

# ARNO<sup>®</sup>

## WERKZEUGE

We have a passion for precision.

# AUSFÜHRUNG FP

Design FP

**Maximale Schnittleistung und minimaler Verschleiß bei der Bearbeitung von Stahl, rostfreiem Stahl und Gusswerkstoffen.**

**Great performance and minimal wear for machining steel, stainless steel, exotics and cast materials.**

Der TiAlN-beschichtete Universalfräser aus pulvermetallurgischem HSS Stahl ist extrem robust, zäh und verschleißfest. Dadurch ergeben sich deutlich verbesserte Standzeiten.



This powder metal cutter with its TiAlN coating is extremely strong, wear resistant and flexible.

Bezeichnung Description	Schneiden Flutes	Fräser Type	Ausführung Design	Spiralwinkel Helix angle	Abb. Picture	Seite Page
<b>FP - Universalfräser für Stahl, rostfreien Stahl, Gusswerkstoffe / Universal cutter for steel, stainless steel and cast materials</b>						
FP60120-...	2	Universal-PM-Fräser Universal PM-cutter	kurz short	30°		<b>248</b>
FP60121-...	2	Universal-PM-Fräser Universal PM-cutter	lang long	30°		<b>249</b>
FP60320-...	2	PM-Voll-Radiusfräser PM-Full ball-nose milling cutter	kurz short	30°		<b>250</b>
FP60321-...	2	PM-Voll-Radiusfräser PM-Full ball-nose milling cutter	lang long	30°		<b>251</b>
FP60135-...	3	Universal-PM-Fräser Universal PM-cutter	extra kurz extra short	30°		<b>252</b>
FP60130-...	3	Universal-PM-Fräser Universal PM-cutter	kurz short	30°		<b>253</b>
FP601.0-...	4 - 6	Universal-PM-Fräser Universal PM-cutter	kurz short	30°		<b>254</b>
FP601.1-...	4 - 6	Universal-PM-Fräser Universal PM-cutter	lang long	30°		<b>255</b>
FP618.0-...	3 - 6	PM-Schrupfräser PM-Roughing cutter	kurz short	30°		<b>256</b>
FP618.6-...	3 - 6	PM-Schrupfräser PM-Roughing cutter	mittellang mid-length	30°		<b>257</b>

Bezeichnung Description	Schneiden Flutes	Fräsertyp Type	Ausführung Design	Spiralwinkel Helix angle	Abb. Picture	Seite Page
<b>FP - Universalfräser für Stahl, rostfreien Stahl, Gusswerkstoffe / Universal cutter for steel, stainless steel and cast materials</b>						
FP618.1-...	3 - 6	PM-Schrupfräser PM-Roughing cutter	lang long	30°		<b>258</b>
FP619.5-...	4 - 6	PM-Schrupfräser PM-Roughing cutter	extra kurz extra short	45°		<b>259</b>
FP619.0-...	3 - 6	PM-Schrupfräser PM-Roughing cutter	kurz short	45°		<b>260</b>
FP620.0-...	3 - 6	PM-Schrupfräser PM-Roughing cutter	kurz short	30°		<b>261</b>
FP620.1-...	3 - 6	PM-Schrupfräser PM-Roughing cutter	lang long	30°		<b>262</b>
<b>FPA - Universalfräser für Aluminium / Universal cutter for aluminium</b>						
FPA61530-...	3	PM-Fein-Schlichtfräser PM-Fine finishing milling cutter	kurz short	43,5°		<b>264</b>
FPA62230-...	3	PM-Schafffräser PM-End mill	kurz short	43,5°		<b>265</b>
FPA62232-...	3	PM-Fein-Schlichtfräser PM-Fine finishing milling cutter	extra lang extra long	43,5°		<b>266</b>
FPA61930-...	3	PM-Schrupfräser PM-Roughing milling cutter	kurz short	43,5°		<b>267</b>
FPA62132-...	3	PM-Schrupfräser PM-Roughing milling cutter	extra lang extra long	43,5°		<b>268</b>

## Universal-PM-Fräser

2 Schneiden, kurze Ausführung



## Universal PM-cutter

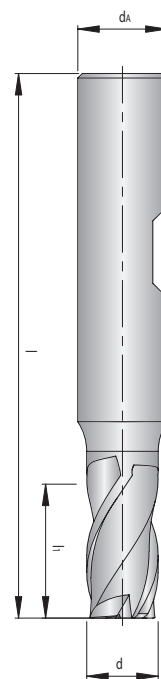
2 flutes, short design



## FP60120-...

Schaft / Shank DIN 6535HB	d e8	d <sub>A</sub> h6	l <sub>1</sub>	l
FP60120-020	2,0	6	4	48
FP60120-030	3,0	6	5	49
FP60120-040	4,0	6	7	51
FP60120-050	5,0	6	8	52
FP60120-060	6,0	6	8	52
FP60120-070	7,0	10	10	60
FP60120-080	8,0	10	11	61
FP60120-090	9,0	10	11	61
FP60120-100	10,0	10	13	63
FP60120-120	12,0	12	16	73
FP60120-140	14,0	12	16	73
FP60120-160	16,0	16	19	79
FP60120-180	18,0	16	19	79
FP60120-200	20,0	20	22	88
FP60120-220	22,0	20	22	88
FP60120-250	25,0	25	26	102

Toleranz / Tolerance (μm)	Nennmessbereich / Diameter range (mm)				
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13



FP

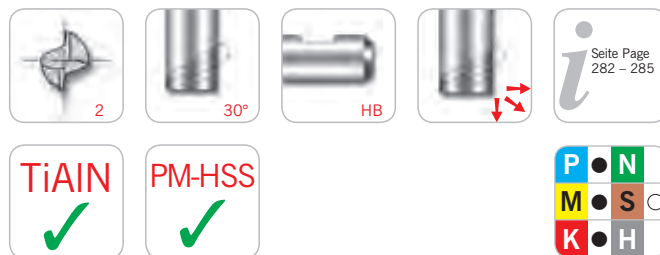
## Universal-PM-Fräser

2 Schneiden, lange Ausführung



## Universal PM-cutter

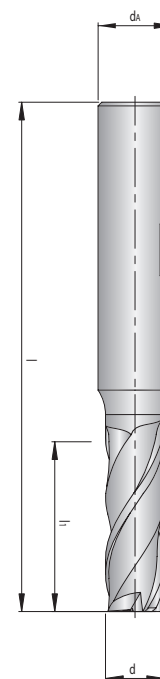
2 flutes, long design



## FP60121-...

Schaft / Shank DIN 6535HB	d e8	d <sub>A</sub> h6	l <sub>1</sub>	l
FP60121-020	2,0	6	7	51
FP60121-030	3,0	6	8	52
FP60121-040	4,0	6	11	55
FP60121-050	5,0	6	13	57
FP60121-060	6,0	6	13	57
FP60121-070	7,0	10	16	66
FP60121-080	8,0	10	19	69
FP60121-090	9,0	10	19	69
FP60121-100	10,0	10	22	72
FP60121-120	12,0	12	26	83
FP60121-140	14,0	12	26	83
FP60121-160	16,0	16	32	92
FP60121-180	18,0	16	32	92
FP60121-200	20,0	20	38	104
FP60121-220	22,0	20	38	104
FP60121-250	25,0	25	45	121

Toleranz / Tolerance (μm)	Nennmessbereich / Diameter range (mm)				
	≥ 1 – 3	> 3 – 6	> 6 – 10	> 10 – 18	> 18 – 30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

## PM-Voll-Radiusfräser

2 Schneiden, kurze Ausführung



## PM-Full ball-nose milling cutter

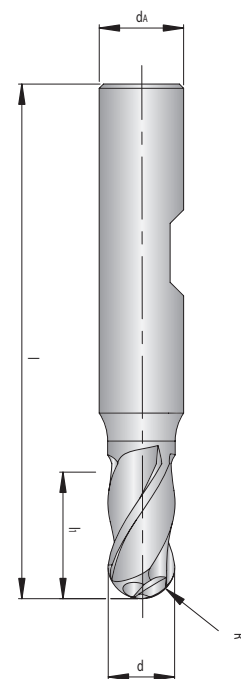
2 flutes, short design



## FP60320-...

Schaft / Shank DIN 6535HB	d	d <sub>A</sub>	l <sub>1</sub>	l	R
FP60320-020	2,0	6	4	48	1,0
FP60320-030	3,0	6	5	49	1,5
FP60320-040	4,0	6	7	51	2,0
FP60320-050	5,0	6	8	52	2,5
FP60320-060	6,0	6	8	52	3,0
FP60320-070	7,0	10	10	60	3,5
FP60320-080	8,0	10	11	61	4,0
FP60320-090	9,0	10	11	61	4,5
FP60320-100	10,0	10	13	63	5,0
FP60320-120	12,0	12	16	73	6,0
FP60320-140	14,0	12	16	73	7,0
FP60320-160	16,0	16	19	79	8,0
FP60320-180	18,0	16	19	79	9,0
FP60320-200	20,0	20	22	88	10,0
FP60320-220	22,0	20	22	88	11,0
FP60320-250	25,0	25	26	102	12,5

Toleranz / Tolerance	
Fräser / Mill	0
Radius	±0,02
Schaft / Shank	h6



FP

## PM-Voll-Radiusfräser

2 Schneiden, lange Ausführung



## PM-Full ball-nose milling cutter

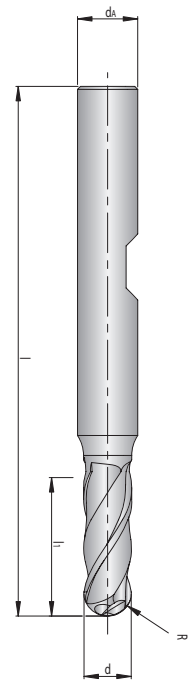
2 flutes, long design



## FP60321-...

Schaft / Shank DIN 6535HB	d	d <sub>A</sub>	l <sub>1</sub>	l	R
FP60321-030	3,0	6	8	56	1,5
FP60321-040	4,0	6	11	63	2,0
FP60321-050	5,0	6	13	68	2,5
FP60321-060	6,0	6	13	68	3,0
FP60321-070	7,0	10	16	80	3,5
FP60321-080	8,0	10	19	88	4,0
FP60321-090	9,0	10	19	88	4,5
FP60321-100	10,0	10	22	95	5,0
FP60321-120	12,0	12	26	110	6,0
FP60321-140	14,0	12	26	110	7,0
FP60321-160	16,0	16	32	123	8,0
FP60321-180	18,0	16	32	123	9,0
FP60321-200	20,0	20	38	141	10,0
FP60321-220	22,0	20	38	141	11,0
FP60321-250	25,0	25	45	166	12,5

Toleranz / Tolerance	
Fräser / Mill	0
Radius	-0,03
Schaft / Shank	±0,02
	h6



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

## Universal-PM-Fräser

3 Schneiden, extra kurze Ausführung



## Universal PM-cutter

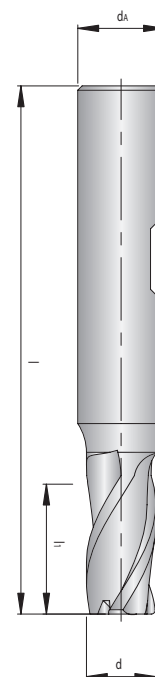
3 flutes, extra short design



## FP60135-...

Schaft / Shank DIN 6535HB	d e8	d <sub>A</sub> h6	l <sub>1</sub>	l
FP60135-020	2,0	6	4	48
FP60135-030	3,0	6	5	49
FP60135-040	4,0	6	7	51
FP60135-050	5,0	6	8	52
FP60135-060	6,0	6	8	52
FP60135-070	7,0	10	10	60
FP60135-080	8,0	10	11	61
FP60135-090	9,0	10	11	61
FP60135-100	10,0	10	13	63
FP60135-120	12,0	12	16	73
FP60135-140	14,0	12	16	73
FP60135-160	16,0	16	19	79
FP60135-180	18,0	16	19	79
FP60135-200	20,0	20	22	88
FP60135-220	22,0	20	22	88
FP60135-250	25,0	25	26	102

Toleranz / Tolerance (μm)	Nennmessbereich / Diameter range (mm)				
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13



FP



## Universal-PM-Fräser

3 Schneiden, kurze Ausführung



## Universal PM-cutter

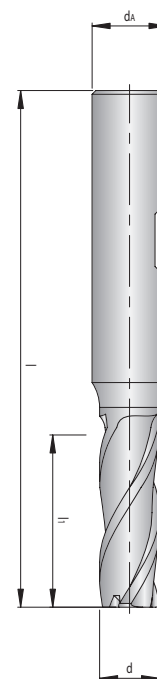
3 flutes, short design



## FP60130-...

Schaft / Shank DIN 6535HB	d e8	d <sub>A</sub> h6	l <sub>1</sub>	l
FP60130-020	2,0	6	7	51
FP60130-030	3,0	6	8	52
FP60130-040	4,0	6	11	55
FP60130-050	5,0	6	13	57
FP60130-060	6,0	6	13	57
FP60130-070	7,0	10	16	66
FP60130-080	8,0	10	19	69
FP60130-090	9,0	10	19	69
FP60130-100	10,0	10	22	72
FP60130-120	12,0	12	26	83
FP60130-140	14,0	12	26	83
FP60130-160	16,0	16	32	92
FP60130-180	18,0	16	32	92
FP60130-200	20,0	20	38	104
FP60130-220	22,0	20	38	104
FP60130-250	25,0	25	45	121

Toleranz /Tolerance (μm)	Nennmessbereich / Diameter range (mm)				
	≥ 1 – 3	> 3 – 6	> 6 – 10	> 10 – 18	> 18 – 30
e8	-14	-20	-25	-32	-40
	-28	-38	-47	-59	-73
h6	0	0	0	0	0
	-6	-8	-9	-11	-13



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

## Universal-PM-Fräser

4 - 6 Schneiden, kurze Ausführung



## Universal PM-cutter

4 - 6 flutes, short design

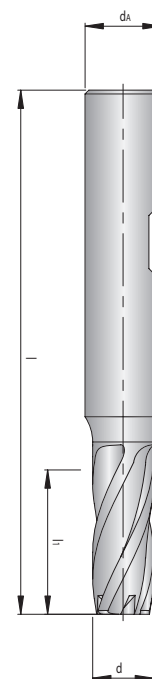


## FP601.0-...

Schaft / Shank DIN 6535HB	d	d <sub>A</sub>	l <sub>1</sub>	l	z
FP60140-020	2,0	6	7	51	4
FP60140-030	3,0	6	8	52	4
FP60140-040	4,0	6	11	55	4
FP60140-050	5,0	6	13	57	4
FP60140-060	6,0	6	13	57	4
FP60140-070	7,0	10	16	66	4
FP60140-080	8,0	10	19	69	4
FP60140-090	9,0	10	19	69	4
FP60140-100	10,0	10	22	72	4
FP60140-120	12,0	12	26	83	4
FP60140-140	14,0	12	26	83	4
FP60140-160	16,0	16	32	92	4
FP60140-180	18,0	16	32	92	4
FP60140-200	20,0	20	38	104	4
FP60140-220	22,0	20	38	104	4
FP60140-250	25,0	25	45	121	4
FP60160-280	28,0	25	45	121	6
FP60160-300	30,0	25	45	121	6
FP60160-320	32,0	32	53	133	6

### Toleranz / Tolerance

Fräser / Mill	+0,03 0
Schaft / Shank	h6



FP

## Universal-PM-Fräser

4 - 6 Schneiden, lange Ausführung



## Universal PM-cutter

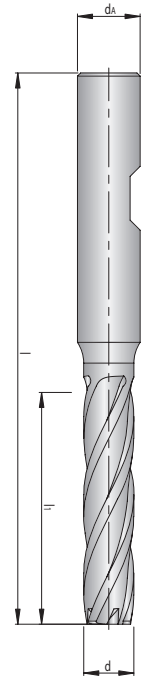
4 - 6 flutes, long design



## FP601.1-....

Schaft / Shank DIN 6535HB	d	d <sub>s</sub>	l <sub>1</sub>	l	z
FP60141-020	2,0	6	10	54	4
FP60141-030	3,0	6	12	56	4
FP60141-040	4,0	6	19	63	4
FP60141-050	5,0	6	24	68	4
FP60141-060	6,0	6	24	68	4
FP60141-070	7,0	10	30	80	4
FP60141-080	8,0	10	38	88	4
FP60141-090	9,0	10	38	88	4
FP60141-100	10,0	10	45	95	4
FP60141-120	12,0	12	53	110	4
FP60141-140	14,0	12	53	110	4
FP60141-160	16,0	16	63	123	4
FP60141-180	18,0	16	63	123	4
FP60141-200	20,0	20	75	141	4
FP60141-220	22,0	20	75	141	4
FP60141-250	25,0	25	90	166	4
FP60161-280	28,0	25	90	166	6
FP60161-300	30,0	25	90	166	6
FP60161-320	32,0	32	106	186	6

Toleranz / Tolerance	
Fräser / Mill	+0,03 0
Schaft / Shank	h6



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

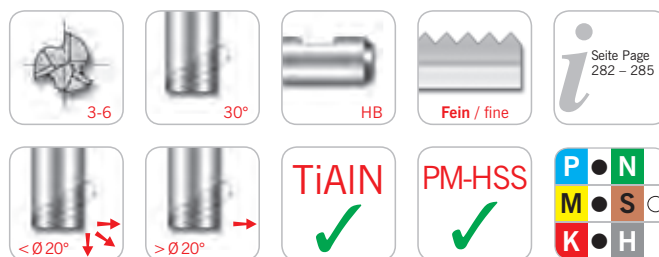
## PM-Schruppfräser

3 - 6 Schneiden, kurze Ausführung



## PM-Roughing cutter

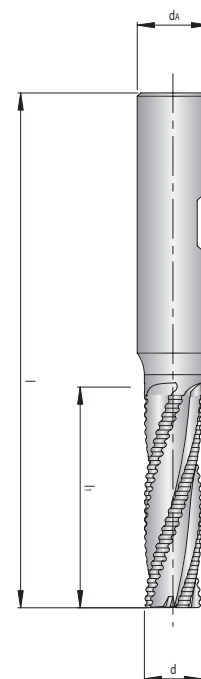
3 - 6 flutes, short design



## FP618.0-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l	z
FP61830-060	6,0	6	13	57	3
FP61830-070	7,0	10	16	66	3
FP61830-080	8,0	10	19	69	3
FP61830-090	9,0	10	19	69	3
FP61840-100	10,0	10	22	72	4
FP61840-120	12,0	12	26	83	4
FP61840-140	14,0	12	26	83	4
FP61840-160	16,0	16	32	92	4
FP61840-180	18,0	16	32	92	4
FP61840-200	20,0	20	38	104	4
FP61850-220	22,0	20	38	104	5
FP61850-250	25,0	25	45	121	5
FP61860-280	28,0	25	45	121	6
FP61860-300	30,0	25	45	121	6
FP61860-320	32,0	32	53	133	6

Toleranz / Tolerance ( $\mu\text{m}$ )	Nennmessbereich / Diameter range (mm)					
	$\geq 1 - 3$	$> 3 - 6$	$> 6 - 10$	$> 10 - 18$	$> 18 - 30$	$> 30 - 50$
js12	$\pm 50$	$\pm 60$	$\pm 75$	$\pm 90$	$\pm 105$	$\pm 125$
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16



FP

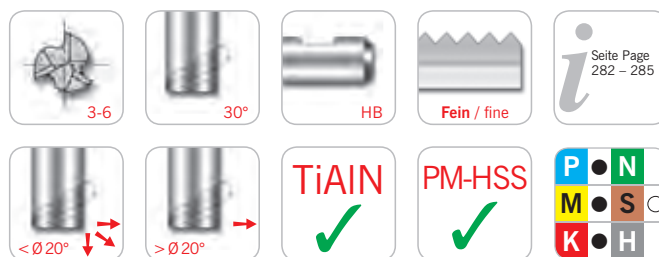
## PM-Schrupfräser

3 - 6 Schneiden, mittellange Ausführung



## PM-Roughing cutter

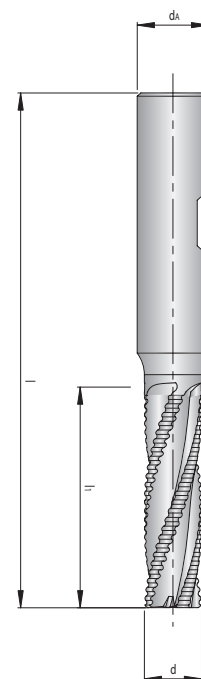
3 - 6 flutes, mid-length design



## FP618.6-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l	z
FP61836-060	6,0	6	19	63	3
FP61836-070	7,0	6	19	63	3
FP61836-080	8,0	10	28	74	3
FP61836-090	9,0	10	28	74	3
FP61846-100	10,0	10	35	84	4
FP61846-120	12,0	12	40	97	4
FP61846-140	14,0	12	40	97	4
FP61846-160	16,0	16	48	108	4
FP61846-180	18,0	16	48	108	4
FP61846-200	20,0	20	58	122	4
FP61856-220	22,0	20	58	122	5
FP61856-250	25,0	25	68	144	5
FP61866-280	28,0	25	68	144	6
FP61866-300	30,0	25	68	144	6
FP61866-320	32,0	32	78	158	6

Toleranz /Tolerance (μm)	Nennmessbereich / Diameter range (mm)					
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30	> 30 - 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16



FP

## SET-FP61836 TiAlN

SET-Inhalt SET, contains [Stück / Pcs.]	Schaft Shank	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l	z
2x -->	FP61836-060	6,0	6	19	63	3
2x -->	FP61836-080	8,0	10	28	74	3
2x -->	FP61836-100	10,0	10	35	84	4
2x -->	FP61836-120	12,0	12	40	97	4

Bestellbezeichnung / Ordering description: SET-FP61836 TiAlN



● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

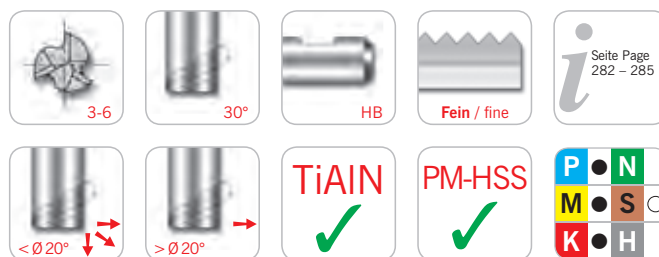
## PM-Schrupfräser

3 - 6 Schneiden, lange Ausführung



## PM-Roughing cutter

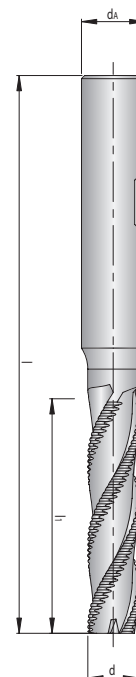
3 - 6 flutes, long design



## FP618.1-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l	z
FP61831-060	6,0	6	24	68	3
FP61831-070	7,0	10	30	80	3
FP61831-080	8,0	10	38	88	3
FP61831-090	9,0	10	38	88	3
FP61841-100	10,0	10	45	95	4
FP61841-120	12,0	12	53	110	4
FP61841-140	14,0	12	53	110	4
FP61841-160	16,0	16	63	123	4
FP61841-180	18,0	16	63	123	4
FP61841-200	20,0	20	75	141	4
FP61851-220	22,0	20	75	141	5
FP61851-250	25,0	25	90	166	5
FP61861-280	28,0	25	90	166	6
FP61861-300	30,0	25	90	166	6
FP61861-320	32,0	32	106	186	6

Toleranz / Tolerance ( $\mu\text{m}$ )	Nennmessbereich / Diameter range (mm)					
	$\geq 1 - 3$	$> 3 - 6$	$> 6 - 10$	$> 10 - 18$	$> 18 - 30$	$> 30 - 50$
js12	$\pm 50$	$\pm 60$	$\pm 75$	$\pm 90$	$\pm 105$	$\pm 125$
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16



FP

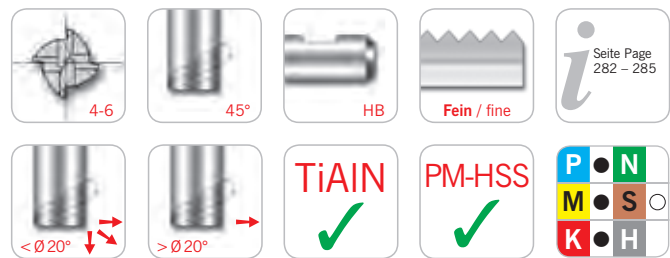
## PM-Schruppfräser

4 - 6 Schneiden, extra kurze Ausführung



## PM-Roughing cutter

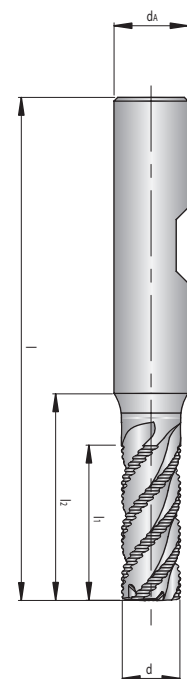
4 - 6 flutes, extra short design



## FP619.5-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l <sub>2</sub>	l	z
FP61945-060	6,0	6	8	-	52	4
FP61945-080	8,0	10	11	-	61	4
FP61945-100	10,0	10	13	23	63	4
FP61945-120	12,0	12	16	28	73	4
FP61955-140	14,0	12	16	-	73	5
FP61955-160	16,0	16	19	31	79	5
FP61965-180	18,0	16	19	-	79	6
FP61965-200	20,0	20	22	38	88	6
FP61965-250	25,0	25	26	46	102	6

Toleranz /Tolerance (µm)	Nennmessbereich / Diameter range (mm)				
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30
js12	± 50	± 60	± 75	± 90	± 105
h6	0	0	0	0	0
	-6	-8	-9	-11	-13



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

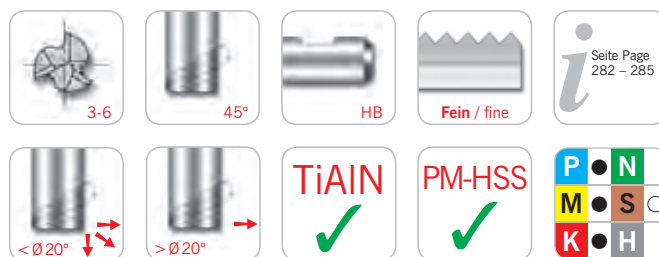
## PM-Schruppfräser

3 - 6 Schneiden, kurze Ausführung



## PM-Roughing cutter

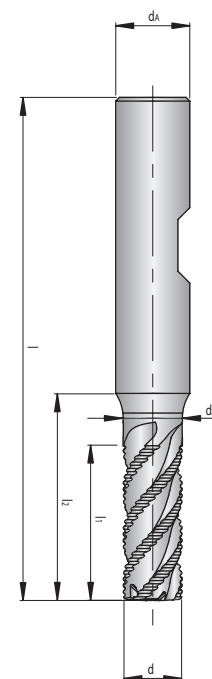
3 - 6 flutes, short design



## FP619.0-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	d <sub>3</sub>	l <sub>1</sub>	l <sub>2</sub>	l	z
FP61930-040	4,0	6	-	11	-	57	3
FP61940-050	5,0	6	-	13	-	57	4
FP61940-060	6,0	6	-	13	-	57	4
FP61940-070	7,0	10	-	16	-	66	4
FP61940-080	8,0	10	-	19	-	69	4
FP61940-090	9,0	10	-	19	-	69	4
FP61940-100	10,0	10	9,5	22	31	72	4
FP61940-110	11,0	12	10,5	22	27	80	4
FP61940-120	12,0	12	11,5	26	37	83	4
FP61940-130	13,0	12	-	26	-	84	4
FP61950-140	14,0	12	-	26	-	83	5
FP61950-150	15,0	12	-	26	-	85	5
FP61950-160	16,0	16	15	32	44	92	5
FP61960-180	18,0	16	-	32	-	92	6
FP61960-200	20,0	20	19	38	54	104	6
FP61960-250	25,0	25	24	45	63	121	6

Toleranz / Tolerance (μm)	Nennmessbereich / Diameter range (mm)				
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30
js12	± 50	± 60	± 75	± 90	± 105
h6	0	0	0	0	0
	-6	-8	-9	-11	-13



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm



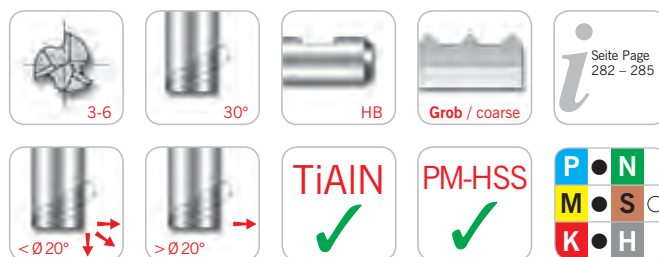
## PM-Schruppfräser

3 - 6 Schneiden, kurze Ausführung



## PM-Roughing cutter

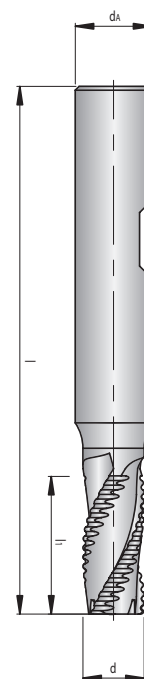
3 - 6 flutes, short design



## FP620.0-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l	z
FP62030-060	6,0	6	13	57	3
FP62030-070	7,0	10	16	66	3
FP62030-080	8,0	10	19	69	3
FP62030-090	9,0	10	19	69	3
FP62040-100	10,0	10	22	72	4
FP62040-120	12,0	12	26	83	4
FP62040-140	14,0	12	26	83	4
FP62040-160	16,0	16	32	92	4
FP62040-180	18,0	16	32	92	4
FP62040-200	20,0	20	38	104	4
FP62050-220	22,0	20	38	104	5
FP62050-250	25,0	25	45	121	5
FP62060-280	28,0	25	45	121	6
FP62060-300	30,0	25	45	121	6
FP62060-320	32,0	32	53	133	6

Toleranz /Tolerance (μm)	Nennmessbereich / Diameter range (mm)					
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30	> 30 - 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16



FP

● = Hauptanwendung / Main application  
○ = Nebenanwendung / Suitable

Alle Angaben in mm / Dimensions in mm

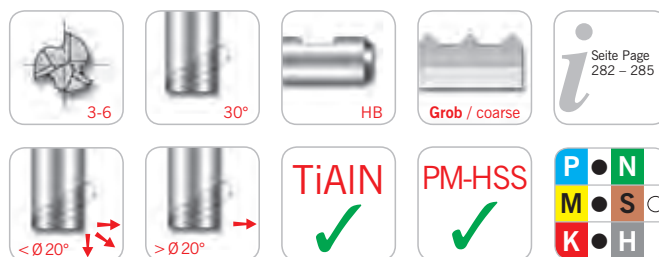
## PM-Schrupfräser

3 - 6 Schneiden, lange Ausführung



## PM-Roughing cutter

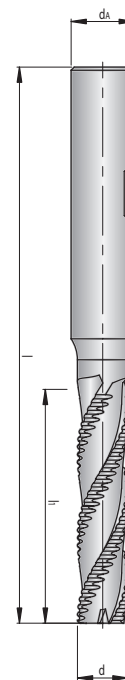
3 - 6 flutes, long design



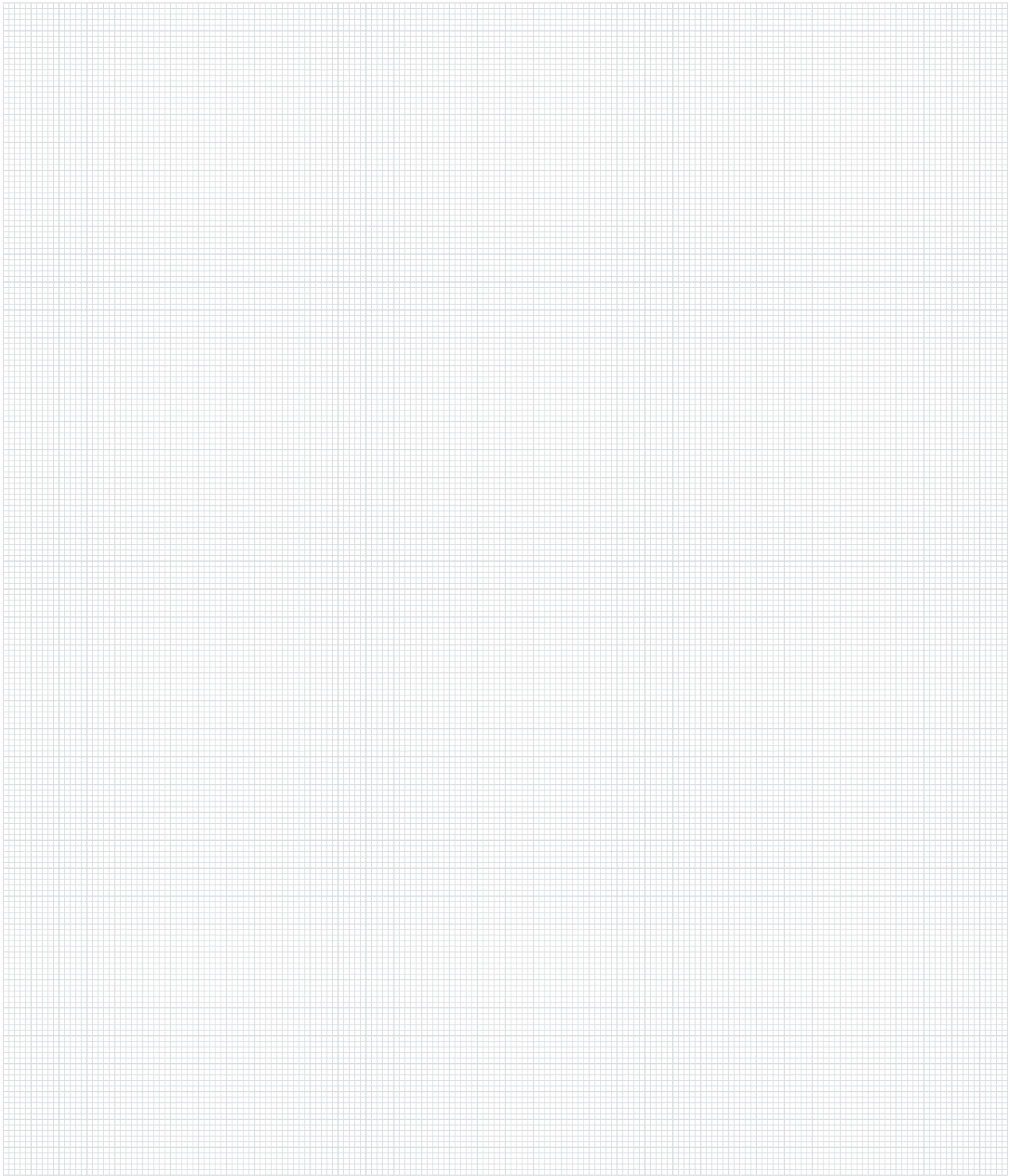
## FP620.1-...

Schaft / Shank DIN 6535HB	d js12	d <sub>A</sub> h6	l <sub>1</sub>	l	z
FP62031-060	6,0	6	24	68	3
FP62031-070	7,0	10	30	80	3
FP62031-080	8,0	10	38	88	3
FP62031-090	9,0	10	38	88	3
FP62041-100	10,0	10	45	95	4
FP62041-120	12,0	12	53	110	4
FP62041-140	14,0	12	53	110	4
FP62041-160	16,0	16	63	123	4
FP62041-180	18,0	16	63	123	4
FP62041-200	20,0	20	75	141	4
FP62051-220	22,0	20	75	141	5
FP62051-250	25,0	25	90	166	5
FP62061-280	28,0	25	90	166	6
FP62061-300	30,0	25	90	166	6
FP62061-320	32,0	32	106	186	6

Toleranz /Tolerance (μm)	Nennmessbereich / Diameter range (mm)					
	≥ 1 - 3	> 3 - 6	> 6 - 10	> 10 - 18	> 18 - 30	> 30 - 50
js12	± 50	± 60	± 75	± 90	± 105	± 125
h6	0	0	0	0	0	0
	-6	-8	-9	-11	-13	-16



FP



**ARNO<sup>®</sup>**  
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# Schnittdatenrichtwerte PM- und HSS-Schafffräser

Ausführung FP, FPA, FPT, FS

ISO	Werkstoff	Festigkeit [N/mm <sup>2</sup> ]	Vorschub-Korrekturfaktor [x f <sub>z</sub> ]	unbeschichtet	beschichtet
				V <sub>c</sub> [m/min]	V <sub>c</sub> [m/min]
<b>P</b>	Allgemeiner Baustahl	< 800	1,2	30-40	60-85
	Automatenstahl	< 800	1,2	25-35	50-70
	Einsatzstahl, unlegiert	< 800	1,2	20-30	45-60
	Einsatzstahl, legiert	< 1000	1	15-25	40-60
	Vergütungsstahl, unlegiert	< 850	1,2	20-30	45-60
	Vergütungsstahl, unlegiert	< 1000	1	15-20	30-40
	Vergütungsstahl, legiert	< 800	1,2	20-30	40-60
	Vergütungsstahl, legiert	< 1300	0,8	15-20	30-40
	Stahlguss	< 850	1,2	20-30	45-60
	Nitrierstahl	< 1000	1	15-20	30-40
	Nitrierstahl	< 1200	0,8	15-20	30-40
	Wälzlagerstahl	< 1200	0,8	15-20	30-40
	Federstahl	< 1200			
	Schnellarbeitsstahl	< 1300			
	Werkzeugstahl für Kaltarbeit	< 1300	0,8	12-18	25-35
	Werkzeugstahl für Warmarbeit	< 1300	0,8	10-15	20-30
<b>M</b>	Stahl und Stahlguss, rostfrei geschwefelt	< 850	1	10-15	20-30
	Nichtrostender Stahl, ferritisch	< 750	1	10-15	20-30
	Nichtrostender Stahl, martensitisch	< 900	1	8-12	15-25
	Nichtrostender Stahl, ferritisch/martensitisch	< 1100	0,9	7-10	15-20
	Nichtrostender Stahl, austenitisch/ferritisch	< 850	1	5-8	10-15
	Nichtrostender Stahl, austenitisch	< 750	1	10-15	20-30
<b>K</b>	Hitzebeständig	< 1100			
	Grauguss mit Lammellengraphit	100-350	1	18-25	35-50
	Grauguss mit Lammellengraphit	300-1000	1	18-25	25-35
	Kugelgraphitguss	300-500	1	15-20	30-40
	Kugelgraphitguss	550-800	1	15-20	30-40
	Temperguss, weiß	350-450	1	15-25	35-45
	Temperguss, weiß	500-650	1	15-20	35-45
	Temperguss, schwarz	350-450	1	15-20	30-40
Temperguss, schwarz	500-700	0,8	12-18	25-35	
<b>N</b>	Aluminium (unlegiert, niedrig legiert)	< 350	1,9	150-180	250-280
	Aluminiumlegierungen < 0,5% Si	< 500	1,9	100-130	140-170
	Aluminiumlegierungen 0,5 - 10% Si	< 400	1,8		120-150
	Aluminiumlegierungen 10 - 15% Si	< 400	1,7		70-140
	Aluminiumlegierungen > 15% Si	< 400			
	Kupfer (unlegiert, niedrig legiert)	< 350	1,2	30-50	70-90
	Kupfer-Knetlegierungen	< 700	1,1	-	120-160
	Kupfer-Sonderlegierungen	< 200 HB	0,9	5-10	15-20
	Kupfer-Sonderlegierungen	< 300 HB			
	Kupfer-Sonderlegierungen	> 300 HB			
	Messing kurzspanend, Bronze, Rotguss	< 600	1,1		120-160
	Messing langspanend	< 600	1,1	80-120	130-170
	Thermoplaste		2	20-30	30-50
	Duroplaste		2	30-40	60-80
	Faserverstärkte Kunststoffe				
<b>S</b>	Magnesium und Magnesiumlegierungen	< 850	1,8	90-120	150-180
	Graphit		1		35-45
	Wolfram und Wolframlegierungen		1,1		10-20
	Molybdän und Molybdänlegierungen				
	Reinnickel		1,1	5-10	10-15
	Nickellegierungen				
	Nickellegierungen	< 850	1,1		16-25
	Nickel-Chromlegierungen				
	Nickel- und Kobaltlegierungen	< 1300	0,7		15-20
	Hochwarmfeste Legierungen	< 1300			
Nickel-Kobalt-(Chrom-)legierungen	< 1400	0,9		10-16	
Nickel- und Kobaltlegierungen	< 1300	1		9-14	
Reintitan	< 900	1	10-15	20-30	
Titanlegierungen	< 700	1,1	10-15	20-25	
Titanlegierungen	< 1200				
<b>H</b>	Stahl gehärtet	< 45 HRC			
		46-55 HRC			
		56-60 HRC			
		61-65 HRC			
		65-70 HRC			

Achtung: Für das Vollnutfräsen ist der Vorschub um 15-20% zu reduzieren.

Die Tabellenwerte sind Richtwerte. Es kann notwendig sein, die Werte den jeweiligen Bearbeitungsumständen anzupassen.

# Cutting datas PM- and HSS End mill

Design FR, FPA, FPT, FS

ISO	Material	Strength [N/mm <sup>2</sup> ]	Correction factor [x f <sub>z</sub> ]	uncoated	coated
				V <sub>c</sub> [m/min]	V <sub>c</sub> [m/min]
<b>P</b>	General construction steel	< 800	1,2	30-40	60-85
	Free cutting steel	< 800	1,2	25-35	50-70
	Case hardened steel, non alloyed	< 800	1,2	20-30	45-60
	Alloyed case hardened steel	< 1000	1	15-25	40-60
	Tempering steel, non alloyed	< 850	1,2	20-30	45-60
	Tempering steel, non alloyed	< 1000	1	15-20	30-40
	Tempering steel, alloyed	< 800	1,2	20-30	40-60
	Tempering steel, alloyed	< 1300	0,8	15-20	30-40
	Steel castings	< 850	1,2	20-30	45-60
	Nitriding steel	< 1000	1	15-20	30-40
	Nitriding steel	< 1200	0,8	15-20	30-40
	Roller bearing steel	< 1200	0,8	15-20	30-40
	Spring steel	< 1200			
	High-speed steel	< 1300			
	Cold working tool steel	< 1300	0,8	12-18	25-35
	Hot working tool steel	< 1300	0,8	10-15	20-30
<b>M</b>	Steel and sulphured cast stainless steel	< 850	1	10-15	20-30
	Stainless steel, ferritic	< 750	1	10-15	20-30
	Stainless steel, martensitic	< 900	1	8-12	15-25
	Stainless steel, ferritic/martensitic	< 1100	0,9	7-10	15-20
	Stainless steel, austenitic/ferritic	< 850	1	5-8	10-15
	Stainless steel, austenitic	< 750	1	10-15	20-30
Heat resistant steel	< 1100				
<b>K</b>	Grey cast iron with lamellar graphite	100-350	1	18-25	35-50
	Grey cast iron with lamellar graphite	300-1000	1	18-25	25-35
	Spheroidal cast iron	300-500	1	15-20	30-40
	Spheroidal cast iron	550-800	1	15-20	30-40
	White cast iron, tempered	350-450	1	15-25	35-45
	White cast iron, tempered	500-650	1	15-20	35-45
	Black cast iron, tempered	350-450	1	15-20	30-40
	Black cast iron, tempered	500-700	0,8	12-18	25-35
<b>N</b>	Aluminium (non alloyed, low alloyed)	< 350	1,9	150-180	250-280
	Aluminium alloys < 0,5% Si	< 500	1,9	100-130	140-170
	Aluminium alloys 0,5% - 10% Si	< 400	1,8		120-150
	Aluminium alloys 10% - 15% Si	< 400	1,7		70-140
	Aluminium alloys > 15% Si	< 400			
	Copper (non alloyed, low alloyed)	< 350	1,2	30-50	70-90
	Copper wrought alloys	< 700	1,1	-	120-160
	Special copper alloys	< 200 HB	0,9	5-10	15-20
	Special copper alloys	< 300 HB			
	Special copper alloys	> 300 HB			
	Short-chipping brass, bronze, red bronze	< 600	1,1		120-160
	Long-chipping brass	< 600	1,1	80-120	130-170
	Thermoplastics		2	20-30	30-50
	Duroplastics		2	30-40	60-80
	Fibre-reinforced plastics				
Magnesium and magnesium alloys	< 850	1,8	90-120	150-180	
Graphite		1		35-45	
Tungsten and tungsten alloys		1,1		10-20	
Molybdenum and molybdenum alloys					
<b>S</b>	Pure nickel		1,1	5-10	10-15
	Nickel alloys				
	Nickel alloys	< 850	1,1		16-25
	Nickel-chromium alloys				
	Nickel and cobalt alloys	< 1300	0,7		15-20
	Nickel and cobalt alloys	< 1300			
	Heat resistant alloys	< 1400	0,9		10-16
	Nickel-cobalt-chromium alloys	< 1300	1		9-14
	Pure titanium	< 900	1	10-15	20-30
	Titanium alloys	< 700	1,1	10-15	20-25
Titanium alloys	< 1200				
<b>H</b>	Tempered steel	< 45 HRC			
		46-55 HRC			
		56-60 HRC			
		61-65 HRC			
		65-70 HRC			

Attention: For full slot machining reduce V<sub>c</sub> around 15-20%.

The datas given are only approximate values. It can be necessary to adjust these datas to the individual machining operation.

Vorschub pro Zahn  $f_z$  [mm]

Feed per tooth  $f_z$  [mm]

Vollmaßfräsen (in einem Schnitt) Full slot milling (in one cut)		Untermaßfräsen (im Rahmen) Profile slot milling (internal profile milling)		Bohrfräsen Circular ramping	
beschichtet / coated		beschichtet / coated		beschichtet / coated	beschichtet / coated
$d_1$ [mm]	$f_z$ [mm]	Schuppen / Roughing $f_z$ [mm]	Schichten / Fine cutting $f_z$ [mm]	$f_z$ [mm]	$f_z$ [mm]
	1,0	0,003	0,003	0,005	0,002
1,5	0,005	0,005	0,007	0,002	0,001
2,0	0,006	0,006	0,009	0,003	0,002
3,0	0,010	0,010	0,016	0,005	0,003
4,0	0,013	0,013	0,024	0,007	0,004
5,0	0,017	0,017	0,033	0,009	0,006
6,0	0,022	0,022	0,043	0,011	0,007
7,0	0,026	0,025	0,051	0,012	0,008
8,0	0,029	0,029	0,061	0,014	0,010
9,0	0,032	0,032	0,071	0,016	0,011
10,0	0,037	0,037	0,082	0,019	0,012
12,0	0,044	0,044	0,101	0,022	0,015
14,0	0,054	0,054	0,118	0,027	0,018
16,0	0,062	0,062	0,135	0,031	0,021
18,0	0,072	0,072	0,151	0,036	0,024
20,0	0,078	0,078	0,167	0,039	0,026
22,0	0,088	0,088	0,184	0,044	0,029
25,0	0,098	0,098	0,208	0,049	0,033
28,0	0,108	0,108	0,217	0,052	0,039
30,0	0,120	0,120	0,230	0,060	0,041
32,0	0,135	0,135	0,251	0,071	0,048
40,0	0,150	0,150	0,260	0,070	0,050

**Achtung:**  
Optimale Ergebnisse werden im Gleichlaufräsen erzielt.

**Attention:**  
For optimal results it is recommended to climb mill.

**Generelle Berechnungsformeln/General rule:**  
Vorschub pro Zahn/Feed per tooth: =  $f_z \cdot K_f$  (fz)

**Bohrvorschub (Fräsen in axialer Richtung): = Tabellenwert/Zähnezahl**  
For axial plunge milling: = **Table value/Number of teeth**

Alle Angaben in mm / Dimensions in mm

FP  
FPA  
FPT  
FS

## Vorschub pro Zahn $f_z$ [mm]

Feed per tooth  $f_z$  [mm]

Schlichten Fine cutting				Schruppen Roughing			
beschichtet / coated				beschichtet / coated			
$d_1$ [mm]	Schlichtgeometrie / Geometry for peripheral milling			Schruppgeometrie / Geometry for roughing			
	$f_z$ [mm]	$f_z$ [mm]	$f_z$ [mm]	$f_z$ [mm]	$f_z$ [mm]	$f_z$ [mm]	
1,0	0,005	0,005	0,005	0,005	0,005	0,005	
1,5	0,007	0,007	0,007	0,007	0,007	0,007	
2,0	0,009	0,009	0,009	0,010	0,010	0,008	
3,0	0,012	0,012	0,010	0,013	0,012	0,010	
4,0	0,018	0,015	0,014	0,016	0,014	0,012	
5,0	0,026	0,020	0,015	0,021	0,018	0,016	
6,0	0,035	0,024	0,017	0,027	0,022	0,019	
7,0	0,045	0,028	0,021	0,031	0,027	0,022	
8,0	0,051	0,032	0,022	0,036	0,030	0,026	
9,0	0,061	0,036	0,025	0,052	0,034	0,031	
10,0	0,072	0,041	0,028	0,047	0,039	0,034	
12,0	0,091	0,049	0,034	0,057	0,047	0,041	
14,0	0,106	0,059	0,041	0,069	0,058	0,050	
16,0	0,121	0,067	0,046	0,079	0,066	0,057	
18,0	0,136	0,077	0,053	0,093	0,078	0,067	
20,0	0,151	0,083	0,057	0,101	0,084	0,073	
22,0	0,166	0,094	0,065	0,114	0,096	0,082	
25,0	0,188	0,104	0,072	0,129	0,108	0,093	
28,0	0,210	0,120	0,083	0,150	0,125	0,108	
30,0	0,225	0,127	0,088	0,161	0,135	0,116	
32,0	0,240	0,137	0,094	0,173	0,145	0,125	
40,0	0,240	0,170	0,120	0,200	0,160	0,140	

**Achtung:**  
Optimale Ergebnisse werden im Gleichlaufräsen erzielt.

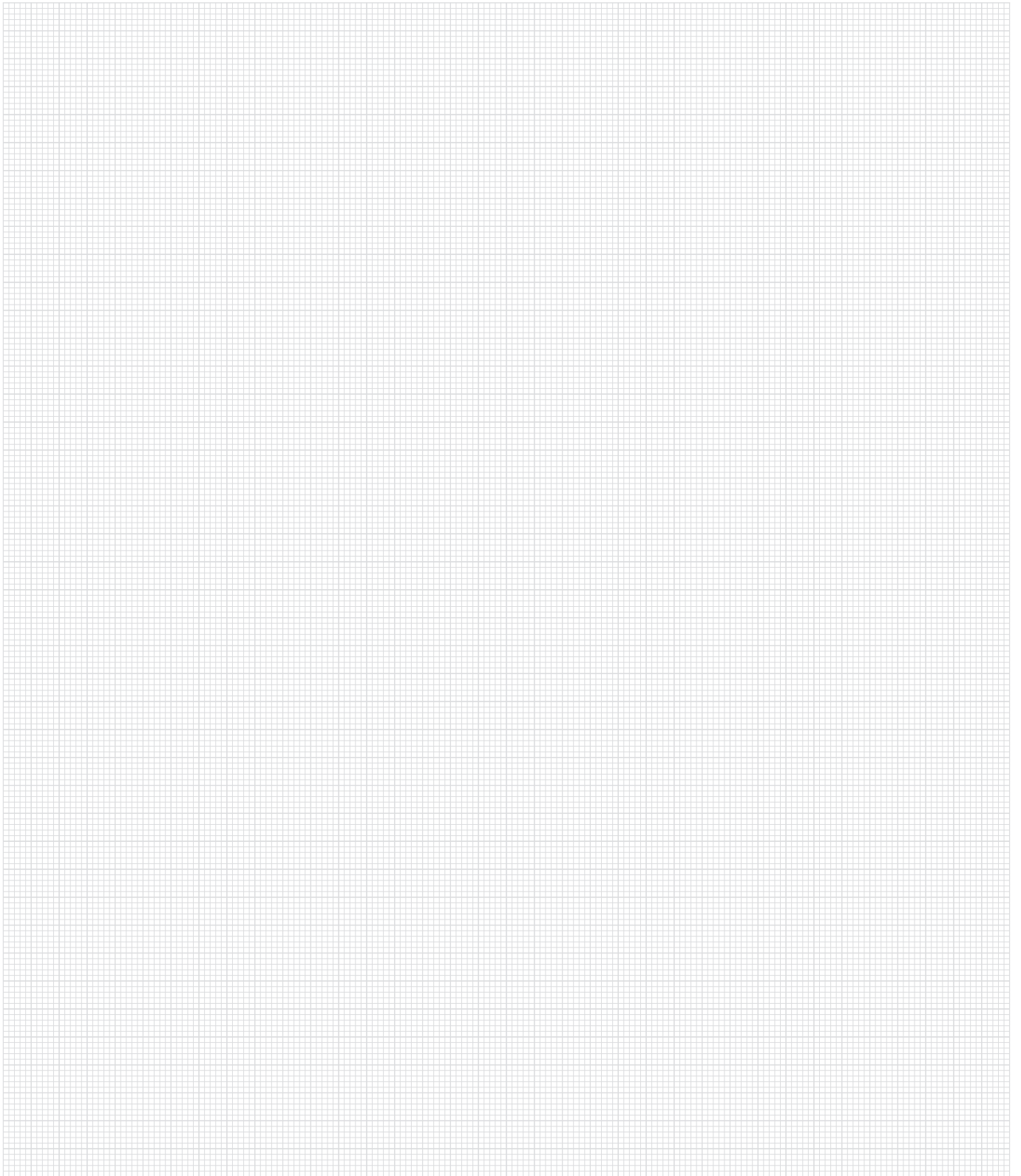
**Attention:**  
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**Generelle Berechnungsformeln/General rule:**  
Vorschub pro Zahn/Feed per tooth: =  $f_z \cdot K_f$  ( $f_z$ )

**Bohrvorschub (Fräsen in axialer Richtung): = Tabellenwert/Zähnezahl**  
For axial plunge milling: = **Table value/Number of teeth**

Alle Angaben in mm / Dimensions in mm

FP  
FPA  
FPT  
FS



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Montags bis donnerstags, 7 bis 18 Uhr und freitags, 7 bis 16 Uhr. GEBÜHRENFREI.