PASSION FOR PRECISION

2014 ENGLISH

WIDIN®
Formerly HA-NA TOOLS CO., LTD.

Head Office & Changwon Factory
172, Sahwa-ro, Uichang-gu, Changwon-city, Gyeongsangnam-do, Korea, 641-847
TEL : 82-55-286-0905 FAX : 82-55-286-0978

WIDIN TEC CO., LTD.
1142-4, Joongri -Dong, SeoGu, DaeGu-City, Korea, 703-833
TEL : 82-53-341-8909~10, 82-53-341-0989~90 FAX : 82-53-353-9809

Chicago Office(WIDIN. INC.)
436 White Pine Rd, Buffalo Glove, IL 60089
TEL : 1-847-947-8320 FAX : 1-847-947-8322

Shanghai Office(WIDIN(SHANGHAI)TRADE CO., LTD.)
B-901, No 400 Pudian Road, Pudong new district, Shanghai, China
TEL : 86-21-5831-8103 FAX : 86-21-5831-8153

www.iwidin.com

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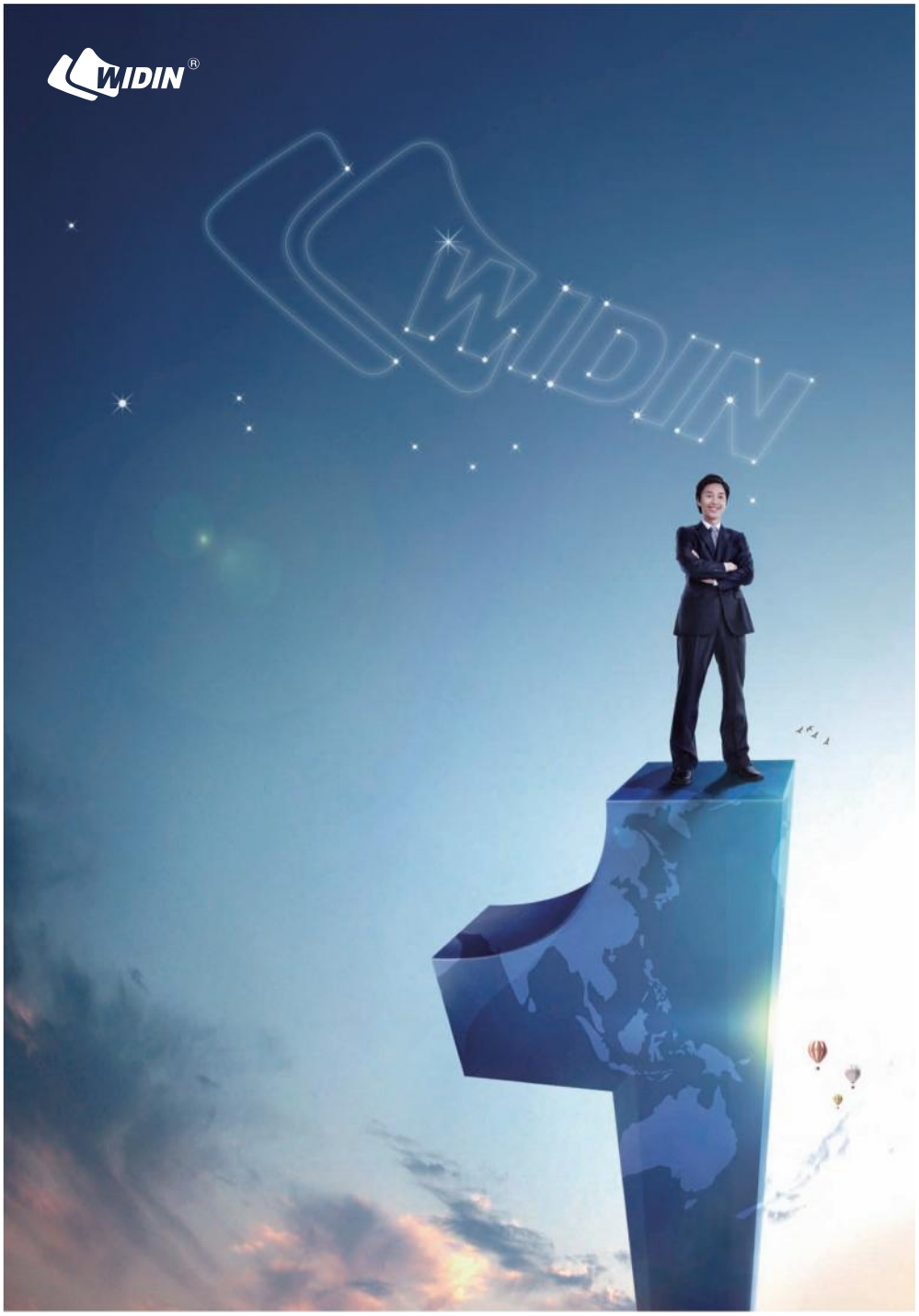

Best Tools, Best Choice For Your Vision

WIDIN's Local Business Sites

Argentina	Germany	Poland
Australia	Greece	Portugal
Austria	Hong Kong	Shanghai
Belgium	India	South Africa
Brazil	Indonesia	Singapore
Canada	Iran	Spain
Chicago	Italy	Sweden
China	Japan	Switzerland
Colombia	Malaysia	Thailand
Czech	Mexico	Turkey
Denmark	Netherlands	U.S.A
Egypt	New Zealand	Vietnam
England	Norway	
France	Philippines	

W Head Office & Changwon Factory	TEL. 82-55-286-0905 / FAX. 82-55-286-0978
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W Shanghai Office	TEL. 86-21-5831-8103/ FAX. 86-21-5831-8153
1 Seoul Office	TEL. 82-2-2679-0980 / FAX. 82-2-2679-0970
2 Shihwa Office	TEL. 82-31-430-5446 / FAX. 82-31-430-5579
3 Daegu Office	TEL. 82-53-604-0968 / FAX. 82-53-604-0932
4 Busan Office	TEL. 82-51-319-0914 / FAX. 82-51-319-0976
5 Changwon Office	TEL. 82-55-277-9911 / FAX. 82-55-237-0904

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The future of WIDIN is always bright.

WIDIN will share the same vision with customers by providing top quality products at competitive price, best service and pursue the core management doctrine of "Customer-based management".

With the WIDIN's rapid growth, its export is also increasing every year through steady improvement in technology, quality and great efforts for opening up a new market.

As WIDIN's mission, endless growth and development, WIDIN will make steady progress to the world.

Global Network

WIDIN will continuously expand its business with the whole world as our market.

Our export started in the late of 90's is growing fast by ceaseless activities to find a new market with our high quality products.

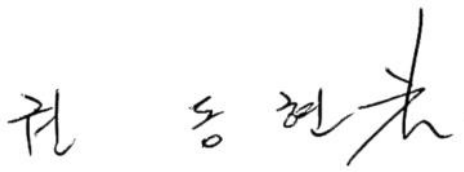
Argentina
Australia
Austria
Belgium
Brazil
Canada
China
Colombia
Czech
Denmark
Egypt
England
France
Germany
Greece
Hong Kong
India
Indonesia
Iran
Italy
Japan
Malaysia
Mexico
Netherlands
New Zealand
Norway
Philippines
Poland
Portugal
South Africa
Singapore
Spain
Sweden
Switzerland
Thailand
Turkey
U.S.A
Vietnam

Greeting

Making customer's dreams a reality- The best mechanical solotion.

Since its establishment in 1988, WIDIN CO.,LTD. has been contributed to pursue the utmost customer satisfaction for the current and potential customers in the globalized market.
With continuously doing development and creativeness of the new technology through the great initiative, we, WIDIN CO.,LTD. is always ready to response of customer needs in customer mind and eye.
To cope with the enormous, various customer demands and satisfaction from popular products to high value added products in the cutting tools industry, WIDIN CO.,LTD. will put its best effort and will play a role of marketing initiator to lead the new 21st era by production and marketing linkage.
Aim to provide the best for money, fine tuned price, utmost quality, excellent customer services based on professionalism, all WIDIN CO.,LTD. will promise to do its best effort at time and where it is.

Thank you.



President and CEO Dong Hyung Kwon

History

1988. 07. Established Hana Cutting Tools Co.,Ltd.
1993. 05. Moved to new premises in Changwon City Korea
2000. 03. Opened the Seoul office at Guro Machine and Tool Complex Area
2001. 04. Appointed as the intensive supporting company for export by Gyeongnam Government
2001. 07. Certified in ISO9001 quality management system
2001. 12. Agreed with Machine Tools Technical Research Center in Changwon International University For Machine Tools Consortium
2002. 05. Registered the Utility Model No. 0277126
2002. 05. Registered the Utility Model No. 0350651
2004. 02 Introduced Automated Tool production Network System
2004. 11. Awarded a Bronze Medal of 34th Precision Technology Encouragement Award
2004. 11. Received a letter of recommendation by Ministry of Commerce & Energy Industry
2005. 02. Opened the Shanghai Office in the Gyeongnam Trade office, Shanghai China
2005. 02. Opened the Busan Office in Busan Industry and Tool Complex Area
2005. 08. Opened the Changwon Office in Changwon
2005. 10. Appointed as a professional manufacturing company in machine parts & materials by the Ministry of Commerce, Industry and Energy
2005. 11. Certified in INNO-BIZ(Innovative company)
2006. 11. Nominated for Excellent Quality Product Manufacturer by Korea chamber of commerce & industry on Nov. 29, 2006
2006. 11. Awarded one million dollar prize
2007. 02 HANA TOOLS CO., LTD. has acquired Patent 'Broken Index type End mill'
2007. 05. Awarded Presidential Prize
2007. 07. Changing name of company from HANA TOOLS CO.,LTD. to WIDIN CO.,LTD.
2008. 07. Observed the 20th anniversary of the foundation with opening new SungJu premises in Changwon city
2008. 11. Awarded three million dollar export prize
2010. 05. Awarded Global standard management awards
2011. 11. Awarded five Million Dollar export achievement prize from Government
2012. 01. Appointed as global hidden champions by Small & medium business Corporation
2012. 06. Moved to a larger facility located in Sahaw-ro, Changwon City

Guide Line to Icons

Raw-Material

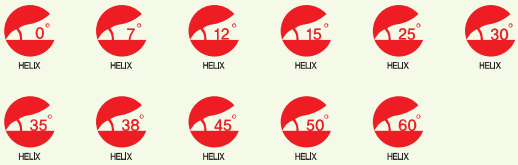
UWC ULTRA FINE **Ultra fine grade** is used in the tool

MG FINE GRAIN **Micro grain grade** is used in the tool

WC **K10~K20 grade** is used in the tool

Number of Teeth

Helix Angle



Coating

AlTiN HH AlTiN + HH

TiAlN SH TiAlN + SH

CRN CRN Coating

AlTiN H AlTiN + H

TiAlN HH TiAlN + HH

DIAMOND Diamond Coating

AlTiN AlTiN

TiAlN TiAlN

D.L.C. D.L.C. Coating

The Type of End Teeth

R Ball Nose

R Corner Radius

C Chamfer

The Type of Periphery

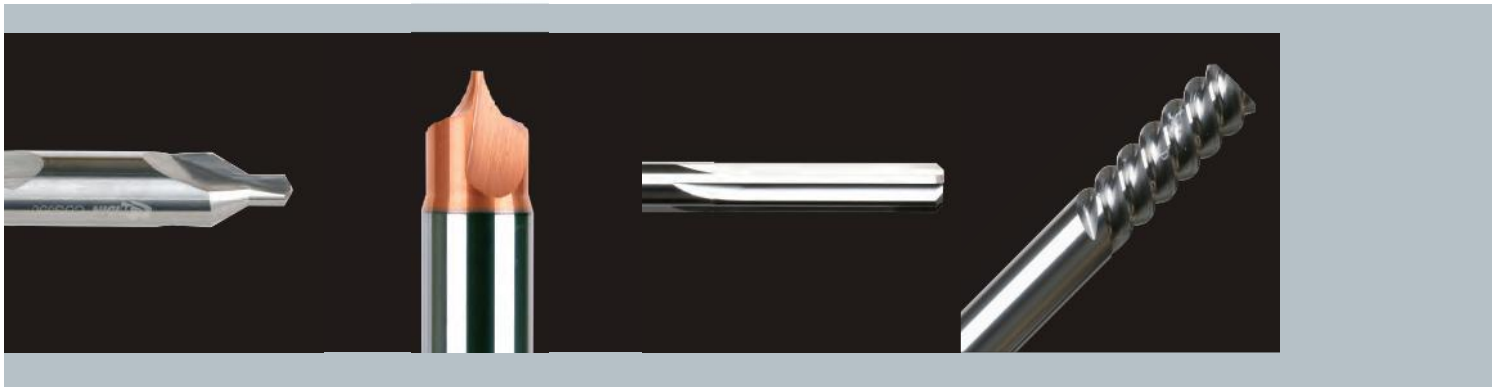
Fine Pitch Type

FINE Flat Shallow Pitch Flat Shallow Pitch Type

CHAMFERED Chamfered Pitch Type

COARSE Conventional Pitch Coarse Pitch Type

SOLID STANDARD



CENTERING TOOLS SERIES
METRIC SIZE

Class	Feature	Type	Appearance	No. of Teeth	Item	App.	EDP. No.	Page
CENTERING TOOLS	Multi-Purpose				Center Drill Solid		CDS	370
				2FLUTE	NC Spotting Drill - 90°, 120°		LDS	371
				2FLUTE	Centering End Mill Solid - 90°		CES302	372
				2FLUTE	Centering End Mill Brazed Type - 90°		CEM	373
					CORNER ROUDING CUTTER		CRC	374

CENTERING TOOLS SERIES
METRIC SIZE

Class	Feature	Type	Appearance	No. of Teeth	Item	App.	EDP. No.	Page
REAMERS	Multi-Purpose	Straight		4&6FLUTE	Straight Flute Reamers		SSR	375
		7° Left Helix		4&6FLUTE	Helical Flute Reamers		SHR	376
		60° Left Helix		4&6FLUTE	Broach Reamers		SBR	377

	Carbon Steels (S45C,S55C...) ~ HB225	Alloy Steels (SCM,SK....) HB225~325	Prehardened Steels(NAK..) HRC30~50	Hardened Steels		Copper	Graphite	Cast Iron FCD400. 500~	Aluminum	Stainless Steels
				~HRc55 SKD61	HRc55~ SKD11					
	○	○							○	
	○	○	○					○		
	○	○							○	

	Carbon Steels (S45C,S55C...) ~ HB225	Alloy Steels (SCM,SK....) HB225~325	Prehardened Steels(NAK..) HRC30~50	Hardened Steels		Copper	Graphite	Cast Iron FCD400. 500~	Aluminum	Stainless Steels
				~HRc55 SKD61	HRc55~ SKD11					
	○	○								

Solid Standard Series

CENTERING TOOLS

Centering Tools

EDP. No.	APPEARANCE	FEATURE	STOCK	PAGE
CDS ...series		SOLID CENTER DRILL	•	370
LDS ...series		NC SPOTTING DRILL	•	371
CES302 ...series		CENTERING END MILL - SOLID	•	372
CEM ...series		CENTERING END MILL - BRAZED TYPE	•	373
CRC ...series		CORNER ROUDING CUTTER	•	374

Reamers

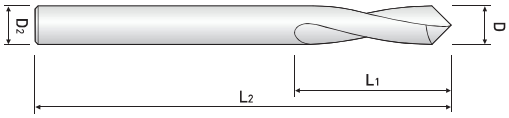
EDP. No.	APPEARANCE	FEATURE	STOCK	PAGE
SSR ...series		STRAIGHT FLUTE REAMERS	•	375
SHR ...series		HELICAL FLUTE REAMERS	•	376
SBR ...series		BROACH REAMERS	•	377

SOLID CENTER DRILL

CDS ...series

FINE GRAIN HELIX

EDP. No.	Dia.	F.L	OAL	SH.Dia.	STOCK
CDS010	1	1	40	3	•
CDS015	1.5	1.5	40	4	•
CDS020	2	2	45	5	•
CDS025	2.5	2.5	45	6	•
CDS030	3	3	55	8	•
CDS040	4	4.5	60	10	•
CDS050	5	5.5	65	12	•

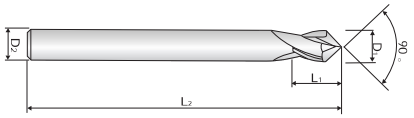


NC SPOTTING DRILL

LDS ...series

FINE GRAIN HELIX

EDP. No.	Dia.	L_1	L_2	D_2	Point Angle	STOCK
LDS030	3	9	50	3	90°	•
LDS030A					120°	•
LDS040	4	10	50	4	90°	•
LDS040A					120°	•
LDS050	5	12	50	5	90°	•
LDS050A					120°	•
LDS060	6	13	60	6	90°	•
LDS060A					120°	•
LDS080	8	23	70	8	90°	•
LDS080A					120°	•
LDS100	10	24	80	10	90°	•
LDS100A					120°	•
LDS120	12	28	80	12	90°	•
LDS120A					120°	•
LDS160	16	32	90	16	90°	•
LDS160A					120°	•
LDS200	20	35	100	20	90°	•
LDS200A					120°	•

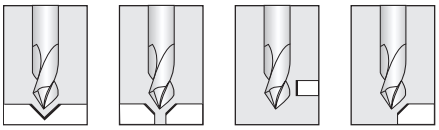


CENTERING END MILL - SOLID

CES302 ...series

FINE GRAIN HELIX

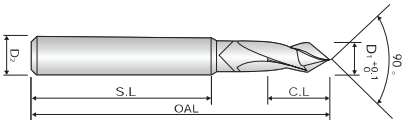
EDP. No.	D_1	L_1	L_2	D_2	STOCK
CES302030	3	6	50	6	•
CES302040	4	8	50	6	•
CES302050	5	10	50	6	•
CES302060	6	12	60	6	•
CES302080	8	16	70	8	•
CES302100	10	18	70	10	•
CES302120	12	20	75	12	•
CES302140	14	24	80	14	•
CES302160	16	26	80	16	•
CES302200	20	32	100	20	•



■ Tolerance

Mill Dia. (mm)	Shank Dia.
0 ~ -0.05	h6

※Items can be changed for quality improvement without notice.

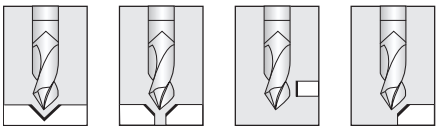


CENTERING END MILL
- BRAZED TYPE

CEM ...series

WC 2 30° HELIX 90°

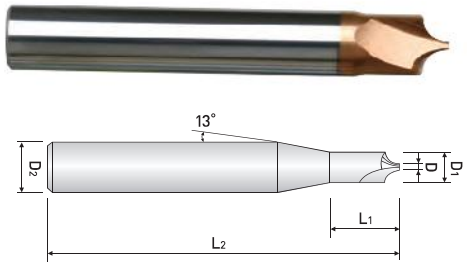
EDP. No.	D_1	C.L	S.L	OAL	D_2	STOCK
CEM1016	10	15	80	115	16	•
CEM1216	12	20	100	145	16	•
CEM1620	16	23	100	150	20	•
CEM2025	20	25	100	155	25	•



■ Tolerance

Mill Dia. (mm)	Shank Dia.
0 ~ +0.1	h7

※Items can be changed for quality improvement without notice.



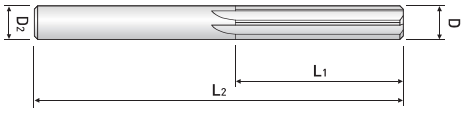
CORNER ROUNDING CUTTER

- Designed for prehardened, hardened and stainless steels and cast iron up to HRc 52.
- By using the newly developed raw-material(0.2 um), it provides excellent performance during high speed cutting.

CRC ...series

ULTRA FINE HELIX

EDP. No.	D	R	D_1	L_1	L_2	D_2	STOCK
CRC 209 050	0.9	0.5	2	3	45	4	•
CRC 209 075	0.9	0.75	2.5	4	45	4	•
CRC 209 100	0.9	1.0	3	5	50	6	•
CRC 259 100	5.9	1.0	8	-	60	8	•
CRC 214 150	1.4	1.5	4.5	8	50	6	•
CRC 249 150	4.9	1.5	8	-	60	8	•
CRC 214 200	1.4	2	5.5	10	50	6	•
CRC 239 200	3.9	2	8	-	60	8	•
CRC 219 250	1.9	2.5	7	13	60	8	•
CRC 219 300	1.9	3	8	-	60	8	•
CRC 219 350	1.9	3.5	9	13	70	10	•
CRC 219 400	1.9	4	10	-	70	10	•
CRC 219 450	1.9	4.5	11	13	80	12	•
CRC 219 500	1.9	5	12	-	80	12	•
CRC 239 600	3.9	6	16	-	85	16	•
CRC 259 700	5.9	7	20	-	85	20	•
CRC 239 800	3.9	8	20	-	85	20	•



STRAIGHT FLUTE REAMERS

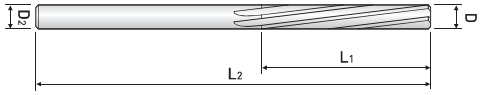
SSR ...series

EDP. No.	Dia.	C.L	OAL	SH.Dia.	Z	STOCK
SSR020	2	25	60	4	4	•
SSR025	2.5	25	60	4	4	•
SSR030	3	28	70	4	6	•
SSR035	3.5	30	75	4	6	•
SSR040	4	30	75	4	6	•
SSR045	4.5	35	80	6	6	•
SSR050	5	35	80	6	6	•
SSR055	5.5	35	80	6	6	•
SSR060	6	35	80	6	6	•
SSR065	6.5	45	100	8	6	•
SSR070	7	45	100	8	6	•
SSR080	8	45	100	8	6	•
SSR090	9	50	110	10	6	•
SSR100	10	50	110	10	6	•
SSR110	11	50	120	12	6	•
SSR120	12	50	120	12	6	•

■ Tolerance

unit=1/1000mm

Tolerance \ Dia.	from 1 to 3	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
Cutting Edge(m5)	+6 +2	+9 +4	+12 +6	+15 +7	+17 +8
Shank(h6)	0 -6	0 -8	0 -9	0 -11	0 -13



HELICAL FLUTE REAMERS

SHR ...series

WC 4&6 7° HELIX

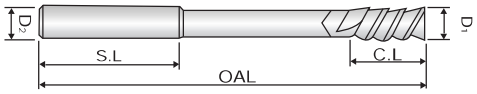
EDP. No.	Dia.	C.L	OAL	SH.Dia.	Z	STOCK
SHR020	2	25	60	4	4	•
SHR025	2.5	25	60	4	4	•
SHR030	3	28	70	4	6	•
SHR035	3.5	30	75	4	6	•
SHR040	4	30	75	4	6	•
SHR045	4.5	35	80	6	6	•
SHR050	5	35	80	6	6	•
SHR055	5.5	35	80	6	6	•
SHR060	6	35	80	6	6	•
SHR065	6.5	45	100	8	6	•
SHR070	7	45	100	8	6	•
SHR080	8	45	100	8	6	•
SHR090	9	50	110	10	6	•
SHR100	10	50	110	10	6	•
SHR110	11	50	120	12	6	•
SHR120	12	50	120	12	6	•

■ Tolerance

㎛=1/1000㎜

Tolerance \ Dia.	from 1 to 3	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
Cutting Edge(m5)	+6 +2	+9 +4	+12 +6	+15 +7	+17 +8
Shank(h6)	0 -6	0 -8	0 -9	0 -11	0 -13

BROACH REAMERS



SBR ...series

WC 4&6 60° HELIX

EDP. No.	D_1	C.L	S.L	OAL	D_2	Z	STOCK
SBR030	3	12	30	70	4	4	•
SBR040	4	12	30	75	4	4	•
SBR050	5	16	35	80	6	4	•
SBR060	6	16	35	80	6	4	•
SBR080	8	20	40	100	8	4	•
SBR100	10	25	45	110	10	4	•
SBR120	12	28	50	120	12	4	•
SBR140	14	30	55	145	14	4	
SBR160	16	35	55	155	16	6	
SBR180	18	38	60	170	18	6	
SBR200	20	40	60	180	20	6	

* Above Φ14 will be manufactured with brazed type.

※ These tools are manufactured based on order received.

■ Tolerance

unit=1/1000mm

Tolerance \ Dia.	from 1 to 3	over 3 to 6	over 6 to 10	over 10 to 18	over 18 to 30
Cutting Edge(m5)	+6 +2	+9 +4	+12 +6	+15 +7	+17 +8
Shank(h6)	0 -6	0 -8	0 -9	0 -11	0 -13

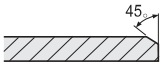
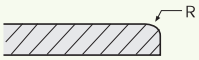
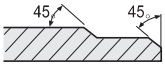
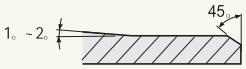
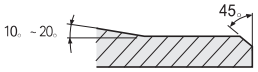
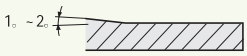
LDS series

MATERIAL	S15C·SS400 ~500N/mm²		S45C		SCM440		SKD61 28HRC		SKD61 34HRC		FC250		AC4D	
V	63~80m/min		40~63m/min		32~50m/min		20~28m/min		16~22m/min		63~100m/min		80~160m/min	
DIAMETER (mm)	RPM (mm^{-1})	FEED (mm/rev)	RPM (mm^{-1})	FEED (mm/rev)	RPM (mm^{-1})	FEED (mm/rev)	RPM (mm^{-1})	FEED (mm/rev)	RPM (mm^{-1})	FEED (mm/rev)	RPM (mm^{-1})	FEED (mm/rev)	RPM (mm^{-1})	FEED (mm/rev)
3	7,500	0.04~0.08	5,500	0.04~0.08	4,500	0.04~0.08	2,500	0.04~0.08	1,500	0.04~0.08	8,000	0.05~0.09	12,000	0.10~0.22
4	5,700	0.05~0.10	4,100	0.05~0.10	3,300	0.05~0.10	1,900	0.05~0.10	1,100	0.05~0.1	6,500	0.07~0.12	9,500	0.12~0.25
6	3,800	0.06~0.12	2,700	0.06~0.12	2,300	0.06~0.12	1,250	0.06~0.12	750	0.06~0.12	4,300	0.12~0.18	6,400	0.14~0.28
8	2,800	0.08~0.15	2,000	0.08~0.15	1,700	0.08~0.15	950	0.08~0.15	550	0.08~0.15	3,200	0.13~0.20	4,800	0.18~0.32
10	2,300	0.10~0.18	1,700	0.10~0.18	1,400	0.10~0.18	750	0.10~0.18	450	0.1~0.18	2,600	0.17~0.25	3,800	0.22~0.36
12	1,900	0.12~0.21	1,400	0.12~0.21	1,200	0.12~0.21	650	0.12~0.21	370	0.12~0.21	2,200	0.21~0.30	3,200	0.25~0.40
16	1,400	0.16~0.28	1,000	0.16~0.28	900	0.16~0.28	500	0.16~0.28	280	0.16~0.28	1,600	0.24~0.32	2,400	0.32~0.48
20	1,150	0.20~0.34	820	0.20~0.34	700	0.20~0.34	400	0.20~0.34	220	0.2~0.34	1,300	0.26~0.40	1,900	0.40~0.60
25	900	0.25~0.45	650	0.25~0.45	560	0.25~0.45	300	0.25~0.45	180	0.25~0.45	1,000	0.30~0.50	1,500	0.50~0.75

Recommendation of Cutting Conditions in Reamer

WORKPIECE			DIAMETER	CUTTING CONDITIONS	
Material	Tensile strength(Kg/mm2)	Hardness(HB)		V (m/min)	f (mm/rev)
Carbon Steel Alloy Steel	~ 100		~10 10~25 25~40	8 ~ 12	0.15 ~ 0.25 0.20 ~ 0.40 0.30 ~ 0.50
	100 ~ 140		~10 10~25 25~40	6 ~ 10	0.12 ~ 0.20 0.15 ~ 0.30 0.20 ~ 0.40
Steel Castings	40 ~ 50		~10 10~25 25~40	8 ~ 12	0.15 ~ 0.25 0.20 ~ 0.40 0.30 ~ 0.50
	50 ~ 70		~10 10~25 25~40	6 ~ 10	0.12 ~ 0.20 0.15 ~ 0.30 0.20 ~ 0.40
Cast Irons		~ 200	~10 10~25 25~40	8 ~ 15	0.20 ~ 0.30 0.30 ~ 0.50 0.40 ~ 0.70
		200 ~	~10 10~25 25~40	6 ~ 12	0.15 ~ 0.25 0.20 ~ 0.40 0.30 ~ 0.50
Aluminum Alloys			~10	15 ~ 25	0.20 ~ 0.30 0.30 ~ 0.50 0.40 ~ 0.70
			10~25 25~40	20 ~30	

The Effect of Chamfer

TWIST DIRECTION	CHARACTERISTICS
	If the work piece is caught by sharp blade edge, dent occurs on the machined surface. It is applied to chucking reamer, etc.
	Guide edge was rounded. The ground surface is excellent but round machining is difficult and it may deteriorate the machined surface.
	It is 2 blade-type. Chip is produced in 2 stages and it provides good results. But regrinding is difficult.
	The guide part of second stage of cutting edge is 1~2°. Cutting edge blade is long and life is limited. It provides good results on finish machining
	The guide part of second stage is 10~20. It is very economical as the length of blade is short and utilized length is long
	It is used for finish machining. It is applied to hand reamer.

The Effect of Twist Angle

TWIST DIRECTION	CHARACTERISTICS
Straight blade (twist angle is 0°)	• Surface is generally poor except cast iron.
Right twist blade	• Excellent machinability and easy to discharge chip • Applicable work piece range is wide • Excellent for high hardness work piece
Left twist blade	• Excellent surface roughness for work piece of aluminium alloys, copper, and copper alloys • It is good for machining soft materials

Trouble Shooting of Reaming

TROUBLE	PLAN	MEASURES
Enlarged Hole	Increase burnishing effects	• Decrease chamfer angle • Decrease back taper • Use S.CI type cutting oil • Increase margin width • Grind 2 stages chamfer • Check reamer diameter
	Suppress the occurrence of built-up-edge	• Increase margin width • Grind 2 stages chamfer • Change heat treatment conditions and microstructure of workpiece • Increase cutting oil supply • Increase cutting speed and reduce feed rate
	Reduce the unbalance of cutting force	• The cutting edge difference shall be less than 0.005mm • Increase cutting speed • Reduce the deviation of main axis and basic Diameter • Check wear conditions of bush and replace it • Change water soluble cutting oil to non-water soluble oil
Shrinked Hole	Reduce finish effects	• Increase the clearance angle of cutting edge • Decrease margin width • Increase back taper • Increase cutting speed
Poor roundness	Reduce Chattering	• Increase the strength of machine • Change to left helix reamer • Increase back taper • Increase feed rate • Reduce the tolerance of bush • Increase margin width • Decrease cutting speed
Poor surface roughness	Increase burnishing	• Use left helix • Grind with 2 stage chamfer • Decrease chamfer angle
	Remove deposit	• Increase rake angle • Reduce feed rate • Increase cutting speed
	Remove chattering	• The cutting edge difference shall be less than 0.005mm • Increase cutting speed • Align main axis center and basic diameter center • Change water soluble cutting oil to non-water soluble oil
	Remove chip interference	• Change shape of flute type • Increase the depth of flute

Hardness Conversion Table

Rm[N/mm²]	HV 10	HB	HRc
240	75	71	
255	80	76	
270	85	81	
285	90	86	
305	95	90	
320	100	95	
335	105	100	
350	110	105	
370	115	109	
385	120	114	
400	125	119	
415	130	124	
430	135	128	
450	140	133	
465	145	138	
480	150	143	
495	155	147	
510	160	152	
530	165	157	
545	170	162	
560	175	166	
575	180	171	
595	185	176	
610	190	181	
625	195	185	
640	200	190	
660	205	195	
675	210	199	
690	215	204	
705	220	209	
720	225	214	
740	230	219	
755	135	223	
770	140	228	
785	145	233	
800	150	238	22
820	155	242	23
835	160	247	24
860	268	255	25
870	272	258	26
900	280	266	27

Rm[N/mm2]	HV 10	HB	HRc
920	287	273	28
940	293	278	29
970	302	287	30
995	310	295	31
1020	317	301	32
1050	327	311	33
1080	336	319	34
1110	345	328	35
1140	355	337	36
1170	364	346	37
1200	373	354	38
1230	382	363	39
1260	392	372	40
1300	403	383	41
1330	413	393	42
1360	423	402	43
1400	434	413	44
1440	446	424	45
1480	458	435	46
1530	473	449	47
1570	484	460	48
1620	497	472	49
1680	514	488	50
1730	527	501	51
1790	544	517	52
1845	560	532	53
1910	578	549	54
1980	596	567	55
2050	615	584	56
2140	639	607	57
	655	622	58
	675		59
	698		60
	720		61
	745		62
	773		63
	800		64
	829		65
	864		66
	900		67
	940		68