

Boron steels

Many grades of Boron steel are rolled at Brinsworth Hot Strip Mills that can be tailored made to meet your requirements.

Boron steels have been developed to improve hardenability during heat treatment by the deliberate addition of boron to a range of medium carbon steels. They possess hardenability equivalent to that of much higher carbon steels and more expensive low alloy steels.

Grades that are produced regularly at Brinsworth Hot Strip Mill are:

	C	Si	Mn	P	S	Al	Cr	B
Boron 922	0.250 0.300	0.200 0.350	1.100 1.300	0.020 max.	0.005 max.	0.025 0.065	0.400 0.600	0.001 0.004
Boron 920	0.340 0.390	0.200 0.300	0.700 0.900	0.020 max.	0.005 max.	0.025 0.060	0.200 0.300	0.001 0.004
Boron 921	0.380 0.420	0.200 0.300	0.750 0.950	0.020 max.	0.005 max.	0.025 0.060	0.250 0.350	0.001 0.004
Boron 924	0.430 0.470	0.200 0.300	0.750 0.950	0.025 max.	0.015 max.	0.025 0.060	0.250 0.350	0.001 0.004

Characteristics of boron steels:-

- Potential savings on raw material costs. Particularly significant where a medium carbon alloy steel is being replaced.
- Lower as-delivered hardness giving improved blanking tool life.
- Inclusion control for good cold formability.
- Reproducible hardenability ensuring consistency of the end product.
- Good hardenability encouraging minimal distortion after heat treatment.
- Water quenching can be used for certain grades and applications.
- Good case hardening response with consistent, reproducible properties.
- Lower tempering temperatures used giving savings on energy costs.

- Tempering treatments may be incorporated into paint curing processes for some applications.
- Increased toughness for equivalent hardness compared to traditional carbon steels.
- Improved weldability through low carbon equivalent.

Typical applications include shovels, spades, plough shares, harrow discs, mower blades, agricultural knives, beet knives and chain side plates.

Typical mechanical properties

Steel Grade	Condition	Re N/mm ²	Rm N/mm ²	EI %	Hv10	Rc
Boron 922	As rolled W/Q O/Q	360	650	25	200	52 49
Boron 920	As rolled W/Q O/Q	350	640	26	200	55 54
Boron 921	As rolled W/Q O/Q	350	650	25	205	56 55
Boron 924	As rolled W/Q O/Q	370	680	24	210	57 56

W/Q – water quenched
O/Q – oil quenched

The selection of a suitable grade of boron strip is based on achieving a balance between formability and hardenability requirements to achieve the desired strength level in the finished component, – always bearing in mind cost implications. Traditionally the strength level has been obtained by increasing the carbon and manganese levels and by alloy additions such as chromium or molybdenum. However, these elements detract from the ductility of the strip in the 'as rolled' or annealed condition.

Boron is a unique alloying element. The addition of only .001 -.004% soluble boron to a suitably protected base steel can produce an increase in hardenability comparable to that obtained by additions of around 0.5% Mn, Cr or Mo, but with little effect on the 'as rolled' or annealed strength. Boron treated steels thus offer the distinct advantage of providing the required strength in the hardened condition but with enhanced ductility in the as delivered condition.

Size range

Mill edge		Sheared edge	
Width (mm)	Thickness (mm)	Width (mm)	Thickness (mm)
150 - 350	1.6 - 10.0	26 - 350	1.6 - 3.5
351 - 400	2.0 - 8.0	26 - 390	2.0 - 3.5
401 - 450	3.0 - 8.0	26 - 410	3.0 - 3.5
451 - 503	4.0 - 8.0	50 - 465	3.5 - 8.0

- Conditions of supply: – Black or pickled & oiled
– Mill or sheared edge.
- Cut lengths: from 1m to 11m.
- Coil dimensions: – Inside diameter 508mm
– Outside diameter 1350mm max.
- Coil weight: up to 9.5kg/mm of strip width.
- Tolerances: width and thickness to EN10048: 1997.

Technical support

Brinsworth has a comprehensive technical support team, available to advise on the use of Boron to achieve the maximum benefit. Technical Account Managers provide specialist advice and help with day-to-day problem solving. Works based metallurgists and the full resources of Corus Research and Development Laboratories are available to assist with longer-term developments.

For further information, enquiries or any technical guidance on potential applications of boron steel please contact the Commercial Department at the address below.

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