

MAPAL fixed reamers and countersinks HSS



Perfect for you.

Fixed reamers, countersinking tools and counterboring tools HSS

NC-reamers
without internal coolant supply
page 3 - 7



NC-reamers in HSS-E

NC-reamers in HSS-E are a particularly cost effective method of producing accurate bores. The operating figures lie below that of reamers in carbide and Cermet but these tools are widely used because they are especially easy to handle. The tools are available ex stock to a very large extent and can be supplied quickly in intermediate sizes.

Another plus point is that the tools can be located directly in an expanding chuck or thermal expanding chuck.

Countersinking tools
countersinking tools, counterboring tools
page 8 - 9

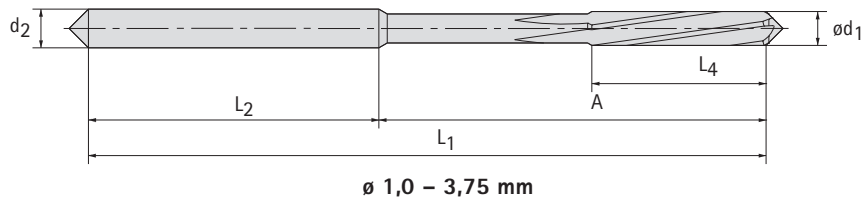


Countersinking tools, the logical programme addition

Countersinking operations are performed on almost every component which needs to be cut. Countersinking tools are particularly used for flush screw connections and also in pre-machining operations for reaming or for deburring bores.

Various tool designs are available – right up to countersinking tools with high wear resistant coatings.

NC-reamers without internal coolant



cutting material	tool location	bore type	tool type
HSS-E	cyl.	through hole	B030505 B030506 B030507



HSS-E, similar to DIN 212, ø 1,5 - 3,01 mm

ød ₁ mm	Production tolerance	L ₁ mm	A mm	L ₄ mm	L ₂ mm	ød ₂ h ₆ mm		B030505 & B030506		
								tool type	Avail-ability	
1,50	H7	40	18	8	22	2	3	B030505	●	
1,51	+ 0,004/0	43	20	9	23	2	3	B030506	●	
1,52	+ 0,004/0	43	20	9	23	2	3	B030506	●	
1,60	H7	43	20	9	23	2	3	B030505	●	
1,70	H7	43	20	9	23	2	3	B030505	●	
1,80	H7	46	22	10	24	2	4	B030505	●	
1,90	H7	46	22	10	24	2	4	B030505	●	
1,97	+ 0,004/0	49	24	11	25	2	4	B030506	●	
1,98	+ 0,004/0	49	24	11	25	2	4	B030506	●	
1,99	+ 0,004/0	49	24	11	25	2	4	B030506	●	
2,00	H7	49	24	11	25	2	4	B030505	●	
2,01	+ 0,004/0	49	24	11	25	2	4	B030506	●	
2,02	+ 0,004/0	49	24	11	25	2	4	B030506	●	
2,20	H7	53	26	12	27	3	4	B030505	●	
2,30	H7	53	26	12	27	3	4	B030505	●	
2,40	H7	57	28	14	29	3	4	B030505	●	
2,48	+ 0,004/0	57	28	14	29	3	4	B030506	●	
2,49	+ 0,004/0	57	28	14	29	3	4	B030506	●	
2,50	H7	57	28	14	29	3	4	B030505	●	
2,51	+ 0,004/0	57	28	14	29	3	4	B030506	●	
2,52	+ 0,004/0	57	28	14	29	3	4	B030506	●	
2,60	H7	57	28	14	29	3	4	B030505	●	
2,70	H7	61	32	15	29	3	6	B030505	●	
2,80	H7	61	32	15	29	3	6	B030505	●	
2,90	H7	61	32	15	29	3	6	B030505	●	
2,97	+ 0,004/0	61	32	15	29	3	6	B030506	●	
2,98	+0,004/0	61	32	15	29	3	6	B030506	●	
2,99	+ 0,004/0	61	32	15	29	3	6	B030506	●	
3,00	H7	61	32	15	29	3	6	B030505	●	
3,01	+ 0,004/0	65	35	16	30	4	6	B030506	●	

Details required for ordering:

Typ	ø
B030506	2,49

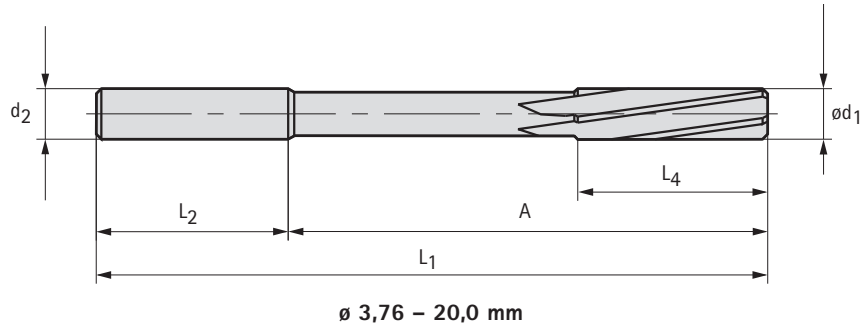
For machining values see page 10.
Special tolerances and intermediate diameters in the given ø-ranges available at short notice.
Detailed delivery time on request.

● available ex stock Germany

NC-reamers without internal coolant

cutting material	tool location	bore type	tool type
HSS-E	cyl.	through hole	B030505 B030506 B030507

P **K₁** **K₂** **N**



HSS-E, similar to DIN 212, ø 3,02 - 5,02 mm

ød ₁ mm	Production tolerance	L ₁ mm	A mm	L ₄ mm	L ₂ mm	ød ₂ h6 mm		B030505 & B030506	
								tool type	Avail-ability
3,02	+ 0,004/0	65	35	16	30	4	6	B030506	●
3,10	H7	65	35	16	30	4	6	B030505	●
3,20	H7	65	35	16	30	4	6	B030505	●
3,30	H7	65	35	16	30	4	6	B030505	●
3,40	H7	70	40	18	30	4	6	B030505	●
3,50	H7	70	40	18	30	4	6	B030505	●
3,60	H7	70	40	18	30	4	6	B030505	●
3,70	H7	70	40	18	30	4	6	B030505	●
3,80	H7	75	43	19	32	4	6	B030505	●
3,90	H7	75	43	19	32	4	6	B030505	●
3,97	+ 0,004/0	75	43	19	32	4	6	B030506	●
3,98	+ 0,004/0	75	43	19	32	4	6	B030506	●
3,99	+ 0,004/0	75	43	19	32	4	6	B030506	●
4,00	H7	75	43	19	32	4	6	B030505	●
4,01	+ 0,004/0	75	43	19	32	4	6	B030506	●
4,02	+ 0,004/0	75	43	19	32	4	6	B030506	●
4,10	H7	75	43	19	32	4	6	B030505	●
4,20	H7	75	43	19	32	4	6	B030505	●
4,30	H7	80	47	21	33	5	6	B030505	●
4,40	H7	80	47	21	33	5	6	B030505	●
4,50	H7	80	47	21	33	5	6	B030505	●
4,60	H7	80	47	21	33	5	6	B030505	●
4,70	H7	80	47	21	33	5	6	B030505	●
4,80	H7	86	52	23	34	5	6	B030505	●
4,90	H7	86	52	23	34	5	6	B030505	●
4,97	+ 0,004/0	86	52	23	34	5	6	B030506	●
4,98	+ 0,004/0	86	52	23	34	5	6	B030506	●
4,99	+ 0,004/0	86	52	23	34	5	6	B030506	●
5,0	H7	86	52	23	34	5	6	B030505	●
5,01	+ 0,004/0	86	52	23	34	5	6	B030506	●
5,02	+ 0,004/0	86	52	23	34	5	6	B030506	●


Details required for ordering:

Typ	ø
B030505	3,3

For machining values see page 10.
Special tolerances and intermediate diameters in the given ø-ranges available at short notice.
Detailed delivery time on request.

● available ex stock Germany

HSS-E, similar to DIN 212, \varnothing 5,12 – 7,0 mm

$\varnothing d_1$ mm	Production tolerance	L ₁ mm	A mm	L ₄ mm	L ₂ mm	$\varnothing d_2 h_6$ mm		B030505 & B030506	
								tool type	Avail- ability
5,10	H7	86	52	23	34	5	6	B030505	●
5,20	H7	86	52	23	34	5	6	B030505	●
5,30	H7	86	52	23	34	5	6	B030505	●
5,40	H7	93	57	26	36	6	6	B030505	●
5,50	H7	93	57	26	36	6	6	B030505	●
5,60	H7	93	57	26	36	6	6	B030505	●
5,70	H7	93	57	26	36	6	6	B030505	●
5,80	H7	93	57	26	36	6	6	B030505	●
5,90	H7	93	57	26	36	6	6	B030505	●
5,97	+ 0,005/0	93	57	26	36	6	6	B030506	●
5,98	+0,005/0	93	57	26	36	6	6	B030506	●
5,99	+ 0,005/0	93	57	26	36	6	6	B030506	●
6,00	H7	93	57	26	36	6	6	B030505	●
6,01	+0,005/0	101	63	28	38	6	6	B030506	●
6,02	+0,005/0	101	63	28	38	6	6	B030506	●
6,10	H7	101	63	28	38	6	6	B030505	●
6,20	H7	101	63	28	38	6	6	B030505	●
6,30	H7	101	63	28	38	6	6	B030505	●
6,40	H7	101	63	28	38	6	6	B030505	●
6,50	H7	101	63	28	38	6	6	B030505	●
6,60	H7	101	63	28	38	6	6	B030505	●
6,70	H7	101	63	28	38	6	6	B030505	●
6,80	H7	109	69	31	40	8	6	B030505	●
6,90	H7	109	69	31	40	8	6	B030505	●
7,00	H7	109	69	31	40	8	6	B030505	●


Details required for ordering:

Typ	\varnothing
B030506	6,02

For machining values see page 10.
Special tolerances and intermediate diameters in
the given \varnothing -ranges available at short notice.
Detailed delivery time on request.

● available ex stock Germany

HSS-E, similar to DIN 212, ø 9,5 - 20,0 mm

ød ₁ mm	Production tolerance	L ₁ mm	A mm	L ₄ mm	L ₂ mm	ød ₂ h6 mm		B030505 & B030506		
								tool type	Avail- ability	
9,50	H7	125	81	36	44	10	6	B030505	●	
9,60	H7	133	87	38	46	10	6	B030505	●	
9,70	H7	133	87	38	46	10	6	B030505	●	
9,80	H7	133	87	38	46	10	6	B030505	●	
9,90	H7	133	87	38	46	10	6	B030505	●	
9,97	+ 0,005/0	133	87	38	46	10	6	B030506	●	
9,98	+ 0,005/0	133	87	38	46	10	6	B030506	●	
9,99	+ 0,005/0	133	87	38	46	10	6	B030506	●	
10,00	H7	133	87	38	46	10	6	B030505	●	
10,01	+ 0,005/0	133	87	38	46	10	6	B030506	●	
10,02	+ 0,005/0	133	87	38	46	10	6	B030506	●	
11,00	H7	142	96	41	46	10	6	B030505	●	
11,97	+ 0,005/0	151	105	44	46	10	6	B030506	●	
11,98	+ 0,005/0	151	105	44	46	10	6	B030506	●	
11,99	+ 0,005/0	151	105	44	46	10	6	B030506	●	
12,00	H7	151	105	44	46	10	6	B030505	●	
13,00	H7	151	105	44	46	10	6	B030505	●	
14,00	H7	160	110	47	50	14	8	B030505	●	
15,00	H7	162	112	50	50	14	8	B030505	●	
16,00	H7	170	120	52	50	14	8	B030505	●	
17,00	H7	175	123	54	52	14	8	B030505	●	
18,00	H7	182	130	56	52	14	8	B030505	●	
19,00	H7	189	131	58	58	16	8	B030505	●	
20,00	H7	195	137	60	58	16	8	B030505	●	



Set of NC-reamers, consisting of 10 pcs.:

ø 1,50 / 2,00 / 3,00 / 4,00 / 5,00 / 6,00 / 7,00 / 8,00 / 10,00 / 12,00 mm H7

B032507

●

Details required for ordering:

Typ	ø
B030506	10,01

For machining values see page 10.

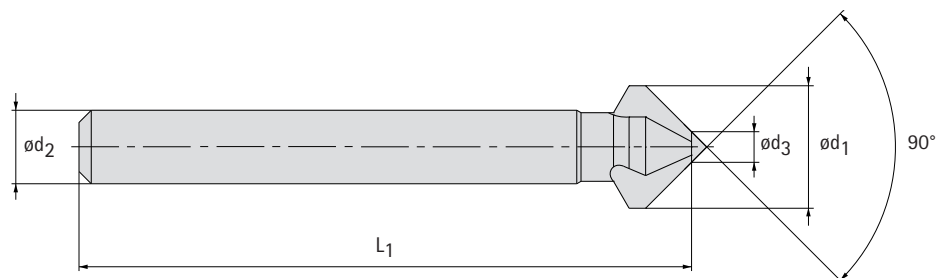
Special tolerances and intermediate diameters in the given ø-ranges available at short notice. Detailed delivery time on request.

● available ex stock Germany

Countersinks 90°

3 flutes, radially relieved

cutting material	tool location	tool type
HSS	cyl.	B051210
TiN-coated	cyl.	B053210
TiAlN-coated	cyl.	B053212



HSS, DIN 335 C, \varnothing 4,3 – 31,0 mm

$\varnothing d_1$ mm	$\varnothing d_3$ mm	L_1 mm	$\varnothing d_2 h_9$ mm		B051210		B053210		B053212	
					Avail- ability		Avail- ability		Avail- ability	
4,30	1,3	40	4	3	●					
4,80	1,5	40	4	3	●		●			
5,00	1,5	40	4	3	●		●			
5,30	1,5	40	4	3	●					
5,80	1,5	45	5	3	●					
6,00	1,5	45	5	3	●		●			
6,30	1,5	45	5	3	●		●		●	
7,00	1,8	50	6	3	●		●			
7,30	1,8	50	6	3	●		●			
8,00	2,0	50	6	3	●		●			
8,30	2,0	50	6	3	●		●		●	
9,40	2,2	50	6	3	●		●			
10,00	2,5	50	6	3	●		●			
10,40	2,5	50	6	3	●		●		●	
11,50	2,8	56	8	3	●		●			
12,40	2,8	56	8	3	●		●		●	
13,40	2,9	56	8	3	●					
14,40	3,0	56	8	3	●					
15,00	3,2	60	10	3	●		●		●	
16,50	3,2	60	10	3	●		●		●	
19,00	3,5	63	10	3	●		●			
20,50	3,5	63	10	3	●		●		●	
23,00	3,8	67	10	3	●		●			
25,00	3,8	67	10	3	●		●		●	
26,00	3,8	67	10	3	●					
28,00	4,0	71	12	3	●					
30,00	4,2	71	12	3	●					
31,00	4,2	71	12	3	●		●		●	

Set of countersinks, similar to DIN 335 C, consisting of 5 pcs. – \varnothing 6,30 / 10,40 / 16,50 / 20,50 / 25,00

HSS	B053553	●	
TiN-coated	B053555	●	
TiAlN-coated	B053554	●	



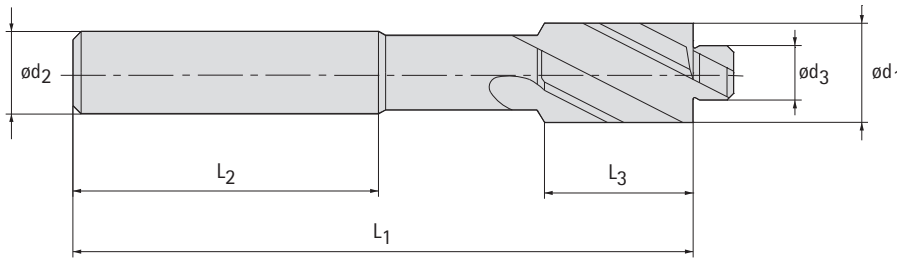
Details required for ordering:

Typ	\varnothing
B051210	9,4

For machining values see page 10.

● available ex stock Germany

Counterbores with pilot



cutting material	tool location	hole type	tool type
HSS	cyl.	fine	B051510
TiN-coated	cyl.	fine	B053510
HSS	cyl.	medium	B051511
TiN-coated	cyl.	medium	B053511
HSS	cyl.	GKL	B051512



HSS, DIN 373, ϕ 6,0 - 20,0 mm

$\phi d_1 z9$ mm	$\phi d_3 e8$ mm	Thread	L_1 mm	L_3 mm	L_2 mm	$\phi d_2 h9$ mm		HSS		TiN-coated	
								Avail-ability		Avail-ability	
For fine through holes								B051510		B053510	
6,00	3,2	M3	71	14	31,5	5	3	●		●	
6,50	3,2	M3	71	14	31,5	5	3	●		●	
6,50	3,7	M3,5	71	14	31,5	5	3	●		●	
8,00	4,3	M4	71	14	31,5	5	3	●		●	
10,00	5,3	M5	80	18	35,5	8	3	●		●	
11,00	6,4	M6	80	18	35,5	8	3	●		●	
15,00	8,4	M8	100	22	40	12,5	3	●		●	
18,00	10,5	M10	100	22	40	12,5	3	●		●	
20,00	13,0	M12	100	22	40	12,5	3	●		●	
For medium through holes								B051511		B053511	
6,00	3,4	M3	71	14	31,5	5	3	●		●	
6,50	3,4	M3	71	14	31,5	5	3	●		●	
6,50	3,9	M3,5	71	14	31,5	5	3	●		●	
8,00	4,5	M4	71	14	31,5	5	3	●		●	
10,00	5,5	M5	80	18	35,5	8	3	●		●	
11,00	6,6	M6	80	18	35,5	8	3	●		●	
15,00	9,0	M8	100	22	40	12,5	3	●		●	
18,00	11,0	M10	100	22	40	12,5	3	●		●	
20,00	13,5	M12	100	22	40	12,5	3	●		●	
For tap holes								B051512			
6,00	2,5	M3	71	14	31,5	5	3	●			
6,50	2,5	M3	71	14	31,5	5	3	●			
6,50	2,9	M3,5	71	14	31,5	5	3	●			
8,00	3,3	M4	71	14	31,5	5	3	●			
10,00	4,2	M5	80	18	35,5	8	3	●			
11,00	5,0	M6	80	18	35,5	8	3	●			
15,00	6,8	M8	100	22	40	12,5	3	●			
18,00	8,5	M10	100	22	40	12,5	3	●			
20,00	10,2	M12	100	22	40	12,5	3	●			

Set of counterbores, DIN 373, consisting of 6 pcs. - M3, M4, M5, M6, M8, M10 - in metal case

For fine through holes, HSS	B053558	●	
For medium through holes, HSS	B053559	●	
For tap holes, HSS	B053560	●	




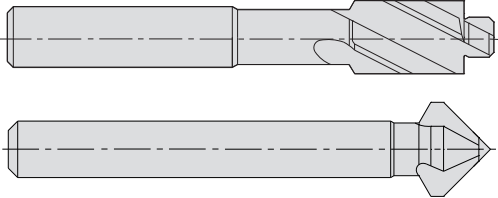
Details required for ordering:

Typ	ϕ
B053511	11,0

For machining values see page 10.

- available ex stock Germany
- available ex stock Germany within 2 weeks

Machining values for fixed HSS reamers

		NC-machine reamers, similar to DIN 212, without IC							Countersinks DIN 335, counterbores DIN 373										
																			
		v_c		\varnothing mm < 5	\varnothing mm 5 - 8	\varnothing mm 8 - 12	\varnothing mm 12 - 16	\varnothing mm 16 - 20	\varnothing mm 30 - 50	v_c		\varnothing mm < 5	\varnothing mm 5 - 8	\varnothing mm 8 - 12	\varnothing mm 12 - 16	\varnothing mm 16 - 20	\varnothing mm 20 - 25	\varnothing mm 25 - 40	\varnothing mm 40 - 63
P	Steel, < 700 N/mm ²	10 - 15	f a	0,1 - 0,15 0,1	0,15 0,1 - 0,2	0,15 - 0,2 0,1 - 0,2	0,2 - 0,25 0,2 - 0,3	0,2 - 0,3 0,2 - 0,3	0,3 - 0,5 0,3 - 0,5	25 - 28	f	0,06	0,08	0,1	0,12	0,14	0,18	0,22	0,3
	Steel, 700 - 900 N/mm ²	8 - 12	f a	0,1 - 0,15 0,1	0,15 - 0,2 0,1 - 0,2	0,15 - 0,2 0,1 - 0,2	0,2 - 0,25 0,2 - 0,3	0,2 - 0,3 0,2 - 0,3	0,3 - 0,5 0,3 - 0,5	18 - 25	f	0,04	0,06	0,08	0,1	0,12	0,14	0,18	0,25
	Steel, 900 - 1200 N/mm ²	-	f a	- -	- -	- -	- -	- -	- -	6 - 10	f	0,03	0,04	0,05	0,06	0,08	0,1	0,12	0,16
M	Stainless steel < 700 N/mm ²	-	f a	- -	- -	- -	- -	- -	- -	4 - 10	f	0,04	0,05	0,06	0,07	0,08	0,09	0,12	0,14
	Stainless steel > 700 N/mm ²	-	f a	- -	- -	- -	- -	- -	- -	4 - 10	f	0,04	0,05	0,06	0,07	0,08	0,09	0,12	0,14
K	Cast iron (CI)	10 - 14	f a	0,1 - 0,15 0,1 - 0,15	0,12 - 0,16 0,1 - 0,2	0,15 - 0,2 0,1 - 0,2	0,2 - 0,35 0,2 - 0,3	0,2 - 0,3 0,2 - 0,3	0,3 - 0,5 0,3 - 0,5	10 - 20	f	0,06	0,1	0,12	0,14	0,18	0,2	0,25	0,28
	Nodular graphite iron (GGG) till GGG 50	-	f a	- -	- -	- -	- -	- -	- -	10 - 18	f	0,06	0,1	0,12	0,14	0,18	0,2	0,25	0,28
	Nodular graphite iron (GGG) > GGG 50	-	f a	- -	- -	- -	- -	- -	- -	8 - 12	f	0,06	0,1	0,12	0,14	0,18	0,2	0,25	0,28
N	Brass/copper Cu/Zn/Mg-alloys	15 - 30	f a	0,12 - 0,16 0,1 - 0,15	0,15 - 0,2 0,15 - 0,2	0,15 - 0,2 0,15 - 0,2	0,2 - 0,25 0,2 - 0,3	0,2 - 0,3 0,2 - 0,3	0,3 - 0,5 0,3 - 0,5	50 - 80	f	0,1	0,12	0,14	0,18	0,2	0,24	0,3	0,4
	Aluminium alloys (Si<7%)	14 - 20	f a	0,12 - 0,16 0,1 - 0,15	0,15 - 0,2 0,15 - 0,2	0,15 - 0,2 0,15 - 0,2	0,2 - 0,25 0,2 - 0,3	0,2 - 0,3 0,2 - 0,3	0,3 - 0,5 0,3 - 0,5	25 - 40	f	0,08	0,1	0,12	0,14	0,18	0,22	0,26	0,3
	Aluminium alloys (Si>7%)	-	f a	- -	- -	- -	- -	- -	- -	10 - 30	f	0,08	0,1	0,12	0,14	0,18	0,22	0,26	0,3
	Plastics, soft	15 - 30	f a	0,12 - 0,16 0,1 - 0,15	0,15 - 0,2 0,15 - 0,2	0,15 - 0,2 0,15 - 0,2	0,2 - 0,25 0,2 - 0,3	0,2 - 0,3 0,2 - 0,3	0,3 - 0,5 0,3 - 0,5	40 - 80	f	0,1	0,12	0,14	0,18	0,2	0,24	0,3	0,4
	Plastics, hard fiber glass-/carbon fiber-rein- forced	-	f a	- -	- -	- -	- -	- -	- -	10 - 25	f	0,1	0,12	0,14	0,18	0,2	0,24	0,3	0,4
S	Titanium	-	f a	- -	- -	- -	- -	- -	- -	4 - 10	f	0,04	0,05	0,06	0,07	0,08	0,09	0,12	0,14
H	Hardened materials 48 - 60 HRC	-	f a	- -	- -	- -	- -	- -	- -	3 - 8	f	0,04	0,05	0,06	0,08	0,08	0,1	-	-

The figures given are guidelines. The best values for the application in question should be calculated from trials or during the machining process as the effects of component geometry, clamping and machine stability cannot be taken into account here.

f = Feed rate [mm/U]
a = Bore allowance in \varnothing [mm]
 v_c = Cutting speed [m/min]

The use of coated tools increases the tool life,
not the possible machining speed.

General information on reamers



Tool construction:

NC chucking reamers in HSS-E are particularly notable for their easy handling.

Because of the secondary cutting edge designed as a radial land which tapers back axially in the diameter, these tools operate reliably in the bore even under conditions which are otherwise difficult.

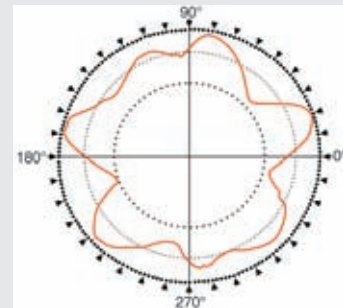
Reamers are normally used at the end of the manufacturing chain for a part. The demands placed on production reliability from these tools are therefore relatively high.

The fixed reamers from MAPAL meet these demands with a series of design and production features:

1. Extremely uneven distribution of cut for a better bore quality (see illustration on the right).
2. Maximum grinding quality in the chip space for safe chip clearance.
3. Maximum grinding quality on the guide chamfers for best surface quality results.
4. Centering on tool on both sides for maximum dimensional accuracy for manufacturing.

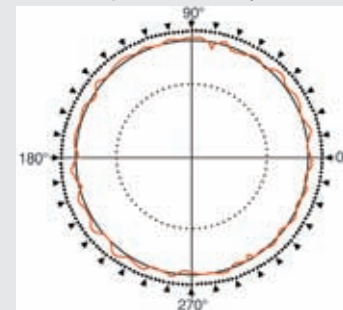
Comparison of uneven distribution/ extremely uneven distribution

Uneven distribution
Circularity errors up to 10 μm



Concentricity results

Extremely uneven distribution
Circularity error 1 – 2 μm

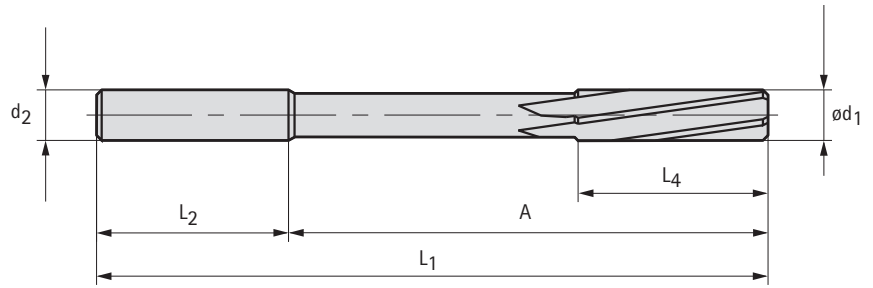


Concentricity results

NC-reamers without internal coolant

cutting material	tool location	bore type	tool type
HSS-E	cyl.	through hole	B030505 B030506 B030507

P K₁ K₂ N



ø 3,76 – 20,0 mm

HSS-E, similar to DIN 212, ø 7,1 – 9,4 mm

ød ₁ mm	Production tolerance	L ₁ mm	A mm	L ₄ mm	L ₂ mm	ød ₂ h6 mm		B030505 & B030506	
								tool type	Avail-ability
7,10	H7	109	69	31	40	8	6	B030505	●
7,20	H7	109	69	31	40	8	6	B030505	●
7,30	H7	109	69	31	40	8	6	B030505	●
7,40	H7	109	69	31	40	8	6	B030505	●
7,50	H7	109	69	31	40	8	6	B030505	●
7,60	H7	117	75	33	42	8	6	B030505	●
7,70	H7	117	75	33	42	8	6	B030505	●
7,80	H7	117	75	33	42	8	6	B030505	●
7,90	H7	117	75	33	42	8	6	B030505	●
7,97	+ 0,005/0	117	75	33	42	8	6	B030506	●
7,98	+0,005/0	117	75	33	42	8	6	B030506	●
7,99	+0,005/0	117	75	33	42	8	6	B030506	●
8,00	H7	117	75	33	42	8	6	B030505	●
8,01	+ 0,005/0	117	75	33	42	8	6	B030506	●
8,02	+ 0,005/0	117	75	33	42	8	6	B030506	●
8,10	H7	117	75	33	42	8	6	B030505	●
8,20	H7	117	75	33	42	8	6	B030505	●
8,30	H7	117	75	33	42	8	6	B030505	●
8,40	H7	117	75	33	42	8	6	B030505	●
8,50	H7	117	75	33	42	8	6	B030505	●
8,60	H7	125	81	36	44	10	6	B030505	●
8,70	H7	125	81	36	44	10	6	B030505	●
8,80	H7	125	81	36	44	10	6	B030505	●
8,90	H7	125	81	36	44	10	6	B030505	●
9,00	H7	125	81	36	44	10	6	B030505	●
9,01	+ 0,005/0	125	81	36	44	10	6	B030506	●
9,02	+ 0,005/0	125	81	36	44	10	6	B030506	●
9,10	H7	125	81	36	44	10	6	B030505	●
9,20	H7	125	81	36	44	10	6	B030505	●
9,30	H7	125	81	36	44	10	6	B030505	●
9,40	H7	125	81	36	44	10	6	B030505	●

Details required for ordering:

Typ	ø
B030505	8,5

For machining values see page 10.
Special tolerances and intermediate diameters in the given ø-ranges available at short notice.
Detailed delivery time on request.

● available ex stock Germany



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