ArcelorMittal Ostrava

ArcelorMittal

Grade for Leaf Spring
51CrV4 (50CrV4)

Steel type: low-alloy high quality chromium-vanadium steel for heat treatment

TDC: According to EN 10089: 2002

Characteristics: Spring steels materials are, because of their properties in the quenched and tempered condition, particularly suitable for the manufacture of spring like components of all kinds. The resilience of the steels depends on their elastic defomability, which enables them to sustain loading within a given range without exhibiting any permanent deformation when the load is removed. The properties required of the steels for springs are obtained by higher carbon contents and alloying constituents such as silicon, manganese, chromium, molybdenum and vanadium, and also by heat-treatment, i.e. hardening with subsequent tempering.

Chemical composition, heat analysis (w%)

	Material N°	C	Si	Mn	P	S	Cr	V	Cu+10Sn
51CrV4	1.8159	0.47-0.55	max. 0.40	0.70-1.10	max. 0.025	max. 0.025	0.90-1.20	0.10-0.25	max. 0.60

Mechanical properties after quenching and tempering (informative)

	Material N°	Quenching temperature [°C]	Quenching agent	Tempering temperature [°C]	Rp0.2 [MPa] min.	Rm [MPa] min.	A [%] min.	Z [%] min.	Impact strength KU 20 °C [J] min.
51CrV4	1.8159	850 ± 10°C	Oil	450 ± 10°C	1200	1350 to 1650	6	30	8

Hardenability

			Limit of range	1,5	3	5	7	9	11	13	15	20	25	30	35	40	45	50
51CrV4	+H	850 ± 5°C	max.	65	65	64	64	63	6	63	63	62	62	61	60	60	59	58
			min.	57	56	55	54	53	51	50	48	44	41	37	35	34	32	32
51CrV4	+HH	850 ± 5°C	max.	65	65	64	64	63	63	63	62	62	62	61	60	60	59	58
			min.	60	59	58	57	56	55	54	53	50	48	45	43	43	42	41

Decarburisation max. (mm): 0.10 + 0.008 X t; where t=thickness of leaf spring

Austenite grain size: ≥ 6 according to EN ISO 643

Surface quality: Bars must be without any surface defects such as folds, cracks, seams, etc., which may be detrimental to its use. Removal of such surface defects by grinding is allowed after agreement.

Non-metallics inclusions: According to DIN 50602, EN 10247

Tolerances on dimensions and shape of spring steel flat bars

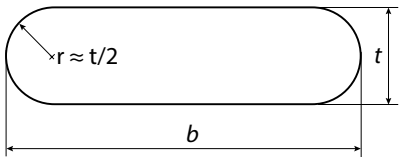
Width b	Nominal widths [b]	Limit deviation [a]
	50 < b ≤ 80	± 0.5
	80 < b ≤ 100	± 0.6
	100 < b ≤ 120	± 0.7
	120 < b ≤ 150	± 0.8
Thickness t	Nominal thickness [b]	Limit deviation [a]
	t ≤ 20	± 0.25
	20 < t ≤ 40	± 0.30
	40 < t ≤ 60	± 0.50
Straightness q		Tolerance in the plane of b
		q < 0.2 % of L

[a] If agreed during the enquiry and order, products may delivered on upper limit; [b] Possible width 50 - 120 mm, thickness 5-50 mm, special requirements may be tailor-made upon agreement

Leaf Spring sizes; Dimension standard: According to EN 10092-1:2004

Types

A (parabolic)



Profile A: Hot rolled spring steel flat bar with half-rounded edges

The cross - section

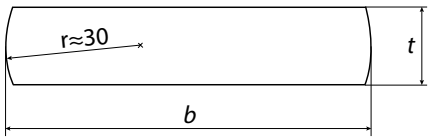
$$A = b * t\,[1 - \frac{t}{b} * (1 - \frac{\Pi}{4})]$$

Moment of inertia

$$I_A = \frac{bt^3}{12} - r^2 * [1 - \frac{t}{b} * (1 - \frac{3\Pi}{16})]$$

Width: 50 - 150 mm
Thickness: 5 - 40 mm
Weight: 1,92 - 44,40 kg/m

B (multileaf)



Profile B: Hot rolled spring steel flat bar with semi-rounded edges

The cross - section

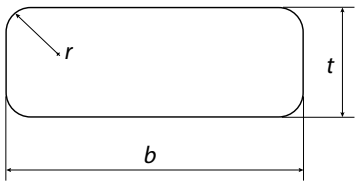
$$A = 2r\left(r * \arcsin\left(\frac{t}{2r} - t\right) + t\left(b + 0{,}5\sqrt{4r^2 - t^2}\right)\right) \sim b * t - 0{,}105796$$

Moment of inertia

$$I_B = \frac{bt^3}{12} - 0{,}2071072 * \frac{t^4}{12}$$

Width: 60 - 150 mm
Thickness: 5 - 30 mm
Weight: 2,33 - 34,58 kg/m

C (air linker)



Profile C: Hot rolled spring steel flat bar with straight ends and rounded edges

The cross - section

$$A = b * t - r^2\,(4 - \Pi)$$

Moment of inertia

$$I_C = \frac{bt^3}{12} - r^2 * \left(r^2 * \frac{16 - 5\Pi}{4} - rt * \frac{10 - 3\Pi}{3} + t^2 * \frac{4 - \Pi}{4}\right)$$

Width: 60 - 150 mm
Thickness: 20 - 60 mm
Weight: 8,99 - 69,68 kg/m

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