

## ABRAZO® 400 Fabrication Guide

### ABRAZO® 400 is a roller quenched steel, combining high strength and toughness with good weldability.

#### Welding

ABRAZO® 400 can be readily welded under normal conditions using MMA, MIG and SAW without preheat, up to a combined thickness of 60mm, provided hydrogen controlled electrodes are used. Consumables should be dried in accordance with scale 'D' of BS 5135.

Welding of ABRAZO® 400 can be successfully carried out using heat inputs in the range of 1.5 - 3.0kJ/mm. The interpass temperature should not exceed 250°C.

Consumables should be chosen on the basis of whether or not the weld metal is exposed to an abrasive medium. Where welded joints are not exposed to wear conditions, lower strength hydrogen controlled mild steel electrodes should be used. Where the weld metal is exposed to abrasive media, hydrogen controlled electrodes producing a weld metal deposit of approximately the same hardness as the parent plate should be used for the capping passes.

#### Stud welding

ABRAZO® 400 can be stud welded without preheat. This means that where wear resistant liner plates are required, they can be fastened by welding, rather than by the more expensive drilling and bolting practices.

#### Preheat – ABRAZO® 400

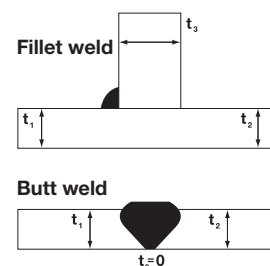
Recommended preheating temperatures:

Combined plate thickness ( $t_1+t_2+t_3$ ) mm	Temperature °C
45	20
60	20
75	75
90	75
120	100
150	150
180	150

The combined plate thickness can be calculated using these diagrams and the formula: Combined plate thickness =  $t_1 + t_2 + t_3$

Please note that the above recommendations are a guide.

For specific or unusual geometries, structural or welding conditions, please contact our technical advisory services on:  
+44 (0) 1724 402106



#### Flame cutting

ABRAZO® 400 can be readily cut using conventional flame cutting practices at ambient temperature, without the need for preheat. The following cutting parameters are recommended.

Plate thickness mm	Nozzel size LPN mm	Cutting O <sub>2</sub> lb/in <sup>2</sup>	Heating O <sub>2</sub> lb/in <sup>2</sup>	Heating Propane lb/in <sup>2</sup>	Cutting Speed mm/min
12.5	10 – 25	45	40	18	450
15	10 – 25	50	40	10	490
25	25 – 40	60	40	20	400
40	40 – 60	70	40	10	310
50	40 – 60	75	40	10	300
65 – 80	60 - 100	71	31	13	239

It should be stressed that care must be taken to achieve a good quality defect-free flame cut edge. Any gouges should be smoothly dressed by grinding immediately after cutting. Other methods of cutting ABRAZO® 400 can be used, such as abrasive water jet cutting where no heat input is involved, or by the use of oxy-plasma cutting which gives a heat affected zone similar to oxy-propane. These latter cutting methods are restricted to plates  $\leq$  25mm thick.

#### Shearing

ABRAZO® 400 can be sheared, but as shear strength is a function of tensile strength, a proportional reduction in the capacity of plate shearing equipment should be anticipated in comparison with mild steel grades. The quality of a sheared edge can be heavily influenced by machine set-up. Shear blades should therefore be sharp and well maintained in order to decrease the forces required for the cutting action.

Cutting angle and blade gap clearance should be monitored to avoid irregularities such as burrs and lips. Sheared edges should be dressed and irregularities removed prior to any subsequent cold forming operation. ABRAZO® 400 should not be sheared at temperatures lower than +10°C.

## Drilling

ABRAZO® 400 should be drilled with care. Armour piercing HSS-Co drills with a point angle of 125°-130° may be used. In this case a rigid holding set up is essential in addition to the correct selection of cutting speed, feed rate, tool geometry and cutting fluid, which should be applied generously. A mild steel backing plate or supporting bars should be placed beneath the plate.

The following cutting speeds and feeds are based on 1500mm wear life using PRESTO 11-211 armour piercing drills.

5mm diameter		10mm diameter		15mm diameter		20mm diameter	
rpm	Feed mm/rev	rpm	Feed mm/rev	rpm	Feed mm/rev	rpm	Feed mm/rev
570	0.05	290	0.10	190	0.16	150	0.20

Alternatively, indexable drills equipped with replaceable carbide inserts may be used for larger holes, but will require very rigid machines. The following recommendations for cutting speeds and feeds for such drills are based upon SECO SD 50 drills.

20mm diameter		25mm diameter		20mm diameter	
rpm	Feed mm/rev	rpm	Feed mm/rev	rpm	Feed mm/rev
570	0.05	190	0.16	150	0.20

Using:

Outer - Type SCMT F2 TP20 TiN/Al2O3 /coated carbide

Inner - Type SPMX S60M carbide (uncoated)

## Punching

ABRAZO® 400 can be cold punched, but it may be a more difficult operation than with mild steel and punch wear will be greater.

## Milling

ABRAZO® 400 can be machined by milling. The following recommendations are given for general guidance.

Steel grade	Cutting speed mm/min	Feed mm/tooth
ABRAZO® 400	100	0.10 – 0.15

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Milling can be affected by the rigidity of the machine tool and the workpiece clamping. Also, small variations in cutting speeds and feed rates can significantly affect tool life and these factors should be taken into account in any milling operation. Advice should be sought from tool manufacturers.

Please note the above data has been determined using dry milling with coated carbide inserts. The application of coolant may, in some cases, facilitate the use of faster cutting speeds and feeds. Advice should be sought from insert manufacturers.

## Cold bending

Where possible, cold bending should be carried out with the bend axis perpendicular to the rolling direction, this being the less onerous of the two directions. The following table contains guidelines for bending to a 90° angle. In general however, bending radii should be as generous as possible.

Bending direction (bend axis)	Minimum inside bending radius	Minimum die opening
Perpendicular to rolling direction	3t	8.5t
Parallel to rolling direction	4t	10t

## Countersinking and counterboring

For countersinking and counterboring, it is recommended that water cooling should be used to improve chip breaking.

To achieve a cutting speed of 25-30mm/min, the following speed and feeds are recommended.

19mm diameter		24mm diameter		34mm diameter	
rpm	Feed mm/rev	rpm	Feed mm/rev	rpm	Feed mm/rev
450	0.15 – 0.20	360	0.15 – 0.20	250	0.10 – 0.15

42mm diameter		57mm diameter	
rpm	Feed mm/rev	rpm	Feed mm/rev
205	0.10 – 0.17	150	0.15 – 0.20

## Hot forming and stress relieving

ABRAZO® 400 is not suitable for hot forming or for applications requiring stress relief.

## Further Information

For any queries regarding product application, metallurgy or mechanical properties please contact our Technical Advisory Service +44 (0) 1724 402106 or email: [plates.technical@corusgroup.com](mailto:plates.technical@corusgroup.com)

All other enquiries may be directed to your account team, or contact us using the details below.

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