

**TATA STEEL**



**Engineering Bar Product Manual**





# EXTENSIVE PRODUCT RANGE

Our Metal Centres provide customers with a quick and convenient way of buying smaller quantities of a wide range of steel products. Ideal for jobs where fast completion is needed. They stock a wide choice of black and bright, carbon and alloy grades. Our range includes round, flat and hexagonal bars in a multitude of sizes.

# Overview

## Further Processing

To save customers processing time and cost we offer:

- single- and multi-cut sawn to length quantities
- a wide range of additional processing services, including boring, proof turning, precision turning, centreless grinding, heat treatment, mechanical testing, ultrasonic/MPI (magnetic particle inspection) crack detecting

## Accreditations

Tata Steel maintains more than 100 market and customer approvals from the worlds leading OEMs and tiers engaged in the aerospace, oil and gas, lifting and excavating, automotive and bearing markets consuming engineering bar. Our manufacturing sites are approved to BS EN 9100:2008, AS9100/AS9120 and BS EN ISO 14001:2004.

## In-depth industry knowledge

Tata Steel service centres serve more than 6,000 individual customers each year. Our extensive experience of steel products, processing and applications can be utilised to support the development of your business.

## Nationwide Next-Day Delivery

We have a well-placed network of sites in Wolverhampton, Newcastle and Bolton. They are conveniently located, with excellent logistics, to service the UK market. Using our own transport fleet and working together with haulier partners, we offer nationwide next-day delivery for urgent orders – even for small or one-off orders.



Please contact your nearest sales office for more information:

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# Product range

	Specification	Finish	Type	Family	EN Equivalent (guidance only)
1	080A15	Bright	Carbon	Low Carbon	EN3B / EN32B
2	080M40 / 080A42	Bright	Carbon	Medium Carbon	EN8 / EN8D
3	210M15 (EN32M)	Bright	Carbon	Low Carbon Free-Cutting	EN32M
4	212A42	Bright	Carbon	Medium Carbon Free-Cutting	EN8DM
5	Hitenspeed 45A	Bright	Carbon	Medium Carbon Free-Cutting	
6	230M07	Bright	Carbon	Low Carbon Free-Cutting	EN1A
7	230M07Pb	Bright	Carbon	Low Carbon Free-Cutting	EN1A Leaded
8	070M20	Black	Carbon	Low Carbon	EN3A
9	070M55	Black	Carbon	Medium Carbon	EN9
10	080M40	Black	Carbon	Medium Carbon	EN8
11	S355J2	Black	Carbon	Low Carbon	
12	605M36	Bright	Alloy	Through- Hardening	EN16
13	Hitenspeed 55	Bright	Alloy	Through- Hardening Free-Cutting	
14	655M13	Bright	Alloy	Case-Hardening	EN36A
15	708M40	Bright	Alloy	Through- Hardening	EN19

	<b>Specification</b>	<b>Finish</b>	<b>Type</b>	<b>Family</b>	<b>EN Equivalent (guidance only)</b>
16	709M40	Bright	Alloy	Through-Hardening	EN19
17	817M40	Bright	Alloy	Through-Hardening	EN24
18	ASTM A193 Grade B7 / A320 Grade L7	Bright	Alloy	Through-Hardening	
19	ASTM A193 Grade B16	Bright	Alloy	Through-Hardening	
20	655M13	Black	Alloy	Case-Hardening	EN36A
21	832M13	Black	Alloy	Case-Hardening	EN36C
22	SAE8620H	Black	Alloy	Case-Hardening	
23	16MnCr5	Black	Alloy	Case-Hardening	
24	605M36	Black	Alloy	Through-Hardening	EN16
25	708M40	Black	Alloy	Through-Hardening	EN19
26	709M40	Black	Alloy	Through-Hardening	EN19
27	817M40	Black	Alloy	Through-Hardening	EN24
28	826M40	Black	Alloy	Through-Hardening	EN26
29	835M30	Black	Alloy	Through-Hardening	EN30B

# 1. 080A15 (EN3B/32B)

## Low Carbon Steel

### Material description:

A general purpose mild steel. Readily weldable and suitable for case hardening. Used where heavy stresses and heat treatment are not involved. Bright flats are of particular interest to the tool making trade.

### Chemical Composition

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	C	Si	Mn	P	S
Min %	0.13	0.10	0.70		
Max %	0.18	0.40	0.90	0.05	0.05

**Size Range:** Rounds 5mm to 250mm

Hexagons 8mm to 36mm

Flats widths 12mm to 200mm, Thicknesses 3mm to 90mm

**Supply Condition:** Bright Drawn or Turned dependant on size

**Alternative specifications:** 080A15, EN3B, EN32B, C15, SAE/AISI 1016



## 2. 080M40 (EN8) & 080A42 (EN8D) Medium Carbon Steel

### Material description:

A medium carbon and medium tensile steel used mainly for axles, spindles, studs, automotive and general engineering components. Suitable for heat treatment where extra strength is required.

### Chemical Composition 080M40

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	C	Si	Mn	P	S
Min %	0.36	0.10	0.60		
Max %	0.44	0.40	1.00	0.050	0.050

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### Chemical Composition 080A42

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	C	Si	Mn	P	S
Min %	0.40	0.10	0.70		
Max %	0.45	0.40	0.90	0.050	0.050

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**Size Range:** Rounds 5mm to 250mm

**Supply Condition:** Bright Drawn or Turned dependant on size

**Alternative specifications:** SAE1042, C40, C45

## 3. 210M15 (EN32M)

### Low Carbon Free - Cutting Steel

#### Material description:

A semi free-cutting carbon case hardening steel with improved machining properties.

#### Chemical Composition

	C	Si	Mn	P	S
Min %	0.12	0.10	0.90		0.10
Max %	0.18	0.40	1.30	0.050	0.18

#### Mechanical Properties (minimums unless stated)

Test Bar (mm Dia)	UTS (N/mm <sup>2</sup> )	Elongation (%)	Impact Izod (J)	Impact KCV (J)
13	490	16	30	35
19 (Preferred size)	460	16	30	35
29	430	18	30	35

**Size Range:** Rounds 12.7mm to 50mm

**Alternative specifications:** EN32M

## 4. 212A42 (EN8DM)

### Medium Carbon Free-Cutting Steel

#### Material description:

A semi free-cutting medium carbon steel mainly used for the manufacture of spindles, nuts, bolts etc.

#### Chemical Composition 080M40

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	C	Si	Mn	P	S
Min %	0.40		1.00		0.120
Max %	0.45	0.25	1.30	0.060	0.200

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**Size Range:** Rounds 8mm to 60mm  
Hexagons 10mm to 36mm

**Supply Condition:** Bright Drawn

**Alternative specifications:** 080A15, EN3B, EN32B, C15, SAE/AISI 1016

# 5. Hitespeed 45A

## Medium Carbon Free-Cutting Steel

### Material description:

Hitespeed 45A is a medium carbon free-cutting steel, combining high strength and ease of machining. By tightly controlling the chemical composition, Hitespeed 45A provides consistent processing, whilst its strength in the as-drawn condition minimises distortion during machining and further treatment. It is suitable for applications including spindles, shafts, hydraulic couplings, braking and drive train components and gears.

### Chemical Composition

	C	Si	Mn	P	S
Min %	0.41		1.35		0.25
Max %	0.45	0.15	1.50	0.04	0.32

### Mechanical properties (heat treated, minimums unless stated)

Test Bar diameter	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Elongation (%)
<40mm (as drawn)	800	685	8
40-75mm (as drawn)	700	600	10
40-75mm (H&T R condition)	700/850	530	10

**Size Range:** Rounds 8mm to 75mm

Hexagons 12.7mm 63.5mm

## 6. 230M07 (EN1A)

### Low Carbon Free-Cutting Steel

#### Material description:

A low carbon steel designed for high speed machining for multi turned parts. Controlled analysis to ensure consistent quality and maximum tool life. Swarf will form in small chips to prevent machine blockage.

#### Chemical Composition

	C	Si	Mn	P	S
Min %			0.90		0.25
Max %	0.15	0.05	1.30	0.090	0.35

#### Mechanical Properties Typical (minimums unless stated, from normalised test piece)

Hot Rolled & Cold Drawn	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Elongation (%)	Hardness HB
≥ 6mm ≤ 13mm	480 Min	400 Min	6	
> 13mm ≤ 16mm	460 Min	380 Min	7	
> 16mm ≤ 40mm	430 Min	340 Min	8	
> 40mm ≤ 63mm	390 Min	280 Min	9	
> 63mm ≤ 76mm	370 Min	240 Min	10	

Hot Rolled & Turned	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Elongation (%)	Hardness HB
6mm < 100mm	360 Min	215 Min	22 Min	103 Min

**Size Range:** Rounds 5mm to 200mm  
Hexagons 10mm to 90mm  
Squares 5mm to 100mm

**Supply Condition:** Bright Drawn or Turned dependant on size

**Alternative specifications:** 11SMn30, SAE1214, SAE1213

## 7. 230M07Pb (EN1A Leaded)

### Low Carbon Free-Cutting Leaded Steel

#### Material description:

A low carbon steel designed for high speed machining for multi turned parts. Controlled analysis to ensure consistent quality and maximum tool life. Swarf will form in small chips to prevent machine blockage. The addition of lead will enhance machineability.

#### Chemical Composition

	C	Si	Mn	P	S	Pb
Min %			0.90	0.040	0.025	
Max %	0.15	0.05	1.30	0.090	0.035	0.25

**Size Range:** Rounds 5mm to 100mm  
Hexagons 10mm to 90mm  
Squares 5mm to 100mm

**Alternative specifications:** 11SMn30Pb, SAE12L14, SAE12L13

## 8. 070M20 (EN3A)

### Low Carbon Steel

#### Material description:

A mild steel used for general engineering purposes. Suitable for low stressed fixings, shafts, rollers etc. Good machining and weldability. Used where heavy stresses and heat treatment are not involved.

#### Chemical Composition

	C	Si	Mn	P	S
Min %	0.16	0.10	0.50		
Max %	0.24	0.40	0.90	0.050	0.050

#### Mechanical Properties Typical (minimums unless stated)

	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	LRS (mm)
Normalised test piece	430	215	126-179	150
Normalised test piece	400	200	116-170	250

**Size Range:** Rounds 40mm to 600mm

**Supply Condition:** As rolled, as forged, subject to size

**Alternative specifications:** C20, C22, DIN 1.1151, EN3A

# 9. 070M55 (EN9)

## 0.55% Medium Carbon Steel

### Material description:

A mild steel used for general engineering purposes. Suitable for low stressed fixings, shafts, rollers etc. Good machining and weldability. Used where heavy stresses and heat treatment are not involved. Swarf will be in long continuous strands.

### Chemical Composition

	C	Si	Mn	P	S
Min %	0.50	0.10	0.50		
Max %	0.60	0.40	0.90	0.050	0.050

### Mechanical Properties Typical (minimums unless stated)

	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	LRS (mm)
Normalised test piece	700	355	201/255	63
Normalised test piece	600	310	170/223	250

**Size Range:** Rounds 50mm to 550mm

**Supply Condition:** As rolled, as forged, Normalised

**Alternative specifications:** C55, SAE1055, DIN 1.0535, EN9



# 10. 080M40 (EN8)

## 0.40% Medium Carbon Steel

### Material description:

A medium carbon, medium tensile steel. Used mainly for axles, spindles, studs, automotive and general engineering components. Suitable for heat treatment where extra strength is required. Material capable of through hardening by quenching and tempering but is commonly supplied in the untreated condition.

### Chemical Composition

	C	Si	Mn	P	S
Min %	0.36	0.10	0.60		
Max %	0.44	0.40	1.00	0.050	0.050

### Mechanical Properties Typical (minimums unless stated, from normalised test piece)

	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	LRS (mm)
Normalised test piece	550	280	152/207	150
Normalised test piece	510	245	146/197	250

**Size Range:** Rounds 50mm to 650mm

**Supply Condition:** As rolled, as forged, Normalised

**Alternative specifications:** 080A42, DIN 1.0511, SAE1040, C40

# 11. S355J2

## Low Carbon Steel

### Material description:

As an unalloyed low carbon mild steel grade, S355 is supplied in the hot rolled condition. The S355 steel specifications are high yield non alloy steels. First specified in the European EN10025 standard and later published by the British Standards Institute (BSI) as BS EN 10025 S355, S355J2 and S355J2+N. These standards superseded the BS4360 grades. The average minimum yield for this material is 355 N/mm<sup>2</sup>, hence the name S355 A medium tensile, low carbon manganese steel which is readily weldable and possess good impact resistance. Machinability is similar to that of mild steel.

### Chemical Composition

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	C	Si	Mn	P	S
Min %					
Max %	0.20	0.55	1.6	0.035	0.035

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**Size Range:** Rounds 50mm to 550mm

**Supply Condition:** As rolled, as forged, Normalised

**Alternative specifications:** DIN 1.1170, 150M19

## 12. 605M36 (EN16)

### Low Alloyed Manganese-Molybdenum Through-Hardening Steel

#### Material description:

An alloy steel with good mechanical properties and is readily machinable. Suitable for bolts, shafts, studs, axles and items that require high shock resistance.

#### Chemical Composition

	C	Si	Mn	P	S	Mo
Min %	0.32	0.10	1.30			0.22
Max %	0.40	0.35	1.70	0.035	0.040	0.32

#### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact Izod (J)
R > 29 150	700/850	540	201/255	12	40
S > 13 100	775-925	600	223/277	11	40
T > 6 63	850-1000	700	248-302	9	40
U > 6 29	925-1075	770	269-331	9	35

**Supply Condition:** Bright Cold Drawn Bar

# 13. Hiten®speed 55

## Low Alloyed Manganese-Molybdenum Through-Hardening Free-Cutting Steel

### Material description:

A high tensile free-cutting manganese molybdenum steel for use when faster cycle times and excellent surface finish are required. Suitable for nuts, bolts, shafts etc.

### Chemical Composition

	C	Si	Mn	P	S	Mo
Min %	0.32		1.30		0.150	0.22
Max %	0.40	0.25	1.70	0.06	0.250	0.32

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)	LRS (mm)
*	*	*	*	*	*	*
*	*	*	*	*	*	*
T	850/1000	740	248/302	10	40	*

**Size Range:** Rounds 10mm to 75mm  
Hexagons 10mm to 70mm

# 14. 655M13 (EN36A)

## 3% Nickel-Chromium Case Hardening Case-Hardening Steel

### Material description:

A nickel chromium case-hardening steel. When carburised and hardened attainable core values of 850-1230N/mm<sup>2</sup> can be achieved. Chromium increases the hardenability while the nickel content will increase the toughness and resistance to shock. Applications include heavy duty gears, transmission components and track rod pins.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.10	0.15	0.35				0.70	3.00
Max %	0.16	0.25	0.60	0.035	0.040	0.15	1.00	3.75

### Mechanical Properties Typical (minimums unless stated, from normalised test piece)

UTS (N/mm <sup>2</sup> )	Elongation (%)	Impact KVC (J)
1000	9	35

**Size Range:** Rounds 12mm to 63.5mm

**Supply Condition:** Bright Cold Drawn Bar

**Alternative specifications:** EN36B, Werksoff 1.5752, 14NiCr14

# 15. 708M40 (EN19)

## Low Alloy 1% Chromium Molybdenum Through-Hardening Steel

### Material description:

A high tensile chromium molybdenum steel with high ductility and good shock resisting properties. Suitable for gears, high tensile studs, shafts etc.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr
Min %	0.36	0.10	0.70			0.15	0.90
Max %	0.44	0.40	1.00	0.035	0.040	0.25	1.20

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact Izod (J)
R >63mm 150mm	700-850	540	201/255	12	40
S >29mm 100	775-925	600	223/277	11	40
T >6mm 63	850-1000	700	248/302	9	40
U >6mm 29	925-1075	770	269/331	98	35

**Size Range:** Rounds 10mm to 63.5mm

**Supply Condition:** Bright Cold Drawn Bar

**Alternative specifications:** SAE4140, 42CrMo4, Werkstoff 1.7225

# 16. 709M40 (EN19)

## Low Alloy 1% Chromium Molybdenum Through-Hardening Steel

### Material description:

A through-hardening steel capable of surface hardening by nitriding. Suitable for applications where good tensile, ductility and shock resistance properties are important. May be induction hardened to give resistance wear. Applications include gears, shafts, rams and high tensile studs.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr
Min %	0.36	0.10	0.70			0.25	0.90
Max %	0.44	0.40	1.00	0.035	0.040	0.35	1.20

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact Izod (J)
R >100mm 150mm	700/850	540	201/255	11	40
S >63mm 150	775/925	600	223/277	11	40
T >29mm 100	850-1000	700	248/302	9	40
U >13mm 63	925-1075	770	269/331	9	35

**Size Range:** Rounds 10mm to 63.5mm

**Supply Condition:** Bright Cold Drawn Bar

**Alternative specifications:** EN19, Werkstoff 1.7225, 42CrMo4

# 17. 817M40 (EN24)

## 1.5% Nickel-Chromium-Molybdenum Through-Hardening Steel

### Material description:

A through-hardening steel capable of surface hardening by nitriding. Excellent resistance to wear and shock. Suitable for shafts, axles and machined parts requiring high strength.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.36	0.10	0.45			0.20	1.00	1.30
Max %	0.44	0.40	0.70	0.035	0.040	0.35	1.40	1.70

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)
T > 63mm < 150mm	850/100	700	248-302	9	40
U > 6mm < 100mm	925/1075	770	269-331	9	35
V > 13mm < 63mm	1000/1150	865	293-352	9	35

**Size Range:** Rounds 12mm to 63.5mm

**Supply Condition:** Bright Cold Drawn Bar

**Alternative specifications:** SAE4340, Werkstoff 1.6565, 34CrNiMo6, 40CrNiMo6



# 18. ASTM A193 B7/A370 L7

## Low Alloy Chromium-Molybdenum Through-Hardening Steel

### Material description:

B7 is a bolting specification for medium-high temperature service. The specification calls for minimum strength and maximum hardness levels. It is considered to be most suitable for components used at temperatures below 450 degrees C. L7 has the same chemical and physical properties as B7, it is designed for low temperature applications down to -100°C (-150°F)

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr
Min %	0.37	0.15	0.65			0.15	0.80
Max %	0.49	0.35	1.10	0.035	0.040	0.25	1.10

### Mechanical Properties Typical (heat treated, minimums unless stated)

Size	Up to 2.5" dia	Over 2.5" dia to 4" dia
UTS (N/mm <sup>2</sup> )	860	795
Yield (N/mm <sup>2</sup> )	725	655
Hardness HB	321 Max	321 Max
Elongation (%)	16	16
CVN at -101°C L7 only (J)	27 joules	N/A
Reduction of Area (%)	50	50
Min Tempering Temperature	593°C (1100°F)	593°C (1100°F)

**Size Range:** Rounds 10mm to 4" dia in thread rolling and nominal sizes (4" dia is B7 only)

# 19. ASTM A193 B16

## Low Alloy Chromium-Molybdenum-Vanadium Through-Hardening Steel

### Material description:

B16 is a bolting specification for high temperature service. It is a heat treated chromium molybdenum vanadium (CrMoV) steel. The specification calls for minimum strength and maximum hardness levels. It is considered to be most suitable for components used at temperatures below 450°C (840°F).

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Al	V
Min %	0.36	0.15	0.45			0.50	0.80		0.25
Max %	0.47	0.35	0.70	0.035	0.040	0.65	1.15	0.015	0.35

### Mechanical Properties Typical (heat treated, minimums unless stated)

Size	UTS (N/ mm <sup>2</sup> )	Yield (N/ mm <sup>2</sup> )	Hardness HB	Elongation (%)	Reduction of Area (%)	Min Tempering Temperature
Up to 2.5" dia	860	725	321 Max	18	50	650°C (1200°F)
Over 2.5" dia to 4" dia	760	655	302 Max	17	45	650°C (1200°F)

**Size Range:** Rounds 10mm to 4" dia in thread rolling and nominal sizes

**Alternative specifications:** Durehete 950

## 20. 655M13 (EN36A)

### 3% Nickel-Chromium Case-Hardening Steel

#### Material description:

A nickel chromium case-hardening steel. When carburised and hardened attainable core values of 850-1230N/mm<sup>2</sup> can be achieved. Chromium increases the hardenability while the nickel content will increase the toughness and resistance to shock. Applications include heavy duty gears, transmission components and track rod pins.

#### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.10	0.10	0.35				0.70	3.00
Max %	0.16	0.40	0.60	0.035	0.04	0.15	1.00	3.75

**Size Range:** Rounds 25mm to 330mm

**Alternative specifications:** EN36B, DIN 1.5752, 14NiCr14

# 21. 832M13 (EN36C)

## 3% Nickel-Chromium-Molybdenum Case-Hardening Steel

### Material description:

EN36C is a case-hardening steel. Additions of chromium and molybdenum increase the degree of hardenability, whilst nickel acts to increase toughness and resistance to shock. It is typically used in applications requiring high levels of surface wear resistance, high tensile strength and good impact properties such as pins, gears, heavy duty bushings, gears, spindles and shafts.

### Chemical Composition

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	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.10	0.10	0.35			0.10	0.70	3.00
Max %	0.16	0.35	0.60	0.035	0.040	0.25	1.10	3.75

**Size Range:** Rounds 80mm to 300mm

**Alternative specifications:** EN36c, SAE/AISI 9310

## 22. SAE8620H

### Low Alloy Chromium-Molybdenum-Nickel Case-Hardening Steel

#### Material description:

SAE8620 is a low alloy chromium molybdenum nickel (CrMoNi) steel, typically used for carburising to create a case hardened part with excellent surface wear resistance. It is typically used in gears, shafts and crankshafts.

#### Chemical Composition

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	C	Si	Mn	P	S	Cr	Ni	Mo
Min %	0.17	0.15	0.60			0.35	0.35	0.15
Max %	0.23	0.35	0.95	0.030	0.040	0.65	0.75	0.25

**Size Range:** Rounds 30mm to 280mm

**Alternative specifications:** EN362, 805M20, DIN 1.6523, AISI 8620

## 23. 16MnCr5

### Low Alloy Chromium-Manganese Case-Hardening Steel

#### Material description:

16MnCr5 is a low alloy chromium, manganese (CrMn) case-hardening steel. When carburised it combines a hard outer surface with a tough core, making it well suited to applications which require a combination of toughness and wear resistance such as shafts, pins and gears in the automotive industry.

#### Chemical Composition

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	C	Si	Mn	P	S	Cr
Min %	0.14		1			0.8
Max %	0.19	0.4	1.3	0.035	0.035	1.1

**Size Range:** Rounds 30mm to 280mm

**Alternative specifications:** 20MnCr5, SAE 8620

# 24. 605M36 (EN16)

## Low Alloy Manganese-Molybdenum Through-Hardening Steel

### Material description:

A through-hardening steel with good resistance to shock and excellent ductility with freedom from temper embrittlement attainable. Applications include low endurance connecting rods, high tensile bolts & nuts, hub spindles and lifting gear spindles.

### Chemical Composition

	C	Si	Mn	P	S	Mo
Min %	0.32	0.10	1.30			0.22
Max %	0.40	0.04	1.70	0.035	0.040	0.32

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)	LRS (mm)
R	700/850	495	201/255	15	28	250
R	700/850	525	201/255	17	50	150
S	775/925	585	223/277	15	50	100
T	850/1000	680	248/302	13	50	63

**Size Range:** Rounds 40mm to 240mm

# 25. 708M40 (EN19)

## Low Alloy 1% Chrome-Molybdenum Through-Hardening Steel

### Material description:

A through-hardening chromium molybdenum steel capable of surface hardening by nitriding with high ductility and good shock resisting properties.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr
Min %	0.36	0.10	0.70			0.15	0.90
Max %	0.44	0.40	1.00	0.035	0.040	0.25	1.20

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)	LRS (mm)
R	700/850	495	201/255	15	28	250
R	700/850	525	201/255	17	50	150
S	775/925	585	223/277	15	50	100
T	850/1000	680	248/302	13	50	63

**Size Range:** Rounds 40mm to 260mm

**Alternative Specifications:** SAE4140, 42CrMo4, DIN 1.7225



# 26. 709M40 (EN19)

## Low Alloy 1% Chromium-Molybdenum Through-Hardening Steel

### Material description:

A through-hardening steel capable of surface hardening by nitriding. Material can be supplied untreated, annealed or Q & T. Bars commonly supplied in the heat treated condition. A low alloy steel that possesses good tensile and shock resistance properties. Wear resistance can be increased by flame hardening and is suitable for nitriding. Applications axles, shafts, gears and induction harden pins.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr
Min %	0.36	0.10	0.70			0.25	0.90
Max %	0.44	0.40	1.00	0.035	0.040	0.35	1.20

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)	LRS (mm)
R	700/850	495	201/255	15	28	250
S	775/925	555	223/277	13	22	250
S	775/925	585	223/277	15	50	150
T	850/1000	680	248/302	13	50	100

**Size Range:** Rounds 40mm to 260mm

## 27. 817M40 (EN24)

### 1.5% Nickel-Chromium-Molybdenum Through-Hardening Steel

#### Material description:

Material can be supplied untreated, annealed or Q & T. This material is capable of being heat treated to produce a wide range of strengths and has a good hardenability enabling uses in medium tensile strengths in medium to large sections. The steel possesses good wear resistance. Good impact values can be obtained at low temperatures. Bars/billets can be supplied in the annealed state which require hardening and tempering but gives better machinability. Applications include shafts, studs, connecting rods, spindle gears, power transmission gears and cam.

#### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.36	0.10	0.45			0.20	1.00	1.30
Max %	0.44	0.40	0.70	0.035	0.040	0.35	1.40	1.70

#### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)
T > 150 ≤ 250	850/100	650	248/302	13	35
T > 63 ≤ 150	850/100	680	248/302	13	50
U > 29 ≤ 100	925/1075	755	269/331	12	42
V > 13 ≤ 63	1000/1150	850	293/352	12	42

**Size Range:** Rounds 30mm to 400mm

**Alternative Specifications:** SAE4340, Werkstoff 1.6565, 34CrNiMo6, 40CrNiMo6

# 28. 826M40 (EN26)

## 2.5% Nickel-Chrome-Molybdenum Through-Hardening Steel

### Material description:

A through-hardening steel capable of surface hardening by nitriding. Excellent resistance to wear and shock. Suitable for shafts, axles and machined parts requiring high strength.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.36	0.10	0.45			0.45	0.5	2.30
Max %	0.44	0.40	0.70	0.035	0.040	0.65	0.8	2.80

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)
U > 150 ≤ 250	925/1075	740	269/331	12	28
U > 100 ≤ 150	925/1075	755	269/331	12	42
V > 63 ≤ 250	1000/1150	835	293/352	12	28
V > 63 ≤ 150	1000/1150	850	293/352	12	42
W > 29 ≤ 250	1075/1225	925	311/375	11	22
W > 29 ≤ 150	1075/1225	940	311/375	11	35

**Size Range:** Rounds 50mm to 300mm

**Alternative Specifications:** 40NiMoCr10-5, DIN 1.6745

# 29. 835M30 (EN30B)

## 4.5% Nickel Chromium-Molybdenum Through-Hardening Steel

### Material description:

EN30B is a nickel chromium molybdenum (NiCrMo) through-hardening steel. It is capable of hardening through relatively large section sizes from air cooling. It is commonly chosen for components requiring high tensile strengths in more complex machined parts. Supplied Annealed. 277Max BHN.

### Chemical Composition

	C	Si	Mn	P	S	Mo	Cr	Ni
Min %	0.26	0.10	0.45			0.20	1.10	3.9
Max %	0.34	0.35	0.70	0.025	0.025	0.35	1.40	4.3

### Mechanical Properties Typical (heat treated, minimums unless stated)

Condition	UTS (N/mm <sup>2</sup> )	Yield (N/mm <sup>2</sup> )	Hardness HB	Elongation (%)	Impact KVC (J)	LRS (mm)
Z*	1550	1235	444	7	16	150

**Size Range:** Rounds 80mm to 200mm Supplied Annealed. 277Max BHN

**Alternative Specifications:** DIN 1.6773, 30NiCrMo16-6

\* Properties cannot always be obtained by bulk heat treatment of bar but can be achieved by the heat treatment of components.

# Weight Factors for Steel

## Rounds

Size (mm<sup>2</sup>) x 0.00616 = kg per metre

Size (inches<sup>2</sup>) x 1.211 = kg per foot

## Squares

Size (mm<sup>2</sup>) x 0.00784 = kg per metre

Size (inches<sup>2</sup>) x 1.542 = kg per foot

## Hexagons

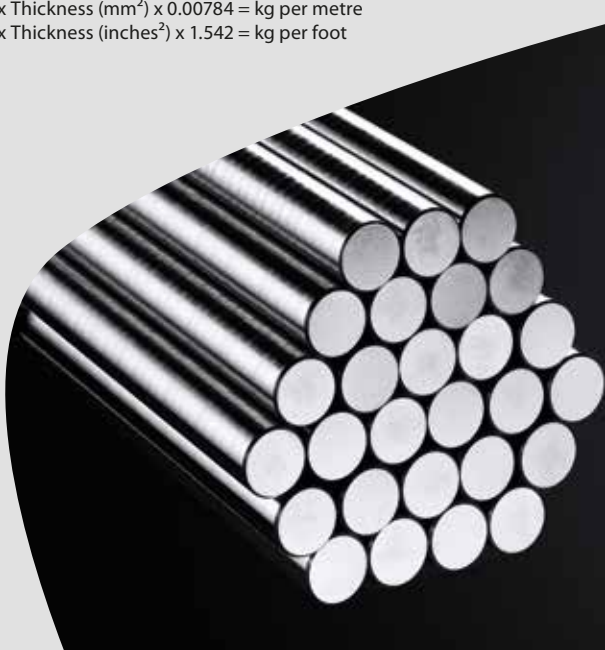
Size (a/f mm<sup>2</sup>) x 0.0068 = kg per metre

Size (inches<sup>2</sup>) x 1.335 = kg per foot

## Flats

Width x Thickness (mm<sup>2</sup>) x 0.00784 = kg per metre

Width x Thickness (inches<sup>2</sup>) x 1.542 = kg per foot



## Round bars

### Imperial weight reference table

Size (" Dia.)	Kg Per Foot	Kg Per Metre
1/32	0.001	0.004
3/64	0.003	0.009
1/16	0.005	0.016
5/64	0.007	0.024
3/32	0.011	0.035
7/64	0.014	0.048
1/8	0.019	0.062
9/64	0.024	0.079
5/32	0.03	0.097
11/64	0.036	0.114
3/16	0.043	0.14
13/64	0.05	0.164
7/32	0.058	0.19
15/64	0.067	0.218
1/4	0.076	0.248
9/32	0.096	0.314
5/16	0.118	0.388
11/32	0.145	0.469
3/8	0.171	0.559
13/32	0.201	0.656
7/16	0.232	0.76
15/32	0.268	0.873
1/2	0.303	0.993
17/32	0.342	1.121
9/16	0.383	1.257

Size (" Dia.)	Kg Per Foot	Kg Per Metre
19/32	0.427	1.401
5/8	0.473	1.552
21/32	0.521	1.711
11/16	0.572	1.878
23/32	0.626	2.052
3/4	0.68	2.235
25/32	0.739	2.425
13/16	0.798	2.623
27/32	0.862	2.828
7/8	0.925	3.042
29/32	0.995	3.263
15/16	1.066	3.492
31/32	1.136	3.729
1	1.211	3.973
1 1/16	1.365	4.485
1 1/8	1.533	5.028
1 13/16	1.71	5.603
1 1/4	1.892	6.208
1 5/16	2.087	6.844
1 3/8	2.291	7.511
1 7/16	2.504	8.21
1 1/2	2.726	8.939
1 9/16	2.957	9.7
1 5/8	3.198	10.491
1 11/16	3.447	11.314

## Round bars

### Imperial weight reference table

Size (" Dia.)	Kg Per Foot	Kg Per Metre
1 3/4	3.71	12.167
1 13/16	3.978	13.052
1 7/8	4.259	13.968
1 15/16	4.55	14.914
2	4.844	15.892
2 1/8	5.47	17.941
2 1/4	6.133	20.113
2 3/8	6.836	22.41
2 1/2	7.571	24.831
2 5/8	8.346	27.376
2 3/4	9.158	30.046
2 7/8	10.011	32.839
3	10.9	35.757
3 1/8	11.83	38.799
3 1/4	12.8	41.965
3 3/8	13.798	45.255
3 1/2	14.837	48.669
3 5/8	15.913	52.208
3 3/4	17.029	55.87
3 7/8	18.183	59.657
4	19.376	63.568
4 1/4	21.875	71.762
4 1/2	24.522	80.453
4 3/4	27.323	89.641
5	30.275	99.325

Size (" Dia.)	Kg Per Foot	Kg Per Metre
5 1/4	33.378	109.506
5 1/2	36.632	120.183
5 3/4	40.038	131.357
6	43.596	143.028
6 1/4	47.304	155.195
6 1/2	51.164	167.859
6 3/4	55.176	181.02
7	59.339	194.677
7 1/4	63.653	208.831
7 1/2	68.118	223.481
7 3/4	72.735	238.628
8	77.054	254.272
8 1/2	87.494	287.049
9	98.091	321.813
9 1/2	109.296	358.563
10	121.091	397.3
10 1/2	133.512	438.733
11	146.531	480.733
11 1/2	169.154	525.429
12	174.384	572.112
13	204.644	671.437
14	237.339	778.708
15	272.455	893.925
16	309.993	1017.088

## Rounds bars

### Metric weight reference table

Size (mm Dia.)	Kg Per Foot	Kg Per Metre
2	0.008	0.026
2.4	0.011	0.036
2.5	0.012	0.039
2.8	0.015	0.049
3	0.017	0.056
3.2	0.019	0.062
3.5	0.023	0.075
4	0.03	0.098
4.2	0.033	0.108
4.4	0.036	0.118
4.5	0.038	0.125
4.8	0.043	0.141
5	0.047	0.154
5.2	0.051	0.167
5.5	0.057	0.187
5.8	0.063	0.207
6	0.068	0.223
6.2	0.072	0.236
6.5	0.079	0.259
6.8	0.087	0.285
7	0.092	0.302
7.5	0.106	0.348
8	0.12	0.394
8.5	0.136	0.446
9	0.152	0.499

Size (mm Dia.)	Kg Per Foot	Kg Per Metre
9.5	0.169	0.554
10	0.188	0.617
10.5	0.207	0.679
11	0.227	0.745
11.5	0.248	0.814
12	0.27	0.886
12.5	0.293	0.961
13	0.317	1.04
13.5	0.342	1.122
14	0.368	1.207
14.5	0.395	1.296
15	0.422	1.385
15.5	0.451	1.48
16	0.481	1.578
16.5	0.511	1.677
17	0.543	1.782
17.5	0.575	1.887
18	0.608	1.995
18.5	0.643	2.11
19	0.678	2.225
19.5	0.714	2.343
20	0.751	2.464
20.5	0.789	2.589
21	0.828	2.717
21.5	0.868	2.848



## Rounds bars

### Metric weight reference table

Size (mm Dia.)	Kg Per Foot	Kg Per Metre
22	0.909	2.982
22.5	0.951	3.12
23	0.993	3.258
23.5	1.037	3.402
24	1.081	3.547
24.5	1.127	3.698
25	1.173	3.849
26	1.269	4.164
27	1.369	4.492
28	1.472	4.83
29	1.579	5.181
30	1.69	5.545
31	1.804	5.919
32	1.923	6.309
33	2.045	6.71
34	2.17	7.12
35	2.3	7.546
36	2.433	7.983
37	2.57	8.432
38	2.711	8.895
39	2.856	9.371
40	3.004	9.856
41	3.156	10.355
42	3.312	10.867
44	3.635	11.926

Size (mm Dia.)	Kg Per Foot	Kg Per Metre
45	3.802	12.474
46	3.973	13.035
48	4.326	14.194
50	4.694	15.401
52	5.077	16.658
54	5.475	17.963
55	5.68	18.636
56	5.888	19.319
58	6.316	20.723
60	6.759	22.176
62	7.217	23.679
64	7.69	25.231
65	7.993	26.028
66	8.179	26.835
68	8.682	28.486
70	9.2	30.185
72	9.733	31.934
74	10.281	33.732
75	10.561	34.651
76	10.845	35.582
78	11.423	37.479
80	12.016	39.424
82	12.625	41.42
85	13.565	44.507
88	14.54	47.706

## Rounds bars

### Metric weight reference table

Size (mm Dia.)	Kg Per Foot	Kg Per Metre
90	15.208	49.896
92	15.892	52.142
95	16.945	55.597
98	18.032	59.163
100	18.776	61.604
105	20.7	67.917
110	22.718	74.538
115	24.831	81.471
120	27.037	88.708
125	29.337	96.255
130	31.731	104.109
135	34.218	112.269
140	36.8	120.741
145	39.476	129.521
150	42.245	138.606
155	45.106	147.993
160	48.065	157.701
165	51.114	167.705
170	54.261	178.03
175	57.498	188.651
180	60.833	199.593
185	64.257	210.827
190	67.78	222.386
195	71.391	234.234
200	75.102	246.41

Size (mm Dia.)	Kg Per Foot	Kg Per Metre
210	82.797	271.657
220	90.873	298.154
230	99.319	325.866
240	108.147	354.83
250	117.342	384.999
260	126.922	416.431
270	136.868	449.064
280	147.2	482.963
290	157.896	518.057
300	168.98	554.423
310	180.425	591.974
320	192.254	630.785
330	204.457	670.823
340	217.036	712.095
350	229.991	754.6

## Hexagonal bars

### Imperial weight reference table

Size (" A/F)	Kg Per Foot	Kg Per Metre
3/16	0.05	0.162
1/4	0.084	0.267
9/32	0.106	0.346
5/16	0.131	0.424
21/64	0.141	0.455
11/32	0.152	0.499
23/64	0.178	0.582
3/8	0.187	0.613
13/32	0.227	0.744
7/16	0.254	0.832
29/64	0.268	0.867
1/2	0.336	1.095
17/32	0.368	1.204
9/16	0.422	1.38
19/32	0.483	1.577
5/8	0.522	1.708
11/16	0.631	2.063
45/64	0.672	2.208
3/4	0.753	2.462
13/16	0.882	2.887
53/64	0.899	2.944
7/8	1.021	3.351
59/64	1.128	3.706
15/16	1.17	3.842
1	1.334	4.381

Size (" A/F)	Kg Per Foot	Kg Per Metre
1 1/64	1.365	4.468
1 1/16	1.506	4.937
1 7/64	1.618	5.301
1 1/8	1.692	5.541
1 13/64	1.927	6.308
1 1/4	2.087	6.843
1 19/64	2.261	7.403
1 5/16	2.301	7.539
1 3/8	2.525	8.28
1 25/64	2.58	8.464
1 7/16	2.753	9.042
1 15/32	2.92	9.594
1 1/2	3.005	9.857
1 5/8	3.527	11.565
1 2/3	3.725	12.214
1 11/16	3.803	12.463
1 3/4	4.091	13.414
1 13/16	4.388	14.382
1 55/64	4.623	15.153
1 7/8	4.699	15.399
2	5.343	17.524
2 3/64	5.602	18.408
2 1/16	5.674	18.623
2 1/8	6.033	19.78
2 7/32	6.736	21.589

## Hexagonal bars

### Imperial weight reference table

Size (" A/F)	Kg Per Foot	Kg Per Metre
2 1/4	6.763	22.176
2 3/8	7.539	24.708
2 13/32	7.752	25.444
2 7/16	7.938	26.014
2 1/2	8.351	27.381
2 37/64	8.845	29.159
2 5/8	9.208	30.185
2 49/64	10.129	33.37
3 5/32	13.249	43.468
3 1/2	16.828	55.209

## Hexagonal bars

### Metric weight reference table

Size (mm A/F)	Kg Per Foot	Kg Per Metre
3.2	0.021	0.069
3.5	0.025	0.083
4	0.033	0.108
4.5	0.042	0.137
5	0.052	0.17
5.5	0.063	0.205
6	0.075	0.244
6.5	0.088	0.287
7	0.102	0.333
7.5	0.117	0.382
8	0.133	0.435
8.5	0.15	0.491
9	0.168	0.55
9.5	0.187	0.613
10	0.207	0.68
10.5	0.228	0.749
11	0.251	0.822
11.5	0.274	0.899
12	0.298	0.979
13	0.35	1.149
14	0.406	1.332
15	0.466	1.53
16	0.531	1.74
17	0.599	1.965
18	0.672	2.203

## Hexagonal bars

### Metric weight reference table

Size (mm A/F)	Kg Per Foot	Kg Per Metre
19	0.748	2.454
20	0.829	2.72
21	0.914	2.998
22	1.003	3.291
23	1.096	3.597
24	1.194	3.916
25	1.295	4.25
26	1.401	4.596
27	1.511	4.957
28	1.625	5.331
29	1.743	5.718
30	1.865	6.12
31	1.992	6.534
32	2.122	6.963
33	2.257	7.405
35	2.539	8.33
36	2.686	8.812
37	2.837	9.309
38	2.993	9.819
40	3.316	10.88
41	3.484	11.43
42	3.656	11.995
45	4.197	13.77
46	4.386	14.388
48	4.775	15.667

Size (mm A/F)	Kg Per Foot	Kg Per Metre
50	5.181	17
52	5.604	18.387
55	6.27	20.57
58	6.972	22.875
60	7.461	24.48
62	7.967	26.139
65	8.757	28.73
68	9.584	31.443
70	10.156	33.32
72	10.744	35.251
75	11.658	38.25
78	12.609	41.371
80	13.264	43.52
85	14.974	49.13
90	16.788	55.08

## Square bars

### Imperial weight reference table

Size (" sq.)	Kg Per Foot	Kg Per Metre
1/16	0.0006	0.015
3/32	0.014	0.04
1/8	0.024	0.075
5/32	0.038	0.121
3/16	0.054	0.172
7/32	0.074	0.237
1/4	0.096	0.313
5/16	0.151	0.49
3/8	0.217	0.708
7/16	0.295	0.961
1/2	0.386	1.264
9/16	0.49	1.593
5/8	0.603	1.973
11/16	0.729	2.382
3/4	0.866	2.843
13/16	1.018	3.333
7/8	1.179	3.87
15/16	1.355	4.436
1	1.542	5.059
1 1/8	1.95	6.399
1 1/4	2.409	7.902
1 3/8	2.917	9.561
1 1/2	3.47	11.382
1 5/8	4.073	13.555
1 3/4	4.722	15.49

Size (" sq.)	Kg Per Foot	Kg Per Metre
1 7/8	5.421	17.782
2	6.169	20.236
2 1/4	7.811	25.608
2 1/2	9.639	31.618
2 3/4	11.661	38.256
3	13.877	45.531
3 1/4	16.286	53.433
3 1/2	18.888	61.972
3 3/4	21.683	71.139
4	24.671	80.944
4 1/4	27.851	91.357
4 1/2	31.224	102.444
4 3/4	34.789	114.141
5	38.548	126.475
5 1/4	42.499	139.436
5 1/2	46.643	153.034
5 3/4	50.979	167.26
6	55.509	182.12

## Square bars

### Metric weight reference table

Size (mm sq.)	Kg Per Foot	Kg Per Metre
4	0.038	0.125
4.5	0.048	0.158
5	0.06	0.196
5.5	0.072	0.237
6	0.086	0.282
6.5	0.101	0.331
7	0.117	0.384
7.5	0.134	0.441
8	0.153	0.501
8.5	0.173	0.566
9	0.194	0.635
9.5	0.216	0.707
10	0.239	0.784
10.5	0.263	0.864
11	0.289	0.984
12	0.344	1.128
13	0.404	1.324
14	0.468	1.536
15	0.538	1.764
16	0.612	2.007
17	0.691	2.265
18	0.774	2.54
19	0.863	2.83
20	0.956	3.136
22	1.157	3.794

Size (mm sq.)	Kg Per Foot	Kg Per Metre
24	1.377	4.515
25	1.494	4.9
27	1.742	5.715
28	1.874	6.146
30	2.151	7.056
32	2.447	8.028
35	2.928	9.604
36	3.097	10.16
38	3.451	11.32
40	3.824	12.544
41	4.018	13.179
42	4.216	13.829
45	4.84	15.876
46	5.057	16.589
48	5.507	18.063
50	5.975	19.6
55	7.23	23.716
60	8.604	28.224
65	10.098	33.124
70	11.711	38.416
75	13.444	44.1
80	15.296	50.176
85	17.268	56.644
90	19.359	63.504
100	23.9	78.4

# TOGETHER WE MAKE THE DIFFERENCE

By understanding your business and goals, we can make a real difference to your performance.

Working in partnership with you, our dedicated account teams can deliver steel products and services that give you the advantage. Whether that's enhancing your product performance, improving your efficiency, helping you to access new markets or creating more sustainable solutions.

Let's work together so our products and services really do make the difference.

We are committed to the future. We will play our part in protecting and enhancing Tata Steel's reputation for sustainable business success combined with corporate citizenship. We are proud to be part of Tata Steel and are dedicated to understanding your business. We will support you to perform in your market and grow together for the future, by putting you first in everything we do.









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