

Alloy Steels – AISI Designations

Alloy steels differ from carbon steels in that they have compositions that extend beyond the limits set for carbon steels. Usually this refers to constituents such as boron, carbon, chromium, manganese, molybdenum, silicon and vanadium. They also have chromium contents less than 4%. Steels with chromium contents of greater than 4% become classified as stainless or tool steels. As a general guide, an alloy steel will have:

Manganese content >1.65%

Silicon content >0.5%

Copper content >0.6%

The American Iron and Steel Institute (AISI) naming system is one of the most widely accepted systems.

Designations usually consist of a four digit number, but sometimes this extends to five. The first two digits indicate what the major alloying element is, while the last 2 or three indicate the carbon content in hundredths of a percent.

Example: AISI 1340 is a manganese containing alloy steel with a 0.40% average carbon content.

The below table summarizes AISI designations for alloy steels

Steel Type	AISI Grade	Ni	Cr	C	Mo	Mn	W	V	Si
CARBON STEELS	11xx	Resulfurized free machining							
	12xx	Resulfurized / Rephosphorized free machining							
	10xx					<1.00			
	15xx					1.00-1.65			
MANGANESE STEEL	13xx					1.75			
NICKEL STEELS	23xx	3.50							
	25xx	5.00							
NICKEL-CHROMIUM STEELS	31xx	1.25	0.65-0.80						
	32xx	1.75	1.07						
	33xx	3.50	1.50-1.57						
	34xx	3.00	0.77						
MOLYBDENUM STEELS	40xx				0.20-0.25				
	44xx				0.40-0.52				
CHROMIUM-MOLYBDENUM STEELS	41xx		0.50-0.95		0.12-0.30				
NICKEL-CHROMIUM-MOLYBDENUM STEELS	43xx	1.82	0.50-0.80		0.25				
	47xx	1.05	0.45		0.20-0.35				
NICKEL-MOLYBDENUM STEELS	46xx	0.85-1.82			0.20-0.25				
	48xx	3.50			0.25				
CHROMIUM STEELS	50xx		0.27-0.65						
	51xx		0.80-1.05						
	50xxx		0.50	min 1.00					
	51xxx		1.02	min 1.00					
52xxx		1.45	min 1.00						
CHROMIUM-VANADIUM STEELS	61xx		0.60-0.95					0.10-0.15	
TUNGSTEN-CHROMIUM STEELS	72xx		0.75				1.75		
NICKEL-CHROMIUM-MOLYBDENUM STEELS	81xx	0.30	0.40		0.12				
	86xx	0.55	0.50		0.20				
	87xx	0.55	0.50		0.25				
88xx	0.55	0.50		0.20-0.35					
SILICON-MANGANESE STEELS	92xx		<0.65			0.65-0.85			1.40-2.00
NICKEL-CHROMIUM-MOLYBDENUM STEELS	93xx	3.25	1.20		0.12				
	94xx	0.45	0.40		0.12				
	97xx	0.55	0.20		0.20				
	98xx	1.00	0.80		0.25				