CLAIMS

We claim:

1. An austenitic stainless steel comprising, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 2.0 Si, 16.0-23.0 Cr, 1.0-5.0 Ni, up to 3.0 Mo, up to 3.0 Cu, 0.1-0.35 N, up to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20° C.

2. The austenitic stainless steel according to claim 1, wherein:

$$0.5 \leq (Mo + W/2) \leq 5.0$$

3. The austenitic stainless steel according to claim 1, having a PRE_W value of greater than about 22.

4. The austenitic stainless steel of claim 1, having a PRE_W value greater than 22 and up to 30.

5. The austenitic stainless steel of claim 1, having a ferrite number greater than 0 and up to 10.

6. The austenitic stainless steel of claim 1, having a ferrite number of 3 up to 5.

7. The austenitic stainless steel of claim 1, having a MD_{30} value less than -10°C.

8. The austenitic stainless steel of claim 1, comprising 3.0-5.0 Ni.

9. The austenitic stainless steel of claim 1, comprising 1.0-3.0 Ni.

10. The austenitic stainless steel of claim 1, comprising up to 0.08 C.

11. The austenitic stainless steel of claim 1, comprising up to 0.50 Si.

12. The austenitic stainless steel of claim 1, comprising 2.0-8.0 Mn.

13. The austenitic stainless steel of claim 1, comprising 3.0-6.0 Mn.

14. The austenitic stainless steel of claim 1, comprising 16.0-22.0 Cr.

15. The austenitic stainless steel of claim 1, comprising 0.14-0.30 N.

16. The austenitic stainless steel of claim 1, comprising 0.40-2.0 Mo.

17. The austenitic stainless steel of claim 1, comprising 0.5-2.0 Mo.

18. The austenitic stainless steel of claim 1, comprising up to 0.008 B.

19. The austenitic stainless steel of claim 1, comprising up to 0.05-0.60 W.

20. The austenitic stainless steel of claim 1, comprising 0.40-2.0 Mo and having a MD_{30} value less than -10°C.

21. The austenitic stainless steel of claim 1, comprising 0.40-2.0 Mo and wherein $0.5 \leq (Mo + W/2) \leq 5.0$.

22. The austenitic stainless steel of claim 21, having a MD_{30} value less than -10°C.

23. The austenitic stainless steel according to claim 1, comprising, in % weight, up to 0.10 C, 2.0-8.0 Mn, up to 1.0 Si, 16.0-22.0 Cr, 1.0-5.0 Ni, 0.40-2.0 Mo, up to 1.0 Cu, 0.12-0.30 N, 0.050-0.60 W, up to 1.0 Co, up to 0.04 P, up to 0.03 S, up to 0.008 B, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20° C.

24. The austenitic stainless steel of claim 23, having a MD_{30} value less than -10°C.

25. The austenitic stainless steel of claim 24, having a PRE_W value of greater than about 22.

26. The austenitic stainless steel according to claim 1, comprising, in weight %, up to 0.08 C, 3.0-6.0 Mn, up to 1.0 Si, 17.0-21.0 Cr, 3.0-5.0 Ni, 0.50-2.0 Mo, up to 1.0 Cu, 0.14-0.30 N, up to 1.0 Co, 0.05-0.60 W, up to 0.05 P, up to 0.03 S, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20°C.

27. The austenitic stainless steel of claim 26, having a MD_{30} value less than -10°C.

28. The austenitic stainless steel of claim 27, having a PRE_W value of greater than about 22.

29. The austenitic stainless steel according to claim 1, consisting of, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 2.0 Si, 16.0-23.0 Cr, 1.0-5.0 Ni, up to 3.0 Mo, up to 3.0 Cu, 0.1-0.35 N, up to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20° C.

30. The austenitic stainless steel of claim 29, having a MD_{30} value less than -10°C.

31. The austenitic stainless steel of claim 30, having a PRE_W value of greater than about 22.

32. An article of manufacture including an austenitic stainless steel comprising, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 2.0 Si, 16.0-23.0 Cr, 1.0-5.0 Ni, up to 3.0 Mo, up to 3.0 Cu, 0.1-0.35 N, up to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20° C.

33. The article of manufacture of claim 32, wherein the austenitic stainless steel has a MD_{30} value less than -10°C.

34. The article of manufacture of claim 32, wherein the austenitic stainless steel comprises 0.40-2.0 Mo.

35. The article of manufacture of claim 32, wherein the article is adapted for use in at least one of low temperature and cryogenic environments.

36. The article of manufacture of claim 32, wherein the article is selected from the group consisting of a corrosion resistant article, a corrosion resistant architectural panel, a flexible connector, a bellows, a tube, a pipe, a chimney liner, a flue liner, a plate frame heat exchanger part, a condenser part, a part for pharmaceutical processing equipment, a sanitary part, and a part for ethanol production or processing equipment.

CLAIMS

1. An austenitic stainless steel comprising, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 0.50 Si, 16.0-23.0 Cr, 3.0-4.9 Ni, 0.40-3.0 Mo, 0.1-0.30 N, up to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number up to 10, a PRE_W value greater than 22 up to 30, and a MD_{30} value of less than 20°C.

2. The austenitic stainless steel according to claim 1, wherein: $0.5 \leq (Mo+W/2) \leq 5.0$

3. The austenitic stainless steel of claim 1, having a ferrite number greater than 0 and up to 10.

4. The austenitic stainless steel of claim 1, having a ferrite number of 3 up to 5.

5. The austenitic stainless steel of claim 1, having a MD_{30} value less than -10°C.

6. The austenitic stainless steel of claim 1, wherein the C is limited to up to 0.08.

7. The austenitic stainless steel of claim 1, wherein the Si is limited to 0.2 to 0.5.

8. The austenitic stainless steel of claim 1, wherein the Mn is limited to 2.0-8.0.

9. The austenitic stainless steel of claim 1, wherein the Mn is limited to 3.0-6.0.

10. The austenitic stainless steel of claim 1, wherein the Cr is limited to 16.0-22.0.

11. The austenitic stainless steel of claim 1, wherein the N is limited to 0.14-0.30.

12. The austenitic stainless steel of claim 1, wherein the Mo is limited to 0.40-2.0.

13. The austenitic stainless steel of claim 1, wherein the Mo is limited to 0.5-2.0.

14. The austenitic stainless steel of claim 1, wherein the B is limited to up to 0.008.

15. The austenitic stainless steel of claim 1, wherein the W is limited to 0.05-0.60.

16. The austenitic stainless steel of claim 1, wherein the Mo is limited to 0.40-2.0 and having a MD_{30} value less than -10°C.

17. The austenitic stainless steel of claim 1, wherein the Mo is limited to 0.40-2.0 and wherein $0.5 \leq (Mo+W/2) \leq 4.0$.

18. The austenitic stainless steel of claim 17, having a MD_{30} value less than -10°C.

19. The austenitic stainless steel according to claim 1, consisting of, in % weight, up to 0.10 C, 2.0-8.0 Mn, up to 0.5 Si, 16.0-22.0 Cr, 3.0-4.6 Ni, 0.40-2.0 Mo, 0.12-0.30 N, 0.050-0.60 W, up

to 1.0 Co, up to 0.04 P, up to 0.03 S, up to 0.008 B, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20°C.

20. The austenitic stainless steel of claim 19, having a MD_{30} value less than -10°C.

21. The austenitic stainless steel according to claim 1, consisting of, in weight %, up to 0.08 C, 3.0-6.0 Mn, 0.2-0.5 Si, 17.0-21.0 Cr, 3.0-4.6 Ni, 0.50-2.0 Mo, 0.14-0.30 N, up to 1.0 Co, 0.05-0.60 W, up to 0.05 P, up to 0.03 S, iron and impurities, the steel having a ferrite number of less than 10 and a MD_{30} value of less than 20°C.

22. The austenitic stainless steel of claim 21, having a MD_{30} value less than -10°C.

23. An article of manufacture including an austenitic stainless steel consisting of, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 0.50 Si, 16.0-23.0 Cr, 3.0-4.9 Ni, 0.40-3.0 Mo, 0.1-0.30 N, up to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number of less than 10, a PRE_W value greater than 22 up to 30, and a MD_{30} value of less than 20°C.

24. The article of manufacture of claim 23, wherein the austenitic stainless steel has a MD_{30} value less than -10°C.

25. The article of manufacture of claim 23, wherein in the austenitic stainless steel Mo is limited 0.40-2.0.

26. The article of manufacture of claim 23, wherein the article is adapted for use in at least one of a low temperature environment and a cryogenic environments.

27. The article of manufacture of claim 23, wherein the article is selected from the group consisting of a corrosion resistant article, a corrosion resistant architectural panel, a flexible connector, a bellows, a tube, a pipe, a chimney liner, a flue liner, a plate frame heat exchanger part, a condenser part, a part for pharmaceutical processing equipment, a sanitary part, and a part for ethanol production or processing equipment.

28. The austenitic stainless steel of claim 1, wherein the Ni is limited to 3.0-4.5.

29. The austenitic stainless steel of claim 1, wherein the W is limited to 0.01-0.60.

30. The austenitic stainless steel of claim 1, wherein the Si is limited to 0.2-0.5 and Mn is limited to 6.0-9.0.

31. The austenitic stainless steel according to claim 1, Mn is limited to 5.5-9.0 and Ni is limited to 4.0-4.9.

32. The article of manufacture of claim 23, wherein in the austenitic stainless steel Si is limited to 0.2-0.5.

33. An austenitic stainless steel consisting of, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 0.50 Si, 16.0-23.0 Cr, 1.0-3.0 Ni, up to 3.0 Mo, 0.1-0.35 N, 0.05 to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number of at least 3 up to less than 10, and a MD_{30} value less than 20°C.

34. The austenitic stainless steel according to claim 33, wherein: $0.5 \leq (Mo+W/2) \leq 5.0$.

35. The austenitic stainless steel according to claim 33, having a PRE_W value of greater than 22.

36. The austenitic stainless steel of claim 33, having a PRE_W value greater than 22 and up to 30.

37. The austenitic stainless steel of claim 33, having a ferrite number of 3 up to 5.

38. The austenitic stainless steel of claim 33, having a MD_{30} value less than -10°C.

39. The austenitic stainless steel of claim 33, wherein C is limited to up to 0.08.

40. The austenitic stainless steel of claim 33, wherein Si is limited to 0.2 to 0.50.

41. The austenitic stainless steel of claim 33, wherein Mn is limited to 2.0-8.0.

42. The austenitic stainless steel of claim 33, wherein Mn is limited to 3.0-6.0.

43. The austenitic stainless steel of claim 33, wherein Cr is limited to 16.0-22.0.

44. The austenitic stainless steel of claim 33, wherein Cr is limited to 17.0-21.0.

45. The austenitic stainless steel of claim 33, wherein Cr is limited to 17.0-20.0.

46. The austenitic stainless steel of claim 33, wherein Cr is limited to 16.0-18.0.

47. The austenitic stainless steel of claim 33, wherein N is limited to 0.1-0.30.

48. The austenitic stainless steel of claim 33, wherein N is limited to 0.14-0.30.

49. The austenitic stainless steel of claim 33, wherein Mo is limited to 0.40-3.0.

50. The austenitic stainless steel of claim 33, wherein Mo is limited to 0.5-2.0.

51. The austenitic stainless steel of claim 33, wherein B is limited to up to 0.008.

52. The austenitic stainless steel of claim 33, wherein W is limited to 0.05-0.60.

53. The austenitic stainless steel of claim 33, wherein Mo is limited to 0.40-2.0 and having a MD_{30} value less than -10°C.

54. The austenitic stainless steel of claim 33, wherein Mo is limited to 0.40-2.0 and wherein 0.5 $\leq$(Mo+W/2) $\leq$4.0.

55. The austenitic stainless steel of claim 51, having a MD_{30} value less than -10°C.

56. The austenitic stainless steel according to claim 33, consisting of, in % weight, up to 0.10 C, 2.0-8.0 Mn, up to 0.50 Si, 16.0-22.0 Cr, 1.0-3.0 Ni, 0.40-2.0 Mo, 0.12-0.30 N, 0.050-0.60 W, up to 1.0 Co, up to 0.008 B, iron and impurities comprising up to 0.04 P and up to 0.03 S, the steel having a ferrite number of at least 3 up to less than 10 and a MD_{30} value less than 20°C.

57. The austenitic stainless steel of claim 56, having a MD_{30} value less than -10°C.

58. The austenitic stainless steel of claim 56, having a PRE_W value greater than 22 up to 30.

59. The austenitic stainless steel according to claim 33, consisting of, in % weight, up to 0.08 C, 3.0-6.0 Mn, up to 0.5 Si, 17.0-21.0 Cr, 1.0-3.0 Ni, 0.50-2.0 Mo, 0.14-0.30 N, up to 1.0 Co, 0.05-0.60 W, iron and impurities comprising up to 0.05 P and up to 0.03 S, the steel having a ferrite number of at least 3 up to less than 10 and a MD_{30} value of less than 20°C.

60. The austenitic stainless steel of claim 59 having a MD_{30} value less than -10°C.

61. The austenitic stainless steel of claim 59, having a PRE_W value greater than 22 and up to 30.

62. An austenitic stainless steel consisting of, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 0.50 Si, 16.0-23.0 Cr, 1.0-3.0 Ni, 0.40-3.0 Mo, 0.1-0.30 N, 0.05 to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number at least 3 up to 10, a PRE_W value greater than 22 up to 30, and a MD_{30} value of less than 20°C.

63. The austenitic stainless steel of claim 62, wherein Mo is limited to 0.40-2.0 and wherein 0.5 $\leq$(Mo+W/2) $\leq$4.0.

64. The austenitic stainless steel of claim 62, wherein the Si is limited to 0.2-0.5 and Mn is limited to 6.0-9.0.

65. An article of manufacture including an austenitic stainless steel consisting of, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 0.50 Si, 16.0-23.0 Cr, 1.0-3.0 Ni, up to 3.0 Mo, 0.1-0.35 N, 0.05 to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number of at least 3 up to less than 10, and a MD_{30} value less than 20°C.

66. The article of manufacture of claim 65, wherein the austenitic stainless steel has a MD_{30} value less than -10°C.

67. The article of manufacture of claim 65, wherein in the austenitic stainless steel Mo is limited to 0.40-2.0 Mo.

68. The article of manufacture of claim 65, wherein the article is adapted for use in at least one

of a low temperature environment and a cryogenic environment.

69. The article of manufacture of claim 65, wherein the article is selected from the group consisting of a corrosion resistant article, a corrosion resistant architectural panel, a flexible connector, a bellows, a tube, a pipe, a chimney liner, a flue liner, a plate frame heat exchanger part, a condenser part, a part for pharmaceutical processing equipment, a sanitary part, and a part for ethanol production or processing equipment.

70. The article of manufacture of claim 66 including an austenitic stainless steel consisting of, in % weight, up to 0.20 C, 2.0-9.0 Mn, up to 0.50 Si, 16.0-23.0 Cr, 1.0-3.0 Ni, 0.40-3.0 Mo, 0.1-0.30 N, 0.05 to 4.0 W, up to 0.01 B, up to 1.0 Co, iron and impurities, the steel having a ferrite number at least 3 up to 10, a PRE_W value greater than 22 up to 30, and a MD_{30} value of less than 20°C.

71. An austenitic stainless steel consisting of, in % weight,
up to 0.20 C,
2.0-9.0 Mn,
up to 1.0 Si,
16.0-23.0 Cr,
1.0-3.0 Ni,
up to 3.0 Mo,
0.1-0.35 N,
0.05 to 4.0 W,
up to 0.01 B,
up to 1.0 Co,
iron and
impurities,
the steel having a ferrite number of at least 3 up to less than 10, and a MD_{30} value less than 20°C.

72. The austenitic stainless steel according to claim 71, wherein:
$0.5 \leq (Mo + W/2) \leq 5.0$.

73. The austenitic stainless steel according to claim 71, having a PRE_W value of greater than 22.

74. The austenitic stainless steel of claim 71, having a PRE_W value greater than 22 and up to 30.

75. The austenitic stainless steel of claim 71, having a ferrite number of 3 up to 5.

76. The austenitic stainless steel of claim 71, having a MD_{30} value less than -10°C.

77. The austenitic stainless steel of claim 71, wherein C is limited to up to 0.08.

78. The austenitic stainless steel of claim 71, wherein Mn is limited to 2.0-8.0.

79. The austenitic stainless steel of claim 71, wherein Mn is limited to 3.0-6.0.

80. The austenitic stainless steel of claim 71, wherein Cr is limited to 16.0-22.0.

81. The austenitic stainless steel of claim 71, wherein Cr is limited to 17.0-21.0.

82. The austenitic stainless steel of claim 71, wherein Cr is limited to 17.0-20.0.

83. The austenitic stainless steel of claim 71, wherein Cr is limited to 16.0-18.0.

84. The austenitic stainless steel of claim 71, wherein N is limited to 0.1-0.30.

85. The austenitic stainless steel of claim 71, wherein N is limited to 0.14-0.30.

86. The austenitic stainless steel of claim 71, wherein Mo is limited to 0.40-3.0.

87. The austenitic stainless steel of claim 71, wherein Mo is limited to 0.5-2.0.

88. The austenitic stainless steel of claim 71, wherein B is limited to up to 0.008.

89. The austenitic stainless steel of claim 71, wherein W is limited to 0.05-0.60.

90. The austenitic stainless steel of claim 71, wherein Mo is limited to 0.40-2.0 and having a MD_{30} value less than -10°C.

91. The austenitic stainless steel of claim 71, wherein Mo is limited to 0.40-2.0 and wherein $0.5 \leq (Mo + W/2) \leq 4.0$.

92. The austenitic stainless steel of claim 91, having a MD_{30} value less than -10°C.

93. An austenitic stainless steel consisting of, in % weight,
up to 0.20 C,
2.0-9.0 Mn,
up to 1.0 Si,
16.0-23.0 Cr,
1.0-3.0 Ni,
0.40-3.0 Mo,
0.1-0.30 N,
0.05 to 4.0 W,
up to 0.01 B,
up to 1.0 Co,
iron and
impurities,
the steel having a ferrite number at least 3 up to 10, a PRE_W value greater than 22 up to 30, and a MD_{30} value of less than 20°C.

94. The austenitic stainless steel of claim 93, wherein Mo is limited to 0.40-2.0 and wherein $0.5 \leq (Mo + W/2) \leq 4.0$.

95. The austenitic stainless steel of claim 93, wherein Mn is limited to 6.0-9.0.

96. An article of manufacture including an austenitic stainless steel consisting of, in % weight,

up to 0.20 C,
2.0-9.0 Mn,
up to 1.0 Si,
16.0-23.0 Cr,
1.0-3.0 Ni,
up to 3.0 Mo,
0.1-0.35 N,
0.05 to 4.0 W,
up to 0.01 B,
up to 1.0 Co,
iron and
impurities, the steel having a ferrite number of at least 3 up to less than 10, and a MD_{30} value less than 20°C.

97. The article of manufacture of claim 96, wherein the austenitic stainless steel has a MD_{30} value less than -10°C.

98. The article of manufacture of claim 96, wherein in the austenitic stainless steel Mo is limited to 0.40-2.0 Mo.

99. The article of manufacture of claim 96, wherein the article is adapted for use in at least one of a low temperature environment and a cryogenic environment.

100. The article of manufacture of claim 96, wherein the article is selected from the group consisting of a corrosion resistant article, a corrosion resistant architectural panel, a flexible connector, a bellows, a tube, a pipe, a chimney liner, a flue liner, a plate frame heat exchanger part, a condenser part, a part for pharmaceutical processing equipment, a sanitary part, and a part for ethanol production or processing equipment.