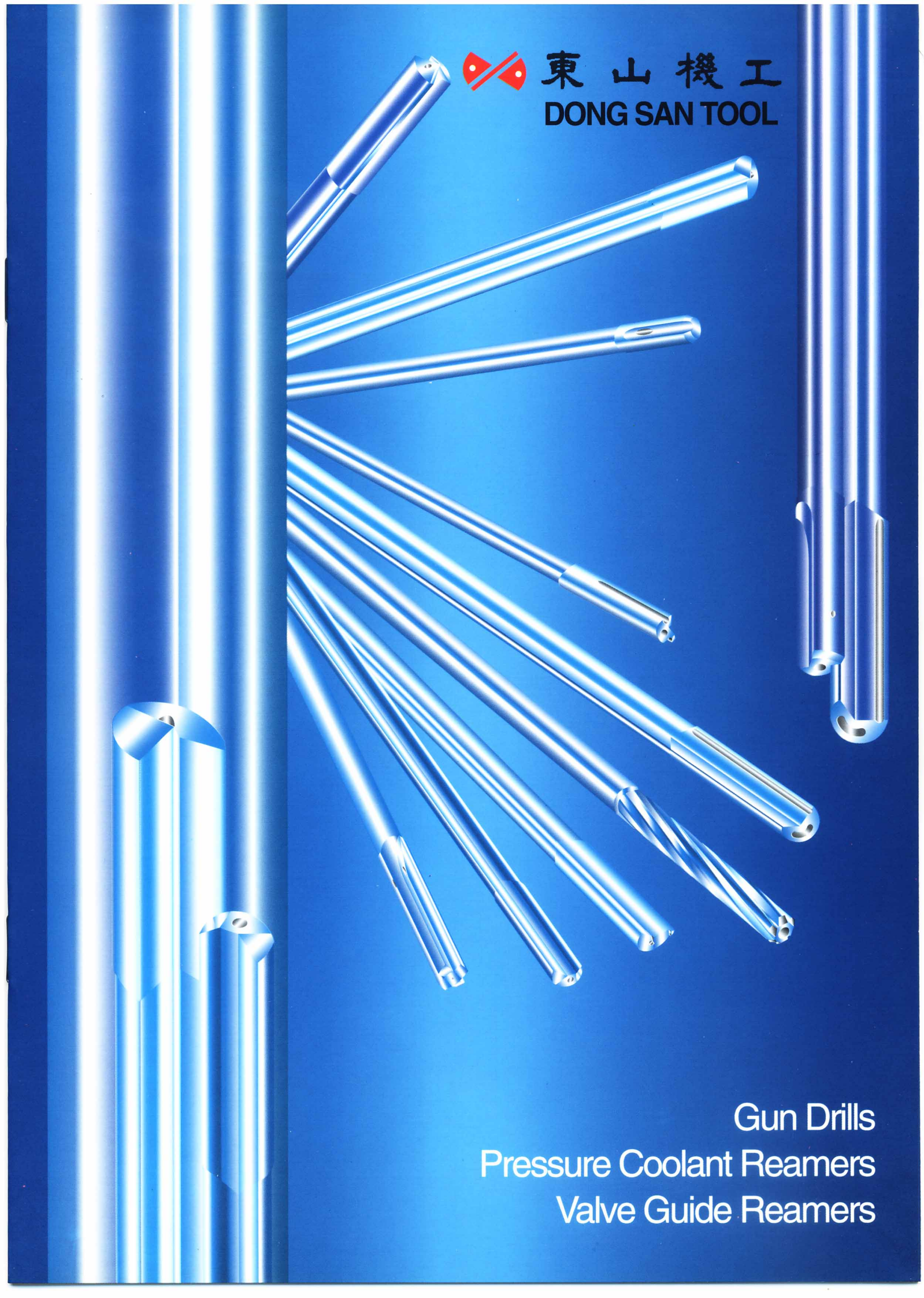
東 山 機 工

DONG SAN TOOL



Gun Drills
Pressure Coolant Reamers
Valve Guide Reamers

건드릴

건드릴은 최초 총렬가공을 위해 개발된 무기생산기술이다. 그러나 자동차공업의 발전과 함께 더욱 발전되었으며 높은 절삭성, 정밀하고 정확한 진직성과 진원도, 우수한 표면조도 등과 같은 많은 장점을 가짐으로 자동차산업, 조선, 항공기산업, 기계 및 공구산업 정유 및 건설, 유공압, 금형산업 등의 깊은 구멍가공에서 선호되는 공구가 되었다.

동산기공은 한국최고의 건드릴 제조업체로 표준형으로부터 스텝건드릴까지 다양한 건드릴을 생산공급하고 있다. 생산범위는 직경 2mm부터 50mm까지 가능하며 소비자의 요청이나 요구에도 충분히 대응하여 생산공급 할 수 있다.

Typical Horizontal Gundrilling Machine

Gundrill

The gun drilling process was originally developed in arms technology for purpose of producing the gun barrels.

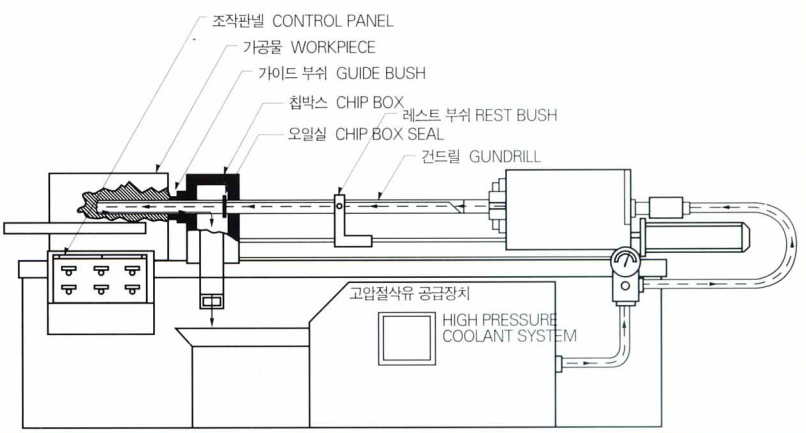
With progress of Automotive industries.

Gundrill was more developed and have more advantages as like high cutting performance, precision exact alignment and roundness, good surface finish.

So, it is preferable in many applications to us the deep hole drilling process, and widely using the automotive, ship and aircraft, machine and tool making, Oil and construction, hydraulic and compressed air, die and mold industries.

Dong san Tool is best korean gundrill manufacturer and offer from standard single lipped gundrill to the multedge solid carbide stepped deep hole drilling tools. Production range of gundrill diameter is 2mm to 50mm and length up to 3000mm.

TYPICAL GUNDRILLING SETUP

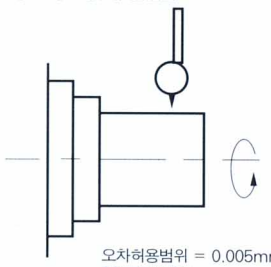


Check point for good performance and cutting geometry

건드릴 작업을 위한 사전점검사항 및 인선부 형상

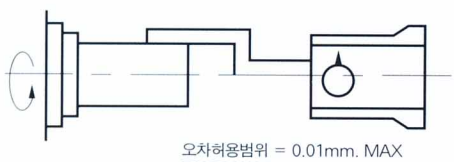
건드릴 작업을 위한 사전 점검사항

1. 스핀들 흔들림 정도
DEVIATION OF SPINDLE



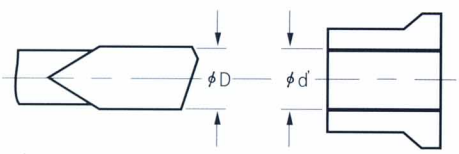
오차허용범위 = 0.005mm. MAX
TOLERANCE

2. 스핀들과 부쉬사이의 동심도
CONCENTRICITY BETWEEN
SPINDLE AND BUSHING



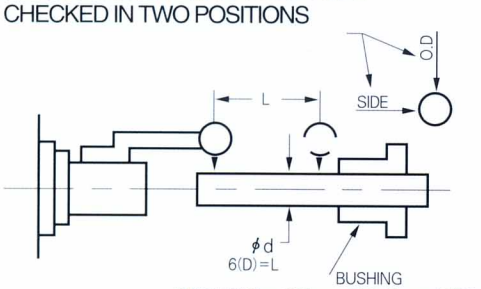
오차허용범위 = 0.01mm. MAX
TOLERANCE

3. 건드릴과 부쉬내경 간의 클리어런스
CLEARANCE BETWEEN DRILL BUSHING
AND DRILL DIAMETER



오차허용범위 = 0.008mm. MAX
TOLERANCE

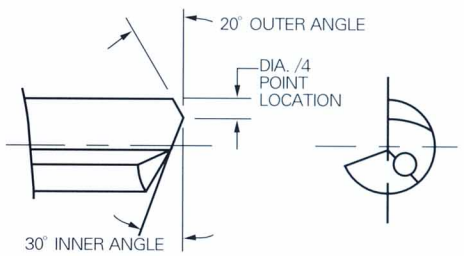
4. 스핀들과 부쉬간의 평행도
PARALLELISM OF SPINDLE TRAVEL
CHECKED IN TWO POSITIONS



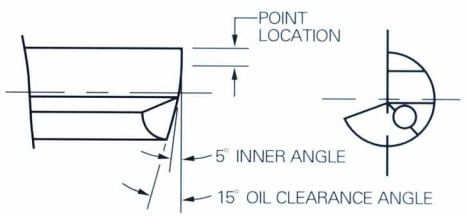
오차허용범위 = 300mm. 당 0.01mm MAX
TOLERANCE

인선부 형상

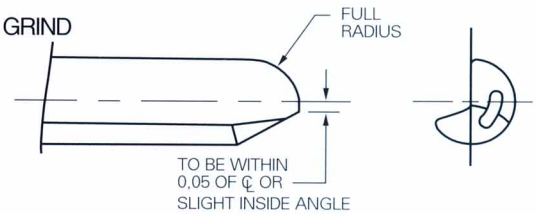
1. 표준형
STANDARD GRIND



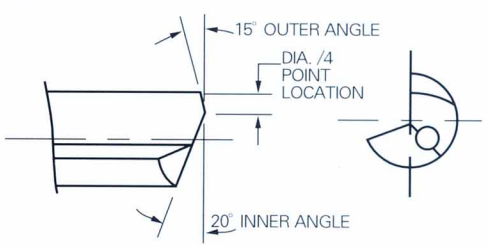
2. 단면 절삭형
END CUTTING GRIND



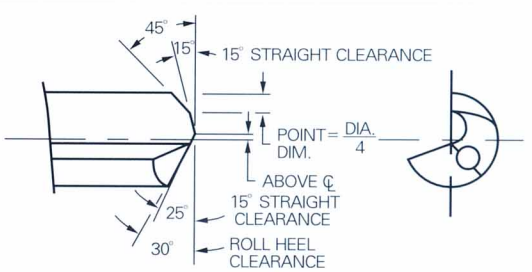
3. 레디우스
FULL RADIUS GRIND



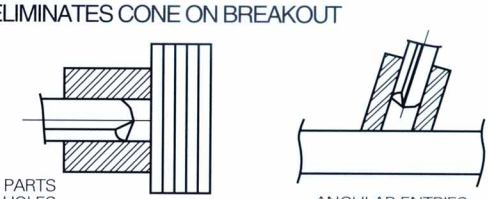
4. 알루미늄형
ALUMINUM GRIND



5. 겹판용
STACK GRIND



6. STACK GRIND ELIMINATES CONE ON BREAKOUT

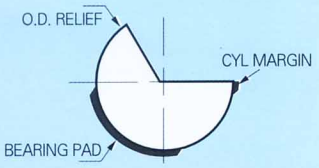


STACKED PARTS
AND INTERSECTING HOLES

ANGULAR ENTRIES

가이드 패드의 종류 | Bearing & Guide pad

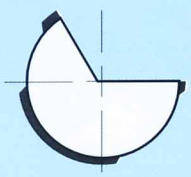
R1 Standard Bearing Pad



강, 스텐레스강, 인코넬, 알루미늄용

All purpose stock drill contour for steel, stainless steel inconel, alumiunm.

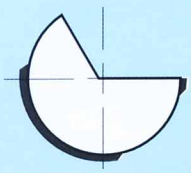
R2 Standard Bearing & Guide Pad



비철금속 및 주물용
건드릴 직경 ϕ5.0까지의 비철금속 및 주물가공용.

Recommended for all non-ferrous and cast iron up to gundrill diameter of 5.0mm.

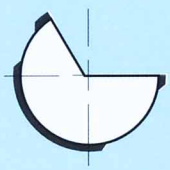
R3 High Bearing Pad



정밀홀가공용, 버어니싱 공정이 요구되는 구멍용, 모든 재질용은 아님.

For good size control(including at exit) special purpose contour where micable diameter is required or extra burnishing action required, not for all materials.

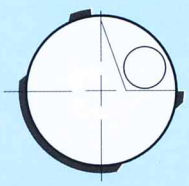
R4 High Bearing & Guide Pad



우수한 표면조도가 요구되는 알루미늄 황동에 적용, 교차홀가공, 단속가공용, 외경 지지가 필요하거나 버어니싱이 요구되는 곳에 적용, 목재나 플라스틱이 혼합된 제품가공에는 약 mm당 1/μ의 백테이퍼를 적용한다. 고니켈 재종에는 높은 버어니싱력으로 인해 사용하지 못한다.

Use in aluminum and brass for best hole finish. Also for intersecting holes and interrupted cuts or where extra o.d. support and burnishing is required. Use with wood and plastic in combination with 0.001mm back taper/mm. Do not use in high nickel content materials due to high burnishing forces.

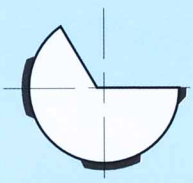
R6 High Bearing & Guide Pad Reamer



밸브가이드와 같은 뚫린 구멍용으로 가공칩이 전면으로 배출된다.

For chips ahead reaming applications when opening up existing holes, e.g., valve guides.

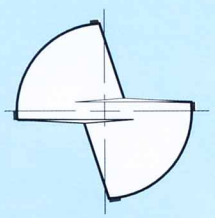
R9 High Interrupted Bearing Pad



정밀홀가공용, 버어니싱공정이 요구되는 홀 가공용. 모든재질에 적용하지 못한다.

For good size control (including at exit). Special purpose contour where micable diameter is required or extra burnishing action required, not for all materials.

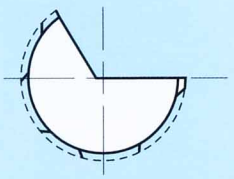
R10 Flute Bearing Pad



알루미늄 등의 고속가공용.

Used for high penetration rates in applications, e.g., lubrication holes. Contour for aluminum shown.

SP Special Contour



주문제작용.

Bearing pad angles as defined by special requirements from Customer.

건드릴 절삭조건 | Gundrill Cutting Condition

이송속도, 회전수, 절삭유압력
Feeds, Speeds and Coolant Pressures.

직경 Dia mm	절삭유 압력 kg/cm²	탄소강 S:C ~200BHN			합금강 Alloy steel ~240BHN			공구강 Tool steel ~200BHN			스테인레스강 stainless steel 280BHN			스테인레스강 stainless steel ~200BHN			동합금 Cu			알루미늄 Al			주철 FC ~180BHN			합금주철 FCD ~200BHN		
		회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm	회전수 RPM/min	이송량 mm/min	L mm
2	105	10000	37	115	10000	40	115	8439	33	150	9713	30	140	10000	36	115	10000	41	115	10000	64	115	10000	92	115	10000	71	115
3	105	10000	60	135	10000	63	155	5626	35	225	6476	33	210	8068	46	170	10000	71	140	10000	120	140	10000	170	140	9660	120	152
4	86	10000	78	150	7245	63	220	4220	38	300	4857	33	280	6051	46	232	10000	90	210	10000	165	174	8439	226	186	6369	125	210
5	77	8727	80	210	5796	62	275	3376	35	375	3885	32	350	4841	45	290	8726	92	220	10000	190	187	7707	225	220	5796	124	265
6	65	7272	79	252	4830	61	330	2813	35	450	3238	30	420	4034	43	348	7272	90	264	10000	220	205	6423	221	264	4830	120	318
7	60	6233	76	294	4140	58	385	2411	33	525	2775	29	490	3458	43	406	6233	89	308	10000	251	222	5505	214	308	4140	117	371
8	55	5454	74	336	3623	56	440	2110	33	600	2428	28	560	3025	41	464	5454	86	352	9674	271	248	4817	209	352	3623	114	424
9	50	4848	71	378	3220	55	495	1875	32	675	2159	28	630	2689	40	522	4848	83	396	8599	262	279	4282	200	396	3220	111	477
10	46	4363	70	420	2898	53	550	1688	30	750	1943	26	700	2420	38	580	4363	81	440	7739	256	310	3854	199	440	2898	109	530
11	43	3966	66	462	2635	52	550	1534	30	825	1766	25	770	2200	38	638	3966	77	484	7035	251	341	3503	194	484	2635	107	583
12	39	3636	66	504	2415	51	660	1407	29	900	1619	25	840	2017	36	696	3636	76	528	6449	243	372	3211	189	528	2415	106	636
13	38	3356	63	546	2229	48	715	1298	28	975	1494	24	910	1862	36	754	3356	74	572	5953	237	403	2964	184	572	2229	104	689
14	35	3116	62	588	2070	48	770	1206	28	1050	1388	23	980	1729	34	812	3116	72	616	5528	230	343	2753	180	616	2070	100	742
15	33	2909	61	630	1932	46	825	1125	28	1125	1295	23	1050	1614	33	870	2909	71	660	5159	226	465	2569	175	660	1932	99	795
16	31	2727	58	672	1812	46	880	1055	25	1200	1214	23	1120	1513	33	928	2727	68	704	4837	220	496	2408	172	704	1811	96	848
17	30	2567	57	714	1705	45	935	993	25	1275	1143	23	1190	1424	33	986	2567	66	748	4552	217	527	2267	169	748	1705	94	901
18	29	2424	56	756	1610	43	990	938	25	1350	1079	21	1260	1345	31	1044	2424	66	792	4299	212	558	2141	166	792	1610	92	954
19	28	2296	56	798	1525	43	1045	888	25	1425	1022	20	1330	1274	30	1102	2296	66	836	4073	208	589	2028	163	836	1525	91	1007
20	28	2182	56	840	1449	43	1100	844	24	1500	971	20	1400	1210	30	1160	2182	63	880	3869	206	620	1927	160	880	1449	88	1060
21	28	2078	51	882	1380	38	1155	804	20	1575	925	18	1470	1153	28	1218	2078	56	924	3685	203	651	1835	152	924	1380	86	1113
22	25	1983	51	924	1318	38	1210	767	20	1650	883	18	1540	1100	28	1276	1983	56	968	3518	201	682	1752	150	968	1317	84	1166
23	23	1897	48	956	1260	36	1265	734	18	1725	845	15	1610	1052	25	1334	1897	51	1012	3365	200	713	1675	150	1012	1260	81	1219
24	23	1818	43	1008	1208	30	1320	703	18	1800	809	15	1680	1008	25	1392	1818	51	1056	3225	198	744	1606	145	1056	1208	79	1272
25	21	1745	43	1050	1159	30	1375	675	18	1875	777	15	1750	968	23	1450	1745	51	1100	3096	198	775	1541	142	1100	1159	76	1325
26	21	1678	43	1092	1115	28	1430	649	17	1950	747	14	1820	931	22	1508	1678	49	1144	2976	190	806	1482	136	1144	1115	72	1378
27	20	1616	40	1134	1073	27	1485	625	17	2025	720	14	1890	896	22	1566	1616	47	1188	2866	183	837	1427	131	1188	1073	70	1431
28	20	1558	40	1176	1035	27	1540	603	16	2100	694	13	1960	864	21	1624	1558	45	1232	2764	177	868	1376	127	1232	1035	67	1484
29	19	1505	40	1218	999	25	1595	582	16	2175	670	13	2030	835	20	1682	1505	44	1276	2669	171	899	1329	122	1276	999	65	1537
30	19	1454	40	1260	996	25	1650	563	15	2250	648	12	2100	807	19	1740	1454	42	1320	2580	165	930	1285	118	1326	966	63	1590

주) L : Rest Bush 없이 작업할 수 있는 드릴길이
만약 드릴길이가 이 길이보다 길면 반드시 Rest Bush를 사용하여야 한다.
만약 Rest Bush의 사용이 불가능하다면 회전수를 줄이거나 짧은 드릴을 선정토록한다.

건드릴 가공 정도 | Drilling Precision

건드릴 가공 공차
Dimensional tolerance

Drilling Precision

		IT	13	12	11	10	9	8	7	6	5
비철금속 Non-ferrous metal	Material machinability										
알루미늄합금 Aluminum alloy (depending on is proportion)											
공구강 Tool steel											
주물 Cast iron											
열처리강 Heat treatable steel σB〉800N/mm²											
질화강 Nitriding steel											
열처리강 Heat treatable steel σB〉800N/mm²											
구조용강 Structural steel											
표면처리강 Cases hardening steel											
가공공차 등급 Drilling quality area											

Normal conditions 일반적인 조건하에서
Favourable conditions 가장 이상적인 조건하에서

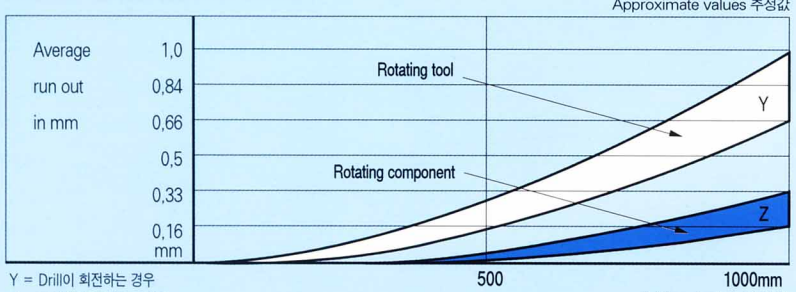
표면조도
Surface Quality

			N12	N11	N10	N9	N8	N7	N6	N5	N4	N3	N2	N1
품질등급 Quality area														
Surface	Rt	µm					21	11,5	6,2	3,4	1,9	1,0		
roughness	Ra	µm					3,2	1,6	0,8	0,4	0,2	0,1		
values	Rz	µm					14	7,6	4,5	2,2	1,2	0,65		

Normal conditions 일반적인 조건하에서
Favourable conditions 가장 이상적인 조건하에서

드릴구멍의 편차
Middle drill-hole deviation

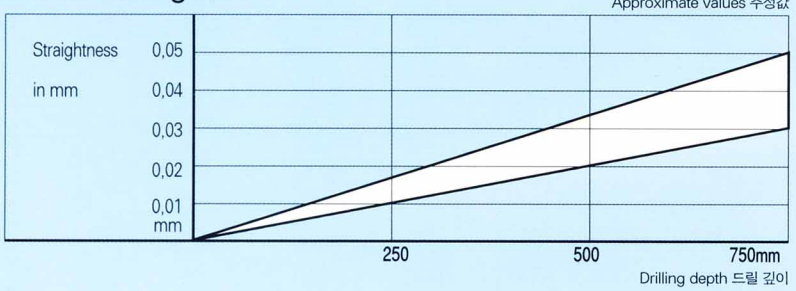
Approximate values 추정값



Y = Drill이 회전하는 경우
Z = 피삭재가 회전하는 경우

진직도
Drill-hole straightness

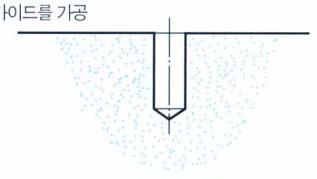
Approximate values 추정값



범용기에서의 건드릴 적용

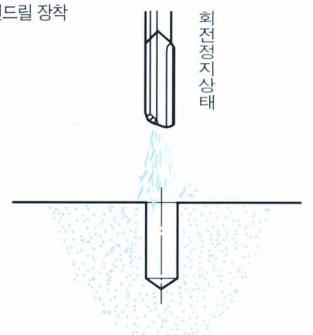
가공순서

❶ 가이드를 가공



구멍의 깊이는 직경의
2~3배가 필요하다

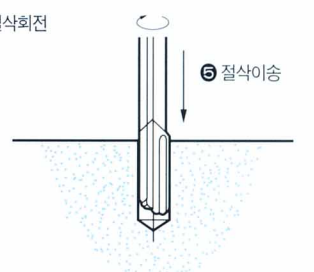
❷ 건드릴 장착



❸ 가공시작전 절삭유를 공급하면서 가이드 홀에 약 300mm/min 속도로 진입 후 가공시작전 2~3mm 전에 정지

❹ 절삭회전

❺ 절삭이송



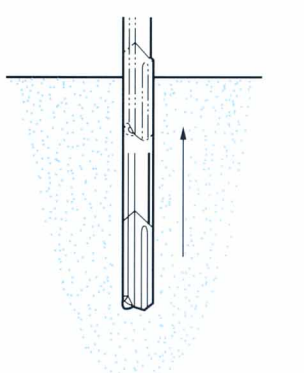
❻ 절삭완료

❼ 복귀

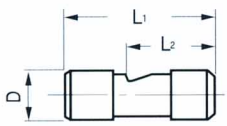
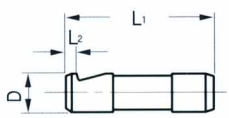
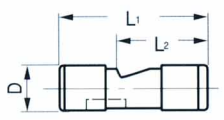
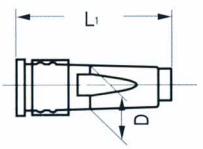
❽ 건드릴 작업위치에서 정지

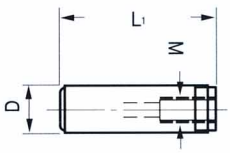
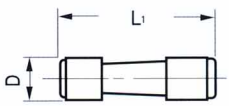
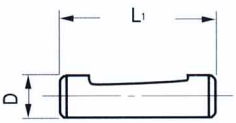
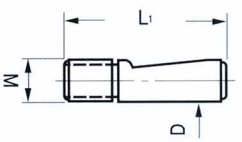
❾ 절삭회전정지

❿ 절삭유공급 원위치로 복귀

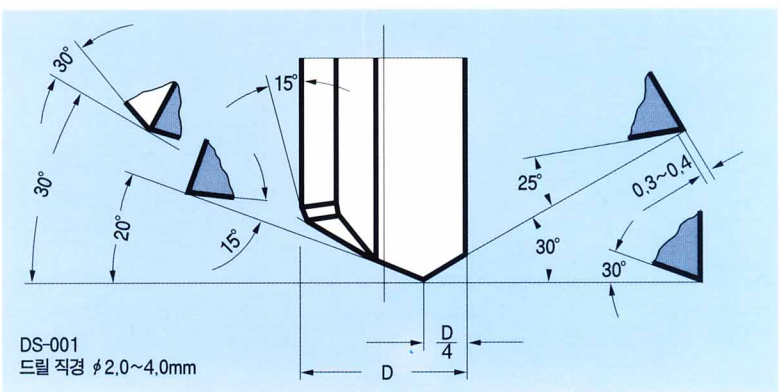


드라이버 종류 및 재연삭 | Drivers / Regrinding

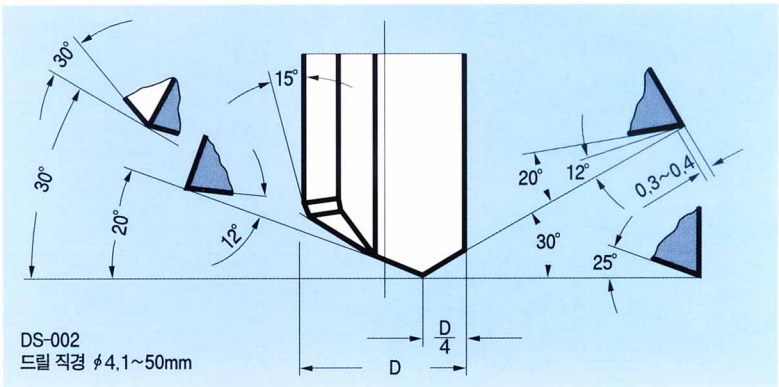
형 상 Design form	발주번호 Order no.	D	L1	L2
	DS-01	10	40	24
	02	16	45	31,2
	03	25	70	34
	04			
	05			
	06	16	50	2,5
	07			
	08			
 수평키 Parallel key	09			
	10	25	70	34
	11			
	12			
	13			
	14	MK 1	84	
	15	MK 3	84	
	16	MK 4	131	
	17			

형 상 Design form	발주번호 Order no.	D	L1	M
	DS-18	10	60	M6×0,5
	19	16	80	M10×1
	20	25	100	M16×1,5
	21	36	120	M25×1,5
	22			
	23			
	24	1/2"	1 1/2"	
	25	3/4"	2 3/4"	
	26	1"	2 3/4"	
	27	1 1/4"	2 3/4"	
	28	1 1/2"	2 3/4"	
	29			
	30	16	112	Tr.16
	31	20	126	Tr.20
	32	28	126	Tr.28
	33	36	162	Tr.36
	34			

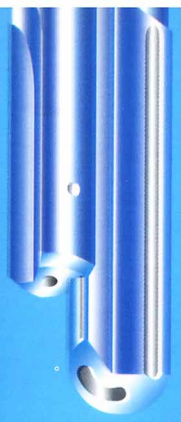
재연삭 | Regrinding



DS-001
드릴 직경 ϕ2,0~4,0mm



DS-002
드릴 직경 ϕ4,1~50mm



東 山 機 工

DONG SAN TOOL CO.

경기도 시흥시 정왕동 2090-2번지
시화공단 2바 302
302, 2Ba, ShiHwa Industrial Comlex.
2090-2, JungWang-Dong, ShiHeung-Shi, KyoungKi-Do, Korea

TEL : (031) 431-6430(代)
FAX : (031) 431-6435