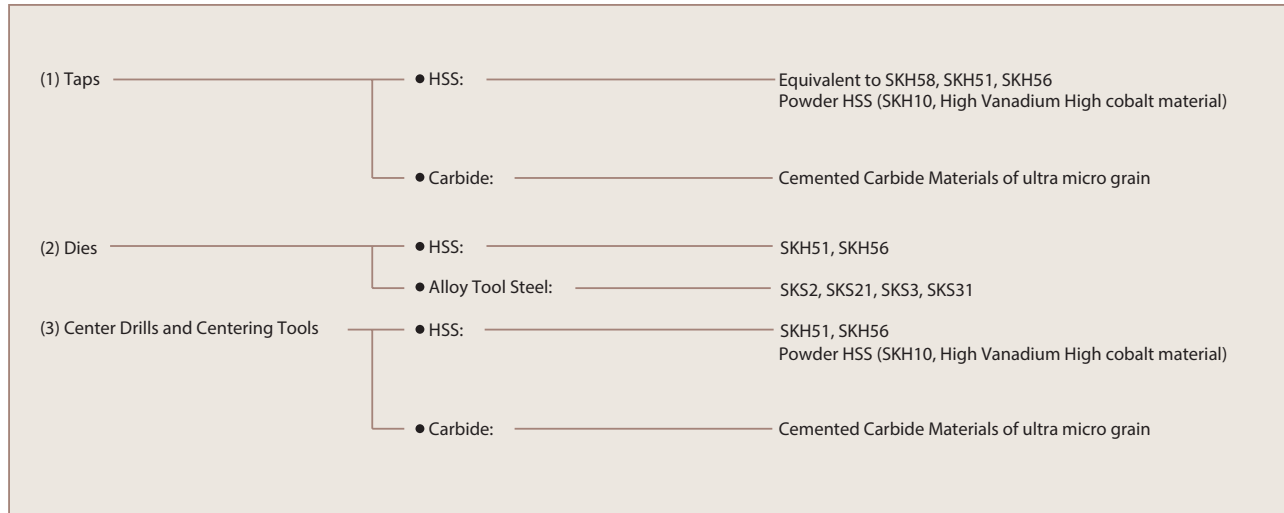
■ for GAS Threads

Size	Class	Recommended hole size (mm)		Thread engagement ratio (Estimation %)
		Max.	Min.	
G1/8-28	G6	9.34	9.22	80~100
G1/4-19	G8	12.64	12.42	80~100
G3/8-19	G8	16.08	15.91	80~100

7. Materials used for Cutting Tools

Materials

We have been seeking the best materials used for cutting tools since the company establishment because the performance of tools are depending on the selection of materials used. Major materials used in our company are listed below.



*For product's improvement, material may be changed without notice.

Circumstance of tools' materials

Tensile strength, heat resistance, corrosion resistance and accuracy are the important features required of tool's materials. These requirements have been changing due to miniaturization and lightening of parts.

And manufacturing methods, as well, have been changing because of necessity of economical efficiency such as saving process/cycle time while parts become hard-to-machine type and their hardness increases.

As a result, the demand of industrial tools by users has become very tough.

For example, higher wear resistance and chipping resistance are required in the area of hardness, and heavy cutting process or high-speed cutting are required in the area of cycle time.

Moreover, product accuracy with its rigidity, laborsaving brought by uniformity, and systematic reliability are highly required.

Therefore, technological improvement of tool steels never stops developing so that they satisfy users needs.

○ The major materials used for taps are already listed in the chart, but those materials are ready to develop from conventional alloy tool steels and current high speed steel into next generation materials such as cemented carbide and cermet materials.

New materials are developed even in high-speed tool steel area, such as SKH51 and SKH58 from SKH2, and they are moving into high performance materials, such as high vanadium, cobalt, and powder HSS made of high vanadium and high cobalt contents.

○ As the material for round dies, were alloy tool steels mostly used because of the relationship with the use of adjustable round dies. However, for the hard-to-machine material, die material has been shifted into High Speed Steel.

○ Major materials for center drills and centering tools are high speed steel materials, but they have been shifting to cobalt type or even cemented carbide from SKH51.

We keep on seeking to develop our technology to meet user's needs and are trying to find the best materials in collaboration with steel manufacturers.

CUTTING TAPS	ISO P
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Chemical composition of the materials specified in JIS

Classification	Symbols	Chemical composition									
		C	Si	Mn	P	S	Cr	Mo	W	V	Co
W type HSS	SKH 2	0.73~0.83	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	—	17.20~18.70	1.00~1.20	—
	SKH 3	0.73~0.83	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	—	17.00~19.00	0.80~1.20	4.50~ 5.50
	SKH 4	0.73~0.83	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	—	17.00~19.00	1.00~1.50	9.00~11.00
	SKH10	1.45~1.60	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	—	11.50~13.50	4.20~5.20	4.20~ 5.20
Mo type HSS	SKH51	0.80~0.88	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	4.70~ 5.20	5.90~ 6.70	1.70~2.10	—
	SKH52	1.00~1.10	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	5.50~ 6.50	5.90~ 6.70	2.30~2.80	—
	SKH53	1.15~1.25	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	4.70~ 5.20	5.90~ 6.70	2.70~3.20	—
	SKH54	1.25~1.40	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	4.20~ 5.00	5.20~ 6.00	3.70~4.20	—
	SKH55	0.87~0.95	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	4.70~ 5.20	5.90~ 6.70	1.70~2.10	4.50~ 5.00
	SKH56	0.85~0.95	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	4.70~ 5.20	5.90~ 6.70	1.70~2.10	7.00~ 9.00
	SKH57	1.20~1.35	≤0.45	≤0.4	≤0.030	≤0.030	3.80~4.50	3.20~ 3.90	9.00~10.00	3.00~3.50	9.50~10.50
	SKH58	0.95~1.05	≤0.7	≤0.4	≤0.030	≤0.030	3.50~4.50	8.20~ 9.20	1.50~ 2.10	1.70~2.20	—
	SKH59	1.05~1.15	≤0.7	≤0.4	≤0.030	≤0.030	3.50~4.50	9.00~10.00	1.20~ 1.90	0.90~1.30	7.50~ 8.50

Classification	Symbols	Usage	Cross chart		
			AISI	VDEH	ISO
W type HSS	SKH 2	Tools for general cutting and other kinds of tools.	T 1	S18-0-1	S1 (HS18-0-1)
	SKH 3	Tools for high speed heavy cutting and other kinds of tools.	T 4	S18-1-2-5	S7 (HS18-1-1-5)
	SKH 4	Tools for cutting hard -to-machine materials and other kinds of tools.	T 5	S18-1-2-10	S6 (HS18-0-1-10)
	SKH10	Tools for cutting ultra hard-to-machine materials and other kinds of tools.	T15	—	S9 (HS12-1-5-5)
Mo type HSS	SKH51	General cutting tools from which toughness is particularly required, and other kinds of tools.	M 2	S6-5-2	S4 (HS6-5-2)
	SKH52	Tools for cutting high hardness material from which comparatively high toughness is required and other kinds of tools.	M 3-1	—	—
	SKH53		M 3-2	S6-5-3	S5 (HS6-5-3)
	SKH54	Tools for cutting ultra hard-to-machine materials and other kinds of tools.	M 4	—	—
	SKH55	High speed cutting tools from which comparatively high toughness is required and other kinds of tools.	M35	S6-5-2-5	S8 (HS6-5-2-5)
	SKH56		M36	—	—
	SKH57	Tools for cutting ultra hard-to-machine materials and other kinds of tools.	—	S10-4-3-10	S10 (HS10-4-3-10)
	SKH58	General cutting tools from which toughness is particularly required, and other kinds of tools.	M 7	S2-9-2	S2 (HS2-9-2)
	SKH59	High speed heavy cutting tools from which comparatively high toughness is required, and other kinds of tools.	M42	S2-10-1-8	S11 (HS2-9-1-8)

The standard of HSS material is specified in JIS. But there are many HSS materials which standard is not specified in JIS. Recently even the kind of HSS-P is getting wider and various. Besides, SKH10, SKH53, SKH57 and their equivalents, such Hi vanadium/hi cobalt material as contains 4-12% vanadium and 8-11% cobalt is now being manufactured. Material engineering will be developed rapidly in the future. Under such situation, there can be many cases where JIS symbols are not used, and the use of larger classification and their symbols is getting popular.

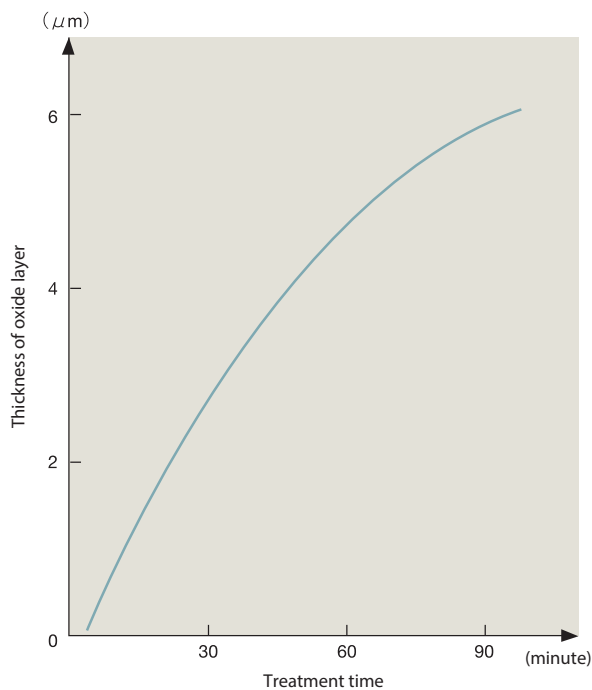
8. Surface Treatment

The best surface treatment is applied to each tap depending on the tapping purpose. Characteristics and effectiveness of surface treatment are introduced at next section.

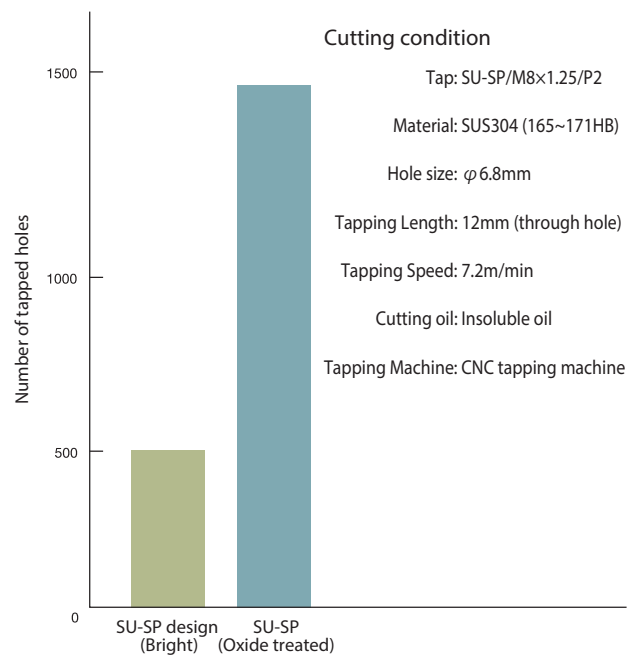
■ Oxidizing

- This treatment was processed by using HOMO furnace being made by LEED AND NORTHUP company USA in 1938, and it is called HOMO treatment. This treatment is also called vapor treatment and steam treatment. Through this treatment, Fe₃O₄ layer of blue black color is produced over the tool surface.
- Oxidization treatment produces porous layer on tool's surface. This porous layer works as oil pocket to reduce friction, to avoid welding and to improve the surface roughness of internal screw. Moreover, longer tool life is expected because the treatment reduces the remaining stress of HSS tools.
- This treatment does not increase the hardness on tool surface. Using the furnace of YAMAWA original design and choosing the proper treatment time, we have marked good result of oxidizing for YAMAWA HSS tools.
- Stainless steel and low carbon steel are the materials that are easy to get welding. We are applying this treatment to the special purpose taps for these materials to get good result. Further due to the reduction of friction force, this treatment has good result for wide range of steel type material.
- We combine oxidizing with nitriding for the taps designed for thermal refined steels of high carbon steels and alloy steels. This double treatment wins good reputation of the market.

■ Thickness of oxide layer and the time of treatment



■ Comparison between bright and oxide treated

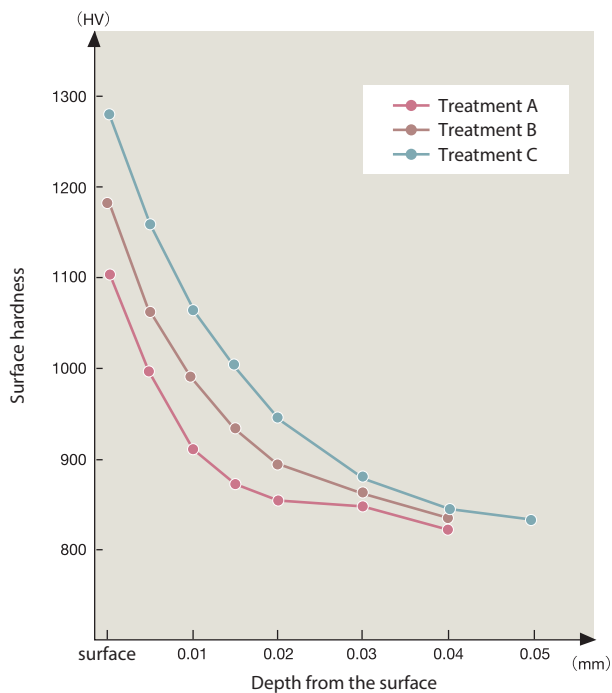


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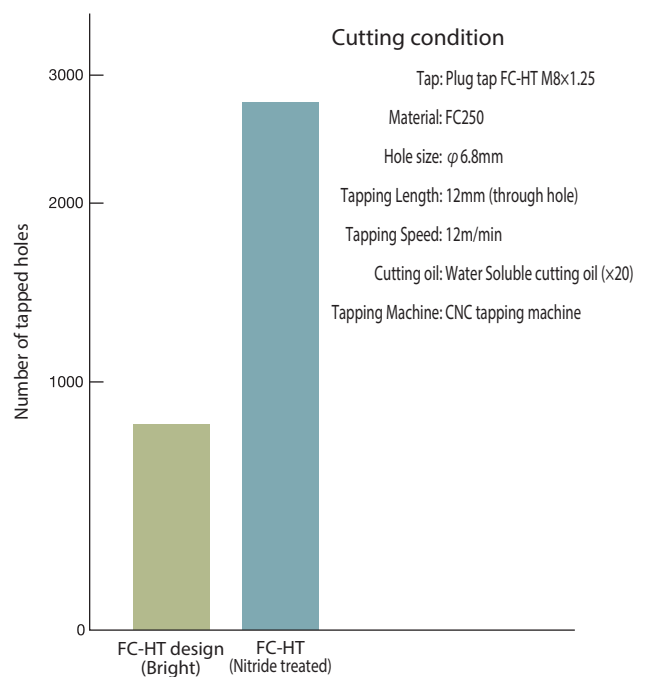
Nitriding

- In this treatment, we have Nitrogen and Carbon soak into the surface of HSS tools, and react with chemical of HSS material to produce hard nitride. There are 3 methods in the treatment, composition gas method, salt bath nitride method and ion nitride method.
- Salt bath nitride treatment is shifted into gas nitride treatment method because of cyanic environmental pollution.
- The temperature of treatment is 500 to 550 degree. Hardness and depth of the treatment can be controlled by active nitrogen concentration and reaction time.
- The high hardness of tool surface minimizes chemical attraction. Result is less welding and friction reduction. Great improvement is expected in tool's performance.
- We have found out the best combinations of hardness and toughness through our treatment technology
- The nitride treatment will be widely applicable to the taps for such workpiece materials as gray cast irons, special cast irons, aluminum diecastings with higher silicone content, copper alloys, and resinoids (plastics). These materials produce small segmental chips and are very abrasive.
- We combine nitrogen and oxidizing for comparatively sticky material such as thermal refined steels of high carbon steel and alloy steel. This double treatment improves the chipping resistance and have won good reputation.

Depth and hardness of Nitride Surface Treatment



Comparison between bright and nitride treated



■ Hard coating

High speed cutting and hard-to-machine material cutting are the recent technology. To meet this tendency, the hard layer coating by vapor deposition over tool's surface has become popular. There are two coating methods, CVD and PVD. PVD is mainly used for tap.

■ Physical Vapor Deposition

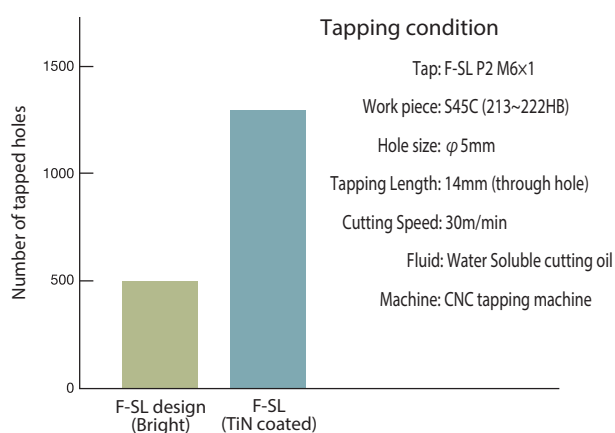
- Inside of the container of high vacuum, are vapor deposition materials heated. And we vapor-deposit particles ionized by electric discharge on tool's surface.
- Due to its low reaction temperature (lower than 500°C), PVD makes little change in shape and hardness of HSS tools.

■ The features and classification of coating

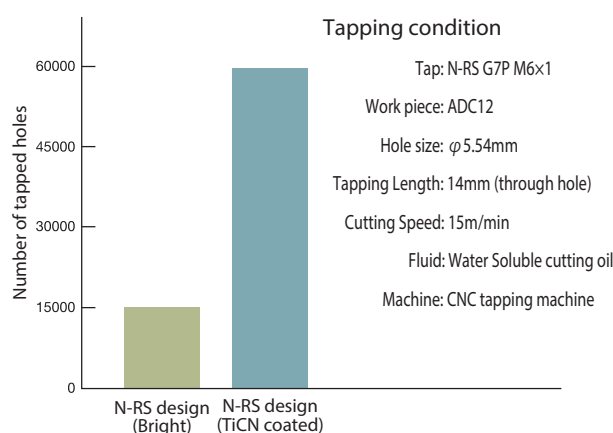
Classification	Titanium nitride (TiN)	Titanium carbonitride (TiCN)	Titanium nitride aluminum (TiAlN)	Chromium nitride (CrN)
Features				
Vickers Hardness	2000~2400	3000~3500	2300~2700	1800~2200
Wear resistance	Good	Excellent	Excellent	Normal
Welding resistance	Good	Good	Good	Excellent
Heat resistance	Good	Normal	Excellent	Excellent
Acid resistance	Good	Normal	Excellent	Good
Slippery	Good	Excellent	Good	Excellent
Color	Gold	Blue Gray Violet	Violet	Silver
Workpiece materials	Carbon Steels Aluminum forging	Carbon Steels Hard Steels Stainless Steels Aluminum forging Cast Irons Brass • Bronze	Stainless Steels Cast Irons	Copper

Note: Evaluation (tri-level) of characteristic features is just comparative of these four coatings, TiN, TiCN, TiAlN, and CrN, in the table. These coatings have great advantages of wear resistance, welding resistance, and friction reduction. The values of vickers hardness are also higher than the heat treatment or nitriding of HSS cutting tools from the table.

■ Comparison between bright and TiN coated



■ Comparison between bright and TiCN coated



9. Carbide Taps

Technological advances in CNC machines and machining centers, and machining automation have helped improve the overall tapping process.

YAMAWA was quick to respond to evolving customer needs resulting from technological innovations.

We can now recommend carbide taps, which provide tremendous improvements in mass-production and in reducing costs. It is estimated that carbide taps have 50 times more durability than HSS taps in tapping, when used properly. YAMAWA engineering believes the best carbide materials suitable for taps are ultramicro grain tungsten carbide, or ultrafine grain carbide made of high cobalt.

■ Features of Carbide Taps

- (1). Excellent durability with high toughness is obtainable.
- (2). High anti-friction features are provided by the material's high hardness and comparatively high toughness, which ultimately results in a longer tool life.
- (3). Specially designed cutting angle and other dimensional features produce the internal threads with high tolerance accuracy and consistency.
- (4). Under certain tapping condition, YAMAWA carbide taps can be used even for tapping hard-to-machine materials.

■ Points to note during tapping with Carbide taps:

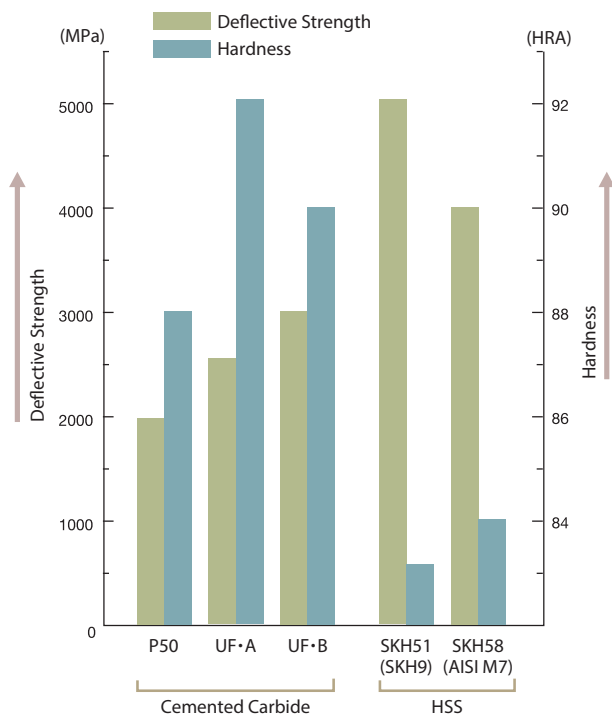
- (1). Machine vibration, or run-out, can lead to Carbide tap chipping and premature failure. Tapping vibrations need to be kept to a minimum.
- (2). Tap holder should be a rigid type for a Carbide tap. A holder attachment with axial float, or radial float tends to promote Carbide tap breakage and chipping.
- (3). The hole to be tapped must be located correctly and on center; any centering off or non-straight drilled hole tends to cause Carbide tap breakage due to deflection. Select correct hole depth with respect to tapping length (for blind hole only). It is especially important to prevent tap damage from chip packing and bottom thrusting in blind hole tapping.
- (4). Cutting lubricants - select grade of lubricant. Improper flow of coolant, or lack of sufficient amount of lubricant, or cooling can increase the likelihood of Carbide tap chipping due to work material welding. Caution must be taken during dry machining to prevent chip welding to the tap.
- (5). Work pieces - we provide Carbide taps with increased toughness, but Carbide taps are inferior to High Speed Steel (HSS) in the area of toughness. As a matter of fact Carbide taps have limited application due to this difference in toughness to HSS.

■ Commonly used materials and cutting conditions

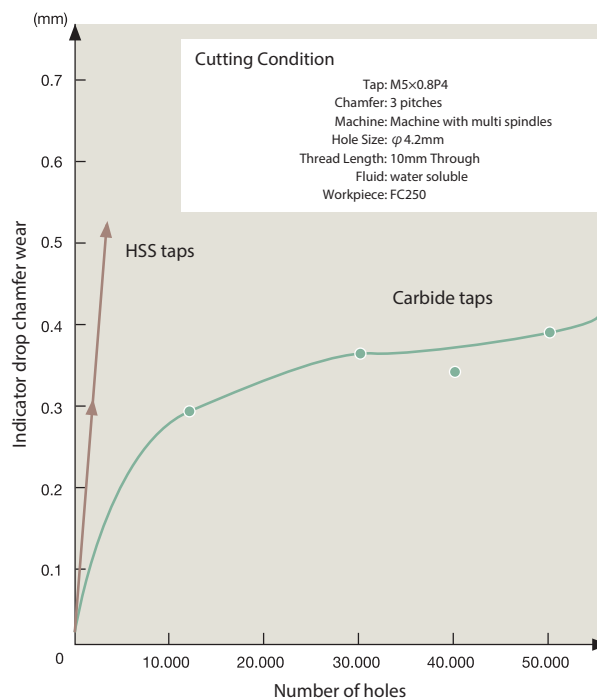
Work Materials		Cutting Speed (m/min)	Cutting Fluid (General recommendation)
Cast Iron	Ordinary	15~25	Dry, light oil, water soluble oil
	Nodular Graphite	10~20	Light oil, water soluble oil
	Malleable	10~20	Water soluble oil
Aluminum		20~40	Light oil, water soluble oil
Copper		15~30	Light oil, water soluble oil
Copper Alloy	Brass	20~30	Light oil, water soluble oil
	Phosphor Bronze	15~30	Light oil, water soluble oil
Die-Cast	Aluminum Alloy	15~25	Mixed oil of lard oil and kerosene
	Zinc Alloy	12~20	Mixed oil of lard oil and kerosene
Plastic	Thermosetting	15~25	Water soluble oil, air
	Thermo Plastic	15~25	Water soluble oil, air
Hard Rubber		15~30	Dry, air

Note: The table shows only general conditions. As for actual cutting operation, please consider the following points: (1) Machine Capacity, (2) Work piece(s), (3) Work Shape, (4) Setup (5) other factors.

■ Toughness and Hardness of Cemented Carbide and HSS



■ Chamfer wear and number of holes of Carbide taps and HSS taps



■ Carbide Tap examples and comparison of tool life

Size		M2x0.4	M8x1.25	M6x1	M8x1.25	M10x1.25
Classification						
Workpiece	Material	Plastic with glass fibre	ADC12	FC250	FC250	FC250
	Part's name	Electric Parts	Car Parts	Electric Parts	Car Parts	Car Parts
Thread Condition	Tapping Hole. condition	ϕ 1.6 Through	ϕ 6.7 Blind	ϕ 5.0 Blind	ϕ 6.7 Blind	ϕ 8.7 Blind
	Tapping Length	4mm	18mm	10mm	16mm	18mm
Condition of Use	Machine	Special Machine	Special Machine	4 spindle Machine	Multi Spindle Machine	Special Machine
	Cutting Speed	6.3m/min	8.5m/min	8m/min	6m/min	5.7m/min
	Fluid	Dry	Water soluble	Water soluble	Water soluble	Water soluble
Number of Holes	Carbide Tap	10.000	75.400	53.000	18.860	38.500
	HSS Tap	200	1.000	1.000	300	500
	Comparison of Life	50	75.4	53	62.9	77

Note: In all situations, HSS taps being used are standard ones.
 Carbide taps, when used properly, bring out a long tool life.
 These data have come from end users of carbide taps.

CUTTING TAPS	ISO P
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10. Selecting different tap holder combinations by machine feed system

The function of machine feed systems

Fully synchronous feed (Rigid) tapping system

Spindle revolution and machine feed are synchronized, a perfect thread lead and feed per revolution are realized.

Feed by lead screws

A better-feed condition is realized because the tap is fed by a master lead screw shaft that has the same thread lead as this tap.

Feed by gear

The tap is fed at the same thread lead by a combinations of gears. This creates a better-feed to thread lead condition.

Asynchronous feed system

Best used when the spindle rotation and the machine feed are set independently, especially, if the machine feed value cannot be accurately predicted to be that of the tap thread lead.

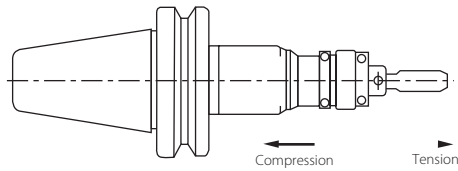
Hydraulic or Pneumatic pressure feed system

Feed is controlled by a pressure regulation system which normally results in an inaccurate feed per revolution compared to the tap thread lead.

Manual feed

Feed is controlled by operator which is difficult to keep a stable amount of feed per revolution.

Holders aspects



Spring direction

Completely rigid holder type

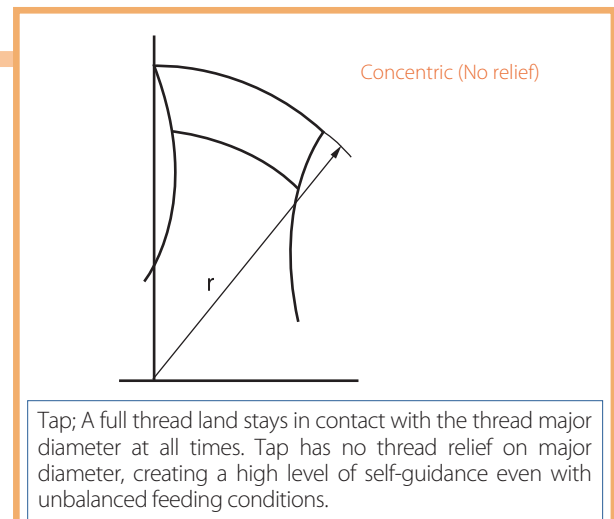
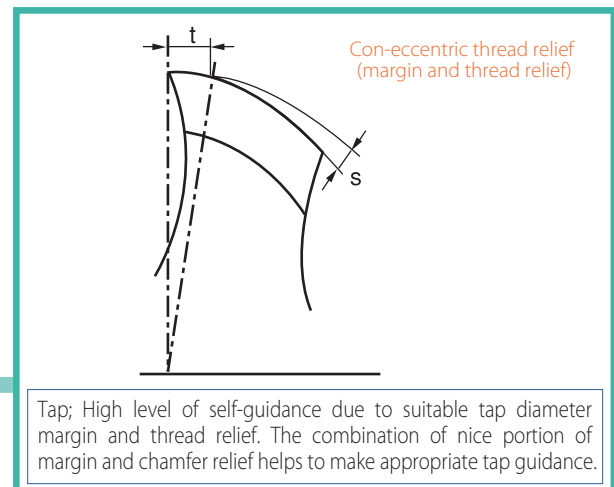
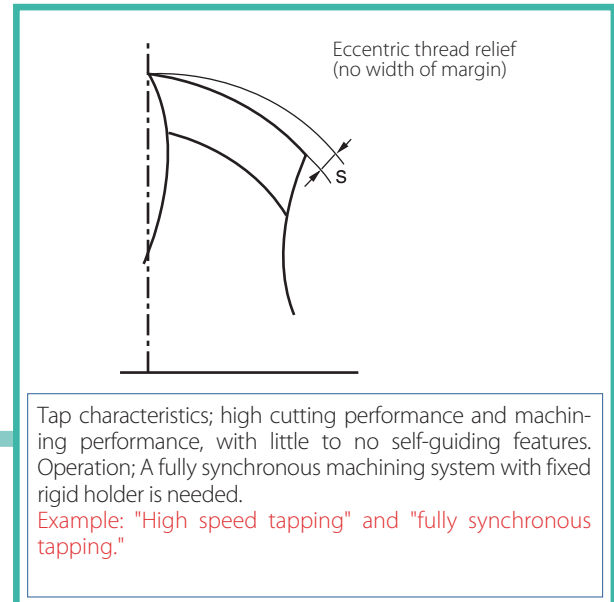
The tap is held with no axial or radial adjustment in the collet and holder.

Adjustable spring floating holder (Tension & Compression)

Machine feed and tap's thread lead errors are corrected by two types of spring system in the holder, the axial tension direction of the tap and the axial compression direction of the tap.

Characteristics of tap self-guiding behavior

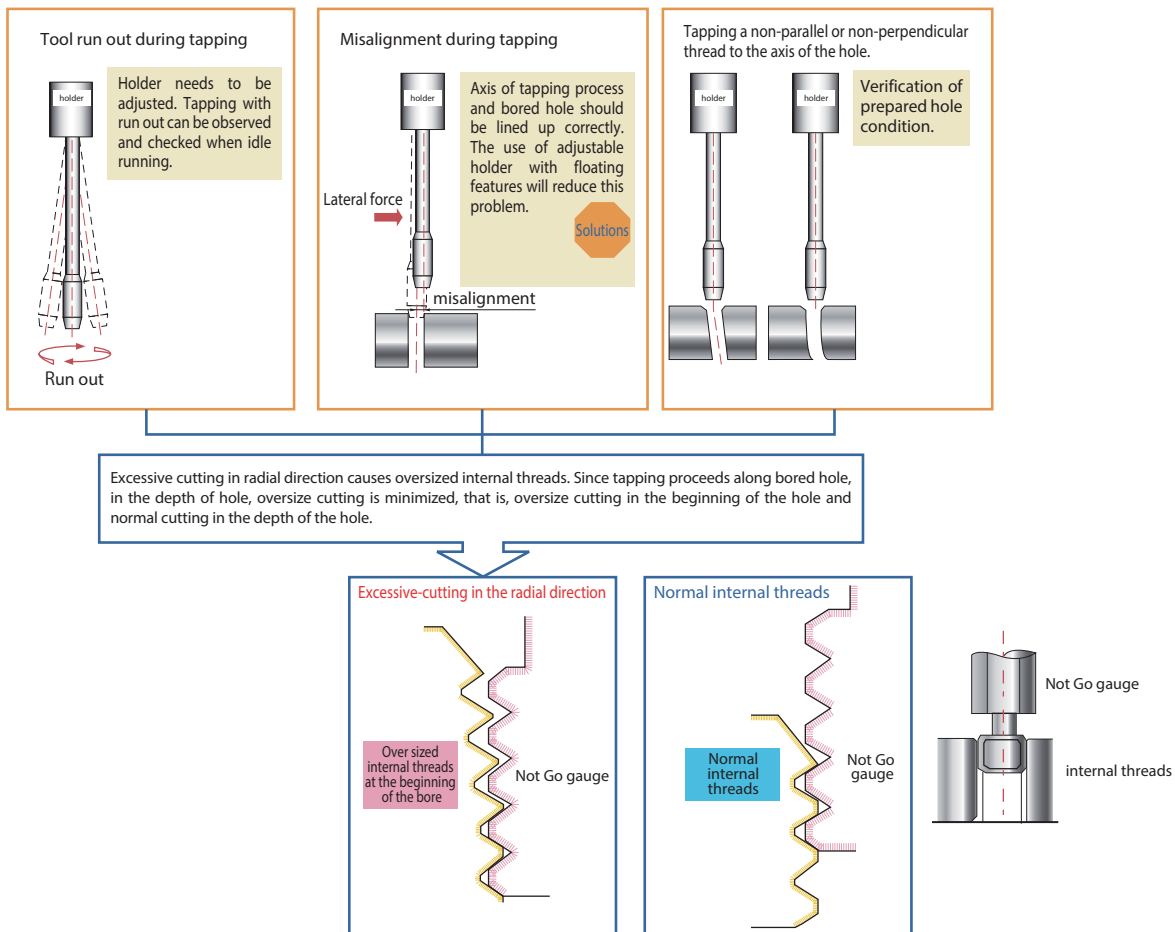
r =tap's radius, s =thread relief, t =margin width



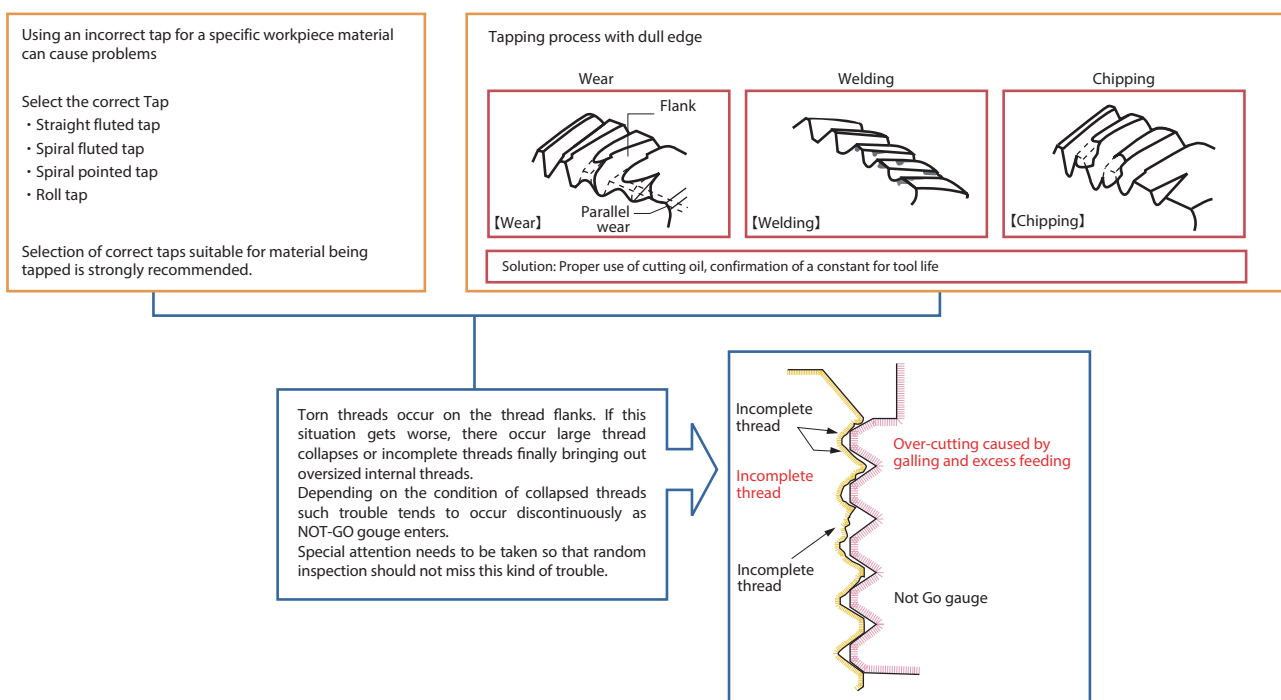
CUTTING TAPS	ISO P
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11. The mechanism for a tap to cut oversize on an internal thread

1. Run out, misalignment and tap cutting in non perpendicular to holes → Over-cutting at radial direction



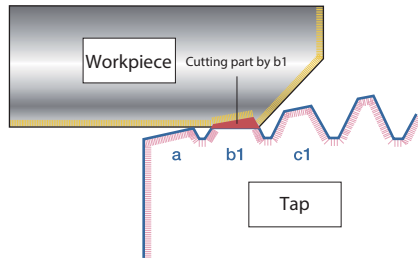
2. Using a tap not suitable for the operation or a tap with dull cutting edge may cause galling and result in over-cutting → Over-cutting caused by galling and excess cutting



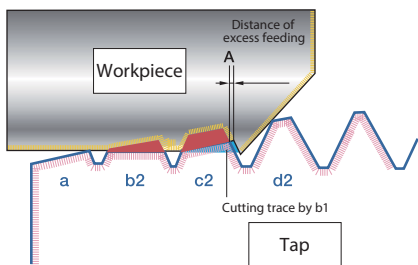
3. Tapping with an improper feed condition → over-cutting at axial direction

Process of over-cutting due to excessive feed

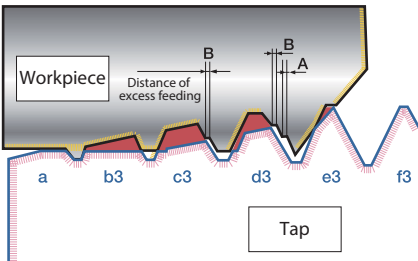
① With cutting edge b1, cutting starts.



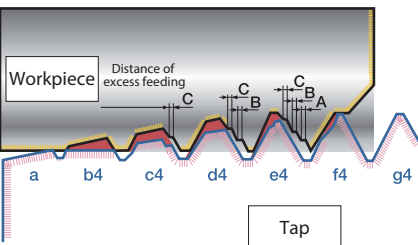
② Position between workpiece and tap after the tap rotates 1 turn.



③ Position between workpiece and tap after the tap rotates 2 turns.



④ The position between workpiece and tap after 3 rotations of tap.



Feed adjustment is strongly recommended.

* (Use fully synchronous feed system and fixing holder)

When using machines that do not have the synchronous feed system, such as drilling machine.

* Adjust the correct weight balance of main spindle properly.

* Use an axial/radial floating holder for adjustment.

Solutions

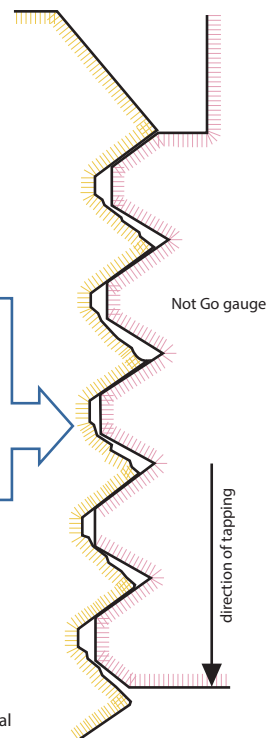
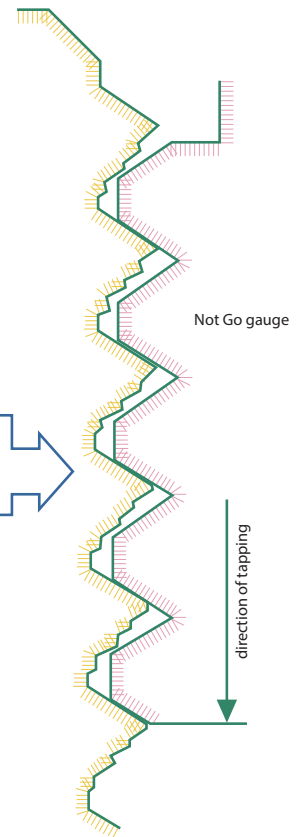
Excessive-cutting of the thread with excessive feeding

Over-cutting of the thread by too slow feeding

Process Opposite of excessive feeding Factors in influencing extra material is cut at back flank.

over-cutting during tapping

- ① The tap mounting condition in the holder.
- ② The condition of bored hole.
- ③ The cutting oil selection.
- ④ Incorrect adjustment of feed balance.
- ⑤ Selection of the tap depending on material being cut.



TECHNICAL INFORMATION	CUTTING TAPS					FORMING TAPS	
	ISO P	ISO M	ISO K	ISO N	ISO S	ISO P - ISO M	ISO N

12. Symbols for Standard Threads

■ Japan

Thread symbols	Kinds of threads	Related Standards
M	Metric screw threads	JIS B 0205-1~0205-4
S	Miniature screw threads	JIS B 0201
UNC	Unified threads, Coarse series	JIS B 0206
UNF	Unified threads, Fine series	JIS B 0208
Tr	Metric Trapezoidal screw threads	JIS B 0216
R	Taper external pipe threads	JIS B 0203 (JIS main book)
Rc	Taper internal pipe threads	JIS B 0203 (JIS main book)
Rp	Parallel internal pipe threads	JIS B 0203 (JIS main book)
G	Parallel pipe threads	JIS B 0202 (JIS main book)
PF	Parallel pipe threads	JIS B 0202 (JIS Appendix)
PT	Taper pipe threads	JIS B 0203 (JIS Appendix)
PS	Parallel internal pipe threads	JIS B 0203 (JIS Appendix)
CTC	Screw threads for rigid metal thin-walled conduit and fitting	JIS C 8305
CTG	Screw threads for rigid metal thick-walled conduit and fitting	JIS C 8305
BC	Cycle threads	JIS B 0225
SM	Screw threads for sewing machine	JIS B 0226 (2001.2.20 repeal)
E	Electric socket and lamp-base threads	JIS C 7709
V	Tire valve threads of automobile	JIS D 4207
CTV	Tire valve threads of cycle	JIS D 9422

■ ISO

Thread symbols	Kinds of threads	Related Standards
M	ISO Metric threads	ISO 261
S	ISO Miniature screw threads	ISO 1501
Tr	ISO Metric trapezoidal screw threads	ISO 2902
UNC	ISO Unified threads, coarse series	ISO 263
UNF	ISO Unified threads, fine series	ISO 263
UNEF	ISO Unified threads, extra fine series	ISO 263
UN	ISO Unified threads, constant pitch series	ISO 263
UNJC	Aerospace - UNJ threads (coarse)	ISO 3161
UNJF	Aerospace - UNJ threads (fine)	ISO 3161
UNJEF	Aerospace - UNJ threads (extra fine)	ISO 3161
UNJ	Aerospace - UNJ threads (constant pitch series)	ISO 3161
MJ	Aerospace - MJ threads	ISO 5855
R	Taper external pipe threads	ISO 7/1
Rc	Taper internal pipe threads	ISO 7/1
Rp	Parallel internal pipe threads	ISO 7/1
G	Parallel pipe threads	ISO 228/1
GL	Glass container threads	ISO 1115
V	Tire valve threads	ISO 4570/1~3

America

Thread symbols	Kinds of threads	Related Standards
UN	Unified inch screw threads	ANSI B 1.1
UNC/UNRC	Unified coarse thread series	ANSI B 1.1
UNF/UNRF	Unified fine thread series	ANSI B 1.1
UNEF/UNREF	Unified extra-fine thread series	ANSI B 1.1
4UN/4UNR	Unified constant-pitch series with 4-threads	ANSI B 1.1
6UN/6UNR	Unified constant-pitch series with 6-threads	ANSI B 1.1
8UN/8UNR	Unified constant-pitch series with 8-threads	ANSI B 1.1
12UN/12UNR	Unified constant-pitch series with 12-threads	ANSI B 1.1
16UN/16UNR	Unified constant-pitch series with 16-threads	ANSI B 1.1
20UN/20UNR	Unified constant-pitch series with 20-threads	ANSI B 1.1
28UN/28UNR	Unified constant-pitch series with 28-threads	ANSI B 1.1
32UN/32UNR	Unified constant-pitch series with 32-threads	ANSI B 1.1
UNS/UNRS	Unified threads of special diameters, pitches and lengths of engagement	ANSI B 1.1
NR	American National thread with a 0.108p to 0.144p controlled root radius	MIL-B-7838
Acme	Acme screw threads	ANSI B 1.5
Stub-Acme	Stub Acme screw threads	ANSI B 1.8
Butt	Buttress inch screw threads	ANSI B 1.9
UNM	Unified miniature thread series	ANSI B 1.10
NC5	Class 5 interference-fit thread	ANSI B 1.12
NPT	American Standard taper pipe threads for general use	ANSI/ASME B 1.20.1
NPTR	American Standard taper pipe threads for railing joints	ANSI/ASME B 1.20.1
NPSC	American Standard straight pipe thread in pipe couplings	ANSI/ASME B 1.20.1
NPSL	American Standard straight pipe threads for loose-fitting mechanical joints with locknuts	ANSI/ASME B 1.20.1
NPSM	American Standard straight pipe threads for free-fitting mechanical joints for fixture	ANSI/ASME B 1.20.1
NPSH	American Standard straight pipe threads for loose-fitting mechanical joints for hose couplings	ANSI/ASME B 1.20.1
NPTF	Dryseal American Standard taper pipe threads	ANSI B 1.20.3, 1.20.4
F-PTF	Dryseal fine taper pipe threads series	ANSI B 1.20.3, 1.20.4
PTF-SAE SHORT	Dryseal SAE short taper pipe threads	ANSI B 1.20.3, 1.20.4
PTF-SPL SHORT	Dryseal special short taper pipe threads	ANSI B 1.20.3, 1.20.4
PTF-SPL EXTRA SHORT	Dryseal special extra short taper pipe threads	ANSI B 1.20.3, 1.20.4
SPL-PTF	Dryseal special taper pipe threads	ANSI B 1.20.3, 1.20.4
NPSI	Dryseal American Standard intermediate internal straight pipe threads	ANSI B 1.20.3, 1.20.4
NPSF	Dryseal American Standard fuel internal straight pipe threads	ANSI B 1.20.3, 1.20.4
ANPT	Aeronautical National Form taper pipe threads	MIL-P-7150
NGO	National gas outlet threads	ANSI B 57.1
NGS	National gas straight threads	ANSI B 57.1
NGT	National gas taper threads	ANSI B 57.1
SGT	Special gas taper threads	ANSI B 57.1
NH	Hose coupling and firehose coupling threads	USAS B 2.4
NHR	Hose coupling and firehose coupling threads	USAS B 2.4
NPSH	Hose coupling and firehose coupling threads	USAS B 2.4
AMO	American Standard microscope objective threads	ANSI B 1.11

CUTTING TAPS	ISO P
	ISO M
	ISO K
	ISO N
	ISO S
	ISO H
	ISO P - ISO M
	ISO N
	ISO N
	ISO N
FORMING TAPS	ISO P - ISO M
	ISO N
TECHNICAL INFORMATION	ISO P - ISO M
	ISO N

■ British

Thread symbols	Kinds of threads	Related Standards
UNS	Unified special series	BS 1580
B.S.W.	British Standard Whitworth coarse threads	BS 84
B.S.F.	British Standard fine threads	BS 84
BSP	British Standard pipe thread (corresponding to R, Rc, Rp of ISO)	BS 21,2779
B.A.	B.A.-Screw threads	BS 93
Acme	General purpose, Acme screw threads	BS 1104
Buttress	Buttress threads	BS 1657
BSC	Cycle threads	BS 811
BSMO	Microscope objective threads	BS 3569
E	Edison screw threads	BS 5042

■ German

Thread symbols	Kinds of threads	Related Standards
GL	Glass containers thread	DIN 168
S	Buttress thread	DIN 513,2781,20401
Rd	Knuckle thread	DIN 262,3182,7273,15403,20400
W	Whitworth-gewinde	DIN 168,477,6630,49301
KS,KT	Screw siles for packages made of Plastics	DIN 6063
E	Edison screw thread	DIN 40400
Pg	Steel conduit thread	DIN 40430
Vg	Automobil tire valve thread	DIN 7756
Gf	Thread for freezing pipes	DIN 4930
Gg	Threads for drill pipe	DIN 4941,20314
HA	Thread for bone screws and nuts	DIN 58810
FG	Bicycle threads	DIN 79012

Old-new code cross reference

CODE		ALTERNATIVE	Cat. page
OLD	NEW		
0021	CD-A		184
0021TI			
0023	CD-R		185
0023TI			
0941	DPO		178
0943	DPO		178
0947	DPO		181
0949	DPO		180
1330JNX		ZELX NI PO	246
1330NX	ZEN-P		130
1340JOX		ZELX NI SP	215
1340OX	ZEN-B		90
1341JNI		ZELX TI SP	213
1341NI	ZET-B		92
1349JNI		ZELX TI LHSP	222
1349NI		ZELX TI LHSP	222
1355TC	OL+RZ		171
1356TC	HP+RZ/HP-RZ		172
1430JNX		ZELX NI PO	246
1430NX	ZEN-P		130
1440JOX		ZELX NI SP	215
1440OX	ZEN-B		90
1441JNI		ZELX TI SP	213
1441NI	ZET-B		92
1449JNI		ZELX TI LHSP	222
1449NI		ZELX TI LHSP	222
1630NX	ZEN-P		130
1640OX	ZEN-B		89
1641NI	ZET-B		91
1641TC			
1649NI	ZET-P		109
1649TC			
1730NX	ZEN-P		130
1740OX	ZEN-B		89
1741NI	ZET-B		91
1741TC			
1749NI	ZET-P		109
1749TC			
1830NX	ZEN-P		130
1840OX	ZEN-B		89
1841NI	ZET-B		91
1841TC			
1849NI	ZET-P		109
1849TC			
1856TC	HP-RZ		172
2620	EH-HT		145
2630	EH-PO		126
2720	EH-HT		145
2730	EH-PO		126
2820	EH-HT		145
2830	EH-PO		126
2920	EH-HT		146
3626	CT-FC		158
3726	CT-FC		158
5980	Y831..... BR NPT		305

CODE		ALTERNATIVE	Cat. page
OLD	NEW		
5984OX	Y831..... INT NPT		306
5985OX		ZELX SS NPT	302
5990	Y831..... NPTF		308
6000			
6110	stock available - not listed in the catalogue		
6110F	HT F		135
6110M	HT M		135
6110V	HT V		135
6211	available on request		
6211F	HT F		135
6211V	HT V		135
6310	available on request		
6310F	HT F		142
6310M	HT M		142
6310V	HT V		142
6412	stock available - not listed in the catalogue		
6412F	HT F		143
6412V	HT V		143
7130			
7140OX			
7530			
7540OX			
8120C			
8120D			
8520C			
8520D			
9020	HT		143
9320	HT		141
9330	PO		117
9335OX	PO-VA		128
9340	SP		55
9345OX	SP-VA		80
9350NI	N+RS / N-RS		169
9350TI		HP+RZ/HP-RZ	172
9351OX	N+RZ/N-RZ		170
9352NI		N+RS/N-RS	169
9352TI		OL+RZ	171
9353	R-D		166
9353TC		HP+RZ/HP-RZ	172
9353TI	R-D Coating		167
9354 6G		HP+RZ/HP-RZ	172
9354TI 6G		HP+RZ/HP-RZ	172
9420	HT		141
9430	PO		117
9435OX	PO-VA		128
9440	SP		55
9445OX	SP-VA		80
9530			
9540OX			
9620	HT		135
9623NI	LA-HT		153
9623TC		AXE-HT	155
9626NI	GG-HT		147
9626NIOH	GG-HT-OH		151
9626TC	GG-HT Coating		149

Items in red are exhausting, recommended alternative code indicated when available.

Old-new code cross reference

CODE		ALTERNATIVE	Cat. page
OLD	NEW		
9626TCOH	GG-HT-OH Coating		152
9630	PO		115
963010	PO		115
96306G	PO		115
9630OH		HDISL	111
9630OX	PO OX		122
9630TC		PO Coating	119
9630TCOH		HDISL	111
9630TH		PO Coating	119
9630TI	PO Coating		119
9634	LA-HT		153
9634TC		AXE-HT	155
9635OX	PO-VA		127
9635TC	PO-VA TiCN		129
9640	SP		53
964005	SP		53
964010	SP		53
96406G	SP		53
9640LH	SP LH		64
9640OH		HFIHS	94
9640TCOH		HFIHS	94
9640TH		SP Coating	57
9640TI	SP Coating		57
9641	LO-SP		70
9641OX	LO-SP OX		73
9641TC			
9641TI			
9642		AL-SP	69
9642 2F		AL-SP	69
9643NI	AL-SP		69
9643TC			
9644OX	SU2-SP		87
9645EOX		SP-BLF 1.5P	83
9645OX	SP-VA		79
9645OX6G	SP-VA		79
9645TC	SP-VA TiCN		82
9646OX	E-SP		77
9647	SP-BLF		83
9647E	SP-BLF 1.5P		83
9647OX	SP-BLF OX		86
9647TC		SP-BLF Coating	85
9647TI	SP-BLF Coating		85
9648OX	PH-SP		75
9665VP	SL+VA		102
9666TI	AU+SL		107
9666TI	AUXSL		108
9685VP	SP+VA		78
9686TI	AU+SP		66
9686TI	AUXSP		67
9720	HT		135
9723NI	LA-HT		153
9723TC		AXE-HT	155
9726NI	GG-HT		147
9726NIOH	GG-HT-OH		151
9726TC	GG-HT Coating		149

CODE		ALTERNATIVE	Cat. page
OLD	NEW		
9726TCOH	GG-HT-OH Coating		152
9730	PO		115
973010	PO		115
97306G	PO		115
9730OH		HDISL	111
9730OX	PO OX		122
9730TC		PO V	119
9730TCOH		HDISL	111
9730TH		PO V	119
9730TI	PO Coating		119
9734	LA-HT		153
9734TC		AXE-HT	155
9735OX	PO-VA		127
9735TC	PO-VA TiCN		129
9740	SP		53
974005	SP		53
974010	SP		53
97406G	SP		53
9740LH	SP LH		64
9740OH		HFIHS	94
9740TCOH		HFIHS	94
9740TH		SP Coating	57
9740TI	SP Coating		57
9741	LO-SP		70
9741OX	LO-SP OX		73
9741TC			
9741TI			
9743NI	AL-SP		69
9743TC			
9744OX	SU2-SP		87
9745EOX		SP-BLF 1.5P	83
9745OX	SP-VA		79
9745OX6G	SP-VA		79
9745TC	SP-VA TiCN		82
9746OX	SP-NW		77
9747	SP-BLF		83
9747E	SP-BLF 1.5P		83
9747OX	SP-BLF OX		86
9747TC		SP-BLF Coating	85
9747TI	SP-BLF Coating		85
9748OX	PH-SP		75
9820	HT		135
9826NI	GG-HT		147
9826NIOH	GG-HT-OH		151
9826TC	GG-HT Coating		149
9826TCOH	GG-HT-OH Coating		152
9830	PO		115
9830TC		PO Coating	119
9830TH		PO Coating	119
9830TI	PO Coating		119
9835OX	PO-VA		127
9840	SP		53
9840OX	SP OX		60
9840TC		SP Coating	58

Items in red are exhausting, recommended alternative code indicated when available.

CODE		ALTERNATIVE	Cat. page
OLD	NEW		
9840TH		SP Coating	58
9840TI	SP Coating		58
9841	LO-SP		70
9841OX	LO-SP OX		73
9841TC			
9841TI			
9845OX	SP-VA		80
9848OX	PH-SP		75
9920	HT		143
9926NI	GG-HT		148
9926TC	GG-HT Coating		150
9930	PO		118
9930OX	PO OX		125
9930TC		PO Coating	120
9930TI	PO Coating		120
9940	SP		56
9940OX	SP OX		63
9940TC		SP Coating	58
9940TI	SP Coating		58
9941	LO-SP		71
9941OX	LO-SP OX		74
9941TC			
9941TI			
9944OX	SU2-SP		87
9945OX	SP-VA		81
9948OX	PH-SP		76
9953	R-D		166
9953TI	R-D Coating		168
AR-D-LH		D LH	621
CD-S-L	CD-SL		647
CD-S-XL	CD-SL		647
CS-Q	CS-Q		692
CS-QM	CS-QM		693
DT-OX			
EH-CT	EH-CT		161
F-SL	F-SL		110
F-SP	F-SP		93
HDASP	HDASP		99
HDISL	HDISL		111

CODE		ALTERNATIVE	Cat. page
OLD	NEW		
HDISP	HDISP		98
HFACT-B	HFACT-B		491
HFACT-P	HFACT-P		490
HFAHS	HFAHS		96
HFASP	HFASP		97
HFICT-B	HFICT-B		493
HFICT-P	HFICT-P		492
HFIHS	HFIHS		94
HFISP	HFISP		95
HP-RZ	HP-RZ		514~516
I-HT 2P	I-HT 2P		427
I-HT 5P	I-HT 5P		427
I-PO	I-PO		395
I-SP	I-SP		319
LS-HT	LS-HT		446
LS-N-RS	LS-N-RS		508
LS-PF	LS-PF		585
LS-PO	LS-PO		410
LS-SP	LS-SP		343
MC-AD-CT	MC-AD-CT		487
MC-HLC	MC-HLC		607
NC-SD		NC-SD V	691
NC-SD-TC		NC-SD V	691
N-PO BSW	PO		401
N-SP BSW	SP		326
OL-RZ	OL+RZ		512
PE-Q	PE-Q		681
PE-Q-V	PE-Q-V		682
PE-S	PE-S		685
PE-S-V	PE-S-V		686
PS	PS		576
PS-L	LS-PS		578
PS-XL	LS-PS		578
PT	PT		551
PT-L	LS-PT		556
PT-XL	LS-PT		556
STI-HT	AL-HT (STI)		467
STI-SP	AL-SP (STI)		367
UH-CT	UH-CT		163

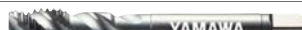
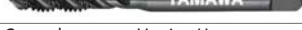
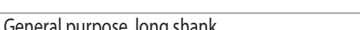
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Line-up index

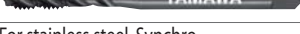
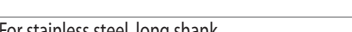
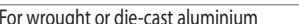
(page numbers refer to the 2016-17 Yamawa General Catalogue)

Spiral fluted taps

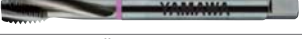
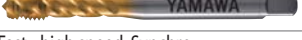
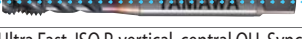
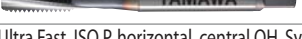
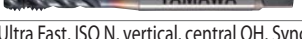
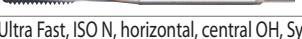


ISP		DIN	
		ANSI	188
		JIS	318
Hand or drilling machine application			
SP		DIN	52
		ANSI	189
		JIS	320
General purpose			
SP 1.5P		DIN	
		ANSI	
		JIS	328
General purpose, short chamfer			
+SP		DIN	
		ANSI	
		JIS	330
General purpose, Version Up			
XSP		DIN	
		ANSI	
		JIS	332
General purpose, Synchro			
SP LH		DIN	64
		ANSI	
		JIS	337
General purpose, left hand thread			
LS-SP		DIN	
		ANSI	
		JIS	343
General purpose, long shank			
MC-SP		DIN	
		ANSI	
		JIS	371
General purpose, long shank, central OH			
LS-SP LH		DIN	
		ANSI	
		JIS	347
General purpose, long shank, left hand thread			
SP OX		DIN	59
		ANSI	193
		JIS	333
General purpose			
+SP OX		DIN	
		ANSI	
		JIS	336
General purpose, Version Up			
SP		DIN	
		ANSI	196
		JIS	
UN8, alloy steel			
SP (Coating)		DIN	57
		ANSI	
		JIS	339
General purpose			
LS-SP V		DIN	
		ANSI	
		JIS	348
General purpose, long shank			
SP-BLF		DIN	83
		ANSI	
		JIS	
General purpose, blind hole >2xD			
SP-BLF OX		DIN	86
		ANSI	
		JIS	
General purpose, blind hole >2xD			
SP-BLF (Coating)		DIN	85
		ANSI	
		JIS	
General purpose, blind hole >2xD			

Central OH = for blind hole with through coolant hole
Radial OH = for through hole with radial coolant hole

LO-SP		DIN	70
		ANSI	
		JIS	369
General purpose			
LS-LO-SP		DIN	
		ANSI	
		JIS	370
General purpose, long shank			
LO-SP OX		DIN	72
		ANSI	
		JIS	
General purpose			
LO-SP		DIN	
		ANSI	197
		JIS	
UN8, alloy steel			
AU+SP		DIN	65
		ANSI	198
		JIS	340
Universal, high performance			
AUXSP		DIN	67
		ANSI	
		JIS	342
Universal, high performance, Synchro			
E-SP		DIN	77
		ANSI	
		JIS	361
For soft structural steel			
HC+SP HC-SP		DIN	
		ANSI	
		JIS	363
For high carbon steel			
HC+SP OX HC-SP OX		DIN	
		ANSI	
		JIS	365
For high carbon steel			
PH-SP		DIN	75
		ANSI	
		JIS	
For hard steel <38HRC			
SP-VA		DIN	79
		ANSI	199
		JIS	350
For stainless steel			
SP+VA		DIN	78
		ANSI	
		JIS	350
For stainless steel, Version Up			
SUXSP		DIN	
		ANSI	
		JIS	355
For stainless steel, Synchro			
ZELX SS SP 6"		DIN	
		ANSI	204
		JIS	
For stainless steel, long shank			
SP-VA (Coating)		DIN	82
		ANSI	
		JIS	
For stainless steel			
SU2-SP		DIN	87
		ANSI	
		JIS	356
For stainless steel, Duplex, Synchro			
AL+SP AL-SP		DIN	68
		ANSI	205
		JIS	366
For wrought or die-cast aluminium			

(page numbers refer to the 2016-17 Yamawa General Catalogue)

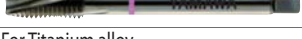
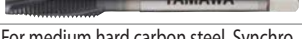
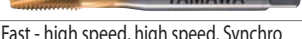
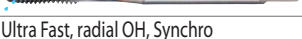
AL-SP 1.5P		DIN ANSI	
	For Aluminium, short chamfer	JIS	368
ZELX ALS SP		DIN ANSI	207
	For die-cast Aluminium	JIS	
ZEN-B		DIN ANSI	89 215
	For Nickel base alloy	JIS	373
ZET-B		DIN ANSI	91 213
	For Titanium alloy	JIS	372
F-SP		DIN ANSI	93 220
	Fast - high speed, Synchro	JIS	374
HFIHS		DIN ANSI	94 375
	Ultra Fast, ISO P, vertical, central OH, Synchro	JIS	
HFISP		DIN ANSI	95 376
	Ultra Fast, ISO P, horizontal, central OH, Synchro	JIS	
HFAHS		DIN ANSI	96 377
	Ultra Fast, ISO N, vertical, central OH, Synchro	JIS	
HFASP		DIN ANSI	97 378
	Ultra Fast, ISO N, horizontal, central OH, Synchro	JIS	
HDISP		DIN ANSI	98 379
	Dry tapping, Steel, central OH, Synchro	JIS	
HDASP		DIN ANSI	99 380
	Dry tapping, Aluminium, central OH, Synchro	JIS	

Central OH = for blind hole with through coolant hole

Radial OH = for through hole with radial coolant hole

Left hand spiral taps for through hole



XSL		DIN ANSI	
	General purpose, Synchro	JIS	382
AU+SL		DIN ANSI	106 383
	Universal, high performance	JIS	
AUXSL		DIN ANSI	108 384
	Universal, high performance, Synchro	JIS	
SL+VA		DIN ANSI	102 386
	For stainless steel, Version Up	JIS	
SUXSL		DIN ANSI	
	For stainless steel, Synchro	JIS	388
ZET-P		DIN ANSI	109 222
	For Titanium alloy	JIS	386
MHSL		DIN ANSI	104 225
	For medium hard carbon steel, Synchro	JIS	392
F-SL		DIN ANSI	110 224
	Fast - high speed, high speed, Synchro	JIS	390
HDISL		DIN ANSI	111 391
	Ultra Fast, radial OH, Synchro	JIS	

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Spiral pointed taps



I-PO	 Hand and drilling machine application	DIN	
		ANSI	228
		JIS	394
PO	 General purpose	DIN	114
		ANSI	229
		JIS	397
+PO	 General purpose, Version Up	DIN	
		ANSI	
		JIS	403
PO LH	 General purpose, left hand thread	DIN	
		ANSI	
		JIS	407
LS-PO	 General purpose, long shank	DIN	
		ANSI	
		JIS	410
MC-PO	 General purpose, long shank, radial OH	DIN	
		ANSI	
		JIS	422
PO OX	 General purpose	DIN	121
		ANSI	232
		JIS	405
+PO OX	 General purpose, Version Up	DIN	
		ANSI	
		JIS	406
PO (Coating)	 General purpose	DIN	119
		ANSI	
		JIS	409
LS-PO V	 General purpose, long shank	DIN	
		ANSI	
		JIS	414
HC+PO HC-PO	 For high carbon steel	DIN	
		ANSI	
		JIS	420
EH-PO	 For hard steel <45HRC	DIN	126
		ANSI	
		JIS	423
PO-VA	 For stainless steel	DIN	127
		ANSI	235
		JIS	415
ZELX SS PO 6"	 For stainless steel, long shank	DIN	
		ANSI	239
		JIS	
PO-VA (Coating)	 For stainless steel	DIN	129
		ANSI	
		JIS	
ZELX AL PO	 For Aluminium	DIN	
		ANSI	240
		JIS	
ZEN-P	 For Nickel base alloy	DIN	130
		ANSI	246
		JIS	424

Hand and machine straight fluted taps



HT		DIN	134
		ANSI	
Taps for hand set F, M, V		JIS	

I-HT		DIN	
		ANSI	242
Hand and drilling machine application		JIS	426

HT		DIN	134
		ANSI	254
General purpose		JIS	428

HT LH		DIN	
		ANSI	
General purpose, left hand thread		JIS	443

LS-HT		DIN	
		ANSI	
General purpose, long shank		JIS	446

LS-HT LH		DIN	
		ANSI	
General purpose, long shank, left hand thread		JIS	454

MC-HT		DIN	
		ANSI	
General purpose, long shank, central and radial OH		JIS	471

HT OX		DIN	
		ANSI	259
General purpose		JIS	

LS-HT V		DIN	
		ANSI	
General purpose, long shank		JIS	456

EH-HT		DIN	145
		ANSI	272
For hard steel <45HRC		JIS	474

Central OH = for blind hole with through coolant hole
 Radial OH = for through hole with radial coolant hole

(page numbers refer to the 2016-17 Yamawa General Catalogue)

ZELX MOLD		DIN	
		ANSI	271
		JIS	
For hard steel <45HRC			

SU-HT		DIN	
		ANSI	
		JIS	458
For stainless steel			

GG-HT		DIN	147
		ANSI	264
		JIS	461
For cast iron			

GG-HT-OH		DIN	151
		ANSI	
		JIS	
For cast iron, central OH			

GG-HT (Coating)		DIN	149
		ANSI	
		JIS	
For cast iron			

GG-HT-OH (Coating)		DIN	152
		ANSI	
		JIS	
For cast iron, central OH			

LA-HT		DIN	153
		ANSI	
		JIS	463
For wrought or die-cast Aluminium			

AXE-HT		DIN	154
		ANSI	266
		JIS	465
For die-cast Aluminium, Synchro			

MG-HT		DIN	
		ANSI	
		JIS	466
For Magnesium alloy			

PL1		DIN	
		ANSI	
		JIS	470
For plastic material			

Central OH = for blind hole with through coolant hole

Radial OH = for through hole with radial coolant hole

Carbide taps

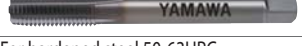
CT-FC		DIN	158
		ANSI	277
		JIS	481
For cast iron			

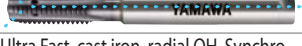
N-CT-LA		DIN	
		ANSI	274
		JIS	478
For Aluminium alloy			

N-CT-PO		DIN	
		ANSI	
		JIS	485
For Aluminium alloy			

MC-AD-CT		DIN	
		ANSI	
		JIS	486
For Aluminium alloy, central OH, Synchro			

EH-CT		DIN	160
		ANSI	
		JIS	488
For hardened steel 45-55HRC			

UH-CT		DIN	162
		ANSI	
		JIS	489
For hardened steel 50-63HRC			

HFICT-P		DIN	
		ANSI	
		JIS	492
Ultra Fast, cast iron, radial OH, Synchro			

HFICT-B		DIN	
		ANSI	
		JIS	493
Ultra Fast, cast iron, central OH, Synchro			

HFACT-P		DIN	
		ANSI	
		JIS	490
Ultra Fast, Aluminium, radial OH, Synchro			

HFACT-B		DIN	
		ANSI	
		JIS	491
Ultra Fast, Aluminium, central OH, Synchro			

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Roll taps

R-D		DIN	166
		ANSI	
		JIS	
General purpose			

R-D (Coating)		DIN	167
		ANSI	
		JIS	
General purpose			

R-D (Coating)		DIN	168
		ANSI	
		JIS	
General purpose			

R+V		DIN	
		ANSI	
		JIS	510
General purpose, Version Up			

N+RZ N-RZ		DIN	170
		ANSI	282
		JIS	496
For steel			

LS-N-RZ		DIN	
		ANSI	
		JIS	501
For steel, long shank			

SC-TL-RZ		DIN	
		ANSI	
		JIS	518
For steel and stainless steel			

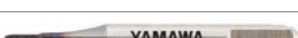
SURZ		DIN	
		ANSI	
		JIS	520
For steel and stainless steel			

OL-RZ		DIN	171
		ANSI	290
		JIS	512
Dry tapping			

HP+RZ HP-RZ		DIN	172
		ANSI	291
		JIS	514
For steel and stainless steel			

MHRZ		DIN	174
		ANSI	294
		JIS	522
For medium hard carbon steel			

MS+RS		DIN	
		ANSI	
		JIS	524
Miniature			

HPsRZ		DIN	
		ANSI	
		JIS	524
Miniature, high performance			

N+RS N-RS		DIN	169
		ANSI	286
		JIS	502
For non-ferrous material			

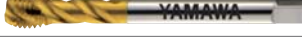
LS-N-RS		DIN	
		ANSI	
		JIS	508
For non-ferrous material, long shank			

Pipe taps - Gas (G)

SP		DIN	56
		ANSI	
		JIS	586
General purpose			

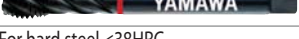
LS-SP-PF		DIN	
		ANSI	
		JIS	587
General purpose, long shank			

SP OX		DIN	63
		ANSI	
		JIS	
General purpose			

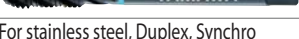
SP (Coating)		DIN	58
		ANSI	
		JIS	
General purpose			

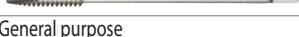
LO-SP		DIN	71
		ANSI	
		JIS	
General purpose			

LO-SP OX		DIN	74
		ANSI	
		JIS	
General purpose			

PH-SP		DIN	76
		ANSI	
		JIS	
For hard steel <38HRC			

SP-VA		DIN	81
		ANSI	
		JIS	
For stainless steel			

SU2-SP		DIN	87
		ANSI	
		JIS	
For stainless steel, Duplex, Synchro			

PO		DIN	118
		ANSI	
		JIS	
General purpose			

PO OX		DIN	125
		ANSI	
		JIS	
General purpose			

PO (Coating)		DIN	120
		ANSI	
		JIS	
General purpose			

HT		DIN	143
		ANSI	
		JIS	582
General purpose			

PF		DIN	
		ANSI	
		JIS	583
General purpose			

PF-LH		DIN	
		ANSI	
		JIS	584
General purpose, left hand thread			

(page numbers refer to the 2016-17 Yamawa General Catalogue)

LS-PF		DIN	
		ANSI	
		JIS	585
General purpose, long shank			

EH-HT		DIN	146
		ANSI	
		JIS	
For hard steel <45HRC			

SU-PF		DIN	
		ANSI	
		JIS	588
For stainless steel			

GG-HT		DIN	148
		ANSI	
		JIS	589
For cast iron			

GG-HT (Coating)		DIN	150
		ANSI	
		JIS	
For cast iron			

CT-PF		DIN	
		ANSI	
		JIS	590
For cast iron and brass, carbide			

Pipe taps - Rp (BSPP)

SP-PS		DIN	
		ANSI	
		JIS	579
General purpose			

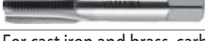
LS-SP-PS		DIN	
		ANSI	
		JIS	580
General purpose, long shank			

Rp		DIN	
		ANSI	
		JIS	575
General purpose			

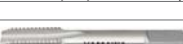
PS		DIN	
		ANSI	
		JIS	576
General purpose			

PS LH		DIN	
		ANSI	
		JIS	577
General purpose, left hand thread			

LS-PS		DIN	
		ANSI	
		JIS	578
General purpose, long shank			

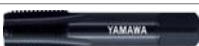
CT-PS		DIN	
		ANSI	
		JIS	581
For cast iron and brass, carbide			

Pipe taps - Rc (BSPT)

SP-PT		DIN	
		ANSI	
		JIS	558
General purpose			
SP-S-PT		DIN	
		ANSI	
		JIS	559
General purpose, short type (lg)			
SP-PT-X		DIN	
		ANSI	
		JIS	560
General purpose, short type (lg)			
LS-SP-PT		DIN	
		ANSI	
		JIS	561
General purpose, long shank			
LS-SP-S-PT		DIN	
		ANSI	
		JIS	562
General purpose, long shank, short type (lg)			
INT-PT		DIN	
		ANSI	
		JIS	563
For stainless steel			
INT-S-PT		DIN	
		ANSI	
		JIS	564
For stainless steel, short type (lg)			
LS-INT-PT		DIN	
		ANSI	
		JIS	565
For stainless steel, long shank			
LS-INT-S-PT		DIN	
		ANSI	
		JIS	566
For stainless steel, long shank			
Rc		DIN	
		ANSI	
		JIS	550
General purpose			
PT		DIN	
		ANSI	
		JIS	551
General purpose			
PT-LH		DIN	
		ANSI	
		JIS	552
General purpose, left hand thread			
PT-X		DIN	
		ANSI	
		JIS	553
General purpose, short type (lg)			
S-PT		DIN	
		ANSI	
		JIS	554
General purpose, short type (lg)			
S-PT LH		DIN	
		ANSI	
		JIS	555
General purpose, short type (lg), left hand			

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Pipe taps - Rc (BSPT)

LS-PT		DIN	
		ANSI	
	General purpose, long shank	JIS	556
LS-S-PT		DIN	
		ANSI	
	General purpose, long shank, short type (lg)	JIS	557
LC-PT		DIN	
		ANSI	
	For low carbon steel	JIS	567
LC-S-PT		DIN	
		ANSI	
	For low carbon steel	JIS	568
SU-PT		DIN	
		ANSI	
	For stainless steel	JIS	569
SU-S-PT		DIN	
		ANSI	
	For stainless steel, short type (lg)	JIS	570
FC-PT		DIN	
		ANSI	
	For cast iron	JIS	571
FC-S-PT		DIN	
		ANSI	
	For cast iron, short type (lg)	JIS	572
CT-PT		DIN	
		ANSI	
	For cast iron and brass, carbide	JIS	573
CT-S-PT		DIN	
		ANSI	
	For cast iron and brass, carbide	JIS	574

Taps for NPT, NPTF, NPS, NPSF

SP NPT		DIN	
		ANSI	
		JIS	594
General purpose			
LS-SP-S-NPT		DIN	
		ANSI	
		JIS	595
General purpose, long shank, short type (lg)			
ZELX SS NPT		DIN	
		ANSI	302
		JIS	
For stainless steel			
INT-NPT		DIN	
		ANSI	
		JIS	596
For stainless steel			
INT-S-NPT		DIN	
		ANSI	
		JIS	597
For stainless steel, short type (lg)			
NPT		DIN	
		ANSI	
		JIS	591
General purpose			
S-NPT		DIN	
		ANSI	
		JIS	592
General purpose, short type (lg)			
LS-NPT		DIN	
		ANSI	
		JIS	593
General purpose, long shank			
NPT		DIN	
		ANSI	305
		JIS	
General purpose			
ZELX MOLD NPT		DIN	
		ANSI	304
		JIS	
For hard steel <45HRC			
INT-NPT		DIN	
		ANSI	306
		JIS	
For stainless steel			
NPT-CI		DIN	
		ANSI	307
		JIS	
For cast iron			
NPTF		DIN	
		ANSI	
		JIS	598
General purpose			
LS-NPTF		DIN	
		ANSI	
		JIS	599
General purpose, long shank			
NPTF		DIN	
		ANSI	308
		JIS	
General purpose			
ZELX SS NPTF		DIN	
		ANSI	303
		JIS	
For stainless steel			
NPTF-CI		DIN	
		ANSI	309
		JIS	
For cast iron			

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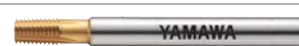
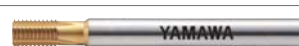
NPS		DIN	
		ANSI	
	General purpose	JIS	600
NPS		DIN	
		ANSI	310
	General purpose	JIS	
NPSF		DIN	
		ANSI	
	General purpose	JIS	601
NPSF		DIN	
		ANSI	311
	General purpose	JIS	

Taps EG (STI) for helical coil



SP STI		DIN	
		ANSI	209
	General purpose	JIS	
SP OX STI		DIN	
		ANSI	211
	General purpose	JIS	
AL-SP		DIN	
		ANSI	
	General purpose	JIS	367
ZELX NI SP STI		DIN	
		ANSI	218
	For Nickel base alloy	JIS	
PO STI		DIN	
		ANSI	242
	General purpose	JIS	
PO OX STI		DIN	
		ANSI	244
	General purpose	JIS	
ZELX NI PO STI		DIN	
		ANSI	249
	For Nickel base alloy	JIS	
HT STI		DIN	
		ANSI	267
	General purpose	JIS	
HT OX STI		DIN	
		ANSI	269
	General purpose	JIS	
AL-HT		DIN	
		ANSI	
	General purpose	JIS	467
N-RS		DIN	
		ANSI	
	For non-ferrous material	JIS	507

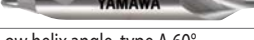
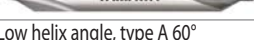
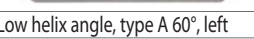
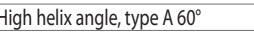
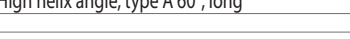
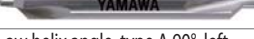
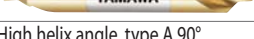
Thread mills

MC-CSLC		DIN	
		ANSI	
	Metric, carbide	JIS	604
MC-CSLC		DIN	
		ANSI	
	Taper Pipe, carbide	JIS	605
MC-CSLC		DIN	
		ANSI	
	Cylindrical Pipe, carbide	JIS	606
MC-HLC		DIN	
		ANSI	
	Metric, HSS-Co	JIS	607
MC-HLC		DIN	
		ANSI	
	Taper Pipe, HSS-Co	JIS	608
MC-HLC		DIN	
		ANSI	
	Cylindrical Pipe, HSS-Co	JIS	609

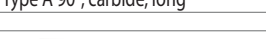
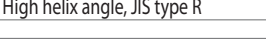
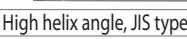
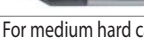
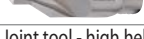
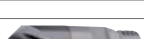
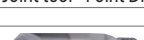
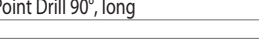
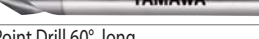
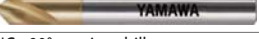
(page numbers refer to the 2016-17 Yamawa General Catalogue)

Dies				
D PO		Spiral pointed	DIN	178
			ANSI	314
			JIS	
D			DIN	
			ANSI	
			JIS	612
D LH		Left hand thread	DIN	
			ANSI	
			JIS	621
D PF		G thread	DIN	
			ANSI	
			JIS	624
D PF LH		G thread, left hand	DIN	
			ANSI	
			JIS	625
D NPSM			DIN	
			ANSI	
			JIS	626
D PT		Rc (BSPT)	DIN	
			ANSI	
			JIS	627
D PT LH		Rc (BSPT), left hand thread	DIN	
			ANSI	
			JIS	628
D NPT			DIN	
			ANSI	
			JIS	629
D NPTF			DIN	
			ANSI	
			JIS	630
MS-RS-D/ RS-D		Rolling die and miniature rolling die	DIN	
			ANSI	
			JIS	631
N-RSD		New rolling die	DIN	
			ANSI	
			JIS	633
RD-DH		Die holder	DIN	
			ANSI	
			JIS	634
RD-DC		Collet for die holder	DIN	
			ANSI	
			JIS	635
RD-DA		Die holder	DIN	
			ANSI	315
			JIS	636

Centering tools

CD-A		DIN	184
		ANSI	
		JIS	
CD-R		DIN	185
		ANSI	
		JIS	
CESA		DIN	
		ANSI	
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		ANSI	
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		JIS	645
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		ANSI	
		JIS	647
CE-SL V		DIN	
		ANSI	
		JIS	648
CD-SL V		DIN	
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		JIS	649
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		JIS	650
CEQA		DIN	
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		ANSI	
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		ANSI	
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	Joint tool, type A 60°, carbide	JIS	673
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	Joint tool - NC starting drill	JIS	677
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PE-QL V		DIN ANSI	
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CS-QM		DIN ANSI	
	60°-90° countersink	JIS	693
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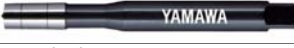
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