

USACUT 45

Super Freecutting Medium Carbon Steel

Colour Code
Black/Yellow

BS 970 : 1991 : 226M44

Chemical Analysis

	Carbon	Manganese	Silicon	Sulphur	Phosphorus
% Min	0.40	1.30	-	0.22	-
% Max	0.48	1.70	0.25	0.30	0.060

Related Specifications

American : SAE/AISI 1144

German : Kurzname 45S20

French : AFNOR 45MF 6.1

Characteristics

The optimum machining steel of the medium carbon grades. Usacut 45 is a resulphurised carbon steel produced to a closely controlled analysis to ensure batch to batch consistency. It is stocked in the bright as drawn condition where it exhibits good tensile and yield strength properties. Components made from Usacut 45 can be flame or induction hardened to a hardness range 37 to 53 R_c.

Typical Applications

Suitable for a wide range of components in the automotive and general engineering industry including gears, shafts, spindles, bolts, nuts, studs, machine parts, etc...

Form of Supply

Bright Bars : As drawn / as turned.

Bars hardened and tempered can be supplied to special order. The range R to T may be specified according to ruling section.

Machinability

The addition of sulphur to a carbon steel leads to the formation of manganese sulphide particles. The particles are insoluble in both liquid and solid steel and therefore become non-metallic inclusions dispersed throughout the steel microstructure. The inclusions act in three ways : reducing the forces in the shear zone ahead of the tool tip, modifying the chip formation to produce broken rather than stringy swarf and providing a built-in lubricant that prevents the chip from sticking to the tool and undermining the cutting edge. Phosphorus is an embrittling element that assists the swarf to breakdown into chips, its content however is limited as too much would be deleterious to machining properties.

Mechanical Properties

Condition	Size range or LRS mm	Tensile Strength MPa	Yield Strength MPa min	0.2% Proof Stress MPa min	Elongation % min	Izod Impact Ft.lb. min.	KVC J min	Hardness HB
Hot rolled + cold drawn or hot rolled + cold drawn + ground	$> 6 \leq 13$	800	650	-	-	-	-	-
	$>13 \leq 29$	760	570	-	-	-	-	-
	$>29 \leq 75$	680	500	-	-	-	-	-
Hardened & tempered + turned or ground	$R \geq 6 \leq 100$	700-850	450	415	16	20	22	201-255
	$S \geq 6 \leq 29$	775-925	525	495	14	15	16	223-277
	$T \geq 6 \leq 13$	850-1000	600	585	12	15	16	248-302
Hardened & tempered + cold drawn or h&t + cold drawn + ground	$R \geq 6 \leq 100$	700-850	525	435	12	20	-	201-255*
	$S \geq 6 \leq 29$	775-925	575	520	10	15	-	223-277*
	$T \geq 6 \leq 13$	850-1000	630	600	9	15	-	248-302*

* For guidance only

Heat Treatment

Bright Bars are supplied in the as drawn condition, if subsequently heat treatment of components is required the following temperatures should be used.

Normalising : 830 – 860 °C Cool in air.

Hardening : 830 – 860 °C Quench in oil.

Tempering : 550 – 660 °C According to the mechanical properties required.

Stock Sizes

The sizes listed below are normally available from stock, other sizes can be supplied to customer requirements.

BRIGHT ROUNDS										inches diameter									
3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/8	1 1/4
1 5/16	1 13/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	1 5/16	1 13/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8
2 1/2	2 5/8	2 3/4	2 7/8	3	3 1/8					2 1/2	2 5/8	2 3/4	2 7/8	3	3 1/8				

BRIGHT ROUNDS										millimetres diameter									
10	12	16	20	25	28	30	32	35	40	10	12	16	20	25	28	30	32	35	40
45	50	55	60	70	75					45	50	55	60	70	75				