

Drilling



Deep hole drilling



Reaming



Countersinking



Technical section






GUHRING

Navigator 2010



This quick reference guide provides an overview of the application range for most of our important high-tech tools. The index for each section lists all the tools and tool types shown here and contains a reference to the price pages.

		for materials						for technologies			
		AlSi alloys and Al wrought alloys	steels up to 800 N/mm ²	high tensile steels	stainless steels	cast materials	other materials*	HSC/high performance	hard machining	min. quantity lubrication	
											*see GühringNavigator
	Ratio drills		○	◐		●	○	◐	○	●	RT 100 F
		○	◐	●	○	◐	◐	◐		●	RT 100 U
							●	●		●	RT 100 R
			○				●	●		○	RT 150 GG (Gühring no. 6068/6069/6070)
		●	●				○	●		○	RT 150 GG (Gühring no. 768/769/770)
				◐	●	●	◐		○	◐	RT 100 T
		○	◐	●	●	◐	●	○			Micro precision drills No. 6400/6401/6408/6412
		◐	◐	◐			●	○		○	FT 200 G
	Interchangeable insert tooling systems	●	●	●	◐	●	●	○		○	HT 800/RT 800
		●	●	●	◐	●	●			○	LT 800
	HSCO drills		○	◐		●					GU 500
					◐		●				GT 500
				○	◐		●			○	GT 80 IK
	Carbide drills				●		◐		○		Type H Gühring no. 1946
	Gun drills	●	●	●	◐	◐	●		○	◐	EB 100
		●	●	●	◐	◐	●		○	◐	EB 80
		●	●				●			◐	ZB 80
				●	●	◐	●		○	○	EB 800
	Solid carbide high-performance reamers			●	●	●	●	●	◐	○	HR 500
	Solid carbide machine reamers	●	●	●	●	●	●		○		NC reamers
	HSS-E machine reamers	◐	◐	●	◐	◐	◐				NC reamers

Drilling tools

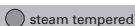


Guhring no. index drilling tools

Guhring no.	Discount group	Standard	Surface finish	Description	Tool material	Type	Page
128	138	Guhring std.	○	Stub drills with 16.0 mm dia. shank	HSCo	N	20
129	138	Guhring std.	○	Stub drills with 25.4 mm dia. shank	HSCo	N	20
136	138	Guhring std.	○	Stub drills with 25.4 mm dia. shank	HSCo	N	20
204	138	DIN 340	●	Long series twist drills	HSS	N	27
205	130	DIN 338	●	Jobber drills	HSS	N	23
206	134	DIN 338	●	Jobber drills	HSS	H	23
207	134	DIN 338	●	Jobber drills	HSS	W	23
208	134	DIN 338	●	Jobber drills	HSS	N	23
209	134	DIN 338	●	Jobber drills	HSS	H	23
210	138	DIN 338	●	Jobber drills	HSS	W	23
211	134	DIN 339	●	Bushing length twist drills	HSS	N	27
217	132	DIN 340	●	Long series twist drills	HSS	N	27
218	134	DIN 340	●	Long series twist drills	HSS	H	27
219	134	DIN 340	●	Long series twist drills	HSS	W	27
220	138	DIN 340	●	Long series twist drills	HSS	N	27
221	138	DIN 340	●	Long series twist drills	HSS	H	27
223	132	DIN 1897	●	Stub drills	HSS	N	20
224	138	DIN 1897	●	Stub drills	HSS	H	20
225	138	DIN 1897	●	Stub drills	HSS	W	20
226	134	DIN 1897	●	Stub drills	HSS	N	20
227	138	DIN 1897	●	Stub drills	HSS	H	20
228	138	DIN 1897	●	Stub drills	HSS	W	20
229	138	DIN 345	●	Standard length twist drills	HSS	N	23
235	134	DIN 1869	●	Extra length twist drills, series 1	HSS	N	28
236	134	DIN 1869	●	Extra length twist drills, series 2	HSS	N	28
237	138	DIN 1869	●	Extra length twist drills, series 3	HSS	N	28
240	132	DIN 338	●	Jobber drills	HSS	N	23
242	136	Guhring std.	●	Extra length twist drills	HSS	GT 100	29
243	138	Guhring std.	●	Extra length twist drills	HSS	GT 100	29
244	138	Guhring std.	●	Extra length twist drills	HSS	GT 100	29
245	132	DIN 345	●	Standard length twist drills	HSS	N	23
246	138	DIN 345	●	Standard length twist drills	HSS	H	23
247	138	DIN 345	●	Standard length twist drills	HSS	W	23
248	138	DIN 345	●	Standard length twist drills	HSS	N	23
251	138	DIN 346	●	Standard length twist drills	HSS	N	23
257	132	DIN 341	●	Bushing length twist drills	HSS	N	27
266	134	DIN 1870	●	Extra length twist drills, series 1	HSS	N	28
267	138	DIN 1870	●	Extra length twist drills, series 2	HSS	N	28
268	138	Guhring std.	●	Stub drills with 12.7 mm dia. shank	HSS	N	23
269	138	Guhring std.	●	Oil feed drills short	HSS	N	28
270	138	Guhring std.	●	Oil feed drills, flute length to DIN 341	HSS	N	28
271	138	Guhring std.	●	Oil feed drills, flute length to DIN 341	HSS	N	28
272	138	Guhring std.	●	Oil feed drills, flute length to DIN 341	HSS	N	28
293	138	Guhring std.	●	Extra length twist drills	HSS	GT 100	29
298	138	Guhring std.	●	Extra length twist drills	HSS	GT 100	29
299	138	Guhring std.	●	Extra length twist drills	HSS	GT 100	29
301	134	DIN 1899	○	Micro-precision drills without oil feed	HSS-E-PM	N	33
303	138	DIN 1899	○	Micro-precision drills without oil feed	HSS-E-PM	N	33
305	134	DIN 338	●	Jobber drills	HSCo	N	24
308	138	DIN 338	●	Jobber drills	HSCo	N	24
311	138	DIN 339	●	Bushing length twist drills	HSCo	N	30
317	134	DIN 340	●	Long series twist drills	HSCo	N	30
329	134	DIN 1897	●	Stub drills	HSCo	GV 120	20
330	138	DIN 1897	●	Stub drills	HSCo	GV 120	20
336	136	DIN 340	●	Long series twist drills	HSCo	GT 100	30
345	134	DIN 345	●	Standard length twist drills	HSCo	N	24
351	138	DIN 346	●	Standard length twist drills	HSCo	N	24
357	138	DIN 341	●	Bushing length twist drills	HSCo	N	20
363	134	Guhring std.	●	Jobber drills	HSS	GV 120	30
370	138	Guhring std.	●	Oil feed drills, flute length to DIN 341	HSCo	GT 100	31
371	138	Guhring std.	●	Oil feed drills, flute length to DIN 341	HSCo	GT 100	31
372	138	Guhring std.	●	Oil feed drills, flute length to DIN 341	HSCo	GT 100	31
374	138	Guhring std.	●	Oil feed drills, flute length to DIN 1870	HSCo	GT 100	31
375	138	Guhring std.	●	Oil feed drills, flute length to DIN 1870	HSCo	GT 100	31
376	138	Guhring std.	●	Oil feed drills, flute length to DIN 1870	HSCo	GT 100	31
390	136	Guhring std.	●	Oil feed drills	HSS	N	28
396	137	DIN 340	●	Long series twist drills	HSCo	GT 100	30
501	136	DIN 340	●	Long series twist drills	HSS	GT 50	27
502	136	DIN 1869	●	Extra length twist drills, series 1	HSS	GT 100	29
503	136	DIN 1869	●	Extra length twist drills, series 2	HSS	GT 100	29
504	136	DIN 1869	●	Extra length twist drills, series 3	HSS	GT 100	29
505	138	DIN 341	●	Bushing length twist drills	HSS	GT 50	27
506	138	DIN 340	●	Long series twist drills	HSS	GT 50	27
511	115	Guhring std.	●	Twist drills with oversize straight shank	HSCo	GU 500	26
512	115	Guhring std.	●	Twist drills with oversize straight shank	HSCo	GU 500	21
513	115	Guhring std.	●	Twist drills with oversize straight shank	HSS-E-PM	GT 500	26
515	115	DIN 1897	●	Stub drills	HSS-E-PM	GT 500	21
523	138	Guhring std.	●	Bushing length twist drills	HSS	N	27
524	138	DIN 1869	●	Extra length twist drills, series 1	HSS	GT 50	28
525	138	DIN 1870	●	Extra length twist drills, series 1	HSS	GT 50	28
526	136	DIN 1870	●	Extra length twist drills, series 1	HSS	GT 100	29
527	136	DIN 1870	●	Extra length twist drills, series 2	HSS	GT 100	29
528	138	DIN 1869	●	Extra length twist drills, series 2	HSS	GT 50	28
529	138	DIN 1869	●	Extra length twist drills, series 3	HSS	GT 50	28
535	136	DIN 340	●	Long series twist drills	HSS	GT 100	27
542	138	DIN 1870	●	Extra length twist drills, series 2	HSS	GT 50	28
549	136	DIN 338	●	Jobber drills	HSS	GT 100	23
550	138	DIN 338	●	Jobber drills	HSS	GT 100	23
551	136	DIN 341	●	Bushing length twist drills	HSS	GT 100	27
552	136	DIN 1897	●	Stub drills	HSS	GT 80	20
553	138	DIN 1897	●	Stub drills	HSS	GT 80	20
558	138	DIN 345	●	Standard length twist drills	HSS	GT 100	23
560	138	DIN 338	●	Jobber drills	HSS	N	23



bright



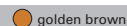
steam tempered



nitrided lands



nitrided



golden brown



TiAlN

Guhring no.	Discount group	Standard	Surface finish	Description	Tool material	Type	Page
561	138	DIN 339	○	Bushing length twist drills	HSS	N	27
563	138	Guhring std.	○	Extra length twist drills	HSS	GT 100	29
564	138	Guhring std.	○	Extra length twist drills	HSS	GT 100	29
565	138	Guhring std.	○	Extra length twist drills	HSS	GT 100	29
566	138	Guhring std.	○	Extra length twist drills	HSS	GT 100	29
592	138	DIN 345	○	Standard length twist drills	HSS	N	23
605	134	DIN 338	○	Jobber drills	HSCO	Ti	24
606	139	DIN 345	○	Standard length twist drills	HSS	GT 100	24
608	138	DIN 338	○	Jobber drills	HSCO	Ti	24
611	109	DIN 6539	○	3-flute Ratio drills, 5 x D	solid carb.	GS 200 U	12
617	134	DIN 340	○	Long series twist drills	HSCO	Ti	30
618	136	DIN 1869	○	Extra length twist drills, series 1	HSCO	GT 100	31
619	138	DIN 1869	○	Extra length twist drills, series 2	HSCO	GT 100	31
620	138	DIN 1870	○	Extra length twist drills, series 1	HSCO	GT 100	31
621	138	DIN 1870	○	Extra length twist drills, series 2	HSCO	GT 100	31
622	136	DIN 338	○	Jobber drills	HSCO	GT 100	24
623	138	DIN 341	○	Bushing length twist drills	HSCO	GT 100	30
645	138	DIN 345	○	Standard length twist drills	HSCO	GT 100	24
651	131	DIN 338	○	Jobber drills	HSS	N	24
652	137	DIN 338	○	Jobber drills	HSS	GT 100	24
653	133	DIN 1897	○	Stub drills	HSS	N	20
654	133	DIN 345	○	Standard length twist drills	HSS	N	24
655	133	DIN 341	○	Bushing length twist drills	HSS	N	27
656	139	DIN 341	○	Bushing length twist drills	HSS	GT 100	27
657	135	DIN 338	○	Jobber drills	HSCO	Ti	25
658	137	DIN 338	○	Jobber drills	HSCO	GT 100	25
659	135	DIN 1897	○	Stub drills	HSCO	GV 120	21
660	135	DIN 1899	○	Micro-precision drills without oil feed	HSS-E-PM	N	33
661	139	DIN 345	○	Standard length twist drills	HSCO	N	25
662	139	DIN 345	○	Standard length twist drills	HSCO	GT 100	25
663	139	Guhring std.	○	Jobber drills	HSCO	GV 120	21
664	139	DIN 338	○	Jobber drills	HSS	N	24
665	139	DIN 338	○	Jobber drills	HSS	GT 100	24
666	139	DIN 339	○	Bushing length twist drills	HSS	N	27
667	133	DIN 340	○	Long series twist drills	HSS	N	27
668	137	DIN 340	○	Long series twist drills	HSS	GT 100	27
669	139	DIN 340	○	Long series twist drills	HSCO	Ti	30
670	137	DIN 1869	○	Extra length twist drills, series 1	HSS	GT 100	29
671	139	DIN 1869	○	Extra length twist drills, series 2	HSS	GT 100	29
672	139	DIN 1897	○	Stub drills	HSS	N	20
701	102	Guhring std.	○	Micro-precision drills without oil feed	solid carb.	N	33
702	102	Guhring std.	○	Stub drills	solid carb.	N	22
703	102	DIN 8037	○	Carbide-tipped twist drill	Carbide	N	22
704	102	DIN 8038	○	Carbide-tipped twist drill	Carbide	N	22
705	102	DIN 8041	○	Carbide-tipped twist drill	Carbide	N	22
706	102	Guhring std.	○	Long series twist drills	solid carb.	N	30
707	102	Guhring std.	○	Carbide tipped spade drills	Carbide	N	22
709	102	Guhring std.	○	Stub drills	solid carb.	N	22
710	102	Guhring std.	○	Jobber drills	Carbide	Duro 150	22
730	102	DIN 6539	○	Stub drills	solid carb.	N	22
731	109	DIN 6539	○	3-flute Ratio drills, 5 x D	solid carb.	GS 200 U	12
732	102	Guhring std.	○	Jobber drills	solid carb.	N	26
745	109	DIN 6539	○	3-flute Ratio drills, 3 x D	solid carb.	GS 200 G	7
768	121	Guhring std.	○	Ratio drills with oil feed, 4 x D	solid carb.	RT 150 GG	10
769	121	Guhring std.	○	Ratio drills with oil feed, 7 x D	solid carb.	RT 150 GG	10
770	121	Guhring std.	○	Ratio drills with oil feed, 10 x D	solid carb.	RT 150 GG	10
773	121	Guhring std.	○	Ratio drills with oil feed, 15 x D	solid carb.	RT 150 GN	11
1020	109	DIN 6539	○	3-flute Ratio drills, 3 x D	solid carb.	GS 200 G	12
1021	109	DIN 6539	○	3-flute Ratio drills, 5 x D	solid carb.	GS 200 U	12
1024	109	DIN 6539	○	3-flute Ratio drills, 5 x D	solid carb.	GS 200 G	12
1025	109	DIN 6539	○	3-flute Ratio drills, 5 x D	solid carb.	GS 200 G	12
1027	109	DIN 6539	○	3-flute Ratio drills, 5 x D	solid carb.	GS 200 F	12
1047	141	Guhring std.	○	Interchangeable inserts "steel" RT 800 WP	solid carb.	RT 800 WP	18
1101	138	Guhring std.	○	Oil feed drills, flute length to DIN 341	HSS	N	28
1131	134	Guhring std.	○	Oil feed drills	HSCO	GT 80 IK	26
1132	135	Guhring std.	○	Oil feed drills	HSCO	GT 80 IK	26
1146	138	DIN 338	○	Jobber drills	M42	N	24
1149	102	Guhring std.	○	Kevlar drills	solid carb.	N	22
1171	128	DIN 6538 K	○	Ratio drills with oil feed, 3 x D	Carbide	RT 80 U	6
1172	128	DIN 6538 M	○	Ratio drills with oil feed, 5 x D	Carbide	RT 80 U	8
1173	128	DIN 6538 L	○	Ratio drills with oil feed, 7 x D	Carbide	RT 80 U	10
1180	121	DIN 6537 K	○	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 F	6
1181	121	DIN 6537 K	○	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 U	6
1182	121	DIN 6537 L	○	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 F	8
1183	121	DIN 6537 L	○	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 U	8
1184	121	DIN 6537 K	○	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	8
1221	137	DIN 338	○	Jobber drills	HSCO	GT 100	25
1222	139	DIN 345	○	Standard length twist drills	HSCO	GT 100	25
1223	137	DIN 338	○	Jobber drills	HSCO	GT 100	25
1224	139	DIN 345	○	Standard length twist drills	HSCO	GT 100	25
1228	137	DIN 1897	○	Stub drills	HSCO	GT 80	21
1242	121	DIN 6539	○	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
1243	121	Guhring std.	○	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
1259	138	DIN 1897	○	Stub drills	M42	N	20
1260	134	DIN 338	○	Jobber drills	HSCO	VA	24
1261	138	DIN 1897	○	Stub drills	HSCO	VA	20
1262	134	DIN 345	○	Standard length twist drills	HSCO	VA	24
1263	138	Guhring std.	○	Jobber drills	HSCO	VA	20
1659	121	DIN 6537 K	○	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 F	7
1660	121	DIN 6537 K	○	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 F	6
1661	121	DIN 6537 K	○	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 U	6
1662	121	DIN 6537 L	○	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 F	8
1663	121	DIN 6537 L	○	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 U	8

Guhring no.	Discount group	Standard	Surface finish	Description	Tool material	Type	Page
1673	121	DIN 6537 K	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
1702	121	DIN 6539	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 F	7
1798	121	DIN 6539	○	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 G	6
1799	121	Guhring std.	○	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 G	9
1946	102	DIN 6537 K	Ⓢ	Twist drills with oversize straight shank	solid carb.	H	22
2047	134	DIN 338	Ⓢ	Jobber drills	HSCO	P2000	25
2048	135	DIN 1897	Ⓢ	Stub drills	HSCO	P2000	20
2456	135	DIN 338	Ⓢ	Jobber drills	HSS	N	24
2457	137	DIN 338	Ⓢ	Jobber drills	HSS	GT 100	24
2458	135	DIN 338	Ⓢ	Jobber drills	HSCO	TI	25
2459	137	DIN 338	Ⓢ	Jobber drills	HSCO	GT 100	25
2460	133	DIN 1897	Ⓢ	Stub drills	HSS	N	20
2461	135	DIN 1897	Ⓢ	Stub drills	HSCO	GV 120	21
2462	137	DIN 340	Ⓢ	Long series twist drills	HSS	GT 100	27
2463	102	DIN 6539	Ⓢ	Stub drills	solid carb.	N	22
2464	102	Guhring std.	Ⓢ	Jobber drills	solid carb.	N	26
2468	121	DIN 6537 K	Ⓢ	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 F	6
2469	121	DIN 6537 K	Ⓢ	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 U	6
2470	121	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 F	8
2471	121	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 U	8
2472	121	DIN 6537 K	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
2473	121	DIN 6539	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
2474	121	Guhring std.	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
2475	121	DIN 6537 K	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 F	7
2477	121	DIN 6537 K	Ⓢ	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 U	6
2478	121	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 F	8
2479	121	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 U	8
2480	121	DIN 6537 K	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
2485	141	Guhring std.	Ⓢ	Interchangeable inserts "steel" RT 800 WP	solid carb.	RT 800 WP	18
2498	137	DIN 1897	Ⓢ	Stub drills	HSCO	GT 80	21
2711	121	Guhring std.	Ⓢ	Ratio drills with oil feed, 7 x D	solid carb.	RT 100 U	10
2712	121	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 F	9
2713	109	DIN 6537 L	○	3-flute Ratio drills, 5 x D	solid carb.	FT 200 G	12
2717	121	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
2718	121	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
2719	121	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
2747	141	Guhring std.	○	Interchangeable inserts "alu" RT 800 WP	solid carb.	RT 800 WP	18
2939	109	DIN 6537 L	Ⓢ	3-flute Ratio drills, 5 x D	solid carb.	FT 200 G	12
2996	121	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
2997	135	DIN 338	Ⓢ	Jobber drills	HSCO	N	25
4044	121	Guhring std.	Ⓢ	Ratio drills with oil feed, 7 x D	solid carb.	RT 100 U	10
4045	121	Guhring std.	Ⓢ	Ratio drills with oil feed, 7 x D	solid carb.	RT 100 U	10
4107	140	Guhring std.	Ⓢ	Tool holders for inter. inserts HT 800 WP 3 x D		HT 800 WP	13
4108	140	Guhring std.	Ⓢ	Tool holders for inter. inserts HT 800 WP 5 x D		HT 800 WP	14
4109	140	Guhring std.	Ⓢ	Tool holders for inter. inserts HT 800 WP 7 x D		HT 800 WP	15
4112	141	Guhring std.	Ⓢ	Interchangeable inserts "steel" HT 800 WP	solid carb.	HT 800 WP	13-15
4113	141	Guhring std.	Ⓢ	Interchangeable inserts "cast" HT 800 WP	solid carb.	HT 800 WP	13-15
4114	141	Guhring std.	○	Interchangeable inserts "alu" HT 800 WP	solid carb.	HT 800 WP	13-15
5242	140	Guhring std.	Ⓢ	Tool holders for inter. inserts RT 800 3 x D	solid carb.	RT 800 WP	18
5243	140	Guhring std.	Ⓢ	Tool holders for inter. inserts RT 800 5 x D	solid carb.	RT 800 WP	18
5248	140	Guhring std.	Ⓢ	Tool holders for inter. inserts RT 800 7 x D	solid carb.	RT 800 WP	18
5510	155	DIN 6537 K	Ⓢ	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 U	6
5511	155	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 U	8
5512	155	Guhring std.	Ⓢ	Ratio drills with oil feed, 7 x D	solid carb.	RT 100 U	10
5513	155	Guhring std.	Ⓢ	Ratio drills with oil feed, 10 x D	solid carb.	RT 150 GG	10
5514	155	DIN 6537 K	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
5515	155	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
5516	155	DIN 6539	○	Stub drills, 3 x D	solid carb.	N	22
5517	155	Guhring std.	○	Standard length twist drills kurz, 5 x D	solid carb.	N	26
5518	155	DIN 6537 L	Ⓢ	3-flute Ratio drills, 5 x D	solid carb.	FT 200	12
5519	159	DIN 338	Ⓢ	Standard length twist drills kurz, 5 x D	HSCO	GU 500 DZ	26
5520	159	DIN 1897	Ⓢ	Stub drills, 3 x D	HSCO	GU 500 DZ	21
5521	159	DIN 1897	Ⓢ	Stub drills, 3 x D	HSS-E-PM	GT 500 DZ	21
5522	159	DIN 338	Ⓢ	Standard length twist drills kurz, 5 x D	HSS-E-PM	GT 500 DZ	26
5523	159	DIN 338	Ⓢ	Standard length twist drills kurz, 5 x D	HSCO	GU 500 DZ	26
5524	159	DIN 1897	Ⓢ	Stub drills, 3 x D	HSCO	GU 500 DZ	21
5525	155	Guhring std.	Ⓢ	Ratio drills with oil feed, 12 x D	solid carb.	RT 100	11
5610	155	DIN 6537 K	Ⓢ	Ratio drills with oil feed, 3 x D	solid carb.	RT 100 U	6
5611	155	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 U	8
5612	155	Guhring std.	Ⓢ	Ratio drills with oil feed, 7 x D	solid carb.	RT 100 U	10
5614	155	DIN 6537 K	Ⓢ	Ratio drills without oil feed, 3 x D	solid carb.	RT 100 U	7
5615	155	DIN 6537 L	Ⓢ	Ratio drills without oil feed, 5 x D	solid carb.	RT 100 U	9
6068	121	Guhring std.	○	Ratio drills with oil feed, 4 x D	solid carb.	RT 150 GG	7
6069	121	Guhring std.	○	Ratio drills with oil feed, 7 x D	solid carb.	RT 150 GG	10
6070	121	Guhring std.	○	Ratio drills with oil feed, 10 x D	solid carb.	RT 150 GG	10
6400	164	Guhring std.	Ⓢ	Micro-precision drills without oil feed, 4 x D	solid carb.	N	33
6401	164	Guhring std.	Ⓢ	Micro-precision drills without oil feed, 7 x D	solid carb.	N	33
6408	164	Guhring std.	Ⓢ	Micro-precision drills with oil feed, 8 x D	solid carb.	N	33
6412	164	Guhring std.	Ⓢ	Micro-precision drills with oil feed, 15 x D	solid carb.	N	33
6501	165	DIN 6537 L	Ⓢ	Ratio drills with oil feed, 5 x D	solid carb.	RT 100 R	8
6502	165	Guhring std.	Ⓢ	Ratio drills with oil feed, 7 x D	solid carb.	RT 100 R	10
6511	165	Guhring std.	Ⓢ	Ratio drills with oil feed, 20 x D	solid carb.	RT 100 T	11
6512	165	Guhring std.	Ⓢ	Ratio drills with oil feed, 25 x D	solid carb.	RT 100 T	11
6513	165	Guhring std.	Ⓢ	Ratio drills with oil feed, 30 x D	solid carb.	RT 100 T	11
6514	165	Guhring std.	Ⓢ	Ratio drills with oil feed, 40 x D	solid carb.	RT 100 T	11
		Guhring std.		LT 800 WP tooling system, ≤ 3 x D		LT 800 WP	19
		Guhring std.		LT 800 WP tooling system, ≤ 6 x D		LT 800 WP	19
		Guhring std.		LT 800 WP tooling system, ≤ 9 x D		LT 800 WP	19
		Guhring std.		LT 800 WP tooling system, ≤ 12 x D		LT 800 WP	19

Tools with bold feed column no. are preferred choice.

Pilot holes are always necessary for drilling depths over 7 x D:

1. The pilot hole can be produced with a short, rigid drill. The diameter should be 0.01 - 0.02 mm larger than the diameter of the Ratio drill. Drilling depth $\geq 1 \times D$.
2. Alternatively, the Ratio Drills can produce their own pilot hole. Cutting speed and feed rate must therefore be reduced by 30-40%.
3. A coolant pressure of 40 bar is recommended.

For safety reasons it is very important, that a drill does not exceed a speed of $n = 6\,000$ rev/min when not supported. The centrifugal forces could break these long tools before reaching the workpiece surface!

Drill Ø mm	Feed column no.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
0.50	0.004	0.006	0.007	0.008	0.010	0.012	0.014	0.016	0.019
1.00	0.006	0.008	0.012	0.014	0.016	0.018	0.020	0.023	0.025
2.00	0.020	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125
2.50	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160
3.15	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200
4.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
5.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
6.30	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315
8.00	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.315
10.00	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
12.50	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500
16.00	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630
20.00	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.630
25.00	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	0.800
31.50	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000
40.00	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000	1.250
50.00	0.250	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.250
63.00	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600
80.00	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600	2.000

Cooling:
☒ without coolant ducts
☐ with coolant ducts

Coolant:
☐ Air
☒ Neat oil
☐ Soluble oil

Cutting direction:
☒ right-hand cutting
☐ left-hand cutting

Material group	Material examples, new description (old description in brackets) <i>Figures in bold = material no. to DIN EN</i>	Tensile str. MPa (N/mm ²)	Hard- ness	Cool- ant
Common structural steels	1.0035 S185(S133), 1.0486 P275N(S1E285), 1.0345 P235GH(H1), 1.0425 P265GH(H2) 1.0050 E295 (S150-2), 1.0070 E360 (S170-2), 1.8937 P500NH (WStE500)	≤500 >500-850		●●
Free-cutting steels	1.0718 11SMnPB30 (9SMnPB28), 1.0736 11SMn37 (9SMn36) 1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤850 850-1000		●●
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30) 1.0503 C45, 1.1191 C45E (Ck45) 1.0601 C60, 1.1221 C60E (Ck60)	≤ 700 700-850 850-1000		●●●
Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4 1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	850-≤1000 1000-1200		●●
Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤750		●●
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850-≤1000 1000-1200		●●
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850-≤1000 >1000-1200		●●
Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9 1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767 X45NiCrMo4	≤850 >850-1000		●●
High speed steels	1.3243 S 6-5-2, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥850-1000		●●
Spring steels	1.5026 55Si7, 1.1716 55Cr3, 1.8159 51CrV4 (51CrV4)		≤330 HB	●●
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305 X8CrNiS18-9 1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi 17-12-2 (V4A) 1.4057 X20CrNi 17 2 (X17CrNi16-2), 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18-2	≤850 ≤850 ≤850		●●●
Hardened steels	-	≤40-48 HRC ≥48-60 HRC		●●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		●●
Cast iron	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	≤240 HB ≤300 HB		●●●
New cast materials CGI	EN-GJV250 (GGV25), EN-GJV350 (GGV35) EN-GJV400 (GGV40), EN-GJV500 (GGV50), SiMo 6	≤220 HB ≤300 HB		●●●
New cast materials ADI	EN-GJS-900-8 (ADI800), EN-GJS-1000-5 (ADI1000) EN-GJS-1200-2 (ADI1200), EN-GJS-1400-1 (ADI1400)	800-1000 1200-1400		●●●
Spheroidal graphite iron and malleable cast iron	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	≤240 HB ≤300 HB		●●
Chilled cast iron	-	≤350 HB		●●
Ti and Ti-alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2 3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2.5, - TiAl8Mo1V1	≤850 ≥850-1200		●●
Aluminium and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		●●
Al wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤450		●●
Al cast alloys ≤ 10 % Si > 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9 3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600 ≤600		●●
Magnesium alloys	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5812.05 G-MgAl6Zn1	≤450		●●
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPB	≤400		●●
Brass, short-chipping long-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2 2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600 ≤600		●●
Bronze, short-chipping	2.1090 CuSn7ZnPB, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600 >600-850		●●●
Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤850 ≥850-1000		●●

Ratio Drills

 $\leq 3 \times D$ drilling depth 2-fluted

Tool material Carb. head
Carbide grade P
Type RT 80 U
Surface finish S
Cooling

Carbide
K
RT 100 G
○
⊗

Carbide
K/P RT 100 F
K/P RT 100 U
S S S S S S S
1660 1180 2468 1661 2477/5510 1181 2469/5610

Guh. no. DIN 6537 HA R
DIN 6538 HE R 1171
DIN 6539 DZ R

1798







V. m/min	Feed col. no.
95	6
80	5
95	7
75	6
80	6
75	6
70	6
75	6
60	5
90	7
75	6
60	5
75	6
60	5
45	5
35	5
40	4
40	2
35	2
35	2
150	7
110	7
110	7
90	6
200	8
200	8
170	8
140	7
80	5
180	6
80	5
60	4

V. m/min	Feed col. no.
130	6
100	6
100	6
80	6
25	2
220	7
220	7
200	8
150	6
180	6
80	5
180	6
80	5
60	4

S	E	Feed column no.							
110	145	6	6	7	6	7	6	7	7
90	120	5	5	6	5	6	5	6	6
130	170	7	7	8	7	8	7	8	8
110	145	7	7	8	7	8	7	8	8
100	130	7	7	8	7	8	7	8	8
95	125	6	6	7	6	7	6	7	7
90	120	6	6	7	6	7	6	7	7
90	120	6	6	7	6	7	6	7	7
110	145	7	7	8	7	8	7	8	8
90	120	6	6	7	6	7	6	7	7
80	105	6	6	7	6	7	6	7	7
110	145	7	7	8	7	8	7	8	8
90	120	6	6	7	6	7	6	7	7
65	85	4	4	5	4	5	4	5	5
85	110	6	6	7	6	7	6	7	7
80	105	4	4	5	5	5	5	5	5
60	80	5	5	6	5	6	5	6	6
50	65	4	4	5	4	5	4	5	5
45	60	3	3	4					
45	60	2	2	3	2	3	2	3	3
45	60	4	4	5	4	5	4	5	5
40	55	4	4	5	4	5	4	5	5
35	45	4	4	5	4	5	4	5	5
40	55	2	2	3	2	3	2	3	3
25	35	1	1	2	1	2	1	2	2
25	35	3	3	4	3	4	3	4	4
160	195	8	8	9	8	9	8	9	9
120	160	8	8	9	8	9	8	9	9
100	140	8	8	9	8	9	8	9	9
95	130	7	7	8	7	8	7	8	8
30	40	2	2	3	2	3	2	3	3
35	45	3	3	4	3	4	3	4	4
30	40	2	2	3	2	3	2	3	3
240	310	8	8	9	8	9	8	9	9
240	310	8	8	9	8	9	8	9	9
220	260	8	8	9	8	9	8	9	9
170	220	8	8	9	8	9	8	9	9
230	280	7	7	8	7	8	7	8	8
95	125	6	6	7	6	7	6	7	7
250	325	7	7	8	7	8	7	8	8
170	220	6	6	7	6	7	6	7	7
95	125	6	6	7	6	7	6	7	7
80	105	5	5	6	5	6	5	6	6
70	90	5	5	6	5	6	5	6	6
60	80	5	5	6	5	6	5	6	6

$\leq 4 \times D$

Carbide	
K	
RT 150 GG	
	
	
768	6068

Vc m/min	Feed column no.	
120	7	7
100	7	7
90	7	7
80	7	7
40	2	2
410	9	7
410	9	7
380	9	7
330	9	7
280	9	9
110	6	6
80	5	5

Ratio Drills

≤5xD drilling depth **2-fluted**

Tool material	Carb. tipped
Carbide grade	P
Type	RT 80 U
Surface finish	S
Cooling	
Guh. no.	DIN 6537 HA R
	HE R
DIN 6538 HE R	1172
G.S.	DZ R

Carbide	K/P
	RT 100 R
	F
	6501

Carbide				Carbide			
K/P				K/P			
RT 100 F				RT 100 U			
S	R	S	R	S	R	S	R
1662	2478	1182	2470	1663	2479/5511	1183	2471/5611



Material chart page 5

Vc m/min	Feed col. no.
95	5
80	4
95	6
75	5
80	5
80	5
75	5
75	5
55	4
90	6
75	5
55	4
70	5
55	4
40	4
35	4
40	3
40	2
35	2
35	2
150	6
110	6
110	6
90	5
200	7
200	7
170	7
140	6

Vc m/min	Feed col. no.
210	9
160	9
130	8
100	8
80	8
60	8
160	8
130	8

S	R	Feed column no.											
110	145	6	7	6	7	6	7	6	7	6	7	6	7
90	120	5	6	5	6	5	6	5	6	5	6	5	6
130	170	7	8	7	8	7	8	7	8	7	8	7	8
110	145	7	8	7	8	7	8	7	8	7	8	7	8
100	130	7	8	7	8	7	8	7	8	7	8	7	8
95	125	6	7	6	7	6	7	6	7	6	7	6	7
90	120	6	7	6	7	6	7	6	7	6	7	6	7
90	120	6	7	6	7	6	7	6	7	6	7	6	7
80	105	6	7	6	7	6	7	6	7	6	7	6	7
110	145	7	8	7	8	7	8	7	8	7	8	7	8
90	120	6	7	6	7	6	7	6	7	6	7	6	7
85	85	4	5	4	5	4	5	4	5	4	5	4	5
85	110	6	7	6	7	6	7	6	7	6	7	6	7
80	105	4	5	4	5	4	5	4	5	4	5	4	5
60	80	5	6	5	6	5	6	5	6	5	6	5	6
50	65	4	5	4	5	4	5	4	5	4	5	4	5
45	60	3	4	3	4	3	4	3	4	3	4	3	4
45	60	2	3	2	3	2	3	2	3	2	3	2	3
45	60	4	5	4	5	4	5	4	5	4	5	4	5
40	55	4	5	4	5	4	5	4	5	4	5	4	5
35	45	4	5	4	5	4	5	4	5	4	5	4	5
40	55	2	3	2	3	2	3	2	3	2	3	2	3
25	35	1	2	1	2	1	2	1	2	1	2	1	2
25	35	3	4	3	4	3	4	3	4	3	4	3	4
160	210	8	9	8	9	8	9	8	9	8	9	8	9
120	160	8	9	8	9	8	9	8	9	8	9	8	9
100	140	8	9	8	9	8	9	8	9	8	9	8	9
95	130	7	8	7	8	7	8	7	8	7	8	7	8
30	40	2	3	2	3	2	3	2	3	2	3	2	3
35	45	3	4	3	4	3	4	3	4	3	4	3	4
30	40	2	3	2	3	2	3	2	3	2	3	2	3
240	310	8	9	8	9	8	9	8	9	8	9	8	9
240	310	8	9	8	9	8	9	8	9	8	9	8	9
220	260	8	9	8	9	8	9	8	9	8	9	8	9
170	220	8	9	8	9	8	9	8	9	8	9	8	9
230	280	7	8	7	8	7	8	7	8	7	8	7	8
95	125	6	7	6	7	6	7	6	7	6	7	6	7
250	325	7	8	7	8	7	8	7	8	7	8	7	8
170	220	6	7	6	7	6	7	6	7	6	7	6	7
95	125	6	7	6	7	6	7	6	7	6	7	6	7
80	105	5	6	5	6	5	6	5	6	5	6	5	6
70	90	5	6	5	6	5	6	5	6	5	6	5	6
60	80	5	6	5	6	5	6	5	6	5	6	5	6

○ bright

● steam tempered

● nitrided lands

● nitrided

● golden brown

A TiAlN



$\leq 5 \times D$ drilling depth 2-fluted

Tool material		Carbide							Carbide	
Carbide grade		K/P							K	
Type		RT 100 F							RT 100 G	
Surface finish										
Cooling										
Guh. no.	DIN 6537	HA	HE	G.S.	HA	HE	G.S.	HA	HE	G.S.
	HA	HE	G.S.	HA	HE	G.S.	HA	HE	G.S.	HA
	HA	HE	G.S.	HA	HE	G.S.	HA	HE	G.S.	HA
		2712			2717	2996/5515		2718	2719/5615	
			1243	2474						1799
		Feed column no.								
V _c m/min	V _c m/min								V _c m/min	Feed col. no.
100	130	7	6	7	6	7	6	7		
85	110	6	5	6	5	6	5	6		
110	145	8	7	8	7	8	7	8		
85	110	7	6	7	6	7	6	7		
90	120	7	6	7	6	7	6	7		
85	110	7	6	7	6	7	6	7		
80	105	7	6	7	6	7	6	7		
80	105	7	6	7	6	7	6	7		
75	100	6	5	6	5	6	5	6		
100	130	8	7	8	7	8	7	8		
90	120	7	6	7	6	7	6	7		
65	85	5	4	5	4	5	4	5		
75	100	6	5	6	5	6	5	6		
70	90	5	4	5	4	5	4	5		
50	65	6	5	6	5	6	5	6		
40	55	5	4	5	4	5	4	5		
	55	4								
35	45	3	2	3	2	3	2	3		
40	55	4	3	4	3	4	3	4		
35	45	4	3	4	3	4	3	4		
35	45	3	2	3	2	3	2	3		
35	45	2	2	3	2	3	2	3		
20	25	2	1	2	1	2	1	2		
20	25	4	3	4	3	4	3	4		
160	195	8	7	8	7	8	7	8	130	6
120	155	8	7	8	7	8	7	8	100	6
120	145	7	6	7	6	7	6	7	100	6
95	125	7	6	7	6	7	6	7	80	6
25	35	3	2	3	2	3	2	3	25	2
30	40	3	3	4	3	4	3	4		
25	35	3	2	3	2	3	2	3		
200	260	9	8	9	8	9	8	9	220	7
200	260	9	8	9	8	9	8	9	220	7
170	220	9	8	8	8	8	8	8	200	8
140	170	8	7	8	7	8	7	8	150	6
200	260	8	7	8	7	8	7	8	180	6
80	105	7	6	7	6	7	6	7	80	5
210	270	8	7	8	7	8	7	8	180	6
140	180	7	6	7	6	7	6	7		
80	105	6	5	6	5	6	5	6	80	5
65	85	6	5	6	5	6	5	6	60	5
60	80	5	4	5	4	5	4	5	60	4
45	60	5	4	5	4	5	4	5	40	3

A AITN

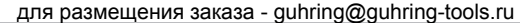
C TiCN

F FIRE

P AlCrN

S TiN

M MolyGlide































$\leq 7 \times D$ drilling depth 2-fluted

 $\leq 10 \times D$ Material chart page 5

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www.guhring-tools.ru



≤12×D ≤15×D 20×D 25×D 30×D 40×D

Tool material		Carbide		Carbide		Carbide		Carbide							
Carbide grade		K/P		K		K30/K40		K30/K40							
Type		RT 100		RT 150 GN		RT 100 T		RT 100 T							
Surface finish															
Cooling															
No.	G.S.	HA HE	 	5525	 	773	 	6511	 	6512	 	6513	 	6514	 
															

Ratio Drills

 $\leq 3 \times D$

Tool material		Carbide
Carbide grade		K
Type		GS 200 G
Surface finish		○
Cooling		☒
Guh. no	DIN 6537 HA	R
	DZ	R
	DZ	L
		745
		1020

 $\leq 5 \times D$ 3-fluted

Carbide						
K	K	K/P	K	K/P	K	K/P
GS 200 G	GS 200 G	GS 200 F	FT 200 G	FT 200 G	GS 200 U	GS 200 U
○	○	○	○	●	○	●
☒	☒	☒	☒	☒	☒	☒
			2713/5518	2939		
1024	1025	1027			731	611
					1021	



Material chart page 5

V _c m/min	Feed column no.
80	6
100	6
120	6
140	6
160	6
180	6
200	6
220	6
240	6
260	6
280	6
300	6
320	6
340	6
360	6
380	6
400	6
420	6
440	6
460	6
480	6
500	6
520	6
540	6
560	6
580	6
600	6
620	6
640	6
660	6
680	6
700	6
720	6
740	6
760	6
780	6
800	6
820	6
840	6
860	6
880	6
900	6
920	6
940	6
960	6
980	6
1000	6
1020	6
1040	6
1060	6
1080	6
1100	6
1120	6
1140	6
1160	6
1180	6
1200	6
1220	6
1240	6
1260	6
1280	6
1300	6
1320	6
1340	6
1360	6
1380	6
1400	6
1420	6
1440	6
1460	6
1480	6
1500	6
1520	6
1540	6
1560	6
1580	6
1600	6
1620	6
1640	6
1660	6
1680	6
1700	6
1720	6
1740	6
1760	6
1780	6
1800	6
1820	6
1840	6
1860	6
1880	6
1900	6
1920	6
1940	6
1960	6
1980	6
2000	6
2020	6
2040	6
2060	6
2080	6
2100	6
2120	6
2140	6
2160	6
2180	6
2200	6
2220	6
2240	6
2260	6
2280	6
2300	6
2320	6
2340	6
2360	6
2380	6
2400	6
2420	6
2440	6
2460	6
2480	6
2500	6
2520	6
2540	6
2560	6
2580	6
2600	6
2620	6
2640	6
2660	6
2680	6
2700	6
2720	6
2740	6
2760	6
2780	6
2800	6
2820	6
2840	6
2860	6
2880	6
2900	6
2920	6
2940	6
2960	6
2980	6
3000	6
3020	6
3040	6
3060	6
3080	6
3100	6
3120	6
3140	6
3160	6
3180	6
3200	6
3220	6
3240	6
3260	6
3280	6
3300	6
3320	6
3340	6
3360	6
3380	6
3400	6
3420	6
3440	6
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3480	6
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3520	6
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3600	6
3620	6
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3680	6
3700	6
3720	6
3740	6
3760	6
3780	6
3800	6
3820	6
3840	6
3860	6
3880	6
3900	6
3920	6
3940	6
3960	6
3980	6
4000	6
4020	6
4040	6
4060	6
4080	6
4100	6
4120	6
4140	6
4160	6
4180	6
4200	6
4220	6
4240	6
4260	6
4280	6
4300	6
4320	6
4340	6
4360	6
4380	6
4400	6
4420	6
4440	6
4460	6
4480	6
4500	6
4520	6
4540	6
4560	6
4580	6
4600	6
4620	6
4640	6
4660	6
4680	6
4700	6
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4740	6
4760	6
4780	6
4800	6
4820	6
4840	6
4860	6
4880	6
4900	6
4920	6
4940	6
4960	6
4980	6
5000	6
5020	6
5040	6
5060	6
5080	6
5100	6
5120	6
5140	6
5160	6
5180	6
5200	6
5220	6
5240	6
5260	6
5280	6
5300	6
5320	6
5340	6
5360	6
5380	6
5400	6
5420	6
5440	6
5460	6
5480	6
5500	6
5520	6
5540	6
5560	6
5580	6
5600	6
5620	6
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5680	6
5700	6
5720	6
5740	6
5760	6
5780	6
5800	6
5820	6
5840	6
5860	6
5880	6
5900	6
5920	6
5940	6
5960	6
5980	6
6000	6
6020	6
6040	6
6060	6
6080	6
6100	6
6120	6
6140	6
6160	6
6180	6
6200	6
6220	6
6240	6
6260	6
6280	6
6300	6
6320	6
6340	6
6360	6
6380	6
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6420	6
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6680	6
6700	6
6720	6
6740	6
6760	6
6780	6
6800	6
6820	6
6840	6
6860	6
6880	6
6900	6
6920	6
6940	6
6960	6
6980	6
7000	6
7020	6
7040	6
7060	6
7080	6
7100	6
7120	6
7140	6
7160	6
7180	6
7200	6
7220	6
7240	6
7260	6
7280	6
7300	6
7320	6
7340	6
7360	6
7380	6
7400	6
7420	6
7440	6
7460	6
7480	6
7500	6
7520	6
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7600	6
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7780	6
7800	6
7820	6
7840	6
7860	6
7880	6
7900	6
7920	6
7940	6
7960	6
7980	6
8000	6
8020	6
8040	6
8060	6
8080	6
8100	6
8120	6
8140	6
8160	6
8180	6
8200	6
8220	6
8240	6
8260	6
8280	6
8300	6
8320	6
8340	6
8360	6
8380	6
8400	6
8420	6
8440	6
8460	6
8480	6
8500	6
8520	6
8540	6
8560	6
8580	6
8600	6
8620	6
8640	6
8660	6
8680	6
8700	6
8720	6
8740	6
8760	6
8780	6
8800	6
8820	6
8840	6
8860	6
8880	6
8900	6
8920	6
8940	6
8960	6
8980	6
9000	6
9020	6
9040	6
9060	6
9080	6
9100	6
9120	6
9140	6
9160	6
9180	6
9200	6
9220	6
9240	6
9260	6
9280	6
9300	6
9320	6
9340	6
9360	6
9380	6
9400	6
9420	6
9440	6
9460	6
9480	6
9500	6
9520	6
9540	6
9560	6
9580	6
9600	6
9620	6
9640	6
9660	6
9680	6
9700	6
9720	6
9740	6
9760	6
9780	6
9800	6
9820	6
9840	6
9860	6
9880	6
9900	6
9920	6
9940	6
9960	6
9980	6
10000	6

○	●	●	Feed column no.					
V _c m/min	V _c m/min	V _c m/min						
80	100				5			5
65	85				4			4
90	110				6			6
75	95				5			5
70	90				5			5
65	85				5			5
60	80				5			5
60	80				5			5
50	70				4			4
80	100				6			6
60	80				5			5
50	70				4			4
55	75				4			4
50	70				4			4
45	50				4			4
35	40				4			4
30	35				3			3
100	140	145	6	6	6	6	7	6
80	100	105	6	6	6	6	7	6
80	100	105	6	6	6	6	7	6
70	90	95	6	6	6	6	7	6
180	200	230		7	7	7	8	7
160	180	200		7	7	7	8	7
150	170	190	7	7	7	7	8	7
120	140	155	6	6	6	6	7	6
180	200	215	6	6	6	6	7	6
		250				4		
180	210	220	6	6	6	6	7	6



$\leq 5 \times D$ Drilling depth

Tool holders $\leq 3 \times D$ Guhring no. 4108



Guhring no.
Tool material
Carbide grade
Surface finish

especially for
machining of

4112

Carbide

K/P

steel



Guhring no.
Tool material
Carbide grade
Surface finish

especially for
machining of

4113

Carbide

K/P

cast materials



Guhring no.
Tool material
Carbide grade
Surface finish

especially for
machining of

4114

Carbide

K

aluminium
and Al-alloys



Material chart page 5

V_c m/min	Feed column no.	V_c m/min	Feed column no.	V_c m/min	Feed column no.
125	6				
105	5				
125	7				
105	6				
125	6				
120	6				
105	5				
105	6				
85	5				
125	7				
105	6				
70	4				
105	5				
70	4				
55	5				
50	4				
55	3				
50	2				
55	3				
40	3				
35	3				
25	2				
25	2				
		100	6		
		90	6		
		80	5		
		80	5		
		80	5		
		80	5		
		120	7		
		100	6		
		90	6		
40	3				
35	2				
				180	7
				180	7
				140	7
				110	7
				180	7
				70	6
				180	7
				120	6
				70	6
				50	6
				45	6
				35	5

 bright☐ steam tempered nitrided lands

● nitrided

 golden brown

A TiAlN

$\leq 7 \times D$ Drilling depth

Tool holders $\leq 3 \times D$ Guhring no. 4109



Guhring no.
Tool material
Carbide grade
Surface finish

especially for
machining of

steep



Guhring no.
Tool material
Carbide grade
Surface finish

especially for
machining of



Guhring no.
Tool material
Carbide grade
Surface finish

especially for
machining of

[illegible][illegible][illegible]

A AlTiN

© TiCN

F FIRE

P AlCrN

S TiN

M MolyGlide

GUHRING

SPECIAL DRILLS

Although we probably offer the most comprehensive standard tool range, there are still applications that require special solutions. Customer specific special solutions are therefore also part of the Guhring program. Put us to the test with your special requirements – thanks to our know-how regarding geometries, tool materials and coatings we will surely convince you!

Drill Ø mm	Feed column no.								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
0.50	0.004	0.006	0.007	0.008	0.010	0.012	0.014	0.016	0.019
1.00	0.006	0.008	0.012	0.014	0.016	0.018	0.020	0.023	0.025
2.00	0.020	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125
2.50	0.025	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160
3.15	0.032	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.160
4.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.200
5.00	0.040	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250
6.30	0.050	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315
8.00	0.063	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.315
10.00	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.400
12.50	0.080	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500
16.00	0.100	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630
20.00	0.125	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.630
25.00	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	0.800
31.50	0.160	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000
40.00	0.200	0.250	0.315	0.400	0.500	0.630	0.800	1.000	1.250
50.00	0.250	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.250
63.00	0.315	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600
80.00	0.400	0.500	0.630	0.800	1.000	1.250	1.600	1.600	2.000

Cooling:
☒ without coolant ducts
☐ with coolant ducts




Coolant:
☐ Air
☒ Neat oil
☐ Soluble oil

Cutting direction:
☒ right-hand cutting
☐ left-hand cutting

Material group	Material examples, new description (old description in brackets) <i>Figures in bold = material no. to DIN EN</i>	Tensile str. MPa (N/mm²)	Hard- ness	Cool- ant
Common structural steels	1.0035 S185(ST33), 1.0486 P275N(STE285), 1.0345 P235GH(H1), 1.0425 P265GH(H2) 1.0050 E295 (St50-2), 1.0070 E360 (St70-2), 1.8937 P500NH (WStE500)	≤500 >500-850		●
Free-cutting steels	1.0718 11SMnPb30 (9SMnPb28), 1.0736 11SMn37 (9SMn36) 1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤850 850-1000		●
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30) 1.0503 C45, 1.1191 C45E (Ck45) 1.0601 C60, 1.1221 C60E (Ck60)	≤ 700 700-850 850-1000		●
Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4 1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	850 ≤1000 1000-1200		●
Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤750		●
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850 ≤1000 1000-1200		●
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850 ≤1000 >1000-1200		●
Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9 1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767 X45NiCrMo4	≤850 >850-1000		●
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥850-1000		●
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4 (51CrV4)		≤330 HB	●
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305 X8CrNiS18-9 1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi 17-12-2 (V4A) 1.4507 X20CrNi 17 2 (X17CrNi16-2), 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18-2	≤850 ≤850 ≤850		●
Hardened steels	-	≤40-48 HRC >48-60 HRC		●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		●
Cast iron	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	≤240 HB <300 HB		●
Spheroidal graphite iron and malleable cast iron	0.7050 EN-GJS-500-7(GG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GG70), 0.8170 EN-GJMB-700-2(GTS70)	≤240 HB <300 HB		●
Chilled cast iron	-	≤350 HB		●
Ti and Ti-alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2 3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2.5, -TiAl8Mo1V1	≤850 >850-1200		●
Aluminium and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		●
Al wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤450		●
Al cast alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600		●
> 10 % Si	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		●
Magnesium alloys	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05 G-MgAl6Zn1	≤450		●
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnNb	≤400		●
Brass, short-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤600		●
long-chipping	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600		●
Bronze, short-chipping	2.1090 CuSn7ZnNb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600 >600-850		●
long-chipping	2.0790 CuNi18Zn19Pb	≤850 >850-1000		●
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		●
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-		●
Kevlar	Kevlar	-		●
Glass, carbon concentrated plast.	GRT/CRP	-		●

Interchangeable inserts

Tool material
Carbide grade
Surface finish
Guhring no.

Carbide		
K	K/P	K/P
○	Ⓢ	●
2747	1047	2485
		
cast iron, aluminium and Al-alloys		general steels

especially for machining of

- for through holes supporting lands must remain in permanent contact.
- for 7 x D, centering is recommended with similar point angle of 140°, or larger, to min. 2/3 cutting edge diameter.
- interrupted cutting (grooves, transverse holes) is not recommended without prior tests. For interrupted cutting (max. 0.2xD) it is recommended to reduce the feed rate whenever possible.
- in contrast to conventional indexable inserts, RT 800 is also suitable for the drilling of stacked sheets.
- when replacing the inserts, it is recommended to also replace the original clamping screw with the included polyamide coated screw.

Tool holder

≤ 3xD

Cooling Guh. no.		5242	
with interchangeable inserts:			
○	Ⓢ	●	
V _c m/min		Feed col. no.	
100	130	6	
85	110	5	
100	130	7	
85	110	6	
100	130	6	
95	125	6	
85	110	5	
85	110	6	
70	90	5	
100	130	7	
85	110	6	
55	70	4	
80	105	5	
55	70	4	
40	55	5	
35	50	4	
40	55	3	
35	50	2	
40	55	3	
30	40	3	
25	35	3	
20	25	2	
20	25	2	
100	160	210	7
80	120	155	7
80	120	155	7
70	100	130	6
10	25	35	2
30	40	3	
25	35	2	
200	220	290	7
180	200	260	7
150	180	235	7
120	150	195	7
180	200	260	7
70	80	105	6
180	210	270	7
120	140	180	6
70	80	105	6
50	65	85	6
45	50	65	6
35	40	55	5
50	80	105	5
50	80	105	5
50	80	105	5
50	80	105	5



≤ 5xD

Cooling Guh. no.		5243	
with interchangeable inserts:			
○	Ⓢ	●	
V _c m/min		Feed col. no.	
95	125	6	
80	105	5	
95	125	7	
80	105	6	
95	125	6	
90	120	6	
80	105	5	
80	105	6	
65	85	5	
95	125	7	
80	105	6	
55	70	4	
80	105	5	
55	70	4	
40	55	5	
35	50	4	
40	55	3	
35	50	2	
40	55	3	
30	40	3	
25	35	3	
20	25	2	
20	25	2	
90	150	195	7
70	110	145	7
70	110	145	7
60	90	120	6
10	25	35	2
30	40	3	
25	35	2	
180	200	260	7
180	200	260	7
140	170	220	7
110	140	180	7
180	200	260	7
70	80	105	6
180	210	270	7
120	140	180	6
70	80	105	6
50	65	85	6
45	50	65	6
35	40	55	5
50	80	105	5
50	80	105	5
50	80	105	5
50	80	105	5



≤ 7xD

Cooling Guh. no.		5248	
with interchangeable inserts:			
○	Ⓢ	●	
V _c m/min		Feed col. no.	
90	120	5	
80	105	4	
90	120	6	
80	105	5	
90	120	5	
85	110	5	
75	100	4	
75	100	5	
65	85	4	
90	120	6	
75	100	5	
55	70	4	
80	105	4	
55	70	3	
40	55	4	
35	50	3	
40	55	2	
35	50	2	
40	55	2	
30	40	2	
25	35	2	
20	25	1	
20	25	1	
90	150	195	6
70	110	145	6
70	110	145	6
60	90	120	5
10	25	35	2
30	40	2	
25	35	1	
180	200	260	6
180	200	260	6
140	170	220	6
110	140	180	6
180	200	260	6
70	80	105	5
180	210	270	6
120	140	180	5
70	80	105	5
50	65	85	5
45	50	65	5
35	40	55	4
50	80	105	4
50	80	105	4
50	80	105	4
50	80	105	4



○ bright ● steam tempered ● nitrided lands ● nitrided ● golden brown ● TiAIN

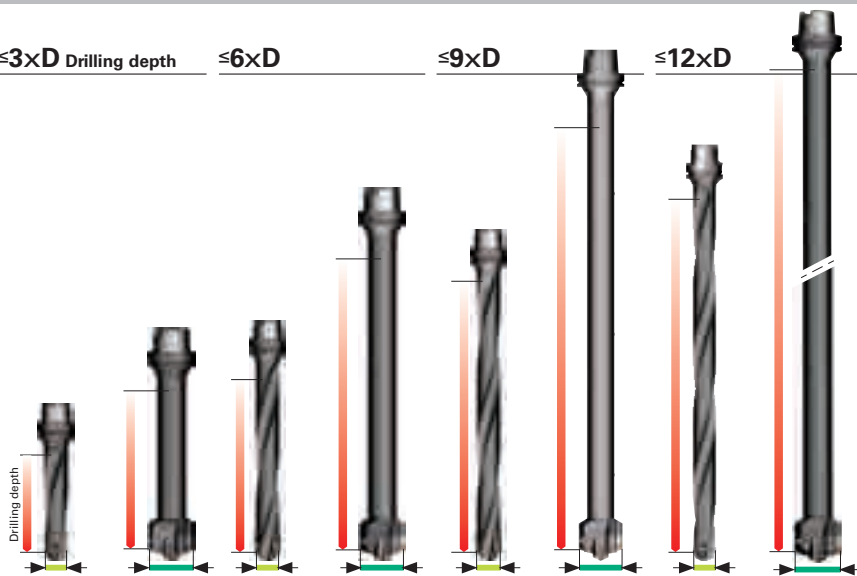


≤3xD Drilling depth

≤6xD

≤9xD

≤12xD



Insert material

Carbide grade

Holder size

Ø range mm

Carbide

depending on insert

400...560

600...950

Carbide

depending on insert

400...560

600...950

Carbide

depending on insert

400...560

600...950

Carbide

depending on insert

400...560

600...950

Feed rate f(mm/rev)	V _c m/min	V _c m/min	V _c m/min	V _c m/min	V _c m/min	V _c m/min	V _c m/min	V _c m/min	V _c m/min
0.20...0.40	110...150	130...180	100...130	120...155	70...120	85...145	60...110	70...130	
0.20...0.40	100...130	120...155	90...120	110...145	70...110	85...130	60...110	70...130	
0.20...0.40	110...150	130...180	100...130	120...155	70...120	85...145	60...120	70...145	
0.15...0.30	100...130	120...160	90...120	110...145	70...110	85...130	60...110	70...130	
0.20...0.40	100...130	120...155	90...120	110...145	80...110	100...130	70...100	85...120	
0.20...0.40	90...120	110...145	80...110	100...130	70...100	85...120	60...90	70...110	
0.15...0.35	80...110	100...130	70...100	85...120	60...90	70...110	55...80	65...100	
0.20...0.40	80...110	100...130	70...100	85...120	60...90	70...110	55...80	65...100	
0.15...0.35	70...100	85...120	65...90	80...110	60...80	70...100	55...75	65...90	
0.20...0.40	90...120	110...145	80...110	100...130	70...100	85...120	60...90	70...110	
0.20...0.40	80...110	100...130	70...100	85...120	60...90	70...110	55...80	65...100	
0.15...0.35	70...100	85...120	65...90	80...110	60...80	70...100	55...75	65...90	
0.20...0.40	80...110	100...130	70...100	85...120	60...90	70...110	55...80	65...100	
0.15...0.35	70...100	85...120	65...90	80...110	60...80	70...100	55...75	65...90	
0.20...0.40	70...100	85...120	65...90	80...115	60...90	70...110	55...80	65...100	
0.15...0.35	70...90	85...110	65...90	80...110	60...80	70...100	55...75	65...90	
0.15...0.35	70...100	85...120	65...95	80...115	60...90	70...110	55...85	65...100	
0.15...0.35	60...90	70...110	55...85	65...100	50...90	55...100	45...75	55...90	
0.15...0.35	55...85	65...100	50...80	60...100	45...75	55...90	40...70	50...85	
0.30...0.60	120...200	145...240	110...180	130...220	100...160	120...190	90...150	110...180	
0.30...0.60	100...160	120...190	90...150	110...180	85...140	100...170	80...130	100...155	
0.30...0.60	100...160	120...190	90...150	110...180	85...140	100...170	80...130	100...155	
0.20...0.40	80...120	100...145	70...110	85...130	60...100	70...120	55...90	65...110	
0.30...0.60	200...300	240...360	180...280	220...340	160...260	190...310	140...240	170...290	
0.30...0.60	180...280	220...340	170...260	200...310	155...250	185...300	135...235	160...280	
0.30...0.60	160...240	190...290	150...230	180...280	140...220	170...260	130...210	155...250	
0.30...0.60	140...200	170...240	130...190	160...230	120...180	145...220	110...170	130...200	
0.30...0.60	120...200	145...240	110...180	130...220	100...160	120...190	90...150	110...180	
0.20...0.40	140...200	170...240	130...190	160...230	120...180	145...220	110...170	130...200	
0.15...0.35	140...200	170...240	130...190	160...230	120...180	145...220	110...170	130...200	
0.30...0.60	120...200	145...240	110...180	130...220	100...160	120...190	90...150	110...180	
0.20...0.40	140...200	170...240	130...190	160...230	120...180	145...220	110...170	130...200	
0.15...0.35	140...200	170...240	130...190	160...230	120...180	145...220	110...170	130...200	

A AITIN

C TiCN

F FIRE

P AlCrN

S TiN

M MolyGlide

Twist drills

 $\leq 3 \times D$ drilling depth

Tool material		HSS			
		N	H	W	GT 80
Guh. no.	Type				
	Surface finish				
	DIN 1897	223	224	225	552
		226	227	228	553
straight shank	[R]				
	[L]				
	[R]				
G.S.	[L]				
	[R]				
MT	[L]				
	[R]				

HSS	
N	N
653	2460
672	

HSC0		M42	
GV 120	VA	N	N
329	1261		1259
330			
		128	129
			136
363	1263		

HSC0
P2000
2048

Material chart page 17

V _c m/min	Feed column no.			
27	6			6
22	5			5
30	6			6
30	5			5
25	5			5
25	5			5
30	6			6
16	4			4
30	6			6
25	6			6
20	6			6
70		7		7
70		7		7
50	7*		7	7
50	6*			6
70	6*	6		6
60	5*		5	5
70		6		6
40	5*		5	5
30	4*	4		4
25	4*			4
15	4*			4
18	4	4		4
28	5*	5	5	5

S	F				
V _c m/min	V _c m/min	Feed col. no.			
30	32	6	5	7	6
24	26	5	5	6	6
33	36	6	7	5	6
33	36	5	5	6	6
28	31	5	6	5	6
28	31	5	6	5	6
25	28	4	4	5	5
22	24	4	4	5	5
33	36	6	7		
20	22	4	4	5	5
14	16	4	4	5	5
18	20	4	4	5	5
33	36	6	6	7	7
33	36	6	6	7	7
28	31	6	6	7	7
22	24	6	6	7	7
	85			8	8
	85			8	8
	60			8	7
	60			8	7
80	90	6	6		
65	70	5	6		
75	80	5	6		
45	50	5	6		
33	36	4	5		
27	30	4	5		
16	18	4	5		
15	18	4	5		
22	29	4	5		
36	47	5	6		

V _c m/min	Feed column no.			
35	5	5		5
30	5			5
40	5	5		5
40	5	5	5	5
40	5	5		5
40	5			5
40	5			5
35	4			4
20	4		4	4
16	3		3	3
36	6	6		6
20	4		4	3
15	3		3	3
16	4		4	3
12	3		3	3
15	4		4	3
12	3		3	3
15	3		3	3
8	2		2	2
18	4	4	4	3
14	3	3	3	3
16	3	3	3	3
4	1			1
8	1		1	1
35	6			5
30	6			5
30	6			5
30	6			5
25	6			5
10	3			3
10	2	2		2
6	2	2		2
90	7			7
90	7			7
80	7			7
70	6			6
70	6			6
40	5			5
60	5			5
40	5			5
35	4	4		4
30	4	4		4
20	4	4		4
15	4	4		4
20	4		4	4
30		4		4

V _c m/min	Feed col. no.
35	6
30	5
40	6
40	5
40	5
40	5
40	5
40	5
25	4
20	3
20	4
15	3
20	4
15	3
18	4
12	3
12	3
8	2
14	4
10	3
12	3
5	2
30	6
30	6
30	6
25	6
10	3
90	7
90	7
80	7
70	6
85	6
80	5
70	5
40	5
40	4
30	4
25	4
15	4
20	4
25	5

○ bright

● steam tempered

● nitrided lands

● nitrided

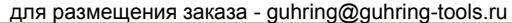
● golden brown

● TiAIN



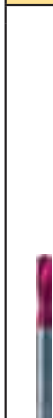
$\leq 3 \times D$ drilling depth

Tool material			HSCO			HSCO			HSCO			HSCO			HSS-E-PM			HSS-E-PM		
Type			GT 80			GV 120			GU 500 DZ			GU 500			GT 500 DZ			GT 500		
Surface finish			S P			S P S			O S			S			S			P		
DIN 1897			1228 2498			659 2461			5524 5520			512			5521			515		
G.S.			R			R			R			R			R			R		
G.S.			R			R			R			R			R			R		
Guh. no.			MT			663														
straight shank																				



$\leq 3 \times D$ drilling depth

Carbide
K
H
A
1946

[illegible]






A TiAIN

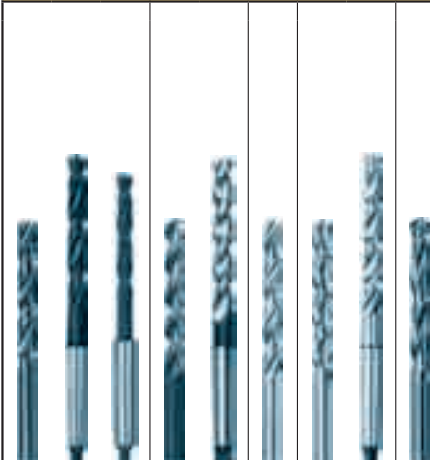
* Cutting lip corrected to appr. 10°



$\leq 5 \times D$ drilling depth

		HSS											
Tool material		N		N		H		W		GT 100			
Type		○		○		○		○		○			
Surface finish		○		○		○		○		○			
Guh. no.	Morse straight shank	DIN 338						206		207		549	
		G.S.						209		210		550	
		DIN 345				229 245		246		247		558	
		DIN 346				248		251					

HSCO					M42
	N	GT 100	Ti	VA	N
					
305		622	605	1260	1146
308			608		
345		645		1262	
351					

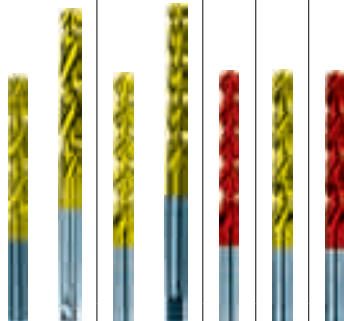


V _c m/min	Feed column no.				
35	5	5		5	5
30	5	5		5	5
40	5	5		5	5
40	5	5		5	5
35	4	4			5
20	4	4			4
16	3	3	3		3
36	6	6	6	6	6
20	4	4			3
15	3	3	3		3
16	4	4			3
12	3	3	3		3
15	4	4			3
12	3	3	3		3
15	3	3	3		3
8	2		2		2
18	4	4	4	4	3
14	3		3	3	
16	3	3	3	3	3
4					1
8			1		1
35	6	6			5
30	6	6			5
30	6	6			5
28	6	6			5
10	3	3	3		3
10			2	2	2
6			2	2	2
90				7	7
90				7	7
80		7		7	7
70		6		6	6
70				6	6
40	5*	5		5	5
60				5	5
40	5*	4		5	5
35	4*			4	4
33	4*			4	4
20	4*	4		4	4
15	4*	4		1	4
20	4	4			4
30				4	



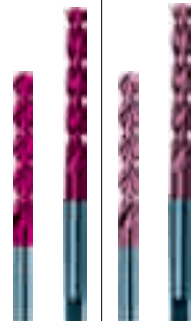
$\leq 5 \times D$ drilling depth

Tool material		HSCo				
		N	GT 100	Ti		
Surface finish		(S)	(S)	(P)	(S)	(P)
str.	DIN 338	2997	658	2459	657	2458
MT	DIN 345	R				
		661	662			



(S)	(P)	Feed column no.				
V _c m/min	V _c m/min					
38	42	6	6	6		
33	36	5	5	5		
44	48	5	5	6		
38	42	5	5	6		
44	48					
44	48	5	5	6		
38	42	4	4	5		
27	30	4	4	5	3	4
22	34	3	3	4		
44	48	4	4	6		
22	24	4	4	5		
18	20	3	3	4		
22	24	4	4	5		
18	20	3	3	4		
19	21	4	4	5		
14	16	3	3	4		
14	17	3	3	4	3	4
9	11	2	2	3	2	2
20	22	4	4	5	4	5
15	17	3		4	3	3
18	20		3	4	3	4
4	6			1		
6	7				2	2
40	45	6	6	7		
35	40	6	6	7		
33	36	6	6	7		
27	29	6	6	7		
12	14			4	3	3
11	12				2	2
7	8				2	2
	85			8		
	72			7		
88	96	5	5	6		
40	45	4				
22	25	4	4	5		
17	20	4	4	5	4	4
22	24	4	4	5		

HSCo	
GT 100	
(A)	(C)
1223	1221
1224	1222



V _c m/min	Feed column no.	
42		6
36		6
48		6
42	5	6
48		
48		
42		5
30		5
34		4
48		7
24		5
20		4
20		5
15		4
21		5
16		4
17		4
11		3
22		5
18		4
45	7	
40	7	
36	7	
29	7	
85	7	
96	6	
25	5	
20	5	
24	5	

HSCo
P2000
(O)
2047



V _c m/min	Feed col. no.
35	6
30	5
40	6
40	5
40	5
40	5
35	4
25	4
20	3
40	6
20	4
15	3
20	4
15	3
18	4
12	3
12	3
8	2
14	4
10	3
12	3
5	2
38	6
30	6
30	6
25	6
10	3
90	7
90	7
80	7
70	6
85	6
80	5
70	5
40	5
40	4
30	4
25	4
15	4
20	4
25	5

(A) AITIN

(C) TiCN

(P) FIRE

(P) AlCrN

(S) TiN

(M) MolyGlide























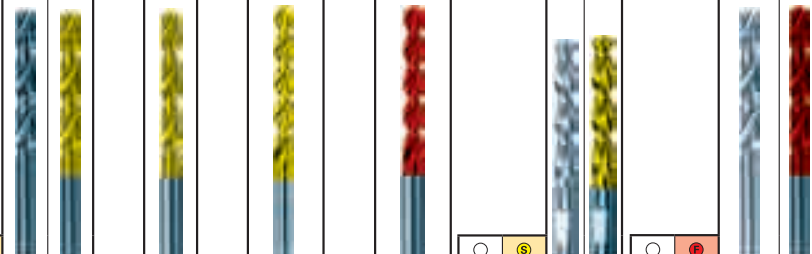








* Use bright finish drills or use drills with bright polished flutes.



guhring@guhring-tools.ru
www.guhring-tools.ru



Twist drills

 $\leq 5 \times D$ drilling depth

Guhr. no. str. shank	Tool material		HSCo		HSCo	HSS-E-PM	HSS-E-PM	HSSCo	Carbide			
	Type	GU 500 DZ	GU 500	GT 500 DZ	GT 500	GT 500	GT 80 IK	N				
	Surface finish	 					 	 				
	Internal cooling	 					 	 				
		5523 5519		5522		513	1131 1132	732/5517	2464			
												
Material chart page 17	 	Feed col. no.		 	Feed col. no.		 	Feed col. no.		 	Feed col. no.	
	Vc m/min	Vc m/min		Vc m/min	Vc m/min		Vc m/min	Vc m/min		Vc m/min	Vc m/min	
	35	45	6 6	38	6	40	6	48	60	7 7	100	5
	30	35	5 5	33	5	32	5	38	48	6 6	90	5
	40	50	6 6	44	6	45	6	48	60	7 7	100	6
	30	40	6 6	40	5	40	5	38	48	6 6	90	5
	32	42	6 6	44	6	42	6	48	60	6 6	100	5
	28	35	6 6	44	6	40	5	48	60	6 6	90	5
	20	22	5 5	40	5	28	4	45	50	5 5	80	5
	15	18	4 4	27	4	25	4	30	33	5 5	80	5
	13	15	3 3	22	3	20	3	25	31	4 4	100	6
	30	40	6 6	44	6	40	4	50	55	7 7	80	5
	16	20	4 4	22	4	22	4	25	31	5 5	65	5
	12	15	3 3	18	3	18	3	25	31	4 4	65	5
	15	18	4 4	22	4	20	4	25	30	5 5	65	4
	10	12	3 3	16	3	15	3	20	24	4 4		
	15	18	4 4	20	4	25	4	24	30	5 5		
	10	13	3 3	15	3	15	3	17	20	4 4		
	10	13	3 3	13	3	15	3	14	18	4 4		
	14	18	4 4	9	2	12	2	12	15	3 3	30	3
10	12	4 4	20	4	15	4	20	25	5 5	25	30	
12	15	4 4	16	4	10	3	14	18	4 4	25	30	
			18	4	12	3	16	20	4 4	25	30	
										20	25	
								4	5	3 3	3	

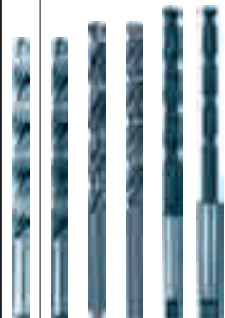
 bright steam tempered nitrided lands nitrided golden brown TiAlN



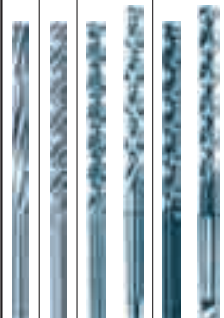
≤10×D

If flute length permits, DIN 338 and DIN 345
can also be applied for holes ≤ 10 x D.

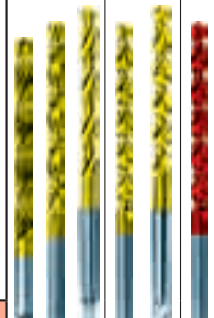
Tool material		HSS	
		N	N
Type		<input type="radio"/>	<input type="radio"/>
Surface finish		<input type="radio"/>	<input type="radio"/>
Internal cooling		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Guh. no.	straight shank	DIN 339 [R]	561 211
		DIN 340 [R]	204 217
		G.S. [R]	220
		DIN 341 [R]	257
		G.S. [R]	523



HSS		GT 50		GT 100	
		H	W	GT 50	GT 100
Type		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Surface finish		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Internal cooling		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Guh. no.	straight shank	218 219	501	535	506
		221		505	551



HSS		GT 100	
		N	GT 100
Type		<input checked="" type="radio"/>	<input checked="" type="radio"/>
Surface finish		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Internal cooling		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Guh. no.	straight shank	666	667 668 2462



V _c m/min	Feed column no.	
24	6	6
20	5	5
27	6	6
27	5	5
22	5	5
22	5	5
27	6	6
14	4	4
27	6	6
27	6	6
22	6	6
18	6	6
45	7	7*
45	6	6*
63	6	6*
54	5	5*
63	5	5*
36	4	4*
28	4	4*
22	4	4*
22	4	4*
14	4	4
22	5	5*

V _c m/min	Feed column no.	
24		6
20		5
27		6
27		5
22		5
22		5
27		6
14		4
27		6
27		6
22		6
18		6
65	7	7
65	7	7
45	7	7
45		7
63	6	6
54	5	5
63	6	5
36	4	5
28	4	4
22		4
14	4	4
22	5	5

S	P	Feed column no.	
28	30	6	7
22	24	5	6
30	33	6	7
30	33	5	6
25	28	5	6
25	28	5	6
22	24	4	5
18	23	4	5
30	33	6	7
14	18	4	5
12	15	4	5
16	19	4	5
10	13	3	4
30	33	6	7
30	33	6	7
24	26	6	7
20	22	6	7
50	55	7	8
50	55	6	7
70		6	
60	65	5	6
40	44	5	6
30		4	
25		4	
14	16	4	5
12	14	4	5
18	23	4	5
32	42	5	

A AITN

C TiCN

F FIRE

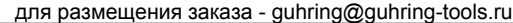
P AlCrN

S TiN

M MolyGlide

* Use bright finish drills or use drills
with bright polished flutes.

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$\leq 10 \times D$ drilling depth

If flute length permits,
DIN 338 and DIN 345
can also be applied for
holes $\leq 10 \times D$.

>10×D drilling depth







			Tool material		
			HSS		
			Type	GT 50	
			Surface finish		
			Internal cooling		
Guh. no.	straight shank	DIN 1869		235 1	524 6
				236 237 2 3	528 529 7 8
Guh. no.	MT	DIN 1870		266 267 4 5	525 542 9 10

Figure 1 displays a sequence of 10 grayscale images (labeled 1 to 10) showing the progression of a crack or defect in a material. The images are arranged in two rows of five. The top row (1-5) shows a crack growing from a central point on a dark background. The bottom row (6-10) shows a crack growing from a central point on a light background. The crack length increases from 1 to 10. Labels 'series 1', 'series 2', and 'series 3' are present above the top row. A label 'series 1' is also present above the bottom row.

A TiAlN

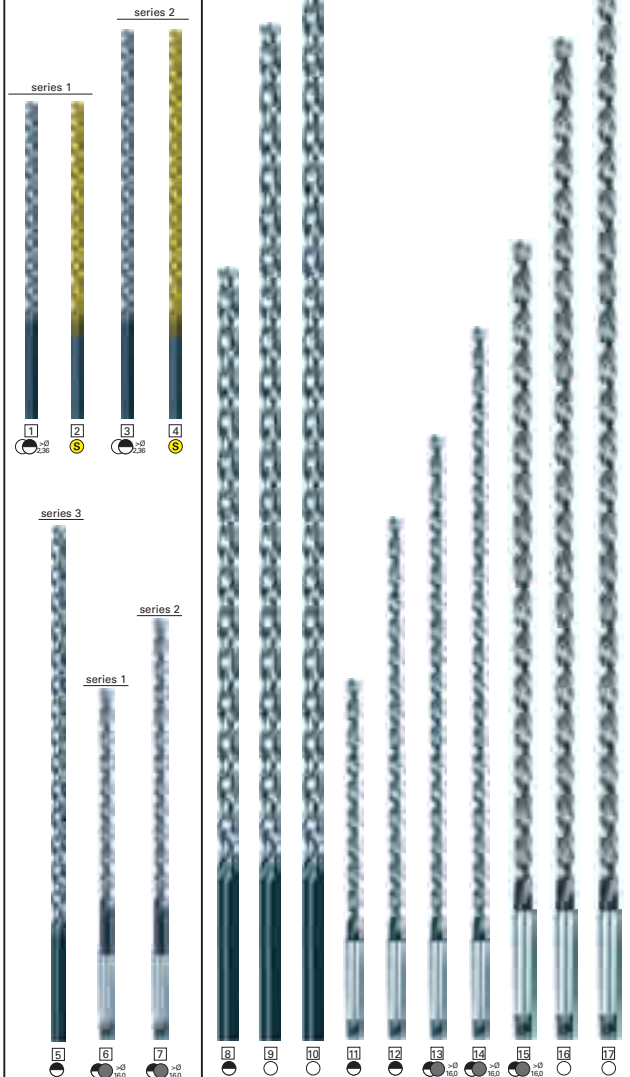
28 | GUHRING

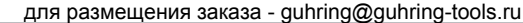
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>10xD drilling depth

Tool material		HSS	HSS
Type		GT 100	GT 100
Surface finish		5	5
Guh. no.	straight shank	DIN 1869	502
		1	670
		503 504	2
		3 5	671
Morse taper	G.S. R	242	
		8	
		243 244	
		9 10	
Guh. no.	Morse taper	DIN 1870	526, 527
		6 7	
		563 564	
		11 12	
Guh. no.	G.S. R	565 566	
		13 14	
		293	
		15	
Guh. no.	G.S. R	298 299	
		16 17	
Vc, m/min	Feed col. no.	22	5
		18	4
		22	5
		18	4
Vc, m/min	Feed col. no.	22	4
		18	4
		22	4
		16	3
Vc, m/min	Feed col. no.	22	5
		12	3
		6	2
		12	3
Vc, m/min	Feed col. no.	22	5
		18	5
		20	5
		14	5
Vc, m/min	Feed col. no.	70	6
		70	6
		55	6
		45	5
Vc, m/min	Feed col. no.	70	5
		28	4
		36	4
		28	3
Vc, m/min	Feed col. no.	22	3
		20	3
		18	3
		12	3
Vc, m/min	Feed col. no.	15	3
		22	4



 $\leq 10 \times D$

If flute length permits, DIN 338 and DIN 345 can also be applied for holes $\leq 10 \times D$.

Material chart page 17

A TiAlN

* Use bright finish drills or use drills with bright polished flutes.



>10xD

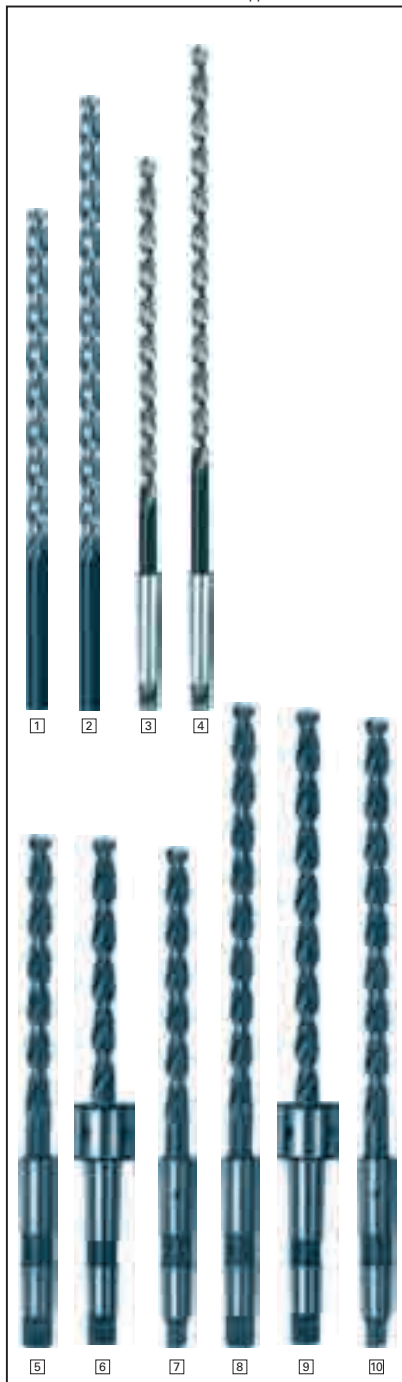
If flute length permits, DIN 338 and DIN 345
can also be applied for holes $\leq 10 \times D$.

Tool material		HSCO
Type		GT 100
Surface finish		≥ 0.160
Int. cooling		
Guh. no.	straight	DIN 1869 618, 619
	MT	G.S.
		DIN 1870 620, 621
		G.S.

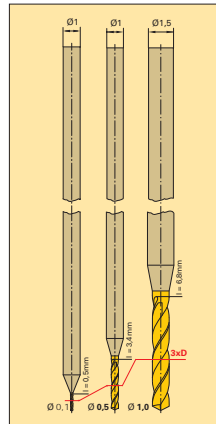
Tool material		HSCO
Type		GT 100
Surface finish		
Int. cooling		
Guh. no.	straight	
	MT	
		370, 371, 372

Tool material		HSCO
Type		GT 100
Surface finish		
Int. cooling		
Guh. no.	straight	
	MT	
		374, 375, 376

V_c m/min	Feed column no.	V_c m/min	Feed column no.	V_c m/min	Feed column no.
30	4	35	6	30	5
25	4	30	5	25	4
33	4	30	6	30	5
30	4	30	5	25	4
33	4	35	5	30	4
33	4	29	5	25	4
20	3	22	4	18	3
14	3	18	4	16	3
10	2	14	3	12	2
29	4	35	6	30	5
14	3	18	4	16	3
10	2	14	3	12	2
10	3	14	4	12	3
8	2	12	3	10	2
11	3	15	4	13	3
8	2	11	3	9	2
8	2	11	3	9	2
5	1	8	2	6	2
10	3	14	4	12	3
8	2	10	3	8	2
10	2	12	3	12	2
3	1	4	2	4	1
5	1	8	1	6	1
20	5	30	6	28	5
16	5	24	6	22	5
5	2	24	6	22	5
6	1	20	6	18	5
5	1	8	3	6	2
		10	2	8	2
		8	2	6	2
50	6				
40	5	60	7*	55	6*
		50	6*	44	5*
30	4				
45	4	38	5*	35	4*
30	4	55	5*	50	4*
25	4	36	5*	33	4*
20	4				
16	3	24	4*	22	4*
10	3	20	4*	18	4*
14	3	14	4*	12	4*
20	3	25	5*	25	4*



Micro-Precision Tools

Micro-precision drill geometry
to DIN 1899
Dimensions in mm

Attention!

Special tables with feed column
nos for micro-precision drills.

Drill Ø mm	Feed col. no. Guhring no. 6400/6401/6408/6412								
	60	61	62	63	64	65	66	67	68
	f (mm/rev.)								
0.80	0.04	0.05	0.06	0.07	0.08	0.08	0.08	0.09	0.09
1.00	0.06	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.12
1.50	0.09	0.10	0.12	0.13	0.15	0.15	0.16	0.17	0.18
2.00	0.12	0.14	0.16	0.18	0.20	0.21	0.22	0.23	0.24
2.50	0.15	0.17	0.20	0.22	0.25	0.26	0.27	0.28	0.30
3.00	0.18	0.21	0.24	0.27	0.30	0.31	0.33	0.34	0.36

Drill Ø mm	Feed column no. Guhring no. 301/303/660/701								
	1	2	3	4	5	6	7	8	9
	f (mm/rev.)								
0.10	0.002	0.003	0.003	0.004	0.006	0.007	0.010	0.013	0.016
0.16	0.002	0.003	0.004	0.005	0.007	0.009	0.012	0.016	0.022
0.25	0.003	0.004	0.005	0.007	0.009	0.011	0.014	0.019	0.024
0.30	0.004	0.005	0.007	0.009	0.011	0.015	0.019	0.025	0.033
0.50	0.005	0.007	0.008	0.011	0.014	0.019	0.024	0.031	0.041
0.63	0.007	0.009	0.012	0.015	0.020	0.026	0.034	0.044	0.057
0.80	0.010	0.013	0.016	0.020	0.024	0.031	0.038	0.048	0.060
1.00	0.020	0.024	0.029	0.035	0.041	0.050	0.060	0.072	0.086
1.50	0.030	0.035	0.040	0.046	0.052	0.060	0.069	0.080	0.092
2.00	0.040	0.046	0.053	0.061	0.070	0.080	0.093	0.106	0.122

Cooling:

- ☐ without coolant ducts
☒ with coolant ducts

Coolant:

- Air
● Neat oil
● Soluble oil

Cutting direction:

- ☒ right-hand cutting
☐ left-hand cutting

Material group	Material examples, new description (old description in brackets) <i>Figures in bold = material no. to DIN EN</i>	Tensile strength Hardness MPa (N/mm ²)	Cool- ant
Common structural steels	1.0035 S185(S133), 1.0486 P275N(SiE285), 1.0345 P235GH(H1), 1.0425 P265GH(H2) 1.0050 E295 (St50-2), 1.0070 E360 (St70-2), 1.8937 P500NH (WStE500)	≤500 >500-850	●
Free-cutting steels	1.0718 11SMnPb30 (9SMnPb28), 1.0736 11SMn37 (9SMn36) 1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤850 850-1000	●
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30) 1.0503 C45, 1.1191 C45E (Ck45) 1.0601 C60, 1.1221 C60E (Ck60)	≤ 700 700-850 850-1000	●
Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4 1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	850 ≤1000 1000-1200	●
Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤750	●
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850 ≤1000 1000-1200	●
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850 ≤1000 >1000-1200	●
Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9 1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767 X45NiCrMo4	≤850 >850-1000	●
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥650-1000	●
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4 (51CrV4)	≤330 HB	●
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305 X8CrNiS18-9 1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi 17-12-2 (V4A) 1.4057 X20CrNi17-2 (X17CrNi16-2), 1.4122 X39CrMoTi17-1, 1.4521 X2CrMoTi18-2	≤850 ≤850 ≤850	●
Hardened steels	-	≤40-48 HRC ≥48-60 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200	●
Cast iron	0.6010 EN-GJL 100(GG10), 0.6020 EN-GJL 200(GG20) 0.6025 EN-GJL 250(GG25), 0.6035 EN-GJL 350(GG35)	≤240 HB ≤300 HB	●
Spheroidal graphite iron and malleable cast iron	0.7050 EN-GJS 500-7(GGG50), 0.8035 EN-GJMW 350-4(GTW35) 0.7070 EN-GJS 700-2(GGG70), 0.8170 EN-GJMB 700-2(GTS70)	≤240 HB ≤300 HB	●
Chilled cast iron	-	≤350 HB	●
Ti and Ti-alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2 3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4M4Sn2.5, -TiAl8Mo1V1	≤850 >850-1200	●
Aluminium and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400	●
Al wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤450	●
Al cast alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600	●
> 10 % Si	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, -G-AlSi12CuNiMg	≤600	●
Magnesium alloys	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05 G-MgAl6Zn1	≤450	●
Copper, low-alloyed	2.7007 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5Zn2Pb	≤400	●
Brass, short-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤600	●
long-chipping	2.0350 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600	●
Bronze, short-chipping	2.1090 CuSn7Zn2Pb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn 2.0790 CuNi18Zn19Pb	≤600 >600-850	●
Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn2, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤850 >850-1000	●
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-	●
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-	●
Kevlar	Kevlar	-	●
Glass, carbon concentrated plastics	GRT/CRP	-	●

○ bright

● steam tempered

● nitrided lands

● nitrided

● golden brown

● TiAlN

 $\leq 4 \times D \leq 7 \times D$ $\leq 8 \times D \leq 15 \times D$

Tool material		Carbide		Carbide		HSS-E-PM		HSS-E-PM		Carbide	
Carbide grade		K/P	K/P	K/P	K/P	-		-		K10/K20	
Type		N	N	N	N	N		N		N	
Surface finish		A	A	A	A	○		S		○	
Guh. no. straight	DIN 1899	R				301		660			
	G.S.	R	6400	6401	6408	6412	303			701	
	Internal cooling		☒	☒							
V _c m/min	Feed column no.		V _c m/min	Feed column no.		V _c m/min	Feed column no.	V _c m/min	Feed column no.	V _c m/min	Feed column no.
90-120	64	62	90-120	58	58	21	6	27	6	50	5
90-110	64	62	90-110	58	58	18	5	23	5	35	4
90-120	64	62	90-120	59	59	18	6	23	6	50	5
80-100	63	61	80-100	59	59	16	5	21	5	45	4
80-110	64	62	80-110	58	58	20	5	26	5	45	4
80-110	64	62	80-110	58	58	18	5	23	5	35	4
80-100	63	61	80-100	58	58	14	4	18	4	30	3
80-100	63	61	80-100	58	58	14	4	18	4	30	3
60-80	62	60	60-80	58	58	12	3	16	3		
90-110	63	61	90-110	57	57	18	6	23	6	50	3
70-100	63	61	70-100	58	58	14	4	18	4	40	3
60-80	62	60	60-80	58	58	12	3	16	3		
60-80	62	60	60-80	57	57	14	4	18	4	25	3
50-70	62	60	50-70	57	57	12	3	16	3		
40-60	62	60	40-60	58	58	16	4	20	4	25	3
40-60	62	60	40-60	58	58	14	3	18	3		
40-60	57	57	40-60	57	57	14	3	18	3		
40-60	57	57	40-60	57	57	8	2	10	2	20	2
30	57	57	60-80	57	57	18	4	20	4	25	3
15	56	56	60	56	56	14	3	16	3	25	2
30	57	57	60-80	57	57	16	3	18	3	25	2
										15	4
10	56	56	25	56	56					15	3
<150	68	66	<150	60	60	26	6	33	6	80	5
<140	68	66	<140	60	60	22	6	28	6	60	5
<140	68	66	<140	60	60	18	6	23	6	60	5
<130	67	65	<130	60	60	22	6	28	6	50	5
15	56	56	35	56	56					45	4
15	56	56	35	56	56					25	4
60-80	68	68	60-80	68	68					160	7
60-80	68	68	60-80	68	68					150	6
120-150	59	59	120-150	59	59	26	7			100	6
120-150	59	59	120-150	59	59	18	6			60	6
						75	6	80	6	150	5
						42	5	53	5	50	5
										67	6
						22	5	28	5	44	4
						22	4	28	4	68	3
						18	4	23	4	49	3
						13	4	16	4	53	3
								14	4	36	3
						16	4	20	4	50	3
						18	4	23	4	36	3
										60	4

A AITN

C TiCN

F FIRE

P AlCrN

S TiN

M MolyGlide



GUHRING



RE-GRINDING & RE-COATING

Guhring thinks big in all service matters. A comprehensive service is a matter of course even post tool sale. One area of our service program is the re-grinding and re-coating of tools – not only Guhring tools – to original geometries and original coatings so the efficiency of your tools is retained indefinitely.

Gun Drills

для размещения заказа - guhring@guhring-tools.ru



guhring@guhring-tools.ru
www.guhring-tools.ru

Gun Drills

Drill Ø mm from	Feed column no.							
	11	12	13	14	15	16	17	18
	f (mm/rev)							
1.50	0.002	0.004	0.006	0.008	0.012	0.020	0.032	0.045
2.00	0.003	0.005	0.007	0.010	0.016	0.028	0.046	0.055
2.50	0.004	0.006	0.008	0.012	0.019	0.030	0.054	0.070
4.00	0.005	0.007	0.010	0.016	0.025	0.043	0.065	0.085
6.00	0.007	0.009	0.013	0.024	0.035	0.061	0.085	0.120
8.00	0.010	0.014	0.022	0.032	0.045	0.068	0.100	0.140
10.00	0.012	0.016	0.028	0.040	0.055	0.075	0.120	0.160
14.00	0.020	0.025	0.035	0.050	0.065	0.085	0.130	0.180
18.00	0.025	0.030	0.040	0.055	0.070	0.095	0.145	0.200
20.00	0.025	0.035	0.045	0.060	0.080	0.110	0.180	0.250
24.00	0.027	0.036	0.047	0.065	0.085	0.130	0.185	0.300
28.00	0.028	0.038	0.049	0.068	0.090	0.140	0.195	0.360
30.00	0.030	0.040	0.050	0.070	0.100	0.150	0.200	0.400
35.00	0.035	0.045	0.055	0.075	0.120	0.180	0.250	0.450
40.00	0.040	0.050	0.060	0.080	0.150	0.200	0.300	0.500

*The feed rates always relate to tools with the recommended coating. In some cases the successful application of un-coated tools cannot be guaranteed.

Gun drills must be guided during spot-drilling.
Gun drills must never operate at full speed without support in the machine shop.



Cutting parameters can be reduced if cooling parameters are insufficient.
Pressure increase systems are also an option.

Material dependent coolants

- soluble oil
- neat oil
- air

The sequence of operations for deep hole drilling

- production of pilot hole (L = 1.5 x D, tolerance H8)
- enter at low revolutions, approx. 200 rev./min, feed rate approx. 500 mm/min
- setting of coolant pressure and revolutions
- uninterrupted drilling to required drilling depth without wood pecking.

When applying gun drills with increased length-diameter-ratio, we recommend machining with reduced cutting parameters (approx. 75% of the optimal cutting speed) up to a drilling depth of approx. 25 mm.

- switching off coolant supply after reaching the required hole depth
- withdrawal in top gear with stationary spindle

Material group	Material examples <i>Figures in bold = material no. to DIN EN 10 027</i>	Tens. str. N/mm²	Hard- ness	Cool- ant	recom- mended coating*	<35xD >35xD			
						v _c m/min	Feed col. no.	v _c m/min	Feed col. no.
Common structural steels	1.0035 S185, 1.0486 StE P275N, 1.0345 P235GH, 1.0425	≤500		○		100	14	95	13
	1.0050 E295, 1.0070 E360, 1.8937 P500NH	>500-850		○		85	14	80	13
Free-cutting steels	1.0718 11SMnPb30, 1.0736 115Mn37	≤850		○		90	14	85	13
	1.0727 46 S20, 1.0728 60 S20, 1.0757 46SPb20	850-1000		○		80	14	75	13
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E	≤ 700		○		90	13	85	12
	1.0503 C45, 1.1191 C45E	700-850		○		80	13	75	12
	1.0601 C60, 1.1221 C60E	850-1000		○		75	13	70	12
Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4	850-1000		○		75	13	70	12
	1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	1000-1200		○		65	13	60	12
Unalloyed case hard. steels	1.0301 C10, 1.1121 C10E	≤750		○	Ⓐ	80	14	75	13
Alloyed case hardened steels	1.7043 38Cr4	850-1000		○		75	13	70	12
	1.5752 14NiCr14, 1.7131 16MnCr5, 1.7264 20CrMo5	1000-1200		○		65	13	60	12
Nitriding steels	1.8504 34CrAl6	≥850-1000		○	Ⓐ	75	13	70	12
	1.8519 31CrMoV9, 1.8550 34CrAlNi7	1000-1200		○	Ⓐ	65	13	60	12
Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9	≤850		○	Ⓐ	75	12	70	11
	1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767	850-1000		○	Ⓐ	65	12	60	11
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 61CrV4	≥850-1000		○	Ⓐ	55	11	50	11
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4	≤330 HB		○	Ⓐ	65	12	60	12
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17	≤850		○		55	13	50	12
	1.4301 X5CrNi18 10, 1.4541 X6CrNiTi18 10, 1.4571	≤850		○		45	13	40	12
	1.4057 X17CrNi16-1, 1.4122 X39CrMo17-1, 1.4521	≤850		○		35	13	35	12
Hardened steels	-	≤40-48 HRC		○		30	12	25	11
	-	>48-60 HRC		○		25	11	20	11
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		○		35	11	30	11
Cast iron	EN-GJL100 ... EN-GJL200	≤240 HB	○	○		85	15	80	14
	EN-GJL250 ... EN-GJL350	<300 HB	○	○		80	15	75	14
Spheroidal graphite iron and malleable cast iron	EN-GJMW-350-4, EN-GJMB-550-4, EN-GJS-500-7	≤240 HB	○	○	Ⓐ	80	14	75	13
	EN-GJMB-700-2, EN-GJS-700-2	<300 HB	○	○		70	14	65	13
Chilled cast iron	-	≤350 HB	○	○		55	13	50	12
Ti and Ti alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2	≤850		○	Ⓐ	35	11	30	11
	3.7154 TiAl6Zr5, 3.7164 TiAl6V4, 3.7184 TiAl4Mo4Sn2.5	850-1200		○		30	11	25	11
Al and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMgT1	≤400		○		150	16	140	14
Al-wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365	≤450		○		120	16	115	14
Al-cast alloys ≤ 10 % Si	3.2131 G-AlSi6Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600		○		150	17	140	16
	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		○		130	17	120	16
Magnesium-alloys	MgMn2, G-MgAl8Zn1, G-MgAl6Zn3	≤450		○		110	16	105	15
	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPB	≤400		○	Ⓐ	75	14	70	13
Copper, low alloyed	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤600		○		120	17	115	16
	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤800		○		90	17	85	16
Brass, short-chipping long-chipping	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600		○		95	16	90	15
	2.0790 CuNi18Zn19Pb	>600-850		○		75	16	70	15
Bronze, short-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤850		○		70	16	65	15
	2.0980 CuAl11Ni, 2.1247 CuBe2	850-1000		○		60	16	55	15
Bronze, long-chipping	Bakelit, Resopal, Pertinax, Moltopren	-		○		75	14	70	13
	Plexiglass, Hostalen, Novodur, Makralon	-		○		70	14	65	13
Duroplastics	Kevlar	-		○		60	13	55	12
Thermoplastics	GFK/CFK	-		○		50	13	45	12
Kevlar	-	-		○		60	13	55	12
Glass/carbon fibre	-	-		○		50	13	45	12

- bright
- steam tempered
- nitrided lands
- nitrided
- golden brown
- Ⓐ TiAlN

Guhring no.	Discount group	Standard	Surface finish	Description	Tool material	Type
5018	123	Guhring std.	S	single-fluted gun drill EB 80, 20 x D	carbide	EB 80
5019	123	Guhring std.	O	two-fluted gun drill ZB 80, 30 x D	carbide	ZB 80
5020	123	Guhring std.	O	single-fluted gun drill EB 100	solid carbide	EB 100
5021	123	Guhring std.	O	single-fluted gun drill EB 80, 40 x D	carbide	EB 80
5022	123	Guhring std.	S	single-fluted gun drill EB 80, 80 x D	carbide	EB 80
5023	123	Guhring std.	S	single-fluted gun drill EB 100	solid carbide	EB 100
5024	123	Guhring std.	O	single-fluted gun drill EB 100	solid carbide	EB 100
5026	123	Guhring std.	O	single-fluted gun drill EB 100	solid carbide	EB 100
5460	123	Guhring std.	S	single-fluted gun drill EB 80, 30 x D	carbide	EB 80
5632	123	Guhring std.	A	single-fluted gun drill EB 100	solid carbide	EB 100
5633	123	Guhring std.	A	single-fluted gun drill EB 100	solid carbide	EB 100
5637	123	Guhring std.	A	single-fluted gun drill EB 100	solid carbide	EB 100
5638	123	Guhring std.	A	single-fluted gun drill EB 100	solid carbide	EB 100
5639	123	Guhring std.	C	single-fluted gun drill EB 80, 20 x D	carbide	EB 80
5640	123	Guhring std.	C	single-fluted gun drill EB 80, 30 x D	carbide	EB 80
5641	123	Guhring std.	C	single-fluted gun drill EB 80, 40 x D	carbide	EB 80
5642	123	Guhring std.	C	single-fluted gun drill EB 80, 80 x D	carbide	EB 80
5643	123	Guhring std.	O	two-fluted gun drill ZB 80, 30 x D	carbide	ZB 80
5644	123	Guhring std.	S	single-fluted gun drill EB 800 with indexable inserts, 30 x D	carbide	EB 800



EB80

single-fluted gun drill

solid carbide head

2.0 ... 40.0

ZB80

two-fluted gun drill

solid carbide head

6.0 ... 27.0

EB800

single-fluted gun drill

with indexable inserts

16.0 ... 40.0



recom- mended coating*	≤35xD		>35xD		recom- mended coating*	≤35xD		>35xD		recom- mended coating*	≤35xD		>35xD	
	Vc m/min	Feed col. no.	Vc m/min	Feed col. no.		Vc m/min	Feed col. no.	Vc m/min	Feed col. no.		Vc m/min	Feed col. no.	Vc m/min	Feed col. no.
S	100	14	95	13							90	15	85	15
	85	14	80	13							80	15	75	15
S	90	14	85	13							85	16	80	16
	80	14	75	13							75	16	70	16
S	90	13	85	12							85	15	80	15
	80	13	75	12							80	15	75	15
	75	13	70	12							75	15	70	15
S	75	13	70	12							75	15	70	15
	65	13	60	12							65	15	60	15
S	80	14	75	13							80	15	75	15
	75	13	70	12							75	15	70	15
	65	13	60	12							70	15	65	15
	65	13	60	12							60	15	55	15
C	75	12	70	11							65	14	60	14
	65	12	60	11							60	14	55	14
P	55	11	50	11							55	14	50	14
	65	12	60	12							65	15	60	15
	55	13	50	12							50	14	45	14
	45	13	40	12							45	14	40	14
	35	13	35	12							40	14	35	14
C	30	12	25	11							30	13	25	13
	25	11	20	11							25	12	20	12
	35	11	30	11							25	13	20	13
	85	15	80	14		85	18	80	17		85	16	80	16
	80	15	75	14		80	18	75	17		80	16	75	16
	80	14	75	13		75	17	70	16		75	16	70	16
	70	14	65	13		70	17	65	16		70	16	65	16
	55	13	50	12		65	16	60	15		55	15	50	15
	35	11	30	11							35	13	30	13
	30	11	25	11							30	12	25	12
	150	16	140	14		120	18	115	17		140	16	135	16
	120	16	115	14		110	18	105	17		125	16	120	16
	150	17	140	16		135	18	130	17		170	17	165	17
	130	17	120	16		120	17	115	16		140	17	135	17
	110	16	100	15							115	16	110	16
	75	14	70	13							75	15	70	15
	120	17	115	16		130	18	125	17		120	17	115	17
	90	17	85	16		120	18	115	17		90	17	85	17
	95	16	90	15		110	17	105	16		95	17	90	17
	75	16	70	15		110	17	105	16		75	17	70	17
	70	16	65	15		95	17	90	16		70	17	65	17
	60	16	55	15		95	17	90	16		60	17	55	17
	75	14	70	13							75	16	70	16
	70	14	65	13							70	16	65	16
	60	13	55	12							60	15	55	15
	50	13	45	12							50	15	45	15

A AITN

C TiCN

F FIRE

P AlCrN

S TiN

M MolyGlide



TM VENDING MACHINE

Guhring's modular TM Vending Machine relieves the customer of all tasks regarding tool storage and administration. Drawer and spiral modules enable the individual adaptation to specific customer storage requirements. The intelligent software ensures tool availability around the clock and detailed evaluation of all consumption and movement data.

Reaming tools





Guhring no.	Discount group	Standard	Surface finish	Description	Tool material	Type	Page
401	105	DIN 212	○	Machine reamers, form A	HSS-E		44
402	105	DIN 212	○	Machine reamers, form B	HSS-E		44
403	105	DIN 212	○	Quick spiral reamers	HSS-E		45
404	105	DIN 208	○	Machine reamers, form A	HSS-E		44
405	105	DIN 208	○	Machine reamers, form B	HSS-E		44
406	105	DIN 208	○	Quick spiral reamers, form C	HSS-E		45
407	105	DIN 219	●	Shell reamers, form A	HSS-E		48
408	105	DIN 219	●	Shell reamers, form B	HSS-E		48
409	105	DIN 219	●	Shell reamers, form C	HSS-E		48
410	105	DIN 2179	○	Machine taper reamers	HSS-E		48
411	105	DIN 2180	○	Machine taper reamers	HSS-E		48
414	105	DIN 311	●	Machine bridge reamers	HSS		48
419	105	Guhring std.	○	Machine bottoming reamers	HSS-E		45
420	105	Guhring std.	○	Machine bottoming reamers	HSS-E		45
430	105	Guhring std.	○	Expanding machine reamers	HSS-E		48
431	105	Guhring std.	○	Stepped machine reamers	HSS-E		48
440	105	DIN 212	○	Machine reamers, form C	HSS-E		44
455	105	Guhring std.	○	NC machine reamers	HSS-E		44
457	105	DIN 212	○	Machine reamers, form A	HSS-E		44
458	105	DIN 8089	○	Machine reamer sets, form B	HSS-E		45
467	105	DIN 212	○	Machine reamers, form C	HSS-E		44
468	105	DIN 212	○	Machine reamers, form D	HSS-E		44
469	105	DIN 212	○	Quick spiral reamers, form E	HSS-E		45
488	105	DIN 8089	○	Machine reamers, form A	HSS-E		45
489	105	DIN 8089	○	Machine reamers, form B	HSS-E		45
490	105	Guhring std.	○	NC machine reamers	HSS-E		44
496	105	DIN 212	○	Machine reamers, form B/D	HSS-E		44
497	105	DIN 8089	○	Machine reamers, form B	HSS-E		45
641	105	DIN 212	●	Machine reamers, form D	HSS-E		44
642	105	DIN 208	●	Machine reamers, form B	HSS-E		44
674	120	~ DIN 8090	○	Machine reamers, form A	carbide		47
717	120	~ DIN 8050	○	Machine reamers, form A	carbide		46
718	120	~ DIN 8050	○	Machine reamers, form B	carbide		46
719	120	~ DIN 8051	○	Machine reamers, form A	carbide		46
720	120	~ DIN 8051	○	Machine reamers, form B	carbide		46
727	120	DIN 8054	○	Shell reamers	carbide		47
737	120	~ DIN 8090	○	Machine reamers, form C	carbide		47
740	120	Guhring std.	○	Expanding machine reamers	carbide		47
743	120	Guhring std.	○	Stepped machine reamers	carbide		47
749	120	Guhring std.	○	Expanding machine reamers	carbide		47
1407	120	~ DIN 8090	○	Machine reamers, form B	carbide		47
1408	120	~ DIN 8093	○	Machine reamers, form A	carbide		46
1409	120	~ DIN 8093	○	Machine reamers, form B	carbide		46
1410	120	~ DIN 8094	○	Machine reamers, form A	carbide		46
1411	120	~ DIN 8094	○	Machine reamers, form B	carbide		46
1427	120	Guhring std.	○	NC machine reamers	solid carb.		46
1428	120	~ DIN 8093	●	Machine reamers, form A	carbide		47
1429	120	~ DIN 8093	●	Machine reamers, form B	carbide		47
1430	120	~ DIN 8090	●	Machine reamers, form A	carbide		47
1431	105	DIN 212	○	Machine reamers with coolant duct, form C	HSS-E		44
1432	105	DIN 8089	○	Machine reamers with coolant duct, form A	HSS-E		45
1449	120	Guhring std.	○	NC machine reamers	solid carb.		46
1675	166	Guhring std.	●	Carbide high performance reamers	solid carb.	HR 500 S	46
1676	166	Guhring std.	●	Carbide high performance reamers	solid carb.	HR 500 D	46
1680	166	Guhring std.	●	Carbide high performance reamers	solid carb.	HR 500 GS	46
1681	166	Guhring std.	●	Carbide high performance reamers	solid carb.	HR 500 GD	46
1682	166	Guhring std.	○	Carbide high performance reamers	solid carb.	HR 500 GS	46
1683	166	Guhring std.	○	Carbide high performance reamers	solid carb.	HR 500 GD	46
1685	166	Guhring std.	●	Carbide high performance reamers	solid carb.	HR 500 S	46
1686	166	Guhring std.	○	Carbide high performance reamers	solid carb.	HR 500 D	46
5527	154	Guhring std.	○	NC machine reamers	solid carb.		46

 bright

☐ steam tempered nitrided lands

● nitrided

 golden brown

A TiAlN

Reaming recommendations for HSS-E machine reamers

Blind hole or through hole

Straight-fluted reamers are generally applied in blind holes as they, due to their cutting edge geometry, evacuate the chips from the hole against the direction of the feed. Spiral reamers are preferred for the application in through holes because the spiral evacuates the chips from the hole in direction of the feed.

Interrupted holes

Spiral reamers are preferred for the application in interrupted holes because the cutting edge geometry, in comparison to straight-fluted tools, possesses a lesser tendency of grabbing on the oblique hole. If the oblique hole is $> 0.25 \times D$, spiral reamers can also be applied in blind holes.

Expanding reamers

Expanding reamers can only be expanded. Subsequently, if the resulting measurement is too large it is not possible to turn the screw back as the pre-tension of the tool would be lost. In most cases this leads to tool breakage. If the pre-tension has been taken from the tool, it requires re-adjusting and re-grinding.

Positional accuracy of the hole

A machine bottoming reamer often provides the best solution when optimal positional accuracy is required, thanks to its special chamfer lead the 'wander' of the tool is minimal. In addition, machine bottoming reamers are often applied when the pre-drilled hole and the reamer are not on the same axis (slight misalignment).

Stock removal allowance of the pre-drilled hole

In the event of the stock removal allowance of the pre-drilled hole exceeding the standard stock removal allowance of 0.2 to 0.3 mm for reaming, a quick spiral reamer or a stepped machine reamers should be applied. It is possible to machine a considerably larger stock removal allowance with these tools, however, they should not be applied in blind holes due to the bevel lead length and the spiral angle.

GUHRING



SPECIAL REAMERS

Special application tasks require special tooling solutions. We, therefore, offer special solutions in addition to our comprehensive standard range:

- **PCD tools for cylinder head parent metal machining**
- **CBN tools for the machining of cylinder head valve seats**
- **Carbide tools with specially developed geometries and specifically developed carbide grades for machining the cylinder head valve guide in sintered metal as well as in brass**

Tools with bold feed column no.
are preferred choice.

For blind holes with close diameter tolerances
choose straight-fluted reamers.

For exact definition of tools please refer to the
"Standard range and technical data" pages.

Reamer Ø mm	Feed column no.				
	71	72	73	74	75
	f (mm/rev.)				
< 4.00	0.080	0.100	0.125	0.300	0.500
4.00	0.100	0.125	0.160	0.300	0.500
5.00	0.100	0.125	0.160	0.400	0.700
6.30	0.125	0.160	0.200	0.400	1.000
8.00	0.160	0.200	0.250	0.600	1.400
10.00	0.200	0.250	0.315	0.600	1.400
12.50	0.200	0.250	0.315	0.800	1.800
16.00	0.250	0.315	0.400	0.800	2.200
20.00	0.315	0.400	0.500	0.800	2.200
25.00	0.400	0.500	0.630	1.000	2.500
31.50	0.400	0.500	0.630	1.000	3.000
40.00	0.500	0.630	0.800	1.200	3.000
50.00	0.630	0.800	1.000	1.400	3.000
> 50.00	0.800	1.000	1.250	1.600	3.000

Cooling:
☒ without coolant ducts
☐ with coolant ducts

Coolant:
☐ Air
☒ Neat oil
☐ Soluble oil

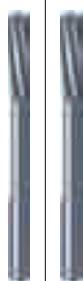
Cutting direction:
☒ right-hand cutting
☐ left-hand cutting

Material group	Material examples, new description (old description in brackets) <i>Figures in bold = material no. to DIN EN</i>	Tensile str. MPa (N/mm²)	Hard- ness	Cool- ant
Common structural steels	1.0035 S185(S133), 1.0486 P275N(StE285), 1.0345 P235GH(H1), 1.0425 P265GH(H2) 1.0050 E295 (St50-2), 1.0070 E360 (St70-2), 1.8937 P500NH (WStE500)	≤500 >500-850		<input checked="" type="radio"/>
Free-cutting steels	1.0718 11SMnPB30 (9SMnPb28), 1.0736 11SMn37 (9SMn36) 1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤850 850-1000		<input checked="" type="radio"/>
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30) 1.0503 C45, 1.1191 C45E (Ck45) 1.0601 C60, 1.1221 C60E (Ck60)	≤ 700 700-850 850-1000		<input checked="" type="radio"/>
Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4 1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	850 ≤1000 1000-1200		<input checked="" type="radio"/>
Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤750		<input checked="" type="radio"/>
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850 ≤1000 1000-1200		<input checked="" type="radio"/>
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850 ≤1000 >1000-1200		<input checked="" type="radio"/>
Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9 1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767 X45NiCrMo4	≤850 >850-1000		<input checked="" type="radio"/>
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥850-1000		<input checked="" type="radio"/>
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4 (51CrV4)		≤330 HB	<input checked="" type="radio"/>
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305 X8CrNiS18-9 1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi 17-12-2 (V4A) 1.4507 X20CrNi 17 2 (X17CrNi16-2), 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18-2	≤850 ≤850 ≤850		<input checked="" type="radio"/>
Hardened steels	-		≤40-48 HRC >48-60 HRC	<input checked="" type="radio"/>
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		<input checked="" type="radio"/>
Cast iron	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	≤240 HB <300 HB		<input checked="" type="radio"/>
Spheroidal graphite iron and malleable cast iron	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	≤240 HB <300 HB		<input checked="" type="radio"/>
Chilled cast iron	-		≤350 HB	<input checked="" type="radio"/>
Ti and Ti-alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2 3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2.5, - TiAl8Mo1V1	≤850 >850-1200		<input checked="" type="radio"/>
Aluminium and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		<input checked="" type="radio"/>
Al wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤450		<input checked="" type="radio"/>
Al cast alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600		<input checked="" type="radio"/>
> 10 % Si	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		<input checked="" type="radio"/>
Magnesium alloys	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05 G-MgAl6Zn1	≤450		<input checked="" type="radio"/>
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPb	≤400		<input checked="" type="radio"/>
Brass, short-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤600		<input checked="" type="radio"/>
long-chipping	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600		<input checked="" type="radio"/>
Bronze, short-chipping	2.1090 CuSn7ZnPb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600 >600-850		<input checked="" type="radio"/>
long-chipping	2.0790 CuNi18Zn19Pb			<input checked="" type="radio"/>
	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤850 >850-1000		<input checked="" type="radio"/>
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		<input checked="" type="radio"/>
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-		<input checked="" type="radio"/>
Kevlar	Kevlar	-		<input checked="" type="radio"/>
Glass, carbon concentrated plast.	GRT/CRP	-		<input checked="" type="radio"/>

NC machine reamers

Tool material	HSS-E	
Form	—	—
Surface finish	○	○
Coolant	☒	☒

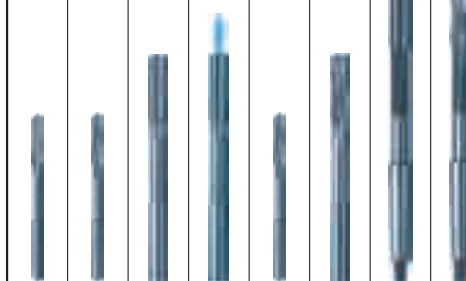
Guhning no.	str. shank	R		
		L		
	DIN 212	R		
	DIN 8089	R		
	G. std.	R	455	490
	DIN 208	R		
MT	G. std.	R		







Machine reamers

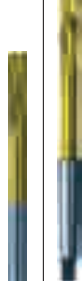
[illegible]

401	402	440	1431	496	468		
457		467					
						404	405



HSS-E	
B	D
	
	

641	
	642



v_e m/min	Feed col. no.
16	72
12	72
12	72
10	71
14	72
12	71
10	71
10	71
8	71
16	72
10	71
8	71
10	71
8	71
14	72
10	71
10	71
6	72
6	72
4	72
4	71
14	71
12	71
12	71
10	71
6	71
4	71
18	73
18	73
20	72
18	72
20	72
18	72
18	72
16	72
20	72
18	72
18	72
14	72
12	73
14	73
10	73
8	73

v_c m/min	Feed col. no.
16	72
12	72
12	72
10	71
14	72
12	71
10	71
10	71
8	71
16	72
10	71
8	71
10	71
8	71
14	72
10	71
10	71
6	72
6	72
4	72
4	71
14	71
12	71
12	71
10	71
6	71
4	71
18	73
18	73
20	72
18	72
20	72
18	72
18	72
16	72
20	72
18	72
18	72
14	72
12	73
14	73
10	73
8	73

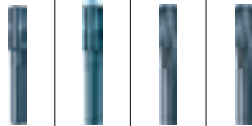
v_c m/min	Feed col. no.
20	71
16	71
16	71
12	71
18	71
16	71
12	71
12	71
10	71
18	71
12	71
10	71
12	71
10	71
16	71
12	71
12	71
8	71
8	71
6	71
6	71
16	71
14	71
16	71
14	71
6	71
4	71
22	73
22	73
22	72
22	72
22	72
20	72
22	72
18	72
22	72
20	72
20	72
18	72
12	73
14	73
12	73
10	73

 bright
 steam tempered
 nitrided lands
 nitrided
 golden brown
 TiAlN

Machine reamers

Tool material
Form
Surface finish
Coolant

Tool material		HSS-E			
		A	A	B	B
Form		○	○	○	○
Surface finish		⊗	⊗	⊗	⊗
Coolant		⊗	⊗	⊗	⊗
<div> <div>Gutting no.</div> <div>MT</div> <div>str. Shank</div> </div>	DIN 212				
	DIN 8089	488	1432	489	497/458
	G. std.				
	DIN 208				
	G. std.				

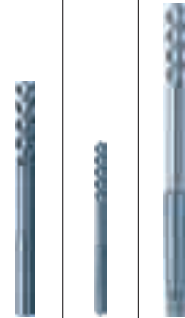


V_c m/min	Feed col. no.
16	71
12	71
12	71
10	71
14	71
12	71
10	71
10	71
8	71
16	71
10	71
8	71
10	71
8	71
14	71
10	71
10	71
6	71
6	71
4	71
4	71
14	71
12	71
12	71
10	71
6	71
4	71
18	73
18	73
20	72
18	72
20	72
18	72
18	72
16	72
20	72
18	72
18	72
14	72
12	73
14	73
10	73
8	73

Quick spiral reamers

H	
E	

HSS-E		
E	-	C
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
469	403	
		406



V_c m/min	Feed col. no.
16	73
12	73
12	73
14	73
12	73
16	73
10	73
5	71
22	73
22	73
20	73
16	73
18	73
12	73
14	73
10	73
8	73

Bottoming reamers

HSS-E	-
-------	---

HSS-E	
-	-
<input type="radio"/>	<input type="radio"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
419	
	420



V _c m/min	Feed col. no.
10	71
8	71
14	71
12	71
10	71
10	71
10	71
10	71
8	71
12	71
10	71
8	71
10	71
8	71
8	71
8	71
8	71
6	71
4	71
4	71
3	71
12	71
10	71
12	71
10	71
4	71
3	71
20	72
20	72
20	71
18	71
14	71
14	71
18	71
16	71
16	71
14	71
16	71
14	71
12	73
10	73
12	73
12	73



Reamers

HR 500
reamers

Tool material	Carb./K10	
Form	—	—
Surface finish	A	A
Coolant	■	■

Guhring no. MT — straight	DIN 8050		
	DIN 8093		
	G. std.	1685 1686	
		1675 1676	
	DIN 8051		
	DIN 8094		



Tool material	Carb./K10	
Form	—	—
Surface finish	A	
Coolant	■	

1680 1681



Tool material	Carb./K10	
Form	—	—
Surface finish	A	
Coolant	■	

1682 1683

NC machine
reamers

Tool material	Carb./K10	
Form	—	—
Surface finish	—	—
Coolant	☒	

1427 1449
5527Machine
reamers

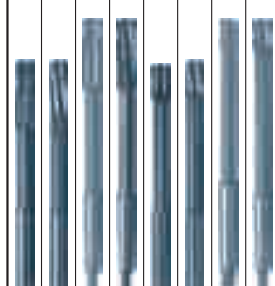
Carbide/K10							
A	B	A	B	A	B	A	B
○	○	○	○	○	○	○	○
☒	☒	☒	☒	☒	☒	☒	☒

1408 1409

717 718

1410 1411

719 720



Material chart page 43

V _c m/min	Feed col. no.	V _c m/min	Feed col. no.	V _c m/min	Feed col. no.	V _c m/min	Feed col. no.	V _c m/min	Feed col. no.	V _c m/min	Feed col. no.
120-250	74-75			100-180	74-75	18	72	18	72		
120-250	74-75			100-180	74-75	16	72	16	72		
120-250	74-75			100-180	74-75	18	72	18	72		
120-250	74-75			100-150	74-75	16	72	16	72		
120-250	74-75			100-180	74-75	18	71	18	71		
120-250	74-75			100-180	74-75	16	71	16	71		
120-250	74-75			100-150	74-75	14	71	14	71		
120-250	74-75			100-150	74-75	14	71	14	71		
120-250	74-75			100-120	74-75	12	71	12	71		
120-250	74-75			100-180	74-75	18	71	18	71		
120-250	74-75			100-150	74-75	14	71	14	71		
120-250	74-75			100-120	74-75	12	71	12	71		
120-250	74-75			100-150	74-75	14	71	14	71		
120-250	74-75			100-120	74-75	12	71	12	71		
120-250	74-75			100-180	74-75	12	71	12	71		
120-250	74-75			100-150	74-75	10	71	10	71		
60-120	74-75	20-60	74-75			10	71	10	71		
60-120	73-74			100-120	74-75						
60-120	74-75	20-60	73-74			8	71	8	71		
60-120	74-75	20-60	73-74			6	71	6	71		
60-120	74-75	20-60	73-74			6	71	6	71		
25-60	73-74	10-30	73								
25-60	73-74										
25-60	73-74	20-60	74			6	71	6	71		
60-100	74-75	60-120	74-75			20	71	20	71		
60-100	74-75	60-120	74-75			18	71	18	71		
120-250	74-75	40-100	74-75	80-150	74-75	20	71	20	71		
60-100	74-75	40-100	74-75			18	71	18	71		
10-40	73-74	20-40	74-75								
30-60	73-74	20-40	74			10	71	10	71		
30-60	73-74	20-40	74			10	71	10	71		
						30	73	30	73		
						30	73	30	73		
						40	72	40	72		
						30	72	30	72		
						25	72	25	72		
80-160	74-75	80-160	74-75			25	72	25	72		
						35	72	35	72		
100-250	74-75	30-100	74-75			30	72	30	72		
100-250	74-75	30-100	74-75			35	72	35	72		
100-250	74-75	30-100	74-75			30	72	30	72		
		30-100	74-75			30	72	30	72		
		30-100	74-75			25	72	25	72		
80-200	74-75	40-120	74-75			20	73	20	73		
80-200	74-75	40-120	74-75			20	73	20	73		
80-200	74-75	40-120	74-75			20	73	20	73		
80-200	74-75	40-120	74-75			20	73	20	73		

○ bright

● steam tempered

● nitrided lands

● nitrided

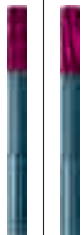
● golden brown

● TiAlN

Machine reamers

	Carbide/K10	
Tool material	A	B
Form	A	A
Surface finish	⊗	⊗
Coolant	⊗	⊗

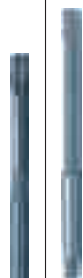
Guhring no.	straight	DIN 8090		
		DIN 8093	1428	1429
		G. std.		
	MT	DIN 8051		
		DIN 8054		
		G. std.		



Expanding reamers

Carb./K10	
A	A
○	○
☒	☒

749	
	740



stepped

Carb./K10
—
○
☒

743



Machine reamers

Carb./K10		
A	B	C
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
674	1407	737

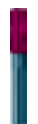
674	1407	737



Shell reamer

Carb/K10
A
A
<input checked="" type="checkbox"/>
1430

1430



Carb./K10
-
<input type="radio"/>
<input checked="" type="checkbox"/>

727



V _c m/min	Feed col. no.
20	73
18	73
20	73
18	73
20	72
18	72
15	72
15	72
20	72
13	71
20	73
15	72
13	71
15	71
13	71
13	71
11	71
11	71
11	71
9	71
7	71
7	71
7	71
22	73
20	73
22	73
20	73
4	71
11	71
11	71
33	73
33	73
44	73
33	73
28	73
28	73
39	73
33	73
39	73
33	73
33	73
28	73
22	73
22	73
22	73
22	73

V_c m/min	Feed col. no.
16	71
14	71
14	71
12	71
14	71
12	71
12	71
12	71
10	71
14	71
12	71
10	71
12	71
10	71
10	71
8	71
8	71
8	71
6	71
6	71
6	71
20	71
18	71
20	71
20	71
4	71
8	71
8	71
25	72
25	72
35	72
30	72
20	72
20	72
30	72
25	72
30	72
25	72
25	72
20	72
16	73
16	73
20	73
20	73

Vc m/min	Feed col. no.
18	73
16	73
18	73
16	73
16	72
18	72
14	72
14	72
12	71
18	73
14	72
12	71
14	71
12	71
12	71
10	71
10	71
10	71
6	71
20	73
18	73
20	73
18	73
10	71
10	71
30	73
30	73
40	73
30	73
25	73
25	73
35	73
30	73
35	73
30	73
30	73
25	73
20	73
20	73
20	73
20	73







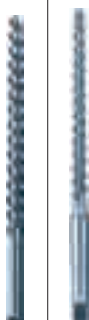
v_c m/min	Feed col. no.
20	72
18	72
18	72
18	72
20	71
18	71
16	71
16	71
12	71
20	71
16	71
14	71
16	71
14	71
14	71
12	71
12	71
8	71
6	71
6	71
6	71
20	71
18	71
20	71
20	71
10	71
10	71
30	73
30	73
40	72
30	72
25	72
35	72
35	72
30	72
30	72
25	72
30	72
25	72
12	73
14	73
10	73
8	73

v_c m/min	Feed col. no.
22	72
20	72
22	72
20	72
22	71
18	71
18	71
13	71
22	71
18	71
15	71
18	71
15	71
15	71
13	71
13	71
9	71
7	71
7	71
7	71
22	71
20	71
22	71
22	71
11	71
11	71
33	73
33	73
44	72
33	72
28	72
39	72
39	72
33	72
33	72
28	72
33	72
28	72
13	73
15	73
11	73
9	73

V_c m/min	Feed col. no.
20	72
20	72
20	72
20	72
20	71
16	71
18	71
14	71
20	72
18	71
14	71
18	71
12	71
14	71
8	71
14	71
12	71
10	71
8	71
22	71
18	71
20	71
18	71
10	71
10	71
30	73
30	73
35	73
25	73
25	73
25	73
30	73
30	73
30	73
25	73
30	73
25	73
20	73
14	73
12	73



Reamers

		Machine br. reamers	Exp. mach. reamers	St. mach. reamers	Shell reamers	Machine taper pin reamers			
Tool material		HSS	HSS-E	HSS-E	HSS-E	HSS-E	HSS-E		
Form		—	—	—	A B	C	—		
Surface finish		●	○	○	● ●	●	○		
Cooling		☒	☒	☒	☒ ☒	☒	☒		
Guhring no.	str.	DIN 9							
		DIN 2179							
		DIN 219							
		DIN 311	414			407 408	409	410	
		DIN 2180							
MT									
		G. std.	430	431			411		
					 				
V _c m/min		Feed col. no.	V _c m/min	Feed col. no.	V _c m/min	Feed col. no.	V _c m/min	Feed col. no.	
14	72	16	71	14	72	16	73	8	72
12	72	12	71	12	72	14	73	8	72
12	72	12	71	12	72	12	71	8	72
10	72	10	71	10	72	10	71	8	72
12	71	14	71	12	72	16	71	8	71
10	71	12	71	12	72	14	71	8	71
8	71	10	71	10	71	10	71	8	71
8	71	10	71	10	71	10	71	8	71
6	71	8	71	10	71	8	71	8	71
12	72	16	72	14	72	16	71	8	72
8	71	10	71	10	71	10	71	6	71
6	71	8	71	10	71	8	71	6	71
8	71	10	71	10	71	10	71	6	71
6	71	8	71	10	71	8	71	6	71
12	71	14	71	12	71	14	71	6	71
8	71	10	71	10	71	10	71	6	71
4	71	10	71	10	71	10	71	6	71
5	71	6	71	8	71	6	71	6	71
4	71	4	71	5	71	4	71	6	71
4	71	4	71	5	71	4	71	6	71
3	71	3	71	3	71	4	71	6	71
12	71	14	71	14	71	14	71	6	71
10	71	12	71	12	71	12	71	6	71
12	71	12	71	14	71	12	71	6	71
10	71	10	71	12	71	10	71	6	71
4	71	4	71	5	71	6	71	6	71
3	71	3	71	4	71	4	71	6	71
18	73	18	72	18	73	18	72	20	73
18	73	18	72	18	73	18	72	20	73
18	73	20	71	22	73	20	72	20	73
16	72	18	71	20	73	18	72	18	73
18	73	20	71	20	73	20	72	20	73
16	72	14	71	16	73	18	72	18	73
18	72	18	71	18	73	18	72	20	73
16	72	16	71	16	73	16	72	18	73
20	72	16	71	16	73	20	72	8	72
16	72	14	71	14	73	18	72	8	72
16	72	16	71	16	73	18	72	8	72
14	72	14	71	14	73	14	72	8	72
12	72	12	73	12	73	12	72	8	72
10	72	12	73	12	73	14	72	8	72
10	72	12	73	12	73	10	72	8	72
10	72	10	73	12	73	8	72	8	72

Material chart page 43
















































Material chart page 43

○ bright ● steam tempered ● nitrided lands ● nitrided ● golden brown Ⓐ TiAlN

Countersinking tools





Guhring no.	Discount group	Standard	Surface finish	Description	Tool material	Type	Page
324	105	DIN 373		Counterbores with fixed pilots, for fine tolerances	HSS		56
325	105	DIN 373		Counterbores with fixed pilots, for medial tolerances	HSS		56
326	105	DIN 373		Counterbores with fixed pilots, for tapping size holes	HSS		56
327	105	DIN 335		90° countersinks, form C	HSS		55
328	105	DIN 335		90° countersinks, form D	HSS		55
432	105	DIN 1862		Spot facers	HSS-E		56
433	105	DIN 1862		Spot facers	HSS-E		56
434	105	DIN 1862		Spot facers	HSS-E		56
435	105	DIN 1862		Spot facers	HSS-E		56
436	105	DIN 1866		90° countersinks, for fine tolerances	HSS		54
437	105	DIN 1866		90° countersinks, for medial tolerances	HSS		54
438	105	DIN 1866		90° countersinks, for tapping size holes	HSS		54
463	105	DIN 375		Counterbores with hole for detachable pilot	HSS		56
470	105	DIN 334		60° countersinks, form A	HSS		54
471	105	DIN 334		60° countersinks, form B	HSS		54
472	105	DIN 334		60° countersinks, form C	HSS		54
473	105	DIN 334		60° countersinks, form D	HSS		54
474	105	DIN 335		90° countersinks, form A	HSS		55
475	105	DIN 335		90° countersinks, form B	HSS		55
476	105	DIN 335		90° countersinks, form C	HSS		55
477	105	DIN 335		90° countersinks, form D	HSS		55
478	105	DIN 347		120° countersinks, form A	HSS		55
479	105	DIN 347		120° countersinks, form B	HSS		55
480	105	Guhring std.		120° countersinks	HSS		55
481	105	Guhring std.		120° countersinks	HSS		55
482	105	DIN 373		Counterbores with fixed pilots, for fine tolerances	HSS		56
483	105	DIN 373		Counterbores with fixed pilots, for medial tolerances	HSS		56
484	105	DIN 373		Counterbores with fixed pilots, for tapping size holes	HSS		56
485	105	Guhring std.		Counterbores with fixed pilots, for fine tolerances	HSS		56
486	105	Guhring std.		Counterbores with fixed pilots, for medial tolerances	HSS		56
487	105	Guhring std.		Counterbores with fixed pilots, for tapping size holes	HSS		56
1318	105	DIN 1866		90° countersinks, for fine tolerances	HSS		54
1319	105	DIN 1866		90° countersinks, for medial tolerances	HSS		54
1323	105	DIN 1866		90° countersinks, for tapping size holes	HSS		54
1326	105	DIN 335		90° countersinks, form C	HSS		55
1601	104	Guhring std.		Pilot counterbores	HSS	KS 125	57
1602	104	Guhring std.		Pilot counterbores	HSS	KS 140	57
1603	104	Guhring std.		Pilot counterbores	carbide	KS 108	57
1604	104	Guhring std.		Pilot counterbores	carbide	KS 115	57
1606	104	Guhring std.		Spotfacers	carbide	KS 100	58
1622	104	Guhring std.		90° countersinks	HSS	KS 100	58
1638	104	Guhring std.		Back spotfacers	HSS		58
1640	104	Guhring std.		Back spotfacers	carbide		58
1654	104	Guhring std.		Pilot counterbores for index. inserts		KS 100	57
1655	104	Guhring std.		Indexable inserts SCHX			57
1656	104	Guhring std.		Indexable inserts SCHX			57
1657	104	Guhring std.		Indexable inserts SCHX			57

 bright

☐ steam tempered nitrified lands

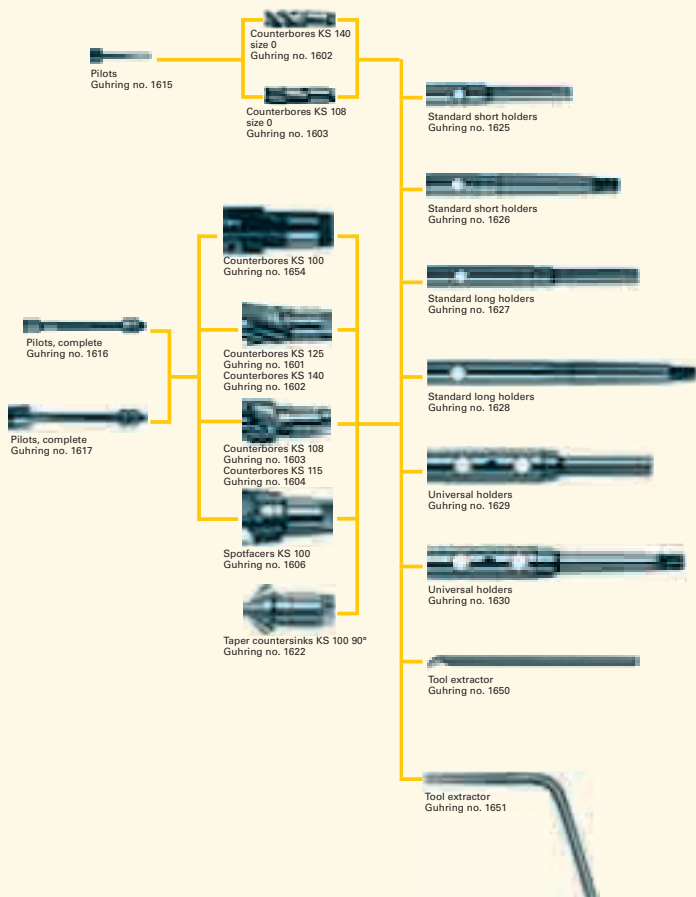
● nitrided

 golden brown

A TiAlN

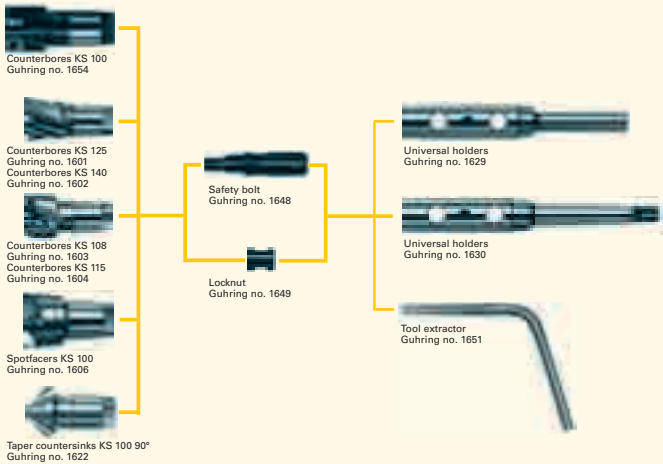
Short counterbore system without tool safety device

for use with conventional machines



Short counterbore system with tool safety device

for use with CNC machining centres, transfer lines, horizontal boring machines, special machines



Tools with bold feed column no.
are preferred choice.

For exact definition of tools please refer to the
"Standard range and technical data" pages.

For multi-fluted countersinking tools the Ø-range for the
respective flute no. is in brackets.

Counter-sink Ø mm	Feed column no.					
	81	82	83	84	85	86
	f (mm/rev.)					
2.00	0.03	0.04	0.06	0.08	0.10	0.13
2.50	0.03	0.05	0.07	0.10	0.13	0.16
3.15	0.03	0.05	0.08	0.11	0.15	0.20
4.00	0.04	0.06	0.09	0.13	0.17	0.22
5.00	0.04	0.07	0.10	0.14	0.18	0.23
6.30	0.04	0.07	0.12	0.15	0.19	0.24
8.00	0.05	0.08	0.13	0.16	0.20	0.25
10.00	0.06	0.09	0.14	0.17	0.22	0.26
12.50	0.06	0.10	0.15	0.19	0.23	0.28
16.00	0.07	0.11	0.17	0.21	0.26	0.31
20.00	0.08	0.13	0.18	0.23	0.28	0.33
25.00	0.09	0.15	0.21	0.26	0.30	0.38
31.50	0.12	0.17	0.24	0.30	0.36	0.42
40.00	0.14	0.21	0.28	0.34	0.40	0.46
50.00	0.17	0.24	0.31	0.36	0.42	0.48
63.00	0.20	0.27	0.33	0.38	0.44	0.50
80.00	0.23	0.30	0.35	0.40	0.46	0.52
100.00	0.25	0.30	0.35	0.40	0.46	0.52

Coolant:

○ Air

● Neat oil

● Soluble oil

Material group	Material examples, new description (old description in brackets) <i>Figures in bold = material no. to DIN EN</i>	Tensile str. MPa (N/mm²)	Hard- ness	Cool- ant
Common structural steels	1.0035 S185(S133), 1.0486 P275N(StE285), 1.0345 P235GH(H1), 1.0425 P265GH(H2) 1.0050 E295 (St50-2), 1.0070 E360 (St70-2), 1.8937 P500NH (WStE500)	≤500 >500-850		●
Free-cutting steels	1.0718 11SMnPb30 (9SMnPb28), 1.0736 11SMn37 (9SMn36) 1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤850 850-1000		●
Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30) 1.0503 C45, 1.1191 C45E (Ck45) 1.0601 C60, 1.1221 C60E (Ck60)	≤ 700 700-850 850-1000		●
Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4 1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	850 ≤1000 1000-1200		●
Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤750		●
Alloyed case hardened steels	1.7043 38Cr4 1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	850 ≤1000 1000-1200		●
Nitriding steels	1.8504 34CrAl6 1.8519 31CrMoV9, 1.8550 34CrAlNi7	≥850 ≤1000 >1000-1200		●
Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9 1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767 X45NiCrMo4	≤850 >850-1000		●
High speed steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≥850-1000		●
Spring steels	1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4 (51CrV4)		≤330 HB	●
Stainless steels, sulphured austenitic martensitic	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305 X8CrNiS18-9 1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi 17-12-2 (V4A) 1.4507 X20CrNi 17 2 (X17CrNi16-2), 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18-2	≤850 ≤850 ≤850		●
Hardened steels	-		≤40-48 HRC >48-60 HRC	●
Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤1200		●
Cast iron	0.6010 EN-GJL-100(GG10), 0.6020 EN-GJL-200(GG20) 0.6025 EN-GJL-250(GG25), 0.6035 EN-GJL-350(GG35)	≤240 HB <300 HB		●
Spheroidal graphite iron and malleable cast iron	0.7050 EN-GJS-500-7(GGG50), 0.8035 EN-GJMW-350-4(GTW35) 0.7070 EN-GJS-700-2(GGG70), 0.8170 EN-GJMB-700-2(GTS70)	≤240 HB <300 HB		●
Chilled cast iron	-		≤350 HB	●
Ti and Ti-alloys	3.7024 Ti99.5, 3.7114 TiAl5Sn2.5, 3.7124 TiCu2 3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2.5, -TiAl8Mo1V1	≤850 >850-1200		●
Aluminium and Al-alloys	3.0255 Al99.5, 3.2315 AlMgSi1, 3.3515 AlMg1	≤400		●
Al wrought alloys	3.0615 AlMgSiPb, 3.1325 AlCuMg1, 3.3245 AlMg3Si, 3.4365 AlZnMgCu1.5	≤450		●
Al cast alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600		●
> 10 % Si	3.2581 G-AlSi12, 3.2583 G-AlSi12Cu, - G-AlSi12CuNiMg	≤600		●
Magnesium alloys	3.5200 MgMn2, 3.5812.05 G-MgAl8Zn1, 3.5612.05 G-MgAl6Zn1	≤450		●
Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5ZnPB	≤400		●
Brass, short-chipping	2.0380 CuZn39Pb2, 2.0401 CuZn39Pb3, 2.0410 CuZn43Pb2	≤600		●
long-chipping	2.0250 CuZn20, 2.0280 CuZn33, 2.0332 CuZn37Pb0.5	≤600		●
Bronze, short-chipping	2.1090 CuSn7ZnPB, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600		●
	2.0790 CuNi18Zn19Pb	>600-850		●
Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10 2.0980 CuAl11Ni, 2.1247 CuBe2	≤850 >850-1000		●
Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	-		○
Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	-		○
Kevlar	Kevlar	-		○
Glass, carbon concentrated plast.	GRT/CRP	-		○

Countersinks

Counter-sinks











Tool material
Angle of taper
Form
Surface finish

HSS

90°

60°











Guhring no.

	—	— A	—	— A	—	— A	A 0.05 1.00	B	C	D
DIN 334							470	471	472	473
DIN 335										
DIN 347										
DIN 1866	436	1318	437	1319	438	1323				
Guhring std.										
No. of flutes (Ø-range)	2 (2...5) 3 (6...19)	2 (5) 3 (6...19)	3	3	3	3	5 (8/12.5) 7 (16/20)	7 (16) 9 (25/31.5) 11 (40) 17 (100)	3	3
										
○	⦿ A	Feed column no.								
V _c m/min	V _c m/min	86	85	85	85	85	85	85	85	85
32	37	85	85	85	85	85	84	85	85	85
30	35	86	85	85	85	85	84	85	85	85
32	37	86	85	85	85	85	84	85	85	85
30	35	85	85	85	85	85	84	85	85	85
32	37	85	85	85	85	85	84	85	85	85
30	35	85	85	85	85	85	84	85	85	85
20	23	85	84	84	84	84	84	84	84	84
15	17	85	84	84	84	84	84	84	84	84
12	14	84	84	84	84	84	84	84	84	84
25	29	86	85	85	85	85	85	85	85	85
15	17	85	84	84	84	84	84	84	84	84
10	12	84	84	84	84	84	84	84	84	84
15	17	85	85	85	85	85	84	85	85	85
12	14	84	84	84	84	84	84	84	84	84
17	20	85	84	84	84	84	84	84	84	84
15	17	84	84	84	84	84	84	84	84	84
15	17	84	84	84	84	84	84	84	84	84
10	12	84	84	84	84	84	84	84	84	84
16	18	85	84	84	84	84	84	84	84	84
12	14	84	84	84	84	84	84	84	84	84
14	16	84	84	84	84	84	84	84	84	84
8	9	84	84	84	84	84	84	84	84	84
6	7	84	84	84	84	84	84	84	84	84
8	9	84	84	84	84	84	84	84	84	84
25	29	85	85	85	85	85	84	85	85	85
16	18	85	84	84	84	84	84	84	84	84
22	25	85	84	84	84	84	84	84	84	84
20	23	84	84	84	84	84	84	84	84	84
8	9	84	84	84	84	84	84	84	84	84
15	17	86	85	85	85	85	85	85	85	85
10	12	85	85	85	85	85	84	85	85	85
90	104	86	85	85	85	85	85	85	85	85
70	81	86	86	86	86	86	85	86	86	86
40	46	86	85	85	85	85	85	85	85	85
30	35	86	85	85	85	85	85	85	85	85
100	115	86	86	86	86	86	85	86	86	86
60	69	85	84	84	84	84	84	84	84	84
80	92	85	85	85	85	85	84	85	85	85
50	58	85	85	85	85	85	84	85	85	85
30	35	86	86	86	86	86	85	86	86	86
26	30	86	86	86	86	86	85	86	86	86
24	28	86	86	86	86	86	85	86	86	86
20	23	86	86	86	86	86	85	86	86	86
30	35	85	84	84	84	84	84	84	84	84
40	46	85	85	85	85	85	84	85	85	85
70	81	85	84	84	84	84	84	84	84	84
40	46	85	85	85	85	85	84	85	85	85

○ bright ● steam tempered ● nitrided lands ● nitrided ● golden brown ⦿ TiAIN

Counter-sinks

Tool material
Angle of taper
Form
Surface finish

HSS									
90°						120°			
A	B	C	C	D	D	A	B		
									
474	475	476	1326	327	477	328	478	479	



A AITIN

C TiCN

F FIRE

P AlCrN

S TiN

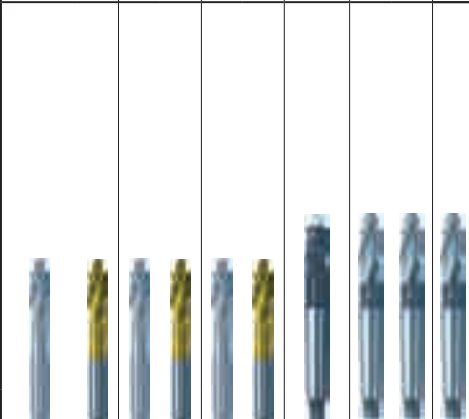
M MolyGlide

Countersinks

Counter-bores

Tool material		HSS							
		with fixed pilot				detach.			
Pilot		with fixed pilot				with fixed pilot			
Surface finish		○	Ⓢ	○	Ⓢ	○	Ⓢ	●	●
Guhr. no.	DIN 373	482	324	483	325	484	326		
	DIN 375							463	
	DIN 1862								
	Guhring std.							485	486 487

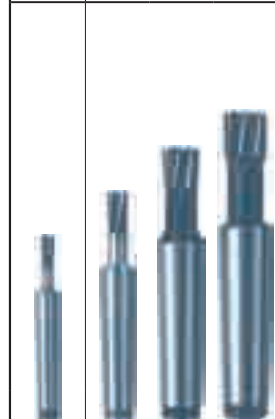
No. of flutes (Ø-range) 2 (2.2...4.3) 3 3 3 3 3 (15...40) 4 (63) 3 3 3 3



Spot facers

HSS-E			
—	—	—	—
432	433	434	435

4 (3.5...5.5) 6 (6...15) 6 (10/11) 8 (20...31) 6 (11/13) 8 (16...30) 8 (17...30) 10 (32...48)





Material chart page 53

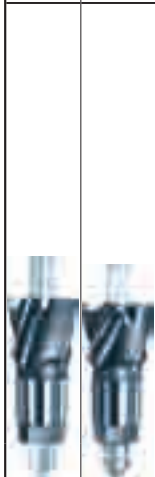
○	Ⓢ	Feed column no.							
V _c m/min	V _c m/min								
32	35	86	85	85	86	85	85		
30	33	85	85	85	85	85	84		
32	35	86	85	85	86	85	85		
30	33	85	85	85	85	85	84		
32	35	85	85	85	85	85	84		
30	33	85	85	85	85	85	84		
20	22	85	84	84	85	84	84		
15	17	85	84	84	85	84	84		
12	13	84	84	84	84	84	84		
25	28	86	85	85	86	85	85		
15	17	85	84	84	85	84	84		
10	11	84	84	84	84	84	84		
15	17	85	84	84	85	84	84		
12	13	84	84	84	84	84	84		
17	19	85	84	84	85	84	84		
15	17	84	84	84	84	84	84		
15	17	84	84	84	84	84	84		
10	11	84	84	84	84	84	84		
16	18	85	84	84	85	84	84		
12	13	84	84	84	84	84	84		
14	15	84	84	84	84	84	84		
8	9	84	84	84	84	84	84		
25	28	85	85	85	85	85	85		
16	18	85	84	84	85	84	85		
22	24	85	84	84	85	84	85		
20	22	84	84	84	84	84	84		
8	9	84	84	84	84	84	84		
15	17	86	85	85	86	85	85		
10	11	85	85	85	85	85	84		
90	99	86	85	85	86	85	85		
70	77	86	86	86	86	86	85		
40	44	86	85	85	86	85	85		
30	33	86	85	85	86	85	85		
100	110	86	86	86	86	86	85		
60	66	85	84	84	85	84	84		
80	88	85	85	85	85	85	84		
50	55	85	85	85	85	84	85		
30	33	86	86	86	86	86	85		
26	29	86	86	86	86	86	85		
24	26	86	86	86	86	86	85		
20	22	86	86	86	86	86	85		
30	33	85	84	84	85	84	84		
40	44	85	85	85	85	85	84		
70	77	85	84	84	85	84	84		
40	44	85	85	85	85	85	84		

V _c m/min	Feed column no.	
30	82	83
27	82	82
30	82	83
27	82	82
30	82	82
27	82	82
24	81	82
20	81	82
15	81	81
28	82	83
18	81	82
12	81	81
18	81	82
15	81	81
20	81	82
17	81	81
20	81	81
12	81	81
12	81	82
6	81	81
8	81	81
8	81	81
12	82	82
10	81	82
10	81	82
8	81	81
5	81	81
10	82	83
7	82	82
100	82	83
80	83	84
80	82	83
70	82	83
75	83	84
50	81	82
60	82	82
45	82	82
40	83	84
36	83	84
35	83	84
28	83	84
25	81	82
32	82	82
60	81	82
32	82	82



Pilot counterbores
Guhring standard

Tool material
Type
Surface finish
Guhring no.
No. of flutes
(Ø-range)

HSS	
KS 125	KS 140
	
1601	1602
3 (10...16)	3 (4.8...17.5)
4 (18...57)	4 (18...79)




V _c m/min	Feed column no.	
30	82	82
27	82	82
30	82	82
27	82	82
30	82	82
27	82	82
24	81	81
20	81	81
15	81	81
28	82	82
18	81	81
12	81	81
18	81	81
15	81	81
20	81	81
17	81	81
20	81	81
12	81	81
12	81	81
6	81	81
8	81	81
8	81	81
8	81	81
12	82	82
10	81	81
10	81	81
8	81	81
5	81	81
10	82	82
7	82	82
100	82	82
80	83	83
80	82	82
70	82	82
75	83	83
50	81	81
60	82	82
45	82	82
40	83	83
36	83	83
35	83	83
28	83	83
25	81	81
32	82	82
60	81	81
32	81	82

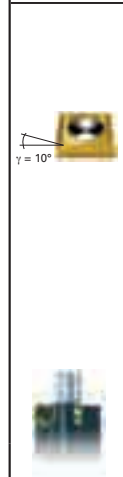
Carb./K15	Carb./M20
KS 108	KS 115
	
1603	1604
3	3





V _c m/min	Feed column no.	
50	83	82
45	82	82
45	83	82
35	82	82
45	82	82
40	82	82
30	82	82
30	82	82
22	81	81
50	83	82
35	82	82
20	81	81
35	82	82
20	81	81
40	82	82
35	81	81
35	81	81
25	81	81
37	82	82
33	81	81
35	81	82
16	81	81
50	84	83
40	83	82
50	83	82
40	82	82
20	81	81
20	83	81
15	82	81
80	83	84
80	84	84
60	83	84
45	83	83
80	84	84
80	82	83
50	82	83
40	82	84
35	84	82
30	84	82
25	84	82
22	84	81
50	82	83
80	82	84
50	82	83
50	82	83

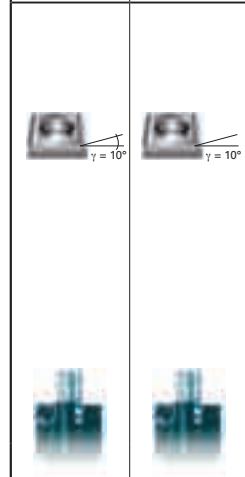
Pilot counterbores Guhring no. 1654
with indexable inserts, Guhring standard

HSS-E

1657
3



V _c m/min	Feed column no.
35	83
31	82
35	83
31	82
35	82
31	82
28	82
23	82
17	81
32	83
20	82
14	81
20	82
17	81
23	82
20	81
23	81
14	81
14	82
7	81
9	81
9	81
14	82
11	82
11	82
9	81
6	81
11	83
8	82
115	83
92	84
92	83
80	83
86	84
57	82
69	82
52	82
46	84
41	84
40	84
32	84
28	82
37	82
69	82
37	82

Carbide/K15	Carbide/P25
	
1655	1656
3	3



V _c m/min	Feed column no.	
50		82
45		82
45		82
35		82
45		82
40		82
30		82
30		82
22		81
50		82
35		82
20		81
35		82
20		81
40		82
35		81
35		81
25		81
37		82
33		81
35		82
16		81
50	84	83
40	83	82
50	83	82
40	82	82
20	81	81
20	83	81
15	82	81
80	84	84
80	82	83
50	82	83
40	82	84
35	84	82
30	84	82
25	84	82
22	84	81
50	82	83
80	82	84
50	82	83
50	82	83



A AITIN

C TiCN

F FIRE

P AlCrN

S TiN

M MolyGlide

Countersinks

Spotfacers
Guhring std.

Tool material
Type
Surface finish
Std. range page
Guhring no.
No. of flutes
(\varnothing -range)

Taper countersinks
Guhring std.Back spotfacers
Guhring std.

Material chart page 53

V_c m/min	Feed column no.	V_c m/min	Feed column no.	V_c m/min	Feed column no.	V_c m/min	Feed column no.
53	83	30	85	30	82	45	83
48	82	27	85	27	82	41	82
48	83	30	85	30	82	41	83
37	82	27	85	27	82	32	82
48	82	30	85	30	82	41	83
42	82	27	85	27	82	36	82
32	82	24	84	24	81	27	83
32	82	20	84	20	81	27	82
23	81	15	84	15	81	20	81
53	83	28	85	28	82	45	82
37	82	18	84	18	81	32	82
21	81	12	84	12	81	18	81
37	82	18	84	18	81	32	82
21	81	15	84	15	81	18	81
42	82	20	84	20	81	36	82
37	81	17	84	17	81	32	81
37	81	20	84	20	81	32	81
27	81	12	84	12	81	23	81
39	82	12	84	12	81	33	82
35	81	6	84	6	81	30	82
37	81	8	84	8	81	32	82
17	81	8	84	8	81	14	81
53	84	12	85	12	82	45	84
42	83	10	84	10	81	36	83
53	83	10	84	10	81	45	83
42	82	8	84	8	81	36	82
21	81	5	84	5	81	18	81
21	83	10	85	10	82	18	81
16	82	7	85	7	82	14	81
84	83	100	85	100	82	72	84
84	84	80	86	80	83	72	84
63	83	80	85	80	82	54	84
48	83	70	85	70	82	63	84
84	84	75	86	75	83	72	84
84	82	50	84	50	81	72	84
53	82	60	85	60	82	45	84
42	82	45	85	45	82	36	84
37	84	40	86	40	83	32	83
32	84	36	86	36	83	27	82
27	84	35	86	35	83	23	82
23	84	28	86	28	83	20	82
53	82	25	84	25	81	45	84
84	82	32	85	32	82	72	84
53	82	60	84	60	81	45	84
53	82	32	85	32	82	45	84

○ bright

● steam tempered

● nitrided lands

● nitrided

● golden brown

● TiAlN

Technical section

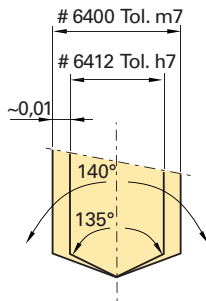


Drilling tools

Pilot drilling

Procedure for micro-precision drills

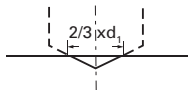
For the application of solid carbide micro-precision drills 15xD we recommend a pilot hole 1xD up to 2xD depth. For this pilot hole, the solid carbide micro-precision drill 4xD is optimally suitable. Its point angle and its diameter tolerance are perfectly adapted.



Centering

In order to achieve full performance with solid carbide micro-precision drills from 8xD drilling depth, we recommend centering.

The ExclusiveLine solid carbide micro-precision drill up to 4xD, Guhring no. 6400, can be applied for this purpose. The centering diameter should be approximately $\frac{2}{3} \times D$.



Procedure for RT 100T

In order to achieve optimal machining results when producing deep holes with type RT 100T especially spotting on radii or on an uneven surface structure, we recommend the following machining steps:

1. Initial milling of surface, i.e. with Guhring's centre cutting Ratio end mill RF 100 U. The surface must be machined at right angles to the entry angle of the drilling operation.
2. Production of a cylindrical pilot hole (tolerance F9) with a minimum drilling depth of $1 \times D$. For this operation we recommend our Ratio drills RT 100 U or RT 100 F respectively. Thanks to a 140° point angle and a m7 tolerance on diameter these Ratio drills are especially suitable for this machining task.
3. Entry of spiral-flute deep hole drill RT 100T in the pilot hole at a speed of approx. 300 rev./min and with a feed rate of approx. 500 mm/min.
4. Setting of coolant pressure and speed.
5. Continuous drilling to complete hole depth without wood pecking.
6. For through holes with oblique exit, reduce the feed rate v_f to 40% approx. 1 mm prior to break-through.
7. After reaching hole depth stop machine spindle and coolant supply, withdrawal in top gear.

Coolant

Filter quality

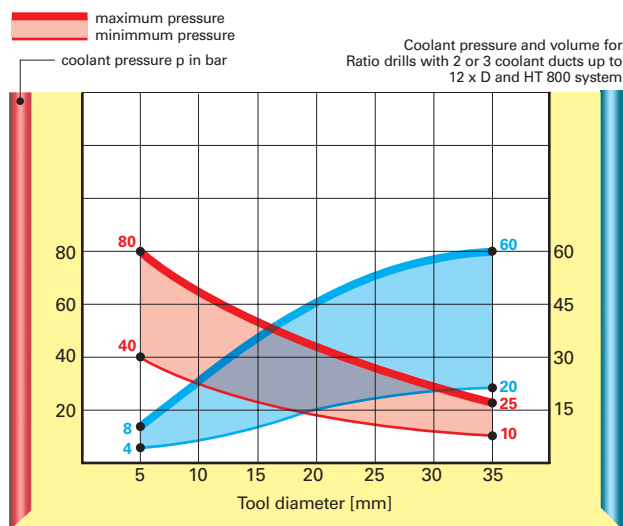
When applying solid carbide micro-precision drills we recommend constant monitoring of the lubricant's filter quality due to the extremely small coolant duct diameters, for example with our check instrument CC 3000.



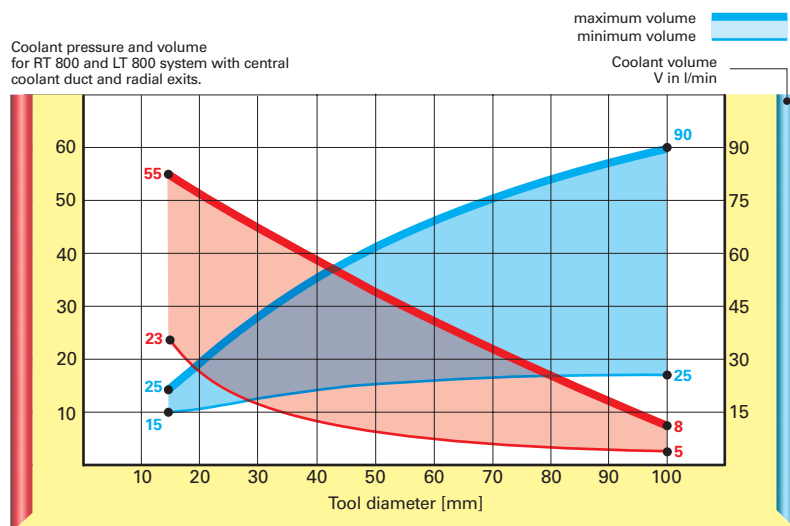
Required coolant pressures and volumes for Ratio drills and T800 tools

The information about coolant pressures and volumes are based on average coolant duct sizes and standard machining tool conditions.

The Guhring PQ 3000 measuring system takes pressure and volume of coolant flow directly in the machining tool using the original tool.



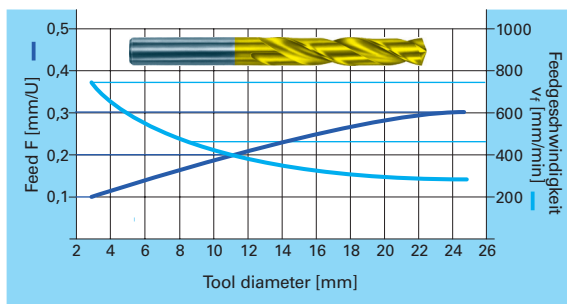
Coolant pressure and volume for RT 800 and LT 800 system with central coolant duct and radial exits.



Drilling tools

Loadability of machine

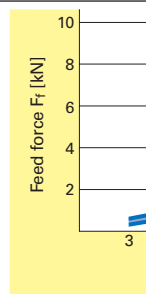
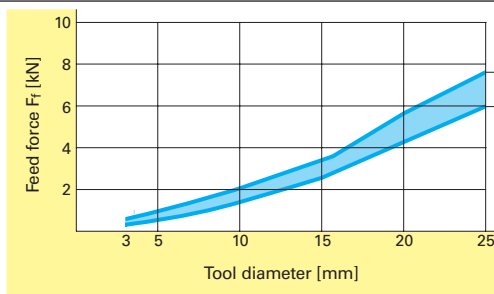
Used tool:
Ratio drills RT 100
Minimum cutting speed:
for steel: $vc = 70$ m/min
(see right table)
for cast iron: $vc = 110$ m/min
for AlSi7: $vc = 200$ m/min



drilling steel (1000 MPa·N/mm²)

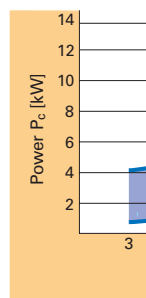
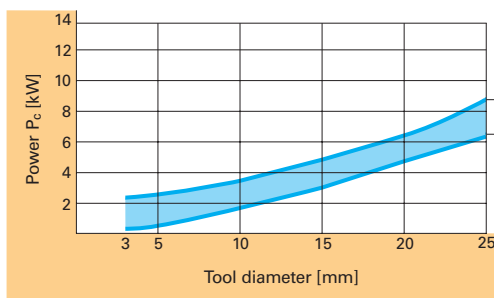
Feed force

F_f has to be converted
linearly for tensile strengths
other than 1000 N/mm²



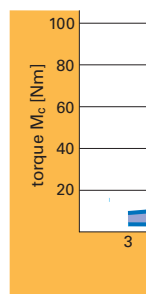
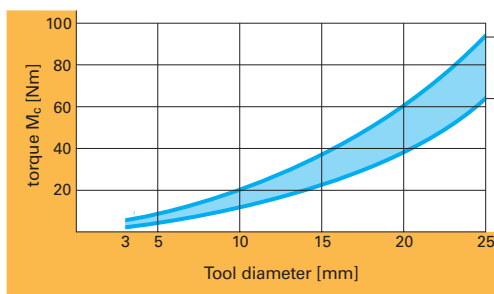
Required power

P_c has to be converted
linearly for tensile strengths
other than 1000 N/mm²



Required torque

M_c has to be converted
linearly for tensile strengths
other than 1000 N/mm²



Loadability of machine

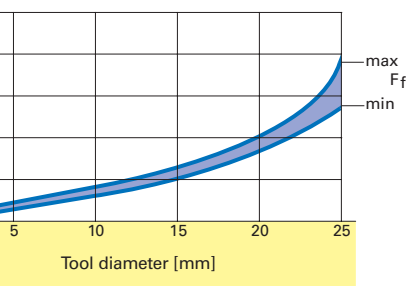
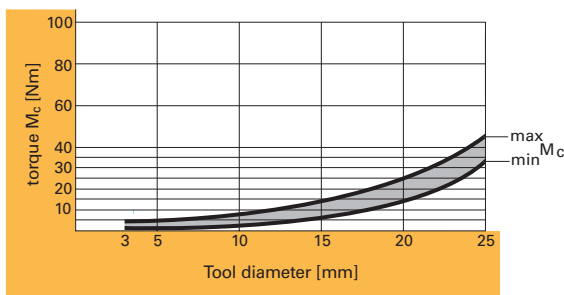
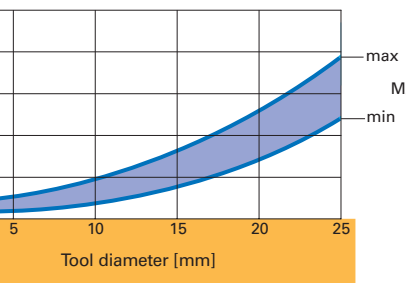
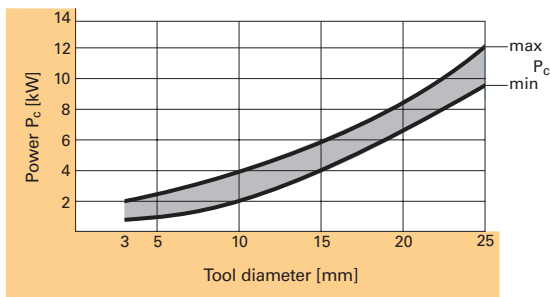
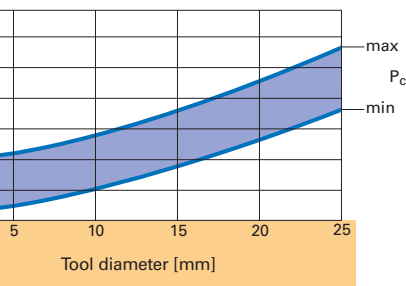
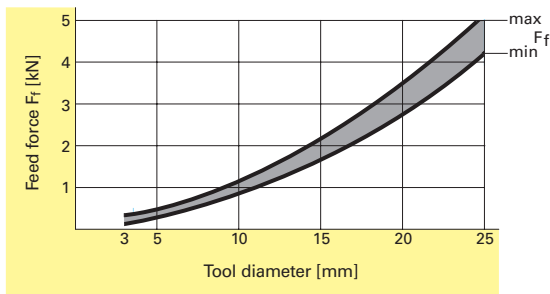
Please find the guidelines for the possible load capacity of the machine with Ratio drills type RT 100 in the diagrams on these pages.

Depending on the tool diameter the engineer may use these illustrations in order to determine the following parameters simply and quickly:

- the required drive power
- the required torque
- whether the used machine spindle would be axially overloaded (feed force load-bearing capacity)

The minimum values (curves) refer to cutting procedures with a new tool, whereas the maximum values refer to a worn tool shortly before the end of its tool life.

The occurring stresses are illustrated for steel, cast iron and AlSi alloys. This shows that the stresses with AlSi7 are lower, however, the machine must be capable of meeting the required values at relatively high revolutions.

drilling cast iron (GG25)**drilling Al-alloys (AlSi7)**

Drilling tools**Troubleshooting drilling tools
Problems and their causes****1 Cutting edge built-up**

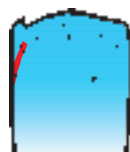
- cutting speed too low
- excessive honing of cutting lip
- when bright finish cutting lips have tool coated

4 Crumbling on cutting lips

- non rigid conditions, insufficient workpiece clamping
- when interrupted cut reduce feed
- max. wear and tear values have been exceeded
- wrong tool type; apply suitable tool (see application recommendations page 20)

2 Crumbling of outer corner

- non rigid conditions, insufficient workpiece clamping
- deviation from concentricity too large
- when interrupted cut reduce feed

5 Land wear

- non rigid conditions, insufficient workpiece clamping
- deviation from concentricity too large
- back taper too small
- wrong coolant (oil), soluble oil too thin

3 Heavy wear and tear at flank

- cutting speed too high
- feed too low
- clearance angle too small

6 Scoring on tool body

- non rigid conditions, insufficient workpiece clamping
- deviation from concentricity too large
- when interrupted cut reduce feed
- for abrasive materials thicken soluble oil if necessary

7 Heavy chisel edge wear and tear

- cutting speed too low
- feed too high
- excessive honing of cutting lip

10 Misalignment, axis shifting

- non rigid conditions, insufficient workpiece clamping
- deviation from concentricity too large
- when spotting area transverse use milling cutter (two-fluted) for spotting
- chisel edge too large

**8 Crumbling at intersection web thinning and cutting lip**

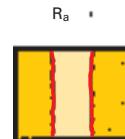
- clearance angle too small
- excessive honing of cutting lip
- wrong tool type; apply suitable tool (see application recommendations page 20)

11 Heavy burring on breakthrough

- feed too high
- max. wear and tear values have been exceeded
- excessive honing of cutting lip

9 Plastic deformation of outer corner

- cutting speed too high
- insufficient coolant; increase coolant (volume, pressure)
- incorrect or no corner chamfer

12 Unsatisfactory surface finish

- non rigid conditions, insufficient workpiece clamping
- deviation from concentricity too large
- insufficient coolant; increase coolant (volume, pressure)

Gun drills

Coolant values

The tasks of the coolant (KSS):

- chip evacuation
insufficient coolant leads to chip congestion and results in tool breakages
- lubricating film
especially with single-fluted gun drills high surface pressure is created between hole and supporting strips. A break in the lubricating film causes excessive friction leading to tool breakages.

- cooling the cutting edge
during the cutting process, temperatures of approx. 800° C are created at the carbide cutting edge, insufficient cooling drastically reduces tool life.

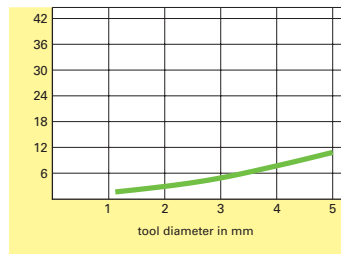
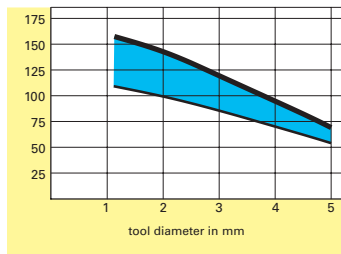
Coolant pressure p in bar



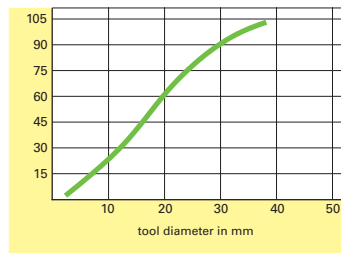
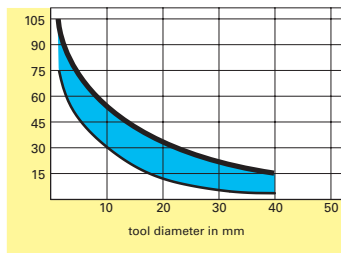
Pressure curves in graph:
The thicker line above indicates deep drilling oil, the bottom line soluble oil.

Coolant volume flow Q in l/min

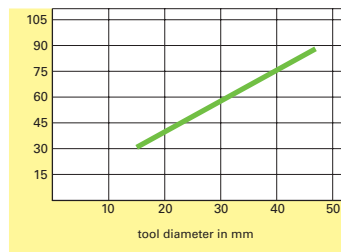
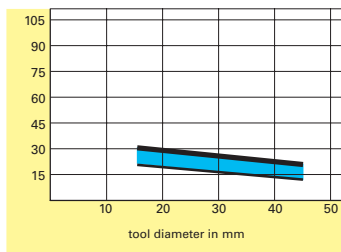
EB100



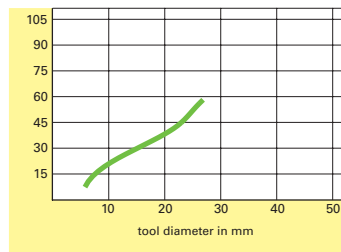
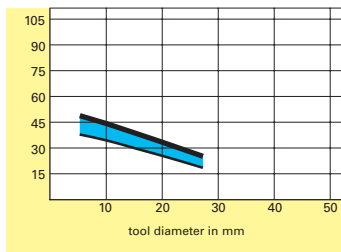
EB80



EB800



ZB80



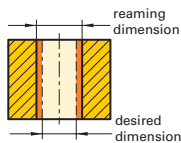
Troubleshooting

Adapted cutting speed, an appropriate feed rate and good cooling and lubricating agents should always be a top priority for reaming operations. A further point to be considered is that the reamer always follows the direction of the pre-drilled hole. An exception is the machine bottoming reamer. Consequently reamers do not correct alignment errors of pre-drilled holes. Errors between the spindle axis and the axis of a pre-drilled hole can be adjusted with the aid of floating holders. The following fault finding chart will be found useful in tracing the cause of some common reaming problems.

Wording:

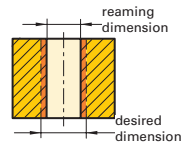
Desired dim. Required finish dimension of bore hole, defined as max./min. dimension of tolerance zone
Reaming dim. the finish dimension reached in fact
„Bore hole“ The reached bore hole after reaming

1 Holes too large



- Tool diameter too large
- Cutting speed/feed rate too high
- Concentricity error of machine spindle
- Bevel lead of tool too short/uneven
- Cutting edge build up due to excessive cutting speeds
- Lubricating agent unsuitable, holes too large due to lubrication
- Axis shifting between tool and pre-drilled hole. Application of floating holders

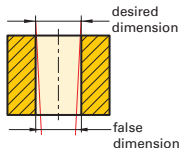
2 Holes too small



- Reamer blunt. Does not cut, only scrapes
- Cutting speed/feed rate too low
- Component is thin-walled, springs back
- Insufficient stock removal allowance, tool seizes in hole

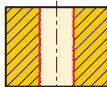


3 Conical hole malformation



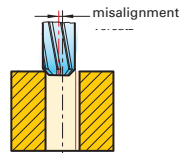
- Tool knocks in spindle
- Bevel lead incorrect
- Axis shifting between tool and pre-drilled hole. Application of floating holders
- Pre-machining inaccurate

4 Unsatisfactory surface finish



- No/insufficient lubrication. Cutting edge build-up.
- Tool damaged, i. e. broken cutting edge
- Material has a tendency to cause build up on cutting edges.
- Surface finish of pre-drilled hole unsatisfactory
- Concentricity bevel lead incorrect
- Chip evacuation restricted

5 Misalignment of hole



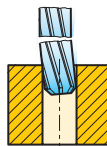
- Pre-drilled hole misaligned
- Concentricity bevel lead incorrect

6 Hole has chatter marks



- Cutting edge build-up
- Grease content in coolant too low
- Circular lands too wide
- Stock removal allowance insufficient
- Tool incorrectly clamped in tool holder
- Machine spindle not concentric

7 Reamer seizes and breaks



- Back taper incorrect
- Circular lands too wide
- Pre-drilled hole is too small
- Bevel lead blunt/ground unevenly
- Feed rate too high

8 Feed scoring marks in hole



- Worn cutting edges
- Crumbling on cutting edges
- Build up on cutting edges

Reaming tools

Special recommendations for reaming with machine reamers

Blind hole or through hole

Straight-fluted reamers are generally applied in blind holes as they, due to their cutting edge geometry, evacuate the chips from the hole against the direction of the feed. Spiral reamers are preferred for the application in through holes because the spiral evacuates the chips from the hole in direction of the feed.

Interrupted holes

Spiral reamers are preferred for the application in interrupted holes because the cutting edge geometry, in comparison to straight-fluted tools, possesses a lesser tendency of grabbing on the oblique hole. If the oblique hole is $> 0.25 \times D$, spiral reamers can also be applied in blind holes.

Stock removal allowance of the pre-drilled hole

In the event of the stock removal allowance of the pre-drilled hole exceeding the standard stock removal allowance of 0.2 to 0.3 mm for reaming, a quick spiral reamer or a machine bridge reamer should be applied. It is possible to machine a considerably larger stock removal allowance with these tools, however, they should not be applied in blind holes due to the bevel lead length and the spiral angle.

Expanding reamers

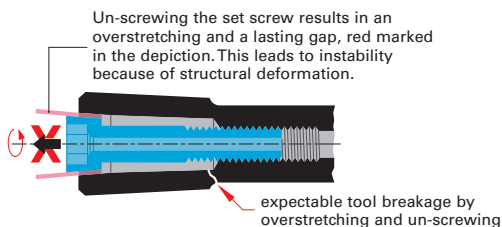
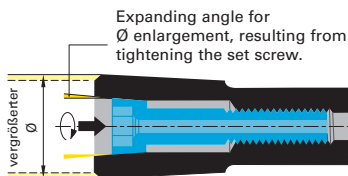
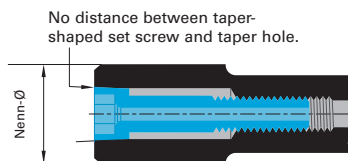
Expanding reamers can only be expanded. Subsequently, if the resulting measurement is too large it is not possible to turn the screw back as the pretension of the tool

would be lost. In most cases this leads to tool breakage. If the pretension has been taken from the tool, it requires re-adjusting and re-grinding.

Positional accuracy of the hole

A machine bottoming reamer often provides the best solution when optimal positional accuracy is required, thanks to its special chamfer lead the 'wander' of the tool is minimal. In addition, machine bottoming reamers are often applied when the pre-drilled hole and the reamer are not on the same axis (slight misalignment).

Schematic depiction of expanding and of risk of tool breakage when re-turning set screw (excessive depiction)



Manufacturing tolerances to DIN 1420

General remarks for the determination of manufacturing tolerances for reamers

The manufacturing tolerances to DIN 1420 are allocated to certain tolerance zones of the holes to be reamed. Generally they ensure the positioning of reamed holes within the relevant tolerance zone as well as the most economical use of the reamer.

It must, however, be taken into account that the size of the reamed hole depends, in addition to the manufacturing tolerance of the reamer, on various other factors, such as angles of cutting edges; bevel lead of reamer; clamping of the workpiece; the tool holder; condition of the machine; the coolant and on the material of the workpiece. Therefore, from time to time other manufacturing tolerances than IT7 (H7) might prove

more advantageous.

However, in the interest of economic production and storage, it is recommended that non-standard manufacturing tolerances are used only in exceptional cases. For determining the manufacturing tolerances the following well-proven *basic rules* were stipulated:

Determination of perm. max. and min. sizes of reamers

The largest permitted reamer diameter ranges at about 15% of the approximate hole tolerance (0.15 IT) below the permissible maximum diameter of the hole (see fig.), whereby the value 0.15 IT will be rounded of to the next higher integer or half μm -value, so that even μm values are derived for $d_{1\text{max}}$. The permissible smallest reamer diameter $d_{1\text{min}}$ ranges at about 35% of the approximate

hole tolerance (0.35 IT) below the permissible maximum diameter $d_{1\text{max}}$ (ex. 1).

Simplified determination of perm. max. and min. reamer dimensions

In order to facilitate calculations, the table on page 48 indicates the upper and lower tolerance limits on the nominal diameter d_1 for the most common "H" tolerance zones. With the aid of these tolerance limits the permissible maximum and minimum reamer dimensions can be calculated (ex. 2).



Example 1

nominal diameter d_1 = 20.000 mm
 maximum diameter of the hole = 20.021 mm
 hole tolerance (IT 7) = 0.021 mm
 15% of the hole tolerance (0.15 IT 7) \approx 0.0031 mm
 \approx 0.004 mm
 maximum reamer diameter:
 $d_{1\text{max}} = 20.021 - 0.004$ = 20.017 mm
 manufacturing tolerance of reamer:
 35% of the hole tolerance (0.35 IT 7) = 0.0073 mm
 \approx 0.008 mm

minimum reamer diameter:

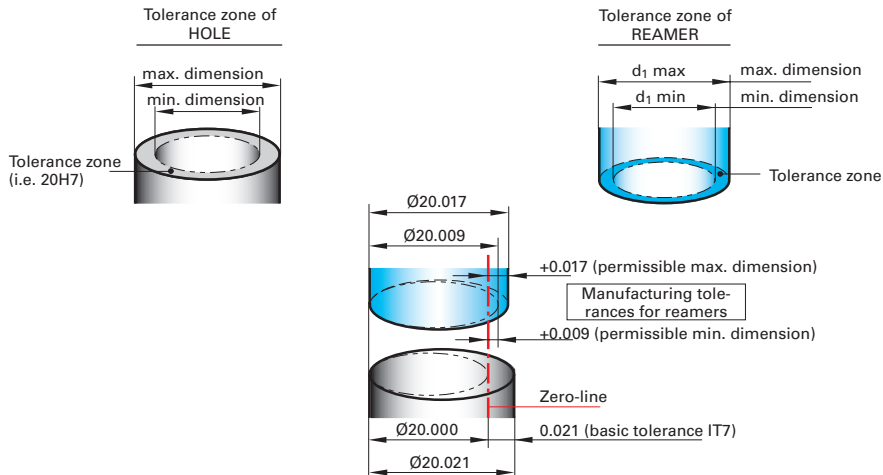
$$d_{1\text{min}} = d_{1\text{max}} - 0.35 \text{ IT } 7 = 20.017 - 0.008 = \underline{20.009 \text{ mm}}$$

Example 2

nominal diameter d_1 = 20.000 mm
 upper tol limit (s. table p. 48) + 17 μm = 0.017 mm
 lower tol. limit (s. table p. 48) + 9 μm = 0.009 mm
 i. e.: $d_{1\text{max}} = 20.000 + 0.017$ = 20.017 mm
 $d_{1\text{min}} = 20.000 + 0.009$ = 20.009 mm

Simplified calculation of the permissible maximum and minimum dimensions for reamers

Example: Hole tolerance zone $\varnothing 20 \text{ H7/nom.}$ dimension d_1 of reamer 20 mm



Reaming tools**Manufacturing tolerances to DIN 1420**(complete range see
Guhring catalogue)**Tolerance zones H6...H12 to DIN 1420**(permissible **upper** and lower tolerances on nominal reamer $\varnothing d_1$ in μm)

our standard manufacturing tolerance

\varnothing range mm	for hole tolerance zone						
	H6	H7	H8	H9	H10	H11	H12
>1.....3	+ 5 + 2	+ 8 + 4	+11 + 6	+21 +12	+ 34 + 20	+ 51 + 30	+ 85 + 50
>3.....6	+ 6 + 3	+10 + 5	+15 + 8	+25 +14	+ 40 + 23	+ 63 + 36	+102 + 60
>6.....10	+ 7 + 3	+12 + 6	+18 +10	+30 +17	+ 49 + 28	+ 76 + 44	+127 + 74
>10.....18	+ 9 + 5	+15 + 8	+22 +12	+36 +20	+ 59 + 34	+ 93 + 54	+153 + 90
>18.....30	+11 + 6	+17 + 9	+28 +16	+44 +25	+ 71 + 41	+110 + 64	+178 +104
>30.....50	+13 + 7	+21 +12	+33 +19	+52 +30	+ 85 + 50	+136 + 80	+212 +124
>50.....80	+16 + 9	+25 +14	+39 +22	+62 +36	+102 + 60	+161 + 94	+255 +150
>80...120	+18 +10	+29 +16	+45 +26	+73 +42	+119 + 70	+187 +110	+297 +174

Stock allowance (reaming dim.) of holes
(recommended values in mm)

material	stock allowance on hole diameter				
	≤ 6	≤ 10	≤ 16	≤ 25	> 25
steels up to 700 MPa	0.1 - 0.2	0.2	0.2 - 0.3	0.3 - 0.4	0.4 - 0.5
steels 700-1000 MPa	0.1 - 0.2	0.2	0.2	0.3	0.3 - 0.4
cast steel	0.1 - 0.2	0.2	0.2	0.2 - 0.3	0.3 - 0.4
grey cast iron	0.1 - 0.2	0.2	0.2 - 0.3	0.3 - 0.4	0.4 - 0.5
malleable cast iron	0.1 - 0.2	0.2	0.3	0.4	0.5
copper	0.1 - 0.2	0.2 - 0.3	0.3 - 0.4	0.4 - 0.5	0.5
brass, bronze	0.1 - 0.2	0.2	0.2 - 0.3	0.3	0.3 - 0.4
light alloys	0.1 - 0.2	0.2 - 0.3	0.3 - 0.4	0.4 - 0.5	0.5
plastics hard	0.1 - 0.2	0.2	0.4	0.4 - 0.5	0.5
plastics soft	0.1 - 0.2	0.2	0.2	0.3	0.3 - 0.4

When using expanding machine reamers or reamers with inserted blades the metal removal allowance should be reduced by approx. 30%. Due to the spiral, the values for quick spiral reamers may be increased by 50 to 100%.

Basic tolerances to DIN ISO 286-1

for length dimensions (nom. sizes) 1...120 mm

IT ▶	3	4	5	6	7	8	9	10	11	12	13	14
nom. size	tolerances in μm											
1.....3	2	3	4	6	10	14	25	40	60	100	140	250
> 3.....6	2,5	4	5	8	12	18	30	48	75	120	180	300
> 6.....10	2,5	4	6	9	15	22	36	58	90	150	220	360
>10.....18	3	5	8	11	18	27	43	70	110	180	270	430
>18.....30	4	6	9	13	21	33	52	84	130	210	330	520
>30.....50	4	7	11	16	25	39	62	100	160	250	390	620
>50.....80	5	8	13	19	30	46	74	120	190	300	460	740
>80...120	6	10	15	22	35	54	87	140	220	350	540	870

The new material abbreviations (selection)

mat. nos.	abbreviation old	abbreviation new	mat. nos.	abbreviation old	abbreviation new	mat. nos.	abbreviation old	abbreviation new	mat. nos.	abbreviation old	abbreviation new	mat. nos.	abbreviation old	abbreviation new
0.6010	GG10	EN-GJL-100	1.0728	60 S 20	-	1.4436	X5CrNiMo 17 13 3	X3CrNiMo17-13-3	1.7043	-	38Cr4	1.7043	-	38Cr4
0.6020	GG20	EN-GJL-200	1.0736	9 SMn 36	11SMn37	1.4438	X2CrNiMo 18 16 4	X2CrNiMo18-16-4	1.7147	20 MnCr 5	20MnCr5	1.7147	20 MnCr 5	20MnCr5
0.6025	GG25	EN-GJL-250	1.0737	9 SMnPb 36	11SMnPb37	1.4460	X4CrNiMo 27 5 2	X3CrNiMoN27-5-2	1.7149	20 MnCrS 5	20MnCrS5	1.7149	20 MnCrS 5	20MnCrS5
0.6035	GG35	EN-GJL-350	1.0756	35 SPb 20	35SPb20	1.4462	X2CrNiMoN 22 5 3	X2CrNiMoN22-5-3	1.7176	55 Cr 3	55Cr 3	1.7176	55 Cr 3	55Cr 3
0.7050	GG50	EN-GJS-500-7	1.0757	45 SPb 20	46SPb20	1.4509	X6CrTiNb 18	X2CrTiNb18	1.7182	27 MnCrB 5 2	27MnCrB5-2	1.7182	27 MnCrB 5 2	27MnCrB5-2
0.7070	GG70	EN-GJS-700-2	1.0760	-	38SMn26	1.4510	X6CrTi 17	X3CrTi17	1.7185	33 MnCrB 5 2	33MnCrB5-2	1.7185	33 MnCrB 5 2	33MnCrB5-2
0.8035	GTW35	EN-GJMW-350-4	1.0761	-	38SMnPb26	1.4511	X6CrNb 17	X3CrNb17	1.7189	39 MnCrB 6 2	39MnCrB6-2	1.7189	39 MnCrB 6 2	39MnCrB6-2
0.8155	GT55	EN-GJMB-550-4	1.0762	-	44SMn28	1.4512	X6CrTi 12	X2CrTi12	1.7213	25 CrMoS 4	25CrMoS4	1.7213	25 CrMoS 4	25CrMoS4
0.8170	GT570	EN-GJMB-700-2	1.0763	-	44SMnPb28	1.4520	X1CrTi 15	X2CrTi17	1.7218	25 CrMo 4	25CrMo4	1.7218	25 CrMo 4	25CrMo4
1.0022	St 01Z	-	1.0873	-	DC06 [Fe P06]	1.4521	X2CrMoTi 18 2	X2CrMoTi18-2	1.7219	-	26CrMo4-2	1.7219	-	26CrMo4-2
1.0035	St 33	S185	1.1103	ESiE 255	S255N1.1	1.4522	X2CrMoNb 18 2	X2CrMoNb18-2	1.7220	34 CrMo 4	34CrMo4	1.7220	34 CrMo 4	34CrMo4
1.0039	St 37 - 2	S235JRH	1.1105	ESiE 315	S315N1.1	1.4532	X7CrNiMoAl 15 7	X8CrNiMoAl15-7-2	1.7225	42 CrMo 4	42CrMo4	1.7225	42 CrMo 4	42CrMo4
1.0044	St 44 - 2	S275JR	1.1121	Ck 10	C10E	1.4541	X6CrNiTi18 10	X6CrNiTi18-10	1.7226	34 CrMoS 4	34CrMoS4	1.7226	34 CrMoS 4	34CrMoS4
1.0050	St 50 - 2	E295	1.1141	CK15	C15E	1.4542	X5CrNiCuNb 17 4	X5CrNiCuNb16-4	1.7227	42 CrMo 4	42CrMo4	1.7227	42 CrMo 4	42CrMo4
1.0060	St 60 - 2	E335	1.1151	Ck 22	C22E	1.4550	X6CrNiNb 18 10	X6CrNiNb18-10	1.7228	50 CrMo 4	50CrMo4	1.7228	50 CrMo 4	50CrMo4
1.0070	St 70 - 2	E360	1.1158	Ck 25	C25E	1.4558	X2NiCrAlTi 32 20	X2NiCrAlTi32-20	1.7264	20 CrMo 5	20CrMo5	1.7264	20 CrMo 5	20CrMo5
1.0114	St 37 - 3U	S235J0	1.1170	28 Mn 6	28Mn6	1.4567	X3CrNiCu 18 9 X	X3CrNiCu18-9-X	1.7321	20 MoCr 4	20MoCr4	1.7321	20 MoCr 4	20MoCr4
1.0226	St 02Z	DX51D	1.1178	Ck 30	C30E	1.4568	X7CrNiAl 17 7	X7CrNiAl17-7	1.7323	20 MoCrS 4	20MoCrS4	1.7323	20 MoCrS 4	20MoCrS4
1.0242	StE 250 - Z2	S250GD	1.1181	Ck 35	C35E	1.4571	-	X6CrNiMoTi17-12-2	1.7333	22 CrMoS 3 5	22CrMoS3-5	1.7333	22 CrMoS 3 5	22CrMoS3-5
1.0244	StE 280 - Z2	S280GD	1.1186	Ck 40	C40E	1.4577	X3CrNiMoTi 25 25	X3CrNiMoTi25-25	1.7335	13 CrMo 4 4	13CrMo4-4	1.7335	13 CrMo 4 4	13CrMo4-4
1.0250	StE 320 - Z2	S320GD	1.1191	Ck 45	C45E	1.4592	X1CrMoTi 29 4	X2CrMoTi29-4	1.7362	12 CrMo 19 5	12CrMo19-5	1.7362	12 CrMo 19 5	12CrMo19-5
1.0301	C 10	-	1.1203	Ck 55	C55E	1.4713	X10CrAl 7	X10CrAlS7	1.7380	10 CrMo 9 10	10CrMo9-10	1.7380	10 CrMo 9 10	10CrMo9-10
1.0301	C 10 Pb	-	1.1206	Ck 50	C50E	1.4724	X10CrAl 13	X10CrAlS13	1.7383	-	11CrMo9-10	1.7383	-	11CrMo9-10
1.0306	St 06 Z	DX54D	1.1221	Ck 60	C60E	1.4742	X10CrAl 18	X10CrAlS18	1.7779	-	20CrMoV13-5-5	1.7779	-	20CrMoV13-5-5
1.0312	St 15	DC05 [Fe P05]	1.1241	Cm 50	C50R	1.4762	X10CrAl 24	X10CrAlS25	1.8159	50 CrV 4	51CrV4	1.8159	50 CrV 4	51CrV4
1.0319	RRSiE 210.7	L210GA	1.1750	C75 W	C75W	1.4821	X20CrNiSi 25 4	X20CrNiSi25-4	1.8504	34 CrAl 6	34CrAl6	1.8504	34 CrAl 6	34CrAl6
1.0322	-	DX56D	1.2067	102 Cr 6	102Cr6	1.4828	X15CrNiSi 20 12	X15CrNiSi20-12	1.8519	31 CrMoV 9	31CrMoV9	1.8519	31 CrMoV 9	31CrMoV9
1.0330	St 12 [St 12]	DC01 [Fe P01]	1.2080	-	X210Cr12	1.4833	X7CrNi 23 14	X7CrNi23-12	1.8550	34 CrAlNi 7	34CrAlNi7	1.8550	34 CrAlNi 7	34CrAlNi7
1.0333	Ust 13	-	1.2083	-	X42Cr13	1.4841	X15CrNiSi 25 20	X15CrNiSi25-21	1.8807	13 MnNiMoV 5 4	13MnNiMoV5-4	1.8807	13 MnNiMoV 5 4	13MnNiMoV5-4
1.0338	St 14 [St 14]	DC04 [Fe P04]	1.2419	-	105WCr6	1.4845	X12CrNi 25 21	X12CrNi25-21	1.8812	18 MnMoV 5 2	18MnMoV5-2	1.8812	18 MnMoV 5 2	18MnMoV5-2
1.0345	H 1	P235GH	1.2767	-	X45NiCrMo4	1.4864	X12NiCrSi 36 16	X12NiCrSi35-16	1.8815	18 MnMoV 6 3	18MnMoV6-3	1.8815	18 MnMoV 6 3	18MnMoV6-3
1.0347	RRSt 13 [RRSt 3]	DC03 [Fe P03]	1.3243	S6-5-2-5	S 6-5-2-5	1.4878	X12CrNiTi18 9	X10CrNiTi18-10	1.8821	TSiE 355TM	P355TM	1.8821	TSiE 355TM	P355TM
1.0348	UH 1	P195GH	1.3343	S6-5-2	S 6-5-2	1.4903	-	X10CrMoVNb9-1	1.8824	TSiE 420TM	P420TM	1.8824	TSiE 420TM	P420TM
1.0350	St 03Z	DX52D	1.3344	S6-5-3	S 6-5-3	1.5026	55 Si 7	55Si7	1.8826	TSiE 460TM	P460TM	1.8826	TSiE 460TM	P460TM
1.0355	St 05Z	DX53D	1.4000	X6Cr 13	X6Cr13	1.5131	50 MnSi 4	50MnSi4	1.8828	ESiE 420TM	P420ML2	1.8828	ESiE 420TM	P420ML2
1.0356	TTSt 35 N	P215NL	1.4000	X6CrAl 13	X6CrAl13	1.5415	15 Mo 3	16Mo3	1.8831	ESiE 460TM	P460ML2	1.8831	ESiE 460TM	P460ML2
1.0358	St 05 Z	-	1.4002	X2Cr 11	X20CrNi12	1.5530	21 MnB 5	20MnB5	1.8832	TSiE 355TM	P355ML1	1.8832	TSiE 355TM	P355ML1
1.0401	C 15	-	1.4005	-	X12CrS13	1.5531	30 MnB 5	30MnB5	1.8835	TSiE 420TM	P420ML1	1.8835	TSiE 420TM	P420ML1
1.0402	C 22	C22	1.4006	X10Cr 13	X12Cr13	1.5532	38 MnB 5	38MnB5	1.8837	TSiE 460TM	P460ML1	1.8837	TSiE 460TM	P460ML1
1.0403	C 15 Pb	-	1.4016	X6Cr 17	X6Cr17	1.5637	10 Ni 14	12Ni14	1.8879	SiE ...	P690Q	1.8879	SiE ...	P690Q
1.0406	C 25	C25	1.4021	X20Cr 13	X20Cr13	1.5662	-	X11CrMo5+1	1.8880	WSiE ...	P690QH	1.8880	WSiE ...	P690QH
1.0419	St 52.0	L355	1.4028	X30Cr 13	X30Cr13	1.5680	-	X12Ni5	1.8881	TSiE ...	P690QL1	1.8881	TSiE ...	P690QL1
1.0424	St 45.8 (ersetz.)	P265	1.4031	X38Cr 13	X38Cr13	1.5710	36 NiCr 6	36NiCr6	1.8882	10 MnTi 3	10MnTi3	1.8882	10 MnTi 3	10MnTi3
1.0424	St 42.8 (ersetz.)	P265	1.4034	X46Cr 13	X46Cr13	1.5715	-	16NiCrS4	1.8888	ESiE ...	P690QL2	1.8888	ESiE ...	P690QL2
1.0425	H2	P265GH	1.4037	X65Cr13	X65Cr13	1.5752	14 NiCr 14	15NiCr13	1.8901	SiE 380	S380N	1.8901	SiE 380	S380N
1.0429	SiE 290.7TM	L290NB	1.4057	X20CrNi 17 2	X17CrNi16-2	1.6210	15 MnNi 6 3	15MnNi6-3	1.8901	SiE 460	S460N	1.8901	SiE 460	S460N
1.0457	SiE 240.7	L245NB	1.4104	X12CrMoS 17	X14CrMoS17	1.6211	16 MnNi 6 3	16MnNi6-3	1.8902	SiE 420	S420N	1.8902	SiE 420	S420N
1.0459	RRSiE 240.7	L245GA	1.4105	X4CrMoS 18	X6CrMoS17	1.6310	20 MnMoNi 5 3	20MnMoNi5-5	1.8903	TSiE 460	S460NL	1.8903	TSiE 460	S460NL
1.0461	SiE 255	S255N	1.4109	X65CrMo 14	X70CrMo15	1.6311	20 MnMoNi 4 5	20MnMoNi4-5	1.8905	SiE 460	P460N	1.8905	SiE 460	P460N
1.0473	19 Mn 6	P395GH	1.4110	X55CrMo 14	X55CrMo14	1.6341	11 NiMoV 5 3	11NiMoV5-3	1.8910	SiE 500	S500N	1.8910	SiE 500	S500N
1.0481	17 Mn 4	P295GH	1.4112	X90CrMoV 18	X90CrMoV18	1.6368	15 NiCuMoNb5	15NiCuMoNb5	1.8917	ESiE 380	S380NL	1.8917	ESiE 380	S380NL
1.0484	SiE 280.7	L290NB	1.4116	X6CrMo 17 1	X6CrMo17-1	1.6511	36 CrNiMo 4	36CrNiMo4	1.8911	ESiE 380	S380NL1	1.8911	ESiE 380	S380NL1
1.0486	SiE 295	P275N	1.4118	X45CrMoV 15	X45CrMoV15	1.6523	21 NiCrMo 2	21NiCrMo2-2	1.8912	TSiE 420	S420NL	1.8912	TSiE 420	S420NL
1.0501	C 35	C35	1.4120	X20CrMo 13	X20CrMo13	1.6526	21 NiCrMoS 2	21NiCrMoS2-2	1.8913	ESiE 420	S420NL1	1.8913	ESiE 420	S420NL1
1.0503	C 45	C45	1.4122	X35CrMo 17	X35CrMo17-1	1.6580	30 CrNiMo 8	30CrNiMo8	1.8915	TSiE 460	P460NL1	1.8915	TSiE 460	P460NL1
1.0505	SiE 315	P315N	1.4125	X105CrMo 17	X105CrMo17	1.6582	34 CrNiMo 6	34CrNiMo6	1.8917	WSiE 500	S500NL	1.8917	WSiE 500	S500NL
1.0511	C 40	C40	1.4301	X5CrNi 18 10	X5CrNi18-10	1.6587	17 CrNiMo 6	16CrNiMo7-6	1.8918	ESiE 460	P460NL2	1.8918	ESiE 460	P460NL2
1.0528	C 30	C30	1.4303	X5CrNi 18 12	X4CrNi18-12	1.7003	38 Cr 2	38Cr2	1.8919	ESiE 500	S500NL1	1.8919	ESiE 500	S500NL1
1.0529	SiE 350 - 3Z	S350GD	1.4305	X10CrNiS 18 9	X8CrNiSi18-9	1.7006	46 Cr 2	46Cr2	1.8930	WSiE 380	P380NH	1.8930	WSiE 380	P380NH
1.0535	C 55	C55	1.4306	X2CrNi 19 11	X2CrNi19-11	1.7016	17 Cr 3	17Cr3	1.8932	WSiE 420	P420NH	1.8932	WSiE 420	P420NH
1.0539	SiE 355N	S355NH	1.4310	X12CrNi 17 7	X10CrNi18-8	1.7023	38 CrS 2	38CrS2	1.8935	WSiE 460	P460NH	1.8935	WSiE 460	P460NH
1.0540	C 50	C50	1.4311	X2CrNiN 18 10	X2CrNiN18-10	1.7025	46 CrS 2	46CrS2	1.8937	TSiE 500	P500NH	1.8937	TSiE 500	P500NH
1.0547	St 52 - 3U	S355J0H	1.4313	X4CrNi 13 4	X3CrNiMo13-4	1.7030	28 Cr 4	28Cr4	1.8972	SiE 415.7	L415NB	1.8972	SiE 415.7	L415NB
1.0582	SiE 360.7	L360NB	1.4318	X2CrNiN 18 7	X2CrNiN18-7	1.7033	34 Cr 4	34Cr4	1.8973	SiE 415.7TM	L415MB	1.8973	SiE 415.7TM	L415MB
1.0601	C 60	C60	1.4335	X1CrNi 25 21	X1CrNi25-21	1.7034	37 Cr 4	37Cr4	1.8975	SiE 445.7TM	L450MB	1.8975	SiE 445.7TM	L450MB
1.0710	15 S 10	-	1.4361	X1CrNiSi 18 15	X1CrNiSi18-15-4	1.7035	41 Cr 4	41Cr4	1.8977	SiE 480.7TM	L485MB	1.8977	SiE 480.7TM	L485MB
1.0715	9 SMn 28	11SMn30	1.4362	X2CrNiN 23 4	X2CrNiN23-4	1.7036	28 CrS 4	28CrS4	1.8978	SiE 550.7TM	L555MB	1.8978	SiE 550.7TM	L555MB
1.0718	9 SMnPb 28	11SMnPb30	1.4401	X5CrNiMo 17 12 2	X5CrNiMo17-12-2	1.7037	34 CrS 4	34CrS4						
1.0721	10 S 20	10S20	1.4404	X2CrNiMo 17 13 2	X2CrNiMo17-12-2	1.7038	37 CrS 4	37CrS4						
1.0722	10 S Pb 20	10SPb20	1.4410	X10CrNiMo 18 9	X2CrNiMoN28-7-4	1.7039	41 CrS 4	41CrS4						
1.0726	35 S 20	35S20	1.4418	X4CrNiMo 16 5-1	X4CrNiMo16-5-1	1.7131	16 MnCrS 5	16MnCrS5						
1.0727	45 S 20	46S20	1.4435	X2CrNiMo 18 14 3	X2CrNiMo18-14-3	1.7139	16 MnCrS 5	16MnCrS5						

