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ND	21	05	C
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Name	Series	Drilling Depth	Cooling
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NICHE
DRILL

21 - For P/K
25 - For N
26 - For M
27 - For S
00 - NC center drill
01 - Carbide Flat-bottom Drill
13 - Micro-dia drill
30 - Carbide Deep-hole Drill
31 - Stepped drill

00 - Center drill
03 - 3*D
05 - 5*D
08 - 8*D

Other sizes available
on request

N - External Cooling
C - Internal Cooling

HA	0800	3T
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Shank Type	Drilling Dia	No. of Flute
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HA - DIN6535

0080 - 0.80 mm

- Default: 2 flutes



HB - DIN6535

0800 - 8.00 mm

3T: 3 flutes



HE - DIN6535

1800 - 18.00 mm

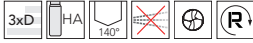
Increment: 0.10 mm



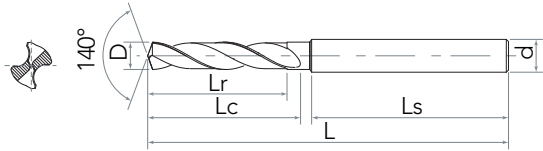


Carbide Ratio Drill

ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



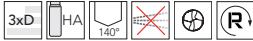
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-0300	3.00	6	62	20	36	17
ND2103-NHA-0310	3.10	6	62	20	36	17
ND2103-NHA-0320	3.20	6	62	20	36	17
ND2103-NHA-0330	3.30	6	62	20	36	17
ND2103-NHA-0340	3.40	6	62	20	36	17
ND2103-NHA-0350	3.50	6	62	20	36	17
ND2103-NHA-0360	3.60	6	62	20	36	17
ND2103-NHA-0370	3.70	6	62	20	36	17
ND2103-NHA-0380	3.80	6	66	24	36	21
ND2103-NHA-0390	3.90	6	66	24	36	21
ND2103-NHA-0400	4.00	6	66	24	36	21
ND2103-NHA-0410	4.10	6	66	24	36	21
ND2103-NHA-0420	4.20	6	66	24	36	21
ND2103-NHA-0430	4.30	6	66	24	36	21
ND2103-NHA-0440	4.40	6	66	24	36	21
ND2103-NHA-0450	4.50	6	66	24	36	21
ND2103-NHA-0460	4.60	6	66	24	36	21
ND2103-NHA-0465	4.65	6	66	24	36	21
ND2103-NHA-0470	4.70	6	66	24	36	21
ND2103-NHA-0480	4.80	6	66	28	36	25
ND2103-NHA-0490	4.90	6	66	28	36	25
ND2103-NHA-0500	5.00	6	66	28	36	25
ND2103-NHA-0510	5.10	6	66	28	36	25
ND2103-NHA-0520	5.20	6	66	28	36	25
ND2103-NHA-0530	5.30	6	66	28	36	25
ND2103-NHA-0540	5.40	6	66	28	36	25
ND2103-NHA-0550	5.50	6	66	28	36	25

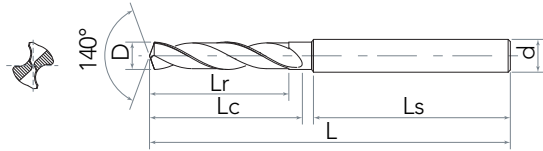
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ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

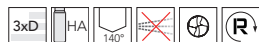
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-0555	5.55	6	66	28	36	25
ND2103-NHA-0560	5.60	6	66	28	36	25
ND2103-NHA-0570	5.70	6	66	28	36	25
ND2103-NHA-0580	5.80	6	66	28	36	25
ND2103-NHA-0590	5.90	6	66	28	36	25
ND2103-NHA-0600	6.00	6	66	28	36	25
ND2103-NHA-0610	6.10	8	79	34	36	30
ND2103-NHA-0620	6.20	8	79	34	36	30
ND2103-NHA-0630	6.30	8	79	34	36	30
ND2103-NHA-0640	6.40	8	79	34	36	30
ND2103-NHA-0650	6.50	8	79	34	36	30
ND2103-NHA-0660	6.60	8	79	34	36	30
ND2103-NHA-0670	6.70	8	79	34	36	30
ND2103-NHA-0680	6.80	8	79	34	36	30
ND2103-NHA-0690	6.90	8	79	34	36	30
ND2103-NHA-0700	7.00	8	79	34	36	30
ND2103-NHA-0710	7.10	8	79	41	36	37
ND2103-NHA-0720	7.20	8	79	41	36	37
ND2103-NHA-0730	7.30	8	79	41	36	37
ND2103-NHA-0740	7.40	8	79	41	36	37
ND2103-NHA-0750	7.50	8	79	41	36	37
ND2103-NHA-0760	7.60	8	79	41	36	37
ND2103-NHA-0770	7.70	8	79	41	36	37
ND2103-NHA-0780	7.80	8	79	41	36	37
ND2103-NHA-0790	7.90	8	79	41	36	37
ND2103-NHA-0800	8.00	8	79	41	36	37
ND2103-NHA-0810	8.10	10	89	47	40	43

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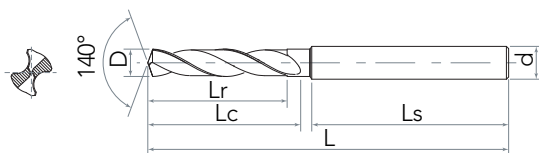


Carbide Ratio Drill

ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys

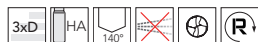


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-0820	8.20	10	89	47	40	43
ND2103-NHA-0830	8.30	10	89	47	40	43
ND2103-NHA-0840	8.40	10	89	47	40	43
ND2103-NHA-0850	8.50	10	89	47	40	43
ND2103-NHA-0860	8.60	10	89	47	40	43
ND2103-NHA-0870	8.70	10	89	47	40	43
ND2103-NHA-0880	8.80	10	89	47	40	43
ND2103-NHA-0890	8.90	10	89	47	40	43
ND2103-NHA-0900	9.00	10	89	47	40	43
ND2103-NHA-0910	9.10	10	89	47	40	43
ND2103-NHA-0920	9.20	10	89	47	40	43
ND2103-NHA-0925	9.25	10	89	47	40	43
ND2103-NHA-0930	9.30	10	89	47	40	43
ND2103-NHA-0940	9.40	10	89	47	40	43
ND2103-NHA-0950	9.50	10	89	47	40	43
ND2103-NHA-0960	9.60	10	89	47	40	43
ND2103-NHA-0970	9.70	10	89	47	40	43
ND2103-NHA-0980	9.80	10	89	47	40	43
ND2103-NHA-0990	9.90	10	89	47	40	43
ND2103-NHA-1000	10.00	10	89	47	40	43
ND2103-NHA-1010	10.10	12	102	55	45	50
ND2103-NHA-1020	10.20	12	102	55	45	50
ND2103-NHA-1030	10.30	12	102	55	45	50
ND2103-NHA-1040	10.40	12	102	55	45	50
ND2103-NHA-1050	10.50	12	102	55	45	50
ND2103-NHA-1060	10.60	12	102	55	45	50
ND2103-NHA-1070	10.70	12	102	55	45	50

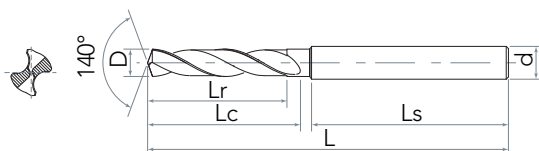
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ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm



Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-1080	10.80	12	102	55	45	50
ND2103-NHA-1090	10.90	12	102	55	45	50
ND2103-NHA-1100	11.00	12	102	55	45	50
ND2103-NHA-1110	11.10	12	102	55	45	50
ND2103-NHA-1120	11.20	12	102	55	45	50
ND2103-NHA-1130	11.30	12	102	55	45	50
ND2103-NHA-1140	11.40	12	102	55	45	50
ND2103-NHA-1150	11.50	12	102	55	45	50
ND2103-NHA-1160	11.60	12	102	55	45	50
ND2103-NHA-1170	11.70	12	102	55	45	50
ND2103-NHA-1180	11.80	12	102	55	45	50
ND2103-NHA-1190	11.90	12	102	55	45	50
ND2103-NHA-1200	12.00	12	102	55	45	50
ND2103-NHA-1210	12.10	14	107	60	45	54
ND2103-NHA-1220	12.20	14	107	60	45	54
ND2103-NHA-1230	12.30	14	107	60	45	54
ND2103-NHA-1240	12.40	14	107	60	45	54
ND2103-NHA-1250	12.50	14	107	60	45	54
ND2103-NHA-1260	12.60	14	107	60	45	54
ND2103-NHA-1270	12.70	14	107	60	45	54
ND2103-NHA-1280	12.80	14	107	60	45	54
ND2103-NHA-1285	12.85	14	107	60	45	54
ND2103-NHA-1290	12.90	14	107	60	45	54
ND2103-NHA-1300	13.00	14	107	60	45	54
ND2103-NHA-1310	13.10	14	107	60	45	54
ND2103-NHA-1320	13.20	14	107	60	45	54
ND2103-NHA-1330	13.30	14	107	60	45	54

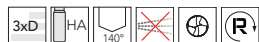
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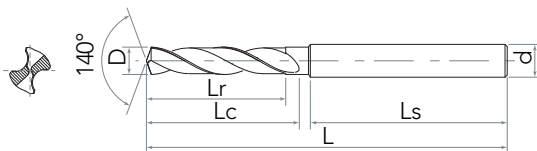


Carbide Ratio Drill

ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



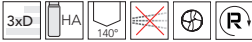
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-1340	13.40	14	107	60	45	54
ND2103-NHA-1350	13.50	14	107	60	45	54
ND2103-NHA-1360	13.60	14	107	60	45	54
ND2103-NHA-1370	13.70	14	107	60	45	54
ND2103-NHA-1380	13.80	14	107	60	45	54
ND2103-NHA-1390	13.90	14	107	60	45	54
ND2103-NHA-1400	14.00	14	107	60	45	54
ND2103-NHA-1410	14.10	16	115	65	48	59
ND2103-NHA-1420	14.20	16	115	65	48	59
ND2103-NHA-1430	14.30	16	115	65	48	59
ND2103-NHA-1440	14.40	16	115	65	48	59
ND2103-NHA-1450	14.50	16	115	65	48	59
ND2103-NHA-1460	14.60	16	115	65	48	59
ND2103-NHA-1470	14.70	16	115	65	48	59
ND2103-NHA-1480	14.80	16	115	65	48	59
ND2103-NHA-1490	14.90	16	115	65	48	59
ND2103-NHA-1500	15.00	16	115	65	48	59
ND2103-NHA-1510	15.10	16	115	65	48	59
ND2103-NHA-1520	15.20	16	115	65	48	59
ND2103-NHA-1530	15.30	16	115	65	48	59
ND2103-NHA-1540	15.40	16	115	65	48	59
ND2103-NHA-1550	15.50	16	115	65	48	59
ND2103-NHA-1560	15.60	16	115	65	48	59
ND2103-NHA-1570	15.70	16	115	65	48	59
ND2103-NHA-1580	15.80	16	115	65	48	59
ND2103-NHA-1590	15.90	16	115	65	48	59
ND2103-NHA-1600	16.00	16	115	65	48	59

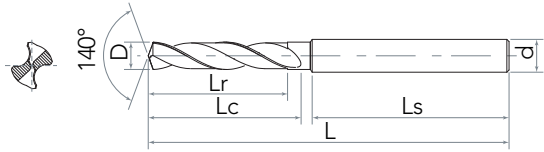
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ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

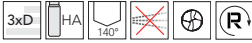
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-1610	16.10	18	123	73	48	67
ND2103-NHA-1620	16.20	18	123	73	48	67
ND2103-NHA-1630	16.30	18	123	73	48	67
ND2103-NHA-1640	16.40	18	123	73	48	67
ND2103-NHA-1650	16.50	18	123	73	48	67
ND2103-NHA-1660	16.60	18	123	73	48	67
ND2103-NHA-1670	16.70	18	123	73	48	67
ND2103-NHA-1680	16.80	18	123	73	48	67
ND2103-NHA-1690	16.90	18	123	73	48	67
ND2103-NHA-1700	17.00	18	123	73	48	67
ND2103-NHA-1710	17.10	18	123	73	48	67
ND2103-NHA-1720	17.20	18	123	73	48	67
ND2103-NHA-1730	17.30	18	123	73	48	67
ND2103-NHA-1740	17.40	18	123	73	48	67
ND2103-NHA-1750	17.50	18	123	73	48	67
ND2103-NHA-1760	17.60	18	123	73	48	67
ND2103-NHA-1770	17.70	18	123	73	48	67
ND2103-NHA-1780	17.80	18	123	73	48	67
ND2103-NHA-1790	17.90	18	123	73	48	67
ND2103-NHA-1800	18.00	18	123	73	48	67
ND2103-NHA-1810	18.10	20	131	79	50	73
ND2103-NHA-1820	18.20	20	131	79	50	73
ND2103-NHA-1830	18.30	20	131	79	50	73
ND2103-NHA-1840	18.40	20	131	79	50	73
ND2103-NHA-1850	18.50	20	131	79	50	73
ND2103-NHA-1860	18.60	20	131	79	50	73
ND2103-NHA-1870	18.70	20	131	79	50	73

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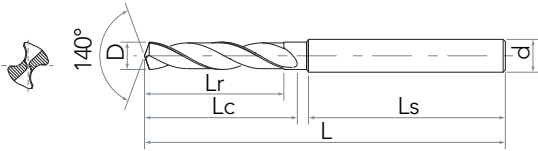
Carbide Ratio Drill

ND2103-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys

Unit: mm

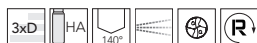


Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-NHA-1880	18.80	20	131	79	50	73
ND2103-NHA-1890	18.90	20	131	79	50	73
ND2103-NHA-1900	19.00	20	131	79	50	73
ND2103-NHA-1910	19.10	20	131	79	50	73
ND2103-NHA-1920	19.20	20	131	79	50	73
ND2103-NHA-1930	19.30	20	131	79	50	73
ND2103-NHA-1940	19.40	20	131	79	50	73
ND2103-NHA-1950	19.50	20	131	79	50	73
ND2103-NHA-1960	19.60	20	131	79	50	73
ND2103-NHA-1970	19.70	20	131	79	50	73
ND2103-NHA-1980	19.80	20	131	79	50	73
ND2103-NHA-1990	19.90	20	131	79	50	73
ND2103-NHA-2000	20.00	20	131	79	50	73

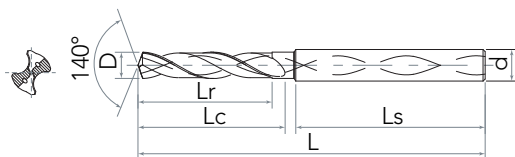
Recommended cutting data see page 87



ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

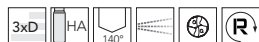
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-0340	3.40	6	62	20	36	17
ND2103-CHA-0350	3.50	6	62	20	36	17
ND2103-CHA-0360	3.60	6	62	20	36	17
ND2103-CHA-0370	3.70	6	62	20	36	17
ND2103-CHA-0380	3.80	6	66	24	36	21
ND2103-CHA-0390	3.90	6	66	24	36	21
ND2103-CHA-0400	4.00	6	66	24	36	21
ND2103-CHA-0410	4.10	6	66	24	36	21
ND2103-CHA-0420	4.20	6	66	24	36	21
ND2103-CHA-0430	4.30	6	66	24	36	21
ND2103-CHA-0440	4.40	6	66	24	36	21
ND2103-CHA-0450	4.50	6	66	24	36	21
ND2103-CHA-0460	4.60	6	66	24	36	21
ND2103-CHA-0465	4.65	6	66	24	36	21
ND2103-CHA-0470	4.70	6	66	24	36	21
ND2103-CHA-0480	4.80	6	66	28	36	25
ND2103-CHA-0490	4.90	6	66	28	36	25
ND2103-CHA-0500	5.00	6	66	28	36	25
ND2103-CHA-0510	5.10	6	66	28	36	25
ND2103-CHA-0520	5.20	6	66	28	36	25
ND2103-CHA-0530	5.30	6	66	28	36	25
ND2103-CHA-0540	5.40	6	66	28	36	25
ND2103-CHA-0550	5.50	6	66	28	36	25
ND2103-CHA-0555	5.55	6	66	28	36	25
ND2103-CHA-0560	5.60	6	66	28	36	25
ND2103-CHA-0570	5.70	6	66	28	36	25
ND2103-CHA-0580	5.80	6	66	28	36	25

See the next page 

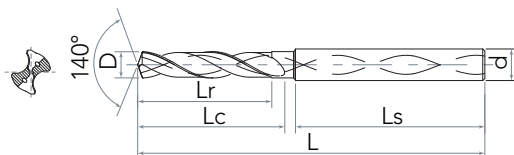


Carbide Ratio Drill

ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



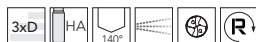
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-0590	5.90	6	66	28	36	25
ND2103-CHA-0600	6.00	6	66	28	36	25
ND2103-CHA-0610	6.10	8	79	34	36	30
ND2103-CHA-0620	6.20	8	79	34	36	30
ND2103-CHA-0630	6.30	8	79	34	36	30
ND2103-CHA-0640	6.40	8	79	34	36	30
ND2103-CHA-0650	6.50	8	79	34	36	30
ND2103-CHA-0660	6.60	8	79	34	36	30
ND2103-CHA-0670	6.70	8	79	34	36	30
ND2103-CHA-0680	6.80	8	79	34	36	30
ND2103-CHA-0690	6.90	8	79	34	36	30
ND2103-CHA-0700	7.00	8	79	34	36	30
ND2103-CHA-0710	7.10	8	79	41	36	37
ND2103-CHA-0720	7.20	8	79	41	36	37
ND2103-CHA-0730	7.30	8	79	41	36	37
ND2103-CHA-0740	7.40	8	79	41	36	37
ND2103-CHA-0750	7.50	8	79	41	36	37
ND2103-CHA-0760	7.60	8	79	41	36	37
ND2103-CHA-0770	7.70	8	79	41	36	37
ND2103-CHA-0780	7.80	8	79	41	36	37
ND2103-CHA-0790	7.90	8	79	41	36	37
ND2103-CHA-0800	8.00	8	79	41	36	37
ND2103-CHA-0810	8.10	10	89	47	40	43
ND2103-CHA-0820	8.20	10	89	47	40	43
ND2103-CHA-0830	8.30	10	89	47	40	43
ND2103-CHA-0840	8.40	10	89	47	40	43
ND2103-CHA-0850	8.50	10	89	47	40	43

See the next page

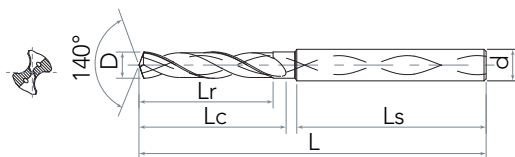


ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm



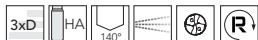
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-0860	8.60	10	89	47	40	43
ND2103-CHA-0870	8.70	10	89	47	40	43
ND2103-CHA-0880	8.80	10	89	47	40	43
ND2103-CHA-0890	8.90	10	89	47	40	43
ND2103-CHA-0900	9.00	10	89	47	40	43
ND2103-CHA-0910	9.10	10	89	47	40	43
ND2103-CHA-0920	9.20	10	89	47	40	43
ND2103-CHA-0925	9.25	10	89	47	40	43
ND2103-CHA-0930	9.30	10	89	47	40	43
ND2103-CHA-0940	9.40	10	89	47	40	43
ND2103-CHA-0950	9.50	10	89	47	40	43
ND2103-CHA-0960	9.60	10	89	47	40	43
ND2103-CHA-0970	9.70	10	89	47	40	43
ND2103-CHA-0980	9.80	10	89	47	40	43
ND2103-CHA-0990	9.90	10	89	47	40	43
ND2103-CHA-1000	10.00	10	89	47	40	43
ND2103-CHA-1010	10.10	12	102	55	45	50
ND2103-CHA-1020	10.20	12	102	55	45	50
ND2103-CHA-1030	10.30	12	102	55	45	50
ND2103-CHA-1040	10.40	12	102	55	45	50
ND2103-CHA-1050	10.50	12	102	55	45	50
ND2103-CHA-1060	10.60	12	102	55	45	50
ND2103-CHA-1070	10.70	12	102	55	45	50
ND2103-CHA-1080	10.80	12	102	55	45	50
ND2103-CHA-1090	10.90	12	102	55	45	50
ND2103-CHA-1100	11.00	12	102	55	45	50
ND2103-CHA-1110	11.10	12	102	55	45	50

See the next page 

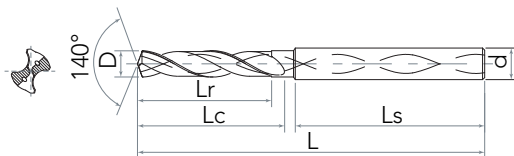


Carbide Ratio Drill

ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys

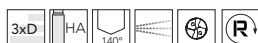


Unit: mm

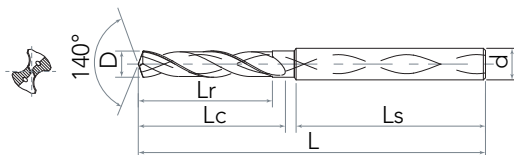
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1120	11.20	12	102	55	45	50
ND2103-CHA-1130	11.30	12	102	55	45	50
ND2103-CHA-1140	11.40	12	102	55	45	50
ND2103-CHA-1150	11.50	12	102	55	45	50
ND2103-CHA-1160	11.60	12	102	55	45	50
ND2103-CHA-1170	11.70	12	102	55	45	50
ND2103-CHA-1180	11.80	12	102	55	45	50
ND2103-CHA-1190	11.90	12	102	55	45	50
ND2103-CHA-1200	12.00	12	102	55	45	50
ND2103-CHA-1210	12.10	14	107	60	45	54
ND2103-CHA-1220	12.20	14	107	60	45	54
ND2103-CHA-1230	12.30	14	107	60	45	54
ND2103-CHA-1240	12.40	14	107	60	45	54
ND2103-CHA-1250	12.50	14	107	60	45	54
ND2103-CHA-1260	12.60	14	107	60	45	54
ND2103-CHA-1270	12.70	14	107	60	45	54
ND2103-CHA-1280	12.80	14	107	60	45	54
ND2103-CHA-1285	12.85	14	107	60	45	54
ND2103-CHA-1290	12.90	14	107	60	45	54
ND2103-CHA-1300	13.00	14	107	60	45	54
ND2103-CHA-1310	13.10	14	107	60	45	54
ND2103-CHA-1320	13.20	14	107	60	45	54
ND2103-CHA-1330	13.30	14	107	60	45	54
ND2103-CHA-1340	13.40	14	107	60	45	54
ND2103-CHA-1350	13.50	14	107	60	45	54
ND2103-CHA-1360	13.60	14	107	60	45	54
ND2103-CHA-1370	13.70	14	107	60	45	54

See the next page

ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

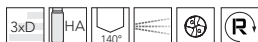
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1380	13.80	14	107	60	45	54
ND2103-CHA-1390	13.90	14	107	60	45	54
ND2103-CHA-1400	14.00	14	107	60	45	54
ND2103-CHA-1410	14.10	16	115	65	48	59
ND2103-CHA-1420	14.20	16	115	65	48	59
ND2103-CHA-1430	14.30	16	115	65	48	59
ND2103-CHA-1440	14.40	16	115	65	48	59
ND2103-CHA-1450	14.50	16	115	65	48	59
ND2103-CHA-1460	14.60	16	115	65	48	59
ND2103-CHA-1470	14.70	16	115	65	48	59
ND2103-CHA-1480	14.80	16	115	65	48	59
ND2103-CHA-1490	14.90	16	115	65	48	59
ND2103-CHA-1500	15.00	16	115	65	48	59
ND2103-CHA-1510	15.10	16	115	65	48	59
ND2103-CHA-1520	15.20	16	115	65	48	59
ND2103-CHA-1530	15.30	16	115	65	48	59
ND2103-CHA-1540	15.40	16	115	65	48	59
ND2103-CHA-1550	15.50	16	115	65	48	59
ND2103-CHA-1560	15.60	16	115	65	48	59
ND2103-CHA-1570	15.70	16	115	65	48	59
ND2103-CHA-1580	15.80	16	115	65	48	59
ND2103-CHA-1590	15.90	16	115	65	48	59
ND2103-CHA-1600	16.00	16	115	65	48	59
ND2103-CHA-1610	16.10	18	123	73	48	67
ND2103-CHA-1620	16.20	18	123	73	48	67
ND2103-CHA-1630	16.30	18	123	73	48	67
ND2103-CHA-1640	16.40	18	123	73	48	67

See the next page 

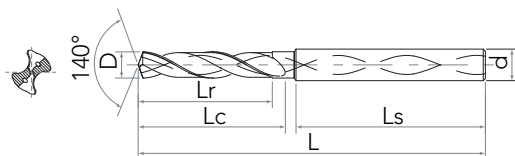


Carbide Ratio Drill

ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



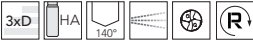
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1650	16.50	18	123	73	48	67
ND2103-CHA-1660	16.60	18	123	73	48	67
ND2103-CHA-1670	16.70	18	123	73	48	67
ND2103-CHA-1680	16.80	18	123	73	48	67
ND2103-CHA-1690	16.90	18	123	73	48	67
ND2103-CHA-1700	17.00	18	123	73	48	67
ND2103-CHA-1710	17.10	18	123	73	48	67
ND2103-CHA-1720	17.20	18	123	73	48	67
ND2103-CHA-1730	17.30	18	123	73	48	67
ND2103-CHA-1740	17.40	18	123	73	48	67
ND2103-CHA-1750	17.50	18	123	73	48	67
ND2103-CHA-1760	17.60	18	123	73	48	67
ND2103-CHA-1770	17.70	18	123	73	48	67
ND2103-CHA-1780	17.80	18	123	73	48	67
ND2103-CHA-1790	17.90	18	123	73	48	67
ND2103-CHA-1800	18.00	18	123	73	48	67
ND2103-CHA-1810	18.10	20	131	79	50	73
ND2103-CHA-1820	18.20	20	131	79	50	73
ND2103-CHA-1830	18.30	20	131	79	50	73
ND2103-CHA-1840	18.40	20	131	79	50	73
ND2103-CHA-1850	18.50	20	131	79	50	73
ND2103-CHA-1860	18.60	20	131	79	50	73
ND2103-CHA-1870	18.70	20	131	79	50	73
ND2103-CHA-1880	18.80	20	131	79	50	73
ND2103-CHA-1890	18.90	20	131	79	50	73
ND2103-CHA-1900	19.00	20	131	79	50	73
ND2103-CHA-1910	19.10	20	131	79	50	73

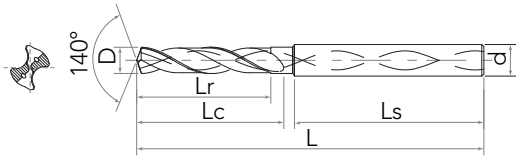
See the next page



ND2103-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

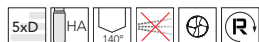
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1920	19.20	20	131	79	50	73
ND2103-CHA-1930	19.30	20	131	79	50	73
ND2103-CHA-1940	19.40	20	131	79	50	73
ND2103-CHA-1950	19.50	20	131	79	50	73
ND2103-CHA-1960	19.60	20	131	79	50	73
ND2103-CHA-1970	19.70	20	131	79	50	73
ND2103-CHA-1980	19.80	20	131	79	50	73
ND2103-CHA-1990	19.90	20	131	79	50	73
ND2103-CHA-2000	20.00	20	131	79	50	73

Recommended cutting data see page 87

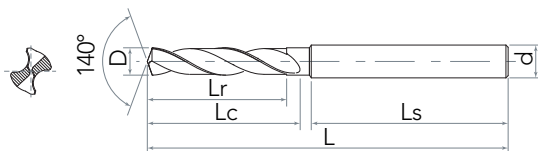


Carbide Ratio Drill

ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys

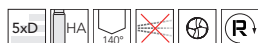


Unit: mm

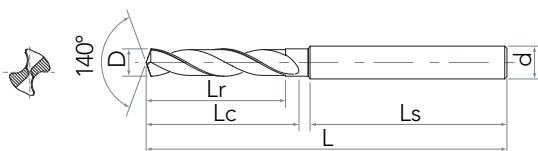
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-0300	3.00	6	66	28	36	25
ND2105-NHA-0310	3.10	6	66	28	36	25
ND2105-NHA-0320	3.20	6	66	28	36	25
ND2105-NHA-0330	3.30	6	66	28	36	25
ND2105-NHA-0340	3.40	6	66	28	36	25
ND2105-NHA-0350	3.50	6	66	28	36	25
ND2105-NHA-0360	3.60	6	66	28	36	25
ND2105-NHA-0370	3.70	6	66	28	36	25
ND2105-NHA-0380	3.80	6	74	36	36	32
ND2105-NHA-0390	3.90	6	74	36	36	32
ND2105-NHA-0400	4.00	6	74	36	36	32
ND2105-NHA-0410	4.10	6	74	36	36	32
ND2105-NHA-0420	4.20	6	74	36	36	32
ND2105-NHA-0430	4.30	6	74	36	36	32
ND2105-NHA-0440	4.40	6	74	36	36	32
ND2105-NHA-0450	4.50	6	74	36	36	32
ND2105-NHA-0460	4.60	6	74	36	36	32
ND2105-NHA-0465	4.65	6	74	36	36	32
ND2105-NHA-0470	4.70	6	74	36	36	32
ND2105-NHA-0480	4.80	6	82	44	36	40
ND2105-NHA-0490	4.90	6	82	44	36	40
ND2105-NHA-0500	5.00	6	82	44	36	40
ND2105-NHA-0510	5.10	6	82	44	36	40
ND2105-NHA-0520	5.20	6	82	44	36	40
ND2105-NHA-0530	5.30	6	82	44	36	40
ND2105-NHA-0540	5.40	6	82	44	36	40
ND2105-NHA-0550	5.50	6	82	44	36	40

See the next page

ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

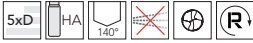
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-0555	5.55	6	82	44	36	40
ND2105-NHA-0560	5.60	6	82	44	36	40
ND2105-NHA-0570	5.70	6	82	44	36	40
ND2105-NHA-0580	5.80	6	82	44	36	40
ND2105-NHA-0590	5.90	6	82	44	36	40
ND2105-NHA-0600	6.00	6	82	44	36	40
ND2105-NHA-0610	6.10	8	91	53	36	50
ND2105-NHA-0620	6.20	8	91	53	36	50
ND2105-NHA-0630	6.30	8	91	53	36	50
ND2105-NHA-0640	6.40	8	91	53	36	50
ND2105-NHA-0650	6.50	8	91	53	36	50
ND2105-NHA-0660	6.60	8	91	53	36	50
ND2105-NHA-0670	6.70	8	91	53	36	50
ND2105-NHA-0680	6.80	8	91	53	36	50
ND2105-NHA-0690	6.90	8	91	53	36	50
ND2105-NHA-0700	7.00	8	91	53	36	50
ND2105-NHA-0710	7.10	8	91	53	36	50
ND2105-NHA-0720	7.20	8	91	53	36	50
ND2105-NHA-0730	7.30	8	91	53	36	50
ND2105-NHA-0740	7.40	8	91	53	36	50
ND2105-NHA-0750	7.50	8	91	53	36	50
ND2105-NHA-0760	7.60	8	91	53	36	50
ND2105-NHA-0770	7.70	8	91	53	36	50
ND2105-NHA-0780	7.80	8	91	53	36	50
ND2105-NHA-0790	7.90	8	91	53	36	50
ND2105-NHA-0800	8.00	8	91	53	36	50
ND2105-NHA-0810	8.10	10	103	61	40	57

See the next page 

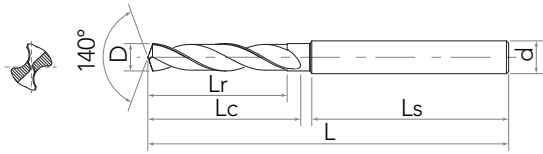


Carbide Ratio Drill

ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-0820	8.20	10	103	61	40	57
ND2105-NHA-0830	8.30	10	103	61	40	57
ND2105-NHA-0840	8.40	10	103	61	40	57
ND2105-NHA-0850	8.50	10	103	61	40	57
ND2105-NHA-0860	8.60	10	103	61	40	57
ND2105-NHA-0870	8.70	10	103	61	40	57
ND2105-NHA-0880	8.80	10	103	61	40	57
ND2105-NHA-0890	8.90	10	103	61	40	57
ND2105-NHA-0900	9.00	10	103	61	40	57
ND2105-NHA-0910	9.10	10	103	61	40	57
ND2105-NHA-0920	9.20	10	103	61	40	57
ND2105-NHA-0925	9.25	10	103	61	40	57
ND2105-NHA-0930	9.30	10	103	61	40	57
ND2105-NHA-0940	9.40	10	103	61	40	57
ND2105-NHA-0950	9.50	10	103	61	40	57
ND2105-NHA-0960	9.60	10	103	61	40	57
ND2105-NHA-0970	9.70	10	103	61	40	57
ND2105-NHA-0980	9.80	10	103	61	40	57
ND2105-NHA-0990	9.90	10	103	61	40	57
ND2105-NHA-1000	10.00	10	103	61	40	57
ND2105-NHA-1010	10.10	12	118	71	45	65
ND2105-NHA-1020	10.20	12	118	71	45	65
ND2105-NHA-1030	10.30	12	118	71	45	65
ND2105-NHA-1040	10.40	12	118	71	45	65
ND2105-NHA-1050	10.50	12	118	71	45	65
ND2105-NHA-1060	10.60	12	118	71	45	65
ND2105-NHA-1070	10.70	12	118	71	45	65

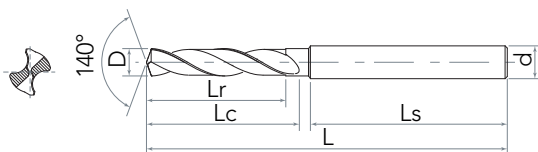
See the next page



ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

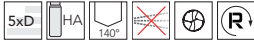
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-1080	10.80	12	118	71	45	65
ND2105-NHA-1090	10.90	12	118	71	45	65
ND2105-NHA-1100	11.00	12	118	71	45	65
ND2105-NHA-1110	11.10	12	118	71	45	65
ND2105-NHA-1120	11.20	12	118	71	45	65
ND2105-NHA-1130	11.30	12	118	71	45	65
ND2105-NHA-1140	11.40	12	118	71	45	65
ND2105-NHA-1150	11.50	12	118	71	45	65
ND2105-NHA-1160	11.60	12	118	71	45	65
ND2105-NHA-1170	11.70	12	118	71	45	65
ND2105-NHA-1180	11.80	12	118	71	45	65
ND2105-NHA-1190	11.90	12	118	71	45	65
ND2105-NHA-1200	12.00	12	118	71	45	65
ND2105-NHA-1210	12.10	14	124	77	45	72
ND2105-NHA-1220	12.20	14	124	77	45	72
ND2105-NHA-1230	12.30	14	124	77	45	72
ND2105-NHA-1240	12.40	14	124	77	45	72
ND2105-NHA-1250	12.50	14	124	77	45	72
ND2105-NHA-1260	12.60	14	124	77	45	72
ND2105-NHA-1270	12.70	14	124	77	45	72
ND2105-NHA-1280	12.80	14	124	77	45	72
ND2105-NHA-1285	12.85	14	124	77	45	72
ND2105-NHA-1290	12.90	14	124	77	45	72
ND2105-NHA-1300	13.00	14	124	77	45	72
ND2105-NHA-1310	13.10	14	124	77	45	72
ND2105-NHA-1320	13.20	14	124	77	45	72
ND2105-NHA-1330	13.30	14	124	77	45	72

See the next page 

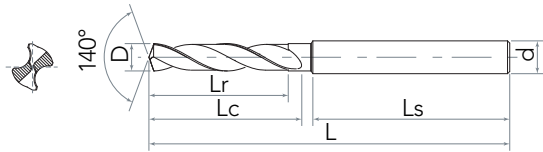


Carbide Ratio Drill

ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



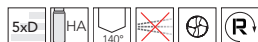
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-1340	13.40	14	124	77	45	72
ND2105-NHA-1350	13.50	14	124	77	45	72
ND2105-NHA-1360	13.60	14	124	77	45	72
ND2105-NHA-1370	13.70	14	124	77	45	72
ND2105-NHA-1380	13.80	14	124	77	45	72
ND2105-NHA-1390	13.90	14	124	77	45	72
ND2105-NHA-1400	14.00	14	124	77	45	72
ND2105-NHA-1410	14.10	16	133	83	48	77
ND2105-NHA-1420	14.20	16	133	83	48	77
ND2105-NHA-1430	14.30	16	133	83	48	77
ND2105-NHA-1440	14.40	16	133	83	48	77
ND2105-NHA-1450	14.50	16	133	83	48	77
ND2105-NHA-1460	14.60	16	133	83	48	77
ND2105-NHA-1470	14.70	16	133	83	48	77
ND2105-NHA-1480	14.80	16	133	83	48	77
ND2105-NHA-1490	14.90	16	133	83	48	77
ND2105-NHA-1500	15.00	16	133	83	48	77
ND2105-NHA-1510	15.10	16	133	83	48	77
ND2105-NHA-1520	15.20	16	133	83	48	77
ND2105-NHA-1530	15.30	16	133	83	48	77
ND2105-NHA-1540	15.40	16	133	83	48	77
ND2105-NHA-1550	15.50	16	133	83	48	77
ND2105-NHA-1560	15.60	16	133	83	48	77
ND2105-NHA-1570	15.70	16	133	83	48	77
ND2105-NHA-1580	15.80	16	133	83	48	77
ND2105-NHA-1590	15.90	16	133	83	48	77
ND2105-NHA-1600	16.00	16	133	83	48	77

See the next page

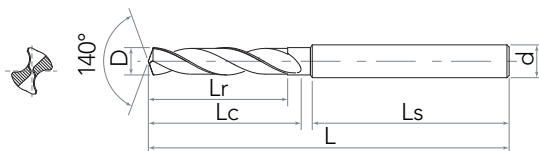


ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm



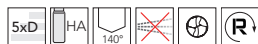
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-1610	16.10	18	143	93	48	87
ND2105-NHA-1620	16.20	18	143	93	48	87
ND2105-NHA-1630	16.30	18	143	93	48	87
ND2105-NHA-1640	16.40	18	143	93	48	87
ND2105-NHA-1650	16.50	18	143	93	48	87
ND2105-NHA-1660	16.60	18	143	93	48	87
ND2105-NHA-1670	16.70	18	143	93	48	87
ND2105-NHA-1680	16.80	18	143	93	48	87
ND2105-NHA-1690	16.90	18	143	93	48	87
ND2105-NHA-1700	17.00	18	143	93	48	87
ND2105-NHA-1710	17.10	18	143	93	48	87
ND2105-NHA-1720	17.20	18	143	93	48	87
ND2105-NHA-1730	17.30	18	143	93	48	87
ND2105-NHA-1740	17.40	18	143	93	48	87
ND2105-NHA-1750	17.50	18	143	93	48	87
ND2105-NHA-1760	17.60	18	143	93	48	87
ND2105-NHA-1770	17.70	18	143	93	48	87
ND2105-NHA-1780	17.80	18	143	93	48	87
ND2105-NHA-1790	17.90	18	143	93	48	87
ND2105-NHA-1800	18.00	18	143	93	48	87
ND2105-NHA-1810	18.10	20	153	101	50	95
ND2105-NHA-1820	18.20	20	153	101	50	95
ND2105-NHA-1830	18.30	20	153	101	50	95
ND2105-NHA-1840	18.40	20	153	101	50	95
ND2105-NHA-1850	18.50	20	153	101	50	95
ND2105-NHA-1860	18.60	20	153	101	50	95
ND2105-NHA-1870	18.70	20	153	101	50	95

See the next page 

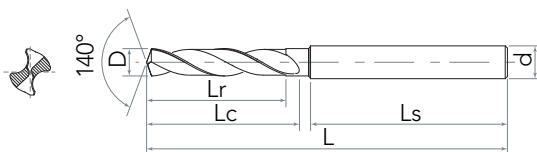


Carbide Ratio Drill

ND2105-NHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys

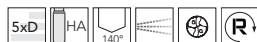


Unit: mm

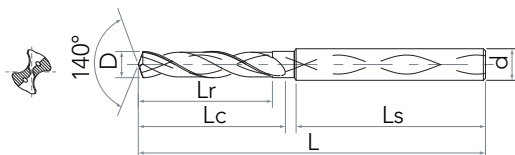
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-NHA-1880	18.80	20	153	101	50	95
ND2105-NHA-1890	18.90	20	153	101	50	95
ND2105-NHA-1900	19.00	20	153	101	50	95
ND2105-NHA-1910	19.10	20	153	101	50	95
ND2105-NHA-1920	19.20	20	153	101	50	95
ND2105-NHA-1930	19.30	20	153	101	50	95
ND2105-NHA-1940	19.40	20	153	101	50	95
ND2105-NHA-1950	19.50	20	153	101	50	95
ND2105-NHA-1960	19.60	20	153	101	50	95
ND2105-NHA-1970	19.70	20	153	101	50	95
ND2105-NHA-1980	19.80	20	153	101	50	95
ND2105-NHA-1990	19.90	20	153	101	50	95
ND2105-NHA-2000	20.00	20	153	101	50	95

Recommended cutting data see page 87

ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AISI alloys



Unit: mm

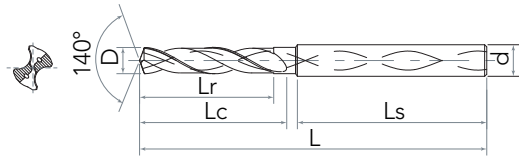
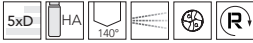
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-0340	3.40	6	66	28	36	25
ND2105-CHA-0350	3.50	6	66	28	36	25
ND2105-CHA-0360	3.60	6	66	28	36	25
ND2105-CHA-0370	3.70	6	66	28	36	25
ND2105-CHA-0380	3.80	6	74	36	36	32
ND2105-CHA-0390	3.90	6	74	36	36	32
ND2105-CHA-0400	4.00	6	74	36	36	32
ND2105-CHA-0410	4.10	6	74	36	36	32
ND2105-CHA-0420	4.20	6	74	36	36	32
ND2105-CHA-0430	4.30	6	74	36	36	32
ND2105-CHA-0440	4.40	6	74	36	36	32
ND2105-CHA-0450	4.50	6	74	36	36	32
ND2105-CHA-0460	4.60	6	74	36	36	32
ND2105-CHA-0465	4.65	6	74	36	36	32
ND2105-CHA-0470	4.70	6	74	36	36	32
ND2105-CHA-0480	4.80	6	82	44	36	40
ND2105-CHA-0490	4.90	6	82	44	36	40
ND2105-CHA-0500	5.00	6	82	44	36	40
ND2105-CHA-0510	5.10	6	82	44	36	40
ND2105-CHA-0520	5.20	6	82	44	36	40
ND2105-CHA-0530	5.30	6	82	44	36	40
ND2105-CHA-0540	5.40	6	82	44	36	40
ND2105-CHA-0550	5.50	6	82	44	36	40
ND2105-CHA-0555	5.55	6	82	44	36	40
ND2105-CHA-0560	5.60	6	82	44	36	40
ND2105-CHA-0570	5.70	6	82	44	36	40
ND2105-CHA-0580	5.80	6	82	44	36	40

See the next page 



Carbide Ratio Drill

ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-0590	5.90	6	82	44	36	40
ND2105-CHA-0600	6.00	6	82	44	36	40
ND2105-CHA-0610	6.10	8	91	53	36	50
ND2105-CHA-0620	6.20	8	91	53	36	50
ND2105-CHA-0630	6.30	8	91	53	36	50
ND2105-CHA-0640	6.40	8	91	53	36	50
ND2105-CHA-0650	6.50	8	91	53	36	50
ND2105-CHA-0660	6.60	8	91	53	36	50
ND2105-CHA-0670	6.70	8	91	53	36	50
ND2105-CHA-0680	6.80	8	91	53	36	50
ND2105-CHA-0690	6.90	8	91	53	36	50
ND2105-CHA-0700	7.00	8	91	53	36	50
ND2105-CHA-0710	7.10	8	91	53	36	50
ND2105-CHA-0720	7.20	8	91	53	36	50
ND2105-CHA-0730	7.30	8	91	53	36	50
ND2105-CHA-0740	7.40	8	91	53	36	50
ND2105-CHA-0750	7.50	8	91	53	36	50
ND2105-CHA-0760	7.60	8	91	53	36	50
ND2105-CHA-0770	7.70	8	91	53	36	50
ND2105-CHA-0780	7.80	8	91	53	36	50
ND2105-CHA-0790	7.90	8	91	53	36	50
ND2105-CHA-0800	8.00	8	91	53	36	50
ND2105-CHA-0810	8.10	10	103	61	40	57
ND2105-CHA-0820	8.20	10	103	61	40	57
ND2105-CHA-0830	8.30	10	103	61	40	57
ND2105-CHA-0840	8.40	10	103	61	40	57
ND2105-CHA-0850	8.50	10	103	61	40	57

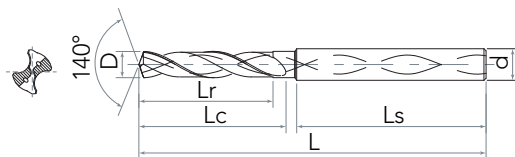
See the next page



ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

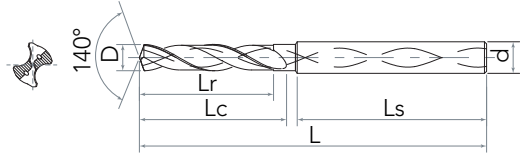
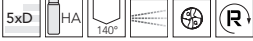
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-0860	8.60	10	103	61	40	57
ND2105-CHA-0870	8.70	10	103	61	40	57
ND2105-CHA-0880	8.80	10	103	61	40	57
ND2105-CHA-0890	8.90	10	103	61	40	57
ND2105-CHA-0900	9.00	10	103	61	40	57
ND2105-CHA-0910	9.10	10	103	61	40	57
ND2105-CHA-0920	9.20	10	103	61	40	57
ND2105-CHA-0925	9.25	10	103	61	40	57
ND2105-CHA-0930	9.30	10	103	61	40	57
ND2105-CHA-0940	9.40	10	103	61	40	57
ND2105-CHA-0950	9.50	10	103	61	40	57
ND2105-CHA-0960	9.60	10	103	61	40	57
ND2105-CHA-0970	9.70	10	103	61	40	57
ND2105-CHA-0980	9.80	10	103	61	40	57
ND2105-CHA-0990	9.90	10	103	61	40	57
ND2105-CHA-1000	10.00	10	103	61	40	57
ND2105-CHA-1010	10.10	12	118	71	45	65
ND2105-CHA-1020	10.20	12	118	71	45	65
ND2105-CHA-1030	10.30	12	118	71	45	65
ND2105-CHA-1040	10.40	12	118	71	45	65
ND2105-CHA-1050	10.50	12	118	71	45	65
ND2105-CHA-1060	10.60	12	118	71	45	65
ND2105-CHA-1070	10.70	12	118	71	45	65
ND2105-CHA-1080	10.80	12	118	71	45	65
ND2105-CHA-1090	10.90	12	118	71	45	65
ND2105-CHA-1100	11.00	12	118	71	45	65
ND2105-CHA-1110	11.10	12	118	71	45	65

See the next page 



Carbide Ratio Drill

ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys

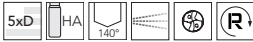
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1120	11.20	12	118	71	45	65
ND2105-CHA-1130	11.30	12	118	71	45	65
ND2105-CHA-1140	11.40	12	118	71	45	65
ND2105-CHA-1150	11.50	12	118	71	45	65
ND2105-CHA-1160	11.60	12	118	71	45	65
ND2105-CHA-1170	11.70	12	118	71	45	65
ND2105-CHA-1180	11.80	12	118	71	45	65
ND2105-CHA-1190	11.90	12	118	71	45	65
ND2105-CHA-1200	12.00	12	118	71	45	65
ND2105-CHA-1210	12.10	14	124	77	45	72
ND2105-CHA-1220	12.20	14	124	77	45	72
ND2105-CHA-1230	12.30	14	124	77	45	72
ND2105-CHA-1240	12.40	14	124	77	45	72
ND2105-CHA-1250	12.50	14	124	77	45	72
ND2105-CHA-1260	12.60	14	124	77	45	72
ND2105-CHA-1270	12.70	14	124	77	45	72
ND2105-CHA-1280	12.80	14	124	77	45	72
ND2105-CHA-1285	12.85	14	124	77	45	72
ND2105-CHA-1290	12.90	14	124	77	45	72
ND2105-CHA-1300	13.00	14	124	77	45	72
ND2105-CHA-1310	13.10	14	124	77	45	72
ND2105-CHA-1320	13.20	14	124	77	45	72
ND2105-CHA-1330	13.30	14	124	77	45	72
ND2105-CHA-1340	13.40	14	124	77	45	72
ND2105-CHA-1350	13.50	14	124	77	45	72
ND2105-CHA-1360	13.60	14	124	77	45	72
ND2105-CHA-1370	13.70	14	124	77	45	72

See the next page

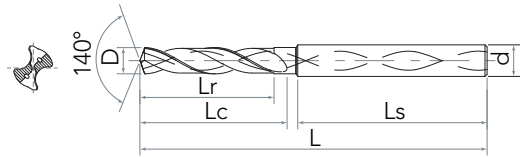


ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AISI alloys

Unit: mm



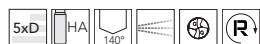
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1380	13.80	14	124	77	45	72
ND2105-CHA-1390	13.90	14	124	77	45	72
ND2105-CHA-1400	14.00	14	124	77	45	72
ND2105-CHA-1410	14.10	16	133	83	48	77
ND2105-CHA-1420	14.20	16	133	83	48	77
ND2105-CHA-1430	14.30	16	133	83	48	77
ND2105-CHA-1440	14.40	16	133	83	48	77
ND2105-CHA-1450	14.50	16	133	83	48	77
ND2105-CHA-1460	14.60	16	133	83	48	77
ND2105-CHA-1470	14.70	16	133	83	48	77
ND2105-CHA-1480	14.80	16	133	83	48	77
ND2105-CHA-1490	14.90	16	133	83	48	77
ND2105-CHA-1500	15.00	16	133	83	48	77
ND2105-CHA-1510	15.10	16	133	83	48	77
ND2105-CHA-1520	15.20	16	133	83	48	77
ND2105-CHA-1530	15.30	16	133	83	48	77
ND2105-CHA-1540	15.40	16	133	83	48	77
ND2105-CHA-1550	15.50	16	133	83	48	77
ND2105-CHA-1560	15.60	16	133	83	48	77
ND2105-CHA-1570	15.70	16	133	83	48	77
ND2105-CHA-1580	15.80	16	133	83	48	77
ND2105-CHA-1590	15.90	16	133	83	48	77
ND2105-CHA-1600	16.00	16	133	83	48	77
ND2105-CHA-1610	16.10	18	143	93	48	87
ND2105-CHA-1620	16.20	18	143	93	48	87
ND2105-CHA-1630	16.30	18	143	93	48	87
ND2105-CHA-1640	16.40	18	143	93	48	87

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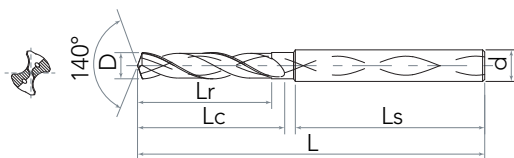


Carbide Ratio Drill

ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed)
up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



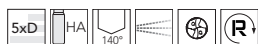
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1650	16.50	18	143	93	48	87
ND2105-CHA-1660	16.60	18	143	93	48	87
ND2105-CHA-1670	16.70	18	143	93	48	87
ND2105-CHA-1680	16.80	18	143	93	48	87
ND2105-CHA-1690	16.90	18	143	93	48	87
ND2105-CHA-1700	17.00	18	143	93	48	87
ND2105-CHA-1710	17.10	18	143	93	48	87
ND2105-CHA-1720	17.20	18	143	93	48	87
ND2105-CHA-1730	17.30	18	143	93	48	87
ND2105-CHA-1740	17.40	18	143	93	48	87
ND2105-CHA-1750	17.50	18	143	93	48	87
ND2105-CHA-1760	17.60	18	143	93	48	87
ND2105-CHA-1770	17.70	18	143	93	48	87
ND2105-CHA-1780	17.80	18	143	93	48	87
ND2105-CHA-1790	17.90	18	143	93	48	87
ND2105-CHA-1800	18.00	18	143	93	48	87
ND2105-CHA-1810	18.10	20	153	101	50	95
ND2105-CHA-1820	18.20	20	153	101	50	95
ND2105-CHA-1830	18.30	20	153	101	50	95
ND2105-CHA-1840	18.40	20	153	101	50	95
ND2105-CHA-1850	18.50	20	153	101	50	95
ND2105-CHA-1860	18.60	20	153	101	50	95
ND2105-CHA-1870	18.70	20	153	101	50	95
ND2105-CHA-1880	18.80	20	153	101	50	95
ND2105-CHA-1890	18.90	20	153	101	50	95
ND2105-CHA-1900	19.00	20	153	101	50	95
ND2105-CHA-1910	19.10	20	153	101	50	95

See the next page

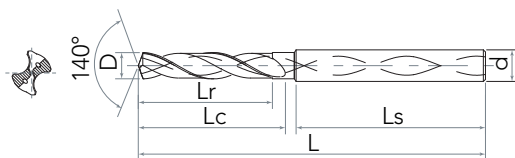


ND2105-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AISi alloys

Unit: mm



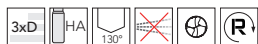
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1920	19.20	20	153	101	50	95
ND2105-CHA-1930	19.30	20	153	101	50	95
ND2105-CHA-1940	19.40	20	153	101	50	95
ND2105-CHA-1950	19.50	20	153	101	50	95
ND2105-CHA-1960	19.60	20	153	101	50	95
ND2105-CHA-1970	19.70	20	153	101	50	95
ND2105-CHA-1980	19.80	20	153	101	50	95
ND2105-CHA-1990	19.90	20	153	101	50	95
ND2105-CHA-2000	20.00	20	153	101	50	95

Recommended cutting data see page 87 

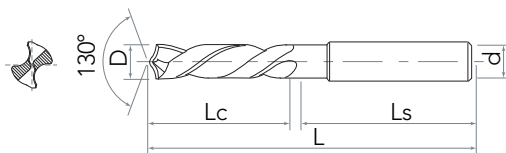


Carbide Ratio Drill

ND2503-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



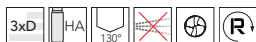
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-0300	3.00	6	66	28	36
ND2503-NHA-0310	3.10	6	66	28	36
ND2503-NHA-0320	3.20	6	66	28	36
ND2503-NHA-0330	3.30	6	66	28	36
ND2503-NHA-0340	3.40	6	66	28	36
ND2503-NHA-0350	3.50	6	66	28	36
ND2503-NHA-0360	3.60	6	66	28	36
ND2503-NHA-0370	3.70	6	66	28	36
ND2503-NHA-0380	3.80	6	74	36	36
ND2503-NHA-0390	3.90	6	74	36	36
ND2503-NHA-0400	4.00	6	74	36	36
ND2503-NHA-0410	4.10	6	74	36	36
ND2503-NHA-0420	4.20	6	74	36	36
ND2503-NHA-0430	4.30	6	74	36	36
ND2503-NHA-0440	4.40	6	74	36	36
ND2503-NHA-0450	4.50	6	74	36	36
ND2503-NHA-0460	4.60	6	74	36	36
ND2503-NHA-0470	4.70	6	74	36	36
ND2503-NHA-0480	4.80	6	82	44	36
ND2503-NHA-0490	4.90	6	82	44	36
ND2503-NHA-0500	5.00	6	82	44	36
ND2503-NHA-0510	5.10	6	82	44	36
ND2503-NHA-0520	5.20	6	82	44	36
ND2503-NHA-0530	5.30	6	82	44	36
ND2503-NHA-0540	5.40	6	82	44	36
ND2503-NHA-0550	5.50	6	82	44	36
ND2503-NHA-0560	5.60	6	82	44	36

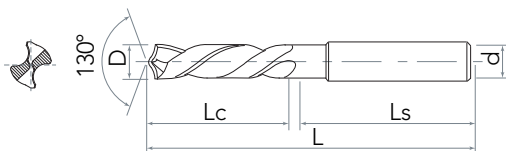
See the next page



ND2503-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

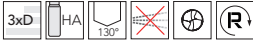
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-0570	5.70	6	82	44	36
ND2503-NHA-0580	5.80	6	82	44	36
ND2503-NHA-0590	5.90	6	82	44	36
ND2503-NHA-0600	6.00	6	82	44	36
ND2503-NHA-0610	6.10	8	91	53	36
ND2503-NHA-0620	6.20	8	91	53	36
ND2503-NHA-0630	6.30	8	91	53	36
ND2503-NHA-0640	6.40	8	91	53	36
ND2503-NHA-0650	6.50	8	91	53	36
ND2503-NHA-0660	6.60	8	91	53	36
ND2503-NHA-0670	6.70	8	91	53	36
ND2503-NHA-0680	6.80	8	91	53	36
ND2503-NHA-0690	6.90	8	91	53	36
ND2503-NHA-0700	7.00	8	91	53	36
ND2503-NHA-0710	7.10	8	91	53	36
ND2503-NHA-0720	7.20	8	91	53	36
ND2503-NHA-0730	7.30	8	91	53	36
ND2503-NHA-0740	7.40	8	91	53	36
ND2503-NHA-0750	7.50	8	91	53	36
ND2503-NHA-0760	7.60	8	91	53	36
ND2503-NHA-0770	7.70	8	91	53	36
ND2503-NHA-0780	7.80	8	91	53	36
ND2503-NHA-0790	7.90	8	91	53	36
ND2503-NHA-0800	8.00	8	91	53	36
ND2503-NHA-0810	8.10	10	103	61	40
ND2503-NHA-0820	8.20	10	103	61	40
ND2503-NHA-0830	8.30	10	103	61	40

See the next page 

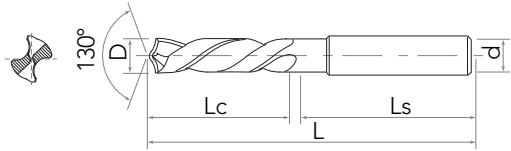


Carbide Ratio Drill

ND2503-NHA



Cast iron - long chipping Al alloys - brass, Bronzes



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-0840	8.40	10	103	61	40
ND2503-NHA-0850	8.50	10	103	61	40
ND2503-NHA-0860	8.60	10	103	61	40
ND2503-NHA-0870	8.70	10	103	61	40
ND2503-NHA-0880	8.80	10	103	61	40
ND2503-NHA-0890	8.90	10	103	61	40
ND2503-NHA-0900	9.00	10	103	61	40
ND2503-NHA-0910	9.10	10	103	61	40
ND2503-NHA-0920	9.20	10	103	61	40
ND2503-NHA-0930	9.30	10	103	61	40
ND2503-NHA-0940	9.40	10	103	61	40
ND2503-NHA-0950	9.50	10	103	61	40
ND2503-NHA-0960	9.60	10	103	61	40
ND2503-NHA-0970	9.70	10	103	61	40
ND2503-NHA-0980	9.80	10	103	61	40
ND2503-NHA-0990	9.90	10	103	61	40
ND2503-NHA-1000	10.00	10	103	61	40
ND2503-NHA-1010	10.10	12	118	71	45
ND2503-NHA-1020	10.20	12	118	71	45
ND2503-NHA-1030	10.30	12	118	71	45
ND2503-NHA-1040	10.40	12	118	71	45
ND2503-NHA-1050	10.50	12	118	71	45
ND2503-NHA-1060	10.60	12	118	71	45
ND2503-NHA-1070	10.70	12	118	71	45
ND2503-NHA-1080	10.80	12	118	71	45
ND2503-NHA-1090	10.90	12	118	71	45
ND2503-NHA-1100	11.00	12	118	71	45

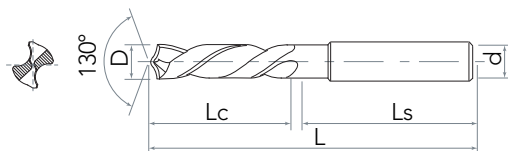
See the next page



ND2503-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

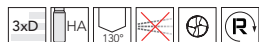
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-1110	11.10	12	118	71	45
ND2503-NHA-1120	11.20	12	118	71	45
ND2503-NHA-1130	11.30	12	118	71	45
ND2503-NHA-1140	11.40	12	118	71	45
ND2503-NHA-1150	11.50	12	118	71	45
ND2503-NHA-1160	11.60	12	118	71	45
ND2503-NHA-1170	11.70	12	118	71	45
ND2503-NHA-1180	11.80	12	118	71	45
ND2503-NHA-1190	11.90	12	118	71	45
ND2503-NHA-1200	12.00	12	118	71	45
ND2503-NHA-1210	12.10	14	124	77	45
ND2503-NHA-1220	12.20	14	124	77	45
ND2503-NHA-1230	12.30	14	124	77	45
ND2503-NHA-1240	12.40	14	124	77	45
ND2503-NHA-1250	12.50	14	124	77	45
ND2503-NHA-1260	12.60	14	124	77	45
ND2503-NHA-1270	12.70	14	124	77	45
ND2503-NHA-1280	12.80	14	124	77	45
ND2503-NHA-1290	12.90	14	124	77	45
ND2503-NHA-1300	13.00	14	124	77	45
ND2503-NHA-1310	13.10	14	124	77	45
ND2503-NHA-1320	13.20	14	124	77	45
ND2503-NHA-1330	13.30	14	124	77	45
ND2503-NHA-1340	13.40	14	124	77	45
ND2503-NHA-1350	13.50	14	124	77	45
ND2503-NHA-1360	13.60	14	124	77	45
ND2503-NHA-1370	13.70	14	124	77	45

See the next page 

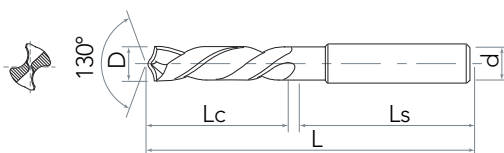


Carbide Ratio Drill

ND2503-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

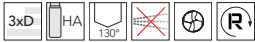
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-1380	13.80	14	124	77	45
ND2503-NHA-1390	13.90	14	124	77	45
ND2503-NHA-1400	14.00	14	124	77	45
ND2503-NHA-1410	14.10	16	133	83	48
ND2503-NHA-1420	14.20	16	133	83	48
ND2503-NHA-1430	14.30	16	133	83	48
ND2503-NHA-1440	14.40	16	133	83	48
ND2503-NHA-1450	14.50	16	133	83	48
ND2503-NHA-1460	14.60	16	133	83	48
ND2503-NHA-1470	14.70	16	133	83	48
ND2503-NHA-1480	14.80	16	133	83	48
ND2503-NHA-1490	14.90	16	133	83	48
ND2503-NHA-1500	15.00	16	133	83	48
ND2503-NHA-1510	15.10	16	133	83	48
ND2503-NHA-1520	15.20	16	133	83	48
ND2503-NHA-1530	15.30	16	133	83	48
ND2503-NHA-1540	15.40	16	133	83	48
ND2503-NHA-1550	15.50	16	133	83	48
ND2503-NHA-1560	15.60	16	133	83	48
ND2503-NHA-1570	15.70	16	133	83	48
ND2503-NHA-1580	15.80	16	133	83	48
ND2503-NHA-1590	15.90	16	133	83	48
ND2503-NHA-1600	16.00	16	133	83	48
ND2503-NHA-1610	16.10	16	133	83	48
ND2503-NHA-1620	16.20	16	133	83	48
ND2503-NHA-1630	16.30	16	133	83	48
ND2503-NHA-1640	16.40	16	133	83	48

See the next page

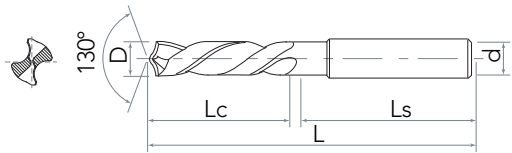




ND2503-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



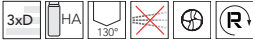
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-1650	16.50	18	143	93	48
ND2503-NHA-1660	16.60	18	143	93	48
ND2503-NHA-1670	16.70	18	143	93	48
ND2503-NHA-1680	16.80	18	143	93	48
ND2503-NHA-1690	16.90	18	143	93	48
ND2503-NHA-1700	17.00	18	143	93	48
ND2503-NHA-1710	17.10	18	143	93	48
ND2503-NHA-1720	17.20	18	143	93	48
ND2503-NHA-1730	17.30	18	143	93	48
ND2503-NHA-1740	17.40	18	143	93	48
ND2503-NHA-1750	17.50	18	143	93	48
ND2503-NHA-1760	17.60	18	143	93	48
ND2503-NHA-1770	17.70	18	143	93	48
ND2503-NHA-1780	17.80	18	143	93	48
ND2503-NHA-1790	17.90	18	143	93	48
ND2503-NHA-1800	18.00	18	143	93	48
ND2503-NHA-1810	18.10	18	143	93	48
ND2503-NHA-1820	18.20	18	143	93	48
ND2503-NHA-1830	18.30	18	143	93	48
ND2503-NHA-1840	18.40	18	143	93	48
ND2503-NHA-1850	18.50	20	153	101	50
ND2503-NHA-1860	18.60	20	153	101	50
ND2503-NHA-1870	18.70	20	153	101	50
ND2503-NHA-1880	18.80	20	153	101	50
ND2503-NHA-1890	18.90	20	153	101	50
ND2503-NHA-1900	19.00	20	153	101	50
ND2503-NHA-1910	19.10	20	153	101	50

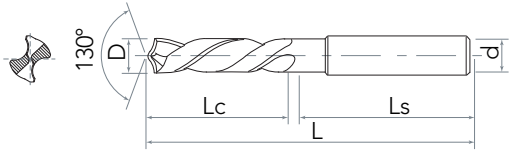
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ND2503-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



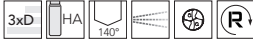
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-NHA-1920	19.20	20	153	101	50
ND2503-NHA-1930	19.30	20	153	101	50
ND2503-NHA-1940	19.40	20	153	101	50
ND2503-NHA-1950	19.50	20	153	101	50
ND2503-NHA-1960	19.60	20	153	101	50
ND2503-NHA-1970	19.70	20	153	101	50
ND2503-NHA-1980	19.80	20	153	101	50
ND2503-NHA-1990	19.90	20	153	101	50
ND2503-NHA-2000	20.00	20	153	101	50

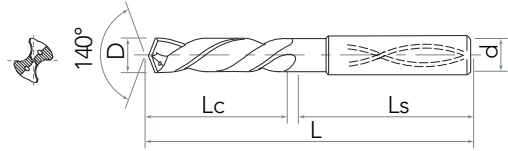
Recommended cutting data see page 87



ND2503-CHA



Aluminium and Al alloys - Al materials with high Si-content



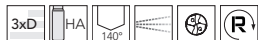
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-0300	3.00	6	66	28	36
ND2503-CHA-0310	3.10	6	66	28	36
ND2503-CHA-0320	3.20	6	66	28	36
ND2503-CHA-0330	3.30	6	66	28	36
ND2503-CHA-0340	3.40	6	66	28	36
ND2503-CHA-0350	3.50	6	66	28	36
ND2503-CHA-0360	3.60	6	66	28	36
ND2503-CHA-0370	3.70	6	66	28	36
ND2503-CHA-0380	3.80	6	74	36	36
ND2503-CHA-0390	3.90	6	74	36	36
ND2503-CHA-0400	4.00	6	74	36	36
ND2503-CHA-0410	4.10	6	74	36	36
ND2503-CHA-0420	4.20	6	74	36	36
ND2503-CHA-0430	4.30	6	74	36	36
ND2503-CHA-0440	4.40	6	74	36	36
ND2503-CHA-0450	4.50	6	74	36	36
ND2503-CHA-0460	4.60	6	74	36	36
ND2503-CHA-0470	4.70	6	74	36	36
ND2503-CHA-0480	4.80	6	82	44	36
ND2503-CHA-0490	4.90	6	82	44	36
ND2503-CHA-0500	5.00	6	82	44	36
ND2503-CHA-0510	5.10	6	82	44	36
ND2503-CHA-0520	5.20	6	82	44	36
ND2503-CHA-0530	5.30	6	82	44	36
ND2503-CHA-0540	5.40	6	82	44	36
ND2503-CHA-0550	5.50	6	82	44	36
ND2503-CHA-0560	5.60	6	82	44	36

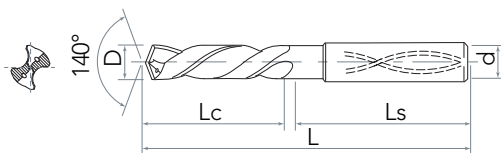
See the next page 



ND2503-CHA



Aluminium and Al alloys - Al materials with high Si-content

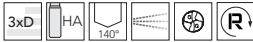


Unit: mm

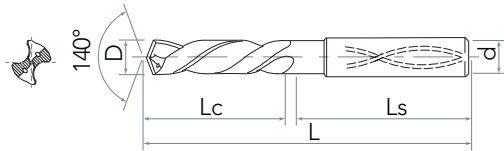
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-0570	5.70	6	82	44	36
ND2503-CHA-0580	5.80	6	82	44	36
ND2503-CHA-0590	5.90	6	82	44	36
ND2503-CHA-0600	6.00	6	82	44	36
ND2503-CHA-0610	6.10	8	91	53	36
ND2503-CHA-0620	6.20	8	91	53	36
ND2503-CHA-0630	6.30	8	91	53	36
ND2503-CHA-0640	6.40	8	91	53	36
ND2503-CHA-0650	6.50	8	91	53	36
ND2503-CHA-0660	6.60	8	91	53	36
ND2503-CHA-0670	6.70	8	91	53	36
ND2503-CHA-0680	6.80	8	91	53	36
ND2503-CHA-0690	6.90	8	91	53	36
ND2503-CHA-0700	7.00	8	91	53	36
ND2503-CHA-0710	7.10	8	91	53	36
ND2503-CHA-0720	7.20	8	91	53	36
ND2503-CHA-0730	7.30	8	91	53	36
ND2503-CHA-0740	7.40	8	91	53	36
ND2503-CHA-0750	7.50	8	91	53	36
ND2503-CHA-0760	7.60	8	91	53	36
ND2503-CHA-0770	7.70	8	91	53	36
ND2503-CHA-0780	7.80	8	91	53	36
ND2503-CHA-0790	7.90	8	91	53	36
ND2503-CHA-0800	8.00	8	91	53	36
ND2503-CHA-0810	8.10	10	103	61	40
ND2503-CHA-0820	8.20	10	103	61	40
ND2503-CHA-0830	8.30	10	103	61	40

See the next page

ND2503-CHA



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

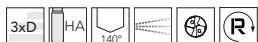
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-0840	8.40	10	103	61	40
ND2503-CHA-0850	8.50	10	103	61	40
ND2503-CHA-0860	8.60	10	103	61	40
ND2503-CHA-0870	8.70	10	103	61	40
ND2503-CHA-0880	8.80	10	103	61	40
ND2503-CHA-0890	8.90	10	103	61	40
ND2503-CHA-0900	9.00	10	103	61	40
ND2503-CHA-0910	9.10	10	103	61	40
ND2503-CHA-0920	9.20	10	103	61	40
ND2503-CHA-0930	9.30	10	103	61	40
ND2503-CHA-0940	9.40	10	103	61	40
ND2503-CHA-0950	9.50	10	103	61	40
ND2503-CHA-0960	9.60	10	103	61	40
ND2503-CHA-0970	9.70	10	103	61	40
ND2503-CHA-0980	9.80	10	103	61	40
ND2503-CHA-0990	9.90	10	103	61	40
ND2503-CHA-1000	10.00	10	103	61	40
ND2503-CHA-1010	10.10	12	118	71	45
ND2503-CHA-1020	10.20	12	118	71	45
ND2503-CHA-1030	10.30	12	118	71	45
ND2503-CHA-1040	10.40	12	118	71	45
ND2503-CHA-1050	10.50	12	118	71	45
ND2503-CHA-1060	10.60	12	118	71	45
ND2503-CHA-1070	10.70	12	118	71	45
ND2503-CHA-1080	10.80	12	118	71	45
ND2503-CHA-1090	10.90	12	118	71	45
ND2503-CHA-1100	11.00	12	118	71	45

See the next page 

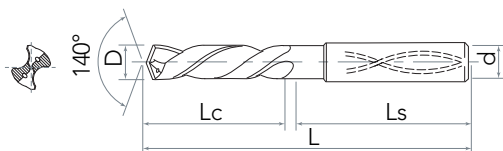


Carbide Ratio Drill

ND2503-CHA



Aluminium and Al alloys - Al materials with high Si-content

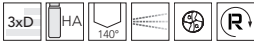


Unit: mm

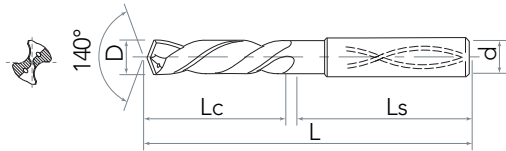
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1110	11.10	12	118	71	45
ND2503-CHA-1120	11.20	12	118	71	45
ND2503-CHA-1130	11.30	12	118	71	45
ND2503-CHA-1140	11.40	12	118	71	45
ND2503-CHA-1150	11.50	12	118	71	45
ND2503-CHA-1160	11.60	12	118	71	45
ND2503-CHA-1170	11.70	12	118	71	45
ND2503-CHA-1180	11.80	12	118	71	45
ND2503-CHA-1190	11.90	12	118	71	45
ND2503-CHA-1200	12.00	12	118	71	45
ND2503-CHA-1210	12.10	14	124	77	45
ND2503-CHA-1220	12.20	14	124	77	45
ND2503-CHA-1230	12.30	14	124	77	45
ND2503-CHA-1240	12.40	14	124	77	45
ND2503-CHA-1250	12.50	14	124	77	45
ND2503-CHA-1260	12.60	14	124	77	45
ND2503-CHA-1270	12.70	14	124	77	45
ND2503-CHA-1280	12.80	14	124	77	45
ND2503-CHA-1290	12.90	14	124	77	45
ND2503-CHA-1300	13.00	14	124	77	45
ND2503-CHA-1310	13.10	14	124	77	45
ND2503-CHA-1320	13.20	14	124	77	45
ND2503-CHA-1330	13.30	14	124	77	45
ND2503-CHA-1340	13.40	14	124	77	45
ND2503-CHA-1350	13.50	14	124	77	45
ND2503-CHA-1360	13.60	14	124	77	45
ND2503-CHA-1370	13.70	14	124	77	45

See the next page

ND2503-CHA



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

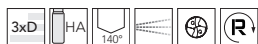
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1380	13.80	14	124	71	45
ND2503-CHA-1390	13.90	14	124	71	45
ND2503-CHA-1400	14.00	14	124	71	45
ND2503-CHA-1410	14.10	16	133	83	48
ND2503-CHA-1420	14.20	16	133	83	48
ND2503-CHA-1430	14.30	16	133	83	48
ND2503-CHA-1440	14.40	16	133	83	48
ND2503-CHA-1450	14.50	16	133	83	48
ND2503-CHA-1460	14.60	16	133	83	48
ND2503-CHA-1470	14.70	16	133	83	48
ND2503-CHA-1480	14.80	16	133	83	48
ND2503-CHA-1490	14.90	16	133	83	48
ND2503-CHA-1500	15.00	16	133	83	48
ND2503-CHA-1510	15.10	16	133	83	48
ND2503-CHA-1520	15.20	16	133	83	48
ND2503-CHA-1530	15.30	16	133	83	48
ND2503-CHA-1540	15.40	16	133	83	48
ND2503-CHA-1550	15.50	16	133	83	48
ND2503-CHA-1560	15.60	16	133	83	48
ND2503-CHA-1570	15.70	16	133	83	48
ND2503-CHA-1580	15.80	16	133	83	48
ND2503-CHA-1590	15.90	16	133	83	48
ND2503-CHA-1600	16.00	16	133	83	48
ND2503-CHA-1610	16.10	18	143	93	48
ND2503-CHA-1620	16.20	18	143	93	48
ND2503-CHA-1630	16.30	18	143	93	48
ND2503-CHA-1640	16.40	18	143	93	48

See the next page 

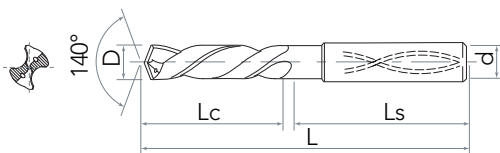


Carbide Ratio Drill

ND2503-CHA



Aluminium and Al alloys · Al materials with high Si-content



Unit: mm

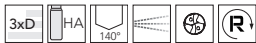
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1650	16.50	18	143	93	45
ND2503-CHA-1660	16.60	18	143	93	45
ND2503-CHA-1670	16.70	18	143	93	45
ND2503-CHA-1680	16.80	18	143	93	48
ND2503-CHA-1690	16.90	18	143	93	48
ND2503-CHA-1700	17.00	18	143	93	48
ND2503-CHA-1710	17.10	18	143	93	48
ND2503-CHA-1720	17.20	18	143	93	48
ND2503-CHA-1730	17.30	18	143	93	48
ND2503-CHA-1740	17.40	18	143	93	48
ND2503-CHA-1750	17.50	18	143	93	48
ND2503-CHA-1760	17.60	18	143	93	48
ND2503-CHA-1770	17.70	18	143	93	48
ND2503-CHA-1780	17.80	18	143	93	48
ND2503-CHA-1790	17.90	18	143	93	48
ND2503-CHA-1800	18.00	18	143	93	48
ND2503-CHA-1810	18.10	20	153	101	50
ND2503-CHA-1820	18.20	20	153	101	50
ND2503-CHA-1830	18.30	20	153	101	50
ND2503-CHA-1840	18.40	20	153	101	50
ND2503-CHA-1850	18.50	20	153	101	50
ND2503-CHA-1860	18.60	20	153	101	50
ND2503-CHA-1870	18.70	20	153	101	50
ND2503-CHA-1880	18.80	20	153	101	50
ND2503-CHA-1890	18.90	20	153	101	50
ND2503-CHA-1900	19.00	20	153	101	50
ND2503-CHA-1910	19.10	20	153	101	50

See the next page

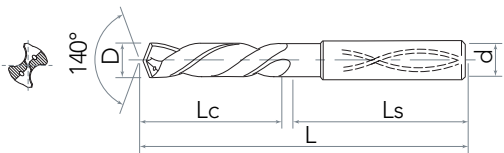




ND2503-CHA



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1920	19.20	20	153	101	50
ND2503-CHA-1930	19.30	20	153	101	50
ND2503-CHA-1940	19.40	20	153	101	50
ND2503-CHA-1950	19.50	20	153	101	50
ND2503-CHA-1960	19.60	20	153	101	50
ND2503-CHA-1970	19.70	20	153	101	50
ND2503-CHA-1980	19.80	20	153	101	50
ND2503-CHA-1990	19.90	20	153	101	50
ND2503-CHA-2000	20.00	20	153	101	50

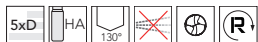
Recommended cutting data see page 87





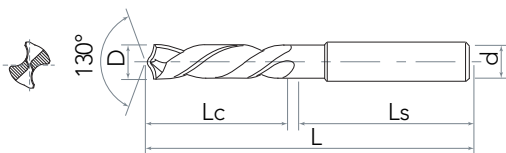
Carbide Ratio Drill

ND2505-NHA



P M K N S H

Cast iron · long chipping Al alloys · brass, Bronzes



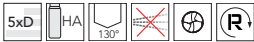
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-0300	3.00	6	66	28	36
ND2505-NHA-0310	3.10	6	66	28	36
ND2505-NHA-0320	3.20	6	66	28	36
ND2505-NHA-0330	3.30	6	66	28	36
ND2505-NHA-0340	3.40	6	66	28	36
ND2505-NHA-0350	3.50	6	66	28	36
ND2505-NHA-0360	3.60	6	66	28	36
ND2505-NHA-0370	3.70	6	66	28	36
ND2505-NHA-0380	3.80	6	74	36	36
ND2505-NHA-0390	3.90	6	74	36	36
ND2505-NHA-0400	4.00	6	74	36	36
ND2505-NHA-0410	4.10	6	74	36	36
ND2505-NHA-0420	4.20	6	74	36	36
ND2505-NHA-0430	4.30	6	74	36	36
ND2505-NHA-0440	4.40	6	74	36	36
ND2505-NHA-0450	4.50	6	74	36	36
ND2505-NHA-0460	4.60	6	74	36	36
ND2505-NHA-0470	4.70	6	74	36	36
ND2505-NHA-0480	4.80	6	82	44	36
ND2505-NHA-0490	4.90	6	82	44	36
ND2505-NHA-0500	5.00	6	82	44	36
ND2505-NHA-0510	5.10	6	82	44	36
ND2505-NHA-0520	5.20	6	82	44	36
ND2505-NHA-0530	5.30	6	82	44	36
ND2505-NHA-0540	5.40	6	82	44	36
ND2505-NHA-0550	5.50	6	82	44	36
ND2505-NHA-0560	5.60	6	82	44	36

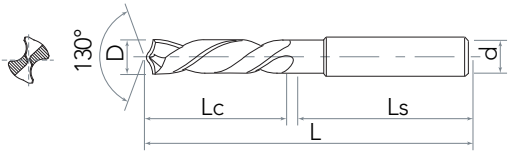
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ND2505-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-0570	5.70	6	82	44	36
ND2505-NHA-0580	5.80	6	82	44	36
ND2505-NHA-0590	5.90	6	82	44	36
ND2505-NHA-0600	6.00	6	82	44	36
ND2505-NHA-0610	6.10	8	91	53	36
ND2505-NHA-0620	6.20	8	91	53	36
ND2505-NHA-0630	6.30	8	91	53	36
ND2505-NHA-0640	6.40	8	91	53	36
ND2505-NHA-0650	6.50	8	91	53	36
ND2505-NHA-0660	6.60	8	91	53	36
ND2505-NHA-0670	6.70	8	91	53	36
ND2505-NHA-0680	6.80	8	91	53	36
ND2505-NHA-0690	6.90	8	91	53	36
ND2505-NHA-0700	7.00	8	91	53	36
ND2505-NHA-0710	7.10	8	91	53	36
ND2505-NHA-0720	7.20	8	91	53	36
ND2505-NHA-0730	7.30	8	91	53	36
ND2505-NHA-0740	7.40	8	91	53	36
ND2505-NHA-0750	7.50	8	91	53	36
ND2505-NHA-0760	7.60	8	91	53	36
ND2505-NHA-0770	7.70	8	91	53	36
ND2505-NHA-0780	7.80	8	91	53	36
ND2505-NHA-0790	7.90	8	91	53	36
ND2505-NHA-0800	8.00	8	91	53	36
ND2505-NHA-0810	8.10	10	103	61	40
ND2505-NHA-0820	8.20	10	103	61	40
ND2505-NHA-0830	8.30	10	103	61	40

See the next page

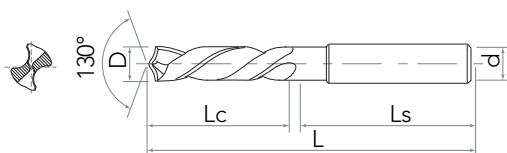


Carbide Ratio Drill

ND2505-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



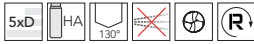
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-0840	8.40	10	103	61	40
ND2505-NHA-0850	8.50	10	103	61	40
ND2505-NHA-0860	8.60	10	103	61	40
ND2505-NHA-0870	8.70	10	103	61	40
ND2505-NHA-0880	8.80	10	103	61	40
ND2505-NHA-0890	8.90	10	103	61	40
ND2505-NHA-0900	9.00	10	103	61	40
ND2505-NHA-0910	9.10	10	103	61	40
ND2505-NHA-0920	9.20	10	103	61	40
ND2505-NHA-0930	9.30	10	103	61	40
ND2505-NHA-0940	9.40	10	103	61	40
ND2505-NHA-0950	9.50	10	103	61	40
ND2505-NHA-0960	9.60	10	103	61	40
ND2505-NHA-0970	9.70	10	103	61	40
ND2505-NHA-0980	9.80	10	103	61	40
ND2505-NHA-0990	9.90	10	103	61	40
ND2505-NHA-1000	10.00	10	103	61	40
ND2505-NHA-1010	10.10	12	118	71	45
ND2505-NHA-1020	10.20	12	118	71	45
ND2505-NHA-1030	10.30	12	118	71	45
ND2505-NHA-1040	10.40	12	118	71	45
ND2505-NHA-1050	10.50	12	118	71	45
ND2505-NHA-1060	10.60	12	118	71	45
ND2505-NHA-1070	10.70	12	118	71	45
ND2505-NHA-1080	10.80	12	118	71	45
ND2505-NHA-1090	10.90	12	118	71	45
ND2505-NHA-1100	11.00	12	118	71	45

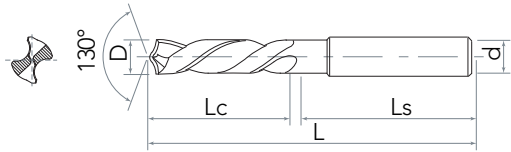
See the next page



ND2505-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

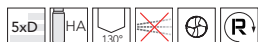
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-1110	11.10	12	118	71	45
ND2505-NHA-1120	11.20	12	118	71	45
ND2505-NHA-1130	11.30	12	118	71	45
ND2505-NHA-1140	11.40	12	118	71	45
ND2505-NHA-1150	11.50	12	118	71	45
ND2505-NHA-1160	11.60	12	118	71	45
ND2505-NHA-1170	11.70	12	118	71	45
ND2505-NHA-1180	11.80	12	118	71	45
ND2505-NHA-1190	11.90	12	118	71	45
ND2505-NHA-1200	12.00	12	118	71	45
ND2505-NHA-1210	12.10	14	124	77	45
ND2505-NHA-1220	12.20	14	124	77	45
ND2505-NHA-1230	12.30	14	124	77	45
ND2505-NHA-1240	12.40	14	124	77	45
ND2505-NHA-1250	12.50	14	124	77	45
ND2505-NHA-1260	12.60	14	124	77	45
ND2505-NHA-1270	12.70	14	124	77	45
ND2505-NHA-1280	12.80	14	124	77	45
ND2505-NHA-1290	12.90	14	124	77	45
ND2505-NHA-1300	13.00	14	124	77	45
ND2505-NHA-1310	13.10	14	124	77	45
ND2505-NHA-1320	13.20	14	124	77	45
ND2505-NHA-1330	13.30	14	124	77	45
ND2505-NHA-1340	13.40	14	124	77	45
ND2505-NHA-1350	13.50	14	124	77	45
ND2505-NHA-1360	13.60	14	124	77	45
ND2505-NHA-1370	13.70	14	124	77	45

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Carbide Ratio Drill

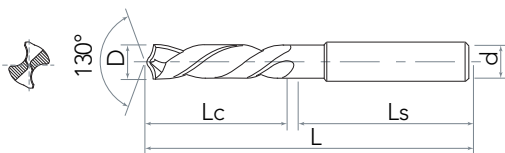
ND2505-NHA



P M K N S H



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

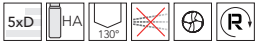
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-1380	13.80	14	124	77	45
ND2505-NHA-1390	13.90	14	124	77	45
ND2505-NHA-1400	14.00	14	124	77	45
ND2505-NHA-1410	14.10	16	133	83	48
ND2505-NHA-1420	14.20	16	133	83	48
ND2505-NHA-1430	14.30	16	133	83	48
ND2505-NHA-1440	14.40	16	133	83	48
ND2505-NHA-1450	14.50	16	133	83	48
ND2505-NHA-1460	14.60	16	133	83	48
ND2505-NHA-1470	14.70	16	133	83	48
ND2505-NHA-1480	14.80	16	133	83	48
ND2505-NHA-1490	14.90	16	133	83	48
ND2505-NHA-1500	15.00	16	133	83	48
ND2505-NHA-1510	15.10	16	133	83	48
ND2505-NHA-1520	15.20	16	133	83	48
ND2505-NHA-1530	15.30	16	133	83	48
ND2505-NHA-1540	15.40	16	133	83	48
ND2505-NHA-1550	15.50	16	133	83	48
ND2505-NHA-1560	15.60	16	133	83	48
ND2505-NHA-1570	15.70	16	133	83	48
ND2505-NHA-1580	15.80	16	133	83	48
ND2505-NHA-1590	15.90	16	133	83	48
ND2505-NHA-1600	16.00	16	133	83	48
ND2505-NHA-1610	16.10	16	133	83	48
ND2505-NHA-1620	16.20	16	133	83	48
ND2505-NHA-1630	16.30	16	133	83	48
ND2505-NHA-1640	16.40	16	133	83	48

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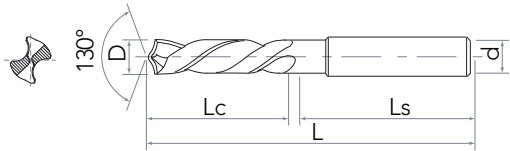




ND2505-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-1650	16.50	18	143	93	48
ND2505-NHA-1660	16.60	18	143	93	48
ND2505-NHA-1670	16.70	18	143	93	48
ND2505-NHA-1680	16.80	18	143	93	48
ND2505-NHA-1690	16.90	18	143	93	48
ND2505-NHA-1700	17.00	18	143	93	48
ND2505-NHA-1710	17.10	18	143	93	48
ND2505-NHA-1720	17.20	18	143	93	48
ND2505-NHA-1730	17.30	18	143	93	48
ND2505-NHA-1740	17.40	18	143	93	48
ND2505-NHA-1750	17.50	18	143	93	48
ND2505-NHA-1760	17.60	18	143	93	48
ND2505-NHA-1770	17.70	18	143	93	48
ND2505-NHA-1780	17.80	18	143	93	48
ND2505-NHA-1790	17.90	18	143	93	48
ND2505-NHA-1800	18.00	18	143	93	48
ND2505-NHA-1810	18.10	18	143	93	48
ND2505-NHA-1820	18.20	18	143	93	48
ND2505-NHA-1830	18.30	18	143	93	48
ND2505-NHA-1840	18.40	18	143	93	48
ND2505-NHA-1850	18.50	20	153	101	50
ND2505-NHA-1860	18.60	20	153	101	50
ND2505-NHA-1870	18.70	20	153	101	50
ND2505-NHA-1880	18.80	20	153	101	50
ND2505-NHA-1890	18.90	20	153	101	50
ND2505-NHA-1900	19.00	20	153	101	50
ND2505-NHA-1910	19.10	20	153	101	50

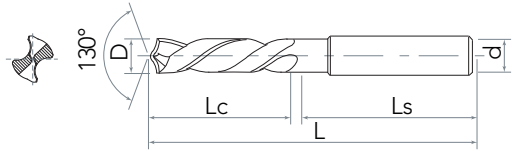
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ND2505-NHA



Cast iron · long chipping Al alloys · brass, Bronzes



Unit: mm

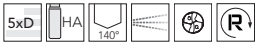
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-NHA-1920	19.20	20	153	101	50
ND2505-NHA-1930	19.30	20	153	101	50
ND2505-NHA-1940	19.40	20	153	101	50
ND2505-NHA-1950	19.50	20	153	101	50
ND2505-NHA-1960	19.60	20	153	101	50
ND2505-NHA-1970	19.70	20	153	101	50
ND2505-NHA-1980	19.80	20	153	101	50
ND2505-NHA-1990	19.90	20	153	101	50
ND2505-NHA-2000	20.00	20	153	101	50

Recommended cutting data see page 87

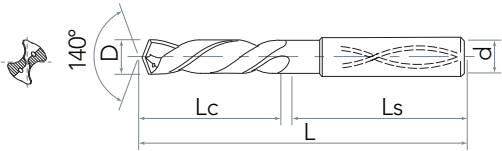




ND2505-CHA



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

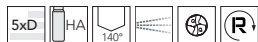
Specification	D (m7)	d (h6)	L	Lc	LS
ND2505-CHA-0300	3.00	6	66	28	36
ND2505-CHA-0310	3.10	6	66	28	36
ND2505-CHA-0320	3.20	6	66	28	36
ND2505-CHA-0330	3.30	6	66	28	36
ND2505-CHA-0340	3.40	6	66	28	36
ND2505-CHA-0350	3.50	6	66	28	36
ND2505-CHA-0360	3.60	6	66	28	36
ND2505-CHA-0370	3.70	6	66	28	36
ND2505-CHA-0380	3.80	6	74	36	36
ND2505-CHA-0390	3.90	6	74	36	36
ND2505-CHA-0400	4.00	6	74	36	36
ND2505-CHA-0410	4.10	6	74	36	36
ND2505-CHA-0420	4.20	6	74	36	36
ND2505-CHA-0430	4.30	6	74	36	36
ND2505-CHA-0440	4.40	6	74	36	36
ND2505-CHA-0450	4.50	6	74	36	36
ND2505-CHA-0460	4.60	6	74	36	36
ND2505-CHA-0470	4.70	6	74	36	36
ND2505-CHA-0480	4.80	6	82	44	36
ND2505-CHA-0490	4.90	6	82	44	36
ND2505-CHA-0500	5.00	6	82	44	36
ND2505-CHA-0510	5.10	6	82	44	36
ND2505-CHA-0520	5.20	6	82	44	36
ND2505-CHA-0530	5.30	6	82	44	36
ND2505-CHA-0540	5.40	6	82	44	36
ND2505-CHA-0550	5.50	6	82	44	36
ND2505-CHA-0560	5.60	6	82	44	36

See the next page

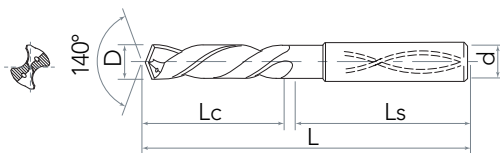


Carbide Ratio Drill

ND2505-CHA



Aluminium and Al alloys - Al materials with high Si-content

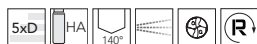


Unit: mm

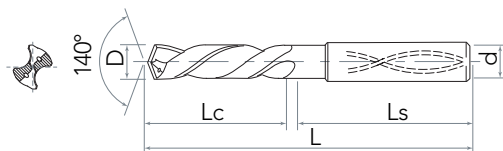
Specification	D (m7)	d (h6)	L	Lc	LS
ND2505-CHA-0570	5.70	6	82	44	36
ND2505-CHA-0580	5.80	6	82	44	36
ND2505-CHA-0590	5.90	6	82	44	36
ND2505-CHA-0600	6.00	6	82	44	36
ND2505-CHA-0610	6.10	8	91	53	36
ND2505-CHA-0620	6.20	8	91	53	36
ND2505-CHA-0630	6.30	8	91	53	36
ND2505-CHA-0640	6.40	8	91	53	36
ND2505-CHA-0650	6.50	8	91	53	36
ND2505-CHA-0660	6.60	8	91	53	36
ND2505-CHA-0670	6.70	8	91	53	36
ND2505-CHA-0680	6.80	8	91	53	36
ND2505-CHA-0690	6.90	8	91	53	36
ND2505-CHA-0700	7.00	8	91	53	36
ND2505-CHA-0710	7.10	8	91	53	36
ND2505-CHA-0720	7.20	8	91	53	36
ND2505-CHA-0730	7.30	8	91	53	36
ND2505-CHA-0740	7.40	8	91	53	36
ND2505-CHA-0750	7.50	8	91	53	36
ND2505-CHA-0760	7.60	8	91	53	36
ND2505-CHA-0770	7.70	8	91	53	36
ND2505-CHA-0780	7.80	8	91	53	36
ND2505-CHA-0790	7.90	8	91	53	36
ND2505-CHA-0800	8.00	8	91	53	36
ND2505-CHA-0810	8.10	10	103	61	40
ND2505-CHA-0820	8.20	10	103	61	40
ND2505-CHA-0830	8.30	10	103	61	40

See the next page

ND2505-CHA



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

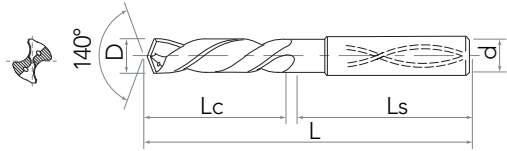
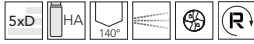
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-0840	8.40	10	103	61	40
ND2505-CHA-0850	8.50	10	103	61	40
ND2505-CHA-0860	8.60	10	103	61	40
ND2505-CHA-0870	8.70	10	103	61	40
ND2505-CHA-0880	8.80	10	103	61	40
ND2505-CHA-0890	8.90	10	103	61	40
ND2505-CHA-0900	9.00	10	103	61	40
ND2505-CHA-0910	9.10	10	103	61	40
ND2505-CHA-0920	9.20	10	103	61	40
ND2505-CHA-0930	9.30	10	103	61	40
ND2505-CHA-0940	9.40	10	103	61	40
ND2505-CHA-0950	9.50	10	103	61	40
ND2505-CHA-0960	9.60	10	103	61	40
ND2505-CHA-0970	9.70	10	103	61	40
ND2505-CHA-0980	9.80	10	103	61	40
ND2505-CHA-0990	9.90	10	103	61	40
ND2505-CHA-1000	10.00	10	103	61	40
ND2505-CHA-1010	10.10	12	118	71	45
ND2505-CHA-1020	10.20	12	118	71	45
ND2505-CHA-1030	10.30	12	118	71	45
ND2505-CHA-1040	10.40	12	118	71	45
ND2505-CHA-1050	10.50	12	118	71	45
ND2505-CHA-1060	10.60	12	118	71	45
ND2505-CHA-1070	10.70	12	118	71	45
ND2505-CHA-1080	10.80	12	118	71	45
ND2505-CHA-1090	10.90	12	118	71	45
ND2505-CHA-1100	11.00	12	118	71	45

See the next page 



Carbide Ratio Drill

ND2505-CHA



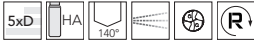
Aluminium and Al alloys - Al materials with high Si-content

Unit: mm

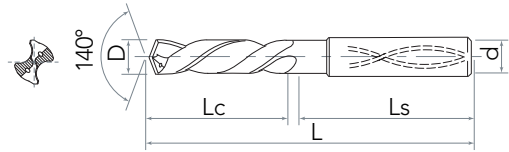
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1110	11.10	12	118	71	45
ND2505-CHA-1120	11.20	12	118	71	45
ND2505-CHA-1130	11.30	12	118	71	45
ND2505-CHA-1140	11.40	12	118	71	45
ND2505-CHA-1150	11.50	12	118	71	45
ND2505-CHA-1160	11.60	12	118	71	45
ND2505-CHA-1170	11.70	12	118	71	45
ND2505-CHA-1180	11.80	12	118	71	45
ND2505-CHA-1190	11.90	12	118	71	45
ND2505-CHA-1200	12.00	12	118	71	45
ND2505-CHA-1210	12.10	14	124	77	45
ND2505-CHA-1220	12.20	14	124	77	45
ND2505-CHA-1230	12.30	14	124	77	45
ND2505-CHA-1240	12.40	14	124	77	45
ND2505-CHA-1250	12.50	14	124	77	45
ND2505-CHA-1260	12.60	14	124	77	45
ND2505-CHA-1270	12.70	14	124	77	45
ND2505-CHA-1280	12.80	14	124	77	45
ND2505-CHA-1290	12.90	14	124	77	45
ND2505-CHA-1300	13.00	14	124	77	45
ND2505-CHA-1310	13.10	14	124	77	45
ND2505-CHA-1320	13.20	14	124	77	45
ND2505-CHA-1330	13.30	14	124	77	45
ND2505-CHA-1340	13.40	14	124	77	45
ND2505-CHA-1350	13.50	14	124	77	45
ND2505-CHA-1360	13.60	14	124	77	45
ND2505-CHA-1370	13.70	14	124	77	45

See the next page

ND2505-CHA



Aluminium and Al alloys - Al materials with high Si-content



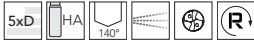
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1380	13.80	14	124	71	45
ND2505-CHA-1390	13.90	14	124	71	45
ND2505-CHA-1400	14.00	14	124	71	45
ND2505-CHA-1410	14.10	16	133	83	48
ND2505-CHA-1420	14.20	16	133	83	48
ND2505-CHA-1430	14.30	16	133	83	48
ND2505-CHA-1440	14.40	16	133	83	48
ND2505-CHA-1450	14.50	16	133	83	48
ND2505-CHA-1460	14.60	16	133	83	48
ND2505-CHA-1470	14.70	16	133	83	48
ND2505-CHA-1480	14.80	16	133	83	48
ND2505-CHA-1490	14.90	16	133	83	48
ND2505-CHA-1500	15.00	16	133	83	48
ND2505-CHA-1510	15.10	16	133	83	48
ND2505-CHA-1520	15.20	16	133	83	48
ND2505-CHA-1530	15.30	16	133	83	48
ND2505-CHA-1540	15.40	16	133	83	48
ND2505-CHA-1550	15.50	16	133	83	48
ND2505-CHA-1560	15.60	16	133	83	48
ND2505-CHA-1570	15.70	16	133	83	48
ND2505-CHA-1580	15.80	16	133	83	48
ND2505-CHA-1590	15.90	16	133	83	48
ND2505-CHA-1600	16.00	16	133	83	48
ND2505-CHA-1610	16.10	18	143	93	48
ND2505-CHA-1620	16.20	18	143	93	48
ND2505-CHA-1630	16.30	18	143	93	48
ND2505-CHA-1640	16.40	18	143	93	48

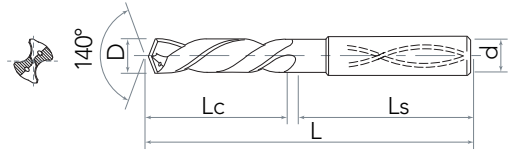
See the next page 



ND2505-CHA



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

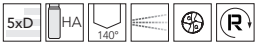
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1650	16.50	18	143	93	45
ND2505-CHA-1660	16.60	18	143	93	45
ND2505-CHA-1670	16.70	18	143	93	45
ND2505-CHA-1680	16.80	18	143	93	48
ND2505-CHA-1690	16.90	18	143	93	48
ND2505-CHA-1700	17.00	18	143	93	48
ND2505-CHA-1710	17.10	18	143	93	48
ND2505-CHA-1720	17.20	18	143	93	48
ND2505-CHA-1730	17.30	18	143	93	48
ND2505-CHA-1740	17.40	18	143	93	48
ND2505-CHA-1750	17.50	18	143	93	48
ND2505-CHA-1760	17.60	18	143	93	48
ND2505-CHA-1770	17.70	18	143	93	48
ND2505-CHA-1780	17.80	18	143	93	48
ND2505-CHA-1790	17.90	18	143	93	48
ND2505-CHA-1800	18.00	18	143	93	48
ND2505-CHA-1810	18.10	20	153	101	50
ND2505-CHA-1820	18.20	20	153	101	50
ND2505-CHA-1830	18.30	20	153	101	50
ND2505-CHA-1840	18.40	20	153	101	50
ND2505-CHA-1850	18.50	20	153	101	50
ND2505-CHA-1860	18.60	20	153	101	50
ND2505-CHA-1870	18.70	20	153	101	50
ND2505-CHA-1880	18.80	20	153	101	50
ND2505-CHA-1890	18.90	20	153	101	50
ND2505-CHA-1900	19.00	20	153	101	50
ND2505-CHA-1910	19.10	20	153	101	50

See the next page

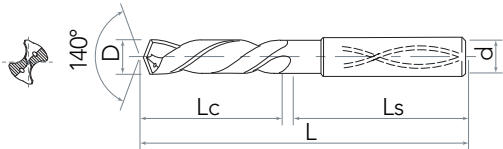




ND2505-CHA



Aluminium and Al alloys · Al materials with high Si-content



Unit: mm

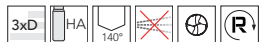
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1920	19.20	20	153	101	50
ND2505-CHA-1930	19.30	20	153	101	50
ND2505-CHA-1940	19.40	20	153	101	50
ND2505-CHA-1950	19.50	20	153	101	50
ND2505-CHA-1960	19.60	20	153	101	50
ND2505-CHA-1970	19.70	20	153	101	50
ND2505-CHA-1980	19.80	20	153	101	50
ND2505-CHA-1990	19.90	20	153	101	50
ND2505-CHA-2000	20.00	20	153	101	50

Recommended cutting data see page 87

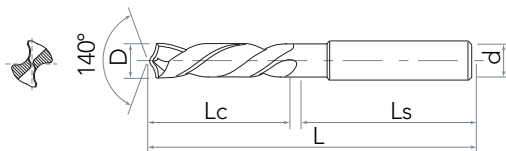


Carbide Ratio Drill

ND2603-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

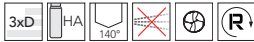
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-NHA-0300	3.00	6	62	20	36
ND2603-NHA-0310	3.10	6	62	20	36
ND2603-NHA-0320	3.20	6	62	20	36
ND2603-NHA-0330	3.30	6	62	20	36
ND2603-NHA-0340	3.40	6	62	20	36
ND2603-NHA-0350	3.50	6	62	20	36
ND2603-NHA-0360	3.60	6	62	20	36
ND2603-NHA-0370	3.70	6	62	20	36
ND2603-NHA-0380	3.80	6	66	24	36
ND2603-NHA-0390	3.90	6	66	24	36
ND2603-NHA-0400	4.00	6	66	24	36
ND2603-NHA-0410	4.10	6	66	24	36
ND2603-NHA-0420	4.20	6	66	24	36
ND2603-NHA-0430	4.30	6	66	24	36
ND2603-NHA-0440	4.40	6	66	24	36
ND2603-NHA-0450	4.50	6	66	24	36
ND2603-NHA-0460	4.60	6	66	24	36
ND2603-NHA-0470	4.70	6	66	24	36
ND2603-NHA-0480	4.80	6	66	28	36
ND2603-NHA-0490	4.90	6	66	28	36
ND2603-NHA-0500	5.00	6	66	28	36
ND2603-NHA-0510	5.10	6	66	28	36
ND2603-NHA-0520	5.20	6	66	28	36
ND2603-NHA-0530	5.30	6	66	28	36
ND2603-NHA-0540	5.40	6	66	28	36
ND2603-NHA-0550	5.50	6	66	28	36
ND2603-NHA-0560	5.60	6	66	28	36

See the next page

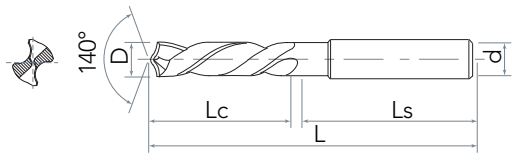




ND2603-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

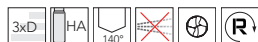
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-NHA-0570	5.70	6	66	28	36
ND2603-NHA-0580	5.80	6	66	28	36
ND2603-NHA-0590	5.90	6	66	28	36
ND2603-NHA-0600	6.00	6	66	28	36
ND2603-NHA-0610	6.10	8	79	34	36
ND2603-NHA-0620	6.20	8	79	34	36
ND2603-NHA-0630	6.30	8	79	34	36
ND2603-NHA-0640	6.40	8	79	34	36
ND2603-NHA-0650	6.50	8	79	34	36
ND2603-NHA-0660	6.60	8	79	34	36
ND2603-NHA-0670	6.70	8	79	34	36
ND2603-NHA-0680	6.80	8	79	34	36
ND2603-NHA-0690	6.90	8	79	34	36
ND2603-NHA-0700	7.00	8	79	34	36
ND2603-NHA-0710	7.10	8	79	41	36
ND2603-NHA-0720	7.20	8	79	41	36
ND2603-NHA-0730	7.30	8	79	41	36
ND2603-NHA-0740	7.40	8	79	41	36
ND2603-NHA-0750	7.50	8	79	41	36
ND2603-NHA-0760	7.60	8	79	41	36
ND2603-NHA-0770	7.70	8	79	41	36
ND2603-NHA-0780	7.80	8	79	41	36
ND2603-NHA-0790	7.90	8	79	41	36
ND2603-NHA-0800	8.00	8	79	41	36
ND2603-NHA-0810	8.10	10	89	47	40
ND2603-NHA-0820	8.20	10	89	47	40
ND2603-NHA-0830	8.30	10	89	47	40

See the next page



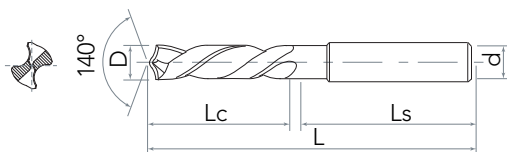
Carbide Ratio Drill

ND2603-NHA



P M K N S H

Stainless/acid/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



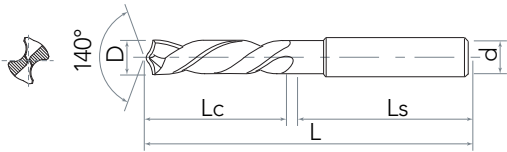
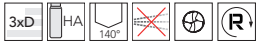
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-NHA-0840	8.40	10	89	47	40
ND2603-NHA-0850	8.50	10	89	47	40
ND2603-NHA-0860	8.60	10	89	47	40
ND2603-NHA-0870	8.70	10	89	47	40
ND2603-NHA-0880	8.80	10	89	47	40
ND2603-NHA-0890	8.90	10	89	47	40
ND2603-NHA-0900	9.00	10	89	47	40
ND2603-NHA-0910	9.10	10	89	47	40
ND2603-NHA-0920	9.20	10	89	47	40
ND2603-NHA-0930	9.30	10	89	47	40
ND2603-NHA-0940	9.40	10	89	47	40
ND2603-NHA-0950	9.50	10	89	47	40
ND2603-NHA-0960	9.60	10	89	47	40
ND2603-NHA-0970	9.70	10	89	47	40
ND2603-NHA-0980	9.80	10	89	47	40
ND2603-NHA-0990	9.90	10	89	47	40
ND2603-NHA-1000	10.00	10	89	47	40
ND2603-NHA-1010	10.10	12	102	55	45
ND2603-NHA-1020	10.20	12	102	55	45
ND2603-NHA-1030	10.30	12	102	55	45
ND2603-NHA-1040	10.40	12	102	55	45
ND2603-NHA-1050	10.50	12	102	55	45
ND2603-NHA-1060	10.60	12	102	55	45
ND2603-NHA-1070	10.70	12	102	55	45
ND2603-NHA-1080	10.80	12	102	55	45
ND2603-NHA-1090	10.90	12	102	55	45
ND2603-NHA-1100	11.00	12	102	55	45

See the next page



ND2603-NHA



P M K N S H

Stainless/acid-/heat-resistant steels - Titanium and Titanium alloys - Inconel, Hastelloy, Monel

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-NHA-1110	11.10	12	102	55	45
ND2603-NHA-1120	11.20	12	102	55	45
ND2603-NHA-1130	11.30	12	102	55	45
ND2603-NHA-1140	11.40	12	102	55	45
ND2603-NHA-1150	11.50	12	102	55	45
ND2603-NHA-1160	11.60	12	102	55	45
ND2603-NHA-1170	11.70	12	102	55	45
ND2603-NHA-1180	11.80	12	102	55	45
ND2603-NHA-1190	11.90	12	102	55	45
ND2603-NHA-1200	12.00	12	102	55	45
ND2603-NHA-1210	12.10	14	107	60	45
ND2603-NHA-1220	12.20	14	107	60	45
ND2603-NHA-1230	12.30	14	107	60	45
ND2603-NHA-1240	12.40	14	107	60	45
ND2603-NHA-1250	12.50	14	107	60	45
ND2603-NHA-1260	12.60	14	107	60	45
ND2603-NHA-1270	12.70	14	107	60	45
ND2603-NHA-1280	12.80	14	107	60	45
ND2603-NHA-1290	12.90	14	107	60	45
ND2603-NHA-1300	13.00	14	107	60	45
ND2603-NHA-1310	13.10	14	107	60	45
ND2603-NHA-1320	13.20	14	107	60	45
ND2603-NHA-1330	13.30	14	107	60	45
ND2603-NHA-1340	13.40	14	107	60	45
ND2603-NHA-1350	13.50	14	107	60	45
ND2603-NHA-1360	13.60	14	107	60	45
ND2603-NHA-1370	13.70	14	107	60	45

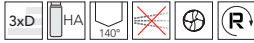
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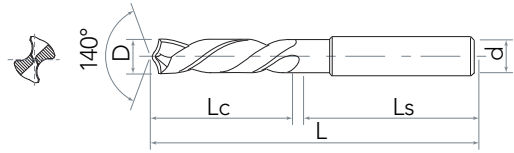


Carbide Ratio Drill

ND2603-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

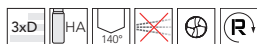


Unit: mm

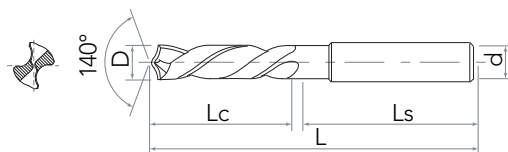
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1380	13.80	14	107	60	45
ND2603-CHA-1390	13.90	14	107	60	45
ND2603-CHA-1400	14.00	14	107	60	45
ND2603-CHA-1410	14.10	16	115	65	48
ND2603-CHA-1420	14.20	16	115	65	48
ND2603-CHA-1430	14.30	16	115	65	48
ND2603-CHA-1440	14.40	16	115	65	48
ND2603-CHA-1450	14.50	16	115	65	48
ND2603-CHA-1460	14.60	16	115	65	48
ND2603-CHA-1470	14.70	16	115	65	48
ND2603-CHA-1480	14.80	16	115	65	48
ND2603-CHA-1490	14.90	16	115	65	48
ND2603-CHA-1500	15.00	16	115	65	48
ND2603-CHA-1510	15.10	16	115	65	48
ND2603-CHA-1520	15.20	16	115	65	48
ND2603-CHA-1530	15.30	16	115	65	48
ND2603-CHA-1540	15.40	16	115	65	48
ND2603-CHA-1550	15.50	16	115	65	48
ND2603-CHA-1560	15.60	16	115	65	48
ND2603-CHA-1570	15.70	16	115	65	48
ND2603-CHA-1580	15.80	16	115	65	48
ND2603-CHA-1590	15.90	16	115	65	48
ND2603-CHA-1600	16.00	16	115	65	48
ND2603-CHA-1610	16.10	18	123	73	48
ND2603-CHA-1620	16.20	18	123	73	48
ND2603-CHA-1630	16.30	18	123	73	48
ND2603-CHA-1640	16.40	18	123	73	48

See the next page

ND2603-NHA



Stainless/acid/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

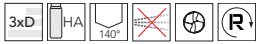
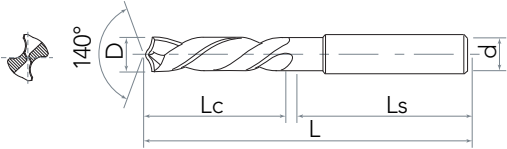
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-NHA-1650	16.50	18	123	73	48
ND2603-NHA-1660	16.60	18	123	73	48
ND2603-NHA-1670	16.70	18	123	73	48
ND2603-NHA-1680	16.80	18	123	73	48
ND2603-NHA-1690	16.90	18	123	73	48
ND2603-NHA-1700	17.00	18	123	73	48
ND2603-NHA-1710	17.10	18	123	73	48
ND2603-NHA-1720	17.20	18	123	73	48
ND2603-NHA-1730	17.30	18	123	73	48
ND2603-NHA-1740	17.40	18	123	73	48
ND2603-NHA-1750	17.50	18	123	73	48
ND2603-NHA-1760	17.60	18	123	73	48
ND2603-NHA-1770	17.70	18	123	73	48
ND2603-NHA-1780	17.80	18	123	73	48
ND2603-NHA-1790	17.90	18	123	73	48
ND2603-NHA-1800	18.00	18	123	73	48
ND2603-NHA-1810	18.10	20	131	79	50
ND2603-NHA-1820	18.20	20	131	79	50
ND2603-NHA-1830	18.30	20	131	79	50
ND2603-NHA-1840	18.40	20	131	79	50
ND2603-NHA-1850	18.50	20	131	79	50
ND2603-NHA-1860	18.60	20	131	79	50
ND2603-NHA-1870	18.70	20	131	79	50
ND2603-NHA-1880	18.80	20	131	79	50
ND2603-NHA-1890	18.90	20	131	79	50
ND2603-NHA-1900	19.00	20	131	79	50
ND2603-NHA-1910	19.10	20	131	79	50

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ND2603-NHA



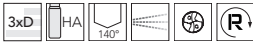
P **M** **K** **N** **S** **H** Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

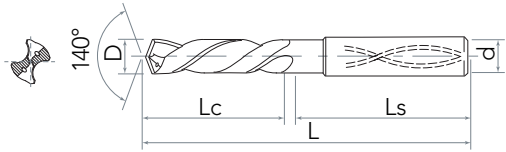
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-NHA-1920	19.20	20	131	79	50
ND2603-NHA-1930	19.30	20	131	79	50
ND2603-NHA-1940	19.40	20	131	79	50
ND2603-NHA-1950	19.50	20	131	79	50
ND2603-NHA-1960	19.60	20	131	79	50
ND2603-NHA-1970	19.70	20	131	79	50
ND2603-NHA-1980	19.80	20	131	79	50
ND2603-NHA-1990	19.90	20	131	79	50
ND2603-NHA-2000	20.00	20	131	79	50

Recommended cutting data see page 87

ND2603-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

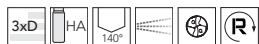
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-0300	3.00	6	62	20	36
ND2603-CHA-0310	3.10	6	62	20	36
ND2603-CHA-0320	3.20	6	62	20	36
ND2603-CHA-0330	3.30	6	62	20	36
ND2603-CHA-0340	3.40	6	62	20	36
ND2603-CHA-0350	3.50	6	62	20	36
ND2603-CHA-0360	3.60	6	62	20	36
ND2603-CHA-0370	3.70	6	62	20	36
ND2603-CHA-0380	3.80	6	66	24	36
ND2603-CHA-0390	3.90	6	66	24	36
ND2603-CHA-0400	4.00	6	66	24	36
ND2603-CHA-0410	4.10	6	66	24	36
ND2603-CHA-0420	4.20	6	66	24	36
ND2603-CHA-0430	4.30	6	66	24	36
ND2603-CHA-0440	4.40	6	66	24	36
ND2603-CHA-0450	4.50	6	66	24	36
ND2603-CHA-0460	4.60	6	66	24	36
ND2603-CHA-0470	4.70	6	66	24	36
ND2603-CHA-0480	4.80	6	66	28	36
ND2603-CHA-0490	4.90	6	66	28	36
ND2603-CHA-0500	5.00	6	66	28	36
ND2603-CHA-0510	5.10	6	66	28	36
ND2603-CHA-0520	5.20	6	66	28	36
ND2603-CHA-0530	5.30	6	66	28	36
ND2603-CHA-0540	5.40	6	66	28	36
ND2603-CHA-0550	5.50	6	66	28	36
ND2603-CHA-0560	5.60	6	66	28	36

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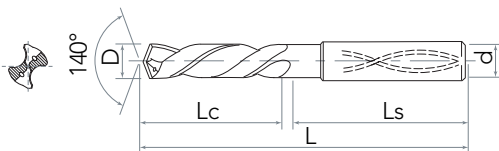


Carbide Ratio Drill

ND2603-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



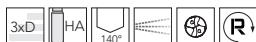
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-0570	5.70	6	66	28	36
ND2603-CHA-0580	5.80	6	66	28	36
ND2603-CHA-0590	5.90	6	66	28	36
ND2603-CHA-0600	6.00	6	66	28	36
ND2603-CHA-0610	6.10	8	79	34	36
ND2603-CHA-0620	6.20	8	79	34	36
ND2603-CHA-0630	6.30	8	79	34	36
ND2603-CHA-0640	6.40	8	79	34	36
ND2603-CHA-0650	6.50	8	79	34	36
ND2603-CHA-0660	6.60	8	79	34	36
ND2603-CHA-0670	6.70	8	79	34	36
ND2603-CHA-0680	6.80	8	79	34	36
ND2603-CHA-0690	6.90	8	79	34	36
ND2603-CHA-0700	7.00	8	79	34	36
ND2603-CHA-0710	7.10	8	79	41	36
ND2603-CHA-0720	7.20	8	79	41	36
ND2603-CHA-0730	7.30	8	79	41	36
ND2603-CHA-0740	7.40	8	79	41	36
ND2603-CHA-0750	7.50	8	79	41	36
ND2603-CHA-0760	7.60	8	79	41	36
ND2603-CHA-0770	7.70	8	79	41	36
ND2603-CHA-0780	7.80	8	79	41	36
ND2603-CHA-0790	7.90	8	79	41	36
ND2603-CHA-0800	8.00	8	79	41	36
ND2603-CHA-0810	8.10	10	89	47	40
ND2603-CHA-0820	8.20	10	89	47	40
ND2603-CHA-0830	8.30	10	89	47	40

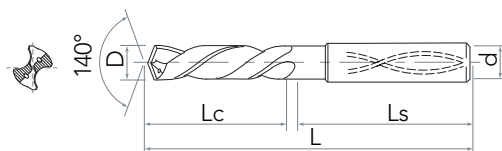
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ND2603-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

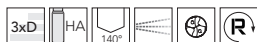
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-0840	8.40	10	89	47	40
ND2603-CHA-0850	8.50	10	89	47	40
ND2603-CHA-0860	8.60	10	89	47	40
ND2603-CHA-0870	8.70	10	89	47	40
ND2603-CHA-0880	8.80	10	89	47	40
ND2603-CHA-0890	8.90	10	89	47	40
ND2603-CHA-0900	9.00	10	89	47	40
ND2603-CHA-0910	9.10	10	89	47	40
ND2603-CHA-0920	9.20	10	89	47	40
ND2603-CHA-0930	9.30	10	89	47	40
ND2603-CHA-0940	9.40	10	89	47	40
ND2603-CHA-0950	9.50	10	89	47	40
ND2603-CHA-0960	9.60	10	89	47	40
ND2603-CHA-0970	9.70	10	89	47	40
ND2603-CHA-0980	9.80	10	89	47	40
ND2603-CHA-0990	9.90	10	89	47	40
ND2603-CHA-1000	10.00	10	89	47	40
ND2603-CHA-1010	10.10	12	102	55	45
ND2603-CHA-1020	10.20	12	102	55	45
ND2603-CHA-1030	10.30	12	102	55	45
ND2603-CHA-1040	10.40	12	102	55	45
ND2603-CHA-1050	10.50	12	102	55	45
ND2603-CHA-1060	10.60	12	102	55	45
ND2603-CHA-1070	10.70	12	102	55	45
ND2603-CHA-1080	10.80	12	102	55	45
ND2603-CHA-1090	10.90	12	102	55	45
ND2603-CHA-1100	11.00	12	102	55	45

See the next page 

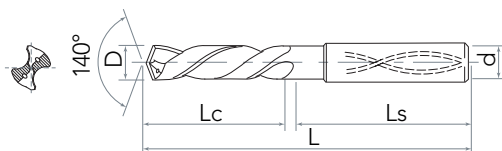


Carbide Ratio Drill

ND2603-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

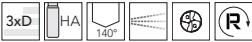
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1110	11.10	12	102	55	45
ND2603-CHA-1120	11.20	12	102	55	45
ND2603-CHA-1130	11.30	12	102	55	45
ND2603-CHA-1140	11.40	12	102	55	45
ND2603-CHA-1150	11.50	12	102	55	45
ND2603-CHA-1160	11.60	12	102	55	45
ND2603-CHA-1170	11.70	12	102	55	45
ND2603-CHA-1180	11.80	12	102	55	45
ND2603-CHA-1190	11.90	12	102	55	45
ND2603-CHA-1200	12.00	12	102	55	45
ND2603-CHA-1210	12.10	14	107	60	45
ND2603-CHA-1220	12.20	14	107	60	45
ND2603-CHA-1230	12.30	14	107	60	45
ND2603-CHA-1240	12.40	14	107	60	45
ND2603-CHA-1250	12.50	14	107	60	45
ND2603-CHA-1260	12.60	14	107	60	45
ND2603-CHA-1270	12.70	14	107	60	45
ND2603-CHA-1280	12.80	14	107	60	45
ND2603-CHA-1290	12.90	14	107	60	45
ND2603-CHA-1300	13.00	14	107	60	45
ND2603-CHA-1310	13.10	14	107	60	45
ND2603-CHA-1320	13.20	14	107	60	45
ND2603-CHA-1330	13.30	14	107	60	45
ND2603-CHA-1340	13.40	14	107	60	45
ND2603-CHA-1350	13.50	14	107	60	45
ND2603-CHA-1360	13.60	14	107	60	45
ND2603-CHA-1370	13.70	14	107	60	45

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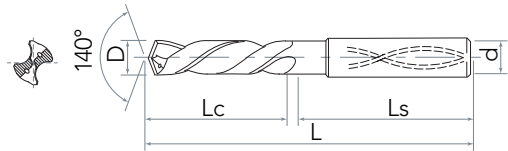




ND2603-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



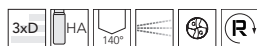
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1380	13.80	14	107	60	45
ND2603-CHA-1390	13.90	14	107	60	45
ND2603-CHA-1400	14.00	14	107	60	45
ND2603-CHA-1410	14.10	16	115	65	48
ND2603-CHA-1420	14.20	16	115	65	48
ND2603-CHA-1430	14.30	16	115	65	48
ND2603-CHA-1440	14.40	16	115	65	48
ND2603-CHA-1450	14.50	16	115	65	48
ND2603-CHA-1460	14.60	16	115	65	48
ND2603-CHA-1470	14.70	16	115	65	48
ND2603-CHA-1480	14.80	16	115	65	48
ND2603-CHA-1490	14.90	16	115	65	48
ND2603-CHA-1500	15.00	16	115	65	48
ND2603-CHA-1510	15.10	16	115	65	48
ND2603-CHA-1520	15.20	16	115	65	48
ND2603-CHA-1530	15.30	16	115	65	48
ND2603-CHA-1540	15.40	16	115	65	48
ND2603-CHA-1550	15.50	16	115	65	48
ND2603-CHA-1560	15.60	16	115	65	48
ND2603-CHA-1570	15.70	16	115	65	48
ND2603-CHA-1580	15.80	16	115	65	48
ND2603-CHA-1590	15.90	16	115	65	48
ND2603-CHA-1600	16.00	16	115	65	48
ND2603-CHA-1610	16.10	18	123	73	48
ND2603-CHA-1620	16.20	18	123	73	48
ND2603-CHA-1630	16.30	18	123	73	48
ND2603-CHA-1640	16.40	18	123	73	48

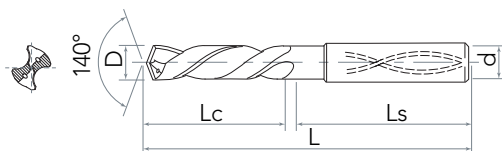
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ND2603-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

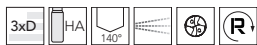
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1650	16.50	18	123	73	48
ND2603-CHA-1660	16.60	18	123	73	48
ND2603-CHA-1670	16.70	18	123	73	48
ND2603-CHA-1680	16.80	18	123	73	48
ND2603-CHA-1690	16.90	18	123	73	48
ND2603-CHA-1700	17.00	18	123	73	48
ND2603-CHA-1710	17.10	18	123	73	48
ND2603-CHA-1720	17.20	18	123	73	48
ND2603-CHA-1730	17.30	18	123	73	48
ND2603-CHA-1740	17.40	18	123	73	48
ND2603-CHA-1750	17.50	18	123	73	48
ND2603-CHA-1760	17.60	18	123	73	48
ND2603-CHA-1770	17.70	18	123	73	48
ND2603-CHA-1780	17.80	18	123	73	48
ND2603-CHA-1790	17.90	18	123	73	48
ND2603-CHA-1800	18.00	18	123	73	48
ND2603-CHA-1810	18.10	20	131	79	50
ND2603-CHA-1820	18.20	20	131	79	50
ND2603-CHA-1830	18.30	20	131	79	50
ND2603-CHA-1840	18.40	20	131	79	50
ND2603-CHA-1850	18.50	20	131	79	50
ND2603-CHA-1860	18.60	20	131	79	50
ND2603-CHA-1870	18.70	20	131	79	50
ND2603-CHA-1880	18.80	20	131	79	50
ND2603-CHA-1890	18.90	20	131	79	50
ND2603-CHA-1900	19.00	20	131	79	50
ND2603-CHA-1910	19.10	20	131	79	50

See the next page



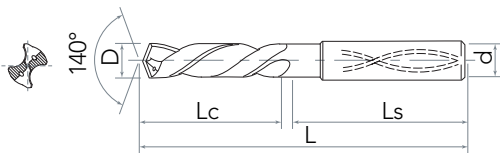


ND2603-CHA



P M K N S H Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

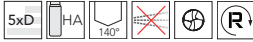


Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1920	19.20	20	131	79	50
ND2603-CHA-1930	19.30	20	131	79	50
ND2603-CHA-1940	19.40	20	131	79	50
ND2603-CHA-1950	19.50	20	131	79	50
ND2603-CHA-1960	19.60	20	131	79	50
ND2603-CHA-1970	19.70	20	131	79	50
ND2603-CHA-1980	19.80	20	131	79	50
ND2603-CHA-1990	19.90	20	131	79	50
ND2603-CHA-2000	20.00	20	131	79	50

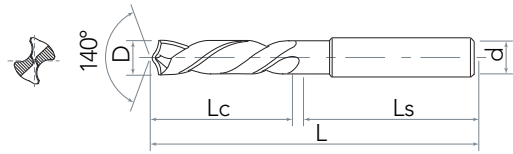
Recommended cutting data see page 87



ND2605-NHA



Stainless/acid-/heat-resistant steels - Titanium and Titanium alloys - Inconel, Hastelloy, Monel



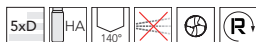
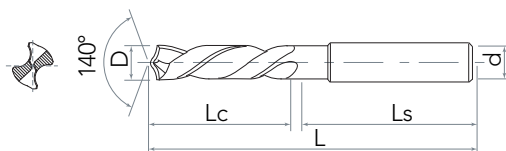
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-0300	3.00	6	66	28	36
ND2605-NHA-0310	3.10	6	66	28	36
ND2605-NHA-0320	3.20	6	66	28	36
ND2605-NHA-0330	3.30	6	66	28	36
ND2605-NHA-0340	3.40	6	66	28	36
ND2605-NHA-0350	3.50	6	66	28	36
ND2605-NHA-0360	3.60	6	66	28	36
ND2605-NHA-0370	3.70	6	66	28	36
ND2605-NHA-0380	3.80	6	74	36	36
ND2605-NHA-0390	3.90	6	74	36	36
ND2605-NHA-0400	4.00	6	74	36	36
ND2605-NHA-0410	4.10	6	74	36	36
ND2605-NHA-0420	4.20	6	74	36	36
ND2605-NHA-0430	4.30	6	74	36	36
ND2605-NHA-0440	4.40	6	74	36	36
ND2605-NHA-0450	4.50	6	74	36	36
ND2605-NHA-0460	4.60	6	74	36	36
ND2605-NHA-0470	4.70	6	74	36	36
ND2605-NHA-0480	4.80	6	82	44	36
ND2605-NHA-0490	4.90	6	82	44	36
ND2605-NHA-0500	5.00	6	82	44	36
ND2605-NHA-0510	5.10	6	82	44	36
ND2605-NHA-0520	5.20	6	82	44	36
ND2605-NHA-0530	5.30	6	82	44	36
ND2605-NHA-0540	5.40	6	82	44	36
ND2605-NHA-0550	5.50	6	82	44	36
ND2605-NHA-0560	5.60	6	82	44	36

See the next page



ND2605-NHA



P M K N S H Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

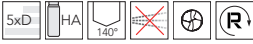
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-0570	5.70	6	82	44	36
ND2605-NHA-0580	5.80	6	82	44	36
ND2605-NHA-0590	5.90	6	82	44	36
ND2605-NHA-0600	6.00	6	82	44	36
ND2605-NHA-0610	6.10	8	91	53	36
ND2605-NHA-0620	6.20	8	91	53	36
ND2605-NHA-0630	6.30	8	91	53	36
ND2605-NHA-0640	6.40	8	91	53	36
ND2605-NHA-0650	6.50	8	91	53	36
ND2605-NHA-0660	6.60	8	91	53	36
ND2605-NHA-0670	6.70	8	91	53	36
ND2605-NHA-0680	6.80	8	91	53	36
ND2605-NHA-0690	6.90	8	91	53	36
ND2605-NHA-0700	7.00	8	91	53	36
ND2605-NHA-0710	7.10	8	91	53	36
ND2605-NHA-0720	7.20	8	91	53	36
ND2605-NHA-0730	7.30	8	91	53	36
ND2605-NHA-0740	7.40	8	91	53	36
ND2605-NHA-0750	7.50	8	91	53	36
ND2605-NHA-0760	7.60	8	91	53	36
ND2605-NHA-0770	7.70	8	91	53	36
ND2605-NHA-0780	7.80	8	91	53	36
ND2605-NHA-0790	7.90	8	91	53	36
ND2605-NHA-0800	8.00	8	91	53	36
ND2605-NHA-0810	8.10	10	103	61	40
ND2605-NHA-0820	8.20	10	103	61	40
ND2605-NHA-0830	8.30	10	103	61	40

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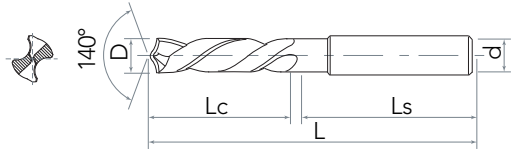
Carbide Ratio Drill

ND2605-NHA



P M K N S H

Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



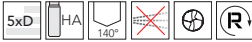
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-0840	8.40	10	103	61	40
ND2605-NHA-0850	8.50	10	103	61	40
ND2605-NHA-0860	8.60	10	103	61	40
ND2605-NHA-0870	8.70	10	103	61	40
ND2605-NHA-0880	8.80	10	103	61	40
ND2605-NHA-0890	8.90	10	103	61	40
ND2605-NHA-0900	9.00	10	103	61	40
ND2605-NHA-0910	9.10	10	103	61	40
ND2605-NHA-0920	9.20	10	103	61	40
ND2605-NHA-0930	9.30	10	103	61	40
ND2605-NHA-0940	9.40	10	103	61	40
ND2605-NHA-0950	9.50	10	103	61	40
ND2605-NHA-0960	9.60	10	103	61	40
ND2605-NHA-0970	9.70	10	103	61	40
ND2605-NHA-0980	9.80	10	103	61	40
ND2605-NHA-0990	9.90	10	103	61	40
ND2605-NHA-1000	10.00	10	103	61	40
ND2605-NHA-1010	10.10	12	118	71	45
ND2605-NHA-1020	10.20	12	118	71	45
ND2605-NHA-1030	10.30	12	118	71	45
ND2605-NHA-1040	10.40	12	118	71	45
ND2605-NHA-1050	10.50	12	118	71	45
ND2605-NHA-1060	10.60	12	118	71	45
ND2605-NHA-1070	10.70	12	118	71	45
ND2605-NHA-1080	10.80	12	118	71	45
ND2605-NHA-1090	10.90	12	118	71	45
ND2605-NHA-1100	11.00	12	118	71	45

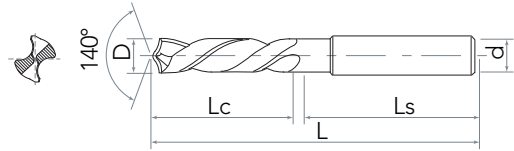
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ND2605-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

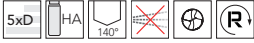
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-1110	11.10	12	118	71	45
ND2605-NHA-1120	11.20	12	118	71	45
ND2605-NHA-1130	11.30	12	118	71	45
ND2605-NHA-1140	11.40	12	118	71	45
ND2605-NHA-1150	11.50	12	118	71	45
ND2605-NHA-1160	11.60	12	118	71	45
ND2605-NHA-1170	11.70	12	118	71	45
ND2605-NHA-1180	11.80	12	118	71	45
ND2605-NHA-1190	11.90	12	118	71	45
ND2605-NHA-1200	12.00	12	118	71	45
ND2605-NHA-1210	12.10	14	124	77	45
ND2605-NHA-1220	12.20	14	124	77	45
ND2605-NHA-1230	12.30	14	124	77	45
ND2605-NHA-1240	12.40	14	124	77	45
ND2605-NHA-1250	12.50	14	124	77	45
ND2605-NHA-1260	12.60	14	124	77	45
ND2605-NHA-1270	12.70	14	124	77	45
ND2605-NHA-1280	12.80	14	124	77	45
ND2605-NHA-1290	12.90	14	124	77	45
ND2605-NHA-1300	13.00	14	124	77	45
ND2605-NHA-1310	13.10	14	124	77	45
ND2605-NHA-1320	13.20	14	124	77	45
ND2605-NHA-1330	13.30	14	124	77	45
ND2605-NHA-1340	13.40	14	124	77	45
ND2605-NHA-1350	13.50	14	124	77	45
ND2605-NHA-1360	13.60	14	124	77	45
ND2605-NHA-1370	13.70	14	124	77	45

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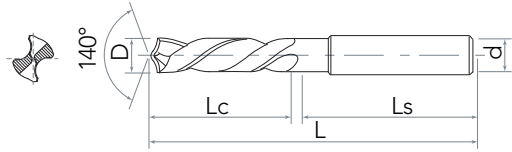


Carbide Ratio Drill

ND2605-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

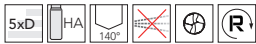
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-1380	13.80	14	124	77	45
ND2605-NHA-1390	13.90	14	124	77	45
ND2605-NHA-1400	14.00	14	124	77	45
ND2605-NHA-1410	14.10	16	133	83	48
ND2605-NHA-1420	14.20	16	133	83	48
ND2605-NHA-1430	14.30	16	133	83	48
ND2605-NHA-1440	14.40	16	133	83	48
ND2605-NHA-1450	14.50	16	133	83	48
ND2605-NHA-1460	14.60	16	133	83	48
ND2605-NHA-1470	14.70	16	133	83	48
ND2605-NHA-1480	14.80	16	133	83	48
ND2605-NHA-1490	14.90	16	133	83	48
ND2605-NHA-1500	15.00	16	133	83	48
ND2605-NHA-1510	15.10	16	133	83	48
ND2605-NHA-1520	15.20	16	133	83	48
ND2605-NHA-1530	15.30	16	133	83	48
ND2605-NHA-1540	15.40	16	133	83	48
ND2605-NHA-1550	15.50	16	133	83	48
ND2605-NHA-1560	15.60	16	133	83	48
ND2605-NHA-1570	15.70	16	133	83	48
ND2605-NHA-1580	15.80	16	133	83	48
ND2605-NHA-1590	15.90	16	133	83	48
ND2605-NHA-1600	16.00	16	133	83	48
ND2605-NHA-1610	16.10	18	143	93	48
ND2605-NHA-1620	16.20	18	143	93	48
ND2605-NHA-1630	16.30	18	143	93	48
ND2605-NHA-1640	16.40	18	143	93	48

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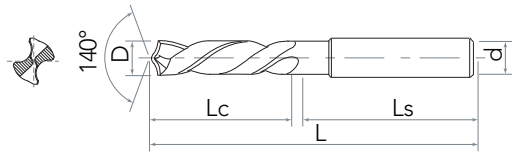




ND2605-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



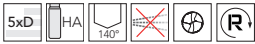
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-1650	16.50	18	143	93	48
ND2605-NHA-1660	16.60	18	143	93	48
ND2605-NHA-1670	16.70	18	143	93	48
ND2605-NHA-1680	16.80	18	143	93	48
ND2605-NHA-1690	16.90	18	143	93	48
ND2605-NHA-1700	17.00	18	143	93	48
ND2605-NHA-1710	17.10	18	143	93	48
ND2605-NHA-1720	17.20	18	143	93	48
ND2605-NHA-1730	17.30	18	143	93	48
ND2605-NHA-1740	17.40	18	143	93	48
ND2605-NHA-1750	17.50	18	143	93	48
ND2605-NHA-1760	17.60	18	143	93	48
ND2605-NHA-1770	17.70	18	143	93	48
ND2605-NHA-1780	17.80	18	143	93	48
ND2605-NHA-1790	17.90	18	143	93	48
ND2605-NHA-1800	18.00	18	143	93	48
ND2605-NHA-1810	18.10	20	153	101	50
ND2605-NHA-1820	18.20	20	153	101	50
ND2605-NHA-1830	18.30	20	153	101	50
ND2605-NHA-1840	18.40	20	153	101	50
ND2605-NHA-1850	18.50	20	153	101	50
ND2605-NHA-1860	18.60	20	153	101	50
ND2605-NHA-1870	18.70	20	153	101	50
ND2605-NHA-1880	18.80	20	153	101	50
ND2605-NHA-1890	18.90	20	153	101	50
ND2605-NHA-1900	19.00	20	153	101	50
ND2605-NHA-1910	19.10	20	153	101	50

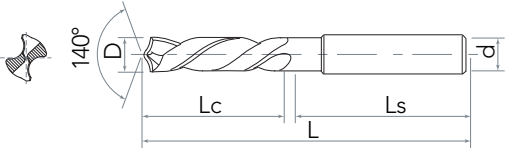
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ND2605-NHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

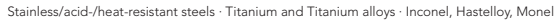


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-NHA-1920	19.20	20	153	101	50
ND2605-NHA-1930	19.30	20	153	101	50
ND2605-NHA-1940	19.40	20	153	101	50
ND2605-NHA-1950	19.50	20	153	101	50
ND2605-NHA-1960	19.60	20	153	101	50
ND2605-NHA-1970	19.70	20	153	101	50
ND2605-NHA-1980	19.80	20	153	101	50
ND2605-NHA-1990	19.90	20	153	101	50
ND2605-NHA-2000	20.00	20	153	101	50

Recommended cutting data see page 87

P M K N S H

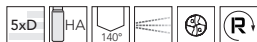


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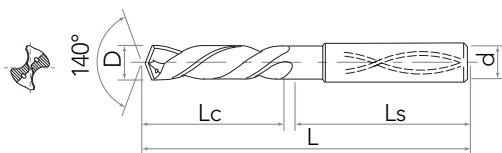


Carbide Ratio Drill

ND2605-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



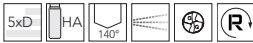
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-0570	5.70	6	82	44	36
ND2605-CHA-0580	5.80	6	82	44	36
ND2605-CHA-0590	5.90	6	82	44	36
ND2605-CHA-0600	6.00	6	82	44	36
ND2605-CHA-0610	6.10	8	91	53	36
ND2605-CHA-0620	6.20	8	91	53	36
ND2605-CHA-0630	6.30	8	91	53	36
ND2605-CHA-0640	6.40	8	91	53	36
ND2605-CHA-0650	6.50	8	91	53	36
ND2605-CHA-0660	6.60	8	91	53	36
ND2605-CHA-0670	6.70	8	91	53	36
ND2605-CHA-0680	6.80	8	91	53	36
ND2605-CHA-0690	6.90	8	91	53	36
ND2605-CHA-0700	7.00	8	91	53	36
ND2605-CHA-0710	7.10	8	91	53	36
ND2605-CHA-0720	7.20	8	91	53	36
ND2605-CHA-0730	7.30	8	91	53	36
ND2605-CHA-0740	7.40	8	91	53	36
ND2605-CHA-0750	7.50	8	91	53	36
ND2605-CHA-0760	7.60	8	91	53	36
ND2605-CHA-0770	7.70	8	91	53	36
ND2605-CHA-0780	7.80	8	91	53	36
ND2605-CHA-0790	7.90	8	91	53	36
ND2605-CHA-0800	8.00	8	91	53	36
ND2605-CHA-0810	8.10	10	103	61	40
ND2605-CHA-0820	8.20	10	103	61	40
ND2605-CHA-0830	8.30	10	103	61	40

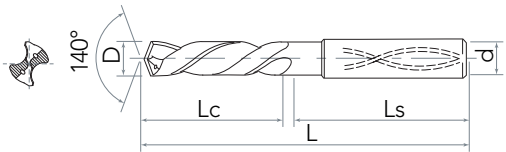
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ND2605-CHA



Stainless/acid-/heat-resistant steels - Titanium and Titanium alloys - Inconel, Hastelloy, Monel



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-0840	8.40	10	103	61	40
ND2605-CHA-0850	8.50	10	103	61	40
ND2605-CHA-0860	8.60	10	103	61	40
ND2605-CHA-0870	8.70	10	103	61	40
ND2605-CHA-0880	8.80	10	103	61	40
ND2605-CHA-0890	8.90	10	103	61	40
ND2605-CHA-0900	9.00	10	103	61	40
ND2605-CHA-0910	9.10	10	103	61	40
ND2605-CHA-0920	9.20	10	103	61	40
ND2605-CHA-0930	9.30	10	103	61	40
ND2605-CHA-0940	9.40	10	103	61	40
ND2605-CHA-0950	9.50	10	103	61	40
ND2605-CHA-0960	9.60	10	103	61	40
ND2605-CHA-0970	9.70	10	103	61	40
ND2605-CHA-0980	9.80	10	103	61	40
ND2605-CHA-0990	9.90	10	103	61	40
ND2605-CHA-1000	10.00	10	103	61	40
ND2605-CHA-1010	10.10	12	118	71	45
ND2605-CHA-1020	10.20	12	118	71	45
ND2605-CHA-1030	10.30	12	118	71	45
ND2605-CHA-1040	10.40	12	118	71	45
ND2605-CHA-1050	10.50	12	118	71	45
ND2605-CHA-1060	10.60	12	118	71	45
ND2605-CHA-1070	10.70	12	118	71	45
ND2605-CHA-1080	10.80	12	118	71	45
ND2605-CHA-1090	10.90	12	118	71	45
ND2605-CHA-1100	11.00	12	118	71	45

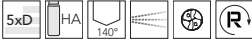
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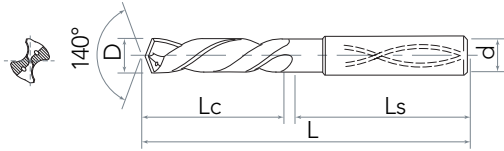


Carbide Ratio Drill

ND2605-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

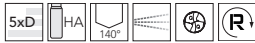
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1110	11.10	12	118	71	45
ND2605-CHA-1120	11.20	12	118	71	45
ND2605-CHA-1130	11.30	12	118	71	45
ND2605-CHA-1140	11.40	12	118	71	45
ND2605-CHA-1150	11.50	12	118	71	45
ND2605-CHA-1160	11.60	12	118	71	45
ND2605-CHA-1170	11.70	12	118	71	45
ND2605-CHA-1180	11.80	12	118	71	45
ND2605-CHA-1190	11.90	12	118	71	45
ND2605-CHA-1200	12.00	12	118	71	45
ND2605-CHA-1210	12.10	14	124	77	45
ND2605-CHA-1220	12.20	14	124	77	45
ND2605-CHA-1230	12.30	14	124	77	45
ND2605-CHA-1240	12.40	14	124	77	45
ND2605-CHA-1250	12.50	14	124	77	45
ND2605-CHA-1260	12.60	14	124	77	45
ND2605-CHA-1270	12.70	14	124	77	45
ND2605-CHA-1280	12.80	14	124	77	45
ND2605-CHA-1290	12.90	14	124	77	45
ND2605-CHA-1300	13.00	14	124	77	45
ND2605-CHA-1310	13.10	14	124	77	45
ND2605-CHA-1320	13.20	14	124	77	45
ND2605-CHA-1330	13.30	14	124	77	45
ND2605-CHA-1340	13.40	14	124	77	45
ND2605-CHA-1350	13.50	14	124	77	45
ND2605-CHA-1360	13.60	14	124	77	45
ND2605-CHA-1370	13.70	14	124	77	45

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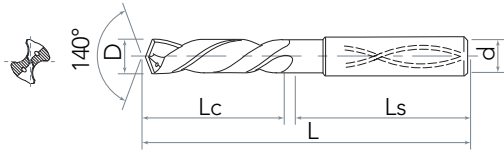




ND2605-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

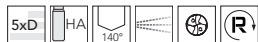
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1380	13.80	14	124	77	45
ND2605-CHA-1390	13.90	14	124	77	45
ND2605-CHA-1400	14.00	14	124	77	45
ND2605-CHA-1410	14.10	16	133	83	48
ND2605-CHA-1420	14.20	16	133	83	48
ND2605-CHA-1430	14.30	16	133	83	48
ND2605-CHA-1440	14.40	16	133	83	48
ND2605-CHA-1450	14.50	16	133	83	48
ND2605-CHA-1460	14.60	16	133	83	48
ND2605-CHA-1470	14.70	16	133	83	48
ND2605-CHA-1480	14.80	16	133	83	48
ND2605-CHA-1490	14.90	16	133	83	48
ND2605-CHA-1500	15.00	16	133	83	48
ND2605-CHA-1510	15.10	16	133	83	48
ND2605-CHA-1520	15.20	16	133	83	48
ND2605-CHA-1530	15.30	16	133	83	48
ND2605-CHA-1540	15.40	16	133	83	48
ND2605-CHA-1550	15.50	16	133	83	48
ND2605-CHA-1560	15.60	16	133	83	48
ND2605-CHA-1570	15.70	16	133	83	48
ND2605-CHA-1580	15.80	16	133	83	48
ND2605-CHA-1590	15.90	16	133	83	48
ND2605-CHA-1600	16.00	16	133	83	48
ND2605-CHA-1610	16.10	18	143	93	48
ND2605-CHA-1620	16.20	18	143	93	48
ND2605-CHA-1630	16.30	18	143	93	48
ND2605-CHA-1640	16.40	18	143	93	48

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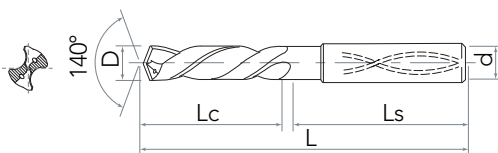


Carbide Ratio Drill

ND2605-CHA



Stainless/acid/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

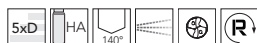


Unit: mm

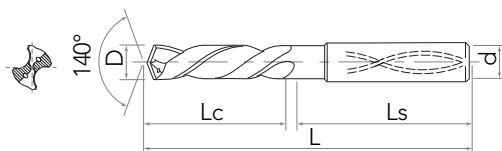
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1650	16.50	18	143	93	48
ND2605-CHA-1660	16.60	18	143	93	48
ND2605-CHA-1670	16.70	18	143	93	48
ND2605-CHA-1680	16.80	18	143	93	48
ND2605-CHA-1690	16.90	18	143	93	48
ND2605-CHA-1700	17.00	18	143	93	48
ND2605-CHA-1710	17.10	18	143	93	48
ND2605-CHA-1720	17.20	18	143	93	48
ND2605-CHA-1730	17.30	18	143	93	48
ND2605-CHA-1740	17.40	18	143	93	48
ND2605-CHA-1750	17.50	18	143	93	48
ND2605-CHA-1760	17.60	18	143	93	48
ND2605-CHA-1770	17.70	18	143	93	48
ND2605-CHA-1780	17.80	18	143	93	48
ND2605-CHA-1790	17.90	18	143	93	48
ND2605-CHA-1800	18.00	18	143	93	48
ND2605-CHA-1810	18.10	20	153	101	50
ND2605-CHA-1820	18.20	20	153	101	50
ND2605-CHA-1830	18.30	20	153	101	50
ND2605-CHA-1840	18.40	20	153	101	50
ND2605-CHA-1850	18.50	20	153	101	50
ND2605-CHA-1860	18.60	20	153	101	50
ND2605-CHA-1870	18.70	20	153	101	50
ND2605-CHA-1880	18.80	20	153	101	50
ND2605-CHA-1890	18.90	20	153	101	50
ND2605-CHA-1900	19.00	20	153	101	50
ND2605-CHA-1910	19.10	20	153	101	50

See the next page

ND2605-CHA



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1920	19.20	20	153	101	50
ND2605-CHA-1930	19.30	20	153	101	50
ND2605-CHA-1940	19.40	20	153	101	50
ND2605-CHA-1950	19.50	20	153	101	50
ND2605-CHA-1960	19.60	20	153	101	50
ND2605-CHA-1970	19.70	20	153	101	50
ND2605-CHA-1980	19.80	20	153	101	50
ND2605-CHA-1990	19.90	20	153	101	50
ND2605-CHA-2000	20.00	20	153	101	50

Recommended cutting data see page 87 



Cutting Data Table

NICHE® NAVIGATOR Ratio drills

General recommendations:

For safety reasons it is very important, that a drill does not exceed a speed of $n = 6,000 \text{ rev./min}$ when unsupported. The centrifugal forces can break these longtools before reaching the workpiece surface!

Application recommendations for 7xD, 10xD and 12xD drills: Pilot holes are necessary for extra length ND drills $\geq 7 \text{ xD}$:

1) The pilot hole can be produced with a short, rigid drill. The diameter should be $0.01 - 0.02 \text{ mm}$ larger than the diameter of the ND drill, the drilling depth $> 1 \text{ xD}$.

2) Alternatively ND drills can produce their own pilot hole. Cutting speed and feed rate should be reduced by 30-40%.

The recommended minimum coolant pressure is 40 bar.

Tools with bold feed column no. are preferred choice.

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	0.310	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



NAVIGATOR Ratio Drills

ISO	Material Group	Material Examples Figures in bold = material no. to DIN EN 10 027	Tensile Strength MPa (N/mm ²)	Hardness	Hardness
P	Common structural steels	1.0035 S185(S133), 1.0486 P275N(S1E285), 1.0345 P235GH(H1), 1.0425 P265GH(H2)	≤500		○
		1.0050 E295 (S150-2), 1.0070 E360 (S170-2), 1.8937 P500NH (WSE500)	≤1000		●
	Free-cutting steels	1.0718 11SMnPb30 (9SMnPb28), 1.0736 11SMn37 (9SMn36)	≤850		○
		1.0727 46S20 (45S20), 1.0728 (60S20), 1.0757 46SPb20 (45SPb20)	≤1000		●
	Unalloyed heat-treatable steels	1.0402 C22, 1.1178 C30E (Ck30)	≤700		○
		1.0503 C45, 1.1191 C45E (Ck45)	≤850		●
		1.0601 C60, 1.1221 C60E (Ck60)	≤1000		○
	Alloyed heat-treatable steels	1.5131 50MnSi4, 1.7003 38Cr2, 1.7030 28Cr4	≤1000		●
		1.5710 36NiCr6, 1.7035 41Cr4, 1.7225 42CrMo4	≤1400		●
	Unalloyed case hardened steels	1.0301 (C10), 1.1121 C10E (Ck10)	≤850		○
	Alloyed case hardened steels	1.7276 10CrMo11, 1.5125 11MnSi6	≤1000		●
		1.5752 15NiCr13, 1.7131 16MnCr5, 1.7264 20CrMo5	≤1400		●
	Nitriding steels	1.8504 34CrAl6	≤1000		○
		1.8519 31CrMoV9, 1.8550 34CrAlNi7	≤1400		●
	Tool steels	1.1750 C75W, 1.2067 102Cr6, 1.2307 29CrMoV9	≤850		○
		1.2080 X210Cr12, 1.2083 X42Cr13, 1.2419 105WCr6, 1.2767 X45NiCrMo4	≤1400		●
H	Hardened steels	1.3243 S 6-5-2-5, 1.3343 S 6-5-2, 1.3344 S 6-5-3	≤1400		●
		1.5026 55Si7, 1.7176 55Cr3, 1.8159 51CrV4 (51CrV4)		≤350 HB	●
M	Stainless steels, sulphured	1.4005 X12CrS13, 1.4104 X14CrMoS17, 1.4105 X6CrMoS17, 1.4305 X8CrNiS18-9	≤900		●
	austenitic	1.4301 X5CrNi18-10 (V2A), 1.4541 X6CrNiTi18-10, 1.4571 X6CrNiMoTi17-12-2 (V4A)	≤1100		●
	martensitic	1.4057 X20CrNi172 (X17CrNi16-2), 1.4122 X39CrMo17-1, 1.4521 X2CrMoTi18-2	≤1500		●
K	Cast iron	0.6010 EN-GJL-100 (GG10), 0.6020 EN-GJL-200 (GG20)		≤240 HB	● ○
		0.6025 EN-GJL-250 (GG25), 0.6035 EN-GJL-350 (GG35)		≤350 HB	● ○
	Spheroidal graphite iron and malleable cast iron	0.7050 EN-GJS-500-7 (GGG50), 0.8035 EN-GJMW-350-4 (GTW35)		≤240 HB	●
		0.7070 EN-GJS-700-2 (GGG70), 0.8170 EN-GJMB-700-2 (GTS70)		≤350 HB	●
	Chilled cast iron	–		≤350 HB	●
	New cast materials GGV	EN-GJV250 (GGV25), EN-GJV350 (GGV35)		≤220 HB	● ○
		EN-GJV400 (GGV40), EN-GJV500 (GGV50), SiMo 6		≤300 HB	● ○
	New cast materials ADI	EN-GJS-800-8 (AD1800), EN-GJS-1000-5 (AD11000)	≤1000		● ○
		EN-GJS-1200-2 (AD11200), EN-GJS-1400-1 (AD11400)	≤1400		● ○

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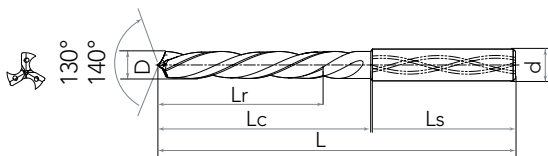
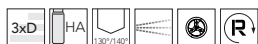


Cutting Data Table

NAVIGATOR Ratio Drills

ISO	Material Group	Material Examples Figures in bold = material no. to DIN EN 10 027	Tensile Strength MPa (N/mm ²)	Hardness	Hardness
S	Special alloys	Nimonic, Inconel, Monel, Hastelloy	≤2000		●
	Ti and Ti alloys	3.7024 Ti99,5, 3.7114 TiAl5Sn2,5, 3.7124 TiCu2	≤850		●
		3.7154 TiAl6Zr5, 3.7165 TiAl6V4, 3.7184 TiAl4Mo4Sn2,5, - TiAl8Mo1V1	≤1400		●
N	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	≤650		●
	Al cast alloys ≤ 10 % Si	3.2131 G-AlSi5Cu1, 3.2153 G-AlSi7Cu3, 3.2573 G-AlSi9	≤600		●
		≤ 24 % 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	≤400		○
	Copper, low-alloyed	2.0070 SE-Cu, 2.1020 CuSn6, 2.1096 G-CuSn5Zn1Pb	≤500		●
	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 CuSn7Zn1Pb, 2.1170 CuPb5Sn5, 2.1176 CuPb10Sn	≤600		● ●
		2.0790 CuNi18Zn19Pb	≤850		●
	Bronze, long-chipping	2.0916 CuAl5, 2.0960 CuAl9Mn, 2.1050 CuSn10	≤850		●
		2.0980 CuAl11Ni, 2.1247 CuBe2	≤1000		●
H	Duroplastics	Bakelit, Resopal, Pertinax, Moltopren	≤150		○
	Thermoplastics	Plexiglass, Hostalen, Novodur, Makralon	≤100		● ○
	Kevlar	Kevlar	≤1000		○
	Glass, carbon concentr. plastics	GFK/CFK	≤1000		○

ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

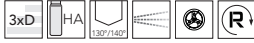
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-0340-3T	3.40	6	62	20	36	17
ND2103-CHA-0350-3T	3.50	6	62	20	36	17
ND2103-CHA-0360-3T	3.60	6	62	20	36	17
ND2103-CHA-0370-3T	3.70	6	62	20	36	17
ND2103-CHA-0380-3T	3.80	6	66	24	36	21
ND2103-CHA-0390-3T	3.90	6	66	24	36	21
ND2103-CHA-0400-3T	4.00	6	66	24	36	21
ND2103-CHA-0410-3T	4.10	6	66	24	36	21
ND2103-CHA-0420-3T	4.20	6	66	24	36	21
ND2103-CHA-0430-3T	4.30	6	66	24	36	21
ND2103-CHA-0440-3T	4.40	6	66	24	36	21
ND2103-CHA-0450-3T	4.50	6	66	24	36	21
ND2103-CHA-0460-3T	4.60	6	66	24	36	21
ND2103-CHA-0465-3T	4.65	6	66	24	36	21
ND2103-CHA-0470-3T	4.70	6	66	24	36	21
ND2103-CHA-0480-3T	4.80	6	66	28	36	25
ND2103-CHA-0490-3T	4.90	6	66	28	36	25
ND2103-CHA-0500-3T	5.00	6	66	28	36	25
ND2103-CHA-0510-3T	5.10	6	66	28	36	25
ND2103-CHA-0520-3T	5.20	6	66	28	36	25
ND2103-CHA-0530-3T	5.30	6	66	28	36	25
ND2103-CHA-0540-3T	5.40	6	66	28	36	25
ND2103-CHA-0550-3T	5.50	6	66	28	36	25
ND2103-CHA-0555-3T	5.55	6	66	28	36	25
ND2103-CHA-0560-3T	5.60	6	66	28	36	25
ND2103-CHA-0570-3T	5.70	6	66	28	36	25
ND2103-CHA-0580-3T	5.80	6	66	28	36	25

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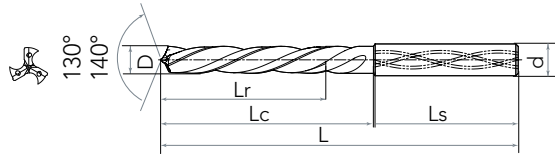


Carbide Ratio Drill - 3 Flutes

ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



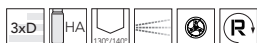
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-0590-3T	5.90	6	66	28	36	25
ND2103-CHA-0600-3T	6.00	6	66	28	36	25
ND2103-CHA-0610-3T	6.10	8	79	34	36	30
ND2103-CHA-0620-3T	6.20	8	79	34	36	30
ND2103-CHA-0630-3T	6.30	8	79	34	36	30
ND2103-CHA-0640-3T	6.40	8	79	34	36	30
ND2103-CHA-0650-3T	6.50	8	79	34	36	30
ND2103-CHA-0660-3T	6.60	8	79	34	36	30
ND2103-CHA-0670-3T	6.70	8	79	34	36	30
ND2103-CHA-0680-3T	6.80	8	79	34	36	30
ND2103-CHA-0690-3T	6.90	8	79	34	36	30
ND2103-CHA-0700-3T	7.00	8	79	34	36	30
ND2103-CHA-0710-3T	7.10	8	79	41	36	37
ND2103-CHA-0720-3T	7.20	8	79	41	36	37
ND2103-CHA-0730-3T	7.30	8	79	41	36	37
ND2103-CHA-0740-3T	7.40	8	79	41	36	37
ND2103-CHA-0750-3T	7.50	8	79	41	36	37
ND2103-CHA-0760-3T	7.60	8	79	41	36	37
ND2103-CHA-0770-3T	7.70	8	79	41	36	37
ND2103-CHA-0780-3T	7.80	8	79	41	36	37
ND2103-CHA-0790-3T	7.90	8	79	41	36	37
ND2103-CHA-0800-3T	8.00	8	79	41	36	37
ND2103-CHA-0810-3T	8.10	10	89	47	40	43
ND2103-CHA-0820-3T	8.20	10	89	47	40	43
ND2103-CHA-0830-3T	8.30	10	89	47	40	43
ND2103-CHA-0840-3T	8.40	10	89	47	40	43
ND2103-CHA-0850-3T	8.50	10	89	47	40	43

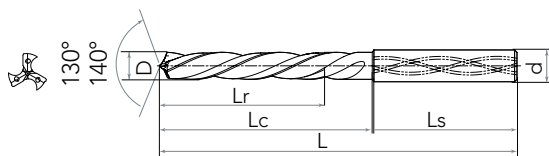
See the next page



ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

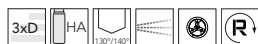
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-0860-3T	8.60	10	89	47	40	43
ND2103-CHA-0870-3T	8.70	10	89	47	40	43
ND2103-CHA-0880-3T	8.80	10	89	47	40	43
ND2103-CHA-0890-3T	8.90	10	89	47	40	43
ND2103-CHA-0900-3T	9.00	10	89	47	40	43
ND2103-CHA-0910-3T	9.10	10	89	47	40	43
ND2103-CHA-0920-3T	9.20	10	89	47	40	43
ND2103-CHA-0925-3T	9.25	10	89	47	40	43
ND2103-CHA-0930-3T	9.30	10	89	47	40	43
ND2103-CHA-0940-3T	9.40	10	89	47	40	43
ND2103-CHA-0950-3T	9.50	10	89	47	40	43
ND2103-CHA-0960-3T	9.60	10	89	47	40	43
ND2103-CHA-0970-3T	9.70	10	89	47	40	43
ND2103-CHA-0980-3T	9.80	10	89	47	40	43
ND2103-CHA-0990-3T	9.90	10	89	47	40	43
ND2103-CHA-1000-3T	10.00	10	89	47	40	43
ND2103-CHA-1010-3T	10.10	12	102	55	45	50
ND2103-CHA-1020-3T	10.20	12	102	55	45	50
ND2103-CHA-1030-3T	10.30	12	102	55	45	50
ND2103-CHA-1040-3T	10.40	12	102	55	45	50
ND2103-CHA-1050-3T	10.50	12	102	55	45	50
ND2103-CHA-1060-3T	10.60	12	102	55	45	50
ND2103-CHA-1070-3T	10.70	12	102	55	45	50
ND2103-CHA-1080-3T	10.80	12	102	55	45	50
ND2103-CHA-1090-3T	10.90	12	102	55	45	50
ND2103-CHA-1100-3T	11.00	12	102	55	45	50
ND2103-CHA-1110-3T	11.10	12	102	55	45	50

See the next page 

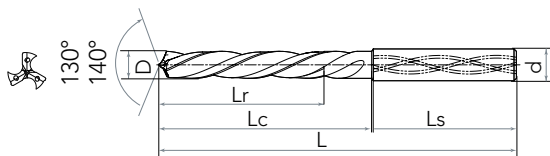


Carbide Ratio Drill - 3 Flutes

ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

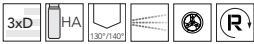
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr c
ND2103-CHA-1120-3T	11.20	12	102	55	45	50
ND2103-CHA-1130-3T	11.30	12	102	55	45	50
ND2103-CHA-1140-3T	11.40	12	102	55	45	50
ND2103-CHA-1150-3T	11.50	12	102	55	45	50
ND2103-CHA-1160-3T	11.60	12	102	55	45	50
ND2103-CHA-1170-3T	11.70	12	102	55	45	50
ND2103-CHA-1180-3T	11.80	12	102	55	45	50
ND2103-CHA-1190-3T	11.90	12	102	55	45	50
ND2103-CHA-1200-3T	12.00	12	102	55	45	50
ND2103-CHA-1210-3T	12.10	14	107	60	45	54
ND2103-CHA-1220-3T	12.20	14	107	60	45	54
ND2103-CHA-1230-3T	12.30	14	107	60	45	54
ND2103-CHA-1240-3T	12.40	14	107	60	45	54
ND2103-CHA-1250-3T	12.50	14	107	60	45	54
ND2103-CHA-1260-3T	12.60	14	107	60	45	54
ND2103-CHA-1270-3T	12.70	14	107	60	45	54
ND2103-CHA-1280-3T	12.80	14	107	60	45	54
ND2103-CHA-1285-3T	12.85	14	107	60	45	54
ND2103-CHA-1290-3T	12.90	14	107	60	45	54
ND2103-CHA-1300-3T	13.00	14	107	60	45	54
ND2103-CHA-1310-3T	13.10	14	107	60	45	54
ND2103-CHA-1320-3T	13.20	14	107	60	45	54
ND2103-CHA-1330-3T	13.30	14	107	60	45	54
ND2103-CHA-1340-3T	13.40	14	107	60	45	54
ND2103-CHA-1350-3T	13.50	14	107	60	45	54
ND2103-CHA-1360-3T	13.60	14	107	60	45	54
ND2103-CHA-1370-3T	13.70	14	107	60	45	54

See the next page

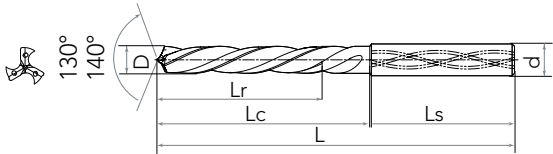




ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

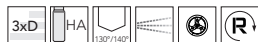
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1380-3T	13.80	14	107	60	45	54
ND2103-CHA-1390-3T	13.90	14	107	60	45	54
ND2103-CHA-1400-3T	14.00	14	107	60	45	54
ND2103-CHA-1410-3T	14.10	16	115	65	48	59
ND2103-CHA-1420-3T	14.20	16	115	65	48	59
ND2103-CHA-1430-3T	14.30	16	115	65	48	59
ND2103-CHA-1440-3T	14.40	16	115	65	48	59
ND2103-CHA-1450-3T	14.50	16	115	65	48	59
ND2103-CHA-1460-3T	14.60	16	115	65	48	59
ND2103-CHA-1470-3T	14.70	16	115	65	48	59
ND2103-CHA-1480-3T	14.80	16	115	65	48	59
ND2103-CHA-1490-3T	14.90	16	115	65	48	59
ND2103-CHA-1500-3T	15.00	16	115	65	48	59
ND2103-CHA-1510-3T	15.10	16	115	65	48	59
ND2103-CHA-1520-3T	15.20	16	115	65	48	59
ND2103-CHA-1530-3T	15.30	16	115	65	48	59
ND2103-CHA-1540-3T	15.40	16	115	65	48	59
ND2103-CHA-1550-3T	15.50	16	115	65	48	59
ND2103-CHA-1560-3T	15.60	16	115	65	48	59
ND2103-CHA-1570-3T	15.70	16	115	65	48	59
ND2103-CHA-1580-3T	15.80	16	115	65	48	59
ND2103-CHA-1590-3T	15.90	16	115	65	48	59
ND2103-CHA-1600-3T	16.00	16	115	65	48	59
ND2103-CHA-1610-3T	16.10	18	123	73	48	67
ND2103-CHA-1620-3T	16.20	18	123	73	48	67
ND2103-CHA-1630-3T	16.30	18	123	73	48	67
ND2103-CHA-1640-3T	16.40	18	123	73	48	67

See the next page

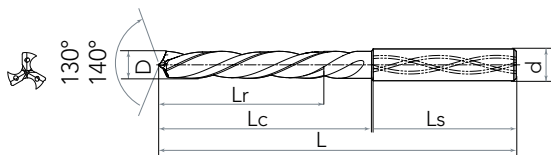


Carbide Ratio Drill - 3 Flutes

ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



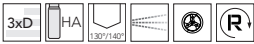
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1650-3T	16.50	18	123	73	48	67
ND2103-CHA-1660-3T	16.60	18	123	73	48	67
ND2103-CHA-1670-3T	16.70	18	123	73	48	67
ND2103-CHA-1680-3T	16.80	18	123	73	48	67
ND2103-CHA-1690-3T	16.90	18	123	73	48	67
ND2103-CHA-1700-3T	17.00	18	123	73	48	67
ND2103-CHA-1710-3T	17.10	18	123	73	48	67
ND2103-CHA-1720-3T	17.20	18	123	73	48	67
ND2103-CHA-1730-3T	17.30	18	123	73	48	67
ND2103-CHA-1740-3T	17.40	18	123	73	48	67
ND2103-CHA-1750-3T	17.50	18	123	73	48	67
ND2103-CHA-1760-3T	17.60	18	123	73	48	67
ND2103-CHA-1770-3T	17.70	18	123	73	48	67
ND2103-CHA-1780-3T	17.80	18	123	73	48	67
ND2103-CHA-1790-3T	17.90	18	123	73	48	67
ND2103-CHA-1800-3T	18.00	18	123	73	48	67
ND2103-CHA-1810-3T	18.10	20	131	79	50	73
ND2103-CHA-1820-3T	18.20	20	131	79	50	73
ND2103-CHA-1830-3T	18.30	20	131	79	50	73
ND2103-CHA-1840-3T	18.40	20	131	79	50	73
ND2103-CHA-1850-3T	18.50	20	131	79	50	73
ND2103-CHA-1860-3T	18.60	20	131	79	50	73
ND2103-CHA-1870-3T	18.70	20	131	79	50	73
ND2103-CHA-1880-3T	18.80	20	131	79	50	73
ND2103-CHA-1890-3T	18.90	20	131	79	50	73
ND2103-CHA-1900-3T	19.00	20	131	79	50	73
ND2103-CHA-1910-3T	19.10	20	131	79	50	73

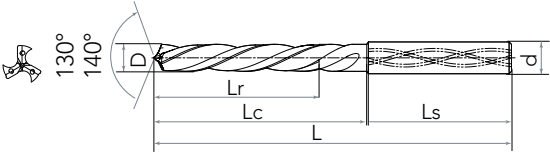
See the next page



ND2103-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2103-CHA-1920-3T	19.20	20	131	79	50	73
ND2103-CHA-1930-3T	19.30	20	131	79	50	73
ND2103-CHA-1940-3T	19.40	20	131	79	50	73
ND2103-CHA-1950-3T	19.50	20	131	79	50	73
ND2103-CHA-1960-3T	19.60	20	131	79	50	73
ND2103-CHA-1970-3T	19.70	20	131	79	50	73
ND2103-CHA-1980-3T	19.80	20	131	79	50	73
ND2103-CHA-1990-3T	19.90	20	131	79	50	73
ND2103-CHA-2000-3T	20.00	20	131	79	50	73

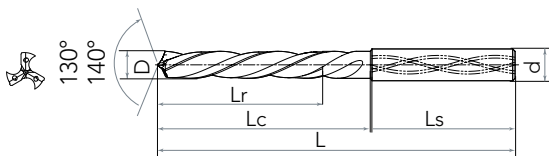
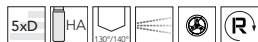
Recommended cutting data see page 132





Carbide Ratio Drill - 3 Flutes

ND2105-CHA-3T



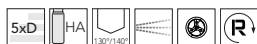
Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

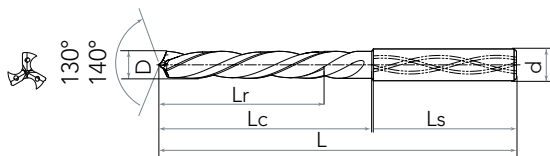
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-0340-3T	3.40	6	66	28	36	25
ND2105-CHA-0350-3T	3.50	6	66	28	36	25
ND2105-CHA-0360-3T	3.60	6	66	28	36	25
ND2105-CHA-0370-3T	3.70	6	66	28	36	25
ND2105-CHA-0380-3T	3.80	6	74	36	36	32
ND2105-CHA-0390-3T	3.90	6	74	36	36	32
ND2105-CHA-0400-3T	4.00	6	74	36	36	32
ND2105-CHA-0410-3T	4.10	6	74	36	36	32
ND2105-CHA-0420-3T	4.20	6	74	36	36	32
ND2105-CHA-0430-3T	4.30	6	74	36	36	32
ND2105-CHA-0440-3T	4.40	6	74	36	36	32
ND2105-CHA-0450-3T	4.50	6	74	36	36	32
ND2105-CHA-0460-3T	4.60	6	74	36	36	32
ND2105-CHA-0465-3T	4.65	6	74	36	36	32
ND2105-CHA-0470-3T	4.70	6	74	36	36	32
ND2105-CHA-0480-3T	4.80	6	82	44	36	40
ND2105-CHA-0490-3T	4.90	6	82	44	36	40
ND2105-CHA-0500-3T	5.00	6	82	44	36	40
ND2105-CHA-0510-3T	5.10	6	82	44	36	40
ND2105-CHA-0520-3T	5.20	6	82	44	36	40
ND2105-CHA-0530-3T	5.30	6	82	44	36	40
ND2105-CHA-0540-3T	5.40	6	82	44	36	40
ND2105-CHA-0550-3T	5.50	6	82	44	36	40
ND2105-CHA-0555-3T	5.55	6	82	44	36	40
ND2105-CHA-0560-3T	5.60	6	82	44	36	40
ND2105-CHA-0570-3T	5.70	6	82	44	36	40
ND2105-CHA-0580-3T	5.80	6	82	44	36	40

See the next page

ND2105-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed Al/Si alloys



Unit: mm

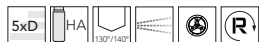
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-0590-3T	5.90	6	82	44	36	40
ND2105-CHA-0600-3T	6.00	6	82	44	36	40
ND2105-CHA-0610-3T	6.10	8	91	53	36	50
ND2105-CHA-0620-3T	6.20	8	91	53	36	50
ND2105-CHA-0630-3T	6.30	8	91	53	36	50
ND2105-CHA-0640-3T	6.40	8	91	53	36	50
ND2105-CHA-0650-3T	6.50	8	91	53	36	50
ND2105-CHA-0660-3T	6.60	8	91	53	36	50
ND2105-CHA-0670-3T	6.70	8	91	53	36	50
ND2105-CHA-0680-3T	6.80	8	91	53	36	50
ND2105-CHA-0690-3T	6.90	8	91	53	36	50
ND2105-CHA-0700-3T	7.00	8	91	53	36	50
ND2105-CHA-0710-3T	7.10	8	91	53	36	50
ND2105-CHA-0720-3T	7.20	8	91	53	36	50
ND2105-CHA-0730-3T	7.30	8	91	53	36	50
ND2105-CHA-0740-3T	7.40	8	91	53	36	50
ND2105-CHA-0750-3T	7.50	8	91	53	36	50
ND2105-CHA-0760-3T	7.60	8	91	53	36	50
ND2105-CHA-0770-3T	7.70	8	91	53	36	50
ND2105-CHA-0780-3T	7.80	8	91	53	36	50
ND2105-CHA-0790-3T	7.90	8	91	53	36	50
ND2105-CHA-0800-3T	8.00	8	91	53	36	50
ND2105-CHA-0810-3T	8.10	10	103	61	40	57
ND2105-CHA-0820-3T	8.20	10	103	61	40	57
ND2105-CHA-0830-3T	8.30	10	103	61	40	57
ND2105-CHA-0840-3T	8.40	10	103	61	40	57
ND2105-CHA-0850-3T	8.50	10	103	61	40	57

See the next page 

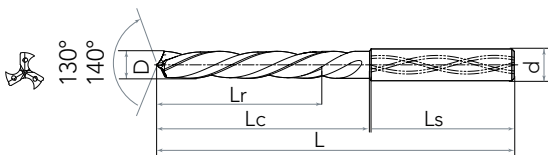


Carbide Ratio Drill - 3 Flutes

ND2105-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



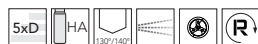
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-0860-3T	8.60	10	103	61	40	57
ND2105-CHA-0870-3T	8.70	10	103	61	40	57
ND2105-CHA-0880-3T	8.80	10	103	61	40	57
ND2105-CHA-0890-3T	8.90	10	103	61	40	57
ND2105-CHA-0900-3T	9.00	10	103	61	40	57
ND2105-CHA-0910-3T	9.10	10	103	61	40	57
ND2105-CHA-0920-3T	9.20	10	103	61	40	57
ND2105-CHA-0925-3T	9.25	10	103	61	40	57
ND2105-CHA-0930-3T	9.30	10	103	61	40	57
ND2105-CHA-0940-3T	9.40	10	103	61	40	57
ND2105-CHA-0950-3T	9.50	10	103	61	40	57
ND2105-CHA-0960-3T	9.60	10	103	61	40	57
ND2105-CHA-0970-3T	9.70	10	103	61	40	57
ND2105-CHA-0980-3T	9.80	10	103	61	40	57
ND2105-CHA-0990-3T	9.90	10	103	61	40	57
ND2105-CHA-1000-3T	10.00	10	103	61	40	57
ND2105-CHA-1010-3T	10.10	12	118	71	45	65
ND2105-CHA-1020-3T	10.20	12	118	71	45	65
ND2105-CHA-1030-3T	10.30	12	118	71	45	65
ND2105-CHA-1040-3T	10.40	12	118	71	45	65
ND2105-CHA-1050-3T	10.50	12	118	71	45	65
ND2105-CHA-1060-3T	10.60	12	118	71	45	65
ND2105-CHA-1070-3T	10.70	12	118	71	45	65
ND2105-CHA-1080-3T	10.80	12	118	71	45	65
ND2105-CHA-1090-3T	10.90	12	118	71	45	65
ND2105-CHA-1100-3T	11.00	12	118	71	45	65
ND2105-CHA-1110-3T	11.10	12	118	71	45	65

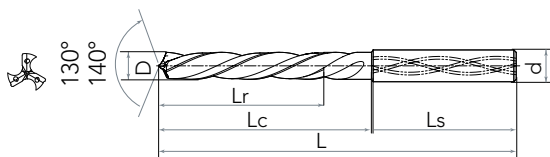
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ND2105-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1120-3T	11.20	12	118	71	45	65
ND2105-CHA-1130-3T	11.30	12	118	71	45	65
ND2105-CHA-1140-3T	11.40	12	118	71	45	65
ND2105-CHA-1150-3T	11.50	12	118	71	45	65
ND2105-CHA-1160-3T	11.60	12	118	71	45	65
ND2105-CHA-1170-3T	11.70	12	118	71	45	65
ND2105-CHA-1180-3T	11.80	12	118	71	45	65
ND2105-CHA-1190-3T	11.90	12	118	71	45	65
ND2105-CHA-1200-3T	12.00	12	118	71	45	65
ND2105-CHA-1210-3T	12.10	14	124	77	45	72
ND2105-CHA-1220-3T	12.20	14	124	77	45	72
ND2105-CHA-1230-3T	12.30	14	124	77	45	72
ND2105-CHA-1240-3T	12.40	14	124	77	45	72
ND2105-CHA-1250-3T	12.50	14	124	77	45	72
ND2105-CHA-1260-3T	12.60	14	124	77	45	72
ND2105-CHA-1270-3T	12.70	14	124	77	45	72
ND2105-CHA-1280-3T	12.80	14	124	77	45	72
ND2105-CHA-1285-3T	12.85	14	124	77	45	72
ND2105-CHA-1290-3T	12.90	14	124	77	45	72
ND2105-CHA-1300-3T	13.00	14	124	77	45	72
ND2105-CHA-1310-3T	13.10	14	124	77	45	72
ND2105-CHA-1320-3T	13.20	14	124	77	45	72
ND2105-CHA-1330-3T	13.30	14	124	77	45	72
ND2105-CHA-1340-3T	13.40	14	124	77	45	72
ND2105-CHA-1350-3T	13.50	14	124	77	45	72
ND2105-CHA-1360-3T	13.60	14	124	77	45	72
ND2105-CHA-1370-3T	13.70	14	124	77	45	72

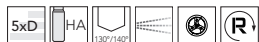
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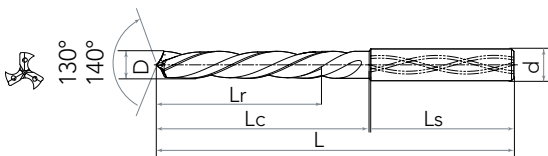


Carbide Ratio Drill - 3 Flutes

ND2105-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



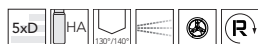
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1380-3T	13.80	14	124	77	45	72
ND2105-CHA-1390-3T	13.90	14	124	77	45	72
ND2105-CHA-1400-3T	14.00	14	124	77	45	72
ND2105-CHA-1410-3T	14.10	16	133	83	48	77
ND2105-CHA-1420-3T	14.20	16	133	83	48	77
ND2105-CHA-1430-3T	14.30	16	133	83	48	77
ND2105-CHA-1440-3T	14.40	16	133	83	48	77
ND2105-CHA-1450-3T	14.50	16	133	83	48	77
ND2105-CHA-1460-3T	14.60	16	133	83	48	77
ND2105-CHA-1470-3T	14.70	16	133	83	48	77
ND2105-CHA-1480-3T	14.80	16	133	83	48	77
ND2105-CHA-1490-3T	14.90	16	133	83	48	77
ND2105-CHA-1500-3T	15.00	16	133	83	48	77
ND2105-CHA-1510-3T	15.10	16	133	83	48	77
ND2105-CHA-1520-3T	15.20	16	133	83	48	77
ND2105-CHA-1530-3T	15.30	16	133	83	48	77
ND2105-CHA-1540-3T	15.40	16	133	83	48	77
ND2105-CHA-1550-3T	15.50	16	133	83	48	77
ND2105-CHA-1560-3T	15.60	16	133	83	48	77
ND2105-CHA-1570-3T	15.70	16	133	83	48	77
ND2105-CHA-1580-3T	15.80	16	133	83	48	77
ND2105-CHA-1590-3T	15.90	16	133	83	48	77
ND2105-CHA-1600-3T	16.00	16	133	83	48	77
ND2105-CHA-1610-3T	16.10	18	143	93	48	87
ND2105-CHA-1620-3T	16.20	18	143	93	48	87
ND2105-CHA-1630-3T	16.30	18	143	93	48	87
ND2105-CHA-1640-3T	16.40	18	143	93	48	87

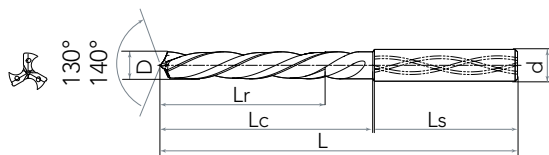
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ND2105-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels (alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

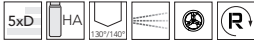
Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1650-3T	16.50	18	143	93	48	87
ND2105-CHA-1660-3T	16.60	18	143	93	48	87
ND2105-CHA-1670-3T	16.70	18	143	93	48	87
ND2105-CHA-1680-3T	16.80	18	143	93	48	87
ND2105-CHA-1690-3T	16.90	18	143	93	48	87
ND2105-CHA-1700-3T	17.00	18	143	93	48	87
ND2105-CHA-1710-3T	17.10	18	143	93	48	87
ND2105-CHA-1720-3T	17.20	18	143	93	48	87
ND2105-CHA-1730-3T	17.30	18	143	93	48	87
ND2105-CHA-1740-3T	17.40	18	143	93	48	87
ND2105-CHA-1750-3T	17.50	18	143	93	48	87
ND2105-CHA-1760-3T	17.60	18	143	93	48	87
ND2105-CHA-1770-3T	17.70	18	143	93	48	87
ND2105-CHA-1780-3T	17.80	18	143	93	48	87
ND2105-CHA-1790-3T	17.90	18	143	93	48	87
ND2105-CHA-1800-3T	18.00	18	143	93	48	87
ND2105-CHA-1810-3T	18.10	20	153	101	50	95
ND2105-CHA-1820-3T	18.20	20	153	101	50	95
ND2105-CHA-1830-3T	18.30	20	153	101	50	95
ND2105-CHA-1840-3T	18.40	20	153	101	50	95
ND2105-CHA-1850-3T	18.50	20	153	101	50	95
ND2105-CHA-1860-3T	18.60	20	153	101	50	95
ND2105-CHA-1870-3T	18.70	20	153	101	50	95
ND2105-CHA-1880-3T	18.80	20	153	101	50	95
ND2105-CHA-1890-3T	18.90	20	153	101	50	95
ND2105-CHA-1900-3T	19.00	20	153	101	50	95
ND2105-CHA-1910-3T	19.10	20	153	101	50	95

See the next page

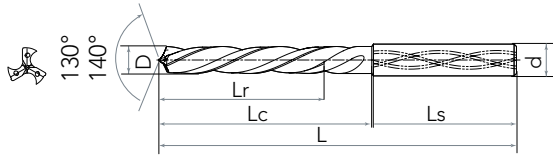


Carbide Ratio Drill - 3 Flutes

ND2105-CHA-3T



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · steels
(alloyed/unalloyed) up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



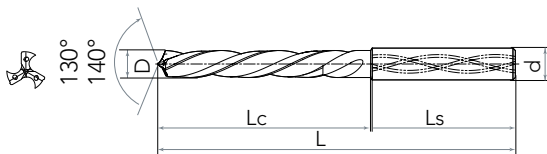
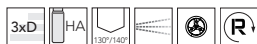
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls	Lr (max)
ND2105-CHA-1920-3T	19.20	20	153	101	50	95
ND2105-CHA-1930-3T	19.30	20	153	101	50	95
ND2105-CHA-1940-3T	19.40	20	153	101	50	95
ND2105-CHA-1950-3T	19.50	20	153	101	50	95
ND2105-CHA-1960-3T	19.60	20	153	101	50	95
ND2105-CHA-1970-3T	19.70	20	153	101	50	95
ND2105-CHA-1980-3T	19.80	20	153	101	50	95
ND2105-CHA-1990-3T	19.90	20	153	101	50	95
ND2105-CHA-2000-3T	20.00	20	153	101	50	95

Recommended cutting data see page 132



ND2503-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content

Unit: mm

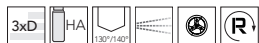
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-0300-3T	3.00	6	66	28	36
ND2503-CHA-0310-3T	3.10	6	66	28	36
ND2503-CHA-0320-3T	3.20	6	66	28	36
ND2503-CHA-0330-3T	3.30	6	66	28	36
ND2503-CHA-0340-3T	3.40	6	66	28	36
ND2503-CHA-0350-3T	3.50	6	66	28	36
ND2503-CHA-0360-3T	3.60	6	66	28	36
ND2503-CHA-0370-3T	3.70	6	66	28	36
ND2503-CHA-0380-3T	3.80	6	74	36	36
ND2503-CHA-0390-3T	3.90	6	74	36	36
ND2503-CHA-0400-3T	4.00	6	74	36	36
ND2503-CHA-0410-3T	4.10	6	74	36	36
ND2503-CHA-0420-3T	4.20	6	74	36	36
ND2503-CHA-0430-3T	4.30	6	74	36	36
ND2503-CHA-0440-3T	4.40	6	74	36	36
ND2503-CHA-0450-3T	4.50	6	74	36	36
ND2503-CHA-0460-3T	4.60	6	74	36	36
ND2503-CHA-0470-3T	4.70	6	74	36	36
ND2503-CHA-0480-3T	4.80	6	82	44	36
ND2503-CHA-0490-3T	4.90	6	82	44	36
ND2503-CHA-0500-3T	5.00	6	82	44	36
ND2503-CHA-0510-3T	5.10	6	82	44	36
ND2503-CHA-0520-3T	5.20	6	82	44	36
ND2503-CHA-0530-3T	5.30	6	82	44	36
ND2503-CHA-0540-3T	5.40	6	82	44	36
ND2503-CHA-0550-3T	5.50	6	82	44	36
ND2503-CHA-0560-3T	5.60	6	82	44	36

See the next page 

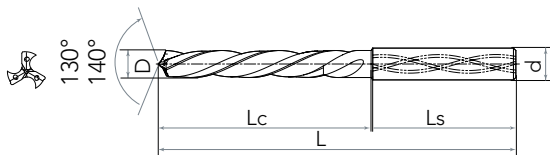


Carbide Ratio Drill - 3 Flutes

ND2503-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content

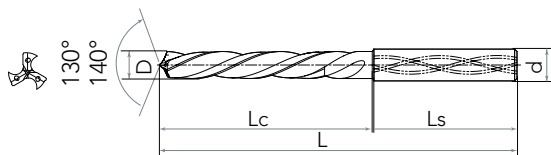
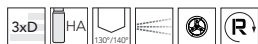


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-0570-3T	5.70	6	82	44	36
ND2503-CHA-0580-3T	5.80	6	82	44	36
ND2503-CHA-0590-3T	5.90	6	82	44	36
ND2503-CHA-0600-3T	6.00	6	82	44	36
ND2503-CHA-0610-3T	6.10	8	91	53	36
ND2503-CHA-0620-3T	6.20	8	91	53	36
ND2503-CHA-0630-3T	6.30	8	91	53	36
ND2503-CHA-0640-3T	6.40	8	91	53	36
ND2503-CHA-0650-3T	6.50	8	91	53	36
ND2503-CHA-0660-3T	6.60	8	91	53	36
ND2503-CHA-0670-3T	6.70	8	91	53	36
ND2503-CHA-0680-3T	6.80	8	91	53	36
ND2503-CHA-0690-3T	6.90	8	91	53	36
ND2503-CHA-0700-3T	7.00	8	91	53	36
ND2503-CHA-0710-3T	7.10	8	91	53	36
ND2503-CHA-0720-3T	7.20	8	91	53	36
ND2503-CHA-0730-3T	7.30	8	91	53	36
ND2503-CHA-0740-3T	7.40	8	91	53	36
ND2503-CHA-0750-3T	7.50	8	91	53	36
ND2503-CHA-0760-3T	7.60	8	91	53	36
ND2503-CHA-0770-3T	7.70	8	91	53	36
ND2503-CHA-0780-3T	7.80	8	91	53	36
ND2503-CHA-0790-3T	7.90	8	91	53	36
ND2503-CHA-0800-3T	8.00	8	91	53	36
ND2503-CHA-0810-3T	8.10	10	103	61	40
ND2503-CHA-0820-3T	8.20	10	103	61	40
ND2503-CHA-0830-3T	8.30	10	103	61	40

See the next page

ND2503-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-0840-3T	8.40	10	103	61	40
ND2503-CHA-0850-3T	8.50	10	103	61	40
ND2503-CHA-0860-3T	8.60	10	103	61	40
ND2503-CHA-0870-3T	8.70	10	103	61	40
ND2503-CHA-0880-3T	8.80	10	103	61	40
ND2503-CHA-0890-3T	8.90	10	103	61	40
ND2503-CHA-0900-3T	9.00	10	103	61	40
ND2503-CHA-0910-3T	9.10	10	103	61	40
ND2503-CHA-0920-3T	9.20	10	103	61	40
ND2503-CHA-0930-3T	9.30	10	103	61	40
ND2503-CHA-0940-3T	9.40	10	103	61	40
ND2503-CHA-0950-3T	9.50	10	103	61	40
ND2503-CHA-0960-3T	9.60	10	103	61	40
ND2503-CHA-0970-3T	9.70	10	103	61	40
ND2503-CHA-0980-3T	9.80	10	103	61	40
ND2503-CHA-0990-3T	9.90	10	103	61	40
ND2503-CHA-1000-3T	10.00	10	103	61	40
ND2503-CHA-1010-3T	10.10	12	118	71	45
ND2503-CHA-1020-3T	10.20	12	118	71	45
ND2503-CHA-1030-3T	10.30	12	118	71	45
ND2503-CHA-1040-3T	10.40	12	118	71	45
ND2503-CHA-1050-3T	10.50	12	118	71	45
ND2503-CHA-1060-3T	10.60	12	118	71	45
ND2503-CHA-1070-3T	10.70	12	118	71	45
ND2503-CHA-1080-3T	10.80	12	118	71	45
ND2503-CHA-1090-3T	10.90	12	118	71	45
ND2503-CHA-1100-3T	11.00	12	118	71	45

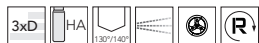
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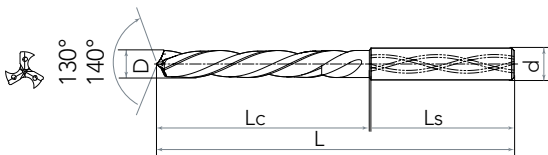


Carbide Ratio Drill - 3 Flutes

ND2503-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content



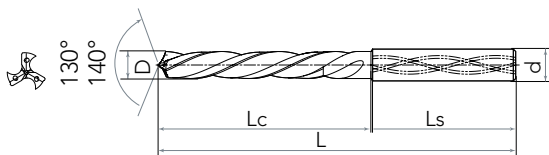
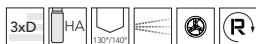
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1110-3T	11.10	12	118	71	45
ND2503-CHA-1120-3T	11.20	12	118	71	45
ND2503-CHA-1130-3T	11.30	12	118	71	45
ND2503-CHA-1140-3T	11.40	12	118	71	45
ND2503-CHA-1150-3T	11.50	12	118	71	45
ND2503-CHA-1160-3T	11.60	12	118	71	45
ND2503-CHA-1170-3T	11.70	12	118	71	45
ND2503-CHA-1180-3T	11.80	12	118	71	45
ND2503-CHA-1190-3T	11.90	12	118	71	45
ND2503-CHA-1200-3T	12.00	12	118	71	45
ND2503-CHA-1210-3T	12.10	14	124	77	45
ND2503-CHA-1220-3T	12.20	14	124	77	45
ND2503-CHA-1230-3T	12.30	14	124	77	45
ND2503-CHA-1240-3T	12.40	14	124	77	45
ND2503-CHA-1250-3T	12.50	14	124	77	45
ND2503-CHA-1260-3T	12.60	14	124	77	45
ND2503-CHA-1270-3T	12.70	14	124	77	45
ND2503-CHA-1280-3T	12.80	14	124	77	45
ND2503-CHA-1290-3T	12.90	14	124	77	45
ND2503-CHA-1300-3T	13.00	14	124	77	45
ND2503-CHA-1310-3T	13.10	14	124	77	45
ND2503-CHA-1320-3T	13.20	14	124	77	45
ND2503-CHA-1330-3T	13.30	14	124	77	45
ND2503-CHA-1340-3T	13.40	14	124	77	45
ND2503-CHA-1350-3T	13.50	14	124	77	45
ND2503-CHA-1360-3T	13.60	14	124	77	45
ND2503-CHA-1370-3T	13.70	14	124	77	45

See the next page



ND2503-CHA-3T



Aluminium and Al alloys · Al materials with high Si-content

Unit: mm

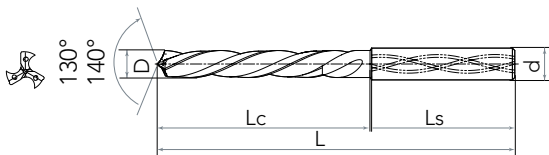
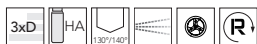
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1380-3T	13.80	14	124	71	45
ND2503-CHA-1390-3T	13.90	14	124	71	45
ND2503-CHA-1400-3T	14.00	14	124	71	45
ND2503-CHA-1410-3T	14.10	16	133	83	48
ND2503-CHA-1420-3T	14.20	16	133	83	48
ND2503-CHA-1430-3T	14.30	16	133	83	48
ND2503-CHA-1440-3T	14.40	16	133	83	48
ND2503-CHA-1450-3T	14.50	16	133	83	48
ND2503-CHA-1460-3T	14.60	16	133	83	48
ND2503-CHA-1470-3T	14.70	16	133	83	48
ND2503-CHA-1480-3T	14.80	16	133	83	48
ND2503-CHA-1490-3T	14.90	16	133	83	48
ND2503-CHA-1500-3T	15.00	16	133	83	48
ND2503-CHA-1510-3T	15.10	16	133	83	48
ND2503-CHA-1520-3T	15.20	16	133	83	48
ND2503-CHA-1530-3T	15.30	16	133	83	48
ND2503-CHA-1540-3T	15.40	16	133	83	48
ND2503-CHA-1550-3T	15.50	16	133	83	48
ND2503-CHA-1560-3T	15.60	16	133	83	48
ND2503-CHA-1570-3T	15.70	16	133	83	48
ND2503-CHA-1580-3T	15.80	16	133	83	48
ND2503-CHA-1590-3T	15.90	16	133	83	48
ND2503-CHA-1600-3T	16.00	16	133	83	48
ND2503-CHA-1610-3T	16.10	18	143	93	48
ND2503-CHA-1620-3T	16.20	18	143	93	48
ND2503-CHA-1630-3T	16.30	18	143	93	48
ND2503-CHA-1640-3T	16.40	18	143	93	48

See the next page 



Carbide Ratio Drill - 3 Flutes

ND2503-CHA-3T



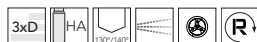
Aluminium and Al alloys · Al materials with high Si-content

Unit: mm

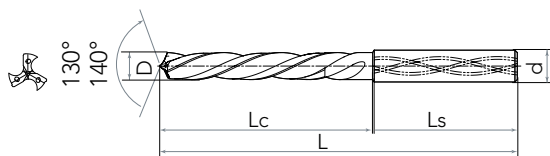
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1650-3T	16.50	18	143	93	45
ND2503-CHA-1660-3T	16.60	18	143	93	45
ND2503-CHA-1670-3T	16.70	18	143	93	45
ND2503-CHA-1680-3T	16.80	18	143	93	48
ND2503-CHA-1690-3T	16.90	18	143	93	48
ND2503-CHA-1700-3T	17.00	18	143	93	48
ND2503-CHA-1710-3T	17.10	18	143	93	48
ND2503-CHA-1720-3T	17.20	18	143	93	48
ND2503-CHA-1730-3T	17.30	18	143	93	48
ND2503-CHA-1740-3T	17.40	18	143	93	48
ND2503-CHA-1750-3T	17.50	18	143	93	48
ND2503-CHA-1760-3T	17.60	18	143	93	48
ND2503-CHA-1770-3T	17.70	18	143	93	48
ND2503-CHA-1780-3T	17.80	18	143	93	48
ND2503-CHA-1790-3T	17.90	18	143	93	48
ND2503-CHA-1800-3T	18.00	18	143	93	48
ND2503-CHA-1810-3T	18.10	20	153	101	50
ND2503-CHA-1820-3T	18.20	20	153	101	50
ND2503-CHA-1830-3T	18.30	20	153	101	50
ND2503-CHA-1840-3T	18.40	20	153	101	50
ND2503-CHA-1850-3T	18.50	20	153	101	50
ND2503-CHA-1860-3T	18.60	20	153	101	50
ND2503-CHA-1870-3T	18.70	20	153	101	50
ND2503-CHA-1880-3T	18.80	20	153	101	50
ND2503-CHA-1890-3T	18.90	20	153	101	50
ND2503-CHA-1900-3T	19.00	20	153	101	50
ND2503-CHA-1910-3T	19.10	20	153	101	50

See the next page

ND2503-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2503-CHA-1920-3T	19.20	20	153	101	50
ND2503-CHA-1930-3T	19.30	20	153	101	50
ND2503-CHA-1940-3T	19.40	20	153	101	50
ND2503-CHA-1950-3T	19.50	20	153	101	50
ND2503-CHA-1960-3T	19.60	20	153	101	50
ND2503-CHA-1970-3T	19.70	20	153	101	50
ND2503-CHA-1980-3T	19.80	20	153	101	50
ND2503-CHA-1990-3T	19.90	20	153	101	50
ND2503-CHA-2000-3T	20.00	20	153	101	50

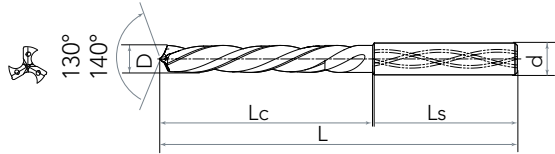
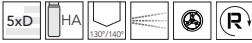
Recommended cutting data see page 132





Carbide Ratio Drill - 3 Flutes

ND2505-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content

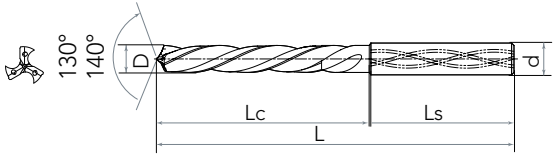
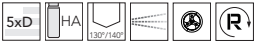
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-0300-3T	3.00	6	66	28	36
ND2505-CHA-0310-3T	3.10	6	66	28	36
ND2505-CHA-0320-3T	3.20	6	66	28	36
ND2505-CHA-0330-3T	3.30	6	66	28	36
ND2505-CHA-0340-3T	3.40	6	66	28	36
ND2505-CHA-0350-3T	3.50	6	66	28	36
ND2505-CHA-0360-3T	3.60	6	66	28	36
ND2505-CHA-0370-3T	3.70	6	66	28	36
ND2505-CHA-0380-3T	3.80	6	74	36	36
ND2505-CHA-0390-3T	3.90	6	74	36	36
ND2505-CHA-0400-3T	4.00	6	74	36	36
ND2505-CHA-0410-3T	4.10	6	74	36	36
ND2505-CHA-0420-3T	4.20	6	74	36	36
ND2505-CHA-0430-3T	4.30	6	74	36	36
ND2505-CHA-0440-3T	4.40	6	74	36	36
ND2505-CHA-0450-3T	4.50	6	74	36	36
ND2505-CHA-0460-3T	4.60	6	74	36	36
ND2505-CHA-0470-3T	4.70	6	74	36	36
ND2505-CHA-0480-3T	4.80	6	82	44	36
ND2505-CHA-0490-3T	4.90	6	82	44	36
ND2505-CHA-0500-3T	5.00	6	82	44	36
ND2505-CHA-0510-3T	5.10	6	82	44	36
ND2505-CHA-0520-3T	5.20	6	82	44	36
ND2505-CHA-0530-3T	5.30	6	82	44	36
ND2505-CHA-0540-3T	5.40	6	82	44	36
ND2505-CHA-0550-3T	5.50	6	82	44	36
ND2505-CHA-0560-3T	5.60	6	82	44	36

See the next page



ND2505-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content

Unit: mm

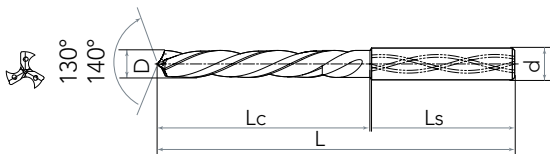
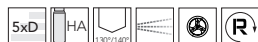
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-0570-3T	5.70	6	82	44	36
ND2505-CHA-0580-3T	5.80	6	82	44	36
ND2505-CHA-0590-3T	5.90	6	82	44	36
ND2505-CHA-0600-3T	6.00	6	82	44	36
ND2505-CHA-0610-3T	6.10	8	91	53	36
ND2505-CHA-0620-3T	6.20	8	91	53	36
ND2505-CHA-0630-3T	6.30	8	91	53	36
ND2505-CHA-0640-3T	6.40	8	91	53	36
ND2505-CHA-0650-3T	6.50	8	91	53	36
ND2505-CHA-0660-3T	6.60	8	91	53	36
ND2505-CHA-0670-3T	6.70	8	91	53	36
ND2505-CHA-0680-3T	6.80	8	91	53	36
ND2505-CHA-0690-3T	6.90	8	91	53	36
ND2505-CHA-0700-3T	7.00	8	91	53	36
ND2505-CHA-0710-3T	7.10	8	91	53	36
ND2505-CHA-0720-3T	7.20	8	91	53	36
ND2505-CHA-0730-3T	7.30	8	91	53	36
ND2505-CHA-0740-3T	7.40	8	91	53	36
ND2505-CHA-0750-3T	7.50	8	91	53	36
ND2505-CHA-0760-3T	7.60	8	91	53	36
ND2505-CHA-0770-3T	7.70	8	91	53	36
ND2505-CHA-0780-3T	7.80	8	91	53	36
ND2505-CHA-0790-3T	7.90	8	91	53	36
ND2505-CHA-0800-3T	8.00	8	91	53	36
ND2505-CHA-0810-3T	8.10	10	103	61	40
ND2505-CHA-0820-3T	8.20	10	103	61	40
ND2505-CHA-0830-3T	8.30	10	103	61	40

See the next page



Carbide Ratio Drill - 3 Flutes

ND2505-CHA-3T



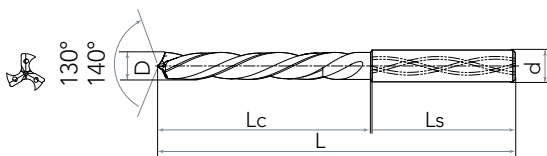
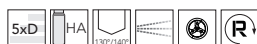
Aluminium and Al alloys · Al materials with high Si-content

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-0840-3T	8.40	10	103	61	40
ND2505-CHA-0850-3T	8.50	10	103	61	40
ND2505-CHA-0860-3T	8.60	10	103	61	40
ND2505-CHA-0870-3T	8.70	10	103	61	40
ND2505-CHA-0880-3T	8.80	10	103	61	40
ND2505-CHA-0890-3T	8.90	10	103	61	40
ND2505-CHA-0900-3T	9.00	10	103	61	40
ND2505-CHA-0910-3T	9.10	10	103	61	40
ND2505-CHA-0920-3T	9.20	10	103	61	40
ND2505-CHA-0930-3T	9.30	10	103	61	40
ND2505-CHA-0940-3T	9.40	10	103	61	40
ND2505-CHA-0950-3T	9.50	10	103	61	40
ND2505-CHA-0960-3T	9.60	10	103	61	40
ND2505-CHA-0970-3T	9.70	10	103	61	40
ND2505-CHA-0980-3T	9.80	10	103	61	40
ND2505-CHA-0990-3T	9.90	10	103	61	40
ND2505-CHA-1000-3T	10.00	10	103	61	40
ND2505-CHA-1010-3T	10.10	12	118	71	45
ND2505-CHA-1020-3T	10.20	12	118	71	45
ND2505-CHA-1030-3T	10.30	12	118	71	45
ND2505-CHA-1040-3T	10.40	12	118	71	45
ND2505-CHA-1050-3T	10.50	12	118	71	45
ND2505-CHA-1060-3T	10.60	12	118	71	45
ND2505-CHA-1070-3T	10.70	12	118	71	45
ND2505-CHA-1080-3T	10.80	12	118	71	45
ND2505-CHA-1090-3T	10.90	12	118	71	45
ND2505-CHA-1100-3T	11.00	12	118	71	45

See the next page 

ND2505-CHA-3T



Aluminium and Al alloys · Al materials with high Si-content

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1110-3T	11.10	12	118	71	45
ND2505-CHA-1120-3T	11.20	12	118	71	45
ND2505-CHA-1130-3T	11.30	12	118	71	45
ND2505-CHA-1140-3T	11.40	12	118	71	45
ND2505-CHA-1150-3T	11.50	12	118	71	45
ND2505-CHA-1160-3T	11.60	12	118	71	45
ND2505-CHA-1170-3T	11.70	12	118	71	45
ND2505-CHA-1180-3T	11.80	12	118	71	45
ND2505-CHA-1190-3T	11.90	12	118	71	45
ND2505-CHA-1200-3T	12.00	12	118	71	45
ND2505-CHA-1210-3T	12.10	14	124	77	45
ND2505-CHA-1220-3T	12.20	14	124	77	45
ND2505-CHA-1230-3T	12.30	14	124	77	45
ND2505-CHA-1240-3T	12.40	14	124	77	45
ND2505-CHA-1250-3T	12.50	14	124	77	45
ND2505-CHA-1260-3T	12.60	14	124	77	45
ND2505-CHA-1270-3T	12.70	14	124	77	45
ND2505-CHA-1280-3T	12.80	14	124	77	45
ND2505-CHA-1290-3T	12.90	14	124	77	45
ND2505-CHA-1300-3T	13.00	14	124	77	45
ND2505-CHA-1310-3T	13.10	14	124	77	45
ND2505-CHA-1320-3T	13.20	14	124	77	45
ND2505-CHA-1330-3T	13.30	14	124	77	45
ND2505-CHA-1340-3T	13.40	14	124	77	45
ND2505-CHA-1350-3T	13.50	14	124	77	45
ND2505-CHA-1360-3T	13.60	14	124	77	45
ND2505-CHA-1370-3T	13.70	14	124	77	45

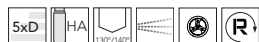
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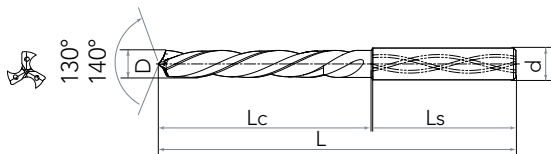


Carbide Ratio Drill - 3 Flutes

ND2505-CHA-3T



Aluminium and Al alloys · Al materials with high Si-content

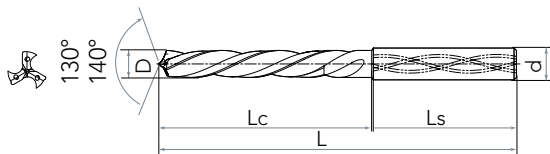
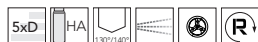


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1380-3T	13.80	14	124	71	45
ND2505-CHA-1390-3T	13.90	14	124	71	45
ND2505-CHA-1400-3T	14.00	14	124	71	45
ND2505-CHA-1410-3T	14.10	16	133	83	48
ND2505-CHA-1420-3T	14.20	16	133	83	48
ND2505-CHA-1430-3T	14.30	16	133	83	48
ND2505-CHA-1440-3T	14.40	16	133	83	48
ND2505-CHA-1450-3T	14.50	16	133	83	48
ND2505-CHA-1460-3T	14.60	16	133	83	48
ND2505-CHA-1470-3T	14.70	16	133	83	48
ND2505-CHA-1480-3T	14.80	16	133	83	48
ND2505-CHA-1490-3T	14.90	16	133	83	48
ND2505-CHA-1500-3T	15.00	16	133	83	48
ND2505-CHA-1510-3T	15.10	16	133	83	48
ND2505-CHA-1520-3T	15.20	16	133	83	48
ND2505-CHA-1530-3T	15.30	16	133	83	48
ND2505-CHA-1540-3T	15.40	16	133	83	48
ND2505-CHA-1550-3T	15.50	16	133	83	48
ND2505-CHA-1560-3T	15.60	16	133	83	48
ND2505-CHA-1570-3T	15.70	16	133	83	48
ND2505-CHA-1580-3T	15.80	16	133	83	48
ND2505-CHA-1590-3T	15.90	16	133	83	48
ND2505-CHA-1600-3T	16.00	16	133	83	48
ND2505-CHA-1610-3T	16.10	18	143	93	48
ND2505-CHA-1620-3T	16.20	18	143	93	48
ND2505-CHA-1630-3T	16.30	18	143	93	48
ND2505-CHA-1640-3T	16.40	18	143	93	48

See the next page 

ND2505-CHA-3T



Aluminium and Al alloys - Al materials with high Si-content

Unit: mm

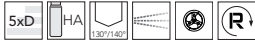
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1650-3T	16.50	18	143	93	45
ND2505-CHA-1660-3T	16.60	18	143	93	45
ND2505-CHA-1670-3T	16.70	18	143	93	45
ND2505-CHA-1680-3T	16.80	18	143	93	48
ND2505-CHA-1690-3T	16.90	18	143	93	48
ND2505-CHA-1700-3T	17.00	18	143	93	48
ND2505-CHA-1710-3T	17.10	18	143	93	48
ND2505-CHA-1720-3T	17.20	18	143	93	48
ND2505-CHA-1730-3T	17.30	18	143	93	48
ND2505-CHA-1740-3T	17.40	18	143	93	48
ND2505-CHA-1750-3T	17.50	18	143	93	48
ND2505-CHA-1760-3T	17.60	18	143	93	48
ND2505-CHA-1770-3T	17.70	18	143	93	48
ND2505-CHA-1780-3T	17.80	18	143	93	48
ND2505-CHA-1790-3T	17.90	18	143	93	48
ND2505-CHA-1800-3T	18.00	18	143	93	48
ND2505-CHA-1810-3T	18.10	20	153	101	50
ND2505-CHA-1820-3T	18.20	20	153	101	50
ND2505-CHA-1830-3T	18.30	20	153	101	50
ND2505-CHA-1840-3T	18.40	20	153	101	50
ND2505-CHA-1850-3T	18.50	20	153	101	50
ND2505-CHA-1860-3T	18.60	20	153	101	50
ND2505-CHA-1870-3T	18.70	20	153	101	50
ND2505-CHA-1880-3T	18.80	20	153	101	50
ND2505-CHA-1890-3T	18.90	20	153	101	50
ND2505-CHA-1900-3T	19.00	20	153	101	50
ND2505-CHA-1910-3T	19.10	20	153	101	50

See the next page 

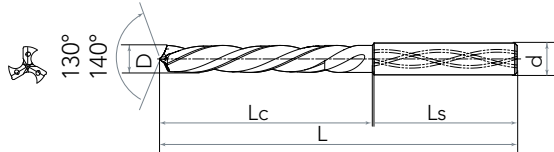


Carbide Ratio Drill - 3 Flutes

ND2505-CHA-3T



Aluminium and Al alloys · Al materials with high Si-content



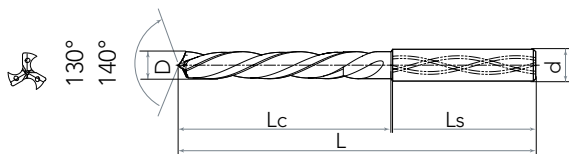
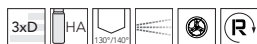
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2505-CHA-1920-3T	19.20	20	153	101	50
ND2505-CHA-1930-3T	19.30	20	153	101	50
ND2505-CHA-1940-3T	19.40	20	153	101	50
ND2505-CHA-1950-3T	19.50	20	153	101	50
ND2505-CHA-1960-3T	19.60	20	153	101	50
ND2505-CHA-1970-3T	19.70	20	153	101	50
ND2505-CHA-1980-3T	19.80	20	153	101	50
ND2505-CHA-1990-3T	19.90	20	153	101	50
ND2505-CHA-2000-3T	20.00	20	153	101	50

Recommended cutting data see page 132



ND2603-CHA-3T



Stainless/acid/heat-resistant steels - Titanium and Titanium alloys - Inconel, Hastelloy, Monel

Unit: mm

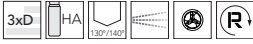
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-0300-3T	3.00	6	62	20	36
ND2603-CHA-0310-3T	3.10	6	62	20	36
ND2603-CHA-0320-3T	3.20	6	62	20	36
ND2603-CHA-0330-3T	3.30	6	62	20	36
ND2603-CHA-0340-3T	3.40	6	62	20	36
ND2603-CHA-0350-3T	3.50	6	62	20	36
ND2603-CHA-0360-3T	3.60	6	62	20	36
ND2603-CHA-0370-3T	3.70	6	62	20	36
ND2603-CHA-0380-3T	3.80	6	66	24	36
ND2603-CHA-0390-3T	3.90	6	66	24	36
ND2603-CHA-0400-3T	4.00	6	66	24	36
ND2603-CHA-0410-3T	4.10	6	66	24	36
ND2603-CHA-0420-3T	4.20	6	66	24	36
ND2603-CHA-0430-3T	4.30	6	66	24	36
ND2603-CHA-0440-3T	4.40	6	66	24	36
ND2603-CHA-0450-3T	4.50	6	66	24	36
ND2603-CHA-0460-3T	4.60	6	66	24	36
ND2603-CHA-0470-3T	4.70	6	66	24	36
ND2603-CHA-0480-3T	4.80	6	66	28	36
ND2603-CHA-0490-3T	4.90	6	66	28	36
ND2603-CHA-0500-3T	5.00	6	66	28	36
ND2603-CHA-0510-3T	5.10	6	66	28	36
ND2603-CHA-0520-3T	5.20	6	66	28	36
ND2603-CHA-0530-3T	5.30	6	66	28	36
ND2603-CHA-0540-3T	5.40	6	66	28	36
ND2603-CHA-0550-3T	5.50	6	66	28	36
ND2603-CHA-0560-3T	5.60	6	66	28	36

See the next page 

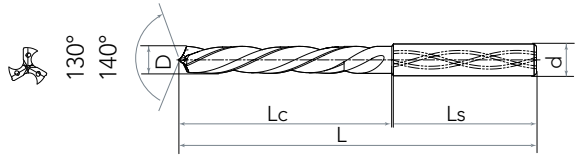


Carbide Ratio Drill - 3 Flutes

ND2603-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

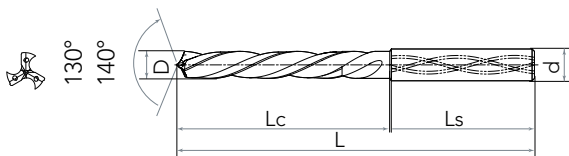
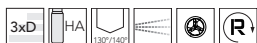


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-0570-3T	5.70	6	66	28	36
ND2603-CHA-0580-3T	5.80	6	66	28	36
ND2603-CHA-0590-3T	5.90	6	66	28	36
ND2603-CHA-0600-3T	6.00	6	66	28	36
ND2603-CHA-0610-3T	6.10	8	79	34	36
ND2603-CHA-0620-3T	6.20	8	79	34	36
ND2603-CHA-0630-3T	6.30	8	79	34	36
ND2603-CHA-0640-3T	6.40	8	79	34	36
ND2603-CHA-0650-3T	6.50	8	79	34	36
ND2603-CHA-0660-3T	6.60	8	79	34	36
ND2603-CHA-0670-3T	6.70	8	79	34	36
ND2603-CHA-0680-3T	6.80	8	79	34	36
ND2603-CHA-0690-3T	6.90	8	79	34	36
ND2603-CHA-0700-3T	7.00	8	79	34	36
ND2603-CHA-0710-3T	7.10	8	79	41	36
ND2603-CHA-0720-3T	7.20	8	79	41	36
ND2603-CHA-0730-3T	7.30	8	79	41	36
ND2603-CHA-0740-3T	7.40	8	79	41	36
ND2603-CHA-0750-3T	7.50	8	79	41	36
ND2603-CHA-0760-3T	7.60	8	79	41	36
ND2603-CHA-0770-3T	7.70	8	79	41	36
ND2603-CHA-0780-3T	7.80	8	79	41	36
ND2603-CHA-0790-3T	7.90	8	79	41	36
ND2603-CHA-0800-3T	8.00	8	79	41	36
ND2603-CHA-0810-3T	8.10	10	89	47	40
ND2603-CHA-0820-3T	8.20	10	89	47	40
ND2603-CHA-0830-3T	8.30	10	89	47	40

See the next page

ND2603-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

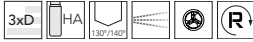
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-0840-3T	8.40	10	89	47	40
ND2603-CHA-0850-3T	8.50	10	89	47	40
ND2603-CHA-0860-3T	8.60	10	89	47	40
ND2603-CHA-0870-3T	8.70	10	89	47	40
ND2603-CHA-0880-3T	8.80	10	89	47	40
ND2603-CHA-0890-3T	8.90	10	89	47	40
ND2603-CHA-0900-3T	9.00	10	89	47	40
ND2603-CHA-0910-3T	9.10	10	89	47	40
ND2603-CHA-0920-3T	9.20	10	89	47	40
ND2603-CHA-0930-3T	9.30	10	89	47	40
ND2603-CHA-0940-3T	9.40	10	89	47	40
ND2603-CHA-0950-3T	9.50	10	89	47	40
ND2603-CHA-0960-3T	9.60	10	89	47	40
ND2603-CHA-0970-3T	9.70	10	89	47	40
ND2603-CHA-0980-3T	9.80	10	89	47	40
ND2603-CHA-0990-3T	9.90	10	89	47	40
ND2603-CHA-1000-3T	10.00	10	89	47	40
ND2603-CHA-1010-3T	10.10	12	102	55	45
ND2603-CHA-1020-3T	10.20	12	102	55	45
ND2603-CHA-1030-3T	10.30	12	102	55	45
ND2603-CHA-1040-3T	10.40	12	102	55	45
ND2603-CHA-1050-3T	10.50	12	102	55	45
ND2603-CHA-1060-3T	10.60	12	102	55	45
ND2603-CHA-1070-3T	10.70	12	102	55	45
ND2603-CHA-1080-3T	10.80	12	102	55	45
ND2603-CHA-1090-3T	10.90	12	102	55	45
ND2603-CHA-1100-3T	11.00	12	102	55	45

See the next page 

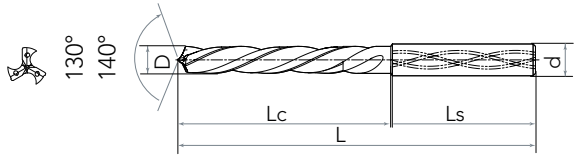


Carbide Ratio Drill - 3 Flutes

ND2603-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



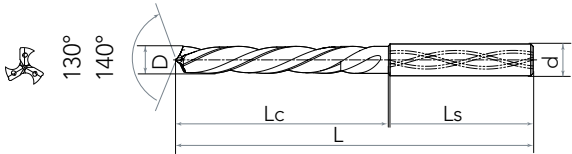
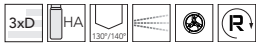
Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1110-3T	11.10	12	102	55	45
ND2603-CHA-1120-3T	11.20	12	102	55	45
ND2603-CHA-1130-3T	11.30	12	102	55	45
ND2603-CHA-1140-3T	11.40	12	102	55	45
ND2603-CHA-1150-3T	11.50	12	102	55	45
ND2603-CHA-1160-3T	11.60	12	102	55	45
ND2603-CHA-1170-3T	11.70	12	102	55	45
ND2603-CHA-1180-3T	11.80	12	102	55	45
ND2603-CHA-1190-3T	11.90	12	102	55	45
ND2603-CHA-1200-3T	12.00	12	102	55	45
ND2603-CHA-1210-3T	12.10	14	107	60	45
ND2603-CHA-1220-3T	12.20	14	107	60	45
ND2603-CHA-1230-3T	12.30	14	107	60	45
ND2603-CHA-1240-3T	12.40	14	107	60	45
ND2603-CHA-1250-3T	12.50	14	107	60	45
ND2603-CHA-1260-3T	12.60	14	107	60	45
ND2603-CHA-1270-3T	12.70	14	107	60	45
ND2603-CHA-1280-3T	12.80	14	107	60	45
ND2603-CHA-1290-3T	12.90	14	107	60	45
ND2603-CHA-1300-3T	13.00	14	107	60	45
ND2603-CHA-1310-3T	13.10	14	107	60	45
ND2603-CHA-1320-3T	13.20	14	107	60	45
ND2603-CHA-1330-3T	13.30	14	107	60	45
ND2603-CHA-1340-3T	13.40	14	107	60	45
ND2603-CHA-1350-3T	13.50	14	107	60	45
ND2603-CHA-1360-3T	13.60	14	107	60	45
ND2603-CHA-1370-3T	13.70	14	107	60	45

See the next page



ND2603-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

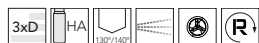
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1380-3T	13.80	14	107	60	45
ND2603-CHA-1390-3T	13.90	14	107	60	45
ND2603-CHA-1400-3T	14.00	14	107	60	45
ND2603-CHA-1410-3T	14.10	16	115	65	48
ND2603-CHA-1420-3T	14.20	16	115	65	48
ND2603-CHA-1430-3T	14.30	16	115	65	48
ND2603-CHA-1440-3T	14.40	16	115	65	48
ND2603-CHA-1450-3T	14.50	16	115	65	48
ND2603-CHA-1460-3T	14.60	16	115	65	48
ND2603-CHA-1470-3T	14.70	16	115	65	48
ND2603-CHA-1480-3T	14.80	16	115	65	48
ND2603-CHA-1490-3T	14.90	16	115	65	48
ND2603-CHA-1500-3T	15.00	16	115	65	48
ND2603-CHA-1510-3T	15.10	16	115	65	48
ND2603-CHA-1520-3T	15.20	16	115	65	48
ND2603-CHA-1530-3T	15.30	16	115	65	48
ND2603-CHA-1540-3T	15.40	16	115	65	48
ND2603-CHA-1550-3T	15.50	16	115	65	48
ND2603-CHA-1560-3T	15.60	16	115	65	48
ND2603-CHA-1570-3T	15.70	16	115	65	48
ND2603-CHA-1580-3T	15.80	16	115	65	48
ND2603-CHA-1590-3T	15.90	16	115	65	48
ND2603-CHA-1600-3T	16.00	16	115	65	48
ND2603-CHA-1610-3T	16.10	18	123	73	48
ND2603-CHA-1620-3T	16.20	18	123	73	48
ND2603-CHA-1630-3T	16.30	18	123	73	48
ND2603-CHA-1640-3T	16.40	18	123	73	48

See the next page

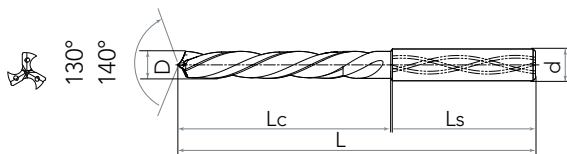


Carbide Ratio Drill - 3 Flutes

ND2603-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

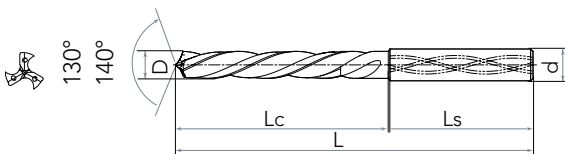
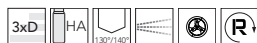


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1650-3T	16.50	18	123	73	48
ND2603-CHA-1660-3T	16.60	18	123	73	48
ND2603-CHA-1670-3T	16.70	18	123	73	48
ND2603-CHA-1680-3T	16.80	18	123	73	48
ND2603-CHA-1690-3T	16.90	18	123	73	48
ND2603-CHA-1700-3T	17.00	18	123	73	48
ND2603-CHA-1710-3T	17.10	18	123	73	48
ND2603-CHA-1720-3T	17.20	18	123	73	48
ND2603-CHA-1730-3T	17.30	18	123	73	48
ND2603-CHA-1740-3T	17.40	18	123	73	48
ND2603-CHA-1750-3T	17.50	18	123	73	48
ND2603-CHA-1760-3T	17.60	18	123	73	48
ND2603-CHA-1770-3T	17.70	18	123	73	48
ND2603-CHA-1780-3T	17.80	18	123	73	48
ND2603-CHA-1790-3T	17.90	18	123	73	48
ND2603-CHA-1800-3T	18.00	18	123	73	48
ND2603-CHA-1810-3T	18.10	20	131	79	50
ND2603-CHA-1820-3T	18.20	20	131	79	50
ND2603-CHA-1830-3T	18.30	20	131	79	50
ND2603-CHA-1840-3T	18.40	20	131	79	50
ND2603-CHA-1850-3T	18.50	20	131	79	50
ND2603-CHA-1860-3T	18.60	20	131	79	50
ND2603-CHA-1870-3T	18.70	20	131	79	50
ND2603-CHA-1880-3T	18.80	20	131	79	50
ND2603-CHA-1890-3T	18.90	20	131	79	50
ND2603-CHA-1900-3T	19.00	20	131	79	50
ND2603-CHA-1910-3T	19.10	20	131	79	50

See the next page

ND2603-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2603-CHA-1920-3T	19.20	20	131	79	50
ND2603-CHA-1930-3T	19.30	20	131	79	50
ND2603-CHA-1940-3T	19.40	20	131	79	50
ND2603-CHA-1950-3T	19.50	20	131	79	50
ND2603-CHA-1960-3T	19.60	20	131	79	50
ND2603-CHA-1970-3T	19.70	20	131	79	50
ND2603-CHA-1980-3T	19.80	20	131	79	50
ND2603-CHA-1990-3T	19.90	20	131	79	50
ND2603-CHA-2000-3T	20.00	20	131	79	50

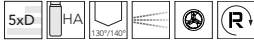
Recommended cutting data see page 132



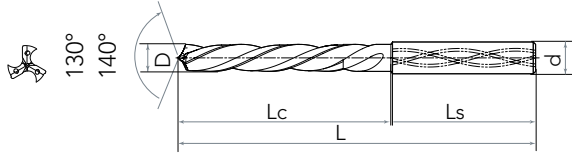


Carbide Ratio Drill - 3 Flutes

ND2605-CHA-3T



Stainless/acid/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

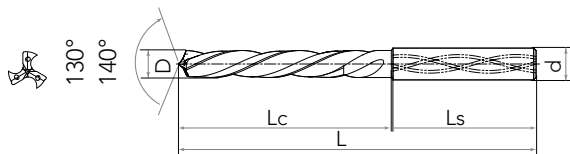
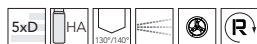


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-0300-3T	3.00	6	66	28	36
ND2605-CHA-0310-3T	3.10	6	66	28	36
ND2605-CHA-0320-3T	3.20	6	66	28	36
ND2605-CHA-0330-3T	3.30	6	66	28	36
ND2605-CHA-0340-3T	3.40	6	66	28	36
ND2605-CHA-0350-3T	3.50	6	66	28	36
ND2605-CHA-0360-3T	3.60	6	66	28	36
ND2605-CHA-0370-3T	3.70	6	66	28	36
ND2605-CHA-0380-3T	3.80	6	74	36	36
ND2605-CHA-0390-3T	3.90	6	74	36	36
ND2605-CHA-0400-3T	4.00	6	74	36	36
ND2605-CHA-0410-3T	4.10	6	74	36	36
ND2605-CHA-0420-3T	4.20	6	74	36	36
ND2605-CHA-0430-3T	4.30	6	74	36	36
ND2605-CHA-0440-3T	4.40	6	74	36	36
ND2605-CHA-0450-3T	4.50	6	74	36	36
ND2605-CHA-0460-3T	4.60	6	74	36	36
ND2605-CHA-0470-3T	4.70	6	74	36	36
ND2605-CHA-0480-3T	4.80	6	82	44	36
ND2605-CHA-0490-3T	4.90	6	82	44	36
ND2605-CHA-0500-3T	5.00	6	82	44	36
ND2605-CHA-0510-3T	5.10	6	82	44	36
ND2605-CHA-0520-3T	5.20	6	82	44	36
ND2605-CHA-0530-3T	5.30	6	82	44	36
ND2605-CHA-0540-3T	5.40	6	82	44	36
ND2605-CHA-0550-3T	5.50	6	82	44	36
ND2605-CHA-0560-3T	5.60	6	82	44	36

See the next page

ND2605-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

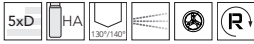
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-0570-3T	5.70	6	82	44	36
ND2605-CHA-0580-3T	5.80	6	82	44	36
ND2605-CHA-0590-3T	5.90	6	82	44	36
ND2605-CHA-0600-3T	6.00	6	82	44	36
ND2605-CHA-0610-3T	6.10	8	91	53	36
ND2605-CHA-0620-3T	6.20	8	91	53	36
ND2605-CHA-0630-3T	6.30	8	91	53	36
ND2605-CHA-0640-3T	6.40	8	91	53	36
ND2605-CHA-0650-3T	6.50	8	91	53	36
ND2605-CHA-0660-3T	6.60	8	91	53	36
ND2605-CHA-0670-3T	6.70	8	91	53	36
ND2605-CHA-0680-3T	6.80	8	91	53	36
ND2605-CHA-0690-3T	6.90	8	91	53	36
ND2605-CHA-0700-3T	7.00	8	91	53	36
ND2605-CHA-0710-3T	7.10	8	91	53	36
ND2605-CHA-0720-3T	7.20	8	91	53	36
ND2605-CHA-0730-3T	7.30	8	91	53	36
ND2605-CHA-0740-3T	7.40	8	91	53	36
ND2605-CHA-0750-3T	7.50	8	91	53	36
ND2605-CHA-0760-3T	7.60	8	91	53	36
ND2605-CHA-0770-3T	7.70	8	91	53	36
ND2605-CHA-0780-3T	7.80	8	91	53	36
ND2605-CHA-0790-3T	7.90	8	91	53	36
ND2605-CHA-0800-3T	8.00	8	91	53	36
ND2605-CHA-0810-3T	8.10	10	103	61	40
ND2605-CHA-0820-3T	8.20	10	103	61	40
ND2605-CHA-0830-3T	8.30	10	103	61	40

See the next page 



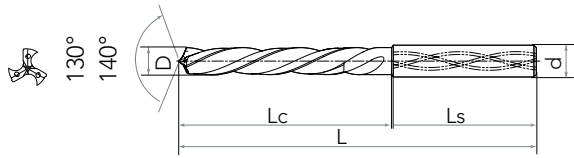
Carbide Ratio Drill - 3 Flutes

ND2605-CHA-3T



P M K N S H

Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

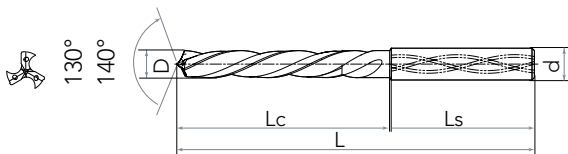
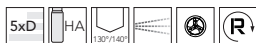


Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-0840-3T	8.40	10	103	61	40
ND2605-CHA-0850-3T	8.50	10	103	61	40
ND2605-CHA-0860-3T	8.60	10	103	61	40
ND2605-CHA-0870-3T	8.70	10	103	61	40
ND2605-CHA-0880-3T	8.80	10	103	61	40
ND2605-CHA-0890-3T	8.90	10	103	61	40
ND2605-CHA-0900-3T	9.00	10	103	61	40
ND2605-CHA-0910-3T	9.10	10	103	61	40
ND2605-CHA-0920-3T	9.20	10	103	61	40
ND2605-CHA-0930-3T	9.30	10	103	61	40
ND2605-CHA-0940-3T	9.40	10	103	61	40
ND2605-CHA-0950-3T	9.50	10	103	61	40
ND2605-CHA-0960-3T	9.60	10	103	61	40
ND2605-CHA-0970-3T	9.70	10	103	61	40
ND2605-CHA-0980-3T	9.80	10	103	61	40
ND2605-CHA-0990-3T	9.90	10	103	61	40
ND2605-CHA-1000-3T	10.00	10	103	61	40
ND2605-CHA-1010-3T	10.10	12	118	71	45
ND2605-CHA-1020-3T	10.20	12	118	71	45
ND2605-CHA-1030-3T	10.30	12	118	71	45
ND2605-CHA-1040-3T	10.40	12	118	71	45
ND2605-CHA-1050-3T	10.50	12	118	71	45
ND2605-CHA-1060-3T	10.60	12	118	71	45
ND2605-CHA-1070-3T	10.70	12	118	71	45
ND2605-CHA-1080-3T	10.80	12	118	71	45
ND2605-CHA-1090-3T	10.90	12	118	71	45
ND2605-CHA-1100-3T	11.00	12	118	71	45

See the next page

ND2605-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

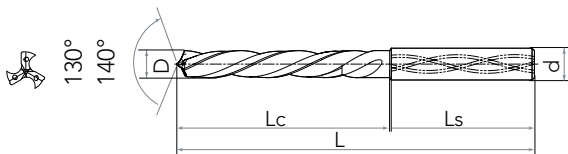
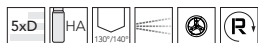
Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1110-3T	11.10	12	118	71	45
ND2605-CHA-1120-3T	11.20	12	118	71	45
ND2605-CHA-1130-3T	11.30	12	118	71	45
ND2605-CHA-1140-3T	11.40	12	118	71	45
ND2605-CHA-1150-3T	11.50	12	118	71	45
ND2605-CHA-1160-3T	11.60	12	118	71	45
ND2605-CHA-1170-3T	11.70	12	118	71	45
ND2605-CHA-1180-3T	11.80	12	118	71	45
ND2605-CHA-1190-3T	11.90	12	118	71	45
ND2605-CHA-1200-3T	12.00	12	118	71	45
ND2605-CHA-1210-3T	12.10	14	124	77	45
ND2605-CHA-1220-3T	12.20	14	124	77	45
ND2605-CHA-1230-3T	12.30	14	124	77	45
ND2605-CHA-1240-3T	12.40	14	124	77	45
ND2605-CHA-1250-3T	12.50	14	124	77	45
ND2605-CHA-1260-3T	12.60	14	124	77	45
ND2605-CHA-1270-3T	12.70	14	124	77	45
ND2605-CHA-1280-3T	12.80	14	124	77	45
ND2605-CHA-1290-3T	12.90	14	124	77	45
ND2605-CHA-1300-3T	13.00	14	124	77	45
ND2605-CHA-1310-3T	13.10	14	124	77	45
ND2605-CHA-1320-3T	13.20	14	124	77	45
ND2605-CHA-1330-3T	13.30	14	124	77	45
ND2605-CHA-1340-3T	13.40	14	124	77	45
ND2605-CHA-1350-3T	13.50	14	124	77	45
ND2605-CHA-1360-3T	13.60	14	124	77	45
ND2605-CHA-1370-3T	13.70	14	124	77	45

See the next page 



Carbide Ratio Drill - 3 Flutes

ND2605-CHA-3T



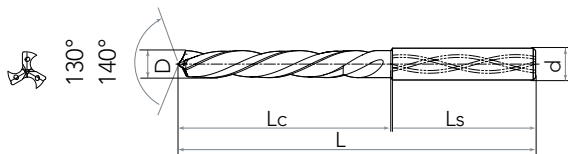
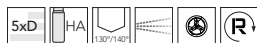
Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1380-3T	13.80	14	124	77	45
ND2605-CHA-1390-3T	13.90	14	124	77	45
ND2605-CHA-1400-3T	14.00	14	124	77	45
ND2605-CHA-1410-3T	14.10	16	133	83	48
ND2605-CHA-1420-3T	14.20	16	133	83	48
ND2605-CHA-1430-3T	14.30	16	133	83	48
ND2605-CHA-1440-3T	14.40	16	133	83	48
ND2605-CHA-1450-3T	14.50	16	133	83	48
ND2605-CHA-1460-3T	14.60	16	133	83	48
ND2605-CHA-1470-3T	14.70	16	133	83	48
ND2605-CHA-1480-3T	14.80	16	133	83	48
ND2605-CHA-1490-3T	14.90	16	133	83	48
ND2605-CHA-1500-3T	15.00	16	133	83	48
ND2605-CHA-1510-3T	15.10	16	133	83	48
ND2605-CHA-1520-3T	15.20	16	133	83	48
ND2605-CHA-1530-3T	15.30	16	133	83	48
ND2605-CHA-1540-3T	15.40	16	133	83	48
ND2605-CHA-1550-3T	15.50	16	133	83	48
ND2605-CHA-1560-3T	15.60	16	133	83	48
ND2605-CHA-1570-3T	15.70	16	133	83	48
ND2605-CHA-1580-3T	15.80	16	133	83	48
ND2605-CHA-1590-3T	15.90	16	133	83	48
ND2605-CHA-1600-3T	16.00	16	133	83	48
ND2605-CHA-1610-3T	16.10	18	143	93	48
ND2605-CHA-1620-3T	16.20	18	143	93	48
ND2605-CHA-1630-3T	16.30	18	143	93	48
ND2605-CHA-1640-3T	16.40	18	143	93	48

See the next page

ND2605-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel

Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1650-3T	16.50	18	143	93	48
ND2605-CHA-1660-3T	16.60	18	143	93	48
ND2605-CHA-1670-3T	16.70	18	143	93	48
ND2605-CHA-1680-3T	16.80	18	143	93	48
ND2605-CHA-1690-3T	16.90	18	143	93	48
ND2605-CHA-1700-3T	17.00	18	143	93	48
ND2605-CHA-1710-3T	17.10	18	143	93	48
ND2605-CHA-1720-3T	17.20	18	143	93	48
ND2605-CHA-1730-3T	17.30	18	143	93	48
ND2605-CHA-1740-3T	17.40	18	143	93	48
ND2605-CHA-1750-3T	17.50	18	143	93	48
ND2605-CHA-1760-3T	17.60	18	143	93	48
ND2605-CHA-1770-3T	17.70	18	143	93	48
ND2605-CHA-1780-3T	17.80	18	143	93	48
ND2605-CHA-1790-3T	17.90	18	143	93	48
ND2605-CHA-1800-3T	18.00	18	143	93	48
ND2605-CHA-1810-3T	18.10	20	153	101	50
ND2605-CHA-1820-3T	18.20	20	153	101	50
ND2605-CHA-1830-3T	18.30	20	153	101	50
ND2605-CHA-1840-3T	18.40	20	153	101	50
ND2605-CHA-1850-3T	18.50	20	153	101	50
ND2605-CHA-1860-3T	18.60	20	153	101	50
ND2605-CHA-1870-3T	18.70	20	153	101	50
ND2605-CHA-1880-3T	18.80	20	153	101	50
ND2605-CHA-1890-3T	18.90	20	153	101	50
ND2605-CHA-1900-3T	19.00	20	153	101	50
ND2605-CHA-1910-3T	19.10	20	153	101	50

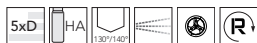
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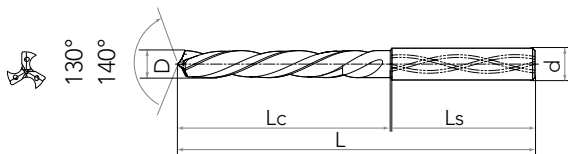


Carbide Ratio Drill - 3 Flutes

ND2605-CHA-3T



Stainless/acid-/heat-resistant steels · Titanium and Titanium alloys · Inconel, Hastelloy, Monel



Unit: mm

Specification	D (m7)	d (h6)	L	Lc	Ls
ND2605-CHA-1920-3T	19.20	20	153	101	50
ND2605-CHA-1930-3T	19.30	20	153	101	50
ND2605-CHA-1940-3T	19.40	20	153	101	50
ND2605-CHA-1950-3T	19.50	20	153	101	50
ND2605-CHA-1960-3T	19.60	20	153	101	50
ND2605-CHA-1970-3T	19.70	20	153	101	50
ND2605-CHA-1980-3T	19.80	20	153	101	50
ND2605-CHA-1990-3T	19.90	20	153	101	50
ND2605-CHA-2000-3T	20.00	20	153	101	50

Recommended cutting data see page 132





NAVIGATOR Carbide Ratio Drill - 3 Flutes

ISO	Material Group	Hardness		SFM	Feed Rate - IPR						
		HRC	BHN		3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm	19.05 mm	25.40 mm
P	Common Structural Steels	-	< 150	590	0.0050	0.0080	0.0125	0.0125	0.0155	0.0195	0.0195
	Common Structural Steels	< 32	< 301	525	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Free-cutting Steels	< 25	< 255	525	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Free-cutting Steels	< 32	< 301	525	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Unalloyed Heat-treatable Steels	< 20	< 220	525	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Unalloyed Heat-treatable Steels	< 25	< 255	525	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
	Unalloyed Heat-treatable Steels	< 32	< 301	425	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Alloyed Heat-treatable Steels	< 32	< 301	460	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
	Alloyed Heat-treatable Steels	< 43	< 402	360	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Unalloyed Case Hardened Steels	< 25	< 255	525	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
	Alloyed Case Hardened Steels	< 32	< 301	460	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
	Alloyed Case Hardened Steels	< 43	< 402	360	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Nitriding Steels	< 32	< 301	360	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Nitriding Steels	< 43	< 402	330	0.0040	0.0065	0.0100	0.0100	0.0125	0.0155	0.0155
	Tool Steels	< 25	< 255	295	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250
	Tool Steels	< 43	< 402	215	0.0050	0.0080	0.0125	0.0125	0.0155	0.0195	0.0195
	High Speed Steels	< 43	< 402	195	0.0040	0.0065	0.0100	0.0100	0.0125	0.0155	0.0155
	Spring Steels	< 38	< 354	195	0.0040	0.0065	0.0100	0.0100	0.0125	0.0155	0.0155
H	Hardened Steels	< 48	< 460	165	0.0030	0.0050	0.0080	0.0080	0.0100	0.0125	0.0125
M	Stainless steels, Sulphured	< 28	< 273	195	0.0030	0.0050	0.0080	0.0080	0.0100	0.0125	0.0125
	Martensitic	< 46	< 435	165	0.0030	0.0050	0.0080	0.0080	0.0100	0.0125	0.0125
	Cast Iron	< 23	< 242	460	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
K	Cast Iron	< 38	< 354	425	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
	Spheroidal Graphite Iron And	< 23	< 242	395	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0250
	Malleable Cast Iron	< 38	< 354	395	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0250

See the next page

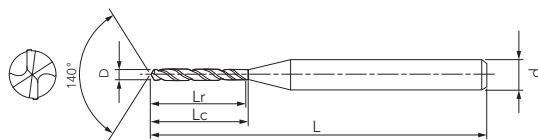
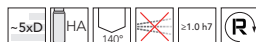


Cutting Data Table

NAVIGATOR Carbide Ratio Drill - 3 Flutes

ISO	Material Group	Hardness		SFM	Feed Rate - IPR						
		HRC	BHN		3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm	19.05 mm	25.40 mm
S	Special Alloys	< 54	< 549	80	0.0030	0.0050	0.0080	0.0080	0.0100	0.0125	0.0155
	Ti And Ti-alloys	< 25	< 255	115	0.0030	0.0050	0.0080	0.0080	0.0100	0.0125	0.0155
	Ti And Ti-alloys	< 43	< 402	100	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100	0.0125
N	Aluminium And Al-alloys	-	< 120	655	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0315
	Al Wrought Alloys	-	< 200	590	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0315
	Al Cast Alloys ≤ 10 % Si	-	< 180	560	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0315
	≤ 24 % Si	-	< 180	460	0.0065	0.0125	0.0155	0.0195	0.0250	0.0250	0.0315
	Magnesium Alloys	-	< 120	655	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0315
	Bronze, Short-chipping	-	< 180	655	0.0065	0.0100	0.0155	0.0155	0.0195	0.0250	0.0315

ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

Unit: mm

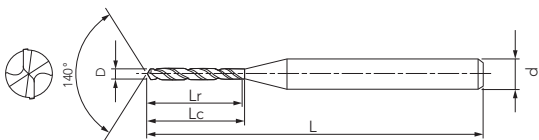
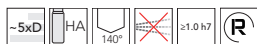
Specification	D	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0010	0.10	3	38	1.4	1.0
ND1305-NHA-0011	0.11	3	38	1.5	1.0
ND1305-NHA-0012	0.12	3	38	1.6	1.0
ND1305-NHA-0013	0.13	3	38	1.8	1.5
ND1305-NHA-0014	0.14	3	38	1.9	1.5
ND1305-NHA-0015	0.15	3	38	2.0	1.5
ND1305-NHA-0016	0.16	3	38	2.1	2.0
ND1305-NHA-0017	0.17	3	38	2.2	2.0
ND1305-NHA-0018	0.18	3	38	2.4	2.0
ND1305-NHA-0019	0.19	3	38	2.5	2.0
ND1305-NHA-0020	0.20	3	38	2.6	2.0
ND1305-NHA-0021	0.21	3	38	2.7	2.5
ND1305-NHA-0022	0.22	3	38	2.8	2.5
ND1305-NHA-0023	0.23	3	38	3.0	2.5
ND1305-NHA-0024	0.24	3	38	3.1	2.5
ND1305-NHA-0025	0.25	3	38	3.3	2.5
ND1305-NHA-0026	0.26	3	38	3.4	3.0
ND1305-NHA-0027	0.27	3	38	3.5	3.0
ND1305-NHA-0028	0.28	3	38	3.7	3.0
ND1305-NHA-0029	0.29	3	38	3.8	3.0
ND1305-NHA-0030	0.30	3	38	4.2	3.0
ND1305-NHA-0031	0.31	3	38	5.9	6.0
ND1305-NHA-0032	0.32	3	38	5.9	6.0
ND1305-NHA-0033	0.33	3	38	5.9	6.0
ND1305-NHA-0034	0.34	3	38	5.9	6.0
ND1305-NHA-0035	0.35	3	38	5.9	6.0
ND1305-NHA-0036	0.36	3	38	6.8	6.0

See the next page





ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

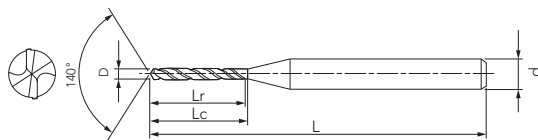
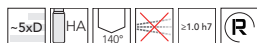
Unit: mm

Specification	D	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0037	0.37	3	38	6.8	6.0
ND1305-NHA-0038	0.38	3	38	6.8	6.0
ND1305-NHA-0039	0.39	3	38	6.8	6.0
ND1305-NHA-0040	0.40	3	38	6.8	6.0
ND1305-NHA-0041	0.41	3	38	7.7	6.0
ND1305-NHA-0042	0.42	3	38	7.7	6.0
ND1305-NHA-0043	0.43	3	38	7.7	6.0
ND1305-NHA-0044	0.44	3	38	7.7	6.0
ND1305-NHA-0045	0.45	3	38	7.7	6.0
ND1305-NHA-0046	0.46	3	38	8.7	6.0
ND1305-NHA-0047	0.47	3	38	8.7	6.0
ND1305-NHA-0048	0.48	3	38	8.7	6.0
ND1305-NHA-0049	0.49	3	38	8.7	6.0
ND1305-NHA-0050	0.50	3	38	8.7	9.0
ND1305-NHA-0051	0.51	3	38	7.2	9.0
ND1305-NHA-0052	0.52	3	38	7.2	9.0
ND1305-NHA-0053	0.53	3	38	7.2	9.0
ND1305-NHA-0054	0.54	3	38	7.2	9.0
ND1305-NHA-0055	0.55	3	38	7.2	9.0
ND1305-NHA-0056	0.56	3	38	7.9	9.0
ND1305-NHA-0057	0.57	3	38	7.9	9.0
ND1305-NHA-0058	0.58	3	38	7.9	9.0
ND1305-NHA-0059	0.59	3	38	7.9	9.0
ND1305-NHA-0060	0.60	3	38	7.9	9.0
ND1305-NHA-0061	0.61	3	38	8.5	9.0
ND1305-NHA-0062	0.62	3	38	8.5	9.0
ND1305-NHA-0063	0.63	3	38	8.5	9.0

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ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

Unit: mm

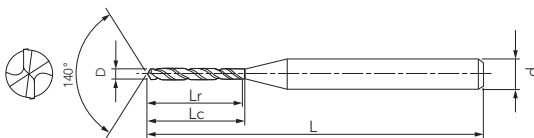
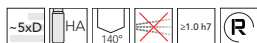
Specification	D	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0064	0.64	3	38	8.5	9.0
ND1305-NHA-0065	0.65	3	38	8.5	9.0
ND1305-NHA-0066	0.66	3	38	9.2	9.0
ND1305-NHA-0067	0.67	3	38	9.2	9.0
ND1305-NHA-0068	0.68	3	38	9.2	9.0
ND1305-NHA-0069	0.69	3	38	9.2	9.0
ND1305-NHA-0070	0.70	3	38	9.2	9.0
ND1305-NHA-0071	0.71	3	38	9.8	10.0
ND1305-NHA-0072	0.72	3	38	9.8	10.0
ND1305-NHA-0073	0.73	3	38	9.8	10.0
ND1305-NHA-0074	0.74	3	38	9.8	10.0
ND1305-NHA-0075	0.75	3	38	9.8	10.0
ND1305-NHA-0076	0.76	3	38	10.5	10.0
ND1305-NHA-0077	0.77	3	38	10.5	10.0
ND1305-NHA-0078	0.78	3	38	10.5	10.0
ND1305-NHA-0079	0.79	3	38	10.5	10.0
ND1305-NHA-0080	0.80	3	38	10.5	10.0
ND1305-NHA-0081	0.81	3	38	11.1	10.0
ND1305-NHA-0082	0.82	3	38	11.1	10.0
ND1305-NHA-0083	0.83	3	38	11.1	10.0
ND1305-NHA-0084	0.84	3	38	11.1	10.0
ND1305-NHA-0085	0.85	3	38	11.1	10.0
ND1305-NHA-0086	0.86	3	38	10.5	10.0
ND1305-NHA-0087	0.87	3	38	10.5	10.0
ND1305-NHA-0088	0.88	3	38	10.5	10.0
ND1305-NHA-0089	0.89	3	38	10.5	10.0
ND1305-NHA-0090	0.90	3	38	10.5	10.0

See the next page 



Micro Carbide Drill

ND1305-NHA



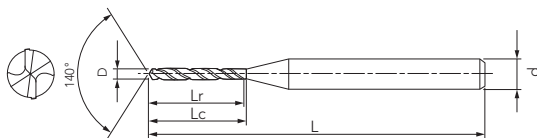
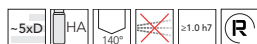
Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0091	0.91	3	38	11.1	10.0
ND1305-NHA-0092	0.92	3	38	11.1	10.0
ND1305-NHA-0093	0.93	3	38	11.1	10.0
ND1305-NHA-0094	0.94	3	38	11.1	10.0
ND1305-NHA-0095	0.95	3	38	11.1	10.0
ND1305-NHA-0096	0.96	3	38	11.6	10.0
ND1305-NHA-0097	0.97	3	38	11.6	10.0
ND1305-NHA-0098	0.98	3	38	11.6	10.0
ND1305-NHA-0099	0.99	3	38	11.6	10.0
ND1305-NHA-0100	1.00	3	38	12.1	12.0
ND1305-NHA-0101	1.01	3	38	8.6	8.0
ND1305-NHA-0102	1.02	3	38	8.6	8.0
ND1305-NHA-0103	1.03	3	38	8.6	8.0
ND1305-NHA-0104	1.04	3	38	8.6	8.0
ND1305-NHA-0105	1.05	3	38	8.6	8.0
ND1305-NHA-0106	1.06	3	38	8.6	8.0
ND1305-NHA-0107	1.07	3	38	8.6	8.0
ND1305-NHA-0108	1.08	3	38	8.6	8.0
ND1305-NHA-0109	1.09	3	38	8.6	8.0
ND1305-NHA-0110	1.10	3	38	8.6	8.0
ND1305-NHA-0111	1.11	3	38	9.5	8.9
ND1305-NHA-0112	1.12	3	38	9.5	8.9
ND1305-NHA-0113	1.13	3	38	9.5	8.9
ND1305-NHA-0114	1.14	3	38	9.5	8.9
ND1305-NHA-0115	1.15	3	38	9.5	8.9
ND1305-NHA-0116	1.16	3	38	9.5	8.9
ND1305-NHA-0117	1.17	3	38	9.5	8.9

See the next page

ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

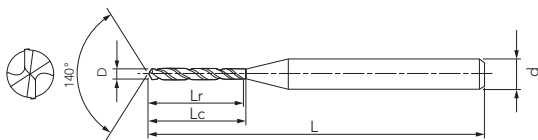
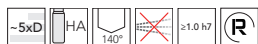
Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0118	1.18	3	38	9.5	8.9
ND1305-NHA-0119	1.19	3	38	9.5	8.9
ND1305-NHA-0120	1.20	3	38	9.5	8.9
ND1305-NHA-0121	1.21	3	38	10.3	9.7
ND1305-NHA-0122	1.22	3	38	10.3	9.7
ND1305-NHA-0123	1.23	3	38	10.3	9.7
ND1305-NHA-0124	1.24	3	38	10.3	9.7
ND1305-NHA-0125	1.25	3	38	10.3	9.7
ND1305-NHA-0126	1.26	3	38	10.3	9.7
ND1305-NHA-0127	1.27	3	38	10.3	9.7
ND1305-NHA-0128	1.28	3	38	10.3	9.7
ND1305-NHA-0129	1.29	3	38	10.3	9.7
ND1305-NHA-0130	1.30	3	38	10.3	9.7
ND1305-NHA-0131	1.31	3	38	11.1	10.5
ND1305-NHA-0132	1.32	3	38	11.1	10.5
ND1305-NHA-0133	1.33	3	38	11.1	10.5
ND1305-NHA-0134	1.34	3	38	11.1	10.5
ND1305-NHA-0135	1.35	3	38	11.1	10.5
ND1305-NHA-0136	1.36	3	38	11.1	10.5
ND1305-NHA-0137	1.37	3	38	11.1	10.5
ND1305-NHA-0138	1.38	3	38	11.1	10.5
ND1305-NHA-0139	1.39	3	38	11.1	10.5
ND1305-NHA-0140	1.40	3	38	11.1	10.5
ND1305-NHA-0141	1.41	3	38	11.9	11.3
ND1305-NHA-0142	1.42	3	38	11.9	11.3
ND1305-NHA-0143	1.43	3	38	11.9	11.3
ND1305-NHA-0144	1.44	3	38	11.9	11.3

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ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

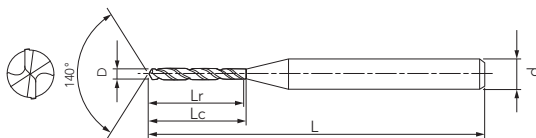
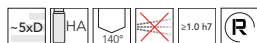
Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0145	1.45	3	38	11.9	11.3
ND1305-NHA-0146	1.46	3	38	11.9	11.3
ND1305-NHA-0147	1.47	3	38	11.9	11.3
ND1305-NHA-0148	1.48	3	38	11.9	11.3
ND1305-NHA-0149	1.49	3	38	11.9	11.3
ND1305-NHA-0150	1.50	3	38	11.9	11.3
ND1305-NHA-0151	1.51	3	45	12.7	12.1
ND1305-NHA-0152	1.52	3	45	12.7	12.1
ND1305-NHA-0153	1.53	3	45	12.7	12.1
ND1305-NHA-0154	1.54	3	45	12.7	12.1
ND1305-NHA-0155	1.55	3	45	12.7	12.1
ND1305-NHA-0156	1.56	3	45	12.7	12.1
ND1305-NHA-0157	1.57	3	45	12.7	12.1
ND1305-NHA-0158	1.58	3	45	12.7	12.1
ND1305-NHA-0159	1.59	3	45	12.7	12.1
ND1305-NHA-0160	1.60	3	45	12.7	12.1
ND1305-NHA-0161	1.61	3	45	13.6	12.9
ND1305-NHA-0162	1.62	3	45	13.6	12.9
ND1305-NHA-0163	1.63	3	45	13.6	12.9
ND1305-NHA-0164	1.64	3	45	13.6	12.9
ND1305-NHA-0165	1.65	3	45	13.6	12.9
ND1305-NHA-0166	1.66	3	45	13.6	12.9
ND1305-NHA-0167	1.67	3	45	13.6	12.9
ND1305-NHA-0168	1.68	3	45	13.6	12.9
ND1305-NHA-0169	1.69	3	45	13.6	12.9
ND1305-NHA-0170	1.70	3	45	13.6	12.9
ND1305-NHA-0171	1.71	3	45	14.3	13.7

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ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

Unit: mm

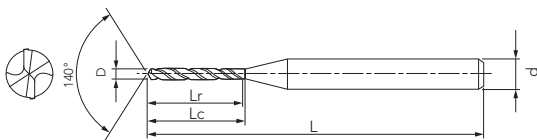
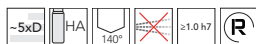
Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0172	1.72	3	45	14.3	13.7
ND1305-NHA-0173	1.73	3	45	14.3	13.7
ND1305-NHA-0174	1.74	3	45	14.3	13.7
ND1305-NHA-0175	1.75	3	45	14.3	13.7
ND1305-NHA-0176	1.76	3	45	14.3	13.7
ND1305-NHA-0177	1.77	3	45	14.3	13.7
ND1305-NHA-0178	1.78	3	45	14.3	13.7
ND1305-NHA-0179	1.79	3	45	14.3	13.7
ND1305-NHA-0180	1.80	3	45	14.3	13.7
ND1305-NHA-0181	1.81	3	45	15.1	14.5
ND1305-NHA-0182	1.82	3	45	15.1	14.5
ND1305-NHA-0183	1.83	3	45	15.1	14.5
ND1305-NHA-0184	1.84	3	45	15.1	14.5
ND1305-NHA-0185	1.85	3	45	15.1	14.5
ND1305-NHA-0186	1.86	3	45	15.1	14.5
ND1305-NHA-0187	1.87	3	45	15.1	14.5
ND1305-NHA-0188	1.88	3	45	15.1	14.5
ND1305-NHA-0189	1.89	3	45	15.1	14.5
ND1305-NHA-0190	1.90	3	45	15.1	14.5
ND1305-NHA-0191	1.91	3	45	15.9	15.3
ND1305-NHA-0192	1.92	3	45	15.9	15.3
ND1305-NHA-0193	1.93	3	45	15.9	15.3
ND1305-NHA-0194	1.94	3	45	15.9	15.3
ND1305-NHA-0195	1.95	3	45	15.9	15.3
ND1305-NHA-0196	1.96	3	45	15.9	15.3
ND1305-NHA-0197	1.97	3	45	15.9	15.3
ND1305-NHA-0198	1.98	3	45	15.9	15.3

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ND1305-NHA



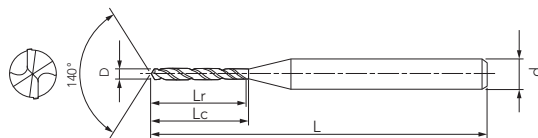
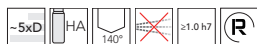
Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0199	1.99	3	45	15.9	15.3
ND1305-NHA-0200	2.00	3	45	15.9	15.3
ND1305-NHA-0201	2.01	3	45	16.7	16.1
ND1305-NHA-0202	2.02	3	45	16.7	16.1
ND1305-NHA-0203	2.03	3	45	16.7	16.1
ND1305-NHA-0204	2.04	3	45	16.7	16.1
ND1305-NHA-0205	2.05	3	45	16.7	16.1
ND1305-NHA-0206	2.06	3	45	16.7	16.1
ND1305-NHA-0207	2.07	3	45	16.7	16.1
ND1305-NHA-0208	2.08	3	45	16.7	16.1
ND1305-NHA-0209	2.09	3	45	16.7	16.1
ND1305-NHA-0210	2.10	3	45	16.7	16.1
ND1305-NHA-0211	2.11	3	45	17.5	16.9
ND1305-NHA-0212	2.12	3	45	17.5	16.9
ND1305-NHA-0213	2.13	3	45	17.5	16.9
ND1305-NHA-0214	2.14	3	45	17.5	16.9
ND1305-NHA-0215	2.15	3	45	17.5	16.9
ND1305-NHA-0216	2.16	3	45	17.5	16.9
ND1305-NHA-0217	2.17	3	45	17.5	16.9
ND1305-NHA-0218	2.18	3	45	17.5	16.9
ND1305-NHA-0219	2.19	3	45	17.5	16.9
ND1305-NHA-0220	2.20	3	45	17.5	16.9
ND1305-NHA-0221	2.21	3	45	18.3	17.7
ND1305-NHA-0222	2.22	3	45	18.3	17.7
ND1305-NHA-0223	2.23	3	45	18.3	17.7
ND1305-NHA-0224	2.24	3	45	18.3	17.7
ND1305-NHA-0225	2.25	3	45	18.3	17.7

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ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

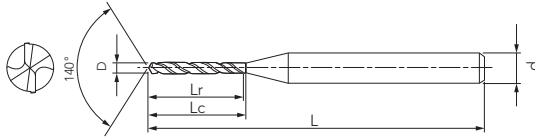
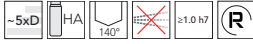
Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0226	2.26	3	45	18.3	17.7
ND1305-NHA-0227	2.27	3	45	18.3	17.7
ND1305-NHA-0228	2.28	3	45	18.3	17.7
ND1305-NHA-0229	2.29	3	45	18.3	17.7
ND1305-NHA-0230	2.30	3	45	18.3	17.7
ND1305-NHA-0231	2.31	3	55	19.1	18.5
ND1305-NHA-0232	2.32	3	55	19.1	18.5
ND1305-NHA-0233	2.33	3	55	19.1	18.5
ND1305-NHA-0234	2.34	3	55	19.1	18.5
ND1305-NHA-0235	2.35	3	55	19.1	18.5
ND1305-NHA-0236	2.36	3	55	19.1	18.5
ND1305-NHA-0237	2.37	3	55	19.1	18.5
ND1305-NHA-0238	2.38	3	55	19.1	18.5
ND1305-NHA-0239	2.39	3	55	19.1	18.5
ND1305-NHA-0240	2.40	3	55	19.1	18.5
ND1305-NHA-0241	2.41	3	55	19.9	19.3
ND1305-NHA-0242	2.42	3	55	19.9	19.3
ND1305-NHA-0243	2.43	3	55	19.9	19.3
ND1305-NHA-0244	2.44	3	55	19.9	19.3
ND1305-NHA-0245	2.45	3	55	19.9	19.3
ND1305-NHA-0246	2.46	3	55	19.9	19.3
ND1305-NHA-0247	2.47	3	55	19.9	19.3
ND1305-NHA-0248	2.48	3	55	19.9	19.3
ND1305-NHA-0249	2.49	3	55	19.9	19.3
ND1305-NHA-0250	2.50	3	55	19.9	19.3
ND1305-NHA-0251	2.51	3	55	20.7	20.1
ND1305-NHA-0252	2.52	3	55	20.7	20.1

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ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

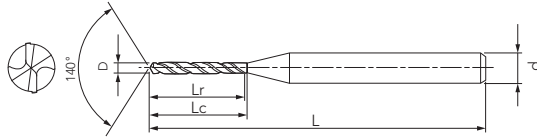
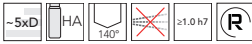
Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0253	2.53	3	55	20.7	20.1
ND1305-NHA-0254	2.54	3	55	20.7	20.1
ND1305-NHA-0255	2.55	3	55	20.7	20.1
ND1305-NHA-0256	2.56	3	55	20.7	20.1
ND1305-NHA-0257	2.57	3	55	20.7	20.1
ND1305-NHA-0258	2.58	3	55	20.7	20.1
ND1305-NHA-0259	2.59	3	55	20.7	20.1
ND1305-NHA-0260	2.60	3	55	20.7	20.1
ND1305-NHA-0261	2.61	3	55	21.5	20.9
ND1305-NHA-0262	2.62	3	55	21.5	20.9
ND1305-NHA-0263	2.63	3	55	21.5	20.9
ND1305-NHA-0264	2.64	3	55	21.5	20.9
ND1305-NHA-0265	2.65	3	55	21.5	20.9
ND1305-NHA-0266	2.66	3	55	21.5	20.9
ND1305-NHA-0267	2.67	3	55	21.5	20.9
ND1305-NHA-0268	2.68	3	55	21.5	20.9
ND1305-NHA-0269	2.69	3	55	21.5	20.9
ND1305-NHA-0270	2.70	3	55	21.5	20.9
ND1305-NHA-0271	2.71	3	55	22.3	21.7
ND1305-NHA-0272	2.72	3	55	22.3	21.7
ND1305-NHA-0273	2.73	3	55	22.3	21.7
ND1305-NHA-0274	2.74	3	55	22.3	21.7
ND1305-NHA-0275	2.75	3	55	22.3	21.7
ND1305-NHA-0276	2.76	3	55	22.3	21.7
ND1305-NHA-0277	2.77	3	55	22.3	21.7
ND1305-NHA-0278	2.78	3	55	22.3	21.7
ND1305-NHA-0279	2.79	3	55	22.3	21.7

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ND1305-NHA



Structural and case hardened steels • Free-cutting steels, heat-treatable steels
• Alloyed steels up to 1200 N/mm² • Cast materials

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Lr(max)
ND1305-NHA-0280	2.80	3	55	22.3	21.7
ND1305-NHA-0281	2.81	3	55	23.1	22.5
ND1305-NHA-0282	2.82	3	55	23.1	22.5
ND1305-NHA-0283	2.83	3	55	23.1	22.5
ND1305-NHA-0284	2.84	3	55	23.1	22.5
ND1305-NHA-0285	2.85	3	55	23.1	22.5
ND1305-NHA-0286	2.86	3	55	23.1	22.5
ND1305-NHA-0287	2.87	3	55	23.1	22.5
ND1305-NHA-0288	2.88	3	55	23.1	22.5
ND1305-NHA-0289	2.89	3	55	23.1	22.5
ND1305-NHA-0290	2.90	3	55	23.1	22.5
ND1305-NHA-0291	2.91	3	55	23.9	23.3
ND1305-NHA-0292	2.92	3	55	23.9	23.3
ND1305-NHA-0293	2.93	3	55	23.9	23.3
ND1305-NHA-0294	2.94	3	55	23.9	23.3
ND1305-NHA-0295	2.95	3	55	23.9	23.3
ND1305-NHA-0296	2.96	3	55	23.9	23.3
ND1305-NHA-0297	2.97	3	55	23.9	23.3
ND1305-NHA-0298	2.98	3	55	23.9	23.3
ND1305-NHA-0299	2.99	3	55	23.9	23.3
ND1305-NHA-0300	3.00	3	55	23.9	23.3

Recommended cutting data see the next page





Cutting Data Table

NAVIGATOR Micro Carbide Drill

ISO	Material Group	Hardness		SFM	Feed Rate - IPR						
		HRC	BHN		0.10 mm	0.16 mm	0.25 mm	0.30 mm	0.50 mm	0.63 mm	0.80 mm
P	Common Structural Steels	-	< 150	330	0.0003	0.0005	0.0008	0.0009	0.0016	0.0024	0.0031
	Common Structural Steels	< 32	< 301	330	0.0003	0.0005	0.0008	0.0009	0.0016	0.0024	0.0031
	Free-cutting Steels	< 25	< 255	330	0.0003	0.0005	0.0008	0.0009	0.0016	0.0024	0.0031
	Free-cutting Steels	< 32	< 301	295	0.0003	0.0004	0.0007	0.0008	0.0014	0.0020	0.0028
	Unalloyed Heat-treatable Steels	< 20	< 220	295	0.0003	0.0005	0.0008	0.0009	0.0016	0.0024	0.0031
	Unalloyed Heat-treatable Steels	< 25	< 255	295	0.0003	0.0005	0.0008	0.0009	0.0016	0.0024	0.0031
	Unalloyed Heat-treatable Steels	< 32	< 301	295	0.0003	0.0004	0.0007	0.0008	0.0014	0.0020	0.0028
	Alloyed Heat-treatable Steels	< 32	< 301	295	0.0003	0.0004	0.0007	0.0008	0.0014	0.0020	0.0028
	Alloyed Heat-treatable Steels	< 43	< 402	230	0.0002	0.0004	0.0006	0.0007	0.0012	0.0016	0.0016
	Unalloyed Case Hardened Steels	< 25	< 255	330	0.0003	0.0004	0.0007	0.0008	0.0014	0.0020	0.0028
	Alloyed Case Hardened Steels	< 32	< 301	280	0.0003	0.0004	0.0007	0.0008	0.0014	0.0020	0.0028
	Alloyed Case Hardened Steels	< 43	< 402	230	0.0002	0.0004	0.0006	0.0007	0.0012	0.0016	0.0016
	Nitriding Steels	< 32	< 301	230	0.0002	0.0004	0.0006	0.0007	0.0012	0.0016	0.0016
	Nitriding Steels	< 43	< 402	195	0.0002	0.0004	0.0006	0.0007	0.0012	0.0016	0.0016
	Tool Steels	< 25	< 255	165	0.0002	0.0004	0.0006	0.0007	0.0012	0.0016	0.0016
	Tool Steels	< 43	< 402	195	0.0002	0.0004	0.0006	0.0007	0.0012	0.0016	0.0016
K	Cast Iron	< 23	< 242	425	0.0004	0.0007	0.0011	0.0013	0.0022	0.0031	0.0043
	Cast Iron	< 38	< 354	425	0.0004	0.0007	0.0011	0.0013	0.0022	0.0031	0.0043
	Spheroidal Graphite Iron And	< 23	< 242	425	0.0004	0.0007	0.0011	0.0013	0.0022	0.0031	0.0043
	Malleable Cast Iron	< 38	< 354	395	0.0004	0.0006	0.0010	0.0020	0.0020	0.0031	0.0039

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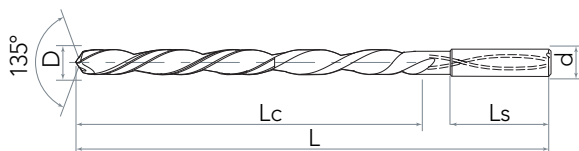
NAVIGATOR Micro Carbide Drill

ISO	Material group	Hardness		SFM	Feed Rate - IPR			
		HRC	BHN		1.00 mm	1.50 mm	2.00 mm	3.00 mm
P	Common Structural Steels	-	< 150	330	0.0047	0.0063	0.0079	0.0094
	Common Structural Steels	< 32	< 301	330	0.0047	0.0063	0.0079	0.0094
	Free-cutting Steels	< 25	< 255	330	0.0047	0.0063	0.0079	0.0094
	Free-cutting Steels	< 32	< 301	295	0.0039	0.0055	0.0067	0.0083
	Unalloyed Heat-treatable Steels	< 20	< 220	295	0.0047	0.0063	0.0079	0.0094
	Unalloyed Heat-treatable Steels	< 25	< 255	295	0.0047	0.0063	0.0079	0.0094
	Unalloyed Heat-treatable Steels	< 32	< 301	295	0.0039	0.0055	0.0067	0.0083
	Alloyed Heat-treatable Steels	< 32	< 301	295	0.0039	0.0055	0.0067	0.0083
	Alloyed Heat-treatable Steels	< 43	< 402	230	0.0035	0.0047	0.0059	0.0071
	Unalloyed Case Hardened Steels	< 25	< 255	330	0.0039	0.0055	0.0067	0.0083
	Alloyed Case Hardened Steels	< 32	< 301	280	0.0039	0.0055	0.0067	0.0083
	Alloyed Case Hardened Steels	< 43	< 402	230	0.0035	0.0047	0.0059	0.0071
	Nitriding Steels	< 32	< 301	230	0.0035	0.0047	0.0059	0.0071
	Nitriding Steels	< 43	< 402	195	0.0035	0.0047	0.0059	0.0071
	Tool Steels	< 25	< 255	165	0.0035	0.0047	0.0059	0.0071
	Tool Steels	< 43	< 402	195	0.0035	0.0047	0.0059	0.0071
K	Cast Iron	< 23	< 354	425	0.0063	0.0087	0.0106	0.0130
	Cast Iron	< 38	< 242	425	0.0063	0.0087	0.0106	0.0130
	Spheroidal Graphite Iron And	< 23	< 354	425	0.0063	0.0087	0.0106	0.0130
	Malleable Cast Iron	< 38	< 354	395	0.0059	0.0083	0.0102	0.0122



Carbide Carbide Deep-hole Drill 12XD

ND3012-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

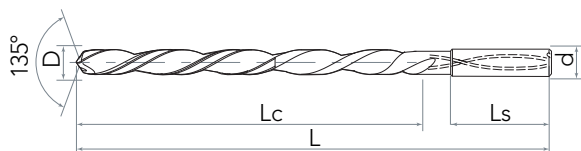
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-0300	3.00	6	90	50	36
ND3012-CHA-0310	3.10	6	90	50	36
ND3012-CHA-0320	3.20	6	90	50	36
ND3012-CHA-0330	3.30	6	90	50	36
ND3012-CHA-0340	3.40	6	90	50	36
ND3012-CHA-0350	3.50	6	90	50	36
ND3012-CHA-0360	3.60	6	90	50	36
ND3012-CHA-0370	3.70	6	90	50	36
ND3012-CHA-0380	3.80	6	102	64	36
ND3012-CHA-0390	3.90	6	102	64	36
ND3012-CHA-0400	4.00	6	102	64	36
ND3012-CHA-0410	4.10	6	102	64	36
ND3012-CHA-0420	4.20	6	102	64	36
ND3012-CHA-0430	4.30	6	102	64	36
ND3012-CHA-0440	4.40	6	102	64	36
ND3012-CHA-0450	4.50	6	102	64	36
ND3012-CHA-0460	4.60	6	102	64	36
ND3012-CHA-0470	4.70	6	102	64	36
ND3012-CHA-0480	4.80	6	116	78	36
ND3012-CHA-0490	4.90	6	116	78	36
ND3012-CHA-0500	5.00	6	116	78	36
ND3012-CHA-0510	5.10	6	116	78	36
ND3012-CHA-0520	5.20	6	116	78	36
ND3012-CHA-0530	5.30	6	116	78	36
ND3012-CHA-0540	5.40	6	116	78	36
ND3012-CHA-0550	5.50	6	116	78	36
ND3012-CHA-0560	5.60	6	116	78	36

See the next page

ND3012-CHA



Structural and case hardened steels · free-cutting steels · Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-0570	5.70	6	116	78	36
ND3012-CHA-0580	5.80	6	116	78	36
ND3012-CHA-0590	5.90	6	116	78	36
ND3012-CHA-0600	6.00	6	116	78	36
ND3012-CHA-0610	6.10	8	146	108	36
ND3012-CHA-0620	6.20	8	146	108	36
ND3012-CHA-0630	6.30	8	146	108	36
ND3012-CHA-0640	6.40	8	146	108	36
ND3012-CHA-0650	6.50	8	146	108	36
ND3012-CHA-0660	6.60	8	146	108	36
ND3012-CHA-0670	6.70	8	146	108	36
ND3012-CHA-0680	6.80	8	146	108	36
ND3012-CHA-0690	6.90	8	146	108	36
ND3012-CHA-0700	7.00	8	146	108	36
ND3012-CHA-0710	7.10	8	146	108	36
ND3012-CHA-0720	7.20	8	146	108	36
ND3012-CHA-0730	7.30	8	146	108	36
ND3012-CHA-0740	7.40	8	146	108	36
ND3012-CHA-0750	7.50	8	146	108	36
ND3012-CHA-0760	7.60	8	146	108	36
ND3012-CHA-0770	7.70	8	146	108	36
ND3012-CHA-0780	7.80	8	146	108	36
ND3012-CHA-0790	7.90	8	146	108	36
ND3012-CHA-0800	8.00	8	146	108	36
ND3012-CHA-0810	8.10	10	162	120	40
ND3012-CHA-0820	8.20	10	162	120	40
ND3012-CHA-0830	8.30	10	162	120	40

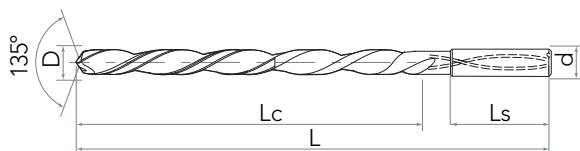
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Carbide Deep-hole Drill 12XD

ND3012-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-0840	8.40	10	162	120	40
ND3012-CHA-0850	8.50	10	162	120	40
ND3012-CHA-0860	8.60	10	162	120	40
ND3012-CHA-0870	8.70	10	162	120	40
ND3012-CHA-0880	8.80	10	162	120	40
ND3012-CHA-0890	8.90	10	162	120	40
ND3012-CHA-0900	9.00	10	162	120	40
ND3012-CHA-0910	9.10	10	162	120	40
ND3012-CHA-0920	9.20	10	162	120	40
ND3012-CHA-0930	9.30	10	162	120	40
ND3012-CHA-0940	9.40	10	162	120	40
ND3012-CHA-0950	9.50	10	162	120	40
ND3012-CHA-0960	9.60	10	162	120	40
ND3012-CHA-0970	9.70	10	162	120	40
ND3012-CHA-0980	9.80	10	162	120	40
ND3012-CHA-0990	9.90	10	162	120	40
ND3012-CHA-1000	10.00	10	162	120	40
ND3012-CHA-1010	10.10	12	204	156	45
ND3012-CHA-1020	10.20	12	204	156	45
ND3012-CHA-1030	10.30	12	204	156	45
ND3012-CHA-1040	10.40	12	204	156	45
ND3012-CHA-1050	10.50	12	204	156	45
ND3012-CHA-1060	10.60	12	204	156	45
ND3012-CHA-1070	10.70	12	204	156	45
ND3012-CHA-1080	10.80	12	204	156	45
ND3012-CHA-1090	10.90	12	204	156	45
ND3012-CHA-1100	11.00	12	204	156	45

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ND3012-CHA



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Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

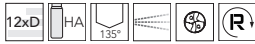
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-1110	11.10	12	204	156	45
ND3012-CHA-1120	11.20	12	204	156	45
ND3012-CHA-1130	11.30	12	204	156	45
ND3012-CHA-1140	11.40	12	204	156	45
ND3012-CHA-1150	11.50	12	204	156	45
ND3012-CHA-1160	11.60	12	204	156	45
ND3012-CHA-1170	11.70	12	204	156	45
ND3012-CHA-1180	11.80	12	204	156	45
ND3012-CHA-1190	11.90	12	204	156	45
ND3012-CHA-1200	12.00	12	204	156	45
ND3012-CHA-1210	12.10	12	204	156	45
ND3012-CHA-1220	12.20	12	204	156	45
ND3012-CHA-1230	12.30	14	230	182	45
ND3012-CHA-1240	12.40	14	230	182	45
ND3012-CHA-1250	12.50	14	230	182	45
ND3012-CHA-1260	12.60	14	230	182	45
ND3012-CHA-1270	12.70	14	230	182	45
ND3012-CHA-1280	12.80	14	230	182	45
ND3012-CHA-1290	12.90	14	230	182	45
ND3012-CHA-1300	13.00	14	230	182	45
ND3012-CHA-1310	13.10	14	230	182	45
ND3012-CHA-1320	13.20	14	230	182	45
ND3012-CHA-1330	13.30	14	230	182	45
ND3012-CHA-1340	13.40	14	230	182	45
ND3012-CHA-1350	13.50	14	230	182	45
ND3012-CHA-1360	13.60	14	230	182	45
ND3012-CHA-1370	13.70	14	230	182	45

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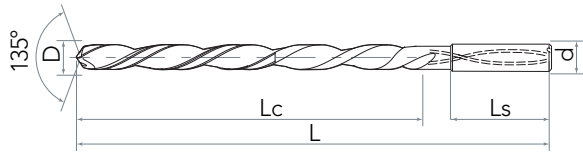


Carbide Deep-hole Drill 12XD

ND3012-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-1380	13.80	14	230	182	45
ND3012-CHA-1390	13.90	14	230	182	45
ND3012-CHA-1400	14.00	14	230	182	45
ND3012-CHA-1410	14.10	14	230	182	45
ND3012-CHA-1420	14.20	14	230	182	45
ND3012-CHA-1430	14.30	14	230	182	45
ND3012-CHA-1440	14.40	14	230	182	45
ND3012-CHA-1450	14.50	16	260	208	48
ND3012-CHA-1460	14.60	16	260	208	48
ND3012-CHA-1470	14.70	16	260	208	48
ND3012-CHA-1480	14.80	16	260	208	48
ND3012-CHA-1490	14.90	16	260	208	48
ND3012-CHA-1500	15.00	16	260	208	48
ND3012-CHA-1510	15.10	16	260	208	48
ND3012-CHA-1520	15.20	16	260	208	48
ND3012-CHA-1530	15.30	16	260	208	48
ND3012-CHA-1540	15.40	16	260	208	48
ND3012-CHA-1550	15.50	16	260	208	48
ND3012-CHA-1560	15.60	16	260	208	48
ND3012-CHA-1570	15.70	16	260	208	48
ND3012-CHA-1580	15.80	16	260	208	48
ND3012-CHA-1590	15.90	16	260	208	48
ND3012-CHA-1600	16.00	16	260	208	48
ND3012-CHA-1610	16.10	16	260	208	48
ND3012-CHA-1620	16.20	16	260	208	48
ND3012-CHA-1630	16.30	16	260	208	48
ND3012-CHA-1640	16.40	16	260	208	48

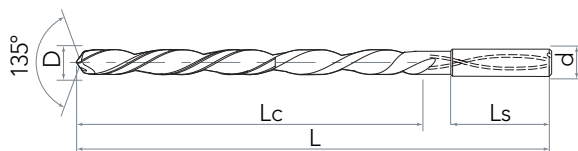
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ND3012-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-1650	16.50	18	285	234	48
ND3012-CHA-1660	16.60	18	285	234	48
ND3012-CHA-1670	16.70	18	285	234	48
ND3012-CHA-1680	16.80	18	285	234	48
ND3012-CHA-1690	16.90	18	285	234	48
ND3012-CHA-1700	17.00	18	285	234	48
ND3012-CHA-1710	17.10	18	285	234	48
ND3012-CHA-1720	17.20	18	285	234	48
ND3012-CHA-1730	17.30	18	285	234	48
ND3012-CHA-1740	17.40	18	285	234	48
ND3012-CHA-1750	17.50	18	285	234	48
ND3012-CHA-1760	17.60	18	285	234	48
ND3012-CHA-1770	17.70	18	285	234	48
ND3012-CHA-1780	17.80	18	285	234	48
ND3012-CHA-1790	17.90	18	285	234	48
ND3012-CHA-1800	18.00	18	285	234	48
ND3012-CHA-1810	18.10	18	285	234	48
ND3012-CHA-1820	18.20	18	285	234	48
ND3012-CHA-1830	18.30	18	285	234	48
ND3012-CHA-1840	18.40	18	285	234	48
ND3012-CHA-1850	18.50	20	310	258	50
ND3012-CHA-1860	18.60	20	310	258	50
ND3012-CHA-1870	18.70	20	310	258	50
ND3012-CHA-1880	18.80	20	310	258	50
ND3012-CHA-1890	18.90	20	310	258	50
ND3012-CHA-1900	19.00	20	310	258	50
ND3012-CHA-1910	19.10	20	310	258	50

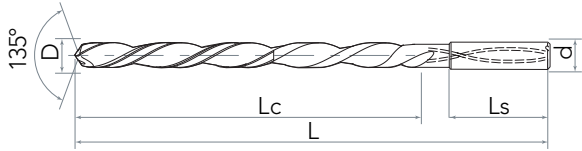
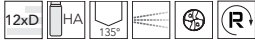
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Carbide Deep-hole Drill 12XD

ND3012-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · cast materials · bronze, Brass · high-alloyed AlSi alloys

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3012-CHA-1920	19.20	20	310	258	50
ND3012-CHA-1930	19.30	20	310	258	50
ND3012-CHA-1940	19.40	20	310	258	50
ND3012-CHA-1950	19.50	20	310	258	50
ND3012-CHA-1960	19.60	20	310	258	50
ND3012-CHA-1970	19.70	20	310	258	50
ND3012-CHA-1980	19.80	20	310	258	50
ND3012-CHA-1990	19.90	20	310	258	50
ND3012-CHA-2000	20.00	20	310	258	50

Recommended cutting data see the next page





NAVIGATOR Carbide Deep-hole Drill 12XD

ISO	Material Group	Hardness			Feed Rate - IPR						
		HRC	BHN	SFM	3.17	6.35	9.52	12.70	15.87	19.05	25.40
P	Common Structural Steels	-	< 150	290	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Common Structural Steels	< 32	< 301	265	0.0040	0.0065	0.0080	0.0100	0.0100	0.0110	0.0125
	Free-cutting Steels	< 25	< 255	325	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200
	Free-cutting Steels	< 32	< 301	300	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200
	Unalloyed Heat-treatable Steels	< 20	< 220	290	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200
	Unalloyed Heat-treatable Steels	< 25	< 255	260	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Unalloyed Heat-treatable Steels	< 32	< 301	265	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Alloyed Heat-treatable Steels	< 32	< 301	265	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Alloyed Heat-treatable Steels	< 43	< 402	195	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Unalloyed Case Hardened Steels	< 25	< 255	290	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200
	Alloyed Case Hardened Steels	< 32	< 301	265	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Alloyed Case Hardened Steels	< 43	< 402	195	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
	Nitriding Steels	< 32	< 301	190	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Nitriding Steels	< 43	< 402	155	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
	Tool Steels	< 25	< 255	145	0.0040	0.0065	0.0080	0.0100	0.0100	0.0110	0.0125
	Tool Steels	< 43	< 402	110	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
	High Speed Steels	< 43	< 402	115	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
	Spring Steels	< 38	< 354	115	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
M	Stainless steels, Sulphured	< 28	< 273	130	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
	Austenitic	< 36	< 337	130	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
	Martensitic	< 46	< 435	140	0.0030	0.0050	0.0065	0.0080	0.0080	0.0090	0.0100
K	Cast Iron	< 23	< 242	370	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	Cast Iron	< 38	< 354	350	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	Spheroidal Graphite Iron And	< 23	< 242	245	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	Malleable Cast Iron	< 38	< 354	260	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200

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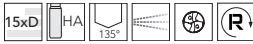
Cutting Data Table

NAVIGATOR Carbide Deep-hole Drill 12XD

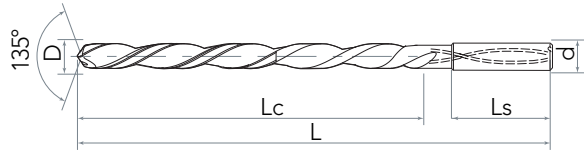
ISO	Material Group	Hardness		SFM	Feed Rate - IPR						
		HRC	BHN		3.17	6.35	9.52	12.70	15.87	19.05	25.40
N	Aluminium And Al-alloys	-	< 120	485	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	Al Wrought Alloys	-	< 200	485	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	Al Cast Alloys ≤ 10 % Si	-	< 180	490	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	≤ 24 % Si	-	< 180	390	0.0080	0.0125	0.0160	0.0200	0.0200	0.0220	0.0245
	Magnesium Alloys	-	< 120	485	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200
	Copper, Low-alloyed	-	< 150	260	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Brass, Short-chipping	-	< 180	390	0.0065	0.0100	0.0125	0.0160	0.0160	0.0180	0.0200
	Long-chipping	-	< 180	390	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Bronze, Short-chipping	-	< 180	135	0.0050	0.0080	0.0100	0.0125	0.0125	0.0140	0.0160
	Bronze, Short-chipping	< 32	< 301	125	0.0040	0.0065	0.0080	0.0100	0.0100	0.0110	0.0125

Note: Pilot holes (depth >1xD) are recommended when drilling depths greater than 7xD. 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 finish drill. Ratio drills can produce their own pilot hole by reducing speed and feed rates by 30-40%.

ND3015-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

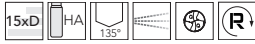
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3015-CHA-0300	3.00	6	95	55	36
ND3015-CHA-0310	3.10	6	106	66	36
ND3015-CHA-0320	3.20	6	106	66	36
ND3015-CHA-0330	3.30	6	106	66	36
ND3015-CHA-0340	3.40	6	106	66	36
ND3015-CHA-0350	3.50	6	116	76	36
ND3015-CHA-0360	3.60	6	116	76	36
ND3015-CHA-0370	3.70	6	116	76	36
ND3015-CHA-0380	3.80	6	116	76	36
ND3015-CHA-0390	3.90	6	116	76	36
ND3015-CHA-0400	4.00	6	116	76	36
ND3015-CHA-0410	4.10	6	133	93	36
ND3015-CHA-0420	4.20	6	133	93	36
ND3015-CHA-0430	4.30	6	133	93	36
ND3015-CHA-0440	4.40	6	133	93	36
ND3015-CHA-0450	4.50	6	133	93	36
ND3015-CHA-0460	4.60	6	133	93	36
ND3015-CHA-0470	4.70	6	133	93	36
ND3015-CHA-0480	4.80	6	133	93	36
ND3015-CHA-0490	4.90	6	133	93	36
ND3015-CHA-0500	5.00	6	133	93	36
ND3015-CHA-0510	5.10	6	150	110	36
ND3015-CHA-0520	5.20	6	150	110	36
ND3015-CHA-0530	5.30	6	150	110	36
ND3015-CHA-0540	5.40	6	150	110	36
ND3015-CHA-0550	5.50	6	150	110	36
ND3015-CHA-0560	5.60	6	150	110	36

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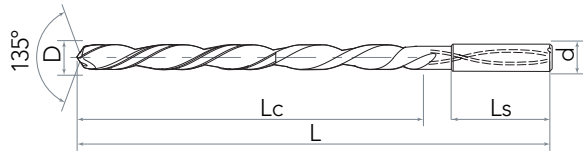


Carbide Deep-hole Drill 15XD

ND3015-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

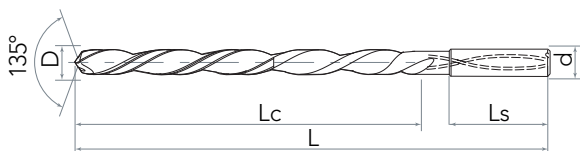
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3015-CHA-0570	5.70	6	150	110	36
ND3015-CHA-0580	5.80	6	150	110	36
ND3015-CHA-0590	5.90	6	150	110	36
ND3015-CHA-0600	6.00	6	150	110	36
ND3015-CHA-0610	6.10	6	150	110	36
ND3015-CHA-0620	6.20	6	150	110	36
ND3015-CHA-0630	6.30	8	167	127	36
ND3015-CHA-0640	6.40	8	167	127	36
ND3015-CHA-0650	6.50	8	167	127	36
ND3015-CHA-0660	6.60	8	167	127	36
ND3015-CHA-0670	6.70	8	167	127	36
ND3015-CHA-0680	6.80	8	167	127	36
ND3015-CHA-0690	6.90	8	167	127	36
ND3015-CHA-0700	7.00	8	167	127	36
ND3015-CHA-0710	7.10	8	183	143	36
ND3015-CHA-0720	7.20	8	183	143	36
ND3015-CHA-0730	7.30	8	183	143	36
ND3015-CHA-0740	7.40	8	183	143	36
ND3015-CHA-0750	7.50	8	183	143	36
ND3015-CHA-0760	7.60	8	183	143	36
ND3015-CHA-0770	7.70	8	183	143	36
ND3015-CHA-0780	7.80	8	183	143	36
ND3015-CHA-0790	7.90	8	183	143	36
ND3015-CHA-0800	8.00	8	183	143	36
ND3015-CHA-0810	8.10	8	183	143	36
ND3015-CHA-0820	8.20	8	183	143	36
ND3015-CHA-0830	8.30	10	204	160	40

See the next page

ND3015-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

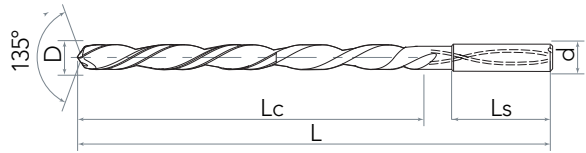
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3015-CHA-0840	8.40	10	204	160	40
ND3015-CHA-0850	8.50	10	204	160	40
ND3015-CHA-0860	8.60	10	204	160	40
ND3015-CHA-0870	8.70	10	204	160	40
ND3015-CHA-0880	8.80	10	204	160	40
ND3015-CHA-0890	8.90	10	204	160	40
ND3015-CHA-0900	9.00	10	204	160	40
ND3015-CHA-0910	9.10	10	221	177	40
ND3015-CHA-0920	9.20	10	221	177	40
ND3015-CHA-0930	9.30	10	221	177	40
ND3015-CHA-0940	9.40	10	221	177	40
ND3015-CHA-0950	9.50	10	221	177	40
ND3015-CHA-0960	9.60	10	221	177	40
ND3015-CHA-0970	9.70	10	221	177	40
ND3015-CHA-0980	9.80	10	221	177	40
ND3015-CHA-0990	9.90	10	221	177	40
ND3015-CHA-1000	10.00	10	221	177	40
ND3015-CHA-1010	10.10	10	221	177	40
ND3015-CHA-1020	10.20	12	247	198	45
ND3015-CHA-1030	10.30	12	247	198	45
ND3015-CHA-1040	10.40	12	247	198	45
ND3015-CHA-1050	10.50	12	247	198	45
ND3015-CHA-1060	10.60	12	247	198	45
ND3015-CHA-1070	10.70	12	247	198	45
ND3015-CHA-1080	10.80	12	247	198	45
ND3015-CHA-1090	10.90	12	247	198	45
ND3015-CHA-1100	11.00	12	247	198	45

See the next page 



Carbide Deep-hole Drill 15XD

ND3015-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3015-CHA-1110	11.10	12	263	214	45
ND3015-CHA-1120	11.20	12	263	214	45
ND3015-CHA-1130	11.30	12	263	214	45
ND3015-CHA-1140	11.40	12	263	214	45
ND3015-CHA-1150	11.50	12	263	214	45
ND3015-CHA-1160	11.60	12	263	214	45
ND3015-CHA-1170	11.70	12	263	214	45
ND3015-CHA-1180	11.80	12	263	214	45
ND3015-CHA-1190	11.90	12	263	214	45
ND3015-CHA-1200	12.00	12	263	214	45
ND3015-CHA-1210	12.10	12	263	214	45
ND3015-CHA-1220	12.20	12	263	214	45
ND3015-CHA-1230	12.30	14	297	248	45
ND3015-CHA-1240	12.40	14	297	248	45
ND3015-CHA-1250	12.50	14	297	248	45
ND3015-CHA-1260	12.60	14	297	248	45
ND3015-CHA-1270	12.70	14	297	248	45
ND3015-CHA-1280	12.80	14	297	248	45
ND3015-CHA-1290	12.90	14	297	248	45
ND3015-CHA-1300	13.00	14	297	248	45
ND3015-CHA-1310	13.10	14	297	248	45
ND3015-CHA-1320	13.20	14	297	248	45
ND3015-CHA-1330	13.30	14	297	248	45
ND3015-CHA-1340	13.40	14	297	248	45
ND3015-CHA-1350	13.50	14	297	248	45
ND3015-CHA-1360	13.60	14	297	248	45
ND3015-CHA-1370	13.70	14	297	248	45

See the next page



ND3015-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3015-CHA-1380	13.80	14	297	248	45
ND3015-CHA-1390	13.90	14	297	248	45
ND3015-CHA-1400	14.00	14	297	248	45
ND3015-CHA-1410	14.10	14	297	248	45
ND3015-CHA-1420	14.20	16	333	281	48
ND3015-CHA-1430	14.30	16	333	281	48
ND3015-CHA-1440	14.40	16	333	281	48
ND3015-CHA-1450	14.50	16	333	281	48
ND3015-CHA-1460	14.60	16	333	281	48
ND3015-CHA-1470	14.70	16	333	281	48
ND3015-CHA-1480	14.80	16	333	281	48
ND3015-CHA-1490	14.90	16	333	281	48
ND3015-CHA-1500	15.00	16	333	281	48
ND3015-CHA-1510	15.10	16	333	281	48
ND3015-CHA-1520	15.20	16	333	281	48
ND3015-CHA-1530	15.30	16	333	281	48
ND3015-CHA-1540	15.40	16	333	281	48
ND3015-CHA-1550	15.50	16	333	281	48
ND3015-CHA-1560	15.60	16	333	281	48
ND3015-CHA-1570	15.70	16	333	281	48
ND3015-CHA-1580	15.80	16	333	281	48
ND3015-CHA-1590	15.90	16	333	281	48
ND3015-CHA-1600	16.00	16	333	281	48

Recommended cutting data see the next page 



Cutting Data Table

NAVIGATOR Carbide Deep-hole Drill 15XD

ISO	Material group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm
P	Common Structural Steels	-	< 150	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Common Structural Steels	< 32	< 301	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Free-cutting Steels	< 25	< 255	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Free-cutting Steels	< 32	< 301	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 20	< 220	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Heat-treatable Steels	< 25	< 255	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 32	< 301	330	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 32	< 301	360	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 43	< 402	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Case Hardened Steels	< 25	< 255	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Alloyed Case Hardened Steels	< 32	< 301	360	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Case Hardened Steels	< 43	< 402	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Nitriding Steels	< 32	< 301	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Nitriding Steels	< 43	< 402	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Tool Steels	< 25	< 255	330	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Tool Steels	< 43	< 402	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	High Speed Steels	< 43	< 402	165	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Spring Steels	< 38	< 354	165	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
H	Hardened Steels	< 48	< 460	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	Hardened Steels	< 66	-	165	0.0010	0.0020	0.0040	0.0060	0.0060	0.0080
M	Stainless steels, Sulphured	< 28	< 273	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Austenitic	< 36	< 337	230	0.0010	0.0020	0.0020	0.0040	0.0040	0.0050
	Martensitic	< 46	< 435	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
K	Cast Iron	< 23	< 242	460	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Cast Iron	< 38	< 354	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Spheroidal Graphite Iron And	< 23	< 242	460	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Malleable Cast Iron	< 38	< 354	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200

See the next page





NAVIGATOR Carbide Deep-hole Drill 15XD

ISO	Material group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm	19.05 mm
K	New Cast Materials GGV	< 20	< 220	330	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials GGV	< 32	< 301	330	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials ADI	< 32	< 301	295	0.0010	0.0065	0.0100	0.0155	0.0155	0.0195
S	Special Alloys	< 54	< 549	100	0.0040	0.0020	0.0020	0.0040	0.0040	0.0050
N	Copper, low-alloyed	-	< 150	395		0.0010	0.0020	0.0030	0.0030	0.0040
	Brass, short-chipping	-	< 180	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200

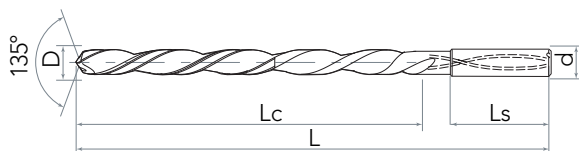


Carbide Deep-hole Drill 20XD

ND3020-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3020-CHA-0300	3.00	6	110	70	36
ND3020-CHA-0310	3.10	6	123	83	36
ND3020-CHA-0320	3.20	6	123	83	36
ND3020-CHA-0330	3.30	6	123	83	36
ND3020-CHA-0340	3.40	6	123	83	36
ND3020-CHA-0350	3.50	6	136	96	36
ND3020-CHA-0360	3.60	6	136	96	36
ND3020-CHA-0370	3.70	6	136	96	36
ND3020-CHA-0380	3.80	6	136	96	36
ND3020-CHA-0390	3.90	6	136	96	36
ND3020-CHA-0400	4.00	6	136	96	36
ND3020-CHA-0410	4.10	6	158	118	36
ND3020-CHA-0420	4.20	6	158	118	36
ND3020-CHA-0430	4.30	6	158	118	36
ND3020-CHA-0440	4.40	6	158	118	36
ND3020-CHA-0450	4.50	6	158	118	36
ND3020-CHA-0460	4.60	6	158	118	36
ND3020-CHA-0470	4.70	6	158	118	36
ND3020-CHA-0480	4.80	6	158	118	36
ND3020-CHA-0490	4.90	6	158	118	36
ND3020-CHA-0500	5.00	6	158	118	36
ND3020-CHA-0510	5.10	6	180	140	36
ND3020-CHA-0520	5.20	6	180	140	36
ND3020-CHA-0530	5.30	6	180	140	36
ND3020-CHA-0540	5.40	6	180	140	36
ND3020-CHA-0550	5.50	6	180	140	36
ND3020-CHA-0560	5.60	6	180	140	36

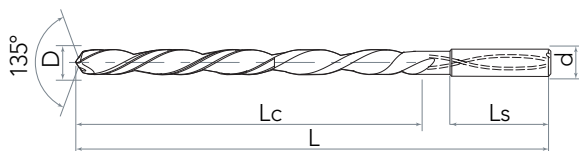
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ND3020-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3020-CHA-0570	5.70	6	180	140	36
ND3020-CHA-0580	5.80	6	180	140	36
ND3020-CHA-0590	5.90	6	180	140	36
ND3020-CHA-0600	6.00	6	180	140	36
ND3020-CHA-0610	6.10	6	180	140	36
ND3020-CHA-0620	6.20	6	180	140	36
ND3020-CHA-0630	6.30	8	202	162	36
ND3020-CHA-0640	6.40	8	202	162	36
ND3020-CHA-0650	6.50	8	202	162	36
ND3020-CHA-0660	6.60	8	202	162	36
ND3020-CHA-0670	6.70	8	202	162	36
ND3020-CHA-0680	6.80	8	202	162	36
ND3020-CHA-0690	6.90	8	202	162	36
ND3020-CHA-0700	7.00	8	202	162	36
ND3020-CHA-0710	7.10	8	223	183	36
ND3020-CHA-0720	7.20	8	223	183	36
ND3020-CHA-0730	7.30	8	223	183	36
ND3020-CHA-0740	7.40	8	223	183	36
ND3020-CHA-0750	7.50	8	223	183	36
ND3020-CHA-0760	7.60	8	223	183	36
ND3020-CHA-0770	7.70	8	223	183	36
ND3020-CHA-0780	7.80	8	223	183	36
ND3020-CHA-0790	7.90	8	223	183	36
ND3020-CHA-0800	8.00	8	223	183	36
ND3020-CHA-0810	8.10	8	223	183	36
ND3020-CHA-0820	8.20	8	223	183	36
ND3020-CHA-0830	8.30	10	249	205	40

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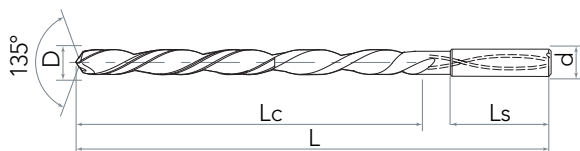


Carbide Deep-hole Drill 20XD

ND3020-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials

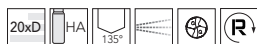


Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3020-CHA-0840	8.40	10	249	205	40
ND3020-CHA-0850	8.50	10	249	205	40
ND3020-CHA-0860	8.60	10	249	205	40
ND3020-CHA-0870	8.70	10	249	205	40
ND3020-CHA-0880	8.80	10	249	205	40
ND3020-CHA-0890	8.90	10	249	205	40
ND3020-CHA-0900	9.00	10	249	205	40
ND3020-CHA-0910	9.10	10	271	227	40
ND3020-CHA-0920	9.20	10	271	227	40
ND3020-CHA-0930	9.30	10	271	227	40
ND3020-CHA-0940	9.40	10	271	227	40
ND3020-CHA-0950	9.50	10	271	227	40
ND3020-CHA-0960	9.60	10	271	227	40
ND3020-CHA-0970	9.70	10	271	227	40
ND3020-CHA-0980	9.80	10	271	227	40
ND3020-CHA-0990	9.90	10	271	227	40
ND3020-CHA-1000	10.00	10	271	227	40
ND3020-CHA-1010	10.10	10	271	227	40
ND3020-CHA-1020	10.20	12	302	253	45
ND3020-CHA-1030	10.30	12	302	253	45
ND3020-CHA-1040	10.40	12	302	253	45
ND3020-CHA-1050	10.50	12	302	253	45
ND3020-CHA-1060	10.60	12	302	253	45
ND3020-CHA-1070	10.70	12	302	253	45
ND3020-CHA-1080	10.80	12	302	253	45
ND3020-CHA-1090	10.90	12	302	253	45
ND3020-CHA-1100	11.00	12	302	253	45

See the next page

ND3020-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

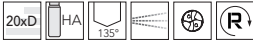
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3020-CHA-1110	11.10	12	323	274	45
ND3020-CHA-1120	11.20	12	323	274	45
ND3020-CHA-1130	11.30	12	323	274	45
ND3020-CHA-1140	11.40	12	323	274	45
ND3020-CHA-1150	11.50	12	323	274	45
ND3020-CHA-1160	11.60	12	323	274	45
ND3020-CHA-1170	11.70	12	323	274	45
ND3020-CHA-1180	11.80	12	323	274	45
ND3020-CHA-1190	11.90	12	323	274	45
ND3020-CHA-1200	12.00	12	323	274	45
ND3020-CHA-1210	12.10	12	323	274	45
ND3020-CHA-1220	12.20	12	323	274	45
ND3020-CHA-1230	12.30	14	367	318	45
ND3020-CHA-1240	12.40	14	367	318	45
ND3020-CHA-1250	12.50	14	367	318	45
ND3020-CHA-1260	12.60	14	367	318	45
ND3020-CHA-1270	12.70	14	367	318	45
ND3020-CHA-1280	12.80	14	367	318	45
ND3020-CHA-1290	12.90	14	367	318	45
ND3020-CHA-1300	13.00	14	367	318	45
ND3020-CHA-1310	13.10	14	367	318	45
ND3020-CHA-1320	13.20	14	367	318	45
ND3020-CHA-1330	13.30	14	367	318	45
ND3020-CHA-1340	13.40	14	367	318	45
ND3020-CHA-1350	13.50	14	367	318	45
ND3020-CHA-1360	13.60	14	367	318	45
ND3020-CHA-1370	13.70	14	367	318	45

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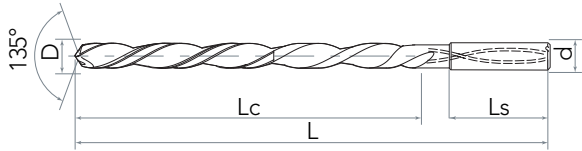


Carbide Deep-hole Drill 20XD

ND3020-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3020-CHA-1380	13.80	14	367	318	45
ND3020-CHA-1390	13.90	14	367	318	45
ND3020-CHA-1400	14.00	14	367	318	45
ND3020-CHA-1410	14.10	14	367	318	45
ND3020-CHA-1420	14.20	16	413	361	48
ND3020-CHA-1430	14.30	16	413	361	48
ND3020-CHA-1440	14.40	16	413	361	48
ND3020-CHA-1450	14.50	16	413	361	48
ND3020-CHA-1460	14.60	16	413	361	48
ND3020-CHA-1470	14.70	16	413	361	48
ND3020-CHA-1480	14.80	16	413	361	48
ND3020-CHA-1490	14.90	16	413	361	48
ND3020-CHA-1500	15.00	16	413	361	48
ND3020-CHA-1510	15.10	16	413	361	48
ND3020-CHA-1520	15.20	16	413	361	48
ND3020-CHA-1530	15.30	16	413	361	48
ND3020-CHA-1540	15.40	16	413	361	48
ND3020-CHA-1550	15.50	16	413	361	48
ND3020-CHA-1560	15.60	16	413	361	48
ND3020-CHA-1570	15.70	16	413	361	48
ND3020-CHA-1580	15.80	16	413	361	48
ND3020-CHA-1590	15.90	16	413	361	48
ND3020-CHA-1600	16.00	16	413	361	48

Recommended cutting data see the next page





NAVIGATOR Carbide Deep-hole Drill 20XD

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm
P	Common Structural Steels	-	< 150	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Common Structural Steels	< 32	< 301	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Free-cutting Steels	< 25	< 255	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Free-cutting Steels	< 32	< 301	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 20	< 220	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Heat-treatable Steels	< 25	< 255	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 32	< 301	330	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 32	< 301	360	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 43	< 402	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Case Hardened Steels	< 25	< 255	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Alloyed Case Hardened Steels	< 32	< 301	360	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Case Hardened Steels	< 43	< 402	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Nitriding Steels	< 32	< 301	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Nitriding Steels	< 43	< 402	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Tool Steels	< 25	< 255	330	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Tool Steels	< 43	< 402	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	High Speed Steels	< 43	< 402	165	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Spring Steels	< 38	< 354	165	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
H	Hardened Steels	< 48	< 460	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	Hardened Steels	< 66	-	165	0.0010	0.0020	0.0040	0.0060	0.0060	0.0080
M	Stainless steels, Sulphured	< 28	< 273	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Austenitic	< 36	< 337	230	0.0010	0.0020	0.0020	0.0040	0.0040	0.0050
	Martensitic	< 46	< 435	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
K	Cast Iron	< 23	< 242	460	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Cast Iron	< 38	< 354	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Spheroidal Graphite Iron And	< 23	< 242	460	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Malleable Cast Iron	< 38	< 354	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200

See the next page



Cutting Data Table

NAVIGATOR Carbide Deep-hole Drill 20XD

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.7 mm	15.87 mm
K	New Cast Materials GGV	< 20	< 220	330	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials GGV	< 32	< 301	330	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials ADI	< 32	< 301	295	0.0010	0.0065	0.0100	0.0155	0.0155	0.0195
S	Special alloys	< 54	< 549	100	0.00040	0.0020	0.0025	0.0035	0.0040	0.0050
N	Copper, Low-alloyed	-	< 150	395		0.0010	0.0020	0.0030	0.0030	0.0040
	Brass, Short-chipping	-	< 180	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200

ND3025-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

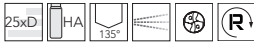
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3025-CHA-0300	3.00	6	125	85	36
ND3025-CHA-0310	3.10	6	141	101	36
ND3025-CHA-0320	3.20	6	141	101	36
ND3025-CHA-0330	3.30	6	141	101	36
ND3025-CHA-0340	3.40	6	141	101	36
ND3025-CHA-0350	3.50	6	156	116	36
ND3025-CHA-0360	3.60	6	156	116	36
ND3025-CHA-0370	3.70	6	156	116	36
ND3025-CHA-0380	3.80	6	156	116	36
ND3025-CHA-0390	3.90	6	156	116	36
ND3025-CHA-0400	4.00	6	156	116	36
ND3025-CHA-0410	4.10	6	183	143	36
ND3025-CHA-0420	4.20	6	183	143	36
ND3025-CHA-0430	4.30	6	183	143	36
ND3025-CHA-0440	4.40	6	183	143	36
ND3025-CHA-0450	4.50	6	183	143	36
ND3025-CHA-0460	4.60	6	183	143	36
ND3025-CHA-0470	4.70	6	183	143	36
ND3025-CHA-0480	4.80	6	183	143	36
ND3025-CHA-0490	4.90	6	183	143	36
ND3025-CHA-0500	5.00	6	183	143	36
ND3025-CHA-0510	5.10	6	210	170	36
ND3025-CHA-0520	5.20	6	210	170	36
ND3025-CHA-0530	5.30	6	210	170	36
ND3025-CHA-0540	5.40	6	210	170	36
ND3025-CHA-0550	5.50	6	210	170	36
ND3025-CHA-0560	5.60	6	210	170	36

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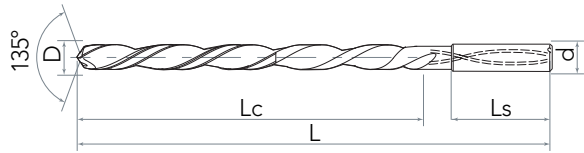


Carbide Deep-hole Drill 25XD

ND3025-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3025-CHA-0570	5.70	6	210	170	36
ND3025-CHA-0580	5.80	6	210	170	36
ND3025-CHA-0590	5.90	6	210	170	36
ND3025-CHA-0600	6.00	6	210	170	36
ND3025-CHA-0610	6.10	6	210	170	36
ND3025-CHA-0620	6.20	6	210	170	36
ND3025-CHA-0630	6.30	8	237	197	36
ND3025-CHA-0640	6.40	8	237	197	36
ND3025-CHA-0650	6.50	8	237	197	36
ND3025-CHA-0660	6.60	8	237	197	36
ND3025-CHA-0670	6.70	8	237	197	36
ND3025-CHA-0680	6.80	8	237	197	36
ND3025-CHA-0690	6.90	8	237	197	36
ND3025-CHA-0700	7.00	8	237	197	36
ND3025-CHA-0710	7.10	8	263	223	36
ND3025-CHA-0720	7.20	8	263	223	36
ND3025-CHA-0730	7.30	8	263	223	36
ND3025-CHA-0740	7.40	8	263	223	36
ND3025-CHA-0750	7.50	8	263	223	36
ND3025-CHA-0760	7.60	8	263	223	36
ND3025-CHA-0770	7.70	8	263	223	36
ND3025-CHA-0780	7.80	8	263	223	36
ND3025-CHA-0790	7.90	8	263	223	36
ND3025-CHA-0800	8.00	8	263	223	36
ND3025-CHA-0810	8.10	8	263	223	36
ND3025-CHA-0820	8.20	8	263	223	36
ND3025-CHA-0830	8.30	10	294	250	40

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ND3025-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

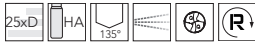
Specification	D (h7)	d (h6)	L	Lc	Ls
ND3025-CHA-0840	8.40	10	294	250	40
ND3025-CHA-0850	8.50	10	294	250	40
ND3025-CHA-0860	8.60	10	294	250	40
ND3025-CHA-0870	8.70	10	294	250	40
ND3025-CHA-0880	8.80	10	294	250	40
ND3025-CHA-0890	8.90	10	294	250	40
ND3025-CHA-0900	9.00	10	294	250	40
ND3025-CHA-0910	9.10	10	321	277	40
ND3025-CHA-0920	9.20	10	321	277	40
ND3025-CHA-0930	9.30	10	321	277	40
ND3025-CHA-0940	9.40	10	321	277	40
ND3025-CHA-0950	9.50	10	321	277	40
ND3025-CHA-0960	9.60	10	321	277	40
ND3025-CHA-0970	9.70	10	321	277	40
ND3025-CHA-0980	9.80	10	321	277	40
ND3025-CHA-0990	9.90	10	321	277	40
ND3025-CHA-1000	10.00	10	321	277	40
ND3025-CHA-1010	10.10	10	321	277	40
ND3025-CHA-1020	10.20	10	321	277	40
ND3025-CHA-1030	10.30	12	359	310	45
ND3025-CHA-1040	10.40	12	359	310	45
ND3025-CHA-1050	10.50	12	359	310	45
ND3025-CHA-1060	10.60	12	359	310	45
ND3025-CHA-1070	10.70	12	359	310	45
ND3025-CHA-1080	10.80	12	359	310	45
ND3025-CHA-1090	10.90	12	359	310	45
ND3025-CHA-1100	11.00	12	359	310	45

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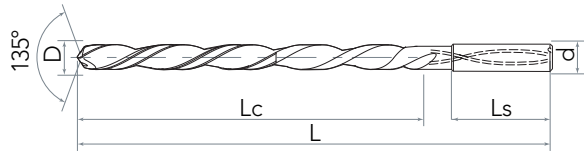


Carbide Deep-hole Drill 25XD

ND3025-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3025-CHA-1110	11.10	12	386	337	45
ND3025-CHA-1120	11.20	12	386	337	45
ND3025-CHA-1130	11.30	12	386	337	45
ND3025-CHA-1140	11.40	12	386	337	45
ND3025-CHA-1150	11.50	12	386	337	45
ND3025-CHA-1160	11.60	12	386	337	45
ND3025-CHA-1170	11.70	12	386	337	45
ND3025-CHA-1180	11.80	12	386	337	45
ND3025-CHA-1190	11.90	12	386	337	45
ND3025-CHA-1200	12.00	12	386	337	45
ND3025-CHA-1210	12.10	12	386	337	45
ND3025-CHA-1220	12.20	12	386	337	45
ND3025-CHA-1230	12.30	14	437	388	45
ND3025-CHA-1240	12.40	14	437	388	45
ND3025-CHA-1250	12.50	14	437	388	45
ND3025-CHA-1260	12.60	14	437	388	45
ND3025-CHA-1270	12.70	14	437	388	45
ND3025-CHA-1280	12.80	14	437	388	45
ND3025-CHA-1290	12.90	14	437	388	45
ND3025-CHA-1300	13.00	14	437	388	45
ND3025-CHA-1310	13.10	14	437	388	45
ND3025-CHA-1320	13.20	14	437	388	45
ND3025-CHA-1330	13.30	14	437	388	45
ND3025-CHA-1340	13.40	14	437	388	45
ND3025-CHA-1350	13.50	14	437	388	45
ND3025-CHA-1360	13.60	14	437	388	45
ND3025-CHA-1370	13.70	14	437	388	45

See the next page



ND3025-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3025-CHA-1380	13.80	14	437	388	45
ND3025-CHA-1390	13.90	14	437	388	45
ND3025-CHA-1400	14.00	14	437	388	45
ND3025-CHA-1410	14.10	14	437	388	45
ND3025-CHA-1420	14.20	16	493	441	48
ND3025-CHA-1430	14.30	16	493	441	48
ND3025-CHA-1440	14.40	16	493	441	48
ND3025-CHA-1450	14.50	16	493	441	48
ND3025-CHA-1460	14.60	16	493	441	48
ND3025-CHA-1470	14.70	16	493	441	48
ND3025-CHA-1480	14.80	16	493	441	48
ND3025-CHA-1490	14.90	16	493	441	48
ND3025-CHA-1500	15.00	16	493	441	48
ND3025-CHA-1510	15.10	16	493	441	48
ND3025-CHA-1520	15.20	16	493	441	48
ND3025-CHA-1530	15.30	16	493	441	48
ND3025-CHA-1540	15.40	16	493	441	48
ND3025-CHA-1550	15.50	16	493	441	48
ND3025-CHA-1560	15.60	16	493	441	48
ND3025-CHA-1570	15.70	16	493	441	48
ND3025-CHA-1580	15.80	16	493	441	48
ND3025-CHA-1590	15.90	16	493	441	48
ND3025-CHA-1600	16.00	16	493	441	48

Recommended cutting data see the next page





Cutting Data Table

NAVIGATOR Carbide Deep-hole Drill 25XD

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm
P	Common Structural Steels	-	< 150	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Common Structural Steels	< 32	< 301	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Free-cutting Steels	< 25	< 255	395	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Free-cutting Steels	< 32	< 301	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 20	< 220	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Heat-treatable Steels	< 25	< 255	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 32	< 301	330	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 32	< 301	330	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 43	< 402	330	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Case Hardened Steels	< 25	< 255	330	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Alloyed Case Hardened Steels	< 32	< 301	330	0.0030	0.0050	0.0080	0.0110	0.0120	0.0160
	Alloyed Case Hardened Steels	< 43	< 402	330	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Nitriding Steels	< 32	< 301	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Nitriding Steels	< 43	< 402	195	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Tool Steels	< 25	< 255	295	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Tool Steels	< 43	< 402	230	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
H	High Speed Steels	< 43	< 402	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	Spring Steels	< 38	< 354	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
M	Hardened Steels	< 48	< 460	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	Hardened Steels	< 66	-	165	0.0010	0.0020	0.0040	0.0060	0.0060	0.0080
K	Stainless steels, Sulphured	< 28	< 273	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Austenitic	< 36	< 337	230	0.0010	0.0020	0.0020	0.0040	0.0040	0.0050
	Martensitic	< 46	< 435	330	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
K	Cast Iron	< 23	< 242	425	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Cast Iron	< 38	< 354	295	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Spheroidal Graphite Iron And	< 23	< 242	425	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200
	Malleable Cast Iron	< 38	< 354	295	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200

See the next page





NAVIGATOR Carbide Deep-hole Drill 25XD

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm
K	New Cast Materials GGV	< 20	< 220	295	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials GGV	< 32	< 301	295	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials ADI	< 32	< 301	260	0.0010	0.0065	0.0100	0.0155	0.0155	0.0195
S	Special Alloys	< 54	< 549	100	0.00040	0.0020	0.0025	0.0035	0.0040	0.0050
N	Copper, Low-alloyed	-	< 150	395		0.0010	0.0020	0.0030	0.0030	0.0040
	Brass, Short-chipping	-	< 180	360	0.0040	0.0060	0.0100	0.0140	0.0160	0.0200



Carbide Deep-hole Drill 30XD

ND3030-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3030-CHA-0300	3.00	6	140	100	36
ND3030-CHA-0310	3.10	6	158	118	36
ND3030-CHA-0320	3.20	6	158	118	36
ND3030-CHA-0330	3.30	6	158	118	36
ND3030-CHA-0340	3.40	6	158	118	36
ND3030-CHA-0350	3.50	6	176	136	36
ND3030-CHA-0360	3.60	6	176	136	36
ND3030-CHA-0370	3.70	6	176	136	36
ND3030-CHA-0380	3.80	6	176	136	36
ND3030-CHA-0390	3.90	6	176	136	36
ND3030-CHA-0400	4.00	6	176	136	36
ND3030-CHA-0410	4.10	6	208	168	36
ND3030-CHA-0420	4.20	6	208	168	36
ND3030-CHA-0430	4.30	6	208	168	36
ND3030-CHA-0440	4.40	6	208	168	36
ND3030-CHA-0450	4.50	6	208	168	36
ND3030-CHA-0460	4.60	6	208	168	36
ND3030-CHA-0470	4.70	6	208	168	36
ND3030-CHA-0480	4.80	6	208	168	36
ND3030-CHA-0490	4.90	6	208	168	36
ND3030-CHA-0500	5.00	6	208	168	36
ND3030-CHA-0510	5.10	6	240	200	36
ND3030-CHA-0520	5.20	6	240	200	36
ND3030-CHA-0530	5.30	6	240	200	36
ND3030-CHA-0540	5.40	6	240	200	36
ND3030-CHA-0550	5.50	6	240	200	36
ND3030-CHA-0560	5.60	6	240	200	36

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ND3030-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials

Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3030-CHA-0570	5.70	6	240	200	36
ND3030-CHA-0580	5.80	6	240	200	36
ND3030-CHA-0590	5.90	6	240	200	36
ND3030-CHA-0600	6.00	6	240	200	36
ND3030-CHA-0610	6.10	6	240	200	36
ND3030-CHA-0620	6.20	6	240	200	36
ND3030-CHA-0630	6.30	8	272	232	36
ND3030-CHA-0640	6.40	8	272	232	36
ND3030-CHA-0650	6.50	8	272	232	36
ND3030-CHA-0660	6.60	8	272	232	36
ND3030-CHA-0670	6.70	8	272	232	36
ND3030-CHA-0680	6.80	8	272	232	36
ND3030-CHA-0690	6.90	8	272	232	36
ND3030-CHA-0700	7.00	8	272	232	36
ND3030-CHA-0710	7.10	8	303	263	36
ND3030-CHA-0720	7.20	8	303	263	36
ND3030-CHA-0730	7.30	8	303	263	36
ND3030-CHA-0740	7.40	8	303	263	36
ND3030-CHA-0750	7.50	8	303	263	36
ND3030-CHA-0760	7.60	8	303	263	36
ND3030-CHA-0770	7.70	8	303	263	36
ND3030-CHA-0780	7.80	8	303	263	36
ND3030-CHA-0790	7.90	8	303	263	36
ND3030-CHA-0800	8.00	8	303	263	36
ND3030-CHA-0810	8.10	8	303	263	40
ND3030-CHA-0820	8.20	8	303	263	40
ND3030-CHA-0830	8.30	10	339	295	40

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Carbide Deep-hole Drill 30XD

ND3030-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3030-CHA-0840	8.40	10	339	295	40
ND3030-CHA-0850	8.50	10	339	295	40
ND3030-CHA-0860	8.60	10	339	295	40
ND3030-CHA-0870	8.70	10	339	295	40
ND3030-CHA-0880	8.80	10	339	295	40
ND3030-CHA-0890	8.90	10	339	295	40
ND3030-CHA-0900	9.00	10	339	295	40
ND3030-CHA-0910	9.10	10	371	327	40
ND3030-CHA-0920	9.20	10	371	327	40
ND3030-CHA-0930	9.30	10	371	327	40
ND3030-CHA-0940	9.40	10	371	327	40
ND3030-CHA-0950	9.50	10	371	327	40
ND3030-CHA-0960	9.60	10	371	327	40
ND3030-CHA-0970	9.70	10	371	327	40
ND3030-CHA-0980	9.80	10	371	327	40
ND3030-CHA-0990	9.90	10	371	327	40
ND3030-CHA-1000	10.00	10	371	327	40
ND3030-CHA-1010	10.10	10	371	327	40
ND3030-CHA-1020	10.20	10	371	327	40
ND3030-CHA-1030	10.30	12	412	363	45
ND3030-CHA-1040	10.40	12	412	363	45
ND3030-CHA-1050	10.50	12	412	363	45
ND3030-CHA-1060	10.60	12	412	363	45
ND3030-CHA-1070	10.70	12	412	363	45
ND3030-CHA-1080	10.80	12	412	363	45
ND3030-CHA-1090	10.90	12	412	363	45
ND3030-CHA-1100	11.00	12	412	363	45

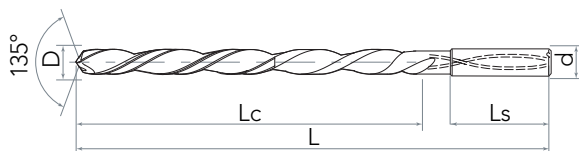
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ND3030-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3030-CHA-1110	11.10	12	443	394	45
ND3030-CHA-1120	11.20	12	443	394	45
ND3030-CHA-1130	11.30	12	443	394	45
ND3030-CHA-1140	11.40	12	443	394	45
ND3030-CHA-1150	11.50	12	443	394	45
ND3030-CHA-1160	11.60	12	443	394	45
ND3030-CHA-1170	11.70	12	443	394	45
ND3030-CHA-1180	11.80	12	443	394	45
ND3030-CHA-1190	11.90	12	443	394	45
ND3030-CHA-1200	12.00	12	443	394	45
ND3030-CHA-1210	12.10	12	443	394	45
ND3030-CHA-1220	12.20	12	443	394	45
ND3030-CHA-1230	12.30	14	507	458	45
ND3030-CHA-1240	12.40	14	507	458	45
ND3030-CHA-1250	12.50	14	507	458	45
ND3030-CHA-1260	12.60	14	507	458	45
ND3030-CHA-1270	12.70	14	507	458	45
ND3030-CHA-1280	12.80	14	507	458	45
ND3030-CHA-1290	12.90	14	507	458	45
ND3030-CHA-1300	13.00	14	507	458	45
ND3030-CHA-1310	13.10	14	507	458	45
ND3030-CHA-1320	13.20	14	507	458	45
ND3030-CHA-1330	13.30	14	507	458	45
ND3030-CHA-1340	13.40	14	507	458	45
ND3030-CHA-1350	13.50	14	507	458	45
ND3030-CHA-1360	13.60	14	507	458	45
ND3030-CHA-1370	13.70	14	507	458	45

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Carbide Deep-hole Drill 30XD

ND3030-CHA



Structural and case hardened steels · free-cutting steels, Heat-treatable steels · alloyed steels up to 1200 N/mm² · stainless steels · cast materials



Unit: mm

Specification	D (h7)	d (h6)	L	Lc	Ls
ND3030-CHA-1380	13.80	14	507	458	45
ND3030-CHA-1390	13.90	14	507	458	45
ND3030-CHA-1400	14.00	14	507	458	45

Recommended cutting data see the next page





NAVIGATOR Carbide Deep-hole Drill 30XD

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm
P	Common Structural Steels	-	< 150	260	0.0030	0.0050	0.0080	0.0120	0.0120	0.0160
	Common Structural Steels	< 32	< 301	260	0.0030	0.0050	0.0080	0.0120	0.0120	0.0160
	Free-cutting Steels	< 25	< 255	360	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200
	Free-cutting Steels	< 32	< 301	330	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200
	Unalloyed Heat-treatable Steels	< 20	< 220	360	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Heat-treatable Steels	< 25	< 255	260	0.0030	0.0050	0.0080	0.0120	0.0120	0.0160
	Unalloyed Heat-treatable Steels	< 32	< 301	260	0.0030	0.0050	0.0080	0.0120	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 32	< 301	260	0.0030	0.0050	0.0080	0.0120	0.0120	0.0160
	Alloyed Heat-treatable Steels	< 43	< 402	260	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Unalloyed Case Hardened Steels	< 25	< 255	260	0.0030	0.0050	0.0080	0.0120	0.0120	0.0160
	Alloyed Case Hardened Steels	< 32	< 301	260	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Alloyed Case Hardened Steels	< 43	< 402	260	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Nitriding Steels	< 32	< 301	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Nitriding Steels	< 43	< 402	195	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Tool Steels	< 25	< 255	260	0.0030	0.0040	0.0060	0.0090	0.0100	0.0120
	Tool Steels	< 43	< 402	230	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	High Speed Steels	< 43	< 402	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	Spring Steels	< 38	< 354	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
H	Hardened Steels	< 48	< 460	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
	Hardened Steels	< 66	-	165	0.0020	0.0020	0.0040	0.0060	0.0060	0.0080
M	Stainless steels, Sulphured	< 28	< 273	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
	Austenitic	< 36	< 337	230	0.0010	0.0020	0.0030	0.0050	0.0050	0.0060
	Martensitic	< 46	< 435	260	0.0020	0.0030	0.0050	0.0070	0.0080	0.0100
K	Cast Iron	< 23	< 242	395	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200
	Cast Iron	< 38	< 354	260	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200
	Spheroidal Graphite Iron And	< 23	< 242	395	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200
	Malleable Cast Iron	< 38	< 354	260	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200

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Cutting Data Table

NAVIGATOR Carbide Deep-hole Drill 30XD

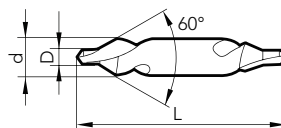
ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		1.59 mm	3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm
K	New Cast Materials GGV	< 20	< 220	260	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials GGV	< 32	< 301	260	0.0005	0.0040	0.0065	0.0100	0.0100	0.0125
	New Cast Materials ADI	< 32	< 301	230	0.0010	0.0065	0.0100	0.0155	0.0155	0.0195
S	Special Alloys	< 54	< 549	100	0.00040	0.0020	0.0025	0.0035	0.0040	0.0050
N	Copper, Low-alloyed	-	< 150	395	0.0010	0.0010	0.0020	0.0040	0.0030	0.0040
	Brass, Short-chipping	-	< 180	330	0.0040	0.0060	0.0100	0.0150	0.0160	0.0200

ND00-NHA



Web thinning $\geq \phi 2.000$

- Relieved cone
 - Without protective countersink
 - For center holes to DIN 332, part 1, form A
 - $D \leq 0.8$ mm: not double ended
- universal material suitability



Unit: mm

Specification	D	d	L
ND00-NHA-0050	0.50	3.15	25.00
ND00-NHA-0080	0.80	3.15	25.00
ND00-NHA-0100	1.00	3.15	31.50
ND00-NHA-0125	1.25	3.15	31.50
ND00-NHA-0160	1.60	4.00	35.50
ND00-NHA-0200	2.00	5.00	40.00
ND00-NHA-0250	2.50	6.30	45.00
ND00-NHA-0315	3.15	8.00	50.00
ND00-NHA-0400	4.00	10.00	56.00
ND00-NHA-0500	5.00	12.50	63.00
ND00-NHA-0630	6.30	16.00	71.00

Recommended cutting data see the next page





Cutting Data Table

NAVIGATOR Carbide Center Drills

ISO	Material Group	Hardness		SFM	Feed Rate - IPR				
		HRC	BHN		0.5 mm	1.0 mm	2.0 mm	2.5 mm	3.15 mm
P	Common Structural Steels	-	< 150	230	0.0003	0.0006	0.0016	0.0020	0.0025
	Common Structural Steels	< 32	< 301	195	0.0003	0.0006	0.0016	0.0020	0.0025
	Free-cutting Steels	< 25	< 255	230	0.0003	0.0006	0.0016	0.0020	0.0025
	Free-cutting Steels	< 32	< 301	230	0.0003	0.0006	0.0016	0.0020	0.0025
	Unalloyed Heat-treatable Steels	< 20	< 220	195	0.0003	0.0006	0.0016	0.0020	0.0025
	Unalloyed Heat-treatable Steels	< 25	< 255	165	0.0003	0.0006	0.0016	0.0020	0.0025
	Unalloyed Heat-treatable Steels	< 32	< 301	150	0.0003	0.0005	0.0013	0.0016	0.0020
	Alloyed Heat-treatable Steels	< 32	< 301	115	0.0003	0.0006	0.0016	0.0020	0.0025
	Alloyed Heat-treatable Steels	< 43	< 402	65	0.0003	0.0005	0.0013	0.0016	0.0020
	Unalloyed Case Hardened Steels	< 25	< 255	195	0.0004	0.0006	0.0020	0.0025	0.0031
	Alloyed Case Hardened Steels	< 32	< 301	115	0.0003	0.0006	0.0016	0.0020	0.0025
	Alloyed Case Hardened Steels	< 43	< 402	65	0.0003	0.0005	0.0013	0.0016	0.0020
	Nitriding Steels	< 32	< 301	80	0.0003	0.0006	0.0016	0.0020	0.0025
	Nitriding Steels	< 43	< 402	65	0.0003	0.0005	0.0013	0.0016	0.0020
	Tool Steels	< 25	< 255	80	0.0003	0.0005	0.0013	0.0016	0.0020
	Tool Steels	< 43	< 402	50	0.0003	0.0005	0.0013	0.0016	0.0020
	High Speed Steels	< 43	< 402	50	0.0003	0.0005	0.0013	0.0016	0.0020
	Spring Steels	< 38	< 354	50	0.0002	0.0003	0.0010	0.0013	0.0016
M	Stainless steels, Sulphured	< 28	< 273	100	0.0003	0.0005	0.0013	0.0016	0.0020
	Austenitic	< 36	< 337	65	0.0003	0.0005	0.0013	0.0016	0.0020
	Martensitic	< 46	< 435	50	0.0003	0.0005	0.0013	0.0016	0.0020
K	Cast Iron	< 23	< 242	165	0.0005	0.0007	0.0025	0.0031	0.0039
	Cast Iron	< 38	< 354	165	0.0004	0.0006	0.0020	0.0025	0.0031
	Spheroidal Graphite Iron And	< 23	< 242	195	0.0005	0.0007	0.0025	0.0031	0.0039
	Malleable Cast Iron	< 38	< 354	165	0.0004	0.0006	0.0020	0.0025	0.0031

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NAVIGATOR Carbide Center Drills

ISO	Material Group	Hardness		SFM	Feed Rate - IPR				
		HRC	BHN		0.5 mm	1.0 mm	2.0 mm	2.5 mm	3.15 mm
S	Special alloys	< 54	< 549	35	0.0002	0.0002	0.0008	0.0010	0.0013
	Ti and Ti-alloys	< 25	< 255	35	0.0002	0.0003	0.0010	0.0013	0.0016
	Ti and Ti-alloys	< 43	< 402	35	0.0002	0.0003	0.0010	0.0013	0.0016
N	Aluminium and Al-alloys	-	< 120	525	0.0006	0.0008	0.0031	0.0039	0.0049
	Al wrought alloys	-	< 200	525	0.0006	0.0008	0.0031	0.0039	0.0049
	Al cast alloys ≤ 10 % Si	-	< 180	330	0.0005	0.0007	0.0025	0.0031	0.0039
	≤ 24 % Si	-	< 180	330	0.0005	0.0007	0.0025	0.0031	0.0039
	Magnesium alloys	-	< 120	460	0.0005	0.0007	0.0025	0.0031	0.0039
	Copper, low-alloyed	-	< 150	395	0.0004	0.0006	0.0020	0.0025	0.0031
	Brass, short-chipping	-	< 180	460	0.0004	0.0006	0.0020	0.0025	0.0031
	long-chipping	-	< 180	295	0.0004	0.0006	0.0020	0.0025	0.0031
	Bronze, short-chipping	-	< 180	230	0.0003	0.0006	0.0016	0.0020	0.0025
	Bronze, short-chipping	< 25	< 255	195	0.0003	0.0006	0.0016	0.0020	0.0025
	Bronze, long-chipping	< 25	< 255	130	0.0003	0.0006	0.0016	0.0020	0.0025
	Bronze, long-chipping	< 32	< 301	115	0.0003	0.0006	0.0016	0.0020	0.0025
H	Duroplastics			130	0.0003	0.0006	0.0016	0.0020	0.0025
	Thermoplastics			195	0.0004	0.0006	0.0020	0.0025	0.0031

See the next page





NAVIGATOR Carbide Center Drills

ISO	Material Group	Hardness		SFM	Feed Rate - IPR			
		HRC	BHN		4.0 mm	5.0 mm	6.3 mm	8.0 mm
P	Common Structural Steels	-	< 150	230	0.0031	0.0031	0.0039	0.0049
	Common Structural Steels	< 32	< 301	195	0.0031	0.0031	0.0039	0.0049
	Free-cutting Steels	< 25	< 255	230	0.0031	0.0031	0.0039	0.0049
	Free-cutting Steels	< 32	< 301	230	0.0031	0.0031	0.0039	0.0049
	Unalloyed Heat-treatable Steels	< 20	< 220	195	0.0031	0.0031	0.0039	0.0049
	Unalloyed Heat-treatable Steels	< 25	< 255	165	0.0031	0.0031	0.0039	0.0049
	Unalloyed Heat-treatable Steels	< 32	< 301	150	0.0025	0.0025	0.0031	0.0039
	Alloyed Heat-treatable Steels	< 32	< 301	115	0.0031	0.0031	0.0039	0.0049
	Alloyed Heat-treatable Steels	< 43	< 402	65	0.0025	0.0025	0.0031	0.0039
	Unalloyed Case Hardened Steels	< 25	< 255	195	0.0039	0.0039	0.0049	0.0063
	Alloyed Case Hardened Steels	< 32	< 301	115	0.0031	0.0031	0.0039	0.0049
	Alloyed Case Hardened Steels	< 43	< 402	65	0.0025	0.0025	0.0031	0.0039
	Nitriding Steels	< 32	< 301	80	0.0031	0.0031	0.0039	0.0049
	Nitriding Steels	< 43	< 402	65	0.0025	0.0025	0.0031	0.0039
	Tool Steels	< 25	< 255	80	0.0025	0.0025	0.0031	0.0039
	Tool Steels	< 43	< 402	50	0.0025	0.0025	0.0031	0.0039
	High Speed Steels	< 43	< 402	50	0.0025	0.0025	0.0031	0.0039
	Spring Steels	< 38	< 354	50	0.0020	0.0020	0.0025	0.0031
M	Stainless steels, Sulphured	< 28	< 273	100	0.0025	0.0025	0.0031	0.0039
	Austenitic	< 36	< 337	65	0.0025	0.0025	0.0031	0.0039
	Martensitic	< 46	< 435	50	0.0025	0.0025	0.0031	0.0039
K	Cast Iron	< 23	< 242	165	0.0049	0.0049	0.0063	0.0079
	Cast Iron	< 38	< 354	165	0.0039	0.0039	0.0049	0.0063
	Spheroidal Graphite Iron And	< 23	< 242	195	0.0049	0.0049	0.0063	0.0079
	Malleable Cast Iron	< 38	< 354	165	0.0039	0.0039	0.0049	0.0063

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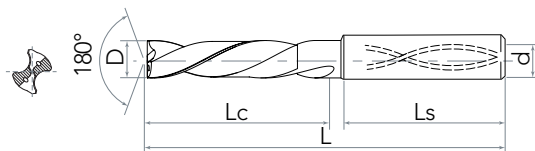
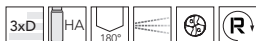
NAVIGATOR Carbide Center Drills

ISO	Material Group	Hardness		SFM	Feed Rate - IPR			
		HRC	BHN		4.0 mm	5.0 mm	6.3 mm	8.0 mm
S	Special alloys	< 54	< 549	35	0.0016	0.0016	0.0020	0.0025
	Ti and Ti-alloys	< 25	< 255	35	0.0020	0.0020	0.0025	0.0031
	Ti and Ti-alloys	< 43	< 402	35	0.0020	0.0020	0.0025	0.0031
N	Aluminium and Al-alloys	-	< 120	525	0.0063	0.0063	0.0079	0.0098
	Al wrought alloys	-	< 200	525	0.0063	0.0063	0.0079	0.0098
	Al cast alloys ≤ 10 % Si	-	< 180	330	0.0049	0.0049	0.0063	0.0079
	≤ 24 % Si	-	< 180	330	0.0049	0.0049	0.0063	0.0079
	Magnesium alloys	-	< 120	460	0.0049	0.0049	0.0063	0.0079
	Copper, low-alloyed	-	< 150	395	0.0039	0.0039	0.0049	0.0063
	Brass, short-chipping	-	< 180	460	0.0039	0.0039	0.0049	0.0063
	long-chipping	-	< 180	295	0.0039	0.0039	0.0049	0.0063
	Bronze, short-chipping	-	< 180	230	0.0031	0.0031	0.0039	0.0049
	Bronze, short-chipping	< 25	< 255	195	0.0031	0.0031	0.0039	0.0049
	Bronze, long-chipping	< 25	< 255	130	0.0031	0.0031	0.0039	0.0049
	Bronze, long-chipping	< 32	< 301	115	0.0031	0.0031	0.0039	0.0049
H	Duroplastics			130	0.0031	0.0031	0.0039	0.0049
	Thermoplastics			195	0.0039	0.0039	0.0049	0.0063



Carbide Carbide Flat-bottom Drill

ND0103-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials

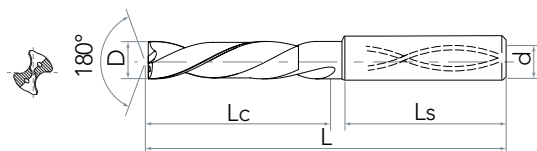
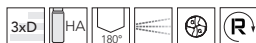
Unit: mm

Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-0300	3.00	6	61	16	36	11.50
ND0103-CHA-0310	3.10	6	61	16	36	11.35
ND0103-CHA-0317	3.17	6	61	16	36	11.25
ND0103-CHA-0320	3.20	6	61	16	36	11.20
ND0103-CHA-0325	3.25	6	61	16	36	11.13
ND0103-CHA-0330	3.30	6	61	16	36	11.05
ND0103-CHA-0340	3.40	6	61	16	36	10.90
ND0103-CHA-0350	3.50	6	61	16	36	10.75
ND0103-CHA-0357	3.57	6	61	16	36	10.65
ND0103-CHA-0360	3.60	6	61	16	36	10.60
ND0103-CHA-0370	3.70	6	61	16	36	10.45
ND0103-CHA-0380	3.80	6	65	18	36	12.30
ND0103-CHA-0390	3.90	6	65	18	36	12.15
ND0103-CHA-0397	3.97	6	65	18	36	12.05
ND0103-CHA-0400	4.00	6	65	18	36	12.00
ND0103-CHA-0404	4.04	6	65	18	36	11.94
ND0103-CHA-0410	4.10	6	65	18	36	11.85
ND0103-CHA-0420	4.20	6	65	18	36	11.70
ND0103-CHA-0430	4.30	6	65	21	36	14.55
ND0103-CHA-0437	4.37	6	65	21	36	14.45
ND0103-CHA-0440	4.40	6	65	21	36	14.40
ND0103-CHA-0450	4.50	6	65	21	36	14.25
ND0103-CHA-0460	4.60	6	65	21	36	14.10
ND0103-CHA-0465	4.65	6	65	21	36	14.03
ND0103-CHA-0470	4.70	6	65	21	36	13.95
ND0103-CHA-0476	4.76	6	65	26	36	18.86
ND0103-CHA-0480	4.80	6	65	26	36	18.80

See the next page



ND0103-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials

Unit: mm

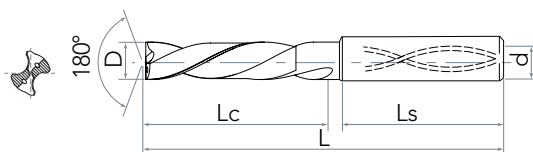
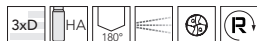
Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-0490	4.90	6	65	26	36	18.65
ND0103-CHA-0500	5.00	6	65	26	36	18.50
ND0103-CHA-0510	5.10	6	65	26	36	18.35
ND0103-CHA-0511	5.11	6	65	26	36	18.34
ND0103-CHA-0516	5.16	6	65	26	36	18.26
ND0103-CHA-0520	5.20	6	65	26	36	18.20
ND0103-CHA-0530	5.30	6	65	26	36	18.05
ND0103-CHA-0540	5.40	6	65	26	36	17.90
ND0103-CHA-0541	5.41	6	65	26	36	17.89
ND0103-CHA-0550	5.50	6	65	26	36	17.75
ND0103-CHA-0555	5.55	6	65	26	36	17.68
ND0103-CHA-0556	5.56	6	65	26	36	17.66
ND0103-CHA-0560	5.60	6	65	26	36	17.60
ND0103-CHA-0570	5.70	6	65	26	36	17.45
ND0103-CHA-0580	5.80	6	65	26	36	17.30
ND0103-CHA-0590	5.90	6	65	26	36	17.15
ND0103-CHA-0595	5.95	6	65	26	36	17.08
ND0103-CHA-0600	6.00	6	65	26	36	17.00
ND0103-CHA-0610	6.10	8	78	31	36	21.85
ND0103-CHA-0620	6.20	8	78	31	36	21.70
ND0103-CHA-0630	6.30	8	78	31	36	21.55
ND0103-CHA-0635	6.35	8	78	31	36	21.48
ND0103-CHA-0640	6.40	8	78	31	36	21.40
ND0103-CHA-0650	6.50	8	78	31	36	21.25
ND0103-CHA-0653	6.53	8	78	31	36	21.21
ND0103-CHA-0655	6.55	8	78	31	36	21.18
ND0103-CHA-0660	6.60	8	78	31	36	21.10

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Carbide Flat-bottom Drill

ND0103-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials

Unit: mm

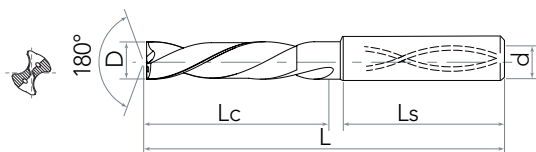
Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-0670	6.70	8	78	31	36	20.95
ND0103-CHA-0675	6.75	8	78	31	36	20.88
ND0103-CHA-0680	6.80	8	78	31	36	20.80
ND0103-CHA-0690	6.90	8	78	31	36	20.65
ND0103-CHA-0700	7.00	8	78	31	36	20.50
ND0103-CHA-0710	7.10	8	78	35	36	24.35
ND0103-CHA-0714	7.14	8	78	35	36	24.29
ND0103-CHA-0720	7.20	8	78	35	36	24.20
ND0103-CHA-0730	7.30	8	78	35	36	24.05
ND0103-CHA-0740	7.40	8	78	35	36	23.90
ND0103-CHA-0750	7.50	8	78	35	36	23.75
ND0103-CHA-0754	7.54	8	78	35	36	23.69
ND0103-CHA-0755	7.55	8	78	35	36	23.68
ND0103-CHA-0760	7.60	8	78	35	36	23.60
ND0103-CHA-0765	7.65	8	78	35	36	23.53
ND0103-CHA-0770	7.70	8	78	35	36	23.45
ND0103-CHA-0780	7.80	8	78	35	36	23.30
ND0103-CHA-0790	7.90	8	78	35	36	23.15
ND0103-CHA-0794	7.94	8	78	35	36	23.09
ND0103-CHA-0800	8.00	8	78	35	36	23.00
ND0103-CHA-0810	8.10	10	87	43	40	30.85
ND0103-CHA-0820	8.20	10	87	43	40	30.70
ND0103-CHA-0830	8.30	10	87	43	40	30.55
ND0103-CHA-0833	8.33	10	87	43	40	30.51
ND0103-CHA-0840	8.40	10	87	43	40	30.40
ND0103-CHA-0850	8.50	10	87	43	40	30.25
ND0103-CHA-0860	8.60	10	87	43	40	30.10

See the next page

ND0103-CHA



180° point geometry for flat bottom of the hole - for piloting, drilling,
Finishing - low burr development - piloting in all positions and materials



Unit: mm

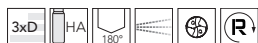
Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-0870	8.70	10	87	43	40	29.95
ND0103-CHA-0873	8.73	10	87	43	40	29.91
ND0103-CHA-0880	8.80	10	87	43	40	29.80
ND0103-CHA-0890	8.90	10	87	43	40	29.65
ND0103-CHA-0900	9.00	10	87	43	40	29.50
ND0103-CHA-0910	9.10	10	87	43	40	29.35
ND0103-CHA-0913	9.13	10	87	43	40	29.31
ND0103-CHA-0920	9.20	10	87	43	40	29.20
ND0103-CHA-0925	9.25	10	87	43	40	29.13
ND0103-CHA-0930	9.30	10	87	43	40	29.05
ND0103-CHA-0934	9.34	10	87	43	40	28.99
ND0103-CHA-0940	9.40	10	87	43	40	28.90
ND0103-CHA-0950	9.50	10	87	43	40	28.75
ND0103-CHA-0952	9.52	10	87	43	40	28.72
ND0103-CHA-0955	9.55	10	87	43	40	28.68
ND0103-CHA-0960	9.60	10	87	43	40	28.60
ND0103-CHA-0970	9.70	10	87	43	40	28.45
ND0103-CHA-0980	9.80	10	87	43	40	28.30
ND0103-CHA-0990	9.90	10	87	43	40	28.15
ND0103-CHA-0992	9.92	10	87	43	40	28.12
ND0103-CHA-1000	10.00	10	87	43	40	28.00
ND0103-CHA-1010	10.10	12	100	52	45	36.85
ND0103-CHA-1020	10.20	12	100	52	45	36.70
ND0103-CHA-1030	10.30	12	100	52	45	36.55
ND0103-CHA-1032	10.32	12	100	52	45	36.52
ND0103-CHA-1040	10.40	12	100	52	45	36.40
ND0103-CHA-1050	10.50	12	100	52	45	36.25

See the next page 

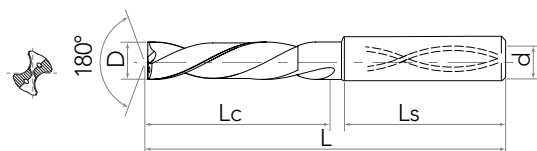


Carbide Flat-bottom Drill

ND0103-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials



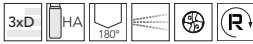
Unit: mm

Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-1060	10.60	12	100	52	45	36.10
ND0103-CHA-1070	10.70	12	100	52	45	35.95
ND0103-CHA-1072	10.72	12	100	52	45	35.92
ND0103-CHA-1080	10.80	12	100	52	45	35.80
ND0103-CHA-1090	10.90	12	100	52	45	35.65
ND0103-CHA-1100	11.00	12	100	52	45	35.50
ND0103-CHA-1110	11.10	12	100	52	45	35.35
ND0103-CHA-1111	11.11	12	100	52	45	35.34
ND0103-CHA-1120	11.20	12	100	52	45	35.20
ND0103-CHA-1130	11.30	12	100	52	45	35.05
ND0103-CHA-1140	11.40	12	100	52	45	34.90
ND0103-CHA-1150	11.50	12	100	52	45	34.75
ND0103-CHA-1151	11.51	12	100	52	45	34.74
ND0103-CHA-1155	11.55	12	100	52	45	34.68
ND0103-CHA-1160	11.60	12	100	52	45	34.60
ND0103-CHA-1170	11.70	12	100	52	45	34.45
ND0103-CHA-1180	11.80	12	100	52	45	34.30
ND0103-CHA-1190	11.90	12	100	52	45	34.15
ND0103-CHA-1191	11.91	12	100	52	45	34.14
ND0103-CHA-1200	12.00	12	100	52	45	34.00
ND0103-CHA-1210	12.10	14	104	57	45	38.85
ND0103-CHA-1220	12.20	14	104	57	45	38.70
ND0103-CHA-1230	12.30	14	104	57	45	38.55
ND0103-CHA-1240	12.40	14	104	57	45	38.40
ND0103-CHA-1250	12.50	14	104	57	45	38.25
ND0103-CHA-1260	12.60	14	104	57	45	38.10
ND0103-CHA-1270	12.70	14	104	57	45	37.95

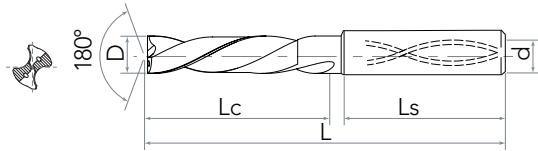
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ND0103-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials



Unit: mm

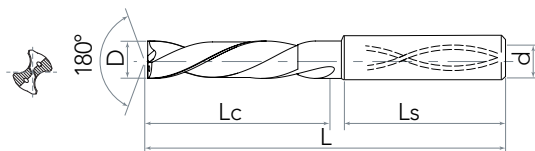
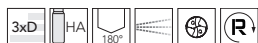
Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-1280	12.80	14	104	57	45	37.80
ND0103-CHA-1290	12.90	14	104	57	45	37.65
ND0103-CHA-1300	13.00	14	104	57	45	37.50
ND0103-CHA-1310	13.10	14	104	57	45	37.35
ND0103-CHA-1320	13.20	14	104	57	45	37.20
ND0103-CHA-1330	13.30	14	104	57	45	37.05
ND0103-CHA-1340	13.40	14	104	57	45	36.90
ND0103-CHA-1349	13.49	14	104	57	45	36.77
ND0103-CHA-1350	13.50	14	104	57	45	36.75
ND0103-CHA-1360	13.60	14	104	57	45	36.60
ND0103-CHA-1370	13.70	14	104	57	45	36.45
ND0103-CHA-1380	13.80	14	104	57	45	36.30
ND0103-CHA-1389	13.89	14	104	57	45	36.17
ND0103-CHA-1390	13.90	14	104	57	45	36.15
ND0103-CHA-1400	14.00	14	104	57	45	36.00
ND0103-CHA-1410	14.10	16	112	62	48	40.85
ND0103-CHA-1420	14.20	16	112	62	48	40.70
ND0103-CHA-1429	14.29	16	112	62	48	40.57
ND0103-CHA-1430	14.30	16	112	62	48	40.55
ND0103-CHA-1440	14.40	16	112	62	48	40.40
ND0103-CHA-1450	14.50	16	112	62	48	40.25
ND0103-CHA-1460	14.60	16	112	62	48	40.10
ND0103-CHA-1468	14.68	16	112	62	48	39.98
ND0103-CHA-1470	14.70	16	112	62	48	39.95
ND0103-CHA-1480	14.80	16	112	62	48	39.80
ND0103-CHA-1490	14.90	16	112	62	48	39.65
ND0103-CHA-1500	15.00	16	112	62	48	39.50

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Carbide Flat-bottom Drill

ND010303-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials

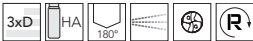
Unit: mm

Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-1508	15.08	16	112	62	48	39.38
ND0103-CHA-1510	15.10	16	112	62	48	39.35
ND0103-CHA-1520	15.20	16	112	62	48	39.20
ND0103-CHA-1530	15.30	16	112	62	48	39.05
ND0103-CHA-1540	15.40	16	112	62	48	38.90
ND0103-CHA-1548	15.48	16	112	62	48	38.78
ND0103-CHA-1550	15.50	16	112	62	48	38.75
ND0103-CHA-1555	15.55	16	112	62	48	38.68
ND0103-CHA-1560	15.60	16	112	62	48	38.60
ND0103-CHA-1570	15.70	16	112	62	48	38.45
ND0103-CHA-1580	15.80	16	112	62	48	38.30
ND0103-CHA-1587	15.87	16	112	62	48	38.20
ND0103-CHA-1590	15.90	16	112	62	48	38.15
ND0103-CHA-1600	16.00	16	112	62	48	38.00
ND0103-CHA-1627	16.27	18	120	70	48	45.60
ND0103-CHA-1630	16.30	18	120	70	48	45.55
ND0103-CHA-1650	16.50	18	120	70	48	45.25
ND0103-CHA-1667	16.67	18	120	70	48	45.00
ND0103-CHA-1670	16.70	18	120	70	48	44.95
ND0103-CHA-1690	16.90	18	120	70	48	44.65
ND0103-CHA-1700	17.00	18	120	70	48	44.50
ND0103-CHA-1707	17.07	18	120	70	48	44.40
ND0103-CHA-1746	17.46	18	120	70	48	43.81
ND0103-CHA-1750	17.50	18	120	70	48	43.75
ND0103-CHA-1755	17.55	18	120	70	48	43.68
ND0103-CHA-1770	17.70	18	120	70	48	43.45
ND0103-CHA-1786	17.86	18	120	70	48	43.21

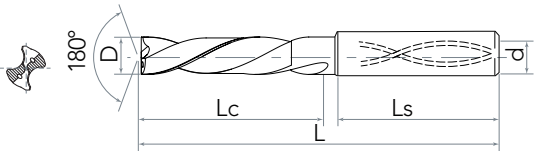
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ND0103-CHA



180° point geometry for flat bottom of the hole · for piloting, drilling,
Finishing · low burr development · piloting in all positions and materials



Unit: mm

Specification	D (n7)	d (h6)	L	Lc	Ls	Lr(max)
ND0103-CHA-1800	18.00	18	120	70	48	43.00
ND0103-CHA-1826	18.26	20	128	76	50	48.61
ND0103-CHA-1850	18.50	20	128	76	50	48.25
ND0103-CHA-1870	18.70	20	128	76	50	47.95
ND0103-CHA-1890	18.90	20	128	76	50	47.65
ND0103-CHA-1900	19.00	20	128	76	50	47.50
ND0103-CHA-1905	19.05	20	128	76	50	47.43
ND0103-CHA-1925	19.25	20	128	76	50	47.13
ND0103-CHA-1930	19.30	20	128	76	50	47.05
ND0103-CHA-1945	19.45	20	128	76	50	46.83
ND0103-CHA-1950	19.50	20	128	76	50	46.75
ND0103-CHA-1955	19.55	20	128	76	50	46.68
ND0103-CHA-1970	19.70	20	128	76	50	46.45
ND0103-CHA-1980	19.80	20	128	76	50	46.30
ND0103-CHA-1984	19.84	20	128	76	50	46.24
ND0103-CHA-2000	20.00	20	128	76	50	46.00

Recommended cutting data see the next page



Cutting Data Table

NAVIGATOR Carbide Flat-bottom Drill

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm	19.05 mm
P	Common Structural Steels	-	< 150	360	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Common Structural Steels	< 32	< 301	280	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Free-cutting Steels	< 25	< 255	360	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Free-cutting Steels	< 32	< 301	280	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Unalloyed Heat-treatable Steels	< 20	< 220	295	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Unalloyed Heat-treatable Steels	< 25	< 255	280	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Unalloyed Heat-treatable Steels	< 32	< 301	260	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Alloyed Heat-treatable Steels	< 32	< 301	295	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Alloyed Heat-treatable Steels	< 43	< 402	215	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Unalloyed Case Hardened Steels	< 25	< 255	330	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Alloyed Case Hardened Steels	< 32	< 301	295	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Alloyed Case Hardened Steels	< 43	< 402	215	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Nitriding Steels	< 32	< 301	245	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Nitriding Steels	< 43	< 402	230	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Tool Steels	< 25	< 255	165	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Tool Steels	< 43	< 402	130	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	High Speed Steels	< 43	< 402	130	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Spring Steels	< 38	< 354	115	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
H	Hardened Steels	< 48	< 460	115	0.0015	0.0020	0.0030	0.0030	0.0040	0.0050
M	Stainless steels, Sulphured	< 28	< 273	130	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	Austenitic	< 36	< 337	50	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	Martensitic	< 46	< 435	115	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
K	Cast Iron	< 23	< 242	525	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Cast Iron	< 38	< 354	395	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Spheroidal Graphite Iron And	< 23	< 242	395	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Malleable Cast Iron	< 38	< 354	310	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Chilled cast iron	< 38	< 354	80	0.0015	0.0025	0.0040	0.0040	0.0050	0.0065

See the next page 

NAVIGATOR Carbide Flat-bottom Drill

ISO	Material Group	Hardness		SFM	Feed Rate - IPR					
		HRC	BHN		3.17 mm	6.35 mm	9.52 mm	12.70 mm	15.87 mm	19.05 mm
K	New Cast Materials GGV	< 20	< 220	330	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	New Cast Materials GGV	< 32	< 301	295	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	New Cast Materials ADI	< 32	< 301	260	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	New Cast Materials ADI	< 43	< 402	230	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
S	Special Alloys	< 54	< 549	65	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	Ti And Ti-alloys	< 25	< 255	50	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	Ti And Ti-alloys	< 43	< 402	50	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
N	Aluminium And Al-alloys	-	< 120	655	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Al Wrought Alloys	-	< 200	655	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Al Cast Alloys ≤ 10 % Si ≤ 24 % Si	-	< 180	560	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
		-	< 180	460	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Magnesium Alloys	-	< 120	655	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Copper, Low-alloyed	-	< 150	260	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Brass, Short-chipping	-	< 180	690	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Long-chipping	-	< 180	460	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Bronze, Short-chipping	-	< 180	260	0.0025	0.0040	0.0065	0.0065	0.0080	0.0100
	Bronze, Short-chipping	< 25	< 255	215	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	Bronze, long-chipping	< 25	< 255	195	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080
	Bronze, long-chipping	< 32	< 301	150	0.0020	0.0030	0.0050	0.0050	0.0065	0.0080



Tailor-made Drill Questionnaire

Note: Please fill all information in appropriate boxes with respect to drilling family

Drill Type ☐ Versatile ☐ Optimized

Unit System ☐ Metric ☐ Inch

Application ☐ Through Hole ☐ Blind Hole

Shank Type ☐  ☐  ☐  ☐ Others _____

Shank Dia Ø _____

Coolant Delivery

☐ None ☐ Air ☐ MQL ☐ Through ☐ Others _____

Drill Geometry

☐ Versatile

☐ Steel ☐ Stainless Steel ☐ Aluminium Alloys ☐ Cast Iron

☐ Hardened Steel ☐ Nickel Base Alloy ☐ Composite ☐ Stack Material

☐ Others ☐ Al Hi Si Content ☐ Al Low Si Content ☐ Titanium Alloys

Coolant Pressure _____

Point Angle _____

Work Piece Material

☐ Steel ☐ Stainless Steel ☐ Aluminium Alloys ☐ Cast Iron

☐ Hardened Steel ☐ Nickel Base Alloy ☐ Composite ☐ Stack Material

☐ Others ☐ Al Hi Si Content ☐ Al Low Si Content ☐ Titanium Alloys

Work Piece Hardness _____

Corner MOD. ☐ YSE ☐ NO

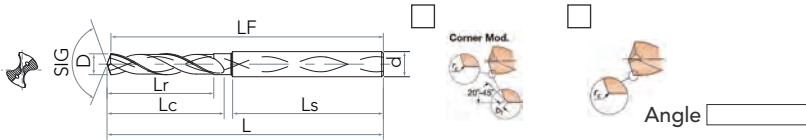
Margin

☐ Single Margin SM ☐ Double Margin DM ☐ Sub Land

re/b1 _____



Generic Representation



D _____ TOL. _____ Lr _____ Dc21 _____ LF _____ L _____

#D1 _____ TOL. _____ L1 _____ CHF ANG 1° _____ CHF L1 _____

"TOL ." - Specify Tolerances To Be Produced On Work Piece Material.

Application Type for Short Hole Drills

- | | |
|--|---|
| ☐ Special diameter and length | ☐ Drill with two steps |
| ☐ Drill with one chamfer | ☐ Drill with two step and one chamfer |
| ☐ Drill with extended reach | ☐ Drill with one steps and two chamfer |
| ☐ Drill with two Chamfer | ☐ Drill with one step |
| | ☐ Other than above |

Customer Need/Requirement:

Describe the real needs of customer in detail and any further information.

Image/Sketch: click on below box to add an image/sketch



Drilling Formulas

SPEEDS & FEEDS (inch)

RPM	=	$SFM \times 3.82 \div D$
SFM	=	$RPM \times D \div 3.82$
IPM	=	$IPR \times RPM$
IPR	=	$IPM \div RPM$
Tim in Cut (sec.)	=	$Hole\ Depth\ (inch) \div IPM \times 60$

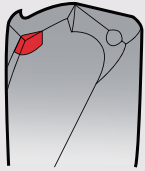
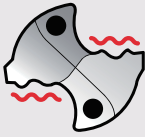
METRIC TO INCH CONVERSION

SFM	=	$m/min \times 3.28$
m/min	=	$SFM \div 3.28$
IPM	=	$mm/min \div 25.4$
mm/min	=	$IPM \times 25.4$
IPR	=	$mm/rev \div 25.4$
mm/rev	=	$IPR \times 25.4$
mm	=	$inch \times 25.4$
inch	=	$mm \div 25.4$
bar	=	$psi \div 14.5$
psi	=	$bar \times 14.5$
gal	=	$L \times 3.79$
L	=	$gal \div 3.79$

LEGEND

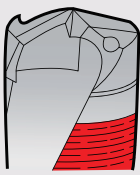
RPM	=	revolutions per minute (spindle speed)
SFM	=	surface feet per minute (cutting speed)
IPM	=	inches per minute (feed rate)
IPR	=	inches per revolution (feed per revolution)
m/min (vc)	=	meters per minute (cutting speed)
mm/min (vf)	=	millimeters per minute (feed rate)
mm/rev (f)	=	millimeters per revolution (feed per revolution)
D	=	tool diameter

Application/Troubleshooting

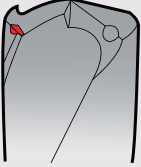
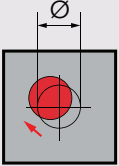
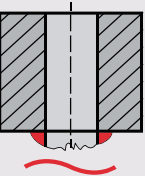
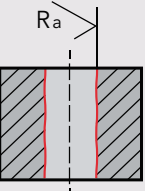
Problem	Cause	Remedy
1. Cutting edge build up 	- Low cutting speed - Excessive honing of cutting lip - Bright finish cutting lip	- Increase cutting speed - Reduce cutting lip honing - Have tool coated
2. Crumbling of outer corners 	- Non rigid conditions, insufficient workpiece clamping - Deviation from concentricity too large - Interrupted cut	- Rigid clamping of workpiece - Check and correct concentricity if possible - Reduce feed
3. Heavy wear at flank 	- Cutting speed too high - Feed too low - Clearance angle too small	- Reduce cutting speed - Increase feed - Increase clearance angle
4. Crumbling on cutting lips 	- Non rigid conditions, insufficient workpiece clamping - Interrupted cut - Max. wear values exceeded - Incorrect tool type	- Rigid clamping of workpiece - Reduce feed - Reduce tool change intervals - Apply suitable tool



Application/Troubleshooting

Problem	Cause	Remedy
5. Land wear 	- Non rigid conditions, insufficient workpiece clamping - Deviation from concentricity too large - Back taper too small - Incorrect coolant (oil), coolant too weak	- Rigid clamping of workpiece - Check and correct concentricity if possible - Reduce tool change intervals - Increase strength of coolant or use neat oil
6. Scoring on tool body 	- Non rigid conditions, insufficient workpiece clamping - Deviation from concentricity too large - Interrupted cut - Abrasive workpiece material	- Rigid clamping of workpiece - Check and correct concentricity if possible - Increase back taper - Increase strength of coolant or use neat oil
7. Heavy chisel edge wear 	- Cutting speed too low - Feed too high - Excessive honing of cutting lip	- Increase cutting speed - Reduce feed - Reduce cutting lip honing
8. Crumbling at intersection, web thinning and cutting lip 	- Clearance angle too small - Excessive honing of cutting lip - Incorrect tool type	- Increase clearance angle - Reduce cutting lip honing - Apply suitable tool

Application/Troubleshooting

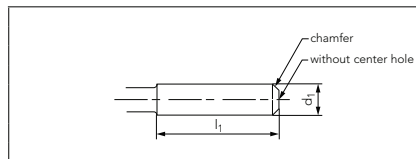
Problem	Cause	Remedy
9. Plastic deformation of outer corner 	- Cutting speed too high - Insufficient coolant volume - Incorrect or no honing at corner	- Reduce cutting speed - Increase volume/pressure - Correct honing
10. Misalignment 	- Non rigid conditions, insufficient workpiece clamping - Deviation from concentricity too large - Spotting area transverse - Chisel edge too large	- Rigid clamping of workpiece - Check and correct concentricity if possible - Use milling cutter (2-fluted) for spotting - Reduce chisel edge
11. Heavy burring on breakthrough 	- Feed too high - Max. wear values exceeded - Excessive honing of cutting lip	- Reduce feed - Reduce tool change intervals - Reduce cutting lip honing
12. Unsatisfactory surface quality 	- Non rigid conditions, insufficient workpiece clamping - Deviation from concentricity too large - Insufficient coolant volume	- Rigid clamping of workpiece - Check and correct concentricity if possible - Increase volume/pressure



Carbide straight shanks DIN 6335 for twist drills and end mills

Form HA, plain

Dimensions in mm

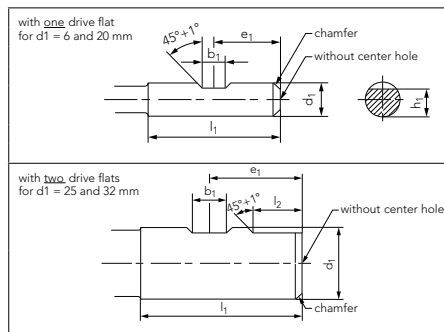


d ₁	l ₁
h6	+2 0
2	28
3	28
4	28
5	28
6	36
8	36
10	40
12	45

d ₁	l ₁
h6	+2 0
14	45
16	48
18	48
20	50
25	56
32	60

Form HB, with drive flat

Dimensions in mm

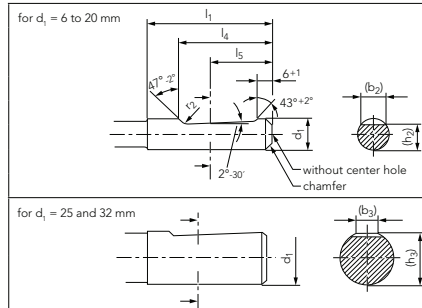


d ₁	b ₁	e ₁	h ₁	l ₁	l ₂
h6	+0,05 0	0 -1	h11	+2 0	+1 0
6	4.2	18	5.1	36	—
8	5.5	18	6.9	36	—
10	7	20	8.5	40	—
12	8	22.5	10.4	45	—
14	8	22.5	12.7	45	—
16	10	24	14.2	48	—
18	10	24	16.2	48	—
20	11	25	18.2	50	—
25	12	32	23	56	17
32	14	36	30	60	19

Form HE, with whistle notch flat without coolant ducts*

Dimensions in mm

* Design: Straight shanks to DIN 6335 are available with or without oil feed holes. Applications for various tools, dimensions and position of oil feed holes are fully described within the standard range sections.



d ₁	(b ₁)	(b ₁)	h ₁	(h ₁)	l ₁	l ₂	l ₃	r ₁
h6	=	(b ₁)	h11	(h ₁)	+2 0	0 -1	Dim. nom.	min.
6	4,3	—	5,1	—	36	25	18	1,2
8	5,5	—	6,9	—	36	25	18	1,2
10	7,1	—	8,5	—	40	28	20	1,2
12	8,2	—	10,4	—	45	33	22,5	1,2
14	8,1	—	12,7	—	45	33	22,5	1,2
16	10,1	—	14,2	—	48	36	24	1,6
18	10,8	—	16,2	—	48	36	24	1,6
20	11,4	—	18,2	—	50	38	25	1,6
25	13,6	9,3	23,0	24,1	56	44	32	1,6
32	15,5	9,9	30,0	31,2	60	48	35	1,6



Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M3 x 0.35	0.1035	2.630	81
M3 x 0.35	0.1039	2.640	79
M3 x 0.35	0.1043	2.650	77
M3 x 0.35	0.1047	2.660	75
M3 x 0.35	0.1051	2.670	73
M3 x 0.35	0.1055	2.680	70
M3 x 0.35	0.1059	2.690	68
M3 x 0.35	0.1063	2.700	66
M3 x 0.35	0.1067	2.710	64
M3 x 0.35	0.1071	2.720	62
M3 x 0.35	0.1075	2.730	59
M3 x 0.50	0.0976	2.480	80
M3 x 0.50	0.0980	2.490	79
M3 x 0.50	0.0984	2.500	77
M3 x 0.50	0.0988	2.510	75
M3 x 0.50	0.0992	2.520	74
M3 x 0.50	0.0996	2.530	72
M3 x 0.50	0.1000	2.540	71
M3 x 0.50	0.1004	2.550	69
M3 x 0.50	0.1008	2.560	68
M3 x 0.50	0.1012	2.570	66
M3 x 0.50	0.1016	2.580	65
M3 x 0.50	0.1020	2.590	63
M3 x 0.50	0.1024	2.600	62
M3 x 0.50	0.1028	2.610	60
M3 x 0.50	0.1031	2.620	59
M3.5 x 0.60	0.1130	2.870	81
M3.5 x 0.60	0.1134	2.880	80
M3.5 x 0.60	0.1138	2.890	78
M3.5 x 0.60	0.1142	2.900	77
M3.5 x 0.60	0.1146	2.910	76

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M3.5 x 0.60	0.1150	2.920	74
M3.5 x 0.60	0.1154	2.930	73
M3.5 x 0.60	0.1157	2.940	72
M3.5 x 0.60	0.1161	2.950	71
M3.5 x 0.60	0.1165	2.960	69
M3.5 x 0.60	0.1169	2.970	68
M3.5 x 0.60	0.1173	2.980	67
M3.5 x 0.60	0.1177	2.990	65
M3.5 x 0.60	0.1181	3.000	64
M3.5 x 0.60	0.1185	3.010	63
M3.5 x 0.60	0.1189	3.020	62
M3.5 x 0.60	0.1193	3.030	60
M3.5 x 0.60	0.1197	3.040	59
M4 x 0.50	0.1370	3.480	80
M4 x 0.50	0.1374	3.490	79
M4 x 0.50	0.1378	3.500	77
M4 x 0.50	0.1382	3.510	75
M4 x 0.50	0.1386	3.520	74
M4 x 0.50	0.1390	3.530	72
M4 x 0.50	0.1394	3.540	71
M4 x 0.50	0.1398	3.550	69
M4 x 0.50	0.1402	3.560	68
M4 x 0.50	0.1406	3.570	66
M4 x 0.50	0.1409	3.580	65
M4 x 0.50	0.1413	3.590	63
M4 x 0.50	0.1417	3.600	62
M4 x 0.50	0.1421	3.610	60
M4 x 0.50	0.1425	3.620	59
M4 x 0.70	0.1283	3.260	81
M4 x 0.70	0.1287	3.270	80
M4 x 0.70	0.1291	3.280	79

See the next page



Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M4 x 0.70	0.1295	3.290	78
M4 x 0.70	0.1299	3.300	77
M4 x 0.70	0.1303	3.310	76
M4 x 0.70	0.1307	3.320	75
M4 x 0.70	0.1311	3.330	74
M4 x 0.70	0.1315	3.340	73
M4 x 0.70	0.1319	3.350	71
M4 x 0.70	0.1323	3.360	70
M4 x 0.70	0.1327	3.370	69
M4 x 0.70	0.1331	3.380	68
M4 x 0.70	0.1335	3.390	67
M4 x 0.70	0.1339	3.400	66
M4 x 0.70	0.1343	3.410	65
M4 x 0.70	0.1346	3.420	64
M4 x 0.70	0.1350	3.430	63
M4 x 0.70	0.1354	3.440	62
M4 x 0.70	0.1358	3.450	60
M4 x 0.70	0.1362	3.460	59
M5 x 0.50	0.1764	4.480	80
M5 x 0.50	0.1768	4.490	79
M5 x 0.50	0.1772	4.500	77
M5 x 0.50	0.1776	4.510	75
M5 x 0.50	0.1780	4.520	74
M5 x 0.50	0.1783	4.530	72
M5 x 0.50	0.1787	4.540	71
M5 x 0.50	0.1791	4.550	69
M5 x 0.50	0.1795	4.560	68
M5 x 0.50	0.1799	4.570	66
M5 x 0.50	0.1803	4.580	65
M5 x 0.50	0.1807	4.590	63
M5 x 0.50	0.1811	4.600	62

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M5 x 0.50	0.1815	4.610	60
M5 x 0.50	0.1819	4.620	59
M5 x 0.80	0.1638	4.160	81
M5 x 0.80	0.1642	4.170	80
M5 x 0.80	0.1646	4.180	79
M5 x 0.80	0.1650	4.190	78
M5 x 0.80	0.1654	4.200	77
M5 x 0.80	0.1657	4.210	76
M5 x 0.80	0.1661	4.220	75
M5 x 0.80	0.1665	4.230	74
M5 x 0.80	0.1669	4.240	73
M5 x 0.80	0.1673	4.250	72
M5 x 0.80	0.1677	4.260	71
M5 x 0.80	0.1681	4.270	70
M5 x 0.80	0.1685	4.280	69
M5 x 0.80	0.1689	4.290	68
M5 x 0.80	0.1693	4.300	67
M5 x 0.80	0.1697	4.310	66
M5 x 0.80	0.1701	4.320	65
M5 x 0.80	0.1705	4.330	64
M5 x 0.80	0.1709	4.340	64
M5 x 0.80	0.1713	4.350	63
M5 x 0.80	0.1717	4.360	62
M5 x 0.80	0.1720	4.370	61
M5 x 0.80	0.1724	4.380	60
M5 x 0.80	0.1728	4.390	59
M6 x 0.50	0.2165	5.500	77
M6 x 0.50	0.2185	5.550	69
M6 x 0.50	0.2189	5.560	68
M6 x 0.50	0.2205	5.600	62
M6 x 0.50	0.2209	5.610	60

See the next page



Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M6 x 0.75	0.2055	5.220	80
M6 x 0.75	0.2067	5.250	77
M6 x 0.75	0.2087	5.300	72
M6 x 0.75	0.2091	5.310	71
M6 x 0.75	0.2106	5.350	67
M6 x 0.75	0.2126	5.400	62
M6 x 0.75	0.2130	5.410	61
M6 x 1.00	0.1949	4.950	81
M6 x 1.00	0.1953	4.960	80
M6 x 1.00	0.1957	4.970	79
M6 x 1.00	0.1961	4.980	79
M6 x 1.00	0.1965	4.990	78
M6 x 1.00	0.1969	5.000	77
M6 x 1.00	0.1988	5.050	73
M6 x 1.00	0.1992	5.060	72
M6 x 1.00	0.2008	5.100	69
M6 x 1.00	0.2012	5.110	69
M6 x 1.00	0.2028	5.150	65
M6 x 1.00	0.2031	5.160	65
M6 x 1.00	0.2039	5.180	63
M6 x 1.00	0.2047	5.200	62
M6 x 1.00	0.2055	5.220	60
M7 x 0.75	0.2461	6.250	77
M7 x 0.75	0.2480	6.300	72
M7 x 0.75	0.2500	6.350	67
M7 x 0.75	0.2520	6.400	62
M7 x 1.00	0.2343	5.950	81
M7 x 1.00	0.2362	6.000	77
M7 x 1.00	0.2378	6.040	74
M7 x 1.00	0.2382	6.050	73
M7 x 1.00	0.2402	6.100	69

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M7 x 1.00	0.2421	6.150	65
M7 x 1.00	0.2441	6.200	62
M8 x 0.50	0.2949	7.490	79
M8 x 0.50	0.2953	7.500	77
M8 x 0.50	0.2969	7.540	71
M8 x 0.50	0.2972	7.550	69
M8 x 0.50	0.2992	7.600	62
M8 x 0.75	0.2854	7.250	77
M8 x 0.75	0.2874	7.300	72
M8 x 0.75	0.2894	7.350	67
M8 x 0.75	0.2902	7.370	65
M8 x 0.75	0.2913	7.400	62
M8 x 1.00	0.2736	6.950	81
M8 x 1.00	0.2756	7.000	77
M8 x 1.00	0.2768	7.030	75
M8 x 1.00	0.2776	7.050	73
M8 x 1.00	0.2795	7.100	69
M8 x 1.00	0.2811	7.140	66
M8 x 1.00	0.2815	7.150	65
M8 x 1.00	0.2835	7.200	62
M8 x 1.25	0.2638	6.700	80
M8 x 1.25	0.2657	6.750	77
M8 x 1.25	0.2677	6.800	74
M8 x 1.25	0.2697	6.850	71
M8 x 1.25	0.2717	6.900	68
M8 x 1.25	0.2736	6.950	65
M8 x 1.25	0.2756	7.000	62
M8 x 1.25	0.2768	7.030	60
M8 x 1.25	0.2776	7.050	59
M9 x 1.00	0.3130	7.950	81
M9 x 1.00	0.3150	8.000	77

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M9 x 1.00	0.3161	8.030	75
M9 x 1.00	0.3169	8.050	73
M9 x 1.00	0.3189	8.100	69
M9 x 1.00	0.3209	8.150	65
M9 x 1.00	0.3228	8.200	62
M10 x 0.75	0.3642	9.250	77
M10 x 0.75	0.3661	9.300	72
M10 x 0.75	0.3677	9.340	68
M10 x 0.75	0.3681	9.350	67
M10 x 0.75	0.3701	9.400	62
M10 x 1.00	0.3524	8.950	81
M10 x 1.00	0.3543	9.000	77
M10 x 1.00	0.3563	9.050	73
M10 x 1.00	0.3579	9.090	70
M10 x 1.00	0.3583	9.100	69
M10 x 1.00	0.3594	9.130	67
M10 x 1.00	0.3602	9.150	65
M10 x 1.00	0.3622	9.200	62
M10 x 1.25	0.3425	8.700	80
M10 x 1.25	0.3437	8.730	78
M10 x 1.25	0.3445	8.750	77
M10 x 1.25	0.3465	8.800	74
M10 x 1.25	0.3480	8.840	71
M10 x 1.25	0.3484	8.850	71
M10 x 1.25	0.3504	8.900	68
M10 x 1.25	0.3524	8.950	65
M10 x 1.25	0.3543	9.000	62
M10 x 1.25	0.3563	9.050	59
M10 x 1.50	0.3319	8.430	81
M10 x 1.50	0.3327	8.450	80
M10 x 1..50	0.3346	8.500	77

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M10 x 1.50	0.3366	8.550	74
M10 x 1.50	0.3386	8.600	72
M10 x 1.50	0.3390	8.610	71
M10 x 1.50	0.3406	8.650	69
M10 x 1.50	0.3425	8.700	67
M10 x 1.50	0.3437	8.730	65
M10 x 1.50	0.3445	8.750	64
M10 x 1.50	0.3465	8.800	62
M10 x 1.50	0.3480	8.840	60
M10 x 1.50	0.3484	8.850	59
M11 x 1.00	0.3917	9.950	81
M11 x 1.00	0.3937	10.000	77
M11 x 1.00	0.3957	10.050	73
M11 x 1.00	0.3969	10.080	71
M11 x 1.00	0.3976	10.100	69
M11 x 1.00	0.3996	10.150	65
M11 x 1.00	0.4016	10.200	62
M12 x 1.00	0.4311	10.950	81
M12 x 1.00	0.4331	11.000	77
M12 x 1.00	0.4350	11.050	73
M12 x 1.00	0.4370	11.100	69
M12 x 1.00	0.4374	11.110	69
M12 x 1.00	0.4390	11.150	65
M12 x 1.00	0.4409	11.200	62
M12 x 1.25	0.4213	10.700	80
M12 x 1.25	0.4220	10.720	79
M12 x 1.25	0.4232	10.750	77
M12 x 1.25	0.4252	10.800	74
M12 x 1.25	0.4272	10.850	71
M12 x 1.25	0.4291	10.900	68
M12 x 1.25	0.4311	10.950	65

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M12 x 1.25	0.4331	11.000	62
M12 x 1.25	0.4350	11.050	59
M12 x 1.50	0.4114	10.450	80
M12 x 1.50	0.4130	10.490	77
M12 x 1.50	0.4134	10.500	77
M12 x 1.50	0.4154	10.550	74
M12 x 1.50	0.4173	10.600	72
M12 x 1.50	0.4193	10.650	69
M12 x 1.50	0.4213	10.700	67
M12 x 1.50	0.4220	10.720	66
M12 x 1.50	0.4232	10.750	64
M12 x 1.50	0.4252	10.800	62
M12 x 1.50	0.4272	10.850	59
M12 x 1.75	0.3996	10.150	81
M12 x 1.75	0.4016	10.200	79
M12 x 1.75	0.4035	10.250	77
M12 x 1.75	0.4039	10.260	77
M12 x 1.75	0.4055	10.300	75
M12 x 1.75	0.4063	10.320	74
M12 x 1.75	0.4075	10.350	73
M12 x 1.75	0.4094	10.400	70
M12 x 1.75	0.4114	10.450	68
M12 x 1.75	0.4130	10.490	66
M12 x 1.75	0.4134	10.500	66
M12 x 1.75	0.4154	10.550	64
M12 x 1.75	0.4173	10.600	62
M12 x 1.75	0.4193	10.650	59
M14 x 1.00	0.5098	12.950	81
M14 x 1.00	0.5118	13.000	77
M14 x 1.00	0.5138	13.050	73
M14 x 1.00	0.5157	13.100	69

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M14 x 1.00	0.5177	13.150	65
M14 x 1.00	0.5197	13.200	62
M14 x 1.25	0.5000	12.700	80
M14 x 1.25	0.5020	12.750	77
M14 x 1.25	0.5039	12.800	74
M14 x 1.25	0.5059	12.850	71
M14 x 1.25	0.5079	12.900	68
M14 x 1.25	0.5098	12.950	65
M14 x 1.25	0.5118	13.000	62
M14 x 1.25	0.5138	13.050	59
M14 x 1.50	0.4902	12.450	80
M14 x 1.50	0.4921	12.500	77
M14 x 1.50	0.4941	12.550	74
M14 x 1.50	0.4961	12.600	72
M14 x 1.50	0.4980	12.650	69
M14 x 1.50	0.5000	12.700	67
M14 x 1.50	0.5020	12.750	64
M14 x 1.50	0.5039	12.800	62
M14 x 1.50	0.5059	12.850	59
M14 x 2.00	0.4685	11.900	81
M14 x 2.00	0.4689	11.910	80
M14 x 2.00	0.4705	11.950	79
M14 x 2.00	0.4724	12.000	77
M14 x 2.00	0.4744	12.050	75
M14 x 2.00	0.4764	12.100	73
M14 x 2.00	0.4783	12.150	71
M14 x 2.00	0.4803	12.200	69
M14 x 2.00	0.4823	12.250	67
M14 x 2.00	0.4843	12.300	65
M14 x 2.00	0.4862	12.350	64
M14 x 2.00	0.4882	12.400	62

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M14 × 2.00	0.4902	12.450	60
M15 × 1.00	0.5492	13.950	81
M15 × 1.00	0.5512	14.000	77
M15 × 1.00	0.5531	14.050	73
M15 × 1.00	0.5551	14.100	69
M15 × 1.00	0.5571	14.150	65
M15 × 1.00	0.5591	14.200	62
M15 × 1.50	0.5295	13.450	80
M15 × 1.50	0.5311	13.490	77
M15 × 1.50	0.5315	13.500	77
M15 × 1.50	0.5335	13.550	74
M15 × 1.50	0.5354	13.600	72
M15 × 1.50	0.5374	13.650	69
M15 × 1.50	0.5394	13.700	67
M15 × 1.50	0.5413	13.750	64
M15 × 1.50	0.5433	13.800	62
M15 × 1.50	0.5453	13.850	59
M16 × 1.00	0.5886	14.950	81
M16 × 1.00	0.5906	15.000	77
M16 × 1.00	0.5925	15.050	73
M16 × 1.00	0.5937	15.080	71
M16 × 1.00	0.5945	15.100	69
M16 × 1.00	0.5965	15.150	65
M16 × 1.00	0.5984	15.200	62
M16 × 1.50	0.5689	14.450	80
M16 × 1.50	0.5709	14.500	77
M16 × 1.50	0.5728	14.550	74
M16 × 1.50	0.5748	14.600	72
M16 × 1.50	0.5768	14.650	69
M16 × 1.50	0.5787	14.700	67
M16 × 1.50	0.5807	14.750	64

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M16 × 1.50	0.5827	14.800	62
M16 × 1.50	0.5846	14.850	59
M16 × 2.00	0.5469	13.890	81
M16 × 2.00	0.5472	13.900	81
M16 × 2.00	0.5492	13.950	79
M16 × 2.00	0.5512	14.000	77
M16 × 2.00	0.5531	14.050	75
M16 × 2.00	0.5551	14.100	73
M16 × 2.00	0.5571	14.150	71
M16 × 2.00	0.5591	14.200	69
M16 × 2.00	0.5610	14.250	67
M16 × 2.00	0.5626	14.290	66
M16 × 2.00	0.5630	14.300	65
M16 × 2.00	0.5650	14.350	64
M16 × 2.00	0.5669	14.400	62
M16 × 2.00	0.5689	14.450	60
M18 × 1.00	0.6673	16.950	81
M18 × 1.00	0.6693	17.000	77
M18 × 1.00	0.6713	17.050	73
M18 × 1.00	0.6720	17.070	72
M18 × 1.00	0.6732	17.100	69
M18 × 1.00	0.6752	17.150	65
M18 × 1.00	0.6772	17.200	62
M18 × 1.50	0.6476	16.450	80
M18 × 1.50	0.6496	16.500	77
M18 × 1.50	0.6516	16.550	74
M18 × 1.50	0.6535	16.600	72
M18 × 1.50	0.6555	16.650	69
M18 × 1.50	0.6563	16.670	68
M18 × 1.50	0.6575	16.700	67
M18 × 1.50	0.6594	16.750	64

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M18 x 1.50	0.6614	16.800	62
M18 x 1.50	0.6634	16.850	59
M18 x 2.00	0.6260	15.900	81
M18 x 2.00	0.6280	15.950	79
M18 x 2.00	0.6299	16.000	77
M18 x 2.00	0.6319	16.050	75
M18 x 2.00	0.6339	16.100	73
M18 x 2.00	0.6358	16.150	71
M18 x 2.00	0.6378	16.200	69
M18 x 2.00	0.6398	16.250	67
M18 x 2.00	0.6406	16.270	67
M18 x 2.00	0.6417	16.300	65
M18 x 2.00	0.6437	16.350	64
M18 x 2.00	0.6457	16.400	62
M18 x 2.00	0.6476	16.450	60
M18 x 2.50	0.6063	15.400	80
M18 x 2.50	0.6083	15.450	79
M18 x 2.50	0.6094	15.480	78
M18 x 2.50	0.6102	15.500	77
M18 x 2.50	0.6122	15.550	75
M18 x 2.50	0.6142	15.600	74
M18 x 2.50	0.6161	15.650	72
M18 x 2.50	0.6181	15.700	71
M18 x 2.50	0.6201	15.750	69
M18 x 2.50	0.6220	15.800	68
M18 x 2.50	0.6240	15.850	66
M18 x 2.50	0.6248	15.870	66
M18 x 2.50	0.6260	15.900	65
M18 x 2.50	0.6280	15.950	63
M18 x 2.50	0.6299	16.000	62
M18 x 2.50	0.6319	16.050	60

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M18 x 2.50	0.6339	16.100	59
M20 x 1.50	0.7264	18.450	80
M20 x 1.50	0.7283	18.500	77
M20 x 1.50	0.7303	18.550	74
M20 x 1.50	0.7323	18.600	72
M20 x 1.50	0.7343	18.650	69
M20 x 1.50	0.7362	18.700	67
M20 x 1.50	0.7382	18.750	64
M20 x 1.50	0.7402	18.800	62
M20 x 1.50	0.7421	18.850	59
M20 x 2.00	0.7047	17.900	81
M20 x 2.00	0.7067	17.950	79
M20 x 2.00	0.7087	18.000	77
M20 x 2.00	0.7106	18.050	75
M20 x 2.00	0.7126	18.100	73
M20 x 2.00	0.7146	18.150	71
M20 x 2.00	0.7165	18.200	69
M20 x 2.00	0.7185	18.250	67
M20 x 2.00	0.7189	18.260	67
M20 x 2.00	0.7205	18.300	65
M20 x 2.00	0.7224	18.350	64
M20 x 2.00	0.7244	18.400	62
M20 x 2.00	0.7264	18.450	60
M20 x 2.50	0.6850	17.400	80
M20 x 2.50	0.6870	17.450	79
M20 x 2.50	0.6874	17.460	78
M20 x 2.50	0.6890	17.500	77
M20 x 2.50	0.6909	17.550	75
M20 x 2.50	0.6929	17.600	74
M20 x 2.50	0.6949	17.650	72
M20 x 2.50	0.6969	17.700	71

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M20 x 2.50	0.6988	17.750	69
M20 x 2.50	0.7008	17.800	68
M20 X 2.50	0.7028	17.850	66
M20 x 2.50	0.7031	17.860	66
M20 x 2.50	0.7047	17.900	65
M20 x 2.50	0.7067	17.950	63
M20 x 2.50	0.7087	18.000	62
M20 x 2.50	0.7106	18.050	60
M20 x 2.50	0.7126	18.100	59
M22 x 1.00	0.8248	20.950	81
M22 x 1.00	0.8268	21.000	77
M22 x 1.00	0.8280	21.030	75
M22 x 1.00	0.8287	21.050	73
M22 x 1.00	0.8307	21.100	69
M22 x 1.00	0.8327	21.150	65
M22 x 1.00	0.8346	21.200	62
M22 x 1.50	0.8051	20.450	80
M22 x 1.50	0.8071	20.500	77
M22 x 1.50	0.8091	20.550	74
M22 x 1.50	0.8110	20.600	72
M22 x 1.50	0.8126	20.640	70
M22 x 1.50	0.8130	20.650	69
M22 x 1.50	0.8150	20.700	67
M22 x 1.50	0.8169	20.750	64
M22 x 1.50	0.8189	20.800	62
M22 x 1.50	0.8209	20.850	59
M22 x 2.00	0.7835	19.900	81
M22 x 2.00	0.7854	19.950	79
M22 x 2.00	0.7874	20.000	77
M22 x 2.00	0.7894	20.050	75
M22 x 2.00	0.7913	20.100	73

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M22 x 2.00	0.7933	20.150	71
M22 x 2.00	0.7953	20.200	69
M22 x 2.00	0.7969	20.240	68
M22 x 2.00	0.7972	20.250	67
M22 x 2.00	0.7992	20.300	65
M22 x 2.00	0.8012	20.350	64
M22 x 2.00	0.8031	20.400	62
M22 x 2.00	0.8051	20.450	60
M22 x 2.50	0.7638	19.400	80
M22 x 2.50	0.7657	19.450	79
M22 x 2.50	0.7677	19.500	77
M22 x 2.50	0.7697	19.550	75
M22 x 2.50	0.7717	19.600	74
M22 x 2.50	0.7736	19.650	72
M22 x 2.50	0.7756	19.700	71
M22 x 2.50	0.7776	19.750	69
M22 x 2.50	0.7795	19.800	68
M22 x 2.50	0.7811	19.840	67
M22 x 2.50	0.7815	19.850	66
M22 x 2.50	0.7835	19.900	65
M22 x 2.50	0.7854	19.950	63
M22 x 2.50	0.7874	20.000	62
M22 x 2.50	0.7894	20.050	60
M22 x 2.50	0.7913	20.100	59
M24 x 1.00	0.9035	22.950	81
M24 x 1.00	0.9055	23.000	77
M24 x 1.00	0.9063	23.020	75
M24 x 1.00	0.9075	23.050	73
M24 x 1.00	0.9094	23.100	69
M24 x 1.00	0.9114	23.150	65
M24 x 1.00	0.9134	23.200	62

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M24 × 1.50	0.8839	22.450	80
M24 × 1.50	0.8858	22.500	77
M24 × 1.50	0.8878	22.550	74
M24 × 1.50	0.8898	22.600	72
M24 × 1.50	0.8917	22.650	69
M24 × 1.50	0.8937	22.700	67
M24 × 1.50	0.8957	22.750	64
M24 × 1.50	0.8976	22.800	62
M24 × 1.50	0.8996	22.850	59
M24 × 2.00	0.8622	21.900	81
M24 × 2.00	0.8642	21.950	79
M24 × 2.00	0.8661	22.000	77
M24 × 2.00	0.8681	22.050	75
M24 × 2.00	0.8701	22.100	73
M24 × 2.00	0.8720	22.150	71
M24 × 2.00	0.8740	22.200	69
M24 × 2.00	0.8748	22.220	69
M24 × 2.00	0.8760	22.250	67
M24 × 2.00	0.8780	22.300	65
M24 × 2.00	0.8799	22.350	64
M24 × 2.00	0.8819	22.400	62
M24 × 2.00	0.8839	22.450	60
M24 × 3.00	0.8209	20.850	81
M24 × 3.00	0.8228	20.900	80
M24 × 3.00	0.8248	20.950	78
M24 × 3.00	0.8268	21.000	77
M24 × 3.00	0.8280	21.030	76
M24 × 3.00	0.8287	21.050	76
M24 × 3.00	0.8307	21.100	74
M24 × 3.00	0.8327	21.150	73
M24 × 3.00	0.8346	21.200	72

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M24 × 3.00	0.8366	21.250	71
M24 × 3.00	0.8386	21.300	69
M24 × 3.00	0.8406	21.350	68
M24 × 3.00	0.8425	21.400	67
M24 × 3.00	0.8437	21.430	66
M24 × 3.00	0.8445	21.450	65
M24 × 3.00	0.8465	21.500	64
M24 × 3.00	0.8484	21.550	63
M24 × 3.00	0.8504	21.600	62
M24 × 3.00	0.8524	21.650	60
M24 × 3.00	0.8543	21.700	59
M27 × 3.00	0.9370	23.800	82
M27 × 3.00	0.9374	23.810	82
M27 × 3.00	0.9409	23.900	80
M27 × 3.00	0.9449	24.000	77
M27 × 3.00	0.9488	24.100	74
M27 × 3.00	0.9528	24.200	72
M27 × 3.00	0.9531	24.210	72
M27 × 3.00	0.9567	24.300	69
M27 × 3.00	0.9606	24.400	67
M27 × 3.00	0.9646	24.500	64
M27 × 3.00	0.9685	24.600	62
M27 × 3.00	0.9689	24.610	61
M27 × 3.00	0.9724	24.700	59
M27 × 2.00	0.9803	24.900	81
M27 × 2.00	0.9843	25.000	77
M27 × 2.00	0.9882	25.100	73
M27 × 2.00	0.9921	25.200	69
M27 × 2.00	0.9961	25.300	65
M27 × 2.00	1.0000	25.400	62
M30 × 3.50	1.0354	26.300	83

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Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M30 × 3.50	1.0394	26.400	79
M30 × 3.50	1.0433	26.500	77
M30 × 3.50	1.0469	26.590	75
M30 × 3.50	1.0472	26.600	75
M30 × 3.50	1.0512	26.700	73
M30 × 3.50	1.0551	26.800	70
M30 × 3.50	1.0591	26.900	68
M30 × 3.50	1.0626	26.990	66
M30 × 3.50	1.0630	27.000	66
M30 × 3.50	1.0669	27.100	64
M30 × 3.50	1.0709	27.200	62
M30 × 3.50	1.0748	27.300	59
M30 × 2.00	1.0984	27.900	81
M30 × 2.00	1.1024	28.000	77
M30 × 2.00	1.1063	28.100	73
M30 × 2.00	1.1094	28.180	70
M30 × 2.00	1.1102	28.200	69
M30 × 2.00	1.1142	28.300	65
M30 × 2.00	1.1181	28.400	62
M30 × 2.00	1.1220	28.500	58
M33 × 3.50	1.1535	29.300	81
M33 × 3.50	1.1563	29.370	80
M33 × 3.50	1.1575	29.400	79
M33 × 3.50	1.1614	29.500	77
M33 × 3.50	1.1654	29.600	75
M33 × 3.50	1.1693	29.770	71
M33 × 3.50	1.1732	29.800	70
M33 × 3.50	1.1772	29.900	68
M33 × 3.50	1.1811	30.000	66
M33 × 3.50	1.1850	30.100	64
M33 × 3.50	1.1874	30.160	62

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M33 × 3.50	1.1890	30.200	62
M33 × 3.50	1.1929	30.300	59
M33 × 2.00	1.2165	30.900	81
M33 × 2.00	1.2189	30.960	79
M33 × 2.00	1.2205	31.000	77
M33 × 2.00	1.2244	31.100	73
M33 × 2.00	1.2283	31.200	69
M33 × 2.00	1.2323	31.300	65
M33 × 2.00	1.2343	31.350	64
M33 × 2.00	1.2362	31.400	62
M33 × 2.00	1.2402	31.500	58
M36 × 4.00	1.2500	31.750	82
M36 × 4.00	1.2520	31.800	81
M36 × 4.00	1.2559	31.900	79
M36 × 4.00	1.2598	32.000	77
M36 × 4.00	1.2638	32.100	75
M36 × 4.00	1.2657	32.150	74
M36 × 4.00	1.2677	32.200	73
M36 × 4.00	1.2717	32.300	71
M36 × 4.00	1.2756	32.400	69
M36 × 4.00	1.2795	32.500	67
M36 × 4.00	1.2811	32.540	67
M36 × 4.00	1.2835	32.600	65
M36 × 4.00	1.2874	32.700	64
M36 × 4.00	1.2913	32.800	62
M36 × 4.00	1.2953	32.900	60
M36 × 4.00	1.2969	32.940	59
M36 × 3.00	1.2913	32.800	82
M36 × 3.00	1.2953	32.900	80
M36 × 3.00	1.2969	32.940	79
M36 × 3.00	1.2992	33.000	77

See the next page





Metric Cut Tap Drill Sizes

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M36 x 3.00	1.3031	33.100	74
M36 x 3.00	1.3071	33.200	72
M36 x 3.00	1.3110	33.300	69
M36 x 3.00	1.3126	33.340	68

81-59% Theoretical Percentage of Thread			
Tap Size	dec	mm	Theor %
M36 x 3.00	1.3150	33.400	67
M36 x 3.00	1.3189	33.500	64
M36 x 3.00	1.3228	33.600	62
M36 x 3.00	1.3268	33.700	59



Technical Details

Unit: mm

DRILL SIZE FOR THREAD FORMING@ 55%THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.91	M 10	0.75	9.72	2#	56	2.01
M 1.1	0.25	1.01	M 10	1.00	9.63	2#	64	2.04
M 1.2	0.25	1.11	M 10	1.25	9.53	3#	48	2.32
M 1.4	0.30	1.29	M 10	1.50	9.44	3#	56	2.34
M 1.6	0.35	1.47	M 11	0.75	10.72	4#	40	2.61
M 1.7	0.35	1.57	M 11	1.00	10.63	4#	48	2.65
M 1.8	0.35	1.67	M 11	1.50	10.44	5#	40	2.94
M 2	0.40	1.85	M 12	1.00	11.63	5#	44	2.96
M 2.2	0.45	2.03	M 12	1.25	11.53	6#	32	3.21
M 2.3	0.40	2.15	M 12	1.50	11.44	6#	40	3.27
M 2.5	0.45	2.33	M 12	1.75	11.35	8#	32	3.87
M 2.6	0.45	2.43	M 14	1.00	13.63	8#	36	3.90
M 3	0.50	2.81	M 14	1.25	13.53	10#	24	4.43
M 3.5	0.60	3.28	M 14	1.50	13.44	10#	32	4.53
M 4	0.70	3.74	M 14	2.00	13.25	12#	24	5.09
M 4.5	0.75	4.22	M 15	1.00	14.63	12#	28	5.15
M 5	0.50	4.81	M 15	1.50	14.44	1/4"	20	5.88
M 5	0.80	4.70	M 16	1.00	15.63	1/4"	28	6.01
M 5.5	0.50	5.31	M 16	1.50	15.44	5/16"	18	7.41
M 6	0.75	5.72	M 16	2.00	15.25	5/16"	24	7.54
M 6	1.00	5.63	M 17	1.00	16.63	3/8"	16	8.93
M 7	0.75	6.72	M 17	1.50	16.44	3/8"	24	9.13
M 7	1.00	6.63	M 18	1.00	17.63	7/16"	14	10.43
M 8	0.75	7.72	M 18	1.50	17.44	7/16"	20	10.64
M 8	1.00	7.63	M 18	2.00	17.25	1/2"	13	11.97
M 8	1.25	7.53	M 18	2.50	17.07	1/2"	20	12.23
M 9	0.75	8.72	M 20	1.00	19.63	9/16"	12	13.50
M 9	1.00	8.63	M 20	2.50	19.07	9/16"	18	13.76
M 9	1.25	8.53				5/8"	11	15.01
						5/8"	18	15.35
						3/4"	10	18.10
						3/4"	16	18.46
						7/8"	9	21.17
						7/8"	14	21.55
						1"	8	24.21
						1"	12	24.61



Unit: mm

DRILL SIZE FOR THREAD FORMING@ 57.5% THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.90	M 10	0.75	9.71	2#	56	2.01
M 1.1	0.25	1.00	M 10	1.00	9.61	2#	64	2.03
M 1.2	0.25	1.10	M 10	1.25	9.51	3#	48	2.31
M 1.4	0.30	1.28	M 10	1.50	9.41	3#	56	2.34
M 1.6	0.35	1.46	M 11	0.75	10.71	4#	40	2.60
M 1.7	0.35	1.56	M 11	1.00	10.61	4#	48	2.64
M 1.8	0.35	1.66	M 11	1.50	10.41	5#	40	2.93
M 2	0.40	1.84	M 12	1.00	11.61	5#	44	2.95
M 2.2	0.45	2.02	M 12	1.25	11.51	6#	32	3.19
M 2.3	0.40	2.14	M 12	1.50	11.41	6#	40	3.26
M 2.5	0.45	2.32	M 12	1.75	11.32	8#	32	3.86
M 2.6	0.45	2.42	M 14	1.00	13.61	8#	36	3.89
M 3	0.50	2.80	M 14	1.25	13.51	10#	24	4.41
M 3.5	0.60	3.27	M 14	1.50	13.41	10#	32	4.52
M 4	0.70	3.73	M 14	2.00	13.22	12#	24	5.07
M 4.5	0.75	4.21	M 15	1.00	14.61	12#	28	5.13
M 5	0.50	4.80	M 15	1.50	14.41	1/4"	20	5.85
M 5	0.80	4.69	M 16	1.00	15.61	1/4"	28	6.00
M 5.5	0.50	5.30	M 16	1.50	15.41	5/16"	18	7.39
M 6	0.75	5.71	M 16	2.00	15.22	5/16"	24	7.52
M 6	1.00	5.61	M 17	1.00	16.61	3/8"	16	8.90
M 7	0.75	6.71	M 17	1.50	16.41	3/8"	24	9.11
M 7	1.00	6.61	M 18	1.00	17.61	7/16"	14	10.40
M 8	0.75	7.71	M 18	1.50	17.41	7/16"	20	10.62
M 8	1.00	7.61	M 18	2.00	17.22	1/2"	13	11.94
M 8	1.25	7.51	M 18	2.50	17.02	1/2"	20	12.20
M 9	0.75	8.71	M 20	1.00	19.61	9/16"	12	13.46
M 9	1.00	8.61	M 20	2.50	19.02	9/16"	18	3.74
M 9	1.25	8.51				5/8"	11	14.97
						5/8"	18	15.32
						3/4"	10	18.06
						3/4"	16	18.43
						7/8"	9	21.12
						7/8"	14	21.52
						1"	8	24.16
						1"	12	24.57



Technical Details

Unit: mm

DRILL SIZE FOR THREAD FORMING@ 60%THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.90	M 10	0.75	9.69	2#	56	2.00
M 1.1	0.25	1.00	M 10	1.00	9.59	2#	64	2.02
M 1.2	0.25	1.10	M 10	1.25	9.49	3#	48	2.30
M 1.4	0.30	1.28	M 10	1.50	9.39	3#	56	2.33
M 1.6	0.35	1.46	M 11	0.75	10.69	4#	40	2.59
M 1.7	0.35	1.56	M 11	1.00	10.59	4#	48	2.63
M 1.8	0.35	1.66	M 11	1.50	10.39	5#	40	2.92
M 2	0.40	1.84	M 12	1.00	11.59	5#	44	2.94
M 2.2	0.45	2.02	M 12	1.25	11.49	6#	32	3.18
M 2.3	0.40	2.14	M 12	1.50	11.39	6#	40	3.25
M 2.5	0.45	2.32	M 12	1.75	11.29	8#	32	3.84
M 2.6	0.45	2.42	M 14	1.00	13.59	8#	36	3.88
M 3	0.50	2.80	M 14	1.25	13.49	10#	24	4.39
M 3.5	0.60	3.26	M 14	1.50	13.39	10#	32	4.50
M 4	0.70	3.71	M 14	2.00	13.18	12#	24	5.05
M 4.5	0.75	4.19	M 15	1.00	14.59	12#	28	5.12
M 5	0.50	4.80	M 15	1.50	14.39	1/4"	20	5.83
M 5	0.80	4.67	M 16	1.00	15.59	1/4"	28	5.98
M 5.5	0.50	5.30	M 16	1.50	15.39	5/16"	18	7.36
M 6	0.75	5.69	M 16	2.00	15.18	5/16"	24	7.51
M 6	1.00	5.59	M 17	1.00	16.59	3/8"	16	8.88
M 7	0.75	6.69	M 17	1.50	16.39	3/8"	24	9.09
M 7	1.00	6.59	M 18	1.00	17.59	7/16"	14	10.37
M 8	0.75	7.69	M 18	1.50	17.39	7/16"	20	10.59
M 8	1.00	7.59	M 18	2.00	17.18	1/2"	13	11.90
M 8	1.25	7.49	M 18	2.50	16.98	1/2"	20	12.18
M 9	0.75	8.69	M 20	1.00	19.59	9/16"	12	13.42
M 9	1.00	8.59	M 20	2.50	18.98	9/16"	18	13.71
M 9	1.25	8.49				5/8"	11	14.93
						5/8"	18	15.30
						3/4"	10	18.01
						3/4"	16	18.40
						7/8"	9	21.07
						7/8"	14	21.48
						1"	8	24.10
						1"	12	24.54



Unit: mm

DRILL SIZE FOR THREAD FORMING@ 62.5% THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.89	M 10	0.75	9.68	2#	56	1.99
M 1.1	0.25	0.99	M 10	1.00	9.58	2#	64	2.02
M 1.2	0.25	1.09	M 10	1.25	9.47	3#	48	2.29
M 1.4	0.30	1.27	M 10	1.50	9.36	3#	56	2.32
M 1.6	0.35	1.45	M 11	0.75	10.68	4#	40	2.57
M 1.7	0.35	1.55	M 11	1.00	10.58	4#	48	2.62
M 1.8	0.35	1.65	M 11	1.50	10.36	5#	40	2.91
M 2	0.40	1.83	M 12	1.00	11.58	5#	44	2.93
M 2.2	0.45	2.01	M 12	1.25	11.47	6#	32	3.17
M 2.3	0.40	2.13	M 12	1.50	11.36	6#	40	3.24
M 2.5	0.45	2.31	M 12	1.75	11.26	8#	32	3.83
M 2.6	0.45	2.41	M 14	1.00	13.58	8#	36	3.87
M 3	0.50	2.79	M 14	1.25	13.47	10#	24	4.38
M 3.5	0.60	3.25	M 14	1.50	13.36	10#	32	4.49
M 4	0.70	3.70	M 14	2.00	13.15	12#	24	5.04
M 4.5	0.75	4.18	M 15	1.00	14.58	12#	28	5.10
M 5	0.50	4.79	M 15	1.50	14.36	1/4"	20	5.81
M 5	0.80	4.66	M 16	1.00	15.58	1/4"	28	5.96
M 5.5	0.50	5.29	M 16	1.50	15.36	5/16"	18	7.34
M 6	0.75	5.68	M 16	2.00	15.15	5/16"	24	7.49
M 6	1.00	5.58	M 17	1.00	16.58	3/8"	16	8.85
M 7	0.75	6.68	M 17	1.50	16.36	3/8"	24	9.08
M 7	1.00	6.58	M 18	1.00	17.58	7/16"	14	10.34
M 8	0.75	7.68	M 18	1.50	17.36	7/16"	20	10.57
M 8	1.00	7.58	M 18	2.00	17.15	1/2"	13	11.87
M 8	1.25	7.47	M 18	2.50	16.94	1/2"	20	12.16
M 9	0.75	8.68	M 20	1.00	19.58	9/16"	12	13.39
M 9	1.00	8.58	M 20	2.50	18.94	9/16"	18	13.69
M 9	1.25	8.47				5/8"	11	14.89
						5/8"	18	15.28
						3/4"	10	17.97
						3/4"	16	18.38
						7/8"	9	21.03
						7/8"	14	21.45
						1"	8	24.05
						1"	12	24.50



Technical Details

Unit: mm

DRILL SIZE FOR THREAD FORMING@ 65%THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.89	M 10	0.75	9.67	2#	56	1.98
M 1.1	0.25	0.99	M 10	1.00	9.56	2#	64	2.01
M 1.2	0.25	1.09	M 10	1.25	9.45	3#	48	2.28
M 1.4	0.30	1.27	M 10	1.50	9.34	3#	56	2.31
M 1.6	0.35	1.45	M 11	0.75	10.67	4#	40	2.56
M 1.7	0.35	1.55	M 11	1.00	10.56	4#	48	2.61
M 1.8	0.35	1.65	M 11	1.50	10.34	5#	40	2.89
M 2	0.40	1.82	M 12	1.00	11.56	5#	44	2.92
M 2.2	0.45	2.00	M 12	1.25	11.45	6#	32	3.15
M 2.3	0.40	2.12	M 12	1.50	11.34	6#	40	3.22
M 2.5	0.45	2.30	M 12	1.75	11.23	8#	32	3.81
M 2.6	0.45	2.40	M 14	1.00	13.56	8#	36	3.85
M 3	0.50	2.78	M 14	1.25	13.45	10#	24	4.36
M 3.5	0.60	3.23	M 14	1.50	13.34	10#	32	4.48
M 4	0.70	3.69	M 14	2.00	13.12	12#	24	5.02
M 4.5	0.75	4.17	M 15	1.00	14.56	12#	28	5.09
M 5	0.50	4.78	M 15	1.50	14.34	1/4"	20	5.79
M 5	0.80	4.65	M 16	1.00	15.56	1/4"	28	5.95
M 5.5	0.50	5.28	M 16	1.50	15.34	5/16"	18	7.31
M 6	0.75	5.67	M 16	2.00	15.12	5/16"	24	7.47
M 6	1.00	5.56	M 17	1.00	16.56	3/8"	16	8.82
M 7	0.75	6.67	M 17	1.50	16.34	3/8"	24	9.06
M 7	1.00	6.56	M 18	1.00	17.56	7/16"	14	10.31
M 8	0.75	7.67	M 18	1.50	17.34	7/16"	20	10.55
M 8	1.00	7.56	M 18	2.00	17.12	1/2"	13	11.84
M 8	1.25	7.45	M 18	2.50	16.90	1/2"	20	12.14
M 9	0.75	8.67	M 20	1.00	19.56	9/16"	12	13.35
M 9	1.00	8.56	M 20	2.50	18.90	9/16"	18	13.66
M 9	1.25	8.45				5/8"	11	14.85
						5/8"	18	15.25
						3/4"	10	17.93
						3/4"	16	18.35
						7/8"	9	20.98
						7/8"	14	21.42
						1"	8	24.00
						1"	12	24.46



Unit: mm

DRILL SIZE FOR THREAD FORMING@ 67.5% THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.89	M 10	0.75	9.66	2#	56	1.98
M 1.1	0.25	0.99	M 10	1.00	9.54	2#	64	2.00
M 1.2	0.25	1.09	M 10	1.25	9.43	3#	48	2.27
M 1.4	0.30	1.26	M 10	1.50	9.31	3#	56	2.31
M 1.6	0.35	1.44	M 11	0.75	10.66	4#	40	2.55
M 1.7	0.35	1.54	M 11	1.00	10.54	4#	48	2.60
M 1.8	0.35	1.64	M 11	1.50	10.31	5#	40	2.88
M 2	0.40	1.82	M 12	1.00	11.54	5#	44	2.91
M 2.2	0.45	1.99	M 12	1.25	11.43	6#	32	3.14
M 2.3	0.40	2.12	M 12	1.50	11.31	6#	40	3.21
M 2.5	0.45	2.29	M 12	1.75	11.20	8#	32	3.80
M 2.6	0.45	2.39	M 14	1.00	13.54	8#	36	3.84
M 3	0.50	2.77	M 14	1.25	13.43	10#	24	4.34
M 3.5	0.60	3.22	M 14	1.50	13.31	10#	32	4.46
M 4	0.70	3.68	M 14	2.00	13.08	12#	24	5.00
M 4.5	0.75	4.16	M 15	1.00	14.54	12#	28	5.07
M 5	0.50	4.77	M 15	1.50	14.31	1/4"	20	5.77
M 5	0.80	4.63	M 16	1.00	15.54	1/4"	28	5.93
M 5.5	0.50	5.27	M 16	1.50	15.31	5/16"	18	7.29
M 6	0.75	5.66	M 16	2.00	15.08	5/16"	24	7.45
M 6	1.00	5.54	M 17	1.00	16.54	3/8"	16	8.80
M 7	0.75	6.66	M 17	1.50	16.31	3/8"	24	9.04
M 7	1.00	6.54	M 18	1.00	17.54	7/16"	14	10.28
M 8	0.75	7.66	M 18	1.50	17.31	7/16"	20	10.53
M 8	1.00	7.54	M 18	2.00	17.08	1/2"	13	11.80
M 8	1.25	7.43	M 18	2.50	16.85	1/2"	20	12.12
M 9	0.75	8.66	M 20	1.00	19.54	9/16"	12	13.32
M 9	1.00	8.54	M 20	2.50	18.85	9/16"	18	13.64
M 9	1.25	8.43				5/8"	11	14.82
						5/8"	18	15.23
						3/4"	10	17.88
						3/4"	16	18.32
						7/8"	9	20.93
						7/8"	14	21.39
						1"	8	23.94
						1"	12	24.43



Technical Details

Unit: mm

DRILL SIZE FOR THREAD FORMING@ 70%THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.88	M 10	0.75	9.64	2#	56	1.97
M 1.1	0.25	0.98	M 10	1.00	9.52	2#	64	2.00
M 1.2	0.25	1.08	M 10	1.25	9.41	3#	48	2.26
M 1.4	0.30	1.26	M 10	1.50	9.29	3#	56	2.30
M 1.6	0.35	1.43	M 11	0.75	10.64	4#	40	2.54
M 1.7	0.35	1.53	M 11	1.00	10.52	4#	48	2.59
M 1.8	0.35	1.63	M 11	1.50	10.29	5#	40	2.87
M 2	0.40	1.81	M 12	1.00	11.52	5#	44	2.90
M 2.2	0.45	1.99	M 12	1.25	11.41	6#	32	3.13
M 2.3	0.40	2.11	M 12	1.50	11.29	6#	40	3.20
M 2.5	0.45	2.29	M 12	1.75	11.17	8#	32	3.79
M 2.6	0.45	2.39	M 14	1.00	13.52	8#	36	3.83
M 3	0.50	2.76	M 14	1.25	13.41	10#	24	4.32
M 3.5	0.60	3.21	M 14	1.50	13.29	10#	32	4.45
M 4	0.70	3.67	M 14	2.00	13.05	12#	24	4.98
M 4.5	0.75	4.14	M 15	1.00	14.52	12#	28	5.05
M 5	0.50	4.76	M 15	1.50	14.29	1/4"	20	5.75
M 5	0.80	4.62	M 16	1.00	15.52	1/4"	28	5.92
M 5.5	0.50	5.26	M 16	1.50	15.29	5/16"	18	7.27
M 6	0.75	5.64	M 16	2.00	15.05	5/16"	24	7.43
M 6	1.00	5.52	M 17	1.00	16.52	3/8"	16	8.77
M 7	0.75	6.64	M 17	1.50	16.29	3/8"	24	9.02
M 7	1.00	6.52	M 18	1.00	17.52	7/16"	14	10.25
M 8	0.75	7.64	M 18	1.50	17.29	7/16"	20	10.51
M 8	1.00	7.52	M 18	2.00	17.05	1/2"	13	11.77
M 8	1.25	7.41	M 18	2.50	16.81	1/2"	20	12.10
M 9	0.75	8.64	M 20	1.00	19.52	9/16"	12	13.28
M 9	1.00	8.52	M 20	2.50	18.81	9/16"	18	13.62
M 9	1.25	8.41				5/8"	11	14.78
						5/8"	18	15.20
						3/4"	10	17.84
						3/4"	16	18.29
						7/8"	9	20.88
						7/8"	14	21.36
						1"	8	23.89
						1"	12	24.39



Unit: mm

DRILL SIZE FOR THREAD FORMING@ 72.5% THREAD								
Metric Threads			Metric Threads			UNC / UNF Threads		
Tap Dia.	Pitch	Drill size	Tap Dia.	Pitch	Drill size	Tap size	TPI	Drill size
M 1	0.25	0.88	M 10	0.75	9.63	2#	56	1.96
M 1.1	0.25	0.98	M 10	1.00	9.51	2#	64	1.99
M 1.2	0.25	1.08	M 10	1.25	9.38	3#	48	2.25
M 1.4	0.30	1.25	M 10	1.50	9.26	3#	56	2.29
M 1.6	0.35	1.43	M 11	0.75	10.63	4#	40	2.53
M 1.7	0.35	1.53	M 11	1.00	10.51	4#	48	2.58
M 1.8	0.35	1.63	M 11	1.50	10.26	5#	40	2.86
M 2	0.40	1.80	M 12	1.00	11.51	5#	44	2.89
M 2.2	0.45	1.98	M 12	1.25	11.38	6#	32	3.11
M 2.3	0.40	2.10	M 12	1.50	11.26	6#	40	3.19
M 2.5	0.45	2.28	M 12	1.75	11.14	8#	32	3.77
M 2.6	0.45	2.38	M 14	1.00	13.51	8#	36	3.82
M 3	0.50	2.75	M 14	1.25	13.38	10#	24	4.30
M 3.5	0.60	3.20	M 14	1.50	13.26	10#	32	4.43
M 4	0.70	3.65	M 14	2.00	13.01	12#	24	4.96
M 4.5	0.75	4.13	M 15	1.00	14.51	12#	28	5.04
M 5	0.50	4.75	M 15	1.50	14.26	1/4"	20	5.72
M 5	0.80	4.61	M 16	1.00	15.51	1/4"	28	5.90
M 5.5	0.50	5.25	M 16	1.50	15.26	5/16"	18	7.24
M 6	0.75	5.63	M 16	2.00	15.01	5/16"	24	7.42
M 6	1.00	5.51	M 17	1.00	16.51	3/8"	16	8.74
M 7	0.75	6.63	M 17	1.50	16.26	3/8"	24	9.00
M 7	1.00	6.51	M 18	1.00	17.51	7/16"	14	10.22
M 8	0.75	7.63	M 18	1.50	17.26	7/16"	20	10.49
M 8	1.00	7.51	M 18	2.00	17.01	1/2"	13	11.74
M 8	1.25	7.38	M 18	2.50	16.77	1/2"	20	12.07
M 9	0.75	8.63	M 20	1.00	19.51	9/16"	12	13.24
M 9	1.00	8.51	M 20	2.50	18.77	9/16"	18	13.59
M 9	1.25	8.38				5/8"	11	14.74
						5/8"	18	15.18
						3/4"	10	17.80
						3/4"	16	18.27
						7/8"	9	20.83
						7/8"	14	21.33
						1"	8	23.84
						1"	12	24.36

MEMO

MEMO



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