High-carbon steel: Martensitic hardened (+QT)

Chemical Composition

Classification of symbols	Numerical classification	European Standard (EN)	Chemical Composition							
			C	Si	Mn	Max. P	Max. S	Cr	V	Ni
C60S	1.1211	EN 10132-4	0.57 - 0.65	0.15 - 0.35	0.60 - 0.90	0.025	0.025	max. 0.40	-	max. 0.40
C67S	1.1231	EN 10132-4	0.65-0.73	0.15 - 0.35	0.60 - 0.90	0.025	0.025	max. 0.40	-	max. 0.40
C75S	1.1248	EN 10132-4	0.70-0.80	0.15 - 0.35	0.60 - 0.90	0.025	0.025	max. 0.40	-	max. 0.40
51CrV4	1.8159	EN 10132-4	0.47 - 0.55	max. 0.40	0.70 - 1.10	0.025	0.025	0.90 - 1.20	0.10 - 0.25	max. 0.40

Equivalents

Classification of symbols	Numerical classification	European Standard (EN)	Approximate international equivalents					
			US (AISI)		Japan (JIS)		China (GB)	
C60S	1.1211	EN 10132-4:2000						
C67S	1.1231	EN 10132-4:2000	1065	A682/684	S65C-CSP	G4802	70	GB/T 1222
C75S	1.1248	EN 10132-4:2000	1074	A682/684	-	-	-	-
51CrV4	1.8159	EN 10132-4:2000	6150	A505/506	SUP 10	G4802	50CrVA	GB/T 1222

Mechanical properties

Classification of symbols	Numerical classification	European Standard (EN)	Mechanical properties and hardness requirements		Rockwell hardness values of steel for springs
			Tempered and quenched (+QT) d		Tempered and quenched (+QT)
			Rm N/mm²	HV	HRC
C60S	1.1211	EN 10132:2021	1150 - 1750	345 - 530	35 - 51.5
C67S	1.1231	EN 10132:2021	1200 - 1900	370 - 580	38.5 - 54
C75S	1.1248	EN 10132:2021	1200 - 1900	370 - 580	38.5 - 54
51CrV4	1.8159	EN 10132:2021	1200 - 1800	370 - 550	38.5 - 52.5

Note: it is possible to specify the hardness values or the tensile strength values, but not both. If neither of the two values is specified, the tensile strength value is calculated. The specification for tensile strength/hardness must fall within a range of 150 N/mm² or 50 HV, unless expressly stated otherwise in the commercial agreement.

Finishes

EN 10132-4:2000

Finish	Description
Rust grey/blue	Unpolished
Bright tempered	Unpolished
Polished	Obtained through fine grinding, abrasive brushing or other procedures.
Polished and coloured	Blue or yellow in colour due to oxidation caused by heat treatment.

Tolerances

THICKNESS TOLERANCES

A) Specified thickness tolerances for cold rolled strip and strip obtained strapping wide precision rolling *w*.

According to the EN 10140:2006 Standard.

Nominal Thickness *t*		Thickness tolerances according to EN 10140 for nominal widths *w* of					
		<125			≥ 125 and <600		
>	≤	A normal	B fine	C precision	A normal	B fine	C precision
-	0.10	± 0.008	± 0.006	± 0.004	± 0.010	± 0.008	± 0.005
0.10	0.15	±0.010	± 0.008	± 0.005	± 0.015	± 0.012	± 0.010
0.15	0.25	±0.015	± 0.012	± 0.008	± 0.020	± 0.015	± 0.010
0.25	0.40	± 0.020	± 0.015	± 0.010	± 0.025	± 0.020	± 0.012
0.40	0.60	± 0.025	± 0.020	± 0.012	± 0.030	± 0.025	± 0.015
0.60	1.00	± 0.030	± 0.025	± 0.015	± 0.035	± 0.030	± 0.020
1.00	1.50	± 0.035	± 0.030	± 0.020	± 0.040	± 0.035	± 0.025
1.50	2.50	± 0.045	± 0.035	± 0.025	± 0.050	± 0.040	± 0.030
2.50	4.00	± 0.050	± 0.040	± 0.030	± 0.060	± 0.050	± 0.035
4.00	6.00	± 0.060	± 0.050	± 0.035	± 0.070	± 0.055	± 0.040

Sizes in mm.

WIDTH TOLERANCES

Width tolerances for strips with sheared edges		Standard slitting tolerances for Metalle Schmidt GmbH [1)]				Width tolerances according to the EN 10140 Standard for nominal widths of:					
Nominal Thickness *t*		3-15	15-50	50-150	>150	<125		≥ 125 and <250		≥250 and <600	
>=	<					A	B	A	B	A	B
0.1	0.4	± 0.075 [2)]	± 0.075 [2)]	± 0.075 [2)]	± 0,10 [2)]	± 0.15	± 0.10	± 0.20	± 0.13	± 0.25	± 0.18

Width tolerances for strips with sheared edges		Standard slitting tolerances for Metalle Schmidt GmbH [1]				Width tolerances according to the EN 10140 Standard for nominal widths of:					
Nominal Thickness t		3-15	15-50	50-150	>150	<125		≥ 125 and <250		≥250 and <600	
>=	<					A	B	A	B	A	B
0.4	0.7	± 0,085	± 0,09	± 0,10	± 0,12	± 0.15	± 0.10	± 0.20	± 0.13	± 0.25	± 0.18
0.7	1.0	± 0.085 [3]	± 0.09 [3]	± 0.10 [3]	± 0.12 [3]	± 0.20	± 0.13	± 0.25	± 0.18	± 0.30	± 0.20
1.0	1.5	± 0.10 [4]	± 0.10 [4]	± 0.10 [4]	± 0.15 [4]	± 0.20	± 0.13	± 0.25	± 0.18	± 0.30	± 0.20
1.5	2.5	on request	± 0.13 [5]	± 0.15 [5]	± 0.16 [5]	± 0.25	± 0.18	± 0.30	± 0.20	± 0.35	± 0.20
2.5	2.6	on request	on request	± 0.16	± 0.175	± 0.25	± 0.18	± 0.30	± 0.20	± 0.35	± 0.25
2.6	4.1	on request	on request	± 0.16	± 0.175	± 0.30	± 0.20	± 0.35	± 0.25	± 0.40	± 0.30
4.1	6.1	on request	on request	± 0.16	± 0.175	± 0.35	± 0.25	± 0.40	± 0.30	± 0.45	± 0.35

1) Other, closer dimensional tolerances are possible under a commercial agreement

2) Including the value t= 0.4

3) Including the value t= 1

4) Including the value t= 1.5

5) Including the value t= 2.5

LENGTH TOLERANCES

Length tolerances	Closer tolerances are possible under a commercial agreement	Positive tolerance in relation to the nominal length, according to the EN 10140 Standard for the	
L ≤ 1000	+ 2	+ 10	+ 6
1000 < L ≤ 2500	+0,002L	+ 0.01 L	+ 6
L > 2500	+0,002L	+ 0.01 L	+ 0.003 L

Sizes in mm.

EDGE CAMBER TOLERANCES

Nominal width (w)	Closer edge curve tolerances possible under a commercial agreement		Edge curve tolerances according to the EN 10140 Standard	
	Maximum deviation 1000 mm			
	Thickness t		Class A (Normal) (maximum deviation)	Class B (FS) (Reduced) (maximum deviation)
	$t \leq 1.20$ mm	$t > 1.20$ mm		
3 ≤ W < 6	2.50	4.00	-	-
6 < W ≤ 10	2.00	3.00	-	-
10 < W ≤ 20	1.00	1.50	5.00	2.00
20 < W < 25	1.00	1.50	5.00	2.00
25 ≤ W < 40	1.00	1.50	3.50	1.50
40 ≤ W < 125	1.00	1.50	2.50	1.25
125 ≤ W ≤ 350	1.00	1.50	2.00	1.00
350 < W < 600	-	-	2.00	1.00

Sizes in mm.

The absolute value of the tolerance can be divided within that range.

RIPPLE - LONGITUDINAL FLATNESS

The flatness tolerance of the strips in cut lengths in the direction of rolling must be a maximum of 10 mm over 1000 mm. Any other flatness requirement must be agreed when placing the order.