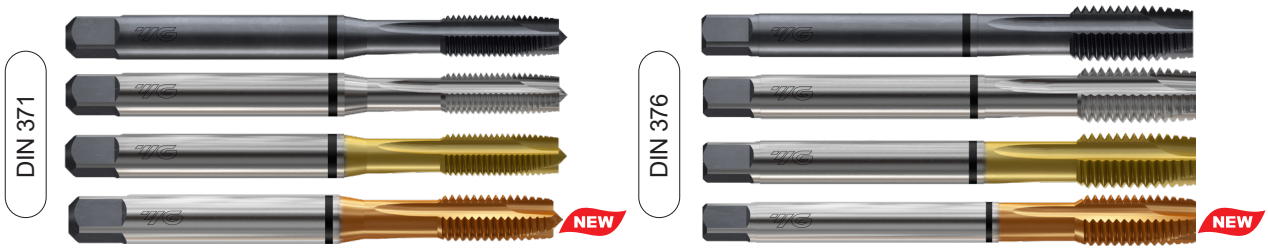
M

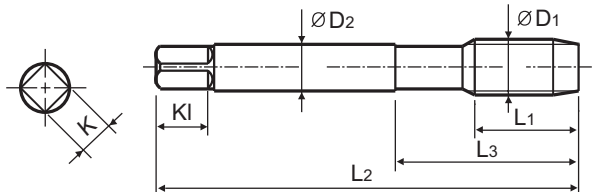
HSS-E SPIRAL POINT TAPS for MULTI-PURPOSE
ISO Metric Coarse Threads - DIN 13

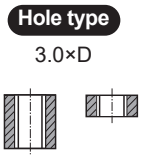
SERIES

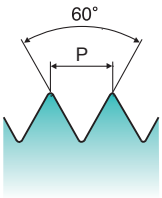
Vap	TB814	TiN	TD814
Bright	TC814	FSH	TC814-U

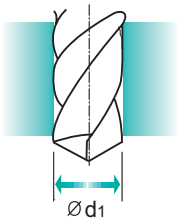
▶ For using multi-purpose and correct thread profiles & long tool life due to special tap geometry.











Material groups **MU** | HSS-E | DIN 371/376 | 6H | 60° | B | Vap Bright TiN | FSH Coating

p.7-8

Machine Taps

Unit : mm

SIZE	Pitch	EDP No.			NEW AOS TAP	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	No. of Flute	Tapping Drill Diameter
ØD1	P	Vap	Bright	TiN	FSH	L1	L2	L3	ØD2	K	Kl	Z	Ød1
M2 ×	0.4	TB814136	TC814136	TD814136	TC814136U	8	45	13	2.8	2.1	5	3	1.6
M2.2 ×	0.45	TB814156	TC814156	TD814156	-	8	45	13	2.8	2.1	5	3	1.75
M2.3 ×	0.4	TB814196	TC814196	TD814196	-	8	45	13	2.8	2.1	5	3	1.9
M2.5 ×	0.45	TB814176	TC814176	TD814176	-	9	50	15	2.8	2.1	5	3	2.05
M2.6 ×	0.45	TB814496	TC814496	TD814496	-	9	50	15	2.8	2.1	5	3	2.15
M3 ×	0.5	TB814206	TC814206	TD814206	TC814206U	11	56	18	3.5	2.7	6	3	2.5
M3.5 ×	0.6	TB814226	TC814226	TD814226	-	12	56	20	4	3	6	3	2.9
M4 ×	0.7	TB814246	TC814246	TD814246	TC814246U	13	63	21	4.5	3.4	6	3	3.3
M4.5 ×	0.75	TB814266	TC814266	TD814266	-	14	70	25	6	4.9	8	3	3.8
M5 ×	0.8	TB814286	TC814286	TD814286	TC814286U	15	70	25	6	4.9	8	3	4.2
M6 ×	1.0	TB814316	TC814316	TD814316	TC814316U	17	80	30	6	4.9	8	3	5.0
M7 ×	1.0	TB814346	TC814346	TD814346	-	17	80	30	7	5.5	8	3	6.0
M8 ×	1.25	TB814366	TC814366	TD814366	TC814366U	20	90	35	8	6.2	9	3	6.8
M9 ×	1.25	TB814396	TC814396	TD814396	-	20	90	35	9	7	10	3	7.8
M10 ×	1.5	TB814426	TC814426	TD814426	TC814426U	22	100	39	10	8	11	3	8.5
M11 ×	1.5	TB814466	TC814466	TD814466	-	22	100	40	8	6.2	9	3	9.5
M12 ×	1.75	TB814506	TC814506	TD814506	TC814506U	24	110	44	9	7	10	3	10.3
M14 ×	2.0	TB814546	TC814546	TD814546	TC814546U	26	110	44	11	9	12	3	12.0
M16 ×	2.0	TB814606	TC814606	TD814606	TC814606U	27	110	44	12	9	12	3	14.0
M18 ×	2.5	TB814656	TC814656	TD814656	TC814656U	30	125	50	14	11	14	4	15.5
M20 ×	2.5	TB814706	TC814706	TD814706	TC814706U	32	140	54	16	12	15	4	17.5
M22 ×	2.5	TB814746	TC814746	TD814746	TC814746U	32	140	54	18	14.5	17	4	19.5

▶ DIN 371(M2~M10) and DIN 376(M11~M52)

▶ NEXT PAGE

* The other coating(TiCN or TiAlN) is available on your request.

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommended	○	◎	◎	◎	◎	◎	◎	◎	◎	○		◎	◎	◎	◎	◎	◎	◎		

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommended			◎			◎	◎	◎													

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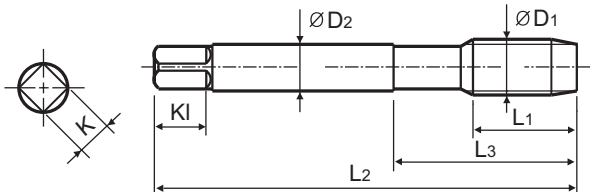
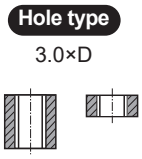
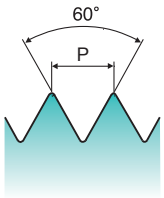
M HSS-E SPIRAL POINT TAPS for MULTI-PURPOSE
ISO Metric Coarse Threads - DIN 13

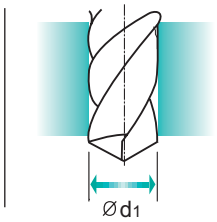
Vap	TB814	TiN	TD814
Bright	TC814	FSH	TC814-U

▶ For using multi-purpose and correct thread profiles & long tool life due to special tap geometry.









Material groups **MU** | HSS-E | DIN 371/376 | 6H | 60° | B | Vap Bright TiN | FSH Coating p.7-8

Machine Taps

Unit : mm

SIZE	Pitch	EDP No.			NEW AOS TAP	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	No. of Flute	Tapping Drill Diameter
ØD1	P	Vap	Bright	TiN	FSH	L1	L2	L3	ØD2	K	Kl	Z	Ød1
M24 ×	3.0	TB814786	TC814786	TD814786	TC814786U	34	160	60	18	14.5	17	4	21.0
M27 ×	3.0	TB814866	TC814866	TD814866	TC814866U	36	160	60	20	16	19	4	24.0
M30 ×	3.5	TB814946	TC81 4946	TD814946	TC814946U	40	180	70	22	18	21	4	26.5
M33 x	3.5	-	TC814A46	TD814A46	-	40	180	70	25	20	23	4	29.5
M36 x	4.0	-	TC814B36	TD814B36	-	50	200	80	28	22	25	4	32.0
M39 x	4.0	-	TC814C06	TD814C06	-	50	200	80	32	24	27	4	35.0
M42 x	4.5	-	TC814C86	TD814C86	-	56	200	85	32	24	27	4	37.5
M45 x	4.5	-	TC814D56	TD814D56	-	58	220	85	36	29	32	4	40.5
M48 x	5.0	-	TC814E26	TD814E26	-	65	250	90	36	29	32	4	43.0
M52 x	5.0	-	TC814F36	TD814F36	-	65	250	90	40	32	35	4	47.0

▶ DIN 371(M2~M10) and DIN 376(M11~M52)
* The other coating(TiCN or TiAlN) is available on your request.

◎ : Excellent ○ : Good

ISO	P											M			K					
Material Description	Non-alloy steel					Low alloy steel				High alloyed steel, and tool steel		Stainless steel			Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc		13	25	28	32	10	29	32	38	15	35	15	23	10	10	26	3	25		21
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	180	260	160	250	130	230
Recommended	○	◎	◎	◎	◎	◎	◎	◎	◎	○		◎	◎	◎	◎	◎	◎	◎		

ISO	N										S							H			
Material Description	Aluminum-wrought alloy		Aluminum-cast, alloyed			Copper and Copper Alloys (Bronze / Brass)			Non Metallic Materials		Heat Resistant Super Alloys					Titanium Alloys		Hardened steel		Chilled Cast Iron	Hardened Cast Iron
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34			55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400 Rm	1050 Rm	550	630	400	550
Recommended			◎			◎	◎	◎													

COMBO TAPS

RECOMMENDED CUTTING CONDITIONS
EMPFOHLENE SCHNEIDKONDITIONEN

ISO	VDI 3323	Material Description	HB	HRc	TB744 TB754 TQ744 TQ754	TC814 TC854 TC834 TC874	TD814 TD854 TD834 TD874	TB814 TB854 TB834 TB874	TCJ05 TCJ09 TCJ01 TCJ02	TDJ05 TDJ09 TDJ01 TDJ02	TBJ05	TCJ06
					Vc (m/min)							
P	1	Non-alloy steel	125			15-20	20-25	15-20	15-20	20-25	15-20	15-20
	2		190	13	15-20	15-20	20-25	15-20	15-20	20-25	15-20	15-20
	3		250	25		12-18	18-24	12-18	12-18	18-24	12-18	12-18
	4		270	28	10-15	10-15	15-20	10-15	10-15	15-20	10-15	10-15
	5		300	32		6-10	10-14	6-10	6-10	10-14	6-10	6-10
	6	Low alloy steel	180	10	10-15	10-15	15-20	10-15	10-15	15-20	10-15	10-15
	7		275	29	10-15	10-15	15-20	10-15	10-15	15-20	10-15	10-15
	8		300	32		6-10	10-14	6-10	6-10	10-14	6-10	6-10
	9		350	38		3-5	5-7	3-5	3-5	5-7	3-5	3-5
	10	High alloyed steel, and tool steel	200	15		3-5	5-7	3-5	3-5	5-7	3-5	3-5
	11		325	35								
M	12	Stainless steel	200	15	7-10	7-10	10-15	7-10	7-10	10-15	7-10	7-10
	13		240	23	5-8	5-8	8-11	5-8	5-8	8-11	5-8	5-8
	14		180	10	4-6	4-6	6-8	4-6	4-6	6-8	4-6	4-6
K	15	Grey cast iron	180	10		10-15	15-20	10-15	10-15	15-20	10-15	10-15
	16		260	26		5-8	8-11	5-8	5-8	8-11	5-8	5-8
	17	Nodular cast iron	160	3		10-15	15-20	10-15	10-15	15-20	10-15	10-15
	18		250	25		5-8	8-11	5-8	5-8	8-11	5-8	5-8
	19	Malleable cast iron	130									
	20		230	21								
N	21	Aluminum-wrought alloy	60									
	22		100									
	23	Aluminum-cast, alloyed	75			15-20	20-25	15-20	15-20	20-25	15-20	15-20
	24		90									
	25		130									
	26	Copper and Copper Alloys (Bronze / Brass)	110			25-35	35-40	25-35	25-35	35-40	25-35	25-35
	27		90			8-12	12-17	8-12	8-12	12-17	8-12	8-12
	28		100		15-20	15-20	20-25	15-20	15-20	20-25	15-20	15-20
	29	Non Metallic Materials										
	30											
S	31	Heat Resistant Super Alloys	200	15								
	32		280	30								
	33		250	25								
	34		350	38								
	35		320	34								
	36	Titanium Alloys	400 Rm									
	37		1050 Rm									
H	38	Hardened steel	550	55								
	39		630	60								
	40	Chilled Cast Iron	400	42								
	41	Hardened Cast Iron	550	55								

SURFACE TREATMENT AND COATING

The applied High Speed Steels holds a grant of good wear resistance and toughness. Therefore YG-1 normally delivers taps with bright and unfinished surface. For certain materials, various surface treatments provide higher advantage in machining.

STEAM TEMPERED - Vap

Steam Tempered is a Fe3O4-oxyd-coating which reduces friction between the tool and workpiece, also preventing cold welding.

NITRIDING - NI

Recommend surface treatment for machining materials that affect wear abrasion, such as grey cast iron, alu-alloys with high Si-percentages (more than 10%).

Below are the various surface treatments for excellent finish surfaces suitable for many applications. The surface treatments are produced and developed within the company.

TiN-COATING

TiN-coating yields a hardness of approx. 2,300 HV and also a heat resistant up to approx. 600°C. The current coating is an excellent all-round coating for normal applications.
Colour : Golden Coefficient of friction against steel : 0.4

TiCN-COATING

TiCN takes place of TiN when the conditions require the coating to have a different hardness and toughness.
The TiCN brings advantages for machining very difficult steels or cutting interrupted bores.
The TiCN-coating has a hardness of approx. 3,000 HV, but is heat resistance only holds up to approx. 400°C, meaning that the TiCN needs an excellent cooling system for a long service life.
Colour : Blue-Grey Coefficient of friction against steel : 0.4

TiAIN-COATING

A special coating for machining abrasive materials such as grey cast iron, alu-alloys with silicon, fiber reinforced plastics, etc., or machining at high temperatures with insufficient cooling, or at high speeds ≥ 600m/min. TiAIN has a hardness of approx. 3,000 HV and is heat resistant up to approx. 800°C.
Colour : Violet-Grey Coefficient of friction against steel : 0.4

Hardslick-COATING

Hardslick combines the advantages of an extremely hard, thermally stable TiAIN-coating with the sliding and lubricating properties of an outer WC/C(Tungsten carbide/carbon)-coating in a novel way. The Hardslick coating has a hardness of approx. 3,000 HV and is temperature-resistant up to approx. 800°C.
Colour : Violet-Grey Coefficient of friction against steel : 0.2

HOLE TYPE			Max. 3.0xD Through Hole									
TOOL MATERIAL			HSS-E									
CHAMFER LEAD ACC. TO DIN2197			B									
FLUTE TYPE			Spiral Point									
SPIRAL FLUTE ANGLE			-									
CLASS OF THREAD			6H	2B	6H	2B	4H	6G	3B	4H	6G	3B	4H
SERIES	M	DIN371/376	TD814 (p.28~29)		TB814 (p.28~29)		TCJ05 (p.30)			TDJ05 (p.30)			TBJ05 (p.30)
		DIN352											
		DIN357/LONG											
	MF	DIN374	TD854 (p.34~36)		TB854 (p.34~36)			TCJ09 (p.37~38)			TDJ09 (p.37~38)		
		DIN2181											
	UNC	DIN371/376		TD834 (p.41)		TB834 (p.41)			TCJ01 (p.42)			TDJ01 (p.42)	
		DIN351											
	UNF	DIN371/374		TD874 (p.43)		TB874 (p.43)			TCJ02 (p.44)			TDJ02 (p.44)	
SURFACE TREATMENT			TiN	TiN	VAP	VAP	Bright	Bright	Bright	TiN	TiN	TiN	VAP
MODEL													
ISO	VDI 3323	Material Description											
P	1	Non-alloy steel	○ (20-25)	○ (20-25)	○ (15-20)	○ (15-20)	○ (15-20)	○ (15-20)	○ (15-20)	○ (20-25)	○ (20-25)	○ (20-25)	○ (15-20)
	2		◎ (20-25)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (20-25)	◎ (20-25)	◎ (15-20)
	3		◎ (18-24)	◎ (18-24)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (18-24)	◎ (18-24)	◎ (18-24)	◎ (12-18)
	4		◎ (15-20)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (10-15)
	5		◎ (10-14)	◎ (10-14)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (10-14)	◎ (10-14)	◎ (10-14)	◎ (6-10)
	6	Low alloy steel	◎ (15-20)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (10-15)
	7		◎ (15-20)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (10-15)
	8		◎ (10-14)	◎ (10-14)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (10-14)	◎ (10-14)	◎ (10-14)	◎ (6-10)
	9		◎ (5-7)	◎ (5-7)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (5-7)	◎ (5-7)	◎ (5-7)	◎ (3-5)
	10	High alloyed steel, and tool steel	○ (5-7)	○ (5-7)	○ (3-5)	○ (3-5)	○ (3-5)	○ (3-5)	○ (3-5)	○ (5-7)	○ (5-7)	○ (5-7)	○ (3-5)
	11												
M	12	Stainless steel	◎ (10-15)	◎ (10-15)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (7-10)
	13		◎ (8-11)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (8-11)	◎ (8-11)	◎ (5-8)
	14		◎ (6-8)	◎ (6-8)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (6-8)	◎ (6-8)	◎ (6-8)	◎ (4-6)
K	15	Grey cast iron	◎ (15-20)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (10-15)
	16		◎ (8-11)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (8-11)	◎ (8-11)	◎ (5-8)
	17	Nodular cast iron	◎ (15-20)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (10-15)
	18		◎ (8-11)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (8-11)	◎ (8-11)	◎ (5-8)
	19	Malleable cast iron											
	20												
N	21	Aluminum-wrought alloy											
	22												
	23	Aluminum-cast, alloyed	◎ (20-25)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (20-25)	◎ (20-25)	◎ (15-20)
	24												
	25												
	26	Copper and Copper Alloys (Bronze / Brass)	◎ (35-40)	◎ (35-40)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (35-40)	◎ (35-40)	◎ (35-40)	◎ (25-35)
	27		◎ (12-17)	◎ (12-17)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (12-17)	◎ (12-17)	◎ (12-17)	◎ (8-12)
	28		◎ (20-25)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (20-25)	◎ (20-25)	◎ (15-20)
	29	Non Metallic Materials											
	30												
S	31	Heat Resistant Super Alloys											
	32												
	33												
	34												
	35												
	36	Titanium Alloys											
	37												
H	38	Hardened steel											
	39												
	40	Chilled Cast Iron											
	41	Hardened Cast Iron											

Max. 2.5xD Blind Hole										Max. 3.0xD Through Hole			
HSS-E									HSS-E	HSS-E			
C									E	B			
Spiral Flute									Spiral Flute	Spiral Point			
R40									R40	-			
6H+0.1	6G	6G	6G	7G	7G	7G	6H	6H	6H	6H	2B	6H	
TBE06 (p.13)	TCE07 (p.14)	TDE07 (p.14)	TBE07 (p.14)	TCE08 (p.15)	TDE08 (p.15)	TBE08 (p.15)	TC804-IC (p.21)		TC807 (p.22)	TC814 (p.28~29)		TC814-U (p.28~29)	M
								TC633 (p.23)					
										TC854 (p.34~36)		TC854-U (p.34~36)	MF
											TC834 (p.41)		UNC
											TC874 (p.43)		UNF
VAP	Bright	TiN	VAP	Bright	TiN	VAP	Bright	Bright	Bright	Bright	Bright	FSH	
												NEW	
○ (15-20)	○ (15-20)	○ (20-25)	○ (15-20)	○ (15-20)	○ (20-25)	○ (15-20)	○ (15-20)	○ (15-20)	○ (15-20)	○ (15-20)	○ (15-20)	○ (20-25)	1 P
◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (20-25)	2
◎ (12-18)	◎ (12-18)	◎ (18-24)	◎ (12-18)	◎ (12-18)	◎ (18-24)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (12-18)	◎ (18-24)	3
◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	4
◎ (6-10)	◎ (6-10)	◎ (10-14)	◎ (6-10)	◎ (6-10)	◎ (10-14)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (10-14)	5
◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	6
◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	7
◎ (6-10)	◎ (6-10)	◎ (10-14)	◎ (6-10)	◎ (6-10)	◎ (10-14)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (6-10)	◎ (10-14)	8
◎ (3-5)	◎ (3-5)	◎ (5-7)	◎ (3-5)	◎ (3-5)	◎ (5-7)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (3-5)	◎ (5-7)	9
○ (3-5)	○ (3-5)	○ (5-7)	○ (3-5)	○ (3-5)	○ (5-7)	○ (3-5)	○ (3-5)	○ (3-5)	○ (3-5)	○ (3-5)	○ (3-5)	○ (5-7)	10
													11
◎ (7-10)	◎ (7-10)	◎ (10-15)	◎ (7-10)	◎ (7-10)	◎ (10-15)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (7-10)	◎ (10-15)	12 M
◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (8-11)	13
◎ (4-6)	◎ (4-6)	◎ (6-8)	◎ (4-6)	◎ (4-6)	◎ (6-8)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (4-6)	◎ (6-8)	14
◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	15 K
◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (8-11)	16
◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (15-20)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (10-15)	◎ (15-20)	17
◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (8-11)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (5-8)	◎ (8-11)	18
													19
													20
													21 N
													22
◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (20-25)	23
													24
													25
◎ (25-35)	◎ (25-35)	◎ (35-40)	◎ (25-35)	◎ (25-35)	◎ (35-40)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (25-35)	◎ (35-40)	26
◎ (8-12)	◎ (8-12)	◎ (12-17)	◎ (8-12)	◎ (8-12)	◎ (12-17)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (8-12)	◎ (12-17)	27
◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (20-25)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (15-20)	◎ (20-25)	28
													29
													30
													31 S
													32
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													38 H
													39
													40
													41