

CERS CERSM CERSF CERSFM

超硬附底刃螺旋絞刀—標準型

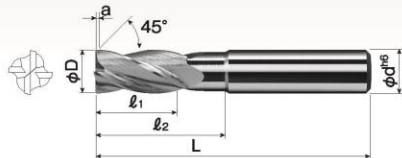
Solid Carbide End Cutting Short Reamers

●被覆品也標準化。

The coating items is standardized.

●盲孔用。

For blind holes



製品番號 Product code	螺旋角 Helix Angle	刃徑公差 Dia Tolerance	表面處理 Surface Treatment	切削條件 Cutting Conditions
CERS		m5		
CERSM	30°	+0.005 0		v20
CERSF		m5	OK-HR	
CERSFM		+0.005 0	OK-HR	

下孔狀態 Prepared Hole		準備孔 Prepared Hole	
通孔 Through	深孔 Deep	盲孔 Stop	橢圓 Ellipse
○	×	○	○

每隔0.1mm steps 每隔0.5mm steps

尺寸 Size							無被覆 Non-Coat		OK-HR被覆 OK-HR coat	
刃徑 D	刃長 L1	頸下長 L2	全長 L	柄徑 d	吸入長 a	刃數 NT	品番 Product No.	標準價格 Standard price NT\$	品番 Product No.	標準價格 Standard price NT\$
2.0	6	15	45	4	0.15	4	CERS-020	1,380	CERSF020	1,650
2.1~2.9	6	15	45	4	0.15	4	CERS-021~029	1,650	CERSF021~029	2,010
3.0	6	15	45	4	0.2	4	CERS-030	1,230	CERSF030	1,500
3.1~3.9	6	15	45	4	0.2	4	CERS-031~039	1,500	CERSF031~039	1,800
4.0	8	15	45	6	0.2	4	CERS-040	1,260	CERSF040	1,530
4.1~4.9	8	15	45	6	0.2	4	CERS-041~049	1,560	CERSF041~049	1,860
5.0	10	20	50	6	0.25	4	CERS-050	1,320	CERSF050	1,590
5.1~5.9	10	20	50	6	0.25	4	CERS-051~059	1,590	CERSF051~059	1,890
6.0	12	25	60	8	0.25	4	CERS-060	1,560	CERSF060	1,860
6.1~6.9	12	25	60	8	0.25	4	CERS-061~069	1,860	CERSF061~069	2,250
7.0	12	25	60	8	0.25	4	CERS-070	1,740	CERSF070	2,100
7.1~7.9	12	25	60	8	0.25	4	CERS-071~079	2,100	CERSF071~079	2,520
8.0	16	30	70	10	0.25	4	CERS-080	2,430	CERSF080	2,940
8.1~8.9	16	30	70	10	0.25	4	CERS-081~089	2,940	CERSF081~089	3,540
9.0	16	30	70	10	0.3	4	CERS-090	2,700	CERSF090	3,240
9.1~9.9	16	30	70	10	0.3	4	CERS-091~099	3,270	CERSF091~099	3,930
10.0	20	35	75	12	0.3	4	CERS-100	3,360	CERSF100	4,050
10.1~10.9	20	35	75	12	0.3	4	CERS-101~109	4,050	CERSF101~109	4,860
11.0	20	35	75	12	0.3	4	CERS-110	3,570	CERSF110	4,290
11.1~11.9	20	35	75	12	0.3	4	CERS-111~119	4,290	CERSF111~119	5,190
12.0	25	35	75	12	0.3	4	CERS-120	3,840	CERSF120	4,620
12.5	30	-	90	12	0.3	4	CERS-125	5,910	CERSF125	7,110
13.0	30	-	90	12	0.3	4	CERS-130	5,910	CERSF130	7,110
13.5	30	-	90	12	0.3	4	CERS-135	6,240	CERSF135	7,500
14.0	30	-	90	12	0.3	4	CERS-140	6,240	CERSF140	7,500
14.5	30	40	90	16	0.3	4	CERS-145	6,930	CERSF145	8,340
15.0	30	40	90	16	0.3	4	CERS-150	6,930	CERSF150	8,340
15.5	30	40	90	16	0.3	4	CERS-155	6,600	CERSF155	7,920
16.0	30	40	90	16	0.3	4	CERS-160	6,600	CERSF160	7,920
16.5	35	-	100	16	0.4	6	CERS-165	10,410	CERSF165	12,480
17.0	35	-	100	16	0.4	6	CERS-170	10,410	CERSF170	12,480
17.5	35	-	100	16	0.4	6	CERS-175	10,410	CERSF175	12,480
18.0	35	-	100	16	0.4	6	CERS-180	10,410	CERSF180	12,480
18.5	35	50	105	20	0.4	6	CERS-185	11,100	CERSF185	13,350
19.0	35	50	105	20	0.4	6	CERS-190	11,100	CERSF190	13,350
19.5	35	50	105	20	0.4	6	CERS-195	11,100	CERSF195	13,350
20.0	35	50	105	20	0.4	6	CERS-200	10,770	CERSF200	12,930

CERSM/CERSFM

每隔0.01mm steps

尺寸 Size							無被覆 Non-Coat		OK-HR被覆 OK-HR coat	
刃徑 D	刃長 ℓ ₁	頸下長 ℓ ₂	全長 L	柄徑 d	吸入長 a	刃數 NT	品番 Product No.	標準價格 Standard price NT\$	品番 Product No.	標準價格 Standard price NT\$
1.95~1.99	6	15	45	4	0.15	4	CERSM0195~0199	1,530	CERSFM0195~0199	1,830
2.00	6	15	45	4	0.15	4	CERSM0200	1,530	CERSFM0200	1,830
2.01~2.09	6	15	45	4	0.15	4	CERSM0201~0209	1,530	CERSFM0201~0209	1,830
2.10~2.90	6	15	45	4	0.15	4	CERSM0210~0290	1,650	CERSFM0210~0290	2,010
2.91~2.99	6	15	45	4	0.2	4	CERSM0291~0299	1,380	CERSFM0291~0299	1,650
3.00	6	15	45	4	0.2	4	CERSM0300	1,380	CERSFM0300	1,650
3.01~3.09	6	15	45	4	0.2	4	CERSM0301~0309	1,380	CERSFM0301~0309	1,650
3.10~3.90	6	15	45	4	0.2	4	CERSM0310~0390	1,500	CERSFM0310~0390	1,800
3.91~3.99	8	15	45	6	0.2	4	CERSM0391~0399	1,410	CERSFM0391~0399	1,680
4.00	8	15	45	6	0.2	4	CERSM0400	1,410	CERSFM0400	1,680
4.01~4.09	8	15	45	6	0.2	4	CERSM0401~0409	1,410	CERSFM0401~0409	1,680
4.10~4.90	8	15	45	6	0.2	4	CERSM0410~0490	1,560	CERSFM0410~0490	1,860
4.91~4.99	10	20	50	6	0.25	4	CERSM0491~0499	1,470	CERSFM0491~0499	1,770
5.00	10	20	50	6	0.25	4	CERSM0500	1,470	CERSFM0500	1,770
5.01~5.09	10	20	50	6	0.25	4	CERSM0501~0509	1,470	CERSFM0501~0509	1,770
5.10~5.90	10	20	50	6	0.25	4	CERSM0510~0590	1,590	CERSFM0510~0590	1,890
5.91~5.99	12	25	60	8	0.25	4	CERSM0591~0599	1,710	CERSFM0591~0599	2,070
6.00	12	25	60	8	0.25	4	CERSM0600	1,710	CERSFM0600	2,070
6.01~6.09	12	25	60	8	0.25	4	CERSM0601~0609	1,710	CERSFM0601~0609	2,070
6.10~6.90	12	25	60	8	0.25	4	CERSM0610~0690	1,860	CERSFM0610~0690	2,250
6.91~6.99	12	25	60	8	0.25	4	CERSM0691~0699	1,950	CERSFM0691~0699	2,340
7.00	12	25	60	8	0.25	4	CERSM0700	1,950	CERSFM0700	2,340
7.01~7.09	12	25	60	8	0.25	4	CERSM0701~0709	1,950	CERSFM0701~0709	2,340
7.10~7.90	12	25	60	8	0.25	4	CERSM0710~0790	2,100	CERSFM0710~0790	2,520
7.91~7.99	16	30	70	10	0.25	4	CERSM0791~0799	2,700	CERSFM0791~0799	3,240
8.00	16	30	70	10	0.25	4	CERSM0800	2,700	CERSFM0800	3,240
8.01~8.09	16	30	70	10	0.25	4	CERSM0801~0809	2,700	CERSFM0801~0809	3,240
8.10~8.90	16	30	70	10	0.25	4	CERSM0810~0890	2,940	CERSFM0810~0890	3,540
8.91~8.99	16	30	70	10	0.3	4	CERSM0891~0899	2,970	CERSFM0891~0899	3,570
9.00	16	30	70	10	0.3	4	CERSM0900	2,970	CERSFM0900	3,570
9.01~9.09	16	30	70	10	0.3	4	CERSM0901~0909	2,970	CERSFM0901~0909	3,570
9.10~9.90	16	30	70	10	0.3	4	CERSM0910~0990	3,270	CERSFM0910~0990	3,930
9.91~9.99	20	35	75	12	0.3	4	CERSM0991~0999	3,690	CERSFM0991~0999	4,470
10.00	20	35	75	12	0.3	4	CERSM1000	3,690	CERSFM1000	4,470
10.01~10.09	20	35	75	12	0.3	4	CERSM1001~1009	3,690	CERSFM1001~1009	4,470
10.10~10.90	20	35	75	12	0.3	4	CERSM1010~1090	4,050	CERSFM1010~1090	4,860
10.91~10.99	20	35	75	12	0.3	4	CERSM1091~1099	3,930	CERSFM1091~1099	4,710
11.00	20	35	75	12	0.3	4	CERSM1100	3,930	CERSFM1100	4,710
11.01~11.09	20	35	75	12	0.3	4	CERSM1101~1109	3,930	CERSFM1101~1109	4,710
11.10~11.90	20	35	75	12	0.3	4	CERSM1110~1190	4,290	CERSFM1110~1190	5,190
11.91~11.99	25	35	75	12	0.3	4	CERSM1191~1199	4,170	CERSFM1191~1199	5,010
12.00	25	35	75	12	0.3	4	CERSM1200	4,170	CERSFM1200	5,010
12.01~12.05	25	35	75	12	0.3	4	CERSM1201~1205	4,170	CERSFM1201~1205	5,010

CER CERM CERF CERFM

超硬附底刃螺旋紋刀

Solid Carbide End Cutting Reamers

●被覆品也標準化。

The coating items is standardized.

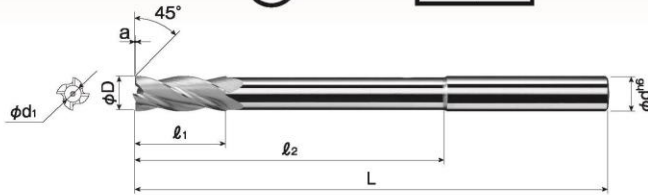
●盲孔用。

For blind holes

(加工例)

Processing example

CER



製品番號 Product code	螺旋角 Helix Angle	刃徑公差 Dia. Tolerance	表面處理 Surface Treatment	切削條件 Cutting Conditions
CER	30° R	m5		r20
CERM		+0.005 0		
CERF		m5	OK-HR	
CERFM		+0.005 0		

下孔狀態 Prepared Hole	
通孔 Through	深孔 Deep
盲孔 Stop	橢圓 Ellipse

每隔0.1mm steps 每隔0.01mm steps

尺寸 Size								無被覆 Non-Coat		OK-HR被覆 OK-HR coat	
刃徑 D	刃長 L1	頸下長 L2	全長 L	柄徑 d	咬入長 a	內徑 d1	刃數 NT	品番 Product No.	標準價格 Standard price NT\$	品番 Product No.	標準價格 Standard price NT\$
2.95~2.99	20	35	60	3	0.2	φ1.0	4	CERM0295~0299	3,960	CERFM0295~0299	5,160
3.0	20	35	60	3	0.2	φ1.0	4	CER-030	3,090	CERF030	4,050
3.00~3.05	20	35	60	3	0.2	φ1.0	4	CERM0300~0305	3,960	CERFM0300~0305	5,160
3.1~3.9	20	35	60	4	0.2	φ1.5	4	CER-031~039	3,900	—	—
3.95~3.99	20	35	60	4	0.2	φ1.5	4	CERM0395~0399	4,230	CERFM0395~0399	5,520
4.0	20	35	60	4	0.2	φ1.5	4	CER-040	3,480	CERF040	4,530
4.00~4.05	20	35	60	4	0.2	φ1.5	4	CERM0400~0405	4,230	CERFM0400~0405	5,520
4.1~4.9	26	45	75	5	0.2	φ2.5	4	CER-041~049	4,500	—	—
4.95~4.99	26	45	75	5	0.2	φ2.5	4	CERM0495~0499	4,770	CERFM0495~0499	6,210
5.0	26	45	75	5	0.2	φ2.5	4	CER-050	4,110	CERF050	5,340
5.00~5.05	26	45	75	5	0.2	φ2.5	4	CERM0500~0505	4,770	CERFM0500~0505	6,210
5.1~5.9	26	65	100	6	0.2	φ3.0	4	CER-051~059	5,160	—	—
5.95~5.99	26	65	100	6	0.2	φ3.0	4	CERM0595~0599	5,640	CERFM0595~0599	7,350
6.0	26	65	100	6	0.2	φ3.0	4	CER-060	4,470	CERF060	5,820
6.00~6.05	26	65	100	6	0.2	φ3.0	4	CERM0600~0605	5,640	CERFM0600~0605	7,350
6.1~6.9	26	70	110	8	0.3	φ3.5	4	CER-061~069	5,730	—	—
6.95~6.99	26	70	110	8	0.3	φ3.5	4	CERM0695~0699	6,090	CERFM0695~0699	7,920
7.0	26	70	110	8	0.3	φ3.5	4	CER-070	5,520	CERF070	7,200
7.00~7.05	26	70	110	8	0.3	φ3.5	4	CERM0700~0705	6,090	CERFM0700~0705	7,920
7.1~7.9	26	85	125	8	0.3	φ4.0	4	CER-071~079	6,930	—	—
7.95~7.99	26	85	125	8	0.3	φ4.0	4	CERM0795~0799	7,560	CERFM0795~0799	9,840
8.0	26	85	125	8	0.3	φ4.0	4	CER-080	5,520	CERF080	7,200
8.00~8.05	26	85	125	8	0.3	φ4.0	4	CERM0800~0805	7,560	CERFM0800~0805	9,840
8.1~8.9	26	90	135	10	0.3	φ4.5	4	CER-081~089	7,830	—	—
8.95~8.99	26	90	135	10	0.3	φ4.5	4	CERM0895~0899	8,520	CERFM0895~0899	11,070
9.0	26	90	135	10	0.3	φ4.5	4	CER-090	6,720	CERF090	8,730
9.00~9.05	26	90	135	10	0.3	φ4.5	4	CERM0900~0905	8,520	CERFM0900~0905	11,070
9.1~9.9	31	100	150	10	0.3	φ5.0	4	CER-091~099	8,880	—	—
9.95~9.99	31	100	150	10	0.3	φ5.0	4	CERM0995~0999	8,880	CERFM0995~0999	11,550
10.0	31	100	150	10	0.3	φ5.0	4	CER-100	8,130	CERF100	10,590
10.00~10.05	31	100	150	10	0.3	φ5.0	4	CERM1000~1005	8,880	CERFM1000~1005	11,550
10.1~10.9	31	105	160	12	0.3	φ5.0	4	CER-101~109	12,210	—	—
10.95~10.99	31	105	160	12	0.3	φ5.0	4	CERM1095~1099	12,390	CERFM1095~1099	16,110
11.0	31	105	160	12	0.3	φ5.0	4	CER-110	11,100	CERF110	14,430
11.00~11.05	31	105	160	12	0.3	φ5.0	4	CERM1100~1105	12,390	CERFM1100~1105	16,110
11.1~11.9	31	105	160	12	0.3	φ6.0	4	CER-111~119	12,420	—	—
11.95~11.99	31	105	160	12	0.3	φ6.0	4	CERM1195~1199	12,600	CERFM1195~1199	16,380
12.0	31	105	160	12	0.3	φ6.0	4	CER-120	11,400	CERF120	14,820
12.00~12.05	31	105	160	12	0.3	φ6.0	4	CERM1200~1205	12,600	CERFM1200~1205	16,380

BCER

超硬焊刃附底刃螺旋紋刀(直柄)

Top Solid Carbide End Cutting Reamers (Straight Shank)

- 先端焊刃型・直柄規格。

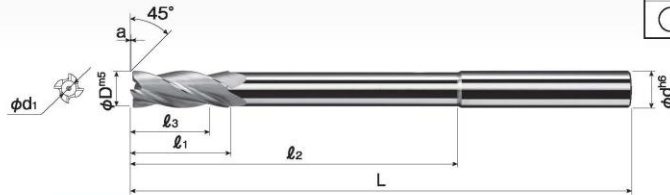
Top-solid type with straight shank

- 盲孔專用紋刀，可獲精緻之加工底面。

Reamers for stop holes, The bottom can be beautifully processed.

- 採用立銼刀柄。

End Mill shank is adopted.



製品番號 Product code	材質 Material	螺旋角 Helix Angle	刃徑公差 Dia. Tolerance	切削條件 Cutting Conditions
BCER	超硬 TOP SOLID	30° R	m5	20

下孔狀態 Prepared Hole		Prepared Hole	
通孔 Through	深孔 Deep	盲孔 Stop	橢圓 Ellipse

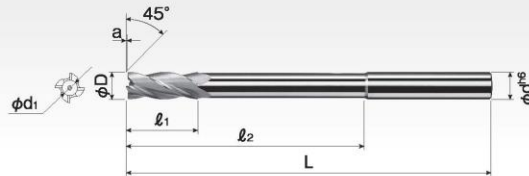
每隔 0.5mm steps

品番 Product No.	尺寸 Size									標準價格 Standard price NT\$
	刃徑 D	刃長 L1	超硬長 L3	頸下長 L2	全長 L	柄徑 d	吸入長 a	內徑 d1	刃數 NT	
BCER-125	12.5	36	26	110	165	12	0.3	φ6.0	4	5,850
BCER-130	13.0	36	26	110	165	12	0.3	φ6.0	4	5,850
BCER-135	13.5	36	26	115	170	16	0.3	φ7.0	4	6,000
BCER-140	14.0	36	26	115	170	16	0.3	φ7.0	4	6,000
BCER-145	14.5	36	26	120	180	16	0.3	φ7.0	4	6,510
BCER-150	15.0	36	26	120	180	16	0.3	φ7.0	4	6,510
BCER-155	15.5	37	27	125	185	16	0.3	φ8.0	4	6,660
BCER-160	16.0	37	27	125	185	16	0.3	φ8.0	4	6,660
BCER-165	16.5	37	27	125	185	16	0.4	φ8.0	6	6,870
BCER-170	17.0	37	27	125	185	16	0.4	φ8.0	6	6,870
BCER-175	17.5	37	27	130	195	20	0.4	φ9.0	6	7,080
BCER-180	18.0	37	27	130	195	20	0.4	φ9.0	6	7,080
BCER-185	18.5	37	27	130	195	20	0.4	φ9.0	6	7,380
BCER-190	19.0	37	27	130	195	20	0.4	φ9.0	6	7,380
BCER-195	19.5	37	27	140	205	20	0.4	φ10.0	6	7,620
BCER-200	20.0	37	27	140	205	20	0.4	φ10.0	6	7,950
BCER-205	20.5	41	31	150	215	20	0.4	φ10.0	6	8,340
BCER-210	21.0	41	31	150	215	20	0.4	φ10.0	6	8,340
BCER-215	21.5	41	31	150	215	20	0.4	φ11.0	6	8,490
BCER-220	22.0	41	31	150	215	20	0.4	φ11.0	6	8,490
BCER-225	22.5	41	31	160	230	25	0.4	φ11.0	6	9,030
BCER-230	23.0	41	31	160	230	25	0.4	φ11.0	6	9,030
BCER-235	23.5	41	31	160	230	25	0.4	φ12.0	6	9,900
BCER-240	24.0	41	31	160	230	25	0.4	φ12.0	6	9,270
BCER-245	24.5	41	31	160	230	25	0.4	φ12.0	6	10,770
BCER-250	25.0	41	31	160	230	25	0.4	φ12.0	6	10,590
BCER-255	25.5	41	31	160	230	25	0.4	φ13.0	6	12,150
BCER-260	26.0	41	31	160	230	25	0.4	φ13.0	6	11,670
BCER-265	26.5	41	31	160	230	25	0.4	φ13.0	6	13,050
BCER-270	27.0	41	31	160	230	25	0.4	φ13.0	6	12,900
BCER-275	27.5	46	36	160	240	32	0.4	φ14.0	8	16,110
BCER-280	28.0	46	36	160	240	32	0.4	φ14.0	8	15,330
BCER-285	28.5	46	36	160	240	32	0.4	φ14.0	8	16,980
BCER-290	29.0	46	36	160	240	32	0.4	φ14.0	8	16,350
BCER-295	29.5	46	36	160	240	32	0.4	φ15.0	8	16,980
BCER-300	30.0	46	36	160	240	32	0.4	φ15.0	8	16,980

CEOR CEORM

超硬附底刃螺旋紋刀(附油孔)

Solid End Cutting Reamers with Internal Coolant Supply



● 全鑄鋼。

Solid type

● 盲孔專用紋刀，可獲精緻之加工底面。

Reamers for stop holes, The bottom can be beautifully processed.

● 採用立銼刀柄。

End Mill shank is adopted.

● 附油孔形狀，排出切削性特優。

According to the internal coolant shape, exhaust of the work pieces is preminent.

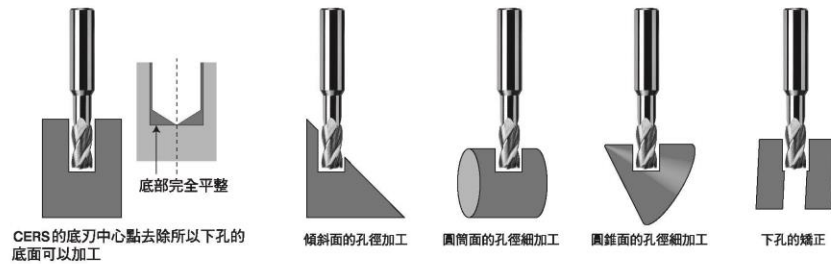
製品番號 Product code	螺旋角 Helix Angle	刃徑公差 Dia. Tolerance	切削條件 Cutting Conditions
CEOR	30°	m5	P20
CEORM		+0.005 0	

下孔狀態		Prepared Hole	
通孔 Through	深孔 Deep	盲孔 Stop	橢圓 Ellipse

每隔 0.1mm steps 每隔 0.01mm steps

品番 Product No.	尺寸 Size								標準價格 Standard Price NT\$
	刃徑 D	刃長 l ₁	頸下長 l ₂	全長 L	柄徑 d	吸入長 a	內徑 d ₁	刃數 NT	
CEORM0495~0499	4.95~4.99	26	45	75	5	0.2	φ2.5	4	5,760
CEOR-050	5.0	26	45	75	5	0.2	φ2.5	4	4,950
CEORM0500~0505	5.00~5.05	26	45	75	5	0.2	φ2.5	4	5,760
CEOR-051~059	5.1~5.9	26	65	100	6	0.2	φ3.0	4	6,150
CEORM0595~0599	5.95~5.99	26	65	100	6	0.2	φ3.0	4	6,780
CEOR-060	6.0	26	65	100	6	0.2	φ3.0	4	5,370
CEORM0600~0605	6.00~6.05	26	65	100	6	0.2	φ3.0	4	6,780
CEOR-061~069	6.1~6.9	26	70	110	8	0.3	φ3.5	4	6,840
CEORM0695~0699	6.95~6.99	26	70	110	8	0.3	φ3.5	4	7,290
CEOR-070	7.0	26	70	110	8	0.3	φ3.5	4	6,660
CEORM0700~0705	7.00~7.05	26	70	110	8	0.3	φ3.5	4	7,290
CEOR-071~079	7.1~7.9	26	85	125	8	0.3	φ4.0	4	8,340
CEORM0795~0799	7.95~7.99	26	85	125	8	0.3	φ4.0	4	9,120
CEOR-080	8.0	26	85	125	8	0.3	φ4.0	4	6,660
CEORM0800~0805	8.00~8.05	26	85	125	8	0.3	φ4.0	4	9,120
CEOR-081~089	8.1~8.9	26	90	135	10	0.3	φ4.5	4	9,360
CEORM0895~0899	8.95~8.99	26	90	135	10	0.3	φ4.5	4	10,230
CEOR-090	9.0	26	90	135	10	0.3	φ4.5	4	8,070
CEORM0900~0905	9.00~9.05	26	90	135	10	0.3	φ4.5	4	10,230
CEOR-091~099	9.1~9.9	31	100	150	10	0.3	φ5.0	4	10,620
CEORM0995~0999	9.95~9.99	31	100	150	10	0.3	φ5.0	4	10,620
CEOR-100	10.0	31	100	150	10	0.3	φ5.0	4	9,780
CEORM1000~1005	10.00~10.05	31	100	150	10	0.3	φ5.0	4	10,620
CEOR-101~109	10.1~10.9	31	105	160	12	0.3	φ5.0	4	14,670
CEORM1095~1099	10.95~10.99	31	105	160	12	0.3	φ5.0	4	14,880
CEOR-110	11.0	31	105	160	12	0.3	φ5.0	4	13,350
CEORM1100~1105	11.00~11.05	31	105	160	12	0.3	φ5.0	4	14,880
CEOR-111~119	11.1~11.9	31	105	160	12	0.3	φ6.0	4	14,910
CEORM1195~1199	11.95~11.99	31	105	160	12	0.3	φ6.0	4	15,120
CEOR-120	12.0	31	105	160	12	0.3	φ6.0	4	13,680
CEORM1200~1205	12.00~12.05	31	105	160	12	0.3	φ6.0	4	15,120

附底刀螺旋紋刀(CERS)的便利使用方法



附底刀的效果

- 只有單刃可接觸的不平整面也能實現安定加工的紋刀。
- 下孔彎曲時也有矯正的作用。

CERS/CERSM/CER/BCER/CEOR(無被覆) : 推薦切削條件 Recommended Cutting Conditions for CERS

被削材	一般構造用鋼 SS400		炭素鋼 S45C,S50C		鋼鐵・合金鋼 FC,FCD,SCM,SKD		鋼質鋼 (30~40HRC) (~50HRC)		不銹鋼 SUS304	鋁合金 A2024,A7075
	切削速度	10~25m/min	10~30m/min	8~25m/min	5~18m/min	5~12m/min	5~15m/min	15~40m/min		
刃徑 (mm)	預留量 (mm/Dia.)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)
4	0.1~0.2	0.05~0.1	0.05~0.1	0.05~0.1	0.03~0.08	0.03~0.08	0.03~0.08	0.1~0.2		
6	0.1~0.25	0.05~0.1	0.05~0.1	0.05~0.1	0.05~0.1	0.03~0.08	0.05~0.1	0.1~0.2		
8	0.1~0.25	0.1~0.25	0.1~0.25	0.08~0.2	0.05~0.15	0.05~0.1	0.08~0.2	0.15~0.3		
10	0.1~0.3	0.1~0.25	0.1~0.3	0.1~0.25	0.08~0.2	0.08~0.15	0.08~0.25	0.15~0.35		
12	0.1~0.3	0.15~0.3	0.15~0.35	0.1~0.25	0.08~0.2	0.08~0.15	0.1~0.3	0.2~0.4		
16	0.2~0.4	0.2~0.3	0.2~0.35	0.15~0.3	0.1~0.2	0.1~0.2	0.1~0.3	0.2~0.4		
20	0.3~0.5	0.2~0.5	0.3~0.6	0.2~0.5	0.15~0.3	0.15~0.25	0.15~0.5	0.3~0.6		

CERSF/CERSFM/CERF(OK-HR被覆) : 推薦切削條件 Recommended Drilling Conditions for CERSF

被削材		一般構造用鋼	炭素鋼	鋼鐵・合金鋼	調質鋼		不銹鋼
		SS400	S45C,S50C	FC,FCD,SCM,SKD	(30~40HRC)	(~50HRC)	
切削速度		10~30m/min	10~35m/min	10~30m/min	5~20m/min	5~15m/min	5~15m/min
刃徑 (mm)	預留量 (mm/Dia.)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)	進給量 (mm/rev)
3	0.1~0.2	0.05~0.1	0.05~0.12	0.05~0.1	0.03~0.08	0.03~0.08	0.03~0.08
4	0.1~0.2	0.05~0.1	0.08~0.15	0.05~0.1	0.05~0.1	0.05~0.1	0.05~0.1
5	0.2~0.3	0.05~0.12	0.1~0.15	0.05~0.12	0.05~0.12	0.05~0.12	0.05~0.1
6	0.2~0.3	0.08~0.15	0.1~0.2	0.08~0.15	0.08~0.15	0.08~0.15	0.05~0.1
8	0.2~0.3	0.1~0.2	0.1~0.3	0.1~0.2	0.1~0.2	0.08~0.15	0.08~0.15
10	0.2~0.3	0.1~0.3	0.15~0.3	0.1~0.3	0.1~0.3	0.1~0.2	0.1~0.2
12	0.2~0.3	0.15~0.35	0.2~0.4	0.1~0.3	0.1~0.3	0.1~0.25	0.1~0.3

注1) 如要加工盲孔底面時, 請將進給速度降至上表所記之1/3以下。

注2) 刃長必需要大於擬加工之孔深。請仔細確認擬加工之深度。

注3) 紋孔加工依使用機械及作業條件而其最佳切削條件亦隨之變動, 因此應做適當的調整為要。

絞刀加工後之最後尺寸

孔徑之要求公差一般均使用JIS所規定之H7公差，對此，一般使用之絞刀外徑公差為m5公差。(請參照下表-1：由JIS摘錄)

但是由於被削材之特性、下孔狀態、切削條件、絞刀形狀，以及絞刀被安裝時之偏擺等因素或有孔徑之擴大(或不足)是在所難免。換言之，並不是一定能獲得所要求之外徑確實在孔徑公差內。

表-1. 孔徑配合尺寸容許公差與絞刀公差

Table-1. Dimensional tolerance for holes and Reamer tolerance

(單位 unit: μ m)

尺寸區分(mm) Classification of dimension (mm)		孔公差 Dimensional tolerance for holes		絞刀公差 Reamer tolerance
以上 Above	以下 Below	H7	H8	m5
—	3	+0.010 0	+0.014 0	+0.006 +0.002
3	6	+0.012 0	+0.018 0	+0.009 +0.004
6	10	+0.015 0	+0.022 0	+0.012 +0.006
10	18	+0.018 0	+0.027 0	+0.015 +0.007
18	30	+0.021 0	+0.033 0	+0.017 +0.008
30	50	+0.025 0	+0.039 0	+0.020 +0.009
50	80	+0.030 0	+0.046 0	+0.024 +0.011
80	120	+0.035 0	+0.054 0	+0.028 +0.013

切削條件及其他條件之基準

絞刀加工依使用機械及作業條件而其最佳切削條件亦隨之變動，因此應做適當的調整為要。以下所記為一般性加工條件，敬請以此為基準使用。(表-2)

表-2. 絞刀條件表(孔徑 ϕ 5~20)

Table-2. Reamer conditions table (hole diameter ϕ 5-20)

被削材 Work materials	孔之傾向 Tendency of holes	超硬絞刀 Carbide Reamers			高速鋼絞刀 High speed steel Reamers		
		切削速度 Cutting Speed (m/min)	預留削除量 Stock amount (mm)	面粗度 之期待值 Expected value of Surface roughness	切削速度 Cutting Speed (m/min)	預留削除量 Stock amount (mm)	面粗度 之期待值 Expected value of Surface roughness
一般構造用鋼 SS Structural steels	大 Widen	8~20	0.2~0.3	12.5S	5~12	0.2~0.3	12.5S
炭素鋼 SC Carbon steels	大 Widen	10~20	0.2~0.3	6.3S	3~10	0.2~0.3	12.5S
合金鋼 SCM, SUJ Alloy steels	大 Widen	7~15	0.2~0.3	6.3S	3~6	0.2~0.3	12.5S
工具鋼 SK, SKD Tool steels	大 Widen	5~15	0.2~0.3	6.3S	3~4	0.2~0.3	6.3S
調質鋼 Hardened steels	~28HRC 大 Widen	5~15	0.15~0.25	6.3S	3~4	0.15~0.25	6.3S
	~40HRC 小 Narrow	5~10	0.1~0.2	6.3S	—	—	—
鑄鐵 FC, FCD Cast iron	大 Widen	7~15	0.2~0.3	6.3S	4~8	0.2~0.3	6.3S
不銹鋼 SUS Stainless steels	小 Narrow	5~15	0.2~0.3	6.3S	3~4	0.2~0.3	6.3S
鋁 A, AC Aluminum	小 Narrow	15~30	0.2~0.3	3.2S	10~20	0.2~0.3	6.3S
銅合金 Copper Alloys	大 Widen	10~25	0.2~0.3	6.3S	8~15	0.2~0.3	6.3S

絞孔加工遇到困難時原因與對策。

Trouble shooting for reaming work

狀 況 Troubles	原 因 Probable causes	對 策 Remedies
外周異常磨耗 (在過常切削時) Abnormal peripheral adrasion	● 咬入角過小。 Too small chamfer angle. ● 切削速度過快。 Too high cutting speed. ● 冷卻不足。 Insufficient cooling. ● 被削材過硬。 Hardness of the work material is too high.	● 加大咬入角。 Increase the chamfer angle. ● 切削速度放慢。 Decrease the cutting speed. ● 供給充分的切削油量。使用切削油是否適當。 Supply sufficient amount of cutting oil. Select cutting oil again. ● 改變絞刀材質。 Change reamer material.
孔徑擴大 Enlargement of hole diameter	● 機械主軸、夾持部或絞刀會鬆動。 Run-out of the chuck or reamer. ● 預留磨除量過大。 Removal amount too large. ● 刀緣部磨蝕。 Fused margin.	● 調查絞刀外周，咬入部有否鬆動。 Check for any deflection at the outer circumference or at biting section of a reamer. ● 減少預留磨除量。 Decrease the removal amount. ● 供給充分的切削油量。 Supply sufficient amount of cutting oil. ● 當磨蝕刀之芯與加工物之芯有否對正。 Check to see if the reamer and work are concentric. ● 調查切削條件，再研磨時之整合性。 Check for any burr made at the time of regrinding.
孔徑縮小 Decreased hole diameter	● 預留磨除量過小。 Removal amount too small. ● 絞刀切削鈍化。 Worm-out cutting edge.	● 增加預留磨除量。 Increase the removal amount. ● 早期再研磨。 Perform regrinding in early stage of wear. ● 調查絞刀刃徑。 Check the reamer diameter. ● 工件之熱膨脹係數大，加工後會收縮。 Shrinkage happens after machining when heat expansion ratio of work is large. ● 縮小刀緣面寬度。 Make the margin width narrower.
孔之真圓度 真直度不良 Defective roundness or straightness	● 預留磨除量過小。 Removal amount too small. ● 螺旋角度不適當。 Incorrect spiral angle. ● 咬入角過大。 Too large chamfer angle.	● 增加預留磨除量。 Increase the removal amount. ● 採用左螺旋，不等分間距絞刀。 Use a left hand helical flute or unequal spacing reamer. ● 減少咬入角。 Decrease the chamfer angle.
加工面粗糙不良 Defective finished surface roughness	● 咬入部及刀緣面之磨蝕。 Fused chamfer or margin. ● 預留磨除量是否適當。 Incorrect removal amount. ● 切屑堵塞。 Chip blockade. ● 切削油量不足。 Insufficient application of cutting fluid. ● 刃型形狀不適合。 Flute tip shapes is not propriety.	● 供給充分的切削油量。 Supply sufficient amount of cutting oil. ● 預留磨除量過多或過少均會造成面粗糙度之不良。 Either too large or too small size of removal amount lowers the quality of surface roughness. ● 改變絞刀刃溝深度及屑槽部份。 Change reamer teeth groove depth and chip pocket depth. ● 供給充分的切削油量。 Supply sufficient amount of cutting oil. ● 調查斜角與背推拔。 Check the rake angle and back taper.
刀緣部磨蝕 Fused margin	● 切削速度過快。 Too high cutting speed. ● 進給速度過快。 Too high feed speed. ● 切屑磨耗、發熱。 Heat generated through worm flute. ● 切削油量不足。 Insufficient application of cutting fluid.	● 放慢切削速度。 Decrease the cutting speed. ● 放慢進給速度。 Decrease the feed speed. ● 早期再研磨、變更絞刀材質。 Perform re-grinding in early stage of wear. Change reamer material. ● 供給充分的切削油量。 Supply sufficient amount of cutting oil.
絞刀折損・燒焦 Broken reamer and burning	● 預留磨除量過大。 Removal amount too large. ● 切屑堵塞。 Chip blockades. ● 切削油量不足。 Insufficient application of cutting fluid. ● 回轉數、進給速度過速。 Too high spindle speed and feed speed. ● 絞刀切削鈍化。 Worm-out cutting edge. ● 刀緣寬度過大。 Margin width too wide.	● 減少預留磨除量。 Decrease the removal amount. ● 改變絞刀刃溝深度及屑槽部份。 Change reamer teeth groove depth and chip pocket depth. ● 供給充分的切削油量。 Supply sufficient amount of cutting oil. ● 放慢回轉數，進給速度。 Decrease spindle speed and feed speed. ● 早期再研磨。 Perform re-grinding in early stage of wear. ● 減少刀緣寬度。 Make the margin width narrower. ● 有否下孔歪曲或歪不正。 Check for bend of hole or center non-alignment.
絞刀壽命短 Reamer life is too short	● 切削條件過速。 Too high cutting conditions. ● 切削油量不足。 Insufficient application of cutting fluid.	● 放慢切削條件。 Decrease the cutting conditions. ● 供給充分的切削油量，使用切削油是否適當。 Supply sufficient amount of cutting oil. Select cutting oil again. ● 提高絞刀刃部硬度。 The edge hardness of the reamer is raised. ● 改變絞刀材質，或給予表面處理。 Change reamer material. Also apply surface coating. ● 由直刃嘗試改用螺旋刃。 Change from the straight flute to helical flute. ● 在絞刀加工對象上能想得到的各種因素做個總檢查。 Review all factors which affect accuracy of reaming work.