

# Carbon Steels - Data Sheet

**Grade: U1004**

AS 1443 / U1004	Approx. Equivalents: AISI / SAE 1005; UNS G10050; BS970 040A04; En2A	Steel Type: Plain Low Carbon
-----------------	--	---------------------------------

## Chemical Composition (% by weight)

C	Si	Mn	P	S
0.06 max	0.35 max	0.25 0.50	0.04 max	0.04 max

## Mechanical Properties

Cold Drawn	Not covered by mechanical properties tables in AS1443
Turned & Polished	

## Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.87	12.6 x 10 <sup>-6</sup>	200,000	Ferromagnetic

## Heat Treatment

Forging	Normalise	Full Anneal	Sub Critical Anneal
1300°C	910 - 950°C	900 - 930°C	500 - 700°C

## Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
45	Not hardenable	Not hardenable	Yes

  

Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	Readily weldable with Low carbon Consumables	Yes	Yes

## Summary

Soft malleable grade, suitable for all general purpose low strength applications: eg. shop fittings, storage racks. Can be "sticky" in machining.

## Grade: U1010 (formerly S1010)

AS 1443 / U1010	Approx. Equivalents: AISI / SAE 1010; UNS G10100; BS970 045M10; En32A; Werkstoff No. 1.0301, 1.1121; DIN C10, Ck10; JIS S10C	Steel Type: Plain Low Carbon
-----------------	--	---------------------------------

### Chemical Composition (% by weight)

C	Si	Mn	P	S
0.08 0.13	0.35 max	0.30 0.60	0.04 max	0.04 max

### Mechanical Properties

Cold Drawn	Not covered by mechanical properties tables in AS1443
Turned & Polished	

### Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.87	$12.2 \times 10^{-6}$	200,000	Ferromagnetic

### Heat Treatment

Forging	Normalise	Full Anneal	Sub Critical Anneal
1300°C	910 - 950°C	900 - 930°C	500 - 700°C

### Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
55	Not hardenable	Not hardenable	Yes

  

Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	Readily weldable with Low carbon Consumables	Yes	Yes

### Summary

Soft ductile material suitable for general purpose "mild steel" applications. Can be "sticky" in machining.

# Grade: M1020 (formerly CS1020)

AS 1443 / U1020 AS 1443 / D3* AS 1443 / T3* *Mechanical Test	Approx. Equivalents: AISI / SAE 1020; UNS G10200; BS970 070M20; En38; Werkstoff No. 1.0402; DIN C22; JIS 20C	Steel Type: Plain Carbon Mild Steel
---	--	--

## Chemical Composition (% by weight)

C	Si	Mn	P	S
0.15 0.25	0.35 max	0.30 0.90	0.05 max	0.05 max

## Mechanical Properties

Cold Drawn Size mm	Yield Strength (MPa) min	Tensile Strength (MPa) min	Elong (5d) % min	Hardness HB Min
< 16	380	480	12	142
> 16 < 38	370	460	12	135
> 38 < 63	340	430	13	126
Turned & Polished Size mm				
< 50	250	410	22	119
> 50 < 250	230	410	22	119

## Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.86	11.7 x 10 <sup>-6</sup>	207,000	Ferromagnetic

## Heat Treatment

Forging	Normalise	Full Anneal	Sub Critical Anneal
1280°C	890 - 940°C	870 - 910°C	500 - 700°C

## Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
65	Not hardenable	Not hardenable	Yes

Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	Readily weldable with low carbon consumables Preheat heavy sections	Yes	Yes, provided %Si is below 0.05%

## Summary

Most common mild steel for non-critical & general applications. Good balance of strength, ductility, toughness & weldability. Tends to be "stocky" in machining.

# Grade: 1045 (formerly K1045)

AS 1443 / 1045 AS 1443 / D6* AS 1443 / T6* *Mechanical Test	Approx. Equivalents: AISI / SAE 1045; UNS G10450; BS70 080A47; En43B; Werkstoff No. 1.0503, 1:1191; DIN C45, Ck45; JIS S45C	Steel Type: Plain Medium Carbon Steel
--	---	--

## Chemical Composition (% by weight)

C	Si	Mn	P	S
0.43	0.10	0.60	0.04 max	0.04 max
0.50	0.35	0.90		

## Mechanical Properties

Cold Drawn Size mm	Yield Strength (MPa) min	Tensile Strength (MPa) min	Elong (5d) % min	Hardness HB Min
< 16	540	690	8	207
> 16 < 38	510	650	8	195
> 38 < 63	500	640	9	190
Turned & Polished Size mm				
All sizes to 260mm	300	600	14	179

## Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.84	11.5 x 10 <sup>-6</sup>	207,000	Ferromagnetic

## Heat Treatment

Forging	Quench	Normalise	Full Anneal	Sub Critical Anneal
1250°C	810 - 850°C Water or Brine	870 - 920°C	800 - 850°C	500 - 700°C

## Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
55	Yes	Yes	No

  

Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	Yes, with appropriate procedures	No	No

## Summary

This grade has high strength with reasonable ductility & weldability. Greatest usage is in hard chrome plated bar for hydraulic & pneumatic rams: eg, Hard chromed bar.

## Grade: 1137 (formerly K1137)

AS 1443 / 1137 AS 1443 / D14* AS 1443 / T14* *Mechanical Test	Approx. Equivalents: AISI / SAE 1137; UNS G11370; BS970 216M36; Werkstoff No. 1.0726; DIN 35S20; JIS SUM41	Steel Type: Medium Carbon Re-Sulphurised Steel
--	---	--

### Chemical Composition (% by weight)

C	Si	Mn	P	S
0.32	0.10	1.35	0.04 max	0.08
0.39	0.35	1.65		0.13

### Mechanical Properties

Cold Drawn Size mm	Yield Strength (MPa) min	Tensile Strength (MPa) min	Elong (5d) % min	Hardness HB Min
< 16	510	660	7	197
> 16 ≤ 38	480	640	7	190
> 38 ≤ 63	460	620	8	185
Turned & Polished Size mm				
All sizes to 260mm	300	600	14	179

### Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.84	11.3 x 10 <sup>-6</sup>	207,000	Ferromagnetic

### Heat Treatment

Forging	Quench	Normalise	Full Anneal	Sub Critical Anneal
1250°C	830 - 860°C Oil or Water	870 - 920°C	790 - 830°C	500 - 700°C

### Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
70	Yes	Yes	No

Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	Yes, with appropriate procedures. Precautions required because of sulphur content	No	No

### Summary

Highest strength free machining steel. Used when other free machining steels have insufficient strength. Eg, tow balls, automotive clutch boss.

# Carbon Steels - Data Sheet 1214 (formerly S1214) Grade

AS 1443 / 1214 AS 1443 / D12* AS 1443 / T12* *Mechanical Test	Approx. Equivalents: SAE J403, AISI/SAE 1213, 1215; UNS G12130; BS970 230M07 En1a; Werkstoff no. 1.0715; DIN 95Mn28; JIS SUM22	Steel Type: Re-Sulphurised and Re-Phosphorised Free Machining Steel
--	---	--

## Chemical Composition (% by weight)

C	Si	Mn	P	S
0.15 max	0.10 max	0.80 1.20	0.04 0.09	0.25 0.35

## Mechanical Properties

Cold Drawn Size mm	Yield Strength (MPa) min	Tensile Strength (MPa) min	Elong (5d) % min	Hardness HB Min
< 16	350	480	7	142
> 16 <= 38	330	430	8	126
> 38 <= 63	290	400	9	115
Turned & Polished Size mm				
All sizes to 260mm	230	370	17	105

## Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.87	12.2 x 10 <sup>-6</sup>	207,000	Ferromagnetic

## Heat Treatment

Forging	Normalise	Full Anneal	Sub Critical Anneal
1300°C	900 - 940°C	890 - 920°C	500 - 700°C

## Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
136	Not hardenable	Not hardenable	Yes
Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	Yes, precautions required because of sulphur content	Limited ductility	No

## Summary

Widely used free machining steel with reasonable ductility & weldability. Used for: eg. shafts which require considerable machining, concrete ferrules (case hardened).

# Grade: 12L14 (formerly S12L14)

AS 1443 / 12L14 AS 1443 / D13* AS 1443 / T13* *Mechanical Test	Approx. Equivalents: AISI / SAE 12L14; UNS G12144; SAE J403; BS970 230M07 leadened En1A leadened; Werkstoff No. 1.07185; DIN 95MnPb28; JIS SUM22L	Steel Type: Leadened, Re-Sulphurised and Re-Phosphorised Free Machining Steel
---	---	---

## Chemical Composition (% by weight)

C	Si	Mn	P	S	Pb
0.15 max	0.10 max	0.80 1.20	0.04 0.09	0.25 0.35	0.15 0.35

## Mechanical Properties

Cold Drawn Size mm	Yield Strength (MPa) min	Tensile Strength (MPa) min	Elong (5d) % min	Hardness HB Min
≤ 16	350	480	7	142
> 16 ≤ 38	330	430	8	126
> 38 ≤ 63	290	400	9	115
Turned & Polished Size mm				
All sizes to 260mm	230	370	17	105

## Physical Properties

Specific Gravity (SG)	Thermal Expansion cm / cm / °C 100°C	Modulus of Elasticity In Tension (MPa 20°C)	Magnetic Permeability
7.87	12.2 x 10 <sup>-6</sup>	207,000	Ferromagnetic

## Heat Treatment

Forging	Normalise	Full Anneal	Sub Critical Anneal
1300°C	900 - 940°C	890 - 920°C	500 - 700°C

## Applications

Machinability Rating %	Through Hardening	Induction / Flame Hardening	Case Hardening (Carburise)
158	Not hardenable	Not hardenable	Yes

Electroplate	Welding	Cold Forming	Hot Dip Galvanising
Yes	No. Lead fumes are a health hazard	Limited ductility	No

## Summary

Premium grade free cutting steel used by repetition engineers for a wide variety of applications. Excellent machinability and suitable for case hardening and electroplating.