LMT Leading Metalworking Technologies

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Turning Products

NANOLOCK

A novelty on the world market!
First nanocrystalline CVD layer

WINNER OF: Styrian NANO-Award & MM-Award EMO 2007 & MWP-Award 2008 UK

NANOLOCK by BOEHLERIT

The innovative breakthrough in hard metal coating towards significantly higher performance in steel machining.

This development is the guarantor of success and central element of coating innovations for milling, turning, bar peeling and crankshaft machining.

The electron microscope reveals it:
In addition to the extremely fine grains (only 25 nanometers), the layer also displays a “composite character”, i.e. two different types of crystals (small, star-shaped needles and large, lenti-form platelets) occur adjacent to each other at the same time.

NANOLOCK

A novelty on the world market!
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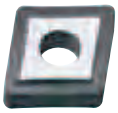
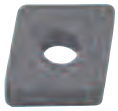
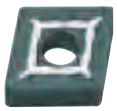
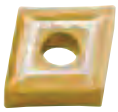
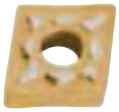
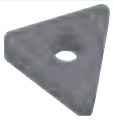
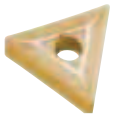
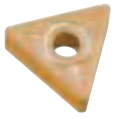
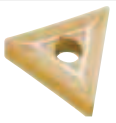
Contents:

BOEHLERIT

Negative indexable inserts for M-tool holders and -boring bars

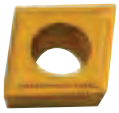
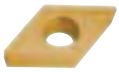
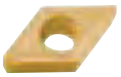
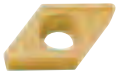
(First choice for roughing, also good for finishing)

CNGG-FMS	CNGG-MRS	CNGG-MS	CNMA	CNMG-BFMS	CNMG-BMR	CNMG-BMRS
						
page 20	page 20	page 20	page 20	page 21	page 21	page 22
CNMG-BMS	CNMG EL/R-BC*)	CNMG-FMP	CNMG-HPT	CNMG-MP	CNMG-MRP	CNMG-MS
						
page 22	page 22	page 23	page 23	page 24	page 25	page 25
CNMM-RP	DNGG-FMS	DNMG-BFMS	DNMG-BMS	DNMG EL/R-BC*)	DNMG-FMP	DNMG-MP
						
page 26	page 27	page 27	page 27	page 28	page 28	page 29
DNMG-MRP	DNMG-MS	SNMA	SNMG-BMR	SNMG-BMRS	SNMG-BMS	SNMG-FMP
						
page 29	page 29	page 30	page 30	page 30	page 30	page 30
SNMG-FMS	SNMG-MP	SNMG-MRP	SNMG-MRS	SNMM	SNMM-BRP	SNMM-RP
						
page 31	page 31	page 31	page 31	page 31	page 32	page 32
TNMA	TNMG-BFMS	TNMG-BMS	TNMG EL/R-BC**)	TNMG-FMP	TNMG-MP	TNMM-RP
						
page 33	page 33	page 33	page 34	page 34	page 34	page 34
VNMG-FMP	VNMG-FMS	VNMG-MP	WNGG-FMS	WNGG-MS	WNMA	WNMG-BFMS
page 35	page 35	page 35	page 36	page 36	page 36	page 36
WNMG-BMR	WNMG-BMRS	WNMG-BMS	WNMG EL/R-BC*)	WNMG-FMP	WNMG-HPT	WNMG-MP
page 37	page 37	page 37	page 38	page 38	page 38	page 38
WNMG-MRP	WNMG-MS					
page 39	page 39					

*) Right hand version shown, left hand version opposite **) Left hand version shown, right hand version opposite

Positive indexable inserts for S-tool holders and -boring bars

(First choice for finishing, suitable for roughing)

CCGT-BAL	CCGT EL/R-BC*)	CCMT-BSF	CCMT-BSM	CCMT-BSMS	DCGT	DCGT-BAL
						
page 40	page 41	page 42	page 42	page 43	page 44	page 44
DCGT EL/R-BC*)	DCGT FL/R-BC*)	DCMT	DCMT-BSF	DCMT-BSM	DCMT-BSMS	RCGT-BAL
						
page 45	page 45	page 46	page 46	page 46	page 46	page 47
RCMX	SCGT-BAL	SCMT	SCMT-BSF	SCMT-BSM	SCMT-BSMS	TCGT-BAL
						
page 47	page 48	page 48	page 48	page 48	page 48	page 50
TCGT EL/R-BC*)	TCMT-BSF	TCMT-BSM	TCMT-BSMS	VBMT	VCGT	VCGT-BAL
						
page 50	page 50	page 51	page 51	page 52	page 52	page 52
VCMT-BSF	VCMT-BSM	VCMT-BSMS	WCGT-BAL	WCMT-BSF	WCMT-BSM	
						
page 53	page 53	page 53	page 54	page 54	page 54	

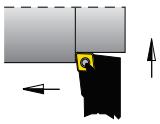
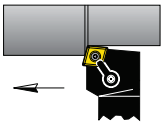
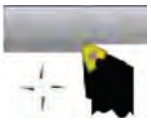
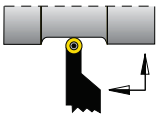
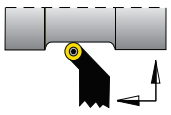
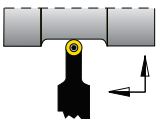
Positive indexable inserts for C-tool holders and boring bars

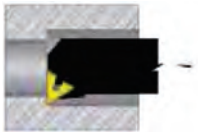
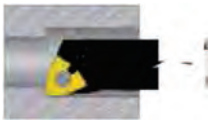
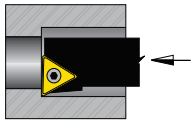
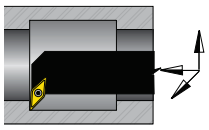
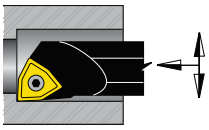
SPMR-FM	TPMR-FM					
						
page 49	page 51					

Indexable inserts for heavy duty machining

CCMT-BSMR	SCMT-BSMR	SCMT-BSR	CNMM-BRP	SNMM-BRP	SNMM-RP	TNMM-BR
						
page 55	page 55	page 55	page 55	page 55	page 55	page 55

*) Right hand version shown, left hand version opposite

Tool Holder	**MCLN R/L**	**MCRN R/L**	**MDJN R/L**	**MDPN N**	**MSDN N**	**MSKN R/L**
Setting Angle	–5° end or side	15° side	–3° side	27.5° side	45° side	15° end
Cutting Direction						
Page No.	58	58	58	59	59	59
Indexable Inserts	CNGG... CNMA... CNMG... CNMM...	CNGG... CNMA... CNMG... CNMM...	DNGG... DNMG... DNMM...	DNGG... DNMG... DNMM...	SNMA... SNMG... SNMM...	SNMA... SNMG... SNMM...
Page No.	20 - 26	20 - 26	27 - 29	27 - 29	30 - 32	30 - 32
Tool Holder	**MTAN R/L**	**MTEN**	**MTFN R/L**	**MTGN R/L**	**MTJN R/L**	**MVJN R/L**
Setting Angle	0° side	30° side	0° end	0° side	–30° side	–3° side
Cutting Direction						
Page No.	60	60	60	61	61	61
Indexable Inserts	TNMA... TNMG... TNMM...	TNMA... TNMG... TNMM...	TNMA... TNMG... TNMM...	TNMA... TNMG... TNMM...	TNMA... TNMG... TNMM...	VNMG...
Page No.	33 - 34	33 - 34	33 - 34	33 - 34	33 - 34	35
Tool Holder	**MWLN R/L**	**SCLC R/L**	**SDJC R/L**	**SRCC R/L**	**SRGC R/L**	**SROC N**
Setting Angle	–5° end or side	–5° end or side	–3° side	–5° end or side	–5° end or side	–3° side
Cutting Direction						
Page No.	62	62	62	63	63	64
Indexable Inserts	WNGG... WNMA... WNMG...	CCGT... CCMT...	DCGT... DCMT...	RCGT... RCMT...	RCGT... RCMT...	RCGT... RCMT...
Page No.	36 - 39	40 - 43	44 - 46	47	47	47
Tool Holder	**SSDCN N**	**SVJC R/L**	**SWLC R/L**			
Setting Angle	45° side	–3° side	–5° end or side			
Cutting Direction						
Page No.	64	64	65			
Indexable Inserts	SCGT... SCMT...	VCGT... VCMT...	WCGT... WCMT...			
Page No.	48	52 - 53	54			

Tool Holder	S-MCLN R/L	S-MDUN R/L	S-MTFN R/L	S-MTUN R/L	S-MVUN R/L
Setting Angle	–5° end or side	–3° end	–0° end	–3° end	–3° end
Cutting Direction					
Page No.	66	66	66	67	67
Indexable Inserts	CNMA... CNMG... CNMM...	DNMA... DNMG... DNMM...	TNMA... TNMG... TNMM...	TNMA... TNMG... TNMM...	VNMG...
Page No.	20 - 26	27 - 29	33 - 34	33 - 34	35
Tool Holder	S-MWLN R/L	S-SCLC R/L	S-SDUC R/L	S-STFC R/L	STUC R/L
Setting Angle	–5° end or side	–5° end or side	–3° end	0° end	–3° end
Cutting Direction					
Page No.	67	68	68	68	69
Indexable Inserts	WNMA... WNMG...	CCGT... CCMT... CCMN...	DCGT... DCMT... DCMW...	TCGT... TCMT...	TCGT... TCMT...
Page No.	36 - 39	40 - 43	44 - 46	50 - 51	50 - 51
Tool Holder	S-SVUC R/L	S-SWUC R/L		SCLC R/L	S-STUC R/L
Setting Angle	–3° end	–3° end		–5° end or side	–3° end
Cutting Direction					
Page No.	69	69		70	70
Indexable Inserts	VCGT... VCMT...	WCGT... WCMT...		CCGT... CCMT...	TCGT... TCMT...
Page No.	52 - 53	54		40 - 43	50 - 51

Grade	ISO	Range of applications	Group of materials						Chip breakers							
		01 05 10 15 20 25 30 35 40 45 50	P Steel	M Stainless	K Grey cast iron	N Nonferrous metals	S Exotic materials	H Hard materials	Roughing	Medium Roughing	Medium	Medium Finishing	Finishing	Copying	Wiper	Nonferrous materials
LC215K	HC-P15		■						RP	MRP	MP *BSM*	FMP *FM*	*BSF*	BC *BC*	HPT	
	HC-K15				□											
LC225K	HC-P25		■						RP	MRP	MP *BSM*	FMP *FM*	*BSF*	BC *BC*	HPT	
	HC-M25			□												
LC240F	HC-P35		■						RP		MP *BSM*	FMP *FM*		BC *BC*		
	HC-M35			□												
LC250F	HC-P40		■						RP							
	HC-S40						□									
LC415Z	HC-S15						■			MRS	MS	FMS				
LC415X	HC-S15						■							BC		
	HC-M15			□												
LC435D	HC-M35			■			□			BMRS	BMS	BFMS *BSMS*		BC *BC*		
	HC-P35		■													
LC610H	HC-K10				■					BMR	*BSM*	FMP	*BSF*			
LC620H	HC-K15				■					BMR	*BSM*	FMP	*BSF*			
LC610T	HC-K10		□		□	■										*BAL*
LW610	HW-K10			□	■	□										*BAL*

Application peak

Full range to ISO 513

01 05 10 15 20 25 30 35 40 45 50

■ Main application

□ Further applications

Chip breakers for negative inserts

Chip breakers for positive inserts

Coated grades

LC215K (HC-P15, HC-K15)
Grade for highest cutting speeds for fine to medium turning, v_c = 590 - 980 sfm. Due to the special K coating this grade is extremely wear resistant. For continuous cut. As alternative also applicable with cast iron.

LC225K (HC-P25, HC-M25)
(Universal turning grade)
Main grade for machining steel materials and easily machinable stainless steels at medium cutting speeds, v_c = 490 - 720 sfm, for light interrupted cut. This general purpose grade is characterised by the properties of high durabiliy and excellent toughness across a wide range of applications.

LC240F (HC-P35, HC-M35)
A combination of an extremely tough carbide with the new „Nanolock MT-CVD layer“. Guarantees maximum performance in heavy interrupted cutting. V_c = up to 490 sfm.

LC250F (HC-P40, HC-S40)
Very tough tungsten carbide. Specially suitable for heavily interrupted cut. Tougher alternative to LC240F, also suitable for super Alloys

LC415X (HC-S15)
A submicron grade with thin PVD-coating and special cutting edges guarantee high performance on small components.

LC415Z (HC-S15, HC-M15)
Special submicron grade for machining super alloys such as Inconel, Titan, etc. , particularly suitable for interrupted cut. Also suitable for austenitic stainless steel. V_c appr. 100 - 200 sfm.

LC435D (HC-M35, HC-P35)
Main grade for turning of austenitic stainless steels at medium to high cutting speeds, v_c = up to 490 sfm. Applicable also for super alloys.

LC610H (HC-K10)
Cast iron turning grade for the area K10. Optimal for machining GG and GGG materials. Possible cutting speeds for GG up to v_c 1200 sfm. Perfectly suitable for dry machining.

LC610T (HC-K10, HC-M10)
The ideal grade for working aluminium materials and other non ferrous metals. Thanks to a very thin micropulse plasma CVD TiAIN coating it is also excellent for finish machining of stainless steels and grey cast iron.

LC620H (HC-K15)
Cast iron turning grade for the area K15. Optimal for machining GG and GGG materials. Possible cutting speeds for GG up to V_c1200 sfm. Perfectly suitable for dry machining.

Uncoated grade

LW610 (K10)
Classic hard metal grade for turning short-chipping materials, standard grade for drilling, countersinking and reaming steel. Also for channelling chilled cast iron cylinders.

Increase your efficiency with colorguide, the perfect colour identification system for finding the right indexable insert. This guide through the variety which you will find on the label of each Boehlerit indexable inserts box informs you quickly and reliably about the suitability of this indexable insert for the intended machining operation. Colorguide saves time and helps to avoid wrong applications.

Symbols printed in a grid which is vertically organized into six main material groups represented by colours (acc. to VDI 3323) and horizontally by three levels of machining (ROUGH - MEDIUM - FINE) define the field(s) of application of the indexable insert.
For example, the above label tells you:
DNMG 110404-FMP in grade LC225K is primarily suitable for medium turning of steels but also for turning of stainless steels, both in continuous cut.
The main material groups include the following materials:

- Steel: Free cutting steels, case hardening steels, heat treatment steels, constructional steels, white malleable cast iron
- Stainless steels: Ferritic Cr-steels, martensitic CrNi-steels, austenitic CrNi-steels
- Cast iron: Grey cast iron, malleable cast iron, spheroidal cast iron, sintered iron
- Non-ferrous metal: Al wrought and Al cast alloys, also soft plastics and fiber-reinforced plastics
- High-temperature alloys: Heat resistant steels, alloys on Ni/Co basis, Ti alloys
- Hardened materials: Hardened steels (≥45 HRC), case hardened steels, clear chill castings.

Material groups	Rough	Medium	Fine
Steel			
Stainless steel			
Iron casting			
Non-ferrous metals			
High temperature alloys			
Hardened materials			

Machining mode	Rough	Medium	Fine
Feed f (inch)	.02 – .05	.01 – .02	.002 – .01
Depth of cut a_p (inch)	.20 – .59	.06 – .20	.004 – .06

Application area		
	Continuous cut	Interrupted cut
Main application	●	▶
Other application	○	▷

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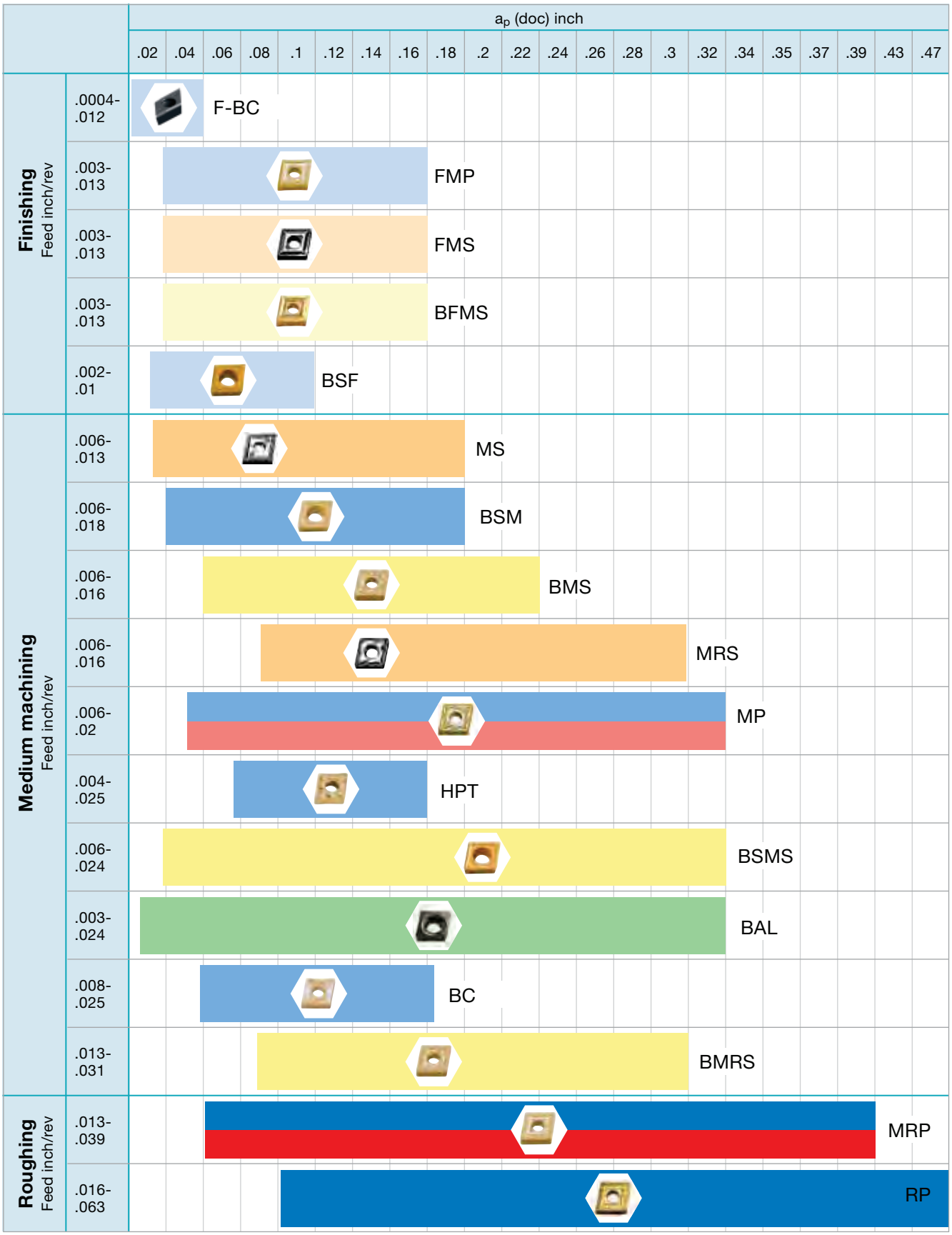

a_p (doc) inch
.02 .04 .06 .08 .1 .12 .14 .16 .18 .2 .22 .24 .26 .28 .3 .32 .34 .35 .37 .39 .43 .47
Finishing
Feed inch/rev
.0004-.012
F-BC
.003-.013
FMP
.003-.013
FMS
.003-.013
BFMS
.002-.01
BSF
Medium machining
Feed inch/rev
.006-.013
MS
.006-.018
BSM
.006-.016
BMS
.006-.016
MRS
.006-.02
MP
.004-.025
HPT
.006-.024
BSMS
.003-.024
BAL
.008-.025
BC
.013-.031
BMRS
Roughing
Feed inch/rev
.013-.039
MRP
.016-.063
RP

Negative inserts

Negative geometries are the best choice

- for larger diameters
- for interrupted to heavily interrupted cut
- on large to medium-size lathes
- to achieve high chip removal volumes

The inserts are available in flat top (e.g. CNMA 432) - exclusively for machining of cast iron as well as with double sided or single sided chipbreaker geometries, for roughing to finishing of steel, cast steel, stainless steel and super alloys.

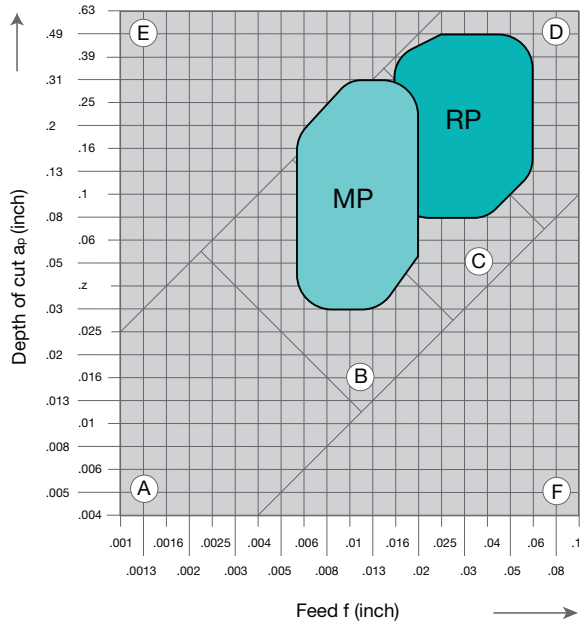
Positive inserts

Positive geometries are the first choice

- for internal turning of narrow hole dameters
- also for turning of small outer diameters
- for machining under unstable conditions

Positive geometries are available for machining steel, stainless steel, cast materials, aluminium, and super alloys.

For both negative as well as positive inserts, geometry BC (Boehlerit Copy) has to be emphasized. This geometry has a very soft cutting characteristic and is specially suitable for turning long thin shafts. These inserts are available for steel and stainless steel.



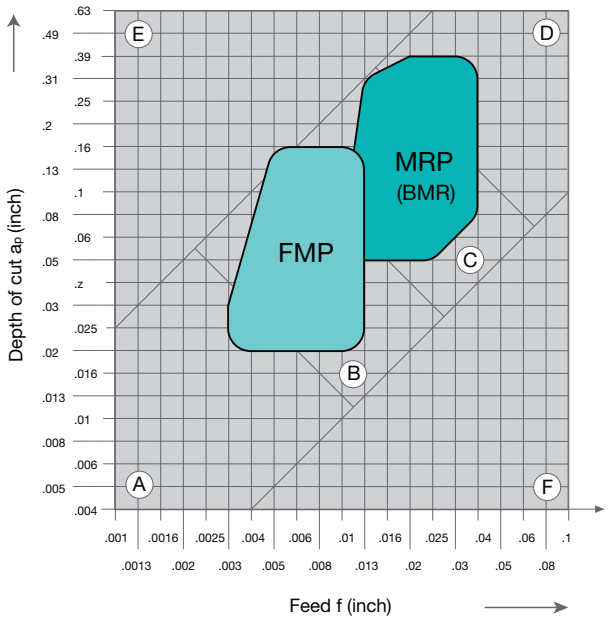
Main geometries

For negative indexable inserts suitable for ISO P and M clamping systems

Controlled chip forming for the middle range of application and roughing.

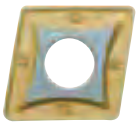
“RP” roughing geometry (Roughing steel)

Universal “MP” geometry (Medium steel)

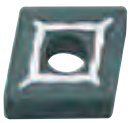


Intermediate geometries

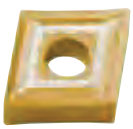
For negative indexable inserts suitable for ISO P and M clamping systems



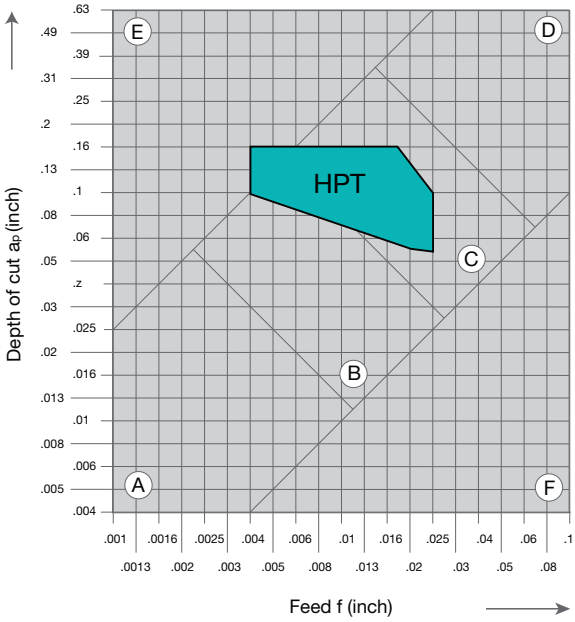
”MRP” (Roughing/Medium steel)



Preferably for cast materials:
”BMR” rough intermediate geometry
(Boehlerit Medium/Roughing)

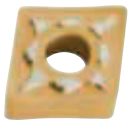


”FMP” fine intermediate geometry
(Finishing/Medium steel)
Preferably for Stainless steels

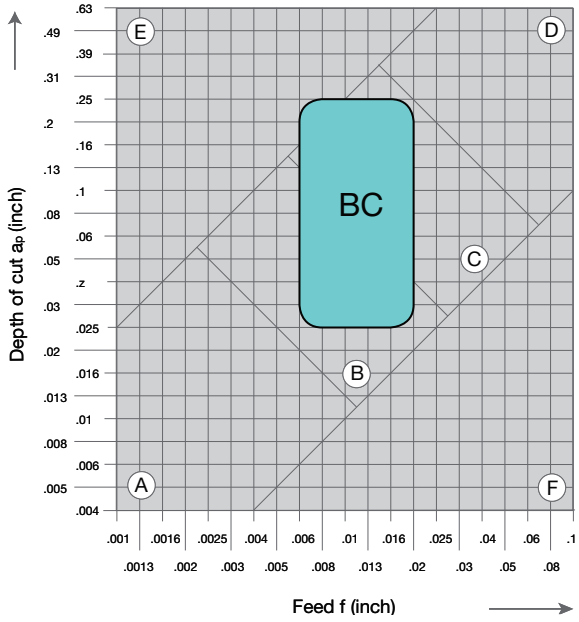


Geometry for better surface quality or higher feed

For negative indexable inserts suitable for ISO P and M clamping systems

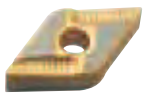


”HPT” High Performance Turning
Suitable for steel

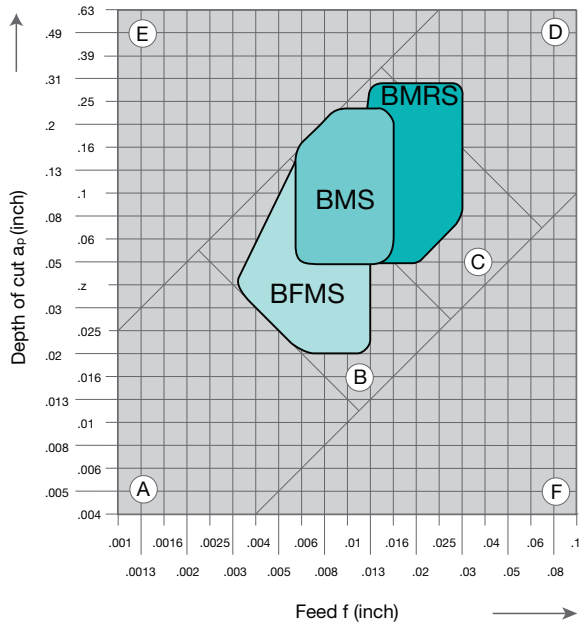


Geometry for copy turning

For negative indexable inserts suitable for ISO P clamping system



“BC” (Boehlerit Copying) geometry specially designed for copy turning, shows unique soft cutting property



Main geometries

For negative indexable inserts suitable for ISO P and M clamping systems

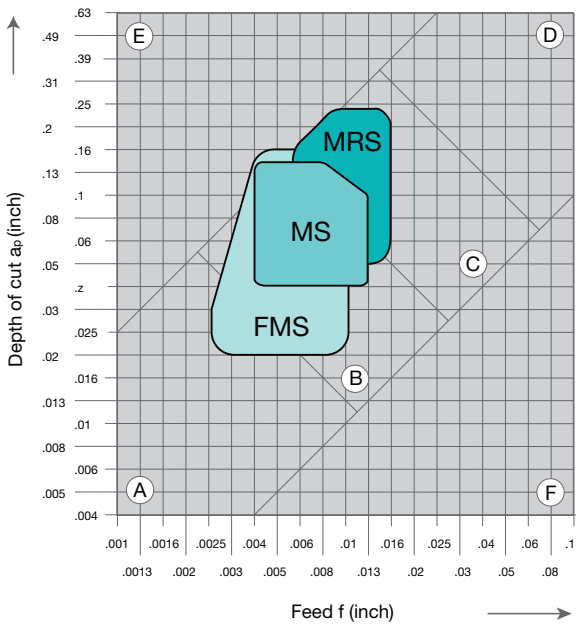
Controlled chip forming without cold hardening over the whole range of application from roughing to finishing of austenitic steels.

Roughing Geometry “BMRS”
(Boehlerit Medium/Roughing Stainless steel)

Universal Geometry “BMS”
(Boehlerit Medium Stainless steel)

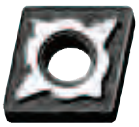
Finishing Geometry “BFMS”
(Boehlerit Finishing/Medium Stainless steel)

Chipbreaker for super alloys, negative indexable inserts

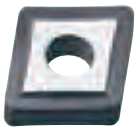


Geometries for super alloys

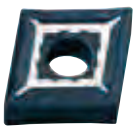
For negative indexable inserts suitable for ISO P and M clamping systems



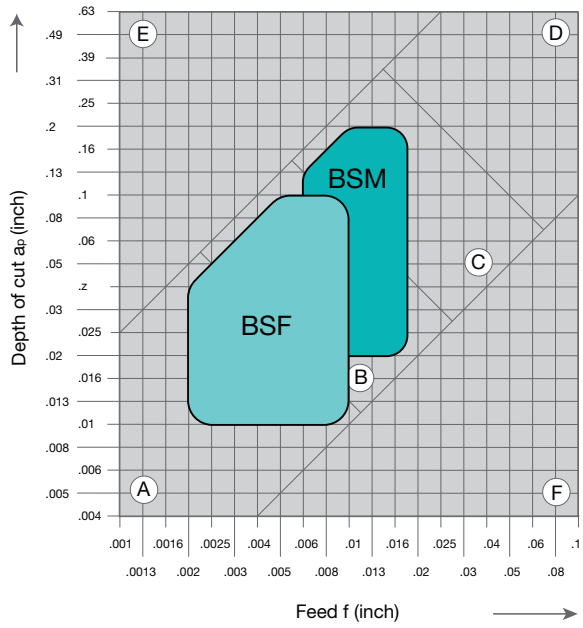
Geometry „MRS“ (Medium Roughing Super alloys)
Stainless steel geometry suitable for special alloys in interrupted cut



Geometry „MS“ (Medium Super alloys)
Specialy for Inconel, Titanium, etc.



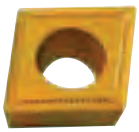
Geometry „FMS“ (Fine Medium Super alloys)
Sharp geometry for machining Super alloys



Main geometries

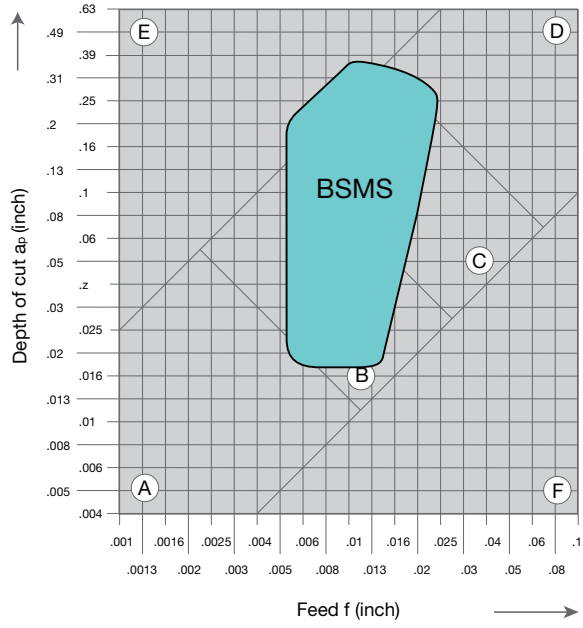
For positive indexable inserts suitable for ISO S clamping system

Universal “BSM”geometry
(Boehlerit ISO S system Medium)



“BSF” finishing geometry
(Boehlerit ISO S system Finishing)

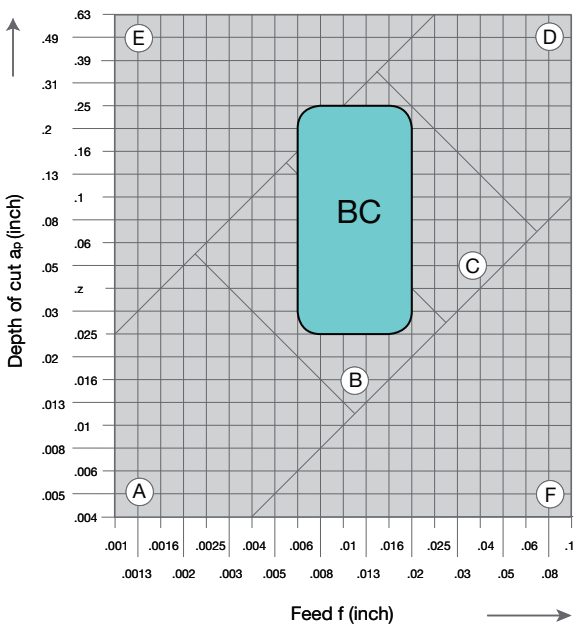
Chipbreaker for stainless steel, positive indexable inserts



Main geometry

For positive indexable inserts suitable for the ISO-S clamping system

Universal Geometry “BSMS”
(Boehlerit ISO-S Medium Stainless steel)



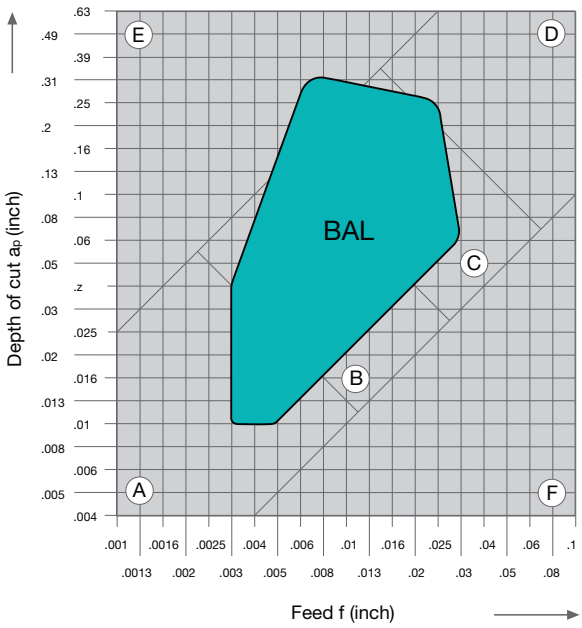
Geometry copy turning of steel

For positive indexable inserts suitable for ISO S clamping system

Preferably for internal turning.

"BC" (Boehlerit Copying) geometry specially designed for copy turning, shows unique soft cutting property

Chipbreaker for non-ferrous metals, positive indexable inserts



Geometry for aluminum machining

For positive indexable inserts suitable for ISO S clamping system

Main chipformer fo aluminum. Best suitable for finishing of stainless steels also.

Geometry "BAL"
(Boehlerit ALuminum)

ANSI / ISO Basic form

A	85°	M	86°
B	82°	O	135°
C	80°	P	108°
D	55°	R	-
E	75°	S	90°
H	120°	T	60°
K	55°	V	35°
L	90°	W	80°

ANSI / ISO Clearance angle

A	3°	G	30°
B	5°	N	0°
C	7°	P	11°
D	15°	O	α°
E	20°	Clearance angle requiring special indication	
F	25°		

ANSI / ISO Type of insert

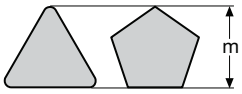
A without chip breaker, with cylindrical fixation hole	R Chip breakeres at one side, without fixation hole
F Chip breakers at both sides, without fixation hole	T Chip breakers at one side, with conical fixation hole
G Chip breakers at both sides, with cylindrical fixation hole	U Chip breakers at both sides, with fixation hole conical from both sides
M Chip breakers at one side, with cylindrical fixation hole	W without chip breaker, with conical fixation hole
N without chip breakers, without fixation hole	X with special features to drawing
Q without chip breakers, with fixation hole conical from both sides	

D **N** **M** **G**

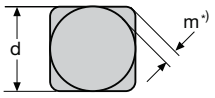
ISO Tolerance classes

Limits of tolerance mm

	m	s	d
A	±0,005[3)]	±0,025	±0,025
C	±0,013	±0,025	±0,025
E	±0,025	±0,025	±0,025
F	±0,005[3)]	±0,025	±0,013
G	±0,025	±0,13	±0,025
H	±0,013	±0,025	±0,013
J	±0,005[3)]	±0,025	±0,05 – ±0,15
K	±0,013[3)]	±0,025	±0,05 – ±0,15
L	±0,025	±0,025	±0,05 – ±0,15
M	±0,08 – ±0,20	±0,13	±0,05 – ±0,15
U	±0,13 – ±0,38	±0,13	±0,08 – ±0,25
	d	**m**	**d**
M	6,35	±0,08	±0,05
	9,52	±0,08	±0,05
	12,7	±0,13	±0,08
	15,88	±0,15	±0,10
	19,05	±0,15	±0,10
	25,4	±0,18	±0,13
U	6,35	±0,13	±0,08
	9,52	±0,13	±0,08
	12,7	±0,20	±0,13
	15,88	±0,27	±0,18
	19,05	±0,27	±0,18
	25,4	±0,38	±0,25



Indexable insert with unequal number of sides



Indexable insert with equal number of sides

3) generally used for indexable inserts with ground face cutting edges.

*) The calculation for the "m" measurement is based on the precise radius in inches.

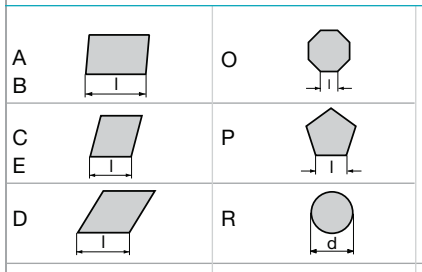
ANSI Tolerance classes

Limits of tolerance inch

	m	s	d
C	±.0005	±.001	±.0010
E	±.0010	±.001	±.0010
G	±.0010	±.005	±.0010
H	±.0005	±.001	±.0005
M	±.003 – ±.007	±.005	±.002 – ±.005
U	±.005 – ±.015	±.005	±.002 – ±.010

M-tolerances for m and s				U-tolerances for m and s			
d	**m**		**d**	**m**		**d**	
	Forms S,T,C, R,W	Form D	Forms S,T,C, R,W,D	Forms S,T,C	Form V	Forms S,T,C	Form V
1/4	±.003	±.004	±.002	±.005	-	±.003	±.002
3/8	±.003	±.004	±.002	±.005	±.007	±.003	±.002
1/2	±.005	±.006	±.003	±.008	±.010	±.005	±.003
5/8	±.006	±.007	±.004	±.011	-	±.007	±.004
3/4	±.006	±.007	±.004	±.011	-	±.007	±.004
7/8	±.006	-	±.005	±.015	-	±.010	-
1	±.007	-	±.005	±.015	-	±.010	-

ANSI / ISO
Inner diameter inch / Length of cutting edge mm



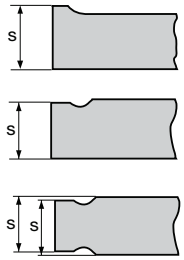
ANSI:

Code	IC=inch
2	1/4
3	3/8
4	1/2
5	5/8
6	3/4
7	7/8
8	1

ISO:

Code	l = mm
06	6,350
09	9,525
11	11,000
12	12,700
15	15,880
16	16,500
19	19,050
22	22,000
25	25,400
27	27,500
33	33,000

ANSI / ISO
Thickness inch / mm



Examples: ANSI			**Examples**: ISO	
1(2)	s=	1/16 inch	01	s= 1,59 mm
1.2	s=	5.64 inch	T1	s= 1,98 mm
1.5(3)	s=	3/32 inch	02	s= 2,38 mm
2	s=	1/8 inch	03	s= 3,18 mm
2.5	s=	5/32 inch	T3	s= 3,97 mm
3	s=	3/16 inch	04	s= 4,76 mm
3.5	s=	7/32 inch	05	s= 5,56 mm
4	s=	1/4 inch	06	s= 6,35 mm
5	s=	5/16 inch	07	s= 7,94 mm
6	s=	3/8 inch	09	s= 9,52 mm

ANSI / ISO
Corner radius inch / mm

Examples: ANSI	
??	r = ???
.5	r = .008 inch
1	r = 1/64 inch
2	r = 1/32 inch
3	r = 3/64 inch
4	r = 1/16 inch
5	r = 5/64 inch
6	r = 3/32 inch

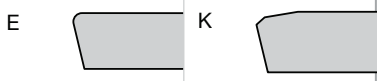
Examples: ISO	
00	r = max 0,2 mm
02	r = .0,2 mm ±0,1
04	r = 0,4 mm ±0,1
08	r = 0,8 mm ±0,1
12	r = 1,2 mm ±0,1
16	r = 1,6 mm ±0,1
20	r = 2,0 mm ±0,1
24	r = 2,4 mm ±0,1

ANSI	**5**	**4**	**1**	**E**	**L**	**-BC**
ISO	**15**	**06**	**04**	**E**	**L**	**-BC**

ANSI/ISO
Edge condition

Sharp cutting edges

Chamfered cutting edges



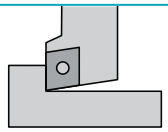
Rounded cutting edges

Double-chamfered cutting edges

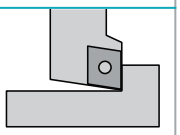
Chamfered and rounded cutting edges

Double-chamfered and rounded cutting edges

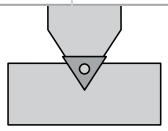
ANSI/ISO
Direction of cut



The indexable insert can only be used for cuts to the left



The indexable insert can only be used for cuts to the right

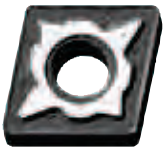
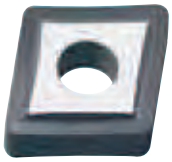
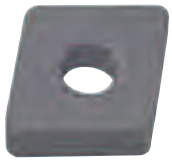


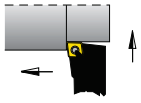
The indexable insert can be used for cuts either to the left or to the right

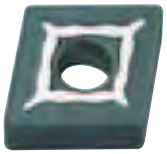
Designation of
Chip groove geometries

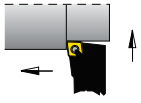
Designations as per manufacturer.

For information Boehlerit chip groove geometries please refer to pages 12 - 17.

	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610
CNGG-FMS 	CNGG 431-FMS	CNGG 120404-FMS										6409954		
	CNGG 432-FMS	CNGG 120408-FMS										6409955		
	CNGG 433-FMS	CNGG 120412-FMS										6409956		
CNGG-MRS 	CNGG 432-MRS	CNGG 120408-MRS										6410863		
	CNGG 433-MRS	CNGG 120412-MRS										6411767		
CNGG-MS 	CNGG 431-MS	CNGG 120404-MS										6400774		
	CNGG 432-MS	CNGG 120408-MS										6400771		
	CNGG 433-MS	CNGG 120412-MS										6400775		
CNMA 	CNMA 431	CNMA 120404						6400798	6400799					
	CNMA 432	CNMA 120408						6400800	6400600					
	CNMA 433	CNMA 120412						6400801	6400601					
	CNMA 434	CNMA 120416						6400802	6400602					
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610

MCLN R/L –5° end or side	MCRN R/L 15° side	S-MCLN R/L –5° end or side
		
Page 58	Page 58	Page 66

	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CNMG-BFMS 	CNMG 321-BFMS	CNMG 090304-BFMS					6400356								
	CNMG 431-BFMS	CNMG120404 BFMS					6400357								
	CNMG 432-BFMS	CNMG120408 BFMS					6400358								
	CNMG 433-BFMS	CNMG 120412-BFMS					6400359								
CNMG-BMR 	CNMG 432-BMR	CNMG 120408-BMR						6400811	6400605						
	CNMG 433-BMR	CNMG 120412-BMR						6400812	6400606						
	CNMG 434-BMR	CNMG 120416-BMR						6400813	6400607						
	CNMG 543-BMR	CNMG 160612-BMR						6400815	6400608						
	CNMG 544-BMR	CNMG 160616-BMR						6437532	6400609						
	CNMG 643-BMR	CNMG 190612-BMR						6400817	6400818						
	CNMG 644-BMR	CNMG 190616-BMR						6400819	6400820						
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

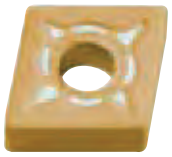
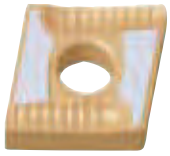
MCLN R/L
–5° end or side

Page 58

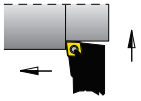
MCRN R/L
15° side

Page 58

S-MCLN R/L
–5° end or side

Page 66

	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CNMG-BMRS 	CNMG 432-BMRS	CNMG 120408-BMRS					6400363								
	CNMG 433-BMRS	CNMG 120412-BMRS					6400364								
	CNMG 543-BMRS	CNMG 160612-BMRS					6400365								
	CNMG 643-BMRS	CNMG 190612-BMRS					6400417								
CNMG-BMS 	CNMG 432-BMS	CNMG 120408-BMS					6400360								
	CNMG 433-BMS	CNMG 120412-BMS					6400361								
	CNMG 543-BMS	CNMG 160612-BMS					6400362								
CNMG EL/R-BC 	CNMG 431 EL-BC	CNMG 120404 EL-BC	6410864	6410865	6412416		6410867								
	CNMG 431 ER-BC	CNMG 120404 ER-BC	6410868	6410869	6412417		6410871								
	CNMG 432 EL-BC	CNMG 120408 EL-BC	6410872	6410873	6412419		6410875								
	CNMG 432 ER-BC	CNMG 120408 ER-BC	6410876	6410877	6412420		6410879								
	CNMG 433 EL-BC	CNMG 120412 EL-BC	6411643	6411644	6412422		6411645								
	CNMG 433 ER-BC	CNMG 120412 ER-BC	6411646	6411647	6412423		6411648								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MCLN R/L –5° end or side	MCRN R/L 15° side	S-MCLN R/L –5° end or side
		
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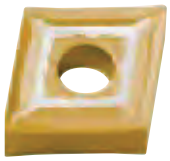
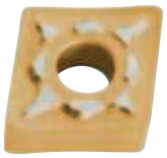
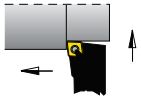
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CNMG-FMP 	CNMG 431-FMP	CNMG 120404-FMP	6410103	6410985	6412418			6400807	6400808						
	CNMG 432-FMP	CNMG 120408-FMP	6410105	6410986	6412421										
	CNMG 433-FMP	CNMG 120412-FMP	6410110	6411089	6412424										
CNMG-HPT  Wiper	CNMG 432-HPT	CNMG 120408-HPT	6410108	6410989											
	CNMG 433-HPT	CNMG 120412-HPT	6410113	6410992											
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MCLN R/L –5° end or side 
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MCRN R/L 15° side 
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S-MCLN R/L –5° end or side 
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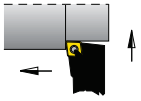
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CNMG-MP 	CNMG 432-MP	CNMG 120408-MP	9175798	9175833	9175843										
	CNMG 433-MP	CNMG 120412-MP	9175943	9175988	9175998										
	CNMG 434-MP	CNMG 120416-MP	9178710	9178711	9178715										
	CNMG 542-MP	CNMG 160608-MP	9187651	9187660	9187671										
	CNMG 543-MP	CNMG 160612-MP	9187653	9187665	9187678										
	CNMG 544-MP	CNMG 160616-MP	9187654	9187670	9187679										
	CNMG 643-MP	CNMG 190612-MP	9186900	9186944	9186948										
	CNMG 644-MP	CNMG 190616-MP	9186941	9196945	9186949										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MCLN R/L
–5° end or side

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MCRN R/L
15° side

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S-MCLN R/L
–5° end or side

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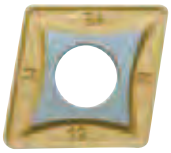
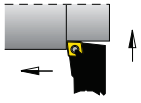
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CNMG-MRP 	CNMG 432-MRP	CNMG 120408-MRP	9196501	9196503	9196504										
	CNMG 433-MRP	CNMG 120412-MRP	9203107	9203109	9203110										
	CNMG 542-MRP	CNMG 160608-MRP	9196508	9196514	9196518										
	CNMG 543-MRP	CNMG 160612-MRP	9196520	9196531	9196532										
	CNMG 544-MRP	CNMG 160616-MRP	9196535	9196536	9196539										
	CNMG 643-MRP	CNMG 190612-MRP	9196559	9196560	9196581										
	CNMG 644-MRP	CNMG 190616-MRP	9196582	9196583	9196584										
	CNMG 645-MRP	CNMG 190624-MRP	9196588	9196606	9196607										
CNMG-MS 	CNMG 431-MS	CNMG 120404-MS										6411770			
	CNMG 432-MS	CNMG 120408-MS										6411772			
	CNMG 433-MS	CNMG 120412-MS										6411774			
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MCLN R/L
–5° end or side

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MCRN R/L
15° side

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S-MCLN R/L
–5° end or side

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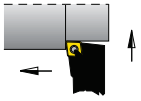
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610
CNMM-RP [1] 	CNMM 432-RP	CNMM 120408-RP	9178717	9178718	9178740									
	CNMM 433-RP	CNMM 120412-RP	9187638	9187642	9187647									
	CNMM 543-RP	CNMM 160612-RP	6437533	6437534	6437535									
	CNMM 544-RP	CNMM160616-RP	6437536	6437537	6437538									
	CNMM 643-RP	CNMM 190612-RP	6437539	6437540	6437541									
	CNMM 644-RP	CNMM 190616-RP	6437542	6437543	6437544									
	CNMM 645-RP	CNMM 190624-RP	6425787	6437545	6437546									
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610

[1] Single sided insert

MCLN R/L –5° end or side	MCRN R/L 15° side	S-MCLN R/L –5° end or side
		
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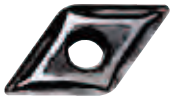
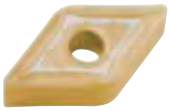
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
DNGG-FMS 	DNGG 431-FMS	DNGG 150404-FMS										6409957			
	DNGG 432-FMS	DNGG 150408-FMS										6409961			
	DNGG 433-FMS	DNGG 150412-FMS										6409962			
	DNGG 441-FMS	DNGG 150604-FMS										6410386			
	DNGG 442-FMS	DNGG 150608-FMS										6410387			
	DNGG 443-FMS	DNGG 150612-FMS										6410388			
DNMG-BFMS 	DNMG 331-BFMS	DNMG 110404-BFMS					6400368								
	DNMG 431-BFMS	DNMG 150404-BFMS					6400447								
	DNMG 432-BFMS	DNMG 150408-BFMS					6400463								
	DNMG 433-BFMS	DNMG 150412-BFMS					6400447								
DNMG-BMS 	DNMG 332-BMS	DNMG 110408-BMS					6400372								
	DNMG 432-BMS	DNMG 150408-BMS					6400445								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MDJN R/L	MDPN N	S-MDUN R/L
–3° side	27.5° side	–3° end
		
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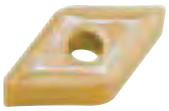
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
DNMG EL/R-BC 	DNMG 331EL-BC	DNMG 110404EL-BC	6410146	6411116	6412447										
	DNMG 331ER-BC	DNMG 110404ER-BC	6410147	6411117	6412448										
	DNMG 332EL-BC	DNMG 110408EL-BC	6410151	6411120	6412450										
	DNMG 332ER-BC	DNMG 110408ER-BC	6410152	6411121	6412451										
	DNMG 431EL-BC	DNMG 150404EL-BC	6410164	6411124	6412461		6400790								
	DNMG 431ER-BC	DNMG 150404ER-BC	6410165	6411125	6412462		6400789								
	DNMG 432EL-BC	DNMG 150408EL-BC	6410799	6411129	6412464		6400792								
	DNMG 432ER-BC	DNMG 150408ER-BC	6410800	6411130	6412465		6400791								
DNMG-FMP 	DNMG 331-FMP	DNMG 110404-FMP	6410145	6410995	6412449			6400832	6400833						
	DNMG 332-FMP	DNMG 110408-FMP	6410149	6411118				6400834	6400835						
	DNMG 333-FMP	DNMG 110412-FMP			6412453										
	DNMG 431-FMP	DNMG 150404-FMP	6410163	6411123											
	DNMG 432-FMP	DNMG 150408-FMP	6410167	6411126											
	DNMG 433-FMP	DNMG 150412-FMP			6412467										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MDJN R/L –3° side	MDPN N 27.5° side	S-MDUN R/L –3° end
		
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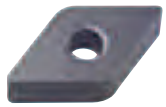
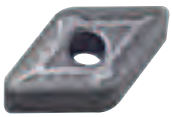
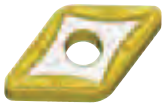
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
DNMA 	DNMA 432	DNMA 150408							6400612						
	DNMA 433	DNMA 150412							6400613						
DNMG-BMR 	DNMG 432-BMR	DNMG 150408-BMR							6400652						
	DNMG 433-BMR	DNMG 150412-BMR							6400617						
DNMG-MP 	DNMG 432-MP	DNMG 150408-MP	9176904	9176905	9176907										
	DNMG 433-MP	DNMG 150412-MP	9176909	9176921	9176923										
DNMG-MRP 	DNMG 432-MRP	DNMG 150408-MRP	9196612	9196792	9196794										
	DNMG 433-MRP	DNMG 150412-MRP	9196796	9196797	9196798										
DNMG-MS 	DNMG 431-MS	DNMG 150404-MS										6411802			
	DNMG 432-MS	DNMG 150408-MS										6411804			
	DNMG 433-MS	DNMG 154612-MS										6411806			
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MDJN R/L –3° side	MDPN N 27.5° side	S-MDUN R/L –3° end
		
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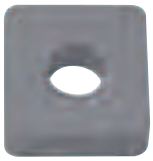
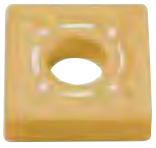
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610
SNMA 	SNMA 432	SNMA 120408						6437564	6400624					
	SNMA 433	SNMA 120412						6400861	6400625					
	SNMA 434	SNMA 120416						6437565	6400626					
	SNMA 543	SNMA 150612							6400627					
SNMG-BMR 	SNMG 432-BMR	SNMG 120408-BMR						6437566	6400631					
	SNMG 433-BMR	SNMG 120412-BMR						6400902	6400632					
	SNMG 643-BMR	SNMG 190612-BMR						6400866						
	SNMG 644-BMR	SNMG 190616-BMR						6400867	6400868					
SNMG-BMRS 	SNMG 432-BMRS	SNMG 120408-BMRS					6400380							
	SNMG 433-BMRS	SNMG 120412-BMRS					6400421							
SNMG-BMS 	SNMG 432-BMS	SNMG 120408-BMS					6400378							
	SNMG 433-BMS	SNMG 120412-BMS					6400379							
SNMG-FMP 	SNMG 321-FMP	SNMG 090304-FMP	6410205	6411146	6412723									
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610

MSDN N	MSKN R/L
45° side	15° end
	
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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
SNMG-FMS [1] 	SNMG 432-FMS	SNMG 120408-FMS										9207275			
	SNMG 433-FMS	SNMG 120412-FMS										9207271			
SNMG-MP 	SNMG 432-MP	SNMG 120408-MP	9196945	9196947	9196949										
	SNMG 433-MP	SNMG 120412-MP	9196961	9196962	9196964										
	SNMG 542-MP	SNMG 150608-MP	9196971	9196972	9196973										
	SNMG 643-MP	SNMG 190612-MP	9186942	9186947	9186950										
SNMG-MRP 	SNMG 432-MRP	SNMG 120408-MRP	9196890	9196893	9196896										
	SNMG 433-MRP	SNMG 120412-MRP	9196897	9196900	9196912										
	SNMG 643-MRP	SNMG 190612-MRP	9196917	9196919	9196920										
	SNMG 644-MRP	SNMG 190616-MRP	9196921	9196922	9196923										
SNMG-MRS 	SNMG 432-MRS	SNMG 120408-MRS										9207274			
	SNMG 433-MRS	SNMG 120412-MRS										9207249			
SNMM 	SNMM 854	SNMM 250716			6412736										
	SNMM 856	SNMM 250724		6415530	6412737										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

[1] Single sided insert

MSDN N 45° side  Page 59

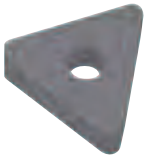
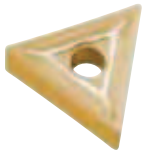
MSKN R/L 15° end  Page 59

	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
SNMM-BRP [1] 	SNMM 856-BRP	SNMM250724-BRP	9102315	9102316	6413213	5008394		6400869	9115449						
	SNMM 866-BRP	SNMM250924-BRP	6411745	6411746	6413214	5008389		6400871	6400872						
SNMM-RP [1] 	SNMM 432-RP	SNMM 120408-RP	9187637	9187641	9187646										
	SNMM 433-RP	SNMM 120412-RP	9200686	9187640	9187643										
	SNMM 543-RP	SNMM 150612-RP	6443849	6437568	6437569										
	SNMM 544-RP	SNMM 150616-RP	6443850	6437570	6437571										
	SNMM 643-RP	SNMM 190612-RP	6443851	6437572	6437573										
	SNMM 644-RP	SNMM 190616-RP	6443852	6437574	6437575										
	SNMM 646-RP	SNMM 190624-RP	6443853	6437576	6437577										
	SNMM 648-RP	SNMM 190632-RP	9196756	9196758	9196760										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

[1] Single sided insert

MSDN N 45° side  Page 59

MSKN R/L 15° end  Page 59

	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610
TNMA 	TNMA 331	TNMA 160404						6400883	6400884					
	TNMA 332	TNMA 160408						6400885	6400633					
	TNMA 333	TNMA 160412						6400886	6400634					
	TNMA 432	TNMA220408						6400887	6400888					
	TNMA 433	TNMA 220412						6400889	6400636					
	TNMA 434	TNMA 220416						6400890	6400637					
TNMG-BFMS 	TNMG 331-BFMS	TNMG 160404-BFMS					6400385							
	TNMG 332-BFMS	TNMG 160408-BFMS					6400386							
TNMG-BMS 	TNMG 332-BMS	TNMG 160408-BMS					6400424							
	TNMG 333-BMS	TNMG 160412-BMS					6400425							
	TNMG 432-BMS	TNMG 220408-BMS					6400387							
	TNMG 433-BMS	TNMG 220412-BMS					6400407							
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610

MTAN R/L 0° side	MTEN N 30° side	MTFN R/L 0° end	MTGN R/L 0° side	MTJN R/L –30° side	S-MTFN R/L –0° end	S-MTUN R/L –3° end
						
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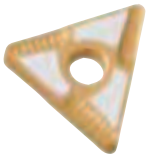
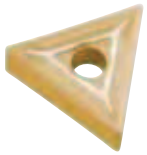
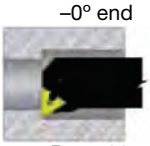
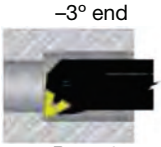
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
TNMG EL/R-BC 	TNMG 331EL-BC	TNMG 160404 EL-BC	6411831	6411832	6411833		6411834								
	TNMG 331ER-BC	TNMG 160404 ER-BC	6411835	6411836	6411837		6411838								
	TNMG 332EL-BC	TNMG 160408 EL-BC	6410954	6410955	6412808		6410957								
	TNMG 332ER-BC	TNMG 160408 ER-BC	6410958	6410959	6412809		6410961								
TNMG-FMP 	TNMG 331-FMP	TNMG 160404-FMP	6410232	6411011	6412807										
	TNMG 332-FMP	TNMG 160408-FMP	6410233	6411012	6412810										
	TNMG 333-FMP	TNMG 160412-FMP		6411171	6412811										
TNMG-MP 	TNMG 332-MP	TNMG 160408-MP	9186191	9186194	9186197										
	TNMG 333-MP	TNMG 160412-MP	9186192	9186195	9186198										
	TNMG 334-MP	TNMG 160416-MP	9186193	9186196	9186199										
	TNMG 432-MP	TNMG 220408-MP	9196980	9196991	9196995										
TNMM-RP  Single sided insert	TNMM 332-RP	TNMM 160408-RP	9196761	9196762	9196763										
	TNMM 432-RP	TNMM 220408-RP	9196764	9196765	9196766										
	TNMM 433-RP	TNMM 220412-RP	9196767	9196768	9196770										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MTAN R/L	MTEN N	MTFN R/L	MTGN R/L	MTJN R/L	S-MTFN R/L	S-MTUN R/L
0° side	30° side	0° end	0° side	–30° side	–0° end	–3° end
						
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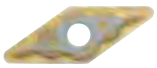
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
VNMG-FMP 	VNMG 332-FMP	VNMG 160408-FMP	6410841	6411194	6412830										
VNMG-FMS 	VNMG 331-FMS	VNMG 160404-FMS										9207245			
	VNMG 332-FMS	VNMG 160408-FMS										9207243			
VNMG-MP 	VNMG 332-MP	VNMG 160408-MP	9205889	9205911	9205914										
	VNMG 333-MP	VNMG 160412-MP	9197001	9197002	9197005										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

MVJN R/L
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S-MVUN R/L
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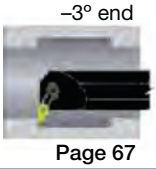
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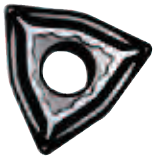
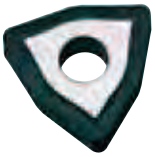
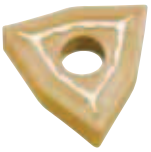
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610
WNGG-FMS 	WNGG 332-FMS	WNGG 060408-FMS										6411840		
	WNGG 431-FMS	WNGG 080404-FMS										6409969		
	WNGG 432-FMS	WNGG 080408-FMS										6409970		
	WNGG 433-FMS	WNGG 080412-FMS										6409971		
WNGG-MS 	WNGG 431-MS	WNGG 080404-MS										6400782		
	WNGG 432-MS	WNGG 080408-MS										6400783		
	WNGG 433-MS	WNGG 080412-MS										6400784		
WNMA 	WNMA 432	WNMA 080408						6400896	6400644					
	WNMA 433	WNMA 080412						6400897	6400645					
WNMG-BFMS 	WNMG 331-BFMS	WNMG 060404-BFMS					6400388							
	WNMG 431-BFMS	WNMG 080404-BFMS					6400389							
	WNMG 432-BFMS	WNMG 080408-BFMS					6400390							
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610

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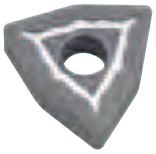
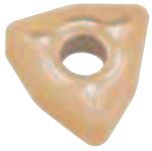
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610
WNMG-BMR 	WNMG 432-BMR	WNMG 080408-BMR						6400899	6400649					
	WNMG 433-BMR	WNMG 080412-BMR						6400900	6400650					
	WNMG 434-BMR	WNMG 080416-BMR						6400901	6400651					
WNMG-BMRS 	WNMG 432-BMRS	WNMG 080408-BMRS					6400428							
	WNMG 433-BMRS	WNMG 080412-BMRS					6400429							
	WNMG 332-BMS	WNMG 060408-BMS					6400391							
	WNMG 432-BMS	WNMG 080408-BMS					6400392							
WNMG-BMS 	WNMG 433-BMS	WNMG 080412-BMS					6400393							
	WNMG 434-BMS	WNMG 080416-BMS					6400427							
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610

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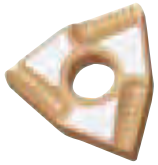
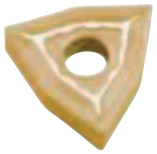
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
WNMG EL/R-BC 	WNMG 431EL-BC	WNMG 080404 EL-BC	6410965	6410966	6412838		6410968								
	WNMG 431ER-BC	WNMG 080404 ER-BC	6410969	6410970	6412839		6410972								
	WNMG 432EL-BC	WNMG 080408 EL-BC	6410973	6410974	6412841		6410976								
	WNMG 432ER-BC	WNMG 080408 ER-BC	6410977	6410978	6412842		6410980								
	WNMG 433EL-BC	WNMG 080412 EL-BC	6411649	6411650	6412844		6411651								
	WNMG 433ER-BC	WNMG 080412 ER-BC	6411652	6411653	6412845		6411654								
WNMG-FMP 	WNMG 331-FMP	WNMG 060404-FMP	6410266	6411206	6412835										
	WNMG 332-FMP	WNMG 060408-FMP	6410268	6411017	6412836										
	WNMG 431-FMP	WNMG 080404-FMP	6410274	6411019	6412840										
	WNMG 432-FMP	WNMG 080408-FMP	6410276	6411020	6412843										
WNMG-HPT 	WNMG 432-HPT	WNMG 080408-HPT	6410279	6411023											
	WNMG 433-HPT	WNMG 080412-HPT	6410284	6411024											
WNMG-MP 	WNMG 432-MP	WNMG 080408-MP	9176194	9176195	9176196										
	WNMG 433-MP	WNMG 080412-MP	9176204	9176205	9176207										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
WNMG-MRP 	WNMG 432-MRP	WNMG 080408-MRP	9196929	9196930	9196941										
	WNMG 433-MRP	WNMG 080412-MRP	5002389	5002391	5002392										
	WNMG 434-MRP	WNMG 080416-MRP	5002393	5002394	5002395										
WNMG-MS 	WNMG 431-MS	WNMG 080404-MS										6411848			
	WNMG 432-MS	WNMG 080408-MS										6411850			
	WNMG 433-MS	WNMG 080412-MS										6411852			
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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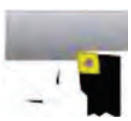
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CCGT-BAL 	CCGT 2 (1.5) (.5)-BAL	CCGT 060202-BAL								6403001				6403002	
	CCGT 2 (1.5) 1-BAL	CCGT 060204-BAL								6403003				6403004	
	CCGT 3 (2.5) (.5)-BAL	CCGT 09T302-BAL								6403006				6403007	
	CCGT 3 (2.5) 1-BAL	CCGT 09T304-BAL								6403010				6403011	
	CCGT 3 (2.5) 2-BAL	CCGT 09T308-BAL								6403012				6403013	
	CCGT 431-BAL	CCGT 120404-BAL								6403017				6403018	
	CCGT 432-BAL	CCGT 120408-BAL								6403022				6403023	
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SCLC R/L –5° end or side	S-SCLC R/L –5° end or side	S-SCLC R/L –5° end or side
		
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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CCGT EL/R-BC 	CCGT 2 (1.5) 1 EL-BC	CCGT 060204 EL-BC	6413123	6413124	6413125		6413126								
	CCGT 2 (1.5) 1 ER-BC	CCGT 060204 ER-BC	6413127	6413128	6413129		6413130								
	CCGT 2 (1.5) 2 EL-BC	CCGT 060208 EL-BC	6413131	6413132	6413133		6413134								
	CCGT 2 (1.5) 2 ER-BC	CCGT 060208 ER-BC	6413135	6413136	6413137		6413138								
	CCGT 3 (2.5) 1 EL-BC	CCGT 09T304 EL-BC	6411749	6411750	6411751		6413139								
	CCGT 3 (2.5) 1 ER-BC	CCGT 09T304 ER-BC	6411752	6411753	6411754		6413140								
	CCGT 3 (2.5) 2 EL-BC	CCGT 09T308 EL-BC	6411755	6411756	6411757		6413141								
	CCGT 3 (2.5) 2 ER-BC	CCGT 09T308 ER-BC	6411758	6411759	6411760		6413142								
	CCGT 432 EL-BC	CCGT 120408 EL-BC	6413143	6413144	6413145		6413146								
	CCGT 432 ER-BC	CCGT 120408 ER-BC	6413147	6413148	6413149		6413150								
	CCGT 433 EL-BC	CCGT 120412 EL-BC	6413151	6413152	6413153		6413154								
	CCGT 433 ER-BC	CCGT 120412 ER-BC	6413155	6413156	6413157		6413158								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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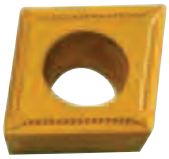
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CCMT-BSF 	CCMT 2 (1.5) 1-BSF	CCMT 060204-BSF	6410084	6411078											
	CCMT 2 (1.5) 2-BSF	CCMT 060208-BSF	6410086	6411080											
	CCMT 3 (2.5) 1-BSF	CCMT 09T304-BSF	6410088	6411082											
	CCMT 3 (2.5) 2-BSF	CCMT 09T308-BSF	6410090	6411083											
	CCMT 431-BSF	CCMT 120404-BSF	6410092	6411084											
CCMT-BSM 	CCMT 2 (1.5) (.5)-BSM	CCMT 060202-BSM	6410083	6411077											
	CCMT 2 (1.5) 1-BSM	CCMT 060204-BSM	6410085	6411079											
	CCMT 2 (1.5) 2-BSM	CCMT 060208-BSM	6410087	6411081											
	CCMT 3 (2.5) 1-BSM	CCMT 09T304-BSM	6410089	6410981	6412408			6400793	6400596						
	CCMT 3 (2.5) 2-BSM	CCMT 09T308-BSM	6410091	6410982	6412409			6400794	6400597						
	CCMT 431-BSM	CCMT 120404-BSM	6410093	6410983	6412410										
	CCMT 432-BSM	CCMT 120408-BSM	6410095	6410984	6412411			6400795	6400598						
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CCMT-BSMS 	CCMT 3 (2.5) 1-BSMS	CCMT 09T304- BSMS					6400352								
	CCMT 3 (2.5) 2-BSMS	CCMT 09T308-BSMS					6400353								
	CCMT 431-BSMS	CCMT 120404-BSMS					6400354								
	CCMT 432-BSMS	CCMT 120408-BSMS					6400355								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
DCGT 	-	DCGT0702008											6424927		
	-	DCGT0702015											6424930		
	-	DCGT11T3015											6424932		
	-	DCGT11T3035											6424935		
DCGT-BAL 	DCGT 2 (1.5) (.5)-BAL	DCGT 070202-BAL								6403379				6403380	
	DCGT 2 (1.5) 1-BAL	DCGT 070204-BAL								6403381				6403382	
	DCGT 3 (2.5) (.5)-BAL	DCGT 11T302-BAL								6503383				6403384	
	DCGT 3 (2.5) 1-BAL	DCGT 11T304-BAL								6403389				6403390	
	DCGT 3 (2.5) 2-BAL	DCGT 11T308-BAL								6403394				6403395	
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
DCGT EL/R-BC 	DCGT 2 (1.5) 1 EL-BC	DCGT 070204 EL-BC	6413170	6413171	6413172		6413173								
	DCGT 2 (1.5) 1 ER-BC	DCGT 070204 ER-BC	6413174	6413175	6413176		6413177								
	DCGT 3 (2.5) 1 EL-BC	DCGT 11T304 EL-BC	5411775	5411776	5411777		6413178								
	DCGT 3 (2.5) 1 ER-BC	DCGT 11T304 ER-BC	6411778	6411779	6411780		6413179								
	DCGT 3 (2.5) 2 EL-BC	DCGT 11T308 EL-BC	6411781	6411782	6411783		6413180								
	DCGT 3 (2.5) 2 ER-BC	DCGT 11T308 ER-BC	6411784	6411785	6411786		6413181								
DCGT FL/R-BC 	DCGT 2 (1.5) 0.2 FL-BC	DCGT0702008 FL-BC											6424925		
	DCGT 2 (1.5) 0.2 FR-BC	DCGT0702008 FR-BC											6424926		
	DCGT 2 (1.5) 0.6 FL-BC	DCGT0702015 FL-BC											6424928		
	DCGT 2 (1.5) 0.6 FR-BC	DCGT0702015 FR-BC											6424929		
	DCGT 3 (2.5) 0.6 FL-BC	DCGT11T3015 FL-BC											6424936		
	DCGT 3 (2.5) 0.6 FR-BC	DCGT11T3015 FR-BC											6424931		
	DCGT 3 (2.5) 0.9 FL-BC	DCGT11T3035 FL-BC											6424933		
	DCGT 3 (2.5) 0.9 FR-BC	DCGT11T3035 FR-BC											6424934		
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

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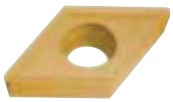
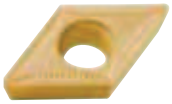
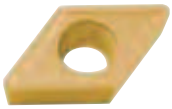
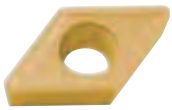
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
DCMT 	DCMT 432	DCMT 150408	6410142	6411114	6412442										
DCMT-BSF 	DCMT 2 (1.5) (.5)-BSF	DCMT 070202-BSF	6410133												
	DCMT 2 (1.5) 1-BSF	DCMT 070204-BSF	6410135	6411109											
	DCMT 3 (2.5) 1-BSF	DCMT 11T304-BSF	6410138	6411112											
DCMT-BSM 	DCMT 2 (1.5) (.5)-BSM	DCMT 070202-BSM	6410134	6411108											
	DCMT 2 (1.5) 1-BSM	DCMT 070204-BSM	6410136	6411110				6400826	6400827						
	DCMT 2 (1.5) 2-BSM	DCMT 070208-BSM	6410137					6400828	6400829						
	DCMT 3 (2.5) 1-BSM	DCMT 11T304-BSM	6410139	6410993	6412439			6400830	6400610						
	DCMT 3 (2.5) 2-BSM	DCMT 11T308-BSM	6410141	6410994	6412440			6400831	6400611						
DCMT-BSMS 	DCMT 3 (2.5) 1-BSMS	DCMT 11T304-BSMS					6400366								
	DCMT 3 (2.5) 2-BSMS	DCMT 11T308-BSMS					6400367								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SDJC R/L
–3° side

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S-SDUC R/L
–3° end

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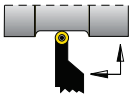
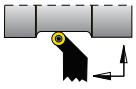
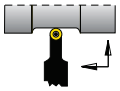
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
RCGT-BAL 	-	RCGT 0602M0-BAL								6406442				6406443	
	-	RCGT 0803M0-BAL								6406447				6406448	
	-	RCGT 1003M0-BAL								6406451				6406452	
RCMX 	-	RCMX 1003M0			6412677										
	-	RCMX 1204M0			6412679							9207238			
	-	RCMX 1606M0	6411742	6411743	6412680			6400843	6437559						
	-	RCMX 2006M0	6411220	6411140	6412681			6400845	6437560						
	-	RCMX 2507M0	6411221	6411141	6412682			6400847	6437561						
	-	RCMX 3209M0	6411222	6411142	6412683			6400849	6437562						
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SRCC R/L	SRGC R/L	SROC N
–5° end or side	–5° end or side	–3° side
		
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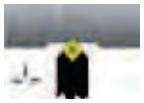
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
SCGT-BAL 	SCGT 432-BAL	SCGT 120408-BAL								6406596				6406597	
SCMT 	SCMT 431	SCMT 120404			6412689										
SCMT-BSF 	SCMT 3 (2.5) 1-BSF	SCMT 09T304-BSF	6410200	6411143				6400851	6426581						
	SCMT 431-BSF	SCMT 120404-BSF	6410202	6411144											
SCMT-BSM 	SCMT 3 (2.5) 2-BSM	SCMT 09T308-BSM	6410201	6411002	6412688										
	SCMT 432-BSM	SCMT 120408-BSM	6410203	6411003	6412690			6400853	6400622						
SCMT-BSMS 	SCMT 432-BSMS	SCMT 120408-BSMS					6400376								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SSDC N
45° side



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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
SPMR-FM 	SPMR 321-FM	SPMR 090304-FM	6410219	6411159	6412779										
	SPMR 322-FM	SPMR 090308-FM		6411160	6412780										
	SPMR 421-FM	SPMR 120304-FM		6411161	6412781										
	SPMR 422-FM	SPMR 120308-FM	6410219	6411162	6412782										
	SPMR 423-FM	SPMR 120312-FM		6411163	6412783										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
TCGT-BAL 	TCGT 2(1.5)1-BAL	TCGT 110204-BAL								6407354				6407355	
	TCGT 3(2.5)1-BAL	TCGT 16T304-BAL								6407358				6407359	
TCGT EL/R-BC 	TCGT 2 (1.5) 1EL-BC	TCGT 110204 EL-BC	6413215	6413216	6413217		6413218								
	TCGT 2 (1.5) 1ER-BC	TCGT 110204 ER-BC	6413219	6413220	6413221		6413222								
	TCGT 3 (2.5) 1EL-BC	TCGT 16T304 EL-BC	6413223	6413224	6413225		6413226								
	TCGT 3 (2.5) 1ER-BC	TCGT 16T304 ER-BC	6413227	6413228	6413229		6413230								
	TCGT 3 (2.5) 2EL-BC	TCGT 16T308 EL-BC	6413231	6413232	6413233		6413234								
	TCGT 3 (2.5) 2ER-BC	TCGT 16T308 ER-BC	6413235	6413236	6413237		6413238								
TCMT-BSF 	TCMT 2 (1.5) (.5)-BSF	TCMT 110202-BSF	6410220	6411164											
	TCMT 2 (1.5) 1-BSF	TCMT 110204-BSF	6410222	6411166											
	TCMT 2 (1.5) 2-BSF	TCMT 110208-BSF	6410224	6411167											
	TCMT 3 (2.5) 1-BSF	TCMT 16T304-BSF	6410226	6411168											
	TCMT 3 (2.5) 2-BSF	TCMT 16T308-BSF	6410228	6411169											
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

S-STFC R/L
0° end

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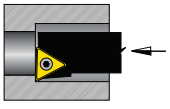
STUC R/L
–3° end

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S-STUC R/L
–3° end

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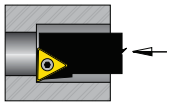
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
TCMT-BSM 	TCMT 2 (1.5) (.5)-BSM	TCMT 110202-BSM	6410221	6411165				6400873	6400874						
	TCMT 2 (1.5) 1-BSM	TCMT 110204-BSM	6410223	6411007	6412795			6400875	6400876						
	TCMT 2 (1.5) 2-BSM	TCMT 110208-BSM	6410225	6411008	6412796			6400877	6400878						
	TCMT 3 (2.5) 1-BSM	TCMT 16T304-BSM	6410227	6411009	6412797			6400879	6400880						
	TCMT 3 (2.5) 2-BSM	TCMT 16T308-BSM	6410229	6411010	6412798			6400881	6400882						
TCMT-BSMS 	TCMT 2 (1.5) 1-BSMS	TCMT 110204-BSMS					6400381								
	TCMT 2 (1.5) 2-BSMS	TCMT 110208-BSMS					6400382								
	TCMT 3 (2.5) 1-BSMS	TCMT 16T304-BSMS					6400383								
	TCMT 3 (2.5) 2-BSMS	TCMT 16T308-BSMS					6400384								
TPMR-FM 	TPMR 1.8 (1.5) 1-FM	TPMR 090204-FM	6410833		6412817										
	TPMR 221-FM	TPMR 110304-FM	6410241	6411182	6412818										
	TPMR 222-FM	TPMR 110308-FM	6410242	6411183	6412819										
	TPMR 321-FM	TPMR 160304-FM	6410243	6411184	6412820										
	TPMR 322-FM	TPMR 160308-FM	6410244	6411185	6412821										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

S-STFC R/L
0° end

Page 68

STUC R/L
–3° end

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S-STUC R/L
–3° end

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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
VBMT 	VBMT 331	VBMT 160404	6410245												
	VBMT 332	VBMT 160408	6410246	6411187											
	VBMT 333	VBMT 160412	6410247	6411188											
VCGT 	VCGT 3 (2.5) 0.2	VCGT1103008											6424975		
	VCGT 3 (2.5) 0.6	VCGT1103015											6424976		
VCMT-BAL 	VCGT 220-BAL	VCGT 110302-BAL								6407748				6407749	
	VCGT 221-BAL	VCGT 110304-BAL								6407752				6407753	
	VCGT 330-BAL	VCGT 160402-BAL								6407754				6407755	
	VCGT 331-BAL	VCGT 160404-BAL								6407759				6407760	
	VCGT 332-BAL	VCGT 160408-BAL								6407764				6407765	
	VCGT 333-BAL	VCGT 160412-BAL								6407769				6407770	
	-	VCGT 220530-BAL								6407776				6407777	
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SVJC R/L
–3° side

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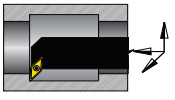
S-SVUC R/L
–3° end



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	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
VCMT-BSF 	VCMT 220-BSF	VCMT 110302-BSF		6411189											
	VCMT 221-BSF	VCMT 110304-BSF	6410249	6411190											
	VCMT 331-BSF	VCMT 160404-BSF	6410250	6411191											
	VCMT 332-BSF	VCMT 160408-BSF	6410252												
VCMT-BSM 	VCMT 331-BSM	VCMT 160404-BSM	6410251	6411015	6412827										
	VCMT 332-BSM	VCMT 160408-BSM	6410253	6411016	6412828										
	VCMT 333-BSM	VCMT 160412-BSM	6410840	6411193	6412829										
VCMT-BSMS 	VCMT 331-BSMS	VCMT 160404-BSMS					6407783								
	VCMT 332-BSMS	VCMT 160408-BSMS					6407790								
	VCMT 333-BSMS	VCMT 160412-BSMS					6407798								
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SVJC R/L
–3° side

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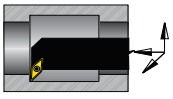
S-SVUC R/L
–3° end

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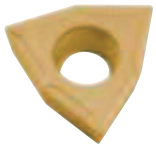
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
WCGT-BAL 	WCGT 3 (2.5) (.5)-BAL	WCGT 06T302-BAL												6407944	
	WCGT 3 (2.5) 1-BAL	WCGT 06T304-BAL								6407945				6407946	
	WCGT 3 (2.5) 2-BAL	WCGT 06T308-BAL								6407947				6407948	
	WCGT 431-BAL	WCGT 080404-BAL												6407952	
	WCGT 432-BAL	WCGT 080408-BAL								6407955				6407956	
WCMT-BSF 	WCMT 432-BSF	WCMT 080408-BSF	6410263	6411204											
WCMT-BSM 	WCMT 3 (2.5) (.5)-BSM	WCMT 06T302-BSM	6410843	6411197											
	WCMT 3 (2.5) 1-BSM	WCMT 06T304-BSM	6410258	6411199											
	WCMT 3 (2.5) 2-BSM	WCMT 06T308-BSM	6410260	6411201											
	WCMT 431-BSM	WCMT 080404-BSM	6410262	6411203	6412832										
	WCMT 432-BSM	WCMT 080408-BSM	6410264	6411205	6412833										
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	

SWLC R/L
–5° end or side

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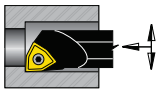
S-SWUC R/L
–3° end



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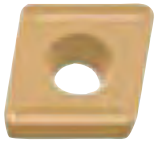
	ANSI-Code	ISO-Code	LC215K	LC225K	LC240F	LC250F	LC435D	LC610H	LC620H	LC610T		LC415Z	LC415X	LW610	
CNMM-BRP 	CNMM 856-BRP	CNMM 250724-BRP	6413166	6413167	6413168			6400822	6400823						
	CNMM 866-BRP	CNMM 250924-BRP	9102285	9102314	6413169	5008396		6400824	6400825						
SNMM-BRP 	SNMM 856-BRP	SNMM 250724-BRP	9102315	9102316	6413213	5008394		6400869	9115449						
	SNMM 866-BRP	SNMM 250924-BRP	6411745	6411746	6413214	5008389		6400871	6400872						
SNMM-RP 	SNMM 856-RP	SNMM 250724-RP			6441680										
TNMM-BR 	TNMM 543-BR	TNMM 270612-BR		6413239											
CCMT-BSMR 	CCMT 866-BSMR	CCMT 250924-BSMR	6412412	6412413	6413159	5008419		6400796	6400797						
SCMT-BSMR 	SCMT 866-BSMR	SCMT 250924-BSMR	6412694	9117422	6413204										
	-	SCMT 380932-BSMR	9102460	6412697	6413206										
SCMT-BSR 	SCMT 864-BSR	SCMT 250916-BSR	6412692	6412693	6413203	5008412		6400854	6400855						
	SCMT 866-BSR	SCMT 250924-BSR	6412695	6412696	6413205	5008415		6400856	6400857						
	-	SCMT 380932-BSR	6412698	6412699	6413207	5008416		6400858	6400859						

BOEHLERIT

M D J N R 1 6 - 4 D

Holding Method

M - Multiple Lock

S - Screw Lock

Insert Shape

80° Diamond

C

55° Diamond

D

Round

R

Square

S

60° Triangle

T

35° Diamond

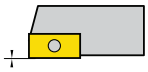
V

80° Trigon

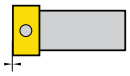
W

Tool Style

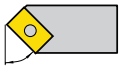
A -Straight Shank
0° Side Cutting Edge Angle



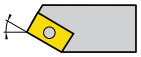
C -Straight Shank
0° End Cutting Edge Angle



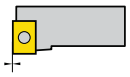
D -Straight Shank
45° Side Cutting Edge Angle



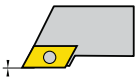
E -Straight Shank
30° Side Cutting Edge Angle



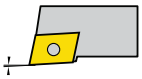
F -Offset Shank
0° End Cutting Edge Angle



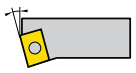
G -Offset Shank
0° Side Cutting Edge Angle



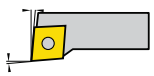
J -Offset Shank
3° Side Cutting Edge Angle



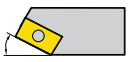
K -Offset Shank
15° End Cutting Edge Angle



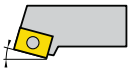
L -Offset Shank
5° End or Side
Cutting Edge Angle



P -Straight Shank
27,5° Side Cutting Edge Angle

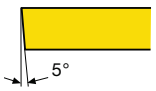


R -Offset Shank
15° Side Cutting Edge Angle



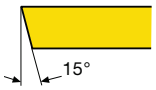
Insert Clearance Angle

B - 5° Positive

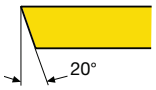


C - 7° Positive

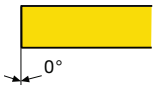
D - 15° Positive



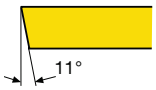
E - 20° Positive



N - 0° Negative

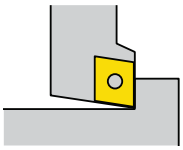


P - 11° Positive

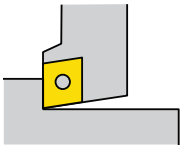


Hand of Tool

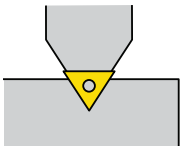
R - Right Hand



L - Left Hand



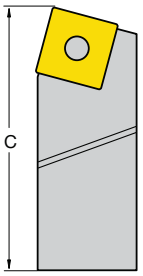
N - Neutral



Insert Size I.C.

Insert I.C.:
(I.C.) shown in 1/8 inch increments

Tool Length



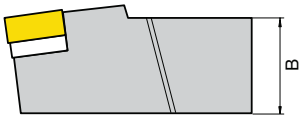
Tool lenght C:
J - 3-1/2“
A - 4.0“
B - 4-1/2“
C - 5.0“
D - 6.0“
E - 7.0“
F - 8.0“

Shank Size

Shank width A

Square shanks:
Shown in 1/16 inch increments
Rectangle shanks:
Shown in 1/8 inch increments

Shank heigth B



Square shanks:
Shown in 1/16 inch increments
Rectangle shanks:
Shown in 1/16 inch increments

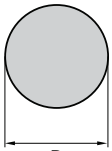
Boring Bar Identification System

BOEHLERIT

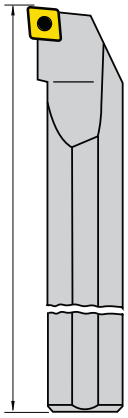
S 16 T - M C L N R - 3

Bar Type
C - Carbide
S - Steel

Bar Diameter
Round Shank:
(D) shown in
1/16 inch



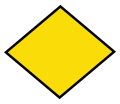
Bar Length
H - 4.0
J - 4-1/2
K - 5.0
M - 6.0
R - 8.0
S - 10.0
T - 12.0
U - 14.0
V - 16.0
Y - 18.0



Holding Method
M - Multiple Lock

S - Screw Lock

Insert Shape
80° Diamond — C



55° Diamond — D

Round — R

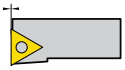
Square — S

60° Triangle — T

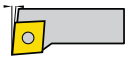
35° Diamond — V

80° Trigon — W

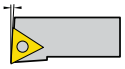
Tool Style
F -Offset Shank
0° End Cutting Edge Angle



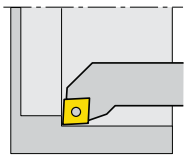
L -Offset Shank
5° End or Side
Cutting Edge Angle



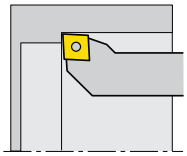
U -Offset Shank
3° End Cutting Edge Angle



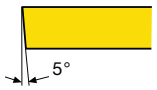
Hand of Tool
R - Right Hand



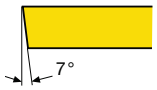
L - Left Hand



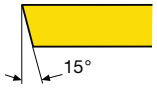
Insert Clearance Angle
B - 5° Positive



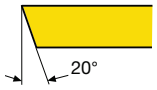
C - 7° Positive



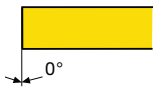
D - 15° Positive



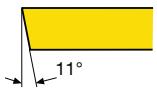
E - 20° Positive



N - 0° Negative



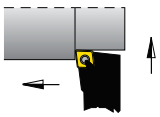
P - 11° Positive



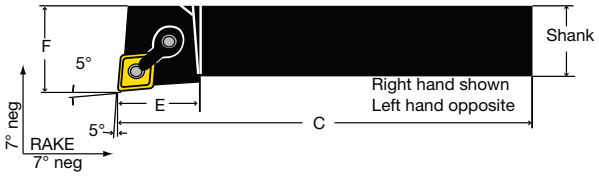
Insert Size I.C.

Insert I.C.:
(I.C.) shown in 1/8
inch increments

MCLN R/L Multiple Lock Negative 80° Diamond Toolholders



Style L - Negative 5° End or Side Cutting Edge angle, for negative 80° diamond CNMG inserts

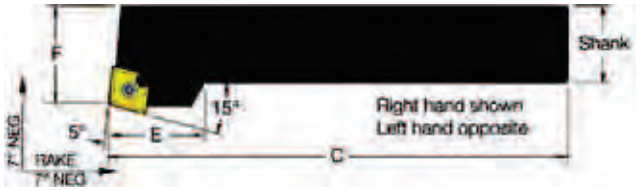


Indexable inserts see pages 20-26

Description	EDP No.		Shank		C	E	F	CNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Right Hand	Left Hand	Width	Height									
MCLNR/L10-4B	30579	30581	.625	.625	4.5	1.250	1.00	43	ICSN-433	NL-46	CL-20	XNS-48	S-46
MCLNR/L12-4B	30582	30583	.750	.750	4.5	1.250	1.00						
MCLNR/L16-4C	30584	30585	1.00	1.00	5.0	1.250	1.25						
MCLNR/L16-4D	30586	30587	1.00	1.00	6.0	1.250	1.25						
MCLNR/L20-4D	30588	30589	1.25	1.25	6.0	1.250	1.50						
MCLNR/L16-5D	30590	30591	1.00	1.00	6.0	1.375	1.25	54	ICSN-533	NL-58	CL-12	XNS-510	S-58
MCLNR/L20-5D	30592	30593	1.25	1.25	6.0	1.375	1.50						
MCLNR/L24-6E	30594	30595	1.50	1.50	7.0	1.500	2.0	64	ICSN-633	NL-68	CL-12	XNS-510	S-68

MCRN R/L Multiple Lock Negative 80° Diamond Toolholders

Style R - 15° Side Cutting Edge angle, for negative 80° diamond CNMG inserts



Indexable inserts see pages 20-26

Description	EDP No.		Shank		C	E	F	CNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Right Hand	Left Hand	Width	Height									
MCRNR/L12-4B	30596	30597	.750	.750	4.5	1.25	0.75	43	ICSN-433	NL-46	CL-9	XNS-58	S-46
MCRNR/L16-4C	30598	30599	1.00	1.00	5.0	1.25	1.25						
MCRNR/L16-4D	30600	30601	1.00	1.00	6.0	1.25	1.25						
MCRNR/L16-5D	30602	30603	1.00	1.00	6.0	1.25	1.25	54	ICSN-533	NL-58	CL-9	XNS-510	S-58
MCRNR/L20-5D	30604	30605	1.25	1.25	6.0	1.25	1.50						

MDJN R/L Multiple Lock Negative 55° Diamond Toolholders

Style J 3° Side Cutting Edge angle, for negative 55° diamond DNMG inserts

Indexable inserts see pages 27-29

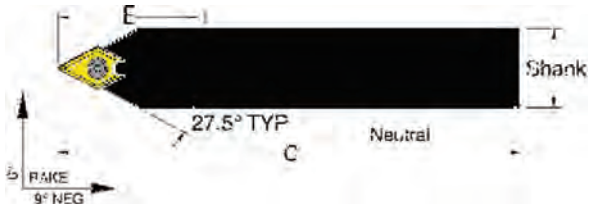
Description	EDP No.		Shank		C	E	F	DNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Right Hand	Left Hand	Width	Height									
MDJNR/L12-4B	30606	30607	.750	.750	4.5	1.25	1.00	43	IDSN-433	NL-46	CL-6	XNS-36	S-46
MDJNR/L16-4C	30608	30609	1.00	1.00	5.0	1.25	1.25						
MDJNR/L16-4D	30610	30611	1.00	1.00	6.0	1.25	1.25						
MDJNR/L20-4D	30612	30613	1.25	1.25	6.0	1.25	1.50						
MDJNR/L24-4E	30614	30615	1.50	1.50	7.0	1.25	2.00						

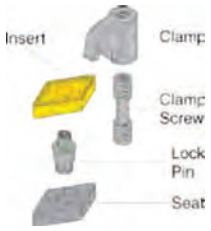
For spare parts ordering number see page 71

MDPN N Neutral Multiple Lock Negative 55° Diamond Toolholders

Style P
27.5° Side Cutting Edge angle, for negative 55° diamond DNMG inserts

Indexable inserts see pages 27-29



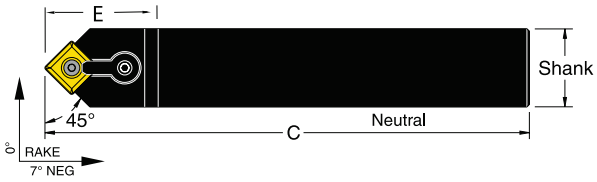


Description	EDP No.	Shank		C	E		DNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Neutral	Width	Height									
MDPNN12-4B	30616	.750	.750	4.5	1.75		43	IDSN-433	NL-46	CL-12	XNS-510	S-46
MDPNN16-4D	30617	1.00	1.00	6.0	1.75							
MDPNN20-4D	30618	1.25	1.25	6.0	1.75							

MSDN N Multiple Lock Negative 45° SquareToolholders

Style D
45° Side Cutting Edge Angle for negative square SNMG inserts

Indexable inserts see pages 30-32

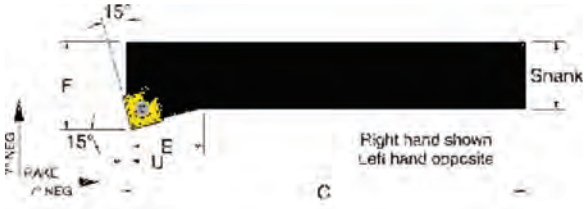


Description	EDP No.	Shank		C	E		SNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Neutral	Width	Height									
MSDNN08-3A	30619	.500	.500	4.0	1.000		32	ISSN-322	NL-34	CL-6	XNS-36	S-34
MSDNN10-3B	30620	.625	.625	4.5	1.000							
MSDNN12-4B	30621	.750	.750	4.5	1.375		43	ISSN-433	NL-46	CL-9	XNS-59	S-46
MSDNN16-4D	30622	1.00	1.00	6.0	1.375							

MSKN R/L Multiple Lock Negative 15° Square Toolholder

Style K
15° End Cutting Edge angle for negative square SNMG inserts

Indexable inserts see pages 30-32



Description	EDP No.		Shank		C	E	F	SNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Right Hand	Left Hand	Width	Height									
MSKNR20-6D	30623	30624	1.25	1.25	6.0	1.50	1.500	64	ISSN-633	NL-68	CL-12	XNS-510	S-68

For spare parts ordering number see page 71

MTAN R/L Multiple Lock Negative Triangle Toolholders

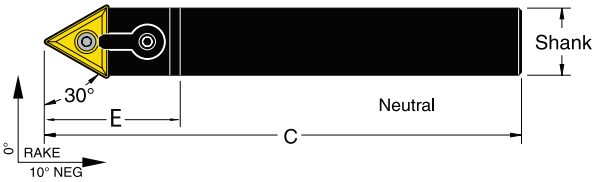
Style A
0° Side Cutting Edge Angle for negative triangle TNMG inserts

Indexable inserts see pages 33-34

Description	EDP No.		Shank					TNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Width	Height	C	E	F	Insert		Pin		Screw	Screw
MTANR/L10-3B	30625	30626	.625	.625	4.5	1.000	.625	32	ITSN-333	NL-34L	CL-6	XNS-36	S-34
MTANR/L12-3B	30627	30628	.750	.750	4.5	1.000	.750						
MTANR/L16-4D	30629	30630	1.00	1.00	6.0	1.375	1.00	43	ITSN-432	NL-46	CL-9	XNS-59	S-46

MTEN Neutral Multiple Lock Negative Triangle Toolholders

Style E
30° Side Cutting Edge Angle for negative triangle TNMG inserts

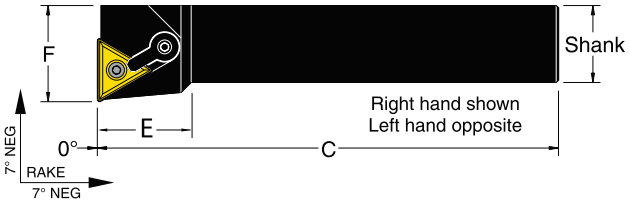


Indexable inserts see pages 33-34

Description	EDP No.	Shank					TNMG	Seat	Lock	Clamp	Clamp	
	Neutral	Width	Height	C	E		Insert		Pin		Screw	
MTENN10-3B	30631	.625	.625	4.5	1.125		32	ITSN-333	NL-34L	CL-6	XNS-36	
MTENN12-3B	30632	.750	.750	4.5	1.125							
MTENN12-4B	30633	.750	.750	4.5	1.500		43	ITSN-432	NL-46	CL-9	XNS-59	
MTENN16-4D	30634	1.00	1.00	6.0	1.500							

MTFN R/L Multiple Lock Negative Triangle Toolholders

Style J
3° Side Cutting Edge angle, for negative triangle TNMG inserts



Indexable inserts see pages 33-34

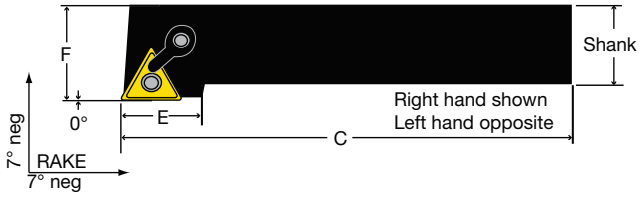
Description	EDP No.		Shank					TNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Width	Height	C	E	F	Insert		Pin		Screw	Screw
MTFNR/L10-3B	30635	30636	.625	.625	4.5	0.875	.875	32	ITSN-333	NL-34L	CL-6	XNS-36	S-34
MTFNR/L12-3B	30637	30638	.750	.750	4.5	0.875	1.00						
MTFNR/L16-3C	30639	30640	1.00	1.00	5.0	0.875	1.25						
MTFNR/L16-3D	30641	30642	1.00	1.00	6.0	0.875	1.25						
MTFNR/L16-4C	30643	30644	1.00	1.00	5.0	1.250	1.25	43	ITSN-432	NL-46	CL-9	XNS-510	S-46
MTFNR/L16-4D	30645	30646	1.00	1.00	6.0	1.250	1.25						

For spare parts ordering number see page 71

MTGN R/L Multiple Lock Negative Triangle Toolholders

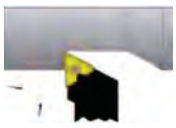
Style G
0° Side Cutting Edge Angle for negative triangle TNMG insert

Indexable inserts see pages 33-34



Description	EDP No.		Shank		C	E	F	TNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Right Hand	Left Hand	Width	Height									
MTGNR/L10-3B	30647	30648	.625	.625	4.5	1.000	.875	32	ITSN-333	NL-34L	CL-6	XNS-36	S-34
MTGNR/L12-3B	30649	30650	.750	.750	4.5	1.000	1.00						
MTGNR/L16-3C	30651	30652	1.00	1.00	5.0	1.000	1.25						
MTGNR/L16-3D	30653	30654	1.00	1.00	6.0	1.000	1.25						
MTGNR/L16-4C	30655	30656	1.00	1.00	5.0	1.375	1.25	43	ITSN-432	NL-46	CL-9	XNS-510	S-46
MTGNR/L16-4D	30657	30658	1.00	1.00	6.0	1.375	1.25						

MTJN R/L Multiple Lock Negative Triangle Toolholders



Style J
3° Side Cutting Edge Angle for negative triangle TNMG inserts

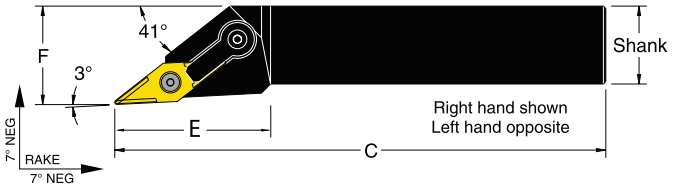
Indexable inserts see pages 33-34

Description	EDP No.		Shank		C	E	F	TNMG Insert	Seat	Lock	Clamp Pin	Clamp Screw	
	Right Hand	Left Hand	Width	Height									
MTJNR/L10-3B	30659	30660	.625	.625	4.5	1.000	.875	32	ITSN-333	NL-34L	CL-6	XNS-36	
MTJNR/L12-3B	30661	30662	.750	.750	4.5	1.000	1.00						
MTJNR/L16-3D	30663	30664	1.00	1.00	6.0	1.000	1.25						
MTJNR/L16-4D	30665	30666	1.00	1.00	6.0	1.250	1.25	43	ITSN-432	NL-46	CL-9	XNS-510	
MTJNR/L20-4D	30667	30668	1.25	1.25	6.0	1.250	1.50						

MVJN R/L Multiple Lock Negative 35° Diamond Toolholders

Style J - Neg
3° Side Cutting Edge Angle for negative 35° diamond VNMG inserts

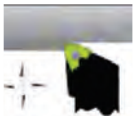
Indexable inserts see page 35



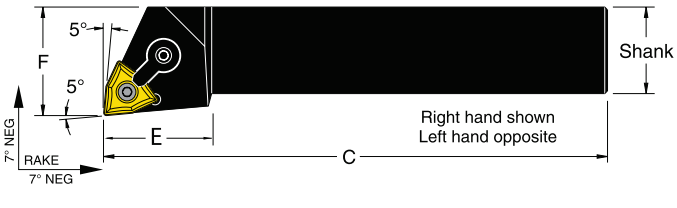
Description	EDP No.		Shank		C	E	F	VNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw	Seat Screw
	Right Hand	Left Hand	Width	Height									
MVJNR/L12-3B	30669	30670	.750	.750	4.5	1.687	1.00	33	IVSN-322	NL-34L	CL-30	XNS-510	S-34
MVJNR/L16-3C	30671	30672	1.00	1.00	5.0	1.687	1.25						
MVJNR/L16-3D	30673	30674	1.00	1.00	6.0	1.687	1.25						
MVJNR/L16-4D	59787	59786	1.00	1.00	5.0	2.000	1.25	43	IVSN-432	NL-46	CL-30	XNS-510	S-46

For spare parts ordering number see page 71

MWLN R/L Multiple Lock 80° Triagon Toolholders



Style L - Neg. 5° End or Side Cutting Edge Angle for negative 80° trigon WNMG inserts

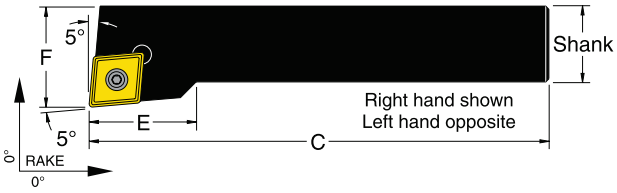


Indexable inserts see pages 36-39

Description	EDP No.		Shank		C	E	F	WNMG Insert	Seat	Lock Pin	Clamp	Clamp Screw
	Right Hand	Left Hand	Width	Height								
MWLNR/L12-3B	30675	30676	.750	.750	4.5	1.00	1.00	33	IWSN-322	NL-34L	CL-6	XNS-36
MWLNR/L12-4B	30677	30678	.750	.750	4.5	1.25	1.00					
MWLNR/L16-4D	30679	30680	1.00	1.00	6.0	1.25	1.25	43	IWSN-432	NL-46	CL-9	XNS-59
MWLNR/L20-4D	30681	30682	1.25	1.25	6.0	1.25	1.50					

SCLC R/L Screw Lock Positive 80° Diamond Toolholders

Style L - Neg. 5° End or Side Cutting Edge Angle for 7° positive 80° diamond CCMT inserts

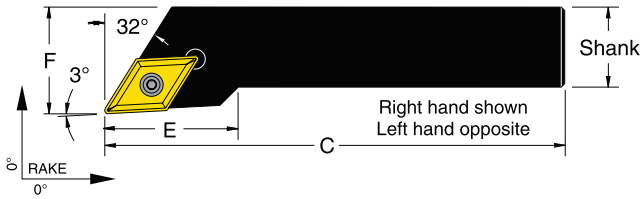


Indexable inserts see pages 40-43

Description	EDP No.		Shank		C	E	F	CCMT Insert	Insert Torx Screw	Torx Key
	Right Hand	Left Hand	Width	Height						
SCLCR/L06-2J	30683	30684	.375	.375	3.5	.49	.500	21.5	TS-25.45-6M1	T-7
SCLCR/L08-3A	30685	30686	.500	.500	4.0	.69	.625			
SCLCR/L10-3B	30687	30688	.625	.625	4.5	.69	.750	32.5	TS-4.7-10M1	T-15
SCLCR/L12-3B	30689	30690	.750	.750	4.5	.69	1.000			
SCLCR/L16-3D	30691	30692	1.00	1.00	6.0	.69	1.250			
SCLCR/L16-4D	18376	18377	1.00	1.00	6.0	.83	1.000	43	TS-103-4MI	T-20

SDJC R/L Screw Lock Positive 55° Diamond Toolholders

Style J - Neg. 3° Side Cutting Edge Angle for 7° positive 55° diamond DCMT inserts

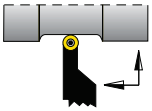


Indexable inserts see pages 44-46

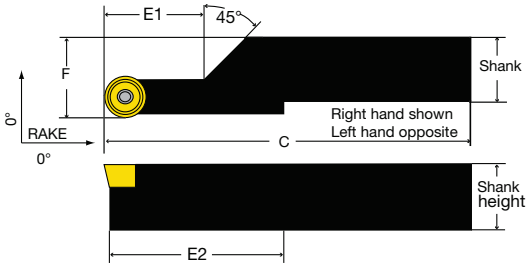
Description	EDP No.		Shank		C	E	F	DCMT Insert	Insert Torx Screw	Torx Key
	Right Hand	Left Hand	Width	Height						
SDJCR/L06-2J	30693	30694	.375	.375	3.5	0.68	.500	21.5	TS-25.45-6M1	T-7
SDJCR/L08-2A	30695	30696	.500	.500	4.0	0.68	.625			
SDJCR/L08-3A	30697	30698	.500	.500	4.0	1.00	.625			
SDJCR/L10-3B	30699	30700	.625	.625	4.5	1.00	.750	32.5	TS-4.7-10M1	T-15
SDJCR/L12-3B	30701	30702	.750	.750	4.5	1.00	1.00			
SDJCR/L16-3D	30703	30704	1.00	1.00	6.0	1.00	1.25			

For spare parts ordering number see page 71

SRCC R/L Screw Lock Positive RCMT Toolholders



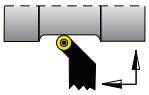
Style C Profiling, Plunging, and Turning for positive round RCMT inserts



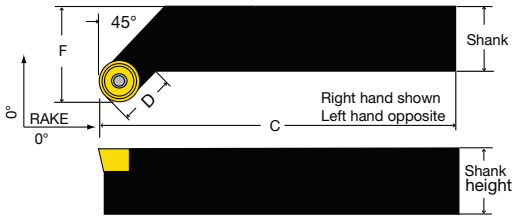
Indexable inserts see page 47

Description	EDP No.		Shank		C	E1	E2	F	RCMT	Insert	Torx	
	Right Hand	Left Hand	Width	Height					Insert	Torx Screw	Key	
SRCCR/L10-06-A	59807	59827	.625	.625	4.000	.810	1.435	.743	0602	TS-25.456M1	T-7	
SRCCR/L12-06-B	59808	59828	.750	.750	4.500	.810	1.560	.868	0602			
SRCCR/L16-06-D	59809	29829	1.00	1.00	6.000	.810	1.810	1.118	0602			
SRCCR/L20-06-D	59810	59830	1.25	1.25	6.000	.810	2.060	1.368	0602			
SRCCR/L12-08-B	59811	59831	.750	.750	4.500	1.020	1.770	.908	0803	TS-3.5-7M1	T-8	
SRCCR/L16-08-D	59812	59832	1.00	1.00	6.000	1.020	2.020	1.158	0803			
SRCCR/L20-08-D	59813	59833	1.25	1.25	6.000	1.020	2.270	1.408	0803			
SRCCR/L12-10-B	59814	59834	.750	.750	4.500	1.230	1.980	.947	1003	TS-35.6-9M1	T-15	
SRCCR/L16-10-D	59815	59835	1.00	1.00	6.000	1.230	2.230	1.197	1003			
SRCCR/L20-10-D	59816	59836	1.25	1.25	6.000	1.230	2.480	1.447	1003			

SRGC R/L Screw Lock Positive RCMT Toolholders



Style L - Neg. 5° End or Side Cutting Edge Angle for 7° positive 80° diamond CCMT inserts

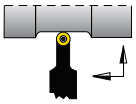


Indexable inserts see page 47

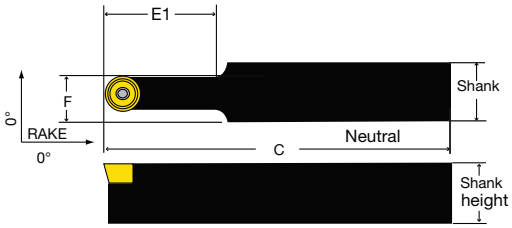
Description	EDP No.		Shank		C	D	F	RCMT	Insert	Torx			
	Right Hand	Left Hand	Width	Height				Insert	Torx Screw	Key			
SRGCR/L10-06-A	59797	59817	.625	.625	4.000	.250	.750	0602	TS-25.456M1	T-7			
SRGCR/L12-06-B	59798	59818	.750	.750	4.500	.420	1.000	0602					
SRGCR/L16-06-D	59799	59819	1.00	1.00	6.000	.420	1.250	0602					
SRGCR/L20-06-D	59800	59820	1.25	1.25	6.000	.420	1.500	0602					
SRGCR/L12-08-B	59801	59821	.750	.750	4.500	.450	1.000	0803	TS-3.5-7M1	T-8			
SRGCR/L16-08-D	59802	59822	1.00	1.00	6.000	.450	1.250	0803					
SRGCR/L20-08-D	59803	59823	1.25	1.25	6.000	.450	1.500	0803					
SRGCR/L12-10-B	59804	59824	.750	.750	4.500	.470	1.000	1003	TS-35.6-9M1	T-15			
SRGCR/L16-10-D	59805	59825	1.00	1.00	6.000	.470	1.250	1003					
SRGCR/L20-10-D	59806	59826	1.25	1.25	6.000	.470	1.500	1003					

For spare parts ordering number see page 71

SROC R/L Screw Lock Positive RCMT Toolholders



Style O - Profling, Plunging, and Turning for positive round RCMT inserts

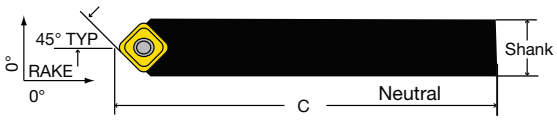


Indexable inserts see page 47

Description	EDP No.	Shank		C	E1	F		RCMT Insert	Insert Torx Screw	Torx Key		
	Neutral	Width	Height									
SROCR/L10-06-A	59837	.625	.625	4.000	.625	.430		0602	TS-25.456M1	T-7		
SROCR/L12-06-B	59838	.750	.750	4.500	.750	.493		0602				
SROCR/L16-06-D	59839	1.00	1.00	6.000	1.00	.618		0602				
SROCR/L20-06-D	59840	1.25	1.25	6.000	1.25	.743		0602				
SROCR/L12-08-B	59841	.750	.750	4.500	.750	.533		0803	TS-3.5-7M1	T-8		
SROCR/L16-08-D	59842	1.00	1.00	6.000	1.00	.658		0803				
SROCR/L20-08-D	59843	1.25	1.25	6.000	.1.250	.783		0803				
SROCR/L12-10-B	59844	.750	.750	4.500	.750	.572		1003	TS-35.6-9M1	T-15		
SROCR/L16-10-D	59845	1.00	1.00	6.000	1.00	.697		1003				
SROCR/L20-10-D	59846	1.25	1.250	6.000	1.25	.822		1003				

SDCN Screw Lock Positive 45° Square Toolholders

Style D 45° Side Cutting Edge Angle for 7° positive square SCMT inserts

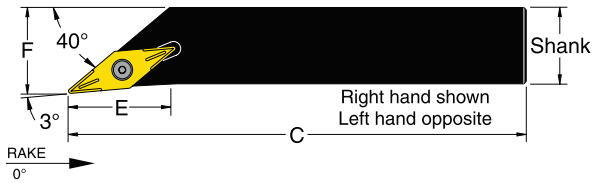


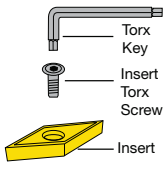
Indexable inserts see page 48

Description	EDP No.	Shank		C			SCMT Insert	Insert Torx Screw	Torx Key			
	Neutral	Width	Height									
SSDCN08-3A	30705	.500	.500	4.0			32.5	TS-4.7-10M1	T-15			
SSDCN10-3B	30706	.625	.625	4.5								
SSDCN12-3B	30707	.750	.750	4.5								

SVJC R/L Screw Lock Positive 35° Diamond Toolholders

Style J Neg. 3° Side Cutting Edge Angle for 7° positive 35° diamond VCMT inserts





Indexable inserts see pages 52-53

Description	EDP No.		Shank		C	E	F	VCMT Insert	Insert Torx Screw	Torx Key			
	Right Hand	Left Hand	Width	Height									
SVJCR/L12-3B	30708	30709	.750	.750	4.5	1.25	1.00	33	TS-4.7-10M1	T-15			
SVJCR/L16-3D	30710	30711	1.00	1.00	6.0	1.25	1.25						
SVJCR/L20-3D	30712	30713	1.25	1.25	6.0	1.25	1.50						

For spare parts ordering number see page 71

SWLC R/L Screw Lock Positive80° Trigon Toolholders

Style L - Neg. 5° End or Side Cutting Edge Angle for 7° positive 80° trigon WCMT inserts

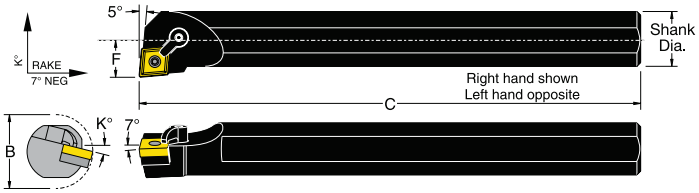
Indexable inserts see page 54

Description	EDP No.		Shank		C	E	F	WCMT Insert	Insert Torx Screw	Torx Key			
	Right Hand	Left Hand	Width	Height									
SWLCR/L06-2J	59795	59794	.375	.375	3.5	.49	.500	21.5	TS-25.45-6M1	T-7			
SWLCR/L08-3A	30714	30715	.500	.500	4.0	.69	.625	32.5	TS-4.7-10M1	T-15			
SWLCR/L10-3B	30716	30717	.625	.625	4.5	.69	.750						
SWLCR/L12-3B	30718	30719	.750	.750	4.5	.69	1.00						
SWLCR/L16-3D	30720	30721	1.00	1.00	6.0	.69	1.25						
SWLCR/L 16-4D	18241	59796	1.00	1.00	6.0	.83	1.250	43	TS-103-4M1	T-20			

For spare parts ordering number see page 71

S-MCLN R/L Multiple Lock Negative 80° Diamond Boring Bars

Style L - Neg. 5° Side or End Cutting Edge Angle for negative 80° diamond CNMG inserts

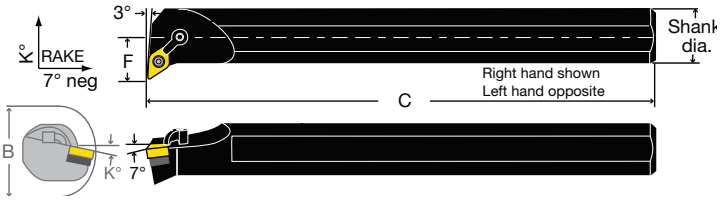


Indexable inserts see pages 20-26

Description	EDP No.		Shank	Min.				CNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Dia.	Bore	C	F	K°	Insert		Pin		Screw	Screw
S16T-MCLNR/L-4	30722	30723	1.00	1.280	12.0	0.640	14°	43	—	NL-44	CL-20	XNS-47	—
S20U-MCLNR/L-4	30724	30725	1.25	1.530	14.0	0.765	14°	43	ICSN-433	NL-46	CL-20	XNS-47	S-46
S24U-MCLNR/L-4	30726	30727	1.50	1.780	14.0	0.890	11°						
S28U-MCLNR/L-4	30728	30729	1.75	2.030	14.0	1.015	11°						
S32V-MCLNR/L-5	30730	30731	2.00	2.562	16.0	1.281	11°	54	ICSN-533	NL-58	CL-12	XNS-510	S-58

S-MDUN R/L Multiple Lock Negative 55° Diamond Boring Bars

Style U - Neg. 3° End Cutting Edge Angle for negative 55°diamond DNMG inserts

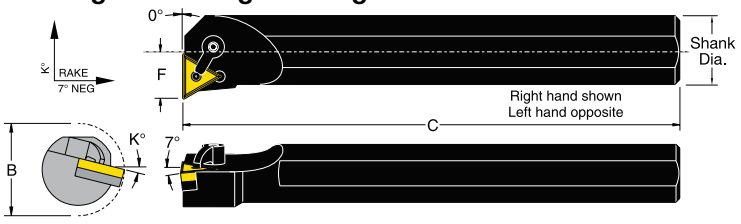


Indexable inserts see pages 27-29

Description	EDP No.		Shank	Min.				DNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Dia.	Bore	C	F	K°	Insert		Pin		Screw	Screw
S20U-MDUNR/L-4	30732	30733	1.25	2.00	14.0	1.000	11°	43	IDSN-433	NL-46	CL-12	XNS-59	S-46
S24U-MDUNR/L-4	30734	30735	1.50	2.25	14.0	1.125	11°						
S32V-MDUNR/L-4	30736	30737	2.00	3.00	16.0	1.375	11°						

S-MTFN R/L Multiple Lock Negative Triangle Boring Bars

Style F - Neg. 0° End Cutting Edge Angle for triangle TNMG inserts



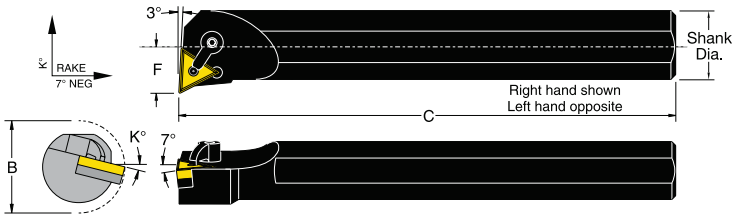
Indexable inserts see pages 33-34

Description	EDP No.		Shank	Min.				TNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Dia.	Bore	C	F	K°	Insert		Pin		Screw	Screw
S16T-MTFNR/L-3	30738	30739	1.00	1.280	12.0	0.640	14°	33	ITSN-322	NL-34L	CL-7	XNS-35	S-34
S20U-MTFNR/L-3	30740	30741	1.25	1.530	14.0	0.765	14°						
S24U-MTFNR/L-4	30742	30743	1.50	2.060	14.0	0.890	11°	43	ITSN-432	NL-46	CL-9	XNS-59	S-46

For spare parts ordering number see page 71

S-MTUN R/L Multiple Lock Negative Triangles Boring Bars

Style U - Neg. 3° End Cutting Edge Angle for negative triangle TNMG inserts

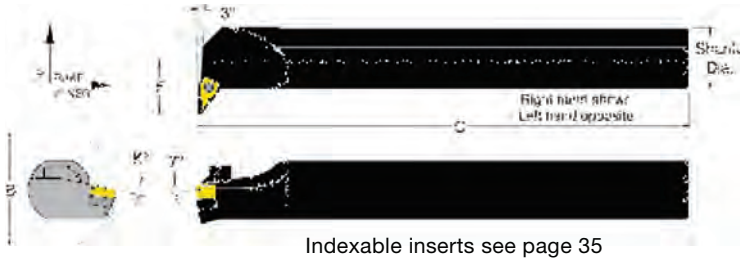


Indexable inserts see pages 33-34

Description	EDP No.		Shank	Min.				TNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Dia.	Bore	C	F	K°	Insert		Pin		Screw	Screw
S12S-MTUNR/L-3	30744	30745	0.75	1.000	10.0	0.500	14°	33	—	NL-33	CL-7	XNS-35	—
S16T-MTUNR/L-3	30746	30747	1.00	1.280	12.0	0.640	14°	33	ITSN-322	NL-34L	CL-7	XNS-35	S-34
S20U-MTUNR/L-4	30748	30749	1.25	1.530	14.0	0.765	14°	43	ITSN-432	NL-46	CL-9	XNS-59	S-46
S24U-MTUNR/L-4	30750	30751	1.50	2.060	14.0	0.890	11°						

S-MVUN R/L Multiple Lock Negative 35° Diamond Boring Bars

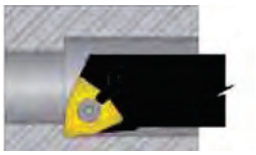
Style U - Neg. 3° End Cutting Edge Angle for negative 35° diamond VNMG inserts



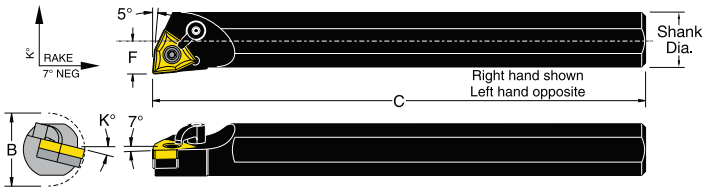
Indexable inserts see page 35

Description	EDP No.		Shank	Min.				VNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Dia.	Bore	C	F	K°	Insert		Pin		Screw	Screw
S12S-MVUNR/L-3	30752	30753	1.00	2.00	12.0	1.000	14°	332	IVSN-322	NL-34L	CL-30	XNS-510	S-34
S32S-MVUNR/L-4	30754	30755	2.00	3.25	16.0	0.625	11°	432	IVSN-433	NL-46	CL-30	XNS-510	S-46

S-MWLN R/L Multiple Lock Negative 80° Trigon Boring Bars



Style L - Neg. 5° Side or End Cutting Edge Angle for negative 80° trigon WNMG inserts



Indexable inserts see pages 36-39

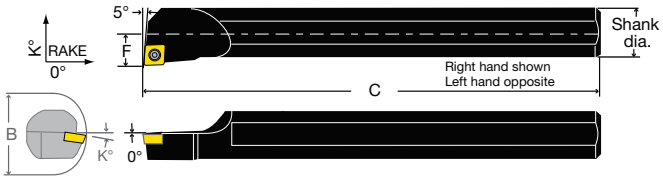
Description	EDP No.		Shank	Min.				TNMG	Seat	Lock	Clamp	Clamp	Seat
	Right Hand	Left Hand	Dia.	Bore	C	F	K°	Insert		Pin		Screw	Screw
S12S-MWLNR/L-3	30756	30757	0.75	0.93	10.0	0.500	14°	33	—	NL-33L	HC-7	SHC-7	
S16T-MWLNR/L-4	30758	30759	1.00	1.28	12.0	0.640	14°	43	—	NL-44	CL-20	XNS-47	
S20U-MWLNR/L-4	30760	30761	1.25	1.53	14.0	0.765	14°	43	IWSN-432	NL-46	CL-20	XNS-47	
S24U-MWLNR/L-4	30762	30763	1.50	1.78	14.0	0.890	11°						

For spare parts ordering number see page 71

BOEHLERIT

S-SCLC R/L Screw Lock Positive 80° Diamond Boring Bars

Style L - Neg. 5° End or Side Cutting Edge Angle for 7° positive 80° diamond CCMT inserts

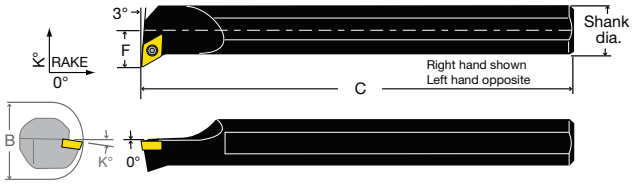


Indexable inserts see pages 40-43

Description	EDP No.		Shank	Min.				CCMT	Insert	Torx
	Right Hand	Left Hand	Dia.	Bore -B	C	F	K°	Insert	Torx Screw	Key
S06M-SCLCR/L-2	30764	30765	0.375	0.500	6.00	.250	-11°	21.5	TS-25.45-6M1	T-7
S08M-SCLCR/L-2	30766	30767	0.500	0.625	6.00	.312	-9°			
S08M-SCLCR/L-3	30768	30769	0.500	0.625	6.00	.312	-11°	32.5	TS-4.7-8M1	T-15
S10R-SCLCR/L-3	30770	30771	0.625	0.812	8.00	.406	-7°			
S12S-SCLCR/L-3	30772	30773	0.750	1.000	10.0	.500	-10°	32.5	TS-4.7-10M1	T-15

S-SDUC R/L Screw Lock Positive 55° Diamond Boring Bars

Style U - Neg. 3° End Cutting Edge Angle for 7° positive 55° diamond DCMT inserts

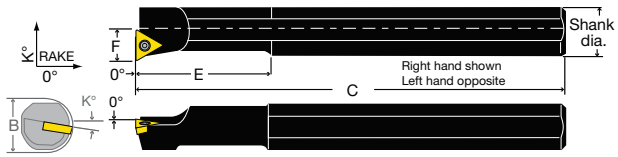


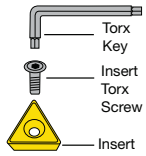
Indexable inserts see pages 44-46

Description	EDP No.		Shank	Min.				DCMT	Insert	Torx
	Right Hand	Left Hand	Dia.	Bore -B	C	F	K°	Insert	Torx Screw	Key
S06M-SDUCR/L-2	30774	30775	0.375	0.625	6.00	.375	-11°			
S08M-SDUCR/L-2	30776	30777	0.500	0.780	6.00	.437	-11°	21.5	TS-25.45-6M1	T-7
S10R-SDUCR/L-2	30778	30779	0.625	0.840	8.00	.500	-5°			
S12S-SDUCR/L-3	30780	30781	0.750	1.125	10.0	.562	-6°	32.5	TS-4.7-10M1	T-15

S-STFC R/L Screw Lock Positive Triangle Boring Bars

Style F - 0° End Cutting Edge Angle for 7° positive triangle TCGT or TCMT inserts



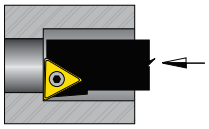


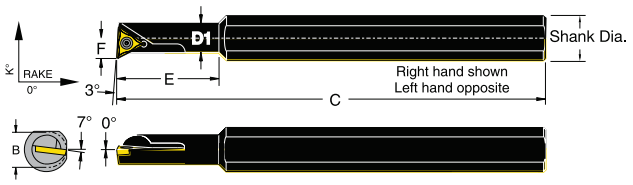
Indexable inserts see pages 50-51

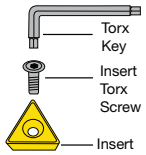
Description	EDP No.		Shank	Min.					TCMT	Insert	Torx
	Right Hand	Left Hand	Dia.	Bore -B	C	E	F	K°	Insert	Torx Screw	Key
S06M-STFCR/L-2	30782	30783	0.375	0.500	6.00	1.00	.250	-11°			
S08M-STFCR/L-2	30784	30785	0.500	0.625	6.00	1.00	.312	-9°	21.5	TS-25.45-6M1	T-7
S12S-STFCR/L-2	30786	30787	0.750	1.000	10.0	1.75	.500	-6°			

For spare parts orzznumber see page 71

S-STUC R Screw Lock Positive Triangle Boring Bars





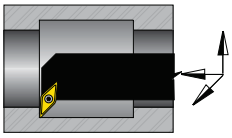


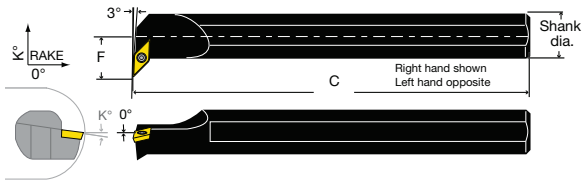
Style U - Neg. 3° End Cutting Edge Angle for 7° positive Triangle inserts TCGT and TCMT

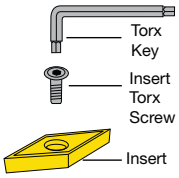
Indexable inserts see pages 50-51

Description	EDP No. Right Hand	Shank Dia.	Min. Bore -B	C	E	F	TCMT Insert	Insert Torx Screw	Torx Key
S06K-STUCR-2	30788	0.500	0.500	5.00	1.25	.208			
S08M-STUCR-2	30789	0.500	0.590	6.00	1.50	.287	21.5	TS-25.45-6M1	T-7
S10R-STUCR-2	30790	0.625	0.750	8.00	2.25	.350			
S12S-STUCR-3	30791	0.750	0.845	10.0	2.50	.422	32.5	TS-4.7-10M1	T-15
S16T-STUCR-3	30792	1.000	1.115	12.0	3.00	.555			

S-SVUC R/L Screw Lock Positive 35° Diamond Boring Bars





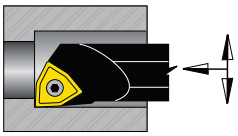


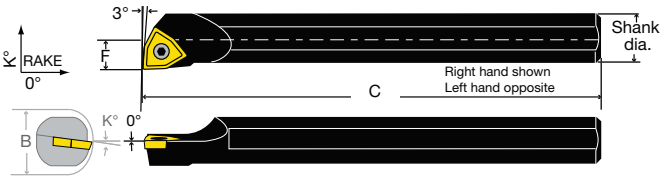
Style U - Neg. 3° End Cutting Edge Angle for 7° positive 35° diamond VCMT inserts

Indexable inserts see pages 52-53

Description	EDP No. Right Hand	EDP No. Left Hand	Shank Dia.	Min. Bore -B	C	F	K°	VCMT Insert	Insert Torx Screw	Torx Key
S12S-SVUCR/L-2	30793	30794	0.75	1.125	10.0	.625	-6°	22	TS-T-7	
S16T-SVUCR/L-2	30795	30796	1.00	1.500	12.0	.750	-6°			
S16T-SVUCR/L-3	30797	30798	1.00	2.000	12.0	.750	-6°	33	TS-4.7-10M1	T-15
S20U-SVUCR/L-3	30799	30800	1.25	2.250	14.0	1.00	-6°			

S-SWUC R/L Screw Lock Positive 80° Trigon Boring Bars





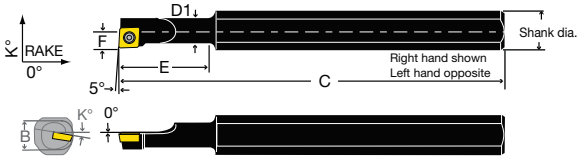
Style U - Neg. 3° End Cutting Edge Angle for 7° positive 80° trigon WCMT inserts

Indexable inserts see page 54

Description	EDP No. Right Hand	EDP No. Left Hand	Shank Dia.	Min. Bore -B	C	F	K°	WCMT Insert	Insert Torx Screw	Torx Key
S06M-SWUCR/L-2	59793	59792	0.375	0.500	6.00	.250	-11°	21.5	TS-25.45-6M1	T-7
S08M-SWUCR/L-2	59791	59790	0.500	0.625	6.00	.312	-9°			
S08M-SWUCR/L-3	30801	30802	0.500	0.625	6.00	.312	-11°	32.5	TS-4.7-8M1	T-15
S10R-SWUCR/L-3	30803	30804	0.625	0.812	8.00	.406	-7°			
S12S-SWUCR/L-3	30805	30806	0.750	1.000	10.0	.500	-10°	32.5	TS-4.7-10M1	T-15
S16T-SWUCR/L-4	59789	59788	1.000	1.280	12.00	.640	-5°	43	TS-103-4M1	T-20

For spare parts ordering number see page 71

S-SCLC R Screw Lock Mini 80° Boring Bars

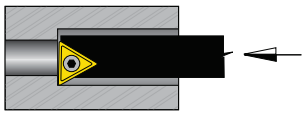


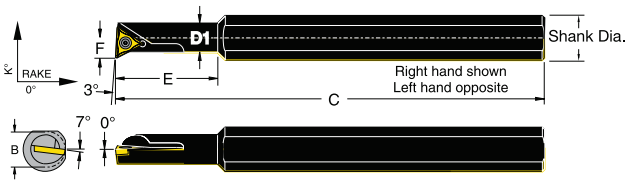
Style L - Neg. 5° End Cutting
Edge Angle for 7° positive
80° diamond CCMT inserts

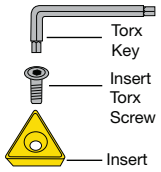
Indexable inserts see pages 40-43

Description	EDP No. Right Hand	Shank Dia.	Min. Bore -B	C	D1	E	F	K°	CCMT Insert	Insert Torx Screw	Torx Key
S06H-SCLCR-2	30807	0.375	0.394	4.00	.315	1.25	.236	-11°	21.5	TS-25.45-6M1	T-7
S08K-SCLCR-2	30808	0.500	0.550	5.00	.390	1.50	.275	-9°			
S10M-SCLCR-2	30809	0.625	0.708	6.00	.472	2.00	.354	-7°			

S-STUC R Screw Lock Mini Triangle Boring Bars







Style U - Neg. 3° End Cutting
Edge Angle for 7° positive
triangle TCMT inserts

Indexable inserts see pages 50-51

Description	EDP No. Right Hand	Shank Dia.	Min. Bore -B	C	D1	E	F	TCMT Insert	Insert Torx Screw	Torx Key
S08H-STUCR-1.2-2	30810	0.500	0.286	4.00	.265	1.125	.143	21.5	TS-06	T-6
S08H-STUCR-1.2-3	30811	0.500	0.313	4.00	.300	1.125	.157			
S08H-STUCR-1.2-4	30812	0.500	0.374	4.00	.358	1.125	.189			

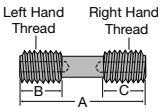
For spare parts ordering number see page 71

Shim Seat

Sold in pkgs. of 10

Desc.	EDP No.	A	T	R
Neg. 80° Diamond Shim Seat				
ICSN-432	30813	.500	.1875	.0312
ICSN-433	30814	.500	.1875	.0469
ICSN-533	30815	.625	.1875	.0469
ICSN-633	30816	.625	.1875	.0469
Neg. 55° Diamond Shim Seat				
IDSN-423	30817	.500	.1250	.0469
IDSN-432	30818	.500	.1875	.0312
IDSN-433	30819	.500	.1875	.0469
Neg. 35° Diamond Shim Seat				
IVSN-322	30820	.375	.1250	.0312
IVSN-324	30821	.375	.1250	.0625
Neg. Square Shim Seat				
ISSN-322	30822	.375	.1250	.0312
ISSN-323	30823	.375	.1250	.0469
ISSN-423	30824	.500	.1250	.0469
ISSN-432	30825	.500	.1875	.0312
ISSN-433	30826	.500	.1875	.0469
ISSN-633	30827	.500	.1875	.0469
Neg. Triangle Shim Seat				
ITSN-322	30828	.375	.1250	.0312
ITSN-323	30829	.375	.1250	.0469
ITSN-332	30830	.375	.1875	.0312
ITSN-333	30831	.375	.1875	.0469
ITSN-432	30832	.500	.1875	.0312
ITSN-433	30833	.500	.1875	.0469
Neg. 80° Trigon Shim Seat				
IWSN-322	30834	.375	.1250	.0312
IWSN-432	30835	.500	.1875	.0312
IWSN-433	30836	.500	.1875	.0469

Finger Clamp Screw



Sold in pkgs. of 10

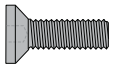
Desc.	EDP No.	A	B	C	Thread	Hex Size
XNS-35	30851	0.625	.22	.22	10-32	3/32
XNS-36	30852	0.750	.25	.25	10-32	3/32
XNS-47	30853	0.875	.28	.28	1/4-28	1/8
XNS-48	30854	1.000	.37	.37	1/4-28	1/8
XNS-58	30855	1.000	.50	.28	5/16-24	5/32
XNS-59	30856	1.125	.47	.41	5/16-24	5/32
XNS-510	30857	1.250	.50	.50	5/16-24	5/32

Multi-Lock Seat Screw

Sold in pkgs. of 10

Desc.	EDP No.	Insert I.C.	Thread	Hex Size
S-34	30858	.375	10-32	5/64
S-46	30859	.500	1/4-28	3/32
S-58	30860	.625	5/16-24	1/8

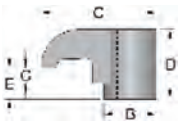
Insert Torx Screw



Sold in pkgs. of 10

Desc.	EDP No.	Insert I.C.	Torx Key
Insert Torx Screw			
TS-06	30863	.156	T-6
TS-25.45-6M1	30861	.250	T-7
TS-4.7-8M1	30864	.375	T-15
TS-4.7-10M1	30862	.375	T-15
TS-44-3	30865	.375	T-10
TS-103-4M1	59785	.500	T-120
TS-3.5-7M1	59779	.315	T-8
TS-35.6-9M1	59778	.394	T-15

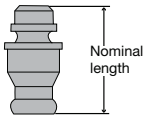
Finger Clamp



Sold in pkgs. of 10

Desc.	EDP No.	B	C	D	E	G	Thread
CL-5	30837	.280	.52	.350	.102	—	10-32
CL-6	30838	.310	.58	.440	.187	.094	10-32
CL-7	30839	.310	.64	.310	.082	—	10-32
CL-9	30840	.430	.75	.660	.344	.125	5/16-24
CL-12	30841	.430	.88	.660	.344	.125	5/16-24
CL-20	30842	.375	.73	.380	.125	—	1/4-28
CL-30	30843	.430	1.0	.660	.344	.125	5/16-24

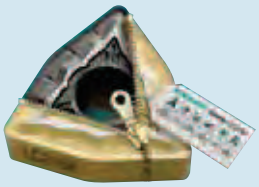
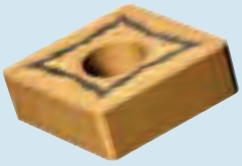
Negative Lock Pin



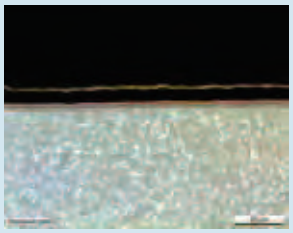
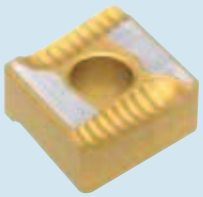
Sold in pkgs. of 10

Desc.	EDP No.	Insert I.C.	Nominal Length	Thread	Hex Size
NL-33	30844	.375	.344	10-32	5/64
NL-33L	30845	.375	.406	10-32	5/64
NL-34	30846	.375	.453	10-32	5/64
NL-34L	30847	.375	.516	10-32	5/64
NL-44	30848	.500	.516	1/4-28	3/32
NL-46	30849	.500	.672	1/4-28	3/32
NL-58	30850	.625	.859	5/16-24	1/8

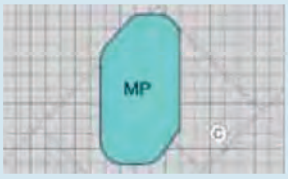
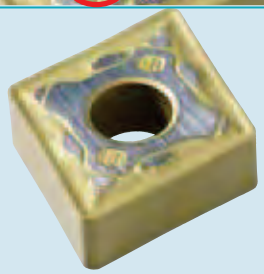
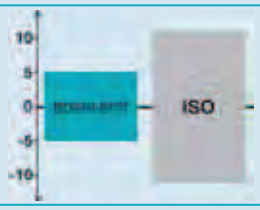
Yellow ceramic coating provides improved performance and makes signs of wear visible at a glance.
LC215K boasts a 30% improvement in tool life and markedly improved cutting speeds.
LC225K has not only a higher wear resistance but also higher toughness on a wide range of steel material.
The innovative turning grades have an extremely hard and heat-resistant Al_2O_3 coating. The new yellow ceramic layer is of particular relevance: wear can be recognised immediately at a glance. The heat-dissipating Drytec surfaces improve dynamic machining and make dry machining possible.

Technological advantages		Customer benefits
First yellow ceramic coating		Three advantages in one coating: Higher cutting speeds in combination with a 30% improvement in tool life. Easy recognition of signs of wear.
Durotec adhesion layer – interlocked design of cross-over between layers		Optimised adhesion of layers guarantees safe cutting speeds of over 300 m/min when working steel materials
Smooth and good-grip indexable inserts		Reduced built-up edge formation and no smudging of indexable inserts through fingerprints
Gradient carbide - carbide enriched with cobalt in the periphery		Greater machining safety, decreased propensity to micro-breakage
Heat-dissipating Drytec surfaces ground after coating		Improved heat dissipation by the tool – makes dry machining possible

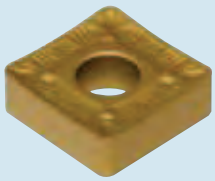
The new LC240F Steeltec steel turning grade guarantees maximum performance in heavy interrupted cutting thanks to the combination of an extremely tough carbide with the new "Nanolock MT-CVD layer".
This grade extends the application range of the new Steeltec LC200- Generation in the tough application area and secures the leading position of the Steeltec turning generation with two patents.

Technological advantages		Customer benefits
Thin MT-CVD coating and yellow cover layer		Soft cut and easy recognition of signs of wear
Nanolock adhesion layer-interlocked design of cross-over between layers		Optimised adhesion of layers guarantees high cutting speed
Extrem tough Gradient carbide-carbide enriched with cobalt in the periphery		Great machining safety, also with heavy interrupted cut
Heat-dissipating Drytec surface ground after coating		Improved heat dissipation through the tool and perfect bearing surface in the toolholder

The Steeltec turning family from Boehlerit is expanded by a new geometry generation. Boehlerit has taken a new path with the development of the chip breaker. The chip breaker has been tested in a special optical “chip channel” and is continuously optimized through rapid prototyping.
The result of the new universal turning geometry MP (middle ISO P steel application) which is provided with a stabilisation chamfer against chip impact when turning against shoulder as well as optimally constructed to prevent cratering thus essentially contributes to increasing the service life. Furthermore the ground surface of the inserts has been increased by 200 %, which essentially improves the dynamic machining.

Technological advantages		Customer benefits
Cutting edge area stabilised in the middle; optimised micro-geometry		No breakage at chip impact. Turning against the shoulder
Chip breaker optimised in the machining tunnel; remarkably soft cut		Reduced friction therefore less cratering, resulting in prolonged tool life
Macro-geometry designed for wide feeding range		Universal geometry with wide chip breaking range
Corner radius dimension and application range are pressed along in the process		Simple allocation of indexable inserts
Particularly large ground surface		Any vibration tendency is virtually eliminated
Drytec heat dissipation faces ground after coating		Improved heat dissipation by the tool facilitates dry turning
Tolerances considerably smaller than specified in the ISO standard		Higher turn down precision

When developing the new RP geometry, the Boehlerit development engineers also chose the solution with the optical “chip channel”. The result of this development is a roughing geometry which features extremely soft chip breaking properties and is very easy to cut. In connection with the Steeltec turning types LC215K, LC225K as well as the new and extremely tough LC240F, Boehlerit now has three extraordinarily economical turning qualities which are all equipped with the ultra-modern innovative Nanolock adhesion layer.

Technological advantages		Customer benefits
Cutting edge area stabilised in the middle; optimised micro-geometry.		Reduced power consumption and thus more machine-friendly.
Chip breaker optimised in the „chip channel“ with particularly soft cut and extremely good chip flow.		The particular cutting edge design results in an insert with good cutting properties. Chip breaking already in the lower feed range.
Macro geometry designed for wide feed range.		Geometry especially developed for heavy-duty applications
Corner radius dimension and application range are pressed along in the process.		Simple allocation of indexable inserts.

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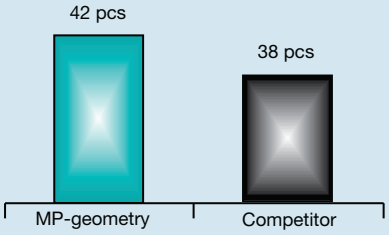
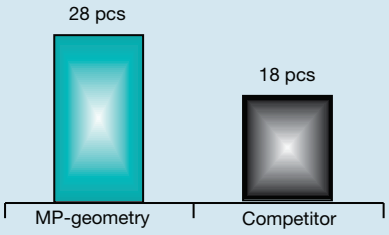
Result



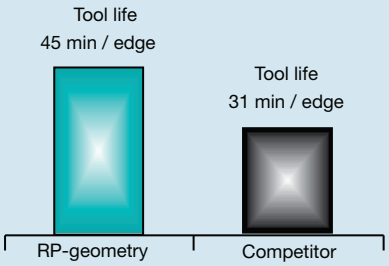
Application:	External turning
Work piece:	Bush
Material:	SAE 4140
Insert / Grade:	CNMG 432-MP LC215K
Cutting data:	v_c 820 - 984 sfm a_p .087 inch f .012 - .018 inch/rev
Cooling:	Emulsion

Result



Application:	Roughing - External Turning
Work piece:	Drill Bit
Material:	SAE 4340
Insert / Grade:	CNMG 432-MP LC225K
Cutting data:	v_c 722 sfm a_p .138 inch f .014 inch/rev
Cooling:	Emulsion

Result

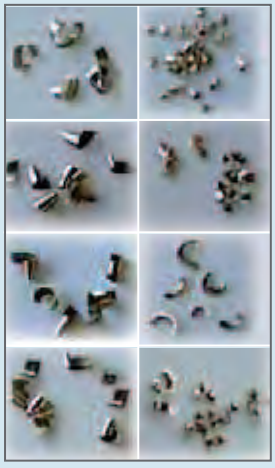


Application:	Roughing - External Turning
Work piece:	Rod
Material:	AISI 347H
Insert / Grade:	SNMM 644-RP LC240F
Cutting data:	v_c 184 sfm a_p .236 - .315 inch f .035 inch/rev
Cooling:	Emulsion

This turning grade has been specifically developed for materials with alloying elements such as Cr (chrome), Ni (nickel), Mo (molybdenum) and S (sulfur), all elements which are found in austenitic stainless steels.
The combination of gradient sinter technology (responsible for increased toughness quality of the cutting edge) and a MT CVD coating minimizing edge built-up makes LC435D the optimum cutting material for all austenitic stainles steels

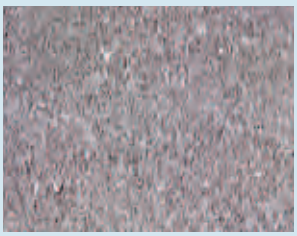
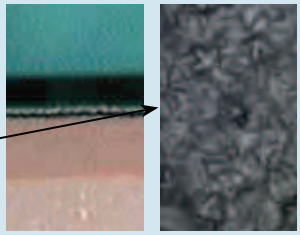
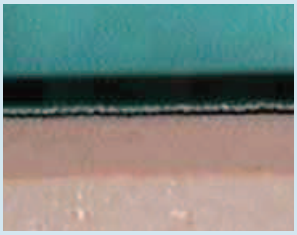
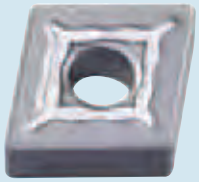
Technological advantages

Customer benefits

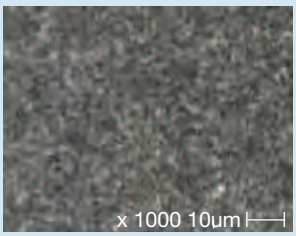
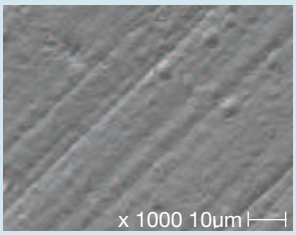
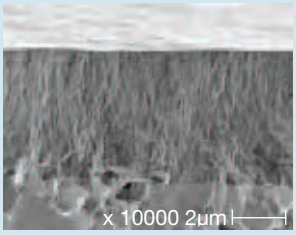
New cutting technology affords even coating build up and extremely smooth insert surface finish.			Reduced built up edges when machining austenitic stainless steels.
Gradient sinter gives increased protection to the cutting edge.			More positive micro-geometry compared to conventional grades eliminates work hardening of the machined austenitic stainless steels
Ground heat dissipation faces through seat grinding after coating.			Reduced heat transfer from cutting assembly to the work-piece, heat dissipation increased into the tool holding system.
Four specialized chipbreakers for Austenitic Stainless Steel **B**oehlerit **F**inishing/**M**edium **S**tainless Steel **B**oehlerit **M**edium **S**tainless Steel **B**oehlerit **M**edium/**R**oughing **S**tainless Steel **B**oehlerit ISO-**S** **M**edium **S**tainless Steel			Optimized chip breaking over a wide application base.

Casttec LC620H goes on and on and on...

The new turning grade Casttec® LC620H has been developed with a new tough carbide substrate. This guarantees manufacturing security when machining grey cast iron (GG) and nodular cast iron (GGG). An innovation in coating, combining an interlocked interlayer with a protective ceramic coating results in highly economic machining at cutting speeds in the range of 1300 sfm for the environmentally - friendly dry machining on grey cast materials.

Technological advantage		Customer benefits
Tough substrate thanks to specially selected base materials.		Machining security even when machining difficult materials (GGG 50/60) and interrupted cutting.
Interlocked interlayer for increased coating (Interlocked interlayer)		Guarantees economic machining in the range of 1300 sfm on grey cast iron (GG)
Protective ceramic coating as heat and diffusion barrier (Protective ceramic coating)		Reduces cratering. Therefore, longer tool life.
Following the coating process the insert seating faces are ground to ensure increased stability (Inserts with chip breakers)		Greater heat transfer through the insert and the tool holder. Therefore cost effective environmentally - friendly dry machining is possible on cast irons.

Supertec LC415Z: For easier machining of super alloys like Inconel, Hastelloy, etc.
A micro-grain substrate and an extremely smooth super nitride coating are provided by this grade; LC415Z is particularly suitable for interrupted cutting. This means that high cutting speeds and tool life are guaranteed.

Technological advantage		Customer benefits
Micro grain substrate for better edge stability		Higher machining safety on superalloys
Special high-temperature resistant supernitride coating		Higher cutting speed due to greater thermal stability of the coating
High aluminium content and fine crystal structure		Longer service life and lower piece costs
Positive macrogeometry and sharp microgeometry		Good chip breaking characteristics on materials that are notoriously difficult to machine

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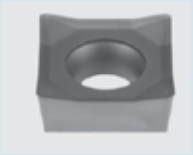
Boehlerit reaps the benefits of Plasma CVD coating technology in the latest grade developed: the LC610T, specially designed for the machining of aluminum. The wafer-thin 1.5 µm TiAlN coating guarantees convincing results from this revolutionary development. Above all, in the machining of aluminum materials and other nonferrous metals. The ultra-thin coating also makes finish-machining on steel and stainless steelspossible.
The new BAL (Boehlerit ALuminum) chip breaker with wave-shape cutting edge guarantees even shorter chips in a wide range of applications, thanks to improved transverse compression.

	Technological advantage		Customer benefits
Up to now		LC610T	
	Ultra smooth insert surface due to the micro-thin coating structure		Greatly reduced sticking tendency, and no edge build-up
	Geometry BAL (**B**oehlerit **AL**uminum) with wafer-thin (1.5 µm) coating - sharp cutting edge		Excellent workpiece surface
	Wave shaped highly positive chip breaker: BAL geometry		Optimum chip breaking, short chips
	Coated indexable inserts for aluminum machining		Considerably less flank wear, no edge build-up on the clearance face, even more economical

Cutting data standard values: LC215K

Material group	Main workpiece material groups and their characteristic letters Workpiece material		Brinell hardness HB	Cutting speed v_c =sfm **LC215K** f = inch/rev .016 - .031	.01 - .016	.002 - .01
P	Unalloyed steel[1]	≈0,15%C annealed	125	689 - 951	984 - 1312	1181 - 1575
		≈0,45%C annealed	190	591 - 820	853 - 1247	1050 - 1476
		≈0,45%C hardened and temp.	250	459 - 689	591 - 984	689 - 1181
		≈0,75%C annealed	270	558 - 787	787 - 1050	984 - 1378
		≈0,75%C hardened and temp.	300	427 - 623	492 - 787	689 - 951
	Low-alloy steel[1]	annealed	180	558 - 787	722 - 1050	984 - 1476
		hardened and temp.	275	427 - 656	591 - 853	689 - 1083
		hardened and temp.	300	394 - 591	558 - 820	656 - 984
		hardened and temp.	350	361 - 558	492 - 722	591 - 787
	High-alloy steel and high-alloy tool steel[1]	annealed	200	492 - 722	722 - 919	853 - 1378
		hardened and temp.	325	328 - 525	459 - 591	558 - 722
	Stainless steel[1]	ferritic / martensitic annealed	200	558 - 722	656 - 919	853 - 1115
		martensitic hardened and temp.	240	459 - 558	492 - 623	689 - 853
M	Stainless steel[1]	austenitic[2], quenched	180			
K	Grey cast iron	perlitic / ferritic	180	591 - 787	787 - 1115	1050 - 1575
		perlitic (martensitic)	260	394 - 591	492 - 656	591 - 689
	Nodular graphite cast iron	ferritic	160	492 - 656	591 - 787	689 - 984
		perlitic	250	394 - 525	525 - 656	591 - 755
	Malleable cast iron	ferritic	130	459 - 656	623 - 787	689 - 984
		perlitic	230	394 - 591	558 - 722	623 - 787

Cutting data standard values: LC225K

Material group	Main workpiece material groups and their characteristic letters Workpiece material		Brinell hardness HB	Cutting speed v_c =sfm **LC225K** f = inch/rev .016 - .031	.01 - .016	.002 - .01
P	Unalloyed steel[1]	≈0,15%C annealed	125	492 - 656	689 - 984	837 - 1345
		≈0,45%C annealed	190	427 - 591	623 - 886	755 - 1247
		≈0,45%C hardened and temp.	250	328 - 492	427 - 689	492 - 837
		≈0,75%C annealed	270	394 - 558	558 - 755	689 - 984
		≈0,75%C hardened and temp.	300	295 - 459	361 - 558	492 - 656
	Low-alloy steel[1]	annealed	180	394 - 558	492 - 755	689 - 1050
		hardened and temp.	275	295 - 459	427 - 623	492 - 755
		hardened and temp.	300	279 - 427	394 - 591	459 - 689
		hardened and temp.	350	262 - 394	361 - 492	427 - 558
	High-alloy steel and high-alloy tool steel[1]	annealed	200	361 - 492	492 - 656	623 - 984
		hardened and temp.	325	230 - 361	279 - 427	394 - 492
	Stainless steel[1]	ferritic / martensitic annealed	200	394 - 492	459 - 656	623 - 787
		martensitic hardened and temp.	240	279 - 394	361 - 459	492 - 623
M	Stainless steel[1]	austenitic[2], quenched	180	295 - 361	394 - 525	394 - 623
K	Grey cast iron	perlitic / ferritic	180			
		perlitic (martensitic)	260			
	Nodular graphite cast iron	ferritic	160			
		perlitic	250			
	Malleable cast iron	ferritic	130			
		perlitic	230			

[1] and cast steel

[2] and austenitic / ferritic

[3] Rm = tensile strength in N/mm²

[4] HRC = Rockwell hardness C

= wet machining

= dry machining

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Cutting data standard values: LC240F

Material group	Main workpiece material groups and their characteristic letters Workpiece material		Brinell hardness HB	Cutting speed v_c =sfm **LC240F** f = inch/rev .016 - .031	.01 - .016	.002 - .01
P	Unalloyed steel[1]	≈0,15%C annealed	125	197 - 328	230 - 361	295 - 558
		≈0,45%C annealed	190	197 - 328	230 - 361	295 - 558
		≈0,45%C hardened and temp.	250	197 - 328	230 - 361	295 - 558
		≈0,75%C annealed	270	197 - 328	230 - 361	295 - 558
		≈0,75%C hardened and temp.	300	197 - 328	230 - 361	295 - 558
	Low-alloy steel[1]	annealed	180	197 - 328	230 - 361	295 - 558
		hardened and temp.	275	230 - 361	230 - 361	295 - 558
		hardened and temp.	300	197 - 328	230 - 361	295 - 558
		hardened and temp.	350	180 - 262	230 - 361	295 - 558
	High-alloy steel and high-alloy tool steel[1]	annealed	200	262 - 361	230 - 361	295 - 558
		hardened and temp.	325	197 - 295	230 - 361	295 - 558
	Stainless steel[1]	ferritic / martensitic annealed	200	295 - 427	230 - 361	295 - 558
		martensitic hardened and temp.	240	230 - 361	230 - 361	295 - 558
M	Stainless steel[1]	austenitic[2], quenched	180	230 - 328	295 - 459	361 - 558
K	Grey cast iron	perlitic / ferritic	180			
		perlitic (martensitic)	260			
	Nodular graphite cast iron	ferritic	160			
		perlitic	250			
	Malleable cast iron	ferritic	130			
		perlitic	230			

[1] and cast steel

[2] and austenitic / ferritic

[3] Rm = tensile strength in N/mm²

[4] HRC = Rockwell hardness C

= wet machining

= dry machining

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Cutting data standard values: LC415Z

Material group	Main workpiece material groups and their characteristic letters Workpiece material		Brinell hardness HB	Cutting speed v_c =sfm **LC415Z** f = inch/rev .016 - .031	.01 - .016	.002 - .01
M	Stainless steel[1]	austenitic[2], quenched	180		427 - 656	
K	Grey cast iron	perlitic / ferritic	180			
		perlitic (martensitic)	260			
	Nodular graphite cast iron	ferritic	160			
		perlitic	250			
	Malleable cast iron	ferritic	130			
		perlitic	230			
N	Aluminium wrought alloys	unhardenable	60			
		hardenable, hardened	100			
	Aluminium cast alloys	≤ 12% Si. unhardenable	75			
		≤ 12% Si. hardenable, hardened	90			
		> 12% Si. unhardenable	130			
	Copper and copper alloys (Bronze / Brass)	Free cutting alloys Pb>1%	110			
		Brass, Red bronze	90			
		Bronze, non leaded copper and electrolitic copper	100			
	Nonmetallic materials	Duroplastics				
		Fibre reinforced plastics Hard rubber				
S	Heat resistant alloys	Fe- based annealed	200		131 - 328	
		Fe- based hardened	280		98 - 230	
		Ni- or Co-based annealed	250		164 - 279	
		Ni- or Co-based hardened	350		66 - 164	
		Ni- or Co-based cast	320		98 - 164	
	Titanium alloys	Pure titanium	Rm[3] 400		164 - 328	
		Alpha- and Beta-alloys hardened	Rm[3] 1050		131 - 262	

[1] and cast steel [2] and austenitic / ferritic [3] Rm = tensile strength in N/mm² [4] HRC = Rockwell hardness C

Cutting data standard values: LC415X

Material group	Main workpiece material groups and their code letters	Cutting speed v_c= sfm **LC415X**	Feed f=inch/rev
P	Machining steel	328 - 722	.0004 - .006
	Steel < 180 HB	328 - 591	.0004 - .008
	Steel > 238 HB	60 - 427	.0004 - .006
M	Stainless steel	60 - 459	.0004 - .008
N	Aluminium	200 - 2.624	.0004 - .012
	Bronze, Brass, Copper	328 - 1.640	.0004 - .012
S	Titanium	131 - 295	.0004 - .006

= wet machining = dry machining

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Cutting data standard values: LC435D

Material group	Main workpiece material groups / Material		Brinell hardness HB	Negative indexable inserts ISO-P-System					Positive indexable inserts ISO-S-System				
				Geometry	Corner radius	Recommended a_p inch	Recommended f_n inch/rev	Cutting speed v_c sfm	Geometry	Corner radius	Recommended a_p inch	Recommended f_n inch/rev	Cutting speed v_c sfm
M	Ferritic	403, 410S, 430, 430F, 434, F6NM, S44600	180	BFMS	1	.020	.006	591 - 820					
					2	.039	.008	525 - 722					
					3	.079	.010	492 - 656					
				BMS	2	.079	.010	525 - 722	BSMS	1	.016	.006	591 - 820
					3	.118	.012	492 - 656		2	.039	.008	525 - 722
					4	.157	.014	459 - 591					
				BMRS	2	.118	.014	492 - 656					
					3	.157	.018	459 - 591					
					4	.197	.020	394 - 525					
	Martensitic	403, 420, 420 SAE, 431	320	BFMS	1	.020	.006	459 - 689					
					2	.039	.008	394 - 591					
					3	.079	.010	361 - 525					
				BMS	2	.079	.010	394 - 591	BSMS	1	.016	.006	459 - 689
					3	.118	.012	361 - 525		2	.039	.008	394 - 591
					4	.157	.014	328 - 459					
				BMRS	2	.118	.014	361 - 525					
					3	.157	.018	328 - 459					
					4	.197	.020	295 - 427					
	Austenitic	301, 302, 303, 304, 304L, 304LN, 305L,	180	BFMS	1	.020	.006	591 - 820					
					2	.039	.008	525 - 722					
					3	.079	.010	492 - 656					
				BMS	2	.079	.010	525 - 722	BSMS	1	.016	.006	591 - 820
					3	.118	.012	492 - 656		2	.039	.008	525 - 722
					4	.157	.014	459 - 591					
				BMRS	2	.118	.014	492 - 656					
					3	.157	.018	459 - 591					
					4	.197	.020	394 - 525					
		316, 316L, 316LN, 317, 317L	180	BFMS	1	.020	.006	525 - 722					
					2	.039	.008	459 - 656					
					3	.079	.010	427 - 591					
				BMS	2	.079	.010	459 - 656	BSMS	1	.016	.006	525 - 755
					3	.118	.012	427 - 591		2	.039	.008	459 - 656
					4	.157	.014	394 - 525					
				BMRS	2	.118	.014	427 - 591					
					3	.157	.018	394 - 525					
					4	.197	.020	328 - 459					

The above recommendations are given for wet machining. For dry machining the recommended values for the cutting speed have to be reduced by appr. 20 %.

Cutting data standard values: LC435D

Material group	Main workpiece material groups: Material		Brinell hardness HB	Negative indexable inserts ISO-P-System: Geometry	Corner radius	Recommended a_p inch	Recommended f_n inch/rev	Cutting speed v_c sfm	Positive indexable inserts ISO-S-System: Geometry	Corner radius	Recommended a_p inch	Recommended f_n inch/rev	Cutting speed v_c sfm
M	Austenitic	318, 321, 321H, 347, F51	180	BFMS	1	.020	.006	459 - 656					
					2	.039	.008	394 - 591					
					3	.079	.010	361 - 525					
				BMS	2	.079	.010	394 - 591	BSMS	1	.016	.006	459 - 689
					3	.118	.012	361 - 525		2	.039	.008	394 - 591
					4	.157	.014	328 - 459					
				BMRS	2	.118	.014	361 - 525					
					3	.157	.018	328 - 459					
					4	.197	.020	262 - 394					
	Hardened austenitic steels	309, 310S, 630, 631, EV8, S13800, S17700	330	BFMS	1	.020	.006	394 - 591					
					2	.039	.008	328 - 525					
					3	.079	.010	295 - 459					
				BMS	2	.079	.010	328 - 525	BSMS	1	.016	.006	394 - 591
					3	.118	.012	295 - 459		2	.039	.008	328 - 525
					4	.157	.014	262 - 394					
				BMRS	2	.118	.014	295 - 459					
					3	.157	.018	262 - 394					
					4	.197	.020	230 - 361					
	Duplex (austenitic/ ferritic	329, F51	260	BFMS	1	.020	.006	328 - 525					
					2	.039	.008	295 - 459					
					3	.079	.010	262 - 394					
				BMS	2	.079	.010	295 - 459	BSMS	1	.016	.006	328 - 525
					3	.118	.012	262 - 394		2	.039	.008	295 - 459
					4	.157	.014	246 - 328					
				BMRS	2	.118	.014	262 - 394					
					3	.157	.018	246 - 361					
					4	.197	.020	230 - 295					

The above recommendations are given for wet machining. For dry machining the recommended values for the cutting speed have to be reduced by appr. 20 %.

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Cutting data standard values: LC610H, LC620H

Material group	Main workpiece material groups and their characteristic letters Workpiece material			Brinell hardness HB	Cutting speed v_c =sfm **LC610H, LC620H** f = inch/rev .016 - .031	.01 - .016	.002 - .01
P	Unalloyed steel[1]	≈0,15%C	annealed	125			
		≈0,45%C	annealed	190			
		≈0,45%C	hardened and temp.	250			
		≈0,75%C	annealed	270			
		≈0,75%C	hardened and temp.	300			
	Low-alloy steel[1]	annealed		180			
		hardened and temp.		275			
		hardened and temp.		300			
		hardened and temp.		350			
	High-alloy steel and high-alloy tool steel[1]	annealed		200			
		hardened and temp.		325			
	Stainless steel[1]	ferritic / martensitic annealed		200			
		martensitic hardened and temp.		240			
M	Stainless steel[1]	austenitic[2], quenched		180			
K	Grey cast iron	perlitic / ferritic		180	689 - 984	984 - 1476	1148 - 1640
		perlitic (martensitic)		260	459 - 656	558 - 787	623 - 886
	Nodular graphite cast iron	ferritic		160	492 - 689	591 - 853	689 - 984
	Malleable cast iron	perlitic		250	361 - 525	427 - 623	492 - 656
		ferritic		130	656 - 919	722 - 984	787 - 1083
		perlitic		230	328 - 492	459 - 722	558 - 787
N	Aluminium wrought alloys	unhardenable		60			
		hardenable, hardened		100			
	Aluminium cast alloys	≤ 12% Si. unhardenable		75			
		≤ 12% Si. hardenable, hardened		90			
		> 12% Si. unhardenable		130			
	Copper and copper alloys (Bronze / Brass)	Free cutting alloys Pb>1%		110			
		Brass, Red bronze		90			
		Bronze, non leaded copper and electrolitic copper		100			
	Nonmetallic materials	Duroplastics Fibre reinforced plastics					
		Hard rubber					
S	Heat resistant alloys	Fe- based	annealed	200			
			hardened	280			
		Ni- or Co-based	annealed	250			
			hardened	350			
		cast		320			
	Titanium alloys	Pure titanium		Rm[3]400			
		Alpha- and Beta-alloys hardened		Rm[3] 1050			
H	Hardened steel	hardened and tempered		55HRC[4]			
		hardened and tempered		60HRC[4]			
	Chilled cast iron	cast		400			
	Hardened cast iron	hardened and tempered		55HRC[4]			

[1] and cast steel

[2] and austenitic / ferritic

[3] Rm = tensile strength in N/mm²

[4] HRC = Rockwell hardness C

= wet machining

= dry machining

Cutting data standard values: LC610T

Material group	Main workpiece material groups and their characteristic letters Workpiece material		Brinell hardness HB	Cutting speed v_c = sfm **LC610T** f = inch/rev .016 - .031	.01 - .016	.002 - .01
M	Stainless steel[1]	austenitic[2], quenched	180			**394 - 984
K	Grey cast iron	perlitic / ferritic	180			*262 - 820
		perlitic (martensitic)	260			
	Nodular graphite cast iron	ferritic	160			*230 - 656
		perlitic	250			
	Malleable cast iron	ferritic	130			*262 - 722
		perlitic	230			
N	Aluminium wrought alloys	unhardenable	60	1640 - 6562	1969 - 8202	2297 - 9843
		hardenable, hardened	100	656 - 3281	984 - 4921	1312 - 6562
	Aluminium cast alloys	≤ 12% Si. unhardenable	75	1312 - 2625	1640 - 3937	1969 - 4921
		≤ 12% Si. hardenable, hardened	90	984 - 1969	1312 - 2953	1640 - 3937
		> 12% Si. unhardenable	130	656 - 1969	984 - 2625	1312 - 3281
	Copper and copper alloys (Bronze / Brass)	Free cutting alloys Pb>1%	110	820 - 1312	820 - 1640	1476 - 2133
		Brass, Red bronze	90	820 - 1969	820 - 2625	1476 - 3281
		Bronze, non leaded copper	100	492 - 820	591 - 984	656 - 1312
		and electrolitic copper				
	Nonmetallic materials	Duroplastics		197 - 230	262 - 328	295 - 394
		Fibre reinforced plastics				
		Hard rubber				

** Only for finishing: f_{max} 0,004 inch/rev, a_{pmax} 0,02 inch

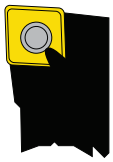
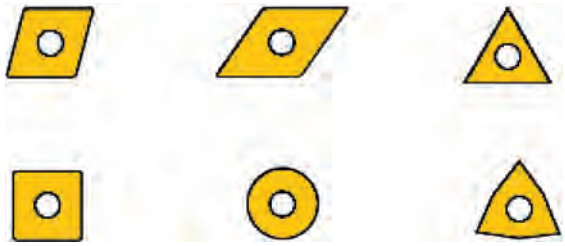
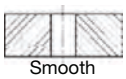
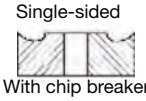
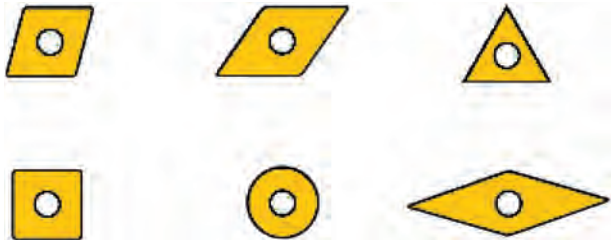
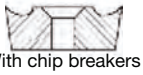
* Only for hardness ≤ 200 HB

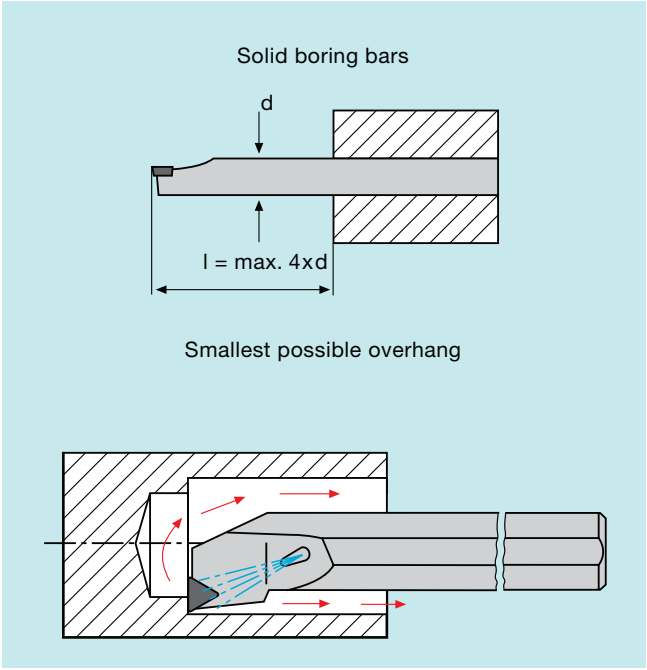
Cutting data standard values: LW610

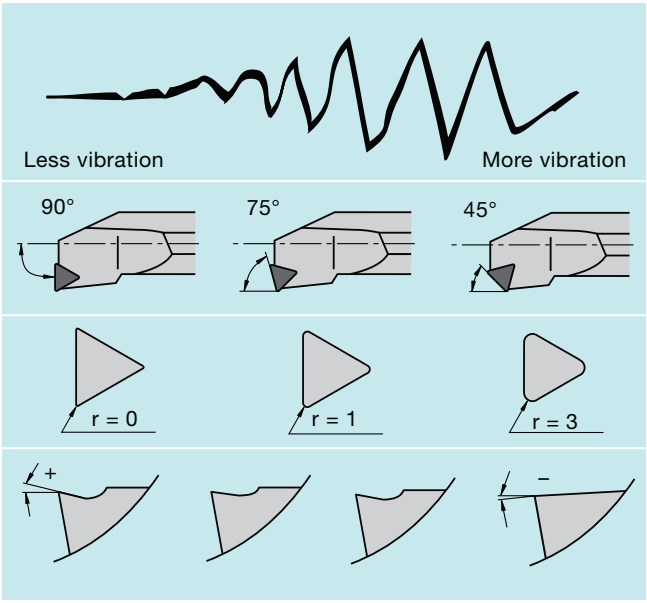
Material group	Main workpiece material groups and their characteristic letters Workpiece material		Brinell hardness HB	Cutting speed v_c = sfm **LW610** f = inch/rev .004 - .016	-
M	Stainless steel[1]	austenitic[2], quenched	180		
K	Grey cast iron	perlitic / ferritic	180	492 - 820	
		perlitic (martensitic)	260	328 - 492	
	Nodular graphite cast iron	ferritic	160	427 - 591	
		perlitic	250	328 - 492	
	Malleable cast iron	ferritic	130	394 - 591	
		perlitic	230	328 - 525	
N	Aluminium wrought alloys	unhardenable	60	1312 - 7874	
		hardenable, hardened	100	525 - 5249	
	Aluminium cast alloys	≤ 12% Si. unhardenable	75	1050 - 3937	
		≤ 12% Si. hardenable, hardened	90	787 - 3117	
		> 12% Si. unhardenable	130	525 - 2625	
	Copper and copper alloys (Bronze / Brass)	Free cutting alloys Pb>1%	110	656 - 1706	
		Brass, Red bronze	90	656 - 2625	
		Bronze, non leaded copper	100	394 - 1050	
		and electrolitic copper			
	Nonmetallic materials	Duroplastics			
		Fibre reinforced plastics			
		Hard rubber			

= dry machining = wet and dry machining

To make it easier to select the correct tool, the LMT-FETTE range has been assessed for each process type.

M-type tool holders		Process type	External	Internal
		Roughing	Very good	Very good
		Finishing	Good	Good
		Shape of the indexable insert		
		Type of the indexable insert	Double-sided Smooth  Double-sided With chip breaker  Single-sided With chip breaker 	
S-type tool holders		Process type	External	Internal
		Roughing	Suitable	Suitable
		Finishing	Very good	Very good
		Shape of the indexable insert		
		Type of the indexable insert	Single-sided With chip breakers  Single-sided Smooth 	



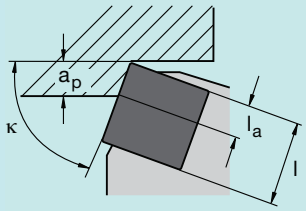


General recommendations

- Use the largest possible shank diameter
- Use the smallest possible overhang
- Use the correct, stable clamping method for the boring bar.
- Cooling lubricant (or compressed air) can improve chip transport and the surface quality, particularly with deep bores or blind holes.

Factors to consider when selecting boring bars for work susceptible to vibration:

- The approach angle should be as close as possible to 90° and not be below 75°.
- Select a small corner radius.
- Use positive holders (S-clamp holder) and indexable inserts.
- Uncoated grades generally have sharper cutting edges and therefore generate less cutting force.

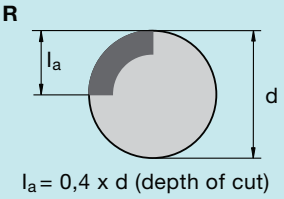


l_a = effective cutting length
l = length of the cutting edge

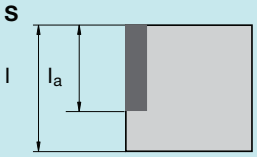
Depth of cut

- Determine the largest depth of cut a_p.
- Determine the effective length of cutting edge (l_a) required. The setting angle (k) and the depth of cut (a_p) should be taken into consideration.
- The smallest length of cutting edge (l_a) required can be found in the table to the left.

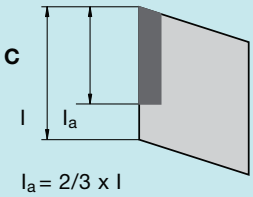
Angle of approach		Depth of cut (a_p) inch										
		.04	.08	.12	.16	.20	.24	.28	.32	.36	.40	.60
		required effective length of the cutting edge (l_a) inch										
	90	.04	.08	.12	.16	.20	.24	.28	.32	.36	.40	.60
105	75	.044	.084	.124	.164	.208	.248	.292	.332	.372	.433	.630
120	60	.047	.901	.138	.185	.228	.276	.323	.366	.433	.472	.709
135	45	.055	.114	.169	.224	.280	.335	.394	.472	.512	.591	.866
150	30	.079	.157	.236	.315	.394	.472	.551	.630	.709	.787	1.181
165	15	.157	.315	.472	.630	.787	.945	1.063	1.220	1.378	1.535	2.283



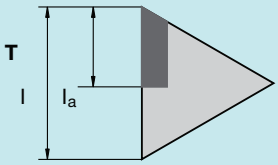
l_a = 0,4 x d (depth of cut)



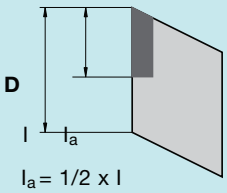
l_a = 2/3 x l



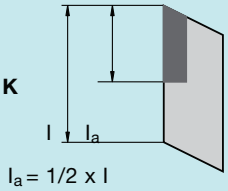
l_a = 2/3 x l



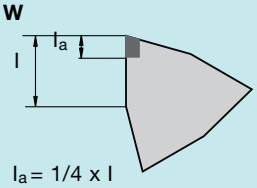
l_a = 1/2 x l



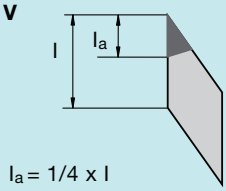
l_a = 1/2 x l



l_a = 1/2 x l



l_a = 1/4 x l



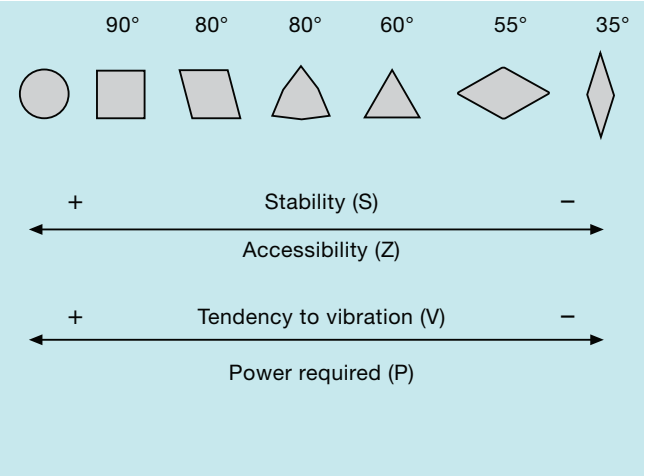
l_a = 1/4 x l

The effective length of the cutting edge:

The point angle of an indexable insert has a great influence on the stability of the cutting edges. Every indexable insert has a maximum effective cutting edge length. The maximum values given in the table are designed for working safety
when rough cutting with a continuous cut.

If the effective length of the cutting edges is lower than the depth of cut, a larger indexable insert should be used or the depth of cut should be reduced.

For additional safety during difficult cutting jobs, a larger or thicker indexable insert should be used. When turning against a shoulder, the depth of cut can be increased considerably. So that no problems arise here, a larger indexable insert should be used or an additional face turning operation should be performed.



Indexable insert shape

The diagram shows the most common indexable insert shapes from round tips right down to 35° indexable inserts.

The arrow on the scale shows that the stability of the cutting edge (S) grows with increasing point angle, Whereas the accessibility (Z) becomes improved by smaller point angles.

Tendency to vibration (V) and power requirement (P) rise with larger point angles.

When turning shapes the maximum copy angle must not be exceeded for inward copying. The angle between the secondary cutting edge and the workpiece shape produced should be at least 2°.

Corner Symbol radius (r) inch	1 1/64 .018	2 1/32 .031	3 3/64 .047	4 1/16 .062	6 3/32 .094
Recommended max. feed rate (f_n) IPR	.001-.014	.016-.028	.02-.04	.028-.05	.04-.07

Corner radius and feed
The corner radius of the indexable insert is a key factor with regard to:
– Stability during rough cutting.
– Surface quality during finishing.

Roughing
– Use the largest possible corner radius to ensure the greatest degree of stability for the cutting edge.
– A large corner radius permits a greater feed rate.
– Use a smaller corner radius if there is a risk of vibration.
When selecting the feed rate for rough turning work, the maximum feed rates given above must not be exceeded in any circumstances. The basic rule is:
IPR Roughing = 0,5 x Corner radius

Maximum feed rate for various corner radii
The most frequently used radii for rough machining are between 1.2 and 1.6 mm.

The table is based on the max. recommended feed rate of 2/3 of the corner radius.

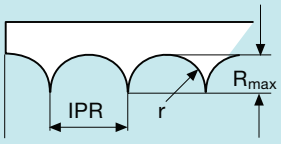
Greater feed rates are possible in the following cases:
– Indexable inserts have a stable cutting edge and a point angle of at least 60°.
– Single-sided indexable inserts.
– Indexable inserts which are used with a setting angle less than 90°.
– Working easily machineable workpiece materials at moderate cutting speeds.

The surface quality and accuracy of the tolerance is greatly influenced by the interaction of the feed rate and corner radius. The stability of the clamping system and the machine are other decisive factors.

General recommendation:

- The surface quality can be improved by using higher cutting speeds and positive rake angles.
- Use a smaller corner radius if there is a risk of vibration.
- Especially high quality surfaces can be achieved using uncoated hard metals (sharper cutting edges than coated grades).

Theoretical maximum roughness height (R_{max})



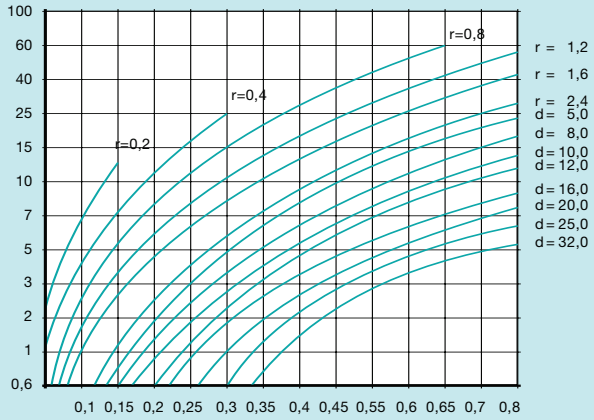
$R_{max} = \frac{IPR^2}{8r} \cdot 1000\ (\mu m)$

R_{max} = Roughness height
r = Corner radius (mm)
IPR = Feed (mm/revolution)

Feed:

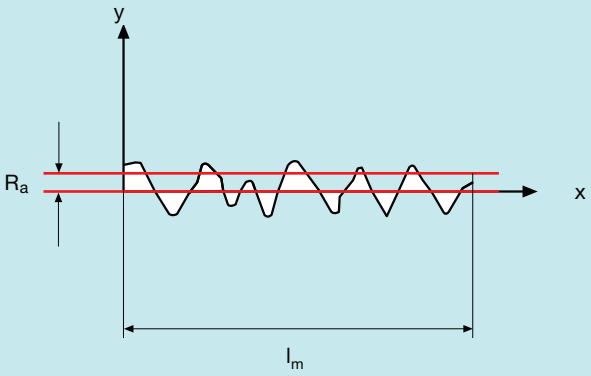
$IPR = \sqrt{\frac{R_{max} \times 8r}{1000}}$

The diagram shows theoretical R_{max} values for specific feed/corner radius combinations.



(mm/revolution) ÷ 25.4 = Feed IPR

Mean roughness figure (R_a)



Procedure:

Look up the appropriate R_{max} value in the conversion table. Then read off the correct combination of corner radius and feed rate.

Conversion table for various measurement systems. This cannot be used to calculate the mathematical relationship between the R_{max} roughness height and the figure for R_a.

R_{max}	Ra = CLA = AA		RMS		Value for
µm	µm	µinch	µm	µinch	roughness
1,6	0,30	11,8	0,33	13,1	
1,8	0,35	13,8	0,39	15,3	
2,0	0,40	15,7	0,44	17,4	N5
2,2	0,44	17,5	0,49	19,4	
2,4	0,49	19,2	0,54	21,3	
2,6	0,53	20,8	0,59	23,1	
2,8	0,58	22,7	0,64	25,2	
3,0	0,63	24,6	0,70	27,3	
3,5	0,71	27,8	0,79	30,9	
4,0	0,80	31,4	0,89	34,8	N6
4,5	0,90	35,2	1,00	39,1	
5,0	0,99	38,8	1,10	43,1	
6,0	1,20	47,2	1,30	52,4	
7,0	1,40	55,1	1,50	61,2	
8,0	1,60	63,0	1,80	70,0	N7
9,0	1,80	71,0	2,00	78,8	
10,0	2,00	97,0	2,20	87,7	
15,0	3,20	126,0	3,10	140,0	N8
20,0	4,40	173,0	4,90	192,0	
25,0	5,80	238,0	6,40	264,0	
27,0	6,30	247,0	7,00	274,0	N9
30,0	7,40	292,0	8,20	324,0	
35,0	8,80	346,0	9,80	384,0	
40,0	10,70	422,0	11,90	468,0	
45,0	12,50	485,0	13,90	538,0	N10
50,0	14,00	552,0	15,50	613,0	

Units

Code	Description	Unit
D_m	Diameter of workpiece inches	inch
V_c	Cutting speed (feet per min.)	ft/min (sfm)
n	Revolutions per minute of work or tool	rpm
T_c	Cutting time, minutes	min.
Q	Metal removal rate, cubic inches per minutes	cu.^{3}/in./min.
l_m	Working length, inches	in
HP_s	Horse power at spindle, hp	hp
HP_m	Horse power at motor, hp	hp
F_n	Feed per revolution	inch/rev (ipr)
F_m	Feed per minutes	ipm
k_r	Approach angle	degree
R_{max}	Profile depth	µm
r_e	Indexable insert corner radius	inch
a_p	Cutting depth	inch
D_2	Starting diameter	inch
d_2	Finish diameter	inch
K	Unit horse power factor	K

"K" Factors

Work Material	Brinell Hardness	RC Hardness	"K" Factor
Steels, wrought and cast	85-200	up to 13	1.64
	201-253	13-25	1.56
	254-286	25-30	1.28
	287-327	30-35	1.10
	328-371	35-40	0.88
	372-481	40-50	0.69
	482-560	50-55	0.59
	561-615	55-58	0.54
P-H stainless steels	150-450	1-48	1.27-0.42
Stainless steels, ferritic, austenitic, & martensitic	135-275	up to 29	1.54-0.76
	286-421	30-45	0.74-0.50
Cast irons, gray, ductile, and malleable	110-149	RB	2.27
	150-175	1-7	2.00
	176-200	7-13	1.89
	201-250	13-25	1.52
	251-300	25-32	1.27
	301-320	32-34.5	1.19
Titanium	250-375	25-40.5	1.33-0.87
High temp. alloys nickel, cobalt based	200-360	13-39	0.83-0.48
Iron base	180-320	8-34.5	0.91-0.53
Nickel alloys	80-360	up to 39	0.91-0.53
Aluminum alloys	30-150	RB	6.25-3.33
Magnesium alloys	40-90	RB	10.0-6.67
Copper	150	1	3.33
Copper alloys	100-150	RB	3.33
	151-243	1-23	2.00

Typical Machine Efficiencies

Direct Drive	.9
Belt Drive	.8
Gear Drive	.7

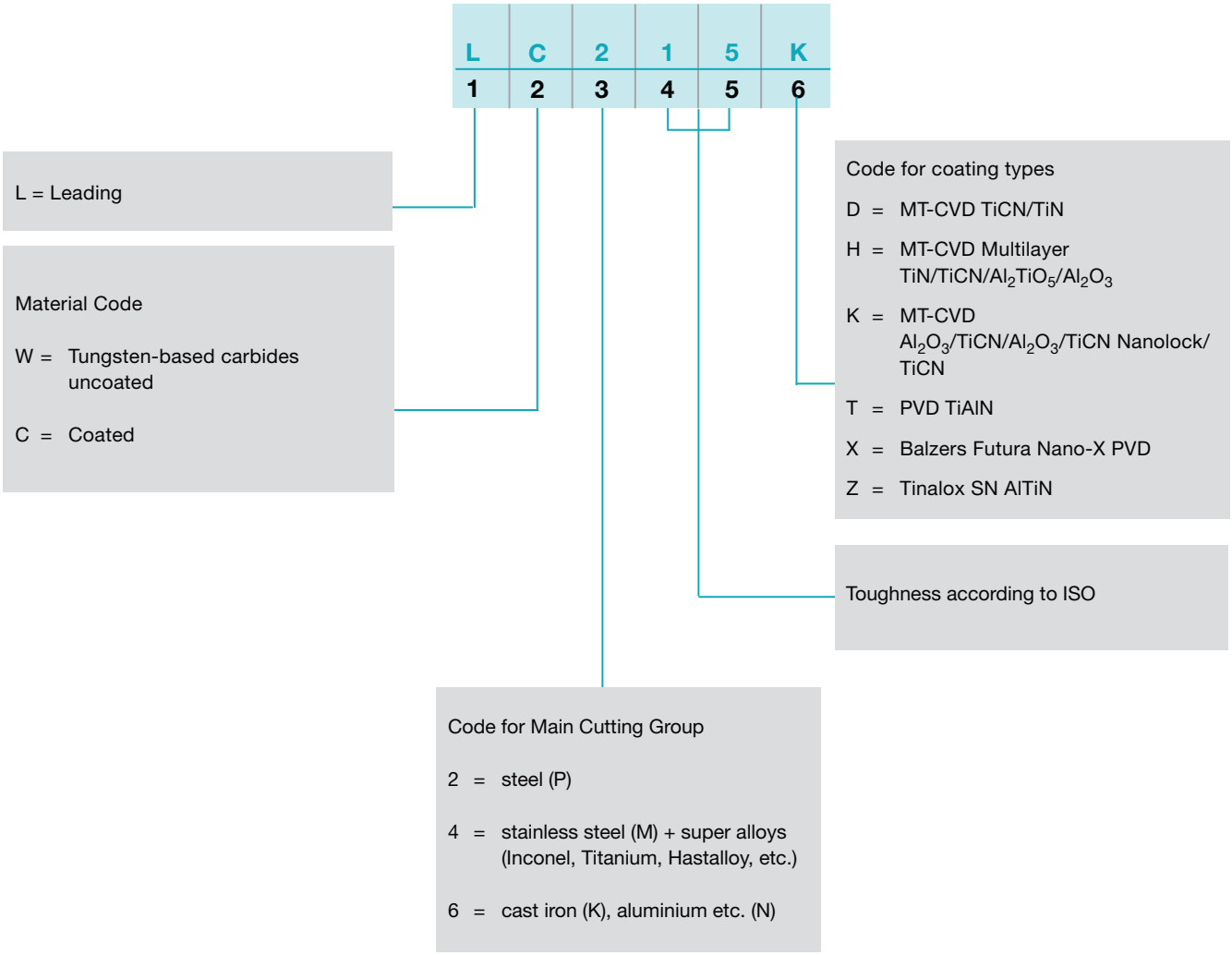
Formulas

To Find	Symbols – Formula	Calc. Formula
Cutting speed (sfm)	$.262 \times n \times D_m$	.262 × rpm × dia.
Revolutions per minute	$3.82 \times V_C \div D_m$	3.82 × sfm ÷ dia.
Inches per minute	$f_n \times n$	ipr × rpm
Inches per revolutions	$F_m \div n$	ipm ÷ rpm
Rate of metal removal cu.in^3 ÷ min.	$\left(\left(\left(\frac{D_2}{2}\right)^2 \times \pi\right) - \left(\left(\frac{D_2}{2}\right)^2 \times \pi\right)\right) \times F_n \times n$	$\left(\left(\left(\frac{\text{start dia.}}{2}\right)^2 \times \pi\right) - \left(\left(\frac{\text{finish dia.}}{2}\right)^2 \times \pi\right)\right) \times \text{ipr} \times \text{rpm}$
Horse power required at spindle Hp_s	Q ÷ K	Q ÷ K
Horse power required at the motor Hp_m	$Hp_s \div EFF$	$Hp_s \div EFF$
Cutting time, minute	$l_m \div f_m$	loc ÷ ipm

Option	Problem											
	Wear of free areas	Extreme crater wear	Formation of built-up edge	Chips in cutting edge	Notch sensibility	Broken indexable insert	Heat cracks	Plastic deformation	Interrupted cut	Poor workpiece surface	Band/snarl chips (not coloured)	Chip shape too narrow (blueing)
T/C wear resistance	↑				↑			↑				
T/C toughness				↑		↑	↑		↑			
Cutting speed	↓	↓	↑		↓			↓	↑	↑		
Feed	↔	↓	↓					↓	↓	↓	↑	↓
Depth of cut					↔				↑		↔	↔
Chip angle		↑	↑	↓		↓			↔			
Chip breaker geometry				↔		↔					↔	↔
Condition of cutting edge				↔					↔			
Corner radius						↑			↑	↑		
Approach angle				↓								
Stability				↑								
Cooling		↑	↑				↑	↑		↑		

↑ increase ↓ reduce ↔ optimize

The Boehlerit grade designation system constitutes a simple, internationally “comprehensible” key. In accordance with the ISO norm, it describes the cutting material in an application-oriented way.
Designations of Boehlerit carbide grades follow the premise of the ISO 513 international norm.



Tensile strength Rm N/mm²	Vickers hardness HV	Brinell hardness HB	Rockwell hardness HRC
255	80	76	
270	85	80,7	
285	90	85,5	
305	95	90,2	
320	100	95	
335	105	99,8	
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	156	
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	235	223	
770	240	228	20,3
785	245	233	21,3
800	250	238	22,2
820	255	242	23,1
835	260	247	24
850	265	252	24,8
865	270	257	25,6
880	275	261	26,4
900	280	266	27,1
915	285	271	27,8
930	290	276	28,5
950	295	280	29,2
965	300	285	29,8
995	310	295	31
1030	320	304	32,2
1060	330	314	33,3
1095	340	323	34,4

Tensile strength Rm N/mm²	Vickers hardness HV	Brinell hardness HB	Rockwell hardness HRC
1125	350	333	35,5
1155	360	342	36,6
1190	370	352	37,7
1220	380	361	38,8
1155	390	371	39,8
1290	400	380	40,8
1320	410	390	41,8
1350	420	399	42,7
1385	430	409	43,6
1420	440	418	44,5
1455	450	428	45,3
1485	460	437	46,1
1520	470	447	46,9
1555	480	(456)	47,7
1595	490	(466)	48,4
1630	500	(475)	49,1
1665	510	(485)	49,8
1700	520	(494)	50,5
1740	530	(504)	51,1
1775	540	(513)	51,7
1810	550	(523)	52,3
1845	560	(532)	53,0
1880	570	(542)	53,6
1920	580	(551)	54,1
1955	590	(561)	54,7
1995	600	(570)	55,2
2030	610	(580)	55,7
2070	620	(589)	56,3
2105	630	(599)	56,8
2145	640	(608)	57,3
2180	650	(618)	57,8
	660		58,3
	670		58,8
	680		59,2
	690		59,7
	700		60,1
	720		61
	740		61,8
	760		62,5
	780		63,3
	800		64
	820		64,7
	840		65,3
	860		65,9
	880		66,4
	900		67
	920		67,5
	940		68

Tensible strength	N/mm²	Rm
Vickers hardness	Diamond pyramid 1368, Test force F ≥ 98 N	HV
Brinell hardness	0,102 x F/D2 = 30 N/mm²	HB
Calculated from: HB = 0,95 x HV	F = Test force in N, D = Ball diameter in mm	
Hardness Rockwell C	Diamond cone 120°, Total test force 1471 ± 9 N	HRC

Material group	Germany		U.S.A.	Great Britain		France	Italy
	W-Nr.	DIN	AISI/SAE	BS	EN	AFNOR	UNI
P	Constructional steels						
	1.0401	C15	1015	080M15	-	CC12	C15C16
	1.0402	C22	1020	050A20	2C	CC20	C20C21
	1.0501	C35	1035	060A35	-	CC35	C35
	1.0503	C45	1045	080M46	-	CC45	C45
	1.0535	C55	1055	070M55	-	-	C55
	1.0601	C60	1060	080A62	43D	CC55	C60
	1.0715	9SMn28	1213	230M07	-	S250	CF9SMn28
	1.0718	9SMnPb28	12L13	-	-	S250Pb	CF9SMnPb28
	1.0722	10SPb20	-	-	-	10PbF2	CF10SPb20
	1.0726	35S20	1140	212M36	8M	35MF4	-
	1.0736	9SMn36	1215	240M07	1B	S300	CF9SMn36
	1.0737	9SMnPb36	12L14	-	-	S300Pb	CF9SMnPb36
	1.0904	55Si7	9255	250A53	45	55S7	55Si8
	1.0961	60SiCr7	9262	-	-	60SC7	60SiCr8
	1.1141	Ck15	1015	080M15	32C	XC12	C16
	1.1157	40Mn4	1039	150M36	15	35M5	-
	1.1158	Ck25	1025	-	-	-	-
	1.1167	36Mn5	1335	-	-	40M5	-
	1.1170	28Mn6	1330	150M28	14A	20M5	C28Mn
	1.1183	Cf35	1035	060A35	-	XC38TS	C36
	1.1191	Ck45	1045	080M46	-	XC42	C45
	1.1203	Ck55	1055	070M55	-	XC55	C50
	1.1213	Cf53	1050	060A52	-	XC48TS	C53
	1.1221	Ck60	1060	080A62	43D	XC60	C60
	1.1274	Ck101	1095	060A96	-	-	-
	1.3401	X120Mn12	-	Z120M12	-	Z120M12	XG120Mn12
	1.3505	100Cr6	52100	534A99	31	100C6	100Cr6
	1.5415	15Mo3	ASTM A204Gr.A	1501-240	-	15D3	16Mo3KW
	1.5423	16Mo5	4520	1503-245-420	-	-	16Mo5
	1.5622	14Ni6	ASTM A350LF5	-	-	16N6	14Ni6
	1.5662	X8Ni9	ASTM A353	1501-509;510	-	-	X10Ni9
	1.5680	12Ni19	2515	-	-	Z18N5	-
	1.5710	36NiCr6	3135	640A35	111A	35NC6	-
	1.5732	14NiCr10	3415	-	-	14NC11	16NiCr11
	1.5752	14NiCr14	3415;3310	655M13; 655A12	36A	12NC15	-
	1.6511	36CrNiMo4	9840	816M40	110	40NCD3	38NiCrMo4(KB)
	1.6523	21NiCrMo2	8620	805M20	362	20NCD2	20NiCrMo2
	1.6546	40NiCrMo22	8740	311-Type 7	-	-	40NiCrMo2(KB)
	1.6582	34CrNiMo6	4340	817M40	24	35NCD6	35NiCrMo6(KB)
	1.6587	17CrNiMo6	-	820A16	-	18NCD6	-
	1.6657	14NiCrMo134	-	832M13	36C	-	15NiCrMo13
	1.7015	15Cr3	5015	523M15	-	12C3	-
	1.7033	34Cr4	5132	530A32	18B	32C4	34Cr4(KB)
	1.7035	41Cr4	5140	530M40	18	42C4	41Cr4
	1.7045	42Cr4	5140	-	-	-	-
	1.7131	16MnCr5	5115	(527M20)	-	16MC5	16MnCr5
	1.7176	55Cr3	5155	527A60	48	55C3	-
	1.7218	25CrMo4	4130	1717CDS110	-	25CD4	25CrMo4(KB)
	1.7220	34CrMo4	4137;4135	708A37	19B	35CD4	35CrMo4
	1.7223	41CrMo4	4140;4142	708M40	19A	42CD4TS	41CrMo4
	1.7225	42CrMo4	4140	708M40	19A	42CD4	42CrMo4

Material group	Germany		U.S.A.	Great Britain		France	Italy
	W-Nr.	DIN	AISI/SAE	BS	EN	AFNOR	UNI
P	Constructional steels						
	1.7262	15CrMo5	-	-	-	12CD4	-
	1.7335	13CrMo4 4	ASTM A182	1501-620Gr27	-	15CD3.5	14CrMo4 5
			F11;F12			15CD4.5	
	1.7361	32CrMo12	-	722M24	40B	30CD12	32CrMo12
	1.7380	10CrMo9 10	ASTM A182	1501-622	-	12CD9,10	12CrMo9,10
			F.22	Gr.31;45	-	-	
	1.7715	14MoV6 3	-	1503-660-440	-	-	-
	1.8159	50CrV4	6150	735A50	47	50CV4	50CrV4
	1.8509	41CrAlMo7	-	905M39	41B	40CAD6,12	41CrAlMo7
	1.8523	39CrMoV13 9	-	897M39	40C	-	36CrMoV12
	Tool steels						
	1.1545	C105W1	W.110	-	-	Y1 105	C98KU
							C100KU
	1.1663	C125W	W.112	-	-	Y2 120	C120KU
	1.2067	100Cr6	L3	BL3	-	Y100C6	-
	1.2080	X210Cr12	D3	BD3	-	Z200C12	X210Cr13KU
							X250Cr12KU
	1.2344	X40CrMoV51	H13	BH13	-	Z40CDV5	X35CrMoV05KU
							X40CrMoV511KU
	1.2363	X100CrMoV51	A2	BA2	-	Z100CDV5	X100CrMoV51KU
	1.2419	105WCr6	-	-	-	105WC13	10WCr6
						107WCr5KU	
	1.2436	X210CrW12	-	-	-	-	X215CrW121KU
	1.2542	45WCrV7	S1	BS1	-	-	45WCrV8KU
	1.2581	X30WCrV9 3	H21	BH21	-	Z30WCV9	X28W09KU
		X30WCrV9 3KU					X30WCrV9 3KU
	1.2601	X165CrMoV12	-	-	-	-	X165CrMoW12KU
	1.2713	55NiCrMoV6	L6	-	-	55NCDV7	-
	1.2833	100V1	W210	BW2	-	Y1 105V	-
	High speed steels						
	1.3243	S 6-5-2-5	-	-	-	Z85WDKCV	HS 6-5-2-5
						06-05-04-02	
	1.3255	S 18-1-2-5	T4	BT4	-	Z80WKCV	X78WCo1805KU
					-	18-05-04-01	
	1.3343	S 6-5-2	M2	BM2	-	Z85WDCV	X82WMo0605KU
						06-05-04-02	
	1.3348	S 2-9-2	M7	-	-	Z100WCWV	HS 2-9-2
						09-04-02-02	
	1.3355	S 18-0-1	T1	BT1	-	Z80WCV	X75W18KU
						18-04-01	

Material group	Germany		U.S.A.	Great Britain		France	Italy
	W-Nr.	DIN	AISI/SAE	BS	EN	AFNOR	UNI
M	Stainless and heat resisting steels						
	1.4000	X6Cr13	403	403S17	-	Z6C13	X6Cr13
	1.4001	X7Cr14					
	1.4006	X10Cr13	410	410S21	56A	Z10C14	X12Cr13
	1.4016	X6Cr17	430	430S15	60	Z8C17	X8Cr17
	1.4027	G-X200Cr14	-	420C29	56B	Z20C13M	-
	1.4034	X46Cr13	-	420S45	56D	Z40CM	X40Cr14
						Z38C13M	
	1.4057	X20CrNi172	431	431S29	57	Z15CNi6.02	X16CrNi16
	1.4104	X12CrMoS17	430F	-	-	Z10CF17	X10CrS17
	1.4113	X6CrMo171	434	434S17	-	Z8CD17.01	X8CrMo17
	1.4313	X5CrNi134	-	425C11	-	Z4CND13.4M	-
	1.4408	G-X6CrNiMo1810		316C16	-	-	-
	1.4718	X45CrSi93	HW3	401S45	52	Z45Cs9	X45CrSi8
	1.4724	X10CrAl13	405	403S17	-	Z10C13	X10CrA112
	1.4742	X10CrAl18	430	430S15	60	Z10CAS18	X8Cr17
	1.4747	X80CrNiSi20	HNV6	443505	59	Z80CSN20.02	X8CrSiNi20
	1.4762	X10CrAl24	446	-	-	Z10CAS24	X16Cr26
	1.4301	X5CrNi1810	304	304S15	58E	Z6CN18.09	X5CrNi1810
	1.4305	X10CrNiS189	303	303S21	58M	Z10CNF 18.09	X10CrNiS18.09
	1.4306	X2CrNi1911	304L	304S12	-	Z2CN 18.10	X2CrNi18.11
				304C12		Z3CN 19.10	
	1.4308	G-X6CrNi18 9	-	304C15	-	Z6CN18.10M	-
	1.4310	X12CrNi177	301	-	-	Z12CN17.07	X12CrNi1707
	1.4311	X2CrNiN1810	304LN	304S26	-	Z2CN18.10	-
	1.4401	X5CrNiMo17122	316	316S16	58J	Z6CND17.11	X5CrNiMo1712
	1.4429	X2CrNiMoN17133	316LN	-	-	Z2CND17.13	-
	1.4435	X2CrNiMo18143	316L	316S12	-	Z2CND17.13	X2CrNiMo1713
	1.4438	X2CrNiMo17133	317L	317S12	-	Z2CND1915	X2CrNiMo1816
	1.4460	X8CrNiMo275	329	-	-	-	-
	1.4541	X6CrNiTi1810	321	2337	312S12	Z6CNT18.10	X6CrNiTi1811
	1.4550	X6CrNiNb1810	347	347S17	58F	Z6CNNb18.10	X6CrNiNb1811
	1.4571	X6CrNiMoTi17122	316Ti	320S17	58J	Z6NDT17.12	X6CrNiMoTi1712
	1.4581	G-X5CrNi	-	318C17	-	Z4CNDNb	XG8CrNiMo1811
		MoNb1810				18 12M	
	1.4583	X10CrNi	318	-	-	Z6CNDNb	X6CrNiMoNb1713
		MoNb1812				17 13B	
	1.4828	X15CrNiSi2012	309	309S24	-	Z15CNS20.12	-
	1.4845	X12CrNi25 21	310S	310S24	-	Z12CN2520	X6CrNi2520
	1.4864	X12NiCrSi3616	330	-	-	Z12NCS35.16	-
	1.4865	G-X40NiCrSi3818	-	330C11	-	-	XG50NiCr3919
	1.4871	X53CrMnNiN219	EV8	349S54	-	Z52CMN21.09	X53CrMnNiN219
				321S12	58B		
	1.4878	X12CrNiTi189	321	321S20	58C	Z6CNT18.12B	X6CrNiTi1811

Material group	Germany		U.S.A.	Great Britain		France	Italy
	W-Nr.	DIN	AISI/SAE	BS	EN	AFNOR	UNI
K	Unalloyed grey cast iron						
			ASTM A48-76				
		GG 10				Ft 10 D	
		GG 15	No 20 B	Grade 150		Ft 15 D	
		GG 20	No 25 B	Grade 220		Ft 20 D	
		GG 25	No 30 B	Grade 260		Ft 25 D	
			No 35 B				
		GG 30	No 40 B	Grade 300		R 30 D	
		GG 35	No 45 B	Grade 350		Ft 35 D	
		GG 40	No 50 B	Grade 400		Ft 40 D	
			No 55 B				
	Alloyed grey cast iron						
		DIN4694	ASTM	3468; 1974			
		GGL-	A436-72			A32-301	
		NiCr 20 2	Type 2	L-NiCr 20 2		L-NC 20 2	
	Unalloyed nodular cast						
			A536-72	2789; 1973		NF A32-201	
		GGG 40	60-40-18	SNG 420/12		FCS 400-12	
		GGG 40.3	-	SNG 370/17		FGS 370-17	
		GGG 35.3	-	-		-	
		GGG 50	80-55-06	SNG 500/7		FGS 500-7	
		GGG 60	-	SNG 600/3		FGS 600-3	
		GGG 70	100-70-03	SNG 700/2		FGS 700-2	
	Alloyed cast steels						
		DIN 1694					
		GGG NiMn 13 7	-	L-NiMn 13 7		L-NM 13 7	
		GGG NiCr 20 2	Type 2	L-NiMn 20 2		L-NC 20 2	
	Malleable cast iron						
			ASTM A47-74				
			A 220-762)				
		-		8 290/6		MN 32-8	
		GTS-35	32510	B 340/12		MN 35-10	
		GTS-45	40010	P 440/7			
		GTS-55	50005	P 510/4		MP 50-5	
		GTS-65	70003	P 570/3		MP 60-3	
		GTS-70	(002)	P 690/2		IP 70-2	

Material group	Germany		U.S.A.	Great Britain		France	Italy
	W-Nr.	DIN	AISI/SAE	BS	EN	AFNOR	UNI
N	Non-ferrous heavy metal alloys						
	2.0321	CuZN37(Ms63)	C27400	CZ 108	-	CuZn37	P-CuZn37
	2.0402	CuZn40Pb2(Ms58)	C37700	CZ 122	-	CuZn39Pb2	P-CuZn3940Pb2
	2.0550	CuZn40Al2	-	Cz135	-	-	-
	2.0780	CuNi12Zn30Pb	-	-	-	-	-
	2.0882	CuNi30Fe	C71500	CN107	-	CuNi30Mn1Fe	CuNi30Mn1Fe
	2.0975	CuAl10Ni	C95800	AB2	-	CuAl10Fe5Ni5	CuAl11Fe4Ni4
	2.1080	CuSn6Zn	-	-	-	-	-
	2.1498	CuSP	-	-	-	-	CuS(P0,01)
	2.3205	PbSb5	-	-	-	-	-
	2.3290	PbSb9	-	-	-	-	-
	Light metal alloys						
	3.1355	AlCuMg2	AA 2024	2024	AW-2024	2024	2024
	3.1645	AlCuMgPb	-	-	-2007	-	-
	3.2581.01	G-AlSi12	B413.0	LM6	AC-44200	A-S 13	3051/G-AS9MG
	3.3527	AlMg2Mn0,8	-	-	AW-5049	-	-
	3.3535	AlMg3	AA 5754	-	-5754	5754	-
	3.4365	AlZnMgCu1,5	AA7075	7075	-7075	7075	7075
	3.5161	MgZn6ZrF30	-	-	-	-	-
	3.5312	MgAl3ZnF25	-	-	-	-	-
	3.5912	G-MgAl9Zn1	-	-	-	-	-
	3.7115	TiAl5Sn2,5	ASTM: B 265	TA14,17	-	T-A5E	-
	3.7165	TiAl6V4	-	TA10-13/TA28	-	-	T-A6V
	3.7174	TiAl6V6Sn2	4971	-	-	-	-
S	High-temperature materials						
	Tradename						
	HS-27	NiCo32Cr26Mo	-	-	-	-	KC20WN
	Hastalloy-C	NiCCr17Ho17FeW	5388C	-	-	NC17DWY	-
	Inconel 718	NiCr19Fe19-NbMo	5838	-	HR8	-	NC19FeNb
	Lescalloy	NiCr16FeTi	-	-	-	-	-
	Nimonic 90	NiCr20Co18Ti	-	-	-	-	-
	Unitemp	NiCr16Co8WAlTi	-	-	-	-	-
	Vakumell	NiCr20TiAl	-	-		-	-
	Vakumelt	NiCo10Cr9WAlTi	-	-	-	-	-
		GTS-70	(002)	P 690/2		IP 70-2	

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Printed in USA 06/2010 EDP #14640