

Rotating tools

MILLING
DRILLING
TAPPING
BORING
REAMING
ROTATING TOOL ADAPTERS



2015

ISO 13399 is an international standard that strives to simplify the exchange of data for cutting tools. You will notice a slight difference through the new parameters and descriptions of each tool.

For the first time ever, there is a standardized way of describing product data regarding cutting tools. When all tools in the industry share the same parameters and definitions, communicating tool information between software systems becomes very straightforward.

How this benefits you

Basically, it means that your systems can talk to ours, as they all speak the same language. Download product data from our web site and use it directly in your CAD/ CAM software to assemble tools that you use in production. No need to look for information in catalogs and interpret data from one system to another. Imagine how much time this will save you!

Short name	Preferred Name
ADJLN	Minimum adjustment limit
ADJLX	Maximum adjustment limit
ADJRG	Adjustment range
ALP	Axial clearance angle
AN	Clearance angle major
ANN	Minor clearance angle
APMX	Depth of cut maximum
APMX_EFW	Depth of cut maximum – End feed
APMX_FFW	Depth of cut maximum – Side feed
AZ	Maximum plunge depth
B	Shank width
BAWS	Workpiece side body angle
BAMS	Body angle machine side
BBD	Balanced by design
BBR	Balanced by rotational test
BCH	Corner chamfer length
BD	Body diameter
BHTA	Body half taper angle
BN	Face land width
BS	Wiper edge length
BSG	Basic standard group
BSR	Wiper edge radius
CDX	Cutting depth maximum
CEMR	Cutting edge major radius
CF	Spot chamfer
CHBA	Chamfer body angle
CHBL	Chamfer body length
CHW	Corner chamfer width
CICT	Cutting item count
CICT _E	Cutting item count – End position
CICT _P	Cutting item count – Peripheral position
CICT _S	Cutting item count – Side position
CICT _T	Cutting item count – Total
CND	Coolant entry diameter
CNSC	Coolant entry style code
CNT	Coolant entry thread size
COATING	Coating
CP	Max coolant pressure
CRKS	Connection retention knob thread size
CRNT	Coolant radial entry thread size
CTPT	Operation type
CUTDIA	Work piece parting diameter maximum
CW	Cutting width
CWN	Minimum cutting width
CWTOLL	Cutting width lower tolerance
CWTOLU	Cutting width upper tolerance
CWX	Cutting width maximum
CXSC	Coolant exit style code
CZC	Connection size code
CZC _{MS}	Connection size code machine side
CZC _{WS}	Connection size code workpiece side
D1	Fixing hole diameter
DAH	Diameter access hole

DAXIN	Axial groove inside diameter minimum
DAXN	Minimum axial-groove outside diameter
DAXX	Maximum axial groove outside diameter
DBC	Diameter bolt circle
DC	Cutting diameter
DCB	Connection bore diameter
DCBN	Connection bore diameter minimum
DCBX	Connection bore diameter maximum
DCF	Cutting diameter face contact
DCIN	Cutting diameter internal
DCN	Minimum cutting diameter
DCON	Connection diameter
DCON _{MS}	Connection diameter machine side
DCON _{WS}	Connection diameter work piece side
DCSF _{MS}	Contact surface diameter machine side
DCSF _{WS}	Workpiece side contact surface diameter
DCX	Maximum cutting diameter
DHUB	Hub diameter
DIX	Maximum tool changer interference diameter
DMIN	Minimum bore diameter
DMM	Shank diameter
DN	Neck diameter
DRVCT	Drive count
DSGN	Design
EPSR	Insert included angle
FHA	Flute helix angle
FLGT	Flange thickness
FTDZ	For thread diameter size
H	Shank height
HA	Thread height theoretical
HB	Thread height difference
HBH	Head bottom offset height
HC	Actual thread height
HF	Functional height
HRY	Lowest point from reference plain
HTB	Body height
HTH	Height
IC	Inscribed circle diameter
INSL	Insert length
INSUC	Insert usage code
IZC	Insert size code
KAPR	Tool cutting edge angle
KAPR_EFW	Tool cutting edge angle – End feed
KCH	Corner chamfer
KRINS	Major cutting-edge angle
KWW	Keyway width
L	Cutting edge length
LAMS	Inclination angle
LB	Body length
LCF	Chip flute length
LCOX	Cut off length maximum
LE	Cutting edge effective length
LF	Functional length
LFN	Minimum functional length
LH	Head length
LPR	Protruding length
LS	Shank length
LSC	Clamping length
LSCN	Minimum clamping length
LSCS	Distance to clamping start
LSCX	Maximum clamping length
LSD	Dead shank length
LU	Usable length (max. recommended)
LU_BFW	Usable length – Back facing
LUX	Usable maximum length
MHD	Mounting hole distance
MID	Master insert identification
MID _E	Master insert identification – End position
MID _S	Master insert identification – Side position
MID _C	Master insert identification – Central position
MID _P	Master insert identification – Peripheral position
MID _I	Master insert identification – Intermediate position
MMCC	Code for preset torque
MMCX	Max cutting torque
NOF	Flute count
NT	Tooth count
OAH	Overall height
OAL	Overall length
OAW	Overall width

OH	Overhang recommended
OHN	Minimum overhang
OHX	Maximum overhang
ORDCODE	Order code
PCL	Peripheral cylindrical length
PDX	Profile distance ex
PDY	Profile distance ey
PHD	Premachined hole diameter
PHDX	Maximum premachined hole diameter
PL	Point length
PNA	Profile included angle
PRFRAD	Profile radius
PRSPC	Profile specification
PSIR	Tool lead angle
PSIRL	Major left hand cutting edge angle
PSIRR	Major right hand cutting edge angle
PSW	Pre-machined slot width
RADH	Radial body height
RADW	Radial body width
RAR	Right-hand relief angle
RE	Corner radius
REL	Corner radius left
RER	Corner radius right
RETO LL	Corner radius lower tolerance
RETO LU	Corner radius upper tolerance
RGL	regrind length
RMPX	Maximum ramping angle
RPMX	Rotational speed maximum
S	Insert thickness
SDL	Step diameter length
SIG	Point angle
SPTL	Split line
SSC	Insert seat size code
SSC _E	Insert seat size code – End position
SSC _P	Insert seat size code – Peripheral position
SSC _S	Insert seat size code – Side position
STA	Step included angle
SUBSTRATE	Substrate
TCDC	Tolerance class cutting diameter
TCDCON	Connection diameter tolerance
TCDMM	Shank diameter tolerance
TCHA	Achievable hole tolerance
TCHAL	Achievable hole tolerance lower
TCHAU	Achievable hole tolerance upper
TCT	Tolerance class tool
TCTR	Thread tolerance class
TD	Thread diameter
TDZ	Thread diameter size
TFLA	Tap floating length ahead
TFLB	Tap floating length behind
TG	Taper gradient
THBTP	Thread back taper property
THCA	Thread helix correction angle
THCHT	Threading chamfer type
THFT	Thread form type
THFTS	Thread form standard series
THL	Thread length
THUB	Hub thickness
TP	Thread pitch
TPI	Threads per inch
TPIN	Minimum threads per inch
TPIX	Maximum threads per inch
TPN	Minimum thread pitch
TPT	Thread profile type
TPX	Maximum thread pitch
TRMAX	Tap range max
TQ	Torque
TSYC	Tool style code
TTP	Thread type
ULDR	Usable length diameter ratio
VCX	Maximum cutting speed
W1	Insert width
WB	Body width
WF	Functional width
WFCIRP	Width to cutting item reference point
WSC	Clamping width
WT	Weight of item
ZEFF	Face effective cutting edge count
ZEFP	Peripheral effective cutting edge count (ZEFP)
ZWX	Maximum number of Wiper inserts

Conversion table

Metric to imperial

Distance

- 1 meter = 39.370 inch
- 1 meter = 3.281 feet
- 1 millimeter = 0.039 inch

Weight

- 1 kilogram = 2.205 pounds
- 1 kilogram = 35.274 ounces

Torque

- 1 Newton meter (Nm) = 0.738 pound-force feet (ft-lbs)
- 1 Newton meter (Nm) = 8.851 pound-force inches (in-lbs)

Imperial to metric

Distance

- 1 inch = 25.4 millimeter
- 1 foot = 0.3 meter
- 1 foot = 304.8 millimeter

Weight

- 1 pound = 0.45 kilogram
- 1 ounce = 28.35 gram

Torque

- 1 pound-force foot (ft-lbf) = 1.4 Newton meter (Nm)
- 1 pound-force inch (in-lbf) = 0.1 Newton meter (Nm)

Formulas and definitions:

- v_c = Cutting speed
- n = Spindle speed
- v_f = table feed
- z_n = total number of cutting edges
- z_c = number of effective cutting edges
- f_z = feed per tooth
- f_n = Feed per revolution
- h_{ex} = maximum thickness
- a_p = Cutting depth
- l_a = insert width
- a_e = cutting width
- a_e/D_c % = Radial immersion
- T = Machining time
- Q = Metal removal rate
- nap = number of passes
- TPI = threads per inch
- k_c = specific cutting force
- R_a = Surface roughness

Metric	Imperial
m/min (meter/minute)	ft/min (feet/minute)
rpm (revolution per minute)	
mm/min	inch/min
mm/z	inch/z
mm/rev	inch/rev
mm	inch
mm	inch
mm	inch
mm	inch
%	%
min	min
cm³/min	inch³/min
N/mm²	lbs/in²
µm	µin

Insert size

- iC = inscribed circle in inch

-  = cutting edge length in mm



Additional tool options designed for your specific requirements.

In addition to our comprehensive standard program, we can offer tools to your dimensions on standard tool terms. With our Tailor Made Service, you are free to specify your own dimensions.

Download Tailor Made forms in PDF format at www.sandvik.coromant.com/us.

For specific details, contact your Sandvik Coromant sales representative.

...and engineered solutions

When standard and Tailor Made solutions do not fulfill your needs you can depend on Sandvik Coromant's extensive experience in engineered tool solutions to cope with particularly demanding criteria.

Tailor Made

– Quick quotation
– Easy to order
– Competitive delivery

CoroMill® 490

Even more possibilities thanks to tailored design!
If you do not find what you need in our comprehensive standard programme, choose the tool shape you require and we will tailor it for you to your dimensions.

Cylindrical

Size D_0 (mm) IC

16	19.05-25.4	08
20	19.05-40	08
25	19.05-50.8	08/14
32	25 - 40	08/14
40	31.75-40	08/14

Weldon

Size D_0 (mm) IC

16	19.05-25.4	08
20	19.05-40	08
25	19.05-50.8	08/14
32	25 - 40	08/14
40	31.75-40	08/14

Coromant Capto®

Size D_0 (mm) IC

C3	19.05-40	08
C4	19.05-55	08/14
C5	19.05-70	08/14
C6	19.05-80	08/14
C8	31.75-84	08/14

HSK type A

Size D_0 (mm) IC

63	20-80	08/14
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Arbor mounting, TDA
acc. to ISO 6462 (including CTS)

Size D_0 (mm) IC

16	37.5 - 50	08
22	38.1 - 80	08/14
22.225	38.1 - 80	08
25.4	40 - 100	08/14
27	44 - 100	08/14
31.75	100 - 125	14

TDB

Size D_0 (mm) IC

32	100-125	14
38.1	125-160	14
40	125-190	14
50.8	160-200	14

TDC

Size D_0 (mm) IC

40	180-200	14
47.625	200-254	14
60	200-254	14

Options

Insert size 08 or 14
 D_0 -08, Diameter - 19.05-84 mm
-14, Diameter - 38.1-254 mm

Pitch type Even or Differential
 Z_n -08, No of inserts 2-10
-14, No of inserts 2-20

Mounting type Arbor mounting
 dm_{cut}/D_{cut} Mounting size, see above

l_1 Reach length, -08, 21 mm - 3 x D_0
-14, 40 mm - 3 x D_0
 l_2 Total length, -08, 74-250 mm,
-14, 98-250 mm
 l_3 Programming length, -08, 40-175.5 mm,
-14, 40-165.5 mm
Coolant hole -08, Yes - D_0 x 63 mm/No
-14, Yes/No - all TDC and TDB size 50.8

Note For specific details regarding the options, contact your Coromant sales representative.

CoroMill® 490

Inquiry/ordering No.

Customer Customer No. (Coromant internal) Date

Street Telephone Customer attention

Post Code/City/State Telefax Issuer

Quantity Customer denomination

main catalogue or supplement catalogue

metric std ☐ Your value/Your choice

above standard

14 Delivered with shims (with exceptions)

30.1-254

Insert size, cutter diameter and pitch

Coromant Capto **HSK A**

Size D_0 (mm) IC Size D_0 (mm) IC

23	19.05-40	08	63	20-80	08/14
24	19.05-55	08/14			
25	19.05-70	08/14			
26	19.05-80	08/14			
28	31.75-84	08/14			

TDB **TDC**

Size D_0 (mm) IC Size D_0 (mm) IC

42	100-125	14	40	180-200	14
48.1	125-160	14	47.625	200-254	14
60	125-180	14	60	200-254	14
63.6	180-200	14			

Arbor mounting **TDA** **TDB** **TDC**

Size D_0 (mm) IC Size D_0 (mm) IC Size D_0 (mm) IC Size D_0 (mm) IC

16	37.5-50	08	20	40-80	08	20	40-80	08
22	38.1-80	08/14	25	40-80	08/14	25	40-80	08/14
22.225	38.1-80	08	25	40-80	08/14	25	40-80	08/14
25.4	40-100	08/14	25	40-80	08/14	25	40-80	08/14
27	44-100	08/14	25	40-80	08/14	25	40-80	08/14
31.75	100-125	14	25	40-80	08/14	25	40-80	08/14

Insert size 14

l_1 max D_0 l_1 min - l_3 max l_3 =

38.1-254 40-3 x D_0

size 50.8

The value/choice must be given
If no value/choice is specified, it will be recommended by the system

**Milling****CoroMill 200 face milling and profiling cutter****Additional tool options**

- Insert size
- Number of inserts
- Diameter
- Shim
- Pitch type
- Mounting type and size
- Tool length

CoroMill 210 for face milling and plunging

- Insert size
- Number of inserts
- Diameter
- Mounting type and size
- Tool length
- Coolant

CoroMill 245 face milling cutter

- Number of inserts
- Right/Left, diameter
- Pitch type
- Mounting type and size
- Tool length

CoroMill 300 face milling and profiling cutter

- Insert size
- Number of inserts
- Diameter
- Pitch type
- Mounting type and size
- Tool length
- Coolant

CoroMill 390 square shoulder face mill

- Insert size
- Diameter
- Pitch type
- Mounting type and size
- Tool length
- Coolant

CoroMill 390 endmills

- Insert size
- Number of inserts
- Diameter
- Pitch type
- Mounting type and size
- Tool length
- Coolant

CoroMill 390 long edge milling cutters

- Insert size
- Number of inserts
- Diameter
- Pitch type
- Mounting type and size
- Tool length
- Coolant

Milling**CoroMill® 419****Additional tool options**

- Number of inserts
- Pitch type
- Coupling, Capto, Arbor, Cylindrical
- Functional length
- Maximum cutting diameter
- Coolant option: Yes or No

CoroMill® 490 face and shoulder mill

- Number of inserts
- Diameter
- Pitch type
- Mounting type and size
- Tool length
- Coolant ($D_c < 2.500$ inch)

CoroMill Century face milling inserts

- Insert grade
- Right/Left hand
- Depth of cut
- Corner shape
- Wiper design

CoroMill 790 square shoulder face mill

- Insert size
- Number of inserts
- Diameter
- Pitch type
- Mounting type and size
- Tool length
- Coolant

CoroMill 331 side and face milling cutter

- Cutter type
- Right/Left hand
- Insert size
- Diameter
- Pitch type
- Mounting type and size

CoroMill 331 inserts

- Insert size
- Insert geometry
- Insert shape/radius
- Corner radius
- Insert grade



Drilling

Coromant Delta

Additional tool options

- Drill diameter
- Carbide grade
- Drill depth
- Chamfers/corner radius
- Tolerance
- Mounting type and size
- Coolant supply

CoroDrill® 880 step and chamfer

- Drill diameter
- Drill depth
- Chamfers/corner radius
- Mounting type and size
- Coolant supply
- Supporting insert

CoroDrill® 860

- Drill diameter
- Drill depth
- Tolerance
- Mounting type and size
- Coolant supply
- Drill type
- Coating (valid for -NM geometry)

CoroDrill® 881

- Drill diameter
- Drill length
- Drill depth
- Mounting type and size

CoroDrill® Delta-C

- Drill diameter/step
- Carbide grade
- Drill depth
- Chamfers/corner radius
- Tolerance
- Mounting type and size
- Coolant supply

Coromant U indexable insert drill

- Drill diameter/step
- Number of extra inserts
- Chamfer inserts
- Drill length
- Drill depth
- Mounting type and size
- Flute length

CoroDrill® 460

- Drill diameter
- Drill depth
- Tolerance
- Mounting type and size
- Coolant supply
- Drill type
- Coating

CoroDrill® 870

Drill tip

- Drill tip diameter
- Point angle
- Corner chamfer
- Corner radius
- Grade

Drill body

- Drill depth
- Mounting type and size
- Step and chamfer drill
- Optimized drill body diameter

CoroDrill® 880

- Drill diameter
- Drill length
- Drill depth
- Mounting type and size
- Flute length



Tapping

CoroTap™ 100/200/300

Additional tool options

- Thread form
- Pitch
- Standard
- Number of flutes
- Tolerance
- Oversize/Undersize
- Coating
- Coolant supply
- Direction of cut
- Chamfers
- Interrupted threads

Reaming

CoroReamer™ 835 and 435

Additional tool options

- Diameter
- Tolerance

Tooling system

Shanks for exchangeable head system (EH)

Additional tool options

- EH coupling size
- Diameter
- Cylindrical or Weldon
- Shank length
- Design, conical or straight

CoroChuck™ 930

- Coupling type
- Coupling size
- Design
- Programing length

Coromant Capto®

Extension/reduction adapters

- Length
- Diameter
- Rotated polygon 90°/180°/270°

For the sake of the environment

Get into the Coromant Recycling Concept (CRC) now!

The Coromant Recycling Concept (CRC) is a comprehensive service for used carbide inserts (including CBN and PCD if “carrier” is cemented carbide) and solid carbide tools offered by Sandvik Coromant to all its customers.

In the light of increasing consumption of non-renewable raw materials, the economic management of dwindling resources is a duty owed by all manufacturers.

Sandvik Coromant is playing its part by offering to collect used carbide inserts and solid carbide tools and recycle them in the most environmentally friendly way.

All used hard-metal inserts are collected in the collection box at the workplace.

When the collection box is sufficiently full, its contents are transferred to the transport box. The full transport box is then sent to the nearest Sandvik Coromant office or to your Coromant dealer who can also give you more information.

The benefits of the CRC speak for themselves

- A one-stop worldwide recycling system.
- For direct and trade customers.
- Simple procedure with collection and transport boxes.
- Less waste, easing the burden on the environment.
- Better utilisation of resources.
- Other manufacturers' carbide inserts are also accepted.



Order collection boxes for each lathe, milling machine, drill or for your machining center. We recommend one collection box for inserts and one separate box for solid carbide tools for each cutting workplace.

Collection box (yellow):	Order numbers
Transport box for solid carbide tools (wooden):	91617
Transport box inserts (wooden):	92994
	92995

Safety information in connection with grinding of cemented carbide

Material composition

Hard metal products contain tungsten carbide and cobalt. Other substances may contain titanium carbide, tantalum carbide, niobium carbide, chromium carbide, molybdenum carbide or vanadium carbide. Some grades contain titanium carbo nitride and/or nickel.

Routes of exposure

Grinding or heating of hard metal blanks or hard metal products will produce dust or fumes with dangerous ingredients that can be inhaled, swallowed or come in contact with the skin or eyes.

Acute toxicity

The dust is toxic by inhalation. Inhalation may cause irritation and inflammation of the airways. Significantly higher acute inhalation toxicity has been reported during simultaneous inhalation of cobalt and tungsten carbide compared to inhalation of cobalt alone. Skin contact can cause irritation and rash. Personnel whose skin is sensitive may experience an allergic reaction.

Chronic toxicity

Repeated inhalation of aerosols containing cobalt may cause obstruction in the airways. Prolonged inhalation of increased concentrations may cause lung fibrosis or lung cancer. Epidemiological studies indicate that workers exposed in the past to high concentrations of tungsten carbide/cobalt carried an increased risk of developing lung cancer.

Cobalt and nickel are potent skin sensitizers. Repeated or prolonged contact can cause irritation.

Risk phrases

Toxic: danger of serious damage to health by prolonged exposure through inhalation

Toxic by inhalation

Limited evidence of a carcinogenic effect.

May cause sensitization by inhalation and skin contact

Preventive measures

Avoid formation and inhalation of dust. Use adequate local exhaust ventilation to keep personal exposure well below the nationally authorised limits.

- If ventilation is not available or adequate, use respirators nationally approved for the purpose.
- Use safety goggles or glasses with side shields when necessary.
- Avoid repeated skin contact. Wear suitable gloves. Wash skin thoroughly after handling.
- Use suitable protective clothing. Launder clothing as needed.
- Do not eat, drink or smoke in the working area. Wash skin thoroughly before eating, drinking or smoking.

Material cross reference list

ISO	MC	CMC	Country										
			Europe	Germany	Great Britain		Sweden	USA	France	Italy	Spain	Japan	
			Standard										
			DIN EN	W.-nr.	BS	EN	SS	AISI/SAE/ASTM	AFNOR	UNI	UNE	JIS	
P	Unalloyed steel												
	P1.1.Z.AN	01.1	S235JR G2	1.0038	4360 40 C	-	1311	A570.36	E 24-2 Ne	-	-	STKM 12A;C	
	P1.1.Z.AN	01.1	S235J2 G3	1.0116	4360 40 B	-	1312	A573-81 65	E 24-U	Fe37-3	-	-	
	P1.1.Z.AN	01.1	C15	1.0401	080M15	-	1350	1015	CC12	C15C16	F.111	-	
	P1.1.Z.AN	01.1	C22	1.0402	050A20	2C/2D	1450	1020	CC20	C20C21	F.112	-	
	P1.1.Z.AN	01.1	C15E	1.1141	080M15	32C	1370	1015	XC12	C16	C15K	S15C	
	P1.1.Z.AN	01.1	C25E	1.1158	-	-	-	1025	-	-	-	S25C	
	P1.1.Z.AN	01.1	S380N	1.8900	4360 55 E	-	2145	A572-60	-	FeE390KG	-	-	
	P1.1.Z.AN	01.1	17MnV7	1.0870	4360 55 E	-	2142	A572-60	NFA 35-501 E 36	-	-	-	
	P1.1.Z.AN	02.1	55Si7	1.0904	250A53	45	2085	9255	55S7	55Si8	56Si7	-	
	P1.1.Z.AN	02.2	-	-	-	-	2090	9255	55S7	-	-	-	
	P1.2.Z.AN	01.2	C35	1.0501	060A35	-	1550	1035	CC35	C35	F.113	-	
	P1.2.Z.AN	01.2	C45	1.0503	080M46	-	1650	1045	CC45	C45	F.114	-	
	P1.2.Z.AN	01.2	40Mn4	1.1157	150M36	15	-	1039	35M5	-	-	-	
	P1.2.Z.AN	01.2	36Mn5	1.1167	-	-	2120	1335	40M5	-	36Mn5	SMn438(H)	
	P1.2.Z.AN	01.2	28Mn6	1.1170	150M28	14A	-	1330	20M5	C28Mn	-	SCMn1	
	P1.2.Z.AN	01.2	C35G	1.1183	060A35	-	1572	1035	XC38TS	C36	-	S35C	
	P1.2.Z.AN	01.2	C45E	1.1191	080M46	-	1672	1045	XC42	C45	C45K	S45C	
	P1.2.Z.AN	01.2	C53G	1.1213	060A52	-	1674	1050	XC48TS	C53	-	S50C	
	P1.2.Z.AN	01.3	C55	1.0535	070M55	-	1655	1055	-	C55	-	-	
	P1.2.Z.AN	01.3	C55E	1.1203	070M55	-	-	1055	XC55	C50	C55K	S55C	
	P1.2.Z.AN	02.1	S275J2G3	1.0144	4360 43C	-	1412	A573-81	E 28-3	-	-	SM 400A;B;C	
	P1.2.Z.AN	02.1	S355J2G3+C2	1.0570	4360 50B	-	2132	-	E36-3	Fe52BFN/Fe52CFN	-	SM490A;B;C;YA;YB	
	P1.2.Z.AN	02.1	S355J2G3	1.0841	150 M 19	-	2172	5120	20 MC 5	Fe52	F-431	-	
	P1.3.Z.AN	01.3	C60E	1.0601	080A62	43D	-	1060	CC55	C60	-	-	
	P1.3.Z.AN	01.3	C60E	1.1221	080A62	43D	1678	1060	XC60	C60	-	S58C	
	P1.3.Z.AN	01.4	C101E	1.1274	060 A 96	-	1870	1095	XC 100	-	F-5117	-	
	P1.3.Z.AN	01.4	C101u	1.1545	BW 1A	-	1880	W 1	Y105	C36KU	F-5118	SK 3	
	P1.3.Z.AN	01.4	C105W1	-	BW2	-	2900	W210	Y120	C120KU	F.515	SUP4	
	P1.3.Z.AN	02.1	S340 MGC	1.0961	-	-	-	9262	60SC7	60SiCr8	60SiCr8	-	
	P1.4.Z.AN	01.1	11SMn30	1.0715	230M07	-	1912	1213	S250	CF9SMn28	11SMn28	SUM22	
	P1.4.Z.AN	01.1	11SMnPb30	1.0718	-	-	1914	12L13	S250Pb	CF9SMnPb28	11SMnPb28	SUM22L	
	P1.4.Z.AN	01.1	10SPb20	1.0722	-	-	-	-	10PbF2	CF10SPb20	10SPb20	-	
	P1.4.Z.AN	01.1	11SMn37	1.0736	240M07	1B	-	1215	S 300	CF9SMn36	12SMn35	-	
	P1.4.Z.AN	01.1	11SMnPb37	1.0737	-	-	1926	12L14	S300Pb	CF9SMnPb36	12SMnP35	-	
	P1.4.Z.AN	01.2	35S20	1.0726	212M36	8M	1957	1140	35MF4	-	F210G	-	
	P1.5.C.UT	01.1	GC16E	1.1142	030A04	1A	1325	1115	-	-	-	-	
	Steel	Low-alloy steel											
		P2.1.Z.AN	02.1	16Mo3	1.5415	1501-240	-	2912	A204Gr.A	15D3	16Mo3KW	16Mo3	-
		P2.1.Z.AN	02.1	14Ni6	1.5622	-	-	-	A350LF5	16N6	14Ni6	15Ni6	-
		P2.1.Z.AN	02.1	21NiCrMo2	1.6523	805M20	362	2506	8620	20NCD2	20NiCrMo2	20NiCrMo2	SNCM220(H)
		P2.1.Z.AN	02.1	17CrNiMo6	1.6587	820A16	-	-	-	18NCD6	-	14NiCrMo13	-
		P2.1.Z.AN	02.1	15Cr3	1.7015	523M15	-	-	5015	12C3	-	-	SCr415(H)
		P2.1.Z.AN	02.1	55Cr3	1.7176	527A60	48	-	5155	55C3	-	-	SUP9(A)
		P2.1.Z.AN	02.1	15CrMo5	1.7262	-	-	2216	-	12CD4	-	12CrMo4	SCM415(H)
		P2.1.Z.AN	02.1	13CrMo4-5	1.7335	1501-620Gr27	-	-	A182 F11;F12	15CD3.5	14CrMo4 5	14CrMo45	-
										15CD4.5			
		P2.1.Z.AN	02.1	10CrMo9 10	1.7380	1501-622 Gr.31;45	-	2218	A182 F.22	12CD9, 10	12CrMo9, 10	TU.H	-
		P2.1.Z.AN	02.1	14MoV6 3	1.7715	1503-660-440	-	-	-	-	-	13MoCrV6	-
		P2.1.Z.AN	02.1	50CoMo4	1.7228	823M30	33	2512	-	-	653M31	-	-
		P2.1.Z.AN	02.2	14NiCr10	1.5732	-	-	-	3415	14NC11	16NiCr11	15NiCr11	SNC415(H)
		P2.1.Z.AN	02.2	14NiCr14	1.5752	655M13; A12	36A	-	3415;3310	12NC15	-	-	SNC815(H)
		P2.1.Z.AN	02.1/02.2	16MnCr5	1.7131	(527M20)	-	2511	5115	16MC5	16MnCr5	16MnCr5	-
		P2.1.Z.AN	02.1/02.2	34CrMo4	1.7220	708A37	19B	2234	4137;4135	35CD4	35CrMo4	34CrMo4	SCM432;SCCRM3
		P2.1.Z.AN	02.1/02.2	41CrMo4	1.7223	708M40	19A	2244	4140;4142	42CD4TS	41CrMo4	42CrMo4	SCM 440
P2.1.Z.AN		02.1/02.2	42CrMo4	1.7225	708M40	19A	2244	4140	42CD4	42CrMo4	42CrMo4	SCM440(H)	
P2.1.Z.AN		03.11	14NiCrMo134	1.6657	832M13	36C	-	-	-	15NiCrMo13	14NiCrMo131	-	
P2.2.Z.AN		02.1	31CrMo12	1.8515	722 M 24	-	2240	-	30 CD 12	30CrMo12	F-1712	-	
P2.2.Z.AN		02.1	39CrMoV13 9	1.8523	897M39	40C	-	-	-	36CrMoV12	-	-	
P2.2.Z.AN		02.1	41CrS4	1.7039	524A14	-	2092	L1	-	105WCR 5	-	-	
P2.2.Z.AN		02.1	50NiCr13	1.2721	-	-	2550	L6	55NCV6	-	F-528	-	
P2.2.Z.AN		03.11	45WCrV7	1.2542	BS1	-	2710	S1	-	45WCrV8KU	45WCrSi8	-	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	36CrNiMo4	1.6511	816M40	110	-	9840	40NCD3	38NiCrMo4(KB)	35NiCrMo4	-	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	34CrNiMo6	1.6582	817M40	24	2541	4340	35NCD6	35NiCrMo6(KB)	-	-	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	34Cr4	1.7033	530A32	18B	-	5132	32C4	34Cr4(KB)	35Cr4	SCr430(H)	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	41Cr4	1.7035	530A40	18	-	5140	42C4	41Cr4	42Cr4	SCr440(H)	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	32CrMo12	1.7361	722M24	40B	2240	-	30CD12	32CrMo12	F.124.A	-	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	51CrV4	1.8159	735A50	47	2230	6150	50CV4	50CrV4	51CrV4	SUP10	
P2.2.Z.AN/P2.5.Z.HT		02.1/02.2	41CrAlMo7	1.8509	905M39	41B	2940	-	40CAD6, 12	41CrAlMo7	41CrAlMo7	-	
P2.3.Z.AN		02.1	100Cr6	1.3505	534A99	31	2258	52100	100C6	100Cr6	F.131	SUJ2	

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Material cross reference list

ISO	MC	CMC	Country	Germany	Great Britain	Sweden	USA	France	Italy	Spain	Japan	
			Europe									
			Standard									
			DIN EN	W.-nr.	BS	EN	SS	AISI/SAE/ASTM	AFNOR	UNI	UNE	JIS
M	Austenitic stainless steel											
	M1.0.Z.AQ	05.11/15.11	X3CrNiMo13-4	1.4313	425C11	-	2385	CA6-NM	Z4CND13.4M Z38C13M	(G)X6CrNi304	-	SCS5
	M1.0.Z.AQ/M1.0.C.UT	05.11/15.11	X53CrMnNiN21-9	1.4871	349S54	-	-	EV8	Z52CMN21.09	X53CrMnNiN21 9	-	SUH35, SUH36
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNiN18-10	1.4311	304S62	-	2371	304LN	Z2CN18.10	-	-	SUS304LN
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNiMoN17-13-3	1.4429	-	-	2375	316LN	Z2CND17.13	-	-	SUS316LN
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNiMo17-12-2	1.4404	316S13	-	2348	316L	Z2CND17-12	X2CrNiMo1712	-	-
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNiMo18-14-3	1.4435	316S13	-	2353	316L	Z2CND17.12	X2CrNiMo17 12	-	SCS16, SUS316L
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X3CrNiMo17-3-3	1.4436	316S33	-	2343, 2347	316	Z6CND18-12-03	X8CrNiMo1713	-	-
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNiMo18-15-4	1.4438	317S12	-	2367	317L	Z2CND19.15	X2CrNiMo18 16	-	SUS317L
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X6CrNiNb18-10	1.4550	347S17	58F	2338	347	Z6CNNb18.10	X6CrNiNb18 11	F.3552 F.3524	SUS347
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X6CrNiMoTi17-12-2	1.4571	320S17	58J	2350	316Ti	Z6NDT17.12	X6CrNiMoTi17 12	F.3535	-
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X10CrNiMoNb 18-12	1.4583	-	-	-	318	Z6CNDNb17 13B	X6CrNiMoNb17 13	-	-
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X15CrNiSi20-12	1.4828	309S24	-	-	309	Z15CNS20.12	-	-	SUH309
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNiMoN17-11-2	1.4406	301S21	58C	2370	308	Z1NCDU25.20	-	F.8414	SCS17
	M1.0.Z.AQ	05.21/15.21	X1CrNiMoCuN20-18-7	1.4547	-	-	2378	S31254	Z1CNDU20-18-06AZ	-	-	-
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X9CrNi18-8	1.4310	-	-	2331	301	Z12CN17.07	X12CrNi17 07	F.3517	SUS301
	M1.0.Z.PH	05.22/15.22	X7CrNiAl17-7	1.4568 1.4504	316S111	-	-	17-7PH	Z8CNA17-07	X2CrNiMo1712	-	-
	M1.0.Z.AQ/M1.0.C.UT	05.21/15.21	X2CrNi19-11	1.4306	304S11	-	2352	304L	Z2CN18-10	X2CrNi18 11	-	-
					304S12							
	M1.1.Z.AQ	05.21/15.21	-	-	304S31	58E	2332, 2333	304	Z6CN18.09	X5CrNi18 10	F.3504 F.3541	SUS304
	M1.1.Z.AQ	05.21/15.21	X5CrNi18-10	1.4301	304S15	58E	2332	304	Z6CN18.09	X5CrNi18 10	F.3551	SUS304
	M1.1.Z.AQ	05.21/15.21	X5CrNiMo17-2-2	1.4401	316S16	58J	2347	316	Z6CND17.11	X5CrNiMo17 12	F.3543	SUS316
	M1.1.Z.AQ	05.21/15.21	X6CrNiTi18-10	1.4541	321S12	58B	2337	321	Z6CNT18.10	X6CrNiTi18 11	F.3553 F.3523	SUS321
	M1.2.Z.AQ	05.21/15.21	X8CrNiS18-9	1.4305	303S21	58M	2346	303	Z10CNF 18.09	X10CrNiS 18.09	F.3508	SUS303
	Super austenitic (Ni>20%) stainless steel											
	M2.0.C.AQ	20.11	G-X40NiCrSi36-18	1.4865	330C11	-	-	-	-	XG50NiCr39 19	-	SCH15
	M2.0.Z.AQ	05.21/15.21	X1NiCrMoCu25-20-5	1.4539	-	-	2562	UNS V 0890A	Z2 NCDU25-20	-	-	-
	M2.0.Z.AQ	05.21/15.21	X8CrNi25-21	1.4845	310S24	-	2361	310S	Z12CN25 20	X6CrNi25 20	F.331	SUH310
	M2.0.Z.AQ	20.11	X12NiCrSi36 16	1.4864	-	-	-	330	Z12NCS35.16	F-3313	-	SUH330
	M2.0.Z.AQ	05.23/15.23	X1NiCrMoCu31-27-4	1.4563	-	-	2584	NO8028	Z1NCDU31-27-03	-	-	-
	Duplex (austenitic/ferritic) stainless steel											
	M3.1.Z.AQ/M3.1.C.AQ	05.51/15.51	X2CrNiN23-4	1.4362	-	-	2376	S31500	-	-	-	-
	M3.1.Z.AQ/M3.1.C.AQ	05.51/15.51	X8CrNiMo27-5	-	-	-	2324	S32900	-	-	-	-
	M3.2.Z.AQ/M3.2.C.AQ	05.52/15.52	X2CrNiN23-4	-	-	-	2327	S32304	Z2CN23-04AZ	-	-	-
	M3.2.Z.AQ/M3.2.C.AQ	05.52/15.52	-	-	-	-	2328	-	-	-	-	-
	M3.2.Z.AQ/M3.2.C.AQ	05.52/15.52	X2CrNiMoN22-53	-	-	-	2377	S31803	Z2CND22-05-03	-	-	-
	M1.1.Z.AQ	05.21/15.21		1.0045	Trade names SANMAC 304 (Sandvik Steel)							
	M1.1.Z.AQ	05.21/15.21			SANMAC 304L (Sandvik Steel)							
	M1.1.Z.AQ	05.21/15.21			SANMAC 316 (Sandvik Steel)							
	M1.1.Z.AQ	05.21/15.21			SANMAC 316L (Sandvik Steel)							
	M1.0.Z.AQ	05.23/15.23			254 SMO							
	M2.0.Z.AQ	05.23/15.23			654 SMO							
	M3.2.Z.AQ	05.52/15.52			SANMAC SAF 2205 (Sandvik Steel)							
M3.2.Z.AQ	05.52/15.52			SANMAC SAF 2507 (Sandvik Steel)								

Material cross reference list

ISO	MC	CMC	Country									
			Europe	Germany	Great Britain	Sweden	USA	France	Italy	Spain	Japan	
			Standard									
			DIN EN	W.-nr.	BS	EN	SS	AISI/SAE/ASTM	AFNOR	UNI	UNE	JIS
K	Malleable cast iron											
	K1.1.C.NS	07.1	-	-	8 290/6	-	0814	-	MN 32-8	-	-	FCMB310
	K1.1.C.NS	07.1	EN-GJMB350-10	0.8135	B 340/12	-	0815	32510	MN 35-10	-	-	FCMW330
	K1.1.C.NS	07.2	EN-GJMB450-6	0.8145	P 440/7	-	0852	40010	Mn 450	GMN 45	-	FCMW370
	K1.1.C.NS	07.2	EN-GJMB550-4	0.8155	P 510/4	-	0854	50005	MP 50-5	GMN 55	-	FCMP490
					P 570/3		0858	70003	MP 60-3			FCMP540
	K1.1.C.NS	07.2	EN-GJMB650-2	0.8165	P570/3	-	0856	A220-70003	Mn 650-3	GMN 65	-	FCMP590
	K1.1.C.NS	07.3	EN-GJMB700-2	0.8170	P690/2	-	0862	A220-80002	Mn700-2	GMN 70	-	FCMP690
	Gray cast iron											
	K2.1.C.UT	08.1	-	-	-	-	0100	-	-	-	-	-
	K2.1.C.UT	08.1	EN-GJL-100	0.6010	-	-	0110	No 20 B	Ft 10 D	-	-	FC100
	K2.1.C.UT	08.1	EN-GJL-150	0.6015	Grade 150	-	0115	No 25 B	Ft 15 D	G 15	FG 15	FC150
	K2.1.C.UT	08.1	EN-GJL-200	0.6020	Grade 220	-	0120	No 30 B	Ft 20 D	G 20	-	FC200
	K2.1.C.UT	08.2	EN-GJL-250	0.6025	Grade 260	-	0125	No 35 B	Ft 25 D	G 25	FG 25	FC250
	K2.1.C.UT	08.2	EN-JLZ	0.6040	Grade 400	-	0140	No 55 B	Ft 40 D	-	-	-
	K2.2.C.UT	08.2	EN-GJL-300	0.6030	Grade 300	-	0130	No 45 B	Ft 30 D	G 30	FG 30	FC300
	K2.2.C.UT	08.2	EN-GJL-350	0.6035	Grade 350	-	0135	No 50 B	Ft 35 D	G 35	FG 35	FC350
	K2.3.C.UT	08.3	GGL-NiCr20-2	0.6660	L-NiCuCr202	-	0523	A436 Type 2	L-NC 202	-	-	-
	Nodular cast iron											
	K3.1.C.UT	09.1	EN-GJS-400-15	0.7040	SNG 420/12	-	0717-02	60-40-18	FCS 400-12	GS 370-17	FGE 38-17	FCD400
	K3.1.C.UT	09.1	EN-GJS-400-18-LT	0.7043	SNG 370/17	-	0717-12	-	FGS 370-17	-	-	-
	K3.1.C.UT	09.1	EN-GJS-350-22-LT	0.7033	-	-	0717-15	-	-	-	-	-
	K3.1.C.UT	09.1	EN-GJS-800-7	0.7050	SNG 500/7	-	0727	80-55-06	FGS 500-7	GS 500	FGE 50-7	FCD500
	K3.2.C.UT	09.2	EN-GJS-600-3	0.7060	SNG 600/3	-	0732-03	-	FGS 600-3	-	-	FCD600
	K3.3.C.UT	09.2	EN-GJS-700-2	0.7070	SNG 700/2	-	0737-01	100-70-03	FGS 700-2	GS 700-2	FGS 70-2	FCD700
	K3.5.C.UT	-	EN-GJSA-XNiCr20-2	0.7660	Grade S6	-	0776	A43D2	S-NC 202	-	-	-
	Compacted graphite iron											
	K4.1.C.UT	-	EN-GJV-300									
	K4.1.C.UT	-	EN-GJV-350									
	K4.2.C.UT	-	EN-GJV-400									
	K4.2.C.UT	-	EN-GJV-450									
	K4.2.C.UT	-	EN-GJV-500									
	Austempered ductile iron											
	K5.1.C.NS	-	EN-GJS-800-8	-	-	-	-	ASTM A897 No. 1	-	-	-	-
	K5.1.C.NS	-	EN-GJS-1000-5	-	-	-	-	ASTM A897 No. 2	-	-	-	-
	K5.2.C.NS	-	EN-GJS-1200-2	-	-	-	-	ASTM A897 No. 3	-	-	-	-
	K5.2.C.NS	-	EN-GJS-1400-1	-	-	-	-	ASTM A897 No. 4	-	-	-	-
	K5.3.C.NS	-	-	-	-	-	-	ASTM A897 No. 5	-	-	-	-

Material cross reference list

ISO	MC	CMC	Country										
			Europe	Germany	Great Britain		Sweden	USA	France	Italy	Spain	Japan	
			Standard										
			DIN EN	W.-nr.	BS	EN	SS	AISI/SAE/ASTM	AFNOR	UNI	UNE	JIS	
N	Aluminum based alloys												
	N1.3.C.AG	30.21	G-AISI9MGWA	3.2373	-	-	4251	SC64D	A-S7G	-	-	C4BS	
	N1.3.C.UT	30.21	G-ALMG5	-	LM5	-	4252	GD-AISI12	A-SU12	-	-	AC4A	
	N1.3.C.UT/N1.3.C.AG	30.21/30.22	-	-	LM25	-	4244	356.1	-	-	-	A5052	
	N1.3.C.UT	-	GD-AISI12	-	-	-	4247	A413.0	-	-	-	A6061	
	N1.3.C.AG	-	GD-AISI8Cu3	-	LM24	-	4250	A380.1	-	-	-	A7075	
	N1.3.C.UT	-	G-AISI12(Cu)	-	LM20	-	4260	A413.1	-	-	-	ADC12	
	N1.3.C.UT	-	G-AISI12	-	LM6	-	4261	A413.2	-	-	-	-	
N1.3.C.AG	-	G-AISI10Mg(Cu)	-	LM9	-	4253	A360.2	-	-	-	-		
S	Nickel based alloys												
	S2.0.Z.AG	20.22	S-NiCr13A16MoNb	LW2 4670	mar-46	-	-	5391	NC12AD	-	-	-	
	S2.0.C.UT	20.24	NiCo15Cr10MoAlTi	LW2 4674	-	-	-	AMS 5397	-	-	-	-	
	S2.0.Z.AG	20.22	NiFe35Cr14MoTi	LW2.4662	-	-	-	5660	ZSNCDT42	-	-	-	
	S2.0.Z.AG	20.22	NiCr19Fe19NbMo	LW2.4668	HR8	-	-	5383	NC19eNB	-	-	-	
	S2.0.Z.AG	20.22	NiCr20TiAk	2.4631	Hr401.601	-	-	-	NC20TA	-	-	-	
	S2.0.Z.AG	20.22	NiCr19Co11MoTi	2.4973	-	-	-	AMS 5399	NC19KDT	-	-	-	
	S2.0.Z.AG	20.22	NiCr19Fe19NbMo	LW2.4668	-	-	-	AMS 5544	NC20K14	-	-	-	
	S2.0.Z.AN	20.21	-	2.4603	-	-	-	5390A	NC22FeD	-	-	-	
	S2.0.Z.AN	20.21	NiCr22Mo9Nb	2.4856	-	-	-	5666	NC22FeDNB	-	-	-	
	S2.0.Z.AN	20.21	NiCr20Ti	2.4630	HR5.203-4	-	-	-	NC20T	-	-	-	
	S2.0.Z.AG	20.22	NiCu30AL3Ti	2.4375	3072-76	-	-	4676	-	-	-	-	
	Cobalt base												
	-	-	CoCr20W15Ni	-	-	-	-	5537C, AMS	KC20WN	-	-	-	
	S3.0.Z.AG	20.32	CoCr22W14Ni	LW2.4964	-	-	-	5772	KC22WN	-	-	-	
	Titanium alloys												
	S4.2.Z.AN	23.22	TiAl5Sn2.5	3.7115.1	TA14/17	-	-	UNS R54520	T-A5E	-	-	-	
	S4.2.Z.AN	23.22	TiAl6V4	3.7165.1	TA10-13/TA28	-	-	UNS R56401	UNS R56400	-	-	-	
	S4.3.Z.AN	23.22	TiAl5V5Mo5Cr3	-	-	-	-	-	T-A6V	-	-	-	
	S4.2.Z.AN	23.22	TiAl4Mo4Sn4Si0.5	3.7185	-	-	-	-	-	-	-	-	
	Heat resistant super alloys	Trade names											
		Iron-based alloys											
		S2.0.Z.UT/S2.0.Z.AN	20.11	Incoloy 800									
		Nickel based alloys											
		S2.0.Z.AN	20.2	Haynes 600									
		S2.0.Z.AN	20.2	Nimocast PD16									
		S2.0.Z.AG	20.2	Nimonic PE 13									
		S2.0.Z.AG	20.2	Rene 95									
		S2.0.Z.AN	20.21	Hastelloy C									
		S2.0.Z.AN	20.21	Incoloy 825									
		S2.0.Z.AN	20.21	Inconel 600									
		S2.0.Z.AN	20.21	Monet 400									
		S2.0.Z.AG	20.22	Inconel 700									
		S2.0.Z.AG	S2.0.Z.AG	Inconel 718									
		S2.0.Z.AG	20.22	Mar – M 432									
		S2.0.Z.AG	20.22	Nimonic 901									
		S2.0.Z.AG	20.22	Waspaloy									
		S2.0.C.NS	20.24	Jessop G 64									
		S3.0.Z.AG	20.3	Air Resist 213									
		S3.0.Z.AG	20.3	Jetalloy 209									
	H	Hardened materials											
		H1.2.Z.HA	04.1	X100CrMo13	1.4108	-	-	2258 08	440A	-	-	-	C4BS
H1.3.Z.HA		04.1	X110CrMoV15	1.4111	-	-	2534 05	610	-	-	-	AC4A	
H1.2.Z.HA		04.1	X65CrMo14	-	-	-	2541 06	0-2	-	-	-	AC4A	

General code key for CoroMill cutters

R	A	390	-	063	Q	22	L	-	11	M	050
1	2	3		4	5	6	7		8	9	10

1 Style

R = Right-hand rotating

2 Performance

A = Inch

3 Main code

E.g.: 390 = CoroMill® 390

4 Cutting diameter

E.g.: 063 = 63 mm

5 Type of coupling

A = Cylindrical, mm

B = Weldon mm

C = Coromant Capto

D = Cylindrical inch

J = CIS Tenon drive

M = Weldon, inch

N = Whistle Notch inch

Q = Arbor mounting mm

O = Cylindrical inch

R = Arbor mounting inch

T = Threaded coupling

W = Whistle Notch mm

HA= HSK form A

6 Coupling size

22 = 22 mm

7 Extra long

L = Extra long

9 Pitch

L = Coarse pitch

M = Close pitch

H = Extra close pitch

10 Length, LF

E.g.: 050 = 50 mm

8 Insert size

11 = 11 mm (LE)

General code key for CoroMill inserts

R	390	-	11	T3	12	M	-	P	L	W
1	2		3	4	5	6		7	8	9

1 Hand of insert R = Right hand L = Left hand	2 Main code E.g.: 390= CoroMill® 390	3 Insert width E.g.: 11=11 mm (.669 inch)
4 Insert thickness, S E.g.: T3 S = 3.97 04 S = 4.76 06 S = 6.33	5 Corner radius E.g.: 12 = 1.2 mm	6 Edge performance M = Highest edge security E = Highest sharpness and precision H = High edge sharpness and high precision K = High cutting sharpness
7 Main ISO application area P M K N S H	8 Operation L = Light cutting M = Medium H = Heavy T = Turn milling	9 Wiper W = Wiper

Code key for CoroMill® 327

CoroMill 327 insert

Grooving and chamfering

327	R	12	-	22	130	45	08	-	GC
1	2	3		4	5	9	12		7

Threading

327	R	06	-	12	100	VM	-	TH
1	2	3		4	10	11		7

Profiling

327	R	06	-	12	220	11	-	RM
1	2	3		4	5	6		7

Grooving

327	R	12	-	28	150	01	-	GM	M
1	2	3		4	5	6		7	8

1 Product name

2 Right-hand insert

3 Coupling size (interface)

4 D_{min} (mm)

5 Insert width

6 Radius ex 02 = radius 0.2 mm (.008 inch)

7 Type of insert

GM = Grooving

RM = Fullnose radius

CH = Chamfering

GC = Grooving and chamfering

TH = Threading

8 M = Close pitch

9 Chamfer 45°

10 Thread pitch

11 Type of thread

12 Max cutting depth, CDX in mm

mm: pitch x 100

inch: No. of threads per inch

VM = V-Profile 60°

MM = Metric 60°

WH = Whitworth 55°

CoroMill® 327 holders

327	-	12	B	15	S	C	-	06
1		2	3	4	5	6		7

1 Product name

2 Shank diameter DMM

3 Shank type

B = Weldon

4 Reach length

5 Shank materials

S = steel

E = solid carbide

6 Internal coolant

7 Coupling size (interface)

Code key for CoroMill® 328

CoroMill® 328 insert

Chamfering	<table><tr><td>328</td><td>R</td><td>13</td></tr><tr><td>1</td><td>2</td><td>3</td></tr></table>	328	R	13	1	2	3	-	<table><tr><td>110</td><td>45</td></tr><tr><td>4</td><td>7</td></tr></table>	110	45	4	7	-	<table><tr><td>GC</td></tr><tr><td>6</td></tr></table>	GC	6
328	R	13															
1	2	3															
110	45																
4	7																
GC																	
6																	
Threading	<table><tr><td>328</td><td>R</td><td>13</td></tr><tr><td>1</td><td>2</td><td>3</td></tr></table>	328	R	13	1	2	3	-	<table><tr><td>150</td><td>VM</td></tr><tr><td>8</td><td>9</td></tr></table>	150	VM	8	9	-	<table><tr><td>TH</td></tr><tr><td>6</td></tr></table>	TH	6
328	R	13															
1	2	3															
150	VM																
8	9																
TH																	
6																	
Grooving	<table><tr><td>328</td><td>R</td><td>13</td></tr><tr><td>1</td><td>2</td><td>3</td></tr></table>	328	R	13	1	2	3	-	<table><tr><td>110</td><td>01</td></tr><tr><td>4</td><td>5</td></tr></table>	110	01	4	5	-	<table><tr><td>GM</td></tr><tr><td>6</td></tr></table>	GM	6
328	R	13															
1	2	3															
110	01																
4	5																
GM																	
6																	

- 1 Product name
 2 Right-hand insert
 3 Insert size
 4 Insert width
 5 Radius ex 02 = radius 0.2 mm (.008 inch)
 6 Geometry
 GM = Grooving
 GC = Grooving and chamfering
 TH = Threading

- 7 Chamfer 45°
 8 Thread pitch
 9 Type of thread

mm: pitch x 100
 VM = V-Profile 60°

CoroMill® 328 cutters

328	-	039	B	25	-	13	M
1		2	3	4		5	6

- 1 Product name
 2 Cutting diameter, DC
 3 Shank type
 B = Weldon
 Q = Arbor
 S = Bore with keyway
 4 Shank/couplings diameter (DCON)
 5 Insert size
 6 Pitch

Code key for CoroMill® 325

Inserts

Cutters

325	R	16	-	150	HA	F	01
1	2	3		4	5	6	7

325	-	12	AP	40	-	16	M
1		2	3	4		5	6

1	Product family
2	R = Right hand L = Left hand
3	Insert size, mm
4	Pitch, mm
5	Thread type HA = HA profile HB = HB profile
6	Edge performance F = Sharp cutting edge
7	Number of teeth

1	Product family
2	Diameter DC mm
3	Machine type / Spindle maker A = Citizen B = Star C = Tsugami D = Tornos E = WTO P = PCM Q = Jarvis
4	Mounting size, mm
5	Insert sizes, mm
6	Close pitch

Code key for CoroMill® 170

Cutter

S	-	170	-	12	-	350	Q	080	N	032	C
		1		2		3	4	5	6	7	8

1 Product family

2 Module

3 Diameter DC, mm

4 Mounting

Q = Arbor metric

R = Arbor inch

J = Arbor CIS

5 Mounting size

e.g. 080 = 80 mm

6 N = Neutral style

7 Number of inserts

8 Diameter of radial keyway

A = 120 mm (4.724 inch)

B = 130 mm (5.118 inch)

C = 140 mm (5.512 inch)

D = 170 mm (6.693 inch)

E = 190 mm (7.480 inch)

Insert

170	-	12	-	24	07	40	E	-	P	R	H	N
1		2		3	4	5	6		7	8	9	10

1 Product family

2 Module

3 Insert size

20 = 20 mm (.787 inch)

24 = 24 mm (.945 inch)

28 = 28 mm (1.102 inch)

4 Insert thickness

07 = 7 mm (.276 inch)

08 = 8 mm (.315 inch)

10 = 10 mm (.394 inch)

5 Radius

e.g. 40 = 4.0 mm

6 Edge performance

E = Highest sharpness and precision

7 Main ISO applications area

P = Steel

8 Type of insert

F = Flank insert

R = Root insert

9 Operation

L = Light

M = Medium

H = Heavy

10 Geometry

N = Neutral

Code key for CoroMill® 176

Cutter

S	-	176	R	-	M	40	-	150	S	50	1	05	
		1			2	3	4		5	6	7	8	9

- 1 Product family

2 Hand of tool

3 Profile type

4 Profile size
- 5 Diameter, D_c mm

6 Mounting type

7 Mounting size

8 Number of starts
- 9 Number of complete windings

05 = 5 windings
- R = Right hand, L = Left hand

M = Module, D = Diametral pitch

40 = 4.0 mm (.157 inch)
- S = Bore with keyway

C = Coromant Capto®

50 = 50 mm (1.969 inch)

Insert

176	M	50	-	N	12	06	10	E	-	P	M
1	2	3		4	5	6	7	8		9	10

- 1 Product family

2 Profile type

3 Profile size

4 Geometry
- 5 Insert width

6 Insert thickness

7 Corner radius

8 Edge performance
- 9 Main ISO applications area

10 Operation
- M = Module, D = Diametral pitch

50 = 5.0 mm (.197 inch)

N = Neutral, i.e. for both right and left hand tools.
- 12 = 12 mm (.472 inch)

06 = 6 mm (.236 inch)

10 = 1.0 mm (.039 inch)

E = Highest sharpness and precision
- P = Steel

L = Light

M = Medium

H = Heavy

Code key for CoroMill® Plura

2	S	3	4	0	-	1200	-	200	-	M	A	1640
1	2	3	4	5		6		7	8	9	10	11

1 Series

- 1:** Versatile
2: Optimized

2 Face geometry**S:** Straight corner radius, center cut**F:** Straight corner radius, no center cut**P:** Straight, center cut**N:** Straight, no center cut**B:** Ball nose**C:** Chamfer tools**H:** High-feed cutter**U:** Chamfer radius**T:** Turn mill**5** Running number to differentiate between tool style codes**6** Cutting diameter (DC) in 1/100.

E.g. 1200 = 12.00 mm

7 Corner radius, chamfer or chamfer radius in 1/100.

E.g. Corner radius 200 = 2 mm.

E.g. Chamfer 045 = 45°

8 Coolant

- No coolant
C: Radial exit coolant
A: Axial exit coolant

9 Primary ISO material

- P:** ISO P
K: ISO K
M: ISO M
S: ISO S
H: ISO H
N: ISO N
X: Multi

3 Flute helix angle

- 0:** 0°<FHA≤15°
1: 15°<FHA≤25°
2: 25°<FHA≤35°
3: 35°<FHA≤45°
4: 45°<FHA≤55°
5: 55°<FHA≤65°

10 Shank

- A:** Cylindrical
B: Weldon
C: Cylindrical with neck
D: Weldon with neck
Y: iLock
F: iLock with neck
G: Undersized

4 Average cutting length of tool style (APMX/DC)

- 0:** 0-0.5 x DC
1: 0.6-1.0 x DC
2: 1.1-1.5 x DC
3: 1.6-2.0 x DC
4: 2.1-2.5 x DC
5: 2.6-3.0 x DC
6: 3.1-3.5 x DC
7: 3.6-4.0 x DC
8: 4.1-5.0 x DC
9: > 5.0 x DC

11 Grade

Code key for CoroMill® Plura

R A 21 5 . 3 A - 100 30 - A C 22 H

1	2	3	4	5	6	7	8	9	10	11	12	13	14
---	---	---	---	---	---	---	---	---	----	----	----	----	----

1 Direction of rotation

R Right hand
L Left hand

2 System of measurement

A Inch version

3 Type of tool

21 End mill

4 Drilling function

5 Non-drilling
6 Drilling

6 Number of teeth

1-9 1 to 9 teeth
A-Z 10 to 32 teeth

8 Cutting diameter**Inch tools.**

Cutting diameter DC in 1/64 inch.

Example: 10 = 5/32 inch

Metric tools.

Cutting diameter DC in 1/10 mm.

Example: 100 = 10.0 mm

9 Helix angle

Degree of helix rounded to nearest 5 degrees

7 Coolant

C = Internal coolant supply
- = External coolant supply

12 Length of shank

S Short shank length
C Long shank length
K Shank length > "C"
L Shank length > "K"
X Shank length > "L"
E Short LF and LU
I Medium LF, medium LU
J Medium LF, long LU
O Long LF, medium LU
P Long LF, long LU

13 Max cutting depth, APMX**Inch tools.**

Cutting length in 1/16 inch

If DC < 1/8 in 1/64 inch

Example: 09 = 9/16 inch for DC 3/16 inch

Metric tools.

Cutting length in mm

If D_c or D_{c2} < 3mm in 1/10 mm

Example: 07 = 7 mm for DC 6 mm 70 = 7 mm for DC 2.5 mm

5 Basic design of end mill

- | | |
|---|--|
| 0 Concave chamfer end mill | 6 Full radius (ball nose) with spherical form |
| 1 Square form with/without corner chamfer, tight tolerance at DC | 7 Conical straight form |
| 2 Square form with corner radius | 8 45° chamfer end mill |
| 3 Square form with/without corner chamfer | 9 30° chamfer end mill |
| 4 Full radius (ball nose) form (6 or less teeth) | H High feed end mill |
| 5 Conical full radius (ball nose) form (6 or less teeth) | T Turn-mill end mill |

10 Corner radius/Conical angle

Corner radius		Conical angle
Metric tools.	Inch tools.	Metric tools.
– No radius	– No radius	– No radius/Angle
A <0.5 mm	A 1/64 inch	M 0.5°
B 0.5 mm	B 1/32 inch	N 1°
C 1.0 mm	C 3/64 inch	O 1.5°
D 1.5 mm	D 1/16 inch	P 2°
E 2.0 mm	E 5/64 inch	Q 2.5°
F 2.5 mm	F 3/32 inch	R 3°
etc.	etc.	S 3.5°
		T 4°
		etc.

11 Shank type

- A** Cylindrical
- B** Weldon
- C** Cylindrical with neck
- E-J** Cylindrical with neck (Neck length/DC, mm)
- E = 0.1 - 1.9 H = 6.0 - 7.9
- F = 2.0 - 3.9 I = 8.0 - 9.9
- G = 4.0 - 5.9 J = 10 - 11.9
- Y = Cylindrical with iLock

14 Geometry type

Cutting edge	TW % of DC	Rake angle γ°
K Kordell	50-60	9°-12°
B Chip breaker	60	4°-7°
U Kordell	<50	9°-12°
A Straight	<45	12°-15°
P Straight	45-55	9°-12°
N Straight	56-65	9°-12°
L Straight	66-75	4°-12°
G Straight	50-75	-3°-3°
H Straight	>75	<-3°
C Compression router		

TW = Core diameter

Code key for exchangeable milling heads

A	316	-	12	S	M	4	50	C	120	05	P
1	2		3	4	5	6	7	8	9	10	11

1 System of measurement A = Inch version	2 Family name E.g.: 316 = CoroMill® 316	3 Size of interface EH coupling size E.g.: 12 = E12	4 Basic design S = Straight = 90° F = Straight no center cutting B = Ball nose C = Chamfer tools H = HFC (high-feed cutter) U = Chamfer radius																								
5 Length of head M = Medium	6 Number of edges E.g.: ZEFP = 4	7 Helix angle Degree of helix rounded to nearest 5 degrees																									
8 Coolant - No coolant C Radial exit coolant A Axial exit coolant	9 Cutting diameter Metric tools. E.g.: 120 = 12.0 mm Inch tools. E.g.: 050 = 0.5 inch	10 Corner radius Metric tools. E.g.: 05 = RE 0.5 mm Inch tools. E.g.: 04 = RE 0.4 mm (.015")																									
11 Geometry <table><tr><td>Geometry</td><td>Rake angle</td><td>Core diameter</td><td></td></tr><tr><td>P</td><td>9-12°</td><td>50%</td><td></td></tr><tr><td>L</td><td>4-12°</td><td>70%</td><td></td></tr><tr><td>G</td><td>-3-3°</td><td>70%</td><td></td></tr><tr><td>K</td><td>9-12°</td><td>60%</td><td>Kordell</td></tr><tr><td>A</td><td>12-15°</td><td></td><td></td></tr></table>				Geometry	Rake angle	Core diameter		P	9-12°	50%		L	4-12°	70%		G	-3-3°	70%		K	9-12°	60%	Kordell	A	12-15°		
Geometry	Rake angle	Core diameter																									
P	9-12°	50%																									
L	4-12°	70%																									
G	-3-3°	70%																									
K	9-12°	60%	Kordell																								
A	12-15°																										

Code key for CoroMill® Plura thread milling endmills

R 21 7 . 1 5 C 100 300 A K 30 N

1	2	3	4	5	6	7	8	9	10	11	12
---	---	---	---	---	---	---	---	---	----	----	----

1 Direction of rotation R Right hand	4 Type of thread 1= Metric/Metric Fine internal thread 2= Metric/Metric Fine external thread 3= UNC/UNF internal thread 4= UNC/UNF external thread 5= NPT internal thread 6= NPT external thread 7= NPTF internal thread 8= NPTF external thread 9= G internal thread 0= G external thread	5 Number of teeth 1-9 1 to 9 teeth 6 Cutting fluid supply C Internal coolant - No coolant through 7 Diameter of tool Cutting diameter in 1/10 mm
2 Type of tool 21 End mill		
3 Function 7 Thread milling		
8 Pitch Pitch in 1/10 mm	9 Shank type A Cylindrical shank B Weldon shank C Cylindrical shank with chamfer	10 Length of shank S Short shank length C Long shank length K Shank length > "C" L Shank length > "K" X Shank length > "L"
11 Max cutting depth, APMX Cutting length in mm (If DC or DCX < 3 mm in 1/10 mm)	12 Geometry type N 10° helix, 9-12° rake angle, internal thread H 30° helix, < 0° rake angle, internal thread P 15° helix 9-10° rake angle S 15° helix 4-5° rake angle	

Code key for complete boring tools

821D	-	125	T	C	16	-	C8
1		2	3	4	5		6

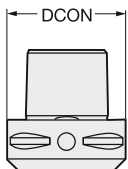
1 Product family
820 = CoroBore 820/820 XL
820L = CoroBore 820L XL
821 = DuoBore 821
821D = DuoBore 821 dampened
825 = CoroBore 825/825 XL
825D = CoroBore 825/825 XL dampened
825L = CoroBore 825L/825L XL
825 EH = CoroBore 825 EH
826 = CoroBore 826 XL
826D = CoroBore 826 XL Dampened
826L = CoroBore 826L XL
825 SL = CoroBore 825 SL face grooving

2 Boring diameter
Ø Max = 125 mm

3 Insert shape
C  Rhombic
S  Square
T  Triangular
R  Round

4 Insert type
Clearance angle
C  7°
N  0°
P  11°

5 Insert size
Insert size = 12 mm

6 Coupling size		
Coromant Capto® size		
	Coupling size	DCON mm (inch)
	C3	32 (1.260)
	C4	40 (1.575)
	C5	50 (1.969)
	C6	63 (2.480)
	C8	80 (3.150)
	C10	100 (3.937)
Coromant Capto®		

Code key for CoroDrill® 870

Drill body

870	-	1250	-	11	L	16	-	3
1		2		3	4	5		6

- 1 Product family
- 2 Minimum drill tip diameter (mm) - DCN
- 3 Tip interface size
- 4 Shank type
L = ISO 9766, LX = ISO 9766 inch
- 5 Shank diameter DMM
- 6 Max hole depth (x D_0)

Drill tip

870	-	1270	-	11	PM
1		2		3	4

- 1 Product family
- 2 Drill tip diameter (mm) - DC
- 3 Tip interface size
- 4 Geometry
MM = ISO M, Medium machining
PM = ISO P, Medium machining
KM = ISO K, Medium machining
GP = General materials, Pilot geometry

Code key for toolholders

Cylindrical holder

A	E12	-	A	20	-	S	S	-	140
1	2		3	4		5	6		7

Coromant Capto® holder

C3	-	A	391.EH	-	10	035
8		1	9		10	7

Solid holder

392.45EH	-	40	-	10	-	056
9		11		10		7

1 System of measurement	2 Size of interface		3 Holder type
A = Inch version	E12= EH coupling size		A = Cylindrical
4 Holder diameter	5 Type of holder	6 Holder material	7 Length of holder
E.g.: DCON = 20 mm	S = Straight C = Conical	S = Steel E = Solid carbide	E.g.: 140 = 140 mm
8 Coupling size	9 Family/ holder type		10 Size of interface
C = Coromant Capto	391.EH = Coromant Capto® EH holder 392.140EH = ISO 7388.1 392.55EH = MAS-BT 403 A392.45EH = CAT V 392.410EH = HSK holder Form A/C A392.R8EH = Bridgeport holder 392.EREH = ER integrated holder		10 = EH coupling size
			11 Taper size
			11 = Taper size for Coromant solid holders

Code key for solid holding tools

A	A	1	B	05	-	50	32	060
1	2	3	4	5		6	7	8

1 Inch version

2 Coolant through center

3 Spindle type

1=ISO 7388/1 (DIN 69871)
2= MAS-BT
3=CAT V-Flange

4 Options

B= Coolant through flange
F= Flange mounting
X= Extra short

5 Holder type

05 = Face mill holder
14= ER Collet chuck
20=Endmill holder Weldon type
27= Short hole drill holder-shank ISO 9766

6 Taper size 30, 40, 50

7 Size bore or pilot, DCON_{WS}

mm (inch)		
09 (0.375)	19 (0.750)	38 (1.500)
13 (0.500)	25 (1.000)	51 (2.000)
16 (0.625)	32 (1.250)	63 (2.500)

8 Programming length, mm

060 = 60 mm

Code key for CoroChuck™ 930

930	-	HA	10	-	S	-	20	-	068
1		2	3		4		5		6

1 Product family 930 hydraulic chuck	2 Machine design C Coromant Capto® HA HSK A HE HSK E I ISO IB ISO BIG-PLUS® V CAT-V VB CAT-V BIG-PLUS® B MAS-BT BB MAS-BT BIG-PLUS®	3 Coupling size Coromant Capto® : C3, C4, C5, C6, C8, C10 HSK: HA04, HA05, HA06, HA08 HA10,HA12 Taper: BB30, BB40, BB50,I30, I40, I50, V40, V50
4 930 version HD Heavy Duty version S Slender version P Pencil version	5 Bore size diameter 20 = 20 mm	6 Programing length 068 = 68 mm

Code key for CoroChuck™ 970

970	-	HA	-	10	-	20	-	115
1		2		3		4		5

1	Product family
	970 tapping chuck

2	Machine design
C	Coromant Capto®
CY	Cylindrical
HA	HSK A
I	ISO
V	CAT V
B	MAS-BT
WE	Weldon

3	Coupling size
	Coromant Capto® : C3, C4, C5, C6, C8, C10
	HSK: HA04, HA05, HA06, HA08 HA10, HA12
	Taper: BB30, BB40, BB50, I30, I40, I50, V40, V50

4	Bore size diameter
20	= 20 mm

5	Programming length
115	= 115 mm

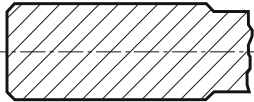
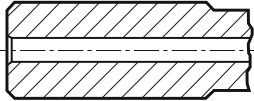
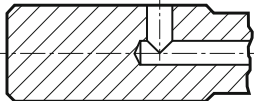
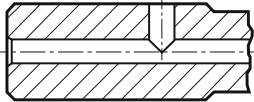
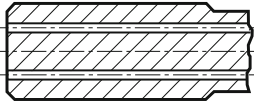
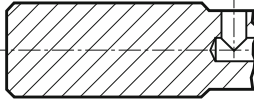
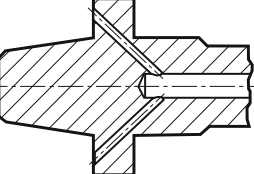
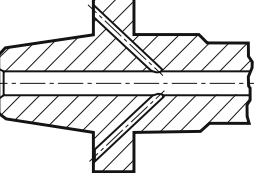
Code key for taps

T200	-	S	D	100	D	A	-	M3
1		2	3	4	5	6		7

1 Product family	2 ISO material P = Steel M = Stainless steel K = Cast iron S = Heat resistant super alloys H = Hardened material N = Non ferrous material X = Crossmaterial	3 Level of material E = Easy M = Medium D = Difficult
4 Number 1 0 0 Different nr for: reinforced or straight shank different chamfer, tool, coolant etc.	5 Std D = DIN A = ANSI & DIN/ANSI J = JIS I = ISO	6 Thread form A = M B = MF C = MJ D = UN E = UNC F = UNF G = UNEF H = UNJC I = UNJF J = UNS K = G L = NPT M = NPTF N = NPSF O = NPSM P = EGM Q = EGMF R = EGUNC S = EGUNF T = PG U = R V = Rc X = Rp Y = BA
7 Dimension Pitch only when needed, like in MF.		
M3 M10x125 (No decimal given in pitch size)		

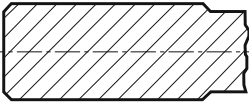
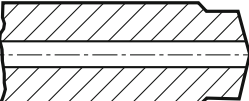
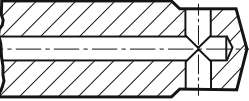
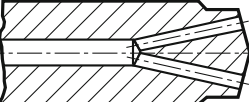
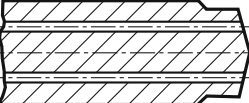
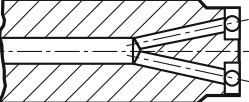
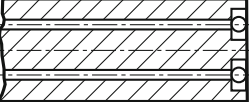
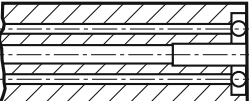
CNSC

Coolant entry style code

Code	Description	Image
0	Without coolant	
1	Axial concentric entry	
2	Radial entry	
3	Axial concentric and radial entry	
4	Axial concentric entry on circle	
5	Radial entry before adapter	
6	Decentral over flange	
7	Decentral over flange and axial	
8	Decentral over slots on the shank	

CXSC

Coolant exit style code

Code	Description	Image
0	No coolant exit	
1	Axial concentric exit	
2	Radial exit	
3	Axial inclined exit	
4	Axial concentric on circle	
5	Axial inclined exit with nozzle, adjustable	
6	Decentral exit with nozzle, adjustable	
7	Decentral over slots on the shank	
8	Axial or decentral with nozzle, adjustable	

Code	Page	Code	Page	Code	Page
161..Cx	J276	390.272	O104	600..Qxx	J228
161..Qxx	J277	390.410	O68	690..Cx	J145
162..Qxx	J278	390.558	O88	690	J144
170..E-P	J272-273	390.58	O121	690..HAxx	J148
176M..-PM	J274	391.60A-OZ	P33	690..Qxx	J147
1B23x-XA	J443-445	391.68	M52-58	820..CC-Cx	M26-28
1B240-XA	J446	392.14019Y	O112	820..CN	M70, M74
1C050-XA/B	J455	392.140277	O109	820..CN-Cx	M63
1P220-XA	J384	392.140EH	O101	820..RC-Cx	M65
1P220-XB	J385	392.272277	O109	820..SC-Cx	M29-30
1P221-XA	J390	392.41005	O64	820..SN	M71, M75
1P221-XB	J391	392.41005C	O63	820..SN-Cx	M64
1P222-XA	J398	392.41005CD	O67	820..SP	M69, M73
1P222-XB	J399	392.41014	O76	820..SP-Cx	M62
1P230-XA	J386	392.41019Y	O75	820..TC	M68, M72
1P230-XB	J387	392.41020	O69	820..TC-Cx	M61
1P231-XA	J392	392.41027	O71	820L..CN	M67
1P231-XB	J393	392.410277	O72	820L..TC	M66
1P240-XA	J400	392.41037	M94, M96	821..CC-Cx	M43
1P240-XB	J401	392.41050	O78	821..RC-Cx	M47
1P250-XA	J388	392.410EH	O61-62	821..SC-Cx	M46
1P250-XB	J389	392.410XL	M140	821..TC-Cx	M44-45
1P251-XA	J394	392.4519Y	O147	821D..CC-Cx	M48
1P251-XB	J395	392.45520	O140	821D..TC-Cx	M49
1P260-XA	J396	392.54005C	O80	825..SL	M135-136
1P260-XB	J397	392.54014	O84	825..SL-Cx	M133-134
1P330-XA	J402	392.54023	O81	825..TC	M112, M114
1P330-XB	J403	392.5519Y	O130	825..TC..EH	M99
1P340-XB	J407	392.55277	O127	825..TC-Axx	M98
1P341-XA	J404	392.55505C	O87	825..TC-Cx	M100-M101, M104
1P341-XB	J405	392.55514	O92	825D..TC-Cx	M103-110
1P3x0-XA	J406	392.55523	O89	825L..TC	M106
1U000-XA	J457	392.55805C	O87	825L..TC..-Cx	M102, M108
260	P46	392.55823	O89	826..TC	M113-115
2B230-NA	J428	392.55EH	O117	826..TC-Cx	M105
2B320-NG	J427	392.58277	O127	826D..TC-Cx	M111
2B330-NC	J425	392.64xXL	M141, M143	826L..TC	M107
2N012-CCOA	J360	392.ER327	O169	826L..TC..-Cx	M109
2P12x-NC	J342-344	392.EREH	O168	830	N5-6
2P123-NG	J345	392.R8.05	O166	835.B..A1-MF	N11-12
2P1x0-NA	J346-347	393.03-SE	P36-38	835.B..A1-PF	N7-8
2P210-NC	J353	393.03-SES	P39-40	835.T..A1-MF	N13-14
2P21x-PC	J379-380	393.14	P23-27	835.T..A1-PF	N9-10
2P23x-NA	J348, J351-352	393.14..D	P28-29	854.1	K106
2P340-PA	J324	393.140C	P11	860.1..A0	K82-86
2P340-PB	J325	393.14-xx	O159	860.1..A1	K73-81
2P341-MA	J326	393.15	P20-21	860.1..A1-MM	K87-96
2P360-PA	J328	393.2060	O164	860.1..A1-NM	K97-101
2P460-NA	J359	393.277	P41	860.2..A1	K107-109
2S220-NC	J349	393.37A	M97	861.1..A1-GM	K111-115
2S221-NG	J350	393.45	P12	861.1..A1-GP	K110
2S340-MA	J327	393.55	P11	862.1..A1-GM	K116-117
316..BM	J447-448	393.CG	P16-17	870..L-x	K34-35
316..CM	J458-459	393.CGP	P19	870..LX-x	K36-37
316..FM	J417-418	393.CGS	P14	870-GP	K30-33
316..HM	J452-453	416.2-L	K61	870-KM	K26-29
316..SM	J408, J410, J412, J414-416	419..Axx	J70	870-MM	K22-25
316..UM	J460	419..Cx	J68	870-PM	K18-21
325..-16M	J245-246	419..Qxx	J69	880..C	K38
326..VM-TH	J472	419N/R	J67	880..Cx	K40-44
326-CH	J456	435.B..A1-XF	N15-16	880..L	K48-52
327..TH	J248-251	435.T..A1-XF	N17-18	880..P	K39
327-CH	J271	452.1-C	K163	880-D..Lxx	K58
327-Erxx	O169	452.1-CM	K162	880-D..LXxx	K60
327-GC	J265	452.4-CM	K161	880-D..Vxx	K59
327-GM	J260-263	452.C1-C	K165	881..C	K62
327-RM	J264	452.R-C	K164	881..Cx	K63-64
327-xxB	O161	452.R-CM	K164	881..Lxx	K65-66
328..Bxx	J255	460.1..A0-XM	K127-132	881..P	K62
328..TH	J247	460.1..A1-XM	K118-126	930-BBxx	O90-91
328..Qxx	J254	490..Axx	J106	930-Bxx	O128-129
328..Sxx	J256	490..Bxx	J108	930-Cx	O43-45
328..TH	J247	490..Cx	J100-101	930-HAxx	O73-74
328-G	J252-253	490..EH	J110	930-lbxx	O82-83
329..Qxx	J258	490..HAxx	J111	930-lxx	O110-111
329..Sxx	J259	490..Qxx	J103	930-VBxx	O97-98
345..Axx	J49	490R/L	J97-99	930-Vxx	O145-146
345..Cx	J45	495..Axx	J268	970-Bxx	O133
345..Qxx	J46	495..Cx	J267	970-CYxx	O160
345N	J44	495..EHxx	J270	970-HAxx	O77
345R/L	J43	495	J266	970-lxx	O114
357..Qxx	J60	5549	M59	970-Vxx	O149
357N/R	J59	5623010	M60	970-WExx	O163
360..Qxx	J62, J65	5692	P10		
360R/L	J61	600..Axx	J229	A	
390.140	O104	600	J227	A..R825	M118

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A1B08	O103	AA2B20	O125	E005	L87
A1B14	O113	AA3B05	O137	E006	L88
A1B20	O105-106	AA3B10	O138	E007	L170
A1B27	O108	AA3B14	O148	E008	L171
A1F05	O102	AA3B20	O141-142	E010	L96-97
A1X20	O107	AA3B27	O143	E011	L98-99
A205	O118	AEHxx-Axx.x-SH	O156	E012	L180
A208	O120	AExx-Axx..CE	O158	E013	L181
A214	O131	AExx-Axx..CS	O158	E015	L100
A227	O126	AExx-Axx..SS	O155	E016	L101
A260	P46	AExx-Axx-SE	O156	E017	L182
A2B05	O118	APMT	J232	E018	L183
A2B08	O120			E020	L112
A2B14	O131-132	C		E021	L113
A2B20	O122-123	Cx-390.00	O150	E022	L193
A2B27	O126	Cx-390.140	O100	E023	L194
A2F05	O118	Cx-390.34705	O152	E025	L114
A2X20	O124	Cx-390.410	O58-59	E026	L115-116
A316..BM	J447-448	Cx-390.419	O60	E027	L195
A316..CM	J458-459	Cx-390.540	O79	E028	L196
A316..FM	J419	Cx-390.55	O115	E030	L127
A316..HM	J452-453	Cx-390.555	O85	E031	L128
A316..SM	J409, J411, J413, J416	Cx-390.562	O86	E032	L205
A316..UM	J460	Cx-390.58	O115	E033	L206
A326..VM-TH	J472	Cx-390.605	O116	E035	L129
A326-CH	J456	Cx-390.612	O60	E036	L130
A327-xxB	O162	Cx-390B.140	O100	E037	L207
A328..Bxx	J255	Cx-390B.540	O79	E038	L208
A328..Qxx	J254	Cx-390B.55	O115	E045	L72
A329..Rxx	J258	Cx-390B.555/558	O85	E046	L73
A329..Txx	J259	Cx-390B.58	O115	E047	L144
A345..Jxx	J48	Cx-391.01	O14	E048	L145
A345..Mxx	J50	Cx-391.01-Vxx	O34	E049	L66
A345..Rxx	J47	Cx-391.02	O15-16	E050	L138
A34-R825C	M130	Cx-391.02CCH	O16	E051	L139
A34-R826C	M130	Cx-391.05	O25	E053	L36
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A35-RXLS	M79, M128	Cx-391.06	O30	E056	L188
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A360..Rxx	J63, J65	Cx-391.14	O50-52	E058	L185
A390.45	O139	Cx-391.19	O46-48	E059	L50
A392.41005	O66	Cx-391.19Y	O49	E060	L120
A392.41005C	O65	Cx-391.20 (14)	O35-36	E064	L238
A392.41005CD	O67	Cx-391.23	O41	E069	L189
A392.41020	O70	Cx-391.27	O39	E074	L241
A392.45277	O144	Cx-391.277	O40	E079	L201
A392.45EH	O136	Cx-391.32	O53	E080	L216
A392.54505C	O95	Cx-391.327	O42	E085	L146
A392.54514	O99	Cx-391.37A/B	M93, M95	E090	L227
A392.54523	O96	Cx-391.50	O57	E091	L228
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A392.R8.05	O166	Cx-391.60B (MC)	O56	E095	L200
A392.R8EH	O165	Cx-391.61	O55	E096	L229
A393.14	P30	Cx-391.68A	M50	E097	L230
A393.14-xx	O159	Cx-391.69A	M51	E099	L231
A393.15	P22	Cx-391.EH	O17-20	E195	L161
A393.277	P41	Cx-391.XL	M139	E207	L157
A393.CG	P18	Cx-A390.00	O151	E212	L159
A393.CGS	P15	Cx-A390.4x	O134-135	E245	L162
A3B27	O143	Cx-A390.54x	O93-94	E258	L158
A40-NXLA35	M78, M127	Cx-A390B.45	O134	E263	L160
A40-R822XLS17	M77, M126	Cx-A391.05	O28	E301	L217
A40-RXLS24	M78, M127	Cx-A391.05C	O26-27	E302	L218
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A419..Cx	J68	Cx-A391.10	O33	E306	L219
A419..Oxx	J70	Cx-A391.19	O47	E308	L220
A419..Rxx	J69	Cx-A391.20 (14)	O37-38	E309	L223
A490..Cx	J102	Cx-A391.23	O41	E310	L224
A490..EH	J110	Cx-A391.EH	O21-22	E313	L215
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A490..Mxx	J109	Cx-R822XL	M76, M123	E315	L221
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A490..Rxx	J104	Cx-R825..AA	M116-117	E317	L234
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A880..LXxx	K53-55	CXS..TC	M85	E346	L141
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E361	L155	EX29PA	L187	R216.2x..AP..G	J358
E362	L209	EX33PA	L198	R216.2x..BC..P	J332
E363	L176	EX39PA	L199	R216.2x..CK/L..P	J336
E364	L93	Exx-Axx-CE	O157	R216.2x..YK..P	J337
E367	L177	Exx-Axx-CS	O157	R216.2x..YL..P	J338
E404	L143	Exx-Axx-SE	O154	R216.3x..30-AE..G	J381
E416	L59	Exx-Axx-SS	O153	R216.3x..30-AI..G	J382
E446	L29			R216.3x..30-AJ..G	J383
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E451	L153	HNGX-KM	J96	R216.3x..40-BC..K	J362
E454	L70	HNMF-KH	J83	R216.3x..45-BC..K	J367
E455	L71			R216.3x..50-AK..H	J340
E462	L32	L		R216.3x..50-AK..P	J331
E463	L33	LCMX	K69	R216.3x..50-BC..P	J333
E523	L236	LDHT	J168	R216.3x..60-AC..L	J372
E530	L240	LEHT	J168	R216.3x..CC/K..K	J365
E596	L237	LEHW	J168	R216.3x..YC..K	J366
E615	L167			R216.3xC..40-DC..K	J364
E616	L84	M		R216.3xC..40-DS..K	J363
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E737	L214			R216.4x	J422-424, J426, J429-430, J432, J437
E738	L213	N		R216.52/3	J438
E821	L57	N123..CM	J257	R216.54	J439
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E823	L58	N260.8	J88	R216.64	J441
E825	L38	N331.1A	J170-172	R216.Tx	J454
E827	L40	N331.1D	J174	R216F..Axx	J241
E830	L51	N331.32..Sxx	J175	R216F	J240
E831	L55	N331.32..Sxx..MQ	J177	R217.1x	J461-466
E832	L53	N331.32..Txx	J176	R217.3x	J467-469
E833	L56	N331.32..Txx..MQ	J178	R217.xx	J470-471
E835	L37	N331.35..Sxx	J185	R245..Axx	J57
E836	L48	N331.52..Sxx	J198	R245	J51-53, J244
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E838	L49	N365..E	J78	R300..Axx	J209-210
E839	L52	N365	J77	R300..Bxx	J211
E852	L74			R300..Cx	J205
E854	L62	R		R300..EH	J213-214
E855	L89	R/L148C	M137	R300	J200-204
E856	L79	R/L148D	M138	R300..Qxx	J207
E862	L147	R/L260.3	J86	R300..Txx	J215-216
E864	L134	R/L260.31	J87	R331.32..Axx	J183
E865	L172	R/L260.8..Qxx	J89	R331.32..Mxx	J184
E866	L156	R/L260.82	J91	R331.32..Qxx	J179
E872	L107	R/L262.4	J166	R331.32..Qxx..MQ	J181
E873	L121	R/L262.42	J167	R331.32..Rxx	J180
E874	L102	R/L331.1A	J173	R331.32..Rxx..MQ	J182
E875	L117	R/L331.52..Sxx	J188	R331.35..Axx	J186
E876	L108	R/L331.52..Txx	J189	R331.35..Mxx	J187
E877	L122	R/L365..Cx	J79	R331.52..Axx	J192, J196
E882	L190	R/L365	J77	R331.52..Mxx	J193, J197
E883	L202	R/L365..Qxx	J80, J82	R331.52..Qxx	J190, J194, J199
E884	L184	R/L590	J149-151	R331.52..Rxx	J191, J195, J199
E885	L197	R/LA260.8..Rxx	J90	R390..Axx	J132, J134
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