

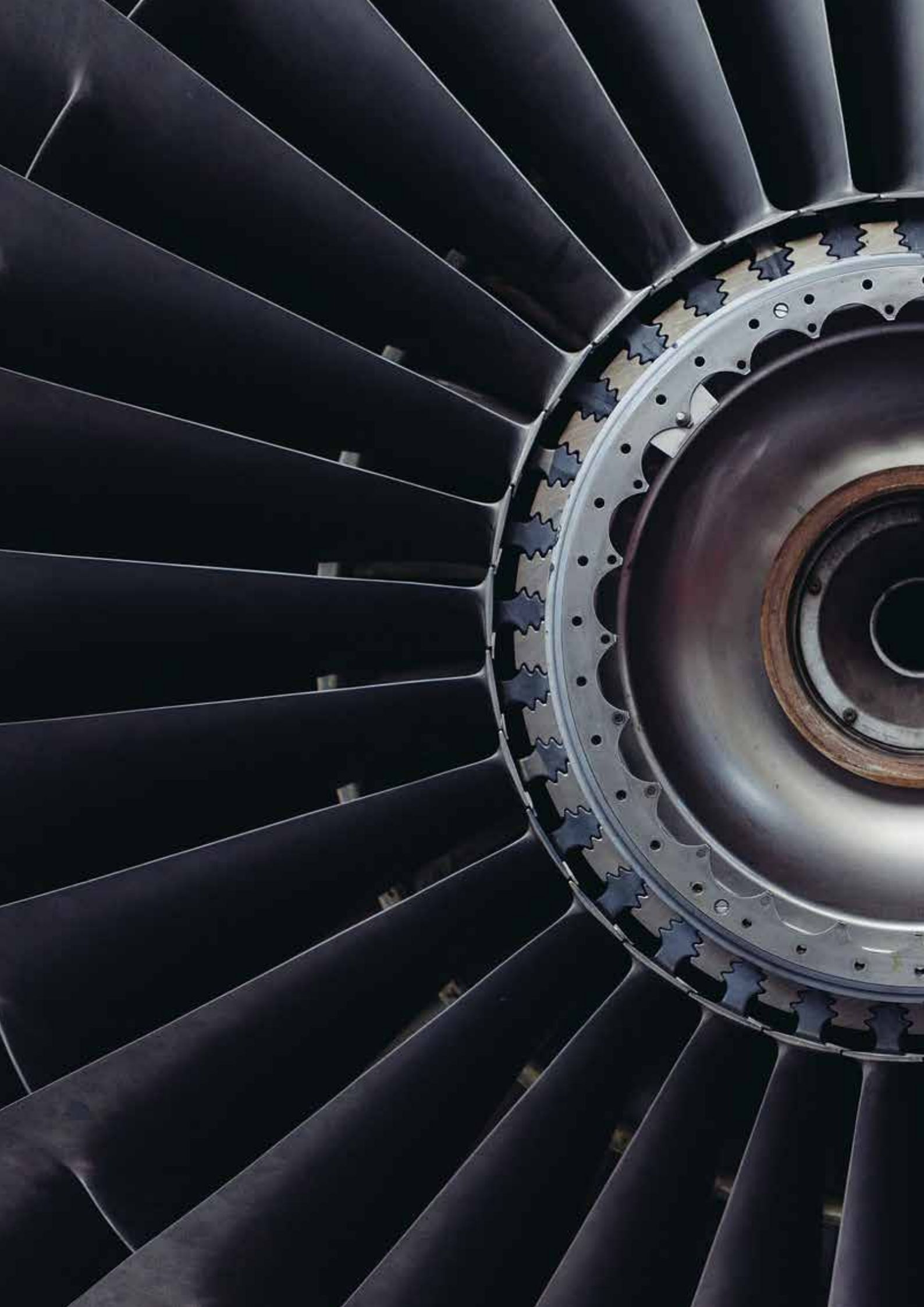


SPOT DRILL

CORNER ROUNDING

ENGRAVING







<b>GENERAL INFORMATIONS</b>	Pag. 4...5
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**REGARDING THIS CATALOGUE**

- This catalogue has been made in 2022
- The items contained in this catalogue may be updated and revised in the future.
- The items in this catalogue may be replaced and/or updated

## GRADE AND MATERIAL CLASSIFICATION

### MATERIAL AND ISO CLASSES





ISO P STEEL	ISO M STAINLESS STEEL	ISO K CAST IRON	ISO N NON FERROUS	ISO H HARDENED STEEL	ISO S SUPER ALLOY	T CLASS TITANIUM
Unalloyed steel, low and high Alloy steel, cast steel	Austenitic, Ferritic (Duplex), Martensitic Stainless Steel	Malleable and Grey Cast Iron, Nodular SG Iron	Alluminium Alloys Wrought, Alluminium Alloys, Copper and Copper Alloys	Extra Hard Steel	High Temperature Ni/Co Alloys	Ti alloy

### EXAMPLE: ARMT 080208CT – IP30

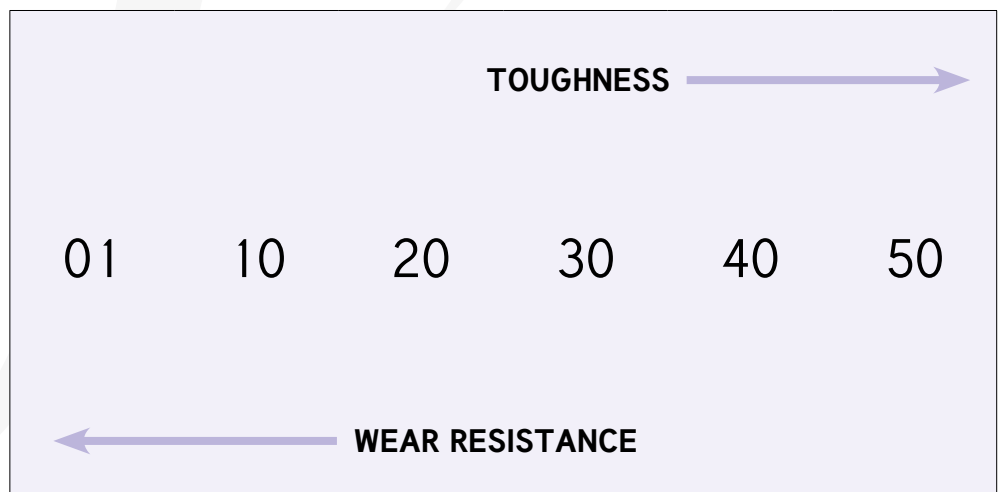
I

P

30

S	Coated insert Use without coolant	
U	Coated insert Use with coolant	
I	Coated insert Use with or without coolant	
N	Uncoated insert Use with or without coolant	

P	Steel
M	Stainless steel
K	Cast iron
N	Non ferrous
H	Hardened
S	Super alloy
T	Ti alloy





QUALITY	ISO										P	M	K	N	H	S	T
	05	10	15	20	25	30	35	40	45	50							
IP20				■							■	□	■	■	□	□	■
IP25					■						■	■	■	■	□	□	■
IP30						■					■	□	■	■	□	□	■
IM20				■							□	■	■	■	□	□	■
IM30						■					□	■	■	■	□	□	■
IK20				■							■	■	■	■	□	□	■
IN10		■									■	□	■	■	□	□	■
IS30							■				□	□	■	■	□	□	■

IP20	Size of WC	Max 1.2 μm																												
<table border="1"> <tr><td>P</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	■	■	■	M	□	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	PVD
P	■	■	■																											
M	□	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>65/100</b>	<b>55/100</b>																												

IM30	Size of WC	Max 3.0 μm																												
<table border="1"> <tr><td>P</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	□	■	■	M	■	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	PVD
P	□	■	■																											
M	■	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>50/100</b>	<b>70/100</b>																												

IP25	Size of WC	Max 1.2 μm																												
<table border="1"> <tr><td>P</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	■	■	■	M	■	■	■	K	■	■	■	N	■	■	■	H	□	■	■	S	□	■	■	T	■	■	■	Coating	PVD
P	■	■	■																											
M	■	■	■																											
K	■	■	■																											
N	■	■	■																											
H	□	■	■																											
S	□	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>70/100</b>	<b>50/100</b>																												

IK20	Size of WC	Max 1.2 μm																												
<table border="1"> <tr><td>P</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	■	■	■	M	■	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	CVD
P	■	■	■																											
M	■	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>60/100</b>	<b>60/100</b>																												

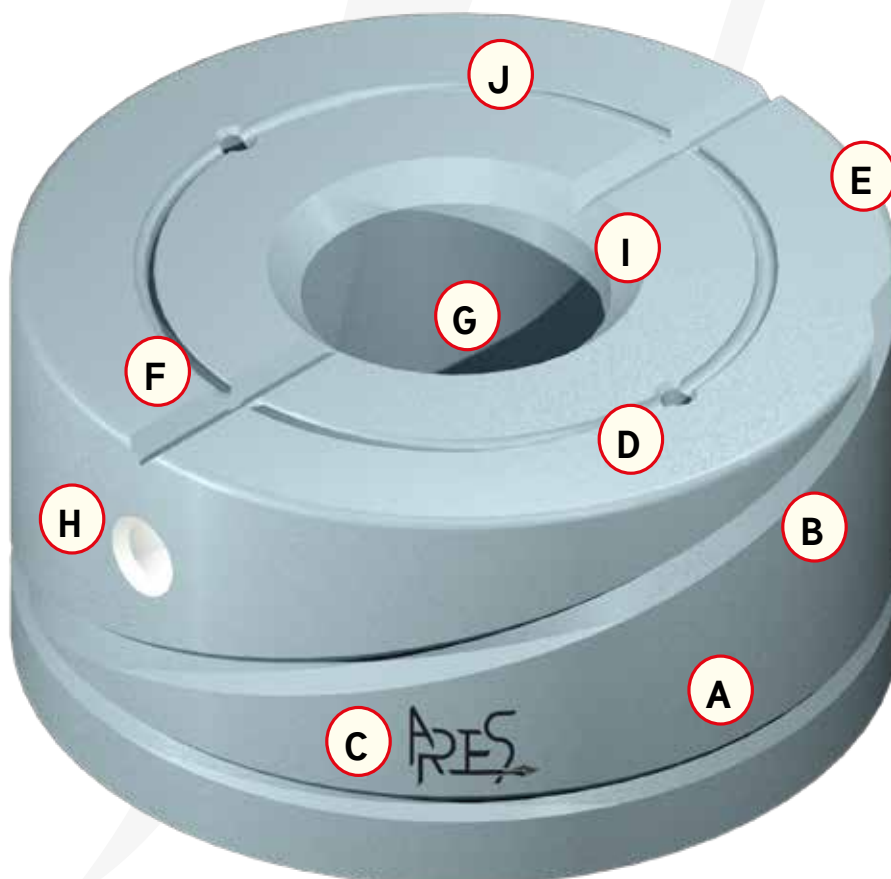
IP30	Size of WC	Max 3.0 μm																												
<table border="1"> <tr><td>P</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	■	■	■	M	□	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	PVD
P	■	■	■																											
M	□	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>35/100</b>	<b>85/100</b>																												

IN10	Size of WC	Max 2.8 μm																												
<table border="1"> <tr><td>P</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	■	■	■	M	□	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	DLC
P	■	■	■																											
M	□	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>90/100</b>	<b>40/100</b>																												





IM20	Size of WC	Max 0.8 μm																												
<table border="1"> <tr><td>P</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	□	■	■	M	■	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	PVD
P	□	■	■																											
M	■	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>75/100</b>	<b>55/100</b>																												


IS30	Size of WC	Max 3.0 μm																												
<table border="1"> <tr><td>P</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>M</td><td>□</td><td>■</td><td>■</td></tr> <tr><td>K</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>N</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>H</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>S</td><td>■</td><td>■</td><td>■</td></tr> <tr><td>T</td><td>■</td><td>■</td><td>■</td></tr> </table>	P	□	■	■	M	□	■	■	K	■	■	■	N	■	■	■	H	■	■	■	S	■	■	■	T	■	■	■	Coating	PVD
P	□	■	■																											
M	□	■	■																											
K	■	■	■																											
N	■	■	■																											
H	■	■	■																											
S	■	■	■																											
T	■	■	■																											
	Wear resistance	Toughness																												
	<b>60/100</b>	<b>80/100</b>																												

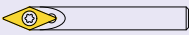


<p>SPOT DRILL</p>	 <p>ARMT 90°    ARMT-H 90°    ARMT 90°</p>	<p>Pag. 8 10</p>
<p>CORNER ROUNDING</p>	 <p>ARMT...RC</p>	<p>Pag. 11 14</p>
<p>ENGRAVING</p>	 <p>ARV 45°    ARV 60°</p>	<p>Pag. 16 18</p>





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<b>23118-10</b>	<b>23118-16</b>	<b>23119-20</b>	<b>23120-20</b>		

	Pag.	<b>11 14</b>
<b>23118-16</b>		

			Pag.	<b>16 18</b>
<b>5147-06</b>	<b>5148-10</b>	<b>5148-12</b>		

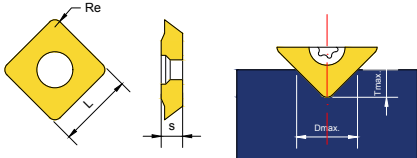
	APPLICATIONS	MULTI-PURPOSE TOOL
<b>A</b>	Grooving	Suitable for: CNC lathe CNC tuning machine CNC milling machine Special use machine
<b>B</b>	Helical groove milling	
<b>C</b>	Engraving	
<b>D</b>	Spotting	
<b>E</b>	Corner rounding	
<b>F</b>	Face groove milling	
<b>G</b>	Internal turning	
<b>H</b>	Centering	
<b>I</b>	Internal chamfering	
<b>J</b>	Face grooving	

# MULTI-PURPOSE INSERT 90°

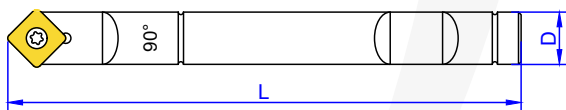
■	Best choice
□	Suitable

●	Available in stock
○	Available upon request (MOQ: 100 pz.)

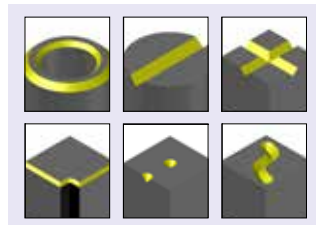
	P	M	K	N	H	S	T	SP20	UP30	SP30	IP20	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30	
ARMT	■	■	■	■	■	■	■						●		●				○					
ARMT													●		●				●					



	CODE	Cutting edges	L	S	Re	Dmax.	Tmax.
	ARMT080208CT-IP30	4	8.31	2.38	0.8	10	4.5
ARMT080208CT-IM30	4	8.31	2.38	0.8	10	4.5	
ARMT080204CT-IP30	4	8.31	2.38	0.4	10	4.5	
ARMT080204CT-IM30	4	8.31	2.38	0.4	10	4.5	
ARMT080204CT-IN10	4	8.31	2.38	0.4	10	4.5	

## HOLDERS



CODE	DIMENSIONS			
	∅ D	L	Angle α	Coolant through-hole
23118-10	10	90	90°	No
23118-10-C	10	90	90°	Yes



SPARE PARTS		
		SVT100
		
	T8	



# MULTI-PURPOSE INSERT 90°/120°



■	Best choice
□	Suitable

●	Available in stock
○	Available upon request (MOQ: 100 pz.)

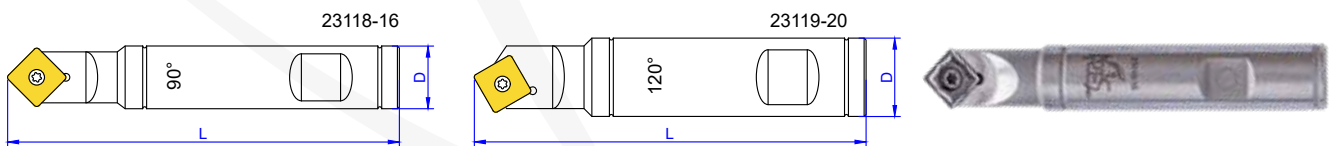
P	■	■	■	■	■	■	□	□	□					□	□	□	
M	□	□	□	□	■	□	■	■	■						□	□	
K					■					■	■						
N													■				
H						□							■				
S						□									■	■	□
T																	■

ARMT		ARMT 11T3CT																
ARMT-H		ARMT 11T3CT-2Z-H																
			SP20	UP30	SP30	IP20	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30
			SP20	UP30	SP30	IP20	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30

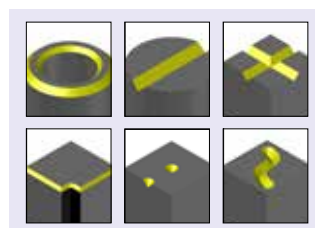
	CODE	Cutting edges	L	S	Re	Dmax.	Tmax.
	ARMT 11T3CT-IP30	4	11.00	4.00	0.8	14	7
	ARMT 11T3CT-IM30	4	11.00	4.00	0.8	14	7
	ARMT 11T3CT-IN10	4	11.00	4.00	0.8	14	7
	ARMT 11T3CT-2Z-H-IP30	2	11.00	4.00	0.8	14	7
	ARMT 11T3CT-2Z-H-IS30	2	11.00	4.00	0.8	14	7

	CODE	Description	Qty.	Avl.
	SPTKIT01	23118-16	1	●
		ARMT 11T3CT-IP30	4	
		SVT101	1	
		T15	1	
	SPTKIT02	23118-16	1	●
		ARMT 11T3CT-IM30	4	
		SVT101	1	
T15		1		

## HOLDERS



CODE	DIMENSIONS			
	Ø D	L	Angle α	Coolant through-hole
23118-16	16	100	90°	No
23118-16-C	16	100	90°	Yes
23119-20	20	100	120°	No



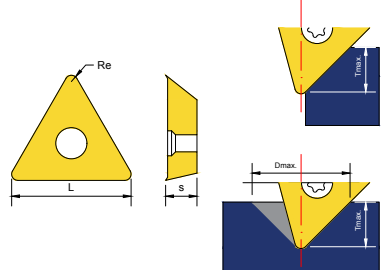
SPARE PARTS		SVT101 2.5 Nm
		T15


# MULTI-PURPOSE INSERT 90°

■	Best choice
□	Suitable

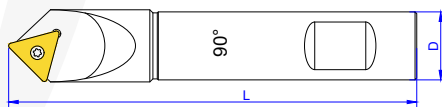
●	Available in stock
○	Available upon request (MOQ: 100 pz.)

	P	M	K	N	H	S	T	SP20	UP30	SP30	IP20	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30	
ARMT	■	■	■	■	■	■	■					●												

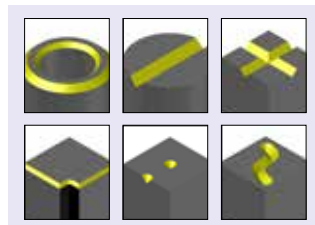
	CODE	Cutting edges	L	S	Re	Dmax.	Tmax.
		ARMT 16T308CT-IP25	3	15.3	4.10	0.8	20



	CODE	Description	Qty.	Avl.	
	SPTKIT03	23120-20		1	○
		ARMT 16T308CT-IP25		4	
		SVT101		1	
		T15		1	

## HOLDERS



CODE	DIMENSIONS			
	Ø D	L	Angle α	Coolant through-hole
23120-20	20	120	90°	No



SPARE PARTS		SVT101 2.5 Nm
		T15

# CORNER ROUNDING INSERT



■	Best choice
□	Suitable

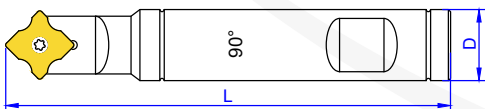
●	Available in stock
○	Available upon request (MOQ: 100 pz.)

P	■	■	■	■	■	■	□	□	□				□	□	□	
M	□	□	□	□	■	□	■	■	■					□	□	
K					■					■	■					
N												■				
H						□							■			
S						□								■	■	□
T																■

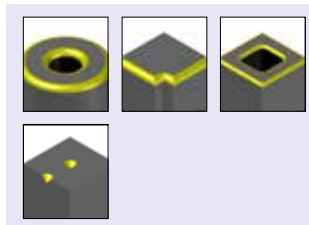
ARMT		ARMT 11T3RC 10																
ARMT		ARMT 11T3RC 15																
ARMT		ARMT 11T3RC 20																
ARMT		ARMT 11T3RC 25																
ARMT		ARMT 11T3RC 30																
			SP20	UP30	SP30	IP20	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30
			SP20	UP30	SP30	IP20	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30

	CODE	Cutting edges	L	S	R	X	Y	Z
	ARMT 11T3RC 10	2	11.11	3.97	1.0	2.75	1.5	2.5
	ARMT 11T3RC 15	2	11.11	3.97	1.5	3.25	1.5	3
	ARMT 11T3RC 20	2	11.11	3.97	2.0	3.75	1.5	3.5
	ARMT 11T3RC 25	2	11.11	3.97	2.5	4.25	1.5	4
	ARMT 11T3RC 30	2	11.11	3.97	3.0	4.75	1.4	4.4

## HOLDERS

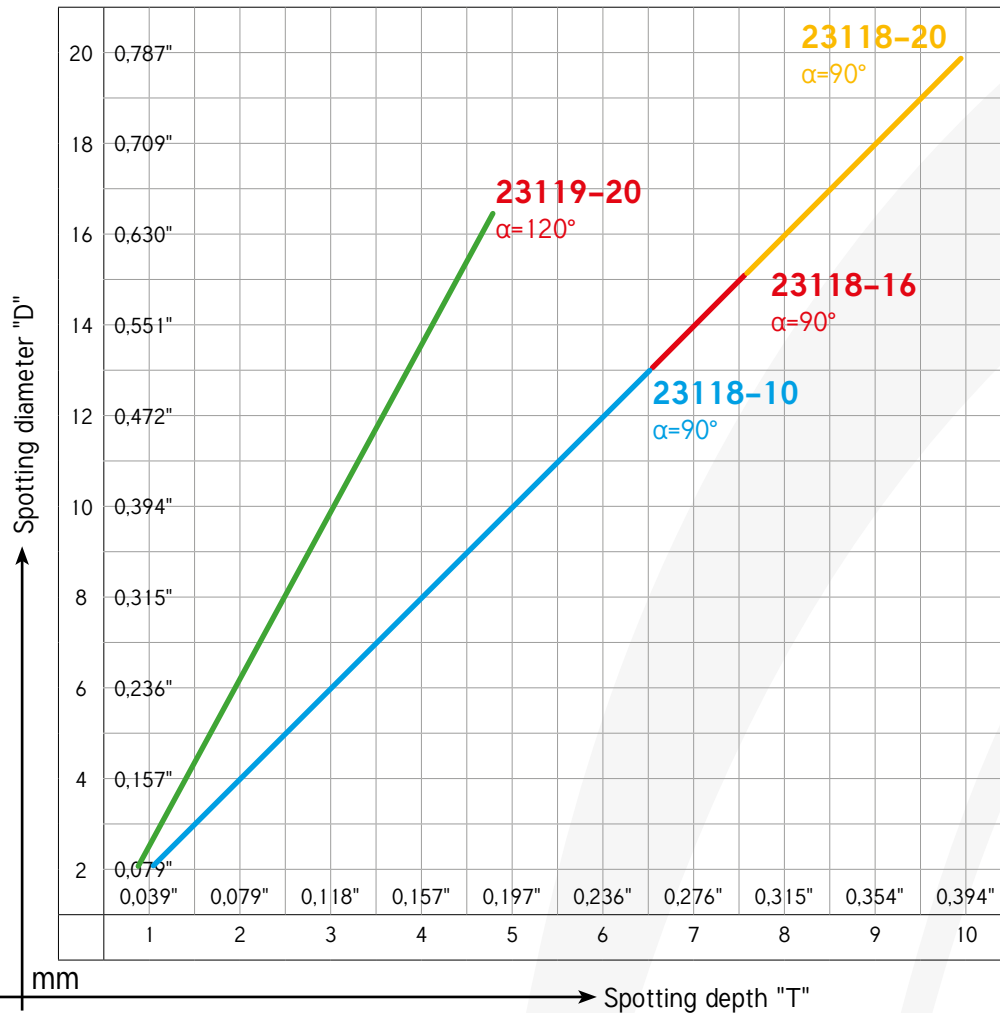


CODE	DIMENSIONS			
	Ø D	L	Angle α	Coolant through-hole
23118-16	16	100	90°	No
23118-16-C	16	100	90°	Yes

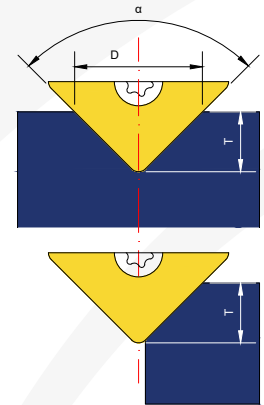


SPARE PARTS		SVT101 2.5 Nm
		T15

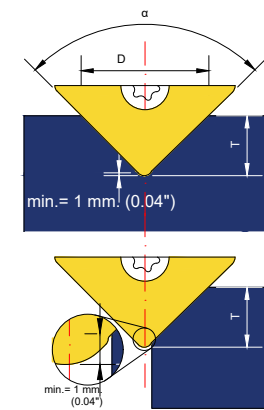
## Spotting diameter / depth chart and speed / feed Rate. Calculation of NC Spot Drill



Sectional view  
spot drilling, engraving  
For all except  
ARMT11T3CT



Sectional view  
(90° chamfering)  
Only for ARMT11T3CT  
(all grades)



### How to use:

1. Get spotting depth "T" from spotting diameter "D"
2. Angle "α" is determined by the chosen insert
3. Draw a horizontal line from "D" axis to the "a" line
4. From that intersection, draw a vertical line to "T" axis. "T" is the drilling depth for the CNC program
5. In chamfering, a 1mm. clearance is required to get a smooth surface
6. Using the "D" in this chart and the cutting speed Vc (see next page), you can calculate the spindle speed S (RPM)
7. Feed rate per minute  $F = f \times S$

d = spotting diameter	S = spindle speed RPM	Vc = cutting speed m/min	f = mm/rev	F = mm/min
$S = \frac{Vc \times 1000}{\pi \times d}$		$F = S \times f$		



**ARMT-CT >> Multi-purpose insert**

To determine spindle speed and feed rate:

- Choose spotting depth to get the spotting diameter (see previous page)
- Spindle speed should be calculated using the maximum spotting/chamfering/grooving diameter

SPOTTING		MATERIAL	Vc (m/min)	f (mm/rev)
	P	Carbon steel	150-250	0.05-0.10
	P	Alloy steel	100-200	0.04-0.08
	M	Stainless steel	65-125	0.03-0.06
	K	Cast iron	80-150	0.05-0.10
	N	Non-ferrous material (Al - Cu)	150-300	0.05-0.10
	T	Ti alloy	40-80	0.03-0.08
	H	Hardened steel 40°-56°HRC	30-60	0.03-0.08
	S	Super alloy	40-80	0.03-0.08

\* For technical construction reason, the insert is not in the center of the holder  
 \* "Z2" inserts allow higher feed rate (+50%)

CHAMFERING		MATERIAL	Vc (m/min)	f (mm/rev)
	P	Carbon steel	150-320	0.15-0.24
	P	Alloy steel	100-250	0.12-0.20
	M	Stainless steel	65-125	0.1-0.20
	K	Cast iron	150-250	0.15-0.25
	N	Non-ferrous material (Al - Cu)	150-320	0.15-0.25
	T	Ti alloy	40-80	0.03-0.08
	H	Hardened steel 40°-56°HRC	30-60	0.03-0.08
	S	Super alloy	40-80	0.03-0.08

GROOVING		MATERIAL	Vc (m/min)	f (mm/rev)
	P	Carbon steel	150-250	0.05-0.10
	P	Alloy steel	100-200	0.04-0.08
	M	Stainless steel	65-125	0.03-0.06
	K	Cast iron	80-150	0.05-0.08
	N	Non-ferrous material (Al - Cu)	150-320	0.05-0.08
	T	Ti alloy	40-80	0.03-0.08
	H	Hardened steel 40°-56°HRC	30-60	0.03-0.08
	S	Super alloy	40-80	0.03-0.08

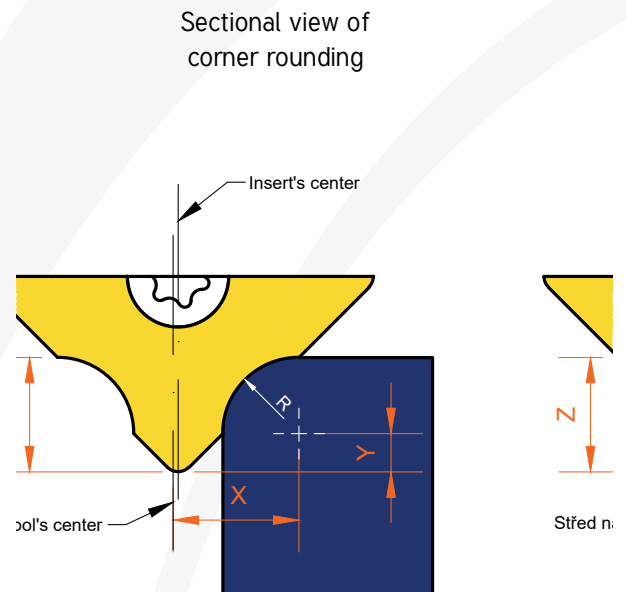
## ARMT-RC » Corner rounding insert

To determine spindle speed and feed rate:

- Spindle speed should be calculated using following formula and suggested cutting parameters.

Calculate the spindle speed	
d = diameter of the tool	$d = 2 \times X$ $S = \frac{Vc \times 1000}{\pi \times d}$ $F = S \times f$
S = spindle speed RPM	
Vc = cutting speed m/min	
f = mm/rev	
F = mm/min	

Calculate the offset of the tool length on CNC	
X = tool radius offset (See table at pag. 11)	$TL = TL' - Y$ $H = X$
Y = distance to the center of radius (See table at pag. 11)	
TL' = tool length	
TL = tool length offset	
H = tool radius offset	



CORNER ROUNDING		MATERIAL	Vc (m/min)	f (mm/rev)
	P	Carbon steel	150-320	0.05-0.10
	P	Alloy steel	100-250	0.05-0.10
	M	Stainless steel	65-125	0.05-0.10
	K	Cast iron	150-250	0.05-0.10
	N	Non-ferrous material (Al - Cu)	150-320	0.05-0.10
	T	Ti alloy	100-300	0.05-0.10
	H	Hardened steel 40°-56°HRC	200-250	0.05-0.10
	S	Super alloy	150-250	0.05-0.10

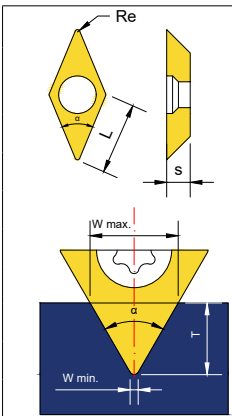


# ENGRAVING INSERT 45°

■	Best choice
□	Suitable

●	Available in stock
○	Available upon request (MOQ: 100 pz.)

	P	M	K	N	H	S	T	SP20	IP20	UP30	SP30	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30	
ARV045	■	□	□	□	□	□	□	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○

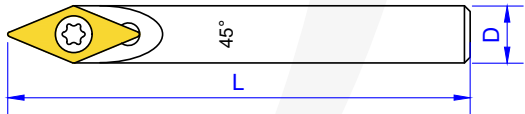


ISO									
CODE	Cutting edges	L	S	Re	W min.	W max.	T min.	T max.	
ARV04506Z2W06-IM20	2	6.35	2.0	0.2	0.65	2.1	0.2	2.0	
ARV04506Z2W06-IP20	2	6.35	2.0	0.2	0.65	2.1	0.2	2.0	

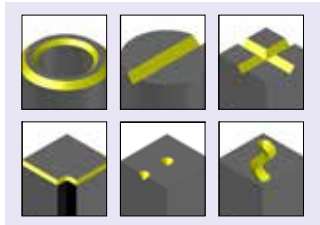


CODE	Description	Qty.	Avl.
ENG45KIT01	5147-V045-06	1	●
	ARV04506Z2W06-IM20	4	
	SVT105	1	
	T7	1	
ENG45KIT02	5147-V045-06	1	●
	ARV04506Z2W06-IP20	4	
	SVT105	1	
	T7	1	

## HOLDERS



CODE	DIMENSIONS			
	Ø D	L	Angle α	Coolant through-hole
5147-V045-06	6	40	45°	No



SPARE PARTS	SVT105 0.9 Nm	
		T7



# ENGRAVING INSERT 60°



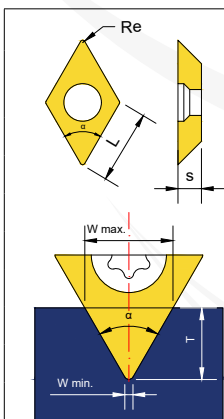
■	Best choice
□	Suitable

●	Available in stock
○	Available upon request (MOQ: 100 pz.)

	P	M	K	N	H	S	T	SP20	IP20	UP30	SP30	IP25	IP30	IM20	IM30	IM40	IK10	IK20	IN10	SH10	IS30	IS40	UT30	
ARV060	■	□	□	□	□	□	□		●					●										



ARV06006Z2W06

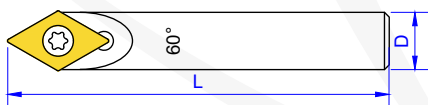


ISO									
CODE	Cutting edges	L	S	Re	W min.	W max.	T min.	T max.	
ARV06006Z2W06-IM20	2	6.35	2.0	0.2	0.65	2.7	0.2	2.0	
ARV06006Z2W06-IP20	2	6.35	2.0	0.2	0.65	2.7	0.2	2.0	

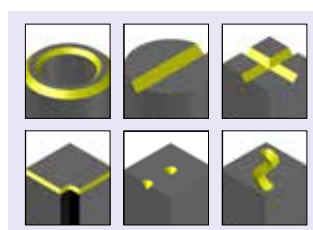


CODE	Description	Qty.	Avl.
ENG60KIT01	5147-V060-06	1	●
	ARV06006Z2W06-IM20	4	
	SVT105	1	
	T7	1	
ENG60KIT02	5147-V060-06	1	●
	ARV06006Z2W06-IP20	4	
	SVT105	1	
	T7	1	

## HOLDERS



CODE	DIMENSIONS			
	Ø D	L	Angle α	Coolant through-hole
5147-V060-06	6	40	60°	No





SPARE PARTS	Description	
		SVT105 0.9 Nm
	T7	

# ENGRAVING INSERT 60°

■	Best choice
□	Suitable

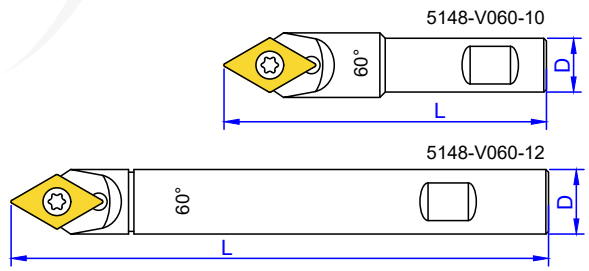
●	Available in stock
○	Available upon request (MOQ: 100 pz.)

P	■	■	■	■	■	■	□	□	□											
M	□	□	□	□	■	□	■	■	■											
K					■						■	■								
N													■							
H					□								■							
S					□													■	■	□
T																				■

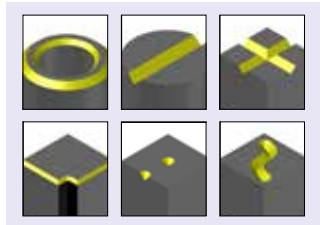
ARV060		ARV06011Z2W02																			
		ARV06011Z2W04																			
		ARV06011Z2W08																			
ARV060		ARV06011Z2W08-H																			



CODE	Cutting edges	L	S	Re	W min.	W max. engr.	W max. spot.	T min.	T max. engr.	T max. spot.	ISO	
											Re	α
ARV06011Z2W02-IP25	2	10.1	4.0	0.1	0.2	1.0	6.8	0.10	0.7	5.8		
ARV06011Z2W04-IP25	2	10.1	4.0	0.2	0.4	2.0	6.8	0.15	1.3	5.7		
ARV06011Z2W08-IP25	2	10.1	4.0	0.4	0.8	3.0	6.8	0.30	1.8	5.0		
ARV06011Z2W08-H-IS30	2	10.1	4.0	0.8	0.8	3.0	6.8	0.11	1.8	5.0		

## HOLDERS



CODE	DIMENSIONS			
	Ø D	L	Angle α	Coolant through-hole
5148-V060-10	10	60	60°	No
5148-V060-12	12	100	60°	No



SPARE PARTS		SVT101 2.5 Nm
		T15



**Components**



**Luxury & Fashion accessories**



**Mold and die**



**Various**



## Comparison

CUTTING DATA			
	5147-V060-06 ARV06006Z2	Engraving tool	Ball nose end mill r0.4
Material	Tool steel SKD61 (JIS G 4404) Tenacity: HRB 92-93 (HB200)		
Spindle speed RPM	10000	10000	10000
Feed rate mm/min	100	100	100
Depth of cut Ap	0.2 mm	0.2 mm	0.05 mm 4 steps to cut 0.2mm
Bottom roughness Ra	0.36 μm	0.83 μm	0.46 μm
Resetting	Not necessary	Necessary	Necessary
Tool life	Long	Short	Short

CUTTING DATA	5147-V060-06 ARV06006Z2	Engraving tool	Ball nose end mill r0.4
Material	SKD 51	SS	SKD 61 (50HRC)
Spindle speed RPM	10000	10000	10000
Feed rate mm/min	300	300	100
Depth of cut Ap	0.1 mm	0.35 mm	0.2 mm
Resetting	Not necessary	Not necessary	Not necessary
Tool life	9.6 meters	7.2 meters	3.5 meters

## Attention!

### Selecting cutting speed and feed rate

- Please select spindle speed and feed rate according to the recommended cutting data
- Downward feed on the z axis should be reduced by 50%

### Coolant recommendation

- Emulsion is recommended when cutting steel, SS, Al and Al-alloy
- Air colling is recommended when cutting cast iron and plastic

### Tool recommendation

- Tool shank runout should be < 0.01mm
- Shrink fit chuck, hydraulic chuck and high precision spring collet chuck are recommended
- Tool pre-balance is necessary: minimum G6.3/10.000 RPM

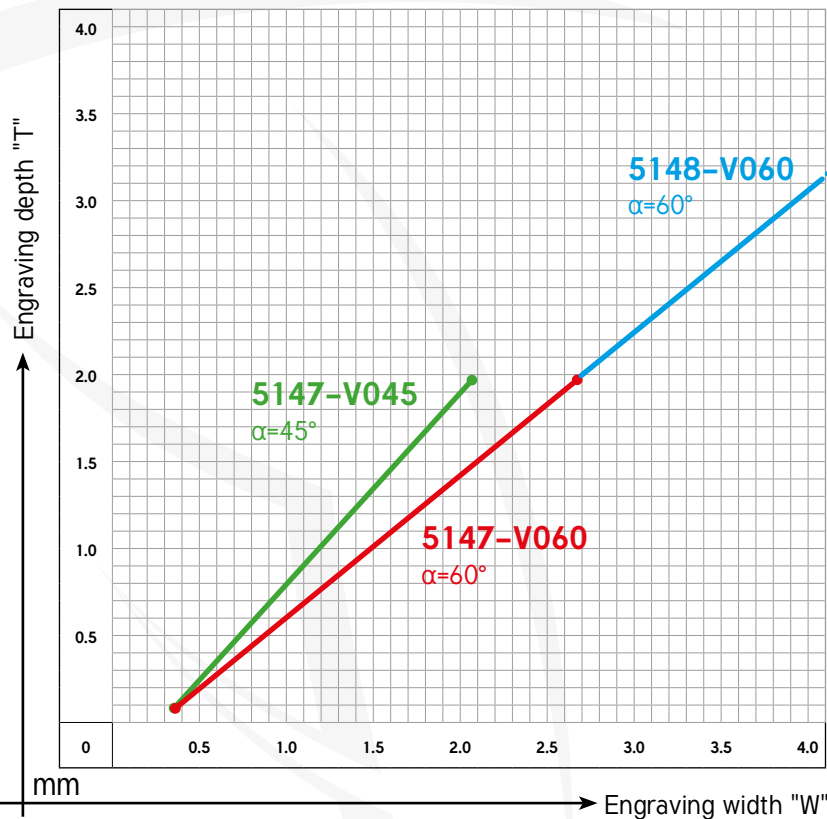
### Insert clamping

- Place and hold the insert against the positioning side of the insert pocket (see below)

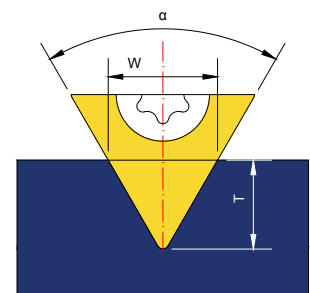


## V045/V060

To use this chart, select the engraving width "W" on the horizontal axis. Select the angle of the engraving insert (45° or 60°) and follow the vertical from the "W" axis to the insert angle line. Follow the vertical line to the vertical axis "T" to get the engraving depth.



Sectional view engraving



$$W = (0,577 \times (T+r) + 0.05) \times 2$$

For a more precise calculation of "W" when use **ARV06011** inserts please use the above formula.

	MATERIAL	S (RPM)	f (mm/rev)
P	Carbon steel	5000-40000	0.008-0.05
P	Alloy steel	5000-40000	0.008-0.03
M	Stainless steel	5000-40000	0.008-0.05
K	Cast iron	5000-40000	0.008-0.03
N	Non-ferrous material (Al - Cu)	5000-40000	0.008-0.08
H	Hardened steel 40°-56°HRC	6000-35000	0.003-0.01

Tmax.: 2 mm

	MATERIAL	1a	2a	3a	4a	5a	6a	~	Finish
P	Carbon steel	0.8	0.6	0.3	0.2	0.1	~	~	0.1
P	Alloy steel	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.1
M	Stainless steel	0.5	0.4	0.3	0.3	0.2	0.2	0.1	0.05
K	Cast iron	0.8	0.6	0.3	0.2	0.1	~	~	0.1
N	Non-ferrous material (Al - Cu)	1.0	0.8	0.2	~	~	~	~	0.1
H	Hardened steel 40°-56°HRC	0.2	0.2	0.15	0.15	0.1	0.1	0.1	0.05

Note: The above Tmax passes are suitable for inserts 04506 and 06006; for inserts 06011 it's possible to increase them of 30%.

# MATERIAL CLASSIFICATION

ISO	GERMANY		ITALY	CHINA	USA	
	W.-Nr	DIN	UNI	GB	AISI/SAE	
P1	1,1133	20 Mn 5	G 22 Mn 3	10 Mn2		
	1,1165	30 Mn 5		ZG35SiMn		
	1,0301	C 10	C 10	10	1011	
	1,0401	C 15	C 15; C 16	15	1015	
	1,0402	C 22	C 20; C 21	20	1020	
	1,0406	C 25	C 25			
	1,1121	Ck 10	C 10		1010	
	1,1141	Ck 15	15; C 16	15	1015	
	1,1151	Ck 22	C 20			
	1,1158	Ck 25	C 25	25	1025	
	1,0037	St 37-2	Fe 360 B			
	1,0116	St 37-3	Fe 360 D FF			
	1,0044	St 44-2	Fe 430 B FN			
	1,0144	St 44-3 N	Fe 430 D FF			
	1,0721	10 S 20	CF 10 S 20		1108	
	1,0722	10 SPb 20	CF 10 SPb 20			
	1,0723	15 S 20				
	1,0726	35 S 20			1140	
	1,0727	46 S 20				
	1,0728	60 S 20				
	1,0711	9 S 20	CF 9 S 22			
	1,0715	9 SMn 28	CF 9 SMn 28		1213	
	1,0736	9 SMn 36	CF 9 SMn 36	Y13	1215	
	1,0718	9 SMnPb 28	CF 9 SMnPb 28		12L3	
	1,0737	9 SMnPb 36	CF 9 SMnPb 36		12L14	
	P2	1,5622	14 Ni 6	14 Ni 6		A350LF5
		1,5423	16 Mo 5	16 Mo 5		4520
1,1167		36 Mn 5		35Mn2	1335	
1,1157		40 Mn 4		40Mn	1039	
1,0528		C 30				
1,0501		C 35	C 35	35	1035	
1,0511		C 40	C 40			
1,0503		C 45	C 45	45	1045	
1,054		C 50				
1,1178		Ck 30				
1,1181		Ck 35	C 35		1035	
1,1186		Ck 40	C 40			
1,1206		Ck 50				
1,1203		Ck 55	C 50	55	1055	
1,057		St 52-3	Fe 510 B; C; D			
1,0535		St 70-2	Fe 690	55	1055	
1,568		12 Ni 19				
1,7012		13 Cr 2				
1,7335		13 CrMo 4 4	14 CrMo 4 5		A182 ; F11	
1,7715		14 MoV 6 3				
1,5732		14 NiCr 10	16 NiCr 11		3415	
1,5752		14 NiCr 14			3415 ; 3310	
1,7015		15 Cr 3	CF9SMn28	15Cr	5015	
1,7262		15 CrMo 5	12 CrMo 4			
1,8521		15 CrMoV 5 9				
1,5919		15 CrNi 6	16 CrNi 4			
1,5415		15 Mo 3	16 Mo 3		A204Gr.A	
1,2735		15 NiCr 14				
1,7337		16 CrMo 4 4	14 CrMo 4 5		A387Gr.12CL	
1,7131		16 MnCr 5	16 MnCr 5	18CrMn	5115	
1,7139		16 MnCrS 5				
1,592		18 CrNi 8				
1,6587		18 CrNiMo 6	18 NiCrMo 7			
1,7311		20 CrMo 2				
1,7264	20 CrMo 5					
1,7147	20 MnCr 5	20 MnCr 5				

P2	1,7149	20 MnCrS 5			
	1,7321	20 MoCr 4			
	1,7323	20 MoCrS 4			
	1,2162	21 MnCr 5			
	1,6523	21 NiCrMo 2	20 NiCrMo 2		8620
	1,7271	23 CrMoB 3 3			
	1,7218	25 CrMo 4	25 CrMo 4 (KB)	30CrMn	4130
	1,7325	25 MoCr 4			
	1,7326	25 MoCrS 4			
	1,703	28 Cr 4			
	1,6513	28 NiCrMo 4			
	1,7707	30 CrMoV 9			
	1,658	30 CrNiMo 8	30 NiCrMo 8		
	1,8519	31 CrMoV 9			
	1,5755	31 NiCr 14			
	1,702	32 Cr 2			
	1,7361	32 CrMo 12	32 CrMo 12		
	1,7033	34 Cr 4	34 Cr 4 (KB)	35Cr	5132
	1,722	34 CrMo 4	35 CrMo 4		
	1,233	35 CrMo 4	35 CrMo 4		
	1,5864	35 NiCr 18			
	1,6511	36 CrNiMo 4	38 NiCrMo 4 (KB)		9840
	1,5736	36 NiCr 10	35 NiCr 9		
	1,571	36 NiCr 6			
	1,7034	37 Cr 4	38 Cr 4		
	1,5122	37 MnSi 4			
	1,7003	38 Cr 2	38 Cr 2		
	1,512	38 MnSi 4			
	1,8523	39 CrMoV 13 9	36 CrMoV 13 9		
	1,2311	40 CrMnMo 7			
	1,2312	40 CrMnMoS 8 6			
	1,2738	40 CrMnNiMo 8			
	1,7035	41 Cr 4	41 Cr 4	40Cr	5140
	1,7223	41 CrMo 4	41 CrMo 4	40CrMoA	4140 ; 4142
	1,7045	42 Cr 4	41 Cr 4	40Cr	5140
	1,7225	42 CrMo 4	42 CrMo 4	42CrMnMo	4140
	1,7561	42 CrV 6			
	1,5223	42 MnV 7			
	1,3563	43 CrMo 4			
	1,3561	44 Cr 2			
	1,7006	46 Cr 2	45 Cr 2		
	1,5121	46 MnSi 4			
	1,3565	48 CrMo 4			
	1,7228	50 CrMo 4			
	1,8159	50 CrV 4	51 CrV 4	50CrVA	6150
	1,5131	50 MnSi 4			
	1,5141	53 MnSi 4			
1,7176	55 Cr 3	55 Cr 3	20CrMn	5155	
1,0904	55 Si 7	55 Si 8	55Si2Mn	9255	
1,2103	58 SiCr 8				
1,0961	60 SiCr 7	60 SiCr 8		9262	
1,2101	62 SiMnCr 4				
1,173	C 45 W				
1,182	C 55 W				
1,0601	C 60	C 60	60	1060	
1,174	C 60 W				
1,1744	C 67 W				
1,152	C 70 W1				
1,162	C 70 W2				
1,175	C 75 W				
1,1525	C 80 W1	C 80 KU			
1,1625	C 80 W2	C 80 KU			
1,183	C 85 W				
1,1191	Ck 45	C 45	Ck45	1045	



P2	1.1221	Ck 60	C 60	60Mn	1060
	1.1231	Ck 67	C 70		
	1.1248	Ck 75	C 75		
	1.8159	GS-50 CrV 4			
	1.006	St 60-2	Fe 590; Fe 60-2		
	1.4006	X 10 Cr 13	X 12 Cr 13	1Cr13	410
	1.4724	X 10 CrAl 13	X 10 CrAl 12	0Cr13Al	405
	1.4762	X 10 CrAl 24	X 16 Cr 26	2Cr25N	446
	1.4006	X 12 Cr 13			
	1.4104	X 12 CrMoS 17	X 10 CrS 17	Y1Cr17	430F
	1.4005	X 12 CrS 13	X 12 CrS 13		
	1.4024	X 15 Cr 13			
	1.4521	X 2 CrMoTi18 2			
	1.4521	X 2 CrMoTi18 2			
	1.4003	X 2 CrNi 12			
	1.4313	X 5 CrNi 13 4	X 6 CrNi 13 04		
	1.4512	X 5 CrTi 12	X 6 CrTi 12		
	1.4	X 6 Cr 13	X 6 Cr 13		
	1.4016	X 6 Cr 17	X 8 Cr 17	1Cr17	430
	1.4002	X 6 CrAl 13	X 6 CrAl 13		
1.2341	X 6 CrMo 4				
1.451	X 6 CrTi 17	X 6 CrTi 17			
1.4511	X 8 CrNb 17	X 6 CrNb 17			
P3	1.738	10 CrMo 9 10	12 CrMo 9 10		
	1.3505	100 Cr 6	100 Cr 6	Gr15 : 45Gr	52100
	1.251	100 MnCrW 4	95 MnWCr 5 KU		
	1.2833	100 V 1	102 V 2 KU	V	W210
	1.2419	105 WCr 6	107 WCr 5 KU	CrWMo	
	1.221	115 CrV 3	107 CrV 3 KU		L2
	1.2516	120 WV 4	110 W 4 KU		
	1.7735	14 CrMoV 6 9			
	1.586	14 NiCr 18			
	1.7709	21 CrMoV 5 7			
	1.6746	32 NiCrMo 14 5			
	1.8504	34 CrAl 6			
	1.8507	34 CrAlMo 5	34 CrAlMo 7		
	1.855	34 CrAlNi 7			
	1.8506	34 CrAlS 5			
	1.6582	34 CrNiMo 6	35 NiCrMo 6 (KW)	40CrNiMoa	4340
	1.6546	40 NiCrMo 2 2	40 NiCrMo 2 (KB)		8740
	1.6565	40 NiCrMo 6			
	1.8509	41 CrAlMo 7	41 CrAlMo 7		
	1.2542	45 WCrV 7	45 WCrV 8 KU	5CrNiMo	S1
	1.2721	50 NiCr 13			
	1.8161	58 CrV 4			
	1.2826	60 MnSiCr 4			
	1.255	60 WCrV 7	55 WCrV 8 KU		
	1.7103	67 SiCr 5			
	1.2108	90 CrSi 5			
	1.1273	90 Mn 4			
	1.2842	90 MnCrV 8	90 MnVCr 8 KU		O2
	1.1545	C 105 W1	C 100 KU	T10	W.110
	1.1645	C 105 W2	C 100 KU		
	1.1654	C 110 W			
	1.1663	C 125 W	C 120 KU	T12A	W.112
	1.1673	C 135 W	C 140 KU		
	1.1274	Ck 101			1095
	1.2887	GS-34 CoCrMoV 19 12			
1.2392	G-X 28 CrMoV 5 1				
1.2606	G-X 37 CrMoW 5 1				
1.4749	X 18 CrN 28				
1.2764	X 19 NiCrMo 4				
1.4021	X 20 Cr 13	X 20 Cr 13	2Cr13	410	
1.4935	X 20 CrMoWV 12 1				

P3	1.4057	X 20 CrNi 17 2	X 16 CrNi 16	1Cr17Ni2	431
	1.4923	X 22 CrMoV 12 1	X22 CrMoV 12 1		
	1.4028	X 30 Cr 13	X 30 Cr 13		
	1.2316	X 36 CrMo 17	X 38 CrMo 16 1 KU		
	1.4418	X 4 CrNiMo 16 5			
	1.4031	X 40 Cr 13	X 40 Cr 14		
	1.4034	X 45 Cr 13	X40Cr14	4Cr13	
	1.4873	X 45 CrNiW 18 9	X 45 CrNiW 18 9		
	1.2767	X 45 NiCrMo 4	42 NiCrMo 15 7		
	1.4109	X 65 CrMo 14			
	1.4747	X 80 CrNiSi 20	X 80 CrSiNi 20		
	1.4112	X 90 CrMoV 18	X CrTi 12		
	1.2711	54 NiCrMoV 6			
	1.2713	55 NiCrMoV 6		5CrNiMo	L6
	1.2744	57 NiCrMoV 7 7			
	1.2762	75 CrMoNiW 6 7			
	1.2369	81 CrMov 42 16			
	1.288	G-X 165 CrCoMo 12			
	1.2601	G-X 165 CrMoV 12			
	1.2201	G-X 165 CrV 12			
	1.3207	S 10-4-3-10	HS 10-4-3-10		
	1.3318	S 12-1-2			
	1.3302	S 12-1-4			
	1.3202	S 12-1-4-5			
	1.3355	S 18-0-1	HS 18-0-1	W18Cr4V	T1
	1.3265	S 18-1-2-10	HS 18-0-1-10		
	1.3257	S 18-1-2-15			
	1.3255	S 18-1-2-5	HS 18-1-1-5	W18Cr4VCo5	T4
	1.3247	S 2-10-1-8	HS 2-9-1-8		
	1.3346	S 2-9-1	HS 1-8-1		
	1.3348	S 2-9-2	HS 2-9-2		M7
	1.3249	S 2-9-2-8			
	1.3333	S 3-3-2	HS 3-3-2		
	1.3343	S 6-5-2	HS 6-5-2	W6Mo5Cr4V2	M35
	1.3243	S 6-5-2-5	HS 6-5-2-5	W6Mo5Cr4V2Co5	
1.3344	S 6-5-3	HS 6-5-3	W6Mo5Cr4V3	M3	
1.3345	S 6-5-3C				
1.3246	S 7-4-2-5	HS 7-4-2-5			
1.2363	X 100 CrMoV 5 1	X 100 CrMoV 5 1 KU	Cr6WV	A2	
1.4125	X 105 CrMo 17	X 105 CrMo 17			
1.2379	X 155 CrVMo 12 1	X 155 CrVMo 12 1 KU			
1.2601	X 165 CrMoV 12	X 165 CrMoW 12 KU	Cr12MoV	D2	
1.2709	X 2 NiCoMoTi 18 9 5				
1.208	X 210 Cr 12	X 210 Cr 13 KU	Cr12	D3	
1.2436	X 210 CrW 12	X 215 CrW 12 1 KU	Cr12W		
1.2706	X 3 NiCrMo 18 8 5				
1.2567	X 30 WCrV 5 3	X 30 WCrV 5 3 KU			
1.2581	X 30 WCrV 9 3	X 30 WCrV 9 3 KU	3Cr2W8V	H21	
1.2885	X 32 CrMoCoV 3 3 3				
1.2365	X 32 CrMoV 3 3	30 CrMoV 12 27 KU			
1.2343	X 38 CrMoV 5 1	X 37 CrMoV 5 1 KU			
1.2367	X 38 CrMoV 5 3				
1.2344	X 40 CrMoV 5 1	X 40 CrMo 5 1 1 KU	4Cr5MoVSi	H13	
1.4305	X 10 CrNiS 18 9	X 10 CrNi 18 09	1Cr18Ni9MoZr	303	
1.431	X 12 CrNi 17 7	X 12 CrNi 17 07			
1.43	X 12 CrNi 18 8				
1.4546	X 5 CrNiNb 18 10	X 6 CrNiNb 18 11			
1.4301	X 6 CrNi 18 10	X 5 CrNi 18 11	0Cr18Ni9	304	
1.4948	X 6 CrNi 18 11	X 5 CrNi 18 10 KW			
1.4303	X 6 CrNi 18 12	X 7 CrNi 18 10			
1.455	X 6 CrNiNb 18 10	X 6 CrNiNb 18 11			
1.4583	X 10 CrNiMoNb 18 12	X 6 CrNiMoNb 17 13	Cr17Ni12Mo3Nb	318	
1.4335	X 12 CrNi 25 21	X 6 CrNi 26 20			
1.4541	X 12 CrNiTi 18 9	X 6 CrNiTi 18 11	1Cr18Ni9Ti	321	
M4					

# MATERIAL CLASSIFICATION

M4	1.4962	X 12 CrNiWTi 16 3			N08031	
	1.4828	X 15 CrNiSi 20 12		1Cr23Ni13	309	
	1.4306	X 2 CrNi 19 11	X 3 Cr Ni 18 11	0Cr19Ni10	304L	
	1.4404	X 2 CrNiMo 17 13 2	X 2 CrNiMo 17 12 2			
	1.4435	X 2 CrNiMo 18 14 3	X 2 CrNiMo 17 13 2	0Cr27Ni12Mo3	316L	
	1.4438	X 2 CrNiMo 18 16 4	X 2 CrNiMo 18 16	00Cr19Ni13Mo3	317L	
	1.4311	X 2 CrNiN 19 11	X 2 CrNiN 18 11		304LN	
	1.4436	X 5 CrNiMo 17 13 3	X 5 CrNiMo 17 13 2			
	1.4308	X 6 CrNi 18 9				
	1.458	X 6 CrNiMoNb 17 12 2	X 6 CrNiMoNb 17 12			
	1.4571	X 6 CrNiMoTi 17 12 2	X 6 CrNiMoTi 17 12	Cr18Ni12Mo2Ti	316Ti	
	1.4841	X 15 CrNiSi 25 20	X 16 CrNiSi 25 20			
	1.4401	X 5 CrNiMo 18 10	X 5 CrNiMo 17 12	0Cr17Ni11Mo2	316	
	1.4547	X 1 CrNiMoN 20 18 7	X 1 CrNiMoN 20 18 7			
	1.4563	X 1 NiCrMoCuN 31 27 4			N08028	
	1.4876	X 10 NiCrAlTi 32 20				
	1.4864	X 12 NiCrSi 36 16		Cr15Ni36W3Ti	330	
M5	1.441	X 2 CrNiMoN 25 7 4	X 2 CrNiMoN 25 7 4			
	1.4507	X 2 CrMoNiCuN 25 6 3				
	1.4501	X 2 CrNiMoCuWN 25 7 4				
	1.4406	X 2 CrNiMoN 17 12 2	X 2 CrNiMoN 17 12			
	1.4429	X 2 CrNiMoN 17 13 3	X 2 CrNiMoN 17 13 3	00Cr17Ni13Mo2	316LN	
	1.4439	X 2 CrNiMoN 17 13 3				
	1.4462	X 2 CrNiMoN 22 5	X 2 CrNiMoN 22 5			
	1.4462	X 2 CrNiMoN 22 5	X 2 CrNiMoN 22 5			
	1.4652	X 2 CrNiMoN 25 22 7				
	1.4362	X 2 CrNiN 23 4			S32304	
	1.4539	X 2 NiCrMoCu 25 20 5				
	1.4539	X 2 NiCrMoCu 25 20 5				
	1.454	X 4 CrNiCuNb 16 4				
	1.446	X 4 CrNiMo 27 5 2	X 3 CrNiMo 27 5 2			
	1.4542	X 5 CrNiCuNb 17 4				
	K6	0.61	GG-10	G10	HT100	CLASS20
		0.615	GG-15	G15	HT150	CLASS25
		0.7033	GGG-35.3			
		0.704	GGG-40	GS 400-12	QT400-18	60-40-18
		0.7043	GGG-40.3	GSO 42/17		
0.8035		GTS-35-10	B 35-12		32510	
0.8145		GTS-45-06	P 45-06		40010	
0.8155		GTS-55-04	P 55-04		50005	
0.62		GG-20	G20	HT200	CLASS30	
0.625		GG-25	G25	HT250	CLASS35	
0.705		GGG-50	GS 500-7	QT500-7	70-50-05	
0.706		GGG-60	GS 600-3	QT600-3	80-60-03	
0.766		GGG-NiCr 20 2				
0.7661		GGG-NiCr 20 3				
0.7652		GGG-NiMn 13 7				
0.666		GGL-NiCr 20 2				
0.6661		GGL-NiCr 20 3				
0.8165		GTS-65-02	P 65-02		70003	
K7		0.63	GG-30	G30	HT300	CLASS45
		0.707	GGG-70	GS 700-2	QT700-2	100-70-03
	0.6655	GGL-NiCuCr 15 6 2				
	0.6656	GGL-NiCuCr 15 6 3				
	0.817	GTS-70-02	P 70-02		90001	
	0.635	GG-35	G35	HT350	CLASS50	
	0.604	GG-40			CLASS55	
	0.708	GGG-80	GS 800-2	QT800-2	120-90-02	
	0.767	GGG-Ni 22				
	0.7683	GGG-Ni 35				
	0.7677	GGG-NiCr 30 1				
	0.7676	GGG-NiCr 30 3				
	0.7683	GGG-NiCr 35 3				
0.7673	GGG-NiMn 23 4					

K7	0.7665	GGG-NiSiCr 20 5 2			
	0.768	GGG-NiSiCr 30 5 5			
	0.6676	GGL-NiCr 30 3			
	0.6667	GGL-NiSiCr 20 5 3			
	0.668	GGL-NiSiCr 30 5 5			
N8	3.0205	Al99			
	3.0255	Al99.5			1000
	3.0275	Al99.7			
	3.0285	Al99.8			
	3.1305	AlCu2.5Mg0.5			
	3.1655	AlCuBiPb			
	3.1325	AlCuMg1			
	3.1355	AlCuMg2			
	3.1255	AlCuSiMn			
	3.3315	AlMg1			
	3.3316	AlMg1.5			
	3.3211	AlMg1SiCu			
	3.3523	AlMg2.5			
	3.3537	AlMg2.7Mn			
	3.3525	AlMg2Mn0.3			
	3.3527	AlMg2Mn0.8			
	3.3535	AlMg3			
	3.3345	AlMg4.5			
	3.3547	AlMg4.5Mn			
	3.3545	AlMg4Mn			
	3.3206	AlMgSi0.5			
	3.321	AlMgSi0.7			
	3.2315	AlMgSi1			
	3.0615	AlMgSiPb			
	3.0505	AlMn0.5Mg0.5			
	3.0525	AlMn0.5Mg0.5			
	3.0515	AlMn1			
	3.0517	AlMn1Cu			
	3.0526	AlMn1Mg1			
	3.4335	AlZn4.5Mg1			
	3.4345	AlZnMgCu0.5			
	3.4365	AlZnMgCu1.5			
	3.1841	G-AlCu4Ti			
	3.1371	G-AlCu4TiMg			
	3.3541	G-AlMg3			
	3.3241	G-AlMg3Si			
	3.3261	G-AlMg5			DG-AISI12
	3.3555	G-AlMg5			DG-AISI12
	3.3292	G-AlMg9			
	3.2381	G-AISI10Mg			
	3.2341	G-AISI5Mg			
	3.2151	G-AISI6Cu4			
3.2371	G-AISI7Mg			4218B	
3.2161	G-AISI8Cu3				
3.2373	G-AISI9Mg			SC64D	
3.5106	G-MgAg3Se2Zr1			QE22	
3.5314	G-MgAl3Zn				
3.5662	G-MgAl6Mn				
3.5612	G-MgAl6Zn				
3.5812	G-MgAl8Zn				
3.5812	G-MgAl8Zn1			AZ81	
3.5912	G-MgAl9Zn1			AZ91	
3.52	G-MgMn2				
3.5103	G-MgSe3Zn2Zr1			EZ33	
3.5105	G-MgTh3Zn2Zr1				
3.2383	G-AISI10Mg(Cu)			A360.2	
3.2382	GD-AISI12			A413.0	
N9		Cu			
	2.1203	CuAg0.1			





N9	2.0940.01	CuAl10Fe			
		CuAl10Fe5Ni5			
	2.0975.01	CuAl10Ni			
	2.0966	CuAl10Ni5Fe4			C63000
	2.0978	CuAl11Ni6Fe5			
	2.0916	CuAl5			
	2.0918	CuAl5As			
	2.0932	CuAl8 Fe3			
	2.1291	CuCr			
	2.131	CuFe2P			
	2.0853	CuNi1.5Si			
	2.0872	CuNi10Fe1Mn			
		CuNi10Zn45			
	2.078	CuNi12Zn30Pb1			
	2.079	CuNi18Zn19Pb			
	2.079	CuNi18Zn19Pb1			
	2.074	CuNi18Zn20			
	2.0742	CuNi18Zn27			
	2.0822	CuNi20			
	2.083	CuNi25			
	2.0835	CuNi30	CuNi30		
	2.0883	CuNi30Fe2Mn2			
		CuNi30FeMn			
	2.0882	CuNi30Mn1Fe			
	2.0857	CuNi3Si			
	2.0842	CuNi44Mn1			
		CuNi5Fe1Mn			
	2.0875	CuNi9Sn2			
	2.1176	CuPb10Sn			C93700
	2.1183	CuPb15Sn			
	2.116	CuPb1P			
	2.1189	CuPb20Sn			
	2.1050.01	CuSn10			
	2.1087	CuSn10Zn			
	2.1051.01	CuSn12			
		CuSn14			
	2.1016	CuSn4			
		CuSn5			
	2.102	CuSn6			
	2.108	CuSn6Zn6			
		CuSn7	CuSn7		
	2.1090.03	CuSn7ZnPb			
	2.103	CuSn8			
	2.023	CuZn10			
	2.024	CuZn15			
	2.025	CuZn20			
	2.046	CuZn20Al2			
		CuZn25Al15			
	2.0261	CuZn28			
	2.047	CuZn28Sn1			
2.0265	CuZn30			C26000	
	CuZn30AlFeMn				
2.049	CuZn31Si1				
2.028	CuZn33				
2.0592.01	CuZn35Al1				
2.054	CuZn35Ni2				
2.0335	CuZn36				
2.0331	CuZn36Pb1.5				
2.0375	CuZn36Pb3				
2.0321	CuZn37	C2700 ; C2720		C27200	
2.0332	CuZn37Pb0.5				
2.0371	CuZn38Pb1.5				
2.053	CuZn38Sn1				
2.0525	CuZn38SnAl				

N9		CuZn39AlFeMn			
	2.0372	CuZn39Pb0.5			
	2.038	CuZn39Pb2			
	2.0401	CuZn39Pb3			
	2.036	CuZn40			
	2.055	CuZn40Al2			
	2.0572	CuZn40Mn1			
	2.058	CuZn40Mn1Pb			
	2.0402	CuZn40Pb2			
	2.041	CuZn44Pb2			
2.022	CuZn5				
H10	1.3401	X 120 Mn 12	XG120Mn12		
S11	1.4876				
S12	2.481				
	2.481				
	2.4602				
2.4819					
S13	2.4619				
	2.4665				
	2.4816				
	2.4851				
	2.4856	NiCr22Mo9Nb	625		N06625
	2.4856	NiCr22Mo9Nb	625		N06625
	2.4856	NiCr22Mo9Nb	625		N06625
	2.4668	NiCr19FeNbMo	718		N07718
	2.4668				
	2.4668				
	2.4669	NiCr15FeNbMo	Inconel x-750		N07750
	2.4669	NiCr15FeNbMo	Inconel x-750		N07750
	2.4061				
	2.4634				
	2.4636				
2.465					
2.4631					
2.4632					
2.4662					
2.4654					
2.4654					
T14	3.7024	Ti 1			R50250
	3.7024	Ti 1			R50250
		TiV10Fe2Al3			
	3.7124	TiCu2			
	3.7164	TiAl6V4	TA10-13 ; TA 28		R56400
	3.7164				
	3.7164				





Oil Mini-MODULE  
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