



■ Made
■ in
■ Germany



SELECT 03

FRANKEN

Sonderaktion
Sales Special
Action spéciale



Rund 100 Jahre Präzision und Innovation

Nearly 100 Years of Precision and Innovation

Près de 100 ans de précision et d'innovation

FRANKEN als Teil der EMUGE-FRANKEN Unternehmensgruppe beschäftigt sich seit seiner Gründung mit der Entwicklung und Produktion von Fräswerkzeugen. Präzision und Innovation prägen das breite Angebot von Fräsern aus Hartmetall und HSS sowie PKD-, CBN- oder wendepplattenbestückten Fräskörpern.

Die Fertigung am deutschen Produktionsstandort in Rückersdorf reicht von Standard-Schaft- und Bohrungsfräsern bis hin zu hochgenauen Form- und Profil-Sonderfräsern. Mit seiner Typen- und Schneidstoffvielfalt, dem hohen Standard und der kompromisslosen Präzision entspricht das Fräserprogramm den höchsten Qualitätsanforderungen.

Als Ergänzung zu den Fräswerkzeugen führen wir ein durchgängiges Programm an Fräserspannmitteln und Zubehör für die verschiedensten Anpassungsmöglichkeiten.

Ever since its foundation FRANKEN as part of the EMUGE-FRANKEN company association has been developing and manufacturing milling tools. The wide range of end mills of solid carbide and HSS as well as PCD and CBN inserts or milling cutters with indexable inserts is characterised by precision and innovation.

The production in our German manufacturing plant in Rückersdorf includes standard end mills and bore cutters as well as highly precise special form and profile milling tools. With its large variety of tool types and cutting materials, the consistently high standards and uncompromising precision, our product range of milling cutters meets even the highest quality requirements.

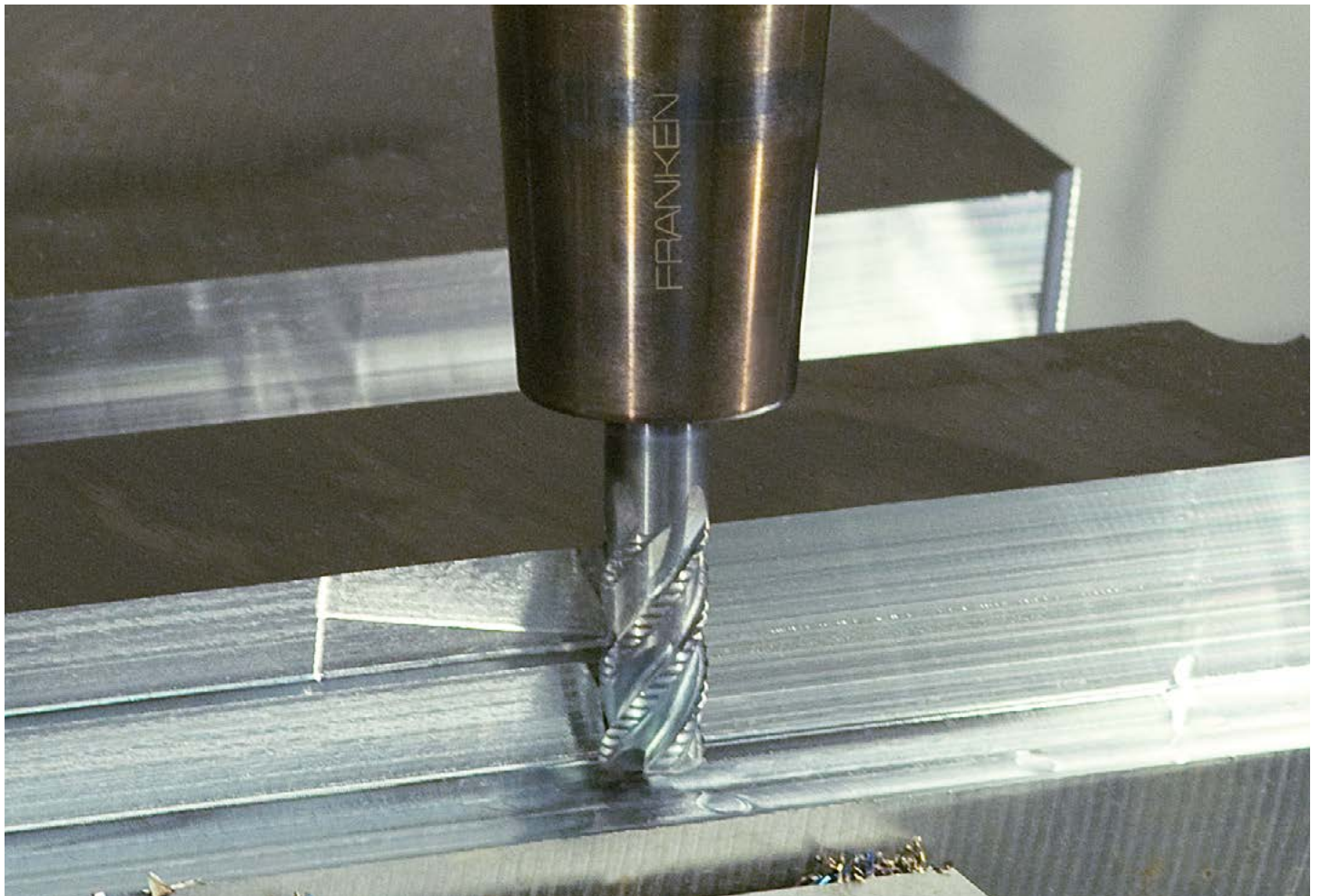
In addition to our selection of milling tools, we also offer a comprehensive range of clamping systems, tool holders and accessories.

Depuis sa fondation, la société FRANKEN, qui fait partie du groupe EMUGE-FRANKEN, conçoit et fabrique des outils de fraisage. La gamme étendue des fraises en carbure ou en acier rapide et des fraises PCD, CBN ou à plaquettes se caractérise par une haute précision et une grande force d'innovation.

Notre programme sur le site de production de Rückersdorf en Allemagne comprend des fraises deux tailles et des fraises à trou standard ainsi que des fraises de forme et des fraises profil spécial très sophistiquées. Avec une telle diversité de types et de substrats outils, un standard supérieur et une précision très rigoureuse, le programme des fraises FRANKEN satisfait aux exigences les plus élevées de qualité.

En complément des outils de fraisage, nous pouvons vous proposer une gamme complète d'attachelements et d'accessoires.





Inhaltsübersicht

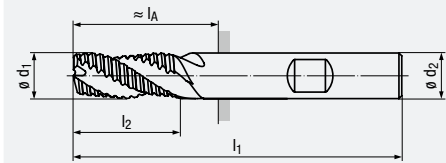
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Artikel-Nr. Art. no. Code article	Hartmetall-Fräser Solid carbide end mills Fraises en carbure monobloc	Werkzeugtyp Tool type Type d'outil	Seite Page Page	Artikel-Nr. Art. no. Code article	HSS-Fräser HSS end mills Fraises en HSS	Werkzeugtyp Tool type Type d'outil	Seite Page Page
2450L		NR	6	2400C		HR	12
2451L							
2455L		NR	7	2401C		HR	12
2413L							
2456L		NR	7	2402C		HR	13
2414L							
2453L		N	8	2403C		N	14
2454L							
2457L		N	8	2404C		N	14
2439L							
2448K		WR	9				
2449K							
2444K		W	9				
2445K							
2446K		W	10				
2447K							
2452K		W	11				

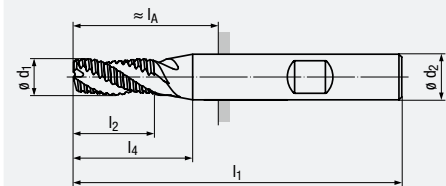
Ein Nachschärfen ist ab ø 10 mm möglich, Preise auf Anfrage
 Regrinding is possible from dia. 10 mm, prices upon request
 Réaffûtage possible à partir de ø 10 mm, prix sur demande

Solid Carbide End Mills – Short Design
Fraises deux tailles en carbure monobloc – version courte

NR



Design l₄:



Ø d ₁ h11	l ₂	l ₁	l ₄	Ø d ₂ h6	l _A 	Z (Flutes)	Artikel-Nr. Art. no. Code article		Artikel-Nr. Art. no. Code article	
6	10	54	–	6	18	4	2450L.006	●	2451L.006	●
8	12	58	–	8	22	4	2450L.008	●	2451L.008	●
10	14	66	–	10	26	4	2450L.010	●	2451L.010	●
12	16	73	–	12	28	4	2450L.012	●	2451L.012	●
16	22	82	–	16	34	4	2450L.016	●	2451L.016	●
20	26	92	–	20	42	4	2450L.020	●	2451L.020	●

Einsatzgebiete	Applications	Utilisations
• Stahlwerkstoffe bis 44 HRC • Gusswerkstoffe • NE-Metalle	• Steel materials up to 44 HRC • Cast materials • Non-ferrous materials	• Aciers jusqu'à 44 HRC • Fontes • Matières non ferreuses
Schnittwerte siehe Seite 17	Cutting conditions, see page 17	Valeurs de coupe, voir page 17

Hartmetall-Schaftfräser – Kurze Ausführung

DIN 6527 K

Solid Carbide End Mills – Short Design

Fraises deux tailles en carbure monobloc – version courte

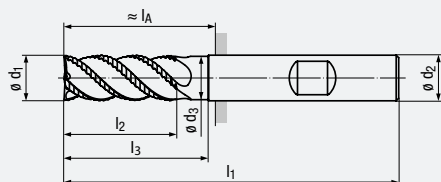
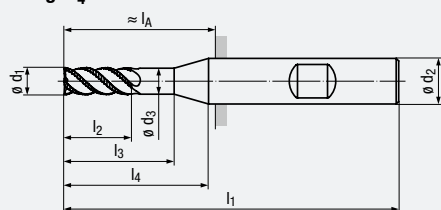
NR



2455L



2413L

Design I₄:

$\emptyset d_1$ h11	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A	Z (Flutes)	Artikel-Nr. Art. no. Code article	Artikel-Nr. Art. no. Code article
3	5	9	50	2,9	14	6	14	3	2455L.003	2413L.003
4	8	12	54	3,8	18	6	18	3	2455L.004	2413L.004
5	9	16	54	4,8	18	6	18	3	2455L.005	2413L.005
6	10	16	54	5,8	—	6	18	4	2455L.006	2413L.006
8	12	20	58	7,7	—	8	22	4	2455L.008	2413L.008
10	14	24	66	9,7	—	10	26	4	2455L.010	2413L.010
12	16	26	73	11,6	—	12	28	4	2455L.012	2413L.012
16	22	32	82	15,5	—	16	34	4	2455L.016	2413L.016
20	26	40	92	19,5	—	20	42	4	2455L.020	2413L.020

Einsatzgebiete	Applications	Utilisations
• Stahlwerkstoffe bis 44 HRC • Gusswerkstoffe • VA, Inox • NE-Metalle • Titan	• Steel materials up to 44 HRC • Cast materials • VA, Inox • Non-ferrous materials • Titanium	• Aciers jusqu'à 44 HRC • Fontes • VA, Inox • Matières non ferreuses • Titane

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Valeurs de coupe, voir page 18

Hartmetall-Schaftfräser – Lange Ausführung

DIN 6527 L

Solid Carbide End Mills – Long Design

Fraises deux tailles en carbure monobloc – version longue

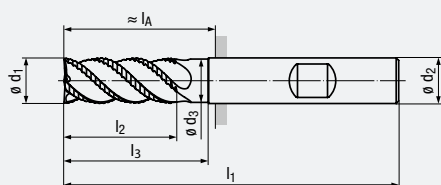
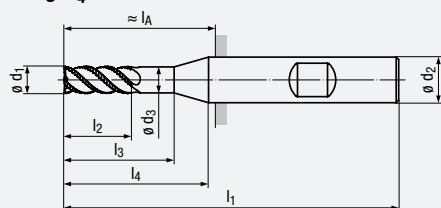
NR



2456L



2414L

Design I₄:

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3	8	14	57	2,9	20	6	21	3	2456L.003	2414L.003
4	11	18	57	3,8	20	6	21	3	2456L.004	2414L.004
5	13	18	57	4,8	20	6	21	3	2456L.005	2414L.005
6	13	20	57	5,8	—	6	21	4	2456L.006	2414L.006
8	19	25	63	7,7	—	8	27	4	2456L.008	2414L.008
10	22	30	72	9,7	—	10	32	4	2456L.010	2414L.010
12	26	35	83	11,6	—	12	38	4	2456L.012	2414L.012
16	32	40	92	15,5	—	16	44	4	2456L.016	2414L.016
20	38	50	104	19,5	—	20	54	4	2456L.020	2414L.020

Einsatzgebiete	Applications	Utilisations
• Stahlwerkstoffe bis 44 HRC • Gusswerkstoffe • VA, Inox • NE-Metalle • Titan	• Steel materials up to 44 HRC • Cast materials • VA, Inox • Non-ferrous materials • Titanium	• Aciers jusqu'à 44 HRC • Fontes • VA, Inox • Matières non ferreuses • Titane

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Cutting conditions, see page 18

Valeurs de coupe, voir page 18

Hartmetall-Schaftfräser – Kurze Ausführung

DIN 6527 K

Solid Carbide End Mills – Short Design

Fraises deux tailles en carbure monobloc – version courte

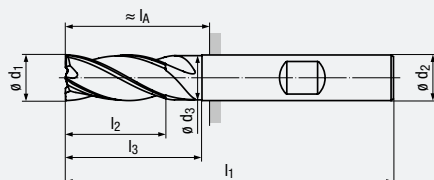
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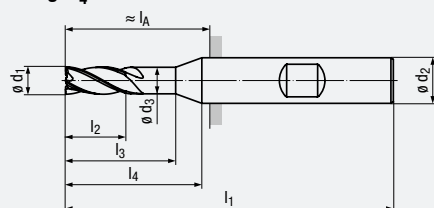
2453L



2454L



Design I₄:



$\emptyset d_1$ h10	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A	Z (Flutes)	Artikel-Nr. Art. no. Code article	Artikel-Nr. Art. no. Code article
3	5	9	50	2,9	14	6	14	4	2453L.003	2454L.003
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5	9	16	54	4,8	18	6	18	4	2453L.005	2454L.005
6	10	16	54	5,8	—	6	18	4	2453L.006	2454L.006
8	12	20	58	7,7	—	8	22	4	2453L.008	2454L.008
10	15	24	66	9,5	—	10	26	4	2453L.010	2454L.010
12	18	26	73	11,5	—	12	28	4	2453L.012	2454L.012
16	24	32	82	15,5	—	16	34	4	2453L.016	2454L.016
20	30	40	92	19,5	—	20	42	4	2453L.020	2454L.020

Einsatzgebiete	Applications	Utilisations
- Stahlwerkstoffe bis 44 HRC - Gusswerkstoffe - VA, Inox - NE-Metalle - Titan	- Steel materials up to 44 HRC - Cast materials - VA, Inox - Non-ferrous materials - Titanium	- Aciers jusqu'à 44 HRC - Fontes - VA, Inox - Matières non ferreuses - Titane

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Cutting conditions, see page 19

Valeurs de coupe, voir page 19

Hartmetall-Schaftfräser – Lange Ausführung

DIN 6527 L

Solid Carbide End Mills – Long Design

Fraises deux tailles en carbure monobloc – version longue

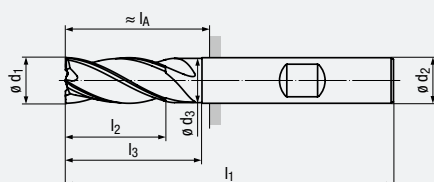
N



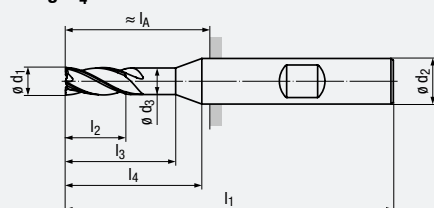
2457L



2439L



Design I₄:



$\emptyset d_1$ h10	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A	Z (Flutes)	Artikel-Nr. Art. no. Code article	Artikel-Nr. Art. no. Code article
3	8	14	57	2,9	20	6	21	4	2457L.003	2439L.003
4	11	18	57	3,8	20	6	21	4	2457L.004	2439L.004
5	13	19	57	4,8	20	6	21	4	2457L.005	2439L.005
6	13	20	57	5,8	—	6	21	4	2457L.006	2439L.006
8	19	25	63	7,7	—	8	27	4	2457L.008	2439L.008
10	22	30	72	9,5	—	10	32	4	2457L.010	2439L.010
12	26	35	83	11,5	—	12	38	4	2457L.012	2439L.012
16	32	40	92	15,5	—	16	44	4	2457L.016	2439L.016
20	38	50	104	19,5	—	20	54	4	2457L.020	2439L.020

Einsatzgebiete	Applications	Utilisations
- Stahlwerkstoffe bis 44 HRC - Gusswerkstoffe - VA, Inox - NE-Metalle - Titan	- Steel materials up to 44 HRC - Cast materials - VA, Inox - Non-ferrous materials - Titanium	- Aciers jusqu'à 44 HRC - Fontes - VA, Inox - Matières non ferreuses - Titane

Schnittwerte siehe Seite 20

Cutting conditions, see page 20

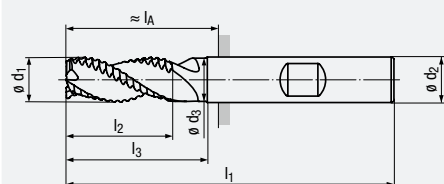
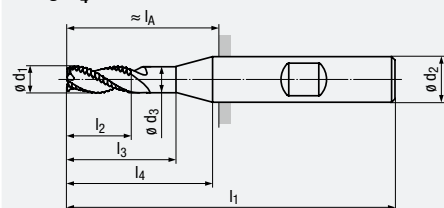
Valeurs de coupe, voir page 20

Hartmetall-Schaftfräser – Lange Ausführung

DIN 6527 L

Solid Carbide End Mills – Long Design

Fraises deux tailles en carbure monobloc – version longue

WRDesign I₄:

ϕd_1 h11	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A  (Flutes)	Z	Artikel-Nr. Art. no. Code article		Artikel-Nr. Art. no. Code article	
3	7	14	57	2,9	20	6	21	3	2448K.003	●	2449K.003	●
4	8	18	57	3,8	20	6	21	3	2448K.004	●	2449K.004	●
5	10	19	57	4,8	20	6	21	3	2448K.005	●	2449K.005	●
6	13	20	57	5,8	–	6	21	3	2448K.006	●	2449K.006	●
8	19	25	63	7,7	–	8	34	3	2448K.008	●	2449K.008	●
10	22	30	72	9,5	–	10	32	3	2448K.010	●	2449K.010	●
12	26	35	83	11,5	–	12	38	3	2448K.012	●	2449K.012	●
16	32	40	92	15,5	–	16	44	3	2448K.016	●	2449K.016	●
20	38	50	104	19,5	–	20	54	3	2448K.020	●	2449K.020	●

Einsatzgebiete	Applications	Utilisations
- Aluminium - NE-Metalle	- Aluminium - Non-ferrous materials	- Aluminium - Matières non ferreuses

Schnittwerte siehe Seite 21

Cutting conditions, see page 21

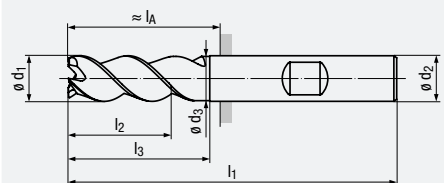
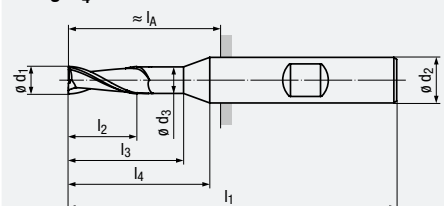
Valeurs de coupe, voir page 21

Hartmetall-Schaftfräser – Lange Ausführung

DIN 6527 L

Solid Carbide End Mills – Long Design

Fraises deux tailles en carbure monobloc – version longue

WDesign I₄:

ϕd_1 h10	l_2	l_3	l_1	ϕd_3	l_4	ϕd_2 h6	l_A  (Flutes)	Z	Artikel-Nr. Art. no. Code article		Artikel-Nr. Art. no. Code article	
2	6	10	57	1,9	20	6	21	2	2444K.002	●	2445K.002	●
3	7	14	57	2,9	20	6	21	2	2444K.003	●	2445K.003	●
4	8	18	57	3,8	20	6	21	2	2444K.004	●	2445K.004	●
5	10	19	57	4,8	20	6	21	2	2444K.005	●	2445K.005	●
6	13	20	57	5,8	–	6	21	3	2444K.006	●	2445K.006	●
8	19	25	63	7,7	–	8	34	3	2444K.008	●	2445K.008	●
10	22	30	72	9,5	–	10	32	3	2444K.010	●	2445K.010	●
12	26	35	83	11,5	–	12	38	3	2444K.012	●	2445K.012	●
16	32	40	92	15,5	–	16	44	3	2444K.016	●	2445K.016	●
20	38	50	104	19,5	–	20	54	3	2444K.020	●	2445K.020	●

Einsatzgebiete	Applications	Utilisations
- Aluminium - NE-Metalle	- Aluminium - Non-ferrous materials	- Aluminium - Matières non ferreuses

Schnittwerte siehe Seite 22

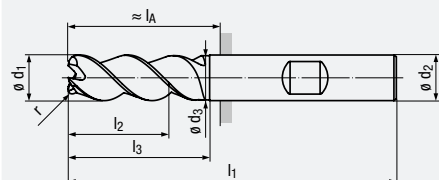
Cutting conditions, see page 22

Valeurs de coupe, voir page 22

Solid Carbide End Mills with Corner Radius – Long Design

Fraises deux tailles rayonnées en carbure monobloc – version longue

W



$\varnothing d_1$ h10	r $\pm 0,02$	l_2	l_3	l_1	$\varnothing d_3$	$\varnothing d_2$ h6	l_A  (Flutes)	Z	Artikel-Nr. Art. no. Code article		Artikel-Nr. Art. no. Code article	
6	0,5	13	20	57	5,8	6	21	3	2446K.006005	●	2447K.006005	●
6	1	13	20	57	5,8	6	21	3	2446K.006010	●	2447K.006010	●
8	1	19	25	63	7,7	8	27	3	2446K.008010	●	2447K.008010	●
8	1,5	19	25	63	7,7	8	27	3	2446K.008015	●	2447K.008015	●
8	2	19	25	63	7,7	8	27	3	2446K.008020	●	2447K.008020	●
10	1	22	30	72	9,5	10	32	3	2446K.010010	●	2447K.010010	●
10	1,5	22	30	72	9,5	10	32	3	2446K.010015	●	2447K.010015	●
10	2	22	30	72	9,5	10	32	3	2446K.010020	●	2447K.010020	●
12	1	26	35	83	11,5	12	38	3	2446K.012010	●	2447K.012010	●
12	1,5	26	35	83	11,5	12	38	3	2446K.012015	●	2447K.012015	●
12	2	26	35	83	11,5	12	38	3	2446K.012020	●	2447K.012020	●
12	2,5	26	35	83	11,5	12	38	3	2446K.012025	●	2447K.012025	●
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16	1,5	32	40	92	15,5	16	44	3	2446K.016015	●	2447K.016015	●
16	2	32	40	92	15,5	16	44	3	2446K.016020	●	2447K.016020	●
16	2,5	32	40	92	15,5	16	44	3	2446K.016025	●	2447K.016025	●
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16	4	32	40	92	15,5	16	44	3	2446K.016040	●	2447K.016040	●
20	1	38	50	104	19,5	20	54	3	2446K.020010	●	2447K.020010	●
20	1,5	38	50	104	19,5	20	54	3	2446K.020015	●	2447K.020015	●
20	2	38	50	104	19,5	20	54	3	2446K.020020	●	2447K.020020	●
20	2,5	38	50	104	19,5	20	54	3	2446K.020025	●	2447K.020025	●
20	3	38	50	104	19,5	20	54	3	2446K.020030	●	2447K.020030	●
20	4	38	50	104	19,5	20	54	3	2446K.020040	●	2447K.020040	●

Einsatzgebiete	Applications	Utilisations
- Aluminium - NE-Metalle	- Aluminium - Non-ferrous materials	- Aluminium - Matières non ferreuses

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Cutting conditions, see page 22

Valeurs de coupe, voir page 22

Hartmetall-Kugelfräser – Kurze Ausführung

Werksnorm

Solid Carbide Ball Nose End Mills – Short Design

Internal Standard

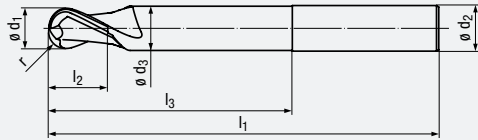
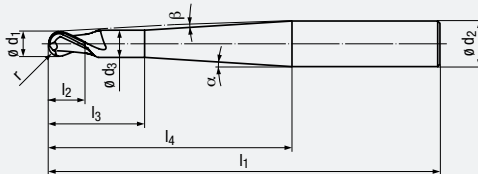
Fraises à bout hémisphérique en carbure monobloc – version courte

Norme usine

W



2452K

Design I₄:

$\emptyset d_1$ $\pm 0,01$	r $\pm 0,005$	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ $h5$	α	β	Z (Flutes)	Artikel-Nr. Art. no. Code article	
0,5	0,25	1	2	38	0,45	9	3	10°	8°	2	2452K.0005	●
1	0,5	2	4	38	0,95	9	3	12,5°	6,5°	2	2452K.001	●
1,5	0,75	2,5	7,5	38	1,4	9	3	32°	5°	2	2452K.0015	●
2	1	3	8	38	1,8	9	3	31°	3,5°	2	2452K.002	●
3	1,5	3,5	10	57	2,8	20	6	11,5°	5°	2	2452K.003	●
4	2	4	12	57	3,8	20	6	11°	3,5°	2	2452K.004	●
5	2,5	5	14	57	4,7	20	6	10°	2°	2	2452K.005	●
6	3	6	20	57	5,6	—	6	—	—	2	2452K.006	●
8	4	7	25	63	7,6	—	8	—	—	2	2452K.008	●
10	5	8	30	72	9,6	—	10	—	—	2	2452K.010	●
12	6	10	35	83	11,5	—	12	—	—	2	2452K.012	●

Einsatzgebiete	Applications	Utilisations
- Aluminium - NE-Metalle	- Aluminium - Non-ferrous materials	- Aluminium - Matières non ferreuses

Schnittwerte siehe Seite 23

Cutting conditions, see page 23

Valeurs de coupe, voir page 23

HSS-Schaftfräser – Extra kurze Ausführung

Werksnorm

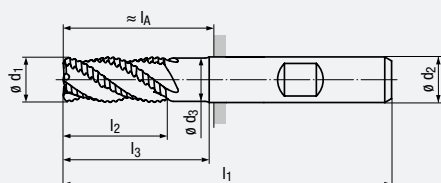
HSS End Mills – Extra Short Design

Internal Standard

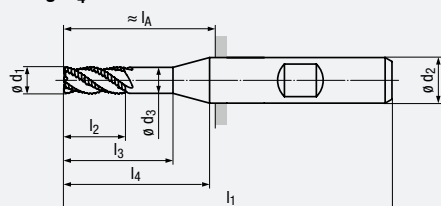
Fraises deux tailles en HSS – version extra courte

Norme usine

HR



Design I₄:



$\emptyset d_1$ kT2	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A	Z	Artikel-Nr. Art. no. Code article	
6	8	14	52	5,5	–	6	16	4	2400C.006	●
8	11	17	61	7,5	19	10	21	4	2400C.008	●
10	13	21	63	9,5	–	10	23	4	2400C.010	●
12	16	26	73	11,5	–	12	28	4	2400C.012	●
14	16	26	73	11,5	–	12	28	4	2400C.014	●
16	19	29	79	15	–	16	31	4	2400C.016	●
18	19	29	79	15	–	16	31	4	2400C.018	●
20	22	36	88	19	–	20	38	4	2400C.020	●

Einsatzgebiete	Applications	Utilisations
- Stahlwerkstoffe - Gusswerkstoffe - Kupfer, Bronze, Messing	- Steel materials - Cast materials - Copper, Bronze, Brass	- Aciers - Fontes - Cuivre, Bronzes, Laitons

Schnittwerte siehe Seite 24

Cutting conditions, see page 24

Valeurs de coupe, voir page 24

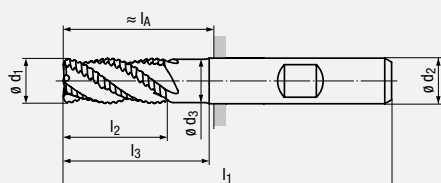
HSS-Schaftfräser – Kurze Ausführung

DIN 844 K

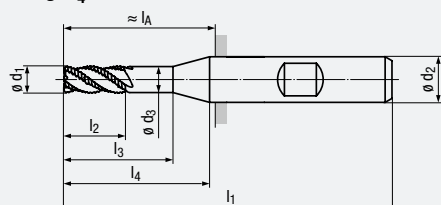
HSS End Mills – Short Design

Fraises deux tailles en HSS – version courte

HR



Design I₄:



$\emptyset d_1$ kT2	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A	Z	Artikel-Nr. Art. no. Code article	
4	11	17	55	–	–	6	19	3	2401C.004	●
5	13	19	57	–	–	6	21	3	2401C.005	●
6	13	19	57	5,5	–	6	21	4	2401C.006	●
8	19	25	69	7,5	27	10	29	4	2401C.008	●
10	22	30	72	9,5	–	10	32	4	2401C.010	●
12	26	36	83	11,5	–	12	38	4	2401C.012	●
14	26	36	83	11,5	–	12	38	4	2401C.014	●
16	32	42	92	15	–	16	44	4	2401C.016	●
18	32	42	92	15	–	16	44	4	2401C.018	●
20	38	52	104	19	–	20	54	4	2401C.020	●
25	45	63	121	24	–	25	65	4	2401C.025	●
28	45	63	121	24	–	25	65	5	2401C.028	●

Einsatzgebiete	Applications	Utilisations
- Stahlwerkstoffe - Gusswerkstoffe - Kupfer, Bronze, Messing	- Steel materials - Cast materials - Copper, Bronze, Brass	- Aciers - Fontes - Cuivre, Bronzes, Laitons

Schnittwerte siehe Seite 24

Cutting conditions, see page 24

Valeurs de coupe, voir page 24

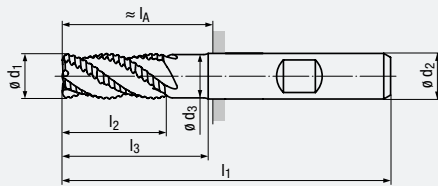
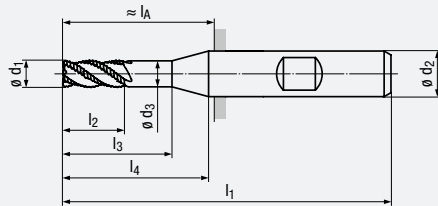
HSS-Schaftfräser – Lange Ausführung

HSS End Mills – Long Design

Fraises deux tailles en HSS – version longue

HR

2402C

Design I₄:

$\emptyset d_1$ k12	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ h6	l_A 	Z	Artikel-Nr. Art. no. Code article	
6	24	30	68	5,5	—	6	32	4	2402C.006	●
8	38	44	88	7,5	46	10	48	4	2402C.008	●
10	45	53	95	9,5	—	10	55	4	2402C.010	●
12	53	63	110	11,5	—	12	65	4	2402C.012	●
16	63	73	123	15	—	16	75	4	2402C.016	●
20	75	89	141	19	—	20	91	4	2402C.020	●
25	90	108	166	24	—	25	110	4	2402C.025	●

Einsatzgebiete	Applications	Utilisations
• Stahlwerkstoffe • Gusswerkstoffe • Kupfer, Bronze, Messing	• Steel materials • Cast materials • Copper, Bronze, Brass	• Aciers • Fontes • Cuivre, Bronzes, Laitons

Schnittwerte siehe Seite 25

Cutting conditions, see page 25

Valeurs de coupe, voir page 25

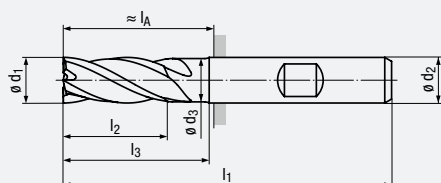
HSS-Schaftfräser – Kurze Ausführung

DIN 69844 / DIN 844 K

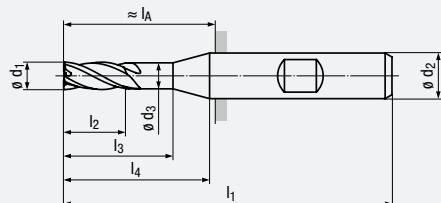
HSS End Mills – Short Design

Fraises deux tailles en HSS – version courte

N



Design I₄:



Ø d ₁ k10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h6	l _A	Z	Artikel-Nr. Art. no. Code article	
4	11	17	55	—	—	6	19	4	2403C.004	●
5	13	19	57	—	—	6	21	4	2403C.005	●
6	13	19	57	5,5	—	6	21	4	2403C.006	●
8	19	25	69	7,5	27	10	29	4	2403C.008	●
10	22	30	72	9,5	—	10	32	4	2403C.010	●
12	26	36	83	11,5	—	12	38	4	2403C.012	●
14	26	36	83	11,5	—	12	38	4	2403C.014	●
16	32	42	92	15	—	16	44	4	2403C.016	●
18	32	42	92	15	—	16	44	4	2403C.018	●
20	38	52	104	19	—	20	54	4	2403C.020	●
22	38	52	104	19	—	20	54	5	2403C.022	●
25	45	63	121	24	—	25	65	5	2403C.025	●
28	45	63	121	24	—	25	65	5	2403C.028	●
30	45	63	121	24	—	25	65	5	2403C.030	●
32	53	70	133	31	—	32	73	6	2403C.032	●
36	53	70	133	31	—	32	73	6	2403C.036	●
40	63	80	155	38	—	40	85	6	2403C.040	●

Einsatzgebiete	Applications	Utilisations
- Stahlwerkstoffe - NE-Metalle (kurzspanend)	- Steel materials - Non-ferrous materials (short-chipping)	- Aciers - Matières non ferreuses (copeaux courts)
Schnittwerte siehe Seite 26	Cutting conditions, see page 26	Valeurs de coupe, voir page 26

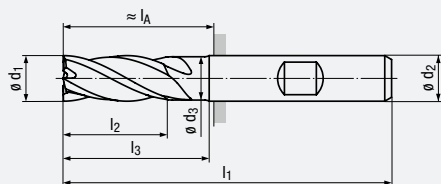
HSS-Schaftfräser – Lange Ausführung

DIN 844 L

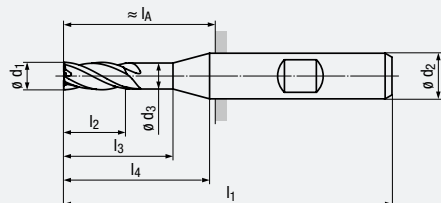
HSS End Mills – Long Design

Fraises deux tailles en HSS – version longue

N



Design I₄:



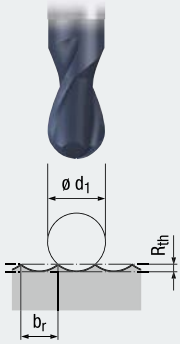
Ø d ₁ k10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h6	l _A	Z	Artikel-Nr. Art. no. Code article	
6	24	30	68	5,5	—	6	32	4	2404C.006	●
8	38	44	88	7,5	46	10	48	4	2404C.008	●
10	45	53	95	9,5	—	10	55	4	2404C.010	●
12	53	63	110	11,5	—	12	65	4	2404C.012	●
14	53	63	110	11,5	—	12	65	4	2404C.014	●
16	63	73	123	15	—	16	75	4	2404C.016	●
18	63	73	123	15	—	16	75	4	2404C.018	●
20	75	89	141	19	—	20	91	4	2404C.020	●
22	75	89	141	19	—	20	91	5	2404C.022	●
25	90	108	166	24	—	25	110	5	2404C.025	●
28	90	108	166	24	—	25	110	5	2404C.028	●
30	90	108	166	24	—	25	110	5	2404C.030	●
32	106	123	186	31	—	32	126	6	2404C.032	●

Einsatzgebiete	Applications	Utilisations
- Stahlwerkstoffe - NE-Metalle (kurzspanend)	- Steel materials - Non-ferrous materials (short-chipping)	- Aciers - Matières non ferreuses (copeaux courts)
Schnittwerte siehe Seite 27	Cutting conditions, see page 27	Valeurs de coupe, voir page 27

Einsatzdaten-Berechnung

Work Data Calculation

Calcul des paramètres de fraisage



$$R_{th} = \frac{d_1}{2} - \sqrt{\frac{d_1^2 - b_r^2}{4}}$$

$$b_r = 2 \sqrt{R_{th} (d_1 - R_{th})}$$

d_1 = Schneidendurchmesser [mm]
Cutting diameter
Diamètre de coupe

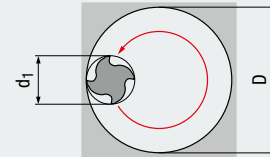
R_{th} = Rautiefe [mm]
Surface roughness
Rugosité (hauteur de profil)

b_r = Zeilensprung [mm]
Line offset
Pas des stries

Innenkontur

Internal contour
Contour intérieur

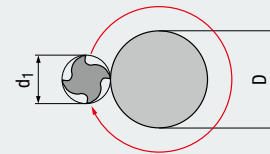
$$v_{fM} = \frac{v_f \times (D - d_1)}{D} \text{ [mm/min]}$$



Außenkontur

External contour
Contour extérieur

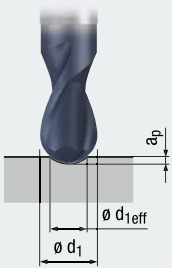
$$v_{fM} = \frac{v_f \times (D + d_1)}{D} \text{ [mm/min]}$$



Effektiver Schneidendurchmesser d_{1eff}

Effective cutting diameter d_{1eff}

Diamètre de coupe effectif d_{1eff}



$$d_{1eff} = 2 \sqrt{a_p (d_1 - a_p)}$$

d_1 = Schneidendurchmesser [mm]
Cutting diameter
Diamètre de coupe

d_{1eff} = Effektiver Schneidendurchmesser [mm]
Effective cutting diameter
Diamètre de coupe effectif

a_p = Axiale Zustellung [mm]
Axial depth of cut
Prise de passe axiale

Drehzahl

Speed/rpm

Vitesse de rotation

$$n = \frac{v_c \times 1000}{d_1 \times \pi} \text{ [min}^{-1}\text{]}$$

Vorschub pro Umdrehung

Feed per revolution

Avance par tour

$$f = f_z \times Z \text{ (flutes) [mm]}$$

Schnittgeschwindigkeit

Cutting speed

Vitesse de coupe

$$v_c = \frac{d_1 \times \pi \times n}{1000} \text{ [m/min]}$$

Vorschubgeschwindigkeit

Feed speed

Vitesse d'avance

$$v_f = f_z \times Z \text{ (flutes) } \times n \text{ [mm/min]}$$

Vorschub pro Zahn

Feed per tooth

Avance par dent

$$f_z = \frac{v_f}{Z \text{ (flutes) } \times n} \text{ [mm]}$$

Mittenspanndicke

Chip thickness

Épaisseur moyenne du copeau

$$h_m = f_z \times \sqrt{\frac{a_e}{d_1}} \text{ [mm]}$$

a_e = Radiale Zustellung [mm]
Radial depth of cut
Prise de passe radiale

Einsatzgebiete – Material

Applications – Material

Utilisations – matière

Einsatzgebiete – Material Applications – material Utilisations – matière				Mat.-Beispiele Mat. exemples Exemples de mat.	Mat.-Nrn. Mat. nos. Nos de mat.
P	Stahlwerkstoffe		Steel materials	Aciers	
	1.1	Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	Cq15 1.1132 S235JR (St37-2) 1.0037 10SPb20 1.0722
	2.1	Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	3.1	Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067
	4.1	Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	5.1	Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
M	Nichtrostende Stahlwerkstoffe		Stainless steel materials	Aciers inoxydables	
	1.1	Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ²	X2CrTi12 1.4512
	2.1	Austenitisch	Austenitic	≤ 950 N/mm ²	X6CrNiMoTi17-12-2 1.4571
	3.1	Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	≤ 1100 N/mm ²	X2CrNiMoN22-5-3 1.4462
K	4.1	Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ²	X2CrNiMoN25-7-4 1.4410
	Gusswerkstoffe		Cast materials	Fontes	
	1.1	Gusseisen mit Lamellengrafit (GJL)	Cast iron with lamellar graphite (GJL)	100-250 N/mm ²	EN-GJL-200 (GG20)
	1.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	250-450 N/mm ²	EN-GJL-300 (GG30)
N	2.1	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	350-500 N/mm ²	EN-GJS-400-15 (GGG40)
	2.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	500-900 N/mm ²	EN-GJS-700-2 (GGG70)
	3.1	Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	300-400 N/mm ²	GJV 300
	3.2	Gusseisen mit Vermiculargrafit (GJV)	Cast iron with vermicular graphite (GJV)	400-500 N/mm ²	GJV 450
H	4.1	Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	250-500 N/mm ²	EN-GJMW-350-4 (GTW-35)
	4.2	Temperguss (GTMW, GTMB)	Malleable cast iron (GTMW, GTMB)	500-800 N/mm ²	EN-GJMB-450-6 (GTS-45)
	Nichteisenwerkstoffe		Non-ferrous materials	Matières non ferreuses	
	Aluminium-Legierungen		Aluminium alloys	Alliages d'aluminium	
S	1.1	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 200 N/mm ²	EN AW-AlMn1
	1.2	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 350 N/mm ²	EN AW-AlMgSi
	1.3	Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 550 N/mm ²	EN AW-AlZn5Mg3Cu
	1.4	Aluminium-Knetlegierungen	Wrought aluminium alloys	Si ≤ 7%	EN AC-AlMg5
S	1.5	Aluminium-Gusslegierungen	Aluminium cast alloys	7% < Si ≤ 12%	EN AC-AlSi9Cu3
	1.6	Aluminium-Gusslegierungen	Aluminium cast alloys	12% < Si ≤ 17%	GD-AlSi17Cu4FeMg
	Kupfer-Legierungen		Copper alloys	Alliages de cuivre	
	2.1	Reinkupfer, niedriglegiertes Kupfer	Pure copper, low-alloyed copper	≤ 400 N/mm ²	E-Cu 57
S	2.2	Kupfer-Zink-Legierungen (Messing, langspanend)	Copper-zinc alloys (brass, long-chipping)	≤ 550 N/mm ²	CuZn37 (Ms63)
	2.3	Kupfer-Zink-Legierungen (Messing, kurzspanend)	Copper-zinc alloys (brass, short-chipping)	≤ 550 N/mm ²	CuZn36Pb3 (Ms58)
	2.4	Kupfer-Aluminium-Legierungen (Alubronze, langsp.)	Copper-alum.alloys (alu bronze, long-chip.)	≤ 800 N/mm ²	CuAl10Ni5Fe4
	2.5	Kupfer-Zinn-Legierungen (Zinnbronze, langspanend)	Copper-tin alloys (tin bronze, long-chipping)	≤ 700 N/mm ²	CuSn8P
S	2.6	Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend)	Copper-tin alloys (tin bronze, short-chipping)	≤ 400 N/mm ²	CuSn7 ZnPb (Rg7)
	2.7	Kupfer-Sonderlegierungen	Special copper alloys	≤ 600 N/mm ²	(AMPICO® 8)
	2.8	Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ²	(AMPICO® 45)
	Magnesium-Legierungen		Magnesium alloys	Alliages de magnésium	
S	3.1	Magnesium-Knetlegierungen	Magnesium wrought alloys	≤ 500 N/mm ²	MgAl6Zn
	3.2	Magnesium-Gusslegierungen	Magnesium cast alloys	≤ 500 N/mm ²	EN-MCMgAl9Zn1
	Kunststoffe		Synthetics	Matières synthétiques	
	4.1	Duroplaste (kurzspanend)	Duroplastics (short-chipping)		Bakelit, Pertinax
S	4.2	Thermoplaste (langspanend)	Thermoplastics (long-chipping)		PMMA, POM, PVC
	4.3	Faserverstärkte Kunststoffe (Faseranteil ≤ 30%)	Fibre-reinforced synthetics (fibre content ≤ 30%)		GFK, CFK, AFK
	4.4	Faserverstärkte Kunststoffe (Faseranteil > 30%)	Fibre-reinforced synthetics (fibre content > 30%)		GFK, CFK, AFK
	Besondere Werkstoffe		Special materials	Matières particulières	
S	5.1	Grafit	Graphite		C 8000
	5.2	Wolfram-Kupfer-Legierungen	Tungsten-copper alloys		W-Cu 80/20
	5.3	Verbundwerkstoffe	Composite materials		Hylite, Alucobond
	Spezialwerkstoffe		Special materials	Matières spéciales	
S	Titan-Legierungen		Titanium alloys	Alliages de titane	
	1.1	Reintitan	Pure titanium	≤ 450 N/mm ²	Ti1
	1.2	Titan-Legierungen	Titanium alloys	≤ 900 N/mm ²	TiAl6V4
	1.3	Titan-Legierungen	Titanium alloys	≤ 1250 N/mm ²	TiAl4Mo4Sn2
S	Nickel-, Kobalt- und Eisen-Legierungen		Nickel alloys, cobalt alloys and iron alloys	Alliages de nickel, cobalt et fer	
	2.1	Reinnickel	Pure nickel	≤ 600 N/mm ²	Ni 99,6
	2.2	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1000 N/mm ²	Monel 400
	2.3	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm ²	Inconel 718
S	2.4	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1000 N/mm ²	Udimet 605
	2.5	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1600 N/mm ²	Haynes 25
	2.6	Eisen-Basis-Legierungen	Iron-base alloys	≤ 1500 N/mm ²	Incoloy 800
	Harte Werkstoffe		Hard materials	Matières dures	
H	1.1	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	44 - 50 HRC	Weldox 1100
	1.2	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	50 - 55 HRC	Hardox 550
	1.3	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	55 - 60 HRC	Armox 600T
	1.4	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	60 - 63 HRC	Ferro-Titanit
	1.5	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	63 - 66 HRC	HSSE

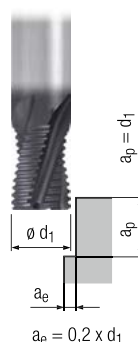
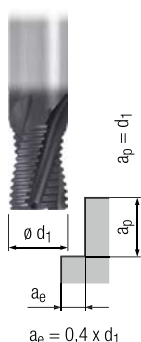
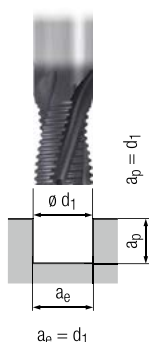
Schnittwerte für Hartmetall-Schaftfräser – Kurze Ausführung

Cutting Conditions for Solid Carbide End Mills – Short Design

Valeurs de coupe pour fraises deux tailles en carbure monobloc – version courte



NR

Gültig für
Valid for
Valable pour2450L
2451L

		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	110	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,007 \times d_1$	□	■	□	■
	2.1	100	$0,004 \times d_1$	110	$0,006 \times d_1$	130	$0,007 \times d_1$	□	■	□	■
	3.1	90	$0,004 \times d_1$	100	$0,005 \times d_1$	110	$0,006 \times d_1$	□	■	□	■
	4.1	80	$0,003 \times d_1$	90	$0,005 \times d_1$	100	$0,006 \times d_1$	□	■	□	
	5.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	90	$0,005 \times d_1$	□	■	□	
M	1.1										
	2.1										
	3.1										
	4.1										
K	1.1	110	$0,005 \times d_1$	130	$0,006 \times d_1$	160	$0,007 \times d_1$	□	■		□
	1.2	110	$0,005 \times d_1$	130	$0,006 \times d_1$	160	$0,007 \times d_1$	□	■		□
	2.1	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	□	■		□
	2.2	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$	□	■		□
	3.1	80	$0,004 \times d_1$	100	$0,005 \times d_1$	120	$0,006 \times d_1$	□	■		□
	3.2	80	$0,004 \times d_1$	100	$0,005 \times d_1$	120	$0,006 \times d_1$	□	■		□
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		□
	4.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	□	■		□
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1										
	2.2										
	2.3	100	$0,005 \times d_1$	120	$0,006 \times d_1$	140	$0,007 \times d_1$			□	■
	2.4										
	2.5	100	$0,005 \times d_1$	110	$0,005 \times d_1$	120	$0,006 \times d_1$			□	■
	2.6										
	2.7										
	2.8										
	3.1										
	3.2										
	4.1										
	4.2										
	4.3										
	4.4										
	5.1										
	5.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$			□	■
	5.3										
S	1.1										
	1.2										
	1.3										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
H	1.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	□	■		
	1.2										
	1.3										
	1.4										
	1.5										

v_c = Schnittgeschwindigkeit · Cutting speed · Vitesse de coupe
 f_z = Vorschub pro Zahn · Feed per tooth · Avance par dent

■ = sehr gut geeignet · very suitable · très approprié
 □ = gut geeignet · suitable · approprié

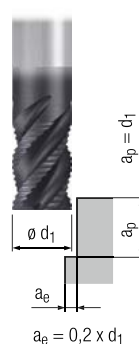
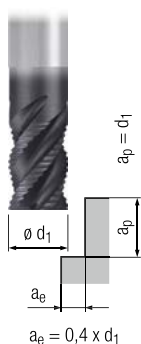
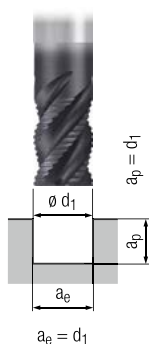
Schnittwerte für Hartmetall-Schaftfräser – Kurze und Lange Ausführung

Cutting Conditions for Solid Carbide End Mills – Short and Long Design

Valeurs de coupe pour fraises deux tailles en carbure monobloc – version courte et longue



NR



Gültig für
Valid for
Valable pour

2413L
2414L
2455L
2456L

		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$		□		■
	2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$		□		■
	3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,005 \times d_1$	□	■		■
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		
	5.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	□	■		
M	1.1	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
	2.1	50	$0,003 \times d_1$	60	$0,004 \times d_1$	70	$0,004 \times d_1$				■
	3.1										
	4.1										
K	1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	■	■		
	1.2	120	$0,005 \times d_1$	140	$0,006 \times d_1$	170	$0,007 \times d_1$	■	■		
	2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	■	■		
	2.2	110	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	■	■		
	3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$	■	■		
	3.2	90	$0,004 \times d_1$	110	$0,005 \times d_1$	130	$0,006 \times d_1$	■	■		
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	■	■		
	4.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$	■	■		
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	2.1	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$				■
	2.2	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$				■
	2.3	110	$0,005 \times d_1$	130	$0,006 \times d_1$	150	$0,007 \times d_1$			□	■
	2.4	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$				■
	2.5	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$				■
	2.6	100	$0,004 \times d_1$	120	$0,005 \times d_1$	140	$0,006 \times d_1$			□	■
	2.7										
	2.8										
	3.1										
	3.2										
S	4.1	240	$0,008 \times d_1$	290	$0,009 \times d_1$	340	$0,011 \times d_1$			□	■
	4.2										
	4.3										
	4.4										
	5.1										
	5.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
	5.3										
S	1.1	60	$0,004 \times d_1$	70	$0,004 \times d_1$	80	$0,005 \times d_1$				■
	1.2										
	1.3										
	2.1										
	2.2										
	2.3										
H	2.4										
	2.5										
	2.6										
	1.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,004 \times d_1$	□	■		
	1.2										
	1.3										
	1.4										
	1.5										

Schnittwerte für Hartmetall-Schaftfräser – Kurze Ausführung

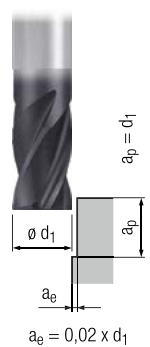
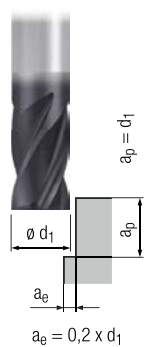
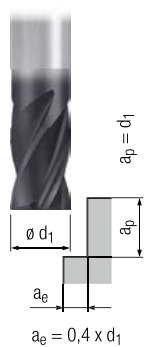
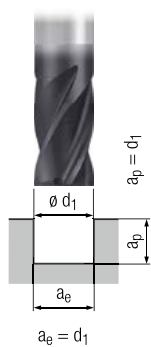
Cutting Conditions for Solid Carbide End Mills – Short Design

Valeurs de coupe pour fraises deux tailles en carbure monobloc – version courte



N

 Gültig für
Valid for
Valable pour

 2453L
2454L


		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	170	$0,005 \times d_1$	190	$0,006 \times d_1$	200	$0,007 \times d_1$	240	$0,008 \times d_1$	□	■	□	■
	2.1	150	$0,004 \times d_1$	170	$0,005 \times d_1$	180	$0,006 \times d_1$	210	$0,007 \times d_1$	□	■	□	■
	3.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■	□	■
	4.1	120	$0,003 \times d_1$	130	$0,004 \times d_1$	140	$0,004 \times d_1$	170	$0,005 \times d_1$	□	■		
	5.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	□	■		
M	1.1	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$			□	■
	2.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■
	3.1	50	$0,002 \times d_1$	60	$0,003 \times d_1$	60	$0,003 \times d_1$	70	$0,004 \times d_1$			□	■
	4.1	30	$0,002 \times d_1$	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,004 \times d_1$			□	■
K	1.1	170	$0,005 \times d_1$	190	$0,006 \times d_1$	200	$0,007 \times d_1$	240	$0,008 \times d_1$	□	■		
	1.2	170	$0,005 \times d_1$	190	$0,006 \times d_1$	200	$0,007 \times d_1$	240	$0,008 \times d_1$	□	■		
	2.1	150	$0,004 \times d_1$	170	$0,005 \times d_1$	180	$0,006 \times d_1$	210	$0,006 \times d_1$	□	■		
	2.2	150	$0,004 \times d_1$	170	$0,005 \times d_1$	180	$0,006 \times d_1$	210	$0,006 \times d_1$	□	■		
	3.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$	□	■		
	3.2	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$	□	■		
	4.1	100	$0,003 \times d_1$	110	$0,004 \times d_1$	120	$0,004 \times d_1$	140	$0,005 \times d_1$	□	■		
	4.2	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■		
N	1.1	220	$0,009 \times d_1$	250	$0,010 \times d_1$	280	$0,011 \times d_1$	300	$0,013 \times d_1$			□	■
	1.2	220	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.3	220	$0,007 \times d_1$	250	$0,008 \times d_1$	280	$0,009 \times d_1$	300	$0,010 \times d_1$			□	■
	1.4	200	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.5												
	1.6												
	2.1	150	$0,005 \times d_1$	170	$0,006 \times d_1$	180	$0,007 \times d_1$	210	$0,008 \times d_1$			□	■
	2.2	150	$0,005 \times d_1$	170	$0,006 \times d_1$	180	$0,007 \times d_1$	210	$0,008 \times d_1$			□	■
	2.3	150	$0,005 \times d_1$	170	$0,006 \times d_1$	180	$0,007 \times d_1$	210	$0,008 \times d_1$			□	■
	2.4	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$			□	■
	2.5	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$			□	■
	2.6	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$			□	■
	2.7	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$			□	■
	2.8	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$			□	■
	3.1	340	$0,009 \times d_1$	370	$0,011 \times d_1$	410	$0,013 \times d_1$	480	$0,014 \times d_1$			□	■
	3.2	340	$0,007 \times d_1$	370	$0,008 \times d_1$	410	$0,010 \times d_1$	480	$0,011 \times d_1$			□	■
	4.1	340	$0,008 \times d_1$	370	$0,009 \times d_1$	410	$0,011 \times d_1$	480	$0,012 \times d_1$			□	■
	4.2	500	$0,008 \times d_1$	550	$0,009 \times d_1$	600	$0,011 \times d_1$	700	$0,012 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$				■
	5.3												
S	1.1	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$	110	$0,006 \times d_1$				■
	1.2	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$				■
	1.3	40	$0,003 \times d_1$	40	$0,003 \times d_1$	50	$0,004 \times d_1$	60	$0,004 \times d_1$				■
	2.1	70	$0,002 \times d_1$	80	$0,002 \times d_1$	80	$0,003 \times d_1$	100	$0,003 \times d_1$				■
	2.2	30	$0,002 \times d_1$	30	$0,002 \times d_1$	35	$0,003 \times d_1$	40	$0,003 \times d_1$				■
	2.3	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.4	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.5	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$				■
H	1.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	□	■		
	1.2	80	$0,003 \times d_1$	90	$0,003 \times d_1$	100	$0,004 \times d_1$	110	$0,004 \times d_1$	□	■		
	1.3			90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,004 \times d_1$	□	■		
	1.4												
	1.5												

v_c = Schnittgeschwindigkeit · Cutting speed · Vitesse de coupe
 f_z = Vorschub pro Zahn · Feed per tooth · Avance par dent

■ = sehr gut geeignet · very suitable · très approprié
 □ = gut geeignet · suitable · approprié

Schnittwerte für Hartmetall-Schaftfräser – Lange Ausführung

Cutting Conditions for Solid Carbide End Mills – Long Design

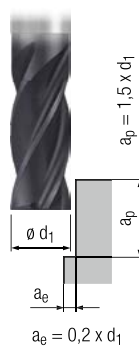
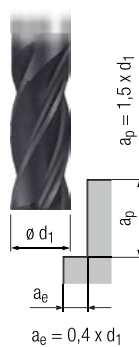
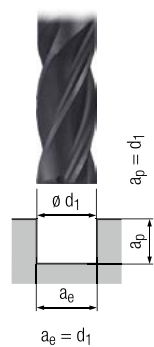
Valeurs de coupe pour fraises deux tailles en carbure monobloc – version longue



N

Gültig für
Valid for
Valable pour

2457L
2439L



		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	140	$0,005 \times d_1$	150	$0,005 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	□	■	□	■
	2.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■	□	■
	3.1	110	$0,004 \times d_1$	120	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,005 \times d_1$	□	■	□	■
	4.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	□	■		
	5.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,003 \times d_1$	130	$0,004 \times d_1$	□	■		
M	1.1	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$			□	■
	3.1	40	$0,002 \times d_1$	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$			□	■
	4.1	30	$0,002 \times d_1$	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,003 \times d_1$			□	■
K	1.1	140	$0,005 \times d_1$	150	$0,006 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	□	■		
	1.2	140	$0,005 \times d_1$	150	$0,006 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	□	■		
	2.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■		
	2.2	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■		
	3.1	110	$0,004 \times d_1$	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	□	■		
	3.2	110	$0,004 \times d_1$	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	□	■		
	4.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	□	■		
	4.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		
N	1.1	220	$0,009 \times d_1$	250	$0,010 \times d_1$	280	$0,011 \times d_1$	300	$0,013 \times d_1$			□	■
	1.2	220	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.3	220	$0,007 \times d_1$	250	$0,008 \times d_1$	280	$0,009 \times d_1$	300	$0,010 \times d_1$			□	■
	1.4	200	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.5												
	1.6												
	2.1	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$			□	■
	2.2	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$			□	■
	2.3	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$			□	■
	2.4	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$			□	■
	2.5	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$			□	■
	2.6	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$			□	■
	2.7	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.8	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	3.1	290	$0,009 \times d_1$	320	$0,010 \times d_1$	350	$0,011 \times d_1$	410	$0,013 \times d_1$			□	■
	3.2	290	$0,007 \times d_1$	320	$0,008 \times d_1$	350	$0,009 \times d_1$	410	$0,010 \times d_1$			□	■
	4.1	290	$0,008 \times d_1$	320	$0,009 \times d_1$	350	$0,009 \times d_1$	410	$0,011 \times d_1$			□	■
	4.2	430	$0,008 \times d_1$	470	$0,009 \times d_1$	520	$0,009 \times d_1$	600	$0,011 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$				■
	5.3												
S	1.1	70	$0,004 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$				■
	1.2	60	$0,003 \times d_1$	70	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
	1.3	40	$0,003 \times d_1$	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,004 \times d_1$				■
	2.1	60	$0,002 \times d_1$	70	$0,002 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$				■
	2.2	20	$0,002 \times d_1$	20	$0,002 \times d_1$	15	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.3	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.4	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.5	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$				■
H	1.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,003 \times d_1$	130	$0,004 \times d_1$	□	■		
	1.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,003 \times d_1$	100	$0,004 \times d_1$	□	■		
	1.3			70	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$	□	■		
	1.4												
	1.5												

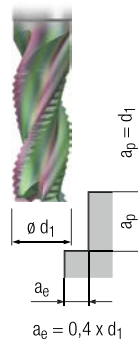
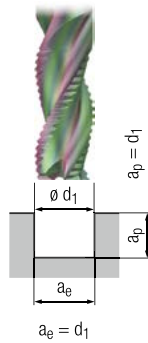
Schnittwerte für Hartmetall-Schaftfräser – Lange Ausführung

Cutting Conditions for Solid Carbide End Mills – Long Design

Valeurs de coupe pour fraises deux tailles en carbure monobloc – version longue



WR



Gültig für
Valid for
Valable pour
2448K
2449K

	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1							
	2.1							
	3.1							
	4.1							
	5.1							
M	1.1							
	2.1							
	3.1							
	4.1							
K	1.1							
	1.2							
	2.1							
	2.2							
	3.1							
	3.2							
	4.1							
	4.2							
N	1.1	300	$0,009 \times d_1$	420	$0,011 \times d_1$		☐	☒
	1.2	430	$0,008 \times d_1$	620	$0,010 \times d_1$		☐	☒
	1.3	385	$0,007 \times d_1$	550	$0,008 \times d_1$		☐	☒
	1.4	270	$0,008 \times d_1$	380	$0,010 \times d_1$		☐	☒
	1.5							
	1.6							
	2.1	100	$0,005 \times d_1$	160	$0,006 \times d_1$	☐	☐	☒
	2.2	100	$0,005 \times d_1$	160	$0,006 \times d_1$	☐	☐	☒
	2.3	100	$0,005 \times d_1$	160	$0,006 \times d_1$	☐	☐	☒
	2.4	80	$0,004 \times d_1$	140	$0,005 \times d_1$	☐	☐	☒
	2.5	80	$0,004 \times d_1$	140	$0,005 \times d_1$	☐	☐	☒
	2.6	80	$0,004 \times d_1$	140	$0,005 \times d_1$	☐	☐	☒
	2.7	60	$0,003 \times d_1$	100	$0,004 \times d_1$	☐	☐	☒
	2.8							
	3.1							
	3.2							
	4.1							
	4.2							
	4.3							
	4.4							
	5.1							
	5.2							
	5.3							
S	1.1							
	1.2							
	1.3							
	2.1							
	2.2							
	2.3							
	2.4							
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

v_c = Schnittgeschwindigkeit · Cutting speed · Vitesse de coupe
 f_z = Vorschub pro Zahn · Feed per tooth · Avance par dent

■ = sehr gut geeignet · very suitable · très approprié
□ = gut geeignet · suitable · approprié

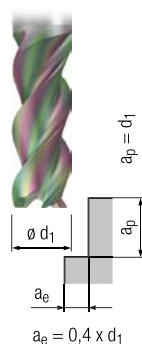
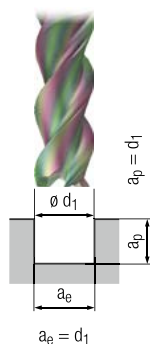
Schnittwerte für Hartmetall-Schaftfräser – Lange Ausführung

Cutting Conditions for Solid Carbide End Mills – Long Design

Valeurs de coupe pour fraises deux tailles en carbure monobloc – version longue



W



Gültig für
Valid for
Valable pour

2444K
2445K
2446K
2447K

	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1							
	2.1							
	3.1							
	4.1							
	5.1							
M	1.1							
	2.1							
	3.1							
	4.1							
K	1.1							
	1.2							
	2.1							
	2.2							
	3.1							
	3.2							
	4.1							
	4.2							
N	1.1	300	$0,006 \times d_1$	420	$0,011 \times d_1$		☐	☒
	1.2	430	$0,005 \times d_1$	620	$0,010 \times d_1$		☐	☒
	1.3	385	$0,005 \times d_1$	550	$0,008 \times d_1$		☐	☒
	1.4	270	$0,005 \times d_1$	380	$0,010 \times d_1$		☐	☒
	1.5							
	1.6							
	2.1	100	$0,005 \times d_1$	160	$0,006 \times d_1$		☐	☒
	2.2	100	$0,005 \times d_1$	160	$0,006 \times d_1$		☐	☒
	2.3	100	$0,005 \times d_1$	160	$0,006 \times d_1$		☐	☒
	2.4	80	$0,004 \times d_1$	140	$0,005 \times d_1$		☐	☒
	2.5	80	$0,004 \times d_1$	140	$0,005 \times d_1$		☐	☒
	2.6	80	$0,004 \times d_1$	140	$0,005 \times d_1$		☐	☒
	2.7	60	$0,003 \times d_1$	100	$0,004 \times d_1$		☐	☒
	2.8							
	3.1							
	3.2							
	4.1							
	4.2							
	4.3							
	4.4							
	5.1							
	5.2							
	5.3							
S	1.1							
	1.2							
	1.3							
	2.1							
	2.2							
	2.3							
	2.4							
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

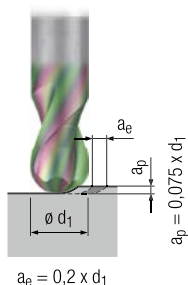
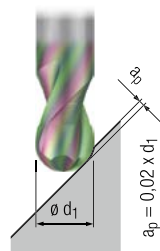
Schnittwerte für Hartmetall-Kugelfräser – Kurze Ausführung

Cutting Conditions for Solid Carbide Ball Nose End Mills – Short Design

Valeurs de coupe pour fraises à bout hémisphérique en carbure monobloc – version courte



W

 Schrappen
 Roughing
 Ébauche

 Schlichten
 Finishing
 Finition

 Gültig für
 Valid for
 Valable pour
 2452K

		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1								
	2.1								
	3.1								
	4.1								
	5.1								
M	1.1								
	2.1								
	3.1								
	4.1								
K	1.1								
	1.2								
	2.1								
	2.2								
	3.1								
	3.2								
	4.1								
	4.2								
N	1.1	900	$0,022 \times d_1$	1200	$0,016 \times d_1$			☐	☒
	1.2	900	$0,020 \times d_1$	1200	$0,014 \times d_1$			☐	☒
	1.3	900	$0,017 \times d_1$	1200	$0,012 \times d_1$			☐	☒
	1.4	600	$0,020 \times d_1$	800	$0,014 \times d_1$			☐	☒
	1.5								
	1.6								
	2.1	200	$0,014 \times d_1$	260	$0,010 \times d_1$			☐	☒
	2.2	200	$0,014 \times d_1$	260	$0,010 \times d_1$			☐	☒
	2.3	200	$0,014 \times d_1$	260	$0,010 \times d_1$	☐	☐	☐	☒
	2.4	160	$0,011 \times d_1$	220	$0,008 \times d_1$			☐	☒
	2.5	160	$0,011 \times d_1$	220	$0,008 \times d_1$			☐	☒
	2.6	160	$0,011 \times d_1$	220	$0,008 \times d_1$	☐	☐	☐	☒
	2.7	100	$0,008 \times d_1$	140	$0,006 \times d_1$			☐	☒
	2.8	100	$0,008 \times d_1$	140	$0,006 \times d_1$			☐	☒
	3.1	450	$0,025 \times d_1$	600	$0,018 \times d_1$			☐	☒
	3.2	450	$0,020 \times d_1$	600	$0,014 \times d_1$			☐	☒
	4.1	350	$0,021 \times d_1$	450	$0,015 \times d_1$		☐	☐	☒
	4.2	500	$0,021 \times d_1$	650	$0,015 \times d_1$		☐	☐	☒
	4.3	200	$0,017 \times d_1$	250	$0,012 \times d_1$		☐	☐	☒
	4.4	140	$0,017 \times d_1$	180	$0,012 \times d_1$		☐	☐	☒
	5.1								
	5.2								
	5.3	220	$0,017 \times d_1$	300	$0,012 \times d_1$	☐	☒		☒
S	1.1	110	$0,010 \times d_1$	150	$0,007 \times d_1$			☐	☒
	1.2	90	$0,010 \times d_1$	120	$0,006 \times d_1$			☐	☒
	1.3	50	$0,008 \times d_1$	70	$0,005 \times d_1$			☐	☒
	2.1	80	$0,008 \times d_1$	110	$0,006 \times d_1$			☐	☒
	2.2	30	$0,006 \times d_1$	50	$0,004 \times d_1$			☐	☒
	2.3	20	$0,006 \times d_1$	40	$0,004 \times d_1$			☐	☒
	2.4								
	2.5								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

v_c = Schnittgeschwindigkeit · Cutting speed · Vitesse de coupe
 f_z = Vorschub pro Zahn · Feed per tooth · Avance par dent

■ = sehr gut geeignet · very suitable · très approprié
 □ = gut geeignet · suitable · approprié

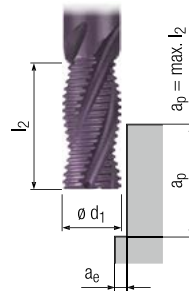
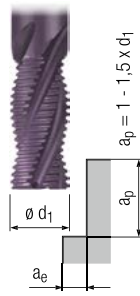
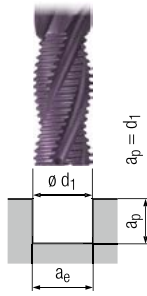
Schnittwerte für HSS-Schaftfräser – Extra kurze und kurze Ausführung

Cutting Conditions for HSS End Mills – Extra Short and Short Design

Valeurs de coupe pour fraises deux tailles en HSS – version extra courte et courte



HR



Gültig für
Valid for
Valable pour
2400C
2401C

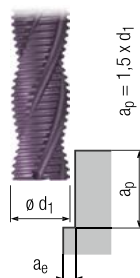
		V_c [m/min]	$a_e = d_1$ f_z [mm]	$a_e = 0,5 \times d_1$ f_z [mm]	$a_e = 0,25 \times d_1$ f_z [mm]			MMS MQL	
P	1.1	60	$0,0035 \times d_1$	$0,0046 \times d_1$	$0,0056 \times d_1$			□	■
	2.1	55	$0,0032 \times d_1$	$0,0042 \times d_1$	$0,0052 \times d_1$				■
	3.1	40	$0,0029 \times d_1$	$0,0038 \times d_1$	$0,0047 \times d_1$				■
	4.1								
	5.1								
M	1.1								
	2.1								
	3.1								
	4.1								
K	1.1	48	$0,0035 \times d_1$	$0,0046 \times d_1$	$0,0056 \times d_1$	□	□	□	■
	1.2	42	$0,0032 \times d_1$	$0,0042 \times d_1$	$0,0052 \times d_1$	□	□	□	■
	2.1	38	$0,0032 \times d_1$	$0,0042 \times d_1$	$0,0052 \times d_1$			□	■
	2.2	34	$0,0029 \times d_1$	$0,0038 \times d_1$	$0,0047 \times d_1$			□	■
	3.1								
	3.2								
	4.1	40	$0,0032 \times d_1$	$0,0042 \times d_1$	$0,0052 \times d_1$			□	■
	4.2								
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	2.1	43	$0,0035 \times d_1$	$0,0046 \times d_1$	$0,0056 \times d_1$				■
	2.2	47	$0,0032 \times d_1$	$0,0042 \times d_1$	$0,0052 \times d_1$				■
	2.3	85	$0,0035 \times d_1$	$0,0046 \times d_1$	$0,0056 \times d_1$			□	■
	2.4	44	$0,0026 \times d_1$	$0,0034 \times d_1$	$0,0042 \times d_1$				■
	2.5	67	$0,0029 \times d_1$	$0,0038 \times d_1$	$0,0047 \times d_1$			□	■
	2.6	77	$0,0035 \times d_1$	$0,0046 \times d_1$	$0,0056 \times d_1$				■
	2.7								
	2.8								
	3.1								
	3.2								
	4.1								
	4.2								
	4.3								
	4.4								
	5.1								
S	5.2	28	$0,0026 \times d_1$	$0,0034 \times d_1$	$0,0042 \times d_1$				■
	5.3								
	1.1	40	$0,0029 \times d_1$	$0,0038 \times d_1$	$0,0047 \times d_1$				■
	1.2	28	$0,0026 \times d_1$	$0,0034 \times d_1$	$0,0042 \times d_1$				■
	1.3								
	2.1	26	$0,0029 \times d_1$	$0,0038 \times d_1$	$0,0047 \times d_1$				■
H	2.2	12	$0,0023 \times d_1$	$0,0030 \times d_1$	$0,0038 \times d_1$				■
	2.3								
	2.4								
	2.5								
	2.6								
H	1.1								
	1.2								
	1.3								
	1.4								
	1.5								

Schnittwerte für HSS-Schaftfräser – Lange Ausführung

Cutting Conditions for HSS End Mills – Long Design

Valeurs de coupe pour fraises deux tailles en HSS – version longue

HR



Gültig für
Valid for
Valable pour
2402C

		V_c [m/min]	$a_e = 0,25 \times d_1$	$a_e = 0,1 \times d_1$			MMS MQL	
			f_z [mm]	f_z [mm]				
P	1.1	35	$0,0038 \times d_1$	$0,0048 \times d_1$			□	■
	2.1	33	$0,0035 \times d_1$	$0,0044 \times d_1$				■
	3.1	15	$0,0032 \times d_1$	$0,0040 \times d_1$				■
	4.1							
	5.1							
M	1.1							
	2.1							
	3.1							
	4.1							
K	1.1	29	$0,0038 \times d_1$	$0,0048 \times d_1$	□	□	□	■
	1.2	25	$0,0035 \times d_1$	$0,0044 \times d_1$	□	□	□	■
	2.1	23	$0,0035 \times d_1$	$0,0044 \times d_1$			□	■
	2.2	15	$0,0032 \times d_1$	$0,0040 \times d_1$			□	■
	3.1							
	3.2							
	4.1	24	$0,0035 \times d_1$	$0,0044 \times d_1$			□	■
	4.2							
N	1.1							
	1.2							
	1.3							
	1.4							
	1.5							
	1.6							
	2.1	26	$0,0038 \times d_1$	$0,0048 \times d_1$				■
	2.2	28	$0,0035 \times d_1$	$0,0044 \times d_1$				■
	2.3	40	$0,0038 \times d_1$	$0,0048 \times d_1$			□	■
	2.4	27	$0,0029 \times d_1$	$0,0036 \times d_1$				■
	2.5	40	$0,0032 \times d_1$	$0,0040 \times d_1$			□	■
	2.6	40	$0,0038 \times d_1$	$0,0048 \times d_1$				■
	2.7							
	2.8							
	3.1							
	3.2							
	4.1							
	4.2							
	4.3							
	4.4							
S	1.1	15	$0,0032 \times d_1$	$0,0040 \times d_1$				■
	1.2							
	1.3							
	2.1	15	$0,0032 \times d_1$	$0,0040 \times d_1$				■
	2.2	10	$0,0026 \times d_1$	$0,0032 \times d_1$				■
	2.3							
	2.4							
H	1.1							
	1.2							
	1.3							
	1.4							
	1.5							

v_c = Schnittgeschwindigkeit · Cutting speed · Vitesse de coupe
 f_z = Vorschub pro Zahn · Feed per tooth · Avance par dent

■ = sehr gut geeignet · very suitable · très approprié
 □ = gut geeignet · suitable · approprié

Schnittwerte für HSS-Schaftfräser – Kurze Ausführung

Cutting Conditions for HSS End Mills – Short Design

Valeurs de coupe pour fraises deux tailles en HSS – version courte

N

Gültig für
Valid for
Valable pour
2403C

								Gültig für Valid for Valable pour 2403C				
	v _C [m/min]	a _e = 0,25 x d ₁		a _e = 0,1 x d ₁		a _e = 0,2 mm						
		f _z [mm]	f _z [mm]	f _z [mm]	f _z [mm]	f _z [mm]	f _z [mm]					
		d ₁ < 32 mm	d ₁ ≥ 32 mm	d ₁ < 32 mm	d ₁ ≥ 32 mm	d ₁ < 32 mm	d ₁ ≥ 32 mm					
P	1.1	60	0,0037 x d ₁	0,0026 x d ₁	0,0052 x d ₁	0,0036 x d ₁	0,0066 x d ₁	0,0040 x d ₁		□	□	■
	2.1	55	0,0034 x d ₁	0,0024 x d ₁	0,0047 x d ₁	0,0033 x d ₁	0,0061 x d ₁	0,0036 x d ₁			□	■
	3.1	40	0,0031 x d ₁	0,0022 x d ₁	0,0043 x d ₁	0,0030 x d ₁	0,0055 x d ₁	0,0033 x d ₁				■
	4.1	38	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
	5.1	30	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
M	1.1	28	0,0031 x d ₁	0,0022 x d ₁	0,0043 x d ₁	0,0030 x d ₁	0,0055 x d ₁	0,0033 x d ₁				■
	2.1	24	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
	3.1	20	0,0025 x d ₁	0,0018 x d ₁	0,0034 x d ₁	0,0024 x d ₁	0,0044 x d ₁	0,0026 x d ₁				■
	4.1	18	0,0022 x d ₁	0,0015 x d ₁	0,0030 x d ₁	0,0021 x d ₁	0,0039 x d ₁	0,0023 x d ₁				■
K	1.1	48	0,0037 x d ₁	0,0026 x d ₁	0,0052 x d ₁	0,0036 x d ₁	0,0066 x d ₁	0,0040 x d ₁	□	□	□	■
	1.2	42	0,0034 x d ₁	0,0024 x d ₁	0,0047 x d ₁	0,0033 x d ₁	0,0061 x d ₁	0,0036 x d ₁	□	□	□	■
	2.1	38	0,0034 x d ₁	0,0024 x d ₁	0,0047 x d ₁	0,0033 x d ₁	0,0061 x d ₁	0,0036 x d ₁			□	■
	2.2	34	0,0031 x d ₁	0,0022 x d ₁	0,0043 x d ₁	0,0030 x d ₁	0,0055 x d ₁	0,0033 x d ₁			□	■
	3.1	29	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
	3.2	25	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
	4.1											
	4.2											
N	1.1											
	1.2											
	1.3											
	1.4											
	1.5											
	1.6											
	2.1	43	0,0037 x d ₁	0,0026 x d ₁	0,0052 x d ₁	0,0036 x d ₁	0,0066 x d ₁	0,0040 x d ₁				■
	2.2	47	0,0034 x d ₁	0,0024 x d ₁	0,0047 x d ₁	0,0033 x d ₁	0,0061 x d ₁	0,0036 x d ₁				■
	2.3	85	0,0037 x d ₁	0,0026 x d ₁	0,0052 x d ₁	0,0036 x d ₁	0,0066 x d ₁	0,0040 x d ₁			□	■
	2.4	44	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
	2.5	67	0,0031 x d ₁	0,0022 x d ₁	0,0043 x d ₁	0,0030 x d ₁	0,0055 x d ₁	0,0033 x d ₁			□	■
	2.6	77	0,0037 x d ₁	0,0026 x d ₁	0,0052 x d ₁	0,0036 x d ₁	0,0066 x d ₁	0,0040 x d ₁				■
	2.7											
	2.8											
	3.1											
	3.2											
	4.1											
	4.2											
	4.3											
	4.4											
	5.1											
	5.2	28	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
5.3												
S	1.1	40	0,0031 x d ₁	0,0022 x d ₁	0,0043 x d ₁	0,0030 x d ₁	0,0055 x d ₁	0,0033 x d ₁				■
	1.2	28	0,0028 x d ₁	0,0020 x d ₁	0,0039 x d ₁	0,0027 x d ₁	0,0050 x d ₁	0,0030 x d ₁				■
	1.3											
	2.1	26	0,0031 x d ₁	0,0022 x d ₁	0,0043 x d ₁	0,0030 x d ₁	0,0055 x d ₁	0,0033 x d ₁				■
	2.2	12	0,0025 x d ₁	0,0018 x d ₁	0,0034 x d ₁	0,0024 x d ₁	0,0044 x d ₁	0,0026 x d ₁				■
	2.3											
	2.4											
H	1.1											
	1.2											
	1.3											
	1.4											
	1.5											

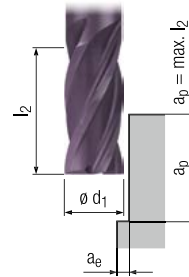
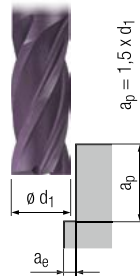
Schnittwerte für HSS-Schaftfräser – Lange Ausführung

Cutting Conditions for HSS End Mills – Long Design

Valeurs de coupe pour fraises deux tailles en HSS – version longue



N

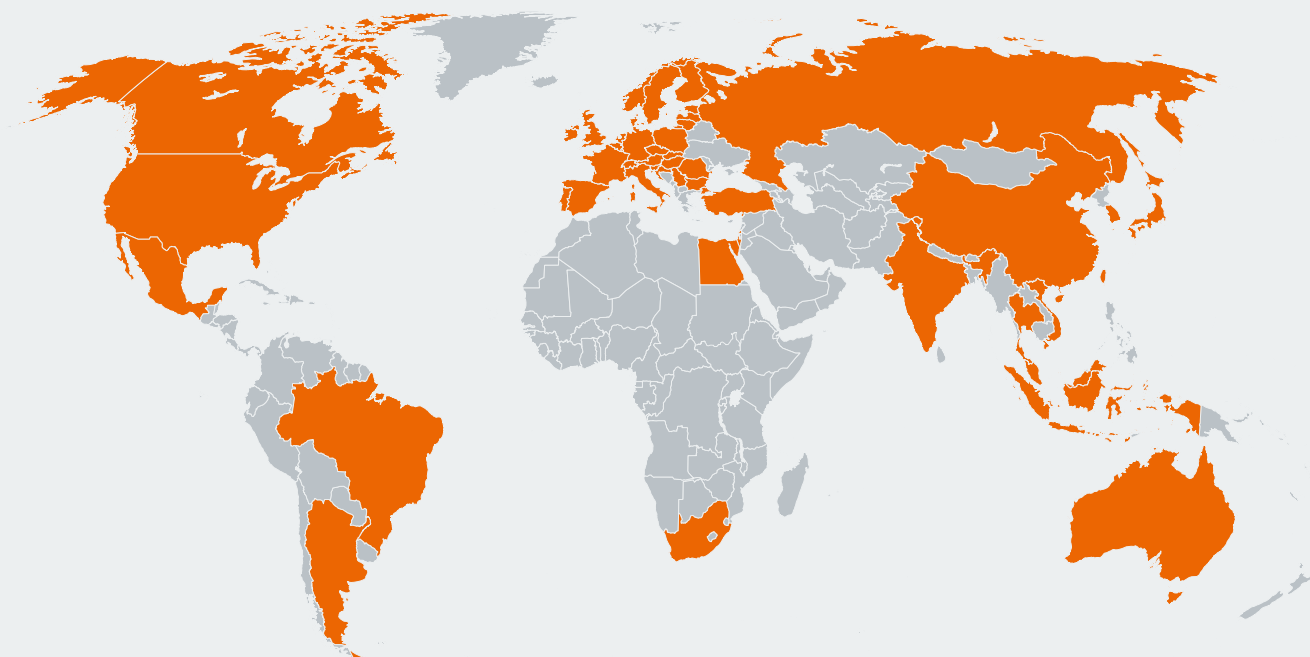


Gültig für
Valid for
Valable pour
2404C

		V_c [m/min]	$a_e = 0,1 \times d_1$		$a_e = 0,2 \text{ mm}$				MMS MQL	
			f_z [mm]	f_z [mm]	f_z [mm]	f_z [mm]				
			$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$	$d_1 < 32 \text{ mm}$	$d_1 \geq 32 \text{ mm}$				
P	1.1	35	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$		□	□	■
	2.1	33	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$			□	■
	3.1	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$				■
	4.1	15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$				■
	5.1	15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$				■
M	1.1	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$				■
	2.1	14	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$				■
	3.1	12	$0,0023 \times d_1$	$0,0019 \times d_1$	$0,0032 \times d_1$	$0,0025 \times d_1$				■
	4.1	11	$0,0020 \times d_1$	$0,0017 \times d_1$	$0,0028 \times d_1$	$0,0022 \times d_1$				■
K	1.1	29	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$	□	□	□	■
	1.2	25	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$	□	□	□	■
	2.1	23	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$			□	■
	2.2	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$			□	■
	3.1	15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$				■
	3.2	15	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$				■
	4.1									
	4.2									
N	1.1									
	1.2									
	1.3									
	1.4									
	1.5									
	1.6									
	2.1	26	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$				■
	2.2	28	$0,0032 \times d_1$	$0,0026 \times d_1$	$0,0044 \times d_1$	$0,0034 \times d_1$				■
	2.3	40	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$			□	■
	2.4	27	$0,0026 \times d_1$	$0,0022 \times d_1$	$0,0036 \times d_1$	$0,0028 \times d_1$				■
	2.5	40	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$			□	■
	2.6	40	$0,0035 \times d_1$	$0,0029 \times d_1$	$0,0048 \times d_1$	$0,0037 \times d_1$				■
	2.7									
	2.8									
	3.1									
	3.2									
	4.1									
	4.2									
	4.3									
	4.4									
S	1.1	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$				■
	1.2									
	1.3									
	2.1	15	$0,0029 \times d_1$	$0,0024 \times d_1$	$0,0040 \times d_1$	$0,0031 \times d_1$				■
	2.2	10	$0,0023 \times d_1$	$0,0019 \times d_1$	$0,0032 \times d_1$	$0,0025 \times d_1$				■
	2.3									
	2.4									
H	1.1									
	1.2									
	1.3									
	1.4									
	1.5									

V_c = Schnittgeschwindigkeit · Cutting speed · Vitesse de coupe
 f_z = Vorschub pro Zahn · Feed per tooth · Avance par dent

■ = sehr gut geeignet · very suitable · très approprié
□ = gut geeignet · suitable · approprié



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