

DRILLING, COUNTERSINKING AND TAPPING BISPLATE®

GENERAL INFORMATION

All grades of BISPLATE® 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 STRUCTURAL GRADES

When drilling the structural BISPLATE® grades 60, 70 and 80 the use of cobalt type high speed steel drills is recommended. Drills equipped with replaceable carbide inserts can also be used.

DRILLING OF WEAR/ABRASION RESISTANT GRADES

BISPLATE® 320, 400 and 450 grades may be drilled with either cobalt type high speed steel drills or drills equipped with replaceable carbide inserts.

With regards to the drilling of BISPLATE® 500 grade, 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 BISPLATE®
- 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)

APPROXIMATE FEEDS AND SPEEDS USING COBALT TYPE HIGH SPEED STEEL DRILLS

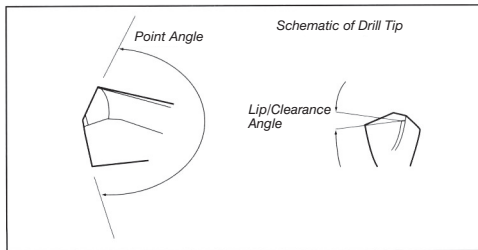
Table 1:

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

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.

Drill Tip Configuration for Cobalt Type High Speed Drills

Fig 2:



Approximate Feeds and Speeds Using Drills With Replaceable Carbide Inserts

RECOMMENDED DRILL TIP CONFIGURATION FOR COBALT TYPE HIGH SPEED DRILLS

Table 2:

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

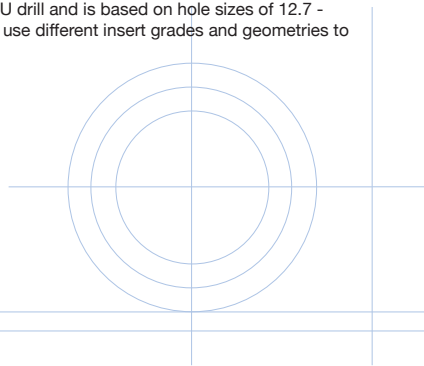
APPROXIMATE FEEDS AND SPEEDS USING DRILLS WITH REPLACABLE CARBIDE INSERTS

Table 3:

BISPLATE® GRADE	INSERT GRADE	SURFACE SPEED (m/min)	FEED RATE (mm/rev)	BRINELL HARDNESS
60	1020	125 - 210	0.06 - 0.18	~220
70	1020	125 - 210	0.06 - 0.18	~240
80	1020	125 - 210	0.06 - 0.18	~260
320	1020	125 - 210	0.06 - 0.18	320 - 360
400	H13A	125 - 210	0.06 - 0.18	370 - 430
450	H13A	70 - 90	0.06 - 0.14	425 - 475
500	H13A	70 - 90	0.06 - 0.12	500 (avg)

Note: Above drilling recommendations are based on using a Sandvik Coromant U drill and is based on hole sizes of 12.7 - 60mm diameter. Through the tool coolant must be used. It may be necessary to use different insert grades and geometries to suit the application.

Further information can be obtained from your local Sandvik Coromant office.



COUNTERSINKING AND COUNTERBORING

Countersinking and counterboring of holes is possible in all BISPLATE® 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 BISPLATE® 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 BISPLATE® 500 grade.

CUTTING SPEEDS AND FEEDS WHEN USING HIGH SPEED STEEL COBALT TYPE TOOLS

Table 4:

BISPLATE® 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
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

CUTTING SPEEDS AND FEEDS WHEN USING REPLACEABLE INSERT TOOLS

Table 5:

BISPLATE® GRADE	CUTTING SPEED (m/min)	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)
60	90 - 110	1675	0.15 - 0.20	1320	0.15 - 0.20	935	0.10 - 0.15	760	0.10 - 0.17	560	0.10 - 0.15
70	80 - 100	1500	0.15 - 0.20	1195	0.15 - 0.20	840	0.10 - 0.15	680	0.10 - 0.17	500	0.10 - 0.15
80	70 - 90	1340	0.15 - 0.20	1060	0.15 - 0.20	750	0.10 - 0.15	605	0.10 - 0.17	445	0.10 - 0.15
320	40 - 60	840	0.15 - 0.20	660	0.15 - 0.20	470	0.10 - 0.15	380	0.10 - 0.17	280	0.10 - 0.15
400	28 - 35	550	0.15 - 0.20	420	0.15 - 0.20	300	0.10 - 0.15	250	0.10 - 0.17	175	0.10 - 0.15
450	25 - 30	450	0.15 - 0.20	360	0.15 - 0.20	250	0.10 - 0.15	200	0.10 - 0.15	150	0.10 - 0.15
500	17 - 20	300	0.15 - 0.20	240	0.15 - 0.20	170	0.10 - 0.15	136	0.10 - 0.17	100	0.10 - 0.15

TAPPING

With the correct tools and cutting speeds, tapping can be performed in all the BISPLATE® grades of steel. For the high hardness BISPLATE® 400, 450 and 500 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 Prototype brand tools have been specifically developed for tapping in the BISPLATE® 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.

TAPPING SPEEDS AND TYPES RECOMMENDED FOR BISPLATE® GRADES

Table 6:

BISPLATE® 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
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.

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