



TECHNICAL GUIDE
**DRILLING, COUNTERSINKING
& TAPPING**



INTRODUCING OUR NEW PRODUCT NOMENCLATURE

Bisalloy Steels has recently introduced a new product nomenclature. The following table details the grade equivalents.

Note: Only the designation has changed – not the product

Previous Name	New Name
BISPLATE® 60	BISALLOY® Structural 60 steel
BISPLATE® 70	BISALLOY® Structural 70 steel
BISPLATE® 80	BISALLOY® Structural 80 steel
BISPLATE® 100	BISALLOY® Structural 100 steel
BISPLATE® 80PV	BISALLOY® Structural 80 Pressure Vessel steel
BISPLATE® 320	BISALLOY® Wear 320 steel
BISPLATE® 400	BISALLOY® Wear 400 steel
BISPLATE® 450	BISALLOY® Wear 450 steel
BISPLATE® 500	BISALLOY® Wear 500 steel
BISPLATE® 600	BISALLOY® Wear 600 steel
BISPLATE® HIA - Class 2	BISALLOY® Armour RHA300 steel
BISPLATE® HIA - Class 1	BISALLOY® Armour RHA360 steel
BISPLATE® HTA	BISALLOY® Armour HTA400 steel
BISPLATE® UHT	BISALLOY® Armour UHT440 steel
BISPLATE® HHA	BISALLOY® Armour HHA500 steel
BISPLATE® UHH	BISALLOY® Armour UHH600 steel

DRILLING, COUNTERSINKING AND TAPPING RECOMMENDATIONS

All grades of BISALLOY® steel are able to be drilled, countersunk and tapped although, as with most fabrication aspects, care should be taken with these grades of steel.

In all cases, suitable high powered and rigid drilling equipment should be used.

DRILLING OF HIGH STRENGTH BISALLOY® STRUCTURAL STEEL GRADES

When drilling the BISALLOY® Structural steel grades (60/70/80/100) the use of cobalt type high speed steel drills is recommended. Drills equipped with replaceable carbide inserts can also be used.

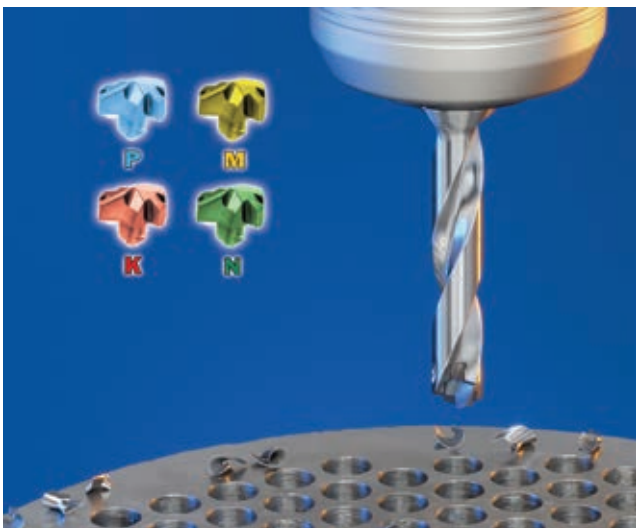
DRILLING OF BISALLOY® WEAR STEEL GRADES

BISALLOY® Wear steel grades (320/400/450) may be drilled with either cobalt type high speed steel drills or drills equipped with replaceable carbide inserts.

With regards to the drilling of BISALLOY® Wear 500/600 steel, we recommend only the use of drills equipped with replaceable carbide inserts.

Recommendations for improved results

- The supporting bars under the plate should be placed as close to the hole as possible.
- If possible, use a plain carbon steel backing plate under the BISALLOY® steel.
- The drilling head should be placed as close as possible to the main support.
- Short length drills are preferred.
- The last part of the hole to be drilled should be done with manual feed.
- Usage of adequate coolant (water and oil emulsion mixture).



DRILLING, COUNTERSINKING AND TAPPING RECOMMENDATIONS

APPROXIMATE FEEDS AND SPEEDS USING COBALT TYPE HIGH SPEED STEEL DRILLS

Table 1:

STEEL GRADE	PERIPHERAL SPEED (m/min)	R.P.M (UPPER FIGURES) AND FEED PER REVOLUTION (mm) FOR GIVEN DRILL SIZE						HARDNESS BRINELL
		5	10	15	20	25	30	
AS3678-Grade 250	23	1465	735	490	370	295	245	~120
		0.10	0.15	0.20	0.25	0.35	0.4	
BISALLOY® Structural 60 steel	20	1280	640	425	320	255	210	~220
		0.10	0.10	0.16	0.23	0.30	0.35	
BISALLOY® Structural 70 steel	19	1210	610	410	300	240	200	~240
		0.10	0.10	0.16	0.23	0.30	0.35	
BISALLOY® Structural 80 steel	18	1150	575	390	290	230	190	~260
		0.10	0.10	0.16	0.23	0.30	0.35	
BISALLOY® Structural 100 steel BISALLOY® Wear 320 steel	12	760	380	250	190	150	130	320 (min)
		0.07	0.10	0.16	0.23	0.30	0.35	
BISALLOY® Wear 400 steel	9	570	285	190	150	110	90	370 (min)
		0.05	0.10	0.16	0.23	0.30	0.35	
BISALLOY® Wear 450 steel	7	440	220	150	110	90	75	425 (min)
		0.05	0.09	0.15	0.20	0.25	0.30	

DRILL TIP CONFIGURATION USING COBALT TYPE HIGH SPEED STEEL DRILLS

Note: This table applies when cobalt type high speed drills are used with a cutting fluid, if no fluid is used the speeds shown above must be reduced.

Table 2:

BISALLOY® STEEL GRADE	POINT ANGLE	LIP/CLEARANCE ANGLE
60	118 deg.	10 deg.
70	118 deg.	10 deg.
80	118 deg.	10 deg.
100/320	125 deg.	7.5 deg.
400, 450	150 deg.	5 deg.



Schematic of Drill Tip



Recommended Drill Tip Configuration for Cobalt Type High Speed Drills

APPROXIMATE FEEDS AND SPEEDS USING DRILLS WITH REPLACEABLE CARBIDE INSERTS

Table 3:

BISALLOY® STEEL GRADE	ISCAR INSERT GRADE	SURFACE SPEED (m/min)	FEED RATE (mm/rev)	HARDNESS BRINELL
60	IC908 or IC808	150 - 250	0.08 - 0.25	~220
70	IC908 or IC808	150 - 220	0.08 - 0.25	~240
80	IC908 or IC808	120 - 190	0.08 - 0.25	~260
100/320	IC908 or IC808	120 - 180	0.08 - 0.20	320 - 360
400	IC908 or IC808	100 - 160	0.06 - 0.18	370 - 430
450	IC908 or IC808	80 - 100	0.06 - 0.18	425 - 475
500	IC908 or IC808	70 - 90	0.06 - 0.14	500 (typical)
600	IC908 or IC808	50 - 70	0.06 - 0.12	600 (typical)



Note: Above drilling recommendations are based on using a ISCAR "DR DRILL" and is based on hole sizes of 12.0 - 70.0 mm diameter. Through the tool coolant must be used. Feed rates are governed by the insert size related to the diameter of the drill.

Further information can be obtained from your local ISCAR representative or ISCAR head office Sydney.

ISCAR Australia Pty Ltd. Toll free phone: 1800 806 016 or email: iscaraus@iscar.com.au



COUNTERSINKING AND COUNTERBORING

Table 4:

BISALLOY® STEEL GRADE	CUTTING SPEED (m/min)	Ø16		Ø20		Ø25		Ø32		Ø40		Ø60	
		RPM	FEED (mm/r)	RPM	FEED (mm/r)	RPM	FEED (mm/r)	RPM	FEED (mm/r)	RPM	FEED (mm/r)	RPM	FEED (mm/r)
60	10-12	250	0.05 -0.2	200	0.05 -0.2	160	0.07 -0.3	110	0.07 -0.3	90	0.07 -0.3	70	0.07 -0.3
70	9-11	210	0.05 -0.2	170	0.05 -0.2	130	0.07 -0.3	90	0.07 -0.3	60	0.07 -0.3	60	0.07 -0.3
80	7-9	170	0.05 -0.2	130	0.05 -0.2	100	0.07 -0.3	70	0.07 -0.3	60	0.07 -0.3	40	0.07 -0.3
100/320	6-8	150	0.05 -0.2	120	0.05 -0.2	90	0.07 -0.3	60	0.07 -0.3	50	0.07 -0.3	40	0.07 -0.3
400 450	4-6	130	0.05 -0.2	105	0.05 -0.2	75	0.07 -0.3	50	0.07 -0.3	40	0.07 -0.3	30	0.07 -0.3

Countersinking and counterboring of holes is possible in all BISALLOY® steel grades with best performance obtained using tools with a revolving pilot. The pilot increases the stability and allows tools with replaceable carbide inserts to be used.

Cobalt type high speed steel drills with a pilot can be used for the BISALLOY® steel grades 60, 70, 80, 320, 400 and 450. The cutting data will vary from machine to machine. A coolant should be used. Replaceable carbide insert tools should be used on BISALLOY® Wear 500 and 600 steel grades.

CARBIDE TIPPED CUTTERS

There is a range of Indexable Carbide Tipped Cutters available from ISCAR. Countersink Tools available as standard in 60, 82, 90 and 120 degrees. Counterbore (Flat Bottom) Drill Heads available from 8.0mm - 25.5mm and Indexable Carbide Tipped Cutters with the ability to generate Counter Bores. For the best solution and cutting conditions contact your local representative or ISCAR Australia on Toll free phone: 1800 806 016 or email: iscaraus@iscar.com.au

Bisalloy Steels wish to thank Sandvik Coromant and Ti-Tek for the information pertaining to drilling, tapping and countersinking contained in this publication.

TAPPING SPEEDS AND TYPES RECOMMENDED FOR BISALLOY® STEEL GRADES

Table 5:

BISALLOY® STEEL GRADE	TAP TYPE (prototype)	TAPPING SPEED (m/min)	SIZE RANGE	LUBRICATION
60	Paradur 20360	15	M3 – M56	Cutting Oil
70	Paradur 20360	15	M3 – M56	Cutting Oil
80	Prototex Inox 202135	6 – 15*	M1.6 – M36	Cutting Oil
100/320	Prototex Inox 202135	6 – 15*	M1.6 – M36	Cutting Oil
400	Prototex Inox 202135	6 – 15*	M1.6 – M36	Cutting Oil
450	Prototex Ni 202602	3	M1.6 – M24	Cutting Oil
500	Paradur H/C 80311	1.6	M3 – M12**	Cutting Oil

*6m/min using steam tempered taps and 15m/min using tin coated tips.

**For larger size threads, thread milling is recommended.

TAPPING

With the correct tools and cutting speeds, tapping can be performed in all the BISALLOY® steel grades of steel. For the high hardness BISALLOY® steel 400, 450, 500 and 600 grades, higher alloyed taps must be used.

Difficulties that commonly arise when thread cutting higher tensile strength steels include tap sticking, torn threads and the short life of taps. The Prototyp brand tools have been specifically developed for tapping in the Bisalloy Steels grades of steel.

With all tapping it is recommended that the cutting speed is accurately controlled.

For best results, cutting oil or grease should be used. For through-holes of up to 2 times diameter in thread depth, in metric sizes, the following tapping tools are recommended.

Note: The introduction of stress concentrations (as a result of tapping) is an important consideration in fatigue applications.



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