Tool Steel

Tel 0121 522 6789

www. carrs-tool.co.uk

Carrs Tool Steel.

Contact Information.

Carrs Tool Steels Limited

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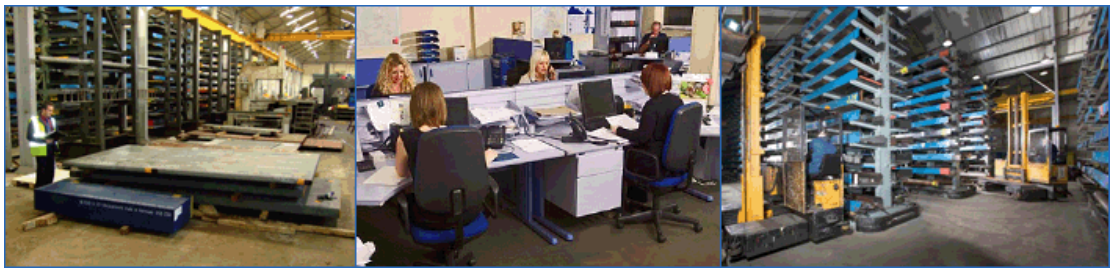
Contact us : Sales@carrs-tool.co.uk



Contents.

CARRS 09B

95MnWCr5 (B01, 1.2510)

Typical Analysis

C	0.95	Cr	0.50
Mn	1.25	V	0.20
W	0.50		

Colour Code

Characteristics

An excellent Oil Hardening low alloy steel. For Cutting Tools required to maintain a keen edge and Forming and Raising Tools where wear resistance is important.

Typical Applications

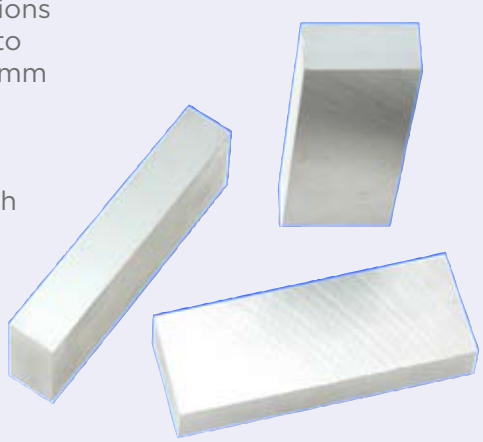
- Broaches
- Gauges
- Drill Bushes
- Jigs
- Deep drawing dies
- Clipping
- Embossing
- Marking punches
- Press tools
- Forming rolls
- Slitting cutters
- Taps and screwing tools
- Rivet forging dies
- Shear blades (rotary)
- Woodworking tools (machine)

Stock

CARRS 09B is stocked in a range of diameters and plate and cut to customers requirements

READYMILLED.COM

Rectangular sections from 25mm3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to -0+0.1mm and with squareness guaranteed to 0.1mm/m.



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CARRS 09B

95MnWCr5 (B01, 1.2510)

HEAT TREATMENT

Annealing

Soak thoroughly at 750/760°C. Cool in furnace not faster than 20°C per hour.

Stress Relieving

Heat uniformly to 625°C max. Allow to equalise and remove from furnace. Cool in still air to room temperature. Stress Relieving before hardening is recommended.

Hardening & Tempering

Thoroughly warm Tools or Components before charging.

Heating & Soaking

(a) Salt Bath Procedure

Charge Tools into Pre-heater chamber at 300/400°C and soak thoroughly up to 1 hour per inch of ruling section. Remove to Neutral Salt Bath operating at 800/810°C and maintain for 15 minutes at temperature or 10 minutes per inch of ruling section (whichever is the greater). (Very large sections required to have maximum hardness may be heated at 820°C.

(b) Open Furnace Procedure

Charge Tools into muffle furnace working at 300/400°C and soak thoroughly, preferably 1 hour per inch of ruling section. Raise heat uniformly to 800/810°C and maintain at this temperature for 10/20 minutes according to size. (Very large sections required to have maximum hardness may be heated to 820°C).

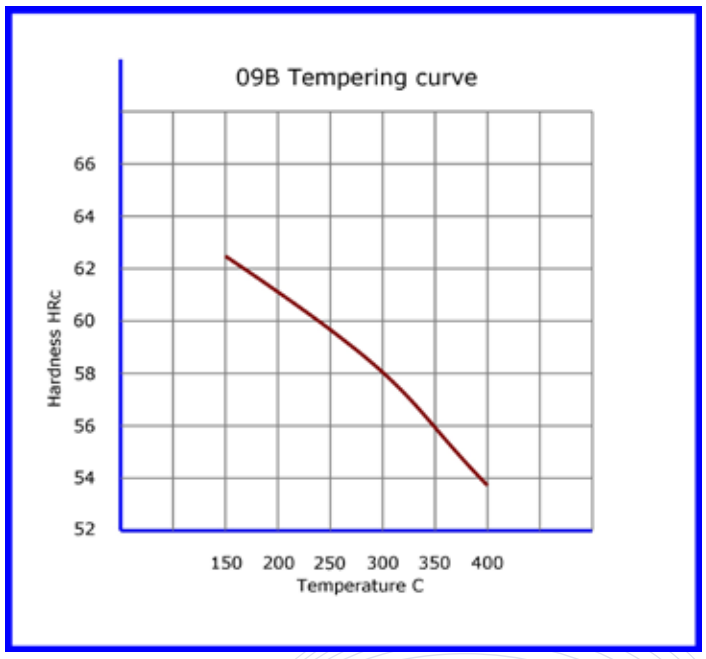
Quenching

(1) Quench in oil - ALTERNATIVELY
(2) Quench in Martempering Salt Bath at 200/250°C. Allow to equalise and cool in still air. Tools should be tempered immediately whilst still hand warm.

Tempering

Temper to your requirements according to the tempering graph - soaking at temperature for 1 hour per inch ruling section or 2 hours whichever is longer.

Tempering Graph



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53S

X40CrMoV5-1 (BH13, 1.2344)

Typical Analysis

C	0.40	Cr	5.00
Mo	1.40	V	1.00
Si	1.00		

Colour Code

Red

Characteristics

This steel is particularly recommended where Tools require to be alternatively heated and cooled, and in operations involving impact shocks. Tools may be water cooled in use without cracking. After normal heat treatment has been carried out, it is suitable for nitriding 0.30 mm (0.012") deep.

Sections and diameters can be supplied in the hardened condition or held against customer call off.

Typical Applications

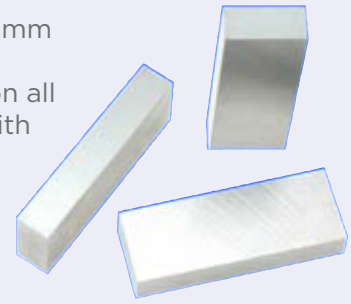
- Hot forging and pressing dies subject to severe abrasion
- Extrusion mandrels for copper and brass
- Barrels and plungers (pressure die-casting)
- Hot chisels
- Drop stamping (die inserts and ejectors)
- Ejectors and nozzles for pressure die-casting of zinc, lead and tin base alloys
- Extrusion dies, mandrels and punches
- Pressure pads
- Extrusion liners
- Extrusion stems and rams
- Blanking and bending tools
- Horizontal and vertical forging punches and dies
- Hot brass pressing dies
- Hot heading tools
- Die-holders
- Backer blocks (extrusion)
- Gripper dies
- Nut forming dies
- Shearing (hot)
- Hot-cropping,billet shearing and circular shearing

Stock

CARRS 53S is stocked in a range of diameters and plate and cut to customers requirements

READYMILLED.COM

Rectangular sections from 25mm 3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.



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53S

X40CrMoV5-1 (BH13, 1.2344)

HEAT TREATMENT

Annealing

Soak thoroughly at 850/860°C. Cool in furnace not faster than 20°C per hour

Stress Relieving

Heat uniformly to 650°C max. Allow to equalise and remove from furnace. Cool in still air to room temperature. Stress Relieving before hardening is recommended.

Hardening & Tempering

Thoroughly warm tools or components before charging

Heating & Soaking

(A) Salt bath procedure

Charge tools into pre-heater chamber at 300/400°C and soak thoroughly (up to 1 hour per inch of ruling section). Remove to neutral salt bath operating at 800/850°C and soak for 15 minutes per inch of ruling section (minimum 20 minutes). Remove to super-heat bath operating at 1,000/1,020°C and soak for 20 minutes at temperature or approximately 10 minutes per inch of ruling section, whichever is greater.

(B) Open furnace procedure

Charge tools into muffle furnace working at 300/400oc and soak thoroughly (up to 1 hour per inch of ruling section). Raise heat to 800/850°C and maintain at this temperature for at least 1 hour per inch of ruling section. Raise heat as rapidly as possible to 1,000/1,020°C and soak for 10/30 minutes according to section. N.B. Soaking at hardening temperature improves the red hardness characteristic.

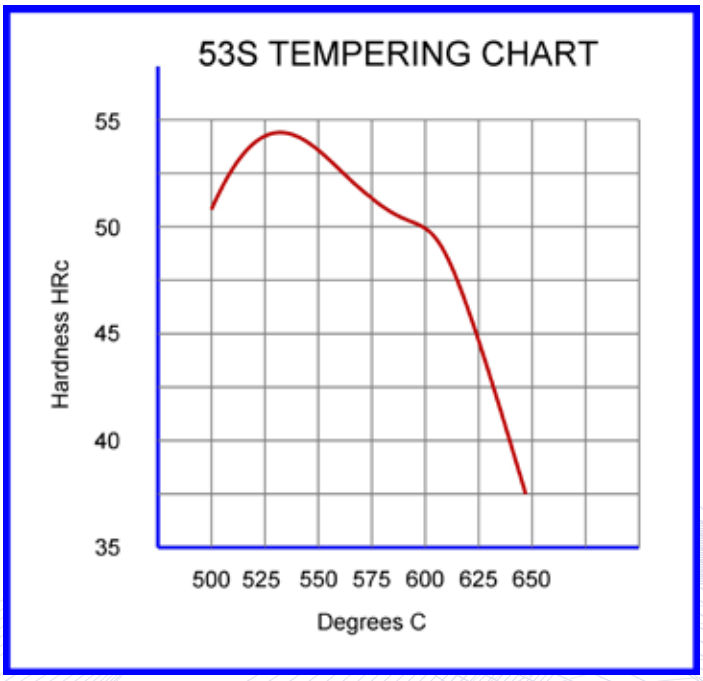
Quenching

(1) Quench in salt bath at 540/560°C. Allow to equalise and cool in still air - alternatively
(2) Cool in still air.

Note: in order to obtain a slightly higher hardness figure large sections may be blown, providing this can be done uniformly with dry air. Tools should be tempered immediately whilst still hand warm.

Tempering

Heat to 550°C and soak at this temperature for 1 hour per inch of ruling section or 2 hours whichever is longer. Allow to cool to room temperature. A second temper should then be given according to the tempering graph, soaking at temperature for 1 hour per inch of ruling section. A third temper is beneficial and should always be carried out where high-duty applications are involved. This steel should respond to hardening by the vacuum furnace, gas quench process.



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53SR

X40CrMoV5-1 (BH13, 1.2344)

Typical Analysis

C	0.40	Cr	5.00
Mo	1.40	V	1.00
Si	1.00		

Colour Code

Characteristics

This material is of the same Chemical analysis as Carr's 53S but has been remelted in the ESR (Electro Slag Refined) process to produce a steel of exceptional cleanliness and isotropy. In addition to the standard certification of analysis, Carrs 53SR is certified in respect on Microstructure and Microbanding in accordance with NADCA Z07-1990, VDG M82-1993. Where required, this material can be supplied tri-axally forged to give a further improvement in properties.

Typical Applications

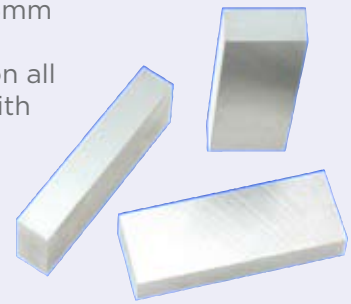
- Pressure die-casting dies and inserts
- Hot forging and pressing dies
- Hot work tooling for particularly arduous applications

Stock

CARRS 53SR is available in flats and diameters, please enquire for current delivery times.

READYMILLED.COM

Rectangular sections from 25mm 3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.



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53SR

X40CrMoV5-1 (BH13, 1.2344)

HEAT TREATMENT

Annealing

Soak thoroughly at 850/860°C. Cool in furnace not faster than 20°C per hour

Stress Relieving

Heat uniformly to 650°C max. Allow to equalise and remove from furnace. Cool in still air to room temperature. Stress Relieving before hardening is recommended.

Hardening & Tempering

Thoroughly warm tools or components before charging

Heating & Soaking

(A) Salt bath procedure

Charge tools into pre-heater chamber at 300/400°C and soak thoroughly (up to 1 hour per inch of ruling section). Remove to neutral salt bath operating at 800/850°C and soak for 15 minutes per inch of ruling section (minimum 20 minutes). Remove to super-heat bath operating at 1,000/1,020°C and soak for 20 minutes at temperature or approximately 10 minutes per inch of ruling section, whichever is greater.

(B) Open furnace procedure

Charge tools into muffle furnace working at 300/400°C and soak thoroughly (up to 1 hour per inch of ruling section). Raise heat to 800/850°C and maintain at this temperature for at least 1 hour per inch of ruling section. Raise heat as rapidly as possible to 1,000/1,020°C and soak for 10/30 minutes according to section. N.B. Soaking at hardening temperature improves the red hardness characteristic.

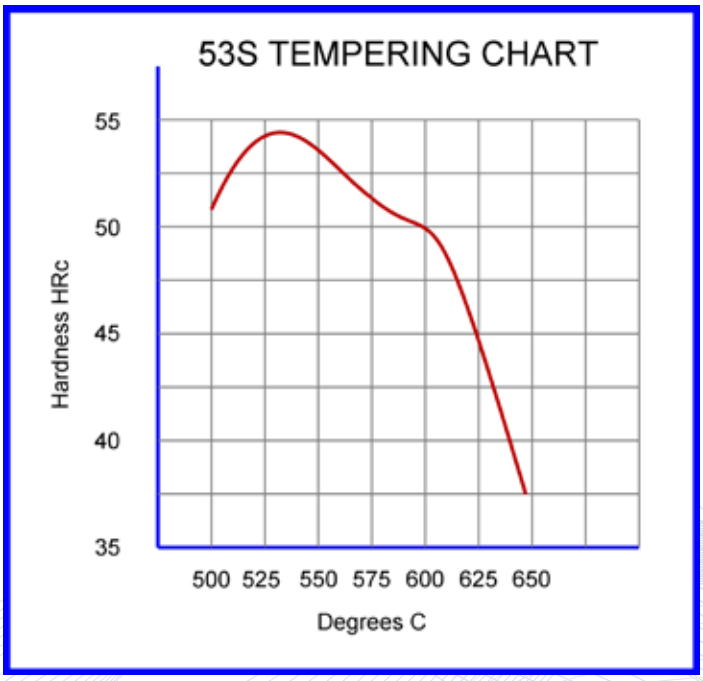
Quenching

(1) Quench in salt bath at 540/560°C. Allow to equalise and cool in still air - alternatively
(2) Cool in still air.

Note: in order to obtain a slightly higher hardness figure large sections may be blown, providing this can be done uniformly with dry air. Tools should be tempered immediately whilst still hand warm.

Tempering

Heat to 550°C and soak at this temperature for 1 hour per inch of ruling section or 2 hours whichever is longer. Allow to cool to room temperature. A second temper should then be given according to the tempering graph, soaking at temperature for 1 hour per inch of ruling section. A third temper is beneficial and should always be carried out where high-duty applications are involved. This steel should respond to hardening by the vacuum furnace, gas quench process.



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CARRS 69S

X153CrMoV12 (BD2, 1.2379)

Typical Analysis

C	1.50	Cr	12.00
Mo	0.80	V	0.90

Colour Code

Yellow

Characteristics

This steel is noted for its resistance to abrasion and its suitability for high-duty tools for hard and heavy gauge materials.

Typical Applications

- Tools requiring resistance to abrasion
- Crushers
- Deep drawing dies
- Gauges
- Blanking tools, general purpose
- Knurling tools
- Press tools, general purpose punches and dies
- Swaging dies
- Thread rolling (flat dies)
- Blanking tools
- Coining
- Press tools, heavy duty.

Alternative Materials

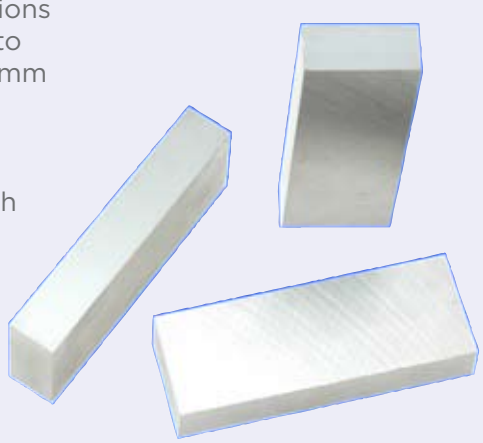
Where higher toughness, hardness and abrasion resistance are required to avoid tool failure by chipping, breaking or premature wear, CARRS DC53 special cold work steel should be specified.

Stock

CARRS 69S is stocked in a range of diameters and plate and cut to customers requirements

READYMILLED.COM

Rectangular sections from 25mm3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to -0+0.1mm and with squareness guaranteed to 0.1mm/m.



CARRS 69S

X153CrMoV12 (BD2, 1.2379)

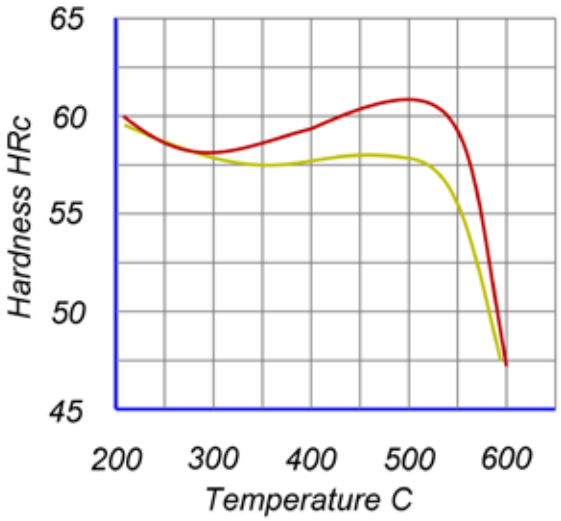
Stress relieving

Stress relieving after rough machining is recommended where there are large changes in section or where tools are particularly delicate. Heat uniformly to 650°C max. Allow to equalise and remove from the furnace. Cool in still air to room temperature. Stress Relieving before hardening is recommended.

Hardening & Tempering

Heat treatment should ideally be carried out using Salt Bath, Fluidised Bed or Vacuum Furnace equipment.

Both hardness and toughness values achievable are dependent on the hardening and tempering temperatures and the equipment employed. Hardening temperatures between 990°C and 1,080°C may be specified. Required properties should be agreed with the heat treatment company selected.



Tempering

Double tempering is necessary.

Nitriding And Other Thermal Processes

It is important that the temperature of any process following hardening and tempering should be lower than the final tempering temperature to avoid tempering back. Select a hardening temperature that will yield the required hardness after the final temper.

The final tempering temperature for Bath Nitriding should be 500-520°C and for Gas Nitriding 550-570°C.

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P20 & Variants

40CrMnNiMo8-6-4

Typical Analysis

C	0.40	Cr	1.90
Mo	0.20	Mn	1.50

Characteristics

P20 is a low alloy plastic mould steel delivered in the pre-hardened condition at approximately 300 HB.

P20 is available in three variants and these are identified as P20, P20S and P20N

P20 (1.2311)

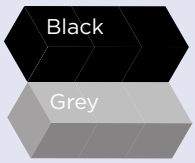
Suitable for plastic mould and bolster applications and may be polished and etch grained.

Colour Code

P20N (1.2738)

As for P20 but with added Nickel to ensure consistent hardness through large sections.

Colour Code



P20S (1.2312)

This is the free-machining version of P20 with added Sulphur. This material is not suitable for polishing or etch graining.

Colour Code

Stock

CARRS P20 is stocked in a range of diameters and plate and cut to customers requirements

Typical Applications

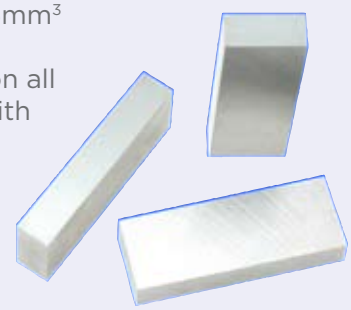
P20 is suitable for plastic mould tools and bolsters up to very large sizes.
Care should be taken to select the correct variant of P20 particularly where polishing and/or etch graining are required.

Alternative Materials

CARRS TOOLOX 33 is similar in hardness to P20, is easier to machine than P20S and will polish and etch grain to a very high standard. Additionally, TOOLOX 33 is extremely stable even where large sections are removed. It also has very high toughness.

READYMILLED.COM

Rectangular sections from 25mm^3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.



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HEAT TREATMENT

Stress Relieving

After machining and particularly after the removal of large sections, stress relieving can be beneficial. Heat uniformly to 500 C and soak for approximately 2 hours before allowing to air cool.

Hardening & Tempering

P20 is delivered in the hardened condition so hardening and tempering in not generally required or recommended.

Nitriding

After finish machining, P20 may be conventionally nitrided to give a hard, abrasion resistant skin to a depth of up to 0.40mm.

Flame & Induction Hardening

This steel is suitable for local flame or induction hardening to 50/55 HRc.

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CARRS P552

835M30, X30NiCrMo 16 6

Typical Analysis

C	0.30	Mn	0.50
Ni	4.25	Cr	1.25
Mo	0.30		

Colour Code

Brown

Characteristics

This is an extremely versatile steel where great strength and toughness are required, combined with a good wearing surface. Where an extra skin hardness is required it may be case-hardened. Alternativeley, it can be supplied heat treated to 95/102 kg.f/sq. mm., 60/65 tons f/sq. in., in which condition it is suitable for machining and requires no further heat treatment.

Stock

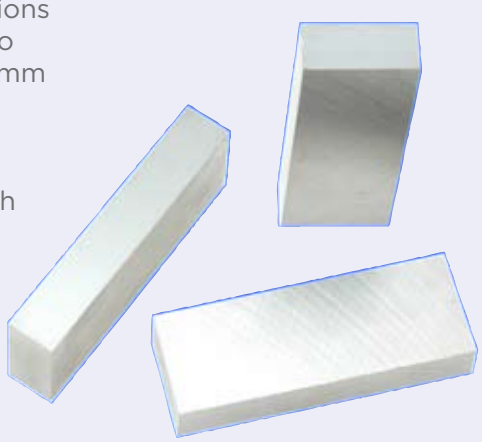
CARRS P552 is stocked in a range of diameters and plate and cut to customers requirements

Typical Applications

- Plastic moulds
- Machine parts requiring maximum compression stregnth
- Rubber moulds
- Drawing plugs (cold)
- Deep drawing dies (cold)
- Gripper dies
- Cases for cold heating, die inserts (light)
- Impact extrusion, die bases and bolsters
- Mandrels, cold tube drawing
- Bolsters for cold swaging
- Bolsters for supporting inserts in die casting
- Thrust blocks
- Shafts
- Cams
- Indexing pins
- Pistons
- Gears
- Arbors
- Bolts
- Pinions
- Wedges
- Cases for nut forming dies
- Die-casting moulds, die inserts, cores and ejectors
- Bending tools
- Hot extrusion Bolsters
- Stems
- Gripper dies
- Drop stamping dies
- Die holders
- Rams

READYMILLED.COM

Rectangular sections from 25mm³ up to 430 X 430 X 150mm can be delivered fine milled on all six faces to -0+0.1mm and with squareness guaranteed to 0.1mm/m.



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CARRS P552

835M30, X30NiCrMo 16 6

HEAT TREATMENT

Annealing

Soak for at least 2 hours per inch of thickness at 650°C. Cool in still air.

Stress Relieving

Heat uniformly to 600/630°C max. Allow to equalise and remove from furnace. Cool in still air to room temperature. Stress relieve before hardening.

Hardening & Tempering

Thoroughly warm Tools or Components before charging.

Heating & Soaking

(a) Salt Bath Procedure

Charge Tools into Pre-heater chamber at 300/400°C and soak thoroughly up to 1 hour per inch of ruling section. Remove to Neutral Salt Bath operating at 820/830°C and maintain for 20 minutes at temperature or 10 minutes per inch of ruling section (whichever is the greater).

(b) Open Furnace Procedure

Charge Tools into muffle furnace working at 300/400°C and soak thoroughly for 1 hour per inch of ruling section. Raise heat uniformly to 820/830°C and maintain at this temperature for sufficient time to allow the tools to equalise. Soak for a few minutes only when this point is reached.

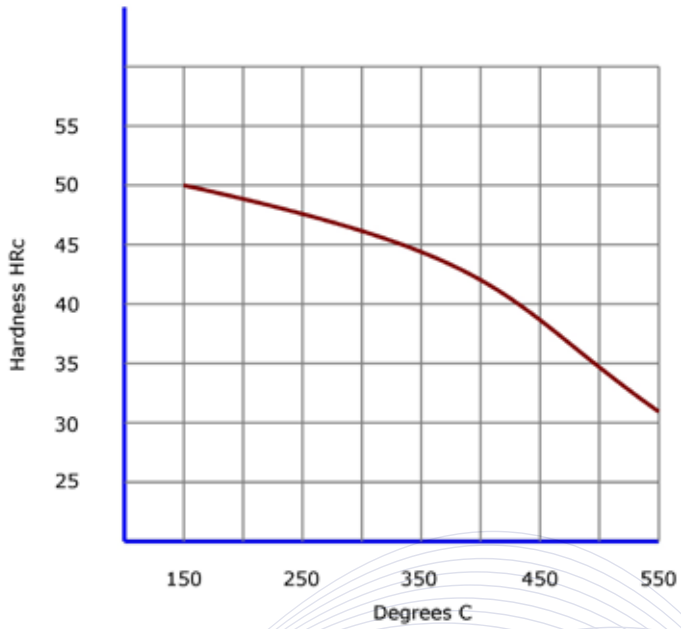
Quenching

(1) Quench in oil - ALTERNATIVELY
(2) Quench in Martempering Salt Bath at 180/220°C. Allow to equalise and cool in still air. Tools should be tempered immediately whilst still hand warm.

Tempering

Temper to your requirements according to the tempering graph - soaking at temperature for 1 hour per inch ruling section or 2 hours whichever is longer. Cool in still air after tempering. This steel should respond to hardening by the vacuum furnace, gas quench process

Tempering Graph



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CARRS P576

45NiCrMo16 (1.2767)

Typical Analysis

C	0.45	Mn	0.40
Ni	4.10	Cr	1.40
Mo	0.30		

Colour Code

Orange

Characteristics

This steel is complimentary to the very popular Carr's P.552. Its increased carbon content enables higher heat treated hardness levels to be obtained for applications demanding extra wear resistance.

Typical Applications

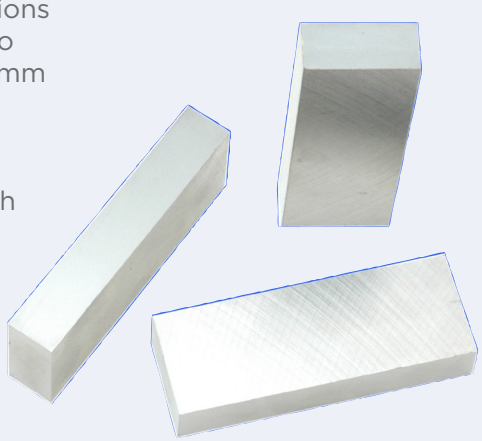
- Plastic moulds
- Rubber moulds etc, which require a higher resistance to wear and mechanical damage than can be obtained with the lower hardness level of Carr's P.552
- For moulds requiring some increased toughness but a higher hardness level than obtainable with Carr's P.552

Stock

CARRS P576 is stocked in a range of diameters and plate and cut to customers requirements

READYMILLED.COM

Rectangular sections from 25mm^3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.



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CARRS P576

45NiCrMo16 (1.2767)

HEAT TREATMENT

Annealing

Soak for at least 2 hours per inch of thickness at 650°C. Cool in still air.

Stress Relieving

Heat uniformly to 600/630°C max. Allow to equalise and remove from furnace. Cool in still air to room temperature. Stress relieve before hardening.

Hardening & Tempering

Thoroughly warm Tools or Components before charging.

Heating & Soaking

(a) Salt Bath Procedure

Charge Tools into Pre-heater chamber at 300/400°C and soak thoroughly up to 1 hour per inch of ruling section. Remove to Neutral Salt Bath operating at 830/850°C and maintain for 20 minutes at temperature or 10 minutes per inch of ruling section (whichever is the greater).

(b) Open Furnace Procedure

Charge Tools into muffle furnace working at 300/400°C and soak thoroughly for 1 hour per inch of ruling section. Raise heat uniformly to 830/850°C and maintain at this temperature for sufficient time to allow the tools to equalise. Soak for a few minutes only when this point is reached.

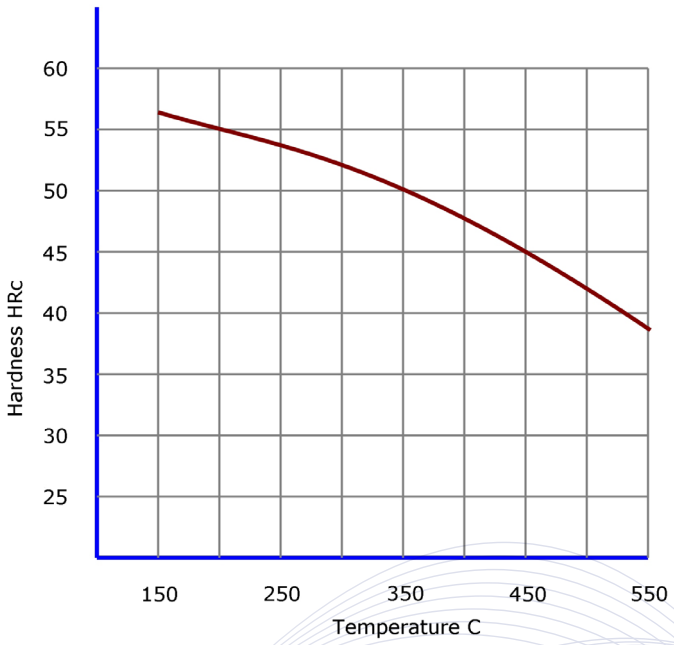
Quenching

(1) Quench in oil - ALTERNATIVELY
(2) Quench in Martempering Salt Bath at 180/220°C. Allow to equalise and cool in still air. Tools should be tempered immediately whilst still hand warm.

Tempering

Temper to your requirements according to the tempering graph - soaking at temperature for 1 hour per inch ruling section or 2 hours whichever is longer. Cool in still air after tempering. This steel should respond to hardening by the vacuum furnace, gas quench process

Tempering Graph



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P1008ESR

X40Cr14 (1.2083, AISI 420)

Typical Analysis

C	0.40	Si	0.40
Mn	0.40	Cr	13.00

Colour Code

Typical Applications

- Injection Moulding
- Blow Moulding

Characteristics

This steel is most suitable for Plastic Moulding Dies where the materials used have a corrosive effect on the mould and where greater wear resistance is required than that available with conventional Stainless Steels.

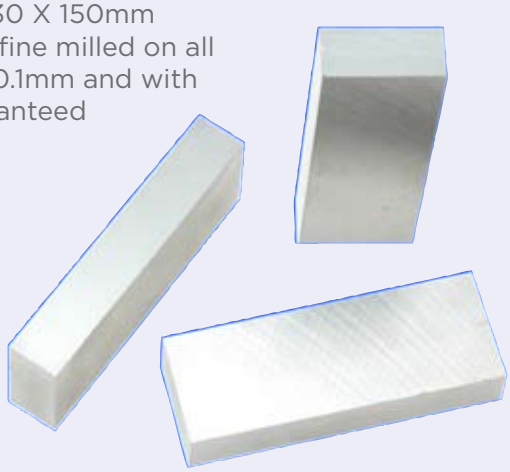
This steel is ESR Quality and suitable for polishing.

Stock

CARRS P1008ESR is stocked in a range of diameters and plate and cut to customers requirements

READYMILLED.COM

Rectangular sections from 25mm 3 up to 430 X 430 X 150mm can be deliveredfine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.



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www. carrs-tool.co.uk

P1008ESR

X40Cr14 (1.2083, AISI 420)

HEAT TREATMENT

Annealing

Heat slowly and uniformly to 780°C.
Cool in still air.

Stress Relieving

Heat uniformly to 650°C max. Allow to equalise and remove from furnace. Cool in still air to room temperature. Stress Relieving before hardening is recommended.

Hardening & Tempering

Thoroughly warm Tools or Components before charging

Heating & Soaking

Heat slowly and uniformly to 1,020°C. Allow to equalise and soak for a few minutes.

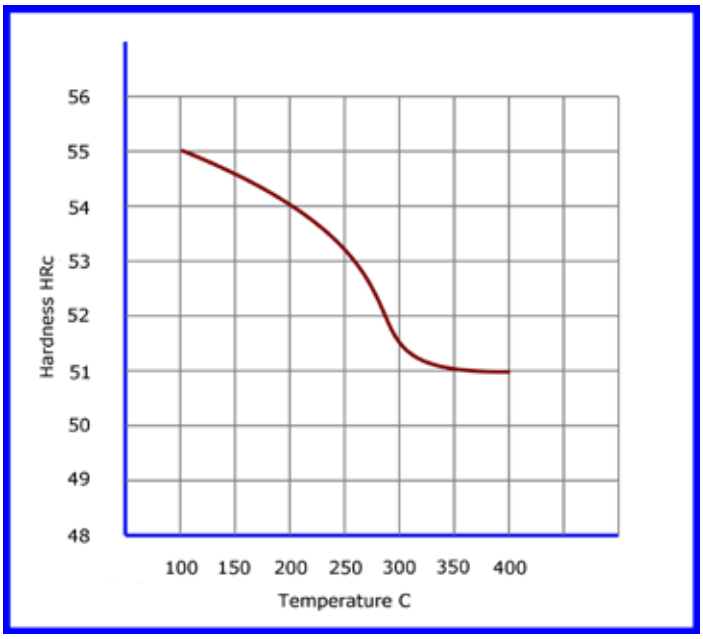
Quenching

Quench in salt at 520°C. Where a slightly lower hardness is acceptable, this steel may be air-cooled. An oil quench will provide a higher hardness but should be used only as a last resort and never where there are sudden changes in section which could lead to cracking.

Tempering

A first temper at 180°C should be given soaking at temperature for 1 hour per inch of ruling section or 2 hours whichever is longer followed by cooling to room temperature. A second temper should be given according to the tempering graph. Tempering above 400°C should be avoided as some reduction of toughness and corrosion resistance may result.

This steel should respond to hardening by the Vacuum furnace, gas quench process.



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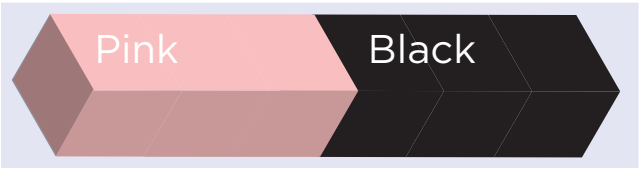
P1009

X38CrMo16 (1.2316)

Typical Analysis

C	0.28	Si	0.30
Mn	0.95	Cr	14.20
Mo	1.10	Ni	0.50

Colour Code



Characteristics

These mould steels have a very high resistance to corrosion and are particularly useful for processing chemically aggressive and acid precipitating materials such as PVC. These steels will take a good polish, can be textured and are amenable to Nitriding.

Rolled or forged flat material is supplied to a slightly modified specification (Carrs PM09 - 1.2316MOD) which improves machinability and corrosion resistance over standard 1.2316. Diameter bar is supplied to the standard specification (Carrs P1009-1.2316)

Stock

CARRS P1009 is available in flats and diameters, please enquire for current delivery times.

Typical Applications

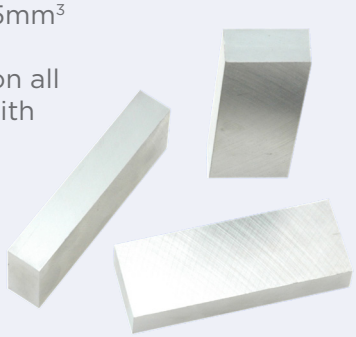
Uses include moulds for environmental and waste water engineering, spraying heads and extrusion mould tools, barrel extruders and construction material for corrosion resistant tooling. Although this steel may be used at temperatures up to 600°C, it is important to note that temperatures in excess of 160°C can promote the production of highly corrosive breakdown products from polymers such as PVC and this temperature should not be exceeded when processing such material.

Physical Properties

P1009 is delivered in the hardened and tempered condition in the hardness range 265-310HB (28-33HRC) in which condition it is readily machinable. Following machining, tools may be put straight into use. Where greater hardness is required, P1009 should be annealed prior to, and hardened after machining.

READYMILLED.COM

Rectangular sections from 25mm^3 up to 430 X 430 X 150mm can be delivered fine milled on all six faces to - 0+0.1mm and with squareness guaranteed to 0.1mm/m.



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P1009

X38CrMo16 (1.2316)

HEAT TREATMENT

Annealing

Soak at 820°C for 6 to 8 hours and cool in still air for a hardness of 230HB.

Hardening & Tempering

Thoroughly warm Tools or Components before charging

Heating & Soaking

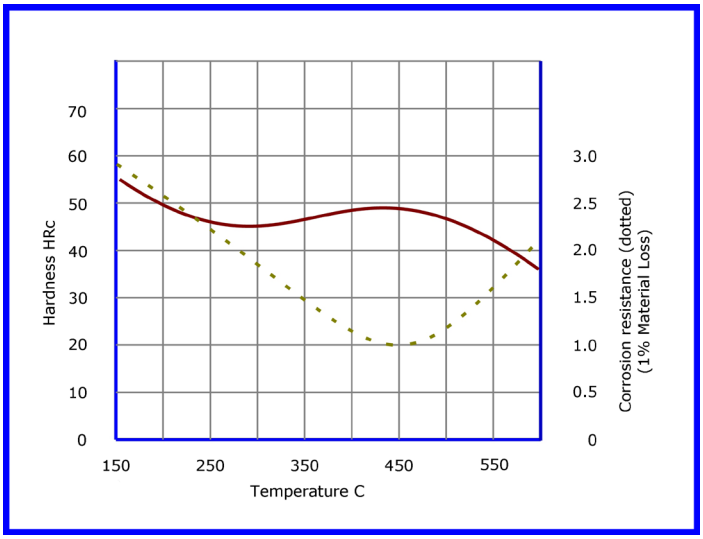
Heat slowly to 400, 650, 850 and finally to 1030°C holding at each temperature for 25 minutes per inch of ruling section.

Quenching

Quench in salt at 500°C for 6 minutes per inch of ruling section. Cool in still air to 150°C, equalise, and then temper immediately.

Tempering

Temper according to the chart but note that tempering between 300°C and 600°C will result in a significant reduction in resistance to corrosion. A second temper is recommended.



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Tool Steel

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