

Material properties and fields of application for several valve steels

Short name	X 45 Cr Si 9 3	X 85 Cr Mo V 18 2	X 53 Cr Mn Ni N 21 9	X 50 Cr Mn Ni Nb N	X 60 Cr Mn Mo V Nb	Ni Cr 20 Ti Al
Brief description	Cr Si-steel	Cromo 193	21-4 N	LV 21-43	ResisTEL	Nimonic 80 A
Material No.	1.4718	1.4748	1.4871	1.4882	1.4785	2.4952
Field of application	intake valve normal stress, skirt material for bimetal-valves	intake valve higher stress, good scaling and wear resistance	intake and exhaust valve with high thermal and corrosion resistance, standard exhaust valve with stellite reinforcement for passenger cars	intake and exhaust valve with high heat resistance and dynamic strength, corrosion r., standard exhaust valve for trucks with and without reinf.	intake and exhaust valve with high wear resistance, high heat resistance and dynamic strength, exhaust valve, for trucks without reinforcement	exhaust valve with highest stress level, valve for racing engines in heavy-oil operation
Physical properties:						
Density / g/cm ³	7.6	7.8	7.8	7.9	7.8	8.17
Thermal conductivity / W/cm K	0.210	0.210	0.147	0.147	0.147	0.122
Average thermal expansion coefficient in 1/K at 20 – 800 °C	13 x 10 ⁻⁶	12 x 10 ⁻⁶	18.5 x 10 ⁻⁶	19 x 10 ⁻⁶	18 x 10 ⁻⁶	15.1 x 10 ⁻⁶
Strengths:						
Tensile strength / N/mm ²	1100-1350	1000-1200	≥ 1000	≥ 950	≥ 1000	≥ 1000
Elongation at rupture / %	12	8	8	12	8	15
0,2% yield strength / N/mm ²						
cold	750	900	600	580	800	900
at 500 °C	400	500	350	340	500	800
600 °C	240	280	300	310	450	780
700 °C	80	120	250	260	400	750
800 °C			200	220	350	550
900 °C				120		360
Hardness assumption:						
at the end of the skirt HRC	≥ 56	≥ 50				
at the seat HV 30	≥ 500	480	≥ 30 *	≥ 30 *	≥ 32 *	≥ 38*
at the groove HV 30	≥ 550	≥ 490				

* after precipitation hardening