



**Innovation Is
Our Tool**

SWISS  QUALITY

URMA Reaming Technology Guide

Ø 7.600 – 13.600 mm

Ø 11.900 – 140.600 mm

Ø 5.800 – 33.100 mm

Sisällysluettelo

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URMA Reaming
RX small

Tilauseimerkkejä

Order Example

Reiän halkaisija Bore Diameter		Teräpalan halkaisija Insert Diameter	
ISO Toleranssi ISO Bore Tolerances	Reiän toleranssi µm Bore Tolerance in µm	Haluttu halkaisija Target Size (Q-Insert)	
Example	Tilauseimerkkejä Order Example RXsG8 H7 -A01 U2 F0512R1	Tilauseimerkkejä Order Example RXsG8 +20-10 -A01 U1 F0514R1	Example
RXs RX small tuotemerkintä RX small system designation	RXs RX small tuotemerkintä RX small system designation	RXs RX small tuotemerkintä RX small system designation	
G Hammasmuoto (G = Suora; L = nousullinen) Flute form (G = straight; L = left-hand helix)	G Hammasmuoto (G = Suora; L = Nousullinen) Flute form (G = straight; L = left-hand helix)	G Hammasmuoto (G = Suora; L = Nousullinen) Flute form (G = straight; L = left-hand helix)	
8 Halkaisija (mm) Diameter (mm)	8 Halkaisija (mm) Diameter (mm)	8.020 Teräpalan halkaisija (mm) Insert diameter (mm)	Diameter
H7 Toleranssi ISO vakio Tolerance in ISO standard	+20-10 Valmistustoleranssi µm Bore tolerance (µm)	Q Teräpalan koodi Code for target size insert	
		+3-3 Valmistustoleranssi (µm) Manufacturing tolerance (µm)	
A01 Leikkuugeometria Cutting geometry	A01 Leikkuugeometria Cutting geometry	A01 Leikkuugeometria Cutting geometry	
Option	Option	Option	Option
U2 Nano viimeistely Tarkemmin sivulla 9 Edge preparation For details see page 9	U1 Nano viimeistely Tarkemmin sivulla 9 Edge preparation For details see page 9	U2 Nano viimeistely Tarkemmin sivulla 9 Edge preparation For details see page 9	
F05 Materiaali Tarkemmin sivulla 11 Cutting material For details see page 11	F05 Materiaali Tarkemmin sivulla 11 Cutting material For details see page 11	F05 Materiaali Tarkemmin sivulla 11 Cutting material For details see page 11	
12R Pinnoite Tarkemmin sivulla 11 Coating For details see page 11	14R Pinnoite Tarkemmin sivulla 11 Coating For details see page 11	12R Pinnoite Tarkemmin sivulla 11 Coating For details see page 11	
1 1 = ohut pinnoite 2 = paksu pinnoite 1 = thin coating 2 = thick coating	1 1 = ohut pinnoite 2 = paksu pinnoite 1 = thin coating 2 = thick coating	1 1 = ohut pinnoite 2 = paksu pinnoite 1 = thin coating 2 = thick coating	

Tilaus esimerkki

Details Order Example

Poraustoleranssit ja soveltuva pinnoitteen paksuus

Bore Tolerances and Applicable Coating Thickness

Bore Diameter	Toleranssin vaihteluväli Bore Tolerance Range	Pinnoittamaton Uncoated	Pinnoitteen paksuus Coating Thickness		Lisähinta tarkkuus toleranssista Surcharge for Tight Tolerances
			1	2	
≥ 14 µm		x	x	x	-
10 – 13 µm		x	x		-
				x	x
6 – 9 µm		x			-
			x	-	x

Esimerkki: Reiän halkaisija 20H7 = toleranssin vaihteluväli 21 µm =

Example: Bore diameter 20H7 = tolerance range 21 µm =

≥ 14 µm

Reiän halkaisija 12 ± 0.005 = toleranssin vaihteluväli 11 µm =Bore diameter 12 ± 0.005 = tolerance range 11 µm =

10 – 13 µm

Haluttu halkaisija (Q teräpala) ja soveltuva pinnoitteen paksuus

Target Size (Q-Inserts) and Applicable Coating Thickness

Insert Diameter	Teräpalan toleranssi Insert Tolerance	Pinnoittamaton Uncoated	Pinnoitteen paksuus Coating Thickness		Lisähinta tarkkuus toleranssista Surcharge for Tight Tolerances
			1	2	
± 4 µm		N/A	N/A	x	-
± 3 µm		N/A	x		-
				x	x
± 2 µm		x			-
			x	N/A	x
± 1 µm		x	N/A	N/A	x

N/A = Ei saatavilla

N/A = Not applicable

Hoonaus (nano viimeistely)

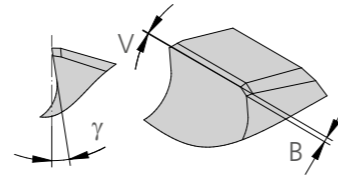
Edge preparation (Nano Finishing)

U1 **Kevyt hoonaus**
Light edge-preparation

U2 **Medium hoonaus**
Medium edge-preparation

U_ **Muita viimeistelyjä pyydetessä**
Other edge-preparations on request

Leikkuugeometriat
Cutting Geometries



vf	Geo	RXG	RXL	Bore type	fz mm	Ra μm	Zyl.	Pos	FC	MD
→	A0	▲		▲ (K1-K8)*	REFERENCE VALUE					
	B0	□	▲	▲	↗	☹	☹	☹	↗	↗
↘	C0	▲		▲ (K1-K8)*	↗	☹	☹	☹	↗	↗
	C1	▲	▲	▲ (K1-K8)*	↗	☹	☹	☹	↗	↗
↘	D0	□	▲	▲	↗	☹	☹	☹	↗	↗
	G0	▲		▲ (K1-K8)*	↘	☹	☹	☹	↘	↘
↘	G1	▲		▲ (K1-K8)*	↘	=	☹	☹	↘	↘
	G1	□		▲	↘	=	☹	☹	↘	↘

Geo	γ	B	V	W	ap mm	Ra μm	Zyl.	FC	MD
STANDARD GEOMETRY (REFERENCE VALUE)									
_1	=	=	↘	=	=	=	=	↗	↗
_2	=	↘	=	=	=	=	=	=	↘
_3	=	=	=	↘	=	☹	=	↘	↘
_4	=	=	=	=	=	=	=	↘	↘
_5	=	=	=	↘	=	=	=	↘	↘
_6	=	=	↘	=	=	=	=	↘	↘
_7	↗	=	↘	=	=	=	=	↘	↘
_8	=	↘	=	=	↘	=	=	=	↘

Erikois geometriat tilauksesta
Special geometries on request

* **Materiaaliryhmät sivulla 88**
* See page 88 for material group

Määritelmät ja laskukaavat sivulla 86
See page 86 for definitions and basic formulas

- | | | | |
|---------------------|---------------------|-----------------------|------------------|
| B = Viisteen pituus | ▲ = Suositeltava | B = Chamfer length | ▲ = Recommended |
| V = Kartio | ■ = Käyttökelpoinen | V = Back taper | ■ = Applicable |
| W = Leveys | □ = Mahdollinen | W = Margin width | □ = Possible |
| FC = Leikkuvoima | ↗ = Suurempi arvo | FC = Cutting force | ↗ = Higher value |
| MD = Vääntömomentti | ↘ = Pienempi arvo | MD = Torque | ↘ = Lower value |
| γ = Teräkulma | ☹ = Parempi | γ = Radial rake angle | ☹ = Improved |
| vf = Syötön suunta | ☹ = Huonompi | vf = Feed direction | ☹ = Worse |

Työstömateriaalit
Cutting Materials overview

ISO Material Code	URMA Material Code	Materiaali Cutting Materials				Pinnoite Coating												
		URMA Code	F05	E10	00	01P_	05P_	07R_	08P_	12R_	14R_	17B_	18B_	10C	20C	21C		
		HM/ Carbide ISO HW-K05	HM/ Carbide ISO HW-K35	Uncoated	TiN	AlTiN	TiAlN + AlCrN	AlCrN	AlCrN	AlCrN	AlCrN	TiSiN	DLC	DLC	DLC			
Työstettävä materiaali Workpiece Material	P	P1	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		P2	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		P3	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		P4	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		P5	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		P6	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		P7	▲	■	□	1	2	1	1	2	1	1	2	1	1			
	M	M1	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		M2	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		M3	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		M4	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		M5	▲	■	□	1	2	1	1	2	1	1	2	1	1			
		M6	▲	■	□	1	2	1	1	2	1	1	2	1	1			
	K	K1	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K2	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K3	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K4	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K5	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K6	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K7	▲	□	□	1	2	1	1	2	1	1	2	1	1			
		K8	▲	□	□	1	2	1	1	2	1	1	2	1	1			
	N	N1	▲	■	□											▲		
		N2	▲	■	□											▲	□	■
		N3	▲	■	□											▲	▲	■
		N4	▲	■	□											▲	▲	■
		N5	▲	■	□											■	▲	■
		N6	▲	■	□											▲	▲	■
	S	S1	▲	■	□	1	2	1	1	2	1	1	2	1	1			
S2		▲	■	□	1	2	1	1	2	1	1	2	1	1				
S3		▲	■	□	1	2	1	1	2	1	1	2	1	1				
S4		▲	■	□	1	2	1	1	2	1	1	2	1	1				
S11		▲	■	□	1	2	1	1	2	1	1	2	1	1				
S12		▲	■	□	1	2	1	1	2	1	1	2	1	1				
S13		▲	■	□	1	2	1	1	2	1	1	2	1	1				
S14		▲	■	□	1	2	1	1	2	1	1	2	1	1				
H	H1	▲	■	□														
	H2	▲	■	□														
	H3	▲	■	□														
SM	SM1	▲	■	□														
	SM2	▲	■	□														
	SM3	▲	■	□														
O	O1	▲	■	□														
	O2	▲	■	□														
	O3	▲	■	□														
	O4	▲	■	□														

- | | |
|---------------------|-----------------|
| ▲ = Suositeltava | ▲ = Recommended |
| ■ = Käyttökelpoinen | ■ = Applicable |
| □ = Mahdollinen | □ = Possible |
| ○ = Kysyttäessä | ○ = On request |

MATERIAL DETAILS PAGE 88

Lastuamisarvot RX small

Cutting Data RX small

Läpireikä
Through Bore

Radial / Stock Removal

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz		ap	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	Ø 7.600-9.600 mm	Ø 9.601-13.100 mm
P	P1	1	RXsL	B01	F0512R1	120-160-200	0.12-0.16-0.20	0.12-0.18-0.25	0.050-0.075	0.05-0.075-0.10
		2	RXsL	B01	F0512R1	120-150-180	0.12-0.16-0.20	0.12-0.16-0.22		
		3	RXsL	B01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20		
	P2	1	RXsL	B01	F0512R1	120-160-200	0.12-0.16-0.20	0.12-0.18-0.25	0.050-0.075	0.05-0.075-0.10
		2	RXsL	B01	F0512R1	120-150-180	0.12-0.16-0.20	0.12-0.16-0.22		
		3	RXsL	B01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20		
	P3	1	RXsL	B01	F0512R1	120-160-180	0.12-0.16-0.20	0.12-0.18-0.25	0.050-0.075	0.05-0.075-0.10
		2	RXsL	B01	F0512R1	120-150-160	0.12-0.16-0.20	0.12-0.16-0.22		
		3	RXsL	B01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20		
	P4	1	RXsL	B01	F0512R1	120-150-180	0.12-0.16-0.20	0.12-0.16-0.20	0.050-0.075	0.05-0.075-0.10
		2	RXsL	B01	F0512R1	120-140-160	0.12-0.16-0.20	0.12-0.16-0.20		
		3	RXsL	B01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20		
	P5	1	RXsL	A07	F0512R1	100-130-160	0.10-0.14-0.18	0.10-0.14-0.18	0.050-0.075	0.050-0.075
		2	RXsL	A07	F0512R1	100-125-150	0.10-0.12-0.15	0.10-0.12-0.15		
		3	RXsL	A07	F0512R1	80-100-120	0.10-0.12-0.15	0.10-0.12-0.15		
	P6	1	RXsL	A07	F0512R1	50-80-100	0.06-0.08-0.12	0.06-0.08-0.12	0.050-0.075	0.050-0.075
		2	RXsL	A07	F0512R1	40-70-90	0.06-0.08-0.12	0.06-0.08-0.12		
		3	RXsL	A07	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12		
	P7	1	RXsL	A06	F0512R1	15-25-40	0.04-0.06-0.10	0.04-0.06-0.10	0.050-0.075	0.050-0.075
		2	RXsL	A06	F0512R1	15-20-30	0.04-0.06-0.10	0.04-0.06-0.10		
		3	RXsL	A06	F0512R1	15-20-30	0.04-0.06-0.10	0.04-0.06-0.10		

M	M1	1	RXsL	A07	F0512R1	50-80-100	0.10-0.14-0.16	0.10-0.14-0.16	0.050-0.075	0.05-0.075-0.10
		2	RXsL	A07	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.14		
		3	RXsL	A07	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12		
	M2	1	RXsL	A07	F0512R1	50-80-100	0.10-0.14-0.16	0.10-0.14-0.16	0.050-0.075	0.05-0.075-0.10
		2	RXsL	A07	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.14		
		3	RXsL	A07	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12		
	M3	1	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.10-0.14-0.16	0.050-0.075	0.050-0.075
		2	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14		
		3	RXsL	A07	F0512R1	25-40-70	0.08-0.10-0.14	0.08-0.10-0.14		
	M4	1	RXsL	A07	F0512R1	25-40-60	0.08-0.10-0.14	0.08-0.10-0.14	0.050-0.075	0.050-0.075
		2	RXsL	A07	F0512R1	20-35-55	0.08-0.10-0.14	0.08-0.10-0.14		
		3	RXsL	A07	F0512R1	20-30-50	0.08-0.10-0.14	0.08-0.10-0.14		
	M5	1	RXsL	A07	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.12	0.050-0.075	0.050-0.075
		2	RXsL	A07	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.12		
		3	RXsL	A07	F0512R1	10-18-30	0.05-0.08-0.12	0.05-0.08-0.12		
	M6	1	RXsL	A07	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.12	0.050-0.075	0.050-0.075
		2	RXsL	A07	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.12		
		3	RXsL	A07	F0512R1	10-18-30	0.05-0.08-0.12	0.05-0.08-0.12		

- AC Työskentely olosuhteet**
- 1** Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar
 - 2** Normaali olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
 - 3** Vaikeat olosuhteet
 - Epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 8xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla

- AC Application Conditions**
- 1** Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar
 - 2** Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available
 - 3** Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - Critical chip evacuation
 - Internal coolant supply available

Läpireikä (kevyesti hakkaava)
Through Bore with Interruption

Radial / Stock Removal

AC	Type	Geometry	Grade	Vc	fz Full Cut		fz Interrupted	ap	
					Ø 7.600-9.600 mm	Ø 9.601-13.100 mm		Ø 7.600-9.600 mm	Ø 9.601-13.100 mm
4	RXsL	A01	F0512R1	120-160-200	0.12-0.16-0.20	0.12-0.18-0.25	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.050-0.075	0.05-0.075-0.10
5	RXsL	A01	F0512R1	120-150-180	0.12-0.16-0.20	0.12-0.16-0.22			
6	RXsG	A01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20			
4	RXsL	A01	F0512R1	120-160-200	0.12-0.16-0.20	0.12-0.18-0.25		0.050-0.075	0.05-0.075-0.10
5	RXsL	A01	F0512R1	120-150-180	0.12-0.16-0.20	0.12-0.16-0.22			
6	RXsG	A01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20			
4	RXsL	A01	F0512R1	120-160-180	0.12-0.16-0.20	0.12-0.18-0.25		0.050-0.075	0.05-0.075-0.10
5	RXsL	A01	F0512R1	120-150-160	0.12-0.16-0.20	0.12-0.16-0.22			
6	RXsG	A01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20			
4	RXsL	A01	F0512R1	120-150-180	0.12-0.16-0.20	0.12-0.16-0.20		0.050-0.075	0.05-0.075-0.10
5	RXsG	A01	F0512R1	120-140-160	0.12-0.16-0.20	0.12-0.16-0.20			
6	RXsG	A01	F0512R1	100-120-150	0.12-0.16-0.20	0.12-0.16-0.20			
4	RXsL	A07	F0512R1	100-130-160	0.10-0.14-0.18	0.10-0.14-0.18		0.050-0.075	0.050-0.075
5	RXsG	A07	F0512R1	100-125-150	0.10-0.12-0.15	0.10-0.12-0.15			
6	RXsG	A07	F0512R1	80-100-120	0.10-0.12-0.15	0.10-0.12-0.15			
4	RXsL	A07	F0512R1	50-80-100	0.06-0.08-0.12	0.06-0.08-0.12		0.050-0.075	0.050-0.075
5	RXsG	A07	F0512R1	40-70-90	0.06-0.08-0.12	0.06-0.08-0.12			
6	RXsG	A07	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12			
4	RXsL	A06	F0512R1	15-25-40	0.04-0.06-0.10	0.04-0.06-0.10		0.050-0.075	0.050-0.075
5	RXsG	A06	F0512R1	15-20-30	0.04-0.06-0.10	0.04-0.06-0.10			
6	RXsG	A06	F0512R1	15-20-30	0.04-0.06-0.10	0.04-0.06-0.10			

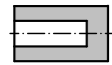
4	RXsL	A07	F0512R1	50-80-100	0.10-0.14-0.16	0.10-0.14-0.16	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.050-0.075	0.05-0.075-0.10
5	RXsL	A07	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.14			
6	RXsG	A06	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12			
4	RXsL	A07	F0512R1	50-80-100	0.10-0.14-0.16	0.10-0.14-0.16		0.050-0.075	0.05-0.075-0.10
5	RXsL	A07	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.14			
6	RXsG	A06	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12			
4	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.10-0.14-0.16		0.050-0.075	0.050-0.075
5	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14			
6	RXsG	A06	F0512R1	25-40-70	0.08-0.10-0.14	0.08-0.10-0.14			
4	RXsL	A07	F0512R1	25-40-60	0.08-0.10-0.14	0.08-0.10-0.14		0.050-0.075	0.050-0.075
5	RXsG	A06	F0512R1	20-35-55	0.08-0.10-0.14	0.08-0.10-0.14			
6	RXsG	A06	F0512R1	20-30-50	0.08-0.10-0.14	0.08-0.10-0.14			
4	RXsL	A07	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.12		0.050-0.075	0.050-0.075
5	RXsG	A06	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.12			
6	RXsG	A06	F0512R1	10-18-30	0.05-0.08-0.12	0.05-0.08-0.12			
4	RXsL	A07	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.12		0.050-0.075	0.050-0.075
5	RXsG	A06	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.12			
6	RXsG	A06	F0512R1	10-18-30	0.05-0.08-0.12	0.05-0.08-0.12			

- AC Työskentely olosuhteet**
- 4** Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar
 - 5** Normaali olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla
 - 6** Vaikeat olosuhteet
 - Epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 8xD
 - Hankala lastunpoisto
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

- AC Application Conditions**
- 4** Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - Optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar
 - 5** Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available
 - 6** Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

Lastuamisarvot RX small

Cutting Data RX small

Pohjareikä
Blind Hole

ISO	UMC	AC	Type	Grade	Sort	Vc	fz		Radial / Stock Removal	
							ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm	ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm
P	P1	1	RXsG	G01	F0512R1	120-160-180	0.08-0.12-0.15	0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G01	F0512R1	120-150-160	0.08-0.10-0.15	0.08-0.12-0.15		
		3	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12	0.08-0.10-0.15		
	P2	1	RXsG	G01	F0512R1	120-160-180	0.08-0.12-0.15	0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G01	F0512R1	120-150-160	0.08-0.10-0.15	0.08-0.12-0.15		
		3	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12	0.08-0.10-0.15		
	P3	1	RXsG	G01	F0512R1	120-150-180	0.08-0.12-0.15	0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G01	F0512R1	120-140-160	0.08-0.10-0.15	0.08-0.12-0.15		
		3	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12	0.08-0.10-0.15		
	P4	1	RXsG	G01	F0512R1	120-150-180	0.08-0.12-0.15	0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G01	F0512R1	120-140-160	0.08-0.10-0.15	0.08-0.12-0.15		
		3	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12	0.08-0.10-0.15		
	P5	1	RXsG	G01	F0512R1	100-120-140	0.08-0.12-0.15	0.10-0.14-0.18	0.050-0.075	0.050-0.075
		2	RXsG	G01	F0512R1	90-110-130	0.08-0.10-0.15	0.10-0.12-0.15		
		3	RXsG	G01	F0512R1	80-100-120	0.06-0.08-0.12	0.10-0.12-0.15		
	P6	1	RXsG	G01	F0512R1	50-80-100	0.06-0.08-0.12	0.06-0.08-0.12	0.050-0.075	0.050-0.075
		2	RXsG	G01	F0512R1	40-70-90	0.06-0.08-0.12	0.06-0.08-0.12		
		3	RXsG	G01	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12		
	P7	1	RXsG	G06	F0512R1	15-25-40	0.04-0.06-0.10	0.04-0.06-0.10	0.050-0.075	0.050-0.075
		2	RXsG	G06	F0512R1	15-20-30	0.04-0.06-0.10	0.04-0.06-0.10		
		3	RXsG	G06	F0512R1	15-20-30	0.04-0.06-0.10	0.04-0.06-0.10		
M	M1	1	RXsG	G07	F0512R1	50-80-100	0.08-0.12-0.14	0.10-0.14-0.16	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G07	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.14		
		3	RXsG	G07	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12		
	M2	1	RXsG	G07	F0512R1	50-80-100	0.08-0.12-0.14	0.10-0.14-0.16	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G07	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.14		
		3	RXsG	G07	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12		
	M3	1	RXsG	G07	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.14-0.16	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.14		
		3	RXsG	G07	F0512R1	25-40-70	0.06-0.08-0.12	0.06-0.08-0.12		
	M4	1	RXsG	G07	F0512R1	25-40-60	0.08-0.10-0.14	0.08-0.12-0.14	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0512R1	20-35-55	0.05-0.08-0.12	0.08-0.10-0.12		
		3	RXsG	G07	F0512R1	20-30-50	0.05-0.08-0.12	0.06-0.08-0.12		
	M5	1	RXsG	G07	F0512R1	15-25-35	0.05-0.08-0.10	0.05-0.08-0.12	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0512R1	15-25-35	0.05-0.08-0.10	0.05-0.08-0.12		
		3	RXsG	G07	F0512R1	15-25-35	0.05-0.08-0.10	0.05-0.08-0.12		
	M6	1	RXsG	G07	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.12	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.12		
		3	RXsG	G07	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.12		



AC Työskentely olosuhteet

- 1 Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar

- 2 Normaali olosuhteet
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 8xD
 - Optimaalinen lastunpoisto ei voida taata
 - Sisäinen jäähdytys saatavilla

- 3 Vaikeat olosuhteet
 - Epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 8xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla

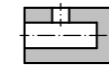


AC Application Conditions

- 1 Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar

- 2 Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available

- 3 Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - Critical chip evacuation
 - Internal coolant supply available

Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut		fz Interrupted	Radial / Stock Removal					
					ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm		ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm				
P	4	RXsG	G01	F0512R1	120-160-180	0.08-0.12-0.15	0.12-0.15-0.18	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.050-0.075	0.05-0.075-0.10			
		5	RXsG	G01	F0512R1	120-150-160	0.08-0.10-0.15				0.08-0.12-0.15		
		6	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12				0.08-0.10-0.15		
	5	4	RXsG	G01	F0512R1	120-160-180	0.08-0.12-0.15		0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10		
		5	RXsG	G01	F0512R1	120-150-160	0.08-0.10-0.15		0.08-0.12-0.15				
		6	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12		0.08-0.10-0.15				
	6	4	RXsG	G01	F0512R1	120-150-180	0.08-0.12-0.15		0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10		
		5	RXsG	G01	F0512R1	120-140-160	0.08-0.10-0.15		0.08-0.12-0.15				
		6	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12		0.08-0.10-0.15				
	4	4	RXsG	G01	F0512R1	120-150-180	0.08-0.12-0.15		0.12-0.15-0.18	0.050-0.075	0.05-0.075-0.10		
		5	RXsG	G01	F0512R1	120-140-160	0.08-0.10-0.15		0.08-0.12-0.15				
		6	RXsG	G01	F0512R1	100-120-150	0.06-0.08-0.12		0.08-0.10-0.15				
	5	4	RXsG	G01	F0512R1	100-120-140	0.08-0.12-0.15		0.10-0.14-0.18	0.050-0.075	0.050-0.075		
		5	RXsG	G01	F0512R1	90-110-130	0.08-0.10-0.15		0.10-0.12-0.15				
		6	RXsG	G01	F0512R1	80-100-120	0.06-0.08-0.12		0.10-0.12-0.15				
	6	4	RXsG	G01	F0512R1	50-80-100	0.06-0.08-0.12		0.06-0.08-0.12	0.050-0.075	0.050-0.075		
		5	RXsG	G01	F0512R1	40-70-90	0.06-0.08-0.12		0.06-0.08-0.12				
		6	RXsG	G01	F0512R1	25-50-70	0.06-0.08-0.12		0.06-0.08-0.12				
	4	4	RXsG	G06	F0512R1	15-25-40	0.04-0.06-0.10		0.04-0.06-0.10	0.050-0.075	0.050-0.075		
		5	RXsG	G06	F0512R1	15-20-30	0.04-0.06-0.10		0.04-0.06-0.10				
		6	RXsG	G06	F0512R1	15-20-30	0.04-0.06-0.10		0.04-0.06-0.10				
	M	4	RXsG	G17	F0512R1	50-80-100	0.08-0.12-0.14		0.10-0.14-0.16	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.050-0.075	0.05-0.075-0.10	
			5	RXsG	G17	F0512R1	40-70-90		0.08-0.10-0.12				0.08-0.10-0.12
			6	RXsG	G16	F0512R1	25-50-70		0.06-0.08-0.12				0.06-0.08-0.12
5		4	RXsG	G17	F0512R1	50-80-100	0.08-0.12-0.14	0.10-0.14-0.16	0.050-0.075		0.05-0.075-0.10		
		5	RXsG	G17	F0512R1	40-70-90	0.08-0.10-0.12	0.08-0.10-0.12					
		6	RXsG	G16	F0512R1	25-50-70	0.06-0.08-0.12	0.06-0.08-0.12					
6		4	RXsG	G17	F0512R1	40-60-80	0.08-0.12-0.14	0.08-0.10-0.14	0.050-0.075		0.050-0.075		
		5	RXsG	G17	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.14					
		6	RXsG	G16	F0512R1	25-40-70	0.06-0.08-0.12	0.08-0.10-0.14					
4		4	RXsG	G16	F0512R1	25-40-60	0.08-0.10-0.14	0.08-0.10-0.14	0.050-0.075		0.050-0.075		
		5	RXsG	G16	F0512R1	20-35-55	0.05-0.08-0.12	0.08-0.10-0.14					
		6	RXsG	G16	F0512R1	20-30-50	0.05-0.08-0.12	0.08-0.10-0.14					
5		4	RXsG	G16	F0512R1	15-25-35	0.05-0.08-0.10	0.05-0.08-0.12	0.050-0.075		0.050-0.075		
		5	RXsG	G16	F0512R1	15-25-35	0.05-0.08-0.10	0.05-0.08-0.12					
		6	RXsG	G16	F0512R1	15-25-35	0.05-0.08-0.10	0.05-0.08-0.12					
6		4	RXsG	G16	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.12	0.050-0.075		0.050-0.075		
		5	RXsG	G16	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.12					
		6	RXsG	G16	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.12					



AC Työskentely olosuhteet

- 4 Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar

- 5 Normaali olosuhteet
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 6xD
 - Optimaalinen lastunpoisto ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

- 6 Vaikeat olosuhteet
 - Epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 8xD
 - Hankala lastunpoisto
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

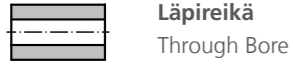
- 4 Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - No optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar

- 5 Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

- 6 Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

Lastuamisarvot RX small

Cutting Data RX small



Läpireikä
Through Bore

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz		Radial / Stock Removal	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm
K	K1	1	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30	0.10-0.15	0.10-0.15-0.20
		2	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20		
	K2	1	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30	0.10-0.15	0.10-0.15-0.20
		2	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20		
	K3	1	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.20-0.25	0.10-0.15	0.10-0.15-0.20
		2	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20		
	K4	1	RXsG	A01	F0514R2	90-120-140	0.12-0.18-0.25	0.16-0.20-0.25	0.075-0.10-0.15	0.10-0.15
		2	RXsG	A01	F0514R2	80-100-120	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	80-100-120	0.08-0.12-0.16	0.10-0.15-0.20		
	K5	1	RXsG	A01	F0514R2	60-80-100	0.10-0.16-0.22	0.12-0.18-0.25	0.075-0.10-0.15	0.10-0.15
		2	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.10-0.15-0.20		
		3	RXsG	G01	F0514R2	50-70-90	0.08-0.12-0.16	0.10-0.12-0.18		
	K6	1	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.12-0.16-0.22	0.075-0.10-0.15	0.10-0.15
		2	RXsG	A01	F0514R2	60-80-100	0.08-0.12-0.14	0.10-0.14-0.18		
		3	RXsG	G01	F0514R2	50-70-90	0.08-0.10-0.12	0.10-0.12-0.18		
	K7	1	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14	0.050-0.075	0.050-0.075-0.10
		2	RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12		
		3	RXsG	G01	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12		
	K8	1	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14	0.050-0.075	0.050-0.075-0.10
		2	RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12		
		3	RXsG	G01	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12		

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz		Radial / Stock Removal	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm
N	N1	1	RXsL	B07	F0510C	180-250-320	0.18-0.25-0.35	0.18-0.25-0.35	0.075-0.10-0.15	0.10-0.15-0.20
		2	RXsL	B07	F0510C	160-220-280	0.16-0.20-0.28	0.16-0.20-0.28		
		3	RXsL	A07	F0510C	140-180-220	0.12-0.16-0.20	0.12-0.16-0.20		
	N2	1	RXsL	B07	F0510C	180-250-320	0.18-0.25-0.35	0.18-0.25-0.35	0.075-0.10-0.15	0.10-0.15-0.20
		2	RXsL	B07	F0510C	160-220-280	0.16-0.20-0.28	0.16-0.20-0.28		
		3	RXsL	A07	F0510C	140-180-220	0.12-0.16-0.20	0.12-0.16-0.20		
	N3	1	RXsL	B07	F0520C	180-250-320	0.18-0.25-0.35	0.18-0.25-0.35	0.075-0.10-0.15	0.10-0.15-0.20
		2	RXsL	B07	F0520C	160-220-280	0.16-0.20-0.28	0.16-0.20-0.28		
		3	RXsL	A07	F0520C	140-180-220	0.12-0.16-0.20	0.12-0.16-0.20		
	N4	1	RXsL	B07	F0520C	140-180-220	0.18-0.22-0.30	0.18-0.22-0.30	0.075-0.10-0.15	0.10-0.15-0.20
		2	RXsL	B07	F0520C	140-180-220	0.12-0.16-0.22	0.12-0.16-0.22		
		3	RXsL	A07	F0520C	140-160-200	0.10-0.14-0.20	0.10-0.14-0.20		
	N5	1	RXsL	A07	F0520C	140-180-220	0.12-0.18-0.25	0.12-0.18-0.25	0.05-0.075-0.10	0.075-0.10-0.15
		2	RXsL	A07	F0520C	140-160-200	0.12-0.16-0.22	0.12-0.16-0.22		
		3	RXsL	A07	F0520C	120-140-180	0.10-0.14-0.20	0.10-0.14-0.20		
	N6	1	RXsL	A07	F0520C	50-70-100	0.12-0.16-0.20	0.12-0.16-0.20	0.05-0.075-0.10	0.075-0.10-0.15
		2	RXsL	A07	F0520C	50-70-100	0.10-0.14-0.18	0.10-0.14-0.18		
		3	RXsL	A07	F0520C	40-60-80	0.10-0.12-0.16	0.10-0.12-0.16		



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaino > 20 bar
- Normaalit olosuhteet
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet
 - Epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus ≤ 8xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available
- Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - Critical chip evacuation
 - Internal coolant supply available



Läpireikä (kevyesti hakkaava)
Through Bore with Interruption

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz Full Cut		fz Interrupted	Radial / Stock Removal	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm		ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm
K	K1	4	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.10-0.15	0.10-0.15-0.20
		5	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25			
		6	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20			
	K2	4	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30		0.10-0.15	0.10-0.15-0.20
		5	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25			
		6	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20			
	K3	4	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.20-0.25		0.10-0.15	0.10-0.15-0.20
		5	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25			
		6	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20			
	K4	4	RXsG	A01	F0514R2	90-120-140	0.12-0.18-0.25	0.16-0.20-0.25		0.075-0.10-0.15	0.10-0.15
		5	RXsG	A01	F0514R2	80-100-120	0.10-0.15-0.20	0.12-0.18-0.25			
		6	RXsG	G01	F0514R2	80-100-120	0.08-0.12-0.16	0.10-0.15-0.20			
	K5	4	RXsG	A01	F0514R2	60-80-100	0.10-0.16-0.22	0.12-0.18-0.25		0.075-0.10-0.15	0.10-0.15
		5	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.10-0.15-0.20			
		6	RXsG	G11	F0514R2	50-70-90	0.08-0.12-0.16	0.10-0.12-0.18			
	K6	4	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.12-0.16-0.22		0.075-0.10-0.15	0.10-0.15
		5	RXsG	A01	F0514R2	60-80-100	0.08-0.12-0.14	0.10-0.14-0.18			
		6	RXsG	G11	F0514R2	50-70-90	0.08-0.10-0.12	0.10-0.12-0.18			
	K7	4	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14		0.050-0.075	0.050-0.075-0.10
		5	RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12			
		6	RXsG	G11	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12			
	K8	4	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14		0.050-0.075	0.050-0.075-0.10
		5	RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12			
		6	RXsG	G11	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12			

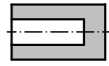
ISO	UMC	AC	Type	Geometry	Grade	Vc	fz Full Cut		fz Interrupted	Radial / Stock Removal	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm		ap Ø 7.600-9.600 mm	ap Ø 9.601-13.100 mm
N	N1	4	RXsL	B07	F0510C	180-250-320	0.18-0.25-0.35	0.18-0.25-0.35	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.075-0.10-0.15	0.10-0.15-0.20
		5	RXsL	A07	F0510C	160-220-280	0.14-0.18-0.25	0.14-0.18-0.25			
		6	RXsG	G17	F0510C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20			
	N2	4	RXsL	B07	F0510C	180-250-320	0.18-0.25-0.35	0.18-0.25-0.35		0.075-0.10-0.15	0.10-0.15-0.20
		5	RXsL	A07	F0510C	160-220-280	0.14-0.18-0.25	0.14-0.18-0.25			
		6	RXsG	G17	F0510C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20			
	N3	4	RXsL	B07	F0520C	180-250-320	0.18-0.25-0.35	0.18-0.25-0.35		0.075-0.10-0.15	0.10-0.15-0.20
		5	RXsL	A07	F0520C	160-220-280	0.14-0.18-0.25	0.14-0.18-0.25			
		6	RXsG	G17	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20			
	N4	4	RXsL	B07	F0520C	140-180-220	0.18-0.22-0.30	0.18-0.22-0.30		0.075-0.10-0.15	0.10-0.15-0.20
		5	RXsL	A07	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20			
		6	RXsG	G17	F0520C	140-160-200	0.10-0.14-0.18	0.10-0.14-0.18			
	N5	4	RXsL	A06	F0520C	140-180-220	0.12-0.18-0.25	0.12-0.18-0.25		0.05-0.075-0.10	0.075-0.10-0.15
		5	RXsL	A06	F0520C	140-160-200	0.12-0.16-0.22	0.12-0.16-0.22			
		6	RXsG	G06	F0520C	120-140-180	0.10-0.12-0.16	0.10-0.12-0.16			
	N6	4	RXsL	A06	F0520C	50-70-100	0.12-0.16-0.20	0.12-0.16-0.20		0.05-0.075-0.10	0.075-0.10-0.15
		5	RXsL	A06	F0520C	50-70-100	0.10-0.14-0.18	0.10-0.14-0.18			
		6	RXsG	G06	F0520C	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14			



AC Työskentely olosuhteet

Lastuamisarvot RX small

Cutting Data RX small

Pohjareikä
Blind Hole

ISO	UMC	AC	Type	Geometry	Grade	Vc	Radial / Stock Removal			
							fz		ap	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	Ø 7.600-9.600 mm	Ø 9.601-13.100 mm
K	K1	1	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30	0.10-0.15	0.10-0.15-0.20
		2	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20		
	K2	1	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30	0.10-0.15	0.10-0.15-0.20
		2	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20		
	K3	1	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.20-0.25	0.10-0.15	0.10-0.15-0.20
		2	RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20		
	K4	1	RXsG	A01	F0514R2	90-120-140	0.12-0.18-0.25	0.16-0.20-0.25	0.075-0.10-0.15	0.10-0.15
		2	RXsG	A01	F0514R2	80-100-120	0.10-0.15-0.20	0.12-0.18-0.25		
		3	RXsG	G01	F0514R2	80-100-120	0.08-0.12-0.16	0.10-0.15-0.20		
	K5	1	RXsG	A01	F0514R2	60-80-100	0.10-0.16-0.22	0.12-0.18-0.25	0.075-0.10-0.15	0.10-0.15
		2	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.10-0.15-0.20		
		3	RXsG	G01	F0514R2	50-70-90	0.08-0.12-0.16	0.10-0.12-0.18		
	K6	1	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.12-0.16-0.22	0.075-0.10-0.15	0.10-0.15
		2	RXsG	A01	F0514R2	60-80-100	0.08-0.12-0.14	0.10-0.14-0.18		
		3	RXsG	G01	F0514R2	50-70-90	0.08-0.10-0.12	0.10-0.12-0.18		
	K7	1	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14	0.050-0.075	0.050-0.075-0.10
		2	RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12		
		3	RXsG	G01	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12		
	K8	1	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14	0.050-0.075	0.050-0.075-0.10
		2	RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12		
		3	RXsG	G01	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12		
N	N1	1	RXsG	G07	F0510C	180-250-320	0.10-0.14-0.20	0.12-0.18-0.25	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G07	F0510C	160-220-280	0.10-0.14-0.20	0.12-0.16-0.22		
		3	RXsG	G07	F0510C	140-180-220	0.10-0.12-0.16	0.10-0.14-0.20		
	N2	1	RXsG	G07	F0510C	180-250-320	0.10-0.14-0.20	0.12-0.18-0.25	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G07	F0510C	160-220-280	0.10-0.14-0.20	0.12-0.16-0.22		
		3	RXsG	G07	F0510C	140-180-220	0.10-0.12-0.16	0.10-0.14-0.20		
	N3	1	RXsG	G07	F0520C	180-250-320	0.10-0.14-0.20	0.12-0.18-0.25	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G07	F0520C	160-220-280	0.10-0.14-0.20	0.12-0.16-0.22		
		3	RXsG	G07	F0520C	140-180-220	0.10-0.12-0.16	0.10-0.14-0.20		
	N4	1	RXsG	G07	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20	0.050-0.075	0.05-0.075-0.10
		2	RXsG	G07	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20		
		3	RXsG	G07	F0520C	140-160-200	0.10-0.12-0.16	0.10-0.12-0.16		
	N5	1	RXsG	G07	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0520C	140-160-200	0.10-0.14-0.18	0.10-0.14-0.18		
		3	RXsG	G07	F0520C	120-140-180	0.10-0.12-0.16	0.10-0.12-0.16		
	N6	1	RXsG	G07	F0520C	50-70-100	0.10-0.14-0.20	0.10-0.14-0.20	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0520C	50-70-100	0.10-0.14-0.18	0.10-0.14-0.18		
		3	RXsG	G07	F0520C	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14		



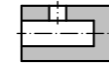
AC Työskentely olosuhteet

- Optimaaliset olosuhteet**
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalan pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet**
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalan pituus ≤ 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet**
 - Epävaka kiinnitys, kone ja/tai kappale
 - Työkalan pituus ≤ 8xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions**
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar
- Suboptimal conditions**
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available
- Difficult conditions**
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - Critical chip evacuation
 - Internal coolant supply available

Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption

AC	Type	Geometry	Grade	Vc	Radial / Stock Removal					
					fz Full Cut		fz Interrupted	ap		
					Ø 7.600-9.600 mm	Ø 9.601-13.100 mm		Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	
K	4	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.10-0.15	0.10-0.15-0.20
		RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25			
		RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20			
	5	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.22-0.30		0.10-0.15	0.10-0.15-0.20
		RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25			
		RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20			
	6	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.20-0.25		0.10-0.15	0.10-0.15-0.20
		RXsG	A01	F0514R2	80-120-160	0.10-0.15-0.20	0.12-0.18-0.25			
		RXsG	G01	F0514R2	70-100-140	0.08-0.12-0.16	0.10-0.15-0.20			
	4	RXsG	A01	F0514R2	100-140-180	0.12-0.18-0.25	0.16-0.20-0.25		0.075-0.10-0.15	0.10-0.15
		RXsG	A01	F0514R2	80-100-120	0.10-0.15-0.20	0.12-0.18-0.25			
		RXsG	G01	F0514R2	80-100-120	0.08-0.12-0.16	0.10-0.15-0.20			
	5	RXsG	A01	F0514R2	60-80-100	0.10-0.16-0.22	0.12-0.18-0.25		0.075-0.10-0.15	0.10-0.15
		RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.10-0.15-0.20			
		RXsG	G11	F0514R2	50-70-90	0.08-0.12-0.16	0.10-0.12-0.18			
	4	RXsG	A01	F0514R2	60-80-100	0.08-0.14-0.18	0.12-0.16-0.22		0.075-0.10-0.15	0.10-0.15
		RXsG	A01	F0514R2	60-80-100	0.08-0.12-0.14	0.10-0.14-0.18			
		RXsG	G11	F0514R2	50-70-90	0.08-0.10-0.12	0.10-0.12-0.18			
	5	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14		0.050-0.075	0.050-0.075-0.10
		RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12			
		RXsG	G11	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12			
	4	RXsG	A01	F0512R1	40-60-80	0.08-0.12-0.14	0.10-0.12-0.14		0.050-0.075	0.050-0.075-0.10
		RXsG	A01	F0512R1	40-60-80	0.08-0.10-0.12	0.08-0.10-0.12			
		RXsG	G11	F0512R1	25-40-70	0.06-0.08-0.10	0.08-0.10-0.12			
N	4	RXsG	G07	F0510C	180-250-320	0.10-0.14-0.20	0.12-0.18-0.25	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.050-0.075	0.05-0.075-0.10
		RXsG	G07	F0510C	160-220-280	0.10-0.14-0.20	0.12-0.16-0.22			
		RXsG	G07	F0510C	140-180-220	0.10-0.12-0.16	0.10-0.14-0.20			
	5	RXsG	G07	F0510C	180-250-320	0.10-0.14-0.20	0.12-0.18-0.25		0.050-0.075	0.05-0.075-0.10
		RXsG	G07	F0510C	160-220-280	0.10-0.14-0.20	0.12-0.16-0.22			
		RXsG	G07	F0510C	140-180-220	0.10-0.12-0.16	0.10-0.14-0.20			
	6	RXsG	G17	F0520C	180-250-320	0.10-0.14-0.20	0.12-0.18-0.25		0.050-0.075	0.05-0.075-0.10
		RXsG	G17	F0520C	160-220-280	0.10-0.14-0.20	0.12-0.16-0.22			
		RXsG	G17	F0520C	140-180-220	0.10-0.12-0.16	0.10-0.14-0.20			
	4	RXsG	G16	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20		0.050-0.075	0.05-0.075-0.10
		RXsG	G16	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20			
		RXsG	G16	F0520C	140-160-200	0.10-0.12-0.16	0.10-0.12-0.16			
	5	RXsG	G17	F0520C	140-180-220	0.10-0.14-0.20	0.10-0.14-0.20		0.050-0.075	0.050-0.075
		RXsG	G16	F0520C	140-160-200	0.10-0.14-0.18	0.10-0.14-0.18			
		RXsG	G16	F0520C	120-140-180	0.10-0.12-0.16	0.10-0.12-0.16			
	4	RXsG	G17	F0520C	50-70-100	0.10-0.14-0.20	0.10-0.14-0.20		0.050-0.075	0.050-0.075
		RXsG	G16	F0520C	50-70-100	0.10-0.14-0.18	0.10-0.14-0.18			
		RXsG	G16	F0520C	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14			



AC Työskentely olosuhteet

- Optimaaliset olosuhteet**
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalan pituus ≤ 4xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet**
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalan pituus ≤ 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet**
 - Epävaka kiinnitys, kone ja/tai kappale
 - Työkalan pituus ≤ 8xD
 - Hankala lastunpoisto
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

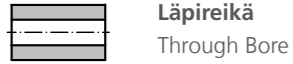


AC Application Conditions

- Optimal conditions**
 - Stable fixture, machine and/or workpiece
 - Tool projection length ≤ 11xD
 - Optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar
- Suboptimal conditions**
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available
- Difficult conditions**
 - Unstable fixture, machine and/or workpiece
 - Tool projection length ≤ 15xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

Lastuamisarvot RX small

Cutting Data RX small



Läpireikä
Through Bore

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz		Radial / Stock Removal ap		
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	
S	S1	1	RXsL	A07	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10			
		3	RXsL	A07	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08			
	S2	1	RXsL	A07	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10			
		3	RXsL	A07	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08			
	S3	1	RXsL	A07	F0512R1	15-20-35	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08			
		3	RXsL	A07	F0512R1	8-15-25	0.04-0.06-0.08	0.04-0.06-0.08			
	S4	1	RXsL	A07	F0512R1	12-18-25	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08			
		3	RXsL	A07	F0512R1	5-12-20	0.04-0.06-0.08	0.04-0.06-0.08			
	S11	S11	1	RXsL	A07	F0512R1	20-40-60	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10
			2	RXsL	A07	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10		
3			RXsL	A07	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08			
S12		1	RXsL	A07	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10			
		3	RXsL	A07	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08			
S13		1	RXsL	A07	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08			
		3	RXsL	A07	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08			
S14		1	RXsL	A07	F0512R1	15-20-30	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	
		2	RXsL	A07	F0512R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08			
		3	RXsL	A07	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08			
H	H1	1	RXsL	A06	F0507R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	
		2	RXsL	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08			
		3	RXsL	A06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08			
	H2	1	RXsL	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08	
		2	RXsL	A06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08			
		3	RXsL	A06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08			
	H3	1	RXsL	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08	
		2	RXsL	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07			
		3	RXsL	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07			
SM	SM1	1	RXsL	B07	F0512R1	140-180-220	0.18-0.25-0.35	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	
		2	RXsL	B07	F0512R1	110-140-170	0.18-0.22-0.30	0.18-0.22-0.30			
		3	RXsL	A07	F0512R1	80-100-120	0.12-0.16-0.20	0.12-0.16-0.20			
	SM2	1	RXsL	B07	F0512R1	120-140-160	0.18-0.22-0.30	0.18-0.22-0.30	0.08-0.10	0.08-0.10-0.15	
		2	RXsL	B07	F0512R1	100-120-150	0.15-0.20-0.25	0.15-0.20-0.25			
		3	RXsL	A07	F0512R1	80-100-120	0.12-0.15-0.20	0.12-0.15-0.20			
	SM3	1	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14	0.050-0.075	0.050-0.075	
		2	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14			
		3	RXsL	A07	F0512R1	25-40-70	0.08-0.10-0.14	0.08-0.10-0.14			
O	O1	1	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	
		2	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20			
		3	RXsL	A07	F0510C	40-60-80	0.10-0.13-0.16	0.10-0.13-0.16			
	O2	1	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	
		2	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20			
		3	RXsL	A07	F0510C	40-60-80	0.10-0.13-0.16	0.10-0.13-0.16			
	O3	1	RXsL	A07	F0520C	40-50-60	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	
		2	RXsL	A07	F0520C	40-50-60	0.10-0.15-0.20	0.10-0.15-0.20			
		3	RXsL	A07	F0520C	40-50-60	0.10-0.13-0.16	0.10-0.13-0.16			
	O4	1	RXsL	A07	F0520C	30-50-60	0.05-0.08-0.10	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.15	
		2	RXsL	A07	F0520C	30-50-60	0.05-0.08-0.10	0.05-0.08-0.10			
		3	RXsL	A07	F0520C	30-50-60	0.05-0.08-0.10	0.05-0.08-0.10			

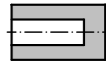


Läpireikä (kevyesti hakkaava)
Through Bore with Interruption

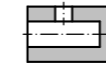
AC	Type	Geometry	Grade	Vc	fz Full Cut		fz Interrupted	Radial / Stock Removal ap					
					Ø 7.600-9.600 mm	Ø 9.601-13.100 mm		Ø 7.600-9.600 mm	Ø 9.601-13.100 mm				
S	4	RXsL	A06	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.05-0.08-0.10	0.05-0.08-0.10			
	5	RXsL	A06	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10						
	6	RXsG	A06	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10						
	5	RXsL	A06	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10						
	6	RXsG	A06	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	15-20-35	0.05-0.08-0.10	0.05-0.08-0.10						
	5	RXsL	A06	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08						
	6	RXsG	A06	F0512R1	8-15-25	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	12-18-25	0.04-0.06-0.08	0.04-0.06-0.08						
	5	RXsL	A06	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08						
	6	RXsG	A06	F0512R1	5-12-20	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	20-40-60	0.05-0.08-0.10	0.05-0.08-0.10				fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.05-0.08-0.10	0.05-0.08-0.10
	5	RXsL	A06	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10						
	6	RXsG	A06	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	20-35-45	0.05-0.08-0.10	0.05-0.08-0.10						
	5	RXsL	A06	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10						
	6	RXsG	A06	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	20-30-45	0.05-0.08-0.10	0.05-0.08-0.10						
	5	RXsL	A06	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08						
	6	RXsG	A06	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08						
	4	RXsL	A06	F0512R1	15-20-30	0.04-0.06-0.08	0.04-0.06-0.08						
	5	RXsL	A06	F0512R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08						
	6	RXsG	A06	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08						
4	RXsL	A06	F0507R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.05-0.08	0.05-0.08-0.10				
5	RXsG	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08							
6	RXsG	A06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08							
4	RXsL	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08							
5	RXsG	A06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08							
6	RXsG	A06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08							
4	RXsL	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07							
5	RXsG	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07							
6	RXsG	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07							
4	RXsL	A07	F0512R1	140-180-220	0.18-0.22-0.30	0.18-0.22-0.30	fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.08-0.10-0.15	0.08-0.10-0.15				
5	RXsL	A07	F0512R1	110-140-170	0.15-0.20-0.25	0.15-0.20-0.25							
6	RXsG	A06	F0512R1	80-100-120	0.12-0.16-0.20	0.12-0.16-0.20							
4	RXsL	A07	F0512R1	120-140-160	0.15-0.20-0.25	0.15-0.20-0.25							
5	RXsL	A07	F0512R1	100-120-150	0.12-0.18-0.22	0.12-0.18-0.22							
6	RXsG	A06	F0512R1	80-100-120	0.12-0.15-0.20	0.12-0.15-0.20							
4	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14							
5	RXsL	A07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14							
6	RXsG	A06	F0512R1	25-40-70	0.08-0.10-0.14	0.08-0.10-0.14							
4	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20				fz syöttö vähennettynä 30% - 60% reduce fz full cut 30 - 60%	0.08-0.10-0.15	0.08-0.10-0.15	
5	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20							
6	RXsG	A07	F0510C	40-60-80	0.10-0.13-0.16	0.10-0.13-0.16							
4	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20							
5	RXsL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20							
6	RXsG	A07	F0510C	40-60-80	0.10-0								

Lastuamisarvot RX small

Cutting Data RX small

Pohjareikä
Blind Hole

ISO	UMC	AC	Type	Grade	Sort	Vc	fz		Radial / Stock Removal ap	
							Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	Ø 7.600-9.600 mm	Ø 9.601-13.100 mm
S	S1	1	RXsG	A07	F0512R1	20-35-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	20-35-45	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08		
	S2	1	RXsG	A07	F0512R1	20-30-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	20-30-45	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08		
	S3	1	RXsG	A07	F0512R1	15-20-35	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	8-15-25	0.04-0.06-0.08	0.04-0.06-0.08		
	S4	1	RXsG	A07	F0512R1	12-18-25	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	5-12-20	0.04-0.06-0.08	0.04-0.06-0.08		
	S11	1	RXsG	A07	F0512R1	20-40-60	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	20-35-45	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08		
	S12	1	RXsG	A07	F0512R1	20-35-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	20-30-45	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08		
	S13	1	RXsG	A07	F0512R1	20-30-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08		
	S14	1	RXsG	A07	F0512R1	15-20-30	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10
		2	RXsG	A07	F0512R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	A07	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
H	H1	1	RXsG	A06	F0507R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10
		2	RXsG	G06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	G06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
	H2	1	RXsG	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08
		2	RXsG	G06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
		3	RXsG	G06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
	H3	1	RXsG	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08
		2	RXsG	G06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07		
		3	RXsG	G06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07		
SM	SM1	1	RXsG	G07	F0512R1	140-180-220	0.12-0.16-0.20	0.12-0.18-0.22	0.08-0.10-0.15	0.08-0.10-0.15
		2	RXsG	G07	F0512R1	110-140-170	0.12-0.16-0.20	0.12-0.16-0.20		
		3	RXsG	G07	F0512R1	80-100-120	0.10-0.14-0.18	0.10-0.14-0.18		
	SM2	1	RXsG	G07	F0512R1	120-140-160	0.10-0.14-0.18	0.12-0.16-0.20	0.08-0.10	0.08-0.10-0.15
		2	RXsG	G07	F0512R1	100-120-150	0.10-0.14-0.18	0.10-0.14-0.18		
		3	RXsG	G07	F0512R1	80-100-120	0.08-0.12-0.16	0.08-0.12-0.16		
	SM3	1	RXsG	G07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14	0.050-0.075	0.050-0.075
		2	RXsG	G07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14		
		3	RXsG	G07	F0512R1	25-40-70	0.08-0.10-0.14	0.08-0.10-0.14		
O	O1	1	RXsG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10	0.08-0.10-0.15
		2	RXsG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20		
		3	RXsG	G07	F0510C	40-60-80	0.10-0.13-0.16	0.10-0.13-0.16		
	O2	1	RXsG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10	0.08-0.10-0.15
		2	RXsG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20		
		3	RXsG	G07	F0510C	40-60-80	0.10-0.13-0.16	0.10-0.13-0.16		
	O3	1	RXsG	G07	F0520C	40-50-60	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10	0.08-0.10-0.15
		2	RXsG	G07	F0520C	40-50-60	0.10-0.15-0.20	0.10-0.15-0.20		
		3	RXsG	G07	F0520C	40-50-60	0.10-0.13-0.16	0.10-0.13-0.16		
	O4	1	RXsG	G07	F0520C	30-50-60	0.05-0.08-0.10	0.05-0.08-0.10	0.08-0.10	0.08-0.10-0.15
		2	RXsG	G07	F0520C	30-50-60	0.05-0.08-0.10	0.05-0.08-0.10		
		3	RXsG	G07	F0520C	30-50-60	0.05-0.08-0.10	0.05-0.08-0.10		

Pohjareikä (keyyesti hakkaava)
Blind Hole with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut		fz Interrupted	Radial / Stock Removal ap		
					Ø 7.600-9.600 mm	Ø 9.601-13.100 mm		Ø 7.600-9.600 mm	Ø 9.601-13.100 mm	
S	S1	4	RXsG	A06	F0512R1	20-35-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	20-35-45	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08		
	S2	4	RXsG	A06	F0512R1	20-30-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	20-30-45	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	15-25-35	0.04-0.06-0.08	0.04-0.06-0.08		
	S3	4	RXsG	A06	F0512R1	15-20-35	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	8-15-25	0.04-0.06-0.08	0.04-0.06-0.08		
	S4	4	RXsG	A06	F0512R1	12-18-25	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	5-12-20	0.04-0.06-0.08	0.04-0.06-0.08		
	S11	4	RXsG	A06	F0512R1	20-40-60	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	20-35-45	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08		
	S12	4	RXsG	A06	F0512R1	20-35-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	20-30-45	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08		
	S13	4	RXsG	A06	F0512R1	20-30-45	0.04-0.06-0.10	0.04-0.06-0.10	0.05-0.08-0.10	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	10-18-30	0.04-0.06-0.08	0.04-0.06-0.08		
	S14	4	RXsG	A06	F0512R1	15-20-30	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10
		5	RXsG	A06	F0512R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	A06	F0512R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
H	H1	4	RXsG	A06	F0507R1	15-25-30	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10
		5	RXsG	G06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	G06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
	H2	4	RXsG	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.04-0.06-0.08	0.05-0.08	0.05-0.08
		5	RXsG	G06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
		6	RXsG	G06	F0507R1	8-15-20	0.04-0.06-0.08	0.04-0.06-0.08		
	H3	4	RXsG	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08
		5	RXsG	G06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07		
		6	RXsG	G06	F0507R1	8-10-15	0.03-0.05-0.07	0.03-0.05-0.07		
SM	SM1	4	RXsG	G07	F0512R1	140-180-220	0.12-0.16-0.20	0.12-0.18-0.22	0.08-0.10-0.15	0.08-0.10-0.15
		5	RXsG	G06	F0512R1	110-140-170	0.12-0.16-0.20	0.12-0.16-0.20		
		6	RXsG	G16	F0512R1	80-100-120	0.10-0.14-0.18	0.10-0.14-0.18		
	SM2	4	RXsG	G07	F0512R1	120-140-160	0.10-0.14-0.18	0.12-0.16-0.20	0.08-0.10	0.08-0.10-0.15
		5	RXsG	G06	F0512R1	100-120-150	0.10-0.14-0.18	0.10-0.14-0.18		
		6	RXsG	G16	F0512R1	80-100-120	0.08-0.12-0.16	0.08-0.12-0.16		
	SM3	4	RXsG	G07	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14	0.050-0.075	0.050-0.075
		5	RXsG	G06	F0512R1	40-60-80	0.08-0.10-0.14	0.08-0.10-0.14		
		6	RXsG	G16	F0512R1	25-40-70	0.08-0.10-0.14	0.08-0.10-0.14		
O	O1	4	RXsG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20	0.08-0.10	0.08-0.10-0.15
		5	RXsG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.10-0.15-0.20		
		6	RXsG	G07	F0510C	40-60-80	0.10-0.13-0.16	0.10-0.13-		

Ø 7.600 – 13.100 mm

Käyttöohjeita RX small

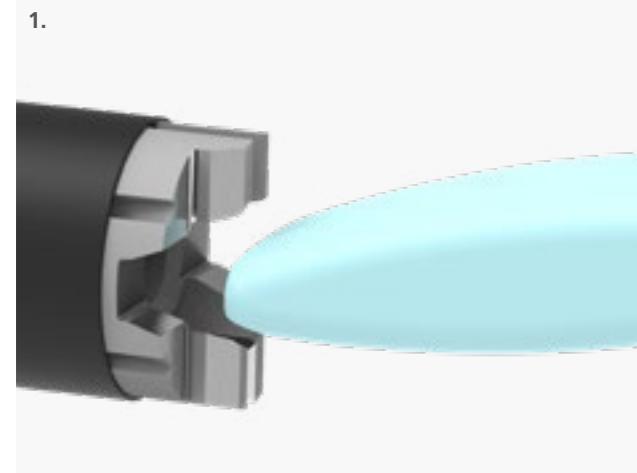
Handling Instructions RX small

Teräpalan vaihtaminen

Insert Change

Älä irroita työkaluvartta pitimestä. Avaa teräpalan ruuvi ja vaihda teräpala.

Optimaalisen tarkkuuden saavuttamiseksi tulee kiinnittää huomiota teräpään puhtauteen ja teräpalan oikeaan kiinnitysvaimaan.



- 1. Puhdistus**
Parastapa viimeistellä puhdistus on mukana tuleva sinitarra.
- 2. Teräpalan vaihtaminen**
Aseta uusi teräpala puhdistettuun pitimeen ja kiristä oikeaan momenttiin.

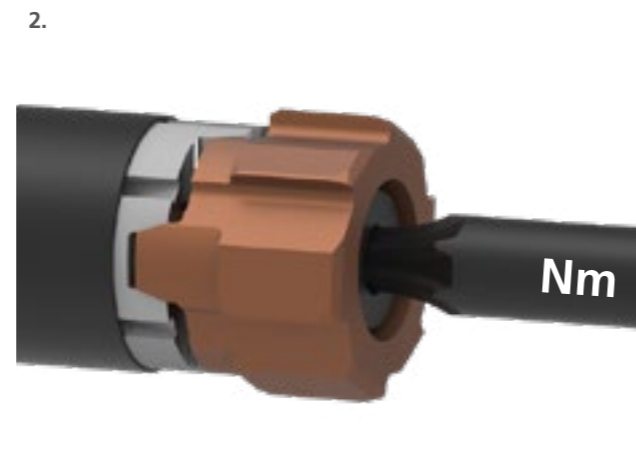
Torx® momenttiavain

Torx®-Torque Wrench

System Size	Clamping Torque	Torx® Size	Order Number
RXs 08	0.6 Nm	T6	G00 40 15
RXs 10	0.9 Nm	T7	G00 40 14
RXs 11	1.4 Nm	T9	G00 40 16
RXs 13	2.0 Nm	T10	G00 40 17

Do not take the shank out of the tool holder. Remove clamping screw and used reaming insert.

For highest repeatability on each insert change, proper cleaning of the interface as well as using the pre-defined tightening torque are imperative.



- 1. Cleaning of the Interface**
The interface can be cleaned most effectively with the modelling clay included in the insert packaging.
- 2. Insert Change**
The insert is placed on the previously cleaned interface and tightened clamping screw with the pre-defined clamping torque.



Ruuvien kiristys vain momenttiavaimella
Tighten screw with torque wrench only

Ø 7.600 – 13.100 mm

Käyttöohjeita RX small

Handling Instructions RX small

Heiton säätö

Run-Out Adjustment

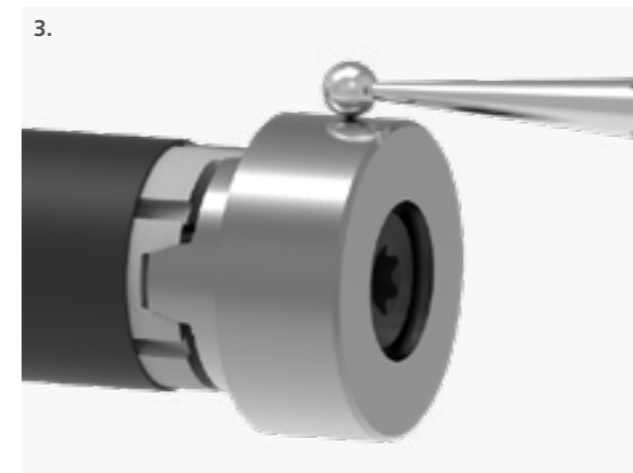
Parhaimman tuloksen saavuttamiseksi tulee kalvain aina kellottaa heitottomaksi. Tällä tavalla pystytään eliminoimaan kaikki virheet, jotka voivat johtua työkalukokoonpanosta tai työstökoneen karasta. Työkalu tulee aina kiinnittää joko säädettävään tai uivaan -istukkaan. RX small kalvaimien heitottomuus voidaan mitata eri menetelmin.

3. Erityisellä lieriömallisella teräpalalla

Helpoin tapa työkalun säätämiseksi on hyödyntää erityistä lieriömallista teräpalaa kellotuksen apuna. Tämä asetusteräpala myydään erikseen. Tarkemmat tiedot löytyy "URMA Reaming" luettelosta.

4. Teräpalan ulkopinnasta

Heitto voidaan kellottaa myös teräpalan pinnasta, mutta tämä menetelmä on hieman hankalampi.



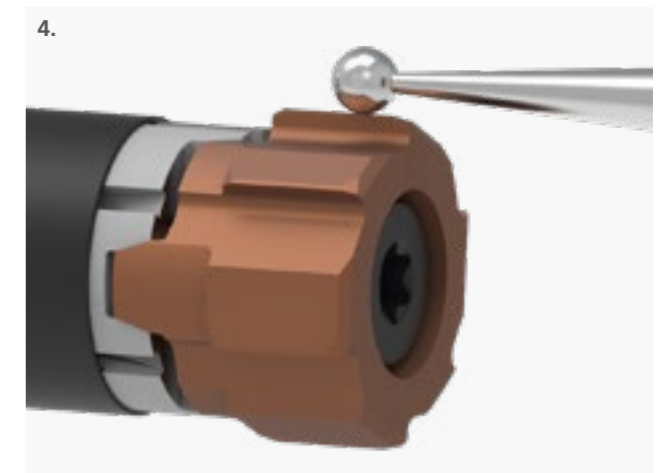
In order to achieve the best reaming results, a tool with zero run-out is absolutely essential. To compensate any run-out error of the tool holder and the machine spindle, we recommend using a compensation holder or floating chuck. The run-out of RX small reamers can be measured with different methods:

3. Measurement Through Run-Out Indicating Insert

The run-out can be easily adjusted and precisely checked by using an indicating insert. It's not included in scope of delivery. Order number can be found in the "URMA Reaming" catalogue.

4. Measurement on the External Diameter of the Insert

The run-out can also be set up via the small margin on the insert. Its handling is, however, more difficult.



Ohjeet kompensatio kartiolle

Instruction Compensation Chuck



URMA-kompensaatio kalvaintyökalujen heitto voidaan säätää optimiin, samalla huomioiden mahdolliset karan ja työkalun virheet.

Menetelmä:

1. Ennen säätöä, varmista että kaikki ruuvit ② on löysätty kokonaan.
2. Laita työkalu koneen karalle.
3. Aseta mittakello (1 μm / 0,0001) kellotusteräpalkan pinnalle ① tai kellotusalueelle joka on merkitty varteen (katso sivu 25).
4. Säädä heitto koneen karalla max. 5 μm / 0,0002 inch (ideaali < 3 μm / 0,0001 inch) neljän säätöruuvien avulla ②.

⚠ Säätöruuvien ei tarvitse olla täysin samalla tasolla säädön jälkeen.

With the URMA compensation chuck, the run-out of reaming tools can be optimally adjusted and, thus, compensate for spindle and tool errors.

Procedure:

1. Before adjusting, make sure that all adjustment screws ② are completely loosened.
2. Load the tool in the machine spindle.
3. Set the indicator (with 1 μm / 0,0001 inch resolution) on the run-out indicating insert ① or on the margin of the insert (see page 25).
4. Set the run-out directly in the machine spindle to max. 5 μm / 0,0002 inch (ideal < 3 μm / 0,0001 inch) by using the four radial adjustment screws ②.

⚠ The adjustment screws do not have to be fully clamped against each other after adjustment.

Uivan istukan käyttöohje

Instruction Floating Chuck



Sorveissa kalvinta tehdään pääasiassa uivilla istukoilla (poikkeustapauksissa mahdollista myös koneistuskeskuksilla).

Asemointivirheet voidaan tasata säätömekanismilla (ei kulmavirheitä).

Suosittelavia ovat leikkuugeometriat kulmilla $\leq 45^\circ$

Menetelmä:

1. Säädä uiva mekanismi käyttäen ruuvia ①.

Säätöruuvi	Uiva mekanismi	Vaikutus työstöjälkeen
Kellonsuuntaan	Jousivoima kasvaa / kohdistusvoima kasvaa	Voi vaikuttaa negatiivisesti työstöjälkeen. (Kierreläjjet ulosvedossa)
vastakkaiseen suuntaan	Jousivoima vähenee / Kohdistusvoima vähenee	Mahdollistaa värinäherkkyyden

Reaming on lathes are mainly done with floating chucks (in exceptional cases also on machining centres).

Positioning errors can be compensated by the adjustable floating mechanism. The deflection should only take place in plane-parallel (No angular error compensation).

Cutting geometries with an angle of $\leq 45^\circ$ are recommended.

Procedure:

1. Adjust the floating mechanism by using the adjustment screw ①.

Adjustment screw	Floating mechanism	Influence on machining
Clockwise rotation	Spring force increases / deflection resistance increases	The surface quality can be negatively influenced (retraction marks)
Counterclockwise rotation	Spring force becomes weaker / deflection resistance decreases	Potential vibration tendency

Säätö:

Pehmeä: Työkalu tulee säätää pienimmälle mahdolliselle "kosketusvoimalle". Kuitenkin huomioden työkalun kokonaisuutena. Työkalun tulee hakeutua automaattisesti aksiaalilinjaan automaattisesti kosketuksen tapahduttua.

Keski: Kiristä säätöruuvi aivan pohjaan ja avaa sitä $1 \pm \frac{1}{4}$ kierrosta takaisinpäin.

Kova: Kiristä säätöruuvi aivan pohjaan ja avaa sitä $\frac{1}{4} - \frac{1}{2}$ kierrosta takaisinpäin.

Adjustment:

Soft: The tool should be adjusted with the lowest possible deflection resistance. Nevertheless, taking into account the weight of the tool, it must jump back automatically into the central axis after deflection.

Medium: Fully tighten the adjusting screw and turn back by $1 \pm \frac{1}{4}$ rotation.

Hard: Fully tighten the adjusting screw and turn back by $\frac{1}{4} - \frac{1}{2}$ rotation.

Suositus perussäädöksi:

Työkalun-Ø Tool-Ø	Pehmeä Soft	Keski Medium	Kova Hard
7.600 – 13.100	X		

Recommendation for the basic setting:

2. Y akselilla varustetuissa sorveissa suositus heitto työkalulle karansuunnassa $< 10 \mu\text{m} / 0,0004 \text{ inch}$ (ideal $< 5 \mu\text{m} / 0,0002 \text{ inch}$).



- Uivan istukan asetukset voivat vaihdella sovelluksesta ja uivan istukan tyyppistä riippuen.
- On suositeltavaa ajaa ensimmäiset reiät alennetulle syötöllä.
- Kaikki arvot on ohjearvoja URMA uiviin istukoihin.



- The setting of the floating mechanism can vary depending on the application and type of floating chuck.
- It is generally recommended to enter the bore with reduced rpm.
- All data are guide values and refer to URMA floating chucks.

URMA Reaming
RX medium

Tilauseimerkkejä

Order Example

Reiän halkaisija Bore diameter		Teräpalkan halkaisija Insert diameter	
ISO Toleranssi ISO bore tolerances	Reiän toleranssi Bore tolerance in μm	Haluttu halkaisija (Q teräpala) Target size (Q-Insert)	
Example	Tilauseimerkkejä Order example RXG42.2 H7 -A01 U2 F0514R1	Tilauseimerkkejä Order example RXG18.2+ 20-10 -A01 U1 F0514R1 H	Example
RX	RX medium tuotemerkintä RX medium system designation	RX	RX medium tuotemerkintä RX medium system designation
G	Hammasmuoto (G = Suora; L = nousullinen) Flute form (G = straight; L = left-hand helix)	G	Hammasmuoto (G = Suora; L = Nousullinen) Flute form (G = straight; L = left-hand helix)
42.2	Halkaisija (mm) Diameter (mm)	18.2	Halkaisija (mm) Diameter (mm)
H7	Toleranssi ISO vakio Tolerance in ISO standard	+20-10	Reiän toleranssi (μm) Bore tolerance (μm)
A01	Leikkuugeometria Cutting geometry	A01	Leikkuugeometria Cutting geometry
Option	U2 Nano viimeistely Tarkemmin sivulla 33 Edge preparation For details see page 33	U1	Nano viimeistely Tarkemmin sivulla 33 Edge preparation For details see page 33
F05	Materiaali Tarkemmin sivulla 35 Cutting material For details see page 35	F05	Materiaali Tarkemmin sivulla 35 Cutting material For details see page 35
14R	Pinnoite Tarkemmin sivulla 35 Coating For details see page 35	14R	Pinnoite Tarkemmin sivulla 35 Coating For details see page 35
1	1 = ohut pinnoite 2 = paksu pinnoite 1 = thin coating 2 = thick coating	1	1 = ohut pinnoite 2 = paksu pinnoite 1 = thin coating 2 = thick coating
Option	H* H = SD aihio (ilman merkintää perus aihio) H = SD blank (without H = regular blank)	H*	H = SD aihio (ilman merkintää perus aihio) H = SD blank (without H = regular blank)

* SD aihio "H" vain RX016 ja RX019 malleihin. Katso "URMA Reaming" luettelo

* SD blank "H" only for RX016 and RX019 see "URMA Reaming" catalogue

Tilaus esimerkki

Details Order Example

Poraustoleranssit ja soveltuva pinnoitteen paksuus

Bore Tolerances and Applicable Coating Thickness

	Toleranssin vaihteluväli Bore Tolerance Range	Pinnoittamaton Uncoated	Pinnoitteen paksuus Coating Thickness		Lisähinta tarkkuus toleranssista Surcharge for Tight Tolerances
			1	2	
Bore Diameter	$\geq 14 \mu\text{m}$	x	x	x	-
	10 – 13 μm	x	x		-
	6 – 9 μm	x		x	-

Esimerkki: Reiän halkaisija 20H7 = toleranssin vaihteluväli 21 μm =Example: Bore diameter 20H7 = tolerance range 21 μm =Reiän halkaisija 12 ± 0.005 = toleranssin vaihteluväli 11 μm =Bore diameter 12 ± 0.005 = tolerance range 11 μm =

Haluttu halkaisija (Q teräpala) ja soveltuva pinnoitteen paksuus

Target Size (Q-Insert) and Applicable Coating Thickness

	Teräpalkan toleranssi Insert Tolerance	Pinnoittamaton Uncoated	Pinnoitteen paksuus Coating Thickness		Lisähinta tarkkuus toleranssista Surcharge for Tight Tolerances
			1	2	
Insert Diameter	$\pm 4 \mu\text{m}$	N/A	N/A	x	-
	$\pm 3 \mu\text{m}$	N/A	x		-
	$\pm 2 \mu\text{m}$	x		x	-
	$\pm 1 \mu\text{m}$	x	N/A	N/A	x

N/A = Ei saatavilla

N/A = Not applicable

Hoonaus (nano viimeistely)

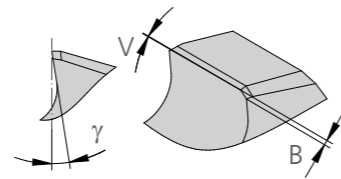
Edge preparation (Nano Finishing)

U1 Kevyt hoonaus
Light edge-preparation

U2 Medium hoonaus
Medium edge-preparation

U_ Muita viimeistelyjä pyydetessä
Other edge-preparations on request

Leikkuugeometriat
Cutting Geometries



vf	Geo	RXG	RXL	Bore type		fz mm	Ra μm	Zyl.	Pos	FC	MD					
	A0	▲		▲ (K1-K8)*	▲	REFERENCE VALUE										
	B0	□	▲	▲	□	↗	⬇	⊕	⊕	↗	↗					
	C0	▲		▲ (K1-K8)*	▲	↗	⬇	⊕	⊕	↗	↗					
	C1	▲		▲ (K1-K8)*	▲	↗	⬇	⊕	⊕	↗	↗					
	D0	□	▲	▲	□	↗	⬇	⊕	⊕	↗	↗					
	G0	▲		▲ (K1-K8)*	▲	↘	⊕	⬇	⬇	↘	↘					
	G1	▲		▲ (K1-K8)*	▲	↘	=	⬇	⬇	↘	↘					
	G1		□	▲												
	Geo	γ	B	V	W	ap mm	Ra μm	Zyl.	FC	MD						
	STANDARD GEOMETRY (REFERENCE VALUE)															
	_1	=	=	↘	=	=	=	=	↗	↗	=					
	_2	=	↘	=	=	↘	=	=	=	=	↘					
	_3	=	=	=	↘	=	⬇	=	↘	↘	=					
	_4	=	=	=	↘	=	=	=	↘	↘	=					
	_5	=	=	=	↘	=	=	=	↘	↘	=					
	_6	=	=	↗	=	=	=	=	↘	↘	=					
	_7	↗	=	↗	=	=	=	=	↘	↘	=					
	_8	=	↗	=	=	↗	=	=	=	↘	↘					
	Geo	γ	B	V	RXG	RXL	Bore type		ap mm	fz mm	Ra μm	Zyl.	Pos.	FC	MD	
	Special cutting geometries (surcharge)															
	REFERENCE GEOMETRY A01															
	S02	=	↗	=	■	□	▲	▲	↗	↘	=	⬇	⬇	↘	↘	
	S04	=	=	↗	■	□	▲	▲	=	↗	⬇	⬇	⊕	↘	↘	
	S08	=	=	=	■	□	▲	▲	↗	↘	⬇	⬇	⬇	↘	↘	
	S10	=	↗	↗	■	□	▲	▲	↗	↘	=	⬇	⬇	↘	↘	
	S12	=	↗	↗	■	□	▲	▲	↗	↘	=	⬇	⬇	↘	↘	
	S13	=	↗	↗	■	□	▲	▲	↗	↘	=	⬇	⬇	↘	↘	
	S14	=	↘	↗	■	□	▲	□	↘	↘	⬇	⊕	⊕	↘	↘	
	S15	=	=	↗	■	□	▲	▲	=	↘	⬇	⬇	⬇	↘	↘	
	S16	↗	↗	↗	■	□	▲	▲	↗	↘	=	⬇	⬇	↘	↘	

Määritelmät ja laskukaavat sivulla 86
See page 86 for definitions and basic formulas

* Materiaaliryhmät sivulla 88
* See page 88 for material group

- | | | | |
|---------------------|---------------------|-----------------------|------------------|
| B = Viisteen pituus | ▲ = Suositeltava | B = Chamfer length | ▲ = Recommended |
| V = Kartio | ■ = Käyttökelpoinen | V = Back taper | ■ = Applicable |
| W = Leveys | □ = Mahdollinen | W = Margin width | □ = Possible |
| FC = Leikkuvoima | ↗ = Suurempi arvo | FC = Cutting force | ↗ = Higher value |
| MD = Vääntömomentti | ↘ = Pienempi arvo | MD = Torque | ↘ = Lower value |
| γ = Teräkulma | ⬇ = Parempi | γ = Radial rake angle | ⬇ = Improved |
| vf = Syötön suunta | ⊕ = Huonompi | vf = Feed direction | ⊕ = Worse |

Työstömateriaalit
Cutting Materials overview

ISO Material Code	URMA Material Code	Materiaali Cutting Materials							Pinnoite Coating											
		URMA Code	F05	T15	B510	B520	BH15	DP30	00	01P_	05P_	07R_	08P_	12R_	14R_	17B_	18B_	10C	20C	21C
		HM / Carbide	Cermet	CBN	CBN	CBN	PKD / PCD	Uncoated	TiN	AlTiN	TiAlN + AlCrN	AlCrN	AlCrN	AlCrN	AlCrN	TiSiN	DLC	DLC	DLC	
P	P1	■	▲					▲	□											
	P2	■	▲					▲	□											
	P3	■	▲					▲	□											
	P4	■	▲					▲	□											
	P5	■	▲					▲	□											
	P6	▲						□	□											
	P7	▲						□	□											
M	M1	▲	□					□	□											
	M2	▲	□					□	□											
	M3	▲						□	□											
	M4	▲						□	□											
	M5	▲						□	□											
	M6	▲						□	□											
K	K1	▲		○				□												
	K2	▲		○				□												
	K3	▲	□		○			□												
	K4	▲	□		○			□												
	K5	▲			○			□												
	K6	▲			○			□												
	K7	▲						□												
	K8	▲						□												
N	N1	▲						○	□											
	N2	▲						○	□											
	N3	▲						○	□											
	N4	▲						○	□											
	N5	▲	□					○	□											
	N6	▲						○	□											
S	S1	▲						□	□											
	S2	▲						□	□											
	S3	▲						□	□											
	S4	▲						□	□											
	S11	▲						□	□											
	S12	▲						□	□											
	S14	▲						□	□											
H	H1	▲						○	□											
	H2	▲						○	□											
	H3	▲						○	□											
SM	SM1	■	▲					▲	□											
	SM2	▲	□					□	□											
	SM3	▲						□	□											
O	O1	▲	□					□												
	O2	▲	□					□												
	O3	▲						○	□											
	O4	▲						○	□											

- | | |
|---------------------|-----------------|
| ▲ = Suositeltava | ▲ = Recommended |
| ■ = Käyttökelpoinen | ■ = Applicable |
| □ = Mahdollinen | □ = Possible |
| ○ = Kysyttäessä | ○ = On request |

Leikkuarvot RX medium

Cutting Data RX medium

Läpireikä
Through Bore

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm
P	P1	1	RXL	B07	T1500	160-200-240	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
		2	RXL	B01	T1500	120-150-180	0.18-0.22-0.30			
		3	RXL	A07	F0512R1	80-110-140	0.12-0.16-0.20			
	P2	1	RXL	B07	T1500	160-200-240	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
		2	RXL	B01	T1500	120-150-180	0.18-0.22-0.30			
		3	RXL	A07	F0512R1	80-110-140	0.12-0.16-0.20			
	P3	1	RXL	B07	T1500	140-180-220	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
		2	RXL	B01	T1500	110-140-170	0.18-0.22-0.30			
		3	RXL	A07	F0512R1	80-100-120	0.12-0.16-0.20			
	P4	1	RXL	B01	T1500	140-180-220	0.18-0.22-0.30	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.15
		2	RXL	B07	F0512R1	110-140-170	0.16-0.20-0.28			
		3	RXL	A07	F0512R1	80-100-120	0.10-0.14-0.18			
	P5	1	RXL	B01	T1500	100-130-160	0.15-0.20-0.25	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		2	RXL	B07	F0512R1	100-125-150	0.15-0.18-0.22			
		3	RXL	A01	F0512R1	80-100-120	0.10-0.14-0.18			
	P6	1	RXL	B01	F0512R1	50-80-100	0.10-0.14-0.16	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	A01	F0512R1	40-70-90	0.08-0.10-0.12			
		3	RXL	A01	F0512R1	25-50-70	0.06-0.08-0.12			
	P7	1	RXL	A06	F0512R1	15-25-40	0.08-0.10-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	A06	F0512R1	15-20-30	0.06-0.08-0.12			
		3	RXL	A06	F0512R1	15-20-30	0.06-0.08-0.10			
M	M1	1	RXL	B07	F0512R1	50-80-100	0.15-0.20-0.25	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		2	RXL	B07	F0512R1	40-70-90	0.15-0.18-0.22			
		3	RXL	A07	F0512R1	25-50-70	0.12-0.14-0.18			
	M2	1	RXL	B07	F0512R1	50-80-100	0.15-0.20-0.25	0.05-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	B07	F0512R1	40-70-90	0.15-0.18-0.22			
		3	RXL	A07	F0512R1	25-50-70	0.12-0.14-0.18			
	M3	1	RXL	B07	F0512R1	40-60-80	0.10-0.14-0.16	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	B07	F0512R1	40-60-80	0.08-0.10-0.12			
		3	RXL	A07	F0512R1	25-40-70	0.06-0.08-0.12			
	M4	1	RXL	A07	F0512R1	25-40-60	0.08-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	A07	F0512R1	20-35-55	0.08-0.10-0.14			
		3	RXL	A07	F0512R1	20-30-50	0.08-0.10-0.14			
	M5	1	RXL	A07	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	A07	F0512R1	15-25-35	0.05-0.08-0.12			
		3	RXL	A07	F0512R1	10-18-30	0.05-0.08-0.12			
	M6	1	RXL	A07	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		2	RXL	A07	F0512R1	15-20-30	0.05-0.08-0.12			
		3	RXL	A07	F0512R1	10-18-30	0.05-0.08-0.12			



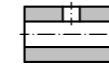
AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalan pituus < 6xD
 - Teräpalkan halkaisija > 35.601
 - Työkalan pituus < 5xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalan pituus < 9xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet
 - Epävaka kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalan pituus < 5xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 6xD
 - Insert diameter > 35.601 Tool projection length < 5xD
 - No optimal chip removal guaranteed
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 7xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available
- Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 9xD
 - Critical chip evacuation
 - Internal coolant supply available

Läpireikä (kevyesti hakkaava)
Through Bore with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal				
							ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm		
P	4	RXL	A06	T1500	160-200-240	0.16-0.20-0.25	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		5	RXL	A06	F0512R1	120-140-180					0.12-0.18-0.22
		6	RXL	A01	F0512R1	80-110-140					0.10-0.15-0.20
	4	RXL	A06	T1500	160-200-240	0.16-0.20-0.25	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		5	RXL	A06	F0512R1	120-140-180					0.12-0.18-0.22
		6	RXL	A01	F0512R1	80-110-140					0.10-0.15-0.20
	4	RXL	A06	T1500	140-180-220	0.16-0.20-0.25	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		5	RXL	A06	F0512R1	110-140-170					0.12-0.18-0.22
		6	RXL	A01	F0512R1	80-100-120					0.10-0.15-0.20
	4	RXL	A01	F0512R1	110-140-170	0.15-0.18-0.22	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.15	
		5	RXL	A01	F0512R1	110-140-170					0.12-0.16-0.22
		6	RXL	A01	F0512R1	80-100-120					0.10-0.12-0.18
	4	RXL	A01	F0512R1	100-120-160	0.15-0.18-0.22	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15	
		5	RXL	A01	F0512R1	100-120-150					0.12-0.16-0.22
		6	RXL	A01	F0512R1	80-100-120					0.10-0.12-0.18
	4	RXL	A01	F0512R1	50-80-100	0.08-0.10-0.12	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A01	F0512R1	40-70-90					0.06-0.08-0.12
		6	RXL	A01	F0512R1	25-50-70					0.04-0.08-0.10
	4	RXL	A06	F0512R1	15-25-40	0.06-0.08-0.12	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A06	F0512R1	15-20-30					0.06-0.08-0.12
		6	RXL	A06	F0512R1	15-20-30					0.04-0.08-0.10
M	4	RXL	A07	F0512R1	50-80-100	0.14-0.16-0.22	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15	
		5	RXL	A07	F0512R1	40-70-90					0.12-0.15-0.20
		6	RXL	A07	F0512R1	25-50-70					0.10-0.14-0.18
	4	RXL	A07	F0512R1	50-80-100	0.14-0.16-0.22	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A07	F0512R1	40-70-90					0.12-0.15-0.20
		6	RXL	A07	F0512R1	25-50-70					0.10-0.14-0.18
	4	RXL	A07	F0512R1	40-60-80	0.10-0.12-0.16	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A07	F0512R1	40-60-80					0.08-0.10-0.12
		6	RXL	A07	F0512R1	25-40-70					0.06-0.08-0.12
	4	RXL	A07	F0512R1	25-40-60	0.08-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A06	F0512R1	20-35-55					0.08-0.10-0.14
		6	RXL	A06	F0512R1	20-30-50					0.08-0.10-0.14
	4	RXL	A06	F0512R1	15-25-35	0.08-0.10-0.12	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A06	F0512R1	15-25-35					0.05-0.08-0.12
		6	RXL	A06	F0512R1	10-18-30					0.05-0.08-0.12
	4	RXL	A06	F0512R1	15-20-30	0.08-0.10-0.12	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		5	RXL	A06	F0512R1	15-20-30					0.05-0.08-0.12
		6	RXL	A06	F0512R1	10-18-30					0.05-0.08-0.12



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalan pituus < 6xD
 - Teräpalkan halkaisija > 35.601
 - Työkalan pituus < 5xD
 - Optimaalinen lastunpoisto taattu
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalan pituus < 7xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet
 - Epävaka kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalan pituus < 9xD
 - Hankala lastunpoisto
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 6xD
 - Insert diameter > 35.601 Tool projection length < 5xD
 - No optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 7xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available
- Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 9xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

Leikkuarvot RX medium Cutting Data RX medium



ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm
P	P1	1	RXG	A07	T1500	140-180-220	0.16-0.20-0.25			
		2	RXG	A06	T1500	120-140-180	0.12-0.18-0.22	0.05-0.08-0.12	0.08-0.10-0.15	0.08-0.10-0.15
		3	RXG	G01	F0512R1	80-110-140	0.08-0.12-0.18			
	P2	1	RXG	A07	T1500	140-180-220	0.16-0.20-0.25			
		2	RXG	A06	T1500	120-140-180	0.12-0.18-0.22	0.05-0.08-0.12	0.08-0.10-0.15	0.08-0.10-0.15
		3	RXG	G01	F0512R1	80-110-140	0.08-0.12-0.18			
	P3	1	RXG	A07	T1500	140-160-200	0.16-0.20-0.25			
		2	RXG	A06	F0512R1	100-130-160	0.12-0.18-0.22	0.05-0.08-0.12	0.08-0.10-0.15	0.08-0.10-0.15
		3	RXG	G01	F0512R1	80-100-120	0.08-0.12-0.18			
	P4	1	RXG	A01	T1500	140-160-200	0.15-0.18-0.22			
		2	RXG	A06	F0512R1	100-130-160	0.12-0.16-0.22	0.05-0.08-0.12	0.05-0.10-0.15	0.08-0.10-0.15
		3	RXG	G01	F0512R1	80-100-120	0.08-0.12-0.18			
	P5	1	RXG	A01	F0512R1	100-120-140	0.14-0.18-0.20			
		2	RXG	G01	F0512R1	90-110-130	0.12-0.16-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G01	F0512R1	80-100-120	0.08-0.12-0.18			
	P6	1	RXG	A01	F0512R1	50-80-100	0.10-0.15-0.18			
		2	RXG	G01	F0512R1	40-70-90	0.08-0.12-0.16	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G01	F0512R1	25-50-70	0.06-0.08-0.12			
P7	1	RXG	A06	F0512R1	15-25-40	0.08-0.12-0.16				
	2	RXG	G06	F0512R1	15-20-30	0.06-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
	3	RXG	G06	F0512R1	15-20-30	0.06-0.08-0.12				
M	M1	1	RXG	A07	F0512R1	50-80-100	0.12-0.15-0.20			
		2	RXG	A07	F0512R1	40-70-90	0.12-0.15-0.20	0.05-0.08-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		3	RXG	G07	F0512R1	25-50-70	0.10-0.14-0.18			
	M2	1	RXG	A07	F0512R1	50-80-100	0.12-0.15-0.20			
		2	RXG	A07	F0512R1	40-70-90	0.12-0.15-0.20	0.05-0.08-0.12	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G07	F0512R1	25-50-70	0.10-0.14-0.18			
	M3	1	RXG	A07	F0512R1	40-60-80	0.10-0.12-0.16			
		2	RXG	A07	F0512R1	40-60-80	0.08-0.10-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G07	F0512R1	25-40-70	0.06-0.08-0.12			
	M4	1	RXG	A07	F0512R1	25-40-60	0.08-0.10-0.14			
		2	RXG	A07	F0512R1	20-35-55	0.08-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G07	F0512R1	20-30-50	0.08-0.10-0.14			
	M5	1	RXG	A07	F0512R1	15-25-35	0.05-0.08-0.12			
		2	RXG	A07	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G07	F0512R1	15-25-35	0.05-0.08-0.12			
	M6	1	RXG	A06	F0512R1	15-20-30	0.05-0.08-0.12			
		2	RXG	A06	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	A06	F0512R1	15-20-30	0.05-0.08-0.12			



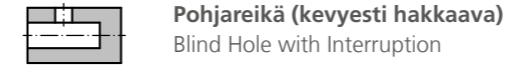
AC Työskentely olosuhteet

- Optimaaliset olosuhteet**
 - Tukeva kiinnitys, kone ja/tai kappale
 - Teräpalan halkaisija < 35.600
 - Työkalan pituus < 6xD
 - Teräpalan halkaisija > 35.601
 - Työkalan pituus < 5xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet**
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Teräpalan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalan halkaisija > 35.601
 - Työkalan pituus < 9xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet**
 - Epävaka kiinnitys, kone ja/tai kappale
 - Teräpalan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalan halkaisija > 35.601
 - Työkalan pituus < 5xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions**
 - Stable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 6xD
 - Insert diameter > 35.601 Tool projection length < 5xD
 - No optimal chip removal guarantee
 - Internal coolant supply > 20 bar
- Suboptimal conditions**
 - Slightly unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 7xD
 - No optimal chip removal guarantee
 - Internal coolant supply available
- Difficult conditions**
 - Unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 9xD
 - Critical chip evacuation
 - Internal coolant supply available



AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal			
							ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm	
P	4	RXG	A06	T1500	140-180-220	0.16-0.20-0.25				
		5	RXG	A06	F0512R1	120-140-180	0.12-0.18-0.22	0.05-0.08-0.12	0.08-0.10-0.15	0.08-0.10-0.15
		6	RXG	G11	F0512R1	80-110-140	0.08-0.12-0.18			
	5	4	RXG	A06	T1500	140-180-220	0.16-0.20-0.25			
		5	RXG	A06	F0512R1	120-140-180	0.12-0.18-0.22	0.05-0.08-0.12	0.08-0.10-0.15	0.08-0.10-0.15
		6	RXG	G11	F0512R1	80-110-140	0.08-0.12-0.18			
	6	4	RXG	A06	T1500	140-160-200	0.16-0.20-0.25			
		5	RXG	A06	F0512R1	100-130-160	0.12-0.18-0.22	0.05-0.08-0.12	0.08-0.10-0.15	0.08-0.10-0.15
		6	RXG	G11	F0512R1	80-100-120	0.08-0.12-0.18			
	7	4	RXG	A01	F0512R1	140-160-200	0.15-0.18-0.22			
		5	RXG	A06	F0512R1	100-130-160	0.12-0.16-0.22	0.05-0.08-0.12	0.05-0.10-0.15	0.08-0.10-0.15
		6	RXG	G11	F0512R1	80-100-120	0.08-0.12-0.18			
	8	4	RXG	A01	F0512R1	100-120-140	0.14-0.18-0.20			
		5	RXG	G11	F0512R1	90-110-130	0.12-0.16-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G11	F0512R1	80-100-120	0.08-0.12-0.18			
	9	4	RXG	A01	F0512R1	50-80-100	0.10-0.15-0.18			
		5	RXG	G11	F0512R1	40-70-90	0.08-0.12-0.16	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G11	F0512R1	25-50-70	0.06-0.08-0.12			
10	4	RXG	A06	F0512R1	15-25-40	0.08-0.12-0.16				
	5	RXG	G16	F0512R1	15-20-30	0.06-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
	6	RXG	G16	F0512R1	15-20-30	0.06-0.08-0.12				
M	4	RXG	A07	F0512R1	50-80-100	0.12-0.15-0.20				
		5	RXG	G17	F0512R1	40-70-90	0.10-0.14-0.18	0.05-0.08-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		6	RXG	G17	F0512R1	25-50-70	0.10-0.14-0.18			
	5	4	RXG	A07	F0512R1	50-80-100	0.12-0.15-0.20			
		5	RXG	G17	F0512R1	40-70-90	0.10-0.14-0.18	0.05-0.08-0.12	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G17	F0512R1	25-50-70	0.10-0.14-0.18			
	6	4	RXG	A07	F0512R1	40-60-80	0.10-0.12-0.16			
		5	RXG	G17	F0512R1	40-60-80	0.06-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G17	F0512R1	25-40-70	0.06-0.08-0.12			
	7	4	RXG	A07	F0512R1	25-40-60	0.08-0.10-0.14			
		5	RXG	G16	F0512R1	20-35-55	0.08-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G16	F0512R1	20-30-50	0.08-0.10-0.14			
	8	4	RXG	A07	F0512R1	15-25-35	0.05-0.08-0.12			
		5	RXG	G16	F0512R1	15-25-35	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G16	F0512R1	15-25-35	0.05-0.08-0.12			
	9	4	RXG	A07	F0512R1	15-20-30	0.05-0.08-0.12			
		5	RXG	G16	F0512R1	15-20-30	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G16	F0512R1	15-20-30	0.05-0.08-0.12			



AC Työskentely olosuhteet

- Optimaaliset olosuhteet**
 - Tukeva kiinnitys, kone ja/tai kappale
 - Teräpalan halkaisija < 35.600
 - Työkalan pituus < 6xD
 - Teräpalan halkaisija > 35.601
 - Työkalan pituus < 5xD
 - Optimaalinen lastunpoisto taattu
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet**
 - Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Teräpalan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalan halkaisija > 35.601
 - Työkalan pituus < 9xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla
- Vaikeat olosuhteet**
 - Epävaka kiinnitys, kone ja/tai kappale
 - Teräpalan halkaisija < 35.600
 - Työkalan pituus < 12xD
 - Teräpalan halkaisija > 35.601
 - Työkalan pituus < 9xD
 - Hankala lastunpoisto
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions**
 - Stable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 6xD
 - Insert diameter > 35.601 Tool projection length < 5xD
 - No optimal chip removal guarantee
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar
- Suboptimal conditions**
 - Slightly unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 7xD
 - No optimal chip removal guarantee
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available
- Difficult conditions**
 - Unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 9xD
 - No optimal chip removal guarantee
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

MATERIAL DETAILS PAGE 88

Leikkuarvot RX medium

Cutting Data RX medium

Läpireikä
Through Bore

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap	ap	ap
								Ø 11.900-23.600 mm	Ø 23.601-35.600 mm	Ø 35.601-140.600 mm
K	K1	1	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30			
		2	RXG	A04	F0514R2	80-110-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		3	RXG	G04	F0514R2	70-90-120	0.10-0.15-0.20			
	K2	1	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30			
		2	RXG	A04	F0514R2	80-110-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		3	RXG	G04	F0514R2	70-90-120	0.10-0.15-0.20			
	K3	1	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30			
		2	RXG	A01	F0514R2	100-120-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		3	RXG	G01	F0514R2	80-100-120	0.10-0.15-0.20			
	K4	1	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30			
		2	RXG	A01	F0514R2	100-120-140	0.12-0.18-0.25	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		3	RXG	G01	F0514R2	80-100-120	0.10-0.15-0.20			
	K5	1	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25			
		2	RXG	A01	F0514R2	60-80-100	0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		3	RXG	G01	F0514R2	50-70-90	0.10-0.12-0.18			
	K6	1	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25			
		2	RXG	A01	F0514R2	60-80-100	0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		3	RXG	G01	F0514R2	50-70-90	0.10-0.12-0.18			
	K7	1	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16			
		2	RXG	A01	F0512R1	40-60-80	0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXG	G01	F0512R1	25-40-70	0.08-0.10-0.12			
	K8	1	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16			
		2	RXG	A01	F0512R1	40-60-80	0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXG	G01	F0512R1	25-40-70	0.08-0.10-0.12			

N	N1	1	RXL	A07	F0510C	180-250-320	0.18-0.25-0.35			
		2	RXL	A07	F0510C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.15	0.08-0.10-0.15
		3	RXL	A07	F0510C	140-180-220	0.15-0.18-0.22			
	N2	1	RXL	A07	F0510C	180-250-320	0.18-0.25-0.35			
		2	RXL	A07	F0510C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.15	0.08-0.10-0.15
		3	RXL	A07	F0510C	140-180-220	0.15-0.18-0.22			
	N3	1	RXL	A07	F0520C	180-250-320	0.18-0.25-0.35			
		2	RXL	A07	F0520C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXL	A07	F0520C	140-180-220	0.12-0.16-0.20			
	N4	1	RXL	A07	F0520C	140-180-220	0.18-0.22-0.30			
		2	RXL	A07	F0520C	140-180-220	0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXL	A07	F0520C	140-160-200	0.12-0.16-0.20			
	N5	1	RXL	A07	F0520C	140-180-220	0.16-0.20-0.28			
		2	RXL	A07	F0520C	140-160-200	0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXL	A07	F0520C	120-140-180	0.12-0.16-0.20			
	N6	1	RXL	A07	F0520C	50-70-100	0.12-0.18-0.25			
		2	RXL	A07	F0520C	50-70-100	0.12-0.16-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXL	A07	F0520C	40-60-80	0.12-0.16-0.22			



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalun pituus < 6xD
 - Teräpalkan halkaisija > 35.601
 - Työkalun pituus < 5xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar

- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalun pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalun pituus < 7xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla

- Vaikeat olosuhteet
 - Epävakaa kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalun pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalun pituus < 9xD
 - Hankala lastunpoisto
 - Sisäinen jäähdytys saatavilla



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 6xD
 - Insert diameter > 35.601 Tool projection length < 5xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar

- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 7xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available

- Difficult conditions
 - Unstable fixture, machine and/or workpiece
 - Insert diameter < 35.600 Tool projection length < 12xD
 - Insert diameter > 35.601 Tool projection length < 9xD
 - Critical chip evacuation
 - Internal coolant supply available

Läpireikä (kevyesti hakkaava)
Through Bore with Interruption

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap	ap	ap
								Ø 11.900-23.600 mm	Ø 23.601-35.600 mm	Ø 35.601-140.600 mm
K	K1	4	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30			
		5	RXG	A04	F0514R2	80-110-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		6	RXG	G04	F0514R2	70-90-120	0.10-0.15-0.20			
	K2	4	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30			
		5	RXG	A04	F0514R2	80-110-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		6	RXG	G04	F0514R2	70-90-120	0.10-0.15-0.20			
	K3	4	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30			
		5	RXG	A01	F0514R2	100-120-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		6	RXG	G01	F0514R2	80-100-120	0.10-0.15-0.20			
	K4	4	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30			
		5	RXG	A01	F0514R2	100-120-140	0.12-0.18-0.25	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		6	RXG	G01	F0514R2	80-100-120	0.10-0.15-0.20			
	K5	4	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25			
		5	RXG	A01	F0514R2	60-80-100	0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		6	RXG	G11	F0514R2	50-70-90	0.10-0.12-0.18			
	K6	4	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25			
		5	RXG	A01	F0514R2	60-80-100	0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		6	RXG	G11	F0514R2	50-70-90	0.10-0.12-0.18			
	K7	4	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16			
		5	RXG	A01	F0512R1	40-60-80	0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	G11	F0512R1	25-40-70	0.08-0.10-0.12			
	K8	4	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16			
		5	RXG	A01	F0512R1	40-60-80	0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	G11	F0512R1	25-40-70	0.08-0.10-0.12			

K	K1	4	RXL	A07	F0510C	180-250-320	0.18-0.25-0.35			
		5	RXL	A07	F0510C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.15	0.08-0.10-0.15
		6	RXL	A07	F0510C	140-180-220	0.12-0.16-0.20			
	K2	4	RXL	A07	F0510C	180-250-320	0.18-0.25-0.35			
		5	RXL	A07	F0510C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.15	0.08-0.10-0.15
		6	RXL	A07	F0510C	140-180-220	0.12-0.16-0.20			
	K3	4	RXL	A07	F0520C	180-250-320	0.18-0.25-0.35			
		5	RXL	A07	F0520C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXL	A07	F0520C	140-180-220	0.12-0.16-0.20			
	K4	4	RXL	A07	F0520C	140-180-220	0.18-0.22-0.30			
		5	RXL	A07	F0520C	140-180-220	0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXL	A07	F0520C	140-160-200	0.12-0.16-0.20			
	K5	4	RXL	A07	F0520C	140-180-220	0.16-0.20-0.28			
		5	RXL	A07	F0520C	140-160-200	0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	A07	F0520C	120-140-180	0.12-0.16-0.20			
	K6	4	RXL	A07	F0520C	50-70-100	0.12-0.18-0.25			
		5	RXL	A07	F0520C	50-70-100	0.12-0.16-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	A07	F0520C	40-60-80	0.10-0.14-0.20			



AC Työskentely olosuhteet

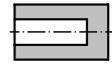
- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalun pituus < 6xD
 - Teräpalkan halkaisija > 35.601
 - Työkalun pituus < 5xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar

- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalun pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalun pituus < 7xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

- Vaikeat olosuhteet
 - Epävakaa kiinnitys, kone ja/tai kappale
 - Teräpalkan halkaisija < 35.600
 - Työkalun pituus < 12xD
 - Teräpalkan halkaisija > 35.601
 - Työkalun pituus < 9xD
 - Hankala lastunpoisto
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

Leikkuarvot RX medium

Cutting Data RX medium

Pohjareikä
Blind Hole

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm
K	K1	1	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30			
		2	RXG	A04	F0514R2	80-110-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		3	RXG	G04	F0514R2	70-90-120	0.10-0.15-0.20			
	K2	1	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30			
		2	RXG	A04	F0514R2	80-110-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		3	RXG	G04	F0514R2	70-90-120	0.10-0.15-0.20			
	K3	1	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30			
		2	RXG	A01	F0514R2	100-120-140	0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		3	RXG	G01	F0514R2	80-100-120	0.10-0.15-0.20			
	K4	1	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30			
		2	RXG	A01	F0514R2	100-120-140	0.12-0.18-0.25	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		3	RXG	G01	F0514R2	80-100-120	0.10-0.15-0.20			
	K5	1	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25			
		2	RXG	A01	F0514R2	60-80-100	0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		3	RXG	G01	F0514R2	50-70-90	0.10-0.12-0.18			
	K6	1	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25			
		2	RXG	A01	F0514R2	60-80-100	0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		3	RXG	G01	F0514R2	50-70-90	0.10-0.12-0.18			
	K7	1	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16			
		2	RXG	A01	F0512R1	40-60-80	0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXG	G01	F0512R1	25-40-70	0.08-0.10-0.12			
	K8	1	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16			
		2	RXG	A01	F0512R1	40-60-80	0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXG	G01	F0512R1	25-40-70	0.08-0.10-0.12			

N	N1	1	RXG	A07	F0510C	180-250-320	0.18-0.25-0.35			
		2	RXG	A07	F0510C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		3	RXG	G07	F0510C	140-180-220	0.12-0.16-0.20			
	N2	1	RXG	A07	F0510C	180-250-320	0.18-0.25-0.35			
		2	RXG	A07	F0510C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		3	RXG	G07	F0510C	140-180-220	0.12-0.16-0.20			
	N3	1	RXG	A07	F0520C	180-250-320	0.18-0.25-0.35			
		2	RXG	A07	F0520C	160-220-280	0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15
		3	RXG	G07	F0520C	140-180-220	0.12-0.16-0.20			
	N4	1	RXG	A07	F0520C	140-180-220	0.18-0.22-0.30			
		2	RXG	A07	F0520C	140-180-220	0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15
		3	RXG	G07	F0520C	140-160-200	0.12-0.16-0.20			
	N5	1	RXG	A07	F0520C	140-180-220	0.16-0.20-0.28			
		2	RXG	A07	F0520C	140-160-200	0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	RXG	G07	F0520C	120-140-180	0.12-0.16-0.20			
	N6	1	RXG	A07	F0520C	50-70-100	0.12-0.18-0.25			
		2	RXG	A07	F0520C	50-70-100	0.12-0.16-0.22	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		3	RXG	G07	F0520C	40-60-80	0.10-0.14-0.20			



AC Työskentelyolosuhteet

1 Optimaaliset olosuhteet

- Tukeva kiinnitys, kone ja/tai kappale
- Teräpalkan halkaisija < 35.600
- Työkalun pituus < 6xD
- Teräpalkan halkaisija > 35.601
- Työkalun pituus < 5xD
- Optimaalinen lastunpoisto taattu
- Sisäinen jäähdytyspaine > 20 bar

2 Normaaliset olosuhteet

- Hiukan epävakaa kiinnitys, kone ja/tai kappale
- Teräpalkan halkaisija < 35.600
- Työkalun pituus < 12xD
- Teräpalkan halkaisija > 35.601
- Työkalun pituus < 9xD
- Optimaalista lastunpoistoa ei voida taata
- Sisäinen jäähdytys saatavilla

3 Vaikeat olosuhteet

- Epävakaa kiinnitys, kone ja/tai kappale
- Teräpalkan halkaisija < 35.600
- Työkalun pituus < 12xD
- Teräpalkan halkaisija > 35.601
- Työkalun pituus < 9xD
- Hankala lastunpoisto
- Sisäinen jäähdytys saatavilla



AC Application Conditions

1 Optimal conditions

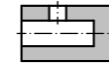
- Stable fixture, machine and/or workpiece
- Insert diameter < 35.600 Tool projection length < 6xD
- Insert diameter > 35.601 Tool projection length < 5xD
- Optimal chip removal guaranteed
- Internal coolant supply > 20 bar

2 Suboptimal conditions

- Slightly unstable fixture, machine and/or workpiece
- Insert diameter < 35.600 Tool projection length < 12xD
- Insert diameter > 35.601 Tool projection length < 7xD
- No optimal chip removal guaranteed
- Internal coolant supply available

3 Difficult conditions

- Unstable fixture, machine and/or workpiece
- Insert diameter < 35.600 Tool projection length < 12xD
- Insert diameter > 35.601 Tool projection length < 9xD
- Critical chip evacuation
- Internal coolant supply available

Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal				
							ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm		
K	4	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%				
		5	RXG	A04	F0514R2	80-110-140		0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		6	RXG	G04	F0514R2	70-90-120		0.10-0.15-0.20			
	4	RXG	A04	F0514R2	90-120-160	0.16-0.22-0.30					
		5	RXG	A04	F0514R2	80-110-140		0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		6	RXG	G04	F0514R2	70-90-120		0.10-0.15-0.20			
	4	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30					
		5	RXG	A01	F0514R2	100-120-140		0.12-0.18-0.25	0.10-0.15-0.20	0.10-0.15-0.20	0.10-0.15-0.25
		6	RXG	G01	F0514R2	80-100-120		0.10-0.15-0.20			
	4	RXG	A01	F0514R2	120-140-180	0.16-0.22-0.30					
		5	RXG	A01	F0514R2	100-120-140		0.12-0.18-0.25	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		6	RXG	G01	F0514R2	80-100-120		0.10-0.15-0.20			
	4	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25					
		5	RXG	A01	F0514R2	60-80-100		0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		6	RXG	G11	F0514R2	50-70-90		0.10-0.12-0.18			
	4	RXG	A01	F0514R2	60-80-100	0.12-0.18-0.25					
		5	RXG	A01	F0514R2	60-80-100		0.10-0.15-0.20	0.08-0.10-0.15	0.10-0.15-0.20	0.10-0.15-0.20
		6	RXG	G11	F0514R2	50-70-90		0.10-0.12-0.18			
	4	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16					
		5	RXG	A01	F0512R1	40-60-80		0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	G11	F0512R1	25-40-70		0.08-0.10-0.12			
	4	RXG	A01	F0512R1	40-60-80	0.10-0.14-0.16					
		5	RXG	A01	F0512R1	40-60-80		0.10-0.12-0.14	0.08-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	G11	F0512R1	25-40-70		0.08-0.10-0.12			

K	4	RXG	A07	F0510C	180-250-320	0.18-0.25-0.35	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%				
		5	RXG	A07	F0510C	160-220-280		0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		6	RXG	G07	F0510C	140-180-220		0.12-0.16-0.20			
	4	RXG	A07	F0510C	180-250-320	0.18-0.25-0.35					
		5	RXG	A07	F0510C	160-220-280		0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.12	0.08-0.10-0.15
		6	RXG	G07	F0510C	140-180-220		0.12-0.16-0.20			
	4	RXG	A07	F0520C	180-250-320	0.18-0.25-0.35					
		5	RXG	A07	F0520C	160-220-280		0.18-0.22-0.30	0.05-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15
		6	RXG	G07	F0520C	140-180-220		0.12-0.16-0.20			
	4	RXG	A07	F0520C	140-180-220	0.18-0.22-0.30					
		5	RXG	A07	F0520C	140-180-220		0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15
		6	RXG	G07	F0520C	140-160-200		0.12-0.16-0.20			
	4	RXG	A07	F0520C	140-180-220	0.16-0.20-0.28					
		5	RXG	A07	F0520C	140-160-200		0.16-0.20-0.28	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	RXG	G07	F0520C	120-140-180		0.12-0.16-0.20			
	4	RXG	A07	F0520C	50-70-100	0.12-0.18-0.25					
		5	RXG	A07	F0520C	50-70-100		0.12-0.16-0.22	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
		6	RXG	G07	F0520C	40-60-80		0.10-0.14-0.20			



AC Työskentelyolosuhteet

4 Optimaaliset olosuhteet

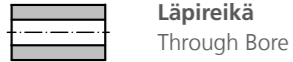
- Tukeva kiinnitys, kone ja/tai kappale
- Teräpalkan halkaisija < 35.600
- Työkalun pituus < 6xD
- Teräpalkan halkaisija > 35.601
- Työkalun pituus < 5xD
- Optimaalinen lastunpoisto taattu
- Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
- Sisäinen jäähdytyspaine > 20 bar

5 Normaaliset olosuhteet

- Hiukan epävakaa kiinnitys, kone ja/tai kappale
- Teräpalkan halkaisija < 35.600
- Työkalun pituus < 12xD
- Teräpalkan halkaisija > 35.601
- Työkalun pituus < 9xD
- Optimaalista lastunpoistoa ei voida taata
- Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
- Sisäinen jäähdytys saatavilla

Leikkuarvot RX medium

Cutting Data RX medium



Läpireikä
Through Bore

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal			
								ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm	
S	S1	1	RXL	A07	F0512R1	20-35-45	0.06-0.10-0.14				
		2	RXL	A07	F0512R1	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		3	RXL	A07	F0512R1	15-25-35	0.06-0.10-0.14				
	S2	1	RXL	A07	F0512R1	20-30-45	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	RXL	A07	F0512R1	20-30-45	0.05-0.08-0.12				
		3	RXL	A07	F0512R1	15-25-35	0.05-0.08-0.12				
	S3	1	RXL	A07	F0512R1	15-20-35	0.06-0.10-0.12	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXL	A07	F0512R1	10-18-30	0.05-0.08-0.10				
		3	RXL	A07	F0512R1	8-15-25	0.05-0.08-0.10				
	S4	1	RXL	A07	F0512R1	12-18-25	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXL	A07	F0512R1	8-15-20	0.05-0.08-0.10				
		3	RXL	A07	F0512R1	5-12-20	0.05-0.08-0.10				
	S11	S11	1	RXL	A07	F0512R1	20-40-60	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
			2	RXL	A07	F0512R1	20-35-45	0.06-0.10-0.14			
3			RXL	A07	F0512R1	15-25-30	0.06-0.10-0.14				
S12		1	RXL	A07	F0512R1	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	RXL	A07	F0512R1	20-30-45	0.06-0.10-0.14				
		3	RXL	A07	F0512R1	15-25-30	0.06-0.10-0.14				
S13		1	RXL	A07	F0512R1	20-30-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	RXL	A07	F0512R1	15-25-30	0.05-0.08-0.10				
		3	RXL	A07	F0512R1	10-18-30	0.05-0.08-0.10				
S14		1	RXL	A07	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXL	A07	F0512R1	10-18-25	0.05-0.08-0.10				
		3	RXL	A07	F0512R1	8-15-20	0.05-0.08-0.10				
H	H1	1	RXL	A06	F0507R1	15-25-30	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXL	A06	F0507R1	10-18-25	0.04-0.06-0.08				
		3	RXL	A06	F0507R1	8-15-20	0.04-0.06-0.08				
	H2	1	RXL	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.05-0.08	0.05-0.08	0.05-0.08-0.10	
		2	RXL	A06	F0507R1	8-15-20	0.04-0.06-0.08				
		3	RXL	A06	F0507R1	8-15-20	0.04-0.06-0.08				
	H3	1	RXL	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08	0.05-0.08-0.10	
		2	RXL	A06	F0507R1	8-10-15	0.03-0.05-0.07				
		3	RXL	A06	F0507R1	8-10-15	0.03-0.05-0.07				
SM	SM1	1	RXL	B07	T1500	140-180-220	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	B07	T1500	110-140-170	0.18-0.22-0.30				
		3	RXL	A07	T1500	80-100-120	0.12-0.16-0.20				
	SM2	1	RXL	B07	F0512R1	120-140-160	0.18-0.22-0.30	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	B07	F0512R1	100-120-150	0.15-0.20-0.25				
		3	RXL	A07	F0512R1	80-100-120	0.12-0.15-0.20				
	SM3	1	RXL	A07	F0512R1	40-60-80	0.10-0.12-0.18	0.08-0.10-0.12	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	A07	F0512R1	40-60-80	0.08-0.10-0.16				
		3	RXL	A07	F0512R1	25-40-70	0.06-0.08-0.14				
O	O1	1	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20				
		3	RXL	A07	F0510C	40-60-80	0.10-0.13-0.16				
	O2	1	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20				
		3	RXL	A07	F0510C	40-60-80	0.10-0.13-0.16				
	O3	1	RXL	A07	F0520C	40-50-60	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	A07	F0520C	40-50-60	0.10-0.15-0.20				
		3	RXL	A07	F0520C	40-50-60	0.10-0.13-0.16				
	O4	1	RXL	A07	F0520C	30-50-60	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXL	A07	F0520C	30-50-60	0.05-0.08-0.10				
		3	RXL	A07	F0520C	30-50-60	0.05-0.08-0.10				



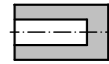
Läpireikä (kevyesti hakkaava)
Through Bore with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal			
							ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm	
4	RXL	A06	F0512R1	20-35-45	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
5	RXL	A06	F0512R1	20-35-45	0.06-0.10-0.14					
6	RXL	A06	F0512R1	15-25-35	0.06-0.10-0.14					
4	RXL	A06	F0512R1	20-30-45	0.06-0.10-0.12					
5	RXL	A06	F0512R1	20-30-45	0.05-0.08-0.12					
6	RXL	A06	F0512R1	15-25-35	0.05-0.08-0.12					
4	RXL	A06	F0512R1	15-20-35	0.06-0.10-0.12					
5	RXL	A06	F0512R1	10-18-30	0.05-0.08-0.10					
6	RXL	A06	F0512R1	8-15-25	0.05-0.08-0.10					
4	RXL	A06	F0512R1	12-18-25	0.05-0.08-0.10					
5	RXL	A06	F0512R1	8-15-20	0.05-0.08-0.10					
6	RXL	A06	F0512R1	5-12-20	0.05-0.08-0.10					
4	RXL	A06	F0512R1	20-40-60	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
5	RXL	A06	F0512R1	20-35-45	0.06-0.10-0.14					
6	RXL	A06	F0512R1	15-25-30	0.06-0.10-0.14					
4	RXL	A06	F0512R1	20-35-45	0.06-0.10-0.14					
5	RXL	A06	F0512R1	20-30-45	0.06-0.10-0.14					
6	RXL	A06	F0512R1	15-25-30	0.06-0.10-0.14					
4	RXL	A06	F0512R1	20-30-45	0.06-0.10-0.14					
5	RXL	A06	F0512R1	15-25-30	0.05-0.08-0.10					
6	RXL	A06	F0512R1	10-18-30	0.05-0.08-0.10					
4	RXL	A06	F0512R1	15-20-30	0.05-0.08-0.10					
5	RXL	A06	F0512R1	10-18-25	0.05-0.08-0.10					
6	RXL	A06	F0512R1	8-15-20	0.05-0.08-0.10					
4	RXL	A06	F0507R1	15-25-30	0.04-0.06-0.08	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
5	RXL	A06	F0507R1	10-18-25	0.04-0.06-0.08					
6	RXL	A06	F0507R1	8-15-20	0.04-0.06-0.08					
4	RXL	A06	F0507R1	10-18-25	0.04-0.06-0.08					
5	RXL	A06	F0507R1	8-15-20	0.04-0.06-0.08					
6	RXL	A06	F0507R1	8-15-20	0.04-0.06-0.08					
4	RXL	A06	F0507R1	8-10-15	0.03-0.05-0.07					
5	RXL	A06	F0507R1	8-10-15	0.03-0.05-0.07					
6	RXL	A06	F0507R1	8-10-15	0.03-0.05-0.07					
4	RXL	A07	T1500	140-180-220	0.18-0.22-0.30		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	RXL	A06	T1500	110-140-170	0.15-0.20-0.25					
6	RXL	A06	F0512R1	80-100-120	0.12-0.16-0.20					
4	RXL	A07	F0512R1	120-140-160	0.15-0.20-0.25					
5	RXL	A06	F0512R1	100-120-150	0.12-0.18-0.22					
6	RXL	A01	F0512R1	80-100-120	0.12-0.15-0.20					
4	RXL	A06	F0512R1	40-60-80	0.10-0.12-0.18					
5	RXL	A06	F0512R1	40-60-80	0.08-0.10-0.16					
6	RXL	A01	F0512R1	25-40-70	0.06-0.08-0.14					
4	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%		0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20					
6	RXL	A07	F0510C	40-60-80	0.10-0.13-0.16					
4	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20					
5	RXL	A07	F0510C	40-60-80	0.10-0.15-0.20					
6	RXL	A07	F0510C	40-60-80	0.10-0.13-0.16					
4	RXL	A07	F0520C	40-50-60	0.10-0.15-0.20					
5	RXL	A07	F0520C	40-50-60	0.10-0.15-0.20					
6	RXL	A07	F0520C	40-50-60	0.10-0.13-0.16					
4	RXL	A07	F0520C	30-50-60	0.05-0.08-0.10					
5	RXL	A07	F0520C	30-50-60	0.05-0.08-0.10					
6	RXL	A07	F0520C	30-50-60	0.05-0.08-0.10					

MATERIAL DETAILS PAGE 90/91

Leikkuarvot RX medium

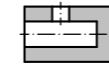
Cutting Data RX medium



Pohjareikä
Blind Hole



ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal			
								ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm	
S	S1	1	RXG	A07	F0512R1	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12	
		2	RXG	A07	F0512R1	20-35-45	0.06-0.10-0.14				
		3	RXG	A07	F0512R1	15-25-35	0.06-0.10-0.14				
	S2	1	RXG	A07	F0512R1	20-30-45	0.06-0.10-0.12	0.05-0.08	0.05-0.08-0.10	0.05-0.10-0.12	
		2	RXG	A07	F0512R1	20-30-45	0.05-0.08-0.12				
		3	RXG	A07	F0512R1	15-25-35	0.05-0.08-0.12				
	S3	1	RXG	A07	F0512R1	15-20-35	0.06-0.10-0.12	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXG	A07	F0512R1	10-18-30	0.05-0.08-0.10				
		3	RXG	A07	F0512R1	8-15-25	0.05-0.08-0.10				
	S4	1	RXG	A07	F0512R1	12-18-25	0.05-0.08-0.10	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXG	A07	F0512R1	8-15-20	0.05-0.08-0.10				
		3	RXG	A07	F0512R1	5-12-20	0.05-0.08-0.10				
	S	S11	1	RXG	A07	F0512R1	20-40-60	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12
			2	RXG	A07	F0512R1	20-35-45	0.06-0.10-0.14			
3			RXG	A07	F0512R1	15-25-30	0.06-0.10-0.14				
S12		1	RXG	A07	F0512R1	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12	
		2	RXG	A07	F0512R1	20-30-45	0.06-0.10-0.14				
		3	RXG	A07	F0512R1	15-25-30	0.06-0.10-0.14				
S13		1	RXG	A07	F0512R1	20-30-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12	
		2	RXG	A07	F0512R1	15-25-30	0.05-0.08-0.10				
		3	RXG	A07	F0512R1	10-18-30	0.05-0.08-0.10				
S14		1	RXG	A07	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXG	A07	F0512R1	10-18-25	0.05-0.08-0.10				
		3	RXG	A07	F0512R1	8-15-20	0.05-0.08-0.10				
H	H1	1	RXG	A06	F0507R1	15-25-30	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	RXG	G06	F0507R1	10-18-25	0.04-0.06-0.08				
		3	RXG	G06	F0507R1	8-15-20	0.04-0.06-0.08				
	H2	1	RXG	A06	F0507R1	10-18-25	0.04-0.06-0.08	0.05-0.08	0.05-0.08	0.05-0.08-0.10	
		2	RXG	G06	F0507R1	8-15-20	0.04-0.06-0.08				
		3	RXG	G06	F0507R1	8-15-20	0.04-0.06-0.08				
H3	1	RXG	A06	F0507R1	8-10-15	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08	0.05-0.08-0.10		
	2	RXG	G06	F0507R1	8-10-15	0.03-0.05-0.07					
	3	RXG	G06	F0507R1	8-10-15	0.03-0.05-0.07					
SM	SM1	1	RXG	A07	T1500	140-180-220	0.18-0.22-0.30	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	A07	T1500	110-140-170	0.15-0.20-0.25				
		3	RXG	G07	T1500	80-100-120	0.10-0.16-0.20				
	SM2	1	RXG	A07	F0512R1	120-140-160	0.15-0.20-0.25	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	A07	F0512R1	100-120-150	0.12-0.18-0.22				
		3	RXG	G07	F0512R1	80-100-120	0.10-0.15-0.20				
	SM3	1	RXG	A07	F0512R1	40-60-80	0.10-0.12-0.18	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	A07	F0512R1	40-60-80	0.08-0.10-0.16				
		3	RXG	G07	F0512R1	25-40-70	0.06-0.08-0.14				
O	O1	1	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20				
		3	RXG	G07	F0510C	40-60-80	0.10-0.13-0.16				
	O2	1	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20				
		3	RXG	G07	F0510C	40-60-80	0.10-0.13-0.16				
	O3	1	RXG	G07	F0520C	40-50-60	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	G07	F0520C	40-50-60	0.10-0.15-0.20				
		3	RXG	G07	F0520C	40-50-60	0.10-0.13-0.16				
	O4	1	RXG	G07	F0520C	30-50-60	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	RXG	G07	F0520C	30-50-60	0.05-0.08-0.10				
		3	RXG	G07	F0520C	30-50-60	0.05-0.08-0.10				



Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption



AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal			
							ap Ø 11.900-23.600 mm	ap Ø 23.601-35.600 mm	ap Ø 35.601-140.600 mm	
4	RXG	A06	F0512R1	20-35-45	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12	
5	RXG	A06	F0512R1	20-35-45	0.06-0.10-0.14					
6	RXG	A06	F0512R1	15-25-35	0.06-0.10-0.14					
4	RXG	A06	F0512R1	20-30-45	0.06-0.10-0.12		0.05-0.08	0.05-0.08-0.10	0.05-0.10-0.12	
5	RXG	A06	F0512R1	20-30-45	0.05-0.08-0.12					
6	RXG	A06	F0512R1	15-25-35	0.05-0.08-0.12					
4	RXG	A06	F0512R1	15-20-35	0.06-0.10-0.12		0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
5	RXG	A06	F0512R1	10-18-30	0.05-0.08-0.10					
6	RXG	A06	F0512R1	8-15-25	0.05-0.08-0.10					
4	RXG	A06	F0512R1	12-18-25	0.05-0.08-0.10		0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
5	RXG	A06	F0512R1	8-15-20	0.05-0.08-0.10					
6	RXG	A06	F0512R1	5-12-20	0.05-0.08-0.10					
4	RXG	A06	F0512R1	20-40-60	0.06-0.10-0.14		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12
5	RXG	A06	F0512R1	20-35-45	0.06-0.10-0.14					
6	RXG	A06	F0512R1	15-25-30	0.06-0.10-0.14					
4	RXG	A06	F0512R1	20-35-45	0.06-0.10-0.14			0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.10-0.12
5	RXG	A06	F0512R1	20-30-45	0.06-0.10-0.14					
6	RXG	A06	F0512R1	15-25-30	0.06-0.10-0.14					
4	RXG	A06	F0512R1	20-30-45	0.06-0.10-0.14	0.05-0.08-0.10		0.05-0.08-0.10	0.05-0.10-0.12	
5	RXG	A06	F0512R1	15-25-30	0.05-0.08-0.10					
6	RXG	A06	F0512R1	10-18-30	0.05-0.08-0.10					
4	RXG	A06	F0512R1	15-20-30	0.05-0.08-0.10	0.05-0.08		0.05-0.08-0.10	0.05-0.08-0.10	
5	RXG	A06	F0512R1	10-18-25	0.05-0.08-0.10					
6	RXG	A06	F0512R1	8-15-20	0.05-0.08-0.10					
4	RXG	A06	F0507R1	15-25-30	0.04-0.06-0.08	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%		0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10
5	RXG	A06	F0507R1	10-18-25	0.04-0.06-0.08					
6	RXG	G06	F0507R1	8-15-20	0.04-0.06-0.08					
4	RXG	A06	F0507R1	10-18-25	0.04-0.06-0.08			0.05-0.08	0.05-0.08	0.05-0.08-0.10
5	RXG	A06	F0507R1	8-15-20	0.04-0.06-0.08					
6	RXG	G06	F0507R1	8-15-20	0.04-0.06-0.08					
4	RXG	A06	F0507R1	8-10-15	0.03-0.05-0.07		0.04-0.05-0.06	0.05-0.08	0.05-0.08-0.10	
5	RXG	G06	F0507R1	8-10-15	0.03-0.05-0.07					
6	RXG	G06	F0507R1	8-10-15	0.03-0.05-0.07					
4	RXG	A07	T1500	140-180-220	0.18-0.22-0.30		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.20
5	RXG	A06	T1500	110-140-170	0.15-0.20-0.25					
6	RXG	G11	F0512R1	80-100-120	0.10-0.16-0.20					
4	RXG	A07	F0512R1	120-140-160	0.15-0.20-0.25			0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.20
5	RXG	A06	F0512R1	100-120-150	0.12-0.18-0.22					
6	RXG	G11	F0512R1	80-100-120	0.10-0.15-0.20					
4	RXG	A06	F0512R1	40-60-80	0.10-0.12-0.18			0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.20
5	RXG	A06	F0512R1	40-60-80	0.08-0.10-0.16					
6	RXG	G11	F0512R1	25-40-70	0.06-0.08-0.14					
4	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%		0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20					
6	RXG	G07	F0510C	40-60-80	0.10-0.13-0.16					
4	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20			0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	RXG	G07	F0510C	40-60-80	0.10-0.15-0.20					
6	RXG	G07	F0510C	40-60-80	0.10-0.13-0.16					
4	RXG	G07	F0520C	40-50-60	0.10-0.15-0.20			0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	RXG	G07	F0520C	40-50-60	0.10-0.15-0.20					
6	RXG	G07	F0520C	40-50-60	0.10-0.13-0.16					
4	RXG	G07	F0520C	30-50-60	0.05-0.08-0.10		0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
5	RXG	G07	F0520C	30-50-60	0.05-0.08-0.10					
6	RXG	G07	F0520C	30-50-60	0.05-0.08-0.10					

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Ø 11.900 – 140.600 mm



Käyttöohje RX medium

Handling Manual RX medium

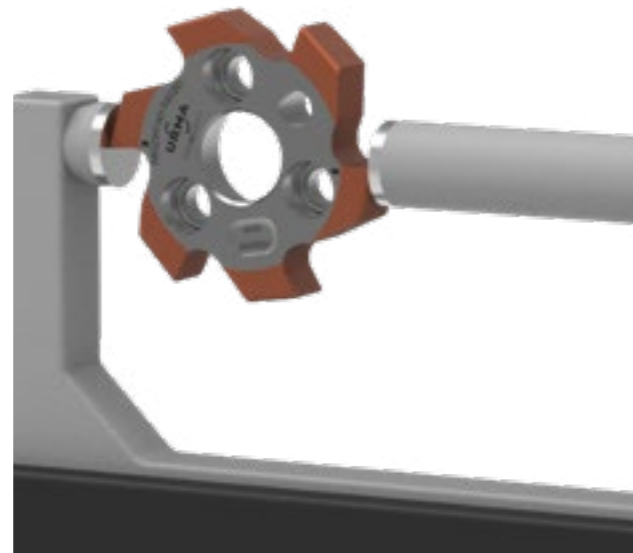
Teräpalojen vaihto

1. Älä irroita työkaluvartta teräpalan pitimestä.
2. Puhdista teräpalan pitimen lyhyt kartio ja tarkasta mahdolliset vauriot.
3. Aseta uusi teräpala paikoilleen (huomioi kohdistustappi) ja kiristä varovasti kiinnitysruuvit.
4. Mikäli mahdollista, käytä Torx®-ruuvinväännintä ruuvien kiristämiseen ristikkäin (katso kiristysmomenttien taulukko).

Inserts Change

1. Do not take the shank out of the tool holder. Remove clamping screws and used reaming insert.
2. Clean short taper of the shank carefully and check for possible damages.
3. Set new insert in position (pay attention to the positioning pin) and slightly tighten the clamping screws.
4. Use the recommended Torx®-torque screw driver to tighten the screws crosswise. (See torque chart).

RX medium Parameter	Standard Insert Holder		SD Insert Holder	
	Torx® Dimension	Torque	Torx® Dimension	Torque
RX 016	6	0.9 Nm	15	4 Nm
RX 019	6	0.9 Nm	20	6 Nm
RX 024	8	1.5 Nm	30	16 Nm
RX 029	8	1.5 Nm	30	16 Nm
RX 036	8	1.5 Nm	30	18 Nm
RX 044	8	1.5 Nm		
RX 052	8	1.5 Nm		
RX 061	8	1.5 Nm		
RX 081	15	3.5 Nm		
RX 101	15	3.5 Nm		
RX 121	15	3.5 Nm		
RX 141	15	3.5 Nm		



Teräpalan halkaisijan mittaaminen

RX medium teräpaloissa on epäsäännöllinen nousu. Halkaisijan mittaamiseksi aseta kaksi merkittyä leikkuuhammasta samaan linjaan. Mittaa suoraan viistetystä kulmasta, koska teräpalat on hiottu kartiomaisiksi.

Measuring of Insert Diameter

RX medium inserts are unequally spaced. To measure the diameter, line up the two marked cutting edges. Measure directly at the chamfer because the inserts are ground with taper.

Ø 11.900 – 140.600 mm



Käyttöohje RX medium

Handling Manual RX medium

Ø < 0.005

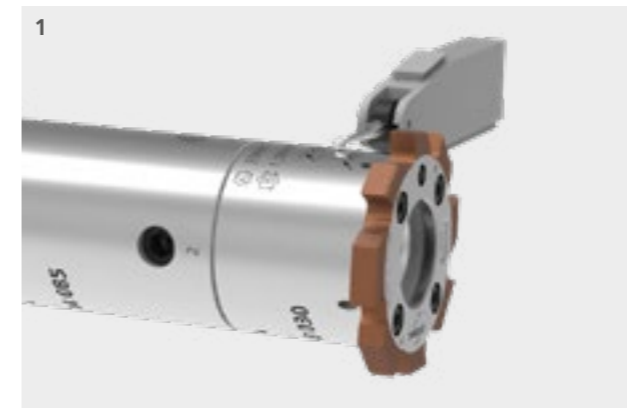
Teräpalan heitto
Insert run-out

Heiton säätö

Run-Out Adjustment

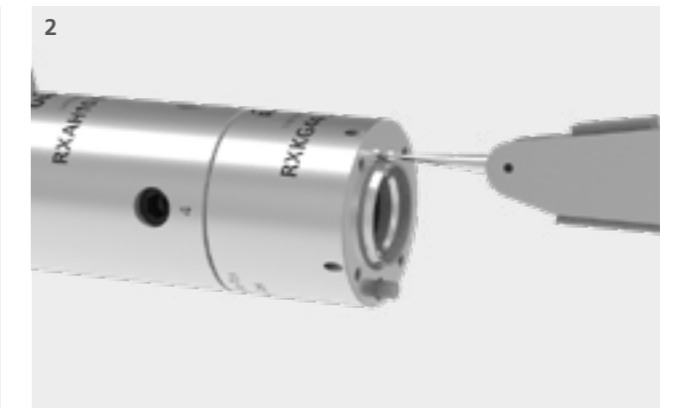
Heitoton työkalu on lähtökohta parhaalle mahdolliselle kalvinnan laadulle. Työstökoneen karan tai työkalupitimen aiheuttaman heiton minimoimiseksi seuraavat pidintyytit ovat suositeltavia: Säädettävä holkki-istukka, hydraulinen istukka tai kutisteistukka. Kalvaimien mittausta voidaan suorittaa eri tavoilla:

To achieve the best reaming results, a tool with perfect run-out is absolutely essential. To compensate any run-out error of the tool holder and the machine spindle, the following compensation holders are recommended: Adjustable collet shrink fit or hydraulic chucks. The run-out can be measured with different methods:



1. Teräpalan pitimen ulkohalkaisijasta

RX medium työkalupitimet on valmistettu erittäin tarkasti kaikilta halkaisijoiltaan. Hyvän lopputuloksen mahdollistava.



1. On the External Diameter of the Insert Holder

RX medium tool holders are manufactured very accurately. This handling method is easy and offers reasonable measuring results.

2. Teräpalan pitimen lyhyestä kartiosta

Kun kalvainterä on irroitettu, mittaa suoraan palapesän lyhyestä kartiosta. Tämä menetelmä on yksinkertainen ja tarjoaa suurimman tarkkuuden.

2. Through Insert Holder Short Taper

With the reamer disassembled, measure directly on the insert holders short taper. This handling method offers high accuracy measuring results.

Ohjeet kompensatio kartiolle

Instruction Compensation Chuck



Heitoton työkalu on lähtökohta parhaalle mahdolliselle kalvinnan laadulle. Työstökoneen karan tai työkalupitimen aiheuttaman heiton minimoimiseksi suosittelemme käytettäväksi säädetävää istukkaa tai uivaa istukkaa. Kalvaimien mittaus voidaan suorittaa eri tavoilla:

Menetelmä:

1. Ennen säätöä, varmista että kaikki ruuvit ② on löysätty kokonaan.
2. Laita työkalu koneen karalle.
3. Asenna mittakello (1 μm / 0,0001 inch tarkkuudella) merkitylle mitta-alueelle ① akselilla.
4. Säädä heitto koneen karalla max. 5 μm / 0,0002" (ideaali < 3 μm / 0,0001") neljän säätöruuvien avulla ②.



Säätöruuvien ei tarvitse olla täysin samalla tasolla säädön jälkeen.

In order to achieve the best reaming results, a tool with zero run-out is absolutely essential. To compensate any run-out error of the tool holder and the machine spindle, we recommend using a compensation holder or floating chuck. The run-out of RX medium reamers can be measured with different methods:

Procedure:

1. Before adjusting, make sure that all adjustment screws ② are completely loosened.
2. Load the tool in the machine spindle.
3. Set the indicator (with 1 μm / 0,0001 inch resolution) on the marked run-out area ① on the shank.
4. Set the run-out directly in the machine spindle to max. 5 μm / 0,0002 inch (ideal < 3 μm / 0,0001 inch) by using the four radial adjustment screws ②.



The adjustment screws do not have to be fully clamped against each other after adjustment.

Uivan istukan käyttöohje

Instruction Floating Chuck



Sorveissa kalvinta tehdään pää-asiaassa uivilla istukoilla (poikkeustapauksissa mahdollista myös koneistuskeskuksilla).

Asemointivirheet voidaan tasata säätömekanismilla (ei kulmavirheitä).

Suosittelavia ovat leikkuugeometriat kulmilla $\leq 45^\circ$.

Menetelmä:

1. Säädä uiva mekanismi käyttäen ruuvia ①.

Säätöruuvi	Uiva mekanismi	Vaikutus työstöjälkeen
Kellonsuuntaan	Jousivoima kasvaa / kohdistusvoima kasvaa	Voi vaikuttaa negatiivisesti työstöjälkeen. (Kierrejäljet ulosvedossa)
vastakkaiseen suuntaan	Jousivoima vähenee / Kohdistusvoima vähenee	Mahdollistaa värinäherkkyyden

Reaming on lathes are mainly done with floating chucks (in exceptional cases also on machining centres).

Positioning errors can be compensated by the adjustable floating mechanism. The deflection should only take place in plane-parallel (No angular error compensation).

Cutting geometries with an angle of $\leq 45^\circ$ are recommended.

Procedure:

1. Adjust the floating mechanism by using the adjustment screw ①.

Adjustment screw	Floating mechanism	Influence on machining
Clockwise rotation	Spring force increases / deflection resistance increases	The surface quality can be negatively influenced (retraction marks)
Counterclockwise rotation	Spring force becomes weaker / deflection resistance decreases	Potential vibration tendency

Säätö:

Pehmeä: Työkalu tulee säätää pienimmälle mahdolliselle kosketusvoimalle". Kuitenkin huomioiden työkalun kokonaispaino. Työkalun tulee hakeutua automaattisesti aksiaalilinjaan automaattisesti kosketuksen tapahduttua.

Keski: Kiristä säätöruuvi aivan pohjaan ja avaa sitä $1 \pm \frac{1}{4}$ kierrosta takaisinpäin.

Kova: Kiristä säätöruuvi aivan pohjaan ja avaa sitä $\frac{1}{4} - \frac{1}{2}$ kierrosta takaisinpäin.

Adjustment:

Soft: The tool should be adjusted with the lowest possible deflection resistance. Nevertheless, taking into account the weight of the tool, it must jump back automatically into the central axis after deflection.

Medium: Fully tighten the adjusting screw and turn back by $1 \pm \frac{1}{4}$ rotation.

Hard: Fully tighten the adjusting screw and turn back by $\frac{1}{4} - \frac{1}{2}$ rotation.

Suositus perussäädöksi:

Työkalun-Ø Tool-Ø	Pehmeä Soft	Keski Medium	Kova Hard
11.900 – 15.600	X		
15.601 – 23.600	X		
23.601 – 35.600		X	
35.601 – 60.600		X	
60.601 – 140.600		X	X

Recommendation for the basic setting:

2. Y akselilla varustetuissa sorveissa maksimi heitto työkalulle karansuunnassa $< 10 \mu\text{m} / 0,0004 \text{ inch}$ (ideaali $< 5 \mu\text{m} / 0,0002 \text{ inch}$).



- Uivan istukan asetukset voivat vaihdella sovelluksesta ja uivan istukan tyypistä riippuen.
- On suositeltavaa ajaa ensimmäiset reiät alennetulle syötöllä.
- Kaikki arvot on ohjearvoja URMA uiviin istukoihin.

2. With an existing Y-axis, we recommend additionally aligning the tool $< 10 \mu\text{m} / 0,0004 \text{ inch}$ (ideally $< 5 \mu\text{m} / 0,0002 \text{ inch}$) concentrically to the spindle axis.



- The settings of the floating mechanism can vary depending on the application and type of floating chuck.
- It is generally recommended to enter the bore with reduced rpm.
- All data are guide values and refer to URMA floating chucks.



Vaihtoehtona uivalle istukalle voidaan tietyissä tapauksissa käyttää kevennettyä pidintä (katso kalvainluettelo).

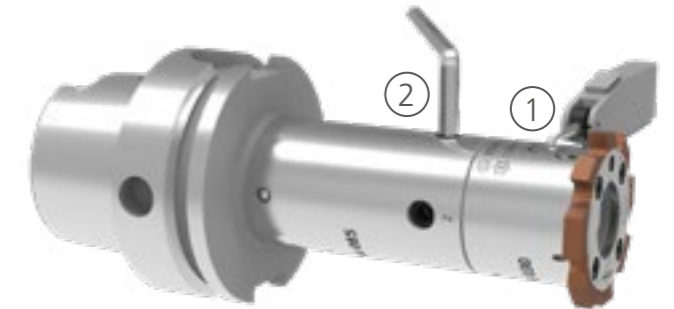
As an alternative to a floating chuck, diameter reduced insert holders can also be used (see reaming catalogue).

Ohje pitimille joissa säätö kiinteästi varressa

Instruction for Shanks with Integrated Compensation Device

Kalvainhalkaisijat yli 35,601 mm

For Reaming Diameters bigger than 35,601 mm



Menetelmä:

1. Kiristä teräpalapitimenruuvi alla olevan taulukon arvon "A" (jos ei ole niin arvon "B") mukaan.

2. Asenna työkalu koneen karalle.

3. Laita mittakello ($1 \mu\text{m} / 0,0001 \text{ inch}$ asteikolla) merkitylle alueelle ① akselilla.

4. Mittaa heitto kahden säätöruuvin akseliilta. Tasaat puolet kokonaisheitosta säätöruuveja kiertämällä. Tarkista heitto kaikissa neljässä pisteessä ja toista säätö, jos tarpeellista. Lukitse kaikki neljä säätöruuvia kevyesti kun heitto on $< 0,005 \text{ mm}$ halkaisijalla.

5. Kiristä keskuskiinnitysruuvi taulukon arvon "B" mukaan.

6. Tarkista heitto ja säädä uudestaan jos tarvetta.

Procedure:

1. Secure central clamping screw according to value "A" in the chart below (if not available, use value "B").

2. Load the tool into the machine spindle.

3. Set the indicator (with $1 \mu\text{m} / 0,0001 \text{ inch}$ resolution) on the marked run-out area ① on the shank.

4. Measure run-out of the two adjustment screw ② axes. Compensate half value of the total run-out error by using the adjustment screws. Check run-out on all four axle points and repeat the adjustment if necessary. Tighten all screws that do not fit tightly, considering the run-out $< 0,005 \text{ mm}$ in diameter.

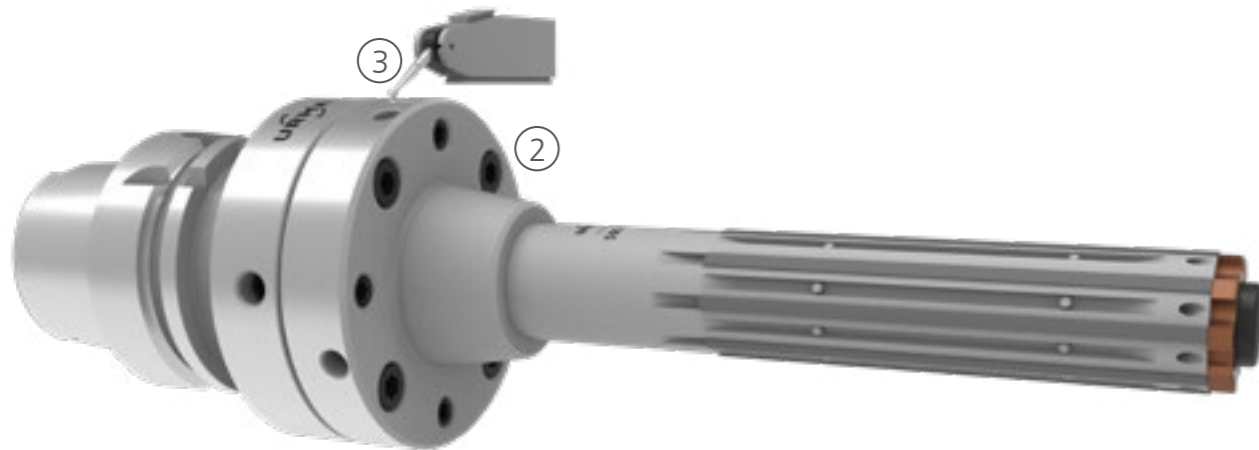
5. Tight the central clamping screw according to table value "B".

6. Check the run-out again and re-adjust if necessary.

RX Parameter	A [Nm]	B [Nm]
RX 044	-	35
RX 052	-	35
RX 061	-	55
RX 081	60	85
RX 101	70	120
RX 121	70	120
RX 141	70	120

Ohje erikoistyökaluille

Instruction for Compensation Module with Special Tools



Erikoismallin pitimiä käytetään esimerkiksi ohjainkisko mallisissa työkaluratkaisuissa. Tällöin voidaan kompensoida molempien akseleiden heittoa.

Työkalun valmistelu:

- Ennen asennusta pitää varmistaa, että kaikki painelevyt on oikein asennettuna.
- Asenna työkalu pitimeen, kiristäen lukitusruuveja ② evyesti (ts., kiristä ruuvia kunnes se on pinnan kanssa tasan, sitten kiristä vielä ¼ kierrosta).
- Asenna työkalu koneen karalle.
- Laita mittakello (1 µm / 0,0001 inch asteikolla) työkalun laipalle ③.

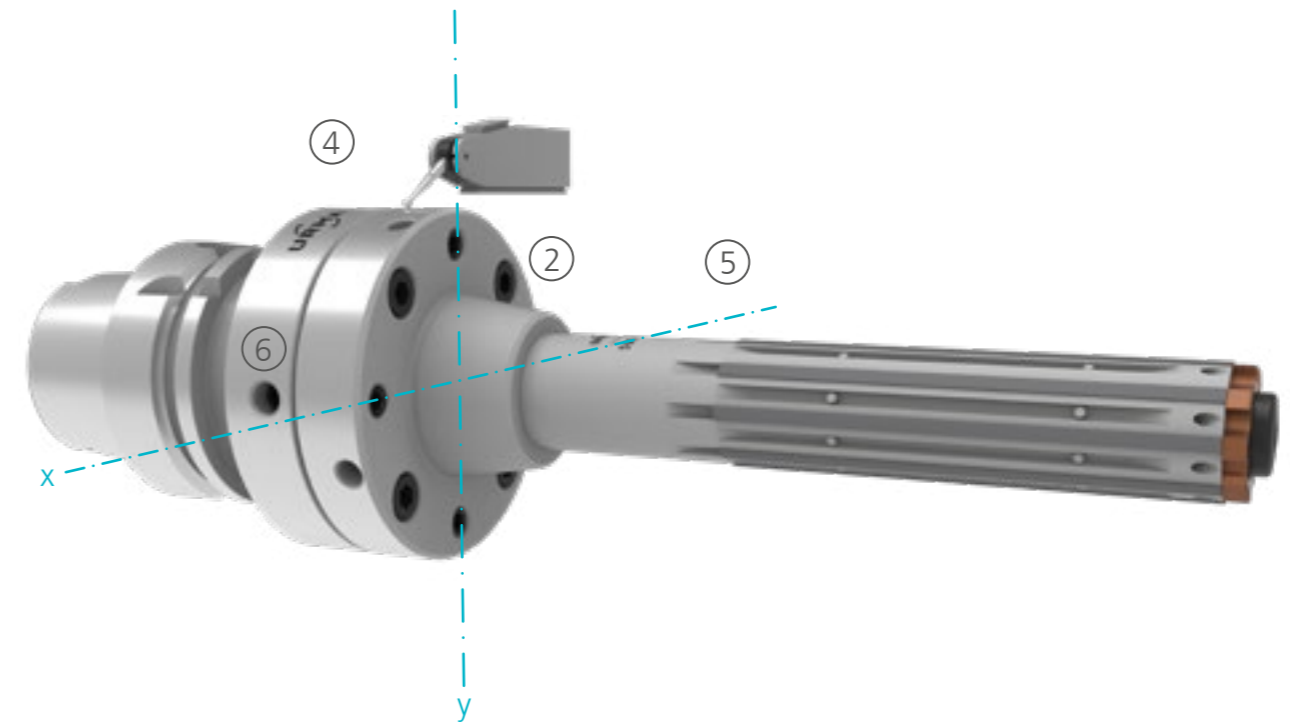
The compensation module is used, for example, to adjust the run-out of guide pad tools. Axis as well as angle errors can be adjusted.

Prepare the Tool:

- Before assembling, it must be ensured that none of the pressure pads discs on the face side stick out.
- Assemble the tool on the compensation module, tightening the clamping screws ② slightly (i.e. tighten the screw until it has contact to the face, then tighten ¼ turn).
- Load the tool into the machine spindle.
- Set the indicator (with 1 µm / 0,0001 inch resolution) on the tool flange diameter ③.

Työkalun säteittäinen säätö – vaihe 1:

Radial alignment of the tool - Step 1:



- Säädä heitto ⑥ säätöruuvien avulla 2 µm / 0,0001 inch sisälle.
 - Tarkista heitto ruuvien ⑥ kohdilta vastakkaisilta puolilta. (ensimmäinen säätö leikkauksen ⑤ suuntaisesti)
 - Tasaa puolet heitosta säätöruuveja kiertämällä. Löysää ruuvit tämän jälkeen.
 - Säädä nyt kello uudestaan "nollaan"
 - Hienosäädä nyt heitto nollaan vastaavalla tavalla kun kohdassa "b" vastakkaisilta puolilta (180°)
 - Toista edelliset vaiheet seuraavalle kohdalle ④
 - Mikäli tarpeellista niin säädä kohta ⑤ uudelleen



Kaikki ruuvi ⑥ tulee muistaa kiristää loppuksi.

- Kiristä nyt ruuvit ②.

- Tarkista työkalun heitto kiristyksen jälkeen
→ uudelleen max. 3 µm / 0,0001 inch

- Align the flange module in 2 µm / 0,0001 inch by using the radial adjustment screws ⑥.
 - Check run-out error with two opposing radial adjustment screws ⑥ (1st adjustment axis ⑤)
 - Correct the value difference of the axis by half, using the corresponding adjusting screw. Loosen the adjusting screw afterwards.
 - Set indicator to "0" value
 - Check the "0" value by turning the tool to 180° and correct if necessary (see "b").
 - Use the same alignment procedure for the second adjustment axis ④
 - If necessary readjust the first axis ⑤

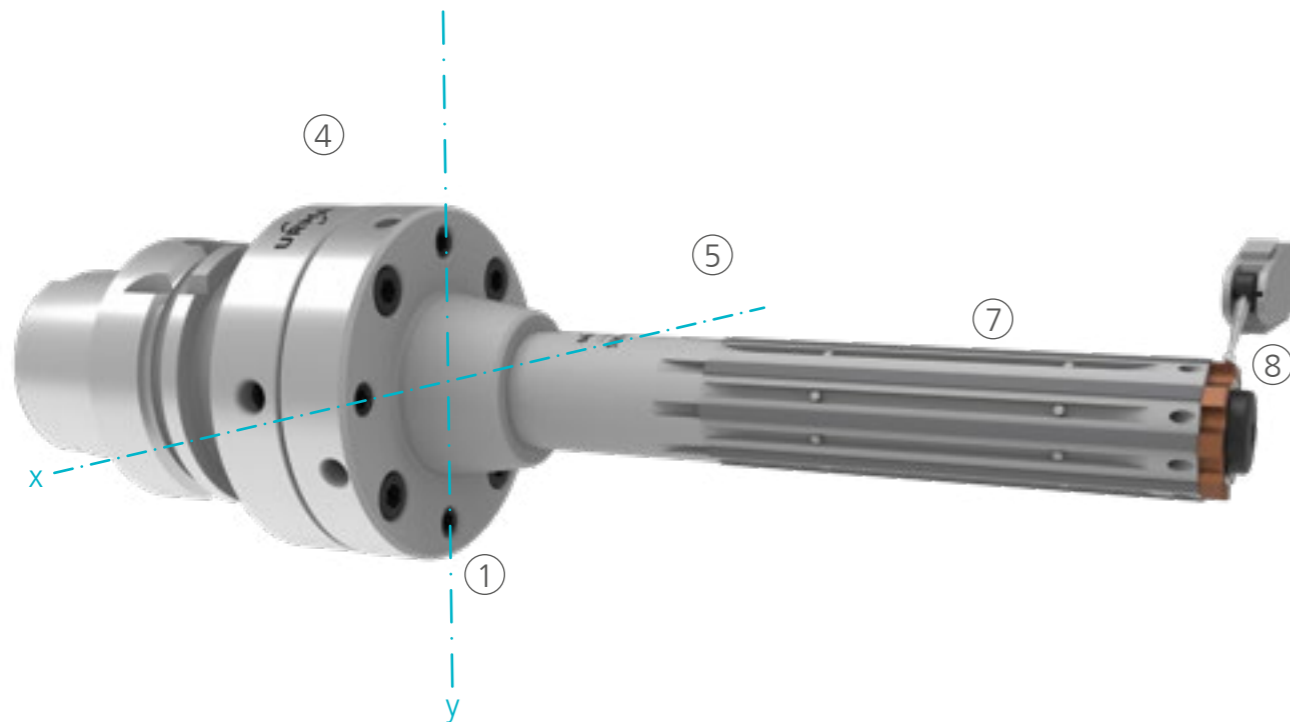


All adjustment screws ⑥ must be tightened after completion of the adjustment process.

- Tighten the clamping screws ②.

- Check the run-out of the flange module again
→ max. 3 µm / 0,0001 inch

Työkalun aksiaalisäätö - Vaihe 2: Aligning the tool angle - Step 2:



8. Aseta tonnikello työkalun kärkeen ⑧:
a. Teräpalan leikkusärmän kohdalle tai kelloitus teräpalan kehälle. Tilaustiedot löytyy "URMA Reaming" luettelosta.
b. RX mallissa runkoon merkitylle alueelle
c. ohjainkiskon päälle

9. Säädä heitto 2 µm sisälle säätöruuvien ① avulla. (kuten kohdassa 5b-f)



On suositeltavaa käyttää vain toista ruuveista ① säätämiseen per akseli (0 ja 90°).

10. Tarkista yhdensuuntaisuus ohjainkiskojen päältä ⑦.
→ Max. 3 µm / 0,0001 inch

8. Set the indicator in front ⑧:
a. on cutting edge or run-out indicating insert (Order number can be found in the "URMA Reaming" catalogue)
b. on RX-taper of the shank (interface)
c. on guide pads

9. Set the angular error to 2 µm by using the axial adjusting screws ① (proceed as described in "point 5 b to f").



It is recommended to use max. one adjustment screw ① per axis (0 and 90°) to adjust the angular error.

10. Check the alignment on the guide pads ⑦.
→ max. 3 µm / 0,0001 inch

Koneistuksessa huomioitavaa Machining Strategies

Alkureikä Piloting

Alkureikää suositellaan seuraavissa tapauksissa:

- Halkaisija- / Pituussuhde > 8xD
- Erittäin tarkat halkaisija sekä samankeskeisyys toleranssit
- Värinäherkyys pitkillä työkaluilla
- Ohjainkiskolliset pitkät työkalut
- Vinot lähtöpinnat ja alussa olevat hakkaavat osuudet

Koneesta ja saatavilla olevista työkalusta riippuen, alkureiät voidaan tehdä:

- lyhyellä kalvaimella
- sorvissa esikoneistamalla
- jyrsimällä tai poraamalla

Lyhyellä kalvaimella:

Tässä vaihtoehdossa käytä lyhintä mahdollista kalvainta esikoneistukseen. Tämä menetelmä takaa erittäin tarkan ja toistettavan alkureiän ja voidaan käyttää niin sorveissa kuin koneistuskeskuksissa. Alkureiän teräpalan halkaisijan ja toleranssin pitää olla samat kuin sitä seuraavalla viimeistely työkalulla.

Piloting is recommended in the following situations:

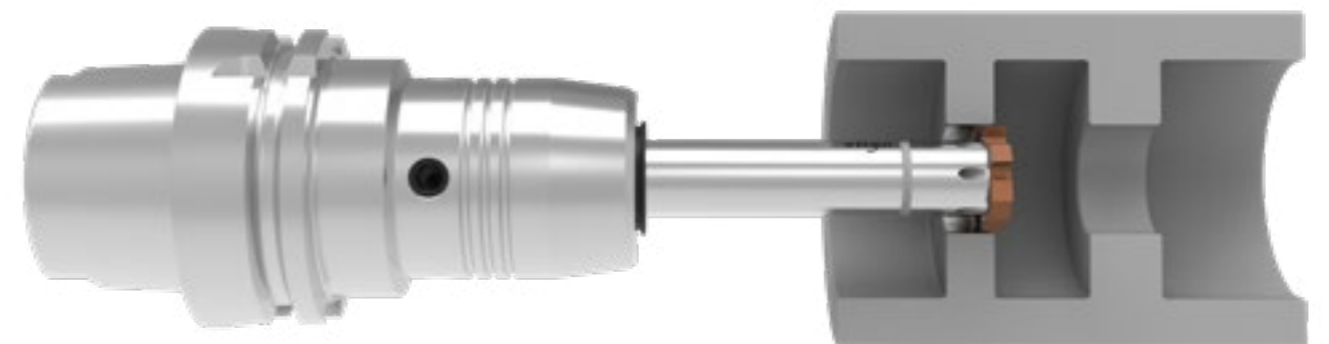
- Diameter / length ratio > 8xD
- To hold narrow position and concentricity tolerances
- Avoidance of entry vibrations with a long tool.
- Use of a long guide pad tool (positioning accuracy)
- For inclined or interrupted bore entry

Depending on the machine and the following tool, pilot holes can be made as follows:

- With a short reamer
- Pre-turning on a lathe
- Milling or boring

With a short reamer:

For this variant, use the shortest possible reamer for the pilot bore. This method provides a very stable and repeatable pilot bore. Mainly used on machining centres. The reaming insert for the pilot tool should have the same diameter and tolerance as the following finishing tool.



Koneistettaessa peräkkäisiä laakeripesiä (kuva) alkureikä kalvetaan vain ensimmäiseen "kaulukseen".



If machining spool or liner-bores (see figure), piloting only the first journal.

Alkureikä

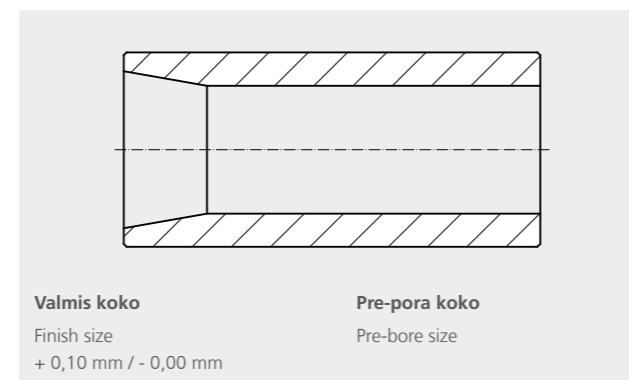
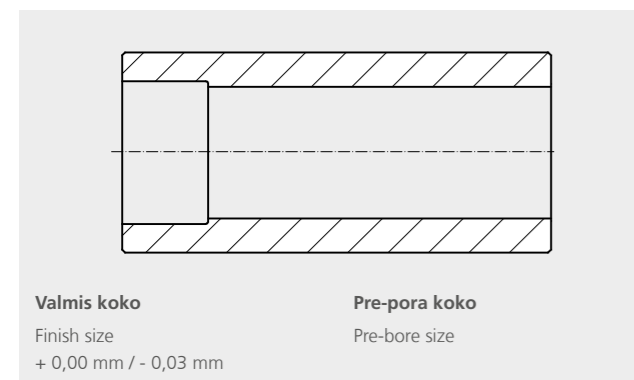
Piloting

Toimintatapa sorvissa:

Sorvissa alkureikä voidaan sorvata mittaan. Tämä voi olla sylinterimäinen tai kartio.

Procedure on a lathe:

The pilot bore can be pre-turned on a lathe. This can have a cylindrical or conical shape.



Toimintatapa työstökeskuksella:

Esireikä voidaan tehdä koneistuskeskuksella useammalla eri menetelmällä:

- Lyhyt kalvaintyökalu (kuvaus kts. s. 57)
- Avartamalla
- Jyrsimällä

Procedure on a Machining centre:

The pilot bore can be made on a machining centre using various methods:

- Short reaming tool (see page 57 for description)
- Boring tool
- Circular milling

⚠ Tarkista alkureikien oikea halkaisija säännöllisesti.

⚠ A regular check of the pilot diameter is essential.

Viimeistelykoneistus

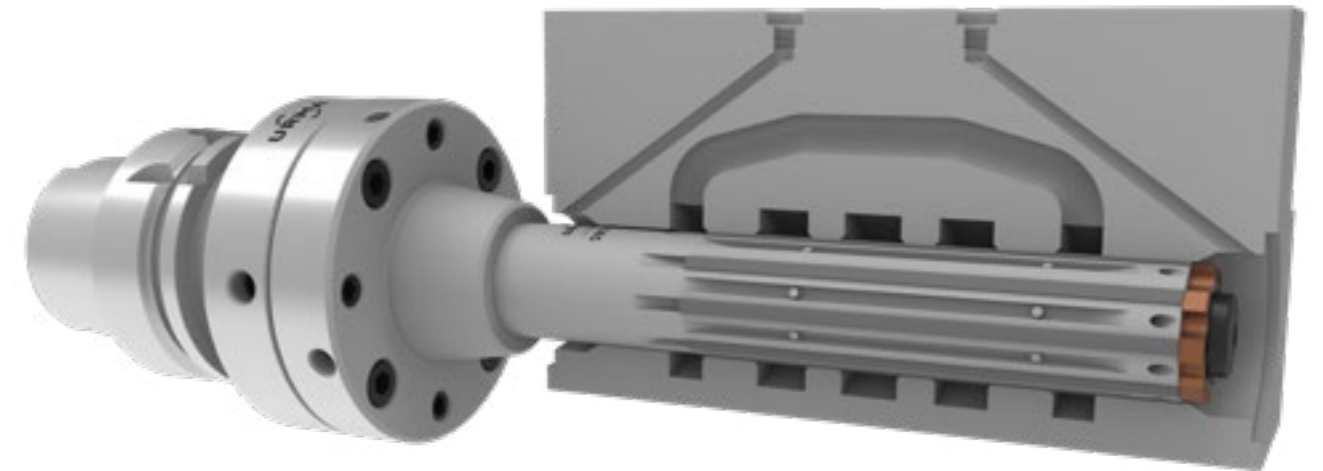
Finish Machining

Toimenpiteet alkureiän jälkeen:

1. Kun mennään esikoneistettuun reikään viimeistelytyö-kalulla, nopeutta pitää laskea ($n = 50-500 \text{ min}^{-1}$), kunnes kalvainkiekko ja ohjauspinnat ovat kosketuksissa. Säätö: "fz ulostulo" = "fz koneistus".
2. Nosta leikkuunopeudet ohje arvoihin ja viimeistele reikä valmiiksi ilman keskeytyksiä.
3. Työkalun ulosveto tapahtuu yleensä 50 – 80% alhaisemmalla pyörimisnopeudella (n) ja n. 3 – 5 kertaa suuremmalla syötöllä (vf mm/min).

Procedure after piloting:

1. When entering into the pilot bore with the finishing tool, the speed must be reduced ($n = 50-500 \text{ rpm}$) until the reaming insert is completely or also parts of the guide pads are engaged. As a rule: "fz entering" = "fz machining".
2. Increase rpm to the selected machining speed and if possible, finish the whole bore without interrupting the feed movement.
3. Tool retraction usually takes place at 50 – 80% reduced speed (n) and approx. 3 – 5 times the machining feed rate (vf mm/min).



⚠ Ohjainpintojen vahingoittumisen välttämiseksi, jäähdytysneste oltava päällä jatkuvasti!

⚠ In order to not damage the guide pads, the internal coolant supply must be guaranteed all the times!

URMA Reaming
RM vario

Tilausesimerkkejä

Order Example

Reiän ISO Toleranssi

Bore Diameter: ISO Bore Tolerances

Reiän toleranssi µm

Bore Diameter: Bore Tolerance in µm

Example	Tilausesimerkkejä Order Example F25N-12.2H7-A W112R	Tilausesimerkkejä Order Example F25N-12.2+20-10-A W112R	Example
---------	---	---	---------

F Lieriövarsi
 A = Ilman läpikäilyähdystä
 B = Läpikäilyähdys läpäreialle
 C = Läpikäilyähdys pohjäreialle
 D = Säädettävä halkaisija, ilman läpikäilyähdystä
 F = Säädettävä halkaisija, läpikäilyähdys läpäreialle
 G = Säädettävä halkaisija, läpikäilyähdys pohjäreialle
 S = Erikoistyökalu, piirustuksen mukaan

Cylindrical shank
 A = solid, without internal coolant supply
 B = solid, with internal coolant supply for through bores
 C = solid, with internal coolant supply for blind holes
 D = expandable, without internal coolant supply
 F = expandable, with internal coolant supply for through bores
 G = expandable, with internal coolant supply for blind holes
 S = special tool (bound to drawing)

2 = Lyhyt malli
4 = Pitkä malli
 2 = short version
 4 = long version

5N = Suorat lastu-urat
7N = Lastu-urat vasenkätiset ja nousulliset
 5N = flute form straight
 7N = flute form left-hand helix

F Lieriövarsi
 A = Ilman läpikäilyähdystä
 B = Läpikäilyähdys läpäreialle
 C = Läpikäilyähdys pohjäreialle
 D = Säädettävä halkaisija, ilman läpikäilyähdystä
 F = Säädettävä halkaisija, läpikäilyähdys läpäreialle
 G = Säädettävä halkaisija, läpikäilyähdys pohjäreialle
 S = Erikoistyökalu, piirustuksen mukaan

Cylindrical shank
 A = solid, without internal coolant supply
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 5N = flute form straight
 7N = flute form left-hand helix

Diameter	12.2 Halkaisija (mm) Diameter (mm)	12.2 Halkaisija (mm) Diameter (mm)	Diameter
H7	Toleranssi ISO vakio Tolerance in ISO standard	+20-10	Reiän toleranssi (µm) Bore tolerance (µm)

A Viisteen leikkuukulma
 A = 45°¹ B = 25°² C = 45/8° D = 30/4°
 E = nousukulma 20°³ F = Leikkaava otsapinta G = 0,5 x 45°
 H = 30° I = 60° K = 75° L = nousukulma 30°³

Chamfer Angle
 A = 45°¹ B = 25°² C = 45/8° D = 30/4°
 E = Curling cut 20°³ F = Face cutting G = 0,5 x 45°
 H = 30° I = 60° K = 75° L = Curling cut 30°³

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W1 Materiaali
 Katso sivulta 63
 Cutting material
 Details see page 63

W1 Materiaali
 Katso sivulta 63
 Cutting material
 Details see page 63

12R Pinnoite
 Katso sivulta 63
 Coating
 Details see page 63

12R Pinnoite
 Katso sivulta 63
 Coating
 Details see page 63

¹ vakio suoralle leikkulle
¹ Standard for straight flute form

² vakio vasenkätisillä nousullisilla lastu-urilla oleville työkaluille
² Standard for tools with left-hand flute form

³ vain suorauraisille työkaluille
³ Only for straight flute form

Työstömateriaalit

Cutting Materials overview

ISO Material Code	URMA Material Code	Materiaali Cutting Materials						Pinnoite Coating							
		URMA Code	W1	T1	B1	B2	D1	Uncoated	01P	05P	07R	08P	12R	14R	10C
			HM/Carbide	Cermet	CBN	CBN	PKD/PCD	Uncoated	TIN	AlTiN	TiAlN + AlCrN	AlCrN	AlCrN	AlCrN	DLC
P	P1		■	▲				▲	□	□				■	■
	P2		■	▲				▲	□	□				■	■
	P3		■	▲				▲	□	□				■	■
	P4		■	▲				▲	□	□				■	■
	P5		■	▲				▲	□	□				■	■
	P6		▲					□	□	□				▲	■
	P7		▲					□	□	□				▲	■
M	M1		▲	□				□	□					▲	■
	M2		▲	□				□	□					▲	■
	M3		▲					□	□					▲	■
	M4		▲					□	□					▲	■
	M5		▲					□	□					▲	■
	M6		▲					□	□					▲	■
K	K1		▲					□	□	□				■	▲
	K2		▲					□	□	□				■	▲
	K3		▲	□	□			□	□	□				■	▲
	K4		▲	□	□			□	□	□				■	▲
	K5		▲					□	□	□	□			■	▲
	K6		▲					□	□	□	□			■	▲
	K7		▲					□	□	□	□			■	▲
	K8		▲					□	□	□	□			■	▲
N	N1		▲				□	□							▲
	N2		▲				□	□							▲
	N3		▲				□	□							▲
	N4		□				▲	▲							□
	N5		▲	□			□	□							▲
	N6		▲				□	□							▲
S	S1		▲					□	□					▲	■
	S2		▲					□	□					▲	■
	S3		▲					□	□					▲	■
	S4		▲					□	□					▲	■
	S11		▲					□	□					▲	■
	S12		▲					□	□					▲	■
	S13		▲					□	□					▲	■
H	H1		▲					□	□		▲			■	■
	H2		■					▲	□		■		□	□	
	H3		■					▲	□		■		□	□	
SM	SM1		■	▲				▲	□					■	■
	SM2		▲	□				□	□					▲	■
	SM3		▲					□	□					▲	■
O	O1		▲	□				□							▲
	O2		▲	□				□							▲
	O3		□					▲	▲						
	O4		□					▲	▲						

▲ = Suositeltava
 ■ = Käyttökelpoinen
 □ = Mahdollinen
 ○ = Kysyttäessä

▲ = Recommended
 ■ = Applicable
 □ = Possible
 ○ = On request

Lastuamisarvot RM vario

Cutting Data RM vario



Läpireikä
Through Bore



ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm
P	P1	1	L	B	T1	120-150-180	0.10-0.18-0.30	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	T1	100-130-160	0.10-0.15-0.25			
		3	L	B	W112R	60-80-100	0.10-0.15-0.25			
	P2	1	L	B	T1	120-150-180	0.10-0.18-0.30	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	T1	100-130-160	0.10-0.15-0.25			
		3	L	B	W112R	60-80-100	0.10-0.15-0.25			
	P3	1	L	B	T1	100-130-160	0.10-0.18-0.30	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	T1	90-120-140	0.10-0.15-0.25			
		3	L	B	W112R	50-70-90	0.10-0.15-0.25			
	P4	1	L	B	T1	80-110-130	0.10-0.16-0.25	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	W112R	80-100-120	0.10-0.14-0.20			
		3	L	B	W112R	40-60-80	0.10-0.14-0.20			
	P5	1	L	B	T1	80-110-130	0.10-0.16-0.25	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	W112R	80-100-120	0.10-0.14-0.20			
		3	L	B	W112R	40-60-80	0.10-0.14-0.20			
	P6	1	L	B	W112R	50-70-100	0.08-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	A	W112R	40-70-90	0.08-0.10-0.14			
		3	L	A	W112R	20-35-50	0.08-0.10-0.14			
	P7	1	L	A	W112R	15-25-40	0.04-0.06-0.08	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	A	W112R	15-20-30	0.04-0.06-0.08			
		3	L	A	W112R	10-15-20	0.04-0.06-0.08			

M	M1	1	L	B	W112R	30-45-60	0.08-0.12-0.18	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	W112R	30-45-60	0.08-0.12-0.15			
		3	L	B	W112R	15-25-35	0.08-0.12-0.15			
	M2	1	L	B	W112R	30-45-60	0.08-0.12-0.18	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	W112R	30-45-60	0.08-0.12-0.15			
		3	L	B	W112R	15-25-35	0.08-0.12-0.15			
	M3	1	L	B	W112R	30-45-60	0.08-0.12-0.16	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	B	W112R	30-45-60	0.08-0.12-0.15			
		3	L	B	W112R	15-25-35	0.08-0.12-0.15			
	M4	1	L	A	W112R	20-35-55	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	A	W112R	20-35-55	0.05-0.08-0.12			
		3	L	A	W112R	10-15-25	0.05-0.08-0.12			
	M5	1	L	A	W112R	15-25-35	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	A	W112R	15-25-35	0.05-0.08-0.12			
		3	L	A	W112R	7-12-15	0.05-0.08-0.12			
	M6	1	L	A	W112R	15-20-30	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	L	A	W112R	15-20-30	0.05-0.08-0.12			
		3	L	A	W112R	5-10-12	0.05-0.08-0.12			



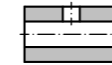
AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
- Kohdat 1 & 2
 - Ilman läpijäähdytystä



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available
- Machining conditions as 1 & 2
 - But without internal coolant



Läpireikä (kevyesti hakkaava)
Through Bore with Interruption



AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal		
							ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm
4	L	A	T1	120-150-180	0.10-0.18-0.30	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	100-130-160	0.10-0.15-0.25				
6	L	A	W112R	60-80-100	0.10-0.15-0.25				
4	L	A	T1	120-150-180	0.10-0.18-0.30		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	100-130-160	0.10-0.15-0.25				
6	L	A	W112R	60-80-100	0.10-0.15-0.25				
4	L	A	T1	100-130-160	0.10-0.18-0.30		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	90-120-140	0.10-0.15-0.25				
6	L	A	W112R	50-70-90	0.10-0.15-0.25				
4	L	A	W112R	80-110-130	0.10-0.16-0.25		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	80-100-120	0.10-0.14-0.20				
6	L	A	W112R	40-60-80	0.10-0.14-0.20				
4	L	A	W112R	80-110-130	0.10-0.16-0.25		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	80-100-120	0.10-0.14-0.20				
6	L	A	W112R	40-60-80	0.10-0.14-0.20				
4	L	A	W112R	50-70-100	0.08-0.10-0.14		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	40-70-90	0.08-0.10-0.14				
6	L	A	W112R	20-35-50	0.08-0.10-0.14				
4	L	A	W112R	15-25-40	0.04-0.06-0.08		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	15-20-30	0.04-0.06-0.08				
6	L	A	W112R	10-15-20	0.04-0.06-0.08				

4	L	A	W112R	30-45-60	0.08-0.12-0.15	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	30-45-60	0.08-0.12-0.15				
6	G	A	W112R	15-25-35	0.08-0.12-0.15				
4	L	A	W112R	30-45-60	0.08-0.12-0.15		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	30-45-60	0.08-0.12-0.15				
6	G	A	W112R	15-25-35	0.08-0.12-0.15				
4	L	A	W112R	30-45-60	0.08-0.12-0.15		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	30-45-60	0.08-0.12-0.15				
6	G	A	W112R	15-25-35	0.08-0.12-0.15				
4	L	A	W112R	20-35-55	0.05-0.08-0.12		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	20-35-55	0.05-0.08-0.12				
6	G	A	W112R	10-15-25	0.05-0.08-0.12				
4	L	A	W112R	15-25-35	0.05-0.08-0.12		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	15-25-35	0.05-0.08-0.12				
6	G	A	W112R	7-12-15	0.05-0.08-0.12				
4	L	A	W112R	15-20-30	0.05-0.08-0.12		0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
5	L	A	W112R	15-20-30	0.05-0.08-0.12				
6	G	A	W112R	5-10-12	0.05-0.08-0.12				



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla
- Kohdat kuten 4 & 5
 - Ilman läpijäähdytystä
 - Kohtalaisesti reian soikeudesta johtuvaa epäsymmetrisyyttä (< 30%)

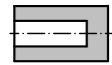


AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available
- Machining conditions as 4 & 5
 - But without internal coolant
 - Medium symmetrical interruptions (< 30%)

Lastuamisarvot RM vario

Cutting Data RM vario



Pohjareikä
Blind Hole

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm
P	P1	1	G	A	T1	120-150-180	0.10-0.14-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	T1	100-130-160	0.10-0.14-0.20			
		3	G	A	W112R	60-80-100	0.10-0.12-0.18			
	P2	1	G	A	T1	120-150-180	0.10-0.14-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	T1	100-130-160	0.10-0.14-0.20			
		3	G	A	W112R	60-80-100	0.10-0.12-0.18			
	P3	1	G	A	T1	100-130-160	0.10-0.14-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	90-120-140	0.10-0.14-0.20			
		3	G	A	W112R	50-70-90	0.10-0.12-0.18			
	P4	1	G	A	T1	80-110-130	0.10-0.14-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	80-100-120	0.10-0.14-0.20			
		3	G	A	W112R	40-60-80	0.10-0.12-0.18			
	P5	1	G	A	W112R	80-110-130	0.10-0.14-0.20	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	80-100-120	0.10-0.12-0.18			
		3	G	A	W112R	40-60-80	0.10-0.12-0.18			
	P6	1	G	A	W112R	50-70-100	0.08-0.12-0.16	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	40-70-90	0.06-0.08-0.12			
		3	G	A	W112R	20-35-50	0.06-0.08-0.12			
	P7	1	G	A	W112R	15-25-40	0.06-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	15-20-30	0.04-0.06-0.10			
		3	G	A	W112R	10-15-20	0.04-0.06-0.10			

M	M1	1	G	A	W112R	30-45-60	0.08-0.12-0.15	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	30-45-60	0.08-0.12-0.15			
		3	G	A	W112R	15-25-35	0.08-0.12-0.15			
	M2	1	G	A	W112R	30-45-60	0.08-0.12-0.15	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	30-45-60	0.08-0.12-0.15			
		3	G	A	W112R	15-25-35	0.08-0.12-0.15			
	M3	1	G	A	W112R	30-45-60	0.08-0.12-0.15	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	30-45-60	0.08-0.12-0.15			
		3	G	A	W112R	15-25-35	0.08-0.12-0.15			
	M4	1	G	A	W112R	20-35-55	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	20-35-55	0.05-0.08-0.12			
		3	G	A	W112R	10-15-25	0.05-0.08-0.12			
	M5	1	G	A	W112R	15-25-35	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	15-25-35	0.05-0.08-0.12			
		3	G	A	W112R	7-12-15	0.05-0.08-0.12			
	M6	1	G	A	W112R	15-20-30	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15
		2	G	A	W112R	15-20-30	0.05-0.08-0.12			
		3	G	A	W112R	5-10-12	0.05-0.08-0.12			



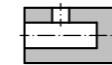
AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla
- Kohdat 1 & 2
 - Ilman läpijäähdytystä



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available
- Machining conditions as 1 & 2
 - But without internal coolant



Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal										
							ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm								
P	4	G	A	T1	120-150-180	0.10-0.14-0.20	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15							
		5	G	A	W112R	100-130-160					0.10-0.14-0.20						
		6	G	A	W112R	60-80-100					0.10-0.12-0.18						
	4	G	A	T1	120-150-180	0.10-0.14-0.20		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15						
		5	G	A	W112R	100-130-160						0.10-0.14-0.20					
		6	G	A	W112R	60-80-100						0.10-0.12-0.18					
	4	G	A	T1	100-130-160	0.10-0.14-0.20			fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15					
		5	G	A	W112R	90-120-140							0.10-0.14-0.20				
		6	G	A	W112R	50-70-90							0.10-0.12-0.18				
	4	G	A	W112R	80-110-130	0.10-0.14-0.20				fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15				
		5	G	A	W112R	80-100-120								0.10-0.14-0.20			
		6	G	A	W112R	40-60-80								0.10-0.12-0.18			
	4	G	A	W112R	80-110-130	0.10-0.14-0.20					fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15			
		5	G	A	W112R	80-100-120									0.10-0.12-0.18		
		6	G	A	W112R	40-60-80									0.10-0.12-0.18		
	4	G	A	W112R	50-70-100	0.08-0.12-0.16						fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15		
		5	G	A	W112R	40-70-90										0.06-0.08-0.12	
		6	G	A	W112R	20-35-50										0.06-0.08-0.12	
	4	G	A	W112R	15-25-40	0.06-0.08-0.12							fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15	
		5	G	A	W112R	15-20-30											0.04-0.06-0.10
		6	G	A	W112R	10-15-20											0.04-0.06-0.10

M	4	G	A	W112R	30-45-60	0.08-0.12-0.15	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15						
		5	G	A	W112R	30-45-60					0.08-0.12-0.15					
		6	G	A	W112R	15-25-35					0.08-0.12-0.15					
	4	G	A	W112R	30-45-60	0.08-0.12-0.15		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15					
		5	G	A	W112R	30-45-60						0.08-0.12-0.15				
		6	G	A	W112R	15-25-35						0.08-0.12-0.15				
	4	G	A	W112R	30-45-60	0.08-0.12-0.15			fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15				
		5	G	A	W112R	30-45-60							0.08-0.12-0.15			
		6	G	A	W112R	15-25-35							0.08-0.12-0.15			
	4	G	A	W112R	20-35-55	0.05-0.08-0.12				fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15			
		5	G	A	W112R	20-35-55								0.05-0.08-0.12		
		6	G	A	W112R	10-15-25								0.05-0.08-0.12		
	4	G	A	W112R	15-25-35	0.05-0.08-0.12					fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15		
		5	G	A	W112R	15-25-35									0.05-0.08-0.12	
		6	G	A	W112R	7-12-15									0.05-0.08-0.12	
	4	G	A	W112R	15-20-30	0.05-0.08-0.12						fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.15	
		5	G	A	W112R	15-20-30										0.05-0.08-0.12
		6	G	A	W112R	5-10-12										0.05-0.08-0.12



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar
- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla
- Kohdat kuten 4 & 5
 - Ilman läpijäähdytystä
 - Kohtalaisesti reiän soikeudesta johtuvaa epäsymmetrisyyttä (< 30%)



AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar
- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available
- Machining conditions as 4 & 5
 - But without internal coolant
 - Medium symmetrical interruptions (< 30%)

MATERIAL DETAILS PAGE 88

Lastuamisarvot RM vario

Cutting Data RM vario



Läpireikä
Through Bore



ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm
K	K1	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K2	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K3	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K4	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K5	1	G	A	W114R	60-80-100	0.10-0.12-0.15			
		2	G	A	W114R	50-60-80	0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	30-40-50	0.10-0.12-0.15			
	K6	1	G	A	W114R	60-80-100	0.10-0.12-0.15			
		2	G	A	W114R	50-60-80	0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	30-40-50	0.10-0.12-0.15			
	K7	1	G	A	W112R	40-60-80	0.08-0.10-0.12			
		2	G	A	W112R	30-50-70	0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W112R	20-30-40	0.08-0.10-0.12			
	K8	1	G	A	W112R	40-60-80	0.08-0.10-0.12			
		2	G	A	W112R	30-50-70	0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W112R	20-30-40	0.08-0.10-0.12			

N	N1	1	L	B	W110C	100-180-250	0.12-0.18-0.25			
		2	L	B	W110C	80-150-220	0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	L	B	W110C	50-90-120	0.12-0.18-0.25			
	N2	1	L	B	W110C	100-180-250	0.12-0.18-0.25			
		2	L	B	W110C	80-150-220	0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	L	B	W110C	50-90-120	0.12-0.18-0.25			
	N3	1	L	B	W110C	100-180-250	0.12-0.18-0.25			
		2	L	B	W110C	80-150-220	0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	L	B	W110C	50-90-120	0.12-0.18-0.25			
	N4	1	L	B	D1	150-250-350	0.10-0.15-0.20			
		2	L	B	D1	150-250-350	0.10-0.15-0.20	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	L	B	D1	100-220-300	0.10-0.15-0.20			
	N5	1	L	B	W110C	100-130-160	0.12-0.18-0.25			
		2	L	B	W110C	80-110-140	0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	L	B	W110C	50-70-80	0.12-0.18-0.25			
	N6	1	L	B	W110C	50-70-100	0.10-0.15-0.20			
		2	L	B	W110C	40-60-80	0.10-0.15-0.20	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	L	B	W110C	25-35-50	0.10-0.15-0.20			

**AC Työskentely olosuhteet**

- 1 Optimaaliset olosuhteet
- Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaino > 20 bar

- 2 Normaaliset olosuhteet
- Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla

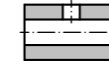
- 3 Kohdat 1 & 2
- Ilman läpijäähdytystä

**AC Application Conditions**

- 1 Optimal conditions
- Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar

- 2 Suboptimal conditions
- Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available

- 3 Machining conditions as 1 & 2
- But without internal coolant



Läpireikä (kevyesti hakkaava)
Through Bore with Interruption



AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal											
							ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm									
K	4	G	A	W114R	80-140-220	0.10-0.14-0.18	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%											
		5	G	A	W114R	80-120-200		0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15							
		6	G	A	W114R	40-70-100		0.10-0.14-0.18										
	4	G	A	W114R	80-140-220	0.10-0.14-0.18		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%										
		5	G	A	W114R	80-120-200			0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15						
		6	G	A	W114R	40-70-100			0.10-0.14-0.18									
	4	G	A	W114R	80-140-220	0.10-0.14-0.18			fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%									
		5	G	A	W114R	80-120-200				0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15					
		6	G	A	W114R	40-70-100				0.10-0.14-0.18								
	4	G	A	W114R	80-140-220	0.10-0.14-0.18				fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%								
		5	G	A	W114R	80-120-200					0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15				
		6	G	A	W114R	40-70-100					0.10-0.14-0.18							
	4	G	A	W114R	60-80-100	0.10-0.12-0.15					fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%							
		5	G	A	W114R	50-60-80						0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15			
		6	G	A	W114R	30-40-50						0.10-0.12-0.15						
	4	G	A	W114R	60-80-100	0.10-0.12-0.15						fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%						
		5	G	A	W114R	50-60-80							0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15		
		6	G	A	W114R	30-40-50							0.10-0.12-0.15					
	4	G	A	W112R	40-60-80	0.08-0.10-0.12							fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%					
		5	G	A	W112R	30-50-70								0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15	
		6	G	A	W112R	20-30-40								0.08-0.10-0.12				
	4	G	A	W112R	40-60-80	0.08-0.10-0.12								fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%				
		5	G	A	W112R	30-50-70									0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	G	A	W112R	20-30-40									0.08-0.10-0.12			

L	4	L	B	W110C	100-180-250	0.12-0.18-0.25	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%									
		5	L	B	W110C	80-150-220		0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15					
		6	L	B	W110C	50-90-120		0.12-0.18-0.25								
	4	L	B	W110C	100-180-250	0.12-0.18-0.25		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%								
		5	L	B	W110C	80-150-220			0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15				
		6	L	B	W110C	50-90-120			0.12-0.18-0.25							
	4	L	B	W110C	100-180-250	0.12-0.18-0.25			fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%							
		5	L	B	W110C	80-150-220				0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15			
		6	L	B	W110C	50-90-120				0.12-0.18-0.25						
	4	L	B	D1	150-250-350	0.10-0.15-0.20				fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%						
		5	L	B	D1	150-250-350					0.10-0.15-0.20	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15		
		6	L	B	D1	100-220-300					0.10-0.15-0.20					
	4	L	B	W110C	100-130-160	0.12-0.18-0.25					fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%					
		5	L	B	W110C	80-110-140						0.12-0.18-0.25	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15	
		6	L	B	W110C	50-70-80						0.12-0.18-0.25				
	4	L	B	W110C	50-70-100	0.10-0.15-0.20						fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%				
		5	L	B	W110C	40-60-80							0.10-0.15-0.20	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		6	L	B	W110C	25-35-50							0.10-0.15-0.20			

**AC Työskentely olosuhteet**

- 4 Optimaaliset olosuhteet
- Tukeva kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaino > 20 bar

- 5 Normaaliset olosuhteet
- Hiukan epävaka kiinnitys, kone ja/tai kappale
 - Työkalun pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

- 6 Kohdat kuten 4 & 5
- Ilman läpijäähdytystä
 - Kohtalaisesti reiän soikeudesta johtuvaa epäsymmetrisyyttä (< 30%)

**AC Application Conditions**

- 4 Optimal conditions
- Stable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - Optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar

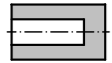
- 5 Suboptimal conditions
- Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

- 6 Machining conditions as 4 & 5
- But without internal coolant
 - Medium symmetrical interruptions (< 30%)

MATERIAL DETAILS PAGE 89

Lastuamisarvot RM vario

Cutting Data RM vario

Pohjareikä
Blind Hole

ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal		
								ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm
K	K1	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K2	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K3	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K4	1	G	A	W114R	80-140-220	0.10-0.14-0.18			
		2	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	40-70-100	0.10-0.14-0.18			
	K5	1	G	A	W114R	60-80-100	0.10-0.12-0.15			
		2	G	A	W114R	50-60-80	0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	30-40-50	0.10-0.12-0.15			
	K6	1	G	A	W114R	60-80-100	0.10-0.12-0.15			
		2	G	A	W114R	50-60-80	0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W114R	30-40-50	0.10-0.12-0.15			
	K7	1	G	A	W112R	40-60-80	0.08-0.10-0.12			
		2	G	A	W112R	30-50-70	0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W112R	20-30-40	0.08-0.10-0.12			
	K8	1	G	A	W112R	40-60-80	0.08-0.10-0.12			
		2	G	A	W112R	30-50-70	0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W112R	20-30-40	0.08-0.10-0.12			

N	N1	1	G	A	W110C	100-180-250	0.10-0.15-0.22			
		2	G	A	W110C	80-150-220	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W110C	50-90-120	0.10-0.15-0.22			
	N2	1	G	A	W110C	100-180-250	0.10-0.15-0.22			
		2	G	A	W110C	80-150-220	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W110C	50-90-120	0.10-0.15-0.22			
	N3	1	G	A	W110C	100-180-250	0.10-0.15-0.22			
		2	G	A	W110C	80-150-220	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W110C	50-90-120	0.10-0.15-0.22			
	N4	1	G	A	D1	150-250-350	0.08-0.12-0.18			
		2	G	A	D1	150-250-350	0.08-0.12-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	D1	100-220-300	0.08-0.12-0.18			
	N5	1	G	A	W110C	100-130-160	0.10-0.15-0.22			
		2	G	A	W110C	80-110-140	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W110C	50-70-80	0.10-0.15-0.22			
	N6	1	G	A	W110C	50-70-100	0.08-0.12-0.18			
		2	G	A	W110C	40-60-80	0.08-0.12-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
		3	G	A	W110C	25-35-50	0.08-0.12-0.18			



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalan pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Sisäinen jäähdytyspaine > 20 bar

- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalan pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Sisäinen jäähdytys saatavilla

- Kohdat 1 & 2
 - Ilman läpijäähdytystä

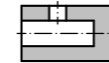


AC Application Conditions

- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Internal coolant supply > 20 bar

- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Internal coolant supply available

- Machining conditions as 1 & 2
 - But without internal coolant

Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption

AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal		
							ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm
fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	4	G	A	W114R	80-140-220	0.10-0.14-0.18			
	5	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W114R	40-70-100	0.10-0.14-0.18			
	4	G	A	W114R	80-140-220	0.10-0.14-0.18			
	5	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W114R	40-70-100	0.10-0.14-0.18			
	4	G	A	W114R	80-140-220	0.10-0.14-0.18			
	5	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W114R	40-70-100	0.10-0.14-0.18			
	4	G	A	W114R	80-140-220	0.10-0.14-0.18			
	5	G	A	W114R	80-120-200	0.10-0.14-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W114R	40-70-100	0.10-0.14-0.18			
	4	G	A	W114R	60-80-100	0.10-0.12-0.15			
	5	G	A	W114R	50-60-80	0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W114R	30-40-50	0.10-0.12-0.15			
	4	G	A	W114R	60-80-100	0.10-0.12-0.15			
	5	G	A	W114R	50-60-80	0.10-0.12-0.15	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W114R	30-40-50	0.10-0.12-0.15			
	4	G	A	W112R	40-60-80	0.08-0.10-0.12			
	5	G	A	W112R	30-50-70	0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W112R	20-30-40	0.08-0.10-0.12			
	4	G	A	W112R	40-60-80	0.08-0.10-0.12			
	5	G	A	W112R	30-50-70	0.08-0.10-0.12	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W112R	20-30-40	0.08-0.10-0.12			

fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	4	G	A	W110C	100-180-250	0.10-0.15-0.22			
	5	G	A	W110C	80-150-220	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W110C	50-90-120	0.10-0.15-0.22			
	4	G	A	W110C	100-180-250	0.10-0.15-0.22			
	5	G	A	W110C	80-150-220	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W110C	50-90-120	0.10-0.15-0.22			
	4	G	A	W110C	100-180-250	0.10-0.15-0.22			
	5	G	A	W110C	80-150-220	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W110C	50-90-120	0.10-0.15-0.22			
	4	G	A	D1	150-250-350	0.08-0.12-0.18			
	5	G	A	D1	150-250-350	0.08-0.12-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	D1	100-220-300	0.08-0.12-0.18			
	4	G	A	W110C	100-130-160	0.10-0.15-0.22			
	5	G	A	W110C	80-110-140	0.10-0.15-0.22	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W110C	50-70-80	0.10-0.15-0.22			
	4	G	A	W110C	50-70-100	0.08-0.12-0.18			
	5	G	A	W110C	40-60-80	0.08-0.12-0.18	0.05-0.10-0.12	0.05-0.10-0.15	0.05-0.10-0.15
	6	G	A	W110C	25-35-50	0.08-0.12-0.18			



AC Työskentely olosuhteet

- Optimaaliset olosuhteet
 - Tukeva kiinnitys, kone ja/tai kappale
 - Työkalan pituus < 3xD
 - Optimaalinen lastunpoisto taattu
 - Kevyesti soikeuden aiheuttama epäsymmetrisyyttä (< 10%)
 - Sisäinen jäähdytyspaine > 20 bar

- Normaalit olosuhteet
 - Hiukan epävakaa kiinnitys, kone ja/tai kappale
 - Työkalan pituus < 6xD
 - Optimaalista lastunpoistoa ei voida taata
 - Keskimääräistä soikeuden aiheuttama epäsymmetrisyyttä (< 30%)
 - Sisäinen jäähdytys saatavilla

- Kohdat kuten 4 & 5
 - Ilman läpijäähdytystä
 - Kohtalaisesti reian soikeudesta johtuvaa epäsymmetrisyyttä (< 30%)



AC Application Conditions

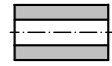
- Optimal conditions
 - Stable fixture, machine and/or workpiece
 - Tool projection length < 3xD
 - Optimal chip removal guaranteed
 - Slightly symmetrical and asymmetrical interruption (< 10%)
 - Internal coolant supply > 20 bar

- Suboptimal conditions
 - Slightly unstable fixture, machine and/or workpiece
 - Tool projection length < 6xD
 - No optimal chip removal guaranteed
 - Medium symmetrical interruptions (< 30%)
 - Internal coolant supply available

- Machining conditions as 4 & 5
 - But without internal coolant
 - Medium symmetrical interruptions (< 30%)

Lastuamisarvot RM vario

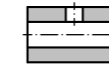
Cutting Data RM vario



Läpireikä
Through Bore



ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal			
								a_p Ø 5.800-10.609 mm	a_p Ø 10.610-18.609 mm	a_p Ø 18.610-33.100 mm	
S	S1	1	L	A	W112R	20-35-45	0.06-0.10-0.14				
		2	L	A	W112R	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		3	L	A	W112R	10-15-20	0.06-0.10-0.14				
	S2	1	L	A	W112R	20-30-45	0.05-0.08-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	L	A	W112R	20-30-45	0.05-0.08-0.12				
		3	L	A	W112R	10-15-20	0.05-0.08-0.12				
	S3	1	L	A	W112R	15-20-35	0.06-0.10-0.12	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	L	A	W112R	10-18-30	0.05-0.08-0.10				
		3	L	A	W112R	6-10-15	0.05-0.08-0.10				
	S4	1	L	A	W112R	12-18-25	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	L	A	W112R	8-15-20	0.05-0.08-0.10				
		3	L	A	W112R	5-10-12	0.05-0.08-0.10				
	S	S11	1	L	A	W112R	20-40-60	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
			2	L	A	W112R	20-35-45	0.06-0.10-0.14			
3			L	A	W112R	10-20-30	0.06-0.10-0.14				
S12		1	L	A	W112R	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	L	A	W112R	20-30-45	0.06-0.10-0.14				
		3	L	A	W112R	10-15-20	0.06-0.10-0.14				
S13		1	L	A	W112R	20-30-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	L	A	W112R	15-25-30	0.05-0.08-0.10				
		3	L	A	W112R	10-15-20	0.05-0.08-0.10				
S14		1	L	A	W112R	15-20-30	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	L	A	W112R	10-18-25	0.05-0.08-0.10				
		3	L	A	W112R	06-10-12	0.05-0.08-0.10				
H	H1	1	L	A	W107R	15-25-30	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	L	A	W107R	10-18-25	0.04-0.06-0.08				
		3	L	A	W107R	5-10-15	0.04-0.06-0.08				
	H2	1	L	A	W107R	10-18-25	0.04-0.06-0.08	0.05-0.08	0.05-0.08	0.05-0.08	
		2	L	A	W107R	8-15-20	0.04-0.06-0.08				
		3	L	A	W107R	4-8-12	0.04-0.06-0.08				
	H3	1	L	A	W107R	8-10-15	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08	0.05-0.08	
		2	L	A	W107R	8-10-15	0.03-0.05-0.07				
		3	L	A	W107R	3-5-8	0.03-0.05-0.07				
SM	SM1	1	L	B	T1	120-160-200	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	B	T1	110-140-170	0.18-0.22-0.30				
		3	L	B	T1	60-80-100	0.12-0.16-0.20				
	SM2	1	L	B	W112R	110-130-160	0.16-0.20-0.25	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	B	W112R	100-110-140	0.12-0.15-0.20				
		3	L	B	W112R	50-60-80	0.12-0.15-0.20				
	SM3	1	L	B	W112R	30-45-60	0.08-0.12-0.16	0.08-0.10-0.12	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	B	W112R	30-45-60	0.08-0.12-0.15				
		3	L	B	W112R	15-25-35	0.08-0.12-0.15				
O	O1	1	L	A	W110C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	A	W110C	40-60-80	0.10-0.15-0.20				
		3	L	A	W110C	40-60-80	0.10-0.13-0.16				
	O2	1	L	A	W110C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	A	W110C	40-60-80	0.10-0.15-0.20				
		3	L	A	W110C	40-60-80	0.10-0.13-0.16				
	O3	1	L	A	W110C	40-50-60	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	A	W110C	40-50-60	0.10-0.15-0.20				
		3	L	A	W110C	40-50-60	0.10-0.13-0.16				
	O4	1	L	A	W110C	30-50-60	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	L	A	W110C	30-50-60	0.05-0.08-0.10				
		3	L	A	W110C	30-50-60	0.05-0.08-0.10				



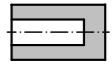
Läpireikä (kevyesti hakkaava)
Through Bore with Interruption



AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal			
							a_p Ø 5.800-10.609 mm	a_p Ø 10.610-18.609 mm	a_p Ø 18.610-33.100 mm	
4	L	A	W112R	20-35-45	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
5	L	A	W112R	20-35-45	0.06-0.10-0.14					
6	L	A	W112R	10-15-20	0.06-0.10-0.14					
4	L	A	W112R	20-30-45	0.06-0.10-0.12					
5	L	A	W112R	20-30-45	0.05-0.08-0.12					
6	L	A	W112R	10-15-20	0.05-0.08-0.12					
4	L	A	W112R	15-20-35	0.06-0.10-0.12					
5	L	A	W112R	10-18-30	0.05-0.08-0.10					
6	L	A	W112R	6-10-15	0.05-0.08-0.10					
4	L	A	W112R	12-18-25	0.05-0.08-0.10					
5	L	A	W112R	8-15-20	0.05-0.08-0.10					
6	L	A	W112R	5-10-12	0.05-0.08-0.10					
4	L	A	W112R	20-40-60	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
5	L	A	W112R	20-35-45	0.06-0.10-0.14					
6	L	A	W112R	10-20-30	0.06-0.10-0.14					
4	L	A	W112R	20-35-45	0.06-0.10-0.14					
5	L	A	W112R	20-30-45	0.06-0.10-0.14					
6	L	A	W112R	10-15-20	0.06-0.10-0.14					
4	L	A	W112R	20-30-45	0.06-0.10-0.14					
5	L	A	W112R	15-25-30	0.05-0.08-0.10					
6	L	A	W112R	10-15-20	0.05-0.08-0.10					
4	L	A	W112R	15-20-30	0.05-0.08-0.10					
5	L	A	W112R	10-18-25	0.05-0.08-0.10					
6	L	A	W112R	06-10-12	0.05-0.08-0.10					
4	L	A	W107R	15-25-30	0.04-0.06-0.08	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
5	L	A	W107R	10-18-25	0.04-0.06-0.08					
6	L	A	W107R	5-10-15	0.04-0.06-0.08					
4	L	A	W107R	10-18-25	0.04-0.06-0.08					
5	L	A	W107R	8-15-20	0.04-0.06-0.08					
6	L	A	W107R	4-8-12	0.04-0.06-0.08					
4	L	A	W107R	8-10-15	0.03-0.05-0.07					
5	L	A	W107R	8-10-15	0.03-0.05-0.07					
6	L	A	W107R	3-5-8	0.03-0.05-0.07					
4	L	B	T1	120-160-200	0.18-0.25-0.35		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	L	B	T1	110-140-170	0.18-0.22-0.30					
6	L	B	W112R	60-80-100	0.12-0.16-0.20					
4	L	B	W112R	110-130-160	0.16-0.20-0.25					
5	L	B	W112R	100-110-140	0.12-0.15-0.20					
6	L	B	W112R	50-60-80	0.12-0.15-0.20					
4	L	B	W112R	30-45-60	0.08-0.12-0.16					
5	L	B	W112R	30-45-60	0.08-0.12-0.15					
6	L	B	W112R	15-25-35	0.08-0.12-0.15					
4	L	A	W110C	40-60-80	0.10-0.15-0.20	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%		0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	L	A	W110C	40-60-80	0.10-0.15-0.20					
6	L	A	W110C	40-60-80	0.10-0.13-0.16					
4	L	A	W110C	40-60-80	0.10-0.15-0.20					
5	L	A	W110C	40-60-80	0.10-0.15-0.20					
6	L	A	W110C	40-60-80	0.10-0.13-0.16					
4	L	A	W110C	40-50-60	0.10-0.15-0.20					
5	L	A	W110C	40-50-60	0.10-0.15-0.20					
6	L	A	W110C	40-50-60	0.10-0.13-0.16					
4	L	A	W110C	30-50-60	0.05-0.08-0.10					
5	L	A	W110C	30-50-60	0.05-0.08-0.10					
6	L	A	W110C	30-50-60	0.05-0.08-0.10					

Lastuamisarvot RM vario

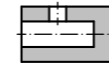
Cutting Data RM vario



Pohjareikä
Blind Hole



ISO	UMC	AC	Type	Geometry	Grade	Vc	fz	Radial / Stock Removal			
								ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm	
S	S1	1	G	A	W112R	20-35-45	0.06-0.10-0.14				
		2	G	A	W112R	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		3	G	A	W112R	10-15-20	0.06-0.10-0.14				
	S2	1	G	A	W112R	20-30-45	0.06-0.10-0.12	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	G	A	W112R	20-30-45	0.05-0.08-0.12				
		3	G	A	W112R	10-15-20	0.05-0.08-0.12				
	S3	1	G	A	W112R	15-20-35	0.06-0.10-0.12	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	G	A	W112R	10-18-30	0.05-0.08-0.10				
		3	G	A	W112R	6-10-15	0.05-0.08-0.10				
	S4	1	G	A	W112R	12-18-25	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	G	A	W112R	8-15-20	0.05-0.08-0.10				
		3	G	A	W112R	5-10-12	0.05-0.08-0.10				
	S	S11	1	G	A	W112R	20-40-60	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12
			2	G	A	W112R	20-35-45	0.06-0.10-0.14			
3			G	A	W112R	10-20-30	0.06-0.10-0.14				
S12		1	G	A	W112R	20-35-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	G	A	W112R	20-30-45	0.06-0.10-0.14				
		3	G	A	W112R	10-15-20	0.06-0.10-0.14				
S13		1	G	A	W112R	20-30-45	0.06-0.10-0.14	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
		2	G	A	W112R	15-25-30	0.05-0.08-0.10				
		3	G	A	W112R	10-15-20	0.05-0.08-0.10				
S14		1	G	A	W112R	15-20-30	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	0.05-0.08-0.10	
		2	G	A	W112R	10-18-25	0.05-0.08-0.10				
		3	G	A	W112R	06-10-12	0.05-0.08-0.10				
H	H1	1	G	A	W107R	15-25-30	0.04-0.06-0.08	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
		2	G	A	W107R	10-18-25	0.04-0.06-0.08				
		3	G	A	W107R	5-10-15	0.04-0.06-0.08				
	H2	1	G	A	W107R	10-18-25	0.04-0.06-0.08	0.05-0.08	0.05-0.08	0.05-0.08	
		2	G	A	W107R	8-15-20	0.04-0.06-0.08				
		3	G	A	W107R	4-8-12	0.04-0.06-0.08				
	H3	1	G	A	W107R	8-10-15	0.03-0.05-0.07	0.04-0.05-0.06	0.05-0.08	0.05-0.08	
		2	G	A	W107R	8-10-15	0.03-0.05-0.07				
		3	G	A	W107R	3-5-8	0.03-0.05-0.07				
SM	SM1	1	G	A	T1	120-160-200	0.18-0.25-0.35	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	T1	110-140-170	0.18-0.22-0.30				
		3	G	I	T1	60-80-100	0.12-0.16-0.20				
	SM2	1	G	A	W112R	110-130-160	0.16-0.20-0.25	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	W112R	100-110-140	0.12-0.15-0.20				
		3	G	I	W112R	50-60-80	0.12-0.15-0.20				
	SM3	1	G	A	W112R	30-45-60	0.08-0.12-0.16	0.08-0.10-0.12	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	W112R	30-45-60	0.08-0.12-0.15				
		3	G	I	W112R	15-25-35	0.08-0.12-0.15				
O	O1	1	G	A	W110C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	W110C	40-60-80	0.10-0.15-0.20				
		3	G	A	W110C	40-60-80	0.10-0.13-0.16				
	O2	1	G	A	W110C	40-60-80	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	W110C	40-60-80	0.10-0.15-0.20				
		3	G	A	W110C	40-60-80	0.10-0.13-0.16				
	O3	1	G	A	W110C	40-50-60	0.10-0.15-0.20	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	W110C	40-50-60	0.10-0.15-0.20				
		3	G	A	W110C	40-50-60	0.10-0.13-0.16				
	O4	1	G	A	W110C	30-50-60	0.05-0.08-0.10	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20	
		2	G	A	W110C	30-50-60	0.05-0.08-0.10				
		3	G	A	W110C	30-50-60	0.05-0.08-0.10				



Pohjareikä (kevyesti hakkaava)
Blind Hole with Interruption



AC	Type	Geometry	Grade	Vc	fz Full Cut	fz Interrupted	Radial / Stock Removal			
							ap Ø 5.800-10.609 mm	ap Ø 10.610-18.609 mm	ap Ø 18.610-33.100 mm	
4	G	A	W112R	20-35-45	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
5	G	A	W112R	20-35-45	0.06-0.10-0.14					
6	G	A	W112R	10-15-20	0.06-0.10-0.14					
4	G	A	W112R	20-30-45	0.06-0.10-0.12					
5	G	A	W112R	20-30-45	0.05-0.08-0.12					
6	G	A	W112R	10-15-20	0.05-0.08-0.12					
4	G	A	W112R	15-20-35	0.06-0.10-0.12					
5	G	A	W112R	10-18-30	0.05-0.08-0.10					
6	G	A	W112R	6-10-15	0.05-0.08-0.10					
4	G	A	W112R	12-18-25	0.05-0.08-0.10					
5	G	A	W112R	8-15-20	0.05-0.08-0.10					
6	G	A	W112R	5-10-12	0.05-0.08-0.10					
4	G	A	W112R	20-40-60	0.06-0.10-0.14	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08-0.10	0.05-0.10-0.12	0.05-0.10-0.12	
5	G	A	W112R	20-35-45	0.06-0.10-0.14					
6	G	A	W112R	10-20-30	0.06-0.10-0.14					
4	G	A	W112R	20-35-45	0.06-0.10-0.14					
5	G	A	W112R	20-30-45	0.06-0.10-0.14					
6	G	A	W112R	10-15-20	0.06-0.10-0.14					
4	G	A	W112R	20-30-45	0.06-0.10-0.14					
5	G	A	W112R	15-25-30	0.05-0.08-0.10					
6	G	A	W112R	10-15-20	0.05-0.08-0.10					
4	G	A	W112R	15-20-30	0.05-0.08-0.10					
5	G	A	W112R	10-18-25	0.05-0.08-0.10					
6	G	A	W112R	06-10-12	0.05-0.08-0.10					
4	G	A	W107R	15-25-30	0.04-0.06-0.08	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.05-0.08	0.05-0.08-0.10	0.05-0.08-0.10	
5	G	A	W107R	10-18-25	0.04-0.06-0.08					
6	G	I	W107R	5-10-15	0.04-0.06-0.08					
4	G	A	W107R	10-18-25	0.04-0.06-0.08					
5	G	A	W107R	8-15-20	0.04-0.06-0.08					
6	G	I	W107R	4-8-12	0.04-0.06-0.08					
4	G	A	W107R	8-10-15	0.03-0.05-0.07					
5	G	I	W107R	8-10-15	0.03-0.05-0.07					
6	G	I	W107R	3-5-8	0.03-0.05-0.07					
4	G	A	T1	120-160-200	0.18-0.25-0.35		fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%	0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	G	A	T1	110-140-170	0.18-0.22-0.30					
6	G	I	W112R	60-80-100	0.12-0.16-0.20					
4	G	A	W112R	110-130-160	0.16-0.20-0.25					
5	G	A	W112R	100-110-140	0.12-0.15-0.20					
6	G	I	W112R	50-60-80	0.12-0.15-0.20					
4	G	A	W112R	30-45-60	0.08-0.12-0.16					
5	G	A	W112R	30-45-60	0.08-0.12-0.15					
6	G	I	W112R	15-25-35	0.08-0.12-0.15					
4	G	A	W110C	40-60-80	0.10-0.15-0.20	fz Syöttö vähennettynä 30% - 50% reduce fz full cut 30 - 50%		0.08-0.10-0.15	0.08-0.10-0.15	0.08-0.10-0.20
5	G	A	W110C	40-60-80	0.10-0.15-0.20					
6	G	A	W110C	40-60-80	0.10-0.13-0.16					
4	G	A	W110C	40-60-80	0.10-0.15-0.20					
5	G	A	W110C	40-60-80	0.10-0.15-0.20					
6	G	A	W110C	40-60-80	0.10-0.13-0.16					
4	G	A	W110C	40-50-60	0.10-0.15-0.20					
5	G	A	W110C	40-50-60	0.10-0.15-0.20					
6	G	A	W110C	40-50-60	0.10-0.13-0.16					
4	G	A	W110C	30-50-60	0.05-0.08-0.10					
5	G	A	W110C	30-50-60	0.05-0.08-0.10					
6	G	A	W110C	30-50-60	0.05-0.08-0.10					

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Käyttöohje säädettävälle kalvaimille "RM vario"

Handling Instructions for Adjustable Reaming Tools "RM vario"

Miksi säädettävä?

- Halkaisija säädettävissä toleranssialueen sisällä (riippuen koneistettavasta materiaalista)
- Mahdollistaa kulumisen kompensoinnin (mikäli pinnanlaatu on edelleen kelvollinen)

Mitä pitää ottaa huomioon:

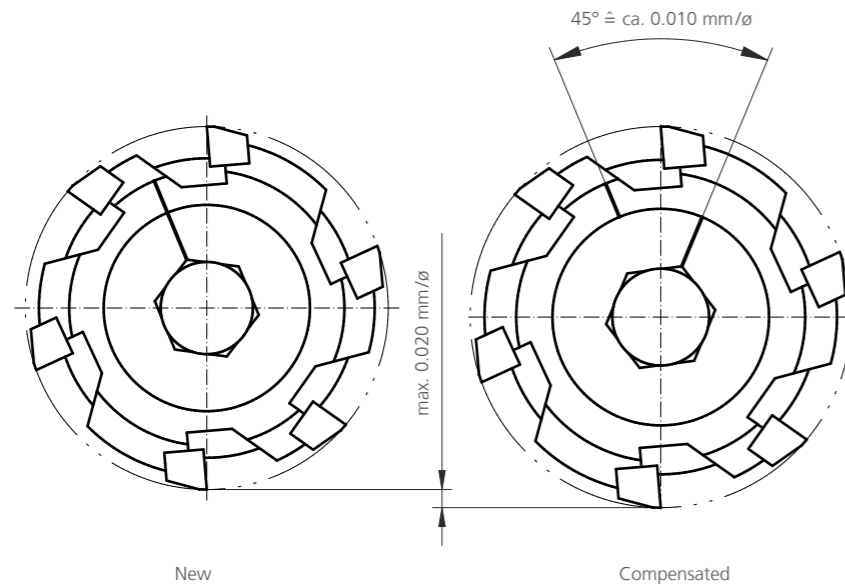
- max. 0,020mm halkaisijan kasvattaminen (leikkuupinnan kulumisen mukaan)
- säädä varovasti – Ei saa korjata takaisin pienemmäksi!
- säätö haluttuun halkaisijaan kuvan mukaisesti (mm/°).

Why adjustable?

- Readjustment of the diameter within the tolerance range (depending on the material to be machined)
- Possible compensation of wear (if the surface quality is still within the tolerance)

What has to be considered:

- Max. 0,020 mm in diameter may be added (otherwise the reaming head can be overstretched)
- Adjust carefully - never turn back!
- Infeed with adjustment dimension (mm/°) according to drawing



Ohjeet kompensatio kartiolle

Instruction Compensation Chuck



Parhaimman tuloksen saavuttamiseksi tulee kalvain aina kellottaa heitottomaksi. Tällä tavalla pystytään eliminoimaan kaikki virheet jotka voivat johtua työkalukokoonpanosta tai työstökoneen karasta. Työkalu tulee aina kiinnittää joko säädettävään tai uivaan -istukkaan. RM vario kalvaimien heitottomuus voidaan mitata eri menetelmin.

Menetelmä:

1. Ennen säätöä, varmista että kaikki ruuvit ① on löysätty kokonaan.
2. Laita työkalu koneen karalle.
3. Asenna mittakello (1 μm / 0,0001 inch tarkkuudella) merkityille mitta-alueelle akselilla.
4. Säädä heitto koneen karalla max. 5 μm / 0,0002" (ideaali < 3 μm / 0,0001") neljän säätöruuvien avulla ①.



Säätöruuvien ei tarvitse olla täysin samalla tasolla säädön jälkeen.

In order to achieve the best reaming results, a tool with zero run-out is absolutely essential. To compensate any run-out error of the tool holder and the machine spindle, we recommend using a compensation holder or floating chuck. The run-out of RM vario reamers can be measured with different methods:

Procedure:

1. Before adjusting, make sure that all adjustment screws ① are completely loosened.
2. Load the tool in the machine spindle.
3. Set the indicator (with 1 μm / 0,0001 inch resolution) on the marked run-out area on the shank.
4. Set the run-out directly in the machine spindle to maximum 5 μm / 0,0002 inch (ideal < 3 μm / 0,0001 inch) by using the four radial adjustment screws ①.



The adjustment screws do not have to be fully clamped against each other after adjustment.

Uivan istukan käyttöohje

Instruction Floating Chuck



Sorveissa kalvinta tehdään pää-asiaa uivilla istukoilla (poikkeustapauksissa mahdollista myös koneistuskeskuksilla).

Asemointivirheet voidaan tasata säätömekanismilla (ei kulmavirheitä).

Suosittelavia ovat leikkuugeometriat kulmilla $\leq 45^\circ$

Menetelmä:

1. Säädä uiva mekanismi käyttäen ruuvia ①.

Säätöruuvi	Uiva mekanismi	Vaikutus työstöjälkeen
Kellonsuuntaan	Jousivoima kasvaa / kohdistusvoima kasvaa	Voi vaikuttaa negatiivisesti työstöjälkeen. (Kierreläjjet ulosvedossa)
vastakkaiseen suuntaan	Jousivoima vähenee / Kohdistusvoima vähenee	Mahdollistaa värinäherkkyyden

Reaming on lathes are mainly done with floating chucks (in exceptional cases also on machining centres).

Positioning errors can be compensated by the adjustable floating mechanism. The deflection should only take place in plane-parallel (No angular error compensation).

Cutting geometries with an angle of $\leq 45^\circ$ are recommended.

Procedure:

1. Adjust the floating mechanism by using the adjustment screw ①.

Adjustment screw	Floating mechanism	Influence on machining
Clockwise rotation	Spring force increases / deflection resistance increases	The surface quality can be negatively influenced (retraction marks)
Counterclockwise rotation	Spring force becomes weaker / deflection resistance decreases	Potential vibration tendency

Säätö:

Pehmeä: Työkalu tulee säätää pienimmälle mahdolliselle "kosketusvoimalle". Kuitenkin huomioiden työkalun kokonaisuutena. Työkalun tulee hakeutua automaattisesti aksiaalilinjaan automaattisesti kosketuksen tapahduttua.

Keski: Kiristä säätöruuvi aivan pohjaan ja avaa sitä $1 \pm \frac{1}{4}$ kierrosta takaisinpäin.

Kova: Kiristä säätöruuvi aivan pohjaan ja avaa sitä $\frac{1}{4} - \frac{1}{2}$ kierrosta takaisinpäin.

Adjustment:

Soft: The tool should be adjusted with the lowest possible deflection resistance. Nevertheless, taking into account the weight of the tool, it must jump back automatically into the central axis after deflection.

Medium: Fully tighten the adjusting screw and turn back by $1 \pm \frac{1}{4}$ rotation.

Hard: Fully tighten the adjusting screw and turn back by $\frac{1}{4} - \frac{1}{2}$ rotation.

Suositus perussäädöksi:

Työkalun-Ø Tool-Ø	Pehmeä Soft	Keski Medium	Kova Hard
5.800 – 15.600	X		
15.601 – 23.600	X	X	
23.601 – 33.100		X	

Recommendation for the basic setting:

2. Y akselilla varustetuissa sorveissa maksimi heitto työkalulle karansuunnassa $< 10 \mu\text{m} / 0,0004 \text{ inch}$ (ideal $< 5 \mu\text{m} / 0,0002 \text{ inch}$).



- Uivan istukan asetukset voivat vaihdella sovelluksesta ja uivan istukan tyyppistä riippuen.
- On suositeltavaa ajaa ensimmäiset reiät alennetulle syötöllä.
- Kaikki arvot on ohjearvoja URMA uiviin istukoihin.

2. With an existing Y-axis, we recommend additionally aligning the tool $< 10 \mu\text{m} / 0,0004 \text{ inch}$ (ideally $< 5 \mu\text{m} / 0,0002 \text{ inch}$) concentrically to the spindle axis.



- The settings of the floating mechanism can vary depending on the application and type of floating chuck.
- It is generally recommended to enter into the bore with reduced rpm.
- All data are guide values and refer to URMA floating chucks.

URMA Reaming Technology

Ratkaisuja kalvintaongelmiin; Työstökeskus

Troubleshooting Machining Centres



	Reikä on liian iso Hole too large				Kartiokkuus Tapered hole				Jälkiä kalvinreiässä Hole shows chatter marks	
	Värinä Vibration	Heitto Run-out error	Materiaalia särmässä Built-up edges	Säteis leikkusyvyy- s ap Radial depth of cut	Kiinni- tyksestä johtuva muodon- muutos Deformation by clamping	Epätasainen materiaali- vahvuus Uneven material thickness	Työstö- kone Machine	Lastuvuo Chip flow	Värinä Vibration	Heitto Run-out error
Työstöarvot Cutting Data										
Syöttö (fz) Feed (fz)	↑		↓				↑/↓	↑		
Pyörimisnopeus Spindle speed (min ⁻¹)	↓		↑					↓		
Säteis leikkusyvyy- s ap Radial depth of cut	↑		↑	↓	⚠		↓	↑		
Työkalu Tool										
Viisteen kulma Chamfer angle	↑				↑			↑		
Heitto Run out	⚠	⚠							⚠	
Tarkista kiinnitys Check the connection	⚠	⚠							⚠	
Tarkista kuluma / vaihda teräpala Check the wear / change the insert			⚠					⚠		
Uiva-istukka Floating chuck									•/⚠	
Pienemmäksi hiottu varsi Diameter reduced holder									•/⚠	
Kompensatio istukka Compensation chuck		•/⚠							•/⚠	
Työkappale Workpiece										
Kiinnitys Workpiece fixture	⚠				⚠/↓			⚠		
Kiinnitysvoima Clamping pressure	⚠				⚠/↓			⚠		
Työstökone Machine										
Muljun vahvuus Coolant mixture	↑		↑				⚠	↑		
Karan asemavirhe Angle-error of spindle						⚠				
Kulmavirhe akselilla Angle-error of axis						⚠				
Värinää tankoautomaatissa Vibrations from bar-feeder										
Koneistus Machining										
Lastuvuo Chip flow				⚠			⚠			
Muljun paine Coolant pressure	⚠/↓		⚠				↑	⚠/↓		
Geometriasta johtuva aksiaalipaine Radial pressure from geometry	↓		⚠	⚠	↓			↓		
karan pyörimisnopeus sisäänmenossa Spindle speed on entry	↓		⚠			⚠		↓		
Sisään- ulossyöttö Feed in feed out										

Toimenpiteet: Mikäli mahdollista tee vain yksi muutos kerrallaan.

Handling: If possible, apply only one modification at once.

↑ Korosta / Paranna
Increase, improve

↓ Vähennä
Reduce, decrease

⚠ Tarkista / optimoi
Check, optimize

• Valinta
Apply

	Huono pinnanlaatu (Mitattuna) Surface quality unsatisfactory (measurable)				Huono pinnanlaatu (visuaalinen) Surface quality unsatisfactory (optically)				Ulosvetojälkiä Retraction marks			Pienireikä tai muoto ongelma Hole too small or shape defect				
	Värinä Vibration	Mate- riaalia särmässä Built-up edges	Heitto Run-out error	Leikkuu- geomet- ria Cutting geometry	Työstö- kone Machine	Syöttö Feed rate	Heitto Run-out error	Leikkuu- geomet- ria Cutting geometry	Työstö- kone Machine	Mate- riaalia särmässä Built-up edges	Mate- riaalin kutistuma Radial com- pres- sion of material	Kiinni- tyksestä johtuva muodon- muutos Radial com- pres- sion through clamping	Teräpalkan kulumi- nen Tool wear	Mate- riaalin kutistuma Radial com- pres- sion of material	Kiinni- tyksestä johtuva muodon- muutos Radial com- pres- sion through clamping	Säteis leikkusyv- yys ap Radial depth of cut
	↑	↓								↓						
	↓	↑								↑						
										↓/↑			↑	↓	↑	
	↑			↓			↑			↑			↑	↑		
							⚠			⚠						
										⚠			⚠	⚠		
							•/⚠			•/⚠	•/⚠					
							•/⚠			•/⚠	•/⚠					
							•/⚠			•/⚠						
	⚠								⚠			⚠/↓		⚠/↓	⚠/↓	
	⚠								⚠			⚠/↓		⚠/↓	⚠/↓	
	↑	↑						↑	↑	↓				↓		
								⚠								
								⚠						⚠		
	⚠	⚠								⚠			⚠			
	↓							⚠		⚠	↓			↓	↓	
	↓															
									•				•		•	

Ratkaisuja kalvintaongelmiin; Sorvas

Troubleshooting Lathes



	Reikä on liian iso Hole too large				Kartiokkuus Tapered hole				Jälkiä kalvinreissä Hole shows chatter marks	
	Värinä Vibration	Heitto Run-out error	Materiaalia särmässä Built-up edges	Säteis leikkusyvyy- s ap Radial depth of cut	Kiinni- tyksestä johtuva muodon- muutos Deformation by clamping	Epätasainen materiaali- vahvuus Uneven material thickness	Työstö- kone Machine	Lastuvuo Chip flow	Värinä Vibration	Heitto Run-out error
Työstöarvot Cutting Data										
Syöttö (fz) Feed (fz)	↑		↓				↑/↓	↑		
Pyörimisnopeus Spindle speed (min ⁻¹)	↓		↑					↓		
Säteis leikkusyvyy- s ap Radial depth of cut	↑		↓		⚠		↓	↑		
Työkalu Tool										
Viisteen kulma Chamfer angle	↑				↑			↑		
Heitto Run out		⚠							⚠	
Tarkista kiinnitys Check the connection	⚠		⚠						⚠	
Tarkista kuluma / vaihda teräpala Check the wear / change the insert	⚠	⚠	⚠					⚠	⚠	
Uiva-istukka Floating chuck	⚠	•/⚠					•/⚠		•/⚠	
Piennemäksi hiottu varsi Diameter reduced holder	⚠	•/⚠					•/⚠		•/⚠	
Kompensatio istukka Compensation chuck										
Työkappale Workpiece										
Kiinnitys Workpiece fixture	⚠				⚠/↓			⚠	⚠	
Kiinnitysvoima Clamping pressure	⚠				⚠/↓			⚠	⚠	
Työstökone Machine										
Muljun vahvuus Coolant mixture			↑				⚠			
Karan asemavirhe Angle-error of spindle	⚠	⚠					⚠	⚠	⚠	
Kulmavirhe akselilla Angle-error of axis	⚠	⚠					⚠	⚠		
Värinää tankoautomaatissa Vibrations from bar-feeder	⚠						⚠	⚠		
Koneistus Machining										
Lastuvuo Chip flow				⚠			⚠			⚠
Muljun paine Coolant pressure	⚠/↓		⚠				↑	⚠/↓		
Geometriasta johtuva aksiaalipaine Radial pressure from geometry	↓		⚠	⚠		↓		↓		
karan pyörimisnopeus sisäänmenossa Spindle speed on entry	↓		⚠					↓		
Sisään- ulossyöttö Feed in feed out										

Toimenpiteet: Mikäli mahdollista tee vain yksi muutos kerrallaan.

Handling: If possible, apply only one modification at once.

↑ Korosta / Paranna
Increase, improve

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Reduce, decrease

⚠ Tarkista / optimoi
Check, optimize






• Valinta
Apply

	Huono pinnanlaatu (Mitattuna) Surface quality unsatisfactory (measurable)				Huono pinnanlaatu (visuaalinen) Surface quality unsatisfactory (optically)				Ulosvetojälkiä Retraction marks			Pienireikä tai muoto ongelma Hole too small or shape defect				
	Värinä Vibration	Mate- riaalia särmässä Built-up edges	Heitto Run-out error	Leikkuu- geomet- ria Cutting geometry	Työstö- kone Machine	Syöttö Feed rate	Heitto Run-out error	Leikkuu- geomet- ria Cutting geometry	Työstö- kone Machine	Mate- riaalia särmässä Built-up edges	Mate- riaalin kutistuma Radial com- pres- sion of material	Kiinni- tyksestä johtuva muodon- muutos Radial com- pres- sion through clamping	Teräpalkan kulumi- nen Tool wear	Mate- riaalin kutistuma Radial com- pres- sion of material	Kiinni- tyksestä johtuva muodon- muutos Radial com- pres- sion through clamping	Säteis leikkusyv- vyys ap Radial depth of cut
	↑	↓								↓						
	↓	↑								↑						
	↑									↑/↓			↑	↓	↑	
	↑			↓			↓			↑			↑	↑		
			⚠				⚠			⚠						
			⚠				⚠			⚠						
	⚠	⚠	⚠	⚠			⚠	⚠		⚠	⚠		⚠	⚠		
	⚠		•/⚠				•/⚠			•/⚠	•/⚠		•/⚠	•/⚠		
	⚠		•/⚠				•/⚠			•/⚠	•/⚠		•/⚠	•/⚠		
	⚠										⚠/↓		⚠/↓	⚠/↓		
	⚠										⚠/↓		⚠/↓	⚠/↓		
	↑	↑								↑	↓			↓		
	⚠		⚠				⚠	⚠		⚠						
	⚠		⚠				⚠	⚠		⚠						
	⚠						⚠			⚠						
	⚠	⚠								⚠			⚠			⚠
	↓									⚠	↓			↓	↓	
	↓															
									•				•			•

Määritelmiä ja peruskaavoja

Definitions and Basic Formulas

Merkitys	Designation
a_p Lastunpaksuus	Depth of cut [mm]
n Kierrosluku	Speed [min^{-1}]
D/d Reiän halkaisija	Bore diameter [mm]
v_c Leikkuunopeus	Cutting speed [m/min]
v_f Syöttö	Feed rate [mm/min]
f Syöttö kierrosta kohti	Feed per rotation [mm]
f_z Syöttö leikkuuta kohti	Feed per tooth [mm]
z Leikkuiden määrä	Number of cutting edges
l_f Feed distance	Feed distance [mm]
R_a Arithmetic centre line average value	Arithmetic centre line average value [μm]
R_t Pohjasta huippuun korkeus	Peak-to-valley height [μm]
R_z Keskimääräinen ohjasta huippuun korkeus	Average peak-to-valley height [μm]
R_m Vetolujuus	Tensile strength [N/mm^2]
t_c Kappaleaika	Machining time [min]
γ Radiaalinen teräkulma	Radial rake angle [Degrees]
ε Kärkikulma	Apex angle [Degrees]
h Lastunpaksuus	Chip thickness [mm]
mc Kiristysmomentti	Material constant
$kc1.1$ Pää leikkuuvoima	Main value cutting force [N/mm^2]
kc Ominaislastuamisvoima	Specific cutting force [N/mm^2]
F_c Leikkuuvoima	Cutting force [N]
b Lastun leveys	Chip width [mm]
P_c Nettoteho	Necessary drive power [kW]
η Tehokulma	Degree of efficiency
M_d Vääntö	Torque [Nm]

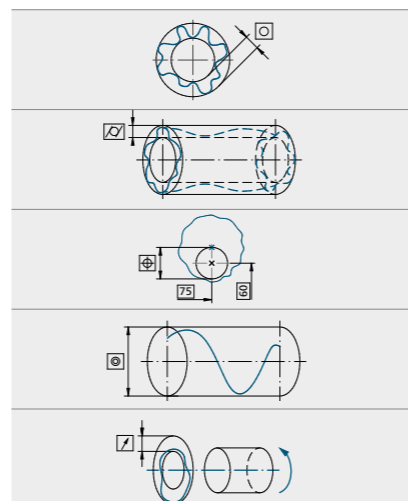
 Ympyrämaisyyttä	Circularity
 Lieriömaisyyttä	Cylindricity
 Sijainti	Position
 Keskeisyys	Concentricity
 Ympyrämaisyyden heitto	Circular runout

Leikkuunopeus Cutting speed	$v_c = \frac{\pi \cdot d \cdot n}{1000}$	m/min
Syöttö/min Feed rate	$v_f = f \cdot n$ $v_f = f_z \cdot z \cdot n$	mm/min
Leikkuuvoima hammastakohti Cutting force (per cutting edge)	$F_c = b \cdot h \cdot k_c$	N

Pyörimisnopeus Speed	$n = \frac{v_c \cdot 1000}{\pi \cdot d}$	min^{-1}
Koneistusaika Machining time	$t_c = \frac{l_f}{f \cdot n}$	min
Tehovaatimus Power requirement	$P_c = \frac{b \cdot h \cdot k_c \cdot v_c \cdot z}{60 \cdot 10^3 \cdot \eta}$	kW

Spanungsbreite / Chip width	
a_p	h
0.05	0.07
0.08	0.11
0.10	0.14
0.15	0.21
0.20	0.28
0.25	0.35

	R_a	R_z
N8	1.6 - 3.2	8.4 - 15
N7	0.8 - 1.6	4.0 - 8.4
N6	0.4 - 0.8	2.2 - 4.0
N5	0.2 - 0.4	1.6 - 2.8
N4	0.1 - 0.2	1.0 - 2.8
N3	0.05 - 0.1	0.8 - 1.1



Leikkuuvoima Specific cutting force	$k_c = \frac{kc1.1}{h^{m_c}}$	N
Vääntö Torque	$M_d = \frac{(D^2 - d^2) \cdot f \cdot k_c}{8 \cdot 10^3}$	Nm

Lähtötietolomake

Machining Study

Lähtettäjä * Sender		Number	
Yritys Company		URMA jälleenmyyjä URMA distributor	
Osoite Address		Yhteyshenkilö Contact	
Työstökone Machine-Tool			
Koneen tyyppi ja valmistaja Machine type and manufacturer			
Pystykarainen * Horizontal <input type="checkbox"/>	Vaakakarainen * Vertical <input type="checkbox"/>		Pyörivät työkalut * Tool rotating <input type="checkbox"/>
Kiinnityksen tyyppi * Spindle holder	Koko * Size	Malli * Execution	
DIN 69893-HSK <input type="checkbox"/>	20 <input type="checkbox"/> 25 <input type="checkbox"/>	A <input type="checkbox"/>	
DIN 69871 <input type="checkbox"/>	30 <input type="checkbox"/> 32 <input type="checkbox"/>	B <input type="checkbox"/>	
MAS-BT <input type="checkbox"/>	40 <input type="checkbox"/> 50 <input type="checkbox"/>	C <input type="checkbox"/>	
Weldonvarsi DIN 1835 Cylinder shank DIN 1835 <input type="checkbox"/>	63 <input type="checkbox"/> 80 <input type="checkbox"/>	D <input type="checkbox"/>	
DIN 69880 VDI <input type="checkbox"/>	100 <input type="checkbox"/>	E <input type="checkbox"/>	
Lastuamisneste Lubricant			
öljy * Oil <input type="checkbox"/>	MMS * 1) MLS 1) <input type="checkbox"/>	Emulsio * Emulsion <input type="checkbox"/>	Emulsion öljypitoisuus Ratio of mixture
Innere Kühlmittelzufuhr * Internal coolant supply <input type="checkbox"/>			Lastuamisnesteen paine * Coolant pressure (bar)
Työkappale Workpiece			
Kuvaus Designation	Materiaalin standardinumero * Material number		Lämpökäsittely (Kovuus) * Treatment condition (hardness)
Koneistusvaatimukset Machining requirements			
Reiän Ø * Bore Ø	Reiän pituus * Bore length	Alkureiän Ø * Pre-machined Ø	
Toleranssi * Tolerance	Jos välissä tyhjää Interfering contours mm	Alkureiän valistusmenetelmä * Method of pre-machining	
Muut toleranssivaatimukset Additional tolerance requirements	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Pohjareikä * Blind Hole <input type="checkbox"/>	
Pinnanlaatu (µm) * Surface quality (µm)	R_a <input type="checkbox"/> R_z <input type="checkbox"/> R_t <input type="checkbox"/>	Hakkaava työstö * Cutting interruption <input type="checkbox"/>	
Päivämäärä * Date			
Liite: Luonnos työkappaleesta * Attachement: your application sketch			

* Pakolliset kentät
Mandatory fields

1) Sumuvoitelu
Minimal lubrication system (mist coolant)

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Materiaalien vertailutaulukko

Material Comparison Table

Teräkset

Steel

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
P	P1		Free-cutting steels	< 600	< 180	1600	0.18	1.0715	11SMn30
	P2		Low-alloy ferritic steels, C < 0.25%wt, low-alloy general structural steels	< 700	< 210	1700	0.18	1.0038	S235JRG2
	P3		Ferritic and ferritic / pearlitic steels, C < 0.25%wt, weldable general structural steels, case-hardening steels	< 800	< 240	1800	0.21	1.7131	16MnCr5
	P4		Heat-treatable steels, construction steels C > 0.25%	< 1000	< 300	1800	0.23	1.1191 1.7225	C45E 42CrMo4
	P5		Through-hardening steels, C > 0.67%wt, spring and bearing steels	700 - 1100	210 - 325	1700	0.27	1.1274 1.2067	C100S 100Cr6
	P6		Alloyed tool steels	700 - 1200	210 - 350	2200	0.25	1.2601	X165CrMoV12
	P7		High alloyed tool steels, high speed steels (HSS)	> 900	> 260	2300	0.25	1.2083 1.2344	X42Cr13 X40CrMoV5-1

Ruostumattomat austeniittiset ja Duplex

Stainless austenitic steel and duplex

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
M	M1		Ferritic & martensitic stainless steels	500 - 900	150 - 260	1700	0.22	1.4005 1.4512 1.4021	X12CrS13 X5CrTi12 X20Cr13
	M2		Free-cutting austenitic stainless steels, less difficult machinable	500 - 900	150 - 260	1700	0.22	1.4305	X8CrNiS18 9
	M3		Low-alloy austenitic stainless steels			2000	0.2	1.4301	X5CrNi18 10
	M4		Alloyed austenitic stainless steels			2100	0.2	1.4435	X2CrNiMo18 14 3
	M5		High-alloy austenitic and duplex stainless steels			2300	0.2	1.4462 1.4548	X2CrNiMoN22 5 3 X5CrNiCuNb17 4 4
	M6		Austenite, duplex and super duplex, very difficult to machine	700 - 1000	210 - 300	2300	0.2	1.4410	X2CrNiMoN25 7 4

Tarkempaa tietoa sivuilla 92 – 100

See pages 92 – 100 for detailed material list

Materiaalien vertailutaulukko

Material Comparison Table

Valuraudat

Cast Irons

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
K	K1		Grey cast irons	< 300	< 90	1100	0.25	0.6025	EN-GJL-250 (GG25)
	K2		Grey cast irons	> 300	> 90	1300	0.27	0.6035	EN-GJL-350 (GG35)
	K3		Ductil cast irons, Malleable cast irons	< 500	< 150	900	0.25	0.7040	EN-GJS-400-15 (GGG40)
	K4		Ductil cast irons, Malleable cast irons	< 800	< 210	1400	0.28	0.7060	EN-GJS-600-3 (GGG60)
	K5		Austempered ductile irons	< 1100	< 325	1500	0.32		EN-GJS-1000-5
	K6		Compactet graphite irons	300 - 500	90 - 150				EN-GJV-400
	K7		Austenitic lamellar cast irons	< 400				0.6655	GGL-NiCuCr 15 6 2
	K8		Austenitic spheroidal graphite and ductil iron	300 - 600	90 - 180			0.7673	EN-GJSA- XNiMn23-4

Ei- rauta metallit

Non-Ferrous Metals

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
N	N1		Aluminum wrought alloy with Si < 2%	< 300	< 150	600	0.23	3.3535	AlMg3
	N2		Aluminum alloys, Si < 7%	< 400	< 120	700	0.25	3.2152	AlSi6Cu4
	N3		Aluminum alloys 8% < Si < 15% and alloys Magnesium	< 400	< 120	700	0.25	3.2163	AlSi9Cu3 AlSi12
	N4		Aluminum alloys, Si > 15%	> 400	> 120	800	0.25		AlSi17Cu4Mg
	N5		Copper alloys, good machinability	< 700	< 210	800	0.2	2.0401 2.1090	CuZn39Pb3 CuSn7Zn4Pb7-C
	N6		Copper alloys, more difficult machinability	> 500	> 150	1000	0.25	2.0966	CuAl10Ni5Fe4

Tarkempaa tietoa sivuilla 92 – 100

See pages 92 – 100 for detailed material list

Materiaalien vertailutaulukko

Material Comparison Table

Seostetut teräkset

Superalloys

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
S	S1		Iron based superalloys	< 800	< 240	2400	0.23	2.4858	NiCr21Mo (Alloy 825)
	S2		Iron based superalloys	> 800	> 240	2600	0.23	1.4980	X6NiCrTiMoVB25-15-2 (Alloy A-286)
	S3		Cobalt based superalloys	600 - 1200		2800	0.23	2.4979	CoCr28MoNi (Stellite 21)
	S4		Nickel based superalloys	700 - 1500		3100	0.23	2.4668	NiCr19NbMo (Inconel 718)

Titaani

Titanium Alloys

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
S	S11		Titanium, low alloyed (α)	< 800	< 240	1300	0.22	3.7025 3.7035 3.7055	Ti1 (Grade 1) Ti2 (Grade 2) Ti3 (Grade 3)
	S12		Titanium, medium alloyed (close to $\alpha + \beta$)	< 1100	< 325	1500	0.22		Ti6Al2Sn 4Zr2Mo0.1Si
	S13		Titanium, high alloyed ($\alpha + \beta$)	900 - 1200	265 - 355	1500	0.22	3.7165	TiAl6V4 (Grade 5)
	S14		Titanium, high alloyed (β)	> 1200	> 355	1700	0.22		Ti10V2Fe3Al Ti5Al5Mo5V3Cr

Kovat materiaalit

Hardened Steels

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
H	H1		Case hardening steels, heat-treatable steels, bearing steels, tool steels	1450 - 1800	< 520	3300	0.22		HRC 45 - 52
	H2		Case hardening steels, heat-treatable steels, bearing steels, tool steels	1800 - 2100	520 - 600	4100	0.22		HRC 53 - 57
	H3		Case hardening steels, heat-treatable steels, bearing steels, tool steels, high-speed steels	> 2100	> 600	4700	0.22		HRC 58 - 62

Tarkempaa tietoa sivuilla 92 – 100

See pages 92 – 100 for detailed material list

Materiaalien vertailutaulukko

Material Comparison Table

Pulverimetallurgiset materiaalit

Powder Metallurgical Materials

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
SM	SM1		Low alloyed sintered materials	200 - 450	< 135				Sint-D11 / C11
	SM2		Medium alloyed sintered materials with Ni < 7%	400 - 600	120 - 180				Sint-D31 / C31
	SM3		High alloyed sintered materials with Cr and Ni > 7%	400 - 600	120 - 180				Sint-D40 / C40 (AISI 316)

Komposiittimateriaalit

Composite Materials

ISO	UMC	Materiaali tietoa	Description	Rm [N/mm ²]	HB	Kc1.1	mc	DIN Nr.	Esimerkki Example
O	O1		Thermoplastic polymers			150	0.26		Polyamid 6 (PA 6) Polyoxymethylen (POM)
	O2		Thermosetting plastics			150	0.26		Epoxyharze (EP)
	O3		Reinforced plastics with < 50% glass fibers			300	0.26		Polyamid 6 mit 30% GF (PA 6 GF30)
	O4		Glass fiber-, carbon fiber- and aramid reinforced plastics			300	0.26		GFK CFK

Tarkempaa tietoa sivuilla 92 – 100

See pages 92 – 100 for detailed material list

Materiaaliryhmien luokitus

Material Group Classification

Teräkset

Steel

UMC	W-Nr	DIN	EN	AFNOR	BS	UNI	JIS	SS	UNS	AISI / ASTM	
P1	1.0711	9 S 20	10 S 20	CF 9 S 22	220 M 07		SUM 21		G 11120	1112	
	1.0715	9 SMn 28	11 SMn 30	S 250	230 M 07	CF 9 SMn 28	SUM 22	1912	G 12130	1213	
	1.0718	9 SMnPb 28	11 SMnPb 30	S 250 Pb		CF 9 SMnPb 28	SUM 22 L	1914	G 12134	12 L 13	
	1.0721	10 S 20	10 S 20	10 F 1	210 M 15	CF 10 S 20			G 11080	1108	
	1.0722	10 SPb 20	10 SPb 20	10 PbF 2		CF 10 SPb 20	SUM 12		G 11084	11 L 08	
	1.0723	15 S 20	15 SMn 13	S 300	210 A 15		SUM 32	1922			
	1.0726	35 S 20	35 S 20	35 MF 4	212 M 36		SUM 41	1957	G 11400	1140	
	1.0727	46 S 20	46 S 20	45 MF 4	212 M 44		SUM 42	1973	G 11460	1146	
	1.0736	9 SMn 36	11 SMn 37	S 300	240 M 07	CF 9 SMn 36	SUM 25		G 12150	1215	
	1.0737	9 SMnPb 36	11 SMnPb 37	S 300 Pb		CF 9 SMnPb 36	SUM 24 L	1926	G 12144	12 L 14	
P2	1.0037	St 37-2	S 235 JR	E 24-2	4360-40 C	Fe 360 B	STKM 12 C	1312		A 570	
	1.0116	St 37-3	S 235 J2G3	E 24-3	4360-40 D	Fe 360 D FF		1313	K 01501	A 573	
	1.0144	St 44-3	S 275 J2G3	E 28-4	4360-43 C	Fe 430 D FF	SM 41 C	1414		1020	
	1.0301	C 10	C 10	AF 34 C 10, XC 10	045 M 10	C 10	S 10 C		G 10100	1010	
	1.0302	C 10 Pb	C 10	AF 34 C 10, XC 10	045 M 10	C 10	S 10 C		G 10100	1010	
	1.0401	C 15	C 15	AF3 7 C 12, XC 18	080 M 15	C 15, C 16	S 15 C	1350	G 10170	1015	
	1.0402	C 22	1 C 22	C 20	050 A 20	C 20	S 22 C	1450	G 10200	1020	
	1.0420	GS 38	GE 200	230-400M	A1		SC 42	1306			
	1.0425	P 265 GH	P 265 GH	A 42 CP	151-400	P 265 GH	SG 30	1430	K 02801		
	1.0446	GS 45	GE 240	E23-45M	A1		SC 450	1305	J 03001		
	1.0552	GS 52	GE 260		A2						
	1.0558	GS 60	GE 300	320-560M	A3	C 45		1606			
	1.0570	St 52-3	S 355 JR	E 36-3	4360-50 C	Fe 510 B	SM 50 YA	2132			
	1.0461	St E 255	S 255 N						K 01800		
	1.0486	St E 285	P 275 N	P 275 N	P 275 N	Fe E 285 KG	SM 41 A		K 01802		
	1.0505	St E 315	P 315 N			Fe E 315 KG	SM 50 A		K 11506		
	1.0562	St E 355	P 355 N	E 355 R/FP	P 355 N	Fe E 355 KG	SM 50 YB	2132	K 12000		
	1.0970	Q St E 260 N	S 260 MC	41 S 7		Fe E 275 TM					
	1.0974	Q St E 340 TM	S 340 MC	E 335 D	HR 40/30						
	1.0975	Q St E 340 N	S 340 NC			Fe E 355 TD					
1.0978	Q St E 380 TM	S 380 MC	E 390 D								
1.0979	Q St E 380 N	S 380 NC			Fe E 380 TD						
1.0980	Q St E 420 TM	S 420 MC	E 430 D	HR 50 F 45	Fe E 420 TM						
1.1121	Ck 10	C 10 E	XC 10	040 A 10		SS 10 C	1265		1010		
1.1141	Ck 15	C 15 E	XC 15, XC 18	080 M 15	C 15, C 16	S 15 C, S 15 CK	1370	G 10170	1015		
1.1158	Ck 25	Z C 25	XC 25	060 A 25	C 25	S 25 C		G 10250	1025		
P3	1.0482	19 Mn 5	P 310 GH	A 52 CP	224-460	Fe 460-2 KW	SG 37		K 03102		
	1.0982	Q St E 460 TM	S 460 MC	E 445 D	50/45 HR						
	1.0984	Q St E 500 TM	S 500 MC	E 490 D		Fe E 490 TM		2662			
	1.0986	Q St E 550 TM	S 550 MC	E 560 D	60/55 HS	Fe E 560 TM					
	1.1120	G 20 Mn 5	GS 20 Mn 5								
	1.1131	G 17 Mn 5	GS 16 Mn 5 v	G 17 Mn 5		G 17 Mn 5					
	1.2162	21 MnCr 5	21 MnCr 5	20 NC 5			SCR 420 H				
	1.5415	15 Mo 3	16 Mo 3	15 D 3	1501-240	16 Mo 3		2912		A 204 Gr. A	
	1.5423	16 Mo 5			1503-245-420	16 Mo 5	SBC 690		K 11522	4520	
	1.5752	14 NiCr 14	14 NiCr 14	12 NC 15	655 M 13		SNC 815 (H)		G 33106	3310, 9314	
	1.5919	15 CrNi 6	15 CrNi 6	16 NC 6	S 107	16 CrNi 4				4320	
	1.5920	18 CrNi 8	18 CrNi 8	20 NC 6							
	1.6587	18 CrNiMo 7 6	18 NiCrMo 7 6	18 NCD 6	820 A 16	18 NiCrMo 7					
	1.7131	16 MnCr 5	16 MnCr 5	16 MC 5	527 M 17	16 MnCr 5	SCR 415	2511	G 51170	5115	
	1.7139	16 MnCrS 5	16 MnCrS 5								
	1.7147	20 MnCr 5	20 MnCr 5	20 MC 5		20 MnCr 5	SMnC 420 (H)		G 51200	5120	
	1.7149	20 MnCrS 5	20 MnCrS 5	20 MnCrS 5			SMnC 21 H			5120 H	
	1.7321	20 MoCr 4	20 MoCr 4				SCM 21 H				
	1.7335	13 CrMo 4 4	13 CrMo 4 5	15 CD 3 5	1501-620 Gr. 27	14 CrMo 4 5		2216		A 182-F11, F12	
	1.7337	16 CrMo 4 4		45 CDV 4	1501-620 Gr. 27	14 CrMo 4 5		2216		A 387 Gr. 12 Cl. 2	
1.7380	10 CrMo 9 10	10 CrMo 9 10	10 CD 9 10	1501-622 Gr. 31	12 CrMo 9 10		2218	J 21890	A 182-F22		
1.8900	St E 380	S 380 N			Fe E 390 KG	SM 50 B					
1.8905	St E 460	P 460 N	E 460-I	P460 N	Fe E 460 KG	SM 53 B	2143	K 02900	A 633 Gr. E		
1.8907	St E 500	S 500 N				SM 58		K 02001			

UMC	W-Nr	DIN	EN	AFNOR	BS	UNI	JIS	SS	UNS	AISI / ASTM
P4	1.0501	C 35	C35+N	AF 55 C 35	060 A 35	C 35		1550	G 10350	1035
	1.0503	C 45	E 335	AF 65 C 45	80 M 46	C 45	S 45 C	1650	G 10430	1045
	1.0511	C 40	C40+N	AF 60 C 40	080 M 40	C 40	S 40 C			1040
	1.0535	St 70-2	E 360	A 70-2		Fe 690		1655		1055
	1.0601	C 60	C60+N	CC 55	080 A 62	C 60			G 10600	1060
	1.0904	55 Si 7	55 SiCr7	55 S 7	250 A 53	55 Si 8		2085, 2090		9255
	1.1151	Ck 22	C 22E	XC 25	055 M 15					1023
	1.1157	40 Mn 4		35 M 5	150 M 36				G 10390	1039
	1.1165	30 Mn 5	G 28 Mn 6	35 M 5	120 M 36		SMn 1 H, SCMn 2		G 13300	1330
	1.1167	36 Mn 5	G 28 Mn 6	40 M 5	150 M 36		SMn 438 (H), SCMn 3	2120	G 13350	1335
	1.1181	Ck 35	C 35 E	XC 38 H1	080 M 36	C 35	S 35 C	1572	G 10340	1035
	1.1191	Ck 45	C 45 E	XC 42	080 M 46	C 45	S 45 C	1672	G 10420	1045
	1.1221	Ck 60	C 60 E	XC 60	080 A 62	C 60	S 58 C	1665, 1678	G 10640	1064
	1.1740	C 60 W		Y3 55			SK 7			1060
	1.2330	35 CrMo 4		34 CD 4	708 A 37	35 CrMo 4		2234	T 51620	4135
	1.2542	45 WCrV 7			BS 1	45 WCrV 8 KU		2710	T 41901	S1
	1.2714	56 NiCrMoV 7	56 NiCrMoV 7		BH 224-5	56 NiCrMoV7 KU	SKT 4		T 51605	P5
	1.5121	46 MnSi 4								5045
	1.5710	36 NiCr 6		35 NC 6	640 A 35		SNC 236			3135
	1.5736	36 NiCr 10		35 NC 11			35 NiCr 9	SNC 631 H		3435
1.5864	35 NiCr 8	35 NiCr 8	40 NC 17							
1.6511	36 CrNiMo 4	36 CrNiMo 4	40 NCD 3	816 M 40	38 NiCrMo 4 (KB)			G 98400	9840	
1.6580	30 CrNiMo 8	30 CrNiMo 8	30 CND 8	823 M 30						
1.6582	34 CrNiMo 6	34 CrNiMo 6	35 NCD 6	817 M 40	35 NiCrMo 6 (KW)	SNCM 447	2541		4340	
1.7033	34 Cr 4	34 Cr 4	32 C 4	530 A 32	34 Cr 4 (KB)	SCR 430 (H)		G 51320	5132	
1.7035	41 Cr 4	41 Cr 4	42 C 4	530 M 40	41 Cr 4	SCR 440 (H)		G 51400	5140	
1.7218	25 CrMo 4	25 CrMo 4	25 CD 4 5	708 M 25	25 CrMo 4 (KB)	SCM 425	2225	G 41300	4130	
1.7220	34 CrMo 4	34 CrMo 4	35 CD 4	708 A 37					4137	
1.7225	42 CrMo 4	42 CrMo 4	42 CD 4	708 M 40	42 CrMo 4	SCM 440 (H)	2244	G 41400	4142, 4140	
1.7228	50 CrMo 4	50 CrMo 4		708 A 47					4150	
1.7361	32 CrMo 12	32 CrMo 12	30 CD 12	722 M 24			2240			
1.8159	50 CrV 4	50 CrV 4	50 CV 4	735 A 50	51 CrV 4	SUP 10	2230	H 61500	6150	
1.8161	58 CrV 4	58 CrV 4		526 M 60						
1.8509	41 CrAlMo 7	41 CrAlMo 7 10	40 CAD 6 12	905 M 39	41 CrAlMo 7	SACM 645	2940	K 24065	A 355 Cl. A	
P5	1.1231	Ck 67	C 67 S	XC 68	060 A 67	C 70		1770	G 10700	1070
	1.1274	Ck 101	C 100 S		060 A 96		SUP 4	1870	G 10950	1095
	1.1545	C 105 W 1	C 105 U	Y1 105		C 100 KU		1880		W1
	1.1645	C 105 W 2		Y1 105		C 100 KU	SK 3			
	1.1663	C 125 W		Y2 120		C 120 KU	SK 2			W1
	1.2210	115 CrV 3	107 CrV 3	100 C 3		107 CrV 3 KU			T 61202	L2
	1.2510	100 MnCrW 4		90 MWCV 5	BO 1	95 MnWCr 5 KU	SKS 3	2140	T 31501	O1
	1.2842	90 MnCrV 8	90 MnCrV 8	90 MV 8	BO 2	90 MnVCr 8 KU			T 31502	O2
	1.3505	100 Cr 6	100 Cr 6	100 C 6	534 A 99	100 Cr 6	SUJ 2	2258	G 51986	52100
	P6	1.2080	X 210 Cr 12	X 210 Cr 12	Z 200 C 12	BD 3	X 210 Cr 13 KU	SKD 1		T 30403
1.2311		40 CrMnMo 7	40 CrMnNiMo 8 6	40 CMD 8		35 CrMo 8 KU				P20
1.2312		40 CrMnMoS 8 6 4	40 CrMnNiMoS 8 6 4	40 CMD 8 S						
1.2316		X 36 CrMo 17	X 36 CrMo 17	Z 35 CD 17						
1.2343		X 38 CrMoV 5 1		Z 38 CDV 5	BH 11	X 37 CrMoV 5 1 KU	SKD 6		T 20811	H11
1.2344		X 40 CrMoV 5 1	X 40 CrMoV 5 1	Z 40 CDV 5	BH 13	X 40 CrMo 5 1 1 KU	SKD 61	2242	T 20813	H13
1.2363		X 100 CrMoV 5 1	X 100 CrMoV 5	Z 100 CDV 5	BA 2	X 100 CrMoV 5 1 KU	SKD 12	2260	T 30102	A2
1.2379		X 155 CrVMo 12 1	X 155 CrVMo 12 1	32 CDV 12 28	BD 2					D2
1.2365		X 32 CrMoV 3 3		32 DCV 28	BH 10	30 CrMoV 12 27 KU	SKD 7		T 20810	H10
1.2436		X 210 CrW 12				X 215 CrW 12 1 KU	SKD 2	2312		
1.2567		X 30 WCrV 5 3	X 30 WCrV 5 3	X 32 WCrV 5						
1.2601		X 165 CrMoV 12				X 165 CrMoV 12 KU		2310		
1.2678		X 45 CoCrWV 5 5 5	X 45 CoCrWV 5 5 5							
1.2713		55 NiCrMoV 6	55 NiCrMoV 6	55 NCDV 7			SKT 4		T 61206	L6
1.2714		55 NiCrMoV 7	56 NiCrMoV 7		BH 224-5	56 NiCrMoV7-KU	SKT 4		T 61206	6F3
1.2743	60 NiCrMo 12 4	60 NiCrMo 12 4								
1.2766	35 NiCrMo 16	35 NiCrMo 16	35 NCD 16	BP 30						
1.2767	X 45 NiCrMo 4	X 45 NiCrMo 4	Y 35 NCD 16			42 NiCrMo 15 7 KU		T 30109	6F7	
P7	1.3207	S 10-4-3-10	HS 10-4-3-10	Z130WKCDV	BT 42	HS 10-4-3-10	SKH 57		T 11334	M44
	1.3243	S 6-5-2-5	HS 6-5-2-5	Z 85 WDKCV 06-05-05-04-02	BM 35	HS 6-5-2-5	SKH 55	2723	T 11336	M35

Materiaaliryhmien luokitus Material Group Classification

Ruostumattomat austeniittiset ja Duplex Stainless austenitic steel and duplex

UMC	W-Nr	DIN	EN	AFNOR	B5	UNI	JIS	SS	UNS	AISI / ASTM	Div.	Condition	Structure	
M1	1.4000	X 6 Cr 13	X 6 Cr 13	Z 6 C 12	403 S 17	X 6 Cr 13	SUS 403	2301	S41008	403		annealed	ferrite	
	1.4006	X 10 Cr 13	X 12 Cr 13	Z 10 C 13	410 S 21	X 12 Cr 13	SUS 410	2302	S41000	410, CA-15		annealed	martensite	
	1.4016	X 6 Cr 17	X 6 Cr 17	Z 8 C 17	430 S 15	X 8 Cr 17	SUS 430	2320	S43000	430		annealed	ferrite	
	1.4021	X 20 Cr 13	X 20 Cr 13	Z 20 C 13	420 S 37	X 20 Cr 13	SUS 420 J 1	2303	S42000	420		annealed	martensite	
	1.4031	X 40 Cr 13	X 39 Cr 13	Z 40 C 14	420 S 45	X 40 Cr 14	SUS 420	2304	S40280	420		annealed	martensite	
	1.4109	X 65 CrMo 14	X 70 CrMo 15	Z 70 D 14			SUS 440 A		S44002	440 A		annealed	martensite	
	1.4112	X 90 CrMoV 18	X 90 CrMoV 18	Z 2 CND 18 05	409 S 19	X CrTi 12	SUS 440 B	2327	S44003	440 B		annealed	martensite	
	1.4125	X 105 CrMo 17	X 105 CrMo 17	Z 100 CD 17		X 105 CrMo 17	SUS 440 C		S44004	440 C		annealed	martensite	
	1.4313	X 5 CrNi 13 4	X 3 CrNiMo 13 3	Z 5 CN 13.4	425 C 11	X 6 CrNi 13 04	SCS 5	2385	J91540		F6NM	annealed	martensite	
	1.4749	X 18 CrN 28	X 18 CrN 28	Z 18 C 25				2322	S44600	446		annealed	ferrite	
M2	1.4305	X 10 CrNiS 18 9	X 10 CrNiS 18 9	Z 10 CNF 18.09	303 S 31	X 10 CrNi 18 09	SUS 303	2346	S30300	303		annealed	austenite	
M3	1.4300	X 12 CrNi 18 8	X 12 CrNi 18 8	Z 12 CN 18	302 S 25		SUS 302	2331	S30200	302		annealed	austenite	
	1.4301	X 6 CrNi 18 10	X 5 CrNi 18 9	Z 6 CN 18.09	304 S 31	X 5 CrNi 18 11	SUS 304	2333	S30400	304		annealed	austenite	
	1.4306	X 2 CrNi 19 11	X 2 CrNi 19 11	Z 2 CN 18.10	304 S 12	X 3 Cr Ni 18 11	SUS 304 L	2352	S30403	304 L		annealed	austenite	
	1.4307	X 2 CrNi 18 9	X 2 CrNi 18 9	CLC 18 9 L	304 S 11		SUS 304 L		S30403	304 L		annealed	austenite	
	1.4310	X 12 CrNi 17 7	X 9 CrNi 18 8	Z 12 CN 17.07	301 S 21	X 12 CrNi 17 07	SUS 301	2331	S30100	301		annealed	austenite	
	1.4401	X 5 CrNiMo 17 12 2	X 5 CrNiMo 17 12 2	Z 3 CND 17 11 1	316 S 31	X 5 CrNiMo 17 12	SUS 316	2347	S31600	316		annealed	austenite	
	1.4404	X 2 CrNiMo 17 13 2	X 2 CrNiMo 17 13 2	Z 3 CND 19 10 M	316 S 12	X 2 CrNiMo 19 11	SUS 316 L	2348	S31603	316 L		annealed	austenite	
	1.4550	X 6 CrNiNb 18 10	X 6 CrNiNb 18 10	Z 6 CNNb 18.10	347 S 31	X 6 CrNiNb 18 11	SUS 347	2338	S34700	347		annealed	austenite	
	M4	1.4311	X 2 CrNiN 19 11	X 2 CrNiN 18 10	Z 2 CN 18 10 Az	304 S 62	X 2 CrNiN 18 11	SUS 304 LN	2371	S30453	304 LN		annealed	austenite
		1.4335	X 12 CrNi 25 21	X 12 CrNi 25 21	Z 12 CN 25 20	310 S 24	X 6 CrNi 26 20	SUH 310, SUS 310 S	2361	S31008	310 S		annealed	austenite
1.4429		X 2 CrNiMoN 17 13 3	X 2 CrNiMoN 17 13 3	Z 2 CND 17 13 Az	316 S 62	X 2 CrNiMoN 17 13 3	SUS 316 LN	2375	S31653	316 LN		annealed	austenite	
1.4435		X 2 CrNiMo 18 14 3	X 2 CrNiMo 18 14 3	Z 2 CND 17 13	316 S 12	X 2 CrNiMo 17 13 2	SCS 16, SUS 316 L	2353	S31603	316 L		annealed	austenite	
1.4441		X 2 CrNiMo 18 15 3	X 2 CrNiMo 18 15 3							316 LVM				
1.4466		X 5 CrNi 18 15	X 3 CrNiMo 18 12 3		317 S 16	X 5 CrNi 18 15	SUS 317	2366	S31700	317		annealed	austenite	
1.4893		X 9 CrNiSiN 21 11 2	X 9 CrNiSiN 21 11 2		310 S 31			2368	S30815		253 MA	annealed	austenite	
M5		1.4417	X 2 CrNiMoSi 19 5	X 2 CrNiMoSi 19 5	Z 2 CND 18.05.2003				2376	S31500		3RE60	annealed	duplex
		1.4460	X 4 CrNiMo 27 5 2	X 3 CrNiMo 27 5 2	Z 3 CND 25.7 Az		X 3 CrNiMo 27 5 2	SUS 329 J 1	2324	S32900	329		annealed	duplex
		1.4462	X 2 CrNiMoN 22 5	X 2 CrNiMoN 22 5 3	Z 2 CND 22.05 Az	332 S 15	X 2 CrNiMoN 22 5		2377	S31803	329 LN	SAF 2205	annealed	duplex
	1.4539	X 2 NiCrMoCu 25 20 5	X 2 NiCrMoCu 25 20 5	Z 2 NCDU 25 20	904 S 13			2562	N08904	904L		annealed	super austenite	
M6	1.4410	X 2 CrNiMoN 25 7 4	X 2 CrNiMoN 25 7 4	Z 3 CND 25.07 Az		X 2 CrNiMoN 25 7 4		2328	S32750	F 53	SAF 2507	annealed	super duplex	
	1.4529	X 1 CrNiMoN 20 18 7	X 1 CrNiMoN 20 18 7	Z 1 CNDU 20.18.05 Az		X 1 CrNiMoN 20 18 7		2778	S31254		254 SMO	annealed	super austenite	
	1.4534	X 3 CrNiMoAl 13 8 2	X 6 NiCrTiMoV 25 15						S13800	XM-13	PH13-8Mo	solu-tion heat treatment	austenite	
	1.4540	X 4 CrNiCuNb 16 4		Z 4 CNUNb 16.4 M					S15500	XM-12	15-5-PH	solu-tion heat treatment	martensite	
	1.4568	X 7 CrNiAl 17 7	X 3 CrNiMoAl 13 8 2	Z 9 CAN 17.7	301 S 81	X 7 CrNiAl 17 7	SUS 631	2388	S17700	AMS 5528	17-7-PH	solu-tion heat treatment	austenite / ferrite	
	1.4652	X 2 CrNiMoN 25 22 7	X 1 CrNiMoN 25 22 8						S32654		654 SMO	annealed	super austenite	
	1.4876	X 10 NiCrAlTi 32 20	X 10 NiCrAlTi 32 20	Z 10 NC 32.21				NCF 800		N08800		Alloy 800	annealed	austenite
	1.4943	X 4 NiCrTi 25 15	X 5 CrNiCuNb 16 4	Z 6 NCTDV 25.15	HR 51			SUH 660	2570	S66286	660	A286	solu-tion heat treatment	austenite

Materiaaliryhmien luokitus Material Group Classification

Valuraudat Cast Irons

UMC	W-Nr	DIN	EN	AFNOR	B5	UNI	JIS	SS	UNS	AISI / ASTM	
K1	0.6010	GG-10	EN-GJL-100	Ft 10 D	Grade 100	G10	FC 100	01 10-00		A48 20 B	
	0.6015	GG-15	EN-GJL-150	Ft 15 D	Grade 150	G15	FC 150	01 15-00	F11601	A48 25 B	
	0.6020	GG-20	EN-GJL-200	Ft 20 D	Grade 220	G20	FC 200	01 20-00	F12101	A48 30 B	
	0.6025	GG-25	EN-GJL-250	Ft 25 D	Grade 260	G25	FC 250	01 25-00	F12401	A48 35 B	
K2	0.6030	GG-30	EN-GJL-300	Ft 30 D	Grade 300	G30	FC 300	01 30-00	F13101	A48 45 B	
	0.6035	GG-35	EN-GJL-350	Ft 35 D	Grade 350	G35	FC 350	01 35-00	F13502	A48 50 B	
	0.6040	GG-40	EN-GJL-400	Ft 40 D	Grade 400	G40					
K3	0.7033	GGG-35.3	EN-GJS-350-22	FGS 370-17	Grade 350/22		FCD 350-22L	07 17-15			
	0.7040	GGG-40	EN-GJS-400-15	FGS 400-12	Grade 420/12	GS 400-12	FCD 400-18L	07 17-02	F32800	60-40-18	
	0.7043	GGG-40.3	EN-GJS-400-18	FGS-370-17	Grade 370/17	GSO 42/17		07 17-12	F32800	60-40-18	
	0.8035	GTW-35-04	EN-GJMW-350-4	MB 350-7	W 35-04	W 35-04	FCMW 300				
	0.8040	GTW-40-05	EN-GJMW-400-5	MB 400-5	W 40-05	GMB 40	FCMW 370				
	0.8135	GTS-35-10	EN-GJMB-350-10	MN 350-10	B 340/12						32-51-00
K4	0.7050	GGG-50	EN-GJS-500-7	FGS 500-7	Grade 500/7	GS 500-7	FCD 500-7	07 27-02	F33800	A536 80-55-6	
	0.7060	GGG-60	EN-GJS-600-3	FGS 600-3	Grade 600/3	GS 600-3	FCD 600-3	07 32-03	F34100	A476 80-60-03	
	0.7070	GGG-70	EN-GJS-700-2	FGS 700-2	Grade 700/2	GS 700-2	FCD 700-2	07 37-01	F34800	A536 100-70-03	
	0.7080	GGG-80	EN-GJS-800-2	FGS 800-2	SNG 800/2	GS 800-2	FCD 800		F36200	120-90-2	
	0.8045	GTW-45-07	EN-GJMW-450-7	MB 450-7	W 45-07	GMB 45	FCMWP 440				
	0.8055	GTW-55				GMB 55					
	0.8065	GTW-65				GMB 65					
	0.8145	GTS-45-06	EN-GJMB-450-6	MN 450-6	P 440/7	P 45-06					
	0.8155	GTS-55-04	EN-GJMB-550-4	MN 550-4	P 510/4	P 55-04					
	0.8165	GTS-65-02	EN-GJMB-650-2	MN 650-3	P 570/3	P 65-02					
K5		GJS-800-8	EN-GJS-800-8							ADI grade 1	850/550/10
		GJS-1000-5	EN-GJS-1000-5							ADI grade 2	1050/700/7
		GJS-1200-2	EN-GJS-1200-2							ADI grade 3	1200/850/4
		GJS-1400-1	EN-GJS-1400-1							ADI grade 4	1400/1100/1
K6		GJV-300	EN-GJV-300								Grade 350
		GJV-350	EN-GJV-350								Grade 400
		GJV-400	EN-GJV-400								Grade 400-15
		GJV-450	EN-GJV-450								Grade 450
		GJV-500	EN-GJV-500								Grade 500
K7	0.6652	GGL-NiMn-13-7	EN-GJLA-XNiMn-13-7	L-NM 13 7	L-NM 13 7		FCA NiMn 13 7		F43000		
	0.6655	GGL-NiCuCr-15-6-2	EN-GJLA-XNiCuCr-15-6-2	L-NUC 15 6 2	Grade F1		FCA NiCuCr 15 6 2		F41000	A436 Type 1	
	0.6660	GGL-NiCr-20-2	EN-GJLA-XNiCr 20-2	L-NC 20 2	Grade F2		FCA NiCr 20 2	05 23-00	F41002	A436 Type 2	
	0.6667	GGL-NiSiCr-20-5-3	EN-GJLA-XNiSiCr-20-5-3	L-NSC 20 5 3			FCA NiSiCr 20 5 3				
	0.6676	GGL-NiCr 30 3	EN-GJLA-XNiCr 30-3	FGL Ni30 Cr3	Grade F3				F41004	A436 Type 3	
	0.6678	GGL-NiCr-35-2									
0.6680	GGL-NiSiCr30-5-5										
K8	0.7659	GGG-NiCrNb-20-2	EN-GJSA-XNiCrNb-20-2								
	0.7683	GGG-Ni-35	EN-GJSA-XNi35	FGS Ni35					F43006	A439 Type D-5	
	0.7660	GGG-NiCr-20-2	EN-GJSA-XNiCr20-2	FGS Ni20 Cr2	Grade S2		FCDA NiCr 20 2		F43000	A436 Type D-2	
	0.7665	GGG-NiSiCr20-5-2	EN-GJSA-XNiSiCr-20-5-2	S-NSC 20 5 2			FCDA NiSiCr 20 5 2				
	0.7670	GGG-Ni-22	EN-GJSA-Xni-22	S-N 22		S-Ni 22	FCDA Ni 22		F43002	A439 Type D-2C	
	0.7676	GGG-NiCr-30-3	EN-GJSA-XNiCr30-3	FGS Ni30 Cr3	Grade S3				F43003	A436 Type D-3	
	0.7652	GGG-NiMn-13-7	EN-GJSA-XNiMn13-7	FGS Ni13 Mn7	Grade S6		FCDA 13 7	07 72-00			
	0.7673	GGG-NiMn-23-4	EN-GJSA-XNiMn23-4	FGS Ni23 Mn4	Grade S2M		FCDA NiMn 23 4		F43010	A439 Type D-2M	
	0.7680	GGG-NiSiCr30-5-5									
	0.7688	GGG-NiSiCr35-5-2									

Materiaaliryhmien luokitus

Material Group Classification

Ei- rauta metallit

Non-Ferrous Metals

UMC	W-Nr	DIN	EN	AFNOR	BS	UNI	JIS	SS	UNS	AISI / ASTM	
N1	3.0255	Al99.5	AW-1050A	A5	1B	4507		4007	AA1050A		
	3.0305	Al99.9	AW-1090								
	3.0515	AlMn1	AW-3103	A-M1	N3	3568		4054	AA3103		
	3.0517	AlMn1Cu	AW-3003	A-M1			A3003		AA3003		
	3.1255	AlCuSiMn	AW-2014	A-U45G	H15			4338	AA2014		
	3.1655	AlCuBiPb	AW-2011	A-U5PbBi	FC1		A2011	4355	AA2011		
	3.2315	AlMgSi1	AW-6082	A-SGM0.7	H30			4212	AA6082		
	3.3206	AlMgSi0.5	AW-6060	A-GS	H9			4103	AA6060		
	3.3210	AlMgSi0.7	AW-6063	A-GSUC				4104	AA6005		
	3.3241	G-AlMg3Si	AW-6061			H20					
	3.3245	AlMg3Si									
	3.3261	G-AlMg5Si									
	3.3315	AlMg1	AW-5005	A-G0.6		N41			4106	AA5005	
	3.3523	AlMg2.5				2L56				AA5052	
	3.3535	AlMg3	AW-5754	A-G3M		N5				AA5754	
	3.3541	G-AlMg3									
	3.3561	G-AlMg5									
	3.4335	AlZn4.5Mg1	AW-7020	A-Z5G		H17		4425	AA7020		
	3.4365	AlZnMgCu1.5	AW-7075	A-Z5GU		2L95/2L96	7075	A7075	AA7075		
	3.5103	G-MgSe3Zn2Zr1	MN65120	ZRE1		MAG6-TE			M12330	AMS 4442	
	3.3527	AlMg2Mn0.8	AW-5049								
	3.5470	GD-MgAl4Si1			G-A451						
	3.5555	AlMg5									
	3.5612	G-MgAl6Zn	MG-P-63		G-A621	MAG-E-121			M11600	AZ61A	
	3.5632	G-MgAl6Zn3									
	3.5812	G-MgAl8Zn	MG-P-61		G-A721	MAG1				AZ80A	
	N2	3.1263	GK-AlCu5Si3								
		3.2131	G-AlSi5Cu1								
		3.2134	G-AlSi5Cu1Mg	AC-AlCu4Ti							
		3.2151	GK-AlSi6Cu4	AC-45000							
		3.2152	GD-AlSi6Cu4	AC-AlSi6Cu4							
		3.2153	G-AlSi7Cu3								
		3.2245	SG-AlSi5								
		3.2341	G-AlSi5Mg	AC-42000	A-57G		LM25	3599	AC 4C	4244	B26
	3.2371	G-AlSi7Mg	AC-42100								
N3	3.2161	G-AlSi8Cu3	AC-46200					4251	A13800	A380	
	3.2162	GD-AlSi8Cu3									
	3.2163	GK-AlSi9Cu3	AC-46200								
	3.2211	GK-AlSi11									
	3.2373	G-AlSi9Mg	AC-AlSi9Mg								
	3.2381	G-AlSi10Mg	AC-43400	A-510G		LM9		4253	A13600	B85	
	3.2382	GD-AlSi12	AC-44200							A413.2	
	3.2383	G-AlSi10MgCu	AC-43200								
	3.2581	G-AlSi12	AC-44200	A-513		LM6	3051		4261		
	3.2582	GD-AlSi15	AC-44300						4247		
3.2583	G-AlSi12Cu				LM20			4260			
3.2982	GD-AlSi12Cu	AC-47100									
N4		G-AlSi17Cu4Mg					ADC14			B390.0	
		G-AlSi18									
		GK-AlSi18CuNiMg									
		G-AlSi21CuNiMg									
	GKAlSi25CuNiMg										

Materiaaliryhmien luokitus

Material Group Classification

UMC	W-Nr	DIN	EN	AFNOR	BS	UNI	JIS	SS	UNS	AISI / ASTM
N5	2.0380	CuZn39Pb2	CW612N							
	2.0401	CuZn39Pb3	CW614N	CuZn39Pb3	CZ121			5170	C38500	
	2.0402	CuZn40Pb2	CW617N	CuZn39Pb2	CZ122			5168	C37800	
	2.0410	CuZn44Pb2	CW622N		CZ104			5272	C68700	
	2.0580	CuZn40Mn1Pb								
	2.0771	CuNi7Zn39Mn5Pb3								
	2.1061	G-CuSn11Pb2-C	CC482K	CuSn12Pb	PB4					C92500
	2.1076	CuSn4Pb4Zn4	CW456K	CuSn4Pb4Zn4				C5441		C54400
	2.1080	CuSn6Zn6								
	2.1086	G-CuSn10Zn								
	2.1090	G-CuSn7Zn4Pb7-C	CC493K	CuSn7Pb6Zn4						C93200
	2.1096	G-CuSn5Zn5Pb5	CC491K	CuSn5Pb5Zn5	LG2			BC6		C83600
	2.1176	CuPb10Sn	CW352H	CuSn10Pb10	LB2				5640	C93700
N6	2.0240	CuZn15	CW502L	CuZn15	CZ102		C2300	5112	C23000	
	2.0250	CuZn20								
	2.0265	CuZn30					C2600			C26000
	2.0321	CuZn37	CW508L	CuZn37	CZ108	P-CuZn37	C2720	5150	C27200	
	2.0360	CuZn40	CW509L							C28000
	2.0470	CuZn28Sn1	CW706R	CuZn29Sn1				5220	C44300	
	2.0530	CuZn38Sn1	CW717R							C46400
	2.0561	CuZn40Al1								
	2.0790	CuNi18Zn19Pb		CuNi18Zn19Pb1						C76300
	2.0872	CuNi10Fe1Mn	CW325H	CuNi10Fe1Mn	CN102	Pt-CuNi10Fe1Mn		5667	C70600	
	2.0932	CuAl8Fe3	CW303G	CuAl7Fe2	CA106	P-CuAl8Fe3				C61400
	2.0940	CuAl10Fe	CC331G	CuAl10Fe	AB1			5710	C95200	CA952
	2.0966	CuAl10Ni5Fe4	CW307G	CuAl10Ni5Fe4	CA104					C63000
	2.0975	CuAl10Ni5Fe5-C	CC333G	CuAl10Ni5Fe5	AB2	CuAl11Fe4Ni4		5716	C95500	CA955
	2.1020	CuSn6	CW452K	CuSn6	PB103	CuSn7	C5191	5428	C51900	
	2.1030	CuSn8	CW453K	CuSn8	PB104		C5210	5431	C52100	
	2.1050	CuSn10	CC480K	CuSn10	CT1			5443	C90700	
2.1087	CuSn10Zn						5458	C90500		
2.1247	CuBe2									
2.1293	CuCrZr				CC102				C18200	
2.1522	CuSi2Mn									
2.1525	CuSi3Mn									

Materiaaliryhmien luokitus

Material Group Classification

Seostetut teräkset

Superalloys

UMC	W-Nr	DIN	UNS	AISI / ASTM	Div.
S1			S35000	633	AM350
			S42300	619	Lapelloy
	1.4958	X5NiCrAlTi 31 20	N08010		Incoloy 800
	1.4974	X12CrCoNi 21 20	R30155	661	N 155
S2	1.4545	X5CrNiCu 15 5	S15500	XM-12	15-5PH
	1.4548	X5CrNiCuNb 17 4 4	S17400	630	17-4PH
	1.4980	X6NiCrTiMoVb 25 15 2	S66286	660	Incoloy A 286
S3	2.4683	CoCr22NiW			Haynes 25
	2.4681	CoCr26Ni9Mo5W			Alloy 188
	2.4711	CoCr20Ni15Mo			ULTIMET
	2.4778	CoCr28			ELGILOY
	2.4967	CoCr20W15Ni			Alloy 150
					Alloy 25
					H531
					Stellite 6
					Stellite 12
	2.4979	CoCr28MoNi			Stellite 21
				Stellite 31	
S4	2.4631	NiCr20TiAl	N07080		Nimonic 80A
	2.4654	NiCr20Co13Mo4Ti3Al	N07001		Waspaloy
	2.4668	NiCr19Fe19Nb5Mo3	N07718		Inconel 718
	2.4669	NiCr15Fe7TiAl	N07750		Inconel X-750
	2.4810	NiMo30	N10002		Hastelloy C
	2.4816	NiCr15Fe	N06600		Inconel 600
	2.4819	NiMo16Cr15W	N10276		Hastelloy C-276
	2.4856	NiCr22Mo9Nb	N06625		Inconel 625
	2.4983	NiCr18Co	N07500	684	Udimet 500

Titaani

Titanium Alloys

UMC	W-Nr	DIN	UNS	AISI / ASTM	Div.
S11	3.7025	Ti1			Grade 1
	3.7035	Ti2			Grade 2
	3.7055	Ti3			Grade 3
	3.7065	Ti4			Grade 4
	3.7114	TiAl5Sn2	R54520		
S12	3.7144	TiAl6Sn2Zr4Mo2	R54620	AMS 4919	Ti 6-2-4-2 / Timetal 1100
	3.7154	TiAl6Zr5			Timetal 685
	3.7195	TiAl3V2.5	R56320	AMS 4943	Grade 9
S13	3.7165	TiAl6V4	R56400	AMS 4920, Grd 5	Ti 6Al-4V
		TiAl6Sn2Zr4Mo6	R56260		Ti 6-2-4-6
		TiAl5Sn2Zr2Mo4Cr4	R58650		Ti 17
	3.7174	TiAl6V6Sn2			
	3.7185	TiAl4Mo4Sn2			Hylite 50
S14		TiV10Fe2Al3		AMS 4986	Ti 10V-2Fe-3Al
		TiAl4.5V3Mo2Fe2			SP 700
		TiMo11Zr6Sn4.5			Beta III
		TiV10Fe2Al3			Ti 10-2-3
					Ti 15-3

Materiaaliryhmien luokitus

Material Group Classification

Kovat materiaalit

Hardened Steels

UMC	W-Nr	DIN	EN	AFNOR	B5	UNI	JIS	SS	UNS	AISI / ASTM	Condition
H1	1.1201	42 CrMo 4	42 CrMo 4	42 CD 4	708 M40	42 CrMo 4	SCM 440 (H)	2244	G41400	4142, 4140	hardened and tempered
	1.2312	40 CrMnMoS 8 6 4	40 CrMnNiMoS 8 6 4	40 CMD 8 S							hardened and tempered
	1.2316	X 36 CrMo 17	X 36 CrMo 17	Z 35 CD 17							hardened and tempered
	1.2343	X 38 CrMoV 5 1		Z 38 CDV 5	BH 11	X 37 CrMoV 5 1 KU	SKD 6		T 20811	H11	hardened and tempered
	1.4534	X 3 CrNiMoAl 13 8 2	X 3 CrNiMoAl 13 8 2						S13800	XM-13	hardened and tempered
	1.6582	34 CrNiMo 6	34 CrNiMo 6	35 NCD 6	817 M 40	35 NiCrMo 6 (KW)	SNCM 447	2541		4340	hardened and tempered
H2	1.7131	16 MnCr 5	16 MnCr 5	16 MC 5	527 M 17	16 MnCr 5	SCR 415	2511	G51170	5115	hardened and tempered
	1.2344	X 40 CrMoV 5 1	X 40 CrMoV 5 1	Z 40 CDV 5	BH 13	X 40 CrMo 5 1 1 KU	SKD 61	2242	T 20813	H13	hardened and tempered
	1.2550	60 WCrV 7		55 WC 20		55 WCrV 8 KU				S1	hardened and tempered
	1.2767	X 45 NiCrMo 4	X 45 NiCrMo 4	Y 35 NCD 16		42 NiCrMo 15 7 KU			T 30109	6F7	hardened and tempered
	1.4109	X 65 CrMo 14	X 70 CrMo 15	Z 70 D 14			SUS 440 A		S44002	440 A	hardened and tempered
	1.4112	X 90 CrMoV 18	X 90 CrMoV 18	Z 2 CND 18 05	409 S 19	X CrTi 12	SUS 440 B	2327	S44003	440 B	hardened and tempered
	1.7225	42 CrMo 4	42 CrMo 4	42 CD 4	708 M 40	42 CrMo 4	SCM 440 (H)	2244	G 41400	4142, 4140	hardened and tempered
	1.1191	Ck 45	C 45 E	XC 42	080 M 46	C 45	S 45 C	1672	G 10420	1045	hardened and tempered
	1.1231	Ck 67	C 67S	XC 68	060 A 67	C 70		1770	G10700	1070	hardened and tempered
	1.1248	Ck 75	C 75S	XC 75	060 A 78	C 75		1774, 1778	G10780	1078, 1080	hardened and tempered
H3	1.1274	Ck 101	C 100S		060 A 96		SUP 4	1870	G10950	1095	hardened and tempered
	1.1545	C 105 W1	C 105U	Y1 105		C 100 KU		1880		W 1	hardened and tempered
	1.2162	21 MnCr 5	21 MnCr 5	20 NC 5			SCR 420 H				hardened and tempered
	1.2210	115 CrV 3	107 CrV 3	100 C 3		107 CrV 3 KU			T 61202	L2	hardened and tempered
	1.2363	X 100 CrMoV 5 1	X 100 CrMoV 5	Z 100 CDV 5	BA 2	X 100 CrMoV 5 1 KU	SKD 12	2260	T30102	A2	hardened and tempered
	1.2379	X 155 CrVMo 12 1	X 155 CrVMo 12 1	Z 160 CDV 12	BD 2	X 155 CrVMo 12 1 KU	SKD 11		T30402	D2	hardened and tempered
	1.2436	X 210 CrW 12				X 215 CrW 12 1 KU	SKD 2	2312			hardened and tempered
	1.2510	100 MnCrW 4		90 MWCV 5	BO 1	95 MnWCr 5 KU	SKS 3	2140	T 31501	O1	hardened and tempered
	1.2842	90 MnCrV 8	90 MnCrV 8	90 MV 8	BO 2	90 MnVCr 8 KU			T 31502	O2	hardened and tempered
	1.3243	S 6-5-2-5	HS 6-5-2-5	Z 85 WDKCV 06-05-05-04-02		HS 6-5-2-5	SKH 55	2723		M35	hardened and tempered
	1.3247	S 2-10-1-8	HS 2-10-1-8	Z 110 DKCWW 09-08-04	BM 42	HS 2-9-1-8	SKH 51		T11342	M42	hardened and tempered
	1.3343	S 6-5-2	HS 6-5-2	Z 85 WDCV 06-05-04-02	BM 2	HS 6-5-2	SKH 9, SKH 51	2722	T11302	M2	hardened and tempered
	1.3355	S 18-0-1	HS 18-0-1	Z 80 WCV 18-04-01	BT 1	HS 18-0-1	SKH 2		T12001	T1	hardened and tempered
	1.3505	100 Cr 6	100 Cr 6	100 C 6	534 A 99	100 Cr 6	SUJ 2	2258	G51986	52100	hardened and tempered
1.4125	X 105 CrMo 17	X 105 CrMo 17	Z 100 CD 17		X 105 CrMo 17	SUS 440 C		S44004	440 C	hardened and tempered	
1.5752	14 NiCr 14	14 NiCr 14	12 NC 15	655 M 13		SNC 815 (H)		G 33106	3310, 9314	hardened and tempered	
1.6587	18 CrNiMo 7 6	18 NiCrMo 7 6	18 NCD 6	820 A 16	18 NiCrMo 7					hardened and tempered	

Materiaaliryhmien luokitus

Material Group Classification

Pulverimetallurgiset materiaalit

Powder Metallurgical Materials

UMC	W-Nr
SM1	Sint-C 00
	Sint-D 00
	Sint-E 00
	Sint-C 01
	Sint-D 01
	Sint-C 10
	Sint-D 10
	Sint-E 10
	Sint-C 11
	Sint-D 11
Sint-C 21	
SM2	Sint-C 31
	Sint-D 31
	Sint-E 31
	Sint-C 32
	Sint-D 32
	Sint-C 35
	Sint-D 35
	Sint-C 36
	Sint-D 36
	Sint-C 39
Sint-D 39	
SM3	Sint-C 40
	Sint-D 40
	Sint-C 42
	Sint-C 43

Komposiitti materiaalit

Composite Materials

UMC	Code	Chemical Description	Trade Names
O1	PC	Polycarbonate	Makrolon, Lexan
	PMMA	Polymethylmethacrylate	Acrylite, Plexiglas
	PS	Polystyrene	Luran, Styron
	PA	Polyamide	Ertalon, Ultramid
	POM	Polyoxymethylene	Delrin, Hostaform
	PP	Polypropylene	Hostalen, Vestolen
O2	PSU	Polysulfone	Mindel, Ultrason
	PF	Phenol formaldehyde resin	Bakelite, Supraplast
	MF	Melamine formaldehyde resin	Resopal, Hornit
	UF	Urea formaldehyde resin	Resamin, Urecoll
O3	EP	Epoxy resin	Epoxy, Araldit
	PA 6 GF 10	Polyamide 6 reinforced with 10% GF	
	PA 6 GF 30	Polyamide 6 reinforced with 30% GF	
	PC GF 20	Polycarbonate reinforced with 20% GF	
	POM GF 20	Polyoxymethylene reinforced with 20% GF	
	POM GF 30	Polyoxymethylene reinforced with 30% GF	
O4	PSU GF 30	Polysulfone reinforced with 30% GF	
	GFK	Glass fibre reinforced plastic	
	CFK	Carbon fiber reinforced plastic	



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